LoRa Data Transmission Module

IOT-L2S-B2MS

User Manual

Heyuan Intelligence Technology Co., Ltd

IMPORTANT DECLARATIONS

1. This document is an instruction manual. Its content will change as product is upgraded without notice. Please contact with Heyuan Intelligence Technology Co., Ltd to get the latest product specifications if it is needed.

2. Heyuan shall not be responsible or liable for any damages or injuries caused by improper meter installation and/or operation.

3. Please read this manual carefully before the product is operated, and once you start, you'll be considered to have read this manual and accept all our terms.

HEYUAN
INTELLIGENCE

Contents

Chapter 1 Product Introduction

Heyuan New LoRa Data Transmission Terminal, Model No.IOT-L2S-B, is universcal commnication interactive equipment designed and manafactured based on LLCC68 LoRa RF chip from Semtech. It can implement a peer-to-peer communication between nodes, without the use of gateways, and extends node reachability through multi-hop communication. The low-cost, flexible and easy-to-configure “out-of-Internet” communication can be ensured wherever and whenever needed. It is widely applied in fields of IoT, wireless meter reading, smart home, smart city, fire safety, industrial manufacturing,agriculture and forestry monitoring, building energy saving etc..

Chapter 2 Technical Parameters

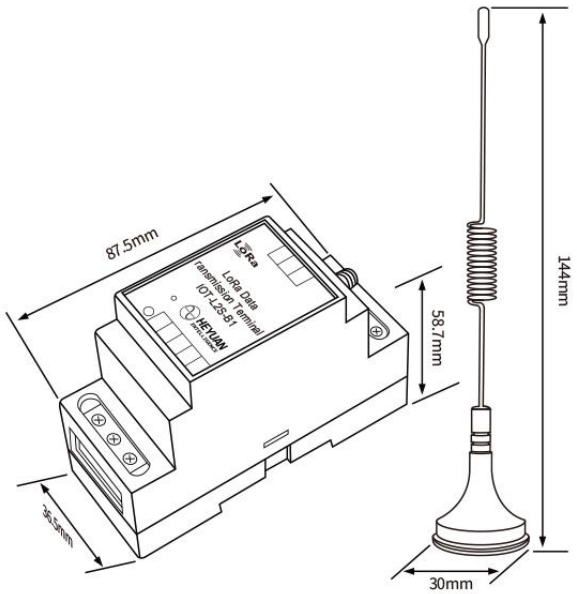
2.1 Technical Parameter

- Power Supply: AC85-265V or 9-36V DC
- Equipped with LoRa chips LLCC68 from Semtech for RF part
- Isolated RS485, Modbus RTU protocol(transparent transmission)
  Baud Rates: 2400-115200bps,8N1, 8E1, 8O1
- Working frequency:430.5~509.5Mhz
- RF Power:+2dBm~+22dBm(settable)
- Sensitivity: -127dBm@2.1kbps
- Data rate range (DrRange): 2.1kbps~62.5kbps
- multi-hop and mesh networking functionalities
- Self-recovery,Self-routing
- Data transmission distance: 300-500m(single-hop, up to 255 multi-hops)
- Installation: 35mmDin rail

2.2 Model Selection

Model No.	RS485 Interfaces	Power Supply Voltage	Wireless parameters	
			Working Frequency	Networking Modes
IOT-L2S-B1M/ IOT-L2S-B2M (Main)	1	AC85-265V/ 9-36VDC	433MHz	Transparent Transmission
IOT-L2S-B1S/ IOT-L2S-B2S (Slaver/Repeater)	1	AC85-265V/ 9-36VDC	433MHz	

2.3 Size



2.4 Interface

No.	Name	
1	RF	SMA interface, Antenna Impedance: 50Ω
2	Reset	Reset
3	Dial Switch	Dialing down and pressing reset to enter the default baud rate(115200)
4	Power	AC/DC power supply
5	RS485/power	RS485-A/B AC power supply L N DC power supply V+, V-
6	TX-LED	Flashing when sending data
7	RX-LED	Flashing when receiving data

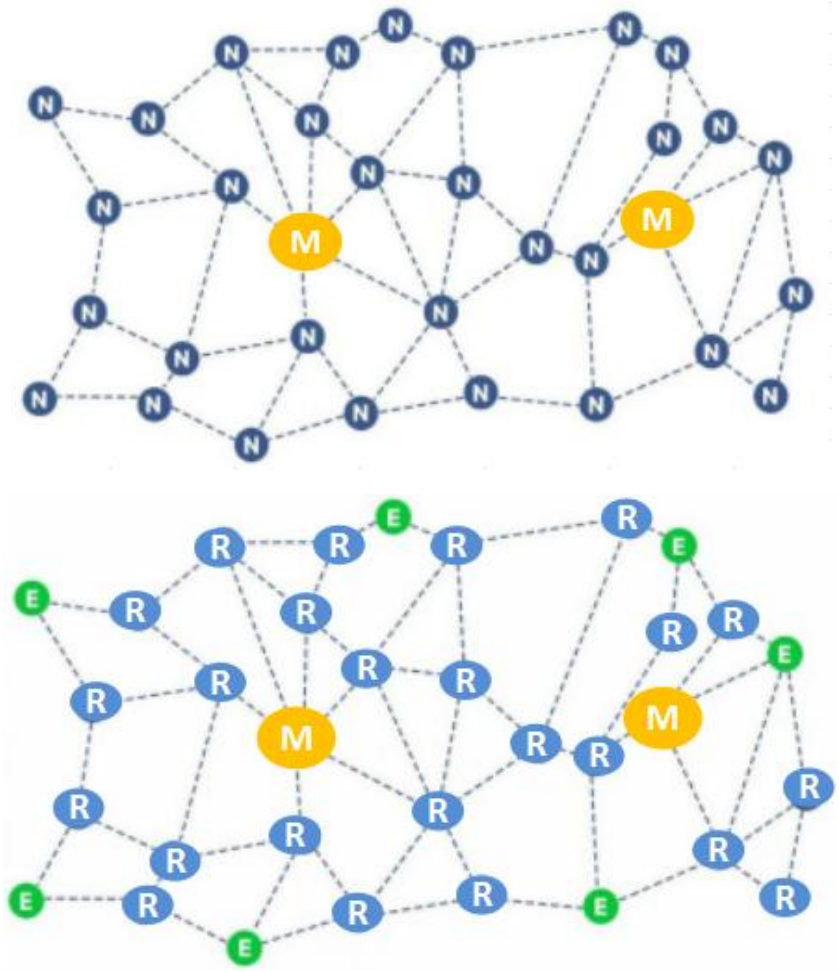
2.5 Electromagnetic compatibility (EMC)

Name	Test Standard	Level
Electrostatic discharge immunity	IEC 61000-4-2:2008	IV
Electrical fast transient/burst immunity	IEC 61000-4-4:2012	IV
Surge immunity	IEC 61000-4-5:2005	IV

