

Sensor Network Module Evaluation Kit

Application Note

Startup Guide

Introduction

This document explains the operation of the Sensor Network Module Evaluation kit. Before using, please read and ensure understanding of the function, operation etc. of the kit.

Precautions

- General Terms
 1. For the export of products which are controlled items subject to foreign and domestic export laws and regulations, you must obtain approval and/or follow the formalities of such laws and regulations.
 2. Products must not be used for military and/or antisocial purposes such as terrorism, and shall not be supplied to any party intending to use the products for such purposes.
 3. Unless provided otherwise, the products have been designed and manufactured for application to equipment and devices which are sold to end-users in the market, such as AV (audio visual) equipment, home electric equipment, office and commercial electronic equipment, information and communication equipment or amusement equipment. The products are not intended for use in, and must not be used for, any application of nuclear equipment, driving control equipment for aerospace or any other unauthorized use. With the exception of the above mentioned banned applications, for applications involving high levels of safety and liability such as medical equipment, burglar alarm equipment, disaster prevention equipment and undersea equipment, please contact an Alps sales representative and/or evaluate the total system on the applicability. Also, implement a fail-safe design, protection circuit, redundant circuit, malfunction protection and/or fire protection into the complete system for safety and reliability of the total system.
 4. Before using products which were not specifically designed for use in automotive applications, please contact an Alps sales representative.
 5. Any disassembly, remodeling, repair etc., of the Module is not covered by this specification and performance thereafter is not warranted or guaranteed.

Disclaimer

- UNDER NO CIRCUMSTANCES SHALL THE COMPANY TAKE OR ASSUME TO TAKE ANY RESPONSIBILITY OR LIABILITY FOR ANY DAMAGES, EITHER DIRECTLY OR INDIRECTLY, TO THE CUSTOMER OR ANY THIRD PARTY, INCLUDING BUT NOT LIMITED TO SPECIAL DAMAGES, LOST PROFIT, LOST OPPORTUNITIES, DAMAGES TO SUBJECT DEVICES, APPLICATIONS, LOSS OF DATA, ETC.

Safety Precautions

This portion of the document describes safety precautions classified by Warning and Caution.



Warning : If mishandled, dangerous situations leading to fatal or serious injuries may occur.

- This product may not be disassembled, remodeled or repaired. Do not attempt to replace batteries while power is on.
- Ensure power is off (switch is OFF) before replacing batteries. Electric shock, fire or failure may occur.
- Do not replace batteries with wet hands.
- Place the module out of reach of small children.
- Ensure battery is not exposed to heat or placed near a fire. (There is a danger of rupture, explosion, leakage etc. occurring).



Caution: In the case of mishandling, the following issues may occur leading to property damage or personal injury.



In some cases, the following described situations may lead to serious consequences.

Please ensure to observe the following without fail.

- When removing the product cover, to avoid injury from the cover or case edge, please handle with special care (wear protective gloves etc.).
- Please avoid prolonged use or storage in high-temperature, direct sunlight or high humid environment which can be a cause of failure or malfunction.
- To avoid damage or destruction due to static electricity, do not touch any part of the metal on this part directly (connector etc.). To avoid an electric shock, before handling the product please touch house/ office metal objects, such as a door knob etc.
- This product is not designed to be dust-proof, water-proof or drip-proof. Please refrain from using in an environment where it is brought into contact with dust, oil or water
- Please ensure to avoid situations where condensation can occur (move product from a cold to warm place quickly etc.).
- Please avoid applying strong force to this product, including striking, dropping, stepping on the product etc.
- For areas where use is forbidden, e.g. in airplanes or hospitals, please refrain from using this product. Do not use any battery besides the specified coin cell battery CR2032. Failure to do so could lead to accidents occurring. Ensure the battery +/– direction is correctly inserted. Failure to do so could lead to accidents occurring.
- Disassembly or remodeling is not permitted.
- This product adheres to Global Radio Laws. Please refer to the “Radio Laws” section of the StartupGuide to confirm the Certification applying to this product. For the Certification already obtained, re-applying for Certification is not necessary. When using this product, please ensure to undertake the following without fail.

Restrictions

- When using this product outside Japan, please confirm in advance whether it has obtained the certification required by Global radio laws.
- Under no circumstances shall the company take or assume any responsibility for any damages, either directly or indirectly, related to this use of this product.
- The contents of this manual are subject to change without notice.
- This product is intended as an evaluation kit, and used in general environment. We do not provide any warranty or guarantee for application specific customer environments.

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1. Product Overview

Sensor Network Module (hereafter “Module”) describes the contained module, which has multiple sensors, sensor micro controller and Bluetooth® low energy wireless communication, which can receive simple commands from the Device (smartphone, tablet etc.)^{Note 1} which has the dedicated software installed, and gather sensing data. The concept of the product is that after setting up, just by switching on the power via a slide switch, sensor data can be easily gather over a long period of time, enabling developers to create that next “something”.



Note 1: Applicable Device (smartphone, tablet etc.) needs Bluetooth 4.0 or higher compatibility.

※Bluetooth® is a registered trademark of Bluetooth SIG, Inc.

2. Characteristics

Contained in this ultra compact, low power package are the following sensors and Bluetooth® low energy wireless communication.

- Sensors: 6 Axis sensor (3 axis Accelerometer & 3 axis Geomagnetic sensor), Pressure sensor, UV/ Ambient Light sensor and Temperature/ Humidity sensor.
- Built in commands allow easy control for the user application.
- Bluetooth® connection operation and Beacon operation.
- Using the user application, 4 types of measurement modes are available for selection. (utilizing Bluetooth® connection).
- Android application: Operation, Graph display, Log data. For details, please refer to “SensorNetwork_Usersmanual_APP_ver x.pdf”.
- A clear case with coin battery (CR2032) holder is provided.

※ Please check the coin battery provided with the Moduule before use, as there may be cases where battery is exhausted.

Part Names

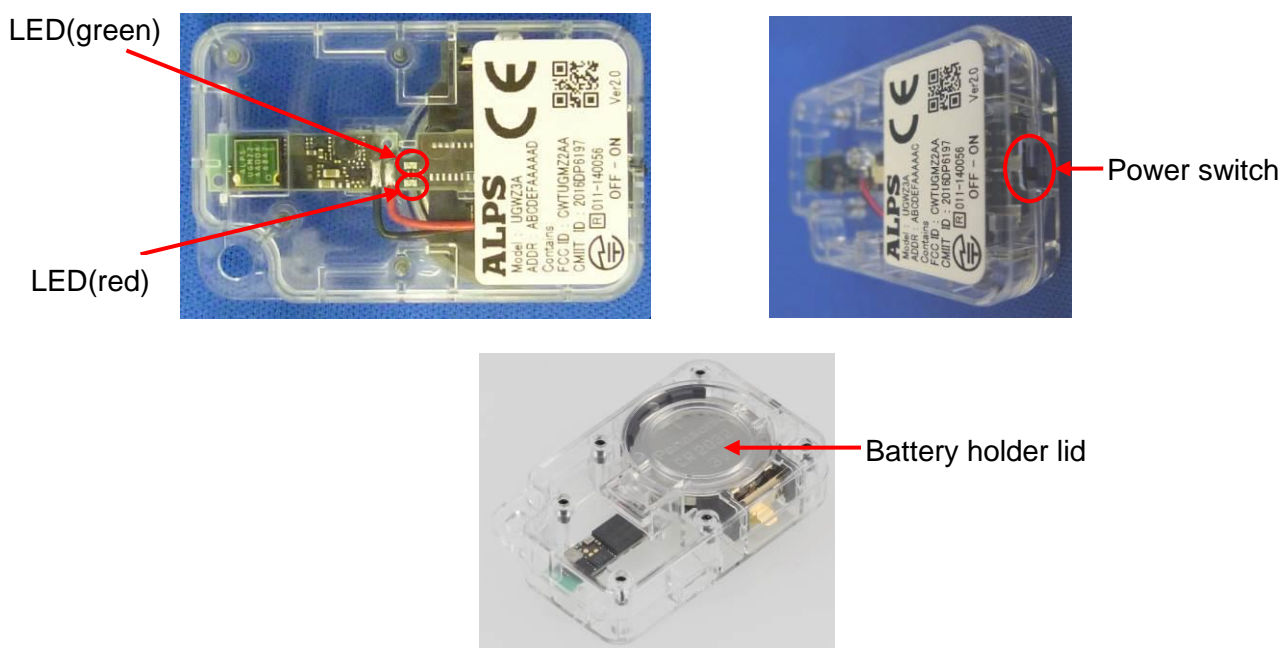


Fig 1

3. System Configuration Example

3.1 Overview

As per “Fig 2” below, the Device (smartphone, tablet etc.) can communicate with and control multiple modules (up to 4). This control is done by downloading the dedicated application (Android). Further, the dedicated application source code is also available.

