Multi-standard, Multi-format Waveform Monitors

Features & Benefits

The WFM7000 and WFM7100 Support HD, SD and Composite Video Formats
The WFM6100 Supports SD and Composite Video Formats
FlexVu™ XGA Display Increases Productivity with the Ability to Create Hundreds of Custom Multiple-view Displays Tailored to Specific Work Practices
CaptureVu Video Frame Capture Improves Efficiency in Troubleshooting and Equipment Setup
MyMenu User-defined Menu Saves Time by Placing Frequently Used Controls On a Single, Easily-accessed Touch-screen Menu
Exclusive Tektronix Gamut Displays Help Ensure Compliant Content
Patented Tektronix Timing and Lightning Displays Help Rapidly and Accurately Adjusts Critical Plant Timing
Extensive Fault Monitoring, Status Reporting and Error Logging Simplify Content Quality Control
Available High-performance SDI Signal Measurement and In-depth Digital Data Analysis Help Quickly Resolve Difficult Quality and Reliability Problems
Exceptional Audio Monitoring Available, Including Support for Dolby Audio Formats and a Front-panel Headphone Connector, Reduce Time and Effort in Verifying Multi-channel Audio Content
Standard and User-definable Safe Area Graticules Help Avoid Errors and Rework in Editing and Format Conversion
Front-panel USB Port For Easy Storage and Transfer of Instrument Settings and Video Data
Network Access and Control Supports Remote-site Monitoring
Fully Digital Processing for Accurate, Repeatable, Drift-free Operation

Applications

Monitoring and Compliance Checking in Video Distribution and Broadcasting
Quality Control in Video Production and Post-production
Equipment Qualification and Troubleshooting in the Installation and Maintenance of Video Facilities and Systems

WFM6100
The SD-capable WFM6100 offers high-performance monitoring and measurement capabilities. It can be configured to monitor either NTSC/PAL analog video (Opt. CPS), SD digital video (Opt. SD), or both video formats. Available audio options offer support for monitoring digital audio (embedded and AES/EBU inputs), analog audio and Dolby audio formats. Available measurement options offer in-depth digital data analysis and SDI signal measurements, such as Eye diagrams and jitter.

WFM7000
The HD-capable WFM7000 offers basic monitoring capabilities for applications involving HD digital video. It can be configured to monitor NTSC/PAL analog video (Option CPS), SD digital video (Option SD), HD digital video (Option HD) or any combination of these video formats. Available audio options offer support for monitoring digital audio (embedded or AES/EBU inputs) and analog audio.

WFM7100
The HD-capable WFM7100 offers high-performance monitoring and measurement for applications involving HD digital video. It combines the video and audio monitoring capabilities available on the WFM7000 with available support for Dolby audio, in-depth data analysis and SDI signal measurement. Ideal for multi-format environments, the WFM6100 and the WFM7000 Series Waveform Monitors offer the performance and flexibility needed for demanding video applications.
Flexible Configurations and Upgrades - Helping You Manage the Digital Transition

To help address the challenges of maintaining both legacy analog and emerging digital video technology during the digital transition, the WFM6100 and the WFM7000 Series offer an exceptionally broad range of options and upgrades. Video monitoring, audio monitoring and measurement options can be added to a previously purchased instrument with a field-installable upgrade. For example, you can purchase a WFM6100 configuration that only monitors composite analog and then add support for SD digital video when your facilities make the transition. If you anticipate a future transition to HD digital technology, you can purchase WFM7000 or WFM7100 configurations without HD support, and then add this capability when your needs change.

CaptureVu - Much More Than “Freezing” a Display

The CaptureVu capability on the WFM6100 and WFM7100 can capture and store the video data from an entire video frame and display this data on waveform, vector, gamut and picture displays. Unlike “freeze” captures, you can compare the live signal to capture data in one kind of display (for example, a waveform display), and then make the same live-to-capture comparison in a different display (such as a vector or picture display).

