

Catalog

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Note: Revision History

Revision	Date	Comment
V1.0	2019-09	First release
V1.1	2020-12	Update description
V1.2	2021-7	Wireless transmission rate setting range on page 13: 1932 changed to 2932
V2.0	2022-10	Software update: Mesh hop level , CRC encryption optional
V2.1	2025-02	Update frequency band and other information

1. Overview

LoRaP30Pro is a super-power 30W LoRa spread-spectrum serial network wireless transmission product developed by NiceRF. It uses advanced LoRa spread spectrum modulation frequency hopping technology, integrates hardware and software anti-crash scheme and LBT anti-interference mechanism. The software is an all-in-one design. It can be switched to different working modes quickly and easily through the PC interface provided by NiceRF according to the user requirement, including the usual point-to-point, point-to-multipoint transparent transmission. And the MESH algorithm designed for wireless independent research and development, the characteristics of automatic routing can form a network transmission without blind zone and distance limitation. Users can also enable data AES128 encryption to get a more secure data transmission. The product is designed to be TTL/RS232/RS485 three-level, and is widely used in wireless remote transmission control industries.

LoRaP30Pro strictly uses lead-free process for production and testing, and meets RoHS and Reach standards.

Note: The LoRa Pro series can be configured to be compatible with several previous LoRa data transmission modules of our company.

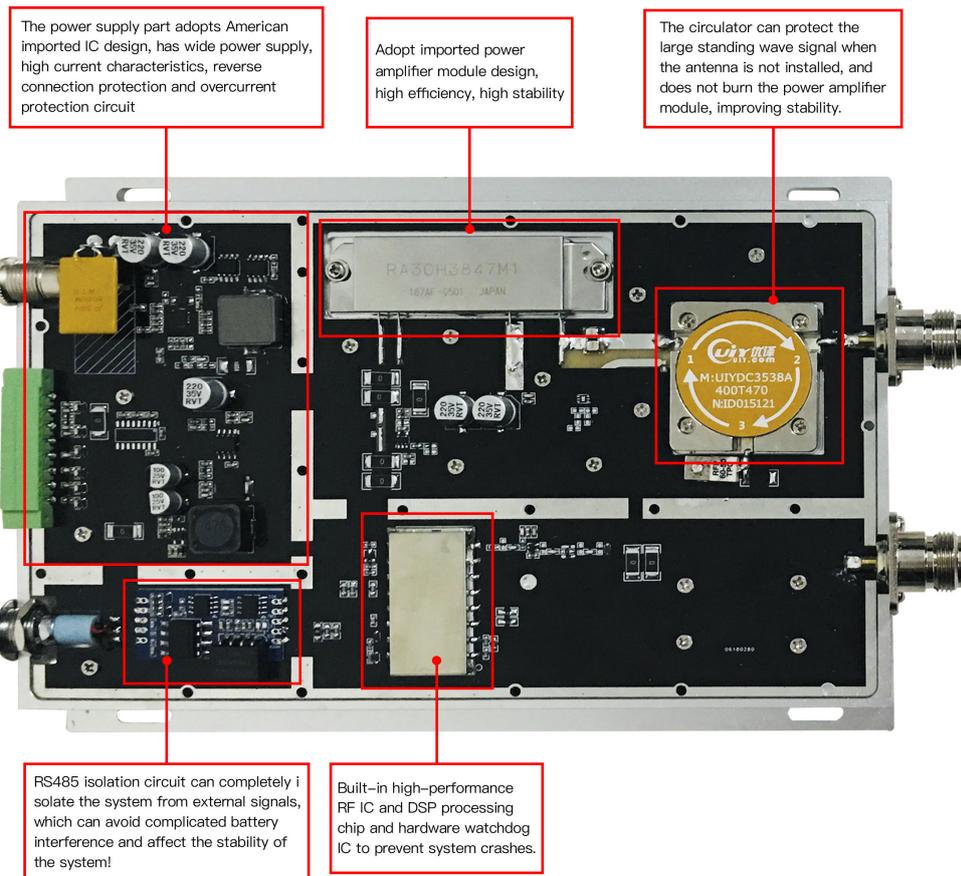
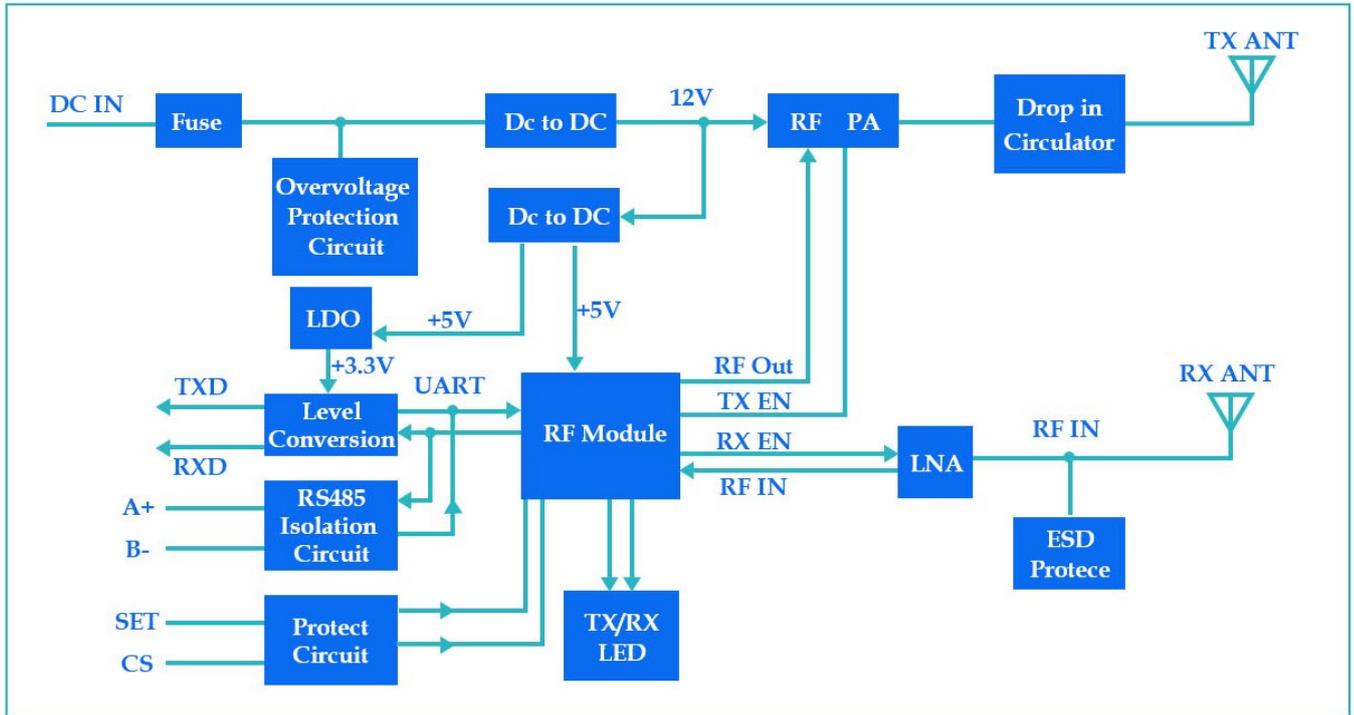
2. Feature

