USER GUIDE FOR ICONNECTOR CELLULAR CAT M1, NB1, 2G, GLOBAL BAND STHC-ISGM1-NB1-2G-NC

STHC-ISGM1-NB1-2G-01-MN-EN-01	SEP-2020

This document is applied for the following products

SKU	STHC	**HW Ver.**	3.3	**FW Ver.**	IoT_N1.0
Item Code	STHC-ISGM1-NB1-2G-NC	iConnector CAT M1, NB1, 2G, Global Band, internal antenna, with 02 relays			

1. Functions Change Log

HW Ver.	FW Ver.	Release Date	Functions Change
3.3	IoT_N1.0	SEP-2020	

2. Introduction

STHC is a Smart IoT Gateway, aka iConnector, a main component in any IoT application. iConnector has a role to connect the real World's things like sensors, meters, ,machines...to server system for data logging, data analytics, monitoring & controls...iConnector support multiple Industrial Fieldbus like Modbus, EthernetIP, Profinet, CClink, Wireless sensor network...It connects to server system via LAN/WAN as Ethernet, WiFi or Cellular.



3. Specification

Host Communication	CAT M1, NB1, 2G, Global Band, internal antenna
Host communication supports	TCP/IP, UDP/IP, FTP, HTTPS, SNMP...
Fieldbus communcation	ModbusRTU x 01 port, 31 slaves, max 19.2 kpbs
Vietnam Type Approval Cerification	QCVN 54:2011/BTTTT, QCVN 15:2015/BTTTT (DAVITEQ B00122019)
Optional	Integrated wireless co-ordinator with external antenna or internal antenna
Optional	Internal buzzer (to replace Relay 1)
Power supply	7..48VDC, avg 200mA, peak 1.5A
Battery	Lithium Battery 3.7VDC
On-board memory & sensors	2MB Flash, PCB temperature sensor
Electrical connectors	M12, 4-pin, coding A or 9mm Power Plug and USB port
SIM slot	01 x micro-SIM (cellular versions only)
Included accessories	mounting bracket for wall mount (cellular version only)
Operating Temperature/Humidity	-20 .. + 60 degC / 95%RH, non-condensing
Housing/Protection	Aluminum+Polycarbonate for Cellular version, anti-UV plastic for Ethernet/WiFi version. All version is IP67 protection
Dimension	H106xW73xD42 for Cellular version, H130xW90xD40 for Ethernet/WiFi versions

Net weight	190 grams for Cellular version, 350 grams Ethernet/WiFi versions
Relay outputs	02 x relay SPST NO contact, 125VAC@0.3A or 24VDC@1A

4. Operation principle

4.1 Modbus communication

4.1.1 Configuration

- Protocol: Modbus RTU
- Address: 1 - 247
- Baud rate: 4800, 9600, 19200
- Parity: none, even, odd
- Stop bits: 1

4.1.2 Configuration via Memory map

We can configure online using the memmaps shown in the table below:

> **Note:** **R:** Read, **W:** Write

IConnector health configuration area:

ADDRESS (in decimal)	ADDRESS (in hex)	LENGTH (in byte)	TYPE	NAME	DESCRIPTION	UNIT	Server
8960	2300	4	float	power supply	External power supply voltage	volt	R
8964	2304	4	float	battery	Battery voltage	volt	R
8982	2316	1	byte	gsm signal quality	GSM signal strength		R

Configuration area 0x7F80:

ADDRESS (in decimal)	ADDRESS (in hex)	LENGTH (in byte)	TYPE	NAME	VALUE (Recommended)	DESCRIPTION	Server
32640	7F80	20	string	CAT-M1 Band			R/W
32660	7F94	20	string	NB1 Band			R/W
32680	7FA8	1	byte	RAT1		0: Configuration running Cat-M1 only, not using RAT2, RAT31: Cat-M12: NB13: GPRS	R/W
32681	7FA9	1	byte	RAT2		0: Not using RAT2, RAT31: Cat-M12: NB13: GPRS	R/W
32682	7FAA	1	byte	RAT3		0: Not using RAT31: Cat-M12: NB13: GPRS	R/W

32683	7FAB	1	byte	apply_new_LTE		write 1 to apply new LTE config	R/W
32684	7FAC	1	byte	attach_network_times	10	• Number of attempts to connect to 1 RAT before switching to the next RAT when connection failed; • RAT1 => RAT2 => RAT3 => RAT1; • One connection attempt takes about 10-20 seconds.	R/W
32685	7FAD	1	byte				R/W
32686	7FAE	2	uint16	time_RAT1		Every **time_RAT1** minutes will try to reconnect to RAT1 if it is currently running at RAT2 or RAT3	R/W
32688	7FB0	2	uint16	time_FOTA	0	• After **time_FOTA** minutes will connect to the server of **Sierra Wireless** 1 time to check for FW updates or not; • Write 0 to turn off FOTA.	R/W

