LT Series LoRa IO Controller User Manual

Document Version: 1.1.2

Image Version: v1.1

Version	Description	Date
1.0	Release	2018-Sep-26
1.0.2	Add 8 channels mode for US915, AU915, CN470	2018-Oct-24
1.0.3	Add current measure photo	2018-Nov-2
1.0.4	Add Cayenne connection guide	2018-Nov-24
1.1	Add downlink trouble shooting, Add Hardware Source code link. Add change log for v1.1. (related to Downlink, Payload part) Add TTN payload format	2019-Jan-24
1.1.1	Add more info for 8 channel mode descript and troubleshooting while use US915 and AU915	2019-Feb-21
1.1.2	Modify trouble shooting for upload via FlashLoader,	2019-Apr-26

	Correct the TTN payload decoder	

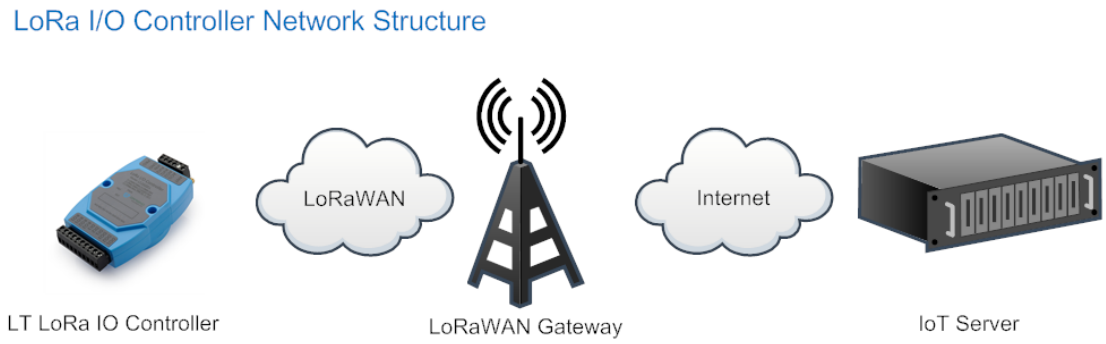
1. Introduction

1.1 What is LT Series I/O Controller

The Dragino LT series I/O Modules are Long Range LoRaWAN I/O Controller. It contains different I/O Interfaces such as: analog current Input, analog voltage input, relay output, digital input and digital output etc. The LT I/O Modules are designed to simplify the installation of I/O monitoring.

The LT I/O Controllers allows the user to send data and reach extremely long ranges. It provides ultra-long range spread spectrum communication and high interference immunity whilst minimizing current consumption. It targets professional wireless sensor network applications such as irrigation systems, smart metering, smart cities, smartphone detection, building automation, and so on.

The LT I/O Controllers is aiming to provide a simple plug and play, low cost installation by using LoRaWAN wireless technology.
The use environment includes:
1) If user's area has LoRaWAN service coverage, they can just install the I/O controller and configure it to connect the LoRaWAN provider via wireless.
2) User can set up a LoRaWAN gateway locally and configure the controller to connect to the gateway via wireless.



1.2 Specifications

Hardware System:

- STM32L072CZT6 MCU
- SX1276/78 Wireless Chip
- Power Consumption:
  - Idle: 4mA@12v
  - 20dB Transmit: 34mA@12v

Interface for Model: LT33222-L:

- 3 x Digital Input (Max, 6V)
- 3 x Digital Output (Max output, 36V,450mA)
- 2 x Relay Output (5A@250VAC / 30VDC)
- 2 x 0~20mA Analog Input (res:0.01mA)
- 2 x 0~30V Analog Input (res:0.01v)
- Power Input 7~ 24V DC.

LoRa Spec:

- Frequency Range:
  - ✓ Band 1 (HF): 862 ~ 1020 Mhz
  - ✓ Band 2 (LF): 410 ~ 528 Mhz
- 168 dB maximum link budget.
- +20 dBm - 100 mW constant RF output vs.
- +14 dBm high efficiency PA.
- Programmable bit rate up to 300 kbps.
- High sensitivity: down to -148 dBm.
- Bullet-proof front end: IIP3 = -12.5 dBm.
- Excellent blocking immunity.
- Low RX current of 10.3 mA, 200 nA register retention.
- Fully integrated synthesizer with a resolution of 61 Hz.
- FSK, GFSK, MSK, GMSK, LoRaTM and OOK modulation.
- Built-in bit synchronizer for clock recovery.
- Preamble detection.
- 127 dB Dynamic Range RSSI.
- Automatic RF Sense and CAD with ultra-fast AFC.
- Packet engine up to 256 bytes with CRC.

1.3 Features

- ✓ LoRaWAN Class A & Class C protocol
- ✓ Optional Customized LoRa Protocol
- ✓ Frequency Bands: CN470/EU433/KR920/US915/EU868/AS923/AU915
- ✓ AT Commands to change parameters

- ✓ Remote configure parameters via LoRa Downlink
- ✓ Firmware upgradable via program port

1.4 Applications

- ✓ Smart Buildings & Home Automation
- ✓ Logistics and Supply Chain Management
- ✓ Smart Metering
- ✓ Smart Agriculture
- ✓ Smart Cities
- ✓ Smart Factory

1.5 Hardware Variants

Model	Photo	Description
LT33222-L		✓ 3 x Digital Input ✓ 3 x Digital Output ✓ 2 x Relay Output (5A@250VAC / 30VDC) ✓ 2 x 0~20mA Analog Input (res:0.01mA) ✓ 2 x 0~30V Analog Input (res:0.01v)

1.6 Firmware Change log

LT Image files

Image v1.1

- Voltage and Current reserve three decimal, previous is two
- Can use any Fport for downlink
- Add AT+CFG to print all settings
- Fix current and voltage glith bug

2. Operation Mode

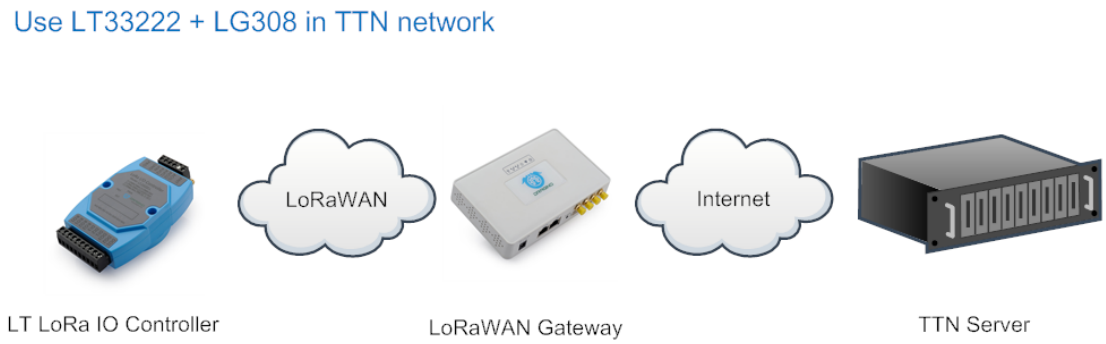
2.1 How it works?

