

SD card real time data recorder, RS232/USB

4 Channels

Data Logging Instrument

PCE-VM 5000



Your purchase of this
4 CHANNELS
VIBRATION METER
with SD CARD 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.

PCE Americas Inc.
711 Commerce Way
Suite 8
Jupiter
FL-33458
USA
From outside US: +1
Tel: (561) 320-9162
Fax: (561) 320-9176
info@pce-americas.com

PCE Instruments UK Ltd.
Units 12/13
Southpoint Business Park
Ensign way
Hampshire / Southampton
United Kingdom, SO31 4RF
From outside UK: +44
Tel: (0) 2380 98703 0
Fax: (0) 2380 98703 9
info@pce-instruments.com

www.pce-instruments.com/english
www.pce-instruments.com

OPERATION MANUAL

TABLE OF CONTENTS

1. FEATURES.....	1
2. SPECIFICATIONS.....	2
3. FRONT PANEL DESCRIPTION.....	9
4. MEASURING PROCEDURE.....	11
4-1 Preparation.....	11
4-2 Unit selection (Acc./Velocity/Displacement selection).....	12
4-3 Function selection	14
4-4 Zero adjustment, Max hold reset procedures.....	15
4-5 Data Hold.....	16
4-6 Data Record (Max./ Min. reading).....	16
4-7 LCD Backlight ON/OFF.....	16
5. DATALOGGER.....	17
5-1 Preparation before execute datalogger function.....	17
5-2 Auto Datalogger (Set sampling time \geq 1 second).....	18
5-3 Manual Datalogger (Set sampling time = 0 second)....	19
5-4 Check time information.....	19
5-5 Check sampling time information.....	20
5-6 SD Card Data structure.....	20
6. Saving data from the SD card to the computer.....	22
7. ADVANCED SETTING.....	23
7-1 Set clock time (Year/Month/Date, Hour/Minute/ Second).....	23
7-2 Set sampling time	24
7-3 Auto power OFF management	24
7-4 Set beep Sound ON/OFF.....	24
7-5 Decimal point of SD card setting.....	25
7-6 SD memory card format.....	25
7-7 Set Metric/Imperial unit.....	26
8. POWER SUPPLY from DC ADAPTER.....	26
9. BATTERY REPLACEMENT.....	27
10. SYSTEM RESET.....	27
11. RS232 PC serial interface.....	27
12. CLASSIFICATION RANGES.....	29
13. SENSITIVITY RELATIVE according ISO 2954.....	30
14. PATENT.....	31

1. FEATURES

- * 4 channels vibration recorder, use SD card to save the 4 channels' data along with time information, paperless.
- * 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.
- * Channels no. : 4 channels (CH1 to CH4)
vibration measurement.
- * Frequency range 10 Hz - 1 kHz, sensitivity relative meet ISO 2954.
- * Professional vibration meter supply with vibration sensor & magnetic base, full set.
- * Metric & Imperial display unit
- * Acceleration, Velocity, Displacement 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 1 second to 3600 seconds.
- * Manual datalogger is available (set the sampling time to 0), during execute the manual datalogger function, it can set the different position (location) No. (position 1 to position 99).

- * 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 UM3/AA (1.5 V) x 8 batteries or DC 9V adapter.
- * RS232/USB PC COMPUTER interface.
- * Include 1 PC vibration sensor, VB-83.
- * Extra vibration sensor, VB-83 can be ordered.
When change the VB-83, it is not necessary to make calibration again.

2. SPECIFICATIONS

2-1 General Specifications

Circuit	Custom one-chip of microprocessor LSI circuit.
Display	LCD size : 82 mm x 61 mm. <i>* with green color backlight.</i>
Channels	4 channels : CH1, CH2, CH3, CH4.
Measurement	Velocity, Acceleration, Displacement

Function	<i>Acceleration, Velocity :</i> RMS, Peak, Max Hold. <i>Displacement :</i> p-p (peak-peak), Max Hold p-p.		
Unit	<i>Measurement</i>	<i>Metric</i>	<i>Imperial</i>
	Acceleration	meter/s ² , g	ft/s ² ,
	Velocity	mm/s, cm/s	inch/s
	Displacement	mm	inch
Frequency range	10 Hz to 1 KHz <i>* Sensitivity relative during the the frequency range meet ISO 2954 Refer to table 1, page 30.</i>		
Circuit	Exclusive microcomputer circuit.		
Peak Measurement	<i>Acceleration, Velocity :</i> To measure and update the peak value. <i>Displacement :</i> To measure and update the peak to peak (p-p) value.		
Max Hold Measurement	<i>Acceleration, Velocity :</i> To measure and update the max. peak value.		
	<i>Displacement :</i> To measure and update the max. peak to peak (p-p) value.		
Zero Button	Under Acceleration (RMS) measurement, sensor motionless , press two Buttons (3-5, 3-7, Fig. 1) >3 seconds.		
Max. Hold Reset Button	Under Max. hold measurement, press two Buttons (3-5, 3-7, Fig. 1) >3 seconds.		

