Digital and Composite Waveform Rasterizers

▶ WVR600 Series – WVR610A · WVR611A

▶ **Features & Benefits**

Serial Digital Interface (SDI), and SDI and Composite Models Support Digital or Hybrid Applications

Analog, Digital and Embedded Audio Options

High-resolution XGA Output for Crisp, Easy-to-Read Displays

FlexVu™ Display – Unique, Flexible Tiling for True "Four Instruments in One" Capability

Fully Digital Processing for Accurate, Repeatable, Drift-free Operation

Exclusive Tektronix Gamut Displays Ensure Compliant Content

Full Remote Control for Complete Installation Flexibility

Instrument Presets for Quick Recall of Commonly Used Configurations

Exclusive Session Screens for Content Status at a Glance

Backlit Buttons for Ease of Operation in Darkened Environments

Online Help Shortens Learning Time

Temperature-dependent Internal Fans Optimize Cooling and Noise

▶ **Applications**

Broadcast Monitoring of Standard Definition (SD) Digital and Composite Signals

Content QA and Compliance Checking
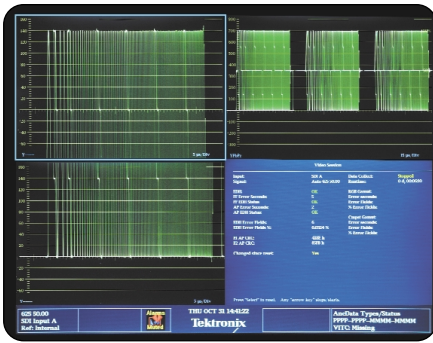
Camera Shading

Contribution Validation

The WVR600 Series Rasterizers broaden the Tektronix line of waveform monitoring products by introducing support for SD-SDI (WVR610A) and hybrid SD-SDI/Composite (WVR611A) applications in a convenient 1 RU form factor. Analog, digital or embedded audio monitoring options can be selected for either instrument.

Powerful Display Flexibility – FlexVu™

To maximize application flexibility, a high-resolution, tiled display design lets users customize presentation of information for each operation they wish to perform. Waveform, vector, gamut, audio (optional), status and picture monitor displays can be combined with line select, gain and magnification in nearly unlimited combinations. These instruments offer a number of exclusive displays that speed and simplify the monitoring and measurement tasks, continuing the Tektronix tradition of measurement leadership.

Unprecedented Display Flexibility

The FlexVu display lets users combine information in ways that have never been available in any video monitoring product. Instead of making users cycle through preset displays to view the information they require, Tektronix has designed an optimal approach that offers complete flexibility.

Furthermore, any time you need a closer look at an individual display, just press the "Full Screen" button for a high-resolution 1024x768 presentation.

A content QA application demonstrates the display flexibility. The instrument is set up to display an RGB paraded waveform in one tile, a view of the white level at 5X gain in another, a view of the black level at 5X gain in a third tile and video session statistics summarizing the overall content quality in the remaining tile. Together this creates an information presentation never before available.

Tektronix

Enabling Innovation

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▶ *Quality of your content at a glance: Waveform parade, white and black levels and a full set of summary statistics.*

After format conversion, problems in the horizontal blanking interval are often the first indication of non-compliant content. For example, by displaying a digitally magnified view of HBLANK, a traditional paraded waveform, a field sweep, and a composite representation of the component signal, all on a single display, these instruments offer an invaluable perspective on this critical part of your content.
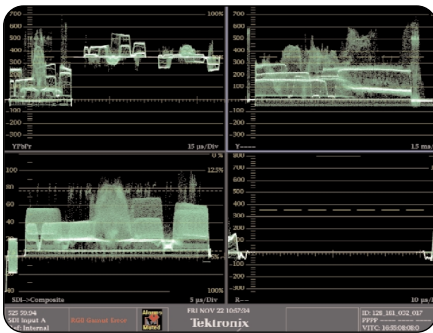
▶ *Magnified view of HBLANK, a paraded waveform, a field sweep, and a composite representation of the component signal.*

Waveform Displays

A complete range of display options lets users choose between parade or overlay presentation of SDI signals in RGB, YPbPr, YRGB or composite formats. Full horizontal timing flexibility is provided with 1Line, 2Line, 1Field and 2Field sweep modes, with or without timing magnification. Both fixed and variable vertical gain are offered, each with the outstanding accuracy and repeatability that comes from a fully digital design.
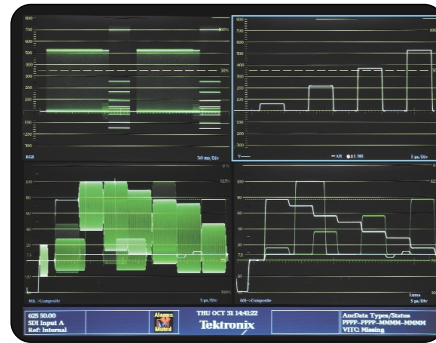

▶ *Four different views of the same signal.*

High-performance composite waveforms are available in the WVR611A. Wide bandwidth and outstanding display quality combine to let users discern even the finest details. A variety of filtering options allows optimized presentation of information.

