

# 1933 Precision Sound-Level Meter and Analyzer

The 1933 reflects 50 years of GR expertise and leadership in acoustic measurements . . .  
... it has no equal.

- three instruments in one
  - precision sound-level meter
  - precision impulse sound-level meter
  - octave-band analyzer
- compact, lightweight, and fully portable
- virtually mistake-proof operation with:
  - OPTI-RANGE
  - easy-to-read meter display
  - extendible microphone mast
- can be used with low-cost dc recorders
- compatible with companion cassette data recorder

**A precision sound laboratory** The 1933 is a precision measuring instrument that conforms to U. S. and international standards for a precision sound-level meter, octave-band analyzer, and impulse sound-level meter. An impact (true peak) measuring capability is also provided. The 1933 measures true rms values (there are no approximations) and automatically warns of invalid readings due to overloads. The complete instrument is in a package one-half the size and weight of conventional analyzers.

**An easy-to-use instrument** Set the upper knob to Weighting and the 1933 becomes a sound-level meter with a pushbutton choice of A, B, or C weighting or flat response from 5 Hz to 100 kHz. Fast and slow meter speeds are also pushbutton selected. Another button allows impulse testing, according to the proposed amendment to IEC 179, or impact (peak sound-pressure level) testing often used for the measurement of industrial impact noise.

Conversion to an octave-band analyzer is equally simple; turn the knob to the desired octave band — there are 10 to choose from, with center frequencies from 31.5 Hz to 16 kHz.

**Virtually mistake-proof measurement** A single control is sufficient to set the meter range, even when the instrument is used as an octave-band analyzer. In other analyzers, two are required: An input range control to set the "all-pass" level and an analyzing range control to provide an on-scale meter indication after the desired octave filter has been selected. (Both are necessary to obtain the maximum analyzing range and maximum dynamic range.) But in the 1933 a unique *automatic*

attenuator system is used (OPTI-RANGE). With this feature, you need only set a single range control for an on-scale indication. A second control is provided for situations where the automatic system may not be suitable, as with some measurements of transient signals.

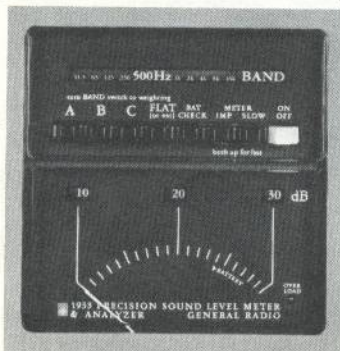
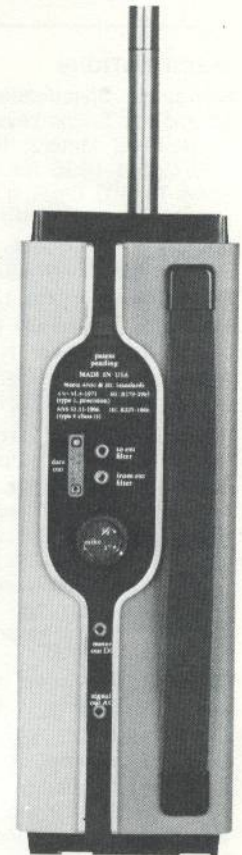
The unusual meter scale also enhances the ease of operation. The meter spans a full 20-dB range, is graduated *linearly* over the entire range, and displays the attenuator setting on the meter face. These features reduce the number of range changes necessary and aid in rapid, error-free interpretation of the readings.

**An expandable sound laboratory** Often it is desirable to record field measurements for further analysis later in the laboratory. With the 1933 and its companion recorder, the 1935, it is easy to make accurate recordings of such measurements. In addition to an a-signal output to drive one channel of the recorder, the 1933 also provides a level-range-code signal that is stored on a second channel of the recorder. On playback, the level-range setting used for the sound-level meter is indicated by a digital display on the panel of the tape recorder. Thus, the tape stores both data and absolute level information.

A dc output, proportional to the meter deflection (linear in dB), is provided to drive a low-cost dc recorder for hard-copy records of the level vs time. This output has a dynamic range of 40 dB plus an additional 20-dB crest-factor allowance.

