

# LoRa Data Transmission Module IOT-L2S-B2MS User Manual



## Heyuan Intelligence Technology Co., Ltd

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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.





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## **Chapter 1 Product Introduction**

Heyuan New LoRa Data Transmission Terminal, Model No.IOT-L2S-B, is universal 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

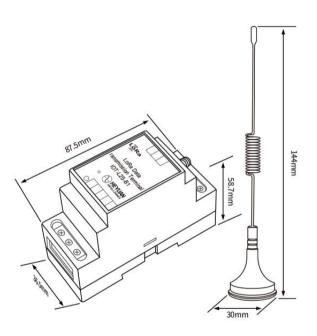
- Power Supply: AC85-265V or 9-36V DC
- Equipped with LoRa chips LLCC68 from Semtech for RF part
- Isolated RS485, Modbus RTU protocol(transparent transmission) Baud Rates: 2400-115200bps,8N1, 8E1, 8O1
- Working frequency:430.5~509.5Mhz
- RF Power:+2dBm~+22dBm(settable)
- Sensitivity: -127dBm@2.1kbps
- 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

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

## 2.3 Size



## 2.4 Interface

No.	Name	
1	RF	SMA interface, Antenna Impedance: 50 $\Omega$
2	Reset	Reset
3	Dial Switch	Dialing down and pressing reset to enter
3	Dial Switch	the default baud rate(115200)
4	Power	AC/DC power supply
		RS485-A/B
5	RS485/power	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**

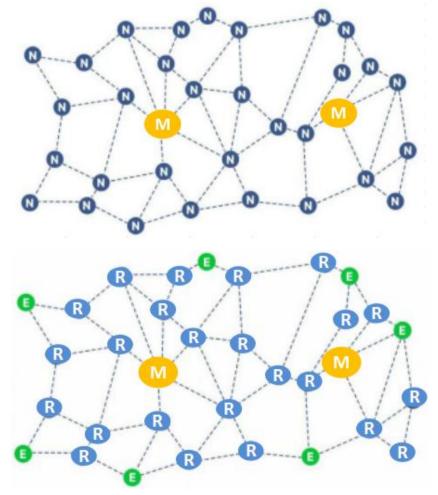
#### **3.1 Name Description**

**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)

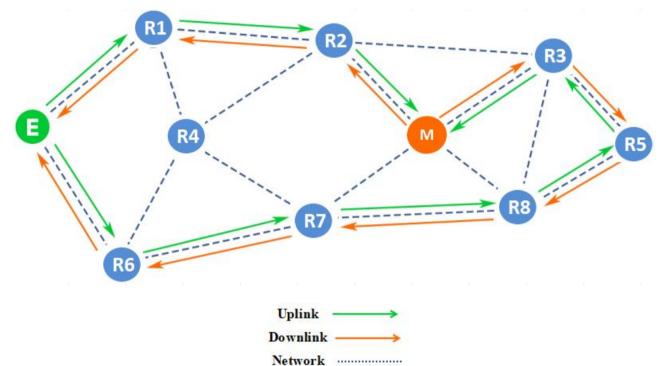


Network Topography



#### 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.  $E \rightarrow R1 \rightarrow R2 \rightarrow M$ ;

#### $E \rightarrow R6 \rightarrow R7 \rightarrow R8 \rightarrow R5 \rightarrow R3 \rightarrow M$

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



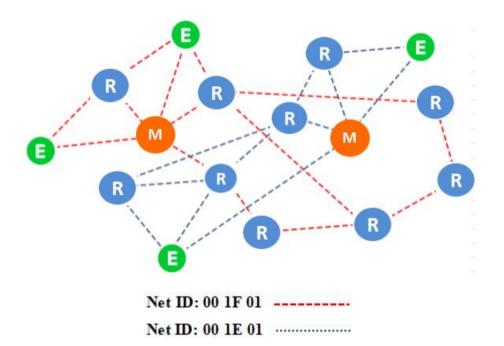
schematic diagram.

