User Manual

Tektronix
/

WVR500
Waveform/Vector Monitor

070-8927-05

C€

WARRANTY

Tektronix warrants that this product will be free from defects in materials and workmanship for a period of three (3) years from the date of shipment. If any such product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by Tektronix, with shipping charges prepaid. Tektronix shall pay for the return of the product to Customer if the shipment is to a location within the country in which the Tektronix service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Tektronix shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of non-Tektronix supplies; or d) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

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Service Assurance

If you have not already purchased Service Assurance for this product, you may do so at any time during the product's warranty period. Service Assurance provides Repair Protection and Calibration Services to meet your needs.

Repair Protection extends priority repair services beyond the product's warranty period; you may purchase up to three years of Repair Protection.

Calibration Services provide annual calibration of your product, standards compliance and required audit documentation, recall assurance, and reminder notification of scheduled calibration. Coverage begins upon registration; you may purchase up to five years of Calibration Services.

Service Assurance Advantages

- Priced well below the cost of a single repair or calibration

- Avoid delays for service by eliminating the need for separate purchase authorizations from your company

- Eliminates unexpected service expenses

For Information and Ordering

For more information or to order Service Assurance, contact your Tektronix representative and provide the information below. Service Assurance may not be available in locations outside the United States of America.

Name	VISA or Master Card number and expiration
Company	date or purchase order number
Address	Repair Protection (1,2, or 3 years)
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. To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

To Avoid Fire or Personal Injury

Use Proper Power Cord. Use only the power cord specified for this product and certified for the country of use.

Connect and Disconnect Properly. Do not connect or disconnect probes or test leads while they are connected to a voltage source.

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.

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

Use Proper Fuse. Use only the fuse type and rating specified for this product.

Avoid Exposed Circuitry. Do not touch exposed connections and components when power is present.

Wear Eye Protection. Wear eye protection if exposure to high-intensity rays or laser radiation exists.

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

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

Provide Proper Ventilation. Refer to the manual's installation instructions for details on installing the product so it has proper ventilation.

Safety Terms and Symbols

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

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

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

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:

WARNING
High Voltage

Protective Ground
(Earth) Terminal

CAUTION
Refer to Manual

Double
Insulated

Preface

This manual is a guide for users of the WVR 500 Waveform/Vector Monitor and contains instructions for its practical use.

Manual Overview

This manual contains the following sections:

Getting Started contains a product description, a list of instrument accessories, and installation instructions.

Operating Basics contains a functional overview of the operation of the front and rear panels, detailed descriptions of the menu selections, graticule and basic measurement descriptions, and a tutorial for instrument familiarization.

Appendix A contains instrument electrical and mechanical specifications.

Appendix B describes the remote control interface and lists the remote commands.

Appendix C covers routine user-service procedures such as replacing fuses and instrument cleaning. Also provided is a list of available instrument options.

Getting Started

Getting Started

This section contains a product description, a list of instrument accessories, and installation instructions.

Product Description

The Tektronix WVR 500 is a half-rack wide, one rack unit high, rasterizing television waveform/vector/picture monitor with NTSC and PAL capability. Without a built-in display device, it outputs a display signal that can be connected to a remote monitor or video switcher.

Traditional applications for this monitor include areas of production, postproduction, and transmission of television signals. Untraditional applications include remote video monitoring of unmanned video uplinks/downlinks and television transmitters.

Key Features

The WVR500 utilizes the following key features:

- Rasterized output which can display the waveform/vector/picture monitor displays simultaneously

- Menu-assisted monitoring operation

- Two channels of video inputs and two video outputs

- Complete instrument operation possible through the RS-232 remote port

- Amplitude alarm for the waveform display

- Ability to store/recall four instrument setups

- Adjustable signal and graticule display colors

- Instrument calibration performed from the front panel

- Universal power supply automatically accommodating AC supplies from 90–250 V, 50–60 Hz

Rasterized Display. The WVR 500 utilizes a proprietary rasterizer which displays analog-like waveforms and vectors and the remote monitor simultaneously with the appropriate measurement graticule.

The rasterized waveform and vector displays can fill the entire display or be reduced to 1/4-screen sized windows over the picture display. The reduced windows can be made transparent for complete viewing of the picture display.

Menus. The WVR 500 menus use a combination of on-screen readout and multi-use buttons, in conjunction with a general-purpose adjustment knob, to control most of its monitoring functions.

RS–232 Port. The RS-232 remote connector enables remote instrument operation. All front-panel controls and menu selections can be operated through this port.

Alarm Mode. For the waveform monitor display only, there is an Alarm mode which highlights any portion of the displayed signal that exceeds the 100 IRE (1.0 V PAL) graticule line.

Calibration. The WVR 500 can be calibrated entirely from the front panel after the movement of an internal jumper. Refer to the *WVR500 Waveform/Vector Monitor Service Manual* for instructions on how to calibrate the instrument.

More Information

- Menu descriptions begin on page 2–11

- A tutorial to acquaint you with the basic functions of the instrument begins on page 2–33

- A complete listing of instrument specifications is located in *Appendix A: Specifications*

- The RS-232 remote interface operation is detailed in *Appendix B: Remote Interface*

- Instrument options are listed in *Appendix C: User Service*

Accessories

Listed below are the standard accessories, optional accessories, and field upgrade kits available with this instrument. Refer to *Appendix C: User Service* for a list of available instrument options.

Standard Accessories

These standard accessories are shipped with the product:

1   Manual, user: WVR 500 (070-8927-xx)

1   Cable assembly, power: United States and Japan only (161-0216-00)

Optional Accessories

There is one optional accessory available for the product:

Manual, service: WVR 500 (070-8897-xx)

Field Upgrade Kits

The following field upgrade kits can be ordered with this instrument, or purchased through a Tektronix field office or distributor. When ordering, include both the name and number of the Field Upgrade Kits. Dimensional drawings are shipped with each cabinet. For more information, contact a Tektronix field office or distributor.

TVGF13. This is a dual side-by-side rack adapter which allows you to mount two half-rack width instruments in a standard 19-inch rack.

TVGF14. This is a dual half-rack width adapter which allows you to mount two half-rack width instruments in a standard half-rack application. The WVR 500 will fit only in the lower portion of this adapter.

Installation

The instructions for instrument installation are followed by instructions for repackaging the instrument for shipment.

Save the shipping carton and packing materials (including antistatic bag) in case it becomes necessary to ship the instrument to a Tektronix Service Center for service or repair.

Electrical Installation

Observe the following information before installing your instrument.

Power Source. These monitors are designed to operate from a single-phase power source having one of its current-carrying conductors at or near earth ground (the neutral conductor). Only the line conductor is fused for over-current protection. Systems that have both current-carrying conductors live with respect to ground (such as phase-to-phase on multiphase systems) are not recommended as power sources. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

> ⚠ **WARNING.** *Dangerous line-potential voltage will be present when mains AC power is supplied to the instrument.*

Mains Frequency and Voltage Range. The WVR 500 monitor operates at 50 and 60 Hz over the range of 90–250 Volts without operator adjustment.

RS–232 Remote Port. The rear-panel RS-232 connector provides a serial interface for remote control of instrument functions. The remote connector is a 9-pin subminiature D-type with male contacts. The remote interface and command set are detailed in Appendix B.

Operational Jumpers. The only operational modifications made to this monitor through internal jumper settings are input coupling and the enabling of the Calibration mode. Refer to *Appendix C: User Service* for instructions on how to change the jumper settings.

Mechanical Installation

All qualification testing was performed with the cabinet installed. To guarantee compliance with specifications, only operate the instrument in a cabinet or rackmount adapter. The Tektronix TVGF13 and TVGF14 provide the proper electrical environment, supply adequate shielding, minimize handling damage, and reduce dust collection within the instrument.

Cabinet. This instrument is shipped installed in a cabinet. There are not any optional cabinets available.

Custom Installation. For applications such as consoles, the instrument can be mounted with the front molding flush or protruding from the console. In both cases, allow approximately three inches of rear clearance for power cord and cable connections. To mount the instrument safely, attach it to a shelf strong enough to hold its weight.

Rackmounting. The WVR 500 monitor is half-rack width and one rack unit high. It requires approximately three inches of rear clearance for power cord and cable connections and 20 inches in front of a rack for installation and removal of the instrument.

Refer to *Field Upgrade Kits* on page 1–3 for information about optional rackmounting hardware.

Repackaging

If you ship an instrument to a Tektronix Service Center, follow these packaging instructions:

1. Attach a tag to the instrument showing: the owner, complete address and phone number of someone at your firm who can be contacted, the instrument serial number, and a description of the required service.

2. Package the instrument in the original packaging materials. If the original packaging materials are not available, follow these directions:

   a. Obtain a carton of corrugated cardboard having inside dimensions six or more inches greater than the dimensions of the instrument. Use a shipping carton that has a test strength of at least 275 pounds.

    b. Surround the instrument with a protective bag (antistatic preferred). If the instrument is not in a cabinet, wrap a cardboard piece around the bagged instrument to protect components.

    c. Pack dunnage or urethane foam between the instrument and the carton. If using Styrofoam kernels, overfill the box and compress by closing the lid. There should be three inches of tightly packed cushioning on all sides of the instrument.

3. Seal the carton with shipping tape, industrial stapler, or both.

Configuration

All instrument configuration parameters are set through the menu system except for the parameters set by the operational jumpers. Refer to *Appendix C: User Service* for instructions on how to change the operational jumper settings.

Operating Basics

Functional Overview

Operating Basics is organized into the following sections:

- *Functional Overview* describes the front-panel controls and rear-panel connectors, special operating modes, and the on-screen readout messages.

- *Using the Menus* describes operating the menus and details of each menu selection.

- *Making Measurements* describes the graticules and provides measurement procedures.

- *Tutorial* provides a procedure to acquaint you with the basic functions of the instrument.

Front-Panel Controls

The front and rear panels are illustrated in Figure 2–1. Each knob is the continuous-rotation type with the adjustment-range limit reached when there are no more visible display changes.

The large center knob has adjustment functions assigned to it through the menus. This knob is referred to as the *General Purpose (GP) Knob*.

The buttons are push and release toggle switches with some of the selections backlit to indicate the current setting.

This instrument does not have an external power switch. The instrument is turned on or off by plugging or unplugging the power cord from the power source.

⚠ *WARNING. If an appropriate power source is supplied to this instrument, line voltage will be present. Do not operate the instrument without the cabinet installed or serious injury could result.*

Front panel   **Rear panel**
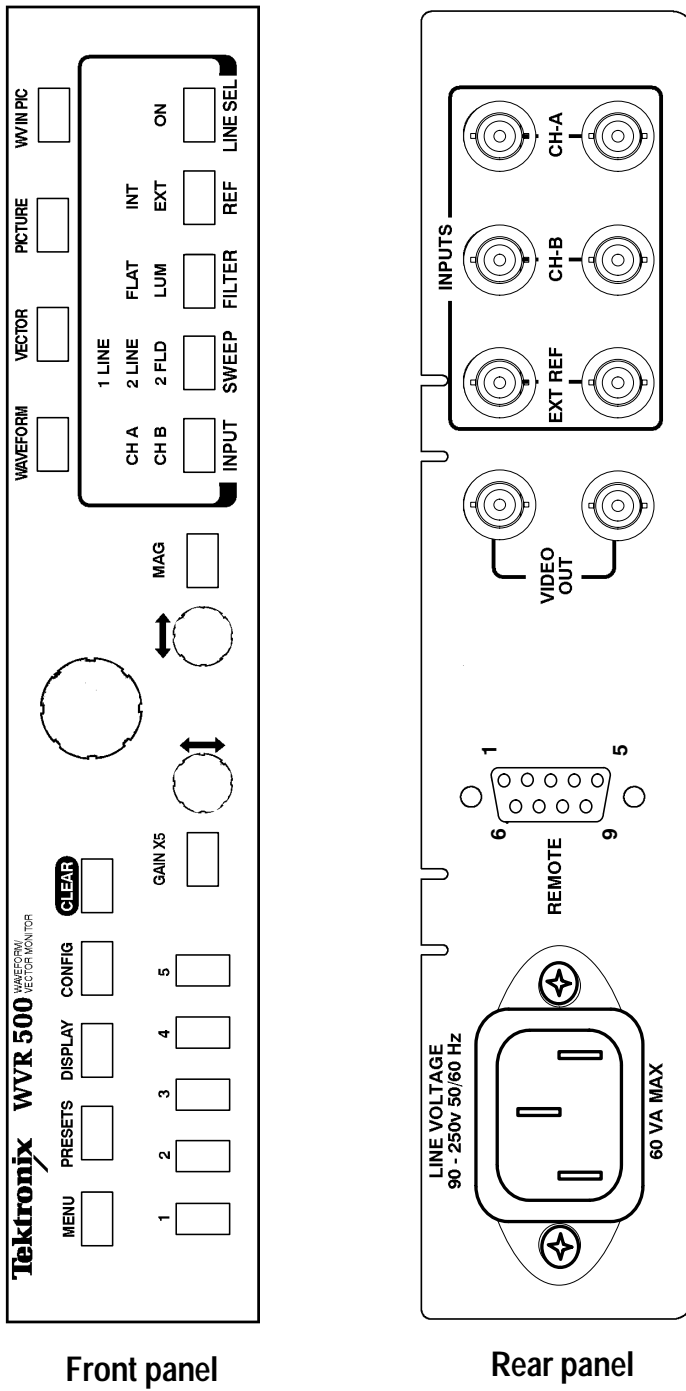
Figure 2–1: Instrument front and rear panels

Display Mode Selection

Press the Waveform button to select the Waveform display mode. The Waveform display mode provides a voltage-versus-time display of the video signal.

Press the Vector button to select the Vector display mode. The Vector display mode provides an XY plot of the demodulated chrominance phase and amplitude portion of the video signal. The angle represents chrominance phase, and the distance from the center represents chrominance amplitude.

Press the Picture button to select the Picture display mode. The Picture display mode presents the video signal as a picture.

Press the WV in Pic button to select the Waveform-in-Picture display mode. The Waveform-in-Picture display mode presents the waveform and/or vector displays, reduced to 1/4-screen sized windows, over the picture display. The reduced waveform and vector displays can be made transparent to view the entire picture display and can be positioned in the upper or lower half of the screen.

Input Channel Selection

Press the Input button to toggle the display between the video signals on the channel A and channel B rear-panel input connectors.

Only one input channel can be selected for display at a time. The currently selected channel is shown by a lighted indicator.

Signal Reference Selection

Press the Ref button to toggle the signal reference between Int (internal reference) and Ext (external reference). The current signal reference is shown by a lighted indicator.

The instrument will operate from external reference signals of composite video or black burst.

Sweep Rate Selection

Sweep rate selection only applies to the Waveform display mode. The current sweep rate is shown by a lighted indicator.

Press the Sweep button to toggle the display through three sweep rates: 1 Line (5 µs/div.), 2 Line (10 µs/div.), and 2 Field.

Press the Mag button to horizontally magnify the sweep to additional sweep rates: 1 Line + Mag (0.5 μs/div.) and 2 Line + Mag (1 μs/div.). 2 Field + Mag magnifies the sweep by approximately X20. An indicator lights when Mag is selected.

