



CLASS 1 SOUND LEVEL METER WITH EXCEL-FORMATTED DATA LOGGING SD CARD

USER'S MANUAL



DSM403SD

Please read this manual carefully and thoroughly before using this product.

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INTRODUCTION

Thank you for purchasing General Tools & Instruments' DSM403SD Class 1 Sound Level Meter with Excel-formatted Data Logging SD Card. Please read this user's manual carefully and thoroughly before using the instrument.

The DSM403SD is a general-purpose handheld instrument that measures the noise level of an environment or the amplitude of sound produced by a piece of machinery. Using an integrated 0.5 in. condenser microphone, the meter can measure sound levels from 30 to 130 dB with a resolution of 0.1 dB and show the results on a front-panel LCD.

Several features and capabilities enhance the meter's versatility. Among them are the option to make measurements using autoranging or any of three manual ranges, the ability to hold readings and display maximum and minimum readings, and user-settable measurement parameters such as frequency weighting (using the "A" and "C" standards) and time weighting (fast or slow). The DSM403SD can be calibrated by an optional laboratory instrument.

Because it is microprocessor-based, the DSM403SD can make full use of the portability, reliability and large storage capacities that SD memory cards offer. Measurements can be made automatically at any sampling rate between one second and one hour. After time-stamping and storing the measurements on an SD card plugged into the instrument (a process called data logging), the user can remove the card and plug it into a laptop or desktop computer either directly or via a USB card reader. The data logs are stored on the card as files with the .xls extension, which can be opened by Microsoft's Excel application.

The DSM403SD has a backlit 2-1/2 in. diagonal display and is powered by six "AA" batteries or an optional 9V AC/DC adapter.

KEY FEATURES

- Big (2.5 in. diagonal) front-panel green backlit LCD is easy to read
- Makes measurements in autoranging mode or within any of three manual ranges
- Displays maximum and minimum readings and holds any reading
- Performs automatic data logging at sampling time settable from 1 second to 1 hour
- Also supports continuous manual data logging and changing of card storage location
- Outputs Excel-compatible data logs
- Accepts SD memory cards of up to 16 GB capacity
- Auto power off function that can be disabled to enable long-term data logging
- Powered by six "AA" batteries or optional 9V AC/DC adapter

WHAT'S IN THE CASE

The DSM403SD comes fully assembled in a hard carrying case along with a sound wind shield ball, a 2 GB SD memory card and this user's manual.

Optional accessories available from General Tools & Instruments include a 94 dB or 94/114 dB sound calibrator and a 9VDC adapter for a 110V power supply. See the Optional Accessories section of this manual on p. 11 for more details.

PRODUCT OVERVIEW

Figure 1 shows all of the controls and indicators on the front, right side, back and bottom of the DSM403SD. Familiarize yourself with the positions and functions of these controls, indicators and connectors before moving on to the Setup Instructions.