In addition to user-initiated captures, the instrument can do a triggered capture that automatically acquires data on the occurrence of specific faults. Triggered captures are particularly useful for finding intermittent errors and for capturing data about fault conditions at remote sites.

With CaptureVu, you can store a video frame generated by one piece of equipment (for example, a camera), and use this as a reference to configure other equipment to have matching video characteristics. The data can also be stored on a USB memory device and transferred to another instrument.

FlexVu™ Display Interface - Four Instruments in One

The WFM6000 and the WFM7000 Series models have an integrated, XGA-resolution display with the Tektronix FlexVu™ user interface. With FlexVu, you can combine separate monitoring and measurement displays four at a time, in almost any combination. Unlike instruments with pre-determined view combinations or more restricted choices, FlexVu lets you create a multi-view display best suited to your specific needs and work practices.
MyMenu and Presets - Frequent tasks at your fingertips
All models offer the MyMenu capability that lets you create a special menu tailored to your particular needs. MyMenu helps streamline instrument operation by letting you place up to seven of your most frequently used functions in one handy on-screen menu.

Using presets, you can quickly configure the instrument for specific tasks or personal preferences. These instruments can store up to 20 presets organized into four groups. You can label the presets and preset groups for easy identification. Each preset can store a different MyMenu.

The presets and MyMenu data can be downloaded to a USB memory device and transferred to another instrument.

Waveform Displays - Quickly Verify and Adjust Critical Signal Parameters
Familiar video waveform displays can show digital video signals in RGB, YPbPr, YRGB or composite formats with flat or low-pass filtering. Waveform displays of composite analog video signals can show NTSC and PAL signals with luma, chroma and luma-chroma filtering. Signal components can be displayed in either parade or overlay mode, and in composite format displays with setup selection. The waveform display has several sweep rates and easy, touch-screen control of vertical gain and horizontal magnification to help you efficiently monitor and measure video waveform parameters. With FlexVu you can see four differently configured waveform displays of the same signal.

Vector, Lightning and SCH Phase Displays - Accurately Control Color Parameters
The vector display offers user-selectable graticules, color targets (75% and 100%) and color axis. The patented Tektronix Lightning display shows luma and chroma amplitudes and lets you verify component timing using a color bar signal. The SCH Phase display helps quickly verify this critical timing parameter of composite analog video signals.

Tektronix-exclusive Gamut Displays - Efficiently Detect and Correct Gamut Problems
The patented Tektronix Split Diamond and Arrowhead gamut displays simplify the process of verifying gamut compliance. The Split Diamond display helps easily identify and correct RGB gamut errors in digital video signals. The Arrowhead display saves time in verifying the gamut compliance of the composite analog video signal generated from a digital video signal. With FlexVu, you can simultaneously monitor both gamut displays to quickly gain complete confidence in content compliance throughout the delivery chain. Also, user-selectable gamut thresholds let you tailor these displays, and the associated gamut alarms, to your particular compliance standards.
Timing Display - Simplify Plant Timing

The patented Tektronix Timing display makes facility timing easy through a simple graphical representation which shows the relative timing of the input signal (the circle) versus the reference signal (the crosshair). For proper timing, the circle is centered on the crosshair and changes color from red to green. The display also has numeric readouts of the timing difference relative to the reference signal, showing vertical timing as number of lines and horizontal time difference in μsec.

Picture Displays - Quick Visual Conformation and Precision Content Adjustment

A full-color picture display shows the video content of the monitored input. The instrument can display the picture on the full-screen, or on up to four views in a multiple-view display. For different input formats, the picture display automatically adjusts to show the full image content. The picture display can also show content advisory codes and decoded closed caption data (EIA608 formats) for easy verification of this critical ancillary data. Editors can choose from several Safe Area graticules on the picture display to quickly verify correct placement of graphics, titles or logos. Graticule choices include the Safe Action and Safe Title graticules defined in the SMPTE, ITU and ARIB standards, plus custom, user-definable graticules. Using FlexVu, editors can see two or more pictures with different graticules to verify correct placement for different formats and standards. You can also select “brightup” conditions that show the location of RGB or composite gamut errors on the picture display. Line and sample brightups show the location of the currently selected line or video data sample.
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Alarms, Quality Statistics and Logging - Thorough and Fast Content Verification

