

Sensor Network Module Evaluation Kit Application Note

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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Confirmed Devices

- Nexus 5 (Android 5.0.1)
- Nexus 6P (Android 6.0)

※This Module has been confirmed with the above Device, for optimal layout and Bluetooth® low energy communication. For Devices other than the above, layout can be different and there is a possibility that Bluetooth® low energy communication may not work.

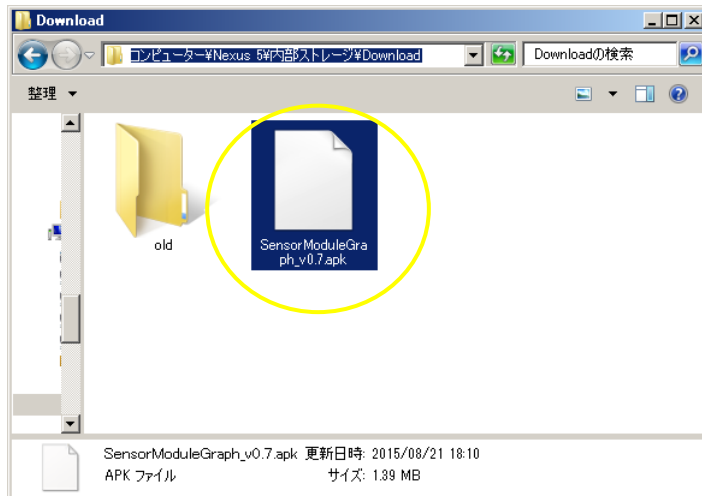
※Bluetooth® is a registered trademark of Bluetooth SIG, Inc.

Each Sensor Name

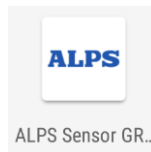
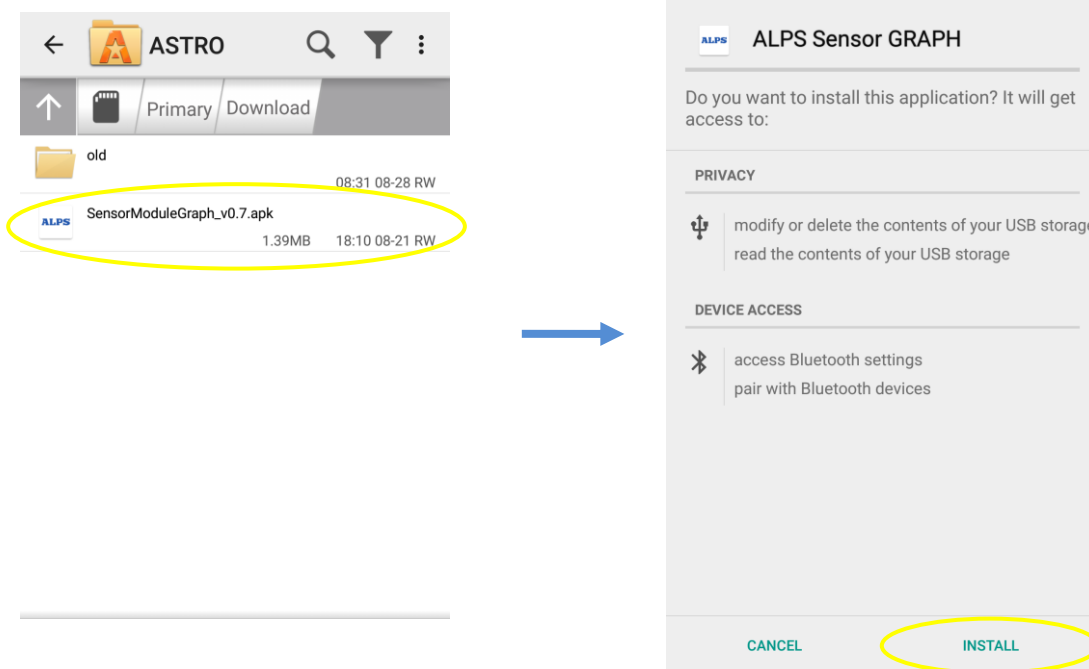
- Accelerometer sensor
- Geo Magnetic sensor
- Pressure sensor
- Humidity sensor
- Temperature sensor
- UV sensor
- Ambient Light sensor

1. Install - Execute

- ① Connect the Device to the PC by USB, and copy “SensorModuleGraph_v***.apk” from the PC to the Devices internal storage ((internal storage)/Download” etc.).
(*** is the version number. Please ensure to use the latest version).



