HD9510UC HD Upconverter

Instruction Manual

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INFORMATION TO USERS IN EUROPE

NOTE

CISPR 22 CLASS A DIGITAL DEVICE OR PERIPHERAL

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

INFORMATION TO USERS IN THE U.S.A.

NOTE

FCC CLASS A DIGITAL DEVICE OR PERIPHERAL

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

WARNING

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

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

REVISION HISTORY

REVISION	DESCRIPTION	DATE
0.1	Preliminary Version	Oct 01
1.0	First Release – updated for versions with Gen-Lock reference	Oct 02
1.1	Updated for Firmware version 2.1 – Added menu items for H and V sizing and position	Mar 03
1.1.1	Updated Jitter spec on HD Video Out	Aug 03

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1. OVERVIEW

The Evertz HD9510UC Upconverter converts a standard definition 525i/59.94 4:2:2 (SMPTE-259M-C) input signal to 1080i/59.94, 1035i/59.94 or 720p/59.94 high definition (SMPTE 292M) video format. Advanced ASIC design results in optimal quality up-conversion with minimum artifacts. The HD9150UC also handles conversion to 480p/59.94 in a SMPTE 292M bitstream. (SMPTE 349M)

The Evertz Upconverter provides complete support for 4:3 to 16:9 aspect ratio conversion. The system provides access to the common 4:3 to 16:9 choices; 16:9 anamorphic stretch, 4:3 with side panels, 16:9 letterbox zoom to full size and 14:9 letterbox zoom to full size 14:9 with side panels.

The Upconverter unit accepts 1 group of embedded audio on the input and re-embeds 1 group into the HD SMPTE 292M 1.5Gbs output. The re-embedded audio is compliant to SMPTE 299M and will have appropriate delay added to compensate for video delay incurred by the upconversion process, thus avoiding the need for external de-embedding and re-embedding of audio.

An optional composite video decoder and audio D to A converter module can be ordered for facilities which are currently using analog video and audio signals. For those analog facilities which will be transitioning to SDI in the future, the composite decoder can be bypassed at any time and the SDI input may be then be used.

The Upconverter electronics is housed in a 1RU rack mount frame. The standard Upconverter has built-in front panel controls, but can also be purchased with a rack mount remote control panel that replaces the built-in control panel (RCP version).

Features

- SDI 4:2:2 input with reclocked loop thru
- 4 HD serial digital (1.485 Gb/s) outputs
- Outputs 1035i, 1080i, in 29.97Hz frame rate and 720p, 480p in 59.94Hz frame rate
- Passes 1 group of embedded audio to the output, with added audio delay to match the video delay
- 64 filter settings and motion detection algorithm ensure highest performance and video quality
- Selectable aspect ratio conversion
- Front panel control or remote rack mount control (optional)
- Available redundant power supply
- Optional analog video and 4 channel audio interface for analog facilities
- Field upgradeable firmware as new features become available
- Adjustable output timing with respect to NTSC or Tri-level sync genlock reference
- Minimum processing delay (3 msec) or 1 frame delay when referenced to input video

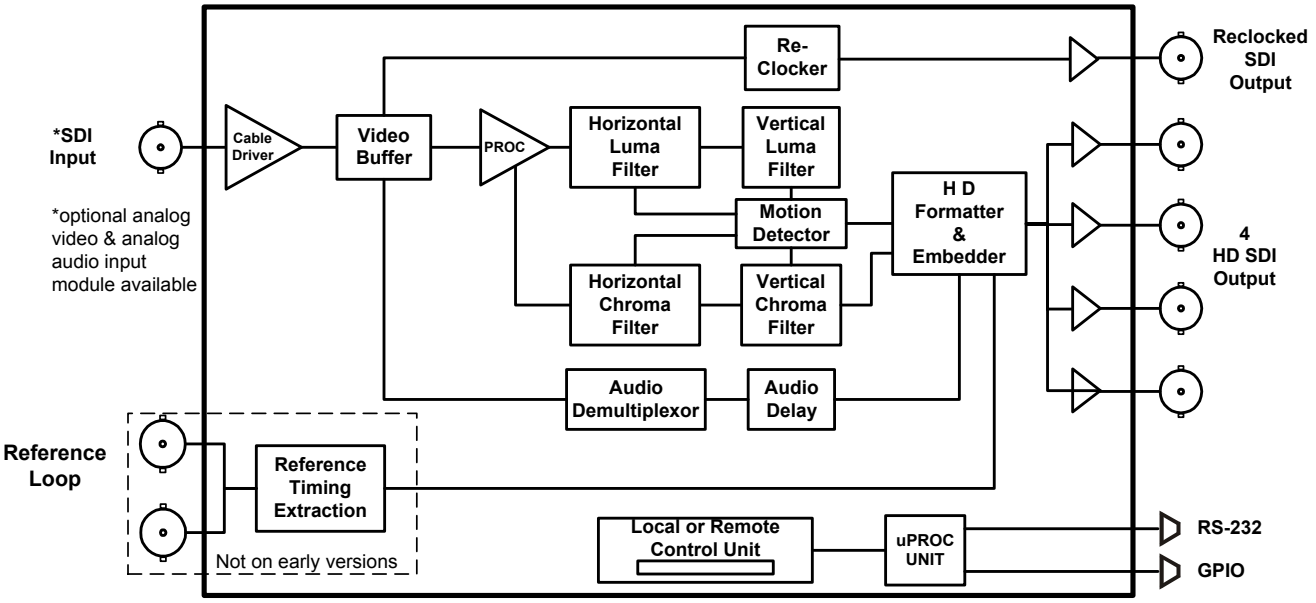

Figure 1-1: HD9510UC Block Diagram

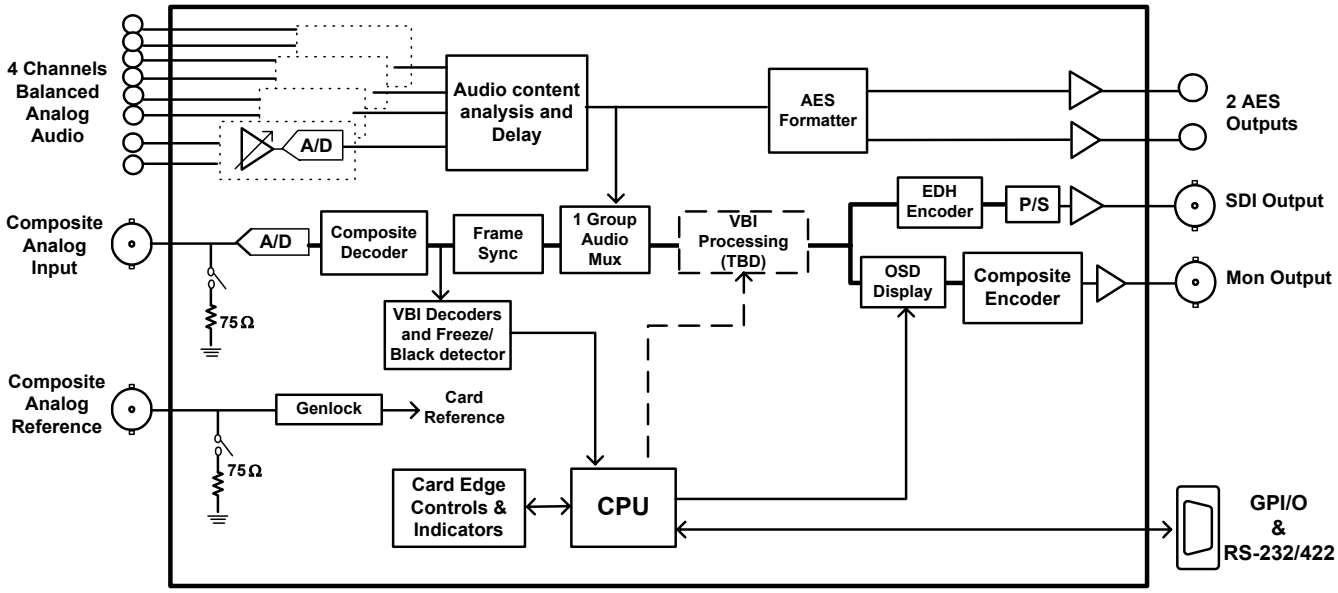

Figure 1-2: HD9510UC-CD-A4 Analog Interface Module Block Diagram

1.1. HOW TO USE THIS MANUAL

This manual is organised into 4 chapters: Overview, Installation, Operation and Technical Description. This chapter contains a quick summary of the Upconverter features and a glossary to define concepts and terms used throughout the remainder of the manual.

Chapter 2 gives a detailed description of the rear panel connectors, and how the Upconverter should be connected into your system.

Chapter 3 gives a detailed description of the operation of the front panel controls, starting with an overview of the pushbuttons and front panel indicators. The operation of the Upconverter using the optional remote control panel is identical to the front panel.

Chapter 4 gives an overview of how to update the firmware in the unit and other technical issues.

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

1.2. GLOSSARY

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

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

4Fsc: Four times subcarrier sampling rate uses in composite digital systems. In NTSC this is 14.3 MHz. In PAL this is 17.7 MHz.

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

SDI An abbreviation for *serial digital interface*, this acronym is most commonly used to refer to Standard definition serial digital television video signals up to 540 Mb/s.

HDTV An abbreviation for *high definition television*, this acronym is most commonly used to refer to High definition serial digital television video signals at 1.485 Gb/s.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ITU-R601: See CCIR601

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

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

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

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

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

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

SMPTE 244M: The SMPTE standard for bit parallel digital interface for composite video signals. SMPTE 244M defines the parameters required to generate and distribute composite video signals on a parallel interface.

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

SMPTE 292M: The SMPTE standard for 1125 line serial digital high definition video interfaces.