- AES128 data encryption
- No blind zone and distance limitation
- LBT (Listen Before Talk) Features
- Diversified serial port parameters
- Hop level in MESH mode
- CRC encryption optional
- Operating voltage range: 12~ 30V
- Up to 40 communication channels in the same frequency band
- LoRa modulation
- MESH self-organizing network mode
- Built-in hardware reset protection circuit
- TTL/RS232/RS485 Level
- Sensitivity up to -139 dBm
- Maximum output power>30W (+45dBm)
- range of working temperature: -40 ~ +85 °C

3. Application

- Remote wireless
- remote control
- Industrial data collection
- Wireless data communication

4. Block Diagram



5. Performance parameters

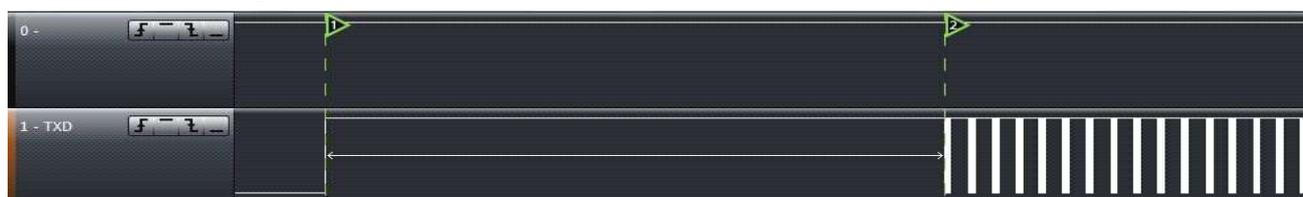
❖ **Note: The module is internally regulated by 3.3V LDO. The CS pin and SET pin control are 3.3V . The serial ports TXD and RXD are also 3.3V.**

Parameter	Min.	Typical	Max.	Unit	Condition
Operating voltage range	12	24	30	V	
Range of working temperature	-40	25	+85	°C	
Current Consumption					
Receiving current		< 23		mA	@24v
Emission current		< 4		A	@45dBm,24V
Radio Frequency Parameter					
Frequency Range	414.92	433.92	453.92	MHz	@433MHz
Date rate	91	656	17353	bps	@LoRa
Transmit power range	30	/	+45	dBm	
Receiving sensitivity		-139		dBm	@91bps

6. Functional description

1) Power-on reset

When the module is powered on for the first time, the module's transceiver indicator will flash 3 times. (If the module is not lit, consider whether the module is damaged.) The reset time is about 2S, as shown in the figure below:



❖ **Note: If you do not need to do this self-test to shorten the reset time, you can contact our company to modify the program version.**

2) Non MESH data transmission mode

Parameter configuration in Non MESH working mode: Working Mode = Non MESH

In this mode of operation, after power-on reset (the CS and SET pins of the @ module are left floating or pulled high), the module enters the state of communication, and both the serial port and the RF section are in receive mode.

After the serial port receives the data of the correct baud rate, the module will automatically process

the data received by the serial port and then deliver it through the wireless circuit (this data packet has been processed by ordinary encryption), at this time, the red indicator light will flash; after the module wireless circuit receives the entire data packet, the blue indicator light will flash, and the module will decode the air data and output it through the serial port (the data has been decrypted, which is the original data transmitted by the serial port), which is a kind of point-to-point and point. Transparent transfer application between multiple points.

