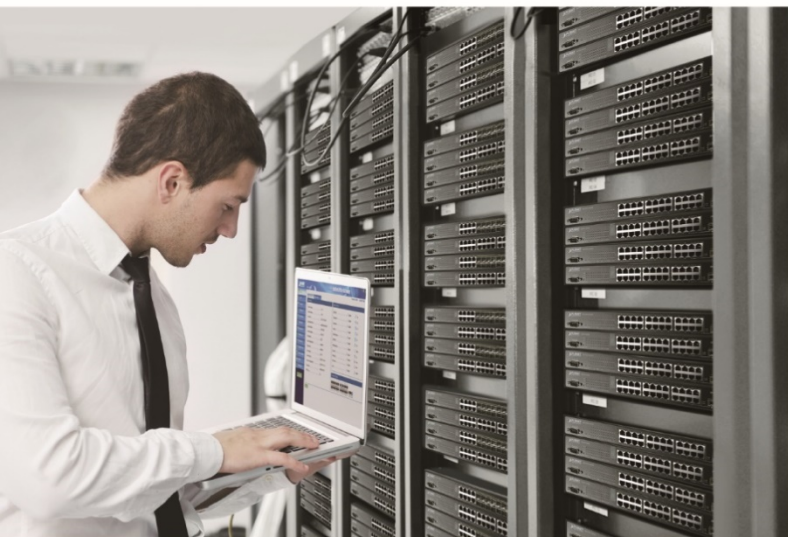




# User's Manual

## LoRa Node Controller

▶ LN501 and LN1152



## **Copyright**

Copyright (C) 2022 PLANET Technology Corp. All rights reserved.

The products and programs described in this User's Manual are licensed products of PLANET Technology. This User's Manual contains proprietary information protected by copyright, and this User's Manual and all accompanying hardware, software, and documentation are copyrighted.

No part of this User's Manual may be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine-readable form by any means, electronic or mechanical including photocopying, recording, or information storage and retrieval systems, for any purpose other than the purchaser's personal use, and without the prior express written permission of PLANET Technology.

## **Disclaimer**

PLANET Technology does not warrant that the hardware will work properly in all environments and applications, and makes no warranty and representation, either implied or expressed, with respect to the quality, performance, merchantability, or fitness for a particular purpose.

PLANET has made every effort to ensure that this User's Manual is accurate; PLANET disclaims liability for any inaccuracies or omissions that may have occurred. Information in this User's Manual is subject to change without notice and does not represent a commitment on the part of PLANET. PLANET assumes no responsibility for any inaccuracies that may be contained in this User's Manual. PLANET makes no commitment to update or keep current the information in this User's Manual, and reserves the right to make improvements and/or changes to this User's Manual at any time without notice.

If you find information in this manual that is incorrect, misleading, or incomplete, we would appreciate your comments and suggestions.

## **FCC Compliance Statement**

This Equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### **CE mark Warning**



The is a class A device, In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

### **WEEE**



To avoid the potential effects on the environment and human health as a result of the presence of hazardous substances in electrical and electronic equipment, end users of electrical and electronic equipment should understand the meaning of the crossed-out wheeled bin symbol. Do not dispose of WEEE as unsorted municipal waste and have to collect such WEEE separately.

### **Trademarks**

The PLANET logo is a trademark of PLANET Technology. This documentation may refer to numerous hardware and software products by their trade names. In most, if not all cases, these designations are claimed as trademarks or registered trademarks by their respective companies.

### **Revision**

User's Manual of PLANET LoRa Node Controller

Model: LN501 and LN1152

Rev.: 1.0 (April, 2022)

Part No. EM-LN501\_LN1152\_v1.0

# Table of Contents

Chapter 1. Product Introduction.....	5
1.1 Package Contents.....	6
1.2 Overview .....	7
1.3 Features .....	8
1.4 Product Specifications .....	9
Chapter 2. Hardware Introduction .....	11
2.1 Physical Descriptions .....	11
2.2 Hardware Installation .....	14
Chapter 3. Preparation .....	18
3.1 Requirements.....	18
3.2 Managing LoRa Node .....	18
Chapter 4. Operations Management .....	19
4.1 Managing LoRa Node .....	19
4.2 LoRaWAN setting.....	21
4.3 Interface setting.....	24
4.3.1 RS485 Settings .....	25
4.3.2 RS232 Settings .....	28
4.3.3 GPIO Settings .....	29
4.3.4 AI Settings.....	31
4.4 Maintenance.....	33
4.4.1 Upgrade .....	33
4.4.2 Backup .....	33
4.4.3 Reset to Factory Default .....	34

## Chapter 1. Product Introduction

Thank you for purchasing PLANET LoRa Node Controller, LN series. The descriptions of these models are as follows:

<b>LN501</b>	Outdoor IP67 LoRa Node Controller with Solar Panel
<b>LN1152</b>	Indoor IP30 LoRa Node Controller

“LoRa Node” mentioned in the manual refers to the above models.

## 1.1 Package Contents

The package should contain the following:

LN501	LN1152
<ul style="list-style-type: none"><li>■ LoRa Node Controller x 1</li><li>■ Quick Installation Guide x 1</li><li>■ Data Cables x 2</li><li>■ Mounting Bracket x 1</li><li>■ Wall Mounting Kits x 1</li><li>■ Hose Clamps x 2</li><li>■ 2550 mAh Battery x 2</li></ul>	<ul style="list-style-type: none"><li>■ LoRa Node Controller x 1</li><li>■ Quick Installation Guide x 1</li><li>■ LoRa Antenna x 1</li><li>■ 12-Pin Terminal Block x 1</li><li>■ Wall Mounting Screws x 2</li><li>■ Power Adapter x 1</li></ul>



Note

If any of the above items are missing, please contact your dealer immediately.

## 1.2 Overview

### Feature-rich Sensor Hub for Connecting Sensors

PLANET LN501 and LN1152 are LoRa node controllers used for data acquisition from multiple sensors. They contain different I/O interfaces such as analog inputs, digital inputs, digital outputs, serial ports and so on to simplify the deployment and replacement of LoRaWAN networks.

- LN501: It can be easily and quickly configured by NFC or wired USB port. For outdoor applications, it provides solar or built-in battery power supply and is equipped with IP67-rated enclosure and M12 connectors to protect itself from water and dust in harsh environments.
- LN1152: It can trigger multiple conditions and actions without a network. With its industrial design and IP30 metal case, the LN1152 is widely used in indoor applications like smart industries, building automation, etc.

### LoRaWAN-based Controller with Rich Industrial Interfaces

The LoRa Node Controller with built-in multiple industrial interfaces connects to all types of sensors, meters and other appliances. It also bridges Modbus data between serial and Ethernet network via LoRaWAN. The LN501 and LN1152 support LoRaWAN class C protocol to be in full compatibility with standard LoRaWAN gateways including PLANET LCG-300 series. It is ideal for large-scale IoT application deployments, such as projects for building automation, smart metering, HVAC system, etc. With multiple interfaces, LoRaWAN Controller can perfectly help retrofit legacy assets into IoT enablement.