All models offer a variety of displays for “status at a glance” signal monitoring and quick, thorough content verification. Using the alarm status display, operators and technicians can quickly detect video faults including gamut, EDH and CRC errors, SDI format problems and many more. The instrument offers several alarm notification methods, including on-screen error icons, audible beep, ground-closure output and SNMP traps.

For verifying and documenting content compliance, the Video Session display shows key status information on the signal plus quality statistics like errored seconds and percentage content with errors.

To support unattended monitoring, and to supply documentation for maintenance records or service level agreements, the instrument logs alarms and other key events (such as format changes). Log entries can be time-stamped with date, time-of-day and time code reference (VITC, ATC or LTC).

All models offer extensive ancillary data monitoring. This includes monitoring the presence of closed caption content formats defined by EIA608, EIA708 and ARIB standards.

Audio Monitoring - Versatile Tools Help Confirm and Adjust Sound Quality

The WFM6100 and the WFM7000 Series offer several options for monitoring both analog and digital audio.

- Option DS monitors digital audio, both embedded and AES/EBU inputs
- Option AD monitors analog audio formats and all the digital audio formats included in Option DS
- Option DD monitors and decodes Dolby Digital audio (AC-3) plus the analog and digital audio formats included in Option AD
- Option DDE monitors and decodes Dolby E plus all the audio formats included in Option DD

Options DD and DDE automatically sense Dolby audio formats and place a status message in the appropriate audio bar, eliminating confusion about audio input formats. Dolby status displays offer in-depth review of decoded Dolby metadata.

All audio options have an audio bar display that can display up to six audio bars for analog inputs, up to eight audio bars on AES/EBU inputs and embedded audio sources and up to ten audio bars when decoding Dolby Digital and Dolby E formats.

The audio options provide user-selectable scales, meter ballistics and audio level indicators. “In-bar” messages show status and fault conditions for each monitored audio channel, reducing the likelihood of an undetected audio problem.

Audio phase displays include phase correlation meters, a flexible Lissajous display (for any pair of channels) and a multiple-channel “Surround Sound” display that shows audio levels (A-weighted or linear), total sound volume, phantom source locations and the dominant sound position.

The Audio Session display shows audio error conditions (such as parity errors), highest true peak and the number of detected, clips, mutes, over-levels and silences. User-specified threshold values determine over-level and silence conditions and the duration a potential audio problem must persist before the instrument generates an alarm.

In addition to monitoring audio inputs, these options can generate analog or digital audio outputs from the analog or AES/EBU audio inputs. They can also generate audio outputs from embedded audio in the video input, or by decoding Dolby audio inputs, including stereo down-mixes. A convenient front-panel headphone connector lets you listen to any stereo audio output.
Multi-standard, Multi-format Waveform Monitors

SDI Signal Measurement and Data Analysis - Resolve the Most Challenging Problems

The WFM6100 and WFM7100 offer options for monitoring and measuring SDI signal parameters:

- For basic SDI signal monitoring, Option EYE has Eye pattern displays, plus readouts of jitter and key cable parameters.
- For more complete SDI signal measurement, Option PHY has all the capabilities of the EYE option plus a jitter waveform display and automated Eye parameter measurements.

On the WFM6100, Options EYE and PHY measure SD-SDI signal parameters. On the WFM7100, these options measure both SD-SDI and HD-SDI signal parameters. Both the EYE and PHY options can display Eye Patterns in 3-Eye, 10-Eye (SD-SDI) or 20-Eye (HD-SDI) mode. These displays include cursors to manually measure Eye parameters and user-selectable clock bandwidths to help isolate jitter components. Option PHY automatically measures Eye amplitude, rise-time and fall-time.

