

## Appendix A: Specifications

The items listed in the following tables describe the performance of the WFM 601i Serial Digital Component Monitor. Performance Requirements are generally quantitative and can be tested by the Performance Verification Procedure, contained in the Service Manual.

Reference information (RI) is valuable data pertaining to the operation and measurement capabilities of this instrument. Only a few of the items listed in this category are testable in the Performance Verification Procedure.

Performance Conditions – The Requirements listed in the electrical specification portion of these specifications apply over an ambient temperature range of 0° C to +40° C. The rated accuracies are valid when the instrument is calibrated at an ambient temperature range of +20° C to +30° C, after a warm-up time of 20 minutes. Test equipment used to verify Performance Requirements must be calibrated and working within the limits specified under the Equipment Required list.

These instruments are intended to operate from an ac power source that will not apply more than 250 V rms between the supply conductors or either supply conductor and ground. A protective ground connection by way of the grounding conductor is essential for safe operation.

**Calibration Interval** The recommended calibration interval is 12 months.

Environmental specifications are listed toward the back of the following tables. In addition a list of appropriate safety and electromagnetic interference (EMI) standards also can be found there.

**Table A-1: Waveform Vertical Deflection**

Characteristic	Performance Requirement	Reference Information
Deflection Factor	For digital input: 700 mV digital input = 700 mV $\pm$ 2% screen display, any magnifier setting.	Any one of the three channels. RGB on screen accuracy $\pm$ 3%.
Variable Gain Range		0.2X to 1.4X.
Frequency Response	Luminance channel (Y), to 5.0 MHz $\leq$ 2% Color difference channels (P <sub>B</sub> & P <sub>R</sub> ) to 2.5 MHz $\leq$ 2%	Typically $\leq$ 1% to 5.75 MHz luminance (Y) channel and $\leq$ 1% to 2.75 MHz for the color difference (P <sub>B</sub> or P <sub>R</sub> ) channel. Line sweep from a 4:2:2 digital signal generator.
Transient Response		Preshoot $\leq$ 1%. Overshoot $\leq$ 1%. Ringing $\leq$ 1%. Pulse-to-bar ratio 0.99:1 to 1.01:1
Field Rate Tilt		$\leq$ 1%.

Appendix A: Specifications

**Table A-1: Waveform Vertical Deflection (Cont.)**

Characteristic	Performance Requirement	Reference Information
Line Rate Tilt		≤ 1%.
Offscreen Recovery		1% variation in baseline of a 5 MHz modulated pulse when positioned anywhere on screen. X1, X5, or X10 with any variable gain setting.
Voltage Cursor Accuracy	± 0.5% over 20–30° C. ± 1% over rated temperature range.	
Differentiated Step Filter		Amplitude of pulses ≤ 1% variation.
Low Pass Filter Gain		1 ± 1%.
Response		≤ 3 dB attenuation at 1 MHz. ≥ 40 dB attenuation at 4 MHz.

**Table A-2: Serial Digital Video Interface (SER A & SER B)**

Characteristic	Performance Requirement	Reference Information
Format		270 Mbit/s component. Complies with SMPTE 259M & CCIR 656.
Input Type		Passive loop through 75Ω compensated.
Input Level		800 mV peak-to-peak ± 10%. Input voltages outside this range may cause reduced receiver performance.
Return Loss	≥ 25 dB 1–270 MHz, channels on or off, power on. ≥ 15 dB 1–270 MHz, power turned off.	
Insertion Loss	≤ 1.5%.	
Transmission Bandwidth	50 kHz – 300 MHz ± 1.0 dB.	–3 dB at not less than 500 MHz.
Loop Through Isolation		≥ 50 dB to 300 MHz.
Serial Receiver Equalization Range	Proper operation with up to 14.5 dB loss at 135 MHz using coaxial cable having $1/\sqrt{F}$ loss characteristics. 800 mV launch amplitude.	150 meters (490 feet) using Belden 8281 coaxial cable.

