Model X-9512
12 x 1 SDI Router
&
Model X-HD9512
12 x 1 High Definition Router

Instruction Manual

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INFORMATION TO USERS IN EUROPE

NOTE

CISPR 22 CLASS A DIGITAL DEVICE OR PERIPHERAL

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

INFORMATION TO USERS IN THE U.S.A.

NOTE

FCC CLASS A DIGITAL DEVICE OR PERIPHERAL

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

WARNING

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

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

REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	Original Version	June 99
1.1	Updated Menu structure to support GVG Ten XL protocol and GPI Mode	Aug 00
1.2	Updated Table 2-4 to correct Pinout labels	May 01
1.3	Added DIP switch 5 to Table 4-1	Feb 02

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1. OVERVIEW

The X-9512 and X-HD9512 series twelve input routing switchers provide a convenient, low cost way to route Standard and High definition serial digital signals. The X-9512 series routers are used for 270, 360 & 540Mb/s standard definition serial digital signals, while the X-HD9512 routers are used for 1.5Gb/s HDTV serial digital signals.

The router 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. All units can also be controlled by contact closures on the GPI control port or through the RS-232 serial remote control port using industry standard switcher protocols.

Features:

- Standard definition units support SMPTE 259M (270Mb/s,360Mb/s,540Mb/s) video signals
- High definition units support SMPTE 292M (1.5 Gb/s) video signals
- Units can be genlocked, from an external source so that a “clean switch” can be achieved.
- Switch point is fully dynamic and controllable from the front panel.
- Video input presence detection displayable on the front panel.
- Remote control panel option available.
- Parallel GPI and RS-232 serial control.
- Programmable source input names available on the front panel.
- Optional video input relay bypass for power failure bypass protection.
- Optional dual power supply configuration.
- Field upgradable firmware as new features become available

1.1. HOW TO USE THIS MANUAL

This manual is organized into 5 chapters: Overview, Installation, Operation, Technical Description and Serial Protocol. This chapter contains a quick summary of the router 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 router 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 router 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.

Chapter 5 is a programmer’s reference to the serial control protocol.

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 organization that recommends standards for the audio industries.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

COMPONENT DIGITAL: A digital representation of a component analog signal set, most often Y, B-Y, R-Y. The encoding parameters are specified by CCIR-601. 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 synchronizing information.

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

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

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

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

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

EBU TECH 3267-E: The EBU recommendation for the parallel interface of 625 line digital video signal. This is a revision of the earlier EBU Tech 3246-E standard 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.

GVG TEN-XL: A 10 x 1 router made by the Grass Valley Group. The serial control protocol used for this router has become an industry standard. The control protocol used to control the Evertz 95XX series routers is an extension of this protocol.

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

ITU-R601: See CCIR601

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

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

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

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

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

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

SMPTE 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.)

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2. INSTALLATION

2.1. REAR PANEL

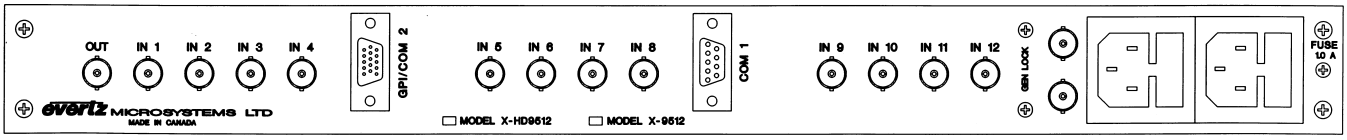

Figure 2-1: Rear Panel Layout

The following sections describe the purpose of the rear panel connectors of the X-9512 and X-HD9512 4 X 1 Router. Sections 2.1.1 to 2.1.5 describe the specific signals that should be connected to the units.

2.1.1. Digital Video Connections (X-9512)

IN 1 to IN 12 input connectors for 10-bit serial digital video signals, compatible with the SMPTE 259M standard. The **IN 1** connector may be bypass protected through an optional bypass relay.

OUT output connector for the Video router section. Video from the selected VIDEO Input bus will be available on this output.

2.1.2. High Definition Digital Video Connections (X-HD9512)

IN 1 to IN 12 input connectors for 10-bit serial digital high definition video signals, compatible with the SMPTE 292M standard. The **IN 1** connector may be bypass protected through an optional bypass relay.

OUT output connector for the Video router section. Video from the selected VIDEO Input bus will be available on this output.

2.1.3. Remote Control Connections

COM 1 An RS-232 serial interface used for updating the firmware or external serial remote control. The *Setup* menu is used to configure the COM 1 port for external control or firmware updating. (See section 3.3.)

This COM1 port has a female 9 pin D with the following pinout

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 1 Pin Definitions

GPI / COM 2 This female high density 15 pin D is a dual function connector. Some of the pins function as an RS-422 serial interface to the optional remote control panel. The remainder of the pins form an opto-isolated Parallel port with 5 inputs and 3 outputs. A Y cable adapter is shipped with the 9512 remote control panel to facilitate connection of the remote panel and GPIO at the same time.

Pin #	Name	Description
1	GND	Chassis ground
2	TX- *	RS-422 Transmit – Output
3	GPO1	General purpose output 1
4	GPO2	General purpose output 2
5	GPI3	General purpose input 3
6	RX- *	RS-422 Receive – Input
7	TX+ *	RS-422 Transmit + Output
8	GPI1	General purpose input 1
9	GPI4	General purpose input 4
10	GP+5V	+5V from general purpose interface board
11	RX+ *	RS-422 Receive + Input
12	GPI5	General purpose input 5
13	GPO3	General purpose output 3 (not used)
14	GPI2	General purpose input 2
15	Vext	External voltage source for GPI's

Table 2-2: GPIO/COM2 Pin Definitions

2.1.4. Gen Lock Video Connections

GENLOCK is a high impedance loop through for connecting an analog video or tri-level sync (X-HD9512 only) reference. The *VIDEO REFERENCE* setup menu item is used to select the correct type of video reference being used.

Jumper J20 and DIP switch 5 allows the user to select the type of genlock signal being applied to the Genlock reference input. In order to access the jumper and DIP switch, you will have to remove the top cover of the unit. Jumper J20 is located at the bottom-left of the 9000GPIO card just below the oscillator crystal, and is labeled VID. The 2-3 position is closest to the left edge of the card, position 1-2 is closest to the center of the card. Make sure you select the proper Gen Lock type after changing the DIP switch and Jumper.

Table 2-1 below shows the correct settings of the DIP switch and jumper for the type of router and genlock provided.

MODEL	GENLOCK SYNC TYPE	DIP 5	J20
9512	Bi-Level (NTSC, PAL)	OFF	1-2
HD9512	Bi-Level (NTSC, PAL)	OFF	1-2
HD9512	Tri-Level (1080i/59.95, 1080p/23.98sF, 720p/59.94, 1080i/50)	ON	2-3

Table 2-3 Gen Lock Select DIP Switch and Jumper Settings

2.1.5. Power Connections

The router 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. The PSU STATUS LEDs on the front panel indicate if the power supplies are operating normally.

