PULSE915-LRW Configuration Guide（05）

LoRaWAN Terminal Series

Version 2.8

Date: 2022-09

friendcom.us

Friendcom has always been committed to technological innovation. Our aim is to provide customers with timely and comprehensive service. For any assistance, please contact our Shenzhen headquarters:

FRIENDCOM AMERICA INC.
20955 Pathfinder Road Ste# 120, Diamond Bar, CA 91765
Tel: +1 (909)480-0485

For technical support, or to report documentation errors, please visit:
friendcom.us
Or email to info@friendcom.us

NOTICE

Information in this document has been carefully reviewed and is considered to be accurate. However, Friendcom assumes no liability resulting from any inaccuracies or omissions in this document, or from use of the information obtained herein. Friendcom reserves the right to make changes to any products described herein and reserves the right to revise this document and to make changes from time to time in content hereof with no obligation to notify any person of revisions or changes. Friendcom does not assume any liability arising out of the application or use of any product described herein.

COPYRIGHTS

This documentation and Friendcom's products described herein may include or describe copyrighted Friendcom material and are considered technical proprietary of Friendcom CO., LTD. Accordingly, any copyrighted material of Friendcom and its licensors contained herein or in Friendcom products described in this manual may not be copied, reproduced, distributed, merged or modified in any manner without the express written permission of Friendcom.

TRADEMARKS

Friendcom and Friendcom logo are registered Trademarks. All other product or service names which are mentioned in this document are the property of their respective owners.

About This Document

Scope

Scope of this document is to presents the parameters configuration of Friendcom wireless pulse acquisition terminal PULSE915-LRW.

Audience

This document is intended for

System engineers (ses),

Application engineers,

and test engineers.

Related Documents

Friendcom_PULSE915-LRW_Terminal_Datasheet

Friendcom_PULSE915-LRW_Terminal_User_Manual

Conventions

Symbol	Indication
	This warning symbol means danger. You are in a situation that could cause fatal device damage or even bodily damage.
	Means reader be careful. In this situation, you might perform an action that could result in module or product damages.
	Means note or tips for readers to use the module.

History

Version	Date	Changes
1.0	2019-05	• Initial draft
1.1	2020-04	• Added UART port configuration content • Typographic modification
1.2	2020-08	• Editorial corrections • Updating of contents
2.0	2020-08	• Updating new LoRaWAN module • Updating of contents
2.1	2021-1	• Upgrade the server platform information.
2.2	2021-2	• Set Timed Reports • Module identification definition
2.3	2021-6	• Modify the ABP and OTAA join network
2.4	2021-7	• Add the software introduction
2.5	2021-8	• Add the curve data report function
2.6	2021-8	• Modify the WIRELESS_MKEY for configuration mode • Add the detail after join failed.
2.7	2022-3	• Modify the JOIN process specification
2.8	2022-9	• Update the company location

Content

1 Introduction

This document describes parameters configuration of PULSE915-LRW(also called FC-714) and application example connected to TTN server. Guided with configuration manual, customers can use the terminal together with any pulse emitting device (water, gas, electricity, etc.) easily.

2 Parameters Configuration

PULSE915-LRW supports UART port wired or wireless parameter configuration. We can query and write parameters like initial reading, pulse constant, RTC real-time clock, pulse type (single or double pulse), sensor type (hall or reed switch) and some LoRaWAN information.

2.1 Wired Configuration

Connect this product to an USB port of your computer with the help of an USB to TTL interface adapter. The port pins connected to this product are as follows:

Table 2- 1 Wired configuration wiring

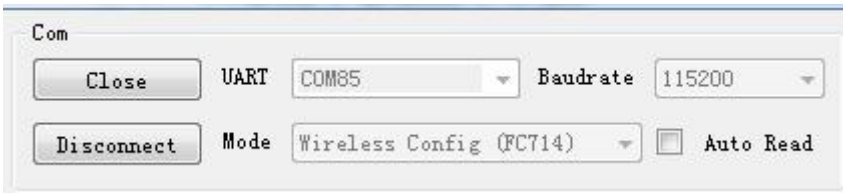
Device port	Description	USB to TTL Adapter	Remarks
IO1-R	Data receiving pin	RxD	TTL Level 0-3.6V
IO1-T	Data transmission pin	TxD	TTL Level 0-3.6V
GND	Power ground	GND	

2.2 Wireless Configuration

Plug-in the wireless USB adapter FC-714-USB to your PC and install the correct driver to configure the product wirelessly. Usually the computer will automatically find and install the driver. If the driver is not installed successfully, please install the PL2303 driver manually.

2.3 Software Interface Introduction

2.3.1 COM Section



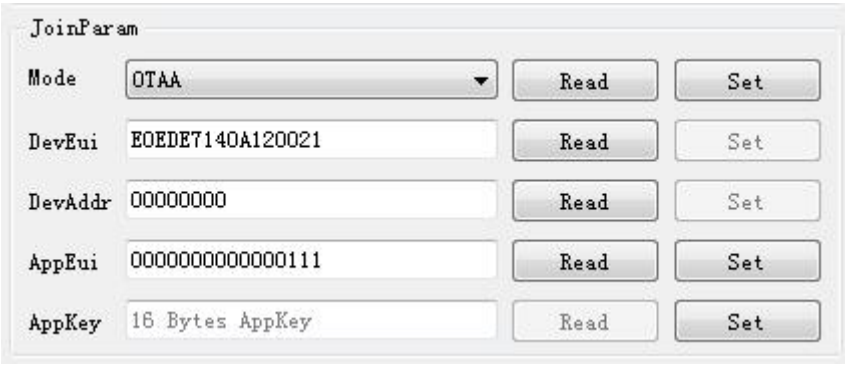
UART: Select the configuration tool or device serial port number.

Baudrate: Select the baud rate of the configuration tool or device.

Mode: Select wired configuration mode or wireless configuration mode, according to the device model NO., select the corresponding mode.

Auto Read: After checking this option, when the device enters the configuration mode, the parameters of the JOIN Param part can be read immediately. Under normal circumstances, it is not recommended to check.

2.3.2 JOIN PARAM Section



Mode: Select OTAA or ABP for network access. It is recommended to use OTAA mode.

DevEui: The EUI number of the device, which is assigned by the device manufacturer, and can be customized by the user.

DevAddr: Device address assigned by LoRaWAN server.

AppEui: App EUI, the number assigned by the device manufacturer, and can be customized by the user.

AppKey: Application key, customized by the user.

2.3.3 METER Section

Pulse: Fill in the number of pulses to set the initial flow value. The initial total number of pulses = initial dosage * pulse constant. Example: the reading of water meter is 713.0m^3 , the pulse constant of water meter is 10.Hence, the pulse number is: 713.0 x 10=7130.

Upload Period: Set the report period. It is recommended to report once a day, that is, set to 1440. The setting of this item is invalid if the frame mode is set to curve frame, and only can daily report at a fixed time.

Pulse Const: Set the pulse constant. Example: 1 liter of water flow generates 1 pulse, that is, 1 m^3 of water flow generates 1000 pulses, so the pulse constant should be 1000 (if the pulse constant is reset, the initial index must be reset as well).

Meter Addr: Device address, provided by the device manufacturer, and can be customized by the user.

Power Out: When using Hall pulse sensor, turn on this option. When using a reed pipe, turn off this option.

Io Pull up: When using the reed pipe, turn on this option. When using Hall pulse sensor, turn off this option.

Measure Mode: Select single pulse or double pulse, depending on the type of pulse sensor.

Frame Mode: Users can choose the appropriate frame format according to their needs. There are four kinds formats can be choose. Short frame, long frame, default curve frame and a custom curve frame. The recommend operation for default curve frame and custom curve frame refer to section 2.5.

2.3.4 RADIO PRARM Section

Band: Set the device frequency band. Please pay attention to regional spectrum control.

Class: Select the working mode, it is recommended to use the CLASS A mode.

ADR: Data rate adaptive function, the network will optimize the rate after it is turned on.

