

# User Manual



## VM100 & VM101 Video Measurement Sets

**070-9522-05**

This document supports firmware version 2.17  
and above.



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City, State, Postal code	Calibration Services (1,2,3,4, or 5 years)
Country	Instrument model and serial number
Phone	Instrument purchase date

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# General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it.

*Only qualified personnel should perform service procedures.*

If this equipment is used in any manner not specified, including failure to follow any rating or direction for use, the protection provided by the equipment may be impaired.

## Injury Precautions

**Use Proper Power Cord.** To avoid fire hazard, use only the power cord specified for this product.

**Avoid Overvoltage.** To avoid electric shock or fire hazard, do not apply potential to any terminal, including the common terminal, that varies from ground by more than the maximum rating for that terminal.

**Ground the Product.** This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

**Do Not Operate Without Covers.** To avoid electric shock or fire hazard, do not operate this product with covers or panels removed.

**Use Proper Fuse.** To avoid fire hazard, use only the fuse type and rating specified for this product.

**Do Not Operate in Wet/Damp Conditions.** To avoid electric shock, do not operate this product in wet or damp conditions.

**Do Not Operate in an Explosive Atmosphere.** To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.

## Product Damage Precautions

**Use Proper Power Source.** Do not operate this product from a power source that applies more than the voltage specified.

**Provide Proper Ventilation.** To prevent product overheating, provide proper ventilation.

**Do Not Operate With Suspected Failures.** If you suspect there is damage to this product, have it inspected by qualified service personnel.

## Safety Terms and Symbols

**Terms in This Manual.** These terms may appear in this manual:



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**WARNING.** Warning statements identify conditions or practices that could result in injury or loss of life.

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**CAUTION.** Caution statements identify conditions or practices that could result in damage to this product or other property.

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**Terms on the Product.** These terms may appear on the product:

**DANGER** indicates an injury hazard immediately accessible as you read the marking.

**WARNING** indicates an injury hazard not immediately accessible as you read the marking.

**CAUTION** indicates a hazard to property including the product.

**Symbols on the Product.** These symbols may appear on the product:



**DANGER**  
High Voltage



Protective Ground  
(Earth) Terminal



**ATTENTION**  
Refer to Manual



Double  
Insulated

## Certifications and Compliances

Refer to the specifications section for a listing of certifications and compliances that apply to this product.





# Preface

This is the user manual for the video measurement set. It contains information about the NTSC (VM100) and PAL (VM101) versions of the instrument. When operating instructions are different for NTSC and PAL, you will receive complete instructions for each version.

## Manual Overview

You will find the following topics covered in this manual:

- *Getting Started* explains how to set up the video measurement set for first-time operation. The section also provides a list of the accessories and options you can purchase.
- *Operating Basics* explains the operation of each control, indicator, and connector on the front and rear panels. The tutorial helps first-time operators use many of the instrument features.
- *Reference* provides a more detailed explanation of instrument features and explains how to use each of the built-in signal measurements.
- *Appendix A: Specifications* lists all instrument specifications and certifications.
- *Appendix B: Remote Control* explains how to operate the video measurement set using the RS-232 remote interface.
- *Appendix C: Performance Verification* explains how to verify the video measurement set performance.
- *Appendix D: Error Messages* lists the error messages you might receive when operating the video measurement set and gives the actions you must take in response to each message.

## Documentation Set

The VM100 and VM101 Video Measurement Sets are supported by two manuals:

- The *VM100 & VM101 Video Measurement Sets User Manual* (Tektronix part number 070-9522-XX) is included with each instrument
- The *VM100 & VM101 Video Measurement Sets Service Manual* (Tektronix part number 070-9288-XX) is an optional accessory that you can purchase from Tektronix



# Getting Started



# Getting Started

This section provides the information you need to use the video measurement set for the first time. Refer to the following sections to prepare the instrument for operation:

- *Product Description* on page 1–1 describes the instrument features
- *Options* on page 1–3 provides a list of the available options
- *Accessories* on page 1–4 describes the accessories that are available for use with the video measurement set
- *Mechanical Installation* on page 1–4 describes different ways for you to rackmount the video measurement set
- *Electrical Installation* on page 1–6 explains how to power on the video measurement set
- *First Time Operation* on page 1–7 explains how to configure the video measurement set features for your application

## Product Description

The Tektronix VM100 and VM101 Video Measurement Sets are low-cost, automatic video measurement instruments. The VM100 measures NTSC signals and the VM101 measures PAL signals.

The video measurement sets are easy to operate. They use existing or inserted test signals and take measurements consistent with regulatory specifications. The video measurement sets allow you to perform measurements that are useful for ensuring the quality of your video signals.

The video measurement sets display measurement results on an easy-to-read alphanumeric LCD screen with backlight. You can also display measurement results on a serial printer or remote PC using the RS-232 serial port.

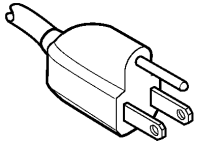
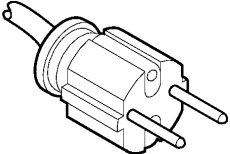
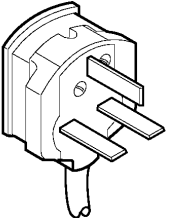
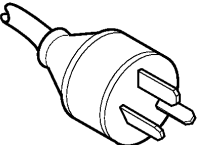
The video measurement sets perform the following measurements (on-screen labels are shown in parentheses):

- Differential Phase (DIFF PHASE)
- Differential Gain (DIFF GAIN)
- Chrominance-to-Luminance Delay (YC DELAY)
- Chrominance-to-Luminance Gain (YC GAIN)
- Signal-to-Noise Ratio (SNR WGT/FLAT)
- Frequency Response (FREQ FCC or AVG)
- Frequency Response Detail (FREQ FLAG, FREQ #1 through FREQ #6) or (FRQmax and FRQmin)
- Group Delay (GRPDLYmax and GRPDLYmin)
- Sync Amplitude (SYNC AMPL)
- Burst Amplitude (BURST AMPL)
- Bar Amplitude (BAR AMPL)
- 2T K-Factor (2T K-FACTOR)
- Luminance Nonlinearity (LUM NON-LIN)
- Hum (HUM P-P, 50/60 Hz, and 100/120 Hz)

## Options

You can purchase the video measurement set with one of the power cord options shown in Table 1-1.

**Table 1-1: Power cord identification**

Plug Configuration	Normal Usage	Option Number
	North America 115 V	Standard
	Europe 230 V	A1
	United Kingdom 230 V	A2
	Australia 230 V	A3

## Accessories

When unpacking the video measurement set for the first time, check inside the shipping carton for the following standard accessories:

- *VM100 & VM101 Video Measurement Sets User Manual*  
(Tektronix part number 070-9522-XX)
- Power cable assembly, standard USA, 125 V (Tektronix part number 161-0216-00)
- Replacement cushioning pads, six each (Tektronix part number 348-0844-00)

You can order optional accessories with the video measurement set or purchase them through a Tektronix field office or distributor. The following optional accessories are available:

- *VM100 & VM101 Video Measurement Sets Service Manual*  
(Tektronix part number 070-9288-XX)
- RS-232 Cable, DCE to DTE  
(Tektronix part number 174-1809-00)
- TVGF15 Mounting Kit  
For use with a 1740A-series waveform monitor)

## Mechanical Installation

The video measurement set requires no assembly. Please read the following sections before installing the video measurement set into a console or equipment rack.

---

**NOTE.** *All qualification testing was performed with the factory-shipped cabinet installed. To guarantee compliance with specifications, operate the instrument only in the original cabinet.*

---



## Custom Installation

---



**CAUTION.** To avoid damage to the video measurement set, be sure to attach it to a shelf that is strong enough to hold its weight (4 lbs/1.81 kg).

---

For applications that require installation into consoles, the video measurement set can be mounted with the front molding flush or protruding from the console. Always allow approximately 3 inches (7.6 cm) of rear panel clearance for cable and power cord connections.

## Rackmounting

The video measurement set is one-half-rack wide and one rack unit high. It requires approximately 3 inches (7.6 cm) of rear panel clearance for power cord and cable connections and 20 inches (50.8 cm) in front of the rack for installation and removal.

You can order the following rackmounting kits from Tektronix:

- TVGF13 adapter (mounts two half-rack width instruments side-by-side in a standard 19-inch rack)
- TVGF14 adapter (allows you to mount two half-rack width instruments in a standard half-rack application)

---

**NOTE.** The video measurement set fits only in the lower portion of the TVGF14 adapter.

---

## Electrical Installation

This section explains how to connect the video measurement set to an AC power source and how to recognize when the power on sequence is complete. If you want to connect a printer, personal computer (PC), or waveform monitor to the RS-232 serial port, refer to page 1–14 and *Appendix B: Remote Control* for more information.

### Power Source Requirements



---

**WARNING.** *To avoid personal injury due to electrical shock, never operate the video measurement set without the protective ground connection by way of the grounding conductor in the power cord.*

---

The video measurement set operates over the range of 90 V<sub>rms</sub> to 250 V<sub>RMS</sub> at either 50 Hz or 60 Hz. The power source should never apply more than 250 V<sub>RMS</sub> between the supply conductors or between either supply conductor and ground.

### Power On Procedure

To power on the video measurement set, connect it to the AC power source. There is no power switch.

The power on sequence completes in approximately 10 seconds. After power on completes, check for the following conditions:

- The LCD display shows the message “No video present, or no lock possible” (if no signals are connected to the rear panel INPUT connector).
- The MEAS button indicator lights.

---

**NOTE.** *The AVG button indicator lights at power on if the AVG feature was in use when AC power was last disconnected.*

---

## First Time Operation

This section guides you through the configuration of each operating parameter. (No configuration is necessary for basic operation.) Refer to Table 1–2 for an overview of the parameters you can configure, the location of the configuration instructions, and the factory default values.

You can configure most parameters using a computer. Refer to *Appendix B: Remote Control* for a listing of the remote commands.

**Table 1–2: Configuration parameters**

Parameter	Page Number	Factory Default Value
MEASURE	1–9	SNR is ON; all other measurements are OFF
ZCR PULSE	1–10	VM100: Line 10 VM101: Line 7
SIG ID RANGE	1–11	VITS
FULL FLD START	1–11	23
REF	1–12	INPUT
HUM (VM100 ONLY)	1–12	60HZ
SNR FILTER	1–13	WEIGHTD
LUM NON LIN	1–13	NORMAL
LIMITS	1–13	OFF
RS232	1–14 for printing 1–15 for computer 1–17 for waveform monitor operation	COMPUTER
PRINTER RS232 BAUD RATE STOP BITS PARITY FLOW CTL	1–14	9600 1 NONE NONE

**Table 1-2: Configuration parameters (cont.)**

Parameter	Page Number	Factory Default Value
COMPUTER RS232 BAUD RATE STOP BITS PARITY FLOW CTL REMOTE ADDR	1-15	9600 1 NONE NONE 0
1995 NOV 11 (Date) YEAR MONTH DAY	1-18	Today's date
10:13:18AM (Time) HOUR MINUTE	1-18	Current time
VIEW ANGLE	1-19	80
SW VER	1-19	Current software version
CALIBRATE	1-20	N/A

Use the following procedures to customize the operation of your video measurement set. Once you have configured the parameters, the video measurement set powers on as you configured it. Refer to *Operating Basics* if you need a detailed description of the front panel buttons or the LCD display.

---

**NOTE.** *The video measurement set uses the last setting that was saved for each parameter if power is interrupted during configuration.*

---

To exit the CONFIGURE menu at any time during these procedures, press the MEAS, SIG ID, MEM, or PRINT buttons.

---

**NOTE.** *If the front panel has been locked with the REMLock remote command, it can be unlocked by holding down the CONFIG button and pressing the FREEZE button.*

---

## Configure the Measurements

The video measurement set performs a group of measurements when you press the MEAS button. The display update rate depends upon the number of measurements made and the presence of valid input signals. You can customize this feature for your application by selecting only the measurements you need.






---

**NOTE.** *No new measurements are performed while the FREEZE or CONFIG lights are on. The REPort and MEMory:SAVe commands use the results that were present when either button was pressed.*

---

The CONFIG button provides access to the instrument configuration.

Perform the following steps to choose measurements that will be performed when you press the MEAS button or use the CONfig:MEAs:<subcommand> remote command on page B-37:

1. 	2. 	3. 	4. 	5. 
Press the <b>CONFIG</b> button.	Select CONFIGURE MEASURE (default). Press the ↵ enter button.	Select the desired measurement. See list below.	Select ON or OFF. Repeat steps 3 and 4 to configure additional measurements.	Press the <b>MEAS</b> button to exit.





The following measurements are available:

- Differential Phase (DIFF PHASE)
- Differential Gain (DIFF GAIN)
- Chrominance-Luminance Delay (YC DELAY)
- Chrominance-Luminance Gain (YC GAIN)
- Signal-to-Noise Ratio (SNR WGT/FLAT)
- Frequency Response (FREQ FCC or AVG and FREQ DETAIL)
- Group Delay (GRPDLYmax and GRPDLYmin)
- Sync Amplitude (SYNC AMPL)
- Burst Amplitude (BURST AMPL)
- Bar Amplitude (BAR AMPL)
- 2T K-Factor (2T K-FACTOR)
- Luminance Nonlinearity (LUM NON-LIN)
- Hum (HUM)

### Configure the Zero Carrier Reference Pulse Trigger Output

The Zero Carrier Reference Pulse Trigger Output synchronizes a demodulator when you take hum measurements. You can configure the output to OFF or to any line from 10 – 20 (VM100) or 7 – 20 (VM101). See page 3–16 for information about using the Zero Carrier Reference Pulse Trigger Output.





Perform the following steps to configure the Zero Carrier Reference Pulse Trigger Output or use the CONFIG:ZCRp remote command on page B–45:

1. <b>CONFIG</b> 	2. 	3. 	4. <b>MEAS</b> 
Press the <b>CONFIG</b> button.	Select CONFIGURE ZCR PULSE.	Select OFF or Line 10 – 20 (VM100) or Line 7 – 20 (VM101).	Press the <b>MEAS</b> button to exit.

## Configure the Signal Identification Range

The SIG ID menu displays all of the test signals that are present in the video signal applied to the INPUT connector. You can configure the SIG ID range to match your system requirements (VITS, FULL, or MAN). See page 3–3 for more information about SIG ID range selection.

Perform the following steps to configure the SIG ID range or use the CONfig:SIGnalid:RANge remote command on page B–42:





1. 	2. 	3. 	4. 
Press the <b>CONFIG</b> button.	Select SIG ID RANGE.	Select VITS, FULL, or MAN.	Press the <b>MEAS</b> button to exit.

**NOTE.** After you configure the signal identification range, the video measurement set reacquires the signal.

## Configure the Full Field Start Line

You can configure the video line used for full field start (valid only when the SIG ID range is FULL). With this feature you can view a specific video line within the active area. See page 3–3 for more information about SIG ID range selection.

Perform the following steps to configure the Full Field Start Line or use the CONfig:SIGnalid:FULLfldstart remote command on page B–40:

1. 	2. 	3. 	4. 
Press the <b>CONFIG</b> button.	Select FULL FLD START.	Select 23 - 94 (VM100) or 23 - 39 (VM101).	Press the <b>MEAS</b> button to exit.





**NOTE.** After you configure the full field start line, the video measurement set reacquires the signal.

---

### Configure the Reference

You can configure the video measurement set to use either an internally generated sync reference or a signal connected to the EXT REF rear panel input. For example, use an external reference if the video input has no sync information.





Perform the following steps to configure the reference or use the CONfig:REFerence remote command on page B–39:

1. <b>CONFIG</b> 	2. 	3. 	4. <b>MEAS</b> 
Press the <b>CONFIG</b> button.	Select CONFIGURE REF.	Select INPUT or EXTERNAL.	Press the <b>MEAS</b> button to exit.

### Configure the Hum Measurement (VM100 Only)

You can configure the hum measurement to match your power line frequency (VM100 only). The video measurement set configuration must match your power line frequency to produce accurate hum measurement results.

Perform the following steps to configure the hum measurement or use the CONfig:HUM remote command on page B–28:





1. <b>CONFIG</b> 	2. 	3. 	4. <b>MEAS</b> 
Press the <b>CONFIG</b> button.	Select HUM.	Select 50HZ or 60HZ.	Press the <b>MEAS</b> button to exit.



### Configure the Signal-to-Noise Ratio Filter

The video measurement set provides weighted and flat filter selections for taking signal-to-noise (SNR) measurements. You can configure the filter type needed for your application.





Perform the following steps to configure the SNR filter or use the **CONfig:FILter** remote command on page B-27:

1. <b>CONFIG</b> 	2. 	3. 	4. <b>MEAS</b> 
Press the <b>CONFIG</b> button.	Select SNR FILTER.	Select WEIGHTD or FLAT.	Press the <b>MEAS</b> button to exit.

### Configure the Luminance Nonlinearity Mode

The video measurement set provides normal and differentiated step (diffstep) modes for taking the luminance nonlinearity (LUM NON-LIN) measurements. You can configure the mode needed for your application.





Perform the following steps to configure the luminance nonlinearity mode or use the **CONfig:LUM** remote command on page B-36.

1. <b>CONFIG</b> 	2. 	3. 	4. <b>MEAS</b> 
Press the <b>CONFIG</b> button.	Select LumNon-Lin.	Select NORMAL or DIFFSTEP.	Press the <b>MEAS</b> button to exit.

### Configure the Limit Table Selection

The video measurement set can compare each measurement to high and low stored values. You can enable limit checking and select from one of four tables of stored values. Use the RS-232 serial port to change the limits from the factory default settings.

Perform the following steps to configure the limit table selection





1. 	2. 	3. 	4. 
Press the <b>CONFIG</b> button.	Select LIMITS.	Select OFF or Table 1 to 4.	Press the <b>MEAS</b> button to exit.

You can also use the remote command **CONfig:LIMit** described on page B-30.

### Configure for Printing

The video measurement set can drive a printer, computer, or waveform monitor using the RS-232 serial port. To print the measurement results, you need to configure the RS-232 serial port for printer operation and then select the parameters that match your printer.

Perform the following steps to configure the RS-232 serial port to drive a printer:

1. 	2. 	3. 	4. 
Press the <b>CONFIG</b> button.	Select CONFIGURE RS232.	Select PRINTER.	Press the <b>MEAS</b> button to exit.





---

**NOTE.** Refer to your printer manual to determine the settings for baud rate, stop bits, parity, and flow control.

*If the RS-232 serial port is not configured for printing, the PRINT button does not respond when you press it.*

---

Perform the following steps to configure the print parameters:

1. 	2. 	3. 	4. 
Press the <b>CONFIG</b> button.	Select <b>CONFIGURE PRINTER RS232</b> . Press the $\downarrow$ enter button.	Select the desired parameters. See Table 1-3.	Press the <b>MEAS</b> button to exit.





**Table 1-3: Print parameters**

Parameter	Choices
BAUD RATE	300, 600, 1200, 2400, 4800, 9600, 19.2K
STOP BITS	1 or 2
PARITY	NONE, EVEN, ODD
FLOW CTL	NONE, XON/XOFF, HARDWARE

### Configure for Computer Communications

The video measurement set can drive a computer, printer, or waveform monitor using the RS-232 serial port. To send the measurement results to a computer or to set up for remote operation, you need to configure the RS-232 serial port for computer operation and then select the parameters that match your computer interface.





Perform the following steps to configure the RS-232 serial port to drive a computer:

1. 	2. 	3. 	4. 
Press the <b>CONFIG</b> button.	Select CONFIGURE RS232.	Select COMPUTER.	Press the <b>MEAS</b> button to exit.

**NOTE.** Refer to your computer manual to determine the settings for baud rate, stop bits, parity, and flow control.

---

Perform the following steps to configure the computer interface parameters:

1. 	2. 	3. 	4. 
Press the <b>CONFIG</b> button.	Select CONFIGURE COMPUTER RS232. Press the ↵ enter button.	Select the desired parameters. See Table 1-4.	Press the <b>MEAS</b> button to exit.

**NOTE.** If COMPUTER was not selected at power on, you will experience a short delay when scrolling through the CONFIGURE RS232 menu choices.

---

**Table 1-4: Computer interface parameters**

Parameter	Choices
BAUD RATE	300, 600, 1200, 2400, 4800, 9600, 19.2K
STOP BITS	1 or 2
PARITY	NONE, EVEN, ODD





Table 1–4: Computer interface parameters (Cont.)

Parameter	Choices
FLOW CTL	NONE, XON/XOFF, HARDWARE, RCDS <sup>1</sup>
REMOTE ADDR <sup>1</sup>	0-126

### Configure for Waveform Monitor Control Function

The video measurement set can drive a computer, printer, or 1740A-series waveform monitor using the RS-232 serial port. The waveform monitor control function allows you to simultaneously view the waveform on a 1740A-series waveform monitor while the video measurement set measures the signal parameters. See page 3–14 for more detailed information about the waveform monitor control function.





Perform the following steps to configure the RS-232 serial port to drive a waveform monitor:

1. <b>CONFIG</b> 	2. 	3. 	4. <b>MEAS</b> 
Press the <b>CONFIG</b> button.	Select <b>CONFIGURE RS232</b> .	Select <b>CONTROL</b> .	Press the <b>MEAS</b> button to exit.

<sup>1</sup> Do not use the RCDS or REMOTE ADDR parameters. They support a custom application.

### Configure the Date

The video measurement set keeps track of the date. Perform the following steps to change the date setting or use the **CONfig:DATE** remote command on page B-26:





1. 	2. 	3. 	4. 
Press the <b>CONFIG</b> button.	Select <b>CONFIGURE &lt;DATE&gt;</b> . Press the ↵ enter button.	Select the <b>YEAR, MONTH, and DAY</b> . See list below.	Press the <b>MEAS</b> button to exit.

The following date parameters are available:

- **YEAR:** 00 to 99 selects 1990 through 2089
- **MONTH:** JAN through DEC
- **DAY:** 1 through 31

### Configure the Time

The video measurement set keeps track of the time. Perform the following steps to change the time setting or use the **CONfig:TIME** remote command on page B-44:





1. 	2. 	3. 	4. 
Press the <b>CONFIG</b> button.	Select <b>CONFIGURE &lt;TIME&gt;</b> . Press the ↵ enter button.	Select the <b>HOUR and MINUTE</b> . See list below.	Press the <b>MEAS</b> button to exit.

The following time parameters are available:

- **HOUR:** 01AM to 12AM and 01PM to 12PM
- **MINUTE:** 00 to 59

### Adjust the LCD View Angle




You can adjust the viewing angle of the LCD display for the best readout with your lighting conditions. To change the viewing angle, place the video measurement set in the lighting conditions where you will use it and then perform the following steps or use the `CONfig:LCDangle` remote command on page B-29:

1.	<b>CONFIG</b> 	2.		3.		4.	<b>MEAS</b> 
	Press the <b>CONFIG</b> button.		Select CONFIGURE VIEW ANGLE.		Select 0 through 180 for best LCD display.		Press the <b>MEAS</b> button to exit.

### Display the Software Version Number

You can view the software version number for the operating system installed in this video measurement set. Refer to this number if you need to report a software problem or order a software upgrade. The software version displayed here should correspond to the version number(s) printed on the title page of this manual.

Perform the following steps to view the software version number or use the `CONfig:SWVersion?` remote query on page B-43:

1.	<b>CONFIG</b> 	2.		3.	<b>MEAS</b> 
	Press the <b>CONFIG</b> button.		Select CONFIGURE SW VER.		Press the <b>MEAS</b> button to exit.

## Calibration





---

**CAUTION.** *To ensure that the video measurement set meets all performance requirements, only qualified service personnel should perform the adjustments.*

*Refer to the VM100 & VM101 Video Measurement Sets Service Manual for test equipment requirements and detailed adjustment instructions.*

---

If you inadvertently enter the CALIBRATION menu, use the following steps to exit the menu without changing internal video measurement set settings:

1. 	2. 
Select PRESS ↵ TO ABORT CAL.	Press the ↵ enter button to exit the menu.





# Operating Basics





# Operating Basics

This section provides the information you need to use each control, indicator, and connector on the front and rear panels. It is divided into the following sections:

- The *Functional Overview* explains how to read the LCD display. You will also find functional descriptions of each front panel button and rear panel connector and a graphical view of the menus.
- The *Tutorial* on page 2–9 guides you through basic instrument operation and measurement procedures.

## Functional Overview

This section contains basic operating instructions for the front panel buttons and LCD display, the menus, and rear panel connectors. Refer to the following pages for the information you need:

- Front panel buttons and LCD display (see page 2–2)
- Menus (see page 2–4)
- Rear panel connectors (see page 2–7)

### Front Panel Buttons and LCD Display

The front panel contains twelve buttons and an LCD display as shown in Figure 2–1. There are seven function buttons, four arrow buttons, and the enter button. A green LED indicator, located at the center of each function button, lights to show when the associated function is turned on. The arrow buttons are designated by directional arrows. A carriage return symbol (↵) identifies the enter button.

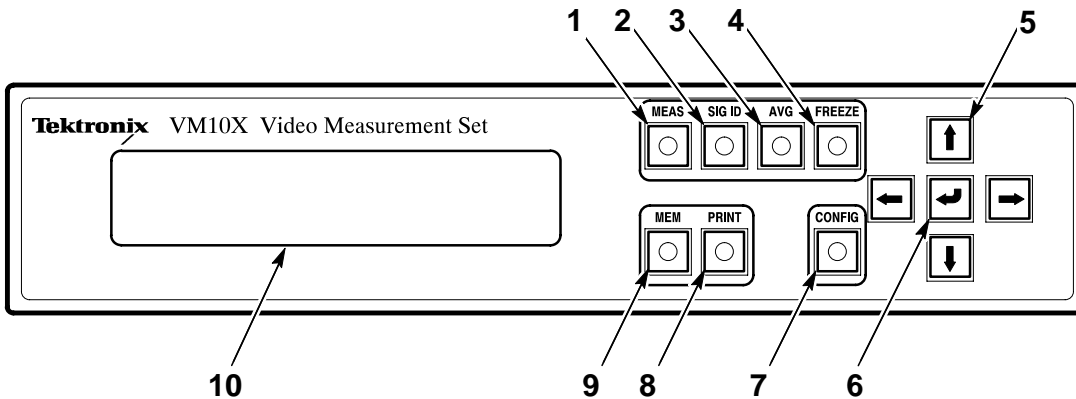


Figure 2–1: Front panel

Five of the function buttons (MEAS, SIG ID, MEM, PRINT, and CONFIG) are exclusive to each other. This means that only one of the functions can be active at a time. When you press another of these buttons the previous function automatically turns off.

---

**NOTE.** If the front panel has been locked with the REMLock remote command, it can be unlocked by holding down the CONFIG button and pressing the FREEZE button.

---

The following descriptions refer to Figure 2–1.

1. **MEAS.** Press the measure button to display the results of measurements the video measurement set performs on the LCD display. Use the CONFIG menu to turn measurements ON or OFF. Measurements must be ON to appear in the MEAS list.

2. **SIG ID.** Press the signal identification button to display the name and location of signals used for measurement when the SIG ID range is set to VITS or FULL, and the source ID (when contained in the signal).
3. **AVG.** Press this toggle switch to turn signal averaging on and off.
4. **FREEZE.** Press this toggle switch to turn the freeze feature on and off. When FREEZE is turned on, all acquisition and measurement activity stops so that you can view intermediate measurement and signal ID results.

To disable the front panel lock feature, hold down the CONFIG button and press FREEZE.

---

***NOTE.** No new measurements are performed while FREEZE is on. The report and memory save commands return the result that was present when FREEZE was pressed.*

---

5. **Arrow Buttons.** Press the up (↑) or down (↓) arrow buttons to scroll through various LCD displays. Press the left (←) and right (→) arrow buttons to change instrument parameters and to view measurement results on other video lines.
6. **Enter Button.** Press the enter (↵) button to enter and exit the CONFIG submenus and to control print and memory functions.
7. **CONFIG.** Press the configure button to access instrument configuration menus and to view the instrument software version.

To disable the front panel lock feature, hold down the CONFIG button and press FREEZE.

---

***NOTE.** No new measurements are performed while CONFIG is on. The report and memory save commands return the result that was present when CONFIG was pressed.*

---

8. **PRINT.** Press the print button to print the current or saved measurement data or to output results to a computer, using the RS-232 serial port. You must configure the RS-232 serial port for

printing and select the print parameters before using the print function.

**9. MEM.** Press the memory button to save the current measurement and SIG ID results in instrument memory and to access memory management selections including ERASE, REPLACE, VIEW, and RENAME.

**10. LCD Display.** The LCD display shows measurement readouts and menu selections. Figure 2–2 shows examples of the text and symbols you will see on the LCD display. The symbols help you navigate quickly through the menu system using the arrow buttons and the enter button. Dots (...) following the menu name indicate that a menu has a submenu.

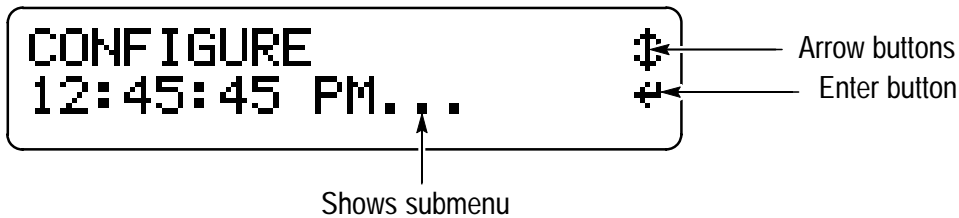


Figure 2–2: LCD display characteristics

### Menus

The MEAS, SIG ID, MEM, PRINT, and CONFIG buttons allow access to additional selections or measurement results. Figures 2–3 and 2–4 show the menu structure of the video measurement set. The SIG ID menu is not shown because its contents depend upon the input signal characteristics.

