WisNode-LoRa-Arduino Library Use Guide

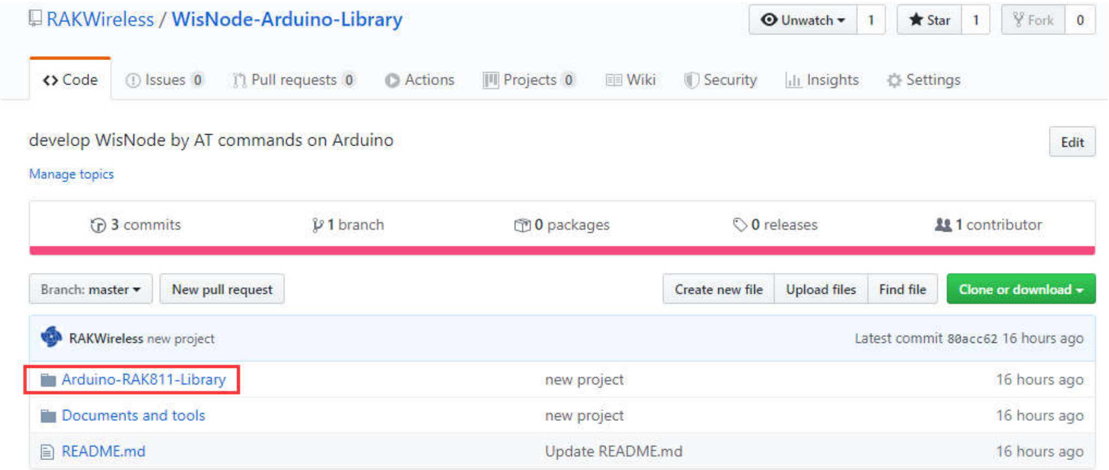
Shenzhen Rakwireless Technology Co., Ltd.
www.rakwireless.com
info@rakwireless.com

CONTENTS

1. RAK811 Arduino Library Use Guide

(1) Download

We upload the RAK811 Arduino library code to the official github. You can find this library at github:https://github.com/RAKWireless/WisNode-Arduino-Library



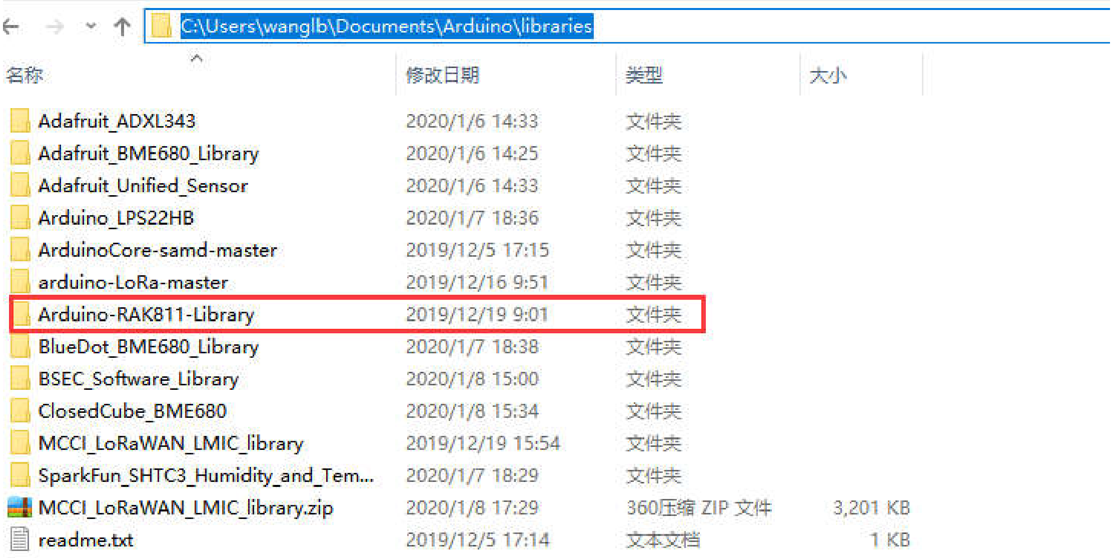
develop WisNode by AT commands on Arduino

RAKWireless new project		Latest commit 80acc62 16 hours ago
Arduino-RAK811-Library	new project	16 hours ago
Documents and tools	new project	16 hours ago
README.md	Update README.md	16 hours ago

Download the library folder “Arduino-RAK811-Library”.

(2) Add to Arduino IDE

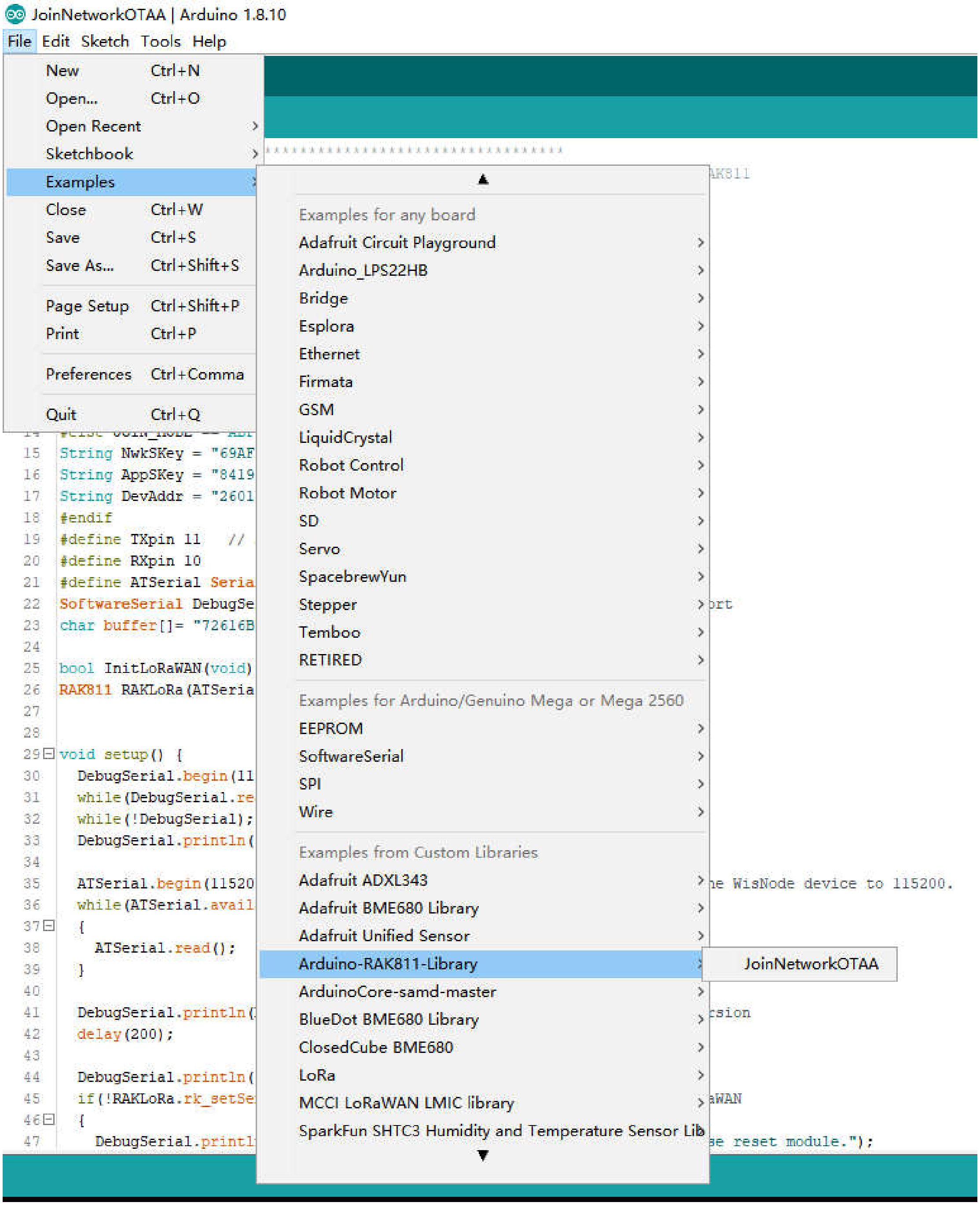
①Copy the “Arduino-RAK811-Library” folder to the Arduino library folder.



