WVR6020, WVR7020, WVR7120, WVR6100 Opt. MB, WVR7000 Opt. MB, and WVR7100 Opt. MB Waveform Rasterizers

Technical Reference

Tektronix

WVR6020, WVR7020, WVR7120, WVR6100 Opt. MB, WVR7000 Opt. MB, and WVR7100 Opt. MB Waveform Rasterizers

Technical Reference

Tektronix

Contacting Tektronix

Warranty

Tektronix warrants that this product will be free from defects in materials and workmanship for a period of one (1) year 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. Parts, modules and replacement products used by Tektronix for warranty work may be new or reconditioned to like new performance. All replaced parts, modules and products become the property of Tektronix.

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.

THIS WARRANTY IS GIVEN BY TEKTRONIX WITH RESPECT TO THE PRODUCT IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED. TEKTRONIX AND ITS VENDORS DISCLAIM ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. TEKTRONIX' RESPONSIBILITY TO REPAIR OR REPLACE DEFECTIVE PRODUCTS IS THE SOLE AND EXCLUSIVE REMEDY PROVIDED TO THE CUSTOMER FOR BREACH OF THIS WARRANTY. TEKTRONIX AND ITS VENDORS WILL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IRRESPECTIVE OF WHETHER TEKTRONIX OR THE VENDOR HAS ADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

[W2 – 15AUG04]

Table of Contents

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. Connect the probe output to the measurement instrument before connecting the probe to the circuit under test. Connect the probe reference lead to the circuit under test before connecting the probe input. Disconnect the probe input and the probe reference lead from the circuit under test before disconnecting the probe from the measurement instrument.

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.

Power Disconnect. The power cord disconnects the product from the power source. Do not block the power cord; it must remain accessible to the user at all times.

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

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

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

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

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.

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.*

Symbols and 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.

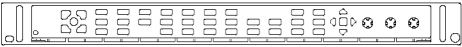The following symbol(s) may appear on the product:
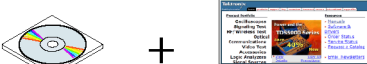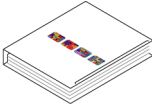
⚠️ CAUTION
Refer to Manual

⏚ Protective Ground
(Earth) Terminal

Preface

This manual contains supplemental user information for the following instruments:

- WVR6020

- WVR7020

- WVR7120

- WVR6100 with Option MB

- WVR7000 with Option MB

- WVR7100 with Option MB

Where to Find More Information

| Item	Purpose	Location
Quick Start User Manual	Installation and high-level overview of instrument operation	WWW.Tektronix.com
Online Help	In-depth instrument operation and UI help	
Specifications and Performance Verification	Specifications and procedure for checking instrument performance	WWW.Tektronix.com
WFM, WVR, and AMM Series Management Information Base (MIB)	SNMP command reference for remotely controlling the instrument	WWW.Tektronix.com
Service Manual	Optional manual supporting module-level servicing of the instrument	

Conventions Used in this Manual

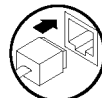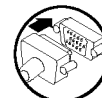The following icons are used throughout this manual:

| Sequence Step	Connect power	Network	XGA
1			
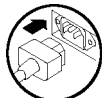
Incoming Inspection

The incoming inspection procedures are optional procedures that check the functionality of the instrument and require no equipment other than a display. For a more robust inspection, see the performance verification procedures in the *Specifications and Performance Verification* manual that is included on the *User Documentation CD* that was shipped with your instrument.

Basic Turn On and Self Test

1. Connect an XGA monitor to the instrument.

2. Connect the AC power cord to the rear of the instrument and to a 100 to 240 VAC source. There is no power switch on your instrument: it will turn on as soon as you apply power.

Monitor / Waveform Resterizer (rear panel) / 2236-022
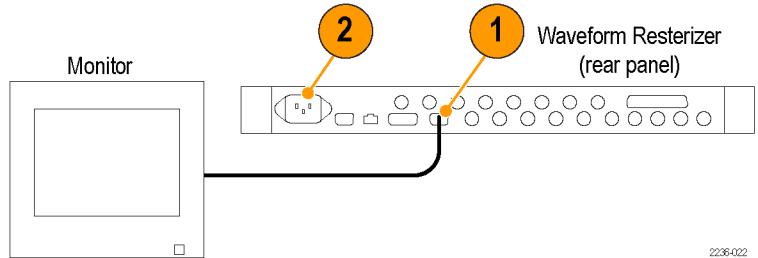
3. Look at the front panel immediately after you apply power. All of the buttons, the text over the three knobs, and the Fault indicator should light up.

Text lights / Fault indicator light / 2236-005
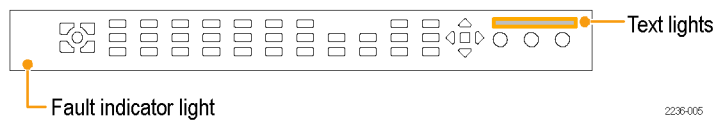
NOTE. After a couple of seconds, the lights in the buttons and text will turn off. After about 15 seconds, the fault light should turn off and the Power On diagnostic page should appear on the monitor.

4. Verify that the instrument passes all self tests. Any failures will be shown in Red. The results of the Power On diagnostics are erased from the screen, but you can view them by selecting **CONFIG** > **Utilities** > **View Diagnostic Log**.

5. After the diagnostics are finished, the instrument state will be restored. When the progress indicator in the lower-right part of the screen is finished, the instrument has finished initializing.

Pass	DSP 2 Composite Check	Pass 1 of 1
Pass	Cmpst DAC Comm	Pass 1 of 1
Pass	Timecode Decoder comm	Pass
Pass	SDI Deserializer Comm	Pass 1 of 1
Pass	SDI CPLD Comm	Pass 1 of 1
Pass	DSP FPGA B Comm	Pass 1 of 1

Front Panel Test

1. Press **FACTORY** to restore the factory preset. Wait for the progress indicator to show the process is complete.

2. Press **FULL** to make the active tile be full screen.

3. Press **HELP** to display the help screen.

4. Press all the other buttons.

   Each button should flash as you press it. Most buttons bring up related help text. Some buttons, such as the presets, bring up the same information. The **HELP** button, the four arrow keys, and the **SEL** button do not bring up help text because they traverse the help panes and content.

5. Press the right arrow key until the Help Contents pane in the upper-left corner is highlighted.

6. Turn the **GENERAL** knob and verify that the selector box moves up and down the list.

7. Press **HELP** to exit help.

DISPLAY SELECT

2236-006

2236-007

Help Contents

Configuring the WVR610A/WVR611A
Using Presets
Using Alarms

Help Index

1–4 (DISPLAY SELECT)
1–5 (PRESETS)
1X (GAIN)
5X (GAIN)

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2236-008
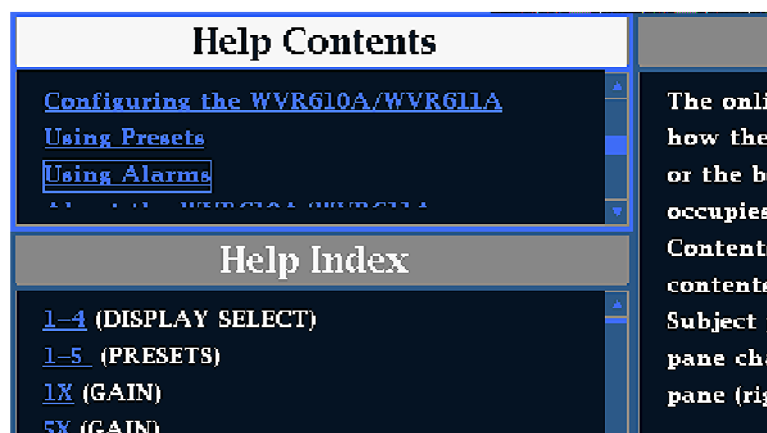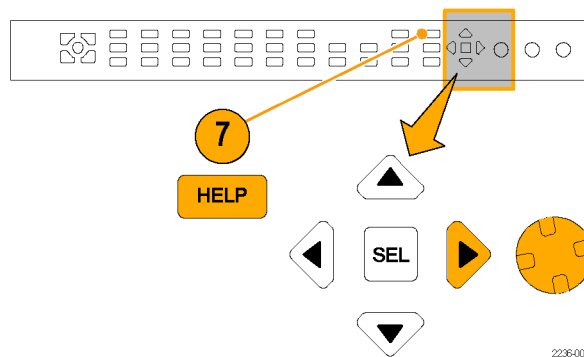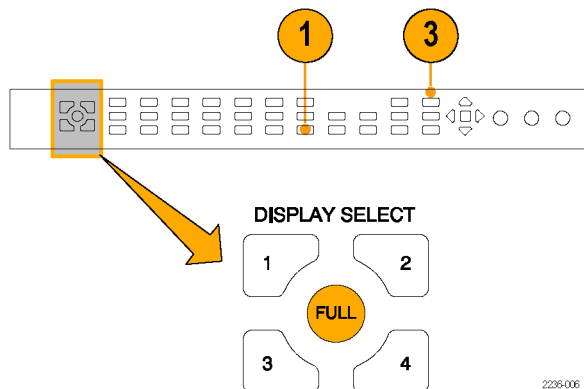
XGA and Extended Diagnostics Test

NOTE. Where the following procedure says to press an arrow key, you can use the general knob on the front panel, if you prefer.

1. Press the **CONFIG** button to display the configuration menu.

2. Select **Utilities** and then press **SEL**.
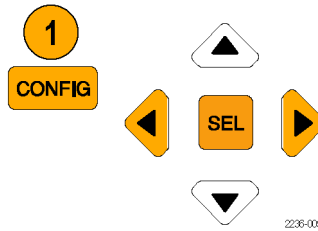
3. Select **CPU Color Palette Check** and verify that 16 distinct colors are displayed. This tests the XGA data path from the CPU.
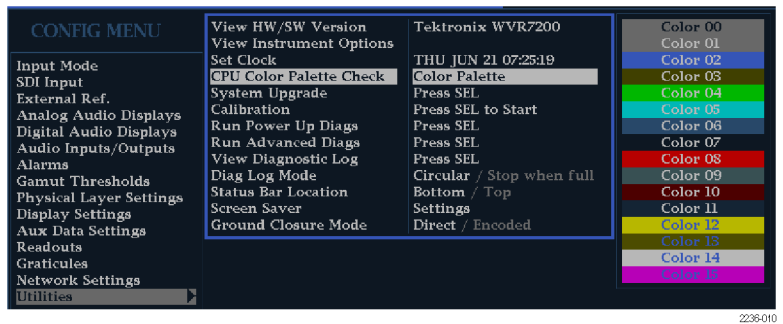
4. Use the down arrow key to navigate to **Run Advanced Diagnostics** and then press **SEL**.
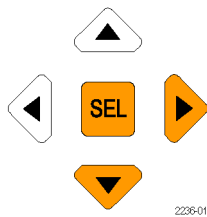
5. When the dialog box appears, use the right arrow key to highlight the **Continue** box and then press **SEL** to run the test.

6. Verify that the XGA DAC is working by looking at the White and Red ramps at the top of the screen, and at the Green and Blue ramps at the bottom of the screen. They should not have steps but should show a smooth transition from dark to light.

7. Verify that the frequencies shown are within 10 kHz, and that rates shown are within 0.1 µs, of the nominal values listed to the right.

8. Verify that the bus bit activity tests (labeled Channel A:, Processor Video:, and Composite Video:, and appearing at the bottom of the screen) are as follows:

    ■ All three tests show both a red and a green bar in each bit location.

    ■ The Processors Video test shows 8 bits from the CPU, a space, then Hsync, a space, Vsync, a space, and then the blank line. It is normal for the Vsync bit to blink occasionally.

9. Press **SEL** or cycle the power to reboot the unit for normal operation.

QDR Clock = 25.174 MHz

VGA clock = 64.480 MHz

Audio PLL1 = 12.288 MHz

Audio PLL2 = 12.288 MHz

Hsync rate : Width = 0.9 µs

Vsync PW: Width = 62.5 µs

Fan Test

If the fault light in the lower left corner of the front panel is not on (Red), the fans are running. You should also be able to hear them and feel air coming out the back of the instrument. At low temperatures, the fans will turn slowly and be very quiet.

Installation Variations

See the *Quick Start User Manual* that was shipped with your instrument for basic installation instructions. Read the following information for other installation situations and for remote communication instructions, an optional procedure that is suitable for incoming inspection of this product.

Connecting Directly to a PC

The following procedure will help you connect your instrument to a PC:

1. Connect the instrument to a PC through an ethernet hub, as shown. A standard crossover cable can be substituted for the hub.

2. Set up the instrument as described in the following procedures (See page 6, *Connecting to a Network.*), choosing Manual IP mode to set the IP address manually. Be sure to set an address that is compatible with the setting of your PC.

3. If you are using an SNMP setup, use the SNMP setup procedure.
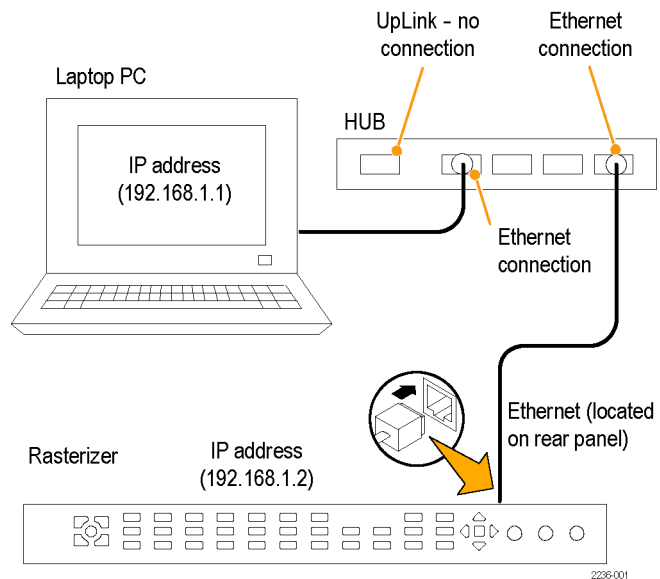
Connecting to a Network

The following topics cover configuring the IP settings, so that you can use your instrument over a network, and configuring SNMP, which is required if you are using commands to control the instrument.

Connection and IP Settings

To allow network access to the instrument, you need to set the IP address. Network addresses can be assigned either automatically or manually. If your network does not use DHCP, you will have to manually enter the address for the instrument. To get an address, talk to your LAN administrator.

