

### VOLTMETER

Ranges:  $\pm 3 \mu\text{V}$  to  $\pm 1000$  volts dc end scale in 18 zero center ranges.

Accuracy:  $\pm (2\%$  of end scale  $+ 0.1 \mu\text{V})$ .

Limits of Zero Control:  $\pm 15 \mu\text{V}$ .

Input Resistance:

3  $\mu\text{V}$  to 3 mV ranges: 100 k $\Omega$  (infinite when nulled).

10 mV to 30 mV ranges: 1 M $\Omega$  (infinite when nulled).

100 mV to 300 mV ranges: 10 M $\Omega$  (infinite when nulled).

1 volt to 1000 volt ranges: 100 M $\Omega$

Internal Bucking Voltage:  $\pm 120\%$  end scale, 3  $\mu\text{V}$  through 300 mV range.

Response Time: 95% of final reading within 3 sec on the 3  $\mu\text{V}$  range. 95% of final reading within 1 sec on the 10  $\mu\text{V}$  to 1000 V ranges.

Superimposed AC Rejection: Ac voltages 60 Hz and above: 80 db greater than end scale--affects reading less than 2%. Peak ac voltage not to exceed max overload voltage.

Drift:  $< 0.5 \mu\text{V/day}$  after 30 minutes warmup. T.C.  $< 0.05 \mu\text{V}/^\circ\text{C}$  from  $0^\circ$  to  $+50^\circ\text{C}$ .

Noise\*:  $< 0.3 \mu\text{V}$  peak-to-peak.

\* Peak-to-peak noise is less than  $0.3 \mu\text{V}$  95% of the time since the noise amplitude approximates a Gaussian distribution where the standard deviation (which is also the rms value) =  $0.075 \mu\text{V}$ .

### AMPLIFIER

Gain: 110 db maximum at recorder output terminals. Gain depends on range.

Output: 0 to  $\pm 1$  volt at 1 mA max for end scale reading. Output level is adjustable for convenience when used with recorders.

Output Impedance: Depends on setting of output level control.  $< 35$  ohms when output level is set to maximum.

Noise: 0.01 Hz to 5 Hz: Same as voltmeter (referred to input).  $> 5$  Hz: rms noise  $< 10$  mV (referred to output).

### DC AMMETER

Current Ranges:  $\pm 30$  pA,  $\pm 100$  pA,  $\pm 300$  pA,  $\pm 1$  nA,  $\pm 3$  nA,  $\pm 10$  nA and  $\pm 30$  nA.

Accuracy:  $\pm (3\%$  of end scale  $+ 1$  pA).

### GENERAL

Overload Voltages: 50 Vdc max, 3  $\mu\text{V}$  to 3 mV ranges; 500 Vdc max, 10 mV to 300 mV ranges; 1200 Vdc max on 1 volt range and above.

Overload Recovery Time: Meter indicates within 3 seconds for a  $10^5$  overload on the 3  $\mu\text{V}$  range; indicates within 3 sec for a  $10^6$  overload on all other ranges.

Input Terminals: Positive and negative terminals are solid copper, gold flashed.

Input Isolation:  $> 10^{10}$  ohms shunted by 250 pF. May be operated up to 500 Vdc or 350 Vac (rms) above ground.

Operating Temperature:  $0^\circ$  to  $+50^\circ\text{C}$ .

Storage Temperature:  $-40^\circ\text{C}$  to  $+60^\circ\text{C}$ .

Power Source: 4 internal rechargeable batteries (furnished). Thirty hour operation per recharge. The 419A may be operated during recharge from ac line. 115 or 230 V  $\pm 10\%$ , 48 to 440 Hz, approximately 3 watts.

Dimensions: Standard -hp- 1/2 module; 6" high, 7-3/4" wide, 8" deep (152 x 197 x 203 mm).