

A810-L900M30 Manual

RS232/RS485 interface, 10km transmission, 850-931MHz LoRa spread spectrum

Star networking, auto-relay, AES encryption, ModBus protocol



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1. Product Overview

A810-L900M30 is a 850-931MHz, 1W, high stability, industrial grade wireless digital radio. It adopts LORA spread spectrum modulation, with RS232 and RS485 interfaces. It adopts efficient cyclic error correction algorithm with high coding efficiency and strong error correction capability, which greatly improves the anti-jamming and high stability of the radio.

2. Product Features

- With data broadcast, data listening, fixed-point transmission, master-slave mode, automatic relay, fixed-point wake-up, automatic answer
- Auto-answer, the receiver automatically replies to the ACK to ensure transmission stability
- Receiving sensitivity up to -130dBm, transmission distance of 10000 meters ^[1]
- Automatic relay, continuous transmission
- AES encryption
- Readable module RSSI ^[2]
- Built-in multiple exception handling mechanisms to ensure long and stable operation of the module
- Maximum transmit power is 30dBm (1W)
- Multi-level baud rate ^[1]
 - Eight common baud rates, default baud rate is 9600bps
 - Baud rate range: 1200bps~115200bps
- Multi-level air rate ^[1]
 - Eight levels of adjustable air rate, default air rate 4.8kbps
- 1.2~62.5kbps
- Frequency 850-931MHz, providing 82 channels with 1MHz interval for each channel ^[4]
 - 850MHz + CHAN * 1MHz
 - CHAN: 0x00~0x51H (corresponding to 850-931MHz)
 - Operates in the 915MHz application-free band by default
- Supply voltage range
 - 8.0V~28VDC
 - Built-in power management module to ensure stable power supply to the radio, able to meet a variety of system requirements
- 1K byte ring FIFO
 - 1K bytes of send FIFO
 - Internal automatic subcontracting of transfers
 - Some combinations of airspeed and baud rate can send infinitely long packets ^[3]

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- **Broadcast Data and Listening** ^[5]
The station address is set to 0xFFFF, which allows listening to data transmissions from all stations on the same channel. The transmitted data can be received by any station with any address on the same channel
- **Fixed-point transmission** ^[5]
Data can be sent from any station and received from a specified station. When multiple receiving stations have the same address channel, data can be received.
- **Wake up in the air** ^[5]
When the wireless wake-up time is not 0, the sender radio will automatically add a wake-up code to wake up the target module when sending data ^[6]
Same transmission method as fixed point transmission

Remark.

[1] test conditions: clear, open, maximum power, antenna gain 5dBi, height greater than 2m, 2.4k air rate

[2] Radio RSSI is internal intelligent processing, the user does not need to care, special needs can be read by command

[3] See the SPEED register in Chapter 7, Section 7.2 Radio Parameter Registers for details

[4] See the CHAN register in Chapter 7, Section 7.2 Radio Parameter Register for details

[5] See Chapter 8 for details on radio functions

[6] The wireless digital radio is compatible with our wireless serial module, and can wake up the wireless serial module over the air.

3. Series Products

Radio Model	Carrier frequency (Hz)	Core Chips	Interface	Size (mm)	Maximum transmit power (dBm)	Communication distance (km)	Antenna Form
A810-L900M21	850M~931M	LLCC68	RS232/RS485	82*84*25	21	5	Glue stick, suction cup
A810-L400M30	410M~441M	LLCC68	RS232/RS485	82*84*25	30	10	Glue stick, suction cup

4. Electrical parameters

Conditions: Tc = 25°C, VCC = 12VDC

Radio Model	Parameter Name	Description	Minimum value	Typical values	Maximum value	Unit
A810-L900M30	Supply voltage		8.0		28	VDC
A810-L900M30	Emission current			260		mA
A810-L900M30	Receiving current			30		mA
A810-L900M30	Operating Frequency Band	850~931MHz, 821 channels, 1MHz step, factory default 915MHz	850	915	931	MHz
A810-L900M30	Transmitting power			30		dBm
A810-L900M30	airspeed	8 levels adjustable (1.2kbps, 2.4kbps, 4.8kbps, 9.6kbps, 19.2kbps, 38.4kbps, 50kbps, 62.5kbps)	1.2k	4.8k	62.5k	bps
A810-L900M30	Reception sensitivity	Receiving sensitivity is independent of serial port baud rate and delay time		-130		dBm
A810-L900M30	Operating temperature	Industrial Products	-40		+85	°C
A810-L900M30	Working humidity	Relative humidity, non-condensing	10%		90%	
A810-L900M30	Storage temperature		-40		+125	°C

5. Radio connection method

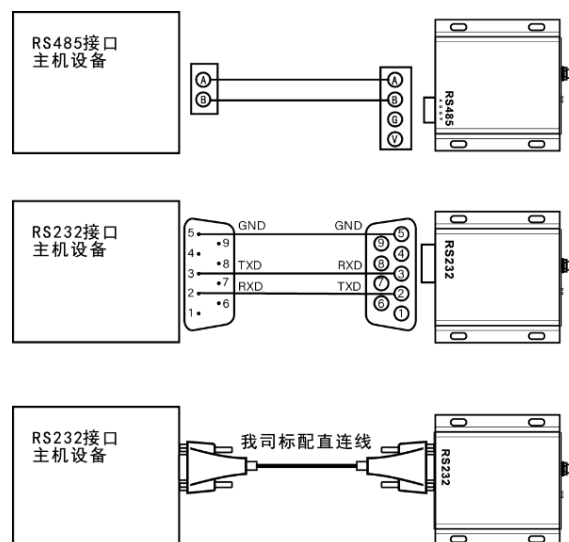


Figure 5-1 Recommended connection diagram

Note: [1] See DTU product manual for detailed connection methods and procedures

[2] Only one RS232 and RS485 can be used at the same time

6. Radio Reset

The default state of the radio RESET indicator is off. Press and hold the RESET button until the RESET indicator flashes, release the button, then the device will produce a reset and restore the factory settings.