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,  $E \rightarrow R1 \rightarrow R2 \rightarrow M$ . To ensure the reliability and real-time performance of message transmission, the lora module will prioritize selecting the second path( $E \rightarrow R1 \rightarrow R2 \rightarrow M$ ) 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

LoRa Mesh	Module Conf	AT Command	Gateway	Msg Parse		En 🕈 C	MAX. <u>-</u> MIN.	S Close
					P			
		MOD	ULE CONF	AT COMMAND	GATEWAY	MSG PARSE		
		anne Tachaolam, All -						

## 4.2 MODULE CONF(configuration)

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

LoRa Mesh Module Conf AT Com	nand Gateway Msg Parse	En 中	🗖 MAX. 🔔 MIN. 😫 Close
Port v S	Baudrate 115200 v StopBit 1	v Parity None v Open Seria	l Port Setting
Module Configuration		LowPo	wer Mode 🛃 Read Status 🖹 Wirte Config
Module Brief Version	n ?.?.? Unique ID ????		
Network Params	Functional Params	Extension Params	Module Brief
Net ID 网络ID	Repeater 🔲 Uart	LoopBack <sup>®</sup> 0-255	
Band 433 MHz 💙	Hiber	Auto Hib(S) ⑦ 0,4-255	
Channel 1 ~		1 unit = 1048.576ms	
Speed(SF) 62.5 kbps ¥		Async Hib(ms) 🤊 0,4-255	
Power 22dBm 💙		1 unit = 16.384ms	
		waitting time	Net ID
Uart Params	Baudrate 2400 💙 StopBit 1	Parity None	Firmware Ver ?.?.?
		None .	Mac Addr 00 00 00 00 00 00
Uart Extend Params			Frequency 000 Mhz
Frame Start 🔋	HandShake Confirm		Power 22.0 dBm
Frame End ()	Sent Ack		Unique ID 000
	Buffer Empty		

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## 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

Module Brief   Version ?;?;?   Unique ID ????     Net IO   Metwork Params   Functional Params   LoopBack® 0:255     Band   433 MHz ~   Channel   1     Channel   1   Hiber   Hiber   1 unit = 1048.576ms     Speed(SF)   62.5 kbps ~   Power   22dBm ~   I unit = 16.384ms     Uart Params   Baudrate   2400 ~   StopBit   Parity   None ~	× Close	- MIN.	4AX. <u>–</u> MII	En 🕈 🗖 MAX.	E	eway Msg Parse	nf AT Command	Module Conf	oRa Mesh
Module Brief   Version ?.?.?   Unique ID ????     Network Params   Functional Params   Extension Params     Net ID					Parity None  Open	115200 <b>v</b> StopBit 1	<b>√ 2</b> Ba		Port
Network Params   Functional Params   Extension Params     Net ID   Image: Comparent of the second	Wirte Config	ead Status	2 Read Status	LowPower Mode				Configuration	🌣 Module C
Net ID           Megini          Band         433 MHz       Channel         1            Hiber           LoopBack         0.255      Speed(SF)          62.5 kbps           Megini           Miber      Power          22dBm           Midrate         2400           StopBit         1           Parity         None           Firmware Ver						Unique ID ????	Version ?.?	ef	Module Brie
Band   433 MHz   Hiber   Auto Hib(s) © 0,4-255   Image: Channel international internatina internatinternational internatinternatinternationa in		rief	1odule Brief	Module I	Extension Params	tional Params		arams	Network Pa
Channel   1     1   1     Speed(SF)   62.5 kbps     0   22dBm     Vart Params   Baudrate     2400   StopBit     1   Parity     None   Firmware Ver					LoopBack <sup>®</sup> 0-255	ater 🔲 Uart		网络ID	Net ID
Speed(SF)   62.5 kbps   Async Hib(ms) © 0,4-255   Init = 16.384ms     Power   22dBm   I unit = 16.384ms   Init = 16.384ms     Uart Params   Baudrate 2400   StopBit 1   Parity None   Firmware Ver					Auto Hib(S) (? 0,4-255	Hiber	lz 🗸	433 MHz	Band
Power 22dBm 1 unit = 16.384ms I unit = 16.384ms   Waiting time waiting time I	-						~	1	Channel
Uart Params Baudrate 2400 v StopBit 1 v Parity None v Firmware Ver									
Uart Params Baudrate 2400 V StopBit 1 V Parity None V Firmware Ver	Net ID						~	22dBm	Power
Uart Params Baudrate 2400 V StopBit 1 V Parity None V	Net 10				waitung time				
	?.?.?	/er	mware Ver	✓ Firmware 1	✓ Parity None	2400 V StopBit 1	Ba	ns	Uart Params
	00 00 00	00 00 00	c Addr 00 00	Mac Addr					
Uart Extend Params Frequency	000 Mh		equency	Frequency				d Params	Uart Extend
Frame Start 🔊 🔲 HandShake Confirm	22.0 dB		wer	Power		ke Confirm		t 🤊	Frame Start
Frame End () Sent Ack Unique ID	000		ique ID	Unique ID				0	Frame End 🤇
Frame Ext Header 🔊 Buffer Empty						npty		Header 📀	Frame Ext H

