Multiformat, Multistandard Portable Waveform Monitor

WFM2200 Datasheet

Features & Benefits

- Portable Instrument that is Ideal for Field Production Setup and Troubleshooting
- Operates with Internal, Rechargeable, and Replaceable Battery Unit; External Recharger Kit and a Battery Unit for Replacement is Available as an Option
- Two SDI Inputs with Multiformat, Multistandard Support
  - WFM2200 comes standard with auto-detection of HD/SD-SDI and multiple Dual Link video formats
  - Upgradeable to include 3G-SDI (Level A and Level B) format support with the purchase of an upgrade key (Option 3G)
- 3G/HD/SD Color Bar and Pathological Signal Generator with Genlock and Moving Picture / Circle for Troubleshooting Signal Paths and Equipment (Note: Option 3G is required for 3G-SDI signal generation)
- Audio Monitoring with up to 16-channel Embedded AES/EBU Audio Simultaneous Monitoring Support with Multichannel Surround Sound*1 Display and Flexible Lissajous Display
- Independent AES Input and Output for Audio Facility Testing
- AES Audio Test Tone Generator for Embedded and AES Output
- Ability to Display Waveform of External Reference Signal and LTC Signal for Quick Diagnosis of the Potential Issues in Sync and Time Distribution System
- Tektronix-patented Diamond and Arrowhead Displays for Color Gamut Compliance Monitoring
- Comprehensive Data Monitoring helps to Quickly Resolve Difficult Content Quality and Reliability Issues (Option DATA)
  - Simultaneous CEA708/608 Closed Caption monitoring; Teletext and OP47 subtitle monitoring
  - Detect and decode ANC data including AFD, WSS, Video Index, TSID, V-Chip, Broadcast Flag/CGMS-A, VITC, LTC, and ANC TC
  - ARIB STD-B35/B37/B39, TR-B22, and TR-B23 support
  - ANC Data Inspector and SDI Data Analysis display helps troubleshoot ANC data and SDI data problems
- Variety of Monitoring Displays
  - Tektronix-patented Timing and Lightning displays makes facility and interchannel timing easy
  - Waveform display of external reference (Black Burst or Tri-Level Sync)
  - Extensive alarms, status reporting, and error logging for 10,000 events simplifies error correction tasks
  - Voltage and Timing Cursor for precise measurement
  - User-definable Safe Area Graticules and AFD Graticule facilitate editing and format conversion tasks
- Unmatched Display Versatility
  - Flexible Quad Tile display tailored to various application needs to increase productivity
  - Full Screen mode that maximizes display size for precise adjustments
  - Thumbnail Picture for content verification
- Unmatched Usability
  - 32 instrument presets for quick recall of commonly used configurations tailored to colorists, editors, or operators
  - USB port enables easy transfer of presets, screenshots, and error log
  - Internal speaker and headphone port for easy monitoring of audio channels
  - Intuitive menu structure and context-sensitive help
  - High-brightness display with crisp, high-resolution LED backlight, ideal for indoor and outdoor usage
  - SNMP and Ethernet remote interface capabilities facilitate centralized monitoring and control
  - Super lightweight and low power consumption design for portable, battery-powered applications

Tektronix®

Applications

- Field Production Setup and Troubleshooting
- System Check Tool in Distribution and Broadcast
- Portable Engineering Tool in Manufacturing

*1 Audio Surround Sound Display licensed from Radio Technische Werksütten GmbH and Co. KG (RTW).

WFM2200

The WFM2200 Portable Video Waveform Monitor provides an ideal solution for basic video and audio monitoring needs with an integrated high-brightness, low-power consumption LED backlit display in a convenient portable form factor. This versatile instrument can operate with an internal battery and DC input through an AC-DC converter unit.

Standard configuration provides multiformat support for HD-SDI (SMPTE 292), SD-SDI (ITU-R BT.601), and Dual Link (SMPTE 372) signal formats. The instrument provides automatic format detection, and with Option 3G supports Level A and Level B SMPTE 425/424 formats.

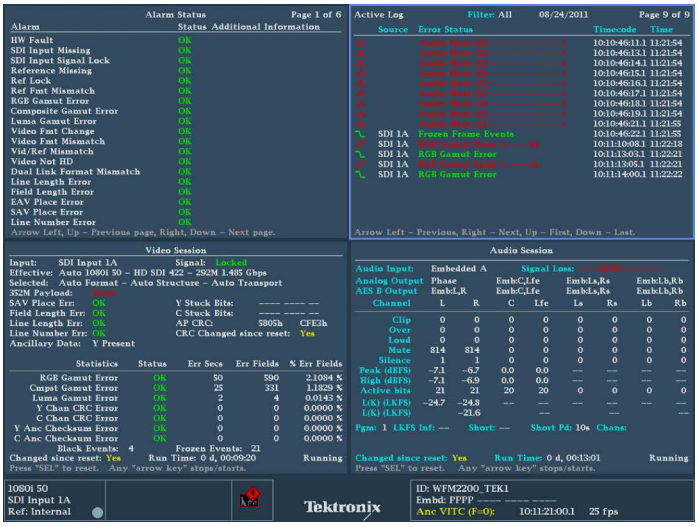
Audio monitoring support for up to 16 channels of Embedded AES/EBU Audio provides a variety of audio level bar monitoring, multichannel surround sound display*1, and flexible Lissajous display. An internal speaker or headphone port can be used for easy compliance verification of digital audio without the need for an additional piece of equipment.

