Imagine COMMUNICATIONS™

Installation and Operation Handbook

TVM-4DG
HD-SDI and SD-SDI Monitor

July 2009

Revision: A

061794

Firmware Release Version 1.03 Notes for the TVM-4DG

If any problems or questions arise due to the items listed below, telephone the Customer Service Department at **610-327-2292** for further clarification.

Fixed Item

Listed below is the TVM-4DG item addressed in this firmware release.

Gamut Display

1. The gamut data will now be correct if power is cycled while viewing SD video with the Gamut Display.

Publication Information

Trademarks

Contact Information

Imagine Communications has office locations around the world. For locations and contact information see: **http://www.imaginecommunications.com/contact us/**

Support Contact Information

For support contact information see:

- Support Contacts: http://www.imaginecommunications.com/services/technical support/
- eCustomer Portal: http://support.imaginecommunications.com

TVM-4DG

HD-SDI and SD-SDI Monitor
Installation and Operation Handbook

Printed July 2009

Item #061794 Rev. A

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

WARNING: To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.

- 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 equipment:

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

Caution: shock hazard

Protective ground connection

Caution: shock hazard

Unit ground

Equipotentiality

Ground

Direct Current

Directives and Compliances

About This Document

This document provides information concerning Harris Corporation's compliance with EU Directive 2002/95/EC and EU Directive 2002/96/EC.

Restriction on Hazardous Substances (RoHS) Directive

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 Technology products sold in the European Union will be fully RoHS-compliant and "lead-free." (See the Harris website, www.harris.com, 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 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

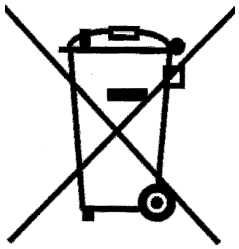
Waste from Electrical and Electronic Equipment (WEEE) Directive

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 Corporation 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 Premier website for more information on dates and deadlines for compliance.) Contact your local Harris Sales representative for information on returning these products for recycling. Harris 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



Standard of the Electronics Industry of the People's Republic of China (SJ/T11363-2006)

This product contains no hazardous substances or elements above the specified limits stated in the Standard of the Electronics Industry of the People's Republic of China, SJ/T11363-2006. This product meets the criteria to be labeled with "Logo 1" (shown in **Figure 3**) as specified in the People's Republic of China Electronic Industry Standard SJ/T11364-2006. This product can be recycled at the end of its useful life and should not be casually discarded.

Figure 3. RoHS Logo – People's Republic of China

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Section 1 ♦ Introduction

Product Description

The TVM-4DG[1] is a half-rack 3RU monitor with waveform monitor, vectorscope, picture, gamut, and timing display. The unit fits into a 19-inch rack using the DRC-2A dual rack mount cabinet (see **Figure 2-1**). It accepts HD-SDI video signals, SD-SDI video signals, and external analog reference video signals. The display presents the image carried by the selected video input as a real-time, full motion picture. Front panel user controls allow for various display and selection modes.

The TVM-4DG 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.

Product Features

The TVM-4DG includes the following features:

- Two active inputs
- HD-SDI and SD-SDI inputs with passive loop-through outputs and auto detection of format
- HD-SDI and SD-SDI monitor output
- Black burst and tri-level reference input
- Half-rack 3RU scope package
- Input standards: SMPTE 259M-C-1997, ITU-R BT.601, SMPTE 292M-1998, SMPTE 296M-2001, and SMPTE 274M-2001

Product Options

The TVM-4DG includes the following options:

- **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)
- **SSC-2**: Single standard case
- **PTC-2**: Portable case with folding stand
- **DRC-2A**: Double rack mount case
- **BLK-1**: Blank panel for DRC-2A

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

Video Standards Supported

The TVM-4DG supports the following video standards:

HD-SDI Video Standards

- 1080i/60
- 1080i/59.94
- 1080i/50
- 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

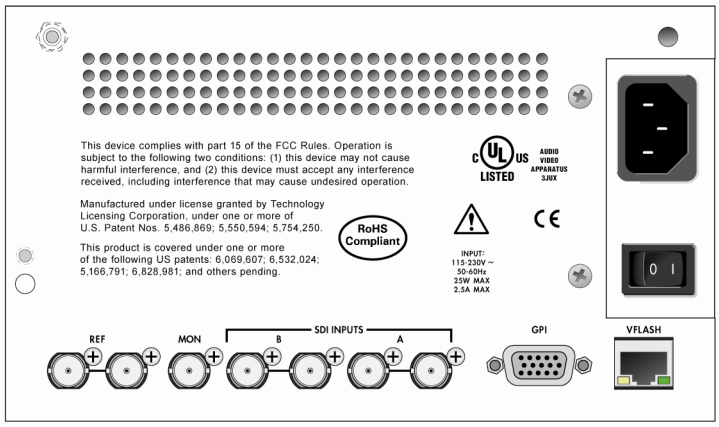
SD-SDI Video Standards

- 525/59.94
- 625/50

TVM-4DG Front Panel and Back Panel Views

Figure 1-1. TVM-4DG Front and Back Panels

Front View



Back View

See **Table 3-1** on page 13 for descriptions of the front panel components.

See **Table 2-2** on page 8 for descriptions of the back panel components.

Safety

See the *Operator's Safety Summary* on page iii for a list of important safety instructions.

Carefully observe all safety alert symbols for dangers, warnings, and cautions. They alert installers and operators of possible dangers or important information contained in this manual.

Keep in mind, though, that warnings alone do not eliminate hazards, nor are they a substitute for safe operating techniques and proper accident prevention measures.

Service and Support

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

- Obtain a Return Authorization (RA) number from the Harris Customer Service Department.
- Attach a tag to the unit with the following information noted:
  - 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 in the manner that it was packed when received when returning for service. If possible, use the original packing materials in the original shipping container.
- Ship the unit to:

  Harris Corporation

  Videotek Test and Measurement

  243 Shoemaker Road

  Pottstown, PA 19464-6433

  Attn: RA *xxx* (where *x* is the RA number)

  Email: BCDService@harris.com

Section 2 ♦ Installation

This section provides information about inspecting, installing, and configuring the TVM-4DG.

Inspecting the Shipment

Before installing the TVM-4DG, inspect the box and the contents. Report any damage to the shipper and telephone the Harris Customer Service Department for service and support (see Section 1, “Service and Support”).

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-4DG
- One *TVM-4DG Installation and Operation Handbook* on CD
- One 75Ω terminator
- One detachable power cord
- One breakout connector (for GPI)

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

Rack-Mounting the TVM-4DG (Optional DRC-2A Case)

NOTE: The TVM-4DG should not be installed in a DRC1 case. If installed in a DRC1 case, the unit will overheat.

When selecting the permanent mounting location for the TVM-4DG, ensure that the flow of air to the ventilation holes on the top and sides of the chassis is not obstructed. Rack mounting the TVM-4DG is illustrated in **Figure 2-1** for the DRC-2A double rack-mount case (for installing one or two TVM-4DGs). The parts required to rack mount the TVM-4DG are listed in **Table 2-1** for the DRC-2A double rack-mount case.

Figure 2-1. Mounting the TVM-4DG in a Rack using the Optional DRC-2A Case

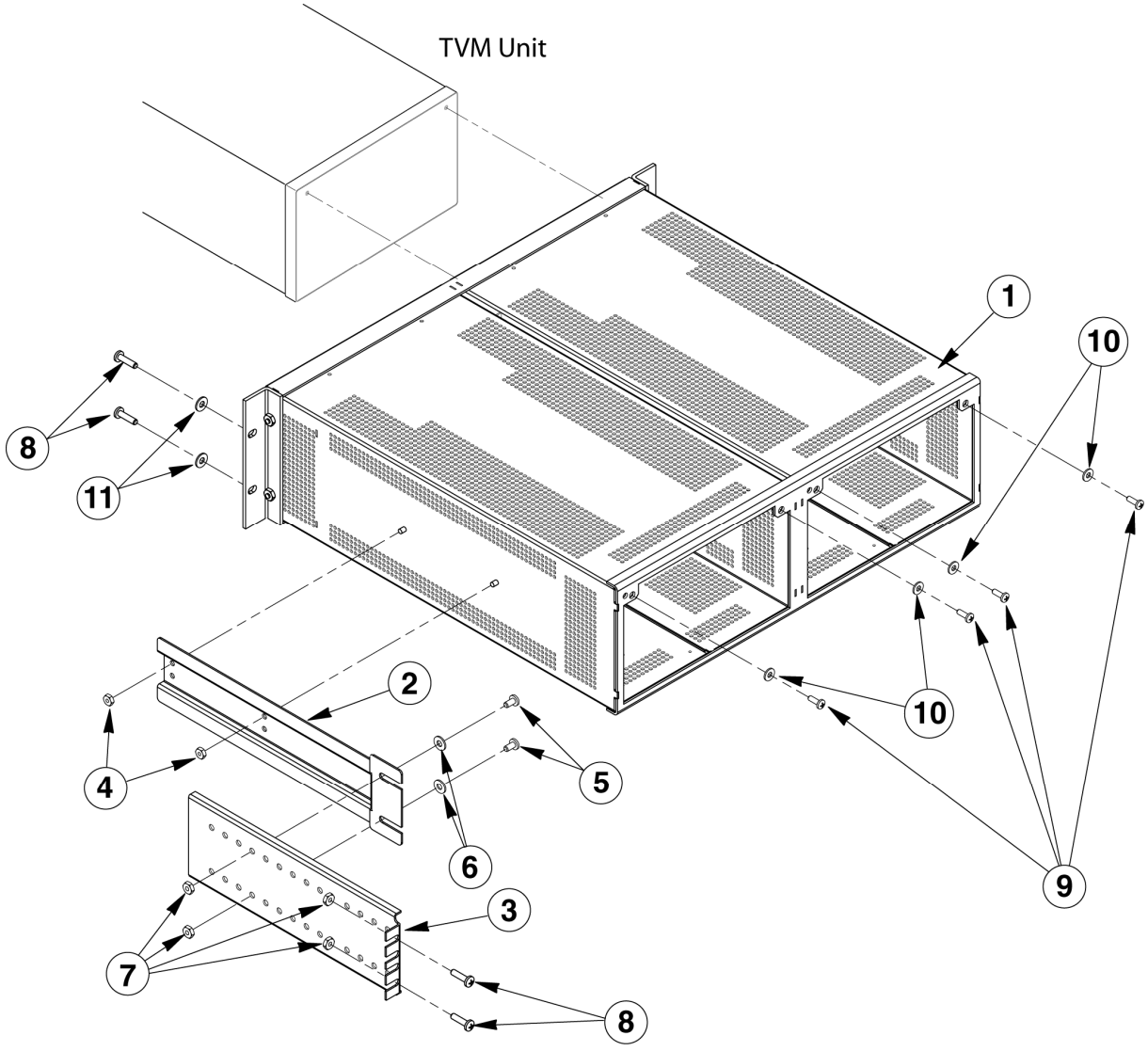


Table 2-1. Parts Required to Rack-Mount the TVM-4DG using the DRC-2A

Key	Item Number	Quantity	Description
1	822112	1	Dual rack case assembly
2	832140	2 (1 each side)	Extension bracket mount
3	832150	2 (1 each side)	Extension bracket

Table 2-1. Parts Required to Rack-Mount the TVM-4DG using the DRC-2A

Key	Item Number	Quantity	Description
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)	#10-32×¾-in. Phillips head screws
9	831064	4(*)	#8-32×½-in. PP screws
10	831114	4(*)	#8 ext. tooth lock washers
11	831019	4 (2 each side)	Nylon washer, rack mount
12	832122	2 (1 each side)	Optional flush-mount rack ears (not shown)

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

To rack-mount the TVM-4DG, follow these steps:

1. Install the extension bracket mounts (ITEM 2) to the dual rack case assembly (ITEM 1), one on each side, using kep nuts (ITEM 4).
2. Install the assembled unit in a rack using screws (ITEM 8) and washers (ITEM 11) as shown.
3. Hold the extension brackets (ITEM 3) in place at the back of the rack, and attach the brackets to the extension bracket mounts (ITEM 2) using hardware Phillips head screws (ITEM 5), flat washers (ITEM 6), and kep nuts (ITEM 7).
4. Install screws (ITEM 8) through the extension brackets (ITEM 3) into the back of the rack rails. Secure using kep nuts (ITEM 7).
5. Tighten all screws and nuts, securing the assembly.
6. Insert the TVM-4DG 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-4DG is fully seated around the front of the DRC-2A.
7. Secure the TVM-4DG to the DRC-2A rack case using PP screws (ITEM 9) and lock washers (ITEM 10).

The installation is complete.