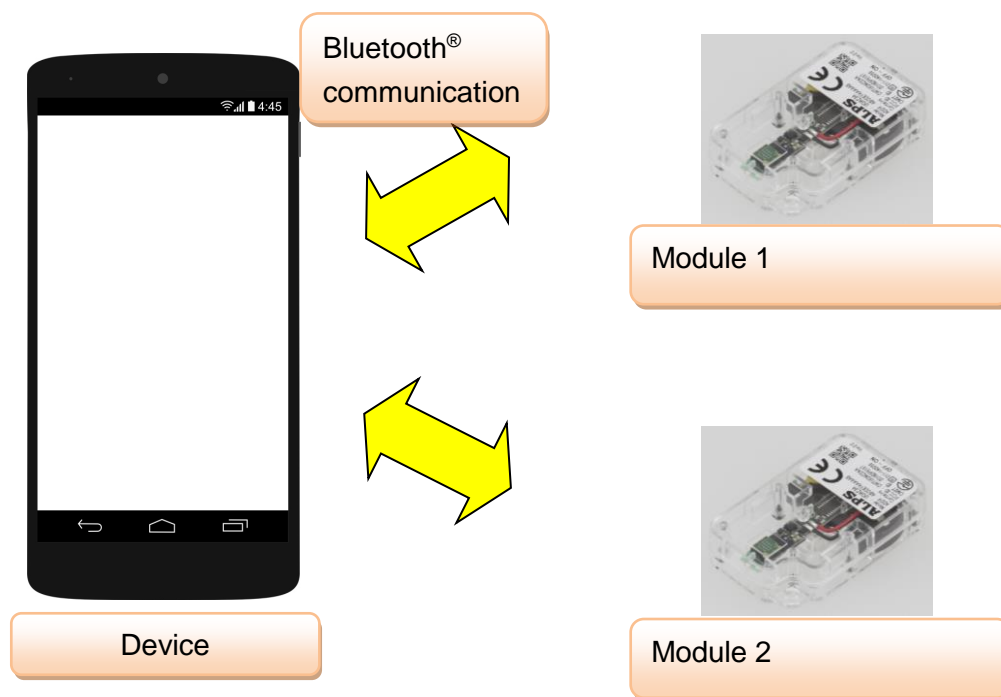


Fig 2 System Configuration Example

3.2 Examples of Application`s Sensor Data Display

As per “Fig 3” below, the modules measured data is sent by wireless (Bluetooth® low energy) communication to the dedicated application on the Device, and the Module can be controlled from the screen as shown.

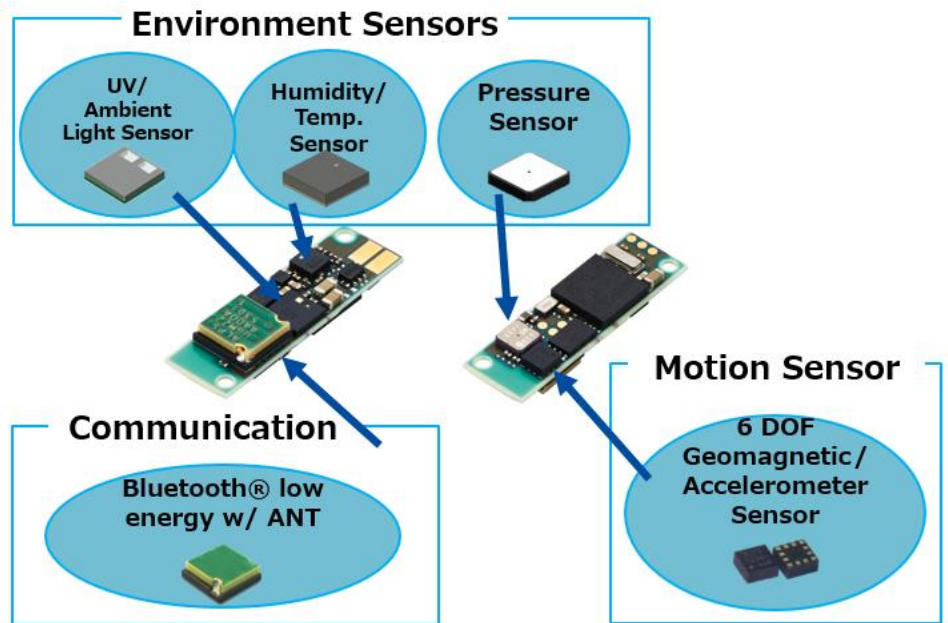
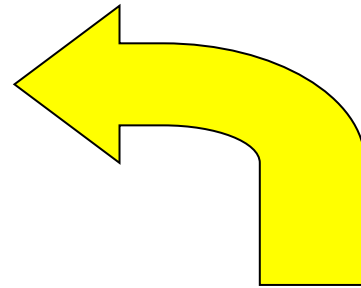
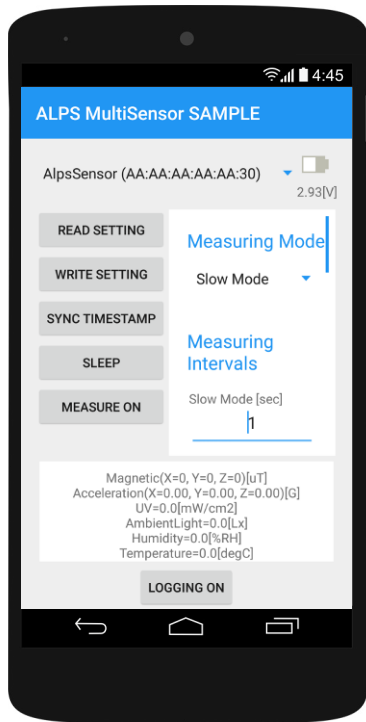


Fig 3 Sensor Data Display Example

4. Operation Guidelines

4.1 Basic Guidelines

- ① Please note that factors such as metal and people etc., can affect the distance and quality of the wireless signal.
- ② This Module is not dustproof or waterproof.
- ③ Please note that dust or water in the Module may not just affect accuracy, it may cause Module failure. The Device and Module can only be operated with the dedicated application. Normal operation between Device and Module cannot be done with just pairing in device "Settings". Please disconnect the pairing in device "Settings" and pair in the dedicated application only.

4.2 Notes on Sensor Measurement

4.2.1 Accelerometer/ Geomagnetic Sensor Settings

Accelerometer, Geomagnetic sensor axis detection is as per "Fig 4" below.

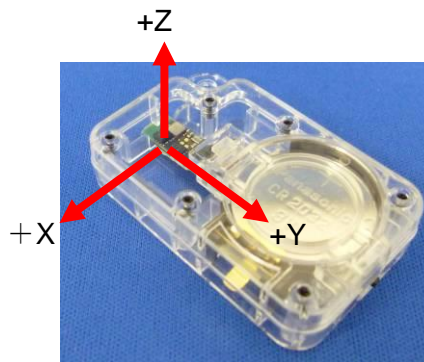


Fig 4 Sensor Sensitivity Axis

4.2.2 UV/ Ambient Light Sensor Explanation

As per "Fig 5" below, the UV/ Ambient Light sensor location is highlighted by the red circle. This area is needed to gather light, so please consider in development and do not block/ cover. (This module is designed for the UV/ Ambient light sensor to be used in the case. When used without the case, the sensor data will be different and needs to be calibrated in the application. The default lighting sunlight, so for other lighting types, please refer to the "SensorNetwork_Usersmanual_Command").

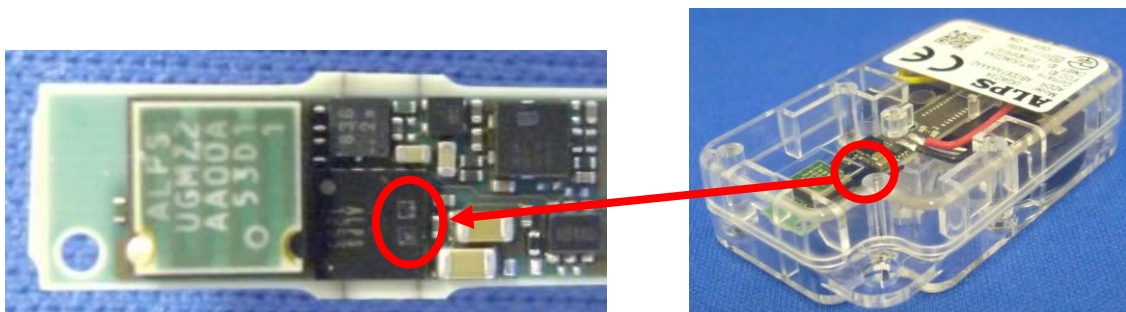
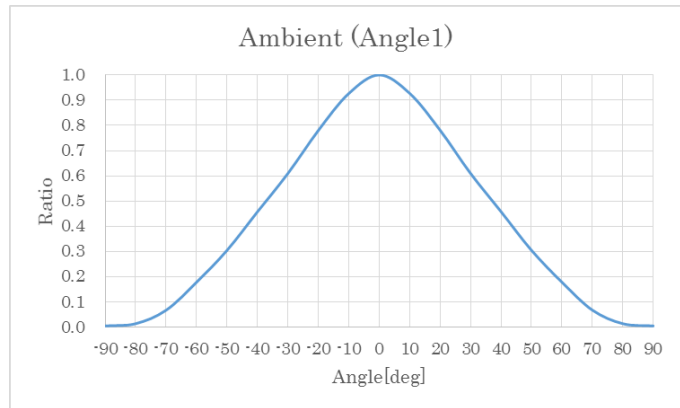
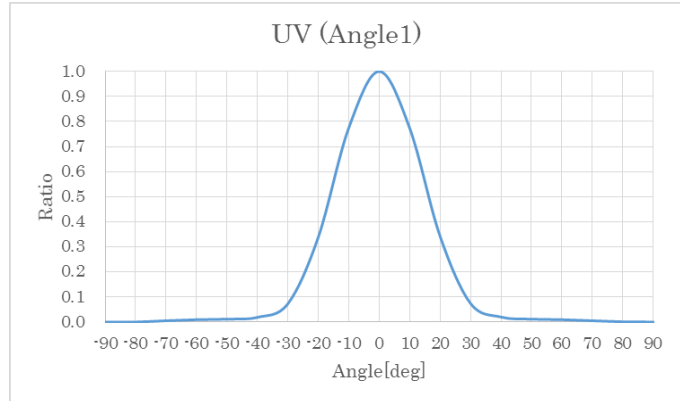
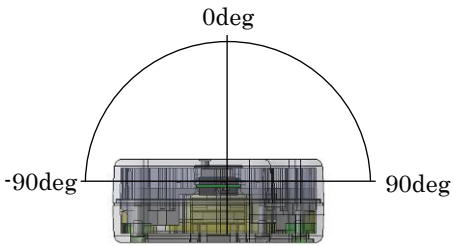