Chapter 3 Mesh Network Instruction

3.1 Name Description

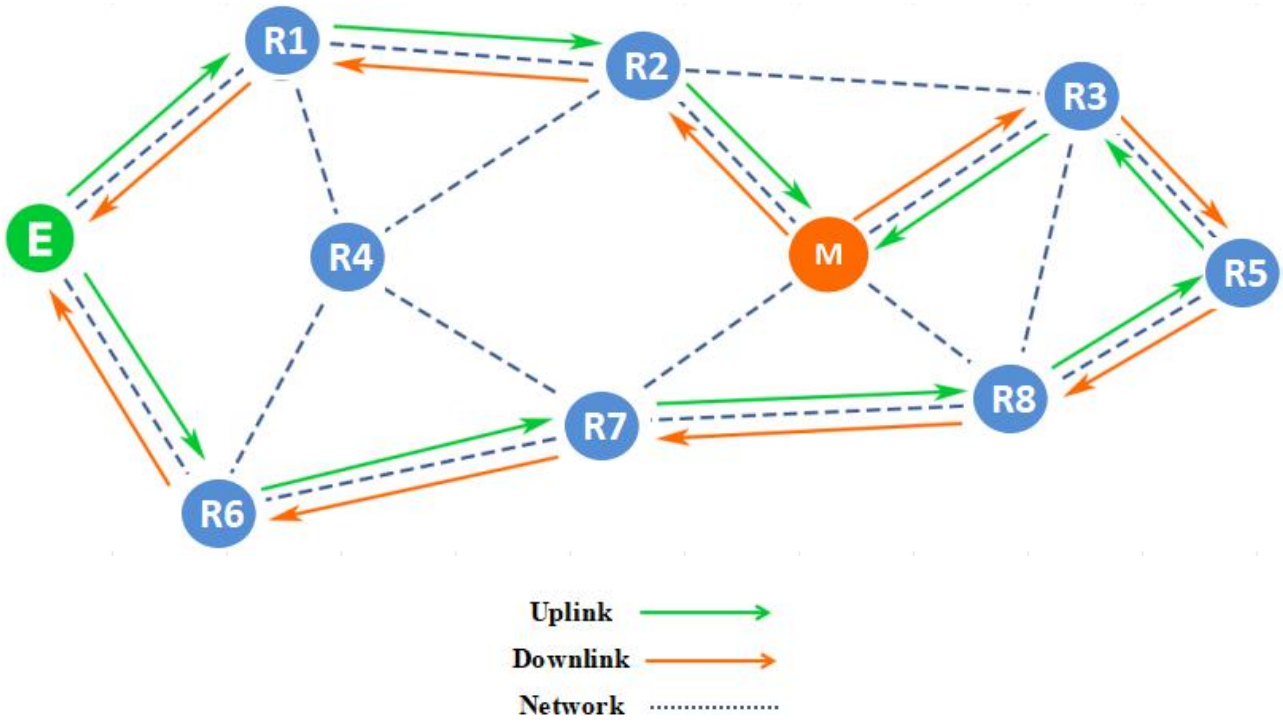
Master node(M): collects data with sensors&transmits to repeater nodes.
Repeater nodes(P): receives sensor data from master node & forwards to end nodes.
End node(E): receive data from repeater nodes& process for data visualization.
(All messages, including broadcasts, are reliably transmitted through 5 handshake attempts, using multiple attempts, collision avoidance, and congestion control mechanisms to ensure that all messages arrive safely and reliably at the destination node)



Network Topography

3.2 Multi-path Data Transmission based on Lora MESH Network

Aimed at the dependable end-to-end data transmitting, Heyuan lora product adopts a multiplex forwarding mode based on multi-path routing, and this type data transmission mode can increase throughput, balance the load, and decrease the end-to-end delay.



Multi-path Schematic Diagram

The blue network shows there are two paths from the End node to the Master node.
E→R1→R2→M;
E→R6→R7→R8→R5→R3→M
The establishment of routing is achieved through flooding, where there is no closed loop between multiple routes and multiple paths are allowed to intersect.Each node will choose as many nodes as possible as its next hop route, and data packets can dynamically switch between multiple paths and be transmitted in parallel.
The invalid routing detection, new route discovery, and changes in network topology are detected by listening to handshake packets between adjacent nodes, without the need for flooding or additional overhead.All nodes only need to find their next hop relay node, without determining the entire path, so this routing protocol has low overhead and is suitable for mobile networks with rapidly changing topology. It can quickly discover the real-time best route and supports ultra large scale networks with 255 level routing.
The routing protocol of our Lora module will integrate multiple selection algorithms for route selection, including distance vector, signal quality (link state). The module can quickly detect the real-time link quality of multiple routes, select the best path routing in a very short time, and if necessary, select the next closest path as the routing.
The routing selection of our module link state algorithm is shown in the multi-path

schematic diagram.

E can transmit data to M through R4, but this path is affected and is an unstable link.

At the same time, there is another path with good link quality from E to M, **E→R1→R2→M.**

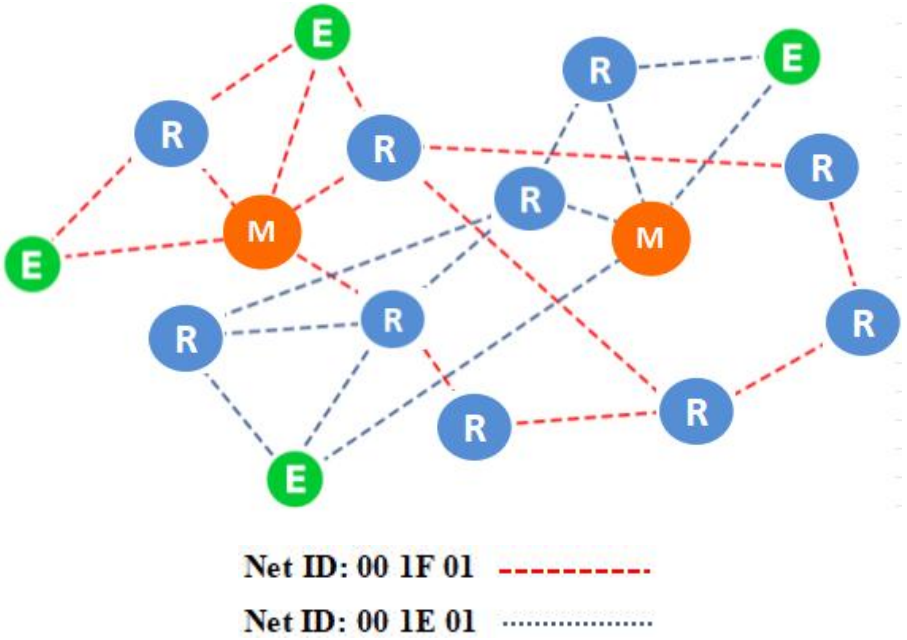
To ensure the reliability and real-time performance of message transmission, the lora module will prioritize selecting the second path(**E→R1→R2→M)** for data transmission.

3.3 Multiple Network with different ID

The lora module supports multiple networks, and nodes with different network IDs cannot communicate with each other,

The node with ID 00 1F 01 cannot communicate with the device with ID 00 1E 01.

The network ID range is from 000000 to FFFFFF, with a total of 16777216 network IDs.

