MODEL 211
SOUND LEVEL METER
Measurement of "A" weighted sound levels from 60 to 120 decibels

The Quest model 211 Sound Level Meter is a general purpose noise measuring instrument for use in virtually any environment: industry, construction, mining, transportation, airports — anywhere there is noise. A primary use is to accurately measure compliance with the federal Occupational Safety and Health Act (OSHA).

SPECIFICATIONS

NOISE LEVEL MEASUREMENT RANGE:
60 to 120 dBA in five pushbutton ranges.

RESPONSE:
Overall response is "A" scale weighted, slow response, and meets ANSI Standard S1.4-1971 for type 2 instrumentation (type S2A).

FREQUENCY RANGE:
20 to 10,000 Hz

READOUT:
(1) Taut-band type meter with direct dBA readout.
(2) Electrical output also available with approximately 1.8 Vrms at full scale behind 1K ohms.
Connector -- Switchcraft, type 780 Tini-plug or equivalent.

MICROPHONE:
High quality SPL ceramic, omnidirectional.

OPERATING TEMPERATURE:
-10° to +50° C.

BATTERIES:
Two NEDA 1604 standard type transistor batteries, Burgess 2U6, Eveready 216, or equivalent. Battery life approximately 50 hours.

CONSTRUCTION:
Solid state integrated circuitry in rugged aluminum housing.

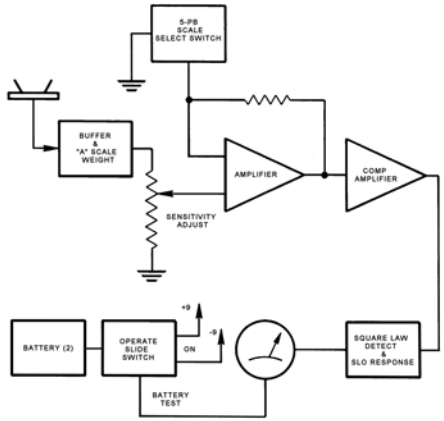
SIZE AND WEIGHT:
Case 2-1/2 x 6 x 1-1/2 inches
Overall 2-3/4 x 7 x 1-7/8 inches
16 oz. including batteries

OPERATION

CONTROLS

ON/OFF SWITCH With this switch in the BATTERY position the condition of the batteries is checked to insure correct operation of the instrument. If the batteries have sufficient capacity for accurate measurement, the meter pointer should deflect to the heavy green line on the scale marked BATTERY CHECK. If the meter deflection is below this area, the batteries must be replaced before making any measurements. With the switch in the ON position, the unit is ready for use. To avoid needless drain on the batteries, set the switch to OFF whenever the instrument is not in use.

RANGE SELECTOR PUSHBUTTONS - These pushbuttons select the correct range according to the existing noise level to be measured. No reading will be obtained unless one of the buttons is depressed. Maximum instrument readability is obtained with the meter pointer deflected to the upper part of the meter scale. Where possible, therefore, select the range to give readings at the upper end of the scale.



211 Sound Level Meter Block Diagram

Photo shows meter reading of almost 106 dBA.

The scale readings are subtracted from or added to the dBA value printed adjacent to the pushbutton, which is depressed. For example, if the pushbutton adjacent to 80 is depressed, a scale reading of 8 indicates a noise level of 88 dBA; a scale reading of -5 indicates a noise level of 75 dBA. In the latter case, easier readability will result if the 70 dBA pushbutton is depressed. In this case the needle will point to +5 dBA again yielding a measurement of 75 dBA.

OPERATING PROCEDURE

To get readings of maximum accuracy, hold the instrument away from the operator at an angle of approximately 70° from the horizontal. Under certain conditions slightly less accurate readings may result from pointing the microphone directly at the noise source.

The instrument is designed to be hand-held. If the unit is placed on any hard surface such as a table-top, check to see that no significant mechanical vibration exists which might yield false meter readings.

Measure noise levels as follows:

1. Select and depress a pushbutton whose range is higher than the expected noise environment.

2. Slide ON-OFF switch to BATTERY position. Meter pointer should be in green BATTERY CHECK area. Replace batteries if pointer is below proper level.