This instrument provides the reliability of the Tektronix waveform monitors family in a portable, basic monitoring product. The WFM2200 offers uncompromised monitoring quality with sharp CRT-like traces, patented Gamut displays, picture thumbnail, display freeze, and an error log for 10,000 events for efficient content compliance verification.

- Video Monitoring Standards and Formats
  - 3G-SDI (Level A and Level B) – Option 3G
  - High Definition SDI
  - Standard Definition SDI
  - Dual Link (4:2:2, 4:4:4, alpha channel, 10 bit, 12 bit)
- Color Gamut Monitoring
  - Arrowhead Display
  - Diamond and Split Diamond Displays
- Digital Audio Support
  - 16-channel Digital AES/EBU (Embedded)
  - AES/EBU Input and Output
  - Audio Bar Displays
  - Lissajous Display
  - Surround Sound Display*1
  - AES Test Tone Generation for Embedded and AES Output
- Measurement and Analysis
  - Simultaneous CEA708/608 Closed Caption Monitoring; Teletext and OP47 Subtitle Monitoring – Option DATA
  - SDI Digital Data Analysis – Option DATA
  - ANC Data Inspector – Option DATA
  - Color Bar and Pathological Signal Generation with 16-channel Embedded Audio and Moving Test Signal

Ease of Use

The intuitive user interface provides backlit buttons and online help. 32 user-configurable presets allow users to recall commonly used configurations tailored to your personal work practices. These presets can be transferred to and from other units (same model) using the USB port. An Ethernet port allows for easy download of screenshots and the Error Log.



Quad Tile display of Alarm Status, Error Log, Video and Audio Sessions.

Picture display with Safe Area Graticule and AFD information.

See and Solve with Tektronix Displays

The “See and Solve” displays in Tektronix video monitors simplify video monitoring tasks such as calibration, error detection, and content correction allowing the user to detect errors at a glance and troubleshoot them efficiently.

Tektronix displays offer the sharpest CRT-like trace quality for clear waveform monitoring with the look and feel of an analog display. The familiar video waveform display can show SD/HD/3G-SDI signals in RGB, YPbPr, YRGB, or pseudo composite. Signal components can be displayed in either Parade or Overlay mode. Cursors within the waveform display allow precise measurement of Voltage and Time to be made. The vector display offers user-selectable graticules, color targets (75% or 100%), and color axis.

With several sweep rates and easy control of vertical gain and horizontal magnification, you can efficiently monitor and measure video waveform parameters.

Specialized displays provide summarized, yet comprehensive reports of alarms, session, and status of content. Powerful displays such as Video Status show a condensed view of error statistics, signal format, presence of ancillary data, and more. These Tektronix-exclusive displays simplify monitoring tasks by providing important content information at a glance.

Errors in the displays can automatically be logged in the Error Log and provided as a report.

Alarms, Quality Statistics, and Logging – Thorough and Fast Content Verification

The WFM2200 offers 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 display. 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) and gamut errors.

The Alarm Status display provides continuous information on the state of each condition currently being monitored by the instrument.

To support unattended monitoring and QC applications, as well as provide documentation for service-level agreements, these instruments maintain an error log of 10,000 events, which facilitates the detection and correction of problems. Log entries are recorded with date, time of day, and time code (VITC, LTC, ANC). The error log can be downloaded to a USB memory stick or through a network connection to .TXT or .HTM formats for easy record keeping and processing on spreadsheets or database software.

