SECTION I
GENERAL INFORMATION

1-1. DESCRIPTION.

1-2. The Hewlett-Packard Model 410C Electronic Voltmeter can be used to measure dc voltage and dc current; ac voltage and resistance. Positive and negative dc voltages from 15 mV to 1500 V full scale and positive and negative dc currents from 1.5 μA to 150 mA can be measured full scale. Resistance from 10 Ω to 10 MΩ mid-scale can be measured with an accuracy of ± 5%; resistance from 0.2 Ω to 500 MΩ can be measured with reduced accuracy. The Model 410C Electronic Voltmeter specifications are given in Table 1-1.

1-3. With the Model 11036A detachable AC Probe, the Voltmeter can be used to measure ac voltage from 20 Hz to 700 MHz. From 20 Hz to 100 MHz, ac voltage from 0.5 to 300 V can be measured; from 100 MHz to 700 MHz, refer to Figure 3-5 for maximum ac voltage that can be applied to the AC Probe. For additional information on the AC Probe, refer to Paragraph 1-9.

1-4. INSTRUMENT AND MANUAL IDENTIFICATION.

1-5. Hewlett-Packard uses a two-section serial number consisting of a four-digit prefix and a five-digit suffix. The prefix and suffix are separated by a letter designating the country in which the instrument was manufactured. (A = U.S.A.; G = West Germany; J = Japan; U = United Kingdom.)

1-6. This manual applies to instruments with the serial prefix indicated on the title page. If changes have been made in the instrument since the printing of this manual, a "Manual Changes" supplement supplied with the manual will define these changes. Be sure to record these changes in your manual. Backdating information located in Appendix C adapts the manual to instruments manufactured prior to this printing. The manual part number is indicated on the title page.

1-7. ACCESSORIES AVAILABLE.

1-8. Accessories are available that extend the ac and dc measuring capabilities of the Voltmeter. A description of these accessories and their specifications is given below.

1-9. Model 11036A AC Probe. This accessory, when used with the Model 410C, permits ac voltage measurements from 0.5 V rms to 300 V rms, full scale over a frequency range of 20 Hz to 700 MHz. Reference calibration accuracy at 400 Hz (sinusoidal) is ± 3% of full scale. Frequency response is ± 10% from 20 Hz to 700 MHz, with indications obtainable to 3000 MHz. Frequency response at 100 MHz is within ± 2%. The Model 11036A responds to the positive-peak-above-average value of the signal applied. The Model 410C is calibrated to read in RMS volts, for sine wave inputs.

1-10. Model 11039A Capacitive Voltage Divider. This accessory (formerly the Model 452A) extends the ac voltage range of the Model 410C to 25 kV. The divider permits measurements of extremely high ac voltage such as encountered in dielectric heating equipment, etc., over a frequency range of 25 Hz to 20 MHz. A fixed gap is provided so that breakdown will occur if the applied voltage exceeds 28 kV at low frequencies. Voltage division is 1000:1, ± 3%, and input capacity is 15 pF. A Model 11018A Adapter is also required to connect the Model 11036A AC Probe to the shielded banana plug fitting of the divider.

1-11. Model 11040A Capacity Divider. This accessory (formerly the Model 453A) extends the ac voltage range of the Voltmeter to 2000 V rms. The divider is for use at frequencies above 10 kHz. Voltage division is 100:1, ± 1%, and input capacity is approximately 2 pF.

1-12. Model 11042A Probe T Connector. This accessory (formerly the Model 455A) is used for connecting the Model 11036A Probe across a 50 Ω transmission line using type N connectors. The T joint is such that connection of the probe into a transmission line will not cause a standing wave ratio greater than 1.1 at 500 MHz and 1.2 at 1000 MHz. With this device, measurement of power traveling through a transmission line may be made with reasonable accuracy to 1000 MHz. The usual precautions must be taken to provide accurate impedance matching and the elimination of standing waves along the line through which power is floating. By using a dummy load at the receiving end of this T joint power output of various devices can be measured. In many applications power going into a real load, such as an antenna, can be conveniently measured up to 1000 MHz with good accuracy.

1-13. Model 11043A Type N Connector. This accessory (formerly the Model 458A) allows the AC Probe to be connected to a 50 Ω coaxial line. The connector uses a male type N connector and a receptacle for receiving the probe. Terminating resistor is not included.

