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Find the *Tektronix WFM 601M* at our website: *Click HERE*

Tektronix

Serial Component Monitors

WFM601A • WFM601E • WFM601M



WFM601A/WFM601E/WFM601M Series Serial Digital Component Monitors mounted in accessory 1700F02 Portable Cases.

WFM601A/WFM601E/WFM601M monitors are self contained, half-rack wide, waveform/vector monitors for the 270 MB serial component operating environment. They share a common design philosophy and are specialized for different applications within the television plant.

The WFM601A is an operational monitor providing the signal monitoring features useful to the graphics workstation, telecine, or camera setup operator.

The WFM601E extends the WFM601 platform to provide a more comprehensive evaluation of the digital transport layer and is used in digital production and master control operating centers.

The WFM601M offers all of the video features of the WFM601A and WFM601E, and provides data analysis capabilities for the installation and maintenance engineer.

WFM601A Serial Component Waveform/Vector Monitor

The WFM601A monitors 270 MB serial component data signals which may be connected directly through two high quality passive loop-through inputs. This allows monitoring of the digital signal path with no need for adapters or other add-on devices. The two inputs allow monitoring of the input and output of a digital processing device without the need for a digital distribution amplifier. The selected input data is evaluated for correct format and status, and the equivalent analog video signal displayed in a traditional form allowing accurate monitoring and adjustment of source or processing equipment.

WFM601A/WFM601E/WFM601M monitors provide the conventional analog displays familiar to Tektronix component signal monitor users. Digital monitoring is as familiar and as useful as viewing an analog component signal.

All models share the basic attributes of the WFM601A:

Two 270 MB Serial Component Loop-through Inputs

Real Time CRT Display Suitable for Live Monitoring

Waveform Parade and Overlay Displays

Waveform Display in RGB or Y-P_B-P_R Levels

Bright Line Select Display

Component Vector Display

Tektronix Lightning, Bowtie, and Diamond Displays

Picture Display of Y Channel

Identification of Embedded Audio Channels

RGB or Y-P_B-P_R Analog Picture Monitor Outputs

Switched 270 MB Serial Component Picture Monitor Output

Waveform Cursors and Markers

SMPTE RP-165 Digital Error Detection and Reporting

New Tektronix Arrowhead Display of NTSC/PAL Gamut Limit

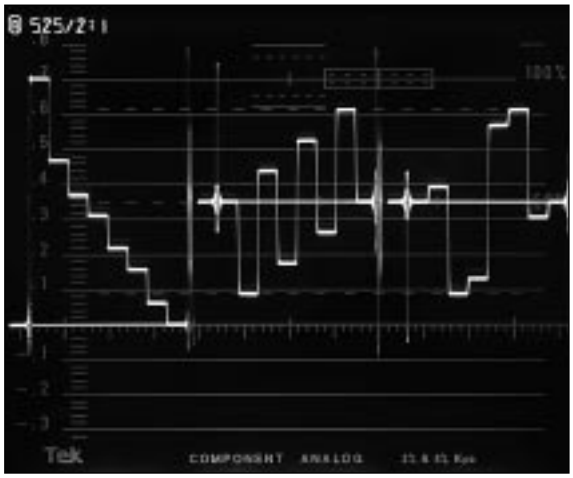
Nine User Front Panel Presets

Environmental, Safety and EMI Certified

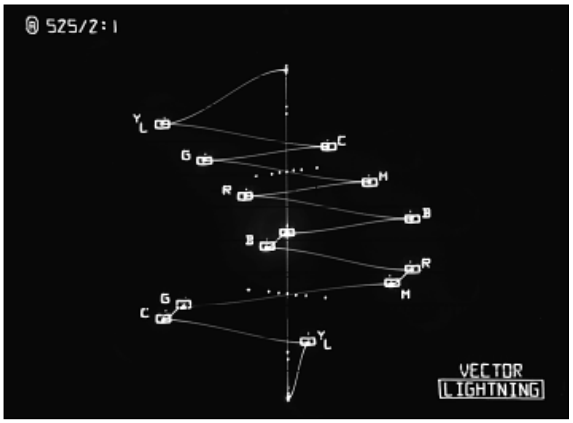
Three Year Tektronix Warranty

CE Marking

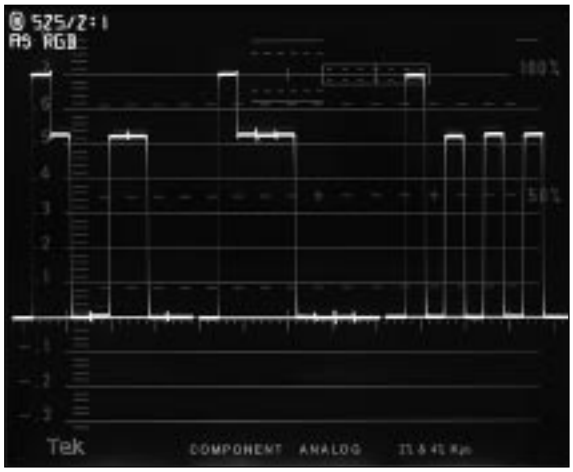
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Digital signal is decoded for analog display in native $Y/P_B/P_R$ format.



Tektronix Lightning display allows quick setup of color-difference format recorders.



RGB format may be selected for camera, telecine, or color graphics applications.

Operating adjustments and measurements are made to the same signal parameters. Setup of digital sources is now as easy as if they were analog.

In addition to waveform overlay and parade displays of the three component channels, WFM601 Series monitors provide three Tektronix-patented displays. The Lightning display helps operators quickly set up color difference component recorders using only the color bar test signal. Using the Diamond display, color graphics operators can easily determine whether creative effects are reproducible in legal RGB color space, and will be warned that values outside the diamonds may cause recording, transmission, or reproduction errors. An important new feature in the WFM601A, WFM601E, and WFM601M is the Tektronix Arrowhead display of video signal composite domain gamut limits. This new display clearly illustrates how the component video signal will translate into a luminance + color subcarrier signal to be transmitted as an amplitude modulated NTSC or PAL signal to the home receiver. The creative operator can use this display to assure intended color and luminance values can be maintained through a composite transmission system.

All models provide analog outputs for an RGB or $Y\text{-}P_B\text{-}P_R$ component picture monitor, and a switched digital output is also provided for the all-digital plant.

The WFM601A is an operator's monitor, for use by a person responsible for the look and continuity of the television picture. It instills confidence that creative adjustments can be made without violating transmission standards, thus assuring trouble-free distribution throughout a facility. The WFM601A is the only model of the series providing an analog audio lissajous display.

WFM601E Serial Component Monitor with Eye Pattern

The WFM601E extends the series platform to provide comprehensive evaluation of the digital transport layer. It allows observation of the analog characteristics (eye pattern and signal level) and digital compatibility (format and range checking) of the serial data stream. The WFM601E provides all video features of the WFM601A and adds an analog waveform display of the incoming data signal.

Features provided by the WFM601E include:

All Video Features of the WFM601A

Eye Pattern View of the Incoming Data Signal

Eye Pattern Timing Cursors with Selectable Jitter Display High Pass Filtering

Eye Pattern Voltage Cursors to Indicate Amplitude of the Incoming Data Signal

Cable Length Readout, Calibrated in Meters

Received Signal Power Readout

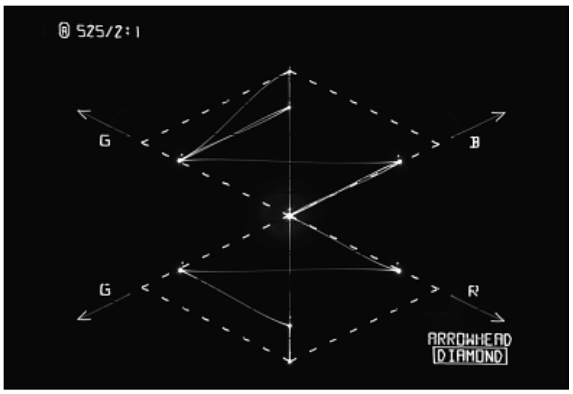
Source Signal Level Meter, Independent of Cable Length

Extended Format Checking and Data Error Detection

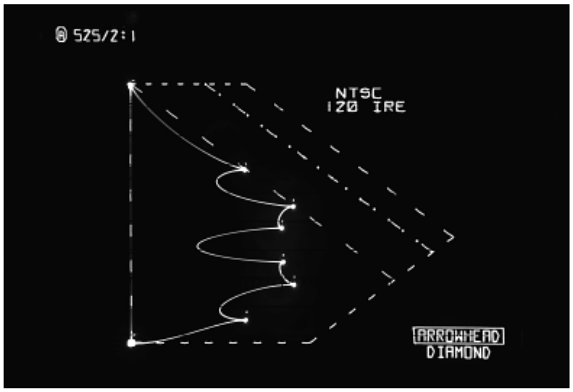
Display of Field Checksums for Fixed Pattern Testing