- ② In file manager etc., run the apk file, and install the application named” ALPS Sensor GRAPH”.

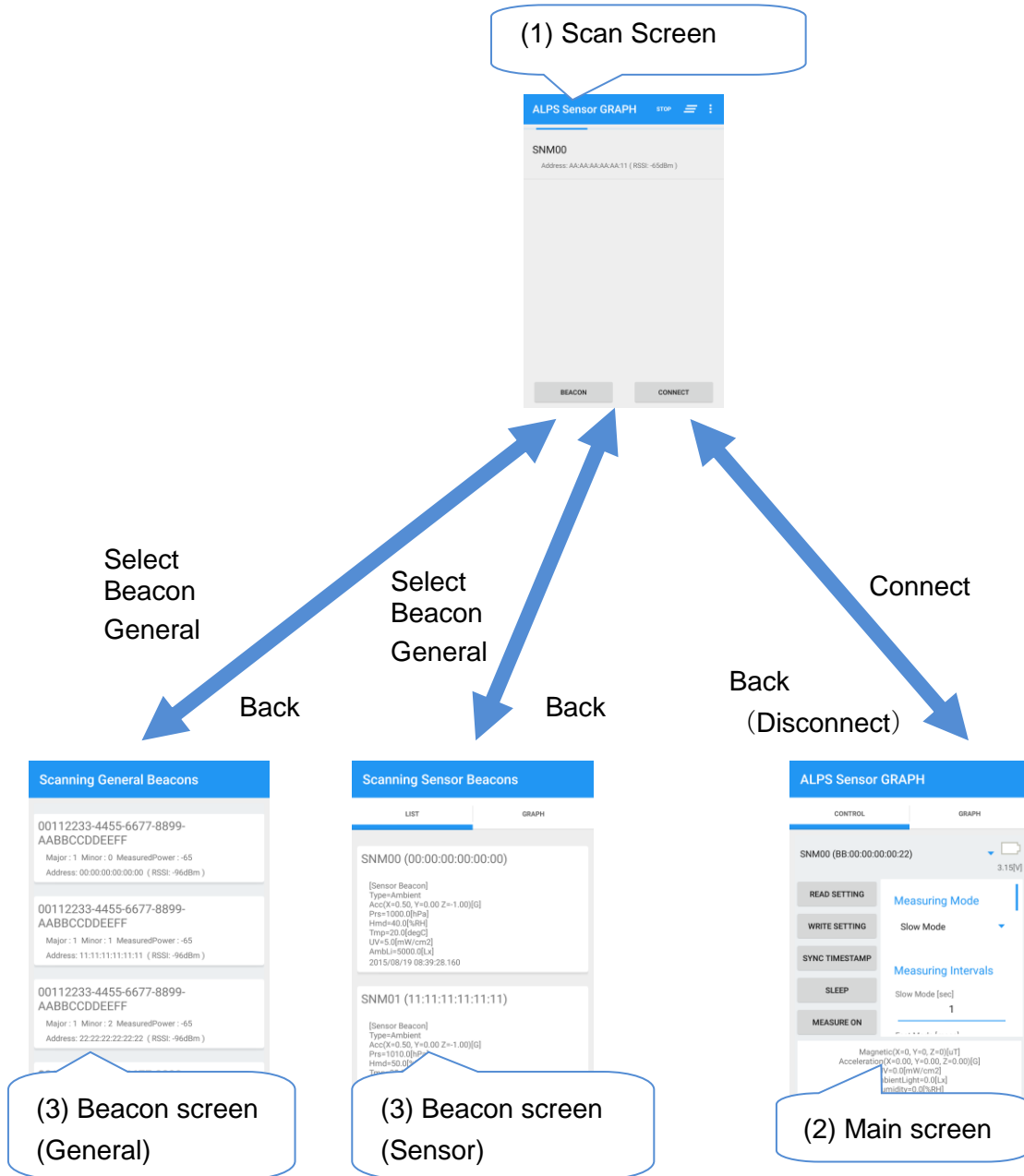


- ③ After installation, this above icon will appear, and tap to open the program. If Bluetooth[®] function is disabled, an error message will occur to remind you to enable the Bluetooth[®].
- ④ Turn on the power of the Sensor Network Module (hereafter Module).

