X0400 Series Routers

Instruction Manual

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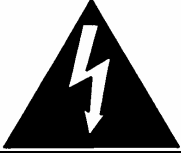   Web Page: http://www.evertz.com

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IMPORTANT SAFETY INSTRUCTIONS

⚡	The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of uninsulated "Dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.
!	The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (Servicing) instructions in the literature accompanying the product.

- Read and keep these instructions
- Heed all warnings.
- Follow all instructions.
- Do not use this apparatus near water
- Clean only with dry cloth.
- Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than other. A grounding-type plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
- Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles and the point where they exit from the apparatus.
- Only use attachments/accessories specified by the manufacturer
- Unplug this apparatus during lightning storms or when unused for long periods of time.
- Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

WARNING TO REDUCE THE RISK OF FIRE OR ELECTRIC – SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOISTURE.
WARNING DO NOT EXPOSE THIS EQUIPMENT TO DRIPPING OR SPLASHING AND ENSURE THAT NO OBJECTS FILLED WITH LIQUIDS ARE PLACED ON THE EQUIPMENT.
WARNING TO COMPLETELY DISCONNECT THIS EQUIPMENT FROM THE AC MAINS, DISCONNECT THE POWER SUPPLY CORD PLUG FROM THE AC RECEPTACLE.
WARNING THE MAINS PLUG OF THE POWER SUPPLY CORD SHALL REMAIN READILY OPERABLE.

INFORMATION TO USERS IN EUROPE

NOTE

This equipment with the CE marking complies with bother the EMC Directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC) issued by the Commission of the European Community.

Compliance with these directives implies conformity to the following European standards:

- EN60065   Product Safety
- EN55103-1   Electromagnetic Interference Class A (Emission)
- EN55103-2   Electromagnetic Susceptibility (Immunity)

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	June 02
1.0	First released version	May 03
1.0.1	Table 2-4 GPIO Cable corrected	Jun 03
1.0.2	Table 2-4 changed to Remote Panel Adapter Cable	Aug 03
1.1	Added ATSC version, added SMPTE 310M for other versions	Feb 05
1.2	Minor typos corrected, firmware menu updated	July 05
1.3	Updated menu items and added section 5.2 Added info for Embedded SoftSwitch for X-0401H version Added info for optional Ethernet SNMP control	Feb 07
1.3.1	Added master/slave function information to section 3	Jul 07
1.3.2	Corrected default settings for sections 2.5.1, 3.8.3, & 3.12.3.	Oct 09

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TABLE OF CONTENTS

Figures

Tables

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CHAPTER 1: OVERVIEW
TABLE OF CONTENTS

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OVERVIEW

1. OVERVIEW

The X0401 series four input routing switchers provide a convenient, low cost way to route Standard and High definition serial digital signals. The X0401S routers are used for 270, 360 & 540Mb/s standard definition serial digital signals, while the X0401H routers are used for 1.5Gb/s HDTV serial digital signals.

The router is available in video only or video with AES configurations. The X0401S-AES4 and X0401H-AES4 units come with 4 levels of AES audio routing for the video buss. The AES output busses can be used in an audio follow video mode, or can be broken away from their associated video buss. Table 1-1 shows the various model numbers and the capabilities of each:

Model	Video		Audio		Control
X0401S	SDI	4 x 1	None		Front Panel
X0401S-RCP	SDI	4 x 1	None		Remote Control Panel
X0401S-AES4	SDI	4 x 1	4	4 x 1	Front Panel
X0401S-AES4-RCP	SDI	4 x 1	4	4 x 1	Remote Control Panel
X0401S-AES4-SS	SDI	4 x 1	4	4 x 1	Front Panel
X0401S-AES4-SS-R	SDI	4 x 1	4	4 x 1	Remote Control Panel
X0401H	HD or SDI	4 x 1	None		Front Panel
X0401H-RCP	HD or SDI	4 x 1	None		Remote Control Panel
X0401H-ES	HD or SDI	4 x 1	None		Front Panel
X0401H-ES-RCP	HD or SDI	4 x 1	None		Remote Control Panel
X0401H-SS	HD or SDI	4 x 1	None		Front Panel
X0401H-SS-RCP	HD or SDI	4 x 1	None		Remote Control Panel
X0401H-AES4	HD or SDI	4 x 1	4	4 x 1	Front Panel
X0401H-AES4-RCP	HD or SDI	4 x 1	4	4 x 1	Remote Control Panel
X0401H-AES4-HSS	HD or SDI	4 x 1	4	4 x 1	Front Panel
X0401H-AES4-HSS-R	HD or SDI	4 x 1	4	4 x 1	Remote Control Panel
X0401H-AES4-HES	HD or SDI	4 x 1	4	4 x 1	Front Panel
X0401H-AES4-HES-R	HD or SDI	4 x 1	4	4 x 1	Remote Control Panel
X0401S-ATSC	310M or SDI	4 x 1	None		Front Panel
X0401S-ATSC-RCP	310M or SDI	4 x 1	None		Remote Control Panel

Table 1-1: Router Models and Features

The router electronics is housed in a 1RU rack mount frame. The standard router 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). An additional remote control panel (X0401S-PANEL or X0401H-PANEL) can also be ordered for any version. 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.

The SoftSwitch™ versions (referred to as SS versions throughout this manual) of the router have the following additional features. The Video output has adjustable vertical timing with respect to the genlock input. The line synchronizers on the video inputs can accommodate differences in timing up to approximately +/- one half line providing clean video switches on the video output. All the AES outputs will have a continuous AES carrier locked to either the video genlock or DARS reference (when the DARS reference is used, Z bit alignment of the AES outputs is also guaranteed). The audio outputs use Evertz patent pending SoftSwitch™ technology to eliminate audible pops when hot switches are performed on synchronous audio sources.

The Embedded SoftSwitch™ (referred to as ESS versions throughout this manual) versions of the router have all the features of the SS versions as well as the following additional features. The embedded audio on the Video 1 buss uses Evertz patent pending SoftSwitch™ technology to eliminate audible pops when switches are performed.   For the Embedded SoftSwitch™ technology to function correctly the AES sources must be synchronous with the *Video Reference* and the A*udio Reference* and the router must be set to *video* (see section 3.6.4). If Embedded SoftSwitch™ functionality is not required (e.g. Dolby E in the embedded stream) then the DARS reference can be used with the AES portions of the router.

The ET option (available only on X-0401H-AES4-HES version at time of writing) allows the router to be controlled via SNMP using the VistaLINK® software or the 9000NCP VistaLINK® remote control panel.

Features:
- Standard definition units support SMPTE 259M (270Mb/s, 360Mb/s, 540Mb/s) or DVB-ASI video signals.
- High definition units support SMPTE 292M (1.5 Gb/s), SMPTE 259M (270Mb/s, 360Mb/s, 540Mb/s) or DVB-ASI video signals.
- Standard and High definition units support SMPTE 310M (19.4 Mb/s) with reclocker turned off.
- ATSC units support SMPTE 310M (19.4 Mb/s) or SMPTE 259M (270Mb/s, 360Mb/s, 540Mb/s) or DVB-ASI.
- Units can be genlocked to an external source so that a "clean switch" can be achieved.
- SoftSwitch™ equipped models provide clean video switches and popless AES switching audio outputs.
- Switch point is fully controllable from the front panel.
- Video input presence detection displayable on the front panel.
- Front panel or Remote control panel versions available. Second control panel can be ordered for either version.
- Programmable source input names available on the front panel.
- Programmable parallel GPI control and tallies.
- Serial remote control via GVG TEN-XL protocol (master or slave).
- Field upgradeable firmware as new features become available.
- Optional video and audio input relay bypass for power failure bypass protection. (Bypass verification test from the front panel menu).
- Optional dual power supplies.
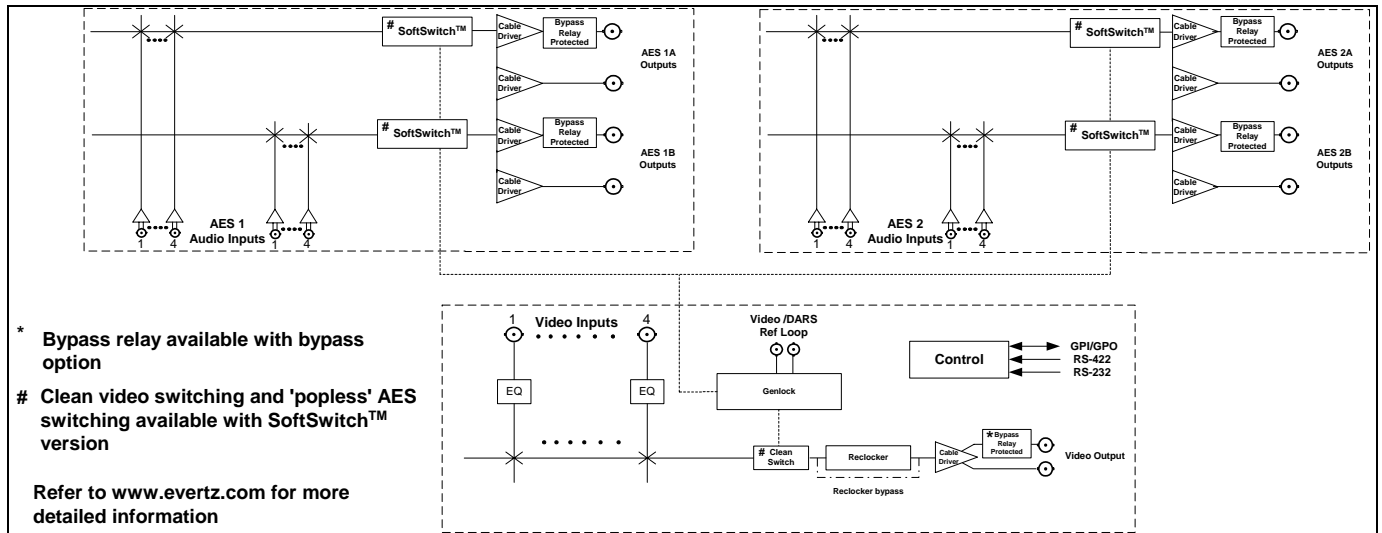
Figure 1-1: X0401S Block Diagram

* **Bypass relay available with bypass option**

\# **Clean video switching and 'popless' AES switching available with SoftSwitch™ version**

Refer to www.evertz.com for more detailed information
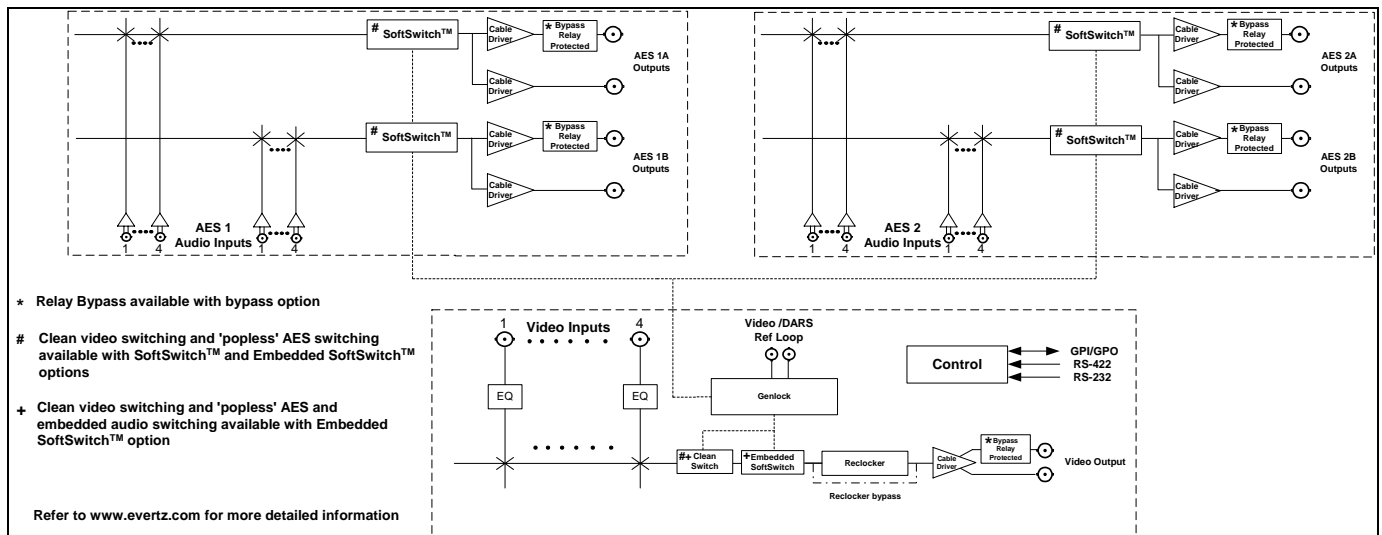
Figure 1-2: X0401H Block Diagram

* **Relay Bypass available with bypass option**

\# **Clean video switching and 'popless' AES switching available with SoftSwitch™ and Embedded SoftSwitch™ options**

+ **Clean video switching and 'popless' AES and embedded audio switching available with Embedded SoftSwitch™ option**

Refer to www.evertz.com for more detailed information

1.1. HOW TO USE THIS MANUAL

This manual is organized into 6 chapters: Overview, Installation, Operation, Technical Description, Serial Protocol, and System Timing. 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 provides a detailed description of the rear panel connectors, and how the router should be connected into your system.

Chapter 3 provides 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 provides 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.

Chapter 6 provides a few video timing examples to aid the system designer in properly timing the router.

✍	**This symbol is intended to alert the user to important operating instructions.**

⚠	**The exclamation point within an equilateral triangle is intended to alert the user to the presence of important safety related operating and maintenance (Servicing) instructions in this manual.**

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 the 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 sub-carrier sampling rate used 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 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 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 check-words 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 check-word, and the third is used to evaluate ancillary data integrity. The check-words 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 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.)

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CHAPTER 2: INSTALLATION
TABLE OF CONTENTS

Figures

Tables

2. INSTALLATION

2.1. REAR PANEL

Figure 2-1: X0401H-AES4 Rear Panel Layout

Figure 2-2: X0401H-AES4 Rear Panel Layout with Ethernet Option
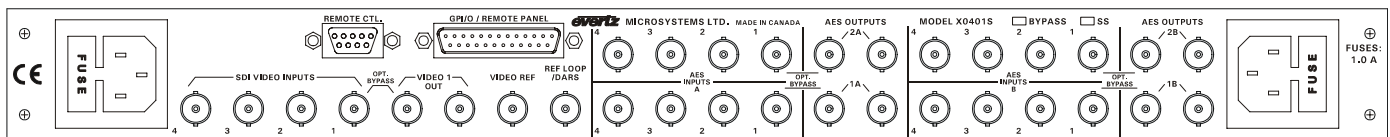
Figure 2-3: X0401S-AES4 Rear Panel Layout
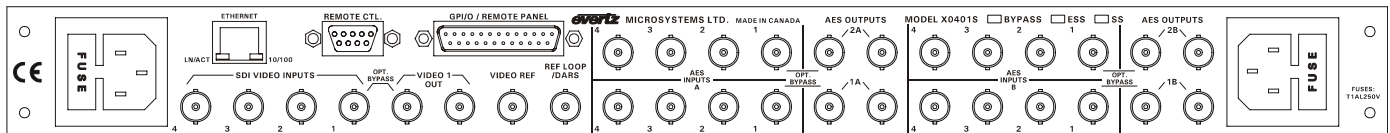
Figure 2-4: X0401S-AES4 Rear Panel Layout with Ethernet Option

Sections 2.1.1 to 2.1.8 describe the purpose of the rear panel connectors and the specific signals that should be connected to the routers. Section 6 provides pictorial representations of the video and audio output configurations for each version of the router.

2.1.1. Standard Definition Digital Video Connections (X0401S)

VIDEO INPUTS 1 to 4: These BNC connectors are for connecting 10-bit serial digital video signals, compatible with the SMPTE 259M standard to the respective video input buss.

VIDEO 1: There are two video output connectors for the Video 1 router buss on X0401S routers. The Video from the selected Video Input buss will be available on two outputs for the buss.

When the bypass relay option is fitted, **INPUT 1** is protected by a bypass relay to the adjacent **VIDEO 1 OUTPUT** BNC. The bypass relays will activate in the event of power loss to the router and can also be activated from the front panel menu.

2.1.2. High Definition Digital Video Connections (X0401H)

VIDEO INPUTS 1 to 4: These BNC connectors are for connecting 10-bit serial digital video signals, compatible with the SMPTE 292M standard to the respective video input buss.

VIDEO 1: There are two video output connectors for the Video 1 router buss. The Video from the selected Video Input buss will be available on two outputs for the buss.

When the bypass relay option is fitted, **INPUT 1** is protected by a bypass relay to the adjacent **VIDEO 1 OUTPUT** BNC. The bypass relays will activate in the event of power loss to the router and can also be activated from the front panel menu.

> ✍ **To be able to pass SD, DVB-ASI or 310M through an HD SoftSwitch router ensure that the soft switch (i.e. line synchronizer) is off.**

2.1.3. Digital Video Connections (X0401S-ATSC)

VIDEO INPUTS 1 to 4: These BNC connectors are for connecting serial digital video signals, compatible with the SMPTE 310M or SMPTE 259M standard to the respective video input buss. The reclocker mode must be set to the video standard in use using the *Setup V1 Output* menu item.

VIDEO 1: There are two video output connectors for the Video 1 router buss on X0401S-ATSC routers. The Video from the selected Video Input buss will be available on two outputs for the buss.

When the bypass relay option is fitted, **INPUT 1** is protected by a bypass relay to the adjacent **VIDEO 1 OUTPUT** BNC. The bypass relays will activate in the event of power loss to the router and can also be activated from the front panel menu.

2.1.4. AES Audio Connections

When the AES4 option is fitted, the Audio 1A, 1B, 2A and 2B buss groups will be available. Each Audio section consists of 4 AES inputs and 2 outputs.

INPUTS 1 to 4: These BNC connectors are used for connecting unbalanced AES audio signals compatible with the SMPTE 276M standard to the respective audio input buss.

OUTPUTS 1 and 2: These BNC connectors are for connecting unbalanced AES audio signals compatible with the SMPTE 276M standard from the respective audio input buss.

When the bypass relay option is fitted, **INPUT 1** is protected by a bypass relay to the adjacent **AUDIO OUTPUT** BNC. The bypass relays will activate in the event of power loss to the router and can also be activated from the front panel menu.

2.1.5. Reference Connections

VIDEO REF: A high impedance loop through for connecting an analog video or tri-level sync (X0401H series only) reference. The *REFERENCE* menu is used to select the correct type of video reference being used.

REF / DARS: On routers with the SoftSwitch™ option fitted (-SS versions) the reference BNCs are shipped as a high impedance video reference loop, however they can also be configured as separate inputs for a Video Reference and a Digital Audio Reference Signal. This is accomplished by removing the top cover of the router and changing three jumpers. See section 4.2.2. The *REFERENCE* menu is used to select the use of the DARS signal when the SoftSwitch™ is enabled on SoftSwitch™ routers.

