

db-2100

Sound Level Meter

Operator's Manual

Thank you for choosing Metrosonics to meet your sound measuring needs. The Metrosonics db-2100 sound level meter is a light weight easy-to-use type 2 instrument. It is our goal to make your decision to purchase a Metrosonics brand product the right one, and to provide support for any questions or concerns that might arise.

The purpose of this manual is to provide the user with all the necessary information to operate the db-2100 sound level meter. The entire manual should be read to fully understand the many features this instrument offers.

This manual is not all inclusive and cannot cover all unique situations. In addition no warranties are contained in this manual except as described under the warranty policy section.

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Table Of Contents

1 Introduction	1
2 General Overview	2
The Display	2
Meter Controls	2
3 Meter Integrity	5
Battery Checks	5
Battery Replacement	5
Rechargeable Batteries	5
Changing The Calibration Level	5
Calibration	5
Calibration Check	6
Operation	7
Meter/Microphone Placement	7
Background Noise	7
Windscreen Effects	8
Chart Recording/Data Recording	9
5 Technical Information	10
Principles of Operation	10
Microphone	10
Weighting Characteristics	11
Internal Electrical Noise	12
Tone Burst Response	12
6 Specifications	13
7 Accessories	15
 Metrosonics Service Policy	 16
Metrosonics Warranty Policy	17

1. Introduction

The Metrosonics Brand model db-2100 sound level meter measures frequency weighted and instantaneous sound pressure level. Applications include laboratory, industrial and community measurement or analysis.

The model db-2100 is an easy-to-use hand held meter with an LCD display that provides a numerical readout. It is housed in a rugged R.F. shielded, injection molded case. The meter is operated with simple slide switches. An output jack on the bottom of the meter is provided for connecting to peripheral devices such as chart recorders, oscilloscopes, audio recorders, etc.

The Metrosonics Brand db-2100 provides Type 2 accuracy and is designed for general field survey work.

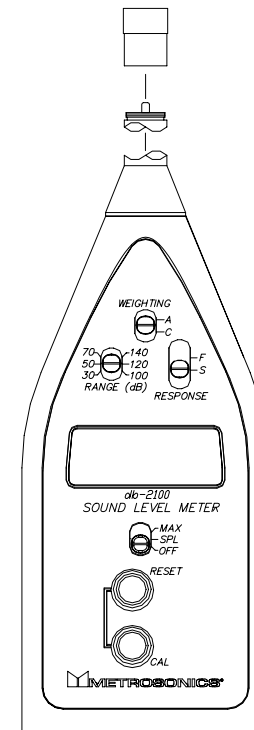


Figure 1. Model db-2100

2 General Overview

The Display:

The LCD display provides a numeric readout in 0.1dB increments along with a LOBAT (Low Battery) indicator. In the SPL mode the numeric display provides a reading of maximum sound pressure level measured during the previous second. In the MAX mode the display holds the highest reading encountered since the meter was placed in MAX, or since the last time the meter was reset.

The LOBAT indicator will light when the voltage of the battery is too low to allow an accurate reading.

A plus sign '+' will appear on the left side of the display if signal peaks cause an overload condition in the electronics. This indicator signals the user to switch to the next higher range to prevent erroneous readings.

If the signal falls below the measuring range, 'UR' (Under Range) will be displayed. This indicator signals the user to switch to the next lower range.

Meter Controls:

OFF/SPL/MAX Switch

With the switch set to SPL the meter continuously displays sound level, automatically updating the display reading once per second.

Setting the switch to MAX causes the display to hold the highest SPL encountered thus far. As a higher SPL occurs, the display changes to show the new value. To reset the value stored, press and hold the RESET button for a few seconds, then release. This will erase the previous MAX value (and display the current value) prior to taking new readings. For response times see figures 8 and 9.

“F” (Fast) / “S” (Slow) Response Switch

The RESPONSE switch controls the rate at which the meter responds to changing input signals. Most sound measurements are done with the response set to SLOW. The FAST response is generally used when measuring short duration noises such as moving vehicles.

