

***SD card real time data recorder***

***4 - 20 mA output***

# **SOUND LEVEL DATA RECORDER**

**Model : MSL-388SD**



Your purchase of this SOUND LEVEL DATA RECORDER with 4 - 20 mA output, marks a step forward for you into the field of precision measurement. Although this meter a complex and delicate instrument, its durable structure will allow many years of use if proper operating techniques are developed. Please read the following instructions carefully and always keep this manual within easy reach.



## **OPERATION MANUAL**

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# 1. FEATURES

- \* Frequency and Time weighting are designed to meet IEC 61672 class 2.
- \* A & C weighting networks comply with standards.
- \* LCD is dot-matrix with backlight and easy reading.
- \* Data-logger and Sound level meter.
- \* 0.5" standard microphone head.
- \* Time weighting (Fast & Slow) dynamic characteristic modes.
- \* Condenser microphone for high accuracy & long-term stability.
- \* Memory function to store the Max. & Min. value.
- \* Hold functions.
- \* Peak Hold functions.
- \* Real time Datalogger.
- \* Records device of an external.  
memory device (SD memory card ) ,Real time Datalogger, it Built-in Clock and Calendar, real time data recorder, sampling time set from 5,10,30,60,120,300,600,1800,3600 seconds.
- \* Innovation and easy operation, computer is not need to setup extra software, after execute datalogger, just take away the SD card from the meter and plug in the SD card into the computer, it can download the all the measured value with the time information ( year/month/date/ hour/minute/second ) to the Excel directly, then user can make the further data or graphic analysis by themselves.
- \* SD card capacity : 1 GB to 16 GB.
- \* Can default auto power off or manual power off.
- \* 4-20 mA analog output.
- \* Microcomputer circuit, high accuracy.
- \* Power by UM4/AAA ( 1.5 V ) x 6 batteries or DC 9V adapter.
- \* RS232/USB PC COMPUTER interface.
- \* Heavy duty & compact housing case.

## 2. SPECIFICATIONS

Circuit	Custom one-chip of microprocessor LSI circuit.																											
Display	LCD size : 50 mm x 30 mm. LCD with backlight ( ON/OFF ).																											
Measurement Type	<b>SPL</b> : Sound pressure level.																											
Measurement Range	SPL : 30-80,50-100,80-130 , Auto ( 30 - 130 dB ).																											
Resolution	0.1 dB.																											
Function	dB ( A & C frequency weighting ), Time weighting ( Fast, Slow ), Data hold , Peak Hold , Record ( Max., Min. ).																											
4-20 mA output	Please refer chapter 4-9 ( page 9 ) Accuracy : $\pm (0.5 \% + 0.05 \text{ mA})$ ( $23 \pm 5 ^\circ \text{C}$ ) loop impedance : max. 200 ohm.																											
Accuracy ( $23 \pm 5 ^\circ \text{C}$ )	Characteristics of " A " frequency weighting network meet IEC 61672-1-2013, class 2. Under 94 dB input signal, the accuracy are : <table><tr><td>31.5</td><td>Hz</td><td>reading <math>\pm 3.0 \text{ dB}</math></td></tr><tr><td>63</td><td>Hz</td><td>reading <math>\pm 2.0 \text{ dB}</math></td></tr><tr><td>125</td><td>Hz</td><td>reading <math>\pm 1.5 \text{ dB}</math></td></tr><tr><td>250</td><td>Hz</td><td>reading <math>\pm 1.5 \text{ dB}</math></td></tr><tr><td>500</td><td>Hz</td><td>reading <math>\pm 1.5 \text{ dB}</math></td></tr><tr><td>1 K</td><td>Hz</td><td>reading <math>\pm 1.0 \text{ dB}</math></td></tr><tr><td>2 K</td><td>Hz</td><td>reading <math>\pm 2.0 \text{ dB}</math></td></tr><tr><td>4 K</td><td>Hz</td><td>reading <math>\pm 3.0 \text{ dB}</math></td></tr><tr><td>8 K</td><td>Hz</td><td>reading <math>\pm 5.0 \text{ dB}</math></td></tr></table> <p><i>Remark :</i> The above spec. are tested under the environment RF Field Strength less than 3 V/M &amp; frequency less than 30 MHz only.</p>	31.5	Hz	reading $\pm 3.0 \text{ dB}$	63	Hz	reading $\pm 2.0 \text{ dB}$	125	Hz	reading $\pm 1.5 \text{ dB}$	250	Hz	reading $\pm 1.5 \text{ dB}$	500	Hz	reading $\pm 1.5 \text{ dB}$	1 K	Hz	reading $\pm 1.0 \text{ dB}$	2 K	Hz	reading $\pm 2.0 \text{ dB}$	4 K	Hz	reading $\pm 3.0 \text{ dB}$	8 K	Hz	reading $\pm 5.0 \text{ dB}$
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8 K	Hz	reading $\pm 5.0 \text{ dB}$																										