2. Overview

ALPS Sensor GRAPH is constructed by (1) Scan Screen, (2) Main Screen and (3) Beacon Screen (General, Sensor)

- (1) The Scan screen has the following functions; Scan and Module select.
- (2) The Main screen has the following functions; Connection, show data being collected, graph display and option to change each setting.
- (3) On the Beacon screen, when the Beacon is being used, this shows data being collected and graph display (Sensor Beacon only).



3. Connect Mode

This mode enables connection to the Module, and to begin to receive the data being communicated.

3.1 Scan - Node Select

STOP/ SCAN button

CLEAR button

Filter ON/OFF button

ALPS Sensor GRAPH

SNM00
Address: BB:00:00:00:00:22 (RSSI: -65dBm)

① Module list

BEACON

CONNECT

Refer to P12 Beacon

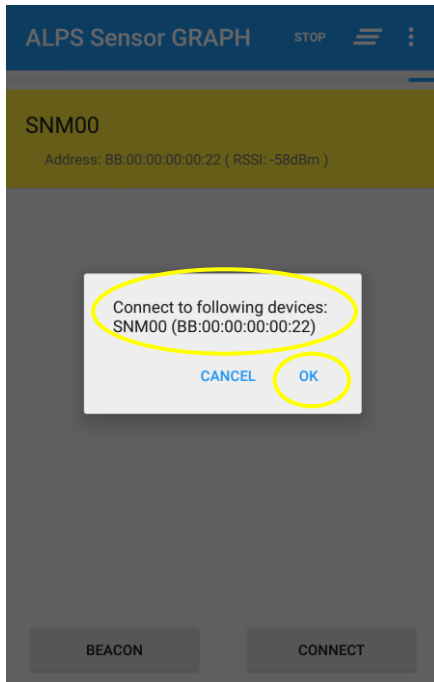
② Connect

Once the application starts, automatically scanning begins and the detected Modules are displayed in the list as shown in the picture on the left. The Module are named as follows: "SNMxx", (where xx are numbers).

- Tap the desired Module to select the Module ("1" Module list) to connect.
- Tap "② Connect" button to connect (up to 4 Modules can be selected and connected at one time).

<About the Menu>

- STOP/ SCAN button
Scan stop/ Scan start.
- CLEAR Button
Clear the displayed list.
After clearing the list, at first press stop and then restart.
- Scan Filter ON/OFF Button
When scanning, turn off the filtering display for all Modules, and not just the Modules named "SNMxx". The default has the Filtering turned ON.



The confirmation screen shows the Module`s BD address, and after confirming with address, tap "OK" to confirm or "Cancel" to return to the previous page.

3.2 Main Window

① After connection is done, the main screen is displayed. It contains the following functions.

The screenshot shows the 'ALPS Sensor GRAPH' main screen. At the top, there are two tabs: 'CONTROL' and 'GRAPH'. Below the tabs, the device ID 'SNM00 (BB:00:00:00:00:22)' is displayed. A battery icon shows a voltage of 3.15[V]. On the left side, there are five buttons: 'READ SETTING', 'WRITE SETTING', 'SYNC TIMESTAMP', 'SLEEP', and 'MEASURE ON'. The main area displays 'Measuring Mode' set to 'Slow Mode' and 'Measuring Intervals' set to 'Slow Mode [sec]' with a value of '1'. At the bottom, there is a 'LOGGING ON' button and a list of sensor data: Magnetic(X=0, Y=0, Z=0)[uT], Acceleration(X=0.00, Y=0.00, Z=0.00)[g], UV=0.0[mW/cm2], AmbientLight=0.0[Lx], Humidity=0.0[%RH], and Temperature=0.0[degC].

Callouts and annotations:

- Switch between main/ graph screens (pointing to the tabs)
- Battery voltage is displayed. (Update" READ SETTING" button) (pointing to the battery icon)
- Displays Module Selected. When more than 1 Module is connected, tap the list to change the display. This will show each Module. Note that each Module must be input separately. (pointing to the device ID)

Numbered annotations:

- (1) READ SETTING
- (2) WRITE SETTING
- (3) SYNC TIMESTAMP
- (4) SLEEP
- (5) MEASURE ON
- (6) LOGGING ON

Legend for numbered annotations:

- (1) P13: Please refer to 3.2.2 Read Setting.
- (2) P10: Please refer to 3.2.1 Write Setting.
- (3) P13: Please refer to 3.2.3 Sync Timestamp.
- (4) P13: Please refer to 3.2.4 Sleep Setting.
- (5) P14: Please refer to 3.2.5 Measurement On/Of.
- (6) P14: Please refer to 3.2.6 Logging On/Off.

