SECTION II - SPECIFICATIONS & DESCRIPTION

SPECIFICATIONS

Ranges:

a. Voltage: 0.01, 0.03, 0.1, 0.3, 1, 3, 10, 30, and 100 volts full scale.
b. Current: 3 amperes to 10^{-13} amperes full scale in 1x and 3x overlapping ranges.
c. Ohms: 10 ohms to 10^{14} ohms full scale on linear 1x and 3x overlapping ranges.
d. Meter scales: Black - Left zero, 0 to 3 and 0 to 10
Red - Center zero, -1.5 to 0 to +1.5 and -5 to 0 to +5.

Accuracy:

a. Voltage: 2% of full scale on all ranges.
b. Current: 3% of full scale from 3 amperes to 10^{-10} amperes. 4% of full scale from 3×10^{-10} to 10^{-13} amperes.
c. Ohms: 3% of full scale from 10 ohms to 10^{10} ohms. 5% of full scale from 3×10^{10} ohms to 10^{14} ohms.

Resistance Standards:

1, 10, 100, 1000, 10^4, 10^5, 10^6, 10^7, 10^8 ohms, 1% accuracy; 10^9, 10^{10}, and 10^{11} ohms, 2% accuracy.
The 10^9 and 10^{10} ohm and 10^{11} resistors may be expected to change slightly in value with age.

Input Impedance:

On the VOLTS position the input impedance is greater than 10^{14} ohms resistive, shunted by approximately 30 micromicrofarads.

Drift:

Less than 2 millivolts per hour after a 1 hour warm-up.

Recorder Output:

1 milliampere or 10 volts for full scale meter deflection, selected by a rear panel switch.

Amplifier:

Frequency response is DC to 500 cycles on the most sensitive range, rising to 10 kc on the least sensitive range. Maximum gain is 1000. Noise is less than 3% (peak to peak) of full scale.

Line Regulation:

A ten percent change in line voltage in the range of 100 to 130 or 200 to 260 volts will cause a change of less than 2 millivolts equivalent input.

Tubes:
Two 5886, two EF86, one 6BH8, two 12AX7, one 12B4A, one 0G3, one 0A2, one 0B2.

Cabinet:
7-1/4 wide by 11-1/2 high by 13-3/4 deep. Weight 21-1/4 lbs.

Power Supply:
100 to 130 (or 200 to 260) volts, 50 to 60 cycles at approximately 50 watts.

DESCRIPTION

The Keithley Model 610A is a line operated multipurpose dc measuring instrument of extremely wide range. The measuring ranges are summarized below:

VOLTAGE: 10 millivolts to 100 volts full scale. The input impedance is greater than 10^{14} ohms shunted by approximately 30 micromicrofarads on the VOLTS position of the RANGE SWITCH. The input resistance may be varied from 10^{11} ohms to 1 ohm in decade steps by rotating the RANGE switch in the AMPERES range marking.

HIGH VOLTAGE WITH ACCESSORIES: The Model 6102A 10:1 divider probe extends the measuring range to 1000 volts. The divider resistance is 10^{10} ohms and its division accuracy is 1%.

The Model 6103A 1000:1 divider probe extends the measuring range to 30 KV. Its input resistance is 10^{12} ohms and its division accuracy is 3%.

CURRENT: 3 amperes to 10^{-13} amperes full scale. From 3 amperes to 3×10^{-3} amperes the current is measured by measuring the drop across a resistor shunted across the input. From 10^{-4} to 10^{-13} amperes, the method above may be used or, by placing the FAST-NORMAL switch on the back panel in the FAST position, negative feedback is applied around the shunt resistor. This makes the input drop negligible and improves speed of response considerably on the low current ranges.

OHMS: 10 ohms to 10^{14} ohms full scale.

The linear ohms scale is achieved by measuring the unknown resistor with a known, constant current flowing through it. The voltage drop across the sample is then proportional to the resistance. Resistance from 10 ohms to 10^{11} ohms full scale is measured by a two terminal method. From 10^{11} to 10^{14} ohms, use of the GUARD terminal available at the rear of the instrument is recommended.

DC AMPLIFIER: The frequency response of the Model 610A as an amplifier is from dc to 500 cycles on the 100 millivolt range rising to 10 kc on the 100 volt range. The output is either 10 volts or 1

milliampere for full scale meter deflection. In the NORMAL micro-microammeter position, one side of the output is grounded. For directions pertaining to the use of recorders see Section IV-G.

CURRENT SOURCE: When measuring ohms, the instrument is designed to supply a constant current to any device placed across its input terminals. The magnitude of the current is equal to the reciprocal of the designation on the OHMS segment of the RANGE switch. Therefore, the instrument may be used as a current source for calibration of other instruments if desired.

CONTROLS AND TERMINALS: The input connector is Gremar Type #6804. The mating connector is supplied as well as an accessory binding post which plugs into the center of the connector. A ground binding post is mounted on the panel above the input connector.

Front Panel controls are:

RANGE switch, located in the center of the front panel under the meter. This control selects VOLTS, OHMS, or AMPERES. On the AMPERES position, a shunt resistor whose value is the reciprocal of the designated range may be used to decrease the input resistance as well as to measure current.

MULTIPLIER switch, located in the center directly under the meter, determines the voltage sensitivity of the dc amplifier, and sets the voltage range when the RANGE is set on VOLTS. On OHMS or AMPERES, the setting of this knob multiplied by the OHMS or AMPERES setting gives the full scale meter range.

ZERO control, located to the left of the MULTIPLIER switch under the meter, is used to set the meter to zero.

METER switch, at the right under the meter, turns the instrument on, determines meter polarity, and permits zero center operation.

OPERATE switch, located at the bottom right, selects normal operation or one of the two check positions.

In the ZERO CHECK position, the input terminals are shorted through 1 megohm, while the amplifier input is shorted. In the RES CHECK position, the internal high megohm resistance standards are measured.

Rear Panel controls are:

FUSE, at the upper right. With 117 volt AC power use 1.5 ampere fuse; with 230 volt power use 1 amp fuse.

POWER INPUT. Unless indicated, instrument is wired for 117 volts 50-60 cps. For 230 volt operation, consult the circuit schematic diagram.

RECORDER CAL. Used to calibrate 1 ma. recorders, so their scale corresponds with the panel meter.

1 MA - 10V. In the 1 MA position, OUTPUT will drive 1 milliampere recorders. In the 10V position, the output is 10 volts for full scale panel meter deflection.

OUTPUT connector for external recorders.

NORMAL-FAST. This control is locked in NORMAL position. In FAST position, current measurements are made with feedback around the shunt resistor. On OHMS, the FAST position is used when the INPUT GUARD terminal is used.

INPUT GUARD. With the NORMAL-FAST switch on FAST, the low impedance end of the test sample is returned to this terminal when it is desired to measure the resistance of a guarded sample.

COARSE ZERO. If the amplifier is quite badly unbalanced, the COARSE ZERO switch is used to bring the front panel ZERO control in range.