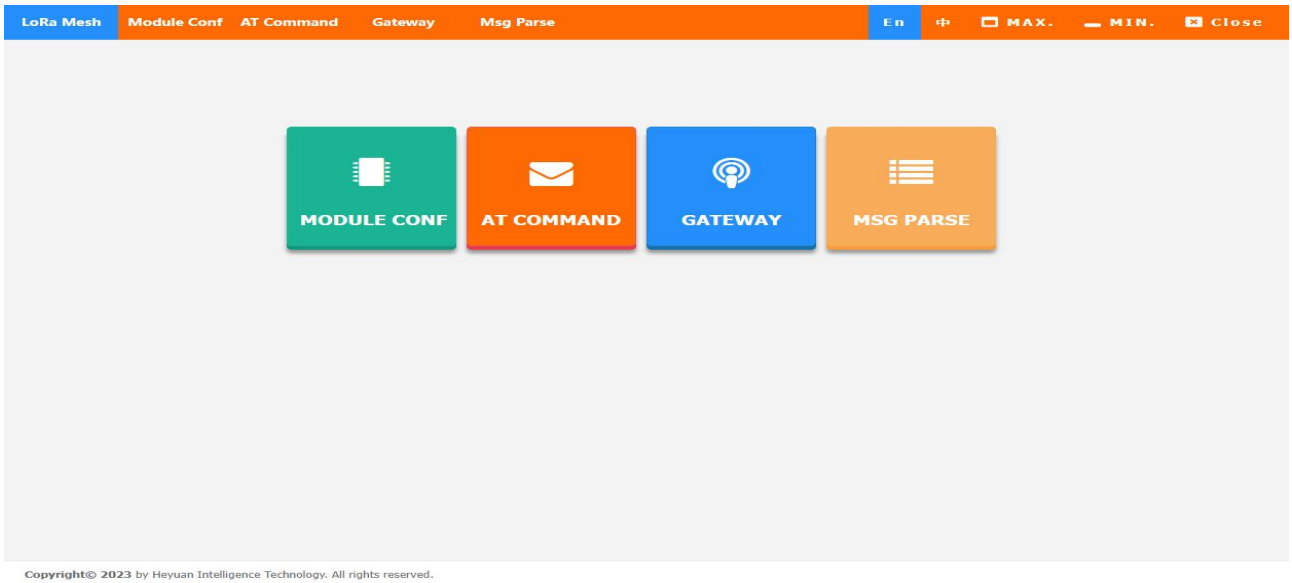


3.4 Detailed Frequency (128) 430.5MHz-509.5MHz

430.5MHz	431MHz	431.5MHz	432MHz	432.5MHz	433MHz	433.5MHz	434MHz
434.5MHz	435 MHz	435.5MHz	436 MHz	436.5MHz	437 MHz	437.5MHz	438 MHz
438.5MHz	439 MHz	439.5MHz	440 MHz	440.5MHz	441 MHz	441.5MHz	442 MHz
442.5MHz	443 MHz	443.5MHz	444 MHz	444.5MHz	445 MHz	445.5MHz	446 MHz
454 MHz	454.5MHz	455 MHz	455.5MHz	456 MHz	456.5MHz	457 MHz	457.5MHz
458 MHz	458.5MHz	459 MHz	459.5MHz	460 MHz	460.5MHz	461 MHz	461.5MHz
462 MHz	462.5MHz	463 MHz	463.5MHz	464 MHz	464.5MHz	465 MHz	465.5MHz
466 MHz	466.5MHz	467 MHz	467.5MHz	468 MHz	468.5MHz	469 MHz	469.5MHz
470.5MHz	471 MHz	471.5MHz	472 MHz	472.5MHz	473 MHz	473.5MHz	474 MHz
474.5MHz	475 MHz	475.5MHz	476 MHz	476.5MHz	477 MHz	477.5MHz	478 MHz
478.5MHz	479 MHz	479.5MHz	480 MHz	480.5MHz	481 MHz	481.5MHz	482 MHz
482.5MHz	483 MHz	483.5MHz	484 MHz	484.5MHz	485 MHz	485.5MHz	486 MHz
494 MHz	494.5 MHz	495MHz	495.5 MHz	496 MHz	496.5 MHz	497 MHz	497.5 MHz
498 MHz	498.5 MHz	499 MHz	499.5 MHz	500 MHz	500.5 MHz	501 MHz	501.5 MHz
502 MHz	502.5 MHz	503 MHz	503.5 MHz	504 MHz	504.5 MHz	505 MHz	505.5 MHz
506 MHz	506.5 MHz	507 MHz	507.5 MHz	508 MHz	508.5 MHz	509 MHz	509.5 MHz

