LoRaWAN Metering Module

(HAC-MLW AU915)

User Manual VI.0

Version Management

Date	Version	Description	Revised by
2021.08	V1 .0	initial version	

Content

1. Overview

　　The HAC-MLW wireless remote meter reading system integrates acquisition,measurement,bidirectional communication and valve control etc, and it conforms to the LORAWAN 1.0.2 standard protocol which is formulated by LoRa Alliance. The system contains wireless meter reading acquisition module HAC-MLW, gateway LoRaWAN , LoRaWAN meter reading charging system (or we call it cloud platform).

2. Meter Module Feature

2.1. Electrical characteristics

No.	Item	Function description
1	Working frequency	LoRaWANR AU915MHz ISM Band
2	Maximum transmitting power	19dbm
3	Receiving sensitivity	<-136dBm
4	Working temperature	—20°C *70°C
5	Working voltage	+2.5V *3.8V
6	Receiving current	<9mA
7	Transmitting current	<l30mA (which is related to transmitting power)
8	Transmitting distance	The maximum line of sight communication distance between the gateway and the meter module is 15km
9	Valve electrical parameter	+2.5V *3.8V
10	Sleep current	<15uA
11	Dimension	42.1mm*24.8mm*3.2mm

2.2 Feature Description

No.	Feature	Function Description
1	Data reporting	There are two data reporting methods. Magnetic trigger to report data: The magnet triggers the hall components of the meter module, and the trigger time must be greater than 2S. Timed and active reporting: the reporting time slice is automatically allocated according to the Device Eui of the meter module, and the data is reported every 24 hours.
2	Power management	It will detect voltages of various states of metering module in real-time and report.

3	Measurement	TTL serial communication
4	Power-down storage	Support power-down storage function,there is no need to re-initialize the measurement value after power-off
6	Monthly and yearly frozen data storage	It can save 10 years of annual frozen data and monthly frozen data of the last 128 months, and the cloud platform can query historical data
7	Parameters setting	Support wireless near and remote parameter settings. The remote parameter setting is realized through the cloud platform, and the near parameter setting is realized through the production test tool.
8	Valve control	Valve type can be set to support remote valve control and valve fault detection (which is optional)

3. Meter module structure and interface definition

3.1. Module structure dimension
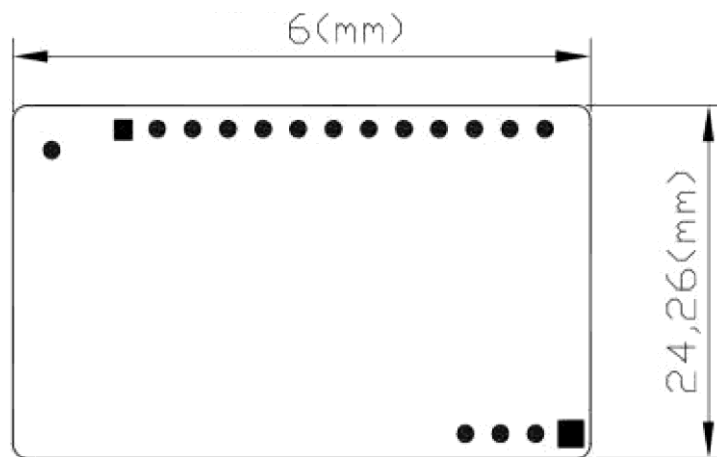
HAC-MLW 尺寸图
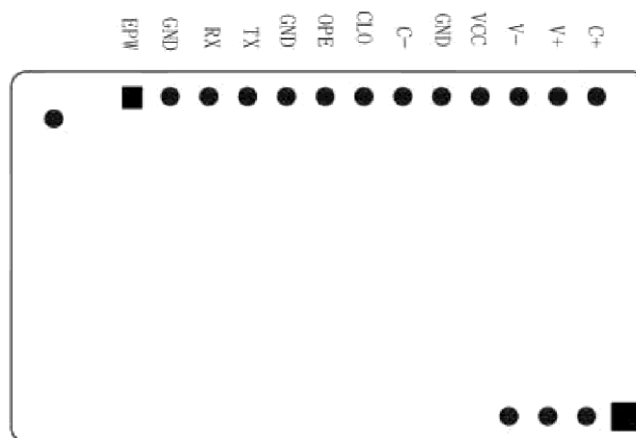
HAC-MLW 管脚分配实例（顶视图）

3.2. Interface definition

No.	Name	Pin description
1	EPW	Power Output
2	GND	Power Negative
3	RX	The S1 access terminal of the pulse can be extended to the RX terminal of LEUART
4	TX	The S2 access terminal of the pulse can be extended to the TX terminal of LEUART
5	GN	Power Negative
6	OPE	Valve open in place detection and signal input terminal
7	CLO	Valve close in place detection and signal input terminal
8	V—	Valve motor drive output terminal
9	V+	Valve motor drive output terminal
10	GND	Power Negative
11	VCC	Power positive（DC2.8V 6.0V）
12	C-	Farad capacitor negative
13	C+	Farad capacitor positive
14	HALL	Hall trigger detection
15	MR3	ADC sampling
16	OKI	Reserved

Note: The withstand voltage of the farad capacitor must be greater than the power supply voltage.

VCC: Connect the positive electrode of the 3.6V ER18505 battery.

EPW: Providing a 3.0V regulated power supply to the outside, the maximum current is 100mA, it needs to be customized and opened.

RX TX:Serial communication pin

The HAC-MLW module can be widely used in wireless remote meter reading systems. The module can be integrated in the meter or installed in a suitable position with an enclosure.

4.Instruction of production test tool

4.1.

No.	Function	LED status description
1	Power-on initialization	The LED light of the meter module will flash once when the power is on (it will be very short)
2	Chip voltage alarm	When the meter module is powered on for the first time, the chip voltage is lower than 3V, the meter module LED light will continue to flash at a frequency of 100ms, and the flashing time is about 30S.
3	Networking	When the meter module is connected to the Internet, the LED light is always on, and the LED light is off when the connection is successful or the maximum number of connections is reached. The LED light on time is related to the networking time, the longest time is 25 seconds (3 times networking).
4	Report data regularly	The meter module reports data regularly and the LED light will flash once (it takes a short time)
5	Magnetic trigger to report data	After the network is successfully connected, the LED of the data reported by the magnetic trigger meter module will flash twice (it will be very short).

5. Instructions of meter module

Step 1. Assemble the meter. It's processed as per the assembly document provided by HAC Telecom , if it is already assembled or does not need to be assembled, ignore this step.

Step 2. Information report and installation: report installation of meter module information (APPK, EUI, etc.) on the cloud platform (which is mainly based on the platform actually used by clients). After the installation is completed, check whether the meter module information is consistent with the platform. If the meter module has not joined the local LoRaWAN network at this time, please follow

step 3; if it has already been joined, please skip step 3.

Step 3. Join the local LoRaWAN network: the magnetic triggering meter module initiates networking, the LED light keeps on during the networking process, and the LED light will turn off when the networking is successful.

Step 4. Report data: Magnetic trigger to report data, check whether the water meter parameters and flow data are accurate through the cloud platform. If the data is deviated, it can be modified by setting parameters.

Step 5. Parameter setting: After the meter module is assembled, use the production test tool provided by HAC (if provided) or the cloud platform for parameter setting. To set the parameters using the cloud platform, you must complete the meter module information installation on the cloud platform.

Step 6. The meter module goes offline: the meter module fails to report in two consecutive reporting cycles, and the meter module goes offline. The next time the data is reported regularly, the network request will be initiated automatically.