C:\Users\wanglb\Documents\Arduino\libraries

名称	修改日期	类型	大小
Adafruit_ADXL343	2020/1/6 14:33	文件夹	
Adafruit_BME680_Library	2020/1/6 14:25	文件夹	
Adafruit_Unified_Sensor	2020/1/6 14:33	文件夹	
Arduino_LPS22HB	2020/1/7 18:36	文件夹	
ArduinoCore-samd-master	2019/12/5 17:15	文件夹	
arduino-LoRa-master	2019/12/16 9:51	文件夹	
Arduino-RAK811-Library	2019/12/19 9:01	文件夹	
BlueDot_BME680_Library	2020/1/7 18:38	文件夹	
BSEC_Software_Library	2020/1/8 15:00	文件夹	
ClosedCube_BME680	2020/1/8 15:34	文件夹	
MCCI_LoRaWAN_LMIC_library	2019/12/19 15:54	文件夹	
SparkFun_SHTC3_Humidity_and_Tem...	2020/1/7 18:29	文件夹	
MCCI_LoRaWAN_LMIC_library.zip	2020/1/8 17:29	360压缩 ZIP 文件	3,201 KB
readme.txt	2019/12/5 17:14	文本文档	1 KB

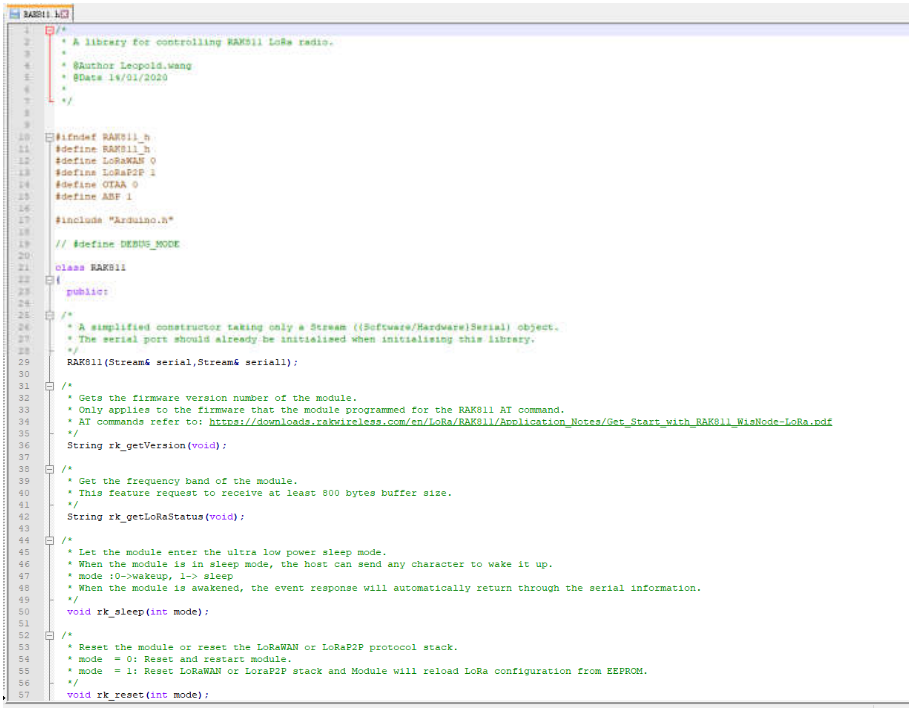
②And then open the Arduino IDE, you can see the RAK811 sample code in the Arduino example.



```
String NwkSKey = "69AF
String AppSKey = "8419
String DevAddr = "2601
#endif
#define TXpin 11   //
#define RXpin 10
#define ATSerial Seria
SoftwareSerial DebugSe
char buffer[]= "72616B

bool InitLoRaWAN(void)
RAK811 RAKLoRa(ATSeria


void setup() {
  DebugSerial.begin(11
  while(DebugSerial.re
  while(!DebugSerial);
  DebugSerial.println(

  ATSerial.begin(11520
  while(ATSerial.avail
  {
    ATSerial.read();
  }

  DebugSerial.println(
  delay(200);

  DebugSerial.println(
  if(!RAKLoRa.rk_setSe
  {
    DebugSerial.printl
```

