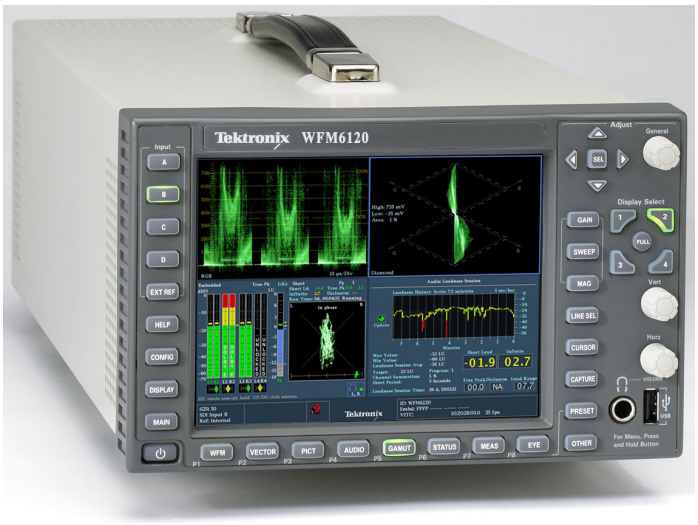
Multistandard, Multiformat Waveform Monitor

WFM6120 Datasheet

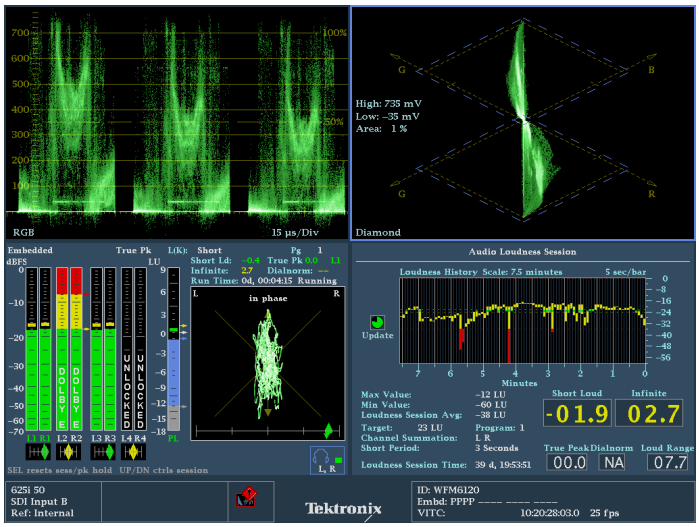


Features & Benefits

- The WFM6120 offers SD-SDI, analog video, and audio monitoring options in one platform
- The WFM6120 measurement and monitoring options provide a flexible range of configurations to maximize productivity
  - Industry-leading Loudness monitoring capabilities
  - Loudness Trend Chart with adjustable display window
  - CEA608 Closed Caption monitoring
  - ANC Inspector simplifies ANC data monitoring
  - AFD (Automatic Format Description) detection with automatic graticule display
  - Broadcast Flag/CGMS detection
  - Black/Frozen picture detect
  - Numerical and graphical display of analog and digital audio formats
  - In-depth digital data analysis helps quickly resolve difficult quality and reliability issues
  - High-performance physical layer measurements of eye and jitter are essential to resolve difficult troubleshooting tasks
  - CaptureVu® advanced video capture simplifies troubleshooting of intermittent errors
  - Monitoring of three user-defined Vertical Ancillary (VANC) data packets on the auxiliary Data Status display – including user-definable names for the three VANC data types with reference to their respective DID/SDID values
- Exceptional audio monitoring, with options for analog, embedded, and digital AES/EBU
- Monitoring of up to 16 channels of embedded AES audio on the audio level bar display (Option AD required)
- Tektronix See and Solve™ displays facilitate compliance verification with FlexVu™, the most powerful four-tile display available
- SNMP and Ethernet remote interface capabilities to facilitate centralized monitoring and control
- Instrument presets for quick recall of commonly used configurations
- Digital cursors for precise time and amplitude monitoring
- Teletext decode and display capability helps operators quickly verify these data services
- Standard and user-definable Safe Area Graticules facilitate editing tasks, reducing the need for reworks and format conversions
- Front-panel USB and headphone ports provide fast access to commonly used tasks
- Eye Overshoot/Undershoot Automated Measurement (Option PHY)
- Audio Channel Status Display (with any audio option)
- Audio Loudness and Peak Measurement (ITU BS.1770-3) (with audio option)
- Audio/Video Delay Measurement Enhancement (Out-of-Service) (Option AVD)
- Teletext Detect and Decode (Closed Caption / Subtitle only)
- Active Format Description (AFD) Decode – in ANC (SMPTE 2016)
- Video Index Decode – Aspect Ratio Only (SMPTE RP186)
- Wide Screen Signaling (WSS) Decode – both in PAL and in Digitized SD-SDI (ITU-BT.1119-2)
- Get/Load Captured Data through Network
- Active Format Description (AFD) Decode and Display Enhancements (SMPTE 2016)
- Decode and Display Broadcast Flag/CGMS
- Black and Frozen Picture Detect
- ANC-LTC and ANC-VITC Time Code Detection and Selection
- Infinite Persistence Mode for Trace, including Eye-pattern Trace (Requires Option EYE or Option PHY, and waveform trace)