2.2. MOUNTING

The Router 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 router 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 router is fitted with the redundant power supply there will be an additional IEC-320 connector on the rear panel.

If the router 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 fuseholder into the power entry module.

Never replace with a fuse of greater value.

2.4. CONNECTING THE REMOTE CONTROL PANEL

The 9512 series routers can be sold with integrated front panel control, or with a rack mountable remote control panel. When the units are shipped with the remote panel, the front panel of the unit has only the PSU Status indicators.

The GPI/COM2 connector on the rear panel is used to connect the remote control panel to the main electronics unit. A Y-cable adapter (Part WA-S36) was supplied with the remote control panel. This cable adapter facilitates simultaneous connection of the remote control panel and the Parallel I/O that shares the 15 pin D connector. The 9 pin female connector on the Y adapter cable may be plugged directly into the remote control panel. For longer distances, simply make your own cable of the required length according to the diagram in Table 2-5. Communications to the remote panel is through an 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.

GPIO Loop Through			9512 GPIO/COM 2 End			Remote Panel End	
15 Pin D Female	Pin	1 Foot	15 Pin D Male	Pin	5 Feet Belden 9729	9 pin D Female	Pin
GND	1	----------	GND	1	----drain 1---	GND	6
TX-	2		TX-	2	-------1b------	TX-	2
GPO1	3	----------	GPO1	3			
GPO2	4	----------	GPO2	4			
GPI3	5	----------	GPI3	5			6
RX-	6		RX-	6	-------2b------	RX-	8
TX+	7		TX+	7	-------1a------	TX+	7
GPI1	8	----------	GPI1	8			
GPI4	9	----------	GPI4	9			
GP+5V	10	----------	GP+5V	10			
RX+	11		RX+	11	-------2a------	RX+	3
GPI5	12	----------	GPI5	12			4
GPO3	13	----------	GPO3	13			
GPI2	14	----------	GPI2	14			
Vext	15	----------	Vext	15			
Frame Gnd	Shield	----drain-----	Frame Gnd	Shield	----drain 2---	Frame Gnd	Shield

Table 2-4: GPIO/COM2 Y Adapter Cable (WA-S36)

Y Adapter 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----	RxGnd	4
	5			
Tx Gnd	6	---drain 1----	TxGnd	6
Tx+	7	-------1b-----	Rx+	7
Rx-	8	-------2a------	Tx-	8
	9			9
Frame Gnd	Shield	---drain 1----	Frame Gnd	Shield

Table 2-5: Remote Control Panel Extender Cable

2.5. CONNECTING THE GENERAL PURPOSE INPUTS AND OUTPUTS

The 15 pin GPIO/COM2 connector has 5 general purpose inputs and 3 general purpose outputs. The inputs are used to activate video bus crosspoints. Two of the output functions can be assigned using the GPO1 and GPO2 menu items on the *Setup* menu. The third output is not used.

All GPI inputs are active low. This means that if you leave an input floating (not connected) then it will not be activated. Lowering the GPI input to a voltage below Vext will activate the input. GPI1 to GPI4 are

used to select Video Bus 1 to 12 crosspoint controls. When these GPI inputs set according to the chart in Table 3-1 and GPI input 5 is activated, the corresponding Video Input Bus is routed to the video router output. See section 3.5 for a complete description of how to use the GPI inputs.

The user can connect GP+5V supplied from the frame into the Vext pin to provide power to the GPIO opto-isolator circuitry. In this configuration the user can activate GPIs simply by connecting the GPI input pins to Ground (see Figure 2-3). This can be done with a button, switch, relay or an open collector transistor. In this configuration the GPOs will be internally pulled up to 5 volts. (See Figure 2-5) Five volts is available to the user to be used for driving external circuitry. Care must be taken to limit the load to 0.5W so there is no affect on the power supply source in the frame.

Alternately, the user can connect an external power source for the opto-isolator circuitry. Figure 2-4 and Figure 2-6 show how to wire the GPIs and GPOs from an external power supply.

Warning: Do not connect GP+5V from one frame to another frames GP+5V.