Frequency Weighting Network	<p>Characteristics of A &amp; C.</p> <p>A weighting : The characteristic is simulated as "Human Ear Listing" response. Typical, if making the environmental sound level measurement, always select to A weighting.</p> <p>C weighting The characteristic is near the "FLAT" response. Typical, it is suitable for checking the noise of machinery (Q.C. check) &amp; knowing the sound pressure level of the tested equipment.</p>
Time weighting (Fast & Slow)	<p>Fast - <math>t = 125 \text{ ms}</math> * "Fast" range is simulated the human ear response time weighting.</p> <p>Slow - <math>t = 1 \text{ s}</math> * "Slow" range is easy to get the average values of vibration sound level.</p>
Peak hold	To keep the Peak(max.) measurement value.
Function selector SPL	<p>range : 30-80dB, 50-100dB, 80-130dB</p> <p>Auto range : 30~130dB.</p>
Frequency	31.5 to 8,000 Hz.
Microphone type	Electric condenser microphone.
Microphone size	Out size, 12.7 mm DIA. ( 1/2 inch).

Calibration	Build in external calibration(key), easy to calibrate on 94 dB level by Key Adjustment. * Calibrated via external SOUND CALIBRATOR ( SC-942, optional ).	
Calibrator	B & K (Bruel & kjaer), MULTIFUNCTION ACOUSTIC CALIBRATOR Type 4226.	
Datalogger Sampling Time Setting range	Auto	5,10,30,60,120,300,600,1800, 3600 seconds.
Memory device	external memory device : SD memory card. 1 GB to 16 GB.	
Data error no.	$\leq 0.1\%$ no. of total saved data typically.	
Advanced setting	<ul style="list-style-type: none"> <li>* Set clock time ( Year/Month/Date,Hour/Minute/ Second ).</li> <li>* Set sampling time .</li> <li>* Auto power OFF management.</li> <li>* Set beep Sound ON/OFF.</li> <li>* Decimal point of SD card setting.</li> <li>* SD memory card Format.</li> </ul>	
Over Indication	Show " - - - - ".	
Data Hold	Freeze the display reading.	
Memory Recall	Maximum & Minimum value.	
Sampling Time of Display	Approx. 1 second.	
Data Output	RS 232/USB PC computer interface. * <i>Connect the optional RS232 cable UPCB-02 will get the RS232 plug.</i> * <i>Connect the optional USB cable USB-01 will get the USB plug.</i>	

Power off	Auto shut off within 10 minutes or manual off by push button. ( <b>If use DC 9V adapter input, Auto power off function will disable</b> ).
Operating Temperature	0 to 50 °C .
Operating Humidity	Less than 85% R.H.
Power Supply	* Alkaline or heavy duty DC 1.5 V battery ( UM4, AAA ) x 6 PCs, or equivalent.
	* DC 9V adapter input. ( AC/DC power adapter ).
Power Current	Normal operation ( w/o SD card save data and LCD Backlight is OFF ) : <i>Approx. DC 8.1 mA.</i>
	When SD card save the data but and LCD Backlight is off ) : consumption will increase <i>Approx. DC 22 ~ 34 mA.</i>
	<i>* If LCD backlight on, the power consumption will increase approx. DC 2.4 mA.</i>
Weight	230 g/ 0.51 LB. (without battery)
Dimension	132 x 80 x 32 mm. ( 5.2 x 3.1 x 1.3 inch ).
Accessories Included	* Instruction manual..... 1 PC * SKT-AS385..... 1 PC * Hanging unit (with sticker)..... 1 PC * Microphone with clip..... 1 PC * AC to DC 9V adapter..... 1 PC
Optional Accessories	* Sound calibrator ( 94 dB ), SC-941. * Sound calibrator ( 94/114 dB ), SC-942. * Sound wind shield ball, SB-01. * SD Card . * USB cable, USB-01. * RS232 cable, UPCB-02. * Data Acquisition software, SW-U801-WIN. * Excel data Acquisition software,SW-E802.

