NB DISCO 95 User Manual

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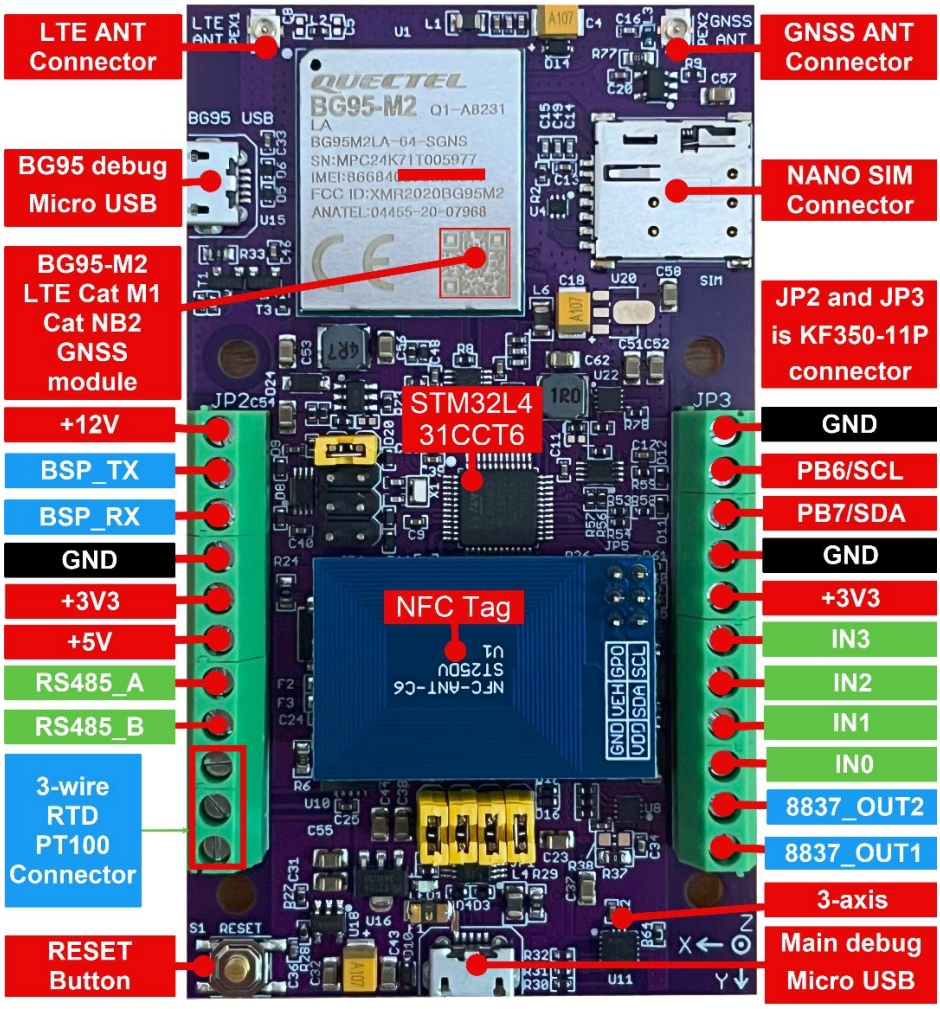
Date: Jan 2025

Status: Released



Revision History

Date	Version	Release Notes
Jan 2025	v1.0	First Release

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1. Introduction

The NB DISCO 95 is an open-source, ready-to-use IoT development kit with LPWA modules that support LTE Cat M1/Cat NB2 and integrated GNSS. Onboard STM32L431CCT6, USB-to-UART bridge controllers, NFC tag, 3-axis accelerometer, RS485 converter, 3-wire RTD converter, 4-channel 16-bit ADC, brushed low-voltage DC motor driver, and controllable power output.

We have flashed the firmware for each NB DISCO 95. You need to plug in the SIM card that supports the NB network and ensure the device is within the NB network range. Then, connect the sensor and Antenna, power it on, and change the MQTT connection parameters to upload sensor data to the MQTT cloud.

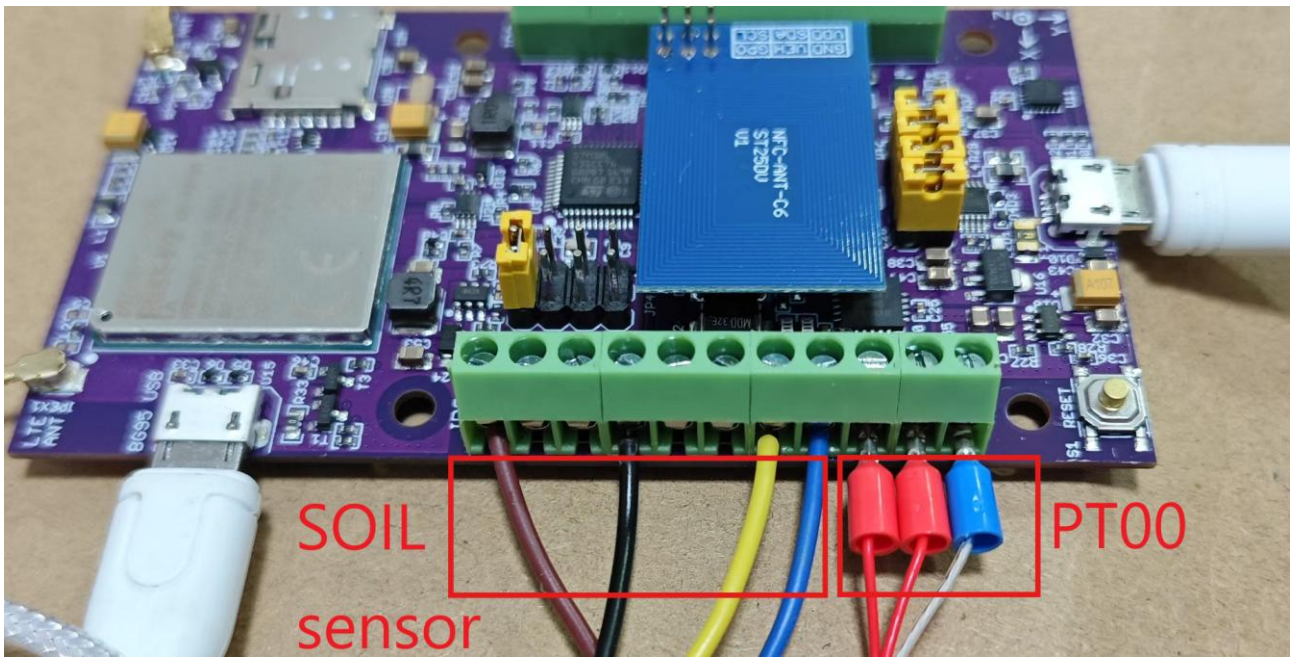
2. Key Features

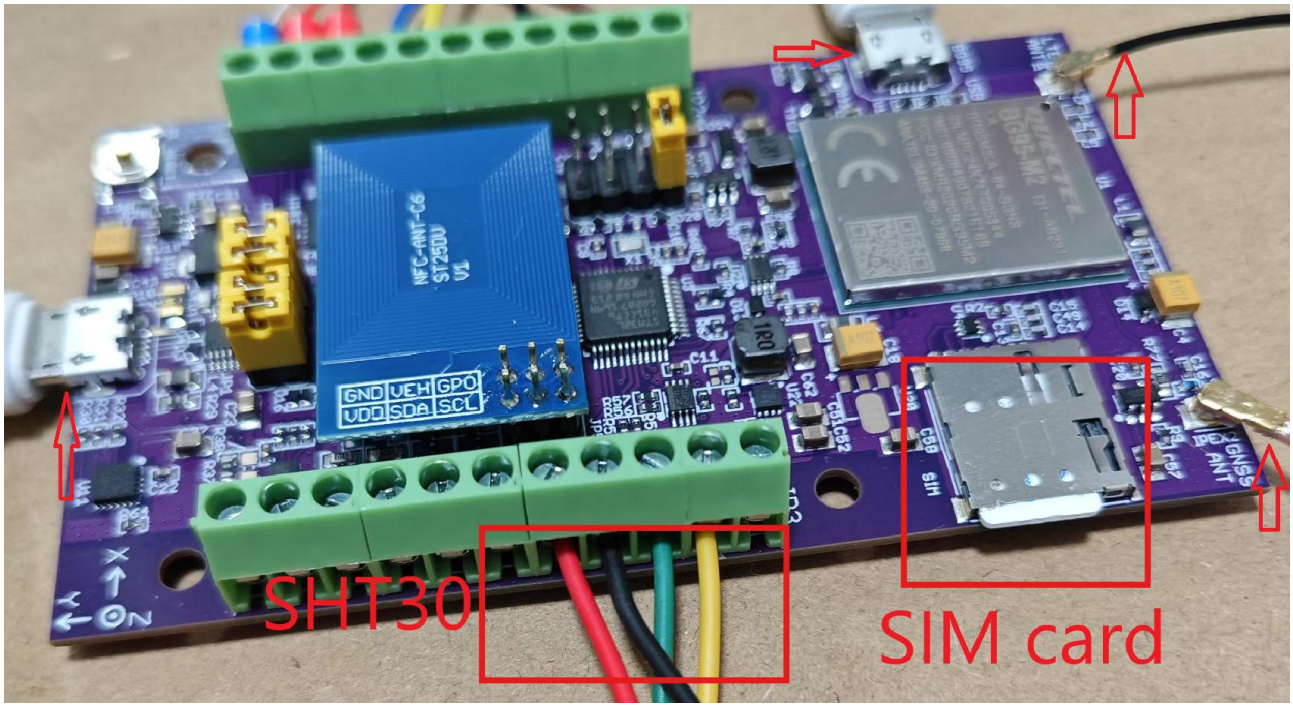
- LPWA modules supporting LTE Cat M1/Cat NB2 and integrated GNSS
- 2 channels of 0 to 20 mA collection (IN0 and IN1)
- 2 channels of 0 to 22V collection (IN2 and IN3)
- Equipped with NFC tag for upgrading firmware and changing configurations
- Controllable +5v/200mA, 12v/100mA power output
- Support connection to various I2C, RS485, UART sensors
- Support 3-wire PT100 temperature collection
- Change configurations by AT commands
- Micro-USB connector for communication with the host PC and board powering

3. Application

- Smart agriculture

4. Sensor wiring diagram





5. How to use NFC Reader 3911 to communicate with the NB DISCO 95 development kits

5.1 What do you need to prepare?

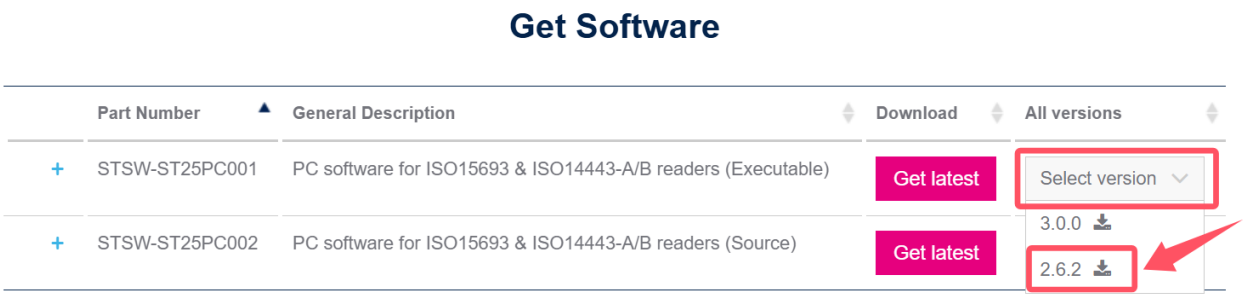
√ Connect the NB DISCO 95 development board to your PC via Micro USB