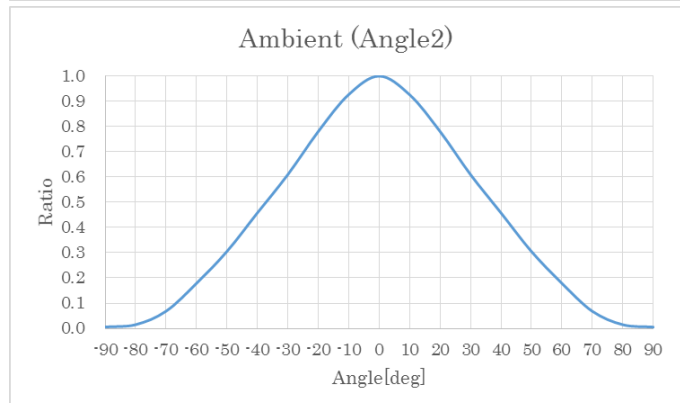
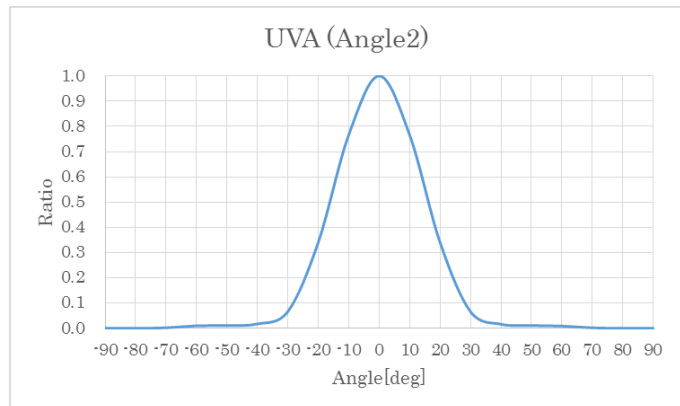
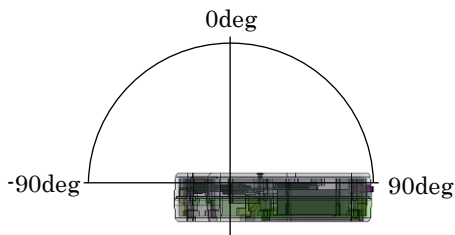
Fig 5 UV/ Ambient Light sensor location

Please note that UV/ Ambient light sensor will attenuate as angle of incidence as attached.
Please refer to the following for the incident angle and the damping ratio.

[Angle1]



[Angle2]



4.2.3 Temperature/ Humidity Sensor Explanation

As per “Fig 6” below, the Temperature/ Humidity sensor location is highlighted by the red circle. This area is needed for detecting the “Temperature” and “Humidity”. Sudden changes in the environment or light directly shining on the sensor may cause data to be different from the ambient environment temperature and humidity where the module is placed.

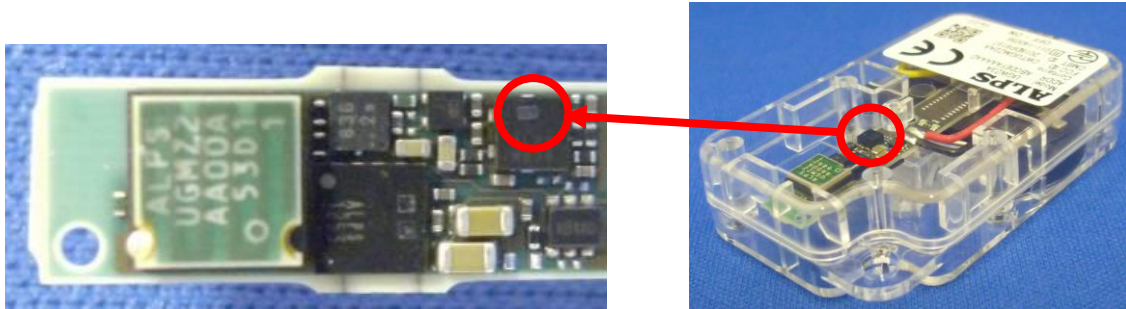


Fig 6 Temperature/ Humidity sensor location

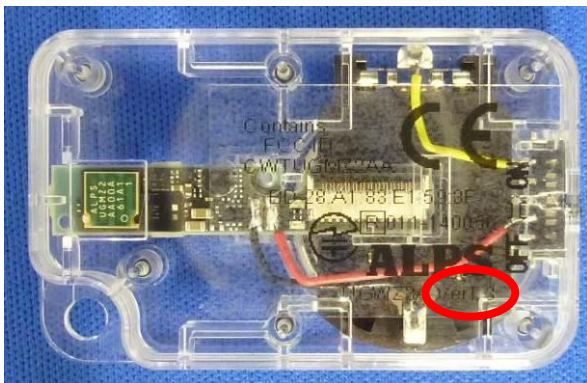
4.3 About the Versions

Sensor Network Module has different versions (Ver.). Depending on the versions, there may be slight differences in the operation. (for details on the operation differences, please refer to “SensorNetwork_Usersmanual_Command”).

The version is written on the lable and circled in red as shown below.

Ver. Mark location (Label Type 1)

Ver. Mark location (Label Type 2)



5. Quick Start

Next the Modules dedicated application steps from installation to data measurement are described. The detailed operation and use of the dedicated application is described in “Android applicationManual” SensorNetwork_Usersmanual_APP”.

5.1 Application Compatible Devices (Device)

- Nexus5 (Android 5.0.1)
- Nexus6P (Android 6.0)