2.1.6. Remote Control Connections

REMOTE CTL: This 9 pin female D connector provides an RS-232 serial interface used for updating the firmware or external serial remote control. The *Setup* menu is used to configure the REMOTE CTL port for external control or firmware updating. (See section 3.3.). This port is wired at the factory as an RS232 DCE port as shown in Table 2-1.

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: Router RS-232 Port Pin Definitions

The port can also be used to connect a remote control panel to the router. To connect to a remote panel the port must be configured as a SMPTE 207M Tributary, as shown in Table 2-2. To reconfigure the port the user must remove the top cover and reposition jumper J26 so that it is on pins 2 & 3 (toward header J23) and move the ribbon cable over to J23.

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

Table 2-2: Router RS-422 Port Pin Definitions

GPI/O / REMOTE PANEL: This female DB-25 pin connector provides 8 General Purpose Opto-isolated inputs (GPIs) and 4 General Purpose isolated relay outputs (GPOs), as well as an RS-422 serial interface for connecting the remote panel. **Vint** provides +5Volts from the Router and **Vext** is used to provide external power to the opto isolators. Typically **Vint** and **Vext** are connected together so that the isolators may be powered from the router. Table 2-3 shows the pin definitions of the GPIO connector. Figure 2-5 shows a schematic of the GPIO circuitry. See section 2.5 for more information on connecting the General Purpose inputs and outputs. The functions of the GPIs and GPOs are assigned using the Setup menu, and can be used to select crosspoints and receive tallies from the router. See section 3.12 and 3.13 for information on setting up the GPIO operation.

Pin #	Name	Description
1	GPI 01	General Purpose Input 01
2	GPI 02	General Purpose Input 02
3	GPI 03	General Purpose Input 03
4	GPI 04	General Purpose Input 04
5	GPI 05	General Purpose Input 05
6	GPI 06	General Purpose Input 06
7	Tx+	RS-422 Tx+(b) Output
8	Tx-	RS-422 Tx-(a) Output
9	GND	Serial I/O Ground
10	Rx+	RS-422 Rx+(b) Input
11	Rx-	RS-422 Rx-(a) Input
12	GND	Serial I/O Ground
13	GPI 07	General Purpose Input 07
14	GPI 08	General Purpose Input 08
15	Vext	External voltage input to power opto isolators
16	Vint	Protected +5 volts output from router
17	GPO 01 C	General Purpose Output 01 Common contact
18	GPO 01 NC	General Purpose Output 01 Normally closed contact
19	GPO 02 C	General Purpose Output 02 Common contact
20	GPO 02 NC	General Purpose Output 02 Normally closed contact
21	GPO 03 C	General Purpose Output 03 Common contact
22	GPO 03 NC	General Purpose Output 03 Normally closed contact
23	GPO 04 C	General Purpose Output 04 Common contact
24	GPO 04 NC	General Purpose Output 04 Normally closed contact
25	GND	Router Chassis ground

Table 2-3: GPI/O Pin Definitions

2.1.7. Ethernet Network Connections

The RJ-45 connector is an Ethernet port used to connect to VistaLINK® for crosspoint routing. See section 5.3 for information on configuring the connection to an Ethernet network.

2.1.8. 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.

2.2.   MOUNTING

The Router is equipped with rack mounting angles and fits into standard 19 inches by 1.75 inches by 7.75 inches (483 mm x 45 mm x 196mm) rack space. The mounting angles may be removed if rack mounting is not desired.

2.3.   POWER REQUIREMENTS

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 a minimum 18 AWG wire size; type SVT marked VW-1, maximum 2.5m in length. If the router is fitted with the redundant power supply there will be an additional IEC-320 connector on the rear panel. The IEC 320 power entry module combines a standard power inlet connector, two 5 x 20 mm fuse holders and an EMI line filter. See section 4.5.1 for information on changing the fuses.

> **If the router is fitted with dual power supplies, ensure that power is removed from both supplies before performing any work on the unit.**

> **CAUTION - TO REDUCE THE RISK OF ELECTRIC SHOCK, GROUNDING OF THE GROUND PIN OF THE MAINS PLUG MUST BE MAINTAINED**

2.4.   CONNECTING THE REMOTE CONTROL PANEL

The X0401 series routers 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. A second control panel (model X0401-PANEL) can be added to either version.

2.4.1. Connecting the Primary Remote Control Panel (RCP Version)

On the RCP version of the router, the primary control panel is connected to the **GPI** connector using the Remote Panel cable adapter with the pin connections shown in Table 2-4. (Part WP400RRP) is supplied with the remote control panel. If you need to connect to the GPI/O pins that share the 25 pin D connector, simply solder to the pins inside the 25 pin male connector end of this cable. The 9 pin female connector on the 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.

X0401 GPIO End			Remote Panel End	
25 Pin D Male	**Pin**	**5 Feet Belden 9729**	**9 pin D Female**	**Pin**
TX+	7	-------1a------	TX+	7
TX-	8	-------1b------	TX-	2
GND	9	---drain1----	GND	6
		---drain2----	GND	4
RX+	10	-------2a------	RX+	3
RX-	11	-------2b------	RX-	8
Frame Gnd	Shield	---drain2----	Frame Gnd	Shield

Table 2-4: Remote Panel Adapter Cable (Part Number WP400RRP)

Router End			Remote Panel End	
9 pin D Male	Pin	Belden 9729	9 pin D Female	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 2----	Frame Gnd	Shield

Table 2-5: Remote Control Panel Extender Cable

2.4.2. Connecting a Second Remote Control Panel

On either the Front Panel Control or Remote Control version of the router a second control panel can be connected to the **REMOTE CONTROL** connector using the 'straight-through' cable provided. For longer distances, simply make your own cable of the required length according to the diagram in Table 2-5. The default configuration of the **REMOTE CONTROL** port on the router is RS-232. Before connecting the remote panel the port must be configured as a SMPTE 207M Tributary as shown in Table 2-2. To reconfigure the port the user must remove the top cover and reposition jumper J26 so that it is on pins 2 & 3 (toward header J23), then move the ribbon cable over to J23. 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.

2.5.   CONNECTING THE GENERAL PURPOSE INPUTS AND OUTPUTS

The 25 pin GPI/O connector has 8 programmable general purpose inputs (GPI) and 4 programmable general purpose outputs (GPO) as shown in Table 2-3. The schematic representation is shown in Figure 2-5. The GPIs are Opto-isolated inputs that can be powered from an external source or from the frame. The GPOs are relay contacts that are normally closed when the power to the router is off.
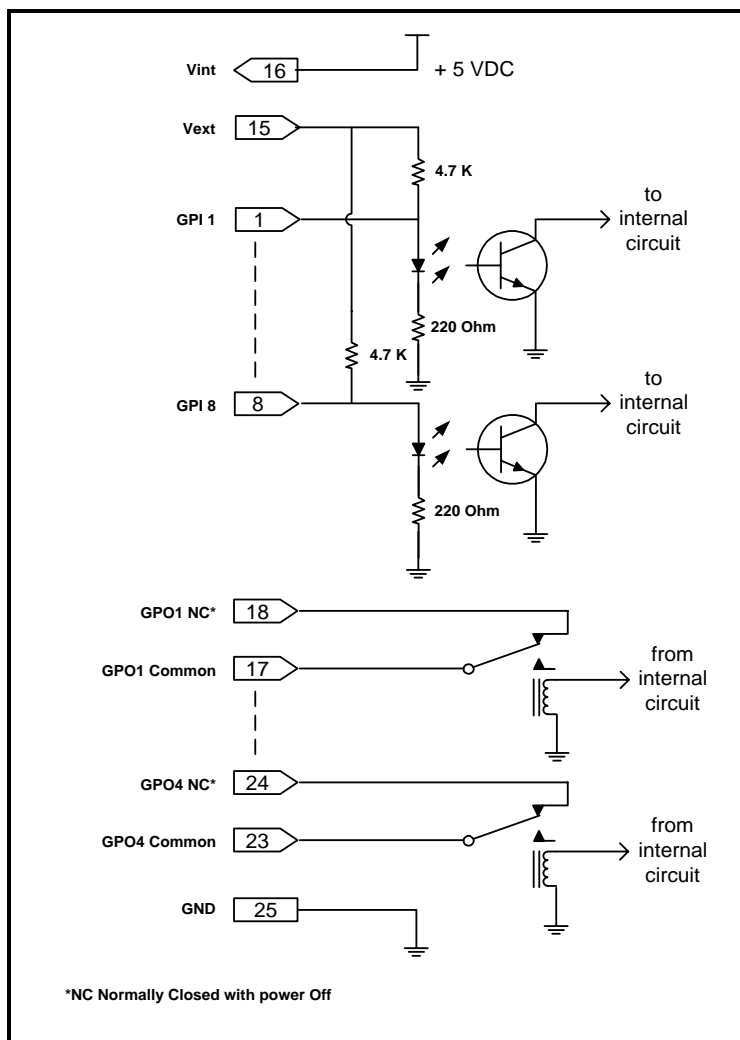
Figure 2-5: General Purpose I/O Schematic

2.5.1. Connecting the General Purpose Inputs

The GPI's are used to activate video and audio bus crosspoints and are programmable in a number of configurations. The GPIs can be configured to operate in one of three encoded modes. In these modes, many of the GPI inputs are pre-assigned to a function. The unused inputs are still available for the user to assign to a particular function using the *Program Gpi's* menu item. When the GPI Encoding is set to none, all 8 inputs are available for the user to assign to particular functions. Sections 3.12.3.1 to 3.12.3.4 describe how each of the GPI encoding modes work and which inputs are available for user assignment.

When the GPI inputs are independently programmed, they can be set to activate on rising or falling edges, or high or low levels.

Low level activation is when a ground level on the input triggers the GPI function when the Opto-isolator is normally powered. See Figure 2-6 and Figure 2-7 for more information.

The *high* level activation is used to trigger the GPI function by providing a positive voltage to a GPI input. This mode is not generally used and should not be considered a first choice.

The *falling* edge activation is used to trigger a GPI function by removing a provided voltage to a GPI or by making a closure to ground when the Opto-isolator is already powered. The falling edge GPI will respond the same as a *low* level activation when the Opto-isolator is normally powered.

The *rising* edge activation is used to trigger a GPI function when power is provided to the Opto isolator, or when the GPI closure to ground is released. This function can be used to trigger a GPI function when a GPO error tally is released.

The user can connect GP+5V supplied from the frame (Vint pin) 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 2-6). This can be done with a button, switch, relay or an open collector transistor.

Warning: Do not connect one frame's GP+5V to another frame's GP+5V.
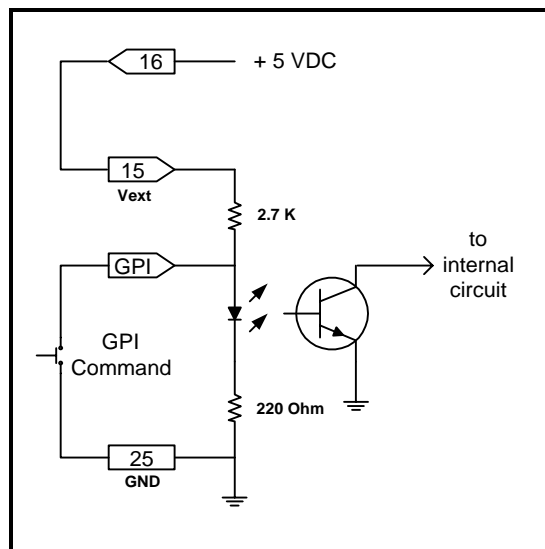
Figure 2-6: Powering the General Purpose Input Opto-Isolators from the Router

Alternately, an external voltage source may be applied as shown in Figure 2-7. The Vext voltage must be greater than the voltage supplied to the GPI by at least 5v.
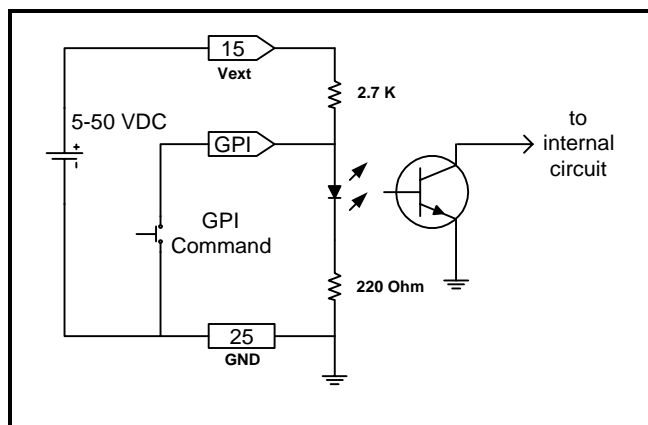
Figure 2-7: Powering the General Purpose Input Opto-Isolators from an External Power Supply

2.5.2. Connecting the General Purpose Outputs

The Programmable GPOs are used to trigger alarms or to provide a limited tally capability. The GPOs will be in the de-energised state when the power is off so all contacts will be closed. When the router is powered up the GPO Relay contacts will open.   An alarm or tally will cause a contact closure. The 4 GPO contact sets can be operated in one of two encoded modes. In these modes, many of the GPO contacts are pre-assigned to a function. When the GPO Encoding is set to none, all 4 contact sets are available for the user to assign to particular functions. Section 3.13.3 describes how each of the GPO encoding modes works and how to configure the GPOs using the *GPO SETUP* menu.

2.5.3. GPI/O Examples

By careful use of the GPI's and GPOs one can create some unique control scenarios for controlling the Router. Figure 2-8 shows an example of such an application. By setting up jumpers for the GPI/O connector and setting the GPI/O configurations in the router *Setup* menu, one can create an auto changeover for a program feed. In this configuration when input 1 fails and that input is currently selected on the output of bus V1, the router will automatically select input 2.
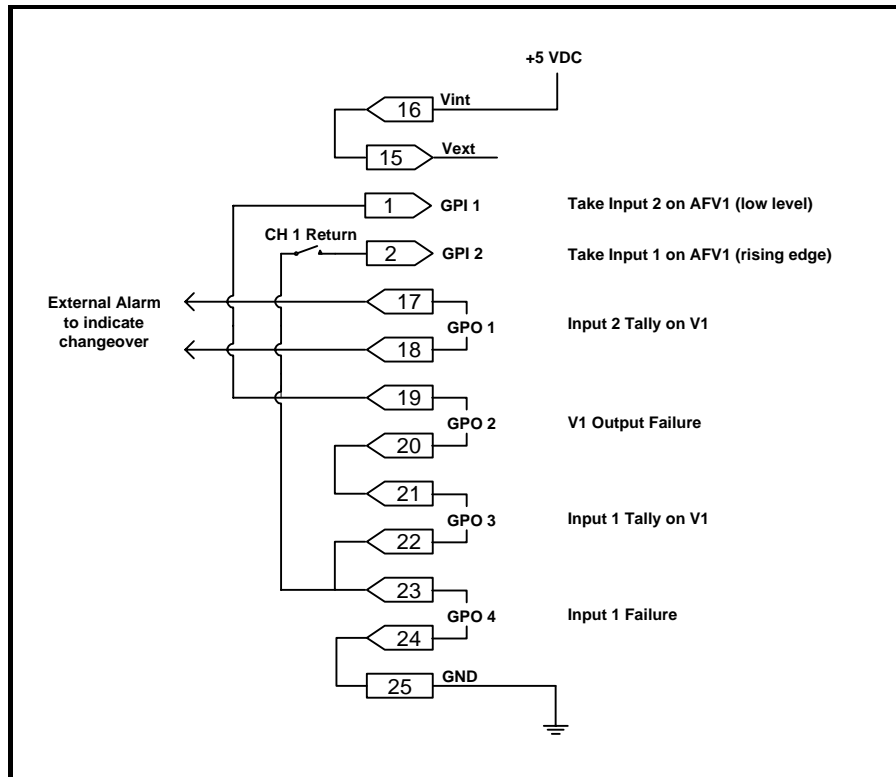
Figure 2-8: GPIO Example – Auto Changeover to Input 2 on Loss of Input 1

If the "CH 1 Return" switch is closed, input 1 will be automatically selected when it is present again. However, the downside being, that if the Input 1 signal failure is sporadic the router will chatter between input 1 and 2. The purpose of this is to show the use of a rising edge GPI trigger.

2.6.   CONTROLLING THE ROUTER USING THE EXTERNAL SERIAL PROTOCOL

The X0401 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 **REMOTE CTL** connector on the rear panel. The *REMOTE CTL* menu uses the *Baud Rate, Serial Format, Serial Address* and *Serial Control* menu items to configure the **REMOTE CTL** port for external control. See section 3.14 for more information on configuring the **REMOTE CTL** port parameters. See section 5 for detailed information about controlling the router.

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

Use the *External control* item on the *Setup Menu* 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. The **REMOTE CTL** port is shipped from the factory configured for RS232 operation. If you require RS-422 operation then you will have to change the port wiring as described in section 2.4.2.

When connecting two X0401 series routers together in a master/slave relationship make sure that the **REMOTE CTL** port is configured the same at both ends (including the RS232 or RS422 wiring). Use the cable shown in Table 2-6 for RS-232 wiring and the cable shown in Table 2-7 for RS-422 wiring. The user can also order a 5600 syncro cable (approx. 1 foot in length) or a 9600-SW-I-0 cable (approx. 5 feet in length) to interconnect two routers with RS-232 wiring. For other applications, consult the manual for the equipment that you are connecting, configure the port accordingly and use the information in Table 2-1 to make an appropriate cable.

Master 0401 End			Slave 0401 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 0401 to Slave 0401 Cable – RS-232 Configuration

Master 0401 End			Slave 0401 End	
9 pin D Male	**Pin**	**Belden 9729**	**9 pin D Male**	**Pin**
Gnd	1	---drain 2----	Gnd	1
Tx-/TxD	2	-------2b------	Rx-/RxD	8
Rx+/RxD	3	-------1a------	Tx+/TxD	7
RxGnd	4		RxGnd	4
	5			5
TxGnd	6		TcGnd	6
Tx+/RTS	7	-------1b-----	Rx+/CTS	3
Rx-/CTS	8	-------2a------	Tx-/RTS	2
	9			9
Frame Gnd	Shield	---drain 1----	Frame Gnd	Shield
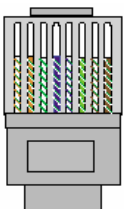
Table 2-7: Master 0401 to Slave 0401 Cable – RS-422 Configuration

2.7. CONTROLLING THE ROUTER USING VistaLINK®

X0401H Series routers fitted with the "+ET" option have a 10Base-T or 100Base-TX Ethernet port, which is used as a point of access to communicate with VistaLINK® for crosspoint routing through the use of Simple Network Management Protocol. (At the time of writing this option is only available on the X0401H-AES4-HES version.) These routers are designed to be used with either 10Base-T (10 Mbps) or 100Base-TX (100 Mbps) also known as *Fast Ethernet,* twisted pair Ethernet cabling systems. When connecting for 10Base-T systems, category 3, 4, or 5 UTP cable as well as EIA/TIA – 568 100Ω STP cable may be used. When connecting for 100Base-TX systems, category 5 UTP cable is required. The cable must be "straight-through" with a RJ-45 connector at each end (See Table 2-8).