√ Connect the NFC Reader 3911 to your PC via Micro USB

√ Download and install Serial port utility Windows® PC software

√ Download and install STSW-ST25PC001 - Windows® PC software for ISO15693, ISO14443-A/B, NFC and industrial readers - STMicroelectronics

The recommended version is 2.6.2



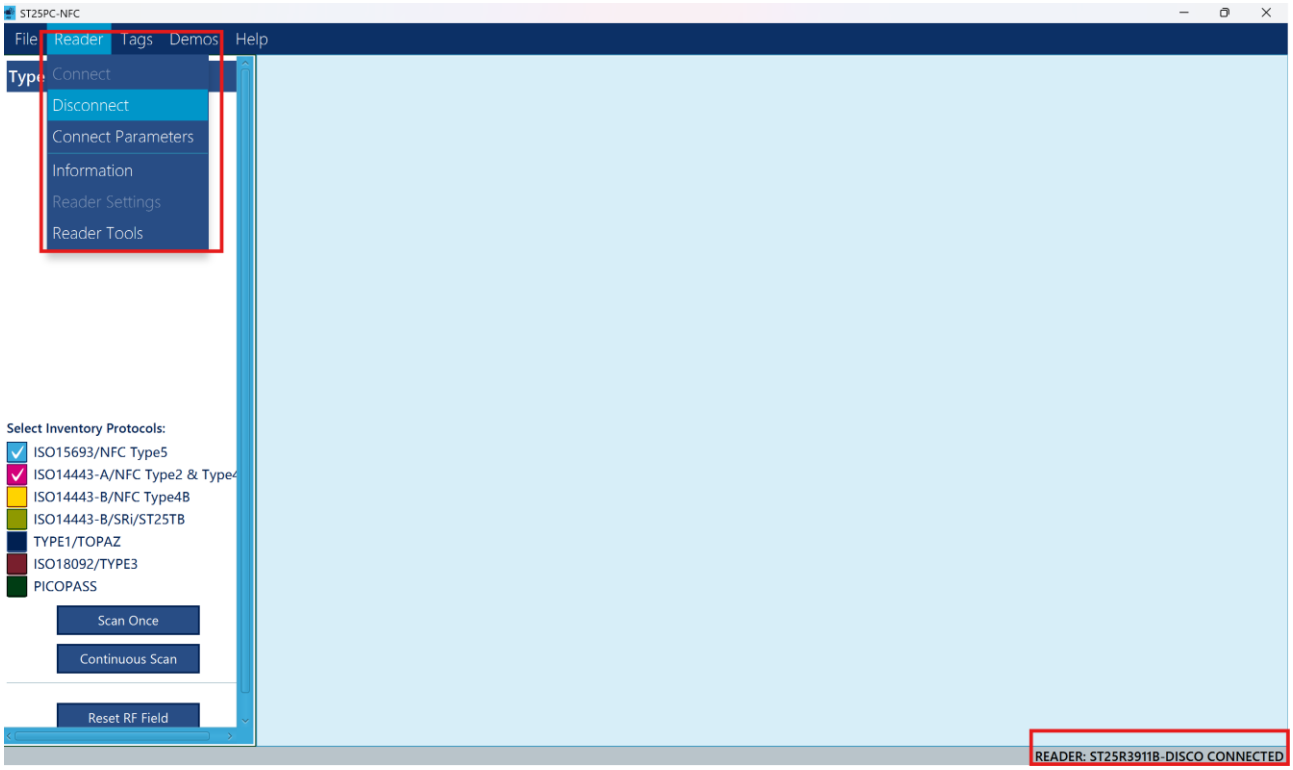
5.2 Scan the NFC tags

Step 1: Open the ST25PC-NFC software 

;

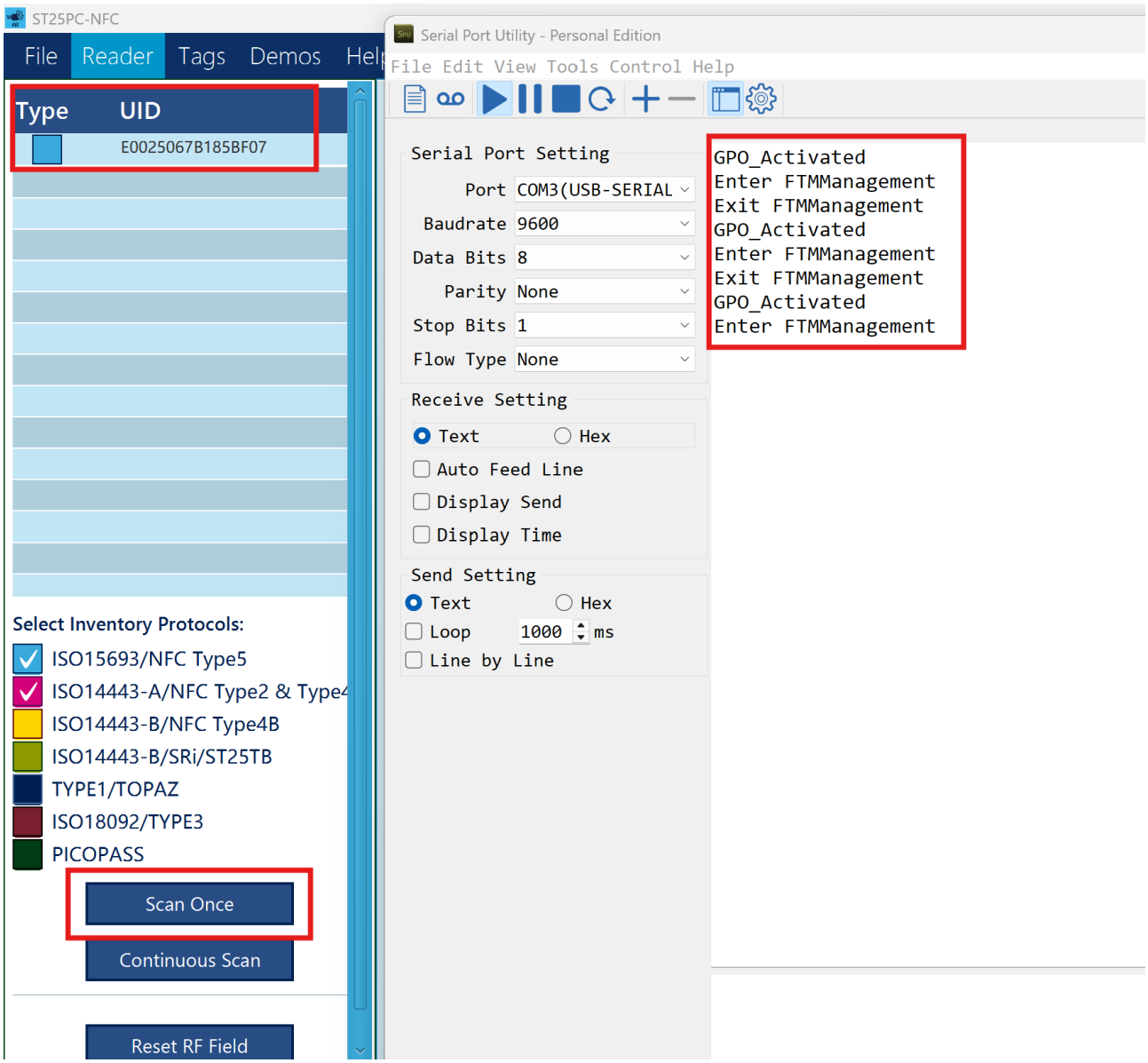
Step 2: Press the NFC Reader 3911 S1 button once to reset the device, The 6 LEDs are fully lit to indicate that the reset is successful;

Step 3: Click Reader → Disconnect → Connect, When ST25R3911B-DISCO CONNECTED is displayed, it means that the NFC reader 3911 is connected to the PC successfully;



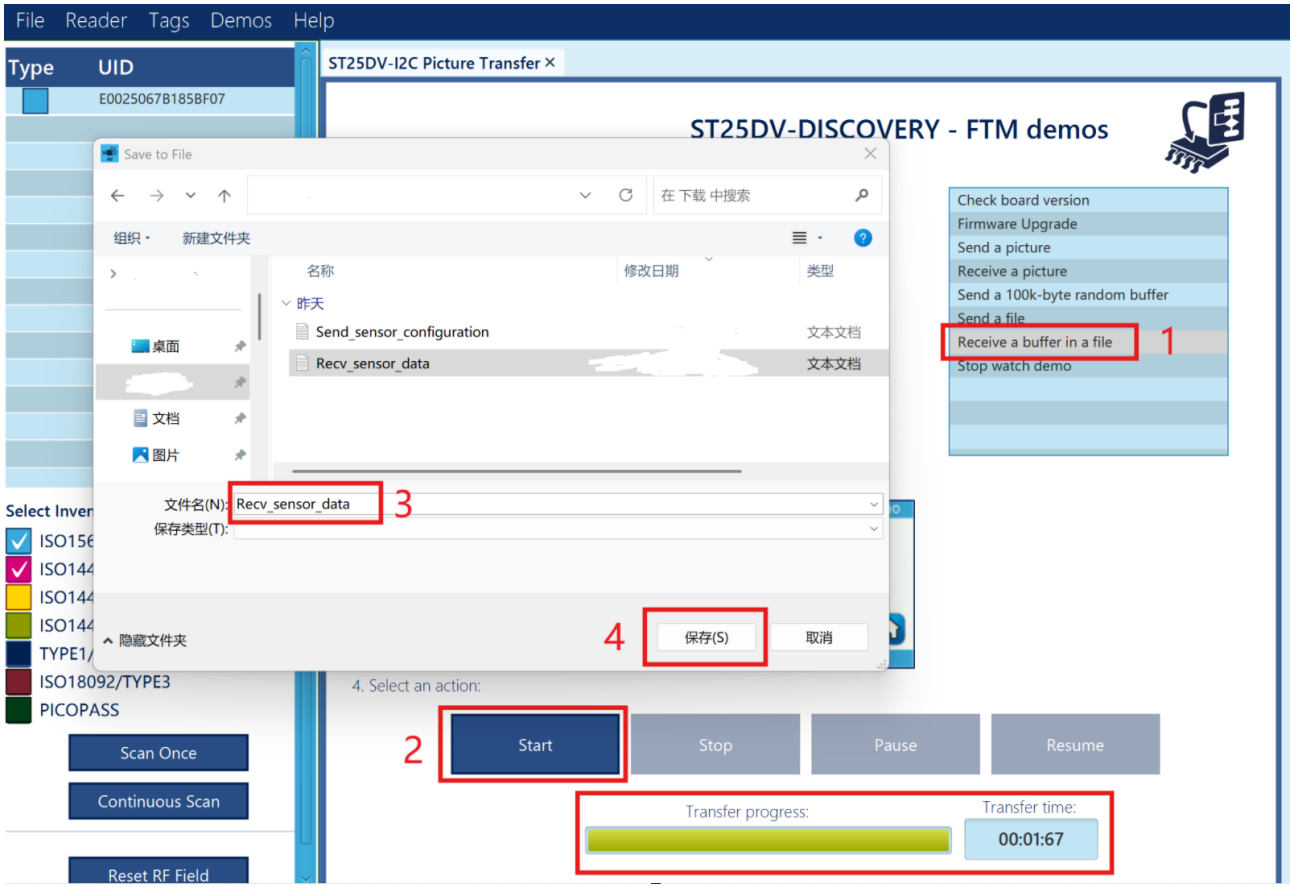
Step 4: Open the serial port utility tool and press the NB DISCO 95 S1 button once to reset the device. Then hold the NFC reader 3911 close to the ST25DV module of the NB DISCO 95 and click Scan Once.