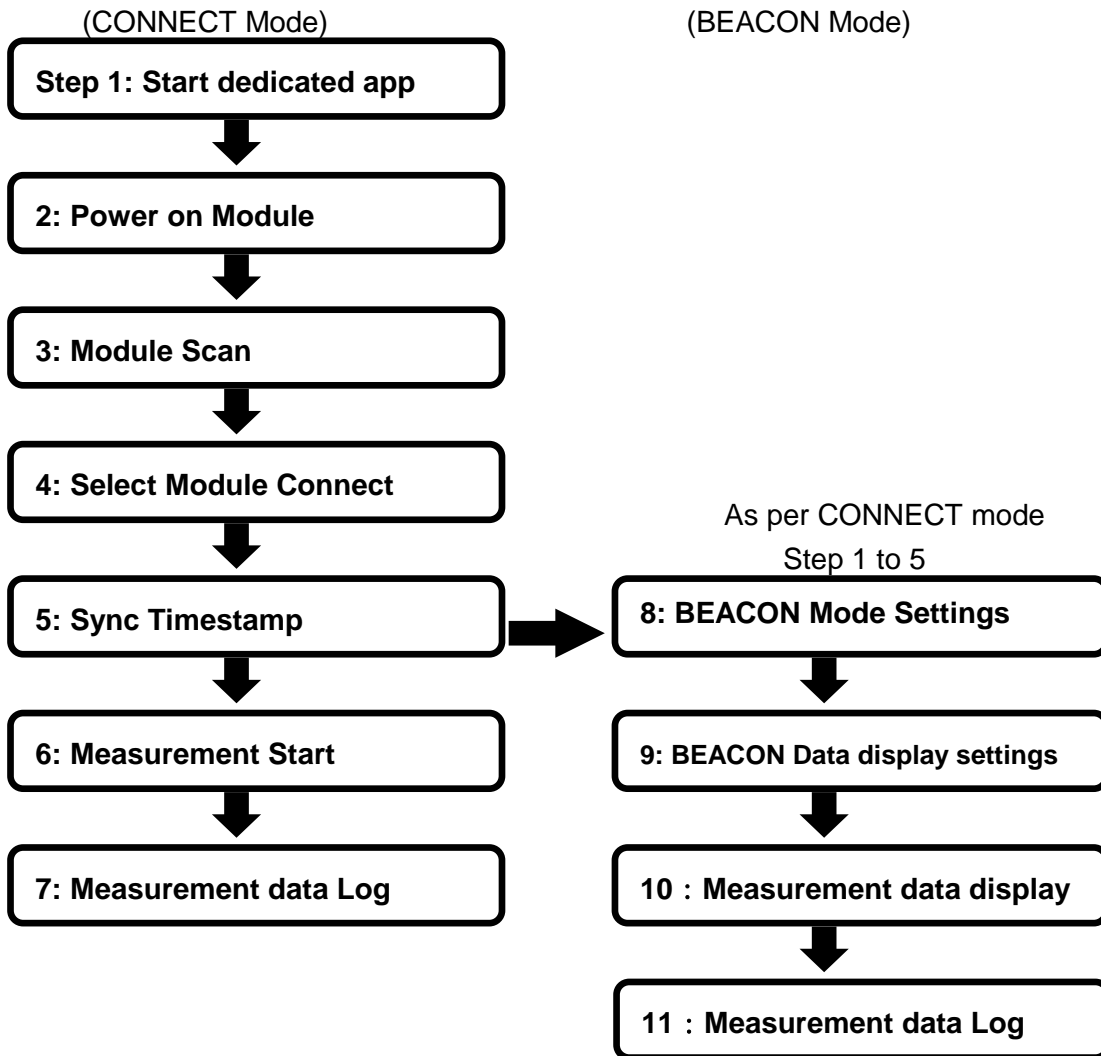
5.2 Prepared App Download / Installation

- ① Download the” SensorModuleGraph_v***.apk” from the following link URL”
<http://www.alps.com/j/iotsmart-network/appdownload/>”. (***) is the version number. Please download the latest version).
- ② “SensorModuleGraph_v***.apk” is in the “GraphApp_v***.zip” file.
- ③ Connect the Device the PC via USB cable and copy the file “SensorModuleGraph_v***.apk” to device storage, making note of the saved location (ex. internal storage, Download etc.).
- ④ Using an Android application, (File Manager etc.), run the” SensorModuleGraph_v***.apk” program and install the file “ALPS Sensor GRAPH”.

5.3 Prepared App Measurement Procedure

In the dedicated application, CONNECT (connection) mode and BEACON modes are available. Each modes measurement procedure is described below.

Procedure Flow



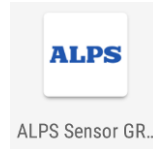
※If there is an error, please start again from Step 1.

5.3.1 Connect Mode Measurement Procedure

Procedure for measuring CONNECT mode in the dedicated application is described below.

Step 1: Running the Dedicated Application

5.2 After installation, the following Icon is created. Run the program by tapping the icon.



If the Bluetooth® feature of the Device is disabled, a message is issued during startup to request to enable the Bluetooth® function.

※The Device and Module can only be operated with the dedicated application.

Normal operation between Device and Module cannot be done with just pairing in device "Settings".
Normal operation between Device and Module cannot be done with just pairing in device "Settings".
Please disconnect the pairing in Device "Settings" and pair in the dedicated application only.

Step 2: Module Power ON

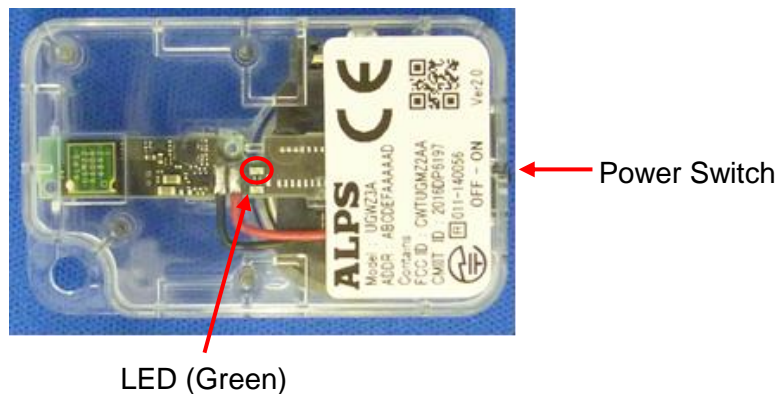
① Turn on Power Switch

② Once the Power Switch is ON, the Red LED will blink once, and the Green LED will blink once.

※Up until Ver 1., only the Green LED would blink.

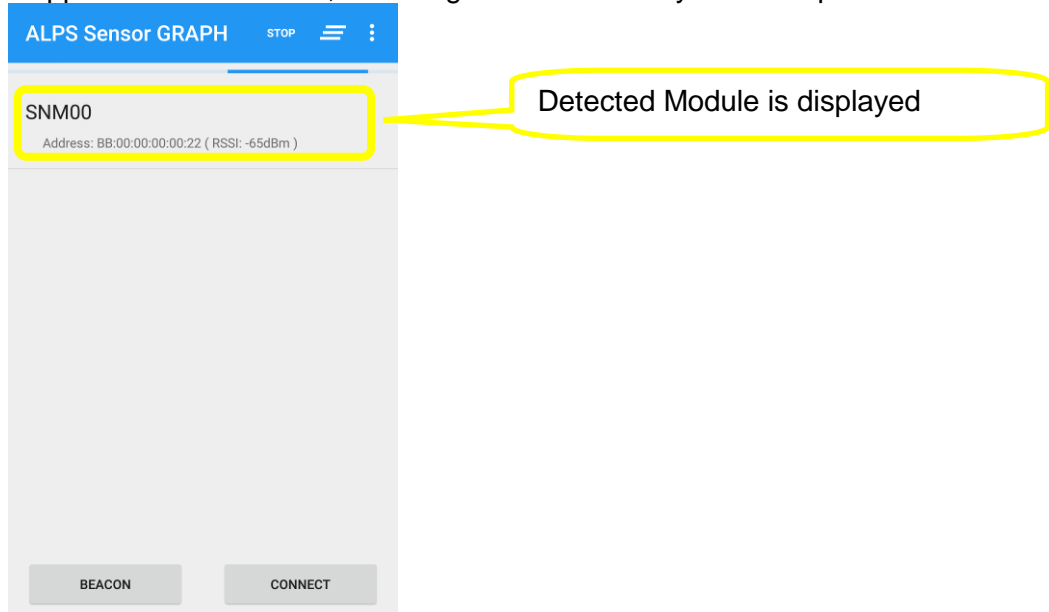
After this, Bluetooth Smart advertising begins.

During advertising, the Green LED will blink once (1) every 10 seconds



Step 3: Module Scan

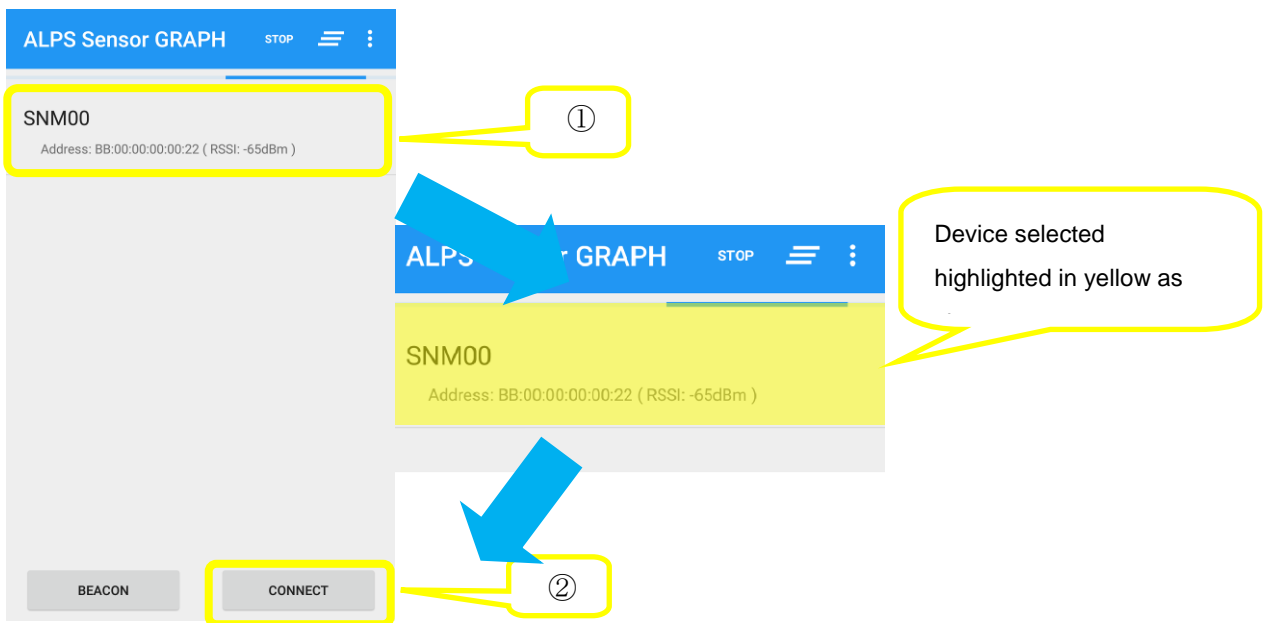
After the dedicated application is launched, scanning will automatically occur as per below.