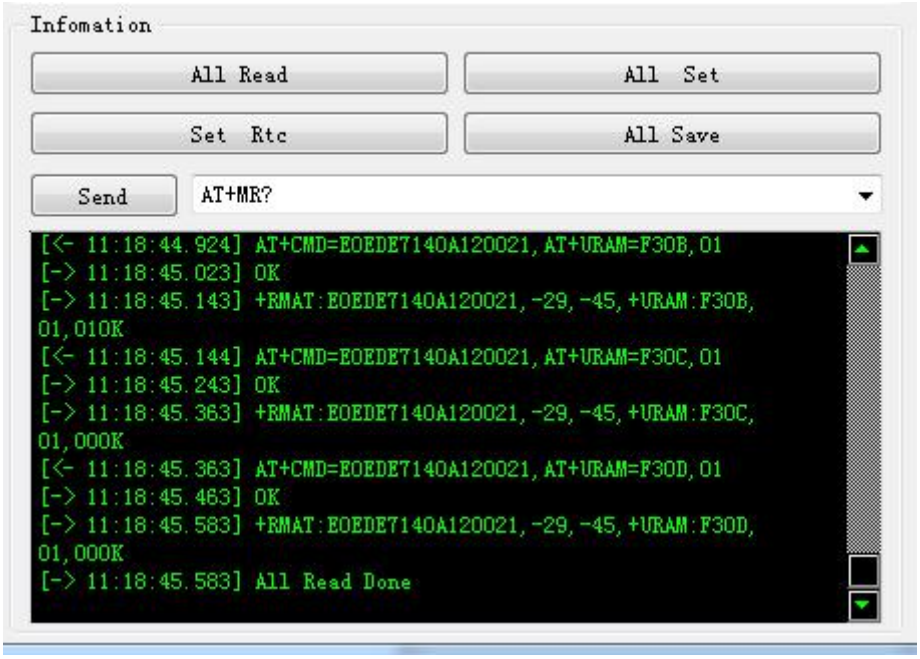
DataRate: Data rate, DR0 rate is the smallest, and the transmission is the farthest. It is recommended to choose DR0.

TxPower: Transmission power, PWR 0 power is 13dBm, PWR 0 to pwr14, the power decreases in turn. Force N means that the transmission power is forced to be N, such as Force 22, that is, the transmission power is 22dBm.

JOINDutyCycle: The maximum total transmission duty cycle of the network. Turning on or off depends on local regulations.

DateDutyCycle: The maximum total transmit duty cycle of data. Turning on or off depends on local regulations.

2.3.5 INFORMATION Section



ALL READ: Read all parameters.

ALL set: All parameter settings.

Set RTC: Set the device clock. After all the parameters are set, please set the device clock so that the data will be reported according to the reporting cycle.

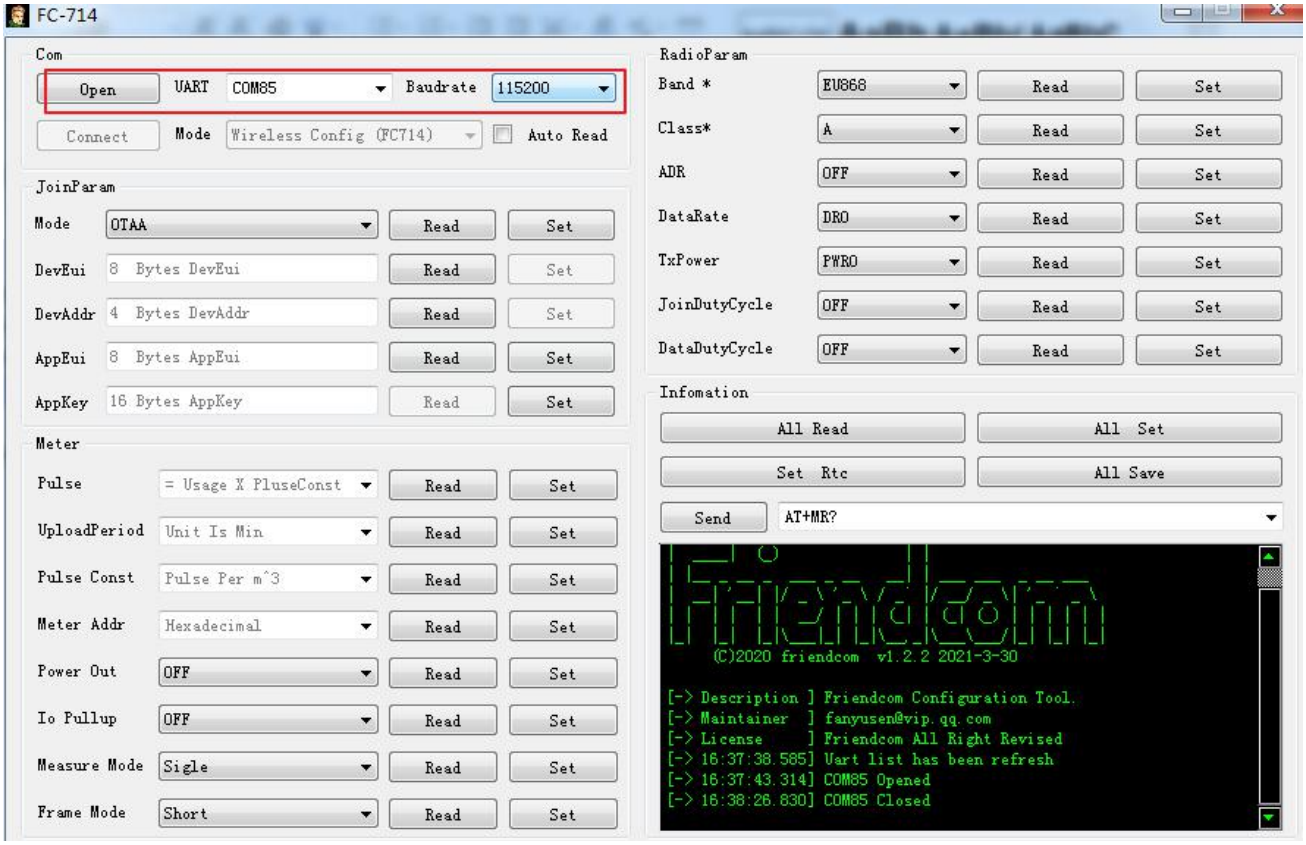
ALL SAVE: Save all parameters. After clicking Save all, please restart the device (AT+RESET), the save will take effect.

SEND: Send AT command.

2.4 Operation Steps

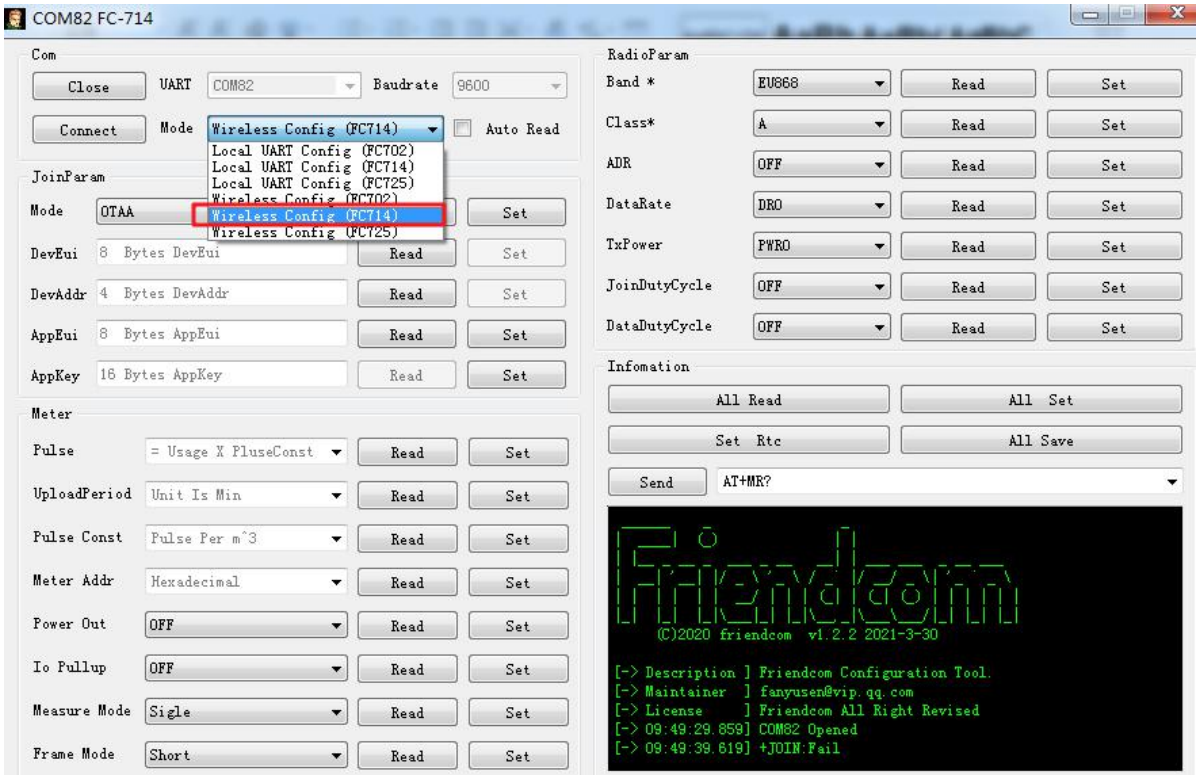
Step 1:

Select the corresponding port number and open the configuration software. The default serial port parameter is baud rate of 115200bps. Click “Open” button to enable the UART port.

