

# PULSE915-LRW Configuration Guide(05)

LoRaWAN Terminal Series

Version 2.8

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## **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
Warning	This warning symbol means danger. You are in a situation that could cause fatal device damage or even bodily damage.
Caution	Means reader be careful. In this situation, you might perform an action that could result in module or product damages.
Note	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
	2020 04	Typographic modification
1.0	2020.08	Editorial corrections
1.2	2020-08	Updating of contents
2.0	2020.08	Updating new LoRaWAN module
2.0	2020-08	Updating of contents
2.1	2021-1	Upgrade the server platform information.
		Set Timed Reports
2.2	2021-2	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
2.0		Add the detail after join failed.
2.7	2022-3	Modify the JOIN process specification
2.8	2022-9	Update the company location



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## 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:

rt	Description	USB to TTL Adapter	

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

Friendcom

om						
Close	UART	COM85	*	Baudrate	115200	-
Disconnect	Mode	Wireless Co	onfig (FO		Auto Re	ad

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	OTAA	▼ Read	Set
DevEui	E0EDE7140A120021	Read	Set
DevÅddr	00000000	Read	Set
AppEui	000000000000111	Read	Set
AppKey	16 Bytes AppKey	Read	Set

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

lleter				
Pulse	= Usage X PluseConst	•	Read	Set
UploadPeriod	Unit Is Min	•	Read	Set
Pulse Const	Pulse Per m^3	•	Read	Set
Meter Addr	Hexadecimal	•	Read	Set
Power Out	OFF	•	Read	Set
Io Pullup	OFF	•	Read	Set
Measure Mode	Sigle	•	Read	Set
Frame Mode	Short	•	Read	Set

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<sup>3</sup>, 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<sup>3</sup> 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 *	EV868	▼ Read	Set
Class*	A	- Read	Set
ADR	OFF	• Read	Set
DataRate	DRO	▼ Read	Set
TxPower	PWRO	• Read	Set
JoinDutyCycle	OFF	▼ Read	Set
DataDutyCycle	OFF	- Read	Set

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

Å	ll Read	All Set
S	et Rtc	All Save
Send	AT+MR?	
- 11:18:44.9	24] AT+CMD=EOEDE7140A	20021, AT+URAM=F30B, 01
> 11:18:45.1	43] +RMAT:EOEDE7140A1:	20021, -29, -45, +URAM: F30B,
,010K		
- 11:18:45.1	44] AT+CMD=EOEDE7140A:	20021, AT+URAM=F30C, 01
> 11:18:45.2	43] OK	
> 11:18:45.3	63] +RMAT:EUEDE714UA1	20021, -29, -45, +0KAM: F30C,
,000A - 11:18:45 3	63] AT+CMD=RORDR71404	20021 AT+1RAM=R30D 01
> 11.18.45.4	63] OK	20021, AT 01Am-150D, 01
> 11:18:45.5	83] +RMAT: EOEDE7140A1	20021 -29 -45 +URAM: F30D
.000K		
> 11-18-45 5	831 411 Read Done	

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.

Com					RadioParam				
Open	VART COM85	<b>→</b> Bε	udrate [	.15200 🔹	Band *	EU868	•	Read	Set
Connect	Mode Wireless Conf:	ig (FC714	U - [	Auto Read	Class*	A	•	Read	Set
JoinParam					ADR	OFF	•	Read	Set
Node OTAA		•	Read	Set	DataRate	DRO	•	Read	Set
DevEui 8 By	rtes DevEui		Read	Set	TxPower	PWRO	•	Read	Set
DevAddr 4 By	rtes DevAddr		Read	Set	JoinDutyCycle	OFF	•	Read	Set
AppEui 8 By	rtes AppEui		Read	Set	DataDutyCycle	OFF	•	Read	Set
AppKey 16 By	rtes AppKey		Read	Set	Infomation				
Weter					Al	l Read		All	Set
Pulse	= Usage X PluseConst	•	Read	Set	Se	t Rtc		All	Save
VploadPeriod	Unit Is Min	•	Read	Set	Send A	F+MR?			
Pulse Const	Pulse Per m^3	•	Read	Set				<u></u>	
Meter Addr	Hexadecimal	•	Read	Set		Y N (C	ทู่สุด	ŶſIJĨÙ	
Power Out	OFF	•	Read	Set	(C)2020 fr	iendcom v1.2	2.2 2021-3	-30	
Io Pullup	OFF	•	Read	Set	[-> Description [-> Maintainer	] Friendcom ] fanyusen@w	Configura vip.qq.com	tion Tool.	
Measure Mode	Sigle	•	Read	Set	[→ License [→ 16:37:38.58 [→ 16:37:42.31	J Friendcom 5] Vart list 4] COM85 Oper	All Right has been	Kevised refresh	
					1 10.01.40.01	41 COMOD ODEL	teu		