Datalogger Sampling Time Setting range	Auto	1 second to 3600 seconds <i>@ Sampling time can set to 1 second, but memory data may loss.</i>
	Manual	Push the data logger button once will save data one time. <i>@ Set the sampling time to 0 second. @ Manual mode, can also select the 1 to 99 position (Location) no.</i>
Data error no.	≤ 0.1 % no. of total saved data typically.	
Memory Card	SD memory card 1 GB to 16 GB.	
Advanced setting	<ul style="list-style-type: none"> * Set clock time (Year/Month/Date, Hour/Minute/ Second) * Set sampling time * Auto power OFF management * Set beep Sound ON/OFF * Decimal point of SD card setting * SD memory card Format * Set Metric/Imperial unit 	
Data Hold	Freeze the display reading. <i>* Only available for the RMS function.</i>	
Memory Recall	Maximum & Minimum value. <i>* Only available for the RMS function.</i>	
Data Output	RS 232/USB PC computer interface. <i>* Connect the optional RS232 cable UPCB-02 will get the RS232 plug. * Connect the optional USB cable USB-01 will get the USB plug.</i>	
Sampling Time of Display	Approx. 1 second.	
Operating Temperature and Humidity	0 to 50 °C. Less than 85% R.H.	

Power Supply	* Alkaline or heavy duty DC 1.5 V battery (UM3, AA) x 8 PCs, or equivalent.
	* DC 9V adapter input. (AC/DC power adapter is optional).
Power Current	Normal operation (w/o SD card save data and LCD Backlight is OFF) : <i>Approx. DC 12 mA.</i>
	When SD card save the data and LCD Backlight is OFF) : <i>Approx. DC 35 mA.</i>
Weight	<i>Meter :</i> 515 g/ 1.13 LB.
	<i>Probe with cable and magnetic base :</i> 99 g/0,22 LB
Dimension	<i>Meter :</i> 203 x 76 x 38 mm <i>Vibration sensor probe:</i> Round 16 mm Dia. x 37 mm. Cable length : 1.2 meter.
Accessories Included	* Instruction manual..... 1 PC * Vibration sensor set, VB-83 with cable..... 1 PC * Magnetic base.....1 PC * Carrying case (CA-08).....1 PC
Optional Accessories	* Vibration sensor set, VB-83 with cable. * SD Card (2 G). * AC to DC 9V adapter. * USB cable, USB-01. * RS232 cable, UPCB-02. * Data Acquisition software,SW-U801-WIN.

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

Acceleration (RMS, Peak, Max Hold)

Unit	m/s ²
Range	0.5 to 199.9 m/s ²
Resolution	0.1 m/s ²
Accuracy	± (5 % + 2 d) reading @ 160 Hz, 80 Hz, 23 ± 5 °C
Calibration Point	50 m/S ² (160 Hz)

Unit	g @ 1 g = 9.8 m/s ²
Range	0.05 to 20.39 G
Resolution	0.01 G
Accuracy	± (5 % + 2 d) reading @ 160 Hz, 80 Hz, 23 ± 5 °C
Calibration Point	50 m/S ² (160 Hz)

Unit	ft/s ²
Range	2 to 656 ft/s ²
Resolution	1 ft/s ²
Accuracy	± (5 % + 2 d) reading @ 160 Hz, 80 Hz, 23 ± 5 °C
Calibration Point	50 m/S ² (160 Hz)

Remark :

RMS : To measure the true RMS value.

Peak : To measure and update the peak value.

Max. Hold : To measure and update the max. peak value.

Velocity (RMS, Peak, Max Hold)

Unit	mm/s
Range	0.5 to 199.9 mm/s
Resolution	0. 1 mm/s
Accuracy	$\pm (5 \% + 2 d)$ reading @ 160 Hz, 80 Hz, $23 \pm 5 ^\circ \text{C}$
Calibration Point	50 mm/s (160 Hz)

Unit	cm/s
Range	0.05 to 19.99 cm/s
Resolution	0. 01 cm/s
Accuracy	$\pm (5 \% + 2 d)$ reading @ 160 Hz, 80 Hz, $23 \pm 5 ^\circ \text{C}$
Calibration Point	50 mm/s (160 Hz)

Unit	inch/s
Range	0.02 to 7.87 inch/s
Resolution	0.01 inch/s
Accuracy	$\pm (5 \% + 2 d)$ reading @ 160 Hz, 80 Hz, $23 \pm 5 ^\circ \text{C}$
Calibration Point	50 mm/s (160 Hz)

Remark :

RMS : To measure the true RMS value.

Peak : To measure and update the peak value.

Max. Hold : To measure and update the max. peak value.

Displacement (p-p, Max Hold p-p)

Unit	mm
Range	1.999 mm
Resolution	0.001 mm
Accuracy	$\pm (5 \% + 2 d)$ reading @ 160 Hz, 80 Hz, $23 \pm 5 ^\circ \text{C}$
Calibration Point	0.141 mm (160 Hz)

Unit	inch
Range	0.078 inch
Resolution	0.001 inch
Accuracy	$\pm (5 \% + 2 d)$ reading @ 160 Hz, 80 Hz, $23 \pm 5 ^\circ \text{C}$
Calibration Point	0.141 mm (160 Hz)

Remark :

p-p :

To measure the Peak to Peak value.

Max. Hold p-p :

To measure and update the max. Peak to Peak value.

@ Above specification tests under the environment RF Field Strength less than 3 V/M & frequency less than 30 MHz only.