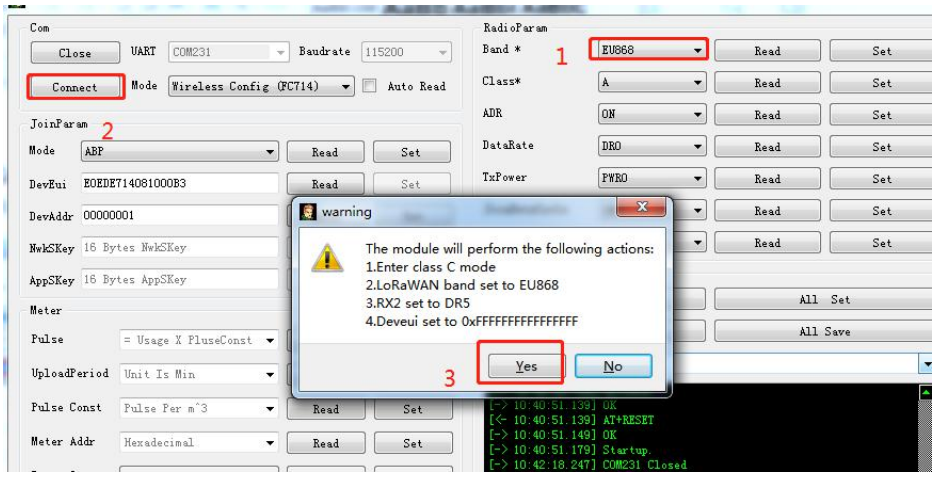


Step 2:

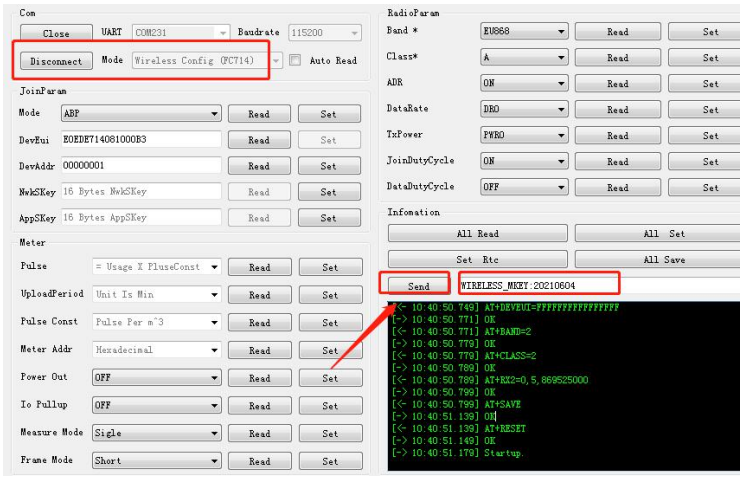
Choose "Wireless Config Tool" (wireless configuration) or “Cable Serial Port Configuration” (wired configuration).



Choose EU868 band, Click “connect “ and “Yes”.



pls send this command 'WIRELESS_MKEY:20210604' as following picture (for HV:82,SV:2A version).



Step 3:

Hold a magnet close to the red area shown in Figure 2-1. Within 4 to 9 seconds, remove the magnet and PULSE915-LRW will enter configuration mode. **Importantly**, the magnet provided is a strong magnet, hence the magnet needs to be removed out of the area as the defined time range for the specific function, otherwise, PULSE915 will continuously be triggered and automatically enter to the other mode.

Magnet hold time	Features	Remarks
2s-4s	Report data once	Typically 3s
4s-9s	Configuration mode	Typically 5s

9s-15s	Reset	Typically 12s
>15s	No response	Close magnet detecting function 60s

Note

- The reed switch inside the product is triggered by a magnet to put the device into configuration mode, then a configuration command is required to send within 30 seconds. If the product does not receive a configuration command in 30 seconds, it will exit the configuration mode. A configuration command will keep device in configuration mode for another 30 seconds.

The trigger position is shown in Figure 2-1.

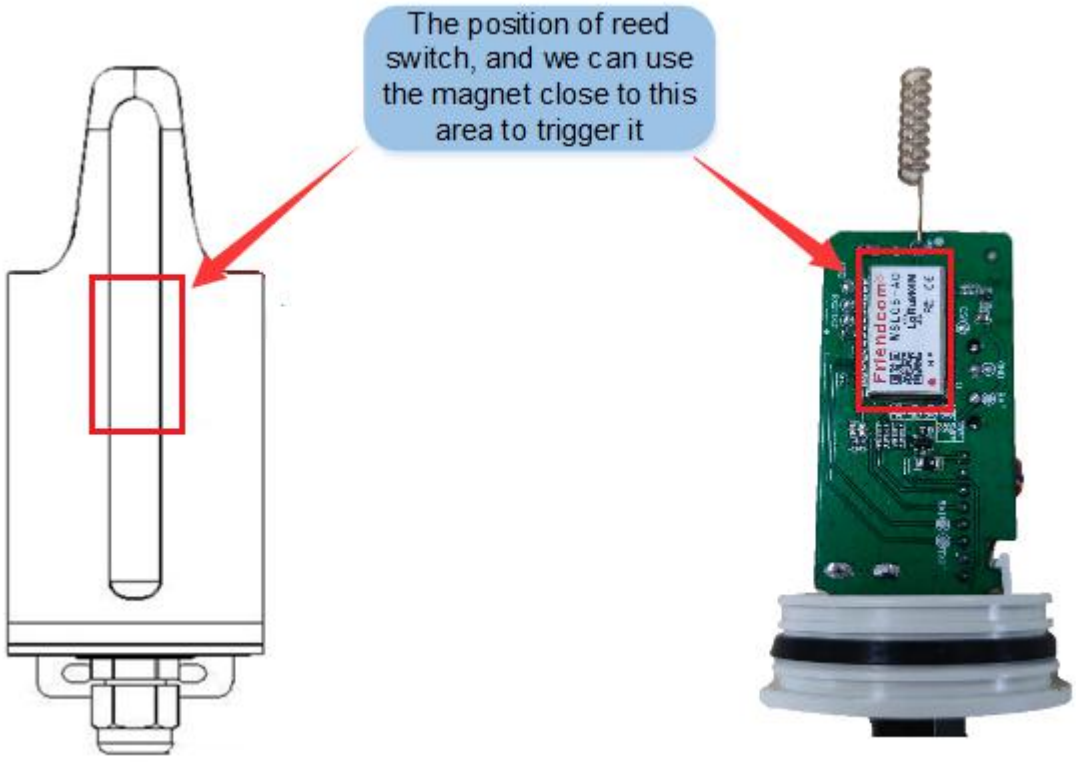
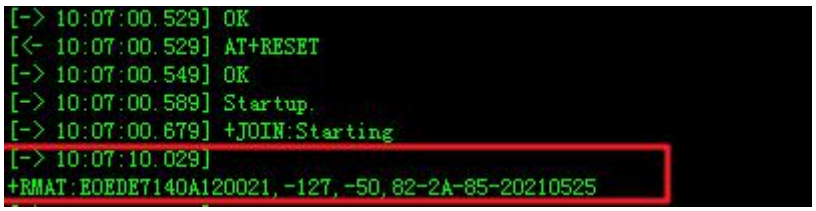


Figure 2-1 Magnet activation position

Note: When you trigger success(4-9s(typically 5s), configuration model), the widow will shows the information just as following picture, then the PULSE915-LRW will enter into configuration mode.