### 3. FRONT PANEL DESCRIPTION

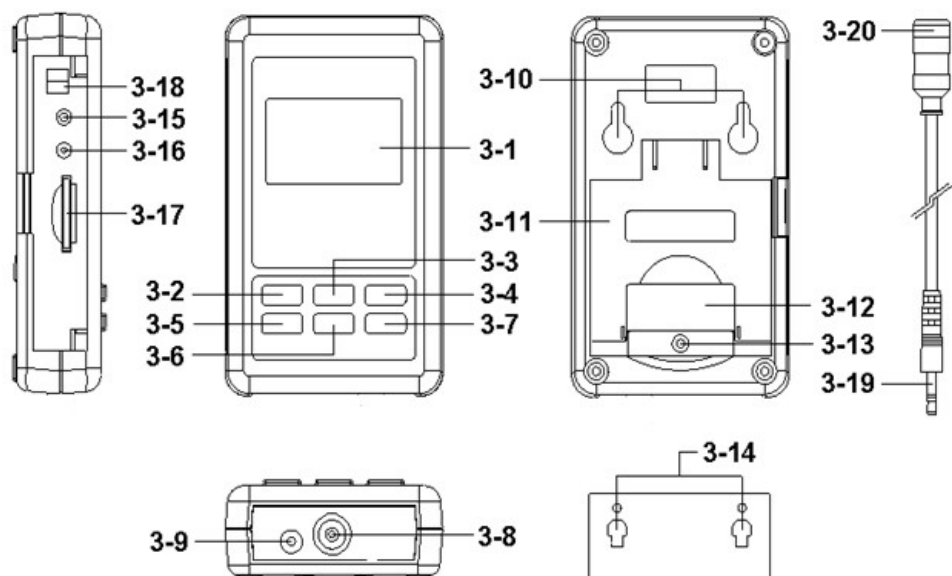


Fig. 1

- |  |   |
|--|---|
| 3-1 Display                            | 3-11 Stand                              |
| 3-2 Power Button( Backlight Button )   | 3-12 Battery cover/ Battery compartment |
| 3-3 ▲ Button ( Range )                 | 3-13 Screw of the battery cover         |
| 3-4 REC Button ( HOLD )                | 3-14 Hanging unit (with sticker)        |
| 3-5 TIME Button (Set)                  | 3-15 Reset Switch                       |
| 3-6 ▼ Button ( A/C ,Fast ,Slow, Peak ) | 3-16 RS232 Output                       |
| 3-7 ENTER Button (Log)                 | 3-17 SD card socket                     |
| 3-8 Microphone input jack              | 3-18 4-20 mA Output Terminal            |
| 3-9 DC 9V adapter socket               | 3-19 Microphone plug                    |
| 3-10 Hanging holes                     | 3-20 Microphone                         |



## 4. MEASURING PROCEDURE

### 4-1 Sound Pressure Measurements (SPL)

In SPL mode the display shows readings of the sound pressure level.

- 1) Power ON the meter by pressing and holding the " Power Button " ( 3-2, Fig. 1 )for at least 1.5 seconds, the meter's default function is " A"( frequency weighting) , " Fast"( time weighting) " Auto range ". The LCD display will show the Symbol " A, FAST , xx.x dB ".

### 4-2 Sound Pressure Measurements Range select

Use the " ▲ Button " ( 3-3, Fig. 1 ) to select the Sound Measurement Range shown (AUTO , 30 - 80 , 50 - 100 , 80 - 130 ,AUTO) reading in the center of the range. If dashes appear on the display select a new range , After power on the default range is " Auto range " In the same time the LCD display will show the text of " AUTO " Under the auto range.

### 4-3 Sound Frequency weighting select

How to select the frequency weighting ( A or C), by pressing and holding the " ▼ Button " ( 3-6, Fig. 1 ) for at least 2 seconds to select A or C Frequency weighting .

