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# VIBRATION METER

Model: PCE-VDR 10

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[www.pce-instruments.com](http://www.pce-instruments.com)



Your purchase of this VIBRATION DATA RECORDER marks a step forward for you into the field of precision measurement. Although this Meter is 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

## OPERATION MANUAL

# TABLE OF CONTENTS

1. FEATURES.....	1
2. SPECIFICATIONS.....	2
3. FRONT PANEL DESCRIPTION.....	5
4. MEASURING PROCEDURE.....	6
5. DATALOGGER.....	9
5-1 Preparation before execute datalogger function.....	9
5-2 Datalogger.....	11
5-3 Check time information.....	12
5-4 SD Card Data structure.....	12.....
6. Saving data from the SD card to the computer.....	13.....
7. ADVANCED SETTING.....	14.....
7-1 Set clock time .....	15.....
7-2 Set sampling time.....	15.....
7-3 Set Auto Power OFF .....	16.....
7-4 Set beeper sound ON/OFF.....	16....
7-5 Set SD card Decimal character.....	17.....
7-6 Set UNIT .....	18
8. POWER SUPPLY from DC ADAPTER.....	19.....
9. BATTERY REPLACEMENT.....	19
10. SYSTEM RESET.....	19...
11. RS232 PC serial interface.....	20..

# 1. FEATURES

- \* Applications for industrial vibration monitoring :  
All industrial machinery vibrates. The level of vibration is a useful guide to machine condition. Poor balance, misalignment & looseness of the structure will cause the vibration level increase, it is a sure sign that the maintenance is needed.
- \* Frequency range 10 Hz – 1kHz, sensitivity relative meet IOS 2954.
- \* Professional vibration meter supply with vibration sensor & magnetic base, full set.
- \* Metric & Imperial display unit.
- \* Acceleration, Velocity measurement.
- \* RMS, Max hold , Peak value measurement.
- \* Max. Hold reset button, Zero button.
- \* Wide frequency range.
- \* Data hold button to freeze the desired reading.
- \* Memory function to record maximum and minimum reading with recall.
- \* Separate vibration probe with magnetic base, easy operation.
- \* Real time SD memory card Datalogger, it Built-in Clock And Calendar,real time data recorder, sampling time set From 5 second to 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 down load 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.

- \* LCD with green light backlight, easy reading.
- \* Can default auto power off or manual power off.
- \* Data hold, record max. and min. reading.
- \* Microcomputer circuit, high accuracy.
- \* Power by UM4/AAA( 1.5V ) x 6 batteries or DC 9V adapter.
- \* RS232/USB PC COMPUTER interface.

## 2. SPECIFICATIONS

### ***2-1 General Specifications***

Circuit	Custom one-chip of microprocessor LSI circuit.
Display	LCD size : 60 mm x 50 mm
Measurement	Acceleration, Velocity
Memory Card	SD memory card. 1 GB to 16 GB.
Datalogger Sampling Time	5/10/30/60/120/300/600/1800/3600 seconds
Data error no.	≤ 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>* Set Auto Power OFF</li> <li>* Set beeper sound ON/OFF</li> <li>* Set SD card Decimal character</li> <li>* SD memory card Format</li> <li>* Set UNIT</li> </ul>
Update Time of Display	Approx. 1 second if measuring data is changed.

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>
Operating Temperature	0 to 50 °C .
Operating Humidity	Less than 85% R.H.
Power Supply * <i>Meter &amp; probe</i>	* DC 9V adapter input. ( AC/DC power adapter is included ).
Power Supply * <i>Clock backup battery</i>	* Alkaline or heavy duty DC 1.5 V battery ( UM4, AAA ) x 6 PCs, or equivalent.
Weight	199 g/0.44 LB.
Dimension	132 x 80 x 32 mm ( 5.2 x 3.1 x 1.3 inch )
Accessories Included	* Instruction manual..... 1 pcs. * Vibration Sensor(VB-81A)..... 1 pcs. * SKT-AS385..... 1 pcs.
Optional Accessories	* SD Card ( 2 GB ) * 2 wires pressure transmitter, TR-PS2W * USB cable, USB-01. * RS232 cable, UPCB-02. * Data Acquisition software, SW-U801-WIN. * Excel Data Acquisition software, SW-E802. * AC-AP9VA (AC to DC 9V adapter)