To connect your instrument to a network and access it with a remote PC, do the following:

NOTE. To connect directly between your PC and the instrument, see Connecting Directly to a PC.
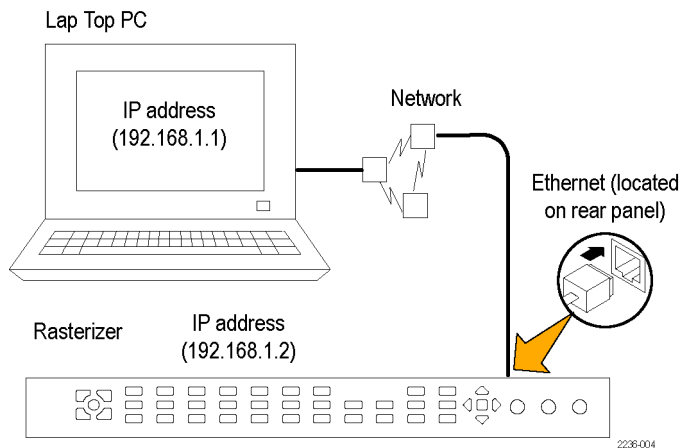
Lap Top PC

IP address
(192.168.1.1)

Network

Ethernet (located on rear panel)

Rasterizer
IP address
(192.168.1.2)

2236-004

1. Press **CONFIG** to display the Configuration menu.

2. Select **Network Settings** > **Web Enable**. Press **SEL** to select **On**.

1   6

CONFIG   SEL

2236-002
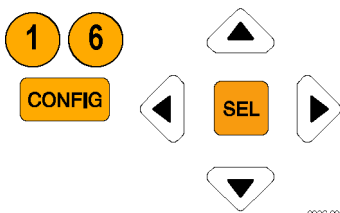
3. Set the IP Config Mode to Manual or DHCP, depending on your network setup.

4. If you cannot use DHCP, set the subnet mask and gateway address network parameters in this menu; see your LAN administrator for required values. (Be sure to use compatible addresses between the PC and the instrument.) You can also set the instrument name and view the MAC Address.

5. If the password is set, note it. You will be prompted for it when you connect to the instrument.
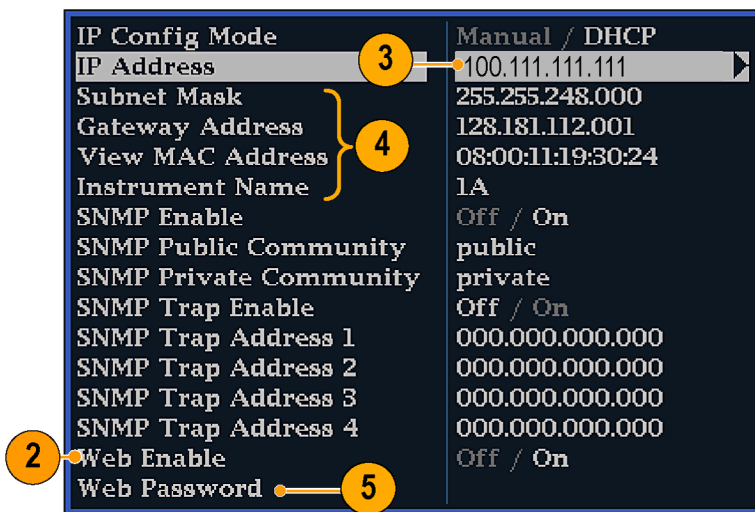
NOTE. *For help with entering or changing the password, select Web Password, and press the HELP button.*

6. Press **CONFIG** to close the Configuration menu.

IP Config Mode	Manual / DHCP
IP Address	100.111.111.111
Subnet Mask	255.255.248.000
Gateway Address	128.181.112.001
View MAC Address	08:00:11:19:30:24
Instrument Name	1A
SNMP Enable	Off / On
SNMP Public Community	public
SNMP Private Community	private
SNMP Trap Enable	Off / On
SNMP Trap Address 1	000.000.000.000
SNMP Trap Address 2	000.000.000.000
SNMP Trap Address 3	000.000.000.000
SNMP Trap Address 4	000.000.000.000
Web Enable	Off / On
Web Password	

2236-003

SNMP Setup

If you intend to use SNMP commands to control the instrument (SNMP control is primarily intended for access through automation systems), you need to set up SNMP parameters.

NOTE. The WFM, WVR, and AMM Series Waveform Monitors wfm_mon.mib and the WVR7120.mib can be downloaded from the instrument Web page.

The procedure to set SNMP settings is similar to that shown on page 2 for IP settings; the parameters that can be set follow:

SNMP Enable	This entry in the Network Settings portion of the Configuration menu allows you to turn on or off the remote access through SNMP.
SNMP Trap Enable	This menu entry allows you to turn on or off the traps that are sent out through SNMP.
SNMP Trap Address	This menu entry allows you to set IP addresses to which SNMP traps are sent through SNMP. Traps can be sent to up to four addresses when error conditions are detected.
	NOTE. A value of all zeroes for the address will disable that trap output.
Private Community String	This menu entry allows you to set the Private Community string. This string is effectively a password. Without this string, SNMP commands cannot change values in the instrument.
	NOTE. The Private String is necessary for SNMP access to write changes into the instrument.
Public Community String	This menu entry allows you to set the Public Community string. This string is effectively a password. Without this string, SNMP commands cannot read values from the instrument.
	NOTE. The Public String is necessary for SNMP access to read values from the instrument.

Remote Communication

The following topics cover remote communications that occur:

- Over an Ethernet network through a Web browser

- Over an Ethernet network through a Java applet

- Over a cable using the optional remote front panel

Using a Web Browser

You can use a Web browser to access the instrument and save screen captures, download presets, and download the error log. Your instrument does need to be connected to an IP network via Ethernet. You will need to set the IP Config Mode, IP Address, Subnet Mask, and possibly the Gateway Address, to meet your network configuration requirements.

To connect to the instrument using a Web browser, do the following:

1. Press **CONFIG** to display the Configuration menu.

2. Select **Network Settings** > **Web Enable**. Press **SEL** to select **On**.
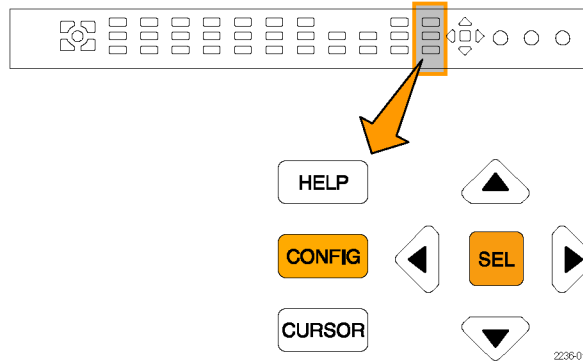
3. Set the IP Config Mode to Manual or DHCP, depending in your network setup.

4. Note the IP Address for use in step 6.

NOTE. You may have to set other network parameters in this menu; see your LAN administrator if required.

5. Press **CONFIG** to close the Configuration menu.
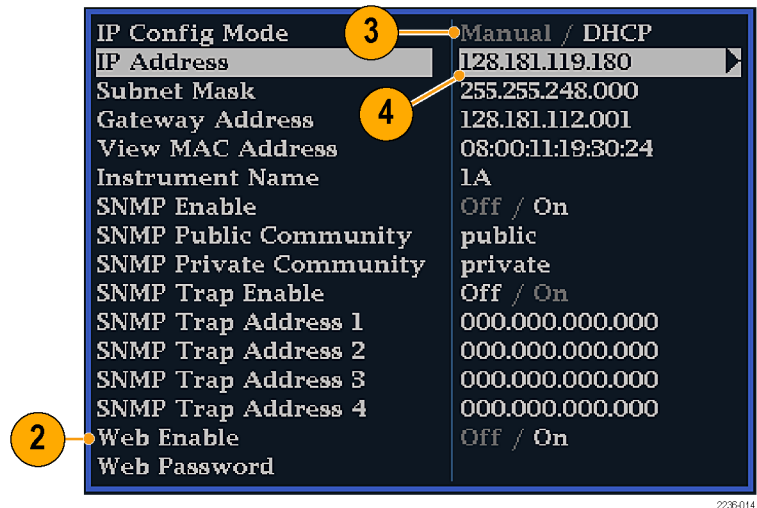
6. Start your Web browser and type the network address of the instrument (from step 4) into the URL entry box like this: [1]

    `http://123.123.123.123/`

---
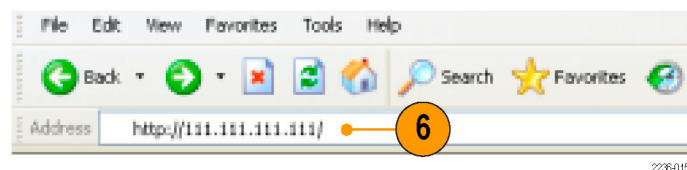
[1] **Many Web browsers do not correctly interpret IP addresses with leading zeros. If the IP address shown in the Configuration menu contains leading zeros as in 124.161.038.151, remove the "0" when entering it into the address line of the browser. For example, 124.161.038.151 should be entered as 124.161.38.151.**

Click on the indicated items to:

1. Start the Java applet (see next procedure).

2. Display a list of Web clients (by network address) currently logged into the instrument.

3. Display a list of the options with which this instrument is equipped.

4. Display instrument online help.

5. Capture the full or status bar displays in BMP or PNG formats. Retrieves the capture for saving to a file.

6. Download and display the Error Log as tab-delimited text or an HTML table.

7. Download and display the Diagnostic Log or Summary as tab-delimited text or an HTML table.

8. Download instrument settings to a file in binary format.

9. Download Preset <N> to a file in binary format, where <N> is any number from 1 to 5.

10. Download each of the MIB files in ASCII format.
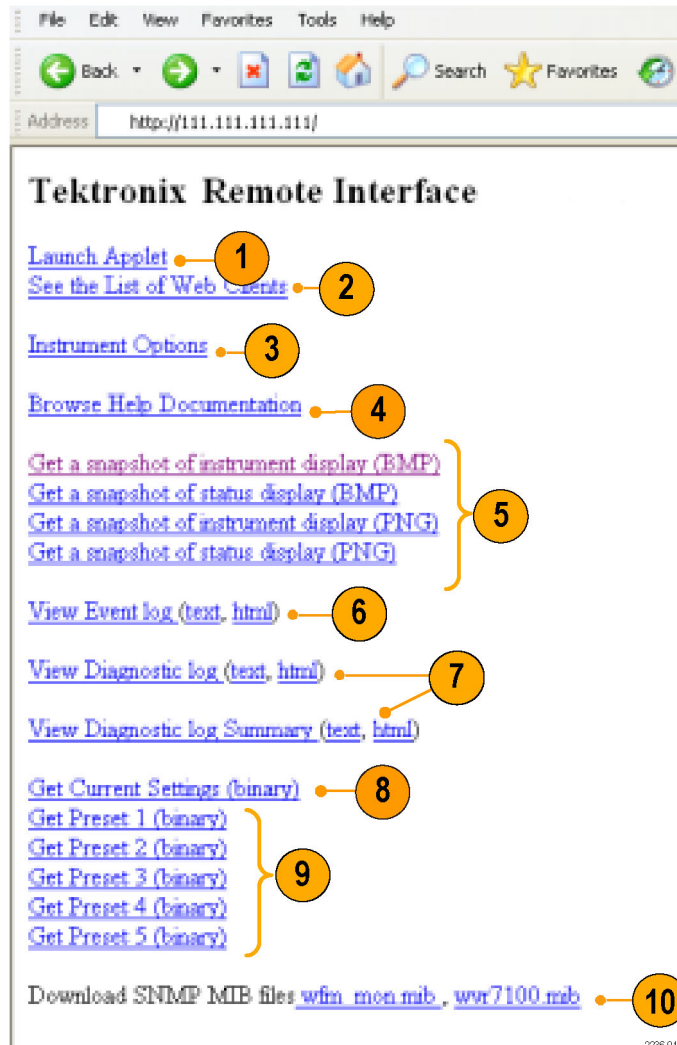
Using the Java Applet

To further extend your control from a remote PC, launch the Java applet from the Web browser to change the instrument settings, display and refresh the instrument screen, save screen captures, download and upload presets, and download the error log. The Java applet provides a menu bar and a virtual front panel that gives you complete remote control over instrument settings.

Note that the Web interface operation is optimized for screen resolutions of 1024 x 768 or higher. Operation on computers with lower resolution requires scroll-bar use to see the entire interface.

Java Applet Requirements

If you install Java on your PC, you can launch a Java applet to control the instrument. The Java Applet requires:

■ Version 1.4.1 (or later) of the Java Run-Time Environment (JRE) from Sun Microsystems installed on your PC. To download the JRE (Java Run-Time Environment) plug-in from Sun Microsystems, download the appropriate code from the Sun Microsystems URL:*http://java.sun.com*

 Once you download the executable file, launch the installation software and follow the instructions.

■ Microsoft Internet Explorer 5.0 or later running on a Windows PC

■ Netscape on Apple Linux or on UNIX machines

NOTE. If you need remote operation on other platforms, use the Java Application, which is a stand-alone application that provides all of the features of the Java applet. The Java Application can be run on any platform that supports Java version 1.4.1 or later, including Windows NT/2000/XP, Linux, Unix, and Mac OS X. The Java application, unlike the Java applet, does not run within a Web browser and, thus, is not subject to the various browser limitations. You can download the Java application package from the Tektronix Web site. Look for WVR Remote Software Package in the download section of the Video Test Product pages.

The Java Application can be used to download instrument presets to a remote file and upload from the remote file to the instrument.


Launching the Applet

When you launch the Java applet, it is downloaded from the instrument and launched. There is no software installation required to use the applet (other than the Java Run-Time Environment noted previously). The instrument supports up to three remote clients (screen updates become slower with each client added).

1. Launch the Web browser as described under *Using a Web Browser*.

2. Once the Remote Interface appears, select **Launch Applet** and the Java applet will be launched.
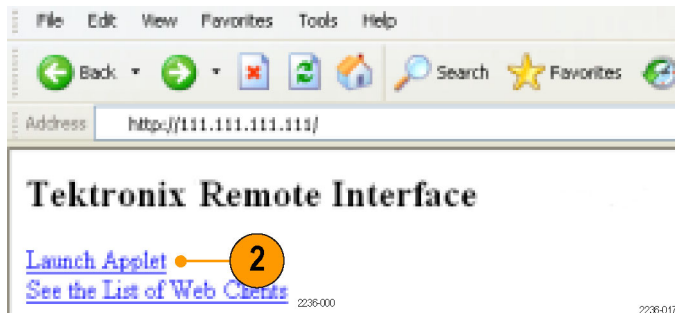
3. Use the menu bar of the Java applet window to quickly access functions that are not available from the front panel. Also, access the Configuration menu by using these menus rather than a front panel button.

4. For front panel functions, click the virtual front panel controls to remotely press most instrument front panel controls.

