



- High Accuracy
- 30 Hz to 54 kHz Frequency Range
- 20 mV to 300 V RMS Voltage Range
- Autoranging
- IEEE-488 Interface
- Self Calibrating

GENERAL

The Model 2251 is Similar to the Popular Model 2250. The 2251 is a Multifunction Voltmeter that Combines a Total Voltmeter, a Phase Angle Voltmeter, and a Waveform Signal Analyzer in a Single Microprocessor-Based Instrument. As a Total Voltmeter the 2251 Can be Used for the RMS Measurement of a Total AC Signal Including Harmonics. In Addition, the 2251 Can Make Various Voltage Gain and Attenuation Measurements Directly in Decibels. As a Phase Angle Voltmeter the 2251 is Capable of Making the Following Multi-Frequency, Phase-Sensitive Measurements on an AC Signal:

Phase Angle: Is the amount of phase shift in degrees between the signal and reference voltage

Fundamental: Is the RMS measurement of a fundamental signal voltage without noise and harmonics

In-Phase: Is the RMS measurement of the vector component of a signal voltage that is in phase with a reference voltage

Quadrature: Is the RMS measurement of the quadrature vector component of a signal voltage that is 90° out of phase with a reference voltage

Signal to Reference Ratio: Is used with total, fundamental, in phase and quadrature modes to display a signal to reference ratio

As an Analyzer the 2251 Uses a Combination of Waveform Sampling and Signal Processing Techniques to Determine the Magnitudes and Phases of a Signal Waveform Under Investigation. These Adjustments Facilitate Signal Analysis. The 2251 Has a Dual-Channel Measurement System which Uses Identical, (though isolation) Signal And Reference Circuits. The Isolation Feature Enables Input Voltages to Float with Respect to Circuit Ground.

TYPICAL APPLICATIONS

- ATE
- Transformer Ratio & Phase Tests
- Amplifier Gain & Phase
- Phase Sensitive Null Detection
- Network Transfer Function Analysis
- Input – Output Impedance Testing
- Wide Band, High Sensitivity Voltage Measurements
- Attenuator Linearity Testing
- Harmonic Analysis
- Accelerometer Testing
- Phase Angle Measurements
- Synchro/Resolver Transducer Testing
- LVDT/RVDT Testing
- Filter Testing – Insertion Loss, Phase Shift measurement of Power Factor & Complex Impedance Phasing of Servo Motors & Servo's

SPECIFICATIONS

Resolution	Voltage Modes 4-1/2 digits Phase Angle 0.01° Frequency Display 3 digits
Signal Scale Range: Voltage Modes	20mV - 300V* in 6 ranges or autoranging <i>* 300V range is actually a 2000V range with maximum signal limitations of 300V. Voltages in excess of 300V should not be applied</i> 0.00° - 360.00° or ±180.00°
Phase Angle Mode	
Reference Voltage Range	2mV - 300Vrms*, autoranging (no adjustment necessary); 400Vdc, total of 700 V peak maximum <i>* 300V range is actually a 2000V range with maximum signal limitations of 300V. Voltages in excess of 300V should not be applied</i>
Frequency Range	30 Hz - 54 kHz in Phase Sensitive and Total modes
Signal Autoranging	Up-ranges at approximately 108% FS; down ranges at approximately 9.9% FS. Note: the above assumes sine wave input. Levels will vary with crest factor on non-sine waves.
Ratio Autoranging	Up-ranges at 160% of range; down ranges at 10% of range.
Displays	<i>Primary:</i> 4 1/2 digits, 0.005% full range resolution.
Voltage	
Phase	0.0° to 359.99° phase lead 0.01° resolution or 0.0° ±180° 0.01° resolution
Displays cont'd	<i>Secondary:</i> Lock Frequency - (in kHz) 3-digit, 0.28" high, 7-segment red LED Null Meter - Zero center scale, moving LED, log scaled, 5/8" high 6" long. Covers dynamic range of scale selected with center having 1-LSB sensitivity.
Input Impedance	<i>Signal & Reference</i> 2 MΩ shunted by 180pF (typical)
Nulling Sensitivity	1μV
Total Mode Noise (20 mv Range)	35μV maximum
0 Volt Input Accuracy	Equal to full scale accuracy spec
Common Mode	30 Hz - 999.9 Hz 116 db min.
Rejection	1 kHz - 5 kHz 100 db min.
(Zero source impedance)	>5 kHz - 32 kHz 90 db min.
	>32 kHz - 54 kHz 81 db min.
Signal & Reference Channel Isolation	1000 MΩ shunted by 2pF Hi with respect to case (guard driven) 1000 MΩ shunted by 10 pF Lo with respect to case (guard driven) 1000 MΩ shunted by 2000 pF between guard and case.