The current sweep rate is displayed in the on-screen readout. X20 is displayed when 2 Field + Mag is selected.

Signal Gain

Press the Gain X5 button to vertically magnify the waveform display by X5. The vector display is magnified X5 in all directions. An indicator lights when Gain X5 is selected.

Variable gain is activated through a menu selection in the Operating menu. The Waveform and Vector display modes have separate gain adjustments. The message Var is displayed in the on-screen readout when variable gain is turned on.

Signal Positioning

For the Waveform display mode, signal positioning is controlled by the ↕ and ↔ knobs.

In the Vector display mode, the signal is auto-centered, and the position cannot be adjusted.

Filter Selection

Filter selections apply to the Waveform display mode only. The current filter selection is shown by a lighted indicator.

Press the Filter button to toggle the waveform display through Flat (no filter), Lum (low-pass filtered for luminance display), and both Flat and Lum filters. The message LP is displayed in the on-screen readout when the Lum filter is selected. The message Par is displayed when both Flat and Lum filters are selected.

2 Line and 2 Field sweep rates display the two filters in a parade, while 1 Line sweep displays an overlay of the two filters.

Line Selection

Line Select mode allows you to select a single line to display from lines 6 to 262 for NTSC and lines 3 to 312 for PAL. You can select

the line to display from fields one and three, two and four, or all fields of the video input signal.

Press the Line Sel button to toggle the Line Select mode on and off. An indicator lights when the mode is turned on. Any open menus will be closed when Line Select mode is turned on.

Line and field selections, as well as screen update speed, are made through the Waveform or Vector display mode Operating menus after the Line Select mode has been turned on.

Both the on-screen readout and the Operating menu display the currently selected line and field numbers when the Line Select mode is turned on.

Line Select mode is not displayed in 2 Field sweep. If 2 Field sweep is selected when Line Select is turned on, the sweep rate will automatically change to 1 Line. While Line Select mode is turned on, the Sweep button will toggle between the 1 Line and 2 Line sweep rates only.

In 2 Line sweep, the line displayed on the left is the selected line.

Menu Control

Menu operation is detailed in *Using the Menus* starting on page 2–11.

The Menu button displays the Operating menu for the currently selected display mode. Contents include variable gain and vector phase control, as well as safe title and safe action windows.

The Presets button displays the Presets Recall/Store menu in the Waveform and Vector display modes only. This menu allows you to save or recall up to four instrument front-panel and menu setups.

The Display button enters the Display menu for the currently selected display mode. Contents include signal and graticule intensity and color adjustments.

The Config button enters the Configure menu, which is the same for all display modes. Several operating parameters, such as instrument monitoring standard, DC restorer clamp speed, and graticule visibility, are set in this menu.

Press the Clear button once to clear the menu display, but leave the GP Knob in control of any function assigned to it through the menus. Press the Clear button a second time to return the GP Knob to the default function of the current display mode.

Menu selections are made by pressing the Numbered Button corresponding to the menu selection number. Menu selections can only be made when the menus are open.

The GP Knob is assigned control of various adjustments through the menus. The current function assigned to the knob is displayed in the on-screen readout.

Instrument Reset

Extraordinary conditions may cause the instrument front-panel controls to become locked. To reset the instrument, unplug the power cord from the power source and then plug it back in.

If this reset does not unlock the controls, contact your Tektronix field office or call Tektronix at the phone number listed in the front of this manual.

Rear-Panel Connectors

The front and rear panels are illustrated in Figure 2–1 on page 2–2.

Loopthrough Inputs

CH-A and CH-B are passive loopthrough video inputs, compensated for 75 Ω. The front-panel Input switch setting determines which channel is displayed.

Ext Ref is a 75 Ω compensated loopthrough synchronization input. Internal or external reference is selected through the front-panel Ref switch. The instrument will operate from external reference signals of composite video or black burst.

Outputs

Video Out is a 75 Ω compensated dual output of the video signal selected by the front-panel Input switch. These outputs can be used to drive a picture monitor and/or a video switcher.

RS232 Remote Connector

Remote is a 9-pin subminiature D-type connector that provides a serial interface for remote control. All front-panel controls and menu settings can be set through this interface. Refer to *Appendix B: Remote Interface* for detailed information about the remote interface.

AC Power

The AC Power plug is a standard AC plug receptacle for 120 or 240 VAC power mains. The plug is compatible with any of the power cord options available with the instrument. The instrument operates at 50 and 60 Hz over the range of 90–250 Volts without operator adjustment.

Special Operating Modes

The following operating modes are turned on through the menus.

Amplitude Alarm Mode

The Amplitude Alarm mode applies to the Waveform display mode only. When the Amplitude Alarm has been turned on, any portion of the signal display exceeding the 100 IRE (1.0 V PAL) graticule line is highlighted. The Amplitude Alarm display is also visible in the waveform-display portion of the Waveform-in-Picture display mode.

The Amplitude Alarm is turned on through the Waveform display mode Operating menu. Characteristics of the highlighted portion of the display, such as intensity and color, are set through the Waveform display mode Display menu.

Variable Gain Mode

The Variable Gain mode is turned on through the Operating menus of the Waveform and Vector display modes.

Turning the Variable Gain mode on in the Waveform display mode does not turn it on in the Vector display mode. The Waveform and Vector display modes have separate variable gain adjustments and do not track with each other.

VAR is displayed in the on-screen readout when Variable Gain is turned on.

When Variable Gain is on, and the GP Knob has been assigned a different control function, selecting variable gain from the menu will reassign the GP Knob to variable gain control. A second press of the button will turn the mode off.

The GP Knob is assigned to variable gain control when you enter the Waveform or Vector display modes if variable gain was left on when that display mode was last exited.

Calibration Mode

The Calibration mode is turned on through the Configure menu after the movement of an internal jumper (A2J27).

Refer to the *WVR500 Waveform/Vector Monitor Service Manual* for instructions on how to calibrate the instrument.

On-Screen Readout

This instrument uses on-screen readouts to display the current front-panel control settings when the Waveform or Vector display modes are selected. The readouts do not appear in the reduced displays of the Waveform-in-Picture display mode. The readout can be turned on or off through the Configure menu. Figure 2–2 shows the locations of the readout messages.

Readout Description

1 The currently selected input channel; CH A or CH B.

2 The current monitoring standard; NTSC or PAL.

3 The current signal reference; Int (internal) or Ext (external).

4 The current filter selection. The readout is blank if Flat filter is selected. LP (low pass) is displayed if Lum filter is selected. PAR (parade) is displayed if both Flat and Lum filters are selected. The readout appears in this location in Waveform display mode only. For the Vector display mode, this readout is in location 7.
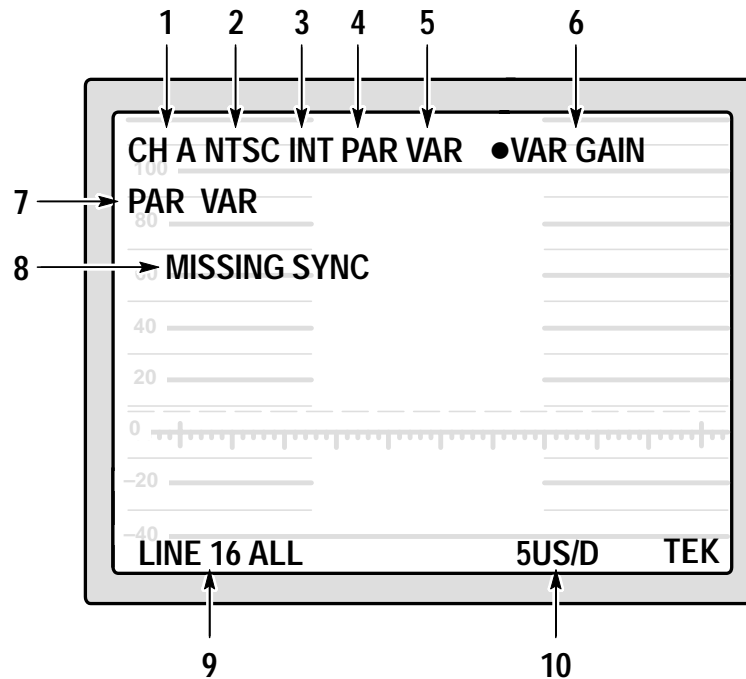
Figure 2–2: On-screen readout display

5 Displays the current state of variable gain. The readout is blank if variable gain is off, and VAR is displayed when variable gain is turned on. The readout appears in this location in the Waveform display mode only. For the Vector display mode, this readout appears in location 7.

6 Displays the current function assigned to the GP Knob.

7 The filter selection and variable gain readout locations for the Vector display mode only.

8 The message Missing Sync or Bad Sync is displayed when the signal reference is lost. Missing Sync is displayed when there is no sync pulse detected by the instrument. Bad Sync is displayed when a sync pulse is detected but cannot be processed.

A Configuration menu selection turns the sync message on and off. The sync message appears in different locations depending on the current display mode. The sync message will not appear if the on-screen readout has been turned off. In Picture display mode, the screen goes completely black if the sync message or readout is turned off.

9 Displays the currently selected line and field numbers when the Line Select mode is turned on. The readout lists the selected line first, followed by the field number. The Missing Sync or Bad Sync messages appear here in the Waveform and Vector display modes when the signal reference is lost.

10 Displays the current sweep rate in the Waveform display mode only; 5US/D for 1 Line sweep, 10US/D for 2 Line sweep, 0.5US/D for 1 Line + Mag sweep, 1US/D for 2 Line + Mag sweep, and X20 for 2 Field + Mag sweep. No readout appears for 2 Field sweep.

Using the Menus

This section contains instructions for using the menus and provides details of each menu selection.

Menu System Overview

Menus are entered by pressing one of the following front-panel buttons: Menu, Presets, Display, and Config. Menus are exited either by pressing the Clear button, selecting a different menu, selecting another display mode, or by turning on the Line Select mode.

The menu selections displayed by each of the four menus are dependent on the current display mode. Several of the menus are multipage, shown by the menu selection option of More. Figure 2–3 illustrates a typical menu display.

```
1 NTSC STANDARD
  PAL  STANDARD

2 CLAMP ON
  CLAMP  OFF

3 FAST  CLAMP
  SLOW  CLAMP

4 PAL  PLUS  V  ON
  PAL  PLUS  V  OFF

5 MORE
```

Figure 2–3: Typical menu display

Making Menu Selections

Menu selections are made by pressing the numbered front-panel button corresponding to the menu selection number. The highlight

bar toggles through the menu selections with each press of the numbered button. Selections can be made only while the menu is displayed.

When the instrument is first turned on, the menus open to page one. When a menu is entered again, it opens to the menu page that was previously open.

GP Knob Function Control

The center unlabeled knob is the General Purpose (GP) Knob. This variable-control knob is assigned various adjustment functions through the menus.

This adjustment knob is sensitive to quick turns. Adjustments should be made with moderate knob-turning speed.

When a menu selection assigns control of a function to the GP Knob, a knob icon appears in front of the function name in that menu. The current function of the GP Knob is displayed next to a knob icon in the on-screen readout.

Each display mode assigns a default function to the GP Knob when the display mode is entered as listed below:

- The Waveform display mode assigns GP Knob control to signal intensity or to variable gain if the variable gain mode was left on when the Waveform display mode was last exited.

- The Vector display mode assigns GP Knob control to vector phase or to variable gain if the variable gain mode was left on when the Vector display mode was last exited.

- The Picture display mode does not assign a default function to the GP Knob.

- The Waveform-in-Picture display mode assigns GP Knob control to vector phase when the Vector display is one of the reduced-size displays. When only the reduced-size Waveform display is selected, the GP Knob is not assigned a function.

Clearing Menu Displays

Press the Clear button once to remove the menu display, but leave the GP Knob in control of any function assigned to it through the

menus. Press the Clear button a second time to return the GP Knob to the default function of the current display mode.

Entering a new display mode while a menu is open closes the open menu and enters the new display mode. The GP Knob is assigned to the default function of the new display mode or to variable gain control if variable gain was left on in the new display mode.

Selecting a different menu for the current display mode with a menu already open closes the current menu and displays the new menu. The GP Knob retains control of the function assigned to it until a new menu selection reassigns it to a new function.

Turning the Line Select mode on closes any open menu and leaves the GP Knob in control of its currently selected function. Turning the Line Select mode off closes any open menu and reassigns the GP Knob to the default function of the current display mode.

Waveform and Vector Display Mode Menus

The Waveform and Vector display mode menus are very similar. The following menu descriptions apply to both display modes unless otherwise noted.

Operating Menu

The Operating menu is entered by pressing the Menu button. The Operating menus of the Waveform and Vector display modes are identical except for the first menu item. A second page of menu selections appears when the Line Select mode is turned on. The Line Select mode is discussed on page 2–4.
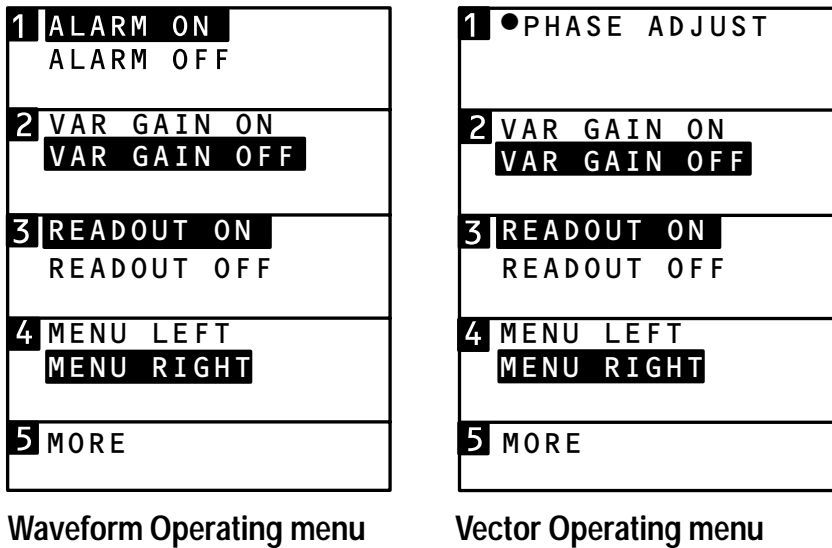
```
┌─────────────────────────┐   ┌─────────────────────────┐
│ [1] ALARM ON            │   │ [1] ●PHASE ADJUST       │
│     ALARM OFF           │   │                         │
│                         │   │                         │
│ [2] VAR GAIN ON         │   │ [2] VAR GAIN ON         │
│     VAR GAIN OFF        │   │     VAR GAIN OFF        │
│                         │   │                         │
│ [3] READOUT ON          │   │ [3] READOUT ON          │
│     READOUT OFF         │   │     READOUT OFF         │
│                         │   │                         │
│ [4] MENU LEFT           │   │ [4] MENU LEFT           │
│     MENU RIGHT          │   │     MENU RIGHT          │
│                         │   │                         │
│ [5] MORE                │   │ [5] MORE                │
└─────────────────────────┘   └─────────────────────────┘
```

Waveform Operating menu   **Vector Operating menu**

Figure 2–4: Waveform/Vector display mode Operating menus page 1

The following first page of Operating menu selections appear for the Waveform and Vector display modes. See Figure 2–4.