Tektronix®

Transition from analog to digital standard definition.



FlexVu™ monitor your way with a variety of displays in multiple tile combinations.

Applications

- Monitoring and compliance checking in video distribution and broadcasting
- Quality control in the video production and post production
- Equipment qualification and troubleshooting in the installation and maintenance of video facilities and systems

From Analog to SD-SDI Digital Video in One Platform

The WFM6120 measurement and monitoring waveform monitor provides precision capabilities such as Patented See and Solve™ displays, Digital Data Analysis, CaptureVu, Physical Layer measurement, and A/V Delay monitoring, making Tektronix the brand of choice for all measurement and monitoring needs that require signal analysis and unquestionable accuracy.

The WFM6120 provides flexible options and field-installable upgrade kits to allow you to make a smooth transition from analog to standard definition (SD-SDI). Standard SD-SDI support and available Composite Analog video allow monitoring display modes of Waveform, Vector, Gamut, Timing, and Status. Optional Analog and Digital audio monitoring can be added to the instrument to provide a variety of audio level displays and audio loudness monitoring. Sophisticated measurement and analysis functions are available, such as physical layer eye and jitter display, data analysis, and A/V Delay measurement. For complete details regarding option and feature availability, please refer to the section of this document on ordering information.

The WFM6120 offers performance monitoring and measurement capabilities for SD-SDI and Analog Composite Video (CPS) formats.

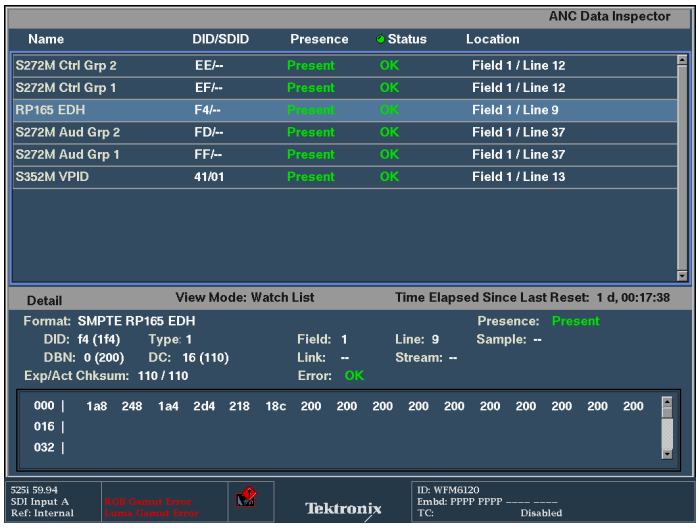
The AD audio option available for WFM6120 offers monitoring for Analog and Digital Embedded or AES/EBU audio.

Available measurement options include eye/jitter (EYE or PHY), Video Data Analysis (DAT), and AV Delay measurement (AVD).