- RS232
- RS485
- GPIO

## 1.3 Features

### Key Features

#### LN501

- Easy to connect with multiple wired sensors through GPIO/AI/RS232/RS485 interfaces
- Long transmission distance up to 11km with line of sight
- Waterproof design including IP67 case and M12 connectors
- Solar powered and built-in battery (optional)
- Quick wireless configuration via NFC
- Compliant with standard LoRaWAN gateways and network servers

#### LN1152

- Easy to connect with multiple wired sensors through GPIO/RS232/RS485 interfaces
- Ultra-wide-distance transmission up to 10km with line of sight
- Triggers multiple conditions and actions
- Embedded watchdog for work stability
- Industrial metal case design with wide operating temperature range
- Compliant with standard LoRaWAN gateways and network servers



## 1.4 Product Specifications

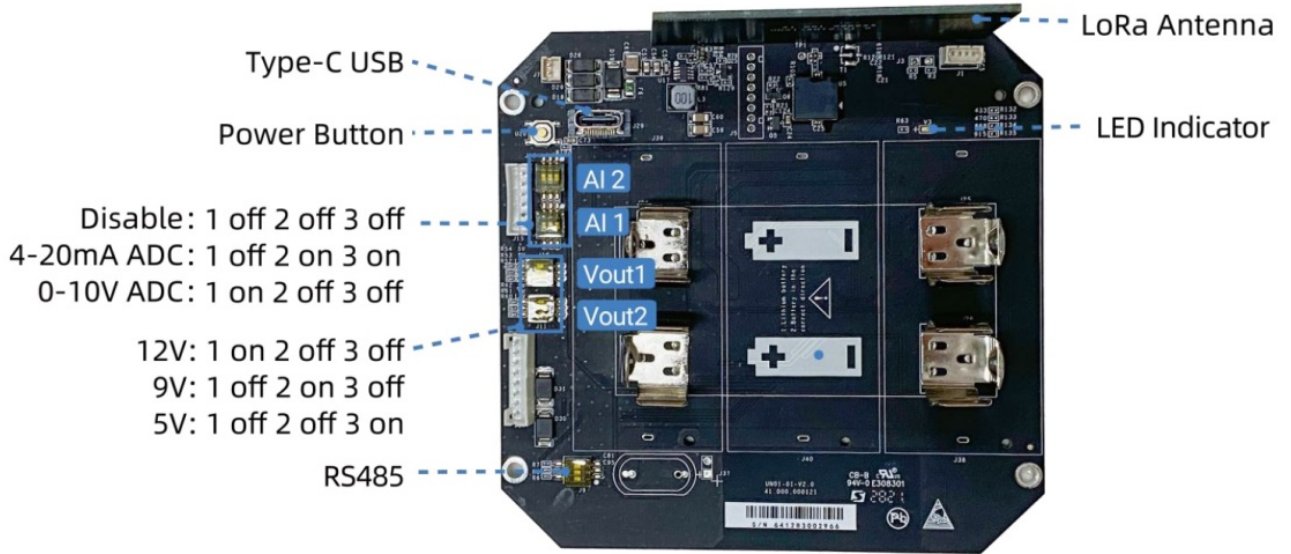
<b>Product</b>	LN501	
<b>Wireless Transmission</b>		
<b>Technology</b>	LoRaWAN	
<b>Frequency</b>	LN501-868M: IN865, EU868, RU864 LN501-915M: US915, AU915, KR920, AS923	
<b>Tx Power</b>	16dBm(868)/20dBm(915)	
<b>Sensitivity</b>	-137dBm @300bps	
<b>Work Mode</b>	Class A, Class C	
<b>Data Interfaces</b>		
Interface Type	M12 A-Coded Male	
IO	Ports	2 x GPIO
	Logical Level	Low: 0~0.9V, High: 2.5~3.3V
	Work Mode	Digital input, digital output, pulse counter
Serial Port	Ports	1 x RS232 or RS485 (Switchable)
	Baud Rate	300~115200 bps
	Protocol	Transparent (RS232), Modbus RTU (RS485)
Analog Input	Ports	2 x Analog input
	Resolution	12 bit
	Input Range	4~20mA or 0~10V (Switchable)
Power Output	Ports	2 x 3.3 V, 2 x 5/9/12 V (Switchable)
<b>Operation</b>		
Power On & Off	NFC, power button (Internal)	
Configuration	PC software (via USB Type C or NFC)	
<b>Physical Characteristics</b>		
Operating Temperature	-20°C to +60°C	
Ingress Protection	IP67	
Dimensions	120 x 120x 55 mm	
Power Connector	1 x M12 A-coded Male Interface	
Power Supply	Solar powered + 2 x 2550mAh battery backup + 5-24 VDC	
Installation	Desktop or wall mounting	
<b>Standards Conformance</b>		
Regulatory Compliance	CE, FCC	

<b>Product</b>	<b>LN1152</b>	
<b>Wireless Transmission</b>		
<b>Technology</b>	LoRaWAN	
<b>Antenna Connector</b>	× 50 Ω SMA Connectors (Center Pin: SMA Female)	
<b>Frequency</b>	LN1152-868: IN865, EU868, RU864 LN1152-915: US915, AU915, KR920, AS923	
<b>Tx Power</b>	16dBm(868)/20dBm(915)	
<b>Sensitivity</b>	-147dBm @300bps	
<b>Work Mode</b>	OTAA/ABP Class C	
<b>Data Interfaces</b>		
<b>Interface Type</b>	3.5mm Terminal Block	
<b>IO</b>	<b>Digital Input</b>	Opto-isolated Digital Inputs, 3-24VDC (pulse counter support)
	<b>Digital Output</b>	SPDT Relay Contact Rating: 3A@DC Max: 30 V or AC Max: 250 V
<b>Serial Port</b>	<b>Ports</b>	RS232/RS485
	<b>Baud Rate</b>	4800~115200bps (RS232)/1200~115200 bps(RS485)
	<b>Protocol</b>	Transparent (RS232), Modbus RTU (RS485)
<b>Others</b>		
<b>Configuration Port</b>	1 × Micro USB	
<b>LED Indicators</b>	1 × System, 1 × ACT	
<b>Built-in</b>	Watchdog, Timer	
<b>Physical Characteristics</b>		
<b>Power Connector</b>	3.5mm terminal block	
<b>Power Supply</b>	5-24 VDC	
<b>Ingress Protection</b>	IP30	
<b>Operating Temperature</b>	-40°C to +70°C	
<b>Relative Humidity</b>	5% to 95% (non-condensing)	
<b>Dimensions</b>	79 × 60 × 24 mm	
<b>Installation</b>	Desktop or wall mounting	
<b>Standards Conformance</b>		
<b>Regulatory Compliance</b>	CE, FCC	

# Chapter 2. Hardware Introduction

## 2.1 Physical Descriptions

### LN501



#### DIP Switch:

Interface	DIP Switch
Power Output	12V: 1 on 2 off 3 off (default) 9V: 1 off 2 on 3 off 5V: 1 off 2 off 3 on
Analog Input	Disable: 1 off 2 off 3 off 4-20mA ADC: 1 off 2 on 3 on (default) 0-10V ADC: 1 on 2 off 3 off
RS485	Disable: 1 off 2 off 3 off (default) Add 120 Ω resistor between A and B: 1 on 2 off 3 off Add 1k Ω pull-up resistor on A: 1 off 2 on 3 off Add 1k Ω pull-down resistor on B: 1 off 2 off 3 on

**Power Button:**

Function	Action	LED Indication
Turn On	Press and hold the button for more than 3s.	Off → On
Turn Off	Press and hold the button for more than 3s.	On → Off
Reset	Press and hold the button for more than 10s.	Blinks.
Check On/Off Status	Quickly press the power button.	Light On: Device is on. Light Off: Device is off.