Configuration Relay:

ADDRESS (in decimal)	ADDRESS (in hex)	LENGTH (in byte)	TYPE	NAME	DESCRIPTION	UNIT	Server
12416	3080	1	byte	relay 1	0: OFF, 1: ON		R/W
12417	3081	1	byte	relay 2	0: OFF, 1: ON		R/W

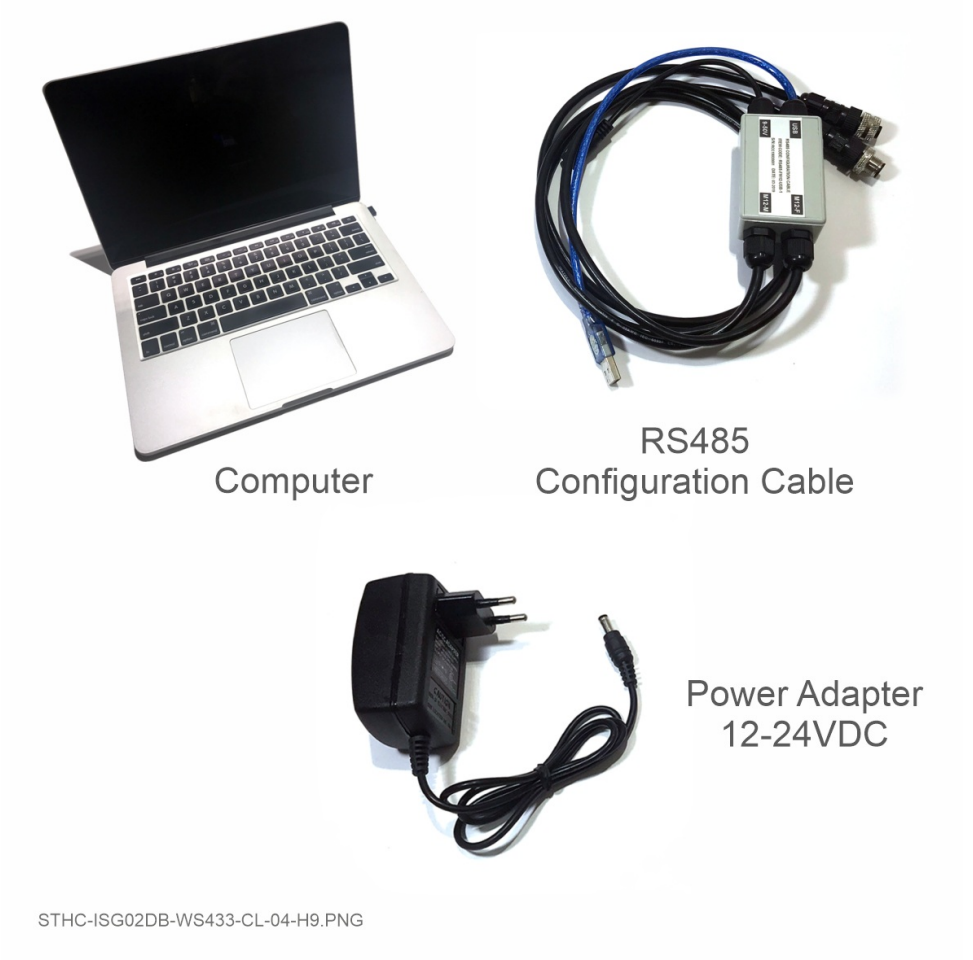
Configuration modem, SIM:

ADDRESS (in decimal)	ADDRESS (in hex)	LENGTH (in byte)	TYPE	NAME	DESCRIPTION	UNIT	Server
160	A0	20	string	modem hl serial			R

180	B4	20	string	imei	identification text for determination of the individual ME		R
200	C8	20	string	imsi	International Mobile Subscriber Identity		R
220	DC	20	string	iccid	SIM Card Identification		R
240	F0	16	string	modem hl fw ver			R
9056	2360	10	string	Model identifier			R
9066	236A	22	string	Active LTE Band			R

4.2 Offline configuration

First, you need to prepare



Step 1: Connect iConnector to RS485 - configuration cable via and power supply iConnector



