WIFI PORTABLE VIBROMETER

CARDVIBRO AIR2

USER'S GUIDE

VM-2012 AIR2
VM-2012C AIR2 CONNECT

IMV CORPORATION
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Revision History

Date	Rev	Details
Feb 14, 2013	0.8.0	New Issue
Feb 21, 2013	0.8.1	Added a clause.
Feb 22, 2013	0.8.2	Added description of vibration criteria.
Feb 28, 2013	1.0.0	Added options of connectors.
Mar 18,2013	1.0.1	Added a status of charge completion
April 17, 2013	1.6.0	Added the functions, Cursor, Top5, Dictionary Added the battery change, Change Evaluation criteria for ISO & Bearing
April 19,2013	1.6.2	Added setting of Android Tablet
March 14,2014	2.0.1	Added IP Code, Manufactured Country, Radio Certification, Distributor Revised Application Screen User Judgment and its criteria level editor
March 3,2017	2.0.2	Change Corporate logo
Sept 11,2017	2.5.0	Improve graph manipulation Add USB wired measurement

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1. INTRODUCTION

We truly appreciate your purchase.
Please read this manual carefully before use and follow the cautions below for your safety.

CAUTION

1. If the subject of the measurement could be hot, rotating, or near the movable parts, assure the safety and fix the pickup for measurement.
   Do NOT hold the pickup manually in these cases to avoid any possible accidents; including burning yourself, and entangled cables.

2. Follow the instructions printed on the battery for replacement and disposal of used batteries. Pay attention to the polarity of the battery for installation.

Should you have any inquiries or find a problem during use, please consult our sales office near you or IMV quality assurance department.

2. CONTENTS OF A PACKAGE

2-1. Product and Parts

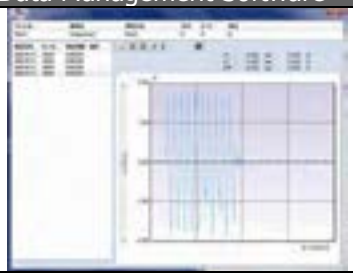
1. CardVibro Air2 (Image: Standard Model)	2. USB Battery Charger	3. USB Cable
		

4. Standard Probe	5. Ni-MH (Rechargeable) Batteries	6. Quick User's Guide
		

2-2. Free Data

1. Android Application / Google Play	2. User's Manual	3. User's Manual Video /YouTube
		

2-3. Optional Accessories

1. Data Management Software	2. Equipment Diagnosis Software	3. Carrying Case
		

4. Magnet	5. Long Probe	6. Cable
 Available for the VM-2012 only.		 Available for the VM-2012C only.

7. Piezoelectric Acceleration Pickup	8. Low Frequency Vibration Measurement Pickup	9. Charge Amplifier
 Available for the VM-2012C only.	 Available for the VM-2012C only.	 Available for the VM-2012C only.

10. Holder	11. Sensor Input Cable	
 Available for the VM-2012C only.	 Available for the VM-2012C only.	

3. FRONT VIEW

Standard Model: VM-2012 **Connector Model: VM-2012C**

(1) Power Button
(2) LED Indicator
(3) USB Outlet Cover
(4) Battery Cover
(5) Strap Mount
(6) Vibration Sensor
(7) Socket (M6 size screw)
(8) Sensor Connector

3-1. Power Button

Press the power button to turn on the device. When it is on, the LED is on.
Press the power button to turn off the device. When it is off, the LED is off.
When the device is on, WiFi goes standby and be ready to be connected.

3-2. LED Indicator

Below shows the meaning of LED indications:

Color	Light	Device
Red ●	Blinking	Connection Standby/Complete Charging
	On	Error
Orange ●	Blinking	Shutting Down or USB Connecting
	On	USB Connected
Green ●	Blinking	Wi-Fi Connecting
	On	Wi-Fi Connected
Red & Orange ●●	Blinking	Charging

3-3. USB Outlet

Loosen two screws and slide the cover counterclockwise to open. You can connect a micro USB cable for charging or vibration measurement with wired connection.
With the USB cover open, you may fail to attain waterproof effects.

3-4. Battery

Use a Philips screwdriver to loosen two screws to open the cover in order to replace batteries. Only AAA rechargeable batteries can be used in the Air2. Do not use non-rechargeable batteries.

3-5. Strap Mount

You can attach a strap to the device.

3-6. Vibration Sensor

Fix the sensor to the area where you want to measure the vibration. For direct measurement, screw the standard probe in the socket at the tip of the sensor. You may screw the magnet in the socket for hands-free measurement.

3-7. Socket (M6 Thread)

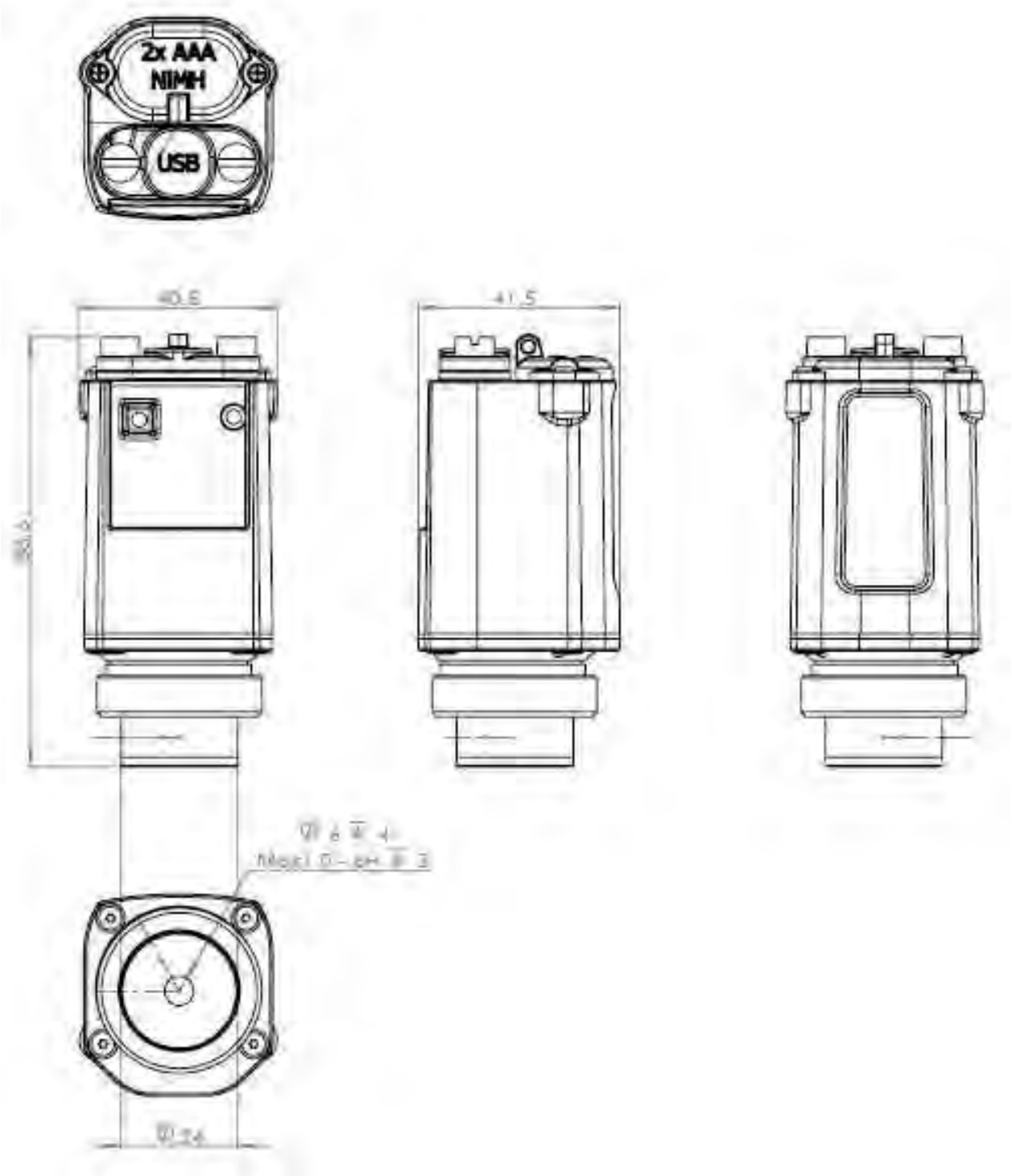
Air2 standard model has an M6 thread. The probe or the optional magnet that can be secured in position with an M6 screw.

3-8. Sensor Connector

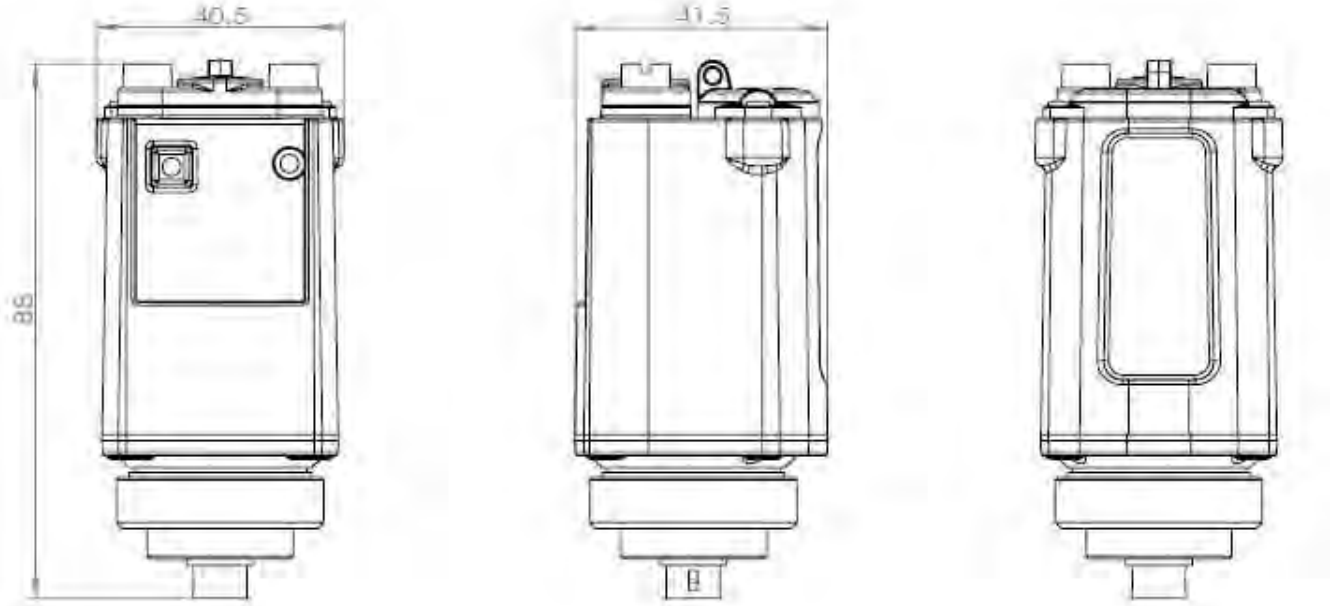
You can use the external pickup by connecting it to the Air2 connector model.

