High Definition Waveform Monitor

WFM1125 Digital Waveform Monitor in accessory 1700F02 case.

WFM1125, Opt. 0A, 0B, 0C and 0D

Features And Benefits

- Waveform/Vector Monitor for HDTV Baseband Video
- Two SMPTE 292M, 1.485 Gb/s Serial Component Inputs
- Available for 1920x1080i, 1280x720p or Dual Digital Video Formats
- Multi-format Option Adds 1920x1080i/50, 1920x1080/24sF and 1920x1080p/24 Formats
- Parade and Overlay Waveform Displays in RGB, GBR or Y/Pb/Pr
- Vector display for 240M or 274M Colorimetry
- Tektronix Diamond, Lightning and Bowtie Displays
- Expanded Waveform Scales for Extended Accuracy
- Waveform Save Mode for Signal Comparison
- NTSC or Tri-level External Reference
- Analog Y/Pb/Pr and Digital Picture Monitor Outputs
- AES/EBU Output of Audio Embedded in SMPTE 274M Data (1920x1080i/60 Format)
- Gamut, Status and Line-by-line CRC Monitoring
- VGA Display and Screen Output

Applications

- Digital High-definition Baseband Monitoring for Production and Broadcast

Digital Television Waveform Monitor

The WFM1125, equipped with Opt. 0A, 0B, 0C or 0D, is the latest in a series of Tektronix high definition waveform monitors to both acquire and display the SMPTE292M television signal in its native digital format. All signal processing is mathematical, resulting in very high display accuracy, even in magnified modes. The only analog processing is an instrument reference to external tri-level or NTSC sync and conversion of the digital signal for output to an external analog picture monitor.

Handling the digital signal without conversion to analog provides several distinct user advantages. Waveforms and screen graphics are clear and bright on the instrument VGA display and the WFM1125 display can be output to a conventional VGA computer monitor for easy viewing in large operating centers. The operator can view video data in its raw, unfiltered form, or mathematically accurate filters may be applied. The operator can store a display for reference, allowing comparison of one video signal to another. The engineer is assured the display is accurate and directly related to data values. And AES/EBU audio embedded in the 1920x1080i/60 video format can be easily extracted for thorough evaluation using a companion Tektronix 764 digital audio monitor.

The WFM1125 selects between two SMPTE 292M, 1.485 Gb/s data signals transporting video and, in the 1920x1080i/60 high definition format (Opt. 0A, 0C or 0D), embedded audio. Opt. 0B monitors video signals in the SMPTE296M, 1280x720p high definition format.

The operator may display data signals as video waveforms in Y/Pb/Pr, RGB or GBR format. A color vector display of the Pb and Pr color difference components is provided for color matching, with graticules corresponding to 75% or 100% color bars with SMPTE 240M (BTA-S001A) or SMPTE 274M (ITU-R BT.709) colorimetry. A Diamond gamut display provides a reliable indicator which allows the graphics operator maximum color flexibility without violating RGB color space. Lightning and Bowtie displays assist the engineer in camera and system setup. These displays can be stored for reference, facilitating camera and graphics matching.

SMPTE 292M error checking is fully supported by the WFM1125 on a line-by-line basis for luminance and chrominance components. A rear panel signal may be enabled to trigger external equipment in the event of a data CRC error. Engineers will appreciate the WFM1125's data list feature, with quick access to ancillary data locations.
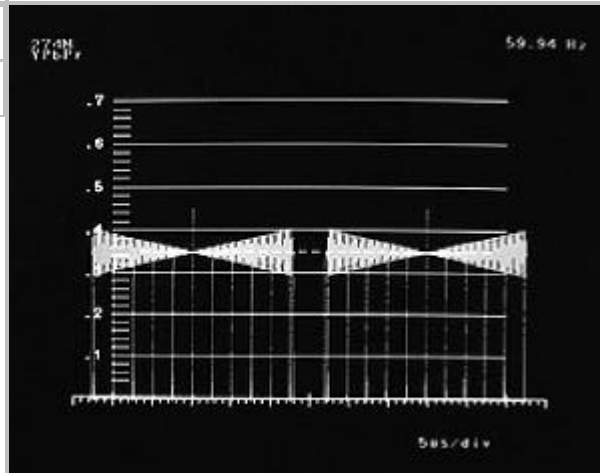
The Tektronix WFM1125 is ideal for both operational and technical monitoring applications. Its selection of video displays and display storage capabilities provide the tools needed by operators to efficiently monitor the creation and correction of digital high definition signals. This same instrument provides the data analysis capabilities needed by the engineer to setup digital high