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## **AT Command**

#### ① TO Get MAC Address

Data Transmission	Example	Description
Direction		
Send command to module	0x41 0x54 0x52 0x44 0x03 0x0C 0x06 0x0D	To get MAC Address
	0x41 0x54 0x52 0x44	AT Command
	0x08	Number of subsequent bytes
Module Receive Command	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
	0x41 0x54 0x52 0x44	AT Command
Module Receive 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	Example	Description	
Direction			
Send command to module	0x41 0x54 0x52 0x44 0x03 0x04 0x01 0x0D	To get frequency band	
	0x41 0x54 0x52 0x44	AT Command	
	0x03	Number of subsequent bytes	
Module Receive Command	0x04	Offset Address	
Module Receive Command	0x07	Convert to binary 00000 111 high 5	
		Bit is the channel	
	0x0D	End	

			Chann	el 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	Band	Channel	Frequency Point	Band	Channel	Frequency Point
00	00000		01	01011		10	10110	
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		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		1	



#### **5** To Get Power

Data Transmission	Example	Description
Direction		
Send command to module	0x41 0x54 0x52 0x44 0x03 0x00 0x01 0x0D	To get power
	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
Module Receive Command	0x00	Offset Address
Module Receive Command	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	Example	Description	
Direction			
Send command to module	0x41 0x54 0x52 0x44 0x03 0x12 0x03 0x0D	To get MAC Address	
	0x41 0x54 0x52 0x44	AT Command	
	0x0	Number of subsequent bytes	
Module Receive Command	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"

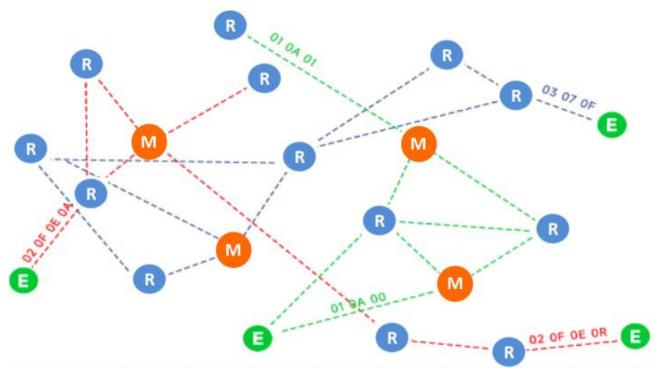
LoRa Mesh Module Conf AT Comma	and Gateway Msg Parse	En 4	🖻 🗖 MAX. 🔔 MIN. 🙁 Close
Port ~ 2	Baudrate 115200 V StopBit 1	v Parity None v Open	
Module Configuration		LowP	Power Mode 🛃 Read Status
Module Brief Version	?.?.? Unique ID ???		
Network Params	Functional Params	Extension Params	Module Brief
Net ID 网络ID	Repeater Uart	LoopBack⑦ 0-255	
Band 433 MHz ¥	Hiber	Auto Hib(S) ② 0,4-255	
Channel 1 ~		1 unit = 1048.576ms	255mesh
Speed(SF) 62.5 kbps V		Async Hib(ms) (9 0,4-255	
Power 22dBm Y		1 unit = 16.384ms waitting time	Net ID
			Firmware Ver
Uart Params	Baudrate 2400 🗸 StopBit 1	✓ Parity None ✓	
Uart Extend Params			Power ??? Mhz
Frame Start 🕐	HandShake Confirm		
Frame End 🛞	Sent Ack		Unique ID ???
Frame Ext Header 🕐	Buffer Empty		
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## 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 FFFFFF.