When connected to ST25PC-NFC PC software, use the NFC reader 3911 to approach the ST25DV module of the NB DISCO 95. The serial port will print Enter FTMManagement, and when it is removed, it will print Exit FTMManagement.

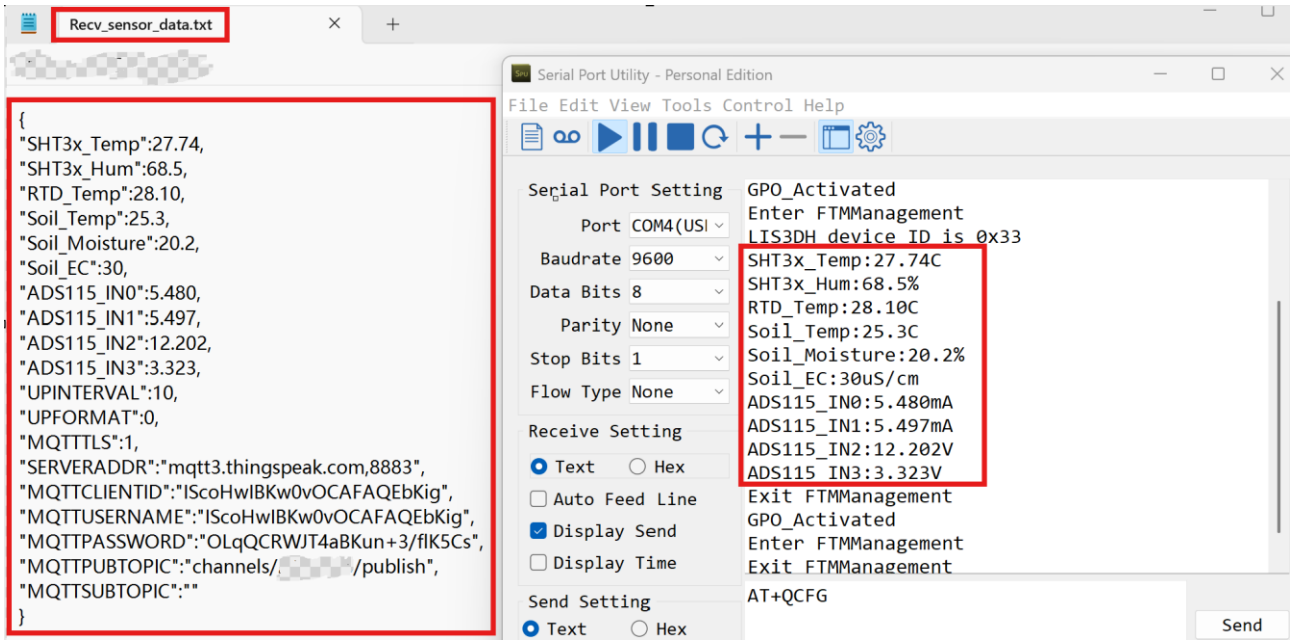


5.3 Get the NB DISCO 95 development board data

Click on the Receive a buffer in a file option, click the start button, wait for the device to collect sensor data, and then save the content as a Recv_sensor_data.txt.



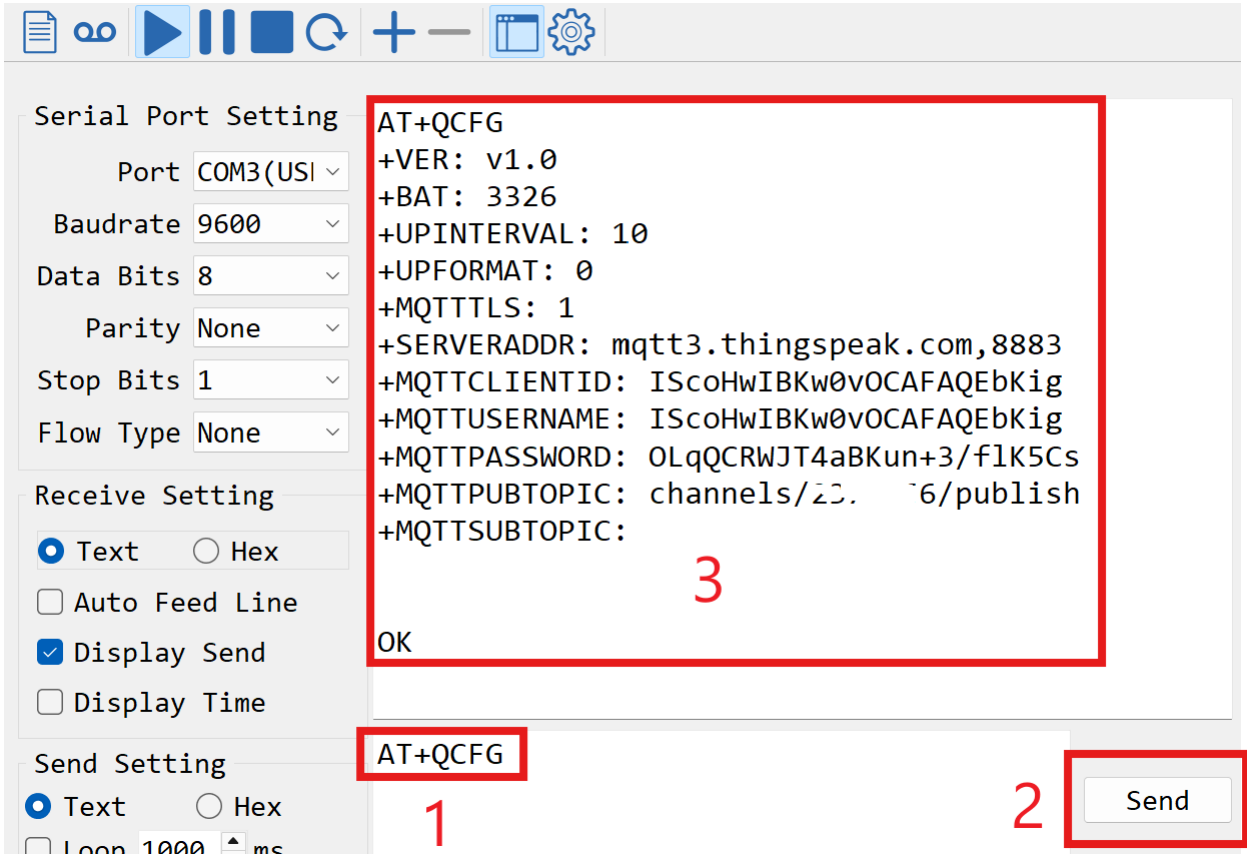
View Recv_sensor_data.txt file content and serial port logs as follows.



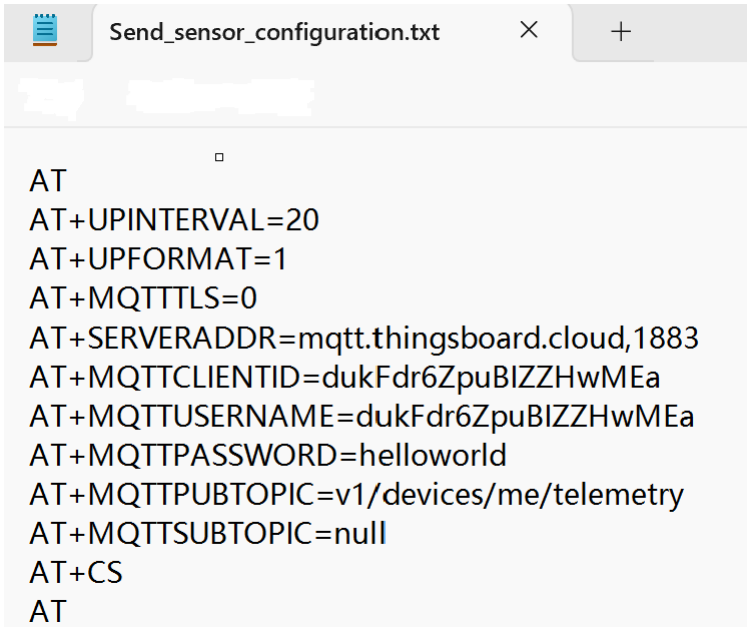
5.4 Set the NB DISCO 95 development board configurations