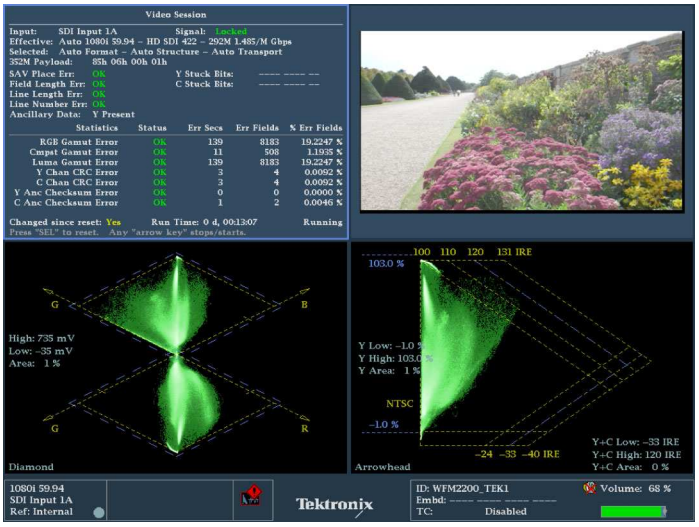
Picture Display – Quick Visual Confirmation and Precision Content Adjustment

For a qualitative view of the content, a full-color Picture display is offered, which can be displayed 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.

You can select bright-up conditions that show the location of RGB or composite gamut errors on the Picture display. The Line Select mode shows the location of the line currently selected within the Picture display.

Users can choose from several Safe Action and Safe Title graticules on the Picture display which help editors and operators easily identify incorrectly positioned video content such as graphics, titles, or logos.

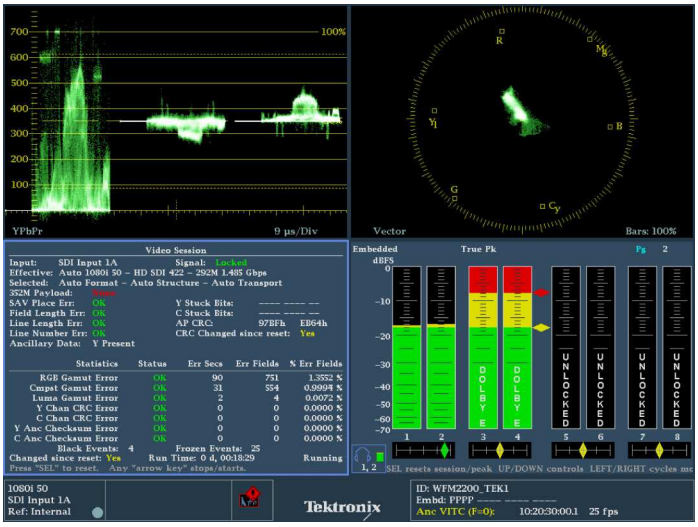
Graticule choices include the Safe Action and Safe Title graticules defined in SMPTE RP218, ITU, and ARIB standards, plus two sets of completely flexible, user-definable graticules. These graticules facilitate editing tasks and reduce the need for format conversions.



Diamond and Arrowhead gamut displays.

Patented Tektronix Gamut Displays – Efficiently Detect and Allow Correction of Gamut Problems

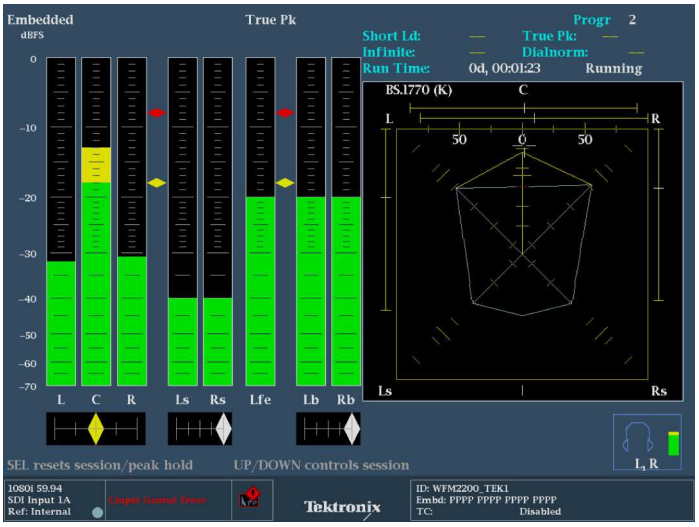
The Tektronix-patented Diamond, Split Diamond, and Arrowhead displays simplify the process of verifying gamut compliance and are ideal for colorists, editors, and operators to visualize whether the content is RGB or Composite Gamut compliant with a single glance. Plus, they are designed to help isolate 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. Within this display, a separate upper and lower luma-only gamut limit can be applied. Each of these displays offers user-selectable gamut thresholds so operators can set monitoring limits appropriate to their specific operation and include a preset for EBU-R103. You can also select bright-up conditions to see the location of gamut errors on the Picture display. In addition, gamut monitoring is fully integrated with the powerful alarm logging and reporting capabilities of the WFM2200.