Make the network connection by plugging one end of the cable into the RJ-45 receptacle of the X0401 Series router and the other end into a port of the supporting hub. When connecting an X0401 Series router directly to the Ethernet port on a computer you will have to use a "crossover" cable as shown in Figure 2-9.

The straight-through RJ-45 cable can be purchased or can be constructed using the pin-out information in Table 2-8. A colour code wiring table is provided in Table 2-8 for the current RJ 45 standards (AT&T 258A or EIA/TIA 258B colour coding shown). Also refer to the notes following Table 2-8 for additional wiring guide information.

Pin 1	Pin #	Signal	EIA/TIA 568A	AT&T 258A or EIA/TIA 568B	10BaseT or 100BaseT
	1	Transmit +	White/Green	White/Orange	X
	2	Transmit –	Green/White or White	Orange/White or Orange	X
	3	Receive +	White/Orange	White/Green	X
	4	N/A	Blue/White or Blue	Blue/White or Blue	Not used (required)
	5	N/A	White/Blue	White/Blue	Not used (required)
	6	Receive –	Orange/White or Orange	Green/White or Green	X
	7	N/A	White/Brown	White/Brown	Not used (required)
	8	N/A	Brown/White or Brown	Brown/White or Brown	Not used (required)

Table 2-8: Standard RJ45 Wiring Colour Codes for "Straight Through" Cables

Note the following cabling information for this wiring guide:
- Only two pairs of wires are used in the 8-pin RJ 45 connector to carry Ethernet signals.
- Even though pins 4, 5, 7 and 8 are not used, it is mandatory that they be present in the cable.
- 10BaseT and 100BaseTX use the same pins; a crossover cable made for one will also work with the other.
- Pairs may be solid colours and not have a stripe.
- Category 5 cable must use Category 5 rated connectors.

The maximum cable run between the X0401 Series router and the supporting hub is 300 ft (**100 m**). The maximum combined cable run between any two end points (i.e. X0401 Series router and PC/laptop via network hub) is 675 feet (205 m).

Devices on the Ethernet network continually monitor the receive data path for activity as a means of checking that the link is working correctly. When the network is idle, the devices also send a link test signal to one another to verify link integrity. The Ethernet port is fitted with two LEDs to monitor the Ethernet connection.

10/100: This Amber LED is ON when a 100Base-TX link is last detected. The LED is OFF when a 10Base-T link is last detected (the LINK LED is ON). Upon power-up the LED is OFF as the last detected rate is not known and therefore defaults to the 10Base-T state until rate detection is completed.

LN/ACT: This dual purpose Green LED indicates that the X0401 Series router has established a valid linkage to its hub, whether the X0401 Series router is sending or receiving data. This LED will be ON when the X0401 Series router has established a good link to its supporting hub. This gives you a good indication that the segment is wired correctly. The LED will BLINK when the X0401 router is sending or receiving data. The LED will be OFF if there is no valid connection.

If you are building a "crossover" cable you must wire it according to Figure 2-9.
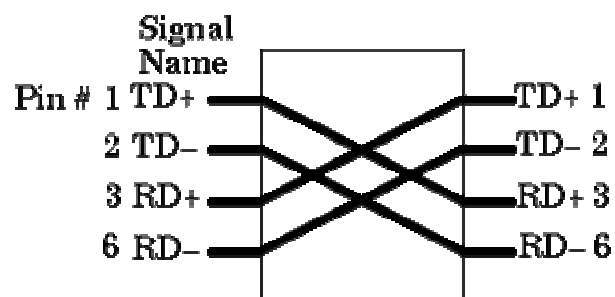
Figure 2-9: Crossover Cable Wiring Diagram

After you have connected the Ethernet cable, you will need to configure the IP address of the router and install the VistaLINK® software. See section 5.2 for more information.

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CHAPTER 3: OPERATION
TABLE OF CONTENTS

Figures

Tables

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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. A second control panel can also be purchased for the routers. This panel is connected to the **REMOTE CTL** port and allows the user to access all of the router functions except the *Setup* menu. All units can also be controlled by contact closures on the GPI control port or through the **REMOTE CTL** serial remote control port using Grass Valley switcher protocol.

3.1. OVERVIEW OF THE FRONT PANEL DISPLAY AND CONTROLS
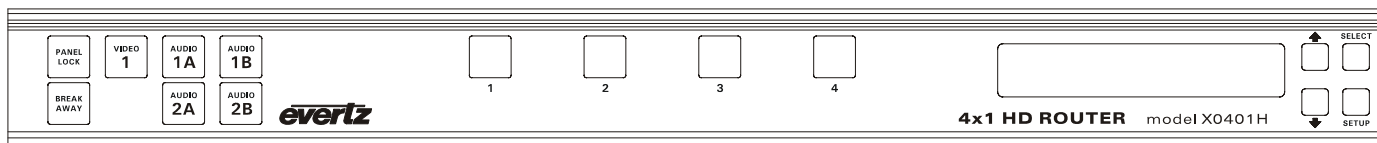
Figure 3-1: Front Panel Layout

Note that the front panel layout for the X0401S and X0401H routers are identical.

3.1.1. Video Router Controls

1 to 4: These four buttons allow the user to select between the 4 available video inputs for the video output buss, as well as selecting the 4 available audio inputs for the AES busses. The button caps can be removed to allow the user to provide his own legends for the buttons.

V1, 1A, 1B, 2A, 2B: These five buttons are used to select the Bus to be controlled by buttons 1 to 4.

PANEL LOCK: This button locks out the use of the control panel.

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

BREAKAWAY: This button initiates the breakaway selection. Pressing this button after the desired breakaway is selected performs the switch of the Video and its associated Audio breakaways.

3.1.2. Setup Key Group

SETUP: This button is used to enter the *Setup* menu, which controls various setup options that configure the operating modes of the router. (See section 3.3 for a complete description of the *Setup* menu.) When you are in the *Setup* menu, this button is also used to back out of the menu selections to the next higher menu level. When exiting the *Setup* menu, the **SETUP** button is also used to discard *menu* option settings and return to normal panel operation.

SELECT: This button is used to choose a sub-menu and navigate to the next level down in the menu structure. It is also used to make a menu selection. When exiting the *Setup* menu, the **SELECT** button is also used to save *menu* option settings and return to normal panel operation.

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

3.1.3. Front Panel Display Messages

In addition to the normal operating mode displays that show the names of the inputs that have been selected, the 0400 series routers show some diagnostic messages to help the user diagnose possible system problems.

`Video Ref. Fail` This message will alternate with the current display message when the video reference signal is not present.

`DARS Ref. Fail`   This message will alternate with the current display message when the Audio Reference menu item is set to DARS, and the DARS reference signal is not present. The Audio reference will default to the Video Reference in this case.

`Genlock Fail`   This message will alternate with the current display message when the Audio Reference menu item is set to DARS, and neither the Video Reference or the DARS reference signal are present.

3.2.   OVERVIEW OF FRONT PANEL OPERATION

3.2.1. Audio Follow Video Switching (AFV)

The X0401 series routers have one video buss and four audio busses (1A, 1B, 2A and 2B) depending on the model (see Table 1-1).

The X0401 routers fitted with the AES4 option have a quad 4 x 1 AES configuration.   On these units, audio busses 1A, 1B, 2A and 2B will follow the video V1 buss.

To select a crosspoint for buss V1, press the **V1** button and then select the desired input by pressing one of the buttons **1** to **4.** Note that when buss V1 is selected the **V1** button will light up as well as the buttons corresponding to the audio busses that are assigned to follow video buss V1. When the desired input is selected the button for that buss will light and the video label for that input will be displayed on the front panel display.   The input labels for the associated audio busses may be displayed momentarily by pressing the respective audio buss keys.

When selecting an audio bus that has been assigned to a video bus, all the buttons for that AFV assigned group will light and any input selection will affect the whole group.

The switch selection may be disallowed if there is no video present on the input chosen depending on the setting of the *No Video Action* menu item in the *Input Setup* menu. A message `No Video Present` will be temporally displayed.   Similarly if the Video input has been turned off using the *Video V1* menu item in the *Input Setup* menu, the switch will be disallowed and the message `Input turned off` will be displayed. Turning off Audio inputs in the *Input Setup* menu will cause the audio switch to be ignored by any AFV switching.

3.2.2. Breakaway Audio on an Audio Follow Video Group

The occasion may arise where the user wants to select a different audio input than what the video bus normally dictates. This is a breakaway function and the router allows for this mode. To initiate a breakaway function the first step is to select the desired input for the Video buss as described in section 3.2.1. Then press the **BREAKAWAY** key to enter the breakaway selection mode. The **BREAKAWAY** key will blink to indicate that breakaway mode has been entered. At the same time all of the audio bus keys for that breakaway group will light up along with the current selected input key. To break away audio Bus 1B press that key. The **Audio 1B** key will blink to indicate the specific breakaway bus. Press the key for the desired input selection for the audio 1B bus. The selected input key will also blink indicating that it will be selected for audio bus 1B when the breakaway is completed. The other input key that is still lit represents the buss selection for the V1 buss and the 1A audio buss that have not changed. The breakaway is now set up. To complete the breakaway, press the **BREAKAWAY** key again. The panel will now show the **BREAKAWAY** key lit and two input keys will also be lit.

To understand which inputs belong to which buss, press the button for the buss in question. Only the input button and the button for that buss will light up - all other keys will be temporally extinguished. During that short interval the display will show the input label for that input key.

To cancel the breakaway simply press the next input selection. At this time all the busses in that AFV group will track to that input selection.

It is also possible when in breakaway mode to select breakaways for all the Audio busses that are assigned to follow the video. Furthermore, it is possible for the breakaway to work on the video bus. This allows for a salvo switch where all audio and video busses are switched to different inputs.

Turning off Audio inputs in the *Input Setup* menu will cause the audio switch to be ignored by any AFV Breakaway switching.

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.

REFERENCE
├ **Reference video**
├ **Output Timing**
│ *(SS and ESS only)*
├ **Input Timing**
│ *(SS and ESS only)*
└ **Reference audio**
   (SS and ESS only)

TRANSITION
├ **Switch Line**
├ **Video Line Sync**
│ *(SS and ESS only)*
├ **1A SoftSwitch**
│ *(SS and ESS only)*
├ **1B SoftSwitch**
│ *(SS and ESS only)*
├ **2A SoftSwitch**
│ *(SS and ESS only)*
├ **2B SoftSwitch**
│ *(SS and ESS only)*
└ **EA SoftSwitch**
   (Embedded only)

INPUT SETUP
├ **Input standard**
├ **V1 inputs**
├ **Audio 1A inputs**
│ **(Audio option only)**
├ **Audio 1B inputs**
│ **(Audio option only)**
├ **Audio 2A inputs**
│ **(Audio option only)**
├ **Audio 2B inputs**
│ **(Audio option only)**
└ **No Video Action**

INPUT LABEL
├ **Input Label File**
├ **Label Video**
├ **Label Audio 1A**
├ **Label Audio 1B**
├ **Label Audio 2A**
└ **Label Audio 2B**

OUTPUT SETUP
└ **Setup V1 Output**

BYPASS
(Bypass option only)
└ **Bypass All A & V**

GPI SETUP
├ **Disable All Gpis**
├ **Enable All Gpis**
├ **Gpi Encoding**
├ **Gpi Type**
└ **Program GPIs**

GPO SETUP
├ **Disable All Gpos**
├ **Enable All Gpos**
├ **Gpo Encoding**
├ **Gpo Type**
└ **Program Gpos**

REMOTE CTL
├ **Baud Rate**
├ **Serial Format**
├ **Serial Address**
├ **Serial Control**
├ **GVG PS Status**
└ **Protocols**

PRESETS
├ **Load Factory**
├ **Load Preset 1**
├ **Load Preset 2**
├ **Save Preset 1**
└ **Save Preset 2**

UTILITY
├ **XPT Panel Lock**
├ **Network**
├ **Firmware Version**
├ **Firmware Update**
└ **Firmware Bin**

EXIT
├ **Save and Exit**
├ **Exit no Save**
└ **Return to Menu**

Figure 3-2: Overview of the Setup Menu

3.4.   NAVIGATING THE SETUP MENU

To enter the 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. Once you have chosen the desired sub-menu, press the **SELECT** key to select the next menu level.

Once in a sub-menu, there may be another menu layer (shown in Title Case), or there may be a list of parameters to adjust (shown in lower case). If there is another set of menu options, use the ↑ **&** ↓ keys to select the desired menu item and press the **SELECT** key. Continue this process until you get to the bottom of the menu tree where the list of parameters to be adjusted is shown.

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 blinking. Pressing the ↑ **&** ↓ keys allows the user to display the possible values for the selected menu item. The various menu 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 is the current value. To move up one level in the menu press the **SETUP** key.

The parameter value that is blinking will become the current value when you exit the menu system by selecting the *Exit and Save* menu option.

You can select other parameters from that sub-menu by using the ↑ **&** ↓ keys, followed by the **SELECT** key. Alternately you can move up one menu item by pressing the **SETUP** key.

When you have made all the desired changes, press the **SETUP** key one or more times until you return to the top of the Menu tree where you will be presented with an Exit menu option. Using the ↑ **&** ↓ keys, choose one of the three options and then press the **SELECT** key. A description of the actions taken for each *Exit* menu option is shown below. You will be prompted to press the **SELECT** key one more time to confirm your decision. Pressing the **SETUP** key at this time will return you to the *Exit* menu level.

SAVE AND EXIT	Selecting this option will permanently save all the changes that were made while in the *Setup* menu. This option also exits the user out of the *Setup* menu and returns them to normal front panel operation.
EXIT NO SAVE	Selecting this option discards any changes made in the *Setup* menu and restores the previous settings. This option also exits the user out of the *Setup* menu and returns them to normal front panel operation.
RETURN TO MENU	This option will return the user to the previous menu item selected in the top level of the *Setup* menu.

Each of the menu items, with function explanations, is described in the following sections.

3.5.   FRONT PANEL SETUP MENU – MAIN MENU

The Front panel *Setup* menu is arranged in a layered structure that groups similar configuration items together. The following section provides a brief description of the first level of menu items that appear when you enter the menu. Selecting one of these items will take you to the next menu level. Sections 3.6 to 3.16 provide detailed descriptions of each of the sub-menus. The tables in sections 3.6 to 3.16 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.

REFERENCE	This menu is used to set up the Genlock Reference.
TRANSITION	This menu is used to set up the Transition type for audio and video.
INPUT SETUP	This menu is used to assign which video and audio inputs are enabled and which audio busses are assigned to follow each of the video busses.
INPUT LABEL	This menu is used to change the default labels for the video and audio inputs.
OUTPUT SETUP	This menu is used to select whether the video outputs will be reclocked on non-reclocked.
BYPASS	This menu is used to manually activate the video and audio bypass relays. (Bypass option only)
GPI SETUP	This menu is used to configure the 8 General Purpose inputs.
GPO SETUP	This menu is used to configure the 4 General Purpose outputs.
REMOTE CTL	This menu is used to configure the Serial Remote Control port.
PRESETS	This menu is used to save and recall user presets, and to restore the router to its factory default condition.
UTILITY	This menu is used to view the current firmware version and to upload new firmware into the router.

3.6.   CONFIGURING THE ROUTER REFERENCES

The *REFERENCE* menus are used to configure the reference timing for the router. The chart below shows the items available in the *REFERENCE* menu. On most routers only the *Reference video* menu item is available. The other menu items are used for configuring the SoftSwitch™ features of routers fitted with the SoftSwitch™ option.   Sections 3.6.1 to 3.6.4 provide detailed information about each of the sub-menus.

Reference Video	Configures the video reference type.
Output Timing	Adjusts the timing of the video output V1 in relation to the Video Reference input on SoftSwitch™ equipped routers
Input Timing	Adjusts the line synchronizer timing of the video output V1 in relation to the Video Reference input on SoftSwitch™ equipped routers
Reference Audio	Selects the Audio reference on SoftSwitch™ equipped routers.

3.6.1. Setting Up the Video Reference

The *Reference Video* menu is used to select the type of reference video being used for the router. The Video reference is used to control the switching point in the video when cross points are changed.

```
REFERENCE
   Reference Video
      ref:ntsc/60
      ref:ntsc/59.94
      ref:pal/50
```

The standard definition X0401S series routers can accept only NTSC or PAL video references.

```
REFERENCE
   Reference Video
      ref:ntsc/60
      ref:ntsc/59.94
      ref:pal/50
      ref:1080i/60
      ref:1080i/59.94
      ref:1080i/50
      ref:1080p/24sF
      ref:1080p/23.98sF
      ref:720p/60
      ref:720p/59.94
      ref: 720p/50
```

The high definition X0401H series routers can accept NTSC or PAL, or Tri-level sync HD video references.

In general, the reference video should be chosen to match the standard of the video program material passing through the router.

For SD program video, a standard definition reference video signal must be used.

For HD program video, a standard definition reference video signal can be used as long as it is at the same frame rate.

e.g.

Input Standard	Valid Reference Video	
	Tri-Level	Bi-Level
ntsc/59.94		ref:NTSC/59.94
pal/50		ref:PAL/50
1080i/60	ref:1080i/60	ref:NTSC/60
1080i/59.94	ref:1080i/59.94	ref:NTSC/59.94
1080i/50	ref:1080i/50	ref:PAL/50
1080p/24sF	ref:1080p/24sF	
1080p/23.98sF	ref:1080p/23.98sF	
720p/60	ref:720p/60	ref:NTSC/60
720p/59.94	ref:1080i/59.94	
720p/50	Ref:720p/50	ref:PAL/50

Table 3-1: Input Video Standards with Valid Reference Video Standards

* These Video Reference formats are not available on the SS and ESS versions of the 0401H.

3.6.2. Setting Up the Video Output Timing
     (SoftSwitch™ and Embedded SoftSwitch™ routers only)

```
REFERENCE
  Output timing
     V phase = 1
```

This menu item is used to set the vertical phase reference for the V1 output on SoftSwitch™ equipped routers. For X0401S routers the V phase has valid values from 1 to 525 lines (525i/59.94 video) or from 1 to 625 lines (625i/50 video) representing V1 output phase delayed with respect to reference video. For X0401H routers operating in high definition mode the V phase has valid values from 1 to 1125 lines representing V1 output phase delayed with respect to reference video.

When the V phase is adjusted, the "V phase" label will blink when the incoming signal that was selected when entering the *Setup* menu is within the line synchronizer range.

3.6.3. Setting Up the Video Line Synchronizer Timing
     (SoftSwitch™ and Embedded SoftSwitch™ routers only)

```
REFERENCE
  Input timing
     line phase = 0
```

This menu item is used to set the line synchronizer acceptance range with respect to the video reference for the V1 output on the SoftSwitch™ equipped routers.

Setting V phase to "1" and line phase to "0" are the standard settings. This will allow any incoming video signal with a +/- one half line timing with respect to the applied video reference to switch cleanly on the V1 bus. The output on V1 will remain constant at 1 line delayed with respect to the applied video reference signal. The timing of the V2 output is not adjustable.

