Models 5010-GPSII
& 5010-GPSII-VITC
GPS Timecode Master

Instruction Manual

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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	July 98
	Manual Change Sheet 1.0-1	Aug 99
	Manual Change Sheet 1.0-2	Aug 99
1.1	Manual change sheets 1.0-1 and 1.0-2 incorporated Support for Accutime 2000 New hardware version with 7700STM circuit card – new rear panel layout	Mar 01
1.2	Jumper drawings for 7700STM circuit card added Default position of JP5 corrected	May 01
1.2.1	Minor Typographical changes made to chapter 3 and 4	Jun 01
1.2.2	Corrected cable drawings in Upgrading Firmware section	Apr 02
1.2.3	Added info for firmware version 050215 - allows change to DST at a user specified time (DSTT register)	Feb 05

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1. INTRODUCTION

The model 5010-GPS II Time Code Master is a full function time code reader/generator system that interfaces to a GPS receiver, allowing the generator time to be precisely synchronized to a world wide time standard known as the Global Positioning system. The model 5010-GPS II Time Code Master is available in two versions. The basic 5010-GPS II 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-GPS II VITC adds Vertical Interval Time Code (VITC) reading and generating capabilities to the basic 5010-GPS II. 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-GPS II'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.

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.

The 5010-GPS II is supplied with a Trimble ACCUTIME II or ACCUTIME 2000 GPS Smart Antenna that houses the GPS receiver, antenna, power supply and other support circuitry in a sealed, shielded, self-contained unit with a digital interface to the 5010-GPS II. Earlier models (referred to as 5010-GPS and 5010-GPS-VITC) were supplied with the Trimble ACCUTIME GPS receiver. When the 5010-GPS II is operated in the GPS TIME/DATE mode, the generator is synchronized to the GPS time reference being received from the smart antenna. When the GPS based time is within 0.5 seconds of the 5010-GPS II's UTC time clock, the generator will continue to increment normally. If for any reason the offset between the 5010-GPS II' UTC time clock and the GPS based time is greater than 0.5 seconds, the generator will resynchronize to the GPS based time. In addition, the 5010-GPS II can be set to resynchronize once per day at a user specified time, or on demand so that the optimal time accuracy is continuously maintained, at the same time minimizing the potential for code disturbances during resynchronization. The 5010's UTC time clock will normally be within +/- 1 colour frame of the GPS based time. A manual time/date mode operates the same as the GPS time/date mode, except that UTC time clock and date may be set from the front panel. This mode is useful where a GPS time reference is not available.

The 5010-GPS II 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 savings' 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 one of the time/date modes, the date information will be encoded into the user bits in one of three formats. 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-GPS II 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-GPS II-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 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-GPS II 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-GPS II 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-GPS II to be conveniently configured for particular customer requirements.

The 5010-GPS 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.

1.1. THE GLOBAL POSITIONING SYSTEM – OVERVIEW

The Global Positioning System (GPS) is a satellite based navigation system operated and maintained by the U.S. Department of Defense. When fully implemented, the GPS will consist of 24 satellites providing worldwide 24 hour, coverage. Originally conceived for military needs, the GPS has a broad array of civilian applications including timing, surveying, marine, land aviation and vehicle navigation. GPS, the most accurate technology available for marine and land navigation is emerging as the technology of choice in timing applications including site and network synchronization.

As a satellite system, the GPS is immune from the limitations of land based systems previously available. By computing the distance to GPS satellites orbiting the earth, a GPS receiver can calculate an accurate position. This process is called satellite ranging. A two-dimensional position calculation requires three satellite ranges. A three-dimensional position calculation, including altitude requires four satellite ranges. GPS receivers can also provide precise time, speed, and course measurements.

1.2. HOW TO USE THIS MANUAL

This manual is organized into 4 chapters: Introduction, Installation, Operation, 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-GPS II-VITC unit. These sections are noted clearly. Throughout the remainder of the manual references to the model 5010-GPS II are applicable to both versions of the unit. Earlier versions of the 5010-GPS II known as 5010-GPS are identical in operation except that they were provided with the ACCUTIME antenna are referred to in the installation section for backwards compatibility. All operational features of the two versions are identical if they are fitted with the latest firmware version.

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

1.3. 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-GPS II.

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

Figures

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2. INSTALLATION

2.1. REAR PANEL CONNECTIONS

There are two different versions of the 5010-GPS II 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 operation of the two versions is similar except where specifically noted in chapter 3.

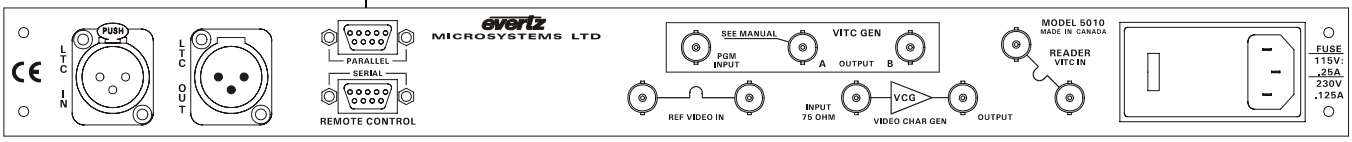


Figure 2-1: Rear Panel Layout – 5010-GPS and Earlier versions or 5010-GPS II

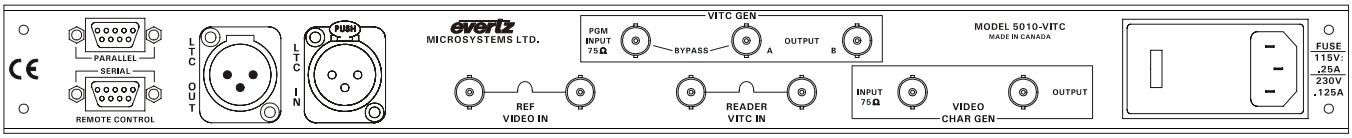


Figure 2-2: Rear Panel Layout – Later Versions of 5010-GPS II

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

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 (model 5010-GPS II-VITC only)

READER VITC IN: A BNC loop used to input video containing vertical interval time code for the VITC reader (model 5010-GPS II-VITC only).

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.

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-GPS II's generator.

2.1.5. Remote Control Connections

PARALLEL: A 9 pin female 'D' connector used for parallel remote control inputs.

SERIAL: A 9 pin female 'D' connector used for connection to the GPS antenna. (See section 2.6 for information about installing the GPS antenna).

2.1.6. Power Connections

LINE: The model 5010-GPS II 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-GPS II 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. (See section 2.6 for information about mounting the GPS antenna).