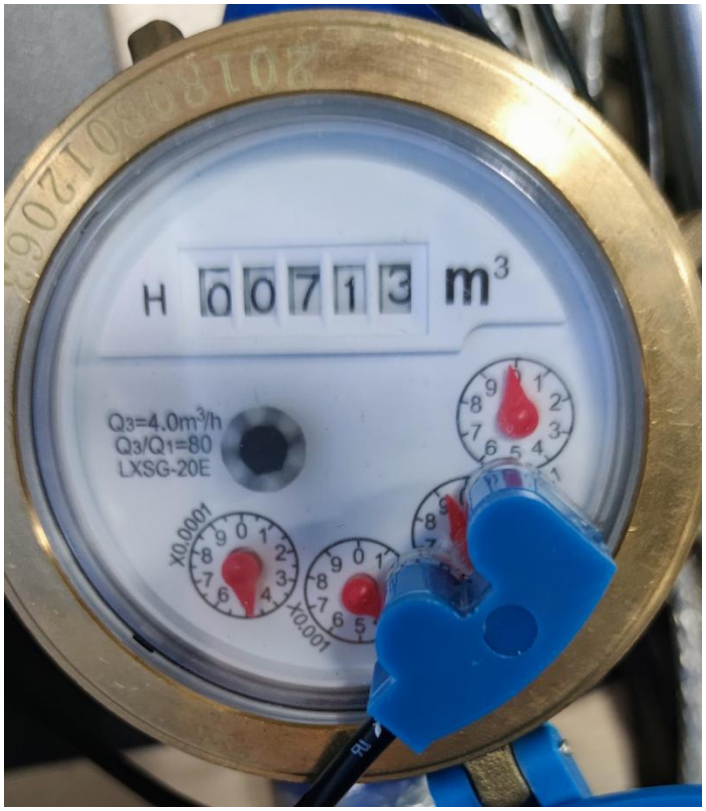


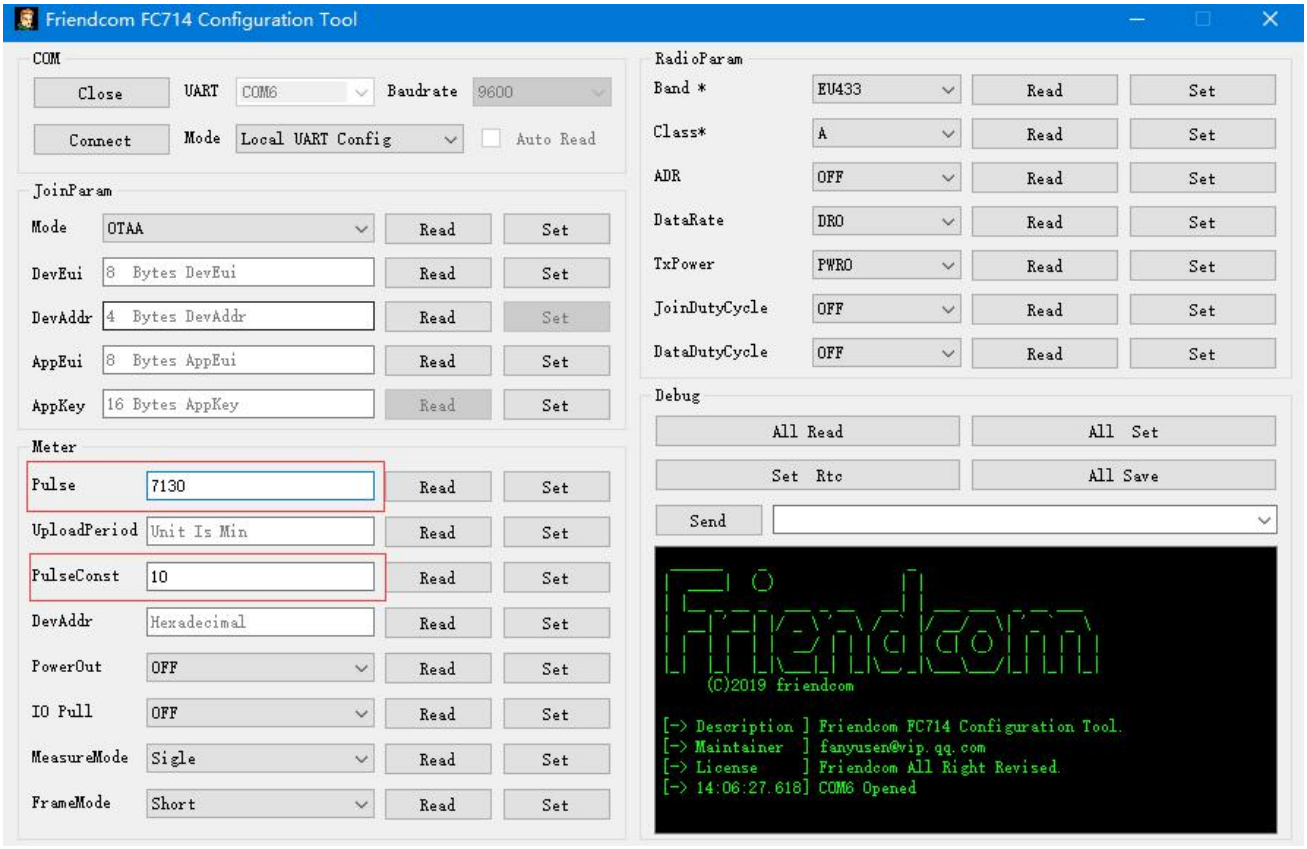
Step 4:

In configuration mode, various commands can be set for PULSE915-LRW through the configuration software. For example, clicking on various query buttons returns the corresponding value.

Parameters such as initial meter index data, pulse weight, clock, sensor type and measurement mode can be configured in “Metering parameter” page. We just need to click the corresponding button on the right to set the parameters.

The sensor type is “Hall” and “Reed Switch”, and measurement mode is “Single pulse” and “Double pulse”. Users can set parameters according to the sensor type and pulse output type of actual device that PULSE915-LRW connected.





Step 5:

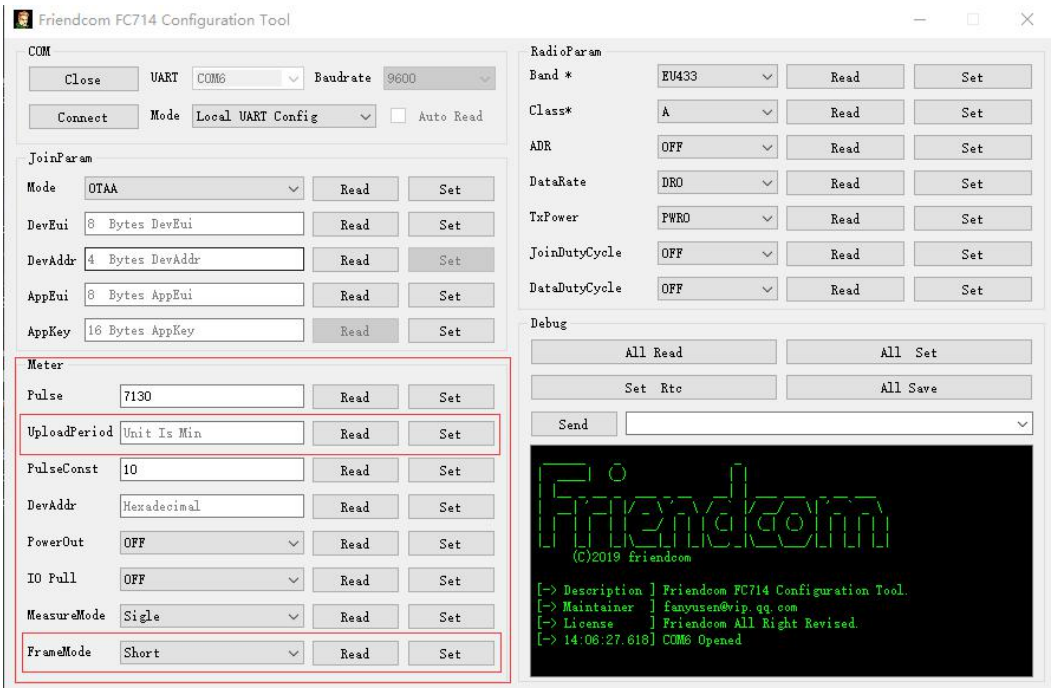
Parameters such as reporting period, device address and data format can be set. We just need to click the corresponding button on the right to set the parameters.

Data report time o'clock in **minutes** can be set according to customer requirements. For example, set as 1440 minutes that indicates 24 hours.

Reporting supports "default curve", "custom curve", "Long frame mode" and "Short frame mode". Users can choose the required data format.

