RS485-LN -- RS485 to LoRaWAN Converter User Manual

Document Version: 1.2

Image Version: v1.2.3

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<th>Description</th>
<th>Date</th>
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<tr>
<td>1.0</td>
<td>Release</td>
<td>2019-Dec-8</td>
</tr>
<tr>
<td>1.0.1</td>
<td>Improve product photos and network structure</td>
<td>2019-Dec-30</td>
</tr>
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<td>1.0.2</td>
<td>Add AT Command to set UART parity</td>
<td></td>
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<tr>
<td>1.1</td>
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1. Introduction

1.1 What is RS485-LN RS485 to LoRaWAN Converter

The Dragino RS485-LN is a RS485 to LoRaWAN Converter. It converts the RS485 signal into LoRaWAN wireless signal which simplify the IoT installation and reduce the installation/maintaining cost.

RS485-LN allows user to monitor / control RS485 devices 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.

For data uplink, RS485-LN sends user-defined commands to RS485 devices and gets the return from the RS485 devices. RS485-LN will process these returns according to user-define rules to get the final payload and upload to LoRaWAN server.

For data downlink, RS485-LN runs in LoRaWAN Class C. When there downlink commands from LoRaWAN server, RS485-LN will forward the commands from LoRaWAN server to RS485 devices.
1.2 Specifications

**Hardware System:**
- STM32L072CZT6 MCU
- SX1276/78 Wireless Chip
- Power Consumption (exclude RS485 device):
  - Idle: 32mA@12v
  - 20dB Transmit: 65mA@12v

**Interface for Model:**
- RS485
- 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 (default Class C)
- AT Commands to change parameters
- Remote configure parameters via LoRa Downlink
- Firmware upgradable via program port
- Support multiply RS485 devices by flexible rules
- Support Modbus protocol
1.4 Applications

- Smart Buildings & Home Automation
- Logistics and Supply Chain Management
- Smart Metering
- Smart Agriculture
- Smart Cities
- Smart Factory
1.5 Firmware Change log

RS485-LN Image files – Download link

**Image v1.2.3**
- Add command AT+CMDDL to be compatible with some modbus device has long time to reply
- Add Watchdog

**Image v1.2.2**
- Update LoRaWAN stack to DR-LWS-003:
  

**Image v1.1**
- Extend RS485 commands from 2 to 15 commands.
- Format of AT+DATAUP and AT+DATACUT has been changed to more flexible.
- Add poll command for downlink.
- Add AT Command to set UART Parity
- Add more RS485 read command entries.

**Image v1.0**
- Release

2. Power ON Device

The RS485-LN can be powered by 7 ~ 24V DC power source. Connection as below
- Power Source VIN to RS485-LN VIN+
- Power Source GND to RS485-LN VIN-

Once there is power, the RS485-LN will be on.
3. Operation Mode

3.1 How it works?
The RS485-LN is configured as LoRaWAN OTAA Class C 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 RS485-LN. 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.

3.2 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 RS485-LN in this example connected to two RS485 devices for demonstration, user can connect to other RS485 devices via the same method. The connection is as below:
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 RS485-LN.

Each RS485-LN is shipped with a sticker with unique device EUI:
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 RS485-LN 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.
3.3 Configure Commands to read data
There are plenty of RS485 devices in the market and each device has different command to read the valid data. To support these devices in flexible, RS485-LN supports flexible command set. User can use AT Commands to configure what commands RS485-LN should send for each sampling and how to handle the return from RS485 devices.