The module itself uses a transparent transmission mechanism, without any additional protocol, users can easily send and receive data through the serial port.

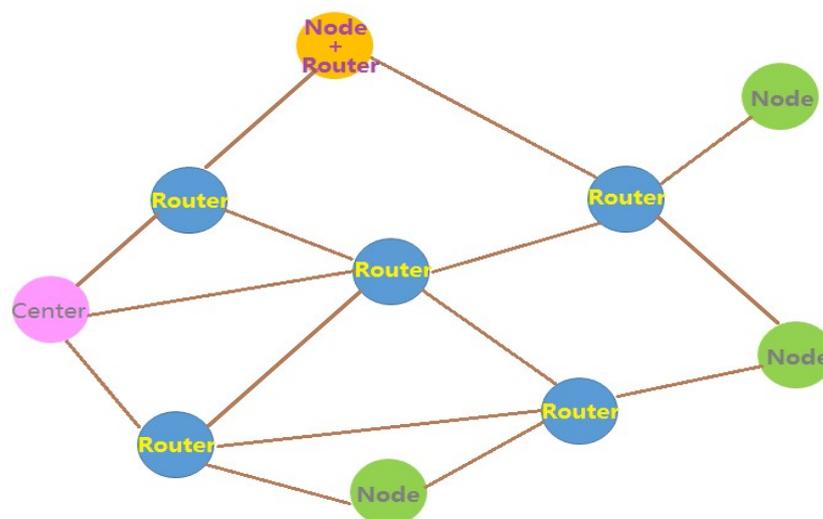
The module can be directly connected to the PC through the USB Convert board, and the serial port software can be used to simulate the data transmission and reception process.

3) MESH network transmission mode

Parameter configuration in MESH networking working mode: Working Mode = MESH

Mode = "Node" or "Router" or "Node & Router"

In MESH mode, the module can be configured to nodes and routes through different settings, which form a MESH network to implement point-to-point and point-to-multipoint transmission. The node module configured as Node mode is similar to the standard communication terminal module. The router-based routing module forwards data in the same network to solve the problem in which a single point-to-point transmission distance is insufficient in many practical applications, and there is no limit to the number of routes in one network, the number of hops for routing can be configured as needed.



The default hop level is set to 0. The module will transmit the data in the shortest routing and shortest time.

Note:

- ◆ In the same MESH network, all modules including node, route and node+route need to be set with different NODE IDs.
- ◆ There is no limit on the number of hops when hop=0. When Hop=n, the packet can be forwarded up to n times. When HOP>0, the number of hops set by modules in the same MESH network can be different.
- ◆ Modules with hop=0 cannot communicate with modules with hop>0.
- ◆ Set hop to 0 to communicate with the old version.

4) AES128 data encryption transmission mode

In the wireless communication process, the module can enable AES128 encryption and its own data encryption function simultaneously. The user can freely read or change the module's AES128 key through the PC software. When the AES128 encryption mode is enabled, the wireless transmission delay will be slightly longer, but the protection of the air data is the better. The AES128 encryption function of the module can be enabled in the application where the transmission data encryption is required.

5) LBT Features (Listen Before Talk)

When multiple transmitters are working at the same time, in order to ensure that they will not interfere with each other, the module checks whether the other transmitters are transmitting in the environment before transmitting. If other transmitters are transmitting wireless signals, they will not transmit until the other transmitters stop. emission.

Special Note: Due to the limited internal data buffer (200 bytes), when the channel is busy, the serial port continue to transmit data to the module, and the data will be overwritten.

6) CRC encryption

The added CRC encryption can be good solution to avoid wrong data output, especially in the bad environment or multi-nodes transmit data simultaneously.

Note: The CRC configuration needs to be the same.

7. Data Transfer Overview

In order to ensure the stability and correctness of wireless data transmission, the following points should be noted in use:

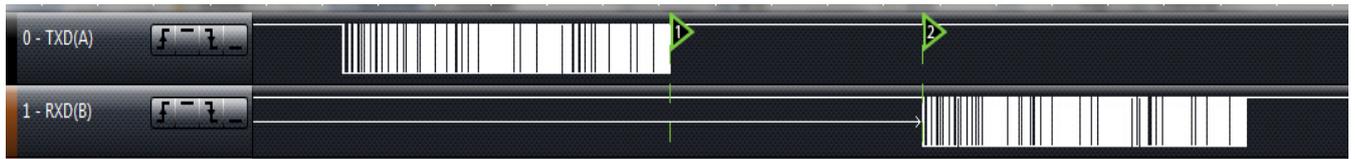
a) Wireless transmission matching

Some settings of RF module in the same network must be set to the same with each other. The frequency band, channel, RF rate, and AES key must be set to the same. If any one of them is different, they cannot communicate with each other. At the same time, the serial port parameters of the module must also be the same as the serial port parameters of the device, otherwise communication will not be possible.