The LT is configured as LoRaWAN OTAA Class A mode by default. It has OTAA keys to join network. To connect a local LoRaWAN network, user just need to input the OTAA keys in the network server and power on the LT. It will auto join the network via OTAA.

In case user can't set the OTAA keys in the network server and has to use the existing keys from server. User can use AT Command to set the keys in the devices.

2.2 Example to join LoRaWAN network

Here shows an example for how to join the TTN Network. Below is the network structure, we use our LG308 as LoRaWAN gateway here.



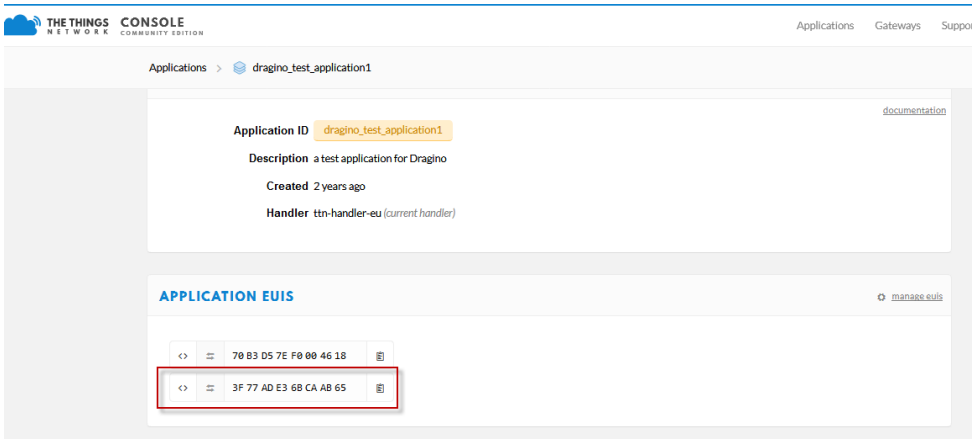
The LG308 is already set to connect to TTN network . So what we need to now is only configure the TTN:

Step 1: Create a device in TTN with the OTAA keys from LT IO controller.

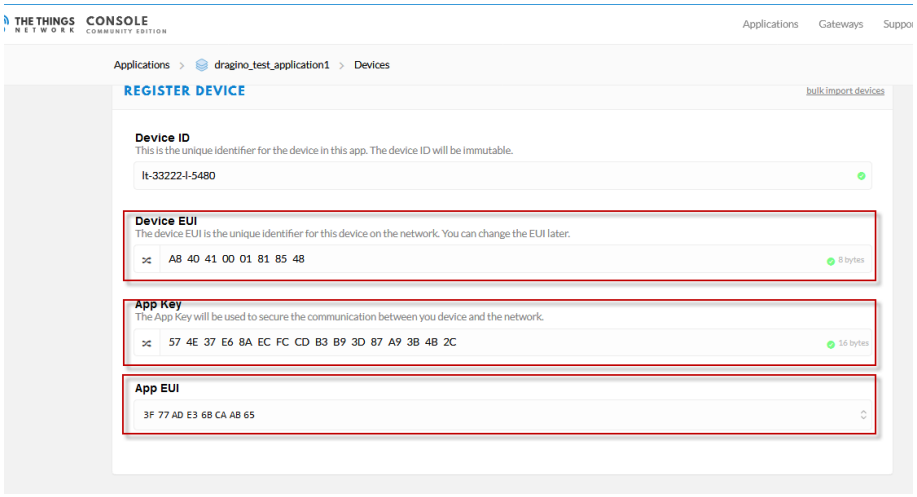
Each LT is shipped with a sticker with the default device EUI as below:

User can enter this key in their LoRaWAN Server portal. Below is TTN screen shot:

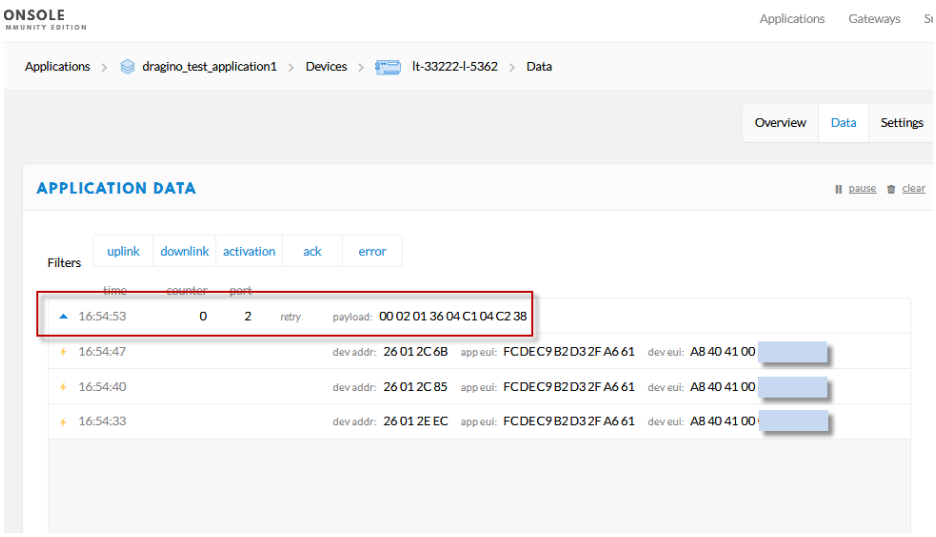
Add APP EUI in the application.



Add APP KEY and DEV EUI



Step 2: Power on LT and it will auto join to the TTN network. After join success, it will start to upload message to TTN and user can see in the panel.



2.3 Uplink Payload

The uplink payload includes totally 9 bytes. Uplink packets use FPORT=2 and every 10 minutes send one uplink by default.

Size(bytes)	2	2	2	2	1
Value	ACI1 Current	ACI2 Current	AVI1 voltage	AVI2 voltage	* (see below)

* is a combination for RO1, RO2, DI3, DI2, DI1, DO3, DO2 and DO1. Totally 1bytes as below

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
RO1	RO2	DI3	DI2	DI1	DO3	DO2	DO1

- ✓ RO is for relay. ROx=1 : close， ROx=0 always open.
- ✓ DI is for digital input. DIx=1: high or float, DIx=0: low.
- ✓ DO is for reverse digital output. DOx=1: output low, DOx=0: high or float.

