



RAK1906 WisBlock Environment Sensor Module User Guide

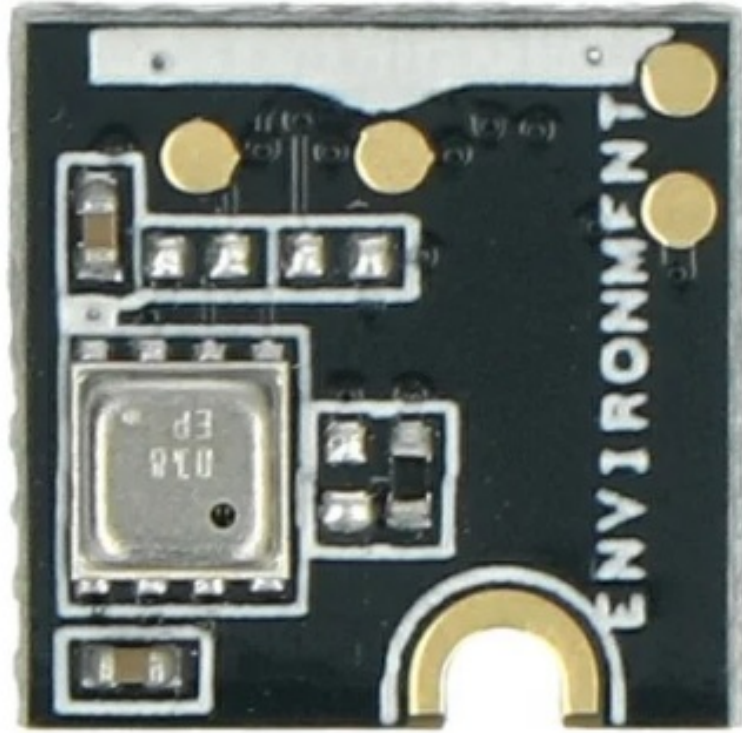
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RAK1906 WisBlock Environment Sensor Module



What Do You Need

Before going through each and every step of using the RAK1906 WisBlock module, make sure to prepare the necessary items listed below:

Hardware

RAK1906

Your choice of WisBlock Base Your choice of WisBlock Core USB Cable

Li-Ion/LiPo battery (optional) Solar charger (optional)

Software

- Download and install Arduino IDE.
- Install the RAKwireless Arduino BSP and add the RAKwireless Core boards to your Arduino Boards Manager.
Follow the steps in the Github repo.

Product Configuration

Hardware Setup

WisBlock can integrate this module, which makes it easy to build up an environmental temperature and humidity data acquisition system. For more information about the RAK1906, refer to the Datasheet. The RAK1906 module gives information about:

- Air pressure
- Air quality
- Ambient Air Temperature Environment Humidity
- RAK1906 module can be connected to any slot of WisBlock Base to communicate with the WisBlock Core. It

will work on SLOT A to D. Also, always secure the connection of the WisBlock module by using compatible screws.

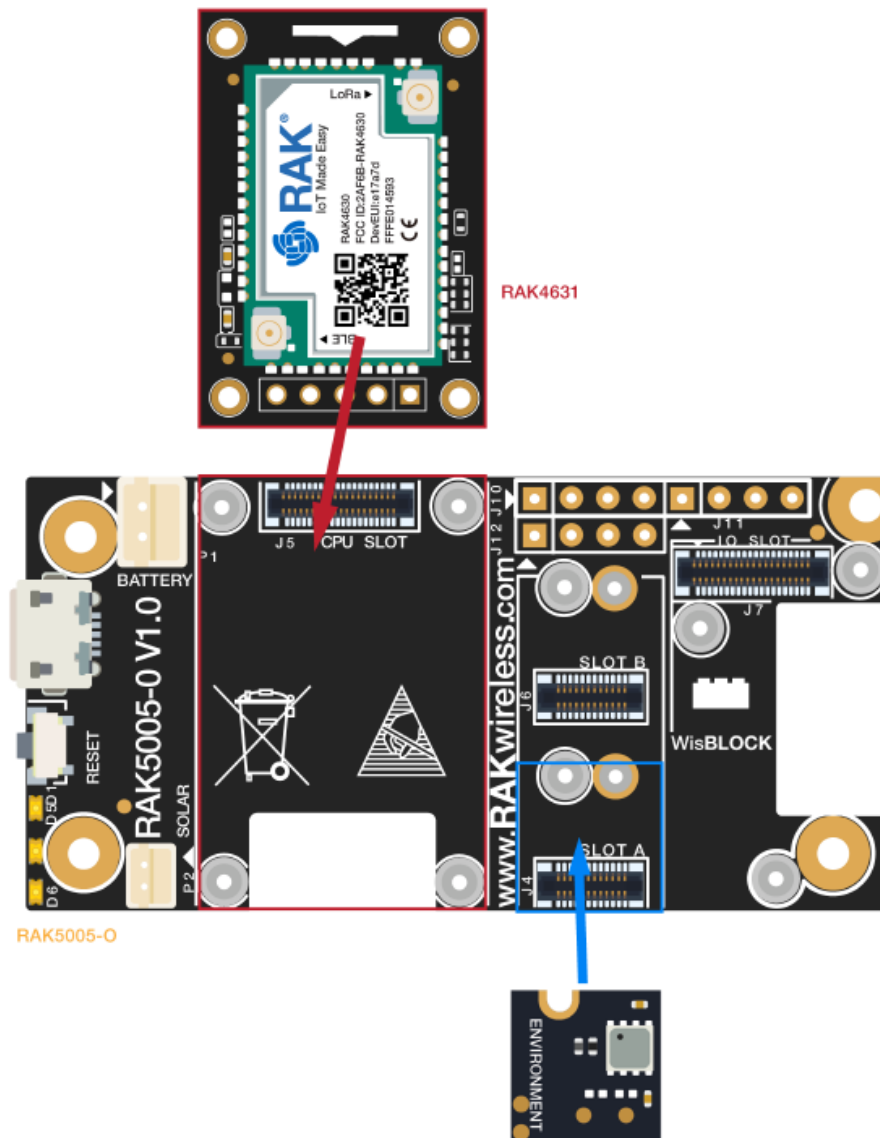


Figure 1: RAK1906 connection to WisBlock Base

Assembling and Disassembling of WisBlock Modules

Assembling

As shown in **Figure 2**, the location for Slots A, B, C, and D are properly marked by silkscreen. Slots C and D are located on the bottom of WisBlock Base. Follow carefully the procedure defined in RAK5005-O module assembly/disassembly instructions to attach a WisBlock module. Once attached, carefully fix the module with an M1.2 x 3 mm screw.