#### Step 2:

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

Com					RadioParam			
Close	UART	C0M82	Baudrate	9600 💌	Band *	EV868	- Read	Set
Connect	Mode	Wireless Config Q	70714) 👻	🕅 Auto Read	Class*	A	- Read	Set
JoinParam		Local UART Config Local UART Config Local UART Config	(FC702) (FC714) (FC725)		ADR	OFF	▼ Read	Set
Mode OTAA	- C	Wireless Config () Wireless Config ()	7 <b>C7</b> 02) 7C714)	Set	DataRate	DRO	<ul> <li>Read</li> </ul>	Set
DevEui 8 By	tes DevE	Wireless Config () ui	(C725) Read	Set	TxPower	PWRO	- Read	Set
DevAddr 4 By	tes DevA	ddr	Read	Set	JoinDutyCycle	OFF	▼ Read	Set
AppEui 8 By	tes AppE	ui	Read	Set	DataDutyCycle	OFF	- Read	Set
AppKey 16 By	tes AppK	ey	Read	Set	Infomation			
Meter			,			l Read		Set
Pulse	= Vsage	X PluseConst 🔻	Read	Set	Se	t Rtc		Save
UploadPeriod	Unit Is	Min 👻	Read	Set	Send A	F+MR?		
Pulse Const	Pulse P	er m^3 👻	Read	Set	j <u>i</u> o			
Meter Addr	Hexadec	imal 🔻	Read	Set	1 EPER/		751666	
Power Out	OFF	•	Read	Set	C)2020 fr	iendcom v1.2.2 20	//	
Io Pullup	OFF	•	Read	Set	[-> Description	] Friendcom Conf:	iguration Tool.	
Measure Mode	Sigle	•	Read	Set	<pre>[-&gt; Maintainer [-&gt; License [-&gt; 00:40:20.85</pre>	] fanyusen@vip.q ] Friendcom All ] [] COM92 Original	q.com Right Revised	
Frama Moda	Short	•	Bead	Set	[-> 09:49:39.61	9] +JOIN:Fail		

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Choose EU868 band, Click "connect " and "Yes" .

Com			RadioParam	Tamao			C
Close	UARI COM231	Baudrate 115200	Dand * 1	60603		Kead	Set
Connect	Mode Wireless Confi	g (FC714) 🔻 🕅 Auto	Read Class*	A	•	Read	Set
JoinParam 🥎			ADR	ON	•	Read	Set
Mode ABP		▼ Read Set	DataRate	DRO	•	Read	Set
DevEui EOEDI	E714081000B3	Read Set	TxPower	PWRO	•	Read	Set
DevAddr 00000	0001	warning	Baskestore	×		Read	Set
NwkSKey 16 B	ytes NwkSKey	The mod	ule will perform the follow	wing actions:	-	Read	Set
AppSKey 16 B	ytes AppSKey	1.Enter c 2.LoRaW	lass C mode AN band set to EU868				
Meter		3.RX2 se	t to DR5			All	Set
Pulse	= Usage X PluseConst	4.Deveui	set to 0xFFFFFFFFFFFFFFF			All	Save
UploadPeriod	Unit Is Min	- (	3 <u>Y</u> es	No			
Pulse Const	Pulse Per m^3	• Read Set	[-> 10:40:51.1 [<- 10:40:51.1	39] OK 39] AT+RESET	9		
			[-> 10:40:51 1	491 OK			