Connecting the TVM-4DG

TVM-4DG Back Panel Connectors

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

Figure 2-2. TVM-4DG Back Panel Connectors

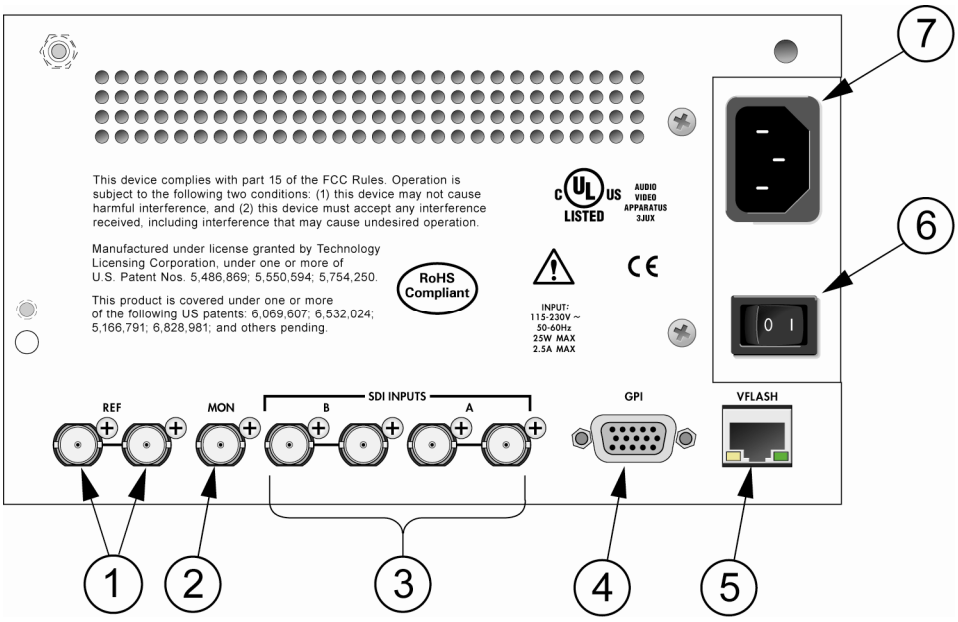


Table 2-2. Description of Back Panel Connectors

Key	Label	Description
1	REF	Female BNC connectors that connect to an external reference signal (NTSC/PAL video, blackburst, or tri-level) from which the horizontal and vertical sync for the TVM-4DG will be derived if EXT has been selected as the REF source. If these connectors are not looped through, then the unused connector must be terminated at 75Ω.
2	MON	Female BNC connector for monitoring of the selected A or B input. This output is a source monitor only and does not include the waveform, vector, gamut, picture, or timing on-screen information.
3	SDI INPUTS A (IN, OUT), B (IN, OUT)	Female BNC looping HD or SD SDI input and output connector (termination required).
4	GPI	15-pin, high-density, female, D-sub connector input and function selection.*
5	VFlash	RJ45, female, 10/100 Base-T Ethernet connection to be used with a PC running the VFlash program.*
6	O/I	On/Off power switch
7		AC power receptacle

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

Ethernet Setup

1. Prior to the TVM-4DG 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
   - An optional Gateway IP

   Be sure to record all addresses. The Gateway address is only needed if the TVM-4DG is routed to an outside network.

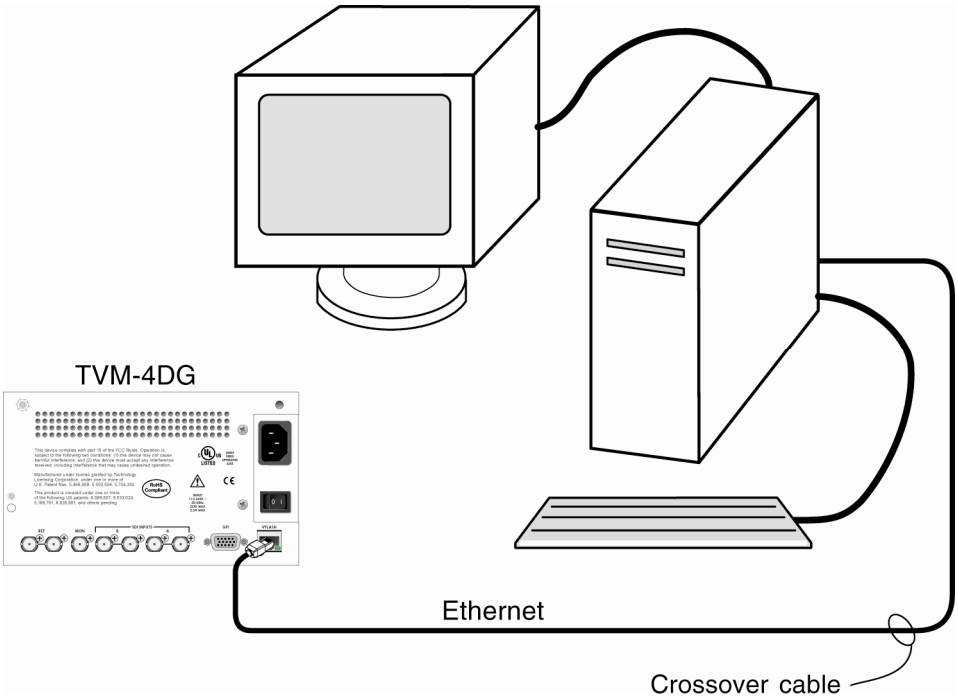
   Record the addresses:

TVM-4DG Interface Static IP Address	
TVM-4DG Interface Subnet Mask	
Gateway IP Address	

2. Identify a host PC to configure and test the TVM-4DG.
3. Choose one of the following connection options:

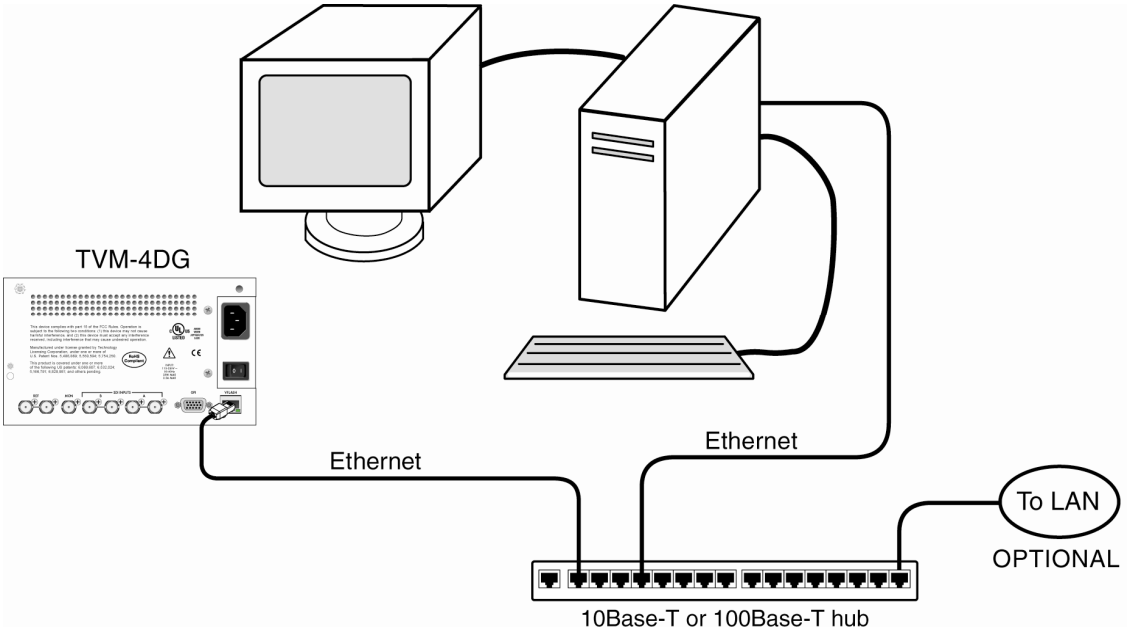
   - For a dedicated PC connection, connect the host PC with a network card to the "VFLASH" connector on the back panel of the TVM-4DG, using a CAT5 crossover cable (not included). See **Figure 2-3**.

Figure 2-3. TVM-4DG Dedicated PC Connection



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

Figure 2-4. TVM-4DG Network PC Connection



Ethernet Configuration

NOTE: Descriptions of the TVM-4DG front panel buttons and knobs are provided in Section 3, “General Operation.”

1. Press the SETUP button on the TVM-4DG front panel.
2. Press the UP or DOWN button until the COMMUNICATIONS menu is highlighted, and then press the ENT (Enter) button to enter the submenu.
3. Press the UP or DOWN button until the IP CONFIGURATION submenu is highlighted, and then press the ENT button to enter the submenu.
4. Choose one of the following:
   - If using DHCP:
     - Turn the LEFT/RIGHT knob to highlight DHCP.
     - Press the UP or DOWN button to toggle the state to ON.
     - Turn the LEFT/RIGHT knob to highlight ACCEPT.
     - Press the ENT button.

     The IP Address, Subnet mask, and Gateway are retrieved from the DHCP server.
   - If not using DHCP:
     - To avoid conflicts, obtain the static IP Address, Subnet Mask, and Gateway from the System Administrator.
     - Press the UP or DOWN button to change the value in the first IP address box.

- Press the ENT button to highlight the next value.
- Repeat for the remainder of the IP Address, Subnet Mask, and Gateway. Turn the LEFT/RIGHT knob to highlight ACCEPT, and then press the ENT button to accept the entered values.

5. Press the EXIT button to exit the submenu.

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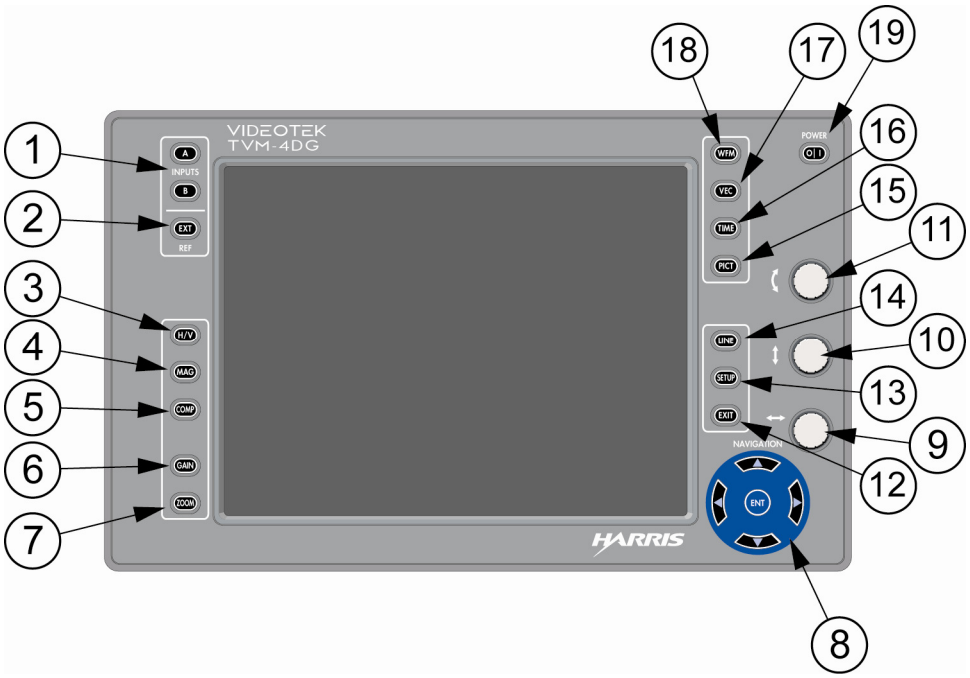
Section 3 ♦ General Operation

Terms

Display: Output that appears on the LCD display

Overview

Figure 3-1. TVM-4DG Front Panel



NOTE: Pressing and holding some of the function buttons will activate menus for additional functionality.

Table 3-1. Front Panel Description

Key	Label	Description
1	INPUTS A and B	Press to select SDI input A or SDI input B
2	EXT	Press to select between the internal and external reference
3	H/V	Toggles between horizontal (1H) and vertical (1V) sweep of the waveform; when only one component is selected, the H/V button cycles through 1H, 2H, 1V, 2V back to 1H
4	MAG	Press to cycle through the magnifications for the waveform display, either a normal horizontal sweep or a sweep that has been horizontally magnified; magnifications are shown below: ▪ Component 1H Sweep magnifications: 5.0 µs, 1.0 µs, 0.5 µs ▪ Component 1V Sweep magnifications: 5.0 ms, 1.0 ms, 0.5 ms, 0.2 ms ▪ Component 2H Sweep magnifications: 10.0 µs, 2.0 µs, 1.0 µs ▪ Component 2V Sweep magnifications: 10.0 ms, 2.0 ms, 1.0 ms, 0.4 ms ▪ Component 3H Sweep magnifications: 15.0 µs, 3.0 µs, 1.5 µs ▪ Component 3V Sweep magnifications:15.0 ms, 3.0 ms, 1.5 ms, 0.6 ms ▪ Component 4H Sweep magnifications: 20.0 µs, 4.0 µs, 2.0 µs ▪ Component 4V Sweep magnifications: 20.0 ms, 4.0 ms, 2.0 ms, 0.8 ms

Table 3-1. Front Panel Description

Key	Label	Description
5	COMP	Press to cycle through individual components (Y, C_B, C_R) or (R, G, B) and then back to the multiple component display (YC_BC_R or RGB)
6	GAIN	Press to cycle through the vertical gain of ×1.00, ×2.50, or ×5.00 for the waveform and vector display
7	ZOOM	Press to cycle through the various zoom displays for the selected waveform or vector display; Zoom mode is indicated with "ZOOM" at the top of the selected display
8	UP/DOWN/LEFT/RIGHT ARROW BUTTONS	Press to move up, down, to the left, or to the right in a selected menu or submenu
	ENT	Press to enable a selected menu or submenu selection
9	LEFT/RIGHT ARROW KNOB	▪ Rotate the knob to move the waveform left and right ▪ Rotate the knob to move left and right in the menu (Global or Pane menu)
10	UP/DOWN ARROW KNOB	▪ Rotate the knob to move the waveform up and down ▪ Rotate the knob to move up and down in the menu (Global or Pane menu)
11	CURVED ARROW KNOB	▪ Rotate the knob to change the line number when line select is enabled ▪ Rotate the knob to move in the menu (Global or Pane menu)
12	EXIT	Press to exit the submenu, Pane menu, or Global Setup menu
13	SETUP	Press to display the Global Setup menu or exit the Global Setup menu
14	LINE	Press to enable Line select mode; If input is interlaced, the line select button cycles through ODD, EVEN, and both fields
15	PICT	Press to select the Picture display
16	TIME	▪ Press to select the Timing display ▪ Press and hold to access the Timing Pane menu
17	VEC	▪ Press to select the Vector display ▪ If Vector display is already selected, press to toggle between Vector and Gamut display ▪ Press and hold to access the Vector or Gamut Pane menu
18	WFM	▪ Press to select the Waveform display ▪ Press and hold to access the Waveform Pane menu
19	POWER	Power switch

Control Types

The TVM-4DG is controlled in three ways:

- **Front Panel Controls**: Controls on the front panel that adjust the parameters that are frequently used
- **Pane Menu**: Pop-up menus within a display that are used to control the parameters for the individual function
- **Global Setup Menu**: Setup menu parameters that affect the entire unit (the Setup menu is accessed by pressing the SETUP button; see Section 4 for the Global Setup menu and the Global Setup menu selections)

Selecting a Video Input

Press the Input A or Input B buttons to select video input.