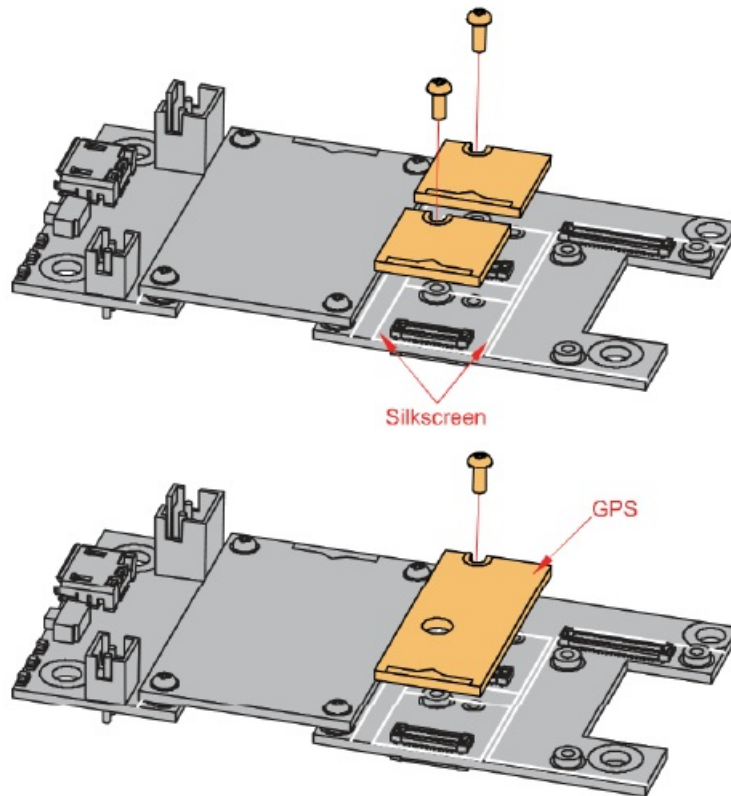


Figure 2: RAK1906 connection to WisBlock Base

Disassembling

The procedure for disassembling any type of WisBlock module is the same.

1. First, remove the screws.

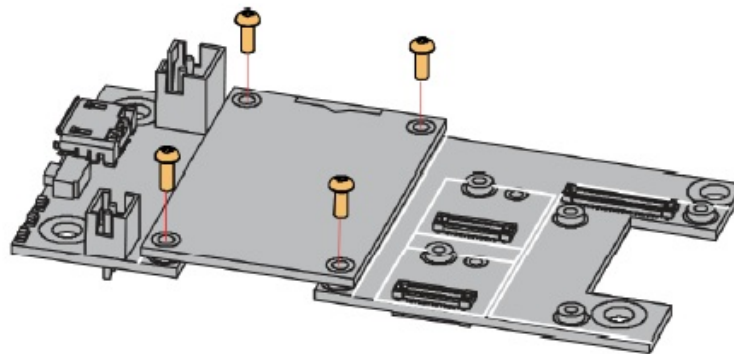


Figure 3: Removing screws from the WisBlock module

1. Once the screws are removed, check the silkscreen of the module to find the correct location where force can be applied.

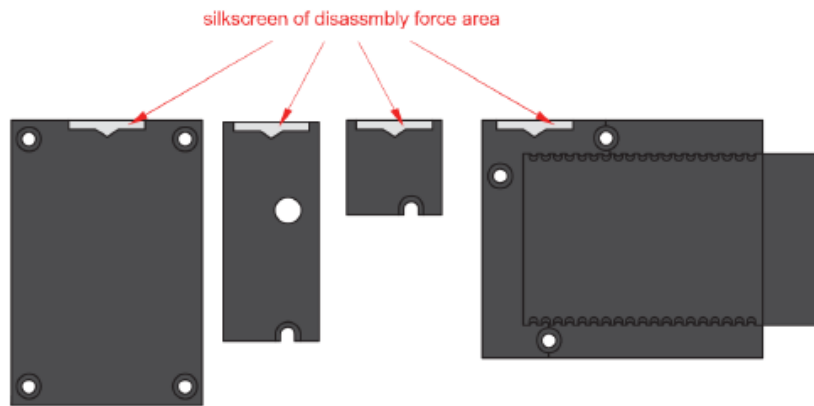


Figure 4: Detaching silkscreen on the WisBlock module

1. Apply force to the module at the position of the connector, as shown in **Figure 5**, to detach the module from the baseboard.

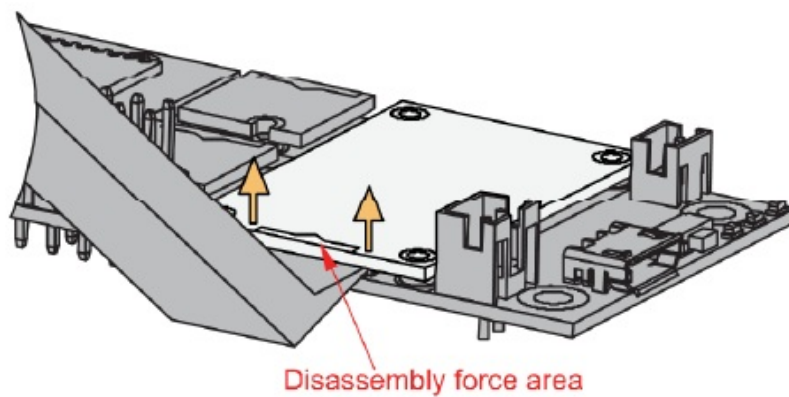


Figure 5: Applying even forces to the proper location of a WisBlock module

NOTE

If you will connect other modules to the remaining WisBlock Base slots, check on the WisBlock Pin Mapper tool for possible conflicts. RAK1906 uses I2C communication lines, and it can cause possible conflict, especially on some IO modules.

After all this setup, you can now connect the battery (optional) and USB cable to start programming the RAK1906.

WARNING

- The battery can cause harm if not handled properly.
- Only 3.7-4.2 V Rechargeable LiPo batteries are supported. It is highly recommended not to use other types of batteries with the system unless you know what you are doing.
- If a non-rechargeable battery is used, it has to be unplugged first before connecting the USB cable to the USB port of the board to configure the device. Not doing so might damage the battery or cause a fire.
- Make sure the battery wires match the polarity on the RAK WisBlock Base Board. Not all batteries have the same wiring.
- Only 5 V solar panels are supported. Do not use 12 V solar panels. It will destroy the charging unit and eventually other electronic parts.

Software Configuration and Example

The RAK1906 is a 4-in-1 Environmental Sensor board that contains the Bosch BME680 chip. It is specially designed for wearables where size and low power consumption are critical requirements. The BME680 contains a small Metal-Oxide (MOX) sensor and an I2C interface used to communicate with WisBlock Core.

WARNING

The BME680 requires a burn-in period to collect accurate readings. The burn-in procedure can be achieved by reading all sensors once every 5 seconds for at least 20 minutes the first time that you use it. For each subsequent use, the readings should stabilize 2-3 minutes after power-up.

Initial Test of the RAK1906 WisBlock Module

If you already installed the RAKwireless Arduino BSP, the WisBlock Core and example code should now be available on the Arduino IDE.