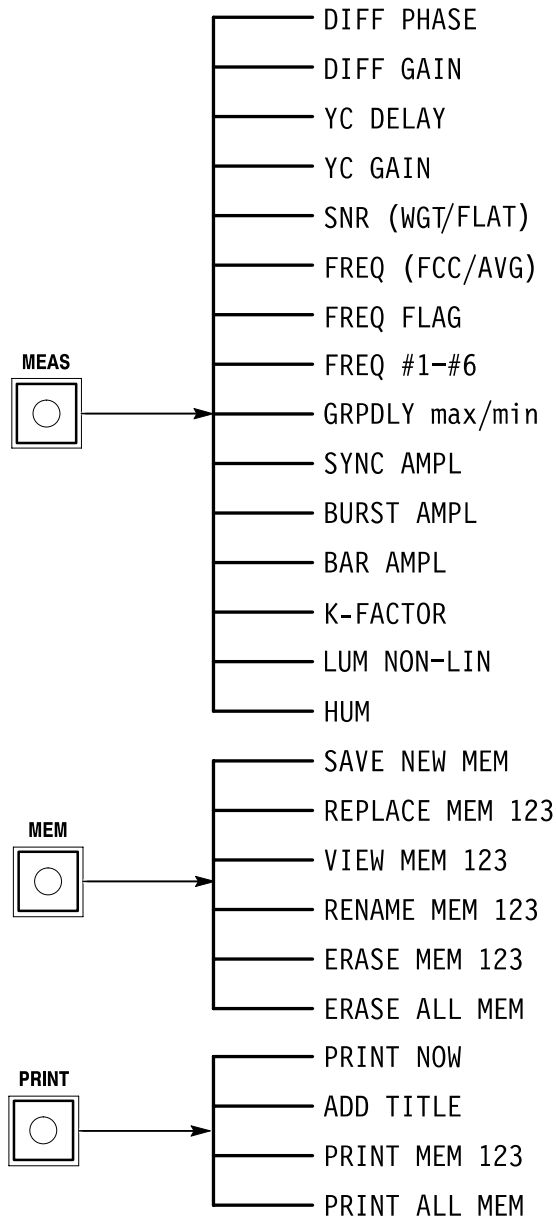


Figure 2-3: The MEAS, MEM, and PRINT menus

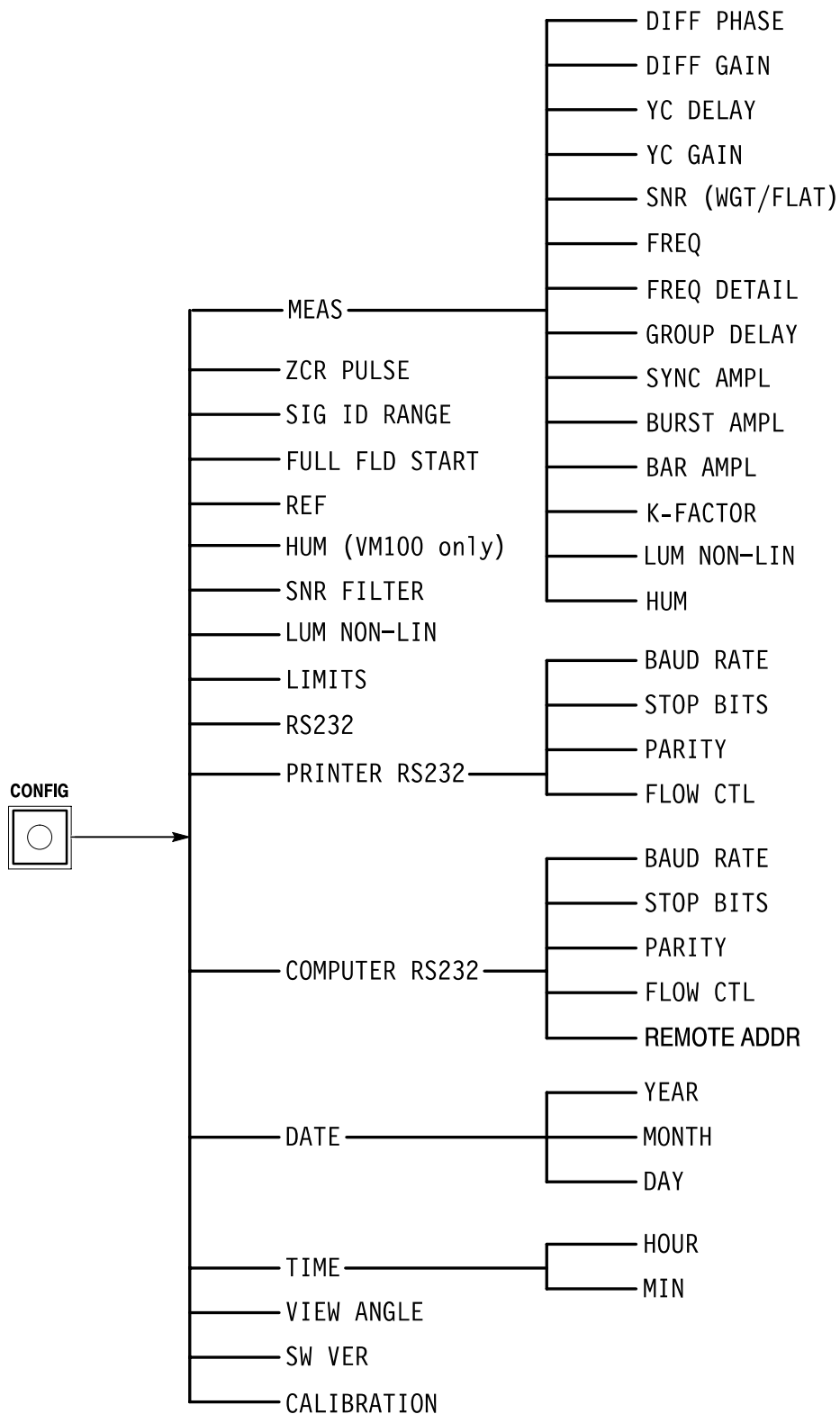


Figure 2-4: The CONFIG menu



## Rear Panel Connectors

There are seven connectors mounted on the video measurement set rear panel. Refer to Figure 2–5 for descriptions.

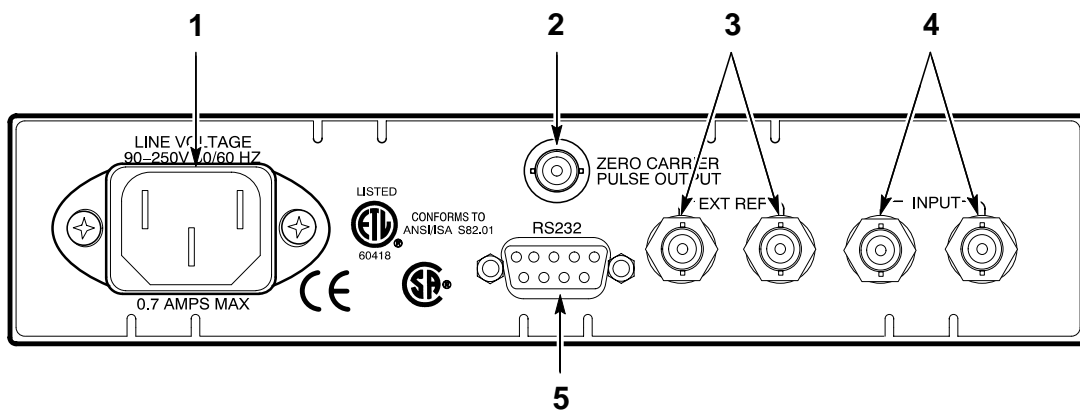


Figure 2–5: Rear panel connectors

1. **AC Power Connector.** The AC power connector is a standard AC plug receptacle for 120 or 240 VAC power mains. The plug is compatible with each available power cord option.
2. **ZERO CARRIER PULSE OUTPUT.** The ZERO CARRIER PULSE OUTPUT produces a reference pulse that triggers a demodulator. Signal amplitude is  $1.5 V_{p-p}$  when driving a  $75 \Omega$  load or TTL compatible when driving a high impedance. This pulse is compatible with the trigger inputs on the following Tektronix Demodulators: DS1200, TDM5, 1450, 1340, and 1350.
3. **EXT REF.** This high-impedance, loop-through input (two BNC connectors) accepts external reference signals of composite video or black burst ( $1 V_{p-p}$ ). Use this input if the video input has no sync information. The input is AC coupled and compensated for  $75 \Omega$ . It is not internally terminated.
4. **INPUT.** This high-impedance, loop-through input (two BNC connectors) accepts video input signals for the video measurement set. The input is AC coupled and compensated for  $75 \Omega$ . It is not internally terminated.

- 5. RS232 Port.** This nine-pin subminiature D-type female connector provides an RS-232 serial interface for printer and computer communication. The port also provides the interface for the waveform monitor control function. See *Appendix B: Remote Control* for pin assignments and a listing of remote commands.

## Tutorial

The following tutorial shows how to use most of the video measurement set features. See the *Reference* section, which begins on page 3–1, for more detailed information on interpreting specific measurements.

During the tutorial you will perform the following tasks:

- Configure the instrument
- Perform signal identification
- Take signal measurements
- Use freeze mode
- Save measurement results
- Print measurement and signal identification results (optional)

The required equipment to perform the tutorial includes a signal source such as a live video feed or the output of an NTSC or PAL TV signal generator with inserted VITS. If you want to print the measurement results, you will also need an ASCII printer with cable.

Table 2–1 shows the equipment needed to complete the tutorial.

**Table 2–1: Equipment for tutorial**

Item Description	Minimum Requirements	Example
Test Signal Generator	Produces NTSC and PAL signals	Tektronix TSG95
Cable, Precision 75 $\Omega$ Coaxial	75 $\Omega$ , 42 in, male-to-male BNC connectors	Tektronix part number 012–0074–00
Termination, 75 $\Omega$	75 $\Omega$ , male BNC connector	Tektronix part number 011–0102–01
Serial ASCII Printer with Cable (optional)	Nine-pin subminiature D-type male connector	General purpose printer with serial port

### Initial Setup

1. Connect the test equipment as shown in Figure 2–6.

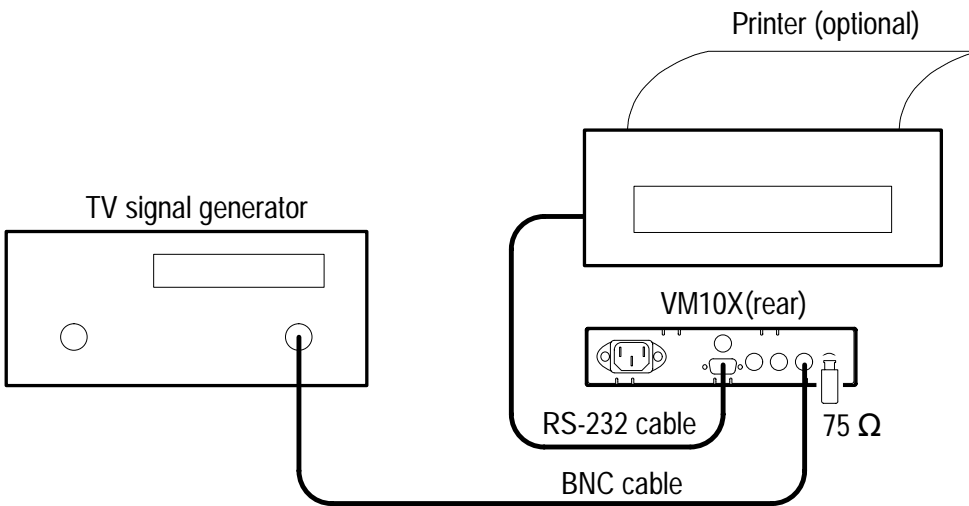


Figure 2–6: Equipment setup for the tutorial

2. Power on the video measurement set as follows:
  - a. Connect the video measurement set to the AC power source.
  - b. Wait until you can read the LCD display (approximately 10 seconds).
3. Power on the TV signal generator and printer (if connected).
4. On the video measurement set, press the **AVG** button to turn averaging on (LED lights).

---

**NOTE.** You will normally operate the video measurement set with averaging turned on.

---

---

## Instrument Configuration

---

**NOTE.** *If the video measurement set displays the message No video present, or no lock possible, check the connection and quality of the video signal before proceeding.*

---

The video measurement set is ready to begin taking measurements immediately after power on. For the purpose of this tutorial you must change or verify some instrument parameters before proceeding:

1. Turn on all measurements within the CONFIGURE MEASURE... menu as follows:
  - a. Press the **CONFIG** button.

---

**NOTE.** *No new measurements are performed while CONFIG is on. The REPort and MEMory:SAVe commands use the results that were present when CONFIG was pressed.*

---

- b. Press the ↵ enter button to enter the CONFIG--MEAS submenu.
    - c. Use the ← or → arrow button to select DIFF PHASE = On.
    - d. Use the ↓ arrow button to select DIFF GAIN.
    - e. Use the ← or → arrow button to select DIFF GAIN = On.
    - f. Repeat steps d and e for each measurement within the list. See page 1–9 for a complete list of the measurements.
2. If you want to print the measurement results, configure the RS-232 serial port for your printer. See page 1–14 for detailed instructions.

---

**NOTE.** *Be sure to match the video measurement set printer parameters to your printer. Refer to the manual for your printer for the correct settings. Refer to Appendix B: Remote Control for a detailed description of the RS-232 serial port pinout.*

---

### Signal Identification

The SIG ID menu, used when the SIG ID range is set to VITS or FULL, displays the name of the video signal that appears on a specific line. Perform the following procedure to identify the signals on each line of your test signal:

1. Press the **SIG ID** button. Check the display for the field 1:line 9 signal identification for VM100. For the VM101, if the SIG ID range is VITS check for field 1:line 5; if the SIG ID range is FULL, check for field 1:line 23 (Figure 2-7).

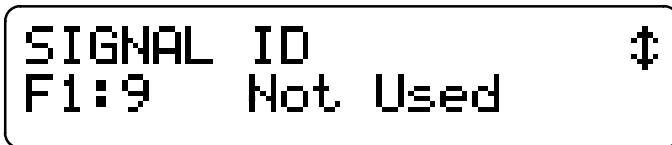


Figure 2-7: Example of the initial SIG ID display

2. Use the ↓ or ↑ arrow buttons to scroll through the vertical interval test signals.

Each time you press the arrow button the display shows the name and location of the next VITS. The decoded source ID code, if present, appears on the right side of the bottom readout line (Figure 2-8).

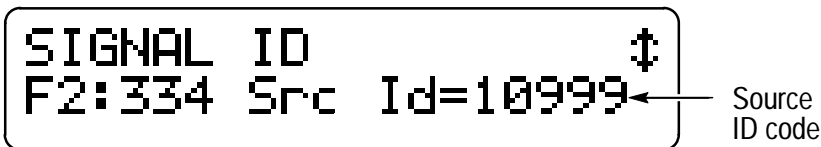


Figure 2-8: Example of a SIG ID display with source ID code

## Signal Measurements

The MEAS button displays the results of signal measurements. Perform the following procedure to use the MEAS feature:

1. If the LED in the AVG button is not lit, press the **AVG** button. Measurements are normally made with averaging turned on.
2. Press the **MEAS** button.

Measurement mode is now active (the LED in the MEAS button lights). SIG ID mode turns off automatically when you turn on measurement mode. The display shows the results of the first available measurement (Figure 2-9).

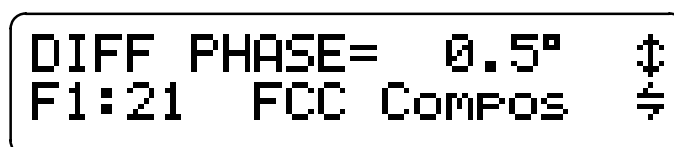


Figure 2-9: Example of differential phase measurement results

3. Use the ↓ or ↑ arrow buttons to scroll through the measurement screens.

While in the measurement mode the video measurement set takes measurements continuously. You will only see the results of measurements that are turned on. (You turned them all on at the beginning of this tutorial).

In general, the top line of the display contains the measurement type on the left and the measured value on the right. The bottom line contains the location and name of the signal that was used to take the measurement. The video measurement set automatically finds the best available signal to use for taking each measurement. For more detailed information about specific measurements, see the *Reference* section.

4. Use the ← or → arrow buttons to view the measurement results for each field, line, and signal on which the measurement is made.

In MANUAL SIGNAL IDENTIFICATION mode, you can change signals for measurement quickly by turning FREEZE on and holding the ← or → arrow button down; releasing the arrow button will cause the new signal to be identified. Remember to turn FREEZE off to resume measurement.

Each time you select a new signal, the video measurement set first updates the field, line, and signal readouts at the bottom of the display. After the field, line, and signal readouts update, you must wait a few seconds for the new measurement results to appear on the display. If only one signal is available the measurement results do not change when you press the ← or → arrow buttons.

---

***NOTE.** If you select a new signal for the DIFF PHASE and YC GAIN measurements, the new signal is automatically used for the DIFF GAIN and YC DELAY measurements, respectively. The video measurement set performs all other measurements independently.*

---

### Freezing the Measurement Activity

The freeze feature stops all acquisition and measurement activity. You can then view the intermediate results of your measurement.

1. If the LED in the MEAS button is not lit, press the **MEAS** button to turn on the measurement mode.
2. Repetitively press the ↓ or ↑ arrow button until the signal-to-noise ratio (SNR) results are displayed. Notice how the measurement results change over time.
3. Press the **FREEZE** button to turn on the freeze feature. The measurements results do not change any more.

---

***NOTE.** No new measurements are performed while FREEZE is on. The REPort and MEMory:SAVe commands use the results that were present when FREEZE was pressed.*

---



4. Press the **FREEZE** button to turn off the freeze feature.

### Storing Measurement Results

The memory function allows you to store measurement and signal identification results. During the following procedure you save measurement results to memory, rename the memory location, view the saved results, and erase the results from memory.

---

**NOTE.** When you press the **MEM** button, the measurement mode automatically turns off.

---

1. Press the **MEM** button.
2. Press the ↵ enter button to save the latest measurement results into a new memory location (Figure 2–10).

If the save is successful, the next screen allows you to rename the saved memory. If you receive a message that indicates you are not able to save the results, refer to page 3–9 for instructions to clear the memory before proceeding.

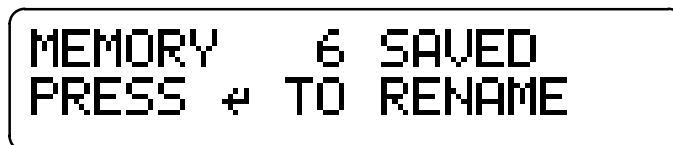


Figure 2–10: Measurements saved to memory

---

**NOTE.** You do not need to change the name of the memory location. To accept the default name (such as *UNNAMED-06*), simply press the enter button to accept the default name.

*You cannot use the same name for more than one memory location.*

---

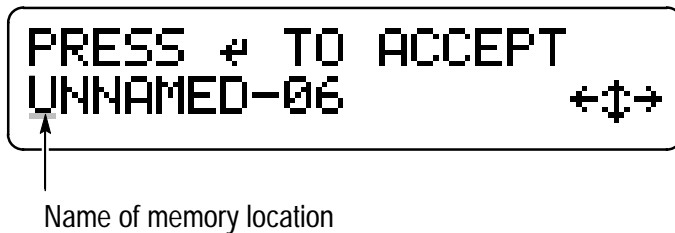
3. To rename the memory location, press the ↵ enter button.

---

**NOTE.** When renaming a memory location, you cannot use the name *UNNAMED-XX* where “XX” is any combination of characters.

---

4. Use the ↓ or ↑ arrow buttons to select the first character of the new name (Figure 2–11).



**Figure 2–11: Renaming a memory location**

5. Press the → arrow button to move the cursor to the right, then use the ↓ or ↑ arrow buttons to select the next character.
6. Repeat step 5 until the new name is complete (you can enter up to ten characters).
7. Press the ↵ enter button to accept the new name.
8. To view the stored measurement results, press the ↑ arrow button to display the message PRESS ↵ TO VIEW MEMORY.
9. Repetitively press the ← or → arrow button to select the memory location you named in step 7.
10. Press the ↵ enter button to view the selected memory.

The first display contains the date and time stamp for the measurement results (Figure 2–12).



Figure 2–12: Date and time stamp display

11. Use the ↓ arrow button to scroll through the measurement results and the signal identification screens.
12. To exit view mode, press the ↵ enter button or the **MEM** button.
13. Press the ↑ arrow button to display the message PRESS ↵ TO ERASE MEMORY.
14. Use the ← or → arrow button to select the memory location you named in step 7.
15. Press the ↵ enter button to erase the selected memory.
16. Repeat steps 8 and 9 to verify the memory location has been erased.

### Printing Measurement and Signal Identification Results

You can send the measurement and signal identification results from the video measurement set directly to a printer. Use the following procedure to print your test results with a title:

---

**NOTE.** Be sure that you have configured the RS-232 serial port for your printer. See page 1–14 for detailed instructions.

*If the RS-232 serial port is not configured for a printer, the PRINT button is inactive.*

---

1. If you have not already done so, connect the video measurement set to the printer.
2. Press the **MEAS** button to turn on the measurement mode.
3. On the video measurement set, press the **PRINT** button.

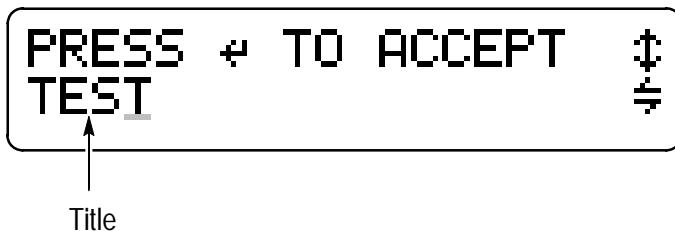
The following message appears on the display: PRESS ↵ TO PRINT NOW.

---

**NOTE.** You can print the measurement results without a title. To do so, press the ↵ enter button now.

---

4. To add a title to your printout, press the ↓ arrow button until the message PRESS ↵ TO ADD TITLE is displayed.
5. To add the title press the ↵ enter button.
6. Use the ↓ or ↑ arrow buttons to select the first character of the new name.
7. Press the → arrow button to move the cursor to the right; use the ↓ or ↑ arrow buttons to select the next character (Figure 2–13).



**Figure 2–13: Adding a title**

8. Repeat step 7 until the title is complete (you can enter up to ten characters).
9. Press the ↵ enter button to accept the title.
10. Press the ↵ enter button to print the current measurement results with your title.

The message PRINT COMPLETE appears after printing completes successfully.

11. Press the ↵ enter button or the **PRINT** button to remove the message.

## Using Limits

Use the limit check feature to verify if the measurement results are within specified limits. Limit violations are shown on the LCD display or returned from a query via the RS-232 remote control interface. Limit checking can be enabled or disabled from either the front panel controls or the remote control interface. If a limit table is in effect when a measurement is stored, the contents of the limit table will be saved with the signal and measurement data,

Limits are only checked at the time of display, the time of reporting, or when the signal memory is recalled. During front-panel operation, a limit is not checked unless the measurement is currently displayed. During remote-control operation, a limit is not checked unless a measurement or report command is issued while the violation is occurring.

Four limit tables containing different values can be loaded into the video measurement set through the remote control interface. The limit tables can be selected from the front-panel configuration menu or by using the remote control `CONfigure:LIMit` command.

---

**NOTE.** *Limit values cannot be modified or inspected from the front panel.*

---

Exceeded limits are indicated on the LCD display by either an  $\uparrow$  or  $\downarrow$  arrow before the measurement value. See Figure 2–14.

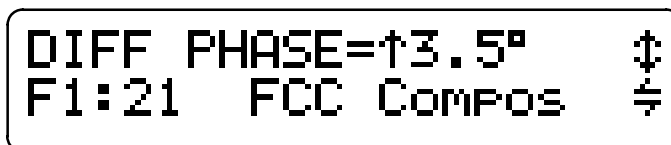
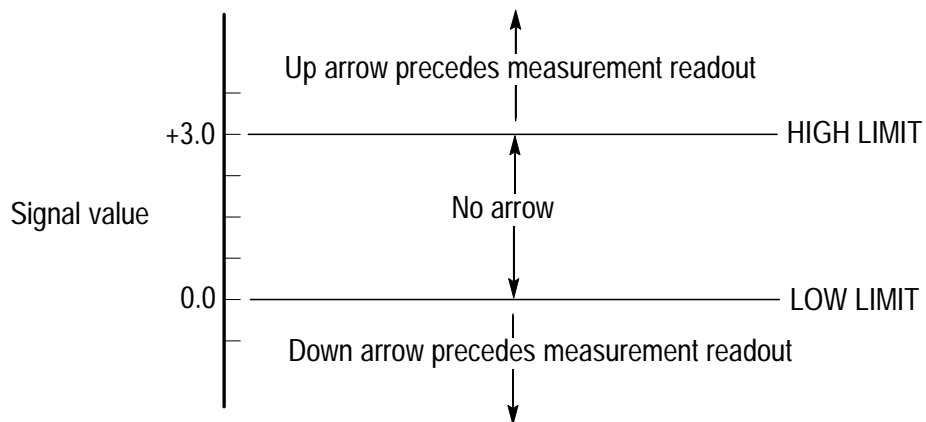


Figure 2–14: Typical high-limit error display

When measurements are reported remotely, exceeded limits are indicated by a  $>$  or  $<$  symbol placed to the right of the measurement value, followed by the limit value that was violated. The symbol

indicates that the measurement value is either greater than or less than the high or low limit value. See Figure 2–15.



**Figure 2–15: Limit Violation**

This completes the *Tutorial*.



# Reference





# General Feature Reference

The *Reference* section provides advanced information about the video measurement set features. It is divided into the following subsections:

- *General Feature Reference* explains how to use the basic instrument features that are controlled from the front panel
- *Taking NTSC Measurements* on page 3–17 explains how to take each of the built-in NTSC measurements using a VM100
- *Taking PAL Measurements* on page 3–43 explains how to take each of the built-in PAL measurements using a VM101

Within the *General Feature Reference* section you will find detailed information about features you access from the front panel, including the following:

- *Signal Averaging* on page 3–2 explains how to use the averaging function
- *Freezing the Measurement Activity* on page 3–3 provides detailed information about the freeze feature
- *Using Signal Identification* on page 3–3 explains how to use the SIG ID feature
- *Using Memory Functions* on page 3–6 explains how to use each memory function
- *Printing Measurement Results* on page 3–11 explains how to print test results, or upload them to a computer
- *Using the Waveform Monitor Control Function* on page 3–14 explains how to view the waveform on a monitor while the video measurement set takes measurements
- *Using the Zero Carrier Reference Pulse Output* on page 3–16 explains how to use the Zero Carrier Reference Pulse Output

## Signal Averaging

The AVG button is an on-off toggle switch that affects all of the measurements. An LED indicator located at the center of the button lights when averaging is ON. Use averaging to reduce the effect of noise on your signal measurements.

### How Averaging Works

The video measurement set performs signal averaging by taking a signal-to-noise measurement on the input signal using a quiet line. From the signal-to-noise measurement, the video measurement set determines how much averaging is needed to meet the measurement accuracy specification for each measurement that is configured to ON through the CONFIG menu. Higher signal-to-noise ratios require less averaging. The video measurement set can then take measurements more quickly.

### Display Update Rate

Averaging and the absence of necessary input signals are two factors that affect the update rate of the display.

When averaging is OFF, the video measurement set does not take a signal-to-noise measurement on the input signal. The result is a faster display update rate.

---

**NOTE.** *When averaging is turned OFF, high noise levels may reduce measurement accuracy.*

---

Some measurements, such as group delay, require certain types of input signals to the video measurement set. The display rate decreases if the proper signals are missing and these measurements are configured ON. Under these conditions the display rate is slower when averaging is ON. To increase the display rate, turn averaging OFF or configure to OFF the measurements that require additional signals. See page 1–9 for configuration instructions.

## Freezing the Measurement Activity

The FREEZE button is an on-off toggle switch. An LED indicator located at the center of the button lights when freeze is ON.

Freeze mode stops all acquisition and measurement activity, stabilizing the measurement results on the display. Use freeze to view intermediate measurement and signal ID results when the signal contains excessive noise or when changing VITS.

In MANUAL SIGNAL IDENTIFICATION mode, you can change signals for measurement quickly by turning FREEZE on and holding the ← or → arrow button down; releasing the arrow button will cause the new signal to be identified. Remember to turn FREEZE off to resume measurement.

---

**NOTE.** *No new measurements are performed while FREEZE is on. The REPort and MEMory:SAVe commands use the results that were present when FREEze was pressed.*

---

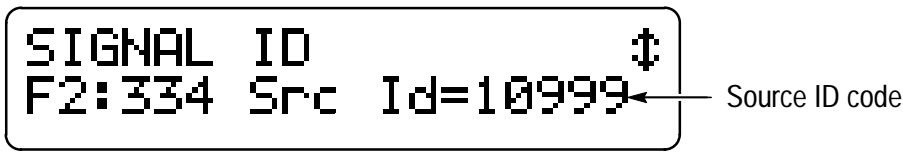
## Using Signal Identification

The SIG ID menu displays the test signals within the VITS or FULL signal identification range that are present in the video signal applied to the INPUT connector. The SIG ID display (Figure 3–1) contains the name, location, and when available, the decoded source ID code. When using a Tektronix VITS 100 or VITS 200 inserter, you can use this code to identify the channel from which saved or printed measurements were taken.

---

**NOTE.** *The SIG ID menu is not used if the MAN signal identification range is selected. The signals can be identified by selecting each field and line for the sync measurement.*

---



**Figure 3-1: Example of a SIG ID display with source ID code**

SIG ID information is saved into memory with the measurement results when using the MEM menu.

### Using SIG ID

Press the SIG ID button to view the SIG ID menu. When SIG ID is ON, an LED indicator located at the center of the button lights. Use the ↓ or ↑ arrow buttons to scroll through the screens. After you view the last screen in the list, the first SIG ID screen appears the next time you press the ↓ arrow button. Refer to page 2-12 for step-by-step instructions on using SIG ID.

### Customizing SIG ID

The CONFIG menu contains two parameters that customize the SIG ID feature: SIG ID RANGE and FULL FLD START.

The SIG ID RANGE selections are VITS and FULL (full field). VITS mode directs the video measurement set to take samples only during the vertical interval. This is the normal operating mode for performing in-service tests. FULL (full field) mode directs the video measurement set to take samples of the active video lines. If you are transmitting a full field test signal (when the channel is out of service) use FULL mode to measure the signal.

When FULL mode is active the FULL FLD START parameter allows you to configure the line on which to start taking measurements in field 1. Using this feature you can sample a specific line of interest. Sampling occurs at the following intervals:

- VM100: every 13 lines
- VM101: every 16 lines

If you have a VM101 and need to sample line 73, select 25 as the starting line. Samples will then occur on lines 41, 57, 73, 87, and so on. Using the same example for the VM100, start on line 21 to sample line 73. See page 1–11 for configuration instructions.

### SIG ID Applications

For VM100 users, SIG ID verifies the presence of the closed caption signal, as specified in the following federal regulation on telecommunications, 47 CFR §76.606, (Section b):

As of July 1, 1993, the operator of each cable television system shall deliver intact closed captioning data contained on line 21 of the vertical blanking interval, as it arrives at the head end or from another origination source, to subscriber terminals and (when so delivered to the cable system) in a format that can be recovered and displayed by decoders meeting §15.119 of this chapter.

For VM100 and VM101 users, SIG ID identifies the signals in Table 3–1 and the signals listed on page 3–19 (NTSC) and page 3–45 (PAL).