※When moving from the scan screen to the main screen, automatically Read Setting is done (takes a few seconds).

② A graph of data measured by tapping appears the graph tab.

The screenshot shows the 'ALPS Sensor GRAPH' graph screen. At the top, there are two tabs: 'CONTROL' and 'GRAPH'. The 'GRAPH' tab is selected. The screen displays 'Acceleration and Magnetic' data for device 'SNM00 (AA:AA:AA:AA:AA:11)'. There are two line graphs: one for Acceleration [g] and one for Magnetic [uT]. The Acceleration graph shows three lines (red, green, blue) fluctuating around 0. The Magnetic graph shows three lines (red, green, blue) fluctuating around 0. Below the graphs, there is a 'Pressure' sensor icon and label.

Callouts and annotations:

- Switch between main and graph screen (pointing to the tabs)

Text annotation:

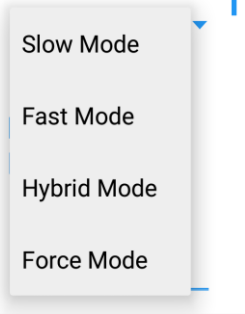
※When the Sync Timestamp is not done, the graph is not displayed. To set this, please refer to P13 3.2.3 Sync Timestamp.

3.2.1 Write Setting

Settings can be changed on the right side of the main menu.
After changing, please tap "WRITE SETTING".

✖Until "WRITE SETTING" is done, changes are not reflected.

Measuring Mode

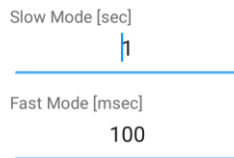


Mesuring Mode

Changes available to measurement modes.

- Slow Mode
Measuring Intervals - Slow Mode interval settings are measured in these Intervals (for all sensors).
- Fast Mode
Fast Mode interval settings are measured in this mode (less than 100ms: Accelerometer, Geomagnetic sensor only/
Over 100ms: all sensors).
- Hybrid Mode
Accelerometer and Geomagnetic sensor are in Fast Mode, and all other Sensors are in Slow mode and interval measurement settings are set accordingly.
- Force Mode
Mode where sensor measurements are manually set" MEASURE ON" changes to" FORCE SAMPLING". Sensor measurement starts once the" FORCE SAMPLING" button is tapped.

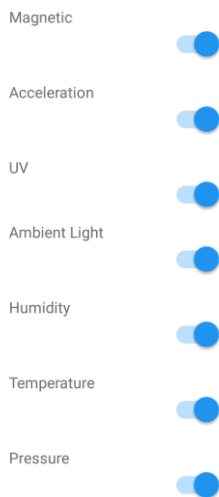
Measuring Intervals



Measuring Intervals

Change measurement intervals. (Slow Mode, Fast Mode input separately.)

Sampling Sensors



Sampling Sensors

Sensor measurement ON/OFF settings.

Timer Sleep Interval [min]



Beacon Behavior

Mode

NormalAdvertising ▼

Device Name

SNM00

Timer Sleep Interval [min]

Setting the time from sleep to wake-up.

Beacon Behavior

For operation at the time of Advertising, set the normal operation and beacon operation.

※After setting the Beacon and after Write Settings, Beacon operation starts when Disconnecting.

※During Beacon operation module connection is possible from the Scan screen.

-NormalAdvertising

Normal operation mode. Beacon operation is not done.

-GeneralBeacon

This mode acts as a generic beacon.

Please input UUID、Major、Minor values here.

※During General Beacon operation, the device name on the scan screen is "NO-NAME".

- SensorBeacon

Sensor data is transmitted in this mode.

Please select the Sensor Type:

- Environment: Accelerometer, UV, Light, Humidity, Temperature, Pressure
- Motion: Accelerometer, Geomagnetic, Pressure.

Device Name

Change the name of the Device being used. (18 characters' maximum).

For the Sensor Beacon, the first five characters at the beginning are used.

※ The changed device name is reflected after the Device is disconnected.

Valid Parameter Range

Slow Mode Interval: 1~65535 [sec]

Fast Mode Interval: 50~999 [msec] ※Accelerometer, Geomagnetic only are 50~99msec
10~49 msec can be input but data will be lost.