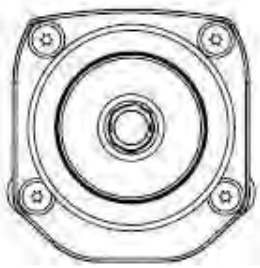
4. DIMENSIONS

4-1. Standard Model



4-2. Connector Model





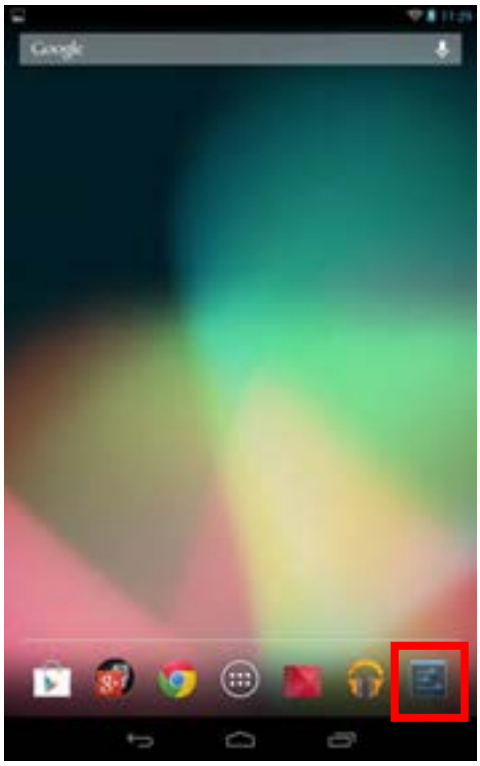
5. HOW TO INSTALL THE SOFTWARE

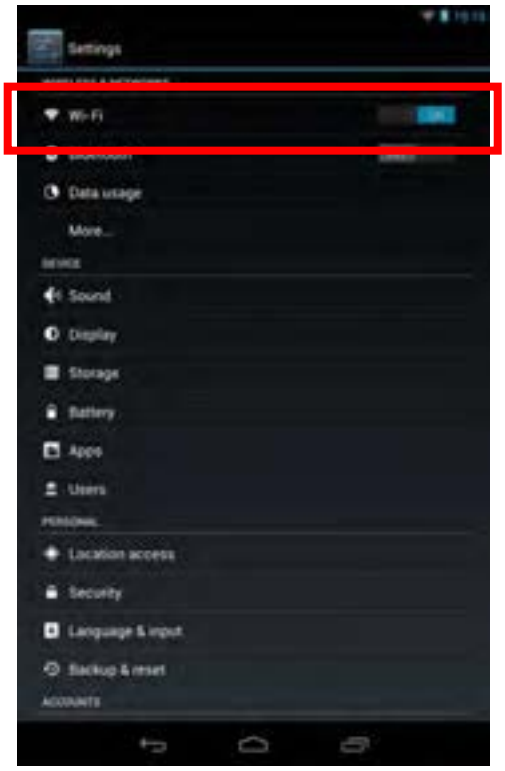
Refer to the quick user's guide for software installation.

6. OPERATING INSTRUCTIONS

6-1. Activation of the Software and Setting of the Tablet PC (Nexus 7)

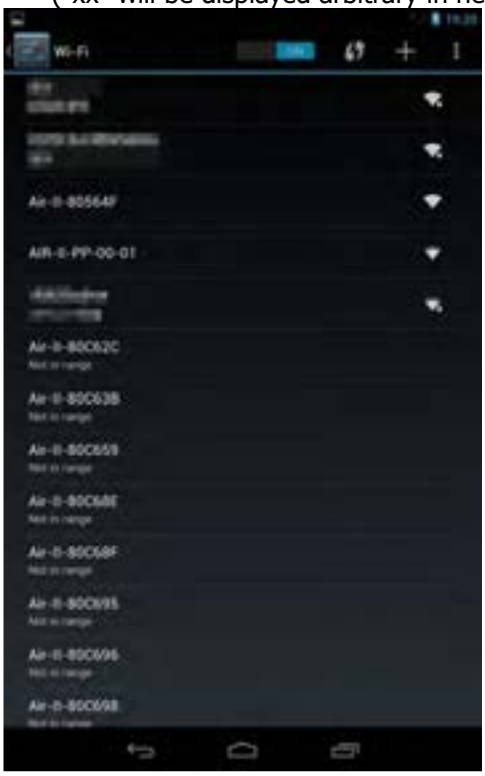
(1) Turn on the tablet PC and get ready to activate WiFi connection.
(2) Press the power button of the Air2 to bring it to standby mode. (LED indicator: Red blinking)
(3) Go to the setting menu of the Android.





(4) Activate WiFi connection.

(5) Select the "Air-II-xxxxxx" listed in the networks as the access point.
("xx" will be displayed arbitrary in hex notation).



(6) Once the status of the "Air-II-xxxxxx" is indicated as connected, the connection is successfully done. At this point, the LED indicator is still red and blinking.

6-2. Measurement Method

Air2 can measure the vibration in 2 modes:

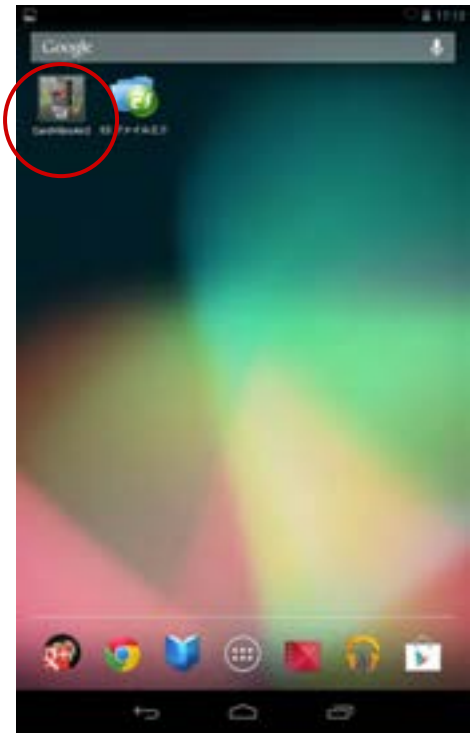
(1) OA Measurement
OA values of vibration data, such as acceleration, velocity, and displacement can be measured and displayed. This mode is loaded with ISO and bearing criteria for quick diagnosis.

(2) FFT/WV
The waveform data of the specified time can be gained. The waveform and FFT data are displayed. Since this function accommodates continuous monitoring, real-time FFT analysis is possible.

See the chapter 6-2-2 and after for more detailed description of each measurement mode.

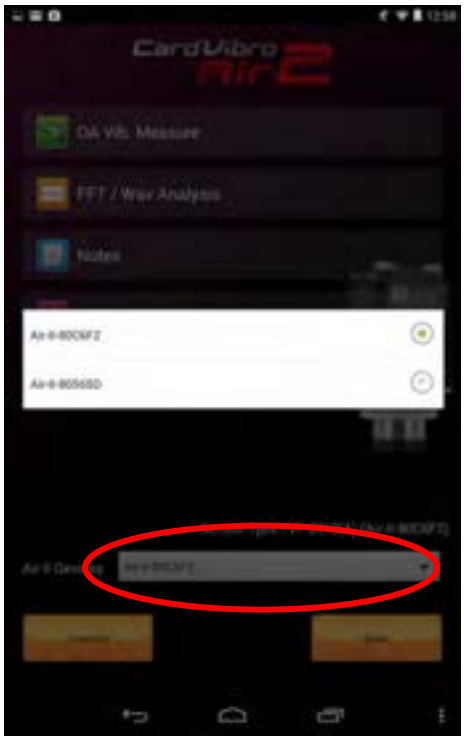
6-2-1. Connection with the Air2

CardVibroAir2 icon will appear in the tablet PC display once the program is correctly installed.



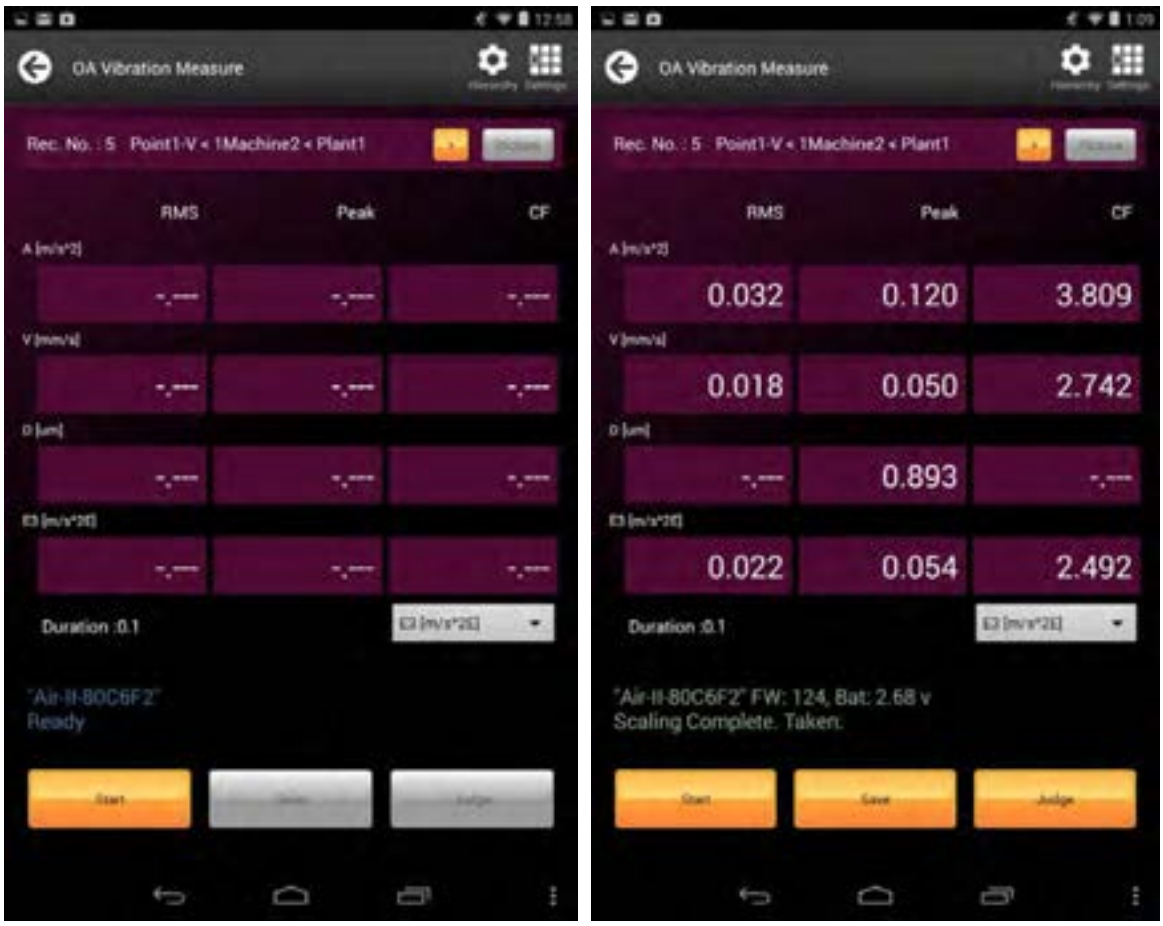
Go to the CardVibroAir2 main menu by touching the icon.

Touch "Scan" in the lower right corner of the main menu. Turn on the Air2 and make sure the red LED indicator is blinking.
Active Air2 device number(s)* will appear. Select the device and touch "Connect."
The selected device number will be indicated as Sensor Type in the top of main menu page.
*The device number is the SSID number indicated in the label on your Air2 body.
You can confirm the connection by the WiFi icon on the upper right corner of the display or in the measurement page.



6-2-2. OA Vibration Measurement

Once the tablet PC is successfully connected to the Air2, touch the "OA Vib. Measure" icon in main menu. Touching the icon will lead you to the OA vibration measurement page.
Be sure the message, "Ready," is indicated below the device number in the display. If not, go back to the main menu and establish the connection.
When the measurement is completed, the values of acceleration (A), velocity (V), displacement (D), and either E1, E2, or E3 will be shown.



You can also save the results as you specify the information of the measured spot. Refer to the chapter 6-2-4 for more details. In addition, quick diagnosis function is available to evaluate the measurement results based on the ISO standard.