Both options use a phase demodulation technique with selectable filters to continuously monitor and measure the peak-to-peak amplitudes of timing and alignment jitter.

The phase demodulation approach helps better characterize the random and deterministic jitter in the input signal. An easy-to-interpret jitter gauge augments the numeric jitter readouts. The jitter waveform display available with Option PHY lets engineers examine signal jitter in greater detail.

An SDI signal status display summarizes key signal parameters. This includes signal strength, cable loss and estimated cable length based on the user-selected cable type. With FlexVu, you can simultaneously display timing and alignment jitter values, cable parameter measurements and different Eye Patterns to help quickly diagnose and resolve problems related to SDI jitter or cable attenuation.

To help efficiently detect and diagnose errors in digital video data, the WFM6100 and WFM7100 offer Option DAT, containing a color-coded data word display, logic waveforms of the video data and a display of data words in user-specified ancillary data packets.
Signal Inputs and Outputs, Peripherals, Communication - Convenient Interfaces for Video Systems

The digital video options (Options SD and HD) have two SDI inputs and a switched output of the selected input signal. The analog video option (Option CPS) has two composite analog video inputs with passive loop-through outputs.

The instrument senses the input format and automatically configures the required settings. It will signal a format mismatch if the applied external reference format is not compatible with the input signal.

The audio options (Options DS, AD, DD and DDE) have up to 16 AES/EBU input channels and up to 8 AES/EBU output channels. Those with support for analog audio have up to 12 analog audio inputs and up to 8 analog audio outputs. All audio options can output to the front-panel headphone port.

The front-panel USB port makes it easy to store captured data or instrument settings on a USB memory stick and transfer this information to another instrument. All models have a 10/100Base-T Ethernet connection and offer remote access and control with a standard Web-browser. You can use this interface to download presets and error logs or print the screen contents for easy record keeping.

For simple remote control, a ground-closure type remote interface can indicate alarm condition or execute instrument presets. An SNMP interface allows easy integration with network management software.
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Characteristics

Video Input and External Reference Formats

WFM6000/7000 Waveform Monitors accept a diverse range of signal formats and external references. The following chart shows all accepted video formats and their compatible external references.

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.


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<thead>
<tr>
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<tbody>
<tr>
<td></td>
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<tr>
<td>Bi-Level Sync</td>
<td>720p</td>
<td>1080p</td>
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<tr>
<td>NTSC 59.94 Hz</td>
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<tr>
<td>PAL 50 Hz</td>
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<tr>
<td>BT601 483i, 59.94 Hz (525)</td>
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<td>BT601 576i, 50 Hz (625)</td>
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<td>296M 720p, 23.98 Hz</td>
<td>x</td>
<td>x(5)</td>
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<td>296M 720p, 24 Hz</td>
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<tr>
<td>296M 720p, 25 Hz</td>
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<td>296M 720p, 29.97 Hz</td>
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<td>296M 720p, 30 Hz</td>
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<td>296M 720p, 50.00 Hz</td>
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<tr>
<td>296M 720p, 59.94 Hz</td>
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<tr>
<td>296M 720p, 60.00 Hz</td>
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<td>x</td>
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<tr>
<td>240M 1035i, 59.94 Hz</td>
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<td>240M 1035i, 60 Hz</td>
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<td>274M, 1080i, 50 Hz</td>
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<td>274M, 1080i, 59.94 Hz</td>
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</table>
**Serial Digital Video Interface**

Inputs -
- 2, only one active at a time. The inputs autodetect between HD and SD signals.
- 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.
  - –6.0 V to +6.0 V, DC + peak AC.
- DC Input Impedance -
  - 20 kΩ, nominal.
- Return Loss -
  - >40 dB to 6 MHz, >35 dB to 30 MHz.
  - >40 dB to 10 MHz (typical).
  - >46 dB to 6 MHz, power on.
- Input Level -
  - 800 mV_{in} ±10%.
- AES Outputs -
  - 8 channels, AES3-3 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.
- BNC: to 100 m of type 8281 cable.
- SD: to 250 m of type 8281 cable.
- AES Input Return Loss -
  - >25 dB relative to 75 Ω from 0.1 to 6 MHz.
- AES Output Return Loss -
  - >25 dB relative to 75 Ω from 0.1 to 6 MHz.

