



213

1 MHz at 20 mV/div

0.4 μ s/div Sweep Rate
with X10
Sweep Magnifier

DMM and Miniscope in
One Unit

Rugged Construction

Internal Battery

Compact, Weighs 1.7 kg (3.7 lb)

True RMS Voltage and Current
Measurements

ENVIRONMENTAL CAPABILITIES

Ambient Temperature — Operating: (battery only), -15°C to +55°C. Charging or operating from ac line: 0°C to +40°C. Nonoperating: -40°C to +60°C.

Altitude — Operating: To 25,000 ft, decrease max temperature by 1°C/1,000 ft above 15,000 ft. Nonoperating: 40,000 ft.

Vibration — Operating and nonoperating: 15 minutes along each of the 3 major axes, 0.06 cm (0.025 in) p-p displacement (4 g's at 55 Hz) to 55 to 10 Hz in 1 minute cycles. Held for 3 minutes at 55 Hz.

Humidity — +40°C or less, 80% or less relative humidity.

Shock — Operating and nonoperating: 150 g's, 1/2 sine, 2 ms duration in each direction along each major axis. Total of 12 shocks.

OTHER CHARACTERISTICS

Power Sources — Internal NiCd batteries provide 3 to 5 hours operation at max trace intensity for a charging and operating temperature between +20°C and +30°C. Internal charger charges batteries when connected to an ac line with instrument turned on or off. Dc operation is automatically interrupted when battery voltage drops below 2 V to protect batteries against deep discharge. Full recharge requires \approx 16 hours. External power source, 90 to 136 V ac (48 to 62 Hz). Option 01 allows operation from an external 180 to 250 V ac (48 to 62 Hz) or dc supply. Power consumption, 8 watts or less.

Insulation Voltage — 500 V RMS or 700 V (dc + peak ac) when operated from internal batteries with line cord and plug stored. When operated from ac, line voltage plus floating voltage not to exceed 250 V RMS or 1.4 X line - (dc + peak ac) not to exceed 350 V.

PHYSICAL CHARACTERISTICS

Dimensions	cm	in
Height	7.6	3.0
Width	13.2	5.2
Depth	22.6	8.9
Weights (approx)	kg	lb
Net (without accessories)	1.7	3.7
Shipping	3.9	8.6

DMM

Provides true RMS readings of voltage and current.

DC AND AC VOLTAGE

Range — 0.1 V to 1000 V full scale in 5 ranges.

Resolution — 100 μ V at 0.1 V full scale.

Accuracy in Dc Mode — For -25°C \pm 5°C.

Range (Full Scale) —

0.1 V	\pm 0.1% of reading \pm 3 counts. Temp coef is (\pm 0.015% of reading + 0.04% of full scale) per °C.
1 V	\pm 0.1% of reading \pm 1 count. Temp coef is (\pm 0.01% of reading + 0.01% of full scale) per °C.
10 V and 100 V	\pm 0.15% of reading \pm 1 count. Temp coef is (\pm 0.015% of reading + 0.01% of full scale) per °C.
1000 V	\pm 0.2% of reading \pm 1 count. Temp coef is (\pm 0.02% of reading + 0.01% of full scale) per °C.

Accuracy in RMS Mode — For 25°C \pm 5°. Temperature coefficient (\pm 0.05% of reading + 0.1% of full scale) per °C.

Range	Within % of reading shown \pm 5 counts*		
	Dc	40 Hz to 4 kHz	4 kHz to 40 kHz
0.1 V	2.5%	1.5%	3.5%
1 V, 10 V, and 100 V	2%	1%	1%
1000 V	2%	1%	2%

*Accuracy limit increases linearly for crest factor $>$ 2 up to twice indicated limit for crest factor of 5.

Input Resistance — 10 M Ω .

Input Capacitance — 150 pF on 0.1 V to 10 V ranges, 100 pF on 100 V and 1000 V ranges.

Settling Time — Dc: 1.5 sec to 0.1% of reading. RMS: 2 s to 1% of reading.

Max Input Voltage —

Dc Coupled	
0.1 V to 10 V	100 V to 1000 V
500 V (dc + peak ac)	800 V (dc + peak ac)
Ac Coupled	
0.1 V to 10 V	
800 V (dc + peak ac)	

DC AND AC CURRENT

Range — 0.1 mA to 1000 mA full scale in 5 ranges.

Resolution — 100 nA at 0.1 mA full scale.

Accuracy in Dc Mode — For -25°C \pm 5°C.

Temperature Coef — (\pm 0.02% of reading \pm 0.04% of full scale) per °C. 0.1 mA \pm 0.5% \pm 3 counts. 1 mA to 1000 mA \pm 0.25% \pm 3 counts.

Accuracy in Ac Mode —

Range	Within % of reading shown \pm 5 counts*		
	Dc	40 Hz to 4 kHz	4 kHz to 40 kHz
0.1 mA	2.5%	1.5%	4.5%
1 mA to 1000 mA	2.5%	1.5%	3.5%

*Accuracy limit increases linearly for crest factor $>$ 2 up to twice the indicated limit for crest factor of 5.