*Note :*

- a. *The characteristic of A weighting is simulated as the " Human Ear Listening " response. Typically always select the A weighting when makes environmental sound level measurement.*
- b. *The C weighting characteristic is near the " FLAT " response. Typically it is suitable for checking the noise of machinery ( Q.C. check ) & knowing the real sound level of the tested equipment.*

#### **4-4 Sound Time Weighting select**

According to various measuring sound source, by pressing the "▼ ( Time Weighting) Button " ( 3-6, Fig. 1 ) once to select the Time Weighting ( Fast or Slow or PEAK Fast ) .

*Note :*

- a. If select the function of " Fast " time weighting, the display will show the unit of " FAST".*
- b. If select the function of " Slow " time weighting, the display will show the unit of " SLOW ".*
- c. If select the function of " PEAK " time weighting, the display will show the unit of " PEAK and FAST " text.*

#### **4-5 Data Hold**

During the SPL measurement, pressing and holding the " HOLD Button " ( 3-4, Fig. 1 ) for at least 2 seconds will hold the measured value & the LCD will display a " HOLD " symbol. pressing and holding the " Hold Button " for at least 2 seconds again will leave the data hold function.

#### **4-6 Data Record ( Max., Min. reading )**

- 1) The data record function records the maximum and minimum readings. Press the " REC Button " ( 3-4, Fig.1 ) once to start the Data Record function and display is shown the " REC " symbol .
- 2) With the " REC " symbol on the display :
  - a) Press the " REC Button " ( 3-4, Fig. 1 ) once, the " REC MAX " symbol along with the maximum value will appear on the display. Press the " REC Button" again the " REC MIN " symbol along with the minimum value will appear on the display. Press the " REC Button" again will show the " REC " symbol only & execute the memory function continuously.

- b) To exit the memory record function, just press the " REC " button > 2 seconds at least. The display will revert to the current reading.

#### **4-7 LCD Backlight ON/OFF**

After power ON, the " LCD Backlight " will light automatically. During the measurement, press the " POWER Button " ( 3-2, Fig. 1 ) once will turn off the " LCD Backlight ".

Press the " POWER Button " once again will turn ON the " LCD Backlight " again.

#### **4-8 Time check**

During the measurement, press the " Time Button " ( 3-5, Fig. 1 ) once display will show Year/Month/Date, Hour/Minute/Second and sampling time information.

#### **4-9 4-20 mA output**

Connect another mA meter into the SOUND LEVER DATA RECORDER ( 3-18 Fig1 4-20 mA Output Terminal) socket ,the recorder will be output 4-20 mA analog signal .

Note : Accuracy :  $\pm (0.5 \% + 0.05\text{mA}) ( 23 \pm 5 ^\circ \text{C} )$

at 30 - 80 dB range (  $\leq 30 \text{ dB} = 4.00 \text{ mA out} , \geq 80 \text{ dB} = 20.00 \text{ mA out} )$

at 50 - 100 dB range (  $\leq 50 \text{ dB} = 4.00 \text{ mA out} , \geq 100 \text{ dB} = 20.00 \text{ mA out} )$

at 80 - 130 dB range (  $\leq 80 \text{ dB} = 4.00 \text{ mA out} , \geq 130 \text{ dB} = 20.00 \text{ mA out} )$

at Auto range (  $\leq 30 \text{ dB} = 4.00 \text{ mA out} , \geq 130 \text{ dB} = 20.00 \text{ mA out} )$

#### **Remark:**

- \* When power use AC to DC adapter, the 4-20 mA will output.

## 5. DATALOGGER

### 5-1 Preparation before execute datalogger function

a. Insert the SD card

Prepare a " SD memory card " ( 1 GB to 16 GB, optional ), insert the SD card into the " SD card socket " ( 3-17, Fig. 1). The front panel of the SD card should face against the left side plastic case.

b. SD card Format (Suggest using AC to DC Adapter)

If SD card just the first time use into the meter, it recommend to make the " SD card Format " at first. , please refer chapter 7-6 ( page 18 ).

c. Time setting

If the meter is used at first time, it should to adjust the clock time exactly, please refer chapter 7-1 ( page 15 ).

d. Decimal format setting



The numerical data structure of SD card is default used the " . " as the decimal, for example "20.6" "1000.53" . But in certain countries ( Europe ... ) is used the " , " as the decimal point, for example " 20, 6 " "1000,53". Under such situation, it should change the Decimal character at first, details of setting the Decimal point, refer to Chapter 7-5, page 17.