SMPTE 299M: The SMPTE standard for embedding AES audio into SMPTE 292M serial digital high definition video.

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

2. INSTALLATION

2.1. REAR PANEL

There are two versions of the HD9510UC. The rear panel of the early version is shown in Figure 2-1 and the rear panel of the current version is shown in Figure 2-2.

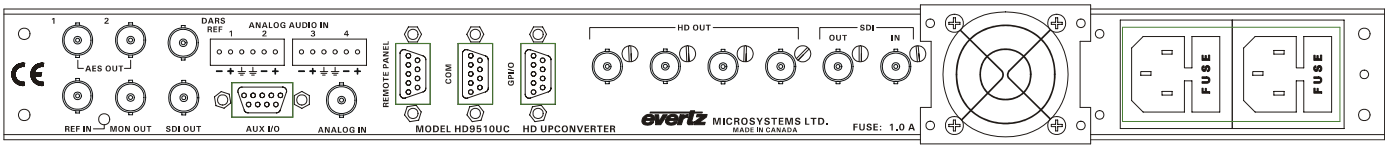

Figure 2-1: HD9510UC Rear Panel Layout – Early version

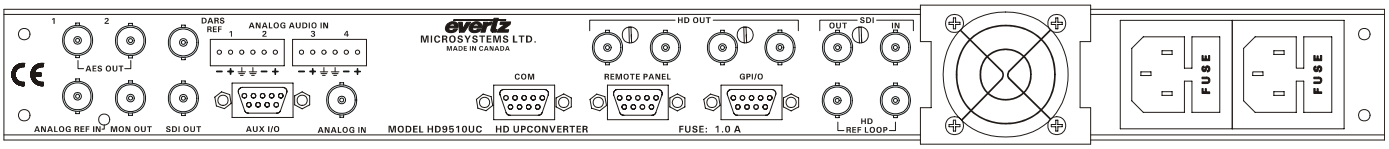

Figure 2-2: HD9510UC Rear Panel Layout – Current version

Sections 2.1.1 to 2.1.5 describe the purpose of the rear panel connectors of the main Upconverter sections and the specific signals that should be connected to the HD9510UC HD Upconverter. Sections 2.1.6 and 2.1.7 describe the purpose of the rear panel connectors and the specific signals that should be connected to the optional composite decoder section of the UpConverter.

2.1.1. Standard Definition Digital Video Connections

SDI IN This BNC connector is for connecting 10-bit serial digital video signals, compatible with the SMPTE 259M standard.

SDI OUT This BNC connector contains a reclocked copy of the input video.

2.1.2. High Definition Digital Video Connections

HD OUT There are four BNC output connectors containing the upconverted 10-bit serial digital video signals, compatible with the SMPTE 292M standard. If the Audio embedder option is enabled, these outputs will contain the group 1 audio present on the SDI input and delayed to match the output video timing.

2.1.3. High Definition Reference Video Connections (Not on Early Version)

HD REF LOOP is a high impedance loop through for connecting an analog video or tri-level sync reference. The *REFERENCE SIGNAL* menu is used to select the correct type of video reference being used.

2.1.4. Remote Control Connections

COM This 9 pin female D connector provides an RS-232 serial interface used for updating the firmware. This port is wired at the factory as an RS232 DCE port as shown in Table 2-1. See chapter 4 for more information about updating the firmware.

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

Table 2-1: COM Port RS-232 Port Pin Definitions

REMOTE PANEL This 9 pin female D connector provides an RS-422 serial interface to the rack mount remote panel. This port is wired as a SMPTE 207M Tributary as shown in Table 2-2.

Pin #	Name	Description
1	GND	Chassis ground
2	Tx-	RS-422 Tx-(a) Output
3	Rx-	RS-422 Rx-(a) Input
4	GND	
5		
6	GND	
7	Rx+	RS-422 Rx+(b) Input
8	Tx+	RS-422 Tx+(b) Output
9	GND	

Table 2-2: Remote Panel RS-422 Port Pin Definitions

GPI/O This 9 pin female D connector provides a general purpose inputs and outputs for the upconverter. This connector is not available on the early units. The pinout is shown in Table 2-3.

Pin #	Name	Description
1	GPI1	Recall Preset 1
2	GPI2	Recall Preset 2
3	GPI3	Recall Preset 3
4	GPI4	Recall Preset 4
5	GPI5	General Purpose input – future use
6	GPI6	General Purpose input – future use
7	GPI7	General Purpose input – future use
8	Gnd	Ground
9	V Ext	External Reference voltage

Table 2-3: GPI/O Port Pin Definitions

2.1.5. Power Connections

The Upconverter has one or two (redundant supply is optional) universal power supplies that operate on either 115 Volt / 60 Hz or 230 Volt / 50 Hz AC.

2.1.6. Composite Decoder Video In And Out

ANALOG IN This BNC connector is for connecting a source of composite analog NTSC video. The input is internally terminated with 75 ohms.

SDI OUT This BNC connector contains decoded video with embedded group 1 audio in the SMPTE 259M-C standard. This output is normally connected to the SDI IN connector on the main part of the Upconverter.

REF IN This BNC connector is for connecting a reference black signal to properly time the decoded output video. The input is internally terminated with 75 ohms.

2.1.7. Composite Decoder Audio In And Out

ANALOG INPUT 1 to 4 Balanced Analog audio input for channels 1 to 4. This audio will be digitized and embedded on the SDI output video. It is also available as AES audio on two separate outputs.

AES OUTPUT 1 AES audio output from channels 1 and 2. This output is not required for the Upconverter application but can be used to provide AES audio to other devices in the plant.

AES OUTPUT 2 AES audio output from channels 3 and 4. This output is not required for the Upconverter application but can be used to provide AES audio to other devices in the plant.

2.2. MOUNTING

The Upconverter is equipped with rack mounting angles and fits into a standard 19 inch by 1.75 inch by 17.75 inch (483 mm x 45 mm x 451mm) rack space. The mounting angles may be removed if rack mounting is not desired.

2.3. POWER REQUIREMENTS

2.3.1. Selecting the Correct Mains Voltage

Power requirements are 115 or 230 volts AC at 50 or 60 Hz. The Upconverter has a universal power supply that automatically senses the input voltage. Power should be applied by connecting a 3-wire grounding type power supply cord to the power entry module on the rear panel. The power cord should be minimum 18 AWG wire size; type SVT marked VW-1, maximum 2.5 m in length. If the Upconverter is fitted with the redundant power supply there will be an additional IEC-320 connector on the rear panel.

If the Upconverter is fitted with dual power supplies, make sure that power is removed from both supplies before performing any work on the unit.

The IEC 320 power entry module combines a standard power inlet connector, two 5 x 20 mm fuse holders and an EMI line filter.

2.3.2. Changing the Fuses

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

Never replace with a fuse of greater value.

2.4. CONNECTING THE REMOTE CONTROL PANEL

The HD9510UC HD Up Converter can be sold with integrated front panel control, or with a rack mountable remote control panel (RCP version). On the RCP version, the front panel of the main unit has only the PSU Status indicators.

On the RCP version of the Upconverter, the remote control panel is connected to the **REMOTE PANEL** connector using a straight through cable provided. For longer distances, simply make your own cable of the required length according to the diagram in Table 2-4. Communications to the remote panel is through a standard straight through RS-422 connection, so the panel can be located up to 1000 feet from the main electronics unit. A plug in 12 VDC adapter supplies power for the remote control panel.

Upconverter End			Remote Panel End	
9 pin D Male	Pin	Belden 9729	9 pin D Male	Pin
	1			1
Tx-	2	-------1a------	Rx-	2
Rx+	3	-------2b------	Tx+	3
Rx Gnd	4	---drain 2----	Rx Gnd	4
	5			
Tx Gnd	6	---drain 1----	Tx Gnd	6
Tx+	7	-------1b-----	Rx+	7
Rx-	8	-------2a------	Tx-	8
	9			9
Frame Gnd	Shield	---drain 1----	Frame Gnd	Shield

Table 2-4: Remote Control Panel Extender Cable

2.5. CONNECTING THE GENERAL PURPOSE INPUTS AND OUTPUTS

The 9 pin GPI/O connector has 7 general purpose as shown in Table 2-3. Figure 2-3 shows a schematic diagram of the GPIO circuitry. The user can connect an external power source for the opto-isolator circuitry. The Vext voltage must be greater than the voltage supplied to GPI by at least 5v. The user can activate GPIs simply by connecting the GPI input pins to Ground. This can be done with a button, switch, relay or an open collector transistor.

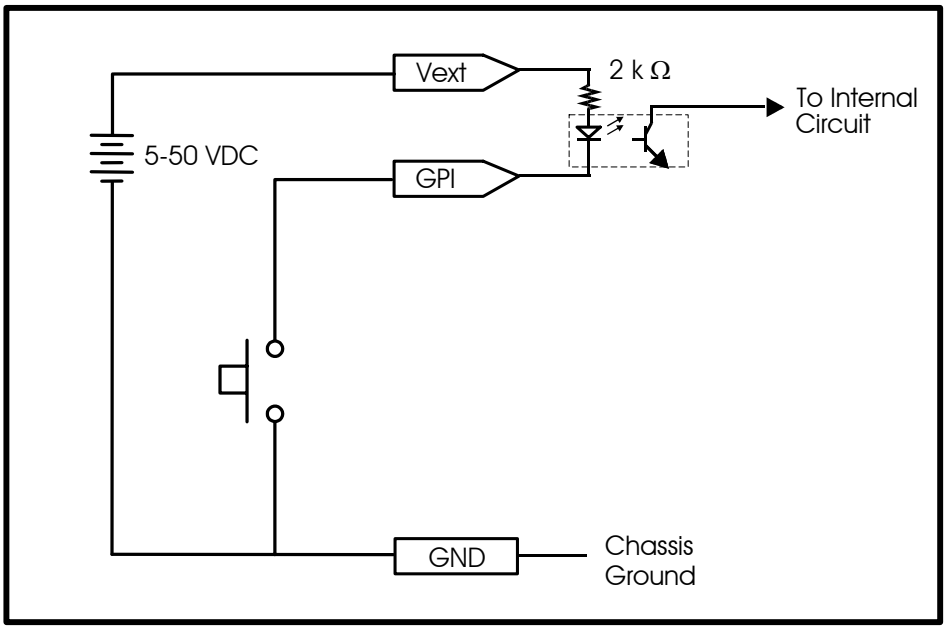

Figure 2-3: Powering the General Purpose Input Opto Isolators from an External Power Supply

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3. OPERATION

The Upconverter electronics is housed in a 1RU rack mount frame and is controlled from the built-in front panel controls. Each model can also be purchased with an optional rack mount remote control panel that replaces the built-in control panel. Operation of the Remote control panel is identical to the built in control panel.

