

Section 4

Specification

Performance Conditions

The specifications that follow apply when the instrument is in the condition of Enhanced Accuracy. Enhanced Accuracy is initiated by pushing the EA button on the specific host mainframe after the system has reached thermal equilibrium, which requires 20 minutes warmup. Enhanced Accuracy is indicated on the CRT display and remains in effect as long as the mainframe internal temperature change is less than 5° C from the temperature at which the calibration was performed. When the 5° C change does occur the accuracy condition becomes Not-Enhanced. In the Not Enhanced condition those Characteristics that are temperature sensitive may not remain within the limits of these specifications.

TABLE 4-1
Electrical Characteristics

Circuit	Characteristic	Performance Requirement				
Display Deflection Factor (Sensitivity)	Calibrated Range	1 mV to 10 V/div.				
	Enhanced DC Accuracy ¹ of 11A33 in 11300-series Mainframes, with on-screen cursors.					
	Without Probes					
	Volts/Div	ΔV DC Acc.	DC Balance	DC Offset Acc.	Vc Acc.	
	1 mV to 99.5 mV	$\pm(1.0\% + 0.04 \text{ div})$	$\pm(0.5 \text{ mV} + 0.13 \text{ div})$	$\pm(0.25\% + 0.70 \text{ mV})$	$\pm(0.15\% + 0.6 \text{ mV})$	
	100 mV to 995 mV	$\pm(1.0\% + 0.04 \text{ div})$	$\pm(5 \text{ mV} + 0.13 \text{ div})$	$\pm(0.30\% + 7 \text{ mV})$	$\pm(0.20\% + 6 \text{ mV})$	
	1 V to 10 V	$\pm(1.0\% + 0.04 \text{ div})$	$\pm(50 \text{ mV} + 0.13 \text{ div})$	$\pm(0.30\% + 70 \text{ mV})$	$\pm(0.20\% + 60 \text{ mV})$	
	With P6135 Probe Set calibrated from 11300-series Calibrator output					
	Volts/Div	ΔV DC Acc.	DC Balance	DC Offset Acc.	Vc Acc.	
	10 mV to 995 mV	$\pm(1.0\% + 0.04 \text{ div})$	$\pm(5.0 \text{ mV} + 0.13 \text{ div})$	$\pm(0.30\% + 7 \text{ mV})$	$\pm(0.20\% + 6 \text{ mV})$	
1 V to 9.95 V	$\pm(1.0\% + 0.04 \text{ div})$	$\pm(50 \text{ mV} + 0.13 \text{ div})$	$\pm(0.30\% + 70 \text{ mV})$	$\pm(0.20\% + 60 \text{ mV})$		
10 V to 100 V	$\pm(1.0\% + 0.04 \text{ div})$	$\pm(0.5 \text{ V} + 0.13 \text{ div})$	$\pm(0.30\% + 0.7 \text{ V})$	$\pm(0.20\% + 0.6 \text{ V})$		
Probe tip TC term	100 ppm/°C	na	na	na		

¹For absolute DC accuracy of single-point measurements using Offset, add the DC Offset Accuracy, DC Balance and ΔV DC Accuracy terms. Apply the ΔV DC Accuracy only to the difference between the Vertical Position setting and the measurement point.

TABLE 4-1 (cont)
Electrical Characteristics
Display Deflection Factor (cont.)

With One P6231 Probe calibrated from 11300-series Calibrator output.

Volts/Div	ΔV DC Acc.	DC Balance	DC Offset Acc.	Vc Acc.	Probe Offset Acc.
10 mV to 995 mV	$\pm(1.1\% + 0.04 \text{ div})$	$\pm(5 \text{ mV} + 0.13 \text{ div})$	$\pm(0.30\% + 7 \text{ mV})$	$\pm(0.20\% + 6 \text{ mV})$	$\pm(0.2\% + 2.0 \text{ mV})$
$\geq 1 \text{ V}$	$\pm(1.1\% + 0.04 \text{ div})$	$\pm(50 \text{ mV} + 0.13 \text{ div})$	$\pm(0.30\% + 70 \text{ mV})$	$\pm(0.20\% + 60 \text{ mV})$	$\pm(0.2\% + 2.0 \text{ mV})$
Probe Tip TC term	100 ppm/ $^{\circ}\text{C}$				

Enhanced DC Accuracy¹ of 11A33 in 11401 and 11402 Mainframes.