First, Move the NFC reader 3911 board away from the ST25DV module, then use the

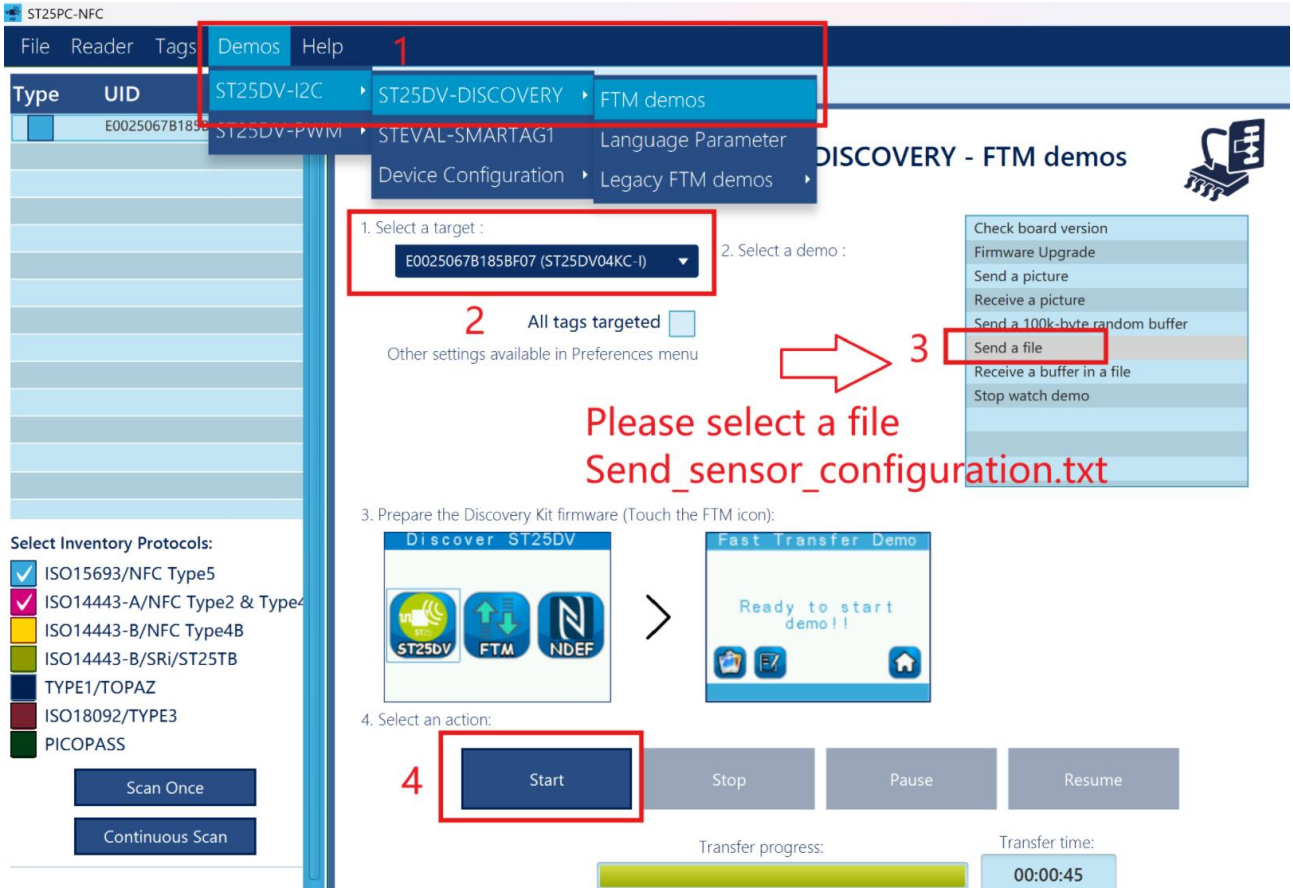
AT+QCFG command to query the current configuration of the NB DISCO 95 development board. Remember to press the ENTER key to wrap the line after the AT command. The serial port logs are as follows.



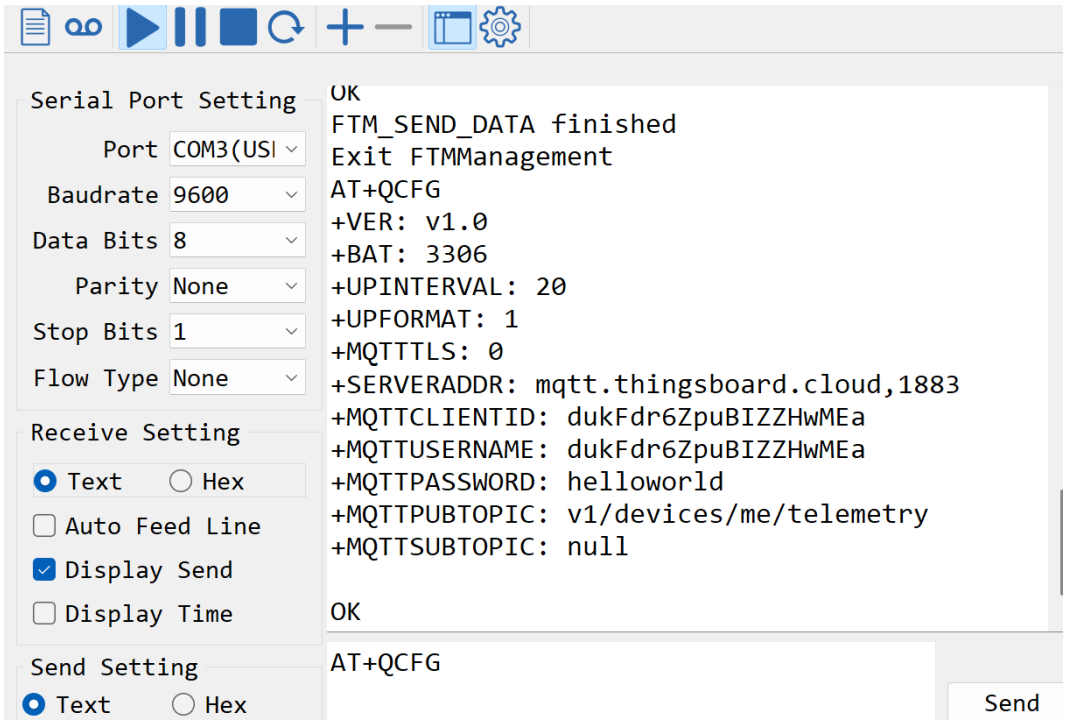
Suppose the following configurations need to be changed.



Use the NFC reader 3911 to approach the ST25DV module of the NB DISCO 95.



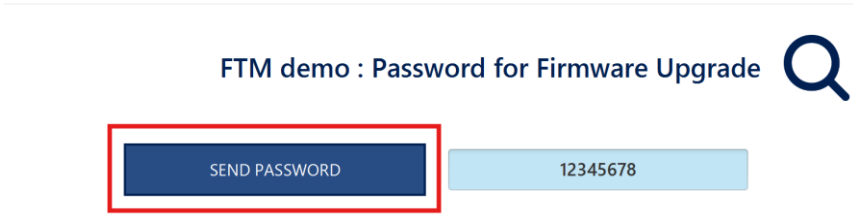
Finally, Move the NFC module away from the ST25 module and use the AT+QCFG command to see if the configuration has changed. The serial port logs are as follows.



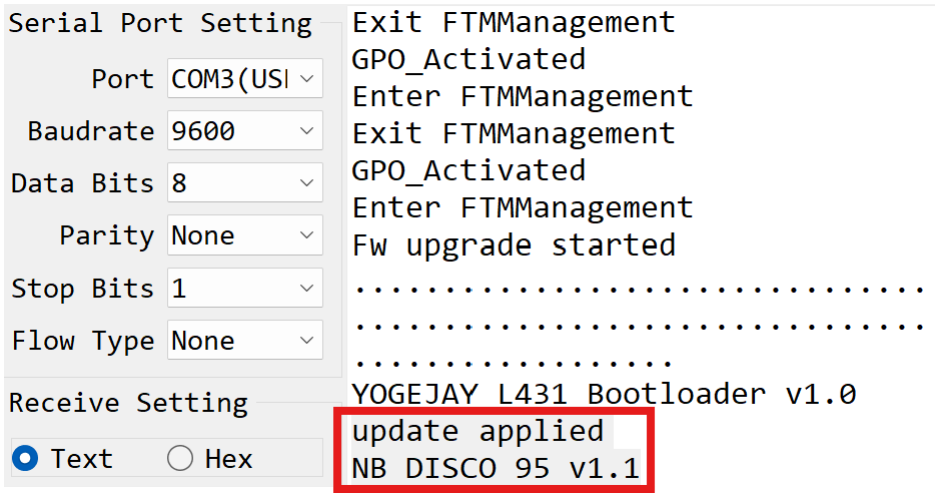
5.5 Upgrade the firmware of the NB DISCO 95 development board

Use the NFC reader 3911 to approach the ST25DV module of the NB DISCO 95.

Click on the Firmware Upgrade option and select a firmware Application_NFC_OTA.bin.



The update is successful when an update applied log appears on the serial port. The serial port logs are as follows.



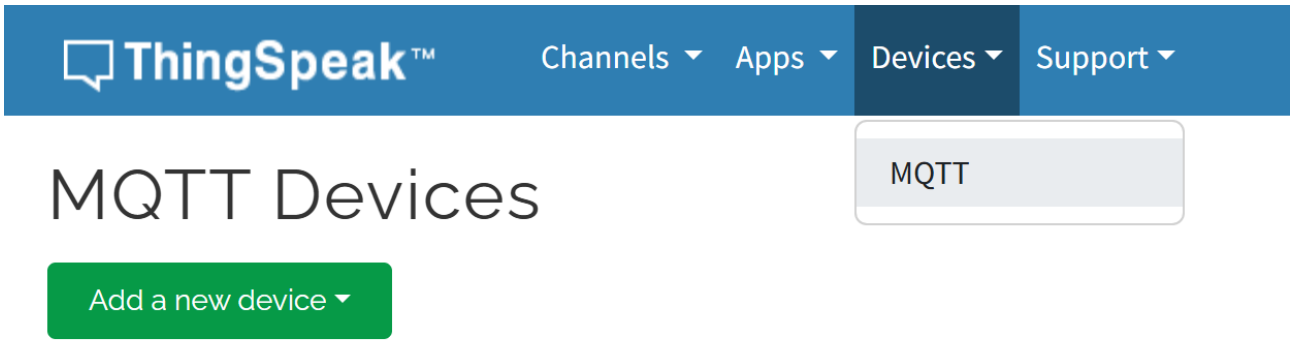
6. Which AT commands are supported by the NB DISCO 95

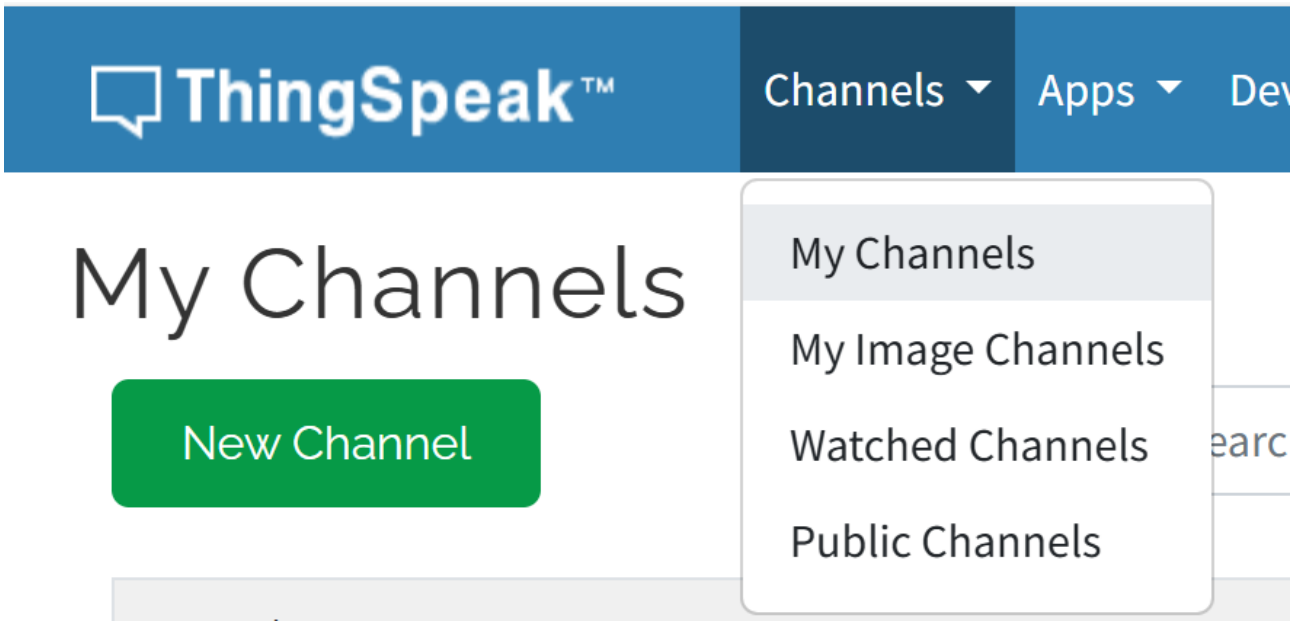
Please refer to the document AT commands for NB DISCO 95.docx, Please use the NFC function or AT commands when the MCU is idle.