The RESPONSE switch positions are as follows:

FAST – 125 millisecond time constant (See Figure 8)

SLOW – 1 second time constant (see Figure 9)

WEIGHTING A/C Switch

The WEIGHTING switch controls the frequency response of the meter. Weightings A or C may be selected. See Section 5 Weighting Characteristics, for further information.

RANGE (dB) Switch

The displayed range of the model db – 2100 is 70dB and is switchable between 30-100 dB, 50-120dB, and 70-140dB. After switching ranges, allow several seconds for the meter to stabilize.

RESET Button

This button is used primarily to clear the MAX sound level when the instrument is in the MAX mode. Pressing the RESET button for at least half a second will cause the reset of MAX. If observation of the changing sound pressure level is desired while in MAX mode, the RESET button may be held down for as long as the SPL display is desired. Upon release of the RESET button, MAX will be reset and the db-2100 resume accumulating MAX. The RESET button also serves as an up arrow during setup.

CAL Button

This button is primarily used to enter the calibration routine, but it also functions as a down arrow during setup.

Overload Detection

The overload indicator is displayed whenever the incoming signal saturates (overloads) the circuitry. It is the '+' sign on the left side of the display. If the overload indicator is on while taking measurements in a low range, increasing the dB Range switch should cause the overload to disappear. If you are already on the highest range setting and an overload condition still exists, the sound level that you are measuring is beyond the capability of the db-2100 due to an extremely high RMS value or a high crest factor (peak to RMS ratio).

Under Range Indicator

Under range is indicated by a “Ur” in the display. The indicator will turn on when the noise level drops below the bottom of a range. Switching to a lower range will turn it off.

Output Jack

The model db-2100 provides an output jack on the bottom of the meter for measuring the weighted AC signal before the RMS/log detector and the DC output of that detector. Both signals are real time. This jack may be connected to any load without affecting the operation of the meter. Connection to low impedance loads will require correction, as the nominal output impedance of the outputs is 1Kohm. Low impedance loads will also shorten battery life. The output jack uses a 3.5 mm stereo plug.

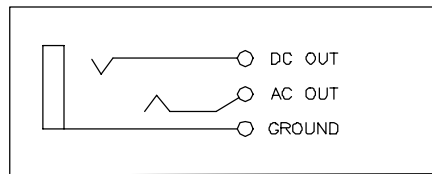


Figure 2. Output Jack Connections

DC Output Function

The sound pressure level over the selected range is represented linearly by the DC output. The output changes 16.7mV/dB or 1V/60dB. This output is primarily provided for connecting a 0 to 1V span data recorder.

AC Output Function

This output provides the amplified, weighted AC signal from the input of the RMS detector.

3 Meter Integrity

Battery Check

At any time other than initial turn on, if the LOBAT indicator on the display is activated, the user must replace the battery. A 9-volt alkaline battery is recommended for best performance. Refer to the label in the battery compartment for battery replacement.

Battery Replacement

Slide the battery door, (located on the bottom of the unit), to the left to open the battery compartment. Refer to the sticker inside the compartment for proper battery orientation.

Rechargeable Batteries

NiMH type rechargeable 9V batteries, such as the Radio Shack® 23-526 (8.4V, 150mAh), and an appropriate charger may be used with the db-2200. It should be noted however, that the fact that these batteries when fully charged only put out about 8.4VDC will significantly shorten battery life. A Radio Shack 23-526 will only operate for about 8hrs before recharging will be required. At the appearance of the LOBAT indicator, these batteries must be recharged.

Nicad (Nickle-cadmium) batteries are NOT recommended

Changing the Calibration Level

Turn on the meter and observe the display. When the calibration level is displayed, press and hold the RESET and CAL buttons simultaneously until dashes appear. To edit the calibration level, use the RESET key to increase the value and use the CAL key to decrease the value. Edit the value to match your calibrator's output. When the desired calibration level is displayed, press and hold the RESET and CAL buttons until dashes appear on the display. This stores the instrument's new calibration level in memory and will not need to be changed again, unless an alternate calibrator is used.

Calibration

It is recommended that the instrument be calibrated before each use. The model db-2100 may be calibrated in any range with a measurement capability greater than your calibrator's output. There is no warm up period required, but for maximum calibration accuracy the calibration should be performed at the temperature of the environment where the study will take place.