3.1. OVERVIEW OF THE FRONT PANEL DISPLAY AND CONTROLS

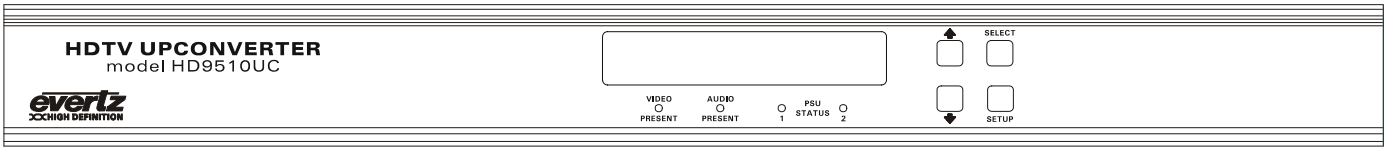


Figure 3-1: Front Panel Layout

3.1.1. Setup Key Group

SETUP This button is used to enter the *Setup* menu which is used to control various setup options to configure the operating modes of the Upconverter. (See section 3.2 for a complete description of the *Setup* menu.) When you are in the *Setup* menu, this button is also used to back out of menu selections to the next higher menu level. When exiting the *Setup* menu, the **SETUP** button is also used to return to normal panel operation.

SELECT This button is used to choose a submenu and navigate to the next level down in the menu structure. It is also used to make a menu choice.

↑ & ↓ The arrow keys are used to navigate through various menu choices at a menu level in the *Setup* menu.

3.1.2. Status Indicators

VIDEO PRESENT This LED will be illuminated when there is valid SDI video present at the input of the Upconverter

AUDIO PRESENT This LED will be illuminated when there is embedded audio present at the input of the Upconverter

PSU STATUS 1, 2 These LED's will be On to indicate that their corresponding power supply is functioning normally. On units fitted with a single power supply the PSU STATUS 2 LED will be Off all the time.

3.1.3. Front Panel Display

The front panel is used to show the status of the Upconverter when it is not in *SETUP* mode. The display shows the output video standard and aspect ratio in use.

3.2. FRONT PANEL SETUP MENU - OVERVIEW

The *SETUP* menu system uses the 16 digit alphanumeric display and provides a quick, intuitive method of configuring the Upconverter. The early versions of the Upconverter do not have all the menu items available.

- **OUTPUT FORMAT**
  - 1080i
  - 720p
  - 1035I
  - 480p
- **OUTPUT ASPECT**
  - 4:3 Side Panel
  - 16:9 Crop
  - 16:9 Stretch
  - 14:9 Crop
- **MOTION DETECTION**
  - Frame
  - Field
  - Mixed
- **H/V FILTER**
  - Enhanced
  - Flat
  - Soft
  - User
- **AUDIO EMBEDDER**
  - On
  - Off
- **TEST GENERATOR**
  - Off
  - Bars
- **4:3 POSITION**
  - Left
  - Center
  - Right
- **SIDE PANEL COLOUR**
  - Black
  - Gray
  - Yellow
  - Red
  - Green
  - White
- **LINE 21 BLANKING**
  - Off
  - On
- **OUTPUT DELAY**
  - Minimum
  - Frame
- **REFERENCE SIGNAL**
  - Video in
  - Tri-level
  - NTSC
- **GENLOCK V PHASE**
  - V Phase
- **GENLOCK H PHASE**
  - H Phase
- **PRESETS**
  - Preset
    - Save
    - Recall
- **H BLANK START**
  - H Bl Start
- **H BLANK END**
  - H Bl End
- **V BLANK START**
  - V Bl Start
- **V BLANK END**
  - V Bl End
- **H POSITION**
  - H Pos
- **V POSITION**
  - V Pos
- **H SIZE**
  - H Size
- **V SIZE**
  - V Size
- **OUTPUT H POS**
  - Out H Pos
- **OUTPUT V POS**
  - Out V Pos
- **FIRMWARE VERSION**
  - Version 2.0

Figure 3-2: Overview of the Setup Menu

3.3. FRONT PANEL SETUP MENU

The Front panel *Setup* menu is arranged in a layered structure that groups similar configuration items together. The following section gives a brief description of the top level of the menu that appears when you enter the menu. Selecting one of these items will allow you to view the current parameter value for that item and make changes. Sections 3.3.1 to 3.3.7 provide detailed descriptions of each of the sub menus. The tables in sections 3.3.1 to 3.3.7 are arranged in an indented structure to indicate the path taken to reach the control. Menu items or parameters that are underlined indicate the factory default values.

OUTPUT FORMAT	Sets up the output video format.
OUTPUT ASPECT	Selects the aspect ratio format of the input video.
MOTION DETECTION	Selects the type of motion compensation algorithm that will be used in the upconversion process.
H/V FILTER	Sets the sharpness of the filters
AUDIO EMBEDDER	Enable or disable the audio deembedder.
TEST GENERATOR	Enable or disable the colour bar generator.
4:3 POSITION	Sets the position of the image in 4:3 side panel mode
SIDE PANEL COLOUR	Sets the colour of the side panels in 4:3 side panel mode
LINE 21 BLANKING	Selects whether line 21 captions are blanked or upconverted
OUTPUT DELAY	Sets the delay for the upconverter (video in referenced)
REFERENCE SIGNAL	Selects the timing reference for the output
GENLOCK V PHASE	Sets the vertical phase of the output with respect to the genlock
GENLOCK H PHASE	Sets the horizontal phase of the output with respect to the genlock
PRESETS	Used to save and recall user presets
H BLANK START	Sets the right side panel width
H BLANK END	Sets the left side panel width
V BLANK START	Sets the bottom letter box panel height
V BLANK END	Sets the top letter box panel height
H POSITION	Sets the left side of the standard definition image that will be upconverted
V POSITION	Sets the top of the standard definition image that will be upconverted
H SIZE	Sets the horizontal size (width) of the standard definition image that will be upconverted
V SIZE	Sets the vertical size (height) of the standard definition image that will be upconverted
OUTPUT H POS	Sets the horizontal position of the upconverted image on the high definition raster
OUTPUT V POS	Sets the vertical position of the upconverted image on the high definition raster
FIRMWARE VERSION	Displays the firmware version of the Upconverter

To enter the on-screen menu system, press the **SETUP** key. This will bring you to the main *Setup* menu where you can use the ↑ **&** ↓ keys to move up and down the list of available sub menus. Top-level menu items are shown in UPPERCASE. To adjust any parameter, use the ↑ **&** ↓ keys to move up or down to the desired parameter. To view the possible values for that item, press the **SELECT** key. The current value for that parameter will be shown blinking. Pressing the ↑ **&** ↓ keys allows you to show the possible

values for the selected parameter. The various parameter values that are not currently selected will NOT be blinking. When you have stopped at the desired value, press the **SELECT** key to save your selection. The value shown will begin blinking; indicating that it has become the current value. To move back to the top level in the menu press the **SETUP** key.

You can select other parameters from the top level of the menu by using the ↑ **&** ↓ keys, followed by the **SELECT** key. Alternately you can exit the *Setup* menu by pressing the **SETUP** key.

Each of the menu items is described in the following sections, with an explanation of what each choice does.

3.3.1. Configuring The Output Video Format

The *OUTPUT FORMAT* menu is used to select the output video format of the Upconverter.

OUTPUT FORMAT
1080i
1035i
720p
480p

The field rate of the 1080I and 1035I interlaced formats is 59.94.

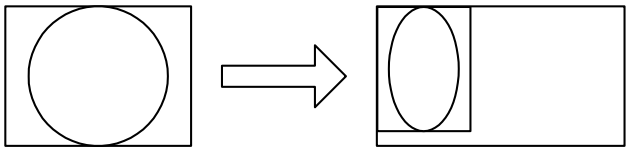
The frame rate of the 720p and 480p progressive formats is 59.94.

3.3.2. Selecting The Output Aspect Ratio Format

The *OUTPUT ASPECT* menu allows the user to select how the 4:3 aspect ratio standard definition image will be converted to the 16:9 aspect ratio high definition image.

OUTPUT ASPECT
Not Applicable

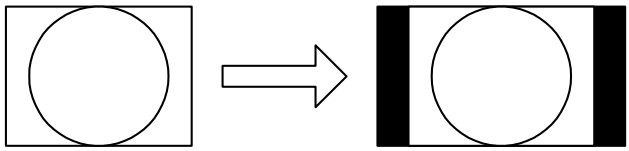
When the *OUTPUT FORMAT* menu item is set to 480P the complete input image is placed in the top left corner of the HD raster.