5. Read the status bar the same way as you would when it is displayed directly from the instrument display. (See *Determining Status At-A-Glance* in the *WVR6020, WVR7020, and WVR7120 Quick Start User Manual*.)
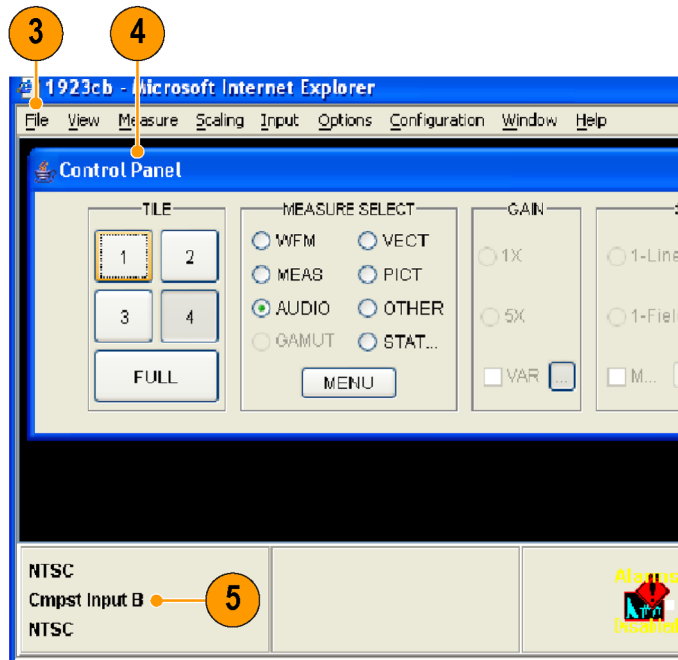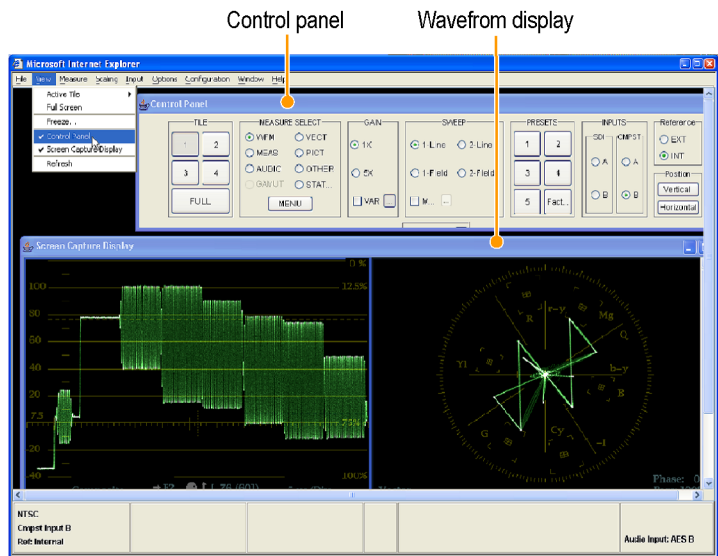

Selecting Displays

1. To turn the display of the virtual front panel on or off, click **View** > **Control Panel**.

2. To turn the display of the Waveform Display Window on or off, click **View** > **Waveform Display**.

NOTE. The displays can be turned on or off independently of each other. Here they are both displayed in the applet window.

Control panel   Wavefrom display

3. To change the refresh rates (defaults are every 10 seconds), do the following:

- Select Options>Settings.

- Adjust the refresh rates to the desired periods in the **Settings** pop up.

- Click **OK** to save the new rates.

NOTE. You can also display the instrument online help from the Java Applet. Select Help > Help... to open online help in a new browser window.
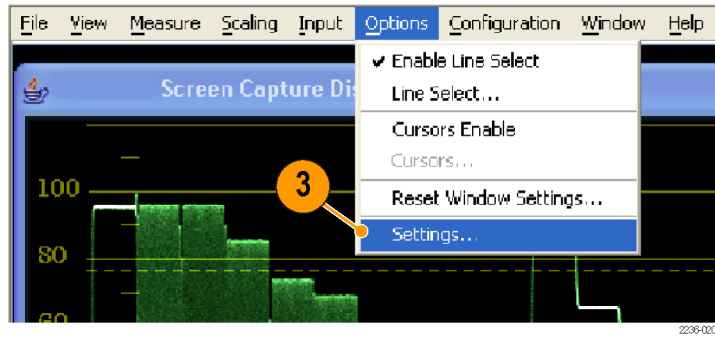
Operating Notes

1. When adjusting variable settings, such as vertical and horizontal position or gain, the Remote Interface displays a small window with a slider that you use to adjust the value.

   For example, to adjust the vertical position of a waveform, select **Scaling** > **Vertical Position** and adjust as desired.

2. To allow for display of pop-up menus for each MEASURE SELECT button, the Remote Interface provides a menu button; select the measurement for which you want to display the pop-up menu.

3. Click the **MENU** button.

NOTE. You can also resize the virtual control panel by clicking and dragging the edges of the panel.
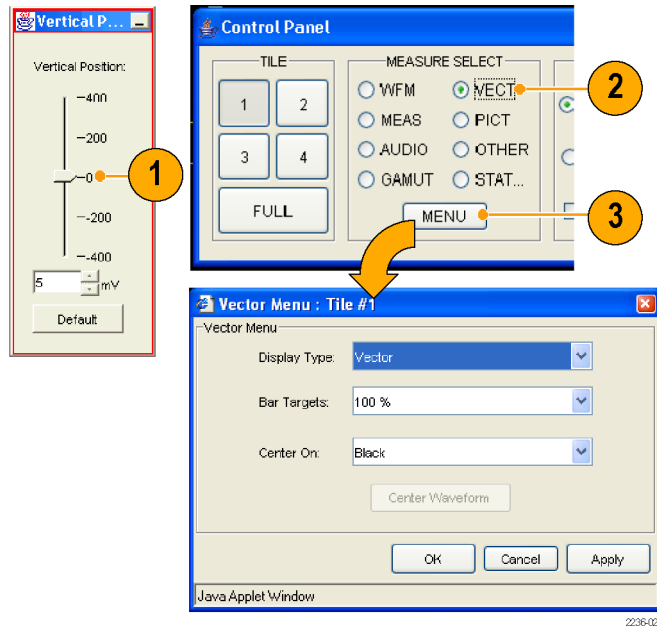
Usage Notes

The Remote Interface Control Panel differs from the instrument front panel in that it provides a menu. The menu provides many controls, some of which duplicate functions that are directly available from the control panel. See the list that follows.

Menu	Commands	Description
File	Restore Settings	Restores instrument-stored setup that you select (one of Preset 1 through Preset 5 or Factory) to the instrument
	Save as Preset	Saves the current instrument settings as setup in the instrument (select any one of Preset 1 through Preset 5)
	Load Presets From File	This selection is disabled in the Java Applet. In the Java Application (see NOTE on page 6), this selection restores the presets (1 through 5) to the instrument from any previously saved presets file that you select
	Save Presets To File	This selection is disabled in the Java Applet. In the Java Application (see NOTE on page 6), this selection saves the instrument presets 1 through 5 in a remote file
	Exit	Closes the Java applet
View	Active Tile	Changes the active tile
	Full Screen	Changes display to Full screen mode
	Freeze	Captures the current image for most of the possible displays in the instrument
	Control Panel	Toggles the display of the control panel window on and off
	Screen Capture Display	Toggles the Waveform Display window on and off
	Refresh	Updates the Waveform Display
Measure	Various control items	Contents of this menu vary with the selection in the instrument control panel (WFM, MEAS, AUDIO, GAMUT, VECT, PICT, OTHER, or STATUS)
Scaling	Vertical Position	Displays a window to enable you to adjust the vertical position
	Horizontal Position	Displays a window to enable you to adjust the horizontal position
	Gain	Enables you to set the Gain to 1X, 5X, or set the variable gain
	Sweep	Enables you to set the sweep mode to One Line, Two Line, One Field, or Two Field
	Mag	Magnifies the Active Tile sweep rate
Input	Inputs and Reference	The settings displayed below **Input** correspond to the controls in the Inputs and Ref groupings on the control panel
Options	Line Select & Cursors commands	These menu entries below **Options** duplicate operation of the Line Select and Cursors controls on the control panel
	Refresh Rate	Specifies how often the Waveform Display should be automatically updated
Configuration	Various controls not available on the front panel	The menu entries below **Configuration** duplicate most of the setups available by display the Configuration menu using the CONFIG button on the instrument front panel
Window	Control Panel	Moves the control panel window to the front if it is covered by the Waveform Display
	Waveform Display	Moves the Waveform Display window to the front if it is covered by the control panel

Menu	Commands	Description
Help	Help	Displays the instrument online help
	About	Displays version information about the Java applet

Using the WVR Remote Front Panel

The WVR Remote Front Panel (RFP) is available to permit remote control of the instrument. The WVR RFP works with the main front panel and connects to the instrument through a cable. This cable may be up to 100 ft. long (a 25 ft. cable ships with the WVR RFP).

■ To configure the WVR RFP, follow the installation instructions that ship with the WVR RFP product.

■ To use the RFP module, use it as you would the integral front panel of an instrument. All operating procedures in this manual and the instrument online help apply to operation from the WVR RFP as well as the integral front panel.

Cable Description. The requirements for cables that can be used with this WVRRFP module follow:

■ Connectors (each end): 9-pin D-SUB, male, with jackscrews

■ Cable: nine conductors, 26 gauge or heavier, shielded

■ Construction: Pins 1-9 of each connector wired to corresponding pins of the alternate connector (connect pin 1 to pin 1, and so on). Shield or drain wire bonded to metal shell at each end.

■ Maximum length: 100 ft

Display Information

This section describes instrument displays and their respective pop-up menus.

NOTE. All pop-up menus are displayed by pressing the specified button for three seconds. To hide a pop-up menu, press the specified button again.

Waveform Display

The WFM button displays the Waveform (WFM) display, which is the voltage versus time display used to view a waveform. You can view the input signal in line or field sweep. You can choose which SDI signal elements are displayed (RGB, YRGB, or YPbPr), and you can apply filters to the signal. You can also display an SDI input as though it were a composite signal. You can also control (in the CONFIG menu) whether EAV, SAV, and ANC data is included in the display.

Waveform Display Elements:

1. Is blank when vertical gain is X1; otherwise indicates that V Gain is x5 or variable.

2. Lists the currently displayed waveform color-space. Dashes (--) indicate components not displayed.

3. Lists the currently selected field and line (when in Line Select mode).

4. Lists the current sweep rate for tile.

5. Lists the Mag rate if MAG is on.
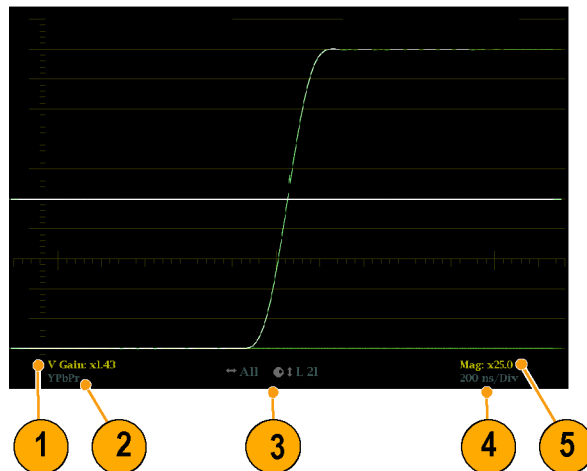
Waveform Pop-up menu and settings

The Waveform pop-up menu enables you to choose the display style and display mode used in the active tile (SDI inputs only), select a filter to apply to the input signal, or center the waveform in the display.

To choose a display mode, select from the following the choices (only available while displaying SDI inputs) in the menu:

- **YPbPr** - Displays the input as Luma (Y) and color difference (Pb, Pr) components.

- **YRGB** - Displays the input as Luma (Y), Red (R), Green (G), and Blue (B) components.

- **RGB** - Displays the input as Red (R), Green (G), and Blue (B) components.

- **SDI** > **Composite** - Displays the SDI input as if it has been encoded into composite. The sync and burst in this mode are synthetic and convey no information about signal quality.

When viewing 525-line SDI input as a composite waveform while using line select mode, both burst phases may appear when you would expect to see only one. This is because the line selection in SDI Mode is an odd/even selection, and composite signals are normally viewed with a one-of-four or one-of-eight line selection.

To choose how the signal components are displayed in the active tile, use the Display Style menu setting (SDI inputs only) to select:

■ **Parade** style - has all the components shown one beside the other.

■ **Overlay** style - has all the components drawn at the same location so that they appear one on top of the other.

The Waveform pop-up menu Filter selection allows you to select filters to be applied to the video. This is useful for isolating a specific characteristic of the input. For example, to measure amplitude, you may want to use a Luma or Low pass filter to remove the high frequency components.

To choose a filter select one of the following filters from the Waveform menu:

■ **Flat** - Display with the full available bandwidth.

■ **Luma** or **Low Pass**- Display only the low-frequency portion of the signal.

■ **Chroma** - Display only the portion of the signal with frequencies near the color sub-carrier. For Composite inputs only.

■ **Flat + Luma** - A combination of a Flat and a Luma waveform from a Composite input; it shows two waveforms in parade configuration.

NOTE. For SDI displays, such as RGB mode, the available filters are Flat and Low Pass. For Composite displays, the available filters are Flat, Luma, Chroma, and Flat+Luma.

To cancel any horizontal or vertical position adjustments and restore the trace to the default position, select **Center Waveform** and press **SEL**. For a tile in WFM mode, this puts the baseline at the zero graticule.
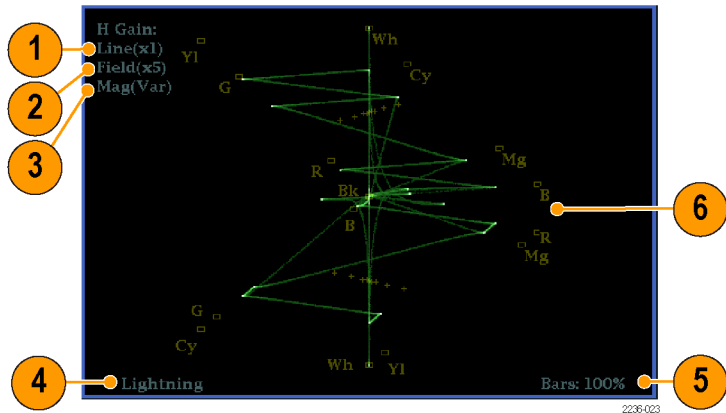
Vector Display

The VECT button calls up the Vector and Lightning displays, which provide for selection between two plots of the color portions of the signal.

Lightning Display Elements:

1. **Line.** Pressing the LINE button sets the horizontal gain to 1X.

2. **Field.** Pressing the FIELD button sets the horizontal gain to 5X.

3. **Mag.** Pressing the MAG button enables you to adjust the horizontal gain using the GENERAL knob.

Lightning & Vector Display Elements:

4. **Display Type.** The selected display, either Lightning or Vector.

5. **Bar Target Setting.** The bar target setting, either 75% or 100%.

6. **Phase.** Appears in Composite Vector inputs only.