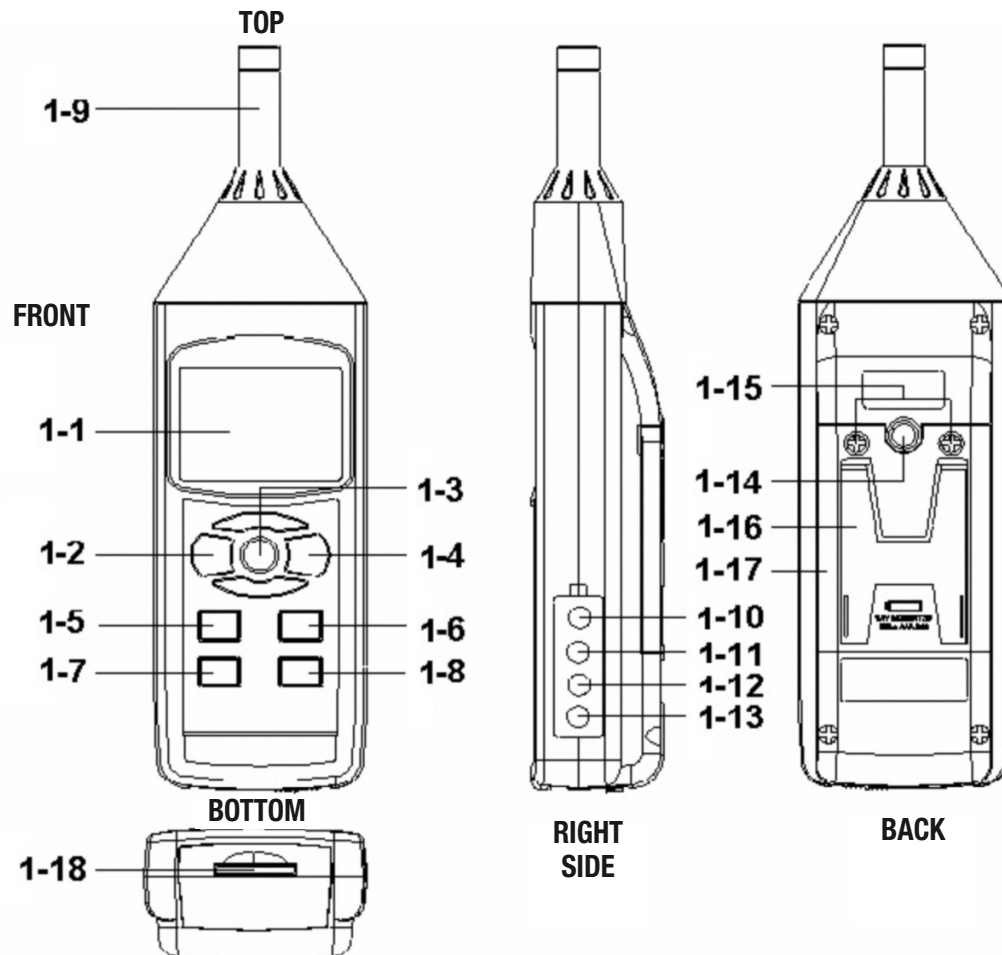


Fig. 1. The DSM403SD's controls and indicators and other physical features

- | | | |
|-----------------------------|-------------------------------|---|
| 1-1 LCD | 1-8 LOGGER button | 1-14 Threaded tripod attachment fitting |
| 1-2 POWER/ESC button | 1-9 Microphone | 1-15 Battery compartment cover screws |
| 1-3 HOLD/NEXT button | 1-10 AC OUT jack | 1-16 Flip-up stand |
| 1-4 REC/ENTER button | 1-11 94dB CAL screw | 1-17 Battery compartment cover |
| 1-5 ▲ button | 1-12 RS232 output jack | |
| 1-6 ▼ button | 1-13 DC9V jack | |
| 1-7 SET button | | 1-18 SD card socket |

SETUP INSTRUCTIONS

1. Choose the power source. Before using the DSM403SD, be sure it is powered by fresh batteries or an optional 9VDC AC adapter plugged into the bottom jack on its right side (callout 1-13).

To remove the battery compartment cover (callout 1-17), remove the two Phillips-head screws holding it in place (callout 1-15). Then install six “AA” batteries in the correct orientation, using the polarity marks on the inside of the compartment as a guide. Replace the cover and secure it by tightening the two screws.

2. Install an SD card. To prepare for setup, also install the supplied 2 GB SD memory card or another card with a capacity from 1 GB to 16 GB in the socket on the bottom of the meter (callout 1-18). When installing the card, make sure its gold contacts are facing front and push the card into the socket until you hear a click. To remove the card, push it in until you hear a click and the card pops out.

Now power on the instrument by pressing the **POWER/ESC** button (callout 1-2) to generate a short beep. (To power off the DSM403SD, press and hold the **POWER/ESC** button until the instrument responds with a long beep.)

When the meter powers on, a series of transient startup screens will briefly appear. Once the display has stabilized, perform the following six setup steps in the order presented.

3. Set the date and time. Press the **SET** button (callout 1-7) and hold it for at least five seconds. When you release the button, the word “dAtE” will appear on-screen below the word “SET”. Quickly (within three seconds) press the **REC/ENTER** button. The display will then show the word “dAtE” above the flashing value “00.01.01” at lower left, above “yy.mm.dd.”