(3)Code introduction

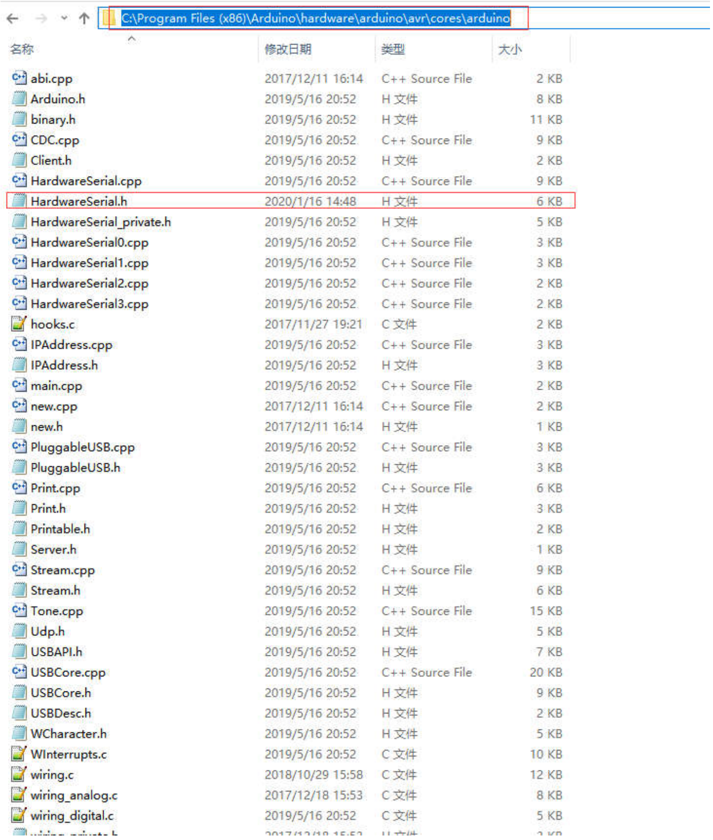
On the library contains the available functions, the user can refer to the RAK811.h file, which has a detailed note on the use of each function.



```
/*
 * A library for controlling RAK811 LoRa radio.
 *
 * @Author Leopold.wang
 * @Date 14/01/2020
 *
 */


#ifndef RAK811_h
#define RAK811_h
#define LoRaWAN 0
#define LoRaP2P 1
#define OTAA 0
#define ABP 1

#include "Arduino.h"

// #define DEBUG_MODE

class RAK811
{
  public:

 /*
  * A simplified constructor taking only a Stream ({Software/Hardware}Serial) object.
  * The serial port should already be initialised when initialising this library.
  */
  RAK811(Stream& serial,Stream& serial1);

 /*
  * Gets the firmware version number of the module.
  * Only applies to the firmware that the module programmed for the RAK811 AT command.
  * AT commands refer to: https://downloads.rakwireless.com/en/LoRa/RAK811/Application_Notes/Get_Start_with_RAK811_WisNode-LoRa.pdf
  */
  String rk_getVersion(void);

 /*
  * Get the frequency band of the module.
  * This feature request to receive at least 800 bytes buffer size.
  */
  String rk_getLoRaStatus(void);

 /*
  * Let the module enter the ultra low power sleep mode.
  * When the module is in sleep mode, the host can send any character to wake it up.
  * mode :0->wakeup, 1-> sleep
  * When the module is awakened, the event response will automatically return through the serial information.
  */
  void rk_sleep(int mode);

 /*
  * Reset the module or reset the LoRaWAN or LoRaP2P protocol stack.
  * mode  = 0: Reset and restart module.
  * mode  = 1: Reset LoRaWAN or LoraP2P stack and Module will reload LoRa configuration from EEPROM.
  */
  void rk_reset(int mode);
```

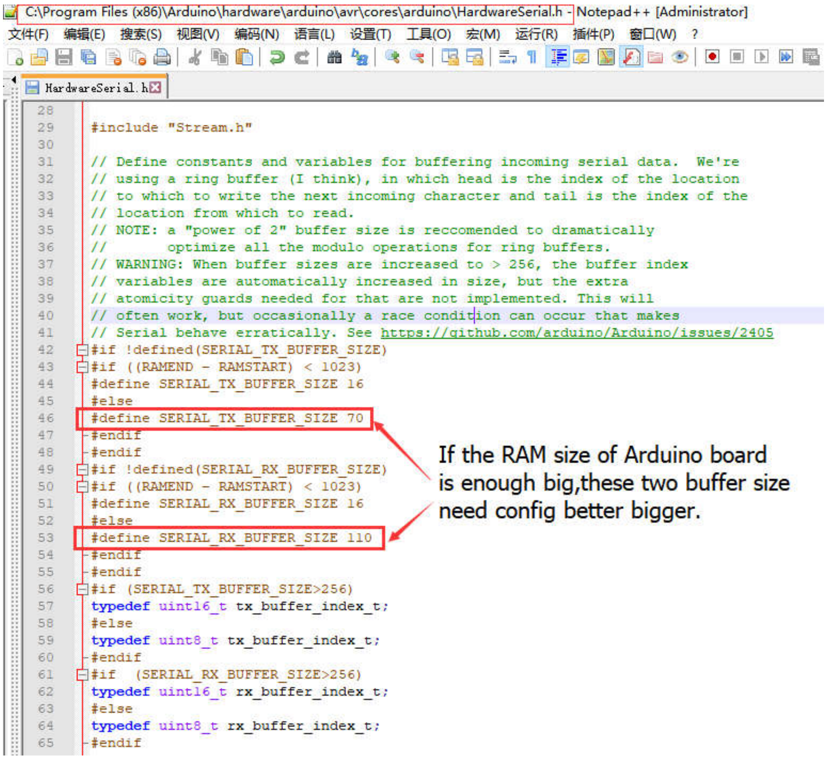
Note:Before compile by Arduino IDE,user should better configure Serial RX and TX buffer size.This must be configured manually in Arduino installation directory.

The following are the minimum recommended sizes.



C:\Program Files (x86)\Arduino\hardware\arduino\avr\cores\arduino

名称	修改日期	类型	大小
abi.cpp	2017/12/11 16:14	C++ Source File	2 KB
Arduino.h	2019/5/16 20:52	H 文件	8 KB
binary.h	2019/5/16 20:52	H 文件	11 KB
CDC.cpp	2019/5/16 20:52	C++ Source File	9 KB
Client.h	2019/5/16 20:52	H 文件	2 KB
HardwareSerial.cpp	2019/5/16 20:52	C++ Source File	9 KB
HardwareSerial.h	2020/1/16 14:48	H 文件	6 KB
HardwareSerial_private.h	2019/5/16 20:52	H 文件	5 KB
HardwareSerial0.cpp	2019/5/16 20:52	C++ Source File	3 KB
HardwareSerial1.cpp	2019/5/16 20:52	C++ Source File	3 KB
HardwareSerial2.cpp	2019/5/16 20:52	C++ Source File	2 KB
HardwareSerial3.cpp	2019/5/16 20:52	C++ Source File	2 KB
hooks.c	2017/11/27 19:21	C 文件	2 KB
IPAddress.cpp	2019/5/16 20:52	C++ Source File	3 KB
IPAddress.h	2019/5/16 20:52	H 文件	3 KB
main.cpp	2019/5/16 20:52	C++ Source File	2 KB
new.cpp	2017/12/11 16:14	C++ Source File	2 KB
new.h	2017/12/11 16:14	H 文件	1 KB
PluggableUSB.cpp	2019/5/16 20:52	C++ Source File	3 KB
PluggableUSB.h	2019/5/16 20:52	H 文件	3 KB
Print.cpp	2019/5/16 20:52	C++ Source File	6 KB
Print.h	2019/5/16 20:52	H 文件	3 KB
Printable.h	2019/5/16 20:52	H 文件	2 KB
Server.h	2019/5/16 20:52	H 文件	1 KB
Stream.cpp	2019/5/16 20:52	C++ Source File	9 KB
Stream.h	2019/5/16 20:52	H 文件	6 KB
Tone.cpp	2019/5/16 20:52	C++ Source File	15 KB
Udp.h	2019/5/16 20:52	H 文件	5 KB
USBAPI.h	2019/5/16 20:52	H 文件	7 KB
USBCore.cpp	2019/5/16 20:52	C++ Source File	20 KB
USBCore.h	2019/5/16 20:52	H 文件	9 KB
USBDesc.h	2019/5/16 20:52	H 文件	2 KB
WCharacter.h	2019/5/16 20:52	H 文件	5 KB
WInterrupts.c	2019/5/16 20:52	C 文件	10 KB
wiring.c	2018/10/29 15:58	C 文件	12 KB
wiring_analog.c	2017/12/18 15:53	C 文件	8 KB
wiring_digital.c	2019/5/16 20:52	C 文件	5 KB
wiring_private.h	2017/12/18 15:53	H 文件	2 KB