The line phase has following valid values:
0401S	0 to +/-700 samples (approx. +/- 25 μsec)
0401H	0 to +/-940 samples (approx. +/- 12 μsec) for 1080 line standards
0401H	0 to +/-620 samples (approx. +/- 8 μsec) for 720 line standards

> *Line Phase* **is specific to a particular reference video standard. Therefore, if the** *Reference Video* **is changed from one standard to another, the** *Line Phase* **will be reset to 0, and must be set up again for the new reference video standard.**

> **The** *V Phase* **and** *Line Phase* **adjustments are REAL TIME ADJUSTMENTS and will affect router timing even without the menu** *EXIT AND SAVE* **menu selection. The** *EXIT AND SAVE* **menu item will save the values while the** *EXIT AND NO SAVE* **menu item will return the router to the original values. For difficult timing situations the presets can be used for different timing setups.**

3.6.4. Setting Up the AES Audio Reference Reference
(SoftSwitch™ and Embedded SoftSwitch™ equipped routers only)

```
REFERENCE
  Reference Audio
    lock to video
    lock 48 kHz DARS
```

This menu is used to select the type of audio reference being used for the SoftSwitch™ equipped routers. These routers can accept a DARS reference signal to ensure the Z bit alignment on the AES outputs. If *video* is selected, the Z bit alignment of the AES outputs is random. If *DARS* is selected and the DARS reference is absent, the router will revert to *video* lock. On the SS routers, for the SoftSwitch™ technology to function correctly, the audio sources must be synchronous with the chosen *Audio Reference.* See section 2.1.5 for information on connecting a DARS reference.

In order for the Embedded SoftSwitch™ technology to function correctly on the ESS routers, the AES sources must be synchronous with the *Video reference* and the A*udio Reference* for the router should be set to *video.* (If you are using a DARS reference with ESS, then the DARS reference must be locked to the video reference.) If Embedded SoftSwitch™ functionality is not required (e.g. Dolby E in the embedded stream) then the AE SoftSwitch can be disabled and the router can function the same as a SoftSwitch™ equipped router.

3.7. CONFIGURING THE VIDEO AND AUDIO TRANSITIONS

3.7.1. Configuring the Switch Line

```
TRANSITION
  Switch Line
    Switch line = 10
```

On the Standard Definition Routers this menu allows the user to select which line of the video reference the switching will occur on. Valid values are 1 to 64, with the default switch line set to 10.

```
TRANSITION
  Switch Line
    Switch line = 7
```

On HD routers this menu allows the user to select which line of the video reference the switching will occur on.

On routers that do not have SoftSwitch™, the switch line number will be the line number of the video reference.

On SoftSwitch™ equipped routers, when using a bi-level sync reference, the switch line number will be the equivalent line number in HD, as shown in Figure 3-3 and Figure 3-4. When using a tri-level sync reference, the switch line number will be the line number of the HD video reference. Valid values are 1 to 64, with the default switch line set to 7 as per SMPTE RP168-2002. For proper timing operation the *Input Standard* setting on the *INPUT SETUP* menu must be set to match the input video format. (See section 3.8.1)
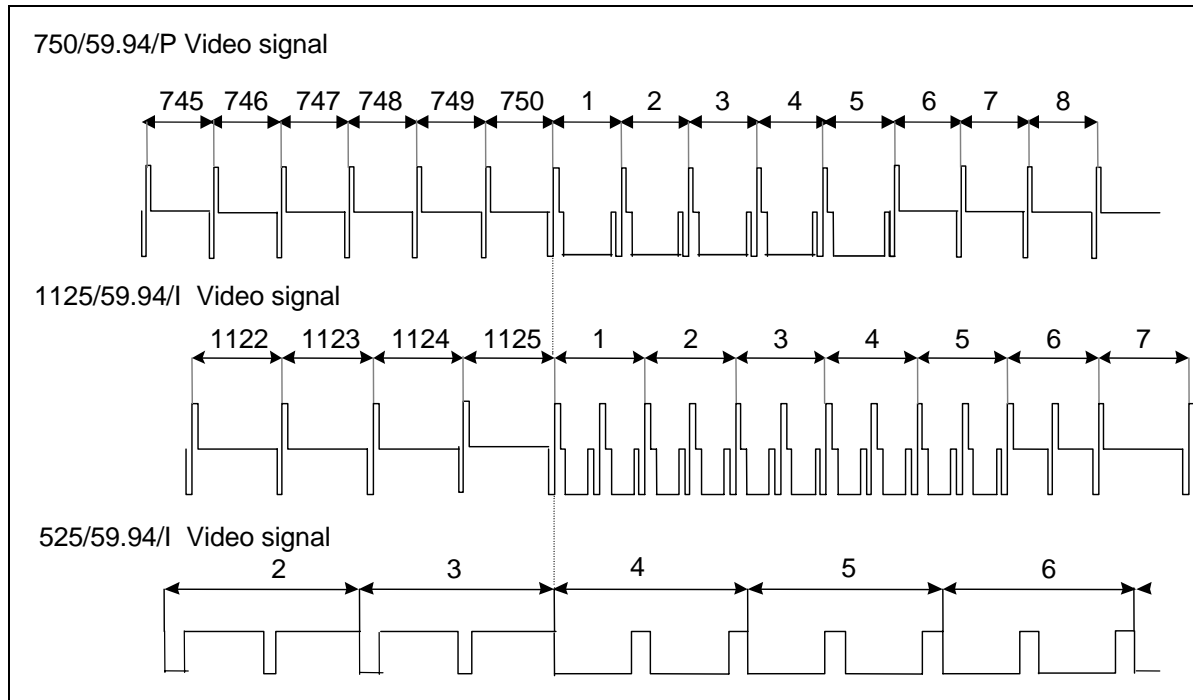
Figure 3-3: Switch Line Selection in 59.94 Hz Field Rate Systems
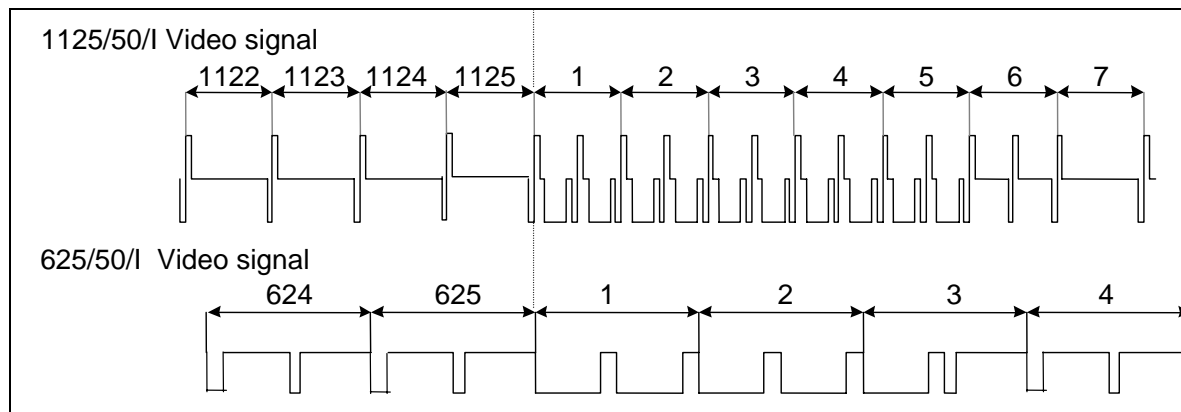
Figure 3-4: Switch Line Selection in 50 Hz Field Rate Systems

3.7.2. Enabling the Video Line Synchronizer for Clean Video Switches (SoftSwitch™ and Embedded SoftSwitch™ equipped routers only)

```
TRANSITION
  Video Line Sync
    line sync:off
    line sync: on
```

This menu allows the user to control the video line synchronizer function on the SoftSwitch™ and Embedded SoftSwitch™ equipped routers. The Line Synchronizer control only affects the V1 video bus output.

When the line synchronizer is set to *Off*, the router will provide a hard switch on the V1 bus.

When the line synchronizer is set to *On*, the router will provide a clean switch on the V1 bus when the input signals are within the line synchronizer range. If the input signal is outside the line synchronizer range, the router will attempt to synchronize the signal but may cause timing shifts in the output picture.

3.7.3. Enabling the AES Audio SoftSwitch™ for Clean Audio Switches (SoftSwitch™ and Embedded SoftSwitch™ equipped routers only)

```
TRANSITION
  1A SoftSwitch
    s.switch:off
    s.switch:on
    s.switch:non pcm
```

This menu allows the user to enable the discrete audio SoftSwitch™ on the SoftSwitch™ equipped routers. When discrete audio SoftSwitch is On, the router will provide a clean AES switch on the AES audio busses associated with the V1 buss.

This function enables the user to turn the discrete audio SoftSwitch *On* or *Off*.

This item should be set to *non pcm* when switching Dolby Audio formats that are not PCM audio based, such as Dobly E.

For simplicity, only 1A SoftSwitch is described in this manual (other options include 1B, 2A, 2B and EA). The EA SoftSwitch option is only used to enable or disable the audio.

3.7.4. Enabling the Embedded Audio SoftSwitch™ for Clean Audio Switches (Embedded SoftSwitch™ equipped routers only)

```
TRANSITION
  EA SoftSwitch
    embedded ss:off
    embedded ss:on
```

This menu allows the user to enable the embedded audio SoftSwitch™ on the Embedded SoftSwitch™ equipped routers. When Embedded Audio SoftSwitch is On, the router will provide a clean audio switch on linear PCM audio embedded on the V1 buss.

This function can be turned *On* or *Off* and should be *Off* when switching non-linear PCM embedded audio such as Dolby E.

3.8.   CONFIGURING THE VIDEO AND AUDIO INPUTS

The *INPUT SETUP* menus are used to disable unused video and audio inputs, and to configure which Audio busses will follow video busses 1 and 2 in an 'Audio follow video' switch. The chart below shows the items available in the *INPUT SETUP* menu. Sections 3.8.1 to 3.8.3 provide detailed information about each of the sub-menus.

Input Standard	Selects the input video standard
V1 inputs	Allows the user to disable unused video inputs
Audio 1A inputs	Allows the user to disable unused inputs on the Audio 1A buss
Audio 1B inputs	Allows the user to disable unused inputs on the Audio 1B buss
Audio 2A inputs	Allows the user to disable unused inputs on the Audio 2A buss
Audio 2B inputs	Allows the user to disable unused inputs on the Audio 2B buss
No Video Action	Allows the user to determine the operation when there is no video input

3.8.1.   Configuring the Router Video Standard (SoftSwitch™ equipped routers only)

INPUT SETUP
Input Standard
std 525/59.94
std 625/50

The standard definition X0401S series routers equipped with SoftSwitch™ have a line synchronizer to provide clean video switches. This menu item must be used to set the video standard in the router in order for the line synchronizer to work correctly.

INPUT SETUP
Input Standard
std:1080i/60
std:1080i/59.94
std:1080i/50
std:1080p/24sF
std:1080p/23.98sF
std:720p/60
std:720p/59.94
std:720p/50
std ntsc/59.94
std:pal/50

The high definition X0401H series routers equipped with SoftSwitch™ and Embedded SoftSwitch™ have a line synchronizer to provide clean video switches. This menu item must be used to set the video standard in the router in order for the line synchronizer to work correctly.

The Reference video standard must also be set correctly for proper operation of the line synchronizer. See section 3.6.1.

3.8.2. Configuring Which Inputs Are Active

The *V1 Inputs, Audio 1A Inputs, Audio 1B Inputs, Audio 2A Inputs,* and *Audio 2B Inputs* menu items allow the user to disable unused inputs. When an input is disabled, the router will not perform a switch to that input even if the front panel button is pressed. Also, disabled inputs will not cause the Input failure tally output to trigger. Disabling inputs for each of the busses is done the same way but for simplicity only the *V1 Inputs* menus will be shown in the manual.

INPUT SETUP
V1 Inputs
video i/p setup

When you select this menu item the V1 button will be blinking. The buttons for the video inputs that are enabled will be On. If you make any changes the V1 button will stop blinking.

To disable an input press the corresponding button - the LED will turn Off and a message (e.g. `Input xx off)` will be shown momentarily on the front panel.

To enable an input press the corresponding button - the LED will turn On and a message (e.g. `Input xx on)` will be shown momentarily on the front panel.

To confirm your selection press the **SELECT** button. The V1 button will start blinking again indicating that you have confirmed your changes.

3.8.3. Configuring When There Is No Video Input Present

INPUT SETUP
No video action
no video:take
no video:no take
no video:black
no video:no tak*

This menu item determines whether a selected switch will occur if there is no video present on the selected input.

When it is set to *take* the switch to the input will be made.

When set to *no take*, the router can still be switched remotely even if there is no input video.

On the SoftSwitch™ routers there is an additional mode. When it is set to *black* and the Line synchronizer is turned on, the switch will be allowed and the video output will be black. When the Line synchronizer is turned off, the switch will be allowed and the output video will contain everything that is present at the input.

When set to *no tak**, the router cannot be switched remotely to an input that has no video.

3.9. LABELLING THE VIDEO AND AUDIO INPUTS

The X0401 Series Routers provide a simple method of identifying each of the video sources with a 16 character label. The *INPUT LABEL* menu is used to change the default input labels for the video and audio inputs. You can either input the label text from a text file (see section 3.9.1), or manually update the individual input labels from the front panel (see section 3.9.2). The chart below shows the items available in the *INPUT LABEL* menu.

Input Label File	Allows the user to upload and download input labels from a text file
Label Video	Allows the user to label the Video inputs
Label Audio 1A	Allows the user to label the Audio 1A inputs
Label Audio 1B	Allows the user to label the Audio 1B inputs
Label Audio 2A	Allows the user to label the Audio 2A inputs
Label Audio 2B	Allows the user to label the Audio 2B inputs

3.9.1. Uploading/Downloading Input Labels from a Text File

INPUT LABEL
Input Label File
Receive file?
Send file?

This menu item is used to upload and download Input Label text files with a terminal program.

Receive File allows you to upload new input labels from a text file.

Send File allows you to download the current input labels to a text file.

It is important to make sure that the structure of the text file that contains the router labels is correct or the router will not accept any of the label definitions. The simplest way to create a file with the correct layout is to download the current labels from the router using the *Send File* menu option. You can then edit the label names, and then upload the new file back to the router using the *Receive File* menu option.

Any serial protocol (remote panel or GVG) that is currently open on the remote port will be closed during the Label updating procedure. The serial protocol will be reopened once the upload or download has finished. Use the procedure described in 4.4 to upload label text files to the router.

3.9.2. Changing the Input Labels from the Front Panel

From the *Input Label* menu use the ↑ & ↓ buttons and press the **SELECT** key to select the input buss you wish to label. The method of labelling each of the inputs is the same. The button corresponding to the buss you have chosen will blink. For simplicity, the manual will describe how to label the video inputs only.

Press the button corresponding to the input 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 change the blinking character, the buss LED will stop blinking. When you have selected the desired character, press the **SELECT** button to save the changes for the first character and advance to the next character. The buss LED will start blinking again indicating you have confirmed the changes to the first character. Follow the same procedure until you have finished entering the label. Make sure that you press the **SELECT** button after you change the rightmost character. Press the **SETUP** button to return to the *select input* menu. To change the label on another input press the desired input button and follow the same procedure. When you have changed all the labels for the selected buss, press the **SETUP** button to return to the *INPUT LABEL* menu.

3.10. CONFIGURING THE VIDEO OUTPUTS

The *OUTPUT SETUP* menus are used to configure the Video Outputs. The chart below shows the items available in the *OUTPUT SETUP* menu. Section 3.10.1 provides detailed information about the sub-menus.

Setup V1 Output	Configures whether the outputs from Video Buss 1 will be reclocked or non-reclocked

3.10.1. Selecting the Reclocking Mode of the Video Outputs (X0401S and X0401H series)

OUTPUT SETUP
Setup V1 Output
<u>reclocked</u>
non reclocked

On the Standard definition and high definition versions of the router, the *Setup V1 Output* menu item determines if the video output will be reclocked or not.

When the router is operated in the *reclocked* mode it will automatically turn off the reclocker when a SMPTE 310M video signal is present at the input.

The router can also be forced to the *non reclocked* mode.

3.10.2. Selecting the Reclocking Mode of the Video Outputs (X0401S-ATSC series)

OUTPUT SETUP
Setup V1 Output
<u>ATSC</u>
SMPTE

On the ATSC versions of the router, the *Setup V1 Output* menu item determines the reclocking rate of the video output.

When the router is operated in the *ATSC* mode it reclocks a SMPTE 310M (19.4Mb/s) video signal.

When the router is operated in the *SMPTE* mode it reclocks a SMPTE 259M or DVB-ASI video signal.

3.11. MANUALLY ACTIVATING THE BYPASS RELAYS

The *BYPASS* menus are used to manually activate the Video and Audio bypass relays. (If the Bypass Relay Option is not installed this menu will be disabled.) The chart below shows the items available in the *BYPASS* menu. The relays will not activate until you exit the menu system with the *Exit and Save* menu option. Section 3.11.1 provides detailed information about the sub-menu.

Bypass	This menu allows the user to manually activate all video and audio bypass relays.

3.11.1. Manually Activating All the Bypass Relays

BYPASS
Bypass All A & V
off
on

Manually activates all the bypass relays when set to *On*. Releases the bypass relays when set to *Off.*

3.12. CONFIGURING THE GENERAL PURPOSE INPUTS (GPI)

The X0401 series routers can be controlled remotely by using 8 general purpose (GPI) inputs. The functions of these inputs can be programmed to suit the specific requirements of the user. The *GPI SETUP* menus are used to configure the functions of the GPI inputs. See section 2.5 for information about connecting the GPI inputs. The chart below shows the items available in the *GPI SETUP* menu. Sections 3.12.1 to 3.12.5 provide detailed information about each of the sub-menus.

Disable All Gpis

This menu allows the user to manually override the programmed functions of all GPI inputs and disable them.

Enable All Gpis

This menu allows the user to enable all GPI inputs and return them to their programmed functions.

Gpi Encoding

This menu allows the user to choose one of 4 pre-defined encoding modes for the GPI inputs.

Gpi Type

This menu allows the user to select whether the GPI input will be level or edge triggered.

Program Gpis

This menu allows the user to program different functions for the GPI inputs that are not previously assigned using one of the encoding modes.

3.12.1. Temporarily Disabling the GPI Functions

GPI SETUP
Disable all Gpis

Pressing the **SELECT** key when this menu item is shown will override the programmed functions of all the GPI inputs. The GPI inputs will not respond when they are disabled.

3.12.2. Re-enabling the GPI Functions

GPI SETUP
Enable all Gpis

Pressing the **SELECT** key when this menu item is shown will restore the programmed functions of all the GPI inputs. Individual GPIs can be disabled using the *Program Gpi's* menu item.

3.12.3. Configuring the Encoding Mode for the GPI Inputs

```
GPI SETUP
    Gpi Encoding
        none
        standard
        hex
        AFV hex
        std. 2
```

The GPIs can be configured to operate in one of four Encoded modes. In these modes, many of the GPI inputs are pre-assigned to a function. The unused inputs are still available for the user to assign to a particular function using the *Program Gpi's* menu item.

When the GPI Encoding is set to none, all 8 inputs are available for the user to assign to particular functions.