Alarm On/Off. For the Waveform display mode only, this selection toggles the Amplitude Alarm mode on and off. The Amplitude Alarm is explained on page 2–7.

Phase Adjust. For the Vector display mode only, this selection assigns control of vector phase to the GP Knob.

Var Gain On/Off. This selection assigns control of variable gain to the GP Knob for the current display mode if the Variable Gain mode is off or if the mode is on and the GP Knob has been assigned to another function. This selection turns variable gain off if the mode is on and the GP Knob is currently assigned to variable gain control.

Readout On/Off. This selection toggles all on-screen readout messages on and off, but the menus and graticules remain visible.

Menu Left/Right. This selection toggles the menu position between the left and right sides of the display.

More. This selection opens the second page of the Operating menu and only appears when the Line Select mode is turned on.

```
1 LINE NUM ADJ
  LINE 46 F 1


2 FIELDS 1 3
  FIELDS 2 4
  ALL FIELDS
3 UPDATE FAST
  UPDATE SLOW


4


5 MORE
```

Figure 2–5: Waveform/Vector display mode Operating menu page 2

The following additional Operating menu selections appear for the Waveform, Vector, and Waveform-in-Picture display modes when the Line Select mode is turned on. See Figure 2–5.

Line Num Adj. This selection assigns control of selecting which video line to display to the GP Knob. The currently selected line and field numbers appear on the second line of this menu-selection display and in the on-screen readout. You can select from lines 6 to 262 for NTSC and lines 3 to 312 for PAL.

Fields. This selection toggles through three choices of video fields from which to display the selected line (fields 1 and 3, fields 2 and 4, or all fields). The current field number selection appears in the on-screen readout when the Line Select mode is turned on.

Update Fast/Slow. This selection toggles the sample rate for the selected line between fast and slow.

More. This selection opens the first page of the Operating menu.

Presets Menu

The Presets menu allows you to save or recall up to four front-panel and menu setups. The Presets menu is entered by pressing the front-panel Presets button and is the same for all display modes.
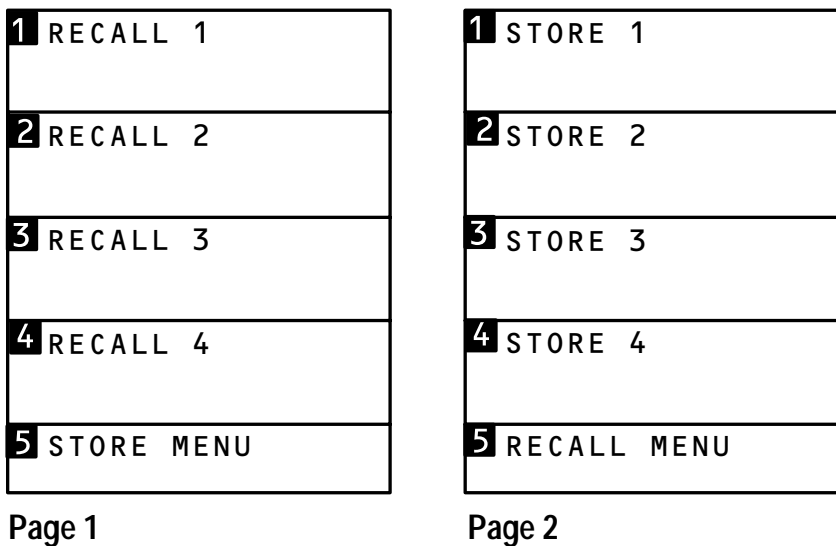
```
┌─────────────────────────┐     ┌─────────────────────────┐
│ 1 RECALL  1             │     │ 1 STORE  1              │
│                         │     │                         │
├─────────────────────────┤     ├─────────────────────────┤
│ 2 RECALL  2             │     │ 2 STORE  2              │
│                         │     │                         │
├─────────────────────────┤     ├─────────────────────────┤
│ 3 RECALL  3             │     │ 3 STORE  3              │
│                         │     │                         │
├─────────────────────────┤     ├─────────────────────────┤
│ 4 RECALL  4             │     │ 4 STORE  4              │
│                         │     │                         │
├─────────────────────────┤     ├─────────────────────────┤
│ 5 STORE  MENU           │     │ 5 RECALL  MENU          │
└─────────────────────────┘     └─────────────────────────┘
      Page 1                          Page 2
```

Figure 2–6: Presets menu

The following Presets menu selections appear for all display modes. See Figure 2–6.

Recall/Store 1–4. These selections recall or store the front-panel and menu settings in memory slots 1 through 4.

Store/Recall Menu. These selections toggle between the Presets Recall and Presets Store menus.

Display Menu

The Display menu is entered by pressing the front-panel Display button. The menu selections on the first two pages of the menu are identical in the Waveform and Vector display modes, with the changes affecting both modes. The Waveform display mode has a third menu page appear with selections for adjusting the Amplitude Alarm display when that mode has been turned on.
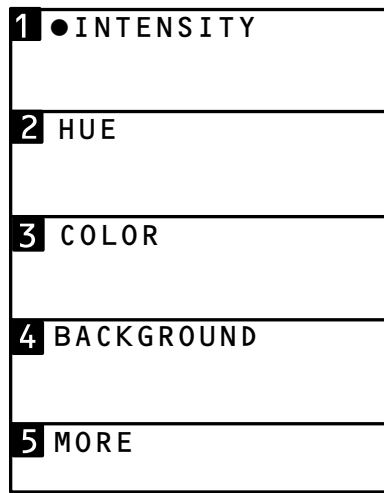
```
┌─────────────────────────────┐
│ 1 ● I N T E N S I T Y       │
│                             │
│                             │
├─────────────────────────────┤
│ 2  H U E                    │
│                             │
│                             │
├─────────────────────────────┤
│ 3  C O L O R                │
│                             │
│                             │
├─────────────────────────────┤
│ 4  B A C K G R O U N D      │
│                             │
│                             │
├─────────────────────────────┤
│ 5  M O R E                  │
│                             │
└─────────────────────────────┘
```

Figure 2–7: Waveform/Vector display mode Display menu page 1

The following menu selections appear on the first page of the Display menu. See Figure 2–7.

Intensity. This selection assigns control of signal intensity to the GP Knob. The signal intensity level can be adjusted from and applies to the Waveform, Vector, and Waveform-in-Picture display modes. Signal intensity is the default function assigned to the GP Knob when the Waveform display mode is selected.

Hue. This selection assigns control of signal hue to the GP Knob. Hue works in conjunction with the Color menu selection to set the desired signal appearance. The signal hue can be adjusted from and applies to the Waveform, Vector, or Waveform-in-Picture display modes.

Color. Assigns control of signal color to the GP Knob. Color works in conjunction with the Hue menu selection to set the desired signal appearance. The signal color can be adjusted from and applies to the Waveform, Vector, or Waveform-in-Picture display modes.

Background. This selection assigns control of the display background intensity to the GP Knob. The background can be adjusted from and applies to all display modes.

More. This selection opens the second page of the Display menu.

```
1 GRAT  INTENSITY


2 GRAT  HUE


3 GRAT  COLOR


4


5 MORE
```

Figure 2–8: Waveform/Vector display mode Display menu page 2

The following menu selections appear on the second page of the Display menu. See Figure 2–8.

Grat Intens. This selection assigns control of graticule intensity to the GP Knob. The graticule intensity can be adjusted from and applies to all display modes.

Grat Hue. This selection assigns control of graticule hue to the GP Knob. Graticule hue works in conjunction with graticule color to set the desired graticule appearance. The graticule hue can be adjusted from and applies to all display modes.

Grat Color. This selection assigns control of graticule color to the GP Knob. Graticule color works in conjunction with graticule hue to set the desired graticule appearance. The graticule color can be adjusted from and applies to all display modes.

More. This selection opens the first page of the Display menu, or the following third page if the Waveform display mode is selected and the Amplitude Alarm is turned on.
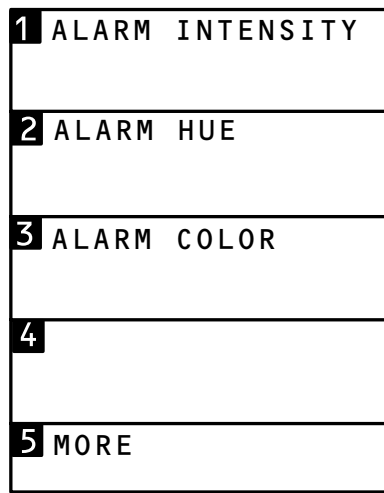
```
┌──────────────────────────┐
│ ▌1▐ ALARM  INTENSITY      │
│                          │
├──────────────────────────┤
│ ▌2▐ ALARM  HUE            │
│                          │
│                          │
├──────────────────────────┤
│ ▌3▐ ALARM  COLOR          │
│                          │
│                          │
├──────────────────────────┤
│ ▌4▐                       │
│                          │
│                          │
├──────────────────────────┤
│ ▌5▐ MORE                  │
│                          │
└──────────────────────────┘
```

Figure 2–9: Waveform display mode Display menu page 3

The Alarm Intens, Alarm Hue, and Alarm Color selections only apply to the amplitude alarm portion of the waveform display in the Waveform and Waveform-in-Picture display modes. See Figure 2–9. The Amplitude Alarm mode is explained on page 2–7.

Alarm Intens. This selection assigns control of alarm intensity to the GP Knob.

Alarm Hue. This selection assigns control of alarm hue to the GP Knob. Alarm hue works in conjunction with alarm color to set the desired alarm appearance.

Alarm Color. This selection assigns control of alarm color to the GP Knob. Alarm color works in conjunction with alarm hue to set the desired alarm appearance.

More. This selection opens the first page of the Display menu.

Configure Menu

The Configure menu is entered by pressing the front-panel Config button. The menu selections in the Configure menu are identical in all display modes, with the changes affecting the appropriate display modes.
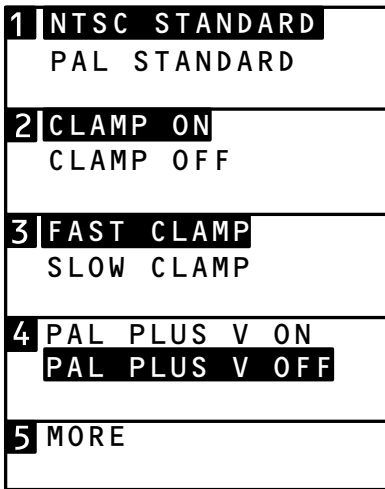
```
┌─────────────────────────┐
│ 1 NTSC  STANDARD        │
│   PAL  STANDARD         │
│                         │
│ 2 CLAMP  ON             │
│   CLAMP  OFF            │
│                         │
│ 3 FAST  CLAMP           │
│   SLOW  CLAMP           │
│                         │
│ 4 PAL  PLUS  V  ON      │
│   PAL  PLUS  V  OFF     │
│                         │
│ 5 MORE                  │
│                         │
└─────────────────────────┘
```

Figure 2–10: Waveform/Vector display mode Configure menu page 1

The following menu selections appear on the first page of the Configure menu. See Figure 2–10.

NTSC/PAL Standard. This selection toggles the instrument measurement standard between NTSC and PAL video standards.

Clamp On/Off. This selection toggles the DC Restorer clamp on and off.

Fast/Slow Clamp. This selection toggles the DC Restorer clamp speed between fast and slow. The slow setting will clamp while displaying any signal hum.

PAL Plus V On/Off. This selection toggles the PAL Plus V mode on and off. When the mode is on, the phase reference of the –V lines of the vector display is inverted and then shown as on overlay on the +V lines to provide a comparison display.

More. This selection opens the second page of the Configure menu.

```
┌─────────────────────────┐
│ ▣ N T S C   A L T   V   O N │
│   ▣ N T S C   A L T   V   O F F │
│                         │
│ ▣ G R A T I C U L E   O N  │
│   G R A T I C U L E   O F F │
│                         │
│ ▣ S Y N C   M E S S A G E   O N │
│   S Y N C   M E S S A G E   O F F │
│                         │
│ ▣ W I D E   S C R E E N   O N │
│ ▣ W I D E   S C R E E N   O F F │
│                         │
│ ▣ M O R E               │
└─────────────────────────┘
```
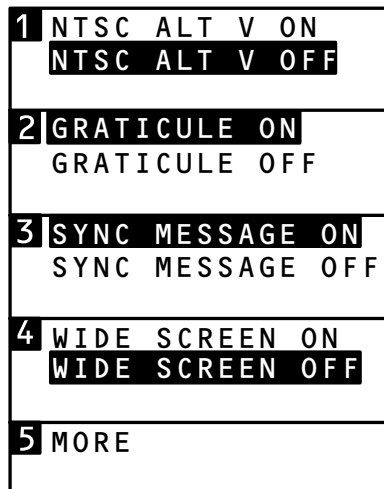
Figure 2–11: Waveform/Vector display mode Configure menu page 2

The following menu selections appear on the second page of the Configure menu. See Figure 2–11.

NTSC Alt V On/Off. This selection toggles the NTSC Alt V mode on and off. This mode is similar in function to the PAL Plus V mode, but it is only used during calibration of the instrument. Refer to the *WVR500 Waveform/Vector Monitor Service Manual* for instrument calibration information.

Graticule On/Off. This selection toggles the measurement graticules on and off.

Sync Message On/Off. This selection toggles the Missing Sync and Bad Sync on-screen readout messages on and off. If this selection is turned on but the Readout On/Off menu selection in the Operating menu is set to Off, the sync messages will not appear.

Wide Screen On/Off. This selection toggles the aspect ratio of the display between 4:3 (off) and 16:9 (on). The Wide Screen On selection supports high-definition television displays.

More. This selection opens the third page of the Configure menu.

```
1 SETUP
   NO SETUP

2 75% BARS
   100% BARS

3 SOFTWARE VERSION


4 CALIBRATE


5 MORE
```
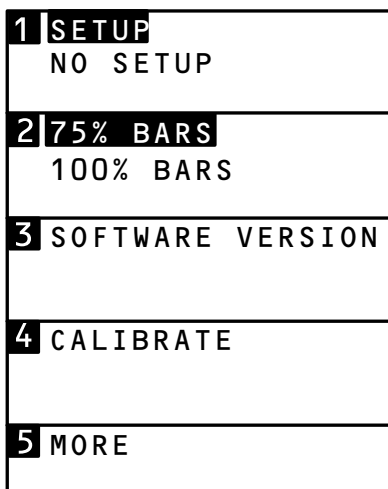
Figure 2–12: Waveform/Vector display mode Configure menu page 3

The following menu selections apply to Figure 2–12.

Setup/No Setup. This selection toggles the instrument between accepting NTSC signals with or without setup.

75%/100% Bars. This selection toggles the instrument between correctly processing 75% or 100% amplitude color bar signals.