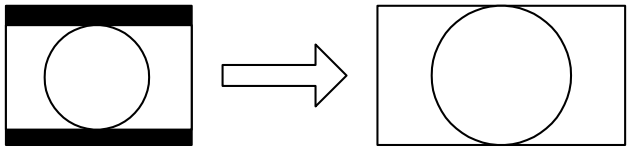
OUTPUT ASPECT
- *4:3 Side Panel*
- *16:9 Crop*
- *16:9 Stretch*
- *14:9 Crop*

When the *OUTPUT FORMAT* menu item is set to 1080i, 1035i, or 720p There are 4 output aspect ratio choices available.

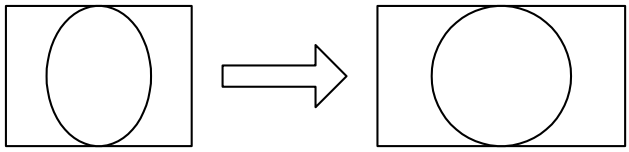
Select *4:3 Side Panel* if the input image is a conventional 4:3 image filling the compete raster. In this mode, images will be normally be upconverted so that the 4:3 image sits in the center of the 16:9 HD raster with side panels. The position of the image can be set by the *4:3 POSITION* menu item.



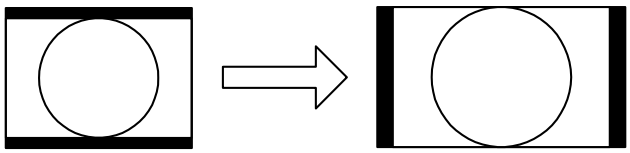
Select *16:9 Crop* if the input image is a letterboxed 16:9 in the 4:3 raster. In this mode, images will be upconverted so that the letterboxed image width is enlarged to fill the complete 16:9 HD raster width. The top and bottom of the image will be cropped.



Select *16:9 Stretch* if the input image is a 16:9 image that has been squeezed to fit into the 4:3 raster (often referred to as anamorphic). In this mode, images will be upconverted so that the 16:9 image width is stretched to fill the complete 16:9 HD raster.



Select *14:9 Crop* if the input image is a letterboxed 14:9 in the 4:3 raster. In this mode, images will be upconverted so that the letterboxed image height is enlarged to fill the complete 16:9 HD raster height. The top and bottom of the image will be cropped and the output image will have side panels.



3.3.3. Selecting The Motion Detection Mode

The *MOTION DETECTION* menu allows the user to select the motion detection mode used during the upconversion.

MOTION DETECTION
Frame
Field
Mixed

In *Field* mode the Upconverter interpolates on a field by field basis. This mode is suitable for high-speed action but gives a softer overall upconversion.

In *Frame* mode the Upconverter interpolates based on a complete interlaced frame thus providing a crisper image. It is a good choice for slower moving images.

In *Mixed* mode the Upconverter uses a mix of frame and field interpolation and generally provides the best overall upconversion. This is the factory default mode.

3.3.4. Setting The Sharpness Of The Filter

The *H/V FILTER* menu allows the user to set the sharpness of the filter used during the upconversion.

H/V FILTER
Enhanced
Flat
Soft
User

There are three set filter values and a user selection that allows customization of the filter.

When you select *User*, press the **SELECT** key to enter the individual H and V filter values. Figure 3-3 shows the different characteristics of the filter when you select different values.

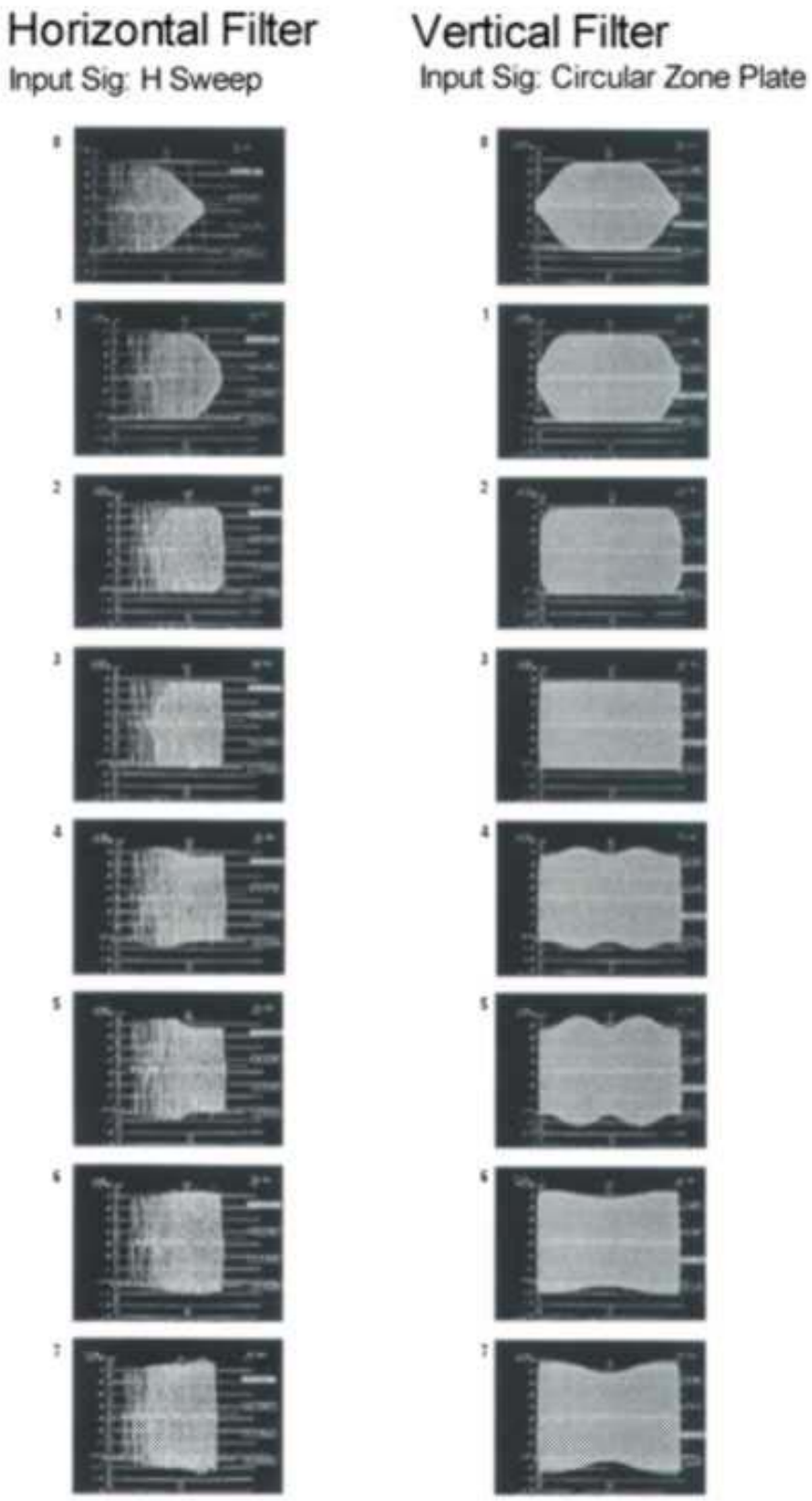


Figure 3-3: Horizontal and Vertical Filter Characteristics

3.3.5. Controlling The Audio Embedder

AUDIO EMBEDDER
Off
On

The *AUDIO EMBEDDER* menu allows the user to pass through embedded audio from the input to the output.

Group 1 audio will be De-embedded from the input and re-embedded on the output, delayed to match the upconversion delay.

3.3.6. Controlling The Test Generator

TEST GENERATOR
Off
Bars

The *TEST GENERATOR* menu allows the user to generate a test colour bar pattern on the HD output. This signal is useful for determining cable wiring integrity downstream of the Upconverter.

3.3.7. Setting the Image Position in 4:3 Side Panel Mode

4:3 POSITION
Left
Center
Right

The *4:3 POSITION* menu allows the user to set the position of the original image within the 16:9 raster when the upconverter is in 4:3 side panel mode.

3.3.8. Setting the Side Panel Colour

SIDE PANEL COLOUR
Black
Gray
Yellow
Red
Green
White

The *SIDE PANEL COLOUR* menu allows the user to set the colour of the side panels when the upconverter is in *4:3 Side Panel* or *14:9 Crop* mode.

3.3.9. Blanking Line 21 Captions

LINE 21 BLANKING
Off
On

The *LINE 21 BLANKING* menu allows the user to blank line 21 where closed captions may be present.

3.3.10. Setting the Upconverter Delay

The *OUTPUT DELAY* menu allows the user to choose one of two delay modes when the upconverter is referenced to input video. This menu item has no effect when the *REFERENCE SIGNAL* menu item is not set to *Video In*.

OUTPUT DELAY
Minimum
Frame

When the Delay is set to minimum the output video will be delayed by the minimum amount.

When the Delay is set to Frame, the output will be delayed 1 frame from the input video.

3.3.11. Setting the Upconverter Reference (Not on early versions)

The *REFERENCE SIGNAL* menu allows the user to choose the type of reference that will be used for the output video. Early versions that do not have a gen lock reference are always references to the input video and do not have this menu item.

REFERENCE SIGNAL
Video In
Tri-level
NTSC

When set to *Video In* the output video will be referenced to the input video. The *OUTPUT DELAY* menu item selects whether the output video is one frame delayed or a minimal delay

When set to *Tri-level* the output video will be referenced to an HD Tri-level sync signal connected to the Reference BNC loop. Tri-level sync should be of the same frame format as the output video format of the upconverter. The *GENLOCK V PHASE* and *GENLOCK H PHASE* menu items adjust the timing of the output with respect to the Tri-level sync reference.