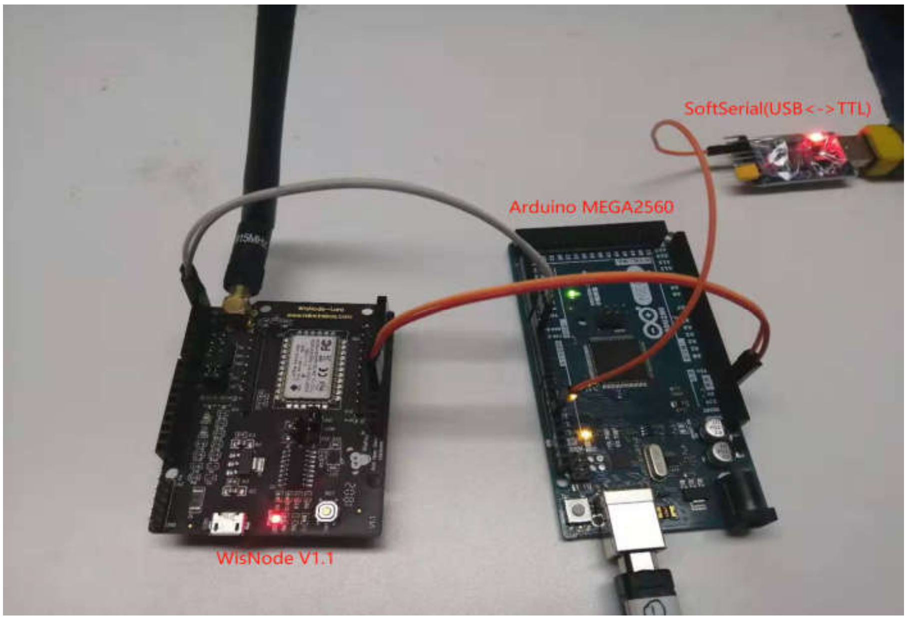

C:\Program Files (x86)\Arduino\hardware\arduino\avr\cores\arduino\HardwareSerial.h - Notepad++ [Administrator]
文件(F) 编辑(E) 搜索(S) 视图(V) 编码(N) 语言(L) 设置(T) 工具(O) 宏(M) 运行(R) 插件(P) 窗口(W) ?
HardwareSerial.h

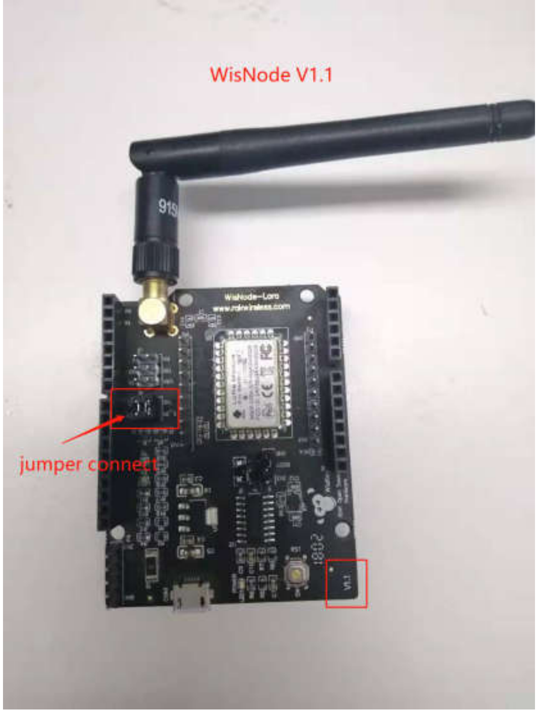
```

#include "Stream.h"

// Define constants and variables for buffering incoming serial data.  We're
// using a ring buffer (I think), in which head is the index of the location
// to which to write the next incoming character and tail is the index of the
// location from which to read.
// NOTE: a "power of 2" buffer size is reccomended to dramatically
//       optimize all the modulo operations for ring buffers.
// WARNING: When buffer sizes are increased to > 256, the buffer index
// variables are automatically increased in size, but the extra
// atomicity guards needed for that are not implemented. This will
// often work, but occasionally a race condition can occur that makes
// Serial behave erratically. See https://github.com/arduino/Arduino/issues/2405
#if !defined(SERIAL_TX_BUFFER_SIZE)
#if ((RAMEND - RAMSTART) < 1023)
#define SERIAL_TX_BUFFER_SIZE 16
#else
#define SERIAL_TX_BUFFER_SIZE 70
#endif
#endif
#if !defined(SERIAL_RX_BUFFER_SIZE)
#if ((RAMEND - RAMSTART) < 1023)
#define SERIAL_RX_BUFFER_SIZE 16
#else
#define SERIAL_RX_BUFFER_SIZE 110
#endif
#endif
#if (SERIAL_TX_BUFFER_SIZE>256)
typedef uint16_t tx_buffer_index_t;
#else
typedef uint8_t tx_buffer_index_t;
#endif
#if  (SERIAL_RX_BUFFER_SIZE>256)
typedef uint16_t rx_buffer_index_t;
#else
typedef uint8_t rx_buffer_index_t;
#endif
```