For example if payload is: `1310 1300 04AB 04ACAA`

The value for the interface is:

ACI1 channel current is 0x1310/1000=4880（DEC）/1000=4.880mA

ACI2 channel current is 0x1300/1000=4.864mA

AVI1 channel voltage is 0x04AB/1000=1.195V

AVI2 channel voltage is 0x04AC/1000=1.196V

The last byte 0xAA= 10101010(B) means

- ✓ [1] RO1 relay channel is close and the RO1 LED is ON.
- ✓ [0] RO2 relay channel is open and RO2 LED is off;
- ✓ [1] DI3 channel is high input and DI3 LED is off;
- ✓ [0] DI2 channel is low input and DI2 is on;
- ✓ [1] DI1 channel is low input and DI1 is on;
- ✓ [0] DO3 channel output state
  - ✧ DO3 is float in case no load between DO3 and V+.;
  - ✧ DO3 is high in case there is load between DO3 and V+.
  - ✧ DO3 LED is off in both case
- ✓ [1] DO2 channel output is low and DO2 LED is on.
- ✓ [0] DO1 channel output state
  - ✧ DO1 is float in case no load between DO1 and V+.;
  - ✧ DO1 is high in case there is load between DO1 and V+.
  - ✧ DO1 LED is off in both case

TTN Payload format:

```
function Decoder(bytes, port) {
 // Decode an uplink message from a buffer
 // (array) of bytes to an object of fields.

 var value=bytes[0]<<8 | bytes[1];
 if(bytes[0] & 0x80)
 {value |= 0xFFFF0000;}
 var ACI1=(value/1000).toFixed(3);  //ACI1 Current,units:mA

 value=bytes[2]<<8 | bytes[3];
 if(bytes[2] & 0x80)
 {value |= 0xFFFF0000;}
 var ACI2=(value/1000).toFixed(3);  // ACI2 Current,units:mA

 value=bytes[4]<<8 | bytes[5];
 if(bytes[4] & 0x80)
 {value |= 0xFFFF0000;}
 var AVI1=(value/1000).toFixed(3);  // AVI1 voltage,units:V

 value=bytes[6]<<8 | bytes[7];
 if(bytes[6] & 0x80)
 {value |= 0xFFFF0000;}
 var AVI2=(value/1000).toFixed(3);  // AVI2 voltage,units:V

 value=bytes[8]
 var DO1=(value&0x01)? "L":"H";    //DO1，Digital Output Status
 var DO2=(value&0x02)? "L":"H";    //DO2，Digital Output Status
 var DO3=(value&0x04)? "L":"H";    //DO3，Digital Output Status
 var DI1=(value&0x08)? "H":"L";    //DI1，Digital Input Status
 var DI2=(value&0x10)? "H":"L";    //DI2，Digital Input Status
 var DI3=(value&0x20)? "H":"L";    //DI3，Digital Input Status
 var RO2=(value&0x40)? "ON":"OFF"; //RO2，Relay Status
 var RO1=(value&0x80)? "ON":"OFF"; //RO1，Relay Status

 return {
    ACI1_mA:ACI1,
    ACI2_mA:ACI2,
    AVI1_V:AVI1,
    AVI2_V:AVI2,
    DO1_status:DO1,
```

```
    DO2_status:DO2,
    DO3_status:DO3,
    DI1_status:DI1,
    DI2_status:DI2,
    DI3_status:DI3,
    RO1_status:RO1,
    RO2_status:RO2,
  };
}
```

2.4 Downlink Payload

Downlink Control Type	FPort	Type Code	Downlink payload size(bytes)
TDC (Transmit Time Interval)	Any	01	4
Digital Output (DO1DO2DO3)	Any	02	4
Relay Output (RO1RO2)	Any	03	3
RESET	Any	04	2

The FPort is not fix, if the payload=0100003C, means to control the END Node's TDC to 0x00003C=60(S), while type code is 01.

Example Downlink payload setting in TTN:

If payload = 0x02010001, while there is load between V+ and DOx, it means set DO1 to low , DO2 to high and DO3 to low. Type code 02 means Digital Output

If payload = 0x030100, it means set RO1 to close and RO2 to open.

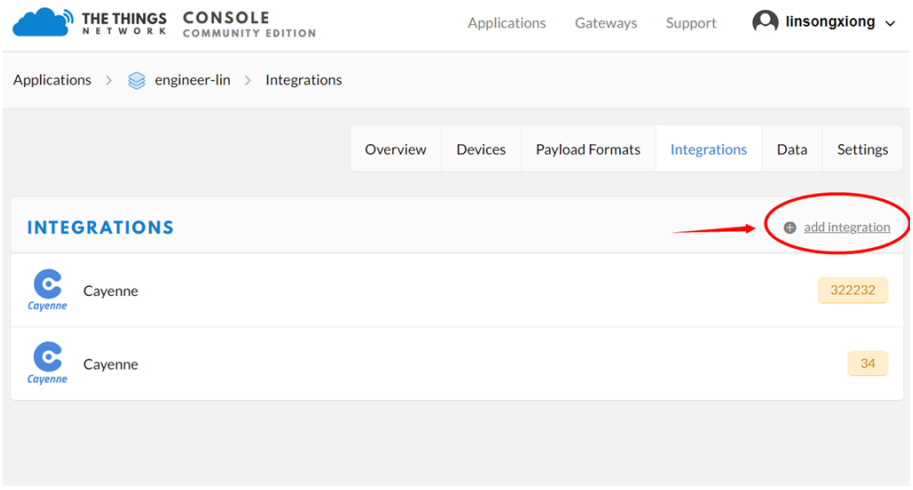
If payload = 0x04FF, it will reset the LT.