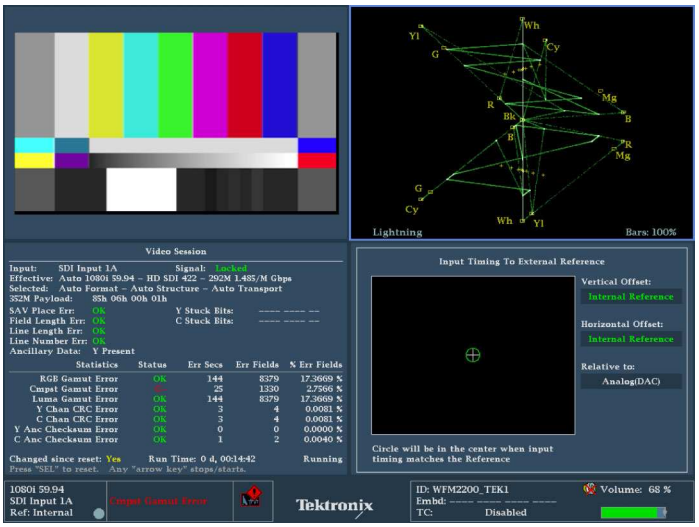
Quad Tile display allows for displays to be viewed simultaneously.

Quad Tile Display – Flexible Monitoring Configuration Customized to Suit Your Application

Tektronix offers multiple display options to suit a variety of applications that can be customized to the user's needs. The Quad Tile display provides flexibility to increase your productivity. The user can configure four different displays within the one instrument. A maximum of two traces can be displayed, along with picture, status, and audio bars to create flexible monitoring configurations that can be saved as presets for quick and easy recall. For instance, a waveform parade, vector, picture, and audio bar display can be configured to monitor the audio and video signal simultaneously within the Quad Tile display. Unlike instruments with predetermined view combinations, Quad Tile lets you create a Quad Tile display tailored to your specific needs and work practices. Each tile can be configured to enable easy signal analysis such as multiple alarm and status screens, different Safe Area Graticules and cursors on each tile, and more.



Audio display with Surround Sound monitoring.



Timing and Lightning displays simplify timing tasks.

Digital Audio and Video Monitoring in One Instrument

The WFM2200 provides high-quality digital filtering and oversampling to insure precise, reliable, and repeatable audio measurements. The instrument provides 16-channel embedded digital audio monitoring with Audio Bars, Lissajous Displays, Surround Display*1, and a headphone port for easy compliance verification of digital audio without the need for an additional piece of equipment. Flexible mapping of the embedded audio inputs to the audio bar displays allows for a variety of audio mixes to be supported from multiple stereo signals to surround and stereo support.

The Surround Sound*1 display provides intuitive graphical representation of channel interaction in a surround sound system. The Bars display provides indication for faults, audio levels, and provides indication of the presence of a Dolby format. The flexible Lissajous display allows the selection of any two audio channels.

Specialized audio displays provide deeper inspection of the signal and make the WFM2200 instrument a comprehensive compact waveform and audio monitor. The audio session displays summarize levels, faults, and number of active bits for each channel. These instruments also feature Audio Control Packet Data and Channel Status displays.

The Dolby Status display gives an in-depth view of VANC Dolby metadata that complies with SMPTE 2020 standard.

*1 Audio Surround Sound Display licensed from Radio Technische Werksütten GmbH and Co. KG (RTW).

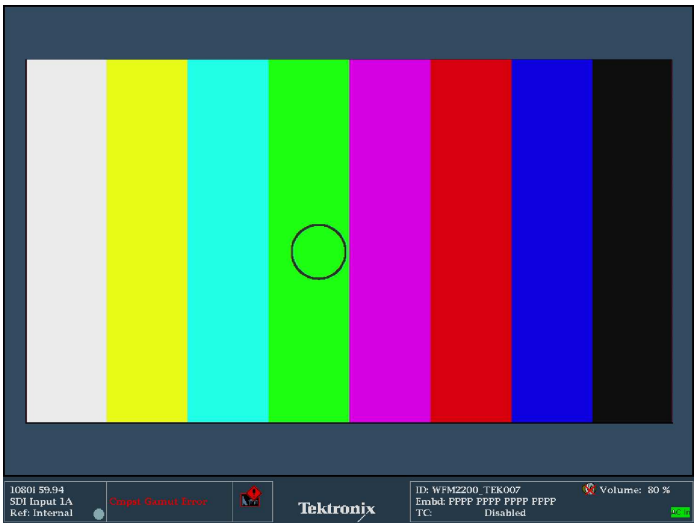
Facility Timing Made Easy

Synchronization is one of the most fundamental and critical procedures in a video facility. Every device in a system must be synchronized in order to successfully create, transmit, and recover video pictures and audio information. The intuitive Timing display clearly shows the timing offsets between HD and SD signals relative to the reference.

This Tektronix-patented Timing display makes facility timing easy through a simple graphical representation which shows the relative timing of the input signal and the reference signal (or a saved offset reference) on an X-Y axis. Simply adjust the timing of the equipment until the circle is within the center of the display for precise, direct measurements of vertical offset in number of lines and horizontal offset in µs.