Note: Our default factory setting is: serial port baud rate 9600bps, data bit 8 bit, stop bit 1 bit, no parity bit.

b) Delay in data in wireless communications

It takes some time for a data transmission. The time varies depending on the amount of data, the data rate setting. There is a certain time delay between the transmitter and the receiver. Under the same conditions, the delay time is fixed (the specific time is determined by the serial port rate, the air rate and the size of the transmitted data packet). The approximate correspondence is also related to the selected working mode, as shown in the following table:



✓ @ Non MESH data transmission mode

Speed rate	91	164	296	656	830	1557	2932	4750	9501	17353
1byte time (ms)	2240	1120	561	323	284	144	75	46	25	15
56bytes time (ms)	5847	3089	1711	941	737	392	220	139	73	45

✓ @ AES encrypted transmission mode

Speed rate	91	164	296	656	830	1557	2932	4750	9501	17353
1byte time (ms)	3251	1641	917	476	435	234	144	94	63	51
56bytes time (ms)	6286	3528	1987	1134	889	545	352	261	190	160

✓ @ MESH network transmission mode

Speed rate	91	164	296	656	830	1557	2932	4750	9501	17353
1byte time (ms)	2568	1285	726	366	326	166	96	55	30	19

56 bytes time (ms)	6175	3418	1875	1023	778	434	241	150	79	49
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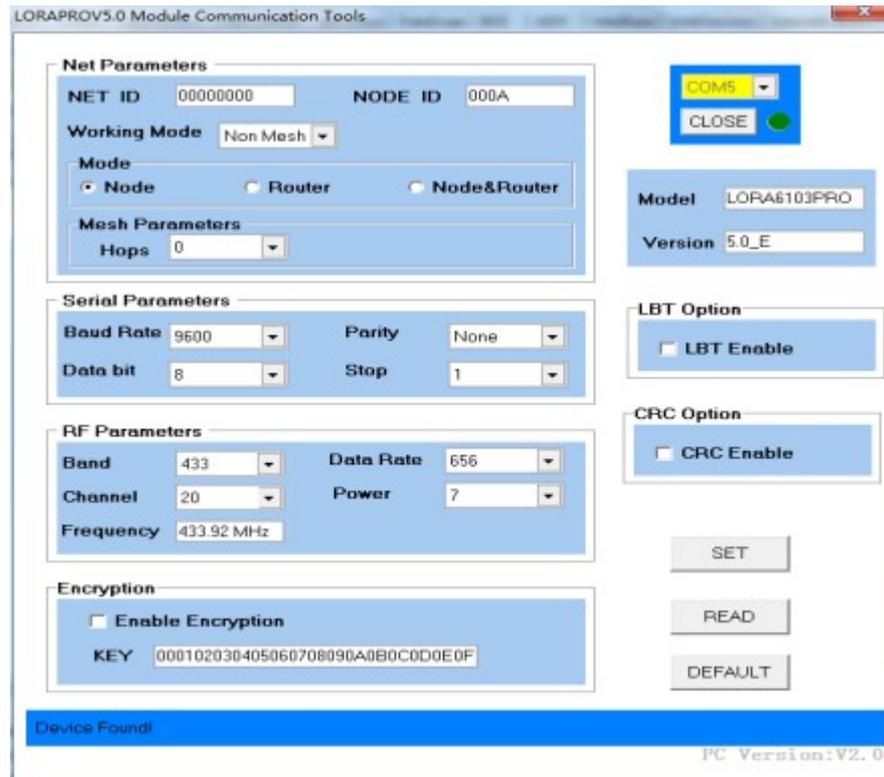
Note: If the LBT function is used, the transmission time is based on the above time, and the random delay due to the LBT function needs to be added.

c) data traffic

There is a data buffer inside the module. The module can send up to 227 bytes of data at one time. A longer communication distance can be achieved by choosing a lower data rate. When sending a large packet, if the serial port baud rate is too high, and the wireless is too slow, there will be data loss. The user can split the data into pieces and ensure that the interval between the serial port sends data is greater than the transmission time of the current RF. If the serial data transmission interval is too short, there may be packet loss caused by data overflow. When the length of the data sent by the serial port is greater than the maximum single-packet transmission byte, the user needs to split the data into pieces and ensure that the interval at which the serial port sends data is greater than the transmission time of the current gear RF.

8. Parameter related configuration

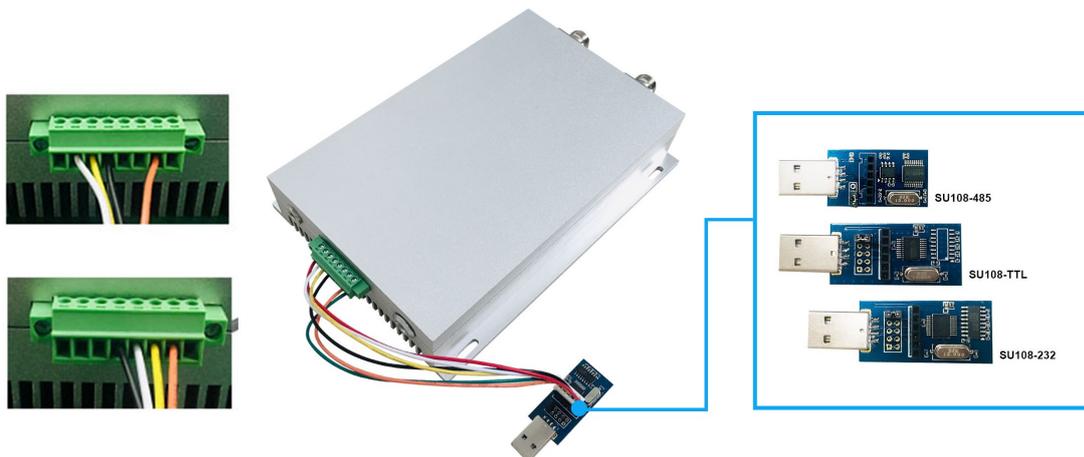
In the working state, pull the SET pin to ground (or short to ground) of module to switch to the configuration mode (if the user uses our USB convert board, just short set pin), the red and blue lights of the module mode will constantly bright. In the configuration mode, the parameters of the module can be configured through the PC software. In the PC software, the corresponding COM port is opened (**viewed under the device manager**), and the PC reads the parameter information from the connected module and displays the corresponding model and version information. The status bar displays the message "Device Found!" when the device is connected. If there is no response, the status bar below displays a message "Device Not Found!", and the product information box above becomes gray invalid. The PC interface when a module is successfully connected is shown below.