SUPPLY POWER 12-24VDC



STHC-ISG02DB-WS433-CL-04-H11.PNG

CONNECT RS485 - CONFIGURATION
TO COMPUTER via USB



STHC-ISG02DB-WS433-CL-04-H13.PNG

Step 2: Open Modbus tool on PC

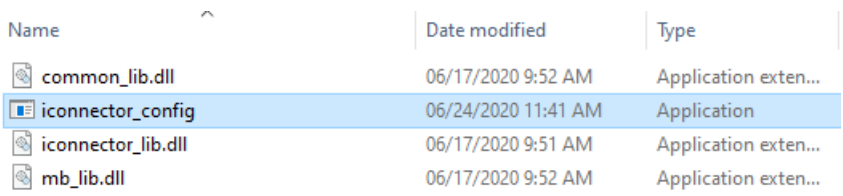
You can download iConnector Configuration Tool with the following link:

https://filerun.daviteq.com/wl/?id=INjzZbDo7Jwyr1x8DAD3x620tNK5u8lF

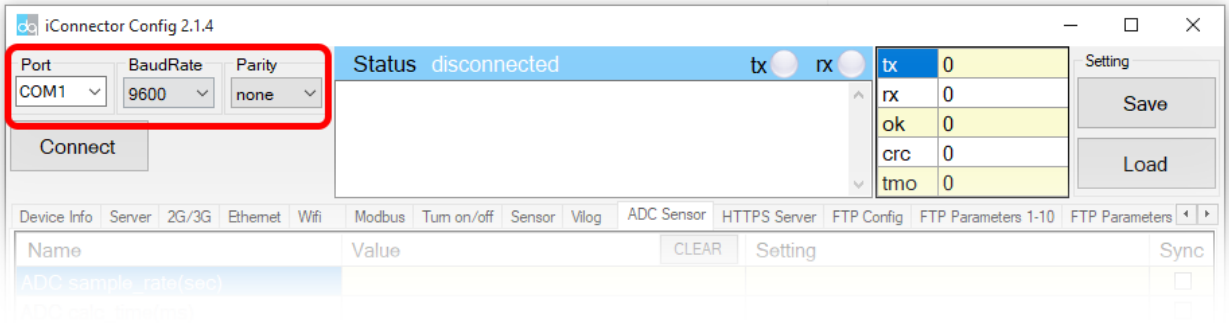
How to use the Modbus configuration software

Step 3: Open Modbus tool on PC

Unzip file and run file application "iconnector_config"



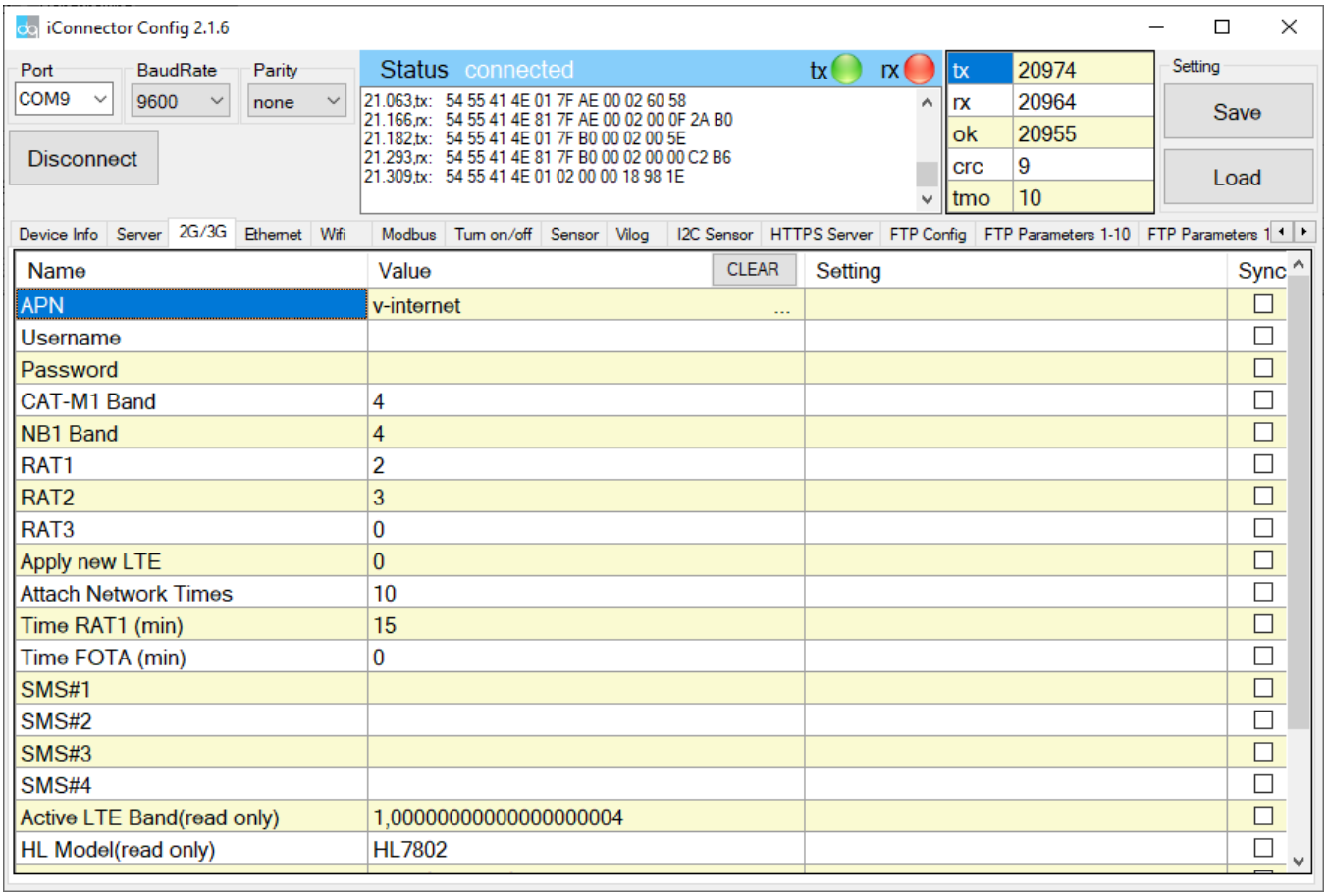
- Choose **COM Port** (the Port which is USB cable plugged in)
- Set the **BaudRate: 9600**, **Parity: none**