Timer Sleep Interval: 1~65535 [min]

General Beacon Major: 0~65535

General Beacon Minor: 0~65535

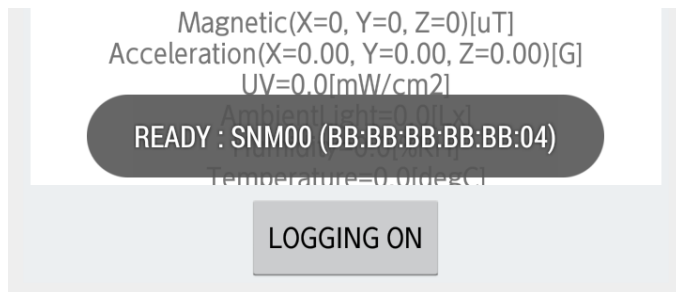
※When writing invalid parameters, NACK (= Negative Acknowledgement)(*1) dialog box is displayed, and the values are displayed as the following default.

- Slow Mode Interval: 1 [sec]
- Fast Mode Interval: 100[msec]
- Timer Sleep Interval: 1 [min]
- General Beacon Major: 0
- General Beacon Minor: 0

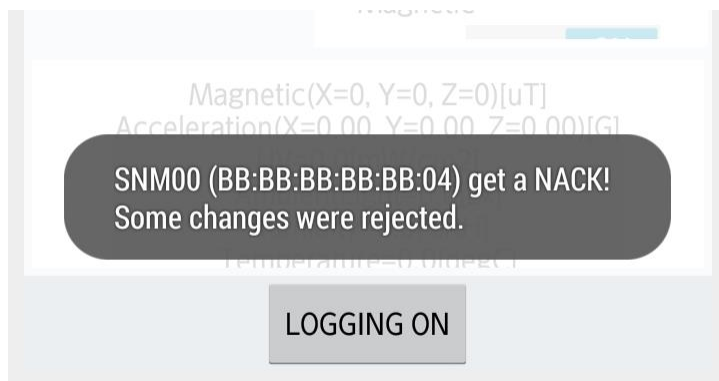
For some operations, (* 1) displayed in NACK is not changed to the default value.

There is a case where the setting value from being reflected, but the operation itself is not guaranteed. Ex. setting the Interval to less than 100msec in Fast mode, when Environment Sensors (UV, Ambient light, Humidity, Temperature, Pressure) are enabled, NACK is displayed.

Guarantee within the set time dialog



Dialog for settings outside guranatee



3.2.2 Read Setting

Tap the "READ SETTING" button, and the following items display the Modules current settings and values.

- Measurement Mode Settings
- Measurement Intervals
- Sensor Measurement ON/ OFF
- Battery Voltage

3.2.3 Sync Timestamp

Synchronizes the time stamp of the Module to the current time of the Device.

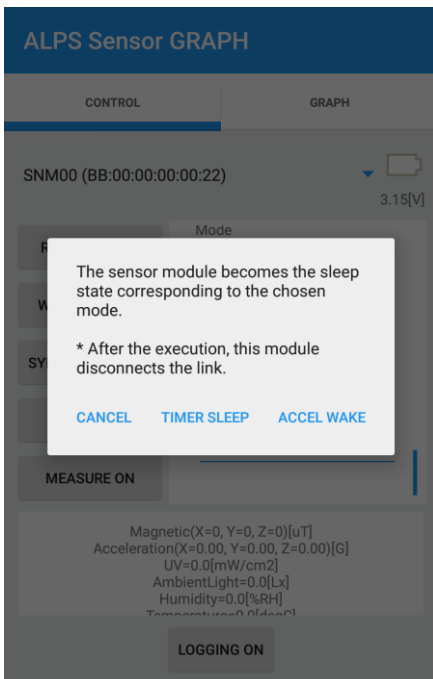
※The graph cannot be displayed if Sync Timestamp is not done.

3.2.4 Sleep Setting

The "SLEEP" button shows the sleep mode settings.

※When sleep is set, the module communication is disconnected.

※After waking up from sleep, the Bluetooth® Smart connection takes a few seconds.



TIMER SLEEP

Enter Timer Sleep mode.

On the right side of the main screen "Timer Sleep Interval", the sleep and wake up can be set.

ACCEL WAKE

Enters Accel Wake mode.