The hall element of metering module is as follow:
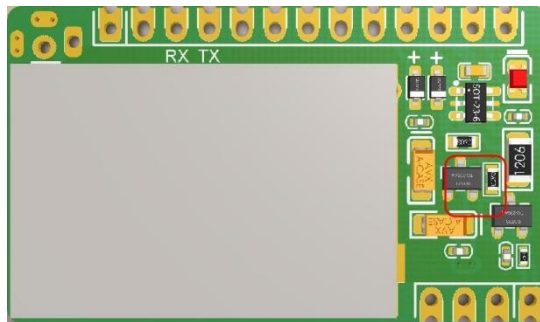
6.Precautions

6.1. The magnet triggers the hall components of the meter module. The triggering time must be greater than 2S. If the trigger time is less than 2S, there is a probability that the data report will fail.

6.2. The magnetic trigger reporting function is invalid when the meter module is connected to the Internet (the LED light of module is always on) or when the valve is controlled.

6.3. The cloud platform cannot check the data reported by the magnetic trigger. The processing method is as follows:

   a) Observe whether the LED indicator status of the meter module meets the described in Chapter 4 when the data is reported by the magnetic trigger.

   b) Check whether the installation information of the cloud platform is consistent with the information of the meter module.

   c) Still unable to solve the data reporting problem, please contact our technical staff.

7. Instruction of Production Test Tool

7.1. Tool list

No.	Tool list	Function description
1	HAC-MLW-F-T l-M2	Parameters setting and test data transfer
2	HAC-MLW-F-T2-M2	Monitor the field strength value of X meters from the LoRaWAN water meter (the distance is based on the production environment, select the returned field strength value -80dBm (the default fluctuation is 10 dBm)) to achieve fixed distance monitor.
3	5V RS232 serial cables 2PCS	Data transmission and HAC-MLW-T 1/2-M2 power supply
4	10cm 915MHz rubber rod antenna 2PCS	HAC-MLW-F-TI/2-M2 antenna
5	RS232 to USB serial cable	HAC-MLW-F-TI-M2 data transmission adapter cable
6	QR code scanning gun	Scan the QR code label of the LoRaWAN water meter to quickly get DeviceEui (which is optional)
7	IR communication device	Parameters setting
8	USB extended cable	Extend infrared communication device

It's shown as below:

7.2. Device connection

7.2.1. Wireless communication device connection

1 ）HAC-MLW-Tl-M2 device connection, 5V RS232 serial cable DB9 female with power interface connects to HAC-MLW-T 1-M2, the other end of DB9 female interface transfers RS232 to USB serial cable to connect to the PC.The 5V RS232 serial cable adapter connects to 220V urban electricity.

It's shown as below:

2) HAC-MLW-T2-M2 equipment connection, 5V RS232 serial cable DB9 female with power interface connects to HAC-MLW-T2-M2, SV RS232 serial cable adapter connects to 220V urban electricity (HAC-MLW-T2-M2 Please refer to 4.3 sample meter standard data collection for the placement location).

3   The QR code scanner is connected to the device, and the QR code scanner is connected to the PC.

7.2.2. Infrared communication device connection

1) use a USB extended cable to connect the infrared communication device to the PC.

7.2.3. Meter data acquisition（wireless communication mode）

Place the HAC-MLW-F-T l-M2 and the standard water meter on the workstation, turn on the host computer and switch to the [Run meter Test] interface, use a magnet to trigger the standard water meter to report data, and wait for the remote end of the HAC-MLW-F-T2-M2 to return data. Adjust the distance between HAC-MLW-F-T2-M2 and the standard water meter so that the returned field strength value is around -80dBm. At this time,fix the position of HAC-MLW-F-T2-M2 , and use the magnet to trigger the standard water meter to obtain 10 packets of remote data. The average of the field strength value of 10 packets' data is the standard field strength value. The standard field strength value is used in the supported software to judge qualified threshold value of the field strength.

In the case of two stations, please ensure that the field strength value of the water meter collected by the distance between the HAC-MLW-T2-M2 and the two stations is between -70dBm and -90dBm. The deployment of the sampling standard field strength is shown in the figure below:
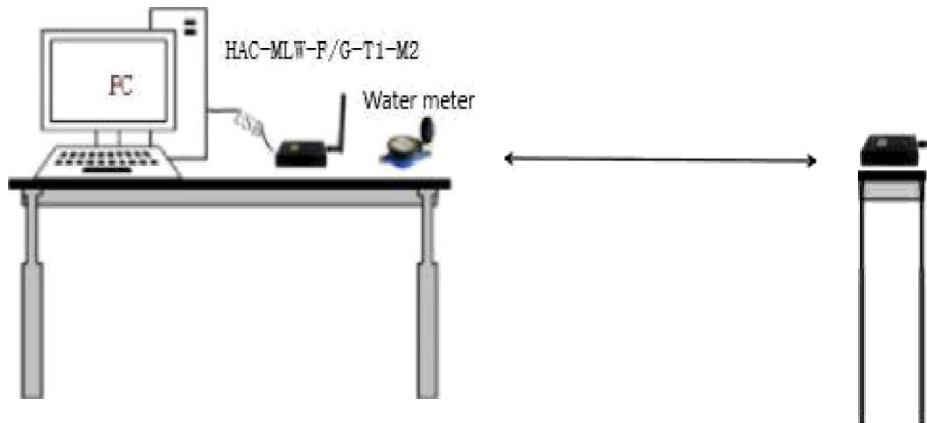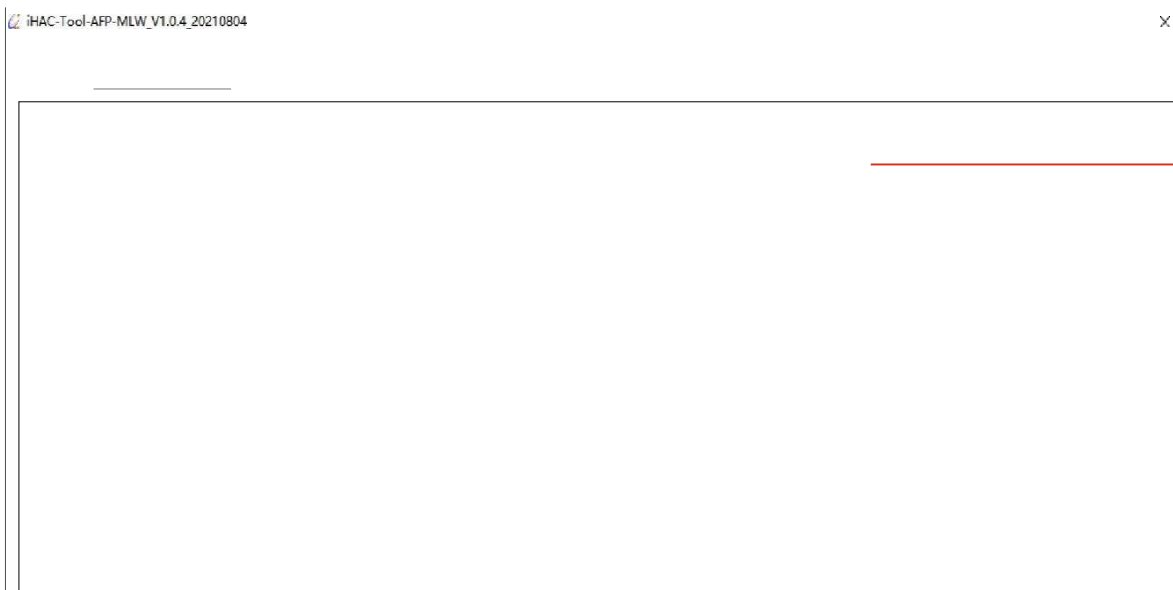
The interface of parameters setting is below:

Obtain the remote field strength value:

7.2.4 Supported software

The software supports two communication methods, namely wireless communication and infrared communication. The software cannot use two communication methods at the same time, only one of them can be used.