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.

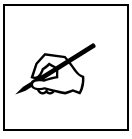
The power entry module combines a standard IEC 320 power inlet connector, voltage selector switch, two 5 x 20 mm fuse holders (one active, one spare) and an EMI line filter.

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

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. 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.

2.4.3. VITC Generator Video In/Out (model 5010-GPS II-VITC 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.

2.4.4. VITC Reader Video Input (model 5010-GPS II-VITC 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. GPS ANTENNA INSTALLATION

The earlier 5010-GPS units were designed to work with the Trimble Accutime I Smart Antenna that can be located up to 100 feet from the 5010-GPS unit. The 5010-GPS II units are designed to work with the Trimble Accutime II or Accutime 2000 Smart Antenna that can be located up to 1000 feet from the 5010-GPS II unit. Operation of the units is identical; it is only the hardware interface between the unit and the Smart Antenna that is different.

The Smart Antenna houses the GPS receiver, antenna, power supply and other support circuitry in a sealed, shielded, self-contained unit with a digital interface to the main unit. The GPS Smart Antenna also receives power from the main unit through the connection cable.

Installation of both types of antennas is similar except that they use different cables and are included for backward compatibility. Section 2.6.2 gives information on installing the 5010-GPS with the Accutime 1 antenna. Section 2.6.3 gives information on installing the 5010-GPS II with the Accutime II or Accutime 2000 antenna. Sections 2.6.1 and 2.6.4 are common to both systems.

Accutime I Smart Antennas can not be connected to the newer 5010-GPS II units, and Accutime II and Accutime 2000 Smart Antennas can not be connected to the original 5010-GPS units.

2.6.1. Mounting the GPS Smart Antenna

The smart antenna's enclosure is completely waterproof and is designed for outdoor installation. It is protected against jamming signals and thus is suitable for reliable operation in most environments. Select an outdoor location for the antenna, like the roof of your building that has a relatively unobstructed view of the sky. Dense wood and concrete or metal structures will shield the antenna from satellite signals. The antenna can receive satellite signals through glass, canvas and thin fiberglass; thus it may be mounted inside a skylight, if an outdoor location is not possible.

The smart antenna is an active-head antenna. For optimal performance, locate the smart antenna as far as possible from transmitting antennas, including radar, satellite communication equipment and cellular transmitters. When locating the antenna near a radar installation, ensure that the antenna is positioned outside of the radar's cone of transmission. Follow the same guidelines when installing the antenna near satellite communication equipment. For best results, mount the antenna at least ten feet away from satellite communication equipment. Do not mount the antenna near high vibration areas such as fan or motor housings, or near sources of heat such as exhaust stacks.

Consider the length of the cable run when selecting the location. A 50 foot cable is supplied; however, longer cables are available on special order from the factory. You may also wire a straight-through extender cable to extend the able distance up to 200 feet. The smart antenna is designed for a pole mount with a 1" - 14 straight thread, which is a common marine antenna mount. For stationary installations a 3/4" pipe thread can be used, but a 1"-14 straight thread is recommended. Pole mounting is illustrated in Figure 2-3.

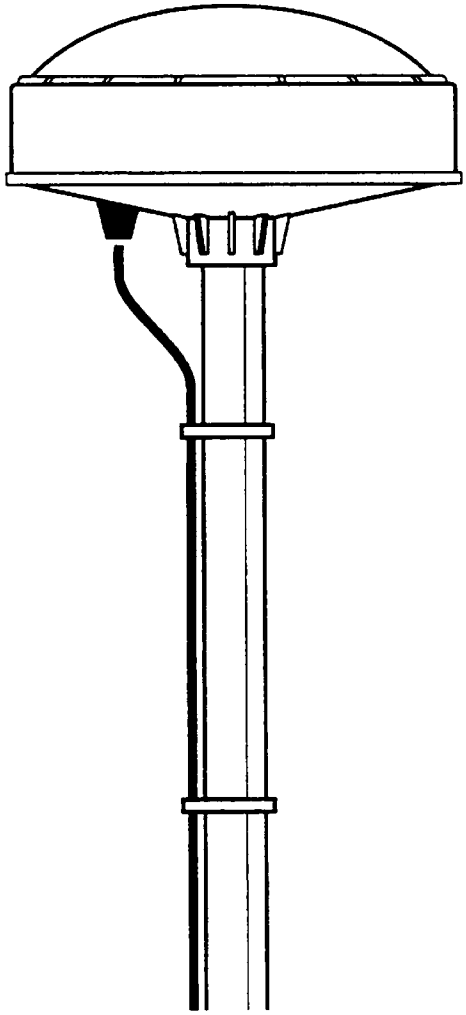


Figure 2-3: Pole Mounting the Smart Antenna

Secure the mounting pole to a solid structure so that it is oriented vertically. Thread the smart antenna onto the pole or pile and hand tighten until snug.

CAUTION: Over-tightening the smart antenna on the pole or using a tool could damage the threaded socket in the base of the antenna. In addition, do not use thread-locking compounds, since they can corrode plastic.

2.6.2. Connecting the Accutime I Antenna to the 5010-GPS

A standard 50 foot long interface cable (Evertz part WA-P20) is provided with the 5010-GPS and the Accutime I smart antenna. One end of this cable is fitted with a weather-tight 7 pin Molex connector. The other end is fitted with a 9 pin male subminiature D connector and should be connected to the SERIAL I/O connector on the rear panel of the 5010-GPS. The pin out of the cable is shown in Figure 2-6. If you require a longer cable, a 100 foot cable may be ordered from the factory (Evertz part WA-P21). Alternately, you can wire a 9 pin Extender cable as shown in Figure 2-7.

Connect the interface cable to the smart antenna. The connector on the interface connector has a locking ring for securing the connection.

CAUTION: Overtightening the locking ring can damage the connector on the smart antenna

Route the interface cable to the location of the 5010-GPS unit using the most direct path. Avoid routing the cable near hot surfaces, sharp or abrasive surfaces, or corrosive fluids or gases. Avoid sharp kinks or bends in the cable. Additional protection such as heat shrink tubing may be required to protect the cable jacket at points where the cable enters the building, especially if the opening is rough or sharp. Once the cable is run, use cable-ties to secure the cable to the pole and to provide strain relief for the connections. When securing the cable, start at the antenna and work towards the 5010-GPS unit.

Before connecting the cable to the 5010-GPS make sure that the jumpers are set correctly inside the 5010-GPS. Improper configuration of the jumpers may cause damage to the smart antenna.