Specifications Continued...

Harmonic Rejection 60 db all even and odd order Harmonics
Data Refresh 25 Hz and above 40 ms nominal 1/f ms max below 25 Hz
Remote Control IEEE-488 1978 standard GPIB
Recorder Output Separate In-Phase and Quad Outputs Provided

Range Full Scale Equals ± 2.0 VDC (± 8.75 Vdc Selectable)
 Accuracy $\pm 0.15\%$
 Resolution 1 mV nominal

Power Requirements 115/230 Vrms $\pm 15\%$, 47 to 67 Hz, 70 VA
Operating Temperature 10°C to 40°C ambient temperature
Operating Position Horizontal
Maximum Tilt Angle $\pm 30^\circ$
Warm-up Time 30 minutes to achieve rated accuracy

Dimensions 5¼" H x 16¾" W x 19"D
 (133.35mm x 425.45mm x 482.6mm)

Weight 35 lb (15.75 kg)

Fuse 2A for 115V Operation
 1A for 230V Operation (included in accessory kit)

Connectors **Type**

Front SIG input 5 way binding post
 Front REF input 5 way binding post
 Rear SIG input MS3102A14S-2P
 Rear REF input MS3102A14S-2P
 Trigger input BNC female
 Recorder output MS3102A14S-2S
 Remote Interface IEEE-488 standard connector
 Power input IEC standard 115/230 V connector

Mating Connectors Signal Input - MS3106A-14S-2S
 (Connector kit: Reference Output- MS3106A-14S-2S
 NAI part # 789005) Recorder Output - MS3106A-14S-2P
 Trigger- BNC (Male)

Accuracy

TOTAL (sum)*, FUND, PHASE SENSITIVE MODES**

FREQUENCY	---VOLTAGE		-----		PHASE
	200V/2000V* Range (*300V RMS MAX)	20mV Range	ALL OTHER RANGES		
>30 Hz to 1.5kHz	0.07% Full Scale +0.20% Reading	0.15% Full Scale +0.07% Reading	0.07% Full Scale Reading	+0.07%	±0.1°
>1.5 kHz to 5 kHz	0.08% Full Scale +0.15% Reading	0.20% Full Scale +0.08% Reading	0.08% Full Scale Reading	+0.08%	±0.1°
>5 kHz to 20 kHz	0.08% Full Scale +0.30% Reading	0.25% Full Scale +0.20% Reading	0.08% Full Scale Reading	+0.20%	±f (in kHz)° /50
>20 kHz to 32 kHz	0.24% Full Scale +0.50% Reading	0.30% Full Scale +0.30% Reading	0.24% Full Scale Reading	+0.30%	±f (in kHz)° /50
>32 kHz to 54 kHz	0.24% Full Scale +1.0% Reading	0.30% Full Scale +1.0% Reading	0.50% Full Scale Reading	+1.0%	±f (in kHz)° /50

TOTAL (Avg) #	0 to 1/2 SCALE	1/2 SCALE to F.S.
>30 Hz to 10kHz Hz	0.25% Full Scale	0.5% reading.
>10 kHz to 30 kHz	0.5% Full Scale	2.0% reading.

* TOTAL (sum) = fundamental + harmonics

TOTAL (Avg) = Average RMS of fundamental + harmonics + noise

** Not including phase errors