Powering Down the TVM-4DG

Press and hold the ON/OFF switch on the front panel until the unit shuts off. Push the ON/OFF button to repower the TVM-4DG.

Keep in mind that, for the ON/OFF switch on the front panel to be operational, the power supply switch on the back panel has to be in the ON position.

Navigating the Setup Menu

NOTE: A function button can be pressed to exit from the Setup menu.

Use the navigation buttons or the setup position knobs to navigate the Setup menu. The setup position knobs and navigation buttons are described below:

Press to exit a menu or a submenu.

Press to enter or exit the SETUP menu.

Press to move up through menu or submenu selections

Press to move left through menu or submenu selections

Press to move right through menu or submenu selections

Press to move down through menu or submenu selections

Press to accept a menu item or submenu

Rotate the knob to enter or exit the submenus.

Rotate the knob to move the menu cursor up and down or to change a value or condition in a menu.

Rotate the knob to move the menu cursor up and down or to change a value or condition in a menu.

Reference

Press the REF button to toggle between the Internal and External Reference selections. The default reference selection is Internal.

Main Title Bar

The main title bar is displayed at the top of the screen, and contains the Harris/Videotek logo, date and time, EDH/CRC status, and model name.

EDH/CRC Status

Error Detection and Handling (EDH) and Cyclical Redundancy Check (CRC) status information is displayed on the LCD display.

EDH status is displayed when the input format is SD.

CRC status is displayed when the input format is HD.

- Green – CRC/EDH detected and OK
- Red – CRC/EDH errors detected
- Clear – No EDH detected

Status Bar

A status bar is displayed at the bottom of the display, and contains information based on the function selected and configuration applied. See the specific pane function section (Waveform, Vector, Picture, Gamut, or Timing) for more detailed information on the status bar that is displayed.

Waveform Display

Pressing the WFM function button accesses the Waveform display. The waveform graticule scales, units of measure, and critical amplitude limits change according to the video format displayed. **Table 3-2** shows the units of measure that appear for a video format. **Table 3-3** lists the critical amplitude limits, which are indicated on the screen by dashed lines for the video formats that can be displayed.

Table 3-2. Video Formats and Units of Measure

Video Format	Unit of Measure
High Definition and Standard Definition 525 and 625	Volts or Percent (Selectable)
Display as Composite	IRE or Unit

Table 3-3. 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

A waveform display is shown in **Figure 3-2** and described in **Table 3-4**. The figure shows the location for the various waveform display fields.

Figure 3-2. Waveform Display Diagram

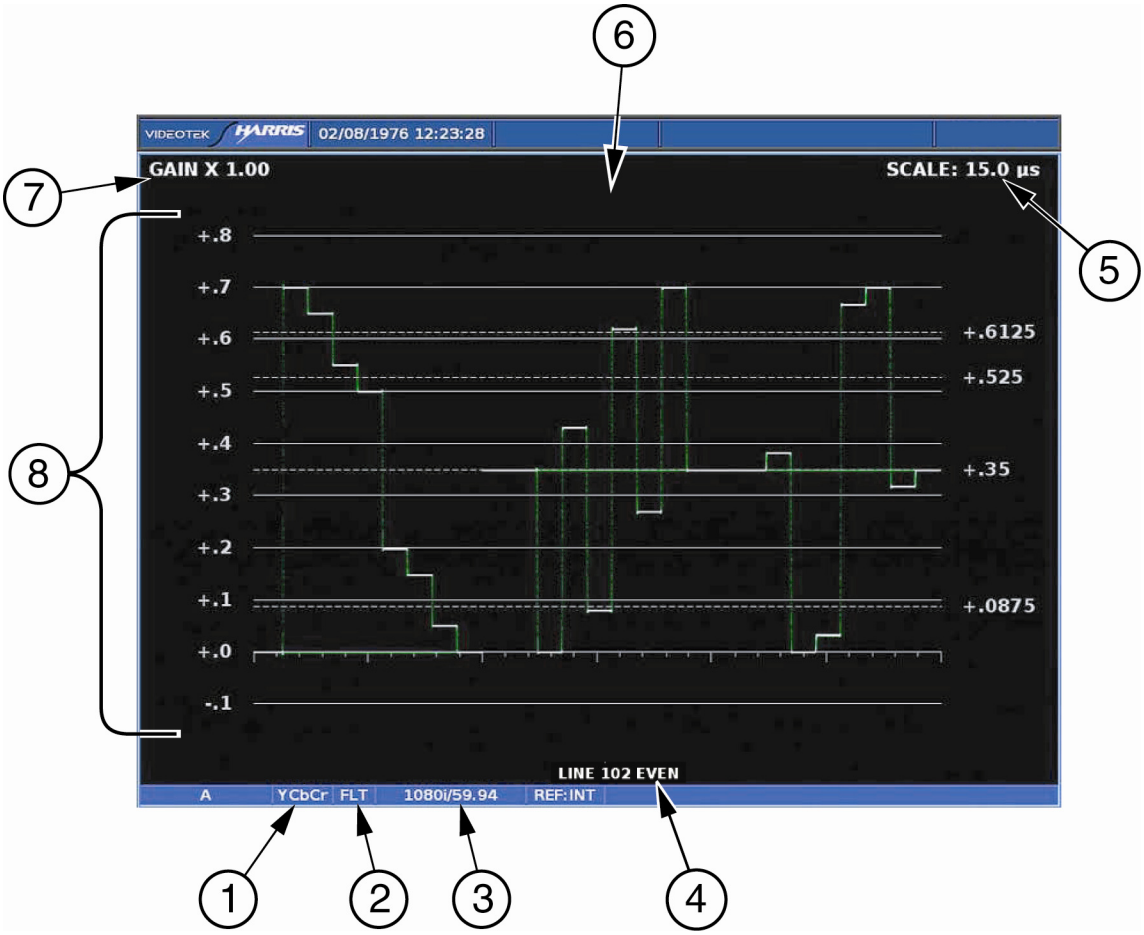


Table 3-4. Description of Waveform Display Diagram

Field Identifier	Field Information	Nomenclature
1	Format	Displays selected format as YC_BC_R, RGB, YRGB, or Composite. YC_BC_R, RGB, or YRGB can be selected in the HD or SD FORMAT submenu of the WFM Pane menu
2	Filter	Displays filter as FLT, LP, or BOW (Bowtie); FLT, LP, F/LP are the filter selections when in composite mode; can be selected in the COMPONENT FILTER submenu of the WFM Pane menu
3	Standard	Displays Line Rate/Frame Rate [1080i/59.94]; can be selected in the VIDEO FORMAT > VIDEO A CONFIGURE or B CONFIGURE menu
4	Line select information	When in Line Select mode, displays selected line as Line number with the ODD or EVEN field
5	Scale	Displays the major graticule indications for time
6	Zoom	▪ Displays Zoom when enabled ▪ Displays Blank when Zoom is disabled ▪ Press the ZOOM button to cycle through the ZOOM modes
7	Gain	Displays selected gain (ranges are ×1.00, ×2.50, and ×5.00); change by pressing the GAIN button
8	WFM graticule	Displays the WFM, Composite, RGB, and YC_BC_R graticule (graticule is dependent on the Video format, Zoom, and scale selections)

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

Figure 3-3 to **Figure 3-5** illustrate some waveform graticules with the critical amplitude limits for the video formats that can be displayed by the TVM-4DG. The critical amplitude limits are indicated on the screen by dashed lines.

Figure 3-3. RGB and YC_BC_R Graticule

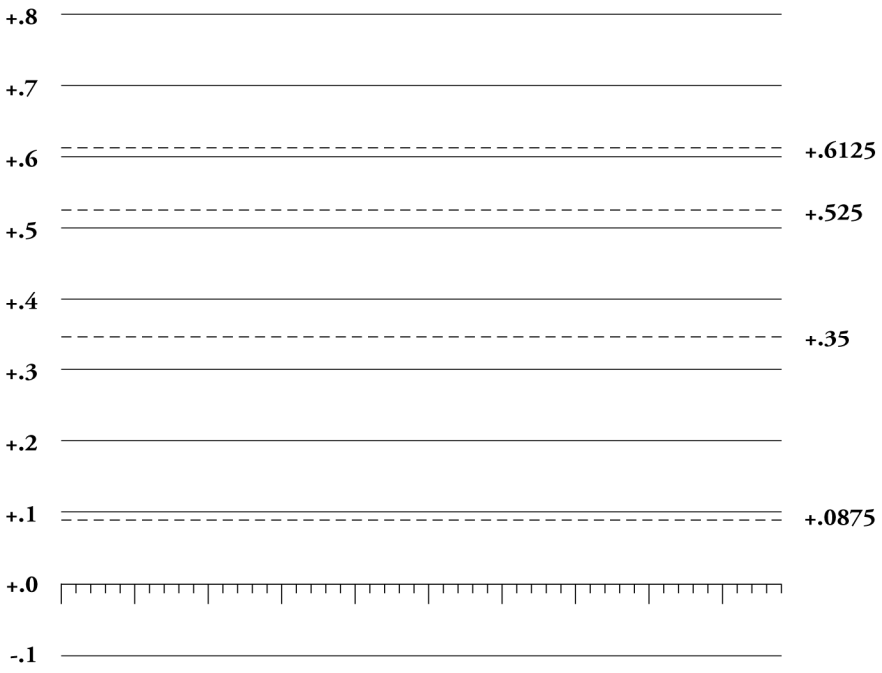


Figure 3-4. RGB and YC_BC_R Zoom 0 mV Graticule

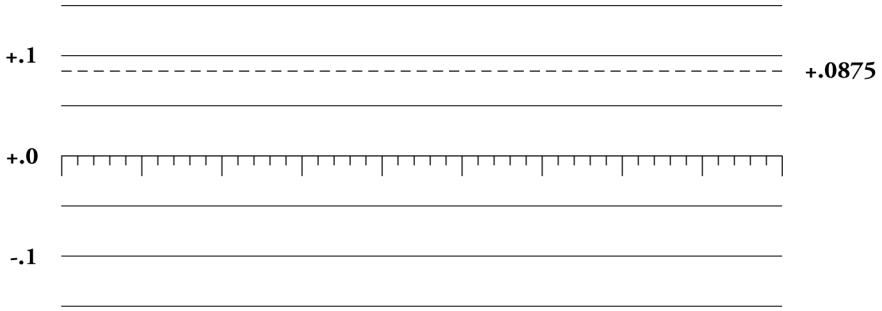
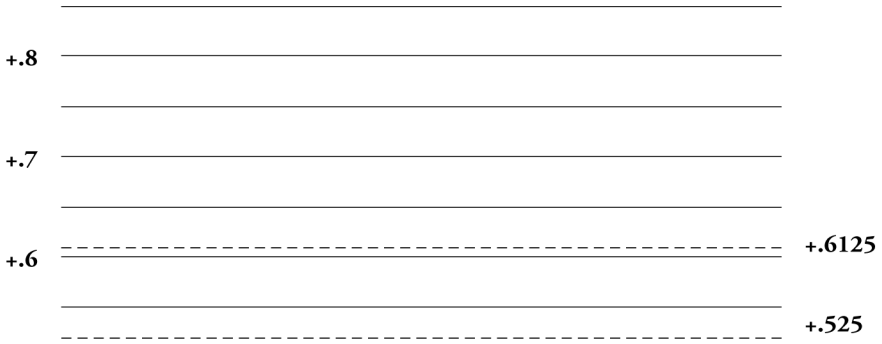