To calibrate the instrument, perform the following procedure:

- 1) Turn on the db-2100 and verify that the LOBAT indicator is not on. Replace the battery if necessary.
- 2) Verify that the calibration level stored in the instrument matches the calibrator's output level. If it does not refer to the section titled "Changing the Calibration Level" above.
- 3) Turn the calibrator on and if optional, set the frequency to 1KHz.
- 4) Carefully place the proper sized calibrator adaptor onto the microphone and the calibrator onto the adapter using downward pressure and a slight twisting motion until the calibrator and adaptor are fully seated.
- 5) Set the db-2100 to SPL, SLOW or FAST and A or C weighting. Set the measuring range so that the calibration level falls within it.
- 6) Press and hold the CAL button until 'CAL' appears in the display. Release the button. Three dashes will appear one at a time, and then disappear. as the meter calibrates. Upon completion of the calibration, a final message of 'P' for pass or 'F' for fail will appear on the display. If the calibration fails review steps one through five.

Calibration Check

It is a good idea to verify calibration after use. To do so, perform the first five steps of the calibration procedure listed above. Verify that the displayed level is within 0.5dB of the calibrator's stated output. If out of tolerance, repeat the above listed calibration procedure.

4 OPERATION

Before taking measurements with the model db-2100, there is a series of quick checks and considerations that should be performed or noted. After switching the unit ON, check for a LOBAT indication on the display, replace battery if necessary.

Although the model db-2100 will maintain accurate calibration over a long period of time, the calibration should be checked and the meter re-calibrated, if necessary, before each use. The calibration should also be checked after each use.

Set the RESPONSE, WEIGHTING, and RANGE (dB) switches as needed. Hold, set, or tripod mount the meter in the desired location. If a MAX measurement is needed, be sure to reset the meter before taking the measurements.

It is always a good idea to document all measurement conditions and meter settings for possible future reference.

Meter/Microphone Placement

Whenever possible, the meter should be tripod-mounted in a relatively open area to minimize reflections from the body or other large reflective structures. Avoid placement against a wall or in a corner. A threaded bushing on the back will accept a standard 1/4-20 tripod fitting.

The microphone cartridge used on the model db-2100 is a free-field microphone. Point the meter directly at the noise source (0 degrees).

Background Noise

Background noise can cause considerable error in measurement when its intensity is close to that of a particular sound source of interest. When it is not possible to eliminate or reduce the background noise, use the curve shown in Figure 3 to correct for the effect of the background noise on the measurement. For example, if the background noise is 45 dB and the sound of interest measures 51 dB, the difference between measurement and background noise is 6 dB. From Figure 3, for a 6 dB difference, 1.3 dB should be subtracted from the measurement. The correct measurement is therefore 51 dB - 1.3 dB = 49.7 dB.

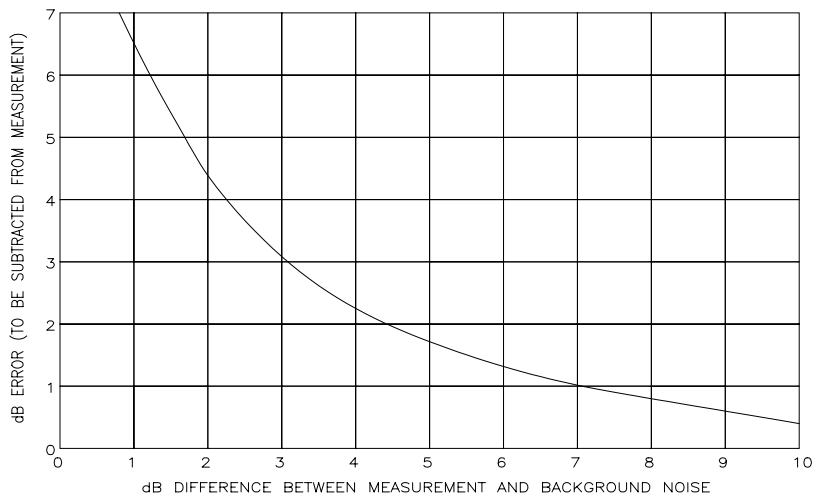


Figure 3. Effects of Background Noise

Windscreen Effects

To prevent measurement errors caused by wind blowing across the microphone, the use of a windscreen is recommended. The windscreen will reduce wind effects and will also help protect the microphone under dusty or oily conditions. Acoustic attenuation effects of the WS-7 windscreen are shown in Figure 4.

