

# Multi-format, Multi-standard Waveform Monitors

► WFM700HD • WFM700A • WFM700M



COMPUTING  
COMMUNICATIONS  
VIDEO

The WFM700 Series of Multi-format Waveform Monitors offers the monitoring capabilities needed in the production, post-production, distribution, and transmission of high-definition (HD) and standard-definition (SD) digital video content.

For mixed HD/SD environments, the multi-format **WFM700A** gives you the tools you need to perform operational monitoring tasks like checking signal validity and content quality, setting levels, and verifying signal paths. The **WFM700HD** offers an HD-only version of these same capabilities. The **WFM700M** offers all the capabilities of the WFM700A plus the digital analysis capabilities important in the design, installation, and maintenance of digital video systems, including eye diagram with

automated measurements, jitter, and data measurements for both HD and SD formats. With available digital audio monitoring support, you can expand the capabilities of any WFM700 configuration to monitor both digital video and audio in a single instrument.

These products combine the best of traditional waveform monitors with the measurement accuracy, repeatability, and stability achievable with fully digital technology. Their modular design lets you purchase the capability you need now and add capabilities later as your requirements change. Backed by Tektronix innovation, service, and support, these modular, multi-format, fully digital waveform monitors lower your cost of ownership while offering powerful tools for monitoring digital video and audio signals.

## ► Features & Benefits

Monitors SD and HD Digital Component Video – Single Product for Both Standards

Exclusive Diamond, Split Diamond and Arrowhead Displays Offer Unique Insight Into the Gamut Compliance of Your Content

Safe Action and Safe Title Graticules Help Editors and Operators Easily Identify Incorrectly Positioned Video Content

Multi-mode Display Improves Efficiency by Letting You View a Wide Variety of Displays Simultaneously

Closed Caption Detection and Decode Let Operators Quickly Verify Correct Closed Captioning in the Video Content

Ancillary Data Analysis Reduces the Time and Effort Needed to Isolate and Diagnose Problems in the Data Content of Video Signals

HD/SD Eye Pattern Display with Automated Measurements and Jitter Display improve Efficiency in the Installation and Maintenance of Digital Video Distribution System (M module only)

Digital Audio Monitoring Capability with Surround Sound Display Verifies Compliance of Digital Video and Digital Audio Signals in a Single Instrument, Conserving Space, and Lowering Capital Expenses (requires purchase of additional module)

TFT Color LCD Display, with Integrated Touch Screen Control, Provides a Unique, Flexible User Interface with Intuitive, Status-at-a-Glance Operation

Remote Interface for Access and Control From Any Location

## ► Applications

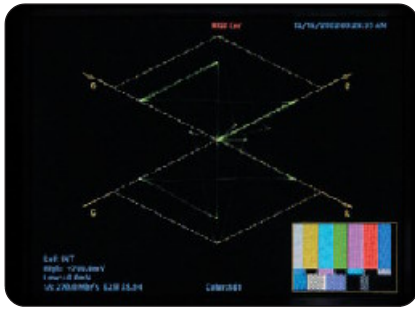
Quality Control in the Production and Post-production of HD/SD Digital Video Content

Monitoring and Compliance Checking in the Distribution and Broadcast of HD/SD Digital Video

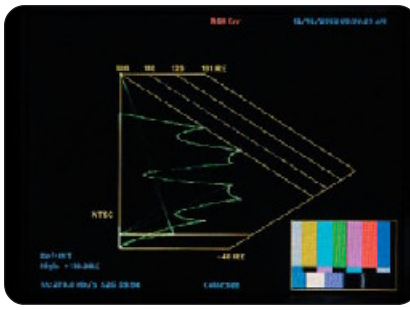
Video Equipment Qualification and Troubleshooting in the Installation and Maintenance of HD/SD Digital Video Facilities and Systems

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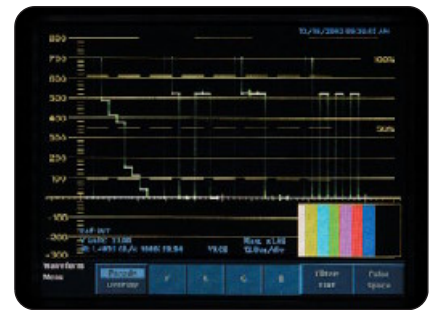
▶ WFM700HD • WFM700A • WFM700M



▶ WFM700 Diamond display.