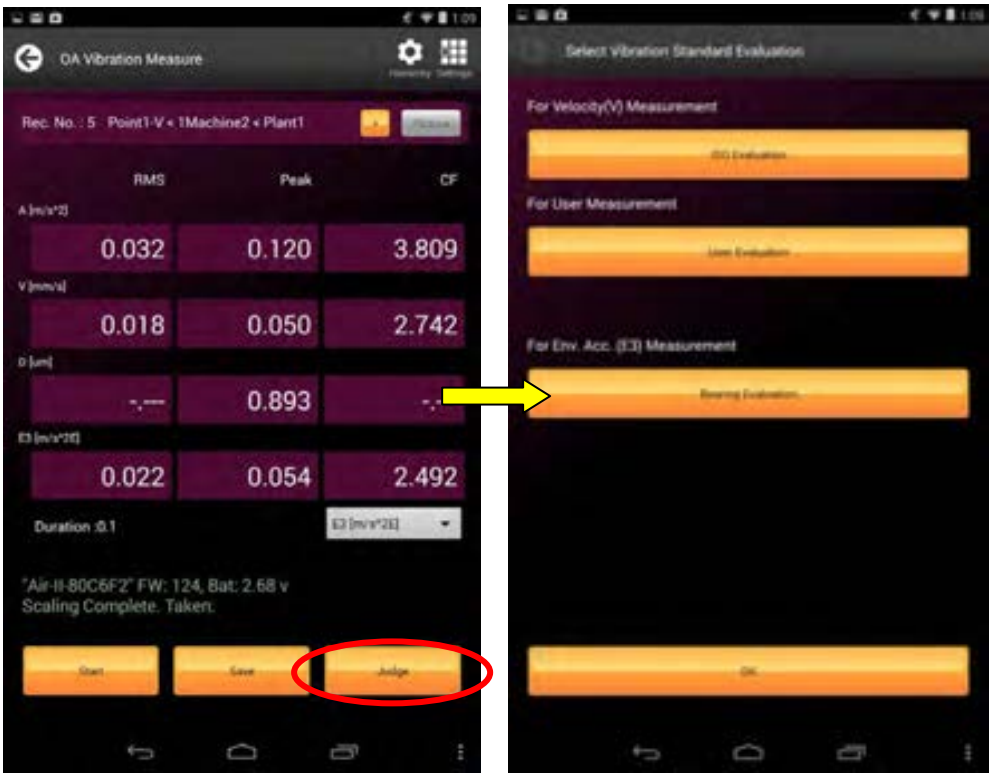
6-2-3. Quick Diagnosis

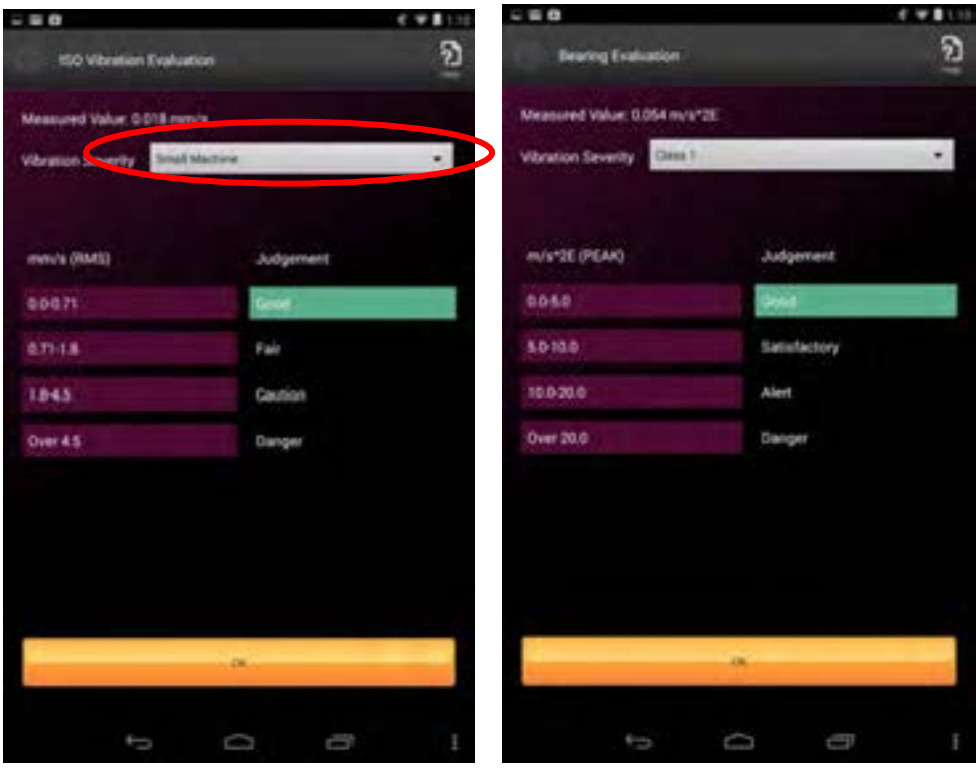
You can go to the diagnosis menu by touching "Judge" button in the measurement result page.
You will see three evaluation criteria:

1. ISO Evaluation
2. Bearing Evaluation
3. User Evaluation

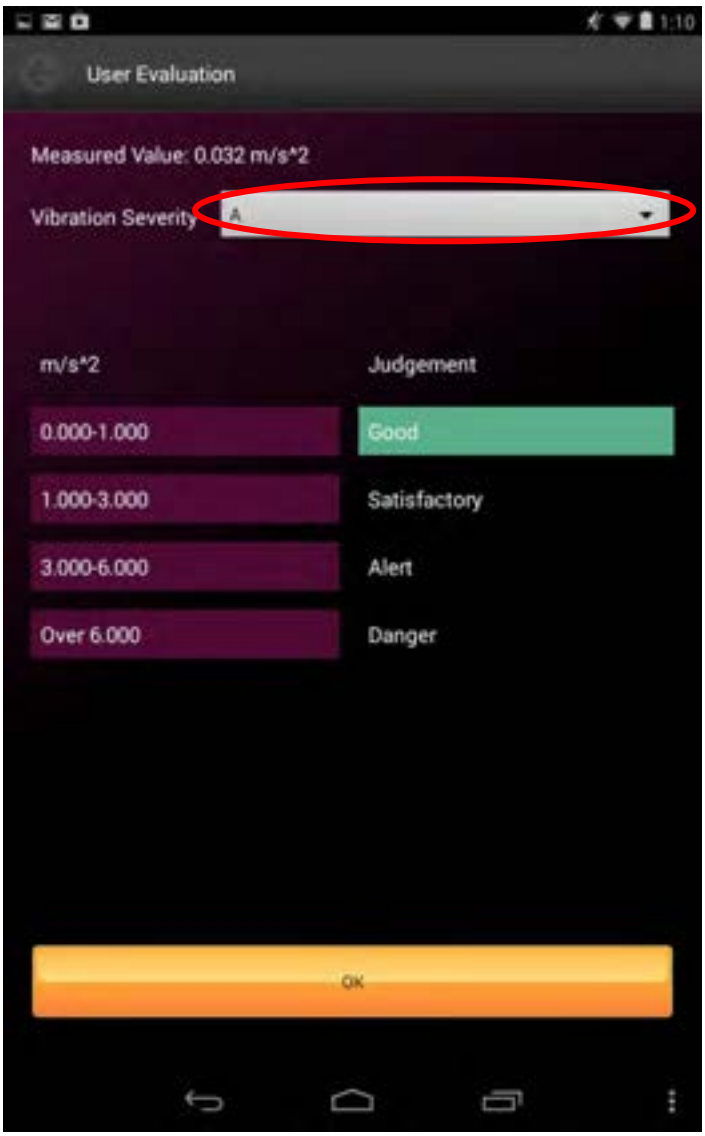
ISO evaluation is a judgment based on the ISO standard. On the other hand, bearing evaluation is a judgment based on the envelope acceleration (E3).
And On User Evaluation, you can define the criteria level for each three functions, namely Acceleration, Velocity and Displacement. How to define is showed in User Judgment Edit page.

Select and touch evaluation method to see the judgment.





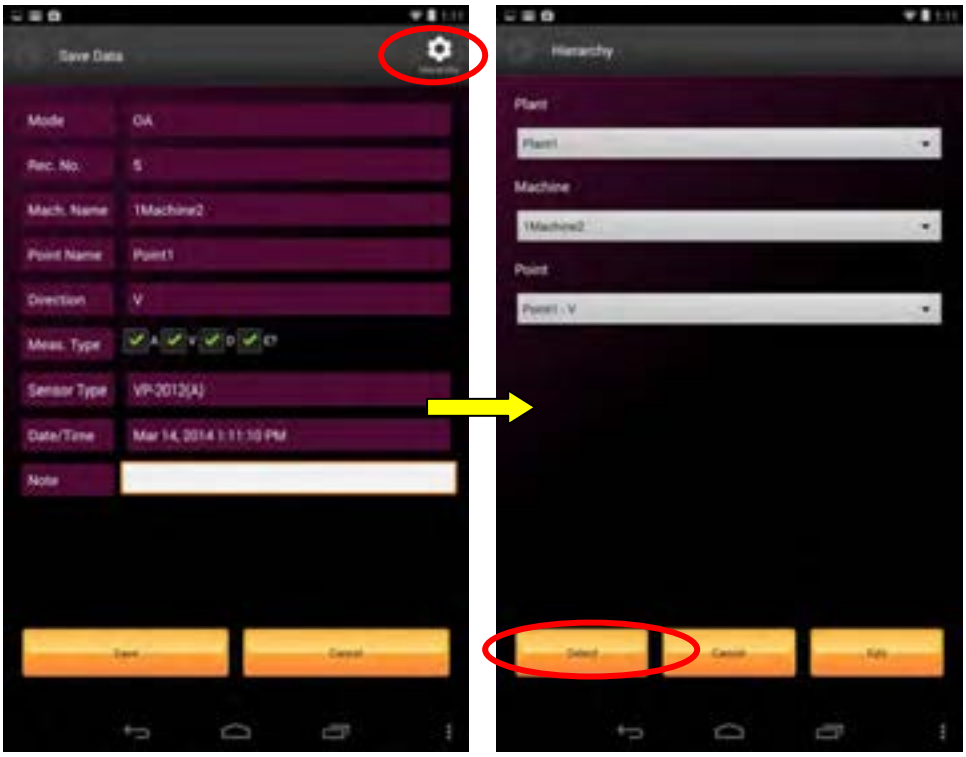
Select the size of the machine to see the judgment.
And also User Judgment screen is showed at next page.



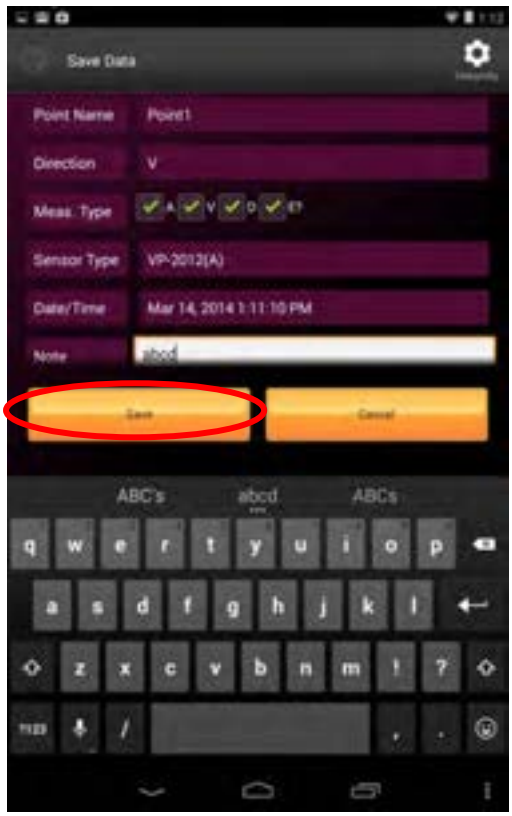
You can select A(Acceleration), V(Velocity) and D(Displacement).

6-2-4. Data Save

The measurement results can be saved by using the database of the measurement spots.
Touch "Save" to go the data save page. Then, touch "Hierarchy."



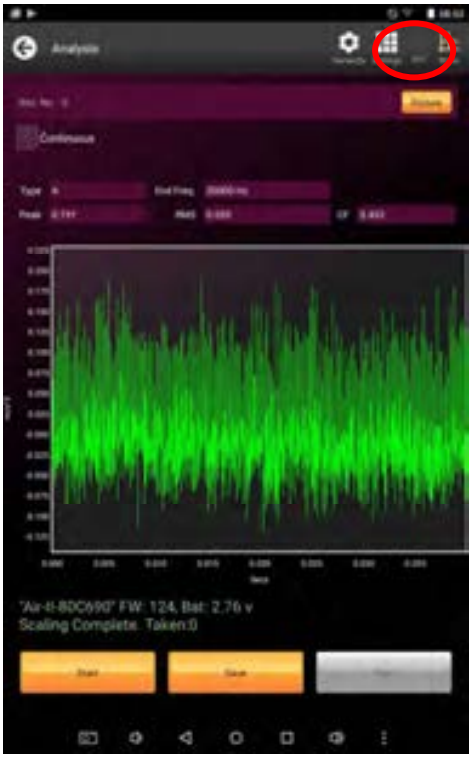
Select the Plant, Machine, and Point from pull-down menu; then touch "Select" at the bottom of the page.
You may select these information before measurement. In that case, touch the "Hierarchy" button in the initial OA Vibration Measure screen to go to the data save page.
Touch "Save" to save the data.
You can move on to the next measurement, if needed.
The saved data can be converted into a chart, etc by using the optional data management software (available at IMV).



And also you can type a short sentence at the Note window, and you can find this note on the optional data management software(DB-2012).