**Data Interface:**

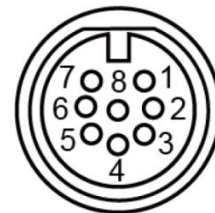
Data Interface 1

Pin	Description
1	5V/9V/12V OUT (Switchable)
2	3.3V OUT
3	GND
4	Analog Input 1
5	Analog Input 2
6	5-24V DC IN



Data Interface 2

Pin	Description	
1	5V/9V/12V OUT (Switchable)	
2	3.3V OUT	
3	GND	
4	GPIO1	
5	GPIO2	
6	RS232/RS485 (Switchable)	
7		
8	Reserved	
PIN	RS232	RS485
6	Tx	A
7	Rx	B



LN1152



PIN	Definition	Description
1	GND	Ground
2	VIN	5-24 V DC
3	RXD	RS232
4	TXD	
5	GND	
6	A	RS485
7	B	
8	IN	DI
9	IN_COM	
10	OUT_COM	DO
11	OUT_NC	
12	OUT_NO	

LED Definition:

LED	Indication	Status	Description
System	System Status	Static	System Start-up
		On for 500 ms, off for 500 ms	The system is running properly.
		On for 200 ms, off for 200 ms	The system is not connected to server.
ACT	Network Status	Off	Failed to access the network
		On for 500 ms, off for 500 ms	Accessed the network successfully

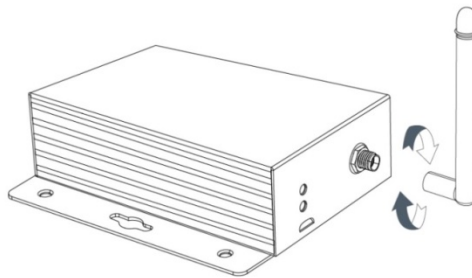
## 2.2 Hardware Installation

Refer to the illustration and follow the simple steps below to quickly install your **LoRa Node**.

### 2.2.1 LoRa Antenna Installation (LN1152)

**Step 1:** Rotate the antenna into the antenna connector accordingly.

**Step 2:** The external LoRa antenna should be positioned vertically for a good signal.



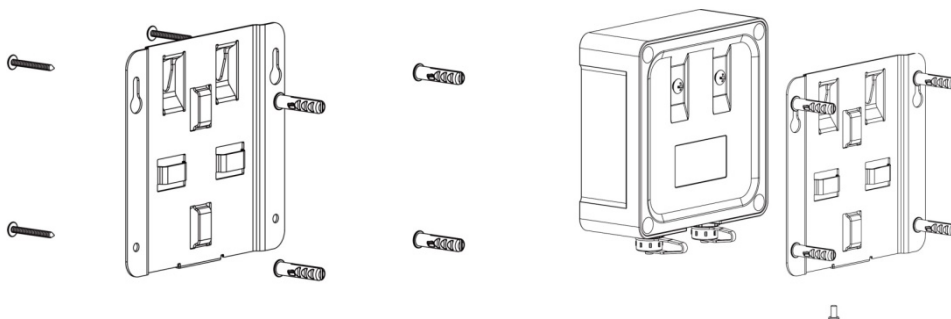
### 2.2.2 Wall Mounting

#### LN501

Make sure you have a wall mounting bracket, bracket mounting screws, wall plugs, wall mounting screws and other required tools.

**Step 1:** Mark the four holes on the wall you prefer to place the device and drill the marked four holes for the wall plugs (anchors). Then place the mounting bracket over the holes with the wall plugs inside, and tighten it with the screws.

**Step 2:** Place the device on the mounting bracket and put the small screw into the hole found on the bottom of the device and then tighten the screw to finish the job.

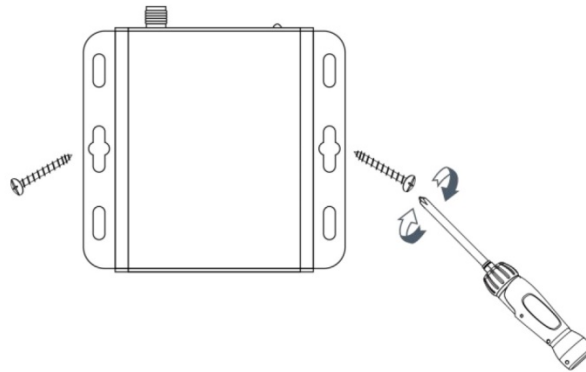


**LN1152**

**Step 1:** Align the LN1152 device horizontally to the desired position on the wall and use a marker pen to mark two mounting holes on the wall.

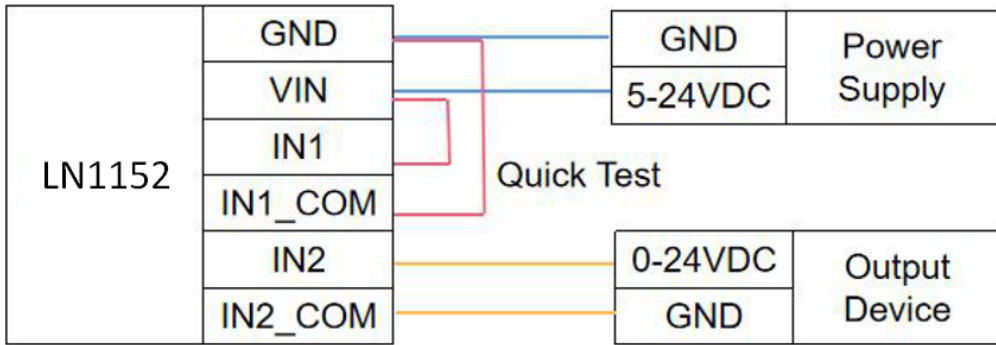
**Step 2:** Drill the two holes marked previously on the wall by using your drill with a 6 mm drill bit.

**Step 3:** Mount the device to the wall by tightly screwing the wall mounting screws (M3 \* 20) into the device mounting holes.

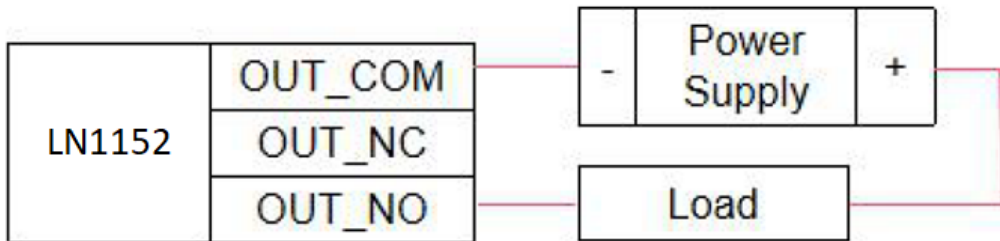


### 2.2.3 Application Wiring

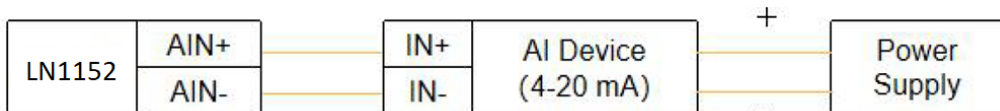
Digital Input:



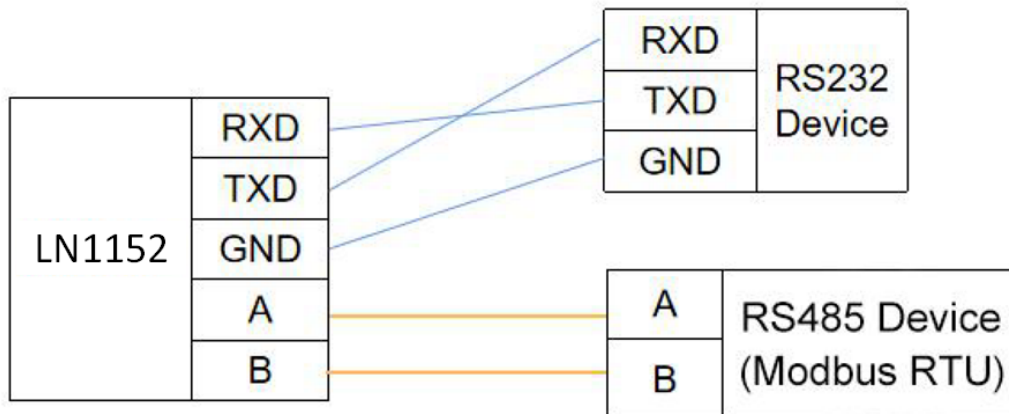
Digital Output:



Analog Input:

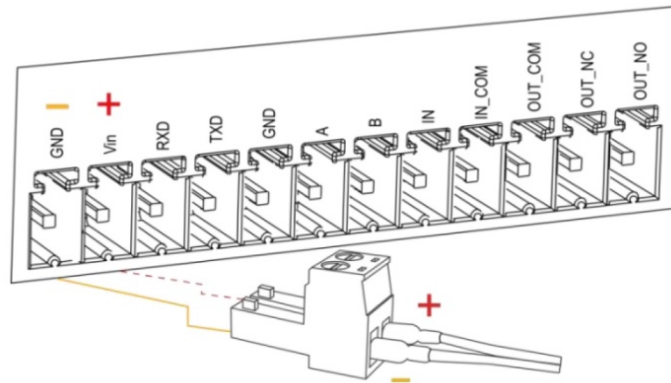


RS232 & RS485:





LN1152 series supports 5-24 V DC power supply. You can use other supplies or power adapter to power on the device.



For industrial applications, it's suggested not to release the metal case and use an independent power supply.

## Chapter 3. Preparation

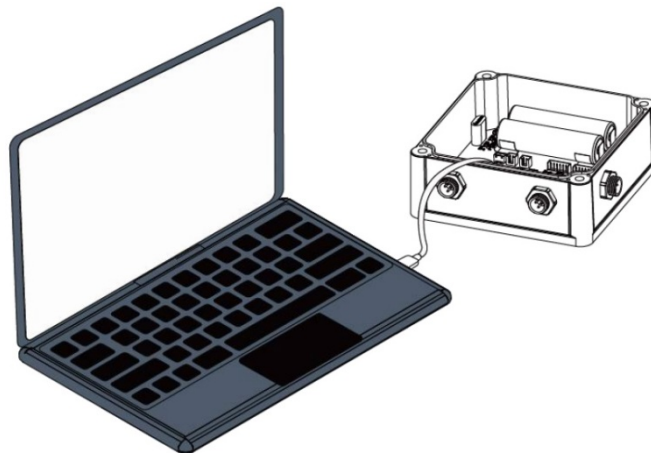
Before accessing the LoRa node controllers, user has to install utility tool for operation.

### 3.1 Requirements

- Workstations running Windows 10/XP/2003/Vista/7/8/2008.
- **Type C USB** cable for **LN501**
- **Micro USB** cable for **LN1152**

### 3.2 Managing LoRa Node

1. Download ToolBox software from Planet web site.
2. <https://www.planet.com.tw/en/support/downloads?&method=keyword&keyword=LN501&view=6#list>
3. Power on the LoRa Node device and then connect it to computer via micro USB port.



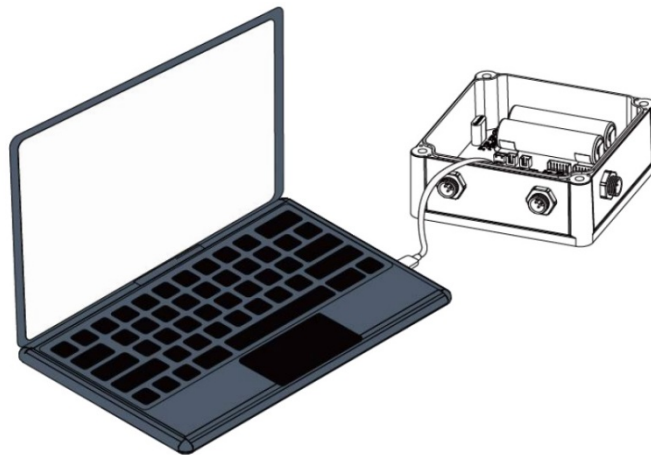
4. Open the ToolBox and select "Type" and then "General", and then click password to log in ToolBox. (Default password: **123456**)

## Chapter 4. Operations Management

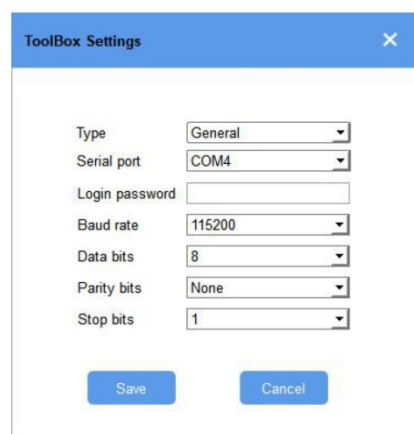
This chapter provides operations details of the LoRa node controller.

### 4.1 Managing LoRa Node

5. Download ToolBox software from Planet web site.
6. <https://www.planet.com.tw/en/support/downloads?&method=keyword&keyword=LN501&view=6#list>
7. Power on the LoRa Node device and then connect it to computer via micro USB port.




8. Open the ToolBox and select "Type" and then "General", and then click password to log in ToolBox. (Default password: **123456**)

A screenshot of a software dialog box titled "ToolBox Settings". The dialog has a blue header bar with a close button (X) on the right. The main area contains several configuration fields:

- Type: General (dropdown menu)
- Serial port: COM4 (dropdown menu)
- Login password: (empty text input field)
- Baud rate: 115200 (dropdown menu)
- Data bits: 8 (dropdown menu)
- Parity bits: None (dropdown menu)
- Stop bits: 1 (dropdown menu)

At the bottom of the dialog, there are two buttons: "Save" and "Cancel".

9. After logging in the ToolBox, you can click “Power On” or “Power Off” to turn on/off device and change other settings.



The screenshot displays the 'ToolBox V7.0.7' interface. On the left is a dark sidebar with navigation icons for 'Status', 'General', 'LoRaWAN Settings', and 'Maintenance'. The main content area is titled 'Status >' and includes a 'Power Off' button in the top right corner. Below the title is a table of device information:

Model:	UC501-915M
Serial Number:	6412B0514427
Device EUI:	24e124412b051442
Firmware Version:	01.12
Hardware Version:	1.0
Device Status:	On
Join Status:	De-Activate
RSSI/SNR:	0/0
Battery:	33%
Channel Mask:	0003
Uplink Frame-counter:	0
Downlink Frame-counter:	0