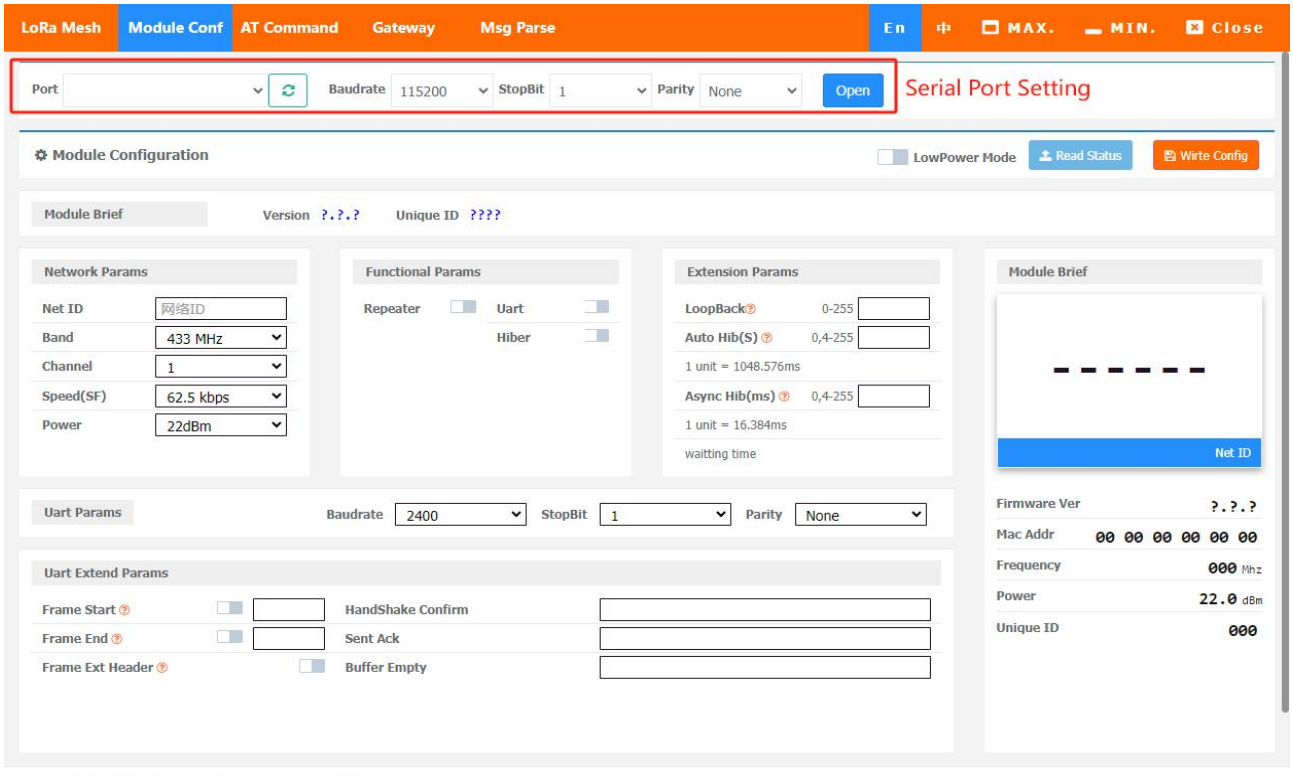
Chapter 4 Configuration & AT Command

4.1 Configuration Tool Overview



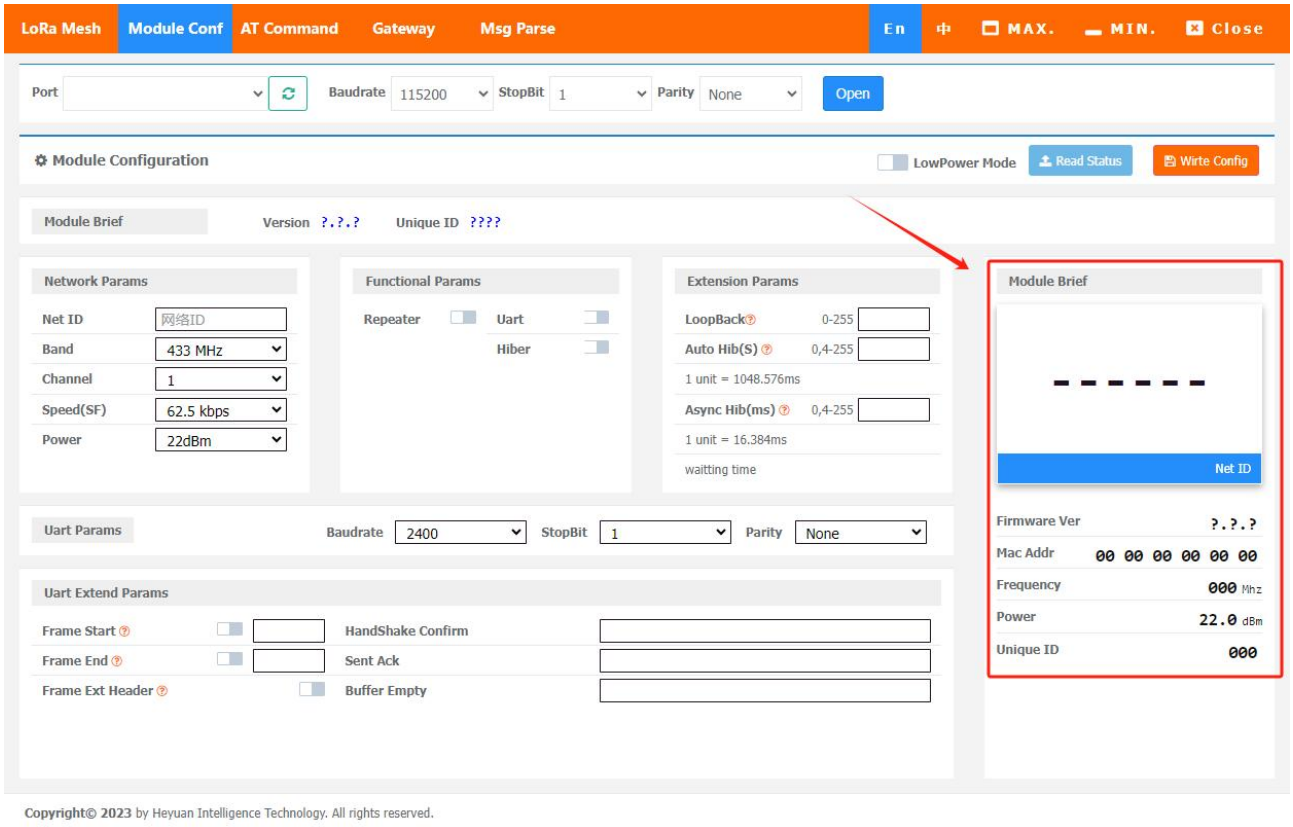
4.2 MODULE CONF(configuration)

Open the suitable port, then read the module status. After the configuration is completed, please click “write config”.



4.2.1 Module Brief

- Net ID:the network to which this module belongs, can be settable.
- Firmware Version
- Mac Address:ASCII code for the last six digits of the unique ID of the module
- Frequency: it can be settable(range 430.5MHz-509.5MHz)
- Power: it can be settable
- Unique ID



AT Command

① TO Get MAC Address

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x52 0x44 0x03 0x0C 0x06 0x0D	To get MAC Address
Module Receive Command	0x41 0x54 0x52 0x44	AT Command
	0x08	Number of subsequent bytes
	0x0C	Offset Address
	0x30 0x33 0x42 0x38 0x45 0x36	MAC Address
	0x0D	End

② TO Get Frequency Band

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x52 0x44 0x03 0x2E 0x01 0x0D	To get frequency band
Module Receive Command	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
	0x0E	Offset Address
	0x3	Convert to binary 00110000 high The third and fourth digits are in the frequency band 00 430MHz-446MHz 01 454MHz-469MHz 10 470MHz -486MHz 11 494MHz-509MHz
	0x0D	End

③ To Get Frequency Channel

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x52 0x44 0x03 0x04 0x01 0x0D	To get frequency band
Module Receive Command	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
	0x04	Offset Address
	0x07	Convert to binary 00000 111 high 5 Bit is the channel
	0x0D	End

Channel List

Binary	Channel	Binary	Channel	Binary	Channel	Binary	Channel
00000	1	01000	9	10000	17	11000	25
00001	2	01001	10	10001	18	11001	26
00010	3	01010	11	10010	19	11010	27
00011	4	01011	12	10011	20	11011	28
00100	5	01100	13	10100	21	11100	29
00101	6	01101	14	10101	22	11101	30
00110	7	01110	15	10110	23	11110	31
00111	8	01111	16	10111	24	11111	32

④ To Get Frequency Point

The frequency point is determined jointly by the frequency band and channel.