### 5-2 Auto Datalogger ( Set sampling time $\geq$ 5 seconds )

a. Start the datalogger

Pressing and holding the " ENTER Button ( 3-7, Fig. 1 ) > 2 seconds , display is shown " LOGGER " , the " LOGGER " will flashing

at the same time the measuring data along with the time information will be saved into the memory circuit.

*Remark :*

*How to set the sampling time, refer to Chapter 7-2, page 16.*

#### **b. Pause the datalogger**

During execute the Datalogger function , if press the " ENTER Button " ( 3-7, Fig. 1 ) once will pause the Datalogger function ( stop to save the measuring data into the memory circuit temporality ). In the same time the text of " LOGGER " will stop flashing.

*Remark :*

*If press the " ENTER Button " ( 3-7, Fig. 1 ) once again will execute the Datalogger again, the text of " LOGGER " will flashing .*

#### **c. Finish the Datalogger**

Press the " ENTER Button "( 3-7, Fig. 1) continuously at least two seconds, the " LOGGER " indicator will be disappeared and finish the Datalogger.

*Remark :*

***When the battery is under the low battery condition ( show the low battery indicator ), the Datalogger function is maybe disable.***

### **5-3 Check time and sampling time information**

During the measurement if press " TIME Button "  
( 3-5, Fig. 1 ) once, the LCD display will  
present the time and sampling time information of Year/Month/  
Date , Hour/ Minute/Second, and sampling time information  
in second unit.

### **5-4 SD Card Data structure**

- 1) When the first time, the SD card is used into the meter,  
the SD card will generate a folder :

#### **SLD01**

- 2) If the first time to execute the Datalogger,  
under the route SLD01\, will generate a new  
file name SLD01001.XLS.  
After exist the Datalogger, then execute again,  
the data will save to the SLD01001.XLS until  
Data column reach to 30,000 columns, then  
will generate a new file, for example SLD01002.XLS
- 3) Under the folder SLD01\, if the total files more  
than 99 files, will generate anew route, such as  
SLD02\ .....

- 4) The file's route structure :

```
SLD01\  
    SLD01001.XLS  
    SLD01002.XLS  
  
    .....  
    SLD01099.XLS  
SLD02\  
    SLD02001.XLS  
    SLD02002.XLS  
  
    .....  
    SLD02099.XLS  
SLDXX\  
    .....  
    .....
```

*Remark : XX : Max. value is 10.*

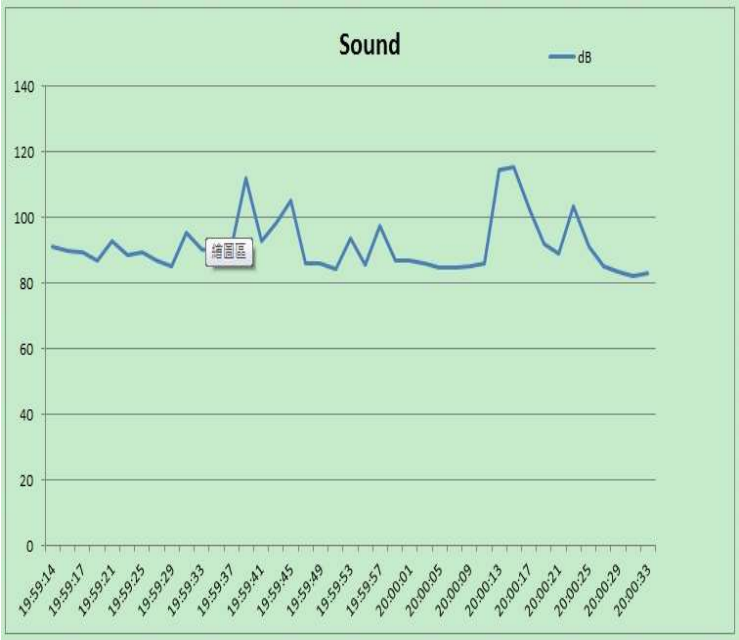
## 6. Saving data from the SD card to the computer ( EXCEL software )