7. Radio Commands

7.1 Command Format

The parameters of our digital transmission radio can be configured to support read and write command operation, and the detailed commands are as follows.

➤ Configuration Mode Command Overview Table

The parameter configuration command only supports parameter modification in the configuration mode, and is valid when the RESET lamp is lit, at which time the serial port parameters are 9600, 8N1.

The configuration command is implemented by adding the register address and register length to the command word, which can realize the configuration of multiple configuration items continuously at the same time.

The command format is as follows.

Command word	Register start address	Number of configuration registers	Register Value	Register Value	Register value n
CMD	REG	LEN	DATA0	...	DATAN
CMD [7] 0 for read, 1 for write	The range of REG in this model is 0x00~0x21	Indicates the number of registers to be operated. When the number of registers to be operated exceeds the number of current operation rights, an error will be returned, for example, if a read-only register is written, an error will be returned.	When reading, you can leave it unfilled, when writing, make sure to correspond to the register length and total length, otherwise it will report an error		
CMD [6] 0 for local command, 1 for remote configuration					
CMD [5]. 0 is return operation success, 1 is return operation error					
CMD[4...0] Reserved					

Note: Register addresses are distinguished by function, not by occupied bytes

Command functions are detailed in the following table, using the default factory configuration as an example.

Command Format	Module Answer	Description
0x80 ADDR LEN VAL1 VAL2 ... VALn (See parameter configuration register description for details)	0x80 ADDR LEN	Configuration success, configuration parameters power down and save
	0xC0 ADDR LEN	Configuration failed, the original configuration parameters were not changed
0x80 0x0B 0x01 0x77 0x77 0x77 0x2E 0x61 0x73 0x68 0x69 0x6E 0x69 0x6E 0x67 0x2E 0x63 0x6F 0x6D	0x80 0x0B 0x01	Data key success
	0xC0 0x0B 0x01	Data key failure
0x00 0x04 0x1B	0x00 0x00 0x25 0x80 0x00 0x02 0xBD 0x00 0x01 0x05 0x03 0xE8 0x00 0x77 0x77 0x77 0x77 0x2E 0x61 0x73 0x68 0x69 0x6E 0x69 0x6E 0x67 0x2E 0x63 0x6F 0x6D 0x7C 0x7C 0x7C 0x7C 0x7C 0x7C 0x05 0x40 0x00 0x23 0x00 0x00 0x00 0x00 0x3C 0x3C 0x00 0x0A 0x04 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00	The module returns the parameters of all currently writable registers in hexadecimal format
0x00 0x00 0x01	A810-L900M30 -v1.0.10	The module will return the current version number in ASCII format
0x80 0x20 0x01	OK	The module generates a reset, during which the module performs a self-test and the AUX goes low, after the reset the AUX goes high and the module starts to work normally. At this time, you can switch the status or initiate the next command
0x80 0x21 0x01	OK	Restore default parameters configuration successfully
0x00 0x01 0x01	XXXX	Read the current data signal RSSI and environment signal RSSI directly. e.g. the module returns XXXX, the first two XX represent the current environment RSSI, the last two XX represent the current data RSSI, convert them to decimal data, it means the current signal strength. This command can be used in all modes

➤ Operating mode command overview table

To configure parameters in operating mode, the configuration command needs to satisfy the following format.

Sync header + ID code + header + command code inverse + command code + data (length is not fixed, refer to command overview table) + CS + sync header inverse + ID code inverse + header inverse + end code

Number of data bits	Value	Description
0, 1	0xAF 0xAF	2BYTE Sync Head

2, 3	0xXX 0xXX	2BYTE ID code, can be a random number, default 0x55 0x55
4	0x5A	1BYTE header
5	0xXX	1BYTE Command Code Inversion (Command Code Reference Command Overview Table)
6	0xXX	1BYTE command code (command code reference command overview table)
7	0xXX	1BYTE start address
8	0xXX	1BYTE command length
8~n	0xXX	Command data, refer to the parameter register table
n+1, n+2	0xXX 0xXX	2BYTE check code, the high eight bits are the sum of all data before CS to take the low 8 bits, the low eight bits are all data before CS iso-or
n+3, n+4	0x50 0x50	2BYTE synchronous header reversal
n+5, n+6	0xXX 0xXX	2BYTE ID code is inverted, default 0xAA 0xAA
n+7	0xA5	1BYTE header is reversed
n+8, n+9	0x0D 0x0A	2BYTE end code

The working mode command function is detailed in the following table, taking the default factory configuration as an example.