▶ WFM700 Arrowhead display.



▶ WFM700 YRGB Waveform display in parade mode.

## Tektronix Exclusive Color Gamut Monitoring

Problems with production and operational equipment can introduce illegal colors in the digital video signal, i.e., colors that fall outside established gamut limits. Every member of the WFM700 Series has the following Tektronix patented gamut monitoring displays:

- ▶ Diamond and Split Diamond – monitoring for RGB gamut compliance
- ▶ Arrowhead – monitoring for composite gamut compliance including luma+chroma and separate luma limit checking

With these specialized displays you can significantly reduce the time and effort needed to perform this critical quality control task.

## Familiar Waveform Monitoring Displays and Controls

All WFM700 models offer familiar waveform displays. You can view digital video signal components in either an RGB, YRGB,  $Y_P, P_r$  color space, displayed in parade or overlay mode. The YRGB color space combines the Y luminance signal with the RGB component signals to give you benefits from both traditional color spaces.

In addition to these digital waveform displays, the WFM700 products can also display a familiar composite representation of an SDI digital signal.

Every WFM700 model offers a rich set of familiar waveform display controls including:

- ▶ 1-line, 2-line, 1-field, and 2-field sweep selections
- ▶ Line and field selects
- ▶ Flat and low-pass filtering
- ▶ 1x, 5x, 10x and variable gain settings
- ▶ 0% and 7.5% setup levels in the composite waveform representation
- ▶ Offset and aligned chroma settings in  $Y_P, P_r$  color space
- ▶ Horizontal magnification
- ▶ Selectable graticules including mV, IRE, and % scales

## Tradition and Innovation in Monitoring Color Amplitude and Timing

Complementing these full-featured waveform displays, every WFM700 product offers two specialized displays for monitoring the color information in digital video signals.

- ▶ The traditional Vector display for monitoring  $P_P, P_r$  color amplitude
- ▶ The Tektronix-patented Lightning display for monitoring luma and chroma amplitudes and interchannel timing



▶ WFM700 Lightning display.

## Automatic Detection of a Wide Range of Signal Formats

All WFM700 models have two terminating inputs for serial digital signals in either SMPTE 292M format (WFM700 HD, WFM700A, and WFM700M) or SMPTE 259M format (WFM700A and WFM700M).

The monitor will automatically detect the signal format and establish the appropriate settings for the various displays.

All models accept an external reference signal for synchronization. You can let the instrument automatically detect the external reference signal format or manually select any of the following formats: NTSC, PAL, 1080i (50 Hz, 59.94 Hz, 60 Hz), 1080p (23.98 Hz, 24 Hz), or 720p (59.94 Hz).

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▶ WFM700 Video Session display.



▶ WFM700 Auxiliary Data Status display.



▶ WFM700 Ancillary Data display.

The following table shows the supported signal formats:

Standard	Physical Interface	Image Format	Field/Frame Rate 60 Hz	Field/Frame Rate 59.94 Hz	Field/Frame Rate 50 Hz	Field/Frame Rate 30 Hz	Field/Frame Rate 29.97 Hz	Field/Frame Rate 25 Hz	Field/Frame Rate 24 Hz	Field/Frame Rate 23.98 Hz
274M	292M	1920x1080i	X (D-292)	X (E-292)	X (F-292)					
274M	292M	1920x1080p				X (G-292)	X (H-292)	X (I-292)	X (J-292)	X (K-292)
274M	292M	1920x1080sF				X <sup>2</sup>	X <sup>2</sup>	X <sup>2</sup>	X	X
240M/260M	292M	1920x1035i	X (A-292)	X (B-292)						
296M	292M	1280x720p	X (L-292)	X (M-292)	X				X	X
ITU-R BT.601 <sup>*1</sup>	259M	720x576i (625)				X (C-259)				
ITU-R BT.601 <sup>*1</sup>	259M	720x483i (525)			X (C-259)					

\*1 ITU-R BT.601 defines sampling for SD serial digital video per SMPTE 259M and ITU-R BT.656.