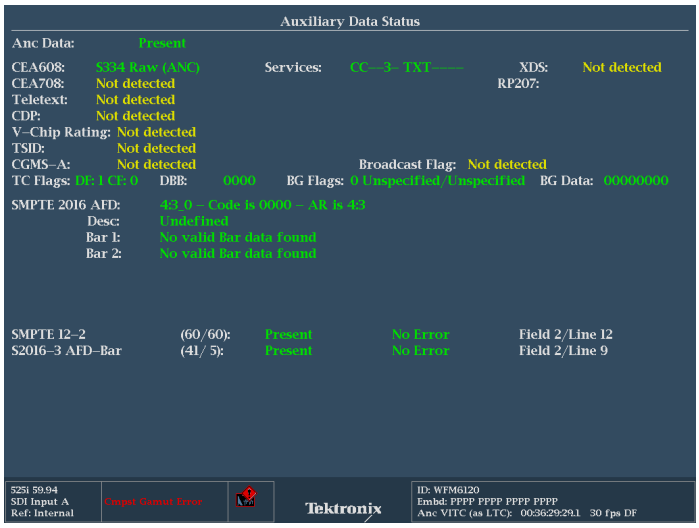
Video Monitoring
SD (Standard Definition SDI)
CPS (Composite Analog)

Audio Monitoring
AD (AES, Embedded and Analog)

Measurement and Analysis
EYE, PHY (Physical Layer)
DAT (Data Analysis)
AVD (A/V Delay)



ANC Data Inspector and CaptureVu provide detailed content analysis.



Aux Status Display.

Extended Digital Analysis Capabilities

The new ANC Data Inspector (available on Option DAT) provides an industry-leading solution to help broadcasters easily and accurately ensure that all required ANC data is present and correctly configured through an intuitive ANC data display.

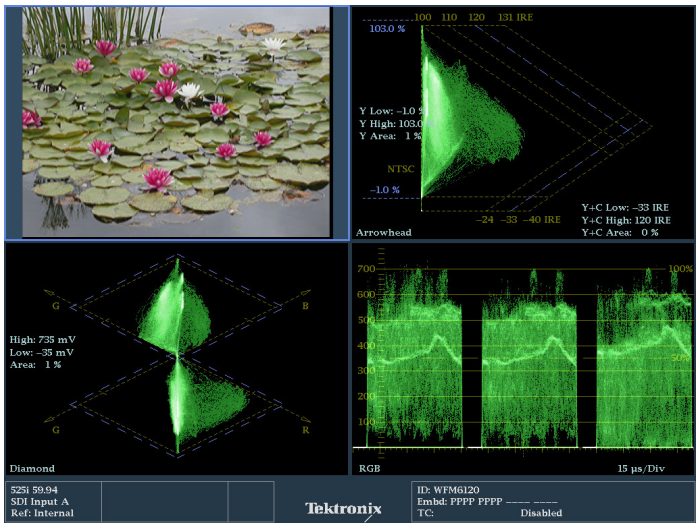
In contrast to existing solutions, the ANC Data Inspector enables operators to easily and quickly ensure that the ANC data is present and free of errors. When errors are detected, engineers are quickly guided to a more detailed view of the data packet content for further analysis. With FlexVu™ each tile can display different CEA608 Closed Caption and individual Teletext subtitles or pages.

CaptureVu, standard on the WFM6120, captures the data of a video frame to recreate any trace display and analyze its digital structure. Captured data can be downloaded through the USB port or through the Ethernet port.

The Auxiliary Data Status display decodes Ancillary data such as Active Format Description (AFD), Video Index Aspect Ratio, WSS, and ARIB information.

Aux Data Status provides summary information on a variety of metadata such as CEA608 Closed Caption, Broadcast Flag/CGMS, Teletext, Time Code, AFD (Active Format Description), Video Index Aspect Ratio, and Wide Screen Signalling.

Today there is a wide variety 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 automatic graticule display is available for the picture display of the waveform monitor along with the binary data and text description.



See and Solve™ displays detect and address problems quickly and efficiently.