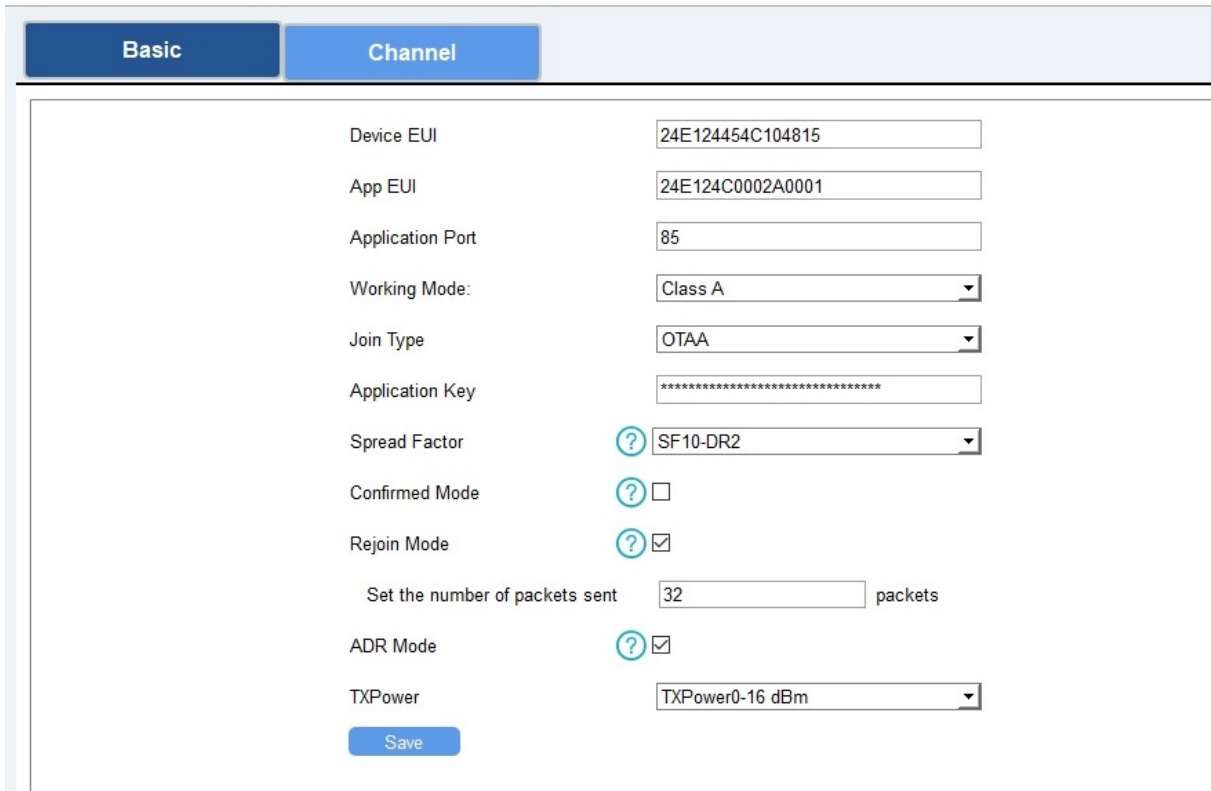
## 4.2 LoRaWAN setting

LoRaWAN setting is used for configuring the transmission parameters in LoRaWAN ® network.

### Basic LoRaWAN Settings:

Go to “LoRaWAN -> Basic” of ToolBox software to configure join type, App EUI, App Key and other information. You can also keep all settings by default.

#### LoRaWAN >



Basic	Channel
Device EUI	24E124454C104815
App EUI	24E124C0002A0001
Application Port	85
Working Mode:	Class A
Join Type	OTAA
Application Key	*****
Spread Factor	SF10-DR2
Confirmed Mode	<input type="checkbox"/>
Rejoin Mode	<input checked="" type="checkbox"/>
Set the number of packets sent	32 packets
ADR Mode	<input checked="" type="checkbox"/>
TXPower	TXPower0-16 dBm
<a href="#">Save</a>	

Object	Description
<b>Device EUI</b>	Unique ID of the device which can also be found on the label.
<b>App EUI</b>	Default App EUI is 24E124C0002A0001.
<b>Application Port</b>	The port is used for sending and receiving data; default port is 85. Note: RS232 data will be transmitted via another port.
<b>Working Mode</b>	LN501: Class A and Class C are available; LN1152: Class C.
<b>Join Type</b>	OTAA and ABP mode are available
<b>Application Key</b>	Appkey for OTAA mode; default is

	5572404C696E6B4C6F52613230313823.
<b>Device Address</b>	DevAddr for ABP mode, default is the 5th to 12th digits of SN.
<b>Network Session Key</b>	Nwkskey for ABP mode, default is 5572404C696E6B4C6F52613230313823.
<b>Application Session Key</b>	Appskey for ABP mode, default is 5572404C696E6B4C6F52613230313823.
<b>Spread Factor</b>	If ADR is disabled, the device will send data via this spread factor.
<b>Confirmed Mode</b>	If the device does not receive ACK packet from network server, it will resend data 3 times at most.
<b>Rejoin Mode</b>	<ul style="list-style-type: none"> <li>● Reporting interval <math>\leq</math> 30 mins: the device will send specific mounts of LoRaMAC packets to check connection status every 30 mins; If no reply after specific packets, the device will re-join.</li> <li>● Reporting interval <math>&gt;</math> 30 mins: the device will send specific mounts of LoRaMAC packets every to check connection status every reporting interval; If no reply after specific packets, the device will re-join.</li> </ul> <p>Note: Only OTAA mode supports rejoin mode.</p>
<b>ADR Mode</b>	Allow network server to adjust datarate of the device.
<b>Tx Power</b>	Tx power of the device.

**LoRaWAN Frequency Settings:**

Go to “LoRaWAN -> Channel” of ToolBox software to select supported frequency and select channels to send uplinks. Make sure the channels match the LoRaWAN gateway.

LoRaWAN >

Basic
Channel

Supported Frequency : AS923

<input type="checkbox"/>	Index	Frequency/MHz	Min Datarate	Max Datarate
<input checked="" type="checkbox"/>	0	<input style="width: 80%;" type="text" value="923.2"/>	<span style="border: 1px solid #ccc; padding: 2px 5px;">5-SF7BW125</span>	<span style="border: 1px solid #ccc; padding: 2px 5px;">0-SF12BW125</span>
<input checked="" type="checkbox"/>	1	<input style="width: 80%;" type="text" value="923.4"/>	<span style="border: 1px solid #ccc; padding: 2px 5px;">5-SF7BW125</span>	<span style="border: 1px solid #ccc; padding: 2px 5px;">0-SF12BW125</span>
<input type="checkbox"/>	2	<input style="width: 80%;" type="text" value="0"/>	<span style="border: 1px solid #ccc; padding: 2px 5px;">5-SF7BW125</span>	<span style="border: 1px solid #ccc; padding: 2px 5px;">0-SF12BW125</span>
<input type="checkbox"/>	3	<input style="width: 80%;" type="text" value="0"/>	<span style="border: 1px solid #ccc; padding: 2px 5px;">5-SF7BW125</span>	<span style="border: 1px solid #ccc; padding: 2px 5px;">0-SF12BW125</span>
<input type="checkbox"/>	4	<input style="width: 80%;" type="text" value="0"/>	<span style="border: 1px solid #ccc; padding: 2px 5px;">5-SF7BW125</span>	<span style="border: 1px solid #ccc; padding: 2px 5px;">0-SF12BW125</span>
<input type="checkbox"/>	5	<input style="width: 80%;" type="text" value="0"/>	<span style="border: 1px solid #ccc; padding: 2px 5px;">5-SF7BW125</span>	<span style="border: 1px solid #ccc; padding: 2px 5px;">0-SF12BW125</span>
<input type="checkbox"/>	6	<input style="width: 80%;" type="text" value="0"/>	<span style="border: 1px solid #ccc; padding: 2px 5px;">0-SF12BW125</span>	<span style="border: 1px solid #ccc; padding: 2px 5px;">5-SF7BW125</span>

If frequency is one of AU915/US915, you can enter the index of the channel that you want to enable in the input box, making them separate by commas.

