

db-210 Low Cost Sound Level Meter

Operator's Manual



Thank you for choosing Metrosonics to meet your sound measuring needs. The Metrosonics db-210 Sound Level Meter is a lightweight, easy-to-use Type 2 instrument. It is our goal to make your decision to buy Metrosonics products 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 the necessary information to operate the db-210 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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Introduction

1. INTRODUCTION

The Metrosonics models db-210 Sound Level Meter measures frequency weighted and time averaged sound pressure level (see Figure 1). Applications include laboratory, industrial, community, military, and audiometric measurement or analysis.

The model db-210 is a easy-to-use hand held meter with an LCD display that provides a numerical readout. The db-210 is housed in a rugged RF shielded, injection molded case. The meter is operated with simple slide switches. An output jack is provided for connecting to peripheral devices such as chart recorders, oscilloscopes, audio recorders, etc.

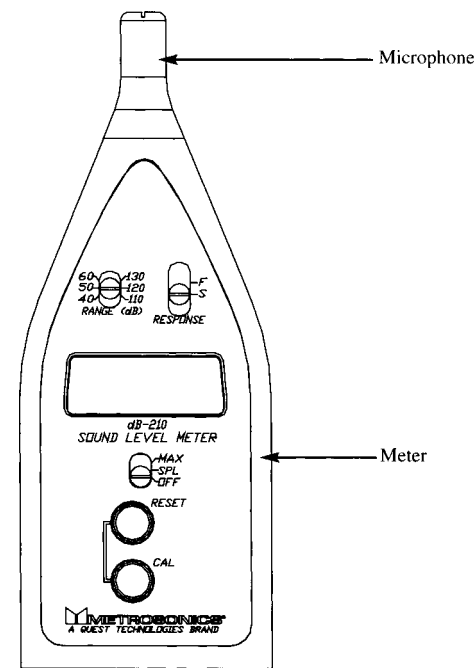


Figure 1. Model db-210

2. GENERAL OVERVIEW

2.1 The Display:

The LCD display provides a numeric readout of sound level in 0.1 dB increments along with a LOBAT (low battery) indicator. In the SPL mode the numeric display provides a reading of the 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 RESET was pressed.

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

The display will show a + sign when 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.

The display will show "Ur" if signal levels are too low to provide an accurate reading. This indicator signals the user to switch to a lower range setting.

2.2 Meter Controls:

2.2.1 OFF/SPL/MAX Switch:

With the switch set to SPL the meter continuously displays sound level, automatically updating the current reading at a rate of 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.

2.2.2 "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 9)

SLOW - 1 second time constant. (See Figure 8)

2.2.3 RANGE (dB) Switch:

The displayed range of the model db-210 is 70 dB and is switchable between 40-110 dB, 50-120 dB, and 60-130 dB. After switching ranges allow several seconds for the meter electronics to stabilize.

2.2.4 RESET Button:

This button is primarily used to clear the MAX sound level when the instrument is in the MAX mode. Pressing the RESET button for at least a half second will cause a reset of MAX. If observation of the changing Sound Pressure Level is desired, while in the 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-210 will resume accumulating MAX. The RESET button also functions as an up arrow during setup (see section 3.2 Changing the Calibration Level).

2.2.5 CAL Button:

This button is primarily used to enter the Calibration routine, (see section 3.3) but it also functions as a down arrow during setup (see section 3.2 Changing the Calibration Level).

2.3 Overload Detection and Under range Indicator:

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-210 due to either an extremely high RMS value or a high crest factor (peak to RMS ratio).

Under range is indicated by a "Ur" in the display. When the noise level drops below the bottom of the range, this indicator will turn on. Switching to a lower range will turn it off.

2.4 Output Jack:

The model db-210 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. This jack may be connected to any load without affecting the operation of the meter. Connection to low impedance loads will require correction for the 1 Kohm impedance of this output and will also decrease battery life. The output jack uses a 3.5mm stereo plug. See Figure 2.

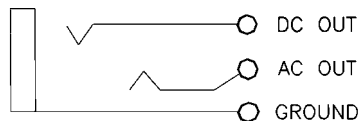


Figure 2. Output Jack Connections

2.4.1 DC Output Function:

The Sound Pressure Level (SPL) over the range selected is linearly represented by a DC output. The output changes 16.7mV/dB or 1V/60dB. This output is primarily provided for connecting a 0 to 1 volt span data recorder.

2.4.2 AC Output Function:

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

3. METER INTEGRITY**3.1 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 battery compartment for battery replacement.

