Multistandard, Multiformat Compact Waveform Monitors

WFM5000 • WFM4000 Data Sheet

WFM4000

Features & Benefits

- **WFM5000 – HD/SD-SDI Compact Waveform Monitor**
- **WFM4000 – SD-SDI Compact Waveform Monitor**
  - Convenient, 3 RU, Half-rack, Short-depth Instrument, Ideal for Space-constrained Environments
  - AC and DC Power Options
  - Patented Gamut Displays Facilitate Compliance Verification
  - TandemVu® Display for Efficient Camera Adjustments
  - Error Log for 10,000 Events Simplifies Error Correction Tasks
  - Fully Digital Processing for Accurate, Repeatable, Drift-free Operation
  - Ethernet Port allows for Easy Download of Screenshots and Error Log
  - Freeze Mode for Trace and Picture Displays
  - Equipped Standard with Monitoring Capacity for 16 Channels of Embedded Audio (up to 8 Simultaneously) and 1 AES Audio Input
  - Front-panel Headphone Port for Easy Monitoring of Audio Channels
  - Audio Bars and Lissajous Displays for Verification of Audio on the Same Instrument
  - 32 User-configurable Presets for Quick Recall of Commonly Used Configurations
  - Patented Tektronix Timing Display Makes Facility Timing Easy
  - User-definable Safe Area Graticules Facilitate Editing Tasks
  - High-brightness Display allows for Indoor and Outdoor Usage
  - Picture Thumbnail with Line-select Marker
  - Intuitive User Interface, Backlit Buttons, and Online Help
  - Front-panel USB Port for Easy Transfer of Instrument Presets and Screenshots
  - SNMP Control for Easy Systems Integration

Applications

- Confidence Monitoring of SDI Video and Uncompressed Digital Audio
- Compliance Checking in Distribution and Broadcast
- Content QA in Production and Post Production
- Portable Monitoring on Camera and Field Production

The WFM5000 and WFM4000 Compact Video Waveform Monitors provide an ideal solution for basic video and audio monitoring needs with an integrated LED backlit display in a convenient 3RU, half-rack, short-depth form factor, suitable for space-constrained environments. These versatile instruments provide options to accept power from a 12 V DC source, a battery, or a 100-240 V AC converter.

Both models come standard with support for 16 channels of Embedded Audio and 1 input for 2 channels of Digital AES Audio.

WFM5000

Supports HD-SDI (SMPTE 292M) and SD-SDI (ITU-R BT.601) monitoring applications. It provides HD/SD format auto-detect.

WFM4000

Supports SD-SDI (ITU-R BT.601) monitoring only.

These instruments provide the reliability of the Tektronix waveform monitors family in a portable, basic monitoring product.

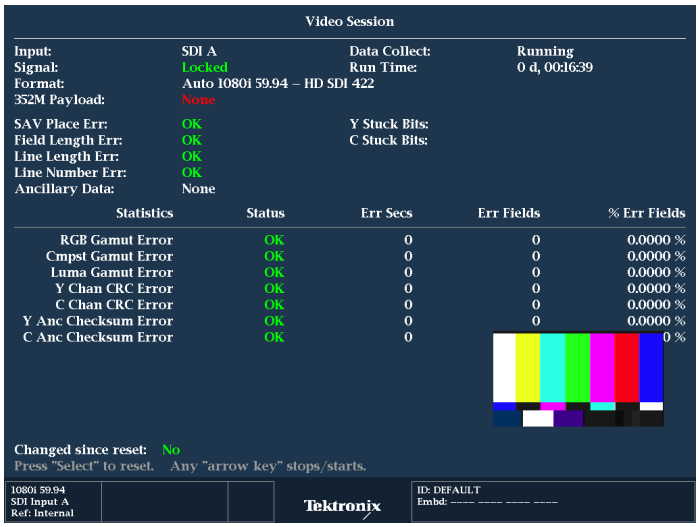
Tektronix®

Tektronix Excellence

WFM5000 and WFM4000 offer 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.