Software Version. This selection displays the current software version of the instrument just below the menu Software Version text.

Calibrate. This selection only appears after the Calibration mode has been internally enabled by placing a jumper on A2J27. Refer to the *WVR500 Waveform/Vector Monitor Service Manual* for detailed calibration information.

More. This selection opens the first page of the Configure menu.

Picture Display Mode Menus

The Picture display mode Operating and Display menus are described on the following pages. The Presets and Configure menus are identical to the Waveform/Vector display mode Presets and Configure menus defined earlier in this section.

Operating Menu

The Picture display mode Operating menu is entered by pressing the front-panel Menu button. The menu selections are different for NTSC and PAL. See Figure 2–13.

NTSC   PAL
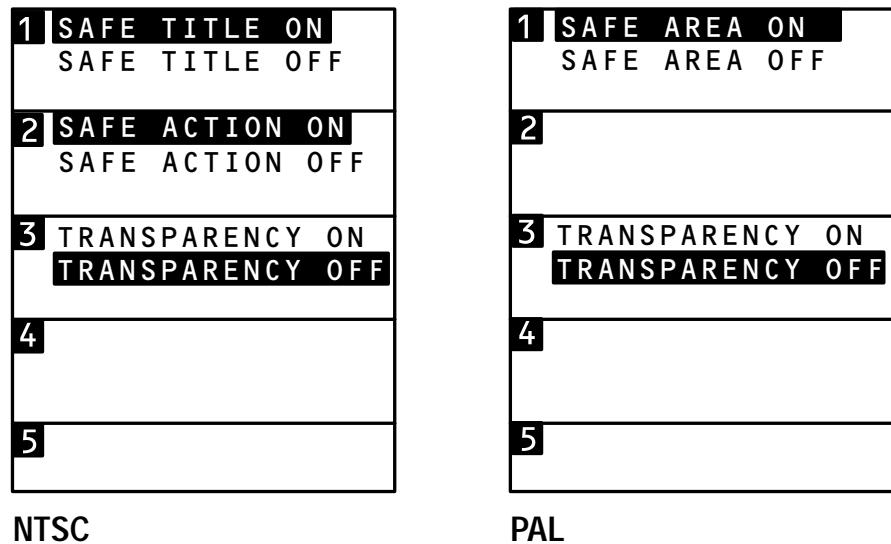
Figure 2–13: Picture display mode Operating menu

Safe Title On/Off. (NTSC only) This selection toggles the Safe Title mode on and off. When this mode is on, an outline depicts the safe title portion of the display.

Safe Action On/Off. (NTSC only) This selection toggles the Safe Action mode on and off. When this mode is on, an outline depicts the safe action portion of the display.

Safe Area On/Off. (PAL only) This selection toggles the Safe Area mode on and off. When this mode is on, an outline depicts the safe area portion of the display.

Transparency On/Off. This selection toggles the Transparency mode on and off. When this mode is on, the menus and safe areas become semitransparent allowing you to view the entire picture. This mode affects both the Picture and the Waveform-in-Picture display modes.

Display Menu

The Picture display mode Display menu only appears after one of the Safe Title, Safe Action, or Safe Area modes has been turned on. These menu selections also appear in the Waveform and Vector display modes Display menu. See Figure 2–14.

```
1  GRAT  INTENSITY


2  GRAT  HUE


3  GRAT  COLOR


4  BACKGROUND


5
```
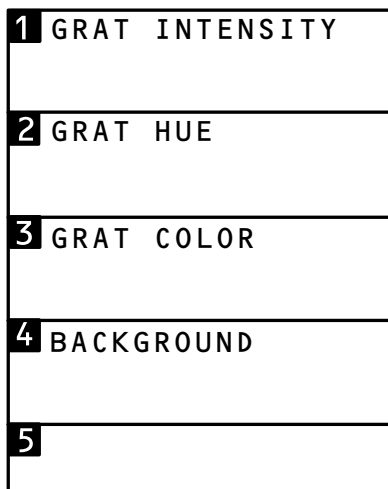
Figure 2–14: Picture display mode Display menu

Grat Intens. This selection assigns control of graticule intensity to the GP Knob. The graticule intensity can be adjusted from and applies to all display modes.

Grat Hue. This selection assigns control of graticule hue to the GP Knob. Graticule hue works in conjunction with graticule color to set the desired graticule appearance. The graticule hue can be adjusted from and applies to all display modes.

Grat Color. This selection assigns control of graticule color to the GP Knob. Graticule color works in conjunction with graticule hue to set the desired graticule appearance. The graticule color can be adjusted from and applies to all display modes.

Background. This selection assigns control of the display background intensity to the GP Knob. The background intensity can be adjusted from and applies to all display modes.

Waveform-in-Picture Display Mode Menus

The Waveform-in-Picture display mode Operating and Display menus are described on the following pages. The Presets and Configure menus are identical to the Waveform/Vector display mode Presets and Configure menus defined earlier in this section.

Operating Menu

The Waveform-in-Picture display mode Operating menu is entered by pressing the front-panel Menu button. See Figure 2–15.
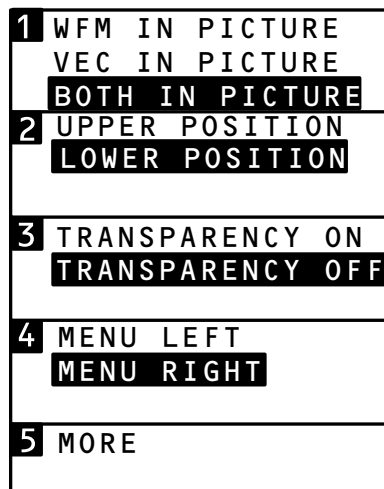
```
1 WFM IN PICTURE
  VEC IN PICTURE
  BOTH IN PICTURE
2 UPPER POSITION
  LOWER POSITION

3 TRANSPARENCY ON
  TRANSPARENCY OFF

4 MENU LEFT
  MENU RIGHT

5 MORE
```

Figure 2–15: Waveform-in-Picture display mode Operating menu page 1

WFM/VEC/Both in Picture. This selection toggles through the display options for the Waveform-in-Picture display mode. The waveform and vector displays can be displayed singly or at the same time.

Upper/Lower Position. This selection toggles the position of the reduced waveform and vector displays between the upper and lower halves of the display.

Transparency On/Off. This selection toggles the Transparency mode on and off. When this mode is on, the menus and reduced waveform and vector displays become semitransparent allowing you to view the

entire picture. This mode affects both the Picture and the Waveform-in-Picture display modes.

Menu Left/Right. This selection toggles the menu position between the left and right sides of the display.

More. This selection opens the second page of the Operating menu.

```
1 ALARM  ON
  ALARM  OFF

2 WFM  VAR  GAIN  ON
  WFM  VAR  GAIN  OFF

3 VEC  VAR  GAIN  ON
  VEC  VAR  GAIN  OFF

4

5 MORE
```
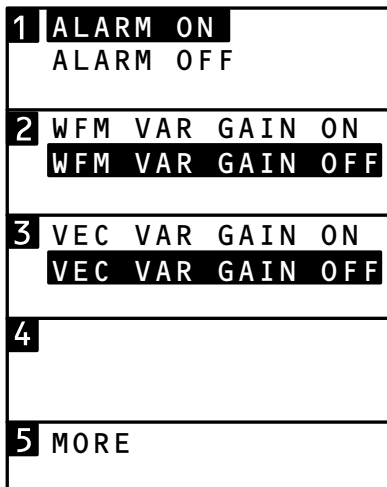
Figure 2–16: Waveform-in-Picture display mode Operating menu page 2

Alarm On/Off. For the Waveform display only, this selection toggles the Amplitude Alarm mode on and off. The Amplitude Alarm is explained on page 2–7.

WFM Var Gain On/Off. This selection assigns control of variable gain for the waveform display to the GP Knob.

VEC Var Gain On/Off. This selection assigns control of variable gain for the vector display to the GP Knob.

More. This selection opens the first page of the Operating menu.

Display Menu

The Waveform-in-Picture display mode Display menu is identical to the Waveform display mode Display menu described earlier in this section.

Making Measurements

Making Measurements contains measurement graticule descriptions, followed by measurement procedures.

This monitor uses a proprietary rasterizer to display the graticules. The internal graticule scales are on the same plane as the CRT phosphor, eliminating parallax errors.

Graticule intensity and color can be adjusted through the Display menu to provide optimum display visibility and contrast.

Waveform Graticules

The following two versions of the waveform graticule are illustrated in Figures 2–17 and 2–18:

- NTSC composite video graticule

- PAL (CCIR) composite graticule

The instrument monitoring standard, set in the Configure menu, selects which measurement graticule is displayed.

Horizontal Scale

The 0 IRE (0.3 V PAL) graticule line is divided into 12 major divisions. Each division represents a unit of time determined by the Sweep and Mag settings. Line sweep rates appear in the on-screen readout, and are as follows:

Sweep Rate	Time/Div	Mag On
1 Line	5 µs/div	0.5 µs/div
2 Line	10 µs/div	1 µs/div

In 2 Field sweep with Mag on, the signal is magnified by X20, and the entire vertical interval can be viewed.

Vertical Scales

The NTSC graticule is scaled in IRE units and extends from –40 to +120 IRE, in 10 IRE increments. Black level setup is denoted by a dashed line at 7.5 IRE. The CCIR (PAL) graticule is scaled in volts and extends from 0 to 1.2 V, in 0.1 V increments.
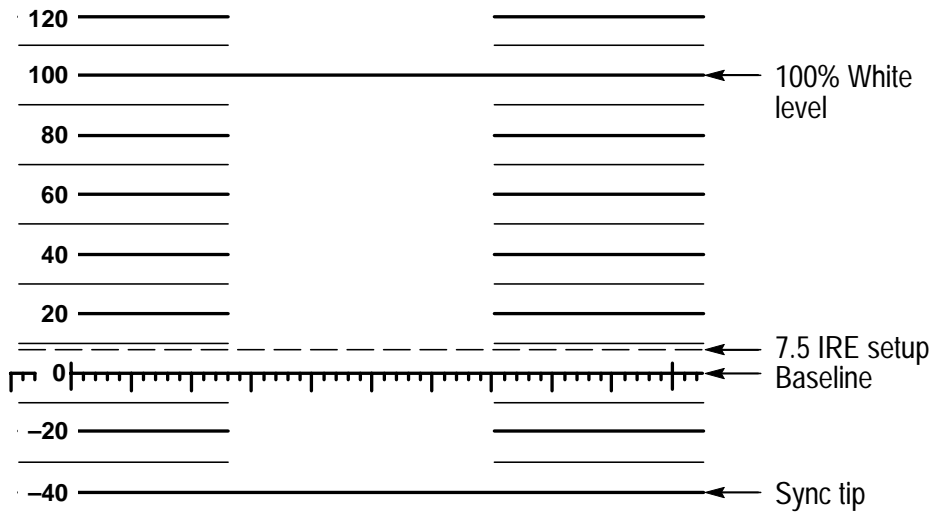
Figure 2–17: NTSC waveform graticule
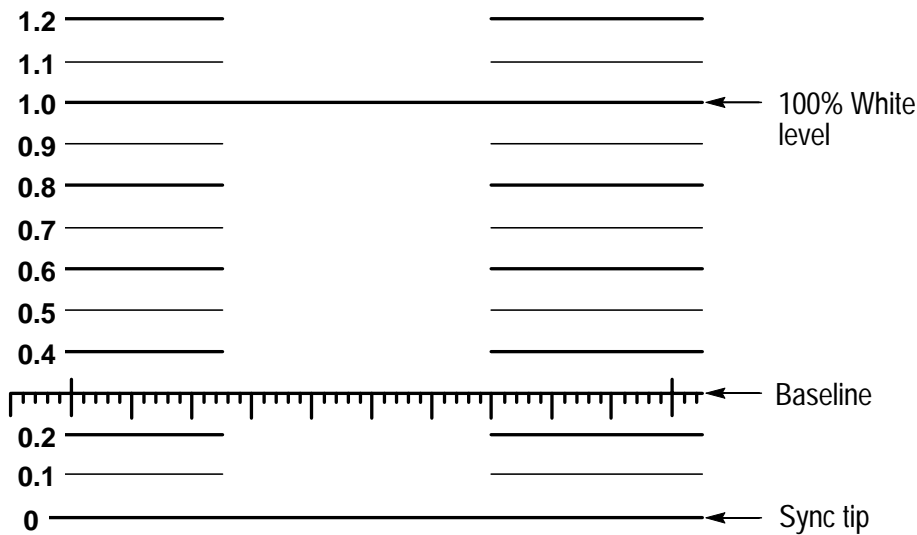
Figure 2–18: PAL waveform graticule

Making Waveform Measurements

Standard Measurements

Standard amplitude and timing measurements of the signal are made by positioning the waveform on the graticule. The position and magnification controls aid in measuring small portions of the waveform.

Peak White

With the blanking signal level on the graticule baseline, the amplitude of the 100% white reference of a color bar should be on the 100 IRE (1.0 V PAL) graticule line.

The Waveform display mode Amplitude Alarm highlights any portion of the signal which exceeds the 100 IRE (1.0 V PAL) graticule line. The Amplitude Alarm mode is turned on in the Operating menu of the Waveform and Waveform-in-Picture display modes, and the alarm's appearance is adjusted in the Display menu.

Vector Graticules

The vector display permits measurements of hue in terms of the relative phase of the chrominance signal with respect to the color burst. Relative amplitude of chrominance to burst is expressed in terms of the displacement from center (radial dimension of amplitude).