7. How to connect to ThingSpeak using NB DISCO 95

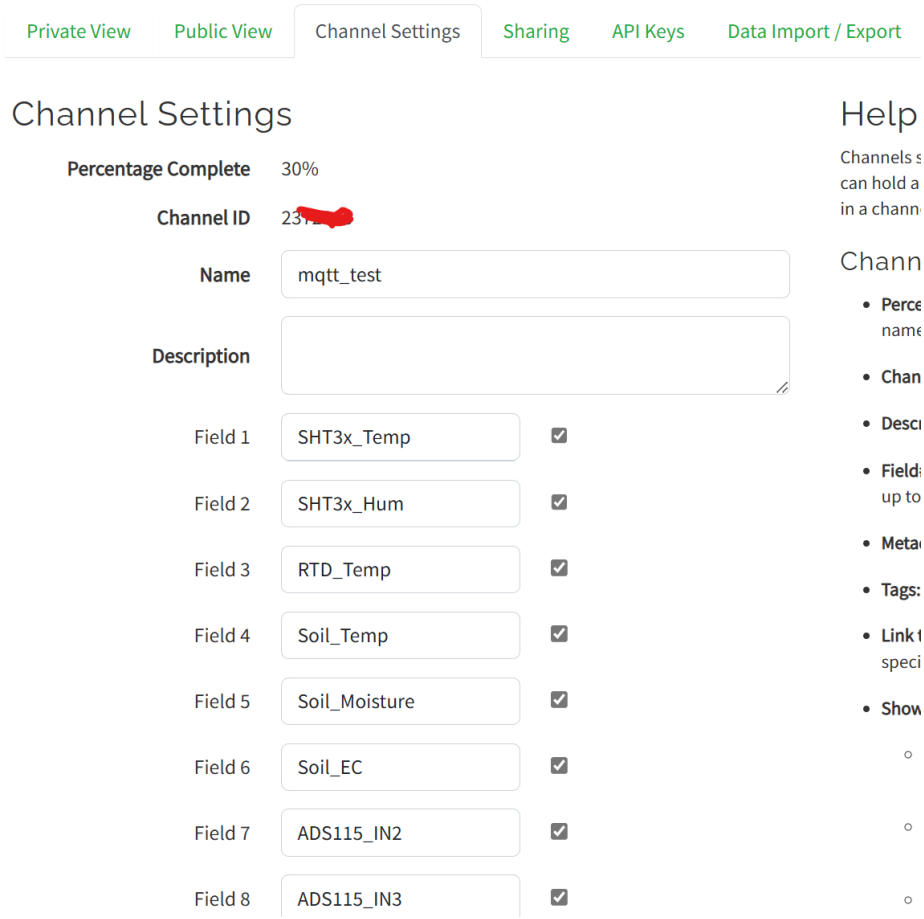
Step 1: Sign up for a ThingSpeak account;

Step 2: Add a new device and channel in ThingSpeak;

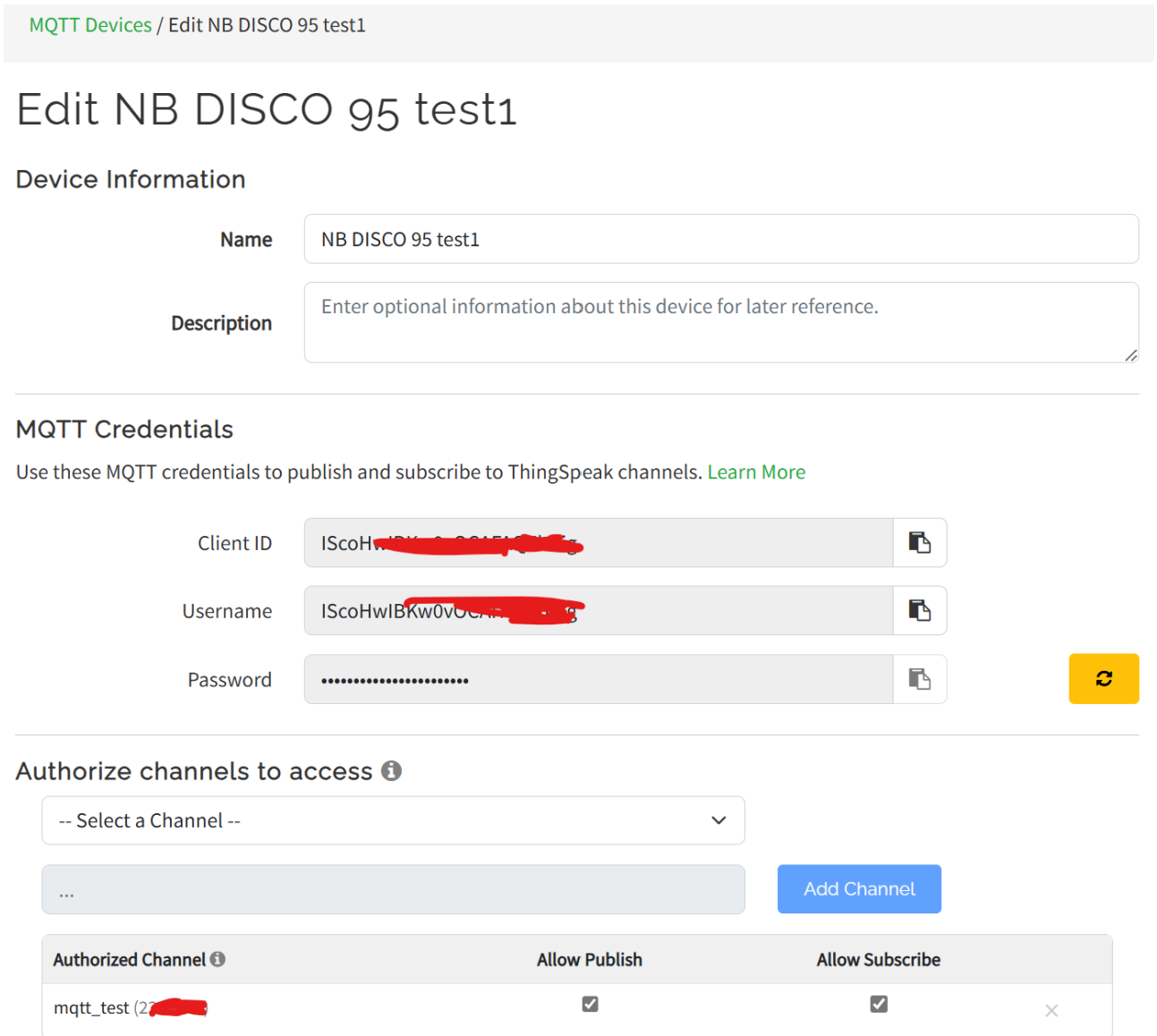


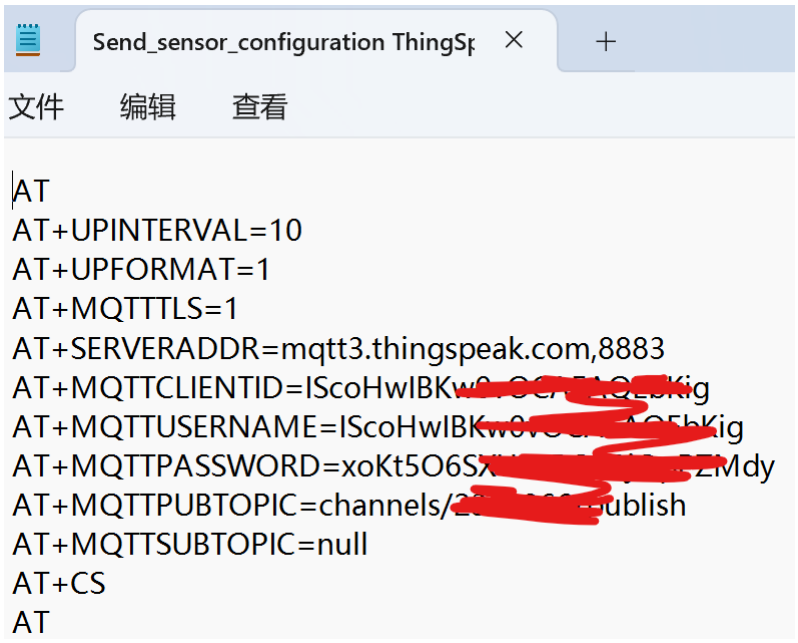


Step 3: Check the box to enable the field, and enter a field name in the ThingSpeak channel settings;



Step 4: Copy the MQTT Credentials and other configurations to the configuration file;





Step 5: Write the configuration file to NB DISCO 95 via NFC Reader 3911;

Step 6: Reset the NB DICO 95 and wait for the data to be uploaded to the platform;

Step 7: View the data on ThingSpeak private view and compare whether the data is correct.

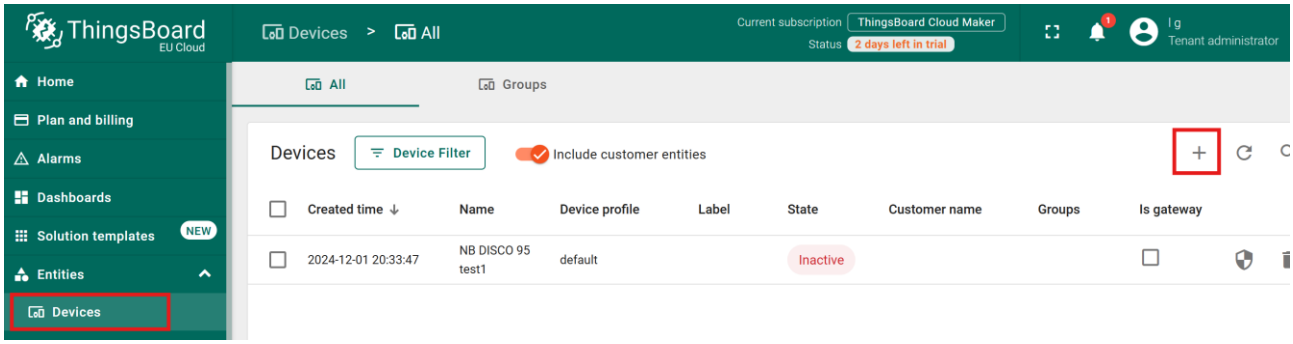
You can also refer to the video tutorial in the video directory for more details.

