Imagine COMMUNICATIONS™

Installation and Operation Handbook

TVM Series
Multi-Format 3 Gb/s, HD-SDI, SD-SDI Monitor

April 2013

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Delivering the Moment

imaginecommunications.com

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TVM Series

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Operator’s Safety Summary

WARNING: These instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform this installation or any servicing unless you are qualified to do so. Refer all servicing to qualified service personnel.

Important Safety Instructions

- Read these instructions.
- 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 the 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.
- The device’s IEC power connector shall remain readily accessible.

Ensuring Safety

The unit should not be exposed to dripping or splashing, and no objects filled with liquids, such as vases, shall be placed on the unit.

When the unit is to be permanently cabled, connect the protective ground conductor before making any other connections.

Operate built-in units only when they are properly fitted into the system.

For permanently cabled units without built-in fuses, automatic switches, or similar protective facilities, the AC supply line must be fitted with fuses rated to the units.

Before switching on the unit, ensure that the operating voltage set at the unit matches the line voltage, if appropriate. If a different operating voltage is to be set, use a fuse with the appropriate rating. Refer to the Installation Instructions.

Units of Protection Class I with an AC supply cable and plug that can be disconnected must be operated only from a power socket with protective ground contact:

Do not use an extension cable—it can render the protective ground connection ineffective.

Do not intentionally interrupt the protective ground conductor.

Do not break the protective ground conductor inside or outside the unit or loosen the protective ground connection; such actions can cause the unit to become electrically hazardous.

Before opening the unit, isolate it from the AC supply. Then ensure that:

Adjustments, part replacements, maintenance, and repairs are carried out by qualified personnel only.

Safety regulations and rules are observed to prevent accidents.

Only original parts are used to replace parts relevant to safety (for example, the power on/off switches, power transformers, and fuses).

Replaceable fuses can be hazardous when live. Before replacing a fuse, disconnect the AC power source.

Use caution when cleaning the equipment; isopropyl alcohol or similar solvents can damage or remove the labels.

Observe any additional safety instructions specified in this manual.

Explanation of Symbols

These symbols may appear on Harris Broadcast equipment:

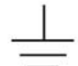

Read the *Operator’s Handbook* or the *Service and Instruction Manual* and observe the safety symbols used.


Unit ground


Caution: shock hazard


Equipotentiality


Protective ground connection


Ground


Direct Current

Caution: shock hazard

Certification Labels and Symbol Locations

On Harris Broadcast equipment, certification labels and symbols are located on the back panel, rear chassis sides, or bottom rear of the chassis. On smaller space-restricted units, most labels and symbols can be found on the bottom rear of the chassis.

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Directives and Compliances

This section provides information concerning Harris Broadcast compliance with EU Directive 2002/95/EC and EU Directive 2002/96/EC.

Restriction on Hazardous Substances (RoHS) Directive 2002/95/EC

Directive 2002/95/EC—commonly known as the European Union (EU) Restriction on Hazardous Substances (RoHS)—sets limits on the use of certain substances found in electrical and electronic equipment. The intent of this legislation is to reduce the amount of hazardous chemicals that may leach out of landfill sites or otherwise contaminate the environment during end-of-life recycling. The Directive, which took effect on July 1, 2006, refers to the following hazardous substances:

- Lead (Pb)
- Mercury (Hg)
- Cadmium (Cd)
- Hexavalent Chromium (Cr-V1)
- Polybrominated Biphenyls (PBB)
- Polybrominated Diphenyl Ethers (PBDE)

In accordance with this EU Directive, all Harris Broadcast products sold in the European Union will be fully RoHS-compliant and “lead-free.” (See the Harris Broadcast website for more information on dates and deadlines for compliance.) Spare parts supplied for the repair and upgrade of equipment sold before July 1, 2006 are exempt from the legislation. Harris Broadcast equipment that complies with the EU directive will be marked with a RoHS-compliant symbol, as shown in Figure 1.

Figure 1. RoHS Compliance Symbol

Waste from Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC

The European Union (EU) Directive 2002/96/EC on Waste from Electrical and Electronic Equipment (WEEE) deals with the collection, treatment, recovery, and recycling of electrical and electronic waste products. The objective of the WEEE Directive is to assign the responsibility for the disposal of associated hazardous waste to either the producers or users of these products. As of August 13, 2005, producers or users are required to recycle electrical and electronic equipment at end of its useful life, and must not dispose of the equipment in landfills or by using other unapproved methods. (Some EU member states may have different deadlines.)

In accordance with this EU Directive, Harris Broadcast and other companies selling electric or electronic devices in the EU will affix labels indicating that such products must be properly recycled.

(See the Harris Broadcast website for more information on dates and deadlines for compliance.) Contact your local Harris Broadcast sales representative for information on returning these products for recycling. Harris Broadcast equipment that complies with the EU directive will be marked with a WEEE-compliant symbol, as shown in **Figure 2**.

Figure 2. WEEE Compliance Symbol

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Section 1 ♦ Introduction

Product Description

The Videotek TVM Series multi-format, 3Gb/s/HD-SDI/SD-SDI video monitoring unit is the most advanced, versatile, and intuitive 3Gb/s/HD-SDI/SD-SDI monitoring instrument available today. With 100% digital signal processing technology; integral, high-resolution, XGA TFT color LCD display; the TVM Series provides an accurate and stable user customizable display of multiple waveform, vector, gamut, audio, picture, relative timing, alarm status, and data analyzer functions in quadrant or full-screen views. Quick setup and parameter changes are possible with direct access to display functions and screen location, 16 presets, context sensitive pop-up menus, and an intuitive navigation system.

The TVM Series units can be completely customized. The TVM-ASX (console that contains the system board) is capable of analyzing HD, SD, and analog formats. The TVM-10, TVM-40, or TVM-50 graphics display engine can be loaded into the unit. Any two of the TVM video input boards can be loaded into the unit. Any one TVM-A3 audio options can be loaded into the unit.

The TVM Series features extensive audio and video alarm capabilities including peak level reporting; video and Dolby® metadata; EIA-608 and 708 closed caption detection/alarm display; and teletext, OP-47, and XDS processing. All real-time signal alarms have user adjustable limits, time stamps from LTC, or DVITC and an internal clock, and logging may include an active link to a frame capture where applicable. Remote interfaces include 10/100Base-T Ethernet and plug-and-play USB port (supporting storage and recall of presets, frame-capture transfer, and keyboard integration). The TVM Series instruments are digital instruments with all-digital architecture; therefore, no periodic calibration is required.

The TVM Series seamlessly integrates into any broadcast, post-production, camera maintenance, satellite or cable facility, and is the ultimate choice for quality control, troubleshooting, or compliance checking applications.

[*]US Patents 6,069,607, 6,532,024, and 6,828,981. UK Patent 2,330,475. Other US and foreign patents pending.

Standard Features

- Dual HD-SDI/SD-SDI inputs with auto detection (TVM9100PKG, TVM9140PKG, or TVM9150PKG)
- Dual 3GB/s/HD-SDI/SD-SDI inputs with auto detection (TVM9140PKG-3GB or TVM9150PKG-3G)
- Display multiple inputs simultaneously (TVM9140PKG, TVM9150PKG) (TVM-40) (TVM-50)
- Pixel Locator/Data Word Analyzer/Camera Maintenance (TVM9140PKG, TVM9150PKG) (TVM-VTM-AAP) or (TVM-40) (TVM-50)
- Dual Link (4:4:4) Y, CB, CR
- A/B Parade and Overlay

Closed Caption detection, alarm, and display (608, 708, and OP-47)
Customizable function display screen location, multiple displays
Alarms with Peak Level Report
Integral high resolution XGA TFT color LCD
Multiple reference inputs
USB port for control and data transfer
XGA, High Resolution, output for 4:3 display (DVI-I)
Patented Video Relative Timing display
Patented Gamut display
16 user presets
Illuminated controls and indicators
Universal half-rack, 3RU configuration
Ethernet with SNMP agent
Router control port
Input standards: SMPTE ST424, SMPTE ST372, SMPTE ST292, SMPTE ST259-C, NTSC, and PAL

TVM Series Configuration

TVM Series Configurations are shown in the following subsections (Console, Graphics Engines, Audio Options, Video Input Options, Auxiliary Options, and TVM Package Configurations).

Console

- **TVM-ASX**: The TVM-ASX console includes chassis, power supply, cooling system fans, system controller, front panel controls, and back panel connections for Ethernet, USB port, one router, one remote control port, and LTC/GPI interface. It supports one graphics display engine, one or two video boards, and one audio board. A graphics display engine module (TVM-10, TVM-40, or TVM-50) and at least one input module are required to operate the console.

Graphics Engines (requires one)

- **TVM-10**: The TVM-10 is a graphics display engine that affords 100% digital signal processing and instrument display capability of one input source at a time. TVM-10 supports 1 picture pane or 1 thumbnail picture.
- **TVM-40**: The TVM-40 is a graphics display engine that affords 100% digital signal processing and instrument display capability of up to four input sources simultaneously. The Advanced Analysis Package (TVM-VTM-AAP) data analyzer function is included in the TVM-40. TVM-40 supports 1 picture pane and 3 thumbnail pictures.
- **TVM-50**: The TVM-50 is a graphics display engine that affords 100% digital signal processing and instrument display capability of up to four input sources simultaneously. The Advanced Analysis Package (TVM-VTM-AAP) data analyzer

function is included in the TVM-50. TVM-50 is capable of displaying up to 4 picture panes at a time. It also supports TVM-VTM-3D.

Audio Options (supports one)

- **TVM-A3-OPT 2**: The TVM-A3-OPT 2 is an advanced audio analysis option, which includes Bargraphs and CineSound®. It allows the user to view up to eight audio channels. It includes 4 analog stereo inputs, 4 AES/EBU shared input/output pairs, and 16 channels of embedded audio. It provides analog monitoring outputs of up to eight channels simultaneously.
- **TVM-A3-OPT 3**: The TVM-A3-OPT 3 is an advanced audio analysis option, which includes Bargraphs and CineSound®. It allows the user to view up to eight audio channels. It includes 4 analog stereo inputs, 8 AES/EBU inputs with 4 shared outputs, and 16 channels of embedded audio. It provides analog monitoring outputs of up to eight channels simultaneously. Channel-mapping, meter labels, and peak value reporting are included.
- **TVM-A3-OPT 5**: The TVM-A3-OPT 5 is an advanced audio analysis option, which includes Bargraphs and CineSound®. It allows the user to view up to eight audio channels. It includes 4 analog stereo inputs, 8 AES/EBU inputs with 4 shared outputs, and 16 channels of embedded audio. It provides analog monitoring outputs of up to eight channels simultaneously. Channel-mapping, meter labels, and peak value reporting are included, as is full Dolby® decoding with up to eight analog outputs.
- **TVM-A3-4004**: The TVM-A3-4004 audio expansion module adds four AES/EBU input pairs.

  NOTE: This module is only available with the TVM-A3-OPT 2 advanced audio analysis option.
- **TVM-A3-OPT 3TL**: The TVM-A3-OPT 3TL is an advanced audio analysis option with 5x oversampling for enhanced True Peak detection, which includes Bargraphs and CineSound®. It allows the user to view up to eight audio channels. It includes 4 analog stereo inputs, 8 AES/EBU inputs with 4 shared outputs, and 16 channels of embedded audio. It provides analog monitoring outputs of up to eight channels simultaneously. Channel-mapping, loudness, meter labels, and peak value reporting are included. All AES inputs are sample rate converted to 48 kHz. The loudness measurement conforms to the ITU-R BS.1770 standard. The loudness metering and setting is implemented in accordance with the EBU R 128 and ATSC A/85 recommendations.
- **TVM-A3-OPT 5TL**: The TVM-A3-OPT 5TL is an advanced audio analysis option with 5x oversampling for enhanced True Peak detection and Dolby, which includes Bargraphs and CineSound®. It allows the user to view up to eight audio channels. It includes 4 analog stereo inputs, 8 AES/EBU inputs with 4 shared outputs, and 16 channels of embedded audio. It provides analog monitoring outputs of up to eight channels simultaneously. Channel-mapping, loudness, meter labels, and peak value reporting are included. All AES inputs are sample rate converted to 48 kHz. It also adds full Dolby decoding to the analog output. The Dolby Output is selectable from any one of the eight pairs of the assigned input type (AES or Embedded). Further, selection of an AES or embedded pair for the AUX meters is available in an eight-

channel display. The loudness measurement conforms to the ITU-R BS.1770 standard. The loudness metering and setting is implemented in accordance with the EBU R 128 and ATSC A/85 recommendations.

- **TVM-OPT V2A**: The TVM-OPT V2A adds Lip Sync timing measurement to the TVM-A3-OPT 3TL or the TVM-A-OPT 5TL option.
- **TVM-A3-OPT 3TO5**: The TVM-A3-OPT3TO5 adds Dolby decoding to existing TVM-A3-OPT 3 and TVM-A3-OPT 3TL.

Video Input Options (supports two)

- **TVM-VTM-ASI**: The TVM-VTM-ASI provides two passive-looping DVB-ASI and SMPTE310 inputs. It accepts two independent MPEG streams and analyzes one selected stream for compliance to measurement guidelines of ETSI TR-101-290 (ETR-290) first, second, and third priority standards.
- **TVM-VTM-SDI-H**: The TVM-VTM-SDI-H provides two passive looping SMPTE ST292 (HD-SDI) and SMPTE ST259-C (SD-SDI) inputs, auto detect, and a switched monitor output.
- **TVM-VTM-SDI-S**: The TVM-VTM-SDI-S provides two passive looping SMPTE ST259-C (SD-SDI) inputs, auto detect, and a switched monitor output. Field upgradeable to HD-SDI with the TVM-VTM-S2H-F.
- **TVM-VTM-S2H-F**: The TVM-VTM-S2H-F adds SMPTE ST292 (HD-SDI) to TVM-VTM-SDI-S
- **TVM-VTM-ACV-2**: The TVM-VTM-ACV-2 is a dual composite analog input module. Adds two composite analog passive looping inputs (NTSC or PAL) with auto-detection and line select. Must be used as inputs C and D.
- **TVM-VTM-EYE-S**: The TVM-VTM-EYE-S provides two active looping SMPTE ST259-C (SD-SDI) inputs, auto detect with Eye pattern and monitor output. Field upgradeable to HD with the TVM-VTM-ES2H-F.

  NOTE: The TVM-VTM-EYE-S must be used as inputs A and B.
- **TVM-VTM-EYE-H**: The TVM-VTM-EYE-H provides two active looping SMPTE ST292 (HD-SDI) and SMPTE ST259-C (SD-SDI) inputs, auto detect with EYE pattern and monitor output.

  NOTE: The TVM-VTM-EYE-H must be used as inputs A and B.
- **TVM-VTM-ES2H-F**: the TVM-VTM-ES2H-F adds SMPTE ST292 (HD-SDI) to the TVM-VTM-EYE-S module.
- **TVM-VTM-JEM**: The TVM-VTM-JEM provides two active looping SMPTE ST292 (HD-SDI) and SMPTE ST259-C (SD-SDI) inputs, auto detect with EYE pattern with advanced Jitter Analysis and monitor output.

  NOTE: The TVM-VTM-JEM must be used as inputs A and B.
- **TVM-VTM-JEM2**: The TVM-VTM-JEM2 provides two active looping SMPTE ST292 (HD-SDI) and SMPTE ST259-C (SD-SDI) inputs, auto detect with EYE pattern with advanced Jitter Analysis and monitor output.

  NOTE:Must be used as inputs A and B. If VTM-40 or VTM-50 Graphics Engine is installed, this option is field upgradable, with TVM-VTM-J2TOJ3-F, to TVM-VTM-JEM3.

- **TVM-VTM-DLK**: The TVM-VTM-DLK expands the dual link capability of the TVM-VTM-EYE-H, TVM-VTM-JEM, and TVM-VTM-SDI-H to include 10-bit RGB (4:4:4) and RGB+A (4:4:4:4) formats.

  NOTE: The TVM-VTM-DLK requires the TVM-40 or TVM-50.

- **TVM-VTM-3GB**: The TVM-VTM-3GB input module for the TVM-40 or TVM-50, and TVM9140PKG and TVM9150PKG accept two active-looping triple-rate (2.97 Gb/s, 1.485 Gb/s, and 270 Mb/s) 3Gb/s-SDI, HD-SDI, or SD-SDI input signals for display and analysis. It also supplies additional support for dual-link HD-SDI 12-bit YCBCR and RGB video formats. One triple-rate SDI monitor output follows the selected SDI video input, or an internal Test Signal Generator can be selected. The internal Test Signal Generator can display color bars, pathological checkfield, or color bars with motion, and is free-running (no genlock capability). Embedded audio and Video Payload ID per SMPTE ST352-2002 ancillary data insertion is also supported.
- **TVM-VTM-JEM3**: The TVM-VTM-3GB input module for the TVM-40 or TVM-50, and TVM9140PKG and TVM9150PKG accept two active-looping triple-rate (2.97 Gb/s, 1.485 Gb/s, and 270 Mb/s) 3Gb/s-SDI, HD-SDI, or SD-SDI input signals for display and analysis. It also supplies additional support for dual-link HD-SDI 12-bit YCBCR and RGB video formats. One triple-rate SDI monitor output follows the selected SDI video input, or an internal Test Signal Generator can be selected. The internal Test Signal Generator can display color bars, pathological checkfield, or color bars with motion, and is free-running (no genlock capability). The Test Signal Generator allows jitter to be deliberately injected into the output signal. Embedded audio and Video Payload ID per SMPTE ST352-2002 ancillary data insertion is also supported, and EYE pattern with advanced jitter analysis.

Auxiliary Options

- **RCU-1000**: The RCU-1000 is the remote control panel for the TVM Series and VTM Series instruments. It replicates all of the front panel controls. It has an RS-422 connection and includes 50 ft (15 m) straight-through cable with RJ11 connectors. The RCU-1000 is the equivalent of one RU in height.
- **TVM-WRTY2**: The TVM-WRTY2 option adds three years to the standard two-year warranty (excludes LCD).
- **TVM-VTM-AAP**: The TVM-VTM-AAP is an advanced analysis package that adds data analyzer functions in quadrant or full-screen views to the TVM9100PKG. This functionality is included in the TVM9140PKG and TVM9150PKG configurations.
- **TVM-VTM-3D**: Available only with TVM1950PKG, this option allows 3D display modes for inputs A and B, or input A in 3D side-by-side video mode.

TVM Package Configurations

- **TVM9100PKG**: This TVM Series package for HD-SDI and SD SDI includes the TVM-ASX (console), TVM-10 (one input source), and one TVM-VTM-SDI-H (SD/HD) input module. It displays one source input at a time and one instance of each function (Waveform/Vector/Picture/ Gamut/…etc.). There is no Data Analysis. The package is limited to SD/HD formats, but can be upgraded. *(Data Analysis upgrade is TVM-VTM-AAP)*

- **TVM9100PKG-EH**: This TVM Series package for HD-SDI and SD-SDI with Eye Pattern includes the TVM-ASX (console), TVM-10 (one input source), and one TVM-VTM-EYE-H (SD/HD EYE) input module. There is no Data Analysis. The package is limited to SD/HD formats, but can be upgraded. *(Data Analysis upgrade is TVM-VTM-AAP)*
- **TVM9100PKG-EJ**: This TVM Series package for HD-SDI and SD-SDI with Eye Pattern and Jitter Analysis includes the TVM-ASX (console), TVM-10 (one input source), and one TVM-VTM-JEM (SD/HD EYE Advanced Jitter Analysis) input module. Eye Pattern and Jitter Analysis also operate with DVB-ASI signals. There is no Data Analysis. The package is limited to SD/HD formats, but can be upgraded. *(Data Analysis upgrade is TVM-VTM-AAP)*
- **TVM9100PKG-EJ2**: This TVM Series package for HD-SDI and SD-SDI with Eye Pattern and Jitter Analysis includes the TVM-ASX (console), TVM-10 (one input source), and one TVM-VTM-JEM (SD/HD EYE Advanced Jitter Analysis) input module. Eye Pattern and Jitter Analysis also operate with DVB-ASI signals. There is no Data Analysis. The package is limited to SD/HD formats, but can be upgraded. *(Data Analysis upgrade is TVM-VTM-AAP)*
- **TVM9100PKG-ES**: This TVM Series package for SD-SDI with Eye Pattern includes the TVM-ASX (console), TVM-10 (one input source), and one TVM-VTM-EYE-S (SD EYE) input module. There is no Data Analysis. The package is limited to SD formats, but can be upgraded. *(HD upgrade is TVM-VTM-S2H-F) (Data Analysis upgrade is TVM-VTM-AAP)*
- **TVM9100PKG-SD**: This TVM Series package for SD-SDI includes the TVM-ASX (console), TVM-10 (one input source), and one TVM-VTM-SDI-S (SD) input module. There is no Data Analysis. The package is limited to SD formats, but can be upgraded. *(HD upgrade is TVM-VTM-S2H-F) (Data Analysis upgrade is TVM-VTM-AAP)*
- **TVM9140PKG**: This TVM Series package for HD-SDI and SD-SDI includes the TVM-ASX (console), TVM-40 (affords the ability for four source inputs simultaneously and Data Analysis), and one TVM-VTM-SDI-H (SD/HD) input module. The package is limited to SD/HD formats, but can be upgraded.
- **TVM9140PKG-3GB**: This TVM Series package for 3Gb/s-SDI, HD-SDI, and SD-SDI includes the TVM-ASX (console), TVM-40 (affords the ability for four source inputs simultaneously and Data Analysis), and one TVM-VTM-3GB input module. There are no format limitations on the TVM9140PKG-3GB.
- **TVM9140PKG-EH**: This TVM Series package for HD-SDI and SD-SDI with Eye Pattern includes the TVM-ASX (console), TVM-40 (affords the ability for four source inputs simultaneously and Data Analysis), and one TVM-VTM-EYE-H (SD/HD EYE) input module. The package is limited to SD/HD formats, but can be upgraded.
- **TVM9140PKG-EJ**: This TVM Series package for HD-SDI and SD-SDI with Eye Pattern and Jitter Analysis includes the TVM-ASX (console), TVM-40 (affords the

ability for four source inputs simultaneously and Data Analysis), and one TVM-VTM-JEM (SD/HD EYE Advanced Jitter Analysis) input module. The package is limited to SD/HD formats, but can be upgraded.

- **TVM9140PKG-EJ3**: This TVM Series package for HD-SDI and SD-SDI with Eye Pattern and Jitter Analysis includes the TVM-ASX (console), TVM-40 (affords the ability for four source inputs simultaneously and Data Analysis), and one TVM-VTM-JEM3 (3Gb/s-SDI, SD-SDI, and HD-SDI EYE Advanced Jitter Analysis) input module.
- **TVM9140PKG-ES**: This TVM Series package for SD-SDI with Eye Pattern includes the TVM-ASX (console), TVM-40 (affords the ability for four source inputs simultaneously and Data Analysis), and one TVM-VTM-EYE-S (SD EYE) input module. The package is limited to SD formats, but can be upgraded. *(HD upgrade is TVM-VTM-S2H-F.)*
- **TVM9140PKG-SD**: This TVM Series package for SD-SDI includes the TVM-ASX (console), TVM-40 (affords the ability for four source inputs simultaneously and Data Analysis), and one TVM-VTM-SDI-S (SD) input module. The package is limited to SD formats, but can be upgraded. *(HD upgrade is TVM-VTM-S2H-F.)*
- **TVM9150PKG**: TVM Series waveform monitor package, supporting four-picture display with HD/SD-SDI inputs.
- **TVM9150PKG-3G**: TVM Series waveform monitor package, supporting four-picture display with 3G/HD/SD-SDI inputs.
- **TVM9150PKG-EH**: TVM Series waveform monitor package, supporting four-picture display with HD/SD-SDI eye pattern inputs.
- **TVM9150PKG-EJ**: TVM Series waveform monitor package, supporting four-picture display with HD/SD-SDI advanced jitter eye pattern inputs.
- **TVM9150PKG-EJ2**: TVM Series waveform monitor package, supporting four-picture display with HD/SD-SDI advanced jitter eye pattern inputs. Field upgradable, with TVM-VTM-J2TOJ3-F, to TVM9150PKG-EJ3.
- **TVM9150PKG-EJ3**: TVM Series waveform monitor package, supporting four-picture display with 3Gb/s-SDI, HD-SDI, and SD-SDI advanced jitter eye pattern inputs.
- **TVM9150PKG-ES**: TVM Series waveform monitor package, supporting four-picture display with SD-SDI eye pattern inputs.

Video Standards Supported

The TVM Series supports the following video standards:

Table 1-1. Options and Supported Video Formats

Video Formats	Video Input Options							
	ASI	ACV-2	SDI-S	SDI-H	EYE-S	EYE-H	JEM and JEM2	3GB and JEM3
DVB-ASI and SMPTE-310	X							
Analog Composite		X						
SD-SDI			X	X	X	X	X	X
HD-SDI				X		X	X	X
3 Gb/s-SDI								X
Dual Link - YCBCR 10 Bit 4:4:4				X		X	X	X
Dual Link –RGB and RGB+A, 10 Bit 4:4:4 and 4:4:4:4				With DLK		With DLK	With DLK	X
Dual Link – YCBCR and RGB 12 Bit 4:4:4								X

Table 1-2. 3Gb/s Formats

Format	10 bit 4:2:2 YCBCR	10 bit 4:4:4 YCBCR	10 bit 4:4:4:4 YCBCR +A	10 bit 4:4:4 RGB	10 bit 4:4:4:4 RGB+A	12 bit 4:2:2 YCBCR	12 bit 4:4:4 YCBCR	12 bit 4:4:4 RGB
1080i								
1080i/60		X	X	X	X	X	X	X
1080i/59.94		X	X	X	X	X	X	X
1080i/50		X	X	X	X	X	X	X
1080p								
1080p/60	X							
1080p/59.94	X							
1080p/50	X							
1080p/30		X	X	X	X	X	X	X
1080p/29.97		X	X	X	X	X	X	X
1080p/25		X	X	X	X	X	X	X
1080p/24		X	X	X	X	X	X	X
1080p/23.98		X	X	X	X	X	X	X
720p								
720p/60		X	X	X	X	X	X	X
720p/59.94		X	X	X	X	X	X	X
720p/50		X	X	X	X	X	X	X
720p/30		X	X	X	X	X	X	X
720p/29.97		X	X	X	X	X	X	X
720p/24		X	X	X	X	X	X	X
720p/23.98		X	X	X	X	X	X	X

Table 1-3. Dual Link Formats

Formats	10 bit 4:4:4 YCBCR	10 bit 4:4:4:4 YCBCR+A	10 bit 4:4:4 RGB	10 bit 4:4:4:4 RGB+A
2K1080p/30	X	X	X	X
2K1080p/29.97	X	X	X	X
2K1080p/25	X	X	X	X
2K1080p/24	X	X	X	X
2K1080p/23.98	X	X	X	X
2K1080PsF/30	X	X	X	X
2K1080PsF/29.97	X	X	X	X
2K1080PsF/24	X	X	X	X
2K1080PsF/23.98	X	X	X	X
1080i/60	X	X	X	X
1080i/59.94	X	X	X	X
1080i/50	X	X	X	X
1080p/30	X	X	X	X
1080p/29.97	X	X	X	X
1080p/25	X	X	X	X
1080p/24	X	X	X	X
1080p/23.98	X	X	X	X
1080PsF/60	X	X	X	X
1080PsF/59.94	X	X	X	X
1080PsF/50	X	X	X	X
1080PsF/30	X	X	X	X
1080PsF/29.97	X	X	X	X
1080PsF/24	X	X	X	X
1080PsF/23.98	X	X	X	X

Table 1-4. HD Formats

	10 bit 4:2:2 YCBCR
1080i	
1080I/60	X
1080I/59.94	X
1080I/50	X
1080p	
1080P/30	X
1080P/29.97	X
1080P/25	X
1080P/24	X
1080P/23.98	X
720p	
720p/60	X
720p/59.94	X
720p/50	X
720p/30	X
720p/29.97	X
720p/24	X
720p/23.98	X

	10 bit 4:2:2 YCBCR
Segmented Frame	
1080P/30sF	X
1080P/29.97sF	X
1080P/25sF	X
1080P/24sF	X
1080P/23.98sF	X

Table 1-5. SD Formats

	10 bit 4:2:2 YCBCR
525/59.94	X
625/50	X

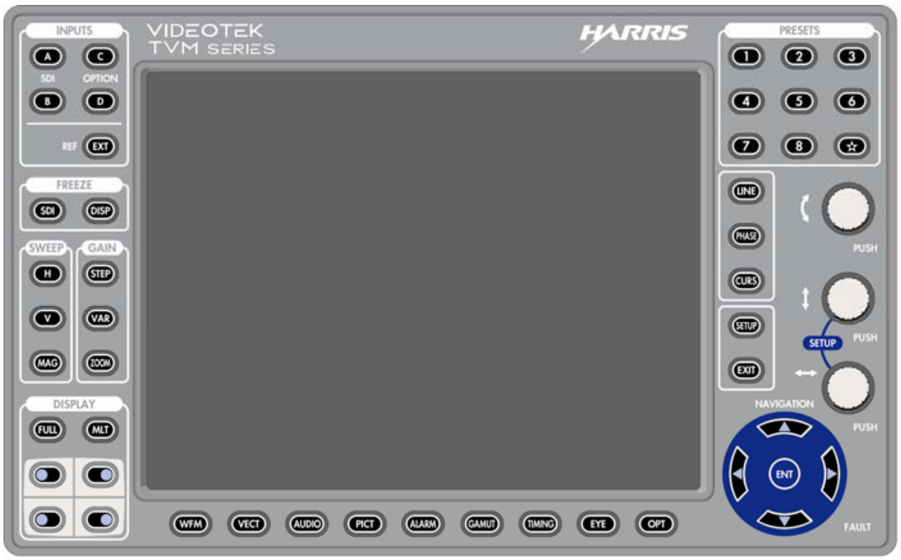
Table 1-6. Analog Composite Formats Supported

NTSC	X
PAL	X

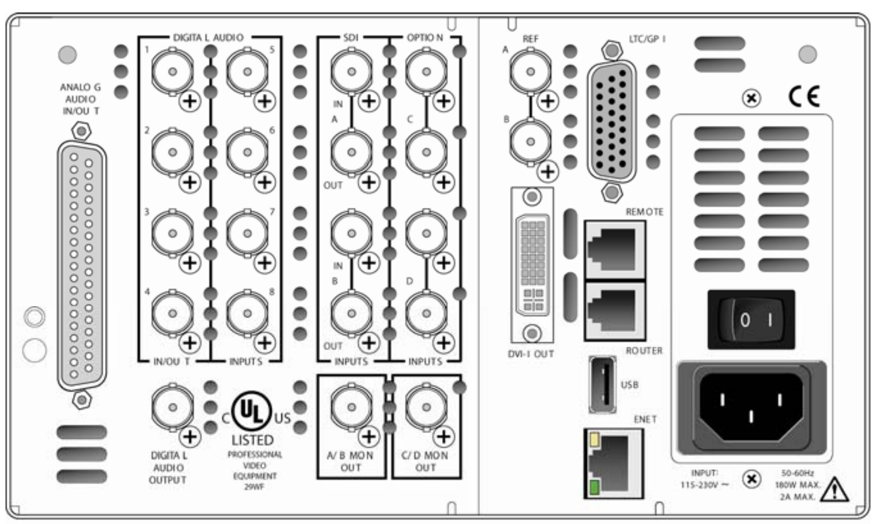
Front and Back Panels

The TVM front and back panels are illustrated in **Figure 1-1**.

Figure 1-1. TVM Front and Back Panels



Front View



Back View

Service and Support

For service and support, telephone the Harris Broadcast Customer Service Department at **1-888-534-8246**. If the problem cannot be resolved over the telephone and the instrument must be shipped to Harris Broadcast for service or repair:

Obtain a Return Authorization (RA) number from the Harris Broadcast Customer Service Department.

Attach a tag to the unit with:

Your company name, address, and telephone number

The name of the contact person at your company

The RA number

The unit serial number

An explanation of the problem

To prevent shipping damage, pack the unit the same way Harris Broadcast had packed it. If possible, use the original packing materials in the original shipping container.

Ship the unit to:

Harris Broadcast
(Address to be provided by Harris Broadcast Customer Service Department)
Attn: RA *xxxx* (where *x* is the RA number)

Email: BCDService@harris.com

Section 2 ♦ Installation

This section provides information about inspecting, installing, and configuring the TVM.

Inspecting the Shipment

Before installing the TVM, inspect the box and the contents. Report any damage to the shipper and telephone the Harris Broadcast Customer Service Department for service and support (see "Service and Support" on page 13).

NOTE: Refer to the enclosed packing sheet for the latest list of items that are supplied with the unit.

The box contains the following:

One TVM Series waveform monitor

One *TVM Series Installation and Operation Handbook* on CD

One 75Ω terminator

One detachable power cord

One breakout connector (for LTC/GPI)

One DVI to VGA adapter

One *SpyderWeb II* Installation CD

One *SpyderWeb II Installation Guide*

One additional breakout connector or 37-pin connector, if the audio option was purchased

Save the box and packing material for any future shipping requirements.

Rack Mounting the TVM

CAUTION: The TVM should not be installed in a DRC-1 case. If installed in a DRC-1 case, the unit will overheat.

When selecting the permanent mounting location for the TVM, make sure that the flow of air to the ventilation holes on the top and sides of the chassis is not obstructed. Rack mounting the TVM is illustrated in **Figure 2-1.** Mounting the TVM in a Rack Using the DRC-2A

for the DRC-2A double rack mount case (for installing one or two TVMs). The parts required to rack mount the TVM into the DRC-2A double rack mount case are listed in **Table 2-1**.

Figure 2-1. Mounting the TVM in a Rack Using the DRC-2A

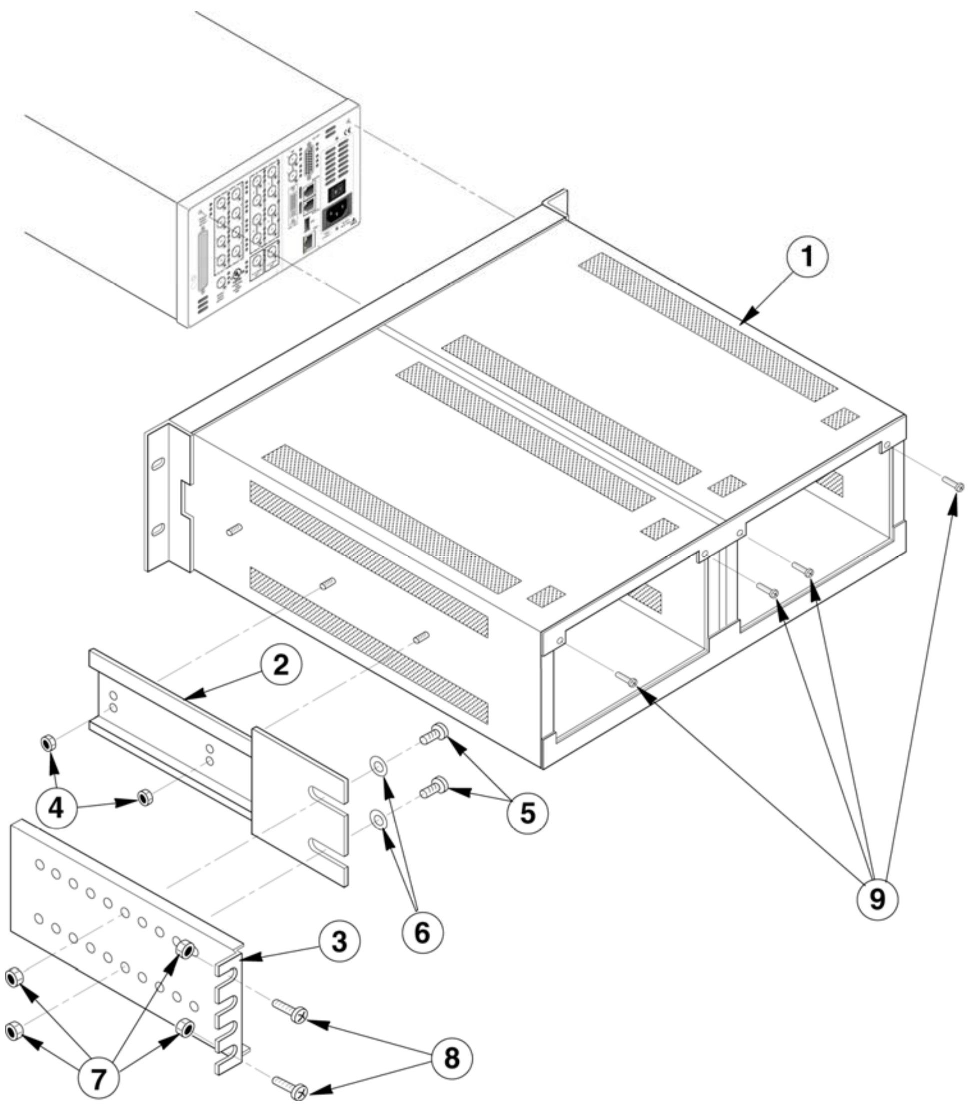


Table 2-1. Parts Required to Rack Mount the TVM Using the DRC-2A

Key	Item Number	Quantity	Description
1	832111	1	Dual rack case assembly
2	832140	2 (1 each side)	Extension bracket mount
3	832150	2 (1 each side)	Extension bracket
4	831119	4 (2 each side)	#8–32 kep nuts
5	831065	4 (2 each side)	#10–32×3/8-in. Phillips head screws
6	831118	4 (2 each side)	#10 flat washers
7	831060	8 (4 each side)	#10–32 kep nuts
8	831030	8 (4 each side)	#10-32×3/4-in. Phillips head screws
9	831064	4(*)	#8–32×1/2-in. PP screws
10	831114	4(*)	#8 Ext. tooth lock washers
11	831019	4 (2 each side)	Nylon washer, rack mount

* Hardware used to secure test equipment into DRC-2A.

To rack mount the TVM, follow these steps:

Install the extension bracket mounts (ITEM 2) to the unit (one on each side) using #8 kep nuts (ITEM 4).

Install the assembled unit in a rack using ¾-in. Phillips head screws (ITEM 8) and lock washers (ITEM 11), as shown in Figure 2-1. Mounting the TVM in a Rack Using the DRC-2A

.

Hold the extension brackets (ITEM 3) in place at the back of the rack, and then attach the brackets to extension bracket mounts (ITEM 2) using hardware ITEMS 5, 6, and 7.

Install screws (ITEM 8) through the extension brackets (ITEM 3) into the back of the rack rails. Secure using #10 kep nuts (ITEM 7).

Tighten all screws and nuts, securing the assembly.

Insert the TVM into either front opening of the DRC-2A. Slide the unit into the DRC-2A until it seats fully against the back flanges of the DRC-2A, and the Bezel of the TVM is fully seated around the front of the DRC-2A.

Secure the TVM to the DRC-2A rack case using ½-in. Phillips head screws (ITEM 9) and tooth lock washers (ITEM 10). The installation is complete.

Connecting the TVM

The back panel connectors are illustrated in **Figure 2-2.** TVM Back Panel Connectors , and the function of each connector is described in **Table 2-2**.

Figure 2-2. TVM Back Panel Connectors

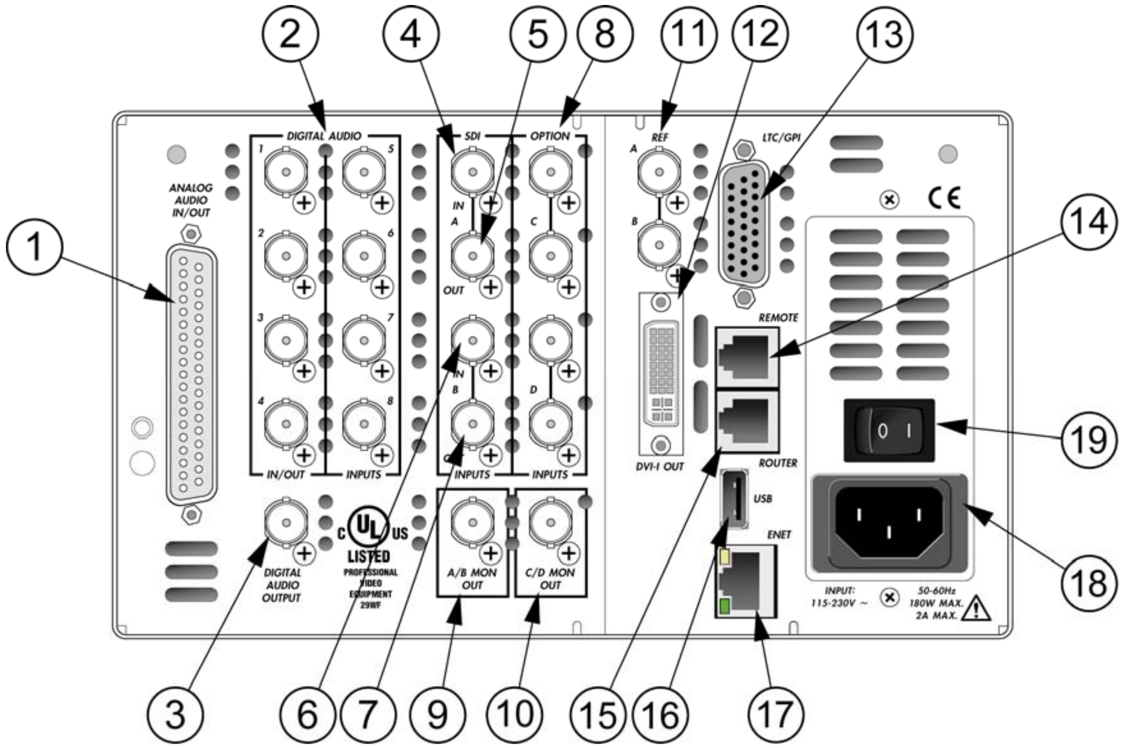


Table 2-2. Description of Back Panel Connectors

Key	Label	Description
1	ANALOG AUDIO IN/OUT	Optional 37-pin, D-sub, male connector; the supplied breakout board can be used for solderless connections*
2	DIGITAL AUDIO IN/OUT 1, 2, 3, 4 (IN/OUT), 5, 6, 7, 8 (IN ONLY)	Optional female BNC connectors for AES/EBU and Dolby Digital audio input
3	DIGITAL AUDIO OUTPUT	Female BNC connector for Dolby audio output
4, 5	SDI INPUT A	Female BNC looping HD or SD SDI input connector (termination required for passive loop-thru inputs)
6, 7	SDI INPUT B	Female BNC looping HD or SD SDI input connector (termination required for passive loop-thru inputs)
8	OPTION C, D	(OPTION) Female BNC connectors for optional inputs; holes are plugged if option is not installed
9	A/B MON OUT	Female BNC connector for monitoring of the selected A or B input If both digital A + B inputs are selected, the output is input A (this output is a source monitor only and does not include the waveform, vector, audio, or alarm on-screen information)

Table 2-2. Description of Back Panel Connectors

Key	Label	Description
		NOTE 1: With TVM-VTM-ASI, Inputs A and B cannot be selected simultaneously **NOTE 2**: With TVM-VTM-3GB, A/B MON OUT can be used as a test generator output (when selected using TVM-VTM-3GB option)
10	C/D MON OUT (not available with TVM-VTM-ACV-2)	Female BNC connector for monitoring of the selected C or D input If both C + D inputs are selected, the output is input C (this output is a source monitor only and does not include the waveform, vector, audio, or alarm on-screen information) **NOTE 1**: With TVM-VTM-ASI Inputs C and D cannot be selected simultaneously **NOTE 2**: With TVM-VTM-HD/SD, C/D MON OUT can be used as a test generator output (when selected using TVM-VTM-3GB option)
11	REF (A, B)	External reference input accepting blackburst and tri-level sync (termination required for loop mode)
12	DVI-I OUT	DVI-I output used to monitor a digital video interface (an adapter is supplied with the TVM to connect a standard XGA monitor to the DVI output)*
13	LTC/GPI	26-pin, high-density, female, D-sub connector for LTC, GPI, and TALLY input*
14	REMOTE	RJ11 socket to connect to the remote control panel*
15	ROUTER	RJ11 socket to control routing switchers.*
16	USB	USB 1.1 port to support memory device for recall and storage of presets, DISP freezes, and SDI data freezes; it also supports flash updates and keyboard functionality*
17	ENET	RJ45, female, 10/100Base-T connection.*
18	Input 115-230V ~ 150-60 Hz 180W max. 2A max.	Power connector
19	(Power Switch)	Power switch that toggles power to the unit

*See Appendix B, “Pinouts,” for the connections.

Ethernet Setup

1. Prior to TVM Network configuration, obtain Transmission Control Protocol/Internet Protocol (TCP/IP) addresses from the System Administrator or from the Internet Service Provider (ISP). These addresses are a static IP address (unless Dynamic Host Configuration Protocol (DHCP) will be used), a Subnet Mask, and an optional Gateway IP.

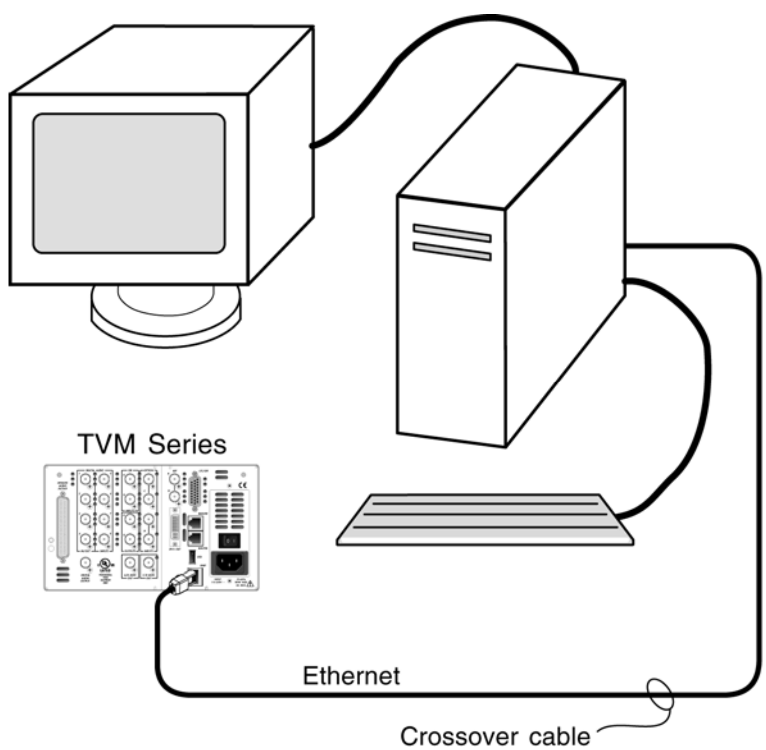
   Be sure to record all addresses in the spaces provided below. The Gateway address is not needed unless the TVM is routed to an outside network.

   Record the addresses:

TVM Interface Static IP Address	
TVM Interface Subnet Mask	
Gateway IP Address	

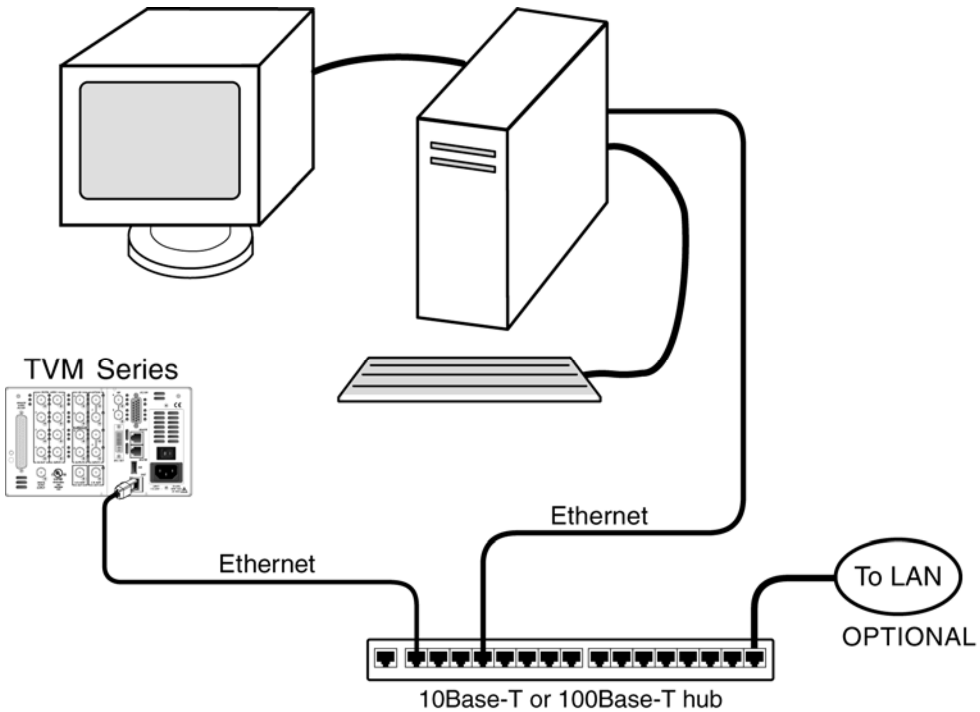
2. Identify a host PC to configure and test the TVM.
3. Choose a dedicated PC connection or network connection method:
   - For a dedicated PC connection, connect the host PC with a network card to the "ENET" connector on the back panel of the TVM, using a CAT5 crossover cable (not included). See **Figure 2-3.** TVM Dedicated PC Connection
   - .

Figure 2-3. TVM Dedicated PC Connection



- For a network connection, connect the network hub to the back panel of the TVM using a CAT5 network cable (not included). See **Figure 2-4.** TVM Network PC Connection
- .

Figure 2-4. TVM Network PC Connection



4. Ethernet Configuration

a) Press the Setup button on the TVM front panel.

b) Press the up/down button to highlight the Communications menu, and then press the ENT button to enter the submenu.

c) Press the up/down button until the IP Configuration submenu is highlighted.

d) Press the ENT button or left/right knob to enter the IP Configuration submenu.

e) (If using DHCP) Press the left/right button to highlight DHCP. When DHCP is highlighted, press the up/down button to toggle the state to ON. Press the right or left button to highlight Accept, and press the ENT button. The IP Address is retrieved from the DHCP server and placed under the appropriate submenu.

(If not using DHCP) Press the left/right button to select IP Address. Press the up/down button to change the value selected, and then press the left/right button to highlight the next value. Repeat for the remainder of the IP Address, Subnet Mask, and Gateway. To avoid conflicts, the static IP Address, Subnet Mask, and Gateway should be obtained from the System Administrator.

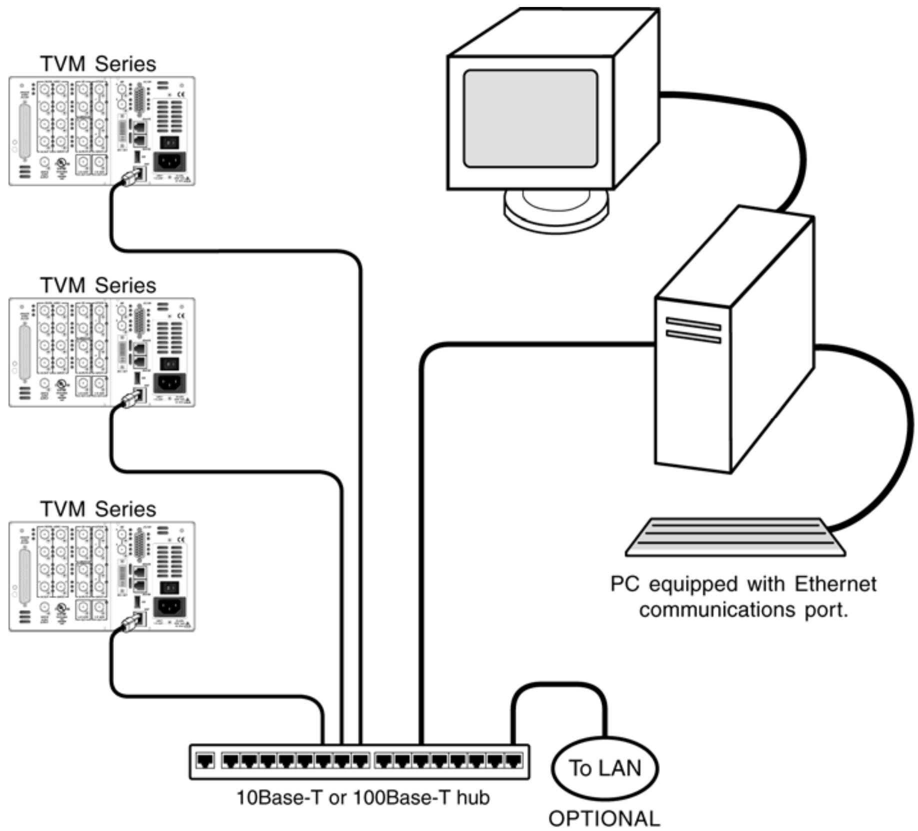
f) Press LEFT/RIGHT TO highlight ACCEPT, and then press ENT to accept the entered values.

g) Press the EXIT button to exit the submenu.

Configuring the TVM for Remote Control

The configuration shown in **Figure 2-5** is for one PC running multi-connection software and equipped with a Network Interface Card (NIC) connected to multiple TVMs and VTMs. The interconnecting cables can be extended using electronic distribution.

Figure 2-5. Multiple TVMs Network PC Connection



Configuring the TVM/VTM with the RCU-1000 Remote Control

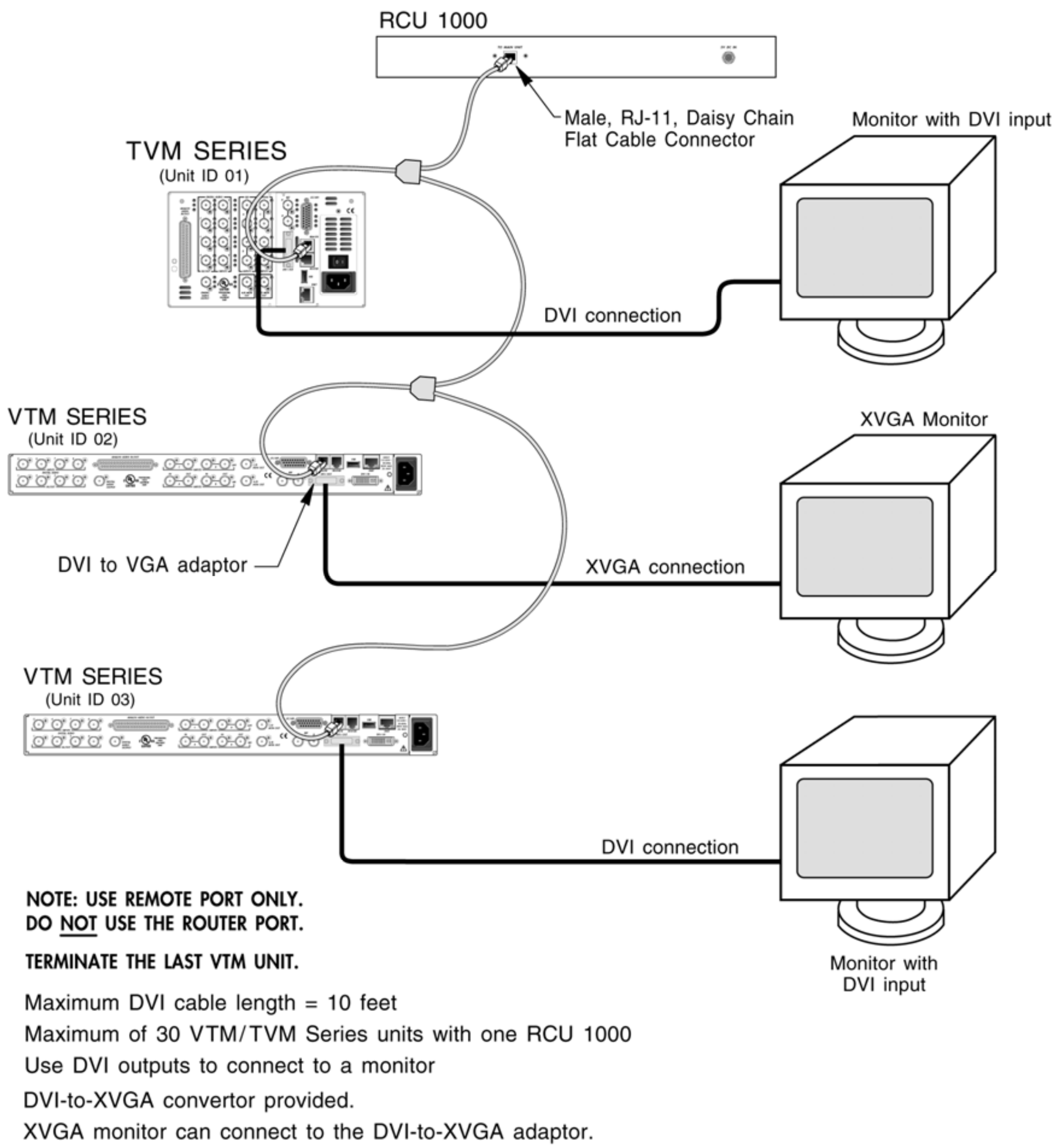
For the following configurations, the interconnecting cables can be extended using electronic distribution. There are two ways to configure the TVM/VTM Series with the RCU-1000 remote control:

One RCU-1000 connected to one TVM/VTM Series unit using the Remote port.

One RCU-1000 connected to multiple TVM/VTM Series units using a multidrop cabling adaptor and straight through cable using RJ11 connectors (not a standard telephone wire) that connects to the REMOTE ports on the back of the TVM/VTM Series units and to the TO MAIN UNIT connector on the back of the RCU.

All TVM/VTM Series units must have unique unit IDs. The unit ID is the identification number of the TVM/VTM Series units, and can be set to any number within a range of 1 to 99 in the Communications menu. The unit IDs should be different than the identification numbers of other units in the same system configuration. The Remote port must be terminated on the last TVM/VTM Series unit, as shown in **Figure 2-6**. The flat cable shown in **Figure 2-6** is a straight through cable. See the *RCU-1000 Installation and Operation Handbook* for more information on the RCU-1000.

Figure 2-6. Connecting the RCU-1000 to Multiple TVM/VTM Series Units



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Section 3 ♦ General Operation

Terms

The following terms are used in this section:

Display: The output at the Front LCD or XGA/DVI connector

Full: Full-screen display of the selected pane (non quad or multi display)

Multi: A multi-quadrant screen that contains preconfigured screens for VTM Classic, Data Analyzer, Custom Timing, Waveform-Vector screens, and 3 Gb/s WFM/VEC (with TVM-VTM-3GB only)

Pane: One quadrant in a multi-quadrant screen (Quad or Multi)

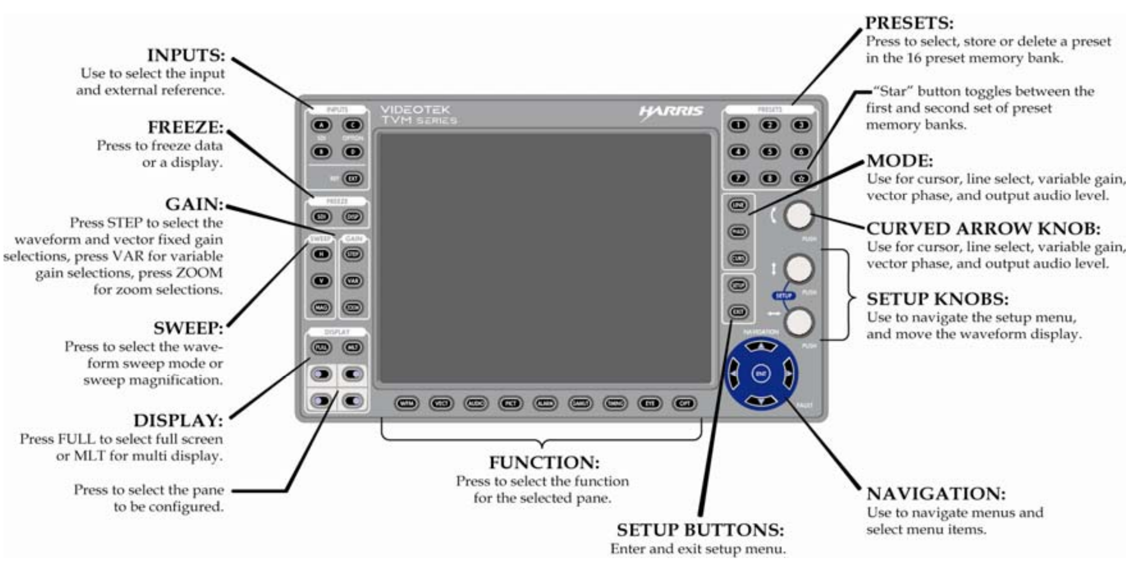
Quad: Screen that contains four panes

Introduction to Operating the TVM Series

The TVM Series, shown and described in **Figure 3-1**, can contain up to four selectable panes on the screen, in standard quad mode. Each pane provides a user-selectable customized display of waveform, vector, gamut, audio, picture, relative timing, alarm status, or data analyzer functions. A sample quad screen with the lower-right pane selected is shown in **Figure 3-2**.

Certain buttons function differently according to the selected pane. Once the pane and function for the pane is determined, more detailed settings can be configured. This section focuses on the operation of the TVM Series according to the selected display.

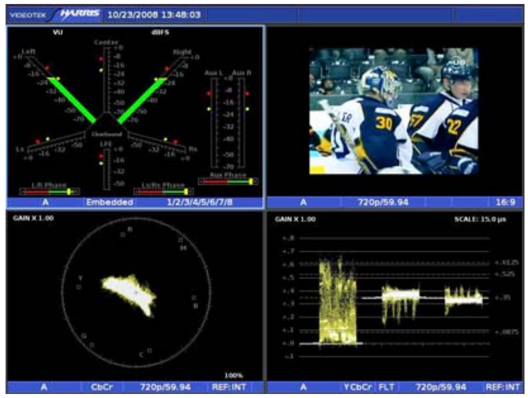
Figure 3-1. TVM Series Front Panel



NOTE: Pressing and holding certain buttons will activate menus for additional functionality.

NOTE: In the Inputs groups, press the A and B (or C and D) buttons at the same time to display inputs A-B (or C-D) simultaneously, if they are the same format.

Figure 3-2. Sample Multi-Display



Types of Controls

The TVM is controlled in three ways:

Quick Controls: Controls on the front panel that adjust parameters that are frequently used.

Pane Menu Settings: Pop-up menus within a pane that are used to control the parameters for the individual pane.

Global Setup Menu Settings: Setup menu parameters that affect the entire unit (not pane-specific). The Setup menu is accessed by pressing the SETUP button.

Front Panel Illumination

The front panel controls are illustrated in **Figure 3-1**. Most buttons and text are in a low-tally (low illumination) state; under certain conditions, however, some buttons and text reach a high-tally (high illumination) state, as described in **Table 3-1**. If an option is not installed, the associated button illumination is OFF. The high and low tally illumination levels can be set in the SYSTEM > CONTROL ILLUMINATION menu.

NOTE: Multiple buttons may be high tally for a pane at the same time. The last control selected using the curved arrow knob in the pane is the active control for that pane.

Table 3-1. Description of Front Panel Controls Illumination

Heading (Group)	Description
Inputs	• The button is high tally when the input is selected and displayed in a pane. The button is low tally when the input is not selected for the selected pane. For C and D, the button does not illuminate when the option is not installed. • When the input buttons are pressed simultaneously, both buttons (A and B, or C and D) are high tally.
Freeze	• **DISP**: The button is high tally when the entire XGA display is frozen. The button is low tally when the XGA display is in live mode. • **SDI**: The button is high tally when one frame of raw data is stored and displayed frozen. The button is low tally when the XGA display is in live mode.

Table 3-1. Description of Front Panel Controls Illumination

Heading (Group)	Description
Gain	• **STEP**: When the button is high tally, X2.5, X5, or X15 is active. When the button is low tally, X1 gain is active. • **VAR**: The button is high tally when in variable mode. The button is low tally when not in variable mode. • **ZOOM**: The button is high tally in any zoom mode (indicated with zoom at the top of the pane). The button is low tally when not in zoom mode.
Sweep	• **H**: The button is high tally when the waveform pane is active and in horizontal sweep mode; otherwise, the button is low tally. • **V**: The button is high tally when the waveform pane is active and in vertical sweep mode; otherwise, the button is low tally. • **MAG**: The button is high tally when the MAG function is enabled in the selected waveform pane; otherwise, the button is low tally.
Display	• **FULL**: The button is high tally when a full-screen is displayed. • **MLT**: The button is high tally when multi-screen mode is selected. • **Pane Select** buttons: The button is high tally to indicate which pane is selected.
Functions	A function button is high tally to indicate the active function for the selected pane.
Setup	• **SETUP**: The Setup button is high tally whenever a Setup or pane menu is displayed. • **EXIT**: The button is high tally when in a setup menu.
Navigation	All buttons are high tally when in a setup menu.
Setup knobs	• **Right/Left arrows**: the arrows are high tally whenever the Pane or Setup menu is enabled. • **Up/Down arrows**: the arrows are high tally whenever the Pane or Setup menu is enabled.
Curved arrow knob	The curved arrow symbol is high tally whenever the knob has a directed function for Cursor, Line Select, Variable Gain, Vector Phase, Audio Output Level, and Setup or Pane menu control. The last control selected using the curved arrow knob is the active control for that pane.
Mode	• **LINE**: the button is high tally when Line Select mode is enabled. • **PHASE**: the button is high tally when phase control mode is enabled. • **CURS**: the button is high tally when cursor mode is enabled.
Presets	• **1 – 8**: the selected preset is high tally when stored or recalled except for preset *8, which is the factory default. A preset must contain settings in order to be selected for recall. • ***:** the button is high tally when the second bank of presets is active (presets 9 through 16). The button is low tally for the first bank of presets when active (presets 1 through 8). *8 is the factory default preset.

