

User's Manual

**EXTECH**<sup>®</sup>  
INSTRUMENTS

A FLIR COMPANY

# Datalogging Sound Level Meter

Model 407764



## ***Introduction***

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Congratulations on your purchase of Extech's Datalogging Sound Level Meter. The meter is capable of performing all your noise measurements needs in addition to it's capabilities for data acquisition (direct data storage to a PC) or datalogging (data storage to internal memory for later download). Data storage enables the user to save data, analyze data and generate reports. This professional meter, with proper care, will provide years of safe reliable service.

### **Safety symbols**



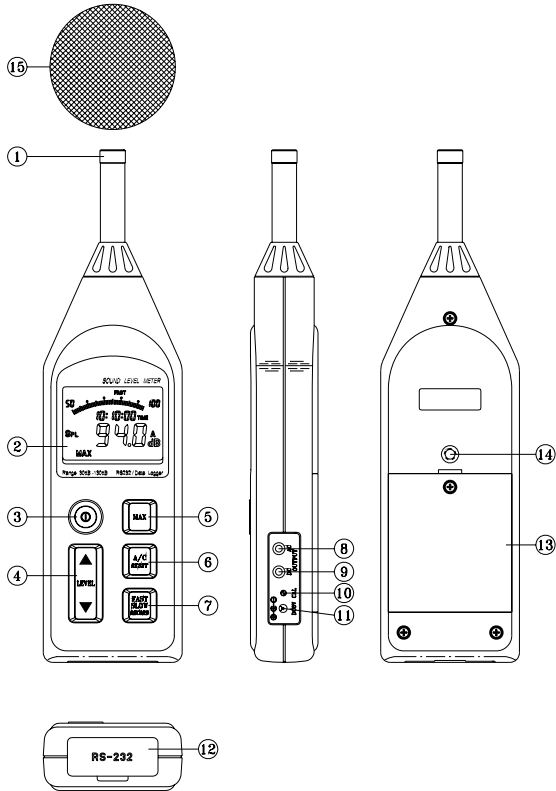
Meter is protected throughout by double insulation or reinforced insulation.



Complies with EMC

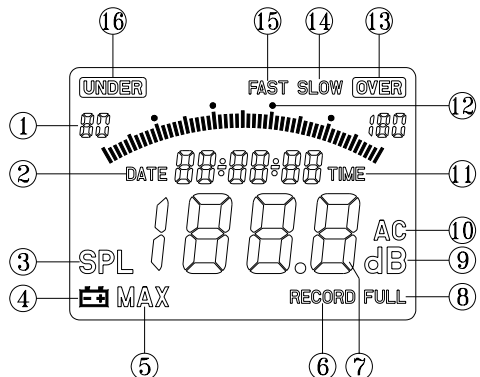
## Meter Description

1. Microphone
2. Display
3. Power switch
4. Level range control switch
5. MAX switch
6. Frequency weighting switch
7. Response time select switch
8. AC output terminal
9. DC output terminal
10. CAL (calibration) pot.
11. External DC 6V power
12. RS-232 interface connector
13. Battery cover
14. Tripod mounting screw
15. Wind-screen



## Display Description

1. Range selection
2. Date information
3. SPL: Instantaneous sound pressure level
4. Low-Battery
5. MAX: Maximum SPL value is held
6. Data recording
7. Measurement value
8. Memory full
9. Units
10. Frequency weighting (A/C)
11. TIME function
12. 50dB level (Bargraph)
13. Over range
14. SLOW time response
15. FAST time response
16. Under range



## Measurement Preparation


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- Read the following safety information before attempting to operate the meter
- Use the meter only as specified or the meter's built-in protection may be impaired.

### Maintenance & Cleaning

- Service not covered in this manual should be performed by qualified personnel
- Periodically wipe the case with a dry cloth. Do not use abrasives or solvents.

### Battery Replacement

When the battery voltage drops to a critical level, the  symbol appears on the LCD. Replace batteries as soon as possible after the battery symbol appears. The batteries (4 AA) are located in the rear battery compartment. Remove the single Philips head screw (center rear) for access to the batteries.