1-14. Model 11045A DC Divider. This accessory extends the maximum dc voltage range of the Model 410C to 30 kV. Voltage division is 100:1, ± 5%, and input resistance is 9900 MΩ. When used with the Model 410C input resistance is 10,000 MΩ. This probe offers maximum safety and convenience for measuring high voltages such as in television equipment, etc. The maximum current drain is 2.5 μA.

Table 1-1. Specifications.

DC VOLTMETER

Voltage Ranges: ± 15 mV to ± 1500 V full scale in 15, 50 sequence (11 ranges).

Accuracy: ± 2% of full scale on any range.

Input Resistance: 100 MΩ ± 1% of 600 mV range and above, 10 MΩ ± 3% on 15 mV, 50 mV, and 150 mV ranges.

DC AMMETER

Current Ranges: ± 1.5 μA to ± 150 mA full scale in 1.5, 5 sequence (11 ranges).

Accuracy: ± 3% of full scale on any range.

Input Resistance: Decreasing from 9 kΩ on 1.5 μA scale to approximately 0.3 Ω on the 150 mA scale.

Special Current Ranges: ± 1.5, ± 5, ± 15 nanoamps may be measured on the 15, 50, and 150 millivolt ranges using the voltmeter probe, with ± 5% accuracy and 10 mΩ input resistance.

OHMMETER

Resistance Range: Resistance from 10 Ω to 10 MΩ center scale (7 ranges).

Accuracy: Zero to midscale: ± 5% of reading or + 2% of midscale, whichever is greater.
+ 7% from midscale to scale value of 2.
+ 8% from scale value of 2 to 3.
± 9% from scale value of 3 to 5.
± 10% from scale value of 5 to 10.

AMPLIFIER

Voltage Gain: 100 maximum.

AC Rejection: 3 dB at 1/2 Hz; approximately 66 dB at 50 Hz and higher frequencies for signals less than 1600 V peak or 30 times full scale, whichever is smaller.

Isolation: Impedance between common and chassis is > 10 MΩ in parallel with 0.1 μF. Common may be floated up to 400 V dc above chassis for dc and resistance measurements.

Output: Proportional to meter indication; 1.5 V dc at full scale, maximum current, 1 mA.

Output Impedance: Less than 3 Ω at dc.

Noise: Less than 0.5% of full scale on any range (p-p).

DC Drift: Less than 0.5% of full scale/year at constant temperature. Less than 0.02% of full scale/°C.

Overload Recovery: Recover from 100:1 overload in < 3 sec.

AC VOLTMETER

Ranges: 0.5 V full scale to 300 V in 0.5, 1.5, 5 sequence (7 ranges).

Accuracy: ± 3% of full scale at 400 Hz for sinusoidal voltages from 0.5 to 300 V rms. The AC Probe responds to the positive peak-above-average value of the applied signal.

Frequency Response: ± 2% from 100 Hz to 50 MHz (400 Hz ref.), 0% to -4% from 50 MHz to 100 MHz ± 10% from 20 Hz to 100 Hz and + 1.5 dB from 100 MHz to 700 MHz.

Frequency Range: 20 Hz to 700 MHz.

Input Impedance: Input capacity 1.5 pF, input resistance > 10 MΩ at low frequencies. At high frequencies impedance drops off due to dielectric loss.

Safety: The probe body is grounded to chassis in the AC Function for safety. All ac measurements are referenced to chassis ground.

Meter: Individually calibrated taut band meter. Responds to positive peak-above-average. Calibrated in rms volts for sine wave input.

GENERAL

Maximum Input: (see Overload Recovery)
DC: 100 V on 15, 50 and 150 mV ranges; 500 V on 0.5 to 15 V ranges; 1600 V on higher ranges.
AC: 100 times full scale or 450 V peak, whichever is less.

Power: 115 or 230 V ± 10%. 48 to 440 Hz, 13 watts (20 watts with 11036A AC Probe).

Dimensions: 6 1/2 in. high (16.5 cm); 5 1/8 in. wide (13.01 cm), 11 in. deep (27.9 cm) behind panel. Fits 5060-0797 Rack Adapter and 1050-series combining cases.

Weight:
Net: 8 lbs. (4.0 kg)
Shipping: approximately 15 lbs. (6.35 kg)

Accessories Furnished: Detachable power cord, NEMA plug; -hp- Model 11036A AC Probe.

Option 02: -hp- Model 410C less AC Probe.