- On the scan screen, the Module name will be displayed as the Bluetooth Smart name starting with “SNM00”.
- When multiple Modules are detected, they will be displayed in the order they were detected.

Step 4: Module Selection and Connection (CONNECT)

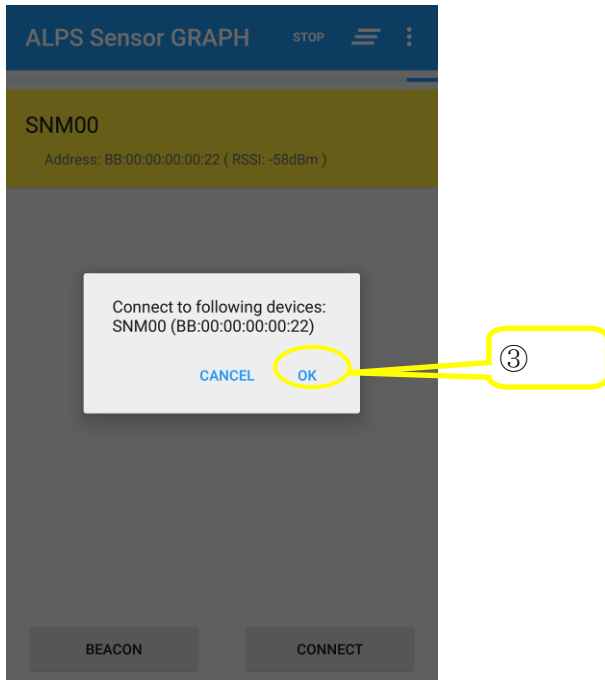
- ① Tap the desired Module. (A 2nd Tap to clear selection).
- ② Tap CONNECT, and move to the confirmation page.



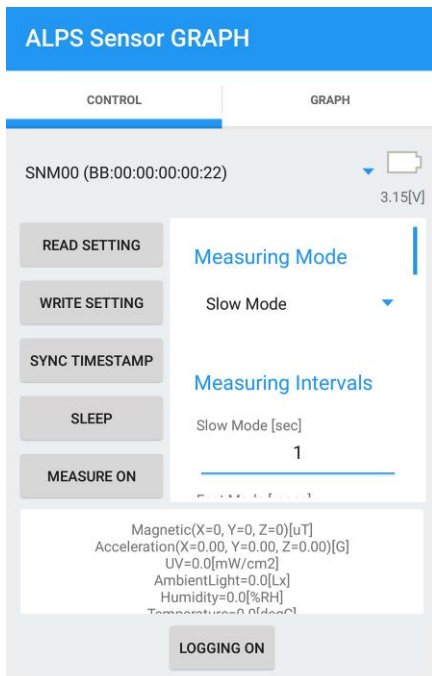
(Completing connection takes a few seconds)

Confirmation Screen

- ③ After confirming Device and BB address, tap OK. Main screen is then displayed.

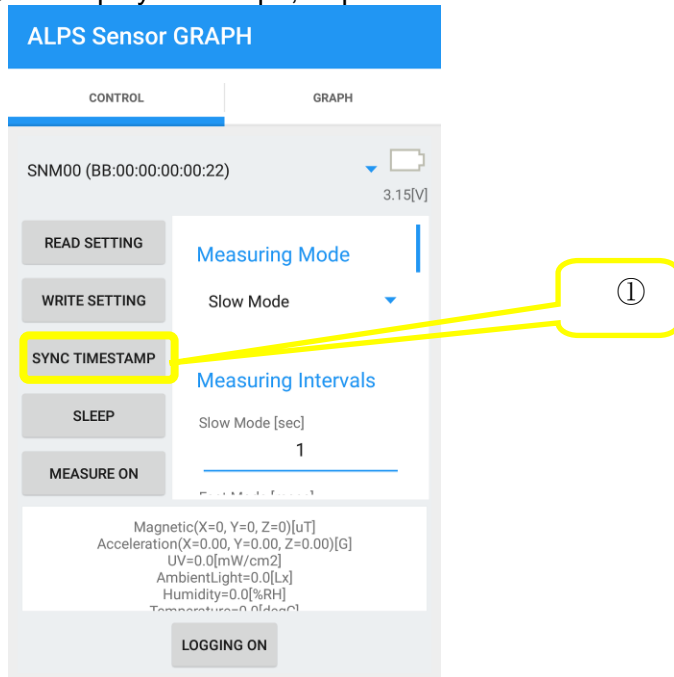


Main Screen



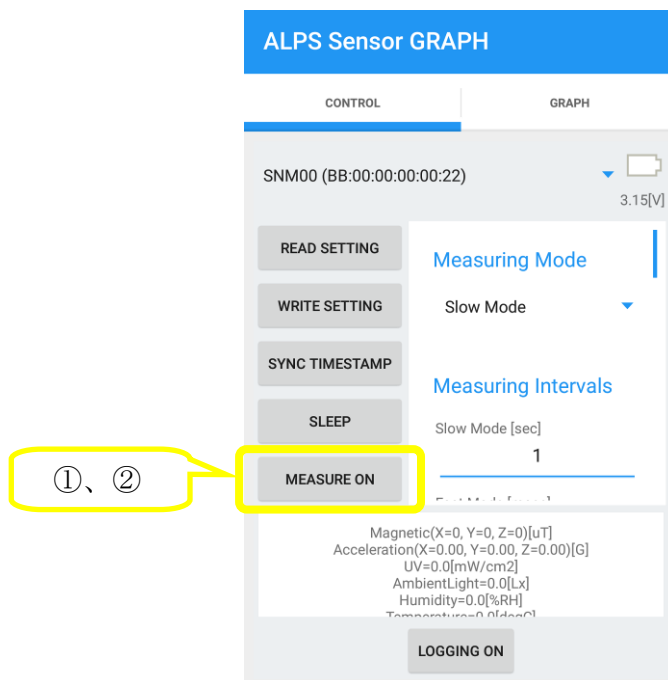
Step 5: Time Syncstamp

① To display the Graph, Tap the SYNC Timestamp on the main screen as shown.

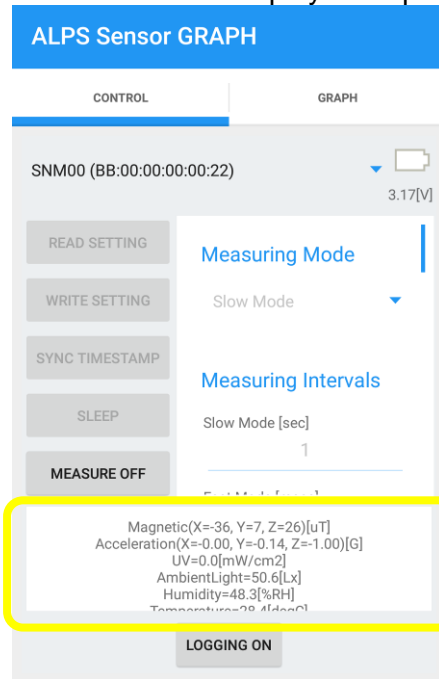


Step 6: Measurement Start

- ① Tapping MEASURE ON starts data measurement, and display changes to MEASURE OFF.
 - ② Tapping MEASURE OFF stops data measurement and display changes to MEASURE ON.
- ① , ② operation repetition is unlimited.

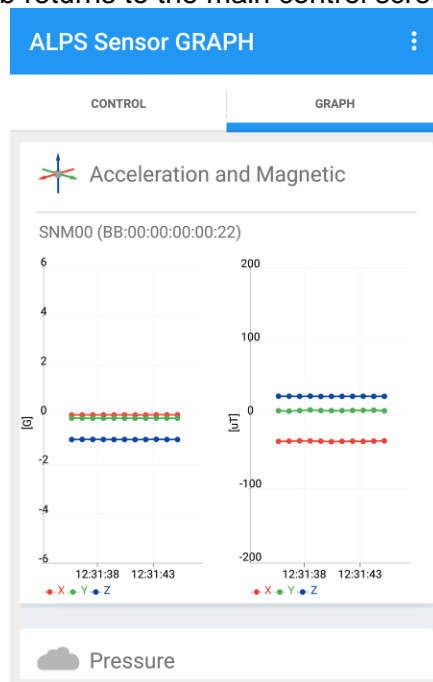


Measured data display example



③ Graph Display

Tapping the GRAPH tab will display the below screen, which shows the data in graph format. Tapping the CONTROL tab returns to the main control screen.