The WFM601E's wide bandwidth Eye Pattern display is an amplitude vs. time view of the 270 MB data signal's analog transmission path. It displays peak jitter and amplitude errors and because it is looking at the actual signal path, provides a useful indication of any reflections due to impedance irregularities. The eye pattern is displayed at video sweep rates to provide correlation with the video signal, and a word correlated mode may be selected by more experienced users to observe pattern dependent crosstalk. Digital signal amplitude and jitter is measured in accordance with proposed SMPTE time constant high-pass filtering, assisted by time and voltage cursors.

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Tektronix Diamond display indicates legal RGB color space.



Arrowhead display indicates that colors will be legal in subsequent composite formats.



The WFM601M identifies co-sited data values in each channel.



The WFM601M and WFM601E provide a comprehensive view of signal status.

A serial signal level meter, calibrated in meters of coaxial cable provides a check to determine how close a system may be running to one important failure point. The voltage level of the data signal at its source is indicated, independent of cable length, to avoid potential equalization errors.

Format checking and reporting are expanded in the WFM601E. Format violations are sensed and clearly reported, and when the EDH signal is present, digital errors in the active or full field picture are reported. A CRC checksum is provided for manufacturing environments where it is common to use fixed pattern test signals to confirm the data integrity of signal processing products. A CRC is calculated for each field of video and displayed on the error screen. If the test signal CRC is known, this allows a data integrity check to be made, allowing limited error checking when EDH is not present in the incoming signal. ANC data identification includes any embedded audio channels present. Format checking provides confidence that checked parameters meet industry requirements for subsequent data recovery.

WFM601M Serial Component Measurement Set

The WFM601M is a measurement quality serial component monitor with all features of the WFM601E. The WFM601M provides additional digital analysis capabilities important to those involved in the design, installation, and maintenance of 270 MB component digital systems.

Features provided by the WFM601M include:

All Features of the WFM601E

Logic Analyzer Data Word Listing for Detailed Pixel Analysis

Field/Line/Word Cursors on Waveform and Picture Monitor with Data Value Display

Jitter Demodulator with Numeric Jitter Readout and Video Correlated Jitter Waveform Display

Calibrated Component Analog Signal Outputs

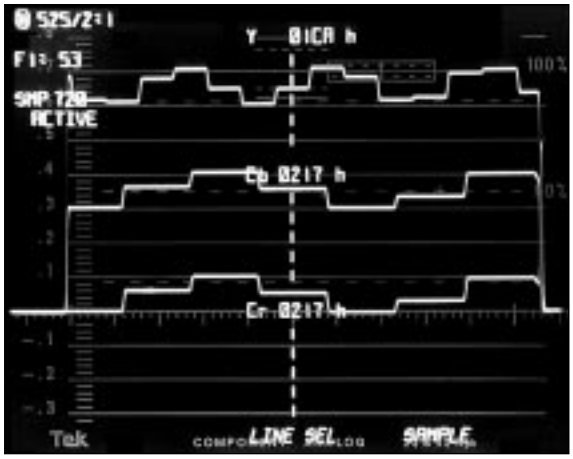
Recovered Clock Output to Reference External Test Equipment

The logic analyzer data word listing allows evaluation of signals to determine conformance to standards. The Y-P_B-y-P_R multiplex is clearly delineated providing a comprehensive, understandable look at data which makes up the serial digital signal. Field/Line/Word cursors on the waveform and external picture monitor provide an intuitive operator access to the data values and a clear presentation of equivalent analog voltage levels.