Band	Channel	Frequency Point	Band	Channel	Frequency Point	Band	Channel	Frequency Point
00	00000	430.5 MHz	01	01011	459.5 MHz	10	10110	481.5 MHz
00	00001	431 MHz	01	01100	460 MHz	10	10111	482 MHz
00	00010	431.5 MHz	01	01101	460.5 MHz	10	11000	482.5 MHz
00	00011	432 MHz	01	01110	461 MHz	10	11001	483 MHz
00	00100	432.5 MHz	01	01111	461.5 MHz	10	11010	483.5 MHz
00	00101	433 MHz	01	10000	462 MHz	10	11011	484 MHz
00	00110	433.5 MHz	01	10001	462.5 MHz	10	11100	484.5 MHz
00	00111	434 MHz	01	10010	463 MHz	10	11101	485 MHz
00	01000	434.5 MHz	01	10011	463.5 MHz	10	11110	485.5 MHz
00	01001	435 MHz	01	10100	464 MHz	10	11111	486 MHz
00	01010	435.5 MHz	01	10101	464.5 MHz	11	00000	494 MHz
00	01011	436 MHz	01	10110	465 MHz	11	00001	494.5 MHz
00	01100	436.5 MHz	01	10111	465.5 MHz	11	00010	495 MHz
00	01101	437 MHz	01	11000	466 MHz	11	00011	495.5 MHz
00	01110	437.5 MHz	01	11001	466.5 MHz	11	00100	496 MHz
00	01111	438 MHz	01	11010	467 MHz	11	00101	496.5 MHz
00	10000	438.5 MHz	01	11011	467.5 MHz	11	00110	497 MHz
00	10001	439 MHz	01	11100	468 MHz	11	00111	497.5 MHz
00	10010	439.5 MHz	01	11101	468.5 MHz	11	01000	498 MHz
00	10011	440 MHz	01	11110	469 MHz	11	01001	498.5 MHz
00	10100	440.5 MHz	01	11111	469.5 MHz	11	01010	499 MHz
00	10101	441 MHz	10	00000	470.5 MHz	11	01011	499.5 MHz
00	10110	441.5 MHz	10	00001	471 MHz	11	01100	500 MHz
00	10111	442 MHz	10	00010	471.5 MHz	11	01101	500.5 MHz
00	11000	442.5 MHz	10	00011	472 MHz	11	01110	501 MHz
00	11001	443 MHz	10	00100	472.5 MHz	11	01111	501.5 MHz
00	11010	443.5 MHz	10	00101	473 MHz	11	10000	502 MHz
00	11011	444 MHz	10	00110	473.5 MHz	11	10001	502.5 MHz
00	11100	444.5 MHz	10	00111	474 MHz	11	10010	503 MHz
00	11101	445 MHz	10	01000	474.5 MHz	11	10011	503.5 MHz
00	11110	445.5 MHz	10	01001	475 MHz	11	10100	504 MHz
00	11111	446 MHz	10	01010	475.5 MHz	11	10101	504.5 MHz
01	00000	454 MHz	10	01011	476 MHz	11	10110	505 MHz
01	00001	454.5 MHz	10	01100	476.5 MHz	11	10111	505.5 MHz
01	00010	455 MHz	10	01101	477 MHz	11	11000	506 MHz
01	00011	455.5 MHz	10	01110	477.5 MHz	11	11001	506.5 MHz
01	00100	456 MHz	10	01111	478 MHz	11	11010	507 MHz
01	00101	456.5 MHz	10	10000	478.5 MHz	11	11011	507.5 MHz
01	00110	457 MHz	10	10001	479 MHz	11	11100	508 MHz
01	00111	457.5 MHz	10	10010	479.5 MHz	11	11101	508.5 MHz
01	01000	458 MHz	10	10011	480 MHz	11	11110	509 MHz
01	01001	458.5 MHz	10	10100	480.5 MHz	11	11111	509.5 MHz
01	01010	459 MHz	10	10101	481 MHz			

⑤ To Get Power

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x52 0x44 0x03 0x00 0x01 0x0D	To get power
Module Receive Command	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
	0x00	Offset Address
	0x18	Convert to binary 00011000, high3 bits are power
	0x0D	End

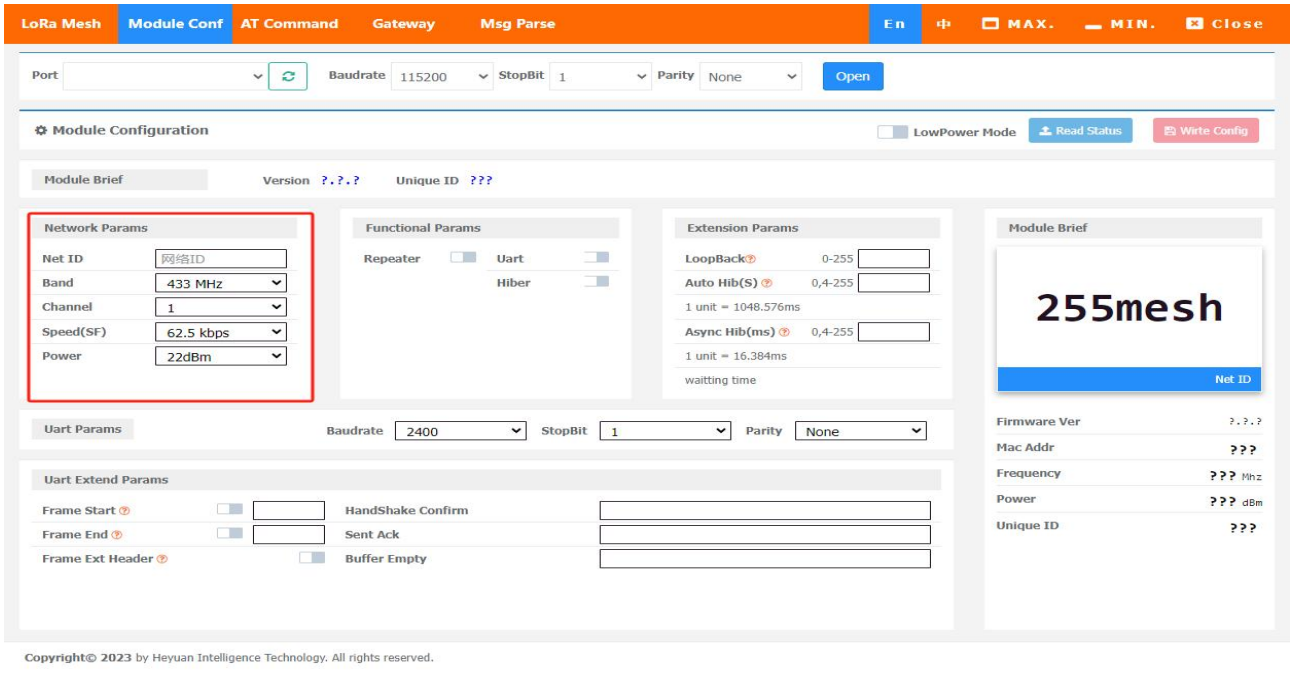
Binary	Power	Binary	Power	Binary	Power	Binary	Power
000	22dbm	010	17dbm	100	11dbm	1100	5dbm
001	20dbm	011	14dbm	101	8dbm	111	2dbm

⑥ To Get Net ID

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x52 0x44 0x03 0x12 0x03 0x0D	To get MAC Address
Module Receive Command	0x41 0x54 0x52 0x44	AT Command
	0x0	Number of subsequent bytes
	0x12	Offset Address
	0x00 0x00 0x00	Net ID
	0x0D	End