6-2-5. FFT/Wav Analysis

Touch the "FFT/Wav Analysis" icon in the main menu.
Be sure the message, "Ready," is indicated below the device number in the display at this point. If not, go back to the main menu and establish the connection.
As you touch "Start," the Air2 starts the measurement.
Once the measurement is completed, you will see the waveform or FFT data in the screen.
FFT and WV can be switched as you press the "FFT" or "WVE" button in the top of the screen.
Also, you can save the data just like the OA vibration measurement. Refer to the 6-2-4 to save the data.
By checking the checkbox of "Continuous" in the FFT/Wave analysis main menu before measurement, the screen will display the waveform or FFT data continuously. However, please note you cannot save these continuous data.

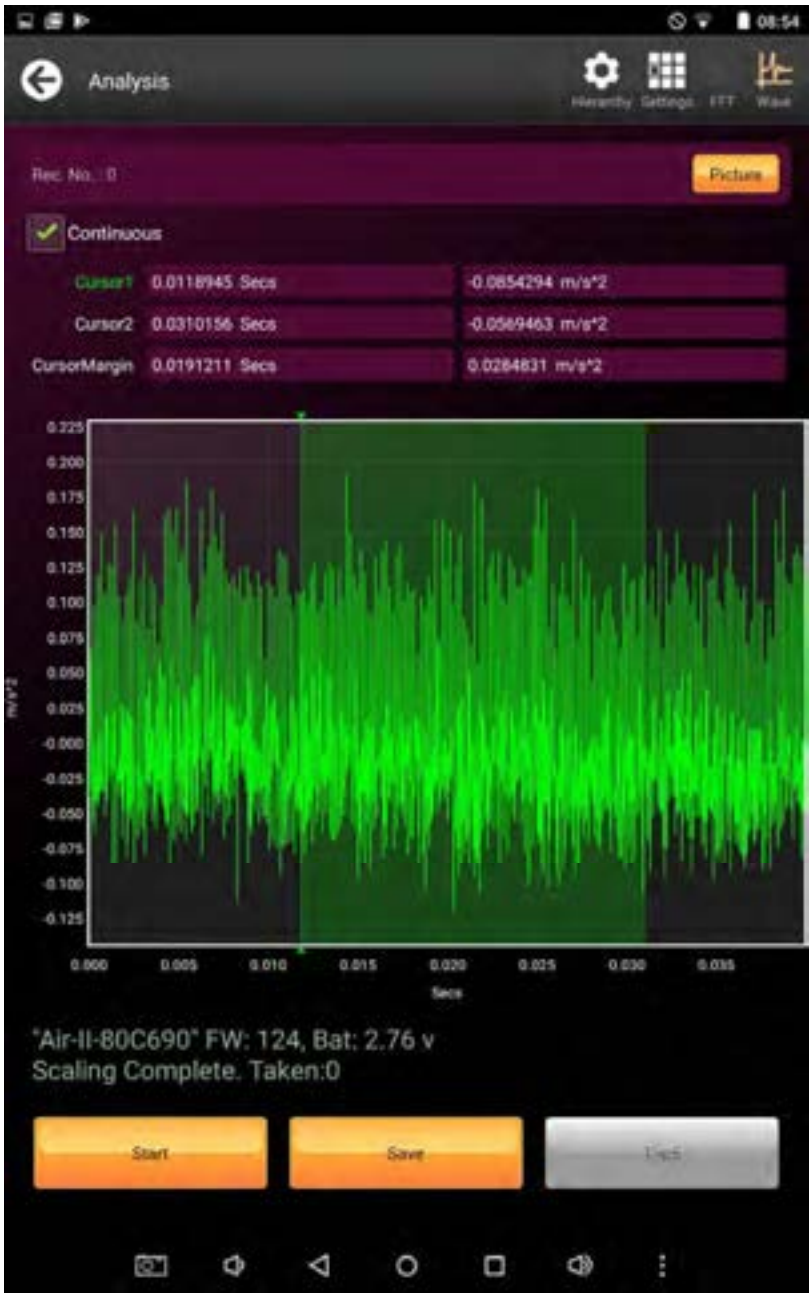

Analysis
Scaling Complete. Taken:0


Analysis
Scaling Complete. Taken:0


Analysis
Continuous
Scaling Complete. Taken:0

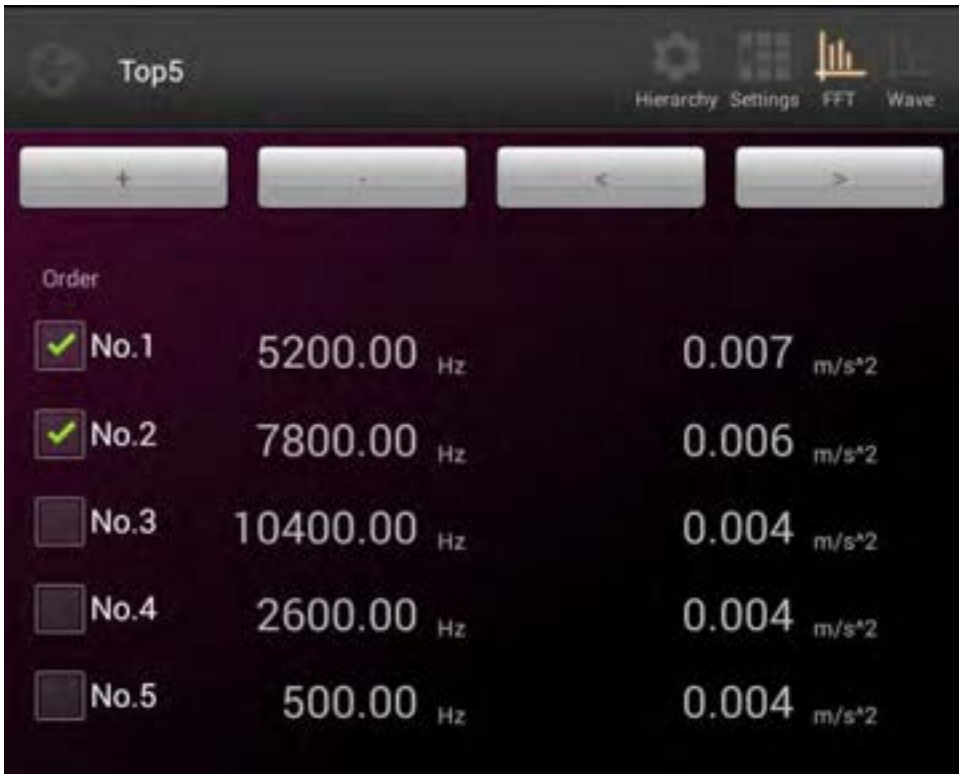
6-2-6. Cursor

When tapping the graph window at twice, the cursor is displayed on the screen, and also disappeared as same way. You can move the cursor by using your finger and moving the finger on the screen.
Also, the value of position indicated by cursor, is displayed at the bottom of the graph window.
You can zoom in and out by two-finger swiping .

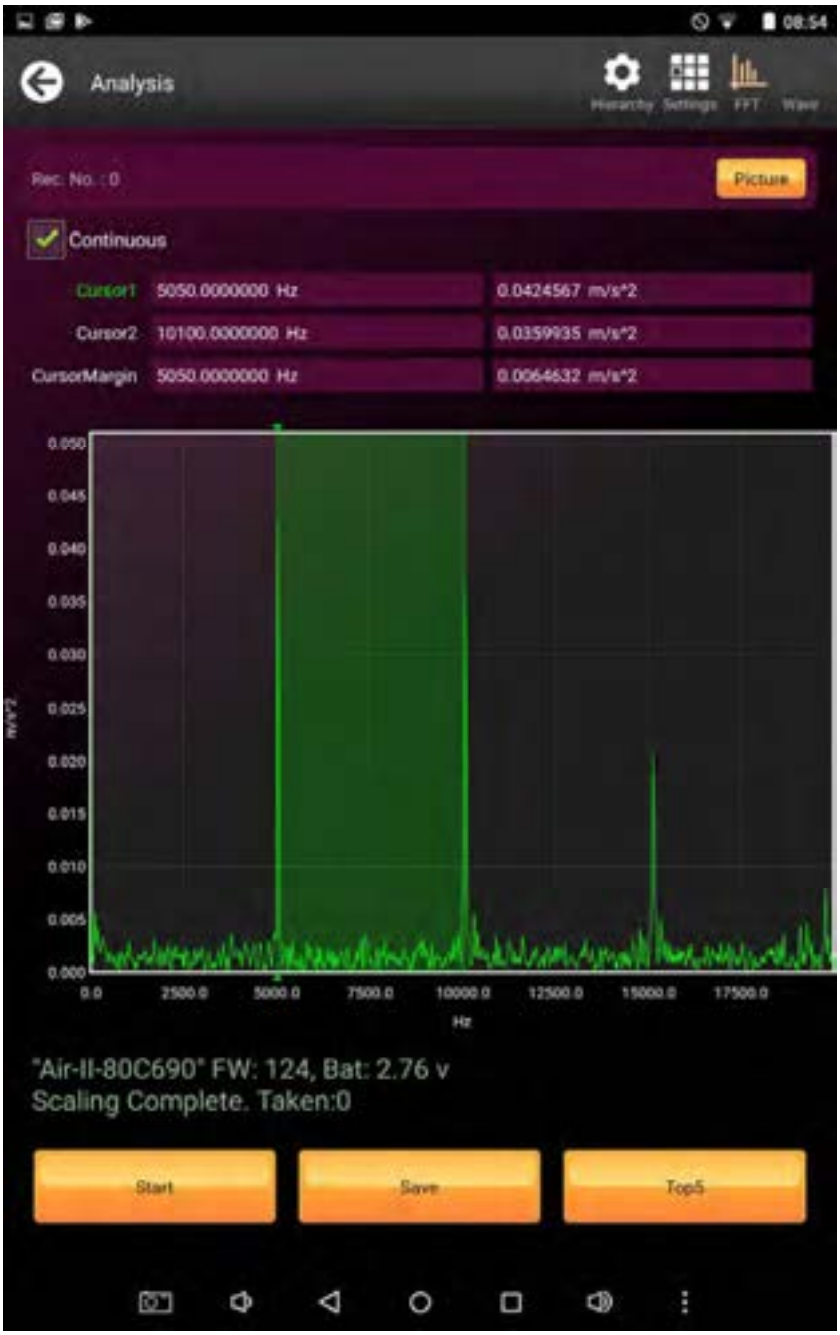


6-2-7. Top5

While the FFT graph is displayed, the "Top5" button is effective. This button identifies and displays frequency and amplitude information for the FFT's five highest amplitude frequency components.

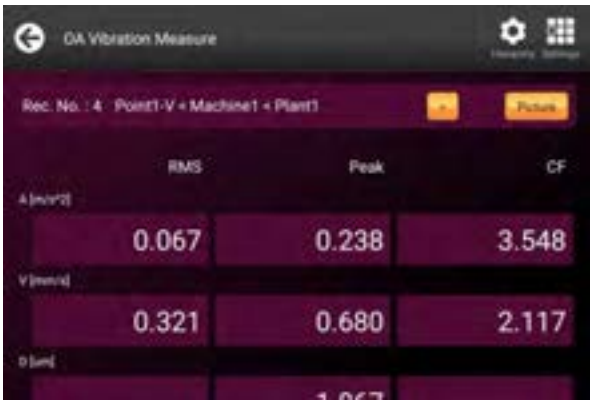


On the Top5 screen, you can check the two checkboxes for displaying the cursors on the FFT graph. We show the sample image at next page.