Command Format	Module Answer	Description
AF AF 55 55 5A FF 00 04 1C 81 BD 50 50 AA AA A5 0D 0A	00 00 25 80 00 02 FA 00 01 05 03 E8 00 77 77 77 77 2E 61 73 68 69 6E 69 6E 67 2E 63 6F 6D 7C 7C 7C 7C 7C 05 40 00 23 00 00 00 00 3C 3C 00 0A 19 00 80 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	The module returns the parameters of all currently writable registers in hexadecimal format
AF AF 55 55 5A 7F 80 04 1C 00 00 25 80 00 02 FA 00 01 05 03 E8 00 77 77 77 77 2E 61 73 68 69 6E 69 6E 67 2E 63 6F 6D 7C 7C 7C 7C 7C 7C 05 40 00 23 00 00 00 3C 3C 00 0A 19 00 80 00 00 00 00 00 00 00 00 00 00 53 8D 50 50 AA AA A5 0D 0A	80 04 1C	Write all parameters

7.2 Radio parameter register

Parameter registers (parameter registers cannot be used alone, they must be used in accordance with the command format of the configuration parameters)

Serial number	Address	Register Permissions	Register Length	Register Description
1	0x00	R	20	Module Version Number
2	0x01	R	4	The first two bytes indicate the current environment RSSI, and the last two bytes indicate the current packet RSSI
3	0x02	R	2	Value of ADC1
4	0x03	R	2	Value of ADC2
5	0x04	R/W	4	Serial port baud rate of the module, customizable in the range of 1200~115200bps
6	0x05	R/W	1	Serial port parameters of the module

				Bit4 is the frame length (data bits + parity bits) 0 for 8 bits 1 for 9 bits Bit5 is the stop bit 0 is 1 bit 1 is 2 bits Bit2 Bit1 is the parity bit 00 is no parity 10 is even parity 11 is odd parity
7	0x06	R/W	2	Bit10 Bit9 Bit8 Bit7 Bit6 Bit5 is the channel number, the default is 1000001 (65) channels Bit4 Bit3 for power 11 : 30dBm 10 : 27dBm 01 : 24dBm 00 : 21dBm Default is 11, power is 30dBm Bit2 Bit1 Bit0 for null speed 111 : 62.5K 110 : 50K 101 : 38.4K 100 : 19.2K 011 : 9.6K 010 : 4.8K 001 : 2.4K 000 : 1.2K Default is 010 with an airspeed of 4.8K [2]
8	0x07	R/W	2	Working mode 0x0001, Pass-through 0x0002, fixed point 0x0004, Master-Slave 0x0020, Relay 0x0080, Polling mode 0x0400, Timing up 0x0100, Passing 0xF001, Control IO output
9	0x08	R/W	1	Auto-answer settings Bit8 is 0 for off, 1 for enable Bit7~Bit0 indicates the number of re-transmissions
10	0x09	R/W	2	Auto-answer re-transmission interval, in ms
11	0x0A	R/W	1	Device as master or slave Bit2 Master (1) or slave (0) of the timed reporting mode Bit1 Master (1) or slave (0) in polling mode Bit0 Master (0) or slave (1) of master-slave mode
12	0x0B	R/W	16	AES Key
13	0x0C	R/W	5	Package-to-package separator content
14	0x0D	R/W	1	Use the length of the separator in bytes
15	0x0E	R/W	1	Serial packet length in bytes
16	0x0F	R/W	2	Serial port packing cycle in 0.1ms
17	0x10	R/W	2	The lowest digit of each three digits indicates whether the default is pull high or pull low

				1 is pull up 0 is pull down The middle bit of each three digits indicates whether the input or output 1 is the input 0 is the output The highest bit of each three digits indicates When in output mode, latch or no latch 1 for flip 0 for press period, flip hold, release flip back to start state
18	0x11	R/W	1	ADC parameters Bit0 is 1 Channel 1 enable 0 Channel 1 off Bit1 is Channel 1 enable Bit1 is 0 Channel 1 off Bit2 is whether or not to report regularly When 1 is reported regularly, when 0 is not reported regularly Bit6~Bit5 ADC precision 00 is 12Bits 01 is 10Bits 10 is 8Bits 11 is 6Bits
19	0x12	R/W	1	ADC acquisition period in 0.5s
20	0x13	R/W	1	ADC data upload period via RF in 0.5s
21	0x14	R/W	1	Low power consumption level in 100ms units
22	0x15	R/W	1	IO control IO timeout time in 0.5s
23	0x16	R/W	1	Data window length in polling mode and active reporting mode, in 200ms
24	0x17	R/W	2	Job Options Bit9 turns on data sending before scanning for new to idle Bit8 opens data sending with random delay before sending Bit6 opens the group number output to request lost packets after the reception is complete Bit5 opens the function of group packet output Bit4 turns remote configuration on or off Bit3 When configured over the air, whether to reply to ACK, only available in one-to-one configuration Bit2 When configured over the air, whether to output the result from the serial port Whether to output packet and packet separator on Bit1 serial output Bit0 output address
25	0x18	R/W	1	Local Group Number
26	0x19	R/W	1	Local Address
27	0x1A	R/W	1	Target group number
28	0x1B	R/W	1	Destination Address
29	0x1C	R/W	1	In relay mode, the path A group number
30	0x1D	R/W	1	Relay mode, path A address
31	0x1E	R/W	1	In relay mode, the path B group number
32	0x1F	R/W	1	Relay mode, path B address
33	0x20	X	1	Module reboot
34	0x21	X	1	Module restores factory settings

7.3 Radio factory settings

Register factory configuration table.