1. First, you need to select the WisBlock Core you have, as shown in **Figures 6** to Figure 8. **RAK4631 WisBlock Core**

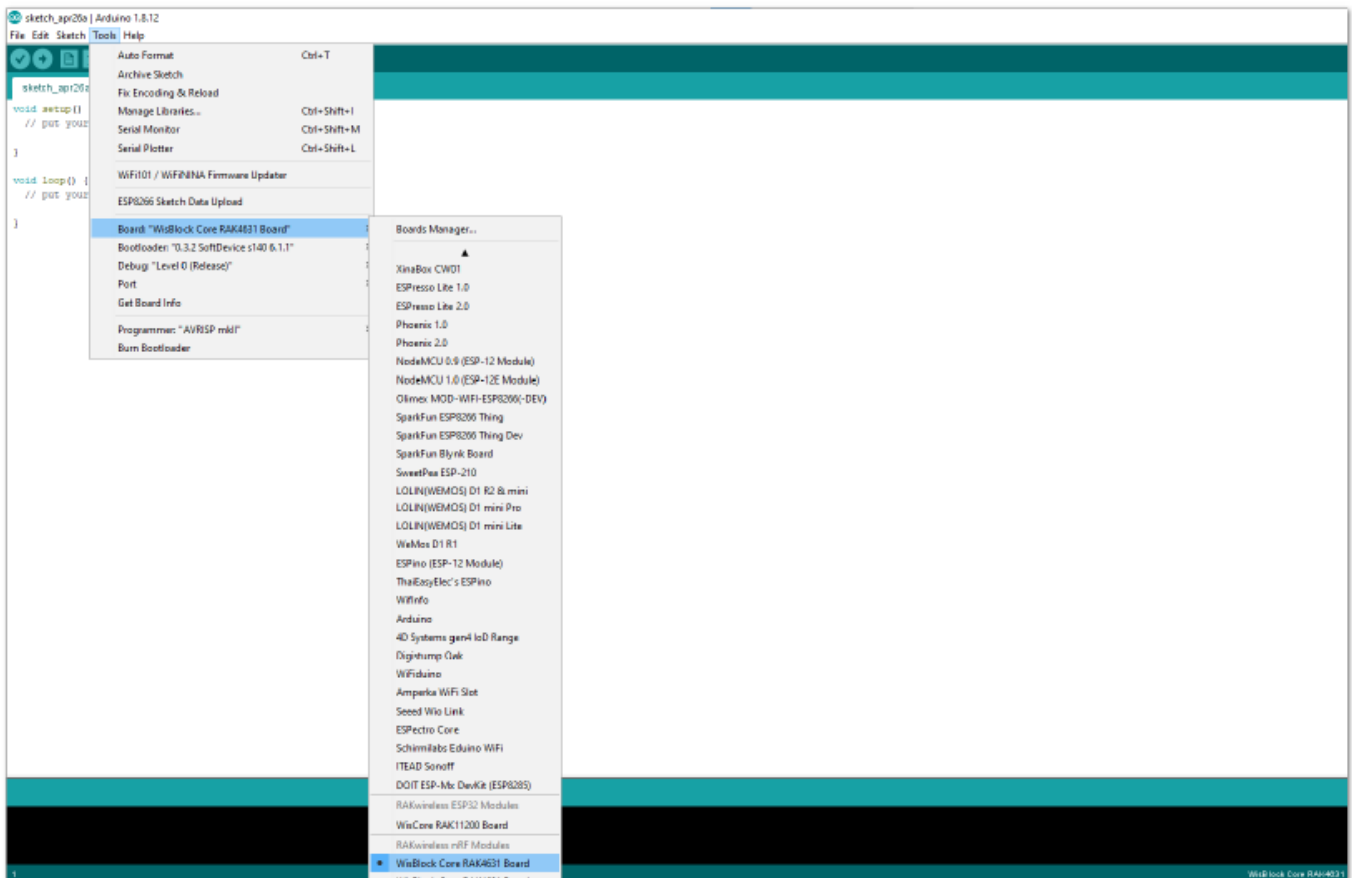


Figure 6: Selecting RAK4631 as WisBlock Core

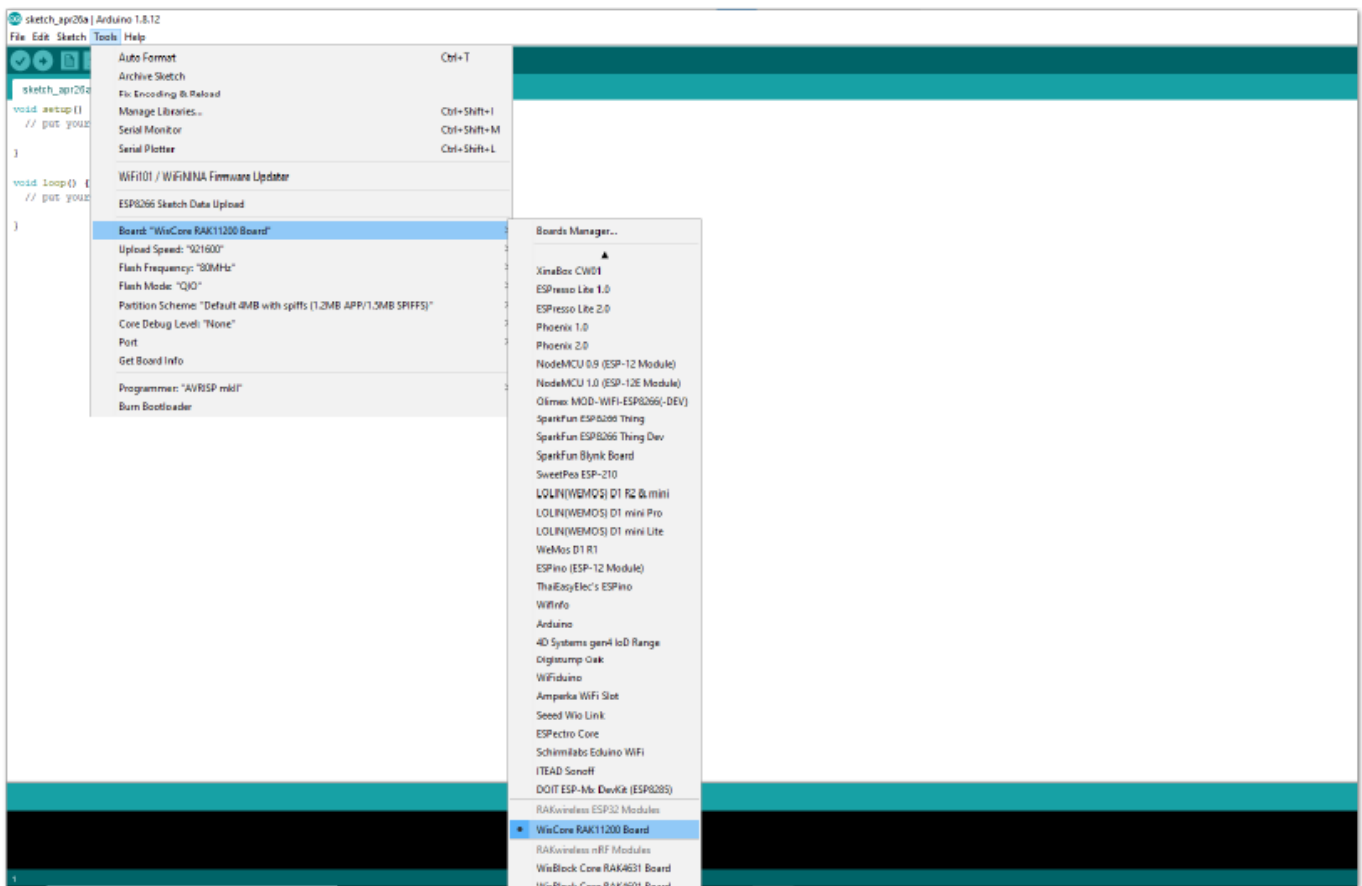


Figure 7: Selecting RAK11200 as WisBlock Core