- 1) After execute the Data Logger function, take away the SD card out from the " SD card socket " ( 3-17, Fig. 1 ).
- 2) Plug in the SD card into the Computer's SD card slot ( if your computer build in this installation ) or insert the SD card into the " SD card adapter ". then connect the " SD card adapter " into the computer.
- 3) Power ON the computer and run the " EXCEL software ".  
Down load the saving data file ( for example the file name : SLD01001.XLS, SLD01002.XLS ) from the SD card to the computer. The saving data will present into the EXCEL software screen ( for example as following EXCEL data screens ) , then user can use those EXCEL data to make the further Data or Graphic analysis usefully.

EXCEL data screen ( for example )

	A	B	C	D	E	F	G
1	Place	Date	Time	Value	Unit		
2	1	2016/9/22	11:32:12	53.5	dBA		
3	2	2016/9/22	11:32:17	53.8	dBA		
4	3	2016/9/22	11:32:22	60.5	dBA		
5	4	2016/9/22	11:32:27	56.5	dBA		
6	5	2016/9/22	11:32:32	56.5	dBA		
7	6	2016/9/22	11:32:37	56.2	dBA		
8	7	2016/9/22	11:32:42	53.5	dBA		
9	8	2016/9/22	11:32:47	76.3	dBA		
10	9	2016/9/22	11:32:52	77.4	dBA		
11	10	2016/9/22	11:32:57	54	dBA		
12	11	2016/9/22	11:33:02	52.4	dBA		
13	12	2016/9/22	11:33:07	52.9	dBA		
14	13	2016/9/22	11:33:12	52.9	dBA		
15	14	2016/9/22	11:33:17	55.9	dBA		
16	15	2016/9/22	11:33:22	56.8	dBA		
17	16	2016/9/22	11:33:27	53.5	dBA		
18	17	2016/9/22	11:33:32	52.6	dBA		
19	18	2016/9/22	11:33:37	59.5	dBA		
20	19	2016/9/22	11:33:42	57.7	dBA		
21	20	2016/9/22	11:33:47	58.5	dBA		

EXCEL graphic screen ( for example )





## 7. ADVANCED SETTING

Under do not execute the Datalogger function, press the " TIME Button " ( 3-5, Fig. 1 ) continuously at least 1.5 seconds will enter the " Advanced Setting " mode. then press the "TIME Button " (3-5, Fig. 1 ) once a while in sequence to select the six main function, the lower display will show :

- DATE.....** Set clock time ( Year/Month/Date, Hour/Minute/Second )
- SP-T.....** Set sampling time ( 5-3600 Seconds )
- POFF.....** Auto power OFF management
- BEEP.....** Set beeper sound ON/OFF
- DEC.....** Set SD card Decimal character
- SD- F.....** SD memory card Format ( DC 9V Adapter only )

***During execute the " Advanced Setting " function, if press " Enter Button " ( 3-7, Fig. 1 ) will into main function. if press " POWER Button " ( 3-2, Fig. 1 ) once will exit the " Advanced Setting " function, the LCD will return to normal screen.***

### **7-1 Set clock time ( Year/Month/Date, Hour/Minute/ Second )**

When the lower display show " DATE "
--------------------------------------

- 1) Use the " ▲ Button " ( 3-3, Fig. 1 ) or " ▼ Button " ( 3-6, Fig. 1 ) to adjust the value ( Setting start from Year value ). After the desired value is set, press the " Enter Button " ( 3-7, Fig. 1 ) once will going to next value adjustment ( for example, first setting value is Year then next to adjust Month, Date, Hour, Minute, Second value ).

- 2) After set all the time value ( Year, Month, Date, Hour, Minute, Second ), the screen will jump to " Set sampling time character " setting screen ( Chapter 7-2 ).

*Remark :*

*After the time value is setting, the internal clock will run precisely even Power is off ( The battery is under normal condition, no low battery condition ).*

## **7-2 Set sampling time ( seconds )**

When the lower display show " SP-T "
--------------------------------------

- 1) Use the " ▲ Button " ( 3-3, Fig. 1 ) or " ▼ Button " ( 3-6, Fig. 1 ) to adjust the value ( 5 ~ 3600 sec.)
- 2) After the Sampling value is selected, press the " ENTER Button " ( 3-7, Fig. 1 ) will save the setting function with default.