**2-2 Electrical Specifications (23±5 °C)**

<b>Function</b>	<b>Unit</b>	<b>Range and Resolution</b>	<b>Accuracy</b>
Acceleration	m/s <sup>2</sup>	0.5 to 199.9 m/s <sup>2</sup>	± ( 5%rdg + 2 d ) @ 80 and 160Hz
	g	0.05 to 20.39 G	
	ft/s <sup>2</sup>	2 to 656 ft/s <sup>2</sup>	
	Calibration Point: 50 m/S <sup>2</sup> ( 160 Hz )		
Velocity	mm/s	0.5 to 199.9 mm/s	± ( 5%rdg + 2 d ) @ 80 and 160Hz
	cm/s	0.05 to 19.99 cm/s	
	inch/s	0.02 to 7.87 inch/s	
	Calibration Point: 50 mm/s ( 160 Hz )		

Above specification tests under the environment RF Field Strength less than 3 V/M & frequency less than 30 MHz only and 23°C ±0.5°C

## 3. FRONT PANEL DESCRIPTION

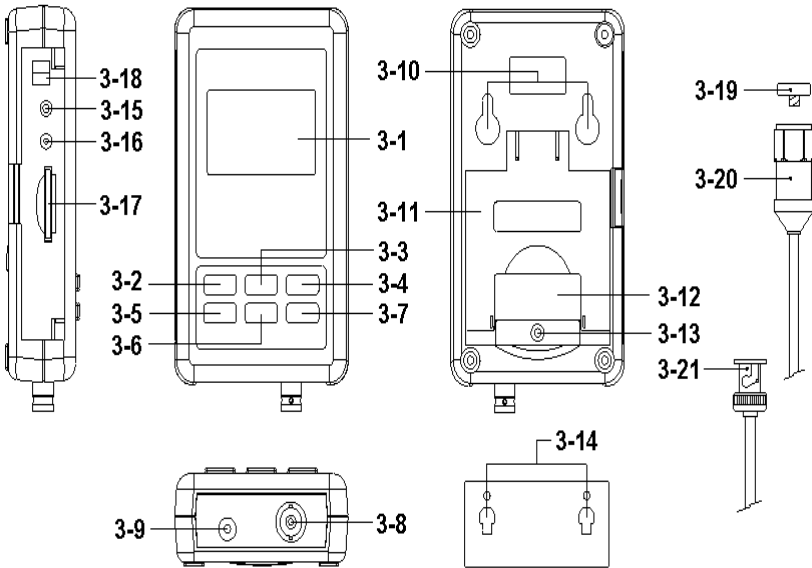


Fig. 1

- |                                       |                                        |
|---------------------------------------|----------------------------------------|
| 3-1 Display                           | 3-12 Battery cover/Battery compartment |
| 3-2 Power button ( Backlight button ) | 3-13 Screw of the battery cover        |
| 3-3 ▲ Button ( Unit Button )          | 3-14 Hanging unit ( with sticker )     |
| 3-4 REC Button ( HOLD Button )        | 3-15 Reset Button                      |
| 3-5 SET Button ( Time Button )        | 3-16 RS-232 Output Terminal            |
| 3-6 ▼ Button ( Function Button )      | 3-17 SD card socket                    |
| 3-7 Logger button ( Enter button )    | 3-18 4-20 mA Output Terminal           |
| 3-8 Vibration Sensor input BNC socket | 3-19 Reset Button                      |
| 3-9 DC 9V power adapter input socket  | 3-20 Vibration Sensor                  |
| 3-10 Hanging holes                    | 3-21 Vibration Sensor BNC              |
| 3-11 Stand                            |                                        |

## 4. MEASURING PROCEDURE

### 1) Power supply installation :

- \* The meter's power supply should install the batteries and connect " AC to DC adapter " together.
- \* The batteries are the power of " Clock ".