3. FRONT PANEL DESCRIPTION

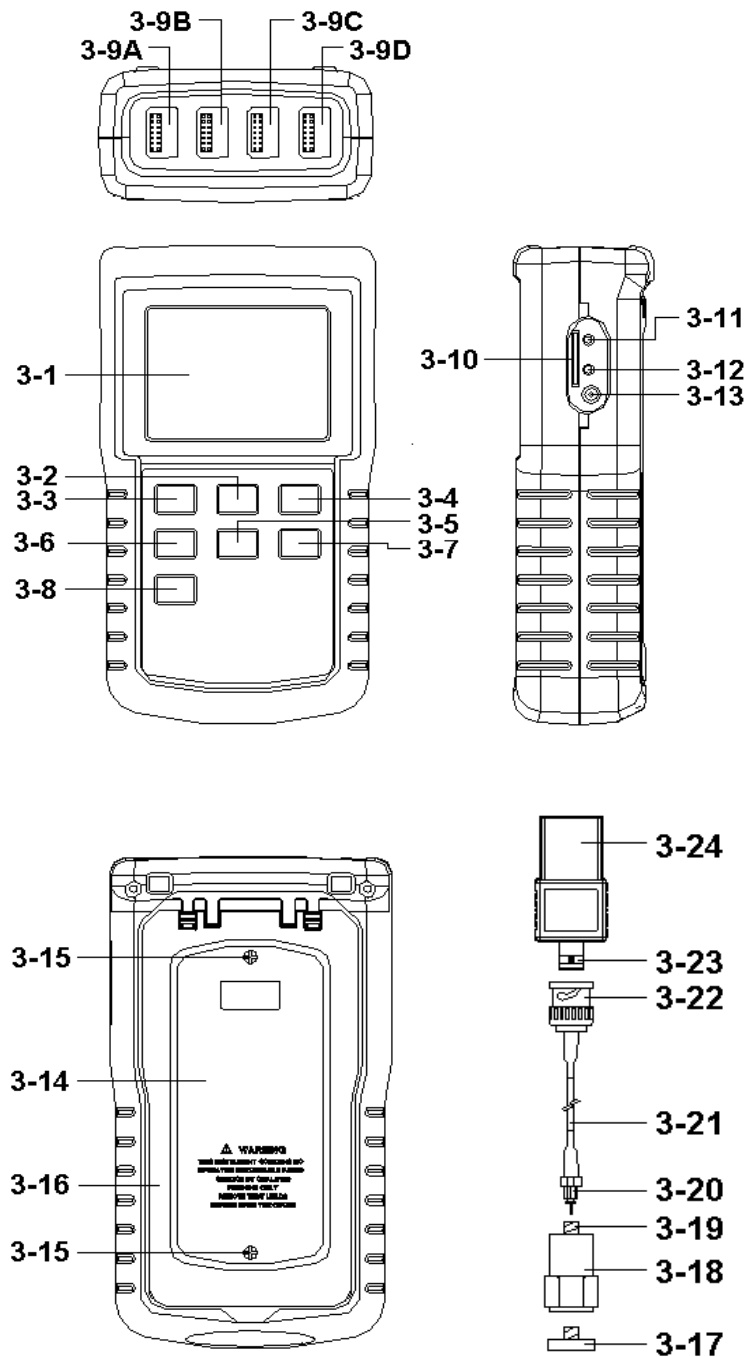


Fig. 1

- 3-1 Display
- 3-2 Power Button (Backlight Button)
- 3-3 Hold Button
- 3-4 REC Button
- 3-5 ACC/VEL/DISP Button (▲ Button)
- 3-6 SET Button (Time Button)
- 3-7 FUNCTION Button (▼ Button)
- 3-8 LOG Button (ENTER Button)
- 3-9A CH1 VB-83 Input Socket
- 3-9B CH2 VB-83 Input Socket
- 3-9C CH3 VB-83 Input Socket
- 3-9D CH4 VB-83 Input Socket
- 3-10 SD Card Socket
- 3-11 RS-232 Output Terminal
- 3-12 Reset Button
- 3-13 DC 9V Power Adapter Input Socket
- 3-14 Battery Compartment/Cover
- 3-15 Battery Cover Screws
- 3-16 Stand
- 3-17 Magnetic Base
- 3-18 Vibration Sensor
- 3-19 Input Socket of Vibration Sensor
- 3-20 Mini Plug of Cable
- 3-21 Sensor Cable
- 3-22 Cable BNC Plug
- 3-23 BNC Socket of VB-83 module
- 3-24 Plug of VB-83 module

4. MEASURING PROCEDURE

4-1 Preparation

1) Install the vibration sensor set

The complete vibration set are :

1. Vibration Sensor, 3-18, Fig 2
2. Sensor Cable, 3-21, Fig. 2
- 3 VB-83 module, 3-24, Fig. 2

* Plug in the " Cable BNC Plug " (3-22, Fig. 2) to the " BNC Socket of VB-83 module " (3-23, Fig. 2).

* Plug in the " Mini plug of cable " (3-20, Fig. 2) to the " Input socket of vibration sensor " (3-19, Fig. 2).