Serial number	Address	Register Permissions	Register Length	Default Parameters
1	0x00	R	20	A810-L900M30 -V1.0.10, module version number
2	0x01	R	4	0x0000 (default), which means that the current environment RSSI is 0x00 and the current package RSSI is 0x00
3	0x02	R	2	0x0000 (default), the value of ADC1, when the data changes after each data acquisition
4	0x03	R	2	0x0000 (default), the value of ADC2, when the data changes after each data acquisition
5	0x04	R/W	4	0x00002580 (9600bps, default) serial port baud rate of the module, customizable, range 1200~115200
6	0x05	R/W	1	0x00 (default) Bit4 is 0. Indicates that the data bits are 8 bits Bit5 is 0. Indicates that the stop bit is 1 bit Bit2 Bit1 is 00 means no checksum Serial port parameters are 8-bit data bit 1-bit stop bit No parity bit
7	0x06	R/W	2	0x02FC (default) Bit10 Bit9 Bit8 Bit7 Bit6 Bit5 is the channel number, the default is 1000001 (65) channels Bit4 Bit3 is the power number, the default is 11, the power is 30dBm Bit2 Bit1 Bit0 is the null speed number, default is 010, the null speed is 2.4K
8	0x07	R/W	2	0x0001 (default) Operating mode is transparent transmission
9	0x08	R/W	1	0x05 (default) Bit8 is 0 to turn off stable transmission by default Bit7~Bit0 is 5, which means the default number of re-transmission is 5 times
10	0x09	R/W	2	1000 in ms, stable transmission re-transmission interval is 1S by default
11	0x0A	R/W	1	0x00 (default) Bit0=0 means that when in master-slave mode, as the host Bit1=0 means that when in polling mode, as a slave Bit2=0 means that when it is in the timed-up report, it acts as a slave
12	0x0B	R/W	16	0x77 0x77 0x77 0x2E 0x61 0x73 0x68 0x69 0x6E 0x69 0x6E 0x67 0x2E 0x63 0x6F 0x6D (default) Indicates that the packet is encrypted using the above AES key
13	0x0C	R/W	5	(default) When the separator output is turned on, the above separator is output between packages
14	0x0D	R/W	1	0x05 (default) Indicates that the maximum valid length for using separators is 5
15	0x0E	R/W	1	64 (default) When the serial input is more than 64 bytes, then every 64 bytes will be treated as 1 packet
16	0x0F	R/W	2	35 (default) When the serial port data idle time exceeds 3.5ms, then the currently received data is treated as a packet
17	0x10	R/W	2	0x0000 (default) Default each IO port is output, pull low, through other modules IO control output is not latching

18	0x11	R/W	1	0x00 Indicates that ADC channel 1 and channel 2 are off and not enabled to send the collected data through RF at regular intervals, with a collection accuracy of 12Bits
19	0x12	R/W	1	60 (default) Data is collected via ADC channels every 30S
20	0x13	R/W	1	60 (default) If ADC data upload is turned on, then the data is sent out every 30S via wireless
21	0x14	R/W	1	0 (default) No wake-up code and no sleep will be sent by default
22	0x15	R/W	1	10 (default) When IO control time exceeds 5S, IO control is considered to be finished
23	0x16	R/W	1	25 (default) Each window time is 5S
24	0x17	R/W	1	0x04 (default) Turn off wireless configuration function, turn off wireless reply to remote configuration result, turn on serial reply to wireless configuration result, turn off outputting separator between packets. Turn off outputting addresses.
25	0x18	R/W	1	0x00, the local group number is 0x00
26	0x19	R/W	1	0x00 with a local address of 0x00
27	0x1A	R/W	1	0x00, the target group number is 0x00
28	0x1B	R/W	1	0x00, the destination address is 0x00
29	0x1C	R/W	1	0x00, in relay mode, the path A group number is 0x00
30	0x1D	R/W	1	0x00, in relay mode, the path A address is 0x00
31	0x1E	R/W	1	0x00, in relay mode, the path B group number is 0x00
32	0x1F	R/W	1	0x00, in relay mode, the path B address is 0x00

Remark.

1、 The configuration of the radio parameters can use the parameter configuration software ASDS provided by the company, the configuration process and steps are detailed in the DTU product manual

2、 Fast communication test of the radio and detailed procedures are described in the DTU product manual

8. Radio Function

8.1 Radio Features Overview

Radio Menu

Radio Function	Data format of the sender	Data format of the receiver	Function Introduction
Transparent Broadcasting	User Data	User Data	Any station that sends data can be received by stations with the same address and the same channel. Sending data is transparent, and what you send is what you receive.
Fixed-point transmission	Receiver address + receiver channel + user data	User Data	Data can be sent from any radio station and received by specified radio stations, and data can be received when multiple receiving radio stations have the same address

			channel. Data can be transmitted point-to-point across channels.
Broadcast and Monitoring (under fixed-point transmission)	0xFF+0xFF+receiver channel+user data	User Data	Broadcast: any station sends data, and all stations under the same channel can receive data at the same time. Listening: a radio with a 0xFFFF address can receive data sent by a radio with any address under the same channel.
Wake Up in the Air	1. In transparent transmission mode. (automatically adds wake-up code 01010101 -----) + User Data 2. In fixed transmission mode. (automatically adds wake-up code 01010101 -----) + Receiver address + receiver channel + user data	User Data	1、 The station will automatically add a wake-up code when sending data 2、 The length of the wake-up code can be set by setting the wireless wake-up time

8.2 Radio function detailed explanation

8.2.1 Transparent Broadcasting

Function Description

Any station sends data, and any station with the same address and the same channel can receive data at the same time.