The following two versions of the vector graticule are illustrated in Figures 2–19 and 2–20:

■ NTSC composite vector graticule

■ PAL (CCIR) composite vector graticule

The instrument monitoring standard, set in the Configure menu, selects which graticule is displayed.
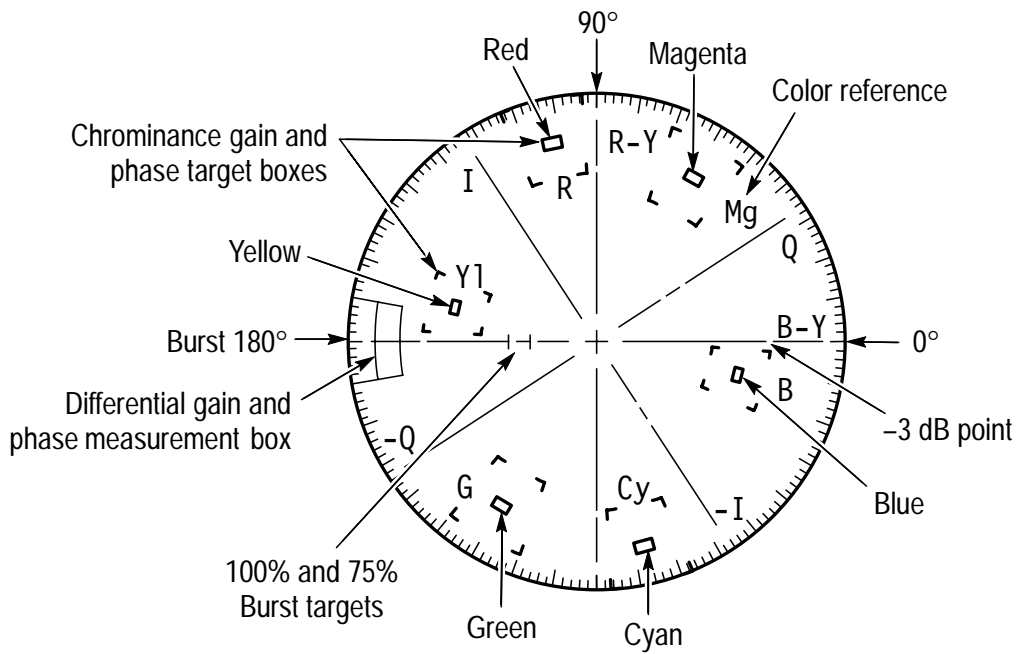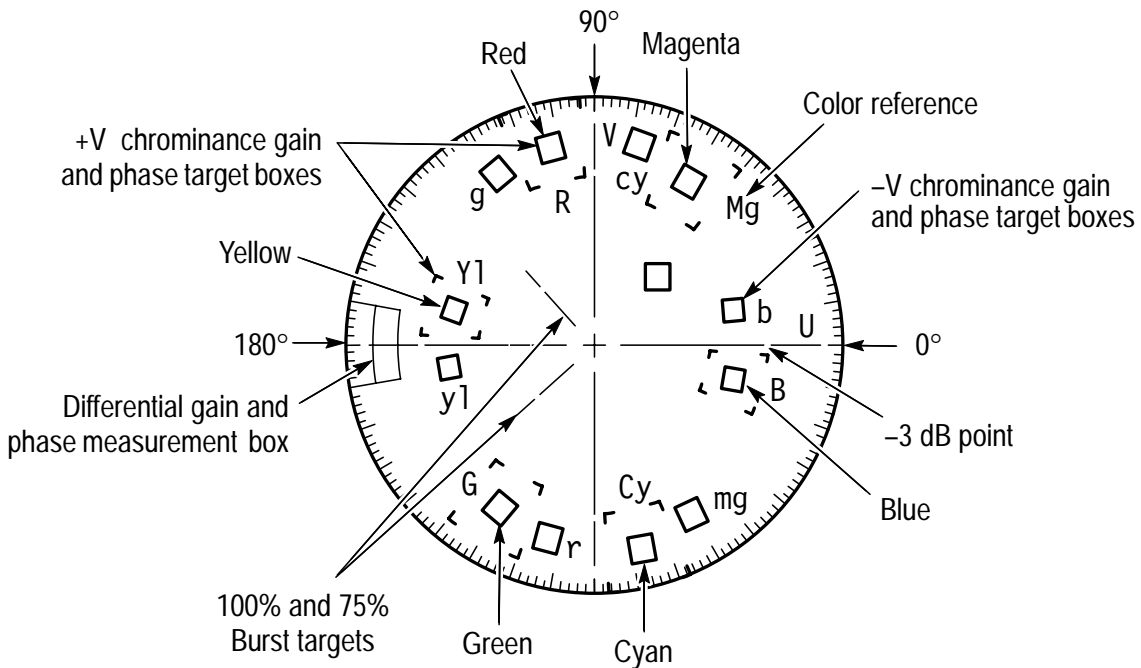
Figure 2–19: NTSC vector graticule

Figure 2–20: PAL vector graticule

Chrominance Vector Targets

The chrominance vectors terminate in a system of graticule targets consisting of two boxes (a small box inside a large box). A sample target is shown in Figure 2–21.

The dimensions of the large boxes represent ±10° centered on the exact chrominance phase and ±20% of chrominance amplitude centered around standard amplitude. The dimensions of the smaller boxes represent ±2.5° and ±2.5 IRE (±3° and ±5% PAL) of chrominance amplitude.

For the PAL graticule, each chrominance vector related to the +V burst terminates in targets consisting of two boxes (a small box inside a large box). The vectors associated with the –V burst terminate in the targets consisting of smaller boxes only.
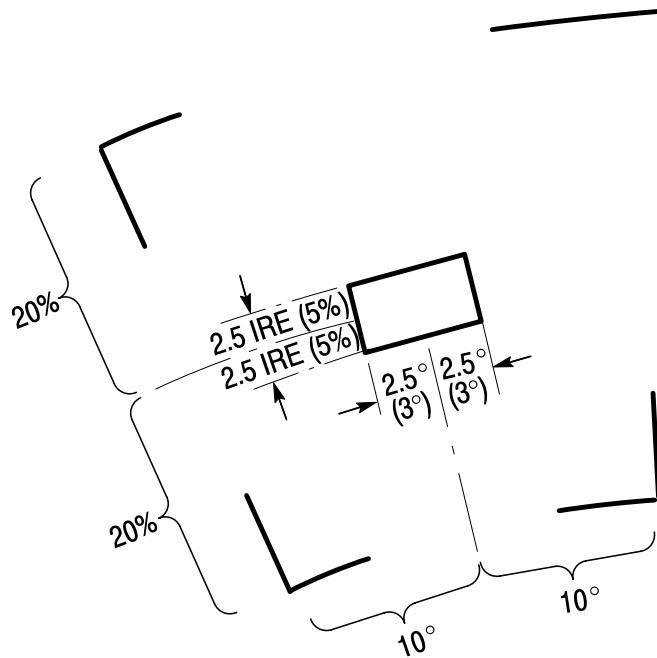
Figure 2–21: Vector targets – NTSC values (PAL values in parentheses)

Differential Phase and Gain Measurement Box

Differential gain (dG) and differential phase (dφ) measurements use the graticule markings located at the outer edge of the B-Y or U axis 180° line. See Figure 2–22.
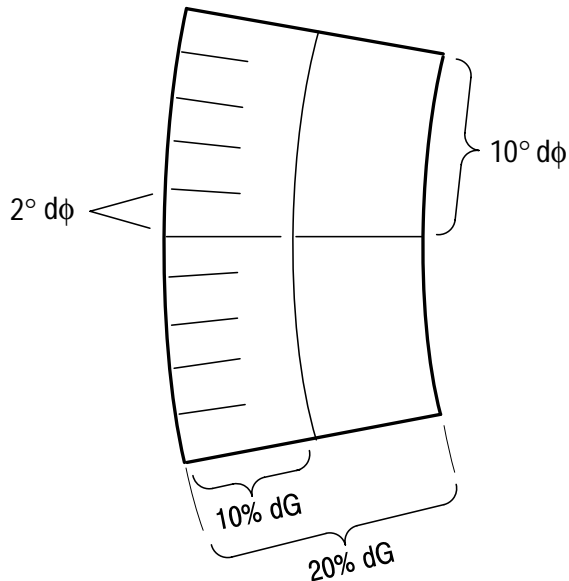

2° dφ

10° dφ

10% dG

20% dG

Figure 2–22: Differential gain and phase measurement box

Making Vector Measurements

Chroma Bandwidth

The horizontal and vertical axes of the vector graticule contain markings for checking chroma bandwidth. A subcarrier frequency sine wave (whose amplitude places it on the outer compass rose) is used as a reference. When the frequency is changed, the diameter of the circle should reduce in size. At a point equal to 70.7% of full amplitude (–3 dB), there are gaps in the horizontal and vertical axes. This calibration aid makes it possible to check the –3 dB points of the demodulator output amplifiers.

Tutorial

This tutorial is designed for operator familiarization and for checking basic instrument operation (not measurement quantities or specifications).

This tutorial assumes that you have read the *Functional Overview* and *Using the Menus* sections of this manual and understand the basics of instrument operation.

If the performing of this procedure reveals improper instrument operation, first check the operation of the associated equipment. If the associated equipment is operating normally, refer the monitor to qualified service personnel for repair or adjustment.

1. Connect the equipment listed in Table 2–1 as described below.

    a. Connect the WVR500 monitor to an appropriate AC power source.

    b. Connect the output of the television signal generator to the CH-A input.

    c. Connect the other side of the CH-A loopthrough to the Ext Ref input.

    d. Terminate the remaining side of the Ext Ref loopthrough in 75 Ω.

    e. Connect a cable from the WVR500 monitor Video Out connector to the input of the picture monitor.

    f. Terminate the picture monitor input in 75 Ω.

    g. Set the signal generator for a 75% color bars output.

2. Initialize the front-panel controls and menu selections.

    a. Select the Waveform display mode.

    b. Select CH A Input, 2 Line Sweep, Flat Filter, and Int Ref.

       Notice that the front-panel indicators light when these selections are made.

Table 2–1: Tutorial required equipment

Equipment	Example
Television signal generator with the following signals: composite color bars; black burst or comparable signal with sync and burst	Tektronix TSG 100 Signal Generator (NTSC) Tektronix TSG 111 Signal Generator (PAL)
Coaxial Cable, 75 Ω (3)	42-inch RG59U (Tektronix Part No. 012-0159-00)
75 Ω Terminator, end-line (2)	Tektronix Part No. 011-0102-00
Picture monitor for the appropriate video standard (NTSC or PAL)	Generic picture monitor with BNC video input connector

      c. Turn Line Sel, Mag, and Gain X5 off if they are turned on.

      d. Enter the Operating menu and select Alarm Off, Var Gain Off, and Readout On.

      e. Enter the Configure menu and select the monitoring standard (NTSC or PAL), PAL Plus V Off, NTSC Alt V Off, Graticule On, Setup, and 75% Bars.

      f. Clear the menu display.

3. Adjust the display appearance.

      a. Use the position controls to place the waveform on the graticule baseline and to center the display.

      Notice that Intensity is displayed in the readout after the knob icon. This indicates that the GP Knob is assigned to adjust signal intensity (default function for the Waveform display mode).

      b. Use the GP Knob to adjust the signal intensity to the desired level.

c. Enter the Display menu and select Grat Intens.

Notice that a knob icon appears by the menu selection indicating that the GP Knob is now assigned control of this function and that Grat Intens appears in the readout.

d. Adjust the GP Knob for the desired graticule illumination.

e. Toggle between Grat Color and Grat Hue in the menu to adjust the graticule color to a desired setting.

The Grat Hue and Grat Color adjustments work in conjunction to set the graticule appearance. The graticule color setting also affects the vector display graticule and safe area outlines in the Picture display mode.

f. Press the Clear button once to exit the Display menu.

Notice that the GP Knob retains control of the Grat Hue or Grat Color function that was last selected, as indicated by the readout.

g. Press the Clear button a second time to return the GP Knob to signal intensity control. The display should appear similar to Figure 2–23.
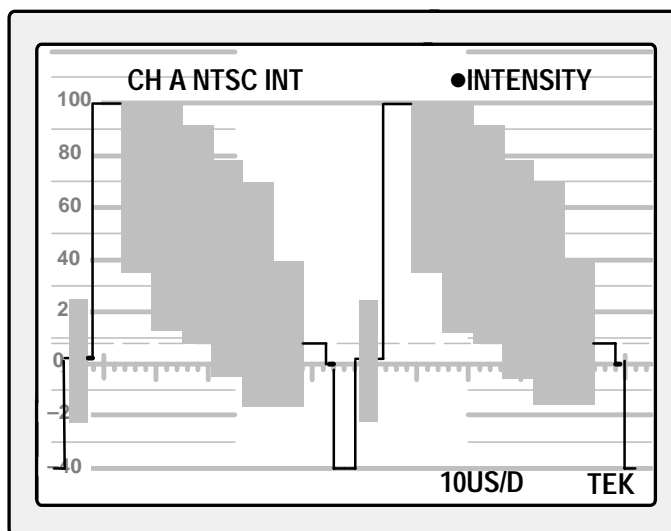
Figure 2–23: Waveform NTSC 2 Line sweep display

4. Select the input channel.

    a. Press the Input button to toggle the display from the CHA to the CHB Input (no signal applied).

    Notice that the readout now displays CHB and that the message Missing Sync appears (indicating that the signal reference is lost).

    b. Press the Input button again to return to the CHA Input display.

5. Select the sweep rate.

    a. Press the Sweep button.

    Notice that the 2 Field indicator lights and that the sweep-rate readout disappears.

    b. Press the Sweep button twice to return to 2 Line sweep.

    Notice the sweep-rate readout reappears.

    c. Turn Mag on.

    Notice that the front-panel Mag indicator lights and that the sweep-rate readout changes to 1US/D.

    d. Use the horizontal-position control to view the entire signal.

    e. Turn Mag off and center the waveform display.

6. Adjust the signal gain.

    a. Turn Gain X5 on and notice that the Gain X5 indicator lights.

    b. Use the vertical-position control to view the entire signal.

    c. Turn Gain X5 off and return the signal to the graticule baseline.

    d. Enter the Operating menu and select Var Gain On.

    Notice that Var appears in the readout and that Wave Gain has replaced Intensity as the GP Knob function.

e. Adjust the GP Knob to vary the signal gain.

f. Press the Clear button once to clear the menu display.

Notice that the GP Knob retains control of variable gain as indicated in the readout.

g. Press Clear a second time to return the GP Knob to intensity control.

Notice that the Variable Gain mode remains on as indicated by Var in the readout.

h. Press the Vector button to select the vector display.

Notice that variable gain is not on since the Waveform and Vector display modes have separate variable gain adjustments.

i. Enter the Operating menu and select Var Gain On.

Notice that Var is displayed and that Vect Gain is the GP Knob function.

j. Select Var Gain Off and notice that the GP Knob returned to vector phase control.

k. Select Waveform display.

Notice that the GP Knob is assigned to Wave Gain control because the Variable Gain mode was left on when the Waveform display mode was exited.

l. Enter the Operating menu and select Var Gain Off.

m. Center the waveform display and position the signal on the graticule baseline.

7. Select the waveform display filter. Filter selections affect the waveform display only.

a. Press the Filter button to select Lum.

Notice that the display changes to show only the luminance portion of the signal. LP, for low-pass filter, is displayed in the readout.

e. Select the Waveform-in-Picture display mode.

f. Enter the Operating menu and notice that the menu page of Line Select mode selections is available. The currently selected line and field numbers appear in the menu.

g. Return to the Waveform display mode.

h. Try to select 2 Field sweep and notice that the sweep rate only toggles between 1 Line and 2 Line sweep rates.

i. Select 2 Line sweep.

j. Select Update Slow from the Operating menu and adjust the vertical position control.

Notice the length of time the signal takes to settle to the new position.

k. Select Update Fast and adjust the signal back to the baseline.