Note: This module is a high-power module. If you use the adapter board to connect to the PC serial port to send and receive data, you need to provide additional power to the module(This module needs to be powered separately).

Note: The power supply is best to use 24V/5A or more power, otherwise it will not enough to power the module!

The wiring method of different levels is shown below:



After the module is correctly connected, the module is in SETTING state. The user can modify the relevant parameters of the module through the PC interface, such as: working frequency band, transceiver channel, air communication rate, transmission power level; serial port baud rate, data bit, stop bit, parity check bit; NET ID, NODE ID, key, etc. Then, click the [SET] button to set the module.

After each parameter is successfully changed, the “OK” message will be sent back. After the PC software receives the OK response, the prompt dialog box for successful operation will pop up; otherwise, the output “ERROR” will pop up. If the operation error is incorrect, if there is no response within 0.5s after the PC sends the command, a communication error will occur and a dialog box for the operation error will pop up. These set parameters will be saved before power down. When the user clicks the [READ] button, the module will return all parameter information of the current module. The user clicks the [DEFAULT] button to set the module's parameters to the factory defaults.

Note: The relevant parameters of the serial port and wireless part in the above PC interface are the factory default values.

In addition to the PC terminal, the user can also read or modify the relevant parameters of the module online through the UART interface. The serial port sends configuration commands to comply with the following protocols.:

Serial Port Baud Rate = 9600 bps Data Bit = 8 Bits Stop Bit = 1 Bits Parity Check Bit = None

The format of the configuration instruction is: AA FA + instruction + [parameter]

The instruction is 1 byte and the parameter is 0 or HEX data.

The return value ends with "\r\n"

➤ **instruction [AA]:**

Read the product model number and version number of the module, without [parameter]

Configuration directive is: AA FA AA

The return value is: “LoRaP30Pro_VER5.0\r\n”

➤ **instruction [01]:**

Read the parameters currently set by the module, without [parameter]

Configuration directive is: AA FA 01

The return value is in order:

Transceiver channel - working frequency band - air communication rate - transmitting power - serial port baud rate - serial data bit - serial port stop bit - serial port check bit - NET ID - NODE ID - MESH - NODE - AES - key \r \n

➤ **instruction [02]:**

Restore module factory default parameters, without [parameter]

Configuration directive is: AA FA 02

Return instruction: "OK\r\n" or "ERROR\r\n"

The default parameter is:

Receive/transmit operating frequency = 433.92 MHz Receive/transmit transmission rate = 656 bps
 Transmit power = 7 (highest)

Serial port baud rate = 9600 bps Serial data bit = 8 Bits Serial port stop = 1 Bits Serial port check bit = None

NET ID = 00 00 00 00 NODE ID = 00 00 MESH = 00 NODE = 00 AES = 00

Key = 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

LBT enable = 0

➤ **instruction [03]:**

Parameter setting command, with [parameter] of 33 bytes, the order is as follows:

Transceiver channel - working frequency band - air communication rate - transmitting power - serial port baud rate - serial data bit - serial port stop bit - serial port check bit - NET ID - NODE ID - MESH - NODE - key type - 16 byte key

Configuration directive is: AA FA 03 XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX

Return instruction: "OK\r\n" or "ERROR\r\n"

1) RF channel: RF frequency

Each frequency band is divided into 40 channels, and the adjacent channels have a step of 1 MHz. The specific corresponding frequencies are shown in the following table:

Band	Channel	1	2	3	4	5	6	7	8	9	10
433	Frequency (MHz)	414.92	415.92	416.92	417.92	418.92	419.92	420.92	421.92	422.92	423.92
	Channel	11	12	13	14	15	16	17	18	19	20
	Frequency (MHz)	424.92	425.92	426.92	427.92	428.92	429.92	430.92	431.92	432.92	433.92
	Channel	21	22	23	24	25	26	27	28	29	30
	Frequency (MHz)	434.92	435.92	436.92	437.92	438.92	439.92	440.92	441.92	442.92	443.92
	Channel	31	32	33	34	35	36	37	38	39	40
	Frequency (MHz)	444.92	445.92	446.92	447.92	448.92	449.92	450.92	451.92	452.92	453.92

2) Wireless transmission rate: RF data transmission speed

Set the wireless transmission rate, [parameter] occupies 1 byte.

