

User Manual

SCB111-485-DC / SCB111-485-SMA



User Manual version: v1.05

SCB111-485 firmware version: V1.2.9 (RTOS version)

SCB111-485 Utility version: V1.2.10

Disclaimer

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Defects, malfunctions, or failures of the warranted Product(s) caused by damage resulting from unforeseeable incidents (such as lighting, floods, fire, etc.), environmental and atmospheric disturbances, other external forces such as power line disturbances and surge, host computer malfunction and virus, incorrect power input, or incorrect cabling, incorrect grounding and damages caused by misuse, abuse, and unauthorized alteration or repair are not warranted.

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1. Overview

The SCB111-485-NB-DC gateway facilitates communication between RS485 RTU devices or sensors and cloud servers using the CAT M1 or NB-IoT cellular network. It securely transmits data in JSON format and MQTT protocol with AES128-bit encryption. The gateway's configuration is by a Micro-USB connection with Windows Utility. The device supports up to 20 Modbus slave devices and allows for 30 Modbus Registers polling and sends the data to the cloud server in four MQTT messages. The device is compact, palm-sized, and weatherproof with an IP68 rating, allowing it to operate in outdoor environments with temperatures ranging from -40 ~70°C. The Firmware upgrade can be made by air (ThingsMaster OTA, FOTA), which is ideal for large-scale outdoor Industrial IoT applications.

The new version firmware v1.2.9 also support 3 operating modes, Standard, Sleep and Alert for different application. (1) Standard Mode – system keep LTE connection without interrupt. (2) Sleep Mode- System keep sleep in low power consumption and auto wake up in a certain duration time. (3) Alert mode – it is working at sleep mode with operating mode change to standard mode for urgent application. In this mode, the system will check the RTU's register value and check whether changes to standard mode to keep LTE always on-line for emergency situation or not.

2. Product Specification

Model and features listed in the table below:

Model Name	Description
SCB111-485-DC	Industrial Smart Modbus RS485 Gateway, NBIoT, LTE Cat. M1, 1 Nano-SIM, Global Band, DO ,9~30Vdc, Build-in spring type antenna
SCB111-485-SMA	Industrial Smart Modbus RS485 Gateway, NBIoT, LTE Cat. M1, 1 Nano-SIM, Global Band, DO ,9~30Vdc, SMA Antenna Connector

Specification – SCB111-485-DC

Technology	
Standard	3GPP Release14 Modbus RTU, TCP, MQTT/ MQTTs, HTTP/ HTTPs
Cellular Properties	
Data Throughput	Cat. M1: 529Kbps (DL)/1119Kbps(UL) Cat. NB2: 136Kbps(DL)/ 150Kbps(UL)
Band Information	Global version Cat.M1 (LTE-FDD):B1/2/3/4/5/8/12/13/14/18/19/20/26/27/28/66/---/ 85 Cat.NB2 (LTE-FDD):B1/2/3/4/5/8/12/13/--- /18/19/20/26/---/28/66/71/85 GSM850/ EGSM900/ DCS1800/ PCS1900
Radio RX Sensitivity	Cat. M1 : -103 dBm (Min.) Cat.NB2: -113 dBm (Min.)
Radio TX Power	Cat.M1/ NB2: 20 (+/- 2.7) dBm GSM/EGSM:33 (+/- 2) dBm DCS/PCS: 30 (+/- 2) dBm
LTE Indication (Utility)	Connected Band, Operating Mode: M1/NB RSRQ: Signal Receive Quality measured, Unit dB RSRP: Signal Received Power for Cat-M1, NB1/NB2, Unit dBm RSSI: Received Signal Strength Indicator, Unit dBm SINR: Signal to Interference plus Noise Ratio, -20~30 dB
Management	
System Management	1 x Micro USB 2.0 internal port for System Utility Configuration Event Log: 100 Entries, supports download file, Erase Data Log Configuration Upload / Download
Network	IPv4/ IPv6
Software Utility	SCB111-485 utility, executed at windows system without Pre-installation
Event Log	100 Event Entries, Power On, Base_Station_Fail, MQTT_Server_Fail
Ping Alive Check	Support Ping function for the Far-End device alive check in GSM mode.
Configure Backup	Configuration Download/Upload via Utility in Text file. Parameter Includes: RTU Port, IoT Parameters, MQTT Parameters, RTU Tag/ Register
System Operating	
Operating Mode	3 Operating Modes – Standard, Sleep, Alert - Standard Mode: LTE Communication keep alive - Sleep Mode: provides energy saving feature and supports Wake up Interval timer, Standby Timer to enable RTU polling and Publish Interval Timer. - Alert Mode: working in sleep /power saving mode, and once the register value is over the threshold value then change to Standard mode with higher frequently publish.
Condition /Alert	Provides Hi/Low Threshold with simultaneous operation of multiple register values and performs logical operations using AND or OR.

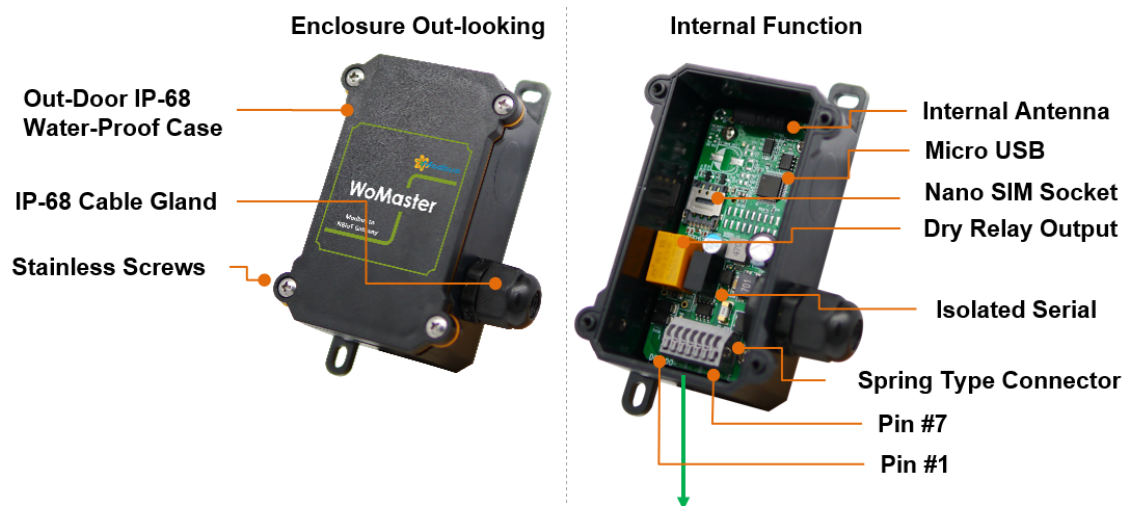
Interface (Internal)	
SIM Socket	1x Nano-SIM Socket
USB	1x Micro USB for configuration & firmware upgrade, operating mode adjust by internal jumper
Antenna	SCB111-485: 1x 3dBi internal Antenna SCB111-485-SMA: Water Proof SMA Connector
Relay Output Note-3	On-Board Screw-less, Spring Type Terminal Connector (20~24AWG) – 2 Conductors Internal Dry Relay Output (DO), Rating: 30VDC/1A
RS485	On-Board Screw-less, Spring Type Terminal Connector (20~24AWG) – 2 Conductors 2-Wire RS485A, RS485B with isolation Baud Rate: 1200, 2400, 4800, 9600bps DMA Polling Time: 120 Seconds /Cycle (Maximum) with 140 Registers Routing Polling (Modbus RTU time-out 200ms)
Power Input	On-Board Screw-less, Spring Type Terminal Connector (20~24AWG) – 2 Conductors Earth Ground (E.G.) - 1 Conductor Power Input: DC24V (Rating 9~30V) Power Consumption: 3W / DC 24V (Maximum), 260uA@ Power Saving mode
LTE Communication	
MQTT Modbus	20 Modbus RTU devices, up to 30 registers Modbus function code: Publish Read Function Code, Subscribe Write function code Modbus Register Data Format: Short/ Unsigned Short/ Integer /Unsigned Integer /Float / ASCII for Modbus function code 03, 04 and Byte-Swap function - Big-Endian, Little-Endian MQTT Publish: Publish interval time setting by Utility Relay State Modbus Function Code 01: Read Coil-Read Output Control bit Modbus Function Code 02: Read Discreet-Read Input bit, Read Input bit Modbus Function Code 03: Read Holding Register – Read Output word Modbus Function Code 04: Read Input Registers – Read Input Word MQTT Subscribe: after system published, the system changes to subscribe mode until next publish. After subscribe control, the

	system will publish ECHO message to MQTT server. The available functions as following: • Relay Control On/Off • Modbus Function Code 05: Write Single Coils – Write one bit output • Modbus Function Code 06: Write single Register – Write one word output
RS485/ TCP Transparent	Bi-Directional data transparent between TCP Server and Modbus RTU Device During the TCP Transparent Mode, the LTE keep connection without suspend
FOTA (Firmware OTA) COTA (Configure OTA)	The firmware upgrade over the air (FOTA) function only available at MQTT operating mode by the HTTP get command. The device subscribe the FOTA command from the MQTT Cloud server. The Modbus RTU configuration support upgrade through the HTTP get command (COTA) new feature Supports 2 Flash-ROM segments ensured system doesn't crash by power interruption during the FOTA.
SSL	MQTTs/HTTPs/TCP supports Validate Certificate, Mutual Authentication
LED Indication	LTE TX/RX (G) : second blinking (no register), blinking slow (registered), fast flashing (LTE communication) LTE State (G): On (LTE module ready), Off (LTE module off) (For power saving will be removed) Power: On (Power ready) (For Power Saving will be removed)
External Interface	
Cable Gland	4-8mm cable diameter, IP68 Protection
SMA Antenna	SCB111-485-SMA: 1 water-proof SMA type connector SCB111-485-DC: Internal Spring type, 3dBi
Mechanical & Installation	
Installation	Wall Mounting with 2 Mounting holes
Dimension	115.6 x 78.2 x 41.5 mm 90 x 50 x 42 mm (without mounting ear, Cable Gland)
Ingress Protection	IP 68 Plastic Housing Note-1
Weight	100g
Environmental	