- Write in the **Setting** column the data to be configured into iConnector;
- Click **Sync** to synchronize data into iConnector;
- After synchronizing the data into iConnector, if the data displayed in the**Value** column shows the corresponding data, the configuration is completed.

SIM CARD CONFIGURATION

Based on the information of the mobile carrier that provides the SIM card, we configure data such as**APN**, **username**, **password** on the 2G/3G tab.



4.2.1 Configure CAT-M1 Band and NB1 Band

<bnd bitmap> Band bitmap in hexadecimal format without the 0x prefix.

This is the logical representation of 1 << (BandNumber - 1).

(Currently only used for RAT CAT-M1 and NB-1.)

0000 00000000 00000000	Not available
0000 00000000 00000001	LTE Band 1 (2000 MHz)
0000 00000000 00000002	LTE Band 2 (1900 MHz)

0000 00000000 00000004	LTE Band 3 (1800 MHz)
0000 00000000 00000008	LTE Band 4 (1700 MHz)
0000 00000000 00000010	LTE Band 5 (850 MHz)
0000 00000000 00000080	LTE Band 8 (900MHz)
0000 00000000 00000100	LTE Band 9 (1900MHz)
0000 00000000 00000200	LTE Band 10 (2100MHz)
0000 00000000 00000800	LTE Band 12 (700 MHz)
0000 00000000 00001000	LTE Band 13 (700 MHz)
0000 00000000 00010000	LTE Band 17 (700 MHz)
0000 00000000 00020000	LTE Band 18 (800MHz)
0000 00000000 00040000	LTE Band 19 (800MHz)
0000 00000000 00080000	LTE Band 20 (800MHz)
0000 00000000 01000000	LTE Band 25 (1900MHz)
0000 00000000 02000000	LTE Band 26 (800 MHz)
0000 00000000 04000000	LTE Band 27 (800 MHz)
0000 00000000 08000000	LTE Band 28 (700MHz)
0002 00000000 00000000	LTE Band 66 (1800MHz)

configure multiple bands, add them up according to hexadecimal.

For example: Configure band 2, 3, 4, 5, then add (0x02 + 0x04 + 0x08 + 0x10) = 0x1E

=> Band configuration is **1E** (the leading zeros can be removed)

4.2.2 RAT1 configuration

0	Configuration running Cat-M1 only, not using RAT2, RAT3
1	Cat-M1
2	NB1
3	GPRS

4.2.3 RAT2 configuration

0	Not using RAT2, RAT3
1	Cat-M1
2	NB1
3	GPRS

4.2.4 RAT3 configuration

0	Not using RAT3
1	Cat-M1
2	NB1
3	GPRS

4.2.5 Configure Apply new LTE

- After configuring we write down 1 to apply the new configuration, go back to RAT1. After execution, ICT will automatically reset to 0.

4.2.6 Configure Attach Network Times

- Number of attempts to connect to 1 RAT before switching to the next RAT when connection failed;
- RAT1 => RAT2 => RAT3 => RAT1;
- One connection attempt takes about 10-20 seconds.

