



Video Measurement Set



1780R Video Measurement Set.

1780R Series

CHARACTERISTICS

Input/Output

Vertical Range, Full Scale -

Fixed: 1.0 V \pm .007 V.

Variable: Approximately 0.67 to 2.00 V.

Vertical Magnification - Fixed, Variable, X5.

Maximum Input Signal -

AC Coupled: 2.0 V_{p-p}, 10% -90% AP.

DC Coupled: \pm 1.5 V (DC + peak AD).

Return Loss -

Inputs A, B, B2 or B3: <40 dB DC to 5 MHz.

Aux Video in, Aux Video out, Pix Mon out

<34 dB DC to 5 MHz.

External Sync Input: <46 dB DC to 5 MHz.

Waveform Monitor Vertical System

Frequency Response (Flat X1) -

50 kHz - 5 MHz:

Input CH A, B, B2 and B3: 1%.

5 MHz - 10 MHz:

Input CH A: 1%.

CH B1, B2 and B3: 2%.

10 MHz - 15 MHz:

Input CH A, B1, B2 and B3: +2%, -5%.

15 MHz 20 MHz:

Input CH A, B1, B2 and B3: +2%, -15%.

Voltage Cursor -

Accuracy \pm 0.2%.

Resolution: 1 mV.

Cal Amplitude-

Accuracy: 1.00 V \pm 0.2%.
Resolution: 1 mV at 1.00 V.

DC Restorer -

Mains Hum Attenuation:
Slow Clamp: \leq 0.9 dB.
Fast Clamp: \geq 26 dB.

Lum/Chroma Gain Ratio - 1:1 \pm 1%.

Vertical Overscan -

1 V_{p-p} Modulated Sin² Composite Signal, X5 Gain: <7 mV variation in baseline of chroma when positioned anywhere between sync tip and 100% white.

DC Channel Matching -

Typically Within: 10 mV.

Common Mode Rejection (A-B1) -

60 Hz: A-B \geq 46 dB.
15 kHz: A-B \geq 46 dB.
1 MHz: A-B \geq 40 dB.
F_{SC}: A-B \geq 34 dB.

Filters -

Luminance: <3 dB down at 1 MHz, \geq 40 dB down at F_{SC}.
Low Pass: \geq 14 dB down at 500 kHz.
Chrominance: Typically \pm 1% of flat at F_{SC}, 3 dB points \pm .75 MHz F_{SC}, within \pm .15 MHz.
Diff'd Steps: <40 dB at F_{SC}.

Linear Waveform Distortion -

Pulse Overshoot and Ringing: \leq 1% of applied pulse amplitude.
25 μ s Bar Tilt: \leq 1% of applied square wave amplitude.
2T Sin² Pulse to Bar Ratio: 1:1 \pm 1%.

Non-linear Waveform Distortion -

Aux Video and Pix Mon out:

Differential Gain: \leq 0.25%, 10-90% APL.
Differential Phase: \leq 0.25°, 10-90% APL.

Probe Input

Input Resistance - Nominally 1.0 megaohm.

Input RC Product - Nominally 20 μ s (20 pF).

Gain Full Scale - 0.1 V, 1.0 V \pm 3%.

Frequency Response - 25 Hz to 10 MHz: \pm 3%.

Probe Calibrator - 1.0 V \pm 0.5%.

Waveform Monitor Horizontal Deflection System

Sweep Rates and Timing Accuracy -

1H (5 $\mu\text{s}/\text{div}$): $\pm 2\%$. 2H (10 $\mu\text{s}/\text{div}$): $\pm 2\%$.

3H (15 $\mu\text{s}/\text{div}$): $\pm 2\%$.

1F displays 1 full field including field rate sync. 2F displays 2 full fields, first field selectable even or odd. 3F displays 3 full fields, first field selectable even or odd.

Sweep Linearity -

1H, 2H or 3H: $\pm 1\%$.

1F, 2F or 3F: ± 0.5 div.

Slow Sweep: $\pm 5\%$ full screen over sweep length.

Magnified Sweep Accuracy -

X5 (1 $\mu\text{s}/\text{div}$): $\pm 1\%$. X10 (0.5 $\mu\text{s}/\text{div}$): $\pm 2\%$.

X20 (0.25 $\mu\text{s}/\text{div}$): $\pm 3\%$. X25 (0.2 $\mu\text{s}/\text{div}$): $\pm 3\%$.

X50 (0.1 $\mu\text{s}/\text{div}$): $\pm 3\%$. X100 (50 ns/div): $\pm 5\%$.

Magnified Sweep Linearity - ± 1 minor division ($\leq 2\%$).

Variable Sweep Range - $< \pm 20\%$.

Slow Sweep Duration - 4 - 12 sec.

Timing Cursors - Accuracy: 5 ns any delay within one line.

Line Select -

Range: Full field, waveform and vector monitors may select different lines.

Field Selection: 1 of 4 for NTSC (1780R) or 1 of 8 for PAL (1781R), even, odd or all fields.

RGB/YRGB -

Staircase Input: 10 V_{p-p} for 9 division wide display ± 1.4 major divisions.

Staircase Operating Signal: DC signal levels plus peak AC, not to exceed -12 V to +12 V.

Maximum AC Signal: 12 V_{p-p} .

Field or Line Rate: Front panel selectable.

External Horizontal Input - 0 to +5 V. 5 V is nominally a 10 div H sweep.

Waveform Monitor Differential Gain and Differential Phase Display**Differential Gain (DG) -**

Deflection Factor: 5% DG deflects the trace 50 IRE (1780R) or 500 mV (1781R) $\pm 5\%$.