08:54
Analysis
Hierarchy
Settings
FFT
Wave
Rec. No. : 0
Picture
Continuous
Cursor1 5050.0000000 Hz 0.0424567 m/s^2
Cursor2 10100.0000000 Hz 0.0359935 m/s^2
CursorMargin 5050.0000000 Hz 0.0064632 m/s^2
m/s^2
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0.0
2500.0
5000.0
7500.0
10000.0
12500.0
15000.0
17500.0
Hz
"Air-II-80C690" FW: 124, Bat: 2.76 v
Scaling Complete. Taken:0
Start
Save
Top5

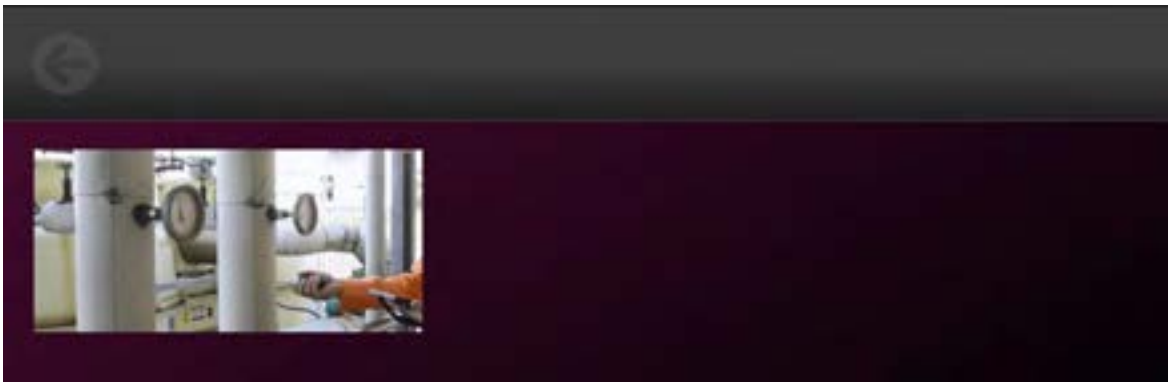
6-2-8. Route Settings

You can use a routing of measurement points from version "1.6.5". This function shows the measurement point which you assigned the order by the management software "DB-2012" on your PC. So please refer the manual of "DB-2012" for details. When you download the database to Android Tablet, the Air2 software shows a first measurement point (see left-side figure), and press the " > " button, the next measurement points will be showed. (see right-side figure) Also, if you want to go backward, you can do by pressing " < " button.



Also, you can attach the figure on "DB-2012" software for each measurement points. The measurement point, which have a figure data, enable the "figure" button. You can see the figure data by pressing the "Figure" button.

By pressing "Close" button, you can go back to a normal window.



6-2-9. Settings

You can set up the measurement conditions by going to settings menu in the FFT/Wave Analysis page. You can change various conditions such as measurement mode, full scale, end frequency, and so on.

Mode:	Select "Normal." "Recorder" can be used to record the waveform. Duration can be set from 1 second up to 30 minutes depending on the end frequency.
Duration:	Only "Recorder" mode needs this setting. You can specify the recording capacity.
Measurement Type:	Select the physical quantity of the waveform; such as acceleration (A), or velocity (V). When the mode is set at Recorder, the waveform of acceleration is recorded.
Full Scale:	Select "Auto."
End Frequency:	Specify the maximum frequency.
Lines:	This is the number of lines in the FFT analysis. The larger the number is, the higher the resolution to be shown becomes.
Averages:	The method of data averaging, and the number of averaging data.
Window:	Window function used in FFT process. Select "Hanning" in regular operation.
Defaults:	Set the selected values to default values.

6-3. Battery Exchange

While measuring, the module identified number and battery voltage are displayed on the screen.

This color has battery information as following.

Blue : Waiting, not measuring once

Green : Full charged

Orange : Operatable voltage

Red : Volatge level is low, please recharge the batteries

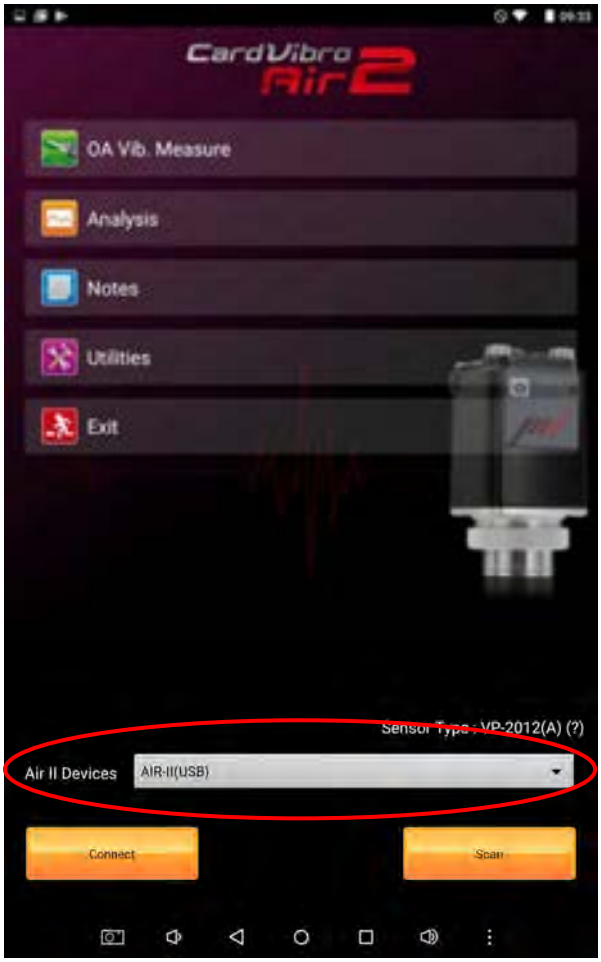
When you find the " Battery Low" on the screen, please shutdown the application, and after recharging, connect the Air2 module again.

Also, if you find the no green color character after full recharging, it seems that the battery has damaged or has no ability for full performance.
In such a case, please change the battery.

6-4. USB Connection

You can use USB Interface for measuring after the application version 2.6.0. If you want to get the data through USB interface, you have to use " USB Host Cable " for a Tablet. But that's' all.

Connect a Tablet to Air2 device through USB Host Cable.
Air2 application shows [Air-II(USB)] on the "Air2 device window".
Press the "connect" button.



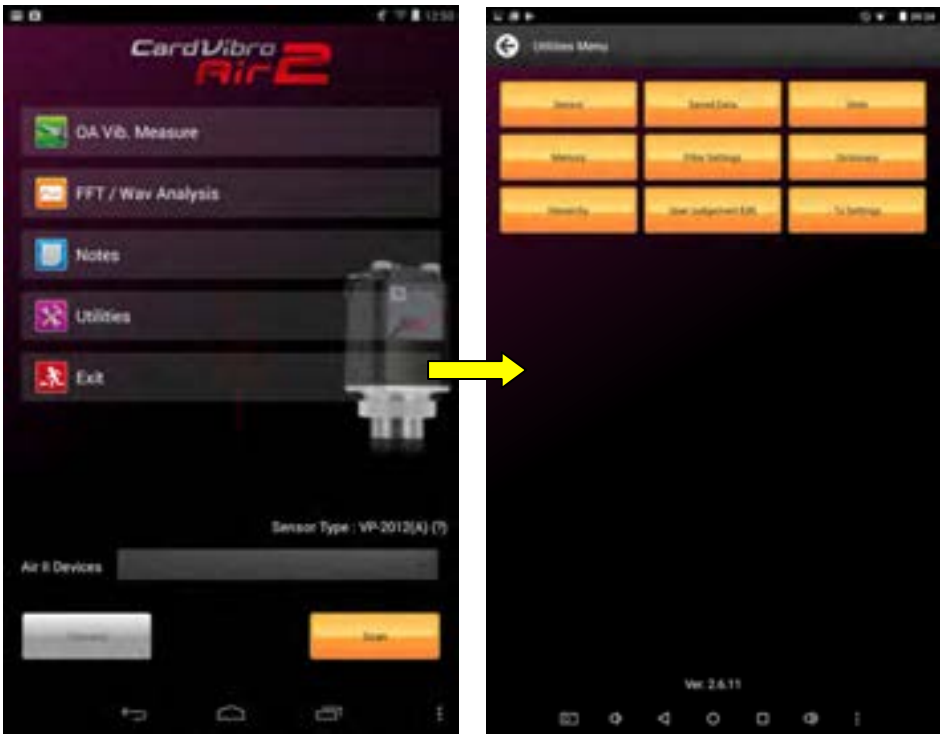
The preparation has been finished by only above procedure. The operation of measurement is as same as a wireless measurement.
But keep in your mind that,

It takes much time to measure by USB port at first time, because Air2 have to translate from wireless to wired operation protocol.

After second measurement, it will take much same time as wireless measurement,
without shutdown application or remove USB cable.

7. UTILITIES

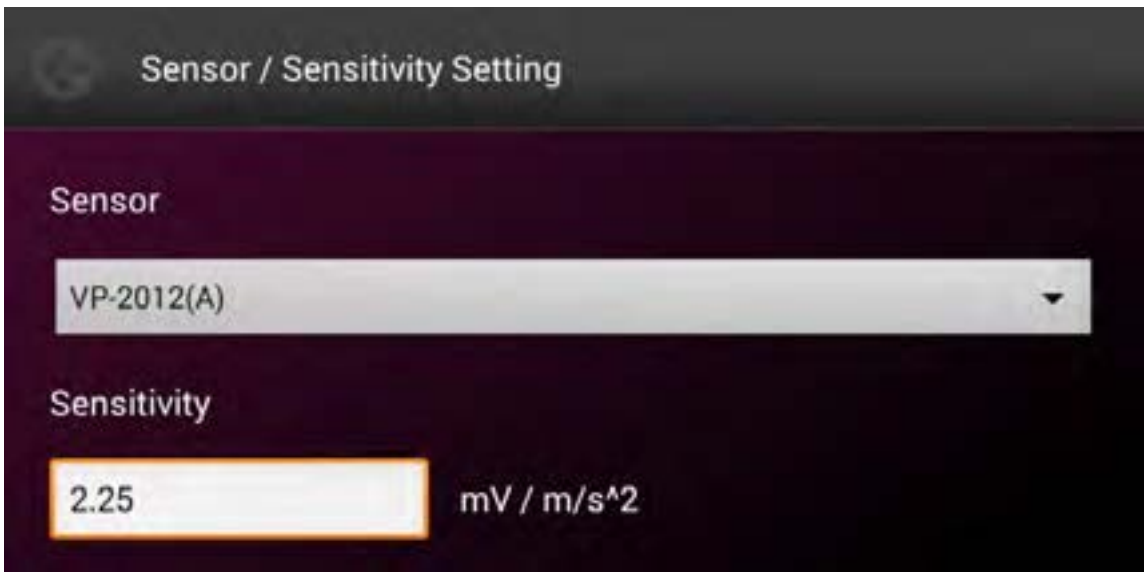
Touch "Utilities" in the main menu to go to utilities menu.



7-1. Sensor

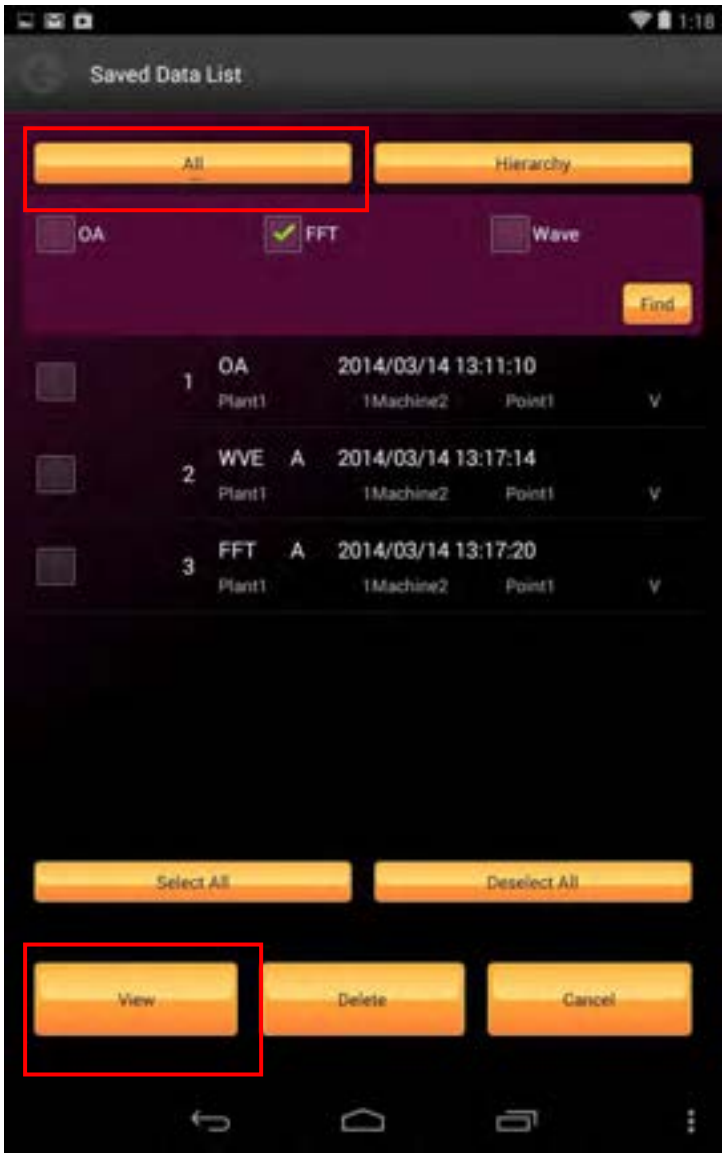
You can set the sensitivity of the sensor/pickup.