Data is sent and received transparently, and what is sent is what is received.

Radio settings

1. Bit 7 of the OPTION special function register needs to be configured to 0. Transparent transmission mode
2. Sending and receiving radio addresses are set to the same value
3. The channels of the transmitting and receiving radio are set to the same value

Examples

Sender		Receiver	
Radio Address	0x1234 (factory default)	Radio Address	0x1234 (factory default)
Radio Channels	0x17 (factory default)	Radio Channels	0x17 (factory default)
Sending data	User Data	Output Data	User Data
	0x11 0x22 0x33		0x11 0x22 0x33

8.2.2 Auto-Answer

Function Description

After the radio sends the data, it will wait for the answer packet from the receiver. When the packet is received, it means the current packet is sent successfully, if the timeout is not received, then the sender radio will automatically resend this packet data until the answer packet is received or until the maximum number of packets is sent.

Radio settings

1. Bit 7 of the 0x08 special function register needs to be configured to 1 to turn on the stable transfer function, which is off by default.
2. It is necessary to configure bits 6~0 of the 0x08 special function register to the number of times re-transmission is required, maximum 127 times, default 5 times
3. The 0x09 special function register needs to be configured to require a re-transmission interval in ms, the default is 1000ms

Examples

Sender		Receiver	
Radio Address	0x1234 (factory default)	Radio Address	0x1234 (factory default)
Radio Channels	0x17 (factory default)	Radio Channels	0x17 (factory default)
Sending data	User Data	Output Data	User Data
	First send 0x11 0x22 0x33		
	No ACK received		
	nth send 0x11 0x22 0x33		0x11 0x22 0x33
	Receive ACK		

8.2.3 Master-Slave Mode

Function Description

The master can send data to the specified slaves, and all slaves can receive the data sent by the master.

Module Settings

1. MD0 = 0, MD1 = 0
2. Need to configure 0x07 special function register to 0x0004, master-slave mode
3. The addresses of the transmitter and receiver modules can be set differently
4. The channels of the transmitter and receiver modules are set to the same

Examples

Sender		Receiver	
Target group number address	0XXXXX	Local group number address	0x5678
Modular channels	0x18	Modular channels	0x18
Master-Slave	Mainframe	Master-Slave	From the machine
Sending data	Receive address high + receive address low + data	Output Data	User Data
	0x56 0x78 0x11 0x22 0x33		0x11 0x22 0x33

8.2.4 Fixed-point transmission

Function Description

Data can be sent from any station and received from a specified station. When multiple receiving stations have the same address channel, data can be received.

Radio settings

1. Bit 7 of the OPTION special function register needs to be configured to 1, fixed-point transmission mode
2. The addresses of the transmitting and receiving stations can be set differently
3. The channels of the transmitting and receiving radio can be set differently
4. The first 3 bytes of the sender's data must be the receiver's address high + address low + channel

Examples

Sender		Receiver	
Radio Address	0XXXXX	Radio Address	0x5678
Radio Channels	0XXXXX	Radio Channels	0x18
Sending data	Receive address high + receive address low + receive channel + data	Output Data	User Data
	0x56 0x78 0x18 0x11 0x22 0x33		0x11 0x22 0x33

8.2.5 Broadcast under fixed point transmission

Function Description

Any station sends data, and all stations under the same channel can receive data.

Radio settings

1. Bit 7 of the OPTION special function register needs to be configured to 1, fixed-point transmission mode
2. The addresses of the transmitting and receiving stations can be set differently
3. The channels of the transmitting and receiving radio can be set differently
4. The first 3 bytes of the sender's data must be 0xFF+0xFF+receiver channel

Examples

Sender		Receiver	
Radio Address	0XXXXX	Radio Address	0XXXXX
Radio Channels	0XXXXX	Radio Channels	0x17 (factory default)
Sending data	0xFF+0xFF+receive channel+user data	Output Data	User Data
	0xFF 0xFF 0x17 0x11 0x22 0x33		0x11 0x22 0x33

8.2.6 Listening under fixed-point transmission

Function Description

Any radio with a 0xFFFF address can receive data from a radio with any address on the same channel.