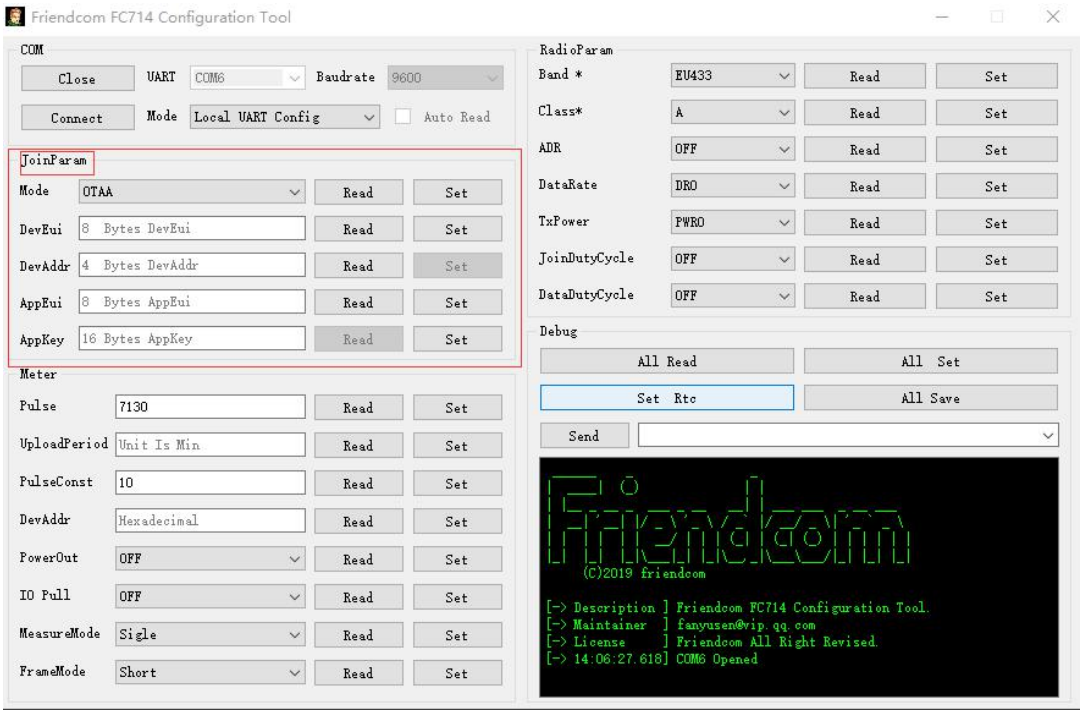
Note

- If the frequency is set to US915, since the LoRaWAN protocol limits the number of reported bytes, the "Report data mode" must be set to "Short frame mode" under the "Other parameters" tab. For other frequencies it can be arbitrarily selected as "Long frame mode" or "Short frame mode".



Step 6:

In the “JoinParam” area, users can read and set join mode, DevEui, DevAddr, AppEui and APPKEY parameters of the LoRaWAN module.



- If the user select the module in **OTAA mode**, you can set the DevEui, AppEui and AppKey parameters.

Users also can Set by using AT command, for example:

AT+JOINMODE=0 (Set OTAA mode)

Set APPEUI

[<- 11:52:08.301] AT+APPEUI=1122334455667788

[-> 11:52:08.375] OK

Set APPKEY

[<- 11:52:36.821] AT+APPKEY=11223344556677889900112233445566

[-> 11:52:36.895] OK

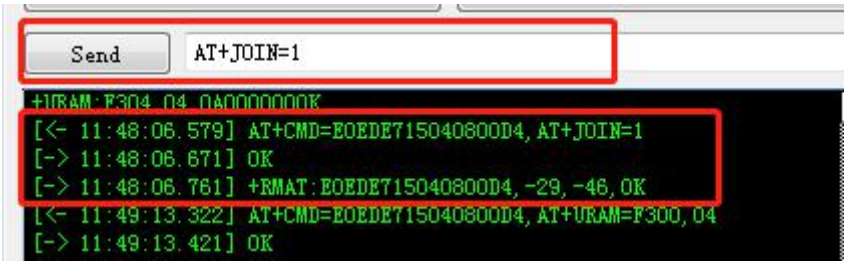
After setting the join mode, DevEui, AppEui and other parameters, user need Set Rtc and save the parameters.

Click the button of “Set Rtc” and ”All Save”.

Note

- Please following section 2.5 If you choose the curve frame.

AT+JOIN=1 (This command is used to Initiate a network access request)



The network access will begin when exit the configuration mode. (If the product does not receive a configuration command in 30 seconds, it will exit the configuration mode)

When you received the uplink message on the Network server, indicating that you have joined the Network.

Note

Pls send the following two command after failed to join the network.

- AT+RESET (to reset the device. It's better to check the setting parameter changed or not after you reset)
- AT+JOIN=1 (to join again)

➢ If the user select the module in **ABP mode**, you can set the DevEui, NWKSKEY, APPSKEY parameters.

Users also can Set by using AT command, for example:

AT+JOINMODE=1 (Set ABP mode)
Set NWKSKEY
[<- 11:52:08.301] AT+NWKSKEY=112233445566778899001122334455 66
[-> 11:52:08.375] OK

Set APPSKEY
[<- 11:52:36.821] AT+APPSKEY=112233445566778899001122334455 66
[-> 11:52:36.895] OK

After setting the NWKSKEY and other parameters,

Click the button of "Set Rtc" and "All Save". (Set Rtc and save the parameters)

Then the device will auto join the network When it comes to the data reporting cycle.

Note

- The user can read and set the parameters by sending AT commands at the serial transmission area. For details of AT commands, please refer to the PULSE915-LRW user manual.

2.5 Curve Frame Configuration Guide

The Pulse 915-LRW divides a day into 96 time points evenly, and the interval between time points It is 15 minutes, as shown in the table below.

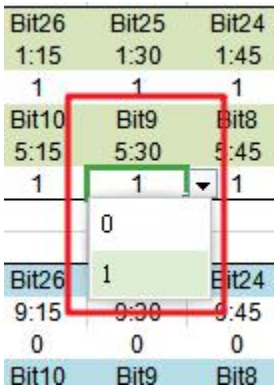
Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24	Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16
0:00	0:15	0:30	0:45	1:00	1:15	1:30	1:45	2:00	2:15	2:30	2:45	3:00	3:15	3:30	3:45
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
4:00	4:15	4:30	4:45	5:00	5:15	5:30	5:45	6:00	6:15	6:30	6:45	7:00	7:15	7:30	7:45
1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0
FFFF8888															
Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24	Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16
8:00	8:15	8:30	8:45	9:00	9:15	9:30	9:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	11:45
1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
12:00	12:15	12:30	12:45	13:00	13:15	13:30	13:45	14:00	14:15	14:30	14:45	15:00	15:15	15:30	15:45
1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0
88888888															
Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24	Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16
16:00	16:15	16:30	16:45	17:00	17:15	17:30	17:45	18:00	18:15	18:30	18:45	19:00	19:15	19:30	19:45
1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
20:00	20:15	20:30	20:45	21:00	21:15	21:30	21:45	22:00	22:15	22:30	22:45	23:00	23:15	23:30	23:45
1	0	0	0	1	0	0	0	1	0	0	0	1	1	1	1
8888888F															
Chosen	39		Mask	FFFF88888888888888888888F					AT Command	AT+UAT0=FFFF88888888888888888888F					

The user can set any desired data collection plan by modifying the 12-byte mask. The mask corresponding to the above figure is FFFF88888888888888888F. The mask can be obtained through the separately provided data collection schedule.

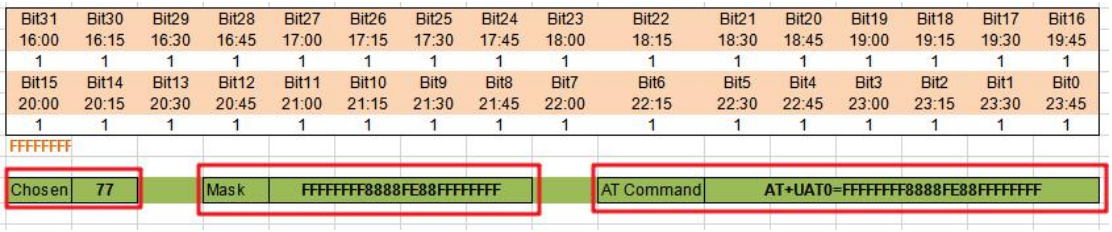
The steps to get the mask are as follows:

1. Set the time point that needs to be reported to 1, and the time point that does not need to be reported to 0.

For example:



2. The currently selected report points, mask, and AT commands are displayed in the lowermost area.



Note

- Due to the limitation of the data length of the LoRaWAN protocol, a maximum of 77 data collection points are currently supported. If the collection point set by the user exceeds 77, the mask and AT command will not be displayed.
- The data collection schedule can be get from FRIENDCOM.