For the Air2, a piezoelectric sensor, VP-2012(A), and a low frequency sensor, VP2012PS1, are available. Use a piezoelectric pickup in regular operation. The VP2012PS1 can be used with the VM-2012C only. It is possible to use the VP2012PS1 with the VM2012, yet, the result may not be accurate.



7-2. Saved Data

You can see the saved data on the tablet PC. When you touched the " save data " button, the following screen is displayed.



If saved data is not shown, please the " All " button is pressed, all saved data is displayed on the screen as above.

And if you want to delete the data, please press the delete button, checking the data

You can display the saved data, by checking the check box of data and touch the " View " button.

In case of OA display

In case of FFT/WV

Also, by checking the check box and pressing " Find " button as following, you can list the specified kind of data.

7-3. Units

Specify the units to show acceleration by m/s^2 or G.

Metric : you can select " m/s^2 " or " G " for acceleration

Velocity -> mm/s
Displacement -> um

English : Unit is fixed to " G " for acceleration

Velocity -> inch/Sec
Displacement -> mil

7-4. Memory

You can see the data capacity used by Air2.

7-5. A Filter

Select FMax for overall vibration acceleration measurements.

And a High-Pass filter is to be set for Overall Displacement Measurement,

Fc :10Hz for setting Low (default)

Fc :20Hz for setting Middle

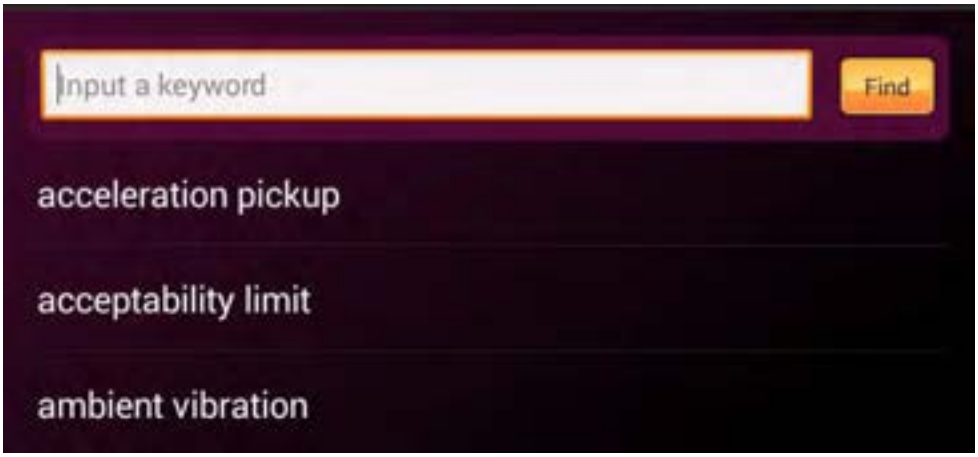
Fc :30Hz for setting High

7-6. Dictionary

This is a simple way for knowing Vibration technical term. You can find and search the technical term by input the keyword.

When you select a technical term and touch the " View " button, the explanation is displayed.

To quickly browse through available topics, enter the first letter of the topic you wish to explore. All topics beginning with your entered letter display.



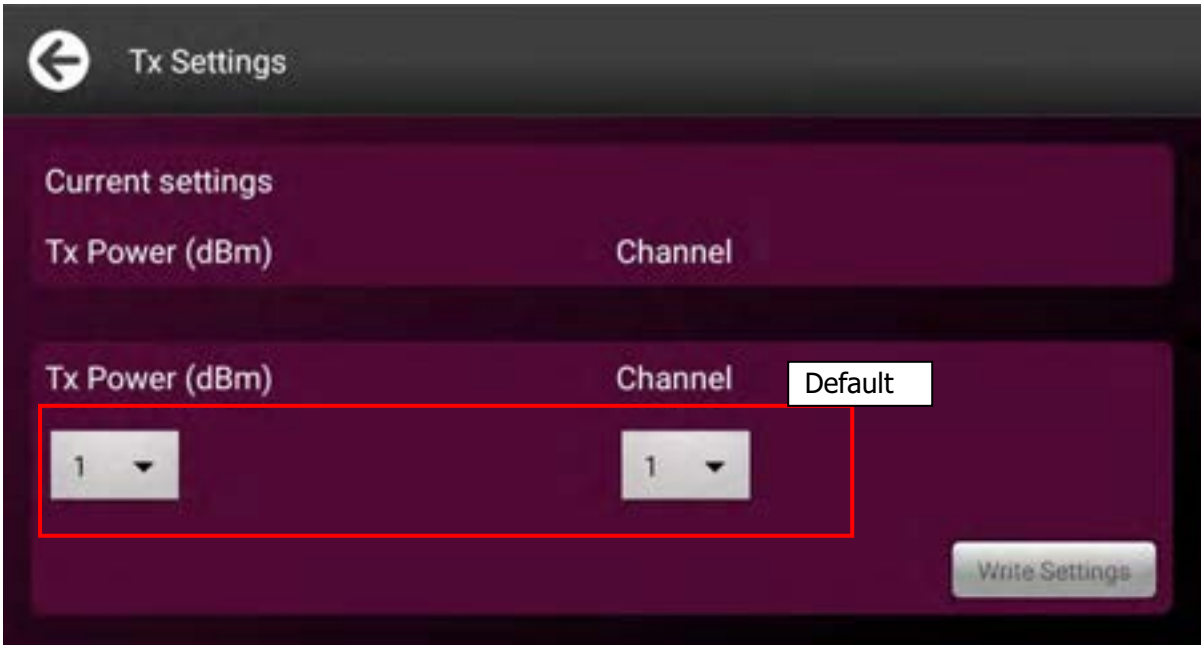
7-7. Hierarchy

You can add or delete the information about the points to measure. You can edit, add, or delete the information.

Next figure is the data entry page to register the new point to measure.

7-8. Tx Settings

You can change the value of Tx Power, Channel. Default setting is fine for regular use. Inappropriate setting may disable the wireless connection.



Tx Power : Changeable from 1dB to 11dB, the default value is 1dB. Larger the Power setting, the transmit power is lager. You have to care the battery life, when you set the large power.

Channel : Changeable from 1CH to 12CH, the default value is 1CH. If you find that Air2 Wifi channel is interfered by another Wifi instrument, please change the channel and set the other channel, pressing " write setting " button.

7-9. User Judgment Edit

You can set the judgment criteria for Acceleration, Velocity and Displacement easily.
Call this function, touching the "User Judgment" button, and typing the values for each threshold values.

8. SPECIFICATIONS

8-1. Basic Specifications

Item	Specs
Interface	**Wireless LAN: IEEE802.11b/g; WiFi; 128bit WEP; WPA/WPA2** **Cable USB: USB2.0, Visual COM Port; Direct Connection**
Wireless Communication	**Infrastructure**
Memory Capacity	**4Mbit, 16bank**
Power Supply	**2 AAA rechargeable batteries**
Consumption Current	**Approx. 150mA (during measurement; WiFi connection)**
Ambient Temp	**From +5C to +50C (Guaranteed only with the attached batteries)**
Ambient Humidity	**From 30 to 90%; No condensation**
Sampling Frequency	**76.8kHz (max)**
AD Resolution	**16bit**
Operational Tablet OS	**Android3.2, Android4.1, Android4.2** **(See IMV website for update information).**
Manufactured Country	**Japan**

8-2. Measurement Specifications

Refer to the chapter 10-1 in the case you will use a low frequency vibration measurement pickup with the Air2 connector model.

Items	Specs
Frequency Range A V D E1 E2 E3	 **Acceleration** **10 to 10kHz (*1)** **Velocity** **10 to 1kHz** **Displacement** **10 to 150Hz** **Envelope Accleration** **DC to 50Hz (5 to 100Hz[BPF])** **Envelope Accleration** **DC to 500Hz (50 to 1kHz[BPF])** **Envelope Accleration** **DC to 5kHz (500 to 10kHz[BPF])**
Maximum Acceleration	**500m/s^2**
Sampling Frequency	**A, E3: 76.8 kHz** **E1, E2, V, D: 38.4 kHz**
Envelope Filter	**A, E3: 20kHz** **E1, E2, V, D: 2kHz**
Measurement Range: A, E1, E2, and E3	**Specified or Automatic** **0 to 5m/s^2 (x200 Range)** **0 to 10m/s^2 (x100 Range)** **0 to 20m/s^2 (x50 Range)** **0 to 50m/s^2 (x20 Range)** **0 to 100m/s^2 (x10 Range)** **0 to 200m/s^2 (x5 Range)** **0 to 500m/s^2 (x2 Range)** **0 to 1000m/s^2 (x1 Range)**
Measurement Range: V	**Specified or Automatic** **0 to 5mm/s (x200 Range)** **0 to 10mm/s (x100 Range)** **0 to 20mm/s (x50 Range)** **0 to 50 mm/s (x20 Range)** **0 to 100mm/s (x10 Range)** **0 to 200 mm/s (x5 Range)** **0 to 500 mm/s (x2 Range)** **0 to1000 mm/s (x1 Range)**

Items	Specs
Measurement Range: D	**Specified or Automatic** **0 to 25μm (x200 Range)** **0 to 50μm (x100 Range)** **0 to 100μm (x50 Range)** **0 to 250μm (x20 Range)** **0 to 500μm (x10 Range)** **0 to1000μm (x5 Range)** **0 to2500μm (x2 Range)** **0 to5000μm (x1 Range)**
OA Vibration Measurement (Overall)	**Indicate the results of all modes (A, V, D, E1, E2, and E3) simultaneously.** **Automatic Range Setting** **Measurement Time: 0.1, 0.5, or 1.0 sec** **Measurement Data: RMS, PEAK,CF (Crest Factor)** **4-Digit Display (ex, 9999, 999.9, 99.99, and 9.999)** **Status Indicator: Execution, Complete**
Evaluation Function	**Evaluation based on the vibration severity standard; ISO-10816 [JIS-B-0906].** **Evaluation of the bearing based on the envelope acceleration (E3 mode).**
FFT/Wave Analysis	**Mode: A, V, D, E1, E2, or E3.** **Range: Specified, or Automatic** **FFT Measurement Conditions:** **Frequency: Selectable from below options** **A: 250, 500, 1k, 2k, 5k, 10k, 15k, 30k Hz** **V: 250, 500, 1k Hz** **D: 250 Hz** **E1: 50 Hz** **E2: 250, 500 Hz** **E3: 250, 500, 1k, 2k, 5k Hz** **Lines: 12800, 6400, 3200, 1600, 800, 400, 200, 100** **Averaging : Stable, Exponential, Peak Hold** **: 1, 2, 4, 8 times** **Window: Hanning, Rectangular, Flat Top** **Measurement Type: Normal, Recorder** **Normal Measurement:** **Recording time of waveform data is determined by FFT measurement condition (analysis frequency, line number). Executes the measurement for average cycle in FFT and records the waveform for frame time (final frame time.)** **Recorder Measurement:** **Acceleration, velocity, and displacement will be recorded for the specified duration. Max Recording Duration: 30min (different per frequency).** **Status Indicator: Execution, Complete**
Graphic Indication	**FFT graph** **Dominant frequency component highest High5 display** **Cursor indication value display** **Zoom scroll value display** **Waveform graph** **Cursor indication display** **Zoom.scroll display**

8-3. VM-2012 Air2 Specifications

Items	**Specs**
Mass	**Approx. 145g**
Dimensions	**40.5mm (W) x 88.6mm (H) x 41.5mm (D)**
Sensor	**Piezoelectric Accelerometer**
Acc. Frequency Range	**From 10 to 10kHz**
Vel. Frequency Range	**From 10 to 1kHz**
Disp. Frequency Range	**From 10 to 150Hz**
Max Measurement Acceleration	**500m/s²**
IP Code	**IP65**

8-4. VM-2012C Air2 Connector Model Specifications

Items	**Specks**
Mass	**Approx. 130g (incl. batteries)**
Dimensions	**40.5mm (W) x 88mm (H) x 41.5mm (D)**
Sensor	**Voltage Output Sensor, ICP Sensor**
Voltage Output Port	**-5V, +5V**
ICP Port	**+24V (2mA)**
Voltage Input Port	**+/- 2.5V**