The Lightning display shows luma and chroma amplitudes and helps users verify component timing using a color-bar signal. The Tektronix-patented Bowtie display complements the timing measurement capability of the Lightning display. Using a special Bowtie test signal in component format, this display helps make precise, accurate measurements of interchannel amplitude and timing.

Generator Status display.

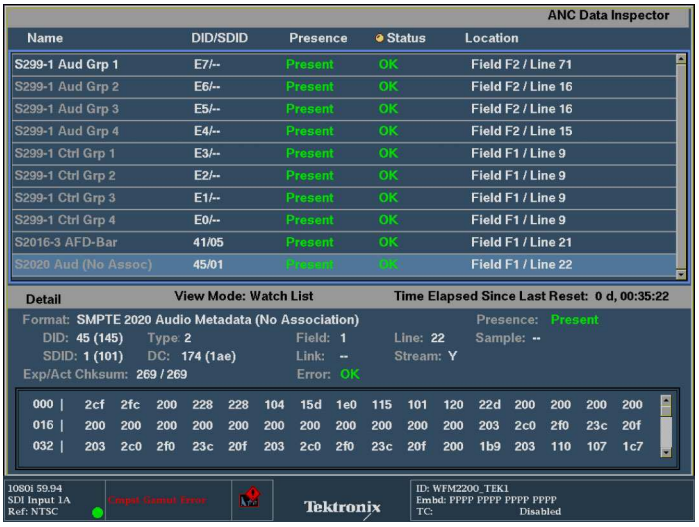


Generator Status display.

Troubleshoot Signal Paths

A simple test signal can be generated from the SDI output that produces 100% or 75% color bars along with pathological test signals with the ability to Genlock the test signal output to the External Reference Input. Audio test tones can be generated at the AES output or embedded in the SDI test signal output.

The user can change the test signal patterns, video format, whether the test signal is moving or static, audio test tone, and audio level. The moving circle allows the user to easily identify whether the test signal is active “live” or still and helps determine problems within the signal path that has been caused by equipment freezing on the last frame. This can be useful for troubleshooting a signal path or piece of equipment without the need to carry an additional generator.



ANC Data Inspector provides detailed content analysis.

Monitoring of Ancillary data (Closed Caption, Time Code, and AFD) using Aux Data Status.

Superior Data Analysis Capabilities for Operators and Engineers

The ANC Data Inspector provides an industry-leading solution to help broadcasters easily and accurately ensure that all required VANC data is present and correctly configured through an intuitive ANC data display.

In contrast to other solutions, the ANC Data Inspector enables operators to quickly and easily ensure that the VANC data is present and free of errors. When errors are detected, engineers are quickly guided to a more detailed view of the data packet content for further analysis.

Closed Caption (CEA708/608) and individual Teletext subtitles can be simultaneously decoded and displayed within the Picture display. Teletext subtitle pages can be decoded in either WST or OP47 format.

Datalist display provides detailed pixel-by-pixel information.

The Auxiliary Data Status display provides summary information on Active Format Description (AFD) per SMPTE 2016, Video Index Aspect Ratio, Wide Screen Signaling (WSS), V-Chip, TSID, CGMS-A, Broadcast Flag, CEA708/608 Closed Caption, Teletext, and Timecode information.

Today there is a wide array of metadata that provides information to a variety of equipment through the processing chain. Monitoring of this metadata is critical to ensure that the processing equipment correctly handles the signal. For instance, correct format of the AFD ensures that the aspect ratio on the display is correctly formatted and the automated AFD graticule is available for the Picture display of the WFM2200 along with the binary data and text description for easy monitoring.

The Datalist display provides detailed information on the actual data values in HD/SD-SDI and 3G-SDI (with Option 3G) input signals. Users can easily use this display to locate protocol errors in the input signals.

The right side of the display shows the data values in hexadecimal, decimal, or binary format and uses the following color coding for easy identification of data types and errors:

- Green – Active video data
- Blue – Data in horizontal or vertical blanking intervals
- White – EAV, SAV, and other reserved words
- Yellow – Data outside nominally allowed values
- Red – Data with illegal values

The left side of display shows un-interpolated digital values plotted against sample numbers as a digital waveform. You can configure this unique display in either Video mode or Data mode.

In Video mode, the display shows the Y, Cb, Cr values aligned temporally, but offset vertically. Like the waveform display, you can configure the display to show 1, 2, or all 3 components.

Video Input and External Reference Formats Supported

Automatic Detection of a Wide Range of Signal Formats

The WFM2200 waveform monitor accepts a wide variety of input signal formats and external references. The monitor will automatically detect the signal format and establish the appropriate settings for the various displays.