Examples:

1, 40: Enabling Channel 1 and Channel 40

1-40: Enabling Channel 1 to Channel 40

1-40, 60: Enabling Channel 1 to Channel 40 and Channel 60

All: Enabling all channels

Null: Indicates that all channels are disabled

Supported Frequency : US915

Enabled Channel Index: 0-71

Channel Index	Frequency/MHz	Channel Spacing/MHz	BW/kHz
0 - 15	902.3 - 905.3	0.2	125
16 - 31	905.5 - 908.5	0.2	125
32 - 47	908.7 - 911.7	0.2	125
48 - 63	911.9 - 914.9	0.2	125
64 - 71	903.0 - 914.2	1.6	500

Note:  
64 channels numbered 0 to 63 utilizing LoRa 125 kHz BW starting at 902.3 MHz and incrementing linearly by 0.2 MHz to 914.9  
8 channels numbered 64 to 71 utilizing LoRa 500 kHz BW starting at 903.0 MHz and incrementing linearly by 1.6 MHz to 914.2

Save

### 4.3 Interface setting

LN501 and LN1152 support data collection by multiple interfaces including GPIOs, analog inputs and serial ports. Besides, they can also power the terminal devices by power output interfaces. Basic settings are as follows:

Go to “**General -> Basic**” of ToolBox software to change the reporting interval.

General >



Object	Description
<b>Reporting Interval</b>	Reporting interval of transmitting data to network server. Default: 20 mins, Range: 1-1080 mins. Note: RS232 transmission will not follow the reporting interval.
<b>Device Returning Power Supply State</b>	If the device loses power and returns to power supply, the device will be on or off according to this parameter.
<b>Interface 1/2 3V3 Output</b>	Enable 3.3V power output. After it is enabled, the power output will supply power <b>continuously</b> .
<b>Change Password</b>	Change the password for ToolBox software to read/write this device.



### 4.3.1 RS485 Settings


1. Connect RS485 device to RS485 port on interface 2. If you need LN501 to power the RS485 device, please connect the power cable of RS485 device to 5V/9V/12V power output on interface 2.
2. Go to “**General -> Serial**” of ToolBox software to enable RS485 and configure serial port settings. Serial port settings should be the same as RS485 terminal devices.

#### General >


Basic	Serial	GPIO	AI
<input type="checkbox"/> Enable			
Interface Type <span style="float: right;">RS485 (Modbus Master) ▾</span>			
<input type="checkbox"/> Interface 1 (Pin1) 5/9/12V Output			
Baud Rate <span style="float: right;">9600 ▾</span>			
Data Bit <span style="float: right;">8 bits ▾</span>			
Stop Bit <span style="float: right;">1 bits ▾</span>			
Parity <span style="float: right;">None ▾</span>			
Execution Interval <span style="float: right;">50 ms</span>			
Max Resp Time <span style="float: right;">500 ms</span>			
Max Retry Times <span style="float: right;">3</span>			
<input type="checkbox"/> Modbus RS485 bridge LoRaWAN <span style="float: right;">?</span>			

Object	Description
<b>Interface 2 (Pin 1) 5V/9V/12V</b>	Enable 5V/9V/12V power output of interface 2 to supply power to RS485 terminal devices. It's 12V by default and you can change DIP switches to change voltage.
<b>Power Output Time Before Collect</b>	LN501 will power the RS485 terminal devices for a period of time before collecting data for terminal device initialization.
<b>Baud Rate</b>	1200/2400/4800/9600/19200/38400/57600/115200 are available.
<b>Data Bit</b>	8 bit is available.
<b>Stop Bit</b>	1 bit and 2 bit are available.
<b>Parity</b>	None, Odd and Even are available.

<b>Execution Interval</b>	The execution interval between Modbus commands.
<b>Max. Response Time</b>	The maximum response time that the LN501 waits for the reply to the command. If it does not get a response after the maximum response time, it is determined that the command has timed out.
<b>Max. Retry Time</b>	Set the maximum retry times after device fails to read data from RS485 terminal devices.
<b>Modbus RS485 Bridge LoRaWAN</b>	If transparent mode is enabled, LN501 will convert Modbus RTU commands from network server to RS485 terminal devices and send Modbus reply originally back to network server. Port: Select from 2-84, 86-223.



When you use power output to power RS485 Modbus slave devices, it only supplies power when reporting interval is coming. It's suggested to power slave devices with external power during the PoC test.

3. Click  to add Modbus channels, and then save configurations.

**Channel Settings**

[Fetch](#)

Channel ID	Name	Slave ID	Address	Quantity	Type	Sign	Value
1	Temperature	1	0	1	Input Register(INT16)	<input type="checkbox"/>	

[Save](#)
[Fetch](#) ⊗ ⊕

Up to 16 channels

Object	Description
<b>Channel ID</b>	Select the channel ID you want to configure, 16 channels selectable.
<b>Name</b>	Customize the name to identify every Modbus channel.
<b>Slave ID</b>	Set Modbus slave ID of terminal device.
<b>Address</b>	The starting address for reading.
<b>Quantity</b>	Set read how many digits from starting address. It fixes to 1.
<b>Type</b>	Select data type of Modbus channels.
<b>Sign</b>	The tick indicates that the value has a plus or minus sign.

Example: If you configure it as the following picture, LN501 will send Modbus read command to terminal device regularly: 01 03 00 00 00 01 84 0A

Channel ID	Name	Slave ID	Address	Quantity	Type	Sign	Decimal Place	Value
1	Temperature	1	0	1	Holding Register(INT16)	<input type="checkbox"/>	0	


Fetch

Save Up to 16 channels

4. For ToolBox software, click “Fetch” to check if LN501 can read correct data from terminal devices. You can also click “Fetch” on the top of list to fetch all channel data.

Channel ID	Name	Slave ID	Address	Quantity	Type	Sign	Value
1	1	1	16	1	Input Register(INT16)	<input type="checkbox"/>	554 <input checked="" type="checkbox"/>
2	2	2	12	1	Holding Register(INT16)	<input type="checkbox"/>	
3	1	1	17	1	Input Register(INT16)	<input type="checkbox"/>	