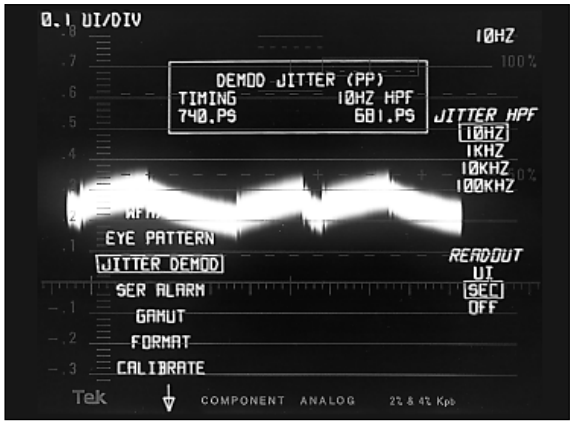
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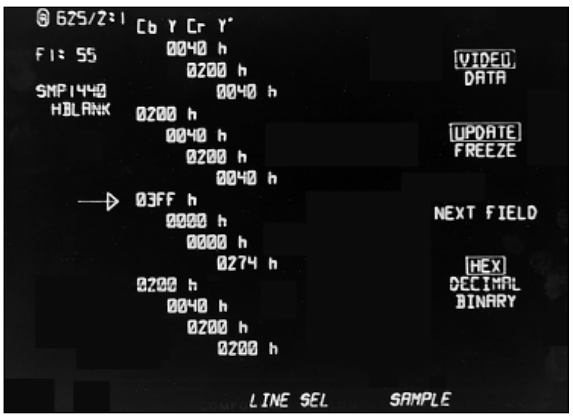
WFM601M wideband data display identifies word values in multiplexed data stream.



WFM601M wideband video display identifies word values in each component channel.



Serial data jitter may be evaluated in real time at video rates, using industry recognized techniques (WFM601M only).



Data values may be listed in Hex, Decimal, or Binary (WFM601M).

A new jitter demodulator with numeric jitter readout provides a documentable value along with a new display relating jitter to time in the video field or line. A jitter demodulator output is provided for further analysis using an audio frequency spectrum analyzer, TDS Series oscilloscope, or VM700T option 40.

Measurement accuracy component analog signal outputs provide a precision video source for measurement of the analog signal represented by the data channel. The WFM601M's analog outputs accurately represent the data signal in terms of amplitude, frequency response and inter-channel timing. When combined with a VM 700T Option 30, the WFM601M allows comprehensive evaluation of a component video signal from analog to data to analog.

Equipment and system designers will appreciate the WFM601M's recovered clock output. This signal provides a reference clock, AFC'd using known time constants, to external test equipment.

Digital monitors for specific applications

The WFM601A provides real time monitoring features to allow creative adjustment of a camera or graphics work station to provide a standardized video program source. This monitor is used at each operating position to provide traditional waveform, vector, and signal gamut monitoring, and digital error checking to assure generation of standards-compliant contribution video.

The WFM601E adds eye pattern to provide a view of the analog signal path transporting the data signal. It is focused towards master control and editing applications where signals are routed and combined into programs.

The WFM601M adds comprehensive data analysis features for personnel designing, installing, and maintaining digital equipment and systems. Data jitter, signal level, and word value displays provide the tools to maintain standardized serial component signals throughout a plant and the WFM601M's precision analog outputs allow measurement to the accuracy of of the best analog measurement sets.

WFM601 Series serial component monitors from Tektronix each provide an efficient set of features for a specific application. Every model is economically priced, yet provides an appropriate set of features to make the checks and measurements to assure maximum performance of your television facility.



The WFM601E and WFM601M provide a display of important data signal analog parameters.

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WFM601 Series Characteristics

Serial Digital Interface

Format — 270 MB/s component. Complies with SMPTE 259M and CCIR656.

Input Type — Passive loop-through, 75 Ω compensated.

Return Loss — ≥ 25 dB 1-270 MHz power on.

Insertion Loss — ≤ 1.5%.

Transmission Bandwidth — 50 kHz -300 MHz ± 1.0 dB.

Loop-Through Isolation — ≥ 50 dB to 300 MHz.

Serial Receiver Equalization Range — Proper operation with coaxial cable up to 19 dB loss at 135 MHz.

Serial Video Diagnostics

Video Error Detection — Active picture and full field rate resolution. Complies with SMPTE RP165. Sets error flag output through rear panel REMOTE connector.

Alarm — Front panel alarm lamp, and in some cases an on-screen readout, warns that one of the following serial signal video format errors has occurred:

SAV placed incorrectly
Line length error
Field length error
Reserved values used improperly
ANC data checksum error
ANC data parity error
ANC data placement error
Absence of serial video signal

On-Screen Diagnostics —

WFM601A, WFM601E, and WFM601M —
Operating line/field rate
Serial video presence
EDH checksum presence
FF CRC errored seconds
AP CRC errored seconds
EDH flag errored seconds
GAMUT errored seconds
Identifies the presence of up to 16 channels of AES/EBU embedded audio.
Reports absence of serial video signal.