When set to *NTSC* the output video will be referenced to a NTSC composite sync or black burst signal connected to the Reference BNC loop. The *GENLOCK V PHASE* and *GENLOCK H PHASE* menu items adjust the timing of the output with respect to the NTSC reference.

3.3.12. Setting the Timing of the Output Video with Respect to the Gen Lock Input (Not on early versions)

The *GENLOCK V PHASE* and *GENLOCK H PHASE* menus allows the user to adjust the timing of the output video when the *REFERENCE SIGNAL* is set to *Tri-Level* or *NTSC*. These menu items are not available on early versions that do not have a gen lock reference.

GENLOCK V PHASE
V Phase = xx

When the *REFERENCE SIGNAL* menu is set to *Tri-level* or *NTSC* the timing of the output video can be adjusted.

The *V Phase* and *H Phase* parameters allow you to control the timing of the output video with respect to the beginning of the frame on the Gen Lock reference input. An internally generated digital video sync structure, locked to the analog genlock reference signal (0_H time of line 1 field 1 for HD Tri-level references or 0_H time of line 4 field 1 for NTSC references) is used to genlock the upconverter. The EAV of line 1 of this digital reference sync is the point to which all the reference phasing adjustments are made. Figure 3-4 and Figure 3-5 show the relationship of the analog tri-level and NTSC inputs to the digital reference sync frame when the *V Phase* and *H Phase* parameters are set to zero.

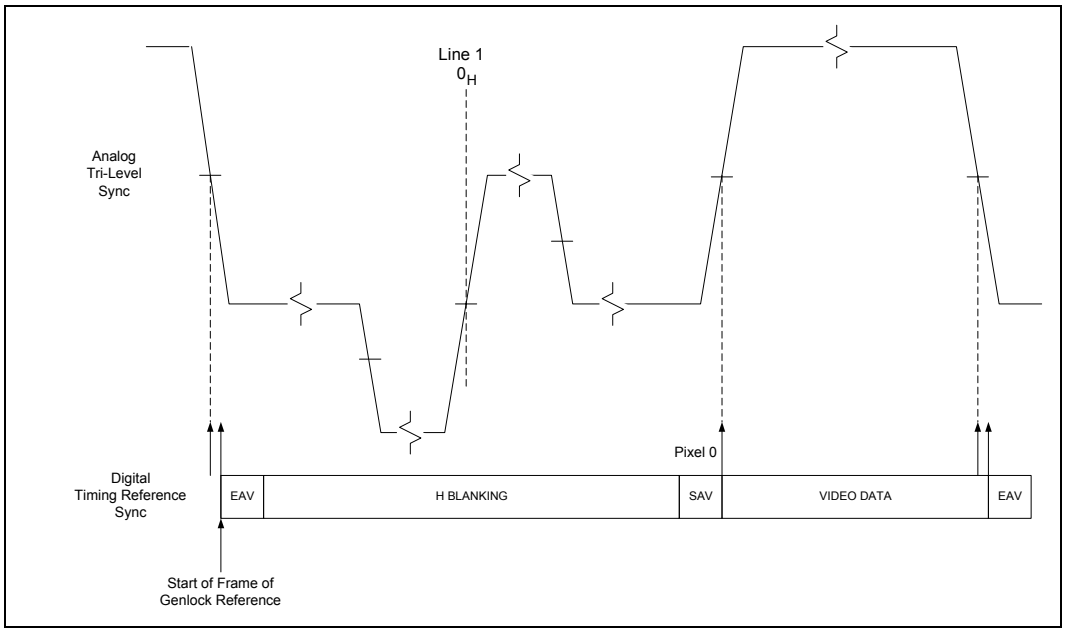


Figure 3-4: Tri-Level Reference Timing

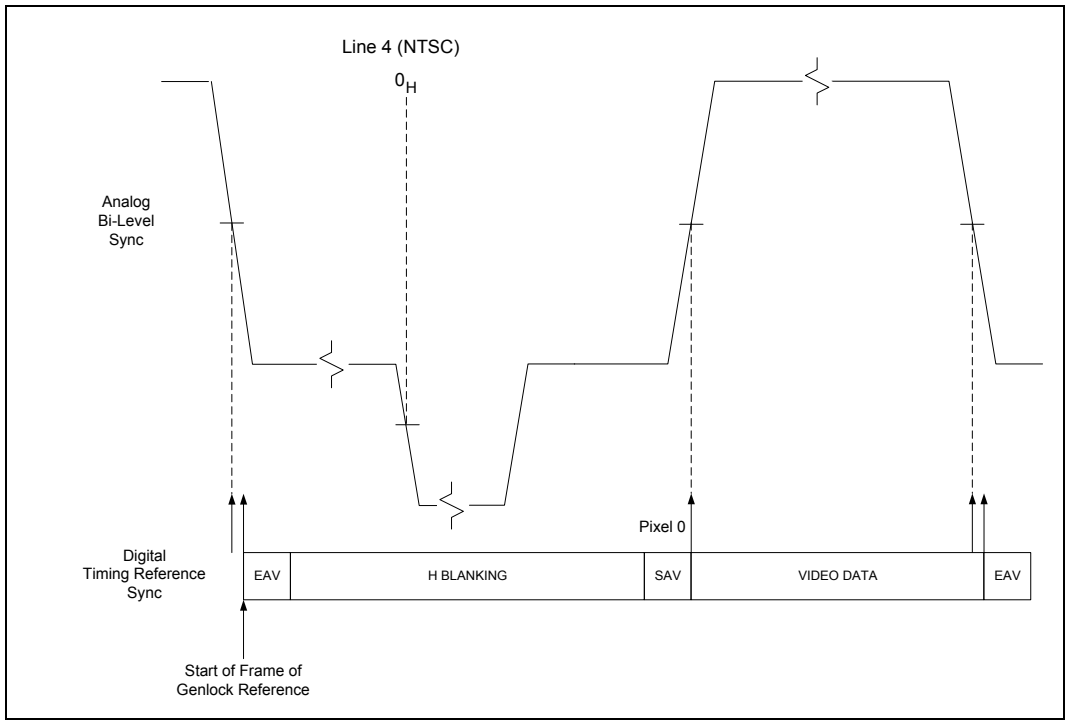


Figure 3-5: Bi-Level Reference Timing

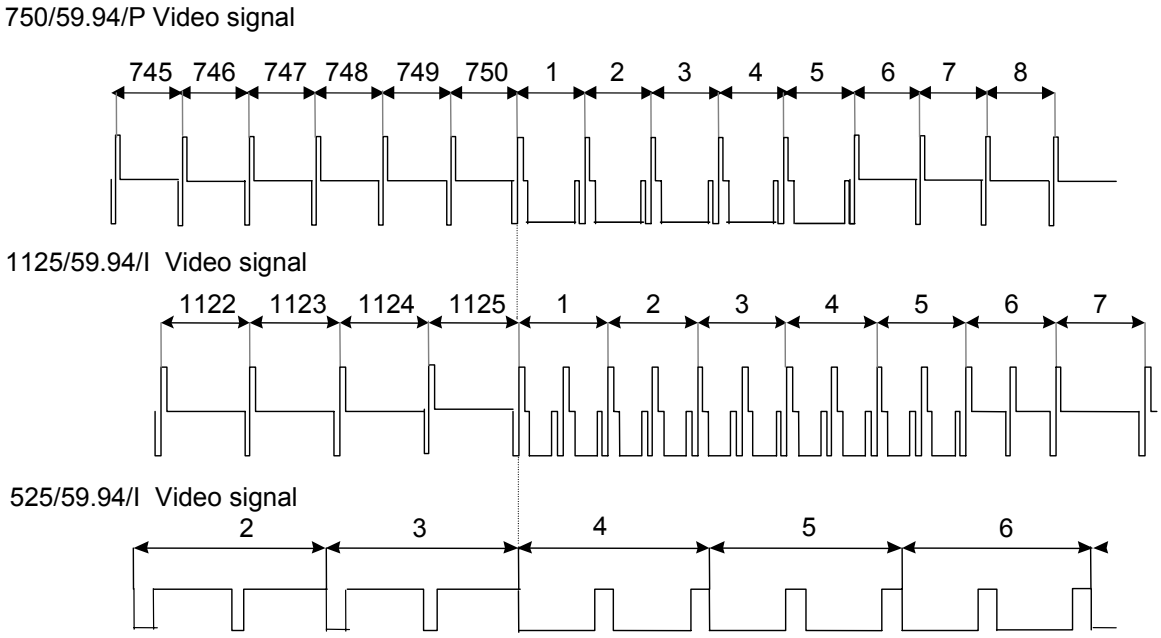


Figure 3-6: Signal Alignment in 59.94 Hz Field Rate Systems

The V parameter provides a coarse adjustment of timing and sets the delay in lines of line 1 of the output HD signal and the beginning of the genlock reference frame. The H parameter provides a fine adjust of timing and sets the delay in pixels of the 0_H time of line 1 of the output signal and the 0_H time of the beginning of the reference frame. If adjustments to the H parameter cause it roll through the pixel number at the start of a new line then the V parameter will change to the next higher or lower line.

The factory default is to align the 0_H time of Line 1 of the output video with the beginning of the genlock reference frame (0_H time of line 1 field 1 for HD Tri-level references or 0_H time of line 4 field 1 for NTSC references). For example, the horizontal reference points of Line 1 of 1125 line, Line 1 of 750 line and Line 4 of 525 line signals shall be coincident (see Figure 3-6).

3.3.13. Saving and Recalling User Presets

The *PRESETS* menu allows the user to save the setup of the upconverter to one of 4 user presets.

PRESETS
Preset 1
Preset 2
Preset 3
Preset 4

Use the up or down arrows to select the user preset you wish to use. Press the SELECT key and you will be prompted to *Save* or *Recall* the preset.