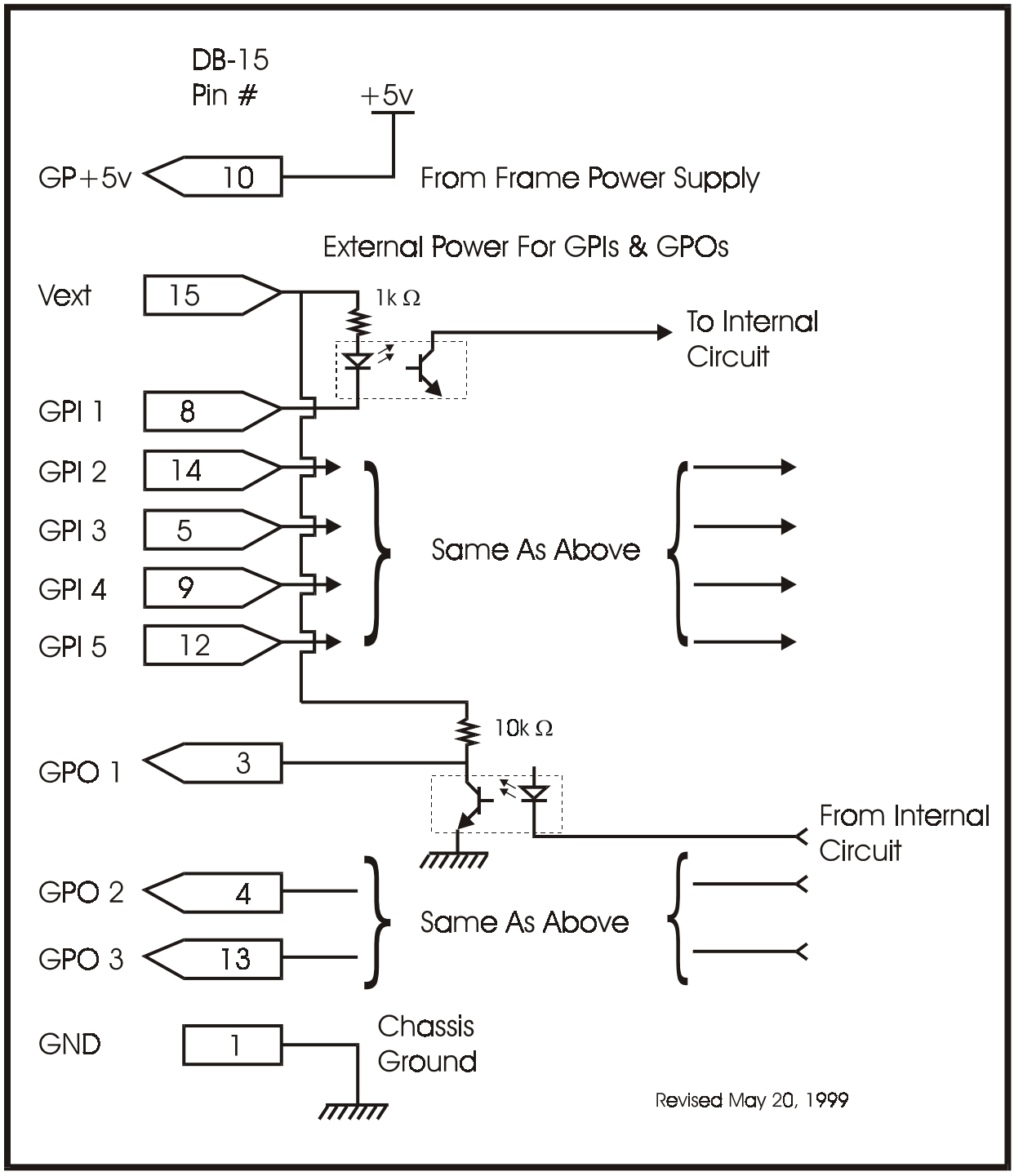

Figure 2-2: General Purpose I/O Schematic

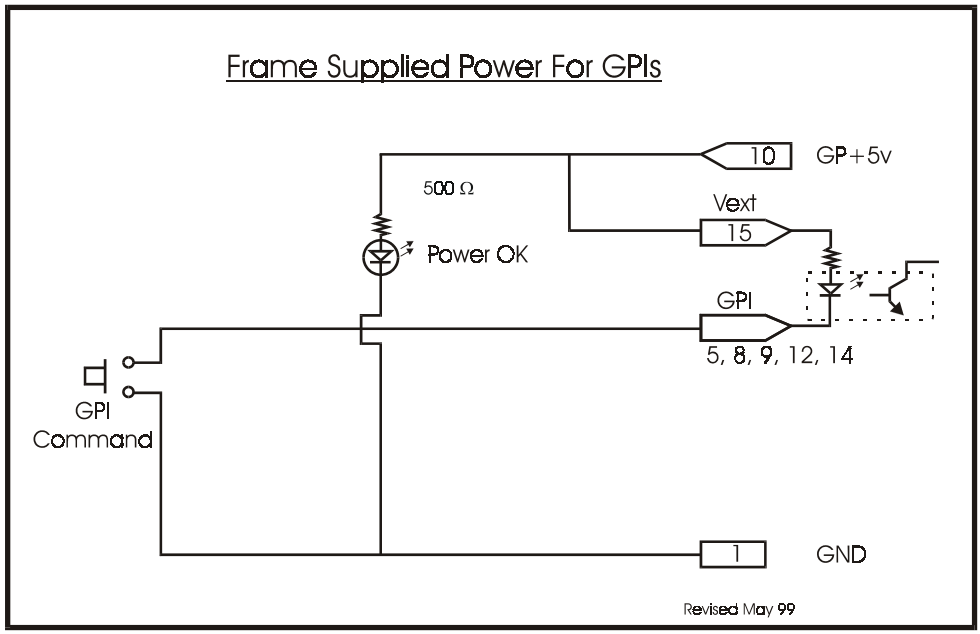

Figure 2-3: Powering the General Purpose Input Opto Isolators from the Router

Alternately, an external voltage source may be applied (Figure 2-4). The Vext voltage must be greater than the voltage supplied to GPI by at least 5v.

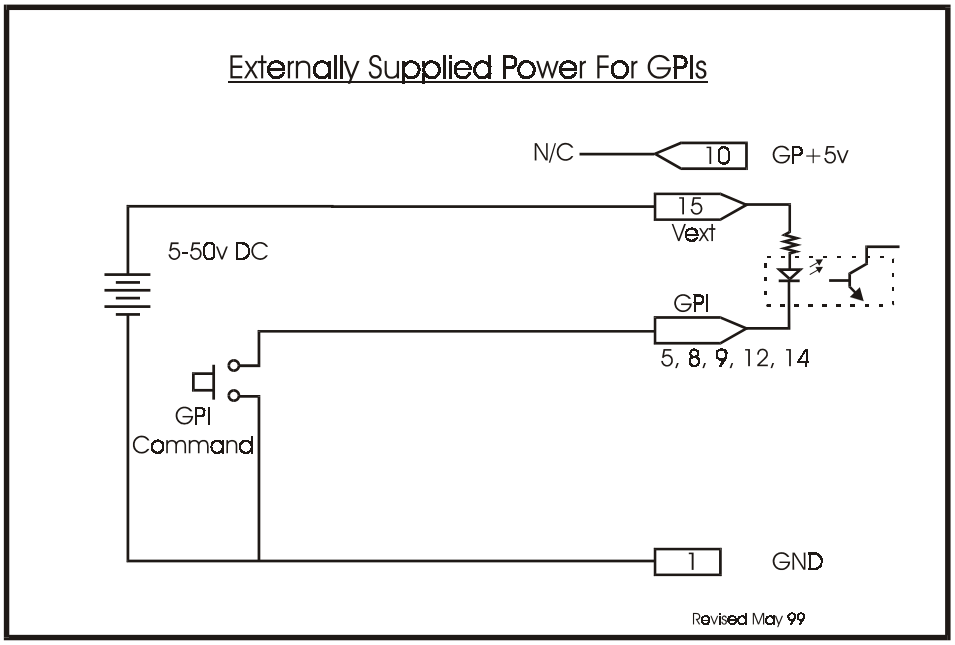

Figure 2-4: Powering the General Purpose Input Opto Isolators from an External Power Supply