#### Batteries

Install the batteries into the battery compartment :

- \* Loose the " Screw of the battery cover " ( 3-13, Fig. 1 ) and take away the " Battery Cover " ( 3-12, Fig. 1 ) from the meter.
- \* Replace with DC 1.5 V battery ( UM4/AAA, Alkaline/Heavy duty type ) x 6 PCs, and reinstate the cover.
- \* Make sure the battery cover is secured after changing the battery.

#### AC to DC adapter

- \* The " AC to DC adapter " is the standard accessory.
- \* Plug the output plug of " AC to DC adapter " into the " DC 9V power adapter input socket " ( 3-9, Fig. 1 )

### 2) Vibration Sensor

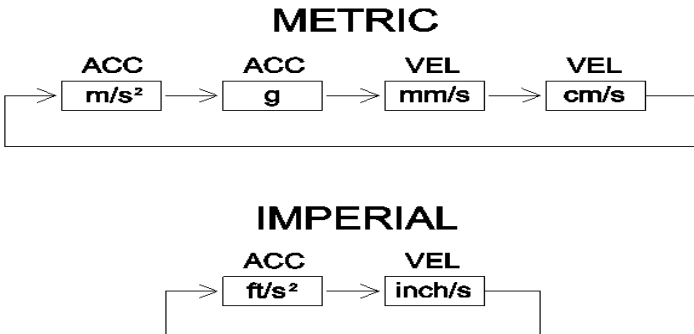
Connect the vibration pickup to the cable supplied. Make sure it is firmly attached. Connect the cable to the meter by attaching it to the "BNC connector( 3-8, Fig. 1 ) on the Bottom of the meter. If the surface to be tested is magnetic, attach the magnetic base to the vibration pickup and attach the pickup to a flat surface. If the surface to be tested is not magnetic, hold the pickup against the surface. Do not hold the cable while making measurements.



### 3) Vibration unit

The currently selected unit of measure is shown on the meter's LCD. To change the unit of measure, press and hold the ▲ Button " Unit Button ( 3-3, Fig. 1 )" until the desired unit of measure appears and then release the button.

if want change metric or imperial please refer chapter 7-7 (page 18 ).



### 4) Function Selection

The currently selected function is shown on the meter's LCD. To change the function, press and hold the button.

"FUNCTION button( 3-6, Fig. 1 )" until the desired function appears, then release the FUNCTION .

**The available functions are:**

**RMS: Typical selection for Acceleration and Velocity**

**PEAK: Displays the peak value of the vibration**

**MAX HOLD: Displays and holds the max value measured**

**MAX HOLD Reset:**

Press and hold the ▲ and ▼ buttons for > 3 seconds to clear the Max. Hold reading.

### 5) Data Hold:

To freeze a displayed reading on the LCD, momentarily press the "HOLD button ( 3-4, Fig. 1 )" (the HOLD icon will appear above the reading). To exit HOLD, press the HOLD button again.

### 6) ZERO Adjustment

The ZERO function is used to remove any small offset caused by temperature changes or other environmental changes.

The zero will only work for a display of 10 or less digits.

1. Connect the vibration sensor to the meter
2. Set the measurement function to Acceleration
3. Make sure the sensor is motionless and not subject to any vibrations.
4. Press and Hold the ▼ and ▲ buttons for 3 seconds and the meter will show zero .

|

### 7) REC ( Record):

For a given measurement session, this meter can record the highest (MAX) and the lowest (MIN) readings for later recall.

