

Table 1-1. Specifications

RANGES															
<p>Output Voltage Ranges: 6 ranges with 10% overrange as follows:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">RANGE</th> <th>SETABILITY</th> </tr> </thead> <tbody> <tr> <td>1 mV</td> <td>.100000 mV to 1.099999 mV in 1 nanovolt steps</td> </tr> <tr> <td>10 mV</td> <td>1.00000 mV to 10.99999 mV in 10 nanovolt steps</td> </tr> <tr> <td>100 mV</td> <td>10.0000 mV to 109.9999 mV in 100 nanovolt steps</td> </tr> <tr> <td>1 V</td> <td>.100000 V to 1.099999 V in 1 microvolt steps</td> </tr> <tr> <td>10 V</td> <td>1.00000 V to 10.99999 V in 10 microvolt steps</td> </tr> <tr> <td>100 V</td> <td>10.0000 V to 109.9999 V in 100 microvolt steps</td> </tr> </tbody> </table>		RANGE	SETABILITY	1 mV	.100000 mV to 1.099999 mV in 1 nanovolt steps	10 mV	1.00000 mV to 10.99999 mV in 10 nanovolt steps	100 mV	10.0000 mV to 109.9999 mV in 100 nanovolt steps	1 V	.100000 V to 1.099999 V in 1 microvolt steps	10 V	1.00000 V to 10.99999 V in 10 microvolt steps	100 V	10.0000 V to 109.9999 V in 100 microvolt steps
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<p>Output Frequency Ranges: continuously adjustable from 10 Hz to 110 kHz in 4 decade ranges with 10% overlap.</p>															
<p>Error Measurement: 2 ranges with zero center dial, $\pm 0.3\%$ or $\pm 3\%$.</p>															
PERFORMANCE RATING															
<p>Accuracy: accuracy holds for a 90-day period and is met after a 1-hour warmup period at $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ with $< 95\%$ R.H.</p>															
<p>Voltage: specifications are relative to a 5 mA thermocouple calibrated by the National Bureau of Standards.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">RANGE</th> <th>ACCURACY</th> </tr> </thead> <tbody> <tr> <td>50 Hz to 20 kHz</td> <td>$\pm (0.02\%$ of setting + 0.002% of range + $10 \mu\text{V}$)</td> </tr> <tr> <td>20 Hz to 50 Hz, 20 kHz to 110 kHz</td> <td>$\pm (0.05\%$ of setting + 0.005% of range + $50 \mu\text{V}$)</td> </tr> <tr> <td>10 Hz to 20 Hz</td> <td>$\pm (0.2\%$ of setting + 0.005% of range + $50 \mu\text{V}$)</td> </tr> </tbody> </table>		RANGE	ACCURACY	50 Hz to 20 kHz	$\pm (0.02\%$ of setting + 0.002% of range + $10 \mu\text{V}$)	20 Hz to 50 Hz, 20 kHz to 110 kHz	$\pm (0.05\%$ of setting + 0.005% of range + $50 \mu\text{V}$)	10 Hz to 20 Hz	$\pm (0.2\%$ of setting + 0.005% of range + $50 \mu\text{V}$)						
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<p>Frequency: $\pm (2\%$ of setting + 0.2% of end scale)</p>															
<p>Error Measurement: $\pm (0.5\%$ of setting + 0.5% of range)</p>															
<p>Temperature Coefficient Voltage: $\pm 0.0003\%$ of setting per $^{\circ}\text{C}$ from 0°C to $+ 55^{\circ}\text{C}$.</p>															
<p>Frequency: $\pm 0.05\%$ of end scale per $^{\circ}\text{C}$ from 0°C to $+ 55^{\circ}\text{C}$.</p> <p>Derate accuracy specifications by this temperature coefficient for operation in temperature range of 0°C to 20°C and 30°C to 50°C.</p>															
<p>Voltage Stability: stability met after 1-hr warmup period at constant temperature with $< 95\%$ R.H.</p>															
OUTPUT CHARACTERISTICS															
<p>Long-Term: $\pm 0.01\%$ of setting for 6 mo. Short Term: $\pm 0.005\%$ of setting for 24 hr.</p>															
<p>Total Distortion and Noise: $\pm (0.05\%$ of setting + $10 \mu\text{V}$ over 100 kHz Bandwidth) on all ranges.</p>															
<p>Total Distortion, Cycle-to-cycle Instability, and Noise: Will cause $< \pm 0.005\%$ of error when used to calibrate an average-responding or true rms-responding instrument from 1 mV to 110 V.</p>															
<p>Load regulation (no load to full load): Output impedance $< 1 \Omega$ on 1 mV, 10 mV, 100 mV ranges.</p>															
<p>On the 1 V, 10 V and 100 V ranges for output current equal to or less than that shown in the diagram below, error is included in the accuracy specification.</p>															
<p>Load capability: 1000 pF or 50 mA. (50 mA allows 800 pF at 100 V, 100 kHz.)</p>															
<p>Line Regulation: $\pm 0.001\%$ of setting change in output voltage for a $\pm 10\%$ change in line voltage. (Included in accuracy specifications).</p>															
<p>Output Terminals: high and low output terminals can be floated $\pm 500 \text{ V}$ dc above chassis ground.</p>															
<p>Counter Output: rear-panel frequency counter output, $2.2 \text{ V} \pm 50\%$, protected against short circuits.</p>															
GENERAL															
<p>RFI: meets Mil-I-6181D when using shielded output connectors.</p>															
<p>Power Requirements: 115 or $230 \text{ V} \pm 10\%$, 50/60 Hz, 70 W nominal, 100 W maximum.</p>															
<p>Operating Temperature: 0°C to $+ 55^{\circ}\text{C}$.</p>															
<p>Storage Temperature: -40°C to $+ 75^{\circ}\text{C}$.</p>															