Power is provided from the 5010-GPS along the interface cable to the smart antenna. Jumpers JP5 and JP12 located near the Serial I/O D connector on the main circuit card of the 5010-GPS must be in the correct position in order to provide power to the antenna. Your 5010-GPS should have been preset at the factory to this configuration but it is wise to remove the top cover of the unit and verify the correct orientation of this jumper before proceeding. See figures 4-6 to 4-8 for the default position of jumpers JP5 and JP12 for various versions of the main circuit board of the 5010-GPS.

Trimble Accutime I Antenna Mini-Con-X #7-281-7PG-3ES (female)		Evertz 5010-GPS 9 pin "D" style (male)
Receive Port (R+)	1 ---------- 7	TX B +
Transmit Port (T-)	2 ---------- 8	RX A -
Transmit Port (T+)	3 ---------- 3	RX B +
Receive Port (R-)	4 ---------- 2	TX A -
Timing pulse 1pps	5 ---------- 4	1 PPS interrupt in
DC Ground	6 ---------- 6	Frame Ground
DC Power IN	7 ---------- 5	+12 V DC Unreg.
	---------- Drain Wire	Shield

Figure 2-4: Accutime I Antenna to 5010-GPS Interface Cable

9 pin "D" style (female) Pin	Pair #	9 pin "D" style (male) Pin	Description
7 ----------	1 ----------	7	TX B +
2 ----------	1 ----------	2	TX A -
8 ----------	2 ----------	8	RX A -
3 ----------	2 ----------	3	RX B +
4 ----------	3 ----------	4	1 PPS interrupt in
6 ----------	4 ----------	6	Frame Ground
5 ----------	4 ----------	5	+12 V DC Unreg.
---------- Drain Wire ----------			Shield

Figure 2-5: Accutime I Antenna Extender Cable

2.6.3. Connecting the Accutime II or Accutime 2000 Antenna to the 5010-GPS II

A standard 50 foot long interface cable (Evertz part WA-T09) is provided with the 5010-GPS II and the smart antenna. One end of this cable is fitted with a weather-tight 12 pin Molex connector. The other end is fitted with a 9 pin male subminiature D connector and should be connected to the SERIAL I/O connector on the rear panel of the 5010-GPS II. The pin out of the cable is shown in Figure 2-6. If you require a longer cable, a 100 foot (Evertz part WA-T76) or 400 foot cable (Evertz part WA-T11) may be ordered from the factory. Custom length weatherproof cables can also be special ordered. Alternately, you can wire a 9 pin Extender cable as shown in Figure 2-7.

Connect the interface cable to the smart antenna. The connector on the interface connector has a locking ring for securing the connection.

CAUTION: Overtightening the locking ring can damage the connector on the smart antenna

Route the interface cable to the location of the 5010-GPS II unit using the most direct path. Avoid routing the cable near hot surfaces, sharp or abrasive surfaces, or corrosive fluids or gases. Avoid sharp kinks or bends in the cable. Additional protection such as heat shrink tubing may be required to protect the cable jacket at points where the cable enters the building, especially if the opening is rough or sharp. Once the cable is run, use cable-ties to secure the cable to the pole and to provide strain relief for the connections. When securing the cable, start at the antenna and work towards the 5010-GPS II unit.

Before connecting the cable to the 5010-GPS II make sure that the jumpers are set correctly inside the 5010-GPS II. Improper configuration of the jumpers may cause damage to the smart antenna.

Power is provided from the 5010-GPS II along the interface cable to the smart antenna. Jumper JP5 located near the Serial I/O D connector on the main circuit card of the 5010 must be in the right most position (labeled 422) in order to provide power to the antenna. Your 5010-GPS II should have been preset at the factory to this configuration but it is wise to remove the top cover of the unit and verify the correct orientation of this jumper before proceeding. See section 4.4 for the location of jumper JP5 for various revisions of the main circuit board.

Trimble antenna Mini-Con 12 pin (female)		**Evertz 5010-GPS II 9 pin "D" style (male)**
DC Ground	9 ----------1	Frame Ground
Receive Port (R-)	2 ----------2	TX A -
Transmit Port (T+)	5 ----------3	RX B +
Timing pulse 1pps	11----------4	1 PPS interrupt in +
DC Power IN	1 ----------5	+12 V DC Unreg.
Timing pulse 1pps	12----------6	1 PPS interrupt in -
Receive Port (R+)	3 ----------7	TX B +
Transmit Port (T-)	4 ----------8	RX A -
	---------- Drain Wire	Shield

Figure 2-6: Accutime II or Accutime 2000 to 5010-GPS II Interface Cable (Evertz part WA-T09)

9 pin "D" style (female) Pin	Pair #	9 pin "D" style (male) Pin	Description
7	1	7	TX B +
2	1	2	TX A -
8	2	8	RX A -
3	2	3	RX B +
4	3	4	1 PPS +
6	3	6	1 PPS -
5	4	5	+12 V DC Unreg.
1	4	1	Ground.
	Drain Wire		Shield

Figure 2-7: Accutime II or Accutime 2000 Extender Cable

2.6.4. System Startup

At power up, the smart antenna will automatically begin to acquire and track the GPS satellite signals. From a cold start, the smart antenna will normally take from 2 to 5 minutes to lock on to sufficient satellites to accurately determine the time. During this time the GPS STATUS display on the 5010-GPS II front panel will show the various stages of initialization. For complete information on configuring the 5010-GPS II to operate with the Smart antenna see section 3.9 of this manual

2.7. REMOTE CONTROL CONNECTOR PIN ASSIGNMENTS

2.7.1. 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-GPS II 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		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

2.7.2. Serial Remote Control

The 5010-GPS II is fitted with a nine pin subminiature 'D' connector labeled Serial I/O. This port is configured at the factory for connection to the GPS Smart Antenna. (For operation with the GPS antenna, see section 2.6.2 and 2.6.3.) This port can also be configured as an RS-232 port to upgrade the firmware in the unit.

Jumpers inside the 5010-GPS II must be changed from the factory default position before connecting it to a computer RS-232 communications port. See section 4.4

The SERIAL I/O port has the following pinout when the unit is configured for connection to the GPS antenna. See section 4.4 for the pinout when the port is configured for firmware upgrades.