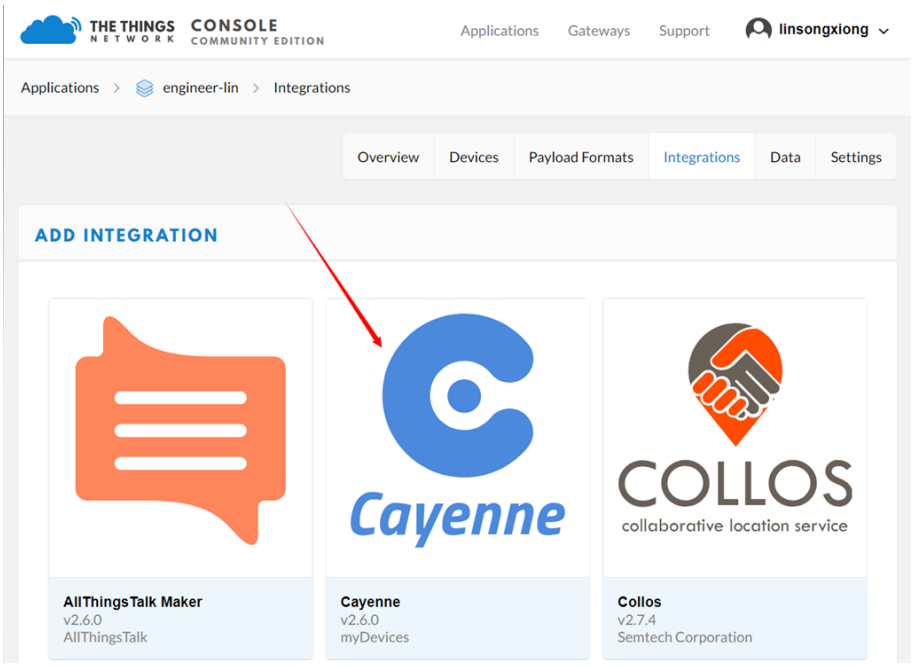
2.5 Show data on Cayenne

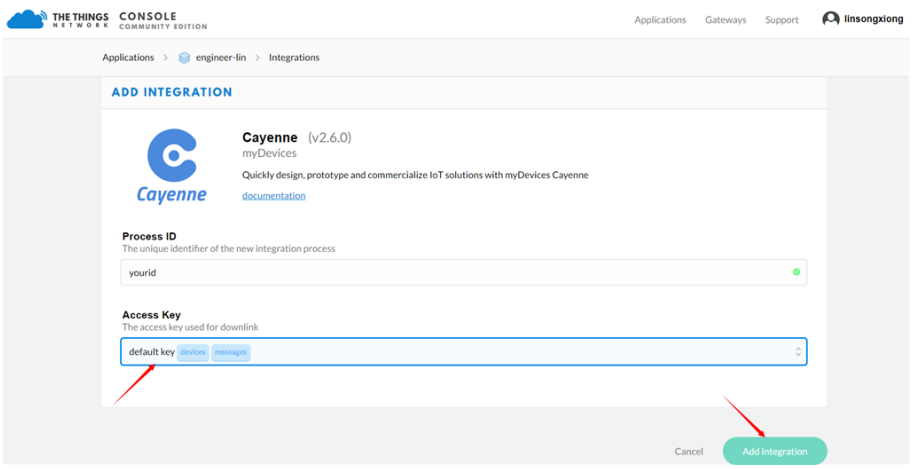
Cayenne provides a human friend interface to show the sensor data, once we have data in TTN, we can use Cayenne to connect to TTN and see the data in Cayenne. Below are the steps:

Step 1: Be sure that your device is programmed and properly connected to the network at this time.

Step 2: To configure your Application to forward data to Cayenne you will need to add an Integration. To add the Cayenne integration, perform the following steps:

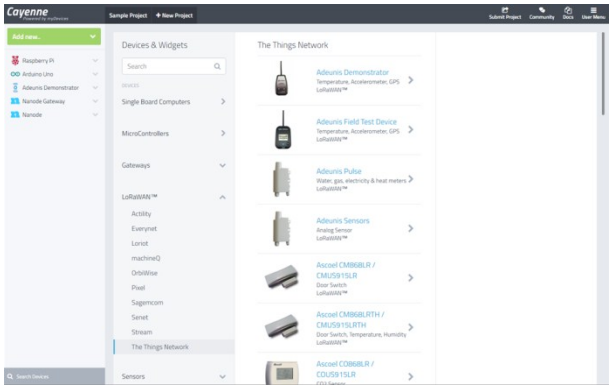


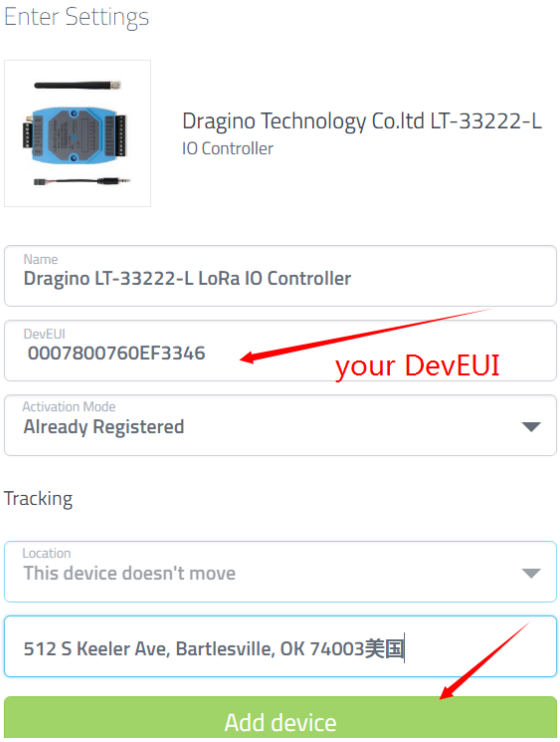




Step 3: Create an account or log in in the mydevices cayenne.

Step 4:Search the LT-33222and add DevEUI

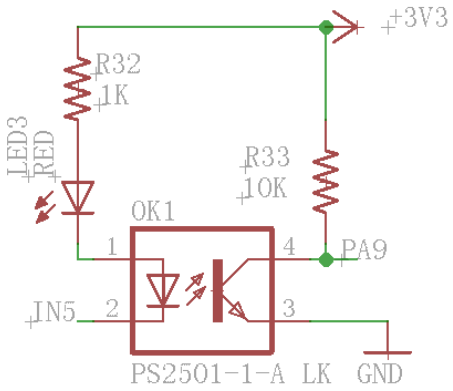




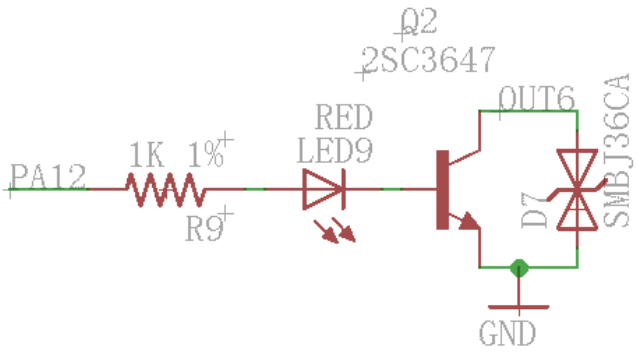

Cayenne
Powered by myDevices
+ Create new project
Create App
Submit Project
Community
Docs
Add new...
Overview
Data
Dragino LT-33222-L LoRa IO Controller
Network: The Things Network
Digital Output 3
Current 1
3.11
Milliampere
Relay 2
Digital Input 3
Digital Output 2
RSSI
-38.00
dBm
Current 2
3.09
Milliampere
Voltage 1
12.15
Volts
Voltage 2
12.17
Volts
Digital Output 1
Relay 1
Digital Input 2
Digital Input 1
Location
地图
卫星图像
Nov 19
Device 640b
Dragino LT-33222-L L...
Current 1
Current 2
Digital Input 1
Digital Input 2
Digital Input 3
Digital Output 1
Digital Output 2
Digital Output 3
Location
Relay 1
Relay 2
RSSI
Voltage 1
Voltage 2
Raspberry Pi