**Table A-3: Serial Video Output (follows SER A/B channel selection)**

Characteristic	Performance Requirement	Reference Information
Format		270 Mbit/s component. Complies with SMPTE 259M & CCIR 656.
Output Level	800 mV peak-to-peak $\pm$ 10% into 75 $\Omega$ load	Internal jumper can change output to 740 mV peak-to-peak $\pm$ 10%.
Return Loss	$\geq$ 15 dB 1-270 MHz	

**Table A-4: Eye Pattern Display**

Characteristic	Performance Requirement	Reference Information
Type		Equivalent Time Sampler
Bandwidth	50 kHz to 450 MHz: -3 dB to +1 dB	Low frequency -3 dB point is 500 Hz.
Rise Time		500 ps (20-80%), 775 ps (10-90%)
Aberrations		< 10%, 800 mV Step
Time Base Jitter		< 200 ps peak-to-peak
Jitter Attenuation 10 Hz HPF		< 10% for frequencies > 20 Hz. -3 dB at approximately 10 Hz.
100 Hz HPF		< 10% for frequencies > 300 Hz. -3 dB at approximately 100 Hz.
1 kHz HPF		< 10% for frequencies > 3 kHz. -3 dB at approximately 1 kHz. Up to 3 dB jitter gain between 2-4 kHz.
Display Modes Overlay		Overlays bits 0-9 of a serial word to form each eye opening. Useful for observing peak signal jitter.
10-Eye		Parades bits 0-9 in a 10-Eye display. Useful for observing word and line correlated jitter.
Deflection Factor Vertical	800 mV $\pm$ 5% with an 800 mV <sub>p-p</sub> input	
Horizontal Overlay Mode	1 ns/Div $\pm$ 3%	
10-Eye Mode	3 ns/Div $\pm$ 3%	
Mag On	500 ps/Div $\pm$ 3%	

**Table A-5: Video Error Detection and Diagnostics**

Characteristic	Performance Requirement	Reference Information
Video Error Detection Type		Active picture and full field. Field rate resolution. Uses CRC check-word system. System is known as EDH (Error Detection and Handling) in industry literature. Complies with SMPTE RP165.
Reporting Means		Front-panel ALARM lamp, rear-panel TTL line, and CRT readout.
Error Statistics		Asynchronous errored seconds. Active picture and full field statistics are separately compiled.
Diagnostics		
Embedded Audio		Identifies the presence of up to 16 channels of AES/EBU digital audio.
Ancillary Data		Identifies the presence of ancillary data (other than audio and EDH) and indicates if a checksum error has occurred.
Format Errors		Warns that a serial signal format error has occurred Detected Errors: 1. SAV placed incorrectly 2. Line length error 3. Field length error 4. Reserved values used improperly 5. ANC data checksum error 6. ANC data parity error 7. ANC data placement error
Signal Lost		Reports absence of serial video signal

**Table A-6: External Reference**

Characteristic	Performance Requirement	Reference Information
Input		Analog composite video or black burst
Maximum Operating Input Voltage		-1.8 V to +2.2 V, dc plus peak ac
Absolute Maximum Input Voltage		-8.5 V to +8.5 V, dc plus peak ac
DC Input Impedance		≥ 20 kΩ
Return Loss	≥ 40 dB to 6 MHz	Typically ≥ 46 dB to 6 MHz; ≥ 40 dB to 10 MHz

**Table A-7: Waveform Horizontal Deflection**

Characteristic	Performance Requirement	Reference Information
Sweep	<p><u>Internal Synchronization:</u> Proper horizontal and vertical synchronization with a component digital signal conforming to CCIR Rec. 601/656 and SMPTE 125M.</p> <p><u>External Synchronization:</u> Proper horizontal and vertical synchronization with a composite sync signal of approximate line and field rate.</p>	Sweep Length: $\approx$ 12 divisions Sweep freeruns without input
Sweep Timing Accuracy	1 Line: 5 $\mu$ s/division $\pm$ 1% 2 Line: 10 $\mu$ s/division $\pm$ 1%	1 Field displays one full field, including field rate sync. 2 Field displays two full fields and the field rate sync between them.
Sweep Linearity	$\pm$ 1%	
Magnified Sweep Accuracy	1 Line: 0.2 $\mu$ s/division $\pm$ 1% 2 Line: 1.0 $\mu$ s/division $\pm$ 1%	
Magnified Sweep Linearity	$\pm$ 1%	
Timing Cursors	Accuracy: $\pm$ 0.5% at 25° C. $\pm$ 1% over operating temperature range	
Horizontal Position Range	Any portion of the synchronized sweep can be positioned on screen in all sweep modes	

**Table A-8: Calibrator**

Characteristic	Performance Requirement	Reference Information
Waveform Square Wave	Amplitude: 0.700 V $\pm$ 1% Frequency: 100 kHz $\pm$ 0.1%	Crystal-controlled 10 $\mu$ s square wave

**Table A-9: Component Vector Mode**

Characteristic	Performance Requirement	Reference Information
Vertical Bandwidth		$\geq$ 1.0 MHz
Horizontal to Vertical Bandwidth Matching	$\leq$ 2° at 500 kHz and 2 MHz	
Vertical Gain Accuracy	$\pm$ 1%	
Horizontal Gain Accuracy	$\pm$ 1%	
Display to Graticule Registration	$\leq$ 0.25 box with the color bar black display dot centered in target.	