## **7-3 Auto power OFF management**

When the lower display show " POFF "
--------------------------------------

- 1) Use the " ▲ Button " ( 3-3, Fig. 1 ) or " ▼ Button " ( 3-6, Fig. 1 ) to select the upper text to " YES " or " NO ".

**YES - Auto Power Off management will enable.**

**NO - Auto Power Off management will disable.**

- 2) After select the upper text to " YES " or " NO ", press the " ENTER Button " ( 3-7, Fig. 1 ) will save the setting function with default.

## 7-4 Set beeper sound ON/OFF

When the lower display show " BEEP "

- 1) Use the " ▲ Button " ( 3-3, Fig. 1 ) or " ▼ Button " ( 3-6, Fig. 1 ) to select the upper text to " YES " or " NO ".

**YES - Meter's beep sound will be ON with default.**

**NO - Meter's beep sound will be OFF with default.**

- 2) After select the upper text to " YES " or " NO ", press the " ENTER Button " ( 3-7, Fig. 1 ) will save the setting function with default.

*Remark :*

*After execute the datalogger function, the buzzer sound will off automatically to prevent any interference of the measurement.*

## 7-5 Decimal point of SD card setting

The numerical data structure of SD card is default used the " . " as the decimal, for example "20.6" "1000.53" . But in certain countries ( Europe ...) is used the " , " as the decimal point, for example " 20,6 " "1000,53". Under such situation, it should change the Decimal character at first.

When the lower display show " DEC "

- 1) Use the " ▲ Button " ( 3-3, Fig. 1 ) or " ▼ Button " ( 3-6, Fig. 1 ) to select the upper text to " USA " or " EURO ".

**USA - Use " . " as the Decimal point with default.**

**EURO - Use " , " as the Decimal point with default.**

- 2) After select the upper text to " USA " or " EURO ", press the " ENTER Button " ( 3-7, Fig. 1 ) will save the setting function with default.

### **7-6 SD memory card Format (Suggest using AC to DC Adapter)**

When the lower display show " SD-F "
--------------------------------------

- 1) Use the " ▲ Button " ( 3-3, Fig. 1 ) or " ▼ Button " ( 3-6, Fig. 1 ) to select the upper text to "YES " or " NO " .

**YES - Intend to format the SD memory card**

**NO - Not execute the SD memory card format**

- 2) If select the upper to " YES ", press the " ENTER Button " ( 3-7, Fig. 1 ) once again, the Display will show text " YES ENTER " to confirm again, if make sure to do the SD memory card format, then press " Enter Button " once will format the SD memory clear all the existing data that already saving into the SD card.


### **REMARK:**

- \* It recommend strongly,do not use memory cards that have been formatted by other meter or by other installation (such as camera...) Reformat the memory cards with your meter.
- \* If the SD memory card exist the trouble during format by the meter ,use the computer to reformat again can fix the problem.

## 8. POWER SUPPLY from DC ADAPTER

The meter also can supply the power supply from the DC 9V Power Adapter, Insert the plug of Power Adapter into " DC 9V Power Adapter Input Socket " ( 3-9, Fig. 1 ).

## 9. BATTERY REPLACEMENT

- 1) When the left corner of LCD display show "  ", it is necessary to replace the battery. However, in-spec. measurement may still be made for several hours after low battery indicator appears before the instrument become inaccurate.
- 2) Loose the " Battery Cover Screws " ( 3-13, Fig. 1 ) and take away the " Battery Cover " ( 3-12, Fig. 1 ) from the instrument and remove the battery.
- 3) Replace with DC 1.5 V battery ( UM4, AAA, Alkaline/heavy duty ) x 6 PCs, and reinstate the cover.
- 4) Make sure the battery cover is secured after changing the battery.