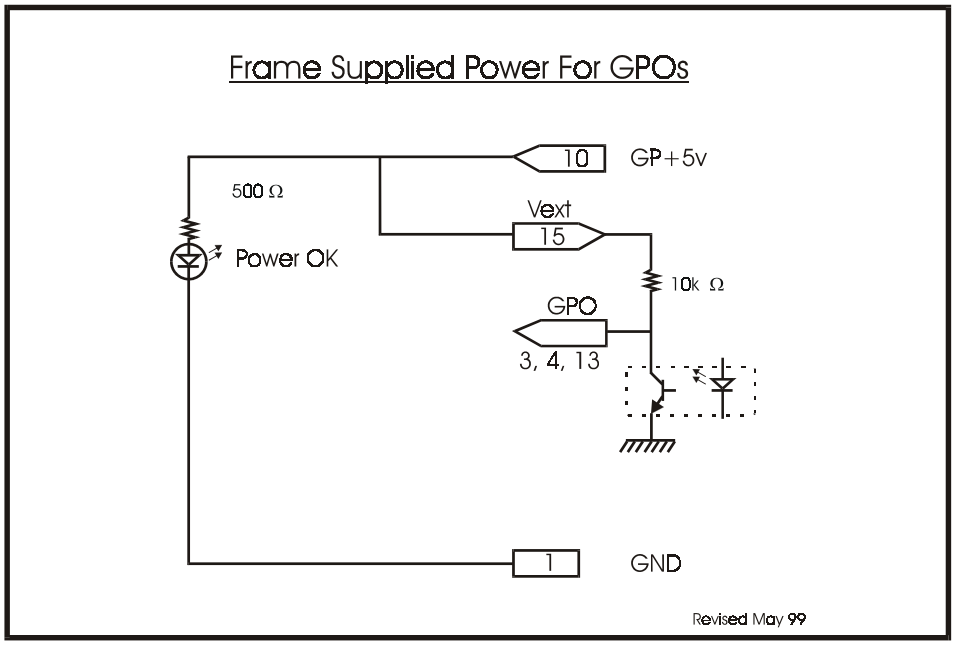

Figure 2-5: Powering the General Purpose Output Opto Isolators from the Router

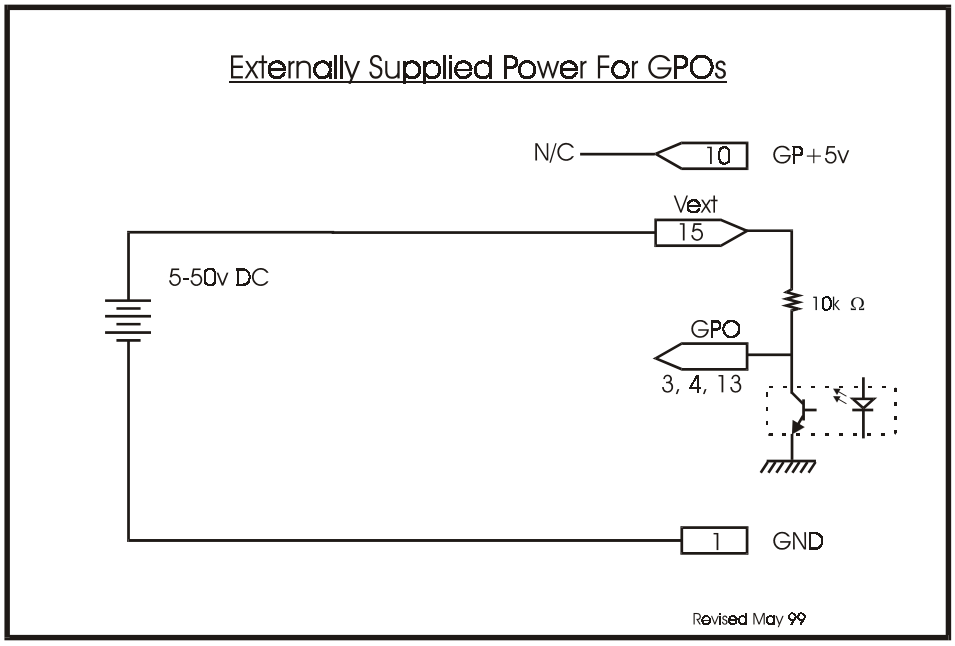

Figure 2-6: Powering the General Purpose Output Opto Isolators from an External Power Supply

2.6. CONTROLLING THE ROUTER USING THE EXTERNAL SERIAL PROTOCOL

The 9512 series routers can be controlled from router control devices or it can control other devices employing industry standard router control protocols. Currently the only control protocol supported is the Grass Valley Ten-XL ASCII protocol. The control device is connected to the router using the COM1 connector on the rear panel. The *Setup* menu is used to configure COM1 for external control using the *External Control, Baud Rate, Serial Format, and Serial Address* menu items.

2.6.1. Connecting the Router to a Grass Valley Ten XL ASCII Control Device

Use the *Setup Menu External control* item and select `Gvg ten xl ASCII` protocol. The *Baud Rate, Serial Address,* and *Serial Format* menu settings must be set to match those required by the GVG control device. If the Router is being controlled by another device set the *Serial Control* menu setting to `slave`. If the router is controlling another device using its remote control port then set the *Serial Control* menu setting to `master`.

When you select `Gvg ten xl ASCII` protocol COM1 is automatically configured for RS232 operation. When connecting two 9512 series routers together in a master/slave relationship use the cable shown in Table 2-6. For other applications you can use the information in Table 2-1 and the manual for the other equipment to make an appropriate cable.

Master 9512 End			**Slave 9512 End**	
9 pin D Male	**Pin**	**Belden 9729**	**9 pin D Male**	**Pin**
	1			1
TxD	2	-------2b------	RxD	3
RxD	3	-------1a------	TxD	2
	4			4
Gnd	5	---drain 2----	Gnd	5
	6			6
RTS	7	-------1b-----	CTS	8
CTS	8	-------2a------	RTS	7
	9			9
Frame Gnd	Shield	---drain 1----	Frame Gnd	Shield

Table 2-6: Master 9512 to Slave 9512 Cable

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3. OPERATION

The router 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. All units can also be controlled by contact closures on the GPI control port or through the RS-232 serial remote control port using Grass Valley switcher protocol.

3.1. OVERVIEW OF THE FRONT PANEL DISPLAY AND CONTROLS

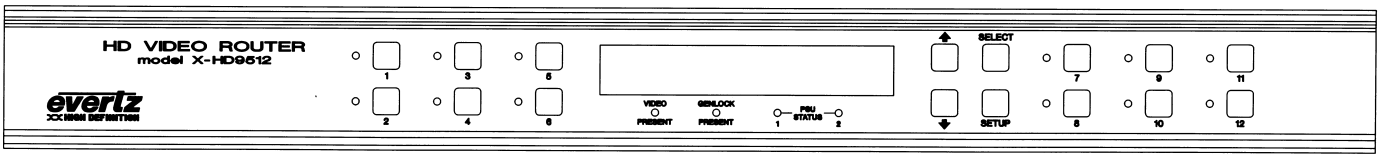

Figure 3-1: Front Panel Layout

3.1.1. Video Router Controls

VIDEO BUS 1 to 12 These twelve buttons allow the user to select between the 12 available video inputs.

3.1.2. Setup Key Group

SETUP This button is used to enter *Setup* menu which is used to control various setup options to configure the operating modes of the routing switchers. (See section 3.3 for a complete description of the *Setup* menu.)

↑ & ↓ The arrow keys are used to navigate through various menu choices in the *Setup* menu. When the router is in *source labeling* mode, the arrow keys are used to select various characters in the source name.

SELECT The button is used to save *Setup menu* choices settings. In *source labeling* mode this key is used to save the new source identification label and return to normal operation.