Note: below description and commands are for firmware version >v1.1, if you have firmware version v1.0. Please check the user manual v1.0 or upgrade the firmware to v1.1

3.3.1 Configure UART settings for RS485 communication
To use RS485-LN to read data from RS485 sensors, connect the RS485-LN A/B traces to the sensors. And user need to make sure RS485-LN use the match UART setting to access the sensors. The related commands for UART settings are:

<table>
<thead>
<tr>
<th>AT Commands</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT+BAUDR</td>
<td>Set the baud rate (for RS485 connection).</td>
<td>AT+BAUDR=9600</td>
</tr>
<tr>
<td></td>
<td>Default Value is: 9600.</td>
<td>Options:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1200,2400,4800,14400,19200,115200)</td>
</tr>
<tr>
<td>AT+PARITY</td>
<td>Set UART parity (for RS485 connection)</td>
<td>AT+PARITY=0</td>
</tr>
<tr>
<td></td>
<td>Option: 0: no parity, 1: odd parity, 2: even parity</td>
<td></td>
</tr>
</tbody>
</table>

3.3.2 Configure RS485 sensors
Some sensors might need to configure before normal operation. User can configure such sensor via PC and RS485 adapter or through RS485-LN AT Commands AT+CFGDEV. Each AT+CFGDEV equals to send a RS485 command to sensors. This command will only run when user input it and won’t run during each sampling.

<table>
<thead>
<tr>
<th>AT Commands</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
</table>
3.3.3 Configure read commands for each sampling

During each sampling, we need confirm what commands we need to send to the RS485 sensors to read data. After the RS485 sensors send back the value, it normally include some bytes and we only need a few from them for a shorten payload.

To save the LoRaWAN network bandwidth, we might need to read data from different sensors and combine their valid value into a short payload.

This section describes how to achieve above goals.

During each sampling, the RS485-LN can support 15 commands to read sensors. And combine the return to one or several uplink payloads.

Each RS485 commands include two parts:

1) What commands RS485-LN will send to the RS485 sensors. There are total 15 commands from \texttt{AT+COMMAND1, ATCOMMAND2,..., to AT+COMMAND15}. All commands are of same grammar.

2) How to get wanted value the from RS485 sensors returns from by 1). There are total 15 AT Commands to handle the return, commands are \texttt{AT+DATACUT1, AT+DATACUT2,..., AT+DATACUT15} corresponding to the commands from 1). All commands are of same grammar.

3) Some RS485 device might has longer delay on reply, so user can use \texttt{AT+CMDDL} to set the timeout for getting reply after the RS485 command is sent. For example \texttt{AT+CMDDL1=1000} to send the open time to 1000ms

After we got the valid value from each RS485 commands, we need to combine them together with the command \texttt{AT+DATAUP}.

Below are examples for the how above AT Commands works.

\texttt{AT+COMMANDx} : This command will be sent to RS485 devices during each sampling, Max command length is 14 bytes. The grammar is:

\begin{verbatim}
AT+COMMANDx=xx xx xx xx xx xx xx xx xx xx xx xx,m
xx xx xx xx xx xx xx xx xx xx xx xx: The RS485 command to be sent
m: 0: no CRC, 1: add CRC-16/MODBUS in the end of this command
\end{verbatim}

For example, if we have a RS485 sensor. The command to get sensor value is: \texttt{01 03 0B B8 00 02 46 0A}. Where \texttt{01 03 0B B8 00 02} is the Modbus command to read the register \texttt{0B B8} where stored the sensor value. The \texttt{46 0A} is the CRC-16/MODBUS which calculate manually.
In the RS485-LN, we should use this command AT+COMMAND1=01 03 0B B8 00 02,1 for the same.
**AT+DATACUTx**: This command defines how to handle the return from AT+COMMANDx, max return length is 40 bytes.

AT+DATACUTx=a,b,c

- **a**: length for the return of AT+COMMAND
- **b**: 1: grab valid value by byte, max 6 bytes. 2: grab valid value by bytes section, max 3 sections.
- **c**: define the position for valid value.