7.2.5. Software installation

Don't need to install the supported software.

Right-click the execute file /t iHAC-Tool-AFP- MLW VI.0.4_2ßZ108D4.exe (iHAC-Tool-AFP-MLW V1.0.4 20210804.exe) on the desktop and run it with the privilege of administrator.

7.2.6. Interface - fi **Serial port setting** l

1. Module serial port configuration, the serial port is selected according to the actual situation (please check the serial port in the device manager), the baud rate is 9600 bps, and no check.

2. Scanner serial port configuration, there are two ways of scanner data interface: ÖSerial port mode, configure it according to the actual situation of scanner; 2USB mode, do not need to configure the serial port parameters, just connect to the computer and use it.

3. The qualified field strength threshold value of the water meter and HAC-MLW-T2-M2 communication, the qualified range of field strength value can be obtained by sampling the standard water meter (the standard value method: trigger the standard water meter by a magnet to obtain 10 packets of remote data, take the average of the field strength values in the 10 packets of data). For more details, please refer to the standard data collection of the sample meter in table 7.3.

4. The voltage qualified value of battery is set to 3.6V.

5.Language setting: choose Chinese or English display interface and report data

It's shown as below:

7.2.7. Interface - fi Parameters Setting I

1). "Use Remote", check "Use Remote" to enable the field strength value monitoring function of the fixed-distance communication between the water meter and HAC-MLW-T2-M2.

2). "The base meter with valve",it's selected according to the type of water meter valve. When the water meter has a valve, check "The base meter with valve" and the valve control command will be executed.

3). "Water meter parameters", preset water meter parameters, including meter type, measurement mode, pulse constant, maximum measurement value, current cumulative flow.

4). "Meter number",it's automatically increased by 1 when it is turned on, and it's automatically increased by 1 based on the success of the previous setting.

5). "DeviceEui", the DeviceEui of the water meter to be tested, scan the QR code label of the water meter with the scanner to quickly obtain the DeviceEui of the water meter.

6). Network access parameters: preset DeviceEui, APPEUI, APPKEY of sample meter. Among them, check "AppKEY transmitted or not", you can set DeviceEui, APPEUI, APPKEY, and if you don't transmit AppKEY, you can only set DeviceEui.

7). Valve and frequency deviation parameters: preset the valve type and frequency deviation of the sample meter. Check the "valve and frequency deviation parameters" to set the sample meter frequency deviation and valve type, and if you don't select valve and frequency deviation parameters" , the valve type and frequency deviation parameters have been set at the factory, so there is no need to set under the normal condition.

8). Timing time setting: the time of the entire setting process after clicking the "Set" button.

9). After setting and presetting the parameters, click the "Setting" button to start the countdown. If the setting is completed within 60 seconds, it will proceed to the next test. If the setting is not completed, the prompt "Failure, detection timeout" will be output on the right.

10). Real-time display of setting parameters and test results.

It's shown as below.
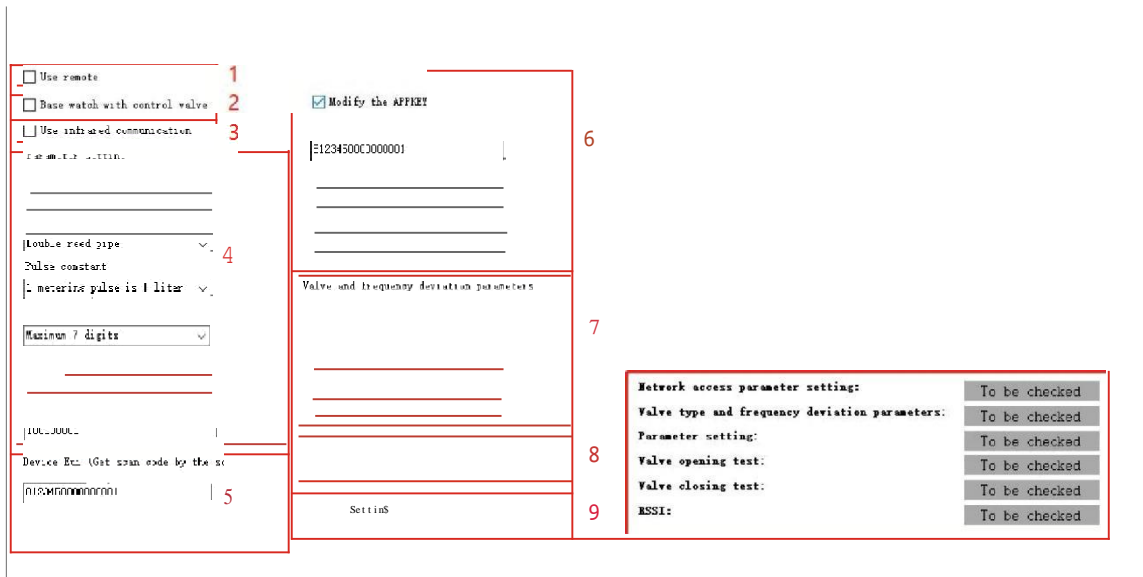
7.2.8 Interface - fi Data Statistics I

After the test is passed, the last reported data will be recorded (the data will not be recorded when the test is unqualified), and the recorded data will be generated into an Excel and stored in the "ExcelFile" file in the installation directory.

It's shown as below:

7.2.9 lntefae- {RunnngMeteyTest}

Real-time display of data in the process of setting parameters, and supports valve control.

1). Valve control: fi11 in the DeviceEui number, click the button "valve open" or "valve close" , and then use a magnet to trigger the water meter to report data to achieve valve control.

2). Clear the data: click the button "Clear the Data" to clear the data displayed in the list.

It's shown as below:
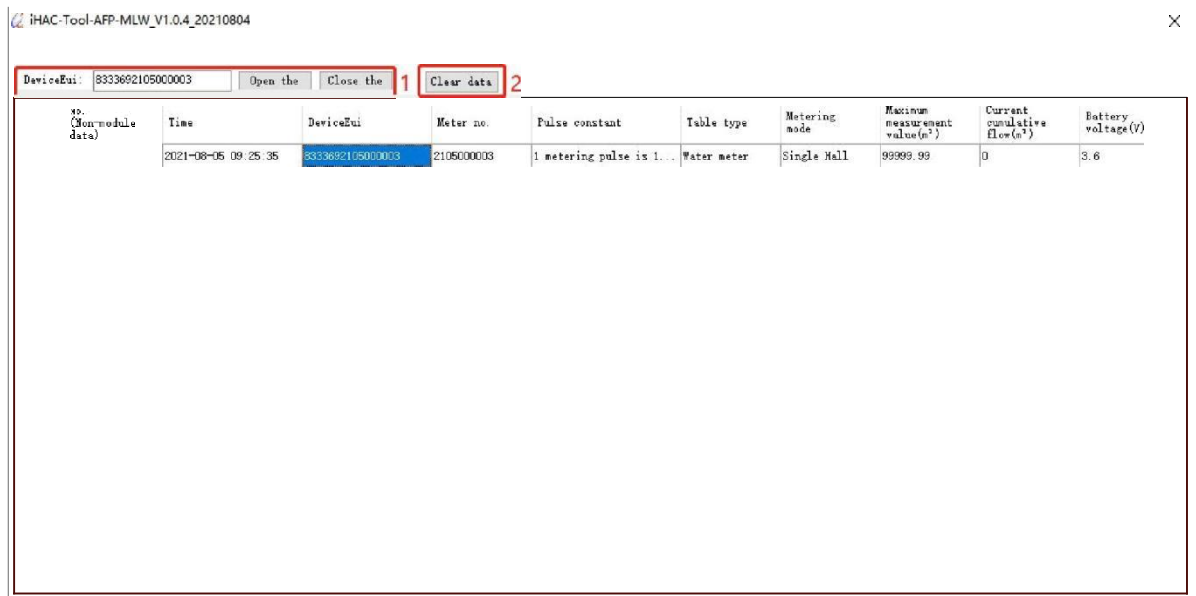
8. Production Test Flow

8.1 Wireless communication mode

8.1.1 The production setting steps can be referred as below:

1). Check "Use remote" and "Base meter with valve".