You, as the end user, are legally bound (**EU Battery ordinance**) to return all used batteries, **disposal in the household garbage is prohibited!** You can hand over your used batteries / accumulators at collection points in your community or wherever batteries / accumulators are sold!

**Disposal:** Follow the valid legal stipulations in respect of the disposal of the device at the end of its lifecycle

## Measurements

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### Default Configuration

1. The meter's default configuration is as follows: 40 to 90dB, 'A' Frequency Weighting, and 'FAST' Response Time
2. The LCD will reflect the meter's configuration.

### Measurement Considerations

1. Use a windscreen to cover the microphone in windy conditions.
2. Calibrate the meter often, especially if the meter has not been used for a long time.
3. Do not store/operate the meter in high temperature/humidity for long periods of time.
4. Keep the meter and the microphone dry.
5. Avoid severe vibration when using the meter.
6. Remove the battery when the meter will be stored for long periods of time.

### Frequency Weighting

Change the Frequency Weighting by pressing the 'A/C' button. The 'A' or 'C' icon will display on the right-hand area of the LCD.

Note: With 'A' weighting selected, the meter responds like the human ear (boosting and cutting the noise amplitude over the frequency spectrum - see Appendix). 'A' weighting is used for environmental measurements, OSHA regulatory testing, law enforcement, and workplace design. Select 'C' weighting for flat response measurements (no boost or cut). 'C' weighting is suitable for the sound level analysis of machines, engines, etc. Most OSHA related testing is performed using 'A' Weighting and SLOW Response Time settings.

### Response Time

Change the Response Time by pressing the 'FAST/SLOW' button. The 'FAST' or 'SLOW' icon will display on the upper area of the LCD.

**Note:** Select FAST to capture noise peaks and noises that occur very quickly. In FAST mode, the meter responds in 200ms. Select the SLOW Mode (meter responds in 500ms) to monitor a sound source that has a reasonably consistent noise level or to average quickly changing levels. Selection of Fast or Slow is determined by the application and any directives or standards related to that application.

### Auto/Manual Range

Press the LEVEL button up arrow to scroll through the following ranges: 30-80dB, 40-90, 50-100dB, 60-110, 70-120, 80-130 and 30-130dB (auto). The display will reflect the range for each button press.

Notes: Use Auto Range when the noise source is relatively steady. Use one of the Manual ranges may be required if the dB levels are changing over a wide range.

## Operation

1. Power the meter and select the desired Response Time (Fast or Slow) and Frequency Weighting (A or C).
2. Select the desired range.
3. Hold the instrument comfortably in hand or position on tripod. Point the microphone toward the noise source, the sound pressure level will be displayed on the meter's LCD display.
4. When MAX (maximum hold) mode is selected by pressing the MAX key, the instrument captures and holds the maximum noise level reading on the display. Press the MAX key again to clear the MAX reading.

## Calibration

Note that a Sound Level Calibrator is required. Set up the meter as listed in Step 1 below. To calibrate the meter;

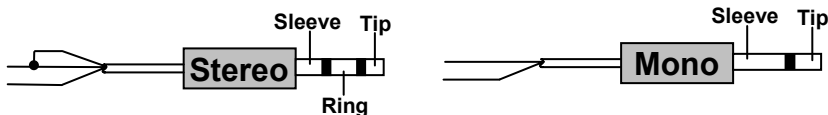
1. Display: SPL (dBA)  
Response Time: FAST  
Disable the MAX function  
Range: 70 to 120dB.
2. Insert the microphone carefully into the sound level calibrator.
3. Power the calibrator and adjust the Sound Level Meter's CAL potentiometer (as shown in figure at right) to match the Calibrator's output.
4. Typically, a Sound Level Calibrator will supply 94dB or 114dB at 1KHz. Adjust the Sound Level Meter's CAL potentiometer for a 94dB or 114dB LCD display



## Analog output

The 407764 has two analog output jacks located on its right side; one for AC and one for DC. For DC, the meter transmits 10mv / dB. For AC the full scale value is 0.707V. The output impedance is 600Ω for AC and 100Ω for DC.