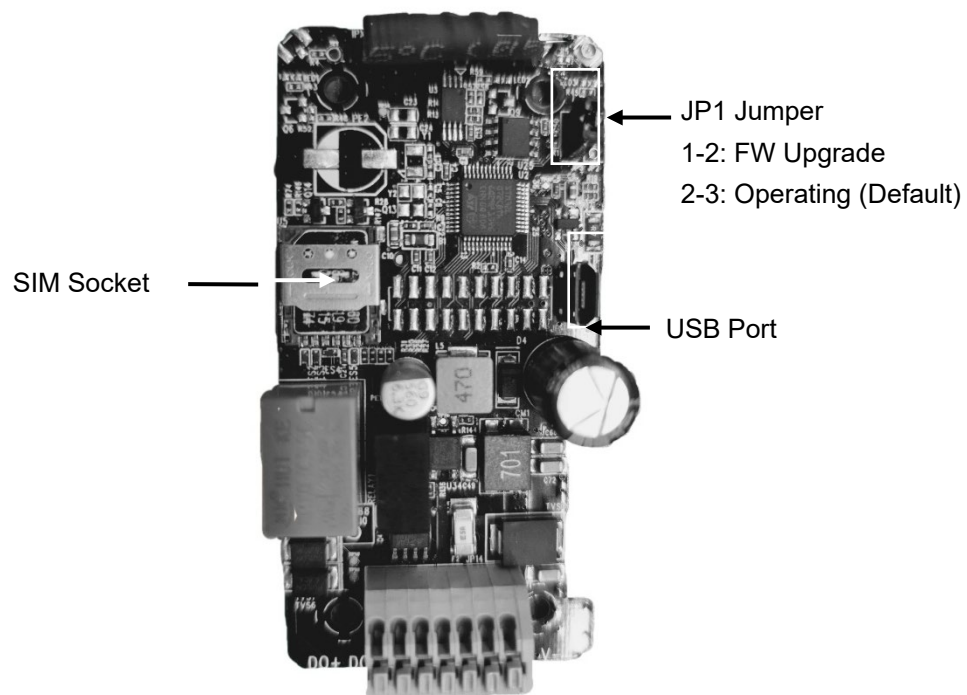
Operating Temperature	-40°C~70°C, 0% ~ 90%, Non-Condensing
Storage Temperature	-40°C~80°C, 0% ~ 90%, Non-Condensing
Reliability & Warranty	
MTBF	> 200,000 Hours
Warranty	3 Years

3. System Appearance & Connector description

The device supports IP68 protection for the interface connection. It can prevent water and dust; all of the interfaces are shown in the below diagram.



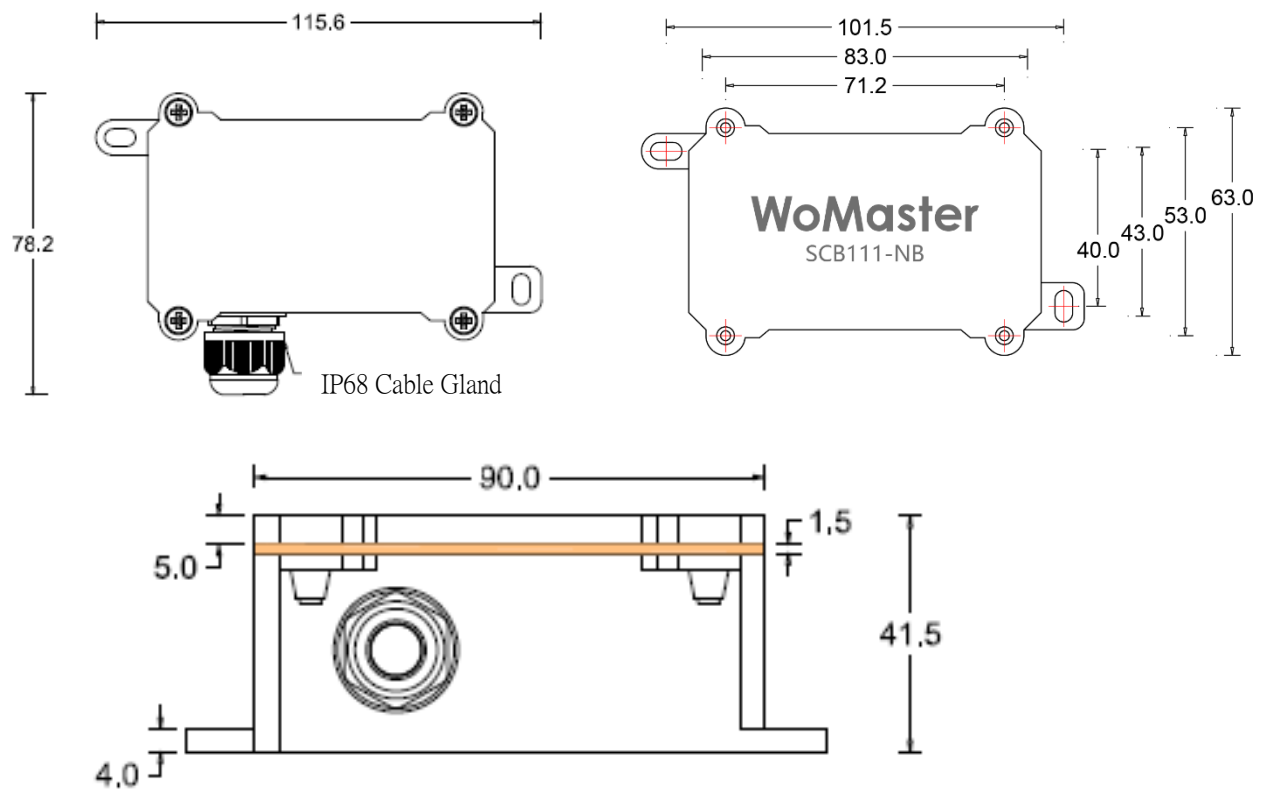
Connector	Pin #1	Pin #2	Pin #3	Pin #4	Pin #5	Pin #6	Pin #7
Function	DO +	DO -	RS485 A	RS485 B	V+	E.G.	V-



4. Hardware Installation

4.1 Housing Dimension

Unit: mm



5. Communication Protocol

The SCB111-485 supports MQTT, MQTTs and HTTPs Cloud Protocol. It also supports FOTA and COTA with HTTP/HTTPs Protocol.

- 1) MQTT Cloud Protocol- Published Modbus RTU Register RAW Data in JSON format, Subscribe Relay Control, Modbus write function code 05,06.
- 2) MQTTs, HTTPs with Bas-Station TLS 1.2.
- 3) Firmware upgrade Over the Air (FOTA) - Http/Https.
- 4) Configuration Upgrade over the Air (COTA) – Http/Https. The current device can only perform RTU Configuration Upgrade Over the Air. The System parameters – Cellular, IoT/ Cloud Server Setting, MQTT/ TCP Transparent, Encryption setting will support by the MQTT command. The following manual have detail sample command for your reference.
- 5) TCP Client with Serial Data Transparent.

5.1 Periodic report data at the device end

5.1.1 MQTT report Payload

-----1st MQTT Payload-----

```
{"seq":"1","time":"1679499252","rssi":"-59","snr":"19","firmware":"V1.2.2","model":"SCB111-485","RTUTagName":"423","Tag-2":"43","Tag-3":"76","Tag-4":"76","Tag-5":"98","Tag-6":"56","Tag-7":"43","Tag-8":"87","Tag-9":"34",.....,"Tag-18":"44","Tag-19":"44","Tag-20":"45"}
```

-----2nd MQTT Payload-----

```
{"Tag-21":"423","Tag-22":"43","Tag-23":"76","Tag-24":"76","Tag-25":"98","Tag-26":"56","Tag-27":"43","Tag-28":"87","Tag-29":"34",.....,"Tag-38":"25","Tag-39":"25","Tag-40":"24"}
```

-----3rd MQTT Payload-----

```
{"Tag-41":"423","Tag-42":"43","Tag-43":"76","Tag-44":"76","Tag-45":"98","Tag-46":"56","Tag-47":"43","Tag-48":"87","Tag-49":"34",.....,"Tag-58":"26","Tag-59":"27","Tag-60":"28"}
```

Name	Type	Note
seq	number	Power on, the number of reports sent (not increased in case of MQTT disconnection and retransmission) This value starts from 1 after task reconnection
time	number	Unix time Stamp of the device
rssi	number	Received signal strength indication (RSSI)

snr	number	Device signal-to-noise ratio (SNR)
firmware	string	Send when seq=1
model	string	Send when seq=1
RTUTagName	string	The RTU Tag Name

5.2 The back-end timely sets the device side system

attributes

5.2.1 Relay control

(1)Relay on command:

```
{"relayctrl":{"val":1}}
```

MQTT Response Payload

```
{"time":"1675345942","relaystate":1}}
```

(2)Relay off command:

```
{"relayctrl":{"val":0}}
```

MQTT Response Payload

```
{"time":"1675346022","relaystate":0}}
```

Name	Type	Note
Relayctrl: val	number	1: Relay on 0:Relay off
time	number	Unix time Stamp of the device
relaystate	number	Current relay status of the device