Vector Pop-up Menu

The Vector pop-up menu enables you to specify the display type and display mode (SDI inputs only), to set the bar targets, and to center the waveform in the display.

To choose the display type (SDI inputs only), use the pop-up menu to choose either:

■ Vector - The Vector display shows a plot of the R-Y signal on the vertical axis and the B-Y signal on the horizontal axis. This display is useful for looking at hue and saturation of the colors, but does not show luminance information.

■ Lightning - The Lightning display shows the same color signals as in vector, but they are plotted versus luminance. One color difference signal is plotted in the top half and the other in the bottom. Lightning is useful for checking chroma and luma gain, and for checking chroma to luma delay using the timing marks that show errors in the green to magenta transition on a color bar signal. This is a Tektronix proprietary display and is for SDI signals only.

To select which scaling should be used in the active tile for either the Vector or Lighting display, use the menu to select 75% or 100% scaling.

To cancel any horizontal or vertical position adjustments and restore the trace to the default position, use the up/down arrow keys to select **Center Waveform** in the menu. Then:

■ For a Lightning display, press **SEL** to center the waveform. The trace is set back to the center of the tile.

■ For a Vector display, press the right-arrow key to select the color you want to locate at the center of the display.

■ For additional vector graticule options, see the Configuration > Graticules menu and select I/Q axis or Compass Rose.

Timing Display

Pressing the MEAS button displays a Tektronix proprietary display that simplifies measuring the timing difference between two signals as the timing is corrected. Using the Tektronix Timing display enables you to easily compare and correct the timing between two signals.

Display Elements:

1. **Input Signal Indicator:** A single [1] circle representing timing of input signal relative to the reference.

2. **Reference Indicator:** A cross-hair indictor centered in the display represents the reference signal.

3. **Vertical Offset:** The timing difference between the reference and input signal.
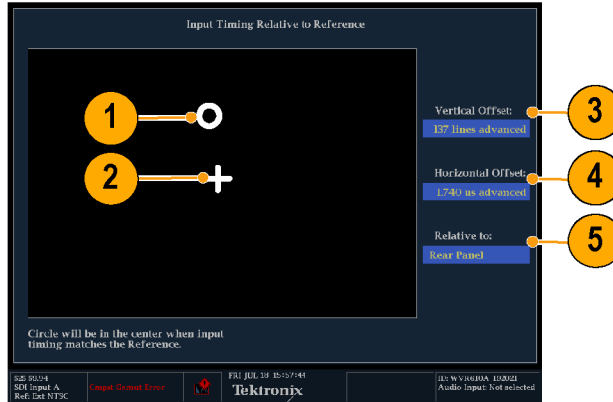
4. **Horizontal Offset:** The timing difference between the reference and input signal.

5. **Relative to:** Indicates the chosen zero point for the timing display. [2]

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[1] More complex timing relationships display multiple circles. See *Timing Displays for Simple Versus Complex Timing*.

[2] Rear Panel is the default setting, where offset is shown as zero when the input and reference are at the same timing at the rear panel of the instrument. If you select *Saved Offset*, you can save the timing from one signal, and then display the timing relative to that saved offset.

Measure Pop-up Menu

The Measure pop-up menu enables you to save a timing setting for comparison with another signal and specify the zero point of the timing display.

To save the timing of the current input as an offset to the timing display, use the **Save Offset** menu entry. The current timing becomes the zero point for the saved offset mode of the timing display. This applies to both the cross-hair target in the middle of the display and the numeric readouts.

NOTE. You cannot save the timing offset if either the input or reference is missing or unlocked. You also cannot save a reference when in internal mode. Saving an offset in these conditions would lead to misleading results so it is not allowed by the instrument. A warning message will appear on the screen if you attempt to save the offset when it is not allowed.

Save Offset allows you to measure the timing between inputs or to match multiple signals. To select the definition for the zero timing offset, use the Relative To: menu entry to select one of the following:

■ **Rear Panel**, which means the timing offset will be shown as zero when the two signals are timed down at the rear of the instrument.

■ **Saved Offset**, which means that the timing will be shown as zero offset when the input signal matches the timing of the signal that was present when the offset was saved using the Save Offset menu entry.

This selection changes both the numeric readouts and the target in the middle of the timing display.

Timing Displays for Simple Versus Complex Timing

The number of circles, with each representing a time offset, varies with the complexity of the timing between the reference and input signals. If you are timing input signals with rates that are integer multiples of the reference rates, the instrument can measure the timing deterministically and displays the relationship as one circle (offset) relative to the cross-hair (reference as is shown).

Such cases include timing an NTSC input (multiplier of 1) or a 525 SDI input whose frame time is 33.36 ms (multiplier of 2), against an NTSC reference, which has a frame time of 66.73 ms.

If you time input rates that are not integer multiples of the reference rates, the instrument cannot measure the timing deterministically, so it displays the relationships as several circles. Each circle represents a possible timing offset measurement relative to the reference cross-hair. Display emphasis is given to the circle that times closest to zero offset and the numerical readouts track this pair.

Nondeterministic cases include timing of slow rate inputs against fast frame-rate references or when timing video against film rates.
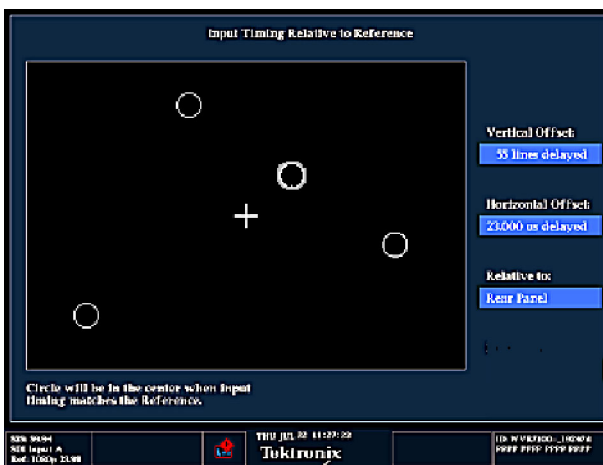
For a case where multiple relationships would display, consider an input of 1080p/23.98 Hz with a reference of NTSC/59.94 Hz:

■ The different rates result in timing relationships between the signals that repeat once for every four fields of the input and five frames of the reference (shown right).

■ Because this allows for five possible ways to measure timing between these two signals, the timing display shows four circles, with emphasis and readouts as previously described above.

1080 p frame timing diagram –vs– NTSC

0 ms   50 ms   100 ms 150 ms 200 ms 250 ms 300 ms

Ref NTSC color frames

Input 1080 p 23.98 frames

Delay 1   Delay 2   Delay 3   Delay 4   Delay 5
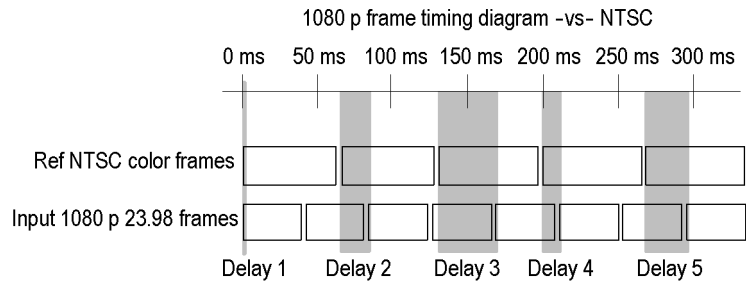
Picture Display

Pressing the PICT button calls up the Picture display, which lets you see the picture generated by the video signal. You can choose to display the picture with or without a Picture Frame, VChip, Closed Captioning (CC), and Safe Area Graticules.

Display Characteristics:

■ In full-screen mode (shown), there is no cropping.

■ Pictures are decimated horizontally or vertically to achieve the correct aspect ratio. This decimation may cause some artifacts. This behavior may be evident on a sweep signal.

■ Also see the online help for the Picture Aspect Ratio for related information.

■ Display can be set to include Closed Captioning text or Teletext overlaid on the picture.
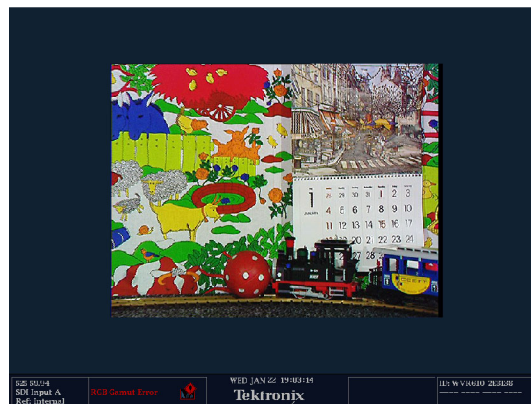
VChip, CC-Display, Teletext, and Safe Area Graticule Characteristics:

1. **VChip Area:** Displays detected VChip ratings from any of these systems: MPAA (US), TV (US), Canadian English, and Canadian French. VChip information is labeled CA (Content Advisory).

2. **Safe Graticules:** SMPTE, BBC, and ARIB B-4 standards for safe area graticules allow for selection of up to two Safe Area and two Safe Title graticules. Custom graticles with adjustable areas can also be specified.

3. **Closed Caption Text and Teletext Area:** Displays closed captioning or Teletext, configurable to decode to the following Closed Caption and Teletext standards:

   - For Composite: EIA-608-line-21 (VBI), TeletextB VBI (PAL)

   - For SD: EIA-608-line-21, EIA-608 (ANC), EIA-608 (708), EIA-708, and TeletextB VBI (625)

   - For HD: EIA-608 (ANC), EIA-608 (708), TeletextB VBI, TeletextB OP47 SDP (ANC), and TeletextB OP47 Multi (ANC)

Safe Area Graticule

Safe Title Graticule
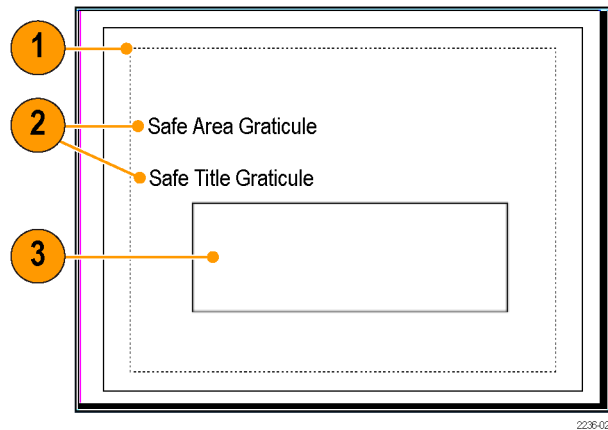
2236-024

NOTE. See Monitoring Closed Captioning (CC), Teletext, and Safe Area Compliance in the Quick Start User Manual.

PICT Pop-up Menu

The Picture pop-up menu enables you to optionally display elements of the video signal outside the active video, turn on display of Close-Caption (CC) text overlaid on the picture, and turn on up to four save area graticules, and otherwise control the PICT display.

To see only the active video portion of the signal, use the menu to switch Picture Frame to On; to see elements of the signal outside the active video, switch Picture Frame to OFF to view user data, embedded audio, and elements in the vertical interval.

NOTE. You can see signal elements outside the active video only when the PICT display is set to FULL. You will not be able to see sync signal elements on Composite signals.

To view CC text overlaid on the display, use the menu to switch **Display Closed Captions** to **ON**.

To select the CC service used to display closed captions, use the menu to set EIA-608 CC Service to a CC or text channel.

NOTE. If you set a PICT display for additional tiles, each one affords independent control of the CC setup. You can turn it on for one tile and leave it off for another, or you can set it to display differently from one tile to another. Conversely, CC configuration set in the CONFIG menu applies globally to all tiles set to PICT.

NOTE. To set the global configuration for CC decoding, use the Aux Data Settings submenu of the CONFIG menu. You can set the CC transport type and other global parameters. See Monitoring Closed Captioning and Teletext in the Quick Start User Manual for more information.

When monitoring to ensure that branding or other elements do not overlay essential text or video action, use the PICT menu to select a Safe Action and Safe Title graticule. The Safe Action Area is the maximum image area within which all significant action should be contained, and the Safe Title Area is the maximum image area within which all significant titles should be contained. You can select standard or custom safe area graticules.

To display safe area graticules overlaid on the display, use the menu to switch up to four Safe Area graticules settings to **ON**.

NOTE. Select and/or define these graticules globally in the Graticules submenu of the CONFIG menu. You can set the Safe Graticule Standard and define dimensions and offsets for custom Safe Graticules. See Monitoring for Safe Area Compliance in the Quick Start User Manual for more information.

Audio Display

Pressing the AUDIO button brings up the Audio Display. The Audio display provides level meters and a phase display for monitoring audio signals. The Audio display always shows the level meters and correlation meters. When you choose to display the phase plot (also known as Lissajous), the left portion of the Audio tile displays the level meters and the right portion the Phase display. You can display Surround Sound in the right part of the Audio Tile, instead of the phase plot. See the figure that follows.

Display Elements
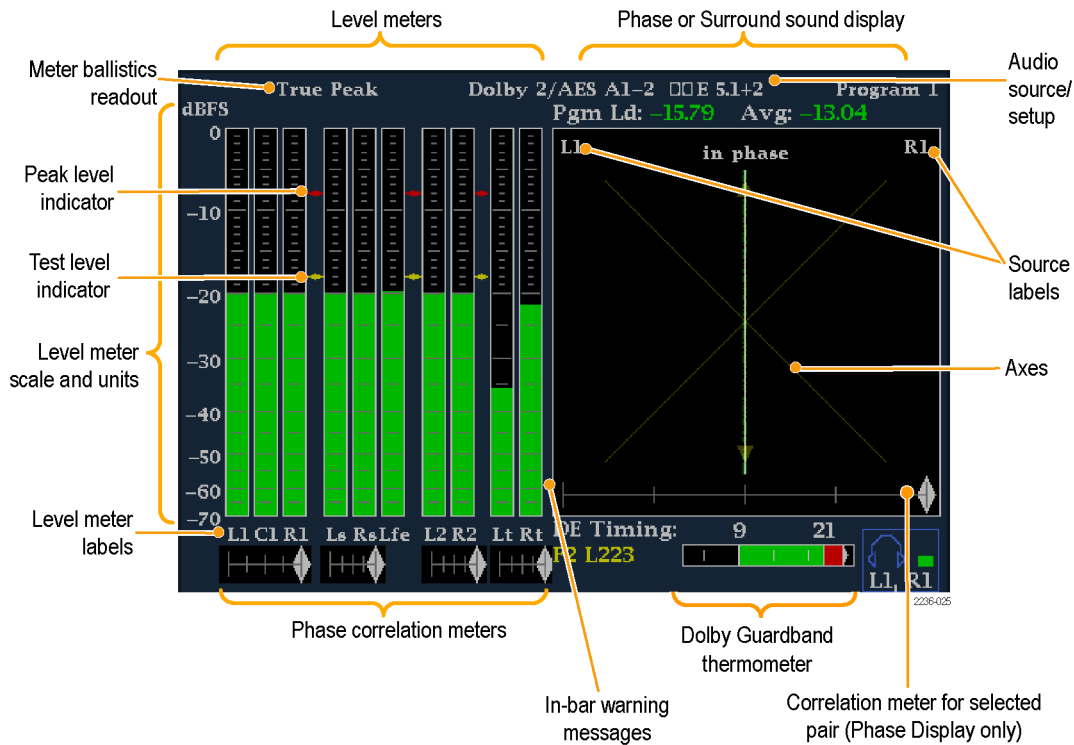
Element Descriptions

Element	Description
Level meters	Can include Dolby channels 9 and 10 if Dolby options are present.
Phase or Surround display	Selects between the Phase display, where the phase of a selected pair of channels is plotted against an X-Y or sound-stage plot, and the Surround Display, where all the channels levels display in positions matching their place in a surround-sound listening environment.
Audio source/setup	Displays selected audio input and related setup information, such as Listening Mode when in Surround display.