Settling Time — 1.5 s to 0.1% of reading

Max Input Current — 2 A RMS or 3 A peak on any scale (fuse and diode protection).

RESISTANCE

Ranges — 1 k Ω to 10 M Ω full scale in 5 ranges.

Resolution — 1 Ω on 1 k Ω scale.

Accuracy — For 25°C \pm 5°C.

Range	% of Reading
1 k Ω	0.5% \pm 3 counts
10 k Ω to 1 M Ω	0.5% \pm 1 count
10 M Ω	1% \pm 1 count

Settling Time — 2 seconds \pm 2 counts.

READOUT

Number of Digits — 3 1/2 digits plus decimal point and sign.

Display Size — 1 cm high by 4 cm wide (5 characters).

Overrange Capability — At least 200% of full scale.

Overrange Indication — Readout displays scrambled characters.

INCLUDED ACCESSORIES

Viewing hood (016-0199-01), carrying case (016-0512-00), 2 test leads (alligator clip to banana jack) (red 012-0015-00) (black 012-0014-00), neck strap (346-0104-00), 2 power line fuses (159-0080-00), power line plug adapter (option 01 only) (161-0077-01), identification tag (334-2614-00), identification tag (000-7983-00).

ORDERING INFORMATION

213 Miniscope/DMM including batteries and probe \$2100

POWER OPTION

Option 01, 180 to 250 V ac (48 to 62 Hz) or dc

(includes batteries and probe) No Charge

OPTIONAL ACCESSORIES

Alligator Clip Kit — A pair of alligator clips that allow connecting the probe and ground lead to large (up to 3/8 in) conductor. Includes: red clip (015-0229-00), yellow clip (015-0230-00), 6-32 to probe adapter (103-0051-01).

Order 015-0231-00 \$16

Probe tip to BNC Panel Connector Adapter

Order 013-0084-01 \$8.00

Probe tip to BNC Cable Adapter,

Order 103-0096-00 \$10.50

Power Cable Adapter Assembly — A short length of two-wire power cord. One end has a female NEC socket fitting the 200 Series power cords; the other end is left open so that the wires can be attached to a non-NEC male power plug. Plugs not supplied.

Order 181-0077-01 \$7.00

The 213 combines a precision 3 1/2 digit digital multimeter and a 1 MHz oscilloscope in one instrument. It is a compact (3 x 5.2 x 8.9 inches) and lightweight (only 3.7 pounds) package that will fit easily into your briefcase or tool kit.

In operation, the light-weight 213 can be hand held, rested on the equipment being tested or carried conveniently on a neck-strap. Operating controls are designed for speedy measurements and easy understanding.

Rugged construction enables the 213 to withstand hostile industrial or transportation environments.

The 213, combining both oscilloscope and DMM functions, fits many on-site service applications. As an example, the 213 is used extensively for preventive maintenance on industrial control systems.

VERTICAL DEFLECTION (VOLTAGE)

Bandwidth — Dc to 1 MHz (-3 dB point) for 20 mV/div to 100 V/div deflection factors. Dc to 400 kHz (-3 dB point) for 5 mV/div and 10 mV/div. Lower -3 dB point for ac coupling is \approx 1 Hz.

Deflection Factor — 5 mV/div to 100 V/div (1-2-5 sequence), accurate \pm 3%. Uncalibrated; continuously variable between steps to at least 250 V/div.

Input R and C — 10 M Ω paralleled by 150 pF for 5 mV/div through 1 V/div and 100 pF for 2 V/div through 100 V/div.

Max Input Voltage —

Input Condition	Max Input Voltage
Dc coupled, 5 mV/div to 1 V/div	500 V (dc + peak ac) at 1 MHz or less
Ac coupled, 5 mV/div to 1 V/div	800 V (dc + peak ac) 500 V peak ac component
Ac, Dc coupled, 2 V/div to 100 V/div	800 V (dc + peak ac) at 1 MHz or less

VERTICAL DEFLECTION (CURRENT)

Bandwidth — Dc to at least 400 kHz (-3 dB point) for 20 μ A/div through 100 mA/div deflection factors. Dc to at least 200 kHz (-3 dB point) for 5 μ A/div and 10 mA/div.

Deflection Factor — 5 μ A/div to 100 mA/div (1-2-5 sequence), accurate \pm 3%. Uncalibrated; continuously variable between steps to at least 250 mA/div.

Max Input Current — 2 A RMS or 3 A peak for any range (fuse and diode protection).

HORIZONTAL DEFLECTION

Time Base — 2 μ s/div to 500 ms/div (1-2-5 sequence), accurate \pm 5%.

Variable Magnifier — Increases all sweep speeds to at least X5 with a max sweep speed of 0.4 μ s/div.

TRIGGER

Modes — Normal (sweep runs when triggered). Automatic (sweep free-runs in absence of trigger signal or for frequencies below 7 Hz).

Trigger Sensitivity and Coupling — Ac Internal, (auto and normal, 1 MHz) 0.5 div. Dc External, 1 MHz, 1 V.

DISPLAY

CRT — 6 x 10 div (0.52 cm/div) display. P43 Phosphor is standard.

Graticule — Internal, black line, non-illuminated.