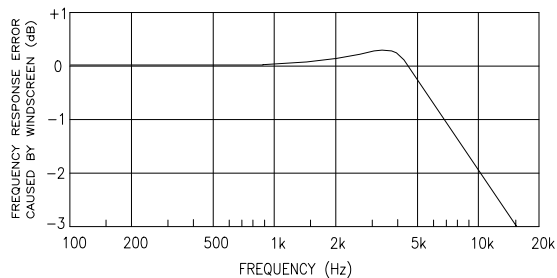


Figure 4. Effects of ws-7 Windscreen

Chart Recording/Datalogging

The model db-2100 has a DC output that is linearly related to the decibel reading on the LCD display by 16.7mV/dB (1V/60dB).

This output, capable of driving up to 100 feet of shielded or twisted pair cable, is intended for use with a chart recorder or data acquisition device that has a high input impedance. The DC output impedance is 1000 ohms. Recorder input resistance may cause loading of this output, which should be taken into account. Multiplication factors for the above numbers are given in the table below for various recorder input impedances.

Input Impedance of Recorder	Multiply DC Voltage By:
10 KOhm	1.100
20 KOhm	1.050
50 KOhm	1.020
100 KOhm	1.010

5 Technical Information

Principles of Operation

The model db-2100 uses low noise, low power analog and digital integrated circuitry to ensure long battery life, maximum stability and superior reliability over a wide range of environmental conditions. Figure 5 is block diagram of the model db-2100 internal circuit operations.

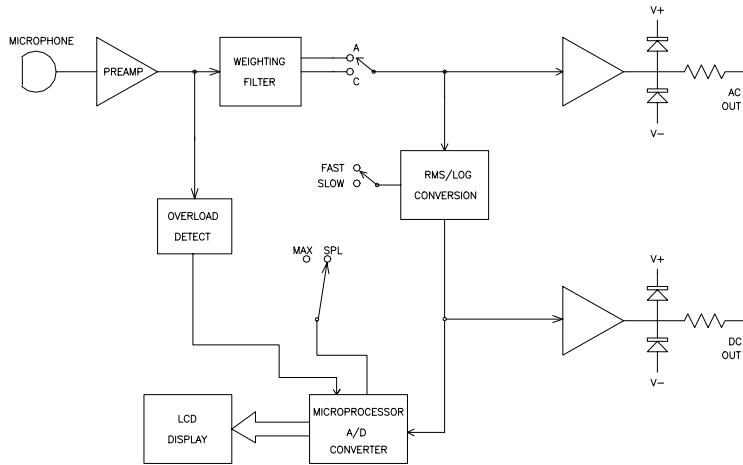


Figure 5. db-2100 Block Diagram

Microphone

The model db-2100 is designed to accept a pre-polarized (electret) Type 2 microphone, P/N 056-316 (QE7052). The Capacitance of this microphone is 15pF. The microphone screws directly onto the fixed microphone extension of the meter case. A typical response curve for the Type 2 microphone is shown in figure 6.

Caution! When installing or removing the microphone, do not unscrew the protective grid. Do not touch the metal foil microphone diaphragm under this grid or permanent damage could result!