Element	Description
Level meter labels	Identifies the signal in each meter bar. The labels vary according to whether the audio sources to the level meter bars are normal channel pairs, surround channels, or Dolby sources (the Dolby source labels include Dolby type).
Level meter ballistics readouts	Displays the selected dynamic response characteristic.
Axes	Shows the orientation of the two audio signals when displaying phase; shows the orientation and amplitudes of the sound field when displaying surround sound. (Axes are selectable for an X-Y or Soundstage plot.)
Phase correlation meters	Displays the phase correlation between the two-channel bars under which it appears. The meter of the pair selected for the Phase display also appears in the Phase display.
Test level and Peak program level indicators	Indicate, as diamond-shaped markers between the level bars, the configurable limits set up for the display. Above the Test level, the bar displays in a yellow color. Above the Peak level, the bar displays in a red color. Test level is also known as Reference level or Line-up level.
Level meter scale and units	By default, the units are in dB relative to full scale (dBFS) for digital inputs and dB relative to 0.775 Volts (dBu) for analog inputs. The 0 dB mark is digital Full scale for digital inputs and 0 dBu for analog inputs. You may also set the 0 dB mark to either the Peak Program level or the Test level. See also CONFIG > Digital Audio Display > set meter type to, and CONFIG > Analog Audio Display > set meter type to.
Dolby Guardband thermometer	Guardband limits can be set for SD, HD, 3G, DL, and CMPST signals. A Dolby Guardband thermometer is displayed on the Audio display so that you can monitor whether or not guardband limits are being exceeded.

NOTE. The surround display is described under Monitoring Surround Sound in the WVR6020, WVR7020, and WVR7120 Quick Start User Manual.

NOTE. The loudness measurement supports three types of filter: Flat, A-weighted, and RLB (ITU-R BS.1770). The measurement can be viewed in the Audio Session display.

Above-bar Warning Messages

This instrument displays warning messages above the level meter bars. The warning messages that can appear above the bars as follows:

Clip. The number of consecutive samples equals or exceeds the # Samples for Clip setting.

OVER. The signal has been at or above the specified Over Level for a time exceeding the Duration for Over setting.

In-bar Warning Messages

This instrument displays warning messages within the level meter bars. The warning messages that can appear are shown below in order of priority.

UNLOCKED. The instrument is not locked to an incoming signal on the indicated input channel. Data cannot be decoded and all data and other errors are ignored. This means that if an AES input is selected, nothing recognizable is present on the input, or if embedded audio is selected, the VIDEO input is unrecognizable.

AES PARITY. The incoming subframe does not have even parity as specified by the digital audio standards. The data sample is unreliable and is ignored. The level meters and Lissajous display treat the sample as a zero sample.

AES CRC ERROR. The CRC code in the AES channel status packet is incorrect. Sometimes the CRC code is set to zero, indicating that the signal is missing; when this is the case, this message is not displayed.

MUTE. The number of consecutive all-zero samples equals or exceeds the # Samples for Mute setting.

SILENCE. The signal has been at or below the specified Silence Level for a time exceeding the Duration for Silence setting.

DISABLED. Indicates that an audio bar is not active. This message is mainly seen with a Dolby Digital source when a listening mode is selected with a reduced number of channels.

AES V BIT. Indicates that the Validity bit is set high for one or more data samples. In the AES/EBU standard, a set validity bit indicates that the sample is not suitable for conversion to audio. By default, the level meter bars and Lissajous display treat the affected samples as zero samples.

NO AUDIO. Indicates that an AES or embedded input has the Non audio bit set.

NOT PRESENT. Indicates that an audio bar is not present in the current audio input. This can be present if a Dolby Digital input has a coding mode indicating a reduced number of channels.

DOLBY D. Indicates an AES or embedded input is Dolby Digital.

DOLBY E. Indicates an AES or embedded input is DOLBY E.

Audio Pop-up Menu

The Audio pop-up menu enables you to select the audio input source and specify whether a phase display or a surround-sound displays appears in a subtile to the right of the level meter display.

To select the source for the Audio display, select **Audio Input** in the menu and set a source. The number of available sources depends on which audio option is installed. Choosing any given input will make that audio the monitored signal regardless of which video input is active. Alternatively, you can choose Follows video to enable the mapping that allows changing the audio source as the video input selection is changed.

NOTE. Use the CONFIG menu to select the mapping of input to bar, the meter type, and the Follows video mapping of audio to video.

Analog Out Atten is used to asjust the levels to the rear panel analog outputs.

To add a 2-channel phase display to the audio tile, set **Aux Display** to **Phase Display** in the Audio pop-up menu. A phase display is also called a "Lissajous" display.

To choose the plot style of the Phase Display, select between the following two entries in the pop-up menu:

■ Sound Stage has axes rotated at a 45 degrees.

■ X-Y has axes that are horizontal and vertical.

To choose the pair of inputs that is displayed in the phase display, select **Phase Pair** and set a value. You can also select Custom, and then specify individual channels for the input pair, using the Phase Channel A and Phase Channel B entries.

To add a multi-channel surround sound display to the audio tile, set **Aux Display** to **Surround Sound** in the Audio pop-up menu. You can also enable either or both of the following entries:

■ Dominance Indicator. When on, indicates the location of the dominant sound in the surround sound image using a cross-hairs pointer (surround display only).

■ Loudness. When set to Flat, results in a non-weighted response; when set to A-weighted, results in a response that more closely matches that of the human ear.

NOTE. The Audio Surround Sound display is courtesy of Radio-Technische Werkstaetten GmbH & Co. KG (RTW) of Cologne, Germany. Surround Sound: Radio-Technische Werkstaetten GmbH & Co.

LTC Waveform Display

Pressing the OTHER button brings up a display of an LTC waveform when one is present. This enables you to check the LTC amplitude and noise, and verify that LTC is locked to the video. The display has two vertical scales, one in Volts and the other in dBu.

Display Elements:

1. **Vertical Scale (V):** The vertical display scale in volts.

2. **Time Code:** when displayed, indicates that the LTC time code is locked to the video.

3. **Horizontal Scale:** The horizontal display scale.

4. **Vertical Scale (dBu):** The vertical display scale in dBu.
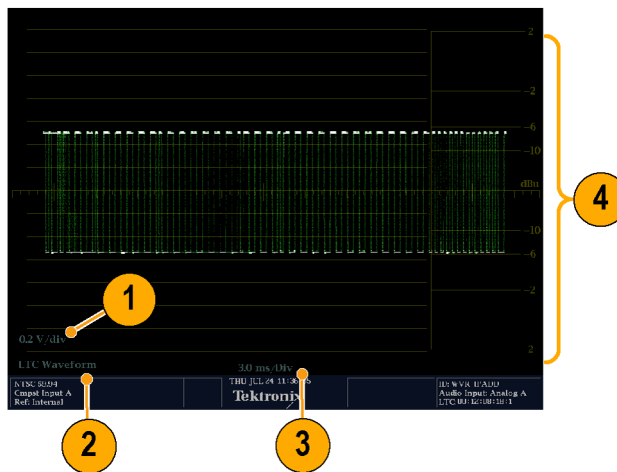
OTHER (LTC) Pop-up Menu

The Other pop-up menu provides access to the Center Waveform function. The Center Waveform function is used to cancel any horizontal or vertical position adjustments and restore the trace to the default position. After bringing up the pop-up menu, press SEL to center the waveform.

Gamut Display

Pressing the GAMUT button calls up the Gamut Display. The Gamut display provides three proprietary Tektronix display types to enable you to easily and quickly check the gamut of an SDI signal. You can choose from the Arrowhead, Diamond, and Split Diamond displays. The Arrowhead display provides NTSC and PAL composite gamut information directly from the SDI signal. The Diamond and Split Diamond displays provide a reliable method of detecting invalid colors.

Display Elements:

1. **High threshold:** Shows the currently specified high threshold (Diamond High or Arrowhead Max).

2. **Low threshold:** Shows the currently specified low threshold (Diamond Low).

3. **Gamut display type:** Shows the selected Gamut display type - Diamond, Split Diamond, or Arrowhead.

4. **Threshold indicators:** Indicates the threshold settings using blue dashed lines.
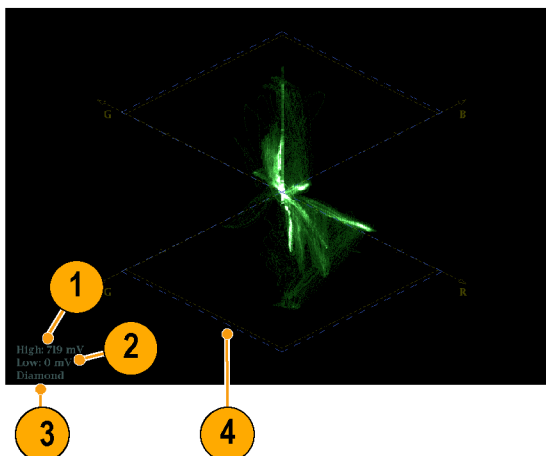
GAMUT Pop-up Menu

The GAMUT pop-up menu allows you to select the type of gamut display shown in the active tile. To change the display type in the GAMUT display, use the pop-up menu to select from the following displays:

■ Diamond shows Gamut violations of the SDI input if translated to RGB color space.

■ Split Diamond offsets the two halves of the Diamond to allow you to better see negative RGB Gamut errors.

■ Arrowhead shows Gamut violations of the SDI input if translated to the Composite domain.

Status Display

Pressing the STATUS button calls up the Status display, which provides several views of signal status. Status displays are text displays that show signal status. You can view current alarms and errors (those occurring now and within the last few seconds), a history of errors and alarms (up to 10,000 entries), video error statistics or audio error statistics. You can display a different Status display type in all four tiles.

NOTE. Press the HELP button and then press the STATUS button to explore help topics on the following status types.

Status display types available:

1. **Video Session:** Control the Video Session settings.

2. **Audio Session**: Control the Audio Session settings.

3. **Aux(iliary) Data Status**: View closed-caption, Teletext, video index, AFD, WSS, and V-chip related status.

   Select to view metadata over VAnc.

4. **Dolby Status**: View Dolby metadata for the currently monitored audio source (AES and embedded input).

   For instruments equipped with Option DDE, Dolby Timing and Dolby VANC data is available. For the latter, you can select to view metadata from the audio data stream or from the VANC.

5. **Error Log:** Control the error logging settings.

6. **Alarm Status:** View current alarm status.

7. **ARIB Status**: Check for the presence and status of ARIB-based information encoding. The rasterizer supports TR-B.22, TR-B.23-1, TR-B.23-2, B.35, B.37, and B.39 ARIB standards. To view the ARIB content displays, enable this option in **CONFIG > Aux Data Settings > ARIB Content Display**.

8. **SDI Status:** View two measurements of signal jitter cable loss in both dB and meters of the selected cable type, and calculated source level. With option PHY, automatic measurements of eye amplitude, rise time, fall time, overshoot, and rise-fall difference are also displayed.

9. **Audio Control:** View the information on audio frame number, sampling frequency, active channels, and relative audio-to-video delay of each channel, as encoded in the audio control packet metadata.

10. **Audio Channel Status:** View the specified channel in the specified format.

STATUS Pop-up Menu

The STATUS pop-up menu enables you to mute alarms, select the type of display that appears in the status screen, and set options related to the selected display type.

STATUS Colors

The STATUS display messages and values appear in different colors to help indicate signal status:

Color	Description
White	Identifies informational items and represents changes in the instrument state
Green	Indicates error conditions that have cleared
Yellow	Indicates that there is a warning condition (that might require attention) or that an error has occurred within 2 seconds
Red	Indicates signal information that has been found to be in an ongoing error state
Gray	Indicates alarm status state of an un-enabled alarm

Alarm Status Errors

When RGB and/or Composite Gamut errors are detected, the associated lines in the Alarm Status display have characters that indicate which gamut threshold(s) are exceeded for each component. The following error codes that may be displayed:

NOTE. To monitor alarms remotely, use a PC to monitor SNMP traps over the Ethernet port (the PC must have SNMP trap service installed). Before SNMP traps can be sent, you must enable and configure the instrument for SNMP control using the Network Settings submenu of the CONFIG menu.

Indicator	Description
R	Signal exceeds the high gamut limit for the red component (RGB gamut)
r	Signal exceeds the low gamut limit for the red component (RGB gamut)
G	Signal exceeds the high gamut limit for the green component (RGB gamut)
g	Signal exceeds the low gamut limit for the green component (RGB gamut)
B	Signal exceeds the high gamut limit for the blue component (RGB gamut)
b	Signal exceeds the low gamut limit for the blue component (RGB gamut)
C	Signal exceeds the high gamut limit for the chroma component (composite gamut from SDI input)
c	Signal exceeds the low gamut limit for the chroma component (composite gamut from SDI input)
Y	Signal exceeds the high gamut limit for the luma component (composite gamut from SDI input)
y	Signal exceeds the low gamut limit for the luma component (composite gamut from SDI input)

Diagnostics Log

This log contains the results of diagnostics tests, boot-ups, and advanced diagnostics that were performed. View the log directly on the instrument by pressing **CONFIG >Utilities > View Diagnostic Log**, or by clicking on the Diagnostics Log link on the Remote Web page.

Error Log

The instrument maintains an error log (also called the event log) in which every logged entry is time-stamped. When you enable Timecode, events are time-stamped with the timecode embedded in the video (or LTC) signal. Enable Timecode from the Aux Data Settings submenu of the Config menu. View the log directly on the instrument by pressing **Status > Error Log**, or by clicking on the Error Log link on the Remote Web page.

> ⚠️ **CAUTION.** *The time of day time stamps in the error log are based on the system time of the instrument when the logging process starts. Changing the system time of the instrument while the error log is in the Running mode does not change the time stamps in the running error log. You must stop and restart the error log before the error log will use the new system time.*

Error log size. The error log can contain up to 10,000 entries. Recording each individual event separately would quickly fill the log. To handle this problem, the instrument classifies log entries as one of the following:

- Single shot. One isolated occurrence is logged as one entry.