Figure 3-5. RGB and YC_BC_R Zoom 700 mV Graticule



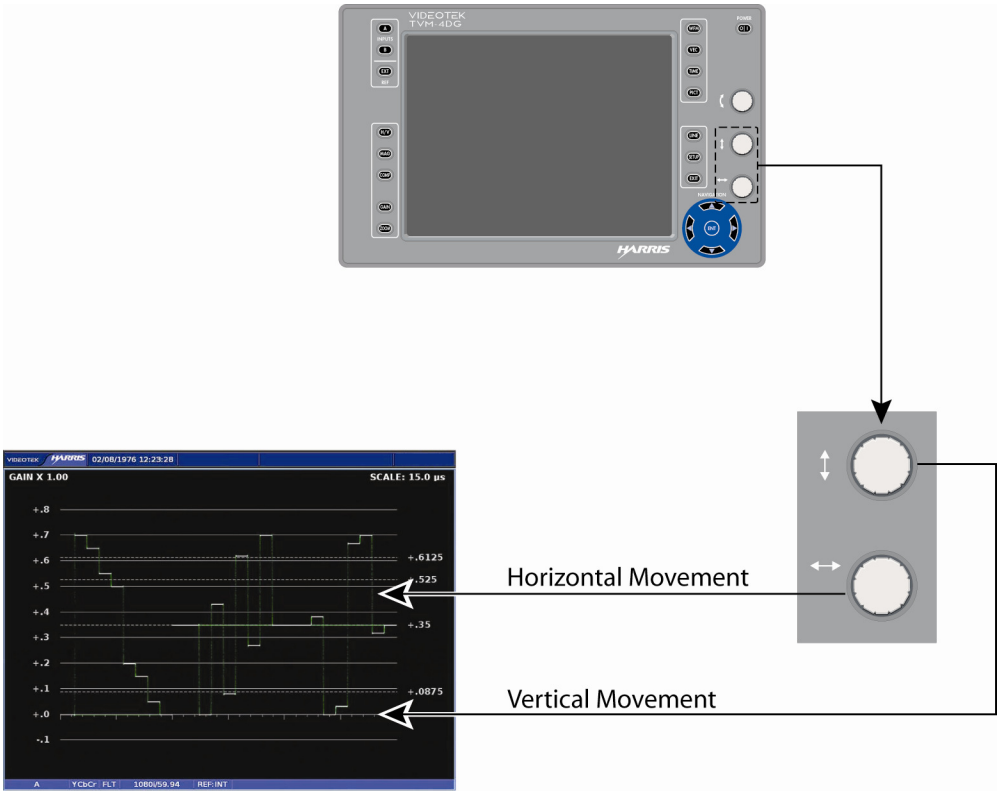
Waveform Front Panel Selections

The following controls directly affect the waveform display: Setup navigation knobs, H/V button, MAG button, GAIN button, and ZOOM button.

Moving the Waveform using the Setup Knobs

Move the Waveform display relative to the graticule by using the LEFT/RIGHT NAVIGATION knob (for horizontal movement) and the UP/DOWN NAVIGATION knob (for vertical movement), as shown in **Figure 3-6**. The waveform can be centered by accessing the waveform pane menu. Pressing and holding the WFM button brings up the waveform pane menu.

Figure 3-6. Moving the Waveform

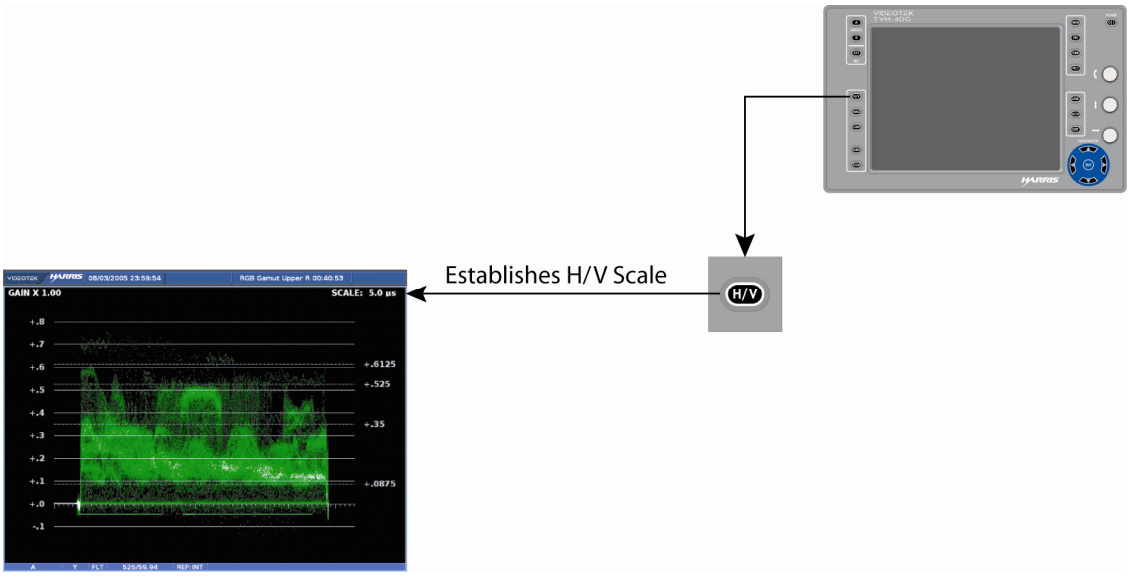


H/V Button

The H/V button is used to determine the sweep rate scale. The scale is displayed in the upper-right area of the waveform pane, as shown in **Figure 3-7**.

- When one waveform component or composite is displayed, the horizontal sweep sequence is 1H, 2H, 1V and 2V.
- When multiple waveform components are displayed the horizontal sweep sequence is 1H and 1V.

Figure 3-7. Establishing the H/V Scale



For horizontal sweeps, press the H/V button one time to select 1H. For vertical sweeps, press the H/V button two times to select 1V.

MAG Button

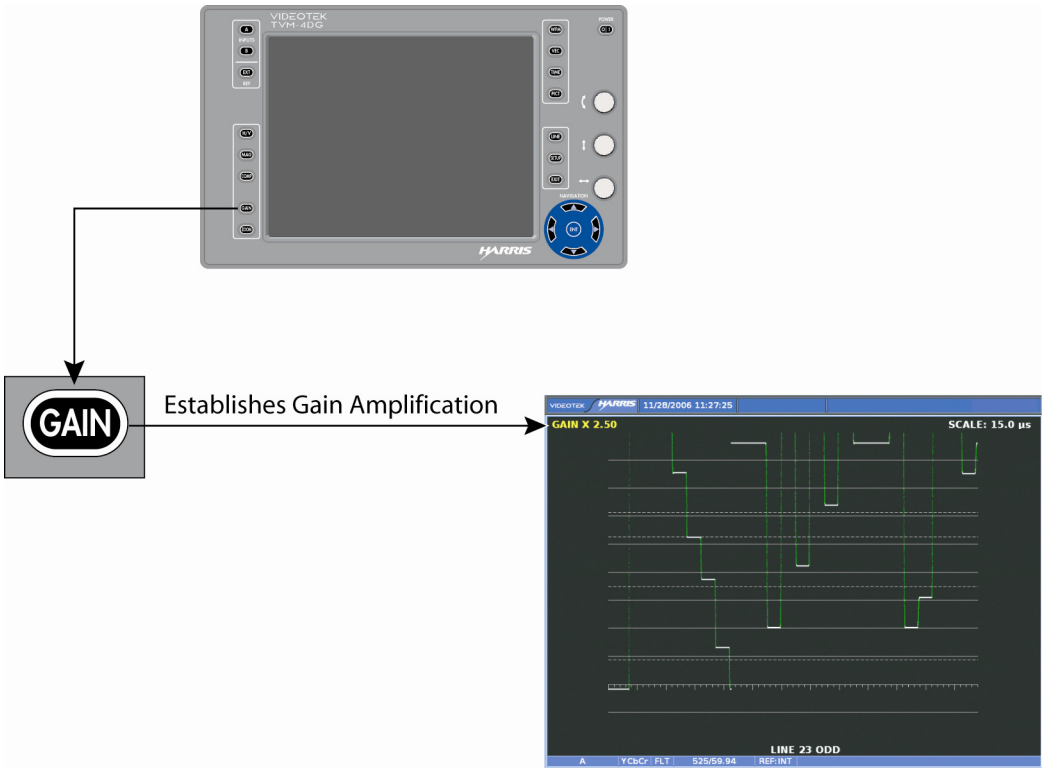
The MAG button is used to change the horizontal magnification or to turn the magnification OFF. The magnifications are shown below:

- Component 1H Sweep magnifications: 5.0 µs, 1.0 µs, and 0.5 µs
- Component 1V Sweep magnifications: 5.0 ms, 1.0 ms, 0.5 ms, and 0.2 ms
- Component 2H Sweep magnifications: 10.0 µs, 2.0 µs, and 1.0 µs
- Component 2V Sweep magnifications: 10.0 ms, 2.0 ms, 1.0 ms, and 0.4 ms
- Component 3H Sweep magnifications: 15.0 µs, 3.0 µs, and 1.5 µs
- Component 3V Sweep magnifications: 15.0 ms, 3.0 ms, 1.5 ms, and 0.6 ms
- Component 4H Sweep magnifications: 20.0 µs, 4.0 µs, and 2.0 µs
- Component 4V Sweep magnifications: 20.0 ms, 4.0 ms, 2.0 ms, and 0.8 ms

Gain Button

The GAIN button is used to set the range of the vertical amplification in the video signal. The standard gain in the video signal is ×1. The gain setting appears in the upper-left portion of the waveform pane, as shown in **Figure 3-8**. The Gain steps are ×1.00, ×2.50, and ×5.00.

Figure 3-8. Establishing the Gain



Zoom Button

The ZOOM button is used to cycle through and select one of three different display selections. At each zoom position, the graticule scale and waveform displays expand to provide more resolution around the zoom point. The display selections include the following:

- ZOOM positioned on the 0 mV or 0% graticule line; 0 IRE or Units when displayed as composite waveform
- ZOOM positioned on the 700 mV or 100% graticule line; 100 IRE or Units when displayed as composite
- ZOOM off

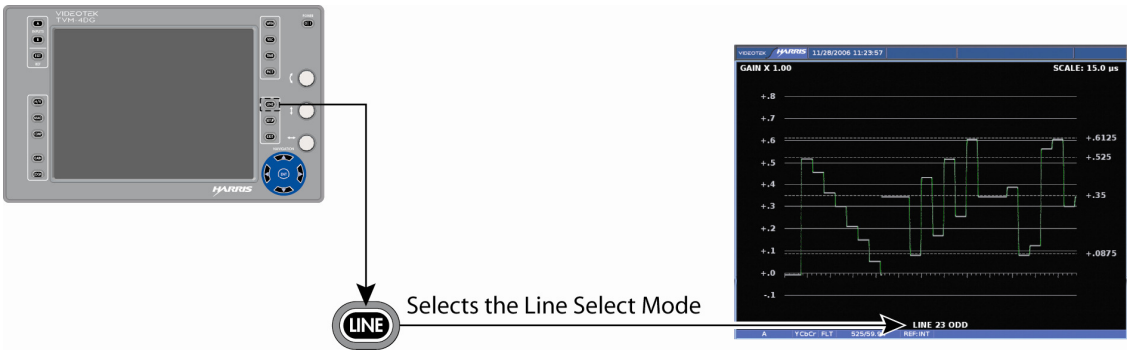
Placing the Waveform Display in Line Select Mode

The LINE button is used to enable the waveform 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 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 3-9**. When Vertical Sweep mode is enabled, the selected line is displayed in red.
2. Press the LINE button again to alternate between the ODD, EVEN, and all fields.
3. Rotate the CURVED ARROW knob to select the line to be displayed.

Figure 3-9. Establishing Line Select



Waveform Pane Menu Selections

Pressing and holding the WFM button enables the Waveform Pane menu. The Waveform Pane menu for HD-SDI waveform monitoring is described in **Table 3-5**. The Waveform Pane menu for SD-SDI waveform monitoring is described in **Table 3-6**. The submenus are different for each format. Default selections are marked with an asterisk (*).

NOTE: Component sequence selections are dynamically dependent on the HD and SD format selection.

Table 3-5. Waveform (HD-SDI) Menu Structure

Menu Selections	Selection Options
COMPONENT FILTER	FLT (FLAT)*
	LP (LOW PASS)
	BOW (BOWTIE)
COMPOSITE FILTER[1]	FLT (FLAT)*
	LP (LOW PASS)
	F/LP (parade of FLAT and LOW PASS filters)
PARADE/OVERLAY	PARADE
	OVERLAY
HD FORMAT	COMPOSITE
	YC_BC_R*
	RGB
	YRGB
BLANKING	BLANK ALL*
	SHOW SAV/EAV

[1] This menu selection only applies when the waveform is transcoded to a composite waveform display.

Table 3-5. Waveform (HD-SDI) Menu Structure

Menu Selections	Selection Options
	SHOW ALL
CENTER WAVEFORM	Press ENT
WAVEFORM SETUP	Press ENT

Table 3-6. Waveform (SD-SDI) Menu Structure

Menu Selections	Selection Options
COMPONENT FILTER	FLT (FLAT) *
	LP (LOW PASS)
	BOW (BOWTIE)
COMPOSITE FILTER[1]	FLT (FLAT) *
	LP (LOW PASS)
	F/LP (parade of FLAT and LOW PASS filters)
PARADE/OVERLAY	PARADE*
	OVERLAY
SD FORMAT	COMPOSITE
	YC_BC_R*
	RGB
	YRGB
BLANKING	BLANK ALL*
	SHOW SAV/EAV
	SHOW ALL
CENTER WAVEFORM	Press ENT
WAVEFORM SETUP	Press ENT

Component Filter Selections

Available filters include the following:

- **FLT** (Flat) – Selects No Filtering; this is the default selection
- **LP** (Low Pass) – Selects the Low Pass filter
- **BOW** (Bowtie) – Selects the Bowtie filter, which is used to check the timing relationships between the digital components (a bowtie test signal is required)

Parade and Overlay Selections

Multiple components can be displayed in a single pane.