**Table 3–1: Additional signals identified by SIG ID mode**

NTSC Signals	PAL Signals
Teletext, VITC, Closed Caption, Zero Carrier Reference Pulse (ZCR Pulse), Source ID (Tektronix VITS 100, VITS 200), Color Bars, Cable Sweep ,VIRS	CCIR Line 331, VITC, Teletext, Colour Bars, UK ITS II, Source ID (Tektronix VITS 201)

## Using Memory Functions

The MEM button provides access to 25 memory locations for storing the current measurement and SIG ID results. Each saved memory location is time and date stamped. Once you save the measurement results, you can rename, view, replace, or erase the memory contents or upload them to a computer. The following procedures explain how to use the memory functions.

---

**NOTE.** *No new measurements are performed while the FREEZE or CONFIG lights are on. The REPort and MEMory:SAVe commands use the results that were present when either button was pressed.*

---

### Saving Measurement Results to Memory

Use the following procedure to save measurement results to a new memory location. If the save is successful, the next screen allows you to rename the saved memory for easy identification.

1. Press the **MEM** button.
2. Press the ↵ enter button to store the latest measurement results into new memory. Your display should resemble Figure 3–2.

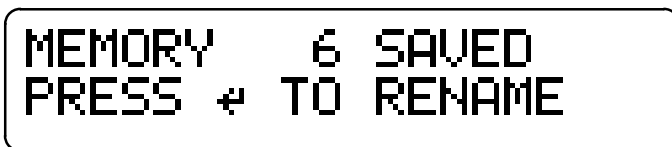


Figure 3–2: Example of display after saving to memory

---

**NOTE.** *The memory is full if the message MEMORY FULL, ERASE OR REPLACE appears. You must erase or replace an existing memory location before saving the current measurement results.*





*The complete name of the memory for the example in Figure 3–2 is UNNAMED–06.*




---

### Renaming Saved Memory Locations

After saving measurement results to a new memory location, you can accept the default name (UNNAMED-00 to UNNAMED-24) or rename the memory location. Memory names can have up to ten characters. Use the following procedure to rename a saved memory location.

**NOTE.** You cannot use the same name for more than one memory location, or the name UNNAMED-XX, where “XX” is any combination of characters.

1. 	2. 	3. 	4. 
Press the MEM button.	Select PRESS ↓ TO RENAME.	Select the memory location to be renamed.	Press the ↓ enter button.

5. 	6. 	7. 
Select the first character of the new name (Figure 3-3).	Select the next character. Add characters until the name is complete.	Press the ↓ enter button to accept the new name.

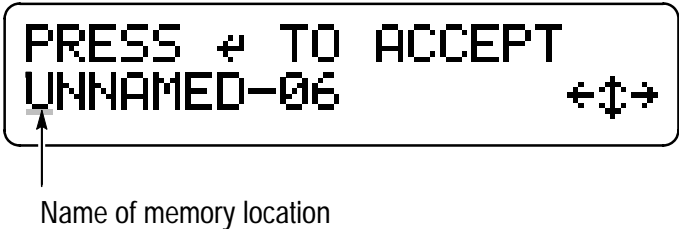









Figure 3-3: Renaming a memory location

### Viewing Memory Contents

After saving measurement results to a new memory location, you can recall the results for viewing. The first display you will see is the date and time stamp that shows when the measurement was taken (Figure 3-4). Use the following procedure to view the memory contents.









Figure 3-4: Date and time stamp display

1. 	2. 	3. 	4. 	5. 
Press the <b>MEM</b> button.	Select <b>PRESS</b>  <b>TO VIEW.</b>	Select the memory location to view.	Press the  enter button.	Scroll through the measurement results.

### Replacing a Memory Location





You can replace a memory location with new measurement results. You might use the replace function to update an existing memory location or to replace an unwanted location with new data. Use the following procedure to replace a memory location.

1. 	2. 	3. 	4. 
Press the <b>MEM</b> button.	Select <b>PRESS</b>  <b>TO REPLACE MEMORY.</b>	Select the memory location to replace.	Press the  enter button to replace the memory.






### Erasing Memory Locations

You can erase the contents of a single memory location or all 25 memory locations at the same time. Use the following procedure to erase one saved memory location.

1. 	2. 	3. 	4. 
Press the <b>MEM</b> button.	Select <b>PRESS ↵ TO ERASE MEMORY.</b>	Select the memory location to erase.	Press the ↵ enter button to erase the memory location.

Use the following procedure to erase all saved memory locations.

1. 	2. 	3. 
Press the <b>MEM</b> button.	Select <b>PRESS ↵ TO ERASE ALL MEMORY.</b>	Press the ↵ enter button two times to erase all memory.

**NOTE.** After erasing all memory locations, you cannot perform the view, rename, replace, and erase functions. The memory must contain at least one saved memory location to perform these functions.

## Uploading Memory Contents to a Computer

You can upload measurement results from the video measurement set memory to a computer. Use the following procedure.

---

**NOTE.** *Be sure that you have configured the video measurement set RS-232 serial port for operation with your computer. See page 1–15 for detailed instructions.*

---

1. Connect the video measurement set to your computer. Refer to *Appendix B: Remote Control* for a detailed description of the RS-232 serial port.
2. Run a terminal emulator or communication program on the computer.

---

**NOTE.** *To avoid data transfer problems, do not use a file transfer protocol such as Kermit or XMODEM.*

---

3. To upload memory contents send one of the following commands:

To upload all memory contents send the command:

MEMory:RECall:ALL? (page B–67)

To upload all results saved in a specific memory location send the command:

MEMory:RECall? <string> (page B–66)

To upload only the results of a one measurement saved in a specific memory location send the command:

MEMory:RECall? <string> (page B–66)

4. Use the terminal emulator or communication program to capture the results that are displayed on the PC screen.

## Printing Measurement Results

Use the PRINT button to print current measurement and signal ID results or the contents of a saved memory location. You can add a title that appears on the printout.

---

**NOTE.** *No new measurements are performed while the FREEZE or PRINT lights are on. The REPort and MEMory:SAVe commands use the results that were present when either button was pressed.*

---

Before printing measurement results you need to connect the printer to the RS-232 serial port on the video measurement set as shown in Figure 3–5. If you need more detailed information about the RS-232 serial port, refer to *RS-232 Interface* on page B–1. You must also configure the video measurement set RS-232 serial port for printer operation, and select RS-232 parameters that match the printer parameters. Refer to page 1–14 for configuration instructions.

---

**NOTE.** *Be sure your printer has paper and is online before you print measurement results.*

---

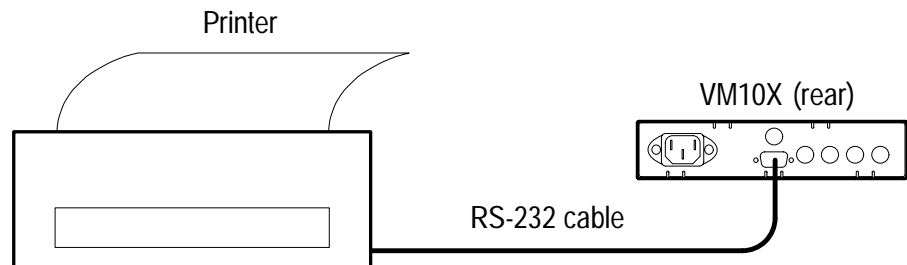





Figure 3–5: Connecting to a printer





### Printing Current Measurement Results

You can send the current measurement results directly to a printer. Be sure to connect a signal to the video measurement set in order to obtain current measurement results. Use the following procedure.

1. 	2. 	3. 
Press the <b>MEAS</b> button to turn on measurement mode.	Press the <b>PRINT</b> button.	Press the ↵ enter button to start printing.

### Adding a Title

Use the following procedure to add a title before you print the current measurement results. Be sure to connect a signal to the video measurement set in order to obtain current measurement results.

1. 	2. 	3. 	4. 
Press the <b>MEAS</b> button to turn on measurement mode.	Press the <b>PRINT</b> button.	Select PRESS ↵ TO ADD TITLE.	Press the ↵ enter button.








5. 	6. 	7. 
Select the first character of the title.	Select the next character (Figure 3-6). Add characters until the title is complete.	Press the ↵ enter button two times to accept the title and to start printing.



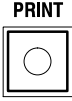


Figure 3-6: Adding a title

**Printing Memory Locations**

Use the following procedure to print the contents of one memory location.

1.		2.		3.		4.	
	Press the <b>PRINT</b> button.		Select PRESS ↵ TO PRINT MEMORY.		Select the memory location to print.		Press the ↵ enter button to print the memory contents.

Use the following procedure to print the contents of all memory locations.

1.		2.		3.	
	Press the <b>PRINT</b> button.		Select PRESS ↵ TO PRINT ALL MEMORY.		Press the ↵ enter button to print the memory contents.

## Using the Waveform Monitor Control Function

The waveform monitor control function allows you to simultaneously view the waveform on a 1740A-series waveform monitor while the video measurement set measures the signal parameters. The video measurement set automatically sends line select commands to the waveform monitor to control the monitor display. The resulting waveform display is the video line where the video measurement set is performing measurements.

---

**NOTE.** For your convenience, Tektronix offers a kit that provides the instructions and hardware needed to connect the video measurement set and waveform monitor. After installing the kit, the video measurement set and waveform monitor are portable as a single unit. See page 1–4 for ordering information.

---

### RS-232 Connections for the Control Function

To connect the video measurement set to the 1740A-series waveform monitor, use a cable with the pinouts shown in Figure 3–7.

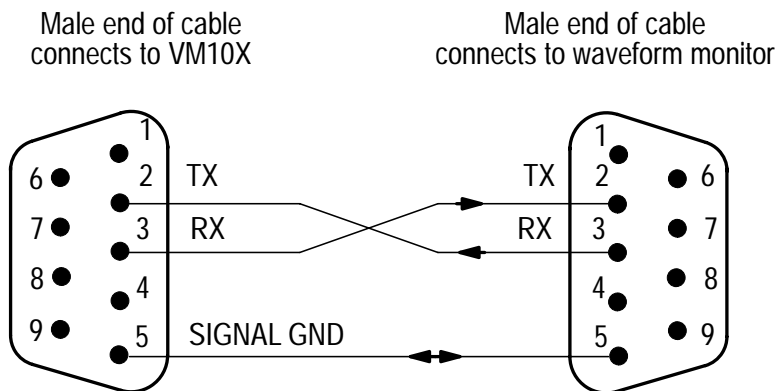


Figure 3–7: Cable pinout for waveform monitor control function

When you configure the video measurement set for control, it automatically selects the communications settings shown in Table 3–2:

**Table 3–2: Control function communications parameters**

Parameter	Automatic Setting
BAUD RATE	9600
STOP BITS	1
PARITY	NONE
FLOW CTL	NONE

### Using the Control Function

Perform the following steps to use the control function:

1. Connect a cable between the RS-232 serial ports on the video measurement set and waveform monitor. See Figure 3–7 for the cable pinout requirements.
2. Power on the video measurement set and waveform monitor.
3. Using the CONFIG menu, configure the video measurement set for the control function (see page 1–17 for detailed instructions).
4. Configure the waveform monitor remote control port for 9600 baud.
5. Set the waveform monitor display mode to Line Select.
6. Connect the video signal to the video measurement set and waveform monitor input connectors.
7. On the video measurement set, press the MEAS button to cause the waveform monitor to display the video signal.

Once configured, the waveform monitor automatically displays the video line currently being measured by the video measurement set.

## Using the Zero Carrier Reference Pulse Output

The video measurement set provides a zero carrier reference pulse (ZCRP) trigger output through the rear panel BNC. Signal amplitude is 1.5 V<sub>p-p</sub> when driving a 75 Ω load or TTL-compatible when driving a high impedance. The output signal is compatible with the following Tektronix demodulators:

- TDM5 Television Demodulator (DS1200 System)
- 1340 Television Demodulator (System M)
- 1350 Television Demodulator
- 1450 Series Television Demodulator System

### Connecting to a Demodulator

To use the zero carrier reference pulse output signal, connect the rear-panel BNC to the ZCRP trigger input of a demodulator. Use a 75 Ω coaxial cable. You must configure the demodulator to accept an external trigger signal. Depending on your application, you must configure the pulse to OFF or to a video line from 10 to 20 (VM100) or 7 to 20 (VM101). Refer page 1–10 for configuration instructions.

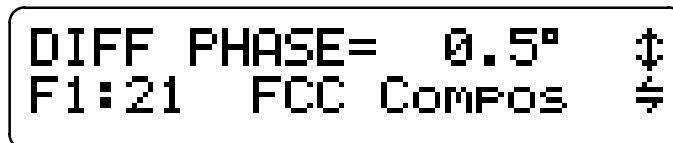
### Zero Carrier Reference Pulse Output Applications

The ZCRP output is often connected to a demodulator to take a hum measurement according to the RS250 measurement technique. The video measurement set trigger controls when the ZCR pulse from the demodulator appears in the video signal.



## Taking NTSC Measurements (VM100)

When you press the MEAS button, the video measurement set performs a series of signal measurements. When measurements are being taken, an LED indicator located at the center of the button is lit. Shortly after pressing the MEAS button, the LCD display shows the results of the first measurement (Figure 3–8). You can then press the ↓ or ↑ arrow button to scroll through the measurement results screens or press the ← or → arrow button to view the measurement results for each field, line, and signal on which the measurement was taken.



DIFF PHASE= 0.5°    ⚡  
F1:21    FCC Compos    ⚡

Figure 3–8: Example of differential phase measurement results

---

**NOTE.** Each time you select a new signal, wait a few seconds for the measurement results to appear on the display. If only one signal is available the measurement results will not change.

---

In MANUAL SIGNAL IDENTIFICATION mode, you can change signals for measurement quickly by turning FREEZE on and holding the ← or → arrow button down; releasing the arrow button will cause the new signal to be identified. Remember to turn FREEZE off to resume measurement.

The video measurement set continues to take measurements as long as the MEAS mode is ON. You can take the following NTSC signal measurements:

- Differential Phase (DIFF PHASE)
- Differential Gain (DIFF GAIN)

- Chrominance-to-Luminance Delay (YC DELAY)
- Chrominance-to-Luminance Gain (YC GAIN)
- Signal-to-Noise Ratio (SNR WGT/FLAT)
- Frequency Response (FREQ FCC)
- Frequency Response Detail (FREQ FLAG, FREQ #1 through FREQ #6) or (FRQmax and FRQmin)
- Group Delay (GRPDLYmax and GRPDLYmin)
- Sync Amplitude (SYNC AMPL)
- Burst Amplitude (BURST AMPL)
- Bar Amplitude (BAR AMPL)
- 2T K-Factor (2T K-FACTOR)
- Luminance Nonlinearity (LUM NON-LIN)
- Hum (HUM P-P, 50/60 Hz, and 100/120 Hz)

You can configure measurements ON or OFF using the CONFIG menu. The video measurement set only performs measurements that are configured ON. Refer to page 1–9 for configuration instructions.

The video measurement set requires an appropriate VITS on the video input to take signal measurements. Table 3–3 lists the VITS in order of their priority of selection. If the video measurement set cannot detect an appropriate signal for a measurement, the measurement will not be completed. Under these conditions, the message SIGNAL NOT AVAILABLE appears on the LCD display. The display update speed decreases if you take measurements when the necessary VITS is not available. You can increase the display rate by configuring unwanted measurements to OFF.

---

**NOTE.** *The VITS used can be on any line from Field 1 Line 10 to 22, and from Field 2 Line 10 to 22.*

*Line 9 is shown but is labelled “not used.”*

---

Table 3–3: VITS signals used for NTSC measurements

Measurement	Signals Used
Differential Phase/Gain (DIFF PHASE/DIFF GAIN)	FCC Composite, NTC7 Composite, Modulated Ramp, Modulated 5/10-Step
Chroma-Luma Delay/Gain (YC DELAY/ YC GAIN)	FCC Composite, NTC7 Composite, Pulse & Bar, Multipulse, Color Multipulse
Signal-to-Noise Ratio (SNR WGT/FLAT)	Quiet Line, 0 Pedestal
Frequency Response (FREQ)	Multiburst, NTC7 Combo, Philips® GCR, Sin(x)/x
Group Delay (GRPDLYmax/min)	Sin(x)/x, Philips® GCR
Sync Amplitude (SYNC AMPL)	Sync (bottom line of screen displays which video line was used)
Burst Amplitude (BURST AMPL)	VM100 begins on field 1, line 10, and checks for first available line with burst. Bottom line of screen displays which signal was used.
Bar Amplitude (BAR AMPL)	FCC Composite, NTC7 Composite
2T K-Factor (2T K-FACTOR)	FCC Composite, NTC7 Composite, Pulse & Bar, Multipulse, Color Multipulse
Luminance Nonlinearity (LUM)	Modulated 5-Step, Luminance Ramp, Luminance 5/10-Step, FCC Composite, NTC7 Composite
Hum (HUM)	Measured during sync tip. Normalized to % using ZCR Pulse if found in the vertical blanking interval. Otherwise units are IRE.

## Measuring Differential Phase

Differential phase distortion, often referred to as “diff phase” or “dP,” is present if the chrominance phase of a signal is affected by luminance level. This phase distortion results when a system is unable to uniformly process the high-frequency chrominance information at all luminance levels. Ideally, the measurement is taken over a wide range (10% to 90%) of full-field average picture levels.

When differential phase distortion is present, changes in hue occur when the picture brightness changes. Colors may not be properly reproduced, particularly in high-luminance parts of the picture.

### Detailed Measurement Description

The video measurement set provides a precision differential phase distortion measurement. You can verify compliance with the federal regulation on telecommunications, 47 CFR §76.605, (Section 12. iii):

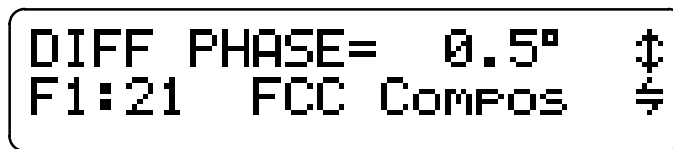
The differential phase for the color subcarrier of the television signal which is measured as the largest phase difference in degrees between each segment of the chrominance signal and reference segment (the segment at the blanking level of 0 IRE), shall not exceed  $\pm 10$  degrees.

One of the following signals must be present at the input to measure differential phase using the VM100:

- NTC7 Composite
- FCC Composite
- Modulated Ramp
- Modulated 5- or 10-Step Staircase

### Measurement Results

Figure 3–9 shows an example of the DIFF PHASE measurement results. The top line shows the measured results. The bottom line shows the field, line, and signal type on which the measurement was taken.



```
DIFF PHASE= 0.5°  †
F1:21  FCC Compos  ‡
```

**Figure 3–9: Differential phase measurement screen**

The measurement result reflects the phase shift of the signal relative to the first luminance level (zero). If you use a modulated staircase signal (such as 5-step of FCC or NTC7 Composite signals, or full-line modulated 5- or 10-step staircase), the error is measured at each step (luminance level). If you use a ramp, six equal segments of the ramp are averaged to produce the measurement result relative to the first segment.

When the video measurement set cannot lock onto the color burst signal, it displays an asterisk (\*). Normally the video measurement set locks to the color burst pulse. If burst lock is not possible, the video measurement set uses sync lock to take the measurement. Under these conditions the measurement accuracy may not be within specifications.

Burst lock is not possible where no burst signal is present. You can take a BURST AMPL measurement to determine if a burst signal is present. If the measured burst amplitude is near zero, then burst is not present. A normal burst amplitude level may indicate other problems such as interference or scrambling.

## Measuring Differential Gain

Differential gain, often referred to as “diff gain” or “dG,” is present if the chrominance gain is affected by luminance level. This amplitude distortion results when a system is unable to uniformly process the high-frequency chrominance signal at all luminance levels. Ideally, the measurement is taken over a wide range (10% to 90%) of full-field average picture levels.

When differential gain is present, color saturation has an unwarranted dependence on luminance level. Color saturation is often improperly reproduced at high luminance levels.

### Detailed Measurement Description

The video measurement set provides a precision differential gain distortion measurement. You can verify compliance with the federal regulation on telecommunications, 47 CFR §76.605, (Section 12. ii):

The differential gain for the color subcarrier of the television signal, which is measured as the difference in amplitude between the largest and smallest segments of the chrominance signal (divided by the largest and expressed in percent), shall not exceed  $\pm 20\%$ .

---

**NOTE.** *The definition becomes ambiguous when either the luminance or chrominance pulse shapes are distorted.*

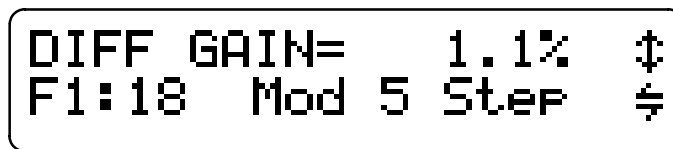
---

One of the following signals must be present at the input to measure differential gain using the VM100:

- NTC7 Composite
- FCC Composite
- Modulated Ramp
- Modulated 5- or 10-Step Staircase

### Measurement Results

Figure 3–10 shows an example of the DIFF GAIN measurement results. The top line shows the measured results. The bottom line shows the field, line, and signal type on which the measurement was taken. The measurement result shows the largest deviation from reference chrominance (the chrominance portion superimposed on 0 IRE, expressed as percent of the largest chrominance amplitude).



```
DIFF GAIN= 1.1%  ‡
F1:18 Mod 5 Step  ‡
```

Figure 3–10: Differential gain measurement screen

Signals such as NTC7 Composite (and some modulated ramps and staircases) exceed 100 IRE prior to transmission. If the modulator under test contains a clipping circuit (90% modulation), clipping may occur on the fifth step of the NTC7 Composite and other 5-step signals that exceed 100 IRE, and the ninth and tenth step of 10-step signals. To avoid clipping, use the FCC Composite signal whenever possible to take differential gain measurements.

## Measuring YC Delay

Chrominance-to-luminance delay inequality (relative chrominance time) is the difference between the time required for the chrominance and luminance portions of the signal to pass through a system.

Delay distortion causes color smearing or bleeding; you will often see it at the edges of objects in the picture. It may also cause poor reproduction of sharp luminance transitions.

### Detailed Measurement Description

The video measurement set provides a chrominance-to-luminance delay measurement that verifies compliance with the federal regulation on telecommunications, 47 CFR §76.605, (Section 12. i):

The chrominance-luminance delay inequality (or chroma delay), which is the change in delay time of the chrominance component of the signal relative to the luminance component, shall be within 170 nanoseconds.

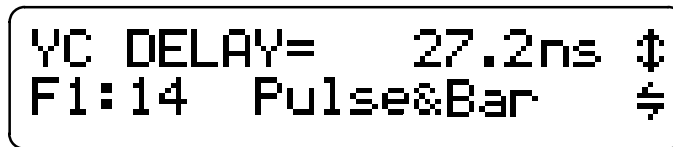
One of the following signals must be present at the input to measure chrominance-to-luminance delay using the VM100:

- NTC7 Composite
- FCC Composite
- Pulse & Bar with a modulated 12.5 T pulse
- Multipulse
- Color Multipulse

### Measurement Results

Figure 3–11 shows an example of the YC DELAY measurement results. The top line shows the measured delay, expressed in nanoseconds. The bottom line shows the field, line, and signal type on which the measurement was taken. The number is positive for delayed chrominance and negative for advanced chrominance. A perfect signal has no delay (0 ns).





YC DELAY= 27.2ns †  
F1:14 Pulse&Bar ‡

**Figure 3–11: Chrominance-to-luminance delay measurement screen**

When the video measurement set cannot lock onto the color burst signal, it displays an asterisk (\*). Normally the video measurement set locks to the color burst pulse. If burst lock is not possible, the video measurement set uses sync lock to take the measurement. Under these conditions the measurement accuracy may not be within specifications.

Burst lock is not possible where no burst signal is present. You can take a BURST AMPL measurement to determine if a burst signal is present. If the measured burst amplitude is near zero, then burst is not present. A normal burst amplitude level may indicate other problems such as interference or scrambling.

---

**NOTE.** *Frequency response aberrations that occur only in a narrow band near the subcarrier frequency can affect the YC Delay measurement results.*

---

## Measuring YC Gain

Chrominance-to-luminance gain inequality (relative chrominance level) is a function of the difference between the gain of the chrominance and the luminance signal components as they pass through a system.

Gain errors most commonly appear as attenuation or peaking of the chrominance information. The resulting picture has incorrect color saturation.

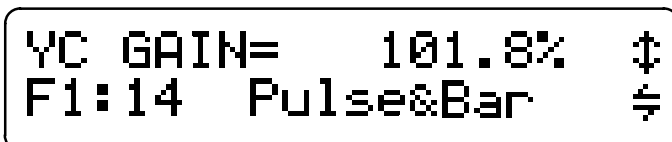
### Detailed Measurement Description

One of the following signals must be present at the input to measure chrominance-to-luminance gain using the VM100:

- NTC7 Composite
- FCC Composite
- Pulse & Bar with a modulated 12.5 T pulse
- Multipulse
- Color Multipulse

### Measurement Results

Figure 3–12 shows an example of the YC GAIN measurement results. The top line shows the measured results. The bottom line shows the field, line, and signal type on which the measurement was taken. The measurement result shows the ratio of chrominance gain to luminance gain. A perfect signal has a 100% YC gain.



```
YC GAIN=    101.8%  †
F1:14  Pulse&Bar  ‡
```

Figure 3–12: Chrominance-to-luminance gain measurement screen

## Measuring Signal-to-Noise Ratio

Noise refers to the fluctuations that are present in any electrical system. Noise can be either random or coherent. It comes from a variety of natural and man-made sources. Although some noise is always present, an excessive amount is undesirable because it degrades or obscures the signal.

Signal amplitudes do not always remain constant as the video signal is processed and transmitted. For this reason an absolute measurement of noise is not relevant; noise has a different affect on signals of different amplitudes. The video measurement set measures signal-to-noise ratio in decibels (dB) because it is the amount of noise relative to the signal amplitude rather than the absolute amount of noise that tends to cause problems.

Noisy pictures often appear grainy or snowy. You may see sparkles of color, blurriness, and a general lack of picture resolution. Equipment often has trouble synchronizing to extremely noisy signals.

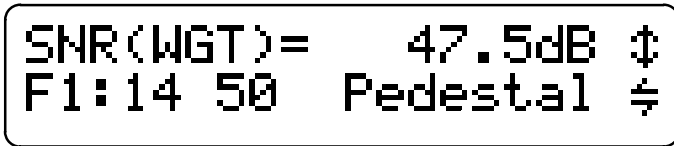
### Detailed Measurement Description

One of the following signals must be present at the input to measure signal-to-noise ratio using the VM100:

- Quiet line
- Black burst (setup)
- Pedestal

### Measurement Results

Figure 3–13 shows an example of the SNR measurement results. The top line shows the measured results displayed in dB; large values indicate good signal quality. The bottom line shows the field, line, and signal type on which the measurement was taken.



SNR(WGT) = 47.5dB ♂  
F1:14 50 Pedestal ♂

**Figure 3–13: Signal-to-noise ratio measurement screen**

The video measurement set uses an EIA RS250B noise filter for noise weighting. The RMS noise amplitude from the filter is referenced to 100 IRE; the reference is not the signal amplitude.

You can configure the video measurement set to use either a weighted or flat filter when taking signal-to-noise measurements (refer to page 1–13 for configuration instructions). Use the weighted filter to provide additional weighting for low frequency noise that is more visible at lower test frequencies. For example, you would use this filter to estimate the image degradation due to noise. Use the flat filter for applications that require equal spectral weighting for all frequency components within the 5 MHz test bandwidth.

The following formula defines the S/N measurement:

$$S/N \text{ ratio } dB = 20 \log \left( \frac{100 \text{ IRE}}{RMS \text{ Noise}} \right)$$

## Measuring Frequency Response (FCC)

Frequency response measurements test the ability of a system to uniformly transfer signal components of different frequencies without affecting their amplitudes. This parameter, also known as gain/frequency distortion or amplitude versus frequency response, evaluates the system amplitude response.

The amplitude variation may be expressed in decibels (dB), percent, or IRE. The reference amplitude (0 dB = 100%) is the white bar flag or a low frequency. Measured frequency response results are only meaningful if they contain three components:

- Measured amplitude
- Frequency at which the measurement was taken
- Reference amplitude

Frequency response problems cause a wide variety of picture aberrations.

### Detailed Measurement Description

One of the following signals must be present at the input to measure frequency response using the VM100:

- Multiburst
- NTC7 Combo
- GCR
- $\text{Sin}(x)/x$

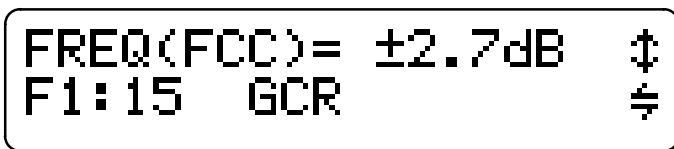
Table 3–4 shows the packet frequencies for the multiburst signals that can be used.

**Table 3-4: Packet frequencies for measuring frequency response**

Signal	Packet Frequency (MHz)						Amplitude	Flag (IRE)
	1st	2nd	3rd	4th	5th	6th		
1410 Multiburst Reduced	.5	1.25	2.0	3.0	3.58	4.1	60 IRE <sub>p-p</sub>	10+60 IRE
1410 Multiburst Full	.5	1.25	2.0	3.0	3.58	4.1	90 IRE <sub>p-p</sub>	10+90 IRE
FCC Multiburst	.5	1.25	2.0	3.0	3.58	4.1	60 IRE <sub>p-p</sub>	40+60 IRE
TSG170 Multiburst	.5	1.00	2.0	3.0	3.58	4.2	70 IRE <sub>p-p</sub>	10+60 IRE
Cable Multiburst	.5	1.25	2.0	3.0	3.75	4.0	60 IRE <sub>p-p</sub>	60 IRE
NTC7 Combo	.5	1.00	2.0	3.0	3.58	4.2	50 IRE <sub>p-p</sub>	50+50 IRE

**Measurement Results**

Figure 3-14 shows an example of the FREQ (FCC) measurement results. The top line shows the measured results expressed in ± dB. The bottom line shows the field, line, and signal type on which the measurement was taken.



**Figure 3-14: Frequency response measurement screen**

Multiburst or NTC7 Combo signals contain discrete frequency packets. The VM100 uses the envelope of each packet to determine the amplitude. It calculates the results using the FCC method. First the video measurement set determines the average amplitude of the six packets. It then finds the maximum and minimum amplitudes in dB relative to the reference flag amplitude. The VM100 uses the following formula calculate the measurement result which is expressed in ±dB. A + indicates gain and a – indicates attenuation.

$$\text{Frequency Response dB} = \left( \frac{\text{Max difference dB} - \text{Min difference dB}}{2} \right)$$

If the input signal is  $\sin(x)/x$  or GCR (ghost cancelling reference), the VM100 takes a fine resolution, continuous frequency response measurement.