Setting	STD SD	STD HD	External Reference Inputs											
			Bi-level Sync		Tri-level 720p			Tri-level 1080p		Tri-level 1080i			1080 SF	
			NTSC	PAL	50 Hz	59.94 Hz	60 Hz	23.98 Hz	24 Hz	50 Hz	59.94 Hz	60 Hz	23.98 Hz	24 Hz
BT601 483i, 59.94 Hz (525)	X		X			X					X			
BT601 576i, 50 Hz (625)	X			X	X					X				
296M 720p, 23.98 Hz		X	X			X		X			X		X	
296M 720p, 24 Hz		X					X		X			X		X
296M 720p, 25 Hz		X		X	X					X				
296M 720p, 29.97 Hz		X	X			X					X			
296M 720p, 30 Hz		X					X					X		
296M 720p, 50 Hz		X		X	X					X				
296M 720p, 59.94 Hz		X	X			X					X		X	
296M 720p, 60 Hz		X					X		X			X		X
240M 1035i, 59.94 Hz		X	X			X					X			
240M 1035i, 60 Hz		X					X		X			X		X
274M 1080i, 50 Hz		X		X	X					X				
274M 1080i, 59.94 Hz		X	X			X					X			
274M 1080i, 60 Hz		X					X		X			X		X
274M 1080p, 23.98 Hz		X	X			X		X			X		X	
274M 1080p, 24 Hz		X					X		X			X		X
274M 1080p, 25 Hz		X		X	X					X				
274M 1080p, 29.9 Hz		X	X			X					X			

Setting	STD SD	STD HD	External Reference Inputs											
			Bi-level Sync		Tri-level 720p			Tri-level 1080p		Tri-level 1080i			1080 SF	
			NTSC	PAL	50 Hz	59.94 Hz	60 Hz	23.98 Hz	24 Hz	50 Hz	59.94 Hz	60 Hz	23.98 Hz	24 Hz
274M 1080p, 30 Hz		X					X					X		
274M 1080sf, 23.9 Hz		X	X			X		X			X		X	
274M 1080sf, 24 Hz		X					X		X			X		X
274M 1080sf, 25 Hz		X		X	X					X				
274M 1080sf, 29.9 Hz		X	X			X					X			
274M 1080sf, 30 Hz		X					X					X		

Supported Dual Link Formats

Format	Sample Structure	Frame/Field Rates
Dual Link		
1920 × 1080	4:2:2 YCbCr 10 bit	60, 60/1.001, and 50 progressive
	4:4:4 RGB 4:4:4:4 RGB +A 10 bit	30, 30/1.001, 25, 24 and 24/1.001 progressive, PsF 60, 60/1.001, and 50 fields interlaced
	4:4:4 RGB 12 bit	
	4:4:4 YCbCr 10 bit 4:4:4:4 YCbCr +A 10 bit	
	4:4:4 YCbCr 12 bit	
	4:2:2 YCbCr 12 bit 4:2:2:4 YCbCr +A 12 bit	
2048 × 1080	4:4:4 RGB 4:4:4:4 RGB +A 10 bit	30, 30/1.001, 25, 24, and 24/1.001 progressive, PsF
	4:4:4 RGB 12 bit	
	4:4:4 YCbCr 10 bit 4:4:4:4 YCbCr +A 10 bit	
	4:4:4 YCbCr 12 bit	
	4:2:2 YCbCr 12 bit 4:2:2:4 YCbCr +A 12 bit	
	4:4:4 XYZ 12 bit	

Supported 3G Single Link Formats

Format	Sample Structure	Frame/Field Rates
3G-SDI Formats		
Single Link		
1920 × 1080	4:2:2 YCbCr 10 bit Level A and Level B	50, 59.94, 60 progressive
	4:2:2 YCbCr 10 bit Level B	23.98, 23.98sF, 24, 24sF, 25, 25sF 29.97, 29.97sF, 30, 30sF progressive 50, 59.94, 60 interlaced
	4:4:4 YCbCr 10 bit 4:4:4:4 YCbCrA 10 bit Level B	
	4:4:4 RGB 10 bit 4:4:4:4 RGB +A 10 bit Level B	
	4:4:4 RGB 12 bit Level B	
	4:2:2 YCbCr 12 bit 4:2:2:4 YCbCrA 12 bit Level B	
	4:4:4 YCbCr 12 bit Level B	
2048 × 1080	4:4:4 RGB 12 bit Level B	23.98, 23.98sF, 24, 24sF, 25, 25sF, 29.97, 29.97sF, 30, 30sF progressive
	4:4:4 XYZ 12 bit Level B	
2 × HD 1920 × 1080	4:2:2 YCbCr 10 bit Level B	23.98, 23.98sF, 24, 24sF, 25, 25sF, 29.97, 29.97sF, 30, 30sF progressive 50, 59.94, 60 interlaced
2 × HD 1280 × 720	4:2:2 YCbCr 10 bit Level B	23.98, 24, 25, 29.97, 30, 50, 59.94, 60 progressive