See and Solve™ with Tektronix Displays

Tektronix See and Solve™ displays simplify video monitoring tasks such as calibration, error detection, and content correction allowing users to detect errors at a glance and troubleshoot them efficiently.

Specialized session and status displays provide summarized, yet comprehensive reports of conditions and measurements of content parameters. The powerful Error Log is configurable and provides detailed reports for up to 10,000 events which can be downloaded using a web browser. Alarms can also activate ground closures and SNMP traps, simplifying centralized monitoring of multiple programs.

The FlexVu four-tile display provides maximum flexibility to increase your productivity.

Unlike instruments with predetermined view combinations or limited choices, FlexVu lets you create a multiview 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.

Tektronix displays offer the sharpest CRT-like trace quality for clear waveform monitoring without pixelation distortions.

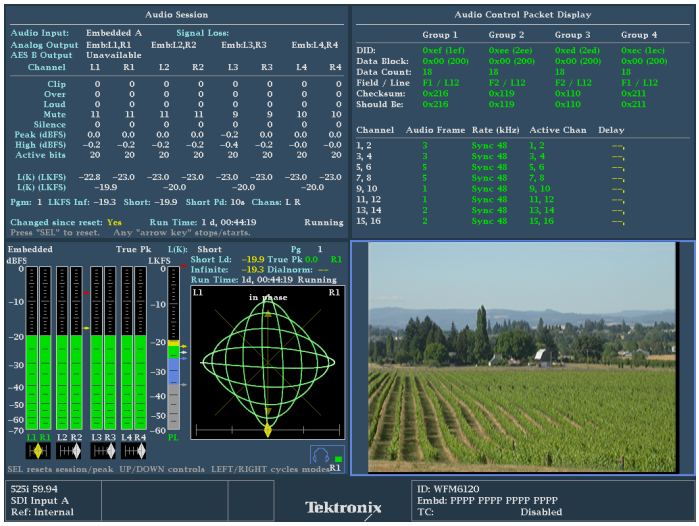
The patented Tektronix Diamond, Split Diamond, and Arrowhead gamut displays simplify the process of verifying gamut compliance.

The Diamond and Split Diamond displays help easily identify and correct RGB gamut errors in digital video signals. The Arrowhead display saves time in verifying composite gamut compliance on analog and digital video signals.

User-selectable gamut thresholds let you tailor these displays and the associated gamut alarms to your particular compliance standards.

You can also select bright-up conditions to see the location of gamut errors on the picture display.

FlexVu – The display that adapts to your work practices.



Comprehensive Audio Monitoring.

Monitoring Tools for Optimum Sound Quality

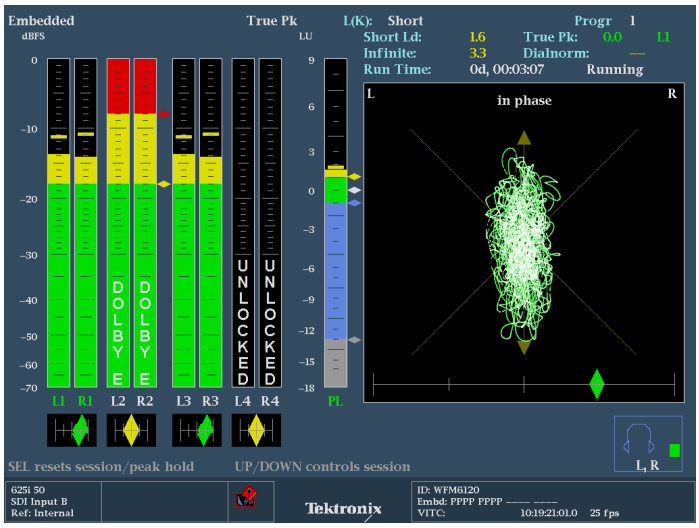
For precise audio measurements, the WFM Series provides high-quality digital filtering and oversampling fully compliant with ITU-R BS.1770-3 and 1771.

For easy monitoring, the WFM audio option provides format auto-detection and flexible mapping of audio inputs to analog or digital audio outputs for connection to external devices.