**Composite Video Interface (Option CPS)**

Inputs -
- Two, only one active at a time. Input Type - Passive loopthrough BNC, 75 Ω compensated.
- 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 -
  - 20 kΩ, nominal.
- Return Loss -
  - >40 dB to 6 MHz, power on.
  - >40 dB to 10 MHz (typical).
  - >46 dB to 6 MHz (typical).
- 35 dB, 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 - <7 mV.
- DC Restore 50 Hz and 60 Hz Attenuation - Fast Mode >95% attenuation, Slow Mode <10% attenuation.
- 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 - 20 kΩ, nominal.
- Return Loss -
  - >40 dB to 6 MHz, >35 dB to 30 MHz.

**User Interface**

1024 (H) x 768 (V) pixels LCD.

**Serial Digital Waveform Vertical Characteristics**

- Analog Composite Waveform
- Vertical Measurement Accuracy - ±1%.
- Frequency Response -
  - HD: >70 dB to 6 MHz.
  - Chrominance Channels (Y): 50 kHz to 30 MHz ±0.5%.
  - Chrominance Channels (Pb,Pr): 50 kHz to 15 MHz ±0.5%.
- 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%.
- Frequency Response -
  - HD: >70 dB to 6 MHz.
  - Chrominance Channels (Y): 50 kHz to 30 MHz ±0.5%.
  - Chrominance Channels (Pb,Pr): 50 kHz to 15 MHz ±0.5%.
- Return Loss - ±6 dB, power on.
- AES Outputs -
  - Up to 8 channels, AES3-3 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 3-1D).
  - For decoded Dolby Digital, output is 24-Bits at a rate of 32, 44.1 or 48 kHz for any one decoded pair. For decoded Dolby E, the output is 24-Bits at 48 kHz, or 47.952 kHz for up to 4 pairs.
  - AES Input Return Loss - >25 dB relative to 75 Ω from 0.1 to 6 MHz.
  - AES Output Return Loss - >25 dB relative to 75 Ω from 0.1 to 6 MHz.

**Physical Characteristics**

- Dimensions: mm
- Height: 133.4
- Width: 215.9
- Depth (front to back): 460.4

**Weight**

- kg: 5.5
- lbs: 12
### Ordering Information

**WFM Models and Options**

Must select one and then desired options.

- **WFM 7100**  
  HD-capable performance monitor.

- **WFM 7000**  
  HD-capable basic monitor.

- **WFM 6100**  
  SD-capable performance monitor.

### Video Options

Must choose at least one when ordering any model.

- **CPS**  
  Composite Analog Monitoring.
  - 2 Composite Analog Inputs.

- **SD**  
  Standard Definition Monitoring.
  - 2 SD SDI Inputs.

- **HD**  
  High Definition Monitoring.
  - Includes the capabilities of EYE option plus advanced physical layer measurements, jitter waveform, and automated eye measurements.

- **EYE**  
  Eye pattern and basic jitter measurement.
  - Allows for logic-level view of video and audio digital data stream and ANC data extraction.

- **PHY**  
  EYE capabilities plus advanced physical layer measurements.

- **DAT**  
  Data analysis capabilities.
  - Allows for logic-level view of video and audio digital data stream and ANC data extraction.

### Audio Options

If audio test is required, select only one option (the advanced options include the features of the basic ones).

- **DS**  
  Audio Monitoring for AES/EBU formats.

- **AD**  
  DS capabilities plus Analog Audio Monitoring.

- **DD**  
  AD capabilities plus Monitoring for Dolby Digital (AC-3) decode.