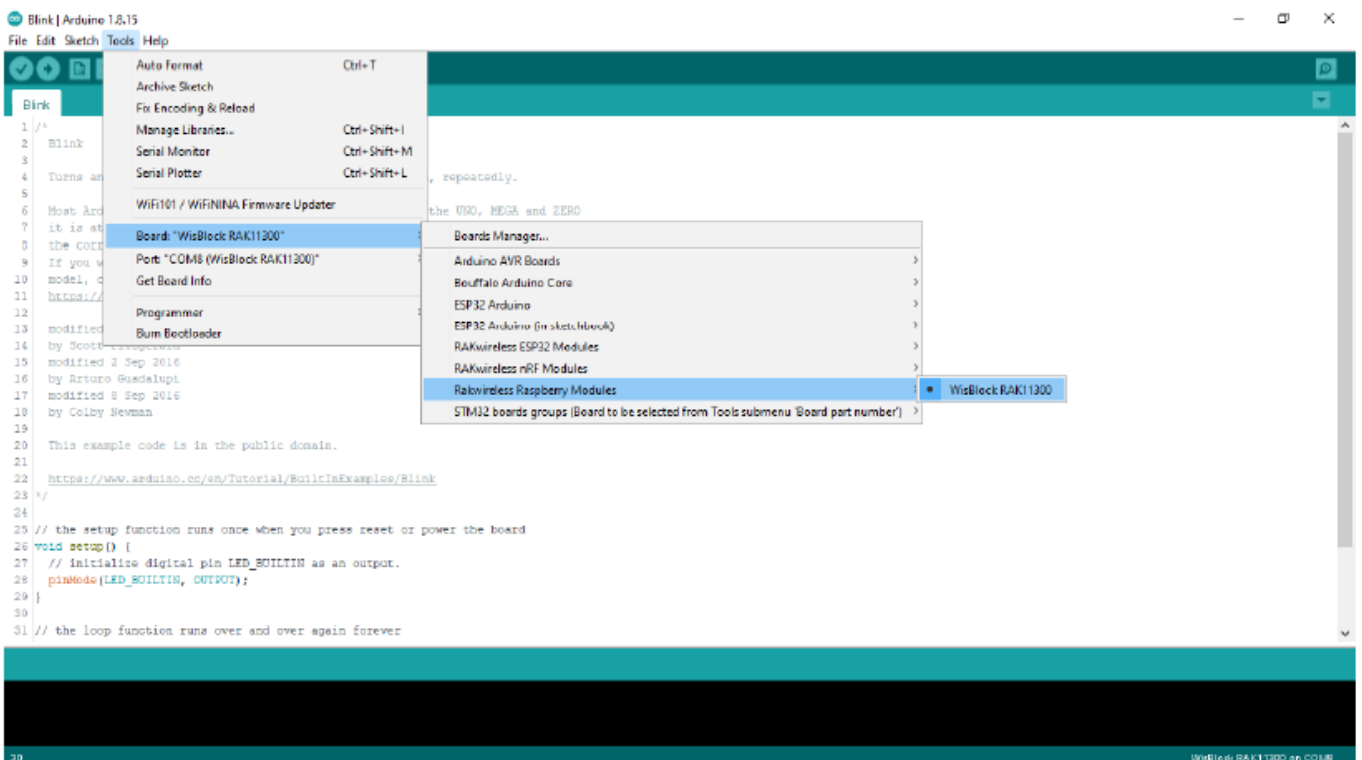


Figure 8: Selecting RAK11310 as WisBlock Core

The RAK1906_Environment_BME680 example in Github will work on all WisBlock Core. You can open the example codes depending on your WisBlock Core, as shown in **Figures 9** to **Figure 11**.