Vector Displays

Traditional component and composite vectors are offered, with selectable 75% and 100% targets. Each display automatically selects the appropriate graticule based on the input format.

The patented Tektronix Lightning display provides unique insight not available in traditional vector displays – allowing users to visualize both luma and chroma amplitudes, as well as quantify inter-channel timing, without taking the equipment out of service.
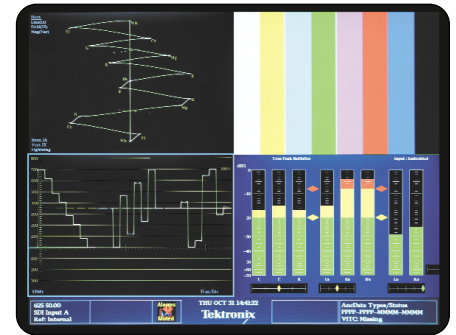
▶ *Lightning display showing Pb advanced timing error.*

Gamut Displays

Monitoring for gamut compliance, traditionally a strength of Tektronix products, is expanded in the WVR610A and WVR611A products. The patented Tektronix Diamond display for monitoring RGB gamut compliance is augmented by the new Split Diamond display. These displays let the operator visualize whether the content is RGB gamut compliant with a single glance. Plus, they are designed to help isolate the out-of-gamut component just as easily.
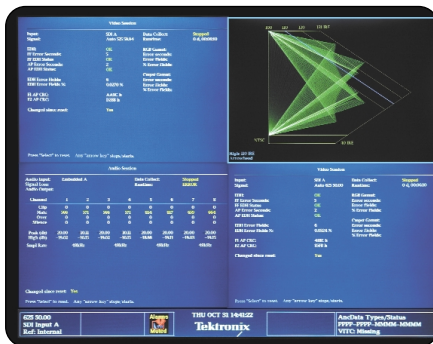
For SDI component content that is destined for broadcast in composite systems, the unique Tektronix Arrowhead display can be used to monitor composite gamut compliance without the need for a separate encoder. The power of the FlexVu display in the WVR600 Series lets you monitor the Diamond and Arrowhead displays simultaneously for complete confidence in content compliance throughout the delivery chain.

▶ *Diamond, Split Diamond and Arrowhead shown in conjunction with a summary of all video errors.*

Each of these displays offers user-selectable gamut thresholds so operators can set monitoring limits appropriate to their specific operation. In addition, gamut monitoring is fully integrated with the powerful alarm logging and reporting capability of the WVR600 Series.

Audio Displays (Optional Capability)

Available in the WVR600 Series are a range of audio options that can add comprehensive audio monitoring capabilities for analog audio, digital audio or both.

Level bars display, or both bars and a Lissajous display, can be selected to provide monitoring for digital audio formats, embedded or externally input, up to 7.1 (or up to four stereo pairs), or for up to two sets of six balanced analog inputs. The level meters offer selectable meter ballistics and scaling. These instruments have a set of two programmable levels designed to optimize detection of out-of-range conditions in analog signals, or in digital signals derived from analog sources. The over and silence settings augment digital clip and mute detection by letting users select levels to represent these conditions in the analog audio domain.

▶ *A summary of audio errors is combined with level bars and Lissajous, picture monitor and vector.*

In addition to audio displays, a full range of audio error conditions can be selected for monitoring, including AES unlock, parity errors and checksum errors.

Status Displays

The WVR600 Series offer a variety of displays designed to show status at a glance, in addition to the status bar continually displayed at the bottom of the screen.

A comprehensive overview of the video content status is presented in the video session screen. Offering a time-based compilation of information, this screen is ideal for presenting evidence of compliance after content screening. Information on input format and session time is presented, along with statistics on Error Detection and Handling (EDH)/Cyclic Redundancy Check (CRC) errors and gamut errors. Information is presented in errored seconds, errored frames and percentage of total frames – together providing a unique quantitative insight to content quality.

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▶ *WVR611A front panel.*

▶ *Audio and video summary statistics combined with a gamut display.*

When one of the audio options is installed, an audio session screen is available to confirm evidence of compliance. This screen records the highest true peak, as well as the number of mutes, clips, overs and silences during the session time.

An alarm status screen can also be displayed providing up-to-the-moment information on the state of each condition currently being monitored by the instrument.

To support unattended monitoring applications, as well as provide documentation for service level agreements, the system maintains a log of all monitored alarms, time stamped with Vertical Interval Time Code (VITC) or Longitudinal Time Code (LTC) and time of day references.