Examples:

- **Grab bytes**:
  ```
  AT+PAYER=1
  AT+COMMAND1=01 03 0b b8 00 02 ,1
  c0 00 05 1 +13
  AT+DATACUT1=10,1,9+6+8+1+3
  a=10, return total 10 bytes (20 20 20 2d 30 2e 32 20 75)
  b=1 grab byte
  c=9+4+6+8+1+3 (grap the 9th, 4th, 6th, 8th, 1th, 3rd byte and link them together by grab sequence)
  so command1 valid value is 20 20 30 32 20 20
  +AT=0
  AT+COMMAND2=0,0
  AT+COMMAND3=0,0
  AT+COMMAND4=0,0
  AT+COMMAND=0,0
  AT+CHS=0
  OK
  END
  = 01 03 0b b8 00 02 46 0a
  RETURN = 20 20 20 2d 30 2e 32 20 75
  PAYLOAD = 01 20 20 2d 30 2e 00
  ```

- **Grab a section**:
  ```
  AT+PAYER=1
  AT+COMMAND1=01 03 0b b8 00 02 ,1
  AT+DATACUT1=8,2,4=8
  +AT=0
  AT+COMMAND2=0,0
  AT+COMMAND3=0,0
  AT+COMMAND4=0,0
  AT+COMMAND5=0,0
  AT+COMMAND6=0,0
  AT+COMMAND7=0,0
  AT+COMMAND=0,0
  AT+CHS=0
  OK
  CMDS = 01 03 0b b8 00 02 46 0a
  RETURN = 20 20 20 2d 30 2e 00
  PAYLOAD = 01 20 2d 30 2e 00
  ```

- **Grab different sections**:
3.3.4 Compose the uplink payload

Through AT+COMMANDx and AT+DATACUTx we got valid value from each RS485 commands, assume these valid value are RETURN1, RETURN2, .., to RETURNx. The next step is how to compose the LoRa Uplink Payload by these RETURNs. The command is AT+DATAUP.

Examples: AT+DATAUP=0

Compose the uplink payload with value returns in sequence and send with a SINGLE UPLINK.

Final Payload is

```
PAYVER + VALID Value from RETURN1 + Valid Value from RETURN2 + ... + RETURNx
```

Where PAYVER is defined by AT+PAYVER, below is an example screen shot.
Examples: AT+DATAUP=1

Compose the uplink payload with value returns in sequence and send with Multiply UPLINKs.

Final Payload is

**PAYVER + PAYLOAD COUNT + PAYLOAD# + DATA**

1) PAYVER: Defined by AT+PAYVER
2) PAYLOAD COUNT: Total how many uplinks of this sampling.
3) PAYLOAD#: Number of this uplink. (from 0,1,2,3...,to PAYLOAD COUNT)
4) DATA: Valid value: max 8 bytes for each uplink so each uplink <= 11 bytes. For the last uplink, DATA will might less than 8 bytes

```
AT+DATAUP=1
AT+PAYVER=1
AT+COMMAND1=01 03 0b b8 00 02 1
AT+COMMAND2=0 0 0 0 0 0 0 0 0
AT+COMMAND3=0 0 0 0 0 0 0 0 0
AT+COMMAND4=0 0 0 0 0 0 0 0 0
AT+COMMAND5=0 0 0 0 0 0 0 0 0
AT+COMMAND6=0 0 0 0 0 0 0 0 0
AT+COMMAND7=0 0 0 0 0 0 0 0 0
AT+COMMAND8=0 0 0 0 0 0 0 0 0
AT+COMMAND9=0 0 0 0 0 0 0 0 0
AT+COMMAND10=0 0 0 0 0 0 0 0 0
AT+COMMAND11=0 0 0 0 0 0 0 0 0
AT+COMMAND12=0 0 0 0 0 0 0 0 0
AT+COMMAND13=0 0 0 0 0 0 0 0 0
AT+COMMAND14=0 0 0 0 0 0 0 0 0
AT+COMMAND15=0 0 0 0 0 0 0 0 0
AT+COMMAND16=0 0 0 0 0 0 0 0 0
AT+COMMAND17=0 0 0 0 0 0 0 0 0
AT+COMMAND18=0 0 0 0 0 0 0 0 0
AT+COMMAND19=0 0 0 0 0 0 0 0 0
AT+COMMAND20=0 0 0 0 0 0 0 0 0
```