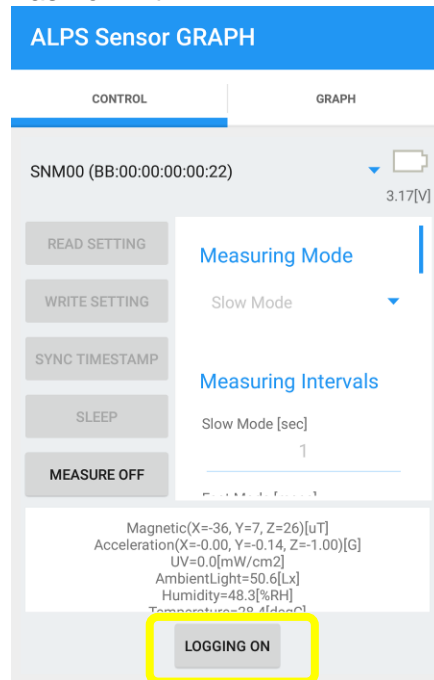


※The graph does not auto scale, and only displays in full screen. Please use just for confirming the Modules operation only.

Step 7: Measurement Data Log

Tapping LOGGING ON starts data logging of the data being measured, and the display changes to LOGGING OFF.

Tapping LOGGING OFF stops the data logging, and the display changes to LOGGING ON.
This operation repetition has no limit.



The log data is saved in csv format.

The csv file is saved in “(internal storage)/ALPS Sensor GRAPH/(Device Name)(BD Address).csv”.

The format is as per the below.

| Time | Index | Mag_X[uT] | Mag_Y[uT] | Mag_Z[uT] | Acc_X[G] | Acc_Y[G] | Acc_Z[G] | UV-A[mW/cm ²] | AmbientLight[Lx] | Humidity[%RH] | Temperature[degC] | Pressure[hPa] |
|------|-------|-----------|-----------|-----------|----------|----------|----------|---------------------------|------------------|---------------|-------------------|---------------|
|------|-------|-----------|-----------|-----------|----------|----------|----------|---------------------------|------------------|---------------|-------------------|---------------|

※About the Time Stamp setting

Once the Module is powered off, the Time Sync stops. The time sync needs to be set again once the Module is powered on again. If the Module is not powered off, then the time sync is unaffected.

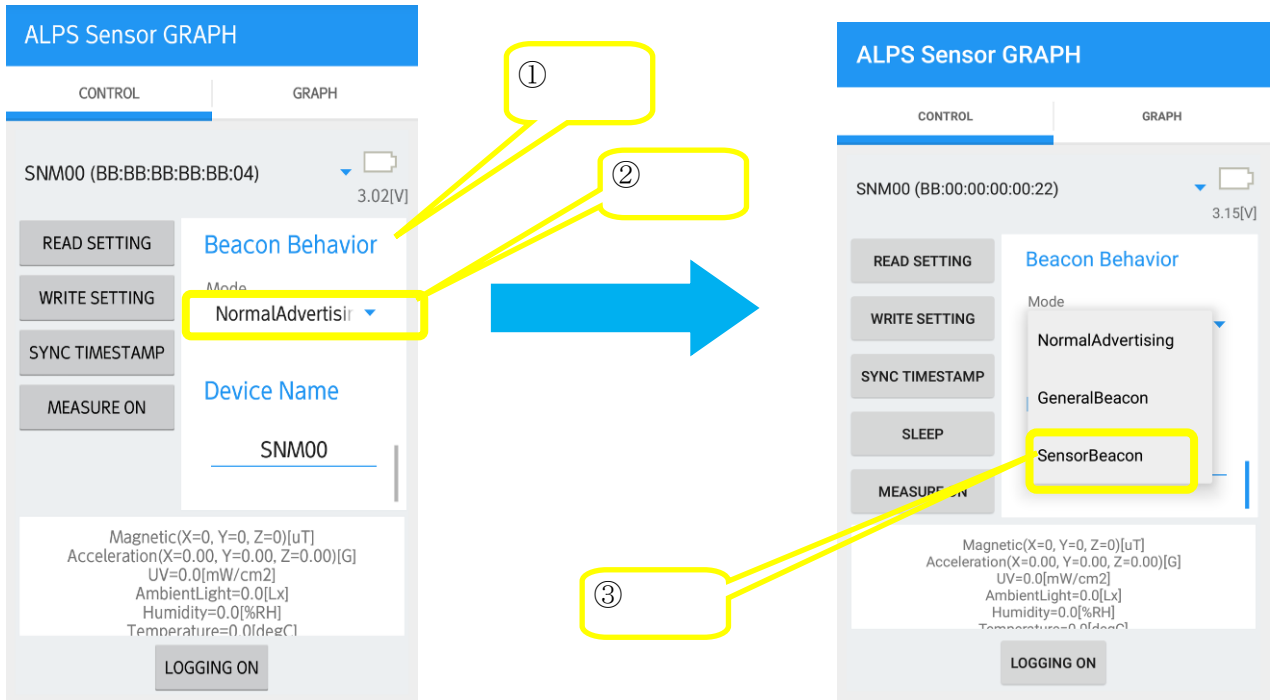
5.3.2 Beacon Mode Measurement Procedure

In BEACON mode, the Device & Module measurement procedure when unconnected is described.

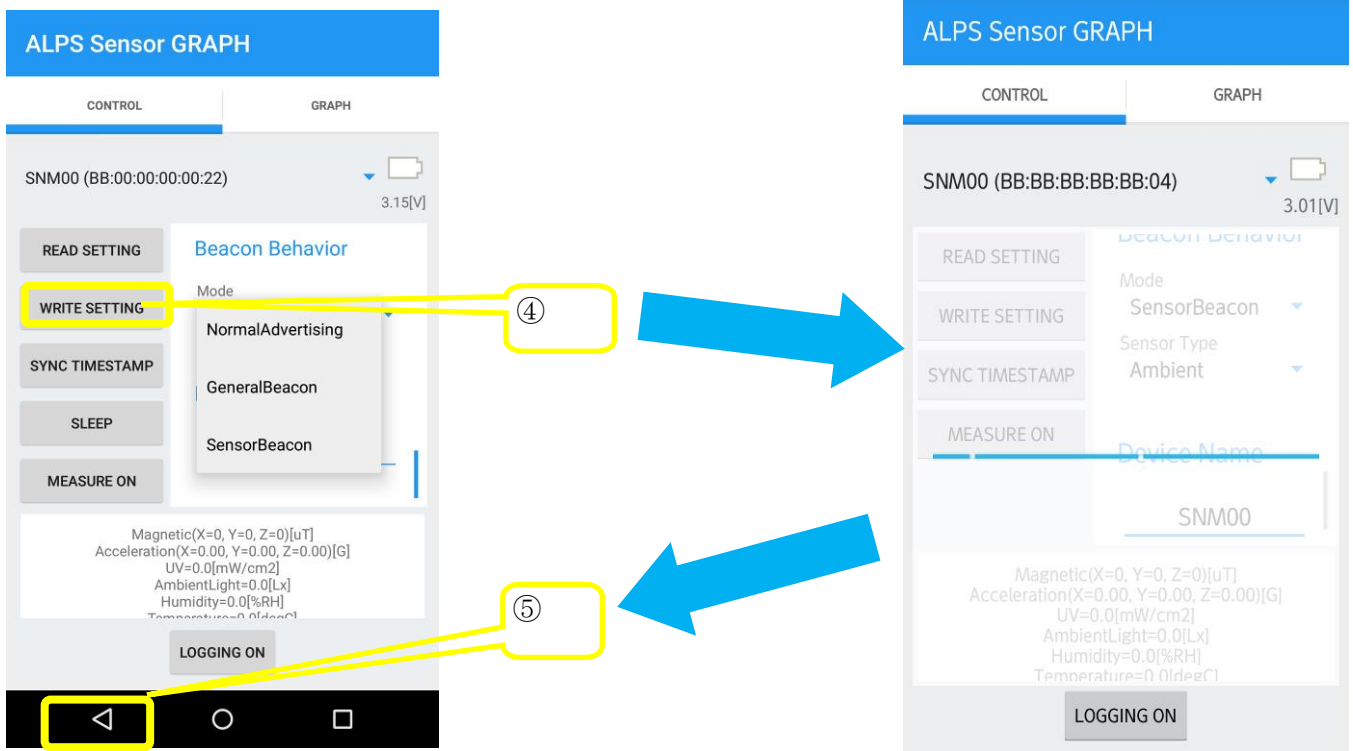
Follow Step 1 to Step 5 of 5.3.1 Connect Mode Measurement Procedure.