3.1.1 Battery Replacement:

Slide the battery door to the left to open the battery compartment and refer to the label inside the compartment for proper battery orientation.

3.1.2 Rechargeable Batteries:

Nicad type rechargeable 9 V batteries (such as Radio Shack® 23-299 7.2 V, 120 mAh) and an appropriate charger may be used with the db-210. The fact that nicad 9 V replacement cells typically operate at 7.2 V will be observed as shorter battery life (approximately 8 hours with Radio Shack® 23-299). At the appearance of the LOBAT indicator the nicad battery must be recharged.

NiMH (Nickel-Metal-Hydride) batteries are NOT recommended. This is due to the excessive discharge of the typical NiMH cell prior to the voltage dropping low enough to activate the LOBAT indicator.

3.2 Changing the Calibration Level:

NOTE: There may be times when it is necessary to change the calibration level that is stored in the meter. This calibration level is the decibel level that is produced by your calibrator. The simple procedure for changing this value is outlined below.

1. Turn on the meter. The display will show:
 - a. All segments for 2 seconds
 - b. The meter revision number for 2 seconds
 - c. The current calibration level stored in the meter for 5 seconds
2. While current calibration level is in the display, press and hold both the RESET and CAL buttons for at least 1/2 second or until dashes appear in the display. Release the RESET and CAL buttons. The meter is now in the calibration level set mode.

NOTE: If the RESET and CAL buttons are continuously held down after the dashes appear, the unit will interpret this as a command to exit calibration level set mode and exit without changing the calibration level.
3. To edit the level, use the RESET key to increase the value and the CAL key to decrease the value. Edit the value to match your calibrators output.

4. When the desired calibration level is displayed, press and hold both the RESET and CAL buttons until dashes appear on the display. The new calibration level is now stored in the instruments memory and will not have to be changed again unless an alternate calibrator is used.

3.3 Calibration:

The model db-210 may be calibrated in any range based on your calibrator's output. There is no warm up period required, but for maximum accuracy calibration of the model db-210 should be performed at the temperature of the environment to be measured. To calibrate, perform the following procedure using a Metrosonics calibrator.

It is recommended that calibration be performed before each use.

1. Check to see that the LOBAT indicator is not on.
2. Check to see that the calibrator SPL output matches the calibration level stored in the meter. If it does not, use procedure outlined in section 3.2. NOTE: Failure to match calibrator output level to calibration level stored in the db-210 will result in erroneous SPL reading.
3. Turn the calibrator ON. If optional, set the frequency to 1 KHz.
4. Place the black adapter ring fully onto the microphone.
5. Set the model db-210 to SPL, SLOW or FAST, and A or C weighting. Set the measuring range so that the calibration level falls within it. NOTE: Attempting to calibrate out of range will result in an "Err" on the display and a failed calibration. The previous calibration data will remain in the instrument.
6. Press the "CAL" button. "CAL" will appear on the display followed by moving dashes. After about 2 seconds the display will show either a "P" for pass or an "F" for fail. If the calibration fails, check settings and repeat procedure.

3.3.1 Calibration Check:

It is a good idea to check calibration after use. To do so, perform the previous steps 1 through 5. Observe the meter display, it should read the calibrator level +/- 0.5 dB. If out of tolerance, run calibration procedure in section 3.3.

4. OPERATION

Before taking measurements with the model db-210, 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. (See Section 3.1)

Although the model db-210 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. (See Section 3.3.1)

Set the 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.

4.1 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-210 is a free field microphone. Point the meter directly at the noise source (0 degrees).

4.2 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.

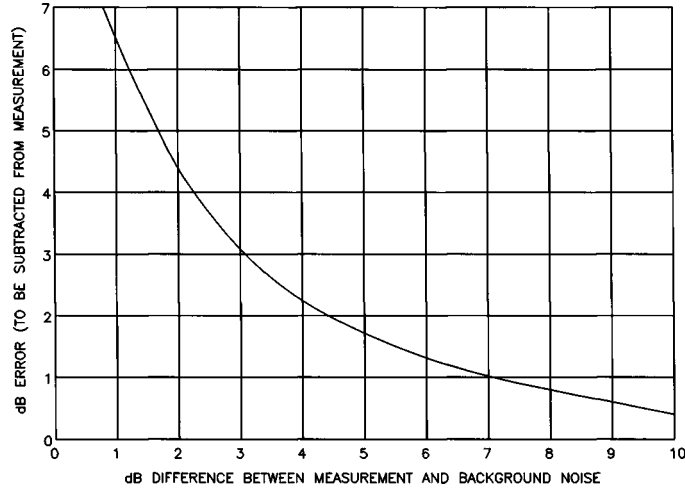


Figure 3. Effects of Background Noise

4.3 Wind Screen Effects:

To prevent measurement errors caused by wind blowing across the microphone, the use of a windscreen is recommended. The wind screen 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.