\*2 These segmented-frame format signals are detected as their corresponding interlaced format.

## “Status-at-a-Glance” Video Session Display

In addition to detecting a wide range of video signal characteristics, the WFM700 waveform monitors offer valuable status and error reporting capabilities, like the unique Video Session display. This display summarizes a variety of statistics relevant to video content health and standards compliance, including:

- ▶ Signal format and colorimetry
- ▶ Stuck bits indicator
- ▶ Presence or absence of ancillary data, including embedded audio, closed caption data, or timecodes

- ▶ Presence or absence of color gamut errors
- ▶ CRC values
- ▶ Errored seconds, errored fields, and % errored fields statistics

## Timing Reference and Auxiliary Data Monitoring

Every WFM700 Series product can detect information contained in the horizontal and vertical synchronization intervals in the digital video, including:

- ▶ Start-of-Active-Video (SAV) and End-of-Active-Video (EAV)
- ▶ Error detection and reporting per SMPTE RP165 for standard definition and SMPTE 292M for high definition

- ▶ Presence of closed caption information in accordance with EIA608 and, if presence, decode and display the data on picture display
- ▶ Presence of closed caption information embedded in accordance with EIA708 and ARIB B37 standards
- ▶ Ancillary Time Code (ATC) and Vertical Interval Time Code (VITC) values
- ▶ Presence of V-chip data and, if presence, the decoded rating information
- ▶ Presence of ARIB STD-B39, ARIB STD-B35, ARIB TR-B22, and ARIB TR-B23

Depending on your preference, WFM700 waveform monitors can either show the SAV and EAV in waveform display or strip out this data prior to display.

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▶ WFM700 picture display with decoded EIA608 Closed Caption data.

The Ancillary Data Display helps you view information contained in any ancillary data packet by specifying the appropriate first data identifier (DID) and secondary data identifier (SDID). All WFM700 Series waveform monitors can display the data as a table of data words in hex format. The display can also show information on data block and count, packet type, and checksums.

## User-adjustable Alarms and Event Logging

Further enhancing the capability available with the Video Session display, all WFM700 Series instruments can report and log a wide range of alarm conditions, including:

- ▶ Input signal or external reference signal missing or format mismatch
- ▶ Color gamut errors
- ▶ EAV/SAV missing or mismatch with line number
- ▶ SAV placement error
- ▶ CRC and EDH errors, code word violations, or field and line length errors
- ▶ Ancillary data and closed caption present/absent errors, parity errors, or checksum errors



▶ WFM700 Event Log.

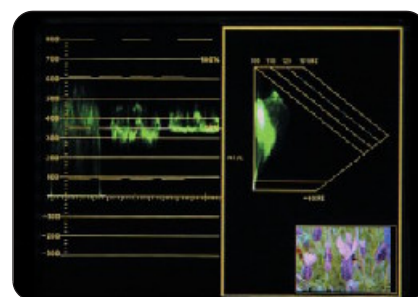
Every WFM700 model maintains an event log with each entry stamped with the time-of-day the event occurred. You can also configure event logging to time stamp events with a VITC value.