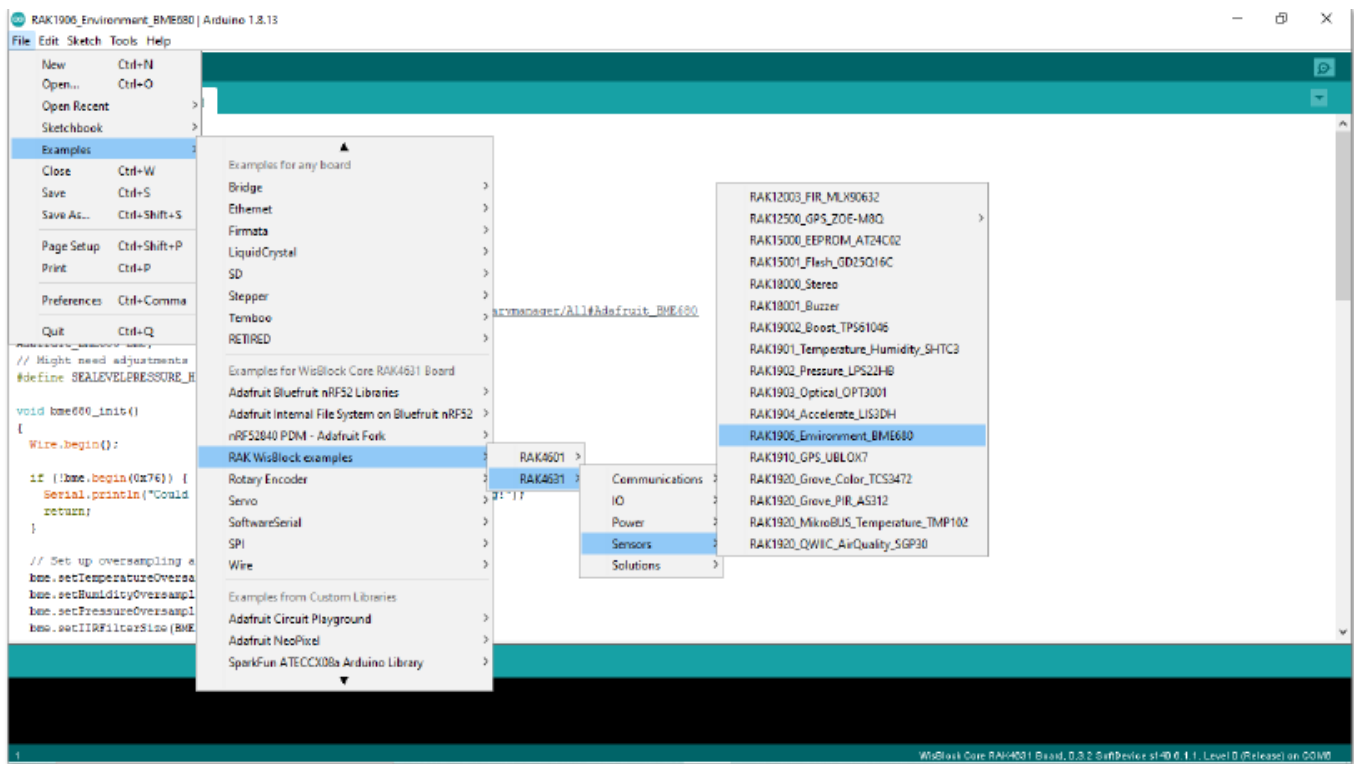


Figure 9: Opening RAK1906 example code for RAK4631 WisBlock Core

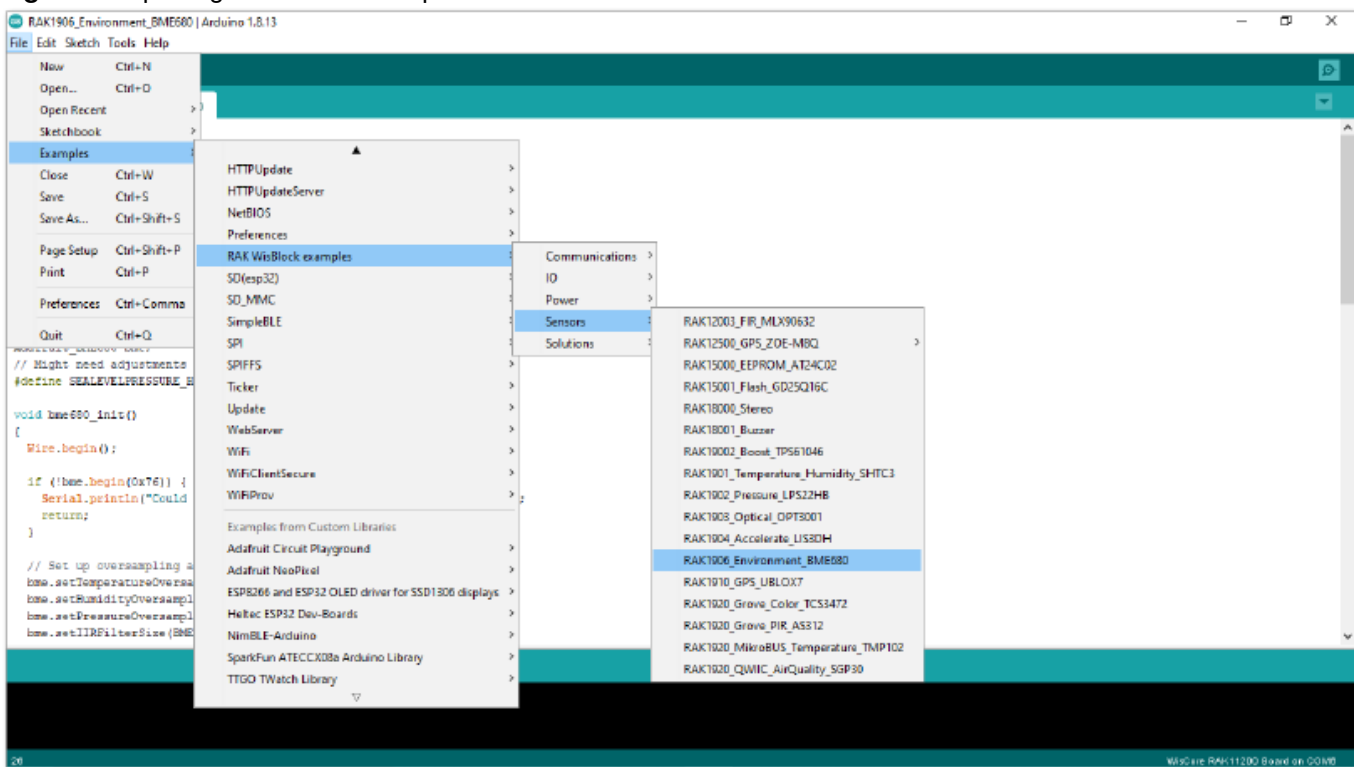


Figure 10: Opening RAK1906 example code for RAK11200 WisBlock Core

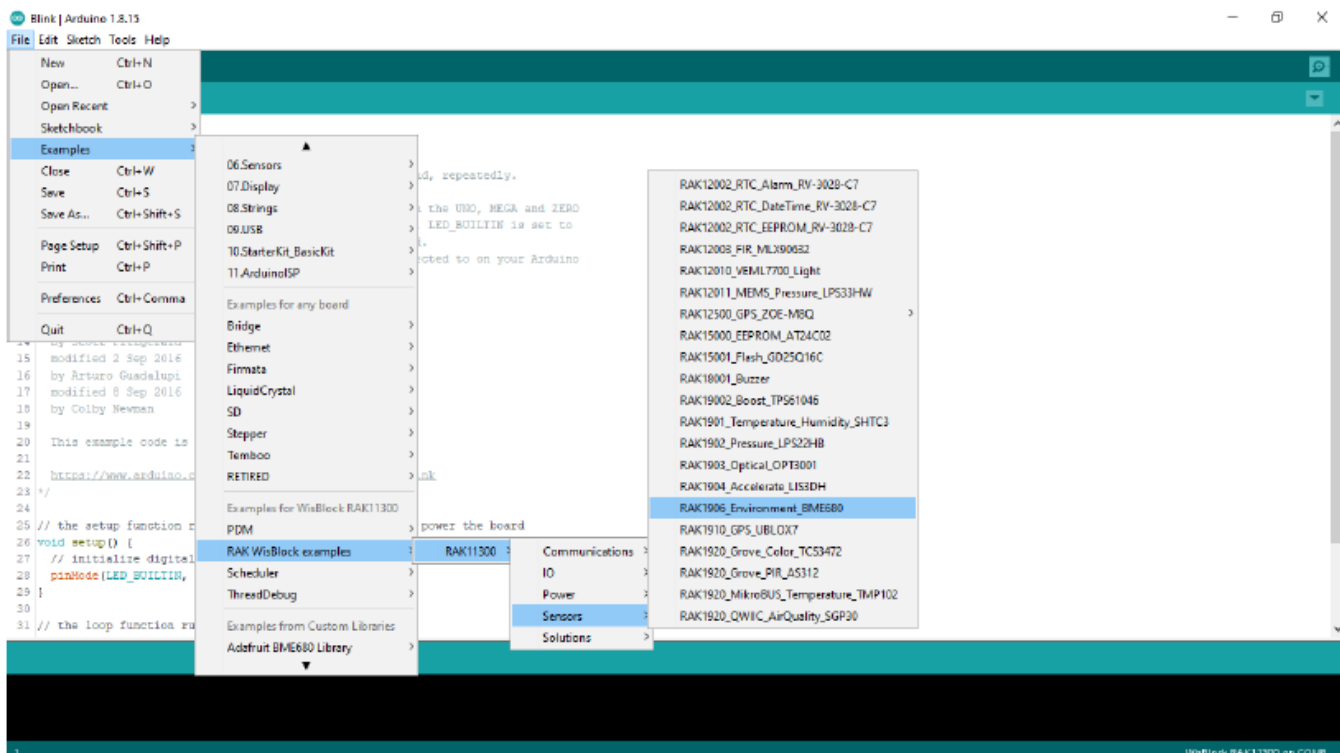


Figure 11: Opening RAK1906 example code for RAK11310 WisBlock Core

1. Once the example code is open, install the Adafruit BME680 library by clicking the link highlighted in yellow, as shown in **Figure 12** and **Figure 13**.