Pin	Name	Description
5	15VDC	+15VDC to GPS Antenna
9	FG	Frame Ground
4	1 Hz	GPS 1 Hz + Input
8	RA	Receive "A"
3	RB	Receive "B"
7	TB	Transmit "B"
2	TA	Transmit "A"
6	1 Hz -	GPS 1 Hz - Input
1	FG	Frame ground

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Figures

3. OPERATING INSTRUCTIONS

The model 5010-GPS II Timecode Master combines the latest LSI technology with sophisticated microcontroller firmware to provide a powerful, flexible time code system. The model 5010-GPS II is available in two versions. The basic model 5010-GPS II 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. It may be operated as a conventional time code generator or its generator may be locked to a GPS based time source to give the generator a precision time reference. The model 5010-GPS II-VITC adds Vertical Interval Time Code (VITC) reading and generating capabilities to the basic 5010-GPS II. 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-GPS II-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-GPS II 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.

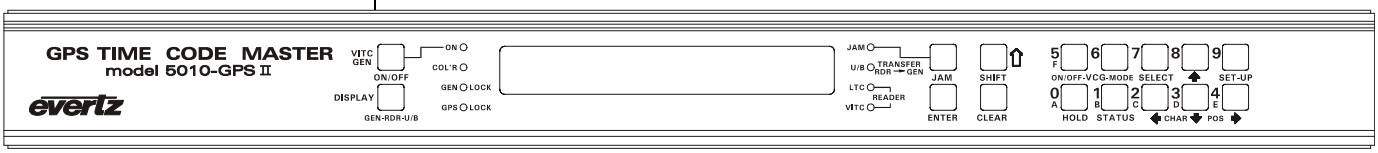


Figure 3-1: Front Panel Layout

3.1.1. Overview of the Pushbuttons

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

VITC GEN ON/OFF Is used to turn the VITC generator on and off. (Model 5010-GPS II-VITC 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-GPS II 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-GPS II. 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-GPS II 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-GPS II-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.

GEN LOCK Indicates that the 5010-GPS II is properly genlocked to a video reference. The VIDEO TYPE setting on the Engineering Setup menu is used to select the video type. If the LED is blinking, it indicates that a valid video reference of the selected type is not present.

GPS LOCK Indicates that the 5010-GPS II generator time and date is locked to the GPS reference time being received from the antenna. The generator will be locked to within 1 colour frame of the GPS time.

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-GPS II-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.

When the generator is in the GPS Time operating mode three additional front panel displays are available

- `UTC` Universal Coordinated Time (adjusted GPS receiver time)
- `UDC` Universal Coordinated Date (adjusted GPS receiver date)
- `GPS STATS` Status information from the GPS receiver

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
GPS@	Time at which GPS resync 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 Savings time begins
DSTEND	Date on which Daylight Savings time ends

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 the TIME DATE or GPD TIME DATE mode, the following special indicators are used between the hours and minutes digits of the front panel time display to identify daylight savings or standard time

Standard Time	**Colon (:)**
Daylight Savings 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 the TIME DATE or GPS 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 savings or standard time

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

3.3.4. Field Identification

When displaying time from the VITC generator or reader, (model 5010-GPS II-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-GPS II lies in the powerful on screen programming menu system that uses the built in character generator. This method of configuring the model 5010-GPS II 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.

GENERATOR
- **GEN MODE**
  - TIME USERBITS
  - TIME DATA
  - TIME RDR TIME
  - TIME RDR UB
  - TIME DATE
  - GPS TIME DATE
- **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 3-2: On Screen Programming Menu Overview

The 5010-GPS II 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 3-3 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.

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

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 3-3: 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-GPS II, 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 3-4 is an overview of the Engineering Setup menu and shows all the menu choices and where you will find the menu items. Figure 3-5 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.

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.

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
- **GPO1 ASSIGN**
  - GEN TIME EVENT
  - RDR TIME EVENT
  - 1 PULSE/SEC
  - 1 PULSE/MIN
  - REF FAIL ALARM
  - GPS FAIL ALARM
- **GPO2 ASSIGN**
  - GEN TIME EVENT
  - RDR TIME EVENT
  - 1 PULSE/SEC
  - 1 PULSE/MIN
  - REF FAIL ALARM
  - GPS 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 3-4: 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

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

GPO2 ASSIGNMENT
- Gpo2 gen event
- Gpo2 rdr event
- Gpo2 1 pulse/sec
- Gpo2 1 pulse/min
- Gpo2 ref failure
- Gpo2 gps 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 3-5: Engineering Toolbox Front Panel Menus

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

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 3-6 shows the items on the GENERATOR drop down menu. The following descriptions appear in the order they appear on the menu.

GENERATOR	
GEN MODE	
TIME	USERBITS
TIME	DATA
TIME	RDR TIME
TIME	RDR UB
TIME	DATE
GPS TIME	DATE
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	

Figure 3-6: GENERATOR Drop Down Menu

3.5.1. Configuring the Generator Operating Modes

GEN MODE	
TIME	USER
TIME	DATA
TIME	RDRTIME
TIME	RDR UB
TIME	DATE
GPS TIME	DATE

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-GPS II is not in the Jam sync mode, the generator Time bits contain time information entered from the front panel. When the 5010-GPS II 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 3.9)

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 3.9)

TIME DATE configures the user bits for entry of date information from the front panel. The internal time clock of the 5010-GPS II 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.

GPS TIME DATE configures the 5010-GPS II to slave its internal time clock to the time information being received from the GPS antenna. The serial port is automatically set to communicate with the GPS Smart Antenna. The internal time clock of the 5010-GPS II 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. See section 3.9 for a complete description of GPS based operation.

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 dddddd 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 or GPS 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 savings time adjustment if daylight savings time is in effect. See section 3.5.7 for a discussion of daylight savings time features of the 5010-GPS II.

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-GPS II 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 or GPS 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-GPS II will only allow valid time zone offsets to be selected. If daylight savings time is observed in your area, then you should enter the time zone offset for standard time. You can set up the daylight savings time adjustment using the procedure outlined in section 3.5.7.

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 (you can program the DST start time using the *DSTB* register):

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 (you can program the DST end time using the *DSTE* register):

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-GPS has four registers to allow the user to set the beginning and ending DST rules. The 5010-GPS makes the following assumptions about DST:

The time advances by 1 hour for DST
For firmware previous to version 050215, the 5010-GPS assumes that DST changeovers occur at 02:00:00 (2 o'clock AM) on Sunday morning. Firmware starting with 050215 allows the user to set the time on Sunday that the DST changeover occurs

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 and the DSTB and DSTE register allows the user to set the time on that day when the changeover to DST occurs.