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

Con				Radi oParan			
Close	UART COM231	- Baudrate	115200 -	Band *	EU868	▼ Read	Set
Disconnect	Mode Wireless Confi	ig (FC714) 👻	📄 Auto Read	Class*	Å	• Read	Set
JoinParan				ADR	N0]	• Read	Set
Mode ABP		▼ Read	Set	DataRate	DRO	- Read	Set
DevEui EOEDH	714081000B3	Read	Set	TzPower	PWRO	• Read	Set
DevAddr 00000	1001	Read	Set	JoinDutyCycle	ON	• Read	Set
NwkSKey 16 By	rtes NwkSKey	Read	Set	DataDutyCycle	OFF	• Read	Set
AppSKey 16 By	rtes AppSKey	Read	Set	Infonation		5 X.	
Meter				AL	l Read		Set
Pulse	= Usage % PluseConst	- Read	Set	Se	et Ric		Save
UploadPeriod	Unit Is Min	- Read	Set	Send W	IRELESS_MKEY:2021	0604	
Pulse Const	Pulse Per m^3	- Read	Set	(- 10:40:50.74 (-> 10:40:50.77 (-> 10:40:50.77)	<pre>49] AT+DEVEUI=FFFF /1] OK /1] AT+DAWD=0</pre>	FFFFFFFFFFFF	
Meter Addr	Hexadecinal	• Read	Set	[-> 10:40:50.77 [-> 10:40:50.77	79] OK 79] AT+CLASS=2		
Power Out	OFF	• Read	Set	[-> 10:40:50.78 [<- 10:40:50.78	89] OK 89] AT+RX2=0, 5, 869	525000	
Io Pullup	OFF	▼ Read	Set	[-> 10:40:50.79 [<- 10:40:50.79	99] OK 99] AT+SAVE		
Measure Mode	Sigle	▼ Read	Set	[← 10:40:51.13 [← 10:40:51.13	19] UN 19] AT+RESET		
Frame Mode	Short	• Read	Set	[→ 10:40:51.17 [→ 10:40:51.17	79] Startup.		

#### 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



 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.



COM				RadioParam				
Close	VART COM6 🗸 :	Baudrate 96	00 🗸	Band *	EV433	~	Read	Set
Connect	Mode Local VART Config	~	Auto Read	Class*	A	~	Read	Set
JoinParam —				ADR	OFF	~	Read	Set
Mode OTAA	× ~	Read	Set	DataRate	DRO	~	Read	Set
DevEui 8 B	)ytes DevEui	Read	Set	TxPower	PWRO	~	Read	Set
DevAddr 4 B	Bytes DevAddr	Read	Set	JoinDutyCycle	OFF	~	Read	Set
AppEui 8 B	Bytes AppEui	Read	Set	DataDutyCycle	OFF	~	Read	Set
AppKey 16 B	Bytes AppKey	Read	Set	Debug				
Meter				Al	l Read		All	Set
Pulse	7130	Read	Set	Se	t Rtc		All	Save
UploadPeriod	Unit Is Min	Read	Set	Send				
PulseConst	10	Read	Set					
DevAddr	Hexadecimal	Read	Set				NETEN.	
PowerOut	OFF ~	Read	Set	(0)2019 5				
IO Pull	OFF 🗸	Read	Set	(-> Description	] Friendcom	FC714 Con	figuration Tool	
MeasureMode	Sigle 🗸 🗸	Read	Set	[-> Maintainer [-> License	] fanyusen@ ] Friendcom	wip.qq.com All Right	Revised.	
				[-> 14:06:27.61	8] COM6 Open	ed		

#### 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.



 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".

COM					RadioParam				
Cla	se VAR	сома 🗸	Baudrate 96	00 🗸	Band *	EU433	~	Read	Set
Conr	ect Mod	e Local VART Confi	s ~	Auto Read	Class*	A	~	Read	Set
JoinPara	m				ADR	OFF	~	Read	Set
Mode	OTAA	~	Read	Set	DataRate	DRO	~	Read	Set
DevEui	8 Bytes Dev	Eui	Read	Set	TxPower	PWRO	~	Read	Set
DevAddr	4 Bytes Dev	Addr	Read	Set	JoinDutyCycle	OFF	~	Read	Set
AppEui	8 Bytes App	Eui	Read	Set	DataDutyCycle	OFF	~	Read	Set
AppKey	16 Bytes App	Key	Read	Set	Debug				
Meter				- <del>1</del> - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	Al:	l Read		All	Set
Pulse	7130		Read	Set	Se	t Rtc		All	Save
UploadPe	riod Unit Is	Min	Read	Set	Send				
PulseCon	st 10		Read	Set			Ē		
DevAddr	Hexadec	imal	Read	Set	1 EPEDY			NPETEN.	
PowerOut	OFF	~	Read	Set	(0)2019 6				
IO Pull	OFF	~	Read	Set	[-> Description	] Friendcom	FC714 Con	figuration Tool.	
MeasureM	ode Sigle	~	Read	Set	[→ Maintainer [→ License	] fanyusen@ ] Friendcom	vip.qq.com All Right	Revised.	
	t		n 1		[-> 14:06:27.61	8] COM6 Open	ed		