Use the up or down arrows to select *Save* and then press the SELECT key to save the setup of the device to the desired preset. The display will blink when it is done.

Use the up or down arrows to select *Recall* and then press the SELECT key to restore the setup of the device from the desired preset. The display will blink when it is done.

3.3.14. Setting the Left and Right Panel Widths (Not on early versions)

The *H BLANK START* and *H BLANK END* menus allows the user to adjust the width of the side panels These menu items are not available on early versions that do not have a gen lock reference. The values must be set separately for each *OUTPUT ASPECT* ratio and VIDEO STANDARD combination.

H BLANK START *H Bl Start: xx*	Sets the right side panel width.
H BLANK END *H Bl End: xx*	Sets the left side panel width.

3.3.15. Setting the Top and Bottom Panel Widths (Not on early versions)

The *V BLANK START* and *V BLANK END* menus allows the user to adjust the start and end of vertical blanking on the HD output picture. These menu items are not available on early versions that do not have a gen lock reference. The values must be set separately for each *OUTPUT ASPECT* ratio and VIDEO STANDARD combination.

V BLANK START *V Bl Start: xx*	Sets the bottom side panel height.
V BLANK END *V Bl End: xx*	Sets the top side panel height.

3.3.16. Setting the limits of the Standard Definition Image that will be Upconverted (Not on early versions)

The *H POSITION, H SIZE, V POSITION* and *V SIZE* menus allow the user to adjust the area of the standard definition picture that will be upconverted. These menu items are not available on early versions that do not have a gen lock reference. The values must be set separately for each *OUTPUT ASPECT* ratio and VIDEO STANDARD combination.

H POSITION *H Pos: xx*	Sets the left edge of the standard definition picture that will be upconverted.
V POSITION *V Pos: xx*	Sets the top edge of the standard definition picture that will be upconverted.
H SIZE *H Size: xx*	Sets the width of the standard definition picture (starting from the *H POSITION* value) that will be upconverted.
V SIZE *V Size: xx*	Sets the height of the standard definition picture (starting from the *V POSITION* value) that will be upconverted.

3.3.17. Setting the Position of the Upconverted Image on the HD Raster (Not on early versions)

The *OUTPUT H POS* and *OUTPUT V POS* menus allow the user to adjust the position of the upconverted image on the output high definition raster. These menu items are not available on early versions that do not have a gen lock reference. The values must be set separately for each *OUTPUT ASPECT* ratio and VIDEO STANDARD combination.

OUTPUT H POS *Out H Pos: xx*	Sets the left edge of the upconverted image on the high definition raster.
OUTPUT V POS *Out V Pos: xx*	Sets the top edge of the upconverted image on the high definition raster.

3.3.18. Displaying The Firmware Version

The *FIRMWARE VERSION* menu allows the user to display the firmware version of the Upconverter

FIRMWARE VERSION *Version 2.0*	See Chapter 4 for information about updating the firmware version of the Upconverter. The early versions of the upconverter will have firmware versions 1.xx and the later ones will have versions 2.xx.

3.4. ENGINEERING SETUP MENU

The Front panel *Engineering Setup* menu is available to configure advanced items, to update the Upconverter firmware and reset the Upconverter to its factory defaults.

Proceed with Caution! Only qualified people should use these menu items. Improper use of the Engineering menu items can cause the Upconverter application firmware to be erased.

The operation of the *Engineering Setup* menu is similar to the main menu system. It contains all the menu items from the main *Setup* menu plus the additional engineering items. To access the *Engineering Setup* menu press the ↑ key and the **SETUP** key at the same time and hold for 5 seconds. After 5 seconds, the top-level item on the menu (*VIDEO OUTPUT*) will appear. The following section gives a brief description of the additional items on the menu. Selecting one of these items will take you to the next menu level where you can select and change parameter values. Sections 3.4.1 to 3.4.4 provide detailed descriptions of each of the sub menus. The tables in sections 3.4.1 to 3.4.4 are arranged in an indented structure to indicate the path taken to reach the control. Menu items or parameters that are underlined indicate the factory default values.

DISPLAY LEVEL	This menu is used to control the brightness of the front panel display.
FACTORY RESET	This menu is used to reset the unit to its factory defaults.
UPGRADE FIRMWARE	This menu is used to upload new firmware to the Upconverter.
ACCESS CTRL REGS	This menu is used to view and change various register values.

3.4.1. Setting The Front Panel Display Brightness

DISPLAY LEVEL
Level 00

The *DISPLAY LEVEL* menu allows the user to set the brightness of the front panel display.

Valid values are 0 to 5

3.4.2. Resetting the Upconverter to its Factory Default Values

FACTORY RESET
Resetting….

The *FACTORY RESET* menu allows the user to restore the factory default values to the Upconverter.

Press *Select &* ↑ to reset the unit

3.4.3. Upgrading The Firmware Version

UPGRADE FIRMWARE
ERASE ALERT

The *UPGRADE FIRMWARE* menu allows the user to update the firmware in the Upconverter.

For more information about upgrading firmware see section 4.3.

3.4.4. Accessing the Engineering Control Registers

The *ACCESS CTRL REGS* menu allows the user to access the control registers for the Upconverter. These registers allow the user to alter the operation of the device and should only be used under direction of Evertz Factory personnel. Table 3-1 lists the control register numbers and their descriptions

Reg	Description	Reg	Description
000	Remote Register	108	Back Colour Y High Register
002	Switch Register	10A	Back Colour Y Low Register
004	Filter (freq response) Register	10C	Back Colour Cb High Register
006	Control (CNT) Register	10E	Back Colour Cb Low Register
008	Out Delay Register	110	Back Colour Cr High Register
00A	Pan Position Register	112	Back Colour Cr Low Register
00C	Process Setup Register	114	Position H Start High Register
00E	Process Video Gain Register	116	Position H Start Low Register
010	Process Chroma Gain Register	118	Position V Start High Register
012	Process Hue High Register	11A	Position V Start Low Register
014	Process Hue Low Register	11C	Output Blanking H End High Register
016	H Position High Register	11E	Output Blanking H End Low Register
018	H Position Low Register	120	Output Blanking H Start High Register
01A	V Position High Register	122	Output Blanking H Start Low Register
01C	V Position Low Register	124	Output Blanking V End High Register
01E	Hue Cos High Register	126	Output Blanking V End Low Register
020	Hue Cos Low Register	128	Output Blanking V Start High Register
022	Hue MSin High Register	12A	Output Blanking V Start Low Register
024	Huw MSin Low Register	200	H Size High Register
026	Hue Sin High Register	202	H Size Low Register
028	Hue Sin Low Register	204	V Size High Register
082	Status Register	206	V Size Low Register
100	V Phase High Register	280	COEF Address 1 Register
102	V Phase Low Register	282	COEF Address 2 Register
104	H Phase High Register	284	COEF Address 3 Register
106	H Phase Low Register	286	COEF Data 1 Register
		288	COEF Data 2 Register
		28A	COEF Read 1 Register
		28C	COEF Read 2 Register
		290	COEF Red Set Register
		292	COEF H/W S/W Select Register

Table 3-1: Control Registers

4. TECHNICAL DESCRIPTION

4.1. SPECIFICATIONS

4.1.1. SDI Video Inputs

Standards: 525 line SMPTE 259M-C (270Mb/s) with Group 1 SMPTE 272M embedded audio
Number of Inputs: 1
Connector: BNC per IEC 169-8
Equalisation: Automatic up to 200m @ 270 Mb/s with Belden 8281 or equivalent cable

4.1.2. Reclocked SDI Video Outputs

Standard: Same as Input
Number of Outputs: 1
Connector: BNC per IEC 169-8
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: 740ps nominal
Overshoot: <10% of amplitude
Wide Band Jitter: < 0.2 UI

4.1.3. HD Video Outputs

Standards: SMPTE 292M (1.5 Gb/s) – standards supported shown in Table 4-1

Common Name	Pixels / Active Lines	Frame Rate	Progressive /Interlace	SMPTE Standard
1080i/59.94	1920 x 1080	29.97 (30/1.001)	I	274M
1035i/59.94	1920 x 1035	29.97 (30/1.001)	I	260M
480p/59.94	720 x 483	59.94 (60/1.001)	P	293M, 349M
720p/59.94	1280 x 720	59.94 (60/1.001)	P	296M

Table 4-1: High Definition Video Output Formats

Number of Outputs: 4
Connector: BNC per IEC 169-8
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: 200ps nominal
Overshoot: <10% of amplitude
Jitter: <0.25 UI at 1 KHz when locked to input video
<0.25 UI @ 10 Hz when locked to external reference

4.1.4. Video Reference

Type: Menu selectable
NTSC Colour Black (1 V p-p) or Composite Bi-level sync (300 mV)
HD Tri-level Sync
Connectors: BNC per IEC 169-8
Termination: High impedance loop through

4.1.5. Analog Video Input (+CD-A4 option only)

Standard: NTSC, SMPTE 170M
Number of Inputs: 1
Connector: BNC per IEC 169-8
Signal Level: 1V nominal
Input Impedance: 75 Ohm
Return Loss: >30dB to 10MHz

4.1.6. Analog Audio Inputs (+CD-A4 option only)

Number of Inputs: 4
Type: Balanced analog audio
Connector: Removable terminal strip
Input Impedance: 20kOhm minimum (differential)
Sampling Frequency: 48kHz
Signal Level: 0dB FS => 18 or 24dBu (jumper selectable)
Level Control Range: +/- 10dB
Frequency Response: +/- 0.1dB (20Hz to 20kHz) (broadcast quality)
SNR: 100dB with input at -0.5dBFS
THD+N: <0.001% (>100dB) @ 1kHz, -0.5 dB FS
CMRR >100dB @ 1kHz