■ The recommended configuration steps for the default curve reporting mode.

1. Configure JoinParam, refer to the previous configuration tutorial
2. Configure RadioParam, refer to the previous configuration tutorial
3. Configure Meter parameters (pulse number, pulse constant, power output, port pull-up, double pulse mode), the configuration tutorial before the parameters
4. Configure Frame Mode as the default curve reporting mode
5. Click Set Rtc to configure the system clock
6. Use AT+UAT2 to configure the reporting time

E.g:

[<- 16:45:53.584] AT+UAT2=09:15

[-> 16:45:53.624] OK

[<- 16:45:59.448] AT+UAT2? (This command is to check the reporting time)

[-> 16:45:59.524] +UAT2: Alarm 3 17:00:00, Upload 09:15:00 + 11min

7. Click All Save

■ Recommended configuration steps for custom curve reporting mode.

1. Configure JoinParam, refer to the previous configuration tutorial
2. Configure RadioParam, refer to the previous configuration tutorial
3. Configure Meter parameters (pulse number, pulse constant, power output, port pull-up, double pulse mode), the configuration tutorial before the parameters
4. Configure Frame Mode as a custom curve reporting mode
5. Click Set Rtc to configure the system clock
6. Use AT+UAT0 to configure the mask of the collection schedule, and use AT+UAT0? to confirm

E.g:

[<- 15:40:29.965] AT+UAT0=FFFF888888888888F888888F

[-> 15:40:30.028] OK

[<- 15:40:36.101] AT+UAT0? (This command is to check the mask.)

[-> 15:40:36.167] +UAT0:42,8D,FFFF888888888888F888888F

7. Use AT+UAT2 to configure the reporting time

E.g:

[<- 16:45:53.584] AT+UAT2=09:15

[-> 16:45:53.624] OK

[<- 16:45:59.448] AT+UAT2? (This command is to check the reporting time)

[-> 16:45:59.524] +UAT2: Alarm 3 17:00:00, Upload 09:15:00 + 11min

8. Click All Save

3 Application Example

3.1 Connect to Network Server

Take TTN (https://account.thethingsnetwork.org/) as an example. Add PULSE915 to the LoRaWAN server in **OTAA mode**(or set ABP mode).

Note

- Make sure that a LoRaWAN gateway has already been connected and added to the server.

This communication example is based on the Friendcom's GW300 gateway.

Step 1：Configure the corresponding parameters of the GW300 gateway. Taking European region as an example, the setting parameters are shown in the figure below:

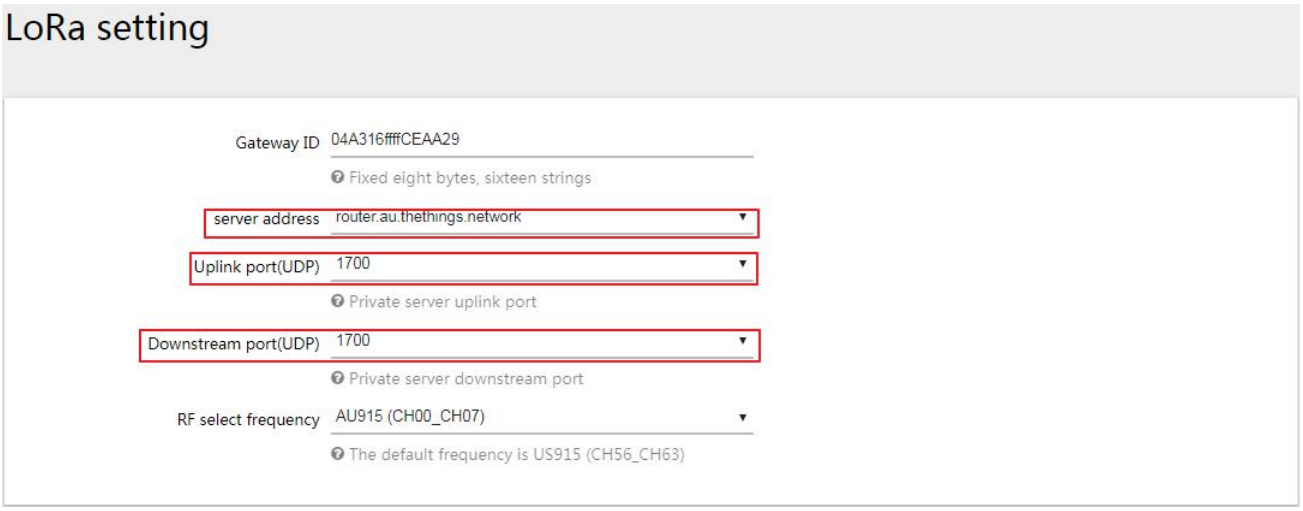
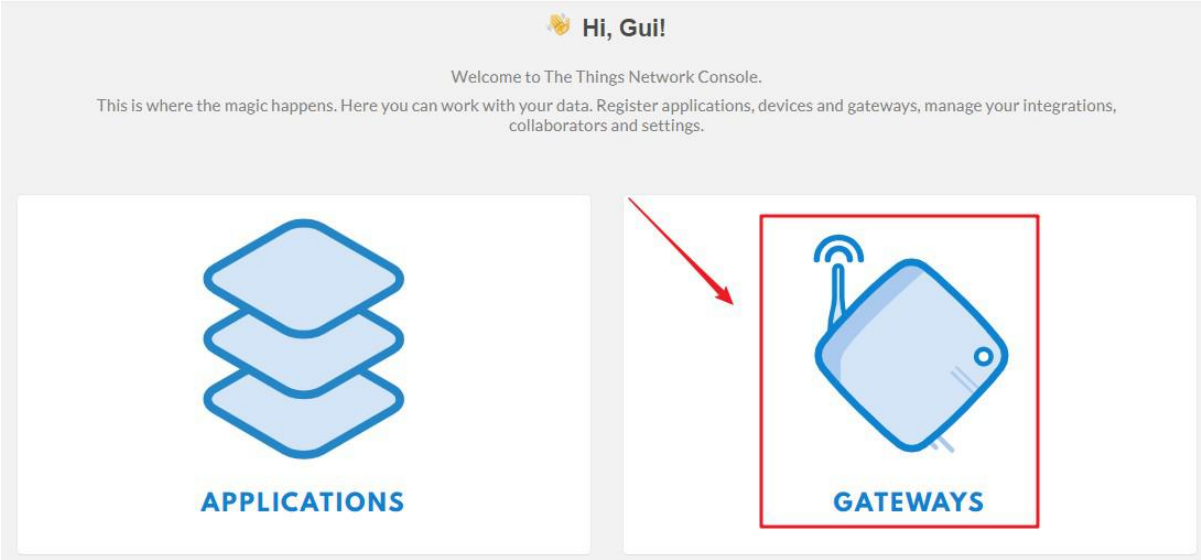


Figure 3-1 Configurate TTN SDK

Step 2: the new user can log on to https://account.thethingsnetwork.org/ register to register account, has been registered account user directly login, please skip this Step.

Step 3： Login to TTN cloud server, click the account drop-down box and select the option "Console", select "Gateways" in the Interface that pops up, and then select "Register Gateways" to Register the new gateway.



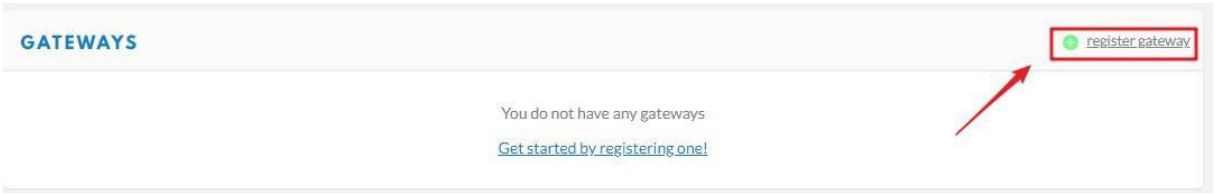


Figure 3-2 TTN Gateway registration Interface

Step 4： Fill in the relevant information in the Interface, check "I'm using the Legacy Packet Forwarder ", and click "Register Gateway" in the lower right corner to complete the Gateway registration.

