Video Time Inserter / IRIG-B Sync Generator Option

SECTION XXIV-I - GENERAL INFORMATION

1-1   INTRODUCTION

1-2   The Video Time Inserter / IRIG-B Sync Generator option is ordered with 1, 2 or 3 Video Channels and with or without the IRIG-B Sync Generator function. The Video Time Inserter Option allows the user to insert (superimpose) time-of-year characters (days through milliseconds) into the input composite video signal. A video menu is provided to allow the user to set various options such as character size, position, input termination and background/character intensity.   The Video Time Inserter provides video pass through when the unit is not powered. This option is installed in Model XL-DC and 705 products.

1-3   VIDEO CHANNEL SPECIFICATIONS

Input connector: Female SMB
Input connector: Female SMB

Input impedance: 75K ohms or 75 ohms (video menu selected)
Output impedance: 75 ohms

Input level: 1Vpp into 75 ohms
Output level: 1Vpp into 75 ohms (2Vpp into high impedance)

An on-screen Video Menu provides the following setup items:

		Factory defaults:
Video channel select	(if more than 1 channel is ordered)	
Video output	Enabled / Disabled	Enabled
Interlaced	Odd / Even	Odd
Video termination	Enabled / Disabled	Enabled (75 ohms)
Character intensity	White - Gray - Black	White
Video background	None, Square, Fringed	None
Background intensity	White - Gray - Black	Black
Days digit control	On / Off On	
Frac(tional) seconds	10ths, 100ths, milliseconds / Off	Milliseconds
Character size	4 sizes	Smallest
Horizontal position	Full screen control	Top left
Vertical position	Full screen control	Top left

1-4   IRIG-B (AM) SYNC GENERATOR INPUT SPECIFICATIONS (OPTION)

Connector: Female SMB (Model 705)   Female BNC (Model XL-DC)
Input impedance: 10K ohms
Input amplitude: 0.5Vpp to 10Vpp
Input ratio: 2:1 to 5:1

NOTE: The IRIG-B Sync Generator Input for the Model XL-DC or Model 705 is assumed to be LOCAL time. If the unit is set to either GPS, UTC, or Standard Time Mode, the unit will calculate a time offset dependent upon the current Time Zone, Leap Seconds offset, and whether DST is active or not.

The IRIG-B Sync Generator derives its time from an amplitude modulated IRIG-B time code input and phase adjusts the GPS-XL time base to the input code. If the input code should fail the receiver will continue to update its time using the internal or external (OPTION) oscillator.

SECTION XXIV-II - INSTALLATION

2-1   INTRODUCTION

2-2   No installation is required when this option is purchased with the Model 705 or XL-DC receiver. This option is not available for field installation in the Model 705. The following installation instructions apply only to installation after the initial purchase of a Model XL-DC.

2-3   FIELD INSTALLATION

2-4   Supplied with the Video Time Inserter / IRIG-B Sync Generator Option are the following:

        1.   87-6001-XL
        2.   Mounting hardware
        3.   Firmware and Replacement Instructions

2-5   **Warning:** Only a qualified technician should attempt installation of this option. Dangerous voltages are present which can cause electric shock that could result in severe injury or even death. Disconnect all power before disassembling the unit!

2-6   The only equipment required for installation is a Phillips screwdriver and an EPROM extraction tool.

2-7   If the receiver is rack mounted, first remove it from the rack. Installation requires inserting the 87-6001-XL Assembly into an empty option slot.

2-8   Remove the top lid and retain the screws. Remove the cover plate of an empty option slot and save the screws. Slide the option assembly into the guides on the side rails of the slot and firmly press the assembly connector into the Bus Backplane Assembly connector. Secure the option to the chassis with the previously saved screws. Install the new EPROM as described in the EPROM Replacement Instructions sent with the option. Replace the lid and secure with the previously saved screws.

2-9   Four position DIP switch SW1 controls the base address of the Video Time Inserter / IRIG-B Sync Generator or any other TrueTime "SmartCard". Each "SmartCard" option is automatically identified when the unit is turned on. In XL-DC applications where multiple "Smart Card" options are installed, each option card requires a different base address. The base address is normally set at the factory and is only of concern when a field installation is performed.