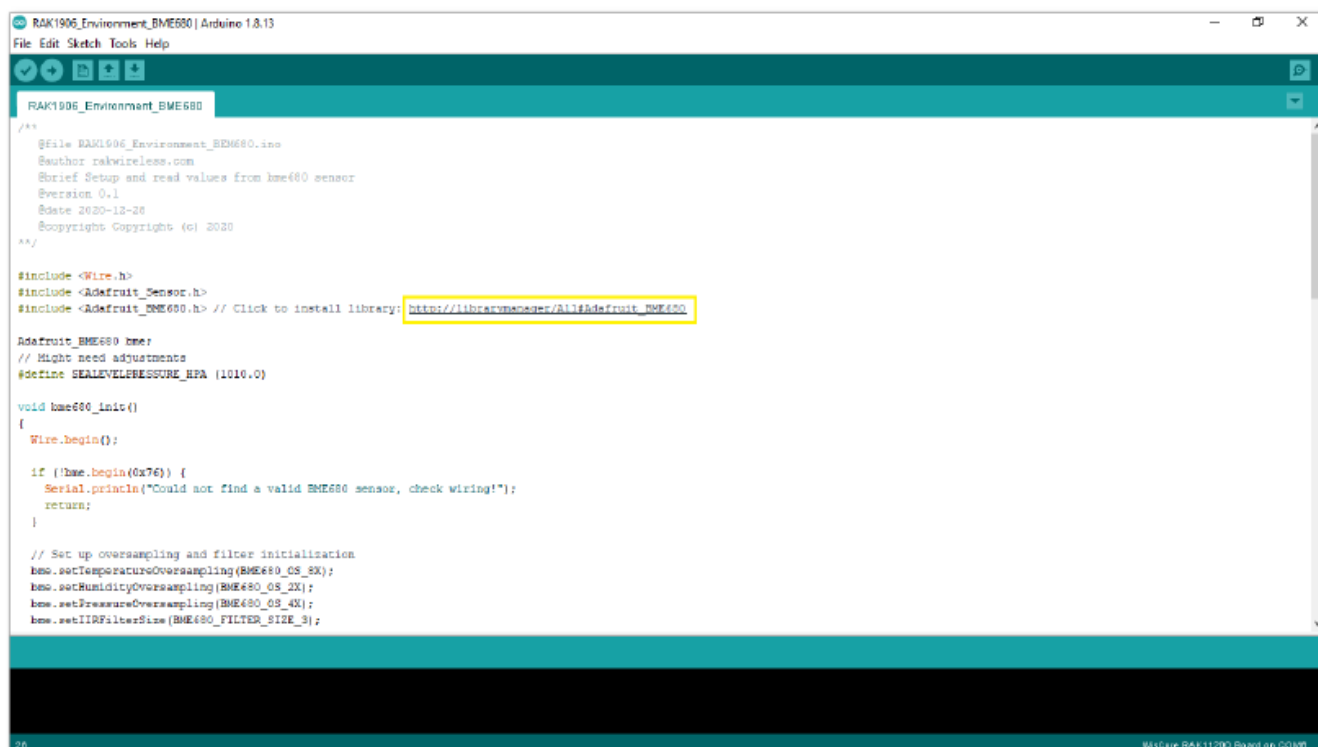


Figure 12: Select Adafruit BME680 library



Figure 13: Installing Adafruit BME680 library During the installation, you will be asked to install the Adafruit Unified Sensor library. Install it as well.

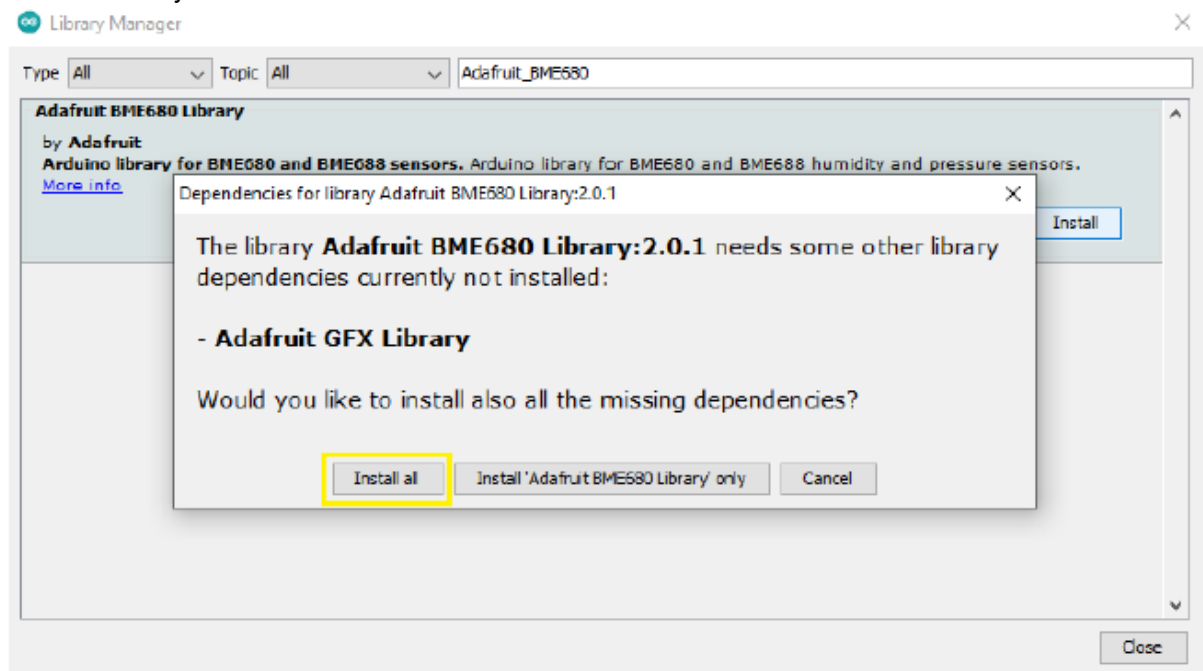


Figure 14: Installing Adafruit Unified Sensor Library

1. After successful installation of the library, you can now select the right serial port and upload the code, as shown in **Figure 15** and **Figure 16**