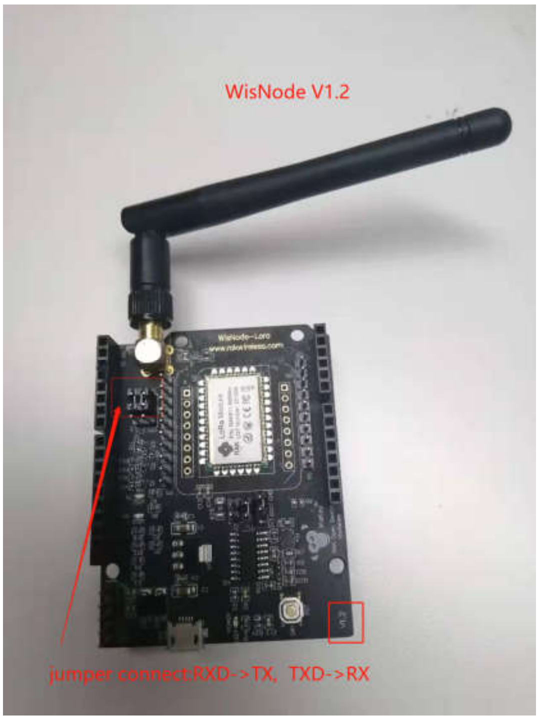
If the RAM size of Arduino board is enough big,these two buffer size need config better bigger.

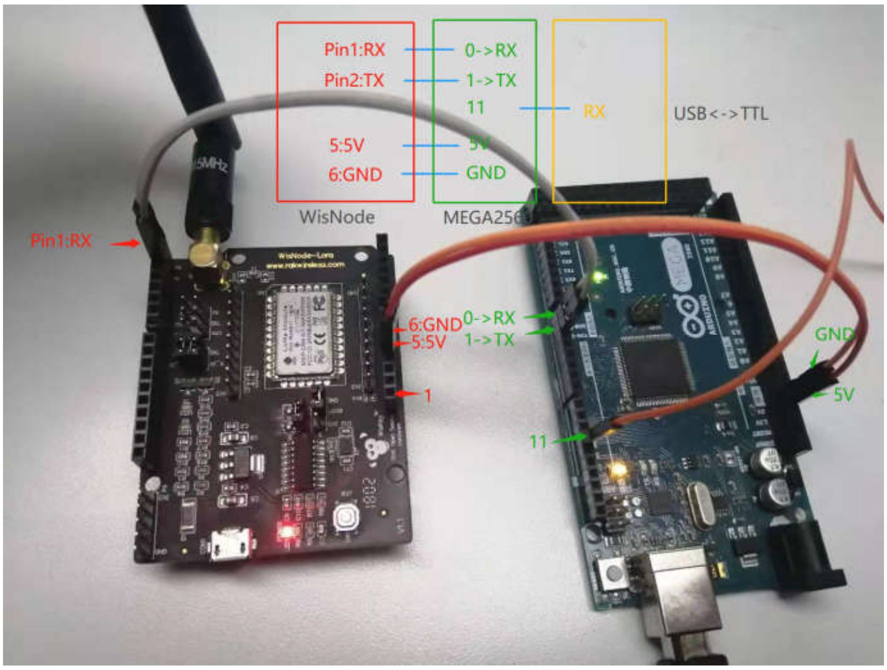
2. Hardware connect

This document will use **Arduino MEGA2560 + WisNode-LoRa** as an example.









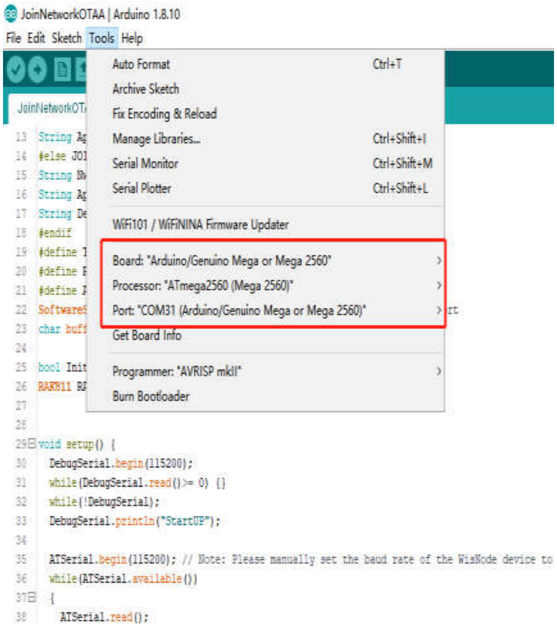
Note: The five wires are connected in the same way with WisNode V1.1 and WisNode V1.2.

3. Flash firmware

①Flash firmware for RAK811 refer to :Get_Start_with_RAK811_WisNode-LoRa.pdf

RAK811-Firmware:https://github.com/RAKWireless/WisNode-Arduino-Library/tree/master/Documents%20and%20tools/RAK811-Firmware

②Complie and Flash app demo JoinNetworkOTAA.ino through Arduino IDE.


JoinNetworkOTAA | Arduino 1.8.10
File Edit Sketch Tools Help
Auto Format Ctrl+T
Archive Sketch
Fix Encoding & Reload
Manage Libraries... Ctrl+Shift+I
Serial Monitor Ctrl+Shift+M
Serial Plotter Ctrl+Shift+L
WiFi101 / WiFiNINA Firmware Updater
Get Board Info
Burn Bootloader

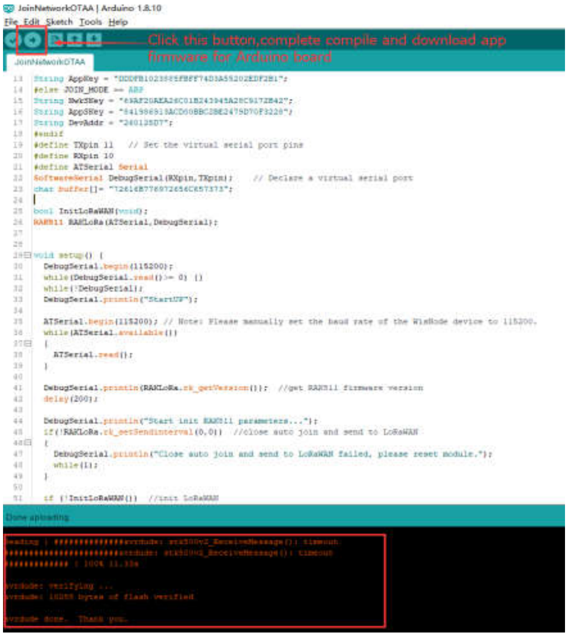
Board: "Arduino/Genuino Mega or Mega 2560"

Processor: "ATmega2560 (Mega 2560)"

Port: "COM31 (Arduino/Genuino Mega or Mega 2560)"