Setting range: 91 164 296 656 830 1557 2932 4750 9501 17353 bps

Parameter	0	1	2	3	4	5	6	7	8	9
Rate (bps)	91	164	296	656	830	1557	2932	4750	9501	17353

- 3) **Transmit power:** This parameter will affect the communication distance (the lower the power level is, the farther the module communication distance is)

Set the transmit power, [parameter] occupies 1 byte。 Setting range: 0-7. unit: dBm

Power level	0	1	2	3	4	5	6	7
Transmit power	30	36.2	38.5	40.4	42.0	44.5	45.3	45.8

- 4) **Serial port baud rate**

Set the baud rate of the serial interface. [Parameter] occupies 1 byte.

Setting range: 1200 2400 4800 9600 14400 19200 38400 57600 76800 115200 bps

Parameter	0	1	2	3	4	5	6	7	8	9
Rate (bps)	1200	2400	4800	9600	14400	19200	38400	57600	76800	115200

- 5) **Serial data bit**

Set the data bit of the serial port, [parameter] occupies 1 byte。 Setting range: 7 bit 、 8 bit、 9 bit

Parameter	1	2	3
Data bit	7bit	8bit	9bit

- 6) **Serial port stop bit**

Set the stop bit of the serial port, [parameter] occupies 1 byte。 Setting range: 1 bit 、 2 bit

Parameter	1	2
Stop bit	1bit	2bit

- 7) **Serial parity bit**

Set the parity bit of the serial port. [Parameter] is 1 byte。 Setting range: No Odd Even

Parameter	1	2	3
Parity test	No	Odd	Even

- 8) **NET ID**

Set the network ID of the RF packet, [parameter] is 4 bytes.

The NET ID of the module is inconsistent and cannot be communicated. Setting range: 00 00 00 00 ~ FF FF FF FF

9) NODE ID

In MESH mode, ensure that each module in the network has a different NODE ID, otherwise they cannot communicate.

Set the node ID of the RF packet, [parameter] is 2 bytes. Setting range: 00 00 ~ FF FF

10) **Working mode** : In normal working mode or MESH networking mode, [Parameter] is 1 byte. Setting range: 00 01

Parameter	0	1
Operating mode	Non MESH	MESH

Note: The module whose MESH networking function has been enabled and the module whose the MESH networking function has been disabled cannot communicate with each other. To ensure communication, the MESH networking function configuration in the same network should be consistent.

11) **Mode selection** : Set the working mode in MESH mode, this option is only valid when the MESH networking function is turned on.

[Parameter] is 1 byte. Setting range: 0~2

Parameter	0	1	2
Working mode 1	node	routing	Routing + node

12) **Encryption selection** : Set whether to enable AES encryption. [Parameter] is 1 byte. Setting range: 00~01

Parameter	0	1
AES encryption	shut down	Open

13) **KEY** : Set the wireless data encryption key, [parameter] is 16 bytes。

Setting range: 0 ~ FF FF

Default factory value: 000102030405060708090A0B0C0D0E0F

➤ instruction [04]

When the module is switched to the configuration state, the RF will detect the surrounding field strength signal in real time. The user can send the corresponding command through the serial port to

obtain the current instantaneous field strength value of the module.

Read command is: AA FA 04

The return value is: Real-time signal strength—\r\n (displayed in characters, range 000~255)

For example: "-032\r\n", indicating the current signal strength value is -32dBm。

➤ instruction [05]

Read the LBT parameter currently set by the module, without [parameter]

Configuration directive is: AA FA 05

The return value is: LBT enable \r\n

For example: Return 01 0D 0A , indicating that idle detection is enabled.

➤ instruction [06]

Parameter setting command, with [parameter] of 1 byte, the parameters are: idle detection enable

Configuration directive is: AA FA 06 XX

The return value is: "OK\r\n"或"ERROR\r\n"

For example: Enable LBT enable, should be sent in hexadecimal: AA FA 06 01

LBT enable: Turn on idle detection, [Parameter] is 1 byte. Setting range: 0~1

Parameter	0	1
LBT enable	shut down	Open

➤ Instruction [07]

Read the number of hops level, without [parameter]

The configuration command is: AA FA 07

Return command: hop number\r\n

For example:

AA FA 07

02 0D 0A

➤ Instruction [08]

Set number of stages command, with [parameter] of 1 byte, parameter is: the number of forwarding stages

Configuration command: AA FA 08 XX

Return : "OK\r\n" or "ERROR\r\n"

For example, if the number of forwarding hops is set to 2, it should be sent in hexadecimal: AA FA 08 02

Number of forwarding hops: [Parameter] is 1 byte. Setting range: 0~16

➤ **Instruction [09]**

Read the CRC status

Command : AA FA 09

Return: 01(00) \r\n ; 01 means enable , 00 means disable.

For example: Return: 01 0D 0A, CRC is enable.