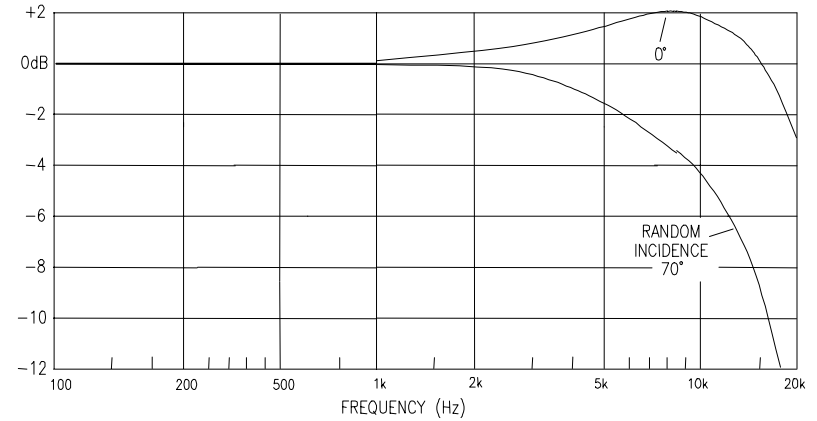


Figure 6. Typical Type 2 Microphone Response

Weighting Characteristics

The weighting characteristics (frequency response) for A and C are shown in figure 7. The “A” weighting response emulates the response of the human ear and is used for most industrial and community noise measurements. Generally, “C” weighting is used for measuring noise reduction in hearing protectors and for other scientific purposes.

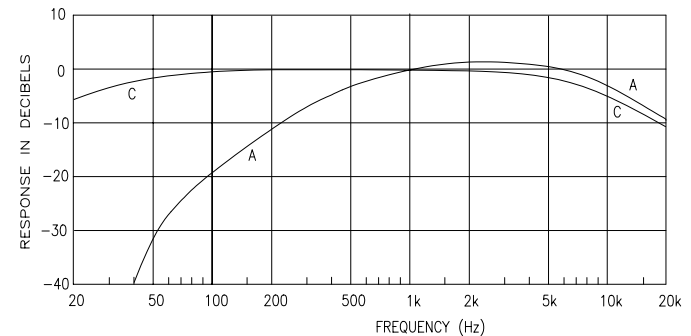


Figure 7. A and C weighting

Internal Electrical Noise

The normal measurement range of the db-2100 meter is approximately 30 to 140dBA and 40 to 140dBC. The inherent noise level is typically 24 dBA

Tone Burst Response

Figures 8 and 9 show the meter response to a sine wave input of various pulse durations for fast and slow settings.

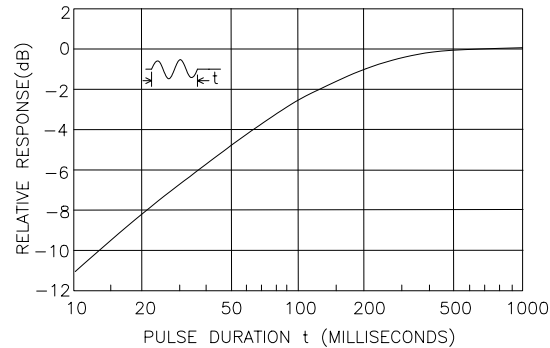


Figure 8. Fast Response

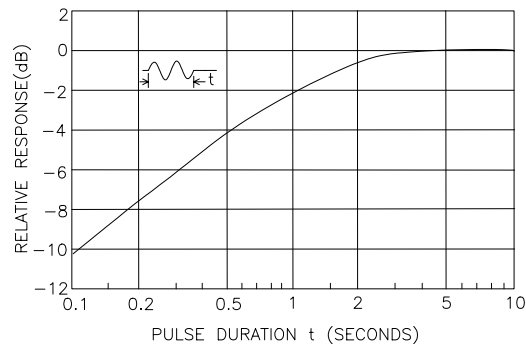


Figure 9. Slow Response

Nominal decay times for each time response setting are as follows:

FAST – 34.7 dB per second
SLOW – 4.35 dB per second

6 Specifications

Standards:	Model db – 2100: Type 2 ANSI S1.4-1983(R1997), IEC 651-1979 EN60651
Display:	3 ½ Digit Liquid Crystal Display. Level display indicates to 0.1dB resolution. Annunciator is included for battery check.
Modes Of Operation:	Measures sound pressure level (SPL) or maximum level (MAX)
Range:	30 to 140 dBA 40 to 140 dBC
Electrical Noise Floor:	23 dBA, 30dBC Typical
Frequency Weighting Networks:	A and C
Meter Response:	Slow and Fast
Microphone:	Removable .52 inch (13.5mm) diameter prepolarized condenser (electret) microphone. Model db-2100: - Type 2 Accuracy (P/N: 056-317 QE 7052)
AC Output:	Approximately 0-1 VAC RMS 1000 ohm output impedance 3.5mm stereo jack
DC Output:	Approximately 0 – 1 VDC Each 0.167V change equals 10dB (1V/60dB). 1000 ohm output impedance 3.5 mm stereo jack
Detector:	True RMS
Overload Indicator:	a '+' sign in the display indicates overload.
Temperature Accuracy:	within 0.5dB at 23°C; Within 1.0 dB over the temperature range of -10°C to +50°C