#### Step 6:

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

COM				RadioParam				
Close	UART COM6 🗸	Baudrate 96	00 ~	Band *	EU433	~	Read	Set
Connect	Mode Local VART Confi	s ~	Auto Read	Class*	A	~	Read	Set
JoinParam				ADR	OFF	~	Read	Set
Mode OTAA	~	Read	Set	DataRate	DRO	~	Read	Set
DevEui 8 B	ytes DevEui	Read	Set	TxPower	PWRO	~	Read	Set
DevAddr 4 B	ytes DevAddr	Read	Set	JoinDutyCycle	OFF	~	Read	Set
AppEui 8 B	ytes AppEui	Read	Set	DataDutyCycle	OFF	~	Read	Set
AppKey 16 B	ytes AppKey	Read	Set	Debug				
Meter					l Read		All	Set
Pulse	7130	Read	Set	Se	t Rtc		All	Save
UploadPeriod	Unit Is Min	Read	Set	Send				
PulseConst	10	Read	Set					
DevAddr	Hexadecimal	Read	Set	L'EPERZ			METER.	
PowerOut	off ~	Read	Set		<u> - ji lic</u>			
IO Pull	off ~	Read	Set	(C)2019 Ir	l Friendcom	FC714 Con	figuration Tool	
MeasureMode	Sigle $\vee$	Read	Set	[→ Maintainer [→ License	] fanyusen@ ] Friendcom	Bvip. qq. com All Right	Revised.	
				[-> 14:06:27.61	8] COM6 Oper	red		

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".





Please following section 2.5 If you choose the curve frame.

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

Send	AT+JOIN=1
1RAM - F304 04	4_0A000000K
[<= 11:48:06.	579] AT+CMD=E0EDE715040800D4, AT+JOIN=1
[-> 11:48:06.	671] OK
[-> 11:48:06.	761] +RMAT: EOEDE715040800D4, -29, -46, 0K
<= 11:49:13	322] AT+CMD=E0EDE715040800D4, AT+URAM=F300, 04
[-> 11:49:13.	421] OK

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.



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=11223344556677889900112233445566 [-> 11:52:08.375] OK

Set APPSKEY [<- 11:52:36.821] AT+APPSKEY=11223344556677889900112233445566 [-> 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.





 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.

Chosen	39		Mask	FFFF8	8888888	8888888	8888F	5	AT Command	A	T+UAT0=	FFFF8888	8888888	8888888	8F
8888888	F														
1	0	0	0	1	0	0	0	1	0	0	0	1	1	1	1
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
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0
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
Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24	Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16
8888888	8														
1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0
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
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0
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
Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24	Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16
FFFF8888	3														
1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0
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
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
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
Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24	Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16

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.

Chosen	77		Mask	FFFF	FFFF8888	FE88FFFF	FFFF		AT Command		AT+UATO	=FFFFFFFF	F8888FE8	8FFFFFFF	Ŧ
FFFFFF			-							3.54					
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
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
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
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
Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24	Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16



- 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:

[-> 15:40:30.028] OK

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

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).



 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:

#### LoRa setting

Gateway ID	04A316ffffCEAA29	
	• Fixed eight bytes, sixteen strings	
server address	router.au.thethings.network	Ŧ
Uplink port(UDP)	1700	Ŧ
	O Private server uplink port	
Downstream port(UDP)	1700	Ŧ
ka se	• Private server downstream port	
RF select frequency	AU915 (CH00_CH07)	•

Figure 3-1 Configurate TTN SDK

**Step 2:** the new user can log on to <u>https://account.thethingsnetwork.org/</u> 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.





GATEWAYS		S register gatev
	You do not have any gateways	
	Get started by registering one!	

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.

Gateways > Register
REGISTER GATEWAY
Gateway ID A unique, human-readable identifier for your gateway. It can be anything so be creative!
I'm using the legacy packet forwarder Select this if you are using the legacy <u>Semtech packet forwarder</u> .
A human-readable description of the gateway
Frequency Plan
The frequency plan this gate way will use

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.