Set the current year by pressing the ▼ or ▲ button repeatedly until the correct value appears above “yy”. Quickly (within three seconds), press the **REC/ENTER** button to store the setting. The next screen that appears will have the value above “mm” flashing. Use the ▼ or ▲ button to navigate to the current month and press the **REC/ENTER** button to store the setting. When the next screen flashes the value above “dd”, again use the ▼ or ▲ button to navigate to the current day and press the **REC/ENTER** button to store the setting.

(If you press buttons too slowly in setup mode, the screen will revert to the normal, real-time measurement display. To return to the first step in the setup sequence, press and hold the **SET** button again. To move ahead to the next field in the sequence or to the next parameter, press the **HOLD/NEXT** button.)

Once you have set the date, the display will prompt you to set the hour, minute and second of the current time. Again use the ▼ or ▲ button to navigate to the correct values, followed by the **REC/ENTER** button to store the settings.

4. Choose a decimal point or comma to represent the decimal division between integers and fractions (for example, American-style 20.88 vs. European-style 20,88). Once you have set the date and time, the display will show the word “bASIC” above the phrase “dEC”. Press the ▼ or ▲ button to make “bASIC” (American style) or “Euro” appear in the upper display, as desired. Press the **REC/ENTER** button to store the selection as the default.

5. Enable or disable auto power off (APO). Once the format of decimal point divisions has been set and stored, the display will show the word “yES” over the term “PoFF”. Press the ▼ or ▲ button until the desired APO management scheme (“yES” for enable; “no” for disable) is displayed. Press the **REC/ENTER** button to store the selection. If enabled, the APO function shuts off the DSM403SD if no front-panel buttons are pressed for ten minutes.

6. Enable or disable the beeper. Once the APO function has been enabled or disabled, the display will show the word “yES” over the word “bEEP”. Press the ▼ button until the desired setting (“yES” or “no”) is displayed, and then press the **REC/ENTER** button to store the selection as the default.

7. Set the data logging sampling time. Once the beeper has been enabled or disabled, the display will show a value above the letters “SP-t”. Press the ▼ or ▲ button to decrease or increase the value until the desired sampling time appears above “SP-t”. The options are 0, 1, 2, 5, 10, 30, 60, 120, 300, 600, 1800 and 3600 seconds (0 seconds to 1 hour).

8. Format the SD card. Once the sampling time has been set and stored, the term “Sd-F” will appear in the lower half of the display. Press the **REC/ENTER** button.

Pressing the **REC/ENTER** button causes the word “no” or “yES” to appear over the term “Sd-F”. Press the ▼ button to make a selection. Choose “yES” whenever a new SD card is being used, or when a used card is being repurposed (from use with another SD card instrument or a camera, for example) and all data on it is to be erased. Choose “no” to preserve any data on a card previously used with this instrument.

If you choose “yES”, after you press the **REC/ENTER** button the instrument will prompt you to confirm that decision by displaying the term “Ent” below “yES” and sounding three beeps (if the beeper is enabled). To confirm that you want to begin the erasure/formatting procedure, press the **REC/ENTER** button. “Ent” will then flash several times and the instrument will sound another three beeps to confirm that the SD card has been erased and formatted.

Once the SD card has been formatted (or not), the display will return to the first of the six steps in the setup sequence—setting the current date and time. To re-enter the setup sequence in order to change one or more settings, press the **REC/ENTER** button. If you are satisfied with the existing settings, press the **POWER/ESC** button to exit setup mode and enter normal operating mode.

CALIBRATING THE METER

The DSM403SD must be calibrated before it can make accurate sound level measurements.

1. To prepare for calibration, obtain a sound calibrator and mate its output connector with the head of the DSM403SD’s microphone (callout 1-9 of Fig. 1). Power on the sound calibrator and manually set its range to 50 to 100 dB.

2. On the DSM403SD, manually set its range to 50 to 100 dB as well by pressing the ▲ button (which has the word “Range” stenciled above it) once. The display will then show the first of three range options: “30 – 80”. Press the ▲ button again and the display will show the second option: “50 – 100”.