Plug in the " Plug of VB-83 module " (3-24, Fig. 2) to the " CH1 VB-83 Input Socket " (3-9A, Fig. 1). If you have extra vibration sensor set, then Plug in to the " CH2/CH3/CH4 VB-83 Input Socket " (3-9B, 3-9C, 3-9D Fig. 1)

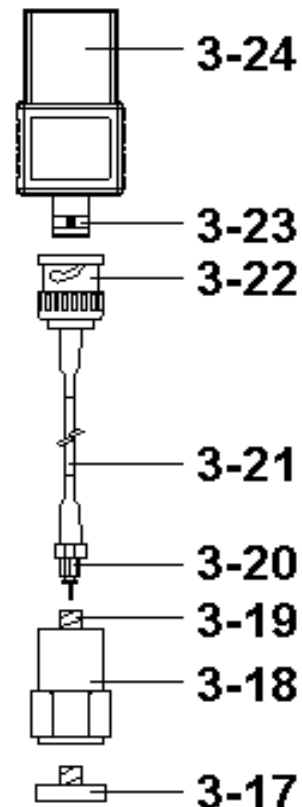


Fig. 2

Remark :

*Extra vibration sensor set, VB-83 can be ordered.
When change the VB-83, it is not necessary to make calibration again due to the vibration detail calibration information already save into the " VB-83 module " (3-24, Fig. 2)*

2) 1) Power on the meter by pressing the " Power button " (3-2, Fig. 1) > 3 seconds continuously.

** After already power on the meter, pressing the " Power button " > 3 seconds continuously will turn off the meter.*

The " Display " (3-1, Fig. 1) will show the 4 channels vibration value (CH1, CH2, CH3, CH4) at the same time. If some channels not plug in the VB-83 Vibration set, then the corresponding channel Display will show " - - - - ".

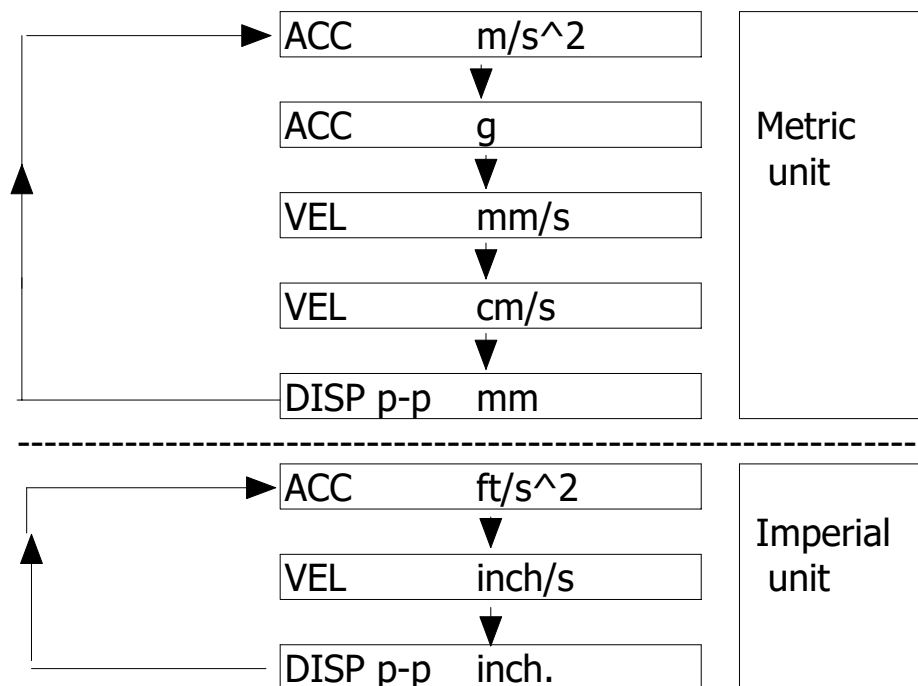
Remark :

1. *If the surface material of measuring article is not the ferrous material, hold the vibration sensor by hand & touch the sensor to the surface of the measuring article,*
- * If the surface material of measuring article is the ferrous material, connect " Vibration sensor " (3-18, Fig. 2) with the " Magnetic base " (3-17, Fig. 2). Put the whole unit (Vibration sensor & Magnetic base) to the surface of measuring article.*
- * Please do not use the finger or hand to touch the " Sensor cable " (3-21, Fig. 1).*

4-2 Unit selection (Acc./Velocity/Displacement selection)

Select the desired display unit by pressing the " ACC/VEL/DISP Button " (3-5, Fig. 1) > 3 seconds (not release the button), the Display will show the following units according Acceleration / Velocity / Displacement in sequence.

Measurement	Unit	
Acceleration <i>* LCD show " ACC "</i>	<i>Metric unit</i>	m/s ² , g
	<i>Imperial unit</i>	ft/s ²
Velocity <i>* LCD show " VEL. "</i>	<i>Metric unit</i>	mm/s, cm/s
	<i>Imperial unit</i>	inch/s
Displacement <i>* LCD show " DISP p-p "</i>	<i>Metric unit</i>	mm
	<i>Imperial unit</i>	inch.



Remark :

1. For the Acceleration measurement, the Display will show the indicator " ACC "
2. For the Velocity measurement, the Display will show the indicator " VEL. "
3. For the Displacement measurement, the Display will show the indicator " DISP p-p "
4. For general applications of industrial vibration monitoring, select " Velocity " or " Acceleration " typically.
5. After select the unit will be saved into the circuit with default.

4-3 Function selection

Select the desired function (RMS, Peak, Max HOLD) by pressing the " Function Button " (3-7, Fig. 1). continuously (not release the button), until the Display will show the desiring function (RMS, Max HOLD, Peak) , then release the " Function Button " (3-7, Fig. 1).