Picture Monitor Display

For a qualitative view of the content, a full-color picture monitor is offered, which can be displayed either in a single tile or as a full-screen presentation. This display is compatible with all input formats and features automatic adjustment for aspect ratio and number of active lines.

Remote Operation

Powerful and flexible remote control features help users integrate these instruments into a variety of remote monitoring scenarios.

Using the built-in 10/100Base-T Ethernet port, users can remotely control every major feature of the instrument and view the display, as well as download the alarm log and print the screen contents for easy record keeping. This powerful Java application offers a variety of control options to suit individual preferences, and allows you to create and recall an unlimited number of instrument presets.

Where simplified interfacing is the dominant requirement, a ground-closure type remote interface provides access to recall of instrument presets and an alarm signal output. The ground-closure interface is ideal for use in master control scenarios or in outside broadcast applications.
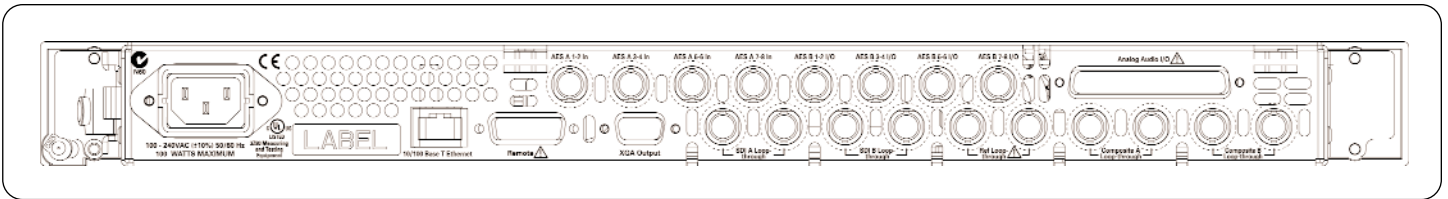
▶ *WVR611A back panel with audio options.*

▶ Characteristics

Serial Digital Video Interface

Formats Supported – ITU-R BT.601 525 line and 625 line, manual or auto detect.

Inputs – 2, only one active at a time.

Input Type – Passive loopthrough BNC, 75 Ω compensated.

Input Level – 800 mV$_{p-p}$, ±10%.

Return Loss –
≥25 dB from 1 MHz to 270 MHz, power on;
≥15 dB from 1 MHz to 270 MHz, power off.

Loopthrough Isolation – >50 dB to 300 MHz.

Receiver Equalization Range –
Proper operation with up to 23 dB loss at 135 MHz using coaxial cable with $1\sqrt{F}$ loss characteristics. Launch amplitude accommodation per SMPTE 259M.

Composite Video Interface (WVR611A Only)

Formats Supported – NTSC, NTSC no setup; PAL I, B, D, G and H.

Inputs – 2, only one active at a time.

Input Type – Passive loopthrough BNC, 75 Ω compensated.

Input Dynamic Range – ±6 dB.

Maximum Operating Amplitude – −1.8 V to +2.2 V, DC + peak AC.

Absolute Maximum Input Voltage – −8.0 V to +8.0 V, DC + peak AC.

DC Input Impedance – 20 kΩ, nominal.

Return Loss – >40 dB to 6 MHz, inputs and power on, typical 35 dB with power off.

Cross-talk Between Channels – >60 dB to 6 MHz.

Loopthrough Isolation – >70 dB to 6 MHz.

DC Offset with Restore On – <2 mV.

DC Restore 50 Hz and 60 Hz Attenuation – Fast mode >95% attenuation, slow mode <10% attenuation.

Lock Range – ±50 ppm remains locked.

External Reference

Sync Formats – NTSC and PAL.

Input Type – Passive loopthrough BNC, 75 Ω compensated.

DC Input Impedance – 20 kΩ, nominal.

Return Loss – >40 dB to 6 MHz.

Lock Range – ±50 ppm remains locked.

Monitor Output

Signal Format (XGA D-sub Output) – 1024x768, 60 Hz vertical rate.

Serial Digital Waveform Vertical Characteristics

Vertical Measurement Accuracy – At X1 gain, ±0.5% of 700 mV full scale; at 5X gain, ±0.2% of 700 mV full scale.

Gain – 1X, 5X, variable range 0.25X to >7.5X.

Frequency Response – Luminance (Y) channel ±0.5% to 5.75 MHz, Color Difference channels (Pb, Pr) ±0.5% to 2.75 MHz.

Analog Composite Waveform Vertical Characteristics (WVR611A Only)

Vertical Measurement Accuracy – ±1% all gain settings.

Gain – 1X, 5X, variable range 0.25X to >7.5X.