Digital Audio and Video Monitoring in One Instrument

These instruments provide standard digital audio monitoring with Audio Bars, Lissajous Displays, and front-panel headphone port for easy compliance verification of digital audio without the need for an additional piece of equipment



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 front-panel USB port.

The Passive loopthrough inputs allow for transparent monitoring at any point of the signal path even if instrument power is off.

An Ethernet port allows for easy download of screenshots and the Error log.

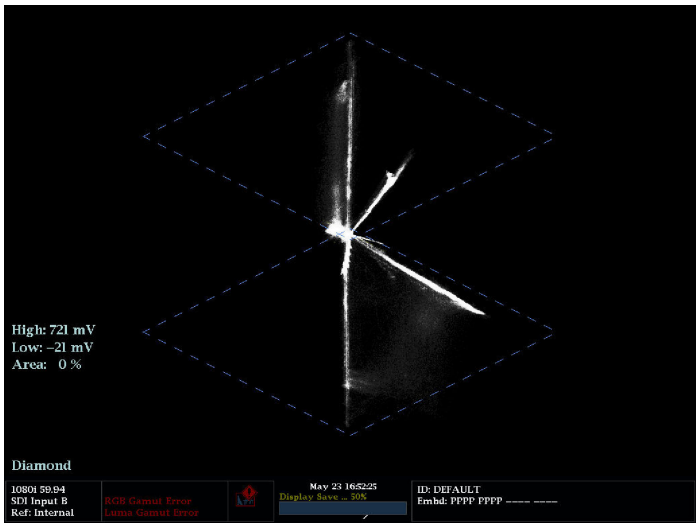
See and Solve with Tektronix Displays

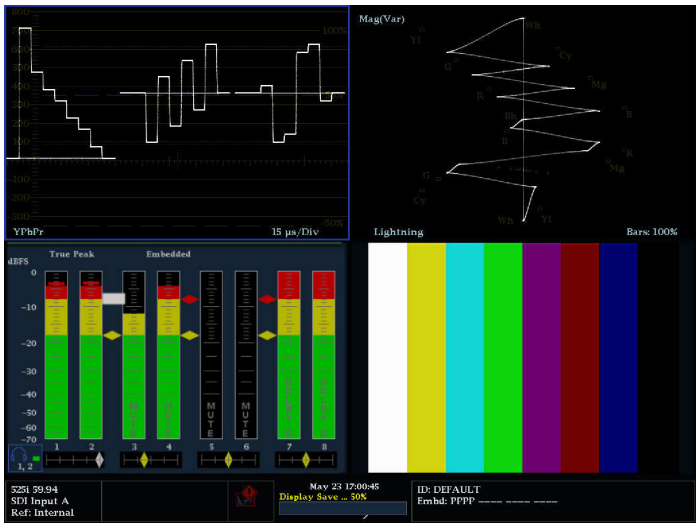
The “See and Solve” displays in Tektronix video monitors simplify video monitoring tasks such as calibration, error detection, and content correction allowing the user to detect errors at a glance and troubleshoot them efficiently.

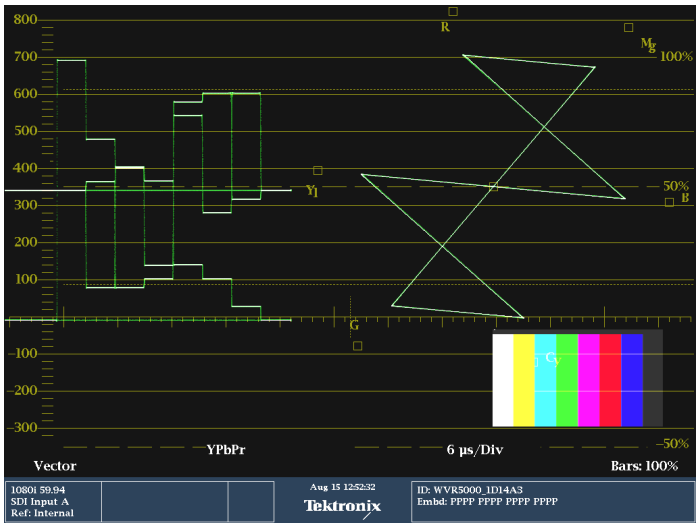
Tektronix displays offer the sharpest CRT-like trace quality for clear waveform monitoring with the look and feel of an analog display. With several sweep rates and easy control of vertical gain and horizontal magnification, you can efficiently monitor and measure video waveform parameters.