Step 6: BEACON Mode Settings

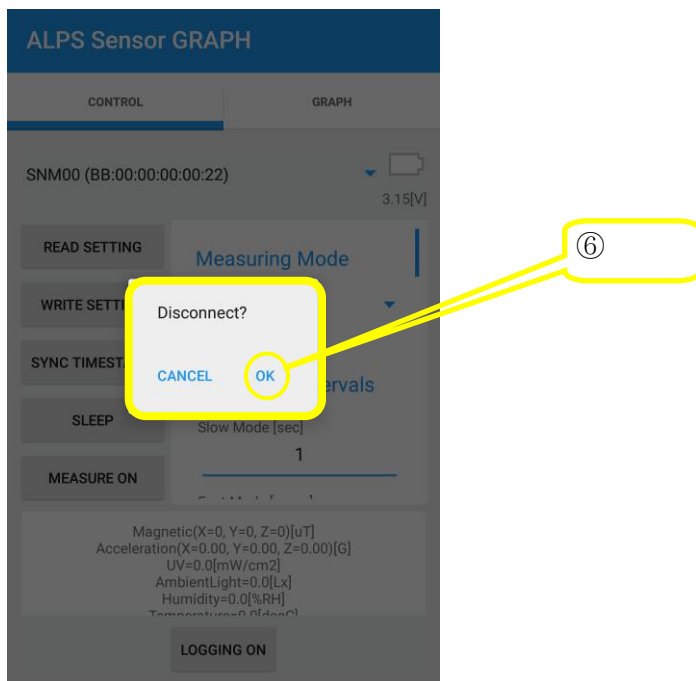
- ① Beacon Behavior is displayed after scrolling down the Menu.
- ② Tapping Mode displays the list.
- ③ Tap Sensor Beacon.



- ④ Tap WRITE SETTING to save settings.
- ⑤ After settings are saved, use device "Return" button as shown.



- ⑥ When "Disconnect?" is displayed, tap OK.



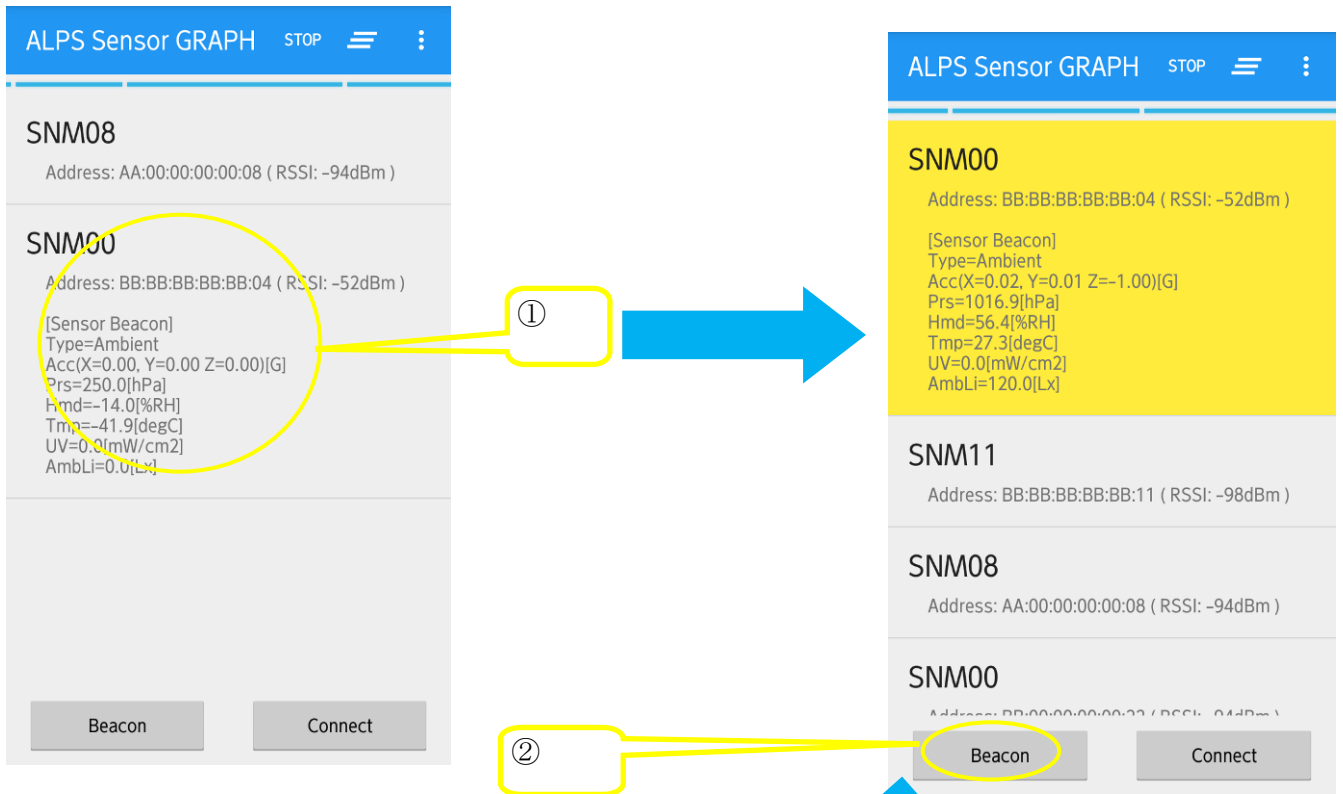
*) To set the Module as a Beacon, this operation is required.

Step 7: Sensor BEACON Data Display Settings

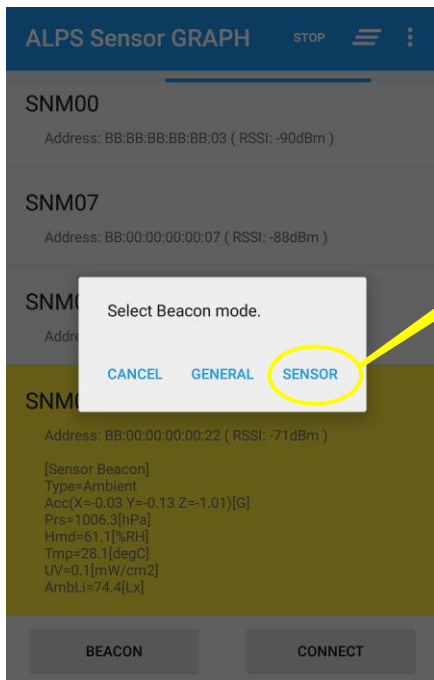
Select desired mode.

Ex. SensorBeacon mode is selected.

- ① Tap Module to display.
- ② Tap Beacon.



- ③ Tap SENSOR.



Step 8: Measurement Data Display

The diagram illustrates the transition between two views of the 'Scanning Sensor Beacons' application. On the left is the 'LIST' view, which displays a table of sensor data for beacon SNM00. On the right is the 'GRAPH' view, which displays a line graph of acceleration and magnetic data over time. A double-headed blue arrow indicates the bidirectional navigation between these views. A yellow callout box points to the 'LIST' and 'GRAPH' tabs, stating 'LIST/ GRAPH screens can be selected'. Another yellow callout box points to the data in the list view, stating 'Data is displayed'. The graph view shows a plot titled 'Acceleration and Magnetic' with axes for time and values, and a legend for X, Y, and Z axes. Below the graph is a 'Pressure' section with a cloud icon.

Scanning Sensor Beacons (LIST view):

- SNM00 (BB:00:00:00:22)
- [Sensor Beacon]
- Type=Ambient
- Acc(X=0.00 Y=-0.14 Z=-1.02)[G]
- Prs=1018.3[hPa]
- Hmd=50.4[%RH]
- Tmp=27.0[degC]
- UV=0.0[mW/cm2]
- AmbLi=25.3[Lx]
- 2015/09/14 13:43:37.640

Scanning Sensor Beacons (GRAPH view):

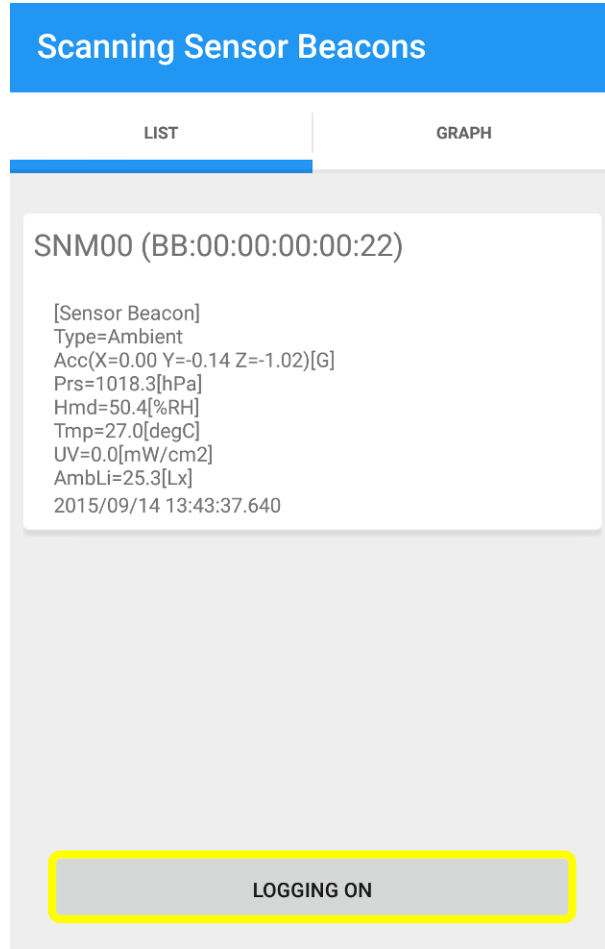
- Acceleration and Magnetic
- Graph showing Acceleration and Magnetic data over time (13:43:26 to 13:43:37).
- Pressure

Annotations:

- LIST/ GRAPH screens can be selected
- Data is displayed

Step 9: Measurement Data Log

Tapping LOGGING ON starts data logging of the data being measured, and the display changes to LOGGING OFF. Tapping LOGGING OFF stops the data logging, and the display changes to LOGGING ON.