---

**NOTE.** Use of a  $\sin(x)/x$  signal may result in a lower signal-to-noise ratio than other signals.

---

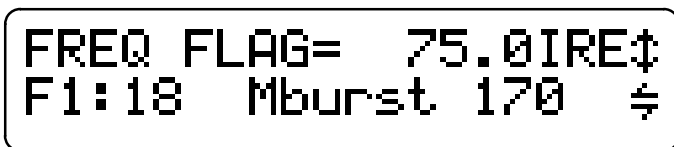
## Measuring Frequency Response Detail

The video measurement set provides two types of frequency response measurements. The basic frequency response measurement, which appears in the CONFIG MEASURE menu as **FREQ** and in the MEAS menu as **FREQ (FCC)**, is described on page 3–29. The second type of frequency response measurement is the frequency response detail. It appears in the CONFIG MEASURE menu as **FREQ DETAIL**.

The measurement results you see in the MEAS menu depend on the signal type that you used. Multiburst and NTC7 Combo signals contain discrete frequency packets. Sin(x)/x and GCR (ghost cancelling reference) contain constant levels of energy over their frequency range. For all signal types the top line of the measurement results screen shows the measured results. The bottom line shows the field, line, and signal type on which the measurement was taken.

### Multiburst and NTC7 Combo Signals

If the video measurement set measures a signal with discrete frequency packets, the flag (reference) amplitude is derived from the multiburst bar amplitude. The **FREQ FLAG** screen (Figure 3–15) shows the flag amplitude.



```
FREQ FLAG= 75.0IRE
F1:18 Mburst 170
```

**Figure 3–15: Frequency flag measurement results**

The following six screens, beginning with **FREQ #1**, show the amplitude of each successive packet measured relative to the flag reference. The first packet measurement is shown in Figure 3–16.



```

FREQ #1=      -0.1dB  †
F1:18  Mburst 170   ‡

```

Figure 3–16: Frequency detail screen showing first packet

### Sin(x)/x and Philips® GCR Signals

If the video measurement set measures a swept signal, the frequency detail measurement provides two screens: FRQmax and FRQmin.

The measurements (in dB) represent the maximum and minimum frequency response of the signal relative to the amplitude of the reference frequency (220 kHz). Following the measurement results you will see the frequency where the maximum or minimum amplitude was found (Figure 3–17). The frequency resolution is limited to 112 kHz. The maximum frequency is 3.9 MHz for sin(x)/x signals and 4.1 MHz for Philips GCR signals.

---

*NOTE. The limit settings for FRQmin and FRQmax respond only to the signal amplitude and not to the signal frequency.*

---

```

Fmax=      +1.2dB 3.6M†
F1:15  Sin(X)/X   ‡

```

Figure 3–17: Measurement screen showing maximum packet amplitude

## Measuring Group Delay

The GRPDLY (group delay) measurement determines the relative time delays (Max and Min) for the frequencies within the test signal. Group delay distortion is present when signal components of different frequencies experience different delays as they pass through a system.

Group delay problems can cause a lack of vertical line sharpness due to luminance pulse ringing, overshoot, or undershoot.

### Detailed Measurement Description

One of the following signals must be present at the input to measure group delay using the VM100:

- Philips® GCR
- Sin(x)/x

### Measurement Results

Figure 3–18 shows an example of the GRPDLY measurement screen for the maximum group delay. The top line shows the measured results, expressed in nanoseconds. The bottom line shows the field, line, and signal type on which the measurement was taken. You can also view the results of the minimum GRPDLY measurement.

The video measurement set measures the maximum and minimum group delay relative to the 220 kHz low frequency reference. The maximum frequency used in the measurement is 3.8 MHz.



```
GRPDLYmax=      15ns  †
F1:14  GCR      ‡
```

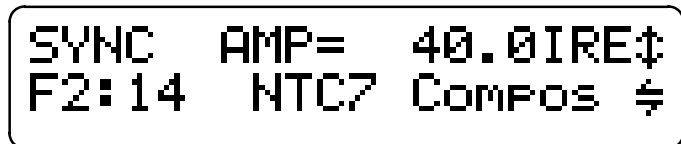
Figure 3–18: Group delay measurement screen

## Measuring Sync Amplitude

The sync amplitude measurement is an average, peak-to-peak measurement. Sync amplitude is an absolute measurement referenced to 714 mV and expressed in IRE units.

The sync amplitude measurement provides a rough indication of video signal quality. For example, sync amplitude measurements of less than 40 IRE may indicate problems such as improper termination, sync compression, or AGC (system gain). A low ratio between burst and sync might indicate chrominance attenuation.

Figure 3–19 shows an example of the SYNC AMPL measurement screen. The top line shows the measured results. The bottom line shows the field, line, and signal type on which the measurement was taken.



```
SYNC  AMP=  40.0IRE
F2:14  NTC7  Compos
```

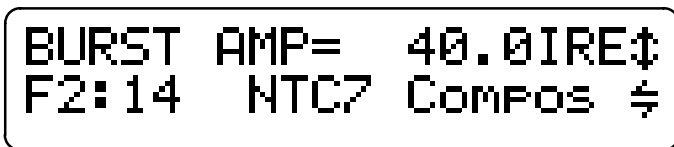
Figure 3–19: Sync amplitude measurement screen

## Measuring Burst Amplitude

The burst amplitude measurement is an absolute measurement referenced to 714 mV and expressed in IRE units.

If burst is missing from the entire field, the measurement result is very close to zero. For example, a monochrome signal has a measured burst amplitude of approximately 0 IRE.

Figure 3–20 shows an example of the BURST AMPL measurement screen. The top line shows the measured results. The bottom line shows the field, line, and signal type on which the measurement was taken.



```
BURST AMP= 40.0IRE‡  
F2:14 NTC7 Compos ‡
```

Figure 3–20: Burst amplitude measurement screen

## Measuring Bar Amplitude

The video measurement set uses either the FCC Composite or NTC7 Composite signal to measure bar amplitude. When the video measurement set locates either signal, it measures bar amplitude and expresses the results in IRE units.

Figure 3–21 shows an example of the BAR AMPL measurement screen. The top line shows the measured results. The bottom line shows the field, line, and signal type on which the measurement was taken.



```
BAR AMP= 40.0 IRE  
F2:14 NTC7 COMPOS
```

Figure 3–21: Bar amplitude measurement screen

## Measuring 2T K-Factor

Use the 2T K-factor measurement primarily to measure linear distortions indicating dispersion due to frequency response and group delay aberrations. Note that non-linear distortions may mask or otherwise affect the linear distortion measurement.

### Detailed Measurement Description

One of the following signals must be present at the input to measure 2T K-factor using the VM100:

- NTC7 Composite
- FCC Composite
- Pulse & Bar
- Multipulse
- Color Multipulse

The video measurement set uses the CCIR NTSC (CMTT) 2T K-Factor graticule to measure the distortion.

### Measurement Results

Figure 3–22 shows an example of the 2T K-FACTOR measurement screen. The top line shows the measured results. The bottom line shows the field, line, and signal type on which the measurement was taken. The displayed value represents the distortion relative to the 2T pulse amplitude, expressed in percent.



```
2T K-FACTOR= 12.2%  †
F1:14  FCC Compos  ‡
```

Figure 3–22: 2T K-factor measurement screen

## Measuring Luminance Nonlinearity

The video measurement set provides a luminance linearity measurement. Luminance linearity is defined as the difference between the largest and the smallest step amplitudes, expressed as a percentage of the largest step amplitude.

The video measurement set provides two methods of measuring luminance nonlinearity: normal and differential step (diff step). The normal method integrates the signal at the center of each step and compares the integrated signals to determine the nonlinearity. The differential step method uses the signal levels on either side of a step to determine the step height. These steps are compared to determine the nonlinearity.

When measuring the luminance nonlinearity of a ramp signal, the video measurement set locates the beginning and ending points on the ramp signal. It then divides the ramp into six equal segments to correspond with the six levels of a 5-step signal. The nonlinearity is then measured using the normal method, even if the differential step method is selected.

The normal method of measuring luminance nonlinearity used by the video measurement set does not use a differential step filter and is less susceptible to noise and high-frequency rolloff. The differential step method of luminance nonlinearity measurement is less susceptible to nonlinear line tilt, which can affect the accuracy of the luminance nonlinearity measurement when measured with the normal method.

### Detailed Measurement Description

One of the following signals must be present at the input to measure luminance nonlinearity using the VM100:

- Modulated 5-Step
- Luminance Ramp
- Luminance 5/10-Step
- FCC Composite
- NTC7 Composite

### Measurement Results

Figure 3–23 shows an example of the LUM NON-LIN measurement screen. The top line shows the measured results, expressed in percent. The bottom line shows the field, line, and signal type on which the measurement was taken. When the measurement is made using the differential step method, an asterisk (\*) is displayed.

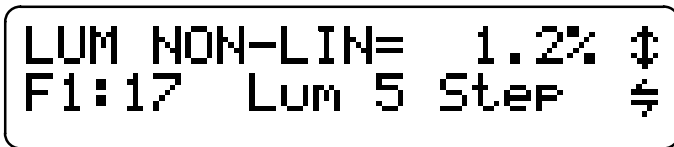


Figure 3–23: Luminance nonlinearity measurement screen

## Measuring Hum

The video measurement set provides a hum measurement that verifies compliance with the federal regulation on telecommunications, 47 CFR §76.605 (Section 11):

The peak-to-peak variation in visual signal level caused by undesired low frequency disturbances (hum or repetitive transients) generated within the system, or by inadequate low frequency response, shall not exceed 3 percent of the visual signal level.

Sync must be present at the input signal to take the hum measurement.

---

**NOTE.** You must configure the hum frequency to match the power line frequency in your area. Refer to page 1–12 for configuration instructions.

---

Figure 3–24 shows an example of the HUM measurement screen. The top line shows the three measured hum parameters in order from left to right:

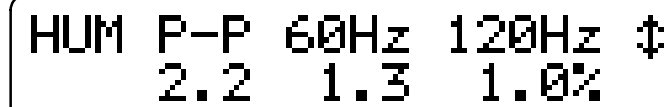


- Overall peak-to-peak transient and periodic low frequency interference
- 50/60 Hz line frequency peak-to-peak amplitude
- 100/120 Hz harmonic of line frequency peak-to-peak amplitude

---

**NOTE.** If any measured value exceeds 99.9, the characters “^^^” are displayed to indicate an overrange condition.

---

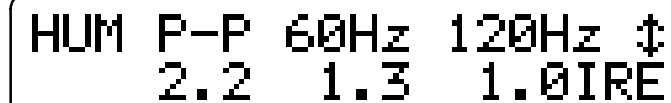


A screenshot of a measurement screen showing hum levels. The text is arranged in two rows. The first row contains the labels 'HUM P-P 60Hz 120Hz ‡'. The second row contains the numerical values '2.2 1.3 1.0%'. The entire text is enclosed in a rounded rectangular border.

**Figure 3–24:** Hum measurement screen with ZCR pulse

The bottom line shows the measured values. When the ZCR pulse is in use, hum is expressed as a percentage of visual carrier amplitude (Figure 3–24). This amplitude is represented at baseband by the difference between the amplitude of the zero carrier reference pulse and sync tip.

If the video measurement set cannot locate the zero carrier reference pulse, the hum measurement is expressed in IRE units (Figure 3–25). Refer to page 1–10 for configuration instructions for the zero carrier reference pulse.



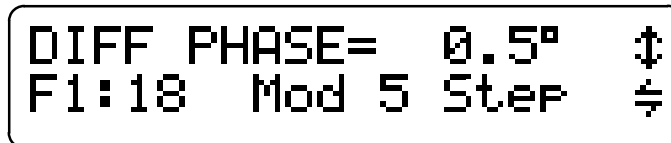
A screenshot of a measurement screen showing hum levels in IRE units. The text is arranged in two rows. The first row contains the labels 'HUM P-P 60Hz 120Hz ‡'. The second row contains the numerical values '2.2 1.3 1.0IRE'. The entire text is enclosed in a rounded rectangular border.

**Figure 3–25:** Hum measurement screen with no ZCR pulse



## Taking PAL Measurements (VM101)

When you press the MEAS button, the video measurement set performs a series of signal measurements. When measurements are being taken, an LED indicator located at the center of the button is lit. Shortly after pressing the MEAS button, you will see the results of the first measurement on the LCD display (Figure 3–26). You can then press the ↓ or ↑ arrow button to scroll through the measurement results screens or press the ← or → arrow button to view the measurement results for each field, line, and signal on which the measurement was taken.



```
DIFF PHASE= 0.5°  ⚡  
F1:18  Mod 5 Step  ⚡
```

Figure 3–26: Example of differential phase measurement results

In MANUAL SIGNAL IDENTIFICATION mode, you can change signals for measurement quickly by turning FREEZE on and holding the ← or → arrow button down; releasing the arrow button will cause the new signal to be identified. Remember to turn FREEZE off to resume measurement.

---

**NOTE.** Each time you select a new signal, wait a few seconds for the measurement results to appear on the display. If only one signal is available the measurement results will not change.

---

The video measurement set continues to take measurements as long as the MEAS mode is ON. You can take the following PAL signal measurements:

- Differential Phase (DIFF PHASE)
- Differential Gain (DIFF GAIN)

- Chrominance-to-Luminance Delay (YC DELAY)
- Chrominance-to-Luminance Gain (YC GAIN)
- Signal-to-Noise Ratio (SNR WGT/FLAT)
- Frequency Response (FREQ AVG)
- Frequency Response Detail (FREQ FLAG, FREQ #1 through FREQ #6) or (FRQmax and FRQmin)
- Group Delay (GRPDLYmax and GRPDLYmin)
- Sync Amplitude (SYNC AMPL)
- Burst Amplitude (BURST AMPL)
- Bar Amplitude (BAR AMPL)
- 2T K-Factor (2T K-FACTOR)
- Luminance Nonlinearity (LUM NON-LIN)
- Hum (HUM P-P, 50 Hz, and 100 Hz)

You can configure measurements ON or OFF using the CONFIG menu. The video measurement set only performs measurements that are configured ON. Refer page 1–9 for configuration instructions.

The video measurement set requires an appropriate test signal on the video input to take signal measurements. Table 3–5 lists the test signals in order of their priority of selection. If the video measurement set cannot detect an appropriate signal for a measurement, the measurement will not be completed. Under these conditions the message SIGNAL NOT AVAILABLE appears on the LCD display. The display update speed decreases if you take measurements when the necessary test signal is not available. You can increase the display rate by configuring unwanted measurements to OFF.

---

**NOTE.** *The test signals used can be on any line from 6 to 22, and from 318 to 335.*

*Line 5 is shown but is labelled “not used.”*

---

Table 3-5: Test signals used for PAL measurements

Measurement	Signals Used
Differential Phase/Gain (DIFF PHASE/DIFF GAIN)	CCIR Line 330, Modulated 5/10-Step, Modulated Ramp, UK ITS I, Oneline ITS
Chroma-Luma Delay/Gain (YC DELAY/ YC GAIN)	CCIR Line 17, UK ITS I, Oneline ITS, Oneline ITS Data
Signal-to-Noise Ratio (SNR WGT/FLAT)	Quiet Line, 0 Pedestal
Frequency Response (FREQ)	CCIR Line 18 (Multiburst), Philips® GCR, Sin(x)/x
Group Delay (GRPDLYmax/min)	Sin(x)/x, Philips® GCR
Sync Amplitude (SYNC AMPL)	Sync (bottom line of screen displays which video line was used)
Burst Amplitude (BURST AMPL)	VM101 begins on field 1, line 7, and checks for first available line with burst. Bottom line of screen displays which signal was used. Lines 6 and 319 are avoided.
Bar Amplitude (BAR AMPL)	CCIR Line 17, CCIR Line 330, UK ITS I, Oneline ITS, Oneline ITS Data
2T K-Factor (2T K-FACTOR)	CCIR Line 17, CCIR Line 330, UK ITS I, Oneline ITS, Oneline ITS Data
Luminance Nonlinearity (LUM NON-LIN)	Luminance 5/10-Step, Luminance Ramp, Modulated 5-Step, CCIR Line 17, CCIR Line 330, UK ITS I, Oneline ITS
Hum (HUM)	Measured during sync tip. Normalized to % using ZCR Pulse if found in the vertical blanking interval. Otherwise units are millivolts.

## Measuring Differential Phase

Differential phase distortion, often referred to as “diff phase” or “dP,” is present if the chrominance phase of a signal is affected by luminance level. This phase distortion results when a system is unable to uniformly process the high-frequency chrominance information at all luminance levels. Ideally, the measurement is taken over a wide range (10% to 90%) of full-field average picture levels.

When differential phase distortion is present, changes in hue occur when the picture brightness changes. Colors may not be properly reproduced, particularly in high-luminance parts of the picture.

### Detailed Measurement Description

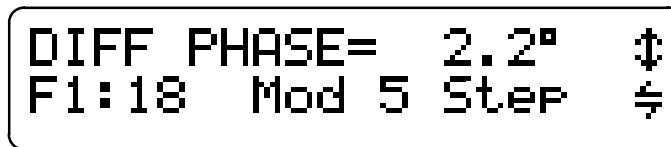
The video measurement set provides a precision differential phase distortion measurement. The measurement is performed as defined by CCIR Rec. 569-1, section 2.10b.

One of the following signals must be present at the input to measure differential phase using the VM101:

- CCIR Line 330
- Modulated 5- or 10-Step
- Modulated Ramp
- UK ITS I
- Oneline ITS

### Measurement Results

Figure 3–27 shows an example of the DIFF PHASE measurement results. The top line shows the measured results. The bottom line shows the field, line, and signal type on which the measurement was taken.



DIFF PHASE= 2.2° ⚡  
F1:18 Mod 5 Step ⚡

**Figure 3–27: Differential phase measurement screen**

The measurement result reflects the phase shift of the signal relative to the first luminance level (zero). If a modulated staircase signal (such as 5-step of composite signals or full-line modulated 5- or 10-step staircase) is used, the error is measured at each step (luminance level). If a ramp is used, six equal segments of the ramp are averaged to produce the measurement result. The measurement result displays the maximum distortion, expressed in degrees of subcarrier phase relative to the first segment.

When the video measurement set cannot lock onto the color burst signal, it displays an asterisk (\*). Normally the video measurement set locks to the color burst pulse. If burst lock is not possible, the video measurement set uses sync lock to take the measurement. Under these conditions the measurement accuracy may not be within specifications.

Burst lock is not possible where no burst signal is present. You can take a BURST AMPL measurement to determine if a burst signal is present. If the measured burst amplitude is near zero, then burst is not present. A normal burst amplitude level may indicate other problems such as interference or scrambling.

## Measuring Differential Gain

Differential gain, often referred to as “diff gain” or “dG,” is present if the chrominance gain is affected by luminance level. This amplitude distortion results when a system is unable to uniformly process the high-frequency chrominance signal at all luminance levels. Ideally, the measurement is taken over a wide range (10% to 90%) of full-field average picture levels.

When differential gain is present, color saturation has an unwarranted dependence on luminance level. Color saturation is often improperly reproduced at high luminance levels.

### Detailed Measurement Description

The video measurement set provides a precision differential gain distortion measurement. The measurement is performed as defined by CCIR Rec. 569-1, section 2.10b.

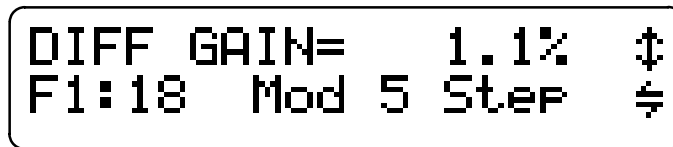
One of the following signals must be present at the input to measure differential gain using the VM101:

- CCIR Line 330
- Modulated 5- or 10-Step
- Modulated Ramp
- UK ITS I
- Oneline ITS

### Measurement Results

Figure 3–28 shows an example of the DIFF GAIN measurement results. The top line shows the measured results. The bottom line shows the field, line, and signal type on which the measurement was taken. The measurement result shows the largest deviation from reference chrominance (the chrominance portion superimposed on 0 IRE, expressed as percent of the first chrominance amplitude).





DIFF GAIN= 1.1% †  
F1:18 Mod 5 Step ‡

Figure 3–28: Differential gain measurement screen

## Measuring YC Delay

Chrominance-to-luminance delay inequality (relative chrominance time) is the difference between the time required for the chrominance and luminance portions of the signal to pass through a system.

Delay distortion causes color smearing or bleeding; you often see it at the edges of objects in the picture. It may also cause poor reproduction of sharp luminance transitions.

### Detailed Measurement Description

The chrominance-to-luminance delay measurement is performed as defined by CCIR Rec. 569, section 2.8.

---

**NOTE.** *The definition becomes ambiguous when either the luminance or chrominance pulse shapes are distorted.*

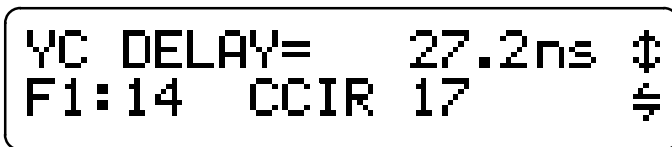
---

One of the following signals must be present at the input to measure chrominance-to-luminance delay using the VM101:

- CCIR Line 17
- UK ITS I
- Oneline ITS
- Oneline ITS Data

### Measurement Results

Figure 3–29 shows an example of the YC DELAY measurement results. The top line shows the measured delay, expressed in nanoseconds. The bottom line shows the field, line, and signal type on which the measurement was taken. The number is positive for delayed chrominance and negative for advanced chrominance. A perfect signal has no delay (0 ns).



The image shows a rectangular box containing two lines of text in a monospaced font. The first line reads "YC DELAY= 27.2ns" followed by a dollar sign symbol. The second line reads "F1:14 CCIR 17" followed by a similar symbol.

Figure 3–29: Chrominance-to-luminance delay measurement screen

When the video measurement set cannot lock onto the color burst signal, it displays an asterisk (\*). Normally the video measurement set locks to the color burst pulse. If burst lock is not possible, the video measurement set uses sync lock to take the measurement. Under these conditions the measurement accuracy may not be within specifications.

Burst lock is not possible where no burst signal is present. You can take a BURST AMPL measurement to determine if a burst signal is present. If the measured burst amplitude is near zero, then burst is not present. A normal burst amplitude level may indicate other problems such as interference or scrambling.

---

**NOTE.** *Frequency response aberrations that occur only in a narrow band near the subcarrier frequency can affect the YC Delay measurement results.*

---

## Measuring YC Gain

Chrominance-to-luminance gain inequality (relative chrominance level) is a function of the difference between the gain of the chrominance and the luminance signal components as they pass through a system.

Gain errors most commonly appear as attenuation or peaking of the chrominance information. The resulting picture has incorrect color saturation.

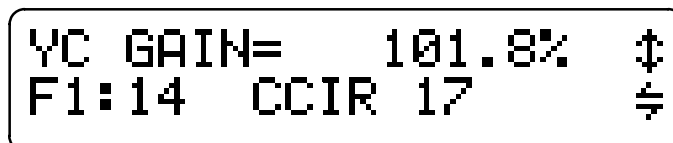
### Detailed Measurement Description

One of the following signals must be present at the input to measure chrominance-to-luminance gain using the VM101:

- CCIR Line 17
- UK ITS I
- Oneline ITS
- Oneline ITS Data

### Measurement Results

Figure 3–30 shows an example of the YC GAIN measurement results. The top line shows the measured results. The bottom line shows the field, line, and signal type on which the measurement was taken. The measurement result shows the ratio of chrominance gain to luminance gain. A perfect signal has a 100% YC gain.



The screenshot shows a measurement screen with two lines of text. The top line displays 'YC GAIN= 101.8%' followed by a double-headed vertical arrow symbol. The bottom line displays 'F1:14 CCIR 17' followed by a double-headed vertical arrow symbol.

Figure 3–30: Chrominance-to-luminance gain measurement screen

## Measuring Signal-to-Noise Ratio

Noise refers to the fluctuations that are present in any electrical system. Noise can be either random or coherent. It comes from a variety of natural and man-made sources. Although some noise is always present, an excessive amount is undesirable because it degrades or obscures the signal.

Signal amplitudes do not always remain constant as the video signal is processed and transmitted. For this reason an absolute measurement of noise is not relevant; noise has a different affect on signals of different amplitudes. The video measurement set measures signal-to-noise ratio in decibels (dB) because it is the amount of noise relative to the signal amplitude rather than the absolute amount of noise that tends to cause problems.

Noisy pictures often appear grainy or snowy. You may see sparkles of color, and you will notice blurriness and a general lack of picture resolution. Equipment often has trouble synchronizing to extremely noisy signals.

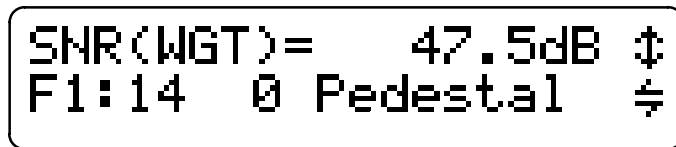
### Detailed Measurement Description

One of the following signals must be present at the input to measure signal-to-noise ratio using the VM101:

- Quiet line
- 0 Pedestal

### Measurement Results

Figure 3–31 shows an example of the SNR measurement results. The top line shows the measured results displayed in dB; large values indicate good signal quality. The bottom line shows the field, line, and signal type on which the measurement was taken.



```
SNR(WGT)= 47.5dB †
F1:14 0 Pedestal ‡
```

**Figure 3–31: Signal-to-noise ratio measurement screen**

The video measurement set uses CCIR Rec. 567-1 low- and high-pass filters. The RMS noise amplitude from the filter is referenced to 700 mV; the reference is not the signal amplitude.

You can configure the video measurement set to use either a weighted or flat filter when taking signal-to-noise measurements (refer to page 1–13 for configuration instructions). Use the weighted filter to provide additional weighting for low frequency noise that is more visible at lower test frequencies. For example, you would use this filter to estimate the image degradation due to noise. Use the flat filter for applications that require equal spectral weighting for all frequency components within the 5 MHz test bandwidth.

The following formula defines the S/N measurement:

$$S/N \text{ ratio } dB = 20 \log \left( \frac{700 \text{ mV}}{RMS \text{ Noise}} \right)$$

## Measuring Frequency Response (AVG)

Frequency response measurements test the ability of a system to uniformly transfer signal components of different frequencies without affecting their amplitudes. This parameter, also known as gain/frequency distortion or amplitude versus frequency response, evaluates the system amplitude response.

The amplitude variation may be expressed in decibels (dB), percent, or IRE. The reference amplitude (0 dB = 100%) is the white bar flag or a low frequency. Measured frequency response results are only meaningful if they contain three components:

- Measured amplitude
- Frequency at which the measurement was taken
- Reference amplitude

Frequency response problems cause a wide variety of picture aberrations.

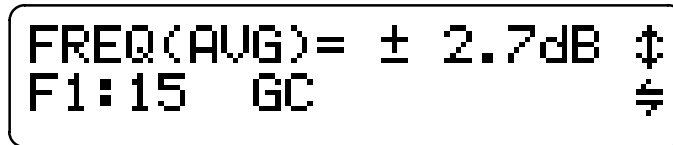
### Detailed Measurement Description

One of the following signals must be present at the input to measure frequency response using the VM101:

- CCIR Line 18 (Multiburst)
- GCR
- Sin(x)/x

### Measurement Results

Figure 3–32 shows an example of the FREQ (AVG) measurement results. The top line shows the measured results expressed in  $\pm$  dB. The bottom line shows the field, line, and signal type on which the measurement was taken.



FREQ(AVG) = ± 2.7dB †  
F1:15 GC ‡

**Figure 3–32: Frequency response measurement screen**

The multiburst and CCIR Line 18 signals contain discrete frequency packets. The VM101 uses the envelope of each packet to determine the amplitude. First, the video measurement set measures the average amplitude of the six packets. Then, it finds the maximum and minimum amplitudes in dB relative to the reference flag amplitude. The VM101 uses the following formula to calculate the measurement result that is expressed in  $\pm$ dB. A + indicates gain and – indicates attenuation.

$$\text{Frequency Response dB} = \left( \frac{\text{Max difference dB} - \text{Min difference dB}}{2} \right)$$

If the input signal is  $\sin(x)/x$  or GCR (ghost cancelling reference) the VM101 takes a fine resolution, continuous frequency response measurement.

---

**NOTE.** Use of a  $\sin(x)/x$  signal may result in a lower signal-to-noise ratio than other signals.

---

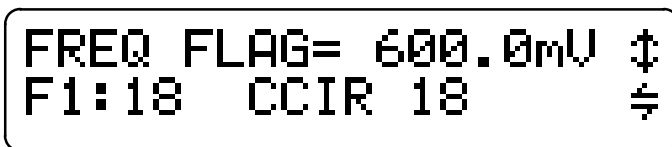
## Measuring Frequency Response Detail

The video measurement set provides two types of frequency response measurements. The basic frequency response measurement, which appears in the CONFIG MEASURE menu as **FREQ** and in the MEAS menu as **FREQ (AVG)**, is described on page 3–54. The second type of frequency response measurement is the frequency response detail. It appears in the CONFIG MEASURE menu as **FREQ DETAIL**.

The measurement results you see in the MEAS menu depend on the signal type that you used. Multiburst and CCIR Line 18 signals contain discrete frequency packets. Sin(x)/x and GCR (ghost cancelling reference) contain constant levels of energy over their frequency range. For all signal types the top line of the measurement results screen shows the measured results. The bottom line shows the field, line, and signal type on which the measurement was taken.

### CCIR Line 18 (Multiburst) Signals

If the video measurement set measures a signal with discrete frequency packets, such as CCIR Line 18, the flag (reference) amplitude is derived from the multiburst bar amplitude. The **FREQ FLAG** screen (Figure 3–33) shows the flag amplitude.



```
FREQ FLAG= 600.0mV  ⌘  
F1:18  CCIR 18      ⌘
```

Figure 3–33: Frequency flag measurement screen

The following six screens, beginning with **FREQ #1**, show the amplitude of each successive packet measured relative to the flag reference. The first packet measurement is shown in Figure 3–34.





```

FREQ #1=      -0.1dB  †
F1:18  CCIR 18    ‡

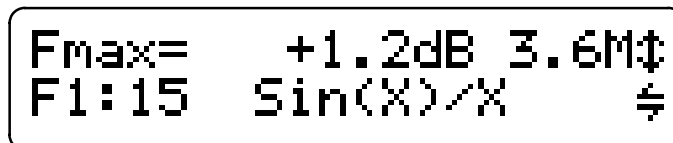
```

Figure 3–34: Frequency detail screen showing first packet

### Sin(x)/x and Philips® GCR Signals

If the video measurement set measures a swept signal, the frequency detail measurement provides two screens: FRQmax and FRQmin.