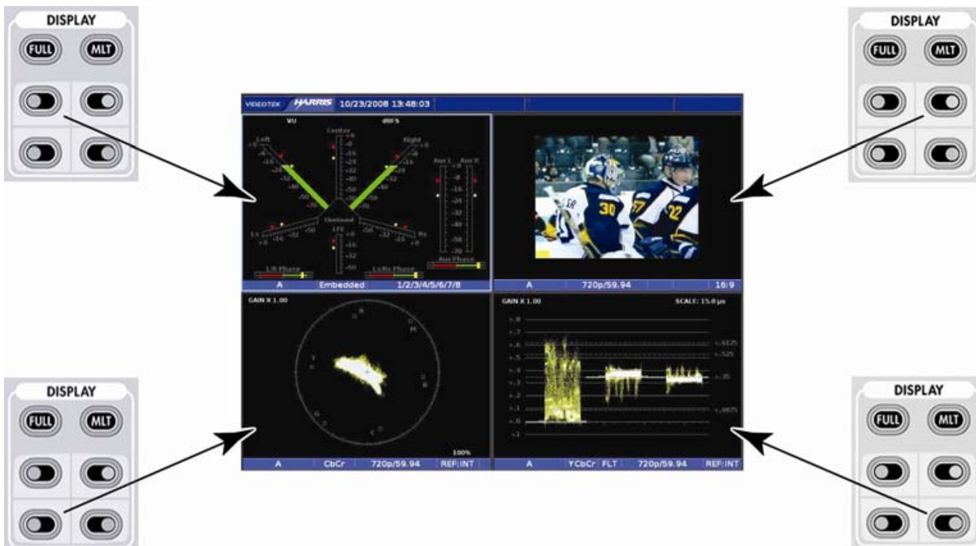
Sleep Mode

Press and hold the ENT and down navigation button to enter and exit Sleep mode. When entering Sleep mode, the instrument will turn off all LEDs and the display. The instrument is still active (that is, alarms still triggered, etc.). When exiting Sleep mode, the instrument returns to an illuminated state.

Selecting a Pane

When multiple panes are displayed, only one pane can be selected at a time. The active pane is highlighted with a bright colored border. Press the desired Display button to select the active pane to be configured, as shown in **Figure 3-3**.

Figure 3-3. Selecting a Pane



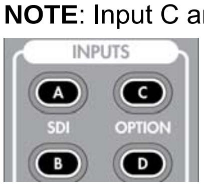
Full-Screen Display Selection

Press the FULL button in the display group to show a full-screen view of a selected pane. The full-screen display encompasses the entire screen. No other pane is displayed. Press the FULL button again to return to the Quad view.

Press the MLT button to access the multi-screen display. The Multi-Screen Display Selection information is found on page 132.

Selecting an Input for a Pane

NOTE: Input C and D buttons will not function if an option is not installed.



Press the Input buttons to select input A, B, A+B, C, D, or C+D. Press the two input buttons (A and B or C and D) simultaneously to produce A+B or C+D overlay if they are the same format. When an input is selected, pressing another input button will change to the new input from the previous input.

There are two modes for selecting inputs: Linked and unlinked mode.

When Linked: All panes change when a new INPUT button is pressed.

When Unlinked: Only the selected pane changes the input when a new input is selected (TVM9140PKG and TVM9150PKG configurations only).

Format Mismatch Message

When selecting A+B or C+D while the inputs are in different formats, the message FORMAT MISMATCH is displayed. The inputs must be changed to the same video format if both inputs are to function simultaneously.

Linking Panes (TVM9140PKG and TVM9150PKG configurations only)

Hold the A, B, C, or D input button for two seconds to enable the Link inputs pop-up menu selection. When the LINK INPUTS menu box appears, press the ENT button to toggle the selection. When linked, all the panes change to the selected input.

If the panes are not linked to an input, the broken link icon appears on top of the menu bar.

Selecting the Function for the Pane

Once a pane is selected, press the function button to select Waveform, Vector, Audio, Picture, Alarm, Gamut, Timing, Eye (only works with Inputs A and B), or Option for the pane. Press and hold the function button to display the pane menu.

Function Not Allowed Message

When a button is pressed that cannot be utilized with the selected Function (Waveform, Vector, etc.), the message FUNCTION NOT ALLOWED briefly appears over the center of the screen.

Option Not Installed Message

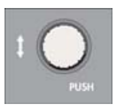
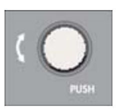
When a button is pressed for an option that is not installed, the message OPTION NOT INSTALLED briefly appears over the center of the screen.

Navigating the Pane Setup menu

NOTE: A function button can be pressed to exit from the menu. If a function other than the displayed function is pressed, the display will change to the newly selected function.

Use the NAVIGATION buttons or the SETUP POSITION knobs to navigate the Pane menu. The SETUP POSITION knobs and Navigation buttons are described below:

	• Press to exit the menu.
	• Press to exit the pane menu.

	• Press to select a menu item or open a menu or submenu.
	• Press to move up in the menu or submenu.
	• Press to move right to the next submenu.
	• Press to move out of the submenu.
	• Press to move down in the menu or submenu.
	• Rotate the knob to move the menu cursor up and down or to change a value or condition in a menu. • Press the knob to exit the menu.
	• Rotate the knob to enter or exit the submenus. • Press the knob to select a menu item or move to the submenu.
	• Rotate the knob to move the menu cursor up and down.

External Reference

Press to select internal or external reference.

Press and hold the EXT button to select the External Reference input configuration. The external reference input configuration is as follows:

Input B or A = BB (Blackburst) or TRI (Tri-level sync) (when LOOP is selected in the EXT menu). If used, terminate with a 75 Ω terminator.

Input A = BB (when SPLIT BB is selected in the EXT menu)

Input B = TRI (when SPLIT TRI is selected in the EXT menu)

The default reference selection is INT. To change the external reference selection:

1. Press and hold the EXT button to access the External Reference menu. **Table 3-2** shows the EXT menu selections.
2. When EXTERNAL REFERENCE is highlighted, press the right navigation button to open the menu selections.
3. Press the up or down navigation to highlight the reference, and press the ENT button to select the reference.
4. Press EXIT to exit the menu.

Table 3-2. EXT Menu

Selection	Selection Option
External reference	Loop (default)
	Split – Follow
	Split – BB
	Split - TRI
Setup	Press ENT

External Reference

NOTE: 1080p 50/59.94/60 Hz tri-level Sync is not supported.

The External Reference submenu is used to set the external reference input as a looping input (one input) or a split input (two inputs). The selections are:

If LOOP is selected, the external reference connectors are tied together.

If SPLIT - FOLLOW is selected while in split-mode, the external reference will be Blackburst for SD and Tri-level for HD.

If SPLIT- BB or SPLIT - FOLLOW is selected in split mode, then external reference A is used.

If SPLIT- TRI or SPLIT - FOLLOW is selected in split mode, then external reference B is used.

When in External Reference (REF:EXT) and in a cross reference condition (for example, HD referenced to BB, or SD referenced to TRI), the waveform will not roll if the frame rates match. A horizontal offset shows the timing difference between the External Reference and the input signal at the start of the frame.

EXT Setup

Press the ENT button to access the global Setup menu. For more information on the global Setup menu, see Section 4.

Pane Overview

There are various screens for the TVM Series: full-screen display, Quad (4 display panes), and multi (2 to 4 display panes). Even if the screen is full screen, quad, or multi screen, the pane contains the Main Title Bar, the display, and the status bar. A diagram of the quad display is shown in **Figure 3-4**. A diagram of the full-screen display is shown in **Figure 3-5**.

Figure 3-4. Sample Quad Diagram

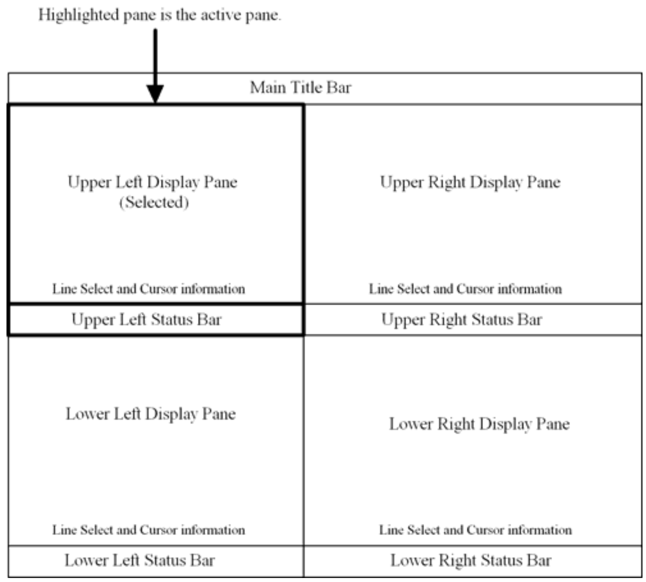
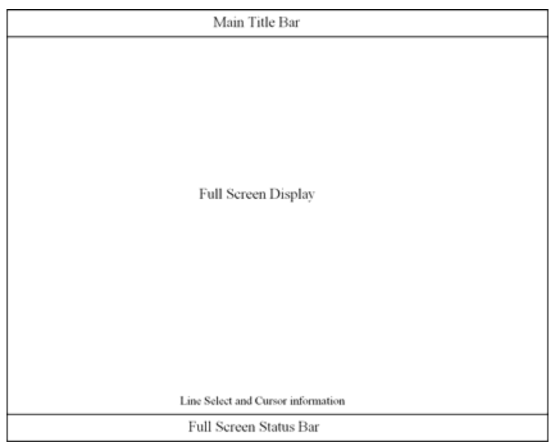


Figure 3-5. Full-Screen Display Diagram



Main Title Bar

The main title bar is displayed at the top of the screen, and contains the Company name, date and time, icon indictors, most current alarm (alarm background color is yellow when active), and the model name.

Icons

Icons appear in the main title bar and are shown in a specified order (left to right). **Table 3-3** shows the icons and the condition for the appearance:

Table 3-3. Description of Icons

Icon	Condition
	Panel Lock engaged
	Aural Alert silenced (No Sound)
	RCU connected and active. The RCU icon replaces the Alarm condition active icon when the RCU is connected and active.
	External USB device connected
	Inputs not linked (broken link)
	Alarm condition active
	DISP or SDI data is frozen in memory. If a display is captured and in memory, DISP overlays the icon. If SDI is captured and in memory, SDI overlays the icon. If both DISP and SDI are captured and in memory, DISP and SDI overlay the icon.

Status Bar

A status bar is located at the bottom of each pane. The status bar for each pane displays information based on the function selected and configuration applied. See the specific pane function section (Waveform, Vector, Audio, Picture, Alarm, Gamut, Timing, Eye, and Option) for more detailed information on the status bar that is displayed.

The Waveform Display

Pressing the WFM function button accesses the Waveform display for the selected pane. The waveform graticule scales, units of measure, and critical amplitude limits change according to the video format displayed. **Table 3-4** shows the units of measure that appear for a video format. **Table 3-5** lists the critical amplitude limits, which are indicated on the screen by special dashed lines for the video formats that can be displayed.

Table 3-4. Video Formats and Units of Measure

Video Format	Unit of Measure
High Definition and Standard Definition 525 and 625	Volts or Percent (Selectable)
Composite or Standard Definition 525 displayed as composite (NTSC)	IRE
Composite or Standard Definition 625 displayed as composite (PAL)	Units or Volts (Selectable)

Table 3-5. Video Formats and Critical Amplitude Limits

Video Format	Critical Amplitude Limits
High Definition and Standard Definition	0.6125 V = upper 75% chroma limit 0.525 V = 75% luminance limit 0.350 V = 50% point; black for color difference channels 0.0875 V = lower 75% chroma limit
Standard Definition 525 as Composite (NTSC)	7.5 IRE – black level

A waveform display is shown in **Figure 3-6** and described in **Table 3-6**. The figure shows the location for the various waveform display fields.

Figure 3-6. Waveform Display Diagram

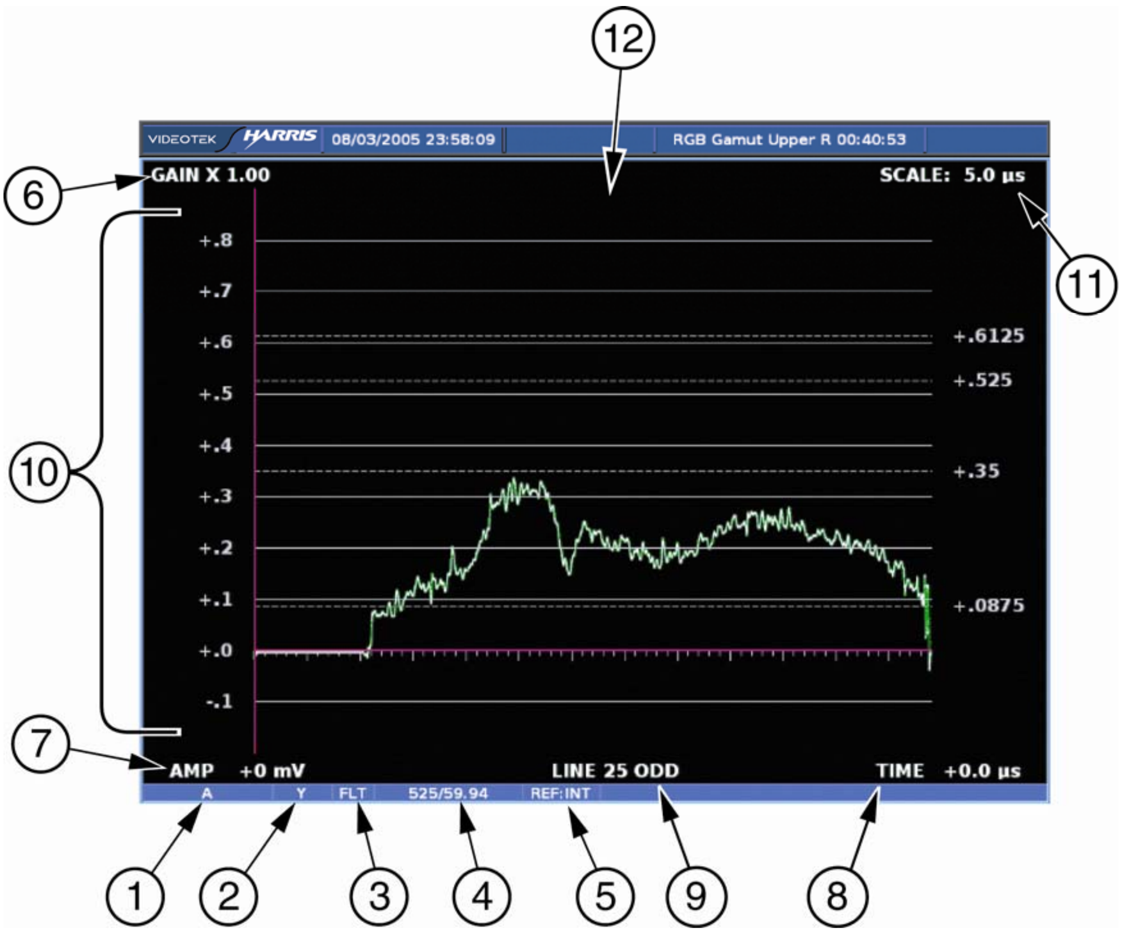


Table 3-6. Description of Waveform Display Diagram

Field Identifier	Field information	Nomenclature
1	Input	Displays user-configurable source IDs for input and routers
2	Format	Displayed as YCBCR, RGB, YRGB, or Composite (CMPST); this can be selected in the HD FORMAT or SD FORMAT submenu of the WFM Pane menu

Table 3-6. Description of Waveform Display Diagram

Field Identifier	Field information	Nomenclature
3	Filter	• Displayed as FLT, LP, CHR, BOW (Bowtie), R-Y • This can be selected in the COMPOSITE or COMPONENT FILTER submenu of the WFM Pane menu
4	Standard	Displays the Line Rate/Frame Rate [1080i/59.94]; this is selected in the VIDEO FORMAT > VIDEO A though D CONFIGURE menu
5	Reference	Displays the reference as INT, EXT (toggled by pressing the EXT button)
6	Gain	Displays the selected gain; Gain ranges are 0.5 to 75.0 for Waveform, and 0.50 to 150.0 for Vector (change by pressing the STEP or VAR button)
7	Amplitude cursor readout	Displays the amplitude cursor as AMP and the selected numerical value followed by the unit or measure (mV, units, or IRE)
8	Time cursor readout	Displays the time cursor as TIME and the selected numerical value followed by the unit or measure (µs)
9	Line select information	Line select is shown as Line number with the ODD or EVEN field (odd or even field will only show for interlaced Video Formats)
10	WFM graticule	Shows the WFM RGB, YCBCR, or Composite graticule; the graticule is dependent upon the Video format, Zoom, and scale selections
11	Scale	Indicates the major graticule indications for time
12	Zoom	• Displays Zoom when enabled • Blank when Zoom is disabled • Press the ZOOM button to cycle through the ZOOM modes

Graticules are configured by selecting the Video Input Format along with the appropriate Waveform Setup scale adjustment (Units, %, or Volts). The scales can also change when ZOOM is pressed.

Figure 3-7 to **Figure 3-9** illustrates some waveform graticules with the critical amplitude limits for the video formats that can be displayed by the TVM. The critical amplitude limits are indicated on the screen by special dashed lines.

NOTE: When in VAR mode for all waveform scales, the graticule scale and numeric identifiers will not be shown. Only the graticule lines will be displayed.

Figure 3-7. RGB and YC_BC_R Graticule

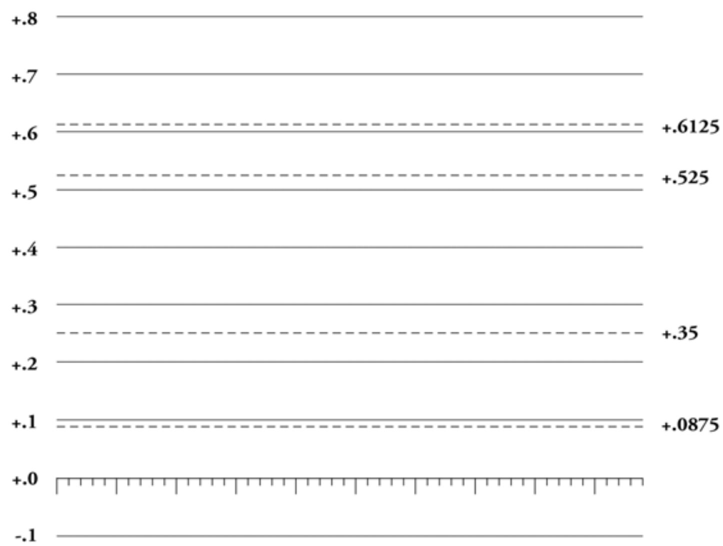


Figure 3-8. RGB and YC_BC_R Zoom 0 mV Graticule

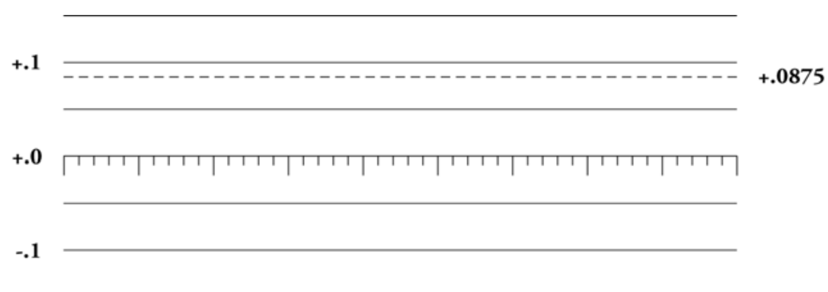
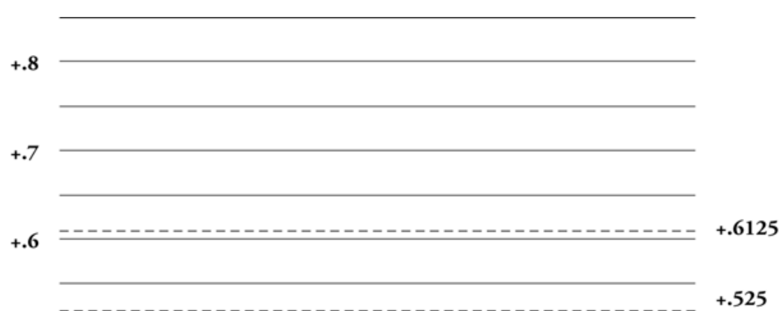


Figure 3-9. RGB and YC_BC_R Zoom 700 mV Graticule



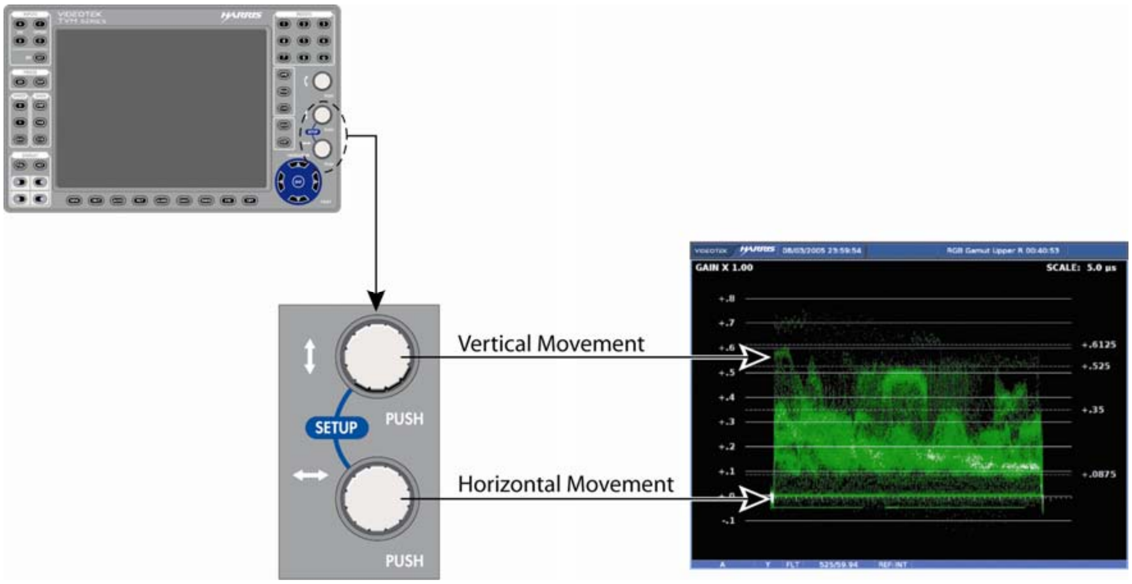
Waveform Front Panel Selections

The following buttons directly affect the waveform display.

Moving the Waveform using the Setup Knobs

Move the Waveform display relative to the graticule by using the left and right arrow knob (for horizontal movement) and the up and down knob (for vertical movement), as shown in **Figure 3-10**. Press the left/right (horizontal direction) or up/down (vertical direction) arrow knob to center the waveform in the particular direction. Centering the waveform can also be performed by using the Waveform pane menu (by pressing and holding the WFM button).

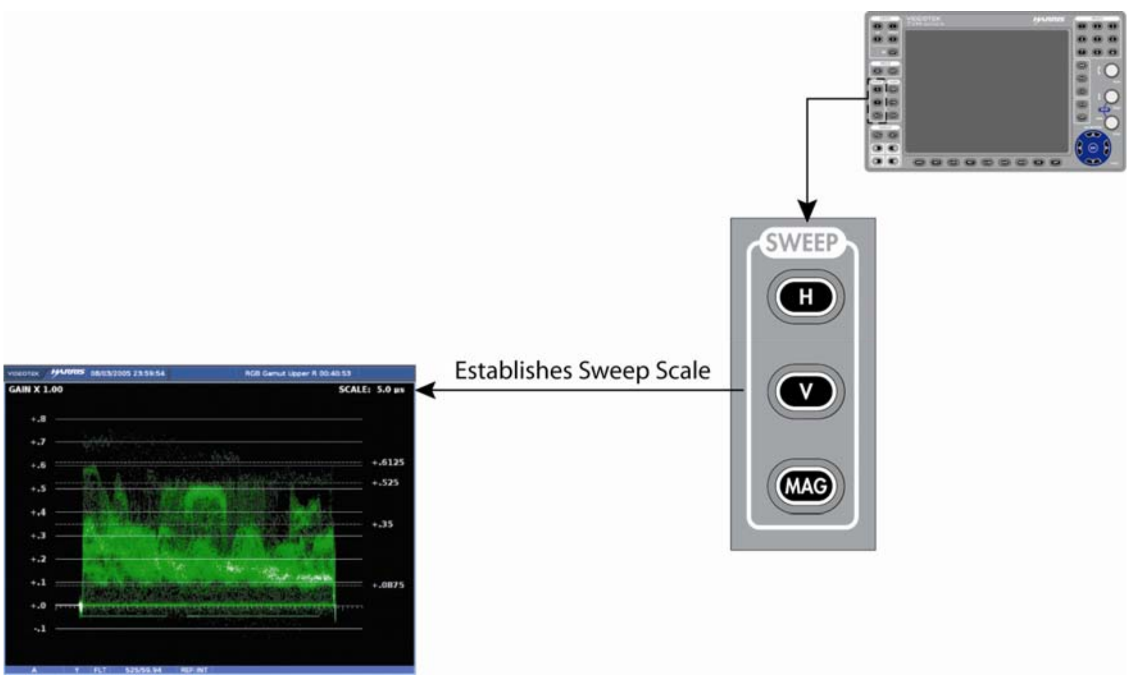
Figure 3-10. Moving the Waveform



Sweep Buttons

The Sweep buttons are used to determine the sweep rate scale. The scale is displayed in the upper-right area of the waveform pane, as shown in **Figure 3-11**.

Figure 3-11. Establishing the Sweep Scale



NOTE: A menu selection is available to produce a 4H or 4V waveform.

In the SWEEP group, press the H button to select one of the horizontal sweep modes. Also, press the H button to step through each component in a signal. The Components that are utilized with the H button can be selected and deselected in the COMPONENT SEQUENCE pane menu. When one to four components are selected, press the H button to view 1H (1 Horizontal or 5.0 µs when one component is shown). With one component selected, press the H button to toggle between viewing one single component H waveform and multiple component H waveforms (with blanking turned off two simultaneous component H waveforms are used to view any ancillary data).

When two components are selected in the COMPONENT SEQUENCE pane menu, press the H button to view 1H or 2H (2 Horizontal or 10.0 µs when 2 simultaneous components are shown). When three components are selected in the COMPONENT SEQUENCE pane, press the H button to view 1H or 3H (3 Horizontal or 15.0 µs when three simultaneous components are shown). When four components are selected in the COMPONENT SEQUENCE pane, press the H button to view 1H or 4H (4 Horizontal or 20.0 µs when four simultaneous components are shown in YRGB).

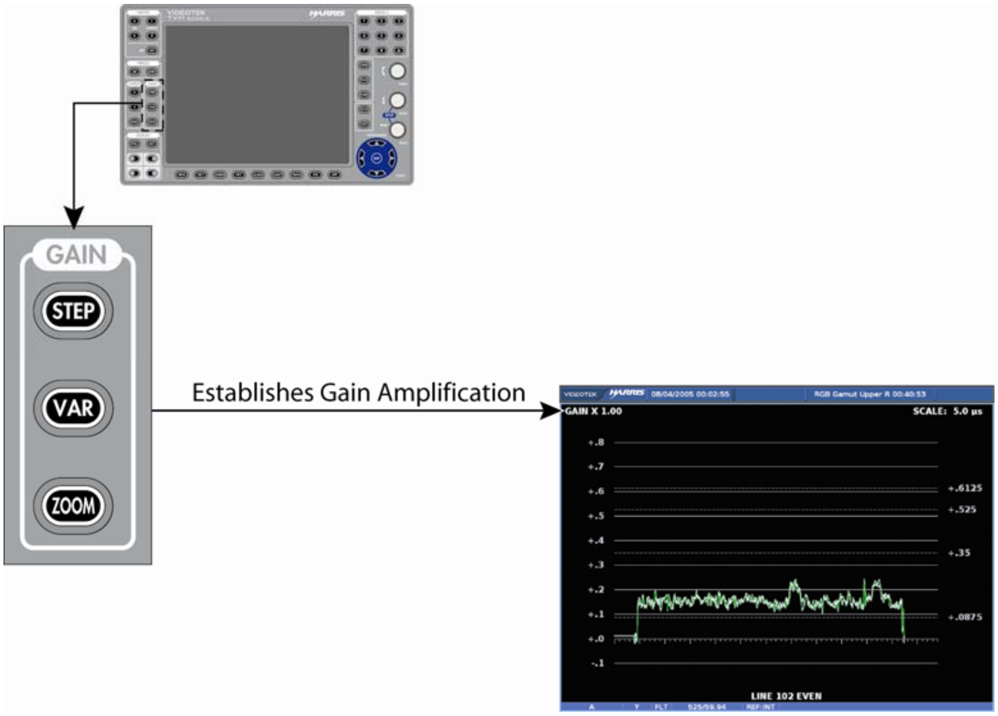
NOTE: Vertical Sweep is disabled when in R-Y mode (ACV only).

Also in the SWEEP group, press the V button to select one of the vertical sweep modes. The Components that are utilized with the V button can be selected and deselected in the COMPONENT SEQUENCE pane menu. A/B mode will show only one component from the selection of R, G, or B when in 2V mode. When one to three components are selected, press the V button to view 1V (1 Vertical when one component is shown). With one component selected, press the V button to toggle between viewing one single component V waveform and two multiple component V waveforms (with blanking turned off two simultaneous component V waveforms are used to view any ancillary data).

When two components are selected in the COMPONENT SEQUENCE pane menu, press the V button to view 1V or 2V (2 Vertical when 2 simultaneous components are shown). When three components are selected in the COMPONENT SEQUENCE pane menu, press the V button to view 1V or 3V (3 Vertical for SDI when three simultaneous components are shown). When four components are selected in the COMPONENT SEQUENCE pane menu, press the V button to view 1V or 4V (4 Vertical for SDI when four simultaneous components are shown).

Press the MAG button to change the horizontal magnification or to turn the magnification OFF.

Figure 3-12. Establishing the Gain



Gain Buttons

Gain is used to set the range of the vertical amplification in the video signal. The standard gain in the video signal is x1. The TVM can be used to set the gain amplification in the video signal using the Gain group of buttons. The gain setting appears in the upper-left portion of the waveform pane, as shown in **Figure 3-12**.

Press the STEP button to step through the available gain selections x1.0, x2.5, x5.0, and x15. Press and hold the STEP button to select the GAIN pane menu. STEP button functionality is modified in the step pop-up menu. The selections are:

Allow all

x1 and x2.5 (only)

x1 and x5 (only)

x1 and x15 (only)

Press VAR to access Waveform Variable Gain. Once the VAR button is illuminated, the Waveform Variable Gain can be adjusted using the CURVED ARROW KNOB. The gain is adjusted in increments of 0.01. The Variable Gain range for a waveform is multiplied by STEP gain. VAR gain is from 0.50 for an effective gain range of 0.50 to 75.00.

Press the VAR button to exit variable gain mode.

Pressing the STEP button while in variable gain selects the next STEP gain.

Press the ZOOM button to cycle through one of three display options:

ZOOM positioned on the 0 IRE, 0 mV, or 0% graticule line

ZOOM positioned on the 100 IRE or 700 mV (or 800 mV for Eye Pattern), or 100% graticule line

Normal

At each zoom position, the graticule scale and waveform displays expand to provide more resolution around the zoom point.

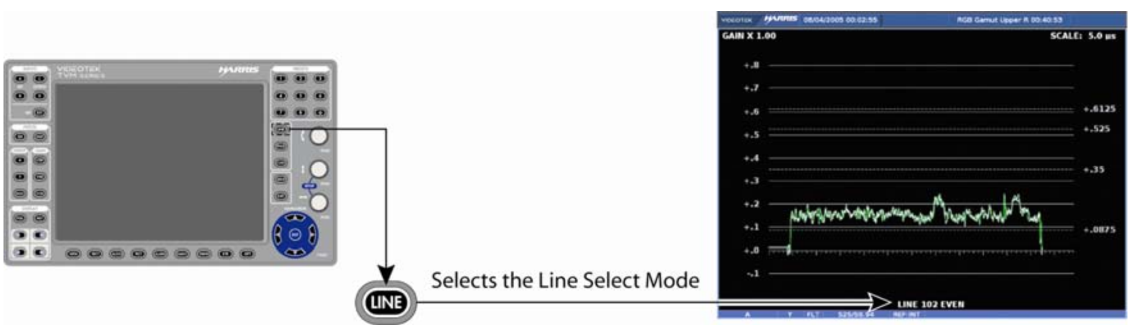
Placing the Waveform Display in Line Select Mode

NOTE: When inputs A and B are selected simultaneously within the same pane, the Line Select function is not available.

Pressing the LINE button enables the selected pane to monitor a single line of a video signal. This enables Line Select to monitor individual areas of the entire image. To view a line in Line Select mode:

1. Press the LINE button to place the selected waveform display pane in Line Select mode. At the bottom-center of the display, the pane displays the Line number and Odd or Even field, as shown in **Figure 3-13**.

Figure 3-13. Establishing Line Select



NOTE: In a Progressive (p) format. Odd and even selection is not available.

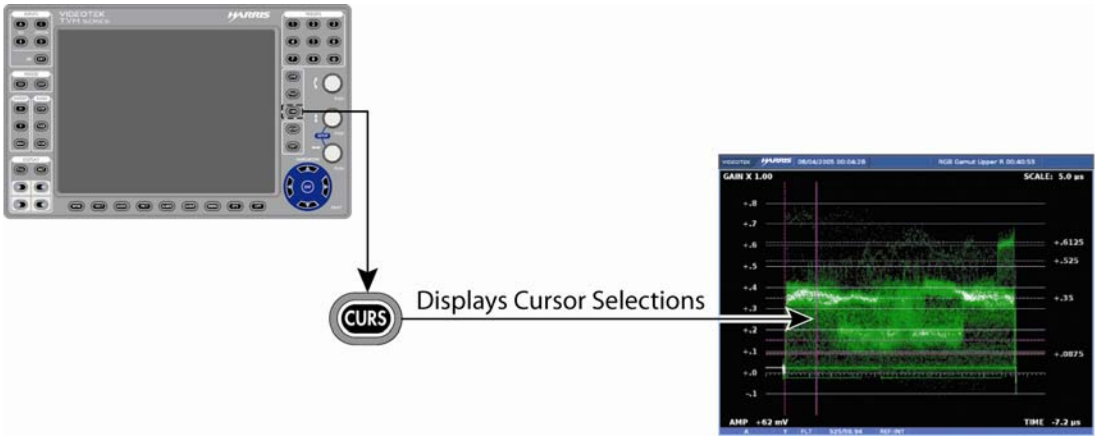
2. Press the CURVED ARROW knob to alternate between ODD and EVEN fields.
3. Rotate the CURVED ARROW knob to select the line to be displayed.

When the panes are linked by the INPUT button, all WFM, VECT, and GAMUT panes are selected when the LINE button is pressed. When a picture is displayed in one of the panes, a marker across the picture approximates the displayed line position (± 1 line).

Waveform Cursor Selections

Cursors are available for precise measurement of waveform voltage and waveform time. The Time Cursor indication is in the lower-right of the pane, and the amplitude cursor indication is in the lower-left of the pane as shown in **Figure 3-14**.

Figure 3-14. Establishing Cursor Select



To enable the time and/or amplitude cursors, press and hold the CURS button. Use the NAVIGATION buttons or knobs to highlight Amplitude or Time. Once selected, press the ENT button to enable it. Once one or both cursors are selected, press the EXIT button to exit the CURS pane menu.

When the cursor is selected, a readout will appear at the bottom of the display. The horizontal cursor is AMPLITUDE. The vertical cursor is TIME.

If both TIME and AMP are displayed, pressing the CURS button will select which cursor to control. In all cases, the TIME or AMP numeric readout at the bottom of the display indicates the difference between the REF and DELTA cursors. The active cursor (REF, DELTA, or both) is shown with small arrows at both ends of the cursor.

Once a cursor is selected for control:

1. Press the CURVED ARROW knob to select the REF or DELTA cursor to control. The REF line is the solid line, and the DELTA cursor is the dotted line.
2. Rotate the knob to move the REF or DELTA cursor to the desired location.
3. Press the knob for the next line. Rotate the knob to move the other line to the desired location.
4. Press the knob a third time to control both the REF and DELTA cursors.
5. Repeat as necessary.

To exit the cursor function while leaving the cursors active, just select another mode in the pane (for example, Line Select, Variable Gain, etc.).

Waveform Pane Menu Selections

Pressing and holding the WFM or DISPLAY PANE buttons in the active waveform pane enables the pane menu. The Waveform Pane menu is described in **Table 3-7** for analog waveform monitoring, **Table 3-8** for SD-SDI waveform monitoring, and **Table 3-9** for 3Gb/s/HD-SDI waveform monitoring. The submenus are different for each format. **Table 3-7** through **Table 3-9** indicates the menu items that are available with the selected formats.

NOTE: The component sequence selections are dynamically dependent on the SD or HD format selection. The component selections will only be shown when the component formats are selected.

Table 3-7. Waveform (Analog) Menu Structure

Selection	Selection Option
Composite filter	FLT (Flat)
	LP (low pass)
	CHR (Chroma)
	F/LP (Flat & low pass)
	R-Y (TVM-VTM- ACV-2 option only)
	K Factor
Parade/Overlay	Parade
	Overlay
Center waveform	Enter
Waveform setup	Press ENT

Table 3-8. Waveform (SD-SDI) Menu Structure

Selection	Selection Option	Selection Option
Composite filter (for digital formats)	Flat (FLT)	
	Low pass (LP)	
	Chroma (CHR)	
	F/LP (Flat & low pass)	
Component filter	Flat	
	Low pass	
	Bow (bowtie)	
Parade/overlay	Parade	
	Overlay	
SD format	CMPST (composite)	
	YCBCR	
	RGB	
	YRGB	
Blanking	Blank all	
	Show EAV/SAV	
	Show all	
Component sequence (related to SD format selection)	If CMPST is selected - Not Available	
	If YCBCR is selected (Y, CB, CR)	On
		Off
	If RGB is selected (R, G, B)	On
		Off

Table 3-8. Waveform (SD-SDI) Menu Structure

Selection	Selection Option	Selection Option
	If YRGB is selected (Y, R G B)	On
		Off
Center waveform	Press ENT	
Waveform setup	Press ENT	

Table 3-9. Waveform (3Gb/s/HD-SDI) Menu Structure

Selection	Selection Option	Selection Option
Composite filter (for digital formats)	Flat (FLT)	
	Low pass (LP)	
	Chroma (CHR)	
	F/LP (Flat & low pass)	
Component filter	FLT (Flat)	
	LP (Low pass)	
	Bow (Bowtie)	
Parade/Overlay	Parade	
	Overlay	
HD format	COMP (Composite)	
	YCBCR	
	RGB	
	YRGB	
	YCBCR + alpha (TVM-VTM-DLK only)	
	RGB + alpha (TVM-VTM-DLK only)	
Blanking	Blank all	
	Show EAV/SAV	
	Show all	
Component sequence (related to HD Format selection)	If CMPST is selected (not available)	
	If Y YCBCR is selected (Y, CB, CR)	On
		Off
	If RGB is selected (R, G, B)	On
		Off
	If YRGB is selected (Y, R G B)	On
		Off
Center waveform	Press ENT	
3D L – R (TVM-VTM-3G only)	Press ENT	
Waveform setup	Press ENT	

Filter Selection

The filters available are dependent upon the input format. The filters available are:

Flat: No filtering.

Low Pass: Selects the Low Pass filter.

Chroma: Selects the Chroma filter.

F/LP: Selects Flat and Low Pass filtering.

R-Y: Selects the R-Y filter (selection available with TVM-VTM-ACV-2 option only).

K Factor: Selects 1H waveform with flat filter, no zoom, and 10x horizontal gain. Sweep, filter, horizontal gain, and zoom are not adjustable in this mode. A special waveform graticule is displayed with markers for measuring K Factor with a 2T Pulse signal (selection available with TVM-VTM-ACV-2 option only).

Bowtie: The bowtie filter is used to check the timing relationships between the digital components. A bowtie test signal is required.

Parade and Overlay Selections

Multiple inputs can be displayed in a single pane.

When PARADE is selected, the components of the same input are shown next to one another (that is, Inputs Y, then CB, then CR in a YCBCR signal).

When OVERLAY is selected for a single input, the components of the input signal are displayed over each other (that is, R over G over B in an RGB signal). When OVERLAY is selected for A & B, like components of each input are over each other (that is, R over R, G over G, and B over B). A & B cannot be displayed in parade mode.

HD or SD Format

When in the Format menu, select one of the display formats: (Y)RGB, YCBCR, or CMPST (Composite). The selected (Y) RGB, YCBCR, or CMPST text is indicated with a check mark. **Table 3-10** lists the relationships between the input and display formats.

Table 3-10. Input and Display Format Relationship

Input Format	RGB	YCBCR	YRGB	COMP	YCBCR + Alpha (10 bit only)	RGB + Alpha (TVM-VTM DLK) (TVM-VTM-3GB 10 bit only) (TVM-VTM-JEM3 10 bit only)
3 Gb/s	Yes	Yes	Yes	Yes	Yes	Yes
HD	Yes	Yes	Yes	Yes	Yes	Yes
SD	Yes	Yes	Yes	Yes	No	No
Analog composite (option)	No	No	No	Yes	No	No

Blanking (SDI Signals only)

The blanking selections are Blank All, EAV/SAV, and Show All.

"Blank All" displays only the active video of the input signal.

“Show EAV/SAV” displays the active video and the EAV/SAV headers of the input signal.

“Show All” displays the ancillary data, EAV/SAV, and active video.

Component Sequence (SDI Signals only)

Select to enable the component Y, CB, and CR when YCBCR is selected in the SD or HD Format menu; Y, R, G, and B, when YRGB is selected in the SD or HD Format menu.

Center Waveform

Press the ENT button to activate the Center Waveform selection. Once ENT is pressed, the waveform returns to the center of the waveform graticule.

3D L - R

Press the ENT button to activate the 3D Left minus Right selection. The waveform display is composed of the luminance value of input A minus the luminance value of input B. This function is only available with TVM-50 and TVM-VTM-3D.

Waveform Setup

Press the ENT button to access the global Waveform setup menu. For more information on the global Waveform Setup menu, see Section 4.

Utilizing the EYE Display (TVM-VTM-EYE-H, TVM9100PKG-EH, TVM9100PKG-ES, TVM9140PKG-EH, TVM9140PKG-ES, TVM9150PKG-EH, TVM9150PKG-ES)

NOTE: Available for Inputs A and B only.

The Eye Pattern display is created by sampling the serial digital signal with the recovered serial clock. The Eye Pattern display is used to measure signal amplitude, jitter, rise time, and other irregularities. Measurement of the transition widths is done by manually setting the cursors on the transition limits of the display and reading the offset in picoseconds (ps). The amount of jitter can also be estimated from the bar display above the Eye Pattern display. Amplitude is similarly measured using cursors.

To access the Eye Pattern display, press the EYE function button on the front panel. The Eye Pattern Display Diagram is displayed in **Figure 3-15** and described in **Table 3-11**.

Figure 3-15. Eye Pattern Display Diagram

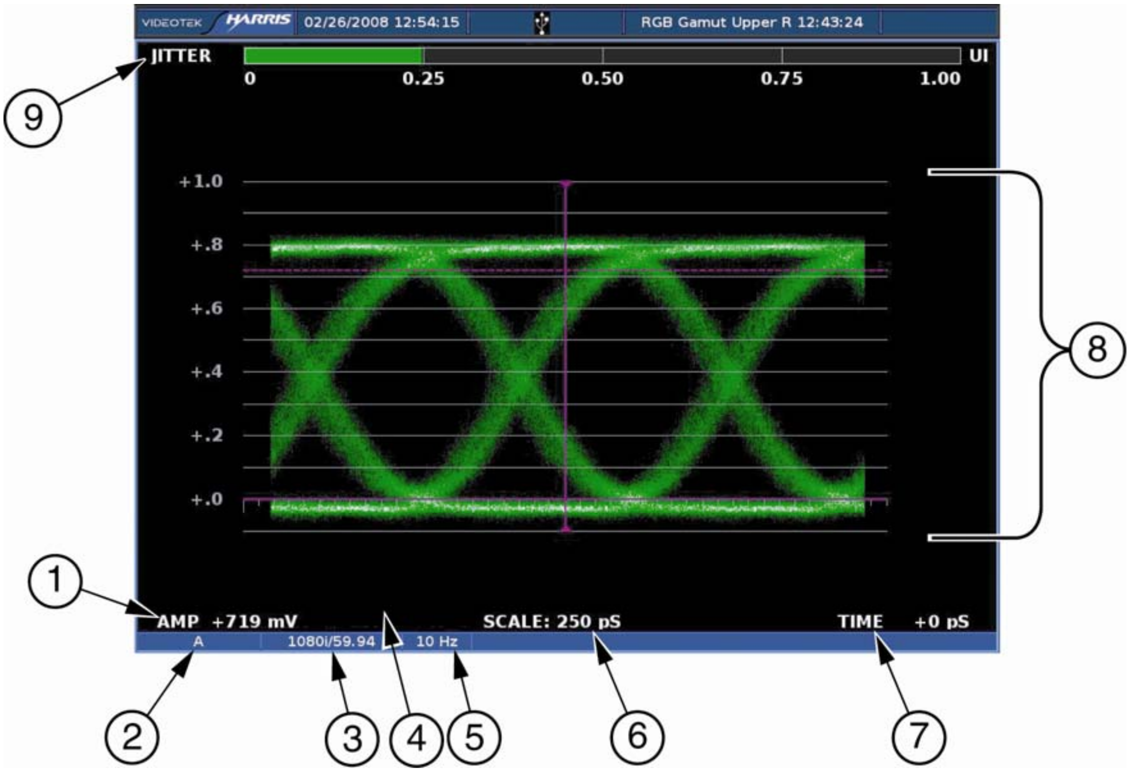


Table 3-11. Description of Eye Pattern Display Diagram

Field Identifier	Field Information	Nomenclature
1	Amplitude cursor readout	Displays the amplitude cursor as AMP and the number in mV
2	Input	Displays the user-configurable source IDs for the input and routers
3	Standard	Line rate/Frame rate
4	Zoom	• Displays the Zoom when enabled • Blank when Zoom is disabled • Press the ZOOM button cycle through Zoom modes
5	High Pass Filter	Displays the selected Eye Filter
6	Scale	Displayed in ps
7	Time cursor readout	Displays the time cursor as Time and the number in ps
8	EYE graticule	Displays the Eye Pattern graticule
9	Jitter Display	Displays the Jitter display; jitter display changes according to the Eye Pattern > Jitter Display Type menu in the Global Setup menu

Figure 3-16 to Figure 3-18 display the Eye pattern graticules.

Figure 3-16. Eye Pattern Graticule

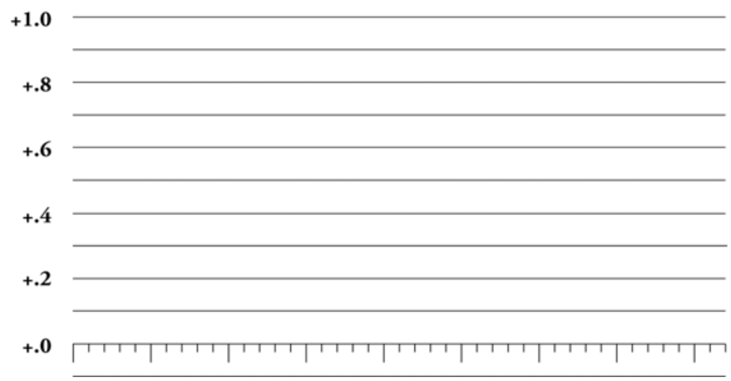


Figure 3-17. Eye Pattern Graticule at Zoom 0V

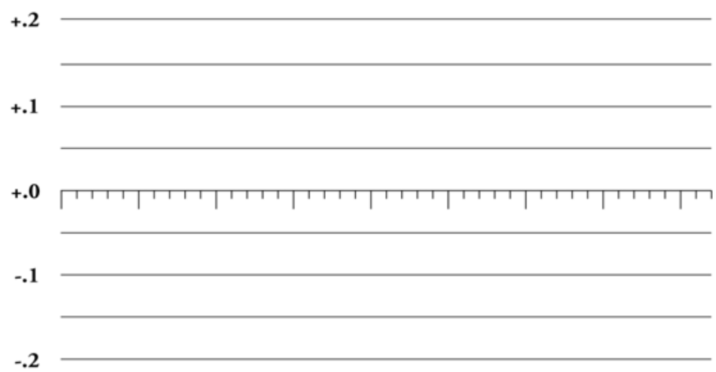


Figure 3-18. Eye Pattern Graticule at Zoom 800 mV

Eye Pattern Observation

The waveform displayed can show both amplitude variations and timing variations. The combination of these “closes” the decision window for determining whether a bit received is “1” or “0.” Common errors including overshoot, bandwidth limitations, and ringing are easily observed with the Eye Pattern display and provide indications of the general quality of the transmission channel and source.

Eye Pattern Rise Time

Rise times of the waveform can be calculated by measuring the 20% to 80% rise time points with the time cursors.

Jitter Meter and Eye Pattern Correlation

The jitter meter located just above the Eye pattern display is intended to display the maximum value of jitter over time. The correlation of values derived by using measurement cursors versus the jitter meter could differ unless the eye pattern is displayed using the maximum persistence setting. A normal persistence setting will make it more difficult to view pixels near the widest sample points, which forces the placement of the measurement cursors to a lower (narrower) jitter value. Jitter can only be selected when the Eye Pattern is enabled.

Horizontal Magnification and Zoom in Eye Pattern Mode

Press the MAG button to step through the available Horizontal Magnifications of x1, x5, and x10: 1 ns, 0.20 ns, and 0.10 ns for SD; 250 ps, 50 ps, and 25 ps for HD; or 125 ps, 25 ps, and 12.5 ps for 3Gbps. The type of magnification along with the format displayed determines how many “Eyes” are displayed. **Table 3-12** describes the Horizontal Magnification Conditions.

Table 3-12. Horizontal Magnification Conditions

Horizontal Mag	Format Displayed	Number of Eyes Displayed
x1 (1 ns, 125 ps, or 250 ps)	SD/HD	3 eye displayed
	SD	10 eyes displayed
	HD	20 eyes displayed
x5 (0.20 ns, 25 ps, or 50 ps)	SD/HD	3/5 eye displayed
	SD	2 eyes displayed
	HD	4 eyes displayed
x10 (0.10 ns, 12.5 ps, or 25 ps)	SD/HD	3/10 eye displayed
	SD	1 eye displayed
	HD	2 eyes displayed

Press the ZOOM button to zoom around the reference graticule. At each zoom position, the graticule scale and eye pattern displays expand to provide more resolution around the zoom point.

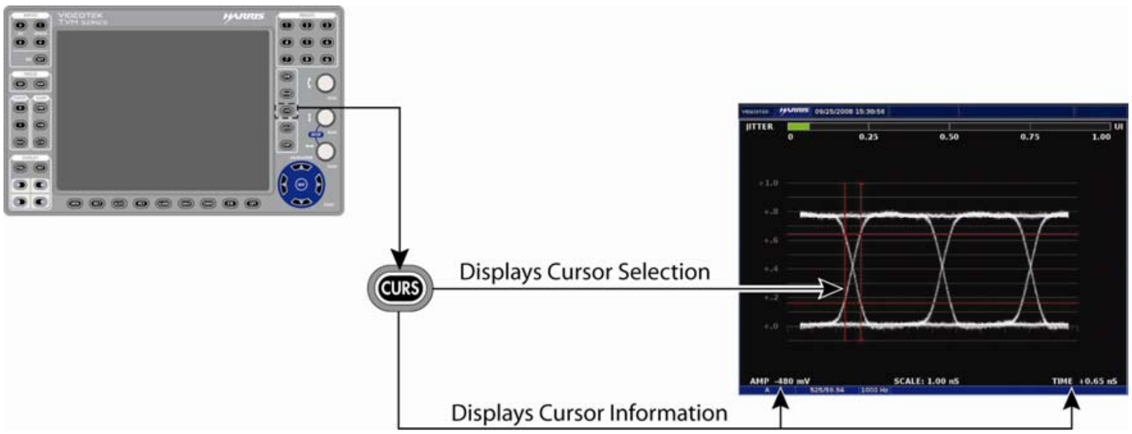
For the Jitter Waveform display, press the ZOOM button to toggle the Jitter gain from OFF (2 UI p-p) to ON (1 UI p-p).

For the Jitter Frequency display, press the ZOOM button to toggle the Frequency Sweep between 0 – 5 MHz or 0 – 1 MHz.

Eye Pattern Cursor Selections

Cursors are available for precise measurement of waveform voltage and waveform time. Press the CURS button on the front panel to enable the cursors for the selected pane. The Time Cursor indication is in the lower-right portion of the screen, and the amplitude cursor indication is in the lower-left of the screen as shown in **Figure 3-0-19**.

Figure 3-0-19. Establishing Cursor Select for Eye Pattern



To enable the time and/or amplitude cursors, press and hold the CURS button. Use the NAVIGATION buttons or knobs to select Amplitude or Time. Once selected, press the ENT button to enable it. Once one or both cursors are selected, press the EXIT button to exit the CURS pane menu.

When the cursor is selected, the indication will appear at the bottom of the display along with the cursor line. The horizontal cursor line is the AMPLITUDE line. The vertical line is the TIME line.

If both TIME and AMP are displayed, pressing the CURS button will select which cursor to control. In all cases, the TIME or AMP numeric readout at the bottom of the display indicates the difference between the REF and DELTA lines. The active line (REF, DELTA, or both) is shown with small arrows at both ends of the line.

Once a cursor is selected for control:

1. Press the CURVED ARROW knob to select the REF or DELTA line to control. The REF line is the solid line, and the DELTA line is the dotted line.
2. Rotate the knob to move the REF or DELTA line to the desired location.
3. Press the knob for the next line. Rotate the knob to move the other line to the desired location.
4. Press the knob a third time to control both the REF and DELTA lines.
5. Repeat as necessary.

Once the cursors are no longer necessary, press and hold the CURS button to return to the Cursor menu and disable the cursor selection submenus. The check mark indicates the cursor is enabled, and no check marks indicate the cursor is disabled.

To exit the cursor function while leaving the cursors active, just select another mode in the pane (for example, Line Select, Variable Gain, etc.).

Eye Pattern Pane Menu Selections

Pressing and holding the EYE function button or the DISPLAY PANE button in the active Eye Pattern pane selects the pane menu. Use the SETUP POSITION knobs or the NAVIGATION buttons to navigate the Pane menu.

The Eye Pattern Pane menu is described in **Table 3-13** for SD-SDI monitoring, and **Table 3-14** for HD-SDI monitoring. The difference between the two menus is the Trigger Mode selections of 10 EYE and 20 EYE.

Table 3-13. Eye SD-SDI Pane Menu Structure

Selection	Selection Option
Jitter HPF	10 Hz
	100 Hz
	1000 Hz
Trigger mode	OVERLAY
	10 EYE
Eye pattern setup	Press ENT

Table 3-14. Eye HD-SDI Pane Menu Structure

Selection	Selection Option
Jitter HPF	10 Hz
	100 Hz
	1000 Hz
Trigger mode	OVERLAY
	20 EYE
Eye pattern setup	Press ENT

Jitter High Pass Filter (HPF) Selection

Because jitter on the data can develop from many sources and have a unique frequency distribution, the bandwidth of the sampling clock recovery circuit will affect the displayed jitter if the frequency of the jitter is within the bandwidth of the clock recovery circuits. Above the loop bandwidth, the loop has no effect on the jitter. While within the bandwidth, the apparent jitter displayed will be satisfied by the loop response.

To access the jitter high pass filter selections, press the EYE button until Eye Pattern pane menu appears. Select between 10 Hz, 100 Hz, or 1 kHz is high tally. When 10 Hz, 100 Hz, or 1 kHz is selected, the –3 dB response points only allow jitter above the selected filter frequency. This is useful with estimating the effects of jitter on clock recovery circuits of similar bandwidths in receivers and inferring the sources of the observed jitter based on frequency components present.

Common filter selections are forced between the Jitter pane and the Eye Pattern pane based upon menu selection choices.

Trigger Mode

The TRIGGER MODE submenu is located in the EYE PATTERN SETUP menu. Within the TRIGGER MODE submenu, two modes of operation are available:

OVERLAY

10/20 EYE (10 Eye and Overlay for SD/20 Eye and Overlay for HD)

Distortions in Overlay mode are all displayed in the visible eye locations of the Eye Pattern display, giving a more easily observed display of the total jitter. Overlay displays three eye openings.

Eye Pattern Setup

Press the ENT button to access the global Eye Pattern setup menu. For more information on the global Eye Pattern Setup menu, see Section 4.

Utilizing the EYE and Jitter Displays (TVM-VTM-JEM, TVM-VTM-JEM2, TVM-VTM-JEM3, TVM9100PKG-EJ, TVM9140PKG-EJ, TVM9100PKG-EJ2,TVM9150PKG-EJ2, and TVM9150PKG-EJ3)

The TVM-VTM-JEM is an Eye Pattern Option with an advanced Jitter and signal auto measure feature. The installation of this option changes the back panel. The back panel is shown in **Figure 3-20**, and the function of each changed connector is described in **Table 3-15**.

Figure 3-20. TVM-VTM-JEM, TVM-VTM-JEM2, and TVM-VTM-JEM3 Option Back Panel Connectors

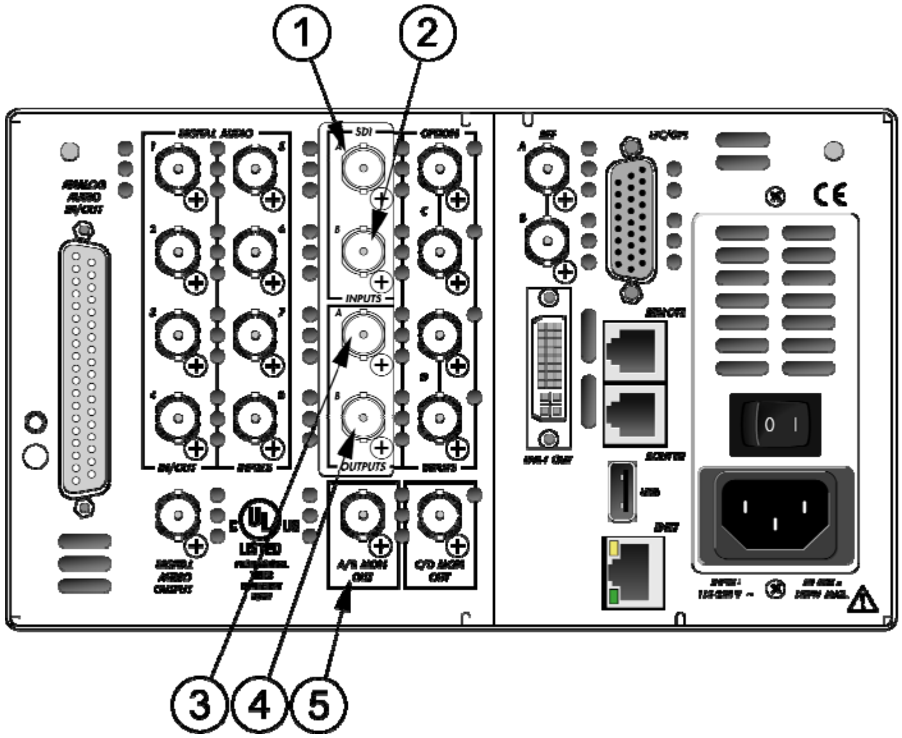


Table 3-15. Description of TVM-VTM-JEM Option Back Panel Connectors

Key	Label	Description
1	A (IN)	Female BNC HD-SDI or SD-SDI input connector
2	B (IN)	Female BNC HD-SDI or SD-SDI input connector
3	A (OUT)	Female BNC looping HD-SDI or SD-SDI output connector
4	B (OUT)	Female BNC looping HD-SDI or SD-SDI output connector
5	A/B MON OUT	Female BNC connector for monitoring of the selected A or B input If both digital A + B inputs are selected, the output is input A (this output is a source monitor only and does not include the waveform, vector, audio, or alarm on-screen information) With TVM-VTM-JEM3, A/B MON OUT can be used as a test generator output (when selected using TVM-VTM-JEM3 option)

NOTE: This option is only available for Inputs A and B only. Only one Eye Pattern and one Jitter screen can be displayed at a time.

- TVM-40 and TVM-50 display Eye waveform or jitter/spectrum waveform in one or two separate panes.
- TVM-10 displays Eye waveform or jitter/spectrum waveform in one pane at a time.

The Eye Pattern display is created by sampling the serial digital signal with the recovered serial clock. The Eye Pattern display is used to measure signal amplitude, jitter, rise time, and other irregularities. Measured parameters are shown a the top of the EYE display, or they can be manually measured by setting the cursors on the transition limits of the display and reading the offset in picoseconds (ps) for HD or nanoseconds (ns) for SD. The amount of jitter can also be estimated from the bar display above the Eye Pattern display. Amplitude is similarly measured using cursors.

To access the Eye Pattern display, press the EYE function button on the front panel. The Eye Pattern display appears in the selected pane, as shown in **Figure 3-21** and described in **Table 3-16**.

- TVM-40 and TVM-50

  Select another pane (a pane that does not contain the Eye pattern display), and press the EYE button again. The Jitter is displayed in the selected pane, as shown in **Figure 3-22** and described in **Table 3-17**. The time bases are 1H, 2H, 1V, and 2V.

- TVM-10

  Press the EYE button again to toggle between the Eye Pattern display and the Jitter Waveform display, as shown in **Figure 3-22** and described in **Table 3-17**. The time bases are 1H, 2H, 1V, and 2V.

Pressing and releasing the EYE button continuously without changing the pane will toggle between the Eye pattern and Jitter Waveform display.

In the Jitter display, press and hold the EYE button to select the JITTER WAVEFORM MODE menu. Selectable modes are Waveform Sweep (jitter vs. time), as shown in **Figure 3-22**; or Frequency Sweep (jitter vs. frequency), as shown in **Figure 3-23** and described in **Table 3-18**. These displays show the relative amplitude of the jitter versus time or versus the frequency at which it occurs. The Jitter Frequency display is useful to determine the frequency of major jitter components.

Simply pressing the EYE button in the Jitter display changes the display to eye pattern. Any other pane that contained the Eye pattern display will change to a blank screen containing the instruction “SELECT NEW FUNCTION.”