5.2.2 Modbus write function code 05,06

(1)Function code 05 command:

```
{"wreg":{"func":5,"ID":1,"addr":1,"val":65280}}
```

```
{"wreg":{"func":5,"ID":1,"addr":1,"val":0}}
```

MQTT Response Payload

```
{"time":"1675345942","ID":1,"addr":1,"result":"success"}}
```

(2)Function code 06 command:

```
{"wreg":{"func":6,"ID":1,"addr":1,"val":60}}
```

MQTT Response Payload

```
{"time":"1675345942","ID":1,"addr":1,"result":"success"}}
```

Name	Type	Note
func	string	Modbus function code (05,06)
ID	number	Modbus RTU ID
addr	number	Modbus Register Address
val	number	Function code 05: 65280: Write single coil to 1 note:65280 is 00FF(H) 0: Write single coil to 0 Function code 06: 60: Write single register to 60
time	number	Unix time Stamp of the device
result	string	Command execution results

5.2.3 Remote system reset

(1)Command:

```
{"reset":{"val":1}}
```

MQTT Response Payload

```
{"time":"1675345942","reset":"success"}}
```

Name	Type	Note
reset:val	string	1: system reset
time	number	Unix time Stamp of the device
reset	string	Command execution results

5.2.4 TCP transparent

(1)Switch TCP transparent transmission through MQTT subscription:

```
{"cmd":{"mode":"transparent","url":"122.114.122.174","port":42822}}
```

MQTT Response Payload

```
{"time":"1675345942","act":"success"}}
```

(2) Send the string “+++” through the server, exit the transparent transmission mode and return to the MQTT subscription mode

Name	Type	Note
mode	string	TCP transparent mode
url	string	TCP server ip
port	number	TCP server port number
time	number	Unix time Stamp of the device
act	string	Command execution results

5.2.5 FOTA (Firmware Over-the-Air)

(1) Command:

```
{"cmd":{"mode":"upgrade","url":"thingsmaster.womaster.eu","port":80,"path":"/public/SCB111-485%20v1.3.9%20oad.bin"}}
```

MQTT Response Payload

```
{"time":"1675345942","result":"FW Upgrade Successful"}}
```

Name	Type	Note
mode	string	FW upgrade
url	string	File Server Domain Name
port	number	Port number of the file server
path	string	File Path
time	number	Unix time Stamp of the device
result	string	FOTA command execution results

5.2.6 COTA (Configure Over-the-Air)

1. CELL information

(1) Query CELL information

Command:

```
{"conf":{"type":"cell","oper":"query"}}
```

MQTT Response Payload

```
{"time":"1675345942","apn":"internet","plmn":"0","mode":0}}
```

(2) CELL information set

Command:

```
{"conf":{"type":"cell","oper":"set","param":{"mode":0,"apn":"internet","plmn":"46000"}}
```

MQTT Response Payload

```
{"time":"1675345942","apn":"internet","plmn":"46000","mode":0}}
```

Name	Type	Note
type	string	The type of the parameter.
oper	string	Parameter operation.
time	number	Unix time Stamp of the device
apn	string	APN accessed by base station
plmn	string	PLMN accessed by base station
mode	number	The mode of accessing the base station(0:auto 1>manual)

2. Serial information

(1) Query serial information

Command:

```
{"conf":{"type":"serial","oper":"query"}}
```

MQTT Response Payload

```
{"time":"1675345942","baud":"9600","parity":"none"}}
```

(2) Serial information set

Command:

```
{"conf":{"type":"serial","oper":"set","param":{"baud":9600,"parity":"event"}}}
```

MQTT Response Payload

```
{"time":"1675345942","baud":"9600","parity":"event"}}
```

Name	Type	Note
type	string	The type of the parameter.
oper	string	Parameter operation.
time	number	Unix time Stamp of the device
baud	number	Serial communication baud rate(9600/4800/2400/1200)
parity	string	Serial communication check method(none/odd/event)

3. MQTT information

(1) Query MQTT information

Command:

```
{"conf":{"type":"mqtt","oper":"query"}}
```

MQTT Response Payload

```
{
  "time": 1681491229,
  "url": "test.mosquitto.org",
  "port": 1883,
  "pubtopic": "wompub",
  "subtopic": "womsub",
  "clientid": "1886",
  "user": "",
  "password": "",
  "pub_int": 3600,
  "auth": 0
}
```

(2) MQTT information set

Command:

```
{
  "conf": {
    "type": "mqtt",
    "oper": "set",
    "param": {
      "url": "test.mosquitto.org",
      "port": 1883,
      "pubtopic": "wompub",
      "subtopic": "womsub",
      "clientid": "1886",
      "user": "user",
      "passwd": "passwd",
      "pub_int": 3600,
      "auth": 0
    }
  }
}
```

MQTT Response Payload

```
{
  "time": 1681491229,
  "url": "test.mosquitto.org",
  "port": 1883,
  "pubtopic": "wompub",
  "subtopic": "womsub",
  "clientid": "1886",
  "user": "user",
  "password": "passwd",
  "pub_int": 3600,
  "auth": 0
}
```

Name	Type	Note
type	string	The type of the parameter.
oper	string	Parameter operation.
time	number	Unix time Stamp of the device
url	string	MQTT Server Domain Name
port	number	Port number of the MQTT server
pubtopic	string	The publishing string of MQTT messages
subtopic	string	The subscribe string of MQTT messages
clientid	string	Client ID
user	string	User name for server login
password	string	Password for server login
pub_int	number	MQTT message publishing interval(second)
auth	number	TLS Authentication mode(0:none 1:one-way 2:double-way)

4. TCP information

(1) Query TCP information

Command:

```
{
  "conf": {
    "type": "tcp",
    "oper": "query"
  }
}
```

MQTT Response Payload

```
{"time":1681491229,"url":"125.10.0.1","port":1255,"auth":0}
```

(2) TCP information set

Command:

```
{"conf":{"type":"tcp","oper":"set","param":{"url":"test.mosquitto.org1","port":1884,"auth":1}}}
```

MQTT Response Payload

```
{"time":1681491229,"url":"test.mosquitto.org1","port":1884,"auth":1}
```

Name	Type	Note
type	string	The type of the parameter.
oper	string	Parameter operation.
time	number	Unix time Stamp of the device
url	string	TCP Server Domain Name
port	number	Port number of the TCP server
auth	number	TLS Authentication mode(0:none 1:one-way 2:double-way)

5. RTU information

(1) Query RTU information

Command:

```
{"conf":{"type":"rtu","oper":"query","param":{"idx":0}}}
```

MQTT Response Payload

```
{"time":1681491389,{"name":"Dir","addr":1,"func":3,"reg":2},{ "name":"Speed","addr":2,"func":3,"reg":1},{ "name":"Hum","addr":3,"func":3,"reg":1},{ "name":"Tem","addr":3,"func":3,"reg":2},{ "name":"PM2.5","addr":3,"func":3,"reg":4}}
```

(2) RTU information set

Command:

```
{"conf":{"type":"rtu","oper":"set","param":{"url":"thingsmaster.womaster.eu","port":80,"path":"/public/rtu.cfg"}}}
```

MQTT Response Payload

```
{"time":1681491229,"act":"success"}
```

Name	Type	Note
type	string	The type of the parameter.

oper	string	Parameter operation.
idx	number	A group of five registers.Start from 0. Eg: idx=0, MQTT response RTU Tag 0~4 Idx=5,MQTT response RTU Tag 5~9
time	number	Unix time Stamp of the device
name	string	Register name
addr	number	Slave device ID
func	number	Modbus function code
reg	number	Register address of slave device
url	string	File Server Domain Name
port	number	Port number of the file server
path	string	File Path
act	string	Command execution results

6. SSL information

(1) Query SSL information

Command:

```
{"conf":{"type":"ssl","oper":"query","param":{"proto":"mqtt","class":0}}}
```

MQTT Response Payload

```
{"time":1681491229,"crc":"2153309461"}
```

(2) SSL information set

Command:

```
{"conf":{"type":"ssl","oper":"set","param":{"url":"thingsmaster.womaster.eu","port":80,"proto":"mqtt","class":0,"crc":2153309461,"path":"/public/mosquitto.org.crt"}}}
```

MQTT Response Payload

```
{"time":1681491229,"act":"success"}
```

Name	Type	Note
type	string	The type of the parameter.
oper	string	Parameter operation.

proto	string	The type of protocol.(mqtt/http/tcp)
class	number	The type of file. (0 server.crt / 1: client.crt / 2: client.key)
time	number	Unix time Stamp of the device
crc	number	CRC code of the authentication file
url	string	File Server Domain Name
port	number	Port number of the file server
path	string	File Path
act	string	Command execution results

6. SCB111-485-DC Utility Configuration

SCB111-485-DC can configuration through a USB interface, The configuration utility- “SCB111-485 RTOS Utility” is a non-Install Utility Tool. You could download it from the website:

www.womaster.eu, or request it from your business representative.

Connects the device to the computer via a USB cable, then the device will automatically change to configure mode. The utility will be described in this chapter.

6.1 Connects device with SCB111-485 Utility

The SCB111-485-NB Utility tool does not perform installation, just executes the Utility. Ensure the device has powered on, connecting with the PC via a USB cable before executing the Utility—“SCB111-485.exe”.

The following diagram is the screen capture of SCB111-485 Utility.