The supplied 3.5mm stereo mini-plug can be used to assemble a cable to connect to either of the meter's analog output jacks. When using a stereo plug, like the one supplied, short the Tip and the Ring (see diagram below). Ground (negative) connects to the Sleeve while the positive signal is taken from the Tip/Ring. For mono plugs, ground connects to the Sleeve while the positive signal is taken from the Tip. The meter output can then be transmitted to a chart recorder, datalogger, or other data storage device.



## Data Logging

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The internal memory of the meter can store up to 128,000 readings in up to 255 recording sessions (called sets). Prior to beginning data storage, the meter's real time clock and the datalogger's sample rate must be set using the supplied software. The clock is set in the Control Panel window and the sample rate is set in the Logger window.

1. Set the real time clock (if required).
2. Set the sample rate (if required).
3. To record data, press & hold the RECORD key for 3 seconds until the "RECORD" symbol flashes once per second on the LCD. Press the Record key again to stop recording data.
4. If the recording memory is full, the "FULL" symbol will appear on the LCD.
5. To clear the recording memory press and hold the RESET key and power the meter. The LCD will show the "dEL" icon letting the user know that the datalog memory has been cleared.
6. To Download or Record data via a PC refer to the PC Interface section below.

## PC Interface

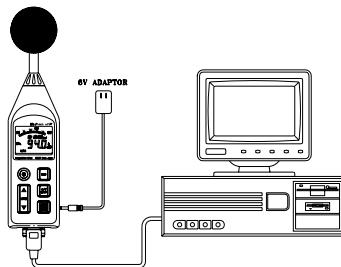
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### Connecting the Meter to a PC

Refer to Figure 5. Connect the 9-pin male connector to the Sound Level Meter, and connect the 9-pin female connector to the 9-pin COM1 PC port.

### PC Requirements

- 486 IBM compatible PC or better
- One 3.5" high density disk drive
- Available serial port.
- 4M Bytes H.D. storage space
- EGA or VGA monitor
- Windows 95, 98, 2000, NT, XP Operating System
- 3-button or 2-button Microsoft compatible mouse. At least a 486 PC is recommended for displaying all software windows with a fast sampling rate (such as 1 second). If a 386/25 PC is used, you can only open one window (LIST, GRAPH, ANALOG) at a time when using fast sampling rates.

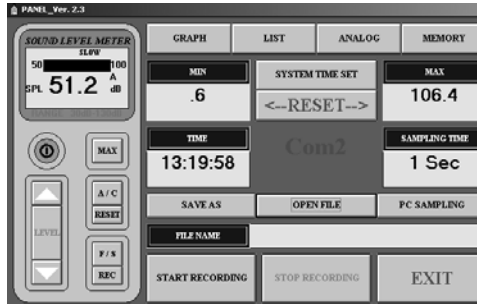


### Installing the Windows Application Program

Follow the instructions on the disk for installation. When installing the software, please use the Visual Basic version (VB) on installation CD.

# Software Control Panel Description

## The Control Panel



### METER SIMULATION

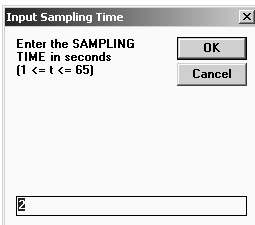
The left side of the Control Panel window provides a replica of the meter's front panel and display.

- MAX:** Hold and update maximum value
- A/C** A/C weighting selection
- RESET** Reboot and clear the data memory
- F/S** Fast/Slow selection
- REC** Enable datalogging
- LEVEL** Set range

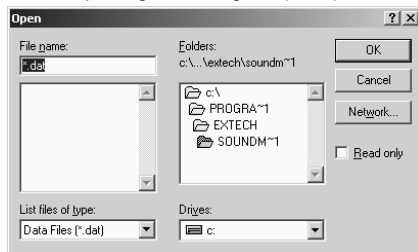
### DATA ACQUISITION CONTROLS and DISPLAYS