2.6 Interface Detail

Digital Input Port: DI1/DI2 /DI3



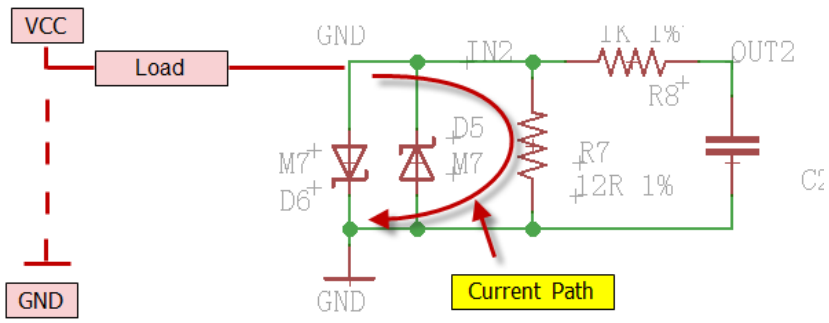
Digital Output Port: DO1/DO2 /DO3



Analog Input Interface:

The analog input interface is as below. The LT will measure the IN2 voltage so to calculate the current pass the Load. The formula is:

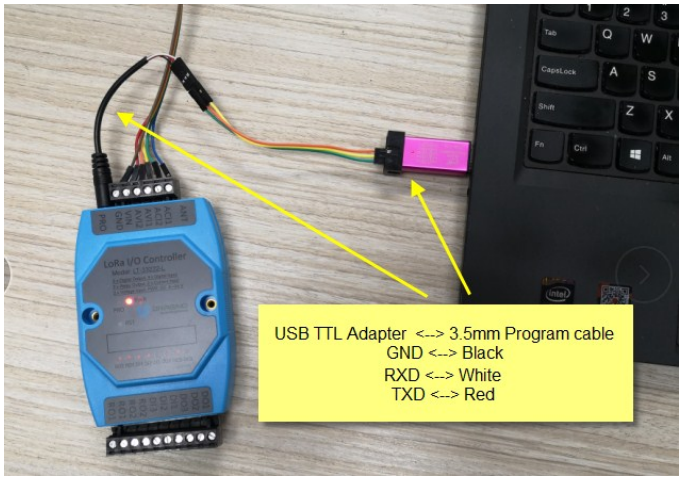
AC2 = (IN2 voltage)/12



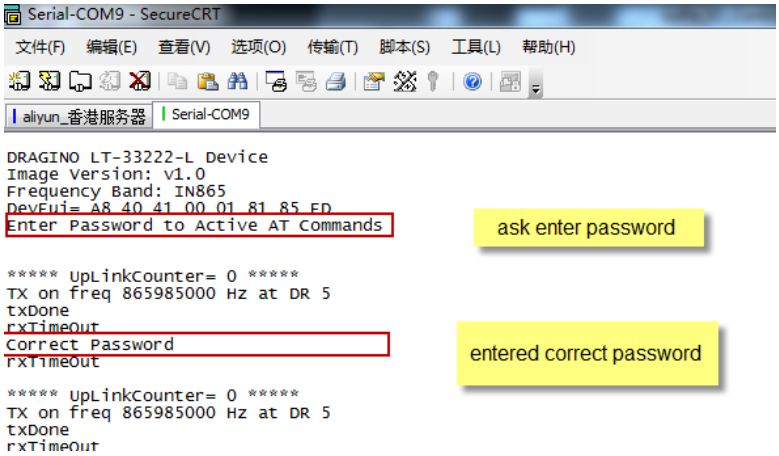
3. Use AT Command

3.1 Access AT Command

LT supports AT Command set. User can use a USB to TTL adapter plus the 3.5mm Program Cable to connect to LT for using AT command, as below.



In PC, User needs to set **serial tool**(such as putty, SecureCRT) baud rate to **9600** to access to access serial console for LT. The AT commands are disable by default and need to enter password (default:**123456**) to active it. As shown below:



Below are the available commands, a more detail AT Command manual can be found at AT Command Manual

AT+<CMD>? : Help on <CMD>

AT+<CMD> : Run <CMD>

AT+<CMD>=<value> : Set the value

AT+<CMD>=? : Get the value

ATZ: Trig a reset of the MCU

AT+FDR: Reset Parameters to Factory Default, Keys Reserve

AT+DEUI: Get or Set the Device EUI

AT+DADDR: Get or Set the Device Address

AT+APPKEY: Get or Set the Application Key

AT+NWKSKEY: Get or Set the Network Session Key
AT+APPSKEY: Get or Set the Application Session Key
AT+APPEUI: Get or Set the Application EUI
AT+ADR: Get or Set the Adaptive Data Rate setting. (0: off, 1: on)
AT+TXP: Get or Set the Transmit Power (0-5, MAX:0, MIN:5, according to LoRaWAN Spec)
AT+DR: Get or Set the Data Rate. (0-7 corresponding to DR_X)
AT+DCS: Get or Set the ETSI Duty Cycle setting - 0=disable, 1=enable - Only for testing
AT+PNM: Get or Set the public network mode. (0: off, 1: on)
AT+RX2FQ: Get or Set the Rx2 window frequency
AT+RX2DR: Get or Set the Rx2 window data rate (0-7 corresponding to DR_X)
AT+RX1DL: Get or Set the delay between the end of the Tx and the Rx Window 1 in ms
AT+RX2DL: Get or Set the delay between the end of the Tx and the Rx Window 2 in ms
AT+JN1DL: Get or Set the Join Accept Delay between the end of the Tx and the Join Rx Window 1 in ms
AT+JN2DL: Get or Set the Join Accept Delay between the end of the Tx and the Join Rx Window 2 in ms
AT+NJM: Get or Set the Network Join Mode. (0: ABP, 1: OTAA)
AT+NWKID: Get or Set the Network ID
AT+FCU: Get or Set the Frame Counter Uplink
AT+FCD: Get or Set the Frame Counter Downlink
AT+CLASS: Get or Set the Device Class
AT+JOIN: Join network
AT+NJS: Get OTAA Join Status
AT+SENDB: Send hexadecimal data along with the application port
AT+SEND: Send text data along with the application port
AT+RECVB: Print last received data in binary format (with hexadecimal values)
AT+RECV: Print last received data in raw format
AT+VER: Get current image version and Frequency Band
AT+CFM: Get or Set the confirmation mode (0-1)
AT+CFS: Get confirmation status of the last AT+SEND (0-1)
AT+SNR: Get the SNR of the last received packet
AT+RSSI: Get the RSSI of the last received packet
AT+TDC: Get or set the application data transmission interval in ms
AT+PORT: Get or set the application port
AT+DISAT: Disable AT commands
AT+PWORD: Set password, max 9 digits
AT+CHS: Get or Set Frequency (Unit: Hz) for Single Channel Mode
AT+CHE: Get or Set eight channels mode, Only for US915, AU915, CN470
AT+CFG: Print all settings