The screenshot shows the SCB111-485 Utility interface. At the top, there are tabs for 'Device' and 'Tools'. Below these, there is a 'COM' dropdown menu set to 'COM30' and a 'Model Name' text field. A 'Connect' button is located to the right. Below this, there are several tabs: 'Serial', 'Cellular', 'MQTT', 'TCP Transparent', 'SSL', 'RTU', and 'Sys.Maintenance'. The 'Serial' tab is selected, and the 'Serial Parameters' section is visible. It contains four configuration fields: 'Serial BaudRate' set to '9600', 'Serial Data Bits' set to '8', 'Serial Parity' set to 'No', and 'Serial Stop Bits' set to '1'. At the bottom right of the 'Serial Parameters' section, there are 'Apply' and 'Reload' buttons.

Click “COM” and select the USB mapping com port number.

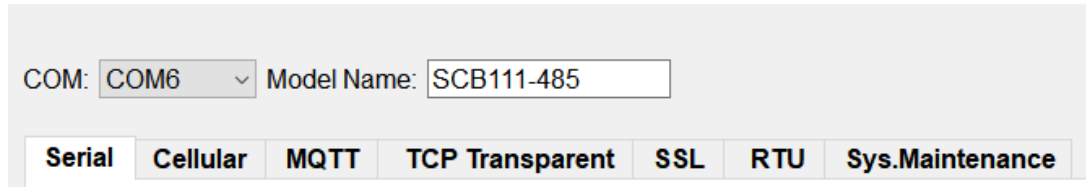
This screenshot shows the 'COM' dropdown menu open, displaying a list of available COM ports: 'COM1', 'COM7', 'COM38', and 'COM23'. The 'COM' dropdown is located at the top left of the interface, next to the 'Model Name' field and the 'Connect' button. The 'Serial' tab is also visible below the dropdown menu.

Start accessing the device via the utility.

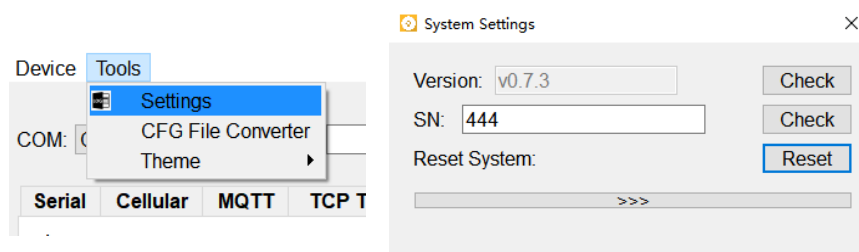
Click “COM” select the USB mapping com port number, and click “Connect”. The default user name and password is “Admin”

Note: Ensure the DC power is applied and the USB is connected between your Windows PC and the SCB111-485 main board.

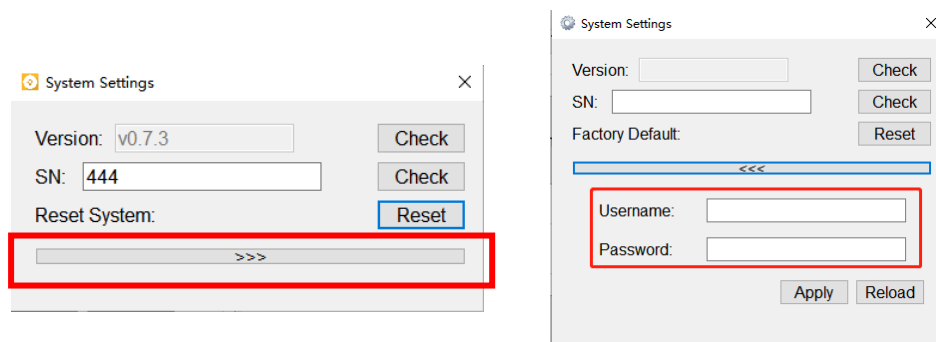
When connected, the default model name will show on the banner. In the following diagram, it shows “SCB111-485” is connected via virtual serial port- COM6.



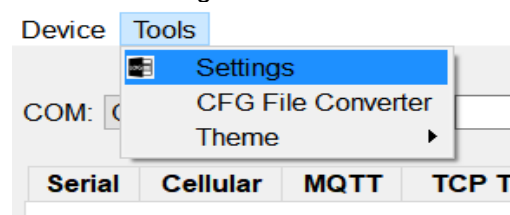
Click the “Tools” and “Setting”, and the dialog provides the version and serial number information, user can click “Check” to show that information. Click “Reset” to reset the device.

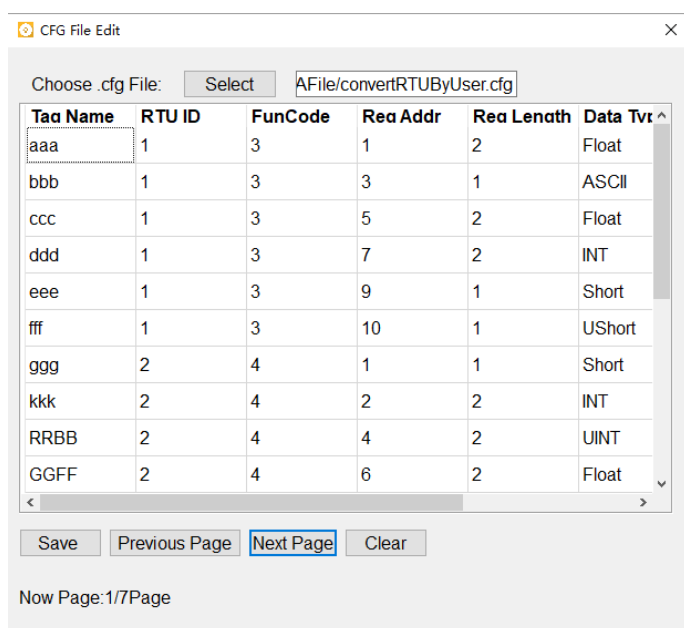


Click the small arrow. you can modify the password. After changing the password, click “Apply”, and a Warning pop-up box will pop up. Click “Yes”, and the modification will be successful. After disconnecting, log in again with the new password.



Click the “Tools” and “CFG File Converter”, and the Users can select .cfg File to edit. This function can be used offline without connecting to SCB111-485 If multiple devices need to change RTU configuration, you can select the. cfg file to update on this page. After the modification is completed, save it and then download the file to the other device through the COTA function.





Select: Select the .cfg file that needs to be updated.

Edit: Select RTU parameters with the mouse and right-click to edit the parameters.

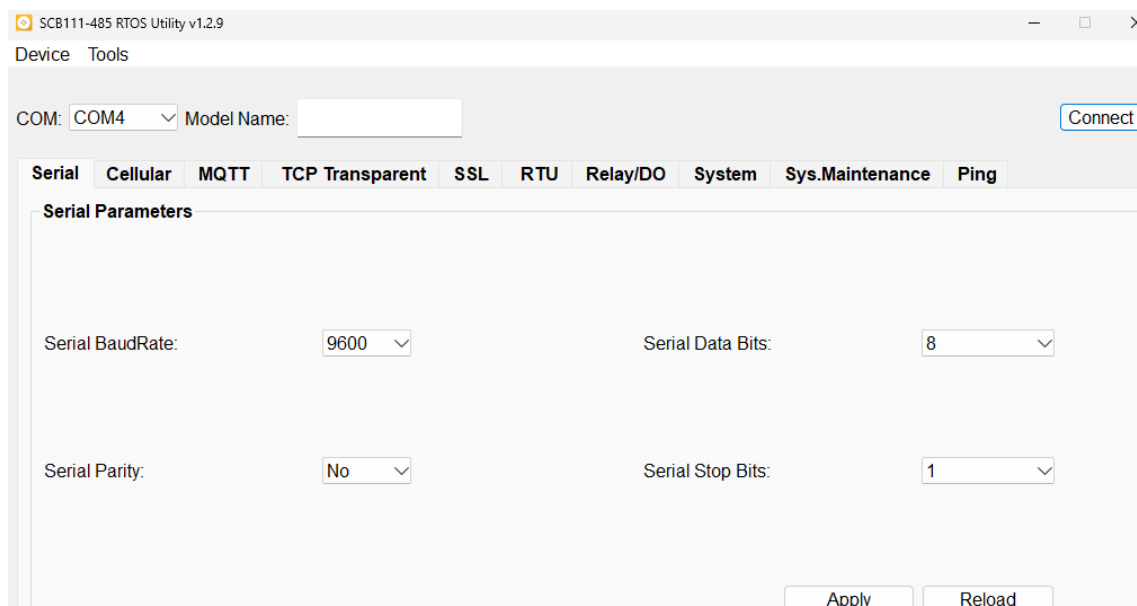
Delete: Select RTU parameters with the mouse and right-click to delete the parameters.

Save: The updated file will be saved to the directory. Path: SCB111-485

Utility\COTAFFile\convertRTUByUser.cfg

6.2 Serial Parameter Setting (Serial TAB)

SCB111-485 support two-wire RS485 serial communication. (Utility version 1.2.9)



Serial Baud Rate: The Baud rate supports from 1200bps to 9600bps

Serial Data Bits: 8 bits supported

Serial Parity: No parity, odd parity, even parity

Serial Stop Bits: 1,2

After all of the parameters are set, click “Apply” to activate those parameters and saving into the device automatically. Click “Reload” to show the current parameters setting from the device for double check.

6.3 Cellular Parameter Setting (Cellular TAB)

The Cellular tab is used for Cellular settings; User can select the setting mode and configure the parameters of the base station connection. (Utility 1.2.9 w/o change)

Setting Mode: It supports Auto Set and Manual Set. Select manual mode will provide PLMN setting.

APN: Access Point Name. The network name of the device is going to access. (Support a length of 51 bytes)

Network Mode: Includes Auto mode, LTE mode, GSM mode. Select Auto mode, The device will search for nearby networks and prioritize the use of LTE networks.

User: the authentication user name of the cellular network.