1. Press the REC button momentarily to access this mode of operation (REC icon appears)
2. The meter is now recording the MAX and MIN readings.
3. Press the REC button again to view the current MAX readings (MAX icon appears). The readings on the display are now the highest readings encountered since the REC icon was switched on (when the MAX-MIN button was first pressed).
4. Press the REC button again to view the current MIN readings (MIN icon appears). The readings on the display are now the lowest readings encountered since the REC icon was switched on (when the REC button was first pressed).
5. To exit the MAX-MIN mode, press and hold the REC button for 3 seconds. The meter will beep, the REC-MAX-MIN icons will switch off, the MAX-MIN memory will clear, and the meter will return to the normal operating mode.

**8) Time check :**

Press the "Time button ( 3-5, Fig. 1 )" once, display will be show Year/Month/Date, Hour/Minute/ Second and samling time information.

**9) 4-20 mA output :**

connect another mA meter in to the vibration data recorder (3-18 Fig. 4-20 mA Output Terminal) socket, At this time the vibration data recorder will be output 4 - 20 mA analog signal ( display show 0 = 4.00mA out, show full scale = 20.00 mA out).

## 5. DATALOGGER

### *5-1 Preparation before execute datalogger function*

Insert the SD card

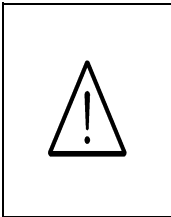
Prepare a " SD memory card " ( 1 GB to 16 GB, optional ), insert the SD card into the " SD card socket " ( 3-17, Fig. 1) with the correct direction exactly.

- \* *It recommend use memory card's capacity is  $\leq 4$  GB.*
- \* *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 card 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.*

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 ).

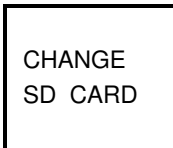
d. Decimal format setting



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

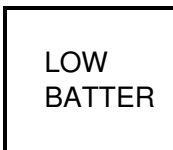
e. 3 Information of LCD display

\* If the Display show :



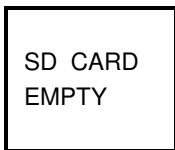
It means that the SD card exist the problem or the SD card memory is full, it should change SD memory card.

\* If the Display show :



It means that the battery is low voltage.

\* If the Display show :



It means that the SD card is not plugged into the meter.

## 5-2 Datalogger

### a. Start the datalogger

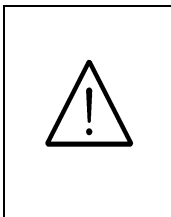
Press the " Logger button ( 3-7, Fig. 1 ) > 2 seconds continuously, until the Display show the indicator " DATALOGGER ", release the " Logger Button " ( 3-7, Fig. 1 ), then the measuring data along the time information will be saved into the memory circuit.

*Remark :*

- \* *How to set the sampling time, refer to Chapter 7-2, page 15.*
- \* *How to set the beeper sound is enable, refer to Chapter 7-4, page 16.*

### b. Finish the Datalogger

During execute the Datalogger function ( Display show the " Datalogger " indicator ), press the " Logger button " ( 3-7, Fig. 1 ) > 2 seconds continuously, until the Display indicator " DATALOGGER " is disappeared, release the " Logger Button " will finish the Datalogger function.



**Before take away the SD card from the meter, it should execute the procedures of " Finish the Datalogger ",**  
**( It should wait for the Display counter to count down to zero value. )**

**otherwise some existing recent save data may loss.**

**5-3 Check time information**

Press " Time button " ( 3-5, Fig. 1 ) > 2 seconds continuously, the LCD display will present the time information of Year/Month/Date, Hour/Minute/Second and the sampling value.

**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 :

**VBC01**

2) If the first time to execute the Datalogger, under the route VBC01\, will generate a new file name VBC01001.XLS.