3.2 Common AT Command Sequence

3.2.1 Multi-channel ABP mode (Use with SX1301/LG308)

If device has not joined network yet:

123456

AT+FDR

123456

AT+NJM=0

ATZ

If device already joined network:

AT+NJM=0

ATZ

3.2.2 Single-channel ABP mode (Use with LG01/LG02)

123456 Enter Password to have AT access.

AT+FDR Reset Parameters to Factory Default, Keys Reserve

123456 Enter Password to have AT access.

AT+NJM=0 Set to ABP mode

AT+ADR=0 Set the Adaptive Data Rate Off

AT+DR=5 Set Data Rate

AT+TDC=60000 Set transmit interval to 60 seconds

AT+CHS=868400000 Set transmit frequency to 868.4Mhz

AT+DADDR=26 01 1A F1 Set Device Address to 26 01 1A F1

ATZ Reset MCU

3.2.3 Change to Class C

From ABP,CLASS A to OTAA,CLASS C

AT+NJM=1

AT+CLASS=C

ATZ

From OTAA，CLASS A to OTAA CLASS C

If sensor JOINED

AT+CLASS=C

ATZ

4. FAQ

4.1 Why there is 433/868/915 version?

Different country has different rules for the ISM band for using the LoRa. Although the LoRa chip can support a wide range of Frequency, we provide different version for best tune in the LoRa part. That is why we provide different version of LoRa.

4.2 What is the frequency range of LT LoRa part?

Different LT version supports different frequency range, below is the table for the working frequency and recommend bands for each model :

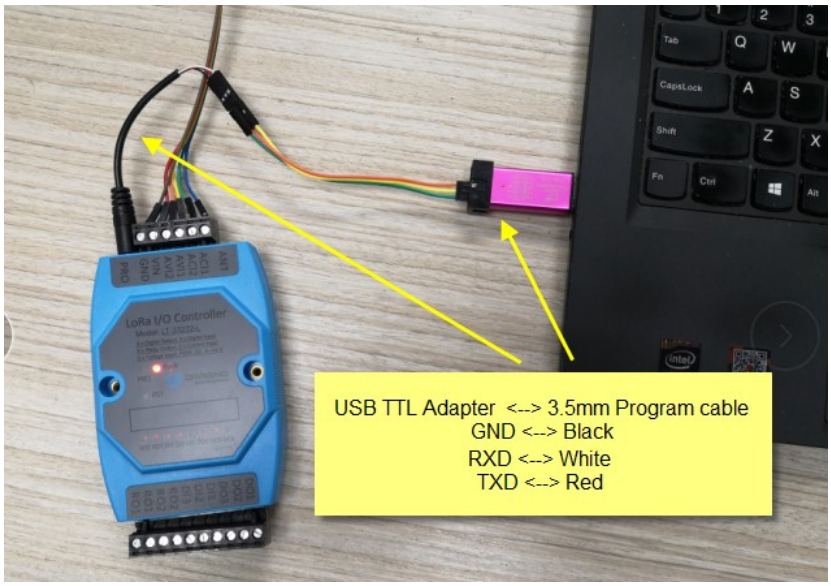
Version	LoRa IC	Working Frequency	Best Tune Frequency	Recommend Bands
433	SX1278	Band2(LF): 410 ~525 Mhz	433Mhz	CN470/EU433
868	SX1276	Band1(HF):862~1020 Mhz	868Mhz	EU868
915	SX1276	Band1(HF):862 ~1020 Mhz	915Mhz	AS923/AU915/ KR920/US915

4.3 How to upgrade the image?

The LT LoRaWAN Controller is shipped with a 3.5mm cable, the cable is used to upload image to LT to:

- ✓ Support new features
- ✓ For bug fix
- ✓ Change LoRaWAN bands.

Below shows the hardware connection for how to upload an image to the LT:

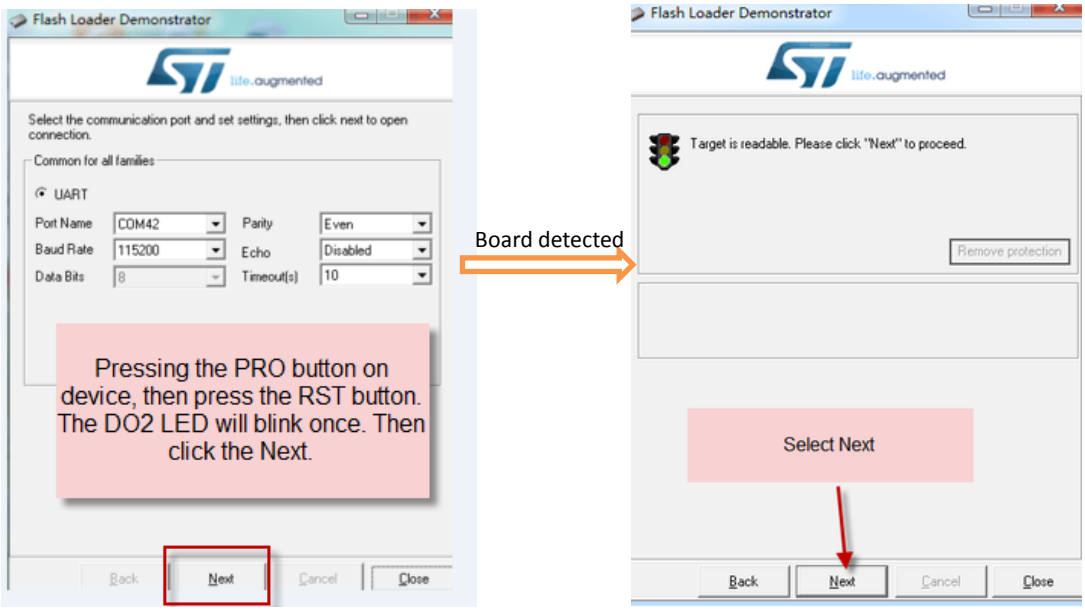


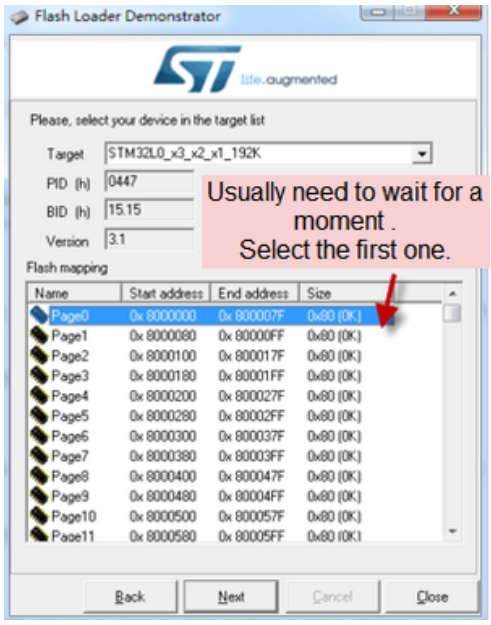
Step1: Download flash loader.

Step2: Download the LT Image files.

Step3: Open flashloader; choose the correct COM port to update.

Hold down the PRO button and then momentarily press the RST reset button and the DO2 led will change from OFF to ON





Notice: In case user has lost the program cable. User can hand made one from a 3.5mm cable.
The pin mapping is:

4.4 How to change the LoRa Frequency Bands/Region?

User can follow the introduction for how to upgrade image. When download the images, choose the required image file for download.

4.5 How to set up LT to work in 8 channel mode in US915, AU915, CN470 bands?

By default, the frequency bands US915, AU915, CN470 works in 72 frequencies. Many gateways are 8 channel gateways, in such case, the OTAA joined time and uplink schedule is **long and unpredictable** while the end node hopping in 72 frequencies.

User can configure the end node to work in 8 channel models by using the AT+CHE command, the 500kHz channels are always includes for OTAA.

For example, in US915 band, the frequency table is as below. By default, end node will use all channels (0~71) for OTAA Join process. After OTAA JOINED, end node will use these all channels (0~71) to send uplink packets.

CHE	US915 Uplink Channels(125KHz,4/5,Unit:MHz,CHS=0)								
0	ENABLE Channel 0-63								
1	902.3	902.5	902.7	902.9	903.1	903.3	903.5	903.7	Channel 0-7
2	903.9	904.1	904.3	904.5	904.7	904.9	905.1	905.3	Channel 8-15
3	905.5	905.7	905.9	906.1	906.3	906.5	906.7	906.9	Channel 16-23
4	907.1	907.3	907.5	907.7	907.9	908.1	908.3	908.5	Channel 24-31
5	908.7	908.9	909.1	909.3	909.5	909.7	909.9	910.1	Channel 32-39
6	910.3	910.5	910.7	910.9	911.1	911.3	911.5	911.7	Channel 40-47
7	911.9	912.1	912.3	912.5	912.7	912.9	913.1	913.3	Channel 48-55
8	913.5	913.7	913.9	914.1	914.3	914.5	914.7	914.9	Channel 56-63
Channels(500KHz,4/5,Unit:MHz,CHS=0)									
	903	904.6	906.2	907.8	909.4	911	912.6	914.2	Channel 64-71

When user uses the TTN network, the US915 frequency bands use are:

- ✓ 903.9 - SF7BW125 to SF10BW125
- ✓ 904.1 - SF7BW125 to SF10BW125
- ✓ 904.3 - SF7BW125 to SF10BW125
- ✓ 904.5 - SF7BW125 to SF10BW125
- ✓ 904.7 - SF7BW125 to SF10BW125
- ✓ 904.9 - SF7BW125 to SF10BW125
- ✓ 905.1 - SF7BW125 to SF10BW125
- ✓ 905.3 - SF7BW125 to SF10BW125
- ✓ 904.6 - SF8BW500

Because the end node is now hopping in 72 frequency, it is makes the devices hard to Join the TTN network and uplink data. To solve this issue, user can access the device via AT Command and run:

AT+CHE=2

ATZ

to set the end node to work in 8 channel mode. The device will work in Channel 8-15 & 64-71 for OTAA, and channel 8-15 for Uplink.

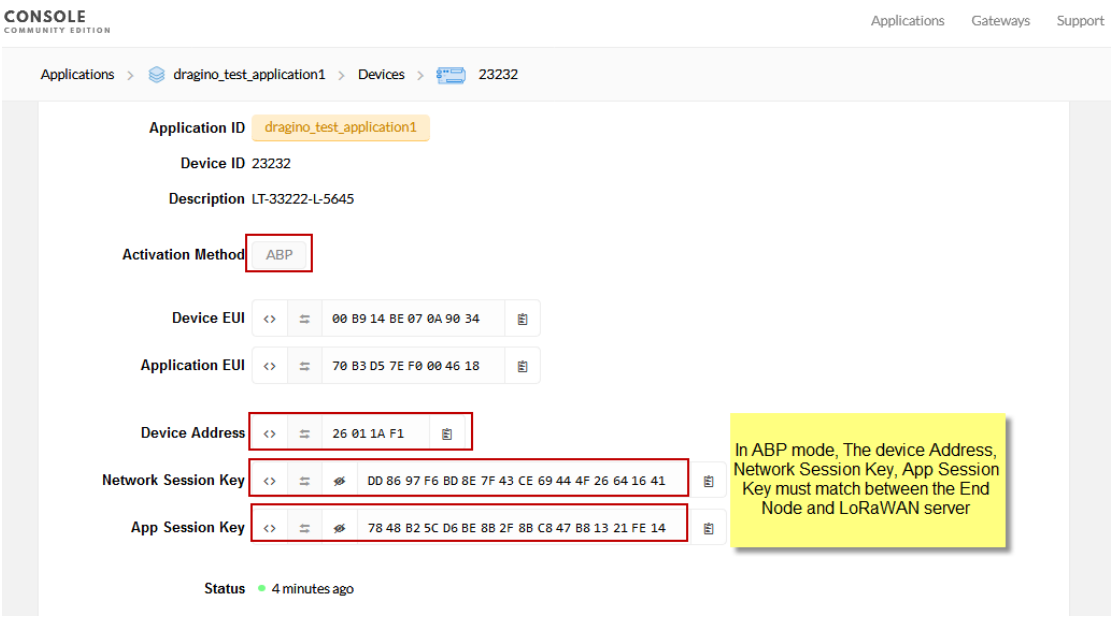
AU915 is similar. Below is the AU915 Uplink Channels.