The measurements (in dB) represent the maximum and minimum frequency response of the signal relative to the amplitude of the reference frequency (220 kHz). Following the measurement results you will see the frequency where the maximum or minimum amplitude was found (Figure 3–35). The frequency resolution is limited to 138.6 kHz. The maximum frequency is 5.1 MHz for sin(x)/x signals and 4.8 MHz for Philips GCR signals.



```

Fmax=      +1.2dB 3.6M†
F1:15  Sin(X)/X    ‡

```

Figure 3–35: Measurement screen showing maximum packet amplitude

---

**NOTE.** The limit settings for FRQmin and FRQmax respond only to the signal amplitude and not to the signal frequency.

---

## Measuring Group Delay

The GRPDLY (group delay) measurement determines the relative time delays (Max and Min) for the frequencies within the test signal. Group delay distortion is present when signal components of different frequencies experience different delays as they pass through a system.

Group delay problems can cause a lack of vertical line sharpness due to luminance pulse ringing, overshoot, or undershoot.

### Detailed Measurement Description

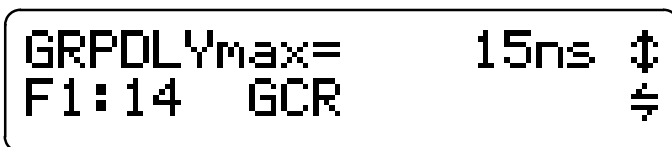
One of the following signals must be present at the input to measure group delay using the VM101:

- Philips® GCR
- Sin(x)/x

### Measurement Results

Figure 3–36 shows an example of the GRPDLY measurement screen for the maximum group delay. The top line shows the measured results, expressed in nanoseconds. The bottom line shows the field, line, and signal type on which the measurement was taken. You can also view the results of the minimum GRPDLY measurement.

The video measurement set measures the maximum and minimum group delay relative to the 220 kHz low frequency reference. The maximum frequency used in the measurement is 4.7 MHz.



```
GRPDLYmax=      15ns  ⌘  
F1:14  GCR      ⌘
```

Figure 3–36: Group delay measurement screen

## Measuring Sync Amplitude

The sync amplitude measurement is an average, peak-to-peak measurement. Sync amplitude is an absolute measurement expressed in millivolts (mV).

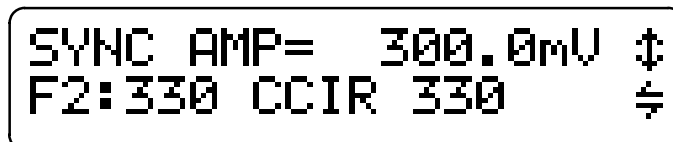
The sync amplitude measurement provides a rough indication of your video signal quality. For example, sync amplitude measurements of less than 300 mV may indicate problems including improper termination, sync compression, or AGC (system gain). A low ratio between burst and sync might indicate chrominance attenuation.

---

**NOTE.** *The sound in sync (SIS) signal cannot be present; the presence of SIS will cause inaccurate sync amplitude measurement results.*

---

Figure 3–37 shows an example of the SYNC AMPL measurement screen. The top line shows the measured results. The bottom line shows the field, line, and signal type on which the measurement was taken.



```
SYNC AMP= 300.0mV  †
F2:330 CCIR 330    ‡
```

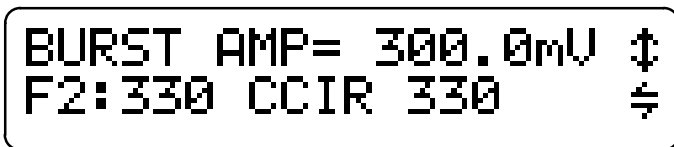
Figure 3–37: Sync amplitude measurement screen

## Measuring Burst Amplitude

The burst amplitude measurement is an absolute measurement expressed in millivolts (mV).

If burst is missing from the entire field, the measurement result is very close to zero. For example, a monochrome signal has a measured burst amplitude of approximately 0 mV.

Figure 3–38 shows an example of the BURST AMPL measurement screen. The top line shows the measured results. The bottom line shows the field, line, and signal type on which the measurement was taken.



```
BURST AMP= 300.0mV  †
F2:330 CCIR 330    ‡
```

Figure 3–38: Burst amplitude measurement screen

## Measuring Bar Amplitude

The video measurement set uses one of the following signals to measure bar amplitude:

- CCIR Line 17
- CCIR Line 330
- UK ITS I
- Onewline ITS
- Onewline ITS Data

When the video measurement set locates a valid signal, it measures bar amplitude and expresses the results in millivolts (mV).

Figure 3–39 shows an example of the BAR AMPL measurement screen. The top line shows the measured results. The bottom line shows the field, line, and signal type on which the measurement was taken.



```
BAR AMP= 700.0mV †
F2:330 CCIR 330 ‡
```

Figure 3–39: Bar amplitude measurement screen

## Measuring 2T K-Factor

Use the 2T K-factor measurement primarily to measure linear distortions indicating dispersion due to frequency response and group delay aberrations. Note that non-linear distortions may mask or otherwise affect the linear distortion measurement.

### Detailed Measurement Description

One of the following signals must be present at the input to measure 2T K-factor using the VM101:

- CCIR Line 17
- CCIR Line 330
- UK ITS I
- Oneline ITS
- Oneline ITS Data

The video measurement set uses the CCIR Rec. 567 Part D.3.5.1.4 2T K-Factor graticule to measure the distortion.

### Measurement Results

Figure 3–40 shows an example of the 2T K-FACTOR measurement screen. The top line shows the measured results. The bottom line shows the field, line, and signal type on which the measurement was taken. The displayed value represents the distortion relative to the 2T pulse amplitude, expressed in percent.



```
2T K-FACTOR= 12.2%  †
F1:14  UK ITS I     ‡
```

Figure 3–40: 2T K-factor measurement screen

## Measuring Luminance Nonlinearity

The video measurement set performs a luminance linearity measurement as defined by CCIR Rec. 569-1, section 2.9. Luminance linearity is defined as the difference between the largest and the smallest step amplitudes, expressed as a percentage of the largest step amplitude.

The video measurement set provides two methods of measuring luminance nonlinearity: normal and differential step (diff step). The normal method integrates the signal at the center of each step and compares the integrated signals to determine the nonlinearity. The differential step method uses the signal levels on either side of a step to determine the step height. These steps are compared to determine the nonlinearity.

When measuring the luminance nonlinearity of a ramp signal, the video measurement set locates the beginning and ending points on the ramp signal. It then divides the ramp into six equal segments to correspond with the six levels of a 5-step signal. The nonlinearity is then measured using the normal method, even if the differential step method is selected.

The normal method of measuring luminance nonlinearity used by the video measurement set does not use a differential step filter and is less susceptible to noise and high-frequency rolloff. The differential step method of luminance nonlinearity measurement is less susceptible to nonlinear line tilt, which can affect the accuracy of the luminance nonlinearity measurement when measured with the normal method.

### Detailed Measurement Description

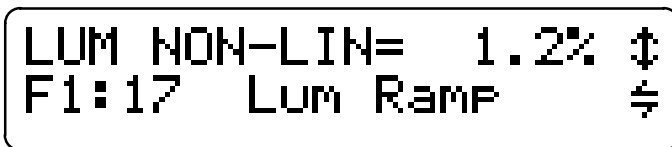
One of the following signals must be present at the input to measure luminance nonlinearity using the VM101:

- Modulated 5-Step
- Luminance Ramp
- Luminance 5/10-Step
- CCIR Line 17
- CCIR Line 330

- UK ITS I
- Oneline ITS

### Measurement Results

Figure 3–41 shows an example of the LUM NON-LIN measurement screen. The top line shows the measured results, expressed in percent. The bottom line shows the field, line, and signal type on which the measurement was taken. When the measurement is made using the differential step method, and asterisk (\*) is displayed.



```
LUM NON-LIN= 1.2% $
F1:17 LUM RAMP *
```

Figure 3–41: Luminance nonlinearity measurement screen



## Measuring Hum

The video measurement set provides a hum measurement to analyze the power line related signal components. Sync must be present at the input signal to take the hum measurement.

---

**NOTE.** When you measure hum the sound in sync (SIS) signal cannot be present; the presence of SIS causes inaccurate hum measurement results.

---

Figure 3–42 shows an example of the HUM measurement screen. The top line shows three measured hum parameters in order from left to right:

- Overall peak-to-peak transient and periodic low frequency interference
- 50 Hz line frequency peak-to-peak amplitude
- 100 Hz harmonic of line frequency peak-to-peak amplitude

---

**NOTE.** If any measured value exceeds 99.9, the characters “^^^” are displayed to indicate an overrange condition.

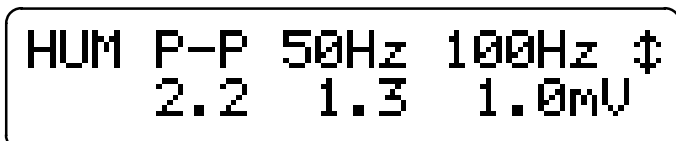
---

HUM	P-P	50Hz	100Hz	‡
	2.2	1.3	1.0%	

Figure 3–42: Hum measurement screen with ZCR pulse

The bottom line shows the measured values. When the ZCR pulse is in use, hum is expressed as a percentage of visual carrier amplitude (Figure 3–42). This amplitude is represented at baseband by the difference between the amplitude of the zero carrier reference pulse and sync tip.

If the video measurement set cannot locate the zero carrier reference pulse, the hum measurement is expressed in millivolts (mV) (Figure 3-43). Refer to page 1-10 for configuration instructions for the zero carrier reference pulse.



HUM	P-P	50Hz	100Hz	\$
	2.2	1.3	1.0mV	

Figure 3-43: Hum measurement screen with no ZCR pulse



# Appendices



# Appendix A: Specifications

This section provides a complete description of the video measurement set specifications. Refer to the *Performance Conditions* for a description of the required temperature range and other pertinent operating conditions.

## Terms Used in Specifications

**Characteristic** — A characteristic refers to a property of the product.

**Performance Requirement [REQ]** — Performance Requirements define characteristics that are essential to the intended application of the product, usually in limit form.

**Reference Information [RI]** — Reference Information explains the performance requirements or stipulates conditions under which the performance requirements are effective. Reference information is not considered to be a statement of guaranteed performance.

**Specification** — A specification is a document or a section of a document that lists and describes characteristics and performance requirements of a product. A specification also may contain reference information.

**Typical** — Typical refers to instrument performance that can be expected but is not guaranteed.

## Performance Conditions

The Performance Requirements listed in the *Electrical Specifications* apply over an ambient temperature range of 0° C to +50° C. The rated accuracies are valid over the entire 0° C to 50° C range and become “typical” for temperatures from –10° C to 0° C. Test equipment used to verify Performance Requirements must be calibrated and working within the specified limits.

All specifications (with the exception of Signal-to-Noise Ratio Measurement Accuracy) apply for Signal-to-Noise Ratio  $\geq 52$  dB (weighted). Averaging (AVG) is enabled for all specifications.

## Electrical Specifications

**Table A-1: Input signal requirements–VIDEO INPUT**

Category	Description
Maximum Operating Voltage	<b>REQ:</b> -1.8 V to +2.2 V
Absolute Maximum Input Voltage	<b>REQ:</b> -8.5 V to +8.5 V
Minimum Operating Voltage	<b>REQ:</b> 1 Vp-p video signal  <b>RI:</b> Typically operates with a 1 Vp-p input, +1 dB or -6 dB
DC Input Impedance	<b>REQ:</b> $\geq 20\text{ K}\Omega$  <b>RI:</b> DC coupling
Return Loss	<b>REQ:</b> >40 dB to 6 MHz  <b>RI:</b> DC coupling

**Table A-2: Input signal requirements–EXT REF**

Category	Description
Absolute Maximum Input Voltage	<b>REQ:</b> -8.5 V to +8.5 V
Minimum Operating Voltage	<b>REQ:</b> 1 Vp-p video signal  <b>RI:</b> Typically operates with a 1 Vp-p input, +1 dB or -6 dB
DC Input Impedance	<b>REQ:</b> $\geq 20\text{ K}\Omega$
Return Loss	<b>REQ:</b> >40 dB to 6 MHz
Video INPUT / EXT REF	
Crosstalk	<b>REQ:</b> >70 dB to 6 MHz
Loop-through Isolation	<b>RI:</b> >70 dB (typical)

Table A-3: Measurement accuracy

Category <sup>1</sup>	Description
Differential Phase	<p><b>REQ:</b> &lt;1.0°</p> <p><b>RI:</b> Typically &lt;0.5° from 20° C to 30° C with test signal generator source</p>
Differential Gain	<p><b>REQ:</b> &lt;2.0%</p> <p><b>RI:</b> Typically &lt;1% from 20° C to 30° C for nominal 300 mV chrominance amplitude</p>
Chrominance-to-Luminance Gain	<p><b>REQ:</b> &lt;2%</p> <p><b>RI:</b> Typically &lt;1% from 20° C to 30° C with test signal generator source</p>
Chrominance-to-Luminance Delay	<p><b>REQ:</b> &lt;20 ns</p> <p><b>REQ:</b> &lt;10 ns from 20° C to 30° C with test signal generator source.</p> <p><b>RI:</b> Typically &lt;5 ns from 20° C to 30° C with test signal generator source</p>
Frequency Response	<p><b>REQ:</b> &lt;0.2 dB</p> <p><b>RI:</b> Typically &lt;0.1 dB (1 %) from 20° C to 30° C with test signal generator source</p> <p><b>RI:</b> VM100: 50 kHz to 4.2 MHz VM101: 50 kHz to 5.8 MHz</p>
2T K-Factor	<p><b>REQ:</b> 2 %</p> <p><b>RI:</b> Typically &lt;0.5 % from 20° C to 30° C with test signal generator source</p>

<sup>1</sup> All tests are performed with AVG enabled. Processing time for each measurement is a function of the signal-to-noise ratio.

**Table A-3: Measurement accuracy (cont.)**

Category <sup>1</sup>	Description
Hum <sup>2</sup>	<p><b>REQ:</b> <math>\pm 1.0\%</math> for hum <math>\leq 4.0\%</math>  <math>\pm 2.0\%</math> for hum <math>&gt; 4.0\%</math> and <math>&lt; 15.0\%</math></p> <p><b>RI:</b> Typically <math>\pm 0.5\%</math> for hum <math>\leq 4.0\%</math></p>
Signal-to-Noise Ratio (Weighted or Flat)	<p><b>REQ:</b> <math>\pm 1</math> dB, 28 dB to <math>&lt; 45</math> dB  <math>\pm 2</math> dB, 45 dB to <math>&lt; 60</math> dB  <math>\pm 3</math> dB, 60 dB to 67 dB (WGT)</p> <p><b>RI:</b> VM100: Noise is weighted with EIA RS-250-B 5 MHz weighted noise filter. (Tektronix part number 015-0215-00 equivalent.)</p> <p>VM101: Noise is weighted with CCIR 567 weighted noise filter</p>
Group Delay	<p><b>REQ:</b> <math>&lt; 20</math> ns</p> <p><b>RI:</b> 50 kHz to 4.8 MHz, within the bandwidth of the signal under test</p>
Sync Amplitude <sup>2</sup>	<b>REQ:</b> $< 1.0\%$
Burst Amplitude	<b>REQ:</b> $< 1.0\%$
Bar Amplitude	<b>REQ:</b> $< 1.0\%$
Luminance Nonlinearity	<b>REQ:</b> $< 1.0\%$

<sup>1</sup> All tests are performed with AVG enabled. Processing time for each measurement is a function of the signal-to-noise ratio.

<sup>2</sup> The hum and sync amplitude measurements are inaccurate in the presence of Sound In Sync (SIS) signals.



Table A-4: Output

Category	Description
Zero Carrier Reference Pulse Output	<b>RI:</b> Can drive demodulator ZCRP trigger of TTL type (Tektronix TDM5, DS1200, 1450) or 1.5 V <sub>p-p</sub> , 75 Ω type (Tektronix 1340, 1350)

Table A-5: AC power source

Category	Description
Mains Voltage Range	<b>REQ:</b> 90-250 VAC 50/60 Hz 0.7 A
Power Consumption	<b>REQ:</b> 30 W maximum

## Environmental Characteristics

Table A-6: Environmental characteristics

Category	Description
Altitude (see page A-6 for safety-related information)	<b>REQ:</b> Operating: to 15,000 f (4572 m) Non-operating: to 50,000 f (15,240 m)  <b>RI:</b> Maximum operating temperature decreases 1° C per 1000 f (305 m)
Humidity	<b>REQ:</b> To 95% relative humidity at or below +50° C
Operating Temperature	<b>REQ:</b> 0° C to + 50° C (32° F to 122° F)  <b>RI:</b> Electrical specifications are guaranteed when the instrument is operated in this temperature range

**Table A-6: Environmental characteristics (cont.)**

Category	Description
Package Drop	<b>REQ:</b> Meets Tektronix 062-2858-00, Rev. B
Random Vibration (Operating and Non-Operating)	<b>REQ:</b> Meets Tektronix Class III (062-2858-00, Rev. B)
Shock (Operating)	<p><b>REQ:</b> Meets Tektronix Class III (062-2858-00, Rev. B)</p> <p><b>RI:</b> Three drops on each face of 50 g, 11 ms duration, half-sine pulse shape for a total of 18 drops</p>
Storage Temperature	<b>REQ:</b> -40° C to + 75° C (-40° F to +167° F)
Loose Load Vibration (Repetitive Shock)	<b>REQ:</b> Meets Tektronix 062-2858-00, Rev. B (page 51, section 17.7.4)
Vehicle Vibration	<b>REQ:</b> Meets Tektronix 062-2858-00, Rev. B

## Safety Standards and Certification

**Table A-7: Certifications and compliances**

Category	Description
Altitude (Maximum Operating)  See page A-5 for additional information	Operating: to 6,500 f (2,000 m)
Certifications	
US Nationally Recognized Testing Laboratory Listing	ANSI/ISA S82 Safety Standard for Electrical and Electronic Test, Measuring, Controlling, and Related Equipment
Canadian Certification	CAN/CSA C22.2 No.1010.1 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use

Table A-7: Certifications and compliances (cont.)

Category	Description
Certifications (continued)	
European Union Compliance	Low Voltage Directive 73/23/EEC, Amended by 93/68/EEC
Additional Compliance	UL3111-1 Standard for Electrical Measuring and Test Equipment
	IEC 1010-1 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use
EC Declaration of Conformity	<p>Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility and Low Voltage Directive 73/23/ECC for Product Safety. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:</p> <p>EMC Directive 89/336/EEC:<sup>1</sup> EN 50081-1 Emissions: EN 55022 Class B Radiated and Conducted Emissions</p> <p>EN 50082-1 Immunity: IEC 801-2 Electrostatic Discharge Immunity IEC 801-3 RF Electromagnetic Field Immunity IEC 801-4 Electrical Fast Transient/Burst Immunity</p> <p>Low Voltage Directive 73/23/EEC: EN 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use</p> <p><sup>1</sup> Using high quality shielded cables.</p>
Equipment Type	Test and Measuring
FCC Compliance	Emissions comply with FCC Code of Federal Regulations 47, Part 15, Subpart B, Class A Limits

**Table A-7: Certifications and compliances (cont.)**

Category	Description
Overvoltage Category	Overvoltage Category II (as defined in IEC 1010-1, Annex J)
Pollution Degree	Pollution Degree 2 (as defined in IEC 1010-1); rated for indoor use only
Safety Class	Class I (as defined in IEC 1010-1, Annex H)
Temperature (Operating)	+5° C to +50° C (+41° F to 122° F)

## Physical Characteristics

**Table A-8: Physical characteristics**

Category	Description
Dimensions	Height: 1.71 in (4.34 cm) Nominal Width: 8.1 in (20.6 cm) Nominal Depth: 17.2 in (43.7 cm) Nominal
Stand-Alone Instrument Weight	4.00 lbs (1.81 kg) Nominal
Packaged Weight (for domestic shipment)	7.12 lbs (3.23 kg) Nominal

## Remote Control Port

**Table A-9: Remote control port**

Category	Description
RS-232 Serial Port	Connector: Nine-pin DCE female  Baud Rate: 300, 600, 1200, 2400, 4800, 9600, or 19.2K

## Appendix B: Remote Control

This section provides a description of the remote control interface and commands for the video measurement set, including the following topics:

- *RS-232 Interface* describes the RS-232 interface
- *SCPI* on page B-4 provides a brief introduction to SCPI
- *Remote Applications* on page B-5 explains how to configure the video measurement set for use with a computer
- *Commands and Queries* on page B-6 defines commands and queries
- *Command Syntax* on page B-6 describes the command syntax
- *Entering Commands* on page B-9 describes how to enter commands
- *Summary of Commands* on page B-11 summarizes the commands by functional group
- Beginning on page B-25, you will find an alphabetical listing of each command that includes a detailed command description, list of parameters, and example syntax and responses

The commands for the video measurement set are compatible with, but not compliant to, the SCPI-1994.0 standards.

---

**NOTE.** Do not use the *RCDS* or *REMOTE ADDR* parameters. They support a custom application.

---

### RS-232 Interface

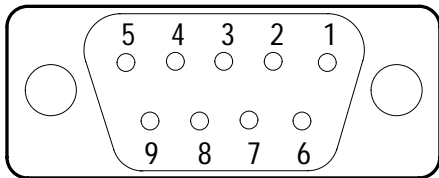
The video measurement set has an RS-232 serial interface with a nine-pin, subminiature, D-type connector mounted on the rear panel.

The RS-232 interface is used for the following applications:

- Upload and print measurement results
- Remote control of the video measurement set or a 1740A-series waveform monitor
- Upgrade instrument software

Refer to Figure B-1 and Table B-1 for the RS-232 serial port pin assignments.

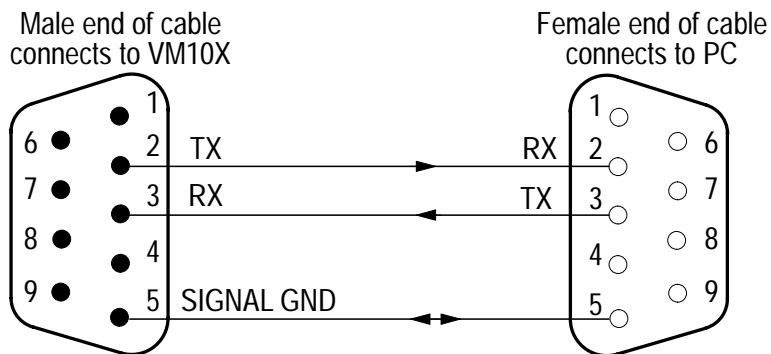
Figures B-2, B-3, and B-4 show the connections between the video measurement set and a PC or modem.



**Figure B-1: Rear panel RS-232 serial port (female)**

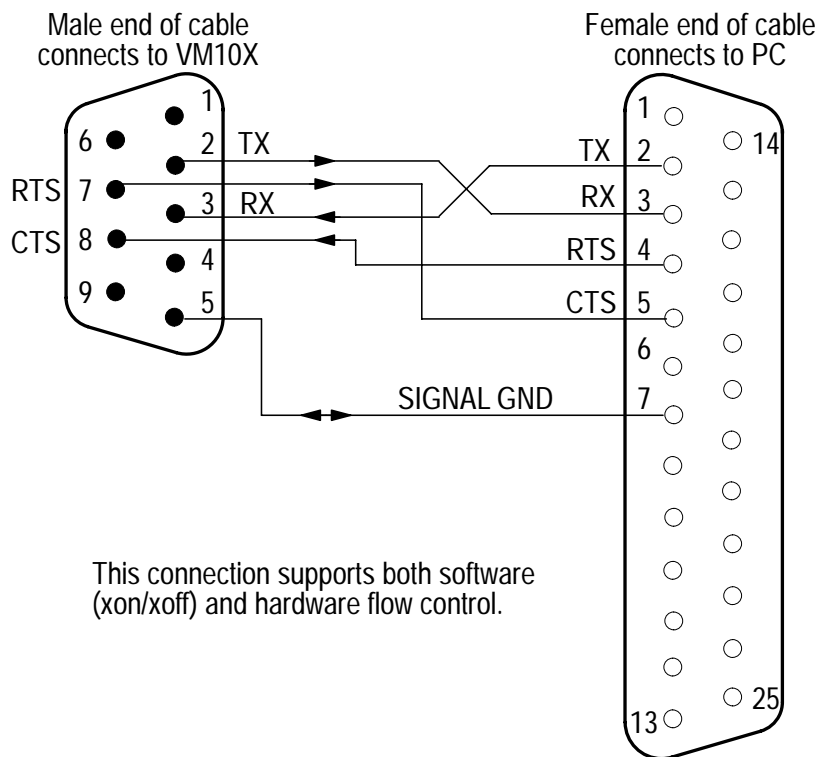
**Table B-1: RS-232 pin connections**

Pin Number	Signal Name	RS-232C Name
1	Not Used (input)	
2	TX (Transmit Data; output)	BA
3	RX (Receive Data; input)	BB
4	Not Used (output)	
5	GND (Signal Ground)	AB
6	Not Used (input)	
7	RTS (Request to Send; output)	CA
8	CTS (Clear to Send; input)	CB
9	Not Used (output)	



Tektronix cable part number 174-1809-xx can be used.  
 This connection supports software flow control (XON/XOFF) only;  
 it has no hardware control.

**Figure B-2: Remote control wiring, VM10X to nine-pin PC connector**



This connection supports both software (xon/xoff) and hardware flow control.

**Figure B-3: Remote control wiring, VM10X to 25-pin PC connector**

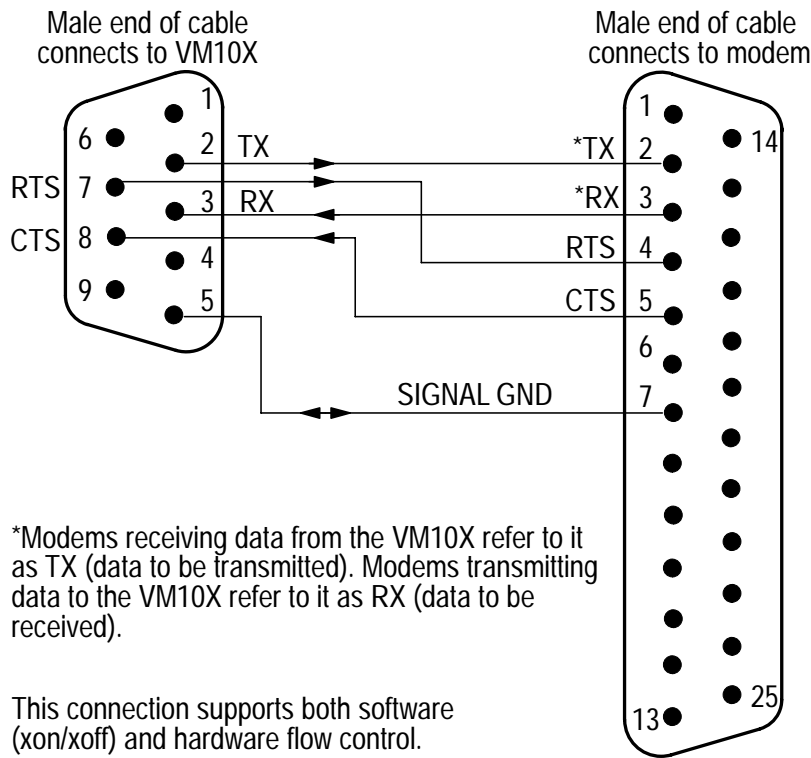


Figure B-4: Remote control wiring, VM10X to 25-pin modem connector

## SCPI

---

**NOTE.** The command set for the video measurement set uses SCPI terminology and syntax, but is not fully compliant with the SCPI standard.

SCPI is not used when FLOW CTL is set to RCDS.

---

SCPI (Standard Commands for Programmable Instruments) is a standard created by an international consortium of the major manufacturers of test and measurement equipment. SCPI uses IEEE-488.2 syntax to provide common commands for the identical functions of various programmable instruments.

The standard simplifies the task of programming a group of instruments that use SCPI. Instead of having to learn different



commands for every instrument, the programmer may use the same commands for the identical functions of each instrument.

## Remote Applications

This section explains how to configure the video measurement set for remote operation using a computer or modem. Use the following procedure:

1. Connect the RS-232 serial port to the PC or modem as shown in Figure B-5. Refer to the table and illustrations on pages B-2 through B-4 as needed to make the correct cable connections.

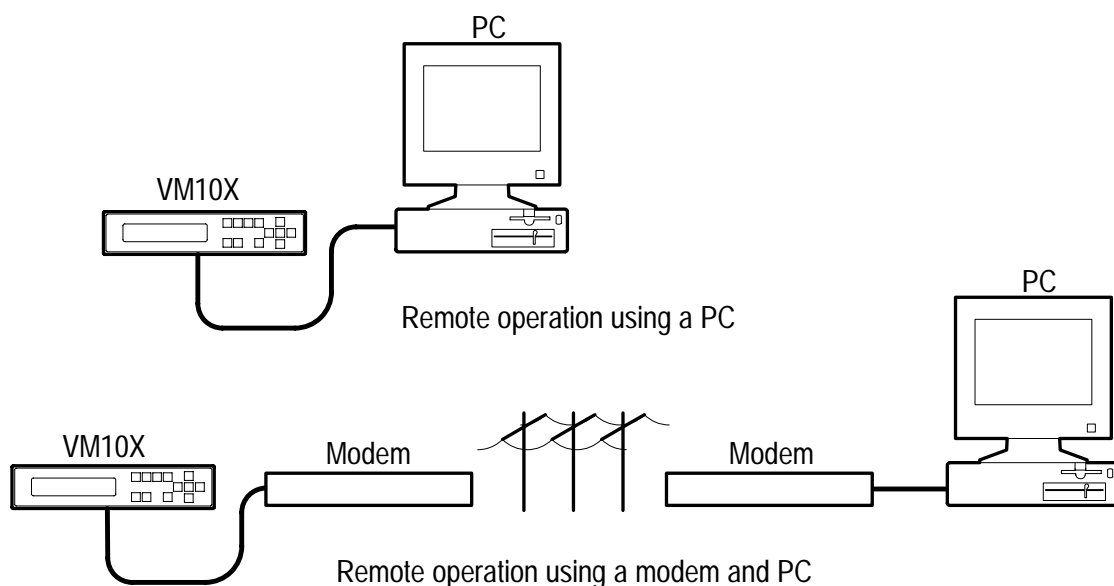


Figure B-5: Examples of remote operation

2. Configure the video measurement set for operation with your computer. See page 1-15 for configuration instructions.
3. If using a modem, configure the modem for operation with your computer. See the manual that came with your modem for instructions.