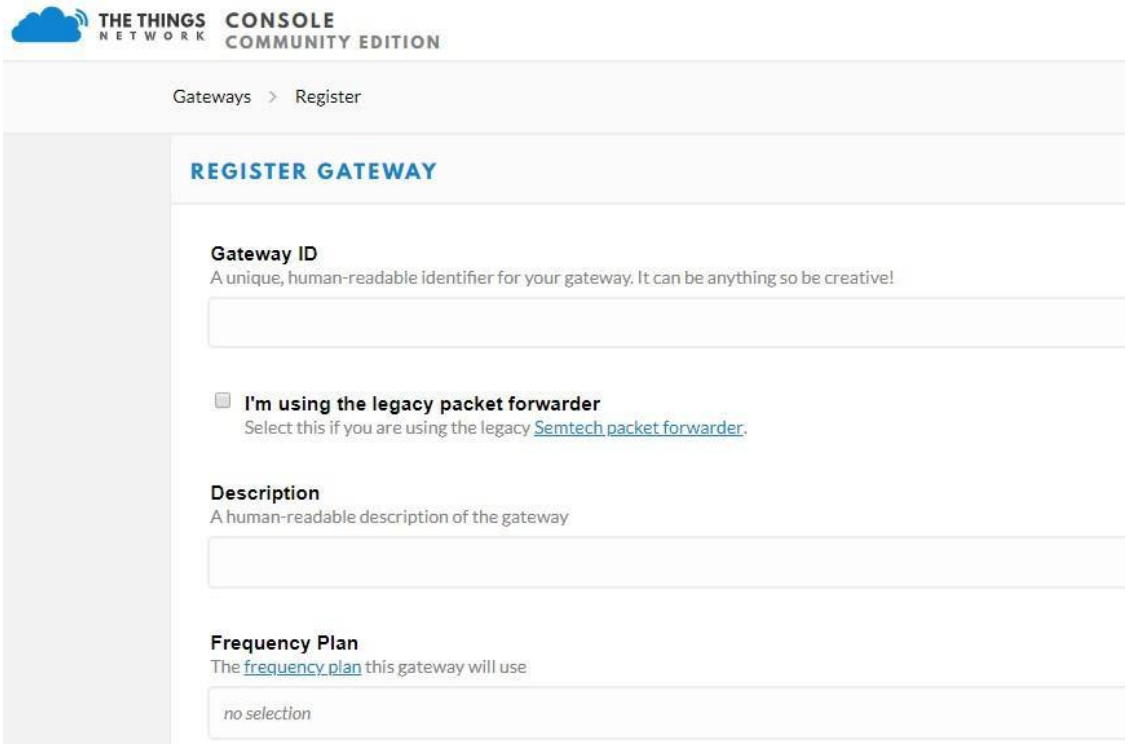


Figure 3-3 TTN server registration gateway

Step 5： Gateway registration is successful. Gateway registration information can be seen in the Gateways interface. If the Gateway has been connected to the Internet at this time, the Gateway on-line information can be seen in the Gateways interface.

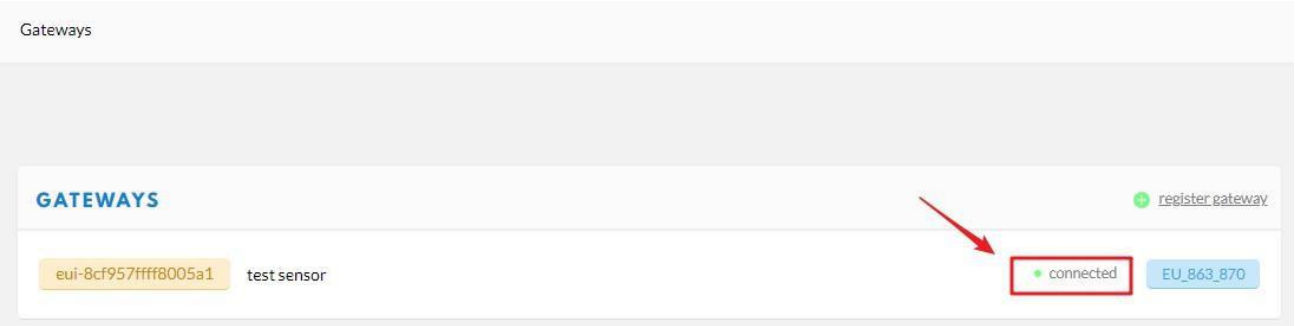
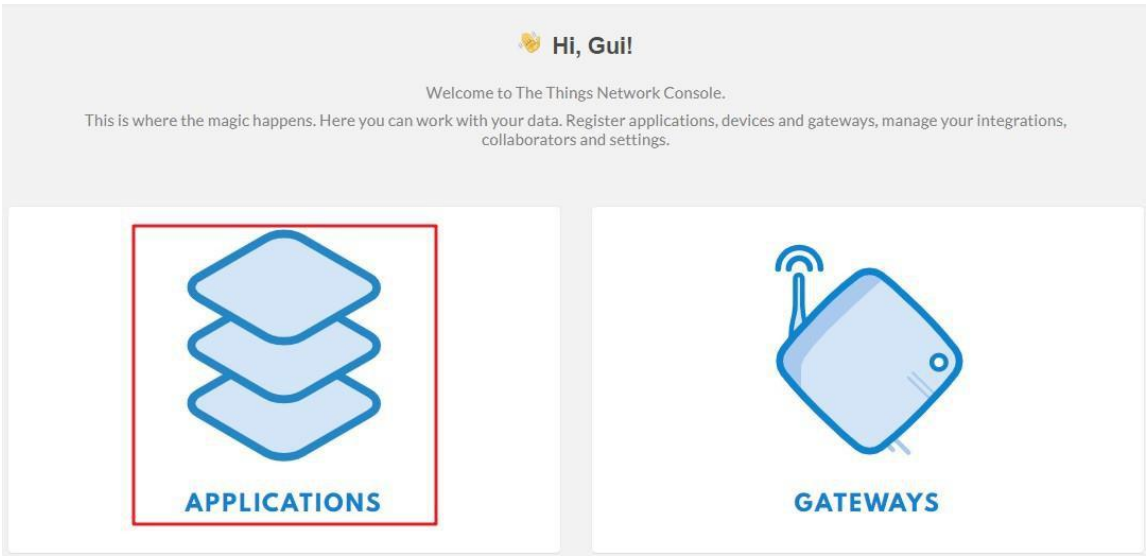


Figure 3-4 TTN server gateway on-line Interface

Step 6： Click the account drop-down box and select the option "Console". In the Interface popup, select "Applications" to add application information.



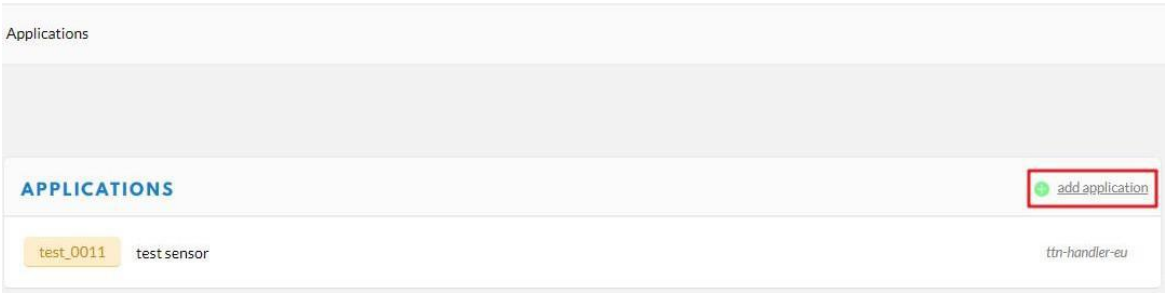


Figure 3-5 TTN server to add applications

Step 7： Fill in the registration information and click "Add Application" in the lower right corner to complete the addition.

