The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J1160 | REV. MAR83
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An American National Standard

OPERATOR EAR SOUND LEVEL MEASUREMENT PROCEDURE FOR SNOW VEHICLES

***Foreword*—**This Document has not changed other than to put it into the new SAE Technical Standards Board Format.

***1. Scope*—**This recommended practice establishes the instrumentation, test site and test procedure for determining the operator ear sound level for snowmobiles.

2. References

2.1 Related Publications—The following publications are provided for information purposes only and are not a required part of this document.

2.1.1 SAE PUBLICATION—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J184—Qualifying a Sound Data Acquisition System

2.1.2 ANSI PUBLICATIONS—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ANSI S1.1—1960 (R-1971)—Acoustical Terminology
ANSI S1.2—1962 (R-1971)—Method for the Physical Measurement of Sound
ANSI S1.4—1971—Specification for Sound Level Meters
ANSI S1.13—1971—Methods for the Measurement of Sound Pressure Levels

***3. Instrumentation*—**The following instrumentation shall be used, where applicable, for the measurements required:

3.1 A precision sound level meter which meets the Type 1 requirements of American National Standard Specification for Sound Level Meters (S1.4-1971).

3.1.1 As an alternative to making direct measurements using a sound level meter, a microphone or sound level meter may be used with a magnetic tape recorder and/or a graphic level recorder or other indicating instrument providing the system meets the requirements of SAE J184—Qualifying a Sound Data Acquisition System.

3.1.2 The microphone shall be used with a wind screen that will not affect the microphone response by more than ±1 dB for frequencies of 20–4000 Hz or ±1.5 dB for frequencies of 4000–10 000 Hz at zero wind speed conditions.

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3.2 An acoustic calibrator (accuracy within ±0.5 dB).

3.3 A calibrated engine speed tachometer (accuracy within ±2% at clutch control rpm).

3.4 A calibrated vehicle speed indicating system (accuracy within ±5% at test speeds).

3.5 A thermometer (accuracy within ±1 °C [2 °F]).

3.6 A barometer (accuracy within ±1%).

3.7 A psychrometer or dew point apparatus.

3.8 An anemometer (accuracy within ±10%).

3.9 A windvane or other device for measurement of wind direction.

4. Test Site

4.1 A suitable test site is a level open space free from the effects of large sound reflecting surfaces. Parked vehicles, signboards or other obstacles must not be located within 30.4 m (100 ft) of the vehicle path.

4.2 The vehicle path shall be covered with snow. A maximum of 7.5 cm (3 in) of loose snow is permitted. As an alternative, a surface of turf, primarily grass not exceeding 7.5 cm (3 in) in height, may be used.

4.3 The start point and the end point shall be 45.7 m (150 ft) apart on the vehicle path.

4.4 The ambient sound level at the location specified in paragraph 6.1 (including wind effects) due to sources other than the vehicle being tested shall be at least 10 dB (A) lower than the noise level with the vehicle operating under test conditions.

5. Procedure

5.1 **Vehicle Operation—**Constant speed and acceleration runs as specified below are the basis for determining sound level of the snowmobile.

5.1.1 CONSTANT SPEED—The vehicle shall be operated at constant speeds of 24 ± 3 km/h (15 ± 2 mile/h) and 48 ± 3 km/h (30 ± 2 mile/h). The vehicle shall be accelerated to test speed before the start point is reached and shall be operated in a straight line from the start point to the end point with the throttle held as steady as possible.

5.1.2 ACCELERATION—The vehicle shall be accelerated from a standing start by establishing wide-open throttle at the start point and wide-open throttle shall be maintained until the end point is reached.

5.1.3 The vehicle shall be at a stabilized operating temperature. At wide-open throttle the engine shall operate within ±5% of its clutch control rpm.

6. Measurements

6.1 The microphone shall be located 25 cm (10 in) to the right and left of the vertical centerline of the operator's head (also centerline of the vehicle) and 51 cm (20 in) to the rear of the rear most point of the handle bars and 76 cm (30 in) above the seat.

6.2 The microphone wind screen is necessary when making measurements on an open, fast moving vehicle. To verify that valid data is being obtained, measure the air velocity at the microphone position while operating the vehicle at the selected speed. The air velocity on the microphone can be minimized by running with the wind. Consult data similar to that shown in Figure 1 to determine the wind generated noise for the microphone and wind screen being used. If the wind generated noise level is at least 10 dB (A) less than the level being measured, the reading will be valid.

6.3 The meter shall be set for *slow* response and the A-weighted network.

6.4 Measurements shall be made only when the ambient wind speed is below 19 km/h (12 mile/h) and the absolute barometric pressure is between 93 and 103 kPa (27.5 and 30.5 in of mercury).

6.5 The applicable reading shall be the highest sound level observed during the run, between the start point and the end point, ignoring unrelated peaks due to extraneous noises.

6.6 Acceleration test runs shall be repeated until three readings within a 2 dB range per vehicle side have been obtained. The acceleration sound level for each side of the vehicle shall be the average of all three readings, rounded to the nearest integer.

6.7 The sound levels shall be reported as a plot for each side of the vehicle of dB (A) versus observed vehicle speed. The constant speed levels shall be plotted at 24 km/h (15 mile/h) and 48 km/h (30 mile/h). The acceleration level shall be plotted at speeds ≥ 72 km/h (45 mile/h).

6.8 The atmospheric temperature, pressure, humidity, wind speed, and direction shall be recorded at the beginning and end of each test sequence. Also record test surface conditions.

7. General Comments

7.1 It is recommended that persons technically trained and experienced in the current technique of sound measurement select the equipment and conduct the tests.

7.2 Proper use of all test instrumentation is essential to obtain valid measurements. Operating manuals or other literature furnished by the instrument manufacturer should be referred to for both recommended operation of the instrument, and precautions to be observed. Specific items to be considered are:

7.2.1 The type of microphone and its orientation relative to the source of noise.

7.2.2 The effects of ambient weather conditions on the performance of all instruments (for example, temperature, humidity, and barometric pressure). Special caution should be exercised when the sound level meter is exposed to low temperatures for extended periods of time.

7.2.3 Proper signal levels, terminating impedances, and cable lengths on multi-instrument measurement systems.

7.2.4 RFI (Radio Frequency Interference) from the snow vehicle itself.

7.2.5 Proper acoustical calibration procedure, to include the influence of extension cables, etc. Field calibration shall be made immediately before and after each test sequence. Either an external or internal calibration means is acceptable for field use, provided that external calibration is accomplished immediately before and after field use.

7.3 The vehicle manufacturer's recommendation governing the proper operation of the vehicle shall be followed.

8. Notes

8.1 **Marginal Indicia—**The change bar (l) located in the left margin is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

PREPARED BY THE SAE COMMITTEE OFF-ROAD SOUND LEVEL COMMITTEE