Level Range Accuracy: +/- 0.7dB from 31.5 – 8000Hz

Crest Factor: Greater than 26dB (crest factor = 20) if peak of signal does not cause an overload.

Temperature Range: Operational: -10°C to +50°C

Storage (Less Batteries): -20°C to +60°C

Operating Humidity: 0 to 95% relative humidity, non-condensing.

Battery: one 9-volt alkaline battery
ANSI/NEDA type 1604A or IEC: TYPE 6LR61
Typical Energizer 522 (Quest P/N 058-176)

Battery Life: 9-volt alkaline, approximately 25-30 hours

Effects of Electromagnetic Fields: Negligible

Effects of Electrostatic Fields: Negligible

Tripod Mount: A threaded insert on the back of the meter accepts a standard ¼ inch tripod mounting screw.

Size: 2.8 x 7.6 x 1.3 inches (Including mic)

Weight: 10.3 oz (293 g.) including battery

7 Accessories

56-990 – Calibrator adaptor for 0.52 inch diameter microphone for use with Metrosonics Brand QC-10M calibrators.

59-344 – WS-7 windscreen for 0.52 inch microphone (pkg. 3)

59-045 – Tripod (Larger)

59-046 – Tripod (Smaller)

59-703 – Input adaptor – Female BNC jack to ½” microphone thread, with 18pF capacitance. Allows direct electrical signal input to the meter.

Quest Service Policy

Congratulations! You have purchased one of the finest instruments available, manufactured by one of the most respected names in safety & industrial hygiene instrumentation. Your instrument is backed by a limited warranty that seeks complete customer satisfaction. Should your instrument require service for any reason, you can expect prompt and courteous attention.

You must obtain a return authorization prior to shipment. We reserve the right to refuse any shipments forwarded without prior authorization.

The following information will expedite the service process and is required when obtaining return authorization:

- 1. Model and serial number of each instrument.**
- 2. Description of work required and symptoms of any failures for each instrument.**
- 3. VISA, MasterCard or American Express credit card -- or -- company purchase order number (non-warranty service only).**
- 4. Billing and/or return shipping addresses.**

Use one of the methods below to obtain return authorization, service pricing and shipping instructions.

International Customers

Contact your local, factory-authorized distributor from whom the product was purchased. To obtain the name of the local factory-authorized distributor, contact us via email at service@quest-technologies.com, via telephone at +(1)-262-567-9157 or via fax at +(1) 262-567-4047.

U.S.A Customers Only

- **Go to the service section of our web site at www.quest-technologies.com.**
- **Contact us via email at service@quest-technologies.com**
- **Contact us at (800) 245-0779. Office hours are 8:00 AM to 5:00 PM U.S. Central Time.**

Warranty Policy

Quest Technologies warrants our instruments to be free from defects in materials and workmanship for one year under normal conditions of use and service. For U.S.A. customers, we will replace or repair (our option) defective instruments at no charge, excluding batteries, abuse, misuse, alterations, physical damage, or instruments previously repaired by other than Quest Technologies. Microphones, sensors, printers, and chart recorders may have shorter warranty periods. This warranty states our total obligation in place of any other warranties expressed or implied. Our warranty does not include any liability or obligation directly resulting from any defective instrument or product or any associated damages, injuries, or property loss, including loss of use or measurement data.

For warranty outside the U.S.A., a minimum of one year warranty applies subject to the same limitation and exceptions as above with service provided or arranged through the authorized Quest sales agent or our Quest European Service Laboratory. Foreign purchasers should contact the local Quest authorized sales agent for details.



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