Without Probes

Volts/Div	ΔV DC Acc.	DC Balance	DC Offset Acc.	Vc Acc.
1 mV to 99.5 mV	$\pm(0.9\% + 0.01 \text{ div})$	$\pm(0.5 \text{ mV} + 0.10 \text{ div})$	$\pm(0.25\% + 0.7 \text{ mV})$	$\pm(0.15\% + 0.6 \text{ mV})$
100 mV to 995 mV	$\pm(0.9\% + 0.01 \text{ div})$	$\pm(5 \text{ mV} + 0.10 \text{ div})$	$\pm(0.30\% + 7 \text{ mV})$	$\pm(0.20\% + 6 \text{ mV})$
1 V to 10 V	$\pm(0.9\% + 0.01 \text{ div})$	$\pm(50 \text{ mV} + 0.10 \text{ div})$	$\pm(0.30\% + 70 \text{ mV})$	$\pm(0.20\% + 60 \text{ mV})$

With P6135 Probe Set calibrated from 11401 and 11402 Calibrator output

Volts/Div	ΔV DC Acc.	DC Balance	DC Offset Acc.	Vc Acc.
10 mV to 995 mV	$\pm(0.9\% + 0.01 \text{ div})$	$\pm(5.0 \text{ mV} + 0.10 \text{ div})$	$\pm(0.30\% + 7 \text{ mV})$	$\pm(0.20\% + 6 \text{ mV})$
1 V to 9.95 V	$\pm(0.9\% + 0.01 \text{ div})$	$\pm(50 \text{ mV} + 0.10 \text{ div})$	$\pm(0.30\% + 70 \text{ mV})$	$\pm(0.20\% + 60 \text{ mV})$
10 V to 100 V	$\pm(0.9\% + 0.01 \text{ div})$	$\pm(0.5 \text{ V} + 0.10 \text{ div})$	$\pm(0.30\% + 0.7 \text{ V})$	$\pm(0.20\% + 0.6 \text{ V})$
Probe tip TC term	100 ppm/ $^{\circ}\text{C}$	na	na	na

With one P6231 Probe calibrated from 11401 and 11402 Calibrator outputs

Volts/Div	ΔV DC Acc.	DC Balance	DC Offset Acc.	Vc Acc.	Probe Offset Acc.
10 mV to 995 mV	$\pm(1.0\% + 0.01 \text{ div})$	$\pm(5 \text{ mV} + 0.10 \text{ div})$	$\pm(0.30\% + 7 \text{ mV})$	$\pm(0.20\% + 6 \text{ mV})$	$\pm(0.20\% + 2.0 \text{ mV})$
$\geq 1 \text{ V}$	$\pm(1.0\% + 0.01 \text{ div})$	$\pm(50 \text{ mV} + 0.10 \text{ div})$	$\pm(0.30\% + 70 \text{ mV})$	$\pm(0.20\% + 60 \text{ mV})$	$\pm(0.20\% + 2.0 \text{ mV})$
Probe Tip TC term	100 ppm/ $^{\circ}\text{C}$				

TABLE 4-1 (cont)
Electrical Characteristics

Circuit	Characteristic	Performance Requirement
Display Deflection Factor (Sensitivity) (cont)	Coarse Resolution	1, 2, 5 sequence.
	Fine Resolution	Depends on Deflection Factor, as follows: Rotating the Fine control one increment will change the Deflection Factor by 1% of the next more-sensitive Coarse setting. For example, with deflection factor set to 198 mV, rotating the Fine control counter-clockwise will cause this sequence of sensitivities: 199 mV, 200 mV, 202 mV, etc. Rotating the Fine control clockwise from 204 mV/div will cause the reverse sequence (202 mV, 200 mV, 199 mV, etc.).
Display Offset	Comparison Voltage	
	Range	
	with Deflection Factor set between 1 mV and 99.5 mV/div	± 8 V.
	with Deflection Factor set between 0.1 V and 0.995 V/div	± 80 V.
	with Deflection Factor set between 1.0 V and 10.0 V/div	± 500 V.
	Resolution	
	Coarse	0.25 division.
	Fine 0.025 division.	
	Accuracy	See <i>Deflection Factor Accuracy</i> , which precedes this characteristic.