definition sources and systems for conformance to standards, compatibility with other devices and best technical quality. The Tektronix WFM1125 digital high definition waveform monitor is the definitive tool for operators and engineers in the new high definition DTV environment.
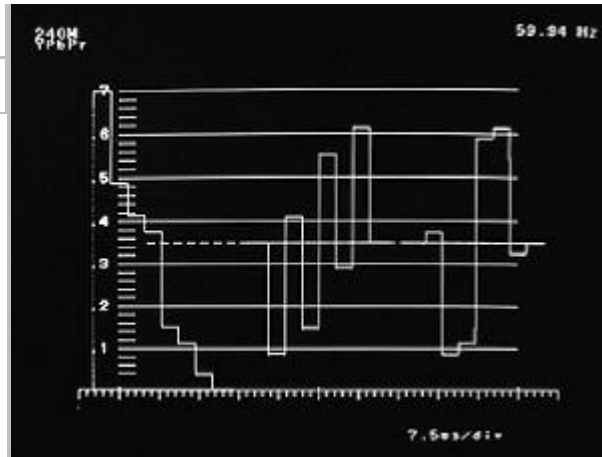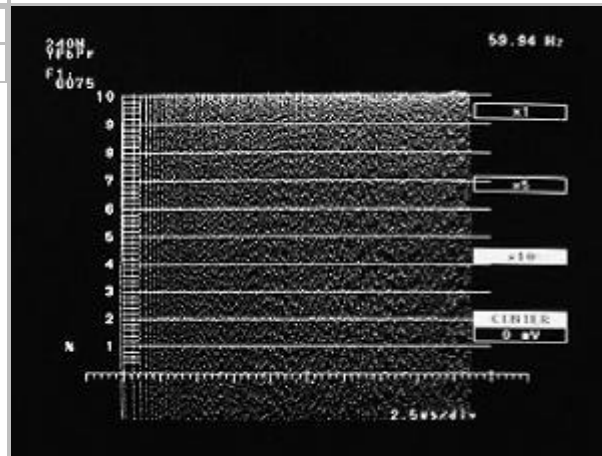
Uninterpolated display shows discrete data word steps.
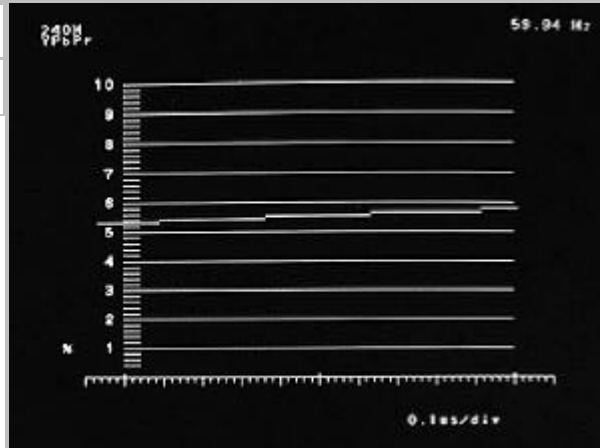
Bowtie display is available to resolve channel-to-channel timing.

Waveform may be displayed RGB or Y/Pb/Pr.

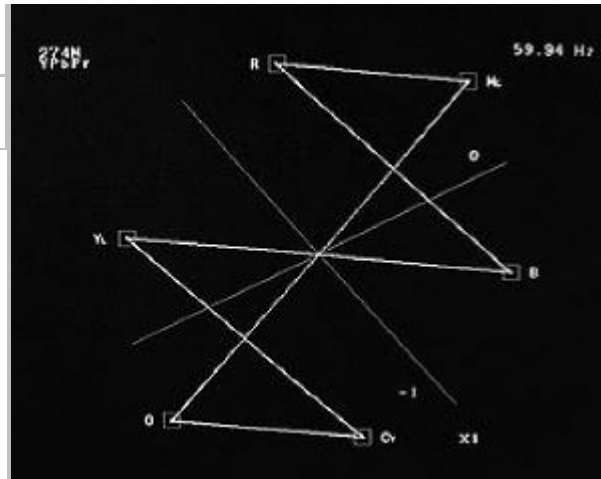240M
Y/Pb/Pr

59.94 Hz

7.5µs/div

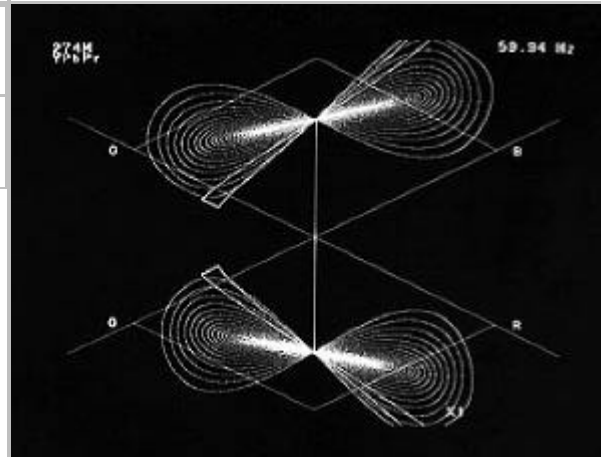30 MHz sweep display magnified x10.