So totally there will be 3 uplinks for this sampling, each uplink include 8 bytes DATA

- **DATA1**=RETURN1 Valid Value + the first two of Valid value of RETURN10= 20 20 0a 33 90 41 02 aa
- **DATA2**=3rd ~ 10th byte of Valid value of RETURN10= 05 81 0a 20 20 20 2d
- **DATA3**=the rest of Valid value of RETURN10= 30

Below are the uplink payloads:
3.3.5 Clear commands
The AT+COMMANDx and AT+DATACUTx settings are stored in special location, user can use below command to clear them.

**AT+CMDEAR**=mm,nn  
mm: start position of erase, nn: stop position of erase

Etc. AT+CMDEAR=1,10 means erase AT+COMMAND1/AT+DATACUT1 to AT+COMMAND10/AT+DATACUT10

Example screen shot:

The uplink screen shot is:

![Uploading Screen Shot](image)

3.3.6 Uplink on demand
Except uplink periodically, RS485-LN is able to uplink on demand. The server send downlink command to RS485-LN and RS485 will uplink data base on the command.

Downlink control command:

**0x08 command**: Poll an uplink with current command set in RS485-LN.

**0xA8 command**: Send a command to RS485-LN and uplink the output from sensors.
3.4 Uplink Payload

<table>
<thead>
<tr>
<th>Size(bytes)</th>
<th>1</th>
<th>Length depends on the return from the commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>PAYLOAD_VER</td>
<td>If the valid payload is too long and exceed the maximum support payload length in server, server will show payload not provided in the LoRaWAN server.</td>
</tr>
</tbody>
</table>

3.5 Downlink Payload

<table>
<thead>
<tr>
<th>Downlink Control Type</th>
<th>Type Code</th>
<th>Downlink payload size(bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDC (Transmit Time Interval)</td>
<td>01</td>
<td>4</td>
</tr>
<tr>
<td>RESET</td>
<td>04</td>
<td>2</td>
</tr>
<tr>
<td>Poll a uplink</td>
<td>08</td>
<td>2</td>
</tr>
<tr>
<td>Clear command</td>
<td>09</td>
<td>3</td>
</tr>
<tr>
<td>09 aa bb same as AT+CMDEAR=aa,bb</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RS485 control command</strong> (Same as AT+CFGDEV with uplink)</td>
<td>A8</td>
<td>Not fix</td>
</tr>
<tr>
<td>A8 MM NN XX XX XX XX YY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set AT+DATAUP command (Same as AT+DATAUP)</td>
<td>AD</td>
<td>2</td>
</tr>
<tr>
<td>AD 00: set AT+DATAUP=0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AD 01: set AT+DATAUP=1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAYLOAD_VER (Same as AT+PAYVER)</td>
<td>AE</td>
<td>2</td>
</tr>
<tr>
<td>AE kk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KK:version</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Configure AT+COMMANDx or AT+DATACUTx</strong></td>
<td>AF</td>
<td>Dynamic</td>
</tr>
<tr>
<td>AR MM NN LL XX XX XX YY</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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:

![Downlink payload setting in TTN](image)

**Type Code 0x04**
If payload = 0x04FF, it will reset the RS485-LN.
Type Code 0x08
If payload = 0x08FF, RS485-LN will immediately send an uplink.