2). Preset the parameters of meter.

3). Use the scanner to scan the QR code label of meter to obtain DeviceEui, or manually enter it.

4). After clicking "Setting", the meter will be triggered to report data and start production test. After the production test is completed, the corresponding prompted message will be output on the upper right. It's shown as below:

8.2. Infrared communication method (the meter must support infrared communication)

8.2.1 The production setup steps are as follow:

1). Check "Use infrared communication".

2). Preset meter parameters

3). Use the scanner to scan the QR code label of meter to obtain DeviceEui, or manually enter it.

4). Align the infrared communication device vertically with the infrared transceiver diodes of meter, and the distance between them is less than 8cm.

5). After clicking "Setting", the meter will be triggered to report data and start production test. After the production test is completed, the corresponding prompted message will be output on the upper right. It's shown as below:
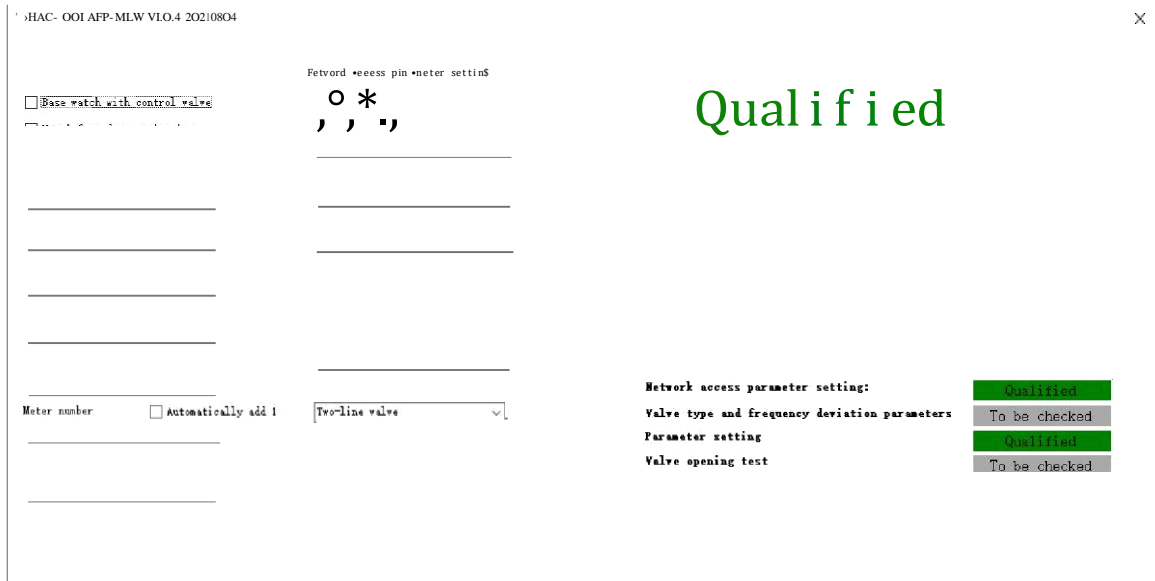
8.3. Precautions for production setup

l). The magnet triggers hall components of meter module. The triggering time must be greater than 2S. If it's less than 2S, there is a possibility that the triggering of the data report will fail.

2). DeviceEui is the only address for communication between meter and the supported software. The DeviceEui entered by the supported software must be consistent with the DeviceEui of meter.

3). When the meter is connected to the Internet (the red light is always on) or when re-transmitting, the function of triggering "data report" is invalid.

4). There is a fault flag in the data reported by the meter, and the parameters can be set only after the fault flag is cleared.

5). Infrared communication will affect the communication between the product and infrared tools under strong light. It is necessary to avoid performing infrared communication under strong light.

6). Use wireless communication to set the parameters, try to avoid multi-station simultaneous production settings, and the production settings will interfere with each other. The more stations, the greater the interference, and the greater the probability of parameter failure.

7). When modifying APPKEY, the default value of APPEUI must be modified. The default value of APPEUI is 4841434D4C570001.

9. LoRaWAN Gateway Device Feature

9.1.Electrical characteristics

No.	Item	Function description
	Working frequency	LoRaWANR AU915MHz ISM Band
2	Maximum transmitting power	19dbm
3	Receiving sensitivity	<-136dBm
4	Working temperature	—20°C *70°C
s	Working voltage	+2.5V *3.8V
6	Receiving current	<9mA
7	Transmitting current	<l30mA (which is related to transmitting power)
8	Transmitting distance	The maximum line of sight communication distance between the gateway and the meter module is 15km
9	Valve electrical parameter	+2.5V *3.8V
io	Sleep current	<15uA
11	Dimension	42.1mm*24.8mm*3.2mm

9.2. Functional characteristics

1). Support LoRaWANR network.

2). 8 LoRa receiving channels, 1 transmitting channel, of which 8 receiving channels receive data at the same time.

3). The maximum line of sight communication distance between gateway and module is 15km.

4). Built-in GNSS synchronization position coordinate information.

5). Support Ethernet and 4G LTE data backhaul links.

6). Robust shell, waterproof IP65 ,

7).Working temperature: -40 °C +80 °C, which is suitable for the outdoor environment.