4.2.7 Configure Time RAT1 (min)

- Every minute of time_RAT1 will try to reconnect with RAT1 if it is currently running in RAT2 or RAT3. Minimum 15 minutes.

4.2.8 Configure Time FOTA (min)

- After **time_FOTA** minutes will connect to the server of**Sierra Wireless** 1 time to check for FW updates or not;
- Write 0 to turn off FOTA.

→ Use to update the new FW for the HL7802 modem.

4.3 Operational principle of RAT1, RAT2, RAT3

When the ICT is started, it will connect to RAT1 first. If the connection is successful, it will run at RAT1.

1. If the ICT connecting to RAT1 fails, it will try to reconnect (Attach Network Times) times.
   - If not, it will be transferred to RAT2.
   - If successfully connected to RAT2 it will run at RAT2.

2. If the ICT connecting to RAT2 fails, it will try to reconnect (Attach Network Times) times.
   - If not, it will be transferred to RAT3.
   - If successfully connected to RAT3 it will run at RAT3.

3. If the ICT connection to RAT3 fails, it will try to reconnect (Attach Network Times) times.
   - If not, it will be transferred to RAT1.
   - If successfully connected to RAT1 it will run at RAT1.

4. Every **time_RAT1 minutes** will try to reconnect to RAT1 if it is currently running at RAT2 or RAT3.
5. Write 1 to Apply new LTE then ICT will try to reconnect to RAT1 immediately (if it is currently running at RAT2 or RAT3).

4.4 The information of modem, sim

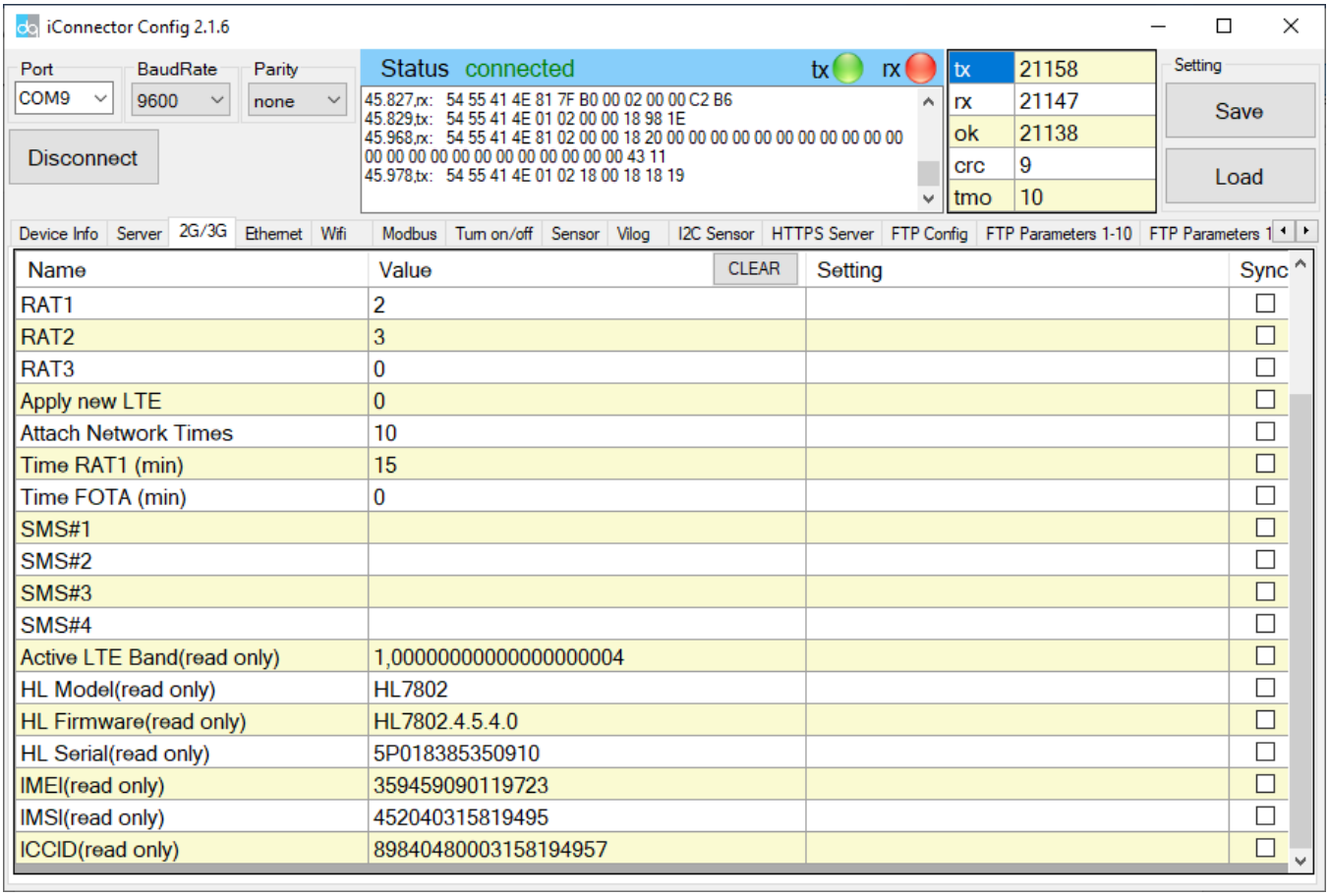
Memmaps information of modem, sim in the table below:

ADDRESS (in decimal)	ADDRESS (in hex)	LENGTH (in byte)	TYPE	NAME	DESCRIPTION	UNIT	Server
160	A0	20	string	modem hl serial			R
180	B4	20	string	imei	identification text for determination of the individual ME		R
200	C8	20	string	imsi	International Mobile Subscriber Identity		R
220	DC	20	string	iccid	SIM Card Identification		R
240	F0	16	string	modem hl fw ver			R
9056	2360	10	string	Model identifier			R
9066	236A	22	string	Active LTE Band			R

> **Active LTE Band:**
>
> Active LTE Band: see which RAT is running, which band.
> • Number **1** at the beginning of the sequence is NB1.
> • Number **4** is band 3 (1800 MHz).

NOTE:

The display of RAT differs from the configuration of Cat-M1, NB1, GPRS as 0, 1, 2; **NOT** 1, 2, 3.



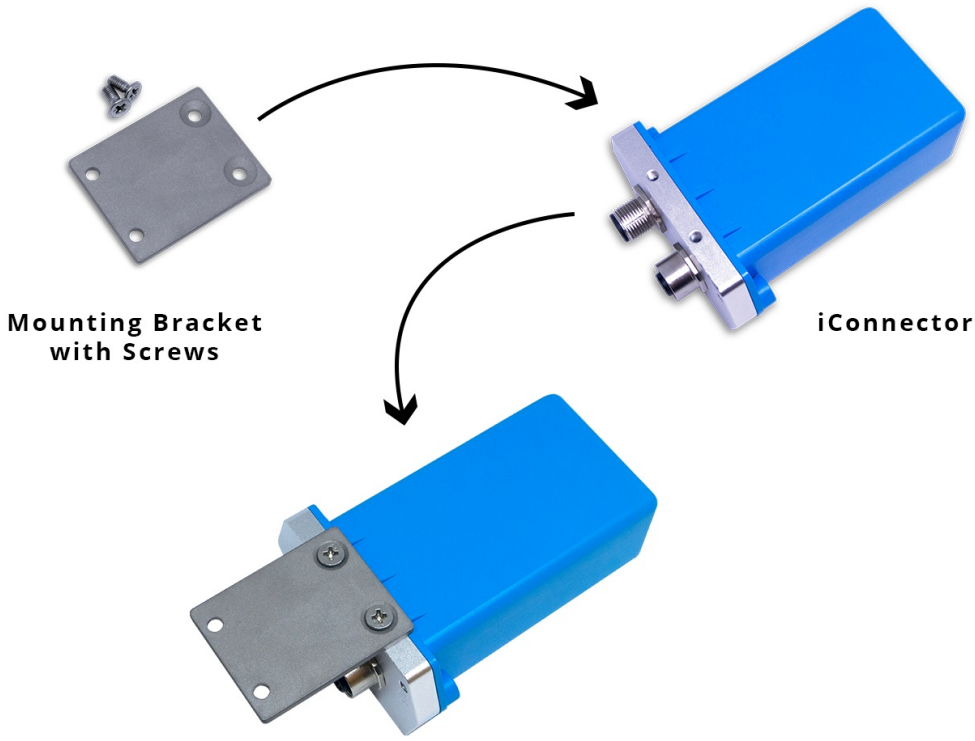
5. Installation

5.1 Installation location

Installed on a wall or in non-metal box. The bracket will be fixed on the wall or material with a planar surface with 2 x M4 screws;

ATTENTION:

DO NOT install the iConnector inside a completed **metallic** box or housing, because the RF signal can not pass through the metallic wall. The housing is made from Non-metallic materials like plastic, glass, wood, leather, concrete, cement...is acceptable.



5.2 IO Wiring

5.2.1 Connect Power Supply and Modbus

- Connect **PWR+** and **PWR-** to **7..48VDC** power supply via M12 Male connector
- Connect **A** and **B** to **RS485** connection.