3. **Press the SET button** on the DSM403SD (callout 1-7 of Fig. 1), which has the term “Fast/Slow” stenciled below it. If the word “FAST” is displayed, move ahead to Step 4. If the word “SLOW” is displayed, press the **SET** button again to change “SLOW” to “FAST”.
4. **Press the ▼ button** on the DSM403SD (which has the term “A/C” stenciled above it). If the letter “A” is displayed in the upper left corner, move ahead to Step 5. If the letter “C” is displayed, press the ▼ button again to change it to an “A”.
5. **When the display shows the terms “A”, “FAST” and “50-100”, the instrument is ready to be calibrated. To calibrate the DSM403SD**, set the output of the sound calibrator to 94 dB and carefully turn the calibration screw on the right side of the meter (callout 1-11 of Fig. 1) until the display shows the following: “94 ± 0.2 dB”.

OPERATING INSTRUCTIONS

To prepare to make sound level measurements, power on the DSM403SD and make sure an SD card is firmly seated in the socket on the bottom of the meter. The meter’s default settings are autoranging on (enabling measurements from 30 to 130 dB), “A” frequency weighting and fast time weighting. Accordingly, when the meter is powered on the display will show the following terms: “A”, “FAST” and “AUTO”. Following are procedures for changing each of these parameters to suit the application.

If you already know that the volume of the machinery or environment you are measuring is within a limited range, you may want to exit autoranging mode (the meter’s default setting) and manually enter and use a specific measurement range.

1. **To use a specific measurement range**, press the ▲ button (which has the word “Range” stenciled above it) once. The display will then show the first of the three range options: “30 – 80” (representing a full-scale range of 30 to 80 dB). Press the ▲ button again and the display will show the second option: “50 – 100”. Press the ▲ button again and the display will show the third option: “80 – 130”.

The shape of the “A” frequency weighting curve simulates the response of the human ear, and is therefore the better choice for measuring the sound level of an environment. By comparison, the “C” weighting curve is flatter, and is therefore better for measuring the sound level of a piece of machinery.

2. **To switch from “A” frequency weighting (the meter’s default setting) to “C” weighting**, press the ▼ button (which has the term “A/C” stenciled above it). The letter “A” at the upper left of the display will change to “C”. To return to “A” weighting, press the ▼ button again.

The third sound measurement parameter you can change is the meter’s response time. Fast time weighting, with a response time of 200 ms, simulates the response time of the human ear and is better for measuring the volume of singular events. Slow weighting, with a response time of 500 ms, is a better choice when you wish to measure the average sound level that an ongoing process (such as the vibration of a machine) produces over time.

3. To switch from fast time weighting (the meter's default setting) to slow time weighting, press the **SET** button, which has the term “Fast/slow” stenciled below it.

Once you have set these three parameters (or kept the meter's default settings), you are ready to make sound level measurements.

4. To make a sound level measurement, point the condenser microphone at the top of the meter in the direction of the sound source. The display will show its volume, in dB units.

Whenever the meter is in measurement mode, you can turn off the backlight (which is on by default) by briefly pressing (but not holding) the **POWER/ESC** button. To reactivate the backlight, briefly press the button again.

Whenever the meter is in measurement mode, you can also check the current date and time by pressing and holding the **▲** button (which has the words “Time check” stenciled below it). Doing so causes the date and time settings to appear briefly in that order at the lower left of the display.

HOLDING AND STORING MEASUREMENTS

1. To hold a measured value, press the **HOLD/NEXT** button during the measurement.

Doing so will cause the word “HOLD” to appear at the top of the display. Pressing the **HOLD/NEXT** button again releases the hold.

2. To hold a maximum reading, press the **LOGGER** button (which has the words “Peak Hold” stenciled below it) while *not* in recording mode. The word “PEAK” will appear on the top line of the display. To release the hold, press the **LOGGER** button again.

3. To record and recall readings, press the **REC/ENTER** button while making measurements. This will make the term “REC” appear at the top of the display. Pressing the **REC/ENTER** button again, briefly, will make the term “MAX” appear to the right of “REC” and switch the display to the maximum value stored in memory during the current recording session. Pressing the **REC/ENTER** button again, briefly, changes the term at the right of “REC” to “MIN” and switches the display to the minimum value stored during the current session.

4. To exit recording mode, press the **REC/ENTER** button and hold it for at least three seconds, until the term “REC” disappears from the top line of the display. The display will then revert to showing real-time readings.