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

#### 2 To Change Net ID

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



	Module Receive Command	0x41 0x54 0x57 0x52 0x05 0x12 0x00 0x00	If the data sent and received are
		0x01 0x0D	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
	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
	0x2E	Offset Address
		Convert to binary 00110000, with
		the 3rd and 4th high bits being
Module Receive Command		the frequency band
	0x30	00 430MHz-446MHz
		01 454MHz-469MHz
		10 470MHz -486MHz
		11 494MHz-509MHz
	0x0D	End

## $\bigcirc$ To Change Band

Data Transmission	Example	Description
Direction		
	0x41 0x54 0x57 0x52	To change band AT Command
	0x03	Number of subsequent bytes
	0x2E	Offset Address
		Convert to binary 00110000, with
		the 3rd and 4th high bits being
Send command to module		the frequency band
	0x30	00 430MHz-446MHz
		01 454MHz-469MHz
		10 470MHz -486MHz
		11 494MHz-509MHz
	0x0D	End
		If the data sent and received are
Module Receive Command	0x41 0x54 0x57 0x52 0x03 0x2E 0x30 0x0D	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	Example	Description
Direction		
Send command to module	0x41 0x54 0x52 0x44 0x03 0x04 0x01 0x0D	To get channel
	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
Module Receive Command	0x04	Offset Address
	007	Convert to binary 00000111, with
	0x07	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	
	0x41 0x54 0x57 0x52	To change channel AT Command	
	0x03	Number of subsequent bytes	
	0x04	Offset Address	
Send command to		Convert to binary 00000111, with high 5 bits	
module	0x07	being the channel, When changing the	
module		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	0x41 0x54 0x57 0x52 0x03 0x04	If the data sent and received are consistent,	
Command	0x07 0x0D	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 bardware environment, the

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

## $\odot$ To Change Speed (SF)

Data Transmission Direction	Example	Description
	0x41 0x54 0x57 0x52	To change SF AT Command
Cand commond to	0x03	Number of subsequent bytes
Send command to module	0x3E	Offset Address
module	0x00	Speed Value
	0x0D	End
Module Receive	0x41 0x54 0x57 0x52 0x03 0x3E	If the data sent and received are consistent,
Command	0x00 0x0D	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	Example	Description
Direction		
Send command to module	0x41 0x54 0x52 0x44 0x03 0x00 0x01 0x0D	To get power
	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
Madula Dessive Command	0x00	Offset Address
Module Receive Command	0x18	Convert to binary 00011000,
		High 3 bits are power
	0x0D	End

#### **(2)** To Change Power

Data Transmission	Example	Description
Direction		
	0x41 0x54 0x57 0x52	To change Power AT Command
	0x03	Number of subsequent bytes
	0x00	Offset Address
Send command to	0x18	Convert to binary 00011000,
module		high 3 bits are power
module		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	0x41 0x54 0x57 0x52 0x03 0x00	If the data sent and received are consistent,
Command	0x18 0x0D	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	
	0x41 0x54 0x52 0x44	AT Command	
	0x03	Number of subsequent bytes	
	0x00	Offset Address	
Module Receive Command	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
	0x41 0x54 0x57 0x52	To enable repeater AT Command
	0x03	Number of subsequent bytes
	0x00	Offset Address
		Convert to binary 00011000, with the high 4th
Cond commond to	0x18	digit indicating repeater status
Send command to		and 1 indicating enable
module		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	0x41 0x54 0x57 0x52 0x03 0x00	If the data sent and received are consistent,
Command	0x18 0x0D	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
	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
	0x00	Offset Address
Module Receive Command		Convert to binary 00011000,with
	0x18	the high 5th digit indicating Uart
		status ,and 1 indicating enable
	0x0D	End

#### ② To Change Uart Status

Data Transmission Direction	Example	Description
	0x41 0x54 0x57 0x52	To change Uart Status AT Command
	0x03	Number of subsequent bytes
	0x00	Offset Address
Send command to module	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
	0x0D	ones End
Module Receive	0x41 0x54 0x57 0x52 0x03 0x00	If the data sent and received are consistent,
Command	0x18 0x0D	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
	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
	0x00	Offset Address
Module Receive Command		Convert to binary 00011000,with
	0x18	the high 6th digit indicating Uart
		status ,and 1 indicating enable
	0x0D	End

#### ② To Change Hiber Status

Data Transmission Direction	Example	Description
	0x41 0x54 0x57 0x52	To change hiber status AT Command
	0x03	Number of subsequent bytes
	0x00	Offset Address
		Convert to binary 00011000, with the high 6th
Send command to	0x18	digit indicating Uart status ,and 1 indicating
module		enable
module		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	0x41 0x54 0x57 0x52 0x03 0x00	If the data sent and received are consistent,
Command	0x18 0x0D	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.