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.

The vector display offers user-selectable graticules, color target, and color axis.







Patented Tektronix Gamut Displays – Efficiently Detect and Correct Gamut Problems

The patented Tektronix Diamond and Split Diamond displays enable Colorists, Editors, and Operators to 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. Within this display, a separate upper and lower luma-only Gamut limit can be applied. This display is very useful for camera balancing.

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 WFM5000 and WFM4000.

TandemVu® Display – Customized Waveform and Vector View

TandemVu provides the ability to visualize waveform and vector or lightning displays simultaneously. Each trace can be positioned and magnified individually based on the user's preferences.

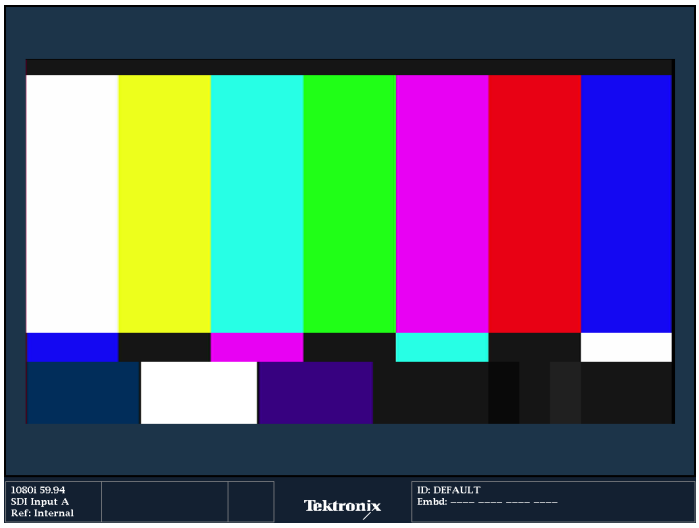
TandemVu provides broadcast operators with an efficient way to adjust and balance cameras in studios or outside broadcast applications.

The Tektronix displays provide sharp traces without pixelation. The waveform display can be presented on parade and overlay modes in RGB, YPbPr, YRGB, or pseudo-composite formats. Both fixed and variable vertical gain are offered, each with the outstanding accuracy and repeatability that comes from a fully digital design.

The Line Select provides a line marker in full-screen and thumbnail picture modes.

The vector display is offered with selectable 75% and 100% targets.

Each display automatically selects the appropriate graticule based on the input format.



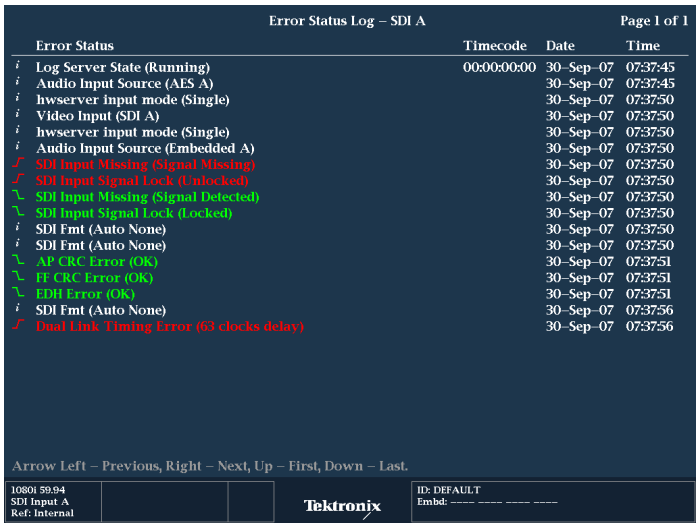
Picture Display – Quick Visual Confirmation and Precision Content Adjustment

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 **brightup** 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.