Figure 3-21. Eye Pattern Display Diagram

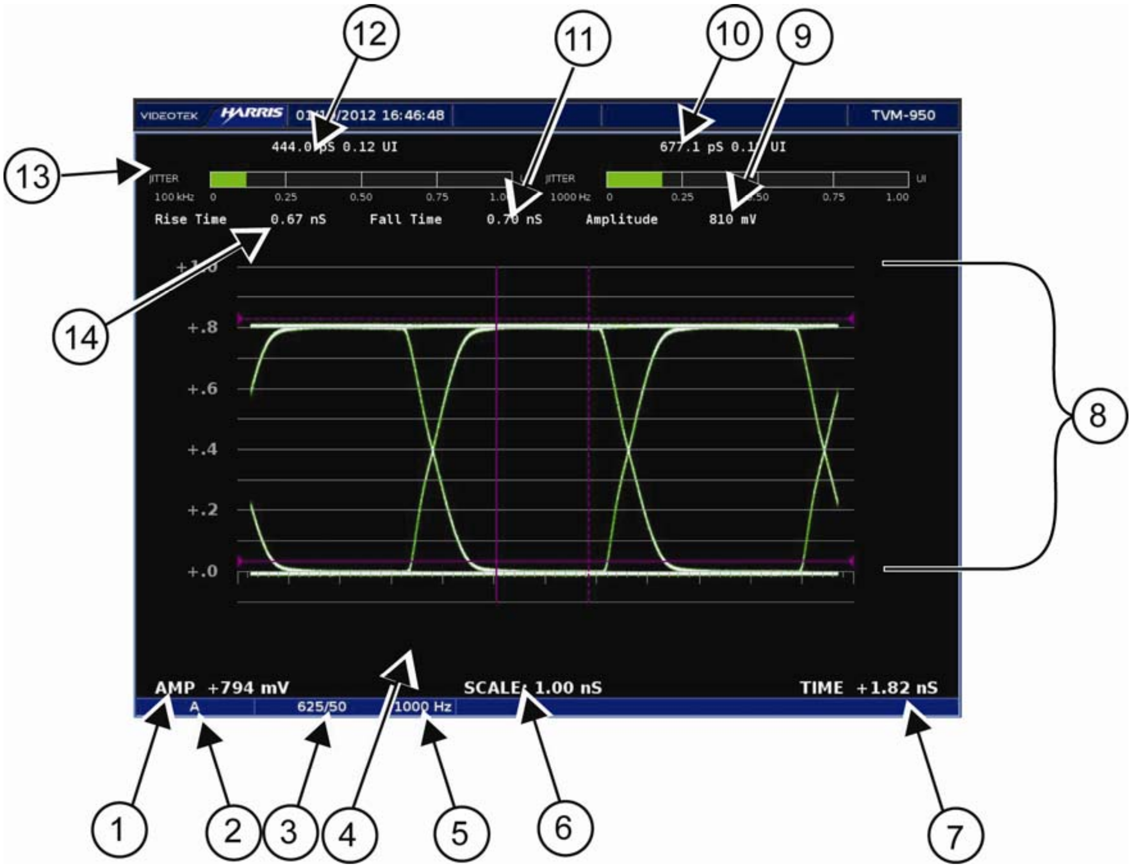


Table 3-16. Description of Eye Pattern Display Diagram

Field Identifier	Field Information	Nomenclature
1	Amplitude cursor readout	Displays amplitude cursor as AMP and the number in mV
2	Input	Displays user-configurable source IDs for input and routers
3	Standard	Line rate/Frame rate
4	Zoom	• Displays the Zoom when enabled • Blank when Zoom is disabled • Press the ZOOM button cycle through Zoom modes
5	High Pass Filter	Displays the selected eye filter
6	Scale	Displayed in ps for HD or ns for SD
7	Time cursor readout	Displays the time cursor as Time and the number in ps
8	EYE graticule	Displays the Eye Pattern graticule
9	Amplitude Value	Displays a numeric value for Eye Amplitude
10	Right Jitter Meter	Calculates jitter based on the HPF (high pass filter) setting of the jitter waveform display
11	Fall Time	Displays a numeric value for fall time
12	Left Jitter Meter	Calculates jitter based on the HPF (high pass filter) setting of the eye pattern display

Table 3-16. Description of Eye Pattern Display Diagram

Field Identifier	Field Information	Nomenclature
13	Jitter Display Bar	Displays the Jitter display. Jitter display changes according to the EYE PATTERN > JITTER DISPLAY TYPE menu in the Global Setup menu
14	Rise Time	Displays a numeric value for rise time

Figure 3-22. Jitter Waveform Display Diagram

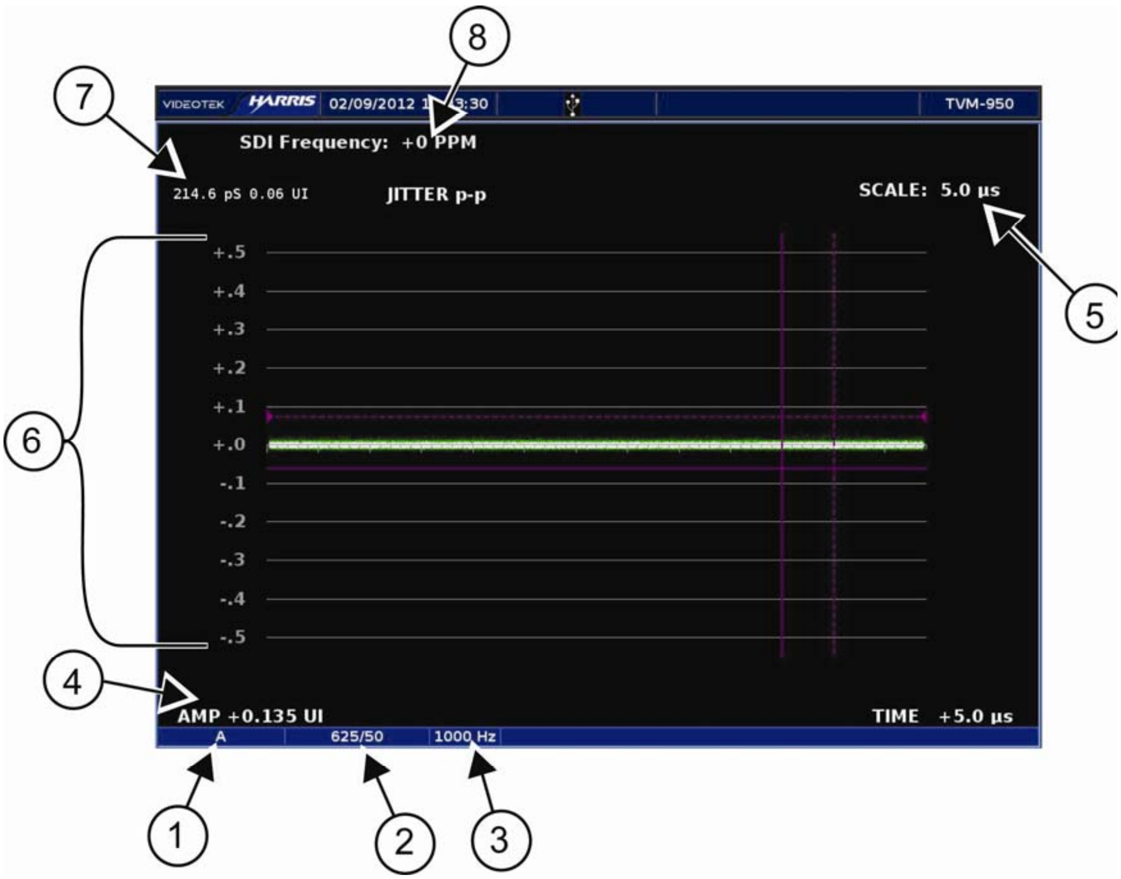


Table 3-17. Description of Jitter Waveform Display Diagram

Field Identifier	Field Information	Nomenclature
1	Input	Displays user-configurable source IDs for input and routers
2	Standard	Line rate/Frame rate
3	High Pass Filter	Displays the selected eye filter
4	Amplitude cursor readout	Displays amplitude cursor as AMP and the number in mV
5	Horizontal Jitter Scale	Displayed in µs
6	Jitter graticule	Displays the Eye Pattern graticule shown in p-p
7	Jitter p-p Value	Display a numeric value for the jitter on the signal
8	SDI Frequency	Displays the SDI signal frequency deviation from nominal, in PPM (parts per million).

Figure 3-23. Frequency Waveform Display Diagram

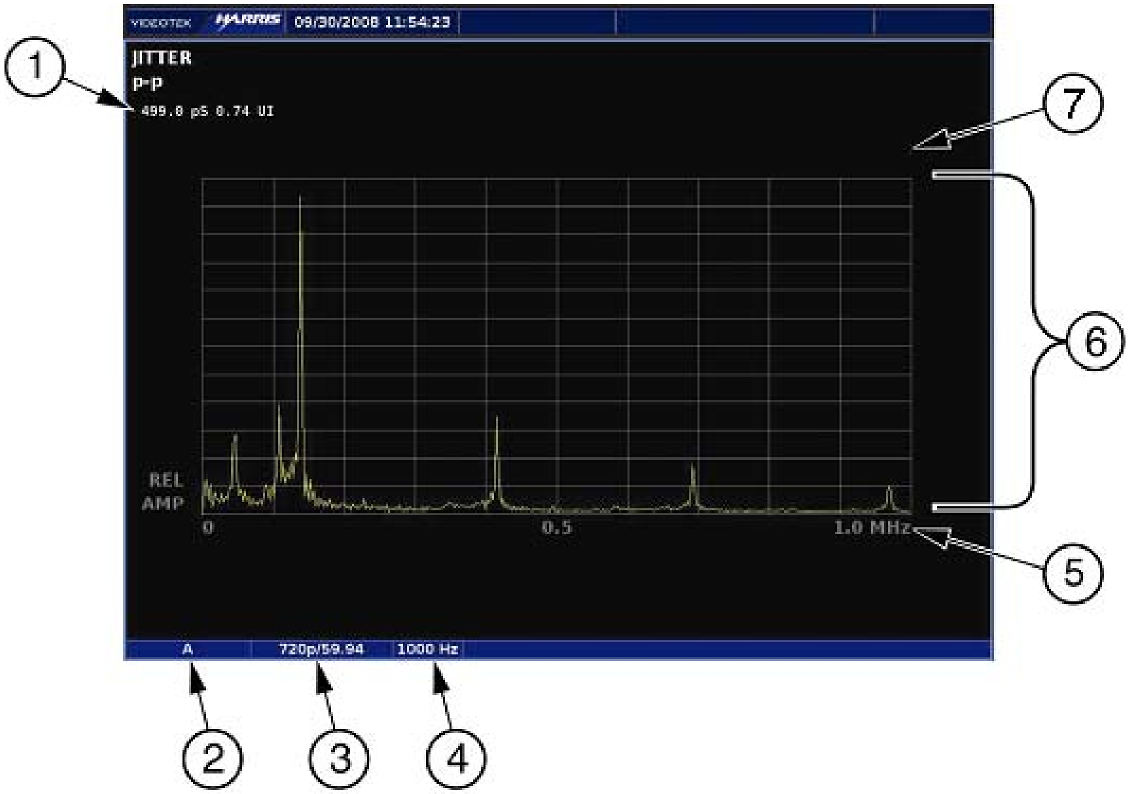


Table 3-18. Description of Frequency Waveform Display Diagram

Field Identifier	Field Information	Nomenclature
1	Jitter p-p Value	Display a numeric value for the jitter on the signal
2	Input	Displays user-configurable source IDs for input and routers
3	Standard	Line rate/Frame rate
4	High Pass Filter	Displays selected jitter filter
5	Horizontal Frequency Scale	Displays Jitter graticule shown relative to frequency
6	Jitter graticule	Displays Frequency Sweep graticule shown in p-p
7	Jitter spectrum gain readout	Displays jitter spectrum gain

Figure 3-24 to **Figure 3-26** displays the Eye pattern graticules.

Figure 3-24. Eye Pattern Graticule

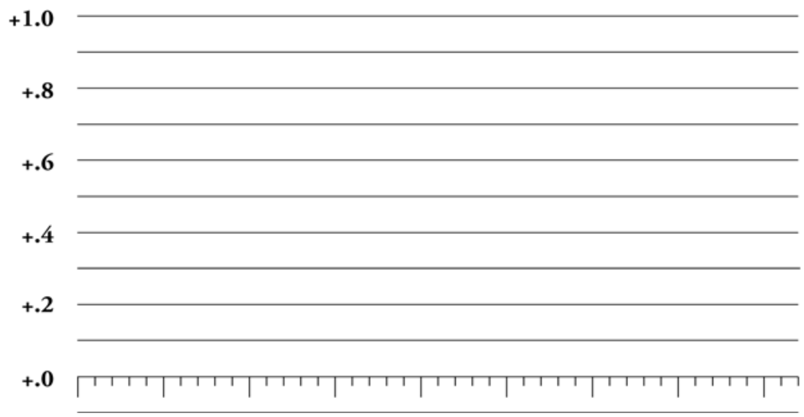


Figure 3-25. Eye Pattern Graticule at Zoom 0V

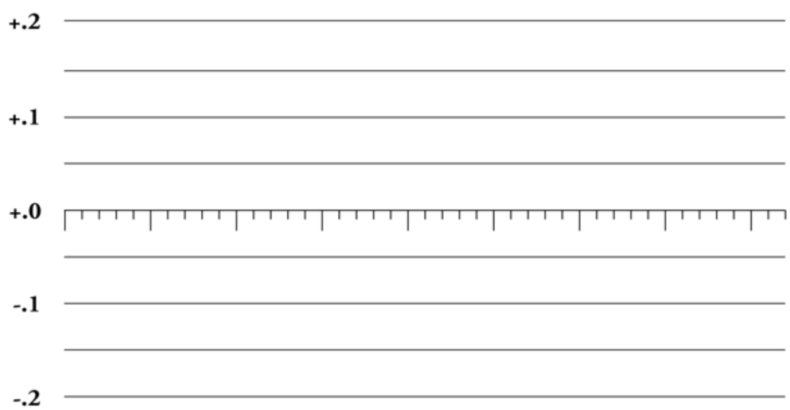


Figure 3-26. Eye Pattern Graticule at Zoom 800 mV

Eye Pattern Measurement Parameters/Considerations

The display will show rise time, fall time, and amplitude. Rise and fall times are displayed in ps for HD and ns for SD. Amplitude is displayed in mV.

The EYE measurement parameters are the most accurate with clean symmetrical data signals. Cable type, length and horizontal jitter decrease the accuracy of the readings.

- Cable length: For best results use less than 2 meters of low loss cable such as Belden 1694A.
- Jitter: When the horizontal jitter is 0.25 UI or more, the rise and fall readings may display dashes instead of numbers. Amplitude will continue to be reported.
- Jitter high pass filters (HPF): The EYE measurements are calculated from the displayed EYE on the screen. Changing the HPF filters allows the operator to decrease the displayed jitter to less than 0.25 UI for EYE readings. Default setting for the EYE HPF is 1000Hz.

If cursors are used to verify the measurements, the cursor readings may not match the automatic parameter readings. The automatic EYE measurements use peak detectors, histograms and curve fitting algorithms over time to give the most accurate readings.

Eye Pattern Parameters

The display will show rise time, fall time, and amplitude. Rise and fall times are display in ps for HD and ns for SD. Amplitude is displayed in mV.

Jitter Meter and Eye Pattern Correlation

The jitter meter is intended to display the maximum value of jitter over time. The correlation of values derived by using measurement cursors versus the jitter meter could differ unless the eye pattern is displayed using the maximum persistence setting. A normal persistence setting will make it more difficult to view pixels near the widest sample points, which forces the placement of the measurement cursors to a lower (narrower) jitter value.

Eye Pattern and Jitter Pane Menu Selections

Pressing and holding the EYE function button or the DISPLAY PANE button in the active Eye Pattern pane or Jitter Waveform pane selects the pane menu. Use the SETUP POSITION knobs or the NAVIGATION buttons to navigate the Pane menu.

The Eye Pattern Pane menu is described in **Table 3-19** for SD-SDI monitoring, and **Table 3-20** for HD-SDI and 3Gbps monitoring. The Jitter Waveform pane menu is described in **Table 3-21.** The difference between the two eye menus is the Trigger Mode selections of 10 EYE and 20 EYE.

Table 3-19. Eye SD-SDI Pane Menu Structure

Selection	Selection Option
Jitter HPF	10 Hz
	100 Hz
	1000 Hz
Trigger mode	OVERLAY
	10 EYE
Eye pattern setup	Press ENT

Table 3-20. Eye HD-SDI and 3Gbps Pane Menu Structure

Selection	Selection Option
Jitter HPF	10 Hz
	100 Hz
	1000 Hz
Trigger mode	OVERLAY
	20 EYE
Eye pattern setup	Press ENT

Table 3-21. Jitter Waveform Pane Menu Structure

Selection	Selection Option
Jitter HPF	10 Hz
	100 Hz
	1000 Hz
	10 kHz
	100 kHz
Jitter waveform mode	Waveform Sweep
	Frequency Sweep
Eye pattern setup	Press ENT

Jitter High Pass Filter (HPF) Selection

Because jitter on the data can develop from many sources and have a unique frequency distribution, the bandwidth of the sampling clock recovery circuit will affect the displayed jitter if the frequency of the jitter is within the bandwidth of the clock recovery circuits. Above the loop bandwidth, the loop has no effect on the jitter. While within the bandwidth, the apparent jitter displayed will be satisfied by the loop response.

To access the jitter high pass filter selections, press and hold the EYE button until the Eye Pattern pane menu appears. Select between 10 Hz, 100 Hz, or 1000 Hz is high tally. When 10 Hz, 100 Hz, or 1000 Hz is selected, the –3 dB response points only allow jitter above the selected filter frequency. This is useful with estimating the effects of jitter on clock recovery circuits of similar bandwidths in receivers and inferring the sources of the observed jitter based on frequency components present.

- With JEM option, changing this selection in the Eye Pane will change the Jitter selection in the Jitter pane (just as changing the selection in the Jitter pane will change the selection in the Eye Pane) unless 10 kHz or 100 kHz is selected in the Jitter pane. Selecting 10 kHz or 100 kHz will provide more Jitter filtering in the Jitter pane, but the Eye pane will not mirror the Jitter filtering selection. As long as 10 kHz or 100 kHz is selected in the Jitter pane, the filtering selection will not coincide with the filter selection in the Eye pane. Only when the selection in the Jitter Pane returns to 10 Hz, 100 Hz, or 1000 Hz will the Jitter pane and the Eye Pane mirror filtering selections.
- With JEM 2 and JEM3 options, eye pattern filter and jitter filter are independently selectable.

Trigger Mode

The TRIGGER MODE submenu is located in the EYE PATTERN SETUP menu. Within the TRIGGER MODE submenu, two modes of operation are available:

OVERLAY (3 Eye SD/HD/3Gbps)

10/20 EYE (10 Eye for SD/20 Eye for HD/3Gbps)

Distortions in Overlay mode are all displayed in the visible eye locations of the Eye Pattern display, giving a more easily observed display of the total jitter. Overlay displays three eye openings.

Jitter Waveform Mode

When the Jitter Waveform pane is first displayed in the selected pane, the Jitter is shown as the plot of the eye jitter vs. time. The Jitter Waveform Mode is used to change the display from the plot of the eye jitter vs. time to the plot of the jitter vs. frequency.

Eye Pattern Setup

Press the ENT button to access the global Eye Pattern setup menu. For more information on the global Eye Pattern Setup menu, see Section 4.

Utilizing the Vector Display

Pressing the VECT button accesses the Vector display for the selected pane. A vector display is shown in **Figure 3-27** and described in **Table 3-22**. This illustrates the general location for the various vector fields.

Figure 3-27. Vector Display Diagram

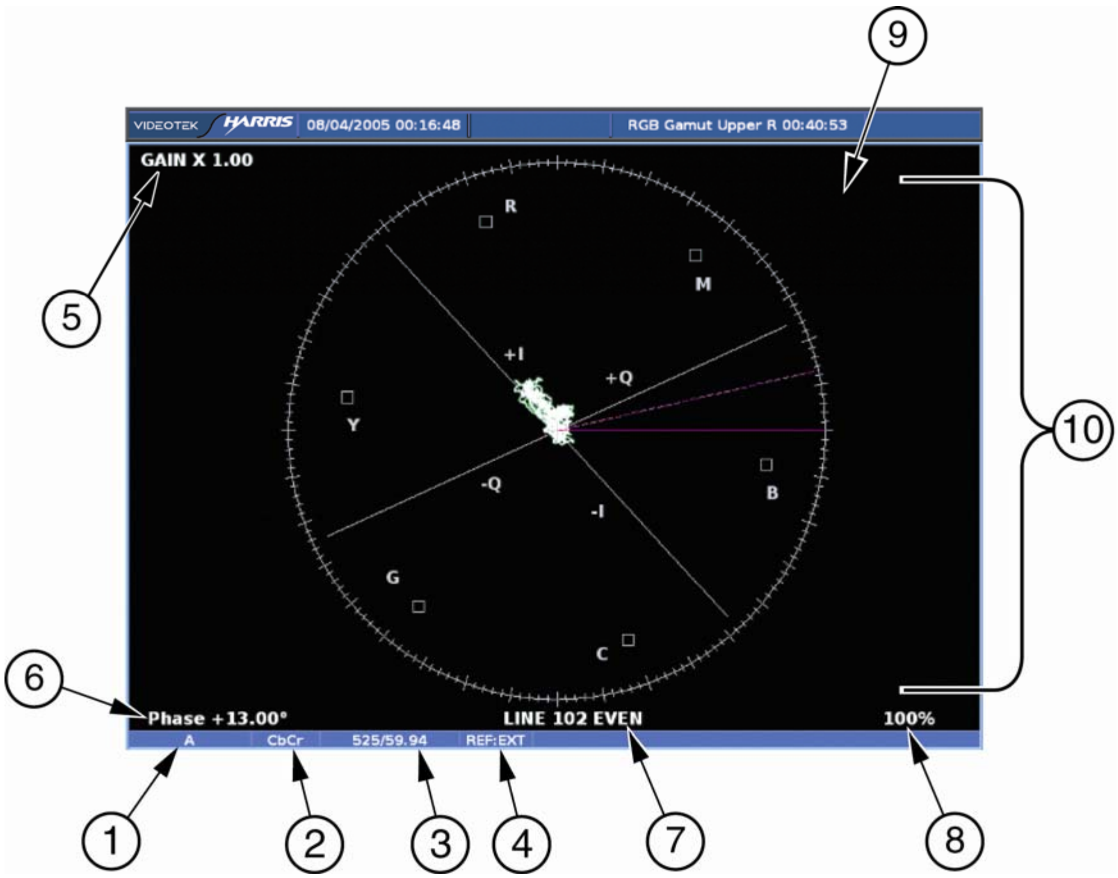


Table 3-22. Description of Vector Display Diagram

Field Identifier	Field Information	Nomenclature
1	Input	Displays user-configurable source IDs for input and routers
2	Format	Displayed as Composite and C_BC_R; this can be selected in the HD FORMAT or SD FORMAT submenu of the VECTOR Pane menu
3	Standard	Displays the Line Rate/Frame Rate [1080i/59.94]; this is selected in the VIDEO FORMAT > VIDEO A through D CONFIGURE menu
4	Reference	Displays the reference as INT, EXT; this is toggled by pressing the EXT button
5	Gain	Displays gain where Gain is 1.00, 2.50, 5.00, or 15.00; this is changed by pressing the STEP or VAR button
6	Phase cursor readout	Displays Phase cursor as PHASE and number in degrees

Table 3-22. Description of Vector Display Diagram

Field Identifier	Field Information	Nomenclature
7	Line select information	Line select is shown as Line and the number with the ODD or EVEN field (odd or even field will only show for certain Video Formats)
8	Vector Standard	Displayed as 75%, 100%, or 75% + 100% (HD only); this is selected in the Vector Pane setup submenu called Analog standard, SD standard, or HD standard
9	Zoom	• Zoom (when enabled) • Blank when disabled • Press the ZOOM button to cycle through Zoom modes
10	Vector graticule	Shows Vector graticule

Graticules are configured by selecting the Video Input Format along with the appropriate Vector Setup standard.

Some graticule scales are illustrated in **Figure 3-28** to **Figure 3-35**.

Figure 3-28. Vector NTSC Graticule

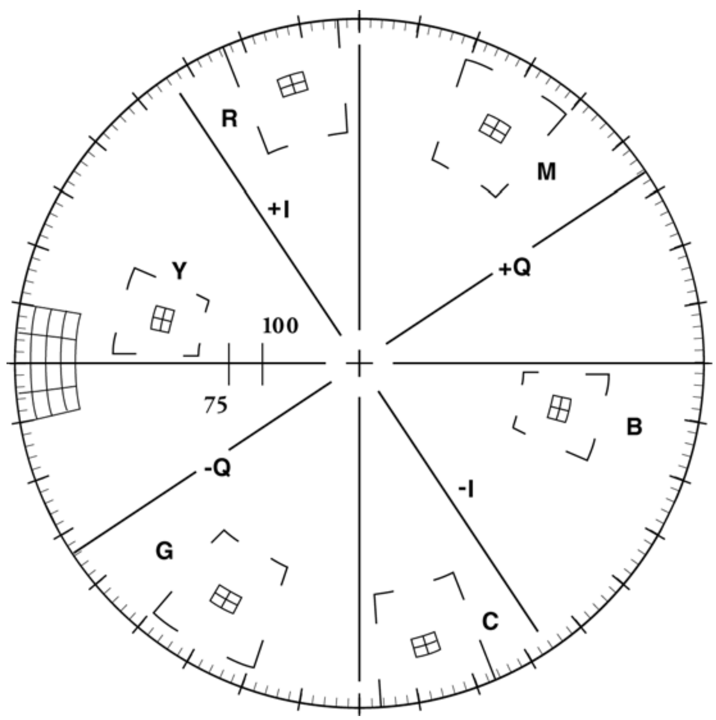


Figure 3-29. Vector NTSC Zoom Upper Left

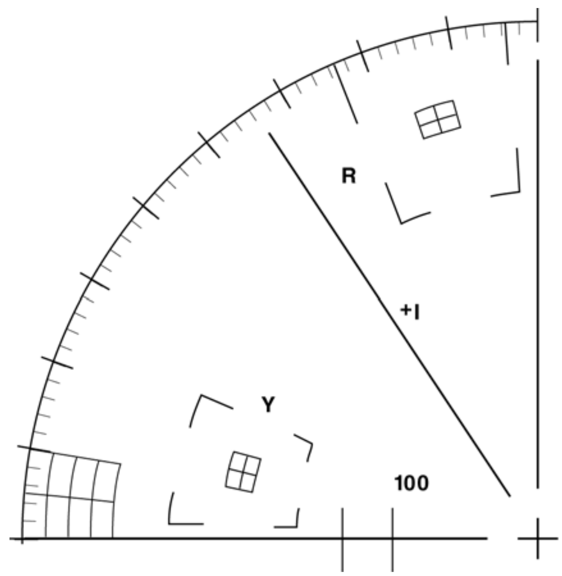


Figure 3-30. Vector NTSC Zoom Upper Right

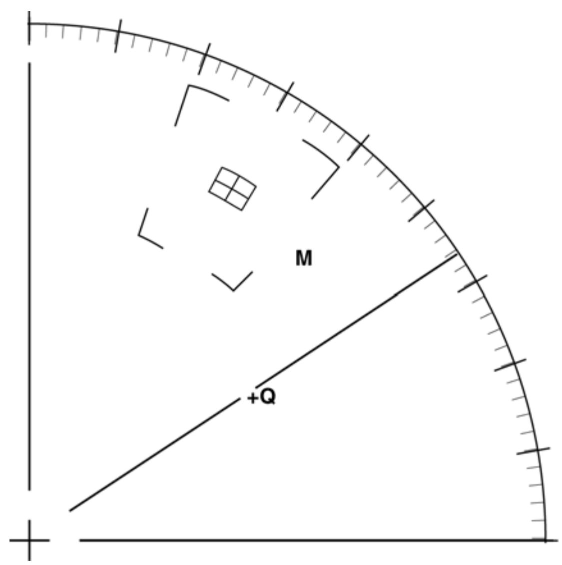


Figure 3-31. Vector NTSC Zoom Lower Right

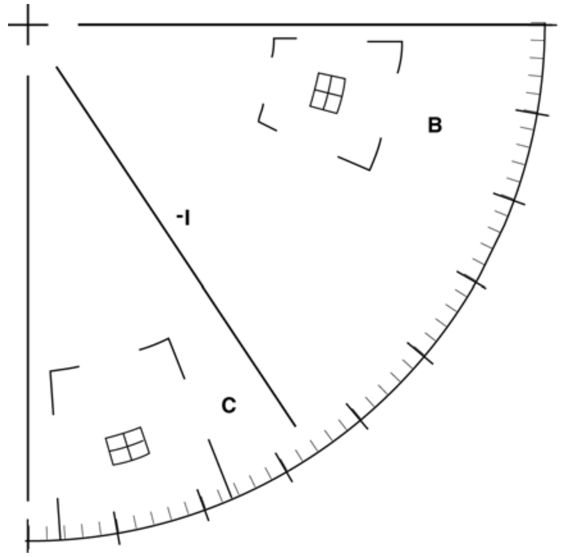


Figure 3-32. Vector NTSC Zoom Lower Left

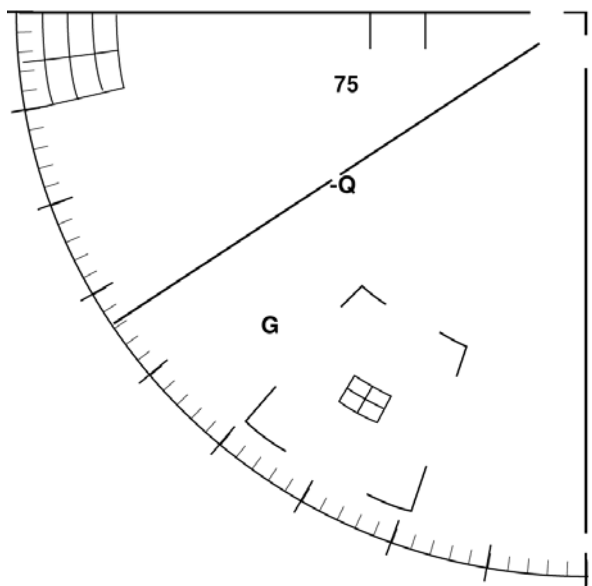


Figure 3-33. Vector PAL Zoom Center

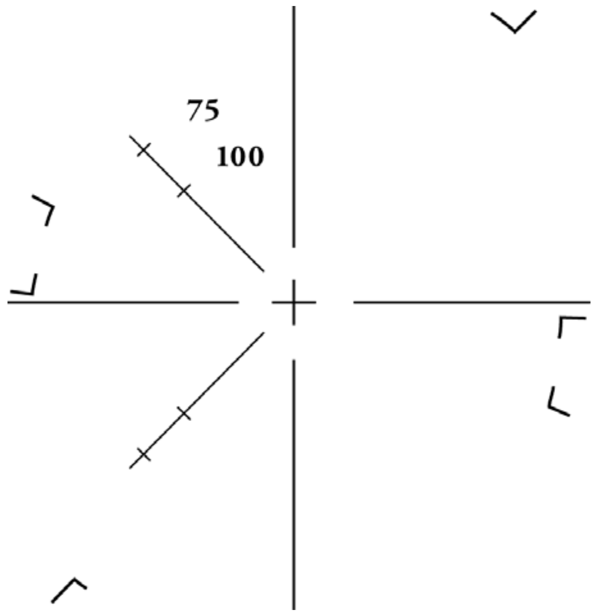


Figure 3-34. Vector SD with I/Q

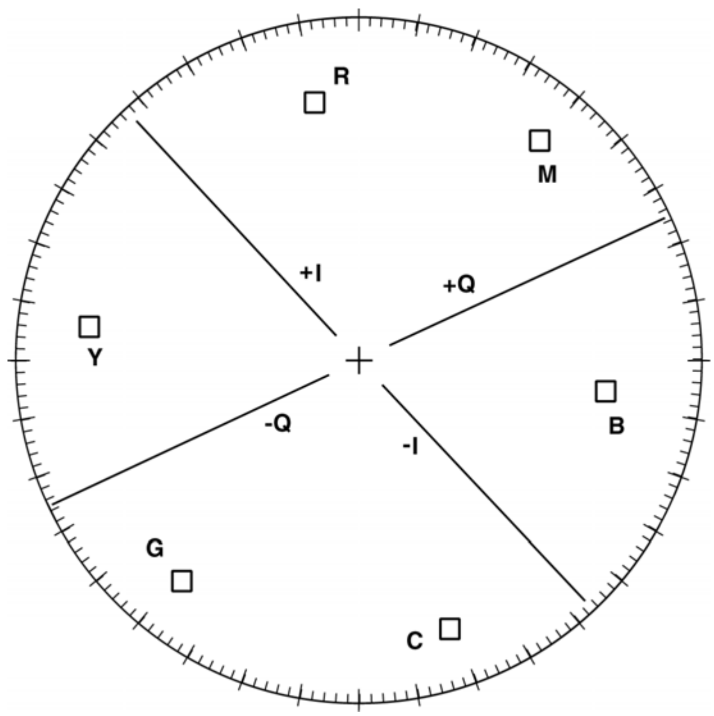
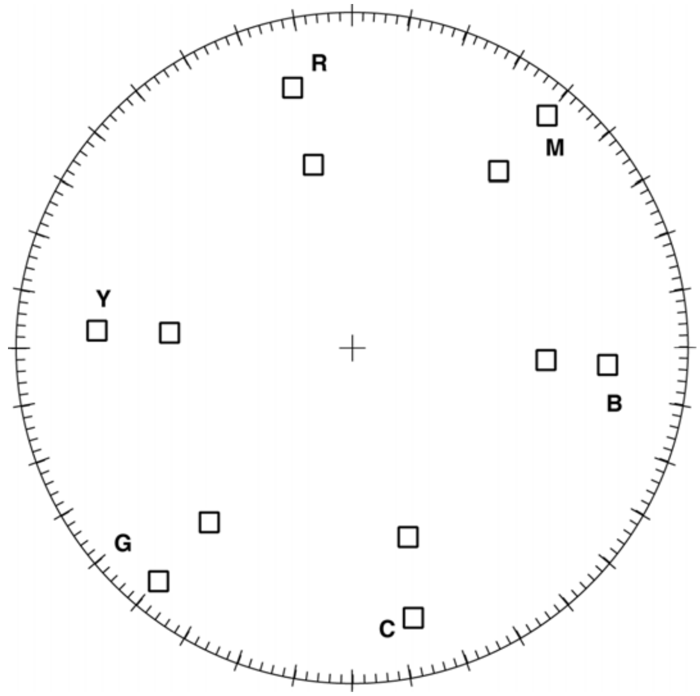


Figure 3-35. Vector HD 75% + 100% Graticule



Controlling the Vector

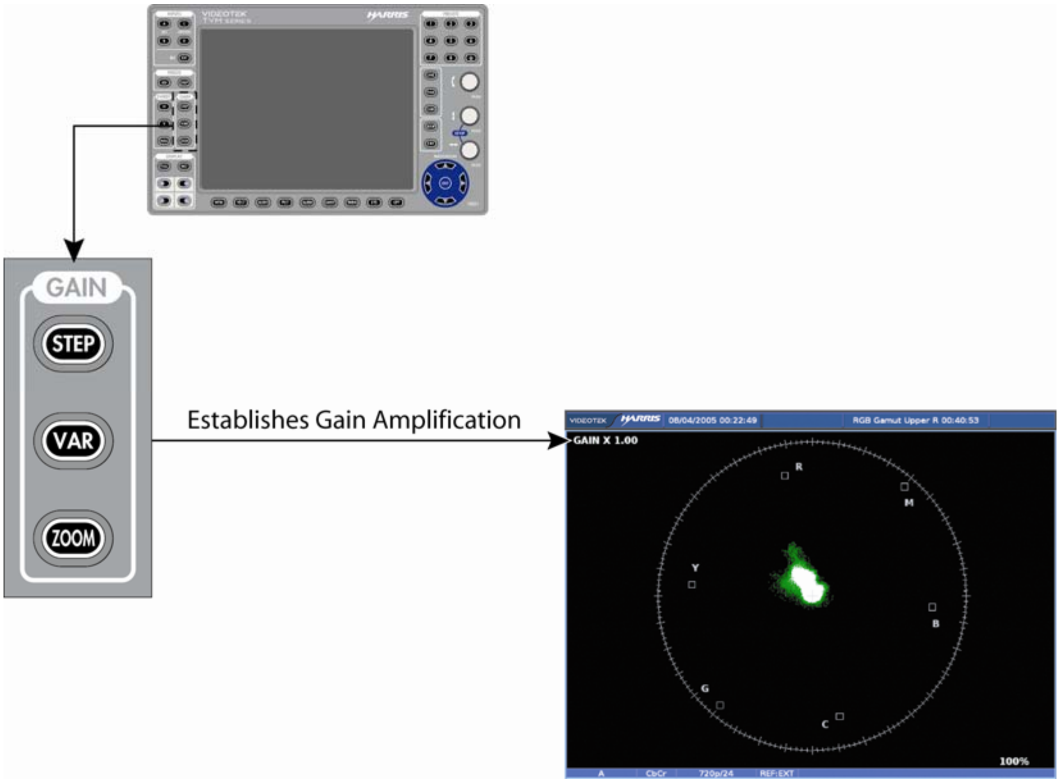
(For Composite analog video input only) A vector display has two individual properties: phase and magnitude. To control the phase of the vector, press the PHASE button and turn the CURVED ARROW knob.

The magnitude is controlled by the Variable Gain. Press the VAR button and then use the CURVED ARROW knob. Variable gain can be used in all formats.

Gain Buttons

The standard gain in the vector is x1.0. The TVM can be used to set the gain amplification in the video signal using the Gain group of buttons. The gain setting appears in the upper-left portion of the vector pane, as shown in **Figure 3-36**.

Figure 3-36. Establishing the Vector Gain



Press the STEP button to step through the available gain selections x1.0, x2.5, x5.0, and x15.0. Press and hold the STEP button to select the GAIN pane menu. Step button functionality is modified in the step pop-up menu. Selections are:

- Allow all
- x1 and x2.5 (only)
- x1 and x5 (only)
- x1 and x15 (only)

Press VAR to access Vector Variable Gain. Once the VAR button is illuminated, the Vector Variable Gain can be adjusted using the curved arrow KNOB. The gain is adjusted in increments of 0.01 from 0.50 to 10.00. The Variable Gain range for a waveform will be x0.50 to x15.00. Multiplying VAR and STEP gain together gives a vector gain range of x0.50 to x150.00.

Press the VAR button to exit Variable Gain mode.

Pressing the STEP button while in Variable Gain selects the next STEP gain.

Press ZOOM to cycle through one of six displays:

Expand the center

Expand the upper-left quadrant

Expand the upper-right quadrant

Expand the lower-right quadrant

Expand the lower-left quadrant

Normal

Vector Zoom is helpful when an increased resolution of phase or saturation is required. Press and hold ZOOM to enable the zoom pop-up menu. This is used to modify the functionality of the ZOOM button. Once selected, press ZOOM to toggle between the selected zoom screen and the normal screen. If normal is selected in the Zoom menu, then pressing ZOOM will step through each zoom display.

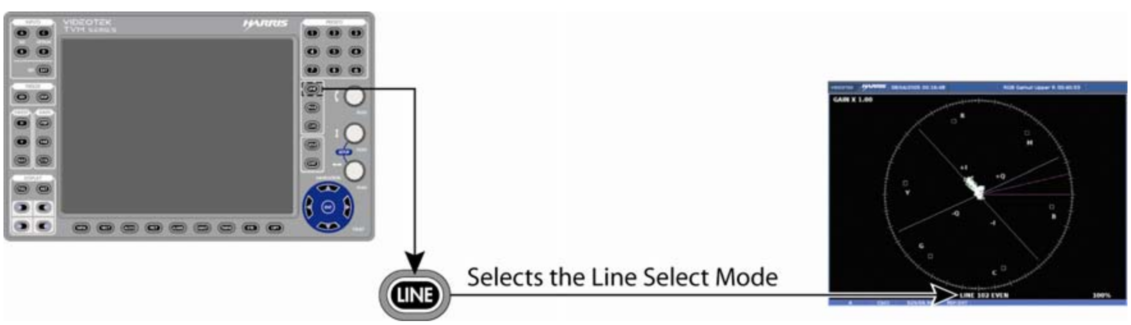
Placing the Vector Display in Line Select Mode

NOTE: When inputs A and B are selected simultaneously, the Line Select function is not available.

Pressing the LINE button enables the selected pane to monitor a single line of a video signal. This enables Line Select to monitor individual areas of the entire image. To view a line in Line Select mode:

1. Press the LINE button to place the selected vector display pane in Line Select mode. At the bottom-center of the display, the pane displays the Line number and Odd or Even field, as shown in **Figure 3-37**.

Figure 3-37. Establishing Line Select



NOTE: In a Progressive (p) format odd and even selection is not available.

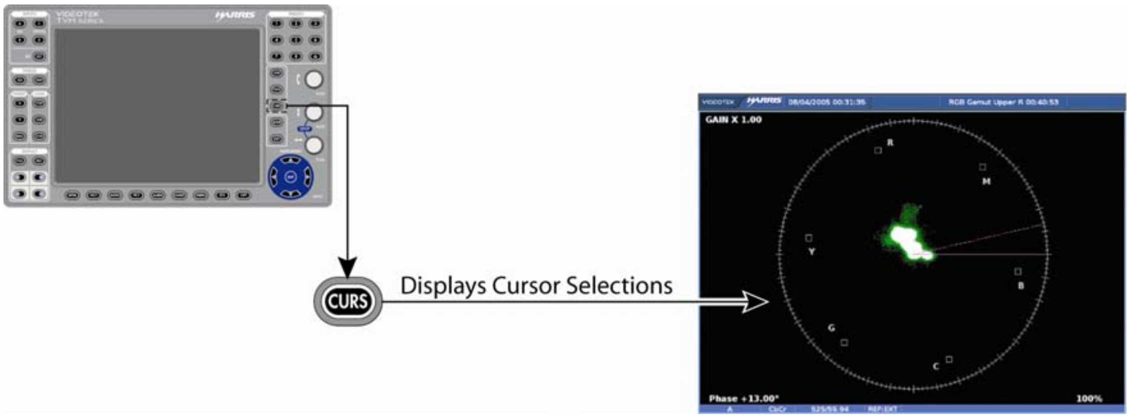
2. Press the CURVED ARROW knob to alternate between the ODD and EVEN fields.
3. Rotate the CURVED ARROW knob to select the line to be displayed.

When the inputs are linked, Line Select is a global setting. When the inputs are not linked, Line Select is pane specific. When a picture is displayed in one of the panes, a marker on the edge of the picture approximates the displayed line position (+/- 1 line).

Vector Cursor Selections

Cursors are available for precise measurement of vector phase (in degrees). Press the CURS button on the front panel to enable the cursors for the selected pane. The Phase Cursor indications are in the lower-left portion of the screen as shown in **Figure 3-38**.

Figure 3-38. Establishing Cursor Select



To enable the Phase cursors, press and hold the CURS button. Once the PHASE pop-up menu appears on the screen, press the ENT button to enable it. Once the cursor is selected, press the EXIT button to exit the CURS pane menu.

When the cursor is selected, the Phase indication appears. Beside the Phase indication is a numeric readout that indicates the difference between the REF and DELTA lines. The active line (REF, DELTA, or both) is shown with small arrows at the outer end of the line.

Once a line is selected for control:

1. Press the curved arrow knob to select the REF or DELTA line to control. The REF line is the solid line, and the DELTA line is the dotted line.
2. Rotate the knob to move the REF or DELTA line to the desired location.
3. Press the knob for the next line. Rotate the knob to move the other line to the desired location.
4. Press the knob a third time to control both the REF and DELTA lines.
5. Repeat as necessary.

Once the cursors are no longer necessary, press and hold the CURS button to return to the Cursor menu and disable the Phase cursor selection. The check mark indicates the cursor is enabled, and no check mark indicates the cursor is disabled.

To exit the cursor function while leaving the cursor active, just select another mode in the pane (that is Line Select, Variable Gain, etc.)

Vector Pane Menu Selections

Pressing and holding the VECT function button or the DISPLAY PANE button in the active vector pane selects the pane menu. Use the SETUP POSITION knobs or the NAVIGATION buttons to navigate the Pane menu.

The Vector Pane menu is described in **Table 3-23** for analog, **Table 3-24** for SD-SDI monitoring, and **Table 3-25** for HD-SDI monitoring. Though all menu items appear on the display in one complete group, the tables below indicate what will function with the selected formats.

Table 3-23. Vector Analog Pane Menu Structure

Selection	Selection Option
Analog standard	75%
	100%
Position	Use H POS and V POS knob. Press KNOB for center.
Setup	Press ENT

Table 3-24. Vector SD-SDI Pane Menu Structure

Selection	Selection Option
SD standard	75%
	100%
Scale SD to composite	Off
	On
Position	Use H POS and V POS knob. Press KNOB for center.
Setup	Press ENT

Table 3-25. Vector HD-SDI Pane Menu Structure

Selection	Selection Option
HD standard	75%
	100%
	75% + 100%
Scale HD to composite	Off
	On
Position	Use H POS and V POS knob. Press KNOB for center.
Vector Setup	Press ENT

Standard

NOTE: This selection also is reflected in the Gamut display for the selected pane.

Standard is used to set the marks on the vector display. The marks on the vector help to visualize the minimum/maximum value of a video signal. The position of the excursion marks are 75% or 100% for analog, SD, and HD. Also, the HD standard can be selected as 75% and 100% simultaneously.

Scaled to Composite (SD and HD only)

Also, with an HD or SD signal, the Scaled to Composite menu can be used to scale the SD or HD vector to reflect a composite format.

Vector Position (Centering the Vector)

Centering the vector should be a one-time calibration. Centering of the vector can be accomplished by adjusting the Vector V position and Vector H position in the VECTOR SETUP menu.

Vector Setup

Press the ENT button to access the global Vector setup menu. For more information on the global Vector Setup menu, see Section 4.

Gamut Display

A constant setback in video production is the difference between the allowable ranges of dissimilar component and composite color spaces. Combinations of values that are within the range of a color difference component video system produce signal amplitudes outside the ranges when the signal is transcoded to composite or RGB color space.

Pressing the GAMUT button accesses the gamut display for the selected pane. The Gamut displays show RGB limits or composite video limits. Both Gamut displays illustrate what colors are causing illegal excursions and whether these digressions are above or below the allowable limits. The inputs are shown as an encoded display with gamut alarms. A Digital Input must be selected in order to view the Gamut display.

The displays show RGB and composite video limits.

Vector excursion marks are displayed in the gamut displays. The excursion marks help to visualize the minimum/maximum value of a 100% color bar signal. The position of the excursion marks depend on the selected Video Format selection from the VIDEO FORMAT > VIDEO A through D CONFIGURE menu.

A gamut display diagram is shown in **Figure 3-39** and described in **Table 3-26**. The diagram illustrates the general location for the various gamut fields.

Figure 3-39. Gamut Display Diagram

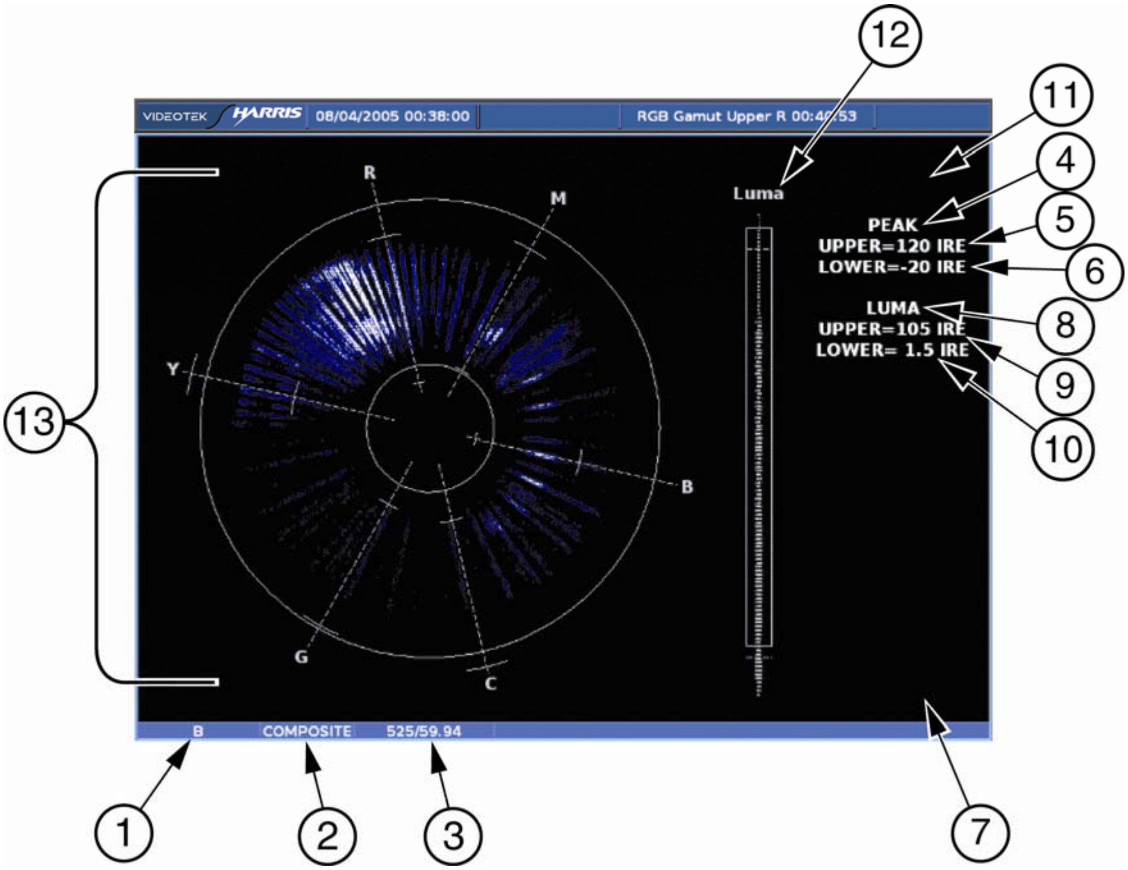


Table 3-26. Description of Gamut Display Diagram

Field Identifier	Field Information	Nomenclature
1	Input	Displays user-configurable source IDs for input and routers
2	Format	Displayed as Composite and RGB; this can be selected in the HD FORMAT or SD FORMAT submenu of the GAMUT Pane menu
3	Standard	Displays the Line Rate/Frame Rate [1080i/59.94]; this is selected in the VIDEO FORMAT > VIDEO A through D CONFIGURE menu
4	Chroma alarm limits	Displayed as RGB (for RGB) and PEAK (for Composite)
5	Upper chroma alarm limit	Displayed as Upper = xxx yy • For RGB xxx is the RGB Gamut upper threshold setting and yy is shown as mV • For Composite, xxx is the Peak upper threshold setting. In Composite, yy is determined by the format (IRE for NTSC and Units or mV for PAL)
6	Lower chroma alarm limit	Displayed as Lower = xxx yy • For RGB xxx is the s the RGB Gamut lower threshold setting, and yy as units • For Composite, xxx is the Peak lower threshold setting. In Composite, yy is determined by the format (IRE for NTSC and Units for PAL)

Table 3-26. Description of Gamut Display Diagram

Field Identifier	Field Information	Nomenclature
7	Line select information	Line select is shown as Line and the number with the ODD or EVEN field (when applicable)
8	Luma alarm limit	Displays Luma when Composite is selected. This field is blank when RGB is selected
9	Upper luma alarm limit (Composite only)	Displayed as Upper = xxx yyl *xxx* is the Luma upper threshold setting, and *yy* is determined by the format (IRE for NTSC and Units or mV for PAL)
10	Lower luma alarm limit (Composite only)	Displayed as Lower = xxx yy; *xxx* is the Luma lower threshold setting, and *yy* is determined by the format (IRE for NTSC and Units or mV for PAL)
11	Zoom	• Zoom (when enabled) • Blank when disabled • Press the ZOOM button to cycle through Zoom modes
12	Luma/Mono bar graticule	Shows the Luma/Mono bar graticule
13	Gamut Graticule	Composite or RGB Gamut graticule

Composite Gamut

The graticule for the composite gamut vector, as shown in **Figure 3-40** and described **in Table 3-27**, is two concentric circles with other identifiers. When setting the upper and lower limits, the upper and lower gamut rings represent the values set from the threshold values of the appropriate format. Set the 525 or 625 (check format) threshold in the VIDEO ALARMS DIGITAL > DIGITAL GAMUT > PEAK GAMUT (UPPER/LOWER) menu to move the gamut rings, or LUMA GAMUT (UPPER/LOWER) > THRESHOLD 525/625 menu to move the luma bar limits. The outer circle (the upper gamut alarm limit) represents the highest allowable amplitude in standard composite units (that is, IRE for NTSC and units for PAL). The inner circle (the lower gamut alarm limit) represents the lowest allowable amplitude. The rings turn red when the alarm is enabled and the values exceed the threshold setting.

The other identifiers are radials that extend at the angle of the designated color. These six lines follow the same displacement as the vector display. Note that since the PAL display is derived solely from component information, there are not two phases for PAL signals. The +V phase is used (making the vectors look similar to NTSC).

NOTE: There is an alarm persistence of two seconds associated with any alarm indication. After an alarm has cleared, two seconds will pass before the gamut alarm indicator returns to normal.

Figure 3-40. Composite Gamut Vector Display Graticule Markings

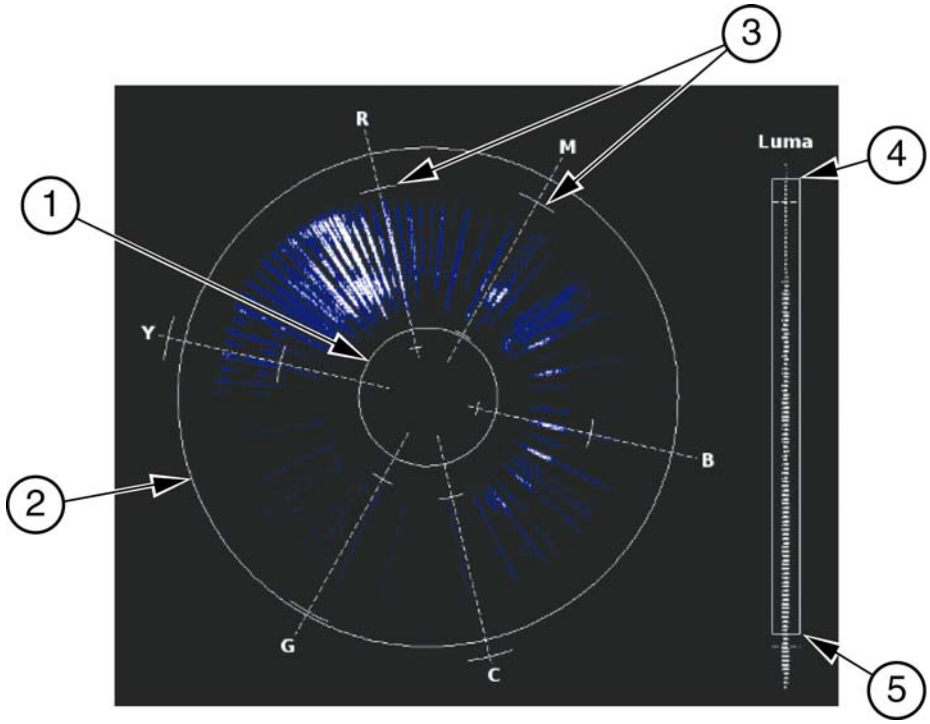


Table 3-27. Description of Composite Gamut Indicators

Key	Indicator	Description
1	Lower gamut ring	The lower gamut ring indicates the Gamut alarm Peak Lower limit. When the Gamut alarm is enabled and the Peak Lower limit is exceeded, the lower gamut ring turns red.
2	Upper gamut ring	The upper gamut ring indicates the Gamut alarm Peak Upper limit. When the Gamut alarm Peak Upper limit is exceeded, the upper gamut ring turns red.
3	Vector excursion mark	The excursion marks help to visualize the minimum/maximum value of 100% color bars.
4	Luma upper limit line	The Luma Upper Limit Line indicates the Gamut alarm Luma Upper limit. When the Gamut alarm is enabled, and the Luma Upper limit is exceeded, the luma upper limit line and LUMA turn red.
5	Luma lower limit line	The Luma Lower Limit Line indicates the Gamut alarm Luma Lower limit. When the Gamut alarm is enabled, and the Luma lower limit is exceeded, the Luma Lower Limit line and LUMA turn red.

RGB Gamut Display

When setting the upper and lower limits, the upper and lower gamut rings represent the threshold values. Set the threshold in the VIDEO ALARMS DIGITAL > DIGITAL GAMUT > RGB (UPPER/LOWER) > THRESHOLD menu to move to gamut rings. The RGB Gamut Display, shown in **Figure 3-41** and described in **Table 3-28**, is similar to the Composite Gamut Display. The RGB Gamut vector displays video amplitudes (which are in mV) in a polar format to represent color information. The rings turn red when the alarm is enabled and the values exceed the threshold setting.

Each R, G, and B pixel is plotted using amplitude and phase. The amplitude is derived from the R, G, B component. The phase is derived from the C_B C_R information of the digital signal. The pixels can be plotted as a single color or as each component color (see the Gamut Setup menu in Section 4). Unlike the composite Gamut vector, which plots two points per pixel, the RGB Gamut vector plots three points. Also, signals with no color content are displayed on a separate bar graph labeled Mono.

The RGB graticule is nearly identical to the composite graticule. The only differences are:

Amplitudes are displayed in mV rather than IRE or UNITS.

The radials representing color vectors are 60° apart since they are displayed in a component color space.

Mono bar graph is for monochrome.

NOTE: There is an alarm persistence of two seconds associated with any alarm indication. After an alarm has cleared, two seconds will pass before the gamut indicator returns to normal.

Figure 3-41. Component Gamut Vector Display Graticule Markings

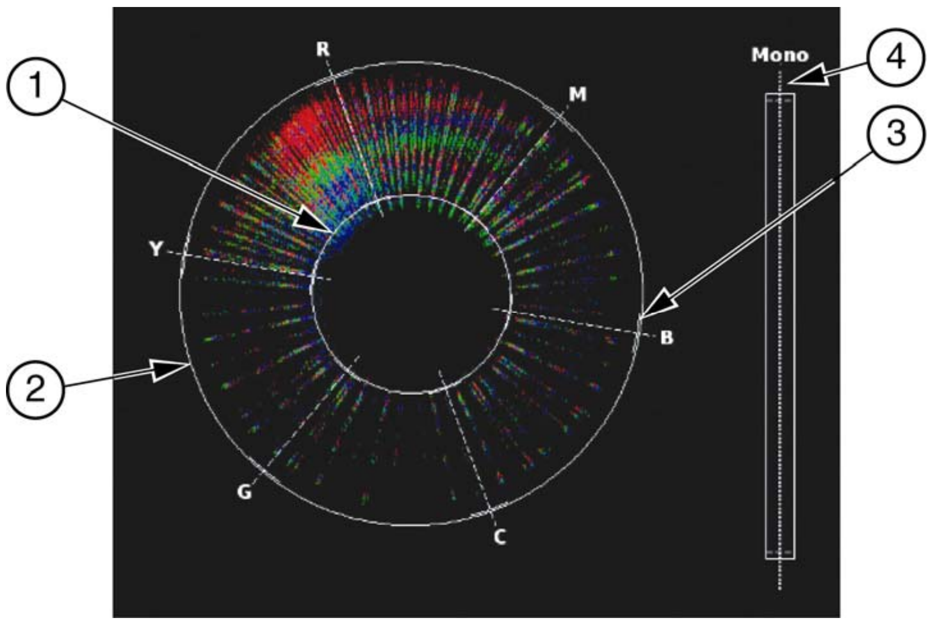


Table 3-28. Description of RGB Gamut Indicators

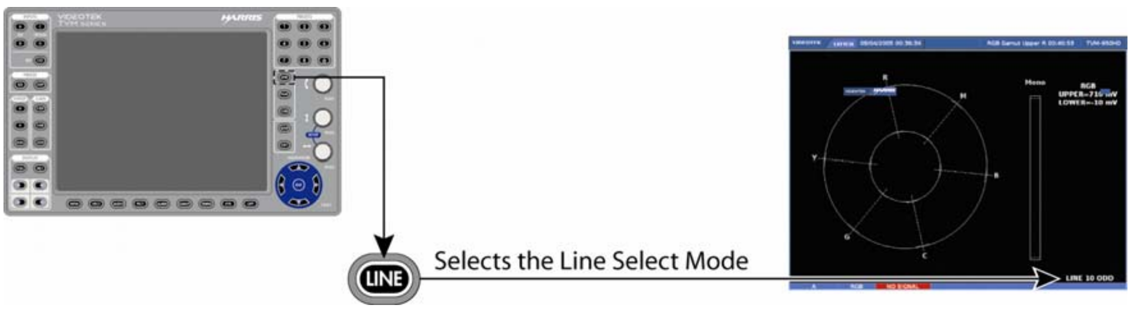
Key	Indicator	Description
1	Lower gamut ring	The lower gamut ring indicates the RGB Gamut alarm Lower limit. When the RGB Gamut alarm is enabled and the Lower limit is exceeded, the lower gamut ring turns red.
2	Upper gamut ring	The upper gamut ring indicates the RGB Gamut alarm Upper limit. When the RGB Gamut alarm is enabled, and the Upper limit is exceeded, the upper gamut ring turns red.
3	Vector excursion mark	The excursion marks help to visualize the minimum/maximum values of 100% color bars.
4	Mono	Mono indicates the monochrome of the RGB signal. There is no alarm associated with Mono.

Placing the Gamut Display in Line Select Mode

Pressing the LINE button enables the selected pane to monitor a single line of a video signal. This enables Line Select to monitor individual lines of the entire image. To view a line in Line Select mode:

1. Press the LINE button to place the selected Gamut display pane in Line Select mode. At the bottom-right of the display, the pane displays the Line number and Odd or Even field, as shown in **Figure 3-42**.

Figure 3-42. Establishing Line Select



NOTE: In a Progressive (p) format odd and even selection is not available.

2. Press the curved arrow knob to alternate between the Odd and Even fields for interlaced formats.
3. Rotate the curved arrow knob to select the line to be displayed.

When the inputs are linked, Line Select is a global setting. When the inputs are not linked, Line Select is pane specific. When a picture is displayed in one of the panes, a marker on the edge of the picture approximates the displayed line position (+/- 1 line).

Gamut Zoom

Press ZOOM to cycle through one of six displays of the Composite or RGB gamut graticule:

Expand the center

Expand the upper-left quadrant

Expand the upper-right quadrant

Expand the lower-right quadrant

Expand the lower-left quadrant

Zoom off

Press and hold ZOOM to select the zoom pop-up menu. This menu is used to modify the ZOOM button. Once selected, press ZOOM to toggle between the selected Zoom screen and the Normal screen. If NORMAL is selected in the ZOOM menu, pressing ZOOM steps through each zoom display.

Gamut Pane Menu Selections

Pressing and holding the GAMUT function button or the selected DISPLAY PANE button in the active gamut pane selects the pane menu. The Gamut Pane menu is described in **Table 3-29**.

Table 3-29. Gamut Menu Structure

Selection	Selection Option
Color space	RGB
	CMPST
Gamut setup	Press ENT

Color Space

Color Space is used to determine the type of gamut graticule that appears in the pane. Selecting RGB displays the RGB gamut graticule. Selecting CMPST displays the Composite gamut graticule.

Gamut Setup

Press the ENT button to access the global Gamut setup menu. For more information on the global Gamut Setup menu, see Section 4.

Picture Display

The picture display pane is used to show the picture of the selected input. Press the PICT button to display the picture in the selected pane. A Picture display diagram is shown in **Figure 3-43** and described in **Table 3-30**. The TVM9150PKG can display up to four pictures when equipped with two input modules. The TVM9140PKG can display one picture and up to four thumbnails when equipped with two input modules. The TVM9100PKG is limited to one picture or thumbnail display.

NOTE: Pictures can be used as thumbnails. Refer to Section 4, ”Picture Setup Menu.”

Figure 3-43. Picture Display Diagram

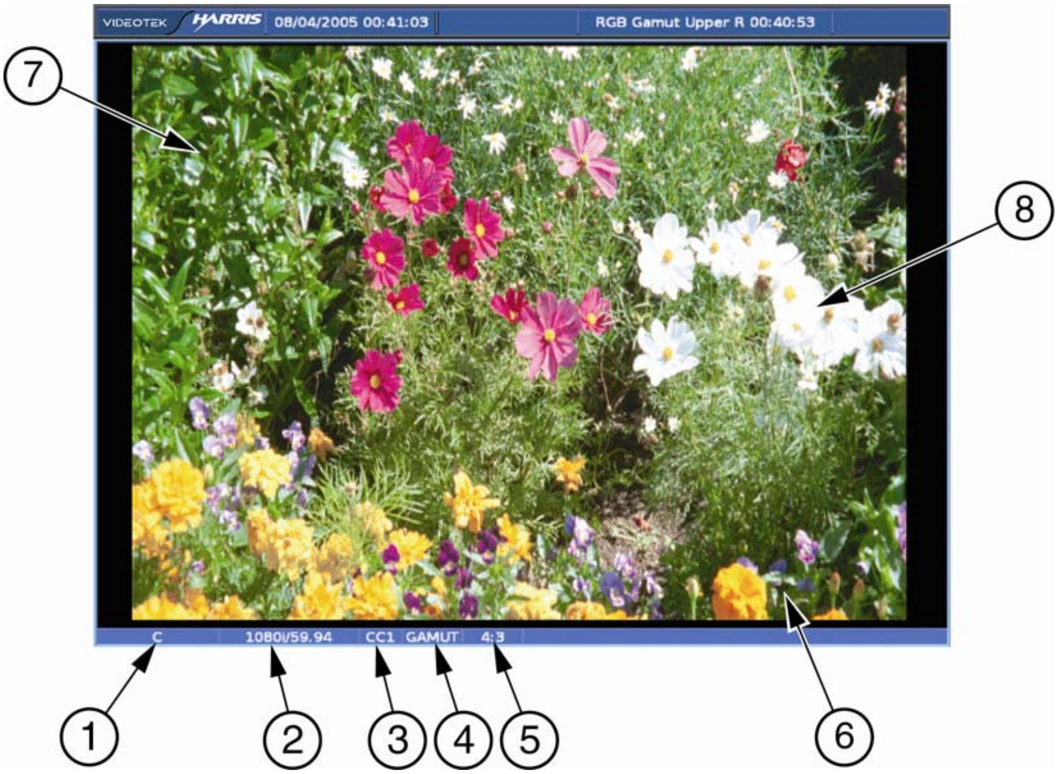
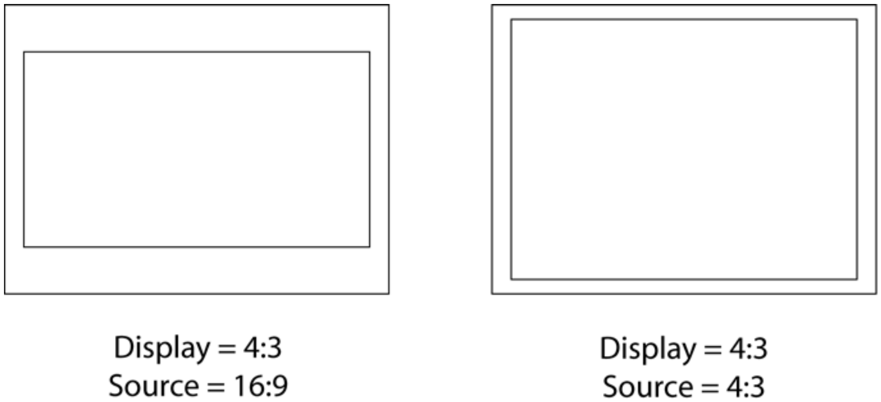


Table 3-30. Description of Picture Display Diagram

Field Identifier	Field Information	Nomenclature
1	Input	Displays user-configurable source IDs for input and routers
2	Standard	Displays the Line Rate/Frame Rate [1080i/59.94]; select the Standard in the VIDEO FORMAT > VIDEO A through D CONFIGURE menu
3	Closed caption	Shown as CC1 – CC4, T1 – T4, TT (Teletext), OP-47, or 708; Closed Caption selections are located in the PICTURE SETUP > CLOSED CAPTION DISPLAY menu
4	Gamut indication status	Displayed when Gamut is enabled (this field is not displayed when Gamut for the input is disabled); select GAMUT in the PICT pane menu to enable GAMUT
5	Aspect ratio	Displays the selected aspect ratio; select the HD or SD aspect ratio in the PICTURE SETUP > SD or HD ASPECT RATIO menu
6	Picture	Displays picture of the selected video input
7	XDS	Displays location of the XDS information
8	Timecode	Displays location of the timecode information

The picture display changes according to the aspect ratio and anamorphic selections in the global setup menu. A picture display diagram, shown as the left drawing in **Figure 3-44**, shows the 4:3 display with a 16:9 source. Also, the picture to the right in **Figure 3-44** shows a 4:3 display with a 4:3 source.

Figure 3-44. Aspect Ratio Source Diagram



Picture Pane Menu Selections

Pressing and holding the PICT function button or the DISPLAY PANE button in the active picture pane selects the pane menu. The Picture Pane menus are described in **Table 3-31** to **Table 3-34** for picture monitoring.