When in the *normal* operating mode, pressing and holding the **SELECT** button followed by one of the **VIDEO BUS** buttons will place the unit in *source label entry* mode. (See section 3.4 for a complete description of how to label the source names.)

3.1.3. Dual Button Keystrokes

When two keys are held down at the same time the standard meanings of the keys are modified. Throughout this manual two button keystrokes are referred to as **SELECT +** ↑ for example. When you see this it means to hold the first key while pressing the second key. Following is an overview of the main dual button functions.

SELECT + VIDEO BUS 1 to 12 This double key press is used to enter *source labeling* mode and initiates labeling one of the video sources.

SELECT + VIDEO BUS 1 This double key press is used in conjunction with the FACTORY RESET item in the setup menu. When the user is attempting to reset the unit to its default parameters, this key press is used to confirm their choice; thus avoiding accidental resetting the unit.

SELECT + VIDEO BUS 12 This double key press is used in conjunction with the UPDATE SOFTWARE item in the setup menu. When the user is attempting to upload new software into the unit this awkward key press is used to confirm their choice; this avoids accidentally entering this mode.

SELECT + ↑ This double key press is used to enter the *source status* mode. In this mode the LED indicators beside the **VIDEO BUS** buttons show which video inputs have video present on the input connectors. Pressing one of the **VIDEO BUS** buttons will display the name of the video source without switching that input to the router output. Press the **SELECT +** ↑ buttons again to return the unit to the normal operation mode.

SELECT +↓ This double key press is used to perform as a global panel lock. All front panel controls except the **SELECT +** ↓ button are disabled when the panel lock is enabled. Pressing the **SELECT +** ↓ buttons will toggle the *Lock* state *On* and *Off*.

The router may still be controlled from the GPI inputs or the serial remote control protocol when the front panel is Locked.

3.2. LED STATUS INDICATORS

VIDEO BUS 1 to 12 In *normal* mode these LED's which are located beside the corresponding buttons will illuminate to indicate which video input is presently routed to the video output. In *source status* mode the LED's will illuminate to indicate which inputs have video present at the connector.

VIDEO PRESENT This LED indicates that the selected video input has video present at its connector.

GENLOCK PRESENT This LED indicates that there is a valid reference on the *GENLOCK* connector.

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.

3.3. FRONT PANEL SETUP MENU

The *SETUP* menu system uses the 16 digit alphanumeric display and provides a quick, intuitive method of configuring the Router. The *SETUP* Menu contains items that pertain to the overall operation of the router. These items are normally only required to be set up at installation time, and do not pertain to the day to day operation of the unit.

The four keys in the Setup key group (**SETUP**, **SELECT,** ↑**,** ↓) are used to cycle through the various items on the *SETUP* menu. The *SETUP* menu consists of a main menu with two or more choices for each menu item. Figure 3-2 is an overview of the *SETUP* menu. The menu items are shown on the left with gray shading and the various choices are shown on the right with no background shading.

Video Reference	Ntsc	Pal	1080i/59.94	1080i/50	1080p/23.98(sF)	720p/59.94
Ref Align	Line 1 align					
Switchover line	10					
External Control	Gvg ten xl ASCII					
Baud Rate	38400		19200	9600		
Serial Format	8.n.1	8.o.1	8.e.1	7.n.1	7.o.1	7.e.1
Serial Address	00					
Serial Control	Master		Slave			
GPO1 Assignment	Switch trig		Gen missing	Psu alarm		
GPO2 Assignment	Switch trig		Gen missing	Psu alarm		
GPI Mode	Default Input #1			Hold Selection		
Display level	0					
Factory reset	SELECT+1=RESET					
Update Software?	Erase alert					

Figure 3-2: Overview of the Setup Menu

To enter the front panel programming menu, press the **SETUP** key. Pressing the ↑ **&** ↓ keys allows you to move vertically within the menu tree. The various menu items are shown in UPPERCASE on the front panel display. To view the possible values for that item, press the **SELECT** key. Pressing the ↑ **&** ↓ keys allows you to show the possible values for the selected menu item. The various menu values are shown in lowercase on the front panel display, and the current value will be blinking. When you have selected the desired menu value press the **SELECT** key to save your choice and return to the main menu tree. If you do not want to change the value for the selected menu item then press the **SETUP** button to return to the main menu tree.

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

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

3.3.1. Selecting the Video Reference Type

Video Reference	Ntsc	Pal	1080i/59.94	1080i/50	1080p/23.98(sF)	720p/59.94

This menu item allows the user to select the type of video reference being used for the router. The Video reference is used to control the switching point in the video when cross points are changed. The standard

definition X-9512 series router can accept only NTSC or PAL video references. The high definition X-HD9512 can accept either standard definiton or high definition video references depending on the setting of an internal jumper and DIP switch. See section 2.1.4 for information on setting the jumper and DIP switch.

3.3.2. Selecting how the Analog Video Reference aligns with the Digital HD signals (X-HD9512 series only)

Ref Align	Line 1 align

This menu item allows the user to select how the Analog video reference aligns with the digital high definition video signals. Currently there are several methods being suggested on how the two signals are aligned. At this time the X-HD9512 series High definition routers assume that line 1 of the analog reference signal is aligned to line 1 of the digital High definition program being switched through the router. Other choices will be available in the future when they are standardized by the SMPTE.

3.3.3. Selecting the Video Line when the Switch will Occur

Swithover line	10

This menu item allows the user to select which line of the video reference the switching will occur on. Press **SELECT** to change the switchover line. Use the up and down arrows to select the line and press the **SELECT** key to activate the new switchover line. The maximum number available is dependent on the VIDEO REFERENCE TYPE selected.

3.3.4. Selecting the External Remote Control Protocol

External Control	Gvg ten xl ASCII

This menu item is used to select the protocol used for control by routing switcher control devices. Currently the only protocol supported is Grass Valley Ten XL protocol. The *External Control*, *Baud Rate, Serial Format, and Serial Address* settings must be set to match the desired control protocol. The 9512 series routers can also serve as controllers by setting the *Serial Control* menu item to `master`.

3.3.5. Selecting the Baud Rate for External Remote Control Port

Baud Rate	38400	19200	9600

This menu item is used to select the baud rate used by the External Remote Control port. The baud rate normally will vary depending on the routing switcher control device. The *External Control*, *Baud Rate, Serial Format, and Serial Address* settings must also be set to match the desired control protocol.

3.3.6. Selecting the Serial Data Format for External Remote Control Port

Serial Format	8.n.1	8.o.1	8.e.1	7.n.1	7.o.1	7.e.1

This menu item is used to select the serial data format used by the External Remote Control port. The data format normally will vary depending on the routing switcher control device. The *External Control*, *Baud Rate,* and *Serial Address* settings must also be set to match the desired control protocol.