After exist the Datalogger, then execute again, the data will save to the VBC01001.XLS until Data column reach to 30,000 columns, then will generate a new file, for example VBC01002.XLS

3) Under the folder VBC01\, if the total files more than 99 files, will generate anew route, such as VBC02\ .....

4) The file's route structure :

- VBC01\
  - VBC01001.XLS
  - VBC01002.XLS
  - .....
  - VBC01099.XLS
- VBC02\
  - VBC02001.XLS
  - VBC02002.XLS
  - .....
  - VBC02099.XLS
- VBCXX\
  - .....

*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 : VBC01001.XLS, VBC01002.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	2000/1/1	00:01:11	1.7 ACC	m/S^2	
3		2	2000/1/1	00:01:16	3.4 ACC	m/S^2	
4		3	2000/1/1	00:01:21	0.7 ACC	m/S^2	
5		4	2000/1/1	00:01:26	5 ACC	m/S^2	
6		5	2000/1/1	00:01:31	2 ACC	m/S^2	
7		6	2000/1/1	00:01:36	5.4 ACC	m/S^2	
8		7	2000/1/1	00:01:41	5.3 ACC	m/S^2	
9		8	2000/1/1	00:01:46	4.7 ACC	m/S^2	
10		9	2000/1/1	00:01:51	3.8 ACC	m/S^2	
11		10	2000/1/1	00:01:56	2.5 ACC	m/S^2	
12		11	2000/1/1	00:02:01	4.6 ACC	m/S^2	
13		12	2000/1/1	00:02:06	10.8 ACC	m/S^2	
14		13	2000/1/1	00:02:11	8.7 ACC	m/S^2	
15		14	2000/1/1	00:02:16	5.1 ACC	m/S^2	
16		15	2000/1/1	00:02:21	5 ACC	m/S^2	
17		16	2000/1/1	00:02:26	4.8 ACC	m/S^2	
18		17	2000/1/1	00:02:31	0.9 ACC	m/S^2	
19		18	2000/1/1	00:02:36	0.8 ACC	m/S^2	
20		19	2000/1/1	00:02:41	2.9 ACC	m/S^2	
21		20	2000/1/1	00:02:46	3.7 ACC	m/S^2	
22		21	2000/1/1	00:02:51	2.8 ACC	m/S^2	
23		22	2000/1/1	00:02:56	4.4 ACC	m/S^2	
24		23	2000/1/1	00:03:01	3.6 ACC	m/S^2	
25		24	2000/1/1	00:03:06	3.3 ACC	m/S^2	

EXCEL graphic screen ( for example )



## 7. ADVANCED SETTING

Under do not execute the Datalogger function, press the " SET button " ( 3-5, Fig. 1 ) > 2 seconds continuously will enter the " Setting " mode., then release the " SET button ". Following press the " SET button " (3-5, Fig. 1 ) once a while in sequence to select the seven main function, the display will show :

**SET DATE....** Set clock time ( Year/Month/Date, Hour/Minute/Second )

**SP-T.....** Set sampling time

**POFF.....** Set Power Auto OFF

**bEEP.....**Set beeper sound ON/OFF

**DEC.....** Set SD card Decimal character USA/EURO

**UNIT.....** METRIC / IMPERIAL



**Remark :**

***During execute the " Setting " function, if within 5 seconds , do not press any buttons further, the LCD Display will return to normal screen.***

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

When the Display show " SET 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 ).

**Remark :**

*The adjusted unit will be flashed.*

- 2) After set all the time value ( Year, Month, Date, Hour, Minute, Second ), press the " SET button " ( 3-5, Fig. 1 ) once will save the time value, then the screen will jump to " Sampling time " setting screen ( Chapter 7-2 ).