- **PARADE** – Enables components to be shown next to one another (for example, Inputs Y, then C_B, then C_R in a YC_BC_R signal); this is the default selection
- **OVERLAY** – Enables components of the input signal to be displayed over each other (for example, R over G over B in an RGB signal).

Composite Filter Selections

The composite filter only applies when the waveform is transcoded to a composite waveform display. Available filters include the following:

- **FLT** (Flat) – Selects No Filtering; this is the default selection
- **LP** (Low Pass) – Selects the Low Pass filter
- **F/LP** – Selects Flat and Low Pass filtering

HD Format/SD Format Selections

The format selections are **Composite**, **YCBCR**, **RGB**, and **YRGB**. The selected text is indicated with a check mark

- **Composite** – Displays waveform transcoded to composite format
- **YC_BC_R** – Selects YC_BC_R format; this is the default selection
- **RGB** – Selects Red Green Blue format
- **YRGB** – Selects YRGB format

Blanking Selections

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

- **Blank All** – Displays only the active video of the input signal; this is the default selection
- **Show SAV/EAV** – Displays the active video and the SAV/EAV headers of the input signal
- **Show All** – Displays the ancillary data, SAV/EAV, and active video

Center Waveform Selections

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

Waveform Setup Selections

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

Vector Display

Pressing the VEC button accesses the Vector display. A vector display is shown in **Figure 3-10** and described in **Table 3-7**. This illustrates the general location for the various vector fields.

Figure 3-10. Vector Display Diagram

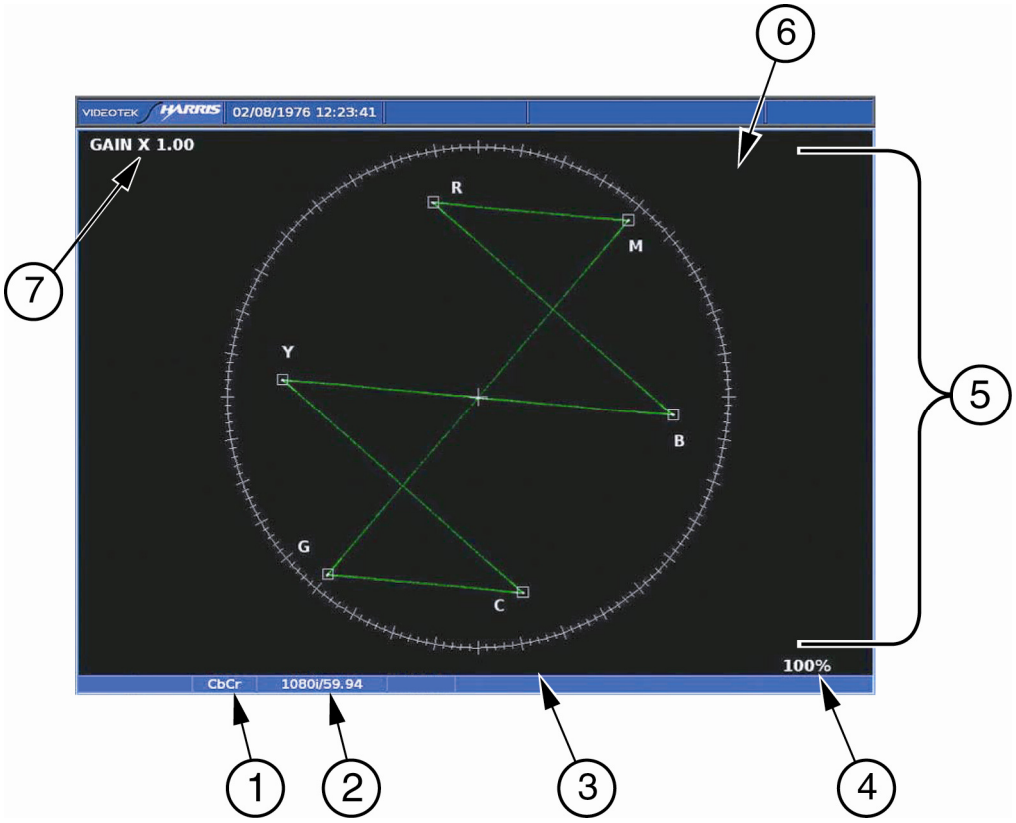


Table 3-7. Description of Vector Display Diagram

Field Identifier	Field Information	Nomenclature
1	Format	Displays format as C_BC_R
2	Standard	Displays selected Line Rate/Frame Rate [1080i/59.94]; selected in the VIDEO FORMAT > VIDEO A CONFIGURE or B CONFIGURE menu
3	Line select information	When in Line Select mode, displays selected line as Line number with the ODD or EVEN field
4	Vector Standard	Displays vector standard as 75% or 100%; selected in the Vector Pane setup submenu called HD or SD STANDARD
5	Vector graticule	Displays selected vector graticule
6	Zoom	▪ Zoom (when enabled) ▪ Blank when disabled ▪ Press the ZOOM button to cycle through the Zoom modes
7	Gain	Displays selected gain, where Gain is 1.00, 2.50, and 5.00; changed by pressing the GAIN button

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

A graticule scale is illustrated in **Figure 3-11** and **Figure 3-12**.

Figure 3-11. Vector SD with I/Q

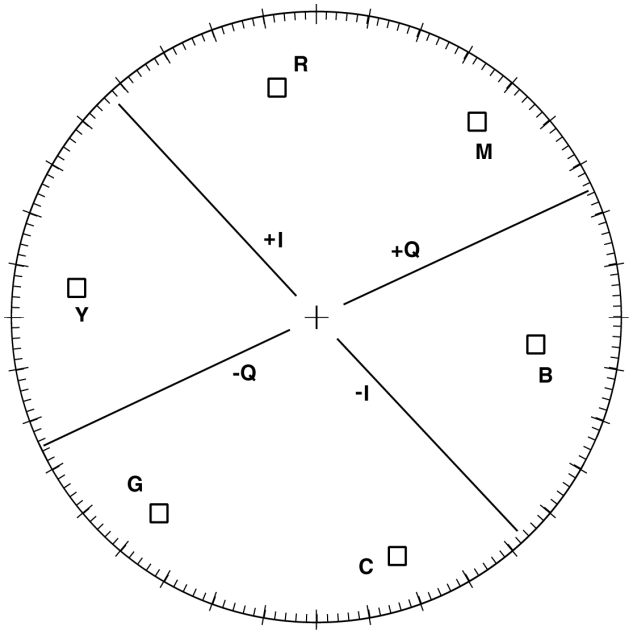
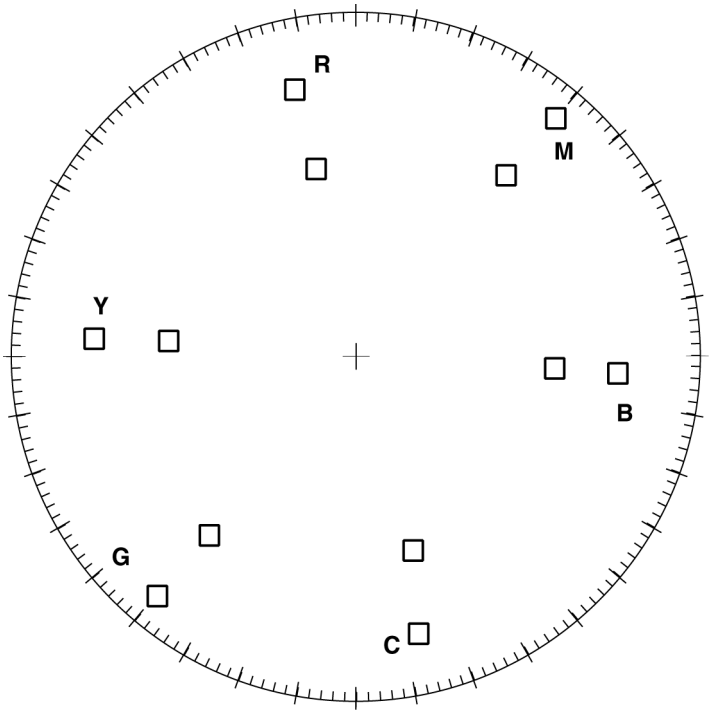


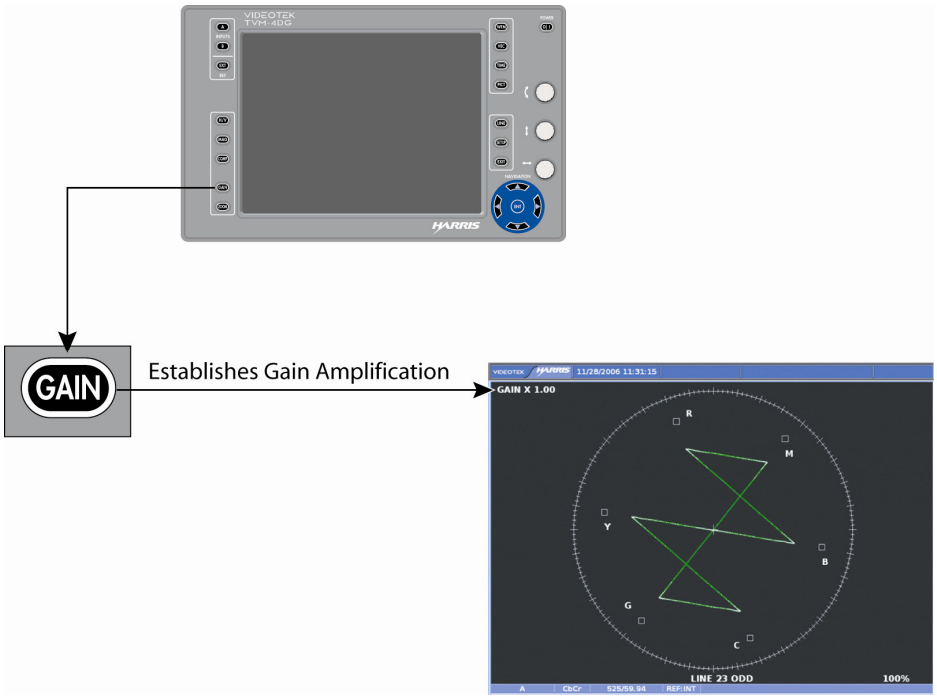
Figure 3-12. Vector HD 75% + 100% Graticule



Gain Button

The standard gain in the vector is ×1.00. The TVM-4DG can be used to set the gain amplification in the video signal using the GAIN button. The gain setting appears in the upper-left portion of the vector pane, as shown in **Figure 3-13**.

Figure 3-13. Establishing the Vector Gain



Press the GAIN button to step through the available gain selections ×1.00, ×2.50, and ×5.00.

Zoom Button

Press the ZOOM button 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
- ZOOM off

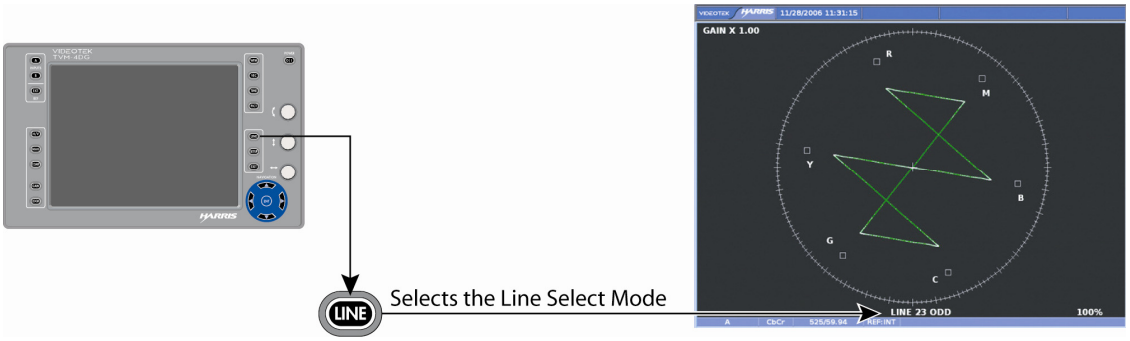
Placing the Vector Display in Line Select Mode

Pressing the LINE button enables the vector 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 the Odd or Even field, as shown in **Figure 3-14**.
2. Press the LINE button again to alternate between the ODD, EVEN, and all fields.
3. Rotate the CURVED ARROW knob to select the line to be displayed.

Figure 3-14. Establishing Line Select



Vector Pane Menu Selections

Pressing and holding the VEC function button selects the Vector Pane menu. Use the Setup Position knobs or the UP, DOWN, LEFT, RIGHT, ENT, and EXIT buttons to navigate the Pane menu.

The Vector Pane menu is described in **Table 3-8**.

Table 3-8. Vector Pane Menu

Menu Selections	Selection Options
HD/SD STANDARD	75%
	100%
	75% +100% (HD format only)
POSITION	USE H POS and V POS knob
CENTER VECTOR	Press ENT
SETUP	Press ENT

Standard

The Standard menu selection 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 HD and SD. 75% + 100% (HD only) shows two sets of boxes in the vector graticule for both the 75% and 100% amplitudes.

Vector Position

The Vector Position can be adjusted by using the UP/DOWN and RIGHT/LEFT knobs.

Center Vector

The vector position can be centered by pressing the ENT button.

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.

Picture Display

The Picture Display pane is used to show a picture of the selected input. Press the PICT button to select the picture display. A Picture display diagram is shown in **Figure 3-15** and described in **Table 3-9**.