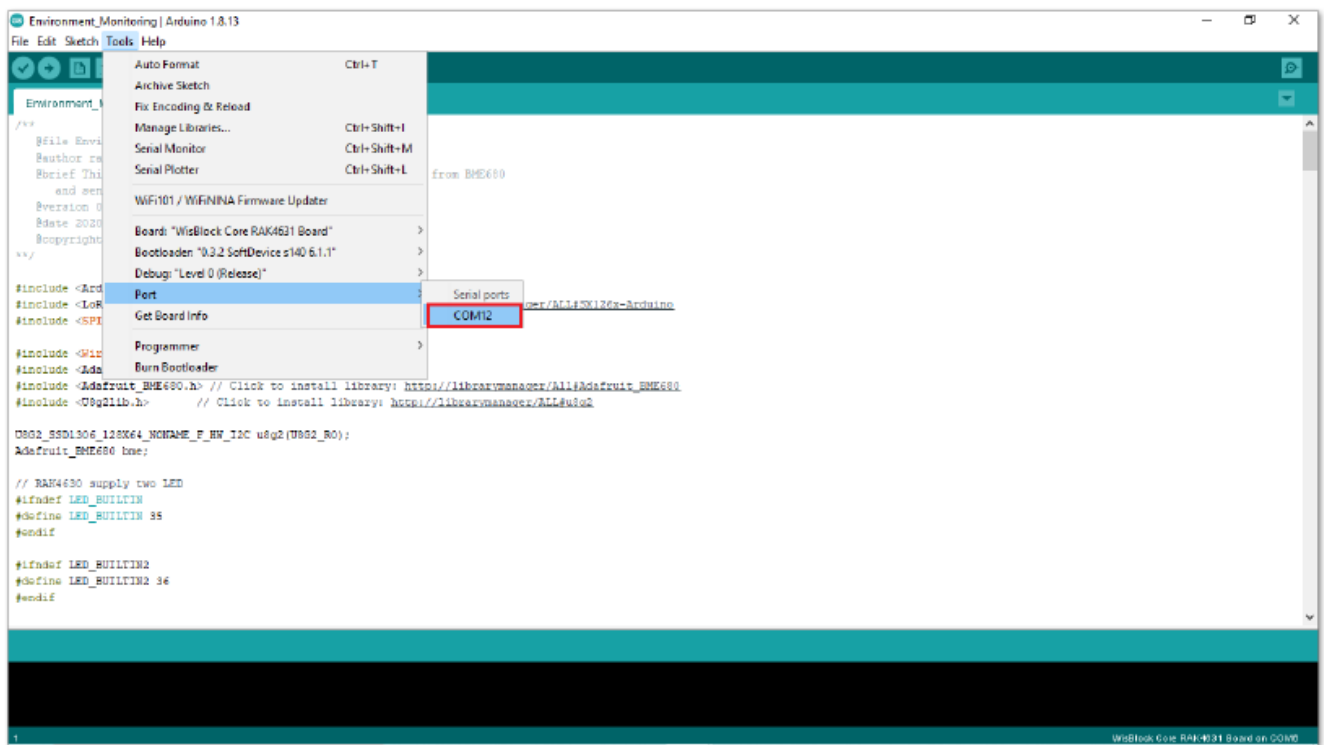


Figure 15: Selecting the correct Serial Port

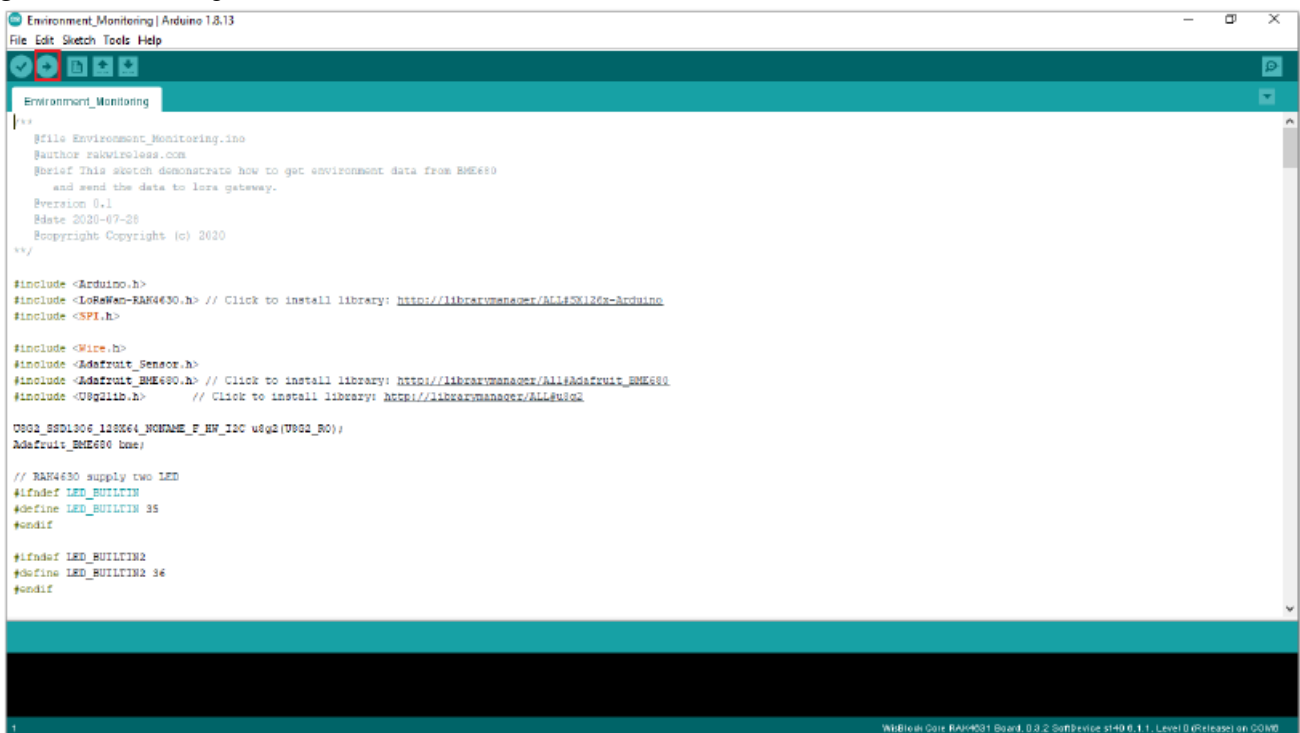


Figure 16: Uploading the RAK1906 example code The RAK1906_Environment_BME680 application gets BME680 sensor data every 5 seconds and prints the results on the serial port.

```

Temperature = 30.66 *C
Pressure = 1013.80 hPa
Humidity = 44.38 %
Gas = 3.89 KOhms

```

```

Temperature = 30.69 *C
Pressure = 1013.78 hPa
Humidity = 44.59 %
Gas = 3.88 KOhms

```

```

Temperature = 30.72 *C
Pressure = 1013.82 hPa
Humidity = 44.37 %
Gas = 3.87 KOhms

```

LoRaWAN Environment Monitoring with RAK1906

This solution shows how to create an environmental data sensor node. The sensor node measures air temperature, air humidity, barometric pressure, and gas levels. After the node joins to server successfully, it then transmits this data periodically to a LoRaWan® server.

These are the quick links that go directly to the specific WisBlock Core module solution that you can use in your RAK1906 project:

- [RAK1906 solution for](#)
- [RAK4631 RAK1906 solution for RAK11310](#)

RAK4631 Solution Requirements

- 1 pc WisBlock Base RAK5005-O 1 pc WisBlock Core RAK4631 1 pc WisBlock Sensor RAK1906 1 pc WisBlock Display RAK1921 1 pc LoRa Gateway
- Arduino IDE
- RAK4630 BSP
- Adafruit BME680 Library SX126x-Arduino Library
- U8g2 library

RAK11310 Solution Requirements

- 1 pc WisBlock Base RAK5005-O 1 pc WisBlock Core RAK11310
- 1 pc WisBlock Sensor RAK1906
- 1 pc WisBlock Display RAK1921 1 pc LoRa Gateway
- Arduino IDE
- Arduino BSP for RAK11300 module Adafruit BME680 Library
- SX126x-Arduino Library
- U8g2 library

Configuring LoRaWAN

There are configurations that you need to set up to ensure that the device can join a LoRaWAN Network server. The steps below will explain the default settings and how to configure it.

1. Set up the LoRa Region.

The default region is EU868.

```
LoRaMacRegion_t g_CurrentRegion = LORAMAC_REGION_EU868;
```

You can change this to a region that is applicable to you like LORAMAC_REGION_US915, LORAMAC_REGION_AU915, etc.

1. Set up the LoRaWAN activation method.

The default is OTAA. `bool doOTAA = true;`

To configure the device to ABP, you need to make this boolean variable false.

1. Set up the message type if confirmed or not.

Default is **confirmed message**.

```
lmh_confirm g_CurrentConfirm = LMH_CONFIRMED_MSG;
```

You can change to an unconfirmed message by changing the value to LMH_UNCONFIRMED_MSG.