Residual DG (10-90% APL): $\leq 0.2\%$ last 90% of track.

Calibrated DG (CRT Readout) -

Resolution: 0.1%.

Accuracy: 0.1% $\pm 10\%$ of reading.

Range: $\pm 5\%$.

Differential Phase (D ϕ) -

Deflection Factor: 5° D ϕ deflects the trace 50 IRE (1780R) or 500 mV (1781R) \pm 5%.
Residual D ϕ : (10-90% APL) \leq 0.1° last 90% of trace.
Calibrated D ϕ (CRT readout):

Resolution: 0.05°.

Accuracy: Burst lock \pm 0.1° over any 10° increment; \pm 0.2° over full 360° range; Ext ref \pm 0.1° over full 360° range.

Digital Recursive Vertical Filter -

Displayed Error Signal White Noise Reduction: Approx. 15 dB.
Cross Luminance Rejection: Approx. 30 dB.
Unit Sample Response: Settles to within 1 dB in 50 samples.
Chrominance Bandwidth: 500 kHz \pm 100 kHz baseband.

Synchronization**Sync Input - Internal:**

Reference Sync Separator: 0.2 to 2.0 V_{p-p} composite video.
Internal Sync Separator: 0.5 to 2.0 V_{p-p} composite video.

External:

Black Burst: 286 mV (1780R), 300 mV (1781R) sync and burst amplitude, +6/-14dB
Composite Sync: 0.2 to 8.0 V_{p-p}.
SCH Modes: 286 mV (1780R), 300 mV (1781R) sync burst \pm 3 dB.

Direct Sync -

Horizontal Frequency Range: 15.734 kHz \pm 100 Hz.

AFC Sync -

Horizontal Frequency Range: 15.734 kHz \pm 200 Hz.
Lock-in Time: <1 second.

Slow Sweep Triggering -

Signal APL change from \leq 10% to 90%.
Sensitivity: 0.4 to 2.0 V_{p-p} composite video with APL change.
Rate: \geq 0.2 Hz.

Remote Sync -

Amplitude: 2.0 to 5.0 V squarewave or 4.0 V composite sync.

Vectorscope Vector Display

Digital Phase Shifter Phase Accuracy - 0.1°.

Chrominance Bandwidth -

Upper -3 dB Point: F_{sc} +500 kHz, \pm 100 kHz.
Lower -3 dB Point: F_{sc} -500 kHz, \pm 100 kHz.

Display - Vector Phase Accuracy: \pm 1.25°.

Quadrature Phasing - \pm 0.5°.

Subcarrier Regenerator -

Pull-in Range: ± 50 Hz of F_{sc} (1780R), ± 10 Hz of F_{sc} (1781R, typically ± 50 Hz).

Phase Shift with Burst Amplitude Change:

Phase Shift with Input Channel Change: $\leq 2^\circ$.

Clamp Stability - Better than 0.4 mm.

Variable Gain Range - +14 dB to -6 dB of 75% colorbar preset gain.

Variable Gain Phase Shift - $\leq 1^\circ$ as gain is varied +3 dB to -6 dB.

Vectorscope XY Display**DC Coupled Differential Inputs Through Rear Panel Connector -**

Input Amplitude: 2 to 9 V_{p-p} , adjustable internally for full scale deflection 0 dBm to +12 dBm for 600 Ohm system. Factory set to 0 dBm.

Maximum Input Voltage: ± 15 V combined peak signal and DC.

Frequency Response: DC to <500 kHz.

X and Y Input Phase Matching: < one trace width of separation to 20 kHz.

Vectorscope SCH Phase Display**Accuracy -**

Absolute: $\pm 5^\circ$ phase at 25°C.

Relative: Typically $\pm 2^\circ$.

Acquisition Time: ≤ 1 second.

Display Range -

Absolute (Internal Reference): $\pm 70^\circ$.

Relative (External Reference): 360° Indicates correct color framing.

CRTs and High Voltage Supplies**Waveform Monitor -**

Viewing Area: 80 mm x 100 mm.

Accelerating Potential: Nominally 20 kV.

Orthogonality: $\pm 1^\circ$.

Vectorscope -

Viewing Area: 80 mm x 100 mm.

Accelerating Potential: Nominally 13.75 kV.

Orthogonality: $\pm 1^\circ$.

Power Requirements**Mains Voltage Ranges -**

110 V AC: 90-132 V.

220 V AC: 200-250 V.

Mains Frequency Range - 48-66 Hz.

Power Consumption - 110 W max.

Environmental

Temperature Range -

Operating: 0°C to +50°C.

Nonoperating: -55°C to +75°C.

Altitude -

Operating: To 15,000 ft. (4.5 km) max.

Nonoperating: To 50,000 ft. (15 km) max.

Humidity - 90-95% noncondensing.

Vibration -

Operating: 0.015 in (0.38 mm) p-p, 10-55 Hz, 75 minutes.

Shock -

Nonoperating: 30 g acceleration, 3 times each major axis, 11 ms, halfsine.

Bench Handling - 4 in. drop to table top on each of four bottom corners.

Transportation -

Vibration: Qualified under National Safe Transit Association (NSTA) Test Procedure 1A-B-1.

Drop Test: Qualified under NSTA Test Procedure IA-B-2.

Certifications

EMC - Certified to the EMC Directive 89/336/EEC.

Safety -

UL1244, CSA231, EN61010-1, IEC61010-1.

Complies with: HD401 S IEC 348.

Physical Characteristics

Dimensions	mm	in.
Height	133.4	5.25
Width	483	19
Length	460	18
Weight (approximate)	kg	lbs.
Net	12.75	28
Shipping	20.1	45