9.3. LoRaWAN Gateway Structure and Interface Definition
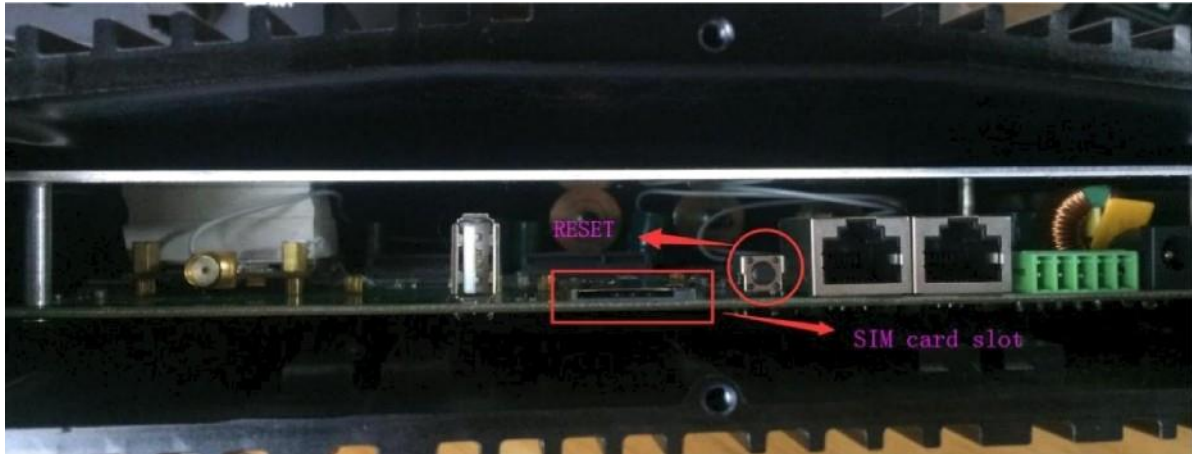
9.3.1. Gateway Structure Dimension
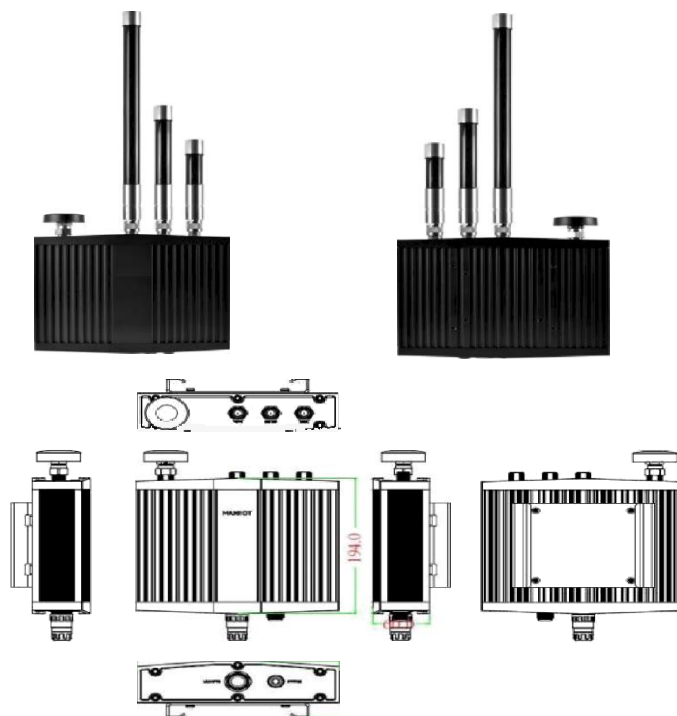
9.3.2. External Interface Definition

1	LAN POE	24V/lA POE power input
2	POWER	DC power input 12 24V
3	WiFi antenna interface	Connect WiFi 2.4G antenna
4	4G antenna interface	Connect 4G antenna
5	LoRa antenna interface	Connect LoRa antenna
6	GPS receiving antenna	GPS receiving antenna

9.3.3. **Internal** Interface **Definition**

No.	Interface/Button	Description
1	SIM Card Slot	Insert a SIM card
2	RESET button	Reset button, reset the system

9.4. LoRaWAN Gateway Installation and Boot

9.4.1 Gateway **Installation**

Please refer to the manual of gateway installation

9.4.2. Gateway boot

There are two ways for the gateway data return link:

1). In Ethernet mode, connect the gateway to the 24V/lA POE power supply and network cable, and it can be turned on after power on.

2). In 4G LTE mode, insert a 4G SIM card (it needs to remove the bottom shell of the gateway), and then connect the gateway to a 24V/1A POE power supply, and it can be turned on when it is powered on.

10. **Device** Management **Platform**

10.1. Account login

Login URL: http://1ora.haciot.cn:50100/mls/, enter the assigned user name and password to log in.
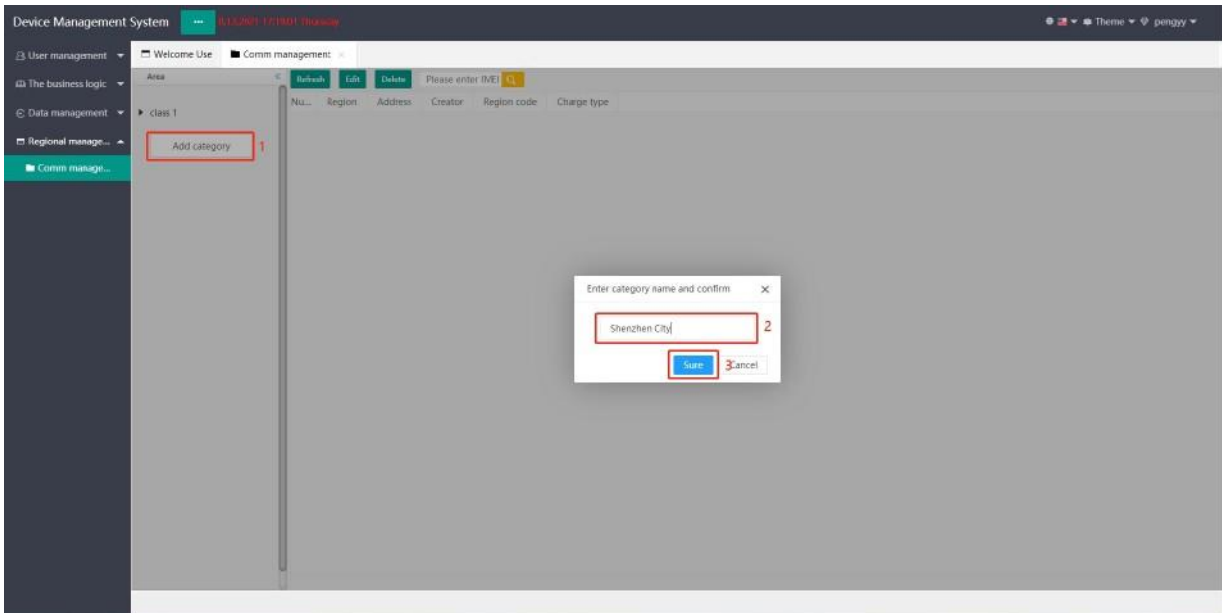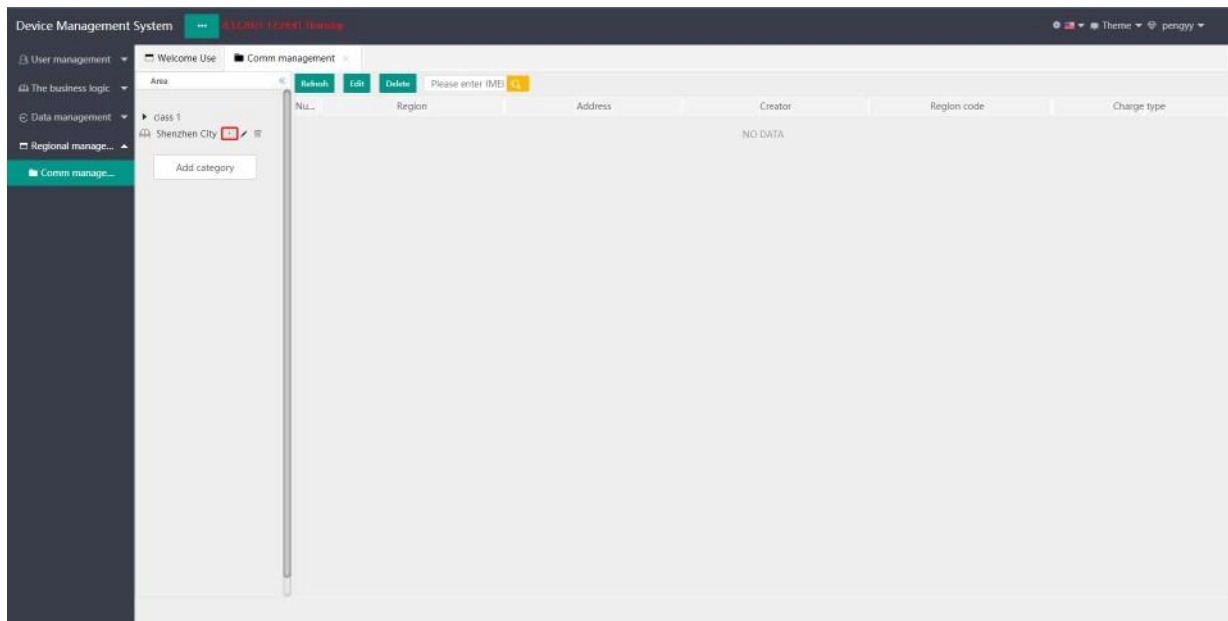
It's shown as below:

10.2. Community management

The community management is divided into three-level areas, such as the 6th floor of Building 2, Xili University Town Creative Park, Nanshan District, Shenzhen. The first floor is Shenzhen City, the second floor is Nanshan District, and the third floor is the 6th floor of Building 2, Xili University Town Creative Park. The name of the community cannot be repeated. You can add up to three floors, or you can add multiple 2-story and 3-story areas.

l). Add the first level area, click "Add Category" to pop up the dialog box of category name , enter Shenzhen and click "OK". It's shown as below:

2) Add a second-level area, click the "+" after the first-level area to pop up a dialog box for entering the sub-category name, enter Nanshan District and click "OK". It's shown as below:

3) Add a third-level area, click the "+" after the second-level area to pop up the dialog box for entering the sub-category name , enter the 6th floor of Building 2, Xili University Town Creative Park, and click "OK". It's shown as below:
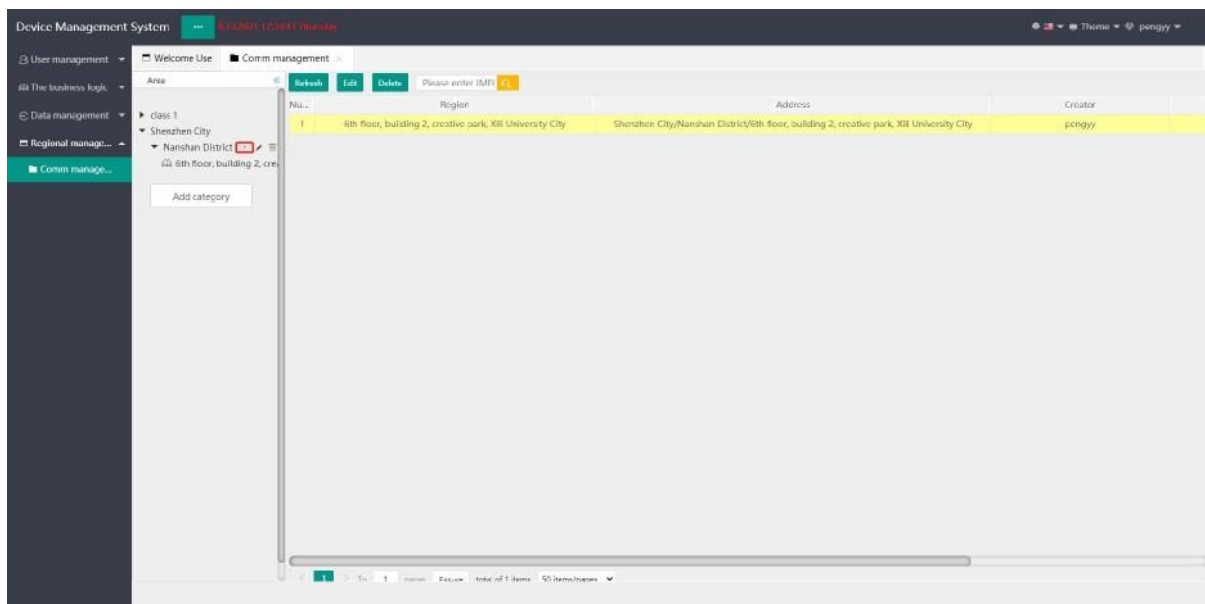
10.3. Device information

l) Download the template, click "Template" to pop up the dialog box of "Platform Selection", select "LORA" and click "Submit" to download the template. It's shown as below:
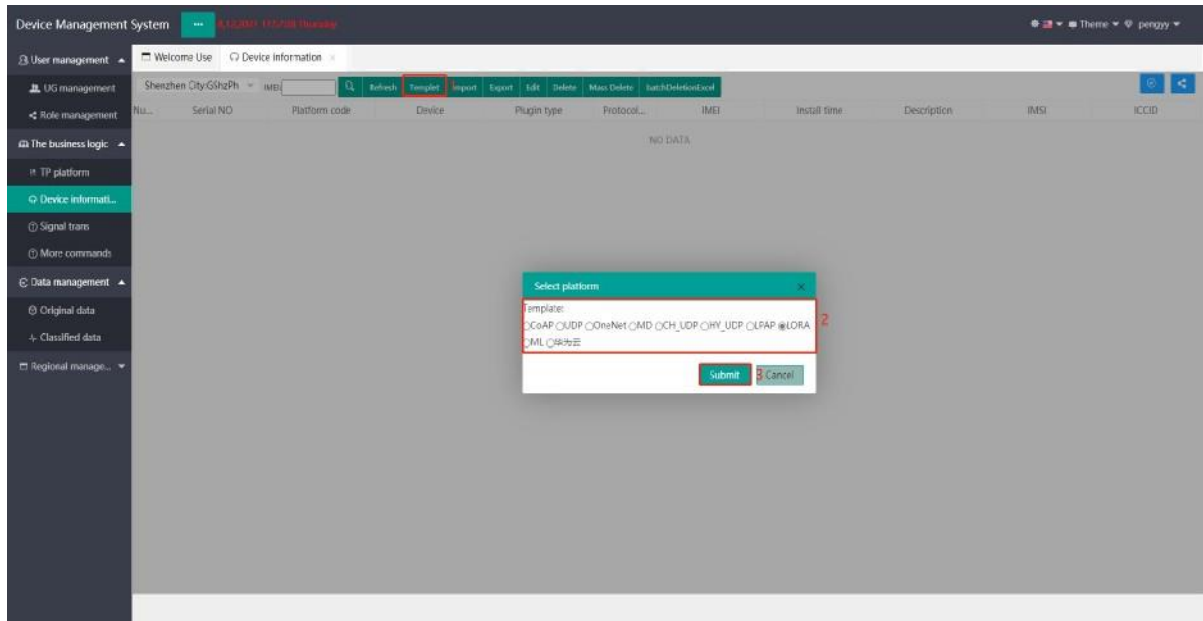
2) Fill in the template information and open the "LORADeviceInfo TelIOT EN" form to fil1 in the module information. It's shown as below:

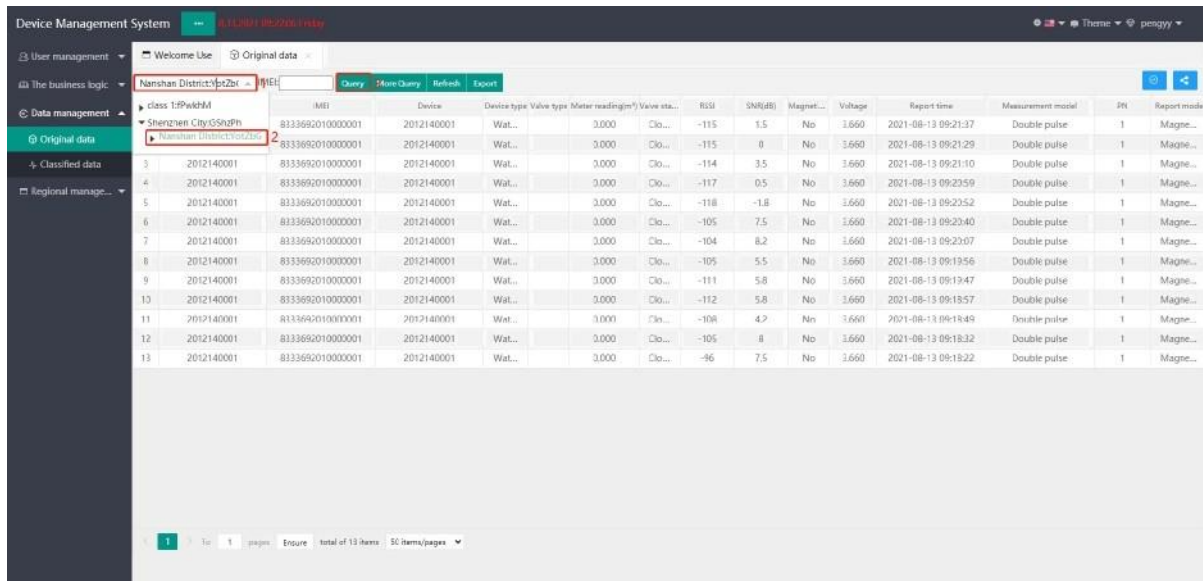3) Import the template, select the third layer area, click "Import" to pop up the "Import file dialog box", select the template type, network access method, community, application and node type, click "choose file" to load the filled template, and finally click "Upload" "

It's shown as below:
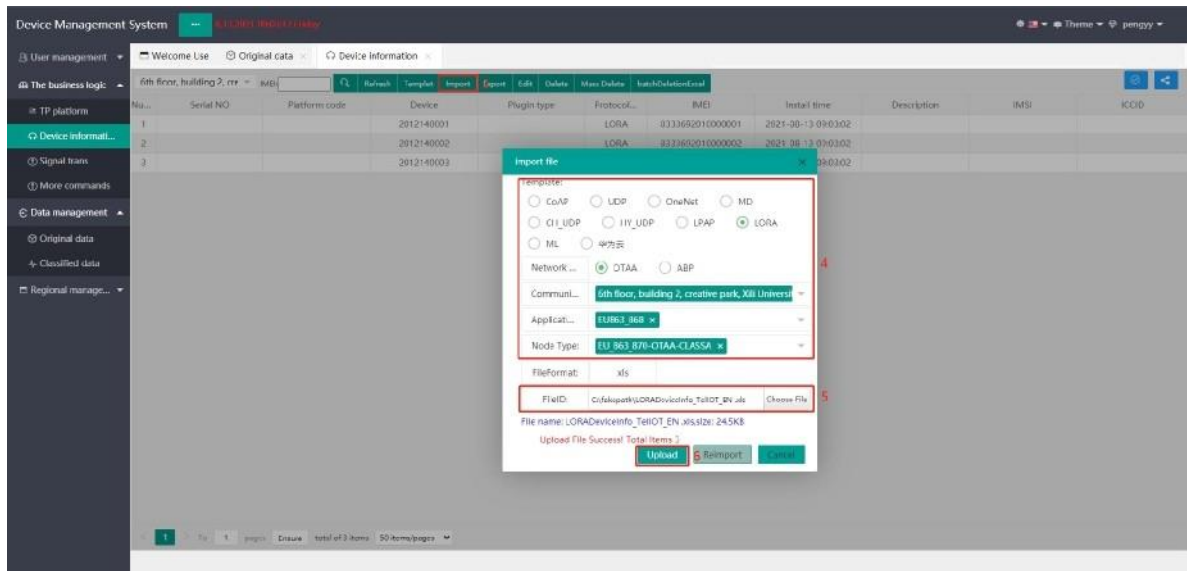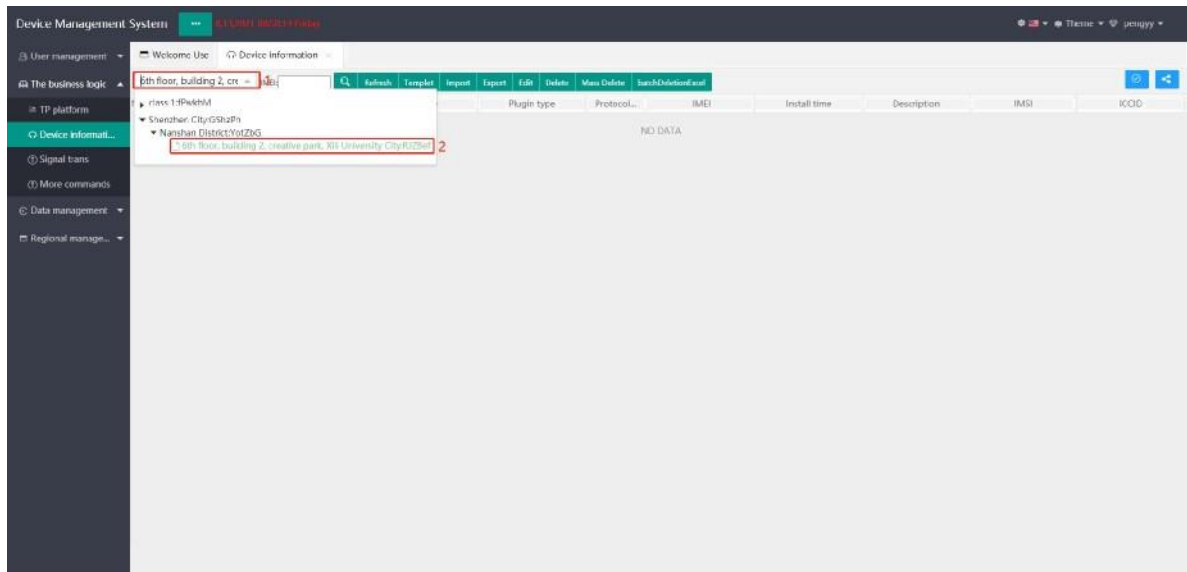
10.4. Data Management

Select the third layer area, click "query" or enter IMEI (DeviceEui) to query. It's shown as below:

10.5. More Command

10.5.1 Select the third layer area, check the IMEI (DeviceEui) of meter, click the command that needs to be transmitted, and then trigger the meter to report data. After the platform receives the data reported by the meter, it will transmit the command. After receiving the command by the meter, execute the corresponding action and report the data. The reported data can be inquired in the data management or in the command information column.

10.5.2 Command transmission description form

No.	Command list	Command Description
1	Set the meter readings command	Set the meter readings
2	Metering mode command	Different metering modes can be configured according to the meter, such as: single and dual pulse metering (hall, reed switch, non-magnetic, etc.)
3	Read monthly freeze command	Read the monthly frozen data generated by the meter, and the meter can save the monthly frozen data of the latest 128 months at most
4	Read yearly freeze command	Read the annual frozen data generated by the meter, the meter can save the annual frozen data for a maximum of 10 years
5	Valve control command	It's used to valve control of meter.
6	Timing dredging valve command	It is used to control the valve of meter at regular time. Open the dredge valve at regular time. The meter will complete the valve at the 3rd of each month. Otherwise, the valve will not be dredged.