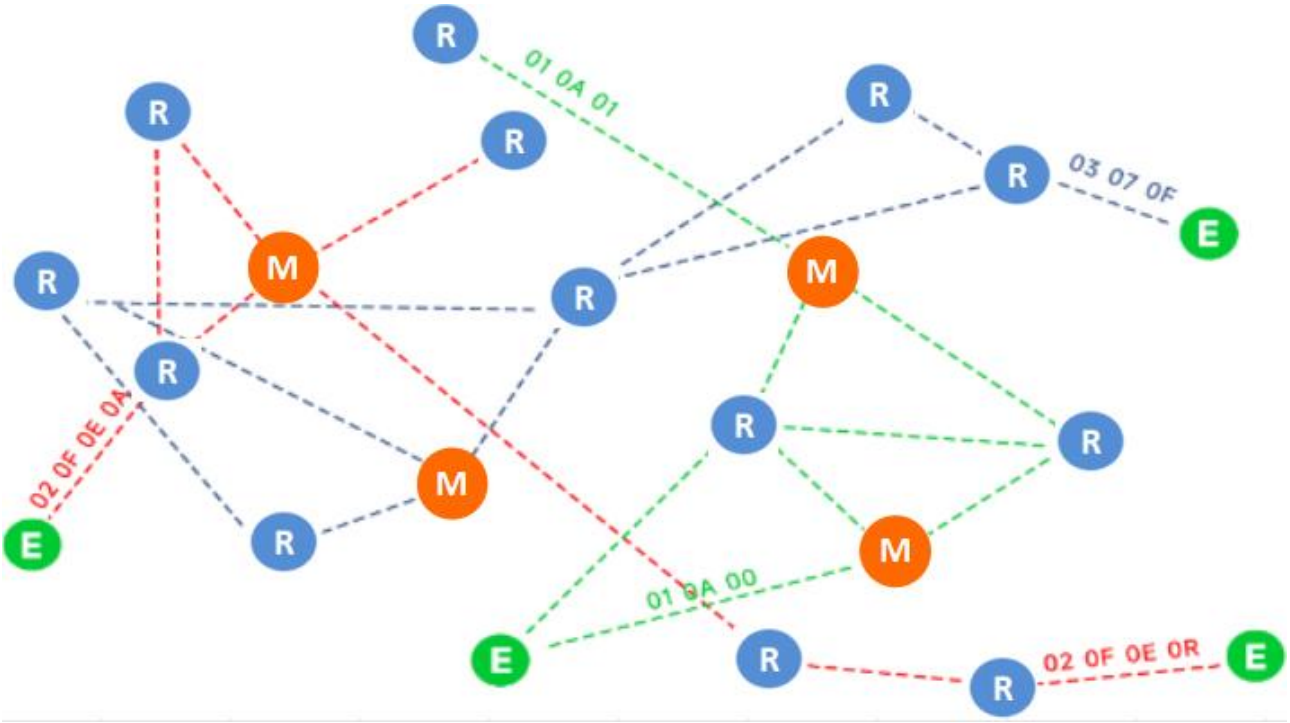
4.2.2 Network Parameter

Network parameters include network ID, wireless frequency band, channel, speed(SF), and power. Only modules with the same configuration can communicate with each other.
After configuration, please click “write config”



4.2.2.1 Net ID

the network ID is used to distinguish different Lora MESH networks, and the lora modules between different net IDs cannot communicate.
The range of net ID values is 00000 FFFFFFF.



Data transmission diagram for different network IDs

Net ID: 00 00 01(red line), transmit data : 02 0F 0E 0R, 02 0F 0E 0A

Net ID: 00 00 02(green line), transmit data : 01 0A 00, 010A 01

Net ID: 00 00 03(blue line), transmit data : 03 07 0F

AT Command

① To Get Net ID

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x52 0x44 0x03 0x12 0x03 0x0D	To get net ID
Module Receive Command	0x41 0x54 0x52 0x44	AT Command
	0x05	Number of subsequent bytes
	0x12	Offset Address
	0x00 0x00 0x00	Net ID
	0x0D	End

② To Change Net ID

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x57 0x52	To change ID AT Command
	0x05	
	0x12	
	0x00 0x00 0x01	New ID
	0x0D	

Module Receive Command	0x41 0x54 0x57 0x52 0x05 0x12 0x00 0x00 0x01 0x0D	If the data sent and received are consistent, it indicates that the change was successful

4.2.2.2 Frequency Band

The module can be configured with 4 bands: 433MHz, 470MHz, 480MHz, and 500MHz. After configuration, please click “write config”

AT Command

① **To Get Band**

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x52 0x44 0x03 0x2E 0x01 0x0D	To get band
Module Receive Command	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
	0x2E	Offset Address
	0x30	Convert to binary 00110000, with the 3rd and 4th high bits being the frequency band 00 430MHz-446MHz 01 454MHz-469MHz 10 470MHz -486MHz 11 494MHz-509MHz
	0x0D	End

② **To Change Band**

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x57 0x52	To change band AT Command
	0x03	Number of subsequent bytes
	0x2E	Offset Address
	0x30	Convert to binary 00110000, with the 3rd and 4th high bits being the frequency band 00 430MHz-446MHz 01 454MHz-469MHz 10 470MHz -486MHz 11 494MHz-509MHz
	0x0D	End
Module Receive Command	0x41 0x54 0x57 0x52 0x03 0x2E 0x30 0x0D	If the data sent and received are consistent, it indicates that the change was successful

4.2.2.3 Channel

Total 32 channels.After configuration, please click “write config”.

AT Command

① **To Get Channel**

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x52 0x44 0x03 0x04 0x01 0x0D	To get channel
Module Receive Command	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
	0x04	Offset Address
	0x07	Convert to binary 00000111, with high 5 bits being the channel
	0x0D	End

Channel List

Binary	Channel	Binary	Channel	Binary	Channel	Binary	Channel
00000	1	01000	9	10000	17	11000	25
00001	2	01001	10	10001	18	11001	26
00010	3	01010	11	10010	19	11010	27
00011	4	01011	12	10011	20	11011	28
00100	5	01100	13	10100	21	11100	29
00101	6	01101	14	10101	22	11101	30
00110	7	01110	15	10110	23	11110	31
00111	8	01111	16	10111	24	11111	32

② **To Change channel**

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x57 0x52	To change channel AT Command
	0x03	Number of subsequent bytes
	0x04	Offset Address
	0x07	Convert to binary 00000111, with high 5 bits being the channel, When changing the channel, it is necessary to first obtain the channel and ensure that the lower 3 bits remain consistent with the original one
	0x0D	End
Module Receive Command	0x41 0x54 0x57 0x52 0x03 0x04 0x07 0x0D	If the data sent and received are consistent, it indicates that the change was successful

4.2.2.4 Speed(SF)

Each frequency has 7kinds of SF.
(62.5kbps,37.5kbps,21.8kbps,12.5kbps,7.0kbps,3.9kbps,2.1kbps)
After configuration, please click “write config”.
When other parameters are consistent with the hardware environment, the lower the air speed, the farther the signal transmission distance.

AT Command

① **To Get Speed (SF)**

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x52 0x44 0x03 0x3E 0x01 0x0D	To get speed AT Command
Module Receive Command	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
	0x3E	Offset Address
	0x00	Speed Value
	0x0D	End

② **To Change Speed (SF)**

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x57 0x52	To change SF AT Command
	0x03	Number of subsequent bytes
	0x3E	Offset Address
	0x00	Speed Value
	0x0D	End
Module Receive Command	0x41 0x54 0x57 0x52 0x03 0x3E 0x00 0x0D	If the data sent and received are consistent, it indicates that the change was successful

Speed(SF) list

Value	SF	Value	SF	Value	SF	Value	SF
00	62.5kbps	0x20	21.8kbps	0x40	7.0kbps	0x60	2.1kbps
10	37.5kbps	0x30	12.5kbps	0x50	3.9kbps		

4.2.2.5 Power

The module supports 8 types of power.
22dbm,20dbm,17dbm,14dbm,11dbm,8dbm,5dbm,2dbm.
After configuration, please click “write config”.