Programmer: "AVRISP mkII"

```
void setup() {
  DebugSerial.begin(115200);
  while(DebugSerial.read()>= 0) {}
  while(!DebugSerial);
  DebugSerial.println("StartUP");

  ATSerial.begin(115200); // Note: Please manually set the baud rate of the WisNode device to
  while(ATSerial.available())
  {
    ATSerial.read();
```



Click this button,complete compile and download app firmware for Arduino board

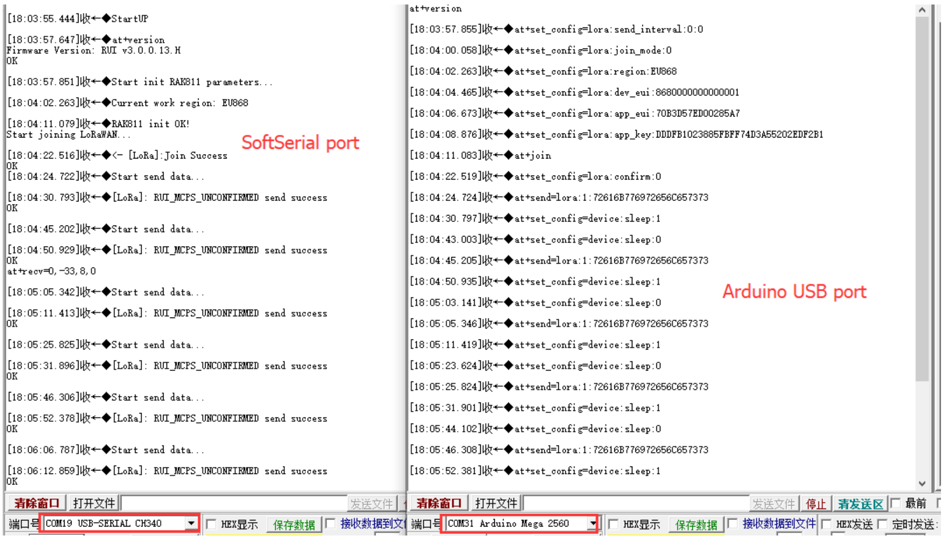
```
String AppKey = "DDDFB1023885FBFF74D3A55202EDF2B1";
#else JOIN_MODE == ABP
String NwkSKey = "69AF20AEA26C01B243945A28C9172E42";
String AppSKey = "841986913ACD00BBC2BE2479D70F3228";
String DevAddr = "260125D7";
#endif
#define TXpin 11   // Set the virtual serial port pins
#define RXpin 10
#define ATSerial Serial
SoftwareSerial DebugSerial(RXpin,TXpin);    // Declare a virtual serial port
char buffer[]= "72616B776972656C657373";

bool InitLoRaWAN(void);
RAK811 RAKLoRa(ATSerial,DebugSerial);


void setup() {
  DebugSerial.begin(115200);
  while(DebugSerial.read()>= 0) {}
  while(!DebugSerial);
  DebugSerial.println("StartUP");

  ATSerial.begin(115200); // Note: Please manually set the baud rate of the WisNode device to 115200.
  while(ATSerial.available())
  {
    ATSerial.read();
  }

  DebugSerial.println(RAKLoRa.rk_getVersion());  //get RAK811 firmware version
  delay(200);

  DebugSerial.println("Start init RAK811 parameters...");
  if(!RAKLoRa.rk_setSendinterval(0,0))  //close auto join and send to LoRaWAN
  {
    DebugSerial.println("Close auto join and send to LoRaWAN failed, please reset module.");
    while(1);
  }

  if (!InitLoRaWAN())  //init LoRaWAN
```

Done uploading.

```
Reading | ################avrdude: stk500v2_ReceiveMessage(): timeout
###########################avrdude: stk500v2_ReceiveMessage(): timeout
############## | 100% 11.33s

avrdude: verifying ...
avrdude: 10088 bytes of flash verified

avrdude done.  Thank you.
```

4. Test LoRa Node with LoRaWAN

Serial console log:



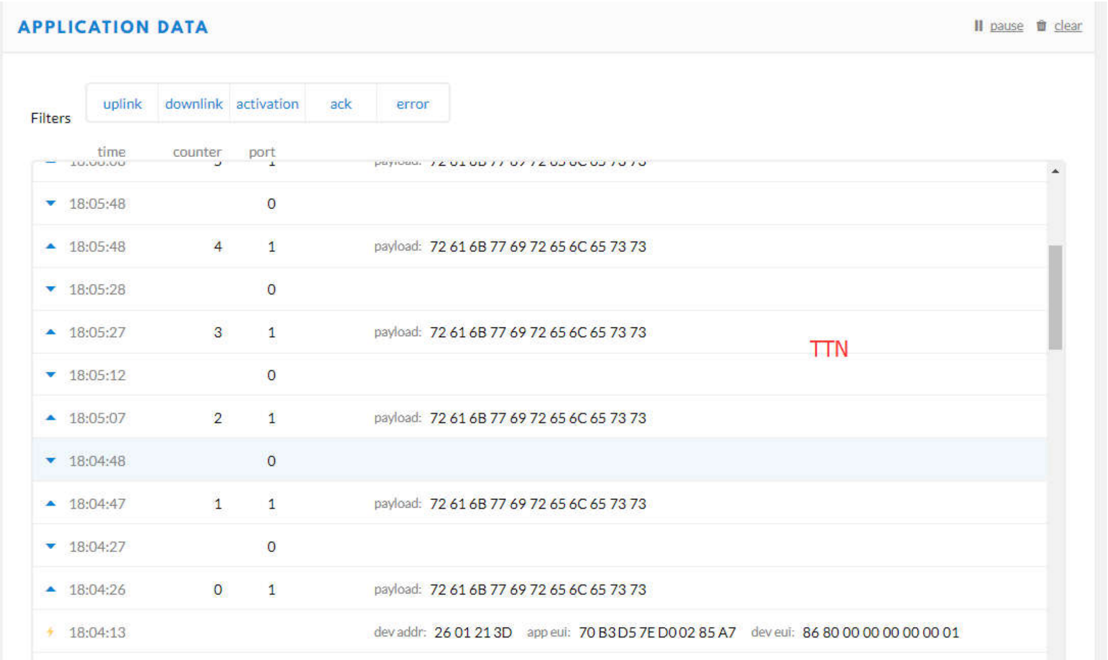
```
[18:03:55.444]收←◆StartUP

[18:03:57.647]收←◆at+version
Firmware Version: RUI v3.0.0.13.H
OK

[18:03:57.851]收←◆Start init RAK811 parameters...

[18:04:02.263]收←◆Current work region: EU868

[18:04:11.079]收←◆RAK811 init OK!
Start joining LoRaWAN...

[18:04:22.516]收←◆<- [LoRa]:Join Success
OK
[18:04:24.722]收←◆Start send data...

[18:04:30.793]收←◆[LoRa]: RUI_MCPS_UNCONFIRMED send success
OK

[18:04:45.202]收←◆Start send data...

[18:04:50.929]收←◆[LoRa]: RUI_MCPS_UNCONFIRMED send success
OK
at+recv=0,-33,8,0

[18:05:05.342]收←◆Start send data...

[18:05:11.413]收←◆[LoRa]: RUI_MCPS_UNCONFIRMED send success
OK

[18:05:25.825]收←◆Start send data...

[18:05:31.896]收←◆[LoRa]: RUI_MCPS_UNCONFIRMED send success
OK

[18:05:46.306]收←◆Start send data...

[18:05:52.378]收←◆[LoRa]: RUI_MCPS_UNCONFIRMED send success
OK

[18:06:06.787]收←◆Start send data...

[18:06:12.859]收←◆[LoRa]: RUI_MCPS_UNCONFIRMED send success
OK
```