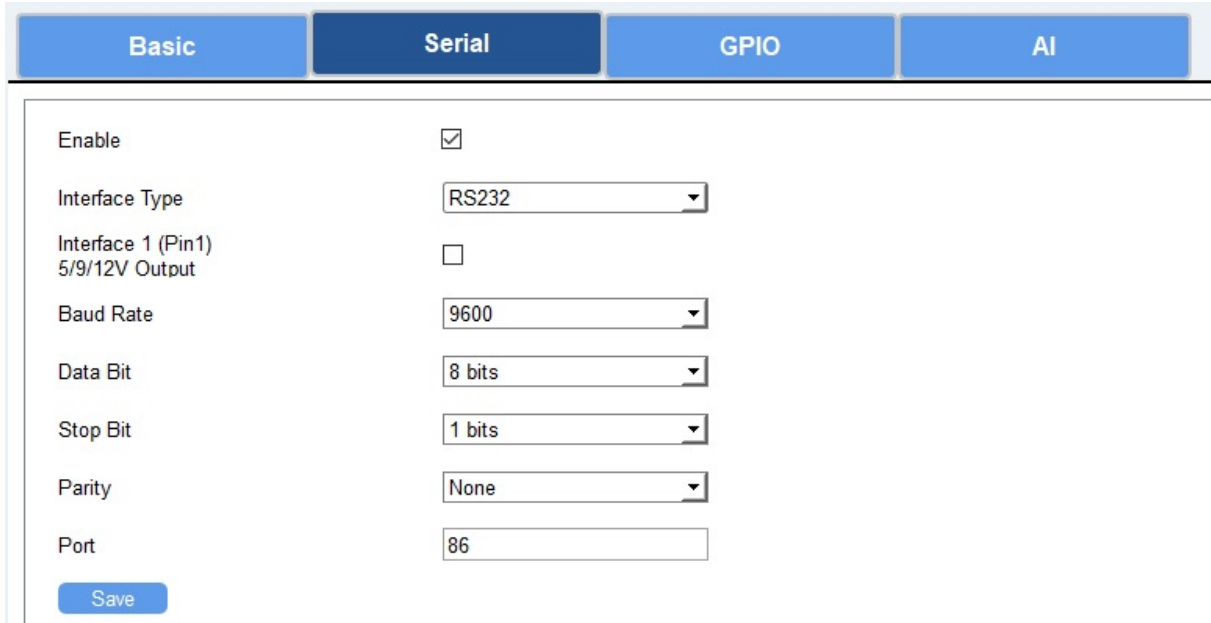
Fetch



**Note** Please do not click “Fetch” frequently since response time to reply is different for every terminal device.

### 4.3.2 RS232 Settings

1. Connect RS232 device to RS232 port on interface 2. If you need LN501 to power the RS232 device, connect the power cable of RS232 device to 5V/9V/12V power output on interface 1.
2. Go to “General -> Serial” of ToolBox software to enable RS232 and configure serial port settings. Serial port settings should be the same as RS232 terminal devices.



Basic	<b>Serial</b>	GPIO	AI
Enable	<input checked="" type="checkbox"/>		
Interface Type	RS232		
Interface 1 (Pin1) 5/9/12V Output	<input type="checkbox"/>		
Baud Rate	9600		
Data Bit	8 bits		
Stop Bit	1 bits		
Parity	None		
Port	86		
<input type="button" value="Save"/>			

Object	Description
<b>Interface 2 (Pin 1) 5V/9V/12V</b>	Enable 5V/9V/12V power output of interface 2 to supply power to RS232 terminal devices continuously. Note: Power output is 12V by default and you can change DIP switches to change voltage.
<b>Baud Rate</b>	1200/2400/4800/9600/19200/38400/57600/115200 are available.
<b>Data Bit</b>	8 bit is available.
<b>Stop Bit</b>	1 bit and 2 bit are available.
<b>Parity</b>	None, Odd and Even are available.
<b>Port</b>	The port used for RS232 data transmission.

### 4.3.3 GPIO Settings

1. Connect devices to GPIO ports on interface 2.
2. Go to “General -> GPIO” of ToolBox software to enable GPIO port.

#### General >

Basic	Serial	GPIO	AI
Interface Name: GPIO 1			
Enable: <input checked="" type="checkbox"/>			
Interface Type: Digital Input1			
Digital Input:  Pull Down			
Status: <input type="text"/> <span>Fetch</span>			
Interface Name: GPIO 2			
Enable: <input checked="" type="checkbox"/>			
Interface Type: Digital Input2			
Digital Input:  Pull Down			
Status: <input type="text"/> <span>Fetch</span>			
<span>Save</span>			

3. Select GPIO type according to your requirements.
  - Digital Input: detect high or low status of devices
  - Digital Output: send voltage signal to trigger devices
  - Counter: pulse counter.

### Digital Input:

Select initial status of digital input. If pull up is selected, falling edge will be triggered; if pull down is selected, rising edge will be triggered. After selection, click “Fetch” to check current status of digital input.

Interface Name	GPIO 1	
Enable	<input checked="" type="checkbox"/>	
Interface Type	Digital Input 1	
Digital Input	<input type="text" value="Pull Down"/>	<input type="text"/>
Status	<input type="text" value="Low"/>	<input checked="" type="checkbox"/> <input type="button" value="Fetch"/>

### Digital Output:

Click “Switch” to check if LN501 can trigger devices by digital output or click “Fetch” to check the current status of digital output.

Interface Name	GPIO 1	
Enable	<input checked="" type="checkbox"/>	
Interface Type	Digital Output 1	
Status	<input type="text" value="Low"/>	<input checked="" type="checkbox"/> <input type="button" value="Fetch"/> <input type="button" value="Switch"/>

### Pulse Counter:

Interface Name	GPIO 1	
Enable	<input checked="" type="checkbox"/>	
Interface Type	Counter	
Digital Input	<input type="text" value="Pull Down"/>	<input type="text"/>
Digital Filter	<input checked="" type="checkbox"/>	<input type="text"/>
keep last value when power off	<input checked="" type="checkbox"/>	
Counter values	<input type="text" value="0"/>	<input type="button" value="Refresh"/> <input type="button" value="Start"/> <input type="button" value="Clear"/>

Object	Description
<b>Digital Input</b>	Initial status of counter. Pull Down: Increase 1 when detecting rising edge Pull Up/None: Increase 1 when detecting falling edge
<b>Digital Filter</b>	It's recommended to enable when pulse period is greater than 250 us.
<b>Keep Last Value When Power Off</b>	Keep the counted values when the device powers off.
<b>Start/Stop</b>	Make the device start/stop counting. Note: LN501 will send non-changeable counting values if you do not click "Start".
<b>Refresh</b>	Refresh to get latest counter values.
<b>Clear</b>	Count the value from 0.

#### 4.3.4 AI Settings

1. Connect analog device to analog input ports on interface 1. If you need LN501 to power the analog device, connect the power cable of analog device to 5V/9V/12V power output on interface 1.
2. Go to "**General -> AI**" of ToolBox software to enable analog input.

Interface 1 (Pin1)  
5/9/12V Output

Power Output Time Before Collect  s

Interface Name Analog Input 1

Enable

Analog Input Signal Type

Status  Fetch

---


Interface Name Analog Input 2

Enable

Analog Input Signal Type

Status  Fetch

3. Select analog input type according to analog device type.




**Note**

Make sure DIP switch has changed before changing “Analog Input Signal Type” to 0-10V.

4. Enable “Interface 1 (Pin 1) 5V/9V/12V” and configure “Power Output Time Before Collect”, LN501 will power the analog devices for a period of time before collecting data.

Interface 1 (Pin1) 5/9/12V Output	<input checked="" type="checkbox"/>
Power Output Time Before Collect	<input style="width: 80px;" type="text" value="1.0"/> s



**Note**

When you use power output to power analog devices, it only supplies power when reporting interval is coming. It's suggested to power slave devices with external power during the PoC test.