Frequency Response – Flat to 5.75 MHz, ±1%.

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Waveform Horizontal Deflection

Sweep Timing Accuracy – ±0.1%.

Sweep Linearity – ±0.1%.

Rates
In OVERLAY Mode –
1 Line: 5 us/div.
2 Line: 10 us/div.
1 Field: 1.5 ms/div for 60 Hz and 2 ms/div for 50 Hz.
2 Field: 3 ms/div for 60 Hz and 4 ms/div for 50 Hz.

Audio Characteristics (Optional Capability)
Level Meter Resolution – 0.056 dB steps at 30 dB scale from full scale to –20 dbfs; 0.20 dB steps at 70 dB scale for signals above –20 dbfs.

Meter Ballistics – True peak, PPM type 1, PPM type 2, extended VU.

Defined/Programmable Level Detection – Mute, clip, user programmable silence, over.

Level Meter Accuracy Over Frequency – –0.5 dB (for analog), –0.2 dB (for digital) from 20 Hz to 20 kHz, 0 to –40 dbfs sine wave, Peak Ballistic mode except for some submultiples of the 48 kHz sampling frequency.

Digital Audio (Options DG and DA)
AES Inputs – 2 sets of 8 channels each, 32 kHz, 44.1 kHz, 48 kHz, 96 kHz, 24-Bit.

AES Input Characteristics – BNC, 75 Ω terminated, unbalanced, 0.2 V to 2 V$_{p-p}$.

AES Input Return Loss – >30 dB relative to 75 Ω from 0.1 to 6 MHz.

AES Outputs (from embedded sources) – Up to 8 channels, 48 kHz, 20-Bit.

AES Output Characteristics – BNC, 75 Ω terminated, unbalanced, 0.9 V to 1.1 V$_{p-p}$ into 75 Ω.

AES Output Return Loss – >25 dB relative to 75 Ω from 0.1 to 6 MHz.

AES Output Jitter – 3.5 nsec, peak, typical, with 700 Hz high-pass filter per AES specification.

Analog Audio (Options AN and DA)
Analog Inputs – Up to 2 sets of 6 channels each.

Analog Input Characteristics – Balanced, unterminated via 37-Pin D-sub connector.

Cross Talk – <88 dB.

Input Impedance – 35 kΩ, typical.

Analog Outputs – Up to 6 channels.

Analog Output Characteristics Balanced or Unbalanced – Unterminated via 37-Pin D-sub connector.

Maximum Output Level –
Balanced: +24 dBu ±0.5 dB
Unbalanced: +10 dBv ±0.5 dB.
Maximum Average Power: 25 mW per pair.
Recommended Load: 600 Ω or higher.

Digital Input to Analog Output Gain Accuracy Over Frequency – ±0.5 dB, 20 Hz to 20 kHz, 0 to –40 dbfs, 20- or 24-Bit inputs.

Analog Input to Analog Output Gain Accuracy Over Frequency – ±1 dB, 20 Hz to 20 kHz, 24 dBu to –16 dBu.

Output Impedance – 50 Ω, nominal.

Power
100 to 240 VAC –10%.
75 W.

Physical Characteristics

Dimensions	mm	in.
Height	44.45	1.75
Width	482.6	19
Depth (front to back including handles and BNCs)	514.35	20.25
Weight	**kg**	**lbs.**
Net	3.97	8.75

▶ Ordering Information

WVR610A

ITU-R BT.601 Serial Digital (2 inputs).

WVR611A

ITU-R BT.601 Serial Digital (2 inputs) and Analog Composite (2 inputs).

Options

Opt. AN – Analog audio capability (see optional accessories).

Opt. DG – Digital audio capability.

Opt. DA – Digital and analog audio capability (see optional accessories).

Power Plug Options

Opt. A0 – US Plug, 115 V, 60 Hz.

Opt. A1 – Euro Plug, 220 V, 50 Hz.

Opt. A2 – UK Plug, 240 V, 50 Hz.

Opt. A3 – Australian Plug, 240 V, 50 Hz.

Opt. A5 – Swiss Plug, 220 V, 50 Hz.

Opt. A10 – China Plug, 50 Hz.

Service Options

Opt. C3 – Calibration Service 3 Years.

Opt. C5 – Calibration Service 5 Years.

Opt. D3 – Calibration Data Report 3 Years (with Option C3).

Opt. D5 – Calibration Data Report 5 Years (with Option C5).

Opt. R3 – Repair Service 3 Years.

Opt. R5 – Repair Service 5 Years.

Optional Accessories

012-1658-00 – Analog audio breakout cable.

Upgrades

Check www.tektronix.com for new firmware downloads.

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Our most up-to-date product information is available at:
www.tektronix.com

Tektronix Measurement products are manufactured in ISO registered facilities.

CE ISO 9001

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