The log data is saved in csv format.

The csv file is saved in " (internal storage)/ALPS Sensor GRAPH/(Device Name)(BD Address).csv".

The format is as per the below.

| Time | Index | Mag_X[uT] | Mag_Y[uT] | Mag_Z[uT] | Acc_X[G] | Acc_Y[G] | Acc_Z[G] | UV-A[mW/cm ²] | AmbientLight[Lx] | Humidity[%RH] | Temperature[degC] | Pressure[hPa] |
|------|-------|-----------|-----------|-----------|----------|----------|----------|---------------------------|------------------|---------------|-------------------|---------------|
|------|-------|-----------|-----------|-----------|----------|----------|----------|---------------------------|------------------|---------------|-------------------|---------------|

6. Regarding Battery Replacement

There is a battery on the underside of the Module. To replace the battery, once the power switch is OFF, remove the coin battery as per "Pic 7", by taking off the battery holder lid and taking out the CR2032 coin battery.

When removing the battery, please use a nonmetal (ceramic etc.) driver as shown below. When inserting, please put it in from the direction of where the metal fittings are placed. (Note: When opening / closing the battery lid, please be careful not to apply excessive force, as it may lead to damage. Please ensure to avoid damage, including deforming the battery during the replacement procedure. Attempting to force the battery may lead to damage).

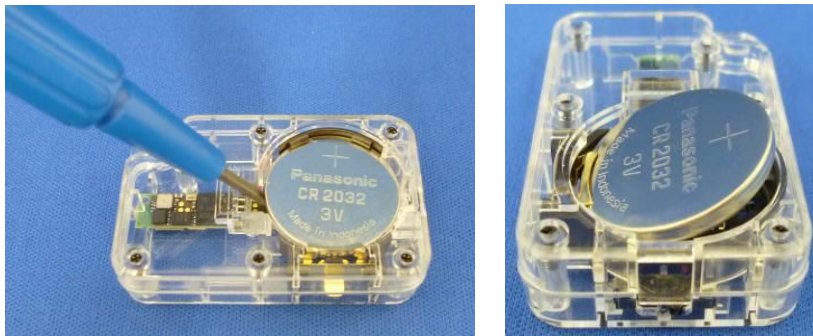


Fig 7

When battery is low, the LED (red) will shine. At this time please replace the battery.



LED (Red)

Fig 8

[Points to Note]

For environmental conservation, we ask that you handle disused batteries according to the municipal (local) laws.

7. About Battery Life

Battery life depends on the usage, settings and the brand of the battery.

Broadly speaking, each sensor measurement setting at 1 time per 1 minute will allow the life to be about 1 year.

8. In Regards to achieving even lower Power Consumption

This Module automatically is set to ensure low power consumption, but further power saving can be achieved with the following 2 points.

【Point 1】 Lower Measurement Operation

Reducing the Module operation frequency can achieve power optimization.

- Stopping unneeded sensors.
- Minimum measurement timings set.

【Point 2】 Using Sleep Mode

Set time to sleep when data is not necessary.

Ex. When operating over long time, set sleep when sensor data acquisition and communication is not required.

- Set Timer Sleep.

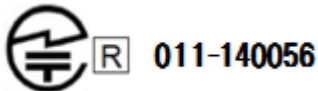
For detailed settings, please refer to "SensorNetwork_Usersmanual_Command".

9. About Radio Law Certification

This product has obtained the following Global Radio Law certification.

<Japan Radio Law>

We have acquired construction design certification for radio equipment listed in Article 2, item 19 of the Certification Rule.



<FCC (North America)>

FCCID: CWTUGMZ2AA

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC CAUTION

Change or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines. This equipment has very low levels of RF energy that are deemed to comply without testing of specific absorption ratio (SAR).

<CE (Europe)>
EN301 489-1 V1.9.2
EN301 489-17 V2.2.1

Manufacture's Name ALPS ELECTRIC CO., LTD.
Model Number UGWZ3A

ALPS[®] ALPS ELECTRIC CO., LTD. ENGINEERING HEADQUARTERS
6-3-36, furukawanakazato, Osaki-City, Miyagi-Pref., 989-6181 Japan

DECLARATION of CONFORMITY For



Product: Multi Sensor Network Module
Model: UGWZ3A

Supplied by

Alps Electric Co., Ltd.
6-3-36, Furukawanakazato Osaki-city
Miyagi-pref 989-6181 Japan

Technical File held by

Alps Electric Co., Ltd.
6-3-36, Furukawanakazato Osaki-city
Miyagi-pref 989-6181 Japan

Notified Body - R&TTE Directive
N/A N/A

R&TTE Directive (Article 3.1(a) Safety)
Standard used for comply
EN 60950-1: 2006 + Amd.11: 2009 + Amd.1: 2010 +
Amd.12: 2011 + Amd.2: 2013
EN 62311: 2008 / EN 62479: 2010

R&TTE Directive (Article 3.1(b) EMC)
EN 301 489-1 V1.9.2
EN 301 489-17 V2.2.1
EN 55032: 2015
EN 55024: 2010

R&TTE Directive (Article 3.2 Spectrum)
EN 300 328 V1.9.1

Means of Conformity

We declare under our sole responsibility that the Product (s) is conformity with the essential requirements and other relevant requirements of the Radio and Telecommunication Terminal Equipment (R&TTE) Directive (1999/5/EC).

Date of issue: November 22, 2016

Signature of Responsible Person:

Name : Kazuhiko Ueda
Title : Manager
Department : Engineering Dep. M9 Group 1
Engineering Headquarters

<SRRC (China)>
CMIIT ID: 2016DP6197

第十三条

1.
 - 使用频率：2.4 - 2.4835 GHz
 - 等效全向辐射功率(EIRP)：天线增益<10dBi 时：≤100 mW 或≤20 dBm ①
 - 最大功率谱密度：天线增益<10dBi 时：≤20 dBm / MHz(EIRP) ①
 - 载频容限：20 ppm
 - 带外发射功率(在 2.4-2.4835GHz 频段以外)：≤-80 dBm / Hz (EIRP)
 - 杂散发射(辐射)功率(对应载波±2.5 倍信道带宽以外)：
 - ≤-36 dBm / 100 kHz (30 - 1000 MHz)
 - ≤-33 dBm / 100 kHz (2.4 - 2.4835 GHz)
 - ≤-40 dBm / 1 MHz (3.4 - 3.53 GHz)
 - ≤-40 dBm / 1 MHz (5.725 - 5.85 GHz)
 - ≤-30 dBm / 1 MHz (其它 1 - 12.75 GHz)
2. 不得擅自更改发射频率、加大发射功率(包括额外加装射频功率放大器)，不得擅自外接天线或改用其它发射天线；
3. 使用时不得对各种合法的无线电通信业务产生有害干扰；一旦发现有干扰现象时，应立即停止使用，并采取措施消除干扰后方可继续使用；
4. 使用微功率无线电设备，必须忍受各种无线电业务的干扰或工业、科学及医疗应用设备的辐射干扰；
5. 不得在飞机和机场附近使用。

*SRRC Certification is valid until 2021(Year) 9 (Month) 30 (Day).

10. Revision History

| Version | Date | Description |
|---------|-------------|---|
| 1.0 | 05.Oct.2015 | Initial release |
| 1.1 | 28.Oct.2015 | Add: 4.2.3 Explanation of Humidity and Temperature |
| 1.2 | 19.Nov.2015 | Change: 5.2 Prepared App Download / Installation URL Change |
| 1.3 | 6.Feb.2017 | <p>All Pages: change Bluetooth® Smart to Bluetooth®</p> <p>Update picture to Ver 2.0</p> <p>Update Precautions and Safety Precautions</p> <p>1 Product Overview: change to Bluetooth® low energy wireless communication</p> <p>4.2.2 UV/ Ambient sensor explanation: add lighting criteria and conversion formula</p> <p>4.3 Add Version explanation</p> <p>5.1 Application Device: Add confirmed device Nexus6P</p> <p>5.3.1 CONNECT Mode Measurement Flow: add LED description and differences in Ver.1.4 onwards</p> <p>6. Battery replacement: update battery replace method explanation. Add Point to note section</p> <p>9. Add Radio law certification section</p> |