- Continuous. Uninterrupted sequence of occurrences is logged as two entries marking the beginning and end of the sequence.

By default, alarms are not enabled for logging. Use the Alarm Setup submenu of the Configure menu to select the number of monitored error conditions.

Eye Display

For instruments equipped with Option EYE, pressing the EYE button calls up the Eye display (for SDI inputs only). The Eye display presents an eye pattern diagram of the SDI input, which lets you verify electrical characteristics of the SDI transport layer. You can measure analog characteristics of the SDI input on the eye pattern using the graticule or voltage and time cursors. Two jitter indicators provide two independent measurements of jitter. You can also set alarms on various parameters (see your instrument online Help). For more information on jitter, search the Tektronix Web site for jitter application notes.

Display Elements:

1. **Eye Pattern:** Displays a waveform you can use for SDI transport verification and analysis.

2. **Jitter Thermometer:** Displays jitter value and relates it to alarm limits.

3. **Equalized Eye Indicator:** If enabled in the CONFIG menu, the Eye pattern is equalized, reducing the jitter noise floor. Amplitude Cursor measurements do not indicate the actual signal amplitude.

4. **Cursor Readouts:** Provide for direct measurements of amplitude and time on the Eye.

5. **Eye Pattern Type:** Either 3 Eye, or 10 Eye (SD)/20 Eye (HD). The latter types can help reveal when jitter at the parallel word rate is present.

6. **Jitter HPF:** Indicates the setting for the Jitter High Pass Filter, set in the CONFIG menu.

At the end of a long cable, the eye diagram may appear so noisy that there is little or no discernable opening. In this situation, limited use of the eye diagram is still possible by selecting Equalized Eye mode. The equalizer compensates for the effects of cable length by applying an inverse response function and then reslicing the signal to a logic level. This causes amplitude information to be lost, but preserves the effects of jitter in the signal.

If the equalized eye display appears clear with a substantial eye opening, then the signal is likely to be recovered error-free. However, if it appears noisy with little eye opening, then there is more potential for data errors to occur in the receiver.

NOTE. For information on taking Eye measurements, see the Monitoring the SDI Physical Layer section of the WVR6020, WVR7020, and WVR7120 Quick Start User Manual.

Eye Pop-up Menu

Pressing the MEAS button on the front panel will bring up the Eye pop-up menu. This menu enables you to center the eye waveform and, more importantly, specify the operation of the Jitter detector that drives the Eye display.

NOTE. Eye diagrams that you display in the upper two display tiles are driven by the Jitter1 detector; those in the lower two tiles, by the Jitter2 detector. To display two Eye diagrams with independent Jitter detectors, display one in an upper tile and one in a lower tile.

Jitter Display

The Jitter Display can be used once you have configured the instrument for Eye measurements and is only available with option PHY. This display shows you the wave shape of the jitter and allows you to view additional time-domain information, such as whether there are jitter components that are synchronous or nearly synchronous to the video line or frame. You can also set alarms on various parameters (see your instrument online Help). For more information on jitter, search the Tektronix Web site for jitter application notes.

Display Elements:

1. **Jitter Waveshape:** Displays the jitter wave shape (the image to the right shows no jitter). This shape is modified by the high-pass filter (HPF) setting.

2. **Jitter Thermometer:** Displays jitter value and relates it to alarm limits.

3. **Jitter HPF:** Indicates the setting for the Jitter High Pass Filter, set in the CONFIG menu.

High-Pass Filter. The high-pass filter bandwidth setting allows you to show only jitter terms above the selected filter frequency. When you select a filter setting, depending on the active input signal, you select the jitter measurement type (Timing, Alignment, or neither, as defined by the SMPTE standard). Use the High Pass Filter soft key to select the lowest settings to measure timing jitter and the higher settings to measure alignment jitter.

To choose the Jitter detector filter, use the Measurement pop-up menu and choose one of the following settings for the Jitter HP Filter entry:

Setting	Description
Timing	Sets the detector high-pass filter to 10 Hz. This is the correct value for measuring timing jitter for both SD and HD signals.
Align	Sets the detector high-pass filter to 1 kHz, as specified by SMTPE, for SD signals; and to 100 kHz for HD signals. These are the correct values for measuring alignment jitter.

10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz	Sets the detector high-pass filter to the selected value.

Jitter Pop-up Menu

The Jitter pop-up menu is accessed by pressing the MEAS button on the front panel. This menu enables you to set the Jitter HPF value, center the waveform, show or hide the meter readout, and change the display type.

NOTE. For instructions on how to take jitter measurements, see the Taking Jitter Measurements section in the WVR6020, WVR7020, and WVR7102 Quick Start User Manual.

Ancillary (ANC) Data Inspector

The ANC Data Inspector is part of the ANC Data Display and is available on instruments with Option DAT. This ancilliary monitoring feature allows you to see all ancilliary data present in a signal. The instrument continually monitors the signal and tells you when changes in the presence of data occur. When Watch List mode is activated, the instrument will display the presence and status of ANC data types you have selected in the Watch List. This allows you to focus on the ANC data types that are important to you.

Elements of the ANC Data Display . The following information is available on the ANC Data Display:

- **DID**: Data Identifier of the requested packet; permissible values range from 1 to 0xFF (255) inclusive

- **Type**: Type of the ANC Data packet; either Type 1 packet (DID greater than or equal to 0x80), or Type 2 packet (DID less than 0x80), as defined by SMPTE 291M; Type 1 packets do not have a SDID field, instead they have a DBN field; the "actual value" (with parity bits added) is displayed in parentheses

- **SDID**: Secondary Data Identifier of the requested packet; permissible values range from 0 through 0xFF (255) inclusive; this field only appears when a Type 2 packet is selected; the "actual value" (with parity bits added) is displayed in parentheses (mutually exclusive with DBN field)

- **DBN**: Data Block Number of the acquired packet; values range from 0 to 0xFF; the "actual value" (with parity bits added) is displayed in parenthesis (mutually exclusive with SDID field)

- **DC**: Data Count word of the acquired packet; the number of User Data words is displayed in decimal; the "actual value" (with parity bits added) is displayed in parenthesis, in hexadecimal

- **Field**: The field of the video from which the packet was acquired; for progressive formats, 1 is displayed

- **Line**: The line of the video (within the field) from which the packet was acquired

- **Stream**: For HD (SMPTE 292M), indicates whether the ancillary packet was acquired from the Y or C data streams; for SD, "N/A" is displayed

- **Status**: Indicates whether packet(s) of the desired type are present in the video; also indicates Checksum or CRC errors

- **Checksum**: Indicates the checksum word that was recovered from the acquired packet

- **Should be**: Indicates the checksum work computed by the instrument, based on data of the packet

- **Format**: Indicates the name of the ancillary data type or standard

- **User Data Words**: Contains the payload of the ancillary packet, displayed in hexadecimal; all 10 bits are displayed

Configuring the ANC Data Inpsector

1. Press a Display Select button. To view the selected tile full screen, press the **FULL** button.

2. Press the **CONFIG** button and use the General knob to navigate to **ANC Data Display**.

3. Press the up arrow key to highlight **User ANC Types**. You can configure up to eight user types.

4. Use the arrow keys and the General knob to select the SDID or DID hex values for each Type.

5. You can also select **Name** to enter a name for a user defined type. When the dialog box appears, enter the name of the ancilliary data type.

6. When you are finished, mark the **Accept** box and press the **SEL** button.

7. Press the **CONFIG** button to dismiss the configuration menu.

8. Press the down arrow key to highlight **Config Watch List**.

9. Press the **SEL** button to view the Watch List menu.

10. Use the General knob to navigate to the ancilliary data type you want to specify on the Watch List in the ANC Data Inspector.

11. Press the **SEL** button to mark the data type you have chosen with an **X**.

12. When you are finished, use the down arrow key to navigate to the **Return** square.

13. Press the **SEL** button.

14. Press and hold the **MEAS** button to access the Measurement pop-up menu.

15. Navigate to **Display Type** using the up/down arrow keys or the General knob.

16. Press the right arrow key to navigate to the Display Type submenu.

17. Use the up/down arrow keys to select **ANC Data Disp.**

18. Press the left arrow key.

19. Press the up arrow key to highlight **View Mode**.

20. Press the **SEL** button to highlight **Watch List**.

21. Press the **MEAS** button to dismiss the pop-up menu.
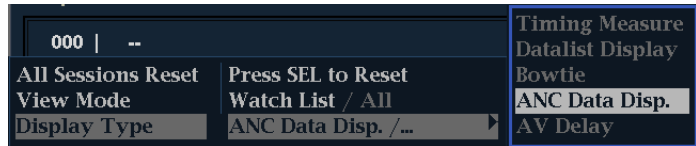
22. Use the arrow keys or the General knob to highlight the ANC data type for which you want to view details. The details will appear in the bottom portion of the display.

23. Press the right/left arrow key to activate the Detail portion of the display. A blue border will appear around the portion of the display that is active.

24. Use the General knob or the up/down arrow keys to scroll through the selected ANC data type details.

25. To expand the detail list, press the **MAG** button.
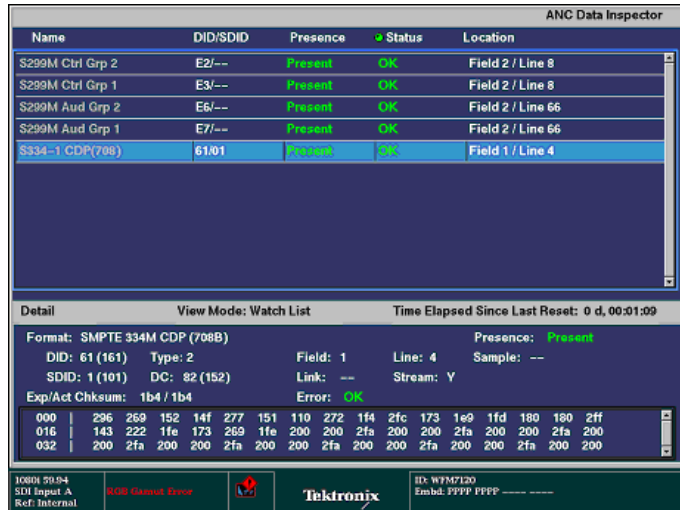
Using the ANC Data Inspector with CaptureVu™. When you use CaptureVu™ with the ANC Data Inspector, the instrument will display all of the ANC data packets for the complete frame of stored data for each of the present ancillary data types. This allows you to investigate problems within the signal and verify that the ancillary data present within the buffer is correct. Use the arrow keys to navigate the various windows and the **MAG** button to expand the Detail view of the ANC Data user words.

After you have configured the ANC Data Inspector as shown in the previous procedure, you can perform the following steps.

1. Check that the ANC Data Inspector is displayed.

2. Press and hold the **CAPTURE** button to display the capture menu.

3. Navigate to **Capture Type** and select **Buffer**.

4. Navigate to **Delete & Capture** and press the **SEL** button to capture the signal.
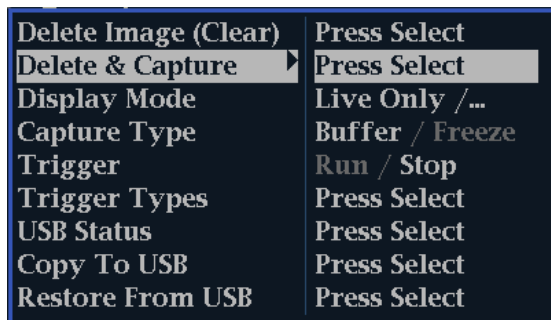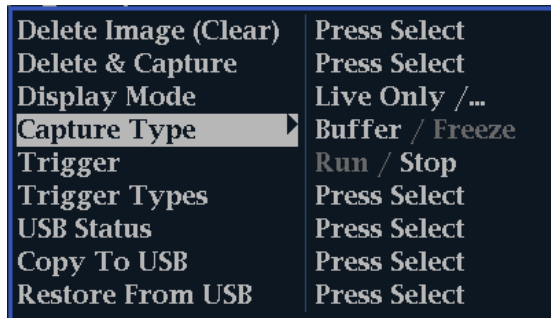
5. Navigate to **Display Mode** and select **Buffer Only**.
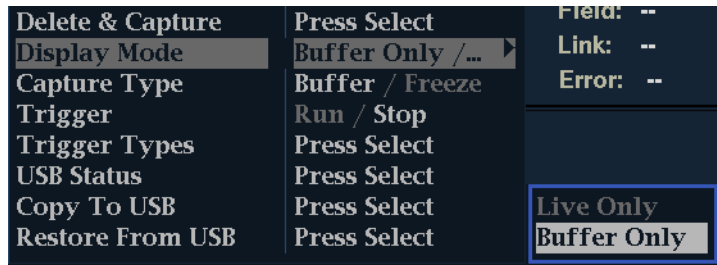
6. Press the **Capture** button to dismiss the pop-up menu.

You can now view the ANC Data packets for the highlighted ANC data type in a single display.

Supplemental Operating Information

This section contains topics that, though of less general interest, may address your particular application needs. These applications include cloning setups, upgrading firmware, and a description of cable types.

Cloning Setups (Presets)

Given the complexity of SDI and other Video signals, instrument setups can become complex as you tailor them to monitor the parameters you want. To save setup time and ensure consistency, you can save instrument setups as presets in your instrument. For the same reasons, you might also want to clone setups to use in setting up other instruments. Saving and recalling of presets in the same instrument is covered in *Using Presets* in the *WVR6020, WVR7020, and WVR7120 Quick Start User Manual*. This section deals with using presets to clone setups.

Using a Web Browser, Java Applet, or Java Application

The Java Application provides a complete cloning solution. From the Java Application, you can:

■ Save the current instrument setup to a <filename>.PRS file

■ Restore the <filename>.PRS file to the same instrument or to a different instrument, overwriting the current setup of the target instrument

■ Select up to all five of Presets 1 - 5 and save them into a single <filename>.PRE file

■ Restore the <filename>.PRE file to the same instrument or to a different instrument, overwriting any stored presets on the target instrument that conflict with the new presets. If a preset was not stored in the file, uploading the PRE file leaves it unaffected on the target.

The Web browser only provides the first capability from the above list for the Java Application.

The Java Applet cannot save settings to, or restore them from, a file.

From a Web Browser

The Web browser provides a quick way to capture individual presets for later upload to other instruments (or the same instrument). Saved files are *.PRS files, and can only be uploaded to the instrument as an overwrite to the current instrument setup, not to Preset 1 - Preset 5, and *only* by using the Java Application. (See *From the Java Application* in this manual).