When the local time is later than the time in the DSTB register (standard time) on the Sunday set in the DSTBEG register and earlier than the time in the DSTE register (daylight time) on the Sunday set in the DSTEND register, the 5010-GPS will automatically add one additional hour to the time. This adjustment to the time is only made when the GEN TIME ADJUST menu item is set to *Local Time.* To disable automatic changeovers to DST set the DSTBEG and DSTEND registers to the same week. For firmware versions previous to 050215, the DSTB and DSTE registers are not available and the changeover time is always 02:00:00:00.

If DST changeovers occur on other days then the user will have to disable automatic 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 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.

To access the DSTB and DSTE registers press the **SHIFT+DISPLAY** buttons one or more times until the display prompt is `DSTB` or `DSTE`. The **ENTER** and **CLEAR** keys are used in conjunction with the numeric keys to enter the time into these registers. Use the procedure outlined in section 3.5.4 to enter the time.

When the 5010-GPS II 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 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-GPS II 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 3.5.14 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. (model 5010-GPS II-VITC 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 (model 5010-GPS II-VITC 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-GPS II 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-GPS II is operating in the GPS TIME DATE mode in the NTSC video standard, it will automatically switch 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-GPS II 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-GPS II 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 3.8.1.) The **COLOUR FRAME** item on the GENERATOR menu is used to select whether the 5010-GPS II 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-GPS II 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

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

NO CODE JAM
RUN
HOLD
MUTE

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

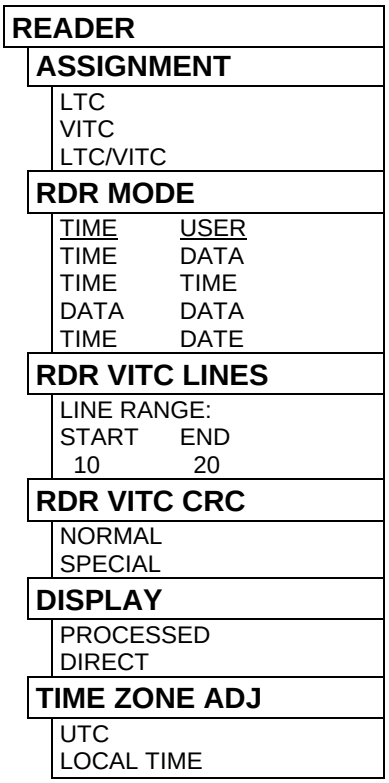
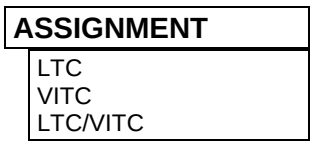


Figure 3-7: READER Drop Down Menu

3.6.1. Selecting the Reader Hardware Configuration



The **ASSIGNMENT** menu is used to select how the reader hardware is configured. The model 5010-GPS II has only an LTC reader so it's reader configuration is fixed at LTC. The model 5010-GPS II-VITC 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-GPS II-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 (model 5010-GPS II-VITC 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*** 4025 Film Footage Encoder.

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

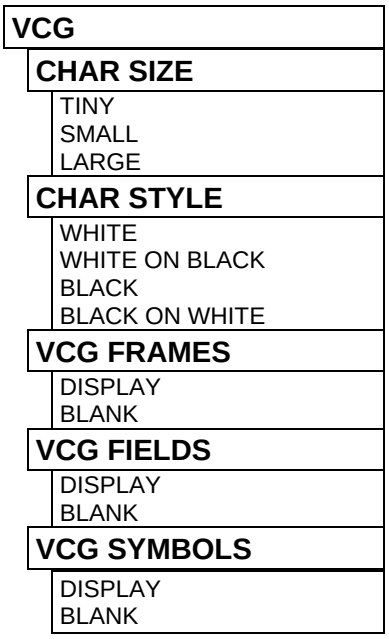
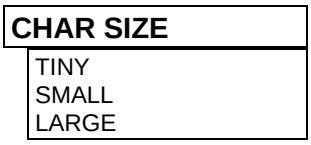


Figure 3-8: VCG Drop Down Menu

The VCG drop down menu is used to select various characteristics of the VCG display. Figure 3-8 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

CHAR STYLE
WHITE
WHITE ON BLACK
BLACK
BLACK ON WHITE

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.

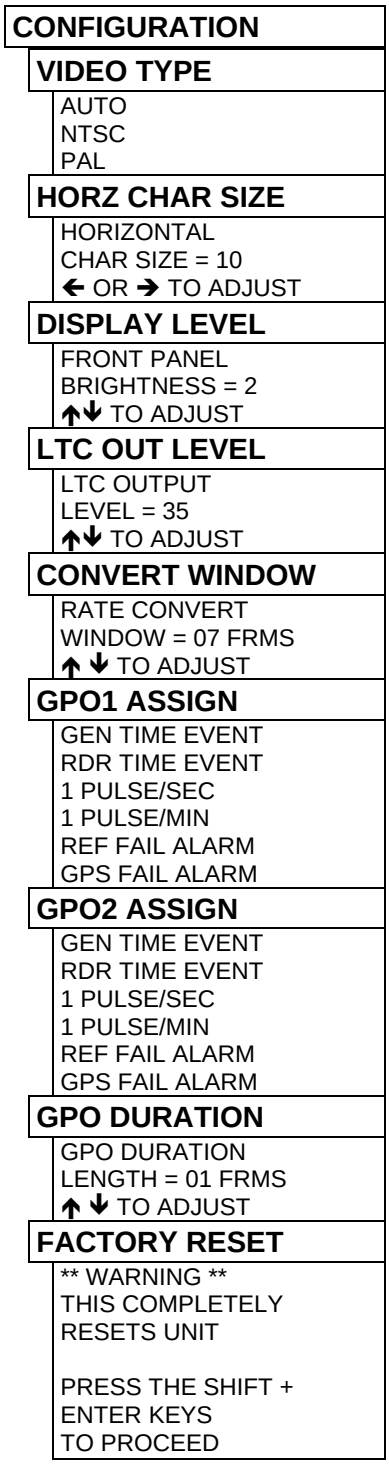


Figure 3-9: CONFIGURATION Drop Down Menu

3.8.1. Selecting the Video Standard

VIDEO TYPE
AUTO
NTSC
PAL

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-GPS II 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
GPS FAIL ALARM

The 5010-GPS 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-GPS II 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.

GPS FAIL ALARM The output will activate when communications to the GPS Receiver 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-GPS II 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-GPS II to the factory default parameters. Press the **SHIFT + ENTER** keys when the sub menu screen is displayed to reset the 5010-GPS II to factory defaults. The 5010-GPS II will perform a power-on configuration before returning to the normal operating mode.