240M
Y/Pb/Pr
F1
0075

59.94 Hz

x1

x5

x10

CENTER
0 mV

2.5µs/div

Lightning display aids setup of component recorders.

274M
Y/Pb/Pr

59.94 Hz

YL
Q
Cr
R
Mg
B
B
R
Mg
G
Cr
YL
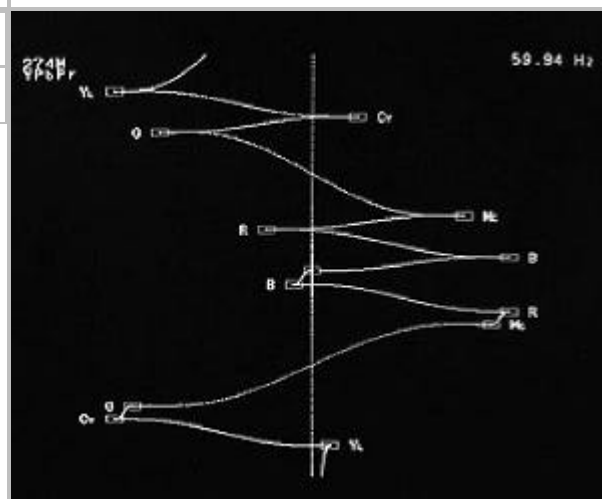
Vector display includes I and Q axis guides for color correction applications.

Out-of-gamut RGB components are easily identified with the Tektronix Diamond display.

Characteristics

Serial Digital Interface

Video Inputs - Two 1.485 Gb/s SMPTE 292M/BTA-S004A compatible.

Impedance - 75 Ohm BNC, internally terminated.

Monitor Output - 1.485 GB repeat of selected input.

Output Level - 800 mV$_{p-p}$ ±10%.

External Reference Input

Sync Format - RS-170A, SMPTE 240M,

SMPTE 274M.

DC Input Impedance - >15 kilohm.

Timing Uncertainty - <5 ns.

Analog Picture Monitor Output

Format - Y, Pb, Pr, with tri-level sync on Y channel.

DAC Resolution - Luminance Channel: 9-Bit, Chrominance Channels: 10-Bit.

Impedance - 75 Ohm unbalanced.

AES/EBU Digital Audio Output (1920x1080i/60 Format Only)

Format - ANSI S.4.40.

Amplitude - 1.0V ±10%.

DC Offset - 0.0V ±50mV.

Rise/Fall Time - 30 ns to 44 ns.

Output Channels -
CH A: 1/2, 3/4, 5/6, 7/8; CH B: 1/2, 3/4, 5/6, 7/8. Different channel pairs must be selected for CH A and CH B.

Vertical Deflection System

Frequency Response -
Luminance (Y) Channel: 50 kHz to 30 MHz within 0.5% of response at 50 kHz.
Chrominance Channels: 50 kHz to 15 MHz within 0.7% of response at 50 kHz.
LOWPASS: ≥10 dB at 15 MHz.

Gain - X1, X5, X10, frequency response accuracy is maintained in X5 and X10.

Offset - CH2 and CH3 may be offset from CH1 by 350 mV.

Cursor Accuracy - <0.25% for full scale.

Horizontal Deflection System

Sweep - Displays "NO SIGNAL" message when no signal is present.

Rates - 1 line, 2 line, 3 line, 1 field.

Line Select - Selected line in 1 line, selected line 1st in 2 line.

Cursor Accuracy - ≤0.25% for full scale.

Component Vector Mode

Frequency Response - >14 MHz.

Vertical Gain Accuracy - <0.25%.

Horizontal Gain Accuracy - <0.25%.

Magnification - X1, X5, X10.

Display - Pb horizontal, Pr vertical.

Lightning and Diamond Modes

Vertical Gain Accuracy - <0.25%.

Horizontal Gain Accuracy - <0.25%.

Lightning Display - Y is displayed vertically. Pb is displayed horizontally on top half of display. Pr is displayed horizontally on bottom half of display.