Password: the authentication password of the cellular network.

PLMN: Number of Public Land Mobile Network. (Manual Setting Cellular parameters)

Apply: Apply a new setting to the device.

Reload: Reload the device currently setting.

Conn. Test: Click “Conn. Test” to establish the connection with the base station.

Cellular Status (Right side Cellular information), after “**Conn. Test**” icon recovery, click the icon “**Refresh**” shows the Cellular testing result.

Provider: The telecom service provider name of the connected.

IMEI: International Mobile Equipment Identity.

IMSI: International Mobile Subscriber Identification Number.

IP: IP address obtained from the base station.

PLMN: The Public Land Mobile Network number which is issued by the service provider.

Sys Mode: The system operating mode with the base station. NBIoT NB1, NB2 or LTE M1.

Freq Band: The band information which is used communicates with the base station.

RSRP (dBm): Reference Signal Receiving Power.

RSSI (dBm): Received signal strength indication. If the value is below -113dBm, then change the install location for a better cellular signal.

RSRQ (dB): Reference Signal Received Quality.

SINR (dB): Signal to Interference plus Noise Ratio.

SIM Status: Show the SIM status.

Connection Status: Connected or searching.

Refresh: Renew the Cellular status.

Tips:

- RSRQ & SINR is most important LTE communication quality parameters.
- SINR: between -20dB ~30dB have good quality
- Poor RSRQ means current base-station of signal converge with lower signal quality –the Connectivity may change
- RSRP: < -100dBm may have loss connection issue.
- RSSI: Poor ← -90dBm~ (Good)~ 25dBm → high Interference

Note: Waiting for a while for the system establishes the connection with the base station, and obtained the cellular information, then click “Refresh” to request data from the system. During communication, the “Refresh” will reverse color.

6.4 MQTT Setting (MQTT TAB)

This Tab is for the Cloud Server setting. The device will publish to the cloud server in the MQTT protocol with a specified topic. (Utility 1.2.9 same)

COM: COM13 Model Name: SCB111-485 Disconnect

Serial Cellular **MQTT** TCP Transparent SSL RTU Sys.Maintenance

MQTT Configuration Table

IOT Server:	test.mosquitto.org
Port:	1883
Publish Topic:	6666
Subscribe Topic	9999
Client ID:	122
Publish Interval (Sec.):	180
User Name:	
Password:	
Report TimeStamp Format:	UNIX Time
Status:	MQTT Successful

Server Connect Test Apply Reload

IOT Server: Address of the MQTT server. Reference: test.mosquitto.org. (51 bytes)

Port: Port number for the IOT Sever.

Publish Topic: The Topic name for MQTT data publish. (51 bytes)

Subscribe Topic: The Topic name for MQTT data subscribe. (51 bytes)

Client ID: Client ID number for the SCB111-485. (51 bytes)

Publish Interval (Sec.): The interval time of data published to the server. The publish interval time should be more than RTU polling interval time. The minimum publish interval time is 3 minutes (180 seconds).

User Name: the user's name for MQTT server login-in

Password: the user's password for MQTT Server login-in

Report TimeStamp Format: The timestamp for reporting data can be chosen from Unix time or local time

Status: Click the “**Server Connect Test**” icon, system will start communicating with the MQTT server and show the connect test result. Before perform Server Connect Test, please click “Apply” to save the new configuration.

Apply: Write the new configuration into the system flash ROM.

Reload: Reload the system configuration and show it on the table.

6.5 TCP Transparent Setting (TCP Transparent TAB)

TCP Server Setting: This tab is for configuring the TCP server settings. The device supports TCP clients with serial data transparency.

MQTT and TCP Configuration: If both MQTT and TCP are configured, the SCB111-485 will prioritize MQTT mode.

Switching to TCP Mode: To ensure the device operates in TCP transparent mode, you need to:

- Erase the MQTT configuration.
- Apply an empty configuration.
- Configure the TCP settings.

The screenshot shows the WoMaster web interface for configuring the SCB111-485 device. At the top, there is a header bar with 'COM: COM6' (a dropdown menu), 'Model Name: SCB111-485' (a text input), and a 'Disconnect' button. Below this is a tabbed interface with tabs for 'Serial', 'Cellular', 'MQTT', 'TCP Transparent' (which is selected), 'SSL', 'RTU', and 'Sys.Maintenance'. The 'TCP Transparent' tab contains a section titled 'TCP/UDP' with the following settings: 'Mode' is set to 'TCP Mode'; 'Server' is set to '125.10.0.1'; and 'Port' is set to '1255'. At the bottom of this section are three buttons: 'Conn. Test', 'Apply', and 'Reload'.

Server: IP Address of the TCP server.

Port: Port number for the TCP Server.

Apply: Write the new configuration into the system flash ROM.

Reload: Reload the system configuration and show it on the table.

6.6 SSL Setting (SSL TAB) – Encrypting communication

The device supports TLS v1.2 for MQTT, TCP, and HTTP protocols. This tab is for setting the protocol type and authentication method.

COM: COM6 Model Name: SCB111-485

Serial Cellular MQTT TCP Transparent **SSL** RTU Sys.Maintenance

Protocol Type: MQTT

Authentication method: No Validate Certificate
Apply Reload

COM: COM6 Model Name: SCB111-485

Serial Cellular MQTT TCP Transparent **SSL** RTU Sys.Maintenance

Protocol Type: MQTT

Authentication method: No Validate Certificate
Apply Reload

COM: COM6 Model Name: SCB111-485

Serial Cellular MQTT TCP Transparent **SSL** RTU Sys.Maintenance

Protocol Type: MQTT

Authentication method: Validate Certificate

Server CA Certificate SelectFile Apply xxx.crt

COM: Model Name:

Serial Cellular MQTT TCP Transparent **SSL** RTU Sys.Maintenance

Protocol Type:

Authentication method:

Server CA Certificate xxx.crt

Client Certificate xxx.crt

Client Private Key xxx.key

Protocol Type: Select MQTT/HTTP/TCP.

Authentication Method: Select No Validate Certificate/ Validate Certificate/ Mutual Authentication. Click Select File, find the certificate you want to upload in your PC, and then click Apply to upload it.

Apply: Write the new configuration into the system flash ROM.

Reload: Reload the system configuration and show it on the table.

6.7 RTU Setting (RTU TAB)

"The SCB111-485 provides an RS-485 interface for Modbus RTU slave connections. Therefore, the utility includes an RTU setup page for configuring RTU device parameters. It supports up to 20 Modbus slave devices and 30 register addresses (firmware v1.2.9).

One short or unsigned short occupies one entry, allowing for a maximum of 30 entries. One float, int, or unsigned int accounts for two entries, so a maximum of 15 entries are allowed for floats, ints, or unsigned ints. The maximum length limit for each ASCII type entry is 19 bytes, which is equivalent to less than two entries."

Serial Cellular MQTT TCP Transparent SSL **RTU** Relay/DO System Sys.Maintenance Ping

MQTT RTU Parameters

Tag Name :

RTU ID:

Function Code:

Address(PLC):

Data Type:

Data Format:

Factor:

Condition:

Value:

Untrigger:

Value:

And/Or Group:

Tag Name	RTU ID	FunCode	Reg Addr	Reg Length	Data Type	Data Format	Factor	Condition	Value
field1	1	3	1	1	Short	AB	1	Disable	0
field2	2	3	1	1	Short	AB	1	>	90

Data Format	Factor	Condition	Value	Untrigger
AB	1	Disable	0	Default
AB	1	>	90	<

Intrigger	Value	Group	Reg State	Condition S
default	0	Or	Tout	Off
	80	Or	OK	Off

Now Page: 1/2Page

Tag Name: The RTU device name. It will forward to Gateway as a Tag Name for recognition. The available character length up to 8.

RTU ID: Modbus ID of RTU Device. The ID should not be duplicated with others.

Function Code: Read Function Code # 01,02,03,04.

Address (PLC): Register address existing in RTU device, range of address is 1-65535. (Support 30 Modbus Registers maximum).

Data Type: The data types reported, include short, ushort, int, uint, float, and ASCII.

Data Format: Reported data format. AB or BA nibble swap.

Factor: Multiplier value for converting RAW data to Real data.

Condition: The condition trigger rule. "Disable", ">", ">=", "<", "<=", "==", "!="

Value: the threshold high value of the condition trigger.

Untrigger: The un- trigger rule. "Disable", ">", ">=", "<", "<=", "==", "!="

Value: the threshold low value of the condition trigger-off

AND/ OR Group: Each tag/register can be set into an OR group or an AND group with high and low threshold values. Once the value of the register is between the high and low thresholds, the condition truth will be 1; otherwise, it will be 0.

The system will perform logical operations on the AND and OR group to obtain the final truth value.

If the final truth value is 1, then system will switch to standard operating mode without LTE disconnection and publish data according to the time setting.

Reload: Reload all the RTU parameters.

Poll Test: Polling Modbus register address.

Clear: Clear RTU parameters on the page. Not delete.

Edit: Select RTU parameters with the mouse and right-click to edit it.

Delete: Select RTU parameters with the mouse and right-click to delete the parameters.

6.8 Relay/DO

This function TAB shows the Relay State and provides Control Test as well.

Relay

Relay Control Test:

☐ On
 ☐ Off

Relay State:

Off

6.9 System

This function tab is for selecting the system operating mode and includes settings for the sleeping mode and RTU global parameters.

System

Operation Status: Standard

Operation Mode: Standard Apply Reload

Sleep Mode

Wakeup Interval: 15 min

Standby Time: 5 sec

Publish Interval: 60 min Apply Reload

RTU Global Parameters

Readout Timeout: 500 ms Apply Reload

Operation Status: currently operating mode

Operating Mode: system operating mode selection.