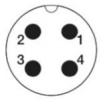
PIN ASSIGNMENT & WIRING



⇦ M12 Plug Female Connection (left side)

1-2: Relay 1 - Normal open contact

3-4: Relay 2 - Normal open contact



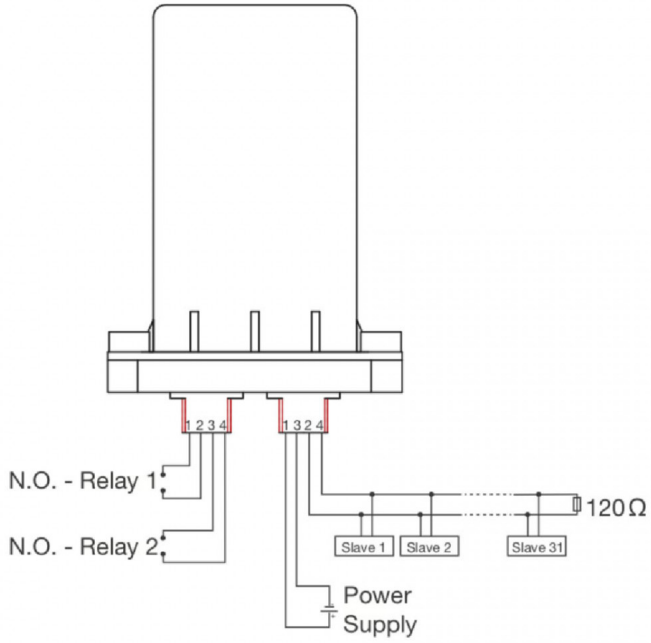
⇦ M12 Plug Male Connection (right side)

1 - PWR+ (Red)

2 - A (White)

3 - GND (Black)

4 - B (Green)

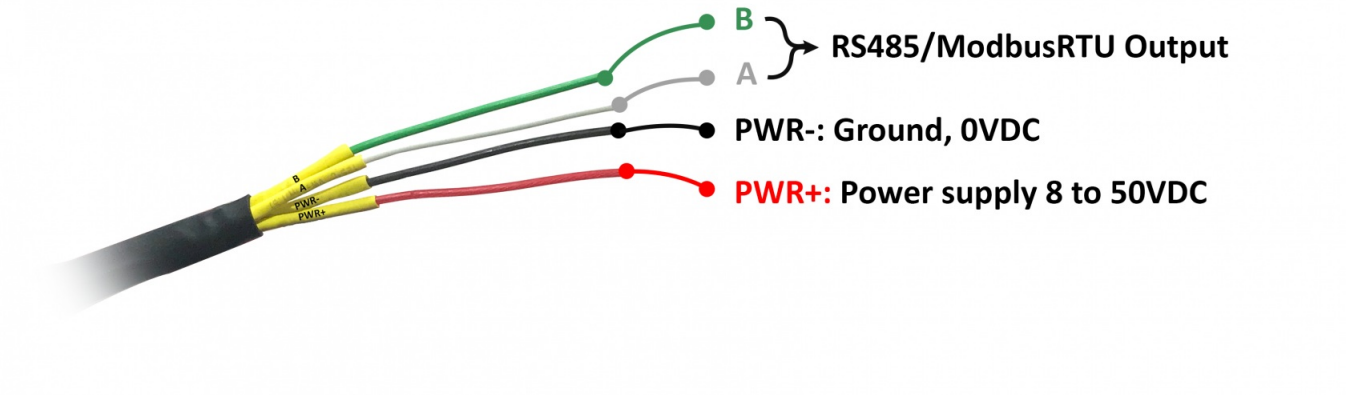


STHC-H2.PNG



Use M12 female connection cable to connect to iConnector





5.3 Battery installation

Steps for battery installation:

Step 1: Using L hex key to unscrew M4 screws at the side of housing



Step 2: Carefully pull out the top plastic housing in the vertical direction



Step 3: Attach the battery connector of the lithium battery and the circuit board together



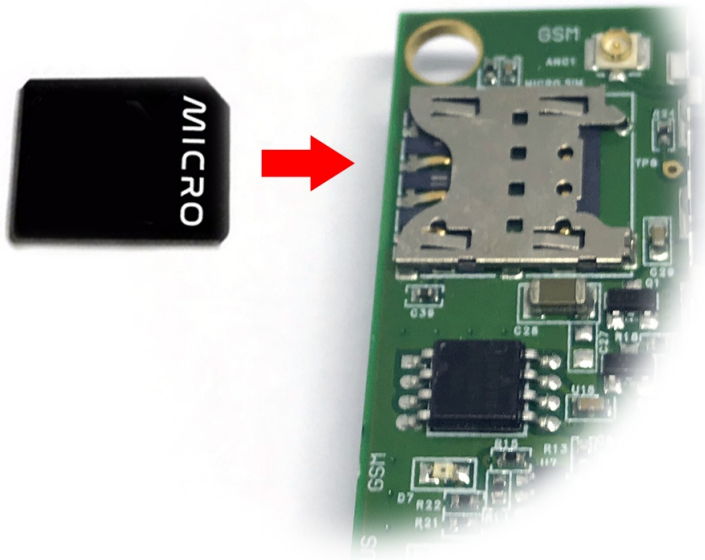
Step 4: Insert the top plastic housing and locking by L hex key