Table 3-31. Picture Analog Menu

Selection	Selection Option
Native	Off
	On
Delay	On
	Off
Delay position	Use the H POS and V POS knobs. Press KNOB for default.
Picture setup	Press ENT

Table 3-32. Picture SD Menu

Selection	Selection Option
Native	Off
	On
Delay	On
	Off
Delay position	Use the H POS and V POS knobs. Press KNOB for default.
Gamut Highlighting	Off
	On
Picture setup	Press ENT

Table 3-33. Picture HD Menu TVM9100PKG, TVM9140PKG

Selection	Selection Option
Delay	On
	Off
Delay position	Use the H POS and V POS knobs. Press KNOB for default.
Gamut Highlighting	Off
	On
Display Dual Link Alpha	Off
	On
Picture setup	Press ENT

Table 3-34. Picture HD Menu TVM9150PKG

Selection	Selection Option
3D Display (See Note on page 80)	Off
	Left-Right
	Mix
	Split
	Mosaic
	Anaglyph
Native (available in full mode only)	Off
	On
Delay	On
	Off
Delay position	Use the H POS and V POS knobs. Press KNOB for default.
Gamut highlighting	On
	Off
Markers	Center
	Safe Title
	Safe Action
	Clean Aperture
	4:3 in 16:9
VBI Mask	Off
	On
Closed Caption display	Off
	On
Anamorphic (available only if SD source)	Off
	On
Time Code Enable	LTC/DVITC
	Position
Brightness	0 – 100%

Table 3-34. Picture HD Menu TVM9150PKG

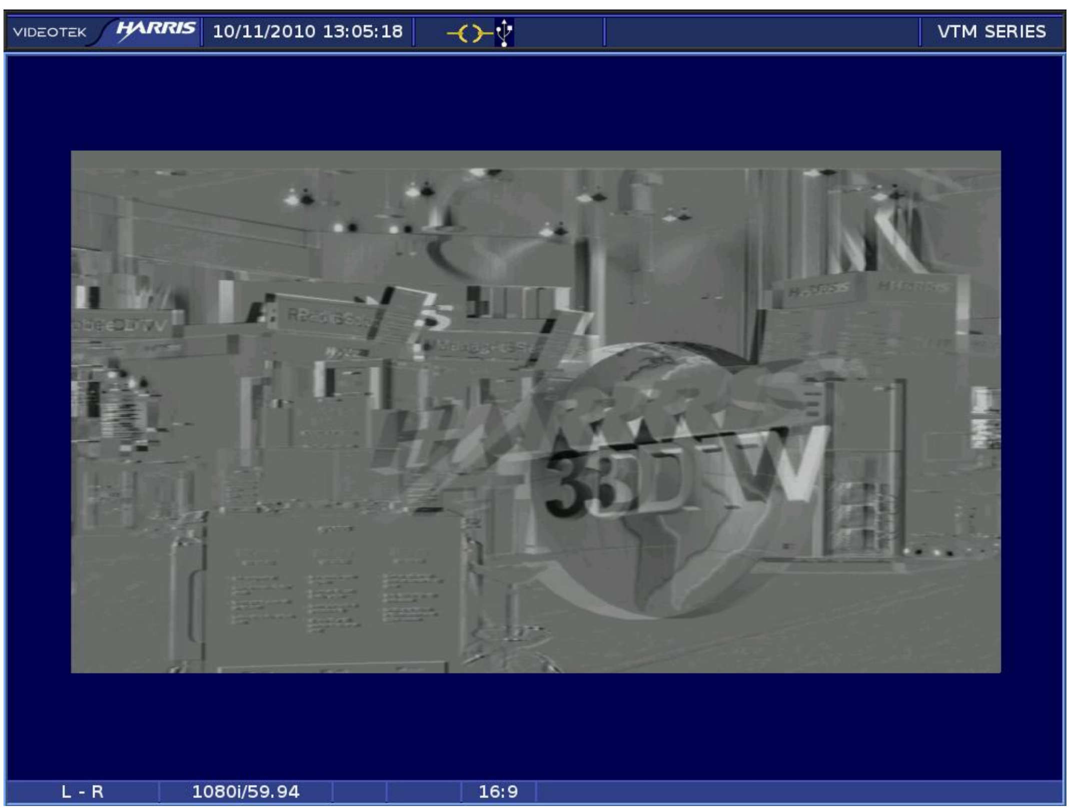
Selection	Selection Option
Contrast	0 – 100%
Color	Off
	On
Display Dual Link Alpha	Off
	On
Picture Setup	Press ENT

3D Mode

3D display mode requires a TVM9150PKG and the TVM-VTM-3D option. Each pane in the TVM can display a 3D input source when the left source is connected to A input, and the right is connected to the B input, or when left and right are in side-by side format on A input.

- **Left – Right**. **S**ubtracts the luma value of the right from the luma value of the Left. The result of the subtraction is pure gray if Left and Right contain no 3D “depth”, otherwise brighter than gray indicates Left Luma > Right Luma, darker than gray indicates Left Luma < Right Luma. The horizontal displacement can be seen to be greater for the Harris 3DTV logo in the foreground than for the background, indicating a larger 3D disparity for this logo than for the background.

Figure 3-45. Left-Right 3D Display Mode



- **Mix**. Superimposes left and right views on each other, making it clear which parts of the scene have greater 3D depth than others. This view is achieved by performing a 50% mix of the Red, Green, and Blue components of the Left and Right image pairs.

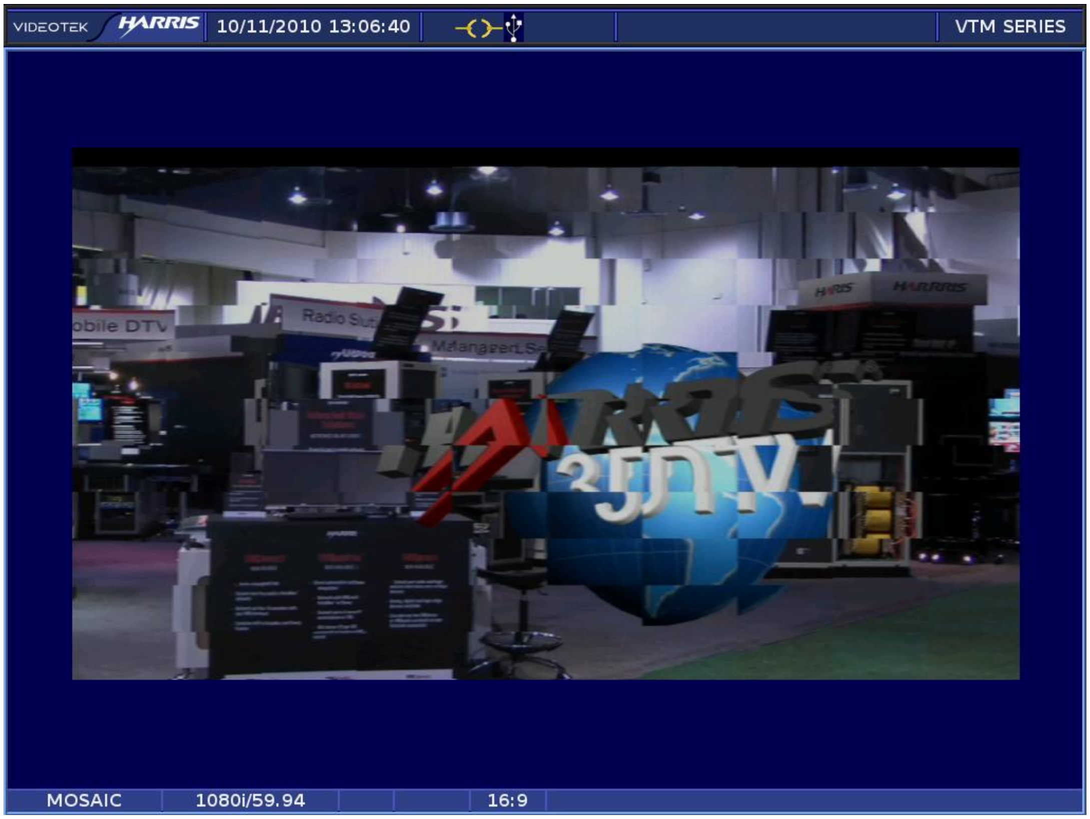
Figure 3-46. Mix 3D Display Mode

- **Split.** Displays vertical mis-alignment of a stereo camera pair. The split position is adjusted by the front panel horizontal adjustment knob, and defaults to the middle of horizontal active picture. To check for vertical mis-alignment, parts of a scene containing little 3D depth such as hills or buildings in exterior shots should not be in different vertical positions in left and right views as the split position is moved across these features. However, parts of a scene with high 3D depth will show a noticeable abrupt change as the split position is moved across these features.

Figure 3-47. Split 3D Display Mode

- **Mosaic**. Exposes differences in color/brightness of the Left and Right sources. For example, for the left and right view of a surface containing a plain constant color such as a wall, a field, or the sky. If the two cameras were matched for color, brightness, and contrast, the mosaic pattern should not be visible. If the cameras were not matched, the mosaic pattern is easily visible. Also adjacent mosaic "boxes" will look more "mismatched" for parts of a scene containing greater 3D disparity. The size of the boxes is adjustable from the front panel using the horizontal and vertical adjustment knobs.

Figure 3-48. Mosaic 3D Display Mode



- **Anaglyph**. This method of viewing 3D is inferior to the use of shutter or polarized glasses, but allows you to check the 3D "effect" using inexpensive Anaglyph glasses on any color display including the TVM's front panel LCD display. Anaglyph glasses are glasses where the two lenses are different (usually chromatically opposite) colors, such as red and cyan.

The Picture Setup Menu contains a sub menu: "Anaglyph Glasses", which provides a choice of Red/Cyan for customers who posses Red/Cyan Anaglyph Glasses, or Green/Magenta. The Green/Magenta is recommended with the use of Trioscopic (Pure Green/Pure Magenta (red + blue)) Anaglyph Glasses.

Figure 3-49. Anaglyph 3D Display Mode

Native Mode

NOTE: The Native mode menu item will only appear when an SD format is detected or selected.

When Native mode is enabled, it displays the SD (analog or digital) picture as mapped 1:1 to the LCD pixels. The quad screen does not have a Native mode option. When Native mode is not checked, the SD picture is scaled to fill the screen.

Delay

Delay is used to view the horizontal and vertical blanking areas of the video signal. DELAY enables and disables the delay mode. Delay Position displays the amount of vertical and horizontal delay. In the Delay position, turn the UP/DOWN and

RIGHT/LEFT knobs to position the picture. The Delay feature is not affected by the Native mode selection.

Gamut Highlighting

NOTE: This selection is not available for 3 Gb/s signals.

When Gamut Highlighting is selected in the Picture Setup menu, a grid pattern appears over the picture display highlighting gamut errors. Gamut highlighting is determined by the GAMUT THRESHOLD settings in the VIDEO ALARM DIGITAL > DIGITAL GAMUT alarm menu.

Picture Setup

Press the ENT button to access the global Picture setup menu. For more information on the global Picture Setup menu, see Section 4.

Markers

There are three markers available to be indicated in the picture. Safe Action is equal to 90% of the picture height and 90% of the picture width. Safe Title is equal to 80% of the picture height and 80% of the picture width. Clean Aperture shows the limits for the active pixel area. Brackets appear on the picture or a box surrounds the picture to show these limits. The center marker identifies the location of the center of the picture.

VBI Mask

The VBI (Vertical Blanking Interval) MASK menu selection is used to mask closed caption and non-active lines. With VBI MASK set to ON, only active lines will be shown on the picture portion of the display.

Closed Caption

Closed Caption data can be decoded and keyed over the picture. The Closed Caption display is provided as a means to verify that captions are present and can be decoded. There is a limit of one Closed Caption display at a time. The display provides a limited character and feature set. The 708 caption service is defined by EIA-708-B Digital Television Closed Captioning standard for High Definition video. All other caption services are defined by EIA/CEA-608-B NTSC Line 21 Data Services standard. The Closed Caption services are:

CC1 – Primary synchronous caption service (608 or 708)

CC2 – Special non-synchronous use captions (608)

CC3 – Secondary synchronous caption service (608 or 708)

CC4 – Special non-synchronous use captions (608)

708 – Digital television caption service (HD only)

T1 – First text service

T2 – Second text service

T3 – Third text service

T4 – Fourth text service

TT – Teletext is displayed over the picture when the PAL or 625/50 format with Teletext data embedded in the vertical blanking interval is utilized, as shown in the sample illustration **Figure 3-50**. Teletext page numbers are selected using the Teletext Page menu.

OP-47 – Teletext is extracted from SD/HD VANC data. OP-47 page numbers are selected using the Teletext Page menu.

XDS – Extended data services.

The default caption service is OFF. Selecting CC1 or CC3 with an EIA-708 embedded signal will decode the derived 608 data, if present. The 608 captioning data and 708 data is extracted at the same time.

Closed captioning supports 112 characters as per EIA/CEA-608B 6.4.1:

Upper and Lower Case Characters	ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
Accented Characters	àáâçèéêîíÑñóôúû
Punctuation Characters	! , . ; : ’ ” # % & @ / ( ) [ ] + - ÷ < > ? ° ¢ $ £ ® TM ½ ¿
Numeric Characters	0 1 2 3 4 5 6 7 8 9
Other Characters	♪, standard space, □, ■

Some characters are not available such as the “e” with the dieresis above it. The French word Noël uses this character. The ë in Noël would appear differently on the screen. Also, Ñ is the only capital accented letter as shown above.

Figure 3-50. Teletext Sample Screen

Anamorphic

The Anamorphic menu selection is used to correct the anamorphic display. Setting the menu selection to ON corrects the SD aspect ratio for the monitor.

Time Code

Time Code is the time that is associated with each video frame. Time Code is keyed over the picture on the right side. Adjacent to the Time Code, the LTC/DVITC is keyed over the picture on the right side when LTC/DVITC is selected. LTC/DVITC cannot be activated unless ENABLE is selected. The submenu POSITION select is used for the vertical placement of the time code at the top, bottom (beyond safe action areas), and middle.

Brightness

Picture Brightness is used to make the picture brightness lighter or darker. The brightness range is from 25% (for the darkest picture) to 200% (for the brightest picture). The default picture brightness is 100%.

Contrast

Picture Contrast is used to increase the overall difference between the lightest and darkest colors. The contrast range is from 25% (for the least amount of difference between the lightest and darkest colors) to 200% (for the most amount of difference between the lightest and darkest colors). The default picture contrast is 100%.

(Picture) Color

Picture Color is used to change the picture to color or monochromatic (black and white). The default menu item for Picture Color is COLOR.

Timing Display

Pressing the TIMING function button accesses the Timing display for the selected pane. A Timing display diagram is shown in **Figure 3-51** and described in **Table 3-35**. The diagram illustrates the general location for the various Timing display fields.

Relative timing of the inputs is compliant with SMPTE RP168.

Figure 3-51. Timing Display Diagram

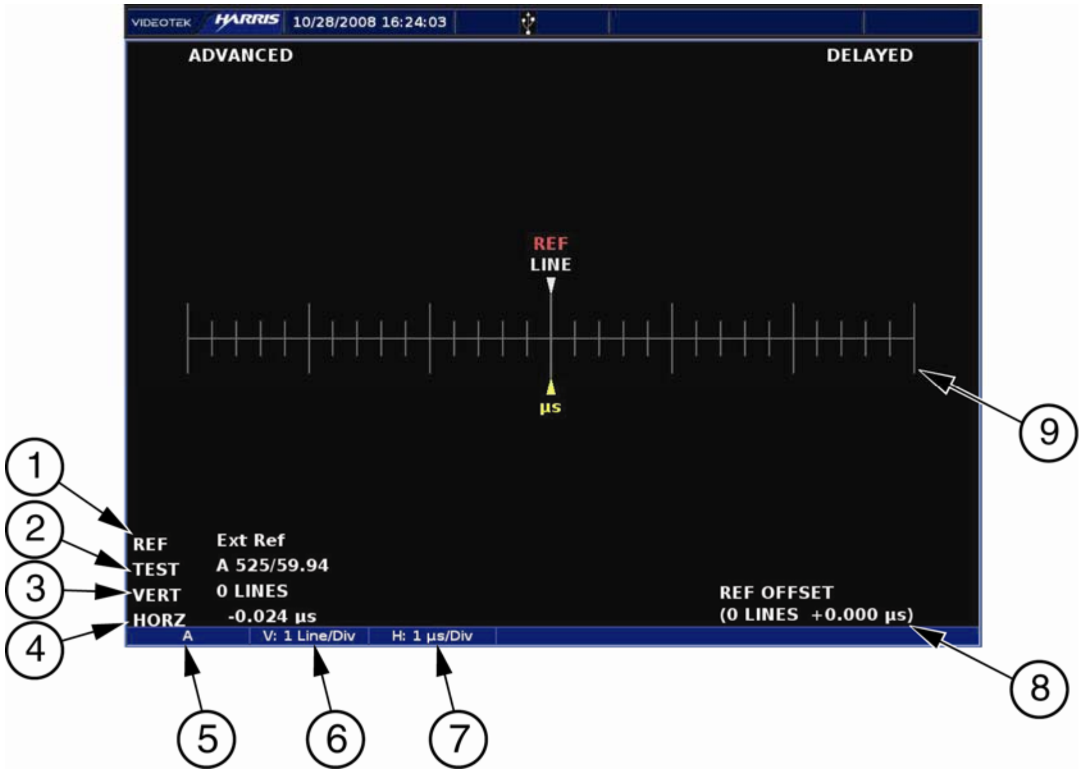


Table 3-35. Description of Timing Display Diagram

Field Identifier	Field Information	Nomenclature
1	Selected reference	Displays the selected reference as REF: *X* where *X* is A, B, C, D, EXT BB, or EXT TRI; the REF is selected in the TIMING pane menu
2	Test	Indicates the input that is being measured, against the Selected Reference in Field Identifier 1; also displays the Selected Reference's Line Rate/Frame Rate [(for example, 1080i/59.94); selected in the VIDEO FORMAT > VIDEO A through D CONFIGURE menu
3	VERT (Vertical)	Displays the Vertical Error Measurement as VERT: *xxx* Line(s), where *xxx* is the measured difference between the reference and the test input alignment of the vertical timing (sync/TRS) in lines
4	HORZ (Horizontal)	Displays the Horizontal Error Measurement as HORZ: *yy.yyy* µs, where *yy.yyy* is the measured difference between the reference and the test input alignment of the horizontal timing (sync/TRS)
5	Input	Displays user-configurable source IDs for input and routers
6	Vertical scale	Displayed as V: 1Line/DIV
7	Horizontal scale	Displayed as H: *X*, where *X* is the number with µs/DIV for analog, SD, and HD formats
8	REF (Reference) offset	Displays that the zero point of the timing measurements are offset from the reference selection by *xx* lines *yy.yyy* µs (the REF offset information is not is displayed when the factory default offset is selected)

Table 3-35. Description of Timing Display Diagram

Field Identifier	Field Information	Nomenclature
9	Timing Graticule	Shows the timing graticules, cursors, and labels

When a signal is processed, there is the potential for it to be delayed with respect to a reference signal. The Analog/Digital timing display is used to indicate when a video input is deviating in time from the reference. See “Reference Selection” on page 90 for more information on reference selection.

REF (Reference), located in the center of the timing display, indicates the reference-timing point for the type of signal being monitored. REF is green when the line and µs (microseconds) cursors are all aligned. As the signal falls out of timing alignment, the line and the µs cursors change color when it moves from REF. When this occurs, the REF turns red. Each hash mark represents a vertical line (top scale) and 1µs (bottom scale). Once the line or µs cursors are at the edge of the display, arrows will appear to the right or left of the timing line.

NOTE: The Timing Display alignment accuracy is ±280 ns.

The bottom of the Timing display contains the following information:

REF – The selected reference input that represents the REF line in the Timing display (EXT REF, INPUT A, B, C, D, LTC).

TEST – The selected input (A, B, C, or D) that is being monitored.

VERTICAL – The offset line in full-video lines between the reference and the displayed video.

HORIZONTAL – The offset time in microseconds between the reference and the displayed video. Horizontal can be yellow at 0 µs. It displays the minimum scale resolution at 1µs and the minimum timing resolution at 0.037 µs for HD (High Definition) and 0.74 µs for SD (Standard Definition).

Things to Remember When Using the Timing Display

1. The Timing Display measures the elapsed time between the vertical syncs of two inputs. The elapsed time is expressed in units of pixels and lines of the selected input video not of the reference.
2. When referencing a standard definition analog or digital video input to a high definition video or external tri-level reference input, the line number indication in the timing display represents standard definition video lines. If the relative timing is adjusted in high definition video lines, it may take an adjustment of two or more lines before the line number changes in the timing display. This is due to the high frequency high definition video lines, which are shorter than the standard definition video lines represented by the timing display.
3. When referencing a high definition video input to a standard definition analog, digital video, or external composite (BB) reference input, the line number indication in the timing display represents high definition video lines. If the relative timing is adjusted in standard definition video lines, a single video line adjustment will cause a change of two or more lines in the timing display. This is due to the

low frequency standard definition video lines, which are longer than the high definition video lines represented by the timing display.

4. The information of the Timing Display should not be used when captured SDI freeze data is displayed.

Timing Pane Menu Selections

Pressing and holding the TIMING function button in the active Timing pane selects the pane menu. The Timing Pane menu is described in **Table 3-36**.

Table 3-36. Timing Pane Menu

Selection	Selection Option	
Reference	Ext ref	
	Input A	
	Input B	
	Input C	
	Input D	
	LTC	
Timing mode	Measurement Mode	Normal
		Classic
	Factory	
	Offset	
	Set zero ref	
	Clear zero ref	
	Adjust Ref Lines	
	Adjust Ref Time	

Reference Selection

The reference selection can be selected from the TIMING pane menu. The Reference selections are:

EXT REF – Reflects current setting of External Reference (selected by pressing and holding the EXT button)

INPUT A – Internal Reference fixed on Input A.

INPUT B – Internal Reference fixed on Input B.

INPUT C – Internal Reference fixed on Input C (Option required).

INPUT D – Internal Reference fixed on Input D (Option required).

LTC – Longitudinal Time Code

Timing Mode

The Timing mode selection is used to set the offset of the reference to the signal. When offset is applied against the reference, OFFSET is shown in the lower right corner of the Timing Pane. REF (Reference), located in the center of the timing display, indicates the Offset from the 0 REF point when Offset is applied. REF is green when the line and µs (microseconds) cursors are all aligned with the Offset reference. As the signal falls out of timing alignment with the Offset reference, the line and the µs cursors change color when it moves from REF. The Timing Mode Selections are:

- **Measurement Mode** – SMPTE RP 168 Annex B section B.4.2 shows three examples of how to perform timing measurements. The first uses an analog waveform monitor to measure an analog source. The second uses an analog waveform monitor to measure a digital source that has been converted to analog. The third uses a digital waveform monitor to measure a digital source.
    - **Normal** mode uses all the digital methods as shown in the third example in SMPTE RP 168.
    - **Classic** mode simulates the second method by adding a delay to account for the assumed D/A converter in the video path. This produces results that match the readings of older instruments.
- **Factory** – Sets the factory reference to 0 REF. When FACTORY is selected, the OFFSET field does not appear on the screen.
- **Offset** – Enables and displays the Offset field. The reference offset is not applied until SET ZERO REF is selected.
- **Set Zero Ref** – Applies the current offset setting as the Zero REF point.
- **Clear Zero Ref** – Clears the setting applied in the SET ZERO REF menu and returns the Reference to the Factory Reference Setting. Offset remains on screen.
- **Adjust Ref Lines** – Use the curved knob to adjust the offset lines.
- **Adjust Ref Time** – Use the curved knob to adjust the offset in µs(microseconds).

Alarm Display

Press the ALARM button to display the alarm display. Pressing and holding the ALARM function button opens the Alarm Pane menu. The default alarm display is the Alarm Log display. The Alarm Status pane can also be selected from the Alarm Pane menu. For information on individual alarms, see Section 5.

Alarm Log Display

The Alarm Log display lists all the alarms, the date, time, time code, duration, and peak value. The alarm list begins with the most recent alarm and can hold a maximum of 200 alarms.

An Alarm Log display diagram is shown in **Figure 3-52** and described in **Table 3-37**. The diagram illustrates the general location for the various alarm fields.

Figure 3-52. Alarm Log Diagram

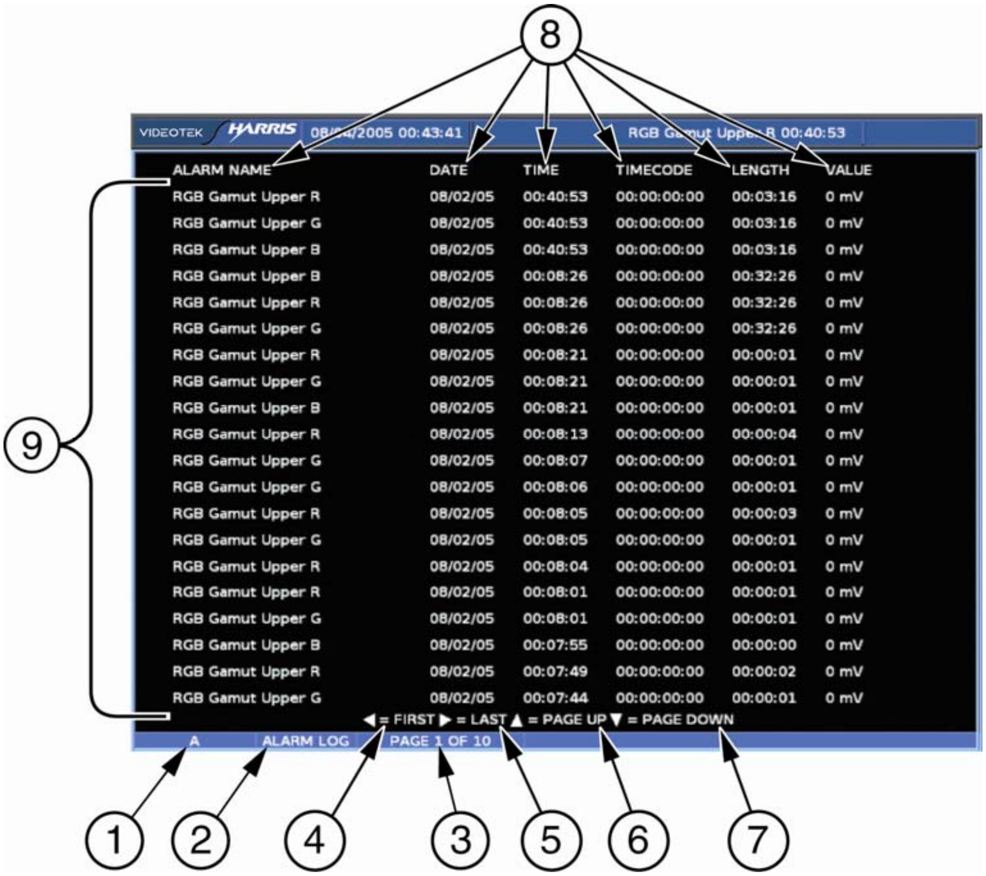


Table 3-37. Description of Alarm Log Display Diagram

Field Identifier	Field Information	Nomenclature
1	Input	Displays the user-configurable source IDs for the input and routers.
2	Display Label	Displayed as ALARM LOG
3	Page Information	Displayed as PAGE X of Y, where *X* is the selected page and *Y* is the total number of pages
4	Paging information	Displays ◄ = First page
5	Paging information	Displays ► = Last page
6	Paging information	Displays ▲ = Page Up
7	Paging information	Displays ▼ = Page Down
8	Column Labels	Displays the labels # (for the number in the alarm list), ALARM NAME, DATE, TIME, TIMECODELENGTH (Duration), and PEAK VALUE*
9	Alarm List	Displays the list of alarms from the most recent alarm to the last recorded alarm (a maximum of 200 alarms can be logged)

***NOTE**: Certain alarm parameters do not have a level measurement that can report a peak value. This is indicated when NO RPV (No Report Peak Value) appears in the PEAK VALUE column. If A^3-OPT2 is installed, all audio alarms will report NO RPV.

When an alarm is first registered, it appears on the alarm display and is highlighted in yellow. If the alarm is short term (that is, two seconds or less), the alarm text is not highlighted after approximately two seconds. If the alarm continues longer than two seconds, the text remains yellow and the alarm duration is incremented. When the next alarm occurs, the previous alarm moves down one position.

The TVM has enough memory for 200 alarms per input. When 200 different alarm events have occurred, alarm number 200 is dropped and the most recent alarm is tagged as 01. To overcome the 200-alarm per input limit, connect a PC to the Ethernet port and use the supplied SpyderWeb II support software. All alarms are passed to the PC and saved.

Use the following NAVIGATION buttons to scroll through the alarm list:

 Press to page up through the alarm list.

 Press to page down through the alarm list.

 Press to select the first page on the list.

 Press to select the last page on the list.

To erase the current group of alarms, press and hold the ENT button for approximately five seconds.

A GPI output dry-contact closure can be used to alert other devices when an alarm occurs. Use the COMMUNICATIONS menu to setup the GPI.

Alarm Status Display

The Alarm Status screen lists all the alarms, the state of each alarm setting, the current alarm limit selection (if applicable), the current alarm duration (if applicable), and the Accumulated alarm count column. An alarm status display diagram is shown in **Figure 3-53** and described in **Table 3-38**. The diagram illustrates the general location for the various alarm status display fields.

Figure 3-53. Alarm Status Display Diagram

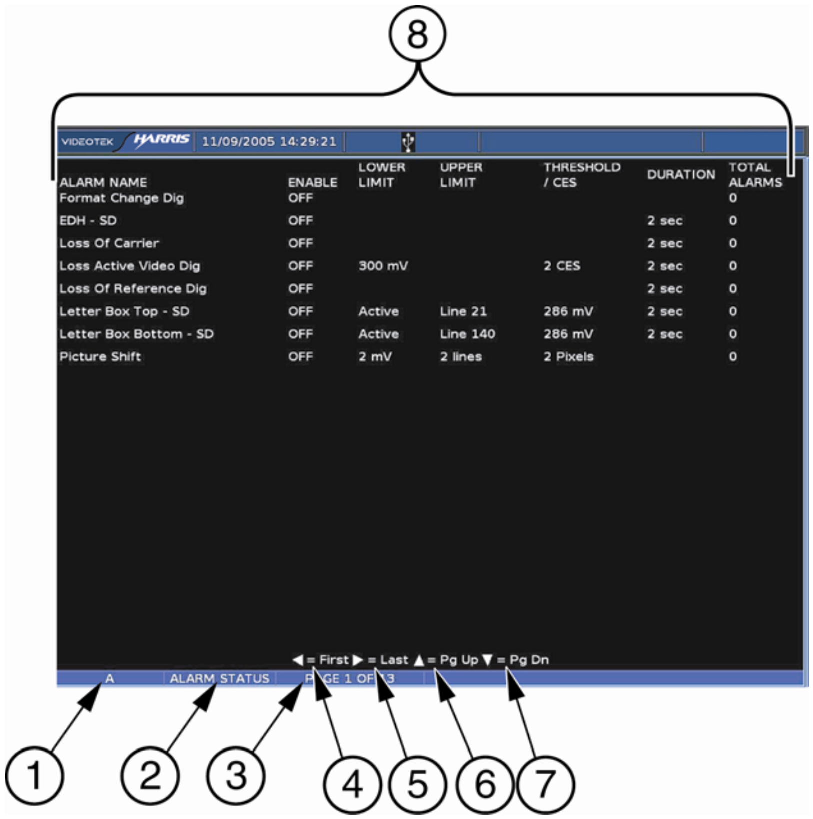


Table 3-38. Description of Alarm Status Display Diagram

Field Identifier	Field Information	Nomenclature
1	Input	Displays the user-configurable source IDs for the input and routers.
2	Display Label	Displayed as ALARM STATUS
3	Page Information	Displayed as PAGE X of Y, where X is the selected page and Y is the total number of pages.
4	Paging information	Displays ◄ = First page
5	Paging information	Displays ► = Last page
6	Paging information	Displays ▲ = Page up
7	Paging information	Displays ▼ = Page down
8	Column Labels	Displays the columns ALARM NAME, ENABLE, LOWER LIMIT, UPPER LIMIT, THRESHOLD/CES, DURATION, and TOTAL ALARMS.

The alarm status screen contains alarm name text that can appear in a colored state. The colored states are:

White: indicates alarm is not enabled.

Green: indicates alarm is enabled and not exceeding alarm limits.

Red: indicates the alarm is enabled and exceeding an alarm limits.

There is a two-second persistence for any Alarm Name color change.

Use the following NAVIGATION buttons to scroll through the alarm list:

 Press to page up through the alarm list.

 Press to page down through the alarm list.

 Press to select the last page on the list.

 Press to select the first page on the list.

Alarm Log and Status Pane Menu Selections

Pressing and holding the ALARM function button in the alarm status pane selects the pane menu. The Alarm Pane menu is described in **Table 3-39**.

Table 3-39. Alarm Status Pane Menu

Selection	Selection Option
Display	Alarm log
	Alarm status
Alarm log display	All
	Video alarms
	Audio alarms
	Time code alarms
	GPI alarms
Mute alarms	Off
	On
Video alarms analog	Press ENT
Video alarms digital	Press ENT
Audio alarms	Press ENT

Display

The Display menu selection is used to select between the Alarm Log and Alarm Status menu.

The Alarm Status screen lists all the alarms, the state of each alarm setting, the current alarm limit selection (if applicable), and the current alarm duration (if applicable).

Alarm Log Display

The Alarm Log Display menu determines the type of information that is displayed in the alarm log screen. The selections are:

All

Video Alarms

Audio Alarms

Time Code Alarms

GPI Alarms

Mute Alarms

Sound occurs when an alarm is activated and SOUND is selected for the alarm in the Alarm Matrix. The Alarm Matrix is accessed in any of the Alarm Setup menus. The mute alarms submenu is used to enable or disable the alarm notification sound.

Video Alarm Analog

Press the ENT button to access the global VIDEO ALARMS, ANALOG menu. For more information on the global SETUP menu, see Section 4.

Video Alarm Digital

Press the ENT button to access the global VIDEO ALARMS, DIGITAL menu. For more information on the global SETUP menu, see Section 4.

Audio Alarms

Press the ENT button to access the global AUDIO ALARMS menu. For more information on the global SETUP menu, see Section 4.

Audio Display

Press the AUDIO button to display the audio display. The TVM accepts up to eight AES/EBU, eight analog, and four groups of embedded inputs, and provides up to eight analog output channels and four AES/EBU output channels. Dolby D and Dolby E inputs are also available on selected options.

Five audio types are selected by pressing the SETUP button and selecting AUDIO SETUP > CONFIGURE INPUT A through D > AUDIO TYPE menu:

ANALOG

AES/EBU - A digital audio standard established jointly by the Audio Engineering Society (AES) and the European Broadcasting Union (EBU).

EMBEDDED - Digital audio information multiplexed onto a serial digital data stream. Up to sixteen channels can be multiplexed on a single stream of SDI video, minimizing cabling and routing requirement.

DOLBY AES - Dolby encoded audio information from a digital audio input. (Dolby option required)

DOLBY EMB. (EMBEDDED) - Dolby Encoded audio information multiplexed onto a serial digital data stream. (Dolby option required)

Configure the audio display type and parameters using the Audio Setup CONFIGURE INPUT A through D submenu. Audio can be displayed as:

- One two-channel bar graph with one Lissajous and one Phase bar

- Two two-channel bar graphs (for a total of four channels) with two Lissajous and two Phase bars
- Three two-channel bar graphs (for a total of six channels) with three Phase bars or CineSound 5.1 with two Phase bars
- Four two-channel bar graphs (for a total of eight channels) with four Phase bars or CineSound 5.1+AUX, 6.1, or 7.1 with up to three phase bars.
- Loudness displays only when the loudness option is installed. One display shows bars with trending chart; the other shows the loudness readout in a numeric format.

Lissajous can be selected as Soundstage or X-Y displays.

Input assignments, scaling, input levels, and response can also be modified using the Audio Setup menu. The function of the audio is dependent upon the audio option installed.

Audio Scales

The Vertical audio graticule scales change according to the scale selections made in the AUDIO SETUP > METER SETUP > ANALOG or DIGITAL SCALE menu and the format being displayed.

The Scales are:

TYPE I

Type IIA

Type IIB

Type I + 8

Nordic

DIN 45406

dBFS (Digital only)

Zero dB Ref dBFS (ref –20 dBFS) (Digital only)

Custom dBFS (Digital only)

Custom dB

Vertical Audio Displays

The Vertical Meter displays the level, reference, and ballistics detail in a vertical format. There are eight analog audio input channels (four stereo pairs), eight AES/EBU digital input channels (eight stereo pairs), and 16 embedded audio channels (serial-digital video input only) available for selection in the menu. A maximum of eight channels display simultaneously. Audio input pairs can be assigned to any meter on the display.

The displayed inputs can also be monitored as analog signals on the 37-pin, D-Sub, ANALOG IN/OUT connector. The displayed AES/EBU or embedded audio will be converted to analog audio for the monitoring output. The output audio level can be adjusted from -50 dB to +6 dB around the reference-input level. The default output level for a -20 dBFS input produces a +4 dBm analog output level (600Ω). For example, when applying a gain adjustment of +6 dB to the output with a -20 dBFS input signal, the audio output level will be +10 dBm into a 600Ω termination. This Audio Output Level adjustment is made in the AUDIO SETUP > OUTPUT PREFERENCES menu. The Audio Output Level adjustment default is 0 dB.

The phase bars are used to monitor the instantaneous phase relationship between two channels of audio. The “+” marking indicates a phase difference of 0 degrees, and the “-” marking indicates a phase difference of 180°. A properly phased stereo pair produces a phase pointer that moves within the green zone, whereas a reversed channel produces a pointer that moves within the red zone. The phase bar polarity in the AUDIO SETUP > METER SETUP > CONFIGURE PHASE BARS > POLARITY menu can be set to Normal or Reverse.

The effect of higher damping in a phase meter is to show an averaged rather than a peak value of phase. The Phase Bar Damping in the AUDIO SETUP > METER SETUP > CONFIGURE PHASE BARS > DAMPING can be set from FAST, 1 to 10, and SLOW.

The Lissajous display appears for two and four bar graphs on the right of the audio pane. The Lissajous display shows the amplitude and phase relationship between two input signals.

Vertical Audio display diagrams are shown in **Figure 3-54** to **Figure 3-57** and described in **Table 3-40** to **Table 3-43**. The Vertical audio graticule scales change according to the scale selections made in the Setup menu and the format being displayed. Some of the markings in the illustrations do not appear on the display.

Figure 3-54. Two Bar Graph Display with Lissajous Diagram

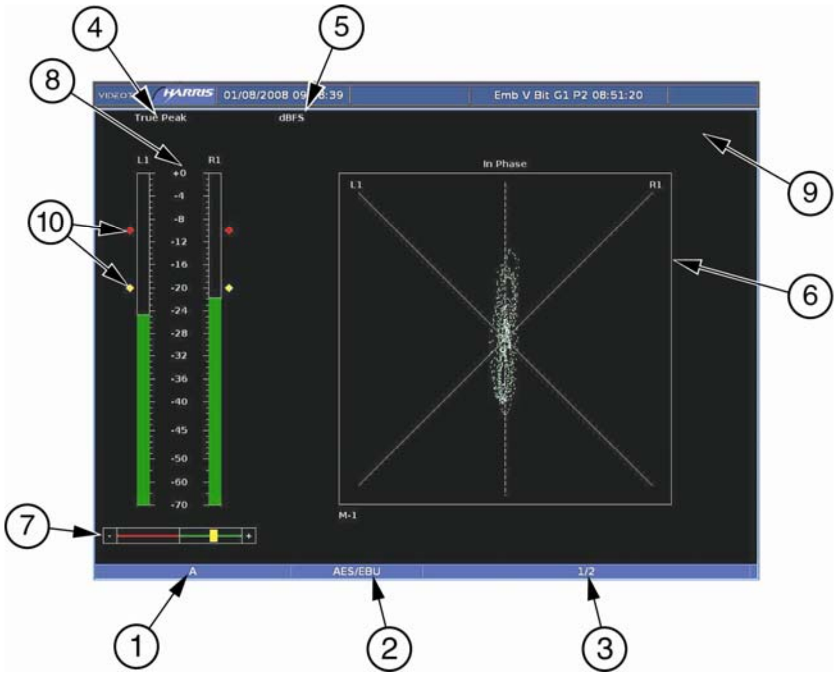


Table 3-40. Description of Two Bar Graph Display with Lissajous Diagram

Field Identifier	Field Information	Nomenclature
1	Input	Displays user-configurable source IDs for input and routers
2	Audio Type	Displayed as Analog, AES, Embedded, Dolby AES, Dolby Embedded
3	Audio Input	Displayed information is option dependent; shown as 1-16 (analog is 1-8, AES is 1-16 or 1-8, and Embedded is 1-16)
4	Meter Response	Displays the selected meter response: VU, Peak, True Peak, VU + Peak, VU + True Peak, Loudness, Custom
5	Scale Selection	Displays the selected meter scale: Type I, Type IIa, Type IIb, Type I + 8, Nordic, DIN 45406, dBFS, Zero REF dBFS, Custom dB, and Custom dBFS (scales are dependent upon audio type)
6	Lissajous Display	Lissajous of bar graph 1 with labels for R, L, and the number of the meter being monitored (that is, M-1)
7	Phase Bar	Phase Meter of bar graph 1
8	Audio Graticule (with meter labels)	Shown as Stereo Pairs (L1, R1), SMPTE 320M, or Custom label
9	Zoom	• Zoom (when enabled) • Blank when disabled • Press the ZOOM button to cycle through Zoom modes
10	Level Markers	Shows peak and reference levels for the signal; this can be adjusted in the AUDIO SETUP > METER SETUP > REF DIGITAL (or ANALOG) menu

Figure 3-55. Four Bar Graph with Lissajous Display Diagram

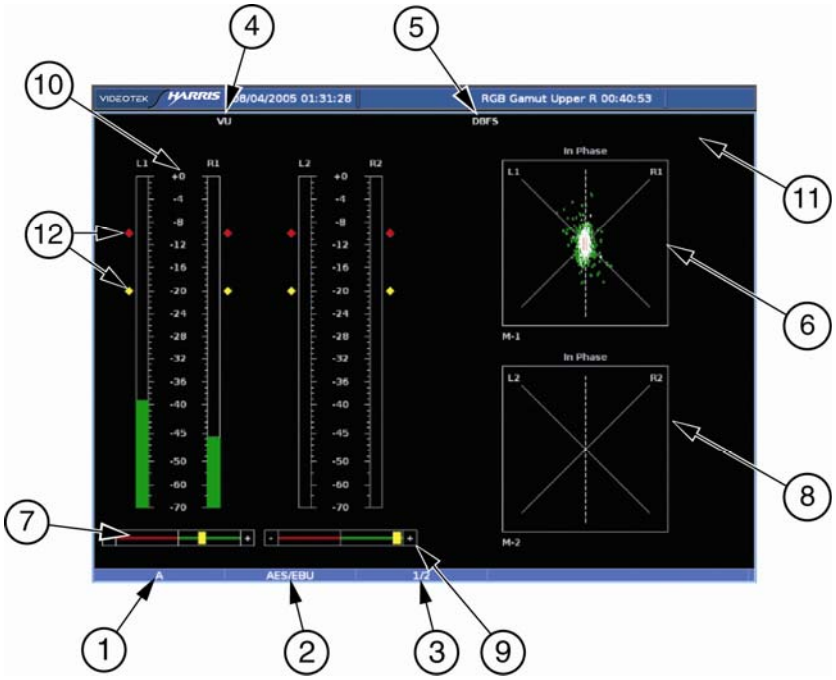


Table 3-41. Description of Four Bar Graph with Lissajous Display Diagram

Field Identifier	Field Information	Nomenclature
1	Input	Displays user-configurable source IDs for input and routers
2	Audio Type	Displayed as Analog, AES, Embedded, Dolby AES, Dolby Embedded
3	Audio Input	Displayed information is option dependent; shown as 1-16 (analog is 1-8, AES is 1-16 or 1-8, and Embedded is 1-16)
4	Meter Response	Displays selected meter response: VU, Peak, True Peak, VU + Peak, VU + True Peak, Loudness, Custom
5	Scale Selection	Displays the selected meter scale: Type I, Type IIa, Type IIb, Type I + 8, Nordic, DIN 45406, dBFS, Zero REF dBFS (scales dependent upon audio type)
6	Lissajous Display (1)	Lissajous of bar graph 1 with labels for R, L, and the number of the meter being monitored (that is, M-1)
7	Phase Bar (1)	Phase Meter of bar graph 1
8	Lissajous Display (2)	Lissajous of bar graph 1 with labels for R, L, and the number of the meter being monitored (that is M-2)
9	Phase Bar (2)	Phase Meter of bar graph 2
10	Audio Graticule (with meter labels)	Shown as L1, R1, L2, and R2 (or Custom label)
11	Zoom	• Zoom (when enabled) • Blank when disabled • Press the ZOOM button to cycle through Zoom modes
12	Level Markers	Shows peak and reference levels for the signal. This can be adjusted in the AUDIO SETUP > METER SETUP > REF DIGITAL (or ANALOG) menu.

Figure 3-56. Six Bar Graph Diagram

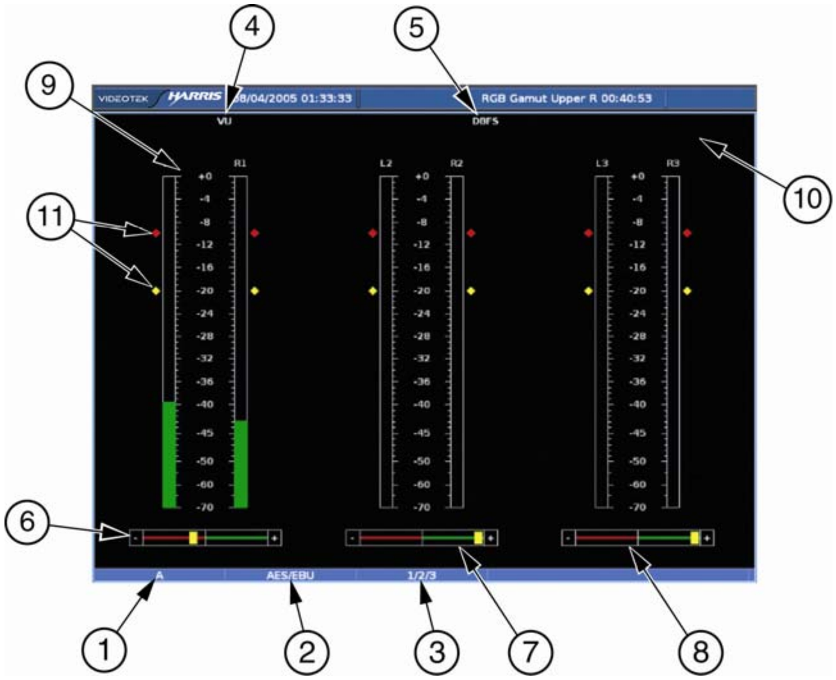


Table 3-42. Description of Six Bar Graph Diagram

Field Identifier	Field Information	Nomenclature
1	Input	Displays user-configurable source IDs for input and routers
2	Audio Type	Displayed as Analog, AES, Embedded, Dolby AES, Dolby Embedded
3	Audio Input	Displayed information is option dependent; shown as 1-16 (analog is 1-8, AES is 1-16 or 1-8, and Embedded is 1-16)
4	Meter Response	Displays the selected meter response: VU, Peak, True Peak, VU + Peak, VU + True Peak, Custom, Loudness
5	Scale Selection	Displays the selected meter scale: Type I, Type IIa, Type IIb, Type I + 8, Nordic, DIN 45406, dBFS, Zero REF dBFS
6	Phase Bar (1)	Phase Meter of bar graph 1
7	Phase Bar (2)	Phase Meter of bar graph 2
8	Phase Bar (3)	Phase Meter of bar graph 3
9	Audio Graticule (with meter labels)	Shown as L1, R1, L2, R2, L3, and R3 (or Custom label)
10	Zoom	• Zoom (when enabled) • Blank when disabled • Press the ZOOM button to cycle through Zoom modes
11	Level Markers	Shows peak and reference levels for the signal; this can be adjusted in the AUDIO SETUP > METER SETUP > REF DIGITAL (or ANALOG) menu

Figure 3-57. Eight Bar Graph Display Diagram

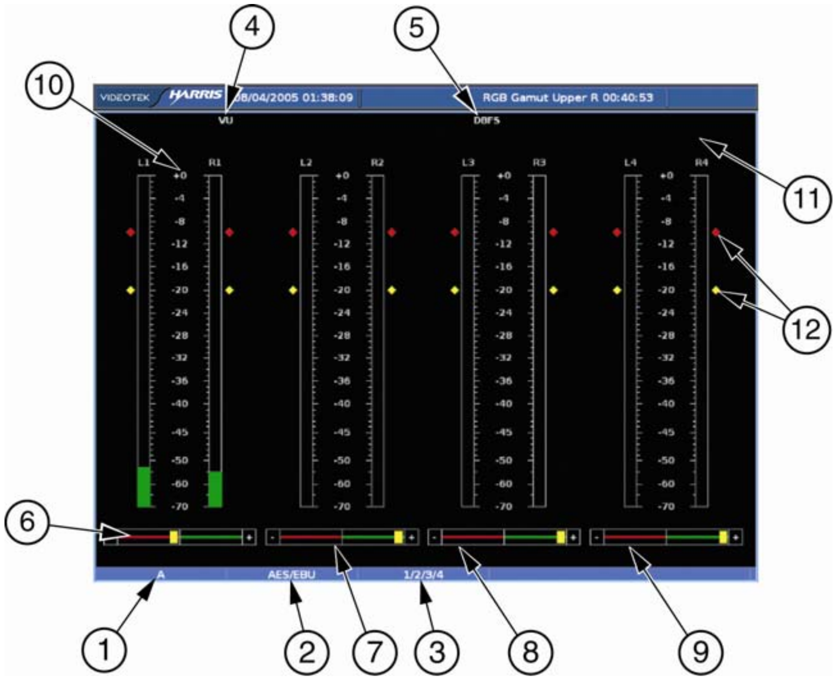


Table 3-43. Description of Eight Bar Graph Display Diagram

Field Identifier	Field Information	Nomenclature
1	Input	Displays user-configurable source IDs for input and routers
2	Audio Type	Displayed as Analog, AES, Embedded, Dolby AES, Dolby Embedded
3	Audio Input	Displayed information is option dependent; shown as 1-16 (analog is 1-8, AES is 1-16 or 1-8, and Embedded is 1-16)
4	Meter Response	Displays selected meter response: VU, Peak, True Peak, VU + Peak, VU + True Peak, Loudness, Custom
5	Scale Selection	Displays the selected meter scale: Type I, Type IIa, Type IIb, Type I + 8, Nordic, DIN 45406, dBFS, Zero REF dBFS
6	Phase Bar (1)	Phase Meter of bar graph 1
7	Phase Bar (2)	Phase Meter of bar graph 2
8	Phase Bar (3)	Phase Meter of bar graph 3
9	Phase Bar (4)	Phase Meter of bar graph 4
10	Audio Graticule (with meter labels)	Shown as L1, R1, L2, R2, L3, R3, L4, and R4 (or Custom label).
11	Zoom	• Zoom (when enabled) • Blank when disabled • Press the ZOOM button to cycle through Zoom modes
12	Level Meters	Shows peak and reference levels for the signal. This can be adjusted in the AUDIO SETUP > METER SETUP > REF DIGITAL (or ANALOG) menu.

CineSound Display

This unique audio display provides an intuitive view of 5.1, 6.1, and 7.1 channels of surround sound audio. The default meter movement is from the center outward, but it can be reversed by a selection in the AUDIO SETUP menu. Two additional channels of audio can be viewed next to the CineSound® display, if required, thereby providing a total of eight channels on the screen. When the CineSound® display is selected, the audio inputs and meter labels follow a SMPTE ST2035:2009 Case 11c mapping scheme as listed in **Table 3-44**.

Table 3-44. CineSound® Audio Input Mapping

Analog Input	AES/EBU Input	CineSound Display Assignment	8-Bar Display Assignment
1	1	Left	1 Left (L1)
2	1	Right	1 Right (R1)
3	2	Center	2 Left (L2)
4	2	Low Frequency Effects (LFE)	2 Right (R2)
5	3	Left Surround (LS)	3 Left (L3)
6	3	Right Surround (RS)	3 Right (R3)
7	4	Left Aux	4 Left (L4)
8	4	Right Aux	4 Right (R4)

The 5.1 CineSound Audio display diagram is illustrated in **Figure 3-58** and described in **Table 3-45**. **Figure 3-59** displays CineSound with 6.1 Channels. **Figure 3-60** displays CineSound with 7.1 Channels.

Figure 3-58. CineSound 5.1 Display Diagram

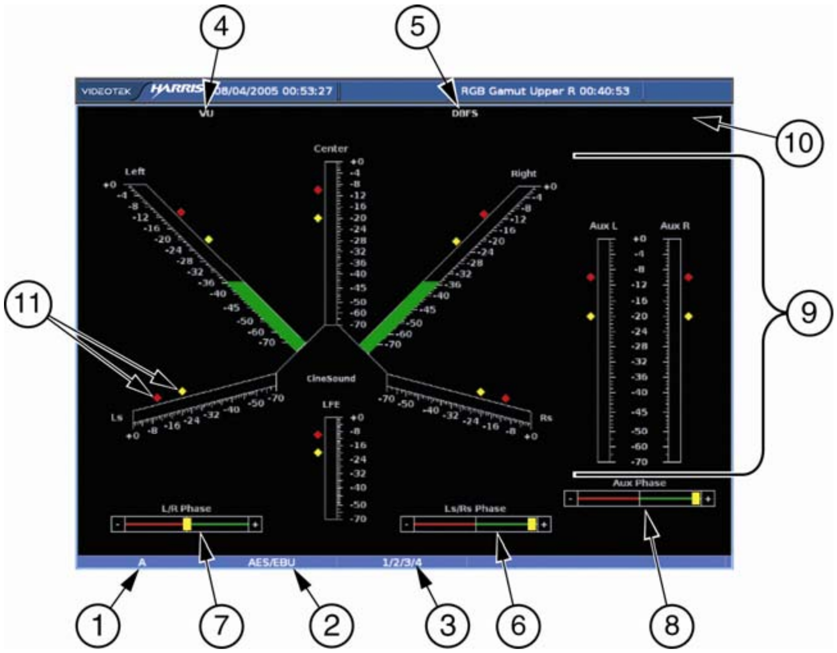


Table 3-45. Description of CineSound Display Diagram

Field Identifier	Field Information	Nomenclature
1	Input	Displays user-configurable source IDs for input and routers
2	Audio Type	Displayed as Analog, AES, Embedded, Dolby AES, Dolby Embedded
3	Audio Input	Displayed information is option dependent; shown as 1-16 (analog is 1-8, AES is 1-16 or 1-8, and Embedded is 1-16)
4	Meter Response	Displays selected meter response: VU (normal), Peak, True Peak, VU + Peak, VU + True Peak, Loudness, Custom
5	Scale Selection	Displays the selected meter scale: Type I, Type IIa, Type IIb, Type I + 8, Nordic, DIN 45406, dBFS, Zero REF dBFS
6	Phase Meter of Surround LR	Displays the Surround LR Phase
7	Phase Meter of Front LR	Displays the Front LR Phase
8	Phase Meter of AUX	Displays the AUX Phase
9	Audio Graticule (with meter labels)	Shown as LFE, Ls, Left, Center, Right, Rs, and AUX L, R (or Custom label); these are the default labels
10	Zoom	• Zoom (when enabled) • Blank when disabled • Press the ZOOM button to cycle through Zoom modes
11	Level Meters	Shows peak and reference levels for the signal; this can be adjusted in the AUDIO SETUP > METER SETUP > REF DIGITAL (or ANALOG) menu

Figure 3-59. CineSound 6.1 Channels Display

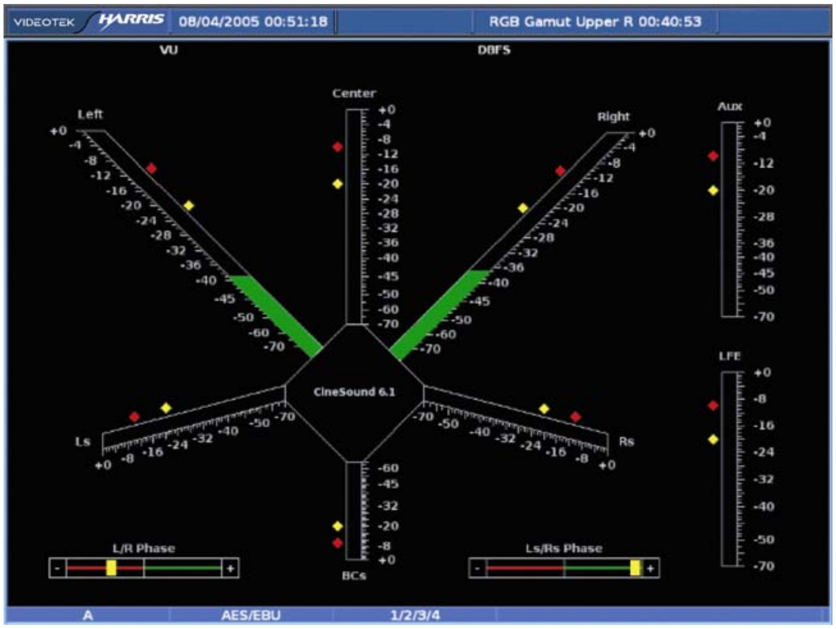
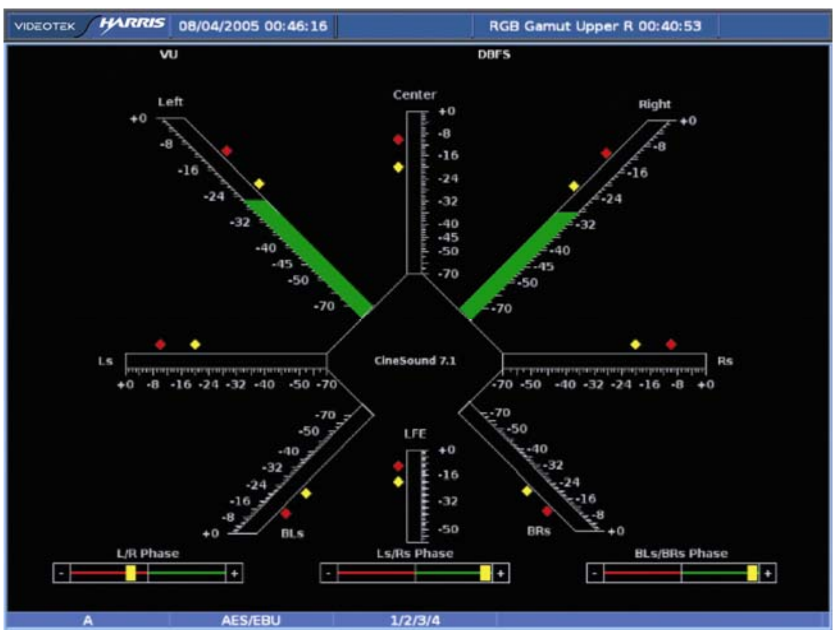


Figure 3-60. CineSound 7.1 Channels Display

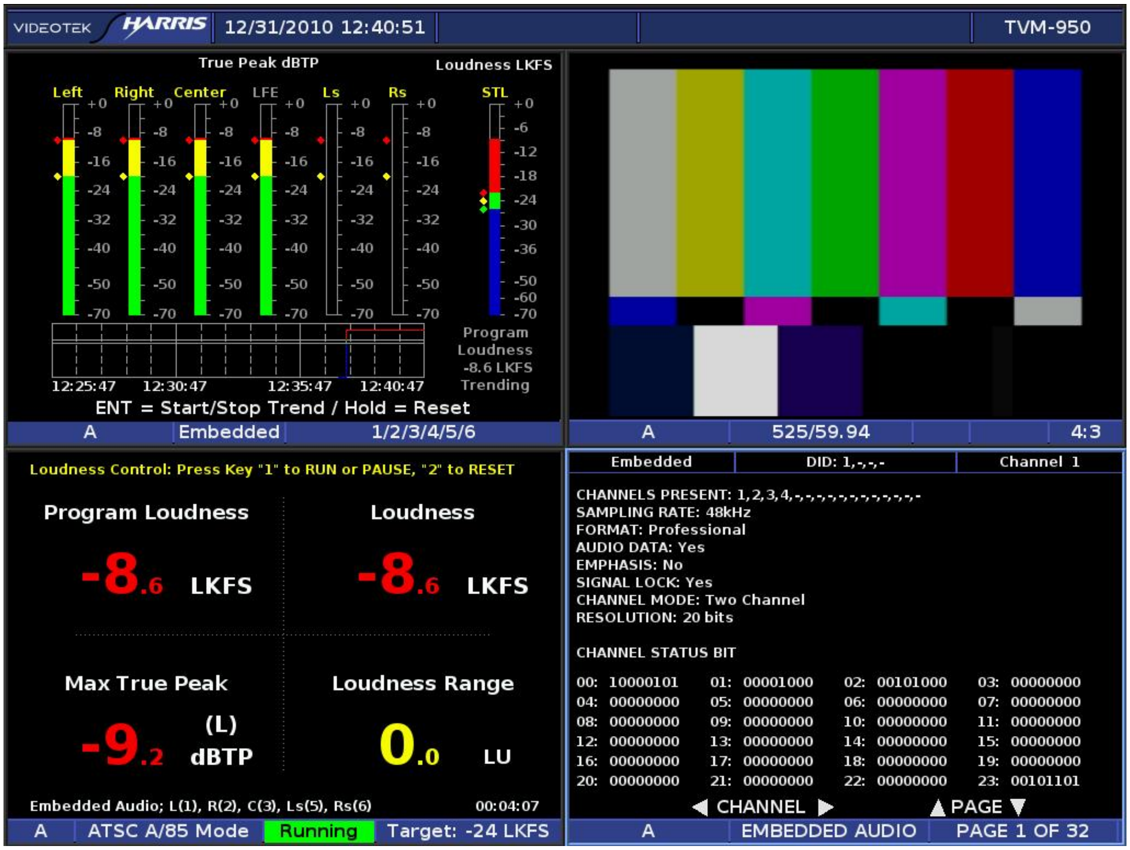


Loudness Displays with TVM/VTM A3-OPT 3/5 TL

With TVM/VTM audio option A3-OPT 3/5 TL installed, you can use Loudness Bar Display and Loudness Numeric Readout to view loudness measurements. With the menu AUDIO SETUP > CONFIGURATION INPUT A through D > AUDIO DISPLAY > LOUDNESS checked, one loudness display alternates with the other by pressing the AUDIO button. Both loudness displays can show up in standard quad mode, like in **Figure-62**. Loudness Bar Display shows true peak and loudness status of

5.1 surround audio. The display contains six true peak audio meters, one BS.1770 loudness meter, and one loudness trending chart. Loudness Numeric Readout shows program loudness, short term integrated loudness, maximum true peak, and loudness range. The display supports three loudness metering modes, including ATSC A/85, EBU R 128, and Custom.

Figure 3-61 Loudness Displays in Standard Quad Mode



Loudness channels are configured through the menu AUDIO SETUP > CONFIGURATION INPUT A through D > AUDIO DISPLAY > LOUDNESS MAPPING:

- **Left**: This selection configures the input of the Left loudness channel. The channel may be disabled, or use the input of audio meter 1 to 8.
- **Right**: This selection configures the input of the Right loudness channel. The channel may be disabled, or use the input of audio meter 1 to 8.
- **Center**: This selection configures the input of the Center loudness channel. The channel may be disabled, or use the input of audio meter 1 to 8.
- **LFE (True Peak Display Only)**: This selection configures the input of the LFE channel. The channel may be disabled, or use the input of audio meter 1 to 8. The LFE channel is used by the LFE true peak audio meter and is NOT included in the loudness calculation.
- **Left Surround**: This selection configures the input of the Left Surround loudness channel. The channel may be disabled, or use the input of audio meter 1 to 8.

- **Right Surround**: This selection configures the input of the Right Surround loudness channel. The channel may be disabled, or use the input of audio meter 1 to 8.

Loudness metering modes are configured through the menu AUDIO SETUP > CONFIGURATION INPUT A through D > AUDIO DISPLAY > LOUDNESS SETUP:

- **Mode**: This selection is used to select the desired loudness metering mode.
    - **ATSC A/85**: Follows ATSC recommended practice A/85.
    - **EBU R 128**: Follows EBU recommendation R 128.
    - **Custom**: This selection allows the user to select a mode that matches the user's in-house standards.
- **Units**: This selection is used to determine the type of scale that appears on the Loudness display.
    - **LKFS:** Loudness K-weighted Full Scale.
    - **LU:** Loudness Units.
- **ATSC A/85 Mode Setup:** Sets the ATSC A/85 loudness metering parameters. This setup is NOT active unless ATSC A/85 is selected in the menu **Mode**.
    - **Program:** This selection is used to set the usage of relative gating threshold applied to the calculation of program loudness. The setting Use Relative Gating is defaulted to off (Not enabled).
      If Use Relative Gating is enabled, the menu Relative Gating Value selects value from -20 to -6. The default setting is -8.
    - **Loudness Integration Time:** This selection is used to set the integration time for the calculation of integrated loudness. Selections are from 0 seconds to 60 seconds. The default selection is 10 seconds.
    - **Max Hold Time:** This selection is used to set the maximum true peak hold time. Selections are 1 to 10 seconds and Infinite. The default selection is Infinite.
    - **Range:** This selection is used to set the relative gating applied to the calculation of loudness range. The relative gating is enabled and the value is fixed at -20.
    - **Target Loudness:** This selection is used to set the desired loudness level.
        - **Level** selections range from -31 LKFS to -1 LKFS. The default selection is -24 LKFS.
        - **High Level Above Target** sets the range of allowable values above the desired loudness level. Selections range from 1 LU to 10 LU. The default setting is 2 LU.
        - **Low Level Below Target** sets the range of allowable values below the desired loudness level. Selections range from 1 LU to 10 LU. The default setting is 2 LU.