Notice the difference in the signal settling time.

l. Select CH B Input (no signal applied) and notice that the line select readout is replaced by the message Missing Sync.

m. Select CH A Input.
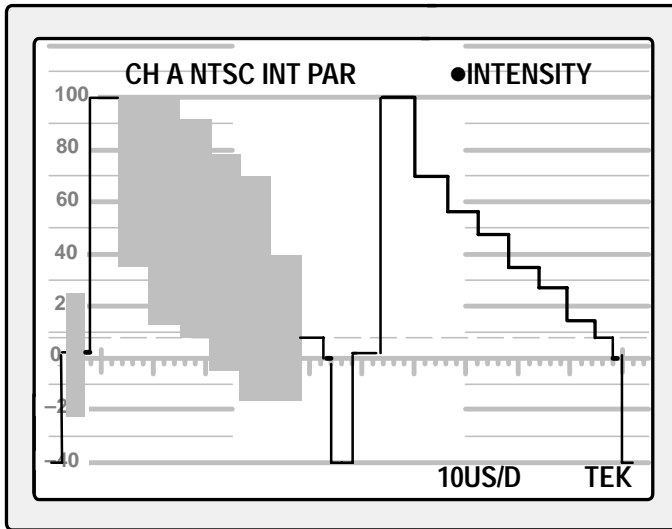
n. Turn the Line Select mode off.

Notice that the menu is cleared, that the selected line and field readout is gone, and that the GP Knob is reassigned to signal intensity.

9. Adjust the Amplitude Alarm display.

a. Enter the Operating menu and select Alarm On.

b. Adjust the vertical-position control and notice that the portion of the signal exceeding the 100 IRE (1.0 V PAL) graticule line is highlighted.

c. Enter the Display menu.

Notice that a third menu page appears with alarm display adjustments. These adjustments only affect the alarm portion of the display.

d. Use the Alarm Intensity, Alarm Hue, and Alarm Color adjustments to set the appearance of the amplitude alarm as you desire.

e. Enter the Waveform-in-Picture display mode.

f. Select WFM In Picture from the Operating menu.

g. Adjust the vertical-position control and notice that the portion of the signal exceeding the 100 IRE (1.0 V PAL) graticule line is highlighted.

10. Adjust the vector display.

a. Select Vector display mode and notice that the GP Knob now controls vector phase.

b. Adjust the GP Knob to place the burst vector on the 180° graticule line. The display should appear similar to Figure 2–25.
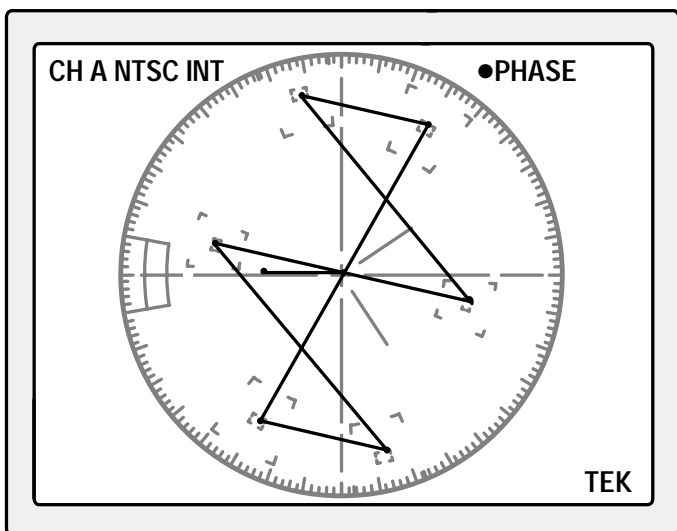

Figure 2–25: Vector display of NTSC color bars signal

11. Adjust the picture display.

    a. Select the Picture display mode.

    b. (NTSC only.) Enter the Operating menu and select Safe Title On and Safe Action On.

        Notice that the safe title and safe action portions of the display are outlined. The picture display should appear similar to Figure 2–26.

    c. (PAL only.) Enter the Operating menu and select Safe Area On.

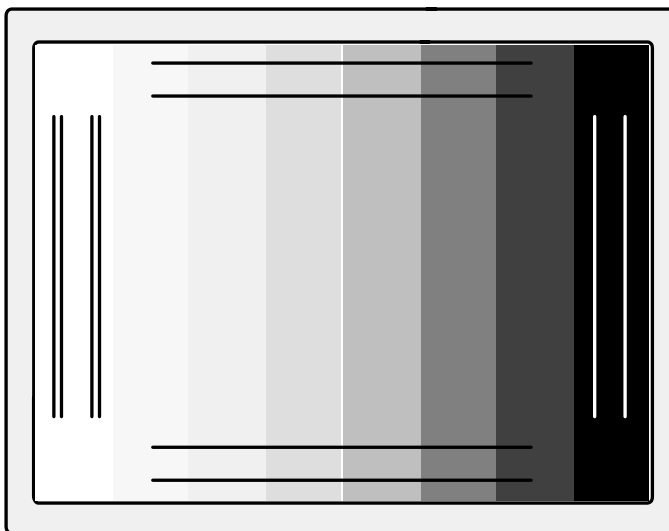   Notice that the safe area portion of the display is outlined.

Figure 2–26: Picture display of NTSC color bars with the Safe Title and Safe Action areas outlined

    d. Select Transparency On from the Operating menu.

        Notice that the menu and safe area portions of the display are now semitransparent, allowing you to view the entire picture display.

e. Enter the Waveform-in-Picture display mode.

Notice that the safe areas turned on in the Picture display mode are not visible. Also notice that the menu and the reduced-size displays are also semitransparent.

f. Return to the Picture display mode and turn off the safe areas and select Transparency Off from the Operating menu.

12. Adjust the Waveform-in-Picture display mode.

a. Select the Waveform-in-Picture display mode.

b. Enter the Operating menu and select Both In Picture. The display should be similar to Figure 2–27.
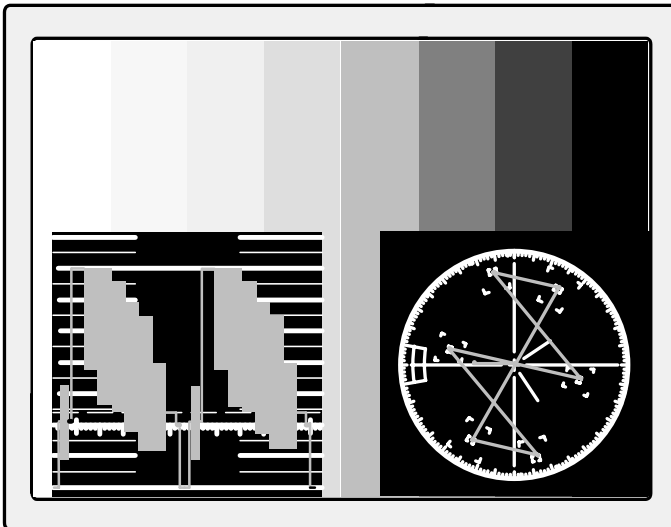

Figure 2–27: Waveform-in-Picture color bars display with Both In Picture selected

c. Adjust the GP Knob and notice that vector phase is being adjusted.

Vector phase is the default function for the GP Knob in the Waveform-in-Picture display mode when the reduced-size vector display is shown. The GP Knob has no default function assigned to it when the reduced-size vector display is not shown.

d. Change the front-panel sweep, filter, and magnification settings, and adjust the position controls while noticing the effect they have on the reduced-size displays.

e. Select Menu Left or Menu Right to move the menu so that you can view the appropriate reduced-size display.

f. Select Upper Position from the Operating menu and notice that the reduced-size displays moved to the upper half of the display.

g. Select WFM Var Gain On from the Operating menu.

h. Adjust the GP Knob and notice that you can adjust the gain of the waveform display.

i. Select the Waveform display mode.

Notice that the gain setting you made in the Waveform-in-Picture display mode appears in the Waveform display mode.

j. Select the Waveform-in-Picture display mode.

k. Select WFM Var Gain Off from the Operating menu.

This concludes the tutorial.

Appendices

Appendix A: Specifications

The specification tables use the following abbreviations.

Performance Requirement (Req). All performance requirements in the specification tables are identified with *Req*, and can be assured by completing the *Performance Verification* procedure in the *WVR500 Waveform/Vector Monitor Service Manual*. Allow a warm-up time of 20 minutes.

Performance requirements in the electrical specifications are valid over an ambient temperature range of +20° C to +30° C. The Performance Requirement tolerances listed in the Electrical Specification are doubled over the temperature range of 0° C to +50° C unless otherwise specified. Test equipment used to verify performance requirements must be calibrated and working within the limits specified in the service manual *Required Test Equipment* list.

Reference Information. Information that amplifies a performance requirement or is of special importance is indicated by *RI*. There is no need to check these items to a specific tolerance.

Table A–1: Vertical deflection system

Category	Description
Deflection Factor	*Req:* 1 V Full Scale: 1 V input displayed within 1% of 140 IRE (1.0 V PAL).
	RI: Flat filter selected.
	Req: X5 Gain: Gain Accuracy ±5%.
	RI: 1 V input signal.
	Req: X5 Gain Registration: ≤1 major division of vertical shift from baseline between unmagnified and magnified signal.
	Req: Variable Gain Range: Input signals between 0.8 V and 2 V can be adjusted to 140 IRE (1.0 V PAL) display. 160 mV and 400 mV for X5 Gain.
	Req: Position Range: 1 V signal can be positioned so that peak white and sync tip can be placed at blanking level, with the DC Restorer Clamp on, regardless of gain setting.
Frequency Response	*Req:* 1 V Full Scale: 50 kHz to 6 MHz within 2% of response at 50 kHz.
	RI: Specifications apply for full screen height video input signal, with Variable Gain off, and Flat filter selected.
	Req: X5 Gain: 50 kHz to 6 MHz within 5% of response at 50 kHz.
	RI: Flat filter selected.
	Req: Luminance Filter: ≥30 dB attenuation at 4.00 MHz.
	RI: Response at 15 kHz does not vary between Flat and Luminance filters by more than 1%.

Table A–1: Vertical deflection system (cont.)

Category	Description

Transient Response	*RI:* Specifications apply for full screen height video input signal, with Variable Gain off, 1 V Full Scale or X5 Gain, using the 2T pulse and 2T bar.
	
	Req: Pulse-to-Bar Ratio: X1: 0.99:1 to 1.01:1.
	  X5: 0.98:1 to 1.02:1.
	
	Req: Field Rate Square Wave or Vertical Window Tilt: ≤1%.
	
	Req: 25 µS Bar Tilt: ≤1%.
	
	Req: Overscan: ≤2% variation in baseline of 100 IRE (700 mV PAL) 12.5T (20T PAL) modulated pulse as it is positioned over the middle 80% of the screen.
	
	RI: Preshoot: ≤1%.
	
	RI: Overshoot: X1: ≤2%.
	  X5: ≤4%.
	
	RI: Ringing: X1: ≤2%.
	  X5: ≤4%.

Maximum Absolute Input Level	*Req:* ± 5 VDC + peak AC. *RI:* Displays in excess of 200 IRE (1.428 V PAL) may cause frequency response aberrations. *RI:* Maximum Operating Input Voltage: Peak AC + DC should be within +8.0 V and –5.6 V for proper operation.
DC Input Impedance	*Req:* ≥15 kΩ. *RI:* Unterminated.
Return Loss (75 Ω)	*Req:* ≥40 dB from 50 kHz to 6 MHz. *RI:* CH-A and CH-B input channels, loopthrough terminated in 75 Ω. Input in use or not in use, instrument power on or off, all deflection factor settings.
Loopthrough Isolation	*RI:* ≥70 dB of isolation between loopthroughs. Measured at F_{SC} between CH-A, CH-B, and Ext Ref inputs.

Table A–1: Vertical deflection system (cont.)

Category	Description	
Crosstalk Between Channels	*RI:*	≥70 dB of isolation between channels. Measured at F_{SC} between CH-A, CH-B, and Ext Ref inputs.
Video Out	*RI:*	Differential Gain (50% APL): Within 1% with a 140 IRE (1.0 V PAL) unit display.
	RI:	Differential Phase (50% APL): Within 1° with a 140 IRE (1.0 V PAL) unit display.
	Req:	Return Loss (75 Ω): ≥30 dB from 50 kHz to 6 MHz.
	RI:	With the instrument turned on.
	Req:	Input to Video Out Gain Ratio: 1:1 ± 5% @ 15 kHz
	RI:	Picture display mode.

Table A–2: DC restoration

Category	Description	
DC Restorer Clamp Time	*RI:*	Back Porch.
Frequency Response at 60 Hz (50 Hz PAL)	*Req:*	Attenuation of 60 Hz (50 Hz PAL) on Input signal: Slow Mode – ≤20%. Fast Mode – ≥90%.
	Req:	Blanking Level Shift with 10% to 90% APL Change: APL changes from 50% to either 10% or 90% will cause blanking level shift of 1 IRE unit (7.14 mV PAL) or less.
	Req:	Blanking Level Shift Due to Presence or Absence of Burst: 1 IRE unit (7.14 mV PAL) or less shift from no color burst to presence of color burst.

Table A–3: Horizontal deflection system

Category	Description
Sweep	*Req:* Sweep will occur in all Horizontal mode settings with or without synchronization.
2 FLD Sweep Repetition Rate	*RI:* Displays 2 full fields, including the field rate sync between them.
2 FLD Sweep Magnification	*RI:* Approximately X20.
1 LINE Sweep Repetition Rate	*Req:* Equal to the line-rate of applied video or external sync.
2 LINE Sweep Repetition Rate	*Req:* Equal to half the line-rate of applied video or external sync.
Sweep Length	*RI:* 2 Line and 2 Field sweep length is nominally 12.5 divisions.
Timing Accuracy	*RI:* All timing and linearity specifications exclude the first and last major divisions of the unmagnified display.
	Req: 10 µs/div. (2 Line): Within 2%.
	Req: 5 µs/div. (1 Line): Within 2%.
	Req: 1 µs/div. (2 Line + Mag): Within 2%.
	Req: 0.5 µs/div. (1 Line + Mag): Within 3%.
Integral Linearity	*Req:* Within 1%.
	RI: Measured between the 10 µs and 110 µs points on the 10 µs/div. sweep.
Sweep Magnifier Registration	*RI:* Magnification occurs about the center of the screen.
Horizontal Position	*Req:* Any portion of a synchronized video sweep can be positioned on screen in all sweep modes.

Table A–4: Synchronization

Category	Description	
Input Requirements	*Req:*	Internal Reference, NTSC: Composite video or black burst with sync amplitudes 40 IRE ±6 dB.
	Req:	Internal Reference, PAL: Composite video or black burst with sync amplitudes 300 mV ±6 dB.
	Req:	External Reference: Sync amplitude between 143 mV and 4 V will synchronize sweeps.
EXT REF Input	*Req:*	DC Input Impedance (Unterminated): ≥15 kΩ.
	Req:	Return Loss (75 Ω): ≥40 dB from 50 kHz to 6 MHz.
	RI:	Loopthrough terminated in 75 Ω, instrument power on or off.
	RI:	Absolute Maximum Input Voltage: ±12 VDC plus peak AC.

Table A–5: Vector mode

Category	Description	
Chrominance Processing	*Req:*	Chrominance Bandwidth: Upper –3 dB Point: F_{SC} +500 kHz, ± 100 kHz. Lower –3 dB Point: F_{SC} –500 kHz, ± 100 kHz.
	RI:	Nominal Subcarrier Frequency (F_{SC}) NTSC: 3.579545 MHz. PAL: 4.43361875 MHz.
	RI:	+V Mode (Applicable to PAL operation only): +V-type display as selected by front-panel menu selection. When selected, V axis is inverted at a half line-rate to produce a single vector display.
Display	*RI:*	Vector Phase Accuracy: ±1.25˚. Measured with color bars signal.
	RI:	Vector Gain Stability: Typically ±2.5%.
	RI:	Quadrature Phasing: Typically ±0.5˚.