Sections 3.12.3.1 to 3.12.3.3 describe how each of the GPI encoding modes work and which inputs are available for user assignment.

3.12.3.1. Standard GPI Encoding

Standard GPI encoding is designed to simply select an 'Audio follow Video' switch of one of the input groups to one of the output busses. There are four GPIs to select each input and two GPIs to perform the switch either in AFV mode or video only. For example, if GPI 3 is low and a falling edge occurs on GPI 7, the audio and video from input 3 will get switched to the output.

GPI #	Action	Function
1	Low	Select Input 1
2	Low	Select Input 2
3	Low	Select Input 3
4	Low	Select Input 4
5	Set by GPI type menu	Set by Program GPI Menu
6	Set by GPI type menu	Set by Program GPI Menu
7	Falling Edge	Switch selected input to AFV1 Outputs
8	Falling Edge	Switch selected Video input to Output

Table 3-2: Standard GPI Encoding Functions

3.12.3.2. HEX GPI Encoding

HEX GPI encoding is designed to perform an audio follow video or breakaway switch selection. Three inputs are encoded to select one of the four inputs. Five GPI inputs perform the switch to one of the video or audio busses or one of the AFV groups.

GPI #	Action	Function
1		Three HEX encoded inputs select one of the 4 input busses – see Table 3-4
2	High or low Level	
3		
4	Falling Edge	Switch selected input to 1A Output
5	Falling Edge	Switch selected input to 1B Output
6	Falling Edge	Switch selected input to 2A Output
7	Falling Edge	Switch selected input to V1 Output
8	Falling Edge	Switch selected input to 2B Output

Table 3-3: HEX GPI Encoding Functions

GPI 3	GPI 2	GPI 1	Input Select
High	High	High	Invalid selection
High	High	Low	1
High	Low	High	2
High	Low	Low	3
Low	High	High	4
Low	High	Low	Invalid selection
Low	Low	High	Invalid selection
Low	Low	Low	Invalid selection

Table 3-4: HEX Input Selection (HEX and AFV HEX Encoding)

3.12.3.3. AFV HEX GPI Encoding

AFV HEX GPI encoding is designed to permit audio follow video switch selection. Three inputs are encoded to select one of the twelve inputs for the AFV group. One GPI input performs the switch to one of the AFV groups. There are four GPI inputs available for user-defined functions.

GPI #	Action	Function
1		
2	High or low Level	Three HEX encoded inputs select one of the four input busses – see Table 3-4
3		
4	Set by GPI type menu	Set by Program GPI Menu
5	Set by GPI type menu	Set by Program GPI Menu
6	Set by GPI type menu	Set by Program GPI Menu
7	Falling Edge	Switch input selected by GPI1-3 to AFV1 Outputs
8	Set by GPI type menu	Set by Program GPI Menu

Table 3-5: AFV HEX GPI Encoding Functions

3.12.3.4. Standard 2 GPI Encoding

Standard 2 GPI encoding is designed to simply select an 'Audio follow Video' switch of one of the input groups to one of the output busses. There are four GPIs to select each input and two GPIs to perform the switch either in AFV mode or video only. The actions of the GPIs are reversed in comparison to the Standard GPI Encoding.

GPI #	Action	Function
1	Falling Edge	Select Input 1
2	Falling Edge	Select Input 2
3	Falling Edge	Select Input 3
4	Falling Edge	Select Input 4
5	Set by GPI type menu	Set by Program GPI Menu
6	Set by GPI type menu	Set by Program GPI Menu
7	Low	Switch selected input to AFV1 Outputs
8	Low	Switch selected Video input to Output

Table 3-6: Standard GPI Encoding Functions

3.12.4. Configuring Whether the GPI Inputs are Edge or Level Activated

```
GPI SETUP
    Gpi Type
        gpi # 1 type
            fall
            rise
            low
            high
```

This menu configures whether the GPI inputs, that are available for user functions, will activate on rising or falling edges, or high or low levels.

Individual menus for each GPI input allow each input to be independently configured. For simplicity, only the *Gpi 1 type* menu will be shown.

3.12.5. Programming the GPI Input Functions

The GPI inputs can be configured to operate in one of four modes using the *Gpi Encoding* menu item. In three of these modes, many of the GPI inputs have pre-assigned functions, and the unused inputs are available for the user to program for a specific function. In the fourth mode (when the GPI Encoding is set to *none*) all 8 GPI inputs are available for the user to program for specific functions.

The *Program Gpi* menu is used to program the functions of the GPI inputs that are available for user functions. Individual menus for each GPI input allow each input to be independently configured. For Simplicity, only the *Gpi 1 type* menu will be shown.

```
GPI SETUP
    Program Gpis
        Program Gpi # 1
            disable gpi
            afv sel. i/p
            v1only sel. i/p
            1a sel i/p
            1b sel i/p
            2a sel i/p
            2b sel i/p
```

If the GPI function is already determined by one of the encoding modes, the front panel will display a message such as `Gpi 1 Encoded`.

The *afv* function will cause the selected video and associated audio inputs to switch to the indicated output busses. The *v1only sel. i/p* function will cause only the selected input video to switch to the output video buss. The *1a, 1b, 2a* and *2b* functions will cause the selected audio input to switch to the output audio buss shown in brackets.

When one of these modes are selected the button corresponding to the selected input will blink. To select another input press the corresponding button (the input button LED will turn On) and confirm your selection by pressing the **SELECT** key (the input button LED will blink).

Disable GPI will turn off the GPI input.

3.13.   CONFIGURING THE GENERAL PURPOSE OUTPUTS (GPO)

The X0401 series routers have four general purpose (GPO) outputs that can be programmed to various functions to suit the specific requirements of the user. The *GPO SETUP* menus are used to configure the functions of the GPO outputs. See section 2.5 for information about connecting the GPO outputs. The chart below shows the items available in the *GPO SETUP* menu. Sections 3.13.1 to 3.13.5 provide detailed information about each of the sub-menus.

Disable All GPOs	This menu allows the user to manually override the programmed functions of all GPO outputs and disable them.
Enable All GPOs	This menu allows the user to enable all GPO outputs and return them to their programmed functions.
Gpo Encoding	This menu allows the user to choose one of two pre-defined encoding modes for the GPO outputs.
GPO Type	This menu allows the user to select whether the GPO output will be latched or momentary.
Program GPOs	This menu allows the user to program different functions for the GPO outputs.

3.13.1. Temporarily Disabling the GPO Functions

GPO SETUP
Disable all GPOs

Pressing the **SELECT** key when this menu item is shown will override the programmed functions of all the GPO outputs. The GPO outputs will be Off when they are disabled.

3.13.2. Re-enabling the GPO Functions

GPO SETUP
Enable all GPOs

Pressing the **SELECT** key when this menu item is shown will restore the programmed functions of all the GPO outputs. Individual GPOs can be disabled using the *Program Gpo's* menu item.

3.13.3. Configuring the Encoding Mode for the GPO Outputs

GPO SETUP
GPO Encoding
<u>*none*</u> *hex V1*

The GPOs can be configured to operate in an encoded mode. In this mode, the GPO outputs are pre-assigned to provide encoded tallies of the router input selections for the V1 buss. Section 3.13.3.1 describes how the GPO encoding modes work.

When the GPO Encoding is set to *none*, all 4 outputs are available for the user to assign to particular functions. Section 3.13.5 describes how to program the individual GPO functions.

3.13.3.1. HEX GPO Encoding

The *HEX V1* GPO encoding mode is designed to allow the four GPO outputs to give tallies for the V1 buss.   The four General purpose outputs are encoded to provide tallies to indicate which one of the 4 inputs is currently routed to the video buss as shown in Table 3-7. The encoded tally is held low while the respective video input is routed to the video output buss.

GPO 3	GPO 2	GPO 1	Output Select
High	High	Low	1
High	Low	High	2
High	Low	Low	3
Low	High	High	4

Table 3-7: HEX Encoded Output Tallies

3.13.4. Configuring Whether the GPO Outputs are Latched or Momentary

```
GPO SETUP
   Gpo Type
      gpo # 1 type
         latch
         1/2 sec
```

This menu configures whether the GPO outputs that are available for user functions will be latched or momentary (0.5 seconds in duration) when the GPO encoding is set to *none*.

Individual menus for each GPO output allow each output to be independently configured. For simplicity, only the *Gpo 1 type* menu will be shown.

3.13.5. Programming the GPO Output Functions

```
GPO SETUP
   Program Gpos
      program gpo # 1
         disable gpo
         power failure
         output v1 fail.
         Ref. Video fail.
         Any v i/p fail.
         Sel. V i/p fail.
         Sel. V1 i/p tally
```

The Program Gpo's menu is used to program the functions of the GPO outputs that are available for user functions. Individual menus for each GPO output allow each output to be independently configured. For simplicity, only the GPO 1 type menu will be shown.

When one of the sel. xx i/p modes is selected the button corresponding to the selected input will blink. To select another input press the corresponding button (the input button LED will turn On) and confirm your selection by pressing the SELECT key (the input button LED will blink).

When set to *disable GPO*, the GPO cannot be used. *Disable GPO* will turn off the GPO output.

When set to *power failure*, this option activates the GPO after the router has re-powered in the event of a power failure.

When set to *output v1 fail*, this option will give contact closure if the output fails. If there is no output signal it will flag it as an error.

When set to *ref. video fail*, the GPO activates if the video reference fails.

When set to *any v i/p fail*, the GPO activates if any input video fails.

When set to any *sel v i/p fail*, the GPO activates if the selected video input fails.

When set to *sel. v1 i/p tally*, the GPO activates if the selected input(s) is active.

3.14.   CONFIGURING THE REMOTE CONTROL PORT OPERATION

The X0401 series routers can be externally controlled using the REMOTE CONTROL port, or can operate as a controller to another slave router. The *REMOTE CTL* menu is used to configure the parameters and protocol for the Remote Control Port. The chart below shows the items available in the *GPI SETUP* menu. Sections 3.14.1 to 3.14.6 provide detailed information about each of the sub-menus. Also see section 2.6 and 5 for specific information about connecting the router to the external device.

Baud Rate	This menu allows the user to set the baud rate.
Serial Format	This menu allows the user to set the serial data format (word length, parity and stop bits).
Serial Address	This menu allows the user to select address of the router that is required for multi-drop protocols.
Serial Control	This menu allows the user to select whether the router will be the master (controller) or slave (controlled) device.
GVG PS Status	This menu item is used to send the power supply status of the router to a GVG controller device using GVG Ten XL protocol.
Protocols	This menu allows the user to select which control protocol will be used.

3.14.1. Selecting the Baud Rate for the Remote Control Port

REMOTE CTL
Baud Rate
9600
19200
38400

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

3.14.2. Selecting the Serial Data Format for the Remote Control Port

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

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

3.14.3. Selecting the Serial Control Address

REMOTE CTL
Serial Address
address = 1
valid address
values are
1 to 64

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 X0401 series router is operating in the *master* mode, it will send out commands to the router that matches its *serial address*. When the X0401 series router is operating in *slave* mode, it will only respond to commands that match its *serial address*. If two X0401 series routers are connected in a master/slave configuration, then the address of both routers must be set the same (only 1 video buss on the X0401).

Use the ↑ and ↓ arrows to select the desired address and press the **SELECT** key to confirm the new address.

The *Baud Rate, Serial Format* and *Serial Control* settings must also be set to match the desired control protocol.

3.14.4. Selecting the Serial Data Control Mode

REMOTE CTL
Serial Control
slave
master

This menu item is used to select the router, which will issue commands or respond to commands on the Remote Control port.

When set to *slave*, the router will respond to commands it receives on the control port.

When set to *master*, the router will issue commands using the currently selected protocol.

In master mode three items are displayed:

1. When the master gets a response back from the slave and it does not match the masters crosspoint setting, it will display "**Error: Mismatch**".
2. When the response from the slave matches the crosspoint setting of the master, and if the power supply status in response is set to 0xff, it will display **REM: V: # A: # PS:xx** (where # is the crosspoint setting of video and audio).
3. When the response from the slave matches the crosspoint setting of the master, and if the power supply status in response is set to anything other than 0xff, it will display **REM: V: # A: # PS: ## (**where # is the crosspoint setting of video and audio, and ## is the actual power supply status value that the master got in response from the slave).

The *Baud Rate, Serial Format,* and *Serial Address* settings must also be set to match the desired control protocol.

An AFV switch can be performed, which switches the audio and video to the same input.

OR

A breakaway of all audio channels at the same time can be performed, but it is not possible to do individual breakaways of each audio. This is the limitation of GVG protocol. It only allows the user to set 1 crosspoint for audio. For example, if you send the following command:

^B0103,

This will set the output video to input 1 and all the output audios to input 4.

When in master mode the control functions the same as above, except that the input selection for audio will be based on the Master's audio channel 1.

3.14.5. Selecting the GVG PS Status

REMOTE CTL
GVG PS Status
<u>*On*</u>
Off

This menu item is used to send the power supply status of the router to a GVG controller device using GVG Ten XL protocol.

When set to *On*, the router will send the status.

When set to *Off*, the router will not send the status.

3.14.6. Selecting the External Remote Control Protocol

REMOTE CTL
Protocols
<u>*gvg ten xl ascii*</u>
performer
remote panel

This menu item is used to select the protocol used for control by routing switcher control devices.

The *Baud Rate, Serial Format, Serial Address* and *Serial Control* settings must also be set to match the desired control protocol.

The *Performer* protocol allows control of the router from a computer or host terminal.

When the Protocol is set to *Remote Panel* the X0401-PANEL remote control panel can be connected to this port. In this mode, the *Baud Rate* and *Serial Format* settings are forced to *9600 baud, 8.n.2.* Also, the physical port wiring must be changed to RS-422 as described in section 2.4.2.

3.15. SAVING AND RECALLING CONFIGURATION PRESETS

The *PRESETS* menu allows the user to save specific configurations to one of two non-volatile presets. Using this menu, these presets can be restored, or the user can restore the router to its factory preset configuration. The chart below shows the items available in the *PRESETS* menu. Section 3.15.1 to 3.15.3 provides detailed information about each of the sub-menus.

Load Factory	This allows the user to restore the router to the factory default configuration.
Load Preset 1	This allows the user to recall the router configuration in user preset 1.
Load Preset 2	This allows the user to recall the router configuration in user preset 2.
Save Preset 1	This allows the user to save the current router configuration to user preset 1.
Save Preset 2	This allows the user to save the current router configuration to user preset 2.

3.15.1. Restoring the Factory Default Settings

PRESETS
Load Factory

This menu item is used to restore the factory default values of all the programmable features in the router.

Pressing the **SELECT** key when this menu item is shown will prompt you to confirm that you want to load the Factory Default configuration. Doing this will override all of your current configuration items. To proceed, press the **SELECT** key one more time. The front panel display will briefly show a message indicating that the Factory default configuration has been loaded. The configuration will not become active until you exit the menu system with the *Exit and Save* menu option.

3.15.2. Recalling a Saved User Preset Configuration

PRESETS
Load Preset 1

This menu item is used to recall the values of all the programmable features in the router saved in user preset 1. (A similar menu item allows you to recall user preset 2).

Pressing the **SELECT** key when this menu item is shown will prompt you to confirm that you want to load the user preset configuration. Doing this will override all of your current configuration items. To proceed, press the **SELECT** key one more time. The front panel display will briefly show a message indicating that the user preset configuration has been loaded. The configuration will not become active until you exit the menu system with the *Exit and Save* menu option.

3.15.3. Saving the Router Configuration to a User Preset

PRESETS
Save Preset 1

This menu item is used to save the values of all the programmable features of the router in user preset 1. (A similar menu item allows you to save into user Preset 2).

Pressing the **SELECT** key when this menu item is shown will prompt you to confirm that you want to save the current configuration to the user preset. Doing this will overwrite the values currently saved in the user preset. To proceed, press the **SELECT** key one more time. The front panel display will briefly show a message indicating that the user preset configuration has been saved. **The saved preset configuration will be copied to the non-volatile memory when you exit the menu system with the *Exit and Save* menu option.** (It takes approximately 30 seconds to complete the copy to non-volatile memory after you exit the menu.)

3.16. MANAGING THE MISCELLANEOUS CONFIGURATION ITEMS

The *UTILITY* menu allows the user to view the Firmware version and to update the firmware to a new version. The chart below shows the items available in the *UTILITY* menu. Sections 3.16.1 to 3.16.4 provide detailed information about each of the sub-menus.

XPT Panel Lock	This allows the user to block crosspoint changes (not able to switch inputs).
Network	This allows the user to configure the router in order to communicate with a VistaLINK® Network.
Firmware Version	This allows the user to view the current firmware version.
Firmware Update	This allows the user to update the firmware in the router.
Firmware Bin	This allows the user to view the name of the firmware file that is currently loaded.

3.16.1. XPT Panel Lock

UTILITY
   XPT Panel Lock
      none
      gpi
      remote
      local
      all

This allows the user to block crosspoint changes. The user will be unable to switch inputs.

By holding down the panel lock button for three or more seconds, the user will bring the crosspoint lock function into affect.

When set to *none*, no crosspoint changes will be blocked.

When set to *gpi*, the user will be unable to change the crosspoints using the GPIs.

When set to *remote*, the user will be unable to change the crosspoints using the remote panel.

When set to *local*, the user will be unable to use the front panel to change the crosspoints.

When set to *all*, the crosspoints cannot be changed using any of the control functions in this sub-menu.

3.16.2. Network Configurations

The *Network* sub-menu allows the user to configure the router in order to communicate with the VistaLINK® network. The chart below shows the items available in the *Network* sub-menu. Sections 3.16.2.1 to 3.16.2.6 provide detailed information about each of the sub-menus.

Use DHCP	Configures whether the router will operate in DHCP mode or not.
Set IP Address	Sets the unique IP address of the router within the network.
Set Netmask	Sets the "subnet mask" of the network.
Set Gateway	Sets the IP address of the "gateway".
Set Broadcast Ad	Sets the "broadcast IP address".
Add Trap Address	Allows the user to define the IP addresses where trap information is sent.
Show Trap Addres	Shows the Trap destination address that is defined.
Remove Trap Addr	Removes Trap Destination Addresses.

3.16.2.1. Configuring DHCP Mode

UTILITY
Network
Use DHCP
<u>*No*</u>
Yes

The *Use DHCP* menu item allows the router to be automatically assigned an IP address from a DHCP server during boot-up. If not running a DHCP server, set this parameter to "No" first before making any changes to other parameters. "No" is the default setting.

3.16.2.2. Setting the IP Address

UTILITY
Network
Set IP Address
192.168.1.XXX

The *Set IP Address* menu item sets the unique IP address of the router within the network. 192.168.1.XXX is an example of an IP address in a private (internal) network. If connecting multiple network devices take care not to use the same IP address for each.

3.16.2.3. Setting the Net Mask

UTILITY
Network
Set Netmask
255.255.255.0

The *Set Netmask* menu item defines the "subnet mask" of the network. Specifically, this parameter outlines all the IP addresses that can communicate with the router. This parameter can be set to 255.255.255.0 for a private network.