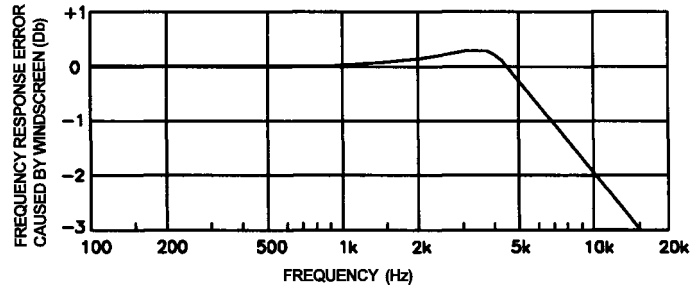


Figure 4. Effects of WS-7

4.4 Chart Recording/DATALOGGING

The model db-210 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 0 to 1 volt DC input chart recorder or data acquisition device that has a high input impedance. The output impedance is 1000 ohms. Chart recorder input impedance may cause loading of this output, which should be taken into account. Multiplication factors for the above numbers are given below for various chart 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

5.1 Principles of Operation:

The Metrosonics model db-210 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 a block diagram of the model db-210 internal circuit operations.

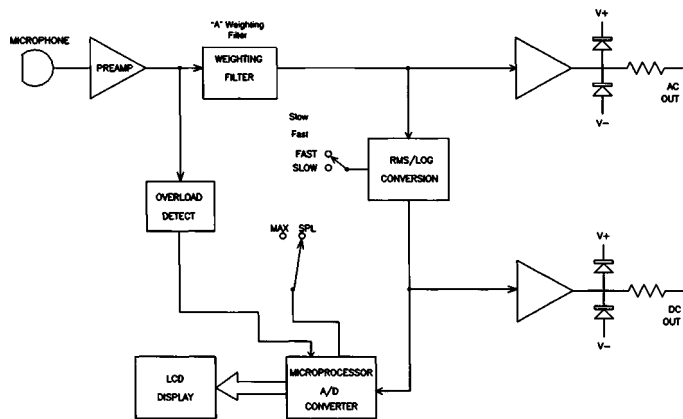


Figure 5. db-210 Block Diagram

5.2 Microphone:

The model db-210 uses a prepolarized (electret) microphone cartridge securely housed in a durable plastic nose cone 0.52" inches in diameter to allow use of a standard Metrosonics P/N 56-990 calibration adapter. A typical response curve is shown in Figure 6.

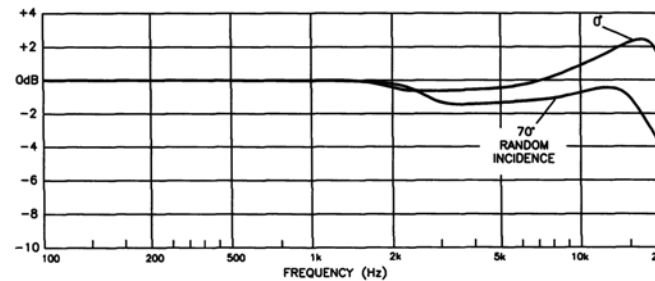


Figure 6. Typical microphone response Type 2

5.3 Weighting Characteristics

The weighting characteristic (frequency response) for A is shown in Figure 7. The "A" weighting response emulates the low level response of the human ear and is used for most industrial and community noise measurements. (The "C" weighted curve is included for comparison purpose).

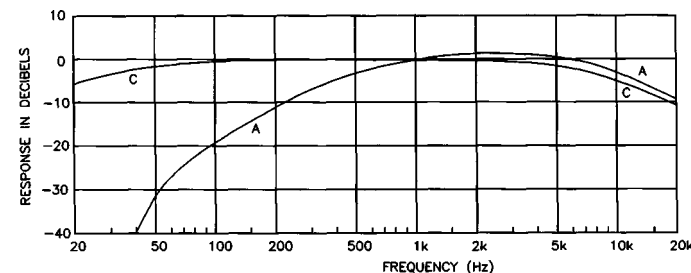


Figure 7. A & C Weighting

5.4 Internal Electrical Noise

The normal measurement range of the db-210 meter is approximately 40 to 130 dBA. The inherent noise level is typically 26 dBA.