## Convenient User Interface Features and Display Modes

WFM700 waveform monitors offer many convenient user interface features and display modes, including:

- ▶ An integrated thin-film LCD color display with touch screen
- ▶ Full-screen and thumbnail picture display
- ▶ Multi-mode display capability that lets you flexibly combine two displays into a single, split-screen view
- ▶ Freeze mode for comparing live signals against a stored reference
- ▶ Electronic graticules and digital cursors
- ▶ Safe action and safe title graticules that help you easily identify incorrectly positioned video content
- ▶ Up to 42 stored presets
- ▶ Print screen capability, context sensitive on-line help, and complete instrument diagnostics

Video monitors and television sets may overscan, i.e., placing parts of the image outside the display area. Incorrect placement of graphics, logos, and other branding elements can obscure text or essential action. The Safe Action and Safe Title graticules help you quickly assure that the action and



▶ WFM700 Multi-mode display.

titles you produced lie within the safe areas defined in SMPTE RP218. The Safe Action Area is the maximum image area within which all significant action shall be contained while the Safe Title Area is the maximum image area within which all significant titles should be contained.

## Powerful Digital Video Waveform Measurement Available

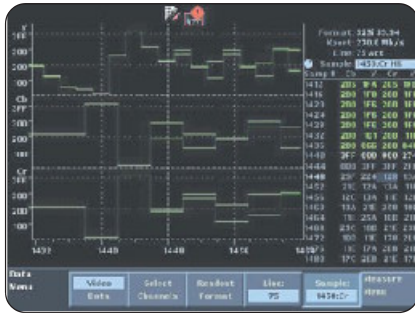
For in-depth technical measurement of digital video signals, you need additional capabilities. For making highly precise inter-channel amplitude and timing measurements, every WFM700 model offers the familiar Bowtie display. The WFM700M offers more comprehensive measurement capability, adding the following displays to those offered on the WFM700A and WFM700HD:

- ▶ Data display
- ▶ Eye pattern display
- ▶ Jitter display

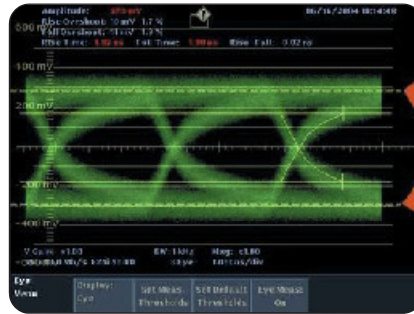
The automated Eye measurements include amplitude, rise time, fall time, rise overshoot, fall overshoot and a histogram of the Eye sample amplitude values. In Jitter Display mode, the WFM700M demodulates the signal jitter, displays a trace of video-correlated jitter vs. time, and measures peak-to-peak time jitter in the active display.

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▶ WFM700 Data display.



▶ WFM700 Eye Pattern display.



▶ WFM700 5.1 multi-channel Surround Sound display.

### Digital Audio Monitoring Available on All Models

All members of the WFM700 Series detect and report the presence or absence of embedded audio channels. You can add more extensive capability for monitoring AES/EBU digital audio channels by including Option DG in your order for any WFM700 Series waveform monitor. You can add this audio monitoring capability to a previously purchased WFM700 model by ordering the WFM7DG field upgrade.

WFM700 Series digital audio monitoring and measurement features include:

- ▶ Monitoring of up to 16 embedded digital audio channels
- ▶ 4 AES/EBU audio inputs/outputs for monitoring up to 8 non-embedded audio channels, or producing up to 8 channels of de-embedded audio output
- ▶ Support for multi-channel digital audio in 5.1 and 7.1 formats
- ▶ Audio Level Bar display of 2, 4, 6, or 8 audio channels with true peak, PPM, and Extended VU meter ballistics and selectable scaling
- ▶ Single-axis Phase Correlation Meter showing the phase relationship between signals on an audio channel pair
- ▶ Flexible Lissajous display showing the phase relationship between channels, with X/Y or Sound Stage (L/R) axis orientation and automatic gain control

- ▶ Surround Sound Display for 5.1 multi-channel digital audio format with total volume, center volume, phantom source and dominant sound indicator as well as  $L_s$  and  $R_s$  correlation meter

Surround Sound Display helps you more precisely mix, master, edit and verify 5.1 multi-channel digital audio. The visual representation of the sound image complements your auditory experience.