4.1.7. Composite Decoder SDI Video Output (+CD-A4 option only)

Standard: 525 line SMPTE 259M-C (270Mb/s) with Group 1 SMPTE 272M embedded audio
Number of Outputs: 1
Connector: BNC per IEC 169-8
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: 740ps nominal
Overshoot: <10% of amplitude
Wide Band Jitter: < 0.2 UI

4.1.8. Composite Decoder Reference Input (+CD-A4 option only)

Type: NTSC Colour Black 1 V p-p
Connectors: BNC per IEC 169-8
Termination: 75 ohm

4.1.9. COM Port

Standard: RS-232
Baud Rate: 57,600
Connector: 9 pin female "D"

4.1.10. General Purpose Inputs

Number of Inputs: 7
Function: Preset select (4), Future use (3)
Type: Opto-isolated, active low with internal pull-ups to externally supplied voltage
Connector: Female DB-9
Signal Level: closure to ground

4.1.11. Upconverter Processing

Internal paths between functional blocks: 12 bits
Mathematical coefficients: 12 bits
Internal processing: Up to 36 bits
Output modes: 16:9 anamorphic stretch, 4:3 with side panels, 16:9 letterbox zoom to full size and 14:9 letterbox zoom to full size 14:9 with side panels.
Motion detection: field/frame/mixed
Processing delay: 3 msec to 1 Frame, dependent on reference and output phasing
Filtering: Independent H and V filters

4.1.12. Electrical

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

4.1.13. Physical

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

4.2. UPGRADING FIRMWARE – CURRENT VERSIONS

The firmware in the HD9510UC Upconverter is contained on a FLASH EPROM. From time to time firmware updates will be provided to add additional features to the unit. To confirm that you have the current version of the upconverter see the rear panel drawing Figure 2-2. See section 4.3 for information on upgrading firmware in early versions of the upconverter.

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

- PC with available communications port. The communication speed is 57600 baud, therefore a 486 PC or better with a 16550 UART based communications port is recommended.
- "Straight-thru" serial extension cable (DB9 female to DB9 male) or (DB25 female to DB9 male).
- Terminal program that is capable of Xmodem file transfer protocol. (such as HyperTerminal)
- New firmware supplied by Evertz.

4.2.1. Terminal Program Setup.

1. Connect the serial cable to the COM DB9 connector on the rear panel

2. Connect the 9 pin connector on the end of the serial update cable to the PCs' RS-232 communications port

3. Start the terminal program.

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

Baud	**57600**
Parity	**no**
Data bits	**8**
Stop bits	**2**
Flow Control	**None**

5. Power up the HD9510UC unit.

4.2.2. Initiating Firmware Upgrade Mode Via The Front Panel

This is the recommended method of updating the software in the HD9510UC Upconverter. It is activated through the *Engineering Setup* menu system. If you cannot invoke the upload mode via the front panel outlined in section 4.2.2 then follow the steps in section 4.2.3.

6. You can invoke the Firmware upgrade mode using the front panel Setup Menu. (See section 3.2 for information on how to operate the front panel menus.) Press the ↑ key and the **SETUP** key at the same time and hold for 5 seconds to enter the *Engineering Setup* menu system, scroll to the *UPGRADE FIRMWARE* menu using the ↑ or ↓ keys and then press **SELECT**. The front panel should then read `ERASE ALERT`. This warning lets the user know that taking the next step will place the unit in programming mode and could erase the software already present in the FLASH device. To proceed, press and hold the **SELECT** and then press the ↓ key. This places the unit in programming mode and opens its serial port to communicate with the terminal software program. The front panel display shows `Program Mode…` Proceed to section 4.2.4 for instructions on uploading the firmware using the terminal program.

4.2.3. Initiating Firmware Upgrade Mode From The Terminal Program

You may send commands to the Upconverter to initiate Firmware upload mode using the terminal program. If the Upconverter is operating normally proceed to step 10. If the Upconverter does not boot properly you will have to enter the command from the Boot monitor as described in steps 7 to 12.

7. Power up the HD9510UC Upconverter. After the unit powers up, a banner with the boot code version information should appear in the terminal window.

For example:

```
EVERTZ MFC5407 MONITOR 2.1.3
COPYRIGHT 1997, 1998, 1999, 2000, 2001 EVERTZ MICROSYSTEMS LTD.
COLD BOOT |
```

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

   - Defective Serial Upgrade cable.
   - Wrong communications port selected in the terminal program.
   - Improper port settings in the terminal program. (Refer to step 4 for settings). Note that HyperTerminal will not change port settings while connected. Click on HyperTerminal's "Disconnect" Button then click the "Reconnect" button to activate changes to the port settings.

9. Hit the <ENTER> key on your computer once.

10. Type the word "upgrade", without quotes, and hit the <ENTER> key once.

11. The boot code will ask for confirmation. Type "y", without quotes.

12. You should now see a prompt asking you to upload the file.

4.2.4. Uploading the new firmware

14. Upload the "*.bin" file supplied using the X-Modem transfer protocol of your terminal program. If you do not start the upload within 10 minutes the unit's Boot code will time out. You can restart the upgrade process by power cycling the unit.

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

    For Example:

```
UPLOAD OKAY
MFC5407 WARM BOOT> |
```

16. The following is a list of possible reasons for a failed upload:

    - If you get the message "transfer cancelled by remote" you must restart the terminal program and load the bin file, then remove and install the module again.
    - The supplied "*.bin" file is corrupt.
    - Wrong file specified to be uploaded.
    - Wrong file transfer protocol used – make sure you specify Xmodem, not Xmodem 1K.
    - The PCs' RS-232 communications port can't handle a port speed of 57600.
    - Noise induced into the Serial Upgrade cable.

4.2.5. Completing the Upgrade

17. Power cycle the unit. The unit should now reboot.

18. You can now close the terminal program and disconnect the RS-232 serial cable from the PC.

4.3. UPGRADING FIRMWARE – EARLY VERSIONS

The firmware in early versions of the HD9510UC Upconverter is contained on a FLASH EPROM built into the microcontroller chip (MCU), and can be upgraded easily using a computer running Windows 95 or later, and the appropriate cable connected to the COM port on the Upconverter rear panel. The firmware file (e.g. HD9510UC.HEX) and a special application called WINISP (which should have been supplied along with the firmware) are required in order to upgrade the firmware. To confirm that you have the early version of the upconverter see the rear panel drawing Figure 2-1. See section 4.2 for information on upgrading firmware in later versions of the upconverter.

4.3.1. Connecting the Computer to the Upconverter

In order to connect the computer you will need a "straight through" cable wired according to Table 4-2 below.

Upconverter End			PC End	
9 pin D Male	**Pin**		**9 pin D Female**	**Pin**
	1			1
TxD	2	----------	RxD	2
RxD	3	----------	TxD	3
	4			4
Sig Gnd	5	----------	Sig Gnd	5
	6			6
RTS	7	----------	CTS	7
CTS	8	----------	RTS	8
	9			9
Frame Gnd	Shield	---drain-----	Frame Gnd	Shield

Table 4-2: Cable to Connect PC to Upconverter for Updating Firmware

4.3.2. Initiating Programming Mode

There are two methods of initiating FLASH programming which should cover programming for most units. If neither of these methods is successful, contact the factory for further instructions.

4.3.2.1. Setup Menu Method

This is the recommended method of updating the software in the HD9510UC Upconverter. It is activated through the *Engineering Setup* menu system. Press and hold the ↑ key and press and hold the **SETUP** key for 5 seconds to enter the menu system, scroll to the *UPGRADE FIRMWARE* menu using the ↑ or ↓ keys and then press **SELECT**. The front panel should then read `ERASE ALERT`. This warning lets the user know that taking the next step will place the unit in programming mode and could erase the software already present in the FLASH device. To proceed, press and hold the **SELECT** and then press the ↓ key.

This places the unit in programming mode and opens its serial port to communicate with the WINISP program. The front panel display shows `Program Mode…` Proceed to section 4.3.3 for information about uploading the firmware using WINISP.

4.3.2.2. Jumper Method

This method should only be attempted if the present software in the unit is not functioning sufficiently enough to allow the user to access the *UPGRADE FIRMWARE* item on the *Setup* menu. This method requires the unit to be powered down, the top cover removed, and the jumpers J27 and J11 on the Mid plane board be placed in the programming position. Then reapply power to the unit and the unit should automatically enter programming mode. Proceed to section 4.3.3 for information about uploading the firmware using WINISP. When finished programming the unit, power down the unit, return the jumpers to their original positions before re powering up the unit.