  - **Absolute Gating:** This selection is used to select the threshold for absolute gating applied to loudness calculation. The value specifies the loudness level below which there is only silence. Selections range from -70 LKFS to -50 LKFS. The default setting is -70 LKFS.
- **EBU R 128 Mode Setup:** Sets the EBU R 128 loudness metering parameters. This setup is NOT active unless EBU R 128 is selected in the menu **Mode**.
  - **Program:** This selection is used to set the usage of relative gating threshold applied to the calculation of program loudness. The relative gating is enabled and the value is fixed at -8.
  - **Short Term Integration:** This selection is used to set the integration time for the calculation of short term loudness. The selection is fixed at 3 seconds.
  - **Max Hold Time:** This selection is used to set the maximum true peak hold time. Selections are 1 to 10 seconds and Infinite. The default selection is Infinite.
  - **Range:** This selection is used to set the relative gating applied to the calculation of loudness range. The relative gating is enabled and the value is fixed at -20.
  - **Target Loudness:** This selection is used to set the desired loudness level.
    - **Level** is fixed at -23 LKFS.
    - **High Level Above Target** sets the range of allowable values above the desired loudness level. Selections range from 1 LU to 10 LU. The default setting is 1 LU.
    - **Low Level Below Target** sets the range of allowable values below the desired loudness level. Selections range from 1 LU to 10 LU. The default setting is 1 LU.
  - **Absolute Gating:** This selection is used to select the threshold for absolute gating applied to loudness calculation. The value specifies the loudness level below which there is only silence. The setting is fixed at -70 LKFS.
- **Custom Mode Setup:** This selection is used to match the user's in-house loudness metering parameters. This setup is NOT active unless Custom is selected in the menu **Mode**.
  - **Program:** This selection is used to set the usage of relative gating threshold applied to the calculation of program loudness. The setting Use Relative Gating is defaulted to on (Enabled).
    If Use Relative Gating is enabled, the menu Relative Gating Value selects value from -20 to -6. The default setting is -8.
  - **Loudness Integration Time:** This selection is used to set the integration time for the calculation of integrated loudness. Selections are from 0 seconds to 60 seconds. The default selection is 3 seconds.

- **Max Hold Time:** This selection is used to set the maximum true peak hold time. Selections are 1 to 10 seconds and Infinite. The default selection is Infinite.
- **Range:** This selection is used to set the relative gating applied to the calculation of loudness range. If Use Relative Gating is ON, Relative Gating Value selects a value from -22 to -18. The default selection is -20.
- **Target Loudness:** This selection is used to set the desired loudness level.
  - **Level** selections range from -31 LKFS to -1 LKFS. The default selection is -23 LKFS.
  - **High Level Above Target** sets the range of allowable values above the desired loudness level. Selections range from 1 LU to 10 LU. The default setting is 1 LU.
  - **Low Level Below Target** sets the range of allowable values below the desired loudness level. Selections range from 1 LU to 10 LU. The default setting is 1 LU.
- **Absolute Gating:** This selection is used to select the threshold for absolute gating applied to loudness calculation. The value specifies the loudness level below which there is only silence. Selections range from -70 LKFS to -50 LKFS. The default setting is -70 LKFS.

- **Trend Time:** This selection is used to set the time scale of the loudness trending chart in Loudness Bar Display. Selections range from 15 seconds to 24 hours.

The source and scale of the loudness meter in Loudness Bar Display are configured through the menu AUDIO SETUP > METER SETUP > LOUDNESS:

- **ATSC A/85 Mode Setup:** Sets the source and scale of the loudness meter. This setup is NOT active unless ATSC A/85 is selected as the menu **Mode**.
  - **Source:** This selection is used to specify the source that drives the loudness meter. Selections include Momentary Loudness and Short Term Loudness. The default selection is Momentary Loudness.
  - **LU Scale:** This selection is used to specify the maximum and minimum values the loudness meter can represent. This scale is NOT active unless LU is selected as the **Units** parameter.
    - **Top** selects the maximum value from 0 LU to 24 LU. The default is 24 LU.
    - **Bottom** selects the minimum values from -50 LU to -10 LU. The default is -46 LU.
  - **LKFS Scale:** This selection is used to specify the maximum and minimum values the loudness meter can represent. This scale is NOT active unless LKFS is selected as the **Units** parameter.
    - **Top** selects the maximum value from -20 LKFS to 10 LKFS. The default is 0 LKFS.

        - **Bottom** selects the minimum values from -70 LKFS to -30 LKFS. The default is -70 LKFS.

- **EBU R 128 Mode Setup:** Set the source and scale of the loudness meter. This setup is NOT active unless EBU R 128 is selected as the menu **Mode**.
    - **Source:** This selection is used to specify the source that drives the loudness meter. Selections include Momentary Loudness and Short Term Loudness. The default selection is Momentary Loudness.
    - **Scale:** This selection is used to specify the EBU loudness scale the loudness meter uses. Selections include EBU+9, EBU+18, and Full Scale (i.e., -70 LKFS to +0 LKFS). The default selection is EBU +9.
- **Custom Mode Setup:** This selection allows you to set the source and scale of the loudness meter. This setup is NOT active unless Custom is selected as the menu **Mode**.
    - **Source:** This selection is used to specify the source that drives the loudness meter. Selections include Momentary Loudness and Short Term Loudness. The default selection is Momentary Loudness.
    - **LU Scale:** This selection is used to specify the maximum and minimum values the loudness meter can represent. This scale is NOT active unless LU is selected as the **Units** parameter.
        - **Top** selects the maximum value from 20 LU to 24 LU. The default is 23 LU.
        - **Bottom** selects the minimum values from -50 LU to -10 LU. The default is -47 LU.
    - **LKFS Scale:** This selection is used to specify the maximum and minimum values the loudness meter can represent. This scale is NOT active unless LKFS is selected as the **Units** parameter.
        - **Top** selects the maximum value from -20 LKFS to 10 LKFS. The default is 0 LKFS.
        - **Bottom** selects the minimum values from -70 LKFS to -30 LKFS. The default is -70 LKFS.

Loudness Bar Display with TVM/VTM A3-OPT 3/5 TL

Loudness Bar display is illustrated in **Figure 3-63** and described in **Table 3-47**. For more information on the loudness feature, see the *A3-OPT 2, A3-OPT 3, A3-OPT 5, A3-4004, and A3-OPT 3/5-TL Installation and Operation Handbook*.

Figure 3-62. Loudness Bar Display with TVM/VTM A3-OPT 3/5 TL

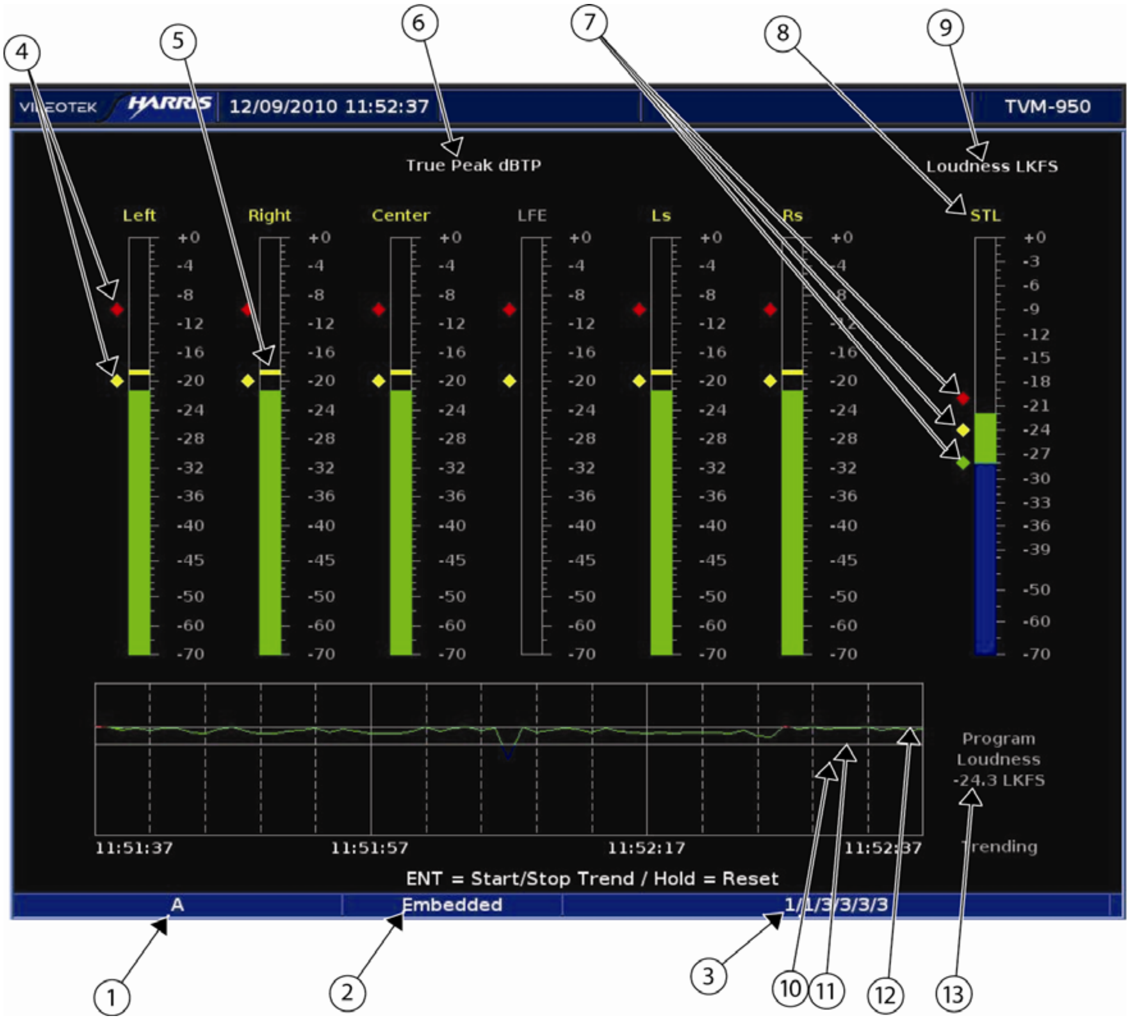


Table 3-46. Description of Loudness Bar Display with TVM/VTM A3-OPT 3/5 TL

Field Identifier	Field Information	Nomenclature
1	Input	Displays user-configurable source IDs for input
2	Audio Type	Displayed as Analog, AES, or Embedded
3	Monitored Audio Input Channels	Displayed information is option dependent; shown as 1 to 16 (Analog is 1-8, AES is 1-16 or 1-8, Embedded is 1-16)
4	Audio Meter Reference and Peak Levels	Indicates true peak reference and peak levels on audio meters, which can be set in menu AUDIO SETUP > METER SETUP > REF LEVEL and AUDIO SETUP > METER SETUP > PK PROGRAM LEVEL DIG > dBFS
5	Audio Meter Floating Peak	Displayed as floating peak on true peak audio meters. The peak hold time can be set in menu AUDIO SETUP > CONFIGURE INPUT A through D > AUDIO DISPLAY > LOUDNESS SETUP > ATSC A/85 (or EBU R 128, Custom) MODE SETUP > MAX HOLD TIME
6	Audio Meter Response and Scale	The first six audio meters show true peak levels in full dBFS scale (-70 dB to 0 dB)
7	Loudness Meter Target	Indicates high level above target (red diamond), target level

Table 3-46. Description of Loudness Bar Display with TVM/VTM A3-OPT 3/5 TL

Field Identifier	Field Information	Nomenclature
	Level / High Level Above Target /Low Level Below Target	(yellow diamond), and low level below target (green diamond) on the loudness meter, which can be set in menu AUDIO SETUP > CONFIGURE INPUT A through D > AUDIO DISPLAY > LOUDNESS SETUP > ATSC A/85 (or EBU R 128, Custom) MODE SETUP > TARGET LOUDNESS
8	Loudness Meter Source	Indicates the loudness meter is driven by momentary or short term loudness value
9	Loudness Meter Scale	Indicates the scale used by the loudness meter
10	Loudness Trending Chart	The trending chart is used to view short-term loudness readings within user-selectable time period. The time can range from 15 seconds to 24 hours. Press the ENT button to Start and Stop the Trending chart. Press and hold the ENT button for five seconds to clear the trending chart.
11	Low Level Below Target Loudness Line	The line shows the loudness value at Low Level Below Target. Trending points below the line are blue, while those above the line are green
12	High Level Above Target Loudness Line	The line shows the loudness value at High Level Above Target. Trending points below the line are green, while those above the line are red
13	Program Loudness	The field shows the readout of program loudness

Loudness Numeric Readout with TVM/VTM A3-OPT 3/5 TL

Loudness Numeric Readout is illustrated in **Figure 3-63** and described in **Table 3-48**. For more information on the loudness feature, see the *A3-OPT 2, A3-OPT 3, A3-OPT 5, A3-4004, and A3-OPT 3/5-TL Installation and Operation Handbook*.

Figure 3-63. Loudness Numeric Readout with TVM/VTM A3-OPT 3/5 TL

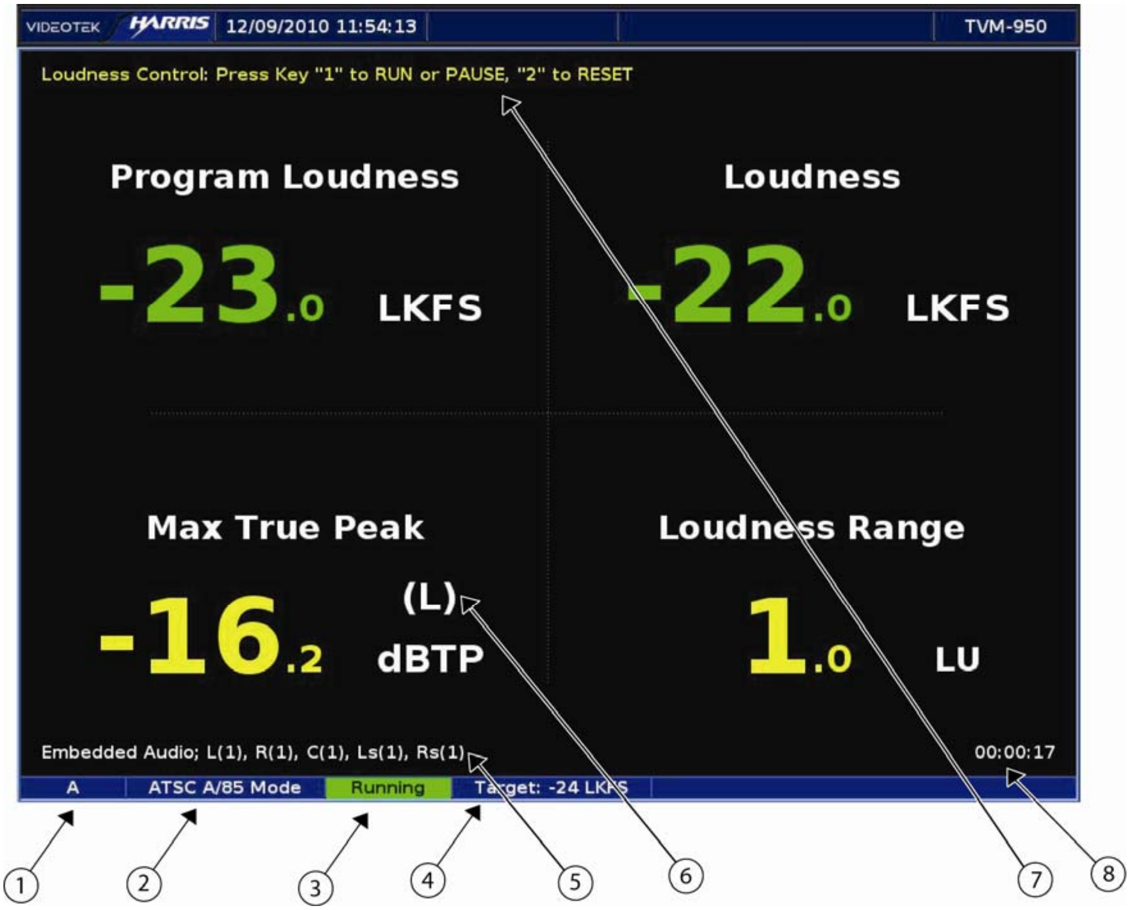


Table 3-47. Description of Loudness Numeric Readout with TVM/VTM A3-OPT 3/5 TL

Field Identifier	Field Information	Nomenclature
1	Input	Displays user-configurable source IDs for input
2	Loudness Metering Mode	Displays loudness metering mode ATSC A/85, EBU R 128, or Custom
3	Loudness Integration Status	Shows the status of loudness integrator. On running, it keeps collecting loudness samples; when paused, it discards loudness samples.
4	Target Loudness	Displays the desirable loudness level
5	Audio Type and Loudness Channel Mapping	The audio type is displayed as Analog, AES or Embedded. The loudness channel mapping is displayed as loudness/surround channel label with audio input channel.
6	Channel with Max True Peak	Shows which channel underwent the maximum true peak.
7	Loudness Control Instruction	The instruction tells the user to how to control the loudness integrator. Pushing numeric key "1" makes the loudness integrator run or pause. Pushing key "2" resets the calculation of program loudness and loudness range. The control is also applied to maximum true peak.
8	Program Clock	Shows how long the loudness integrator has been running.

Expanding the Audio Display

Press the ZOOM button to access the audio zoom feature. The range of the zoom is dependent upon the selections made in the ZOOM CENTER and ZOOM RANGE menu. Press and hold ZOOM to access this menu.

ZOOM CENTER: Adjustable from +0 dB to –50 dB in 1 dB steps. The default is the REFERENCE LEVEL setting. The ZOOM CENTER adjustment is restricted by AUDIO SCALE, REFERENCE LEVEL, and ZOOM RANGE selections.

ZOOM RANGE: Adjustable from 4 dB to 20 dB in 2 dB steps. The default is 10 dB. The ZOOM RANGE adjustment is restricted by AUDIO SCALE, REFERENCE LEVEL, and ZOOM CENTER selections. Zoom must be enabled to view the new adjustments.

Audio Menu Selections

Pressing and holding the AUDIO function button in the active audio pane selects the audio pane menu. The Audio Pane menu is described in **Table 3-39**.

Table 3-48. Alarm Pane Menu

* = Default

Selection	Selection Option
Audio input check	Off
	Analog
	AES 1 – 4
	AES 5 – 8
	Embedded 1 – 8
	Embedded 9 – 16
Lissajous	Soundstage
	X – Y
V2A timing display (TVM-A3-OPT V2A option only)	Off*
	On
Audio setup	Press ENT

Audio Input Check

The Audio Input Check is a quick way of checking the audio sources. It displays and changes 8-CH bar graphs with the input source selected from the pane menus. It overrides input selections and is only active while it is enabled.

Lissajous

Select to determine the type of Lissajous display that appears in the Audio pane. There are two type of Lissajous displays (Soundstage and X-Y). The soundstage selection displays a Lissajous, which is rotated so that the in-phase signals appear on the vertical axis and out of phase signals appear on the horizontal axis.

X-Y displays a Lissajous with the left channel mapped to the vertical axis, and the right channel mapped to the horizontal axis.

V2A Timing Display (TVM-A3-OPT V2A only)

NOTE: The TVM-A3-OPT V2A option is only available when the TVM-A3-OPT 3TL or TVM-A3-OPT 5TL is purchased. The V2A option must be used with a GEN-STAR or an X85 device containing the Video/Audio Timing test signal.

The TVM-A3-OPT V2A option is used to receive a VA2 test signal and analyze the timing between the video and the audio. The V2A (Video-to-Audio) Timing Display menu is used to enable and disable the Lip Sync Timing display. After analysis, the V2A Lip Sync Timing display, when enabled, shows the audio and video timing differences (if any) that occur during the following processes:

Up, cross, and down conversion

Analog-to-digital conversion

Digital-to-analog conversion

MPEG coding and decoding

Lip sync indicators appear next to each channel in the bar graph and CineSound displays. The markers indicate the channel number and the timing difference in milliseconds. The indicators do not appear on the loudness display. Positive numbers indicate that the audio is leading the video. Negative numbers indicate that the audio is lagging the video. A question mark (?) appears when no V2A signal is present, no video signal is present, or no audio signal is present.

Audio Setup

Press the ENT button to access the global Audio Setup menu. For more information on the Audio, see the *A^3-OPT 2, A^3-OPT 3, A^3-OPT 5, A^3-4004, and A^3-OPT 3/5-TL Installation and Operation Handbook*.

Option Display

NOTE: Only one option display can be shown at a time.

Pressing the OPTION function button accesses the Optional display for the selected pane. To select the type of optional display that for the pane, press and hold the OPT button to access the OPTION pane menu. The Option Pane menu is described in **Table 3-49**.

Table 3-49. Option Pane Menu

Selection	Selection Option
Display	Dolby metadata (Only if the Dolby option is installed)
	Video metadata
	Dolby VANC
	XDS
	Teletext
	CRC
	ASI
	Embedded audio data
Setup	Press ENT

Display

The display that appears for the selected input is determined by the Display submenu of the Option Pane setup menu. The displays that are selectable are:

Dolby Metadata (described on page 117)

Video Metadata (described on page 119)

Dolby VANC (described on page 121)

XDS (described on page 124)

Teletext (described on page 125)

CRC (described on page 126)

ASI (described on page 128)

Embedded Audio Data (described on page 132)

Option Setup

Press the ENT button to access the global setup menu. For more information on the global Setup menu, see Section 4.

Dolby Metadata Display (Option Dependent)

Metadata is Dolby specific information found in the input audio stream that is used to configure encoders that will transmit the Dolby Digital (AC-3) information to audio decoders.

When the metadata information appears on the display, use the up and down navigation buttons to page through the metadata list. Press the right navigation button to move to the next program list. Press the left navigation button to move to the previous program list. The metadata is read from the Dolby stream and cannot be changed.

1. Bitstream Format
2. Program Config
3. Dolby E position
4. Data Rate
5. Bitstream Mode
6. Channel Mode
7. LFE Channel (Enabled/Disabled)
8. Dolby Surr (Surround) Mode
9. Dialogue Level
10. Center Downmix Level
11. Surround Downmix Level
12. Audio Prod (Production) Information
13. Room Type
14. Mix Level
15. RF Overmod Protection
16. Lt/Rt Surround Downmix
17. Lt/Rt Center Downmix
18. Lo/Ro Surround Downmix
19. Lo/Ro Center Downmix
20. Pref. Stereo Downmix
21. Dolby Surr (Surround) Ex. Mode
22. A/D Converter Type
23. Original Bitstream
24. Copyright Bit
25. DC Filter
26. Lowpass Filter
27. LFE Lowpass Filter
28. Surround Attenuation
29. Surround Phase Shift
30. Line Mode Comp Gain
31. Dynamic Range Gain
32. RF Mode Comp Gain
33. Compression Gain

A Dolby Metadata display diagram is shown in **Figure 3-64** and described in **Table 3-50**. The diagram illustrates the general location for the various waveform display fields.

Figure 3-64. Dolby Metadata Display Diagram

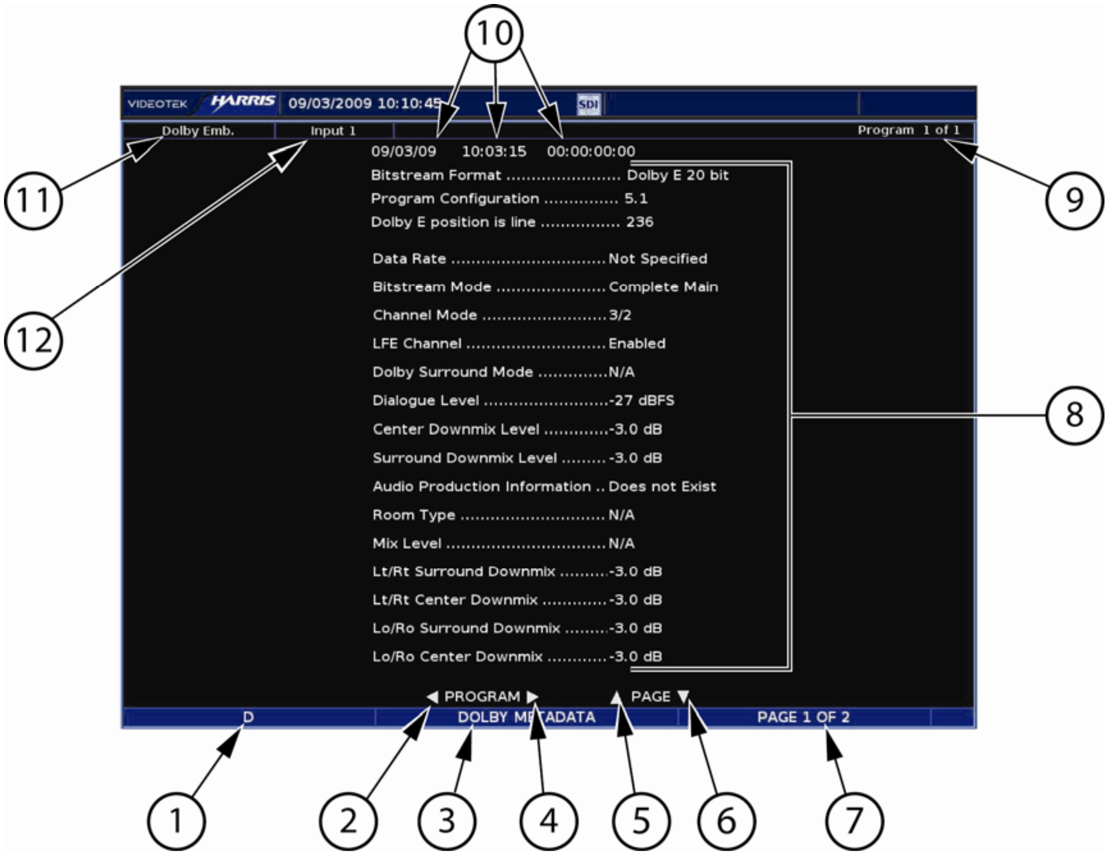


Table 3-50. Description of Dolby Metadata Display Diagram

Field Identifier	Field Information	Nomenclature
1	Input	Displays user-configurable source IDs for input and routers
2	Paging information	Displays ◀ = Previous program
3	Display label	Shown as Dolby Metadata
4	Paging information	Displays ▶ = Next program
5	Paging information	Displays ▲ = Page up
6	Paging information	Displays ▼ = Page down
7	Page information	Shown as page X of Y where X is the page number and Y is the total number of pages.
8	Metadata information	Supplied by the A^3-OPT 5 board
9	Program Information	Shows how many programs are available for the current Dolby format, and to which program the metadata parameters apply
10	Date, internal time, selected time code, time stamp	Date is shown as month/day/year, internal time is shown as hour: minute: seconds, and time code is shown as hour: minute: seconds: frame
11	Audio type	Displayed as Analog, AES, Embedded, Dolby AES, Dolby Embedded
12	Dolby display input	The input selected in the AUDIO SETUP > CONFIGURE INPUT (A through D) > DOLBY SETUP > DISPLAY INPUT menu is the Dolby display input displayed (Dolby inputs are shown as one digital input)

Video Metadata

The Video metadata display provides a description and location in text form of specific data embedded in the video signal. A Video Metadata display diagram is shown in **Figure 3-65** and described in **Table 3-51**. The diagram illustrates the general location for the various Video Metadata display fields.

Figure 3-65. Video Metadata Display Diagram

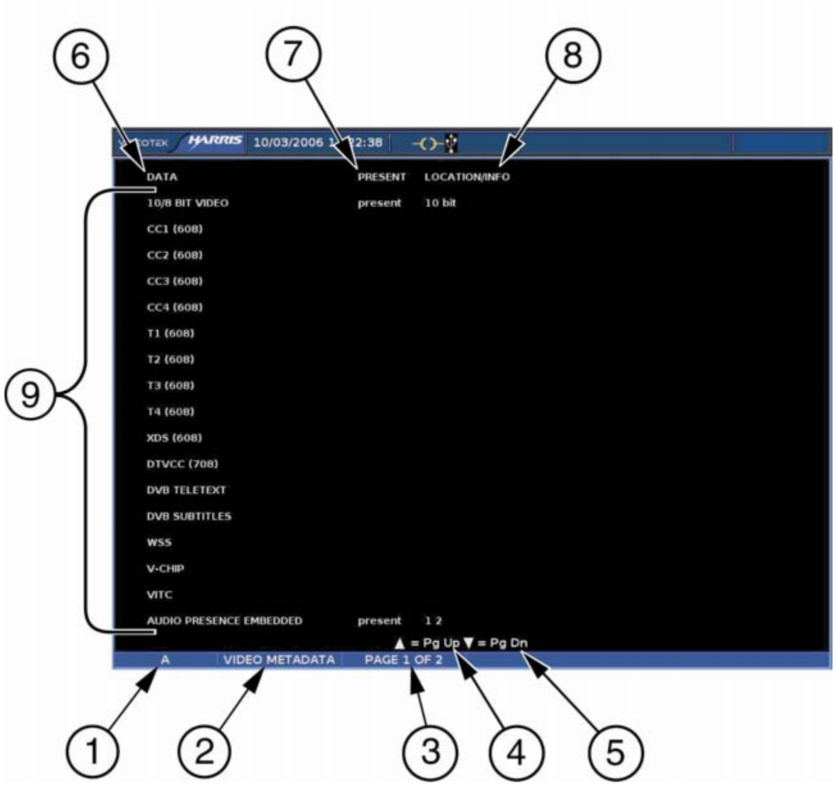


Table 3-51. Description of the Video Metadata Display Diagram

Field Identifier	Field Information	Nomenclature
1	Input	Displays user-configurable source IDs for input and routers
2	Display label	Displayed as Video Metadata
3	Page information	Shown as page X of Y, where X is the page number and Y is the total number of pages
4	Paging information	Displays ▲ = Page up
5	Paging information	Displays ▼ = Page down
6	Data column label	Indicates the Data column
7	Present column label	Indicates the data detected
8	Location/info column label	Indicates the location information from the appropriate specification when it is detected
9	Metadata information	Displays the video metadata information

The display, shown in **Figure 3-65**, shows a chart that is split into three columns, which shows the information to be identified.

The DATA COLUMN lists the Video metadata parameter.

The PRESENT column has two states: No data detected (blank box) and Data Detected (indicated as present).

The LOCATION/INFO column displays the location information from the appropriate specification when it is detected.

Table 3-52. Sample Video Metadata Pane List

Data	Present	Location/Info
10/8 bit video	Present	10—bit
CC-1 (608)	Present	Line 21
CC-2 (608)		
CC-3 (608)	Present	Line 21
CC-4 (608)		
T-1 (608)		
T-2 (608)		
T-3 (608)		
T-4 (608)		
XDS (608)		
DTVCC (708)		
DVB teletext		
DVB subtitles	Present	Line 23
WSS		
V chip		
VITC		
Audio presence embedded		1, 2, 3, 4

The second page consists of Video Indexing information for Class 1 (title only), as shown in **Table 3-53**.

Table 3-53. Sample Video Index Pane

Data	Location/Info
Video index class 1	
Standard/aspect ratio	625/50 4×3
Gamut	RGB
Sampling	4:0:0
Pan	Pixels: -305.0000
Tilt	Lines: -281.75
Zoom	Lines: +563.5

Table 3-53. Sample Video Index Pane

Data	Location/Info
WSS	
PAL plus	
Active format description	

Table 3-54. Video Payload Identifier and Active Format Descriptor

Data	Location/info
Video payload identifier	0X89c9001
Link status/bit depth	100% 10 bit
Sampling structure	4:2:2 YCBCR
Frame rate	TS=Prog PS= Prog 50 Hz
Digital interface std	2.97Gb/s 1080i/p
Active format description	0X50
AFD code	16:9 L
Bar data flag	
Bar data1	
Bar data2	
Pan and scan data	

Dolby VANC Display

Dolby VANC Metadata is Dolby specific information found in the video ancillary data that is used to configure encoders that will transmit the Dolby Digital (AC-3) information to audio decoders.

Dolby VANC metadata contains several possible payload types. The Dolby VANC metadata may contain any of the following payload types:

- Dolby E Complete
- Dolby E Essential
- Dolby D Complete XBSI
- Dolby D Complete
- Dolby D Essential

When the metadata information appears on the display, use the up and down navigation buttons to page through the metadata list. Press the right navigation button to move to the next payload. Press the left navigation button to move to the previous payload. The metadata is read from the Dolby stream and cannot be changed.

Dolby E Complete Payload

1. Program Config
2. Frame Rate Pitch
3. SMPTE Time Code
4. Description Text 1
5. Description Text 2
6. Description Text 3
7. Description Text 4
8. Description Text 5
9. Description Text 6
10. Description Text 7
11. Description Text 8

Dolby E Essential Payload

1. Program Config
2. Frame Rate Pitch
3. Pitch Shift Code

Dolby D Complete XBSI Payload

1. Program ID
2. Data Rate
3. Bitstream Mode
4. Audio Coding Mode
5. Center Mix Level
6. Surround Mix Level
7. Dolby Surround Mode
8. Low Frequency Effects
9. Dialog Normalization
10. Language Code Exists
11. Language Code
12. Audio Production Info Exists
13. Mix level
14. Room Type
15. Copyright
16. Original Bitstream
17. Extended Bitstream 1 exists
18. Downmix Mode
19. Lt/Rt Center Mix Level
20. Lt/Rt Suround Mix Level
21. Lo/Ro Center Mix Level
22. Lo/Ro Suround Mix Level
23. Extended Bitstream 2 exists
24. Dolby Surround EX Mode
25. Dolby Headphone Mode
26. A/D Converter Type
27. High Pass Filter
28. Low Pass Filter
29. LFE Low Pass Filter
30. Surround Phase Shift
31. Surround Attenuation
32. RF Mode Pre-emphasis
33. Compression Gain Profile
34. Compression Gain Value
35. Dynamic Range profile
36. Dynamic Range 1
37. Dynamic Range 2
38. Dynamic Range 3
39. Dynamic Range 4

Dolby D Complete Payload

1. Program ID
2. Reserved
3. Bitstream Mode
4. Audio Coding Mode
5. Center Mix Level
6. Surround Mix Level
18. Timecode 1
19. Timecode 2 Exists
20. Timecode 2
21. High Pass Filter
22. Low Pass Filter
23. LFE Low Pass Filter

Dolby D Complete Payload

7. Dolby Surround Mode
8. Low Frequency Effects
9. Dialog Normalization
10. Language Code Exists
11. Language Code
12. Audio Production Info Exists
13. Mix level
14. Room Type
15. Copyright
16. Original Bitstream
17. Timecode 1 Exists
24. Surround Phase Shift
25. Surround Attenuation
26. RF Mode Pre-emphasis
27. Compression Gain Profile
28. Compression Gain Value
29. Dynamic Range Profile
30. Dynamic Range 1
31. Dynamic Range 2
32. Dynamic Range 3
33. Dynamic Range 4

Dolby D Essential Payload

1. Program ID
2. Data Rate
3. Bitstream Mode
4. Audio Coding Mode
5. Low Frequency Effects
6. Dialog Normalization
7. Compression Gain Profile
8. Compression Gain
9. Dynamic Range Profile
10. Dynamic Range 5
11. Dynamic Range 6
12. Dynamic Range 7
13. Dynamic Range 8

A Dolby Metadata display diagram is shown in **Figure 3-66** and described in **Table 3-55**. The diagram illustrates the general location for the various fields.

Figure 3-66. Dolby VANC Metadata Display Diagram

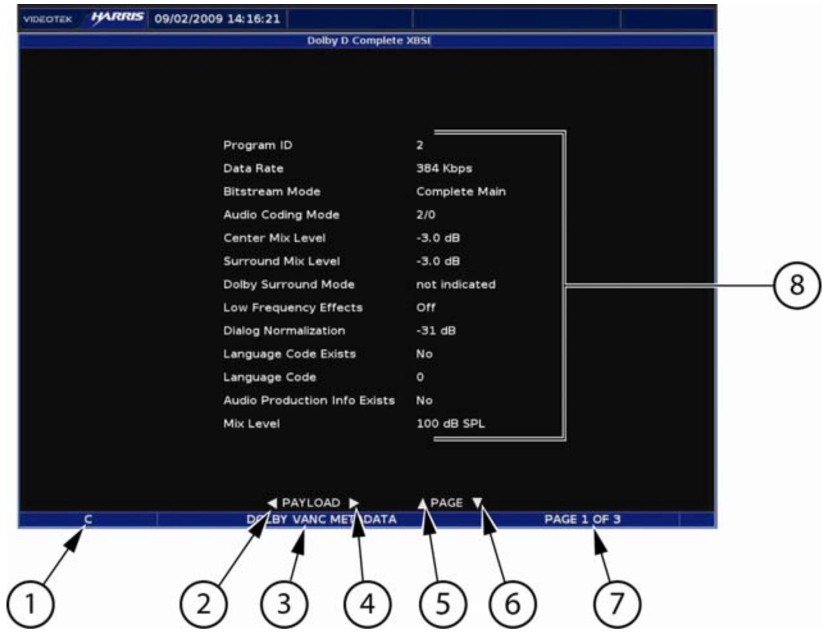


Table 3-55. Description of Dolby VANC Metadata Display Diagram

Field Identifier	Field Information	Nomenclature
1	Input	Displays user-configurable source IDs for input and routers
2	Paging information	Displays ◄ = Previous payload
3	Display label	Shown as Dolby VANC Metadata
4	Paging information	Displays ► = Next payload
5	Paging information	Displays ▲ = Page up
6	Paging information	Displays ▼ = Page down
7	Page information	Shown as page X of Y, where X is the page number and Y is the total number of pages
8	Metadata information	Supplied by the video board

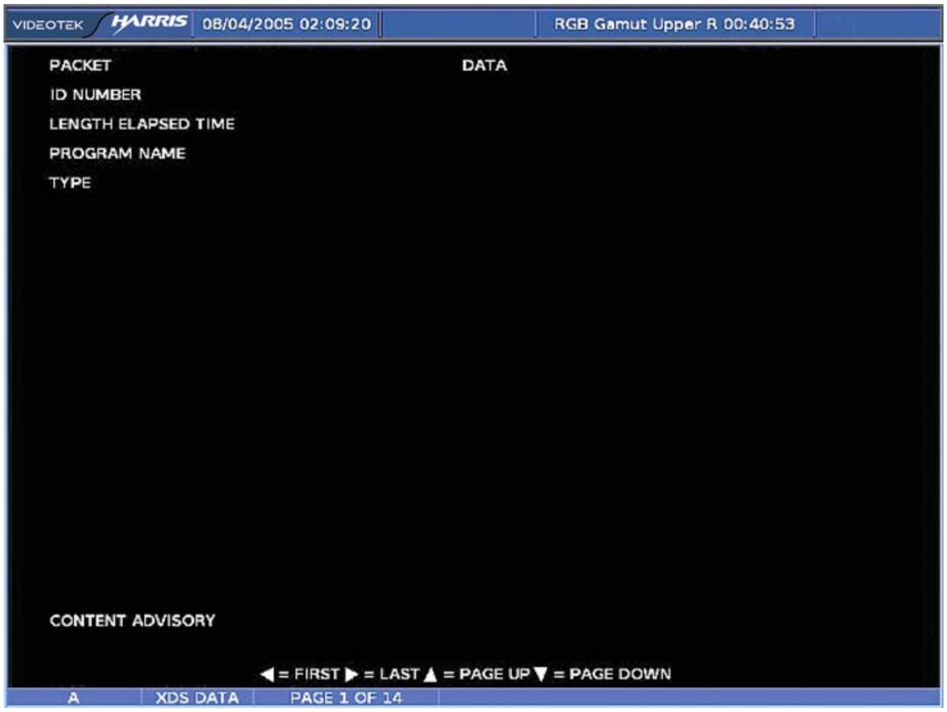
XDS

Extended Data Services (XDS) is a data service that provides current and future program information (such as the program name, type, and content advisory information). It also provides other related information (such as a national weather service message and time zone information).

Press the NAVIGATION buttons to scroll through the available pages. Only the information that is available in the video stream will appear next to the XDS field. If the information is not available in the data stream, the displayed information following the title is blank.

Deactivate the XDS pane by making another selection using the OPTION pop-up menu, or pressing a different function button in the selected pane. A sample XDS pane is shown in **Figure 3-67**.

Figure 3-67. XDS Pane



Teletext

NOTE: If the format selected is not a valid format for teletext, NOT VALID DISPLAY FOR INPUT FORMAT appears on the screen. PAL and 625 are the only formats that functions with teletext. The Teletext display does not show OP-47 data.

Teletext functionality is operational when enabled in the OPTION DISPLAY pane menu. When enabled, the TVM monitors for teletext.

The Teletext Detect alarm is activated when the presence of Teletext is not detected in the vertical blanking interval for some time in excess of the duration setting. The Teletext Not Updating alarm is also activated when the Teletext carrier is present and the data word is null for a period in excess of the duration setting. Press the DOWN arrow to go to the Index page (page 100). Press the LEFT ARROW button to go to the previous page, and press the RIGHT ARROW button to go to the next page.

Press the ENT button to open the Teletext Page Input screen. From this screen, select the page where the teletext can be viewed. Use the up/down Navigation buttons to change the number for the page. Press the left/right button to move between numeric positions.

CRC

CRC evaluates SD and HD formats. CRC functionality is operational when enabled in the OPTION DISPLAY pane menu. When enabled and the OPTION button is pressed, the CRC display appears.

A CRC display diagram is shown in **Figure 3-68** and described in **Table 3-56**. The diagram illustrates the general location for the various CRC display fields.

Figure 3-68. CRC Display Diagram

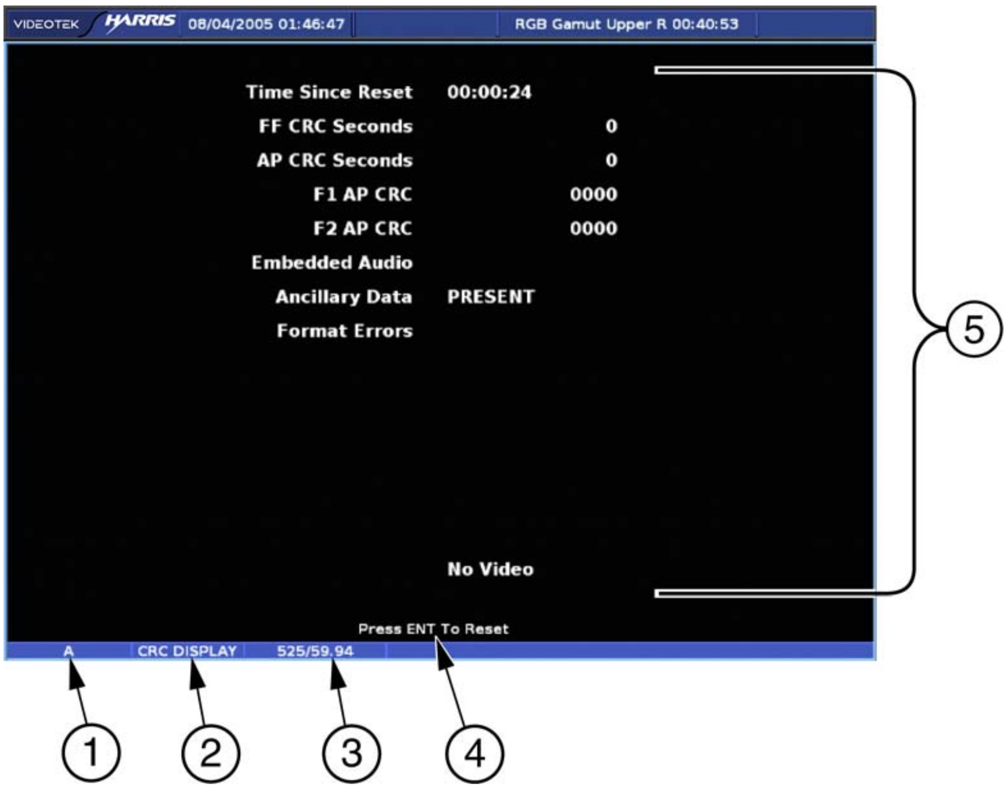


Table 3-56. Description of the CRC Display Diagram

Field Identifier	Field Information	Nomenclature
1	Input	Displays user-configurable source IDs for input and routers
2	Display label	Displayed as CRC DISPLAY
3	Standard	Displayed as the line rate/frame rate [1080i/59.94]; when no signal is present, No Signal appears
4	Reset information	Reset information; press ENT to reset is displayed
5	CRC timer, information and errors	Lists the CRC information

The following information is displayed when the CRC display is ON and an SD format is detected:

Display					Description
Time since Reset			00:00:00		Hr:min:sec, elapsed time since last reset
FF	CRC	Seconds		Value	Full field CRC error in seconds
AP	CRC	Seconds		Value	Active Picture CRC error in seconds
	F1	AP	CRC	Value	CRC value (Check Sum) for active picture, field one
	F2	AP	CRC	Value	CRC value (Check Sum) for active picture, field two
Embedded Audio				Value	Detects how many groups of audio are available
Ancillary Data				Present	Detects other ancillary information
Format Errors					Detects a format error

The following information is displayed when the CRC display is ON and an HD format is detected:

Display				Description
Time since Reset		00:00:00		Hr:min:sec, elapsed time since last reset
CRC	Error Free	Seconds	Value	Length of time in seconds CRC is error free
CHROMA				-
	Embedded Audio		Value	Detects how many groups of audio are available
	Ancillary Data		Present	Detects other ancillary Chroma information
LUMA				-
	Ancillary Data		Present	Detects ancillary Luma information
	Format Errors		Y* C*	Detects a format error

***** Y=Luma and C=Chroma

The CRC Window Format Error types are displayed under FORMAT ERRORS when they are detected. The CRC format error types are:

SAV PLACED INCORRECTLY (SAV)

LINE LENGTH ERROR (Line Length)

FIELD LENGTH ERROR (Field Length)

RESERVED VALUES USED IMPROPERLY (Reserved Values)

ANC DATA CHECKSUM ERROR (ANC Checksum)

ANC DATA PARITY ERROR (ANC Parity)

ANC DATA PLACEMENT ERROR (ANC Placement)

ABSENCE OF SERIAL VIDEO INPUT (No Video)

Press and hold the ENT button on the front panel to reset the CRC elapsed time to zero and clear the EDH errors. The CRC error types are described in Section 5.

ASI (Option TVM-VTM-ASI only)

NOTE: To enable the ASI screen, refer to “Option Display” on page 115.

The ASI screen is used to analyze the transport stream that complies with the ATSC or DVB standard. It utilizes text and graphical formats and trending for up to 20 selectable programs simultaneously. It accepts two independent MPEG streams and analyzes the selected stream in real-time for compliance to measurement guidelines of ETSI TR-101-290 (ETR-290) first, second, and third priority standards. The priority standards are:

ETR 290 1st Priority

ETR 290 2nd Priority (DVB)

ETR 290 2nd Priority (ATSC)

ETR 290 3rd Priority (DVB)

ETR 290 3rd Priority (ATSC)

Two formats that can be monitored in the MPEG stream are DVB and ATSC. Digital Video Broadcasting (DVB) is a specific project office of the European Broadcast Union. This group has produced a set of digital broadcasting standards. The Advanced Television Systems Committee (ATSC) is the parent organization that developed, tested, and described the form and function of the US digital television formats. DVB ASI and SMPTE310 are automatically detected and not manually selected.

To select the ATSC or DVB format:

1. Press and hold the INPUT (A, B, C, or D) button. The T.S. FORMAT menu appears.

Select the ATSC or DVB format in the T.S. FORMAT menu.

The ASI screen, shown in **Figure 3-69**, displays the selected program information for the MPEG stream. The information is displayed based on the table selected. The other selection to show information is BW (bandwidth).

Figure 3-69. ASI Display Diagram (ATSC Standard Selected)

Navigate the screen using the left, right, up, and down navigation buttons. Press the LEFT and RIGHT navigation buttons to select the available video programs in the stream. Information related to the programs appears as soon as the program is selected.

Press the up and down navigation buttons or turn the curved arrow knob to scroll through the available tables. The tables are determined by the ATSC or DVB formats. If a program is removed from the transport stream, the associated program indication turns red and “NO PROGRAM” appears.

If ATSC is the format for the stream, the tables that appear are:

INFO (from the Program and System Information Protocol (PSIP))

PAT (Program Association Table) - The PAT tells the decoder how many programs are in a stream and points to the Program Map Tables (PMTs) that contain the information where the parts for any given program can be found.

PMT (Program Map Table) - The PMT points to the component video, audio, and data streams that make up the program.

MGT (Master Guide Table) – The MGT defines the type, packet identifiers, and PSIP tables in the transport stream. Only the System Time Table (STT) is not defined in the MGT tables. Press ENT and the up and down navigation buttons to scroll through the tables.

VCT (Virtual Channel Table) – The VCT tabulates virtual channel attributes for tuning.

RRT (Region Rating Table) – The RRT indicates the ratings for various countries.

STT (System Time Table) – The SST indicates the time.

EIT (Event Information Table) – The EIT lists the events and information for the virtual channels. The information includes, name, start time, and duration. Press ENT and the up and down navigation buttons to scroll through the events.

EPG (Electronic Program Guide) – The EPG indicates a list of the programs and the times the programs occur. Press ENT and the up and down navigation buttons to scroll through the programs.

BW (Bandwidth) – The BW screen displays the trend data, total bandwidth, and bandwidth per program.

DVB Stream Formats

If DVB is the format for the stream, the tables that appear are:

INFO (from the Service Information Table [SI])

PAT (Program Association Table) - The PAT tells the decoder how many programs are in a stream and points to the Program Map Tables (PMTs) that contain the information where the parts for any given program can be found.

PMT (Program Map Table) - The PMT points to the component video, audio, and data streams that make up the program.

EIT (Event Information Table) – The EIT lists the events for the virtual channels. Press ENT and the up and down navigation buttons to scroll through the events.

CAT (Conditional Access Table) - The Conditional Access Table (CAT) is the pointer to the Entitlement Management Message (EMM) associated with the CA system(s) that it uses.

NIT (Network Information Table) – the NIT contains the information for the transmissions of a stream in a network. Each stream is individually identified with a network ID and a transport stream ID.

SDT (Service Description Table) – The SDT describes services found within a transport stream. Press ENT and the up and down navigation buttons to scroll through the services.

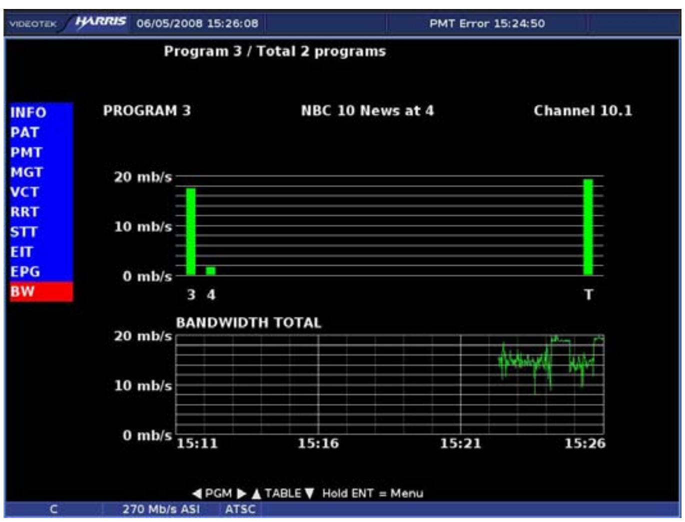
BW (Bandwidth) – The BW screen displays the trend data, total bandwidth, and bandwidth per program.

Bandwidth and Trending Screen

The Bandwidth screen, shown in **Figure 3-70**, indicates the trend data, total bandwidth, and the bandwidth per program. The top of the display is a bar graph. The far right of the bar graph indicates the total bandwidth. The bars to the left of the total bandwidth bar indicate the bandwidth per program.

Beneath the bar graph is a plotted chart (trending chart) that displays the bandwidth level in Mb/s over the selected time. The trending chart is displayed with the selectable bandwidth level on the left and the selectable time on the bottom of the chart. The trending chart can display the Total bandwidth over time, the selected program, or NULL bandwidth. Samples are plotted in 15, 30, 45, or 60-minute intervals.

Figure 3-70. ASI Bandwidth Display



ASI Menu Selections

Pressing and holding the ENT button in the active ASI pane selects the ASI pane menu. The ASI Pane menu is described in **Table 3-57**.

Table 3-57. ASI Pane Menu

Selection	Selection Option
Data format	Hex
	Decimal
UTC offset	-12.00 to +12.00 hours (0.00 is default)
Trend time	15 minutes
	30 minutes
	45 minutes
	60 minutes
Trend scale	10 Mb/s to 150 Mb/s
Trend display	Total
	Follow PGM select
	Null bandwidth

T.S. Format

The Transport Stream Format menu is used to determine the format that complies with the MPEG stream. The format selections are ATSC and DVB.

Data Format

The Data Format menu is used to determine the numeric base for the Transport Stream information that is displayed: Hex or Decimal

UTC Offset

The Universal Time Coordinated (UTC) Offset is used to provide an offset of the time shown on the display to the time zone of the unit. The UTC Offset parameters are in hour increments.

Trend Time

The X-axis of the trending chart contains the selected trending time. When new data is entered into the trending display, the time interval on the X-axis changes while the plot lines shift from right to left. The TRENDING TIME is set in 15, 30, 45, or 60-MINUTE increments:

Trend Scale

The Y-axis of the trending chart is used to indicate the scale that is plotted on the trending chart. Bandwidth data is plotted on a scale of 10 Mb/s to 150 Mb/s.

Trend Display

The Trend Display menu item is used to select the type of information that is shown in the trending display. The selections are the Total Bandwidth, the bandwidth of the selected program, and Null Bandwidth. The Null Bandwidth is the bandwidth that is used by the Null packet.

Embedded Audio Data

When enabled in the OPTION pop-up menu, the Embedded Audio display appears. Each channel is displayed on two pages. The first page is CHANNEL STATUS BIT and the second page is USER BIT. Audio Control Packet data provides the first block of information at the top of the pane. The Audio Control Packet information is embedded at line 9 or 571 (interlaced only) of the horizontal ancillary data for the Y channel.

At the top of the pane DID indicates the audio groups that are embedded as audio, and a “-”indicates the audio group is not present. Also, the channel number for the data displayed is shown.

The remaining Embedded Audio information provided in the Embedded Audio pane includes the following:

CHANNELS PRESENT indicates all of the active channels by showing the channel number. When the channel is not present, a “-” appears.

SAMPLING RATE indicates the sampling frequency of the embedded audio.

FORMAT indicates the professional or consumer audio format.

AUDIO DATA indicates if the data received is audio (shown with YES) or not audio (shown with NO).

EMPHASIS indicates No, NA, TC, and J17. No indicates no emphasis. NA indicates that there is no data available or defined. TC indicates the time constant of 50/15 µs. J17 indicates CCITT J.17 (800 HZ insertion loss of 6.5 dB).

SIGNAL LOCK indicates a lock of the source sampling frequency.

CHANNEL MODE indicates NA, two channel, 1 channel, primary/secondary, and Stereo. NA indicates that the data value is not available or reserved.

RESOLUTION indicates 20 or 24 bit audio packets.

The CHANNEL STATUS BIT/USER BIT shows all 192 bits of information by byte. Channel status bit/User Bit information analyzes the bits, decodes the information, and displays the selected data.

When the Embedded Audio data information appears on the display, use the up and down navigation buttons to scroll through the audio data. Press the right navigation button to select the next channel. Press the left navigation button to select the previous channel.

Multi-Screen Display Selection

Press the MLT button in the display group to toggle between the MLT and Quad or Full Screen. MLT is high tally when selected. Press and hold the MLT button to access the MLT DISPLAY menu where one of the following can be selected:

TVM CLASSIC: Enables the display to be setup like a classic TVM display, as described on page 133.

DATA ANALYZER: Enables the Data Analyzer display, as described on page 135. The menu item is not accessible without the TVM-VTM-AAP option in the TVM9100PKG. It is standard in the TVM9140PKG and TVM9150PKG.

TIMING CUSTOM: Enables the Custom Timing Display, as described on page 144.

WFM/VEC ONLY: Enables the Waveform and Vector to only be displayed, as described on page 144.

3Gb/s WFM/VEC: For best monitoring of the 3Gbs signal (this menu item is not accessible without the TVM-VTM-3GB option and TVM9140PKG or TVM9150PKG).

TVM Classic

Pressing and holding the MLT button accesses the MLT DISPLAY menu. From the MLT DISPLAY menu, select TVM CLASSIC to have the TVM convert the screen to the classic TVM style display, as shown in **Figure 3-71**.

Figure 3-71. TVM Classic Display Diagram

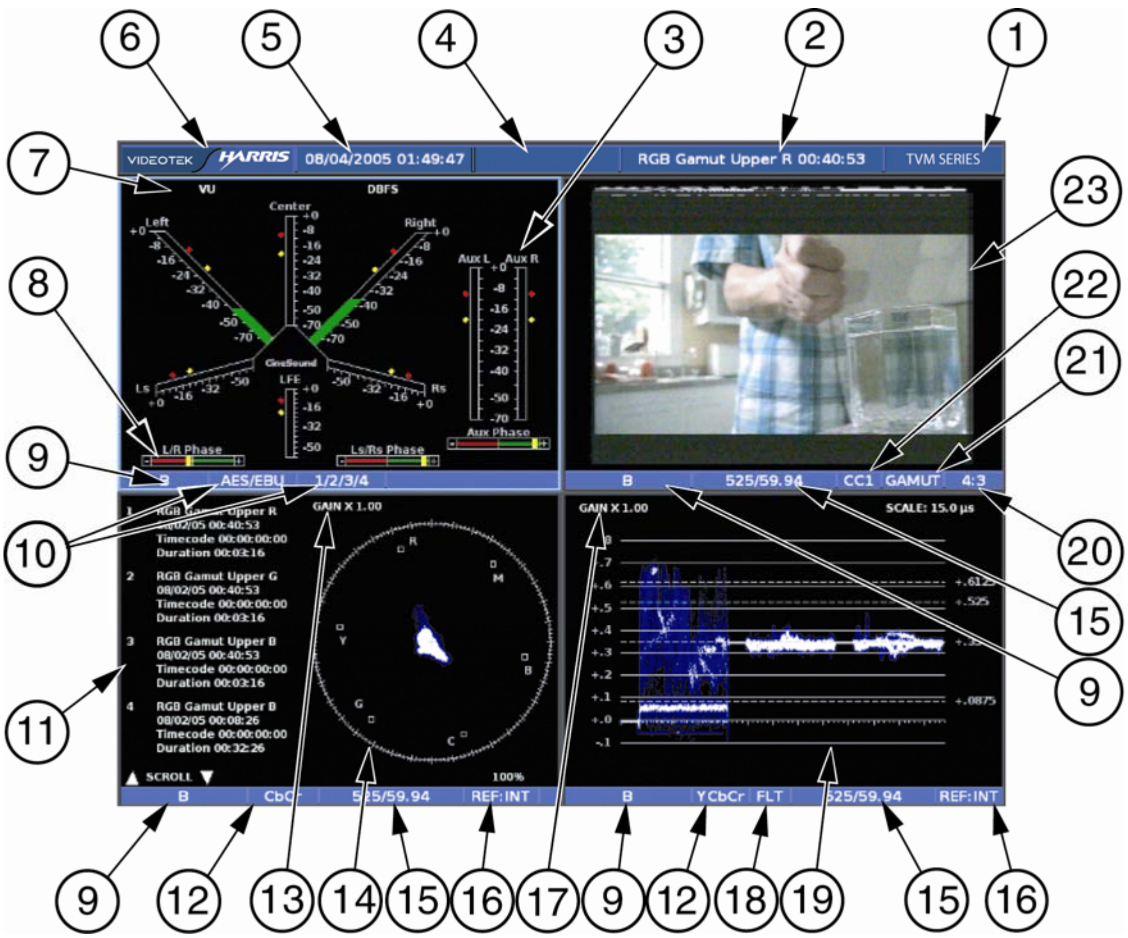


Table 3-58. Description of Simultaneous TVM Classic Display

Key	Description
1	Model Number
2	Latest Alarm indication with the date and time the alarm occurred (highlighted in yellow when active)
3	Location of the Lissajous (X, Y) display of the audio input meter or the AUX location in the 5.1 and AUX/LFE in 6.1 CineSound display
4	Icon status indication
5	Date and time of internal clock
6	Company name
7	Location of the audio
8	Audio phase bar when audio graticule meters are displayed
9	Indicates the input selection
10	Indicates the format and input channels
11	Alarm display
12	Indicates the format selection
13	Vector Gain indication
14	Vector or Gamut display of selected inputs
15	Indicates the detected or selected video standard
16	Indicates the reference
17	Waveform gain indication
18	Waveform Filter selection
19	Waveform or Eye Pattern and Jitter display of selected input(s)
20	Indicates the selected aspect ratio of the picture
21	Picture Gamut indication
22	Indicates the Closed Caption selection
23	Displays the picture for the selected input

The TVM Classic panes are located in fixed pane locations. Panes cannot be moved while in this mode. Press the appropriate display button to highlight and change a function selection (that is from vector to gamut or waveform to eye pattern). The TVM classic display can only utilize a single input.

The panes are linked together for Line select and cursor movement. When line select is enabled, the WFM and VEC are in line select and the picture cursor show and follow the line selection.

The alarm log changes in TVM Classic mode. When an alarm is first registered, it appears at the top of the alarm display area in yellow. If the alarm is short term (that is, two seconds or less), the alarm text reverts to the original graticule color after approximately two seconds. If the alarm continues longer than two seconds, the text remains yellow and the alarm duration is incremented. When the next alarm occurs, the previous alarm moves down one position.

The TVM has enough memory for 200 alarms per input. When 200 different alarm events have occurred, alarm number 200 is dropped and the most recent alarm is tagged as 1. Use the up or down navigation buttons to scroll through the alarm list. **Figure 3-72** shows a sample alarm in TVM Classic mode.

Figure 3-72. Sample Alarm Message

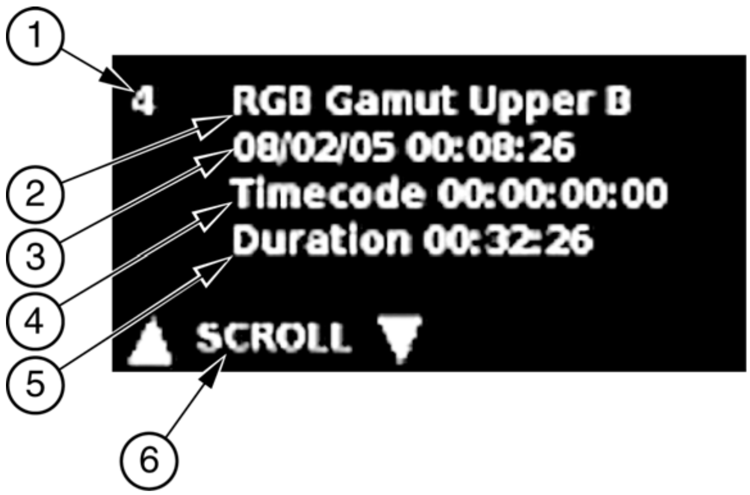


Table 3-59. Description of Sample Alarm Message

Key	Description
1	Index number, from 1-200
2	Alarm type, which describes the error
3	Date and time (the internal clock setting in month/day/year and hour:minute:second)
4	Time code, which is from the LTC/CLOCK, VITC, or D-VITC (shown in day:hour:minute:second:frame)
5	Duration, which is the length of time that the error occurred (shown in hour:minute:second)
6	Scroll Up and Down indication. Use the up and down navigation buttons to scroll through the alarm list.

Data Analyzer Display (HD-SDI and SD-SDI Only)

NOTE 1: Data display only operates with digital inputs.

NOTE 2: When Data Analyzer is utilized, the unit is forced into Line Select mode.

Pressing and holding the MLT button accesses the MLT DISPLAY menu. From the MLT DISPLAY menu, select DATA ANALYZER to display the data word analyzer. The data display contains the data and the picture zoom box. A cursor also appears in the picture display.

To navigate through the Data display, select the Data mode display pane. Once selected, use the curved arrow knob or the horizontal knob for navigation.

The data samples per page actually represent two unique pixels. Both of these pixels have exactly the same color information, formed from the combination of one CB and one CR sample. That color information is combined with the first Y sample (the “cosited” Y sample) for the first pixel of the group and combined with the second Y sample (Y’, or Y prime) for the second pixel.

The pixel cursor and the zoomed picture elements are displayed next to the data. The target area within the pixel cursor reflects the Pixel Group Display menu selection 2H, 8H, or 2H×4V. When selecting Data Analyzer, the pixel cursor appears on the picture pane. The pixel cursor shows the location of the data displayed in the Data zoom pane. Look at the Picture Zoom display for the precise location of the Data display cursor. The pixel cursor is described in “Pixel Cursor” on page 137.

Referring to item 6 in **Figure 3-73**, the first pixel will be formed from the samples 1440, 1441, and 1442. The color information for this pixel comes from CB and CR, or samples 1440 and 1442. Sample 1441 is the unique Y sample.

When Line Select is enabled, the cursor on the picture can be moved up and down with the curved arrow knob. Pressing the up and down navigation buttons or turning the horizontal knob moves the cursor left and right.

A sample Data Mode display is shown in **Figure 3-73** and described in **Table 3-60**.