The display shows the audio level balance among the left (L), right (R), left-surround ( $L_s$ ), and right-surround ( $R_s$ ) channels on the ruled scales radiating from the center. A vertical bar between the L and R channels shows the center (C) channel audio level.

The polygon formed by connecting the level indicator endpoints shows the total sound volume formed by the L, R,  $L_s$ , and  $R_s$  channels. This connecting line will bend away from the center if the two signals have a positive correlation, will bend towards the center if the signals have a negative correlation, and will not bend if the signals have no correlation. In addition to this total volume indicator, the display has a separate center volume indicator by connecting the ends of the L, C, and R channel level by straight lines.

Phantom source indicators (PSIs) located on each side of the display show the location of potential phantom sound sources formed by adjacent channels.

The display also has a cross-hair pointer that shows the location of the dominant sound in the sound image, and a correlation meter at the bottom of the display that shows the correlation between the  $L_s$  and  $R_s$  channel.

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The audio monitoring module supports the embedded and AES/EBU formats shown in the following table:

Audio Standard	Physical Interface	Sampling Frequency	
		48.0 kHz	44.1 kHz
AES3-1992 (r1997)	AES-3id-2001	X	X
AES3-1992 (r1997)	SMPTE 259M	X	
AES3-1992 (r1997)	SMPTE 292M	X	

Complementing these standard displays, the Channel Status display decodes the information in the Channel Status block defined in AES3-1992 (r1997) for both consumer-grade and professional-grade audio.

Audio monitoring support adds several alarm conditions to the list of video alarms described earlier, including detection of:

- ▶ Audio CRC errors
- ▶ Clip, mute, over, and silence conditions
- ▶ Audio parity errors
- ▶ Embedded audio absence and AES audio unlock

Like the session display used to monitor video signals, all WFM700 models with audio monitoring capability offer an Audio Session screen that lets you quickly check the health of any digital audio channels and track key audio signal parameters. Key fields include:

- ▶ Highest true peak, highest uninterpolated peak, and highest bar reading
- ▶ Sample rate and active bits
- ▶ The number of clips, mutes, overs, and silences
- ▶ Invalid samples
- ▶ Detected receiver errors

### Multiple Inputs/Outputs for Easy System Integration

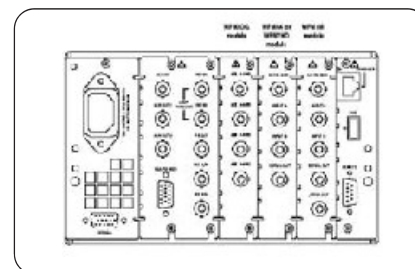
In addition to the inputs and outputs described earlier, every WFM700 model has the following connections:

- ▶ VGA output for viewing the LCD display on a detached VGA monitor
- ▶ Analog component video picture monitor outputs
- ▶ VGA picture monitor output that follows the component picture monitor output for viewing the picture on an inexpensive VGA display
- ▶ Looping inputs for bi-level and tri-level sync
- ▶ One switched SDI output that follows the selected input
- ▶ An SD SDI picture monitor output

### Network Access and Control

The WFM700 Series offers two forms of remote access and control:

- ▶ A 9-pin remote control port reports alarm conditions and lets you control the monitor by selecting one of seven available instrument presets
- ▶ A network remote control interface lets you view the WFM700 displays using a standard Web-browser over an Ethernet-based network
- ▶ SNMP (Simple Network Management Protocol) speeds development and integration of remote control software for external control and reporting of major functions of the WFM700, including all error alarms



▶ WFM700 Back Panel with two WFM700M video input modules and an audio input module installed.