7	Device type command	It configures different device type of meter, such as: water meter, electric meter, heat meter, gas meter etc.
8	Read module time	It's used to read the current time of meter.
9	Write module time	It's used to set the module time
10	Valve dredge command	It's used to dredge the valve of meter.
11	Read the software version info command	Read the current software version information of meter

It's shown as below:
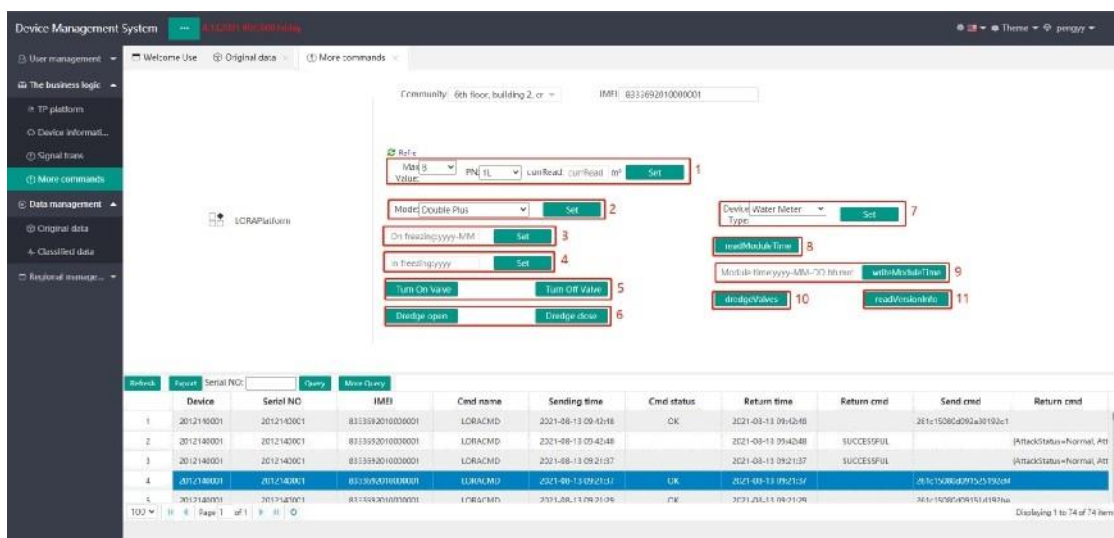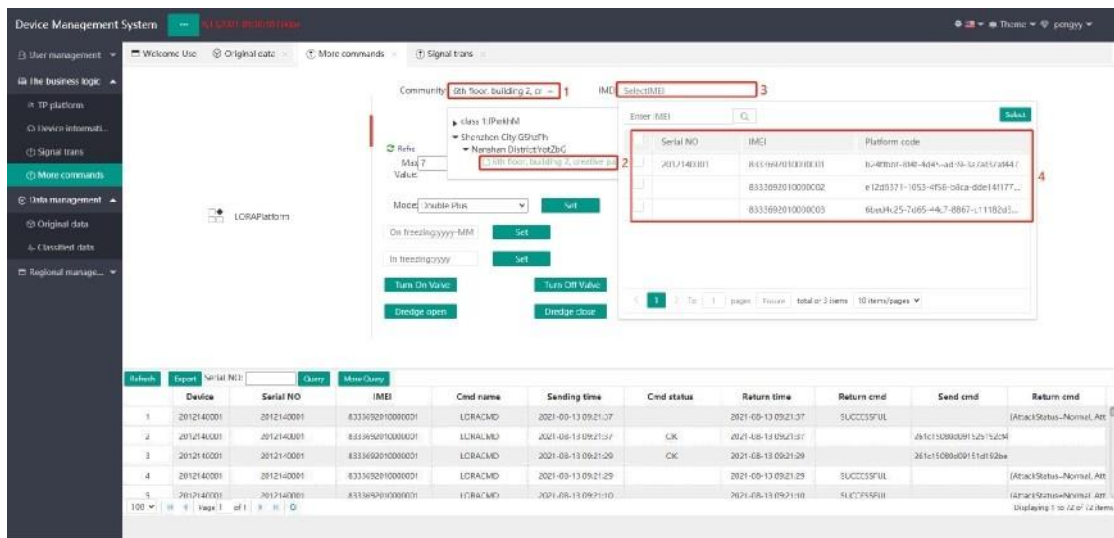
The command information column will display the uplink and downlink command information, double-click

to view the detailed information. It's shown as below:

Sales and Service

You can contact our sales person to purchase modules and development kits.

Address:9th   Floor,Block A,Building l,International Innovation   Va11ey,Xingke l'' street,Nanshan district,Shenzhen,Guangdong

Tellphone: 0755-23981076/1077/1078/1079

Service hotline: 13322922467

Sales Manager: anlan@rf-module-china.com

Website: www.haccom.cn

FCC Caution.

This device complies with part 15 of the FCC Rules. Operation is subject to the following
two conditions:
(1) This device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

Any Changes or modifications not expressly approved by the party responsible for
compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
-Reorient or relocate the receiving antenna.
-Increase the separation between the equipment and receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Integration instructions for host product manufacturers according to KDB 996369
D03 OEM Manual v01

2.2 List of applicable FCC rules
List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below concerning the need to notify host manufacturers that further testing is required.

Explanation: FCC Part 15 Subpart C 15.249

2.3 Summarize the specific operational use conditions
Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to-point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain, specifically for master devices in 5 GHz DFS bands.

Explanation: The EUT is NB IOT external rubber rod waterproof integrated antenna, the antenna use a permanently attached antenna which is not replaceable.

2.4 Limited module procedures
If a modular transmitter is approved as a "limited module," then the module manufacturer is responsible for approving the host environment that the limited module is used with. The manufacturer of a limited

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module must describe, both in the filing and in the installation instructions, the alternative means that the limited module manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.

A limited module manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval.

This limited module procedure is also applicable for RF exposure evaluation when it is necessary to demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module.

Explanation: The Module is not a limited module.

2.5 Trace antenna designs

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects: layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.

a) Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s), dielectric constant, and impedance as applicable for each type of antenna);

b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency, the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered);

c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout;

d) Appropriate parts by manufacturer and specifications;

e) Test procedures for design verification; and

f) Production test procedures for ensuring compliance.

The module grantee shall provide a notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

Explanation: Yes, the antenna use a permanently attached antenna which is not replaceable, Please refer to the antenna specification book for antenna dimension.

2.6 RF exposure considerations

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information: (1) to the host product manufacturer, to define the application conditions (mobile, portable – xx cm from a person's body); and (2) additional text needed for the host product manufacturer to provide to end users in their end-product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).

Explanation: Transmitter meets MPE calculation of 47 CFR 1.1307 and KDB 447498. Refer to MPE Reports

2.7 Antennas

A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also

identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an "omni-directional antenna" is not considered to be a specific "antenna type")).

For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product. The module manufacturers shall provide a list of acceptable unique connectors.

Explanation: The EUT is NB IOT external rubber rod waterproof integrated antenna, the antenna use a permanently attached antenna which is not replaceable.

2.8 Label and compliance information

Grantees are responsible for the continued compliance of their modules to the FCC rules. This includes advising host product manufacturers that they need to provide a physical or e-label stating "Contains FCC ID" with their finished product. See Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748.

Explanation: The modular has a permanent fixed label, and below statement was listed in the User Manual ;The host device must be labeled to display the FCC ID of the module "Contains FCC ID: 2BFX9E-BULK"

2.9 Information on test modes and additional testing requirements

Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host.

Grantees can increase the utility of their modular transmitters by providing special means, modes, or instructions that simulates or characterizes a connection by enabling a transmitter. This can greatly simplify a host manufacturer's determination that a module as installed in a host complies with FCC requirements.

Explanation: The module comply with all specific rules applicable to the transmitter including all the conditions provided in the integration instructions by the grantee, Refer to test report

2.10 Additional testing, Part 15 Subpart B disclaimer

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Explanation: The module without unintentional-radiator digital circuity, so the module does not require an evaluation by FCC Part 15 Subpart B. The host shoule be evaluated by the FCC Subpart B.