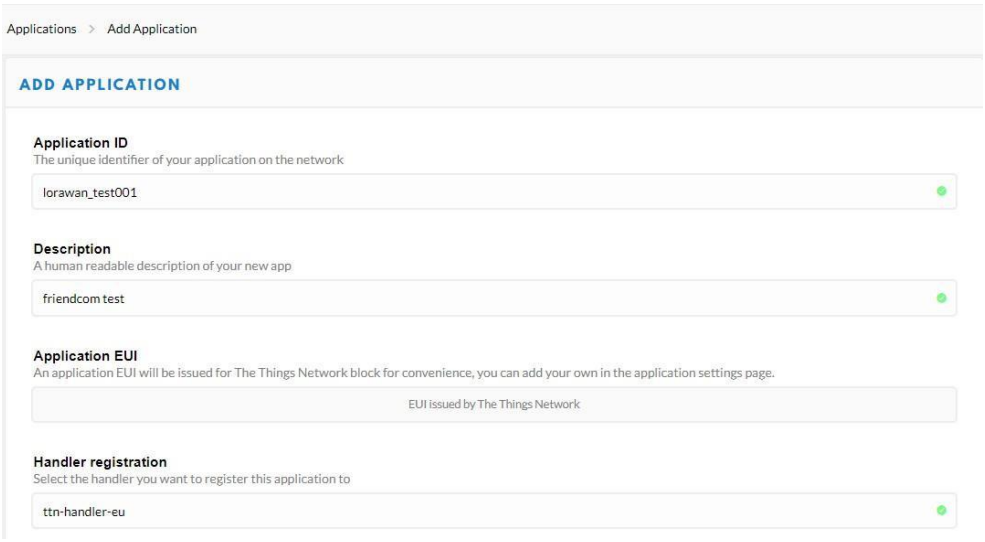


Figure 3-6 TTN server added application Settings Interface

Step 8： Enter the device - >; Register Device, fill in the node DevAddr, DevEui and APPKEY respectively (Make sure the DEVEUI, APPKEY parameters are the same as the PULSE 915 device. Please see the Page 15,”step 6”), and click "register" in the lower right corner to complete the registration.

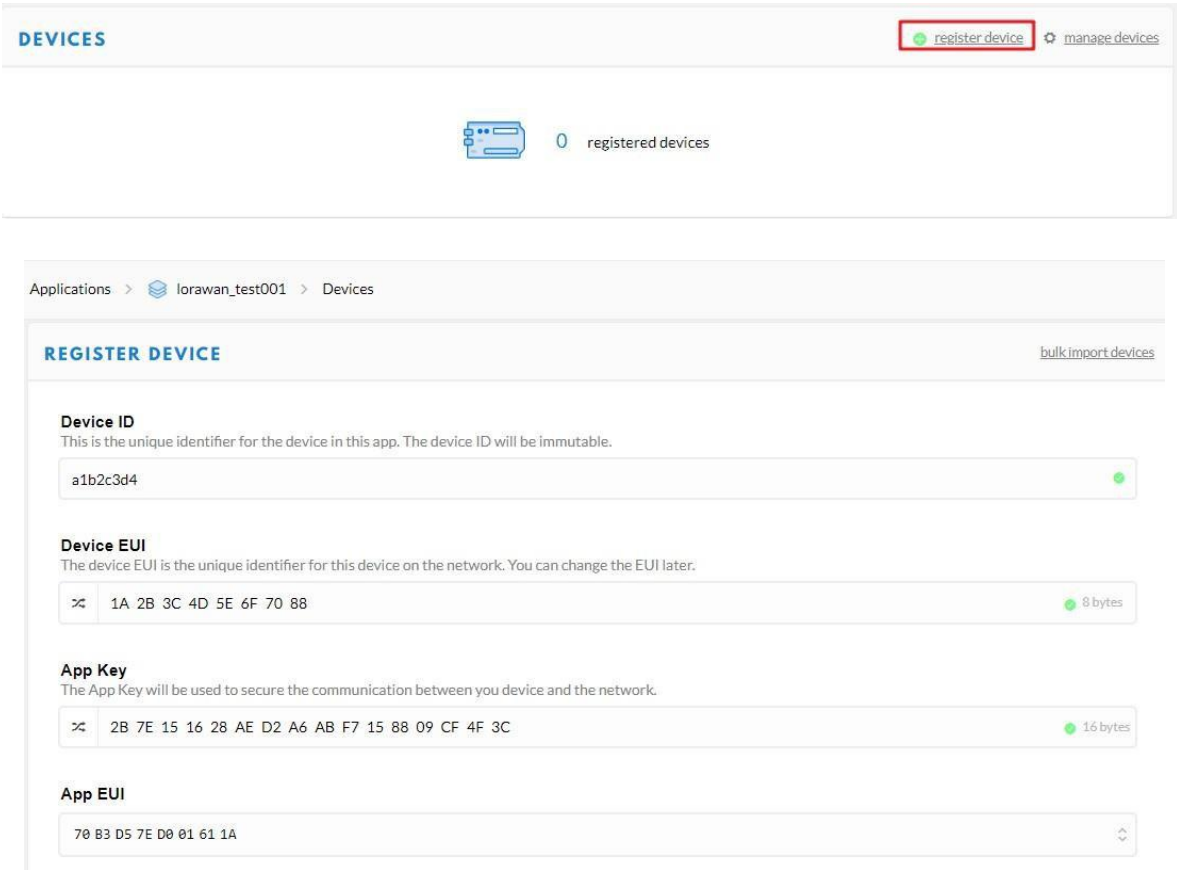


Figure 3-7 TTN server registration terminal devices

Step 9： Set the parameters of PULSE915 and enter the network. Please check Section 2.4 and set the parameters.

Finally, the PULSE915 is connected to the network. See Step 6 on pages 15 for detailed steps to join the network.

When you receive the Network Join message, you are returned indicating that you have joined the Network.

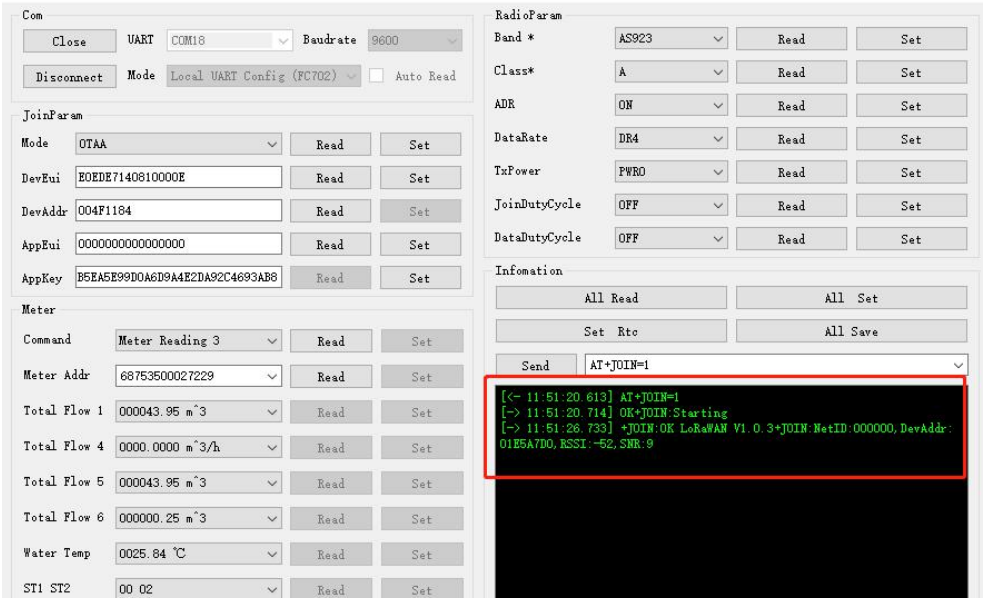


Figure 3-8 PULSE915-LRW Join Network

Step 10： Users can views the Data of the PULSE915 in the Data page under the TTN cloud server device list.

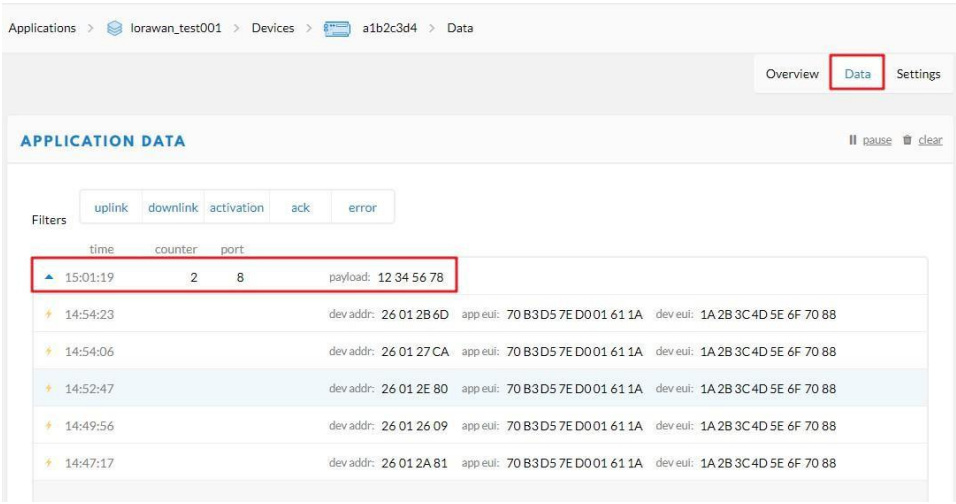


Figure 3-9 TTN server data view