端口号 COM19 USB-SERIAL CH340

```
at+version

[18:03:57.855]收←◆at+set_config=lora:send_interval:0:0

[18:04:00.058]收←◆at+set_config=lora:join_mode:0

[18:04:02.263]收←◆at+set_config=lora:region:EU868

[18:04:04.465]收←◆at+set_config=lora:dev_eui:8680000000000001

[18:04:06.673]收←◆at+set_config=lora:app_eui:70B3D57ED00285A7

[18:04:08.876]收←◆at+set_config=lora:app_key:DDDFB1023885FBFF74D3A55202EDF2B1

[18:04:11.083]收←◆at+join

[18:04:22.519]收←◆at+set_config=lora:confirm:0

[18:04:24.724]收←◆at+send=lora:1:72616B776972656C657373

[18:04:30.797]收←◆at+set_config=device:sleep:1

[18:04:43.003]收←◆at+set_config=device:sleep:0

[18:04:45.205]收←◆at+send=lora:1:72616B776972656C657373

[18:04:50.935]收←◆at+set_config=device:sleep:1

[18:05:03.141]收←◆at+set_config=device:sleep:0

[18:05:05.346]收←◆at+send=lora:1:72616B776972656C657373

[18:05:11.419]收←◆at+set_config=device:sleep:1

[18:05:23.624]收←◆at+set_config=device:sleep:0

[18:05:25.824]收←◆at+send=lora:1:72616B776972656C657373

[18:05:31.901]收←◆at+set_config=device:sleep:1

[18:05:44.102]收←◆at+set_config=device:sleep:0

[18:05:46.308]收←◆at+send=lora:1:72616B776972656C657373

[18:05:52.381]收←◆at+set_config=device:sleep:1
```

端口号 COM31 Arduino Mega 2560

TTN log:

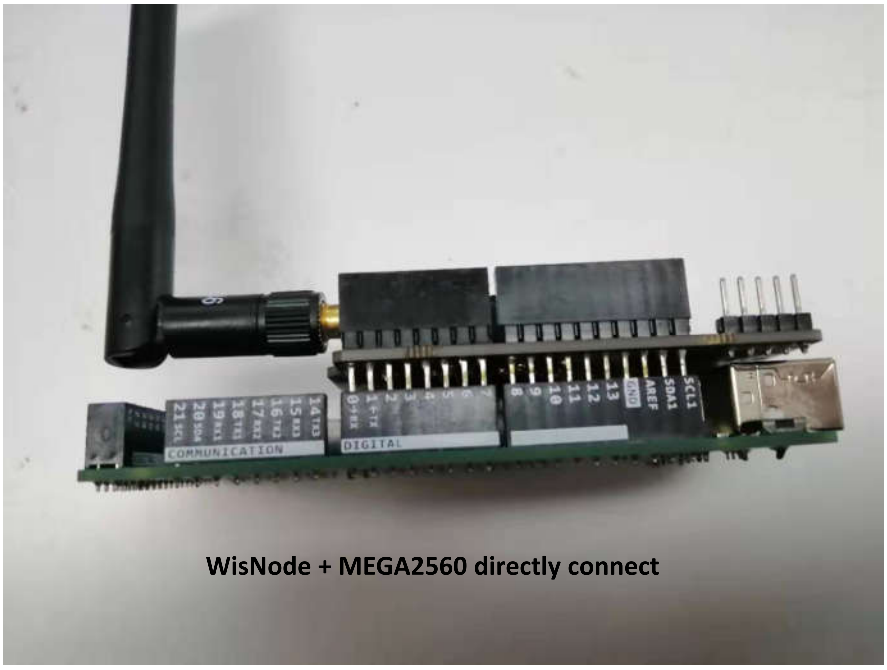


	time	counter	port	
▲	18:06:08	5	1	payload: 72 61 6B 77 69 72 65 6C 65 73 73
▼	18:05:48		0	
▲	18:05:48	4	1	payload: 72 61 6B 77 69 72 65 6C 65 73 73
▼	18:05:28		0	
▲	18:05:27	3	1	payload: 72 61 6B 77 69 72 65 6C 65 73 73
▼	18:05:12		0	
▲	18:05:07	2	1	payload: 72 61 6B 77 69 72 65 6C 65 73 73
▼	18:04:48		0	
▲	18:04:47	1	1	payload: 72 61 6B 77 69 72 65 6C 65 73 73
▼	18:04:27		0	
▲	18:04:26	0	1	payload: 72 61 6B 77 69 72 65 6C 65 73 73
⚡	18:04:13			dev addr: 26 01 21 3D app eui: 70 B3 D5 7E D0 02 85 A7 dev eui: 86 80 00 00 00 00 00 01

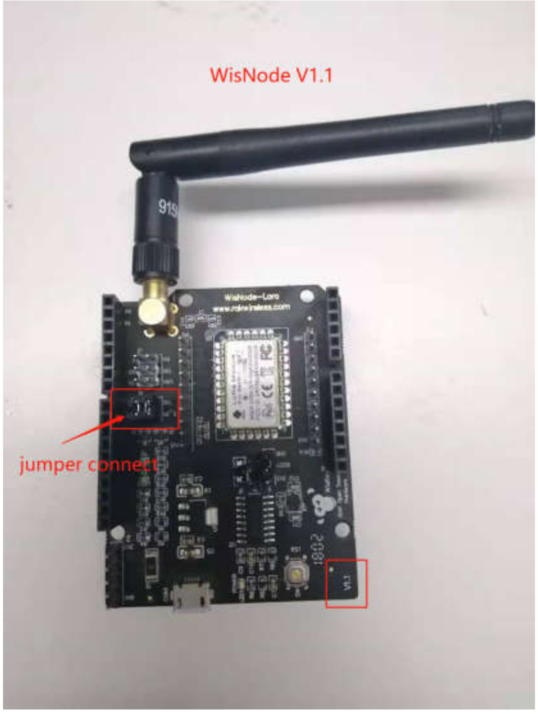
5. Quickly connection boards

Note: This section serves as a reference only.