Connection to the module is disconnected, and will wake up when the value of the acceleration sensor exceeds a certain threshold.

3.2.5 Measurement On/Off

Tapping "MEASURE ON" in the main menu starts sensor measurement, and the display changes to "MEASURE OFF".

The data being measured is displayed in the lower part of the main screen.

Tapping "MEASURE OFF" stops data measurement, and the display changes to "MEASURE ON".

3.2.6 Logging On/Off

Tapping "LOGGING ON" starts the collection in csv file format, and the display changes to "LOGGING OFF".

Tapping "LOGGING OFF" stops the data collection, and the display changes to "LOGGING ON".

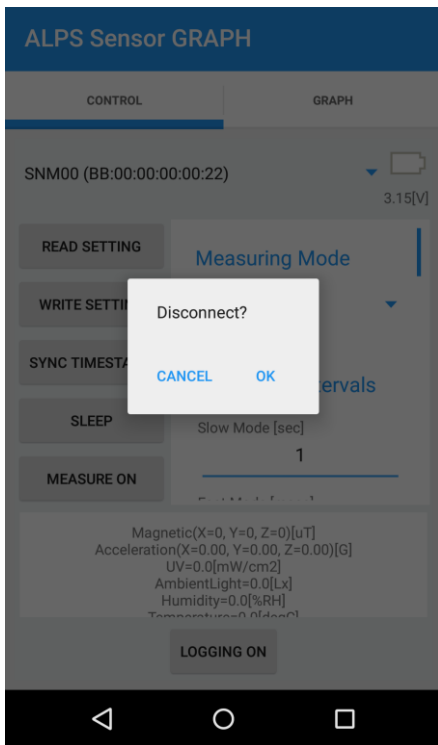
The csv file is saved in "(internal storage)/ALPS Sensor GRAPH/(Device Name)(BD Address).csv".

The csv file format appears as per the example below.

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

※Up to 4 Modules Data Log can be collected. However, the data is not collected in 1 file, but each Modules data will have its own file. Also, as the Modules settings are input one by one, the start and stop times of the collected data will have differences reflecting this (depends on how long the user takes to turn on/ off.)

3.2.7 Disconnect



Tapping Return on the Device as shown allows operation to be disconnected. After disconnection, all the Modules are disconnected and the screen moves back to the scan screen. (if 4 Modules are connected, all 4 will be Disconnected at this time).

If there is interference in the radio signal etc., causing disconnection, it will re-connect automatically. In this case, it will be the individual Modules affected, and only the impacted Modules will be Disconnected.

※If you Disconnect during the measurement, the measurement is continued even after Disconnect and will be displayed once the Module is reconnected.

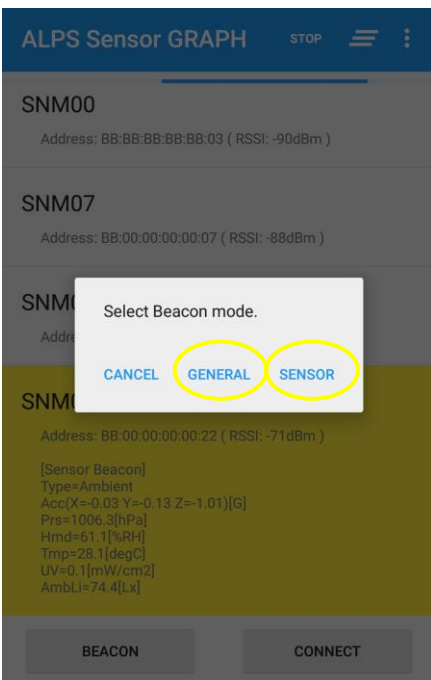
4. Beacon Mode

This mode shows the receiving and displaying of Beacon data. Maximum Modules is 4 (four).

※ On the Beacon screen, the data from the Module is displayed, which is then set in beacon mode. To configure the module in beacon mode, on the main screen please refer to (P11) 3.2.1 Write Setting of Beacon Behavior or select Sensor Beacon.



Tap the desired Module on the Scan screen to select, and then tap “BEACON”.