TABLE 4-1 (cont)
Electrical Characteristics

Circuit	Characteristic	Performance Requirement
Display Offset (cont)	Amplifier Offset Range With Deflection Factor between 1 mV and 99.5 mV/div With Deflection Factor between 0.1 V and 0.995 V/div With Deflection Factor between 1 V and 10.0 V/div Resolution Coarse Fine 0.025 division. Accuracy	± 1 V. ± 10 V. ± 100 V. 0.25 division. See <i>Deflection Factor Accuracy</i> , which precedes this characteristic.
	Probe Offset (+OS, -OS) Range of voltage supplied to probe Resolution Coarse Fine Accuracy	± 1.0 V. Probe-tip offset depends on type of probe used. See <i>Recommended Probes</i> , in this manual, or any probe manual. 0.25 division. 0.025 division. See <i>Deflection Factor Accuracy</i> , which precedes this characteristic.

TABLE 4-1 (cont)
Electrical Characteristics

Circuit	Characteristic	Performance Requirement			
Common Mode Rejection Ratio (measured with sine wave)	With Deflection Factor set between 1 mV and 99.5 mV/div (DC coupled)	Test signal ± 4 V (8 V p-p) 10,000:1 DC to 1 MHz 2,000:1 at 5 MHz. Test signal ± 8 V (16 V p-p) 5,000:1 DC to 1 MHz 2,500:1 at 2 MHz. Test signal ± 0.5 V (1 V p-p) 1,000:1 at 10 MHz 500:1 at 20 MHz.			
	With Deflection Factor set between 0.1 V and 0.995 V/div (DC coupled)	Test signal ± 15 V (30 V p-p) 1,000:1 DC to 1 MHz 100:1 10 MHz to 20 MHz.			
	With Deflection Factor set between 1 V and 10 V/div (DC coupled)	Test signal ± 50 V (100 V p-p) 500:1 DC to 250 kHz.			
	AC Coupled; 60 Hz	At least 50:1.			
Display Frequency Response	High Frequency Limit (-3 dB) and Calculated Rise Time of Display, Auxiliary, and Trigger signals, $Z_{in}=1\text{ M}\Omega$ or $50\ \Omega$	Type of Mainframe			
		11301(A)	11302(A)	11401	11402
	Volts/Division				
	1 mV - 1.99 mV	120 MHz 2.9 ns	120 MHz 2.9 ns	120 MHz 2.9 ns	12 MHz 2.9 ns
	2 mV - 10 V	150 MHz 2.3 ns	150 MHz 2.3 ns	150 MHz 2.3 ns	150 MHz 2.3 ns
	Low Frequency -3 dB point, AC coupled	10 Hz or less.			