3. Slide switch to ON.

4. Change pushbutton selection as necessary to obtain meter readings at the upper end of the scale without exceeding the meter limit.

5. Read sound level results.

6. Slide switch to OFF when reading is completed.

EXAMPLE OF NOISE EXPOSURE MEASUREMENT

Using the 211 Sound Level Meter to determine OSHA compliance in a constant noise environment is a simple task. Merely read the sound level at each workers station. Record the date, reading and worker-station. From Table 1 determine the permissible time of exposure for the measured noise level.

For a varying noise environment continuous measurements must be taken over the workday, and the following formula must be solved to determine worker exposure:

$$\frac{C_1}{T_1} + \frac{C_2}{T_2} + \cdots \frac{C_n}{T_n} \leq 1 \text{ for total permissible exposure}$$

where C is the length of time at a particular measured noise level T is the time per day permitted at that noise level. The length of time permitted at various noise levels is shown in Table 1.

TABLE 1 OSHA PERMISSIBLE NOISE EXPOSURE

Length of Exposure – T (Hrs/Day)	Equivalent Maximum Noise Level (dBA)
8	90
6	92
4	95
3	97
2	100
1 ½	102
1	105
½	110
¼ or less	115

In order to use the Quest 211 or any other sound level meter in a varying noise environment, many noise measurements should be made at the workers station — enough so that the readings are representative of the workers exposure. All noise levels must be read, and the duration at each level noted. As many as 30 or more

readings may be necessary to account for all the noise variations. However, in the example we assume that only four basic noise levels are present, and that the duration of each is as follows:

Measurement Interval (C)	Average dBA Measurement
1 Hr.	92
1 Hr.	100
4 Hrs.	90
2 Hrs.	87

It is assumed that the noise levels remain relatively constant during the intervals between measurements. Some judgment may be required in making such an assumption.

Substituting these values in the formula gives the following result:

1 Hr @ 92 dBA = 1/6; 1 Hr @ 100 dBA = 1/2; 4 Hrs @ 90 dBA = 4/8; 2 Hrs @ 87 dBA = 0.

Summing all the exposure fractions yields

1/6 + 1/2 + 4/8 + 0 = 1.17

Since 1.0 is the maximum allowable value, the computation indicates that workers in this area were overexposed by 17%.

It is obvious that in a changing noise environment the above procedure can be very complex, time-consuming, and costly. For these conditions it is suggested that the Quest M-6 Sound Hazard Integrator be used rather than a sound level meter. The M-6 automatically accumulates all variations in noise. It produces a continuous readout of the percentage of permissible exposure. No operator or calculations are required.

BATTERY REPLACEMENT

Batteries should be replaced whenever a battery test gives a low indication on the meter. To replace batteries, remove the rear cover plate by unscrewing the retaining screws. The batteries are located directly below the microphone in the upper section of the unit. Carefully remove the used batteries and replace with two 9 volt transistor batteries, Burgess 2U6, or equivalent.

CAUTION

The batteries must be replaced with the ON/OFF switch in the OFF position to avoid damage to the unit.

CALIBRATION

The 211 meter is calibrated both electrically and acoustically at the factory. With proper care it should retain its accuracy for an extended period. It is recommended however, that the meter calibration be checked at least every six months. This may be done either by using the Quest model CA-10 Sound Level Calibrator or a similar type device with a preferred calibration frequency of 1000 Hz.

If the Quest CA-10 Calibrator is used, set the Calibrator selector to 100 dB. Depress the 90 dB pushbutton on the 211 Sound Level Meter. Carefully insert the 211 microphone fully into the coupler cavity on the CA-10. With both units ON, the meter should read + 10 dBA (full scale). Adjustment, if necessary, may be made using the small recessed screw located in the base of the 211. Other scales may also EH checked if desired. For best accuracy, however, the meter should be Calibrated at full scale deflection.

NOTE

If another calibrator is used with a frequency other than 1000 Hz, the equivalent "A" scale sound level must be known to set the 211 meter properly.

QUEST WARRANTY POLICY

None.

SERVICE POLICY

This unit is no longer serviceable. It <u>can</u> be calibrated but if service is required the parts are unavailable.

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