**Other features** The microphones fit atop a telescoping 12-inch extension to reduce the effects of the instrument and operator on the sound field. There is rarely a need for extension cables and tripod. If these are necessary, however, a 60-foot cable and tripod are available. A 10-foot cable is supplied as standard equipment. Measurements are unaffected by the cables because the preamplifier in the 1933 is detachable and connects to the cable at the microphone end, to prevent signal loss.

A complete line of electret-condenser and ceramic microphones can be used with the 1933. Most users will want at least two: The one-half-inch random-incidence microphone, supplied, for smooth high-frequency response and nearly ideal directional characteristics, and the one-inch random-incidence microphone for measurements of very low sound levels. To simplify changing from one microphone to the other, two sensi-



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tivity presets are provided in the 1933. You can use two microphones alternately, in a series of measurements, without recalibration; merely turn the sensitivity switch to the position corresponding to the microphone being used.

**For field or lab use** The 1933 operates for up to 20 hours on self-contained batteries. A companion instrument, the 1940 Power Supply and Charger, allows the analyzer to be operated from the ac line and provides rechargeable batteries and a charging circuit.

**Several versions to choose from** Four versions of the basic instrument are offered, the difference among them being the number and types of microphones supplied. Versions with flat perpendicular-incidence response microphones are offered for the convenience of customers in those countries (particularly in Europe) where it has become customary to measure with this type of microphone. It should be noted that all versions offered comply with IEC 179.

## SPECIFICATIONS

**Standards:** Specifications meet ANSI S1.4-1971 for Type 1 (precision) Sound-Level Meters; IEC 179-1965 for Precision Sound-Level Meters; IEC 123-1961 for Sound-Level Meters; ANSI S1.11-1966 for Octave, Half-Octave, and Third-Octave Band Type 0 Class II Filter Sets; IEC 225-1966 for Octave, Half-Octave, and Third-Octave Band Filters for the Analysis of Sound and Vibrations; and Proposed IEC 179 amendment for impulse measurement.

**Sound Level:** 10 to 130 dB re 20  $\mu\text{N}/\text{m}^2$  with 1-in. microphone, 30 to 140 dB with  $\frac{1}{2}$ -in. microphone, direct reading.

**Frequency:** 5 Hz to 100 kHz, essentially flat response. **ANALYSIS:** 10 octave bands with center frequencies from 31.5 Hz to 16 kHz. **WEIGHTING:** A, B, and C.

**Display:** **METER:** 20-dB scale linearly marked in dB and lower, center, and upper values automatically indicated on scale. **RESPONSE:** Fast, slow, absolute peak, and impulse (per IEC 179 amendment), pushbutton selected. Precise rms detection for signals with  $\leq 20$ -dB crest factor at full scale, crest-factor capacity greater below full scale. **OVERLOAD:** Signal peaks monitored at 2 critical points to provide positive panel-lamp warning. **RANGING:** Automatic system (OPTIRANGE) maximizes analyzing range and signal-to-noise ratio for each level range-control setting; manual control provides override. Increment between ranges, 10 dB.

**Filters:** **WEIGHTING:** A, B, C, and flat; pushbutton selected. **OCTAVE BANDS:** 10, manually selected, with  $3.5 \pm 1$ -dB attenuation at nominal cutoff,  $> 18$ -dB attenuation at  $\frac{1}{2}$  and 2X center frequency,  $> 70$ -dB ultimate attenuation. **EXTERNAL FILTERS** can be substituted for internal weighting networks and octave-band filters; connect to 2 miniature phone jacks.

**Input:**  $\frac{1}{2}$ -in. or 1-in. electret-condenser microphone with flat random-incidence response; mounted with detachable preamplifier on 12-in. extendible mast, or on 10-ft. extension cable supplied, or on 60-ft. cable available. Input can also be from tape recorder. **INPUT IMPEDANCE:**  $1 \text{ G}\Omega \ll 3 \text{ pF}$ .