### ▶ Characteristics

#### Serial Digital Video Interface

**Video Inputs** – 2 per card – only one active at a time.

**Input Type** – 75 Ω BNC, internally terminated.

**Launch Amplitude Accommodation** – 800 mV ±10% for full specification, 800 mV ±30% up to 20 dB cable attenuation.

**Jitter Tolerance** – 0.4 U<sub>I,p-p</sub>, typical above 2 MHz.

**Return Loss** – 15 dB to 1.5 GHz.

**Isolation Between Inputs** – >45 dB to 1 GHz.

#### Switched Serial Video Output Format

– 1.485 Gbps or 270 Mbps repeat of selected input.

**Output Level** – 800 mV<sub>p-p</sub> ±5% into 75 Ω load.

**Return Loss** – 15 dB to 1.5 GHz.

**Output Type** – 75 Ω BNC.

#### External Reference

**Sync Format** – NTSC, PAL, 1080i 50 Hz, 1080i 59.94 Hz, 1080i 60 Hz, 720p 59.94 Hz, 1080p 23.98 Hz, 1080p 24 Hz.

**Input Type** – 75 Ω BNC passive loop.

**Return Loss** – 40 dB to 30 MHz.

**Hum** – Operates with 500 mV<sub>p-p</sub>.

**Signal/Noise** – Operates to 25 dB.

#### Serial SD Only Monitor Output Content Follows Active Input With Brightups

– SD only digital version of RGB/Y'P'bP'r analog picture monitor output on Ref board.

**Rate** – 270 Mbps.

**Signal Level** – 800 mV ±5% into 75 Ω.

**Return Loss** – 20 dB, 5 MHz to 270 MHz.

**Output Type** – 75 Ω BNC.

#### Picture Monitor Outputs

**Signal Format, BNC Outputs** – Y, P'b, P'r with sync on Y, RGB with sync on all, HD and SD. HD sync is tri-level.

**Signal Format, VGA D-sub Outputs** – Same signal as on BNC outputs, also have TTL H and V drive.

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**Impedance** – 75  $\Omega$  unbalanced.

**Active Video Accuracy** – 700 mV  $\pm 5\%$ <sub>p-p</sub>  
(Y'P'bP'r mode).

**Black (Blanking) Output Level** – 0 mV  $\pm 25$  mV  
for HD and SD.

**Frequency Response, SD** – Y, G, B and R  $\pm 5\%$   
to 5.5 MHz.

**Frequency Response, HD** – Y, G, B and R  $\pm 8\%$   
to 30 MHz.

## AES Audio Interface

**Audio Inputs** – 4 inputs, 8 audio channels, meets  
Requirements of AES-3id-2001.

**Input Type** – 75  $\Omega$  BNC, internally terminated,  
unbalanced.

**Input Amplitude Range** – 0.2 V to 2 V<sub>p-p</sub>.

**Input Sample Rate** – 32 k to 96 k samples/sec.

**Input Lock Range** –  $> \pm 5\%$ , typical.

**Input Return Loss** – Better than 25 dB from 0.1 to  
6 MHz.

**Audio Outputs** – Up to 8 audio channels from  
Embedded Audio only.

**Output Format** – 48 kHz, 20 bit, meets require-  
ments of SMPTE 276M-1995 (AES-3id-2001).

**Output Amplitude Range** – 0.9 V to 1.1 V<sub>p-p</sub>  
into 75  $\Omega$ .

**Output Sample Rate** – Locked to embedded  
sample rate (nominally 48 kHz).

**Output Jitter** – Meets AES3-1997.

**Output Return Loss** – Better than 25 dB  
0.1 to 6 MHz.

## Waveform Vertical Deflection

**Vertical Measurement Accuracy Using Graticule  
or Cursor** –

At 1x,  $\pm 0.5\%$  of 700 mV full scale.

At 5x,  $\pm 0.2\%$  of 700 mV full scale.

At 10x,  $\pm 0.1\%$  of 700 mV full scale.

**Gain** – 1x, 5x, 10x, variable.

**Variable Gain Range** – 0.25x to 14x.

**Frequency Response, HD\*1** –

Luminance channel (Y): 50 kHz to 30 MHz  $\pm 0.5\%$ .

Chrominance channels (P'b, P'r): 50 kHz to 15 MHz  
 $\pm 0.5\%$ .