TABLE 4-1 (cont)
Electrical Characteristics

Circuit	Characteristic	Performance Requirement
Step Response	Overdrive recovery time; deflection factor set between 1 mV and 99.5 mV/div. (DC coupled) 1 mV within 300 μ s.	Recovery to 0 V from overdrive up to ± 8 V, slew rate less than 0.5 V/ns. 0.25% within 40 ns, 2 mV within 100 μ s.
Input Impedance	50 Ω , DC or AC Coupled	50 $\Omega \pm 0.5\%$ in parallel with approx. 15 pF.
	1 M Ω DC Coupled	1 M $\Omega \pm 0.30\%$ in parallel with approx. 15 pF.
	AC Coupled	0.022 μ F in series with 1 M $\Omega \pm 0.30\%$ and in parallel with approx. 15 pF.
	1 G Ω , DC Coupled	Greater than 1 G Ω in parallel with approx. 15 pF.
	Power-Down Condition	Inputs disconnected.
Maximum Input Voltages	50 Ω DC or AC Coupled	5 Vrms (0.5 watt); 0.5 watt-second pulses not exceeding 25 V peak.
	1 M Ω or 1 G Ω , DC or AC Coupled	
	1 mV to 99.5 mV/division	
	Absolute Maximum	± 50 V DC+peak AC. 50 V peak-to-peak AC up to 3 MHz, decreasing 20 dB/decade to 0.5 V at 300 MHz.
	Operating Range	± 8 V DC + peak AC.
	100 mV to 995 mV/division	
	Absolute Maximum	± 500 V DC + peak AC. 500 V peak-to-peak AC up to 300 kHz, decreasing 20 dB/ decade to 0.5 V at 300 MHz.
	Operating Range	+80 V DC + peak AC.
	1 V to 10 V/division	
	Absolute Maximum	± 500 V DC + peak AC. 500 V peak-to-peak AC up to 300 kHz, decreasing 20 dB/ decade to 0.5 V at 300 MHz.

TABLE 4-2
Environmental Characteristics

Characteristic	Information
Ambient temperature (External to main frame)	
Operating within specs.	0° to +50°C., mainframe ambient.
Nonoperating	–40° to +75°C.
Humidity, Operating and Nonoperating	Five days, per MIL-T-28800C, Type III, class 5 as described in 3.9.2.2 and 4.5.5.1.2.2.
Altitude	
Operating	To 4,570 m (15,000 ft.).
Nonoperating	To 15,200 m (50,000 ft.).
Vibration	
Operating, installed on Flexible Extender	MIL-T-28800C, Sec. 4.5.5.3.1, type III, class 5.
Shock, Nonoperating (not installed in mainframe)	MIL-T-28800C, Sec. 4.5.5.4.1, type III, class 5.
Bench Handling (operating and nonoperating)	MIL-T-28800C, Sec. 4.5.5.4.3, type III, class 5.
Packaged Product Vibration and Shock	
Vibration and Bounce of Packaged Product	Meets ASTM D999-75, Method A (NSTA Project 1A-B-1).
Drop of Packaged Product	Meets ASTM D775-61, Paragraph 5 (NSTA Project 1A-B-2).
Electromagnetic Compatibility	MIL. STD. 461B, FCC Part 15, Subpart J, Class A. VDE 0871/6.78, Class B.

TABLE 4-3
Physical Characteristics

Characteristic	Information
Weight (max)	2 lbs. 2 oz. (964 grams).
Weight of Packaged Product (max)	5 lbs. 0 oz. (2.3 kg).
Dimensions	Refer to Figure 4-1.

Recommended Probes

The 11A33 is compatible with Level 1 and 2 TEKPROBES.

TEKPROBE is Tektronix' name for the interface used with probes designed for the 11000-series of oscilloscopes and plug-in units. TEKPROBES have output connectors with one or more spring-loaded coding pins.

A Level 1 probe uses analog encoding to indicate the probe's scale factor to the plug-in unit.

A Level 2 probe uses an EEPROM to store data about the probe's transfer units, scale factor, and output voltage scale factor. Such data is serially encoded, then stored in the EEPROM. The probe data is intended to be read once at instrument power-up or when the probe is first connected to a plug-in unit (that is, at probe power-up).

Tektronix recommends these probes for use with the 11A33:

P6134 Subminiature 10X Passive Probe with ID. With 1 M Ω inputs, the P6134's input impedance is 10 M Ω in parallel with 10.5 pF. The P6134 is a Level 1 probe.

P6135 Subminiature 10X Passive Probe Set. The P6135's input impedance is 1 M Ω in parallel with 15 pF. Attenuation of probe is adjustable to permit matching the two attenuation factors. The P6135 is a Level 1 probe.

P6231 Low Impedance Subminiature 10X Active Probe. The P6231 has a bandwidth of 1.5 GHz, input impedance of 450 Ω , and DC offset of ± 5 V controlled by the 11A33. Probe scaling is 5:1 for PLSOFFSET and MNSOFFSET. The P6231 is a Level 2 probe.