- MIN:** Displays the minimum value recorded
- MAX:** Displays the maximum value recorded
- TIME:** Displays the Real Time Clock Setting
- SAMPLING TIME** Display of data acquisition sampling rate (Fig 7)
- PC SAMPLING:** Opens data acquisition sampling rate selection box. (Datalogging sample rate is set in the MEMORY "Logger" window)
- <--RESET-->:** Resets the MIN and MAX stored readings
- SYSTEM TIME SET:** Sets the meter's clock to the value of the pc clock
- SAVE AS:** Opens the data file storage window (\*.dat)
- OPEN FILE:** Opens the data file retrieve window (\*.dat) (Fig.8)
- FILE NAME:** Displays name and location of data acquisition file
- START RECORDING:** After opening a file, click to start recording.
- STOP RECORDING:** Stop recording and close the file
- EXIT** Close program

Selecting the datalog sample rate

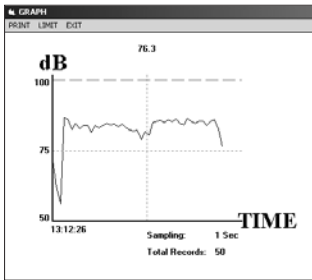


Opening a datalog file (\*.dat)



## DISPLAY SELECTIONS

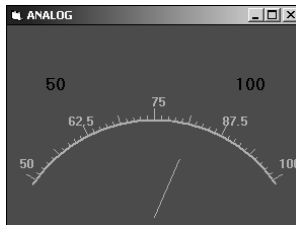
### GRAPH



### LIST

Date	Time	Value	Type	Bat	Range	D / U
09-10-2001	14:01:59	86.3	A		50-100	
09-10-2001	14:02:00	83.9	A		50-100	
09-10-2001	14:02:01	84.7	A		50-100	
09-10-2001	14:02:02	84.7	A		50-100	
09-10-2001	14:02:03	84.7	A		50-100	
09-10-2001	14:02:04	84.6	A		50-100	
09-10-2001	14:02:05	85.2	A		50-100	OVER
09-10-2001	14:02:06	84.4	A		50-100	
09-10-2001	14:02:07	85.6	A		50-100	
09-10-2001	14:02:08	84.9	A		50-100	
09-10-2001	14:02:09	83.8	A		50-100	
09-10-2001	14:02:10	82.7	A		50-100	
09-10-2001	14:02:11	83.5	A		50-100	OVER
09-10-2001	14:02:12	84.2	A		50-100	OVER
09-10-2001	14:02:13	86.2	A		50-100	OVER
09-10-2001	14:02:14	83.5	A		50-100	

### ANALOG



## Logger Window (memory setup/ data download)

The Logger window sets the sample rate of the meter's internal memory and provides the controls to download display and save stored data.

- MEMORY** Displays memory size
- REMAINING** Displays amount of unused memory
- TIME OF METER** When clicked, downloads and displays the meter's date and time
- ID CODE** Numeric Identification code. Enter the code in the box and click on the bar to store the code.
- SAMPLING** Datalogger sample rate. Enter the sample rate in the box (in seconds) and click on the SAMPLING bar to store the value.
- NUMBER OF SETS** Click on the bar to download the stored data
- TIME OF RECORDING** Click on the bar to display sets downloaded. Click on a set to select data for display
- NUMBERS OF REC** Displays the number of records (data points) in the selected set.
- SHOW DATA** Display, Save or Graph data from selected set

SET	DATE-----TIME
1	12/07/05----12:19:09
2	12/07/05----12:20:33
3	12/07/05----12:27:05
4	12/07/05----12:42:03
5	12/07/05----14:58:50



## DATA DOWNLOAD PROCEDURE

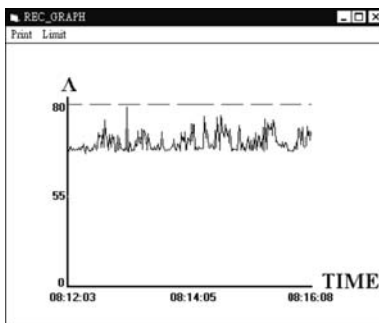
1. Click the **MEMORY** icon in the Control Panel screen.
2. Click the **NUMBERS OF SETS** button, the number of sets will appear.
3. Click on the **TIME OF RECORDING** button to view each recorded set.
4. Click on a **SET** in the **TIME OF RECORDING** box. The number of records in the set will appear and the data will be downloaded from meter to PC. Save to disk if desired.
5. Click the **SHOW DATA** button for details on each record. Figure 13 shows the data list. Select **SAVE**, **PRINT**, **GRAPH**, or **EXIT** from the menu choices.