- **DDE**  
  DD capabilities plus Dolby E decode monitoring.

### Eye/Jitter and Data Analysis Options

- **EYE**  
  Eye pattern and basic jitter measurement.

- **PHY**  
  EYE capabilities plus advanced physical layer measurements.

### Power Options

- **Opt. A0**  
  North America power.

- **Opt. A1**  
  Universal Euro power.

- **Opt. A2**  
  United Kingdom power.

- **Opt. A3**  
  Australia power.

- **Opt. A4**  
  240 V, North America power.

- **Opt. A5**  
  Switzerland power.

- **Opt. A6**  
  Japan power.

- **Opt. A10**  
  China power.

- **Opt. A99**  
  No power cord or AC adapter.
Language Options
L0 – English manual.
L7 – Simplified Chinese manual.

Service Options
Opt. C5 – Calibration Service 5 Years.
Opt. D5 – Calibration Data Report 5 years with Option C5.
Opt. R3 – Repair Service 3 years (including warranty).
Opt. R5 – Repair Service 5 years (including warranty).

Other Options
Opt. NRC – No portable or rack cabinet.
Opt. 01 – Portable cabinet.
Opt. 02 – Dual rack cabinet (same as WFM7F05 option NN).
Opt. 05 – Dual rack cabinet (same as WFM7F05 option ON).
Opt. 06 – Filler panel for dual rack cabinet.
Opt. 02 – Analog audio breakout cable.

Optional Accessories
WFM7F02 – Portable cabinet with handle, feet, tilt bail and front panel cover.
WFM7F05 – Dual rackmount for WFM6100, WFM7000, WFM7100, 1700 Series, WFM601 Series, WFM700 Series, 760A and 764.

Post-sale Upgrades
WFM61UP – Upgrade kit for WFM6100. Upgrade by ordering WFM61UP with appropriate options: CPS, SD, DS, AD, DDE, EYE, PHY, DAT.
WFM70UP – Upgrade kit for WFM7000. Upgrade by ordering WFM70UP with appropriate options: CPS, SD, HD, DS, AD.
WFM71UP – Upgrade kit for WFM7100. Upgrade by ordering WFM71UP with appropriate options: CPS, HD, SD, AD, DD, DDE, EYE, PHY, DAT.

Extended Service Offerings
See next page.
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- **WFM6100** • **WFM7000** • **WFM7100**

### Extended Service Offerings

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<tr>
<th>Model</th>
<th>Service Description</th>
<th>Warranty Details</th>
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<tbody>
<tr>
<td>WFM6100</td>
<td>CA1 - Single Calibration.</td>
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<tr>
<td>WFM6100</td>
<td>R1PW - Repair Service 1 year (post warranty).</td>
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<tr>
<td>WFM6100</td>
<td>R2PW - Repair Service 2 years (post warranty).</td>
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<tr>
<td>WFM6100</td>
<td>R3DW - Repair Service 3 years (includes warranty).</td>
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<tr>
<td>WFM6100</td>
<td>R5DW - Repair Service 5 years (includes warranty).</td>
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<tr>
<td>WFM7000</td>
<td>CA1 - Single Calibration.</td>
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<tr>
<td>WFM7000</td>
<td>R1PW - Repair Service 1 year (post warranty).</td>
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<tr>
<td>WFM7000</td>
<td>R2PW - Repair Service 2 years (post warranty).</td>
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<td>R3DW - Repair Service 3 years (includes warranty).</td>
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<tr>
<td>WFM7000</td>
<td>R5DW - Repair Service 5 years (includes warranty).</td>
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</tbody>
</table>

**WFM7100**
- **CA1** - Single Calibration.
- **R1PW** - Repair Service 1 year (post warranty).
- **R2PW** - Repair Service 2 years (post warranty).
- **R3DW** - Repair Service 3 years (includes warranty).
- **R5DW** - Repair Service 5 years (includes warranty).