AUTOMATIC VS. MANUAL DATA LOGGING

The DSM403SD can automatically log data at a user-selected sampling period from 1 second to 3,600 seconds (one hour). To view the sampling time that the instrument has been set up to use, press and hold the **▼** button (which has the words “Sampling check” stenciled below it) once. The lower readout of the display will briefly show the term “SP-t”, followed by the sampling time in seconds. To change the sampling time, perform Step 7 of the Setup Instructions.

Before entering data logging mode, remember to disable the meter's Auto Power Off function. To do so, enter Setup mode (as explained in the Setup Instructions on pages 5 and 6) and select “no” during Step 5.

Also be sure that the meter either is running on fresh batteries or is being powered by AC through a 9VDC adapter.

- 1. To start automatic data logging**, press the **REC/ENTER** button once. The top line of the display will show the term “REC”. Pressing the **LOGGER** button at this point will make “REC” flash and add the flashing term “LOGGER” at the top right of the display. This indicates that the instrument is sampling measurements at the programmed rate and storing the readings and their time stamps in memory.
- 2. To pause automatic data logging**, press the **LOGGER** button once; this will make the flashing term “LOGGER” disappear from the top right of the display and change the term “REC” from flashing to constant. Pressing the **LOGGER** button again resumes automatic data logging.
- 3. To end automatic data logging**, press the **REC/ENTER** button and hold it for at least two seconds. This will cause “REC” to disappear from the top line of the display.
- 4. To log data manually**, set the sampling time to zero using Step 7 of the Setup Instructions. Then press the **REC/ENTER** button once. The display will show the term “REC” on the top line, a value in the middle, and below it the letter “P” on the left and a number from 1 to 99 on the same line to the right. The number indicates the position on the SD card that will be used to store manually logged data.

Now press the **LOGGER** button. This will cause the term “LOGGER” to briefly appear at the upper right of the display. As in automatic data logging mode, in this mode the instrument is storing measurements and their time stamps on the SD card.

In manual data logging mode, however, measurements are being stored continuously (with a sampling time of zero), and their locations on the card can be changed.

- 5. To change the storage location** of manually logged data, press the **SET** button once; this will cause the “P” to disappear from the left side of the display and the value on its line to begin flashing. Once the flashing begins, you can use the ▼ and ▲ buttons to change the flashing value to any number between 1 and 99. Once you have chosen the storage location, press the **REC/ENTER** button to save the setting. This will cause the value to stop flashing and the “P” to return.
- 6. To end manual data logging**, press the **REC/ENTER** button and hold it for at least three seconds. This action will cause “REC” to disappear from the top line of the display.

TRANSFERRING DATA FROM THE SD CARD TO A COMPUTER

After automatic or manual data logging of measurements, remove the SD card from the meter and plug it into your computer either directly (if it has an SD card slot) or through an SD card reader.

Because the files containing time-stamped data logs have the file extension .xls, they open in Microsoft’s Excel application. Figures 2 and 3 show two kinds of Excel presentations: a data-only screen and a graphics-only screen.

	A1				Place
	A	B	C	D	E
1	Place	Date	Time	Value	Unit
2	1	2009/10/16	16:47:05	60.8	dB
3	2	2009/10/16	16:47:07	66.9	dB
4	3	2009/10/16	16:47:09	68.8	dB
5	4	2009/10/16	16:47:11	71	dB
6	5	2009/10/16	16:47:13	82.3	dB
7	6	2009/10/16	16:47:15	92.3	dB
8	7	2009/10/16	16:47:17	93.1	dB
9	8	2009/10/16	16:47:19	93.1	dB
10	9	2009/10/16	16:47:21	89.8	dB
11	10	2009/10/16	16:47:23	90.2	dB
12	11	2009/10/16	16:47:25	89.9	dB
13	12	2009/10/16	16:47:27	93.2	dB
14	13	2009/10/16	16:47:29	90.7	dB
15	14	2009/10/16	16:47:31	82	dB
16	15	2009/10/16	16:47:33	86.2	dB