Fri	er	h	CO	m
		<b>IU</b>		

Gateways	
GATEWAYS	• register gateway
eui-8cf957ffff8005a1 test sensor	• connected EU_863_870

#### 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.

😻 Hi, Gui!	
Welcome to The Things Network Console. This is where the magic happens. Here you can work with your data. Register applications, devices and gateways, manage your integration collaborators and settings.	ns,
APPLICATIONS GATEWAYS	
Applications	
APPLICATIONS	add application
test_0011 test sensor	ttn-handler-eu

#### 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.

DD APPLICATION	
Application ID	
The unique identifier of your application on the network	
lorawan_test001	
Description	
A human readable description of your new app	
friendcom test	
Application EUI An application EUI will be issued for The Things Network block for convenience, you can add your own in EUI issued by The Things Network	the application settings page.
fandler registration elect the handler you want to register this application to	

#### 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.

EVICES	register device
0 registered devices	
Applications > 😂 lorawan_test001 > Devices	
REGISTER DEVICE	bulk import devices
Device ID This is the unique identifier for the device in this app. The device ID will be immutable.	
Device EUI The device EUI is the unique identifier for this device on the network. You can change the EUI later.	
× 1A 2B 3C 4D 5E 6F 70 88	🧑 8 bytes
App Key The App Key will be used to secure the communication between you device and the network.	
× 28 7E 15 16 28 AE D2 A6 AB F7 15 88 09 CF 4F 3C	🥚 16 bytes
App EUI	
70 B3 D5 7E D0 01 61 1A	0

#### 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.

Com						RadioParam					
Close	e VAF	COM18	~	Baudrate	9600 🗸 🗸	Band *	AS923	∼ Read	Set		
Disconn	nect Mod	le Local VART	Config (	FC702) 🖂	Auto Read	Class*	A	✓ Read	Set		
JoinParam	1					ADR	ON	∼ Read	Set		
Kode C	OTAA		~	Read	Set	DataRate	DR4	∼ Read	Set		
)evEui E	E0EDE7140810000E			Read	Set	TxPower	PWRO	∼ Read	Set		
JevAddr 0	D04F1184			Read	Set	JoinDutyCycle	OFF	∼ Read	Set		
AppEui 0	000000000000000000000000000000000000000			Read	Set	DataDutyCycle	OFF	∼ Read	Set		
AppKey B	5EA5E99DO	A6D9A4E2DA92C4	693AB8	Read	Set	Infomation					
leter						ĹA	ll Read		l Set		
Command	Mete	Meter Reading 3 V Read Set				Set Rto All Save			L Save		
Meter Add	år 6875	3500027229	~	Read	Set	Send 4	AT+JOIN=1				
Total Flo	ow 1 0000	43.95 m <sup>°</sup> 3	~	Read	Set	[<= 11:51:20.6 [→ 11:51:20.7	13] AT+JOIN=1 14] OK+JOIN:Starti	ng	P. 000000 P 113		
Cotal Flo	w 4 0000	.0000 m^3/h	~	Read	Set	[-> 11:51:25.733] *JULN:0K LokaWAN VI. 0.3*JULN:NetLD:000000, DevAddy 01E5A7D0, RSSI: -52, SNR:9					
Total Flo	ow 5 0000	43.95 m <sup>^</sup> 3	~	Read	Set	L					
Total Flo	w 6 0000	00.25 m <sup>^</sup> 3	~	Read	Set						
fater Tem	NP 0025	.84 °C	~	Read	Set						
ST1 ST2	00 0	2	~	Read	Set						

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.

oplicatio	ns > 🤘 l	orawan_test	001 > Dev	/ices >	e a1	b2c3d4 → [	Data					
										Overview	Data	Settings
APPL	ICATION	DATA									II pause	e 🗎 <u>clear</u>
Filters	uplink	downlink	activation	ack	erro	t						
_	time	counter	port									
-	15:01:19	2	8		payload:	12 34 56 78						
*	14:54:23				dev addr:	26 01 2B 6D	app eui:	70 B3D5 7E D001 61 1A	dev eui:	1A 2B 3C 4D 5E 6F 70 88		
*	14:54:06				dev addr:	26 01 27 CA	app eui:	70 B3D5 7E D001 61 1A	dev eui:	1A 2B 3C 4D 5E 6F 70 88	5	
*	14:52:47				dev addr:	26 01 2E 80	app eui:	70 B3D5 7E D001 61 1A	dev eui:	1A 2B 3C 4D 5E 6F 70 88		
*	14:49:56				dev addr:	26 01 26 09	app eui:	70 B3D5 7E D0 01 61 1A	dev eui:	1A 2B 3C 4D 5E 6F 70 88	5	
*)	14:47:17				dev addr:	26 01 2A 81	app eul:	70 B3D5 7E D001 61 1A	dev eui:	1A 2B 3C 4D 5E 6F 70 88	1	

Figure 3-9 TTN server data view