Radio settings:

1. Bit 7 of the OPTION special function register needs to be configured to 1, fixed-point transmission mode
2. The address of the listening radio must be set to 0xFFFF

- The channels of the listening and transmitting stations must be set to the same
- The first 3 bytes of the sender's data must be 0xXX+0xXX+listening channel

Examples

Sender		Receiver	
Radio Address	0x1234 (factory default)	Radio Address	0xFFFF
Radio Channels	0x17 (factory default)	Radio Channels	0x17 (factory default)
Sending data	arbitrary address high + arbitrary address low + receive channel + user data	Output Data	User Data
	0xXX 0xXX 0xXX 0x17 0x11 0x22 0x33		0x11 0x22 0x33

8.2.7 Wake Up in the Air

Function Description

The transmitter module in the wake-up state can wake up the receiver module in the power-saving state over the air. If a valid wake-up code is received during the "listening" process, the module will calculate the time of the arrival of the valid data. If the time of valid data arrival is longer than the time of three wake-up codes, the device will continue to enter the sleep state and wait until the data arrives to wake up and receive the data automatically. If it is less than the time of three wake-up codes, the module will keep waiting for the valid data packets. After receiving, the serial port will be opened and the received wireless data will be sent through TXD, after sending, the module will continue to enter the "sleep-listening" working state.

Module Settings

- The sender module must be operating in the wake-up working state (MD0 = 1, MD1 = 0)
- The sender sets the length of the wake-up time by setting the wireless wake-up time register 0x14. The wireless wake-up time of the sender module is greater than or equal to the listening interval of the receiver module to ensure that the receiver module can listen to the wake-up code when it is in the power-saving working state. After receiving the wake-up code, the receiver module calculates whether it needs to enter the sleep state again. If the time of valid data arrival is greater than the time of three wake-up codes, the module will enter the sleep state again and wake up before the arrival of valid data to complete the data reception.
- Receiver module must be in power-saving operation (MD0 = 1, MD1 = 1)
- Set the listen interval time register 0x14 of the receiver module to ensure that the receiver module can receive a valid wake-up code within the listen interval time.
- In general application cases, it is sufficient for both the sender and receiver modules to set the wake-up time register 0x14 to the same value.

8.2.8 Relay

Function Description

The device in relay mode will forward the received data backward according to the set path until the target device for the purpose of extending the transmission distance.

Module Settings

1. MD0 = 0, MD1 = 0; MD0 = 1, MD1 = 0
2. Need to configure 0x07 special function register to 0x0020, relay mode
3. Set the previous group number address and the next group number address in relay mode (0x1B~0x1E registers)
4. The channels of the relay module and the transmitter module must be set to the same

8.2.9 Output Address

Function Description

When the output address function is turned on, it precedes the user data with the address information of the sender so that the receiver can distinguish the source of the data.

Module Settings

1. Need to turn on the 0x17 special function register to output address function

Examples

Sender		Receiver	
Destination group number address	0x0000 (factory default)	Local group number address	0x0001 (factory default)
Modular channels	0x17 (factory default)	Modular channels	0x17 (factory default)
Sending data	User Data	Output Data	User Data
	0x11 0x22 0x33		0x00 0x00 0x11 0x22 0x33

8.2.10 Output separator

Function Description

When the output delimiter function is turned on, it precedes the user data with a user-set delimiter so that the recipient can distinguish the boundaries of the data.

Module Settings

1. Need to turn on the 0x17 special function register for output separator
2. Set the 0x0C special function register to the content of the separator you want to send
3. Set the 0x0D special function register to the length of the desired separator

Examples

Sender		Receiver	
Destination group number address	0x0000 (factory default)	Local group number address	0x0001 (factory default)
Modular channels	0x17 (factory default)	Modular channels	0x17 (factory default)
Sending data	User Data	Output Data	User Data
	123456789		123456789

8.2.11 Packages available with Function Description

The data received from the serial port will not be sent out immediately, it will wait until a group packet boundary set by the user before passing the data out. The maximum group packet can be matched with 230 bytes, and if the packet splitting time is less than the transmission time of three bytes at the current baud rate, the module will automatically correct to the transmission time of three bytes.

Module Settings

1. The 0x0E special function register needs to be configured with the desired number of bytes of sub-packet length, 64 bytes by default.
2. The 0x0F special function register needs to be configured for the desired packet splitting interval, which defaults to three bytes of transmission delay.

Remark.

The setting of [1] 0x14 is described in the OPTION register in Chapter 6.2 Module parameter configuration commands.

[2] The average power consumption is determined by the duty cycle of the highest power consumption and the lowest power consumption. The power consumption of the module is influenced by the airspeed, baud rate, wake-up time and the number of bytes sent.

8.2.12 Passing mode Function Description

A device in pass-through mode will automatically transmit data in both up and down directions until the final node outputs data. If you need to output data at every node, just set the destination address to 0xFF.

Module Settings

1. The 0x07 special function register needs to be configured to pass the mode 0x0100.
2. Set the address of the module at each level, and the address increases in sequence.

8.2.13 Send after random delay Function Description

A device that sends with random delay turned on will delay the data for a random period of time before sending it out each time, in order to reduce the chance of data collisions, and the maximum delay time will be less than the transmission time of a full packet.

Module Settings

1. Need to turn on the 0x17 special function register for random delay

8.2.14 Send after scanning channel Function Description

The device that sends after opening the scanning channel will scan whether the current channel is occupied before sending data each time, and if it is occupied will wait for a period of time and then scan again until the channel is clean before sending the data out, in order to reduce the chance of data collision.