Standard: LTE connection remains active without interruption.

Sleep Mode: A low-power state to reduce power consumption. The system will automatically wake up, switch on the relay at set intervals, and wait for a period standby time to poll data. The publishing schedule will follow the publish interval timer.

Alert: Operates in sleep mode. If the register value exceeds the condition rule, the system switches to Standard mode for emergency situations, with continuous regular register polling and publishing. The publish time interval according the MQTT timer period setting.

Wakeup Interval: A time period, the system will wake up and start working.

Standby Time: The standby time is the waiting period for external RTU read/write operations. When the SCB111-485 wakes up, the relay will activate and switch on the power of the external device, and wait for a standby period for those devices to be ready for data polling. Once, the system has completed the data polling and publish, it will switch off the relay and enter sleep mode.

RTU Global Parameters: setting the RTU device read timeout timer.

RTU Global Parameters

Readout Timeout: 500 ms Apply Reload

6.10 Sys. Maintenance Setting (Sys. Maintenance TAB)

The Utility can download system logs and erase historical logs, as well as upload and download device configuration information.

Download System Log: Download the device event log. Support 100 event logs. (Sys on power/BS_F/S_F)

Path: SCB111-485 Utility\LogFile\EventLogResult.csv

Erase Log: Erase historical logs.

Upload Configure File To Device: Upload device configuration file. The configuration name and path should keep as original. The SCB111-485 only recognize file name – config.ini.

Path: SCB111-485 Utility\ConfigureFile\config.ini

Download Configure File From Device: Download the current configuration file.

Path: SCB111-485 Utility\ConfigureFile\config.ini

Download RTU From and Convert COTA File: Download the current configuration file and convert it to .cfg File

Path: SCB111-485 Utility\COTAFFile\convertRTUFromDevice.cfg

6.11 Ping TAB

This device supports Ping function and can write IP Address on the utility. Ping the target server ensures that the device can establish a connection with the server.

COM: COM3 Model Name: SCB111-485 Disconnect

Serial Cellular MQTT TCP Transparent SSL RTU Sys.Maintenance Ping

Ping

IP Address: 180.101.50.242 Reload Apply Start Ping

SCB111-485
?
X

Stop the Ping Testing ?

Click 'Yes', stop and switch the LTE module to LTE mode.

Click 'No', continue to perform the Ping function and the network mode is GSM mode.(Note: Please do not disconnect the USB or turn off power! Otherwise,the network will keep on GSM until powered on for 1 hour then switch to LTE.

Yes No

Read Ping Result:

Reply ID: 1 From 180.101.50.242 Response: Time=946ms

Reply ID: 2 From 180.101.50.242 Response: Time=235ms

Reply ID: 3 From 180.101.50.242 Response: Time=522ms

Reply ID: 4 From 180.101.50.242 Response: Time=439ms

Reply ID: 5 From 180.101.50.242 Response: Time=200ms

Reply ID: 6 From 180.101.50.242 Response: Time=175ms

Reply ID: 7 From 180.101.50.242 Response: Time=181ms

Reply ID: 8 From 180.101.50.242 Response: Time=199ms

Reply ID: 9 From 180.101.50.242 Response: Time=278ms

Reply ID: 10 From 180.101.50.242 Response: Time=182ms

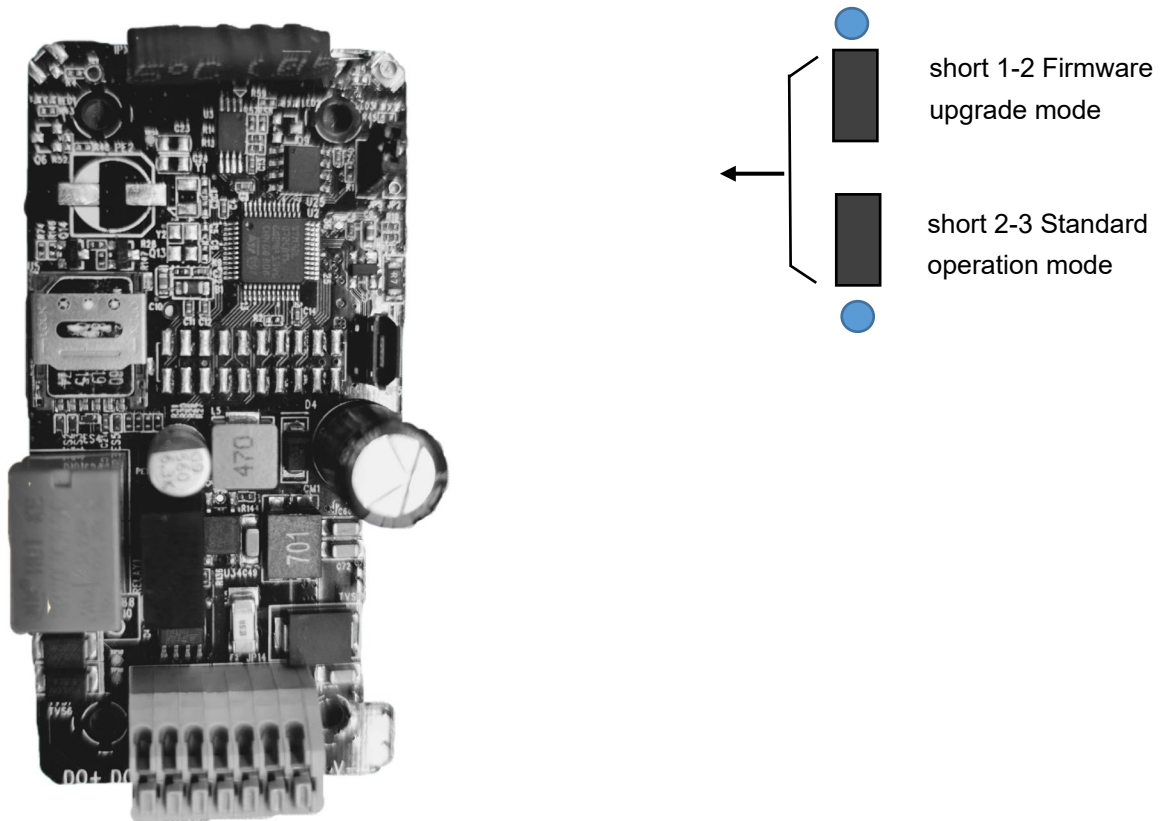
Clear

OK

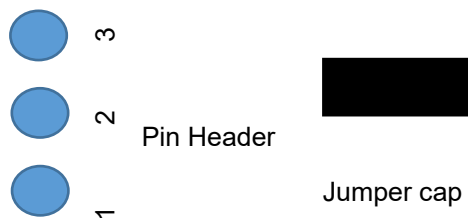
7 System Firmware Upgrade

The device supports the firmware upgrade function. The default setting is 2-3 short for normal operation, and short 1-2 pin will get into firmware upgrade mode. Programming new firmware via the USB and STM32 software tool which performs by Windows. The input power range is 9-30V DC. (**Recommended 24V DC**).

When the device operates in different modes, the jumper cap position is set as shown in the figure below.



Pin numbers of row pins are shown in the figure below:



The firmware programming tool is downloaded from the hyperlink -

<https://www.st.com/en/development-tools/stm32cubeprog.html>

All of the copyrights belong to ST Semiconductor. It needs to perform online registration.

Select the software version which depends on your programming platform.
The following procedure based on Windows 64 bits O.S.

Get Software

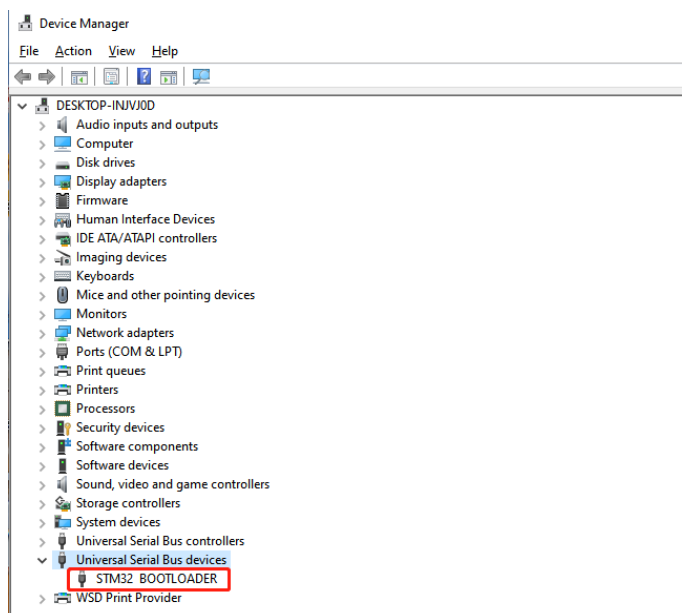
Part Number	Download	Previous versions
+ STM32CubePrg-Lin	Get Software	Select version ▼
+ STM32CubePrg-Mac	Get Software	Select version ▼
+ STM32CubePrg-W32	Get Software	Select version ▼
+ STM32CubePrg-W64	Get Software	Select version ▼

7.9 Update STM32 Driver

After the software installation is completed, it is necessary to confirm whether the STM32 driver is available before upgrading.

Disconnect the power supply of SCB111-485 and change the position of the jumper cap to upgrade mode. Connect your device to your PC using USB. Open the PC Device Manager and “STM32 BOOTLOADER” will be displayed in the Universal Serial Bus devices subdirectory. The installation success status is shown in the following figure.

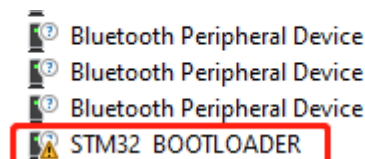
If the drive is yellow appears, the properly. You driver at this



shown as follows: A exclamation mark drive is not installed need to reinstall the time.