Figure 3-15. Picture Display Diagram

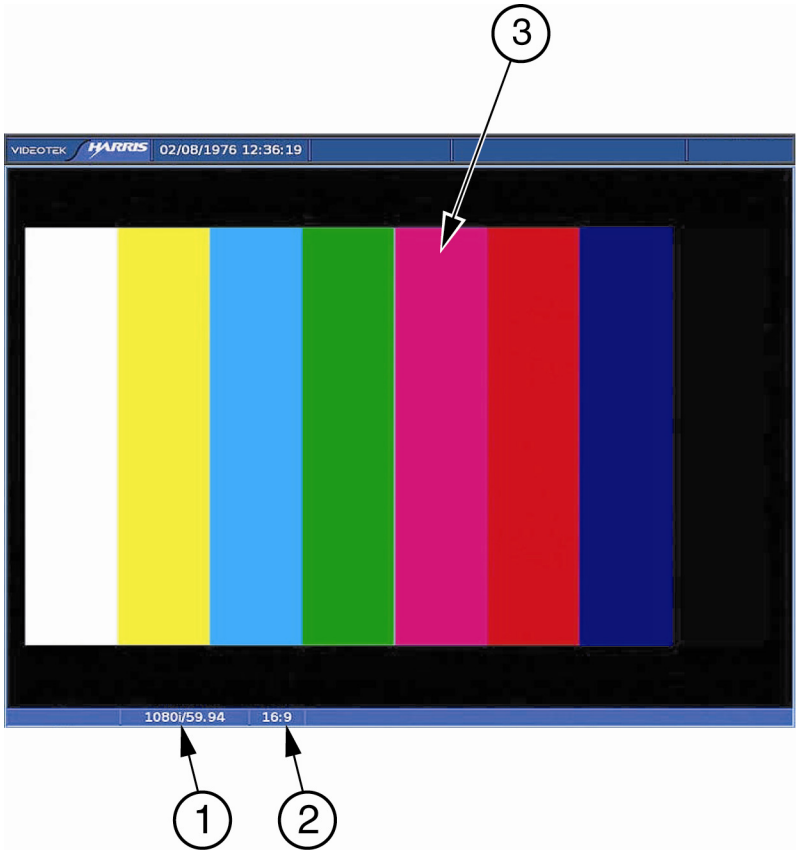


Table 3-9. Description of Picture Display Diagram

Field Identifier	Field Information	Nomenclature
1	Standard	Displays selected Line Rate/Frame Rate [1080i/59.94]; select in the VIDEO FORMAT > VIDEO A or B CONFIGURE menu
2	Aspect Ratio	Displays selected aspect ratio
3	Picture	Display selected picture of the selected video input

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 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 VEC button will toggle the display between Vector and Gamut. 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.

The displays show RGB and composite video limits.

Vector excursion marks are shown 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 and B CONFIGURE menu.

A gamut display diagram is shown in **Figure 3-16** and described in **Table 3-10**. The diagram illustrates the general location for the various gamut fields.

Figure 3-16. Gamut Display Diagram

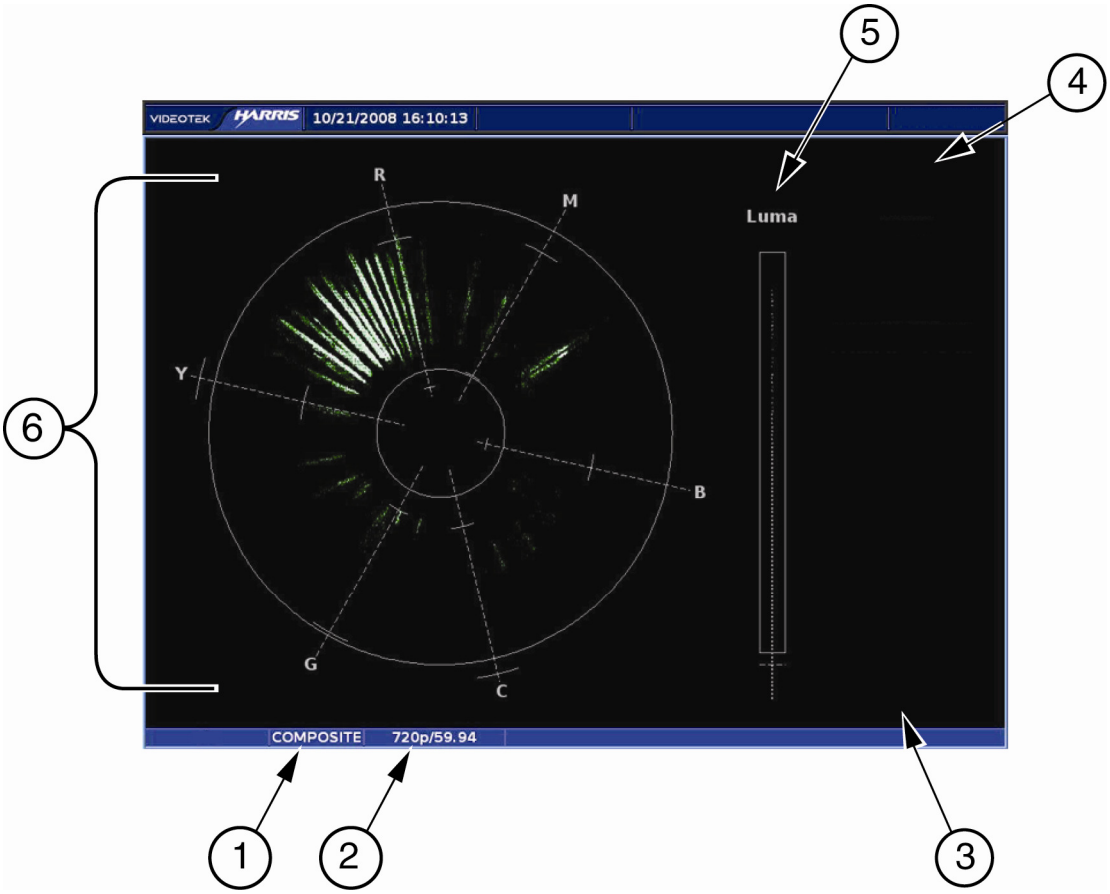


Table 3-10. Description of Gamut Display Diagram

Field Identifier	Field Information	Nomenclature
1	Format	Displayed as Composite and RGB (can be selected in the COLOR SPACE submenu of the GAMUT Pane menu)
2	Standard	Displays the Line Rate/Frame Rate [1080i/59.94] (selected in the VIDEO FORMAT > VIDEO A and B CONFIGURE menu)
3	Line select information	Line select is shown as Line and the number with the ODD or EVEN field (when applicable)
4	Zoom	▪ Zoom (when enabled) ▪ Blank (when disabled) ▪ Press the ZOOM button to cycle through the Zoom modes
5	Luma/Mono bar graticule	Shows the Luma/Mono bar graticule
6	Gamut graticule	Composite or RGB Gamut graticule

Composite Gamut Display

The graticule for the composite gamut vector, as shown in **Figure 3-17** and described in **Table 3-11**, is two concentric circles with other identifiers. The outer ring (the gamut peak upper limit) represents the highest allowable amplitude in standard composite units (that is, IRE for NTSC and units for PAL), and is fixed at 120 IRE for NTSC and 123 units for PAL. The inner ring (the gamut peak lower limit) represents the lowest allowable amplitude, and is fixed at -20 IRE for NTSC and -20 units for PAL. The upper luma bar is fixed at 100 IRE for NTSC and 100 units for PAL. The lower luma bar limit is fixed at 1.5 IRE for NTSC and -5 units for PAL.

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 is not two phases for PAL signals. The +V phase is used (making the vectors look similar to NTSC).

Figure 3-17. Composite Gamut Vector Display Graticule Markings

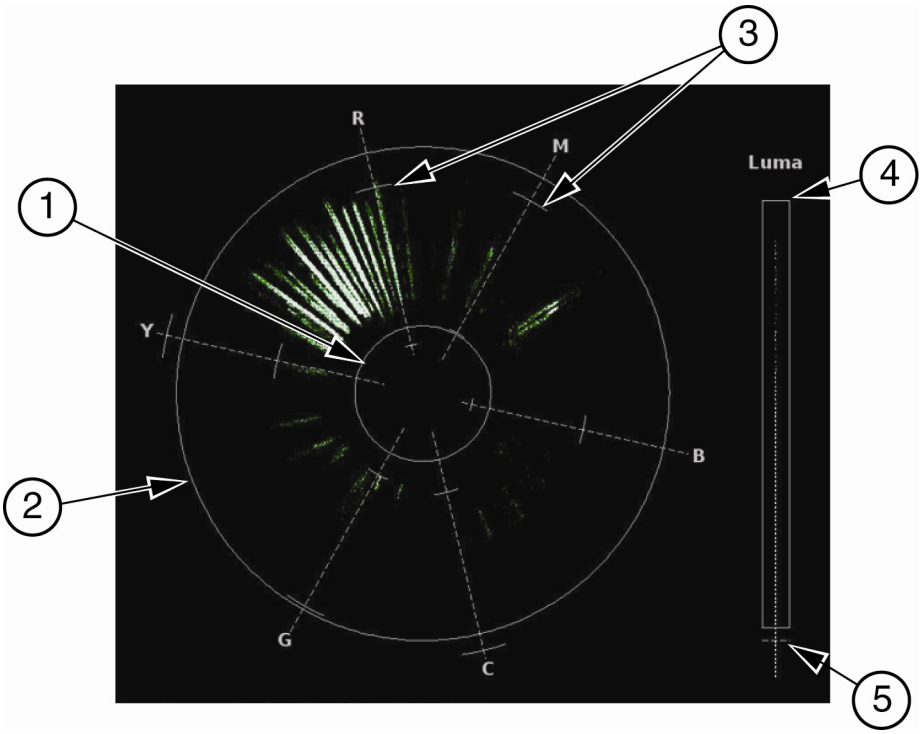


Table 3-11. Description of Composite Gamut Indicators

Key	Indicator	Description
1	Lower Gamut Ring	Indicates the Gamut Peak lower limit (fixed at -20 IRE for NTSC and -20 units for PAL)
2	Upper Gamut Ring	Indicates the Gamut Peak upper limit (fixed at 120 IRE for NTSC and 123 units for PAL)
3	Vector Excursion Mark	Helps user to visualize the minimum/maximum value of 100% color bars
4	Luma Upper Limit Line	Indicates the Gamut Luma upper limit (fixed at 100 IRE for NTSC and 100 units for PAL)
5	Luma Lower Limit Line	Indicates the Gamut Luma lower limit (fixed at 1.5 IRE for NTSC and -5 units for PAL)

RGB Gamut Display

The RGB Gamut vector displays video amplitudes (which are in mV) in a polar format to represent color information.

Each R, G, and B pixel is plotted using amplitude and phase. The amplitude is derived from the RGB 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 as follows:

- Amplitudes are displayed in mV rather than IRE or UNITS.

- Levels are fixed at 700 mV (upper) and 0 mV (lower) for both gamut and luma.
- The radials representing color vectors are 60° apart since they are displayed in a component color space.
- Mono bar graph is for monochrome.

Figure 3-18. Component Gamut Vector Display Graticule Markings

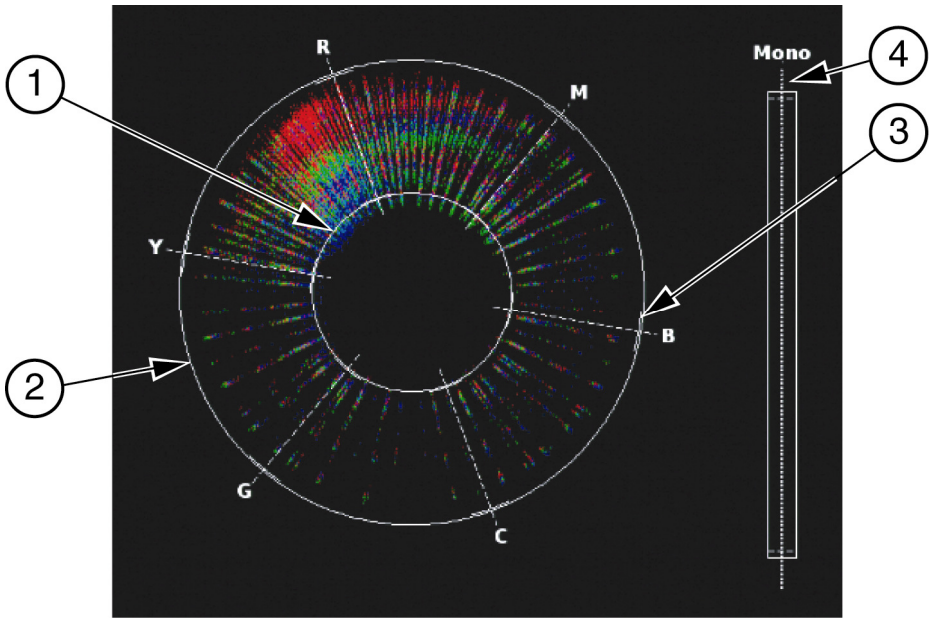


Table 3-12. Description of RGB Gamut Indicators

Key	Indicator	Description
1	Lower Gamut Ring	Indicates the RGB Gamut lower limit (fixed at 0 mV limit)
2	Upper Gamut Ring	Indicates the RGB Gamut upper limit (fixed at 700 mV)
3	Vector Excursion Mark	Helps user to visualize the minimum/maximum values of 100% color bars
4	Mono	Indicates the monochrome of the RGB signal

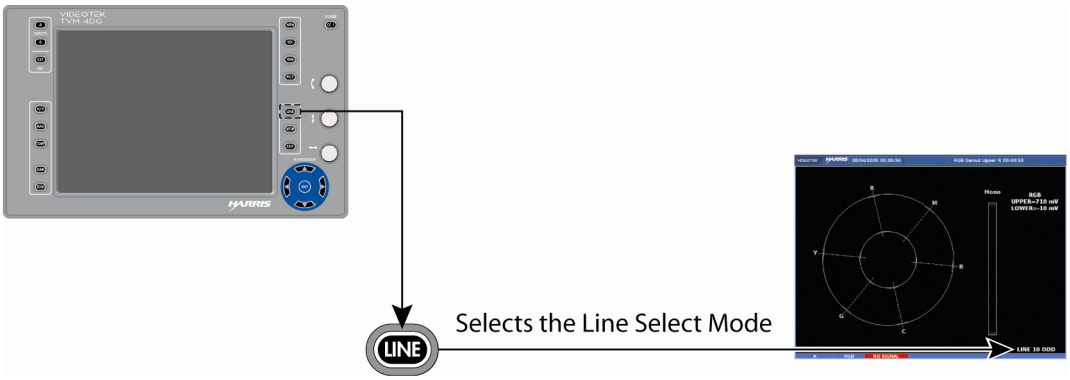
Placing the Gamut Display in Line Select Mode

Pressing the LINE button enables the 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 gamut display pane in Line Select mode. At the bottom-right of the display, the pane displays the Line number and the Odd or Even field, as shown in **Figure 3-14**.
2. Press the LINE button again to alternate between the ODD, EVEN, and all fields.
3. Rotate the CURVED ARROW knob to select the line to be displayed.