9. VIBRATION EVALUATION STANDARD

Evaluation Standard Loaded in the Air2 are as follows:

Criteria	Pickup (Sensor)	Measurement Type
ISO Vibration Evaluation Standard (Vibration Severity)	VM-2012 VP-2012 Acc. Pickup (using VM-2012C)	Vibration level (OA value*) measurement Velocity (V) value
Bearing Evaluation	VM-2012 VP-2012A Acc. Pickup (using the VM-2012C)	Vibration level (OA value) measurement

9-1. ISO Vibration Evaluation Standard – Vibration Evaluation Standard by Vibration Severity

Quote from the Vibration Standard Evaluation (Velocity) ISO 10816-3 Second edition 2009-02-01

Vibration Severity Card

Velocity Severity		Machinery Group 2 (Medium Machines)		Machinery Group 1 (Large Machines)	
ISO 10816-3		Rated Power: 15 kW to 300 kW		Rated Power: >300 kW	
in/sec eq. Peak	mm/sec RMS	Electrical Machines with Shaft Height 160 to 315 mm (6.30 to 12.40 in.)		Electrical Machines with Shaft Height >315 mm (>12.40 in.)	
0.61	11.0	Unacceptable (Danger)	Unacceptable (Danger)	Unacceptable (Danger)	Unacceptable (Danger)
0.39	7.1		Unsatisfactory (Alert)	Unsatisfactory (Alert)	Unsatisfactory (Alert)
0.25	4.5	Unsatisfactory (Alert)			Satisfactory
0.19	3.5		Satisfactory	Satisfactory	
0.16	2.8	Satisfactory			Good
0.13	2.3		Good	Good	
0.08	1.4	Good			
0.04	0.7				
0.00	0.0				
Foundation		Rigid	Flexible	Rigid	Flexible

Group 1: Large machines with rated power above 300 kW;
electrical machines with shaft height H >= 315 mm.
These machines normally have sleeve bearings. The range of operating or nominal speeds is relatively broad and ranges from 120 r/min to 15 000 r/min.

Group 2: Medium-sized machines with a rated power above 15 kW up to and including 300 kW;
electrical machines with shaft height 160 mm <= H < 315 mm.
These machines normally have rolling element bearings and operating speeds above 600 r/min.

Options are:

G2 and Rigid (default)
- Alert: 2,8 mm/s (0.16 in./s)
- Danger: 4,5 mm/s (0.25 in./s)

G2 and Flexible
- Alert: 4,5 mm/s (0.25 in./s)
- Danger: 7,1 mm/s (0.39 in./s)

G1 and Rigid
- Alert: 4,5 mm/s (0.25 in./s)
- Danger: 7,1 mm/s (0.39 in./s)

G1 and Flexible
- Alert: 7,1 mm/s *(0.39 in./s)*
- Danger: 11,0 mm/s *(0.61 in./s)*

9-2. Bearing Evaluation

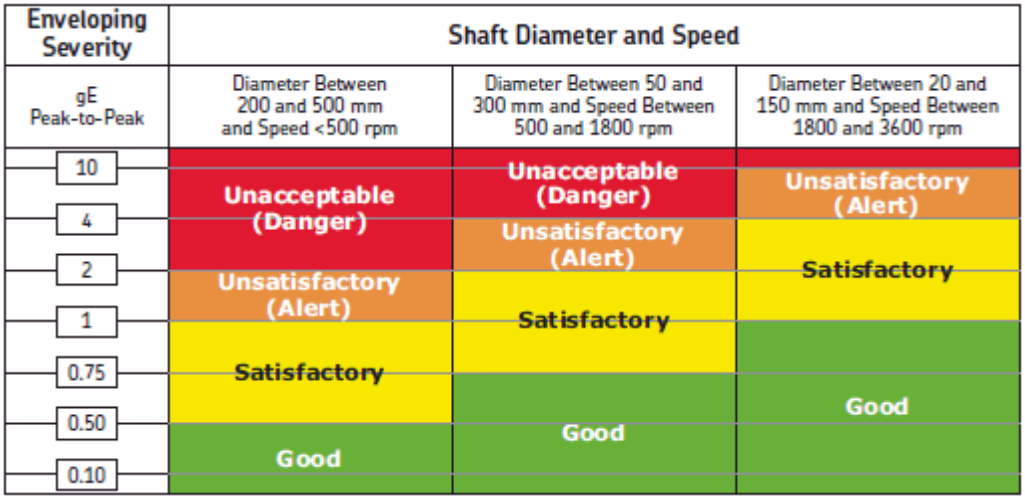
In order to evaluate bearing, we have established the guideline using the value of the E3 envelope acceleration.
The values in the chart below shall be applied only to the general guidelines. The best way to make a judgment on the severity is to take the trend of measurement results into consideration.

Classes:
(a) Class 1
Inner Diameter of the Bearing: From 200 to 500 mm
Number of Rotations: Less than 500RPM

(b) Class 2
Inner Diameter of the Bearing: From 50 to 300 mm
Number of Rotations: From 500 to 1800 RPM

(c) Class 3
Inner Diameter of the Bearing: 20 to 150 mm
Number of Rotations: 1800 or 3600RPM

Judgment will be made based on the peak of the E3.
As shown in the diagram in the following page, the program will select the applicable criteria based on the inner diameter of the bearing and the number of rotations of the concerned machinery.



The Enveloped Acceleration Classification (***CL1, CL2*** or ***CL3***) that best describes the general size and speed of the bearings being measured should be selected.

Options are:

CL1: Bearings with a bearing bore diameter be-tween 200 and 500 mm*(7.9 and 19.7 in.)*and a shaft speed below 500 r/min.
Alert: 1 gE
Danger: 2 gE

CL2 (default): Bearings with a bearing bore diameter between 50 and 300 mm*(2.0 and 11.8 in.)* and a shaft speed between 500 and 1 800 r/min.
Alert: 2 gE
Danger: 4 gE

CL3: Bearings with a bearing bore diameter be-tween 20 and 150 mm*(0.8 and 5.9 in.)* and a shaft speed from 1 800 to 3 600 r/min.
Alert: 4 gE
Danger: 10 gE

1G=9.806m/s^2

10. VM-2012C CONNECTOR MODEL

VM-2012C does not have a built-in sensor. Instead, an external sensor (pickup) of your choice can be connected for vibration measurement. Below accessories are available for this Air2.

- VP-2012PS1 – Low Frequency Vibration Measurement Pickup
- CA-2012 – Charge Amplifier

10-1. VP-2012PS1 – Low Frequency Vibration Measurement Pickup

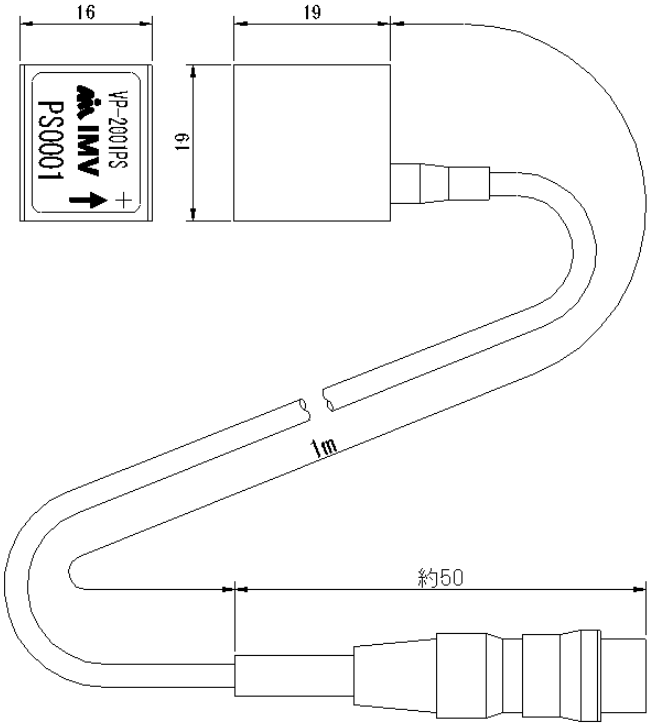
Items	**Specs**
Frequency Range A V D	 **Acceleration 3 to 100Hz** **Velocity 3 to 100Hz** **Displacement 3 to 100Hz**
Maximum Acceleration	**20m/s^2**
Sampling Frequency	**A, V, D: 9.6 kHz**
Envelope Filter	**A, V, D: 2kHz**
Measurement Range: A, E1, E2, and E3	**Specified or Automatic** **0 to 0.1m/s^2 (x200 Range)** **0 to 0.2m/s^2 (x100 Range)** **0 to 0.4m/s^2 (x50 Range)** **0 to 1m/s^2 (x20 Range)** **0 to 2m/s^2 (x10 Range)** **0 to 4m/s^2 (x5 Range)** **0 to 10m/s^2 (x2 Range)** **0 to 20m/s^2 (x1 Range)**
Measurement Range: V	**Specified or Automatic** **0 to 0.5mm/s (x200 Range)** **0 to 1mm/s (x100 Range)** **0 to 2mm/s (x50 Range)** **0 to 5 mm/s (x20 Range)** **0 to 10mm/s (x10 Range)** **0 to 20 mm/s (x5 Range)** **0 to 50 mm/s (x2 Range)** **0 to 100 mm/s (x1 Range)**
Measurement Range: D	**Specified or Automatic** **0 to 2.5μm (x200 Range)** **0 to 5μm (x100 Range)** **0 to 10μm (x50 Range)** **0 to 25μm (x20 Range)** **0 to 50μm (x10 Range)** **0 to 100μm (x5 Range)** **0 to 250μm (x2 Range)** **0 to 500μm (x1 Range)**
OA Vibration Measurement (Overall)	**Indicate the results of all modes (A, V, and D) simultaneously.** **Automatic Range Setting** **Measurement Time: 1, 5, or 10 sec** **Measurement Data: RMS, PEAK,CF (Crest Factor)** **4-Digit Display (ex, 9999, 999.9, 99.99, and 9.999)** **Status Indicator: Execution, Complete**

Items	Specs
FFT/Wave Analysis	**Mode: A, V, or D** **Range: Specified, or Automatic** **FFT Measuremnt Conditions:** **Frequency: Selectable from below options** **A: 125 Hz** **V: 125 Hz** **D: 125 Hz** **Averaging: Stable, Exponential, Peak Hold** **: 1, 2, 4, 8 times** **Window: Hanning, Rectangular, Flat Top** **Measurement Type: Normal, Recorder** **Normal Measurement:** **Recording time of waveform data is determined by FFT measurement condition (analysis frequency, line number). Executes the measurement for average cycle in FFT and records the waveform for frame time (final frame time.)** **Recorder Measurement:** **Acceleration, velocity, and displacement will be recorded for the specified duration. Max Recording Duration: 30min (different per frequency).** **Status Indicator: Execution, Complete**
Graphic Indication	**FFT graph** **Dominant frequency component highest High5 display** **Cursor indication value display** **Zoom scroll value display** **Waveform graph** **Cursor indication display** **Zoom.scroll display**

VP-2012PS1 Specifications

Items	Specs
Measurement Range	+/- 20m/s^2
Sensitivity	102mV/m/s^2 +/- 5%
Linearity	+/- 0.5%
Frequency Range	1 to 100Hz (+/- 0.5dB)
Resolution	Smaller than 0.06 m/s^2
Temperature Characteristic(Sensitivity)	Under 6mV/C
Power-Suplly Voltage	+/- 5V to +/- 15V
Ambient Temp	0 to 50C
Mass	36g
Impact Resistance	4000m/s^2
Size	19 x 19 x 16 mm
Cable	1m