5. Click “Fetch” to check if LN501 can read correct data from analog devices.

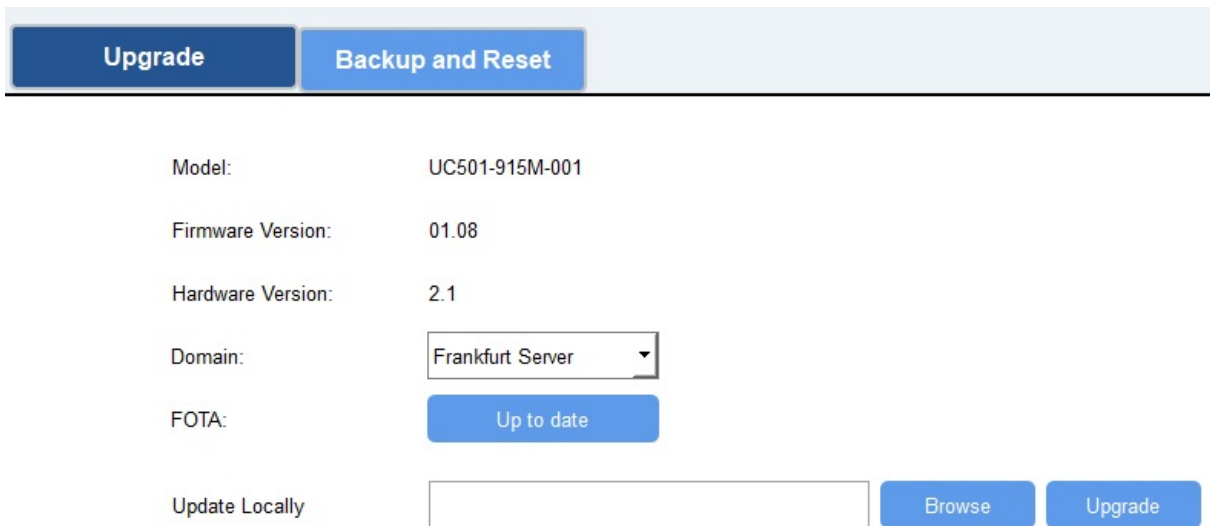
Interface Name	Analog Input 2
Enable	<input checked="" type="checkbox"/>
Analog Input Signal Type	<input style="width: 150px;" type="text" value="0-10 V"/>
Status	<input style="width: 150px;" type="text" value="0.00 V"/> <span style="margin-left: 10px;"></span> <span style="margin-left: 10px;"><a href="#" style="background-color: #4a90e2; color: white; padding: 2px 10px; border-radius: 3px;">Fetch</a></span>



## 4.4 Maintenance

### 4.4.1 Upgrade

Go to “**Maintenance -> Upgrade**” of ToolBox software, click “Browse” to import firmware and upgrade the device. You can also click “Up to Date” to search for the latest firmware of the device and upgrade.

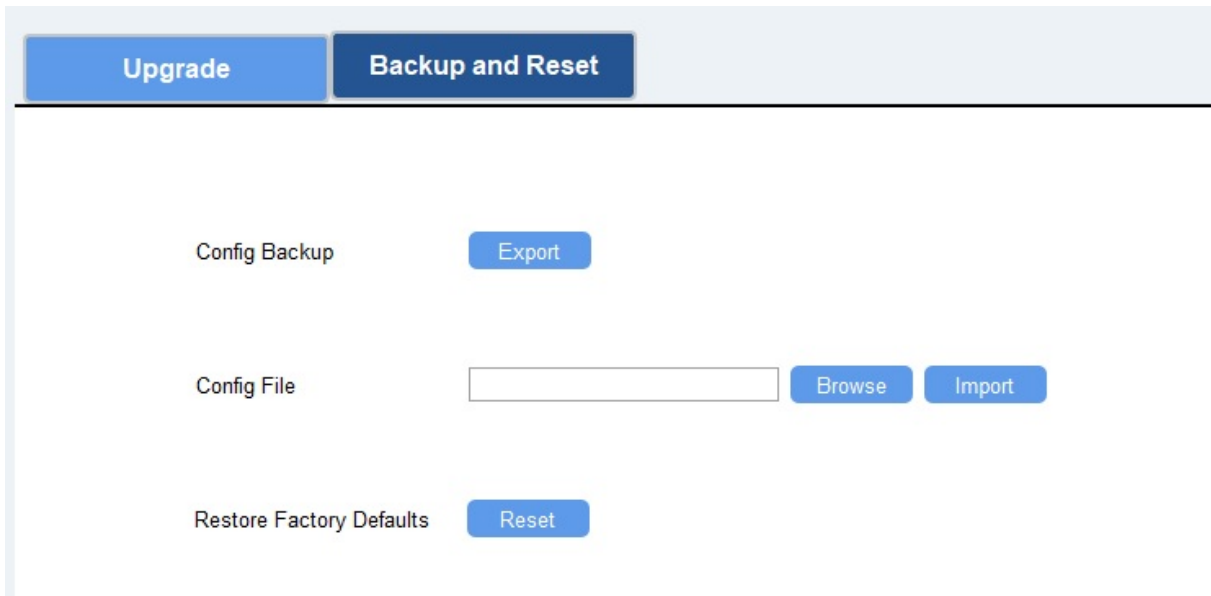


Model:	UC501-915M-001
Firmware Version:	01.08
Hardware Version:	2.1
Domain:	Frankfurt Server
FOTA:	Up to date
Update Locally	<input type="text"/> Browse Upgrade

### 4.4.2 Backup

LN501 devices support configuration backup for easy and quick device configuration in bulk. Backup is allowed only for devices with the same model and LoRa frequency band. Please select one of following methods to back up device:

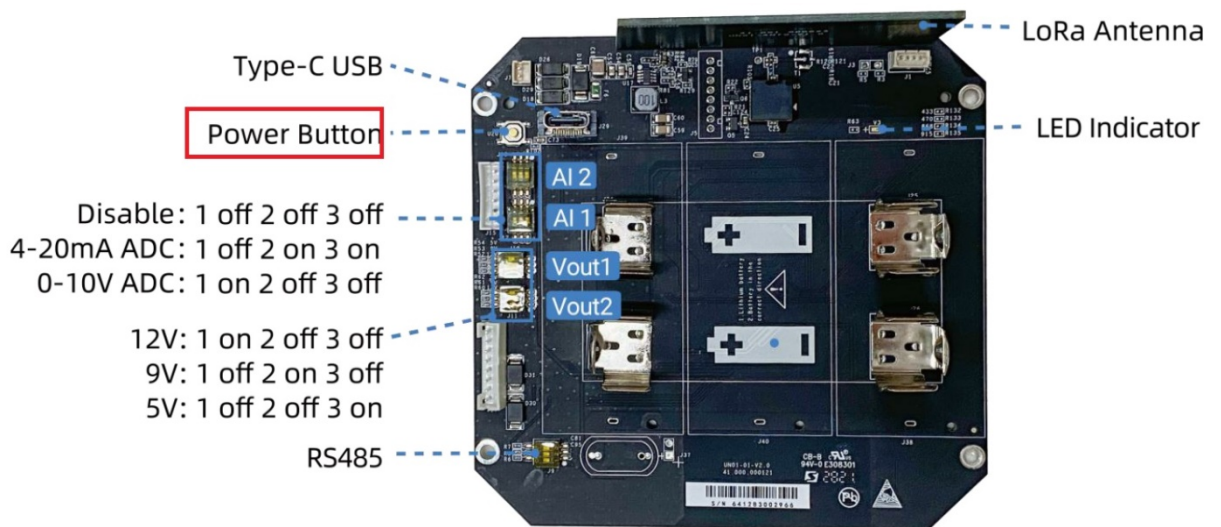
1. Go to “**Maintenance -> Backup and Reset**”, click “Export” to save current configuration as backup file.
2. Click “Browse” to select backup file, and then click “Import” to import the configurations.



### 4.4.3 Reset to Factory Default

Please select one of following methods to reset device:

- Hardware: Open the case of LN501 and hold on power button for more than 10s.



- ToolBox Software: Go to “Maintenance -> Backup and Reset” to click “Reset”.