Select the Beacon mode desired

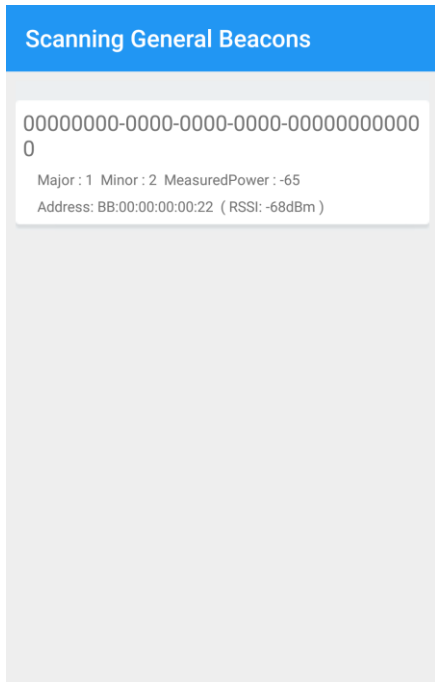
- General Beacon is “General”.
- Sensor Beacon is “Sensor”

※General Beacon data cannot be displayed on the Sensor Beacon screen.

※Sensor Beacon data cannot be displayed on the General Beacon screen.

4.1 General Beacon Window

Receiving of beacon data in General Beacon mode.
 UUID, Major, Minor, Measured Power, BD address and RSSI values are displayed.



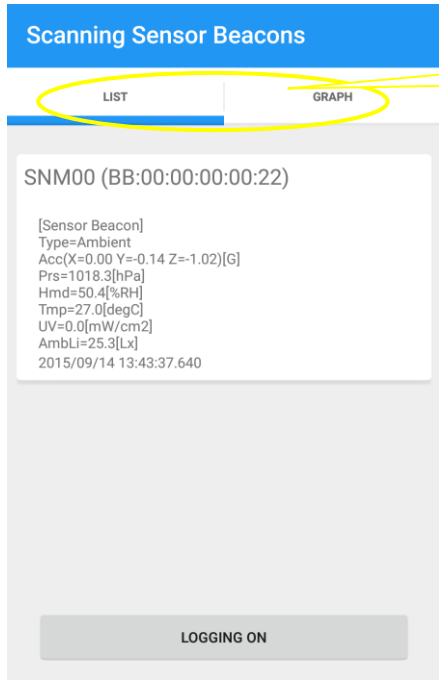
4.2 Sensor Beacon Window

Receiving of Beacon data in Sensor Beacon mode.
 Received sensor data of numerical display, graphical display, log output is possible.

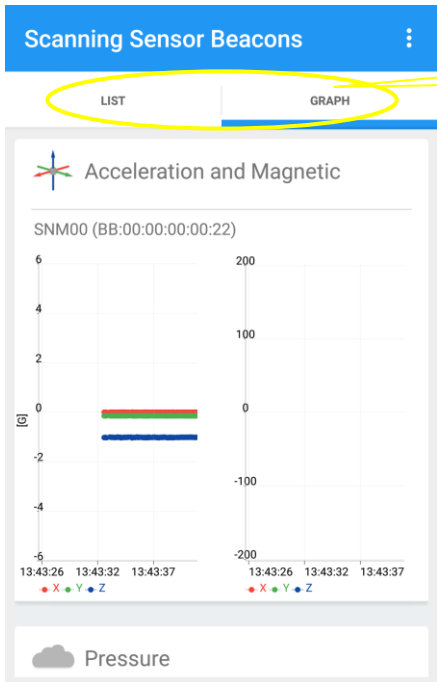
CSV File

This files are saved in" (internal storage)/ALPS Sensor GRAPH/ SensorBeaconsLog.csv".
 The csv file format is as per the following shown attachment.

		uT			g		
		Geo	Mag	XYZ	Accel	XYZ	
Time	LocalName	Mag_X	Mag_Y	Mag_Z	Acc_X	Acc_Y	Acc_Z
mW/cm ²	Lx	%RH	degC	hPa			
UV-A	AmbientLight	Humidity	Temperature	Pressure			



Switch between Main and Graph screen



Switch between Graph and Main screen

Revision History

Version	Date	Description
1.0	05.Oct.2015	Initial release
1.1	05.Feb.2016	Corrections & Additional Explanations P.12 Fast Mode Interval 50-99ms P. 7/9/14 Specify "up to 4 Modules"
1.2	6.Feb.2017	All pages: Bluetooth [®] Smart corrected to Bluetooth [®] ·low energy Precautions, Safety Precaution: information updated Confirmed devices portion added Nexus6P 3.2.1 Write Setting: Timer Sleep Interval screen added