WFM601E and WFM601M only —
Identifies the presence of ancillary data (other than audio and EDH) and indicates if a checksum error has occurred.

External Reference

Input — Analog composite video or black burst.

Return Loss — ≥ 40 dB to 6 MHz.

Waveform Vertical Deflection

Deflection Factor — ≤ 2%.

Variable Gain Range — +12 dB to –6 dB.

Frequency Response —
Luminance channel (Y), to 5.0 MHz ≤ 2%.
Color difference (P_B & P_R), to 2.5 MHz ≤ 2%.

Transient Response — ≤ 1%.

Voltage Cursor Accuracy — ± 0.5%, 20-30°C.

Field Rate Tilt — ≤ 1%.

Line Rate Tilt — ≤ 1%.

Waveform Horizontal Deflection

Sweep Timing Accuracy—
1 line, 5 µS/div, mag 0.2 µS/div, ± 1%.
2 line, 10 µS/div, mag 1.0 µS/div, ± 1%.
1 field, displays 1 full field.
2 field, displays 2 full fields, and data between them.

Sweep Linearity — ± 1% center 10 divisions of sweep.

Timing Cursor Accuracy — ±0.5% @ 25°C.

Horizontal Position Range

Any portion of the synchronized sweep may be positioned on screen in all sweep modes.

Calibrator

Waveform Squarewave —
Amplitude: 700 mV ± 1.0%.
Frequency: 100 kHz ± 0.1%.

Analog Audio Mode (WFM601A only)

Input — DC coupled differential.

Full Scale Selection — 0, 4, 8, 12 dBm full scale, menu selected.

Full Scale Accuracy — ± 0.5 dB at 1 kHz.

Maximum Input Voltage — ± 8 V peak.

Bandwidth — –3 dB, ≥ 500 kHz.

X & Y Input Phase Matching — ≤ 1° at 20 kHz.

Input Impedance — 20 kΩ nominal.

Component Vector Mode

Vertical Bandwidth — ≥ 1.0 MHz ± 100 kHz.

Horizontal to Vertical Match — ≤ 2° at 500 kHz or 2 MHz.

Vertical Gain Accuracy — ± 1%.

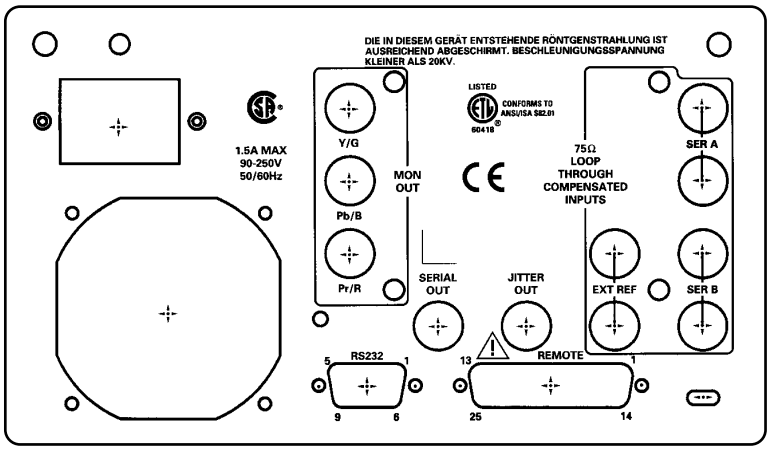
Horizontal Gain Accuracy — ± 1%.

Electronic Graticule Accuracy — ± 1%.

Display to Graticule Registration — ≤ 0.25 box.

Vector Display —
P_B displayed on horizontal axis.
P_R on vertical axis.

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WFM601A/WFM601E/WFM601M rear panel. Jitter Out connector is active only in the WFM601M.

Lightning, Diamond and Arrowhead Modes

Vertical Gain Accuracy — ± 2%.

Electronic Graticule Display —
Y is displayed vertically.

Lightning Mode —
P_B is displayed horizontally on top half of the display.
P_R is displayed horizontally on bottom half of the display.

Diamond Mode —
Green plotted vs. Blue on top half of the display.
Green plotted vs. Red on bottom half of the display.

Arrowhead Mode — Luminance displayed vertically, black clamped bottom left. Equivalent subcarrier amplitude displayed horizontally, zero clamped left. Graticule displays 75% color bar, transmitter zero carrier, and 100% color bar limits. Adjustable gamut alarm.