The Surround Sound[1] display, the most comprehensive audio analyzer, provides intuitive graphical representation of the channels' interaction in a system. The Bars display provides indicators for faults, audio levels, and Dolby format information. The flexible Lissajous display allows the selection of any two audio channels.

Specialized audio displays provide deeper insight of the signal. The audio session display summarizes levels, faults, and number of active bits for each channel. The user can select from three loudness filters; flat, A-weighted, and RLB (BS.1770-3). These instruments also feature Audio Control Packet Data and Channel Status displays.

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

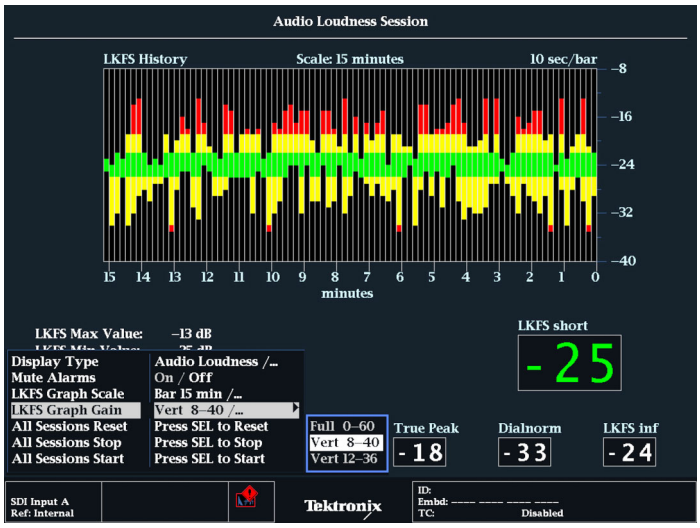


Audio Monitoring with Loudness Meter.

Audio Loudness Session.

Loudness Monitoring

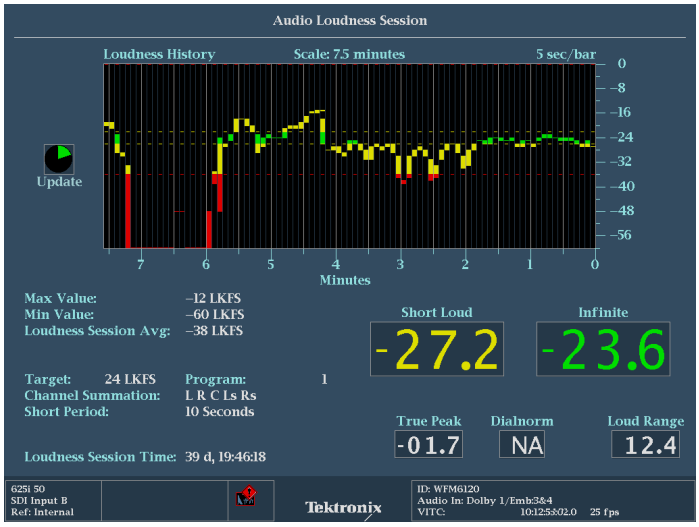
- Measure Loudness and true peaks per ITU-R BS.1770-3/1771 and ATSC RP A/85 recommendations
- Measure Loudness and true peaks of combination of discrete audio channels
- Measure Loudness using infinite or short-term measurement techniques per ITU-R-BS.1770-3 specifications, and display both values simultaneously (user-selectable integration time in increment of seconds for short-term measurements)
- Start/Stop capability for the duration of the segment, showing infinite and short-term measurements
- Simultaneously display Dialnorm value from Dolby metadata and the measured Loudness value on the same display
- Loudness measurement value in LKFS per ITU-R-BS.1770-3
- Loudness meter is available on the audio-level meter display



User-selectable Vertical Scaling.