Fig. 2. Typical Excel data-only screen

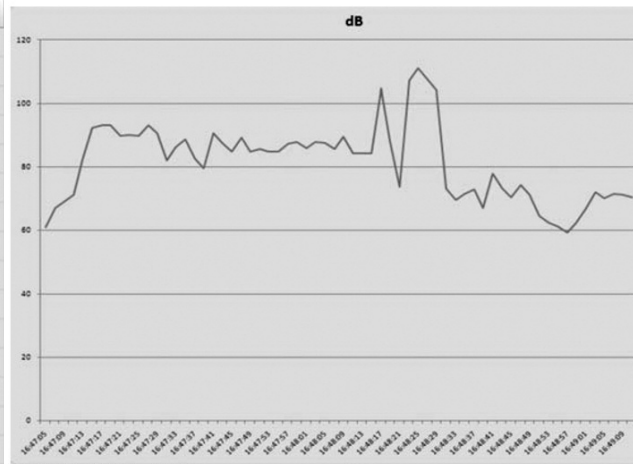


Fig. 3. Typical Excel graphics-only screen

SPECIFICATIONS

Display type	LCD with green backlight
Display size	2.05 x 1.5 in. (52 x 38mm)
Parameter measured	dB
Frequency range	31.5 Hz to 16 kHz
Measurement range	30 to 130 dB in autoranging mode; user can also select fixed range of 30 to 80 dB, 50 to 100 dB, or 80 to 130 dB
Measurement weighting	By frequency and time, using Class 1 IEC 61672 standard; frequency weighting uses "A" or "C" standard; time weighting is fast or slow (200 ms or 500 ms response time)
Measurement accuracy	With "A" frequency weighting: ± 2.0 dB @ 31.5 Hz, 1.5 dB @ 63 Hz, 1.5 dB @ 125 Hz, 1.4 dB @ 250 Hz, 1.4 dB @ 500 Hz, 1.1 dB @ 1 kHz, 1.6 dB @ 2 kHz, 1.6 dB @ 4 kHz, +2.1 dB and -3.1dB @ 8 kHz; +3.0 dB and -6.0 dB @ 12.5 kHz, +3.5 dB and -17.0 dB @ 16 kHz
Measurement resolution	0.1 dB
Sampling time options	0, 1, 2, 5, 10, 30, 60, 120, 300, 600, 1800 or 3600 seconds
Settable parameters	Date, time, auto power off, beep sound, sampling time, decimal point or comma decimal division, "A" or "C" frequency weighting, fast or slow time weighting
Storable readings	Maximum, minimum, peak
AC output	0 to 0.5Vrms full-scale in all three manual measurement ranges
AC output impedance	600 ohms
SD card capacity	1 GB to 16 GB

Operating temperature	32° to 122°F (0° to 50°C)
Operating relative humidity	0 to 85%
Power source	6 “AA” batteries or optional 9-VDC AC adapter
Dimensions of meter	9.65 x 2.68 x 1.77 in. (245 x 68 x 45mm)
Weight of meter	1.08 lb. (489g)

MAINTENANCE TIPS

When the icon  appears in the left corner of the display, it's time to replace the six “AA” batteries that power the instrument (although measurements will remain valid for several hours after the low-battery indicator first appears). Replacing the batteries requires removing the two screws that secure the battery compartment cover as explained in Step 1 of the Setup Instructions. After inserting fresh batteries in the correct orientation, tighten the screws to secure the cover.

Remove the batteries when storing the meter for an extended period of time.

Do not drop or disassemble the meter or immerse it in water.

OPTIONAL ACCESSORIES

- SCAL1356 Sound Level Calibrator
- AC1 9VDC Adapter for 110VAC Power Supply

WARRANTY INFORMATION

General Tools & Instruments' (General's) DSM403SD Class 1 Sound Level Meter with Excel-formatted Data Logging SD Card is warranted to the original purchaser to be free from defects in material and workmanship for a period of one year.. Subject to certain restrictions, General will repair or replace this instrument if, after examination, the company determines it to be defective in material or workmanship.

This warranty does not apply to damages that General determines to be from an attempted repair by non-authorized personnel or misuse, alterations, normal wear and tear, or accidental damage. The defective unit must be returned to General Tools & Instruments or to a General-authorized service center, freight prepaid and insured.

Acceptance of the exclusive repair and replacement remedies described herein is a condition of the contract for purchase of this product. In no event shall General be liable for any incidental, special, consequential or punitive damages, or for any cost, attorneys' fees, expenses, or losses alleged to be a consequence of any damage due to failure of, or defect in any product including, but not limited to, any claims for loss of profits.



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