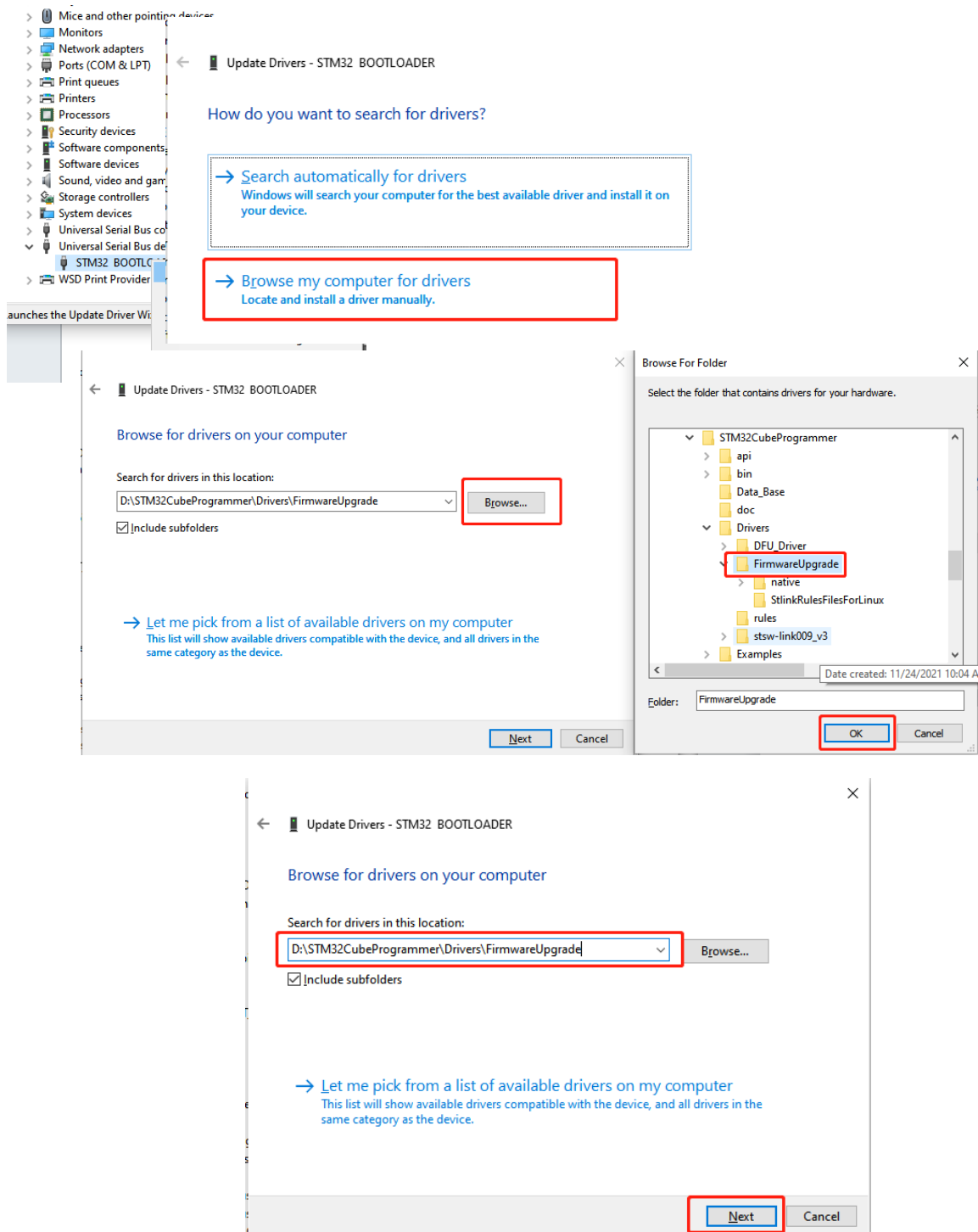
Update driver

Right-click "STM BOOTLOADER"=>Update driver=>Browse my computer for drivers=>Browse=> STM32CubeProgrammer\ Drivers\ FirmwareUpgrade=> OK=> Next



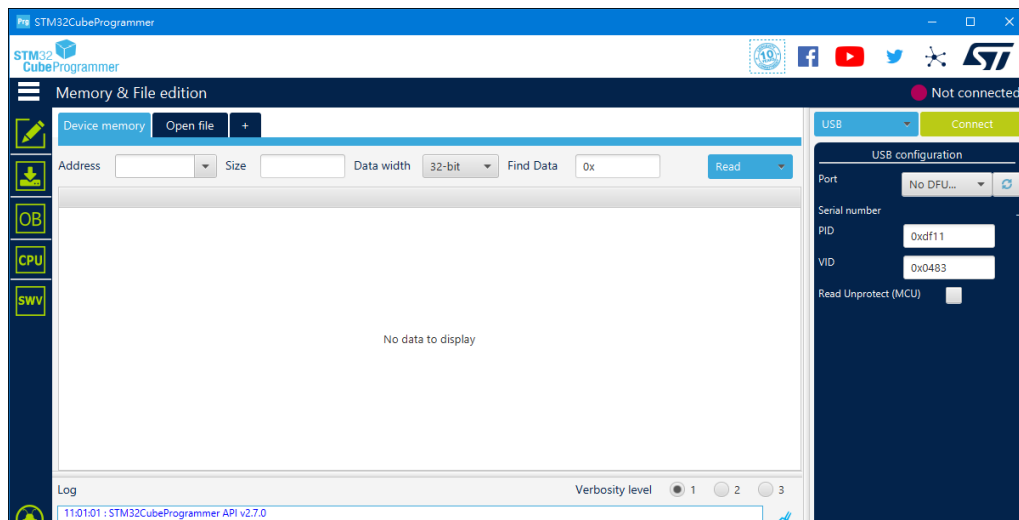
steps:

After completing the above steps, the yellow exclamation mark on the drive disappears, indicating that the drive has been successfully installed.



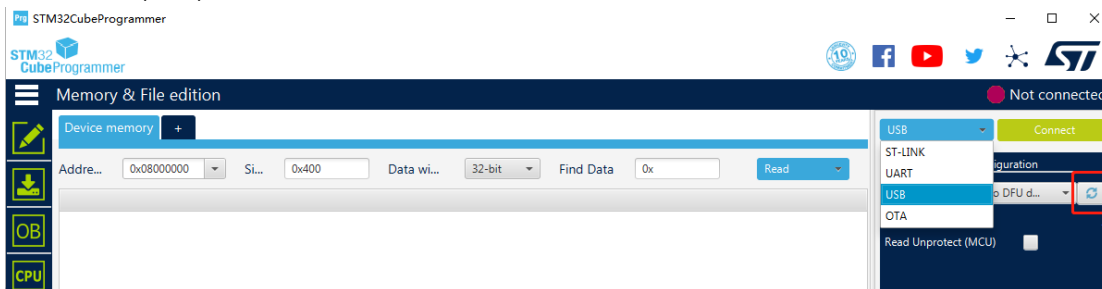
7.10 Start STM32 Cube Programmer

Step-1. Run the software “STM32 Cube Programmer”, the User Interface is like as below:

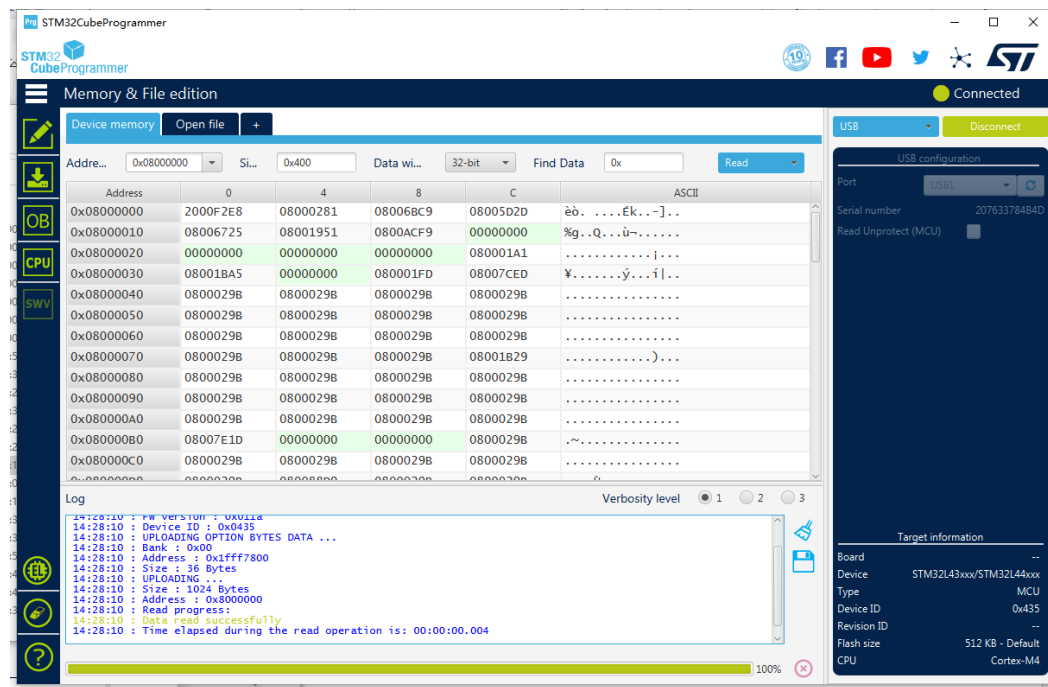


Step-2.