3.16.2.4. Setting the Gateway

UTILITY
Network
Set Gateway
255.255.255.0

The *Set Gateway* menu item identifies the IP address of the "gateway". In its simplest sense the gateway is a device that routes packets to different networks. If configured, the IP address of the gateway must reside in the X0401 router's local subnet, which was defined by the subnet mask. In a private network, this gateway could be identified as 192.168.1.1.

> **To communicate beyond the private (internal) network and into the internet, all messages must be relayed via the gateway (firewall). As a result, the firewall must be configured separately by the end-user to facilitate communication. Consult your network administrator if establishing a communication link beyond the private network.**

3.16.2.5. Setting the Broadcast Address

UTILITY
Network
Set Broadcast Ad
192.168.1.1

The *Set Broadcast Address* menu item sets the "broadcast" IP address". For example, in a private network with a subnet mask configured as 255.255.255.0, this parameter can be set to 192.168.1.255. This will allow information to be sent to all devices on a specific subnet.

3.16.2.6. Setting the Trap Addresses

There are three menu items that are used to set, remove and show the trap addresses. These menu items allow the user to define the IP address of the trap listeners for when the asynchronous fault messages are sent. After selecting the "Add Trap Address" or "Remove Trap Address" option, IP addresses are entered one at a time.

UTILITY
Network
Add Trap Address
192.168.1.xxx

The *Add Trap Address* menu item adds a SNMP trap server IP address to the TRAP distribution list. This server will log any alarm event generated by the router.

UTILITY
Network
Show Trap Addres

The *Show Trap Address* menu item displays all the entered SNMP trap server IP addresses. Use the UP and DOWN arrow keys to scroll through the list.

UTILITY
Network
Remove Trap Addr
192.168.1.xxx

The *Remove Trap Address* menu item removes a SNMP **trap server** IP address from the TRAP distribution list.

The following chart is provided for you to write down the Network settings that you have programmed into the router.

Router Parameters	IP Address
Hostname	
IP Address	
Netmask	
Gateway	
Broadcast	
Trap Address	

3.16.3. Setting the Community Strings

UTILITY
Network
R. Community Str.
W. Community Str.

Community Strings are considered as "passwords" within SNMP, controlling the ability to read ("GET") and/or read/write ("SET") values to a specific destination. "GET" and "SET" messages include the community strings within their PDU (protocol data units). By factory default, community strings are set to "public" and "private", respectively. If these settings are changed, the SNMP manager's community string must agree with the "SET" string. Otherwise no communication will occur between the router and manager.

The *Read Community String* menu item is the "public" factory default. (No changes required. However, if these settings are changed, the manager must have the identical settings. Otherwise no communication will occur between the router and the manager.)

The *Write Community String* menu item is the "private" factory default. (No changes required. However, if these settings are changed, the manager must have the identical settings. Otherwise no communication will occur between the router and the manager.)

3.16.4. Managing the Router Firmware

There are three menu items that allow you to read the firmware name, version number and initiate a firmware upgrade from the front panel.

3.16.4.1. Reading the Router Firmware Version

UTILITY
Firmware Version

This menu item is used to read the firmware version of the router.

3.16.4.2. How to Update the Router Firmware

UTILITY
Firmware Update
Sel to upgrade

This menu item is used to initiate an upload of new firmware into the router.

Pressing the **SELECT** key when this menu item is shown will prompt you to confirm that you want to update the firmware. Doing this will erase the current firmware. To proceed, press the **SELECT** key one more time. The front panel display will show a message indicating that the router is waiting for you to upload new firmware. See section 4.3 for more information on updating the firmware.

3.16.4.3. Reading the Router Firmware Version

UTILITY
Firmware Bin

This menu item is used to view the name of the firmware file that is currently loaded.

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CHAPTER 4: TECHNICAL DESCRIPTION
TABLE OF CONTENTS

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4. TECHNICAL DESCRIPTION

4.1. SPECIFICATIONS

4.1.1. Video Specifications (X0401S Series)

4.1.1.1. SD Video Inputs

Standards:	SMPTE 259M (270Mb/s, 360Mb/s, 540Mb/s), DVB-ASI
	SMPTE 310M (19.4Mb/s) in non-reclocked mode only
Number of Inputs:	4
Connector:	BNC per IEC 61169-8 Annex A
Equalisation:	Automatic up to 250m @ 270 Mb/s
	with Belden 8281 or equivalent cable
Return Loss:	> 15 dB up to 540 Mb/s
Input Timing	(SoftSwitch™ equipped Models only)
Input Range:	measured with respect to the Genlock reference
	± one half line when *V phase* = 1, *Line phase* = 0

4.1.1.2. SD Video Outputs

Standard:	Same as Input
Number of Outputs:	2 reclocked outputs - Reclocking on outputs may be turned off
	input 1 bypass protected to output 1 when bypass relay option is installed
Connector:	BNC per IEC 61169-8 Annex A
Signal Level:	800mV nominal
DC Offset:	0V ±0.5V
Rise and Fall Time:	950ps nominal
Overshoot:	<10% of amplitude
Return Loss:	> 15 dB up to 540 Mb/s
Wide Band Jitter:	< 0.2 UI
Output Timing	(SoftSwitch™ and Embedded SoftSwitch™ equipped Models only)
Output Phase	measured with respect to the Genlock reference
	1 line to a full frame of delay– set by *V phase* parameter. The active video content
	will align to the nearest line.

4.1.2. Video Specifications (X0401H Series)

4.1.2.1. HD Video Inputs

Standards:	SMPTE 292M (1.5 Gb/s), SMPTE 259M (270Mb/s, 360Mb/s, 540Mb/s), DVB-ASI
	SMPTE 310M (19.4Mb/s) in non-reclocked mode only
Number of Inputs:	4
Connector:	BNC per IEC 61169-8 Annex A
Equalisation:	
HD Video Stds:	Automatic up to 100m with Belden 1694 or equivalent cable
	(50 m on Input 1 when the optional Bypass relay is installed)
SD Video Stds:	Automatic up to 250m with Belden 8281 or equivalent cable
Return Loss:	> 15 dB up to 1.5 Gb/s
Input Timing	(SoftSwitch™ and Embedded SoftSwitch™ equipped Models only)

Input Range:	measured with respect to the Genlock reference
	± one half line when *V phase* = 1, *Line phase* = 0

4.1.2.2. HD Video Outputs

Standard:	Same as Input
Number of Outputs:	2 reclocked outputs - Reclocking on outputs may be turned off.
	input 1 bypass protected to output 1 when bypass relay option is installed
Connector:	BNC per IEC 61169-8 Annex A
Signal Level:	800mV nominal
DC Offset:	0V ±0.5V
Rise and Fall Time:	
HD Video Stds:	200ps nominal
SD Video Stds:	950ps nominal
Overshoot:	<10% of amplitude
Wide Band Jitter:	< 0.2 UI
Return Loss:	> 15 dB up to 1 Gb/s, > 12 dB up to 1.5 Gb/s
Output Timing	(SoftSwitch™ and Embedded SoftSwitch™ equipped Models only)
Output Phase	measured with respect to the Genlock reference
	1 line to a full frame of delay– set by *V phase* parameter. The active video content will align to the nearest line.

4.1.3. Video Specifications (X0401S-ATSC Series)

4.1.3.1. Video Inputs

Standards:	
ATSC mode	SMPTE 310M (19.4Mb/s)
SMPTE mode	SMPTE 259M (270Mb/s, 360Mb/s, 540Mb/s), DVB-ASI
Number of Inputs:	4
Connector:	BNC per IEC 61169-8 Annex A
Equalisation:	Automatic up to 250m @ 270 Mb/s
	with Belden 8281 or equivalent cable
Return Loss:	> 15 dB up to 540 Mb/s
Input Timing	(SoftSwitch™ equipped Models only)
Input Range:	measured with respect to the Genlock reference
	± one half line when *V phase* = 1, *Line phase* = 0

4.1.3.2. Video Outputs

Standard:	Same as Input
Number of Outputs:	2 reclocked outputs
	input 1 bypass protected to output 1 when bypass relay option is installed
Connector:	BNC per IEC 61169-8 Annex A
Signal Level:	800mV nominal
DC Offset:	0V ±0.5V
Rise and Fall Time:	950ps nominal
Overshoot:	<10% of amplitude
Return Loss:	> 15 dB up to 540 Mb/s
Wide Band Jitter:	< 0.2 UI

4.1.4. Video Reference

Type:	Menu selectable - depends on video format (See section 2.1.5)
	NTSC or PAL Colour Black 1 V p-p
	Composite Bi-level sync (525i/59.94 or 625i/50) 300 mV
	HD Tri-level Sync (X0401H versions only)
Connector:	BNC per IEC 61169-8 Annex A
Termination:	
Standard models:	High impedance loop through
SoftSwitch™ models:	High impedance loop through or High impedance non-looping or 75 ohm non looping (jumper selectable)

4.1.5. AES Audio Inputs (AES4 versions only)

Standards:	SMPTE 276M single ended AES
Number of Inputs:	4 Groups of 4
Connector:	BNC per IEC 61169-8 Annex A
Signal Level:	1 V p-p ± 10%
Return Loss:	> 25 dB up to 6 MHz

4.1.6. AES Audio Outputs (AES4 versions only)

Standards:	SMPTE 276M single ended AES
Number of Outputs:	4 busses, 2 outputs per bus
	input 1 bypass protected to output 1 when bypass relay option is installed
Connector:	BNC per IEC 61169-8 Annex A
Signal Level:	1 v p-p
Return Loss:	> 35 dB up to 6 MHz
Reference:	From Video Reference.
	On SoftSwitch™ equipped routers, menu selectable to Video or DARS. (DARS reference requires jumper configuration inside the router. See section 4.2.2)

4.1.7. DARS Reference (SoftSwitch™ and Embedded SoftSwitch™ equipped routers only)

Note:	DARS reference requires jumper configuration inside the router. See section 4.2.2
Type:	Digital Audio Signal with 48Khz sample rate
Standard:	SMPTE 276M-1995 single ended AES
Connector:	BNC per IEC 61169-8 Annex A
Termination:	Inactive, High impedance non-looping or 75 ohm non looping (jumper selectable)

4.1.8. GPI Control Port

Number of Inputs:	8 opto-isolated, programmable functions
Number of Outputs:	4 sets of relay contacts, normally closed, programmable functions
Relay Max Current:	1 A at 30 V DC

4.1.9. Serial Remote Control

Standard:	RS-232 or RS-422, programmable baud rate
Connector:	9 pin female "D"
Protocol:	GVG Ten XL ASCII, master or slave or Remote Control Panel

4.1.10. Remote Control Panel Port

Standard: RS-422, 9600 baud rate
Connector: 6 pins on GPIO 25 pin female "D"
Protocol: Remote Control Panel

4.1.11. Ethernet Port (Routers fitted with +ET option only)

Network Type: Fast Ethernet 100 Base-TX IEEE 802.3u standard for 100 Mbps baseband CSMA/CD local area network
Ethernet 10 Base-T IEEE 802.3 standard for 10 Mbps baseband CSMA/CD local area network
Connector: RJ-45
Function: Crosspoint control using SNMP with VistaLINK® or 9000NCP panel

4.1.12. Electrical

Voltage: Auto-ranging 100 to 240 Volts AC, 50/60 Hz
Fuse Rating: 250 V, 1 amp 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 7.75" D.
(483mm W x 45mm H x 196mm D)
Weight: 8 lbs. (3.5Kg)

4.2.   JUMPERS

4.2.1.   Configuring the Remote Control Serial Port

The Remote Control (REMOTE CTL) Serial port can be configured for various pin-outs, as described in section 2. During manufacture, the serial port is configured for RS-232 DCE.

To reconfigure the serial port as an RS-422 Tributary, it is necessary to disconnect the power from the router and remove the top cover.   Reposition jumper J26 so that it is on pins 2 & 3 (toward header J23) and move the ribbon cable from header J29 to header J23. The pin-outs corresponding to RS-232 DCE and RS-422 controller configurations are given in Table 2-1 and Table 2-2 respectively. It is impossible to tell whether the serial port pin-out has been altered without opening the unit for inspection.

4.2.2. Configuring the Router for a DARS Reference

The REF/DARS BNC can be configured as either a high impedance loop through from the REF BNC (factory default) or as a 75 ohm terminated DARS reference input.

To reconfigure this BNC for a DARS input it is necessary to disconnect the power from the router and remove the top cover. Jumper J19 controls whether the BNC will be a loop through or a DARS reference input. Position jumper J19 in the *Loop* position (pins 2 & 3) for loop through operation. Position jumper J19 in the *Split* position (pins 1 & 2) for DARS operation. In addition, you should also set the termination jumpers for the REF and REF/DARS input BNCs to the 75 ohm position. Position jumper J20 in the *75* position to terminate the REF input BNC. Position jumper J12 in the *75* position to terminate the REF/DARS input BNC.

4.3. UPGRADING FIRMWARE

The X0401 series routers contain firmware that is contained in a FLASH EPROM device. From time to time firmware updates will be provided to add additional features to the unit.

You will need the following equipment in order to update the X0401 Router 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.

4.3.1. Step 1 – Terminal Program Setup

1. If the REMOTE CTL connector is configured as a standard RS-232 DCE port (default from the factory) connect a 'straight-through' serial cable to the REMOTE CTL DB9 connector on the rear panel.

    If the REMOTE CTL connector has been configured as an RS-422 tributary port, (as described in section 2.1.6) it can be automatically reconfigured as an RS-232 port with a non-standard pinout by grounding pin 5. You will need to connect a special serial cable as shown in Table 4-1 to the REMOTE CTL DB9 connector on the rear panel. This cable will automatically change the port to RS-232 levels.

X0401 End			PC End	
9 pin D Male	Pin		9 pin D Female	Pin
Gnd	1			1
Tx-/TxD	2	-------1b------	TxD	2
Rx+/RxD	3	-------1a------	RxD	8
RxGnd	4	---drain----	Sig Gnd	5
Select	5	---drain----	Sig Gnd	5
TxGnd	6			6
Tx+/RTS	7			7
Rx-/CTS	8			8
	9			9
Frame Gnd	Shield	---drain----	Frame Gnd	Shield

Table 4-1: Serial Upgrade Cable for Use When Remote CTL Port is Set to RS-422 Configuration

---

2. Connect the 9 pin female 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**

6. Power up the X0401 series router unit.

4.3.1.1.   Step 2 – Invoke Upload Mode via the Front Panel

If you cannot invoke the upload mode via the front panel outlined in section 4.3.1.1 then follow the steps in section 4.3.1.2.

7. You can invoke the Software upgrade mode using the front panel Setup Menu. (See section 3.2 for information on how to operate the front panel menus.)

- Press the **SETUP** button once to enter the front panel menu.
- Press the ↑ **&** ↓ keys until the front panel display reads `SOFTWARE UPGRADE`.
- Press the **SELECT** button to select the software upgrade mode.
- The front panel display should now show the message `Select = Upgrade`.
- Press the **SELECT** button to confirm the *Upgrade* operation, or press the **SETUP** button two times to return to normal operating mode.
- Proceed to Step 4 for instructions on uploading the firmware.

4.3.1.2.   Step 3 – Invoke Upload Mode from the Terminal Program

In the event that you cannot initiate upload mode from the front panel menu, you may send commands to the Router to initiate upload mode using the terminal program.

8. Power up the X0401 Router. After the unit powers up, a banner with the boot code version information should appear in the terminal window. The cursor to the right of the word "BOOT>" should be spinning for about 5 seconds and then the unit will continue to boot.

For example:

```
EVERTZ MCF5407 MONITOR 2.3 BUILD 8
COPYRIGHT 1997, 1998, 1999, 2000, 2001, 2002 EVERTZ MICROSYSTEMS LTD.
28F160C3B FLASH DETECTED
BRD=X0401
MODEL=X0401H-AES4-SS
PROD=X0401H-AES4-SS
FRAME=9000SFF
MCF5407 COLD BOOT>  |
```

9. 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 7 for settings). Note that Hyperterminal will not change port settings while connected. Click on Hyperterminal's "Disconnect" button then click the "Call" button to activate changes to the port settings.

10. While the cursor is spinning, press the <CTRL> and <X> keys on your computer keyboard at the same time, this should stop the cursor from spinning. The spinning prompt will only remain for about 5 seconds. You must press <CTRL-X> during this 5 second delay. If the unit continues to boot-up, simply cycle the power and repeat this step.

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

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

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

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

4.3.2. Step 4 – Uploading the New Firmware

15. 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.

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

    For Example:

```
UPLOAD OKAY
MCF5407 COLD BOOT> |
```

17. 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 cannot handle a port speed of 57600.
    - Noise induced into the Serial Upgrade cable.

4.3.3. Step 5 – Completing the Upgrade

18. Type the word "boot", without quotes, and hit the <ENTER> key once or power cycle the unit. The unit should now reboot.

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

4.4. UPLOADING ROUTER INPUT LABELS FROM A TEXT FILE

The *Input Label File* menu item allows labels for the video and audio inputs to be input from the serial port of the router using a simple terminal program such as HyperTerminal. It is important to make sure that the structure of the text file that contains the router labels is correct, or the router will not accept any of the label definitions. The simplest way to create a file with the correct layout is to download the current labels from the router using the *Send File* menu option. You can then edit the label names, and upload the new file back to the router using the *Receive File* menu option.

Any serial protocol (remote panel or GVG) that is currently open on the remote port will be closed during the Label updating procedure. The serial protocol will be reopened once the upload or download has finished.

The following procedure describes the process used to upload labels to the router:

4.4.1. Step 1 – Terminal Program Setup

1. If the REMOTE CTL connector is configured as a standard RS-232-C DCE port (default from the factory) connect a 'straight-through' serial cable to the REMOTE CTL DB9 connector on the rear panel.

   If the REMOTE CTL connector has been configured as an RS-422 tributary port, (as described in section 2.1.6) it can be automatically reconfigured as an RS-232 port with a non-standard pin-out by grounding pin 5. You will need to connect a special serial cable as shown in Table 4-1 to the REMOTE CTL DB9 connector on the rear panel. This cable will automatically change the port to RS-232 levels.

2. Connect the 9 pin female 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**

   If you are using HyperTerminal this is done using the *File/Properties* menu item. Note that HyperTerminal will not change port settings while connected. Click on HyperTerminal's "Disconnect" button then click the "Call" button to activate changes to the port settings.

5. Configure the terminal program to capture text to a file. If you are using HyperTerminal this is executed using the *Transfer/Capture Text* menu item.

4.4.2. Step 2 – Download the Current Labels from the Router

6. Invoke the *Label Send File* mode using the front panel Setup Menu. (See section 3.4 for information on how to operate the front panel menus.)

- Press the **SETUP** button once to enter the front panel menu.
- Press the ↑ **&** ↓ keys until the front panel display reads `INPUT LABEL.`
- Press the **SELECT** button.
- Press the ↑ **&** ↓ keys until the front panel display reads `Input Label File.`
- Press the **SELECT** button.
- Press the ↑ **&** ↓ keys until the front panel display reads `Send file?`
- Press the **SELECT** button twice to send the file to the terminal program.

7. When you have captured the file, you will need to close the capture file. If you are using HyperTerminal this is executed using the *Transfer/Capture Text* menu item again.