---

**NOTE.** *If your modem requires more signals than those shown in Figure B–4, refer to the manual that came with the modem for the necessary information.*

---

4. Read the information in this section to become familiar with remote operation of the video measurement set.
5. Refer to the command descriptions that begin on page B–25 for a listing of the commands that you can enter. See *Command Syntax* on page B–6 for detailed command entry instructions.

---

**NOTE.** *To upload the video measurement set measurement and signal identification results, use the REPort? command (page B–80). Use your PC terminal program to capture the results that are displayed on the PC screen.*

---

## Commands and Queries

The controller (your PC) sends instructions to the video measurement set in the form of commands or queries. Commands modify control settings or tell the instrument to perform a specific action. Queries cause the instrument to send data or status information back to the controller. A question mark at the end of a command identifies it as a query.

Different product manuals may also use the terms “program messages” or simply “commands” to refer to commands and queries as a whole. This manual uses the term “commands” to mean any type of instruction from the controller to the video measurement set.

## Command Syntax

Any instruction that you send to the video measurement set that complies with SCPI must have at least three basic elements:

- Command header
- Parameter (if required)
- Message terminator or separator

### Command Header

The command header has a hierarchical structure that can be represented by a command tree (see Figure B-6). A mnemonic designates each level of the hierarchy. A colon separates the levels.

The top level of the tree is the root level. A root node is a mnemonic at the root level. A root node and one or more lower-level nodes form a header path to the last node called the leaf node.

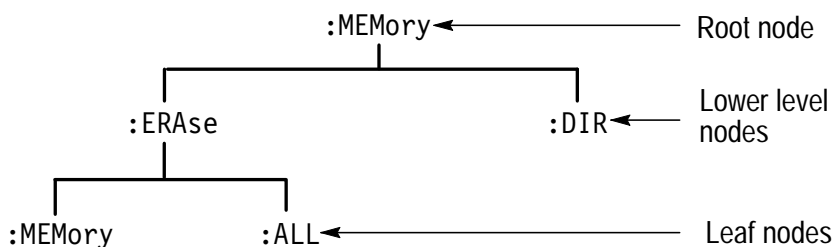


Figure B-6: Tree hierarchy

The header path and leaf node together form the command header. Figure B-7 shows the command header for the leaf node indicated in Figure B-6.

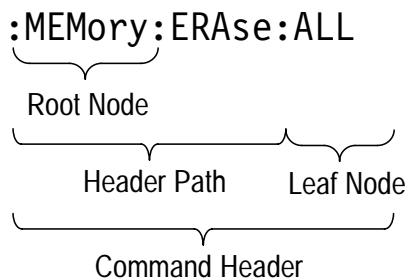
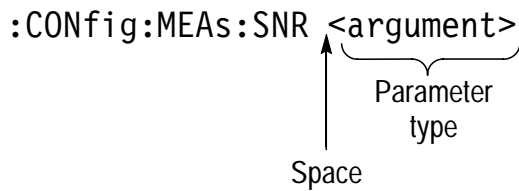


Figure B-7: Command header

### Parameter

You must include values for commands that have parameters. In this manual, the < > symbols enclose the parameter type when stating the syntax of the command. For example, the syntax of the command in Figure B–8 includes the <argument> parameter type.



**Figure B–8: Command header with parameter**

Table B–2 defines the parameter types for the video measurement set.

**Table B–2: Parameter types for syntax descriptions**

Parameter Type	Description	Example
argument	Parameters that represent instrument functions	F50 or F60 ON or OFF
NR1	Integers	0, 1, 15
NR2	Decimal numbers	1.2, 3.141516, 6.5
NR3	Floating point numbers	3.1E–1, 2.01E+1
NRf	NR1, NR2, or NR3	1, 1.2, 3.1E–1
string	Alphanumeric characters (must be within quotation marks)	"Memory 1"

For the actual value of the parameter type <argument> you may enter any of the parameters listed for the command. For the command in Figure B–8, entering OFF turns the signal-to-noise ratio (SNR) measurement off and entering ON turns the measurement on.

The following example includes both the header and a value for the parameter type:

```
:CONfig:SIGnalid:FULlflDstart 24
```

Parameter values that appear in this manual are often separated by a vertical line. This vertical line means the same thing as the word “or.” For example, values for the parameter <argument> are as follows:

```
OFF|ON
```

This is the same thing as saying “OFF or ON.” Any single value is a valid parameter.

---

**NOTE.** Do not include the <, >, or | symbols when entering the actual value for a parameter.

---

### Message Terminator and Message Separator

The video measurement set accepts the following message terminators:

- LF      Line feed code (hexadecimal 0A)
- CR      Carriage return code (hexadecimal 0D)

A semicolon separates one command from another when the commands appear on the same line.

## Entering Commands

The standards that govern the command set for the video measurement set allow for a certain amount of flexibility when you enter commands. For example, you can abbreviate many commands or combine commands into one message that you send to the video measurement set. This flexibility, called friendly listening, saves programming time and makes the command set easier to remember and use.

### Command Characters

The video measurement set is not sensitive to the case of command characters. You can enter commands in either uppercase or lowercase.

You can precede any command with ASCII space characters. You must, however, use at least one space between the parameter and the command header. The maximum number of characters in a command line is 510.

### Abbreviating Commands

Because the video measurement set assumes that a command starts from the root, you have the option of beginning the initial command header with a colon (:).

Most commands have a long form and a short form. The listing for each command in this section shows the abbreviations in uppercase. For example, you can enter the query `:REPort:DIFPhase?` simply as `REP:DIFP?` (or `rep:difp?`).

### Combining Commands

You can combine (concatenate) commands and queries using a semicolon (;) as long as the total number of characters is  $\leq 198$ . The video measurement set executes concatenated commands in the order it receives them. When you concatenate queries, the video measurement set combines the responses into a single response message. For example, if the average and freeze modes are set to ON and OFF, the command

```
AVG?;FREEze?
```

returns the message

```
"ON";"OFF"
```

If the command that follows the semicolon has a different header path from the root level, you must use a colon to force a return to the root level:

```
CON:ZCR?;:REP:DIFG?
```

If the command that follows the semicolon has the same header path, you may omit the colon and the path and state only the new leaf node. This makes it possible, for example, to shorten the concatenated query

```
REPort:HUM:PP?;:REPort:HUMF50HZ?;:REPort:HUM:F100HZ?
```

into

```
REPort:HUM:PP?;F50HZ?;F100HZ?
```

You can combine commands and queries into the same message. Note, for example, the following combination:

```
CONfig:FILter Flat;:CONfig:FILter?
```

or

```
CONfig:FILter Flat;FILter?
```

## Summary of Commands

The tables in this section summarize the command set of the video measurement set. These tables divide the commands into the following functional groups:

- Front Panel Commands
- Measurement Commands
- Memory Commands
- Signal Change Commands
- Configuration Commands
- Report Measurements Commands
- Help Commands

The tables also provide a brief description of each command.

### Front Panel Commands

Table B–3 lists the front panel commands that control and query the settings of the video measurement set. To a large extent, the commands duplicate the function of the front panel controls and indicators.

**Table B–3: Front panel commands**

Command	Description
AVG <OFF ON>	Turn averaging ON or OFF.
AVG?	Return the status of averaging.
FREEze <OFF ON>	Turn freeze ON or OFF.
FREEze?	Return the status of freeze.

### Measurement Commands

---

**NOTE.** *The measurement commands cause the video measurement set to take the specified measurement outside the normal operating system sequence. After you issue the command, a time delay will occur while the measurement is made. You can avoid this delay by issuing a report measurement command instead.*

---

Table B–4 lists the measurement commands that initiate measurements and return the measurement results. Add the WHERE subcommand to include the field number, line number, and signal type in the return string.



Table B-4: Measurement commands

Command	Description
MEASure:BARamp1[:WHERE] <field,line>	Perform a bar amplitude measurement.
MEASure:BURStamp1[:WHERE] <field,line>	Perform a burst amplitude measurement.
MEASure:DIFGain[:WHERE] <field,line>	Perform a differential gain measurement.
MEASure:DIFPhase[:WHERE] <field,line>	Perform a differential phase measurement.
MEASure:FREQresp[:WHERE] <field,line>	Perform a frequency response measurement.
MEASure:GDLY[:WHERE] <field,line>	Perform a group delay measurement.
MEASure:HUM	Perform a hum measurement.
MEASure:KFACTOR[:WHERE] <field,line>	Perform a 2T K-factor measurement.
MEASure:LUM[:WHERE] <field,line>	Perform a luminance nonlinearity measurement.
MEASure:SNR[:WHERE] <field,line>	Perform a signal-to-noise ratio measurement.
MEASure:SYNCamp1[:WHERE] <field,line>	Perform a sync amplitude measurement.
MEASure:YCGain[:WHERE] <field,line>	Perform a chrominance-to-luminance gain measurement.
MEASure:YCDelay[:WHERE] <field,line>	Perform a chrominance-to-luminance delay measurement.

## Memory Commands

Table B–5 lists the memory commands that control management functions for the video measurement set memory.

**Table B–5: Memory commands**

Command	Description
MEMory:DIR?	Return a listing of the saved memory locations.
MEMory:ERASE[:MEM] <string>	Clear the specified memory location.
MEMory:ERASE:ALL	Clear all memory locations.
MEMory:RECALL[:MEM]? <string>	Return the contents of the saved memory location.
MEMory:RECALL:ALL?	Return the contents of all saved memory locations.
MEMory:RECALL:CAL	Restore calibration data from memory.
MEMory:RECALL:DEFAULT	Restore the factory default values.
MEMory:RECALL:LIMITS? <string>	Returns specified memory location limits.
MEMory:RECALL:SETTINGS	Restore the last power off settings.
MEMory:RENAME <string>,<string>	Rename the memory location.
MEMory:SAVE[:MEM] [<string>]	Save current measurement results to memory.
MEMory:SAVE:CAL	Save the internal calibration results.
MEMory:SAVE:SETTINGS	Save current settings for use at power on.

## Signal Change Commands

Table B–6 lists the signal change commands that cause the video measurement set to make measurements on the next or previous video lines where valid signals are present.

**Table B–6: Signal change commands**

Command	Description
NEXTmeas:BARamp1	Cause the bar amplitude measurement to occur on the next line with a valid signal type.
NEXTmeas:BURStamp1	Cause the burst amplitude measurement to occur on the next available signal type.
NEXTmeas:DIFGain	Cause the differential gain measurement to occur on the next line with a valid signal type.
NEXTmeas:DIFPhase	Cause the differential phase measurement to occur on the next line with a valid signal type.
NEXTmeas:FREQresp	Cause the frequency response measurement to occur on the next line with a valid signal type.
NEXTmeas:FREQresp:DETail	Cause the frequency response detail measurement to occur on the next line with a valid signal type.
NEXTmeas:GDLY	Cause the group delay measurement to occur on the next line with a valid signal type.
NEXTmeas:KFACTOR	Cause the 2T K-factor measurement to occur on the next line with a valid signal type.
NEXTmeas:LUM	Cause the luminance nonlinearity measurement to occur on the next line with a valid signal type.
NEXTmeas:SNR	Cause the signal-to-noise ratio measurement to occur on the next line with a valid signal type.
NEXTmeas:SYNCamp1	Cause the sync amplitude measurement to occur on the next line with a valid signal type.
NEXTmeas:YCDelay	Cause the chrominance-to-luminance delay measurement to occur on the next line with a valid signal type.
NEXTmeas:YCGain	Cause the chrominance-to-luminance gain measurement to occur on the next line with a valid signal type.

**Table B-6: Signal change commands (cont.)**

<b>Command</b>	<b>Description</b>
PREVmeas:BARamp1	Cause the bar amplitude measurement to occur on the previous line with a valid signal type.
PREVmeas:BURStamp1	Cause the burst amplitude measurement to occur on the previous line with a valid signal type.
PREVmeas:DIFGain	Cause the differential gain measurement to occur on the previous line with a valid signal type.
PREVmeas:DIFPhase	Cause the differential phase measurement to occur on the previous line with a valid signal type.
PREVmeas:FREQresp	Cause the frequency response measurement to occur on the previous line with a valid signal type.
PREVmeas:FREQresp:DETail	Cause the frequency response detail measurement to occur on the previous line with a valid signal type.
PREVmeas:GDLY	Cause the group delay measurement to occur on the previous line with a valid signal type.
PREVmeas:KFACTOR	Cause the 2T K-factor measurement to occur on the previous line with a valid signal type.
PREVmeas:LUM	Cause the luminance nonlinearity measurement to occur on the previous line with a valid signal type.
PREVmeas:SNR	Cause the signal-to-noise ratio measurement to occur on the previous line with a valid signal type.
PREVmeas:SYNCamp1	Cause the sync amplitude measurement to occur on the previous line with a valid signal type.
PREVmeas:YCDeLay	Cause the chrominance-to-luminance delay measurement to occur on the previous line with a valid signal type.
PREVmeas:YCGain	Cause the chrominance-to-luminance gain measurement to occur on the previous line with a valid signal type.

## Configuration Commands

Table B–7 lists the configuration commands that setup many of the video measurement set operating parameters.

**Table B–7: Configuration commands**

Command	Description
CONfig:DATE <mm,dd,yy>	Set the internal date.
CONfig:DATE?	Return the internal date.
CONfig:FILter <Flat Weighted>	Select the filter type for signal-to-noise ratio measurements.
CONfig:FILter?	Return the filter type.
CONfig:HUM <F50 F60>	Select the hum frequency for hum measurements (VM100 only).
CONfig:HUM?	Return the hum frequency.
CONfig:LCDangle <0 - 180>	Set the LCD display viewing angle.
CONfig:LCDangle?	Return the LCD display viewing angle.
CONfig:LIMit <T1   T2   T3   T4   OFF>	Select a limit table or disable limits.
CONfig:LIMit?	Returns limit table setting.
CONfig:LIMit:T1?	Lists contents of limit table 1.
CONfig:LIMit:T2?	Lists contents of limit table 2.
CONfig:LIMit:T3?	Lists contents of limit table 3.
CONfig:LIMit:T4?	Lists contents of limit table 4.
CONfig:LIMit:DEFault <T1   T2   T3   T4>	Set the selected limit table to the default values.
CONfig:LIMit:<table>:DIFPhas <min, max>	Set the differential phase limits in the specified table.
CONfig:LIMit:<table>:DIFPhas?	Return the differential phase limits from the specified table.
CONfig:LIMit:<table>:DIFGain <min, max>	Set the differential gain limits in the specified table.
CONfig:LIMit:<table>:DIFGain?	Return the differential gain limits from the specified table.

**Table B-7: Configuration commands (cont.)**

<b>Command</b>	<b>Description</b>
CONfig:LIMit:<table>:YCDelay <min, max>	Set the chrominance to luminance delay limits in the specified table.
CONfig:LIMit:<table>:YCDelay?	Return the chrominance to luminance delay limits from the specified table.
CONfig:LIMit:<table>:YCGain <min, max>	Set the chrominance to luminance gain limits in the specified table.
CONfig:LIMit:<table>:YCGain?	Return the chrominance to luminance gain limits from the specified table.
CONfig:LIMit:<table>:SNR:Flat <min, max>	Set the signal-to-noise ratio (flat filter) limits in the specified table.
CONfig:LIMit:<table>:SNR:Flat?	Return the signal-to-noise ratio (flat filter) limits from the specified table.
CONfig:LIMit:<table>:SNR:Weighted <min, max>	Set the signal-to-noise ration (weighted filter) limits in the specified table.
CONfig:LIMit:<table>:SNR:Weighted?	Return the signal-to-noise ration (weighted filter) limits from the specified table.
CONfig:LIMit:<table>:FREQ:Avg <min, max>	Set the frequency response limits in the specified table.
CONfig:LIMit:<table>:FREQ:Avg?	Return the frequency response limits from the specified table.
CONfig:LIMit:<table>:FREQ:Flag <min, max>	Set the frequency response flag amplitude limits in the specified table.
CONfig:LIMit:<table>:FREQ:Flag?	Return the frequency response flag amplitude limits from the specified table.
CONfig:LIMit:<table>:FREQ:P1 <min, max>	Set the frequency response packet 1 amplitude limits in the specified table.
CONfig:LIMit:<table>:FREQ:P1?	Return the frequency response packet 1 amplitude limits from the specified table.
CONfig:LIMit:<table>:FREQ:P2 <min, max>	Set the frequency response packet 2 amplitude limits in the specified table.

Table B-7: Configuration commands (cont.)

Command	Description
CONfig:LIMit:<table>:FREQ:P2?	Return the frequency response packet 2 amplitude limits from the specified table.
CONfig:LIMit:<table>:FREQ:P3 <min, max>	Set the frequency response packet 3 amplitude limits in the specified table.
CONfig:LIMit:<table>:FREQ:P3?	Return the frequency response packet 3 amplitude limits from the specified table.
CONfig:LIMit:<table>:FREQ:P4 <min, max>	Set the frequency response packet 4 amplitude limits in the specified table.
CONfig:LIMit:<table>:FREQ:P4?	Return the frequency response packet 4 amplitude limits from the specified table.
CONfig:LIMit:<table>:FREQ:P5 <min, max>	Set the frequency response packet 5 amplitude limits in the specified table.
CONfig:LIMit:<table>:FREQ:P5?	Return the frequency response packet 5 amplitude limits from the specified table.
CONfig:LIMit:<table>:FREQ:P6 <min, max>	Set the frequency response packet 6 amplitude limits in the specified table.
CONfig:LIMit:<table>:FREQ:P6?	Return the frequency response packet 6 amplitude limits from the specified table.
CONfig:LIMit:<table>:FREQ:MIN <min, max>	Set the frequency response minimum amplitude limits in the specified table.
CONfig:LIMit:<table>:FREQ:MIN?	Return the frequency response minimum amplitude limits from the specified table.
CONfig:LIMit:<table>:FREQ:MAX <min, max>	Set the frequency response maximum amplitude limits in the specified table.
CONfig:LIMit:<table>:FREQ:MAX?	Return the frequency response maximum amplitude limits from the specified table.
CONfig:LIMit:<table>:GDLY:MIN <min, max>	Set the group delay minimum amplitude limits in the specified table.
CONfig:LIMit:<table>:GDLY:MIN?	Return the group delay minimum amplitude limits from the specified table.
CONfig:LIMit:<table>:GDLY:MAX <min, max>	Set the group delay maximum amplitude limits in the specified table.

**Table B-7: Configuration commands (cont.)**

<b>Command</b>	<b>Description</b>
CONfig:LIMit:<table>:GDLY:MAX?	Return the group delay maximum amplitude limits from the specified table.
CONfig:LIMit:<table>:SYNCamp1 <min, max>	Set the sync amplitude limits in the specified table.
CONfig:LIMit:<table>:SYNCamp1?	Return the sync amplitude limits from the specified table.
CONfig:LIMit:<table>:BURStamp1 <min, max>	Set the burst amplitude limits in the specified table.
CONfig:LIMit:<table>:BURStamp1?	Return the burst amplitude limits from the specified table.
CONfig:LIMit:<table>:BARamp1 <min, max>	Set the bar amplitude limits in the specified table.
CONfig:LIMit:<table>:BARamp1?	Return the bar amplitude limits from the specified table.
CONfig:LIMit:<table>:KFACTOR <min, max>	Set the 2T K-factor limits in the specified table.
CONfig:LIMit:<table>:KFACTOR?	Return the 2T K-factor limits from the specified table.
CONfig:LIMit:<table>:LUM <min, max>	Set the luminance nonlinearity limits in the specified table.
CONfig:LIMit:<table>:LUM?	Return the luminance nonlinearity limits from the specified table.
CONfig:LIMit:<table>:HUM:PP <min, max>	Set the peak-to-peak hum with no ZCR pulse limits in the specified table.
CONfig:LIMit:<table>:HUM:PP?	Return the peak-to-peak hum with no ZCR pulse limits from the specified table.
CONfig:LIMit:<table>:HUM:PP:PCT <min, max>	Set the peak-to-peak hum with ZCR pulse limits in the specified table.
CONfig:LIMit:<table>:HUM:PP:PCT?	Return the peak-to-peak hum with ZCR pulse limits from the specified table.
CONfig:LIMit:<table>:HUM:F50 <min, max>	Set the 50 Hz hum with no ZCR pulse limits in the specified table.



Table B-7: Configuration commands (cont.)

Command	Description
CONfig:LIMit:<table>:HUM:F50?	Return the 50 Hz hum with no ZCR pulse limits from the specified table.
CONfig:LIMit:<table>:HUM:F50:PCT <min, max>	Set the 50 Hz hum with ZCR pulse limits in the specified table.
CONfig:LIMit:<table>:HUM:F50:PCT?	Return the 50 Hz hum with ZCR pulse limits from the specified table.
CONfig:LIMit:<table>:HUM:F60 <min, max>	Set the 60 Hz hum with no ZCR pulse limits in the specified table (VM100).
CONfig:LIMit:<table>:HUM:F60?	Return the 60 Hz hum with no ZCR pulse limits from the specified table (VM100).
CONfig:LIMit:<table>:HUM:F60:PCT <min, max>	Set the 60 Hz hum with ZCR pulse limits in the specified table (VM100).
CONfig:LIMit:<table>:HUM:F60:PCT?	Return the 60 Hz hum with ZCR pulse limits from the specified table (VM100).
CONfig:LIMit:<table>:HUM:F100 <min, max>	Set the 100 Hz hum with no ZCR pulse limits in the specified table.
CONfig:LIMit:<table>:HUM:F100?	Return the 100 Hz hum with no ZCR pulse limits from the specified table.
CONfig:LIMit:<table>:HUM:F100:PCT <min, max>	Set the 100 Hz hum with ZCR pulse limits in the specified table.
CONfig:LIMit:<table>:HUM:F100:PCT?	Return the 100 Hz hum with ZCR pulse limits from the specified table.
CONfig:LIMit:<table>:HUM:F120 <min, max>	Set the 120 Hz hum with no ZCR pulse limits in the specified table (VM100).
CONfig:LIMit:<table>:HUM:F120?	Return the 120 Hz hum with no ZCR pulse limits from the specified table (VM100).
CONfig:LIMit:<table>:HUM:F120:PCT <min, max>	Set the 120 Hz hum with ZCR pulse limits in the specified table (VM100).
CONfig:LIMit:<table>:HUM:F120:PCT?	Return the 120 Hz hum with ZCR pulse limits from the specified table (VM100).

**Table B-7: Configuration commands (cont.)**

<b>Command</b>	<b>Description</b>
CONfig:LINE:<subcommand><field, line>	Set the field and line for the specified measurement in manual signal identification mode.
CONfig:LINE:<subcommand>?	Return the field and line for the specified measurement in manual signal identification mode
CONfig:LUM <Normal Diffstep>	Select Normal or Diffstep method for luminance nonlinearity measurements.
CONfig:LUM?	Return the method used for luminance nonlinearity measurements.
CONfig:MEAs:<subcommand>	Configure the selected measurement ON or OFF.
CONfig:MEAs:<subcommand>?	Return the selected measurement configuration.
CONfig:REference <Internal External>	Select INTERNAL or EXTERNAL sync frequency reference.
CONfig:REference?	Return the frequency reference selection.
CONfig:SIGNALid:FULLfldstart <23 - 94> (VM100) or <23 - 39> (VM101)	Select the starting video line number for the SIG ID mode when FULL is selected.
CONfig:SIGNALid:FULLfldstart?	Return the starting video line number.
CONfig:SIGNALid:LINEspacing?	Return the line spacing for the SIG ID mode when FULL is selected.
CONfig:SIGNALid:RANGE <Vits Full>	Select the range for the SIG ID mode.
CONfig:SIGNALid:RANGE?	Return the range for the SIG ID mode.
CONfig:SWVersion?	Return the current software version.
CONfig:TIME <hh,mm>	Set the time of the 24 hour internal clock.
CONfig:TIME?	Return the time of the internal clock.

**Table B-7: Configuration commands (cont.)**

Command	Description
CONfig:ZCRpulse <"OFF" "10" - "20"> (VM100) or <"OFF" "7" - "20"> (VM101)	Set the zero carrier reference pulse to OFF or a video line you specify.
CONfig:ZCRpulse?	Return the zero carrier reference pulse setting.

### Report Measurements Commands

Table B-8 lists the commands that report the current measurement results.

**Table B-8: Report measurements commands**

Command	Description
REPort[:ALL]?	Return the current measurement results from all memory locations.
REPort:subcommand[:WHERE]?	Return the current results of the measurement. Add WHERE to return the field number, line number, and signal type.

### Help Commands

Table B-9 lists the help commands that return a summary of the commands in the command set.

**Table B-9: Help commands**

Command	Description
HELP	Return a summary of the available commands.
HELP?	Return a summary of the available commands.





# Command List

## AVG

The command turns the averaging feature ON or OFF. The query form returns ON if averaging is ON and OFF if averaging is OFF.

### Syntax

AVG <argument>

### Parameters

OFF|ON

### Returns

"Off"|"On"

### Examples

AVG OFF turns off the averaging feature.

AVG? returns "On" if the averaging feature is ON.

## CONfig:DATE

The command sets the internal date within the video measurement set memory. The query form returns the current date setting. The error message “Parameter out of range” is returned for commands outside the limits allowed.

### Syntax

CONfig:DATE <mm,dd,yy>

where <mm> is the month (1 – 12), <dd> is the day (1 – 31), and <yy> is the year (00 – 99 representing 1990 – 2089).

CONfig:DATE?

### Parameters

mm: 1 – 12

dd: 1 – 31

yy: 00 – 99

---

**NOTE.** *If you enter 31 for the date when a month has less than 31 days, the value is automatically rounded to the highest number allowed for that month.*

---

### Returns

mm-dd-yy

### Examples

CONfig:DATE 3,15,96 sets the date to March 15, 1996.

CONfig:DATE? might give the response 4-21-97 where 4 is the month of April, 21 is the twenty first day, and 97 is the year 1997.

## CONfig:FILter

The command selects the filter type that is used to perform the signal-to-noise measurement. The query form returns the current filter selection.

### Syntax

```
CONfig:FILter <argument>
```

```
CONfig:FILter?
```

### Parameters

```
Flat|Weighted
```

### Returns

```
"Flat"|"Weighted"
```

### Examples

```
CONfig:FILter Flat sets the signal-to-noise filter selection to "flat."
```

```
CONfig:FILter? gives the response "Weighted" if WEIGHTD is the current selection.
```

## CONfig:HUM

The command selects the hum frequency that is used to complete the hum measurement (VM100 only). The query form returns the current hum frequency selection.

The command is not valid for the VM101 because only 50 Hz hum measurements can be made. The message “Command not allowed” is returned if you issue the command to a VM101. The VM101 will respond to the query.

### Syntax

CONfig:HUM <argument> (VM100 only)

CONfig:HUM?

### Parameters

F50 | F60

### Returns

"F50" | "F60"

### Examples

CONfig:HUM F50 sets the hum frequency selection to 50 Hz.

CONfig:HUM? gives the response "F60" if the current setting is 60 Hz.



## CONfig:LCDangle

The command sets the viewing angle of the LCD display. The query form returns the current LCD display angle setting.

### Syntax

```
CONfig:LCDangle <NR1>
```

```
CONfig:LCDangle?
```

### Parameters

NR1: 0 - 180

### Returns

NR1: 0 - 180

### Examples

CONfig:LCDangle 90 sets the LCD display viewing angle near the middle of its range.

CONfig:LCDangle? gives the response 60 if the current viewing angle setting is 60.

## CONfig:LIMit

Use this command to select a limit table or to disable limit checking. The query form returns the limit table selected.

### Syntax

CONfig:LIMit <argument>

CONfig:LIMit?

### Parameters

T1 | T2 | T3 | T4 | Off

### Returns

“T1” | “T2” | “T3” | “T4” | “Off”

### Examples

CONfig:LIMit Off disables limit checking.

CONfig:LIM T3 enables limit checking using limit table 3.

CONfig:LIMit? returns “T2” if the current limit table setting is T2.

## **CONfig:LIMit:<table>? (Query Only)**

Use this query to list the contents of the selected limit table.

### **Syntax**

CONfig:LIMit:<table>

### **Parameters**

<table> = T1 | T2 | T3 | T4

### **Returns**

The complete set of limits defined for the selected limit table.

### **Examples**

CONfig:LIMit:T1?

## CONfig:LIMit:<table>:<parameter>

Use this command form to set or query the limits for measurements within a given limit table. The query form returns the minimum and maximum values for the specified parameter in the specified table. Refer to Table B-7 for command syntax details.

### Syntax

CONfig:LIMit:<table>:<parameter> <min, max>

CONfig:LIMit:<table>:<parameter>?

### Parameters

<table> = T1 | T2 | T3 | T4

<parameter> = Listed in Table B-7 starting on page B-17.

<min, max> = -9999.99 to +9999.99

### Returns

The minimum and maximum limits set for the given parameter in the specified table.

### Examples

CONfig:LIMit:T1:DIFPhase 0, 1.00 sets the differential phase lower limit (minimum) to zero and the upper limit (maximum) to 1.00 in Limit Table 1.

CONfig:LIMit:T2:HUM:PP:PCT? returns the limits for peak-to-peak hum with ZCR pulse set in Limit Table 2.

## CONfig:LIMit:DEFault <table>

Use this command to set the contents of the selected limit table to the factory defaults.

### Syntax

CONfig:LIMit:DEFault <table>

### Parameters

table = T1 | T2 | T3 | T4

### Examples

CONfig:LIMit:DEFault T1 sets all the limits in Limit Table T1 to their default values.

---

**NOTE.** To view default values, use the *CONfig:LIMit:<table>* command.

---

## CONfig:LINE

The command sets the field and line used for a measurement in manual signal identification mode. The query returns the field and line used for a measurement in manual signal identification mode. The hum measurement is not specific to a field and line.

### Syntax

CONfig:LINE:<subcommand from table> <field,line>  
 CONfig:LINE:<subcommand from table>?

Table B–10 lists the subcommands:

**Table B–10: CONfig:LINE subcommands**

Subcommand	Measurement Name
BARamp1	Bar amplitude
BURStamp1	Burst amplitude
DIFGain	Differential gain
DIFPhase	Differential phase
FREQ	Basic frequency response
FREQ:DETail	Detailed frequency response
GDLY	Group delay
KFACTOR	2T K-factor
LUM	Luminance nonlinearity
SNR	Signal-to-noise ratio
SYNCamp1	Sync amplitude
YCDeLay	Chrominance-to-luminance delay
YCGain	Chrominance-to-luminance gain

**Parameters**

Field: F1|F2

Table B–11 lists the available lines.

**Table B–11: CONfig:LINE available lines**

Field 1 (F1)	Field 2 (F2)
9 – 263 (NTSC)	9 – 262 (NTSC)
6 – 310 (PAL)	318 – 623 (PAL)

**Returns**

Field and line for the measurement selected by the subcommand.