If you don't have an NFC Reader 3911 board, you can use the onboard USB-to-UART bridge to change the device configuration via AT commands.

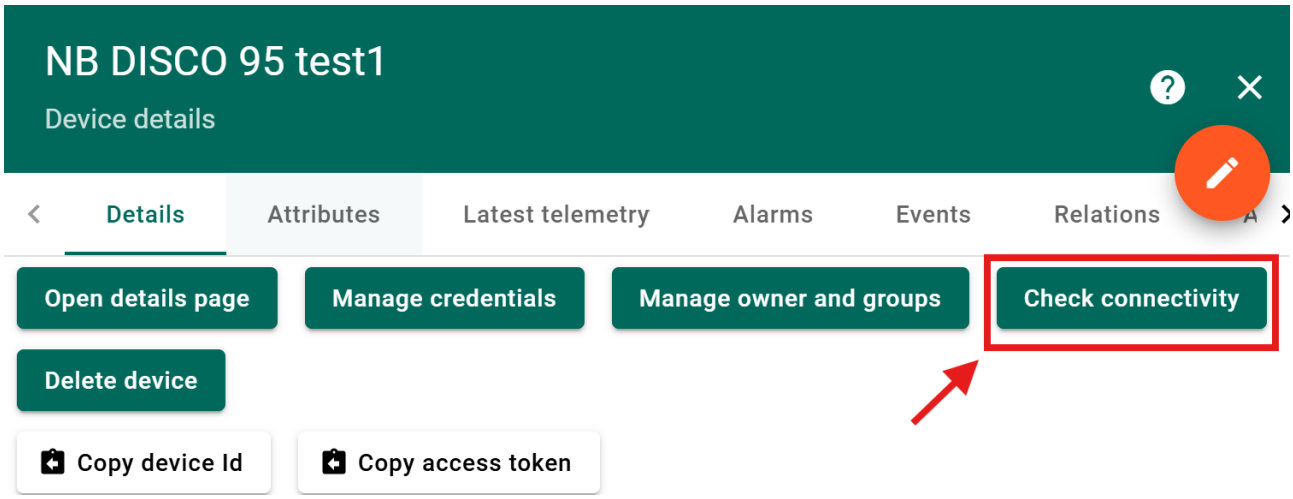
8. How to connect to ThingsBoard using NB DISCO 95

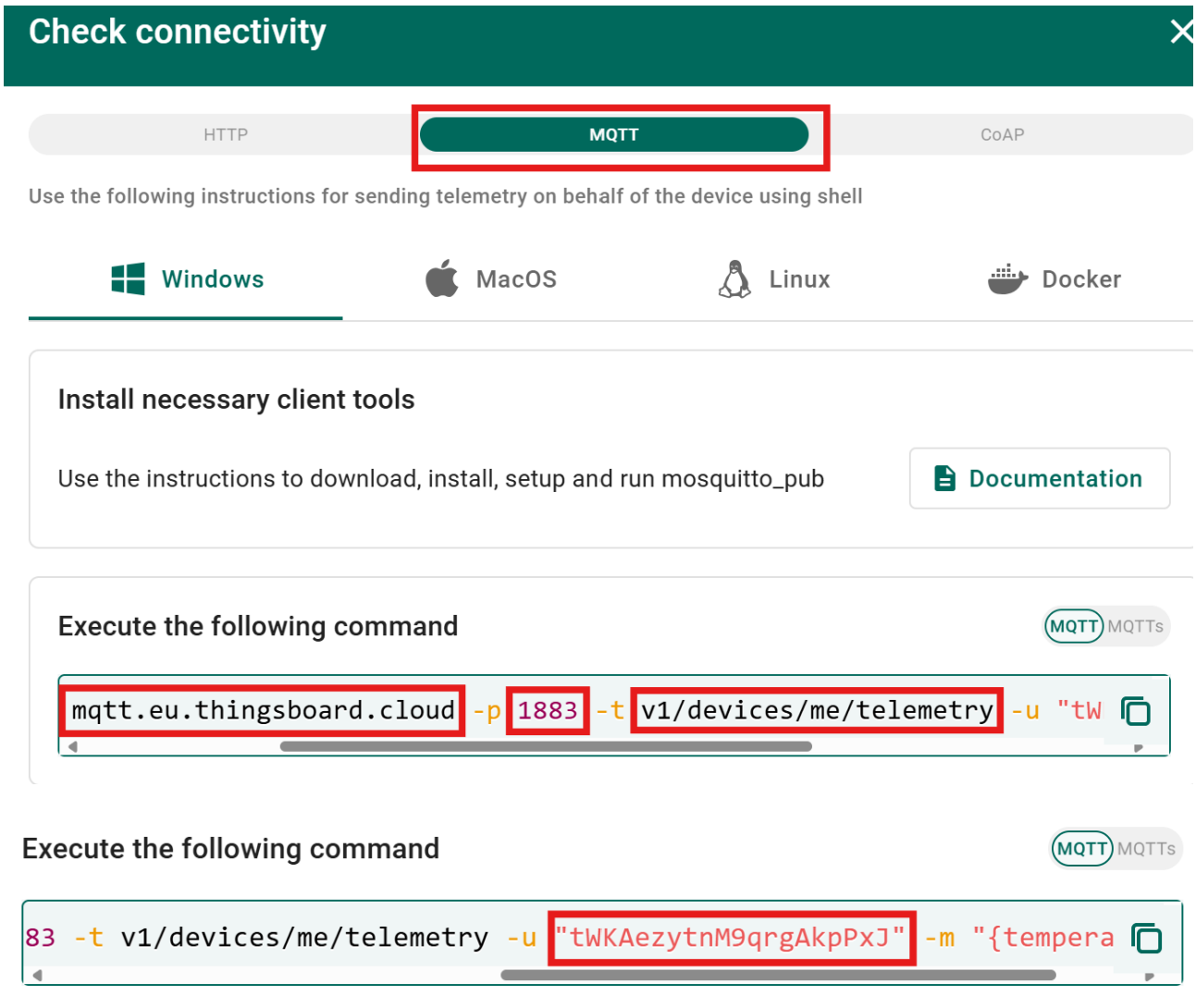
Step 1: Sign up for a ThingsBoard account;

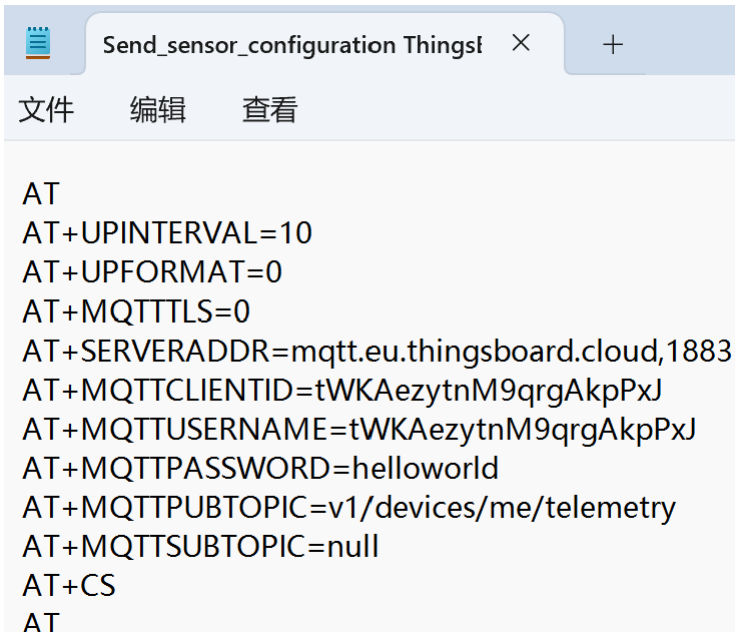
Step 2: Add a new device in ThingsBoard;



Step 3: Copy the MQTT Credentials and other configurations to the configuration file;







Step 4: Write the configuration file to NB DISCO 95 via NFC Reader 3911;

Step 5: Reset the NB DICO 95 and wait for the data to be uploaded to the platform;

Step 6: View the data on ThingsBoard latest telemetry and compare whether the data is correct.

You can also refer to the video tutorial in the video directory for more details.

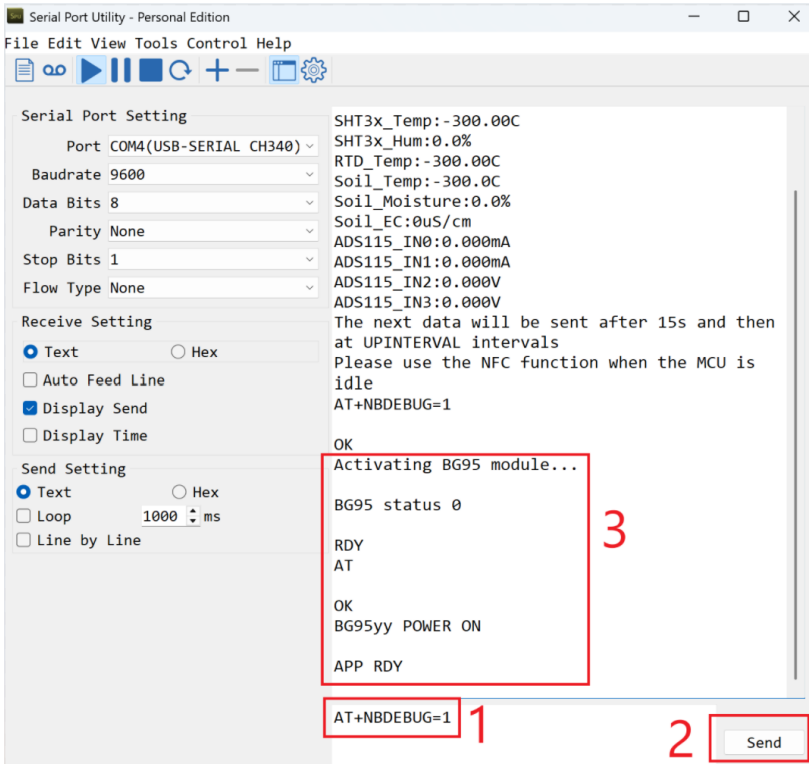
If you don't have an NFC Reader 3911 board, you can use the onboard USB-to-UART bridge to change the device configuration via AT commands.