Figure 3-19. Establishing Line Select



Gamut Zoom

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

Gamut Pane Menu Selections

Pressing and holding the GAMUT function button selects the Pane menu. The Gamut Pane menu is described in **Table 3-13**.

Table 3-13. Gamut Menu Structure

Menu Selections	Selection Options
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.

Timing Display

Pressing the TIME function button accesses the Timing display. A Timing display diagram is shown in **Figure 3-20** and described in **Table 3-14**. The diagram illustrates the general location for the various Timing display fields.

Figure 3-20. Timing Display Graticule Markings

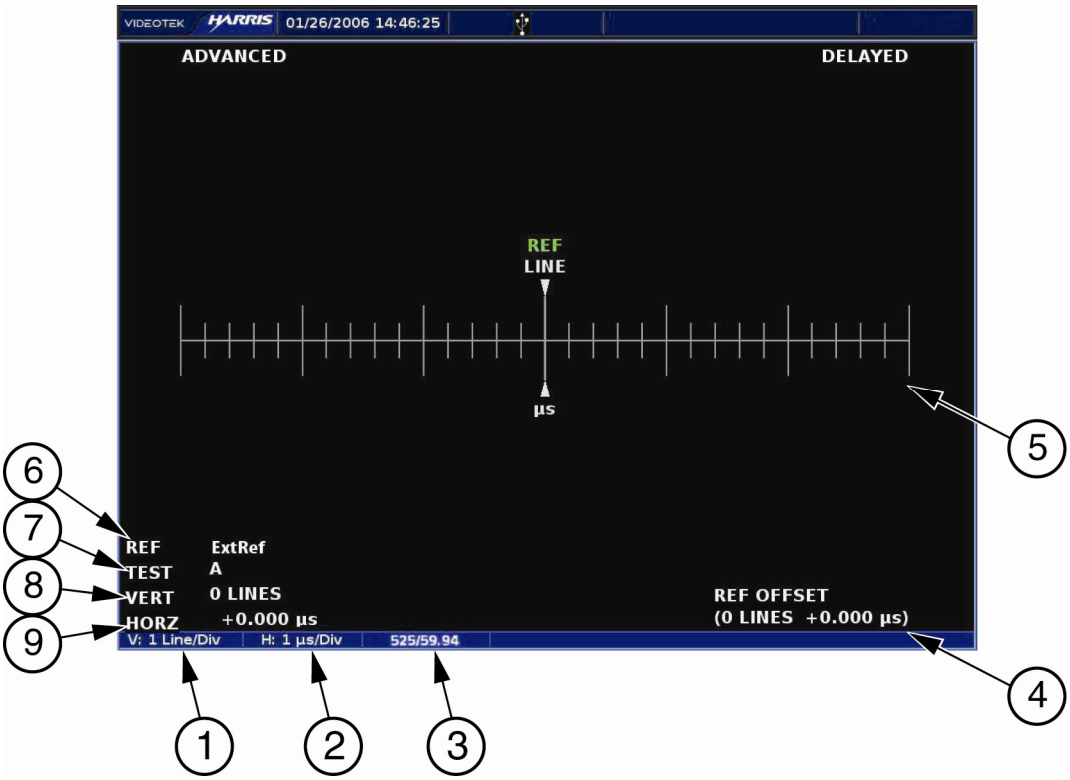


Table 3-14. Description of Timing Display Diagram

Field Identifier	Field Information	Nomenclature
1	Vertical scale	Displays scale as V: 1Line/DIV
2	Horizontal scale	Displays scale as H: 1µs/DIV
3	Standard	Displays the Line Rate/Frame Rate 525/59.94]; select the Standard in the VIDEO FORMAT > VIDEO A or B CONFIGURE menu
4	REF OFFSET	Displays that zero point of timing measurements are offset from the REF selection by xx lines yy.yyy µs
5	Timing graticules, cursors and labels	Displays timing graticules, cursors, and labels
6	Reference status	Displays selected reference status as REF: EXT REF or REF: EXT REF MISSING

Table 3-14. Description of Timing Display Diagram

Field Identifier	Field Information	Nomenclature
7	Test	Indicates test input that is being measured against the Selected Reference in Field Identifier 5
8	VERT (Vertical)	Displays 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
9	HORZ (Horizontal)	Displays 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)

When a signal is processed, there is the potential for it to be delayed with respect to a reference signal. The timing display is used to indicate when a video input is deviating in time from the external reference.

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 µsec (microseconds) cursors are all aligned. As the signal falls out of timing alignment, the line and the µsec 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 1 µs (bottom scale). Once the line or µsec 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:

- **TEST** – The selected input (A or B) that is being monitored.
- **VERT** – The offset line in full-video lines between the reference and the displayed video.
- **HORZ** – The offset time in microseconds between the reference and the displayed video. Horizontal can be yellow at 0 µsec. 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 the external reference and the selected input. The elapsed time is expressed in units of microseconds and lines of the selected input video not of the reference.
2. When referencing a standard definition video input to an 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.

Timing Pane Menu Selections

Pressing and holding the TIME function button in the active Timing pane selects the pane menu. The Timing Pane menu is described in **Table 3-15**.

Table 3-15. Timing Pane Menu

Menu Selections	Selection Options
TIMING MODE	FACTORY
	OFFSET
	SET ZERO REF
	CLEAR ZERO REF

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 µsec (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 µsec cursors change color when it moves from REF. Timing Mode Selections are as follows:

- **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 the screen.

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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 SETUP, UP, DOWN, LEFT, RIGHT, ENT, and EXIT buttons to navigate the Global Setup menu. The SETUP POSITION knobs and Navigation buttons are described below:

Press to enter the Setup menu or to Exit Setup menus.

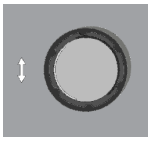
Press to exit the matrix screen, submenu, or the Setup menu.

Press to move up in the menu or matrix screen.

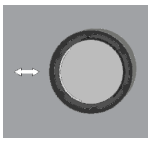
Press to move left in the menu or matrix screen.

Press to move right in the menu or matrix screen.

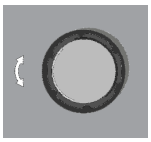
Press to move down in the menu or matrix screen.



Rotate the knob to move up and down or to change a value or condition in a menu, or to move up or down in the matrix screen.



Rotate the knob to move forward or backward in the menu, or to select the previous or next box in the matrix screens.



Rotate the knob to move up and down or to change a value or condition in a menu, or to move up or down in the matrix screen.

Press to select a menu item or a Matrix box.

Global Setup Menu

The following tables make up the global setup menu. Default selections are marked with an asterisk (*). The Setup menu items, with corresponding Table and Description pages, are listed in **Table 4-1**.

Setup Menu Items

Table 4-1. Setup Menu Items

Setup Menu Item	Table Page	Description Page
Video format	40	44
Waveform setup	41	44
Vector setup	42	44
Gamut setup	42	45
Display setup	42	46
Communications	43	47
System	43	48
About	43	49

Setup Menu Tables

Table 4-2. Video Format Menu

Menu Selections	Selection Options
VIDEO A CONFIGURE	AUTODETECT (*)
	1080i/60
	1080i/59.94
	1080i/50
	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

Table 4-2. Video Format Menu

Menu Selections	Selection Options
	525/59.94
VIDEO B CONFIGURE	AUTODETECT (*)
	1080i/60
	1080i/59.94
	1080i/50
	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

Table 4-3. Waveform Setup Menu

Menu Selections	Selection Options
DIGITAL WAVEFORM GRATICULE	PERCENT
	VOLTS (*)
NTSC PEDESTAL	OFF
	ON (7.5 IRE) (*)
WAVEFORM INTENSITY	25% TO 200% [100% = NORMAL (*)]
WAVEFORM CONTRAST	25% TO 200% [100% = NORMAL (*)]
PERSISTENCE	NORMAL (*)
	1 TO 6
	INFINITE
ATTACK	LOW (*)
	2 TO 6
	MAX

Table 4-4. Vector Setup Menu

Menu Selections	Selection Options
SD I/Q LINES	OFF (*)
	ON
VECTOR INTENSITY	25% TO 200% [100% = NORMAL (*)]
VECTOR CONTRAST	25% TO 200% [100% = NORMAL (*)]
PERSISTENCE	NORMAL (*)
	1 TO 6
	INFINITE
ATTACK	LOW (*)
	2 TO 6
	MAX

Table 4-5. Gamut Setup Menu

Menu Selections	Selection Options
GAMUT INTENSITY	25% TO 200% [100% = NORMAL (*)]
GAMUT CONTRAST	25% TO 200% [100% = NORMAL (*)]
PERSISTENCE	NORMAL (*)
	1 TO 6
	INFINITE
COLOR PLOT	SINGLE COLOR
	RGB (*)

Table 4-6. Display Setup Menu

Menu Selections	Selection Options
DISPLAY COLORS	MATRIX SCREEN (See **Table 4-7** for the Display Colors Menu)
GRATICULE INTENSITY	25% TO 200% (100% = NORMAL)
SCREEN SAVER	OFF (*)
	1 TO 60 MIN
BACKLIGHT CONTROL	1% TO 100% (50%*)

Table 4-7. Display Colors Menu

Display Colors	INA	INB	GRAT	BKGD
Black	N/A	N/A	N/A	X
Blue	X	X	X	X
Green	X	X	X	N/A
Cyan	X	X	X	X
Red	X	X	X	N/A
Purple	X	X	X	X
LT Gray	X	X	X	X
DK Gray	X	X	X	X
LT Blue	X	X	X	X

Table 4-7. Display Colors Menu

Display Colors	INA	INB	GRAT	BKGD
LT Green	X	X	X	X
LT Cyan	X	X	X	X
LT Red	X	X	X	X
LT Purple	X	X	X	X
Yellow	X	X	X	X
White	X	X	X	X

Table 4-8. Communications Setup Menu

Menu Selections	Selection Options	Selection Options
IP CONFIGURATION	ETHERNET CONFIG SCREEN	–
UNIT ID	1-99	–
GPI INPUT	MATRIX SCREEN (See **Table 4-9** for the GPI Input Menu)	–

Table 4-9. GPI Input Menu

GPI Input	1	2	3	4
INPUT A	X			
INPUT B		X		
WAVEFORM			X	
VECTOR				X
TIMING				
PICTURE				

Table 4-10. System Setup Menu

Menu Selections	Selection Options	Selection Options
SET TIME	ENTER NEW TIME SCREEN	
CONTROL ILLUMINATION	CONTRAST	Min
		2-9 (3*)
		Max
	BRIGHTNESS	Min*
		2-9 (3*)
		Max

Table 4-11. About Menu

Menu Selections	Selection Options
ABOUT	ABOUT SCREEN

Video Format Menu Selections

Video A Configure/Video B Configure

The Video "A and B" 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.

Waveform Setup Menu Selections

The Waveform Setup menu is used to select waveform units of measurement, intensity, contrast, persistence, and attack.

Digital Waveform Graticule

Digital Waveform Graticule is used to select the unit of measurement for the digital waveform. The selections are PERCENT or VOLTS. The default selection 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).

Waveform Intensity

Waveform Intensity is used to raise or lower the brightness of the displayed waveform. The range of intensity is 25% to 200%. The default intensity setting is NORMAL (100%).

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%. The default contrast setting is NORMAL (100%).

Persistence

Persistence is used to determine how long a data point (pixel) in the waveform remains on the display. The selections are NORMAL, 1 TO 6, and INFINITE. The default selection is NORMAL.

Attack

Attack is the initial intensity that the data point (pixel) appears in the display. The range of attack is LOW, 2 to 6, and MAX. The default selection is LOW.

Vector Setup Menu Selections

The Vector Setup menu is used to select the SD I/Q lines, vector intensity, vector contrast, persistence, and attack.

SD I/Q Lines

SD I/Q Lines is used to turn the I and Q marker lines on the Vector Display OFF and ON. The default selection is OFF.