Remarks :

1. *RMS measurement is intend to measure and root means square (RMS) value.*
 - a. *Available for Acceleration, Velocity only*
When the select to the unit of Acceleration or Velocity,
 - b. *The Display will show the indicator " RMS ".*
 - c. *Typically, for Acceleration and Velocity measurement always select the RMS measurement.*
2. *Max HOLD measurement is intend to measure and update the max. peak value.*
 - a. *Available for Acceleration, Velocity, Displacement measurement.*
 - b. *The Display will show the indicator " Max HOLD ".*
3. *Peak measurement is intend to measure the peak vibration value.*
 - a. *Available for Acceleration, Velocity measurement only.*
 - b. *The Display will show the indicator " Peak ".*
4. *After select the Function will be saved into the circuit with default.*

4-4 Zero adjustment, Max hold reset procedures

Zero adjustment procedures

Due to drift of environment temperature value, battery power change, meter used for a long time or other reasons. The display value may exist not zero value (few digits) in case of no signal into the " Vibration Sensor ". General speaking those not zero value will not effect the measurement typically. However if intend to make the precision measurement, the following zero adjustment procedures should be executed as :

- 1)Vibration sensor set, VB-83 is ready, connect the " Plug of VB-83 module " (3-24, Fig. 1) to the " CH1, CH2, CH3, CH4 VB-83 Input Socket " (3-9A, B, C, D, Fig. 1).
- 2)Select the measurement to the " Acceleration "
- 3)Keep the vibration sensor motionless, no signal into the vibration sensor.
- 4)Under Acc./Velocity/Displacement measurement if press the " ▲ Button " (3-5, Fig. 1) and " ▼ Button " (3-7, Fig. 1) together > 3 seconds, then the " CH1 " symbol will flasing.

** Press the " SET Button " (3-6, Fig. 1) to select the channel no. (CH2, CH3, CH4), after the exact channel is selected, the channel no. will flashing .*

Press " Enter Button " (3-8, Fig. 1) to let the display reach zero value according the selected channle no. (flashing).

- 5)The zero adjustment can be execute only the display value show the no. less than 10 digits.

Max hold reset procedures

Under execute the Max Hold function if press the " ▲ Button " (3-5, Fig. 1) and " ▼ Button " (3-7, Fig. 1) together > 3 seconds, then the " CH1 " symbol will flasing.

** Press the " SET Button " (3-6, Fig. 1) to select the channel no. (CH2, CH3, CH4), after the exact channel is selected, the channel no. will flashing .*

Press " Enter Button " (3-8, Fig. 1) to clear the existing Max hold value according the selected channle no. (flashing).

4-5 Data Hold

During the measurement, press the " Hold Button " (3-3, Fig. 1) once will hold the measured value & the LCD will display a " HOLD " symbol.

Press the " Hold Button " once again will release 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 there will be a " REC " symbol on the display.
- 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.
 - b) Press the " REC Button " (3-4, Fig. 1) again, the " REC MIN " symbol along with the minimum value will appear on the display.
 - c) Press the " REC Button " (3-4, Fig. 1) again, the the " MIN " symbol will be appeared, LCD only show the " REC " symbol, the meter start the Data Record function again.
- 3) To exit the memory record function, just press the " REC Button " (3-4, Fig. 1) > 3 seconds continuously. The display will revert to the current reading.

4-7 LCD Backlight ON/OFF

- 1) After power ON, the " LCD Backlight " will light automatically. During the measurement, push the " Backlight Button " (3-2, Fig. 1) once will turn OFF the " LCD Backlight ".
- 2) Push the " Backlight Button " once again will turn ON the " LCD Backlight " again.

5. DATALOGGER

5-1 Preparation before execute datalogger function

a. Insert the SD card

Prepare a " SD memory card " (1 G to 16 G, optional), insert the SD card into the " SD card socket " (3-10, Fig. 1). The front panel of the SD card should face against the the down case.

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

b. SD card Format

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 25).

**** 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 23).

d. Decimal for



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 7-2, page 25.

5-2 Auto Datalogger (Set sampling time ≥ 1 second)

a. Start the datalogger

Press the " LOG Button (3-8, Fig. 1) > 3 seconds continuously, the lower LCD will show the " LOGGER " indicator and flashing per sampling time, at the same time 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 24.*

** How to set the beeper sound is enable, refer to Chapter 7-4, page 24.*

b. Pause the datalogger

During execute the Datalogger function, if press the " LOG Button " (3-8, Fig. 1) once will pause the Datalogger function (stop to save the measuring data into the memory circuit temporally). In the same time the the " LOGGER " will be no flashing.

Remark :

If press the " LOG Button " (3-8, Fig. 1) once again will execute the Datalogger again, the bottom text of " LOOGER " will flashing.

c. Finish the Datalogger

During execute the Datalogger function, press the " LOG Button (3-8, Fig. 1) > 3 seconds continuously again will finish the Datalooger function, the " LOGGER " indicator will be disappeared and finish the Datalogger. function.

5-3 Manual Datalogger (Set sampling time = 0 second)

a. Set sampling time is to 0 second

Press the " LOG Button (3-8, Fig. 1) once , the low LCD will show the indicator " LOGGER ", then press the " LOG Button " (3-8, Fig. 1) once, the bottom indicator " LOGGER " will flashing once and Beeper will sound once, at the same time the measuring data along the time information will be saved into the memory circuit. The lower Display will show the Position (Location) no. and saved into the SD card too.