Figure 3-73. Data Mode Display (HD-SDI and SD-SDI Only)

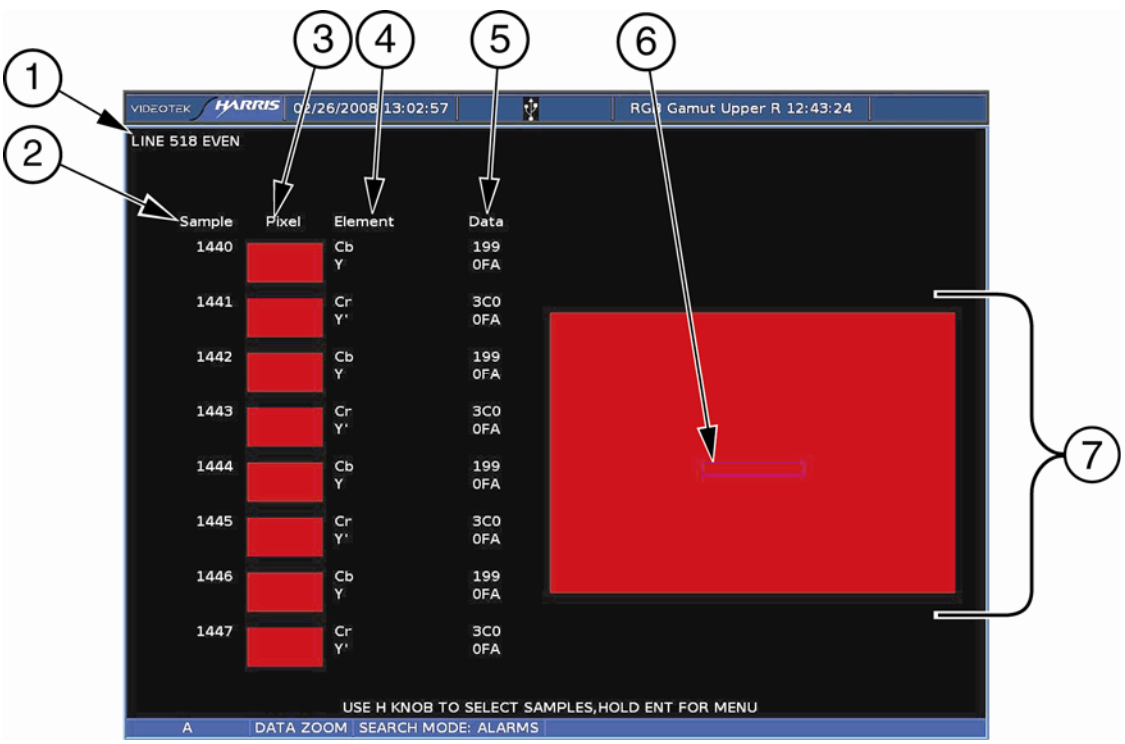


Table 3-60. Description of Data Mode Display (SD-SDI and HD SDI Only)

Key	Indicator	Description
1	Line	Indicator that shows the line number of the picture along with the Even (E) and/or Odd (O) line selection; line number corresponds to the cursor on the picture
2	Sample	Indicates the selected pixel samples inside the pixel cursor
3	Pixel	Complete information for two pixels

Table 3-60. Description of Data Mode Display (SD-SDI and HD SDI Only)

Key	Indicator	Description
4	Elements	Elements that show the component samples for each pixel; There are two elements per pixel sample grouping: C_B, Y and C_R, Y^I
5	Data	Value of C_B, Y, C_R, and Y^I in decimal, hexadecimal, or binary form
6	Cursor	Cursor for the Data Zoom Display; represents the exact location of the cursor in the Picture Display (The cursor area indicates the pixels that are represented in the Pixel, Element, and Data columns)
7	Picture zoom	Zoomed portion of picture display to show precise pixel locations

Pixel Cursor

When selecting Data Analyzer, the pixel cursor appears on the picture display. The Pixel cursor in the picture display shows the general location of the data displayed in the Data Zoom pane. Look at the Picture Zoom display for the precise location of the Data display cursor. Rotate the HORIZONTAL LEFT/RIGHT knob to move the pixel cursor horizontally (left and right). Also, when the when the LINE button is enabled (the LINE button is high tally), turn the CURVED ARROW knob to move the pixel cursor vertically (up and down), and to change the line. As the cursor is adjusted, the data in the data display changes.

The target area within the Pixel Cursor reflects the Pixel Group Display menu selection 2H, 8H, or 2H×4V.

NOTE: When scrolling the data pixel cursor, the cursor will stop or disappear when it reaches the limits of the active video. The picture zoom will continue to move within the vertical or horizontal blanking regions. The data area, located in the lower left of the display, will continue to scroll, and show all of the data on the line. The data will not agree with the cursor in the Picture Zoom Area when the picture zoom stops scrolling. When the extreme horizontal or vertical limits are reached, the pixel cursor will jump to the other side of the picture and continue to scroll into the active video region. The picture zoom cursor and the data display will show the same pixel information when the picture cursor is within the active video region.

Data Display Pop-Up Menu

The Data Display menu selections are used to set Data Analyzer functions. Press and hold the ENT button when the Data Display is shown and selected to access the Data menu. The Data Display submenu items are described in **Table 3-61**.

Table 3-61. Data Analyzer Setup Menu

* = Default selection
** = SD-SDI and HD-SDI only

Selection	Selection Option
Trigger on alarm**	Off**
	On
Data display format	Hex*
	Decimal
	Binary
Pixel group display	2H**

Table 3-61. Data Analyzer Setup Menu

* = Default selection
** = SD-SDI and HD-SDI only

Selection	Selection Option
	8H*
	2H x 4V**
Navigation mode	Normal
	Data search**
	Alarm search**
Data search	See "Data Search" on page 139 for complete list
Custom data search	000 to FFF (hexadecimal values)

Trigger on Alarm

NOTE: Only if the alarms are enabled via the Alarms menu will an alarm occur and activate the Trigger on Alarm feature.

Trigger on Alarm is used to freeze data and show where an alarm occurred, then highlight the information for the pixel that is creating the alarm. The highlighted pixel data is shown in the Data display. The pixel cursor is placed over the first pixel creating the alarm.

NOTE: In the Video Alarms > Digital/Alarm Reporting Matrix table, if the TRIGGER FREEZE is set, the waveform and vector displays freeze and change color with an alarm. If the TRIGGER DATA CAPTURE is set, the data for the Data display freezes on an alarm.

The following are general steps for Data Analyzer, TRIGGER ON ALARM, SDI data capture of alarm, and ALARM SEARCH navigation.

Press and hold the SDI button to clear the SDI capture.

Press the SETUP button.

Under VIDEO ALARMS DIGITAL > ALARM REPORTING SETUP, set an alarm in the Trigger Data Capture column (Ex: Luma Gamut Upper).

Under VIDEO ALARMS DIGITAL set the same alarm.

Press the MLT button for Multilevel mode, press and hold the MLT button, and then select DATA ANALYZER.

Highlight the upper left pane, and then press and hold the ENT button for the DATA ANALYZER submenu.

Set TRIGGER ON ALARM, and then, in NAVIGATION MODE, set ALARM SEARCH.

When the alarm trips an SDI capture will be made.

Press the SDI button.

Press the ENT button to find the first alarm point in the SDI capture. Each push of the ENT button will find the next error.

Data Display Format

The Data Display Format is used to determine the numeric base for the pixel information that is displayed: Decimal, Hex, or Binary.

Pixel Group Display

Pixel Group Display is used to determine the cursor size and the samples displayed. The Pixel Group Display selections are:

2H: 2 pixel on the same line

8H: 8 pixel samples from the same line*

2H×4V: 2 horizontal pixels and 4 vertical pixels*

* SD-SDI and HD-SDI only

Navigation Mode

Navigation mode is used to choose between three search selections. The Navigation mode selections are NORMAL, DATA SEARCH, and ALARM SEARCH.

NORMAL: Navigates the data display manually.

DATA SEARCH: (SD-SDI and HD-SDI only) Enables data search mode. When enabled, the values correspond to the data ID selection made in the DATA SEARCH menu are highlighted. Press the ENT button to select the lines containing the selected data ID.

ALARMS SEARCH: (SD-SDI and HD-SDI only) When selected, the pixel data that created the alarm is highlighted in yellow in the Data Display. For multiple alarms, press the ENT button to move between the pixel information of each alarm.

Some alarms that are triggered will have an “H” indication for High or Upper and an “L” indication for Low or Lower indication when the alarm search is performed. The alarms that show these indications are Luma Upper and Lower, RGB Upper and Lower, and Peak Upper and Lower.

To search for a specific alarm after the data capture has been performed, turn off all alarms except the alarm to be searched in the captured data display. Note that when this happens, the disabled alarms will not be enabled in the live display. Therefore, no disabled alarm can be triggered and registered in the Alarm Log until the alarms are enabled again. Once all alarms, except the alarm(s) to be searched, are disabled, the Alarms Search feature will only search for the enabled alarm(s) in the captured data display.

Data Search (SD-SDI and HD-SDI only)

The Data Search menu is used to select the data ID of the ancillary data that will be highlighted when Data Search mode is enabled in the Navigation Mode menu. The Data Search selections are as follows:

200	Undefined Format
180	Marked Packets for Deletion

260	Ancillary Time Code
284	Data End Marker Packet
288	Data Start Marker Packet
1E3	299M, HDTV, Control, Group 1
2E2	299M, HDTV, Control, Group 2
2E1	299M, HDTV, Control, Group 3
1E0	299M, HDTV, Control, Group 4
2E7	299M, HDTV, Audio, Group 1
1E6	299M, HDTV, Audio, Group 2
1E5	299M, HDTV, Audio, Group 3
2E4	299M, HDTV, Audio, Group 4
2FF	AES Audio Data, Group 1
1FD	AES Audio Data, Group 2
1FB	AES Audio Data, Group 3
2F9	AES Audio Data, Group 4
1EF	AES Control Packet, Group 1
2EE	AES Control Packet, Group 2
2ED	AES Control Packet, Group 3
1EC	AES Control Packet, Group 4
1FE	AES Extended Packet, Group 1
2FC	AES Extended Packet, Group 2
2FA	AES Extended Packet, Group 3
FF8	AES Extended Packet, Group 4
2F0	Metadata Packets
1F4	Error Detection (EDH)
2F5	Time Code
161/101	Closed Caption (EIA-708-B)
161/102	Closed Caption (EIA-608 Data)
162/101	Program Description DTV
162/102	Data Broadcast (DTV)
162/203	VBI Data
108/108	MPEG Recording
140/101	SDTI Transport
140/102	HD-SDTI Transport
140/104	Link Encryption Msg 1
140/205	Link Encryption Msg 2
140/206	Link Encryption Metadata
241/101	Payload ID VANC

241/205 AFD and Bar Data
241/206 Pan Scan Data
241/107 ANSI/SCTE 104 Msg
241/108 DVB/SCTE VBI Data
143/101 Inter Station Control
143/102 Subtitling Dist Packet
143/203 ANC Packet
244/104 KLV Metadata In VANC
244/214 KLV Metadata In HANC
244/244 UMID and Program ID
145/101 Dolby Audio Metadata
145/102 Comp Audio Metadata
145/203 Comp Audio Metadata
145/104 Comp Audio Metadata
145/205 Comp Audio Metadata
145/206 Comp Audio Metadata
145/107 Comp Audio Metadata
145/108 Comp Audio Metadata
145/209 Comp Audio Metadata
250/101 WSS Data
151/101 Film Codes
164/164 Time Code in VANC
164/27F VITC in HANC
Dolby Sync 16 Bit
Dolby Sync 20 Bit
Dolby Sync 24 Bit

Custom Pressing the ENT button will access the next event determined by the DATA SEARCH or ALARM SEARCH criteria in the data Analyzer Setup menu. Every press of the ENT button will move the cursor to the next Data Search or Alarm Search result.

Custom Data Search

The Custom Data search is used to select a specific Data ID of the ancillary data that may not be listed in the data search menu. The value is in hexadecimal form.

Data Analyzer Display (TVM-VTM-3GB and TVM-VTM-JEM3 Options)

NOTE 1: When Data Analyzer is utilized, the unit is forced into Line Select mode.

NOTE 2: Pixel cursor movements are previously described on page 137.

The display characteristics of the DATA ANALYZER will change if the detected incoming format is one of the following:

Level A - Direct image format mapping (SMPTE 425M-A)

Level B - 2 x SMPTE 292M HD SDI mapping (SMPTE 425M-B)

The unit is successfully configured for Dual-Link operation.

If one of the conditions listed above is detected, the basic format of the pane changes and appears as shown in **Figure 3-74** (Level A) and **Figure 3-75** (Level B). Dual-link display appears as shown in **Figure 3-76.** For Level A and B format, each data stream contained within the input is represented as a column.

Figure 3-74. Data Analyzer Display with TVM-VTM-3GB (Level A)

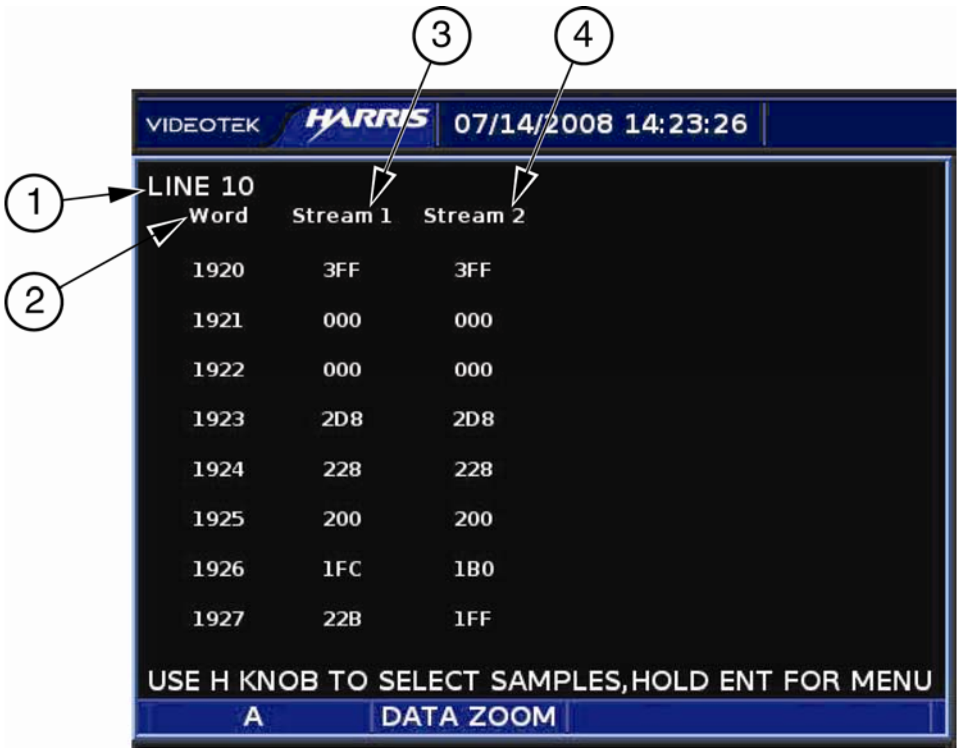


Figure 3-75. Data Analyzer Display with TVM-VTM-3GB (Level B)

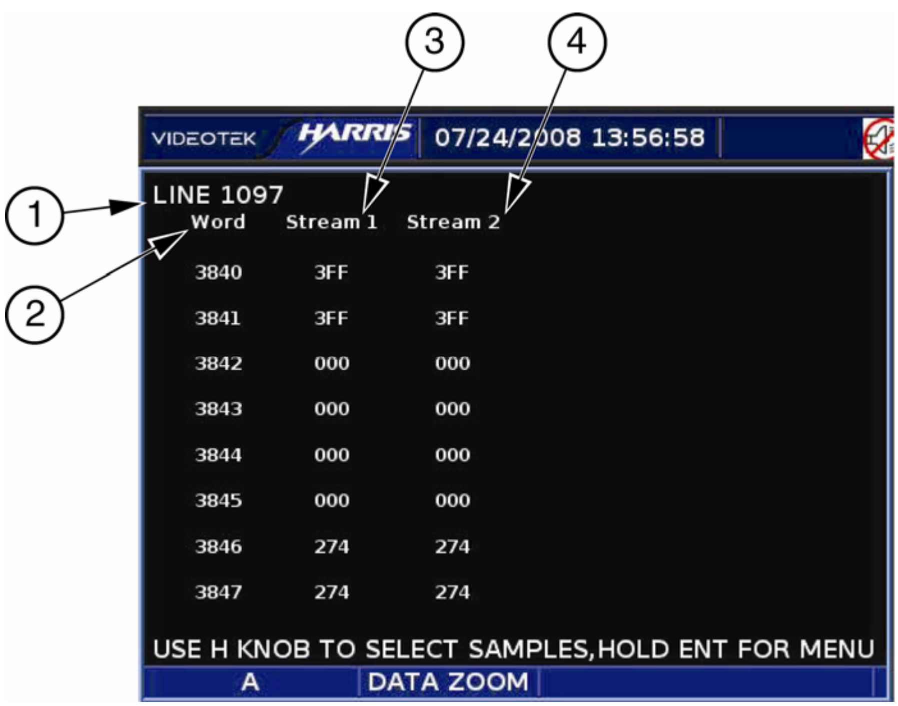


Table 3-62. Data Analyzer Display with TVM-VTM-3GB (Levels A and B)

Key	Indicator	Description
1	Line	Indicator that shows the line number of the picture along with the Even (E) and/or Odd (O) line selection; line number corresponds to the cursor on the picture
2	Word	Indicates the data word associate with both the Stream 1 and Stream 2 data
3	Stream 1	Data values for Stream 1 represented as C_B, Y, C_R, and Y' in decimal, hexadecimal, or binary form
4	Stream 2	Data values for Stream 2 represented as C_B, Y, C_R, and Y' in decimal, hexadecimal, or binary form

For Level B or Dual-Link operation, data is represented as two separate full bandwidth data links.

Figure 3-76. Data Analyzer Display with TVM-VTM-3GB (Dual-Link)

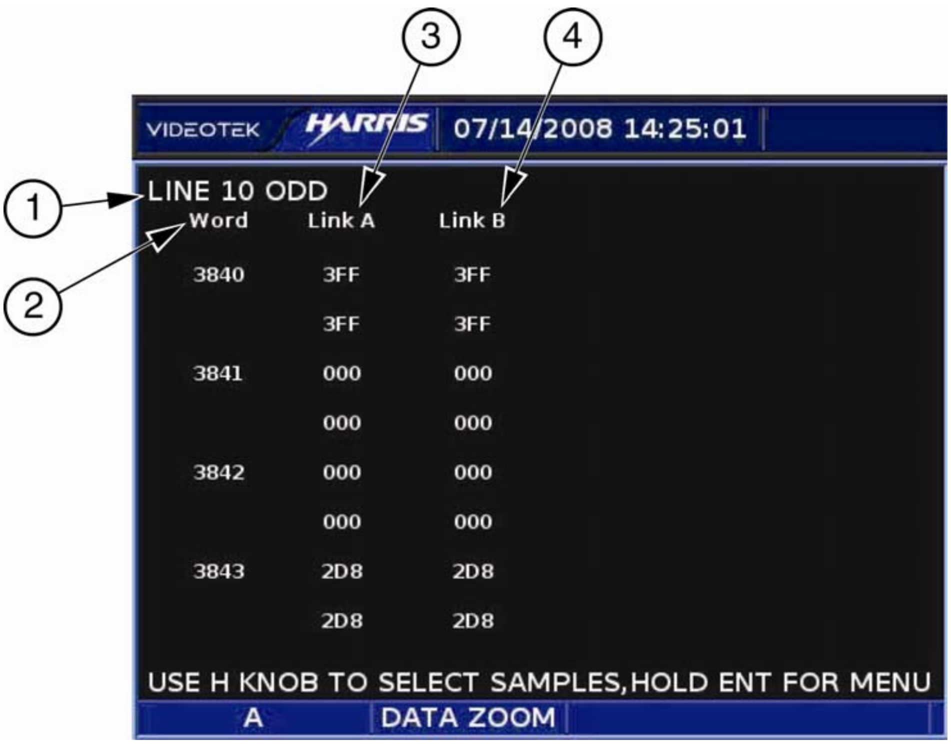


Table 3-63. Data Analyzer Display with TVM-VTM-3GB (Level B)

Key	Indicator	Description
1	Line	Indicator that shows the line number of the picture along with the Even (E) and/or Odd (O) line selection line number corresponds to the cursor on the picture
2	Word	Indicates the data word associate with both Link A and Link B data
3	Link A	Data values for Link A represented as C_B, Y, C_R, and Y' in decimal, hexadecimal, or binary form
4	Link B	Data values for Link B represented as C_B, Y, C_R, and Y' in decimal, hexadecimal, or binary form

Timing Custom Display

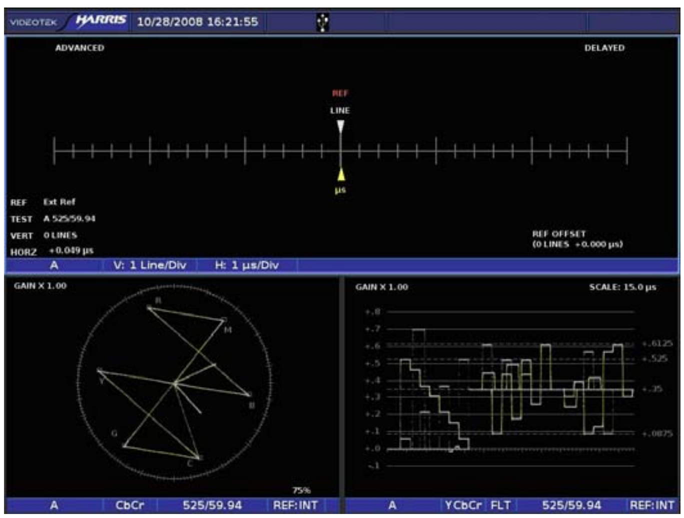
Relative timing of the inputs is compliant with SMPTE RP168.

Selecting the Timing Custom Display creates a fixed three-pane display with the Timing Display filling the top two horizontal panes. The Timing pane status information appears in the lower-left section of the pane.

The Vector or Gamut display is the lower-left pane. The waveform display is the lower-right display. These displays cannot be moved. Selecting the pane and then pressing and holding the WFM, VEC, GAMUT, or TIMING function buttons open the associated pane menu.

A sample illustration of the Timing Custom Display is shown in **Figure 3-77**.

Figure 3-77. Custom Timing Display



The upper-left DISPLAY button is high tally when the timing display is selected.

WFM/VEC Only Display (Dual-Screen Display)

Pressing and holding the MLT button accesses the MLT DISPLAY menu. From the MLT DISPLAY menu, select WFM/VEC ONLY to display the dual Waveform and Vector display. The Vector or Gamut display appears in the upper-left pane, and the waveform or eye pattern display appears in the upper-right pane. The lower two panes are off and not functional while using this display.

A sample illustration of the Waveform/Vector only display is shown in **Figure 3-78**.

Figure 3-78. WFM/VEC Only Display

3Gb/s WFM/VEC Mode (with TVM-VTM-3GB, TVM-40, and TVM-50 only)

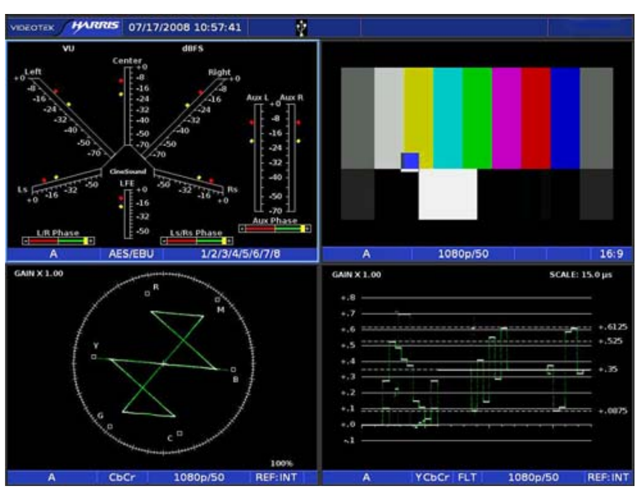
NOTE: When in 3Gb/s mode, one input should have a 3 Gb/s input in order to be functional.

The TVM-VTM-3GB has two active-looping triple-rate (2.97 Gb/s, 1.485 Gb/s, and 270 Mb/s) inputs and one-triple rate SDI monitor output. The signal from the monitor output can be the video input of the selected pane or, from a menu selection, can be an internal test generator that displays color bars, pathological, or color bars with motion. The generator can insert embedded audio and Video Payload ID per SMPTE 352M-2002 ancillary data. The test signal generator is free-running and can not be genlocked to any input or reference. The TVM-VTM-3GB supports dual-link HD-SDI 12-bit YCBCR and RGB video formats.

The 3 Gb/s WFM/VEC Mode Display

The default 3 Gb/s display shows the Waveform, Vector, Picture, and Audio display, as shown in **Figure 3-79**. A blank pane will appear if an audio option is not installed in the system. Any changes to the panes are remembered for future operation.

Figure 3-79. 3Gb/s WFM/VEC Mode Display



Using the TVM-VTM-3GB as a Monitor

The 3Gb/s WFM/VEC mode is the best method to monitor the 3Gb/s video formats and frame rates. Resources from other functions are needed to display 3Gb/s signals so there are restrictions to audio lissajous and the number of vector and waveform panes. When 3Gb/s mode is selected only one input can be displayed at a time. Once the 3Gb/s signal input is selected, the waveform, vector, picture, and audio will reflect the current input signal condition. The Waveform, Vector, Audio, and Picture display panes function the same as described in their appropriate sections.

The 3Gb/s mode produces the following changes in the TVM:

The same video input is displayed in the four panes.

Picture gamut highlighting is disabled in 3Gb/s WFM/VEC mode. Further, the picture will only show half of the video lines in 1080p/50/59.94/60 formats.

There is no audio Lissajous in 3Gb/s WFM/VEC mode. Also, if two or four channels of audio are displayed, the TVM will automatically switch into an eight-channel configuration.

Waveform and Vector displays show all lines for each frame. When not in 3Gb/s WFM/VEC mode, half of the lines are displayed.

When performing a data capture, FREEZE + LIVE is not available.

Using the TVM-VTM-3GB as a Test Signal Generator

NOTE: The video output format is restricted to 10-bit YCBCR signals.

NOTE: The MONITOR OUT/GENERATOR A-B menu only appears in the Setup menu if the TVM-VTM-3GB board appears in slot 1.

NOTE: The MONITOR OUT/GENERATOR C-D menu only appears in the Setup menu if the TVM-VTM-3GB board appears in slot 2.

The TVM-VTM-3GB can be used as a signal generator. Using the MONITOR OUT/GENERATOR A-B or MONITOR OUT/GENERATOR C-D setup menu, set the 3GB option to output a Monitor, Pathological, Colorbar, or Colorbar with Motion display using one of the video formats listed below. The TVM-VTM-3GB can also be used to output a -18 dBFS or -20 dBFS tone to a maximum of 4 different audio groups.

The available video output signals are as follows:

1080i/59.94

1080i/50

1080p/59.94

1080p/50

720p/59.94

720p/50

625/50

525/59.94

For more information on the MONITOR OUT/GENERATOR A-B or C-D setup menus, see page 184.

Presets

Presets are used to store menu configurations and display settings. A total of 15 presets can be stored in the TVM. Press PRESET button 1 to 8 to select a preset from the associated bank of presets. Preset bank A contains presets 1 to 8. Preset bank B contains presets 9 to 16. Press the STAR button to toggle between preset banks A and B.

The STAR button is low tally when using the first bank of presets containing Presets 1 to 8, and high tally when using the second bank of presets containing Preset 9 to 16. Press and hold the * button to access the preset menu. The Preset menu is described in **Table 3-64**. Preset *8 is locked as the factory default, and cannot be changed. For more information on Preset *8, see page 147.

Storing Presets

NOTE: Freeze Mode configurations cannot be stored in a preset. Also, any data that is frozen in freeze mode cannot be stored in a preset. For more information on Freeze Mode, see “Freeze and Freeze + Live Mode” on page 150.

To store a preset in bank A, press and hold the desired preset number button (1 to 8) for three seconds. The number button is high tally upon release after holding the button for three seconds. Also, a beep will sound if the Aural alert is enabled in the SYSTEM SETUP menu.

To store a preset in bank B, first press the STAR till the STAR button is high tally. Once the STAR button is high tally, press and hold the desired preset number button (1 to 7) for three seconds. The number button is high tally upon release.

Recalling Presets

NOTE: Information must be stored in a preset location before being recalled.

Press any number from 1 to 8 to directly select the stored preset in bank A. Press STAR and any number from 1 to 7 to directly select the stored preset in bank B. Press preset *8 to select the factor default settings. Preset STAR 8 is never empty and will recall the factory default settings.

If a preset does not exist for the selected number when selected, nothing happens.

Preset *8 (Factory Preset)

Press Preset 8 in bank B (when the * is high tally) to access the factory-preset mode. This preset contains the factory default settings.

Preset Setup Menu

Press and hold the * button to access the preset menu. The Preset Setup menu is described in **Table 3-64**.

Table 3-64. Preset Setup Menu

Selection	Selection Option	Selection Option
Name preset	1 to 8	Rename screen
Name * preset	*1 to *7	Rename screen
Clear preset	1 to 8	Press ENT
Clear * preset	*1 to *7	Press ENT
	All	Press ENT
Setup	Press ENT	

Name Preset

The NAME PRESET menu is used to name bank A preset locations using the Rename screen. On the Rename screen use the RIGHT and LEFT NAVIGATION buttons to move between character locations, and use the up and down navigation buttons to select a character in the highlighted character location. When complete, press the right or left navigation buttons until ACCEPT or CANCEL is highlighted. ACCEPT saves the data. CANCEL will not save the data. This is useful for when a preset is saved to a USB device.

Name * Preset

The NAME * PRESET menu is used to name bank B preset location using the Rename screen. On the Rename screen use the right and left navigation buttons to move between character locations, and use the up and down navigation buttons to select a character in the highlighted character location. When complete, press the right or left navigation buttons until ACCEPT or CANCEL is highlighted. ACCEPT saves the data. CANCEL will not save the data. This is useful for when a preset is saved to a USB device.

Clear Preset

The Clear Preset menu is used to clear the preset and the preset name in bank A. Press ENT to clear both the preset and CUSTOM name from the memory. Preset *8 cannot be configured with this menu item.

Clear * Preset

The Clear * Preset menu is used to clear the preset and the preset name in bank B. Press ENT to clear both the preset and CUSTOM name from the memory. Preset *8 cannot be configured with this menu item.

Setup

Press the ENT button to access the global setup menu. For more information on the global Setup menu, see Section 4.

Capturing a Display

The TVM is capable of holding frame-captured displays in internal memory. The DISP button is high tally when a capture is performed or recalled. If no frame had been captured in the pane, press the DISP button to capture the screen. The DISP button is high tally when a frame is captured. Only one captured frame can be cached in the unit at a time. The frame will remain cached until the frame is cleared. Once the frame is frozen and the DISP button is high tally, press the DISP button to toggle between the captured frame and the live frame.

Clear Captured Frame

While a live screen is showing, press and hold the DISP button to access the DISP menu. The DISP menu contains the CLEAR XGA CAPTURE menu. Select CLEAR XGA CAPTURE and press the ENT button to clear the frozen frame in the pane. Once the frozen frame is cleared from the pane, a new frame capture can be performed.

Capturing Display Information

The TVM is capable of holding frame-captured information. If no data had been captured, press the SDI button to capture the data in that pane. (For the TVM-VTM-3GB option, the unit must be in MLT mode. SDI capture is not available when unit is in either 3D or Dual-Link mode. Pressing the SDI button with 3D or Dual-Link enabled places the message "Function not Available" on the display.) The SDI button is high tally when information is captured. Only one captured data can be cached in the unit at a time. The data will remain cached until the data is cleared. Once the data is frozen and the SDI button is high tally, press the SDI button to toggle between displaying the captured data and the live data.

When selecting a different pane, the SDI button will change according to the current configuration of that pane (that is, if the captured data in the cache is displayed or not displayed). When returning to a pane that already contains and displays the cached captured data, the SDI button reaches a high-tally state.

When MULTI mode DATA ANALYZER display is selected, the SDI button selection affects all the panes on the display.

Press and hold the SDI button to access the SDI menu. The SDI menu consists of the Clear Capture and Freeze mode menu items.

SDI is deselected if the SDI button is pressed, the input changes, or a format changes for the selected input signal. A FORMAT MISMATCH error occurs when the currently selected format for the pane is different than the format of the frozen data in the cache. SDI capture cannot be performed when an audio pane is the active pane.

Clear Captured Data

Press and hold the SDI button to access the SDI menu. The SDI menu contains the CLEAR SDI CAPTURE menu. Select CLEAR SDI CAPTURE and press the ENT button to clear the frozen information in the pane. Once the frozen data is cleared from the pane, a new data capture can be performed.

Freeze and Freeze + Live Mode (SD-SDI and HD-SDI only)

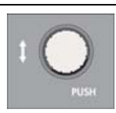
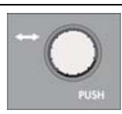
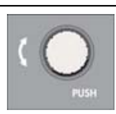
Freeze mode contains two selections: Freeze and Freeze + Live. Selecting Freeze mode will separate the frozen display from the live display. When SDI is high tally, data that was captured in the cache is displayed. When the SDI button is low tally, the Live data is displayed.

Freeze + Live is selected to show live display overlaying the captured display.

Section 4 ♦ Global Setup Menu Functions

Navigating the Setup Menu

Press the SETUP button to access the global setup menu. Use the SETUP POSITION knobs or the NAVIGATION buttons to navigate the Global Setup menu. The SETUP POSITION knobs and Navigation buttons are described below:

	• Press to enter the Setup menu. • Press to exit from the Setup menu.
	• Press to exit the Rename or Matrix screen, or the Setup menu.
	• Press to move up in the menu or Matrix screen. • Press to select a character in the Rename screen.
	• Press to move left in the menu or Matrix screen. • Press to select the previous character in the Rename screen.
	• Press to move right in the Menu, Matrix, or Rename screen.
	• Press to move down in the menu or Matrix screen. • Press to scroll down the list of characters in the Rename screen.
	• Rotate to move the menu cursor up and down, or to change a value or condition in a menu. • Press to select a character or matrix box in the Rename or Matrix screens. • Press the knob to exit the displayed Rename or Matrix screen, or the entire Setup menu. • Rotate to change a character in the Renaming screen, or move to the corresponding box up or down in the Matrix screen.
	• Rotate to move forward or backward in the menu. • Press to select a menu item. • Rotate to select the previous or next box in the Matrix or Rename screens.
	• Rotate to move the menu cursor up and down. • Rotate to select a character in the Rename screen, or move up and down in the Matrix screen.
	• Press to select a menu item or a Matrix box. • Press to move to the next character box in the Rename screen.

Setup Menu and Alarm Tables

The following tables make up the global setup menu. "(Default)" is shown next to each of the default menu selections. The Setup menu items are listed in **Table 4-1** with their corresponding Table and Description pages:

Table 4-1. Setup Menu Tables

Setup Menu Item	Table Page	Description Page
Video Format Menu	153	179
Waveform Setup Menu	159	180
Eye Pattern Setup Menu	53	182
Vector Setup Menu	160	183
Gamut Setup Menu	161	183
Picture Setup Menu	161	184
Audio Setup Menu**	-	-
Audio Alarms Menu**	-	-
Video Alarms, Analog Menu	164	208*
Time Code Alarms Menu	168	211*
TS (Transport Stream) Alarms Menu	169	212*
Monitor Out/Generator A-B	173	184
Monitor Out/Generator C-D	174	184
Display Setup Menu	173	189
Communications Menu	176	191
System Menu	178	194
About Menu	179	200

* The alarm descriptions are in Section 5, "Alarm Descriptions."

** For information on Audio, see the *A3-OPT 2, A3-OPT 3, A3-OPT 5, A3-4004*, and A3-OPT 3/5-TL Installation and Operation Handbook.

Table 4-2. Video Format Menu

***** = Default

Selection	Selection Option	Selection Option
Video A format	Autodetect*	
	2Kp/60 (TVM-VTM-3GB only)	
	2Kp/59.94 (TVM-VTM-3GB only)	
	2Kp/50 (TVM-VTM-3GB only)	
	2Kp/30	
	2Kp/29.97	
	2Kp/25	
	2Kp/24	
	2Kp/23.98	
	2Kp/30sF	
	2Kp/29.97sF	
	2Kp/25sF	
	2Kp/24sF	
	2Kp/23/98sF	
	1080i/60	
	1080i/59.94	
	1080i/50	
	1080p/60 (TVM-VTM-3GB only)	
	1080p/59.94 (TVM-VTM-3GB only)	
	1080p/50 (TVM-VTM-3GB only)	
	1080p/30	
	1080p/29.97	
	1080p/25	
	1080p/24	
	1080p/23.98	
	1080p/30sF	
	1080p/29.97sF	
	1080p/25sF	
	1080p/24sF	
	1080p/23.98sF	
	720p/60	

Table 4-2. Video Format Menu

***** = Default

Selection	Selection Option	Selection Option
	720p/59.94	
	720p/50	
	720p/30	
	720p/29.97	
	720p/24	
	720p/23.98	
	625/50	
	525/59.94	
Video A structure	Auto/10 bit YCBCR* 4:2:2	
	10 bit YCBCR 4:4:4	
	10 bit RGB 4:4:4	
	12 bit YCBCR 4:4:4	
	12 bit RGB 4:4:4	
	12 bit YCBCR 4:2:2	
Video B format	Autodetect*	
	2Kp/60 (TVM-VTM-3GB only)	
	2Kp/59.94 (TVM-VTM-3GB only)	
	2Kp/50 (TVM-VTM-3GB only)	
	2Kp/30	
	2Kp/29.97	
	2Kp/25	
	2Kp/24	
	2Kp/23.98	
	2Kp/30sF	
	2Kp/29.97sF	
	2Kp/25sF	
	2Kp/24sF	
	2Kp/23/98sF	
	1080i/60	
	1080i/59.94	
	1080i/50	
	1080p/60 (TVM-VTM-3GB only)	

Table 4-2. Video Format Menu

***** = Default

Selection	Selection Option	Selection Option
	1080p/59.94 (TVM-VTM-3GB only)	
	1080p/50 (TVM-VTM-3GB only)	
	1080p/30	
	1080p/29.97	
	1080p/25	
	1080p/24	
	1080p/23.98	
	1080p/30sF	
	1080p/29.97sF	
	1080p/25sF	
	1080p/24sF	
	1080p/23.98sF	
	720p/60	
	720p/59.94	
	720p/50	
	720p/30	
	720p/29.97	
	720p/24	
	720p/23.98	
	625/50	
	525/59.94	
Video B structure	Auto/10 bit YCBCR* 4:2:2	
	10 bit YCBCR 4:4:4	
	10 bit RGB 4:4:4	
	12 bit YCBCR 4:4:4	
	12 bit RGB 4:4:4	
	12 bit YCBCR 4:2:2	
Enable dual link A-B	Off	
	On	
3D Format (requires option TVM-OPT 3D)	A Left B: right	
	A: Side by Side	
Video C format	Autodetect*	
	2Kp/60 (TVM-VTM-3GB only)	

Table 4-2. Video Format Menu

***** = Default

Selection	Selection Option	Selection Option
	2Kp/59.94 (TVM-VTM-3GB only)	
	2Kp/50 (TVM-VTM-3GB only)	
	2Kp/30	
	2Kp/29.97	
	2Kp/25	
	2Kp/24	
	2Kp/23.98	
	2Kp/30sF	
	2Kp/29.97sF	
	2Kp/25sF	
	2Kp/24sF	
	2Kp/23/98sF	
	1080i/60	
	1080i/59.94	
	1080i/50	
	1080p/60 (TVM-OPT 3GB only)	
	1080p/59.94 (TVM-OPT 3GB only)	
	1080p/50 (TVM-OPT 3GB only)	
	1080p/30	
	1080p/29.97	
	1080p/25	
	1080p/24	
	1080p/23.98	
	1080p/30sF	
	1080p/29.97sF	
	1080p/25sF	
	1080p/24sF	
	1080p/23.98sF	
	720p/60	
	720p/59.94	
	720p/50	
	720p/30	

Table 4-2. Video Format Menu

***** = Default

Selection	Selection Option	Selection Option
	720p/29.97	
	720p/24	
	720p/23.98	
	625/50	
	525/59.94	
	NTSC (Only available with inputs C and D when the TVM-VTM ACV-2 option)	
	PAL (Only available with inputs C and D when the TVM-VTM ACV-2 option)	
Video C structure	Auto/10 bit YCBCR* 4:2:2	
	10 bit YCBCR 4:4:4	
	10 bit RGB 4:4:4	
	12 bit YCBCR 4:4:4	
	12 bit RGB 4:4:4	
	12 bit YCBCR 4:2:2	
Video D format	Autodetect*	
	2Kp/60 (TVM-VTM-3GB only)	
	2Kp/59.94 (TVM-VTM-3GB only)	
	2Kp/50 (TVM-VTM-3GB only)	
	2Kp/30	
	2Kp/29.97	
	2Kp/25	
	2Kp/24	
	2Kp/23.98	
	2Kp/30sF	
	2Kp/29.97sF	
	2Kp/25sF	
	2Kp/24sF	
	2Kp/23/98sF	
	1080i/60	
	1080i/59.94	
	1080i/50	

Table 4-2. Video Format Menu

***** = Default

Selection	Selection Option	Selection Option
	1080p/60 (TVM-VTM-3GB only)	
	1080p/59.94 (TVM-VTM-3GB only)	
	1080p/50 (TVM-VTM-3GB only)	
	1080p/30	
	1080p/29.97	
	1080p/25	
	1080p/24	
	1080p/23.98	
	1080p/30sF	
	1080p/29.97sF	
	1080p/25sF	
	1080p/24sF	
	1080p/23.98sF	
	720p/60	
	720p/59.94	
	720p/50	
	720p/30	
	720p/29.97	
	720p/24	
	720p/23.98	
	625/50	
	525/59.94	
	NTSC (Only available with inputs C and D when the TVM-VTM ACV-2 option)	
	PAL (Only available with inputs C and D when the TVM-VTM ACV-2 option)	
Video D structure	Auto/10 bit YC_BC_R*4:2:2	
	10 bit YC_BC_R 4:4:4	
	10 bit RGB 4:4:4	
	12 bit YC_BC_R 4:4:4	
	12 bit RGB 4:4:4	
	12 bit YC_BC_R 4:2:2	
Enable dual link C-D	Off	
	On	

Table 4-2. Video Format Menu

***** = Default

Selection	Selection Option	Selection Option
Source ID	Input A	Rename Screen (Rename, and then select ACCEPT or CANCEL)
	Input B	
	Option C	
	Option D	

Table 4-3. Waveform Setup Menu

***** = Default

Selection	Selection Option
Digital waveform graticule	Percent
	Volts*
NTSC pedestal	Off
	On (7.5 IRE)
PAL waveform scale	Units
	Volts*
DC restore (only available with TVM-OPT ACV-2 option)	Off
	Slow*
	Fast
Waveform intensity	25% to 200% (100% is normal)
Waveform contrast	25% to 200% (100% is normal)
Persistence	Normal*
	1 to 6
	Infinite
Attack	9* to 15 (9 is normal)
	Max (16)
Error highlighting	Off
	On

Table 4-4. Eye Pattern Setup Menu

***** = Default

Selection	Selection Option
Jitter display type	0 to 1.0 UI*
	0 to 0.2 UI
	0 to 3700 ps (SD) 0 to 673 ps (HD) 0 to 337 ps (3Gbps)
	0 to 740 ps (SD) 0 to 135 ps (HD) 0 to 67 ps (3Gbps)
Eye intensity	25% to 200% (100% is normal)
Eye contrast	25% to 200% (100% is normal)
Persistence	Normal*
	1 to 6
	Infinite
Attack	Low (1)
	2 to 15 (9* is normal)
	Max (16)
Jitter intensity (OPT JEM)	25% to 200% (100% is normal)
Jitter contrast (OPT JEM)	25% to 200% (100% is normal)
Jitter persistence (OPT JEM)	Normal*
	1 to 6
	Infinite
Jitter attack (OPT JEM)	Low (1)
	2 to 15 (9* is normal)
	Max (16)

Table 4-5. Vector Setup Menu

***** = Default

Selection	Selection Option
PAL overlay	Normal*
	Overlay
SDI I/Q lines	Off*
	On
Vector intensity	25% to 200% (100% is normal)
Vector contrast	25% to 200% (100% is normal)
Persistence	Normal*
	1 to 6
	Infinite
Attack	Low (1)
	2 to 15 (9* is normal)

Table 4-5. Vector Setup Menu

* = Default

Selection	Selection Option
	Max (16)

Table 4-6. Gamut Setup Menu

* = Default

Selection	Selection Option
Gamut intensity	25% to 200% (100% is normal)
Gamut contrast	25% to 200% (100% is normal)
Persistence	Normal*
	1 to 6
	Infinite
Color plot	Single color
	RGB*
Data error persistence	Normal*
	1 to 6
	Infinite

Table 4-7. Picture Setup Menu

* = Default

Selection	Selection Option	Selection Option
Thumbnail	Upper left pane	Upper left
		Upper right
		Lower left
		Lower right
		Off*
	Upper right pane	Upper left
		Upper right
		Lower left
		Lower right
		Off*
	Lower left pane	Upper left
		Upper right
		Lower left
		Lower right
		Off*
	Lower right pane	Upper left
		Upper right
		Lower left
		Lower right

Table 4-7. Picture Setup Menu

***** = Default

Selection	Selection Option	Selection Option
		Off*
Markers (TVM9100PKG and TVM9140PKG only)	Center	Off
		On
	Safe Title	Off
		Corners
		Box
	Safe Action	Off
		Corners
		Box
	Clean Aperture	Off
		Corners
		Box
	4:3 in 16:9	Off
		Corners
		Box
Closed caption display (TVM9100PKG and TVM9140PKG only)	Off*	
	CC1	
	CC2	
	CC3	
	CC4	
	T1	
	T2	
	T3	
	T4	
	708	
	TT	
	OP-47	
	EIA 708 service	Service 1 to 7
	XDS	Off*
		On
		Line 6 See **Table 4-18** on page 185
	Size	Small*
		Large
	Teletext page	000 to 8FF (100*)
Anamorphic	Off*	

Table 4-7. Picture Setup Menu

***** = Default

Selection	Selection Option	Selection Option
(TVM9100PKG and TVM9140PKG only)	On	
Time Code (TVM9100PKG and TVM9140PKG only)	Enable	
	LCD/DVITC	
	Position	Top
		Middle *
		Bottom
Brightness (TVM9100PKG and TVM9140PKG only)	25% to 200% (100% default)	
Contrast (TVM9100PKG and TVM9140PKG only)	25% to 200% (100% default)	
Color (TVM9100PKG and TVM9140PKG only)	On (color) *	
	Off (mono)	
Blue gun	Off*	
	On	
Red gun	Off*	
	On	
Green gun	Off*	
	On	
VBI Mask (TVM9100PKG and TVM9140PKG only)	Off*	
	On	
Anaglyph Glasses (TVM9150PKG only)	Green / Magenta	
	Red / Cyan	

Table 4-8. Video Alarms, Analog Menu

***** = Default

Selection	Selection Option	Selection Option	Selection Option
Alarm reporting setup	Matrix screen		
Format change	Enable	Off*	
		On	
Loss of signal	Enable	Off*	
		On	
	Duration	0 to 60 seconds (2 seconds*)	
Loss of reference	Enable	Off*	
		On	
	Duration	0 to 60 seconds (2 seconds*)	
Loss of video	Enable	Off*	
		On	
	Threshold NTSC	NTSC IRE: 0 to 50 IRE (40*)	
	Threshold PAL	PAL units: 0 to 51 units (41 units*) PAL mV: 0 to 357 mV (287 mV*)	
	Duration	0 to 60 seconds (2 seconds*)	
Analog gamut	Peak upper	Enable	Off*
			On
		Threshold NTSC	NTSC IRE: 50 to 140 IRE (120*)
		Threshold PAL	PAL units: 51 to 143 units (136 units*) PAL mV: 357 to 1000 mV (951 mV*)
		Sensitivity	1 to 20 CES (2 CES*)
		Duration	0 to 60 seconds (2 seconds*)
	Peak lower	Enable	Off*
			On
		Threshold NTSC	NTSC IRE: -40 to 0 IRE (-20*)
		Threshold PAL	PAL units: -41 to 0 units (-34 units*) PAL mV: -285 to 0 mV (-238 mV*)
		Sensitivity	1 to 20 CES (2 CES*)

Table 4-8. Video Alarms, Analog Menu

***** = Default

Selection	Selection Option	Selection Option	Selection Option
		Duration	0 to 60 seconds (2 seconds*)
	Luma upper	Enable	Off*
			On
		Threshold NTSC	NTSC IRE: 50 to 140 IRE (105*)
		Threshold PAL	PAL units: 51 to 143 units (107 units*) PAL mV: 357 to 1000 mV (748 mV*)
		Sensitivity	1 to 20 CES (18 CES*)
		Duration	0 to 60 seconds (2 seconds*)
	Luma lower	Enable	Off*
			On
		Threshold NTSC	NTSC IRE: -5.0 to 10 IRE (-2.5*)
		Threshold PAL	PAL units: -10 to 0 units (-5 units*) PAL mV: -70 to 0 mV (-35 mV*)
		Sensitivity	1 to 20 CES (18 CES*)
		Duration	0 to 60 seconds (2 seconds*)
Captioning	CC not detected – ANL	Enable	Off*
			On
		Duration	10 to 600 seconds (240 seconds*)
	CC not updating – ANL	Enable	Off*
			On
		Duration	10 to 600 seconds (240 seconds*)
	TT not detected – ANL	Enable	Off*
			On
		Duration	10 to 600 seconds (240 seconds*)
	TT not updating – ANL	Enable	Off*
			On
		Duration	10 to 600 seconds (240 seconds*)
	XDS not detected –	Enable	Off*

Table 4-8. Video Alarms, Analog Menu

***** = Default

Selection	Selection Option	Selection Option	Selection Option
	ANL		On
		Duration	10 to 600 seconds (240 seconds*)
	XDS not updating – ANL	Enable	Off*
			On
		Duration	10 to 600 seconds (240 seconds*)
	ST not detected – ANL	Enable	Off*
			On
		Duration	10 to 600 seconds (240 seconds*)
	ST not updating – ANL	Enable	Off*
			On
		Duration	10 to 600 seconds (240 seconds*)
Sync and burst	H sync upper	Enable	Off*
			On
		Threshold NTSC	NTSC IRE: -50 to -42 IRE (-45*)
		Threshold PAL	PAL units: -51 to -46 units (-46 units*) PAL mV: -356 to -320 mV (-322 mV*)
		Duration	0 to 60 seconds (2 seconds*)
	H sync lower	Enable	Off*
			On
		Threshold NTSC	NTSC IRE: -38 to -20 IRE (-35*)
		Threshold PAL	PAL units: -42 to -20 units (-36 units*) PAL mV: -292 to -142 mV (-252 mV*)
		Duration	0 to 60 seconds (2 seconds*)
	Burst upper	Enable	Off*
			On
		Threshold NTSC	NTSC IRE: 42 to 50 IRE (45*)

Table 4-8. Video Alarms, Analog Menu

***** = Default

Selection	Selection Option	Selection Option	Selection Option
		Threshold PAL	PAL units: 46 to 51 units (46 units*) PAL mV: 321 to 357 mV (322 mV*)
		Duration	0 to 60 seconds (2 seconds*)
	Burst level lower	Enable	Off*
			On
		Threshold NTSC	NTSC IRE: 20 to 38 IRE (35*)
		Threshold PAL	PAL units: 20 to 42 units (36 units*) PAL mV: 143 to 293 mV (252 mV*)
		Duration	0 to 60 seconds (2 seconds*)
Burst/chroma phase	Enable	Off*	
		On	
	Field	Odd*	
		Even	
	Line	1 to 50 line(s) (25 lines*)	
	Position	0.0 to 64.0 μs (49.5 μs *)	
	Phase	0 to 359.75 degrees (283.5 degrees*)	
	Range	5 to 20 degrees (7.5 degrees*)	
	Duration	0 to 60 seconds (2 seconds*)	
H blanking	Enable	Off*	
		On	
	Width NTSC	NTSC μ seconds: 8 to 16 μ seconds (10.9*)	
	Width PAL	PAL μ seconds: 8 to 16 μ seconds (12*)	
	Window	0.1 to 0.5 μ seconds (0.1*)	
	Duration	0 to 60 seconds (2 seconds default)	
V blanking	Enable	Off*	
		On	

Table 4-8. Video Alarms, Analog Menu

* = Default

Selection	Selection Option	Selection Option	Selection Option
	Width NTSC	NTSC line: 20 to 25 lines (20 lines*)	
	Width PAL	PAL line: 25 to 30 lines (30 lines*)	
	Duration	0 to 60 seconds (2 seconds*)	
SC/H phase	Enable	Off*	
		On	
	Range	5 to 89 degrees (20 degrees*)	
	Duration	0 to 60 seconds (2 seconds*)	
VITS	Lines NTSC	Matrix screen: NTSC: 10 to 22 odd and even line (off*) off, active, inactive	
	Lines PAL	Matrix screen: PAL: 6 to 23 odd, 319 to 336 even (off*) off, active, inactive	
	Threshold NTSC	NTSC IRE: 0 to 100 IRE (40*)	
	Threshold PAL	PAL units: 0 to 102 units (41 units*) PAL mV: 0 to 714 mV (287 mV*)	
	Duration	0 to 60 seconds (2 seconds*)	

Table 4-9. Time Code Alarms Menu

* = Default

Selection	Selection Option	Selection Option
Alarm reporting setup	Matrix screen	
LTC loss of time code	Enable	Off*
		On
	Duration	0 to 600 seconds (240 seconds*)
LTC time code level	Enable	Off*
		On
	Range	0.2 to 1.8 volts (0.5*)
	Duration	0 to 600 seconds (240 seconds*)
LTC time code framing	Enable	Off*
		On
	Range	1.5 to 10.5* lines

Table 4-9. Time Code Alarms Menu

* = Default

Selection	Selection Option	Selection Option
	Duration	0 to 600 seconds (240 seconds*)
LTC time code continuity	Enable	Off*
		On
LTC/DVITC compare (TC sync)	Enable	Off*
		On
	Threshold	1 to 30 frames (1 frame*)
	Duration	0 - 60 seconds (2 seconds*)
D-VITC loss of time code	Enable	Off*
		On
	Duration	0 to 600 seconds (240 seconds*)
D-VITC line	Enable	Off*
		On
	Line 525	525 line: 10 to 30 lines (line 14*)
	Line 625	625 line: 6 to 30 lines (line 14*)
	Duration	0 to 600 seconds (240 seconds*)
D-VITC continuity	Enable	Off*
		On
D-VITC CRC	Enable	Off*
		On
	Duration	0 to 600 seconds (240 seconds*)

Table 4-10. TS Alarms Menu (TVM-VTM ASI)

* = Default

Selection	Selection Option	Selection Option	Selection Option
Alarm reporting setup	Matrix screen		
Loss of signal	Enable		
	Duration	0 to 60 seconds (2 seconds*)	
CRC change (ATSC)	PAT		
	PMT		
	STT		
	MGT		
	VCT		

Table 4-10. TS Alarms Menu (TVM-VTM ASI)

***** = Default

Selection	Selection Option	Selection Option	Selection Option
	RRT		
	EIT		
	ETT		
CRC change (DVB)	PAT		
	PMT		
ETR 290 1st priority	TS sync loss	Enable	
		Duration	0 to 60 seconds (2 seconds*)
	Sync byte error	Enable	
		Duration	0 to 60 seconds (2 seconds*)
	PAT error	Enable	
		Duration	0.1 to 5.0 seconds (0.5 seconds*)
	Continuity count error	Enable	
		Duration	0 to 60 seconds (2 seconds*)
	PMT error	Enable	
		Duration	0.1 to 5.0 seconds (0.5 seconds*)
	PID error	Enable	
		Duration	0 to 60 seconds (2 seconds*)
ETR 290 2nd priority	Transport Error	Enable	
		Duration	0 to 60 seconds (2 seconds*)
	CRC error (ATSC)	PAT	
		PMT	
		EIT	
		STT	
		MGT	
		VCT	
		RRT	
		ETT	
		Duration	0 to 60 seconds (2 seconds*)
	CRC error (DVB)	PAT	
		CAT	
		PMT	

Table 4-10. TS Alarms Menu (TVM-VTM ASI)

***** = Default

Selection	Selection Option	Selection Option	Selection Option
		SDT	
		NIT	
		BAT	
		TOT	
		EIT	
		Duration	0 to 60 seconds (2 seconds*)
	PCR error	Enable	
		Discontinuity	10 to 1000 ms (100 ms*)
		Repetition	10 to 1000 ms (40 ms*)
	PCR accuracy	Enable	
		Threshold	100 to 2000 ns (500 ns*)
	PTS error	Enable	
		Threshold	100 to 2000 ms (500 ms*)
	CAT error	Enable	
		Duration	0 to 60 seconds (2 seconds*)
ETR 290 3rd priority	NIT actual error (DVB only)	Enable	
		Short range	10 to 100 ms (25 ms*)
		Range	1000 ms to 50000 ms (10000 ms*)
	NIT other error (DVB only)	Enable	
		Range	1000 to 50000 ms (10000 ms*)
	SDT actual error (DVB only)	Enable	
		Short range	10 to 100 ms (25 ms*)
		Range	500 to 50000 ms (2000 ms*)
	SDT other error (DVB only)	Enable	
		Range	1000 ms to 50000 ms (10000 ms*)
	EIT actual error (DVB only)	Enable	
		Short range	10 to 100 ms (25 ms*)
		Range S0	500 to 50000 ms (2000 ms*)
		Range S1	500 to 50000 ms (2000 ms*)
	EIT other error	Enable	

Table 4-10. TS Alarms Menu (TVM-VTM ASI)

***** = Default

Selection	Selection Option	Selection Option	Selection Option
	(DVB only)	Range S0	500 to 50000 ms (2000 ms*)
		Range S1	500 to 50000 ms (2000 ms*)
	EIT PF error (DVB only)	Enable	
	Unreferenced PID error	Enable	
		Duration	0 to 60 seconds (2 seconds*)
	Repetition error (DVB)	RST enable	
		RST repetition	10 to 100 ms (25 ms*)
		TDT enable	
		TDT short range	10 to 100 ms (25 ms*)
		TDT range	5000 to 120000 ms (30000 ms*)
		SI enable	
	Repetition error (ATSC)	MGT enable	
		MGT range	50 to 2000 ms (150 ms*)
		STT enable	
		STT repetition	250 to 60000 ms (1000 ms*)
		RRT enable	
		RRT repetition	5000 to 120000 ms (60000 ms*)
		VCT enable	
		VCT repetition	50 to 3000 ms (400 ms*)
		EIT enable	
		EIT repetition	50 to 20000 ms (500 ms*)
	Base PID error		
	Buffer errors	Monitored program	Program 3 to Program 5
		TBB	
		TBSB	
		MBB	
		EBB	
		BB	
		BSB	
	Empty buffer error		
	Data delay error		

Table 4-11. Monitor Out/Generator A-B

* = Default

Selection	Selection Option	Selection Option
Function	Monitor*	
	Pathological	
	Colorbar	
	Colorbar with motion	
Video format	1080i/59.94	
	1080i/50	
	1080p/59.94	
	1080p/50	
	720p/59.94	
	720p/50	
	625/50	
	525/59.94*	
Audio output level	-18* or -20 dBFS	
Enable audio	Off*	
	Enable group 1-2	
	Enable group 1-4	
Jitter Output (If TVM-VTM-JEM2 or TVM-VTM-JEM3 board is available only)	On/Off*	On
		Off*
	Frequency	50 Hz
		500 Hz
		5 kHz*
		50 kHz
		500 kHz
	Intensity	Low*
		Low-Mid
		Mid
		Mid-High
		High

Table 4-12. Monitor Out/Generator C-D

***** = Default

Selection	Selection Option
Function	Monitor*
	Pathological
	Colorbar
	Colorbar with motion
Video format	1080i/59.94
	1080i/50
	1080p/59.94
	1080p/50
	720p/59.94
	720p/50
	625/50
	525/59.94*
Audio output level	-18* or -20 dBFS
Enable audio	Off
	Enable group 1-2
	Enable group 1-4

Table 4-13. Display Setup Menu

***** = Default

Selection	Selection Option	Selection Option	Selection Option
Display colors	Matrix screen (see **Table 4-14** for the display colors menu)		
Graticule intensity	25% to 200%		
Cursor intensity	25% to 200%		
XGA freeze	Freeze from clock	HH:MM:SS	
		Enable	Off*
			On
	Freeze on alarm	First alarm manual return to live*	
		First alarm auto return to live	
Monitor	Screen saver	Off*	
		1 to 60 min	
	Output level	1V p-p*	
		0.7V p-p	
	Monochrome display		

Table 4-13. Display Setup Menu

***** = Default

Selection	Selection Option	Selection Option	Selection Option
LCD backlight	Min		
	Max*		

Table 4-14. Display Colors Menu

Black (Only available as a background color)

Blue

Green (Not available as a background color)

Cyan

Red (Not available as a background color)

Purple

LT Gray

DK Gray

LT Blue

LT Green

LT Cyan

LT Red

LT Purple

Yellow

White

NOTE: LT=Light and DK=Dark

Table 4-15. Communications Setup Menu

***** = Default

Selection	Selection Option	Selection Option	Selection Option
RCU port	Termination	Off*	
		On	
IP configuration	Ethernet config screen		
GPI input function	Input 1	Select input A*	
		On air A	
		Select/On air A	
		User GPI alarm 1	
		Recall Preset 1	
	Input 2	Select input B*	
		On air B	
		Select/On air B	
		User GPI alarm 2	
		Recall Preset 2	
	Input 3	Select input C*	
		On air C	
		Select/On air C	
		User GPI alarm 3	
		Recall Preset 3	
	Input 4	Select input D*	
		On air D	
		Select/On air D	
		User GPI alarm 4	
		Recall Preset 4	
	Input 5	Recall preset 5*	
		User GPI alarm 5	
	Input 6	Recall preset 6*	
		User GPI alarm 6	
	Input 7	Recall preset 7*	
		User GPI alarm 7	
	Input 8	Recall preset 8*	
		User GPI alarm 8	
	Input 9	Recall preset 9*	
		User GPI alarm 9	

Table 4-15. Communications Setup Menu

***** = Default

Selection	Selection Option	Selection Option	Selection Option
GPI output function	GPO out 1 polarity	Normally open*	
		Normally closed	
	GPI out 2 polarity	Normally open*	
		Normally closed	
	GPI out 1 setup	Follow input A	
		Follow input B	
		Follow input C	
		Follow input D	
		Follow alarms*	
	GPI out 2 setup	Follow input A	
		Follow input B	
		Follow input C	
		Follow input D	
		Follow alarms*	
GPI alarm names	Input 1	Rename screen	
	Input 2	Rename screen	
	Input 3	Rename screen	
	Input 4	Rename screen	
	Input 5	Rename screen	
	Input 6	Rename screen	
	Input 7	Rename screen	
	Input 8	Rename screen	
	Input 9	Rename screen	
GPI alarm reporting setup	GPI alarm reporting matrix		
Router port	Input selection	A to B (A is the default) for 2 inputs A to D (A is default) for 4 inputs	
	Configuration	Disabled*	
		Enable router	
		Enable scanner	
	Router mode channel	Ch 1 to ch 12	
	Scanner mode sequence	Ch 1 to ch 12	
	Dwell time	1 to 60 seconds (5 seconds*)	
	Channel names	Channel 1 to channel 12	Rename screen
Unit ID	1* to 99		

Table 4-16. System Setup Menu

* = Default

Selection	Selection Option	Selection Option	Selection Option
Panel lockout	Enter password	Screen lock/unlock front panel presets	
Change password	Enter password screen		
Clock display	Off		
	System clock*		
Set time	Enter new time screen		
Time code input	ANL	LTC*	
		VITC	
		VITC line NTSC	Line 10 to line 30 (line 14*)
		VITC line PAL	Line 6 to line 30 (line 14*)
	SD	LTC*	
		DVITC	
		DVITC line 525	Line 10 to line 30 (line 14*)
		DVITC line 625	Line 6 to line 30 (line 14*)
	HD	LTC*	
		ANC LTC	
		ANC DVITC 0	
		ANC DVITC 1	
Aural alert	Off		
	On*		
Control illumination	Brightness	Min	
		2 to 9 (3*)	
		Max	
	Contrast	Min	
		2 to 9 (3*)	
		Max	
	Auto off	Off*/On	
	Auto off time	15, 30, 45 seconds, 1 to 60 minutes (10 minutes default)	
Diagnostics	System fault log	System fault log screen	
File Navigator**	File navigation screen		

Table 4-16. System Setup Menu

***** = Default

Selection	Selection Option	Selection Option	Selection Option
Flash update from USB**	Insert device with flash update	Press ENT to begin	
Feature upgrade from USB**	Insert device with feature update	Press ENT to begin	

** Appears when USB drive is attached

Table 4-17. About Menu

Selection	Selection Option
About	About Screen

Video Format Menu

The Video Format menu items are described below.

Video A, B, C, or D Format

The Video "A, B, C, D" Configure menu is used to automatically or manually select the video format reference standard for the selected input. The format selection determines the unit of measure and the critical amplitude limits for the input. The default selection, AUTODETECT, is used to automatically detect the format of the input signal.

Video A, B, C, or D Structure

The Video "A, B, C, D" Structure menu is used to configure the signal handling path to a 10-bit or 12-bit RGB or YC_BC_R sampling structure. 12-bit modes are not available with formats 1080p/60, 1080p/59.94, and 1080p/50. 4:4:4 and 4:2:2 are the format rates selected with the 10-bit and 12-bit sampling structures. 4:2:2 is only available with 12-Bit YC_BC_R. The selections are:

Auto 10 bit YC_BC_R 4:2:2: The sampling structure is determined from the Video Payload Identifier (VPI). If there is no detected VPI, a 10-bit YC_BC_R sampling structure will be assumed.

10-bit YC_BC_R 4:4:4: The signal handling path will be configured for a 10-bit YC_BC_R mode of operation.

10-bit RGB 4:4:4: The signal handling path will be configured for a 10-bit RGB mode of operation.

12-bit YC_BC_R 4:4:4: The signal handling path will be configured for a 12-bit YC_BC_R mode of operation. This selection is only available for 3Gb/s HD, when a TVM-VTM-3GB board is detected for the appropriate channels.

12-bit RGB 4:4:4: The signal handling path will be configured for a 12-bit RGB mode of operation. This selection is only available for 3Gb/s HD, when a TVM-VTM-3GB board is detected for the appropriate channels.

12-bit YCBCR 4:2:2: The signal handling path will be configured for a 12-bit YC_BC_R mode of operation. This selection is only available for 3Gb/s HD, when a TVM-VTM-3GB board is detected for the appropriate channels.

Dual Link

Inputs A and B and C and D have DUAL LINK selections. Selecting a format with DUAL LINK forces the Input A YCBCR format to link with Input B or the Input C YCBCR format to link with Input D. Inputs A or B cannot be linked to inputs C or D, and inputs C or D cannot be linked with inputs A or B.

The TVM-VTM-DLK option expands the Dual Link capability. Inputs A and B and C and D contain another DUAL LINK selection: RGB. Selecting a format with DUAL LINK can force Input A to include the YCBCR or RGB format to link with Input B or the Input C YCBCR or RGB format to link with Input D. Inputs A or B cannot be linked to inputs C or D, and inputs C or D cannot be linked with inputs A or B.