CHE	AU915 Uplink Channels(125KHz,4/5,Unit:MHz,CHS=0)								
0	ENABLE Channel 0-63								
1	915.2	915.4	915.6	915.8	916	916.2	916.4	916.6	Channel 0-7
2	916.8	917	917.2	917.4	917.6	917.8	918	918.2	Channel 8-15
3	918.4	918.6	918.8	919	919.2	919.4	919.6	919.8	Channel 16-23
4	920	920.2	920.4	920.6	920.8	921	921.2	921.4	Channel 24-31
5	921.6	921.8	922	922.2	922.4	922.6	922.8	923	Channel 32-39
6	923.2	923.4	923.6	923.8	924	924.2	924.4	924.6	Channel 40-47
7	924.8	925	925.2	925.4	925.6	925.8	926	926.2	Channel 48-55
8	926.4	926.6	926.8	927	927.2	927.4	927.6	927.8	Channel 56-63
Channels(500KHz,4/5,Unit:MHz,CHS=0)									
	915.9	917.5	919.1	920.7	922.3	923.9	925.5	927.1	Channel 64-71

4.6 How to set up LT to work with Single Channel Gateway such as LG01/LG02?

In this case, users need to set LT-33222-L to work in ABP mode & transmit in only one frequency. Assume we have a LG02 working in the frequency 868400000 now , below is the step.

Step1: Log in TTN, Create an ABP device in the application and input the network session key (NETSKEY), app session key (APPSKEY) from the device.



Note: user just need to make sure above three keys match, User can change either in TTN or Device to make then match. In TTN, NETSKEY and APPSKEY can be configured by user in setting page, but Device Addr is generated by TTN.

Step2: Run AT Command to make LT work in Single frequency & ABP mode. Below is the AT commands:

123456 Enter Password to have AT access.
AT+FDR Reset Parameters to Factory Default, Keys Reserve
123456 Enter Password to have AT access.
AT+NJM=0 Set to ABP mode
AT+ADR=0 Set the Adaptive Data Rate Off
AT+DR=5 Set Data Rate (Set AT+DR=3 for 915 band)
AT+TDC=60000 Set transmit interval to 60 seconds
AT+CHS=868400000 Set transmit frequency to 868.4Mhz
AT+DADDR=26 01 1A F1 Set Device Address to 26 01 1A F1
ATZ Reset MCU

As shown in below:

```
***** UpLinkCounter= 0 *****
TX on freq 865402500 Hz at DR 5
txDone
Correct Password
rxTimeOut
AT+rxTimeOut
FD
***** UpLinkCounter= 0 *****
TX on freq 865402500 Hz at DR 5
txDone
R
DRAGINO LT-33222-L Device
Image Version: v1.0
Frequency Band: IN865
DevEui= A8 40 41 00 01 81 85 EE
Enter Password to Active AT Commands

Please set the parameters or reset Device to apply change
Correct Password
AT+NJM=0
OK
AT+ADR=0
OK
AT+DR=5
OK
AT+TDC=60000
OK
AT+CHS=868400000
OK
AT+DADDR=26 01 1A F1
OK
ATZ
DRAGINO LT-33222-L Device
Image Version: v1.0
Frequency Band: IN865
DevEui= A8 40 41 00 01 81 85 EE
Enter Password to Active AT Commands

JOINED

***** UpLinkCounter= 0 *****
TX on freq 868400000 Hz at DR 5
txDone
rxTimeOut
rxTimeOut
```

5. Trouble Shooting

5.1 Downlink doesn't work, how to solve it?

By default, LT will open two RX windows to get downlink message after uplink. If the server's radio parameter is not match with the radio parameters in downlink, the downlink message won't arrive. And in UART access to LT, user will see below message:

txDone
rxTimeout
rxTimeout

If user see below output:

txDone
rxDone
rxTimeout

It means the downlink message arrive but not parse. In this case, user need to set FPORT=2 in the server side for downlink message.

5.2 Connection problem while using USB <----> TTL to upload firmware.

Issue: While using USB to TTL to upload firmware via UART interface. It works for several times but most of times it fails.

Checklist:

1. Double check if follow up exactly the steps as manual.
2. Check if hardware works fine: a) check if AT command works, b) check if ISP / flash switch works: PA12 will have different output level while set the ISP/Flash Switch in different position. c) check if reset button works.
3. If you use Windows10 system. Please change the flash loader to run in Windows7 compatibility mode.

4. We see a case the FT232 USB TTL adapter has reliability issue with the PC USB chipset(Intel). In this case, even point 1 & 2 work, it still has serious reliability issue for uploading. If this happen, change a PC or change a USB to TTL adapter will solve.

5.3 Why I can't join TTN in US915 /AU915 bands?

It is about the channels mapping. Please see this link for detail.

6. Order Info

General Version:

- **LT-33222-L-EU433**: LT with frequency bands EU433
- **LT-33222-L-EU868**: LT with frequency bands EU868
- **LT-33222-L-KR920**: LT with frequency bands KR920
- **LT-33222-L-CN470**: LT with frequency bands CN470
- **LT-33222-L-AS923**: LT with frequency bands AS923
- **LT-33222-L-AU915**: LT with frequency bands AU915
- **LT-33222-L-US915**: LT with frequency bands AU915
- **LT-33222-L-IN865**: LT with frequency bands AU915
- **LT-33222-L-CN779**: LT with frequency bands AU915

7. Packing Info

Package Includes:

- ✓ LT I/O Controller x 1
- ✓ Stick Antenna for LoRa RF part x 1
- ✓ Bracket for controller x1
- ✓ Program cable x 1

Dimension and weight:

- ✓ Device Size: 13.5 x 7 x 3 cm
- ✓ Device Weight: 105g
- ✓ Package Size / pcs : 14.5 x 8 x 5 cm
- ✓ Weight / pcs : 170g

8. Support

- Support is provided Monday to Friday, from 09:00 to 18:00 GMT+8. Due to different timezones we cannot offer live support. However, your questions will be answered as soon as possible in the before-mentioned schedule.
- Provide as much information as possible regarding your enquiry (product models, accurately describe your problem and steps to replicate it etc) and send a mail to

support@dragino.com

9. Reference

- Product Page
- Image Download
- AT Command Manual
- Hardware Source