\*1 For monochrome signals, R, G and B bandwidths  
equal Y bandwidth.

## Waveform Horizontal Deflection

**Sweep Accuracy** –  $\pm 0.5\%$ , all rates, fully  
digital system.

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

**Rates** – 1, 2, 3, 4 line or field, depending  
on mode.

**Line Select** – Selected line in 1 line, selected first  
line in 2 line or parade.

## Eye Pattern Display

**Type** – Equivalent time sampler.

**Signal Bandwidth** – 50 kHz to 2.5 GHz at  
 $-3$  dB point.

**Timebase Jitter** – (Note: in 1 kHz high pass filter)  
(HD) – 70 ps, typical.  
(SD) – 150 ps, typical.

**Eye Clock Bandwidth Accuracy** – Actual  $-3$  dB  
point within 10% of nominal.

**Display Modes, SD** –

Overlay: Overlays all bits to form each eye opening.  
Useful for observing peak jitter.

10 Eye: Displays eye relative to the parallel clock  
and line sync. Useful for observing jitter correlated to  
line rate and word clock.

**Display Modes, HD** –

Overlay: Overlays all bits to form each eye opening.  
Useful for observing peak jitter.

20 Eye: Displays eye relative to the parallel clock  
and line sync. Useful for observing jitter correlated  
to line rate and word clock.

## Jitter Display

**Type** – Demodulated recovered clock per  
SMPTE RP184.

**Digital Readout** – Accuracy:  $< 0.05$  UI + 10%,  
typical, of reading for jitter frequencies from three  
times high-pass filter selection to 1 MHz.

Note: High-pass filter selection is set in Jitter  
Waveform Mode.

**Jitter Waveform Gain Error** –  $< 0.1$  UI + 10%,  
typical, of reading for jitter frequencies from three  
times high-pass filter selection to 1 MHz.

**Jitter Waveform High-pass Filter Selection** –  
10 Hz, 1 kHz, 10 kHz, 100 kHz.

**Jitter Output** – 100 mV/UI,  $\pm 10\%$  into 75 $\Omega$  load.

**Jitter Frequency Response** –  $-3$  dB at 5 MHz  
(typical).

## RGB Gamut Error Detection

**Detection Level** –

High Limit, +630 mV to +756 mV in 1 mV steps.

Low Limit,  $-50$  mV to +35 mV in 1 mV steps.

## Arrowhead (NTSC/PAL Composite Gamut Limit Display Mode)

**Detection Level** –

Accuracy,  $\pm 7$  mV.

Luma+Chroma High Limit (NTSC-derived formats),  
90 IRE to 135 IRE in 1 IRE steps.

Luma+Chroma Low Limit (NTSC-derived formats),  
 $-50$  IRE to  $-10$  IRE in 1 IRE steps.

Luma+Chroma High Limit (PAL-derived formats),  
630 mV to 950 mV in 1 mV steps.

Luma+Chroma Low Limit (PAL-derived formats),  
 $-400$  mV to  $-100$  mV in 1 mV steps.

Luma only High Limit, 90% to 108% in 1% steps.

Luma only Low Limit,  $-6\%$  to  $+5\%$  in 1% steps.

## Audio Level Meter

**Level Meter Resolution** – 0.05 dB steps at 10 dB  
scale, from full scale to  $-40$  dB FS.

0.25 dB steps at 0 to  $-70$  dB scale, for signals  
above  $-40$  dB FS.

**Level Meter Accuracy** –

0.2 dB from 20 Hz to 20 kHz with 0 to  $-40$  dB FS  
sine-wave input. PPM Ballistic mode except within  
7 Hz of some submultiples of the 192 kHz

oversampling frequency. For example:

13.714 kHz  $\pm 7$  Hz  $-0.22$  dB.

16.0 kHz  $\pm 7$  Hz  $-0.30$  dB.

19.2 kHz  $\pm 7$  Hz  $-0.43$  dB (worst case).