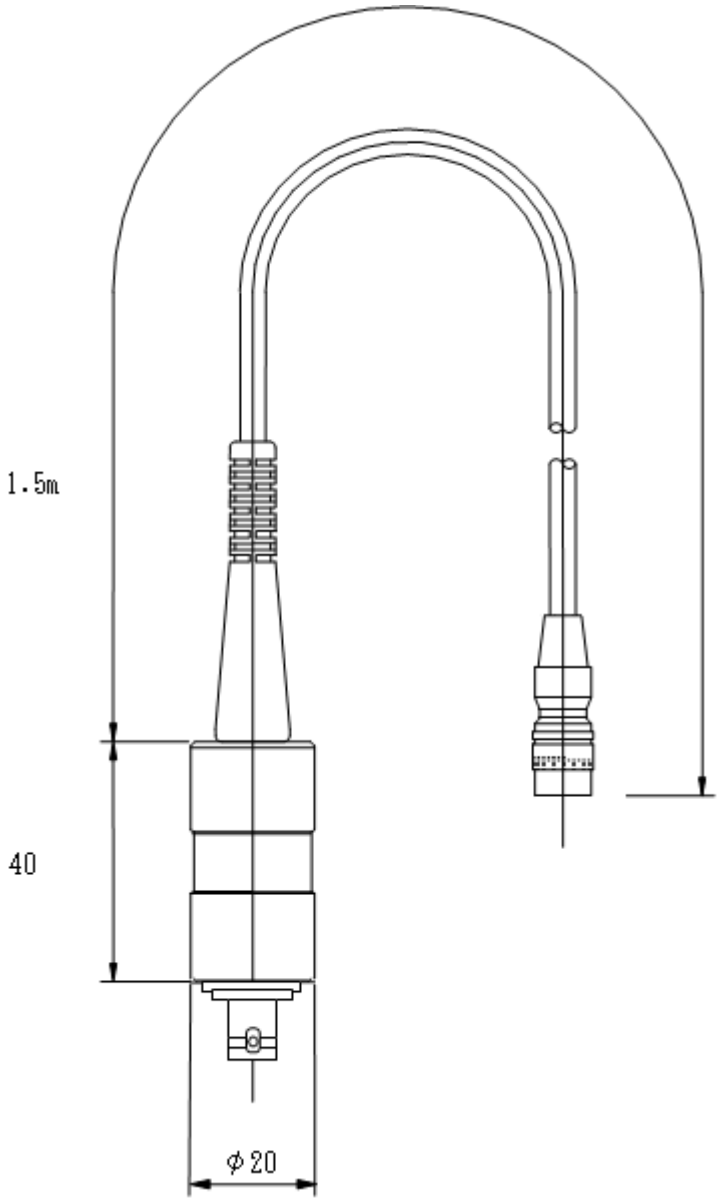
Fig 1. VP-2012PS1



10-2. CA-2012 Charge Amplifier

Items	Specs
Gain	1m V/pC +/-0.3dB 以内
Capacitance	1000pF
Frequency Range	3 to 10kHz +/- 0.5dB
Max Output Voltage	+/- 2V
Power Supply	DC +/-5V
Output Impedance	100Ω
Ambient Temp	-20 to 80C
Ground	Case
Material (Case)	SUS
Cable Length	1.5m
Connector	Device Side: 6-pin Round Sensor Side: BNC

Fig 2. CA-2012

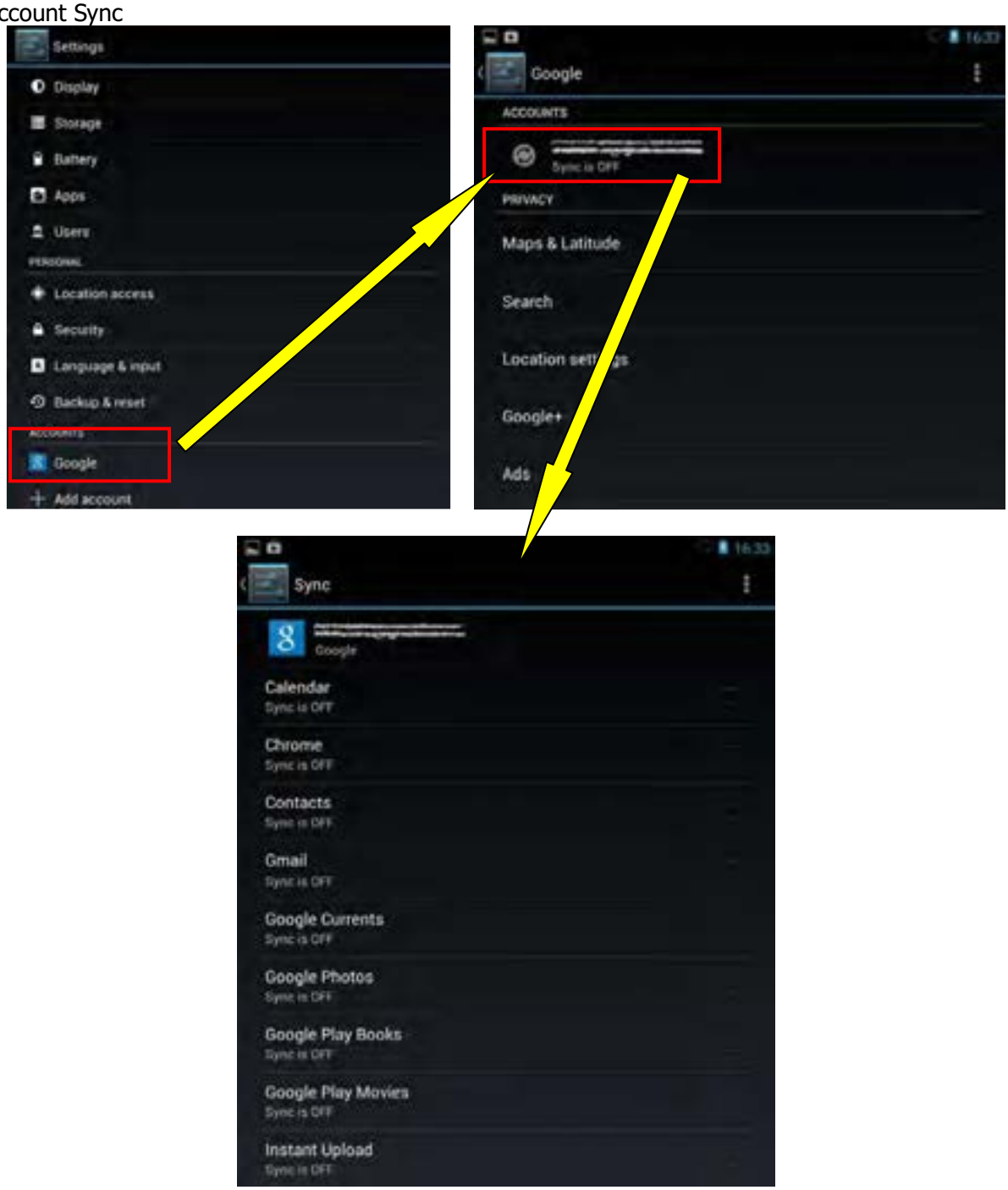


11. Advanced Setting of Android Tablet

Android OS and applications backup and version up their program automatically through an access point, it is very convenient for users. But our Air2 application have to connect to Air2 WiFi module, if the connect ion is shut down by automatic access to another access point, Air2 application can not receive measurement data.

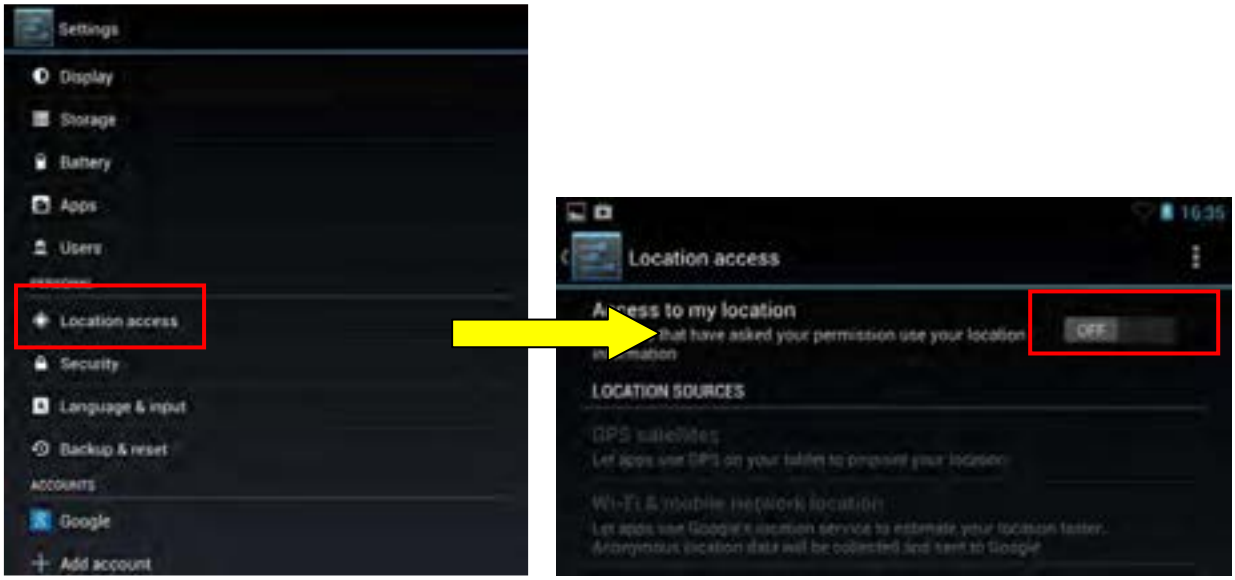
For protecting such a situation, following setup is very suitable.

1) Account Sync



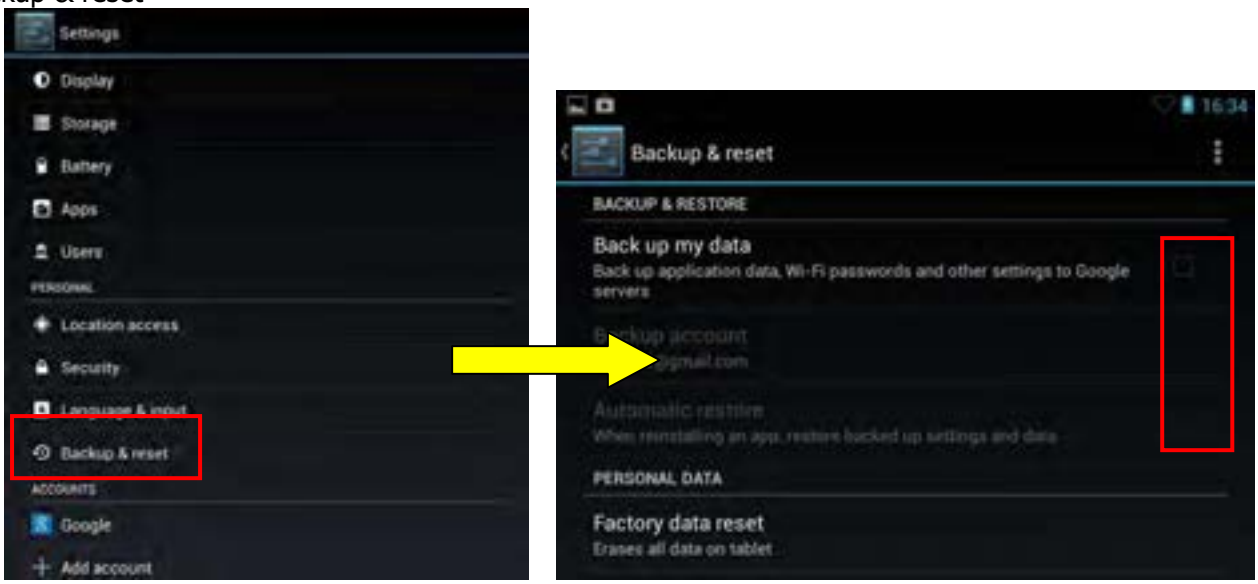
As above screenshots shows, please set all Sync Off. (No check to check boxes)

2) Location Access



As above screenshots shows, please turn off Access to my location.

2) Backup & reset



As above screenshots shows, please no check to check boxes.

Regarding other Tablet PCs, they have same functions to control accessibility. please refer to their document and set them like the same.

12. RADIO CERTIFICATION

R 005-100372(VM-2012) R 005-100373(VM-2012C)

FCC ID:T9J-RN171

IC ID:6514A-RN171

CMIIT ID:2013DJ7665(VM-2012) CMIIT ID:2013DJ7666(VM-2012C)

NCC ID: CCXXxxYYyyyZzW

<NCC声明>

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MSIP-CRM-IMV-CardVibroAir2

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- Do not apply excess shock or pressure to the device.
- Attach the device at appropriate area of the object of measurement. IMV accepts no responsibility for any damages in the specimen or an accident during use caused by wrong attachment.
- Annual calibration is highly recommended to keep the degree of precision.
- Refer to our website for installation of the app and recommended tablet PCs.

14. CONTACT INFORMATION

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