3.9. GLOBAL POSITION SYSTEM OPERATION

The 5010-GPS II is supplied with a Trimble Accutime II or Accutime 2000 GPS Smart Antenna that houses the GPS receiver, antenna, power supply and other support circuitry in a sealed, shielded, self-contained unit with a digital interface to the 5010-GPS II. See section 2.6 for information on mounting the antenna and connecting it to the 5010-GPS II.

3.9.1. Setting the GPS Time Reference Mode

To operate the 5010-GPS II in its GPS based time mode select the **GPS TIME DATE** mode from the **GENERATOR MODE MENU.** (See section 3.5.1 for information about setting the **GENERATOR MODE)**

When the 5010-GPS II is operating in the NTSC video standard, it will automatically switch to the Drop Frame mode so that it's time base is as close as possible to real time.

The front panel display will show a sequence of messages, indicating the status of the GPS receiver. The most common messages you will see are:

`GPS STS:  NO FIX`	indicates no satellite position fixes yet
`GPS STS:  NO SATS`	indicates no usable satellites yet
`GPS STS: 1 SV FIX`	1 satellite vector fixed
`GPS STS: 2 SV FIX`	2 satellite vectors fixed
`GPS STS:  FIXING`	obtaining 2 dimensional position fix
`GPS STS: GET TIME`	getting time from receiver
`GPS STS: GET PPS`	getting timing pulses from receiver

While this message is being shown, the 5010-GPS II is acquiring the time and date information and synchronizing its internal UTC clock to the receiver time and timing pulses. Once stable timing pulses are detected from the antenna, the **JAM** LED will come on, indicating that synchronization is occurring. Once the synchronization is complete, the **JAM** indicator will go off, and the **GPS LOCK** indicator will go on. After synchronization has been achieved, the 5010-GPS II's colour framing circuitry will adjust the time code so that it is on a valid colour frame sequence. The 5010-GPS II's UTC time clock will normally be within +/- 1 colour frame of the GPS based time. The front panel GPS status message will show

`GPS STS:  xx SATS`	xx indicates the number of visible sattelites

This message is available any time that the antenna is connected and the 5010-GPS II is in the **GPS TIME DATE** mode. Press the **DISPLAY** key to display other front panel messages.

If the antenna is not connected, the front panel will show the message:

```
NO GPS ANTENNA
```

If the antenna is not responding properly, the front panel will show the message:

```
ANTENNA ERROR 01
```

If this occurs, check the installation procedure outlined in section 2.6 of this manual.

3.9.2. Viewing the GPS Receiver Status

When viewing the status screen (**STATUS** button) 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-GPS II synchronized to the GPS Receiver and other information pertaining to the GPS operation.

3.9.3. Displaying the Receiver's UTC Time

When the 5010-GPS II is receiving valid time information from the smart antenna, two additional front panel displays are available. To access them press the **DISPLAY** button one or more times until the desired message is visible.

UTC Universal Coordinated Time (adjusted GPS receiver time)
UDC Universal Coordinated Date (adjusted GPS receiver date)

3.9.4. Controlling the Synchronization Accuracy to the GPS Based Time

When the 5010-GPS II is operated in the **GPS TIME DATE** mode, the generator is synchronized to the GPS time reference being received from the smart antenna. During normal operation, the 5010-GPS II will monitor the difference between the GPS Receiver time and its UTC time clock. When the GPS Receiver time is different from the 5010-GPS II's UTC time by more than one half second, the 5010-GPS II will rejam to the GPS Receiver. Under certain circumstances, it may be desirable to disable this feature. DIP switch #3 on the 5010-GPS II main circuit card will disable the auto jamming function.

When DIP switch #3 is CLOSED, this continuous monitoring is disabled. Jamming to the GPS Receiver will still occur once a day at the "GPS@" time (provided the GPS@ register is armed for continuous mode). If the DIP switch is CLOSED when the unit powers up, it will jam the generator to the GPS Receiver ONCE. After that, the unit will only jam to the GPS Receiver time at the "GPS@" times, or if the user forces a jam to the Receiver time using the SHIFT+JAM keypress (described below).

When DIP switch #3 is OPEN (default), the 5010-GPS II will also resynchronize to the GPS Receiver time when there is a difference of more tan one half second between the GPS Receiver time and the 5010-GPS' UTC time.

3.9.5. Setting the Time Each Day When the 5010-GPS II will Synchronize to the GPS time.

The 5010-GPS II can also be set to resynchronize once per day at a user specified time, so that the optimal time accuracy is continuously maintained, at the same time minimizing the potential for code disturbances during resynchronization.

The **GPS**@ register contains the time each day when the internal UTC clock will be synchronized to the GPS receiver time. Normally this time should be set to occur during a time of the day least likely to cause interruptions if there is a minor skip in the time. (usually between midnight and 6:00 am) The factor default setting for the **GPS**@ register is midnight. To set another value into the **GPS**@ register, use the following procedure.

Hold down the **SHIFT** key and press the **DISPLAY** button one or more times until the **GPS@** prompt is shown at the left of the display. The **ENTER** and **CLEAR** keys are used in conjunction with the numeric keys to set the generator time.

Press the **ENTER** key to recall the last time that you entered into the **GPS@** 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 time press the **ENTER** key to complete the data entry into the **GPS@** register.

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.

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.

Numeric entry mode must be terminated (GPS@ will be On steady) before any of the front panel keys will resume normal operation.

3.9.6. Entering the Time Zone Offset

The 5010-GPS II 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.

To enter the time zone offset you must enter valid information into the generator user bits. See section 3.5.6 for information on setting the time zone. Also see section 3.5.7 for information about adjusting for daylight savings time changes.

3.9.7. Setting The Format Of The Date Information In The User Bits

In one of the time/date modes, the date information will be encoded into the user bits in one of three formats. 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-GPS II 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. See section 3.5.2 for information on selecting the date format.

3.10. 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-GPS II 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

3.10.1. 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-GPS II-VITC. 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.

3.10.2. General Purpose Outputs

The 5010-GPS 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-GPS 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.

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Figures

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4. TECHNICAL DESCRIPTION

4.1. OVERVIEW

The Model 5010-GPS II LTC/VITC Timecode Generator/Reader combines the latest LSI technology with sophisticated microcontroller firmware to provide a powerful, flexible time code reader system. The basic model 5010-GPS II 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-GPS II-VITC adds Vertical Interval Time Code (VITC) reading and generating capabilities to the basic 5010-GPS II. 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-GPS II-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-GPS II to be conveniently configured for particular customer requirements.