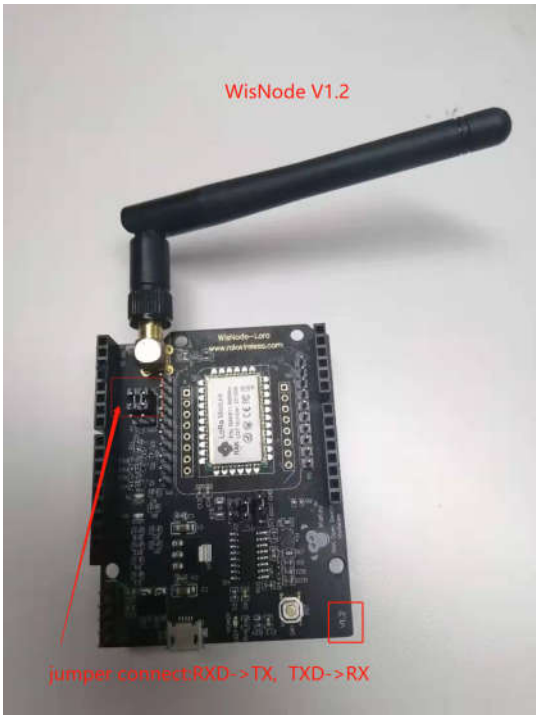
(1) WisNode + MEGA2560 can directly connect as above picture,but WisNode must be done something as following.



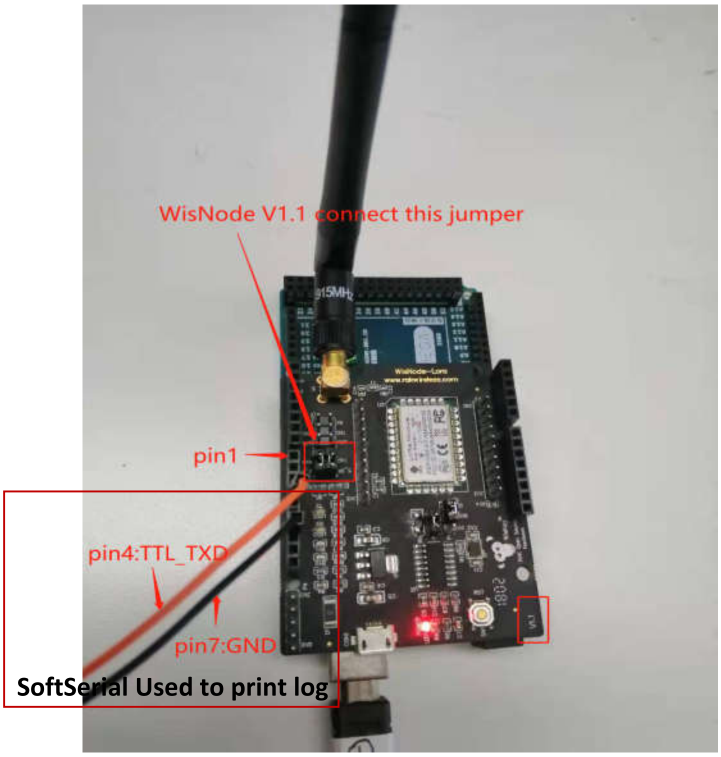
WisNode + MEGA2560 directly connect

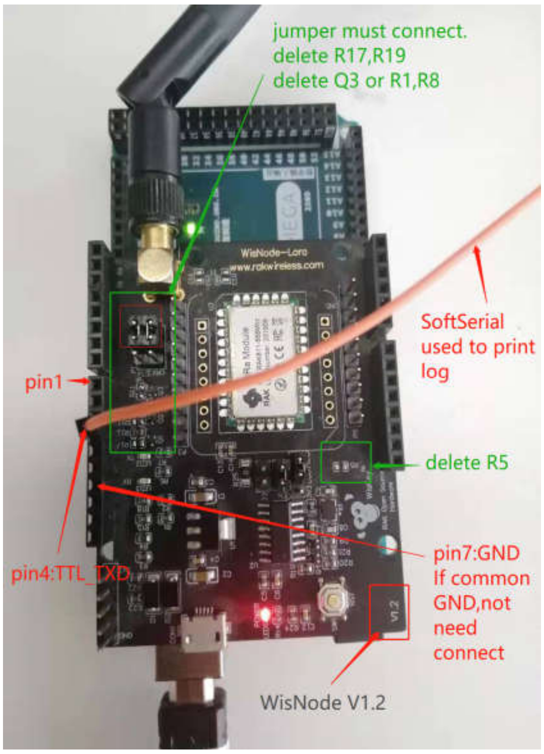


WisNode V1.1

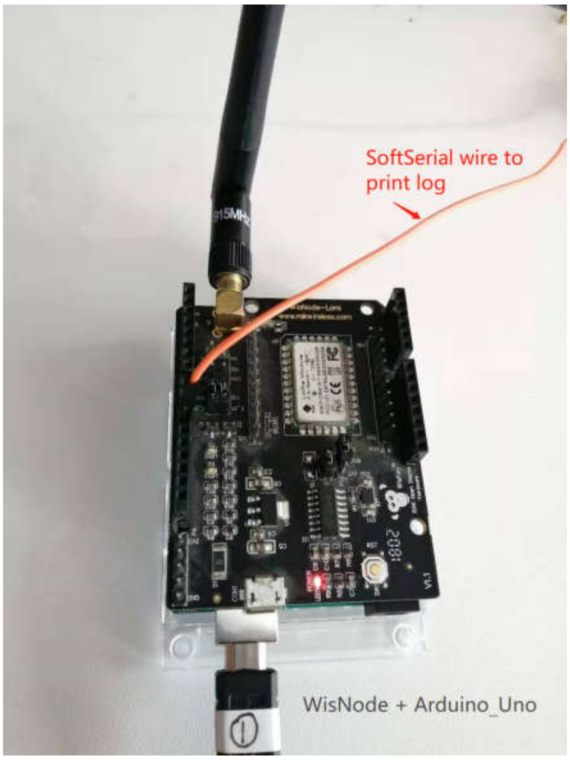


WisNode V1.2


WisNode V1.1 connect this jumper
pin1
pin4:TTL_TXD
pin7:GND
SoftSerial Used to print log



(2)WisNode + Arduino_Uno : WisNode must be done something Same as above.



If you have any questions, welcome to our forum to ask your question: http://support.rakwireless.com/.

You can also send your question to this email: ken.yu@rakwireless.com