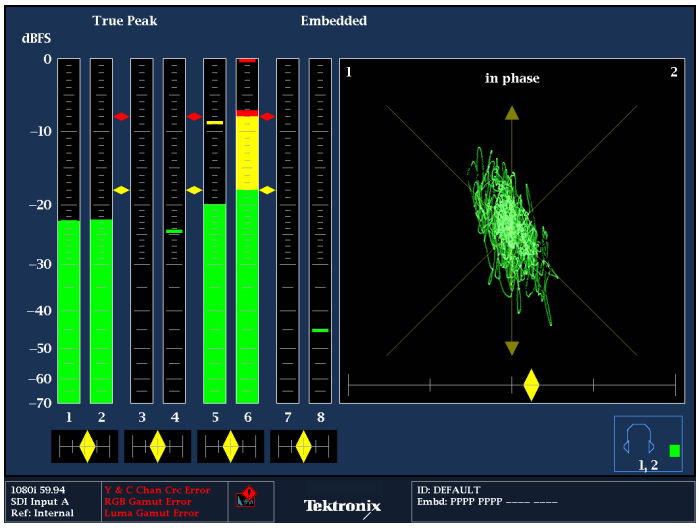
Alarms, Quality Statistics, and Logging – Thorough and Fast Content Verification

The WFM5000 and WFM4000 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 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 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 TXT or HTM formats for easy record keeping and processing on spreadsheets or database software.



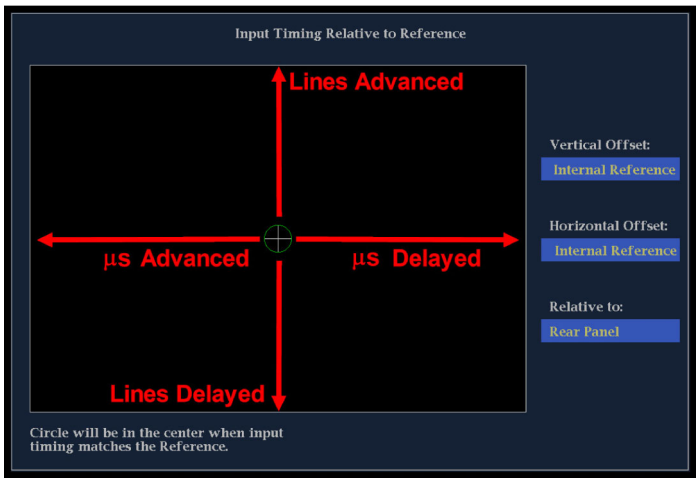
Digital Audio Capabilities – Equipped Standard

Audio monitoring capabilities for both Digital AES and Embedded Audio are available as standard in the WFM5000 and WFM4000.

The instruments feature Level Bars display and both Bars and Lissajous display. These displays can be selected to provide monitoring for both Digital AES and Embedded Audio formats with up to eight channels (2 channels for AES Audio).

The level meters offer selectable meter ballistics and scaling plus they are user configurable. 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.

The Audio Session display records the highest true peak, as well as the number of mutes, clips, overs, and silences during the session time. Tektronix instruments provide accurate peak level measurements.



Timing Display – Quickly Confirm All Your Devices Are Synchronized

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. This intuitive display makes facility timing easy through a simple graphical representation which clearly shows the timing offsets between HD and SD signals relative to the reference.

The patented Tektronix Timing display presents a unique timing comparison between a digital (SD or HD) signal and a house reference signal (composite or tri-level sync), thus eliminating the complexity in timing SD an HD signals. Timing differences are displayed numerically in terms of vertical lines and horizontal time in µs relative to the house reference signal. A simple graphical display shows the relative timing of the input signal (the circle) versus the reference signal (the crosshair). When the two signals are properly timed, the circle changes from red to green color and is concentric with the crosshair.

Characteristics

Video Input and External Reference Formats

The WFM5000 and WFM4000 waveform monitors accept a wide variety of input signal formats and external references. The following chart illustrates all the video inputs (first column), cross referenced with their compatible external references.