**Table A-9: Component Vector Mode (Cont.)**

Characteristic	Performance Requirement	Reference Information
Electronic Graticule Shape		Minimal visible gaps or tails at corners of target boxes.
Vector Display		$P_B$ is displayed on horizontal axis and $P_R$ is displayed on vertical axis.

**Table A-10: Lightning and Diamond Mode**

Characteristic	Performance Requirement	Reference Information
Vertical Gain Accuracy	$\pm 2\%$	
Electronic Graticule Display Lightning		Y is displayed vertically. $P_B$ is displayed horizontally on top half of display. $P_R$ is displayed horizontally on bottom half of display.
Diamond		GBR Deflection axis indicated.

**Table A-11: Bowtie Mode**

Characteristic	Performance Requirement	Reference Information
Common Mode Rejection Ratio		$\geq 34$ dB at 2.5 MHz
Accuracy		$\pm 3\%$
Interchannel Timing Match		$\pm 2.0$ ns

**Table A-12: Picture Monitor Outputs**

Characteristic	Performance Requirement	Reference Information
Signal Format		EBU/N10
Active Video Accuracy	700 mV $\pm 3\%$	Typically $<1\%$
Sync Amplitude Accuracy		300 mV $\pm 10\%$
Monitor Output Impedance		Nominally 75 $\Omega$ ; back porch clamped to 0 V.

**Table A-13: Power Source**

Characteristic	Performance Requirement	Reference Information
Electrical Rating	90 – 250 V, 50/60 Hz, 1.5 A maximum	Continuous range from 90 to 250 Vac
Supply Type		Single Phase
Supply Connection		Detachable cord set
Power Consumption		< 110 VA (75 watts)

**Table A-14: CRT Display**

Characteristic	Performance Requirement	Reference Information
CRT Viewing Area		80 X 100 mm Horizontal: 12.5 divisions Vertical: 1.19 V
Accelerating Potential		Nominally 13.75 kV
Trace Rotation Range	$> \pm 1^\circ$ from horizontal	Total adjustment range is typically $\geq 8^\circ$ .
Graticule		Internal with variable illumination.

**Table A-15: Environmental Characteristics**

Characteristic	Performance Requirement	Reference Information
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 feet (4572 meters)	IEC 1010-1 compliant to 2000 meters.
Storage Altitude	To 50,000 feet (15,240 meters)	
Vibration	5 minutes at 5 – 15 Hz with 0.060 inch displacement 5 minutes at 15 – 25 Hz with 0.040 inch displacement 5 minutes at 25 – 55 Hz with 0.020 inch displacement Military Specification: Mil-T-28800D, Paragraph 1.2.2, Class 3	
Mechanical Shock	Non Operating: 50 g's 1/2 sine, 11 ms duration 3 shocks per surface (18 total)	
Transportation	Qualified under NSTA Test Procedure 1A, Category II (24 inch drop)	
Equipment Type		Measurement
Equipment Class		IEC 1010-1, Annex H, Class III

**Table A-15: Environmental Characteristics (Cont.)**

Characteristic	Performance Requirement	Reference Information
Installation Category		Category II (as defined in IEC 1010-1, Annex J) NOTE: Rated for indoor use only.
Pollution Degree		Pollution degree 2 (as defined in IEC 1010-1)
Humidity	Proper operation at 95% +0, -5% Relative Humidity	Do not operate with visible moisture on the circuit boards.

**Table A-16: Certification**

Characteristic	Standard
Safety	<b>Designed to meet or exceed:</b> UL1244 CSA Standard 231 IEC 1010-1 (for operation up to 2000 meters)

**Table A-17: Physical Characteristics**

Characteristic	Description
Dimensions	Height: 5 1/4 inches (133.4 millimeters) Width: 8 1/2 inches (215.9 millimeters) Depth: 18 1/8 inches (460.4 millimeters)
Weight	Net: 8 pounds (3.8 kilograms) Shipping: 15.7 pounds (7.2 kilograms) approximate