

New product applications

Digital phase-angle voltmeter boasts accuracy greater than comparable analog units

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The digital techniques used in the Model 225 phase-angle voltmeter provide readings accurate to 0.1 percent of the voltage and 0.25° of the phase angle. Comparable analog instruments provide 2 percent voltage accuracy and 1° phase-angle accuracy.

Said by its manufacturer to be the industry's first all-digital unit, the instrument features a $4\frac{1}{2}$ -digit display, remote BCD and analog outputs, and facilities for local or remote programming. The unit is especially suitable for digitally controlled checkout systems, as well as a high-accuracy and versatile bench instrument.

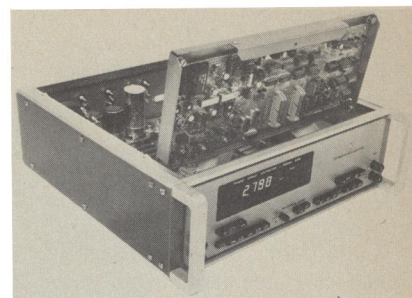
Phase-angle voltmeters are used for resolving an ac signal into its basic components: total voltage (like an ordinary ac voltmeter), fundamental voltage (harmonics and noise removed), in-phase voltage, quadrature voltage, and phase angle. The last three signal components are measured with respect to an arbitrary, but coherent, reference voltage. These instruments are used in the design and testing of components and instruments that are powered by, or process, ac signals. Some examples are calibration of filters, precision transformers, ac amplifiers, servos, resolver/synchro control systems, and carrier-operated sensing transducers and systems. In the avionics field, phase-angle voltmeters are widely used to calibrate flight control, navigation, compass, and fire-control systems.

Model 225 measures total voltage over a range of 10 Hz to 100 kHz, and provides phase-sensitive voltage and phase-angle measurements at any two (optionally four) spot frequencies within the 30-Hz to 30-kHz band. When operating in the phase-sensitive mode, the unit provides 0.1 percent voltage measuring accuracy and 0.25° phase-angle accuracy at mid-band frequencies (around 400 Hz), and accommodates spot-frequency variations to ± 5 percent. Phase angle is measured by internal computation circuits

that determine angle θ from analog voltage values for $V \sin \theta$ and $V \cos \theta$.

The instrument handles a maximum input voltage of 500 volts rms, with intermediate ranges down to 10 mV full scale. An optionally available autorange circuit can be selected by front-panel push-buttons, or remotely under digital control. The autorange circuit provides correct decimal point positioning. Another optionally available feature is the front-panel reference control, which introduces a variable 0° through $\pm 45^\circ$ offset into the reference channel, to compensate external phase shifts. Further options include fixed-frequency (transformer) and wide-band (solid state) input signal isolating circuits, which reduce common mode and ground loop errors.

Analog phase-angle voltmeters measure phase angle by introducing a variable phase shift into the reference channel and adjusting this phase shift to maximize the signal component $V \cos \theta$. The amount of phase shift introduced then defines phase angle. However, the digital instrument eliminates the adjustable phase shifter, with its linearity errors and



[1] The instrument handles a maximum input voltage of 500 volts rms.

temperature sensitivity. Instead, phase angle is computed from separate measurements of $V \cos \theta$ and $V \sin \theta$.

Model 225 lists singly from \$3450, depending upon optional extras. A lower-priced version, Model 220, listing singly from \$2950, does not provide autorange, digital output, and phase-angle measurements, but is designed primarily as a low-cost single-frequency instrument for automatic test equipment applications.

Complete information is available from North Atlantic Industries, Inc., Terminal Drive, Plainview, N.Y. 11803.

Circle No. 31 on Reader Service Card

[2] Accuracies of 0.1 percent of voltage and 0.25° of phase angle are obtainable.