Table A–5: Vector mode (cont.)

Category	Description

Subcarrier Regenerator	*Req:* Pull-In Range
	      NTSC: $\pm$50 Hz of F_{SC}.
	      PAL: $\pm$10 Hz of F_{SC}.
	
	    RI: Subcarrier Regenerator free runs in absence of appropriate signal. Reference can be burst of either the displayed signal or the external reference signal.
	
	    RI: Pull-In Time: Within 1 second, with subcarrier frequency within 50 Hz (10 Hz for PAL) of F_{SC}.
	
	Req: Phase Shift with Subcarrier Frequency Change:
	      NTSC: $\pm$2° from F_{SC} to (F_{SC} +50 Hz), or F_{SC} to (F_{SC} – 50 Hz).
	      PAL: $\pm$2° from F_{SC} to (F_{SC} +10 Hz), or F_{SC} to (F_{SC} – 10 Hz).
	
	Req: Phase Shift with Burst Amplitude Change: $\pm$2° from nominal burst amplitude to $\pm$6 dB.
	
	    RI: Internal or external burst reference.
	
	Req: Phase Shift with Input Channel Change: $\pm$0.5°.
	
	    RI: With external reference selected.
	
	Req: Phase Shift with Variable Gain Control: $\pm$1° as gain is varied from +3 dB to –6 dB.
	
	    RI: Phase Control Range: 360° continuous rotation.
	
	Req: Burst Jitter: 0.5° rms or less.
	
	    RI: With 140 IRE (1 V PAL) composite video input. Internal or external referenced.

Display Characteristics	*RI:* Differential Phase: $\pm$1°.
	
	    RI: Differential Gain: $\pm$1%.
	
	    RI: Measured with 140 IRE (1 V PAL) linearity signal (5-step, 10-step, or Ramp) with 40 IRE (300 mV PAL) of subcarrier.

Table A–6: Power source

Category	Description
Mains Voltage Range	*Req:* 90–250 V.
Mains Frequency Range	*Req:* 48 Hz to 66 Hz.
Power Consumption	*RI:* 25 Watts maximum.
Power Fuse Rating	*Req:* 250 V, 2 A, F-type.

Table A–7: Physical characteristics

Category	Description
Dimensions	*RI:* Height: 1 3/4 inches (44.5 mm). Width: 8 inches (203.2 mm). Length: 18 1/2 inches (469.9 mm).
Weight	*RI:* Approximately 4.0 lbs (approximately 1.8 kg).

Table A–8: Environmental characteristics

Category	Description	
Temperature	*RI:*	Non-Operating: –55° C to +75° C. Operating: 0° C to +50° C. (IEC 1010-1 compliance to +40° C.)
Altitude	*RI:*	Non-Operating: To 50,000 feet. Operating: To 15,000 feet. (IEC 1010-1 compliance to 2000 meters.)
Equipment Type	*RI:*	Measurement (as defined in IEC 1010-1, Annex H).
Equipment Class	*RI:*	Class I (as defined in IEC 1010-1 Annex H).
Installation Category	*RI:*	Installation Category II (as defined in IEC 1010-1, Annex J). Note: Rated for indoor use only.
Pollution Degree	*RI:*	Pollution Degree 2 (as defined in IEC 1010-1).
Vibration – Operating	*RI:*	15 minutes each axis at 0.015 inch, frequency varied from 10–55–10 Hz in 1-minute cycles with instrument secured to vibration platform. Ten minutes each axis at any resonant point or at 55 Hz if a resonant point is not found. MIL-T-28800D, Paragraph 1.2.2, Class 3.
Shock – Non-Operating	*RI:*	30 g's, 1/2 sine, 11 ms duration, 3 shocks per surface (18 total).
Transportation	*RI:*	Qualified under NSTA Test Procedure 1A, Category II (24 inch drop).
Humidity	*RI:*	Will operate at 95% relative humidity for up to five days. Meets the five-day cycling humidity tests as called out in Tektronix standard 062-2847-00.

Table A–9: Certifications and compliances

Category	Description

EC Declaration of Conformity	Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:
	
	EMC Directive 89/336/EEC:
	
	    EN 50081-1 (Emissions):
	        EN 55022 Class B Radiated and Conducted Emissions
	
	    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
	
	Conditional Statements:
	    1. High quality shielded cables must be used to insure compliance to the above listed standards.
	
	Low Voltage Directive 73/23/EEC, Amended by 93/68/EEC:
	
	    EN 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use.
	                    Part 1: General Requirements.

Safety Standards U.S. Nationally Recognized Laboratory Listing	 UL1244 Standard for Electrical and Electronic Measuring and Testing Equipment.
Canadian Certification	CAN/CSA C22.2 No. 231 CSA Safety Requirements for Electrical and Electronic Measuring and Test Equipment.
European Union Compliance	Low Voltage Directive 73/23/EEC, Amended by 93/68/EEC. EN61010-1 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use.
Additional Compliance	IEC1010-1 Safety Requirements for Electrical for Measurement, Control, and Laboratory Use.

Table A–9: Certifications and compliances (cont.)

Category	Description
Safety Certification Compliance	
Temperature, operating	+5 to +40° C
Altitude (maximum operating)	2000 meters
Equipment Type	Test and measuring
Safety Class	Class I (as defined in IEC 1010–1, Annex H) – grounded product
Overvoltage Category	Overvoltage Category II (as defined in IEC 1010–1, Annex J).
Pollution Degree	Pollution Degree 2 (as defined in IEC 1010–1). Note: rated for indoor use only.

Appendix B: Remote Interface

The rear-panel remote connector is an interface for RS-232 serial binary data interchange. All of the monitoring functions available from the front-panel controls and menu selections can be made through the remote interface.

This section lists the equipment requirements for setting up the interface, as well as the command set for operating the instrument through the interface.

Equipment Requirements

The equipment required to communicate to the WVR 500 monitor through the remote interface consists of a terminal or a PC with terminal emulation and a cable to connect the terminal to the instrument.

Remote Cable

The rear-panel remote connector is a 9-pin subminiature D-type with male contacts. The pin-out assignments for the remote connector are shown in Figure B–1.

The remote cable only needs three pins connected for the remote interface to operate. The required cable connections for a 9-pin PC connector are shown in Figure B–2. Figure B–3 illustrates the required cable connections for a 25-pin PC connector.

The unused remote connector pins are for hardware control. The WVR 500 monitor is not designed to respond to commands on those unused pins.

NOTE. The WVR500 monitor will not respond to the remote ^S or ^Q flow control commands.

```
PIN              FUNCTION
1.   DCD    Received Line Signal Detector
2.   RXD    Received Data
3.   TXD    Transmitted Data
4.   DTR    DTE Ready
5.   GND    Signal Ground
6.   DCR    DCE Ready
7.   RTS    Request to Send
8.   CTS    Clear to Send
9.   NC     No Connection
```
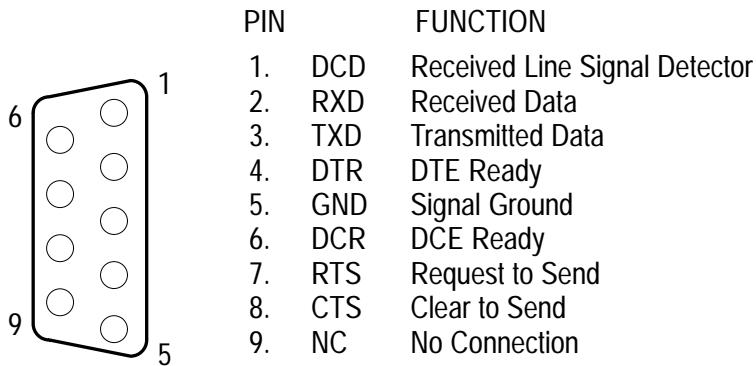
Figure B–1: Remote connector pin-out assignments
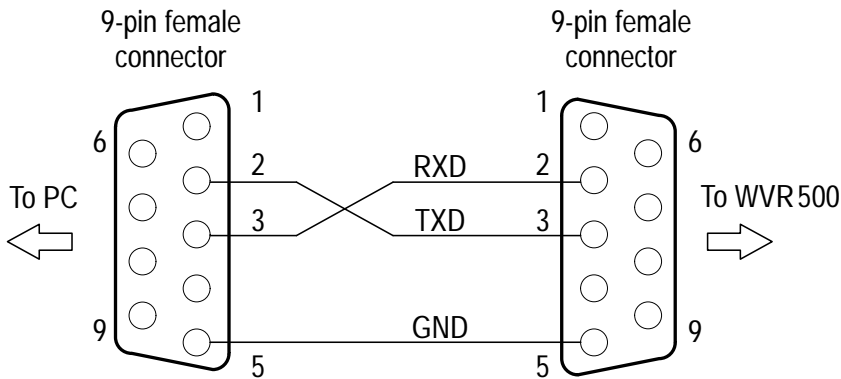
Figure B–2: Remote cable hookup for 9-pin PC connector
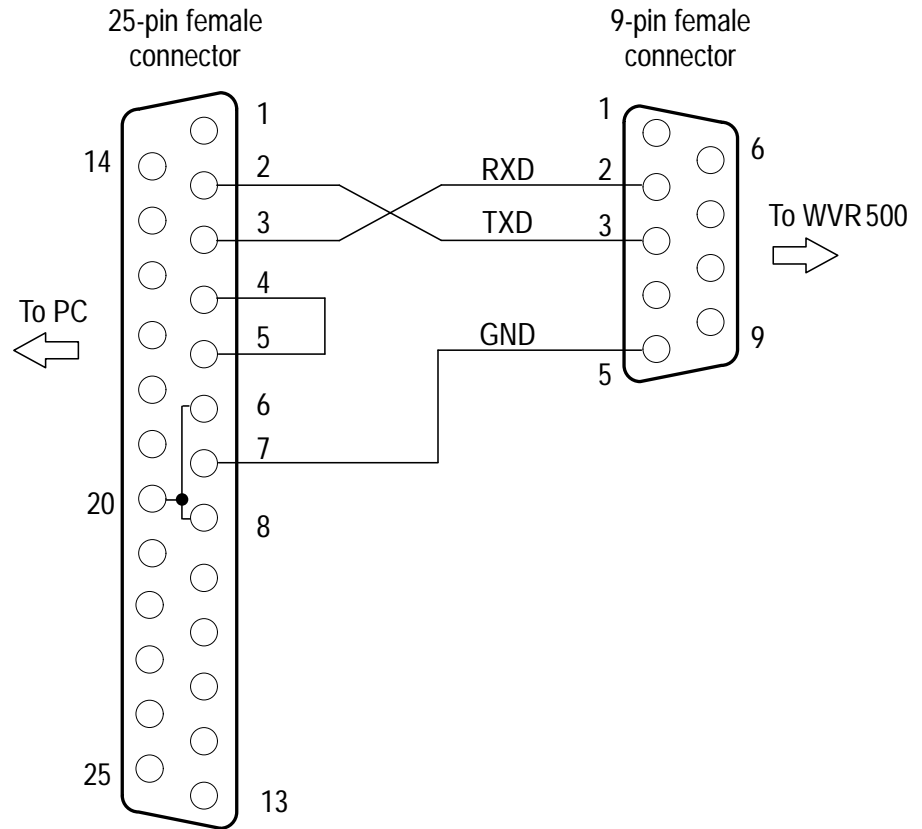
Figure B–3: Remote cable hookup for 25-pin PC connector

B–3

Terminal or PC

To communicate to the WVR 500 monitor, a "dumb" terminal, or a PC with a terminal emulation program is required. The communication parameters required by the WVR 500 monitor are as follows:

- Terminal emulation: ANSI

- Commands: ANSI 8 bit, 1 stop bit

- Operational mode: full duplex

- Data rate: 9600 baud

- Data type: asynchronous

- Parity: no

Key Sequences for ANSI Arrow Key Emulation

Some terminals may not have arrow keys which emit the ANSI escape sequence that is required to be able to make remote instrument adjustments. The key sequences listed below emulate the arrow key functions.

<ESC> [A   Up arrow key.

<ESC> [B   Down arrow key.

<ESC> [C   Right arrow key.

<ESC> [D   Left arrow key.

The phrase <ESC> refers to the terminal Escape key. For most terminals, typing

<CTRL> [

is the same as pressing the <ESC> key.

The letter portion of the key sequences can be entered in either uppercase or lowercase.

Remote Commands

The WVR 500 monitor is controlled through the remote interface by commands sent from the terminal or PC. Commands are sent by typing the command on the terminal and pressing the <RETURN> or <ENTER> key.

Command Syntax

The WVR 500 monitor has been programmed to respond to a specific set of defined commands. The commands are case sensitive and must be entered using lowercase characters.

Most commands are entered in the form of:

function [argument]

With a few exceptions, the *function* portion of the command mimics the name of the associated front-panel control. The *argument* portion of the command line resembles the selections available with the control.

For example, the command

filter flat

sets the instrument Filter setting to Flat.

When only the *function* portion of the command is entered, the instrument will respond by displaying a list of the available arguments.

Command Abbreviations. The WVR 500 monitor will respond to abbreviated commands when enough of a command has been entered to distinguish it from another command. Sometimes the first letter of a command is all that is needed for the instrument to respond.

For example, the command

f f

also sets the instrument Filter setting to Flat.

Main Command Menu

The Main command menu is displayed by typing help. This menu displays the *function* portion of the commands without any of the trailing arguments.

All commands must start with one of the commands listed in the Main command menu that is shown below.

Command	Function
help	Display the Main command menu
waveform	Select Waveform display mode
vector	Select Vector display mode
picture	Select Picture display mode
wvip	Select Waveform-in-Picture display mode
input	Select video input channel
sweep	Set sweep rate
filter	Select filter
reference	Select video reference
gain	Set vertical magnifier on or off
mag	Set horizontal magnifier on or off
line_sel	Set Line Select mode on or off
menu	Operational menu commands
display	Display menu commands
presets	Select/save a preset
configure	Configuration menu commands
calibrate	Calibration menu commands
clear	Clear a menu display
knob	Map GP Knob to terminal arrow keys, show value
vh	Map position controls to terminal arrow keys
?set	State of machine/front panel

Remote Command Definitions

The following commands are listed in alphabetical order with complete syntax. See the *Command Syntax* discussion on Page B–5 for command abbreviation hints.