9. How to use BG95 USB to debug BG95-M2 module with AT Commands

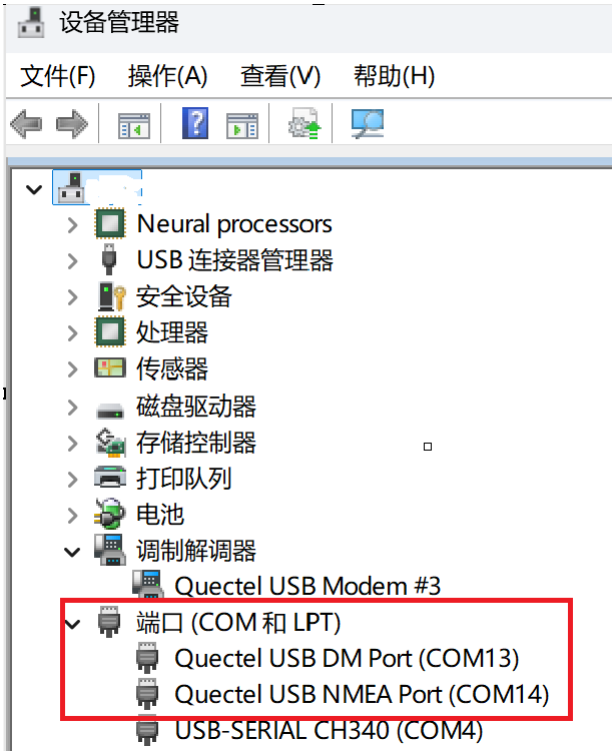
Step 1: Install the software in the Tools directory;

Step 2: Please use a Micro USB cable to connect BG95 USB to the PC;

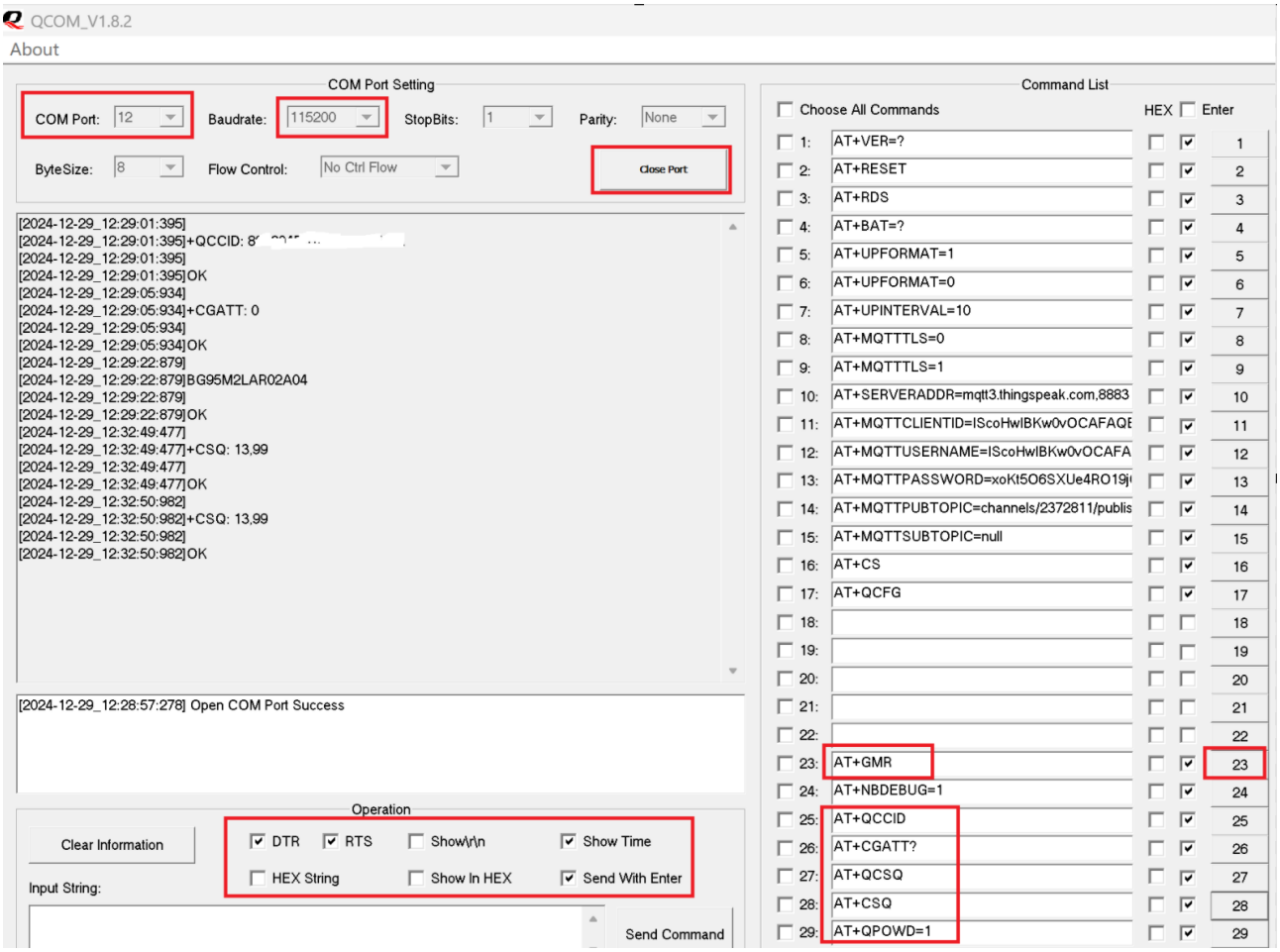
Step 3: Please input AT+NBDEBUG=1 to put the device into BG95-M2 debug mode;



Step 4: Check the serial port of the BG95-M2 analog in Device Manager;



Step 4: Use QCOM_V1.8.2 PC software to debug the BG95-M2 module via the AT command.



10. Flash memory layout

PARTITION	Address	Size
Bootloader	[0x00000 - 0x04FFF]	20KB
FW header	[0x05000 - 0x057FF]	2KB
APP	[0x05800 - 0x1E7FF]	100KB
FOTA	[0x1E800 - 0x377FF]	100KB
Reserved	[0x37800 - 0x3F7FF]	32KB
USER APP Params	[0x3F800 - 0x3FFFF]	2KB

11. How to upgrade the NB DISCO 95 firmware

11.1 Via NFC Reader 3911

Please refer to Section 4.5.

11.2 Via STM32CubeProg

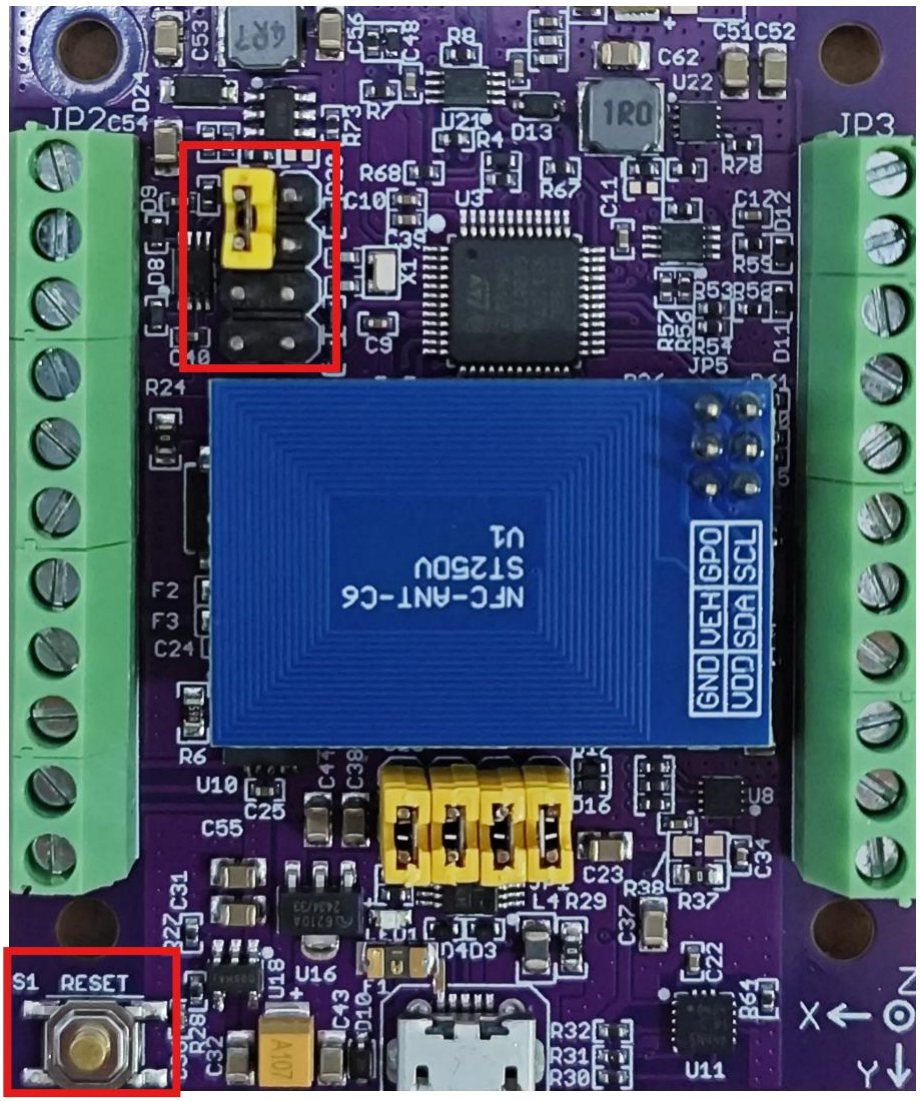
Step 1: Download and install STM32CubeProg - STM32CubeProgrammer software for all STM32 - STMicroelectronics Windows® PC software, the recommended version is 2.14.0;

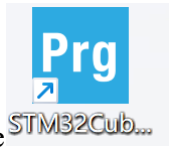
Get Software

	Part Number	General Description	Latest version	Download	All versions
+	STM32CubePrg-Lin	STM32CubeProgrammer software for Linux	2.17.0	Get latest	Select version
+	STM32CubePrg-Mac	STM32CubeProgrammer software for Mac	2.17.0	Get latest	Select version
+	STM32CubePrg-W32	STM32CubeProgrammer software for Win32	2.17.0	Get latest	Select version
+	STM32CubePrg-W64	STM32CubeProgrammer software for Win64	2.17.0	Get latest	Select version

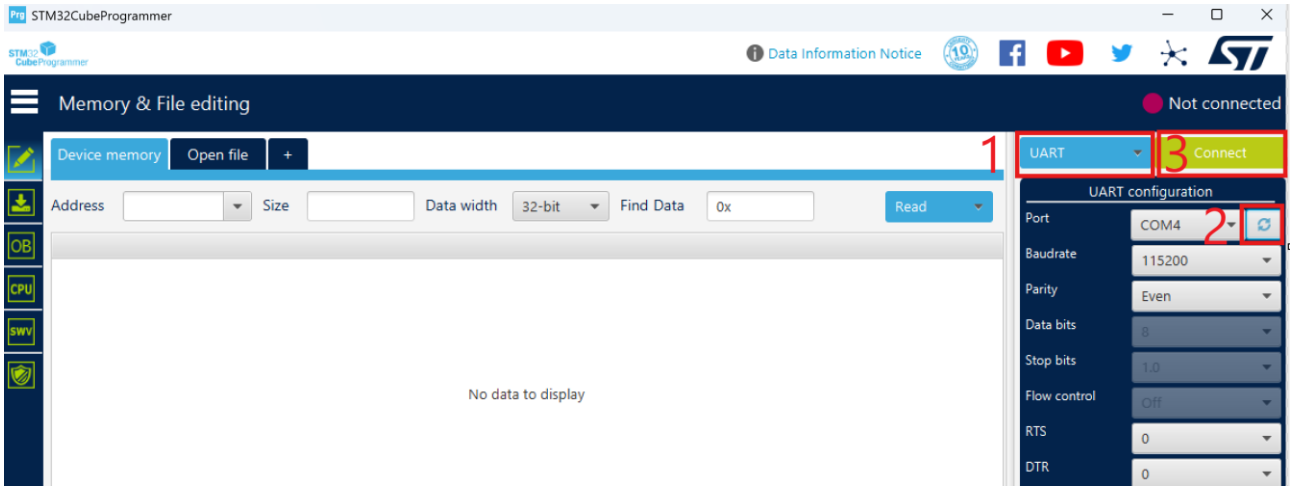
Select version
2.14.0
2.13.0
2.10.0

Step 2: Short-circuit the boot pin and 3V3 pin through the yellow jump, then press the S1 button once to reset the device;