SECTION I

GENERAL INFORMATION

1-1. DESCRIPTION.

1-2. The Hewlett-Packard Model 745A AC Calibrator is a compact, wide-range ac calibration standard. The instrument provides highly-accurate ac calibration voltages from 0.1 mV rms to 110 V rms; or up to 1100 V rms using the companion Model 746A High Voltage Amplifier. The 745A output frequency is continuously adjustable from 10 Hz to 110 kHz in four overlapping decade ranges. The 745A output voltage is selectable in six decade ranges (1 mV through 100 V). A seventh range (1000 V ext.) is provided for use with the external high voltage amplifier. Output voltage can be varied from 10% of range to 110% of range in steps as small as 1 ppm of range. The six back-lighted voltage set controls provide a direct readout of the 745A voltage setting. In addition, the 745A is equipped with an error measurement function which can be used to provide a direct reading of calibration errors in percent of setting.

1-3. The 745A VOLTAGE RANGE, FREQUENCY RANGE, ERROR RANGE and SENSE functions are programmable through the rear panel REMOTE PROGRAM connector by transistor or switch closures to ground. The output frequency can also be varied remotely by applying an adjustable analog voltage or an adjustable resistance between the appropriate program line and ground. Refer to Section III for further information.

1-4. ACCESSORIES.

1-5. Table 1-2 is a list of accessories supplied with the Model 745A.

1-6. HIGH VOLTAGE AMPLIFIER.

1-7. The Hewlett-Packard Model 746A High Voltage Amplifier extends the output voltage capability of the 745A from 110 V rms to 1100 V rms, with a specified midband accuracy of 0.04% of setting. Consult the nearest Hewlett-

Packard Sales and Service Office for further information (Office locations are listed in Appendix B).

1-8. INSTRUMENT AND MANUAL IDENTIFICATION.

1-9. Hewlett-Packard uses a two-section serial number. The first section (prefix) identifies a series of instruments. The last section (suffix) identifies a particular instrument within the series. If a letter is included with the serial number, it identifies the country in which the instrument was manufactured. If the serial number of your instrument differs from the one on the title page of this manual, a change sheet will be supplied to make this manual compatible with newer instruments. The backdating information in Appendix C will adapt this manual to earlier instruments. All correspondence with Hewlett-Packard should include the complete serial number.

1-10. CHANGE SHEETS.

1-11. If the serial prefix of your instrument is greater than the one listed on the title page of this manual, a change sheet will be supplied. The change sheet is included to correct errors in the manual (ERRATA) and to make the manual compatible with instruments manufactured after the printing date of this manual (numbered changes).

Table 1-2. Accessories

DESCRIPTION	-HP- PART NO.
Accessory Kit includes the following:	00745-84403
Filter Pad (2 ea.)	03320-62703
Rack Mounting Kit	5060-0777
Printed Circuit Board Extender (22 pin)	5060-0630
Printed Circuit Board Extender (15 pin)	5060-0049
Printed Circuit Board Extender (10 pin)	5060-0091
Remote Program Connector	1251-0084