3.3.7. Selecting the Serial Address

Serial Address	00

The GVG Ten XL protocol allows multiple devices to be addressed. The *Serial Address* menu item is used to set a unique address for each router that is connected. When the 9512 is operating in the *master* mode, it will send out commands to the router that matches its *serial address*. When the 9512 is operating in the *slave* mode, it will only respond to commands that match its *serial address.* If two 9512 series routers are connected in a master/slave configuration, then the address of both routers must be set the same. Use the ↑ and ↓ arrows to select the desired address and press the **SELECT** key to save the new address.

3.3.8. Selecting the Serial Data Control Mode

Serial Control	Master	Slave

This menu item is used to select the router will issue commands or respond to commands on the External Remote Control port. When set to `Master`, the router will issue commands using the currently selected protocol. When set to `Slave`, the router will respond to commands it receives on the control port. The *External Control*, *Baud Rate,* and *Serial Format* settings must be set to match the desired control protocol.

3.3.9. Selecting the General Purpose Contact Closure Output Functions

GPO1 Assignment	Switch trig	Gen missing	Psu alarm

GPO2 Assignment	Switch trig	Gen missing	Psu alarm

These two menu items are used to select the functions for the two general purpose contact closure outputs. Each of the general purpose outputs is an opto-isolated open collector output. (See installation section 2.5 for details about connecting the general purpose outputs. Currently GPO3 is not used.

Switch trig The general purpose output will generate a contact closure each time one of the outputs is switched. The pulse will occur at exactly the time when the switch occurs.

Gen missing The general purpose output will generate a contact closure when there is no genlock reference present.

Psu alarm The general purpose output will generate a contact closure when one of the power supplies is not functioning properly. This feature is only available on units fitted with redundant power supplies.

3.3.10. Selecting the Operating Mode of the General Purpose Inputs

GPI Mode	Default Input #1	Hold Selection

Each of the general purpose inputs is opto-isolated with a pull-up to an externally supplied voltage. See Installation section 2.5 for details about connecting the general purpose inputs. The GPI inputs are active low. This means that if you leave an input floating (not connected) then it will not be activated. Lowering the GPI input to a voltage below Vext will activate the input. This menu item is used to select how the GPI inputs will control the router.

GPI1 to GPI4 are used to select one of the crosspoints according to Table 3-1. When the GPI5 input is activated, the Video Input Bus selected by GPI1 to GPI4 is routed to the video router output. See section 3.5 for more information on controlling the router using the GPI inputs.

Default Input #1 When GPI1 to GPI4 inputs are high and GPI5 is activated, Video Input Bus 1 is routed to the video router output.

Hold Selection When GPI1 to GPI4 inputs are high and GPI5 is activated, the last Video Input Bus that was routed to the video router output will continue to be routed to the output bus.

3.3.11. Setting the Front Panel Display Brightness

Display level	1

This menu item allows the user to set the brightness of the front panel display. Press the **SELECT** key to change the brightness. Use the ↑ and ↓ arrows to select the desired brightness and press the **SELECT** key to save the new display brightness.

3.3.12. How to Restore the Factory Default Settings

Factory Default	Select + 1 = reset

This menu item is used to restore the factory default values of all the programmable features in the router. Press the **SELECT** key to initiate the factory reset. Press and hold the **VIDEO BUS 1** key and then press the **SELECT** key to complete the factory reset. The Front panel display will show the message `Resetting…`while the factory defaults are being loaded. When the reset is complete, the router will reboot.

3.3.13. How to Update the Router Software

Update Software	Erase Alert

This menu item is used to initiate firmware upgrades to the router. (See section 4.1 for a complete description of the firmware upgrade procedure.)

3.4. LABELLING THE SOURCES

The 9512 Routers provide a simple method of identifying each of the video sources with a 16 character name. To enter the *source labeling* mode, press and hold the **SELECT** button and then press the **VIDEO BUS** button corresponding to the video source you wish to label.

The label associated with the selected input bus will be displayed on the front panel with the leftmost character blinking. Use the ↑ **&** ↓ buttons to change the first character of the displayed label. When you have selected the desired character, press the **SETUP** button to advance to the next character. Follow the same procedure until you have finished entering the label. Press the **SELECT** button to save the source identification label.

3.5. CONTROLLING THE VIDEO BUS CROSSPOINTS FROM THE GPI INPUTS

The 15 pin GPIO/COM2 connector has 5 general purpose inputs that can be used to activate the video bus crosspoints. See section 2.5 for information on connecting the GPI inputs.

GPI4	GPI3	GPI2	GPI1	Video Input Selected
High	High	High	High	No input selected (Action depends on GPI Mode setting
High	High	High	Low	Video Input 1
High	High	Low	High	Video Input 2
High	High	Low	Low	Video Input 3
High	Low	High	High	Video Input 4
High	Low	High	Low	Video Input 5
High	Low	Low	High	Video Input 6
High	Low	Low	Low	Video Input 7
Low	High	High	High	Video Input 8
Low	High	High	Low	Video Input 9
Low	High	Low	High	Video Input 10
Low	High	Low	Low	Video Input 11
Low	Low	High	High	Video Input 12
Low	Low	High	Low	No input selected
Low	Low	Low	High	No input selected
Low	Low	Low	Low	No input selected

Table 3-1: Selecting the Video Input Busses with the GPI Inputs

The GPI inputs are active low. Inputs that are floating (not connected) or held at Vext will be sensed as high by the internal circuitry. Lowering the GPI input to a voltage at least 1 volt below Vext will cause it to be sensed as low. GPI 1 to GPI 4 are used to select Video Bus 1 to 12 crosspoints respectively. When one of these GPI inputs are activated according to Table 3-1, and GPI 5 input is activated, the corresponding Video Input Bus is routed to the video router output. For example when GPI2 is brought low and GPI1, GPI3, and GPI4 are left floating then video bus input 2 will be switched to the video output when GPI5 is brought low.

The *GPI Mode* Menu setting controls the behaviour of the GPI control when no crosspoints are selected.

Default Input #1 When GPI1 to GPI4 inputs are high and GPI5 is activated, Video Input Bus 1 is routed to the video router output.

Hold Selection When GPI1 to GPI4 inputs are high and GPI5 is activated, the last Video Input Bus that was routed to the video router output will continue to be routed to the output bus.