**Examples**

CONfig:LINE:DIFFPhase F1,17

CONfig:LINE:YCDelay? might return the response "F2,332".

## CONfig:Lum

The command sets the luminance nonlinearity measurement method.  
The query form returns the current luminance nonlinearity measurement method.

### Syntax

CONfig:Lum <argument>

CONfig:Lum?

### Parameters

Normal|Diffstep

### Returns

"Normal"|"Diffstep"

### Examples

CONfig:Lum Diffstep sets the diffstep luminance nonlinearity measurement method.

CONfig:Lum? gives the response "Normal" if the luminance nonlinearity measurement method is set to NORMAL.



## CONfig:MEAs:subcommand

The CONfig:MEAs: command, when followed by a subcommand that selects the measurement mode, configures the measurement ON or OFF. Measurement configuration determines which measurements can be performed in response to the MEASure:<subcommand> and REPort:<subcommand> commands. The query form returns the ON/OFF status of the measurement.

### Syntax

CONfig:MEAs:<subcommand from table> <argument>  
 where <subcommand from table> selects which measurement to configure and <argument> turns the measurement ON or OFF.

CONfig:MEAs:<subcommand from table>?

Table B-12 lists the subcommands:

**Table B-12: CONfig:MEAs subcommands**

Subcommand	Measurement Name
BARamp1	Bar amplitude
BURStamp1	Burst amplitude
DIFGain	Differential gain
DIFPhase	Differential phase
FREQ	Basic frequency response
FREQ:DETail	Detailed frequency response
GDLY	Group delay
HUM	Hum
KFACTOR	2T K-factor
LUM	Luminance nonlinearity
SNR	Signal-to-noise ratio
SYNCamp1	Sync amplitude

**Table B-12: CONfig:MEAs subcommands (cont.)**

<b>Subcommand</b>	<b>Measurement Name</b>
YCDelay	Chrominance-to-luminance delay
YCGain	Chrominance-to-luminance gain

**Parameters**

OFF|ON

**Returns**

"Off"|"On"

**Examples**

CONfig:MEAs:DIFPhase on configures the differential phase measurement ON.

CONfig:MEAs:DIFPhase? gives the response "Off" if the differential phase measurement is configured OFF.

## CONfig:REference

The command selects the INTERNAL or EXTERNAL sync frequency reference. The query form returns the current reference frequency selection.

### Syntax

CONfig:REference <argument>

CONfig:REference?

### Parameters

Internal|External

### Returns

"Internal"|"External"

### Examples

CONfig:REference Internal sets the sync frequency reference selection to INTERNAL.

CONfig:REference? gives the response "External" if the current reference setting is EXTERNAL.

## CONfig:SIGnalid:FULlflldstart

The command selects the video line number where sampling begins when the SIG ID RANGE is set to full field mode (FULL). The query form returns the current video line selection.

When FULL (full field mode) is selected, the video measurement set takes samples every 13 (VM100) or 16 (VM101) lines. If the starting line is 23 and you have a VM101, samples will occur at lines 23, 39, 55, 71, and so on. By changing the starting line, you can sample any video line within the active area.

### Syntax

```
CONfig:SIGnalid:FULlflldstart <NR1>
```

```
CONfig:SIGnalid:FULlflldstart?
```

### Parameters

NTSC: 23 – 94  
PAL: 23 – 39

### Returns

NTSC: 23 – 94  
PAL: 23 – 39

### Examples

CONfig:SIGnalid:FULlflldstart 25 sets the video line number to 25.

CONfig:SIGnalid:FULlflldstart? gives the response 29 if the current FULL FIELD START setting is video line 29.

## **CONfig:SIGnalid:LINespacing? (Query Only)**

The query returns the linespacing for the SIG ID mode when full field mode (FULL) is active.

### **Syntax**

CONfig:SIGnalid:LINespacing?

### **Returns**

13 (VM100)

16 (VM101)

### **Examples**

CONfig:SIGnalid:LINespacing? gives the response 13 if the video measurement set is a VM100.

## CONfig:SIGnalid:RANge

The command selects the range for the SIG ID mode. The query form returns the current range selection.

---

***NOTE.** After you issue a command to configure the signal identification range, the video measurement set reacquires the signal.*

---

### Syntax

CONfig:SIGnalid:RANge <argument>

CONfig:SIGnalid:RANge?

### Parameters

Vits|Full|Manual

### Returns

"Vits"|"Full"|"Manual"

### Examples

CONfig:SIGnalid:RANge full sets the SIGNAL ID range to FULL.

CONfig:SIGnalid:RANge? gives the response "Vits" if the current RANGE setting is VITS.

## CONfig:SWVersion? (Query Only)

The query returns the version of software currently installed in the video measurement set.

### Syntax

CONfig:SWVersion?

### Returns

SW Version x.xx PAL  
SW Version x.xx NTSC

### Examples

CONfig:SWVersion? might give the response SW Version 1.64 PAL if the video measurement set is a VM101. Your actual version number may be different.

## CONfig:TIME

The command sets the 24-hour internal time clock for the video measurement set memory. The query form returns the current time setting. The error message, “Parameter out of range,” is returned for commands outside the limits allowed.

### Syntax

CONfig:TIME <hour>,<minute>

where <hour> is an hour from 0 – 23 (0 = 12 AM, 12 = 12 PM) and <minute> is a minute from 0 – 59.

CONfig:TIME?

### Parameters

hour: 0 – 23 (0 – 11 for AM, 12 – 23 for PM)

minute: 1 – 59

### Returns

hh,mm

### Examples

CONfig:TIME 14,30 sets the time clock to 2:30 PM.

CONfig:TIME? gives the response 9:23 if the current time is 9:23 AM.

CONfig:TIME? gives the response 14:30 if the current time is 2:30 PM.



## CONfig:ZCRp

The command sets the zero carrier reference pulse to OFF or to a video line you specify. The query form returns the current zero carrier reference pulse setting.

### Syntax

```
CONfig:ZCRp <string>
```

```
CONfig:ZCRp?
```

---

**NOTE.** The <string> must be surrounded by quotation marks (for example, "10" or "OFF").

---

### Parameters

```
"OFF" | "10" - "20" (VM100)  
"OFF" | "7" - "20" (VM101)
```

### Returns

```
"OFF" | "10" - "20" (VM100)  
"OFF" | "7" - "20" (VM101)
```

### Examples

CONfig:ZCRp "20" sets the zero carrier reference pulse to video line 20.

CONfig:ZCRp? gives the response "OFF" if the zero carrier reference pulse is currently set to OFF.

## FREEze

The command turns the freeze feature ON or OFF. The query form returns "On" if freeze is ON and "Off" if freeze is OFF.

### Syntax

FREEze <argument>

### Parameters

OFF|ON

### Returns

"Off"|"On"

**Examples** FREEze OFF turns off the freeze feature.  
FREEze? returns "On" if the freeze feature is ON.

---

**NOTE.** *No measurements are performed while FREEze is on. The REPort and MEMory:SAVe commands use the results that were present when FREEze was activated.*

*To resume taking measurements, FREEZe must be off and either of the MEAS or SIG ID LEDs lit.*

---

## HELP

The command and query form both return a list of most commands within the command set, and a brief description of each command.

### Syntax

HELP  
HELP?

### Parameters

None.

### Returns

Available commands:

AVG data	Signal averaging; data = <on,off>.
CON:DAT data	Configure date; data = <mm,dd,yy>.
CON:FIL data	Configure SNR filter; data = <flat,weighted>.
CON:LIM data	Select limit table; data = <T1, T2, T3, T4, OFF>
CON:LIM:DEF data	Restore limit table defaults; data = <T1, T2, T3, T4>
CON:LIM:Tx?	Report limit table; Tx = <T1, T2, T3, T4>
CON:LIM:TX meas l,h	Configure measurement limit: Tx = <T1, T2, T3, T4> l = minimum, h = maximum
CON:MEA:meas data	Configure measurement <meas>; data = <on,off>.
CON:REF data	Configure sync reference; data = <input,external>.
CON:SIG:FUL data	Configure full field start; data = <23,,39>.
CON:SIG:RAN data	Configure signal ID range; data = <vits,full>.
CON:SIG:LIN?	Display full field signal ID line spacing.
CON:SWV?	Display software version.
CON:TIM data	Configure time; data = <hh,mm>.
CON:ZCR data	Configure ZCRP; data = <"off", "7", ..., "20">.

FREEze data	Freeze feature; data = <on/off>.
MEAS:meas data	Take a measurement and display the result; data = <F1,F2>,<line>.
MEAS:meas:WHER data	Take a measurement and display the result including signal ID; data = <F1,F2>,<line>.
MEM:DIR?	List measurement memory directory.
MEM:ERA name	Erase “name” measurement memory.
MEM:ERA:ALL	Erase all measurement memories.
MEM:REC? name	Recall measurement from “name” memory.
MEM:REC:CAL	Recall calibration from memory.
MEM:REC:DEF	Recall default settings from memory.
MEM:REC:SET	Recall settings from memory.
MEM:REN name1, name2	Rename memory from “name1” to “name2”.
MEM:SAV	Save measurement to (default name) memory.
MEM:SAV name	Save measurement to “name” memory.
MEM:SAV:CAL	Save calibration to memory.
MEM:SAV:SET	Save settings to memory.
NEXT:meas	Display next signal used for <meas>.
PREV:meas	Display previous signal used for <meas>.
REPort?	Display all current measurement results.
REP:<meas>?	Display measurement <meas> result.
REP:<meas>:WHER?	Display measurement <meas> result including signal ID.
REP:HUM:PP?	Display peak-to-peak hum result.
REP:HUM:F50HZ?	Display 50Hz hum result.
REP:HUM:F100HZ?	Display 100Hz hum result.

### Examples

HELP returns the list of commands and a brief description of each command.

## MEASure:BARamp1[:WHERE]

The command initiates a bar amplitude measurement on the signal connected to the INPUT, and returns the measurement results. You must specify the field and line where the measurement will be made.

The video measurement set requires certain types of input signals to successfully run the measurement. Refer to the *Reference* section for details. If you attempt to measure an invalid signal, the message “inappropriate measurement for this signal,” is returned.

### Syntax

```
MEASure:BARamp1 <field,line>
MEASure:BARamp1:WHERE <field,line>
```

### Parameters

Field: F1|F2  
Line: See table

Field 1 (F1)	Field 2 (F2)
9 – 263 (NTSC)	9 – 262 (NTSC)
6 – 310 (PAL)	318 – 623 (PAL)

### Examples

MEASure:BARamp1 f2,17 might give the response 41 IRE where 41 IRE is the measurement result (VM100 example).

MEASure:BARamp1:WHERE f2,17 might give the response 711 mV F2:17 MULTIBURST where 711 mV is the measurement result, F1:12 are the field and line number, and MULTIBURST is the signal type (VM101 example).

## MEASure:BURStamp[:WHERE]

The command initiates a burst amplitude measurement on the signal connected to the INPUT, and returns the measurement results. You must specify the field and line where the measurement will be made.

The video measurement set requires certain types of input signals to successfully run the measurement. Refer to the *Reference* section for details. If you attempt to measure an invalid signal, the message, “inappropriate measurement for this signal,” is returned.

### Syntax

```
MEASure:BURStamp <field,line>
MEASure:BURStamp:WHERE <field,line>
```

### Parameters

Field: F1|F2  
Line: See table

Field 1 (F1)	Field 2 (F2)
9 – 263 (NTSC)	9 – 262 (NTSC)
6 – 310 (PAL)	318 – 623 (PAL)

### Examples

MEASure:BURStamp f1,12 might give the response 45 IRE where 45 IRE is the measurement result (VM100 example).

MEASure:BURStamp:WHERE f1,12 might give the response 303.4 mV F1:12 MULTIBURST where 303.4 mV is the measurement result, F1:12 are the field and line number, and MULTIBURST is the signal type (VM101 example).

## MEASure:DIFGain[:WHERe]

The command initiates a differential gain measurement on the signal connected to the INPUT, and returns the measurement results. You must specify the field and line where the measurement will be made.

The video measurement set requires certain types of input signals to successfully run the differential gain measurement. Refer to the *Reference* section for details. If you attempt to measure an invalid signal, the message, “inappropriate measurement for this signal” is returned.

### Syntax

```
MEASure:DIFGain <field,line>
MEASure:DIFGain:WHERe <field,line>
```

### Parameters

Field: F1|F2  
Line: See table

Field 1 (F1)	F2
9 – 263 (NTSC)	9 – 262 (NTSC)
6 – 310 (PAL)	318 – 623 (PAL)

### Examples

MEASure:DIFGain f1,20 might give the response 1.2% where 1.2% is the measurement result.

MEASure:DIFGain:WHERe f1,20 might give the response 1.2% F1:20 NTC7COMP where 1.2% is the measurement result, F1:20 are the field and line number, and NTC7COMP is the signal type.

## MEASure:DIFPhase[:WHERE]

The command initiates a differential phase measurement on the signal connected to the INPUT and returns the measurement results. You must specify the field and line where the measurement will be made.

The video measurement set requires certain types of input signals to successfully run the measurement. Refer to the *Reference* section for details. If you attempt to measure an invalid signal, the message, “inappropriate measurement for this signal,” is returned.

### Syntax

```
MEASure:DIFPhase <field,line>
MEASure:DIFPhase:WHERE <field,line>
```

### Parameters

Field: F1|F2  
Line: See table

Field 1 (F1)	Field 2 (F2)
9 – 263 (NTSC)	9 – 262 (NTSC)
6 – 310 (PAL)	318 – 623 (PAL)

### Examples

MEASure:DIFPhase f1,20 might give the response 12.3° where 12.3° is the measurement result.

MEASure:DIFPhase:WHERE f1,20 might give the response 12.3° F1:20 NTC7COMP where 12.3° is the measurement result, F1:20 are the field and line number, and NTC7COMP is the signal type.



## MEASure:FREQresp[:WHERE]

The command initiates a frequency response measurement on the signal connected to the INPUT and returns the measurement results. You must specify the field and line where the measurement will be made.

The video measurement set requires certain types of input signals to successfully run the measurement. Refer to the *Reference* section for details. If you attempt to measure an invalid signal, the message, “inappropriate measurement for this signal,” is returned.

The VM100 measures frequency response using the FCC method to calculate the results FREQ (FCC). The VM101 measures frequency response by making a fine resolution, continuous frequency response measurement FREQ (AVG). If the input signal contains discrete frequency packets, such as the multiburst signal, the video measurement set measures the amplitude of each packet with reference to the flag amplitude. Otherwise, the video measurement set measures the overall response, the minimum amplitude, and the maximum amplitude within the signal bandwidth.

### Syntax

```
MEASure:FREQresp <field,line>
MEASure:FREQresp:WHERE <field,line>
```

### Parameters

Field: F1|F2  
Line: See table

Field 1 (F1)	Field 2 (F2)
9 – 263 (NTSC)	9 – 262 (NTSC)
6 – 310 (PAL)	318 – 623 (PAL)

### Examples

```
MEASure:FREQresp f1,17 might give the response
6.0 dB FREQ(FCC)
108.8 IRE FREQ FLAG
0.2 dB FREQ#1
0.7 dB FREQ#2
0.3 dB FREQ#3
-2.0 dB FREQ#4
-4.6 dB FREQ#5
-11.7 dB FREQ#6
```

where 6.0 dB FREQ(FCC) is the overall response measurement result ( $\pm$  dB), 108.8 IRE FREQ FLAG is the amplitude reference, and XX dB FREQ#1 - #6 are the signal amplitudes at each frequency within the packet (VM100 example).

```
MEASure:FREQresp:WHERe f1,12 might give the response
6.0 dB FREQ(AVG) F1:12 CGR
1.4 dB FRQmax F1:12 GCR
-10.2 dB FRQmin F1:12 GCR
```

where 6.0 dB FREQ(AVG) F1:12 GCR is the overall response measurement result ( $\pm$  dB) with field and line number, and the signal type. 1.4 dB FRQmax is the maximum measured amplitude and -10.2 dB FRQmin is the minimum measured amplitude (VM101 example).

## MEASure:GDLY[:WHERE]

The command initiates a group delay measurement on the signal connected to the INPUT and returns the maximum and minimum measurement results. You must specify the field and line where the measurement will be made.

The video measurement set requires certain types of input signals to successfully run the measurement. Refer to the *Reference* section for details. If you attempt to measure an invalid signal, the message, “inappropriate measurement for this signal,” is returned.

### Syntax

```
MEASure:GDLY <field,line>
MEASure:GDLY:WHERE <field,line>
```

### Parameters

Field: F1|F2  
Line: See table

Field 1 (F1)	Field 2 (F2)
9 – 263 (NTSC)	9 – 262 (NTSC)
6 – 310 (PAL)	318 – 623 (PAL)

### Examples

```
MEASure:GDLY f2,15 might give the response
118.2 ns GRPDLYmax
0.0 ns GRPDLYmin
where 118.2 ns GRPDLYmax is the maximum measured delay and
0.0 ns GRPDLYmin is the minimum measured delay.
```

```
MEASure:GDLY:WHERE f2,15 might give the response
118.2 ns GRPDLYmax F2:15 SINX/X
0.0 ns GRPDLYmin F2:15 SINX/X
where 118.2 ns GRPDLYmax is the maximum measured delay with
field and line number, and signal type. The minimum measured delay
is 0.0 ns GRPDLYmin.
```

## MEASure:HUM

The command initiates a hum measurement on the signal connected to the INPUT and returns the measurement results. If the ZCR pulse is present hum is expressed as a percentage of the visual carrier amplitude. If the ZCR pulse is not present hum is expressed in IRE units (VM100) or millivolts (VM101).

### Syntax

MEASure:HUM

### Parameters

None

### Examples

MEASure:HUM might give the response

1.3 IRE P-P

0.3 IRE 60HZ

0.2 IRE 120HZ.

where 1.3 IRE P-P is the overall peak-to-peak transient and periodic low frequency interference, 0.3 IRE 60HZ is the 60 Hz line frequency peak-to-peak amplitude, and 0.2 IRE 120HZ is the 120 Hz harmonic of line frequency peak-to-peak amplitude (VM100 example).

MEASure:HUM might give the response

2.3 mV P-P

1.3 mV 50HZ

1.2 mV 100HZ.

where 2.3 mV P-P is the overall peak-to-peak transient and periodic low frequency interference, 1.3 mV 50HZ is the 50 Hz line frequency peak-to-peak amplitude, and 1.2 mV 100HZ is the 100 Hz harmonic of line frequency peak-to-peak amplitude (VM101 example).

## MEASure:KFACTOR[:WHERE]

The command initiates a 2T K-factor measurement on the signal connected to the INPUT, and returns the measurement results. You must specify the field and line where the measurement will be made.

The video measurement set requires certain types of input signals to successfully run the measurement. Refer to the *Reference* section for details. If you attempt to measure an invalid signal, the message, “inappropriate measurement for this signal,” is returned.

### Syntax

```
MEASure:KFACTOR <field,line>
MEASure:KFACTOR:WHERE <field,line>
```

### Parameters

Field: F1|F2  
Line: See table

Field 1 (F1)	Field 2 (F2)
9 – 263 (NTSC)	9 – 262 (NTSC)
6 – 310 (PAL)	318 – 623 (PAL)

### Examples

MEASure:KFACTOR f2,17 might give the response 5.7% where 5.7% is the measurement result.

MEASure:KFACTOR:WHERE f2,17 might give the response 5.7% F2:17 MULTIBURST where 5.7% is the measurement result, F1:12 are the field and line number, and MULTIBURST is the signal type.

## MEASure:LUM[:WHERE]

The command initiates a luminance nonlinearity measurement on the signal connected to the INPUT and returns the measurement results. You must specify the field and line where the measurement will be made.

The video measurement set requires certain types of input signals to successfully run the measurement. Refer to the *Reference* section for details. If you attempt to measure an invalid signal, the message, “inappropriate measurement for this signal,” is returned.

### Syntax

```
MEASure:LUM <field,line>
MEASure:LUM:WHERE <field,line>
```

### Parameters

Field: F1|F2  
 Line: See table

Field 1 (F1)	Field 2 (F2)
9 – 263 (NTSC)	9 – 262 (NTSC)
6 – 310 (PAL)	318 – 623 (PAL)

### Examples

MEASure:LUM f1,15 might give the response 1.2%  
 where 1.2% is the measurement result.

MEASure:LUM:WHERE f1,15 might give the response 1.2% F1:15  
 LUM RAMP where 1.2% is the measurement result, F1:15 are the  
 field and line number, and LUM RAMP is the signal type.

## MEASure:SNR[:WHERE]

The command initiates a signal-to-noise ratio measurement on the signal connected to the INPUT and returns the measurement results. You must specify the field and line where the measurement will be made.

The video measurement set requires certain types of input signals to successfully run the measurement. Refer to the *Reference* section for details. If you attempt to measure an invalid signal, the message, “inappropriate measurement for this signal,” is returned.

### Syntax

```
MEASure:SNR <field,line>
MEASure:SNR:WHERE <field,line>
```

### Parameters

Field: F1|F2  
Line: See table

Field 1 (F1)	Field 2 (F2)
9 – 263 (NTSC)	9 – 262 (NTSC)
6 – 310 (PAL)	318 – 623 (PAL)

### Examples

MEASure:SNR f1,17 might give the response 44 dB where 44 dB is the measurement result.

MEASure:SNR:WHERE f1,17 might give the response 44 dB F1:17 0 PEDESTAL where 44 dB is the measurement result, F1:17 are the field and line number, and 0 PEDESTAL is the signal type.

## MEASure:SYNCamp[:WHERe]

The command initiates a sync amplitude measurement on the signal connected to the INPUT and returns the measurement results. You must specify the field and line where the measurement will be made.

The video measurement set requires certain types of input signals to successfully run the measurement. Refer to the *Reference* section for details. If you attempt to measure an invalid signal, the message, “inappropriate measurement for this signal,” is returned.

### Syntax

```
MEASure:SYNCamp1 <field,line>
MEASure:SYNCamp1:WHERe <field,line>
```

### Parameters

Field: F1|F2  
Line: See table

Field 1 (F1)	Field 2 (F2)
9 – 263 (NTSC)	9 – 262 (NTSC)
6 – 310 (PAL)	318 – 623 (PAL)

### Examples

MEASure:SYNCamp1 f1,12 might give the response 60 IRE where 60 IRE is the measurement result (VM100 example).

MEASure:SYNCamp1:WHERe f1,12 might give the response 306.1 mV F1:12 0 PEDESTAL where 306.1 mV is the measurement result, F1:12 are the field and line number, and 0 PEDESTAL is the signal type (VM101 example).



## MEASure:YCGain[:WHERE]

The command initiates a chrominance-to-luminance gain measurement on the signal connected to the INPUT and returns the measurement results. You must specify the field and line where the measurement will be made.

The video measurement set requires certain types of input signals to successfully run the measurement. Refer to the *Reference* section for details. If you attempt to measure an invalid signal, the message, “inappropriate measurement for this signal,” is returned.

### Syntax

```
MEASure:YCGain <field,line>
MEASure:YCGain:WHERE <field,line>
```

### Parameters

Field: F1|F2  
Line: See table

Field 1 (F1)	Field 2 (F2)
9 – 263 (NTSC)	9 – 262 (NTSC)
6 – 310 (PAL)	318 – 623 (PAL)

### Examples

MEASure:YCGain f2,15 might give the response 102% where 102% is the measurement result.

MEASure:YCGain:WHERE f2,15 might give the response 102% F2:15 PULSE&BAR where 102% is the measurement result, F2:15 are the field and line number, and PULSE&BAR is the signal type.

## MEASure:YCDelay[:WHERE]

The command initiates a chrominance-to-luminance delay measurement on the signal connected to the INPUT and returns the measurement results. You must specify the field and line where the measurement will be made.

The video measurement set requires certain types of input signals to successfully run the measurement. Refer to the *Reference* section for details. If you attempt to measure an invalid signal, the message, “inappropriate measurement for this signal,” is returned.

### Syntax

```
MEASure:YCDelay <field,line>
MEASure:YCDelay:WHERE <field,line>
```

### Parameters

Field: F1|F2  
 Line: See table

Field 1 (F1)	Field 2 (F2)
9 – 263 (NTSC)	9 – 262 (NTSC)
6 – 310 (PAL)	318 – 623 (PAL)

### Examples

MEASure:YCDelay f2,15 might give the response 4 ns where 4 ns is the measurement result.

MEASure:YCDelay:WHERE f2,15 might give the response 4 ns F2:15 NTC7COMP where 4 ns is the measurement result, F2:15 are the field and line number, and NTC7COMP is the signal type.

## **MEMory:DIR? (Query Only)**

The query returns a listing of the saved memory locations.

### **Syntax**

MEMory:DIR?

### **Returns**

A listing of the saved memory locations and their names.

### **Examples**

MEMory:DIR? might return  
MEMORY1  
MEMORY2  
UNNAMED-02  
UNNAMED-03  
UNNAMED-04.

The number of memories and the memory names returned depends on the memory contents of your video measurement set.

## MEMory:ERAsE[:MEM]

The command clears the memory locations you specify.

### Syntax

MEMory:ERAsE[:MEM] <string>

---

**NOTE.** The <string> must be surrounded by quotation marks (for example, "3" or "ABC").

---

### Parameters

<string> (up to 10 characters)

### Examples

MEMory:ERAsE "4" clears the memory location named 4.

## MEMory:ERAsE:ALL

The command clears all memory locations.



**CAUTION.** *This command erases all memory locations. Use the MEMory:ERAsE[:MEM] command to erase a single location.*

---

### Syntax

MEMory:ERAsE:ALL

### Parameters

None.

### Examples

MEMory:ERAsE:ALL clears all memory locations.

## MEMory:RECall[:MEM]? (Query Only)

The query returns the contents of the saved memory location you specify.

### Syntax

MEMory:RECall[:MEM]? <string>  
where <string> is the name of the saved memory location.

---

**NOTE.** The <string> must be surrounded by quotation marks (for example, "3" or "ABC").

---

### Parameters

<string> (up to 10 characters)

### Returns

The contents of the specified memory.

### Examples

MEMory:RECall? "3" returns the contents of the memory location named 3.

## **MEMory:RECall:ALL? (Query Only)**

The query returns the contents of all the saved memory locations.

### **Syntax**

MEMory:RECall:ALL?

### **Parameters**

None.

### **Returns**

The contents of all saved memory locations.

### **Examples**

MEMory:RECall:ALL? returns the contents of all saved memory locations.

## **MEMory:RECall:CAL**

The command restores the current calibration data from memory.

### **Syntax**

MEMory:RECall:CAL

### **Examples**

MEMory:RECall:CAL restores the current calibration data from memory.



## MEMory:RECall:DEFault

The command restores the video measurement set to the factory default settings. See Table 1–2 on page 1–7 for a list of the default settings.



**CAUTION.** *To avoid the loss of calibration, this command must be followed by a MEMory:RECall:CAL command.*

*If this command is issued with RS-232 handshaking enabled, a loss of communication may occur.*

---

### Syntax

MEMory:RECall:DEFault

### Parameters

None.

### Examples

MEMory:RECall:DEFault restores each control setting to the factory default state.

## **MEMory:RECall:LIMits?**

Use this query to list the contents of the limit table associated with specified memory.

### **Syntax**

MEMory:RECall:LIMits? "<string>"

### **Parameters**

<string> = up to ten characters

### **Returns**

The complete limit listing associated with the selected memory location.

### **Examples**

MEMory:RECall:LIMits? "TEST4"

## **MEMory:RECall:SETtings**

The command restores the settings that were active when the video measurement set was last turned off.

### **Syntax**

MEMory:RECall:SETtings

### **Parameters**

None.

### **Examples**

MEMory:RECall:SETtings restores each control setting to the state that was active when power was last turned off.

## MEMory:REName

The command changes the name of a memory location to a new name that you specify. If the specified name already exists the memory is not renamed and an error message is returned.

### Syntax

MEMory:REName <string>,<string>

where <string>,<string> is the name or number of the saved memory location you want to change followed by the new name.

---

**NOTE.** *The <string> must be surrounded by quotation marks (for example, "3" or "ABC").*

---

### Parameters

<string> (up to 10 characters)

### Examples

MEMory:REName "TEST","NEWTEST" changes the name of the memory location named "TEST" to "NEWTEST."

## MEMory:SAVe[:MEM]

If you do not specify a memory name, the command saves the current measurement results into the next available memory location. If you specify a memory location, the command saves the current measurement results to that location. Saving data to an existing memory location overwrites that location. The memory name can have up to ten characters.

---

**NOTE.** *If the video measurement set returns the message -360, BUSY; ACQUIRING NEW DATA; after you issue the MEMory:SAVe command you must resend the command. The video measurement set cannot respond to the MEMory:SAVe command when it is acquiring new data.*

---

### Syntax

MEMory:SAVe[:MEM]  
MEMory:SAVe[:MEM] <string>  
where <string> is the name of the saved memory location.

---

**NOTE.** *The <string> must be surrounded by quotation marks (for example, "3" or "ABC").*

---

### Parameters

Up to ten characters.

### Examples

MEMory:SAVe saves the current measurement results into memory location 6 if memory locations 1, 2, 3, 4, and 5 already contain saved measurement results.

MEMory:SAVe "TEST" saves the current measurement results into a memory location named "TEST."

## MEMory:SAVe:CAL

The command saves the internal calibration results into memory.



---

**CAUTION.** *If this command is issued, previous values for calibration will be overwritten.*

---

### Syntax

MEMory:SAVe:CAL

### Parameters

None.

### Examples

MEMory:SAVe:CAL saves the results from the internal calibration into memory.

## MEMory:SAVe:SETtings

The command saves the current settings to memory; the settings are implemented the next time power on occurs.



**CAUTION.** *If this command is issued, previous values for settings will be overwritten.*

---

### Syntax

MEMory:SAVe:SETtings

### Parameters

None.

### Examples

MEMory:SAVe:SETtings saves the current settings to memory.

## NEXTmeas:subcommand

The `NEXTmeas:` command, when followed by a subcommand that selects the measurement mode, causes the video measurement set to measure the results on the next line of video in the measurement list that contains a valid signal. When you reach the end of the list (field 2:line 623 for PAL, field 2:line 263 for NTSC), the next `NEXTmeas:` command causes the measurement to occur on the first line in the list (field 1:line 6 for PAL, field 1:line 9 for NTSC).

---

**NOTE.** *If the video measurement set returns the message -360, BUSY; ACQUIRING NEW DATA; after you issue the NEXTmeas command you must resend the command. The video measurement set cannot respond to the NEXTmeas command when it is acquiring new data.*

---

### Syntax

`NEXTmeas:<subcommand from table>`

where <subcommand> selects which measurement moves to the next line that contains a valid signal.