➤ **Instruction [0A]**

Read the CRC status

Command : AA FA 09

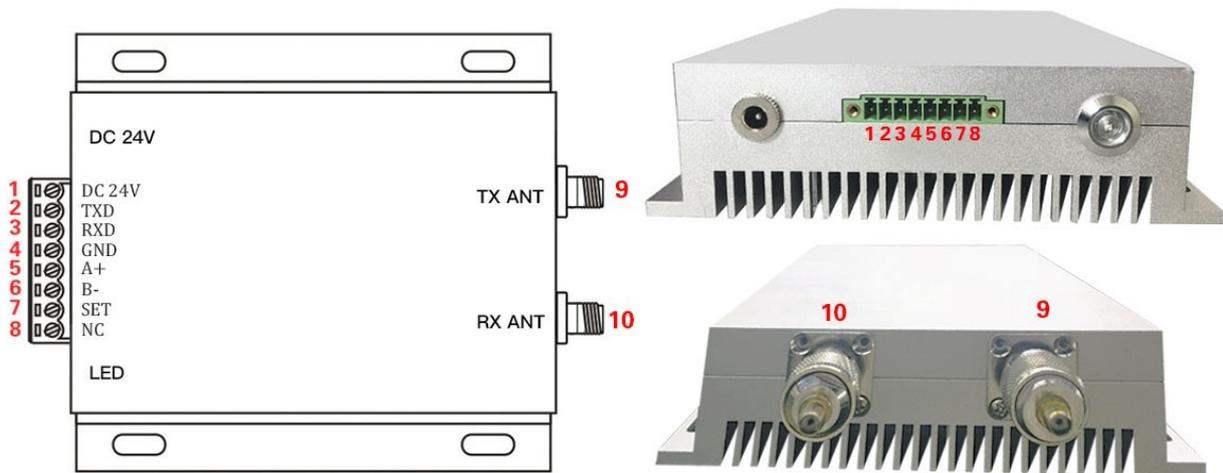
Return: 01(00) \r\n ; 01 means enable , 00 means disable.

For example: Return: 01 0D 0A, CRC is enable.

CRC Enable: Enable/disable CRC, [Parameter] is 1 byte. Setting range: 0~1

Parameter	0	1
CRC Enable	close	open

9. Pin description



Pin number	Pin definition	Description
1	VCC	Power supply
2	TXD	Serial data receiving pin of the product (@ interface is TTL/RS232 level)
3	RXD	Serial data receiving pin of the product (@ interface is TTL/RS232 level)
4	GND	Power ground
5	A+	485 interface A+ of the connected device (@ module interface is 485 level)

6	B-	485 interface B- of the connected device (@ module interface is 485 level)
7	SET	Configuration parameter enable (set low to enable parameter configuration, default high level output)
8	CS	Module enable (low sleep, default high output)
9	TX ANT	Transmitting antenna interface
10	RX ANT	Receiving antenna interface

Note: Improper use may cause permanent device failure, PLEASE be sure to connect the antennas on the transmitting and receiving ends correctly before using this radio!!!

10. Communication antenna

The antenna is an important part of the communication components. Its performance directly affects the performance of the communication system. The antenna impedance required by the product is 50 ohms. Users can purchase antennas according to their own application environment. In order to make the module work better, it is recommended to use the antenna provided by NiceRF.