Saving to a file

1. Connect to the networked instrument from your networked PC using your PC resident Web browser. See *Using a Web Browser* if you need instructions.
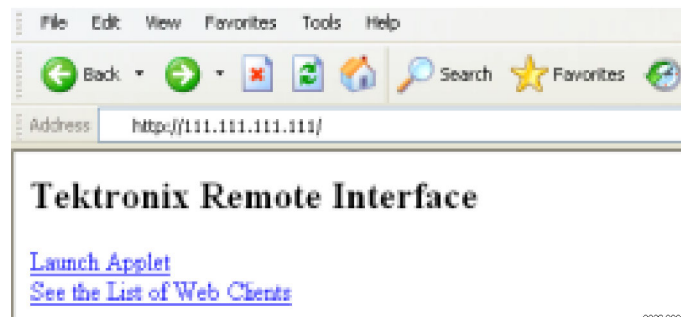
2. Click to save a copy of the current settings of the networked instrument to a local file.

3. Click any preset from 1 to 5 to save a copy of that preset from the networked instrument to a local file.

Get Current Settings (binary) — **2**
Get Preset 1 (binary)
Get Preset 2 (binary)
Get Preset 3 (binary)
Get Preset 4 (binary) — **3**
Get Preset 5 (binary)
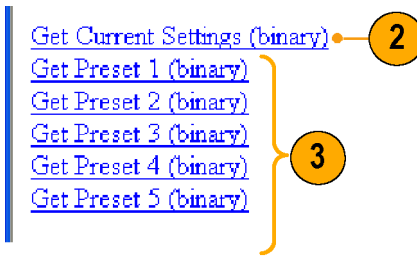
4. In the Save As dialog box that displays, navigate to the location in which you want to save the preset.

5. Rename the file if desired.

6. Click the **Save** button to save the preset in a file.

To recall a preset that you have stored to a file, you must use the Java Application. (See *From the Java Application*.)
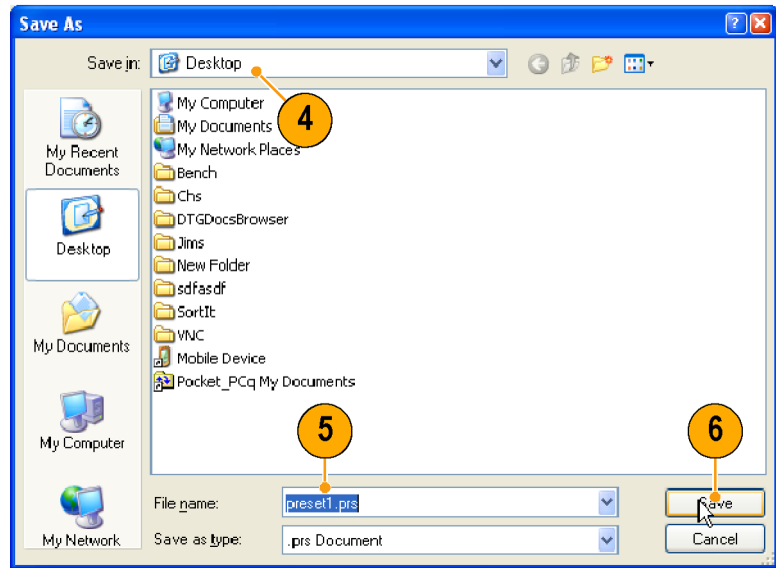
From the Java Application

You can save and upload instrument Presets to files from the Java Application. This application provides the only way to later upload to other instruments (or to the same instrument); the Web browser and the Java Applet cannot upload presets.

Java Application Requirements. If you install Java on your PC, you can launch a Java applet to control the instrument. The Java Applet requires:

- A computer running on any platform that supports Java version 1.4.1 or later, including Windows NT/2000/XP, Linux, Unix, and Mac OS X.

- Java Standard Runtime Environment version 1.4.1 or later. The Java runtime must already be installed on your system in order to use the Java application.

- The Java application package (wvr7120.zip) from the Tektronix Web site, installed on the computer.

- This instrument, networked or otherwise connected for remote control from the computer.

Once you download the archive file, extract the installation and open the Readme file. The Readme file explains installation on the supported platforms. When you have completed installation, perform the following steps.

Launching the Java Application

1. On your networked computer, click the shortcut or link to the application. See the Readme file that came with the application download if you need more information.

2. In the IP Address box that appears, enter the IP address of your networked instrument.

3. Enter the instrument password, if one is set. Inspect the Web Password entry in **Network Settings** in the CONFIG menu if you need to get the password.
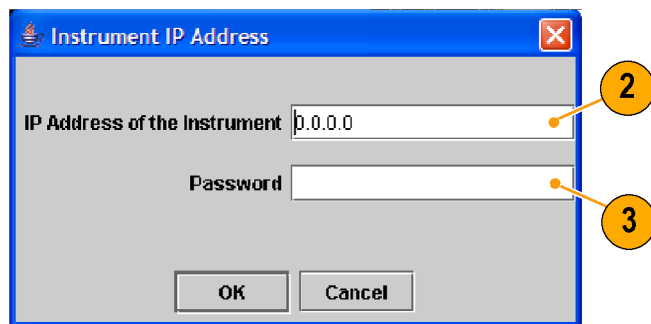
Saving the current setup to a file

1. To save the current instrument setup, select **Save as Preset...** in the File menu.

2. Click **Browse** to open the Save dialog box. Click to check button and enter a path and name for the target file. Alternatively, you can:

   - Click to check the File button and enter the full path and name for the target file.

   - Save the current setup to any of the onboard Presets 1-5 listed in the Save As Preset dialog box.
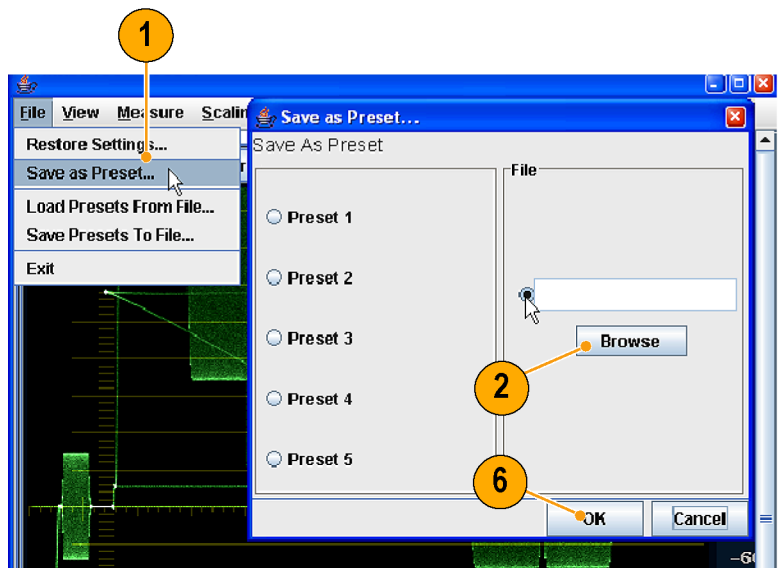
3. Navigate to the directory in which you want to store the settings file.

4. Enter a descriptive name for the target file. Use the suffix .PRS for the setup file.

5. Click **Save**.

6. Click **OK** in the Save as Preset dialog box.

7. Click **OK** to dismiss the Confirmation message that appears.
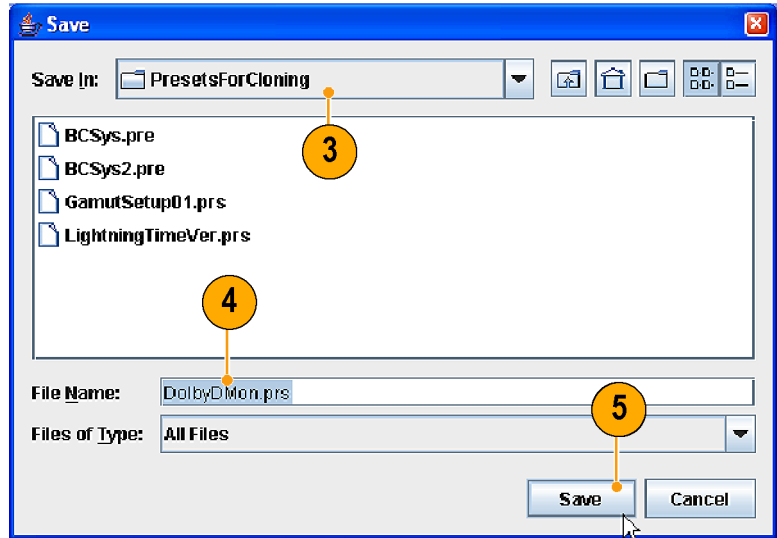
Recalling settings from a file

1. Select **Restore Settings...** in the File menu.

NOTE. Settings, when recalled from a PRS file, always replace the current setup, so save the current setup to a Preset if you want to preserve it.

2. Click the File selection button.

3. Click **Browse** to display the Open dialog box.
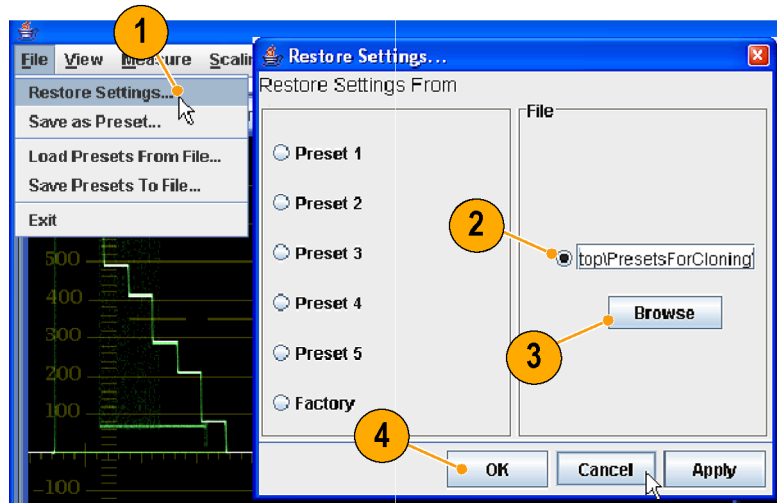
4. Navigate to the file to be restored and select it.

5. Click **Open**.

6. Click **OK** in the Restore Settings dialog box.
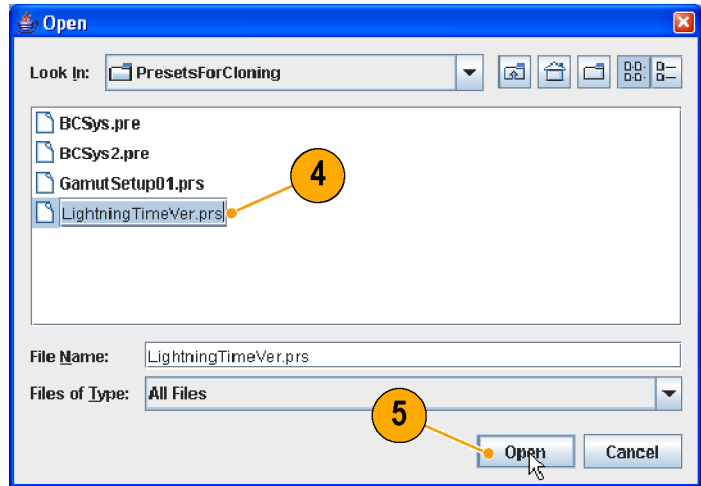
Saving all Presets to a file

1. To save the instrument Presets (Preset 1-5) into a single file, **Save Presets to File...** in the File menu.

2. Click to check the boxes for all Presets that you want to save.

3. Click **...** to open the Save dialog box.
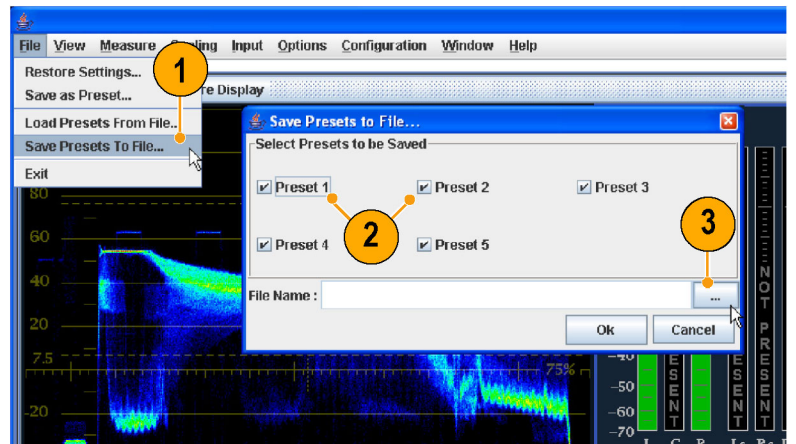
4. Navigate to the directory in which you want to store the settings file.

5. Enter a descriptive name for the file, and click **Save**. Use the suffix .PRE for the setup file.

6. Click **Save** in the Save Presets to File dialog box.

7. Click **OK** to dismiss the Confirmation message that appears.
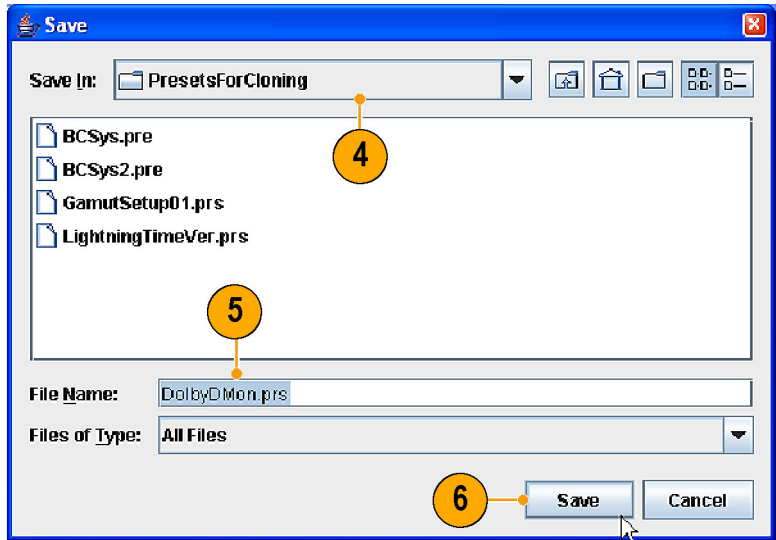
Recalling Presets from a file

1. If cloning the saved presets to another instrument, close and relaunch the Java Application, entering the IP of that instrument. See *Launching the Java Application*.