Video Signal Generation and Genlock Signal Formats Supported

Output SDI Format	External Reference Inputs											
	Bi-level Sync		Tri-level 720p			Tri-level 1080p		Tri-level 1080i			1080 SF	
	NTSC	PAL	50 Hz	59.94 Hz	60 Hz	23.98 Hz	24 Hz	50 Hz	59.94 Hz	60 Hz	23.98 Hz	24 Hz
525i, 59.94 Hz	X			X		X			X		X	
625i, 50 Hz		X	X					X				
720p, 50 Hz		X	X					X				
720p, 59.94 Hz	X			X		X			X		X	
720p, 60 Hz					X		X			X		X
1080i, 50 Hz		X	X					X				
1080i, 59.94 Hz	X			X		X			X		X	
1080i, 60 Hz					X		X			X		X
1080p, 23.98 Hz	X			X		X			X		X	
1080p, 24 Hz					X		X			X		X
1080p, 25 Hz		X	X					X				
1080p, 29.97 Hz	X			X		X			X		X	
1080p, 30 Hz					X		X			X		X
1080p, 50 Hz		X	X					X				
1080p, 59.94 Hz	X			X		X			X		X	
1080p, 60 Hz					X		X			X		X
1080sf, 23.98 Hz	X			X		X			X		X	
1080sf, 24 Hz					X		X			X		X

Characteristics

Serial Digital Video Interface

Characteristic	Description
Inputs	2 inputs Auto-detection of 3G, Dual Link, HD, and SD signals (Option 3G required for 3G formats)
Input Type	BNC, internally terminated 75 Ω
Input Level	800 mV_{p-p}, ±10%
Input Equalization	270 Mb/s: Up to 315 m of type 1694A cable 1.5 Gb/s: Up to 170 m of type 1694A cable 3 Gb/s: Up to 115 m of type 1694A cable
Output	SDI Switched Output. Selectable, active input, or test signal
Return Loss (Inputs and Outputs)	>15 dB from 1 MHz to 1.5 GHz, power on or off >10 dB from 1.5 GHz to 3 GHz, power on or off

Serial Digital Audio Interface

Characteristic	Description
Input	48 kS/s, AES 3-ID, ANSI/SMPTE 276M
Input Type	BNC, internally terminated 75 Ω
Input Level	0.5 V_{p-p} to 2 V_{p-p}
Output	48 kS/s, AES 3-ID, ANSI/SMPTE 276M
Output Type	BNC, 75 Ω
Output Level	0.9 V_{p-p} to 1 V_{p-p} into 75 Ω

Linear Time Code Input

Characteristic	Description
Input	Linear Time Code per SMPTE 12M-1
Input Type	Unbalanced, BNC, >10 kΩ
Input Level	0.2 V_{p-p} to 5 V_{p-p}

External Reference

Characteristic	Description
Sync Formats	NTSC and PAL and tri-level sync
Input Type	BNC, 75 Ω internally terminated
Return Loss	>40 dB to 6 MHz >35 dB to 30 MHz
Lock Range	±50 ppm

Serial Digital Waveform Vertical Characteristics

Characteristic	Description
Vertical Measurement Accuracy	At 1x 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	
SD	Luminance (Y) channel ±0.5% to 5.75 MHz Color Difference channels (Pb, Pr) ±0.5% to 2.75 MHz
HD	Luminance (Y) channel ±0.5% to 30 MHz Difference channels (Pb, Pr) ±0.5% to 15 MHz
3G	Luminance (Y) channel ±0.5% to 60 MHz Difference channels (Pb, Pr) ±0.5% to 30 MHz

Waveform Horizontal Characteristics

Characteristic	Description
Sweep Timing Accuracy	±0.5%
Sweep Linearity	±0.2%

Audio Characteristics

Characteristic	Description
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, BBC PPM, extended VU
Defined/ Programmable Level Detection	Mute, clip, user-programmable silence, over
Level Meter Accuracy	±0.1 dB from 20 Hz to 20 kHz, 0 to –40 dBFS sine wave, Peak Ballistic mode