In addition to dual link features described above, TVM-VTM-3GB also supports 12 bit and 1080p 50/59.94/60 formats.

3 D Format

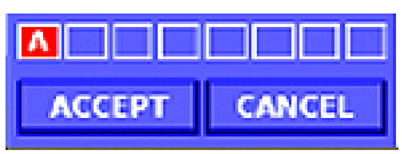
An input source containing 3D video supports the following display as either:

- Left source connected to A input, right source connected to B input.
- Left and right in Side-by-Side format on A input.

Source ID

The Source ID is the ID of the signal for the selected input. The default Source ID is the input selection (Input A to Input D), but the text can be changed by using the Rename Screen, as shown in **Figure 4-1**. On the Rename Screen, press the up/down navigation buttons to change the character in the character box, and press the right/left navigation buttons to change the character box. Select ACCEPT and ENT to accept the changed information. Select CANCEL and press ENT, or press EXIT to cancel the changes.

Figure 4-1. Source ID Rename Screen



Waveform Setup Menu

The Waveform Setup menu is described below.

Digital Waveform Graticule

The Digital Waveform Graticule menu is used to select the unit of measurement for the Digital Waveform Graticule. The selections are Volts or Percent. The default selection for the Digital Waveform Graticule menu is VOLTS.

NTSC Pedestal (or 7.5 IRE Setup)

When in 525/60 Composite format, set the NTSC PEDESTAL to OFF if using a 0 IRE pedestal signal. When set to OFF, the Vector graticules change to the proper levels in order to display an NTSC signal without 7.5 IRE setup. The NTSC PEDESTAL default position is ON (7.5 IRE).

PAL Waveform Scale

The PAL Waveform scale menu is used to select the unit of measurement for the PAL Waveform. The selections are Volts or Units. The default selection for the PAL Waveform menu is UNITS.

DC Restore (TVM-VTM-ACV-2)

DC Restore is used to have the voltage supplied to the analog signal in order to maintain a DC level on the waveform. The blanking level is offset and shifts due to the presence or absence of burst: 1 IRE unit or less. The DC Restore selections are OFF, SLOW, and FAST.

OFF = DC offset appears

SLOW = Hum still viewed in the signal

FAST = Fully restores the signal

Waveform Intensity

The Waveform Intensity is used to raise or lower the brightness of the displayed waveform.

Waveform Contrast

Waveform Contrast is used to adjust the overall difference between the lightest and darkest colors of the waveform. The range of contrast is 25% to 200%. NORMAL is the default contrast setting.

Persistence

Persistence is used to determine how long a data point (pixel) in the waveform remains on the display. The ranges of Persistence are NORMAL, 1 TO 6, and INFINITE. NORMAL is the default setting.

Attack

Attack is the initial intensity that the data point (pixel) appears in the display. The range of attack is 9 to 15 (9 is normal), and MAX (the greatest intensity). NORMAL is the default intensity.

Error Highlighting

Error highlighting changes the color of the portion of the waveform that exceeds the alarm settings. OFF is the default. The highlighting is dependent upon the format and gamut settings selected. The following are rules to consider:

Composite format with Flat filter follows the alarm settings for Gamut Peak upper and lower. It follows the threshold settings for the alarm, even when it is not enabled.

Composite format with Low Pass filter follows the Luma Upper and Lower thresholds.

Component format with RGB filter will follow the RGB gamut.

No highlighting in YCBCR or YRGB.

Eye Pattern Setup Menu

The Eye Pattern Setup menu is used to select the Jitter Display Type, Persistence, Eye Intensity, Eye Contrast, and Attack.

Jitter Display Type

The Jitter Display Type menu is used to change the scale of the jitter meter.

Eye Intensity

The Eye Intensity submenu is used to raise or lower the brightness of the displayed Eye Pattern. The range of intensity is 25% to 200%.

Eye Contrast

The Eye Contrast submenu is used to adjust the overall difference between the lightest and darkest colors of the Eye Pattern. The range of intensity is 25% to 200%.

Persistence

Persistence is used to determine how long a data point (pixel) in the Eye Pattern remains on the display (refresh rate). The ranges of Persistence are NORMAL, 1 TO 6, and INFINITE. If INFINITE is selected, the waveform data point will always remain on the screen.

For Eye pattern, the correlation of values derived by using measurement cursors versus the jitter meter could differ unless the eye pattern is displayed using the maximum persistence setting. A normal persistence setting will make it more difficult to view pixels near the widest sample points, which forces the placement of the measurement cursors to a lower (narrower) jitter value. Jitter can only be selected when the Eye Pattern is enabled.

Attack

Attack is the initial intensity that the data point (pixel) appears in the display. The range of attack is LOW (the lowest intensity), 2 to 15 (9 is normal), and MAX (the greatest intensity).

Vector Setup Menu

The Vector Setup menu is used to select the PAL Overlay, SDI I&Q, Vector Intensity, Vector Contrast, Persistence, and Attack.

PAL Overlay (TVM-VTM-ACV-2)

A PAL signal by default appears in parade mode. The PAL Overlay menu is used to determine if the PAL signal should be in Parade or Overlay mode.

When in Parade mode multiple components of the same signal are shown next to one another (that is, Inputs Y, then CB, then CR in a YCBCR format). When in Overlay mode, the multiple components of the same signal are displayed over each another (that is, R over G over B in an RGB format).

SDI I/Q Lines

The SDI I/Q Lines submenu is used to turn OFF and ON the I and Q marker lines on the Vector Display. The default condition is OFF.

Vector Intensity

The Vector Intensity is used to raise or lower the brightness of the displayed vector. The range of intensity is 25% to 200%. NORMAL (100%) is the default.

Vector Contrast

Vector Contrast is used to adjust the overall difference between the lightest and darkest colors of the vector. The range of contrast is 25% to 200%. NORMAL (100%) is the default.

Persistence

Persistence is used to determine how long a data point (pixel) in the vector remains on the display. The ranges of persistence are NORMAL, 1 TO 6, and INFINITE.

Attack

Attack is the initial intensity that the data point (pixel) appears in the display. The range of attack is LOW (the lowest intensity), 2 to 15 (9 is normal), and MAX (the greatest intensity).

Gamut Setup Menu

The Gamut Setup menu is used to change the Gamut Intensity, Gamut Contrast, Persistence, Attack, Color Plot, and Data Error Persistence.

Gamut Intensity

The Gamut Intensity is used to raise or lower the brightness of the displayed gamut. The range of intensity is 25% to 200%. NORMAL (100%) is the default.

Gamut Contrast

Gamut Contrast is used to adjust the overall difference between the lightest and darkest colors of the gamut. The range of contrast is 25% to 200%. NORMAL (100%) is the default.

Persistence

Persistence is used to determine how long a data point (pixel) in the Gamut remains on the display. The ranges of Persistence are NORMAL, 1 TO 6, and INFINITE.

Color Plot

The Color Plot is used to set the color for plotting RGB pixels. The pixels can be one single color or individual colors (Red, Green, or Blue). Multiple colors help to indicate which color of the RGB signal moves beyond the inner and outer parameters of the gamut graticule. Select RGB for multiple colors.

Data Error Persistence

Data Error Persistence is used to determine how long a point of data in the Composite Gamut remains on the display. The ranges of Persistence are NORMAL, 1 TO 6, and INFINITE.

Picture Setup Menu

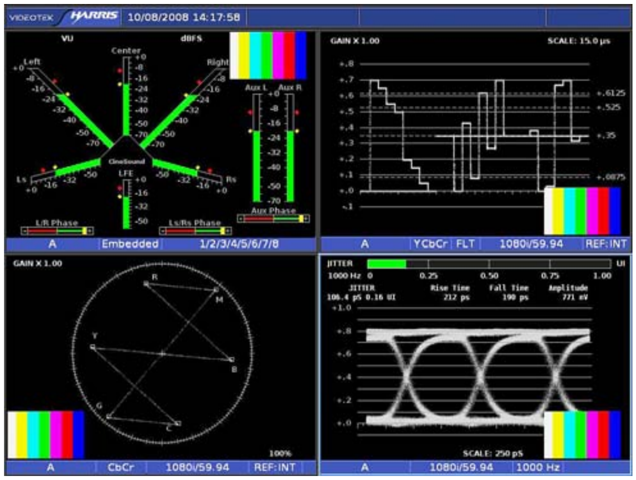
The Picture Setup menu items are described below.

Thumbnail

A thumbnail is approximately 1/16 of the full screen display or 1/16 of the pane. It is used to show the picture that is being measured in the pane or display. The TVM9100PKG can show 1 thumbnail or 1 picture pane. The TVM9140PKG can show 1 picture and 3 thumbnails. The TVM9150PKG can show 4 pictures or 4 thumbnails.

The thumbnail picture is shown in one corner of each Upper Left, Upper Right, Lower Left, and Lower Right pane by using the THUMBNAIL menu. A sample quad-screen display containing 4 thumbnails is shown in **Figure 4-2**.

Figure 4-2. Sample Thumbnail Screen



Markers

There are three markers available to be indicated in the picture. Safe Action is equal to 90% of the picture height and 90% of the picture width. Safe Title is equal to 80% of the picture height and 80% of the picture width. Clean Aperture shows the limits for the active pixel area. Brackets appear on the picture or a box surrounds the picture to show these limits. The center marker identifies the location of the center of the picture.

Closed Caption Display

The Closed Caption Display menu is used to determine the type of closed caption display that should appear with the picture. The Closed Captions selections are C1 to CC4, T1 to T4, Teletext, OP-47, and 708 (which is HD only) Service 1 to 7. For more information on Closed Captioning, see “Closed Caption” on page 85.

XDS

The Extended Data Services (XDS) display is located in the upper-left corner of the picture display, when it is enabled in the Picture Setup > Closed Caption Display > XDS menu. The XDS menu is used to enable and disable XDS along with selecting the information for line 6.

When XDS is selected, XDS data is decoded. There are five fixed lines (ID number, Length of Time Elapsed, Program Name, Channel Info Network Name, and Content Advisory), and one selectable line. Use the up/down navigation buttons to select an item for the XDS.

The XDS selections are shown in Table 4-18. The bold items are always shown and cannot be changed on the XDS display. All items are selectable for line 6. For more information on XDS, see “XDS” on page 121.

Table 4-18. XDS Line Selections

Selection	Selection Option	Selection Option
ID number	Future content advisory	PSIP structure control
Length elapsed time	Future audio services	PSIP EIT descriptor

Table 4-18. XDS Line Selections

Program name	Future caption services	PSIP data carriage
Channel info network name*	Future copy management	Channel info call letters
Type	Future aspect ratio	Channel info tape delay
Content advisory	Future composite packet 1	Channel info TSID
Audio services	Future composite packet 2	Misc time of day
Caption services	Future description	Misc impulse capture ID
Copy management	PSIP minor channel	Misc supplemental data location
Aspect ratio	PSIP event number	Misc time zone
Composite packet 1	PSIP event start	Out of band channel
Composite packet 2	PSIP event duration	Channel map pointer
Description	PSIP program name	Channel map header
Future id number	PSIP program type	Channel map packet
Future length elapsed time	PSIP content advisory	National weather SVC code
Future program name	PSIP audio services	National weather SVC msg
Future type	PSIP caption services	

*NOTE: Not available for Line 6 selection.

(Closed Caption) Size

The Size menu is used to select the size of the text of the closed caption display. The selections are large (covers more of the displayed video signal) or small (covers less of the displayed video signal).

Teletext Page

NOTE: If the format selected is not a valid format for teletext, NOT VALID DISPLAY FOR INPUT FORMAT appears on the OPT Teletext screen. PAL and 625 are the only formats that function with teletext. OP-47 Page Select uses this menu.

The Teletext Page menu item is used to select the page where the teletext can be viewed. Use the up/down navigation buttons to change the number for the page. Press the left/right button to move between numeric positions. Press ACCEPT to display the selected page.

When Teletext displays over the picture, press the down arrow to go to the Index page (page 100). Press the left arrow button to go to the previous page, and press the right arrow button to go to the next page.

The Teletext Detect alarm is activated when the presence of Teletext is not detected in the vertical blanking interval for some time in excess of the duration setting. The Teletext Not Updating alarm is also activated when the Teletext carrier is present and the data word is null for a period in excess of the duration setting.

Anamorphic

The Anamorphic menu selection is used to correct the anamorphic display. Setting the menu selection to ON changes the actual source aspect ratio to an aspect ratio that fills the screen (for example, SD squeezed horizontally 16 x 9 to 4 x 3 source). The anamorphic selection is not available in 16 x 9 source aspect ratio.

Time Code

Time Code is the time that is associated with each video frame. Time Code is keyed over the picture on the right side. Adjacent to the Time Code, the LTC/DVITC is keyed over the picture on the right side when LTC/DVITC is selected. LTC/DVITC cannot be activated unless ENABLE is selected. The submenu POSITION select is used for the vertical placement of the time code at the top, bottom (beyond safe action areas), and middle.

Brightness

Picture Brightness is used to make the picture brightness lighter or darker. The brightness range is from 25% (for the darkest picture) to 200% (for the brightest picture). The default picture brightness is 100%.

Contrast

Picture Contrast is used to increase the overall difference between the lightest and darkest colors. The contrast range is from 25% (for the least amount of difference between the lightest and darkest colors) to 200% (for the most amount of difference between the lightest and darkest colors). The default picture contrast is 100%.

(Picture) Color

Picture Color is used to change the picture to color or monochromatic (black and white). The default menu item for Picture Color is Color.

Blue Gun

Blue Gun is a setup feature that is used to show the blue color component of the input video. Use the Blue Gun feature to set the Saturation and Hue by matching the intensity of all blue bars when a SMPTE split field color bar signal is applied.

Red Gun

Red Gun is a setup feature that is used to show the red color component of the input video. Use the Red Gun feature to set the Saturation and Hue by matching the intensity of all red bars when a SMPTE split field color bar signal is applied.

Green Gun

Green Gun is a setup feature that is used to show the green color component of the input video. Use the Green Gun feature to set the Saturation and Hue by matching the intensity of all green bars when a SMPTE split field color bar signal is applied.

VBI MASK

The VBI (Vertical Blanking Interval) MASK menu selection is used to mask closed caption and non-active lines. With VBI MASK set to ON, only active lines will be shown on the picture portion of the display.

Anaglyph Glasses (TVM9150PKG and TVM-VTM-3D)

The 3 D display mode called Anaglyph is best viewed using 3 D glasses. There are two types of glasses that are supported. The first type is green / magenta colored filters. The second type is red / cyan colored filters.

Monitor Out/Generator A-B and C-D

NOTE 1: The video output format is restricted to 10-bit YCBCR signals.

NOTE 2: The MONITOR OUT/GENERATOR A-B menu only appears in the Setup menu if the TVM-VTM-3GB board appears in slot 1.

NOTE 3: The MONITOR OUT/GENERATOR C-D menu only appears in the Setup menu if the TVM-VTM-3GB board appears in slot 2.

The TVM-VTM-3GB can be used as a signal generator. The MONITOR OUT/GENERATOR A-B or C-D setup menu is used to set the 3GB option to output a Monitor, Pathological, Colorbar, or Colorbar with Motion display using one of the video formats listed in the Video Format submenu of the Monitor Out/Generator A-B or C-D menu. The TVM-VTM-3GB can also be used to output a -18 dBFS or -20 dBFS tone to a maximum of four different audio groups.

The Function submenu selects the following displays to use as a test signal display:

Monitor: Select Monitor to display the input signal.

Pathological: Select Pathological to display a SDI/HD-SDI pathological pattern checkfield.

Colorbar: Select Colorbar to display a standard colorbar display.

Colorbar with Motion: Select Colorbar with Motion to display a standard colorbar display with a bouncing square that moves around the display.

The video output signals that are selectable in the Video Format menu are:

1080i/59.94

1080i/50

1080p/59.94

1080p/50

720p/59.94

720p/50

625/50

525/59.94

The Audio Level menu is used to select between the -18 dBFS and -20 dBFS test tones. The selected tone is output to the selected audio groups in the ENABLE AUDIO menu.

The Jitter Output submenu only appears in the Setup menu if the TVM-VTM-JEM2 or TVM-VTM-JEM3 board appears in slot 1.

- The Jitter Output submenu allows the user to inject jitter into generated signals on the monitor output. Enable turns on the jitter generator.
- Frequency selects the frequency of the injected jitter. Frequency selections are 50 Hz, 500 Hz, 5 kHz, 50 kHz, and 500 kHz.
- Intensity selects the jitter intensity. Intensity selections are Low, Low-Mid, Mid, Mid-High, and High. High intensity equates approximately to a jitter of 0.5 UI.

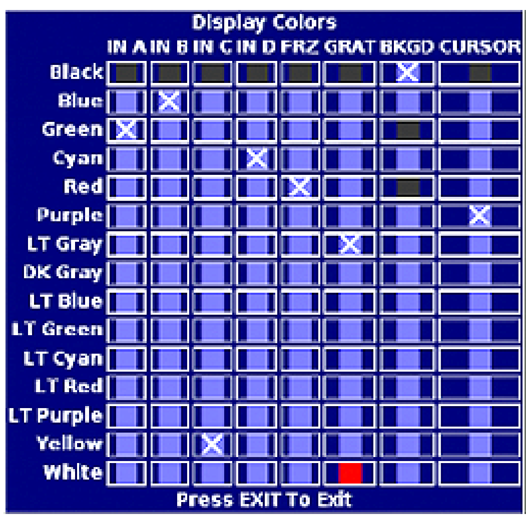
Display Setup

The Display Setup menu is used to configure the Display colors, graticule and cursor Intensity, XGA Freeze, Monitor, and LCD Backlight.

Display Colors

The display colors are used to select the colors for the background, cursors, signals, and graticules of the TVM. The colors are listed in **Table 4-13** on page 175. The Display Color Selection Screen, shown in **Figure 4-3**, is used to set the colors. Any color selection that is not available is blocked out and not accessible. “X” indicates the selection on the screen.

Figure 4-3. Display Color Selection



Use the NAVIGATION buttons to select the cell for the color and function. Once selected, press the ENT button to assign the color to that function. Though the same color can be used for multiple functions, each function can only use one color. Black cells in the Display Color Screen indicate color selections that cannot be made for specific functions.

NOTE: The background color is selectable. There is a 50% reduction in the luminance level of the background relative to the same color of other attributes (for example, text or graticules). This is to assure a contrast when the background color selection is the same, such as red enabled alarms over a red background.

Graticule Intensity

The Graticule Intensity submenu is used to raise or lower the brightness of the displayed graticule.

Cursor Intensity

The Cursor Intensity submenu is used to raise or lower the brightness of the displayed cursor.

XGA Freeze

The XGA Freeze Setup menu is used to determine the factors for when a display is frozen.

Freeze Trigger From Clock

The Freeze Trigger From Clock is used to create a frame capture at a specified time.

Freeze on Alarm

Freeze on Alarm is used to create a frame capture when one or more user-selectable alarms are triggered. The FREEZE ON ALARM selections are used to automatically or manually return from the frozen picture to the active picture after a frame capture is performed. Pressing the DISP button will override the FREEZE FROM CLOCK and FREEZE ON ALARM menu selections.

If FREEZE ON ALARM is set to FIRST ALARM MANUAL RETURN TO LIVE the frozen screen is immediately displayed when an alarm is triggered. The DISP button must be pressed to return the screen to the active display.

If FREEZE ON ALARM is set to FIRST ALARM AUTO RETURN TO LIVE, the active picture replaces the frame capture. No other captures are performed.

Monitor

The monitor menu is used to select the aspect ratio, screen saver, and output level for the monitor. The Monitor menu can also be used to change the entire color display to monochrome.

Screen Saver

The screen saver is used to provide a blank screen after there is no activity for the specified duration. The time it takes for the screen saver to activate can range from 1 to 60 minutes.

Output Level

The Output Level submenu is used to determine the monitor output level. The default monitor output level is 1V p-p. The other output level selection is 0.7V p-p.

Monochrome Display

The Monochrome Display submenu is used to change between a color and monochrome display. The default Monochrome Display setting is OFF.

LCD Backlight

The LCD Backlight submenu is used to determine if the backlight brightness level. To lower the backlight level select MIN. The default backlight level is MAX.

Communications Setup

The Communications Setup menu is used to configure the communication between the TVM and any peripheral hardware and Software connected to the unit.

RCU Port

The RCU Port submenu controls the termination for the remote port on the back of the TVM.

Termination

One RCU-1000 connects to multiple TVM instruments using a multidrop straight through wire with RJ11 connectors (not a standard telephone wire) that connects to the REMOTE ports on the back of the TVMs and to the TO MAIN UNIT connector on the back of the RCU. All TVMs must have unique unit IDs, as described in Unit ID on page 194. The REMOTE port must be terminated on the last TVM or TVM Series instrument.

IP Configuration

The IP CONFIGURATION menu is used to configure the TVM for Ethernet communication. The Ethernet interface provides a high-speed communication link to the third party applications (such as SNMP) over standard LAN and Internet networks. The interface conforms to industry Ethernet standards:

Connection via a standard RJ45 socket

Automatic detection and switching between 10Base-T and 100Base-T

SNMP Communications

TCP/IP stack is fully compliant with RFC2500, “Internet Official Protocol Standards”

Fully compliant with IEEE 802.3 Ethernet standard

The interface can accept a static IP address, or it can obtain an IP address dynamically from a DHCP server. The IP Address, Subnet Mask, Gateway Address, DHCP enable, and Port are programmable from the Unit Ethernet Setup menu system. The settings are performed in the IP Configuration screen.

IP Address

The IP Address is used to select a static IP address (unless Dynamic Host Configuration Protocol (DHCP) will be used). The IP address must not be the same address as another instrument or PC on the network. Network conflicts will occur if two devices have the same IP address. See the System Administrator to determine a static IP address that will avoid conflicts.

Subnet Mask

The Subnet Mask is used to configure the Subnet Mask on a network if DHCP is not enabled. If DHCP is not used to automatically detect the Subnet Mask on a network, the Subnet Mask must be manually configured. Unlike the IP address, the Subnet Mask must be the same Subnet Mask as the network Subnet Mask. See the System Administrator to determine the Subnet Mask.

Gateway

The Gateway is the network address that provides access to an outside network. Use the Gateway submenu to configure the Gateway on a network if DHCP is not enabled. If DHCP is not used to automatically detect the Gateway on a network, the Gateway must be manually configured. Unlike the IP address, the Gateway must be the same Gateway address as the network Gateway address. See the System Administrator to determine the Gateway address.

DHCP

The Dynamic Host Configuration Protocol (DHCP) function is used to have the TVM automatically configure an IP Address, Subnet Mask, and Gateway every time the unit is powered on. The IP Address is dynamic and could change each time the TVM is powered on. DHCP Enable is set to OFF by default.

GPI Input Function and GPI Alarm Names

The input GPIs have selectable functions. There are selectable functions to allow external control of the unit using the default settings. Another function of the GPI is to show an onscreen alarm with a user-selected identification from an external input. The user-selected identification can be renamed in the GPI ALARM NAMES window.

To change the GPI User Identification:

1. Press Setup to display the Setup menu.

Use the navigation buttons to move the cursor to Communications Setup menu.

Press the ENT button.

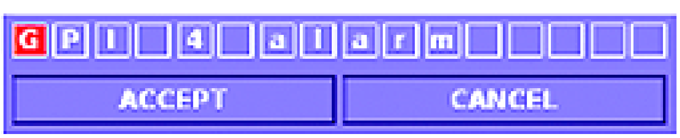
Use the navigation buttons to move the cursor to GPI ALARM NAMES.

Press the ENT button.

Use the navigation buttons to select the desired input (INPUT 1 to INPUT 9).

Press the ENT button. The GPI Rename Screen, shown in **Figure 4-4**, appears.

Figure 4-4. GPI Rename Screen



Use the right/left navigation buttons to select character box.

Press the up/down navigation buttons to select a character.

Repeat until the name is complete.

Press the ENT or right, left, or ENT navigation buttons until ACCEPT is selected.

Press the ENT button over ACCEPT to accept the name, or CANCEL to not use the changed name. Press the EXIT button at any time to cancel the name change and return to the previous submenu.

GPI Output Function

The GPI Output Function submenu is used to determine the GPO Polarity and GPO Output Setup for each input.

GPO Out 1 and 2 Polarity

There are two output GPIs that are associated with a list of alarms. All GPI alarm activation selections are set to the default OFF until the alarm is enabled. When an alarm is enabled, the GPI functions according to the GPO OUT 1 and 2 POLARITY setting (NORMALLY OPEN, NORMALLY CLOSED). The default polarity is NORMALLY OPEN.

NORMALLY OPEN: The contact closure on the GPI board is normally open. When the contact closure closes, the GPO alarm is activated.

NORMALLY CLOSED: The contact closure on the GPI board is normally closed. When the contact closure opens, the GPO is activated.

GPO Out 1 and 2 Setup

The GPO Out 1 and 2 Setup submenu is used to select what input or alarm the GPO follows. If set to FOLLOW INPUT A, B, C or D and that input is selected or deselected, the GPO will change state. If FOLLOW ALARMS is selected, the GPO will change its polarity setting whenever an alarm occurs on any input.

GPI Alarm Reporting Setup

The GPI Alarm Reporting Setup menu accesses the GPI Alarm Reporting Matrix. In the GPI Alarm Reporting Matrix select what functions each GPI Alarm (GPI Alarm 1 through 9) will trigger when an alarm is activated. Each alarm can be selected to trigger one or more of the following: LOG, SOUND, SNMP TRAP, GPI OUT 1, GPI OUT 2, FREEZE, DATA CAPTURE, and STREAMER.

Router Port

There is one RJ11 router control port located on the back panel. The port is used to control Harris Broadcast RS series routers. The router can be switched manually or set to scan all inputs. The router can be set to continuously scan selected inputs searching for alarm conditions. All alarm conditions detected by the TVM will be logged on the display (maximum 200 alarms), or a PC to produce a continuous log file.

Router control is accessed in the Setup menu under COMMUNICATIONS > ROUTER PORT. Under the Router Port menu are the following submenus:

INPUT SELECTION: Use to select which input (A, B, C, or D) the router scans.

CONFIGURATION: Use to DISABLE, ENABLED ROUTER, ENABLED SCANNER. ENABLED ROUTER will allow manual control, and ENABLED SCANNER will force the router to sequentially switch through all activated inputs.

ROUTER MODE CHANNEL: Select the channel manually.

SCANNER MODE SEQUENCE: Selects which channels are enabled for scanner mode.

DWELL TIME: Use to pause the router on each input for the selected time. Each input of the router can also be given a unique name that will be placed in the log file when an alarm is detected on that input.

CHANNEL NAMES: The inputs can be renamed by selecting using the Channel Rename screen.

Unit ID

The unit ID is the identification number of the TVM. It can be set to any number within a range of 1 to 99 and should be different than the identification numbers of other units in the same system configuration.

System Setup Menu

The System Setup menu is used to control the system configuration selections.

Panel and Preset Lockout

The Panel Lockout feature is used to disable front panel control until the proper password is entered. The Preset Lockout feature, located within the Panel Lockout menu, is used to prevent storing settings in selected presets.

Similar to the Panel Lockout feature, the Preset Lockout is also password protected. When a user locks a preset configuration into the TVM, it will not be able to be altered until the password is entered. The Presets are locked and unlocked using the Password screen, shown in **Figure 4-5**.

NOTE: The default password is 0-0-0.

Figure 4-5. Panel and Preset Lock/Unlock Screen.

To lock or unlock the presets or front panel:

NOTE: Once Front Panel is selected to be locked out, the front panel is locked. Press the SETUP button to enter the password to return to the Setup menu.

1. Press the Setup button to display the Setup menu.
2. Use the navigation buttons to move the cursor to the System menu.
3. Press the ENT button.
4. Use the navigation buttons to move the cursor to PANEL LOCKOUT.
5. Press the ENT button. The Enter Password screen appears.
6. Use the up and down navigation buttons to move the cursor to select 0-9 (first digit in password).
7. Use the right navigation button to select the second password number.
8. Use the up and down navigation buttons to move the cursor to select 0-9 (second digit in password).
9. Use the right navigation buttons to select the third password number.
10. Use the up and down navigation buttons to move the cursor to select 0-9 (third digit in password). When the password is correctly entered, LOCKED will change to UNLOCK.
11. Use the right and left navigation buttons to move the cursor to select UNLOCK.
12. Press the ENT button.
13. Use the up and down navigation buttons to move the cursor to select the Preset Number or front panel.
14. Press the ENT button to toggle between Lock and Unlock on the highlighted Preset Number selection.
15. Repeat the previous two steps for any other selection needed to be made.
16. After the settings are complete, press the EXIT button to exit the menu.

(If the front panel was locked in the steps above) The front panel is locked once EXIT is pressed. Any button pressed besides the Setup button will invoke the PANEL LOCKED OUT message. Subsequent presses of the Setup button will invoke the ENTER PASSWORD setup screen. The panel will be unlocked and the Setup menu can only be accessed after a valid password has been entered.

To unlock the locked front panel:

NOTE: The default password is 0-0-0.

1. Press the Setup button until the Enter Password Screen appears.
2. Use the up and down navigation buttons to move the cursor to select 0-9 (first digit in password).
3. Use the right navigation button to select the second password number.
4. Use the up and down navigation buttons to move the cursor to select 0-9 (second digit in password).

5. Use the right navigation button to select the third password number.
6. Use the up and down navigation buttons to move the cursor to select 0-9 (third digit in password). When the password is correctly entered, LOCKED will change to UNLOCK.
7. Press the right navigation button to select UNLOCK and press the ENT button to unlock the front panel. Press EXIT at any time to keep the front panel locked.

To change the password:

NOTE: The default password is 0-0-0.

1. Press the Setup button to display the Setup menu.
2. Use the navigation buttons to move the cursor to the Communication Setup menu.
3. Press the ENT button.
4. Use the navigation buttons to move the cursor to CHANGE PASSWORD.
5. Press the ENT button. The Enter Password screen appears.
6. Use the up and down navigation buttons to move the cursor to select 0-9 (first digit in the current password).
7. Use the right navigation button to move the cursor to the second password number.
8. Use the up and down navigation buttons to select 0-9 (second digit in the current password).
9. Use the right navigation button to select the third password number.
10. Use the up and down navigation buttons to move the cursor to select 0-9 (third digit in the current password). When the correct password is entered, LOCKED changes to UNLOCK will appear.
11. Use the right and left navigation buttons to move the cursor to UNLOCK.
12. Press the ENT button. The Enter New Password screen appears. It is time to ENTER A NEW PASSWORD.
13. Use the up and down navigation buttons to select 0-9 (first digit in the new password).
14. Use the right navigation button to move the cursor to the second password number.
15. Use the up and down navigation buttons to move the cursor to select 0-9 (second digit in the new password).
16. Use the right navigation button to move the cursor to the third password number.
17. Use the up and down navigation buttons to move the cursor to select 0-9 (third digit in the new password).
18. Use the right navigation button to move the cursor to select ACCEPT.
19. Press the ENT button. The new password has been set.

Clock Display

The Clock Display menu is used to toggle the clock display on the Main Title Bar off and on.

Set Time

When selecting Set Time, the Enter New Time Screen, shown in **Figure 4-6**, appears. The Enter New Time screen is used to set the internal clock of the unit. Press the up and down navigation button to change the values of each time selection. Press the right and left navigation buttons to move between the Hour, Minute, Second, Month, Day, Year, ACCEPT, and CANCEL selections. Once the internal date and time is entered, press ENT when the accept button is highlighted to save the settings.

Figure 4-6. Enter New Time Screen

Time Code Input

The Time Code Input is used to determine the Time Code Source for each format. The TVM can read LTC (Longitudinal Time Code) and DVITC (Digital Vertical Interval Time Code) based on the format selected. The Time Code Input menu has three submenus:

ANALOG: reads LTC and VITC

SD: reads LTC and DVITC

HD: reads LTC, ANC LTC, and ANC DVITC

DVITC for SD and VITC for NTSC and PAL are monitored on selected lines.

After DVITC is selected, adjust the line selection in the DVITC LINE 525 or DVITC LINE 625 submenus to the selected line. The range for DVITC LINE 525 is adjustable from Line 10 to 30, and DVITC LINE 625 is adjustable from line 6 TO 30.

After VITC is selected, adjust the line selection in the VITC LINE NTSC or VITC LINE PAL submenus to the selected line. The range for VITC LINE NTSC is adjustable from Line 10 to 30, and VITC PAL is adjustable from line 6 TO 30.

For more information on displaying Time code, see "**Time Code**" on page 187.

Aural Alert

Aural Alert is used to enable and disable the audible tone that originates from inside the TVM. The Aural alert sounds when a minimum or maximum menu control value is reached. The default Aural Alert setting is ON.

Control Illumination

The Control Illumination submenu is used to control the brightness of the front panel button tally states.

Brightness

Set the brightness of the buttons in a low tally state using the Brightness submenu.

Contrast

The low tally state will never be brighter than the high tally state. The Contrast menu was created to avoid this issue. The Contrast submenu is used to set the brightness of the High Tally state. The brightness of the high tally state is determined by the contrast and brightness of the low tally state.

Auto Off

Set the Auto Off to turn off the front panel LEDs when no buttons are pressed after the designated Auto Off Time.

Auto Off Time

When Auto Off is enabled, the Auto Off Time is used to turn off the front panel LEDs when no buttons are pressed after 15 seconds, 30 seconds, 45 seconds, or 1 to 60 minutes.

Diagnostics (System Fault Log)

The System Fault Log, shown in **Figure 4-7**, is used to show the faults that occur within the system.

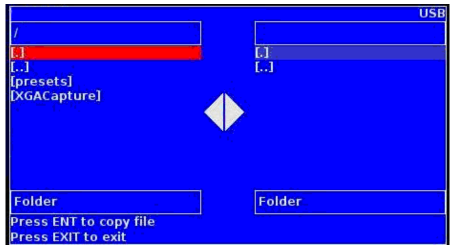
Figure 4-7. System Fault Log

File Navigator

NOTE: The FILE NAVIGATOR menu item does not appear if a USB removable drive is not connected to the USB port on the back of the unit.

The File Navigator is used to control the presets and frame captures for the TVM. Any stored preset or frame capture can be stored, onto the USB removable drive. Pressing the ENT button on the FILE NAVIGATOR menu item access the File Manager Screen, shown in **Figure 4-8**.

Figure 4-8. File Navigator Screen



The left column of the File Navigator screen shows what is available to be transferred to the USB drive. The stored presets are located in the PRESETS folder, and the frame captures are located in the FRAME CAPTURE folder. Use the navigation buttons to move among the folders and files. Press the ENT button to enter a folder.

When a preset or XGA capture is selected, press the ENT button to copy the file over to the USB drive*. When the ENT button is pressed, the Enter Name for Preset on USB Drive Screen appears. Press the up/down navigation buttons to change the character. Press the right/left navigation buttons to move to the next character, ACCEPT, or CANCEL. Once the file is renamed, select ACCEPT and press ENT to copy the file to the USB drive. Press CANCEL to not copy the file. Pressing the EXIT button also will not transfer the file to the USB drive.

The right column shows what is stored in the USB memory device. The stored Presets and XGA captures on the USB drive are shown in this column.

* A file extension of .”xml” will automatically be added to the preset file name prior to being written to the USB drive. In order for a valid preset to be loaded from a USB drive, it must have the .”xml” extension.

Flash Update from USB

NOTE 1: Presets are lost when performing a flash update. Ensure that the presets are saved on a USB memory device before flashing.

NOTE 2: The menu item will not appear if a USB memory device is not installed. Disregard the FAULT indication on the front panel during the flash update.

The FLASH FROM USB menu is used in coordination with a USB memory stick to update the unit. Attach the USB stick into the back of the unit. Access the SYSTEM > FLASH UPDATE FROM USB > PRESENT. The unit then proceeds into flash mode. Flash update status is shown with the line-by-line programming and sector results. When complete, Flash Update Complete appears on the screen. Cycle the power to continue normal operation.

Feature Upgrade from USB

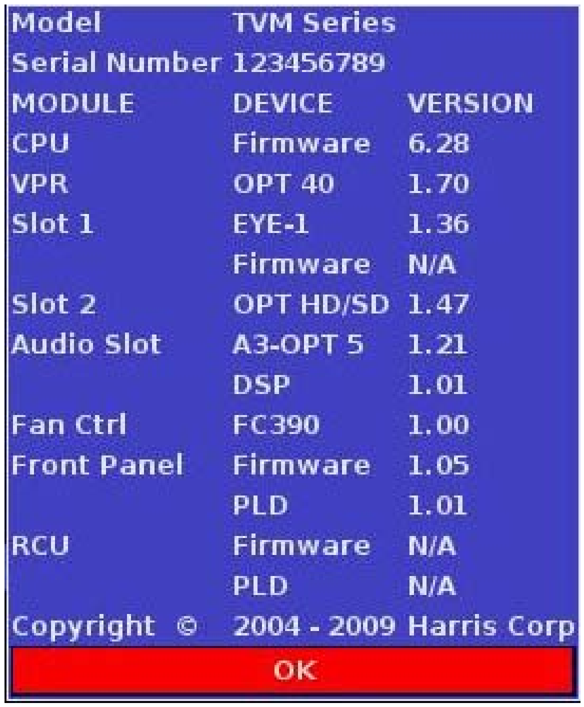
NOTE: The serial number on the device must match the serial number on the feature file. INSERT USB DEVICE WITH FEATURE UPGRADE appears when the serial number of the device does not match the serial number on the feature file.

The FEATURE UPGRADE FROM USB menu is used in coordination with a USB memory stick containing the feature file for the device to update the unit. Attach the USB stick into the unit. Access the SYSTEM > FEATURE UPGRADE UPDATE FROM USB menu. Press the ENT button to proceed into feature upgrade mode. When complete, UPGRADE SUCCESSFUL appears on the screen. Cycle the power to continue normal operation.

About

The About Screen, shown in **Figure 4-9**, contains the model, serial number, module, device, and version. Press the EXIT, SETUP, ENT, left navigation button, or press the LEFT/RIGHT CONTROL Knob to exit from the screen.

Figure 4-9. About Screen



Section 5 ♦ Alarm Descriptions

Setting Alarms

Most alarms monitor all lines of the video signal. The VITS alarm is an exception. The VITS alarm is used to monitor activity or the lack of activity on a particular line. The GAMUT alarm is more typical. The GAMUT alarm will monitor the entire active picture for errors over the selected limits chosen on the menu.

Limits are selected in the SETUP Menu by choosing a value using the up/down or curved arrow knobs, or the up or down NAVIGATION buttons.

Sensitivity and Duration are two general terms used in the alarm menus:

Sensitivity

Sensitivity is set by Consecutive Errored Samples (CES). When setting amplitude limits, a noise spike can exceed the limit while the video amplitude can be within the limit. With the CES set to a low number, a spike is detected and an alarm is displayed. Set the CES to a higher number to ignore the fast spike. Each CES occurs at 37ns intervals for SD and 13.5ns for HD. Use this as a guideline to select the appropriate CES value.

Not all alarms have CES associated with them; in such cases, use the duration to increase or decrease the general sensitivity.

Duration

This value is used to determine how long an error must persist before it is reported. Set the duration to 0 to cause an error to be displayed as soon as the CES value is met.

Alarm Message Contents and Limitations

Figure 5-1. Sample Alarm Message (TVM Classic Mode Display)

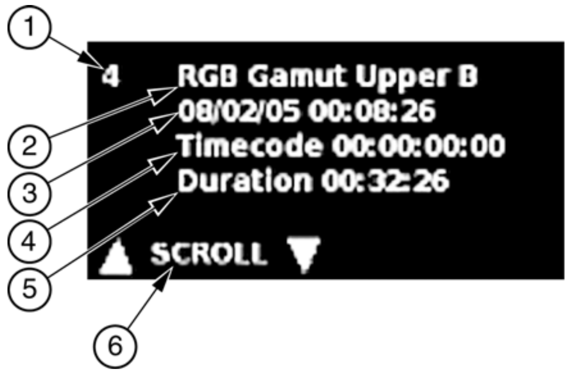


Table 5-1. Description of Sample Alarm Message

Key	Description
1	Index number, from 1-200
2	Error type, which describes the alarm
3	Date and time (the internal clock setting in month/day/year and hour:minute:second)
4	Time code, which is from the LTC/CLOCK, VITC, or D-VITC (shown in day:hour:minute:second:frame)
5	Duration, which is the length of time that the error occurred (shown in hour:minute:second)
6	Press the up or down navigation buttons to move up and down the alarm list.

When an alarm is first registered, it appears at the top of the alarm display area and is yellow. If the alarm is short term (that is, two seconds or less), the alarm text reverts to the original graticule color after approximately two seconds. If the alarm continues longer than two seconds, the text remains yellow and the alarm duration is incremented. When the next alarm occurs, the previous alarm moves up one position.

The unit has enough memory for 200 alarms per input. When 200 different alarm events have occurred, alarm number 200 is dropped and the most recent alarm is tagged as 01.

Use the up and down navigation buttons to scroll through the alarm list. Press and hold ENT to erase the current group of alarms. A GPI output dry-contact closure can be used to alert other devices when an alarm occurs. Use the Communications menu to setup the GPI.

Video Alarms Digital Descriptions

The Video Alarms Digital menu contents are listed below.

Format Change

The Format Change alarm is used to indicate that the video format has been changed.

Payload Identifier Mismatch (TVM-VTM-3GB only)

The Payload Identifier Mismatch alarm is used to indicate that the payload received from the input stream does not match the detected input format such as HD/SD and frame rate.

Loss of Payload Identifier (TVM-VTM-3GB only)

The Loss of Payload Identifier alarm is used to indicate when the video payload is not detected in the received data stream for a period in excess of the duration setting.

Digital Gamut

RGB Gamut Upper/Lower

The RGB Upper and Lower alarm occurs when any component of the transcoded RGB signal falls outside the upper or lower limits for a period in excess of the duration setting. The Sensitivity can be increased to provide immunity to fast transcoding spikes.

Luma Gamut Upper/Lower

The Luma Upper and Lower alarms scan the composite encoded signal derived from the selected digital input. The alarms occur when the luminance video falls outside the adjustable limits for a period in excess of the duration setting. The Sensitivity can be increased to provide immunity to fast noise spikes.

Peak Gamut Upper/Lower

The Peak Upper and Lower alarms scan the composite encoded signal derived from the selected digital input. The alarm occurs when the peak video falls outside the adjustable limits for a period in excess of the duration setting. The Sensitivity can be increased to provide immunity to fast noise spikes.

EDH – SD

Per SMPTE RP 165-1994; the EDH-SD alarm occurs when one or more errors are detected for a period in excess of the duration setting (Standard definition only).

CRC HD

The CRC HD alarm occurs when the internally calculated CRC value is different from the received CRC value (High definition only).

CRC Alarms

The following information is displayed when the CRC display is ON and an SD format is detected:

Display					Description
Time since Reset			00:00:00		Hr:min:sec, elapsed time since last reset
FF	CRC	Seconds		value	Full field CRC error in seconds
AP	CRC	Seconds		value	Active Picture CRC error in seconds
	F1	AP	CRC	value	CRC value (Check Sum) for active picture, field one
	F2	AP	CRC	value	CRC value (Check Sum) for active picture, field two
Embedded Audio				value	Detects how many groups of audio are available
Ancillary Data				Present	Detects other ancillary information
Format Errors					Detects a format error

The following information is displayed when the CRC display is ON and an HD format is detected:

Display				Description
Time since Reset		00:00:00		Hr:min:sec, elapsed time since last reset
	CRC	Error Free	value	Length of time in seconds CRC is error free
CHROMA				-
	Embedded Audio		value	Detects how many groups of audio are available
	Ancillary Data		Present	Detects other ancillary Chroma information
LUMA				-
	Ancillary Data		Present	Detects ancillary Luma information
Format Errors			Y* C*	Detects a format error

***NOTE**: Y=Luma and C=Chroma

The following are CRC Window Format Error types, which are further described in **Table 5-2**, and are displayed under FORMAT ERRORS when they are detected:

SAV PLACED INCORRECTLY (SAV)

LINE LENGTH ERROR (line length)

FIELD LENGTH ERROR (field length)

RESERVED VALUES USED IMPROPERLY (reserved values)

ANC DATA CHECKSUM ERROR (ANC checksum)

ANC DATA PARITY ERROR (ANC parity)

ANC DATA PLACEMENT ERROR (ANC placement)

ABSENCE OF SERIAL VIDEO INPUT (no video)

Press the ENT button to reset the CRC elapsed time to zero and clear the EDH errors.

Table 5-2. CRC Alarm Error Types

Error Type	Description
CRC errored seconds	The integer number of seconds in which an EDH or CRC error has existed.
SAV placed incorrectly	SAV is relative to EAV. The number of words is a constant for any given video format between EAV and SAV. EAV is detected and used as the reference. The correct number of words is counted, and then SAV is detected. The SAV Placed Incorrectly alarm occurs when a proper SAV sequence is not detected or if SAV is detected before the correct number of words between EAV and SAV.
Line length error	The Line Length Error occurs when there are an incorrect number of words between EAV and SAV.
Field length error	The number of lines is constant between the B bit going high and the start of vertical blanking. The Field Length Error occurs when there is deviation in the line number count.
Reserved values used improperly	The Reserved Values Used Improperly alarm occurs when the eight most significant bits (SD) or all ten bits (HD) are all “1” or “0” in any place other than an EAV, SAV, or ancillary header.
Ancillary data checksum error	The Ancillary Data Checksum Error occurs when the internal calculated CRC value is different from the received CRC value.
Ancillary data parity error	The Ancillary Data Parity Error occurs when the internal calculated parity value is different from the received parity value.
Ancillary data placement error	The Ancillary Data Placement Error occurs if an ancillary header appears outside of blanking.
Absence of serial video input	The Absence of Serial Video Input error occurs when the signal in the serial video input is lost.

Loss of Carrier

The Loss of Carrier alarm occurs when there is no TRS (Timing Reference Signal) detected.

Loss of Active Video

The Loss of Active Video occurs when active video falls below the adjustable threshold for a period in excess of the duration setting.

Loss of Reference

The Loss of Reference alarm occurs when no sync signal is detected in the external reference for a period in excess of the duration setting. To select the appropriate external reference, see “Reference Selection” on page 90.

Letterbox – SD

Letterbox is the top and bottom border surrounding the active video. The top border is defined as having video below the threshold on the set line and having video above on the following line. The bottom border is defined as having video above the threshold on the previous line and video below the threshold on the set line. The Letterbox SD alarm is activated when either the top line or the bottom line deviates from the user settings (Standard definition only).

Pillarbox – HD

The Pillarbox is the border to the right and left of the active video. The “End of Left Border” and “Start of Right Border” defines the set points when the video is below the threshold. If the video is outside of the threshold and CES values for the specified duration, the Pillar Box HD alarm occurs (High definition only).

Picture Shift

The Picture Shift alarm activates when the luma portion of the video does not exceed the amplitude threshold along any of the four borders of active video. The “Left/Right” and “Top/Bottom” border settings define the tolerance of the Picture Shift alarm. If one or more pixels are above the threshold for each of the four tolerance borders, no alarm will be declared. For interlaced video formats Picture Shift checks the first field only. For example, if a signal is 525/59.94 SDI video format, where “Left/Right” is set to 20 pixels, “Top/Bottom” is set to 4 lines, the threshold is set to 2 mV, and the “Duration” is set to 2 seconds, the alarm will be activated if pixels 1 through 20 or 701 through 720, or lines 1 through 4, or 240 through 244 of active video do not exceed the 2 mV threshold and exceeds the duration of 2 seconds.

AFD Not Detected

The AFD Not Detected alarm is activated when the AFD ancillary data packet is not Present in the input signal.

Captioning

CC Not Detected – 608

The Closed Caption Not Detected 608 alarm is activated when the presence of EIA/CEA-608-B closed caption data on line 21(284) with valid parity bits is not detected for a period in excess of the duration setting.

CC Not Updating- 608

The Closed Caption Not Updating 608 alarm is activated when closed caption carrier is present and the EIA/CEA-608-B data word on line 21 is null for a period in excess of the duration setting.

CC Not Detected – 708

The Closed Caption Not Detected 708 alarm is activated when no valid DTVCC services are detected for a period in excess of the duration setting.

CC Not Updating – 708

The Closed Caption Not Updating 708 alarm is activated when data received for the active window through a DTVCC C0, G0, C1, G1 Code Set Mapping command is unchanging for a period in excess of the duration setting.

Teletext Not Detected – SD

The Teletext Not Detected SD alarm occurs when the presence of Teletext is not detected for a period in excess of the duration setting.

Teletext Not Updating – SD

The Teletext Not Updating alarm occurs when the Teletext carrier is present and the data word is the same for a period in excess of the duration setting.

Subtitle Not Detected - SD

The Subtitle Not Detected alarm occurs when the presence of Subtitles is not detected for a period in excess of the duration setting.

Subtitle Not Updating - SD

The Subtitle Not Updating alarm occurs when Subtitles carrier is present and the subtitles are the same for a period in excess of the duration setting.

WSS (Widescreen Signaling) Not Detected

The Widescreen Signaling Not Detected alarm occurs when the presence of Widescreen Signaling for Widescreen Format is not detected for a period in excess of the duration setting.

XDS Not Detected - SD

The XDS Not Detected alarm occurs when the presence of XDS is not detected for a period in excess of the duration setting.

XDS Not Updating - SD

The XDS Not Updating alarm occurs when XDS is present and the data word is the same for a period in excess of the duration setting.

Eye Jitter

The Eye Jitter alarm occurs when the eye pattern jitter exceeds the threshold for a period in excess of the duration setting.

Timing Alarm

The Timing Alarm occurs when the Time and Line range(s) are exceeded for a period in excess of the duration setting.

Video Alarms Analog Descriptions

The Video Alarms Analog menu contents are listed below.

Format Change

The Format Change alarm is used to indicate that the video format has been changed.

Loss of Signal

The Loss of Signal alarm occurs when no sync signal is detected for a period in excess of the duration setting.

Loss of Reference

The Loss of reference alarm occurs when no sync signal is detected in the external reference for a period in excess of the duration setting. To select the appropriate external reference, see “Reference Selection” on page 90.

Loss of Video

The Loss of Video occurs when active video falls below the adjustable threshold for a period in excess of the duration setting.

Analog Gamut

Peak Upper

The Peak Upper alarm occurs when active video falls outside the upper limit for a period in excess of the duration setting. Peak video includes luminance and/or chrominance.

Peak Lower

The Peak Lower alarm occurs when active video falls outside the lower limit for a period in excess of the duration setting. Peak video includes luminance and/or chrominance.

Luma Upper

The Luma Upper alarm occurs when the luminance portion of the active picture falls outside the upper limit for a period in excess of the duration setting.

Luma Lower

The Luma Lower alarm occurs when the luminance portion of the active picture falls outside the lower limit for a period in excess of the duration setting.

Sync and Burst

H (Horizontal) Sync Upper

The H Sync Upper alarm occurs when the horizontal sync pulse falls outside the upper limit for a period in excess of the duration setting.

H (Horizontal) Sync Lower

The H Sync Lower alarm occurs when the horizontal sync pulse falls outside the lower limit for a period in excess of the duration setting.

Burst Upper

The Burst Upper alarm occurs when the peak absolute value of burst falls outside the upper limit for a period in excess of the duration setting.

Burst Lower

The Burst Lower alarm occurs when the peak absolute value of burst falls outside the lower limit for a period in excess of the duration setting.

Burst to Chroma Phase

The Burst to Chroma Phase alarm occurs when the relative phase between burst and a particular color on a selected line and location on the line exceeds a user-defined upper and lower phase tolerance for a period in excess of the duration setting.

For example, assume that the Vertical Interval Test Signal of color bars on line 17, field 2 is selected. Also, assume the line position is set to monitor the blue color packet with a range of 5° and duration of 0 seconds. If the phase error between burst and the blue vector point exceeds ± 5°, an alarm occurs.

Horizontal Blanking (H Blanking)

The Horizontal Blanking (H Blanking) alarm occurs when the time interval between beginning of horizontal sync and the start of active video violates the specified limits for a period in excess of the duration setting.

The limits are 8.0 µs to 16 µs.

For this measurement to be accurate, active video must be higher than 20 IRE (NTSC) or 350 mV (PAL).

Vertical Blanking

The Vertical Blanking alarm occurs if the number of lines during the vertical blanking period violates the selected width limit for a period in excess of the duration setting. The selectable widths are 20 to 25 Lines for NTSC, and 25 to 30 Lines for PAL.

SC/H Phase

The SC/H Phase alarm occurs when the phase angle of burst compared to the 50% point of the leading edge of horizontal sync on line 10 of field 1 (NTSC) or line 1 (PAL) exceeds the range setting for a period in excess of the duration setting. The range is ± 5° to 90° in NTSC and ± 5° to 45° in PAL.

VITS

The VITS alarm occurs when the selected lines become active or inactive as set by the amplitude threshold for a period in excess of the duration setting. One or more lines can be monitored, and they do not have to be successive. For example, line 17/E can be monitored for activity over 50 IRE while line 20/O is monitored for inactivity under 50 IRE. The threshold and duration settings are global.

Captioning

Closed Caption Not Detected – Analog

The Closed Caption Not Detected alarm is activated when the presence of a closed caption data word on line 21(284) with valid parity bits is not detected in a composite signal for a period in excess of the duration setting.

Closed Caption Not Updating – Analog

The Closed Caption Not Updating alarm is activated when closed caption carrier is present and the data word on line 21 is null in a composite signal for a period in excess of the duration setting.

Teletext Not Detected – Analog

(PAL signals only) The Teletext Not Detected - Analog alarm occurs when the presence of Teletext is not detected for a period in excess of the duration setting.

Teletext Not Updating – Analog

(PAL signals only) The Teletext Not Updating - Analog alarm occurs when Teletext carrier is present and the data word is the same for a period in excess of the duration setting.

XDS Not Detected – Analog

The XDS Not Detected - Analog alarm occurs when the presence of XDS is not detected for a period in excess of the duration setting.

XDS Not Updating – Analog

The XDS Not Updating - Analog alarm occurs when XDS is present and the data word is the same for a period in excess of the duration setting.

Time Code Alarm Descriptions

There are two types of Time Code Alarms: LTC and DVITC Time Code Alarms.

LTC Time Code Alarms

The LTC Time Code Alarms are listed below.

LTC Loss of Time Code

The Loss of Time Code alarm occurs when the peak-to-peak level of the LTC input signal falls below an adjustable limit for a period in excess of the duration setting.

LTC Time Code Level

The Time Code Level alarm occurs when the peak-to-peak level of the LTC input signal falls outside the user defined range limits for a period in excess of the duration setting.

LTC Time Code Framing

The Time Code Framing alarm occurs when the alignment of the start of LTC (ANSI/SMPTE 12M-1999) exceeds the range limit for a period in excess of the duration setting.

LTC Time Code Continuity

The Time Code Continuity alarm occurs when a break or interruption in the time-code count occurs.

LTC/VITC Compare (TC Sync)

The LTC/VITC (TC Sync) alarm occurs when LTC and VITC are compared and differ beyond the threshold (1 to 30 frames) selection for a period in excess of the duration setting.

DVITC Time Code Alarm Error Types

The DVITC Time Code Alarms are listed below.

DVITC Loss of Time Code

The DVITC Loss of Time Code alarm occurs when no DVITC Time Code in the video signal is detected for a period in excess of the duration setting.

DVITC Line

The DVITC Line alarm is used to select the line number on which the D-VITC time code is detected for the “D-VITC Continuity” and “D-VITC CRC” fields. When time code is not detected on the selected line number, the alarm activates.

DVITC Continuity

The DVITC Continuity alarm occurs when a break or interruption in the digital vertical interval time code (VITC) frames occur for a period in excess of the duration setting.

DVITC CRC

The DVITC CRC alarm occurs when the cyclic redundancy check (CRC) within the digital vertical interval time code field does not correlate with the calculated CRC for a period in excess of the duration setting

TS Alarms Descriptions (TVM-VTM-ASI)

The TS Alarms menu contents are listed below.

Alarm Reporting Setup

The TS Alarm Reporting Setup menu is used to accesses the Alarm Reporting Matrix. In the Alarm Reporting Matrix select what functions each Alarm will trigger when an alarm is activated. An alarm occurrence can trigger a log indication, sound, SNMP trap, GPI OUT 1 and GPI OUT 2.

Loss of Signal

The Loss of Signal alarm is activated when the signal carrier is not detected.

CRC Change

The CRC change alarm occurs when the selected table's CRC information changes. The selectable monitored tables are PAT, PMT, STT, MGT, VCT, RRT, EIT, and ETT.

ETR 290 1st Priority

The ETR 290 1st Priority menu contains the TS Sync Loss alarm, Sync Byte Error alarm, PAT Error alarm, Continuity Count Error alarm, PMT Error alarm, and PID Error alarm.

TS Sync Loss

The TS Sync Loss alarm activates when two or more consecutive corrupted sync bytes occur for a period in excess of the duration setting.

Sync Byte Error

Sync Byte Error activates as soon as the correct sync byte (0x47) does not appear after 188 or 204 bytes.

PAT Error

The PAT Error alarm activates when the PAT table is missing for a period in excess of the duration setting.

Continuity Count Error

The Continuity Count Error alarm activates on "Incorrect Packet Order" and "Lost Packet."

PMT Error

The PMT Error alarm occurs when there is no PMT and the corresponding program is not decodable.

PID Error

A Packet Identifier (PID) error occurs when a data stream for each PID is not identified for a period in excess of the range setting. The error might occur where transport streams are multiplexed, or demultiplexed and remultiplexed.

ETR 290 2nd Priority

The ETR 290 2nd Priority menu contains the Transport Error, CRC Error, PCR Error, PCR Accuracy Error, PTS Error, and CAT Error alarm settings.

Transport Error

The Transport Error alarm activates when erroneous transport stream packets are counted.

CRC Error

The Cyclic Redundancy Check (CRC) checks for the Program Access Table (PAT), Conditional Access Table (CAT), Program Map Table (PMT), Service Description Table (SDT), Network Information Table (NIT), Bouquet Association Table (BAT), Time Offset Table (TOT), Event Information Table (EIT), System Time Table (STT), Master Guide Table (MGT), Virtual Channel Table (VCT), Region Rating Table (RRT), and the Extended Text Table (ETT). A CRC Error alarm indicates if the content of any selected table is corrupted.

PCR Error

A Program Clock Reference (PCR) is used to re-generate the local 27 MHz system clock. If the PCR does not have sufficient regularity, the clock can jitter or drift and the receiver/decoder can become unlocked. When irregularities occur outside the PCR Error ranges, the PCR Error alarm activates. In Digital Video Broadcasting (DVB), a repetition period of not more than 40 ms is recommended.

PCR Accuracy

A PCR Accuracy Error occurs when the synthesized clock falls outside the set range. A PCR accuracy of ± 500 ns is intended to be sufficient for the color subcarrier to be synthesized from the system clock.

PTS Error

Presentation time stamps (PTS) determine the time when a picture is shown on the screen. A PTS Error occurs when PTS is not detected in a signal. The PTS should occur at least every 700 ms. The PTS are only accessible if the transport stream is not scrambled.

CAT Error

The Condition Access Table (CAT) is the pointer to find the Entitlement Management Message (EMM) associated with the CA system(s) that it uses. If the CAT is not present, the receiver is not able to receive management messages, and a CAT Error alarm activates.

ETR 290 3rd Priority

The ETR 290 3rd Priority menu contains the NIT Actual Error, NIT Other Error, SDT Actual Error, SDT Other Error, EIT Actual Error. EIT Other Error, EIT PF Error, Unreferenced PID Error, Repetition Error, Base PID Error, Buffer Errors, Empty Buffer Error, and Data Delay Error alarms.

NIT Actual Error (DVB only)

The NIT Actual Error alarm activates for the following reasons:

The NIT Error occurs when the Network Information Table is not detected for the set range.

The NIT Error occurs when two sections of the Table ID occur faster than the set Short Range.

The NIT table contains an invalid ID. The NIT table IDs must contain a valid ID. The IDs 0x40, 0x41, 0x72 must be present at PID (Packet Identifier) 0x0010.

NIT Other Error (DVB only)

The NIT Other Error alarm activates when Network Information Table sections with the same number appear slower than the repetition rate.

SDT Actual Error (DVB only)

The SDT Actual Error alarm activates for the following reasons:

The SDT Error occurs when the Service Description Table is not detected for the set range.

The SDT Error occurs when two sections of the Table ID occur faster than the set Short Range.

The SDT table contains an invalid ID. The SDT table IDs must contain a valid ID. The IDs 0x42, 0x46, 0x4A, and 0x72 must be present at PID 0x0011.

SDT Other Error (DVB only)

The SDT Other Error alarm activates when Service Description Table sections with the same number appear slower than the repetition rate.

EIT Actual Error (DVB only)

The EIT Actual Error alarm activates for the following reasons:

The EIT Error occurs when section zero (S0) or section one (S1) of the Event Information Table is not detected for the set range. The range parameter is independent for each section.

The EIT Error occurs when two sections of the Table ID occur faster than the set Short Range.

The EIT table contains an invalid ID. The EIT table IDs must contain a valid ID. The IDs 0x4E, 0x6F, or 0x72 must be present at PID 0x0012

EIT Other Error (DVB only)

The EIT Other Error alarm activates when Event Information Table sections (S0 or S1) with the same number appear slower than the repetition rate. The range parameter is independent for each section.

EIT PF Error (DVB only)

The EIT table contains two sub tables: section 0 (EIT-P) and section 1 (EIT-F). If one sub table is present, then the other table must be present. The EIT PF Error alarm occurs if section 0 (EIT-P) or section 1 (EIT-F) is missing.

Unreferenced PID Error

A PID is found in each packet and should be referenced in the PMT (Program Map Tables) or CAT (Conditional Access Table). The alarm activates when a PID that was not referenced in the PMT or CAT occurs.

Repetition Error

The Repetition Error alarm occurs when one of the following tables falls outside the maximum repetition rate or range: Running Status Table (RST), Time and Data Table (TDT).

RST Enable and Repetition

The RST table activates the Repetition Error alarm when the appearance of the Running Status Table falls outside the maximum repetition rate. Also, the RST table IDs must contain a valid ID. The IDs 0x70 or 0x72 must be present at PID 0x0013. The RST Error also occurs when the table ID is not a valid ID.

TDT Enable, TDT Short Range, and TDT Range

The TDT table activates the Repetition Error alarm for the following reasons:

The TDT Error occurs when the TDT is not detected for the set range.

The TDT Error occurs when two sections of the Table ID occur faster than the set Short Range.

The TDT table contains an invalid ID. The TDT table IDs must contain a valid ID. The IDs 0x70, 0x72, or 0x73 must be present at PID 0x0014.

MGT Range

The MGT table activates the Repetition Error alarm when the appearance of the Master Guide Table falls below the minimum repetition rate.

STT Repetition

The STT table activates the Repetition Error alarm when the appearance of the System Time Table falls below the minimum repetition rate.

RRT Repetition

The RRT table activates the Repetition Error alarm when the appearance of the Rating Region Table falls below the minimum repetition rate.

VCT Repetition

The VCT table activates the Repetition Error alarm when the appearance of the Virtual Channel Table falls below the minimum repetition rate.

EIT Repetition

The EIT Error alarm activates when the appearance of the Event Information Table falls below the minimum repetition rate.

Base PID Error

The Base PID Error alarm occurs when a table other than the following tables appear at PID 0x1FFB: MGT, CVCTR, TVCT, STT, DCCT, DCC-SCT, and/or RRT. The table IDs associated with these tables are 0xC7, 0xCD, 0xC4, 0xC8, 0xC9, 0xD3, or 0xD4.

Buffer Errors

The Buffer Errors alarm occurs when an underflow or an overflow of buffers occur in the MPEG-2 reference decoder for the selected program. The buffers are the Transport Buffer (TB), Transport Buffer System Buffer (TBSB), Multiplexing Buffer (MBB), Elementary Stream Buffer (EBB), Main Buffer (BB), and PSI Input Buffer (BSB).

Empty Buffer Error

The Empty Buffer Error occurs when the Transport Buffer is not empty at least once per second.

Data Delay Error

The Data Delay Error occurs when the data through the TSTD buffer is delayed for more than one second. Also, the Data Delay Error can occur when a delay in the data through the TSTD occurs for more than one minute.

Section 6 ♦ External Control

Using the Keyboard Commands

Table 6-1 lists the keyboard commands used for remote operation of a single TVM or multiple TVM units with a USB keyboard connected. This table continues on the next page.

Table 6-1. Keyboard Commands

Function	Keystroke	Description
Input	A, a	Selects INPUT A
Input	B, b	Selects INPUT B
Input	Alt+A	Selects INPUT A+B
Input	C, c	Selects INPUT C
Input	D, d	Selects INPUT D
Input	Alt+C	Selects INPUT C+D
Bypass	Ctrl+B	Toggles Bypass
EXT	X, x	Toggles Internal/External Reference
DISP	J, j	Toggles Frozen/Live Display
SDI	K, k	Toggles Frozen/Live data display
FULL	F, f	Toggles the selected quadrant full-screen/quad screen
MLT	M, m	Toggles Multi-mode/Normal-mode
UL	1	Selects the Upper Left Quadrant
UR	2	Selects the Upper Right Quadrant
LL	3	Selects the Lower Left Quadrant
LR	4	Selects the Lower Right Quadrant
WFM	W, w	Selects the Waveform display in the current quadrant
VECT	E, e	Selects the Vector display in the current quadrant
AUDIO	U, u	Selects the Audio display in the current quadrant
PICT	I, i	Selects the Picture display in the current quadrant
ALARM	9	Selects the Alarm display in the current quadrant
GAMUT	G, g	Selects the Gamut display in the current quadrant
TIMING	T, t	Selects the Timing display in the current quadrant
EYE	Y, y	Selects the Eye display in the current quadrant
OPT	O, o	Selects the Option display in the current quadrant
H	H, h	Selects the Horizontal Sweep mode
V	V, v	Selects the Vertical Sweep mode
MAG	N, n	Changes the horizontal magnification
STEP	S, s	Steps through the available gain selections
ZOOM	Z, z	Cycles through the Zoom modes

Table 6-1. Keyboard Commands

Function	Keystroke	Description
1	F1	Selects Preset 1
2	F2	Selects Preset 2
3	F3	Selects Preset 3
4	F4	Selects Preset 4
5	F5	Selects Preset 5
6	F6	Selects Preset 6
7	F7	Selects Preset 7
8	F8	Selects Preset 8
▲	↑	Up Navigation button
►	→	Right Navigation button
▼	↓	Down Navigation button
◄	←	Left Navigation button
ENT	Enter	Enter button
SETUP	Home	Toggle Setup mode
EXIT	End	Exit menu
LINE	L, l	Toggle Line Select
PHASE	P, p	Toggle Phase control
CURS	R, r	Cycle through Cursor control
Curved Arrow CW	>	Curved Arrow knob clockwise rotation
Curved Arrow CCW	<	Curved Arrow knob counter-clockwise rotation
Curved Arrow Push	/	Curved Arrow knob push
↕ CW	Page Up	Vertical knob clockwise rotation
↕ CCW	Page Down	Vertical knob counter-clockwise rotation
↕ Push	Insert	Vertical knob push
↔ CW	]	Horizontal knob clockwise rotation
↔ CCW	[	Horizontal knob counter-clockwise rotation
↔ Push	\	Horizontal knob push
Cold Start	Ctrl+Alt+Del	Cold Start

SpyderWeb II

The *SpyderWeb II*™ Unattended Networked Monitoring System is used to monitor and control TVM/TVM series devices from a single PC at a local or remote location. After the installation of a Harris Broadcast series device, the Ethernet port can be connected directly to the Ethernet port of a PC.