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4. TECHNICAL DESCRIPTION

4.1. SPECIFICATIONS

4.1.1. Video Specifications X-9512

4.1.1.1. SD Video Inputs

Standards: SMPTE 259M (270Mb/s, 360Mb/s, 540Mb/s)
Number of Inputs: 12
Connector: BNC per IEC 169-8
Equalization: Automatic up to 225m @ 270 Mb/s
with Belden 8281 or equivalent cable
Return Loss: > 15 dB up to 540 Mb/s

4.1.1.2. SD Video Output

Standard: Same as Input
Number of Outputs: 1 (reclocked)
Connector: BNC per IEC 169-8
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: 470ps nominal
Overshoot: <10% of amplitude
Return Loss: > 15 dB up to 540 Mb/s
Wide Band Jitter: < 0.2 UI

4.1.2. Video Specifications X-HD9512

4.1.2.1. HD Video Inputs

Standards: SMPTE 292M (1.5 Gb/s)
Number of Inputs: 12
Connector: BNC per IEC 169-8
Equalization: Automatic up to 75m
with Belden 1694 or equivalent cable
(50 m on Input 1 when the optional Bypass relay is installed)

4.1.2.2. HD Video Outputs

Standard: Same as Input
Number of Outputs: 1 (reclocked)
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
Wide Band Jitter: < 0.15 UI

4.1.3. Gen Lock Input

Type: Menu selectable - depends on video format (See section 2.1.4)
HD Tri-level Sync (X-HD9512 only)
NTSC or PAL Colour Black 1 V p-p
Composite Bi-level sync (525i/59.94 or 625i/50) 300 mV
Connectors: BNC per IEC 169-8
Termination: High impedance loop through

4.1.4. Electrical

Voltage: 110 - 230 Volts AC, 50/60 Hz – unit autosenses the voltage
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

4.2. DIP SWITCH SETTINGS

Switch	Name	Normal	Function when Off	Function when On
1	Inputs	Off	Must be Off for 12 x 1 router	
2	Reserved	Off	Must be Off for 12 x 1 router	
3	Standard		Standard Def (SMPTE 259M)	High Def (SMPTE 292M)
4	Factory Reset	Off	Recall Parameters on power up	Reset to factory defaults on power up
5	Gen Lock	Off	PAL/NTSC Gen Lock	HD Tri-level Gen Lock (HD9512 only)
6	Not Used	Off		
7	Program	Off	Normal	Force MCU programming on power up
8	ISP Check	Off	ISP parameters checked on power up	No ISP checks on power up

Table 4-1: DIP Switch Settings

Dip 1, 2, and 3, must be set according to the product type.

4.3. UPDATING THE FIRMWARE IN THE ROUTER

The firmware in the 9512 series routers 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 COM1 port on the router rear panel. The firmware file and a special application called WINISP (which should have been supplied along with the firmware) are required in order to upgrade the firmware.

4.3.1. Connecting the Computer to the Router

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

Router 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	
	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 Router 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 9512 series router products. It is activated through the *Setup* menu system. Use the **SETUP** key to enter the menu system, scroll to the *UPDATE SOFTWARE* 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 **VIDEO BUS 12** key. This places the unit in programming mode and opens its serial port to communicate with the WINISP program. The front panel display shows `Programming…` Proceed to section 4.3.3 for information about uploading the firmware using WINISP.

4.3.2.2. DIP Switch 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 SOFTWARE?* item on the *Setup* menu. This method requires the unit to be powered down, the top cover removed, and the DIP switch 7 placed in the ON 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 DIP switch to its original OFF position before re powering up the unit.

4.3.3. Programming the MCU Using WINISP

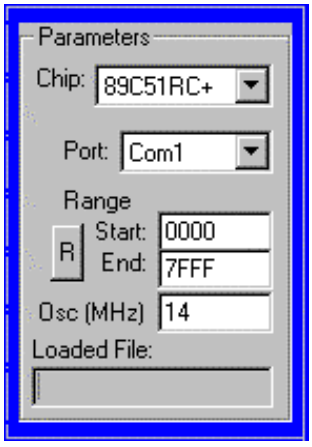
Start the WINISP application.

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 14 to match the internal crystal value of 14.7456MHz.

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 only 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 Router

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

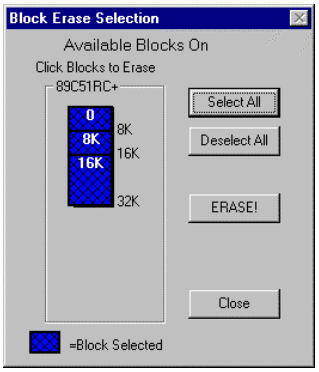
4.3.3.3. Reprogramming the Boot Vector and Status Byte

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.

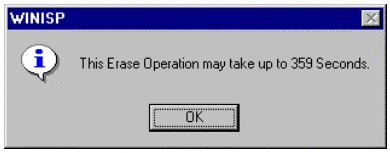
If the Boot Vector or the Status byte are not read back as "FC" and "00" respectively they must be correctly changed before proceeding. First note that the security bits are typically read back as ON. This is a bug in the WINISP program. To correct this, first change all the security bits to OFF. Next 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 Router

First erase the MCU in the router 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)

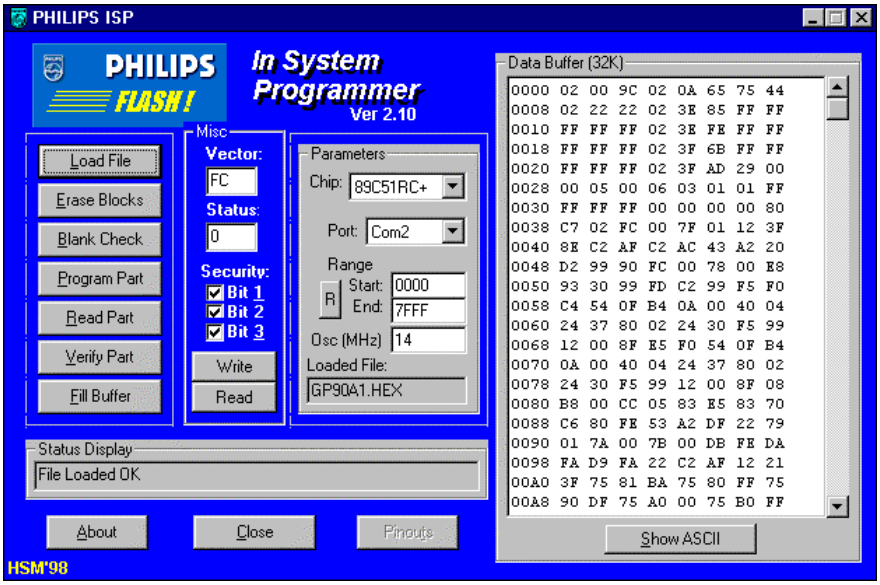


Then press the ERASE button and a message will appear indicating how long the erase function will take.