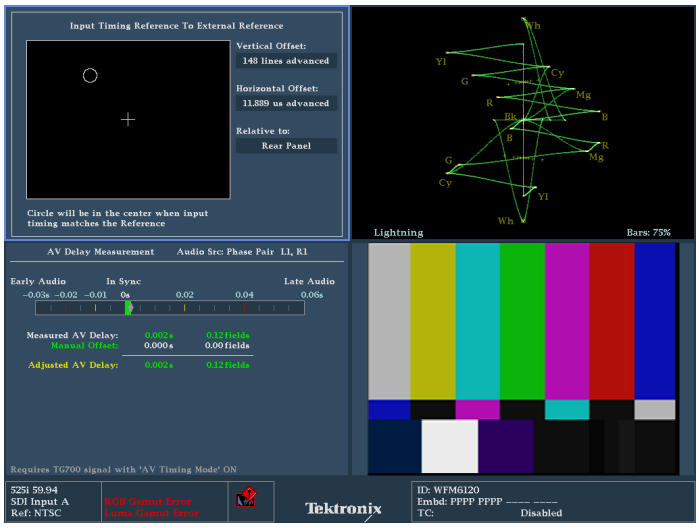
Trend Analysis Features

- Loudness Trend Chart with adjustable display window
- Storage of Loudness measurement values to USB or through Web UI



Loudness Session bar graph plots loudness value over time.

Physical Layer options provide precise measurements for video signals.



Timing and Lightning displays simplify timing tasks.

Top Reliability on Physical Layer Measurements

Tektronix is the technological leader for eye/jitter measurement solutions.

Options EYE and PHY provide unique capabilities such as reporting jitter levels above 1 UI and jitter filters from 10 Hz to 100 kHz for SD-SDI.

An easy-to-interpret gauge provides direct readout for jitter measurements. The user can configure timing and alignment readouts to be displayed simultaneously to effectively isolate the sources of jitter.

The SDI Signal Status display summarizes key signal parameters such as signal strength, cable loss, and estimated cable length measurements.

Additionally, Option PHY provides Tektronix-exclusive jitter waveform displays to view the jitter related to line and field rates. This option automatically measures eye amplitude, rise/fall time, and overshoot/undershoot.

With FlexVu, you can simultaneously display timing and alignment jitter values, cable parameter measurements, and display different eye patterns to help quickly diagnose and resolve problems related to SDI timing jitter or cable attenuation. The Infinite Persistence mode of the waveform monitor can be used to more easily view the eye opening of the physical layer signal.

Facility Timing Made Easy

Audio/Video synchronization is an important challenge in the processing of video materials.

Option AVD displays the A/V delay on a graphical bar indicator. The measurement readout gives facility engineers the tool to ensure system integrity and facilitate A/V delay compliance.

This option provides out-of-service measurement of A/V delay for analog or digital audio and video formats.

A TG700 is required to generate the SDI signal which contains the audio and video sequence that can be distributed through the system and measured by the waveform monitor.

The patented Tektronix Timing display makes facility timing easy through a simple graphical representation which shows the relative timing of the input signal and reference signal on an X-Y axis.

The Lightning display shows luma and chroma amplitudes and helps you verify component timing using a color bar header signal. The SCH Phase display helps quickly verify this critical timing parameter of composite analog video signals.

Characteristics

Composite Video Interface (Option CPS)

Formats Supported – NTSC, NTSC no setup, PAL.

Inputs – Two, 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 – –6.0 V to +6.0 V, DC + peak AC.

DC Input Impedance – 15k, nominal.

Return Loss –
>40 dB to 6 MHz, (typical) power on.
>40 dB to 10 MHz (typical) power on.
>46 dB to 6 MHz (typical) power on.
35 dB (typical), power off (standard amplitude video).

Crosstalk between Channels – >60 dB to 6 MHz.

Loopthrough Isolation – >70 dB to 6 MHz.

DC Offset with Restore Off – <20 mV.

DC Restore 50 Hz and 60 Hz Attenuation –
Fast mode >95% attenuation, Slow mode <10% attenuation, <10% peaking. Slow mode typ peaking 8% at 50 Hz and 60 Hz.

Lock Range – ±50 ppm remains locked.

External Reference

Input Type – Passive loopthrough BNC, 75 Ω compensated.

DC Input Impedance – 15 kΩ, nominal.

Return Loss (Typical) – >40 dB to 6 MHz, >35 dB to 30 MHz.

User Interface

1024 (H) × 768 (V) pixels LCD.