5.5 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.

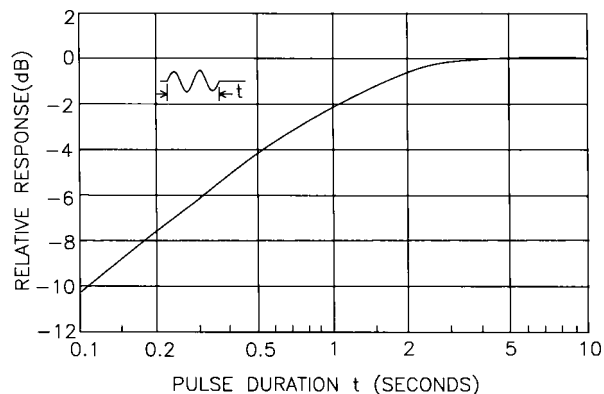


Figure 8. Slow Response

Nominal decay times for slow response weighting is as follows:

- SLOW - 4.35 dB per second
- FAST - 34.7 dB per second

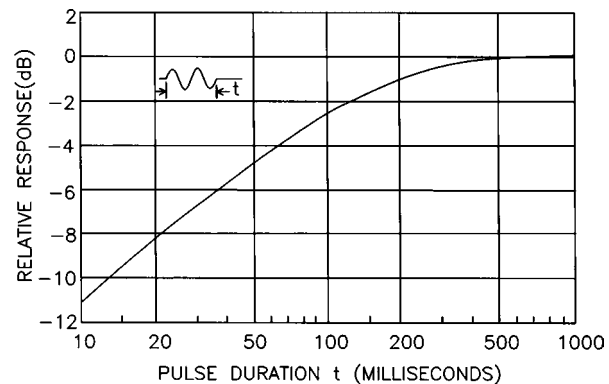


Figure 9. Fast Response

6. SPECIFICATIONS

Standards:	Model db-210: Type 2 ANSI S1.4-1983(R1997), IEC 651-1979 EN60651
Display:	3 1/2 Digit Liquid Crystal Display. Level display indicates to 0.1 dB resolution. Annunciator is included for Battery Check.
Modes of Operation:	Measures sound pressure level (SPL) or maximum level (MAX).
Range:	40 to 130 dBA
Electrical Noise Floor:	Approximately 26 dBA typical
Frequency Weighting Networks:	A
Meter Response:	Slow and Fast
Microphone:	Non-removable prepolarized condenser (electret) microphone cartridge mounted in plastic 0.52" (13.5 mm) diameter nose cone
AC Output:	Approximately 0 - 1 V AC RMS. 1000 ohm output impedance, 3.5 mm stereo jack
DC Output:	Approximately 0 - 1 V DC RMS. 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
Accuracy:	Within 0.5 dB at 23°C; Within 1.3 dB over the temperature range of 0°C to +40°C

Specifications

Level Range Accuracy:	+/- 0.7dB from 31.5- 8000 Hz
Crest Factor:	Greater than 26dB (crest factor = 20) if peak of signal does not cause an overload. Crest factor is sufficient to handle the signal if the overload indicator does not light.
Temperature Range:	Operation: 0°C to +50°C
Storage (less batteries):	-20° 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 (Metrosonics 058-176)
Battery Life:	9 Volt Alkaline, approximately 25-30 hours
Effect of Electromagnetic Fields:	Negligible.
Effect of Electrostatic Fields:	Negligible.
Tripod Mount:	A threaded insert on back of the meter accepts a standard 1/4 inch tripod mounting screw.
Size :	2.8 x 7.6 x 1.3 inches
Weight:	8.4 oz. (238 g.) including battery

Accessories

7. ACCESSORIES

- 56-990 Calibrator Adapter for 0.52 inch diameter microphone for use with Metrosonics "QC-" series calibrators
- 59-344 WS-7 Windscreen for 0.52 inch microphone (pkg. of 3) 59-045 Tripod (Larger) 59-046 Tripod (Smaller)

METROSONICS SERVICE POLICY

Service Policy

Congratulations! You have just 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 cards 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. Customers Only

- Go to our web site at www.quest-technologies.com and click on the "recalibration & Repair" button on our home page
- 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

METROSONICS WARRANTY POLICY

Warranty Policy

Quest Technologies warrants Metrosonics 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, and printers 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 one-year warranty applies to the same limitation and exceptions as above with service provided or arranged through the authorized Metrosonics distributor or our Quest European Service Laboratory. Foreign purchasers should contact the local Metrosonics distributor for details.



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