Note: In the example for Figure 12, there are 3 sets of recorded data in memory. Set No. 3 has 15 records. Note: If you need to change the **ID CODE** or the **SAMPLING** time, click on the desired parameter, type the changes and click on the bar.

List of datalogged set

REC	DATE	TIME	VALUE	A/C	BAT	RANGE	O/U
233	99-04-09	08:15:55	69.2	A		40-90	
234	99-04-09	08:15:56	69.3	A		40-90	
235	99-04-09	08:15:57	68.2	A		40-90	
236	99-04-09	08:15:58	62.2	A		40-90	
237	99-04-09	08:15:59	63.9	A		40-90	
238	99-04-09	08:16:00	61.7	A		40-90	
239	99-04-09	08:16:01	60.9	A		40-90	
240	99-04-09	08:16:02	61.5	A		40-90	
241	99-04-09	08:16:03	62.2	A		40-90	
242	99-04-09	08:16:04	70.4	A		40-90	
243	99-04-09	08:16:05	66.3	A		40-90	
244	99-04-09	08:16:06	68.1	A		40-90	
245	99-04-09	08:16:07	64.4	A		40-90	

Graph of datalogged set



Selecting a range of datalogged records

## Specifications

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<b>Applicable Standards</b>	IEC651 Type 2, ANSI S1.4 Type 2
<b>Accuracy</b>	±1.5dB (under reference conditions)
<b>Frequency range</b>	31.5Hz - 8KHz
<b>Measuring level</b>	30 - 130dB
<b>Frequency weighting</b>	A and C
<b>Microphone</b>	0.5" Electret condenser microphone
<b>Display</b>	4-digit LCD Resolution: 0.1dB Display period: 0.5 sec.
<b>Bargraph</b>	50dB scale (1dB steps). Display period: 50mS; Auto-ranging: 100dB scale, 2dB steps
<b>Sampling rate</b>	50mS
<b>Memory size</b>	128,000 records / 255 sets (non-volatile memory)
<b>Datalogging sample rate</b>	1 to 86,400 seconds per record
<b>Time weighting</b>	FAST: 125mS, SLOW: 1 sec.
<b>MAX</b>	Maximum reading held
<b>Level ranges</b>	30-80dB, 40-90dB, 50-100dB, 60-110 dB, 70-120dB, 80-130dB (Total of 6 ranges)
<b>Auto range</b>	30 to 130dB
<b>Linearity range</b>	50dB
<b>Alarm function</b>	OVER indicator for readings higher than high limit. UNDER indicator for readings lower than low limit.
<b>AC output</b>	0.707 Vrms at Full Scale Output impedance approx. 600Ω
<b>DC output</b>	10mV / dB Output impedance approx. 100Ω
<b>Power supply</b>	Four 1.5V 'AA' batteries
<b>Battery life</b>	Approx. 30 hrs continuous operation
<b>AC adapter</b>	Voltage: 6VDC Voltage Ripple: < 100mVpp Supply Current: > 100mADC Socket: Pin Ground Casing: Positive External Diameter: 3.5mm
<b>Operating temperature</b>	0 to 40°C (32 to 104°F)
<b>Operating humidity</b>	10 to 80%RH
<b>Storage temperature</b>	-10 to 60°C (14 to 140°F)
<b>Storage humidity</b>	10 to 80%RH
<b>Memory size</b>	128,000 data records with Date and Time Stamping
<b>RS-232 Interface</b>	Baud rate: 9600bps
<b>Dimensions</b>	265 × 72 × 35mm (10.4 x 2.8 x 1.4")
<b>Weight</b>	Approx. 358g (11.5 oz) including battery
<b>Accessories</b>	Batteries, carrying case, screwdriver, windscreen, 3.5mm plug, RS-232 cable, Windows™ compatible software.