SECTION XXIV-III - OPERATION

3-1   VIDEO TIME INSERTER

3-2   The 87-6001-X Video Time Inserter / IRIG-B Sync Generator Option Board inputs a composite video signal and inserts time and status characters. This option is setup using the front panel VIDEO SETUP Enter and Arrow buttons on Models 705-3XX and 705-4XX and from the front panel keypad (function 24) on Models XL-DC-601 and XL-DC-602. Time information consists of seconds through hours data with day of year and millisecond data selectable. Additionally, when the unit is unlocked the time information is followed by an unlock "U" status character. The following discussion provides Video Setup for Model 705. Video Setup for XL-DC models with the Video Time Inserter will be indicated by parenthesis such as (keypad function 24).

3-3   On the Model 705, the video channel, if more than one channel is ordered, is selected by holding down the Enter button and using the arrow buttons to scroll from one channel to another. On Models XL-DC-601 and XL-DC-602, the front panel LCD display provides a menu for video channel selection.

3-4   Once the video channel has been selected, the user may adjust the video display as desired using the on-screen video display menu. The video menu is invoked by the Enter button (keypad function 24) as previously described. The left and right arrows buttons (keys) are used to change the value of the selected on-screen menu item.

3-5   After the user has completed the video setup, the on-screen menu will disappear after a 10-second time-out. The on-screen menu that was shown prior to the time-out reappears when the Video Setup ENTER button (keypad function 24) is pressed (selected).

3-6   The Video Time Inserter IC on the 87-6001-X assembly is configured for use with 2Vpp on-board video. The video input amplifier provides a fixed gain of two. The gain of two is required to provide unity gain video throughput (75 ohm output impedance / 75 ohm impedance load). The input stage provides a 75 ohm termination when Input Termination is selected <u>ON</u> (factory default) or 75K ohms when input termination is <u>OFF</u> (selected through the video menu). The video output is 2Vpp into a high impedance and 1Vpp into 75 ohms (assuming 1Vpp input video).

3-7   Pressing the ENTER button (FUNC/ENTR) will scroll through the following choices:

		<u>Factory defaults:</u>
Video channel select	(if more than 1 channel is ordered)	
Video output	Enabled / Disabled	Enabled
Interlaced	Odd / Even	Odd
Video termination	Enabled / Disabled	Enabled (75 ohms)
Character intensity	White - Gray - Black	White
Video background	None, Square, Fringed	None
Background intensity	White - Gray - Black	Black
Days digit control	On / Off On	
Frac(tional) seconds	10ths, 100ths, milliseconds / Off	Milliseconds
Character size	4 sizes	Smallest
Horizontal position	Full screen control	Top left
Vertical position	Full screen control	Top left

Pressing the left or right arrow buttons (keys) will alter the value.

3-8   <u>IRIG-B SYNC GENERATOR</u> (OPTION)

3-9   The IRIG-B Sync Generator derives its time from an amplitude modulated IRIG-B time code input (CODE IN) and phase adjusts the GPS-XL assemblies time base to the input code. If the input code should fail, the receiver will continue to update its time using the internal or external (OPTION) oscillator. When IRIG-B (AM) is connected to CODE IN and the GPS-XL assembly determines that the code is valid, the GPS-XL will use the incoming code to synchronize and change the time in the unit - <u>even if the GPS-XL is tracking and locked to satellites</u>.

3-10   IRIG-B code does not include year information. The GPS-XL will use whatever year information was present prior to switching to the IRIG-B Sync Generator code. The user may change the year by using Serial I/O Function 03 (Keypad Function 03). Refer to manual section III.

SECTION XXIV-IV - THEORY OF OPERATION

4-1   <u>INTRODUCTION</u>

4-2   The GPS-XL Processor Assembly 87-6XX and the 87-6001-X Assembly implement the Video Time Inserter / IRIG-B Sync Generator Option.

Video Time Inserter

4-4   Refer to the 86-6001 schematic in this manual section. The 87-6XX GPS-XL Assembly initializes the 87-6001-X Video Time Inserter / IRIG-B Sync Generator Assembly at power on through FPGA U4. U4 is the interface between the GPS-XL processor and the on board HC11 "Smart Card" processor U14. The HC11 on-board processor and FPGA U4 provide the serial interface to the video inserter ICs U18, U9 and U5. The following describes channel 1 of the Video Time Inserter; the other channels (OPTION) operate similarly.