SpyderWeb II has three basic functions:

Remote control of the TVM/TVM

Gather and organize alarm information generated by TVM/VTM

Initiate, display, and transfer frame captures from the TVM/VTM

SpyderWeb II uses a network connection for monitoring and control of up to 30 TVM/TVM series units. The *SpyderWeb II* program runs cooperatively with other Windows® programs. It runs "in the background" of a PC using a Windows operating system, allowing use of the PC for other tasks. *SpyderWeb II* alarms the user of any problems detected in any of the connected TVMs/VTMs. (Under any of the Alarm Reporting Setup matrix tables, set Send SNMP Trap for each alarm so SpyderWeb II can recover the alarm.)

Browser Interface

The website for each unit is accessed by pointing the web browser at the TVM/VTM IP address. Before the default web screen appears, a password must be entered to access the instrument. Each password allows specific privileges. The following passwords are case-sensitive:

VTMUser: Allows read-only access to the instrument

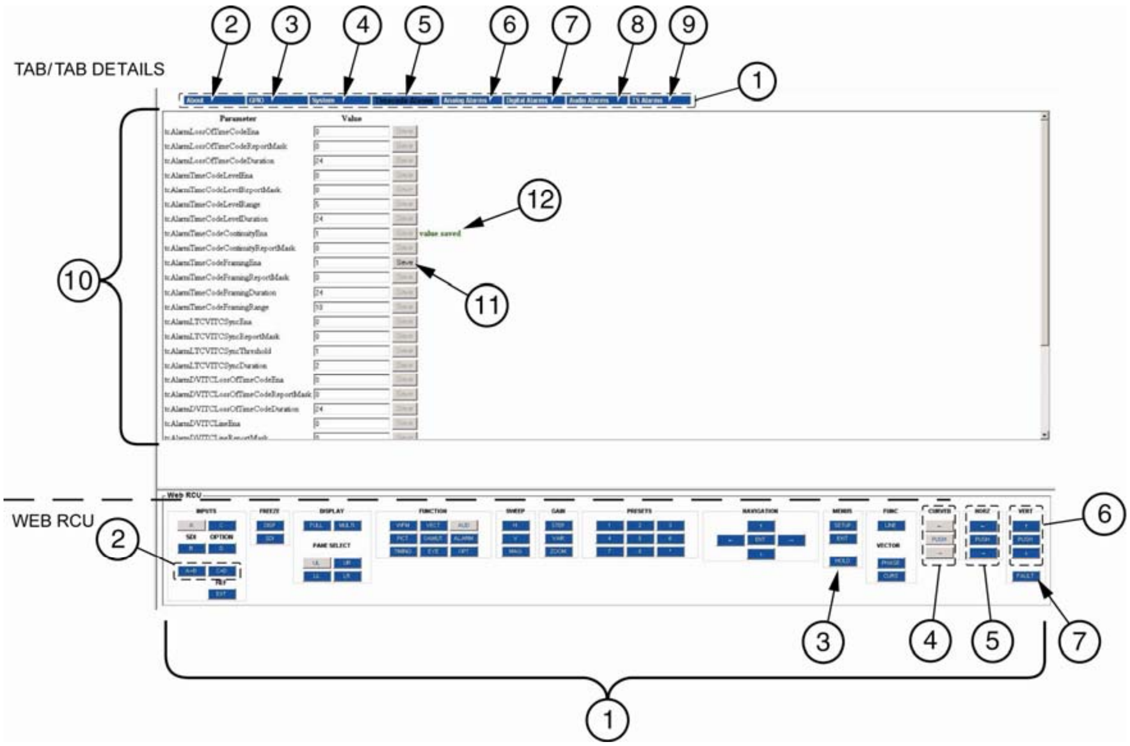
VTMSystem: Allows read/write access to instrument

VTMAdmin: Allows read/write access to instrument.

Once the password has been entered, the default web page (the ABOUT Screen), is the first screen that appears. The screen indicates the model number, version, serial number, and what is installed in each slot of the instrument.

A sample Web Remote Display is shown in **Figure 6-1,** and described in **Table 6-3**. The screen is split into two sections. The sections are the Tab/Tab details section and the Web RCU section.

Figure 6-1. Sample Web Remote Display



Tab/Tab Details

Clicking the Tab at the top of the screen will link to the appropriate tab page, as shown in the example in **Figure 6-1**. **Table 6-2** describes the fields shown in the Tab/Tab Details section.

Table 6-2. Tab/Tab Details Description

Key	Field	Description
1	Web function tabs	Click the Tab to access the appropriate Tab page for the specified tab function.
2	About	The ABOUT tab is a read-only screen that contains the Firmware Version, VPR ID, Slot 1 ID, Slot 2 ID, Audio ID, Display firmware version, Panel version, RCU version, and serial number information. This is similar to the ABOUT screen described on page 200.
3	GPIO	The GPIO tab displays the GPI Alarm Rename screen. All 9 GPI Alarm names can be changed on this screen. There is a 16-character limit for each GPI Alarm Name.
4	System	The System Screen is used to rename the Input Source IDs and indicate the number of current monitored alarms. The Input Source ID is described on page 180. The number of current monitored alarms field is a read-only display that indicates the number of active alarms for the selected input. This field does not indicate the alarms for all the inputs at the same time.

Table 6-2. Tab/Tab Details Description

Key	Field	Description
5	Timecode alarms	The Time Code Alarms Screen indicates the Alarm Enable and Parameter Settings field for each Time Code Alarm. The Enable Field is set with a “0” for Disable Alarm or a “1” for Enable Alarm. See **Table 4-9** on page 168 for the list of alarm parameters.
6	Analog alarms	The Analog Alarms Screen indicates the Alarm Enable and Parameter Settings field for each Analog Video Alarm. The Enable Field is set with a “0” for Disable Alarm or a “1” for Enable Alarm. See **Table 4-8** on page 164 for the list of alarm parameters.
7	Digital alarms	The Digital Alarms Screen indicates the Alarm Enable and Parameter Settings field for each Digital Video Alarm. The Enable Field is set with a “0” for Disable Alarm or a “1” for Enable Alarm.
8	Audio alarms	The Audio Alarms Screen indicates the Alarm Enable and Parameter Settings field for each Audio Alarm. The Enable Field is set with a “0” for Disable Alarm or a “1” for Enable Alarm. See the *A^3-OPT 2, A^3-OPT 3, A^3-OPT 5, A^3-4004, and A^3-OPT 3/5-TL Installation and Operation Handbook* for the complete list of audio alarms for the selected option.
9	TS alarms	The TS Alarms Screen indicates the Alarm Enable and Parameter Settings field for each TS Alarm. The Enable Field is set with a “0” for Disable Alarm or a “1” for Enable Alarm. See **Table 4-10** on page 169 for the list of alarm parameters
10	Tab page	Lists all the fields associated with the selected tab. To see the latest values of the instrument for the selected TAB PAGE press the F5 button to refresh the screen.
11	SAVE button	The SAVE button is used to save the changed parameter values for the selected field. The SAVE button will not be enabled for any field until the field parameter changes. Once the SAVE button is enabled, click the SAVE button to save the changes.
12	Value change indication	Shown as VALUE SAVED or COULD NOT SAVE VALUE. This appears after the SAVE button is pressed. It will remain on the screen until another tab or the refresh button (F5) is pressed.

Web RCU

The Web RCU is located at the bottom of the screen, as shown in **Figure 6-1**. **Table 6-3** describes the fields shown in the Tab/Tab Details section.

The button colors in the Web RCU section provide the following indications on the status of the instrument:

WHITE: The button is in use (similar to the high tally indication on the front panel).

BLUE: The button is not in use (similar to low tally indications on the front panel).

Table 6-3. Web Remote Display Description

Key	Field	Description
1	Web RCU (virtual control panel)	The WEB RCU is the virtual front panel controls for the TVM/TVM instrument. All the buttons relate to specific buttons on the front panel. There are some slight differences to the WEB RCU that differ from the actual front panel of the instrument. Those differences are listed below.
2	A+B, C+D buttons	Press to select INPUT A and B or INPUT C and D simultaneously.
3	HOLD Button	Some functions of the TVM/TVM instrument require that certain buttons need to be pressed and held. Because buttons on the virtual control panel cannot be physically pressed and held, the HOLD button on the Virtual Control Panel is used to hold the next selected button.
4	Curved (arrow) buttons	• Pressing the Right arrow button is similar to turning the curved arrow knob to the right (up). • Pressing the Left arrow button is similar to turning the curved arrow knob to the left (down). • Pressing the PUSH button is similar to pressing the curved arrow knob to perform the selected knob function according to the menu or pane selected.
5	Horizontal buttons	• Pressing the Up arrow button is similar to turning the Right/Left knob to the right (right). • Pressing the Down arrow button is similar to turning the Right/Left knob to the left (left). • Pressing the PUSH button is similar to pressing the Right/Left knob to perform the selected knob function according to the menu or pane selected.
6	Vertical buttons	• Pressing the Right arrow button is similar to turning the Up/Down knob to the right (up). • Pressing the Left arrow button is similar to turning the Up/Down knob to the left (down). • Pressing the PUSH button is similar to pressing the Up/Down knob to perform the selected knob function according to the menu or pane selected.
7	Fault button	The fault button is used to indicate when a fault occurs in the TVM/TVM instrument. Pressing this button has no effect.

SNMP Communications

A Management Information Base (MIB) is an object database that can be monitored by a Network Management System (NMS). The protocol standardized for communicating MIB objects between an Agent and a Network Management System is the Simple Network Management Protocol (SNMP).

An object in the Videotek TVM Series MIB represents each TVM Series parameter and status, and each object can be referred to by a numeric designation called an Object ID (OID). The root OID (Enterprise ID) for Videotek MIBs is 1.3.6.1.4.1.10039. The full MIB tree is:

iso(**1**)**.**org(**3**)**.**dod(**6**)**.**internet(**1**)**.**private(**4**)**.**enterprises(**1**)**.10039**.videotekMIB(**1**).vtRelease(**10**).vtTVMSeries(**1**)

Additionally, the TVM Series supports SNMPv1 and SNMPv2c traps. The TVM Series MIB branch is called vtTVMSeries. The TVM Series MIB can be found on the SNMP Support CD that is supplied with the instrument.

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Section 7 ♦ Troubleshooting

WARNING: These instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform this installation or any servicing unless you are qualified to do so. Refer all servicing to qualified service personnel.

NOTE: When power is applied to the unit, the display shows the startup screen for about 45 seconds.

If the TVM is not functioning properly, first verify that:

The TVM is connected to a power source (90–264 VAC, 50/60 Hz nominal).
All cables are correctly connected (see Section 2, “Installation”).

Initial difficulties with operation or display can be due to improper setup. Review the SETUP MENU (see Section 3, “Operation”) to ensure that the proper adjustments have been made for the signal requirements.

Cold Starting the TVM

NOTE: A cold start resets all front panel and Setup menu selections to the factory-default settings. All user settings are lost. See Section 3, “Operation,” for the factory-default settings.

If a problem persists after the cables are correctly connected and the unit is set up, perform a Cold Start. Only one procedure needs to be performed to cold start the unit. The first type of cold start procedure is a front panel Cold Start, as described below. The second type of cold start procedure is a Warm Start that is described on page 225. The third type of cold start is a Cold Start after a VFlash update that is described on page 226. *The Ethernet default settings for the TVM are*:

IP: 192.0.0.100
Subnet Mask: 255.255.255.192
Gateway: 0.0.0.0

Cold Start

The front panel COLD start procedure is a cold starting procedure that does not require the power to be disconnected from the unit. To perform a front panel cold start:

1. Push and hold the Setup button, up/down knob, and right/left knob. For a minimum of five seconds. The Cold Start message appears on the screen.
2. Once the message appears, the cold start is complete.

Warm Start

The Warm Start procedure performs a cold start on the unit, but does not erase the Presets from memory. To perform a warm start:

1. Push and hold the Setup button and curved arrow knob for a minimum of five seconds until the Warm Start message appears on the display.
2. Once the message appears, the warm start is complete.

Cold Start after VFlash

After a VFlash update is performed, cycle the power and perform a cold start to continue. To perform a cold start after a VFlash update:

1. Unplug the power to the TVM/TVM device and wait 30 seconds.
2. Plug the power back into the device while pushing and holding the Setup button, up/down knob, and right/left knob. Hold the buttons until the display appears.
3. Once the quad display appears, the cold start is complete.

Problems, Causes, and Solutions

Table 7-1. TVM Series: Problems, Causes, and Solutions

Problem/Symptom	Possible Cause	Solution or Explanation
No display on external XGA monitor	The monitor is not powered up.	Check to see that the monitor is plugged in and powered up.
	The full-screen picture display is selected but no signal is present on the input selected.	Press DISPLAY to de-select the full-screen picture display.
Display on External XGA monitor is not centered	The XGA monitor is not correctly adjusted.	Use the monitor controls to center the display.
Waveform not locked when External Reference (EXT REF) is selected	The video signal is too low in amplitude or the sync edge is too noisy.	Verify that the External Reference signal is of sufficient amplitude.
	EXT REF is selected but there is no reference input, or the External Reference is non-synchronous.	Select Internal Reference (INT REF) and/or verify that the External Reference signal is synchronous.
Waveform not locked when External Reference (EXT REF) is selected (cont)	External Reference inputs are not connected properly for the configuration.	Check that the external reference configuration is in the expected mode (Loop or Split). If in loop mode, there should only be one input signal. If in split mode, the Blackburst signal should be applied to the REF A input, while a Tri Level signal should be applied to the REF B input.
Audio level reading too low	The input reference level is not correctly set.	Use the SETUP MENU to check the input reference level setting.
When displaying an A&B or C&D parade, the second display is not locked or is offset	The two signals are not genlocked or are not timed.	Genlock or time the signals.
Eye Pattern not clear	There is excessive cable length.	Add digital DA to cable run. Add reclocking DA to cable run.
	There is excessive jitter.	Source is causing jitter.
Picture width not correct	The aspect ratio is not set correctly.	Change aspect ratio in the setup menu.
Input switches by itself	The router control is on.	Turn off router control in the setup menu.

Table 7-1. TVM Series: Problems, Causes, and Solutions

Problem/Symptom	Possible Cause	Solution or Explanation
No communications on Ethernet port	The IP address is incorrect.	Provide the correct IP address in setup menu.
	Incorrect Ethernet cable	For a direct connection, use a crossover cable. For a network connection, use a standard Ethernet cable.

If the problem still exists after troubleshooting the TVM, see “Service and Support” on page 13 for further instructions.

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Appendix A ♦ Specifications

Specifications are subject to change without notice.

Video Input Specifications: 3Gb/s/HD-SDI/SD-SDI Option

Item	Specification
Digital inputs	Two (2) dual standards inputs accepting Standard definition, SMPTE 259 MC formats or High definition SMPTE 292M, 372M, 424M, 425M-AB formats including: 525/59.94, 625/50, 1080i/60, 1080i/59.94, 1080i/50, 1080p/60, 1080p/59.94, 1080p/50, 1080p/30, 1080p/29.97, 1080p/25, 1080p/24, 1080p/23.98, 1080/30sF, 1080/29.97sF, 1080/25sF, 1080/24sF, 1080/23.98sF, 720p/60, 720p/59.94, 720p/50, 720p/30, 720p/29.97, 720p/24 Hz, 720p/23.98, Format Standard Dual Link SMPTE 372M 4:4:4 (YCBCR) 10 bit
Data rate	270 MB/s, 1.485 Gb/s, 2.97 Gb/s, auto detect; also div by 1.001 rates
Connectors	4 BNCs, active looping inputs 1 BNC monitor output
Level	800 mV, nominal source amplitude
Input cable equalization	• Up to 80 meters of Belden 1694A from 1.485 Gb/s to 2.97 Gb/s • Up to 100 meters of Belden 8281 at 1.485 Gb/s • Up to 250 meters of Belden 8281 at 270 Mb/S
Return loss	• ≤ -15 dB 5 MHz to 1.485 GHz • ≤ -10 dB 1.485 GHz to 2.97 Gb/s
Monitor output	Follows the selected digital input
Monitor output data rate	270 Mb/s, 1.485 Gb/s and 2.97 GHz
Monitor output connector	BNC
Monitor output level	800 mV, nominal

Video Input Specifications: HD-SDI/SD-SDI Option

Item	Specification
Digital inputs	Two (2) dual standards inputs accepting Standard definition, SMPTE 259 MC formats or High definition SMPTE 292M, 372M, formats including: 525/59.94, 625/50, 1080i/60, 1080i/59.94, 1080i/50, 1080p/30, 1080p/29.97, 1080p/25, 1080p/24, 1080p/23.98, 1080/30sF, 1080/29.97sF, 1080/25sF, 1080/24sF, 1080/23.98sF, 720p/60, 720p/59.94, 720p/50, 720p/30, 720p/29.97, 720p/24 Hz, 720p/23.98, Format Standard Dual Link SMPTE 372M 4:4:4 (YCBCR) 10 bit
Data rate	270 MB/s, 1.485 Gb/s auto detect
Connectors	4 BNCs, Hi-Z passive looping 4 BNCs, active looping with option EYE-H
Level	800 mV, nominal
Input EQ	• Up to 100 meters of Belden 8281 at 1.485 Gb/s • Up to 250 meters of Belden 8281 at 270 Mb/S
Return loss	• ≤ -25 dB 100 kHz to 270 MHz • ≤ -15 dB 5 MHz to 1.485 GHz

Video Input Specifications: HD-SDI/SD-SDI Option

Item	Specification
Monitor output	Follows the selected digital input
Monitor output data rate	270 Mb/s and 1.485 Gb/s
Monitor output connector	BNC
Monitor output level	800 mV, nominal

Video Input Specifications: SD-SDI Option

Item	Specification
Digital inputs	Two (2) SMPTE 259-MC inputs, auto detect 525/59.94 and 625/50
Data rate	270 Mb/s auto detect
Connectors	Hi-Z looping 4 BNCs, active looping, option EYE-S
Level	800 mV, nominal source amplitude
Input cable equalization	Up to 250 meters of Belen 8281 at 270 Mb/s
Return loss	≤ -25 dB 100 kHz to 270 MHz
Monitor output	Follows the selected digital input
Monitor output data rate	270 Mb/s
Monitor output connector	BNC
Monitor output level	800 mV, nominal

Video Input Specifications: Analog Option

Item	Specification
Analog inputs (C and D only)	Two (2) NTSC/PAL composite video auto detect
Signal level	1V p-p
Input impedance	Hi-Z, looping
Return loss	≤ -45 dB 100 kHz to 5 MHz
Reference inputs	
Inputs	Analog Blackburst, NTSC/PAL composite video, Tri-level sync auto detect per SMPTE 274M
Levels	286 mV p-p ± 6 dB (Blackburst NTSC) 300 mV p-p ± 6 dB (PAL sync and burst) 600 mV p-p ± 3 dB (Tri level Sync)
Impedance	Selectable Hi-Z looping or 75Ω terminating

Eye and Jitter/Frequency Patterns

Item	Specification
Eye display input	Displays pre-equalized waveforms
Eye display types	• SD: 3 eye or 10 eye • HD/3Gbps: 3 eye or 20 eye

Eye and Jitter/Frequency Patterns

Item	Specification
Eye horizontal mag	• x1 - SD/HD/3Gbps = 3 eye displayed - SD = 10 eyes displayed - HD/3Gbps = 20 eyes displayed • x5 - SD/HD/3Gbps = 3/5 eye displayed - SD = 2 eyes displayed - HD/3Gbps = 4 eyes displayed • x10 - SD/HD/3Gbps = 3/10 eye displayed - SD = 1 eye displayed - HD/3Gbps = 2 eyes displayed
EYE amplitude display accuracy	± 5% @ 800mV input level
Measurement analog bandwidth	• 50 kHz to 2.25 GHz • -3 to +1 dB relative to 750 MHz
Jitter high pass filters	- 3 db response points *(For EYE and jitter / frequency displays)* • 10 Hz ± 2 Hz • 100 Hz ± 10 Hz • 1 KHz ± 100 Hz *(For jitter / frequency displays, option JEM, digitally filtered)* • 10KHz ± 500 Hz • 100 KHz ± 5 KHz *On JEM, Jitter / frequency display follows selected eye pattern high pass filter select (10 Hz, 100 Hz, or 1 kHz).On JEM 2 and JEM3, Jitter and frequency displays are independently selectable.*
Jitter overshoot	≤ 20% of amount on input between high pass filter -3 db frequency to 10X all high pass filter bandwidths.
Intrinsic jitter	• ≤ 70 ps for HD • ≤ 150 ps for SD *Jitter displayed with ideal input, default display settings with cursor measurement and 1 KHz filter selection, including crosstalk*
Intrinsic wander	• ≤ 150 ps for HD • ≤ 300 ps for HD *With 10 Hz filter, observed over 1 hour after warm up*
Lock-up time	≤ 1 second 1 KHz loop filter ≤ 5 seconds 10 Hz loop filter
Jitter display type ***Option JEM only***	Bar graph showing jitter magnitude
Jitter display range ***Option JEM only***	0 UI to 1.0 UI
Jitter frequency plot ***Option JEM only***	Displays a frequency histogram from the filter setting up to a maximum frequency of 1 MHz or 5 MHz
Rise time measurement ***Option JEM only***	± 20 ps typical 800 mV with clean signal, free of aberrations Limited by eye display accuracy
Fall time measurement ***Option JEM only***	± 20 ps typical 800 mV with clean signal, free of aberrations Limited by eye display accuracy

Eye and Jitter/Frequency Patterns

Item	Specification
Amplitude measurement ***Option JEM only***	± 10 mV typical 800 mV with clean signal, free of aberrations *Limited by eye display accuracy*

DVI-I Output Specifications

Item	Specification
Digital levels	Per DDWG DVI rev 1
R, G, B levels	Selectable 0.7 or 1V p-p, nominal
Pixel rate	65 Mp/s
Analog R,G,B impedance	75Ω
Horizontal sync	Negative TTL pulse @ 48,363 Hz ± 1%
Vertical sync	Negative TTL pulse @ 60.004 Hz ± 1%
Display accuracy	• ± 1% waveform • ± 1° vector • ± 37 ns Timing Digital • ± 300 ns Timing Analog
Connector	29-pin DVI-I, female

Audio Options

Item	Specification
Inputs (analog)	Eight monophonic or four stereo channels, balanced or unbalanced
Maximum input level	+24 dBu
Input connector	37-pin, D-sub, male
Impedance	> 20kΩ
Inputs (digital)	Four AES/EBU serial digital pairs with input expansion option to eight. Sixteen embedded audio channels, one Dolby® E or AC-3 stream
Input connectors	Four or eight, BNC, female
Impedance	75Ω
Outputs (analog)	Eight monophonic or four stereo channels, balanced or unbalanced, follows selected audio input; Dolby inputs produce a two channel mix down and/or full eight channel decode
Output level	+24 dBu max +6 to –50 dB adjustable For digital audio, -20 dBFS produces a +4 dBu analog output level
Output connector	37-pin D-sub, male, shared with inputs
Impedance	10Ω unbalanced or 20Ω balanced, nominal
Signal to noise	100 dB (relative to signal level out of +24 dBu), typical

Audio Options

Item	Specification
Outputs (digital)	4 AES/EBU and one Dolby® Digital, Dolby® E, or AES stream embedded in the selected digital video source
Output connector	Four shared with input
Impedance	75Ω, BNC, female

Control Specifications

Item	Specification
GPI	Nine total with input and preset recall selections or individually user configured as alarm input
GPO	Two alarms, user configured
Connector	26-pin HD (high density) D-sub, female
Input impedance	10 kΩ returned to +5 VDC
Alarm output	Relay closure
Maximum relay current	350 mA @ 30 VDC
External router control	One RJ11 female, for use with Harris Broadcast RS-12 series routers for future expansion
Peripheral interface	USB 1.1 supporting storage devices, and keyboard
Connector	USB 1.1, Type A, female

Display Specifications

Item	Specification
General	A quadrant display for viewing an input on up to four different displays as picture, waveform, vector, audio, alarm status, timing, optional eye pattern, simultaneously or individually as a full screen display of each separately. Additional data analyzer display for pixel analysis. Also, view multiple waveform and vectors of the same or different inputs.
Waveform	Composite; YC_BC_R or RGB, parade/overlay of like formats
Sweep time base	• 1H or 2H with x1, x5, and x10 horizontal magnification • 1V or 2V with x1, x5, and x25 horizontal magnification
Waveform accuracy	≤ 1%
Eye (optional)	Display Eye or waveform individually or paraded
Sweep time base	Overlay or 10 Eye (SD), 20 Eye (HD)
Filters	10, 100 Hz, 1 kHz
Vector	R-Y vs. B-Y for Analog C_B vs. C_R for HD or SD
Vector accuracy	≤ 1°
Gamut	Encoded or RGB gamut displays with upper and lower limit selection
Audio (Optional)	2, 4, 6, or 8 channels displayed simultaneously

Time Code Specifications

Item	Specification
Input	• LTC via back panel connector • Ancillary Time Code (HD only) • DVITC extracted from SD inputs
Display	• Displayed directly • Used to set internal clock

SDI Freeze

Item	Specification
Freeze-capable displays	• Waveform • Vector • Picture • Data
Display differentiation method	Frozen waveform and vector can be set to a different color than live. All inputs (Inputs A, B, C, D) can each have a different color, and the frozen waveform and vector can be a third color.
Freeze triggers	• Menu selections: waveform, vector, and picture • Alarm: data
Waveform and vector frozen displays	• Display frozen • Display live • Display both
Picture displays	• Display frozen • Display live
Frozen waveform control	The following can be altered on a frozen waveform: • Field select (odd or even) • H Mag • V Mag • H pos • V pos • All sweep and filter settings

Data Analyzer

Item	Specification
Displays	• Data: Four-word (maximum) display of samples of a particular line • Pixel: Three word – Y, CB, CR display of a particular picture element • Three modes to display pixel data (pixels within the pixel cursor): 2H: displays 2 horizontal pixels 8H: displays 8 horizontal pixels 2H x 4V: displays 2 horizontal pixels and 4 vertical pixels
Control	• Front Panel selects what to display • Line Select knob selects a line • Up/Down buttons choose which samples/pixel to display
Interaction with alarms	• Alarms can trigger data freeze • Peak (Upper and Lower), Luminance (Upper and Lower), and RGB Gamut cause errored samples to be highlighted

CRC Error Display

Item	Specification
Display position	Replaces alarm window
Display enable	By menu choice
Parameters displayed	• FF CRC Sec (full-field CRC errored seconds- SD only) • AP CRC Sec (active picture CRC errored seconds – SD only) • F1 AP CRC Value – displays the most recent active picture CRC for field 1 (SD only) • F2 AP CRC Value – displays the most recent active picture CRC for field 2 (SD only) • Format Errors • Time since last reset • Embedded audio presence • Other ancillary data presence
Format errors monitored	• SAV placed incorrectly • Line-length error • Field-length error • Reserved values used improperly • ANC data checksum error • ANC data parity error • ANC data placement error • Absence of serial video input
CRC error-specific controls	Errored second counter rest

Closed Captioning Displays

Item	Specification
Standards	• SD: Implements the digitized form of line 21 analog closed captioning (EIA-608B) • SD 625/50: Implements Teletext decoding (ETSI EN 300 706) • SD and HD: Implements OP-47 • HD: Implements vertical ancillary captioning (EIA-708B)
Data types supported	• CC1: primary • CC3: secondary • 708: Digital television caption service (HD only)

Gamut Display

Item	Specification
Monitored parameters	• Composite gamut (positive and negative chroma packet excursions about luma levels) • RGB gamut
Display type	• Polar; Angle of display always represents hue (as in a vectorscope) • Composite display amplitude plots luma plus half of saturation and luma minus half of saturation, with magnitude in IRE or units; concentric circles represent minimum and maximum ranges • Component display plots R, G, and B amplitudes, with magnitude in mV; concentric circles represent minimum and maximum ranges
Display position	Replaces vector display

Magnification

Item	Specification
Waveform sweep MAG selection	x1, x5, and x10; pressing the MAG button will cycle through x1, x5, and x10 horizontal magnification
Waveform step gain selection	x1, x2.5, x5, and x15; pressing the STEP button will cycle through x1, x2.5, x5, and x15 vertical magnification
Waveform gain	Variable from x0.50 to x5.00; when combined with STEP gain, the waveform gain is variable between 0.50 and 75.00
Vector gain	STEP gain of x1, x2.5, x5, and x15 Variable gain of x0.50 to x10.00 When combined, vector gain is effectively x0.50 to x150.0

Ethernet

Item	Specification
Standard	10/100 Base-T conforms to IEEE802.3
Connector	RJ45
Performance metric	Transfer a captured frame to a PC in ≤ 30 seconds, dedicated LAN
Number of simultaneous connections	6

External Routing Control

Item	Specification
Switcher protocol	RS-12X
Number of RS-XX	One
Physical interconnection standard	RS-485

Power Requirements

Item	Specification
AC power source	90 – 264 VAC, 50 - 60 Hz, nominal
Power consumption	150 VA maximum

Mechanical

Item	Specification
Dimensions	• Height: 5.25 in. (13.34 cm) • Width: 8.2 in. (21.6 cm) • Depth: 16.6 in. (42.24 cm)
Weight	9.0 lb (4.07 kg)

Environmental

Item	Specification
Operating temperature	0° to +50°C (0° to +45°C option JEM and 3GB)

Environmental

Item	Specification
Storage temperature	-40° to +65°C
Humidity (non-condensing)	Operating: 20% to 80% Non-operating: 5% to 90%
Transportation	24 in. (9.5 cm) impact-drop survivable in original factory packaging
Altitude (operating)	6562 ft (2000 m)
Pollution degree	Pollution Degree 2

Standard Accessories

Item	Specification
Standard accessories	• *TVM Installation and Operation Handbook* • Breakout connector for GPI/TALLY/LTC/CLOCK • One rack mounting kit • One power cord • DVI to VGA adapter

TVM Options

Item	Specification
TVM-VTM-3D	Option to add 3D displays to TVM9150PKG-xx and VTM4150PKG-xx packages
TVM-VTM-ACV-2	Two (2) looping analog composite video inputs for NTSC or PAL format.
TVM-VTM-SDI-S	Two (2) looping inputs for SMPTE 259M-C (SD-SDI) with auto detect and monitor output; replaces standard A/B inputs or C/D inputs.
TVM-VTM-S2H-F	Software *Feature Upgrade* to add SMPTE 292M (HD-SDI) to TVM-VTM-SDI-S.
TVM-VTM-SDI-H	Two (2) looping inputs for SMPTE 292M (HD-SDI) or SMPTE 259M-C (SD-SDI) with auto detect and monitor output; replaces standard A/B inputs or C/D inputs.
TVM-VTM-EYE-S	Two (2) looping inputs for SMPTE 259M-C (SD-SDI) with auto detect, EYE pattern and monitor output; replaces standard A and B inputs (must be used as inputs A and B [Only one per unit]).
TVM-VTM-ES2H-F	Software *Feature Upgrade* to add SMPTE 292M (HD-SDI) to TVM-VTM-EYE-S.
TVM-VTM-EYE-H	Two (2) looping inputs for SMPTE 292M (HD-SDI) or SMPTE 259M-C (SD-SDI) with auto detect, Eye pattern and monitor output; replaces standard A and B inputs (must be used as inputs A and B [only one per unit]).
TVM-VTM-JEM	Two looping inputs for SMPTE 292M (HD-SDI) or SMPTE 259M-C (SD-SDI), auto detect with Eye pattern and monitor output with advanced jitter analysis and monitor output (must be used as inputs A and B [only one per unit]).

TVM Options

Item	Specification
TVM-VTM-JEM2	Two looping inputs for SMPTE 292M (HD-SDI) or SMPTE 259M-C (SD-SDI), auto detect with Eye pattern and monitor output with advanced jitter analysis and monitor output (must be used as inputs A and B [only one per unit]). Field upgradable, with TVM-VTM-J2TOJ3-F, to TVM-VTM-JEM3.
TVM-VTM-J2TOJ3-F	*Software Feature Upgrade* for TVM-VTM-JEM2 to TVM-VTM-JEM3.
TVM-VTM-3GB	Input module which accepts two active-looping triple-rate (2.97 Gb/s, 1.485 Gb/s, and 270 Mb/s) HD-SDI or SD-SDI input signals for display and analysis. One triple-rate SDI monitor output is switchable from following the selected SDI video input to becoming an internal test generator that displays color bars, pathological checkfield, and color bars with motion. The Test Signal Generator is free-running (no genlock capability). Embedded audio and Video Payload ID per SMPTE 352M-2002 ancillary data insertion is supported. Supplies additional support for dual-link HD-SDI 12-bit YCBCR and RGB video formats. Requires TVM-40 or TVM-50.
TVM-VTM-JEM3	Input module which accepts two active-looping triple-rate (2.97 Gb/s, 1.485 Gb/s, and 270 Mb/s) HD-SDI or SD-SDI input signals for display and analysis including Eye pattern and advanced jitter analysis. One triple-rate SDI monitor output is switchable from following the selected SDI video input to becoming an internal test generator that displays color bars, pathological checkfield, and color bars with motion. The Test Signal Generator allows jitter to be deliberately injected into the output signal. The Test Signal Generator is free-running (no genlock capability). Embedded audio and Video Payload ID per SMPTE 352M-2002 ancillary data insertion is supported. Supplies additional support for dual-link HD-SDI 12-bit YCBCR and RGB video formats. Requires TVM-40 or TVM-50.
TVM-VTM-ASI	Two (2) passive-looping DVB-ASI and SMPTE310 inputs. It accepts two independent MPEG streams and analyzes one selected stream for compliance to measurement guidelines of ETSI TR-101-290 (ETR-290) first, second, and third priority standards.
TVM-VTM-DLK	Expands the dual link capability of the TVM-VTM-SDI-H, TVM-VTM-EYE-H, and TVM-VTM-JEM to include 10-bit RGB (4:4:4) and RGB+A (4:4:4:4) formats. Requires TVM-40 or TVM-50.
TVM-VTM-AAP	Software *Feature Upgrade.* Advanced Analysis Package that adds data analyzer functions in quadrant or full-screen views to the TVM-10. Included in TVM-40 and TVM-50.
TVM-A3-OPT 2	Advanced Audio Analysis Option. Bargraphs and CineSound®. View up to eight audio channels. Includes 4 analog stereo inputs, 4 AES/EBU shared input/output pairs and 16 channels of embedded audio. Analog monitoring outputs of up to eight channels simultaneously.
TVM-A3- 4004	Audio Expansion module. Adds four AES/EBU input pairs. Only available with A3-OPT 2.
TVM-A3-OPT 3	Advanced Audio Analysis Option. Bargraphs and CineSound®. View up to eight audio channels. Includes 4 analog stereo inputs, 8 AES/EBU inputs with 4 shared output and 16 channels of embedded audio. Analog monitoring outputs of up to eight channels simultaneously.

TVM Options

Item	Specification
TVM-A3-OPT 3TL	Advanced Audio Analysis Option with 5x oversampling for enhanced True Peak detection. Bargraphs and CineSound®. View up to eight audio channels. Includes 4 analog stereo inputs, 8 AES/EBU inputs with 4 shared outputs and 16 channels of embedded audio. Analog monitoring outputs of up to eight channels simultaneously. Channel-mapping, loudness, meter labels, and peak value reporting included. All AES inputs are sample rate converted to 48 kHz. The loudness measurement conforms to the ITU-R BS.1770 standard. The loudness metering and setting is implemented in accordance with the EBU R 128 and ATSC A/85 recommendations.
TVM-A3-OPT 5	Full Dolby decoding. Advanced Audio Analysis Option. Bargraphs and CineSound®. View up to eight audio channels. Includes 4 analog stereo inputs, 8 AES/EBU inputs with 4 shared output and 16 channels of embedded audio. Analog monitoring outputs of up to eight channels simultaneously.
TVM-A3-OPT 5TL	Advanced Audio Analysis Option with 5x oversampling for enhanced True Peak detection and Dolby. Bargraphs and CineSound®. View up to eight audio channels. Includes 4 analog stereo inputs, 8 AES/EBU inputs with 4 shared outputs and 16 channels of embedded audio. Analog monitoring outputs of up to eight channels simultaneously. Channel-mapping, loudness, meter labels, and peak value reporting included. All AES inputs are sample rate converted to 48 kHz. It also adds full Dolby decoding to the analog output. The Dolby Output is selectable from any one of the eight pairs of the assigned input type (AES or Embedded). Further, selection of an AES or embedded pair for the AUX meters is available in an eight-channel display. . The loudness measurement conforms to the ITU-R BS.1770 standard. The loudness metering and setting is implemented in accordance with the EBU R 128 and ATSC A/85 recommendations.
TVM-A3-OPT 3TO5	Adds Dolby decoding to existing TVM-A3-OPT 3 A-D and TVM-A3-OPT 3TL.
TVM-OPT V2A	Adds Lip Sync to the TVM-A3-OPT 3TL or TVM-A3-OPT 5TL.
TVM-OPT 3D	Adds 3D picture display modes to the TVM-50 graphics module.
RCU-1000	Remote control panel for the TVM series, VTM series, instructions; replicates all of the front panel controls; RS-422 connection, includes 50 ft (15 m) of cable with RJ11 connectors; One RU in height.
TVM-WRTY1	Full Extended Warranty Plan: Adds three years to the standard two-year warranty, including a one-year extension on the LCD display warranty.
TVM-WRTY2	Adds three years to the standard two-year warranty.
PTC-2	Portable case with folding stand
DRC-2A	Double Rackmount Case
BLK-1	Blank panel for DRC-2A

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Appendix B ♦ Pinouts

Figure B-1. Analog Audio In/Out 37-Pin, Male, D-Sub Connector for Audio Options

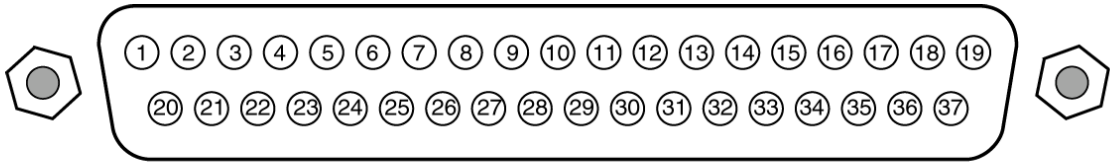

Table B-1. Pinouts for ANALOG AUDIO IN/OUT Connector and Audio Breakout Board

Pinout	Signal	Pinout	Signal
1	Analog input 1 –	20	Analog input 1 +
2	Analog input 2 –	21	Analog input 2 +
3	Analog input 3 –	22	Analog input 3 +
4	GND	23	Analog input 4 +
5	Analog input 4 –	24	Analog input 5 +
6	Analog input 5 –	25	Analog input 6 +
7	Analog input 6 –	26	GND
8	Analog input 7 –	27	Analog input 7 +
9	Analog input 8 –	28	Analog input 8 +
10	GND	29	Analog output 1 +
11	Analog output 1 –	30	Analog output 2 +
12	Analog output 2 –	31	Analog output 3 +
13	Analog output 3 –	32	Analog output 4 +
14	Analog output 4 –	33	Analog output 5 +
15	Analog output 5 –	34	Analog output 6 +
16	Analog output 6 –	35	Analog output 7 +
17	Analog output 7 –	36	Analog output 8 +
18	Analog output 8 –	37	GND
19	GND		

Figure B-2. DVI-I Out Connector

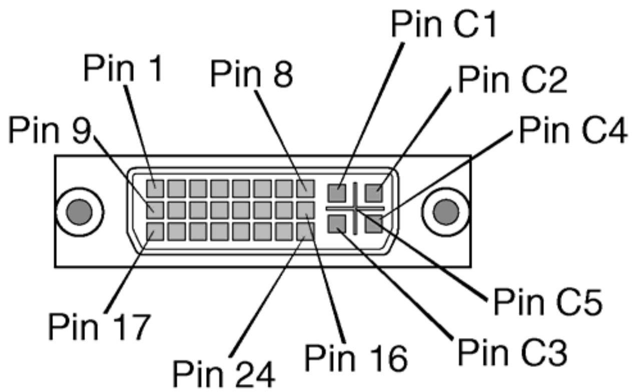

Table B-2. Pinouts for DVI-I Out Connector

Pinout	Signal		Pinout	Signal
1	TMDS data 2-		16	Hot plug detect
2	TMDS data 2+		17	TMDS data 0-
3	TMDS data 2/4 shield		18	TMDS data 0+
4	TMDS data 4-		19	TMDS data 0/5 shield
5	TMDS data 4+		20	TMDS data 5-
6	DDC clock		21	TMDS data 5+
7	DDC data		22	TMDS clock shield
8	Analog vertical sync		23	TMDS clock+
9	TMDS data 1-		24	TMDS clock-
10	TMDS data 1+		C1	Analog red
11	TMDS data 1/3 shield		C2	Analog green
12	TMDS data 3-		C3	Analog blue
13	TMDS data 3+		C4	Analog horizontal sync
14	+5v power		C5	Analog ground (analog, R, G, and B return)
15	Ground (return for +5V, Hsync, and Vsync)			

Figure B-3. LTC/GPI 26-Pin, Female, D-Sub Connector

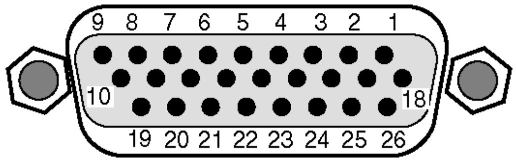

Figure B-4. LTC/GPI Breakout Board

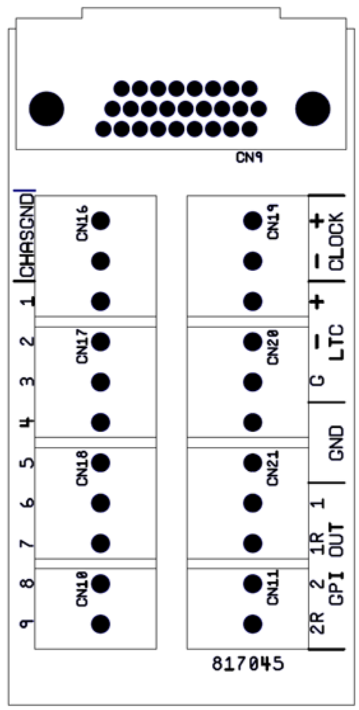

Table B-3. Pinouts for LTC/GPI Connector and LTC/GPI Breakout Board

Pinout	Signal
1	GND
2	GPI input #4 (Select input D)
3	GPI input #3 (Select input C)
4	GPI input #2 (Select input B)
5	GPI input #1 (Select input A)
6	GPI input #7 (Select Preset 3)
7	GPI input #8 (Select Preset 4)
8	GPI input #9 (Select Preset 5)
9	GPI input #6 (Select Preset 2)
10	GPI input #5 (Select Preset 1)
11	GND
12	Reserved
13	GPI output #1

Pinout	Signal
14	Return for GPI #1
15	GPI output #2
16	Return for GPI #2
17	Reserved
18	Reserved
19	Reserved
20	Reserved
21	Reserved
22	Reserved
23	Reserved
24	LTC high in
25	LTC ground
26	LTC low in

Figure B-5. Remote RJ11 Control Connector

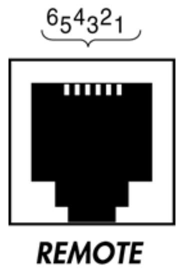

Table B-4. Remote RJ11 Control Connector Pinouts

Pinout	Signal	TVM	RCU1000
1	OPEN	Open	GND
2	RX -	Received by TVM Series	Transmit from RCU
3	RX +	Received by TVM Series	Transmit from RCU
4	TX -	Transmit from TVM Series	Received by RCU
5	TX +	Transmit from TVM Series	Received by RCU
6	GND	GND	GND

Figure B-6. Router RJ11 Control Connector

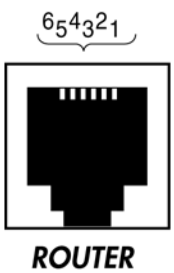

Table B-5. Router RJ11 Control Connector Pinouts

Pinout	Signal
1	OPEN
2	OPEN
3	TX
4	RX
5	OPEN
6	GND

Figure B-7. Ethernet RJ45 Connector

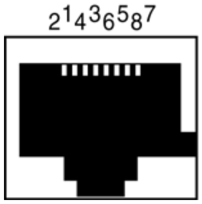

Table B-6. Ethernet RJ45 Connector Pinouts

Pinout	Signal	Pinout	Signal
1	TX+	5	N.C.
2	TX-	6	RX-
3	RX+	7	N.C.
4	N.C.	8	N.C.

Figure B-8. USB Connector

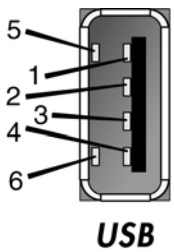

Table B-7. USB Connector Pinouts

Pinout	Signal
1	VCC
2	Data -
3	Data +
4	GND
5	GND
6	GND

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Appendix D ♦ Glossary

601 An international standard (ITU-R BT.601) for component digital television. It defines the sampling systems, matrix values, and filter characteristics for digital television.

8 VSB Vestigial sideband modulation with 8 discrete amplitude levels.

16 VSB Vestigial sideband modulation with 16 discrete amplitude levels.

Advanced Television Systems Committee (ATSC) The parent organization that developed, tested and described the form and function of the US digital television formats.

AES/EBU A digital audio standard established jointly by the Audio Engineering Society (AES) and the European Broadcasting Union (EBU).

Artifacts Unwanted visible effects in the picture created by disturbances in the transmission or image processing, such as edge crawl or ‘hanging dots’ in analog pictures or ‘pixelation’ in digital pictures.

Aspect Ratio The ratio of horizontal to vertical dimensions. A square has an aspect of 1:1 since the horizontal and vertical measurements are always equal. Current television screen aspect ratios are 4:3 and 16:9.

Asynchronous Serial Interface (ASI) A transmission method adopted by the DVB, and called DVB-ASI. The transmission method allows for the transport of varying data payloads in a constant data stream. The DVB-ASI transport stream rate is 270 Mb/s.

Audio Breakaway Routing video and accompanying audio in separate signal paths.

Audio-Follow Routing video and accompanying audio together in the same signal path.

Auto Trans Automatic transition. The execution of a single wipe or fade from current picture to another picture by way of an automatic device.

Active Format Description (AFD) An ancillary data packet in a digital video interface for the purpose of describing certain spatial characteristics of a high definition or standard definition video image. Formatted according to SMPTE 2016, AFD information is intended to guide video equipment regarding the presentation of video of one aspect ratio on a display of another aspect ratio. Bar Data information is used to signal the precise unused areas of active video when the active image does not completely fill the picture area, in particular widescreen cinema material carried letterboxed in a frame with bars top and bottom

Bandwidth The range of frequencies used to transmit information such as picture and sound.

Baseband Video An unmodulated video signal.

Black Also color black, blackburst. A composite color video signal that has the composite sync, reference burst, and a black video signal.

Blanking Processor A circuit which removes sync, burst and blanking from the program video and then replaces it with sync, burst and blanking from the reference input. The process ensures constant sync and burst levels on program video.

Booga Good to view in order to see.

Border An electronically-generated picture member which is used in wipes to separate the two video sources used in the wipe. It is of even thickness and has color produced by the matte generator.

Broadcast Legal Encoding video signal parameters to conform to prescribed limits for broadcast. Encoding rules vary by NTSC, PAL, country and broadcast facility.

BTSC Broadcast Television Standards Committee. A US standard for stereo audio encoding in NTSC broadcast television.

CAV Component Analog Video

CES Consecutive Errored Samples

Composite Video A single video signal that includes all color video and timing information. A composite signal includes luminance, chrominance, blanking pulses, sync pulses and color burst information.

Chrominance The color portion of a video signal that represents the saturation and hue. Black, gray and white have no chrominance; color signals have both chrominance and luminance.

CH Chroma

Chrominance/Luminance Delay (C/L Delay) A measurement that indicates the amount to which chrominance and luminance are aligned with respect to each other. A low C/L delay figure can minimize the effects of ghosts or color offset on the received picture.

Clipping The electronic process of shearing off the peaks of either the white or black excursions of a video signal for limiting purposes. Clipping is often performed prior to modulation to limit the signal.

CMRR Common Mode Rejection Ratio

Color Burst The portion of a color video signal which contains a short sample of the color subcarrier. It is used as a color synchronization signal to establish a reference for the color information following it and is used by a color monitor to decode the color portion of a video signal. The color burst acts as both amplitude and phase reference for color hue and intensity. The color oscillator of a color television receiver is phase locked to the color burst.

Composite Sync A signal consisting of horizontal sync pulses, vertical sync pulses and equalizing pulses only.

CRC Cyclical Redundancy Check

Crosspoint An electronic switch, usually controlled by a button on the panel. Control logic will allow for only one crosspoint, for each bus, to be switched “ON” on at a time.

D/A Conversion of digital to analog signals.

DA Distribution Amplifier

Data Element An item of data as represented before encoding and after decoding.

Decoded Stream The decoded reconstruction of a compressed bit stream.

Decibel (dB) A logarithmic measure of the ratio between two powers, voltages, currents, sound intensities, etc. Signal-to-noise ratios are expressed in decibels.

Default A factory preset value or condition.

Demodulator A receiver, such as for television broadcast, cable, and closed circuit applications. A TV demodulator receives and processes off-air or cable RF signals and provides baseband video and audio outputs.

DHCP Dynamic Host Configuration Protocol

Differential Gain A measurement that specifies how much the chrominance gain is affected by the luminance level. Expressed as a percentage showing the largest amplitude change between any two levels, it indicates how much color saturation variance occurs when the luminance level changes.

Differential Phase A peak-to-peak measurement that specifies the extent to which the chrominance phase is affected by the luminance level. Expressed in degrees of subcarrier phase, it indicates how much hue shift occurs with luminance level changes.

Digital Video Broadcasting (DVB) A specific project office of the European Broadcast Union. This group has produced a set of digital broadcasting standards.

DSK Down Stream Key, a keyer which is electronically located after (or down stream from) all other functions of a switcher. The key resulting will appear to be on top of all other pictures from the switcher.

D-VITC Digital Vertical Interval Time Code. Timecode information stored on specific lines in the vertical blanking interval of a television signal.

Display In the TVM series, the output at the Front LCD or XGA/DVI connector.

EAV End of Active Video in component digital systems.

EBU European Broadcasting Union

Editor A device or system which controls video tape recorders, video switchers, and other related devices in order to electronically splice segments of recorded video into a finished production.

EDH Error Detection and Handling. A recommended practice defined in SMPTE RP 165. A system to generate and then detect video data errors in serial digital video systems.

Effects Keyer A keyer which is electronically located in the mix/wipe generator portion of a switcher. The resulting key would appear under the down stream key.

EIA Rack Space or Unit A specific size as designated by the Electronics Industry Association. The rack unit is 19 inches wide and is 1.75 inches tall. A device which requires 3 EIA rack units is 19 inches wide and 5.25 inches (3×1.75 = 5.25) tall.

Elementary Stream (ES) A generic term for one of the coded video, audio or other variable length bit streams which are packetized to form MPEG-2 transport streams. Consists of compressed data from a single source (audio, video, data, etc.). One elementary stream is carried in a sequence of PES packets with one and only one stream ID.

Embedded Audio Digital audio information multiplexed onto a serial digital data stream. Up to sixteen channels can be multiplexed on a single stream of 601 video, minimizing cabling and routing requirement.

ENG Electronic News Gathering

Encoded Clip Softness In the encoded legalization process, “softness,” as applied to encoded clips, refers to the processing of the video at the point of the clip. The clips are applied in YCBCR color space. The clip point is either an immediate limit (no softness) or will have a range of values leading to the clip point, all reduced to smooth the clip point to a less immediate limit (softness).

Encoded Legalization Limiting of the luminance and color difference signals such that, once encoded into a composite video signal, the resultant encoded video does not violate the maximum or minimum signal levels as defined by the specific encoding rules. NTSC and PAL video plus various users of these types of video have many varied rules for maximum and minimum encoding limits. Encoded legalization usually calculates first the encoded luminance value and then the corresponding chroma value to make legalization judgments.

Encoded Video A combined single video signal that is constructed from either separate RGB or luminance and two color difference video signals. NTSC, PAL, and SECAM are all examples of encoded video.

Envelope Detection An RF signal detection technique that does not respond to phase variations in the carrier signal, enabling measurement of a transmitter’s incidental phase. When used together with synchronous detection, envelope detection helps isolate either video and/or RF as the causes of phase distortion.

External Key Input This is an alternate source for key cut. This is usually a separate external input to a switcher

Fade-thru-Black A production technique which is a two step process. The first step will fade the program video to black. The second step will fade from black to the video selected on the preview bus. This is usually used in major scene transitions.

Fade-to-Black A production technique which simply fades the program video to black and program audio to silent. This is used to end programs and to escape from embarrassing pictures or sounds.

Field A picture or picture portion which is produced within one cycle of vertical synchronization. In interlaced systems, a full picture or frame requires two consecutive fields.

FM Trap A circuit designed to minimize potential interference from strong FM signals in receiving equipment, such as a TV demodulator. For example, an FM trap can attenuate signals between 88-108 MHz to reduce interference on NTSC television channel 6.

Frame A single full resolution picture as viewed in either a video or film system. In the case of interlaced video, two consecutive fields provide all of the information of one frame. In non-interlaced systems, one cycle of vertical synchronization produces a frame. A 60 Hz interlaced system, produces 30 frames of video in one second. A 60 Hz progressive (or non-interlaced) system, produces 60 frames of video in one second. Common frame rates are 24 (film) 25, 29.97, 30, 50, 59.94 and 60.

Frame Synchronizer An electronic device that synchronizes two or more video signals. Using one input as a reference, it locks a second signal to the reference.

Frame Store An electronic method of capturing and storing a single frame of video.

Full A full-screen display of the selected pane (non quad or multi display).

Gamma This term applies to the linearity of the change from black to white. Gamma controls adjust the gray or 50% point of the video either up or down, with the effect of changing the gray level of the video.

Gamut The whole or total of whatever is being addressed. In color space, gamut refers to all colors which are included in a particularly defined color group, such as 601 gamut.

Genlock (Generator Lock) A method of synchronization involving the generation of a video signal that is time and phase locked with another signal.

GPI General Purpose Interface

Headend In a cable TV system, the facilities where program sources (satellite, terrestrial, VTR, local) are received and remodulated for distribution through a cable plant.

High Definition Television (HDTV) High definition television has a resolution of approximately twice that of conventional television in both the horizontal (H) and vertical (V) dimensions and a picture aspect ratio (H to V) of 16:9.

High Level A range of allowed picture parameters defined by the MPEG-2 video coding specification which corresponds to high definition television.

HRC Harmonically-Related Carrier

Hue Color tint

ICPM Incidental Carrier Phase Modulation. A measurement of picture carrier phase distortion (affected by the video signal level) that occurs in the transmitter.

IP Internet Protocol

IRC Incrementally-Related Carrier

I.R.E. Refers to the Institute of Radio Engineers, and is used as a unit of measurement. In NTSC television, 1 volt of signal equals 140 IRE units.

ISP Internet Service Provider

Jitter A deformation of a signal affected by poor synchronization.

Key An effect in television where a selected portion of background video is removed and replaced with another video.

Key Cut In a key effect, this is the video which designates the portion of background video which is removed.

Key Fill In a key effect, this is the video which is used to replace the portion of background video which was removed. This may be the same video as the Key Cut video.

Key Invert In a key effect, this is an electronic action which reverses the polarity of the key cut signal. It makes black appear as white, and white appear as black.

Key Mask In a key effect, it uses a wipe pattern from the wipe pattern generator to restrict the key cut from removing video in a portion of the screen. This requires the use of the wipe pattern generator and the Mask/Preset Size controls.

Key Source Another term which is the same as key cut.

Legalization The modification of serial digital video to conform to analog color space rules, as required by users.

LCD Liquid Crystal Display

LED Light-Emitting Diode

LFE Low Frequency Effects

Lissajous A display of the amplitude and phase relationships between two input signals.

LS Left Surround

LTC Longitudinal Time Code, A SMPTE timecode standard usually recorded onto the linear audio track of a VTR.

Luminance The degree of brightness (black and white portion of the video signal) at any given point in the video image. A video signal is comprised of luminance, chrominance and sync. If luminance is high, the picture is bright and if low the picture is dark. Changing the chrominance does not affect the brightness of the picture.

Main Level A range of allowed picture parameters defined by the MPEG-2 video coding specification with maximum resolution equivalent to standard definition television.

Main Profile A subset of the syntax of the MPEG-2 video coding specification that is supported over a large range of applications. Applications include, MP@HL (Main profile at high level) and MP@ML (Main profile at main level).

Mask/Preset Size Uses the wipe pattern generator in the keyer portion of the effects generator. This is used to adjust the size of a preset pattern or for adjusting the size of a mask to block a portion of the key cut (source) from use in the keyer.

Matte Generator An internal generator which can make any color, is used for border color and may be used for key fill. It is identical to the Color Background Generator, but simply used in other areas of the switcher.

Mbps Megabits Per Second

mV Millivolts

M/E Mix/Effects System

MP@HL Main profile at high level

MP@ML Main profile at main level

MPEG Refers to standards developed by the ISO/IEC JTC1/SC29 WG11, Moving Picture Experts Group.

MPEG-2 Refers to ISO/IEC standards 13818-1 (Systems), 13818-2 (Video), 13818-3 (Audio), and 13818-4 (Compliance).

Multi In the TVM series, contains preconfigured screens (for TVM Classic, Data Analyzer, Custom Timing, and Waveform-Vector screens only)

Multi-Level Effects Applies to any effects generator which can do more than one effect at a time. Typically, a multi level switcher can produce a Key and a Background transition in the same effects generator at one time.

NTSC National Television Systems Committee, the color television system used in the United States, Canada, Mexico and Japan.

NVRAM Nonvolatile RAM

Packet Identifier (PID) A unique integer value used to associate elementary streams of a program in a single or multi-program transport stream.

Packet A packet consists of a header followed by a number of contiguous bytes from an elementary data stream. It is a layer in the system coding syntax.

Packetized Elementary Stream (PES) The data structure used to carry elementary stream data. The packets consist of a header followed by payload data, and a stream is a series of packets which form an elementary stream and have a single stream identification.

PAL Phase Alternation Line; the standard color television system in many European and other countries.

Pane In the TVM series, this term applies to one quadrant in a multi-quadrant screen (Quad or Multi).

Passive Looping Video and audio signals routed through components, even if power is removed. Signals are not amplified or processed, maintaining transparency.

Payload Identifier see Video Payload ID.

Pedestal Level An offset used in a video system to separate the active video from the blanking level by maintaining the black level above the blanking level by a small amount.

Pixel A Picture cell or Picture element representing one sample of picture information, such as an individual sample of R, G, B, luminance or chrominance.

Preset Refers to establishing any condition prior to use on the Program output. This term is used in reference to wipe patterns and is often interchanged with Preview.

Preview The video output channel used to view the intended Program results prior to the execution of the next transition.

PRO Audio A transmitted audio channel for talent cueing via Interrupt Foldback (IFB) to ENG vans and remote applications. Some demodulators support PRO audio monitoring.

Program A transport stream combination of a video stream and one or more audio and data streams associated with that video stream. In analog terms, “Program” refers to the Base Band video and audio produced by the final output of a switcher.

Program Association Table (PAT) A list of all programs that are in the ATSC data stream.

Program Map Table (PMT) A listing of all elementary streams that comprise a complete (television) program.

Program Clock Reference (PCR) This is a time reference signal that is placed in MPEG streams for the purpose of time coordinating various data streams.

Program and System Information Protocol (PSIP) Information sent out as part of an ATSC transport stream which lists all of the video, audio, data and program information contained in the stream. This is the “TV guide” for a given stream.

Progressive Scanning Also non-interlaced. A system of video scanning where lines of a picture are transmitted consecutively, such as with VGA monitor displays.

Push-push Toggle Switch An electro-mechanical device which, when pushed, alternates the condition of the switch. Push once, it’s off, push again, it’s on.

Quadrature Output An output in a television demodulator used for measuring Incidental Carrier Phase Modulation (ICPM) in a transmitter.

QPSK Quadrature Phase Shift Keying, typically used by satellite downlinks.

QAM Quadrature Amplitude Modulation, the technique used by cable TV systems (64-QAM and 256-QAM) to remodulate signals for distribution in a cable plant.

Quad In the TVM series, this term applies to a screen that contains four panes.

RGB Legalization Limiting of luminance and color difference video signals such that, once transcoded into RGB component video signals, the resultant video does not violate the maximum or minimum signal levels as defined by component video level rules. Typically, the maximum value for R, G, or B is 700 mV, and the absolute minimum value for any of these signals is 0 mV.

Reclocking The process of regenerating digital data with a clock recovered from the input data.

Resolution A measure of the finest detail that can be seen, or resolved, in a reproduced image.

RS Right Surround

RS-422 Recommended Standard number 422, an E.I.A. standard which describes a type of data interchange. Television products use this standard as its communication format between the electronics frame and editors, control panel and computers. An RS-422 line may be extended up to 1,000 feet (304m).

Sampling Process by which an analog signal is sampled to convert the analog signal to digital.

SAP Secondary Audio Program, used in television broadcast for second language broadcasting, simulcasting, and separate audio programming.

Saturation Color intensity

SAW Filter Surface Acoustic Wave filter

Segment Error Rate (SER) A calculated average of uncorrected transport stream packets vs. total packets as accumulated over a designated period of time.

Signal to Noise Ratio -Analog (SNR) A measurement of the noise level in a signal expressed in dB (decibels) as a ratio of between the audio or video signal's maximum peak-to-peak signal voltage and the measured voltage of noise present when the signal is removed. Higher SNR figures indicate that any noise introduced by system components will not be perceived in the picture and sound output signals.

Signal to Noise Ratio-8VSB (SNR) As applies to 8VSB transmissions, this is a calculated average power of the ideal signal divided by the actual demodulated signal power.

SMPTE Society of Motion Picture and Television Engineers

Standard Definition Television (SDTV) This term is used to signify a digital television system in which the quality is approximately equivalent to that of NTSC. This equivalent quality may be achieved from pictures originated at the 4:2:2 level of ITU-R BT.601 and subjected to processing as part of the bit rate compression. The results should be such that when judged across a representative sample of program material, subjective equivalence with NTSC is achieved. The displayed picture may be either the traditional 4:3 or the wide-screen 16:9 aspect ratio.

STL Studio Transmitter Link

Synchronous Detection A common detection technique used in television demodulators that removes quadrature distortion, enabling comparison of transmitter output with video input signal.

S-Video Also Y/C. Transmits luminance and color portions separately via multiple wires, thus avoiding the color encoding process and resulting loss of picture quality.

Tally A system used to light lamps and indicate usage. Most production switchers have an internal tally system to indicate selected functions, and which selected functions are currently involved with Program.

TCP Transmission Control Protocol

Telecine A device used to convert film to video; movie film is digitally sampled and converted to video frame by frame in real-time.

TCXO Temperature Compensated Crystal Oscillator

THD Total Harmonic Distortion

Transport Stream-ATSC (TS) Consists of the following: (1) Packets: 188 bytes - fixed length with descriptive data, (2) Carries several programs, (3) has a PID which identifies the type of TS packet (video, audio, other), and (4) carries descriptive information about the program.

UHF Ultra High Frequency

Unity Gain An electronic term indicating that a signal will be neither amplified or attenuated. One volt of signal level in results in one volt of signal level out.

Vector A measure that has two individual properties: magnitude and direction.

Vector Clip A special encoded clip version that limits only the C_B and C_R input video signals and does not affect (nor is it affected by) the luminance component. This color-only clip limits the maximum vector excursions as viewed in an encoded state and is intended for users who wish to prevent encoded vectors from ever exceeding the perimeter circle of an encoded vector display.

VHF Very High Frequency

VITC Vertical Interval Time Code, a method for recording on to video tape the timecode address for each video frame inserted in the vertical interval.

Video Payload ID An ancillary data packet in a digital video interface for the purpose of identifying the video payload. Formatted according to SMPTE 352M the data includes the video format and interface transport, the picture rate and the picture and transport scanning methods, the sampling structure, and extended aspects of the video payload providing information about the channel assignment, dynamic range and bit-depth of the video payload.

Waveform A visual representation of a signal in the shape of a wave that plots amplitude versus time.

White Level The brightest part of a video signal, corresponding to approximately 1.0 Volt.

White Balance An electronic process used to calibrate the picture for accurate color display in different lighting conditions.

Wipe A special effect in which two pictures from different video sources are displayed on one screen. Production switchers and special effects generators provide numerous wipe patterns varying from simple horizontal and vertical wipes to multi-shaped, multi-colored arrangements.

XGA High resolution 1024×768 non-interlaced (progressive) display monitor

XVGA Extended Video Graphics Adapter

YP_BP_R: CAV format composed of luminance (Y) and two color difference signals (P_B and P_R)

Y/C Also S-video. Describes the separation of video signal luminance and chrominance components.

Zero Carrier Pulse (chopper) In a TV demodulator, removes the carrier in the vertical interval for a short period, enabling depth of field measurement.

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