Type Code 0xA8
0xA8 downlink command can be used to control the RS485 devices via LoRaWAN.
Format: \texttt{A8|MM|NN|XX XX XX XX|YY}
Where:
\begin{itemize}
  \item MM: 1: add CRC-16/MODBUS ; 0: no CRC
  \item NN: The length of RS485 command
  \item XX XX XX XX: RS485 command total NN bytes
  \item YY: How many bytes will be uplink from the return of this RS485 command, if YY=0, RS485-LN will execute the downlink command without uplink; if YY>0, RS485-LN will uplink total YY bytes from the output of this RS485 command
\end{itemize}

For example,
The RS485 Alarm we use here use Modbus RTU to communicate.
✓ The command to active alarm is: \texttt{0A 05 00 04 00 01 4C B0}, Where 0A 05 00 04 00 01 is the Modbus command to read the register 00 40 where stored the DI status. The 4C B0 is the CRC-16/MODBUS which calculate manually.
✓ The command to deactivate alarm is: \texttt{0A 05 00 04 00 00 8D 70}, Where 0A 05 00 04 00 00 is the Modbus command to read the register 00 40 where stored the DI status. The 8D 70 is the CRC-16/MODBUS which calculate manually.

So if user want to use downlink command to control to RS485 Alarm, he can use:
\begin{itemize}
  \item \texttt{A8|01|06|0A 05 00 04 00 01|00}: to activate the RS485 Alarm
  \item \texttt{A8|01|06|0A 05 00 04 00 00|00}: to deactivate the RS485 Alarm
\end{itemize}
A8 is type code and 01 means add CRC-16/MODBUS at the end, the 3rd byte is 06, means the next 6 bytes are the command to be sent to the RS485 network, the final byte 00 means this command don’t need to acquire output.

Type Code 0xAF
0xAF downlink command can be used to set AT+COMMANDx or AT+DATACUTx.
Note: if user use AT+COMMANDx to add a new command, he also need to send AT+DATACUTx downlink.
Format: \texttt{AF|MM|NN|LL|XX XX XX XX|YY}
Where:
\begin{itemize}
  \item MM: the ATCOMMAND or AT+DATACUT to be set. Value from 01 ~ 0F,
  \item NN: 0: no CRC; 1: add CRC-16/MODBUS ; 2: set the AT+DATACUT value.
  \item LL: The length of AT+COMMAND or AT+DATACUT command
  \item XX XX XX XX: AT+COMMAND or AT+DATACUT command
  \item YY: If YY=0, RS485-LN will execute the downlink command without uplink; if YY=1, RS485-LN will execute an uplink after got this command.
\end{itemize}

Example:
\texttt{AF|03|01|06|0A 05 00 04 00 01|00}: Same as AT+COMMAND3=0A 05 00 04 00 01,1
3.6 Buttons

<table>
<thead>
<tr>
<th>Button</th>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT</td>
<td>If RS485 joined in network, press this button for more than 1 second, RS485 will upload a packet, and the SYS LED will give a <strong>Blue blink</strong></td>
</tr>
<tr>
<td>RST</td>
<td>Reboot RS485</td>
</tr>
<tr>
<td>PRO</td>
<td>Use for upload image, see <a href="#">How to Update Image</a></td>
</tr>
</tbody>
</table>

3.7 LEDs

<table>
<thead>
<tr>
<th>LEDs</th>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWR</td>
<td>Always on if there is power</td>
</tr>
<tr>
<td>SYS</td>
<td>After device is powered on, the SYS will <strong>fast blink in GREEN</strong> for 5 times, means RS485-LN start to join LoRaWAN network. If join success, SYS will be <strong>on GREEN for 5 seconds</strong>. SYS will <strong>blink Blue</strong> on every upload and <strong>blink Green</strong> once receive a downlink message.</td>
</tr>
</tbody>
</table>
4. Use AT Command

4.1 Access AT Command
RS485-LN supports AT Command set. User can use a USB to TTL adapter plus the 3.5mm Program Cable to connect to RS485-LN to use AT command, as below.