Select the Interface –USB, and refresh the Port located at USB Configuration, then it will show the “USB X(Port)”.

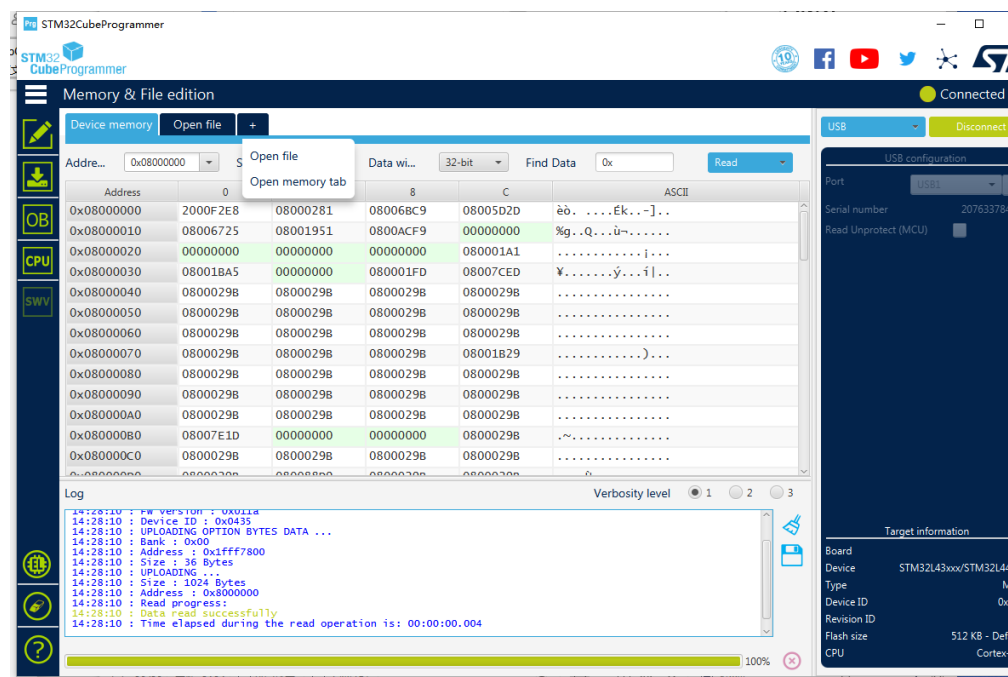


Click the “Connect”, then the tool will download the current HEX from the system. The UI will like as below:

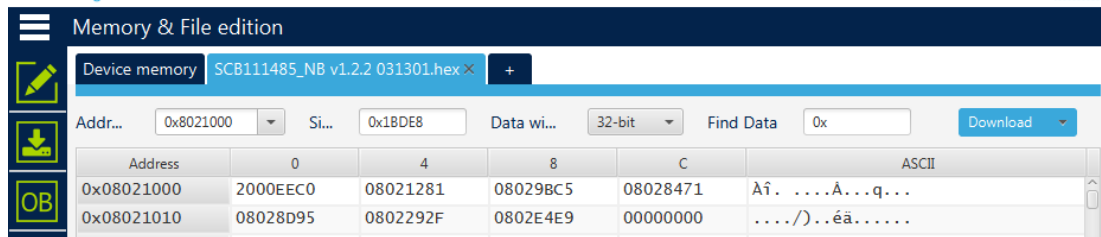


Now, the programming tool is successfully connected to the system.

Step-3: Download new firmware for the programmer. Click “Open file” and select target firmware – SCB111-485 xxx. hex.

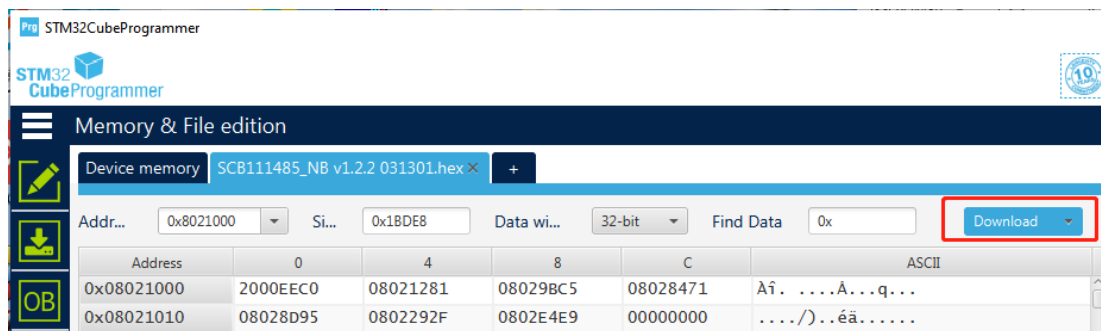


Once select target new firmware, the programmer will read and create a new TAB “SCB111-485 xxx. hex”.



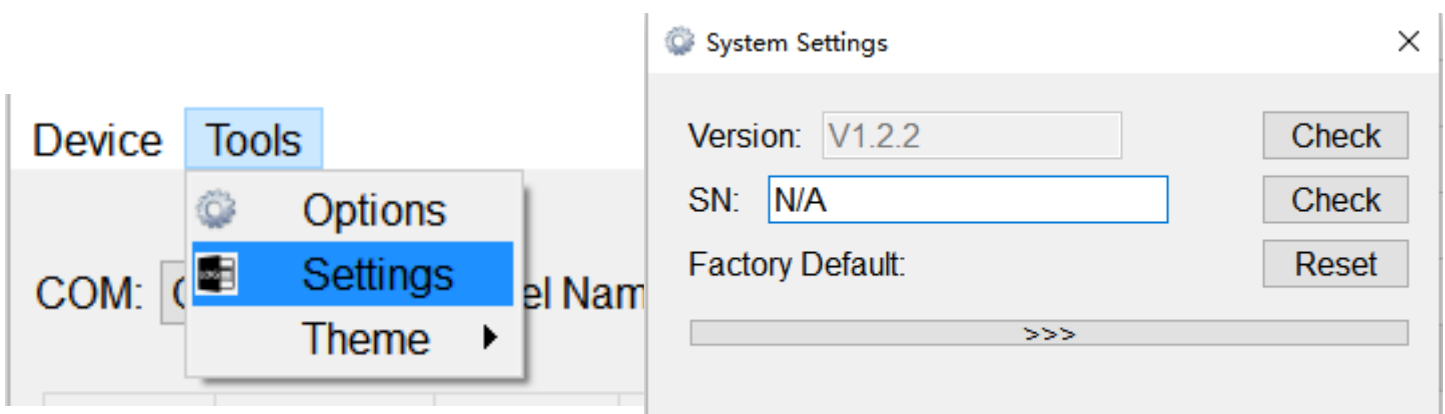
Step-4: Start Programming into the system

Click the "Download" icon to start programming into the system. After completed programming, it will pop up dialogue to remind process done.



Step-5 Finish Firmware Upgrade process

Disconnect the power supply, close the programming tool, and change the jumper to 2-3 short. Then power on the system and use the "SCB111-485-NB Utility" to check the firmware version. Click the Tools –Setting, and perform a version Check. It shows the version you upgraded. Congratulations, the firmware upgrade was successful. Don't forget to check the setting again, ensure the setting is not changed due to the firmware upgrade.



Release Note

Release Note – SCB111-485-DC			
Version	Description	By	Date
0.1	New edition based on SCB111-485-NB, Industrial RS485 to NB-IoT Gateway/Converter, LTE NB2/Cat.M1, 2-wire RS485, 10-60VDC Utility v1.7.3	Ann	2022,July,14
0.1	Release SCB111-485 RTOS v1.2.x, Utility v1.2.x: 1. System use FREE RTOS kernel. 2. Support Modbus Device, Register Setting -20 Devices, 140 Registers. 3. Modbus Function Code: 01, 02, 03, 04, 05, 06. 4. Support issuing commands through MQTT subscribe.(Relay control, Register write , System reset). 5. Support TCP Client with Serial Data Transparent. 6. Support FOTA (Firmware upgrade with HTTP). 7. 100 event log. (Sys on power/BS_F/S_F). 8. Support TLS v1.2 when use MQTTs/TCPs/HTTPs.	Ann	2023,Mar,24
0.2	Add : Utility Function Tab—Sys.Maintenance TAB Update driver steps	Ann	2023,Mar,28
0.3	Add: COTA information and command	Ann	2023,April,27
0.4	Add: Improve the interpretation of “idx” How to upload authentication certificates	Ann	2023,May,17
V1.00	Change Enclosure Outlooking, Inner Function Drawing. Add more description for the CoTA. Relay – 30Vdc/1A	RF	2023,May,23
V1.01	Add new function in Utility: 1. CFG File Converter 2. Download RTU Form Device And Convert COTA File	Ann	2023,June 13,
V1.02	FW v1.2.5, Utility v1.2.5 1. Support Local time/Unix time switching 2. Adjust the maximum length of parameters such as APN and MQTT to 51 bytes 3. Adjust the maximum length of RTU name characters to 8 bytes	Ann	2023,Aug,31
V1.03	FW v1.2.6, Utility v1.2.6	Ann	2023,Sep,28

	1. Support short/ushort/flat/int/uint/ascii types, supports byte-swapping. 2. Update description: Number of entries in different data formats.		
V1.04	Update MQTT information set command Add Ping function	Ann	2024, Jan, 11
V1.05	New version firmware: 1. Reduce the RTU entry number to 30 2. New model with SMA connector – SCB111-485-SMA 3. Multiple operating mode – standard, sleeping, alert modes 4. Supports condition rule for alert mode 5. Model: (1) SCB111-484-dc (internal antenna) (2) SCB111-485-SMA (SMA antenna connector)	RF	2025,JAN,13