Command	Definition
calibrate enc_hue	Assign the GP Knob to encoder hue control.
calibrate freq_resp	Assign the GP Knob to frequency response control.
calibrate horiz_1x_reg	Assign the GP Knob to horizontal 1x registration control.
calibrate horiz_5x_reg	Assign the GP Knob to horizontal 5x registration control.
calibrate phase_zero	Set the vector phase to zero.
calibrate quad_phase	Assign the GP Knob to quadrature phase control.
calibrate rast_contrst	Assign the GP Knob to rasterizer contrast control.
calibrate rast_freq	Assign the GP Knob to rasterizer frequency control.
calibrate resid_sc1	Assign the GP Knob to residual subcarrier 1 control.
calibrate resid_sc2	Assign the GP Knob to residual subcarrier 2 control.
calibrate sweep_size	Assign the GP Knob to sweep size control.
calibrate vect_gain_cal	Assign the GP Knob to vector gain control.
calibrate vect_sym_cal	Assign the GP Knob to vector symmetry control.
calibrate vert_1x_base	Assign the GP Knob to vertical 1x base control.
calibrate vert_5x_base	Assign the GP Knob to vertical 5x base control.
calibrate wfm_vert_size	Assign the GP Knob to waveform vertical size control.
clear	Clear the menu from the instrument display.
configure alt_v_off	Turn off the NTSC ALT V mode.

Command	Definition
configure alt_v_on	Turn on the NTSC ALT V mode.
configure clamp_fast	Set the DC Restorer clamp speed to fast.
configure clamp_off	Turn off the DC Restorer clamp.
configure clamp_on	Turn on the DC Restorer clamp.
configure clamp_slow	Set the DC Restorer clamp speed to slow.
configure grat_off	Turn off the measurement graticules.
configure grat_on	Turn on the measurement graticules.
configure ntsc	Select NTSC measurement standard.
configure pal	Select PAL measurement standard.
configure plus_v_off	Turn off the PAL PLUS V mode.
configure plus_v_on	Turn on the PAL PLUS V mode.
configure rdout_off	Turn off the readout display.
configure rdout_on	Turn on the readout display.
configure setup_off	Turn off the NTSC setup.
configure setup_on	Turn on the NTSC setup.
configure sync_msg_off	Turn off the Bad/Missing Sync messages.
configure sync_msg_on	Turn on the Bad/Missing Sync messages.
configure wide_screen_off	Turn off the wide screen mode.
configure wide_screen_on	Turn on the wide screen mode.
configure 75%_bars	Set the vector gain for 75% color bars.
configure 100%_bars	Set the vector gain for 100% color bars.
display alarm_color	Assign the GP Knob to Amplitude Alarm display color control.
display alarm_hue	Assign the GP Knob to Amplitude Alarm display hue control.
display alarm_intensity	Assign the GP Knob to Amplitude Alarm display intensity control.

Command	Definition
display background	Assign the GP Knob to background intensity control.
display both_pip	Set the Waveform-in-Picture display mode to display both the waveform and vector displays.
display color	Assign the GP Knob to trace color control.
display grat_color	Assign the GP Knob to graticule color control.
display grat_hue	Assign the GP Knob to graticule hue control.
display grat_intensity	Assign the GP Knob to graticule intensity control.
display hue	Assign the GP Knob to trace hue control.
display intensity	Assign the GP Knob to trace intensity control.
display lower_position	Display the windows for the Waveform-in-Picture display mode in the lower position.
display transp_off	Turn off transparency for the Waveform-in-Picture and Picture display modes.
display transp_on	Turn on transparency for the Waveform-in-Picture and Picture display modes.
display upper_position	Display the windows for the Waveform-in-Picture display mode in the upper position.
display vect_pip	Set the Waveform-in-Picture display mode to display only the vector display.
display wfm_pip	Set the Waveform-in-Picture display mode to display only the waveform display.
filter flat	Select flat filter.
filter luma	Select luminance filter.
filter parade	Select parade filter.
gain normal	Select normal vertical gain.
gain 5x	Select 5x vertical gain.
help	Display the main remote command menu.
input a	Select channel A for input.

Command	Definition
input b	Select channel B for input.
knob	Map the current GP Knob function to the terminal arrow keys. The instrument will respond back with the current GP Knob function and numerical value. Entering the command *knob [number]*, will assign the entered number to be the new knob value.
line_sel off	Turn off Line Select mode.
line_sel on	Turn on Line Select mode.
mag normal	Select normal horizontal sweep.
mag 10x	Turn on the horizontal magnifier.
menu action_off	Turn off the NTSC Safe Action area outline.
menu action_on	Turn on the NTSC Safe Action area outline.
menu alarm_off	Turn off the waveform Amplitude Alarm mode.
menu alarm_on	Turn on the waveform Amplitude Alarm mode.
menu all_fields	Set the Line Select mode to display all fields.
menu area_off	Turn off the PAL Safe Area outline.
menu area_on	Turn on the PAL Safe Area outline.
menu both_pip	Set the Waveform-in-Picture display mode to display both the waveform and vector displays.
menu field_1	Set the Line Select mode to display fields 1 and 3.
menu field_2	Set the Line Select mode to display fields 2 and 4.
menu line_num_adj	Assign the GP Knob to line number selection control for the Line Select mode.
menu lower_position	Display the windows for the Waveform-in-Picture display mode in the lower position.
menu menu_left	Set the menus to the left side of the display.
menu menu_right	Set the menus to the right side of the display.
menu phase	Assign the GP Knob to vector phase control.
menu rdout_off	Turn off the readout display.

Command	Definition
menu rdout_on	Turn on the readout display.
menu title_off	Turn off the NTSC Safe Title area outline.
menu title_on	Turn on the NTSC Safe Title area outline.
menu transp_off	Turn off transparency for the Waveform-in-Picture and Picture display modes.
menu transp_on	Turn on transparency for the Waveform-in-Picture and Picture display modes.
menu update_fast	Set the Line Select mode update speed to fast.
menu update_slow	Set the Line Select mode update speed to slow.
menu upper_position	Display the windows for the Waveform-in-Picture display mode in the upper position.
menu var_off	Turn off variable gain for the currently selected display mode (Waveform or Vector).
menu var_on	Turn on variable gain for the currently selected display mode (Waveform or Vector).
menu vect_pip	Set the Waveform-in-Picture display mode to display only the vector display.
menu vect_var_on	Turn on vector variable gain for the Waveform-in-Picture and Vector display modes.
menu vect_var_off	Turn off vector variable gain for the Waveform-in-Picture and Vector display modes.
menu wfm_pip	Set the Waveform-in-Picture display mode to display only the waveform display.
menu wfm_var_on	Turn on waveform variable gain for the Waveform-in-Picture and Waveform display modes.
menu wfm_var_off	Turn off waveform variable gain for the Waveform-in-Picture and Waveform display modes.
picture	Select Picture display mode.
presets default	Reset the four presets to the factory settings.

Command	Definition
presets init_cals	Reset the instrument calibration values to the factory precalibration default settings. *Note: The instrument will only respond to this command when the calibration jumper (A2J27) has been installed.*
presets recall_1	Recall the instrument and menu settings stored in memory location 1.
presets recall_2	Recall the instrument and menu settings stored in memory location 2.
presets recall_3	Recall the instrument and menu settings stored in memory location 3.
presets recall_4	Recall the instrument and menu settings stored in memory location 4.
presets store_1	Store the current instrument and menu settings in memory location 1.
presets store_2	Store the current instrument and menu settings in memory location 2.
presets store_3	Store the current instrument and menu settings in memory location 3.
presets store_4	Store the current instrument and menu settings in memory location 4.
reference external	Select external video reference.
reference internal	Select internal video reference.
sweep 1l	Select 1 Line sweep.
sweep 2l	Select 2 Line sweep.
sweep 2f	Select 2 Field sweep.
vector	Select Vector display mode.
vh	Assign vertical and horizontal position control to the terminal arrow keys.
waveform	Select Waveform display mode.
wvip	Select Waveform-in-Picture display mode.

Command	Definition
?set	Display the current front-panel settings.
?set calibr	Display the current calibration values.
?set config	Display the current Configure menu settings.
?set gain	Display the current vertical magnifier setting.
?set filter	Display the current waveform filter selection.
?set input	Display the current input channel selection.
?set line_sel	Display the current Line Select mode settings.
?set mag	Display the current horizontal magnifier setting.
?set menu	Display the current Operational menu settings.
?set wvip	Display the current display settings for the Waveform-in-Picture display mode.
?set reference	Display the current signal reference setting.
?set sweep	Display the current sweep rate.
?set ?set	Display the instrument settings that can be checked by the *?set* command.

Appendix C: User Service

This section contains instructions for user and preventive maintenance as well as a list of available instrument options. If the instrument does not function properly, it should be referred to qualified service personnel or returned to Tektronix for service. Instructions for repackaging the instrument for shipment are provided on page 1–5.

Do Not Service Alone. Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect Power. To avoid electric shock, disconnect the mains power by means of the power cord or, if provided, the power switch.

Operational Jumpers

The only operational modifications made to this monitor through internal jumper settings are input coupling and the enabling of the Calibration mode.

Perform the following procedure to change the position of the operational jumpers.

⚠️ *WARNING. Dangerous line-potential voltage will be present when mains AC power is supplied to the instrument. Remove the power cord from the instrument before performing this procedure.*

1. Remove the power cord from the instrument.

2. Remove the instrument top cover. See Figure C–1.
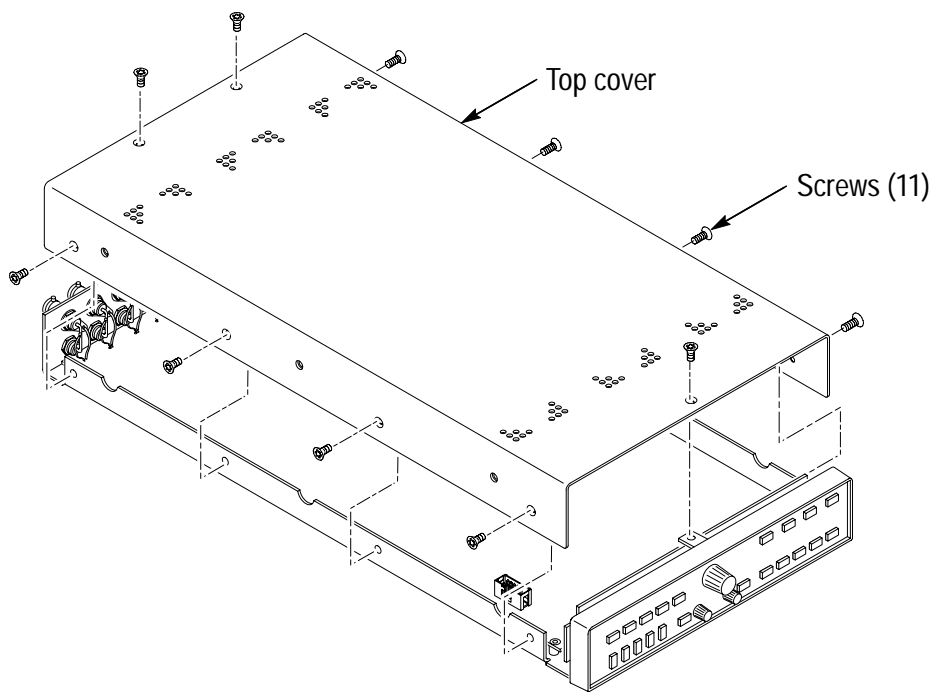
Figure C–1: Removing the top cover

NOTE. Do not change the position of the jumpers listed in Table C–1 that are for factory use only.

3. Move the operational jumpers listed in Table C–1 to the position you require for your application. Figure C–2 shows the location of the jumpers on the Main board.

4. Replace the instrument top cover.

Table C–1: Internal operational jumper selections

Jumper number	Name	Function
A2J1	CH A Input Coupling	1-2 DC coupled 2-3 AC coupled (factory preset)
A2J2	CH B Input Coupling	1-2 DC coupled 2-3 AC coupled (factory preset)
A2J27	Cal Mode Enable	Installed: Calibration mode (jumper is installed on both pins) Not installed: Normal operation (jumper is installed on one pin only)
A2J17, A2J18 A2J19, A2J20 A2J100	Factory Use Only	1-2 Factory use only 2-3 Operating Position
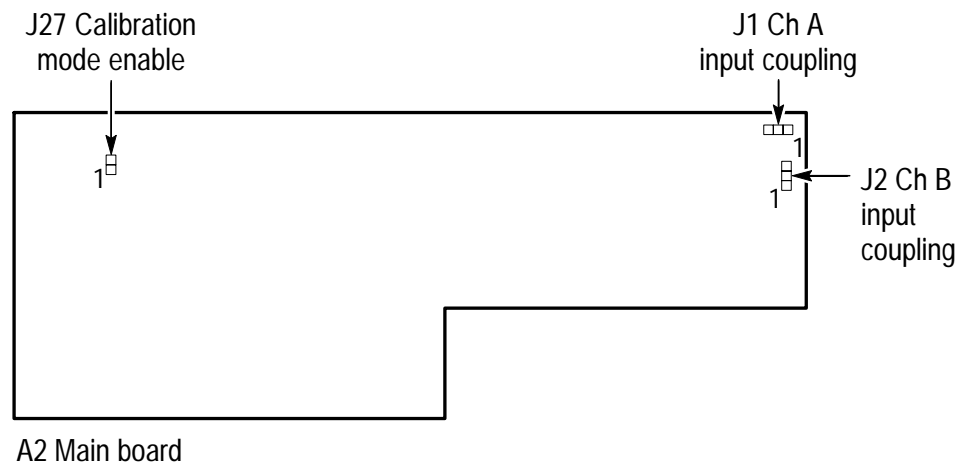
Figure C–2: Operational jumper locations

Cleaning

The instrument should be cleaned often enough to prevent dust and dirt from accumulating. Dirt acts as a thermal insulator, preventing effective heat dissipation, and can also provide high-resistance electrical leakage paths between conductors or components in a humid environment.

⚠️ *CAUTION. Do not allow water to get inside any enclosed assembly or component. Do not clean any plastic materials with benzene, toluene, xylene, acetone, or similar compounds, because they may damage the plastic.*

Exterior

Clean the dust from the outside of the instrument with a soft, clean cloth or small brush. A brush is especially useful for removing dust from around the selector buttons, knobs, and connectors. Hardened dirt can be removed using a soft cloth dampened with a mild detergent and water solution. Abrasive cleaners should not be used.

Interior

Interior cleaning and maintenance should be performed by qualified service personnel only. Instructions for interior maintenance are provided in the WVR500 Service Manual.

⚠️ *CAUTION. A 2% RMA flux content solder is recommended for making repairs in this instrument. Cleaning of rosin residue is not recommended. Most cleaning solvents tend to reactivate the rosin and spread it under components where it may cause corrosion under humid conditions. The rosin residue, if left alone, does not exhibit these corrosive properties.*

Instrument Options

Options available for the WVR 500 are limited to power cord selections.

Power Cords

Any of the following power cord options can be ordered for the WVR 500 monitor. If no power cord option is specified, instruments are shipped with a North American 125 V power cord.

Unless otherwise specified, power cords for use in North America are UL listed and CSA certified. Cords for use in areas other than North America are approved by at least one test house acceptable in the country to which the product is shipped.

Option A1. Power, Universal Europe, 220 V/16 A (Locking Power Cord)

Option A2. Power, United Kingdom, 240 V/15 A (Power Cord)

Option A3. Power, Australia, 240 V/10 A (Power Cord)

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