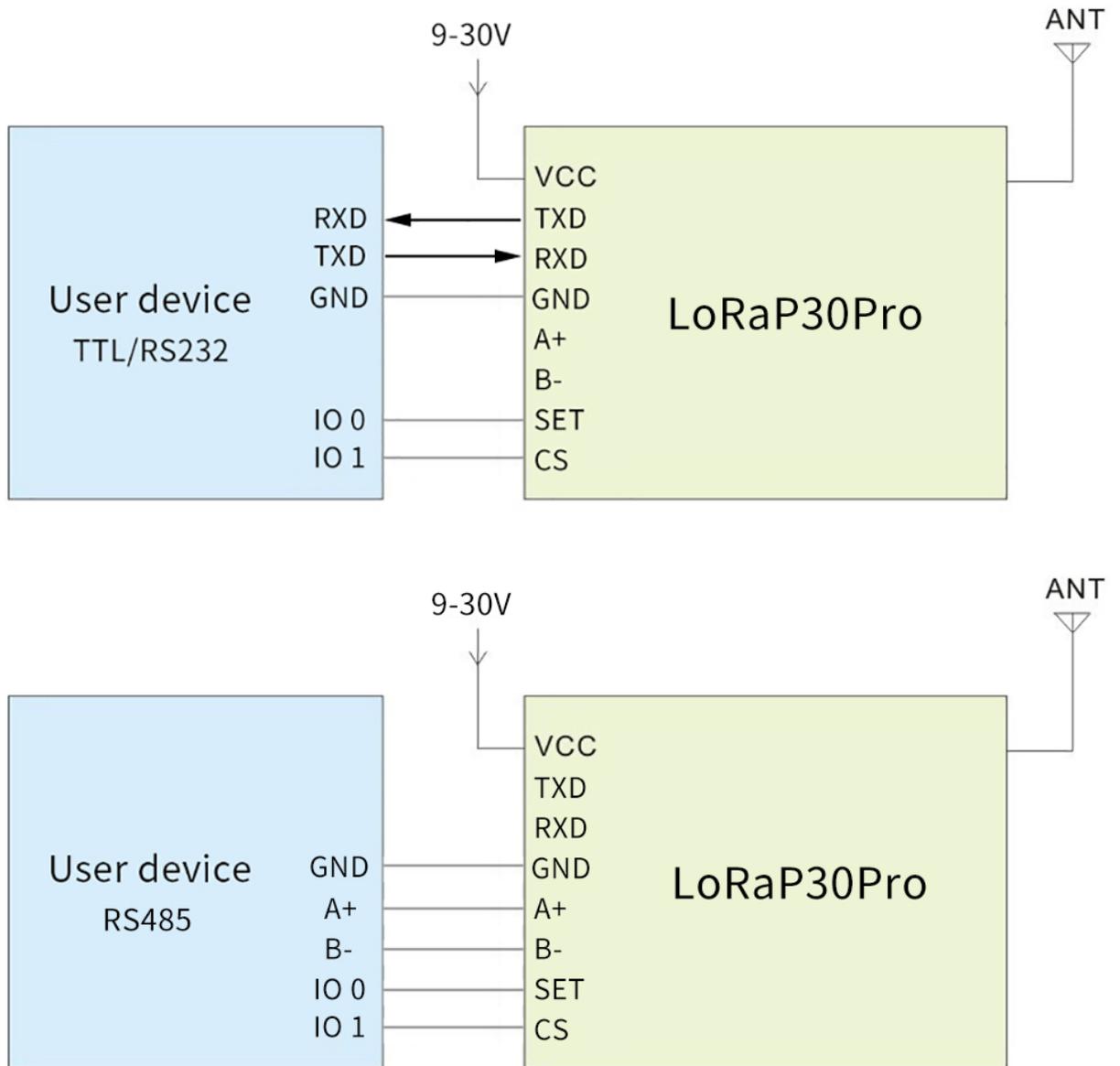


- ★ The following principles should be followed during antenna use to ensure the best communication distance of the module.:
 - Try not to be close to the ground surface of the antenna, and it is best to stay away from obstacles;
 - If use suction cup antenna , the lead wire should be straightened as much as possible, and the suction cup base should be attached to a metal object;
 - When purchasing the Yagi antenna, it is highly recommended that the transmitting antenna be placed vertically and the receiving antenna placed horizontally!

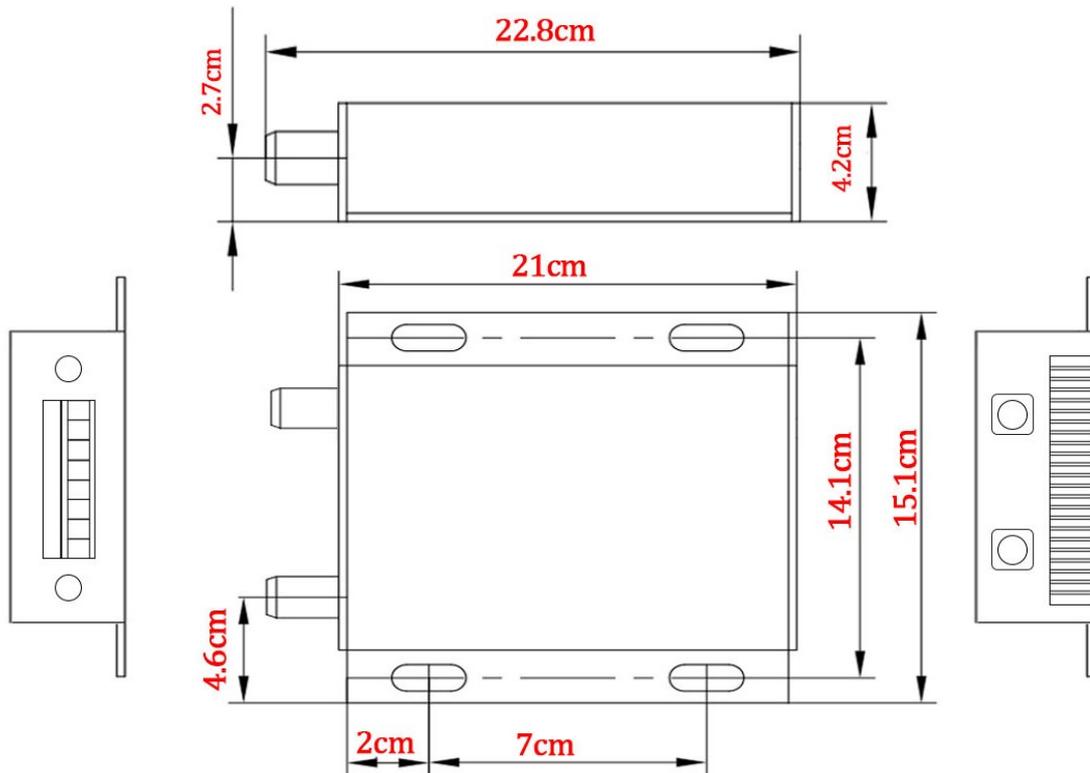
Note: Due to the high power , the radio must be connected to the antenna before running, otherwise the internal power amplifier module may be damaged! Receive and transmit antenna

placement distance must be greater than 1.5 meters!

11. Typical Application circuit



12. Mechanical size (unit: cm)



13. Product Ordering Information

Customers need 485 interface, 433MHz band module, the order model is: LoRaP30Pro-485-433.

Currently this product has the following models:

Order model	product type
LoRaP30Pro-TTL-433	TTL level interface, working frequency band is 433MHz
LoRaP30Pro-232-433	232 level interface, working frequency band is 433MHz
LoRaP30Pro-485-433	485 level interface, working frequency band is 433MHz

For more information ,please visit www.nicerf.com.