Serial Digital Waveform Vertical Characteristics

Vertical Measurement Accuracy – At 1X, ±0.5%; at 5X, ±0.2% of 700 mV full scale mode.

Gain – X1, X2, X5, and X10.

Frequency Response

SD –
Luminance Channel (Y): 50 kHz to 5.75 MHz ±0.5%.
Chrominance Channels: 50 kHz to 2.75 MHz ±0.5%.

Analog Composite Waveform Vertical Characteristics (Option CPS)

Vertical Measurement Accuracy – ±1% all gain settings.

Gain – X1, X2, X5, and X10.

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

Waveform Horizontal Sweep Characteristics

Sweep Timing Accuracy – ±0.5%, all rates, fully digital system.

Sweep Linearity – 0.2% of time displayed on screen, fully digital system.

Vector Characteristics

Vector Amplitude Accuracy – ±2%.

Vector Phase Accuracy – ±2°.

Audio Characteristics

(Optional Capability)

Level Meter Resolution – 0.056 dB steps at 30 dB scale, from full scale to –20 dBFS.

User-selectable Scales –
Analog: dBu, Din, Nordic, VU, IEEE PPM, BBC Scale, and user definable.
Digital: dBFS, Din, Nordic, VU, IEEE PPM, BBC Scale, and user definable.

Meter Ballistics – Selectable from true peak, PPM type 1, PPM Type 2, and Extended VU.

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

Level Meter Accuracy over Frequency – +0.1 dB (Digital), +0.5 dB (Analog) from 20 Hz to 20 kHz, 0 to –40 dBFS sine wave, Peak Ballistic mode (except for within 5 Hz of some submultiples of the sampling frequency).

Digital Audio (Option AD)

Inputs – Two sets with 8 channels each, 32-192 kHz, 24 bit. Meets requirements of AES 3-ID and SMPTE 276M-1995.

Input Characteristics – BNC, 75 Ω terminated, unbalanced, 0.1 V_{p-p} to 2 V_{p-p}.

Input Return Loss – 25 dB (typical) relative to 75 Ω from 0.1 to 24 MHz.

Outputs – Up to 8 channels, AES3-ID output, 48 kHz 20 bit for embedded, 48 kHz 24 bit for analog to AES. For AES to AES loopthrough, output format equals input format.
Meets requirements of SMPTE 276M-1995 (AES 3-ID).

Output Characteristics – BNC, 75 Ω terminated, unbalanced, 0.9 V_{p-p} to 1.1 V_{p-p} into 75 Ω.

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

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

Analog Audio (Option AD)

Analog Inputs – Two sets of 6 channels each.

Analog Input Characteristics – Balanced, unterminated through the rear-panel connector.

Crosstalk – <90 dB.

Input Impedance – 24k, typical.

Analog Outputs – 8 channels.

Analog Output Characteristics – Balanced: unterminated through the rear-panel connector.

Maximum Output Level – Balanced: +24 dBu ±0.5 dB.

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 – +1.0 dB, 20 Hz to 20 kHz, 24 dBu to –16 dBu.

Output Impedance – 50 Ω nominal.

Video Input and External Reference Formats Supported

Automatic Detection of a Wide Range of Signal Formats

The WFM6120 waveform monitor accepts a 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.

Supported Digital Formats (SD Standard)

Standard	Format	Frame Rate (Hz)
259M (SD)	720 × 576i (625)	50 Hz 59.94Hz
	720 × 483i (525)	

Physical Characteristics

Dimensions	mm	in.
Height	133.4	5.25
Width	215.9	8.5
Depth (Front to back, including handles and BNCs)	460.4	18.125
Weight	**kg**	**lb.**
Net	5.5	12
Shipping, approximate	9.6	21
Power 100 to 240 V AC, 50/60 Hz		

Ordering Information

SD-SDI standard. CaptureVu™ XGA display with FlexVu™, AV Delay capable, front-panel USB and headphone port, remote control port, external display output, picture monitor outputs, network access and control, SNMP.