Supported Input Formats	External Reference Inputs									
	NTSC	PAL		720p		1080p/sF			1080i	
	59.94 Hz	50 Hz	50 Hz	59.94 Hz	60 Hz	23.98 Hz	24 Hz	50 Hz	59.94 Hz	60 Hz
483i, 59.94 Hz (525), BT601*1	X			X					X	
576i, 50 Hz (625), BT601*1		X	X					X		
720p, 23.98 Hz*2	X			X		X			X	
720p, 24 Hz*2					X		X			X
720p, 25 Hz*2		X	X					X		
720p, 29.97 Hz*2	X			X					X	
720p, 30 Hz*2					X					X
720p, 50 Hz*2		X	X					X		
720p, 59.94 Hz*2	X			X		X			X	
720p, 60 Hz*2					X		X			X
1035i, 59.94 Hz*2	X			X					X	
1035i, 60 Hz*2					X		X			X
1080i, 50 Hz*2		X	X					X		
1080i, 59.94 Hz*2	X			X					X	
1080i, 60 Hz*2					X		X			X
1080p, 23.98 Hz*2	X			X		X			X	
1080p, 24 Hz*2					X		X			X
1080p, 25 Hz*2		X	X					X		
1080p, 29.97 Hz*2	X			X					X	
1080p, 30 Hz*2					X					X
1080sf, 23.98 Hz*2	X			X		X			X	
1080sf, 24 Hz*2					X		X			X
1080sf, 25 Hz*2		X	X					X		
1080sf, 29.97 Hz*2	X			X					X	
1080sf, 30 Hz*2					X					X

*1 Available with the WFM5000 and WFM4000.

*2 Available with the WFM5000 only.

The monitor will automatically detect the signal format and establish the appropriate settings for the various displays. You can select an expected signal format from the list of supported formats. If the expected format and detected format differ, the instrument will report a format mismatch.

The instrument will signal a format mismatch if the applied external reference format is not compatible with the input signal.

Serial Digital Video Interface

Characteristic	Description
Inputs	2, only one active at a time
	For WFM5000, the inputs auto-detect between HD and SD signals
Input Type	Passive loopthrough BNC, 75 Ω compensated
Input Level	800 mV_{p-p}, ±10%
Return Loss (Typical values)	≥25 dB from 1 MHz to 270 MHz, power on ≥15 dB from 1 MHz to 270 MHz, power off >15 dB from 1 MHz to 1.5 GHz, power on or off
Loopthrough Insertion Loss	For HD, equivalent to 10 m of type 8281 cable
Loopthrough Isolation	>50 dB to 300 MHz
Receiver Equalization Range	Typically for SD to 250 m of type 8281 cable; for HD to 100 m of type 8281 cable

External Reference

Characteristic	Description
Sync Formats	NTSC and PAL and tri-level sync
Input Type	Passive loopthrough BNC, 75 Ω compensated
DC Input Impedance	20 kΩ, nominal
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, Color Difference channels (Pb, Pr) ±0.5% to 15 MHz

Waveform Horizontal Deflection

Characteristic	Description
Sweep Timing Accuracy	±0.1%
Sweep Linearity	±0.1%

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 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
AES Inputs	1 set of 2 channels, 32 kHz, 44.1 kHz, 48 kHz, 96 kHz, 192 kHz, 24 bit BNC, 75 Ω terminated, unbalanced, 0.2 V to 2 V_{p-p} Return Loss: >30 dB relative to 75 Ω from 0.1 to 6 MHz

Power

- 12 V DC In
- Power adapter accepts 100 to 240 V AC –10%, 50/60 Hz

Input Voltage

Characteristic	Description
Voltage Range	12-15 V DC nominal
	10.75-18 V DC min-max operating
Supply Connection	XLR 4-pin male connector
	Pin 1 = V(–)
	Pin 4 = V(+)
	Pin 2, 3 NC
Power Consumption	22 W typical 30 W max
Surge	6 amps at 12 V
Fuse Rating	4 amp internal self-resetting fuse
Transient, Over, and Reverse Voltage Protection	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 failure

Physical Characteristics

Dimensions	cm	in.
Height	13.208 cm	5.2 in.
Width	21.336 cm	8.4 in.
Depth (Front to back including handles and BNCs)	13.97 cm	5.5 in.
Weight	**kg**	**lb.**
Net	1.56 kg	3 lb. 7 oz.