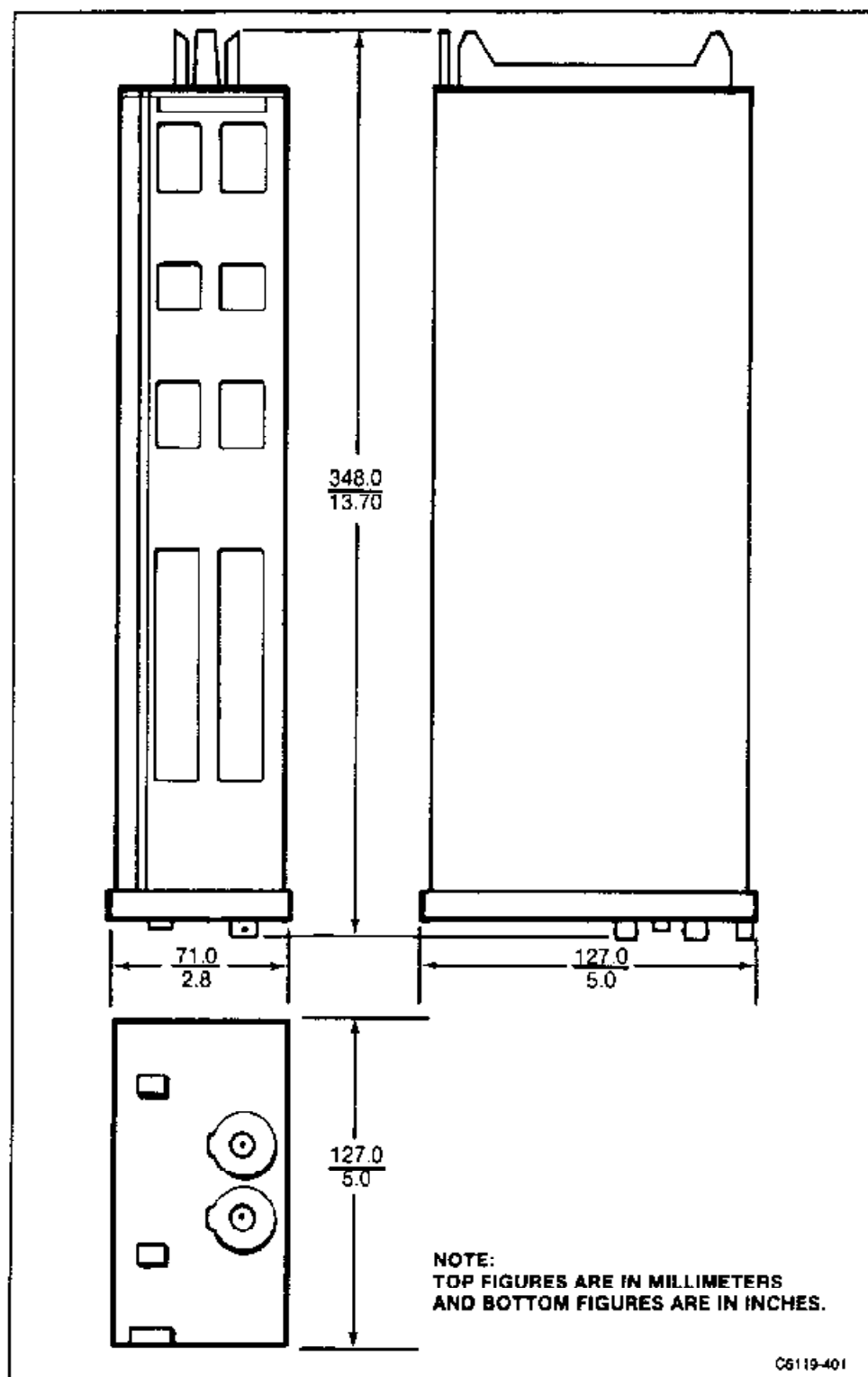


Figure 4-1. Dimensions of 11A33