Module Settings

1. It is necessary to turn on the 0x17 special function register to scan the channel and then send

8.2.15 Proactive Polling

Function Description

Devices in polling mode automatically form a star network. When a slave device sends data, it does not send it to the master device immediately, but waits for a request from the master device and sends the data out only when it receives the request. The master device sends data and needs to wait for the send window of the master device before sending the data out.

Module Settings

1. Need to configure the special function register 0x07 polling mode 0x0800
2. You need to set the 0x0A special function register to polling mode host or slave.
3. Set the address of the host and slave.

8.2.16 Packet Output

Function Description

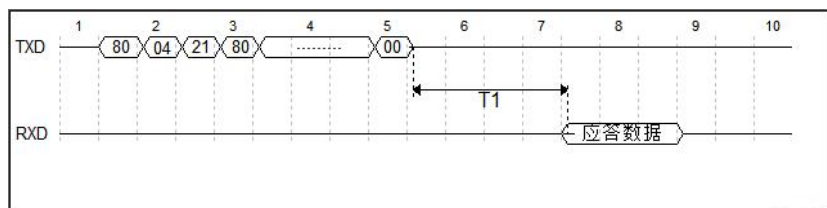
This function requires both the sender and the receiver to turn on the packet grouping function. When the receiver receives the data, it will group the data into a large packet, up to 800 bytes, and output a large packet all at once, which is more widely applicable.

Module Settings

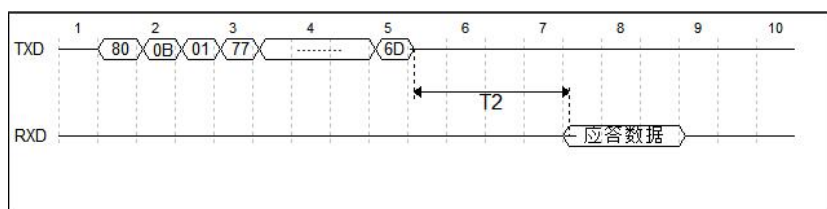
1. The 0x17 special function register needs to be turned on for packet output function for both transmit and receive
2. If you need to ensure the reliability of the data, you can choose to turn on the option to request lost packets after reception is complete under the 0x17 special function register.

9. Timing Chart

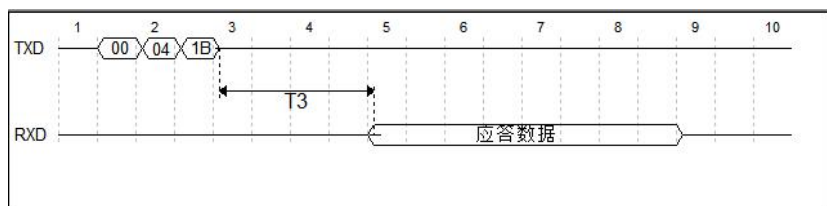
1. Module parameter configuration commands



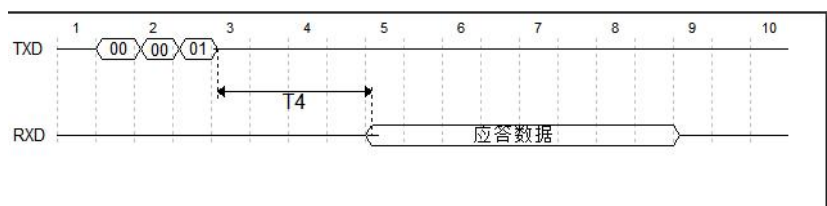
2. Module encryption key setting command



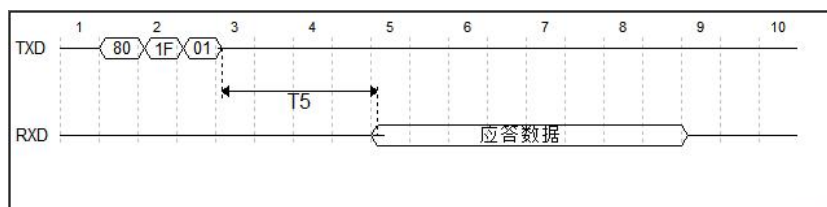
3. Read module configuration parameters command



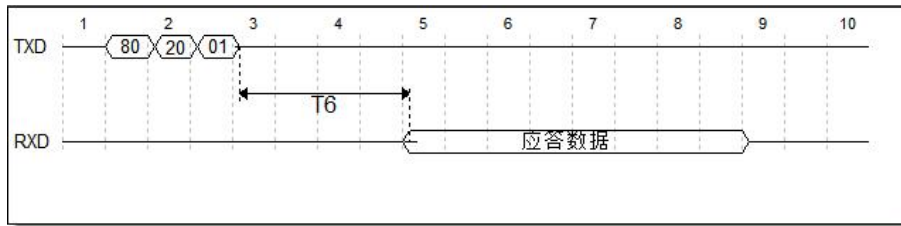
4. Read module hardware version number command