Vector Intensity

Vector Intensity is used to raise or lower the brightness of the displayed vector. The range of intensity is 25% to 200%. The default selection is NORMAL (100%).

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%. The default selection is NORMAL (100%).

Persistence

Persistence is used to determine how long a data point (pixel) in the vector remains on the display. The range of Persistence is NORMAL, 1 TO 6, and INFINITE. The default setting is NORMAL.

Attack

Attack is the initial intensity that the data point (pixel) appears in the display. The range of Attack is LOW, 2 to 6, and MAX. The default setting is LOW.

Gamut Setup Menu

The Gamut Setup menu is used to change the Gamut Intensity, Gamut Contrast, Persistence, 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, & 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.

Display Setup Menu Selections

The Display Setup menu is used to configure the Display colors, graticule intensity, monitor, and time code.

Display Colors

Display Colors is used to select the colors for the background, signals, and graticules of the TVM-4DG. The colors are listed in **Table 4-7**. The Display Color Selection Screen, shown in **Figure 4-1,** is used to set the colors. Any color selection that is not available is blocked out and not selectable. "X" indicates the selection on the screen.

Figure 4-1. Display Color Selection

Use the NAVIGATION knobs to select the cell for the color and function. Once selected, press the ENT button to assign the selected color to that function. Although the same color can be used for multiple functions, each function can use only 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.

Graticule Intensity

Graticule Intensity is used to raise or lower the brightness of the displayed graticule. The range of intensity is 25% to 200%. The default selection is NORMAL (100%).

Screen Saver

The screen saver is used to provide a blank screen after there is no control activity for the specified duration. The timeframe for the screen saver to activate can range from 1 to 60 minutes.

Backlight Control

The LCD Backlight submenu is used to determine the backlight brightness level. The range of intensity is 1% to 100%. The default selection is 50%.

Communications Setup Menu Selections

The Communications Setup menu is used to configure the communication between the TVM-4DG and any peripheral hardware and software connected to the unit.

IP Configuration

The IP CONFIGURATION menu is used to configure the TVM-4DG for Ethernet communication. The Ethernet interface provides a high-speed communication link to the VFlash application over standard LAN and Internet networks. The interface conforms to industry Ethernet standards:

- Connection via a standard RJ45 socket
- Automatic detection and switching between 10BaseT and 100BaseT
- TCP/IP stack is fully compliant with RFC2500, “Internet Official Protocol Standards”
- Fully compliant with the 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, and DHCP are programmable from the IP Configuration menu. The settings are performed in the IP Configuration matrix 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 DHCP function is used to have the TVM-4DG 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-4DG is powered on. DHCP Enable is set to OFF by default.

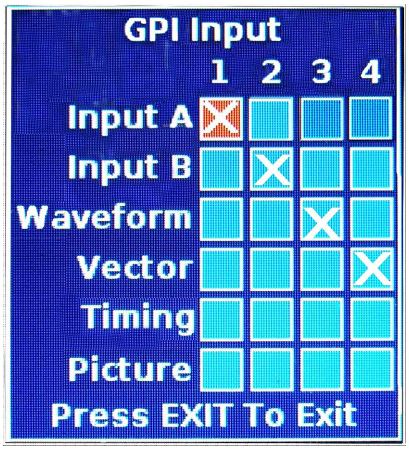
Unit ID

The unit ID is the identification number of the TVM-4DG. 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. The ID number is used for updating software using the VFLASH program.

GPI Input

The GPI Input Function Screen, shown in **Figure 4-2**, is used to enable the GPI INPUT and determine their function.

Figure 4-2. GPI Input Selection



The numbers across the top of the matrix designate the GPI input number. “X” indicates the selection on the screen. INPUT A default is GPI input 1; INPUT B default is GPI input 2; WAVEFORM default is GPI input 3; VECTOR default is GPI input 4.

To make a selection, move the cursor using arrow buttons, and then press ENT.

System Setup Menu Selections

The System Setup menu is used to control the system configuration selections.

Set Time

When selecting Set Time, the Enter New Time Screen, shown in **Figure 4-3**, appears. The Enter New Time screen is used to set the internal clock of the unit. Press the UP and DOWN buttons (or rotate the UP/DOWN NAVIGATION knob) to change the values of each time selection. Press the ENT button (or rotate the LEFT/RIGHT NAVIGATION knob) to move between the Hour, Minute, Second, Month, Day, Year, ACCEPT, and CANCEL selections. Once the internal date and time is entered, press the ENT button when the ACCEPT button is highlighted to save the settings.

Figure 4-3. Enter New Time Screen

Control Illumination

The Control Illumination submenu is used to control the brightness of the front panel button tally states.

Contrast [1]

The Contrast submenu is used to set the brightness of the High Tally state. The range of contrast is MIN, 2 to 9, and MAX. The default selection is 3.

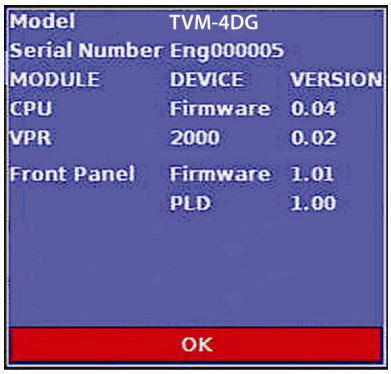
Brightness

The Brightness selection is used to set the brightness of the buttons in a low tally state using the Brightness submenu. The range of brightness is MIN, 2 to 9, and MAX. The default selection is 3.

About Menu Selection

The About Screen, shown in **Figure 4-4**, contains the model, serial number, module, device, and version. Press the EXIT or ENT button, or turn the LEFT/RIGHT control knob to exit from the screen.

Figure 4-4. About Screen



[1] Since the low tally state will never be brighter than the high tally state, the Contrast menu was created to avoid this issue.

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Section 5 ♦ 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 25 seconds.

If the TVM-4DG is not functioning properly, first verify the following:

- The TVM-4DG 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 operation was correct to ensure that the proper adjustments have been made for the signal requirements.

Problems, Causes, and Solutions

Table 5-1. TVM-4DG Problems, Causes, and Solutions

Problem/Symptom	Possible Cause	Solution or Explanation
Waveform not locked when External Reference (EXT REF) is selected	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
Problems displaying SDI inputs	Inputs not terminated	Terminate Inputs
No communications on VFlash port	IP address is incorrect	Provide the correct IP address in setup menu
	Incorrect Ethernet cable	▪ For direct connection, use a crossover cable ▪ For network connection, use a standard Ethernet cable

If the problem still exists after troubleshooting the TVM-4DG, see "Service and Support" on page 4 for further instructions.

Cold Starting the TVM-4DG

NOTE: A cold start resets all front panel and Setup menu selections to the factory-default settings. All user settings are lost.

If a problem persists after the cables are correctly connected and the unit is set up, perform a Cold Start. Although two different procedures can cold start the TVM-4DG, 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 (see "Cold Start Procedure" on page 52). The second type of cold start procedure is a cold start after a VFlash update (see "Cold Start after VFlash" on page 52.

The Ethernet default settings for the TVM-4DG are as follows:

- IP: 192.0.0.100
- Subnet Mask: 255.255.255.192
- Gateway: 0.0.0.0

Cold Start Procedure

The Front Panel Cold Start procedure is a cold starting procedure that does not require the power to be disconnected from the unit. IP information is preserved. To perform a Front Panel Cold Start:

1. Push and hold the EXIT, LINE, and PICT buttons for a minimum of five seconds until the Cold Start message appears on the display.
2. Once the message appears, the cold start is complete.

Updating with VFlash

The TVM-4DG is updated using the VFlash program. Obtain the latest .flu file from our Premier website, and then follow the instructions in the *VFlash User Guide* located on the VFlash CD to update the device.

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. Turn off the power to the TVM-4DG device and wait 30 seconds.
2. Turn on the power for the device while pushing and holding the EXIT button, LINE button, and PICT button. Hold the buttons until the Cold Start message appears.
3. Once the Waveform display appears, the cold start is complete.

Appendix A ♦ Specifications

Specifications are subject to change without notice.

Video Specifications

Item	Specification
Inputs A and B (Digital)	Two (2) serial digital interface inputs accepting high definition and standard definition formats
Standards	SMPTE 259M-C-1997, ITU-R BT.601, SMPTE 292M-1998, SMPTE 296M-2001, and SMPTE 274M-2001
Data rate	270 Mb/s, 1.485 Gb/s
Connectors	4 BNCs, Hi-Z passive looping
Level	800 mV, nominal
Input cable equalization	Up to 250 meters of 8281 at 270 Mb/s Up to 100 meters of 8281 at 1.485 Gb/s
Return loss	≤ -25 dB 5 MHz to 270 MHz ≤ -15 dB 270 MHz to 1.485 GHz

Control Specifications

Item	Specification
GPI	Four total inputs whose functions are assigned by a menu selection (Input A, Input B, waveform, vector/gamut, timing, and picture)
GPO	Tally for input A or B selection
Connector	15-pin HD (high density) D-sub, female
Input impedance	10 kΩ returned to +5 VDC
Tally output	Relay closure when input B is selected
Maximum relay current	350 mA @ 30 VDC

Display Specifications

Item	Specification
Waveform	YC_BC_R RGB, YRGB, or Composite parade/overlay of like formats
Sweep time base	1H, 1V, 2H, 2V
Waveform accuracy	≤ 1%
Vector	C_B vs. C_R for SD and HD
Vector accuracy	≤ 1°

Magnification Specifications

Item	Specification
Waveform Sweep MAG selection	1H with ×1.00, ×5.00, and ×10.00 horizontal magnification 1V with ×1.00, ×5.00, ×10.00, and ×25.00 horizontal magnification Pressing the MAG button will cycle through ×1.00, ×5.00, ×10.00, and ×25.00 horizontal magnification
Waveform Step Gain selection	×1.00, ×2.50, and ×5.00 Pressing the ZOOM button will cycle through ×1.00, ×2.50, and ×5.00 magnification

VFlash Specifications

Item	Specification
Standard	10/100 Base-T conforms to IEEE802.3
Connector	RJ-45

Power Requirements Specifications

Item	Specification
AC power source	90 – 264 VAC, 50 – 60 Hz, nominal
Power consumption	25 W maximum

Mechanical Specifications

Item	Specification
Dimensions	▪ Height: 5.25 in. (13.34 cm) ▪ Width: 8.50 in. (21.59 cm) ▪ Depth: 17.75 in. (45.09 cm)
Weight	5.00 lb (2.27 kg)

Environmental Specifications

Item	Specification
Operating temperature	0° to +50°C
Storage temperature	-40° to +65°C
Humidity	0 to 90% (non-condensing)
Transportation	24-in. (60.96-cm) impact-drop survivable in original factory packaging

Standard Accessories

Item	Specification
Standard accessories	▪ One CD containing the *TVM-4DG Installation and Operation Handbook* ▪ Breakout connector for GPI ▪ One power cord

Options

Item	Specification
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)
SSC-2	Single standard case
PTC-2	Portable case with folding stand
DRC-2A	Double rack mount case
BLK-1	Blank panel for DRC-2A

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Appendix B ♦ Pinouts

Figure B-1. GPI Connector

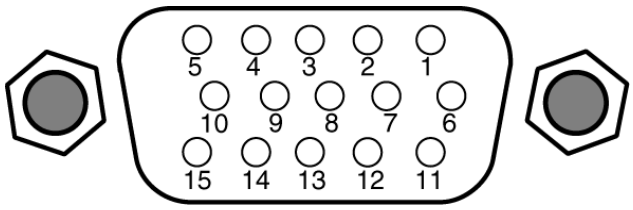

Table B-1. Pinouts for GPI Connector

Pinout	Signal
1	GPO - Output
2	GPI 1 - Input
3	GPI 2 - Input
4	GPI 3 - Input
5	GPI 4 - Input
6	GPO Return
7	GND
8	GND

Pinout	Signal
9	GND
10	N/A
11	N/A
12	N/A
13	GND
14	N/A
15	GND

Figure B-2. VFlash RJ-45 Connector

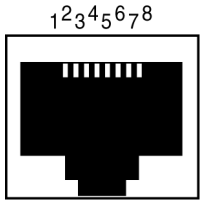

Table B-2. VFlash RJ-45 Connector Pinouts

Pinout	Signal
1	TX+
2	TX-
3	RX+
4	N.C.

Pinout	Signal
5	N.C.
6	RX-
7	N.C.
8	N.C.

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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.

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.

Border An electronically-generated picture member that 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.

Display The output that appears on the TVM-4DG LCD display

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.

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 in. wide and 5.25 in. (3×1.75 = 5.25) high.

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 YC_BC_R 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.

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

Graticule A graticule is a network of fine lines, dots, cross hairs, or wires in the focal plane of the eyepiece of an optical instrument.

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

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-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.

Pane One quadrant in a four-quadrant screen

PAL Phase Alternation Line; the standard color television system in many European and other countries.

Passive Looping Video and audio signals routed through components, even if power is removed. Signals are not amplified or processed, maintaining transparency.

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.

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 nor 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.

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

YC_BC_R CAV format composed of luminance (Y) and two color difference signals (C_B and C_R); the digital counterpart of YP_BP_R

YP_BP_R: CAV format composed of luminance (Y) and two color difference signals (P_B and P_R); the analog counterpart of YC_BC_R

Y/C Also S-video. Describes the separation of video signal luminance and chrominance components.

YRGB CAV format composed of luminance (Y) and red, green, and blue color channels

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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