## 10. RS232 PC SERIAL INTERFACE

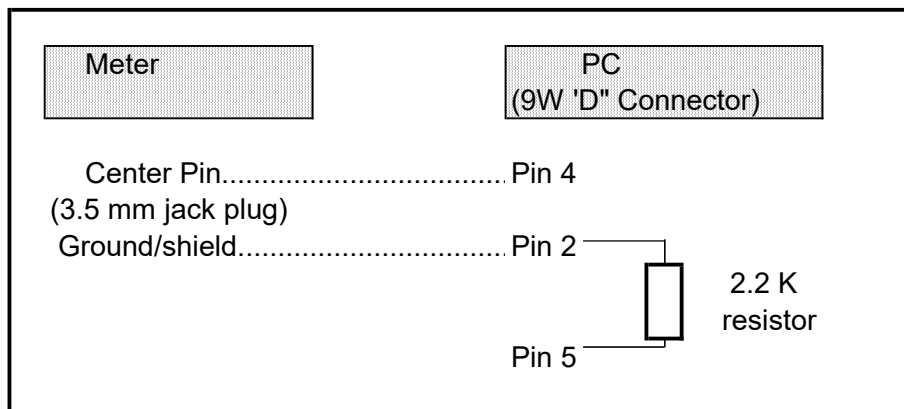
The instrument has RS232 PC serial interface via a 3.5 mm terminal ( 3-16, Fig. 1 ).

The data output is a 16 digit stream which can be utilized for user's specific application.

**Remark:**

- \* **When power use AC to DC adapter, the RS-232 signal will output.**

A RS232 lead with the following connection will be required to link the instrument with the PC serial port.



The 16 digits data stream will be displayed in the following format :

D15 D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1 D0

**Each digit indicates the following status :**

D15	Start Word
D14	4
D13	When send the SPL display data = 1
D12, D11	Annunciator for Display dB = 17
D10	Polarity 0 = Positive    1 = Negative
D9	Decimal Point(DP), position from right to the left 0 = No DP, 1= 1 DP, 2 = 2 DP, 3 = 3 DP
D8 to D1	Display reading, D1 = LSD, D8 = MSD For example : If the display reading is 1234, then D8 to D1 is : 00001234
D0	End Word

## 11. CALIBRATION

- 1) Prepare the optional " SOUND CALIBRATOR ", such as " SC-941 " or " SC-942 " ( set range to 94.0 dB ). Power on the Sound Calibrator & plug calibrator output socket into the " Microphone " head ( 3-20, Fig. 1 ) of the Sound Level meter.
- 2) Select " Time Weighting " at " Fast " position.
- 3) Select " A " weighting.
- 4) Press and Hold the " Time " and " Enter " Key > 5 sec. into Calibration mode , then use " ▲ Button " and " ▼ Button " Key to Adjust, until the display reading value within " 94 +/- 0.2 " dB.
- 5) Press " Enter " Key to save the calibration , screen will be flash. then press " TIME " Key back to measurement.

## 12. FREQUENCY WEIGHTING CHARACTERISTICS OF A & C NETWORKS

Frequency	A Weighting Charac.	C Weighting Charac.	Tolerance ( IEC 61672 Class 2 )
31.5 Hz	-39.4 dB	-3 dB	±3.0 dB
63 Hz	-26.2 dB	-0.8 dB	±2.0 dB
125 Hz	-16.1 dB	-0.2 dB	±1.5 dB
250 Hz	-8.6 dB	0 dB	±1.5 dB
500 Hz	-3.2 dB	0 dB	±1.5 dB
1 KHz	0 dB	0 dB	±1.0 dB
2 KHz	+1.2 dB	-0.2 dB	±2.0 dB
4 KHz	+1 dB	-0.8 dB	±3.0 dB
8 KHz	-1.1 dB	-3 dB	±5.0 dB

## 13. TONEBURST RESPONSE ( F/S ) CHARACTERISTICS

Charac.	Max. response ref. continuous signal	Tolerance ( IEC 61672 Class 2 )
F ( Fast )200ms	- 1.0 dB	$\pm 1.0$ dB
S ( Slow )500ms	- 4.1 dB	$\pm 1.0$ dB

## 14. PATENT

The meter ( SD card structure ) already  
get patent or patent pending in following  
countries :

Germany	Nr. 20 2008 016 337.4
JAPAN	3151214
TAIWAN	M 358970
	M 359043
CHINA	ZL 2008 2 0189918.5
	ZL 2008 2 0189917.0
USA	Patent pending