Ordering Information

WFM5000

Waveform Monitor with support for HD-SDI and SD-SDI Serial Digital Monitoring (2 passive loopthrough inputs).
Digital audio monitoring in Embedded (16 channels) and AES/EBU (2 channels) formats.
Uses same physical inputs for HD and SD – auto-detect between HD and SD.
Note: Please specify power option when ordering.

WFM4000

Waveform Monitor with support for SD-SDI Serial Digital Monitoring (2 passive loopthrough inputs).
Digital audio monitoring in Embedded (16 channels) and AES/EBU (2 channels) formats.
Note: Please specify power option when ordering.

Power Options

Option	Description
AC-DC Power Adapter	
A0	North America
A1	Universal EURO
A2	United Kingdom
A3	Australia
A5	Switzerland
A6	Japan
A10	China
A11	India
A99	No AC-DC Power Adapter

Accessories

Order Number	Description
Rackmount Accessories for WFM5000/4000	
Cabinet Accessories	
WFM50F01	Portable Cabinet
WFM50FSC (WFM50F01 is required)	Soft Carrying Case to accompany the WFM Series Portable Cabinet
WFM50F02	Dual Rack Cabinet for two WFM5000/4000
Dual Rack Cabinet	
WFM50F03	WFM5000 and WFM7000 Series
WFM50F03	WFM4000 and WFM6000 Series
WFM50F06	Filler Panel for Dual Rack Cabinet
Battery Accessories	
WFM50FGM	Battery Adapter Plate (Anton Bauer Gold-Mount)
WFM50FVM	Battery Adapter Plate (Sony/IDX V-Mount)
Other Optional Accessories	
146-0156-xx	12 V DC Anton Bauer Battery
016-2005-xx	12 V DC Anton Bauer Battery Charger

Service Options

Option	Description
C3	Calibration Service 3 Years
C5	Calibration Service 5 Years
D1	Calibration Data Report
D3	Calibration Report 3 Years (w/ C3)
D5	Calibration Report 5 Years (w/ 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)
CA1	Provides a single calibration event or coverage for the designated calibration interval, whichever comes first
R1PW	Repair Service Coverage 1 Year Post Warranty
R2PW	Repair Service Coverage 2 Years Post Warranty
R3DW	Repair Service Coverage 3 Years (includes product warranty period). Starts at the time of customer instrument purchase
R5DW	Repair Service Coverage 5 Years (includes product warranty period). Starts at the time of customer instrument purchase

Manuals

User Manual CD in English, Simplified Chinese, and Japanese is supplied with the instrument.

CE

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

Contact Tektronix:

ASEAN / Australasia (65) 6356 3900

Austria 00800 2255 4835*

Balkans, Israel, South Africa and other ISE Countries +41 52 675 3777

Belgium 00800 2255 4835*

Brazil +55 (11) 3759 7627

Canada 1 800 833 9200

Central East Europe and the Baltics +41 52 675 3777

Central Europe & Greece +41 52 675 3777

Denmark +45 80 88 1401

Finland +41 52 675 3777

France 00800 2255 4835*

Germany 00800 2255 4835*

Hong Kong 400 820 5835

India 000 800 650 1835

Italy 00800 2255 4835*

Japan 81 (3) 6714 3010

Luxembourg +41 52 675 3777

Mexico, Central/South America & Caribbean 52 (55) 56 04 50 90

Middle East, Asia, and North Africa +41 52 675 3777

The Netherlands 00800 2255 4835*

Norway 800 16098

People's Republic of China 400 820 5835

Poland +41 52 675 3777

Portugal 80 08 12370

Republic of Korea 001 800 8255 2835

Russia & CIS +7 (495) 7484900

South Africa +41 52 675 3777

Spain 00800 2255 4835*

Sweden 00800 2255 4835*

Switzerland 00800 2255 4835*

Taiwan 886 (2) 2722 9622

United Kingdom & Ireland 00800 2255 4835*

USA 1 800 833 9200

* European toll-free number. If not accessible, call: +41 52 675 3777

Updated 10 February 2011

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**

02 Oct 2011 2PW-21468-4