AT Command

① **To Get Power**

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x52 0x44 0x03 0x00 0x01 0x0D	To get power
Module Receive Command	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
	0x00	Offset Address
	0x18	Convert to binary 00011000, High 3 bits are power
	0x0D	End

② **To Change Power**

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x57 0x52	To change Power AT Command
	0x03	Number of subsequent bytes
	0x00	Offset Address
	0x18	Convert to binary 00011000, high 3 bits are power When changing power, it is necessary to first obtain the channel and ensure that the lower 5 bits remain consistent with the original one
	0x0D	End
Module Receive Command	0x41 0x54 0x57 0x52 0x03 0x00 0x18 0x0D	If the data sent and received are consistent, it indicates that the change was successful

Power List

Binary	Power	Binary	Power	Binary	Power	Binary	Power
000	22dbm	010	17dbm	100	11dbm	1100	5dbm
001	20dbm	011	14dbm	101	8dbm	111	2dbm

4.2.3 Functional Parameter

Functional parameters include relay enable(can be used as repeater), serial enable(Uart), and sleep enable(Hiber).
After configuration, please click “write config”.

4.2.3.1 Repeater

When the module in the Lora MESH network is too far away from the master or the signal strength is too low, the module will forward data to the master through the repeater modules. It is recommended to enable relay function on non low-power modules. Relay functions are enabled by default

AT Command

① **To Get Repeater Status**

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x52 0x44 0x03 0x00 0x01 0x0D	To get repeater status
Module Receive Command	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
	0x00	Offset Address
	0x18	Convert to binary 00011000, with the high 4th digit indicating repeater status and 1 indicating enable
	0x0D	End

② **To Enable Repeater Function**

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x57 0x52	To enable repeater AT Command
	0x03	Number of subsequent bytes
	0x00	Offset Address
	0x18	Convert to binary 00011000, with the high 4th digit indicating repeater status and 1 indicating enable When changing the relay status, it is necessary to obtain it first to ensure that the other bits are consistent with the original ones
	0x0D	End
Module Receive Command	0x41 0x54 0x57 0x52 0x03 0x00 0x18 0x0D	If the data sent and received are consistent, it indicates that the change was successful

4.2.3.2 Uart

The module in the MESH network can close the serial port function and enable the relay function, acting as a pure repeater module.
The module that requires active data transmission must enable serial port functionality.
The serial port function is enabled by default.
After configuration, please click “write config”.Configuration.

AT Command

① **To Get Uart Status**

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x52 0x44 0x03 0x00 0x01 0x0D	To get Uart status
Module Receive Command	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
	0x00	Offset Address
	0x18	Convert to binary 00011000,with the high 5th digit indicating Uart status ,and 1 indicating enable
	0x0D	End

② **To Change Uart Status**

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x57 0x52	To change Uart Status AT Command
	0x03	Number of subsequent bytes
	0x00	Offset Address
	0x18	Convert to binary 00011000,with the high 5th digit indicating Uart status ,and 1 indicating enable When changing the Uart status, it is necessary to obtain it first to ensure that the other bits are consistent with the original ones
	0x0D	End
Module Receive Command	0x41 0x54 0x57 0x52 0x03 0x00 0x18 0x0D	If the data sent and received are consistent, it indicates that the change was successful

4.2.3.3 Hiber

In the lora MESH network, modules can be configured for sleep to further reduce power consumption. If autonomous sleep or asynchronous sleep is configured, the sleep parameter must be enabled.
After configuration, please click “write config”.Configuration.

AT Command

① **To Get Hiber Status**

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x52 0x44 0x03 0x00 0x01 0x0D	To get hiber status
Module Receive Command	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
	0x00	Offset Address
	0x18	Convert to binary 00011000,with the high 6th digit indicating Uart status ,and 1 indicating enable
	0x0D	End

② **To Change Hiber Status**

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x57 0x52	To change hiber status AT Command
	0x03	Number of subsequent bytes
	0x00	Offset Address
	0x18	Convert to binary 00011000,with the high 6th digit indicating Uart status ,and 1 indicating enable When changing the Uart status, it is necessary to obtain it first to ensure that the other bits are consistent with the original ones
	0x0D	End
Module Receive Command	0x41 0x54 0x57 0x52 0x03 0x00 0x18 0x0D	If the data sent and received are consistent, it indicates that the change was successful

4.2.4 External Parameter

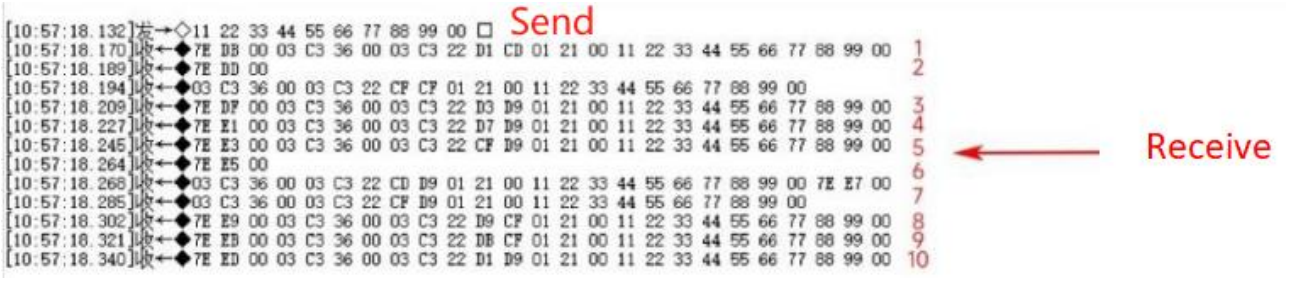
4.2.4.1 LoopBack

In order to test the air network function of the lora MESH network module, the loopback frequency can be configured to test whether the module's sending and receiving data functions are intact, with a value range of 1 to 254. Configuring 255 represents not using loopback frequency testing.

The loop back testing is when the slaver module sends the data received from the master without any modifications to the master.

The number of loops is configured to send data several times. For example, if the number of loops is set to 10 and the master receives 00 00 01 data, the slaver module will return 10 packets of 00 00 01 data.

Please change the loop count to 00 or FF after the loopback test is completed in order to send data normally.



AT Command

① **To Get Loop Times**

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x52 0x44 0x03 0x1D 0x01 0x0D	To get loop times
Module Receive Command	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
	0x1D	Offset Address
	0x0A	The number of loops, converted to decimal, is 10 times. 00 to FF corresponds to 0 to 255, where 00 and FF are not configured
	0x0D	End

② **To Change Loop Times**

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x57 0x52	To change loop times AT Command
	0x03	Number of subsequent bytes
	0x1D	Offset Address
	0x0A	The number of loops, converted to decimal, is 10 times. 00 to FF corresponds to 0 to 255, where 00 and FF are not configured
	0x0D	End
Module Receive Command	0x41 0x54 0x57 0x52 0x03 0x1D 0x0A 0x0D	If the data sent and received are consistent, it indicates that the change was successful

4.2.4.2 Auto Hiber

For end nodes that do not require data relay and routing forwarding, they can only turn on radio frequency for data transmission when they need to send or inquire about their own data packets. After data transmission is completed, they can immediately enter sleep, which is called autonomous sleep.