Remark :

*During execute the Manual Datalogger, it can use the " ▲ Button " (3-5, Fig. 1) or " ▼ Button " (3-7, Fig. 1) to set the measuring position (1 to 99, for example room 1 to room 99) to identify the measurement location , the lower Display will show P x (x = 1 to 99).
(x = 1 to 99).*

b. Finish the Datalogger

During execute the Datalogger function, press the " LOG Button (3-8, Fig. 1) > 3 seconds continuously again will finish the Datalogger function, the " LOGGER " indicator will be disappeared and finish the Datalogger function.

5-4 Check time information

During the normal measurement (not execute the Datalogger), If press " Clock Button " (3-6, Fig. 1) once , the lower LCD display will present the time information of Year/Month, Date/Hour, Minute/Second and the Sampling time information in sequence.

5-5 SD Card Data structure

- 1) When the SD card is used into the meter, the SD card
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.

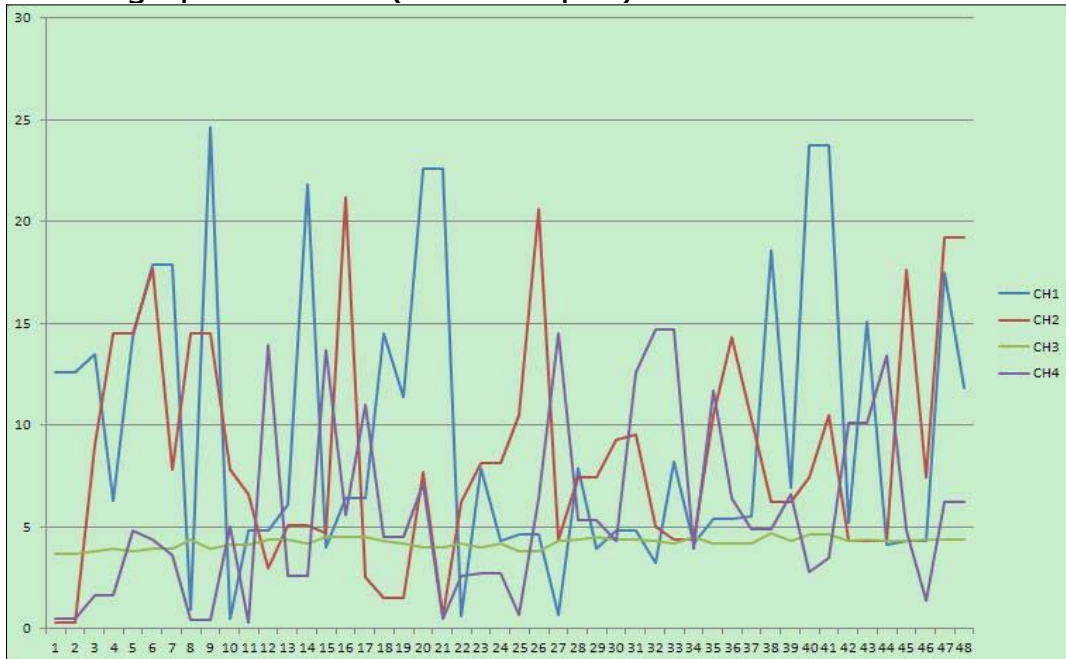
6. Saving data from the SD card to the computer (EXCEL software)