In PC, User needs to set serial tool (such as putty, SecureCRT) baud rate to 9600 to access serial console of RS485-LN. Below is the output for reference:
More detail AT Command manual can be found at AT Command Manual
4.2 Common AT Command Sequence

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

If device has not joined network yet:

AT+FDR
AT+NJM=0
ATZ

If device already joined network:

AT+NJM=0
ATZ

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

AT+FDR     Reset Parameters to Factory Default, Keys Reserve
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+RX2FQ=868400000 Set RX2Frequency to 868.4Mhz (according to the result from server)
AT+RX2DR=5 Set RX2DR to match the downlink DR from server. see below
AT+DADDR=26 01 1A F1 Set Device Address to 26 01 1A F1, this ID can be found in the LoRa Server portal.
ATZ        Reset MCU

Note:
1. Make sure the device is set to ABP mode in the IoT Server.
2. Make sure the LG01/02 gateway RX frequency is exactly the same as AT+CHS setting.
3. Make sure SF / bandwidth setting in LG01/LG02 match the settings of AT+DR. refer this link to see what DR means.
4. The command AT+RX2FQ and AT+RX2DR is to let downlink work. to set the correct parameters, user can check the actually downlink parameters to be used. As below. Which shows the RX2FQ should use 868400000 and RX2DR should be 5

5. FAQ

5.1 How to upgrade the image?
The RS485-LN LoRaWAN Controller is shipped with a 3.5mm cable, the cable is used to upload image to RS485-LN to:

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

Below shows the hardware connection for how to upload an image to RS485-LN:

**Step 1:** Download flash loader.
**Step 2:** Download the LT Image files.
**Step 3:** Open flashloader; choose the correct COM port to update.

Hold down the PRO button and then momentarily press the RST reset button and the SYS led will change from OFF to ON. While SYS LED is RED ON, it means the RS485-LN is ready to be program.
HOLD PRO then press the RST button, SYS will be ON, then click next.

Usually need to wait for a moment. Select the first one.

You can see the location of your programming.

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

![Cable Pin Mapping](image)

### 5.2 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.
5.3 How to set up RS485-LN to work with Single Channel Gateway such as LG01/LG02?

In this case, users need to set RS485-LN 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.

![TTN Device Configuration](image)

Note: user just need to make sure above three keys match, User can change either in TTN or Device to make them 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:

- ```AT+FDR```     Reset Parameters to Factory Default, Keys Reserve
- ```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:
AT+IDR
DRAGINO RS485-LN Device
Image Version: v1.0
LoRaWAN Stack: DR-LoS-002
Frequency Band: EU868
Device- Addr 00 00 01 01 00 00 72
[100]RX on freq 869525000 Hz at OR 0
Please set the parameters or reset device to apply change
AT+ADM=0
OK
AT+DR=5
OK
AT+TOC=0000
OK
AT+CHS=868A0000
OK
AT+OAMD=26 01 10 F1
OK
AT2

DRAGINO RS485-LN Device
Image Version: v1.0
LoRaWAN Stack: DR-LoS-002
Frequency Band: EU868
Device- Addr 00 00 01 01 00 00 72
JOINED
[100]RX on freq 869525000 Hz at OR 0
Payload: 01
[100]RX on freq 869525000 Hz at OR 0
[1105]RX on freq 868A00000 Hz at OR 5
[1107]TX on freq 868A00000 Hz at OR 3
[2006]RX on freq 868A00000 Hz at OR 5
6. **Trouble Shooting**

6.1 **Downlink doesn’t work, how to solve it?**

Please see this link for debug:


6.2 **Why I can’t join TTN in US915/AU915 bands?**

It might about the channels mapping. Please see for detail.


7. **Order Info**

**Part Number:** RS485-LN-XXX

**XXX:**
- **EU433:** frequency bands EU433
- **EU868:** frequency bands EU868
- **KR920:** frequency bands KR920
- **CN470:** frequency bands CN470
- **AS923:** frequency bands AS923
- **AU915:** frequency bands AU915
- **US915:** frequency bands US915
- **IN865:** frequency bands IN865
- **CN779:** frequency bands CN779
- **KZ865:** frequency bands KZ865

8. **Packing Info**

**Package Includes:**
- RS485-LN x 1
- Stick Antenna for LoRa RF part x 1
- 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
9. 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
10. Reference

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