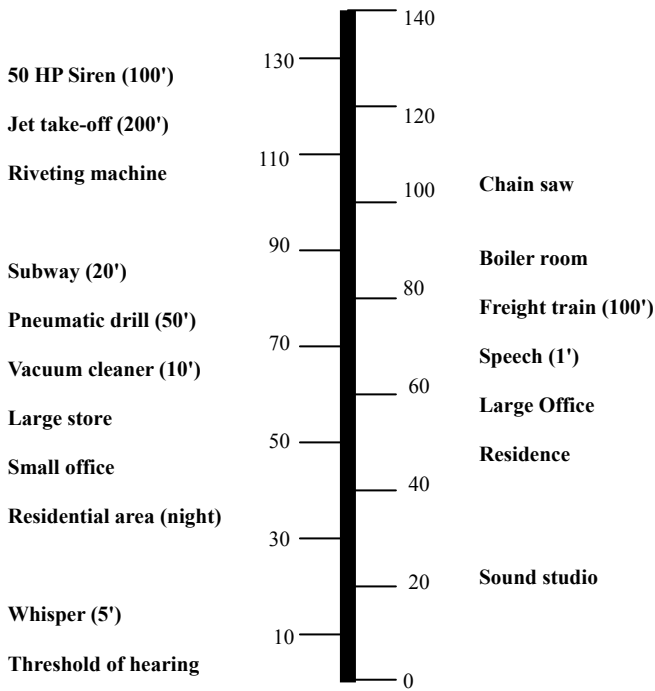
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## ***Appendix - Typical 'A' Weighted Sound Levels***

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## Software Protocol

### Data Protocol Baud rate: 9600bps

Byte1	Byte2	Byte3	Byte4	Byte5
02	Status	Function		03
Leading byte				Ending byte

#### Status Byte2

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	
0	Fast	C	Normal	Normal	Normal	0	0	0	30-80
1	Slow	A	Max	Full	Rec	0	0	1	40-90
						0	1	0	50-100
						0	1	1	60-110
						1	0	0	70-120
						1	0	1	80-130
						1	1	0	30-130
						1	1	1	

#### Function Byte3

	Bit7	Bit6	Bit5	Bit4 (x10 <sup>2</sup> )	Bit3-0 (x10)
0	Normal	Normal	Normal	00-19	
1	OVER	UNDER	BT		

#### Function Byte4

	Bit7-4 (x 10 <sup>0</sup> )	Bit3-0 (x10 <sup>-1</sup> )
0	00-99	
1		

## Command Protocol

### Set time and date - Send 7 bytes

D	YY	MM	dd	hh	mm	ss
leading byte	year	month	date	hour	min	sec

### Set sampling rate – Send 3 bytes

W	high byte	low byte
leading byte	1 – 65535 sec	

### Set ID code – Send 3 bytes

X	high byte	low byte
leading byte	1 – 65535	

### Get software version – Output “V” - Receive 1 byte (0 – 255)

### Get system argument – Output “Y” – Receive 10 bytes

ID Code	Version	ID code	Data sets	Last address	Sample rate
2bytes	1 byte	1 byte	1 byte	3 bytes	2 bytes

### Get time and date – Output “C” - Receive 6 bytes (YY+MM+dd+hh+mm+ss)

### Receive 6 bytes (Sets+YY+MM+dd+hh+mm+ss+Status+Sample rate+Records)

### Get Record – Output “K”+N records”

Receive (YY+MM+dd+hh+mm+ss+Status+Sampling rate+Records+1<sup>st</sup> record+2<sup>nd</sup> record+...+nth record)

Erase Command: “EEE” (3 bytes)

Switch Fast/Slow: “F” (1 byte)

Switch A/C: “A” (1 byte)

Switch range: “U” (up), “P” (down) (1 byte)

Set MAX spl; “M” (1 byte)

Stop Recording: “T” (1 byte)

Start Recording: “S” (1 byte)