- 1) After execute the Data Logger function, take away the SD card out from the " SD card socket " (3-10, 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	H	I	J	K
1	Place	Date	Time	CH1	Unit	CH2	Unit	CH3	Unit	CH4	Unit
2	1	2010/12/9	18:11:34	12.6	ACC m/S^2	0.3	ACC m/S^2	3.7	ACC m/S^2	0.5	ACC m/S^2
3	2	2010/12/9	18:11:37	12.6	ACC m/S^2	0.3	ACC m/S^2	3.7	ACC m/S^2	0.5	ACC m/S^2
4	3	2010/12/9	18:11:39	13.5	ACC m/S^2	9	ACC m/S^2	3.8	ACC m/S^2	1.6	ACC m/S^2
5	4	2010/12/9	18:11:41	6.3	ACC m/S^2	14.5	ACC m/S^2	3.9	ACC m/S^2	1.6	ACC m/S^2
6	5	2010/12/9	18:11:43	14.4	ACC m/S^2	14.5	ACC m/S^2	3.8	ACC m/S^2	4.8	ACC m/S^2
7	6	2010/12/9	18:11:45	17.9	ACC m/S^2	17.7	ACC m/S^2	3.9	ACC m/S^2	4.4	ACC m/S^2
8	7	2010/12/9	18:11:47	17.9	ACC m/S^2	7.8	ACC m/S^2	3.9	ACC m/S^2	3.6	ACC m/S^2
9	8	2010/12/9	18:11:49	0.9	ACC m/S^2	14.5	ACC m/S^2	4.4	ACC m/S^2	0.4	ACC m/S^2
10	9	2010/12/9	18:11:51	24.6	ACC m/S^2	14.5	ACC m/S^2	3.9	ACC m/S^2	0.4	ACC m/S^2
11	10	2010/12/9	18:11:53	0.5	ACC m/S^2	7.8	ACC m/S^2	4.1	ACC m/S^2	5	ACC m/S^2
12	11	2010/12/9	18:11:55	4.8	ACC m/S^2	6.6	ACC m/S^2	4.1	ACC m/S^2	0.3	ACC m/S^2
13	12	2010/12/9	18:11:57	4.8	ACC m/S^2	3	ACC m/S^2	4.4	ACC m/S^2	13.9	ACC m/S^2
14	13	2010/12/9	18:11:59	6.1	ACC m/S^2	5.1	ACC m/S^2	4.4	ACC m/S^2	2.6	ACC m/S^2
15	14	2010/12/9	18:12:01	21.8	ACC m/S^2	5.1	ACC m/S^2	4.2	ACC m/S^2	2.6	ACC m/S^2
16	15	2010/12/9	18:12:03	4	ACC m/S^2	4.7	ACC m/S^2	4.5	ACC m/S^2	13.7	ACC m/S^2
17	16	2010/12/9	18:12:05	6.4	ACC m/S^2	21.2	ACC m/S^2	4.5	ACC m/S^2	5.6	ACC m/S^2
18	17	2010/12/9	18:12:08	6.4	ACC m/S^2	2.5	ACC m/S^2	4.5	ACC m/S^2	11	ACC m/S^2
19	18	2010/12/9	18:12:10	14.5	ACC m/S^2	1.5	ACC m/S^2	4.3	ACC m/S^2	4.5	ACC m/S^2
20	19	2010/12/9	18:12:12	11.4	ACC m/S^2	1.5	ACC m/S^2	4.2	ACC m/S^2	4.5	ACC m/S^2
21	20	2010/12/9	18:12:14	22.6	ACC m/S^2	7.7	ACC m/S^2	4	ACC m/S^2	7.1	ACC m/S^2
22	21	2010/12/9	18:12:16	22.6	ACC m/S^2	0.6	ACC m/S^2	4	ACC m/S^2	0.5	ACC m/S^2
23	22	2010/12/9	18:12:18	0.6	ACC m/S^2	6.2	ACC m/S^2	4.2	ACC m/S^2	2.6	ACC m/S^2
24	23	2010/12/9	18:12:20	7.9	ACC m/S^2	8.1	ACC m/S^2	4	ACC m/S^2	2.7	ACC m/S^2
25	24	2010/12/9	18:12:22	4.3	ACC m/S^2	8.1	ACC m/S^2	4.2	ACC m/S^2	2.7	ACC m/S^2
26	25	2010/12/9	18:12:24	4.6	ACC m/S^2	10.5	ACC m/S^2	3.8	ACC m/S^2	0.7	ACC m/S^2
27	26	2010/12/9	18:12:26	4.6	ACC m/S^2	20.6	ACC m/S^2	3.8	ACC m/S^2	6.4	ACC m/S^2
28	27	2010/12/9	18:12:28	0.7	ACC m/S^2	4.4	ACC m/S^2	4.3	ACC m/S^2	14.5	ACC m/S^2

EXCEL graphic screen (for example)



7. ADVANCED SETTING

Under do not execute the Datalogger function, press the " SET Button " (3-6, Fig. 1) continuously at least 3 seconds will enter the " Advanced Setting " mode. then press the " SET Button " (3-6, Fig. 1) once a while in sequence to select the eight main function, the lower display will show :

- dAtE.....**Set clock time (Year/Month/Date, Hour/Minute/Second)
- SP-t.....**Set sampling time
- PoFF.....**Auto power OFF management
- bEEP.....**Set beeper sound ON/OFF
- dEC.....**Set SD card Decimal character
- Sd F.....** SD memory card Format
- unit.....**Set Metric/Imperial unit

Remark :

During execute the " Advanced Setting " function, if press " SET Button " (3-6, Fig. 1) > 3 seconds 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 " (3-5, Fig. 1) or " ▼ Button " (3-7, Fig. 1) to adjust the value (Setting start from Year value). After the desired value is set, press the " Enter Button " (3-8, 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 value will be flashed.

- 2) After set all the time value (Year, Month, Date, Hour, Minute, Second), press the " ENTER Button " (3-8, Fig. 1) once will save the time value.

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 (Seconds)

When the lower display show " SP-t "

- 1) Use the " ▲ Button " (3-5, Fig. 1) or " ▼ Button " (3-7, Fig. 1) to adjust the value (0, 1, 2, 5, 10, 30, 60, 120, 300, 600, 1800, 3600 seconds).
- 2) After the Sampling value is selected, press the " Enter Button " (3-8, 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 " (3-5, Fig. 1) or " ▼ Button " (3-7, Fig. 1) to select the upper value 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 " (3-8, 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 " (3-5, Fig. 1) or " ▼ Button " (3-7, Fig. 1) to select the upper value to " yES " or " no ".

yES - Meter's beep sound will be ON with default.
no - Meter's beep sound will be OFF with default.
is power ON.

- 2) After select the upper text to " yES " or " no ", press the " ENTER Button " (3-8, Fig. 1) will save the setting function with default.

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 " (3-5, Fig. 1) or " ▼ Button " (3-7, 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 " (3-8, Fig. 1) will save the setting function with default.

7-6 SD memory card Format

When the lower display show " Sd F "

- 1) Use the " ▲ Button " (3-5, Fig. 1) or " ▼ Button " (3-7, Fig. 1) to select the upper value 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 " (3-8, 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.