Diamond Display - GBR deflection axis indicated on display.

Bowtie Mode

Common Mode Rejection Ratio - >44 dB to 15 MHz.

Accuracy - <0.25%.

Internal Timing Match - 0 clock cycles.

RGB Transcoder

Matrix Coefficients - SMPTE240M (BTA-S001A) or SMPTE 274M (ITU-R BT.709).

Status Display

Word Range - 1.82 lines (4000 words).

Display Format - HEX, DEC.

Save and Display Waveform

Delay Time from Button Push - Less than three frames.

Reference Memory Size - One frame.

Warning Display

CRC Error LED - Remains on 0.5 seconds after error.

CRC Error Count - Number of errors and time since last start.

GAMUT Error - Nominally 105% of legal RGB.

Instrument Setups

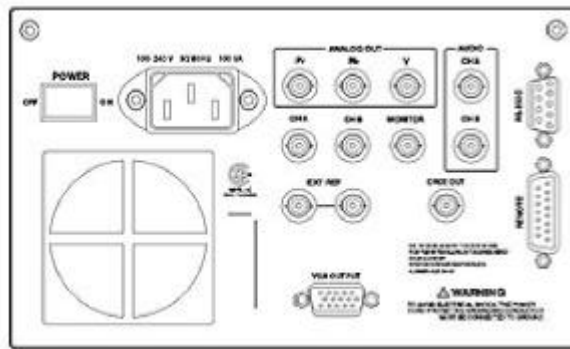**Number of Memories -** Four setups.

Save/Recall - Front panel or remote ground closure.

Display

Display Area - 9.5 cm horizontal x 7.1 cm vertical.

Resolution - 640 H x 480 V pixels.

WFM1125 rear panel.

Environmental, EMC, Safety

Temperature - Operating: 0 to +40°C.

Humidity - Operating: 20% to 80%, noncondensing.

Altitude - Operating: Up to 15,000 ft. (4,572 m).

Shock - Operating: 294 m/s2 (30G), half sine, 11 ms

duration.

Safety Compliance - UL 3111-1, CSA1010.1, EN61010-1, IEC61010-1. MC=UL1244.

Emission - EN 55011, EN 61000-3-2.

Immunity - IEC 61000-4-2, 61000-4-4; EN 61000-4-11; ENV 50140, 50142, 50204; FCC Part 15, Subchapter B, Class A.

Power

Source Power -
Voltage Ranges: 90 to 240 VAC.
Line Frequency: 48 to 63 Hz.

Power Consumption - 90 W, 100 VA maximum.

Physical Characteristics

Dimensions	mm	in.
Height	133	5.2
Width	216	8.5
Depth	432	17
Weight	kg	lbs.
Net	6	13.2

Warranty

One year, return to Tektronix Factory Service Center.

The WFM1125 Digital Television Waveform Monitor is manufactured by Sony/Tektronix Corporation in Japan.

Ordering Information

WFM1125 High Definition Digital Television Waveform Monitor

(Either Opt. 0A, 0B, 0C or 0D must be ordered with

instrument.)

Includes: U.S. Power Cord, User's Manual and Calibration Certificate.

WFM1125 Recommended Accessories

1700F00 - Cabinet without handle or feet.

1700F02 - Portable cabinet with handle, feet, front cover.

1700F05 - Dual rackmount cabinet for two half-rack instruments.

1700F06 - Blank panel for unused side of dual rackmount.

1700F07 - Drawer for unused side of dual rackmount.

International Power Plug Options

Opt. A1 - Universal Euro power cord.

Opt. A2 - United Kingdom power cord.

Opt. A3 - Australia power cord.

Opt. A5 - Switzerland power cord.

WFM1125 Options

(Line rate Opt. 0A, 0B, 0C or 0D must be specified.)

Opt. 0A - Configured for operation with SMPTE 274M, 1920x1080i video with embedded AES/EBU audio.

Opt. 0B - Configured for operation with SMPTE 296M, 1280x720p video. Embedded audio is not extracted with this option.

Opt. 0C - Configured for dual standard operation with SMPTE 274M, 1920x1080i, or SMPTE 296M, 1280x720p video. AES/EBU audio is extracted only in SMPTE 274M video format.

Opt. 0D - Configured for multi-standard operation; 1920x1080i/60(59.94), 1280x720p/60 (59.94), 1920x1080i/50, 1920x1080p/24(23.98), 1920x1080/24(23.98)sF. AES/EBU audio is extracted in

1920x1080i/60(59.94) video format.

ISO9002 Certified
JMI-0113

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