4.4.3. Step 3 – Editing the Label Text File

8. Using a text editor such as Notepad, edit the input labels in the file you have captured.

> ⚠️ **Note: It is not recommended that you use a word processor such as Microsoft Word, as it may append hidden control codes into the text file, which will not allow the edited file to be uploaded correctly to the router.**

The file structure is as follows:

```
[category_a]<CR><LF>
labelvar_a1=value 1<CR><LF>
labelvar_a3=value 2<CR><LF>
labelvar_a2=value 3<CR><LF>
[category_b]<CR><LF>
labelvar_b1=value<CR><LF>
labelvar_b2=value<CR><LF>
<CR><LF>
<CR><LF>
<CR><LF>
Note: <CR><LF> = Enter key
```

Each category is enclosed in square brackets [] and identifies the input category (e.g. `[VIDEO]`, `[AUDIO1A]`) for a group of associated label variables. The label variables must follow their associated category in the file and represent the label names that can be changed in the router. The value that follows the equals sign is a 16 character maximum length text string that is assigned to the variable. Alphanumeric characters such as a-z, A-Z, 0-9 and punctuation (ISO Character values 32 to 126) are valid. Label variables can be in any order as long as they occur in the correct category section of the file. Physical inputs on the router that do not have an associated label variable will retain their original value when the label file is uploaded to the router. If a label variable is specified more than once, the last value in the file will be used.

4.4.4.   Step 4 – Upload the New Label file to the Router

9.   Invoke the *Label Receive File* mode using the front panel Setup Menu. (See section 3.2 for information on how to operate the front panel menus.)

- Press the **SETUP** button once to enter the front panel menu.
- Press the ↑ **&** ↓ keys until the front panel display reads INPUT LABEL.
- Press the **SELECT** button.
- Press the ↑ **&** ↓ keys until the front panel display reads Input Label File.
- Press the **SELECT** button.
- Press the ↑ **&** ↓ keys until the front panel display reads Receive file?
- Press the **SELECT** button. A text prompt Send file to router now will appear on the terminal program screen.

10. Configure the terminal program to send the label text file. If you are using HyperTerminal this is executed using the *Transfer/Send Text File* menu item.

11. Exit the menu system by pressing the **SETUP** key one or more times until you return to the top of the Menu tree where you will be presented with an Exit menu. Using the ↑ **&** ↓ keys, choose the *SAVE AND EXIT* item and then press the **SELECT** key. You will be prompted to press the **SELECT** key one more time to confirm your decision.

4.4.5.   Sample Label Text Files

Example 1
The category [AUDIO2B] is before the category [VIDEO] but will still be accepted. Variable input4_audio2B for category [AUDIO2B] will not be modified. For category [VIDEO], input1_video is specified more than once so the last occurrence is used.

```
[AUDIO2B]
input1_audio2B=INPUT # 1 (2B)
input2_audio2B=INPUT # 2 (2B)
input3_audio2B=INPUT # 3 (2B)
[VIDEO]
input1_video=Input # 1 Video
input2_video=Input # 2 Video
input1_video=Test # 1 Video
```

Example 2
All the variables for the category [VIDEO] are in alphabetic order. Variable input4_audio2B for [AUDIO2B] is out of order but will still be accepted.

```
[VIDEO]
input1_video=Input # 1 Video
input2_video=Input # 2 Video
input3_video=Input # 3 Video
input4_video=Input # 4 Video
[AUDIO2B]
input1_audio2B=INPUT # 1 (2B)
input2_audio2B=INPUT # 2 (2B)
input4_audio2B=INPUT # 4 (2B)
input3_audio2B=INPUT # 3 (2B)
```

Example 3

Category [AUDIO2B] has a variable that does not belong to it (input1_video). An error message will be displayed on HyperTerminal and on the router front panel indicating the reason.

```
[AUDIO2B]
input1_audio2B=INPUT # 1 (2B)
input2_audio2B=INPUT # 2 (2B)
input3_audio2B=INPUT # 3 (2B)
input1_video=Input # 1 Video
```

HyperTerminal Output:
```
Warning: Unrecognized variable: input1_video
Error: Some labels or variables were not recognized
```

Front Panel Output:
```
Bad labels/vars
```

4.5. SERVICING INSTRUCTIONS

CAUTION – These servicing instructions are for use by qualified service personnel only. To reduce risk of electric shock, do not perform any servicing instructions in this section of the manual unless you are qualified to do so.

4.5.1. Changing the Fuses

Check that the line fuse is rated for the correct value marked on the rear panel. Never replace with a fuse of greater value.

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 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.

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CHAPTER 5: SERIAL CONTROL
TABLE OF CONTENTS

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5.   REMOTE CONTROL OF THE ROUTERS

Sections 5.1 and 5.2 provide documentation on two different serial remote control protocols that can be used to control the X0401 series routers. Section 5.3 describes the control of the router crosspoints using SNMP with VistaLINK® or the X-NCP2 Router control panel.

5.1.   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 X0401 series routers using the GVG TEN-XL ASCII command protocol. There are some hardware differences between the X0401 series routers and the Grass Valley TEN-XL routers, which have required differences in implementation of the protocol for the X0401 series routers.

When the X0401 series router is operating in the *master* mode, it will send out commands to the router that matches its *serial address*. When the X0401 series router is operating in the *slave* mode, it will only respond to commands that match its *serial address*. If two X0401 series routers are connected in a master/slave configuration, then the address of both routers must be set the same.

The *Setup Menu* in the router must be used to configure the **REMOTE CTL** port. See section 3.14 for information about configuring the serial port.

5.1.1.   Serial Data Format

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

Standard: RS-232 (Can be set to RS-422 by changing internal Jumpers)(See section 2.4.2)
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).

5.1.2.   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 X0401 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 4 x 1 router family contains 4 internal crosspoints, only crosspoints #1 to #4 are valid. Valid sources range from 0 to 3 decimals or 0x00 to 0x03, as shown in Table 5-1. The remaining sources in the Ten-XL protocol will be ignored by the X0401 routers.

Data Byte		Corresponding Source
Hex Value	**ASCII Character**	
0x30	0	1
0x31	1	2
0x32	2	3
0x33	3	4

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

5.1.3. 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..3)
[XPT(A)]	ASCII hex code for Audio crosspoint (i.e.0..3)
[PSUPP]	ASCII hex code for the Power Supply Status (i.e.0x31 = active, 0x30 = either inactive)

Table 5-2: ASCII Command Definitions

5.1.3.1. 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)]

5.1.3.2. Read or Query Command

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

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

5.1.3.3. 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]

5.1.4. Command Examples

The following are examples of the GVG's TEN-XL ASCII protocol write and read commands controlling a X0401S-AES model router. The *Serial Address* menu item is assumed to be set to 01.

5.1.4.1. Input Selection – Audio Follow Mode

Switch the video 1 buss and its associated audio busses to video input 4 (crosspoint # 3)

> **ASCII string:** ^B0133   [^B = control+B which is the STX code]
> **Hex string:**   [0x02][0x30][0x31][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:** 13F
> **Hex string:**   [0x33][0x33][0x31]

to indicate that the router has switched and that the power supply is active. Note: The router will <u>always</u> respond to a valid request.

5.1.4.2. Input Selection – Breakaway Mode

Switch the video 1 buss to video input 2 (crosspoint # 1).
Switch the audio associated with the video 1 buss 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 output to input 2 or video crosspoint #1, and the audio 2A and 2B busses to input 4 or audio crosspoint #3, and then reply with:

> **ASCII string:** 13F
> **Hex string:**   [0x31][0x33][0x31]

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

5.1.4.3. Router Status Request

Request the crosspoint settings of the video buss and its associated audio busses.

> **ASCII string:** ^B01^E   [^B = control+B which is the STX code]
>   [^E = control+E which is the ENQ code]
> **Hex string:**   [0x02][0x30][0x31][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 video buss is set to video input 2 or crosspoint #1 and the associated audio busses are set to audio input 4 or crosspoint #3. It also indicates that the power supply is active.

5.2. PERFORMER PROTOCOL

The Performer Protocol enables control of the router from a computer or host terminal. The protocol is case sensitive so you must ensure that you are using UPPERCASE letters when entering the commands. All of the commands in the performer protocol have the following format:

<CR><ADDR><LEN><DATA>

Where,

<CR>   - Carriage Return (ENTER), is used to start all commands.

<ADDR>   - Indicates the Hexadeciminal address of the router that is being tested.

<LEN>   - Indicates the hexadeciminal number representing the number of characters sent in the <DATA> command.

<DATA>   - Indicates one of more command strings (see Table 5-3).

Any error in the <DATA> portion of the command will result in "ERR P" being displayed on the screen for approximately 2 seconds.

The following table provides the performer command strings, the parameters and a brief description:

COMMAND STRING	DESCRIPTION
D<Lvl><Src><Dest>	Data command, used to preset sources to destinations.
A	All destinations Take of the current preset matrix.
T<Dest>	Take of specified destination (must be refreshed every 30 seconds).
P<Dest>	Protect specified destination (must be refreshed every 30 seconds).
C<Dest>	Clear protect on specified destination.
R	Reset router to factory defaults.
Q<Dest>	Query for status of specified destination.
S<PC><Lvl><Scr><Dest>	Status response (only sent from router to master).

Table 5-3: Performer ASCII Command Definitions

The Q command is the only command that will generate a response. Multiple status commands may be sent in one reply message, depending on the state of the router*.

The following table provides a list of the common parameters found in the performer command strings and the possible values in the X0401 router:

PARAMETER	VALUES
\<Lvl\> ⇔ \<Lvl Hi\>\<Lvl Lo\>	Hexideciminal number representing the selectable outputs of the router: 00 – All Levels (AFV) 01 – Video 02 – Audio 1A 03 – Audio 1B 04 – Audio 2A 05 – Audio 2B
\<Dest\> ⇔ \<Dest Hi\>\<Dest Lo\>	Always 01 on X0401 router.
\<Src\> ⇔ \<Src Hi\>\<Src Lo\>	Source for a specified output. The value can range from 0-3.
\<PC\>	A single character indicating whether a destination is protected: P – Protected Active C – Protect Clear

Table 5-4: Common ASCII Performer Command Parameters

The following table provides a list of test cases with accompanying result actions. Refer to Table 5-5 and/or the performer protocol documentation (located in the same folder of this document) if you wish to devise your own test cases.

PARAMETER	VALUES
\<CR\>\<ADDR\>07D000101 **\<CR\>\<ADDR\>01A**	First command should display "DATA Received". Second command will change all outputs to source 2.
\<CR\>\<ADDR\>07D000101 **\<CR\>\<ADDR\>03T01**	First command should display "DATA Received". Second command will change all outputs to source 2.
\<CR\>\<ADDR\>03Q01	Displays "QUERY Complete" and outputs a message to the screen with the following format: \<ADDR\>\<LEN\>S\<PC\>\<Lvl\>\<Src\>\<Dest\> Representing the current status of the router*.
\<CR\>\<ADDR\>08SP000101	Displays "ERR P".
\<CR\>\<ADDR\>08D000201A	Changes all outputs to source 3.
\<CR\>\<ADDR\>03P01	Displays "Protect: ON".
\<CR\>\<ADDR\>03C01	Displays "Protect: OFF".
\<CR\>\<ADDR\>0AP01D000101	Displays "Dest. Protected".
\<CR\>\<ADDR\>0ED000101AP01Q01	Outputs "0108SP000101" to the console.
\<CR\>\<ADDR\>27D000001D010001 **D020101D030201D040301AQ01**	Outputs "0120SC000001SC020101 SC030201SC040301" to the console.
\<CR\>\<ADDR\>0ED000001AP01Q01 **Wait approximately 30 seconds then enter the command below repeatedly until the result on the right is achieved*:** **\<CR\>\<ADDR\>03Q01**	First command will output "0108SP000001", indicating that Protect (P) is on. Protect will expire in 30 seconds, resulting in the second command outputting "0108SC000001" to the console. (*See protocol specification for more details.)
\<CR\>\<ADDR\>01R	Displays "RESET Complete".

Table 5-5: Command Examples

5.3.   ETHERNET CROSSPOINT CONTROL

The router must be configured to run on the same subnet as the PC running the VistaLINK® client or 9000NCP in order to control router crosspoints.

All crosspoint control is facilitated via VistaLINK® or a 9000NCP. Refer to sections 2.7 and 3.16.2 for information on connecting the Ethernet cabling and setting up the IP addresses for the router. Refer to the VistaLINK® manual for more details regarding the installation and setup of VistaLINK®. Refer to section 5.3.1 of this manual for details on using VistaLINK® to control the source to destination crosspoints.

5.3.1.   Router Crosspoint Control Using VistaLINK® (Routers fitted with the +ET option only)

Routing of the crosspoints can be controlled and monitored using VistaLINK® control. Figure 5-1 displays the VistaLINK® controls that adjust the routing of each of the optical or electrical crosspoints.

The crosspoint routing is indicated in a grid format where the selected route will be indicated by a blue rectangle.
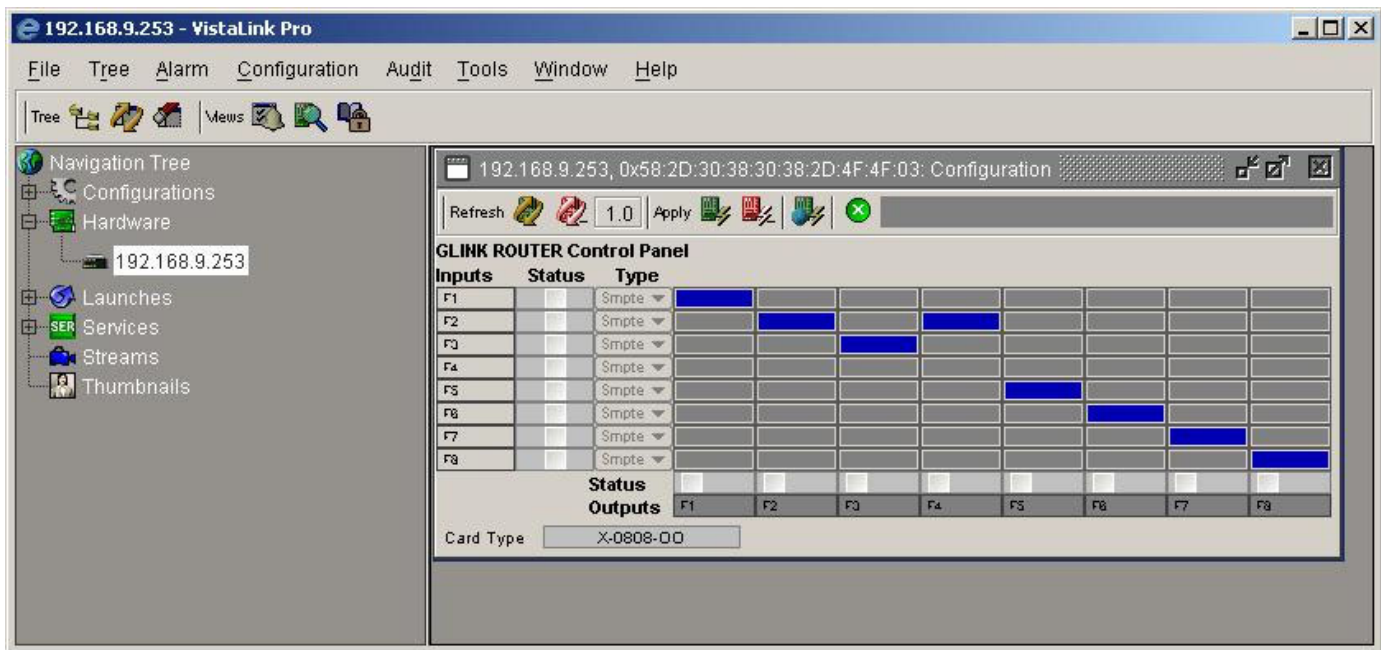
Figure 5-1: VistaLINK® Control of the X0401 Routers

5.3.1.1.   Inputs

Each of the available sources to the router are shown in the column labelled Inputs. They will each be numbered and will be preceded with either an F or C indicating it is a Fiber optic or Coaxial input.

5.3.1.2.   Outputs

Each of the available destinations from the router are shown in the row labelled Outputs. They will each be numbered and will be preceded with either an F or C indicating it is a Fiber optic or Coaxial input.

5.3.1.3.   Status

The Status row and column are not applicable for this product.

5.3.1.4.   Type

The Type column is not applicable for this product.

5.3.1.5.   Card Type

This field reports the type of router that is connected.

5.3.1.6.   Refresh

This button is used to retrieve the current status of the crosspoints. Refresh will perform a single, real-time update and display which sources are routed to each destination.

5.3.1.7.   Apply

This button will send a single update to the router to apply any crosspoint changes in VistaLINK® that have been made since the last refresh.

5.3.1.8.   Dynamic Apply

This button will enable real-time updates to the router to instantly apply all crosspoint changes.

5.3.1.9.   Global Apply

This button will send a single update to all routers of the same type to apply any crosspoint changes in VistaLINK® that have been made since the last refresh.

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CHAPTER 6: VIDEO TIMING CONSIDERATIONS
TABLE OF CONTENTS

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6.   VIDEO AND AUDIO OUTPUT CONFIGURATIONS

The following diagrams show how to set up the system timing under a number of different input signal conditions so that SoftSwitch™ equipped routers can perform a clean switch on the V1 buss.