## General Specifications

### Power

**Mains Voltage Range** – 100 to 240 VAC  $\pm 10\%$ .

**Mains Frequency** – 50 or 60 Hz.

**Power Consumption (typical)** –

$\leq 100$  W with 1 Video Input Module.

$\leq 125$  W with 2 Video Input Modules.

150 W max.

**VGA O/P** – This connector allows the front panel  
display to be replicated on a remote VGA monitor.

**Ethernet Connector** – Allows the instrument to be  
connected to a 10/100Base-T Ethernet circuit for  
remote control and firmware update.

### Environmental

**Temperature** –

0  $^{\circ}$ C to +40  $^{\circ}$ C (operating).

$-20$   $^{\circ}$ C to +60  $^{\circ}$ C (nonoperating).

**Humidity** – 20% to 80% RH at up to 40  $^{\circ}$ C,  
noncondensing (operating).

**Altitude** –

to 3,000 m (operating).

to 12,192 m (nonoperating).

### Safety

Designed and tested for compliance with:

ANSI/ISA s82.02.01, Can/CSA C22.2 No. 1010.1,  
IEC 61010-1, UL 3111-1, 93/68/EEC and  
EN 61010-1.

### EMI

Tested for compliance with:

► FCC, CFR Title 47, part 15, Subpart B,  
Class A

► EN 55103-1/2, Class B emissions

► European EMC directive, video standard

## Physical Characteristics

Dimensions	mm	in.
Height	133.4	5.25
Width	215.9	8.5
Depth	460.4	18.125
Weights	kg	lb.
Net	5.5	12.125
Shipping (approx.)	9.6	21.164

# Multi-format, Multi-standard Waveform Monitors

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## ► Ordering Information

The following models complete with one video input module (two video inputs).

### Instruments

#### WFM700HD

SMPTE 292M Serial Digital Waveform Monitor.

#### WFM700A

ITU-R BT.601 and SMPTE 292M Serial Digital Waveform Monitor.

#### WFM700M

ITU-R BT.601 and SMPTE 292M Serial Digital Waveform Monitor with additional video measurements.

### Optional Modules

Options installed and tested at time of manufacture. Maximum of two video modules and one audio module in an instrument.

**Option 2HD** – Serial digital monitoring module for SMPTE 292M.

**Option 2A** – Serial digital monitoring module for ITU-R BT.601 and SMPTE 292M.

**Option 2M** – Serial digital measurement module for ITU-R BT.601 and SMPTE 292M.

**Option DG** – AES/EBU digital audio monitoring module.

### Power Plug Options

**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. AC** – China power.

### Accessories

**Opt. 01** – Portable cabinet.

**Opt. 02** – Dual rackmount.

### Service

**Opt. C3** – Calibration Service 3 Years.

**Opt. D1** – Calibration Data Report.

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

**Opt. R3** – Repair Service 3 Years.

### Language

**Opt. L0** – English user manual.

**Opt. L5** – Japanese user manual.

**Opt. L9** – Korean user manual.

### Field Upgrade Kits

Shipped as a kit and installed in the field. Maximum of two video modules and one audio module in an instrument.

**WFM7HD** – Serial digital monitoring module for SMPTE 292M.

**WFM7A** – Serial digital monitoring module for ITU-R BT.601 and SMPTE 292M.

**WFM7M** – Serial digital measurement module for ITU-R BT.601 and SMPTE 292M.

**WFM7DG** – AES/EBU digital audio monitoring module.

**Opt. IF** – Upgrade Installation Service.

### Optional Accessories

**WFM7F02** – Portable cabinet includes handle, feet, tilt bail and front panel cover.

**WFM7F03** – Plain cabinet.

**WFM7F05 Opt. ON or Opt. NN** – Dual rackmount for 1700 Series, WFM601 Series, WFM700 Series, 760A and 764.

**071-0915-xx** – Service Manual for WFM700 Series products (WFM700HD, WFM700A and WFM700M).