7-7 Set Metric/Imperial unit

When the lower display show " unit "

- 1) Use the " ▲ Button " (3-5, Fig. 1) or " ▼ Button " (3-7, Fig. 1) to select the LCD symbol " m/s² " or " ft/s² ".

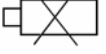
m/s² - Meter will measure under " Metric " unit
f/s² - Meter will measure under " Imperial " unit

- 2) After select the symbol to " m/s² " or " ft/s² ", press " ENTER Button " (3-8, Fig. 1) will save the setting function with default.

8. POWER SUPPLY from DC ADAPTER

The meter also can supply the power supply from the DC 9V Power Adapter (optional). Insert the plug of Power Adapter into " DC 9V Power Adapter Input Socket " (3-13, Fig. 1). The meter will permanent power ON when use the DC ADAPTER power supply (The power Button function is disable).

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 screws of the " Battery Cover Screws " (3-15, Fig. 1) and take away the " Battery Cover " (3-14, Fig. 1) from the instrument and remove the battery.
- 3) Replace with DC 1.5 V battery (UM3, AA, Alkaline/heavy duty) x 8 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 :

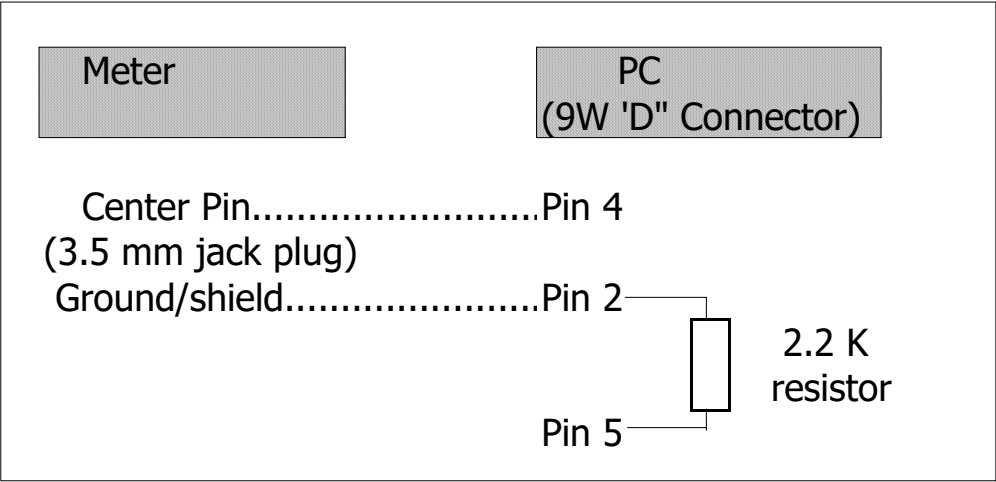
During the power on, use a pin to press the " Reset Button " (3-12, Fig. 1) once a while will reset the circuit system.

11. RS232 PC SERIAL INTERFACE

The instrument has RS232 PC serial interface via a 3.5 mm terminal (3-11, Fig. 1).

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

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	Function : CH1, CH2, CH3, CH4 When send the CH1 value, D13 = 1 When send the CH2 value, D13 = 2 When send the CH3 value, D13 = 3 When send the CH4 value, D13 = 4		
D12, D11	Annunciator for Display		
	m/s ² = 92	ft/s ² = 97	
	mm/s = 93	cm/s = 95	inch/s = 98
	mm = 94	inch = 96	g = 57
D10	0		
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 <i>For example : If the display reading is 1234, then D8 to D1 is : 00001234</i>
D0	End Word

RS232 FORMAT : 9600, N, 8, 1

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

12. CLASSIFICATION RANGES

For the valuation of machines and equipment in the ISO 2372 and VDI 2056, four different kinds of machine groups with four classification ranges and their limits for vibration severity (mm/s) are determined.

The classifications for each machine group are specified as follows :

Small machines, especially production electrical motors of up to 15 KW (Group K)

Good	0 to 0.71 mm/s
Acceptable	0.72 to 1.80 mm/s
Still permissible	1.81 to 4.5 mm/s
Dangerous	> 4.5 mm/s

Medium sized machines, especially electrical motors with 15 up to 75 KW output, without special foundations (Group M)

Good	0 to 1.12 mm/s
Acceptable	1.13 to 2.80 mm/s
Still permissible	2.81 to 7.1 mm/s
Dangerous	> 7.1 mm/s

Large machines on heavy foundations (Group G)
--

Good	0 to 1.80 mm/s
Acceptable	1.81 to 4.50 mm/s
Still permissible	4.51 to 11.2 mm/s
Dangerous	> 11.2 mm/s

Largest machines and turbo machines with a special foundations (Group T).
--

Good	0 to 2.80 mm/s
Acceptable	2.81 to 7.10 mm/s
Still permissible	7.11 to 18.0 mm/s
Dangerous	> 18 mm/s

13. SENSITIVITY RELATIVE to the reference sensitivity at 80 Hz , according ISO 2954

Frequency		Normal value	Relative sensitivity	
			Minimum value	Maximum value
10	Hz	1.0	0.8	1.1
20	Hz	1.0	0.9	1.1
40	Hz	1.0	0.9	1.1
80	Hz	1.0	1.0	1.0
160	Hz	1.0	0.9	1.1
500	Hz	1.0	0.9	1.1
1000	Hz	1.0	0.8	1.1

Table 1

14. PATENT

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

Germany

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