SDI Generator Characteristics

Characteristic	Description
Test Signals	100% Color Bar 75% Color Bar Pathological Signal
Output Format	525i/59.94 Hz 625i/50 Hz 720p/ 50 Hz,59.94 Hz, 60 Hz 1080i/50 Hz, 59.94 Hz, 60 Hz 1080p/23.98 Hz, 24 Hz, 25 Hz, 29.97 Hz, 30 Hz, 50 Hz,59.94 Hz, 60 Hz 1080PsF/23.98 Hz, 24 Hz
Reference Input Signal	NTSC/PAL black burst or HDTV tri-level sync (720p, 1080i)
Lock Range	±30 ppm
Genlock Time Adjustment	
Vertical Offset Range	± half of the frame length where the frame length is the shorter frame of the generated video or reference signal
Horizontal Offset Range	±32 µs Resolution: 37 ns Accuracy: 100 ns of the setting

Power

- Power adapter accepts 100 to 240 V AC ±10% 50/60 Hz
- Adapter output is 19 V DC nominal

Input Voltage

Characteristic	Description
Voltage Range	19 V DC nominal 10.75 to 20 V DC min-max operating
Supply Connection	2.5/5.5 mm DIN
Power Consumption	24 W typical 35 W max
Surge	20 A at 12 V
Fuse Rating	4 A, internal self-resetting fuse
Transient, Over, and Reverse Voltage	Reverse- and over-voltage protected to ±30 V DC The unit may power itself down in the presence of high transient voltages. This prevents damage to the unit and is not a fault

Physical Characteristics

Dimension (including boot, excluding projections)	mm	in.
Height	216	8.5
Width	208	8.2
Depth	36	1.4
Weight	**kg**	**lb.**
Net (w/ battery)	1.8	4
Net (w/o battery)	1.4	3

Environmental

Characteristic	Description
Temperature	
Operating	0 °C to +40 °C
Nonoperating	–20 °C to +60 °C
Humidity	
Operating	20% to 80% relative humidity at up to +40 °C, noncondensing
Nonoperating	5% to 90% relative humidity at up to +60 °C, noncondensing
Altitude	
Operating	Up to 10,000 ft. (3,000 m)
Nonoperating	Up to 40,000 ft. (12,000 m)

Ordering Information

Model	Option	Description
WFM2200		3G/HD/SD Waveform Monitor, 2 SDI Inputs (3G, HD, and SD-SDI support on the same inputs – auto detect) Base unit includes HD, SD, and Dual-Link signal format support Option 3G required for 3G-SDI support
	3G	Add support for 3G-SDI signal formats (Level A and Level B)
	DATA	Add Ancillary Data monitoring (including decoding of 708 and 608 Closed Captions, Teletext and OP47 Subtitles, AFD, and CGMS-A), and ANC Data Inspector

Note: Please specify power plug when ordering.

Post Sale Upgrade Options

Model	Option	Description
WFM220UP		Post Sale Upgrade for WFM2200 3G/HD/SD-SDI Waveform Monitor Option 3G required to be installed in the WFM2200 for 3G-SDI support
	3G	Add support for 3G-SDI signal formats (Level A and Level B)
	DATA	Add Ancillary Data monitoring (including decoding of 708 and 608 Closed Captions, Teletext and OP47 Subtitles, AFD, and CGMS-A), and ANC Data Inspector

International Power Plugs

Option	Description
Opt. A0	North America power
Opt. A1	Universal Euro power
Opt. A2	United Kingdom power
Opt. A3	Australia power
Opt. A5	Switzerland power
Opt. A6	Japan power
Opt. A10	China power
Opt. A11	India power
Opt. A12	Brazil power
Opt. A99	No power cord or AC adapter

Optional Accessories

Accessory	Description
WFM200BA	Rechargeable Battery Pack for Replacement
WFM200BC	External Battery Recharger Unit
WFM200FSC	Soft Carry Case for WFM2200

Service Options

Option	Description
Opt. C3	Calibration Service 3 Years
Opt. C5	Calibration Service 5 Years
Opt. D3	Calibration Data Report 3 Years (with Opt. C3)
Opt. D5	Calibration Data Report 5 Years (with Opt. C5)
Opt. G3	Complete Care 3 Years (includes loaner, scheduled calibration and more)
Opt. G5	Complete Care 5 Years (includes loaner, scheduled calibration and more)
Opt. R3	Repair Service 3 Years (including warranty)
Opt. R5	Repair Service 5 Years (including warranty)
Opt. R5DW	Repair Service Coverage 5 Years (includes product warranty period). 5-year period starts at time of customer instrument purchase. This option is available if the instrument is within product warranty. It is not available once instrument exits warranty period
Opt. R3DW	Repair Service Coverage 3 Years (includes product warranty period). 3-year period starts at time of customer instrument purchase. This option is available if the instrument is within product warranty. It is not available once instrument exits warranty period

WFM2200 connectors.

Rechargeable battery pack.

Portable case.

CE

Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.

Product(s) complies with IEEE Standard 488.1-1987, RS-232-C, and with Tektronix Standard Codes and Formats.

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For Further Information. Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit **www.tektronix.com**

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