2. Select **Load Presets From File** in the File menu.

3. Click the ... button to display the Open dialog box.
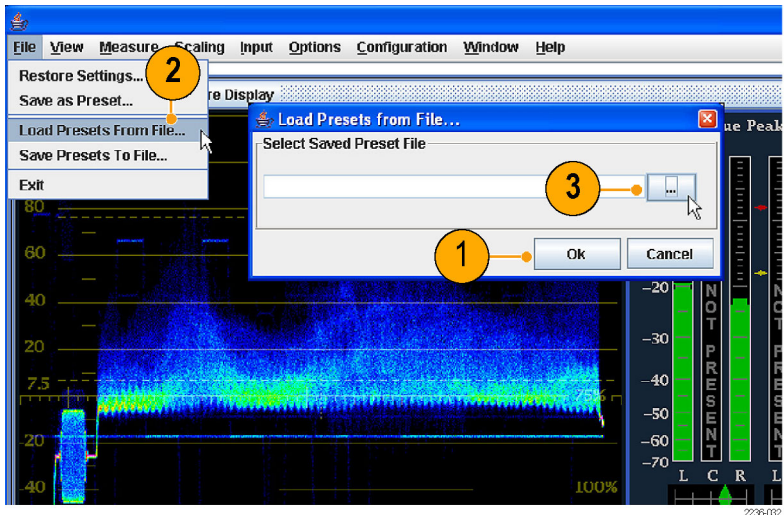
4. Navigate to the file to be restored and select it.

5. Click **Open**.

⚠️ *CAUTION. The next step will restore files to the same Preset locations on the instrument that they were saved from when stored to file. This will overwrite any existing setups in those locations.*

6. Click **OK** in the Load Presets from File dialog box.

7. Repeat this procedure to clone setups to other instruments as needed.
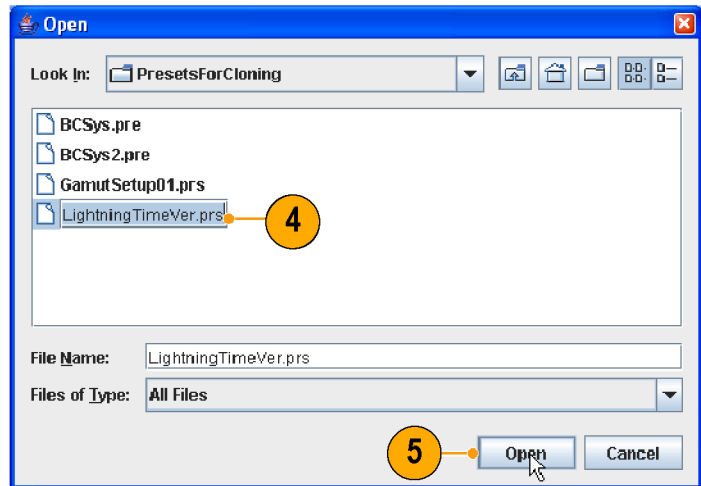
Usage Notes

When saving presets as files for later cloning to other instruments, take note of the following:

■ Option configuration mismatch between Clone source preset and the target result in some different setup parameters. The target accepts only the common setup parameters. Parameters not supported by the target are ignored: parameters not supported in the source remain unchanged in the target.

■ Model mismatch (WVR6020, WVR7020, or WVR7120) between Clone source preset and the target result in some different setup parameters. The target accepts only the common parameters setup parameters. Parameters unsupported by the target are ignored: parameters not supported in the source remain unchanged in the target.

Upgrading Instrument Software

System Upgrade (CONFIG > Utilities > System Upgrade) is used to upgrade the system software of this instrument. The upgrade is performed across an Ethernet network.

PC System Requirements

The data-transfer utility for upgrading the instrument runs on these PC systems: Windows 98, Windows NT 4.0, Windows ME, Windows 2000, and Windows XP.

The data-transfer utility also requires Winsock 2.0, an ethernet interface, and 10 MB of free disk space be present on the PC system.

Before You Begin

Before performing installing new software, read about possible fault conditions and their remedies and about how this instrument uses button animation to signal upgrade progress and events.

FAULT Recovery and Cautions

■ The boot monitor will assert a FAULT after an unsuccessful software update operation. The failure of the software update can be caused by a network communication error, time-out, or a corrupt firmware package. When it detects a software update error, the instrument returns to the ready state (tile buttons flashing).

In this event, you can try to resend the software data to the instrument. In the case of repeated failures, check to make sure that you have the correct software release for the instrument.

■ The boot monitor might also detect errors in the DHCP software which can result from repeatedly switching between factory and DHCP network settings. The FAULT light remains lit and the instrument fails to obtain an address from a DHCP server.

In this event, reboot the instrument by pressing one of the MEASURE SELECT buttons or by removing power from the instrument. When the instrument reboots, hold down the FULL button to return the instrument to the software update mode.

■ When using DHCP, there is a small possibility that the instrument will be assigned a different address when the software update mode is activated. (If the unit is not off or disconnected from the network for very long, then typically the instrument will get the same address as it had previously.)

In this event, you may need to abort the update (see CAUTION that follows), go the Configuration menu and get the current IP address, and use that address in the update process. If this does not work the first time, you may need to try again or use the manual IP address mode. Alternatively, you can temporarily set the IP address to the default value (192.168.1.1) once it is in upgrade mode by pressing the **SEL** button, and use that address in the upgrade procedure. After the upgrade is completed, the original IP address will be restored.

⚠ *CAUTION. Once the instrument has started to erase internal flash memory, DO NOT remove power from the instrument. If you do so, the instrument will only boot in the software update mode until new software has been loaded into the instrument flash memory. Therefore, use the MEASURE select buttons to abort a software update. Remove power from the instrument only as a last resort.*

■ The instrument will automatically switch to factory default if DHCP discovery fails. Press the SEL button to restart DHCP discovery.

NOTE. FAULTS will not be logged into the diagnostic log because the boot monitor is running, not the main instrument software.

Button Animation During Upgrade

Button indication	State	Description
Flashing DISPLAY SELECT buttons	Ready	Instrument is ready to receive software data and is waiting for a connection from the PC host
Flashing arrow buttons	DHCP discovery	Instrument is negotiating for an IP address from a DHCP server
SEL button lit	Factory IP configuration	Instrument is configured with factory default IP address of `192.168.1.1`
Arrow and SEL not lit	Manual IP configuration	Instrument is configured with manual IP configuration
Arrow buttons lit, SEL not lit	DHCP configuration	Instrument has received an IP address from a DHCP server

Button Animation During Upgrade (cont.)

Button indication	State	Description
WFM button lit	Receiving software	Instrument is receiving software data
VECT button lit	Erasing flash memory	Instrument is erasing internal flash memory
MEAS button lit	Programming flash memory	Instrument is programming internal flash memory
1X button lit	Verifying flash memory	Instrument is verifying programming of internal flash memory

Installing the Software

To install new software in an instrument:

Download the Software Package

1. To download the latest version of the instrument software, navigate to the Tektronix Web site at the http://www.tek.com/products/video_test.

2. Click on the *Download Software* link and then select the *Video/Audio Signal Monitors* link. This will give you a list of available downloads.

   Sort by Date Added to get the most current version of software and then find your instrument model for the software-upgrade package you need.

3. Click the downloaded archive and extract the archived files into a directory of your choice.

4. Extract the following files: transfer.exe, firmware.pkg and readme.txt.
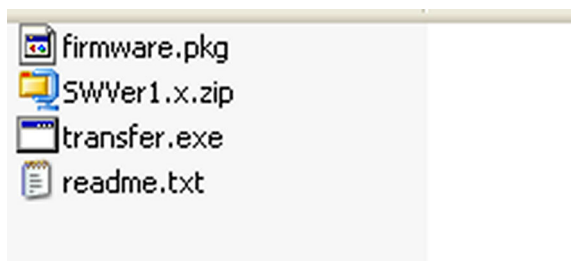
Enter System Upgrade Mode

5. The IP address for the instrument will appear on the upgrade screen. You can also find it in **Config > Network Settings > IP Address**.

6. On the instrument, press the left-arrow key to return to the main CONFIG menu and select **Utilities**.

7. Highlight **System Upgrade**, and press **SEL**. This displays the System Software Upgrade window.

8. To continue with the upgrade, press the right-arrow key to select **Continue** and press **SEL**.

   The monitor display goes to black and the DISPLAY SELECT keys flash in sequence.
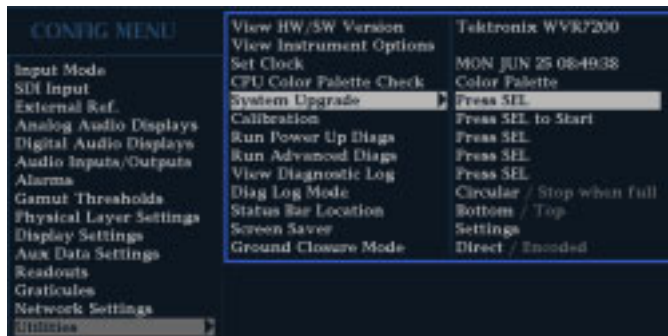
9. If the arrow keys also flash, the instrument is in DHCP mode. *Wait until the arrow keys stop flashing before proceeding.*
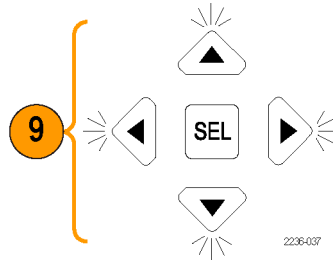
Run the Upgrade

10. On the PC, double-click the **transfer.exe** file to launch the transfer program.

11. In the window that appears, type the network address (for example: 128.181.221.002) or DNS name of the instrument you want to update. Make sure to delete any leading zeroes, as shown in the example in the illustration.

Press **Enter**.

NOTE. To stop the software update, you can press any MEASURE button on the front-panel of the instrument before the words Erasing Flash... appear in the transfer utility window.

12. The transfer utility displays **done** when the software upgrade completes.

When the software upgrade completes, the instrument will reboot.

13. To update another instrument, type the IP address of that instrument at the prompt and press **Enter** on your PC keyboard to start the software upgrade. If you won't be updating another instrument, press **Enter** to exit the transfer utility.

Upgrading Multiple Instruments

You can upgrade several instruments in one session, one at a time, if you have determined their addresses. To upgrade, use the Windows Command Prompt. Enter the following line in a Command Prompt window (substituting the addresses of your machines):

```
transfer.exe 192.181.115.1 192.181.115.2 192.181.115.3
```

Separate the addresses with a space.

Alternatively, you can use file redirection to input the IP addresses to the transfer.exe utility. To do this, create a text file containing a carriage-return delimited list of IP addresses or DNS names for the instruments to be updated. If you created a text file named HOSTS.TXT, you would enter the following command to update a group of instruments:

```
transfer.exe < HOSTS.TXT
```

NOTE. You can also place the instrument into the upgrade mode by pressing the FULL button while applying power to the instrument.

Verifying the Upgrade

After you have completed the software upgrade, the instrument will reboot and come up in an operational mode.

To verify the functional performance of your instrument, perform the *Incoming Inspection* procedures.

NOTE. See the Readme.txt file that is included with the software-upgrade package to determine whether all of the current Configuration menu and instrument-mode settings were preserved through upgrading.

Description of Cable Types

The Cable Type selection in the CONFIG > Physical Layer Settings menu enables you to specify the type of cable that most closely matches the cable used to connect the signal source to the instrument. The following is a list of supported cable type descriptions:

■ **Belden 8281**. Coax-Double Braided RG-59/U Type Number of Coax: 1 RG Type: 59/U AWG: 20 Stranding: Solid Conductor Material: BC- Bare Copper Insulation Material: PE-Polyethylene Outer Shield Material: TC-Tinned Copper/TC-Tinned Copper Outer Jacket Material: PE-Polyethylene Plenum (Y/N): N Plenum Number: 88281 Nom. Characteristic Impedance: 75 ohm Applications: Precision Video Cable for Analog and Digital, Double Braided RG-59/U Type, Broadband Coax, Headend/Video Cables, Precision Video Cable for Analog and Digital, RG-59/U Type

■ **Belden 1694A.** Coax-Low Loss Serial Digital Coax Number of Coax: 1 RG Type: 6/U AWG: 18 Stranding: Solid Conductor Material: BC-Bare Copper Insulation Material: Gas-injected FHDPE-Foam High Density Polyethylene Outer Shield Material Trade Name: Duofoil: Outer Shield Material: Aluminum Foil-Polyester Tape-Aluminum Foil/TC-Tinned Copper Outer Jacket Material: PVC-Polyvinyl Chloride Plenum (Y/N): N Plenum Number: 1695A Nom. Characteristic Impedance: 75 ohm Applications: Precision Video Cable for Analog and Digital, Low Loss Serial Digital Coax, Video Cable, Precision Video Cables for Analog and Digital Applications, Precision Video Cable for Analog and Digital, RG-6/U Type

■ **Belden 1505**. Coax-RG-59/U Type Number of Coax: 1 RG Type: 59/U AWG: 20 Stranding: Solid Conductor Material: BC-Bare Copper Insulation Material: Gas-injected FHDPE-Foam High Density Polyethylene Outer Shield Material Trade Name: Duofoil: Outer Shield Material: Aluminum Foil-Polyester Tape-Aluminum Foil/TC-Tinned Copper Outer Jacket Material: PVC-Polyvinyl Chloride Plenum (Y/N): N Plenum Number: 1506A Nom. Characteristic Impedance: 75 ohm Applications: Broadband Coax, Headend/Video Cables, Video Cable, Precision Video Cables for Analog and Digital Applications, Precision Video Cable for Analog and Digital, RG-59/U Type

■ **Belden 1855A.** Coax-Sub-Miniature Number of Coax: 1 RG Type: Sub-miniature 59/U AWG: 23 Stranding: Solid Conductor Material: BC-Bare Copper Insulation Material: Gas-injected FHDPE-Foam High Density Polyethylene Outer Shield Material Trade Name: Duofoil: Outer Shield Material: Aluminum Foil-Polyester Tape-Aluminum Foil/TC-Tinned Copper Outer Jacket Material: PVC-Polyvinyl Chloride Plenum (Y/N): N Nom. Characteristic Impedance: 75 ohm Applications: Video Cable, Precision Video Cables for Analog and Digital Applications, Precision Video Cable for Analog and Digital, Sub-Miniature, Precision Video Cable for Analog and Digital, Sub-Miniature RG-59/U Type

■ **Canare L-5CFB.** Coax-Solid Copper Center Conductor; Foam PE Dielectric Tinned Copper Braid + 100% Foil Shield Dielectric; 100% Sweep Tested; Nominal O.D. in. (mm): .303 (7.7); PVC Jacket Thickness in. (mm): .043 (1.1)

■ **Image 1000.** Coax-Conductor size: nominal mm 1.0; Conductor material: Copper, Plain; Dielectric material: Cellular PE; Inner Screen: Aluminium Polyester Tape; Outer Screen: Tinned Copper Braid 95%; Jacket Material: LSOH (PVC to special order); Nominal Diameter: mm 6.8; Cable weight: kg/km 60.0; Impedance ohms (+/-1): 75.0 Capacitance (nominal): p/F/m 56.0 DC resistance max ohms/100m: 2.19 Velocity of propagation %: 83.0

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