Bowtie Mode

Common Mode Rejection Ratio — ≥ 34 dB at 2.5 MHz.

Accuracy — ±3%.

Interchannel timing match — ±2.0 nS.

Electronic Graticule Display —
$Y\text{-}P_B$ displayed on the left half of the display.
$Y\text{-}P_R$ displayed on the right half of the display.

Transcoded Analog Outputs

Signal Formats — GBR or Y/Pb/Pr.

Sync amplitude accuracy — 300 mV ±10%.

Analog output impedance — Nominally 75 Ω.

Active Video Accuracy (Y/Pb/Pr) — 700 mV ±3% (WFM601M ±1%).

The following analog output parameters are specified for the WFM601M only:

Frequency response — Y to 5.75 MHz: ≤ 1%. P_B and P_R to 2.75 MHz: ≤ 1%.

Non-Linearity — ≤ 0.5%.

Group delay error — Y at 5.75 MHz: ≤ 5 nS. P_B and P_R at 2.75 MHz: ≤ 10 nS.

Interchannel timing match — $Y\text{-}P_B$ and $Y\text{-}P_R$ ±5 nS.

Sync to video timing — 525 line rate: 9.037 uS ±50 nS. 625 line rate: 9.777 uS ±50 nS.

Return Loss — 50 kHz to 5 MHz ≥40 dB.

Power Source

Mains Voltage Range — 90-250 V.

Mains Frequency — 50 or 60 Hz.

Power Consumption — <75 Watts.

CRT Display

Viewing Area — 80 x 100 mm.

Accelerating Potential — Nominally 13.75 kV.

Trace Rotation Range — >± 1° from horizontal.

Graticule — Internal waveform graticule with variable illumination.

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Environmental Characteristics

Operating Temperature — 0° to 40° C (+32° to +122° F).

Storage Temperature — –40° to + 75° C (–40° to +158° F).

Operating Altitude — to 15,000 ft. (4572 meters). IEC 1010-1 compliant to 2000 meters.

Storage Altitude — to 50,000 ft. (15,240 meters).

Vibration — Mil-T-28800D, Para 1.2.2, class 3.

Mechanical Shock — Nonoperating, 50g's, 1/2 sine, 3 shocks/surface, 18 total.

Transportation — Qualified under NSTA Test Procedure 1A, Category II (24 inch drop).

Humidity — 95% noncondensing up to 5 days.

Pollution Degree — Degree 2, IEC 1010-1.

Safety

Designed and tested for compliance with —
ANSI/ISA S82.01
CAN/CSA C22.2 No. 1010.1
IEC 1010-1
UL 3111-1
93/68/EEC.

EMI

Tested for compliance with —
47 CFR Chapter 1 (FCC Rules) Part 15, Class A
EN 50081-1
EN 50082-1
EN 60555-2
Must be installed in Tektronix 1700F00, 1700F02, or 1700F05 cabinet to qualify for EMI certification.

Physical Characteristics

Dimensions —
Height: 5 1/4 inches (133.4 mm).
Width: 8 1/2 inches (215.9 mm).
Depth: 18 1/8 inches (460.4 mm).

Weight —
Net: 8 lbs. (3.8 kilograms).
Shipping: 15.7 lbs (7.2 kilograms).

Ordering Information

WFM 601A
Serial Component Monitor

WFM 601E
Serial Component Monitor with Eye Pattern

WFM601M
Serial Component Measurement Set

WFM601 series instruments are supplied with an instruction manual, power cable, spare graticule lamps, spare fuse, and spare air filters. White (P4) phosphor is standard. To meet safety and EMI listing requirements order a cabinet or rack mount from the Optional Accessories list.

Options

Option A1 — Universal Europe locking power cord.

Option A2 — United Kingdom power cord.

Option A3 — Australia power cord.

Option A5 — Switzerland power cord.

Optional Accessories

070-9836-00 — Service manual,WFM601A/WFM601E/WFM601M.

1700F00 — Plain cabinet, no handle or feet.

1700F02 — Portable cabinet with handle, feet, tilt bail and front panel cover.

1700F05 — Dual rack mount.

1700F06 — Blank panel for unused half of dual rack mount.

1700F07 — Drawer for unused half of dual rack mount.

011-0163-00 — Wideband 75 Ω termination.

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From other areas, contact: Tektronix, Inc. Export Sales, P.O. Box 500, M/S 50-255, Beaverton, Oregon 97077-0001, USA (503) 627-1916

ISO 9001

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