(**NOTE:** When reinstalling the cover, pay attention to put the PCB edge into the middle slot of the box inside as shown below)

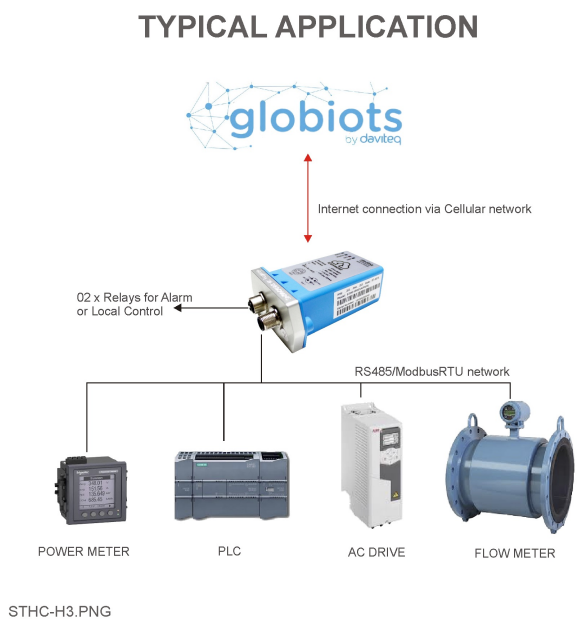


5.4 Insert SIM card

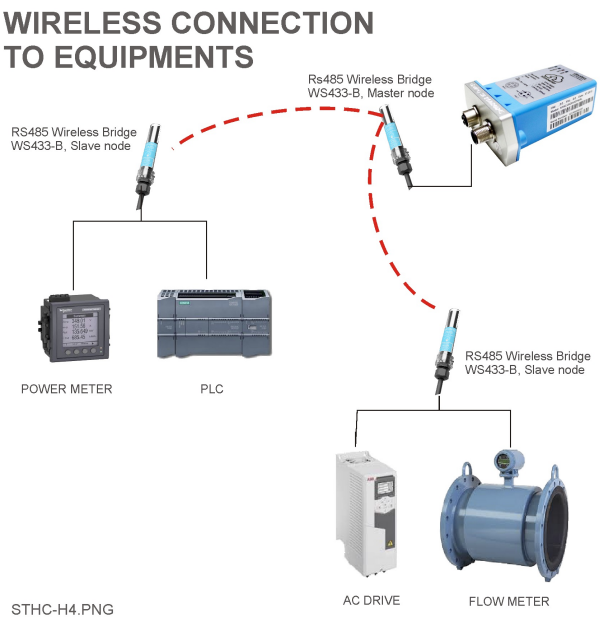
- Open iConnector cover with hex key and install the SIM card;
- Please insert the SIM in the direction printed on the label.



6. Example application



STHC-H3.PNG



STHC-H4.PNG

7. Troubleshooting

No.	Phenomena	Reason	Solutions

1	Data does not go to server, N/A	iConnector lost connection with server	• Check out the iConnector power supply • Check the operation of the sim (data, packages, ...) • Check the network coverage of the network in the area where iConnector is installed • Check physical Sim, Sim tray
2	• Data sent to server is held • Modbus error = 20 • Led modbus off	• Loss of the modbus connection • The configuration of parameter & modbus command is wrong	• Check for modbus wiring • Check the status of the modbus circuit of iConnector and Slaves • Check the parameter & modbus command configuration on Cloud
3	The data posted on Globiots is wrong, the phenomenon of value is changed abnormally continuously	Configuration parameter & modbus command is wrong	Check and correctly configure parameters & modbus commands
4	• Led status of iconnector not light • Led status 4s flashes once (iConnector is only running on battery)	Lost power iConnector	Check iConnector power supply
5	Led network does not light	• Not yet added iConnector to server or the information is wrong • Sim has run out of data • The device is out of range • Sim is broken	• Check out the information of iConnector add on server • Check the operation of the sim (data, packages, ...) • Check the network coverage of the network in the area where iConnector is installed • Check physical Sim, Sim tray

8. Support contacts

Manufacturer

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