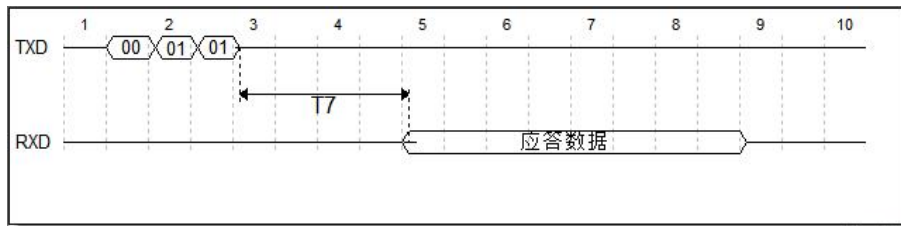
5. Module reset command



6. Restore module default parameter command



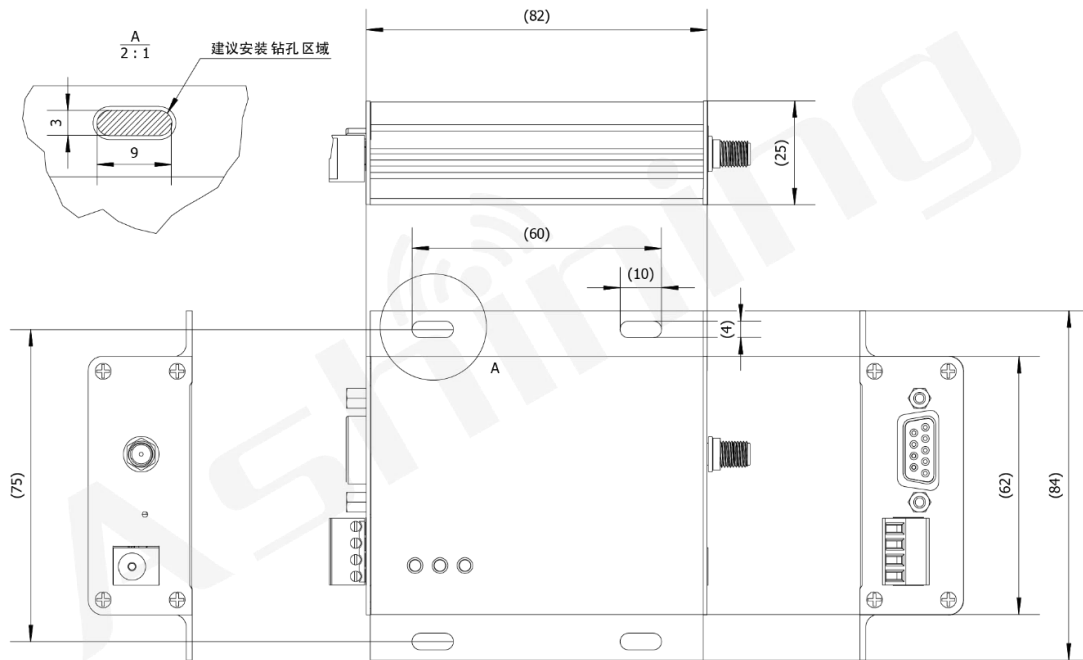
7. Read current data signal RSSI and environment RSSI commands directly



Parameter Name	T_answer	Description	Minimum value	Typical values	Maximum value	Unit
Module Command Answer Delay	T1	Parameter configuration delay		100		ms
	T2	Read module configuration parameters delay		40		ms
	T3	Read module hardware version number delay		10		ms
	T4	Waiting for module reset delay		40		ms
	T5	Read module voltage delay		60		ms
	T6	Configure module encryption key delay		60		ms
	T7	Recovery module default parameter delay		50		ms
Waiting for data transmission completion delay	T_Packet	Delay time required to finish sending a packet of data				ms

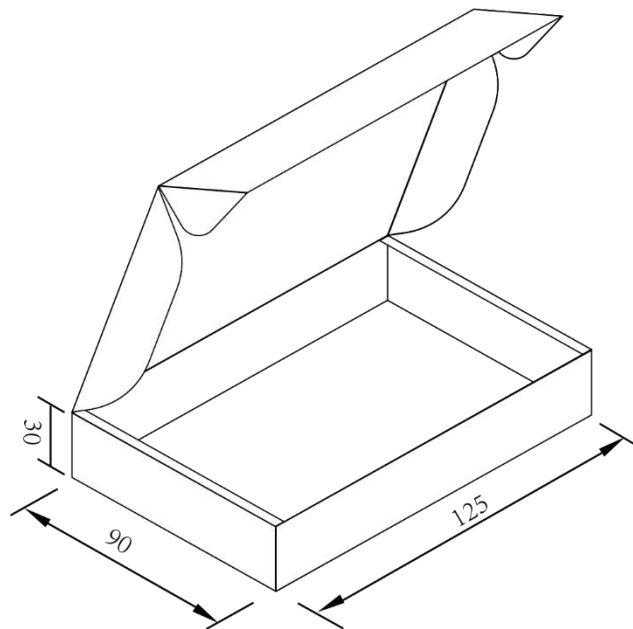
10. Package Information

10.1 Mechanical size



11. Packaging method

11.1 DTU tooling(unit:mm)



Important Notes and Disclaimers

Due to the continuous improvement of hardware and software of the product, this specification is subject to change, and the latest version of the specification shall prevail in the end.

Users who use this product need to pay attention to the product dynamics at the official website so that users can get the latest information of this product in time.

The pictures and diagrams used in this specification are for illustrating the functions of this product and are for reference only.

The measurement data in this specification are measured by our company at room temperature for reference only, please refer to the actual measurement.

Chengdu Ashining Technology Co., Ltd. reserves the right of final interpretation and modification of all contents in this specification.