There are two different versions of the 5010-GPS II 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-GPS II-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 4.2 describes the DIP switch functions, section 4.3 described the user calibrations and section 4.4 describes the method of updating to a new firmware version.

4.2. DIP SWITCH FUNCTIONS

The main circuit board of the model 5010-GPS II 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-GPS II to factory defaults on power up
7	Reserved	Open	Normal operation	N/A
8	Reserved	Open	Normal operation	N/A

Figure 4-1: DIP Switch Functions

4.3. USER ADJUSTMENTS AND DIAGNOSTICS

4.3.1. 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 4-2: Keyboard Scan Codes

4.3.2. Calibrating the VITC Generator Keyer (Model 5010-GPS-VITC 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 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.

4.3.3. 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-GPS II and to channel A of your oscilloscope and terminate it. Connect the character generator video output of the model 5010-GPS II 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.

4.3.4. Calibrating the Colour Frame Detection Circuit

Calibration of the colour frame detector is accomplished in software. Separate calibration values are maintained in the 5010-GPS'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-GPS II 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.

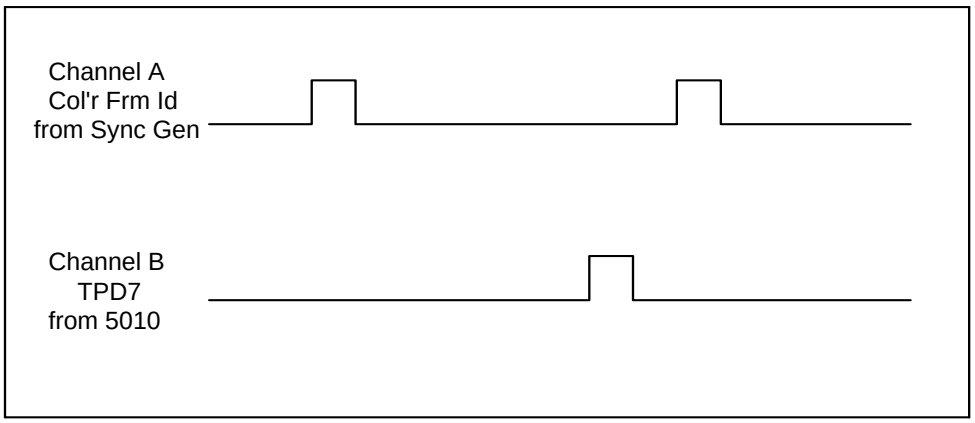

Figure 4-3: PAL Colour Frame Calibration

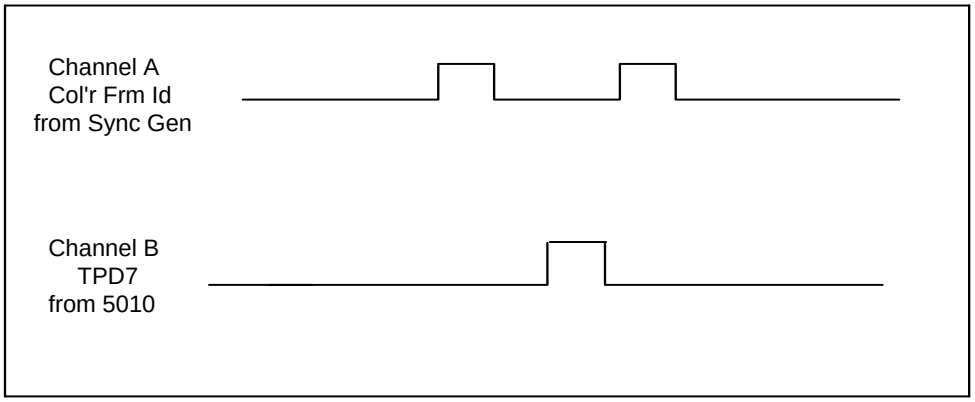

Figure 4-4: NTSC Colour Frame Calibration

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-GPS II to its normal operating mode.

4.4. UPDATING TO A NEW FIRMWARE VERSION

The 5010-GPS II 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-GPS II using a computer. This facilitates firmware upgrades in the field.

The 5010-GPS II provides power to its antenna through the serial port!! Before connecting your computer to the SERIAL I/O connector you MUST change the internal jumpers on the main circuit card inside the 5010-GPS II before you can update the firmware otherwise damage may result to your computer serial port. When you are done programming you must return the jumpers to the original position normal operation of the antenna.

The internal jumpers inside the unit are different depending on the version of the 5010-GPS II hardware that you have. Section 4.4.1 gives instructions for setting the jumpers for the earlier version of the 5010-GPS II and 5010-GPS units with the rear panel shown in figure 2-1. Section 4.4.2 gives instructions for setting the jumpers for the newer version of the 5010-GPS II with the rear panel shown in figure 2-2.

4.4.1. Configuring the Serial Port Jumpers - Original 5010-GPS II

Disconnect the power from the 5010-GPS II. 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 4-5 or Figure 4-6 to configure the 5010-GPS II for firmware upgrading.

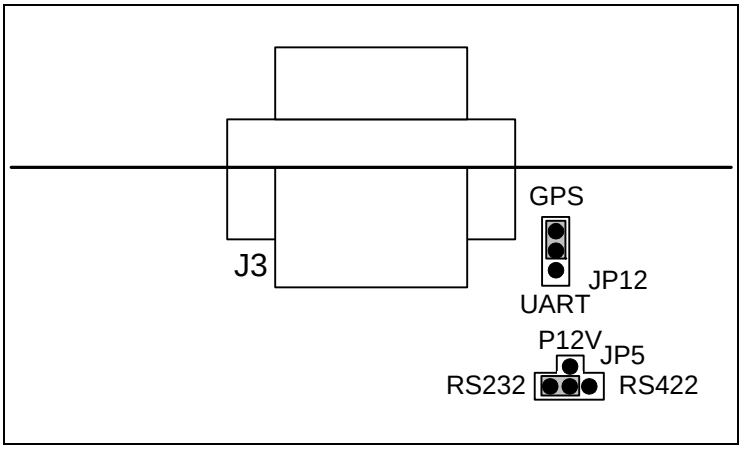

Figure 4-5: Jumper Positions For Programming Mode On Rev H 5200 Boards.