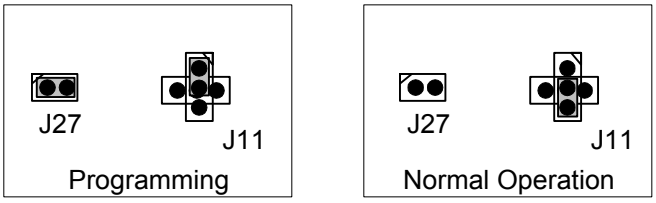


Figure 4-1:Configuring the Programming Jumpers

4.3.3. Programming the MCU Using WINISP

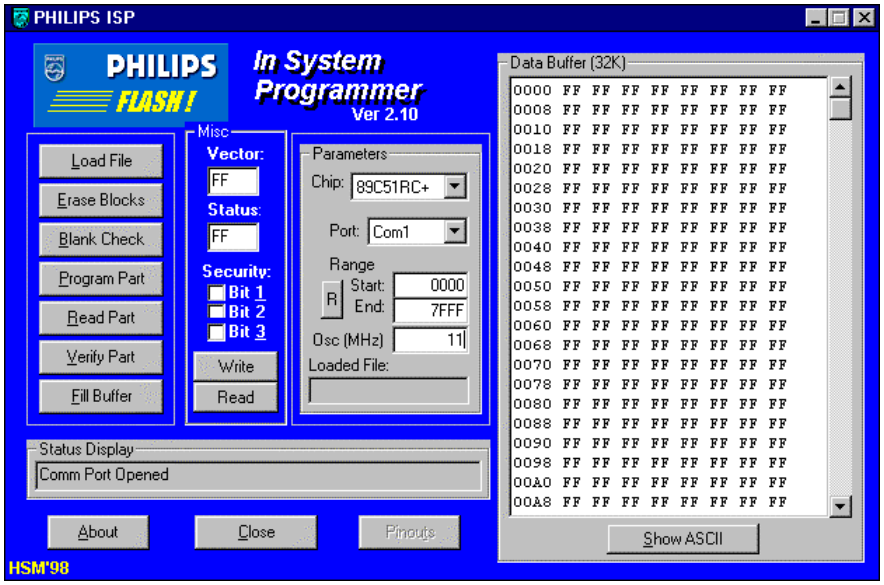
Start the WINISP application.

4.3.3.1. WINISP Configuration Setup

Configure the WINISP software by selecting the following items in the Parameters boxes that are coloured yellow.

1. Set the Chip setting to “89C51RC+”.
2. Set the communications port to the port you have your straight through downloading serial cable connected to.
3. Set the Osc frequency to 11 to match the internal crystal value of 11.05MHz.

When you are finished the parameters box should look like this:



WINISP is now ready to communicate with the unit.

Care must be taken at this point to ensure that the Vector value of the flash microcontroller is not over written as this can force the MCU into a mode that only can be corrected by returning the unit to the factory. To prevent this from happening do NOT press the WRITE button in the MISC box.

4.3.3.2. Confirming Communications with the Upconverter

Press the READ button. The Status Display should come back with the message “Boot Vector Read OK”. If it does not then check your power and serial connections. If the communications link is OK then the MCU should return the Vector value “FC” and a status value of “00”. If it does not you must first correct this problem following the procedure outlined in section 4.3.3.3 below.

If all is OK you are ready to program the MCU. Proceed to section 4.3.3.4

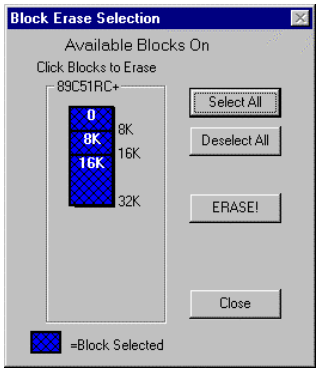
4.3.3.3. Reprogramming the Boot Vector and Status Byte

The following procedure should be used with caution. Reprogramming the Boot Vector incorrectly will make the unit cease to function normally and require that you return the unit to the factory for updating.

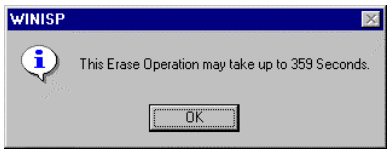
If the Boot Vector or the Status byte are not read back as “FC” and “00” respectively they must be correctly changed before proceeding. First note that the security bits are typically read back as ON. This is a bug in the WINISP program. To correct this, first change all the security bits to OFF. Next manually set the Boot Vector data to “FC” and the Status Byte to “00”. Then press the WRITE button. A message should appear warning you that you are about to overwrite these registers. Double check that the values you entered are correct and then proceed with the overwrite. Care must be taken here as incorrectly setting these values may result in the unit being placed in a state that requires the unit to be returned to the factory. If all goes well proceed with the programming of the MCU as outlined in the next section

4.3.3.4. Reprogramming the Microcontroller in the Upconverter

First erase the MCU in the Upconverter by pressing the ERASE button and selecting all three sections by clicking on them individually. (WINISP has a bug which causes the SELECT ALL button to not function correctly and the erase function will hang the program)

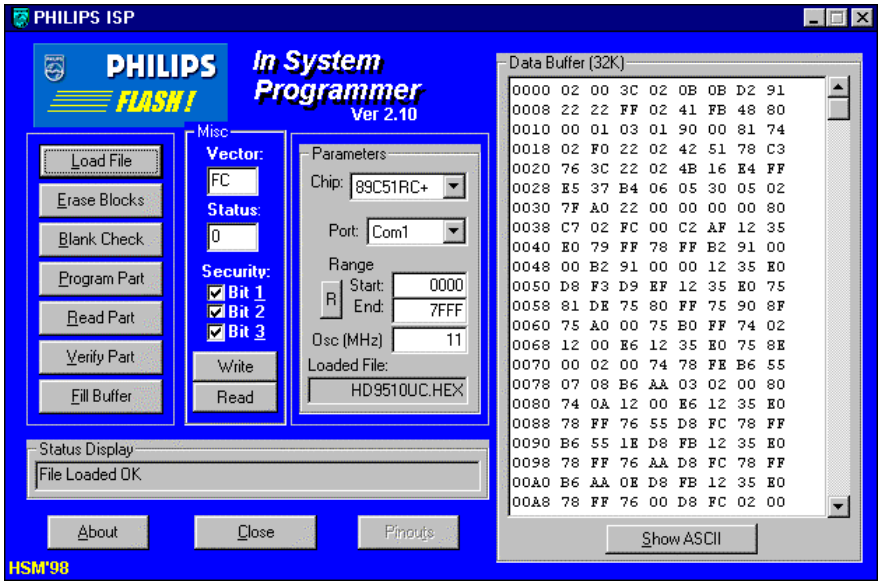


Then press the ERASE button and a message will appear indicating how long the erase function will take.

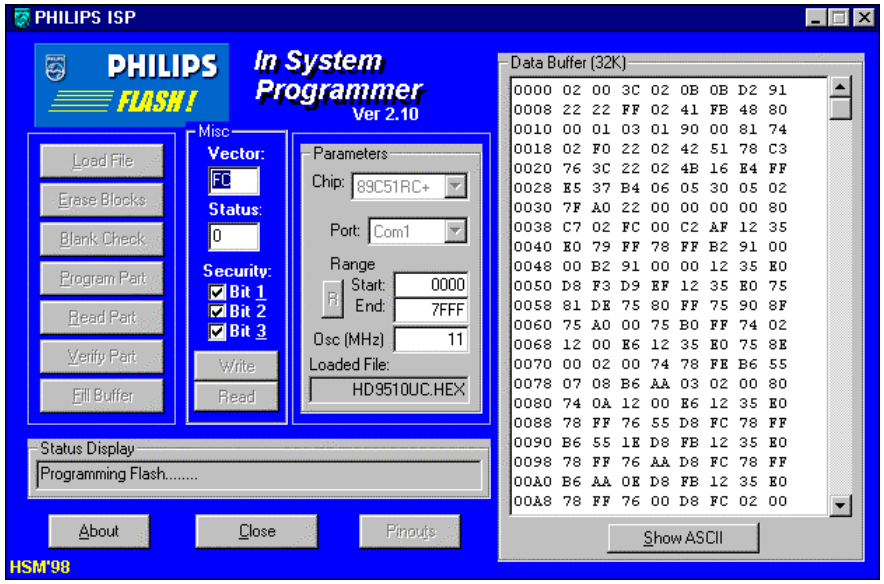


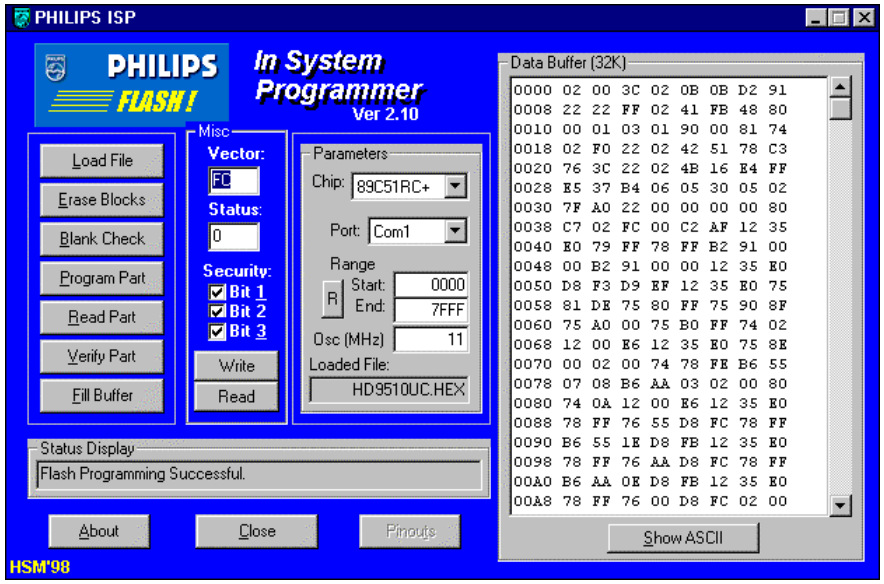
This is a worst case timing and you should not be alarmed if the erase function is much quicker than indicated. Typical erase times are in the order of ten to fifteen seconds. After erasing you should verify the erase with a BLANK CHECK. The status display on the screen should say “The selected range is Blank.”

If all goes well, press the LOAD FILE button. You will be presented with a standard Windows file picker dialog box that allows you to select the HD9510UC hex file and load it into WINISP’s internal buffer.



Then press the PROGRAM PART button and the new software will be downloaded into the unit.





When finished verify the programming using the VERIFY PART button. If the part verifies then you are done. Power down and then re power the unit and you will have successfully upgraded the software. If you used the jumper method to initiate programming, remember to restore the jumpers to their original positions.