Video Options

Option	Description
SD	STANDARD
CPS	Add support for monitoring NTSC/PAL composite analog video, 2 inputs with passive loopthrough outputs
Audio Option	
AD	Add support for monitoring digital audio, embedded and AES/EBU inputs, up to 8 AES/EBU inputs (16 channels), up to 4 AES/EBU outputs (8 channels) capabilities available, plus support for monitoring analog audio, up to 12 analog audio inputs, up to 8 analog audio outputs
Analysis Options (Customer orders either EYE or PHY, not both)	
EYE	Add support for eye diagrams, jitter measurement, cable parameter measurements
PHY	Add capabilities available on Opt. EYE, plus jitter waveform and eye parameter measurements
DAT	Add in-depth video data and Ancillary data analysis
AVD	Adds support for AV Delay measurements (requires signals provided from the TG700 with the DVG7 module with A/V Timing mode enabled)

Service Options

Option	Description
CA1	Provides a single calibration event or coverage for the designated calibration interval, whichever comes first
C3	Calibration Service 3 Years
C5	Calibration Service 5 Years
D1	Calibration Data Report
D3	Calibration Data Report 3 Years (with Option C3)
D5	Calibration Data Report 3 Years (with Option C5)
G3	Complete Care 3 Years (includes loaner, scheduled calibration and more)
G5	Complete Care 5 Years (includes loaner, scheduled calibration and more)
R3	Repair Service 3 Years (including warranty)
R5	Repair Service 5 Years (including warranty)

Power Options

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

Language Options

Option	Description
L0	English manual
L5	Japanese manual
L7	Simplified Chinese manual

Accessories

Option	Description
WFM7F02	Portable Cabinet, includes handle, feet, tilt bail, and front-panel cover
WFMRACK-NN	Dual Rack Cabinet New-New
WFMRACK-ON	Dual Rack Cabinet Old-New
WFM50F06	Filler Blank Panel for WFMRACK
62	Analog audio breakout cable, 6 feet, male 62-pin connector to 8 XLR male output connectors, and 12 XLR female input connectors
077-0081-xx	Service manual for the WFM6120 product

Upgrade Kit Nomenclature

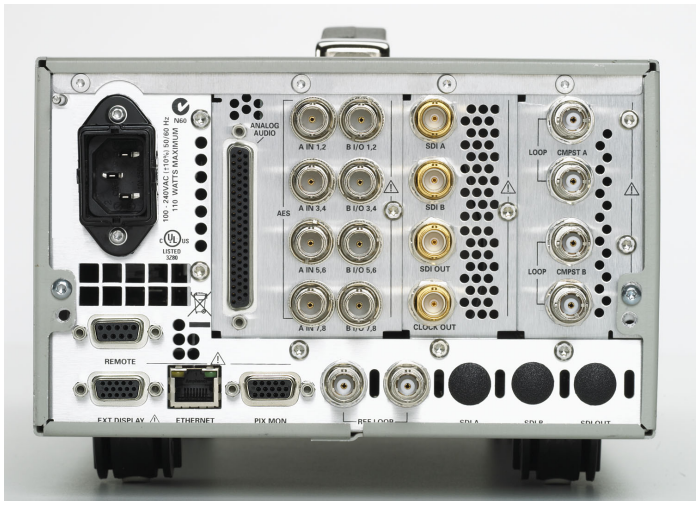
Post Sale Upgrades

Customers can upgrade previously purchased instruments by ordering the appropriate options from the upgrade kit as shown in the following table. Customer must order with at least one option from the table below.

Upgrade	Description
WFM612UP	Field-installable, post sale upgrades for WFM6120

Video Upgrade Options

Option	Description
CPS	Add support for monitoring of NTSC/PAL composite analog video, 2 inputs
AD	Add support for analog, embedded, and discrete AES/EBU audio, 8 digital and 12 analog inputs
ALOG	Add support for Audio Loudness Session display with trend chart and audio loudness data-saving capability. Audio option AD also required
AVD	Add support for out-of-service audio/video delay measurements. Audio option AD also required
EYE	Add support for eye diagrams, jitter measurement, cable parameter measurements
PHY	Add capabilities on Opt. EYE, plus jitter waveform and automated eye measurements
DAT	Add in-depth video data and Ancillary data analysis



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

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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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