[10:57:18.132]法→○11 22 33 44 55 66 77 88 99 00 □ [10:57:18.170]版←●7E D8 00 03 C3 36 00 03 C3 22 D1	Send	
[10:57:18.170]版←◆7E DB 00 03 C3 36 00 03 C3 22 D1	1 CD 01 21 00 11 22 33 44 55 66 77 88 99 00	
[10:57:18.189]收←◆7E DD 00	2	
[10:57:18.194] W + ♦ 03 C3 36 00 03 C3 22 CF CF 01 21	1 00 11 22 33 44 55 66 77 88 99 00	
[10:57:18.209]Wg+++ 7E DF 00 03 C3 36 00 03 C3 22 D3	3 19 01 21 00 11 22 33 44 55 66 77 88 99 00 3	
[10:57:18.227]收+◆7E E1 00 03 C3 36 00 03 C3 22 D7	7 19 01 21 00 11 22 33 44 55 66 77 88 99 00 4	
[10:57:18.245]收←◆7E E3 00 03 C3 36 00 03 C3 22 CE	F D9 01 21 00 11 22 33 44 55 66 77 88 99 00 5	Receive
[10:57:18.264] Wet + 7E E5 00	6	
[10:57:18.268]收↔◆03 C3 36 00 03 C3 22 CD D9 01 21		
[10:57:18.285]Wg+ €03 C3 36 00 03 C3 22 CF D9 01 21		
[10:57:18.302]Vg ← ● 7E E9 00 03 C3 36 00 03 C3 22 D9		
[10:57:18.321] Ug + • 7E EB 00 03 C3 36 00 03 C3 22 DE		
[10:57:18.340]收←◆7E ED 00 03 C3 36 00 03 C3 22 D1	1 D9 01 21 00 11 22 33 44 55 66 77 88 99 00 10	

## 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
	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
	0x1D	Offset Address
		The number of loops, converted
Module Receive Command		to decimal, is 10 times.
	0x0A	00 to FF corresponds to 0 to 255,
		where 00 and FF are not
		configured
	0x0D	End



#### ② To Change Loop Times

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

v C	Baudrate 115200 v StopBit 1 v	Parity None V Open Ste	p 3 Change the parameters, and opern po
Module Configuration			wPower Mode ᆂ Read Status 🖺 Wirte Config
Module Brief Version	n ?.?.? Unique ID ????	Ste	p 2 Write the configuration into the modu
Network Params	Functional Params	Extension Params	Module Brief
Net ID 网络ID Band 433 MHz Channel 1 Speed(SF) 62.5 kbps Power 22dBm	Repeater Uart Hiber	LoopBack     0-255       Auto Hib(S)     0,4-255       1 unit = 1048.576ms     Async Hib(ms)       Async Hib(ms)     0,4-255       1 unit = 16,384ms     waiting time	] ] Net ID
Uart Params	Baudrate 2400 🗸 StopBit 1	Parity None	Firmware Ver ?.?.?
	Step 1 Modify the parame	ators	Mac Addr 00 00 00 00 00
Uart Extend Params	Step 1 Modify the parame	eters	Frequency 000 Mit
Frame Start 🔋	HandShake Confirm		Power 22.0 dt
Frame End 🕐	Sent Ack		Unique ID 000
Frame Ext Header 🍞	Buffer Empty		]

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## **AT Command**

## **Baud Rate List**

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
	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
	0x04	Offset Address
Module Receive Command	0.07	Convert to binary 0000 0111. The
	0x07	lower 3 bits are the baud rate,
	0x0D	End

#### ② To Change Baud Rate

Data Transmission	Example	Description	
Direction			
	0x41 0x54 0x57 0x52	To change loop times AT Command	
	0x03	Number of subsequent bytes	
Send command to	0x04	Offset Address	
module		lower 3 bits are the baud rate,	
module	0x07	it is necessary to obtain it first to ensure that the other	
		bits are consistent with the original ones	
	0x0D	End	
Module Receive	0x41 0x54 0x57 0x52	If the data sent and received are consistent, it indicates	
Command	0x03 0x04 0x07 0x0D	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
	0x41 0x54 0x52 0x44	AT Command
	0x03	Number of subsequent bytes
	0x05	Offset Address
Module Receive Command		Convert to binary 100000000.
	0x00	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	
	0x41 0x54 0x57 0x52	To change Parity and Stop Bit AT Command	
	0x03	Number of subsequent bytes	
Send command to	0x05	Offset Address	
module	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	0x41 0x54 0x57 0x52	If the data sent and received are consistent, it indicates	
Command	0x03 0x05 0x00 0x0D	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**

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