1. Set up, device class.

Default is **Class A**.

```
DeviceClass_t g_CurrentClass = CLASS_A; You can change this to CLASS_B (still under development) or CLASS_C.
```

1. Set up the keys.

- Configuration keys for OTAA Activation:
 - `uint8_t nodeDeviceEUI[8] = {0x88, 0x88, 0x88, 0x88, 0x88, 0x88, 0x33, 0x33};`
 - `uint8_t nodeAppEUI[8] = {0xB8, 0x27, 0xEB, 0xFF, 0xFE, 0x39, 0x00, 0x00};`
 - `uint8_t nodeAppKey[16] = {0x88, 0x88, 0x88, 0x88, 0x88, 0x88, 0x88, 0x88, 0x88, 0x88, 0x88, 0x88, 0x88, 0x88, 0x88, 0x88};`
- Configuration keys for ABP Activation:
 - `uint32_t nodeDevAddr = 0x260116F8;`
 - `uint8_t nodeNwsKey[16] = {0x7E, 0xAC, 0xE2, 0x55, 0xB8, 0xA5, 0xE2, 0x69, 0x91, 0x51, 0x96, 0x06, 0x06, 0x06, 0x06, 0x06};`
 - `uint8_t nodeAppsKey[16] = {0xFB, 0xAC, 0xB6, 0x47, 0xF3, 0x58, 0x45, 0xC7, 0x50, 0x7D, 0xBF, 0x16, 0x16, 0x16, 0x16, 0x16};`

1. Set up uplink period. .

The default is 20000 ms. `#define LORAWAN_APP_INTERVAL 20000`

Data Format

Byte1	Byte2		Byte3	Byte4		Byte5	
1	Temperature1		Temperature2	Humidity1		Humidity2	
Byte6	Byte7	Byte8	Byte9	Byte10	Byte11	Byte12	Byte13

Barometric1 Barometric2 Barometric3 Barometric4 Gas1 Gas2 Gas3 Gas4

- Byte1 is a marker for the data type, here always 1.
- Every byte value is MSB first.
- Temperature is sent as two bytes, enlarged 100 times for accuracy. For example, 2510 means 25.01 C, sent as 0x09 0xCE.
- Humidity is sent as two bytes, enlarged 100 times for accuracy. For example, 4173 means 41.73%, sent as 0x10 0x4D.
- Barometric pressure is sent as four bytes, enlarged 100 times for accuracy. For example, 100945 means 1009.45 hPa, sent as 0x00 0x01 0x8A 0x51.
- Gas resistance is sent as four bytes. For example, 63560 Ohm, sent as 0x00 0x00 0xF8 0x48.

Attention

If this example is implemented for Region US915, DR0 cannot be used because the package size is too large to fit into the allowed payload. When you successfully uploaded the example sketch, open the Serial Monitor of the Arduino IDE to see the sensor's reading logs. If you see the logs, as shown below, then your RAK1906 is properly communicating to the WisBlock core.

```
10:30:07.777 -> =====
10:30:07.777 -> Welcome to RAK4630 LoRaWan!!!
10:30:07.777 -> Type: OTAA
10:30:07.777 -> Region: EU868
10:30:07.777 -> =====
10:30:07.777 -> Chip ID=0x61
10:30:12.974 -> OTAA Mode, Network Joined!
10:30:33.999 -> Sending frame now...
10:30:33.999 -> result: Tem:28.70C Hum:67.00% Pres:948.50KPa Gas:276460hms
10:30:33.999 -> lmh_send ok count 1
10:30:53.979 -> Sending frame now...
10:30:53.979 -> result: Tem:28.70C Hum:67.00% Pres:948.50KPa Gas:2424880hms
10:30:54.012 -> lmh_send ok count 2
10:31:14.006 -> Sending frame now...
10:31:14.006 -> result: Tem:28.70C Hum:67.00% Pres:948.50KPa Gas:4571740hms
10:31:14.006 -> lmh_send ok count 3
10:31:33.997 -> Sending frame now...
10:31:33.997 -> result: Tem:28.69C Hum:67.00% Pres:948.50KPa Gas:741020hms
10:31:34.032 -> lmh_send ok count 4
```

Data arrives at the LoRaWAN server.

```
10:30:35 AM      uplink

  ad: true
  applicationID: "1"
  applicationName: "app"
  data: "AQs2GwAAXXCAAB/p=="
  devEUI: "8688888888882222"
  deviceName: "tdz"
  fPort: 0
  fPort: 2
  object: {} 2 keys
    decodeDataHex: "010b361a2c0001728200006bf"
    decodeDataString: "010b361a2c0001728200006bf"
  tsInfo: {} 2 keys
    dr: 0
    frequency: 867700000

10:30:35 AM      join
```

Figure 17: LoRaWAN Environment Monitoring example

Documents / Resources

RAK LoRaWAN Center

RAK1906 Quick Start Guide

Prerequisites

What Do You Need?

Hardware

Software

Product Configuration

Hardware Setup

[RAK RAK1906 WisBlock Environment Sensor Module \[pdf\] User Guide](#)
RAK1906, WisBlock Environment Sensor Module, RAK1906 WisBlock Environment Sensor Module

References

- [RAK5005-O Baseboard Installation Guide | RAKwireless Documentation Center](#)
- [RAKwireless Documentation Center](#)

- [!\[\]\(eae20f1adff742df783f6f7e3bbe72d1_img.jpg\) RAK1906 WisBlock Environmental Sensor Module Datasheet | RAKwireless Documentation Center](#)
- [!\[\]\(43c6e08c5a1618d745b54da5c843274e_img.jpg\) GitHub - adafruit/Adafruit_BME680](#)
- [!\[\]\(f5ee48910650695cea680b2433c1d60d_img.jpg\) GitHub - beegee-tokyo/SX126x-Arduino: Arduino library to use Semtech SX126x LoRa chips and modules to communicate](#)
- [!\[\]\(da0f02caffeb5a74776a1d5d1892b059_img.jpg\) GitHub - olikraus/u8g2: U8glib library for monochrome displays, version 2](#)
- [!\[\]\(edb096eed27f3ac1241ba8d18d05acad_img.jpg\) GitHub - RAKWireless/RAK-RP-Arduino: Arduino BSP for RAKwireless WisBlock RAK11300 Core modules.](#)
- [!\[\]\(554d866cfdb5a2c8f73998019542d337_img.jpg\) GitHub - RAKWireless/RAKwireless-Arduino-BSP-Index: RAKwireless BSP Support for the Arduino Board Manager](#)
- [!\[\]\(c1170582320733ace24db86bc6d97423_img.jpg\) WisBlock/examples/common/sensors/RAK1906_Environment_BME680 at master · RAKWireless/WisBlock · GitHub](#)
- [!\[\]\(51c4b897e692428305845816e97ca71e_img.jpg\) WisBlock/examples/RAK11300/solutions/Environment_Monitoring at master · RAKWireless/WisBlock · GitHub](#)
- [!\[\]\(810c0da19263e18e2f95623517bed1dc_img.jpg\) WisBlock/examples/RAK4630/solutions/Environment_Monitoring at master · RAKWireless/WisBlock · GitHub](#)
- [!\[\]\(8982e3c27257070d79f8096c6d667915_img.jpg\) Battery Connector Cable/5 pcs battery wires – RAKwireless Store](#)
- [!\[\]\(cf565e63df317467714cf7de070ecedc_img.jpg\) Solar Panel Connector Cable/5 pcs solar wires – RAKwireless Store](#)
- [!\[\]\(76264d27c3f3933123acb961f2a449e7_img.jpg\) The plug-and-play WisBlock Base is now available on RAK – RAKwireless Store](#)
- [!\[\]\(8996ef01d8e0ad40113c18b518eacb7a_img.jpg\) The super-compact and durable RAK WisBlock Core now available – RAKwireless Store](#)
- [!\[\]\(8c5548d81cda50e4e278860b2cb9a70a_img.jpg\) BME680 Environmental Sensor | IoT Home Environmental Monitoring Sensors – RAKwireless Store](#)
- [!\[\]\(968380ddaf0d76ade5d8f4f1e1863930_img.jpg\) Software | Arduino](#)

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