**Remark :**

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

**7-2 Set sampling time**

When the Display show " SP-T "

- 1) Use the " ▲ Button " ( 3-3, Fig. 1 ) or " ▼ Button " ( 3-6, Fig. 1 ) to adjust the sampling value :

**5 seconds, 10 seconds, 30 seconds, 60 seconds, 120 seconds  
, 300 seconds, 600 seconds, 1800seconds, 3600 seconds.**

After the desired value is set, press the " Enter Button "  
( 3-7, Fig. 1 ) to save the adjusting value with default.

### **7-3 SET POFF ON/OFF**

When the Display show " POFF "

- 1) Use the " ▲ Button " ( 3-3, Fig. 1 ) or " ▼ Button "  
( 3-6, Fig. 1 ) to select the text to " yES " or " no " .

**YES - Meter's will be Auto power off .**

**NO - Meter's Auto power off Will be 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 Display show " BEEP "

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

## 7-5 Decimal point of SD card setting

When the Display show " DEC "

The numerical data structure of SD card is used the "." as the decimal with default, 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.

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

## **7-6 Set UNIT**


When the Display show "UNIT METRIC "

- 1) Use the " ▲ Button " ( 3-3, Fig. 1 ) or " ▼ Button " ( 3-6, Fig. 1 ) to select the upper Display text to METRIC or IMPERIAL
- 2) press the " Enter Button " ( 3-7, Fig. 1 ) will save the setting METRIC or IMPERIAL with default.

## 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 " Screw of the battery cover " ( 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. SYSTEM RESET

If the meter happen the troubles such as :

*CPU system is hold ( for example, the key button can not be operated... ).*

Then make the system RESET will fix the problem.

The system RESET procedures will be either following

method :

During the power on, use a pin to press the " Reset Button " ( 3-15, Fig. 1 ) once a while will reset the circuit system.

# 11. RS232 PC SERIAL INTERFACE

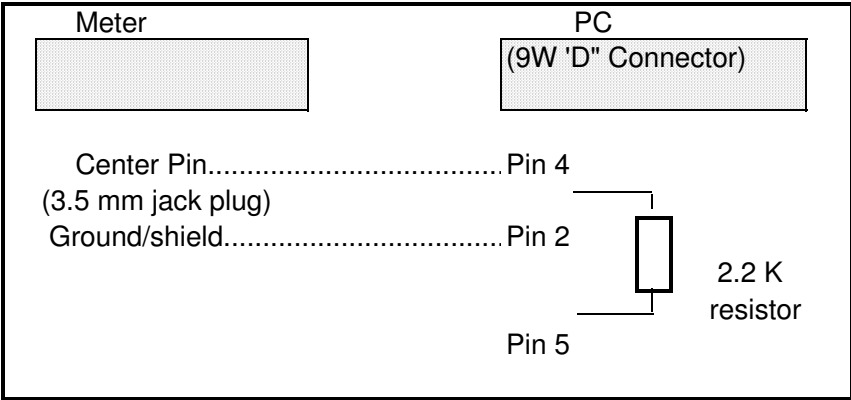
The instrument has RS232 PC serial interface via a 3.5 mm terminal ( 3-16, Fig. 1 ) .

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

**Remark:**

\* **When power use AC/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 :**

D0	End Word		
D1 & D8	Display reading, D1 = LSD, D8 = MSD For example : If the display reading is 1234, then D8 to D1 is : 00001234		
D9	Decimal Point(DP), position from right to the left 0 = No DP, 1= 1 DP, 2 = 2 DP, 3 = 3 DP		
D10	Polarity 0 = Positive      1 = Negative		
D11 & D12	Annunciator for Display		
	m / s <sup>2</sup> = 92	g = 57	mm / s = 93
	cm / s = 95	ft / s <sup>2</sup> = 97	inch / s = 98
D13	When send the up display data = 1 When send the middle display data = 2		
D14	4		
D15	Start Word		

**RS232 FORMAT : 9600, N, 8, 1**

Baud rate	9600
Parity	No parity
Data bit no.	8 Data bits
Stop bit	1 Stop bit