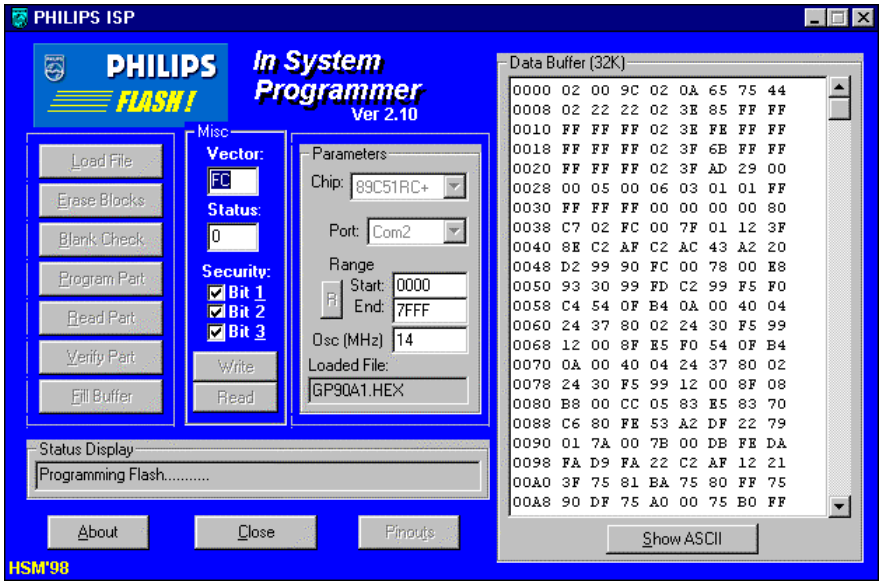


This is a worst case timing and you should not be alarmed if the erase function is much quicker than indicated. After erasing you should verify the erase with a BLANK CHECK.

If all goes well, press the LOAD FILE button and load the GP90A1.hex file 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 DIP switch method to initiate programming, remember to restore DIP switch 7 to its original position.

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5. CONTROLLING 95XX ROUTERS USING GVG TEN-XL ASCII PROTOCOL

The following sections are provided as a technical reference for programmers who want to write their own software to control the Evertz 95xx series routers using the GVG TEN-XL ASCII command protocol. There are some hardware differences between the 95xx series routers and the Grass Valley TEN-XL routers which have required differences in implementation of the protocol for the 95xx series routers. The *Setup Menu* in the router must be used to configure the COM 1 port. See the appropriate sections in chapter 3 on configuring the serial port.

5.1. SERIAL DATA FORMAT

In GVG's TEN-XL ASCII protocol all words sent and received use the following format:

Standard: RS-232
Data Rate: Default 38400 Baud (Can be set using the *Baud Rate* menu item)
Data Format: Default 8 data bits, even parity, 1 stop bit (Can be set using the *Serial Format* menu item)

5.2. DEFINITIONS

1 GVG's TEN-XL ASCII protocol uses standard ASCII hex codes for the transmission of commands. Programmers must use the hex equivalent code in order to successfully convey commands from their controlling software to the 95xx series router. Hexadecimal [hex] numbers are represented with the prefix "0x."

i.e. decimal "14" = "0x0E."

2. There are two reserved words in GVG TEN-XL ASCII Protocol. They are illustrated in the table below.

Reserved Word	Hexadecimal Equivalent	Control Character
STX	0x02	^B
ENQ	0x05	^E

3. Internal crosspoint numbers are 'zero-based', meaning that crosspoint number 1 is accessed as source 0. Since GVG TEN-XL protocol is based on 10 internal crosspoints and the Evertz 12 x 1 router family contains 12 internal crosspoints it was necessary to extend the protocol to include crosspoint #11 and #12. Valid sources range from 0 to 3 (0 to 11 for the 9512 series routers) decimal or 0x00 to 0x0B as shown in Table 5-1.

Data Byte		Corresponding Source
Hex Value	ASCII Character	
0x30	0	1
0x31	1	2
0x32	2	3
0x33	3	4
0x34	4	5
0x35	5	6
0x36	6	7
0x37	7	8
0x38	8	9
0x39	9	10
0x41	A	11*
0x42	B	12*

*- Not found in regular GVG TEN-XL protocol.

Table 5-1: Crosspoint numbers and their Internal Source Numbers

5.3. COMMAND FORMATS

Commands are issued by concatenating a sequence of hex codes or parameters as shown in Table 5-2. All codes are adjacent to each other with no spaces in between bytes.

Parameter	Definition
[STX]	ASCII hex code for Start of Transmission
[ENQ]	ASCII hex code for Inquiry
[HI ADDR]	ASCII hex code for the High byte of the address
[LO ADDR]	ASCII hex code for the Low byte of the address
[XPT(V)]	ASCII hex code for Video crosspoint (i.e.0..9, A, B)
[XPT(A)]	ASCII hex code for Audio crosspoint (i.e.0..9, A, B)
[PSUPP]	ASCII hex code for the Power Supply Status (i.e.0x31 = active, 0x30 = either inactive)

Table 5-2: ASCII Command Definitions

5.3.1. Write or Take Command

This command is used to switch the active crosspoint in the router.

[STX][HI ADDR][LO ADDR][XPT(V)][XPT(A)]

5.3.2. Read or Query Command

This command is used to read back the status of the router.

[STX][HI ADDR][LO ADDR][ENQ]

5.3.3. Reply Command String

This reply is sent back from the router in response to the Write or Read command. It indicates which audio and video crosspoints are active, and the current status of the power supplies.

[XPT(V)][XPT(A)][PSUPP]

5.4. COMMAND EXAMPLES:

The following are examples of the GVG's TEN-XL ASCII protocol write and read commands.

5.4.1. Input Selection – Audio Follow Mode

Switch both audio and video of the router at address 00 to video input 4 (crosspoint # 3)

ASCII string: ^B0033 [^B = control+B which is the STX code]
Hex string: [0x02][0x30][0x30][0x33][0x33]

This will cause the router to switch the video to input 4 or video crosspoint #3, and both audio channels of the audio to input 4 or audio crosspoint #3, and then reply with:

ASCII string: 331
Hex string: [0x33][0x33][0x31]

to indicate that the router has switched and that the power supply is active. Note-The router will always respond to a valid request.

5.4.2. Input Selection – Breakaway Mode

Switch the video of the router at address 01 to video input 2 (crosspoint # 1).
Switch the audio of the router at address 01 to audio input 4 (crosspoint # 3)

ASCII string: ^B0113 [^B = control+B which is the STX code]
Hex string: [0x02][0x30][0x31][0x31][0x33]

This will cause the router to switch the video to input 2 or video crosspoint #1, and both audio channels of the audio to input 4 or audio crosspoint #3, and then reply with:

ASCII string: 131
Hex string: [0x31][0x33][0x31]

to indicate that the router has switched and that the power supply is active.

5.4.3. Router Status Request

Request the crosspoint settings of the router at address 06

ASCII string: ^B06^E [^B = control+B which is the STX code]
[^E = control+E which is the ENQ code]
Hex string: [0x02][0x30][0x36][0x05]

This will cause the router to respond with the current crosspoint status:

ASCII string: 131
Hex string: [0x31][0x33][0x31]

to indicate that the router at address 06 is set to video input 2 or crosspoint #1 and audio to input 4 or crosspoint #3. It also indicates that the power supply is active.