6.1.   ALL INPUT SIGNALS ARE TIMED TO REFERENCE

This example shows the timing setup for a clean switch when all input signals are in time with the reference. The V1 buss output will be delayed 1 line with respect to the reference.
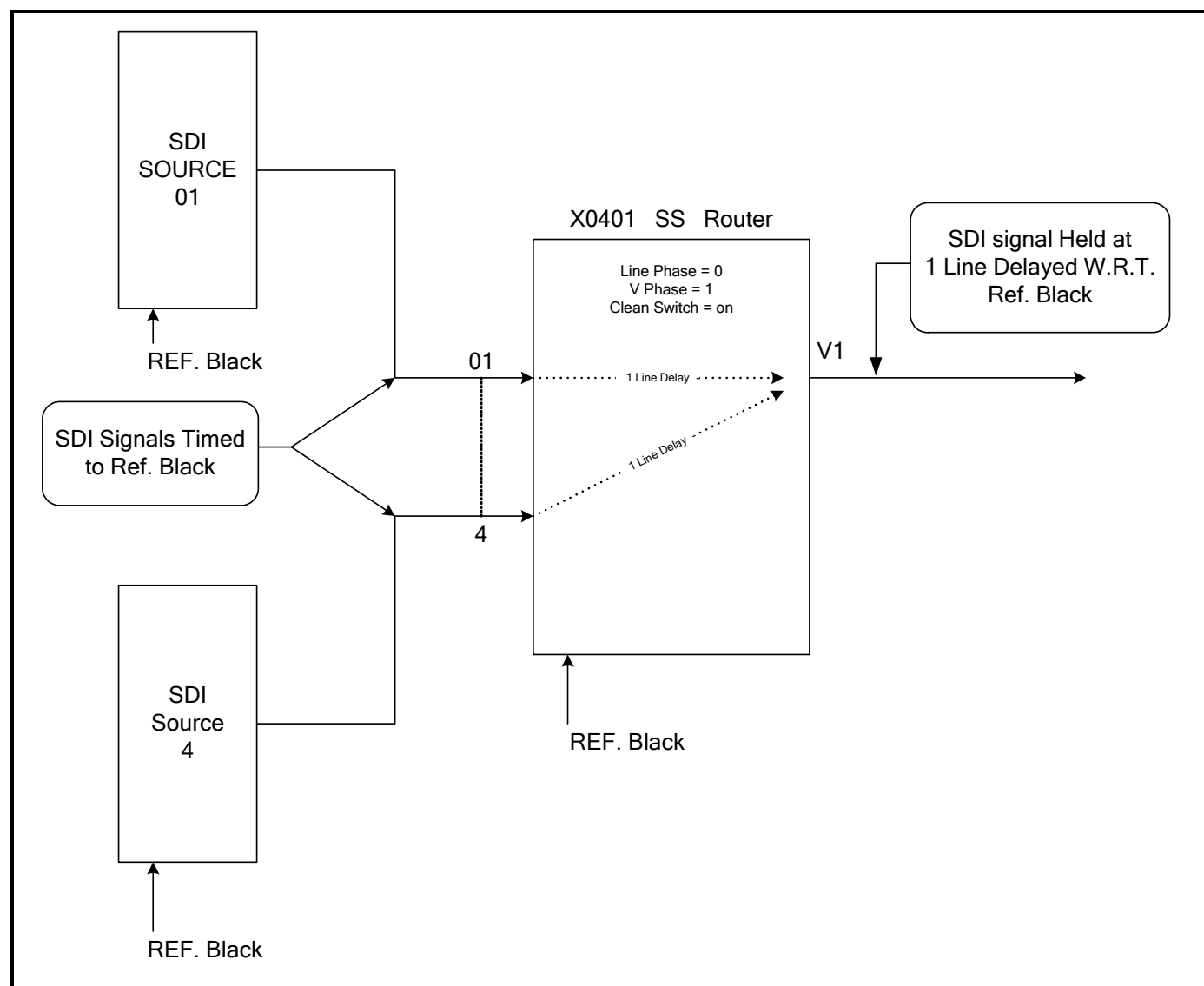
Figure 6-1: Timing Example 1 – Inputs In Time with Reference

6.2. INPUT SIGNALS ARE TIMED TO WITHIN +/- 1 LINE OF REFERENCE

This example shows the input timing range requirements for a clean switch in the most basic configuration. The V1 buss output will be delayed 1 line with respect to the reference.
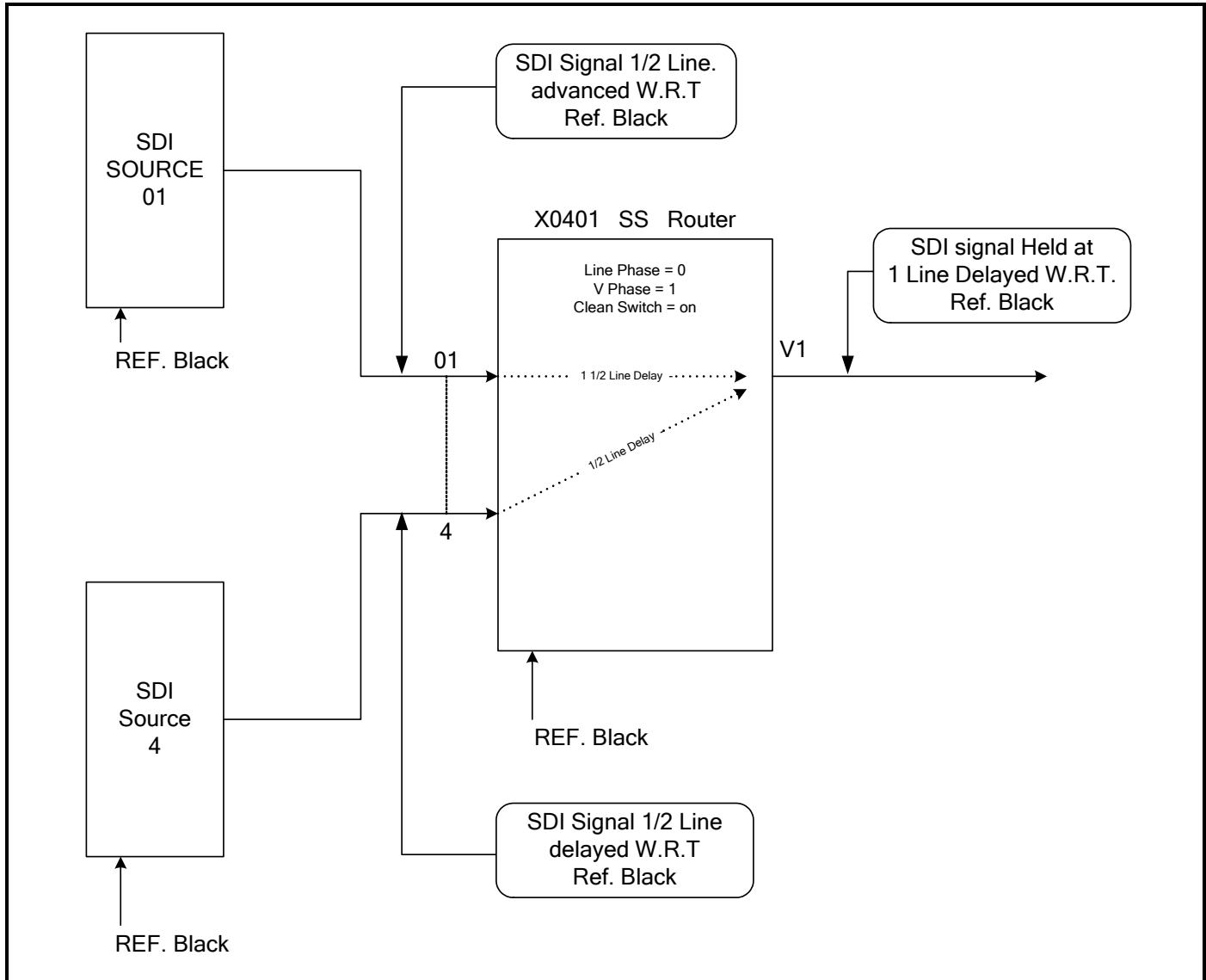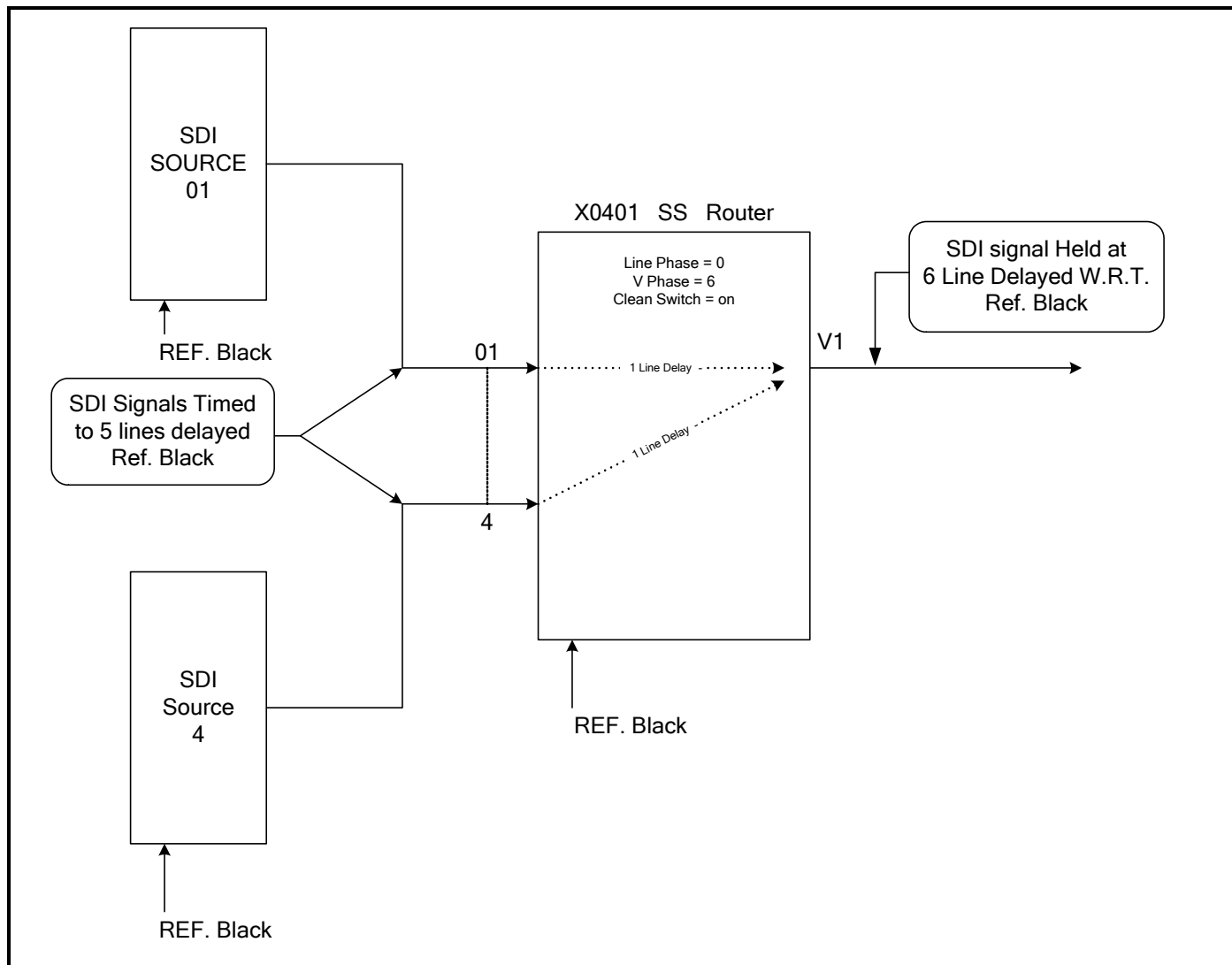

Figure 6-2: Timing Example 2 – Inputs In Time with Reference

6.3.   ALL INPUT SIGNALS ARE TIMED TOGETHER BUT DELAYED 5 LINES FROM REFERENCE

This example shows how to set up the router timing when the input signals are delayed by more than one line. The V1 buss output will be delayed 6 lines with respect to the reference.

Figure 6-3: Timing Example 3 – Inputs In Time but Delayed 5 Lines from Reference

6.4. ALL INPUT SIGNALS ARE TIMED WITHIN A RANGE OF +/- 1 LINE FROM EACH OTHER BUT DELAYED 5 LINES FROM REFERENCE

This example shows how the router can perform a clean switch on input signals that are delayed by more than a one from the reference, and are mistimed with respect to each other. The V1 buss output will be delayed 6 lines with respect to the reference.
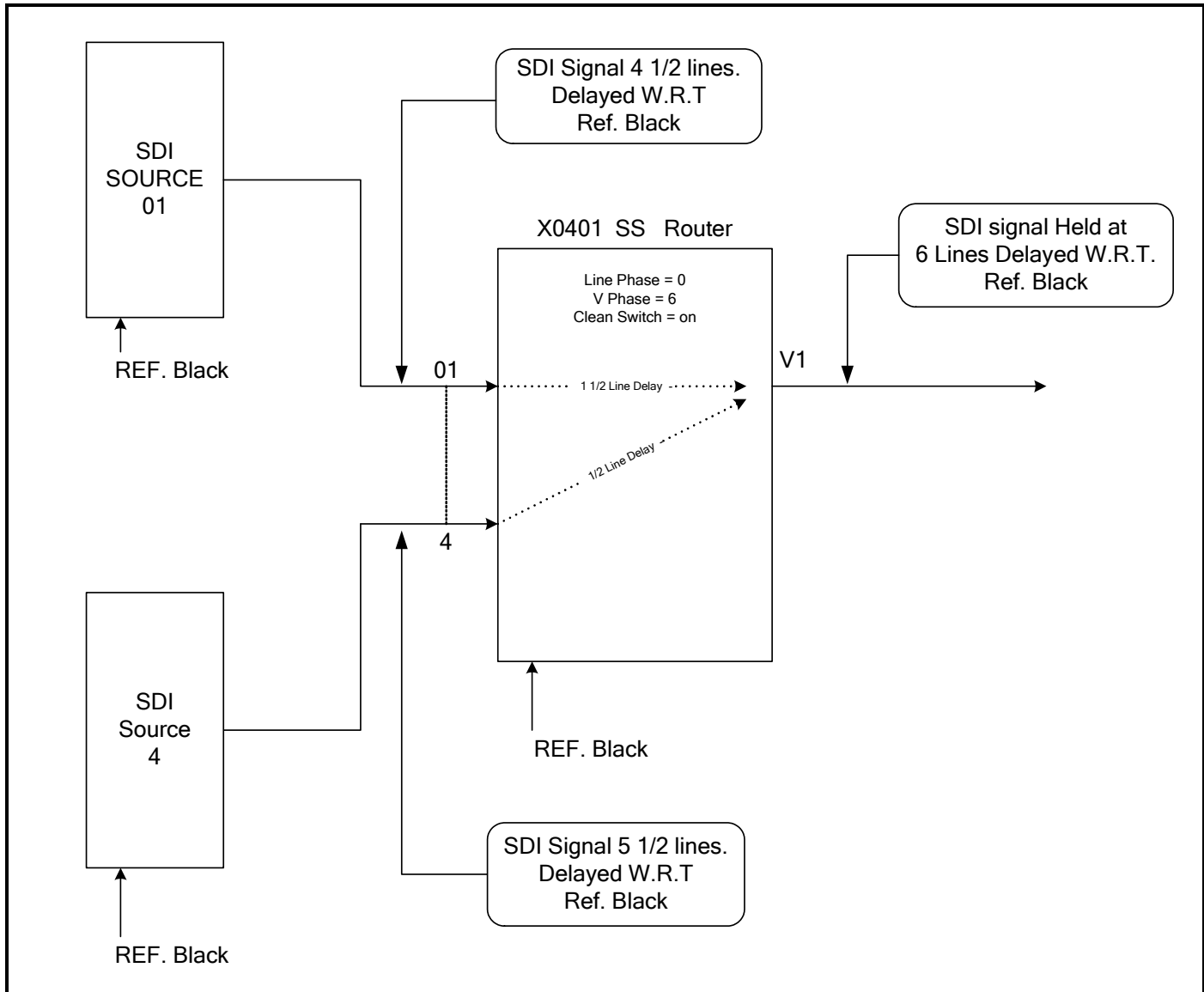

Figure 6-4: Timing Example 4 – Inputs Not In Time and Delayed from Reference

6.5. ALL INPUT SIGNALS ARE TIMED WITHIN A RANGE OF +/- 1 LINE FROM EACH OTHER BUT DELAYED 5 LINES FROM REFERENCE

This example shows how a production switcher can be clean switched in and out of a 0400 series SoftSwitch™ router being used as a bypass router. Controlling the timing of the incoming signals can allow all sources to be switched cleanly in the X0401S-SS series router. At the same time all the signals are in time with the production switcher. Finally, the production switcher can also be presented to the bypass router within the range of the X0400 series router's line synchronizer.
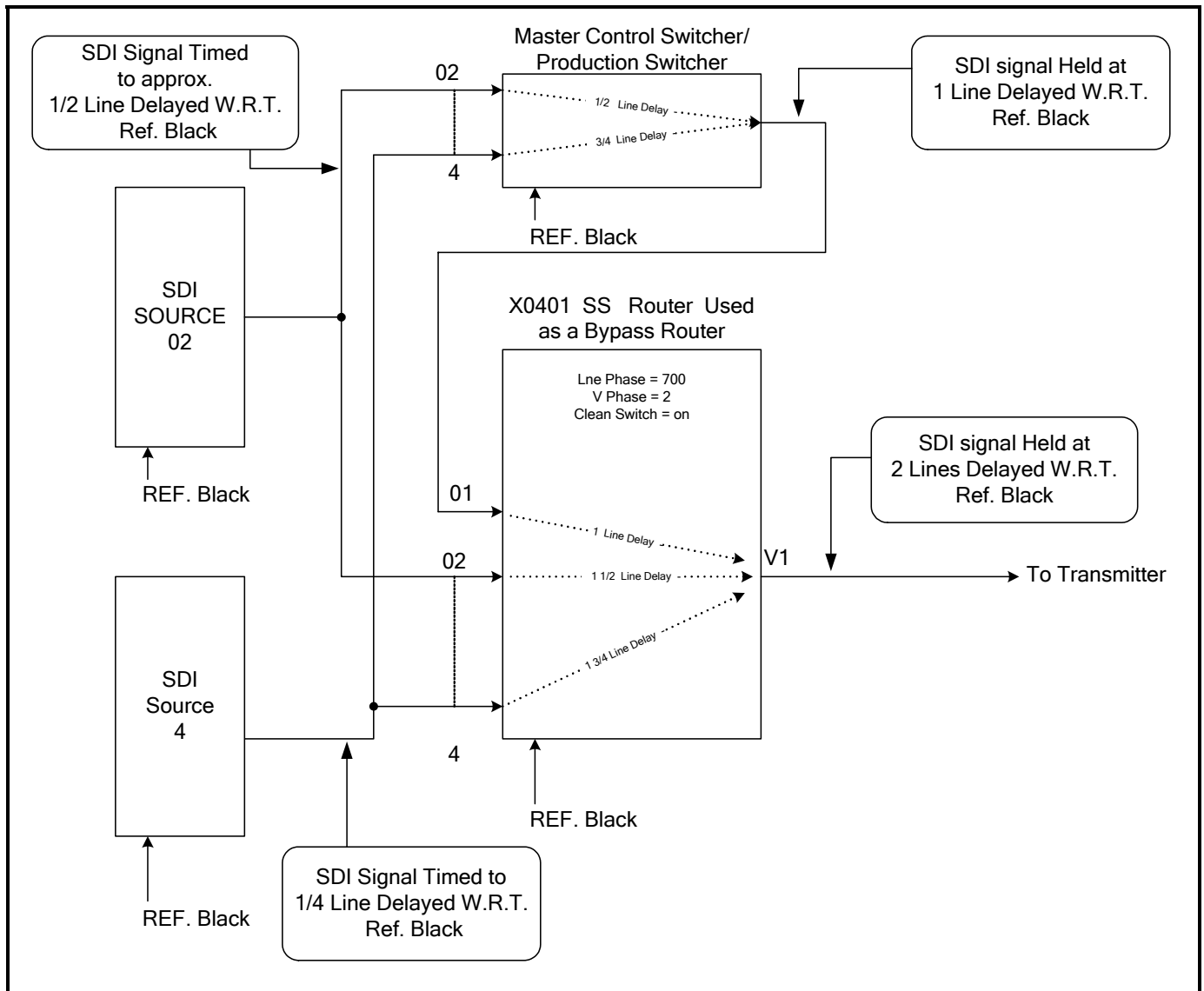
Figure 6-5: Timing Example 5 – Bypass Router for Production Switcher

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