**Output:** **SIGNAL OUTPUT:** 0.5 V rms behind 600  $\Omega$  corresponding to full-scale meter deflection, any load permissible. **RANGE CODE:** Contact closures provide sound-level-meter range information to 1935 Cassette Data Recorder. **DETECTED OUTPUT:** 4.5 V dc behind 4.5 k $\Omega$  corresponding to full-scale meter deflection, output is linear in dB at 0.1 V/dB over 60-dB range (40-dB normal range plus 20-dB crest-factor allowance), any load permissible.

**Calibration:** **FACTORY:** Fully tested and calibrated to all specifications; acoustical response and sensitivity are measured in a free field by comparison with a Western Electric 640AA laboratory standard microphone whose calibration is traceable to the U.S. National Bureau of Standards. **ON-SITE:** Built-in calibrator provides quick test of electrical circuits;



GR 1562 Sound-Level Calibrator is available for simple test of over-all calibration, including microphones.

**Environment:** **TEMPERATURE:**  $-10$  to  $+50^\circ\text{C}$  operating,  $-40$  to  $+60^\circ\text{C}$  storage with batteries removed. **HUMIDITY:** 0 to 90% RH. **VIBRATION AND MICROPHONICS:** Conform to applicable ANSI and IEC standards.

**Supplied:** Microphone attenuator, tool kit, 10-ft microphone extension cable, batteries.

**Available:** 1940 Power Supply and Charger, electret-condenser microphones, ceramic microphone cartridge and adaptor, earphone, tripod, cables, and windscreens.

**Power:** 4 alkaline energizer C cells supplied provide  $\approx 20$ -h operation; 1940 Power Supply and Charger allows line operation of 1933 and includes rechargeable batteries and charging source. Battery check provided on 1933.

**Mechanical:** Small, rugged, hand-held case with standard 0.25-20-in. threaded hole for tripod mounting. **DIMENSIONS** (wxhxd): 6.25x9x3 in. (159x229x76 mm). **WEIGHT:** 5.5 lb (2.5 kg) net, 10 lb (4.6 kg) shipping.

Description	Catalog Number
<b>1933 Precision Sound-Level Meter and Analyzer</b> (Conforms to IEC 179 and ANSI S1.4-1971, Type 1.) With $\frac{1}{2}$ -in. and 1-in. flat random-incidence response Electret-Condenser Microphones	1933-9700
With $\frac{1}{2}$ -in. flat random-incidence response Electret-Condenser Microphone only	1933-9701
<b>1933 Precision Sound-Level Meter and Analyzer</b> (Conforms to IEC 179; recommended for Europe.) With $\frac{1}{2}$ -in. and 1-in. flat perpendicular-incidence response Electret-Condenser Microphones	1933-9702
With $\frac{1}{2}$ -in. flat perpendicular-incidence response Electret-Condenser Microphone only	1933-9703
<b>Accessories Available</b>	
Electret-Condenser Microphones	
Flat random-incidence response, 1-in.	1961-9601
Flat perpendicular-incidence response, 1-in.	1961-9602
Flat random-incidence response, $\frac{1}{2}$ -in.	1962-9601
Flat perpendicular-incidence response, $\frac{1}{2}$ -in.	1962-9602
Flat perpendicular-incidence response, $\frac{3}{4}$ -in.	1963-9602
Ceramic Microphone Cartridge and Adaptor, 1-in.	1560-9570
Earphone	1935-9601
Tripod	1560-9590
Cables	
Microphone extension cable, 60 ft.	1933-9601
Miniature phone plug to 1933 microphone mast	1933-9602
Miniature phone plug to double banana plug	1560-9677
Miniature phone plug to standard phone plug	1560-9678
Miniature phone plug to BNC	1560-9679
Windscreens, reduce wind noise, protect	
For 1-in. microphone, set of 4	1560-9521
For $\frac{1}{2}$ -in. microphone, set of 4	1560-9522
1562-A Sound-Level Calibrator	1562-9701
Battery, spare for 1933, uses 4	8410-1500
Cassette Data Recorder	1935-9700
Power Supply and Charger	1940-9701



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