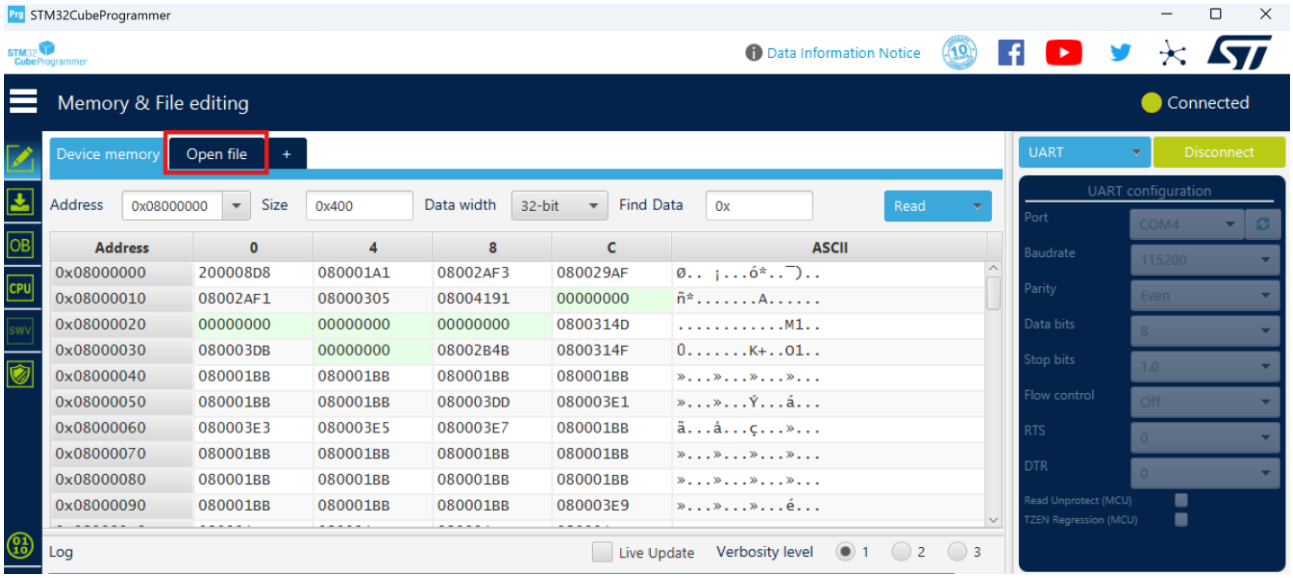


Step 3: Open STM32CubeProgrammer PC software 

;

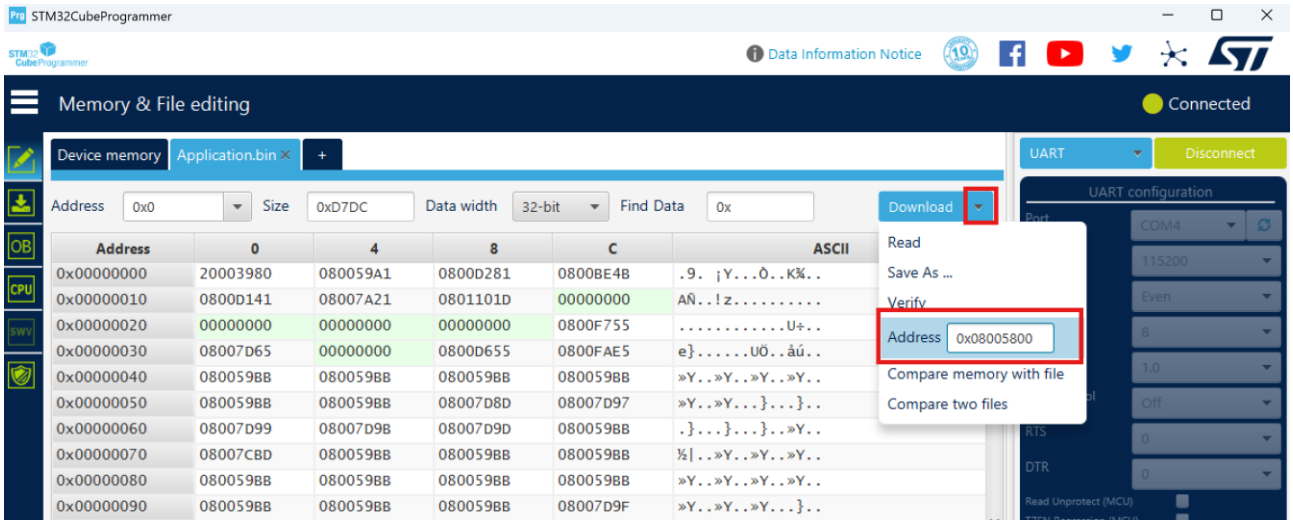


Step 4: Click Open file option to select firmware Application.bin;

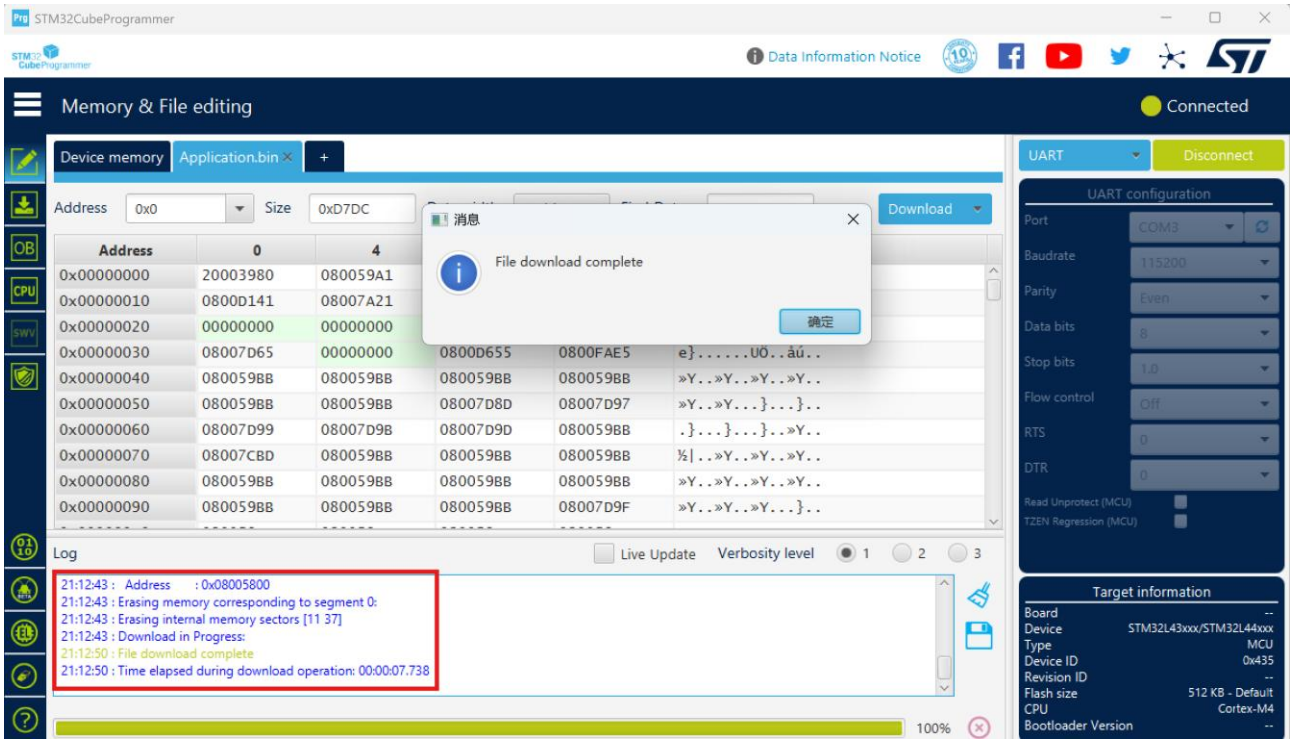


Step 5: Click 

to change the address to 0x08005800;



Step 6: Click  and wait for the firmware download to complete.



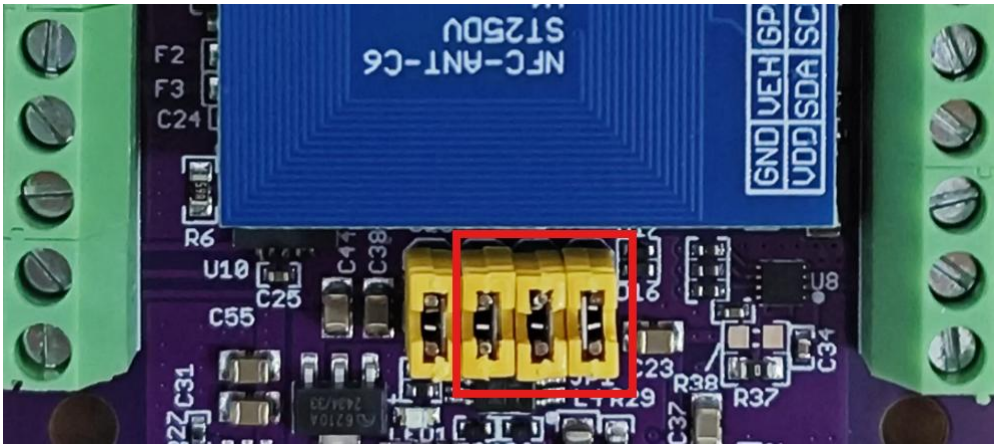
12. Sleep current

After the device sends uplink data or processes a task, it will enter sleep mode.

You need to unplug the 3 yellow jump caps in the red box, and then measure the sleep current.

The purpose of removing the jump cap is to disconnect from the CH340E.

The sleep current is about 96uA@5V



13. Package information

1 X IP68 Soil Temp, Moisture, and EC sensor with a cable length of 2m

1 X Class-A PT100 temperature sensor with a cable length of 1m

2 X Micro USB cable

1 X SHT30 temperature and humidity sensor with a cable of 1m

1 X NB DISCO 95 board

1 X SMA to IPEX1 RF connector

1 X Active GPS/BD Antenna

1 X LTE Antenna

14. Support

Please send an email to dove.huang@aliyun.com.