Table B-13 lists the subcommands:

**Table B-13: NEXTmeas subcommands**

Subcommand	Measurement Name
BARamp1	Bar amplitude
BURStamp1	Burst amplitude
DIFGain	Differential gain
DIFPhase	Differential phase
FREQresp	Frequency response
FREQresp:DETail	Frequency response detail



Table B-13: NEXTmeas subcommands (cont.)

Subcommand	Measurement Name
GDLY	Group delay
KFACTOR	2T K-factor
LUM	Luminance nonlinearity
SNR	Signal-to-noise ratio
SYNCAMPL	Sync amplitude
YCDelay	Chrominance-to-luminance delay
YCGain	Chrominance-to-luminance gain

**Parameters**

None.

**Examples**

Send `REPort:SNR:WHERE` to return the results of the signal-to-noise ratio measurement, including field and line number (F2:21):

```
SNR(WGT)=41.0dB F2:21 0 PEDESTAL
```

Send `NEXTmeas:SNR` to cause the signal-to-noise ratio measurement to occur on the next video line.

Send `REPort:SNR:WHERE` again to return the results of the current signal-to-noise ratio measurement, including field and line number (F2:25): `SNR(WGT)=44.8dB F2:25 0 PEDESTAL`.

## PREVmeas:subcommand

The `PREVmeas:` command, when followed by a subcommand that selects the measurement mode, causes the video measurement set to measure the results on the previous line of video in the measurement list that contains a valid signal. When you reach the beginning of the list (field 1:line 6 for PAL, field 1:line 9 for NTSC) the next `PREVmeas:` command causes the measurement to occur on the last line in the list (field 2:line 623 for PAL, field 2:line 262 for NTSC).

---

**NOTE.** *If the video measurement set returns the message -360, BUSY; ACQUIRING NEW DATA; after you issue the PREVmeas command you must resend the command. The video measurement set cannot respond to the PREVmeas command when it is acquiring new data.*

---

### Syntax

`PREVmeas:<subcommand from table>`  
 where <subcommand> selects which measurement moves to the previous line that contains a valid signal.

Table B–14 lists the subcommands:

**Table B–14: PREVmeas subcommands**

Subcommand	Measurement Name
BARamp1	Bar amplitude
BURStamp1	Burst amplitude
DIFGain	Differential gain
DIFPhase	Differential phase
FREQresp	Frequency response
FREQresp:DETail	Frequency response detail
GDLY	Group delay
KFACTOR	2T K-factor
LUM	Luminance nonlinearity

Table B-14: PREVmeas subcommands (cont.)

Subcommand	Measurement Name
SNR	Signal-to-noise ratio
SYNCamp1	Sync amplitude
YCDelay	Chrominance-to-luminance delay
YCGain	Chrominance-to-luminance gain

**Parameters**

None.

**Examples**

Send `REPort:SNR:WHERe` to return the results of the signal-to-noise ratio measurement, including field and line number (F2:21):

```
SNR(WGT)=41.0dB F2:21 0 PEDESTAL
```

Send `PREVmeas:SNR` to cause the signal-to-noise ratio measurement to occur on the previous video line.

Send `REPort:SNR:WHERe` again to return the results of the current signal-to-noise ratio measurement, including field and line number (F2:15): `SNR(WGT)=44.8dB F2:15 0 PEDESTAL`.

## REPort[:ALL]? (Query Only)

The query returns the current measurement results and the signal identification table.

---

**NOTE.** *If the video measurement set returns the message -360, BUSY; ACQUIRING NEW DATA; after you issue the REPort? query you must resend the command. The video measurement set cannot respond to the REPort? query when it is acquiring new data.*

---

### Syntax

REPort?  
REPort:ALL?

**Returns** The complete set of current measurement results and the signal identification table.

### Examples

REPort:ALL? or REP?.

## **REACquir**

The command causes the automatic measurement process to restart.

### **Syntax**

REACquir

### **Parameters**

None.

### **Examples**

REACquir or REAC.

## REMLock

The command locks the front panel so that key presses are ignored. The front panel lock can be unlocked by holding down the CONFIG button and pressing the FREEZE button. The query returns the current front panel lock status.

### Syntax

```
REMLock<argument>  
REMLock?
```

### Parameters

On|Off.

### Returns

On|Off.

### Examples

```
REMLock On  
REMLock?
```

## REPort:subcommand[:WHERe]?

The REPort: command, when followed by a subcommand that selects the measurement mode, reports the last results of the measurement. The WHERe subcommand adds the field number, line number, and video signal type to the response.

---

**NOTE.** *If the video measurement set returns the message -360, BUSY; ACQUIRING NEW DATA; after you issue the REPort command you must resend the command. The video measurement set cannot respond to the REPort command when it is acquiring new data.*

---

### Syntax

REPort:<subcommand from table>?  
 where <subcommand> selects the measurement mode.  
 REPort:<subcommand from table>[:WHERe]?

Table B–15 lists the subcommands:

**Table B–15: REP subcommands**

Subcommand	Measurement Results Returned
BARamp1[:WHERe]	Bar amplitude
BURStamp1[:WHERe]	Burst amplitude
DIFGain[:WHERe]	Differential gain
DIFPhase[:WHERe]	Differential phase
FREQ:AVG[:WHERe]	Frequency response
FREQ:FLAG[:WHERe]	Flag amplitude for frequency response reference
FREQ:MAX[:WHERe]	Maximum frequency response value
FREQ:MIN[:WHERe]	Minimum frequency response value
FREQ:<P1 – P6>[:WHERe]	Frequency response of packets
GDLY:MAX[:WHERe]	Maximum group delay

**Table B-15: REP subcommands (cont.)**

<b>Subcommand</b>	<b>Measurement Results Returned</b>
GDLY:MIN[:WHERE]	Minimum group delay
HUM:PP?	Hum, peak-to-peak
HUM:F100hz?	Hum at 100 Hz
HUM:F120hz?	Hum at 120 Hz (VM100 only)
HUM:F50hz?	Hum at 50 Hz
HUM:F60hz?	Hum at 60 Hz (VM100 only)
KFACTOR[:WHERE]	2T K-Factor
LUM[:WHERE]	Luminance nonlinearity
SNR[:WHERE]	Signal-to-noise ratio
SYNCamp1[:WHERE]	Sync amplitude
YCDelay[:WHERE]	Chrominance-to-luminance delay
YCGain[:WHERE]	Chrominance-to-luminance gain

**Parameters**

None.

**Examples**

REPort:SNR? might give the response 67.6 dB F1at where 67.6 dB is the measurement result and F1at is the selected filter type.

REPort:SNR:WHERE might give the response SNR(WGT)= 66.7 dB F1:17 0 PEDESTAL where SNR(WGT) is the measurement type, 66.7 dB is the measurement result, F1:17 are the field and line number, and 0 PEDESTAL is the signal type.



# Appendix C: Performance Verification

This section contains information needed to test the performance of the video measurement set. The procedure tests each characteristic that is designated as checked (REQ) in *Appendix A: Specifications*.

The Performance Verification Procedure is divided into the following parts:

- *General Information* provides basic information you need before performing the tests
- *Prerequisites* on page C-2 describes conditions that must be met before performing the tests
- *Equipment Required* on page C-2 lists the test equipment you need to perform the tests
- *Test Record* on page C-4 provides a way to record the test results
- *Performance Verification Procedure* on page C-5 provides the procedures needed to test the video measurement set

## General Information

Read the following information before performing the *Performance Verification Procedure*.

### Purpose

This procedure verifies that the video measurement set performance is in conformance with the specifications that are designated as checked (REQ) in *Appendix A: Specifications*.

### Test Interval

As a general rule, these tests should be done once a year to ensure that the instrument is operating within specified parameters.

## Prerequisites

The tests in this section comprise a valid confirmation of performance and functionality when the following requirements are met:

- The video measurement set must have been last adjusted at an ambient temperature between +20° C and +30° C and must be operating at an ambient temperature between 0° C and +50° C.
- For operating temperatures below +20° C, you must allow a warmup period of up to 25 minutes (no warmup time is needed for temperatures at or above +20° C).
- The cabinet is installed on the video measurement set.
- The video measurement set is in an environment within the limits described in Table A–6 on page A–5.

## Equipment Requirements

These procedures use external, traceable signal sources to directly test characteristics that are designated as (REQ) in *Appendix A: Specifications*. Table C–1 shows the required test equipment.

Table C-1: Test equipment

Item Description	Minimum Requirements	Example
Test Signal Generator	Amplitude accuracy: $\pm 0.5\%$ Differential phase: $\pm 0.3^\circ$ Differential gain: $\pm 0.3\%$ K-factor: $\pm 0.3\%$ Chroma delay: 2.5 ns Chroma gain: $\pm 0.5\%$ Luminance nonlinearity: $\pm 0.4\%$ Group delay: $\leq 3$ ns Frequency response: $\pm 0.05$ dB from 0.5 – 4.8 MHz, $\pm 0.06$ dB at 5.8 MHz	Tektronix TG 2000 with the AVG module
Cable, Precision 75 $\Omega$ Coaxial	75 $\Omega$ , 42 in, male-to-male BNC connectors	Tektronix part number 012-0074-00
Termination, 75 $\Omega$	75 $\Omega$ , male BNC connector	Tektronix part number 011-0102-01

## Test Record

Use this form to record the results of the *Performance Verification Procedure* for the video measurement set.

Serial Number	Performed By	Date
Procedure Step	Requirement	Test Result
Differential Phase	$\pm 1.0^\circ$	
Differential Gain	$\pm 2.0\%$	
Sync Amplitude	$\pm 1\%$	
Burst Amplitude	$\pm 1\%$	
Bar Amplitude	$\pm 1\%$	
2T K-Factor	$\leq 2\%$	
Chroma-Luma Delay	$\pm 10$ ns	
Chroma-Luma Gain	$\pm 2.0\%$	
Luminance Nonlinearity	$\pm 1\%$	
Max Group Delay	0 to 20 ns	
Min Group Delay	0 to -20 ns	
Frequency Response		
FREQ FLAG	$\pm 1\%$	
FREQ #1	$\pm 0.2$ dB	
FREQ #2	$\pm 0.2$ dB	
FREQ #3	$\pm 0.2$ dB	
FREQ #4	$\pm 0.2$ dB	
FREQ #5	$\pm 0.2$ dB	
FREQ #6	$\pm 0.2$ dB	

## Performance Verification Procedure

This section provides the procedures needed to test the video measurement set. If you are not familiar with the operation of the video measurement set, perform the *Tutorial* on page 2–9 before proceeding.

The following procedures test the NTSC (VM100) and PAL (VM101) versions of the video measurement set. When the test signal requirements and measurement results are not the same for the VM100 and VM101, the test procedure will specify the differences.

### Initial Setup

1. Connect the output of the test signal generator to the rear-panel input of the video measurement set. If you are using a TG 2000 generator, configure the AVG1 module for a composite output on all channels and connect the cable as shown in Figure C–1.
2. Power on the test signal generator and the video measurement set. Allow at least a 15 minute warm-up period before proceeding.

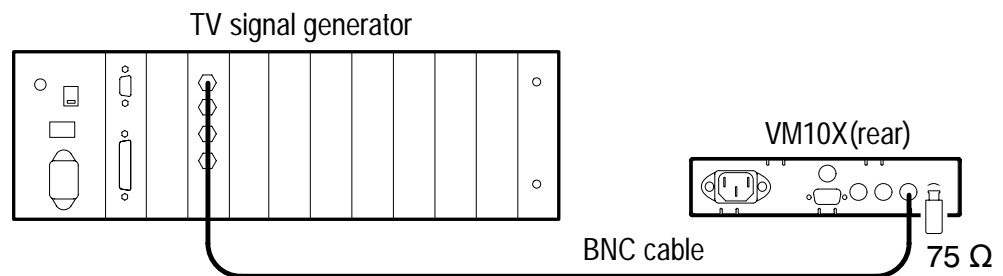


Figure C–1: Initial setup for the PV Procedure

### Configure the Video Measurement Set

1. On the video measurement set, press the AVG button to turn averaging on (LED is illuminated).
2. Press the CONFIG button.
3. Press the ↵ enter button to enter the CONFIG MEAS submenu.

---

**NOTE.** All measurements must be configured to ON except for SNR and HUM.

---

4. Press the ↓ arrow button to scroll through the CONFIG MEAS submenu. Press the → arrow button to turn off the SNR and HUM measurements.
5. Press the ↵ enter button to exit the menu.

### Signal Identification

1. On the video measurement set, press the SIG ID button. Verify that the LED in the center of the button is illuminated.
2. Press the ↓ arrow button to scroll through the SIG ID menu. Verify that all of the signal names and locations match the VITS signals generated by the test signal generator.

### Differential Phase

1. Set the test signal generator to produce the following signal:
  - VM100: NTC7 Composite signal
  - VM101: CCIR 330 signal
2. On the video measurement set, press the MEAS button and check that the LED in the center of the button is illuminated.
3. Verify that the displayed differential phase is within  $\pm 1.0^\circ$ .

### Differential Gain

1. Set the test signal generator to produce the following signal:
  - VM100: NTC7 Composite signal
  - VM101: CCIR 330 signal
2. On the video measurement set, press the ↓ arrow button to scroll to the DIFF GAIN measurement screen.
3. Verify that the displayed differential gain is within  $\pm 2.0\%$ .

### Sync Amplitude

1. Set the test signal generator to produce the following signal:
  - VM100: NTC7 Composite signal
  - VM101: CCIR 330 signal
2. On the video measurement set, press the ↓ arrow button to scroll to the SYNC AMPL measurement screen.
3. Verify that the displayed sync amplitude is within  $\pm 1\%$ .

### Burst Amplitude

1. Set the test signal generator to produce the following signal:
  - VM100: NTC7 Composite signal
  - VM101: CCIR 330 signal
2. On the video measurement set, press the ↓ arrow button to scroll to the BURST AMPL measurement screen.
3. Verify that the displayed burst amplitude is within  $\pm 1\%$ .

### Bar Amplitude

1. Set the test signal generator to produce the following signal:
  - VM100: NTC7 Composite signal
  - VM101: CCIR 330 signal
2. On the video measurement set, press the ↓ arrow button to scroll to the BAR AMPL measurement screen.
3. Verify that the displayed bar amplitude is within  $\pm 1\%$ .

### 2T K-Factor

1. Set the test signal generator to produce the following signal:
  - VM100: NTC7 Composite signal
  - VM101: CCIR 330 signal
2. On the video measurement set, press the ↓ arrow button to scroll to the 2 T K-FACTOR measurement screen.
3. Verify that the displayed measurement is within  $\leq 2\%$ .

### Chrominance-to-Luminance Delay

1. Set the test signal generator to produce the following signal:
  - VM100: NTC7 Composite signal
  - VM101: CCIR 17 signal
2. On the video measurement set, press the ↓ arrow button to scroll to the YC DELAY measurement screen.
3. Verify that the displayed delay is within  $\pm 10$  ns.

### Chrominance-to-Luminance Gain

1. Set the test signal generator to produce the following signal:
  - VM100: NTC7 Composite signal
  - VM101: CCIR 17 signal
2. On the video measurement set, press the ↓ arrow button to scroll to the YC GAIN measurement screen.
3. Verify that the displayed chrominance-to-luminance gain is within  $\pm 2.0\%$ .



### Luminance Nonlinearity

1. Set the test signal generator to produce a Luminance 5-Step signal.
2. On the video measurement set, press the ↓ arrow button to scroll to the LUM NON-LIN measurement screen.
3. Verify that the displayed luminance linearity is within ±1%.

### Group Delay

1. Set the test signal generator to produce a Philips<sup>®</sup> GCR or Sinx/x signal.
2. On the video measurement set, press the ↓ arrow button to scroll to the GRPDLYmax measurement screen.
3. Verify that the displayed max group delay is 0 to 20 ns.
4. Press the ↓ arrow button to scroll to the GRPDLYmin measurement screen.
5. Verify that the displayed min group delay is 0 to –20 ns.

---

**NOTE.** If your TV test signal generator does not provide measurements in dB, use the following equation to convert the signal generator's frequency packet amplitude to dB before proceeding to the Frequency Response test:

$$\text{Characterized pkt (dB)} = 20 \log \frac{[\text{pkt (character)}] \times [\% \text{flag} \div 100\%]}{[\text{flag (character)}]}$$

*pkt (character)* is the amplitude of a specific packet  
*% flag* is the size of the packet relative to the flag element—typ. 100%  
*flag (character)* is the amplitude of the flag element of multiburst

---

### Frequency Response

1. Set the test signal generator to produce the following signal:
  - VM100: multiburst signal
  - VM101: CCIR18 signal
2. On the video measurement set, press the ↓ arrow button to scroll to the FREQ FLAG measurement screen.
3. Verify that the displayed amplitude is within  $\pm 1\%$ .
4. Press the ↓ arrow button to scroll to the FREQ #1 measurement screen.
5. Verify that the displayed amplitude is within  $\pm 0.2$  dB.
6. Repeat steps 4 and 5 for the FREQ #2, FREQ #3, FREQ #4, FREQ #5, and FREQ #6 measurement results.

## Appendix D: Error Messages

This section contains a list of the error messages you might receive when operating the video measurement set. Following each message is a brief explanation and possible actions you can take in response to the message. Table D–1 contains error messages you might receive when operating the video measurement set manually. Table D–2 contains error messages you might receive during remote operation.

---

*NOTE.* Table D–2 does not apply if *FLOW CTL* is set to *RCDS*.

---

**Table D–1: Error messages for manual operation**

Message	Possible Response
Memory full, erase or replace	Erase or replace one or all memory locations
Acquiring new data	Wait for signal acquisition to complete
Identifying changed video	Wait for signal identification to complete
No video present or no lock possible	Apply video signal to INPUT, or check the input signal quality

**Table D–2: Error messages for remote operation**

Message	Possible Response
–100, "Command error; SetEnum failed;"	Reenter command with correct syntax
–100, "Command error; Command not allowed;"	Reenter command with correct syntax
–100, "Command error; Illegal header suffix;"	Reenter command with correct syntax
–104, "Data type error; Unrecognized character data;"	Reenter command with correct syntax

**Table D-2: Error messages for remote operation (cont.)**

<b>Message</b>	<b>Possible Response</b>
-108, "Parameter not allowed; Too many parameters;"	Reenter command with correct syntax
-109, "Missing parameter; Unexpected termination detected;"	Reenter command with correct syntax
-110, "Command header error; Illegal trailing colon on header;"	Reenter command with correct syntax
-113, "Undefined header; Command not found;"	Reenter command with correct syntax
-120, "Numeric data error; Unrecognized numeric character data;"	Reenter command with correct syntax
-121, "Invalid character in numeric; Unexpected input following numeric data;"	Reenter command with correct syntax
-151, "Invalid string data; Unexpected input following string data;"	Reenter command with correct syntax
-255, "Directory full; Memory not saved;"	Delete memory and retry
-256, "FileName not found; Memory not erased;"	Use correct filename
-256, "FileName not found; Cannot view memory;"	Use correct filename
-256, "FileName not found; Memory not renamed;"	Use correct filename
-257, "FileName error; Duplicate memory name;"	Use correct filename
-320, "Invalid number of arguments; Field and line required;"	Use the correct number of arguments
-320, "Invalid number of arguments; Non line-specific measurement;"	Use the correct number of arguments
-321, "Parameter out of range; Line number;"	Use a valid NTSC or PAL line number
-322, "Inappropriate; Measurement for this signal;"	Requested measurement is not possible for the signal; use a different signal
-323, "Measurement error; In hum measurement"	Apply video signal to INPUT, or check the input signal quality

Table D-2: Error messages for remote operation (cont.)

Message	Possible Response
-324, "Parameter out of range; Record number;"	Use a valid parameter
-324, "Parameter out of range; Sample number;"	Use a valid parameter
-324, "Parameter out of range; ZCRP location;"	Use a valid parameter
-324, "Parameter out of range; Month;"	Use a valid parameter
-324, "Parameter out of range; Day;"	Use a valid parameter
-324, "Parameter out of range; Year;"	Use a valid parameter
-324, "Parameter out of range; Hour;"	Use a valid parameter
-324, "Parameter out of range; Minute;"	Use a valid parameter
-325, "Signal; Not available;"	An appropriate signal for the requested measurement is not available; apply a different signal
-326, "Command not available; NTSC only"	The command is used for NTSC only, not for PAL
-326, "Command not available; 50Hz configured;"	Use commands related to 60 Hz operation
-326, "Command not available; 60Hz configured;"	Use commands related to 50 Hz operation
-327, "Measurement; Not configured;"	The requested measurement is not configured; use CONfig:MEAS:<sub-command> to configure the measurement
-328, "Measurement; In progress;"	The requested measurement is being made but the result is not yet available
-340, "Video ID error; Possible bad video input;"	Check the quality of the input video signal
-360, "Busy; Acquiring new data;"	Wait for the data acquisition to complete
-361, "Video error; No video present or no lock possible;"	Check the quality of the input video signal





# Glossary





# Glossary

## **AC-Coupled**

A connection that removes the constant voltage (DC component) on which the signal (AC component) is riding. It is implemented by passing the signal through a capacitor.

## **AM**

Amplitude Modulation (AM) is the process by which the amplitude of a high-frequency carrier is varied in proportion to the signal of interest. In the PAL television system, AM is used to encode the color information and to transmit the picture.

Several different forms of AM are differentiated by various methods of sideband filtering and carrier suppression. Double sideband suppressed carrier is used to encode the PAL color information, while the signal is transmitted with a large-carrier vestigial sideband scheme.

## **APL**

Average Picture Level. The average signal level (with respect to blanking) during active picture time, expressed as a percentage of the difference between the blanking and reference white levels.

## **Back Porch**

The portion of the video signal that lies between the trailing edge of the horizontal sync pulse and the start of the active picture time. Burst is located on back porch.

## **Bandwidth**

The range of frequencies over which signal amplitude remains constant (within some limit) as it is passed through a system.

## **Baseband**

Refers to the composite video signal as it exists before modulating the picture carrier. Composite video distributed through a studio and used for recording is at baseband.

**Black Burst**

Also called “color black,” black burst is a composite video signal consisting of all horizontal and vertical synchronization information and burst. Typically it is used as the house reference synchronization signal in television facilities.

**Blanking Level**

Refers to the 0.3 V level (with respect to sync tip) that exists before and after horizontal sync and during the vertical interval.

**Breezeway**

The portion of the video signal that lies between the trailing edge of the horizontal sync pulse and the start of burst. Breezeway is part of back porch.

**Broad Pulses**

Another name for the vertical synchronizing pulses in the center of the vertical interval. These pulses are long enough to be distinguished from all others and are the part of the signal actually detected by vertical sync separators.

**Bruch Blanking**

A four-field burst blanking sequence employed in PAL signals to ensure that burst phase is the same at the end of each vertical interval.

**Burst**

A small reference packet of the subcarrier sine wave sent on every line of video. Since the carrier is suppressed, this phase and frequency reference is required for synchronous demodulation of the color difference signals in the receiver.

**B-Y**

B–Y is one of the color difference signals used in the NTSC and PAL systems, obtained by subtracting luminance (Y) from the blue camera signal (B).

**Chrominance**

Chrominance refers to the color information in a television picture. Chrominance can be further broken down into two properties of color: hue and saturation.

**Chrominance Signal**

The high-frequency portion of the video signal, obtained by quadrature amplitude modulation of a 4.43 MHz (PAL) or 3.58 MHz (NTSC) subcarrier with R-Y and B-Y information.

**Composite Video**

A single video signal containing all of the necessary information to reproduce a color picture. Created by adding quadrature amplitude modulated U and V to the luminance signal.

**CW**

Continuous Wave. Refers to a separate subcarrier sine wave used for synchronization of chrominance information.

**dB (Decibel)**

A decibel is a logarithmic unit used to describe signal ratios. For voltages,  $dB = 20 \text{ Log}_{10} (V_1/V_2)$ .

$$dB = 20 \text{ Log}_{10} \left( \frac{V}{V_{ref}} \right)$$

**DC-Coupled**

A connection configured so that both the signal (AC component) and the constant voltage on which it is riding (DC component) are passed through.

**DC Restorer**

A circuit used in picture monitors and waveform monitors to clamp one point of the waveform to a fixed DC level.

**Demodulator**

In general, this term refers to any device which recovers the original signal after it has modulated a high frequency carrier. In television, it may refer to:

1. An instrument, such as a Tektronix 1350, which takes video in its transmitted form (modulated onto the picture carrier) and converts it to baseband.
2. The circuits that recover R-Y and B-Y from the composite signal.

**Equalizing Pulse**

The pulses that occur before and after the broad pulses in the vertical interval.

**Envelope Detection**

A demodulation process in which the shape of the RF envelope is sensed. Diode detectors use this process.

**Field**

In interlaced scan systems, the information for one picture is divided up into two fields. Each field contains half of the lines required to produce the entire picture. Adjacent lines in the picture are in alternate fields.

**FM**

Frequency Modulation (FM) is the process by which the frequency of a carrier signal is varied in proportion to the signal of interest. In the NTSC and PAL television systems, audio information is transmitted using FM.

**Frame**

A frame (sometimes called a “picture”) contains all the information required for a complete picture. For interlaced scan systems, there are two fields in a frame.

**Front Porch**

The portion of the video signal between the end of active picture time and the leading edge of horizontal sync.

**Genlock**

The process of locking both sync and burst of one signal to sync and burst of another, thus making the two signals completely synchronous.

**Graticule**

The scale that is used to quantify the information on a waveform monitor or vectorscope display. Graticules may either be screened onto the faceplate of the CRT itself (internal graticule) or onto a piece of glass or plastic that fits in front of the CRT (external graticule). They can also be electronically generated.

**Harmonic Distortion**

If a sine wave of a single frequency is put into a system and harmonic content at multiples of that frequency appears at the output there is harmonic distortion present in the system. Harmonic distortion is caused by non-linearities in the system.

**Horizontal Blanking**

Horizontal blanking is the entire time between the end of the active picture time of one line and the beginning of active picture time of the next line. It extends from the start of front porch to the end of back porch.

**Horizontal Sync**

Horizontal sync is the  $-300$  mV (PAL) and  $-40$  IRE (NTSC) pulse occurring at the beginning of each line. This pulse tells the picture monitor to go back to the left side of the screen and trace another horizontal line of picture information.

**Hue**

Hue is the property of color that allows us to distinguish between colors such as red, yellow, purple, etc.

**Hum**

Hum refers to the undesirable couple of the 50 Hz (PAL) or 60 Hz (NTSC) power sine wave into other electrical circuits.

**Intercarrier Sound**

A method used to recover audio information. Sound is separated from video by beating the sound carrier against the video carrier, producing a 4.5 MHz (NTSC) or 5.5 MHz (PAL) IF that contains the sound information.

**IRE (VM100)**

A unit equal to  $1/140$  of the peak-to-peak amplitude of the video signal, which is typically one volt. The 0 IRE point is at blanking level, with sync tip at  $-40$  IRE and white extending to  $+100$  IRE. IRE stands for Institute of Radio Engineers, the organization that defined the unit.

**ITS (VM101)**

Insertion Test Signal. A test signal that is inserted in one line of the vertical interval to facilitate in-service testing.

**Linear Distortion**

Refers to distortions that are independent of signal amplitude.

**Luminance**

The signal that represents brightness, or the amount of light in the picture. This is the only signal required for black and white pictures and, for color systems, it is obtained as a weighted sum ( $Y = 0.3R + 0.59G + 0.11B$ ) of the R, G, and B signals.

**Modulated**

When referring to television test signals, this term implies that chrominance information is present. (For example, a modulated ramp has subcarrier on each step.)

**Modulation**

A process that allows information to be moved around in the frequency domain in order to facilitate transmission or frequency-domain multiplexing. See AM and FM for details.

**Non-Linear Distortion**

Refers to distortion that are amplitude-dependent.

**NTSC**

National Television System Committee. The organization that developed the television standard currently in use in the United States, Canada, and Japan. Now, NTSC is generally used to refer to that standard.

**PAL**

Phase Alternate Line. Refers to one of the television systems used in Europe and many other parts of the world. The phase of one of the color difference signals alternates from line to line to help cancel out phase errors.

**Quadrature AM**

A process that allows two signals to modulate a single carrier frequency. The two signals of interest amplitude modulate carrier signals that are the same frequency but differ in phase by 90 degrees (hence the Quadrature notation). The two resultant signals can be added together and both signals recovered at the other end if they are also demodulated 90 degrees apart.

**Quadrature Distortion**

Distortion resulting from the asymmetry of sidebands used in vestigial sideband television transmission. Quadrature distortion appears when envelope detection is used but can be eliminated by using a synchronous demodulator.

**RF**

Radio Frequency. In television applications, RF generally refers to the television signal after the picture carrier modulation process.

**RGB**

Red, Green and Blue. The three primary colors used in color television's additive color reproduction system. These are the three color components generated by the camera and used by the picture monitor to produce a picture.

**Saturation**

The property of color that relates to the proportion of white light in the color. Highly saturated colors are vivid, while less saturated colors have more white mixed in and therefore appear pastel. For example, red is highly saturated, while pink is the same hue but much less saturated.

In signal terms, saturation is determined by the ratio between luminance level and chrominance amplitude. It should be noted that a vectorscope does not display saturation: the length of the vectors represents chrominance amplitude. In order to verify that the saturation of the colors in a color bar signal is correct, you must check luminance amplitudes with a waveform monitor in addition to observing the vectors.

**Setup**

In NTSC systems, video black is typically 7.5 IRE above the blanking level. This 7.5 IRE level is referred to as the black setup level or simply as setup.

**Subcarrier**

Refers to the high-frequency signal used for quadrature amplitude modulation of the color difference signals. The subcarrier frequency is 3,579,545 Hz (NTSC) or 4,433,618.75 Hz (PAL).

**Synchronous Detection**

A demodulation process in which the original signal is recovered by multiplying the modulated signal with the output of a synchronous oscillator locked to the carrier.

**Termination**

In order to accurately send a signal through a transmission line, there must be an impedance at the end that matches the impedance of the source and of the line itself. Amplitude errors and reflections will otherwise result. Video is a 75  $\Omega$  system, so a 75  $\Omega$  terminator must be put at the end of the signal path.

**Unmodulated**

When referring to television test signals, this term refers to pulses and pedestals that do not have high-frequency chrominance information added to them.

**Vectorscope**

A specialized oscilloscope that demodulates the video signal and presents a display of R–Y versus B–Y (V versus U). The angle and magnitude of the displayed vectors are respectively related to hue and saturation.

**Vertical Interval**

The synchronizing information that appears between fields and tells the picture monitor to go back to the top of the screen to begin another vertical scan.

**Waveform Monitor**

A specialized oscilloscope for evaluating television signals.

**Y**

Abbreviation for luminance.

**Zero Carrier Reference**

A pulse in the vertical interval which is produced by the demodulator to provide a reference for evaluating depth of modulation.





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