4-5   With power off and relay K3 relaxed, VIDEO1 IN is connected to VIDEO1 OUT. This allows for video pass-through mode when the unit is not powered. At power-on K3 is energized and VIDEO1 OUT connects to video output buffer amplifier U13. VIDEO1 IN is connected to video input op-amp U13 which operates as a non-inverting gain of two amplifier stage. The 75 ohm input termination is controlled by TMOS switch Q3. This switch, which is selected to be ON or OFF through the video menu, allows the user to either enable or disable on-board 75 ohm termination. If the user elects to disable on-board termination, the video input signal specification of 1Vpp into 75 ohms must be met for proper operation of the Video Time Inserter assembly.

4-6   The composite video signal from U13:B is routed to both the video inserter IC and to sync separator IC U12. U12 provides vertical, composite, and interlace (odd/even) sync detection of the incoming video signal. The vertical sync from U12 is used as an interrupt to the on-board HC11 processor. The processor uses this interrupt to update the inserted video during blanking time (this allows for "glitch free" operation in the video output). The vertical sync from U12 is also sampled by the RC integrator on U7. When external video is detected, signal EXTVID1 is a logic 1. A logic 1 on EXTVID1 informs the on-board HC11 processor (U14) that an external video source is connected. When EXTVID1 is a logic 0, the HC11 processor instructs the video inserter IC (U18) to switch to the internal video mode. When the EXTVID1 signal is a logic low (no VIDEO1 IN signal), analog switch U7 directs the vertical sync signal that is generated by the video inserter IC U18 to the HC11 processor interrupt input. This interrupt control provides "glitch free" operation of the video display even when operating from the internal video mode.

4-7   The sync separator IC U12 provides automatic interlace detection. If the incoming video signal is non-interlaced, the 87-6001-X assembly will automatically switch to the non-interlaced mode.

4-8   The composite sync output from U12 is connected to clamping diode D6, providing clamped video to the video inserter IC (U18). The video inserter IC phase locks to this video signal for stable video insertion. Pot R35 is a white level video adjustment. This Pot is factory set and should not require any user adjustment. The video inserter IC (U18) includes an LC oscillator "dot clock" which determines the width of the inserted video characters and a crystal oscillator which provides a clock for the NTSC internal video mode of operation.

4-9   The incoming (clamped) composite video signal combined with the inserted video characters are output from video inserter IC U18 and connected to video output buffer U13:A. This buffer provides a low source impedance for the VIDEO1 OUT signal. Some of the channel 1 video circuitry is powered from 5 volt regulator U17. This regulator provides noise immunity from the on-board logic supply.

4-10   NOTE: In Model 705 applications that use the Wide Range / Internal Battery Power Supply, the Video Time Inserter / IRIG-B Sync Generator will not operate when the Model 705 is operating from the internal battery pack.

4-11 through 4-19 reserved

IRIG-B Sync Generator (OPTION)

4-20   An IRIG-B source is connected to the 86-6001 board on J7. J7 connects to dual op-amp U20. This op-amp and associated support components implement an AGC circuit. The AGC will allow operation of the sync generator if the IRIG-B input signal is between 0.5 to 10 volts peak to peak.

4-21   The output from the AGC (U20:A) is connected to voltage comparators U16 and U19. U16 produces the signal Not MK and U19 produces the signal CAR. Both of these signals are connected to FPGA U4 which produces the signal AGC CODE. Jumper JP3 is connected from 2 to 3 when amplitude modulated IRIG-B is used as the source for the synchronized generator. The signal from JP3 pin 2 (DCCODE) is connected to the on-board HC11 processor.

4-22   The HC11 processor (U14) reads the incoming code (DCCODE) and communicates the IRIG-B time through FPGA U4 to the GPS-XL processor assembly, the master clock. The GPS-XL processor uses the IRIG-B source to phase adjust its time base to the input code. When the IRIG-B source is connected to the unit and the GPS-XL processor assembly determines that the code is valid, the GPS-XL will use the incoming code to synchronize and change the time in the unit - even if the GPS-XL is tracking and locked to satellites. If the input code should fail, the receiver will continue to update its time using the internal or external (OPTION) oscillator.

SECTION XXIV-V - MAINTENANCE AND TROUBLESHOOTING

5-1   INTRODUCTION

5-2   This option has been designed to provide maintenance-free operation. Under normal use, it will require no calibration or adjustment. Before assuming a malfunction, first be certain that the unit using the Video Time Inserter / IRIG-B Sync Generator Option is functioning properly. Verify that all connectors are secure and that coax cables are good. If all but the 87-6001-X Video Time Inserter / IRIG-B Sync Generator Assembly appears to be operating properly, please contact a TrueTime Customer Service Representative.