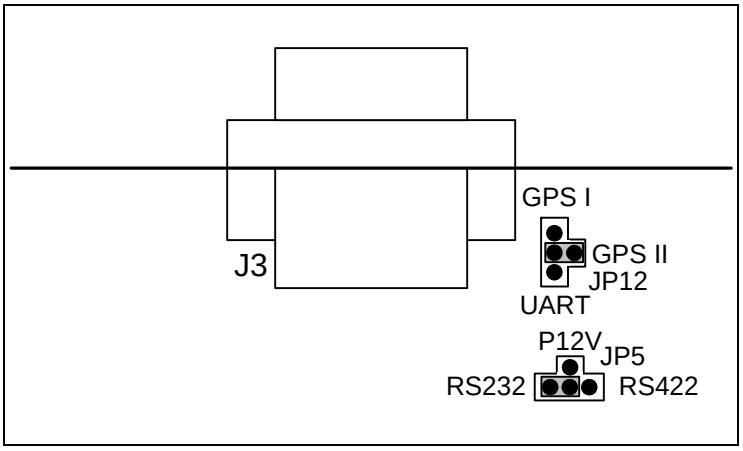

Figure 4-6: Jumper Positions For Programming Mode On Rev J 5200 Boards.

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

5010-GPS II 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 4.4.3 to upgrade the firmware. When the unit is successfully upgraded disconnect power from the unit. Return the jumpers to the positions shown in Figure 4-7 or Figure 4-8 for normal operation. Reinstall the top cover of the unit and reconnect the antenna cable to the SERIAL I/O connector.

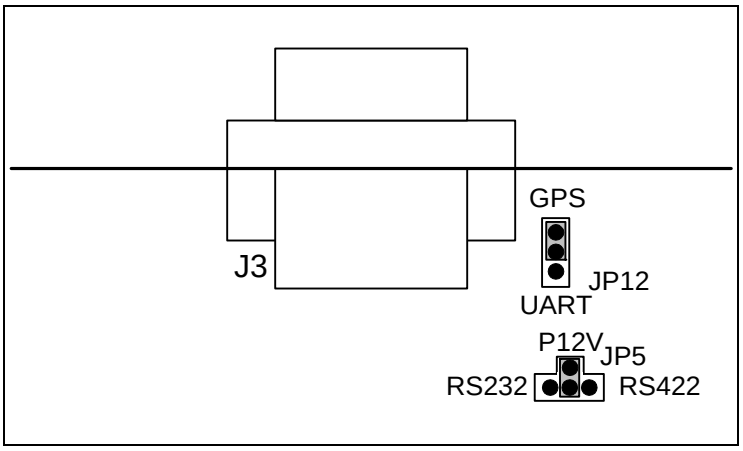

Figure 4-7: Jumper Positions For Normal Operating Mode On Rev H 5200 Boards.

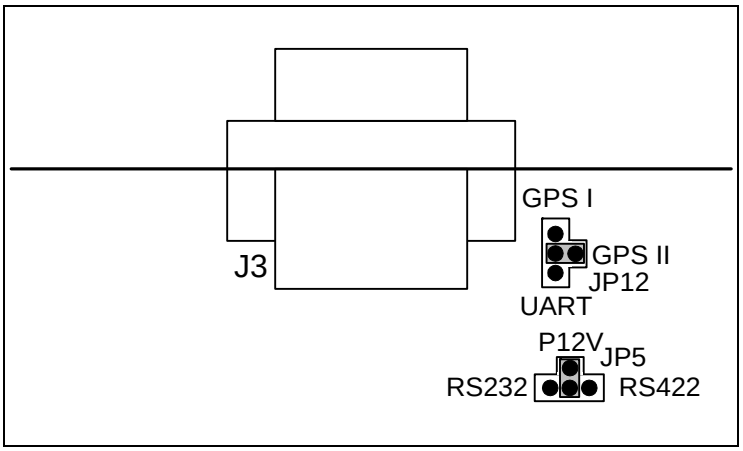

Figure 4-8: Jumper Positions For Normal Operating Mode On Rev J 5200 Boards.

4.4.2. Configuring the Serial Port Jumpers - Newer 5010-GPS II

Disconnect the power from the 5010-GPS II. 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 4-9 to configure the 5010-GPS II for firmware upgrading.

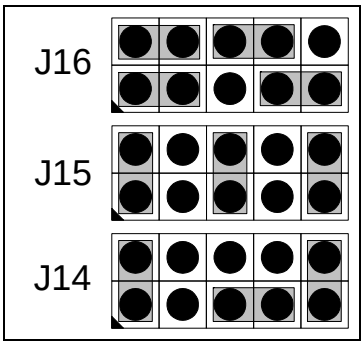

Figure 4-9: Jumper Positions For Programming Mode On 7700STM Boards.

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

5010-GPS II 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 4.4.3 to upgrade the firmware. When the unit is successfully upgraded disconnect power from the unit. Return the jumpers to the positions shown in Figure 4-10 for normal operation. Reinstall the top cover of the unit and reconnect the antenna cable to the SERIAL I/O connector.

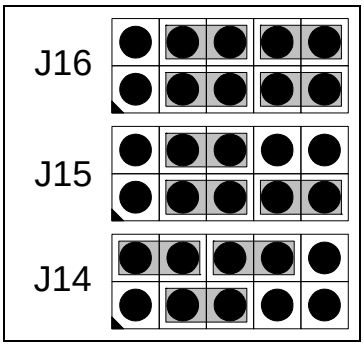

Figure 4-10: Jumper Positions For Normal Operating Mode On 7700STM Boards.

4.4.3. Upgrading The Firmware

1. Connect the 5010-GPS II to the computer's serial port using the cable described in section 4.4.1 or 4.4.2. Most computers have

two serial communications ports (known as COM1 and COM2). If you have both serial ports available, connect the 5010-GPS II 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-GPS II for programming at 38400 baud hold down the ↑ key while you apply power to the 5010-GPS II. When the 5010-GPS II 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-GPS II for programming at 9600 baud hold down the ↓ key while you apply power to the 5010-GPS II. When the 5010-GPS II completes its boot-up sequence, the front panel will display `LOAD FLASH - 9600`

4. The 5010-GPS II firmware is contained in an Intel HEX format file. On earlier versions of the hardware (with rear panel shown in Figure 2-1) the file will be called AG52A9.HEX. On the later versions of the hardware (with rear panel as shown in Figure 2-2) the file will be called AG57A9.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-GPS II. Run FL.EXE, with the appropriate '.hex' file as the first argument. For example:

   FL AG57A9.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 AG57A9.HEX /p2

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

FL AG57A9.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-GPS II 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-GPS II. The Flash loader will give a status report as it sends each line of the HEX file to the 5010-GPS II. During programming the 5010-GPS II 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-GPS II 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-GPS II will automatically switch to its FLASH program memory if programming is successful. As a part of the 5010-GPS II 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