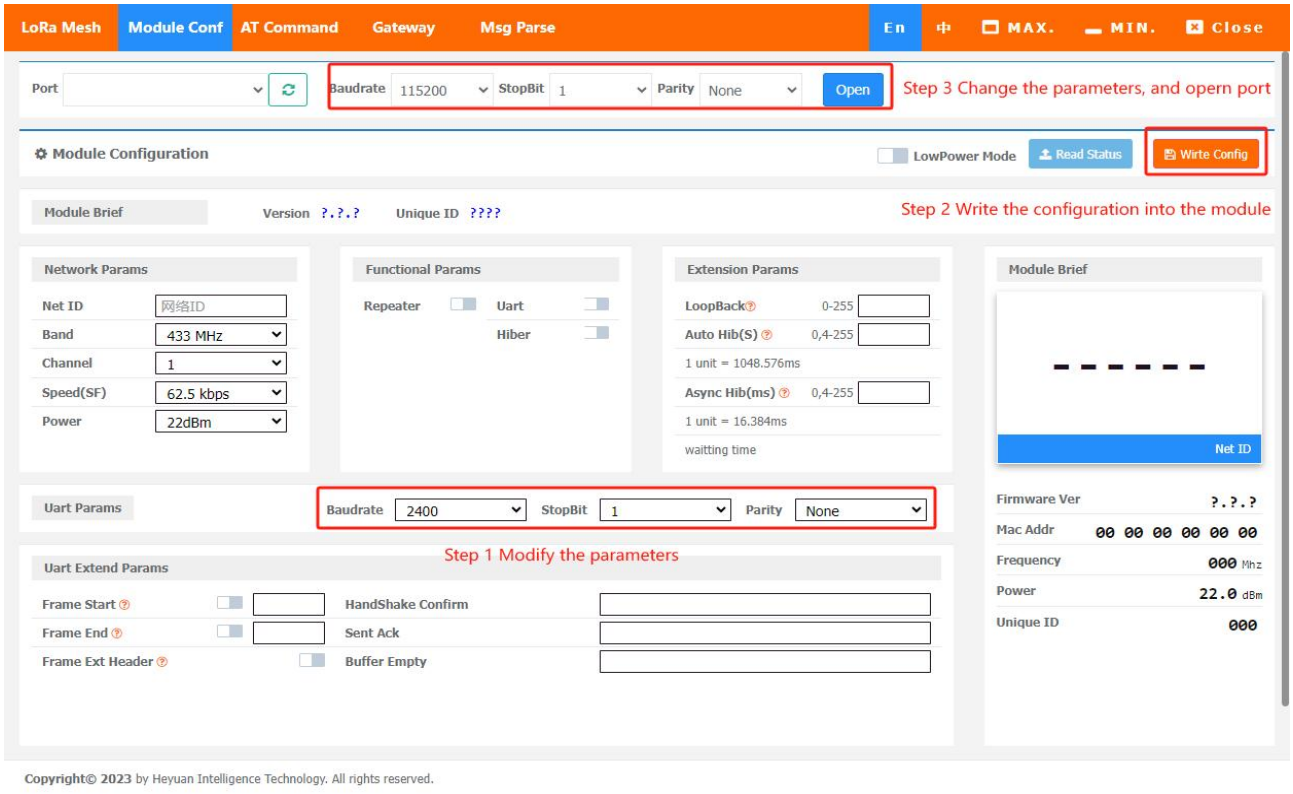
To use autonomous sleep, the relay function needs to be turned off. If sleep is not enabled or relay is enabled, this parameter does not take effect.

It need to be configured the sleep time interval.

One interval is 1048ms.The maximum configurable sleep time is 4.47 minutes.

If the autonomous sleep interval is set as 0, the module will not wake up actively and can only be awakened through the serial port.

4.2.5 Serial Port Setting



AT Command

Baud Rate List

Binary	Baud Rate	Binary	Baud Rate	Binary	Baud Rate	Binary	Baud Rate
000	2400 bps	010	9600 bps	100	19200 bps	1100	57600 bps
001	4800 bps	011	14400 bps	101	38400 bps	111	115200 bps

Parity List

Binary	Parity
00	None
01	Odd
10	Even

Stop Bit List

Binary	Stop Bit
000000	1 bit
010000	1.5 bits
100000	2 bits

① To Get Baud Rate

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x52 0x44 0x03 0x04 0x01 0x0D	To get baud rate AT Command
Module Receive Command	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
	0x04	Offset Address
	0x07	Convert to binary 0000 0111. The lower 3 bits are the baud rate,
	0x0D	End

② To Change Baud Rate

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x57 0x52	To change loop times AT Command
	0x03	Number of subsequent bytes
	0x04	Offset Address
	0x07	lower 3 bits are the baud rate, it is necessary to obtain it first to ensure that the other bits are consistent with the original ones
	0x0D	End
Module Receive Command	0x41 0x54 0x57 0x52 0x03 0x04 0x07 0x0D	If the data sent and received are consistent, it indicates that the change was successful

③ To Get Parity and Stop Bit

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x52 0x44 0x03 0x05 0x01 0x0D	To get Parity and Stop Bit
Module Receive Command	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
	0x05	Offset Address
	0x00	Convert to binary 100000000. The high 2 bits are the parity bits, and the low 6 bits are the stop bits.
	0x0D	End

④ **To Change Parity and Stop Bit**

Data Transmission Direction	Example	Description
Send command to module	0x41 0x54 0x57 0x52	To change Parity and Stop Bit AT Command
	0x03	Number of subsequent bytes
	0x05	Offset Address
	0x00	Convert to binary 100000000. The high 2 bits are the parity bits, and the low 6 bits are the stop bits.
	0x0D	End
Module Receive Command	0x41 0x54 0x57 0x52 0x03 0x05 0x00 0x0D	If the data sent and received are consistent, it indicates that the change was successful

Chapter 5 After-sales Service

Product Warranty

1. The product warranty period is one year.
2. The company is responsible for free maintenance or exchange within one-year warranty period.
3. The cost of the components and freight shall be charged for improper meter installation and/or operation.
4. Over the warranty period, part of the maintenance cost according to actual situation will be charged.

Service Guarantee

1. Product technical consulting and quality complaints will be replied within 12 hours.
2. Solutions for quality complaints will be provided within 24 hours.
3. Except statutory holidays and force majeure.

Chapter 6 Contact US

Headquarter Add.: 7F No.1 Aosheng Building, 1166 Xinluo Street, High-tech Development Zone, Jinan, P.R. China 250101
Factory Add.: 2F Innovation Factory, Feiyue Road, High-tech Development Zone, Jinan, P.R. China 250101
Tel: +86 0531 68621770-863
E-mail: info@heyuanintel.com
Website: www.heyuanintel.com