E70-915NW14S User Manual

Chengdu Ebyte Electronic Technology Co.,Ltd.

C

Disclaimer

EBYTE reserves all rights to this document and the information contained herein. Products, names, logos and designs described herein may in whole or in part be subject to intellectual property rights. Reproduction, use, modification or disclosure to third parties of this document or any part thereof without the express permission of EBYTE is strictly prohibited.

The information contained herein is provided “as is” and EBYTE assumes no liability for the use of the information. No warranty, either express or implied, is given, including but not limited, with respect to the accuracy, correctness, reliability and fitness for a particular purpose of the information. This document may be revised by EBYTE at any time. For most recent documents, visit www.ebyte.com.

1. Overview

E70-915NW14S is the star network module, operating at 915MHz, based on originally imported TI CC1310 and 15.4-Stack protocol, with coordinator and terminal as a whole There are long range, standard range and high-speed transmission modes. Maximum 200 nodes can send data to one coordinator. Use industry-standard AT commands for operating configuration, which greatly simplifies user operations.

E70-915NW14S is the first 915MHz wireless module that solves a series of problems caused by traditional modules. Users will spend less effort to deal with complex network protocols, which greatly reduces the difficulty of customer development and shortens the user's development period. The protocol guarantees the stability and packet rate of the entire wireless communication system.

E70-915NW14S strictly follows design standards of FCC, CE, CCC and meets various RF certification requirements for exporting.

Model No.	Frequency	Transmit power	Reference distance(PCB/IPX)	Package	Antenna
E70 (915NW14S)	915M	14dBm	2500m	SMD	IPEX/Stamp hole

2. Features

[Ultra-low power consumption]: The average current in sleep mode is less than 4uA.

[Three transmission formats]: In coordinator mode, it supports broadcast transmission, short address transmission, and long address transmission.

[Multiple Sends and Receives]: Supports up to 200 nodes concurrently transmitting data to ensure the reliability and timeliness of data transmission.

[AES128 encryption]: Communication uses AES128 data encryption to ensure data packet security and reliability.

[Parameter saving]: After the parameters are set by the user, the module parameters will be saved and will not be lost when the power is turned off. After the power is turned on again, the module will work according to the set parameters.

[Three transmission modes]: The firmware integrates long-distance mode, standard transmission mode, and high-speed rate mode, which is suitable for many different applications.

[Low-power node]: Can be configured as a low-power node (sleeping node) mode. In this mode, the node periodically wakes up to request data.

[8 kinds of data output modes]: Users can configure multiple data output modes to meet different demand scenarios.
[CSMA / CA]: Supports carrier sense multiple access with collision avoidance (CSMA-CA).

3. Technical Parameters

3.1 General parameters

Model No.	Size	Net weight	working temperature	Working humidity	Storage temperature
E70 (915NW14S)	16 * 26 mm	1.65±0.1g	-40 ~ 85℃	10% ~ 90%	-40 ~ 125℃

3.2 Electrical parameters

3.2.1 Transmit current

Model No.	Min	Typ	Max	Unit	Remark
E70 (915NW14S)		27		mA	● When designing the power supply circuit for the module, it is often recommended to reserve more than 30% of the margin, as the whole machine is conducive to long-term stable work; ● The current required for the instant of launch is large but often because the transmission time is extremely short, the total energy consumed may be smaller; ● When customers use an external antenna, the degree of impedance matching between the antenna and the module at different frequency points will affect the magnitude of the transmit current to varying degrees.

3.2.2 Receiving current

Model No.	Min	Typ	Max	Unit	Remark

E70 (915NW14S)	7	8	10	mA	● The current consumed by the RF chip in the pure receiving state is called the receiving current. Some RF chips with communication protocols or developers have loaded some self-developed protocols on the whole machine, which may cause the receiving current of the test to be too large； ● The current in the purely receiving state is often mA level, and the "receiving current" of the μA level needs to be processed by the developer through software;

3.2.3 Sleep current

Model No.	Min	Typ	Max	Unit	Remark
E70 (915NW14S)	0.5	1	2	μA	● Sleep current usually refers to the current consumed by the CPU, RAM, clock and some registers reserved, and the SoC is in a very low power consumption state; ● Sleep current is often much smaller than the current consumed by the power supply part of the machine at no load, so it is not necessary to be too demanding.

3.2.4 Supply voltage

Model No.	Min	Typ	Max	Unit	Remark
E70 (915NW14S)	2.2	3.3	3.8	V DC	● The power supply voltage is at the maximum value for a long time, and there is a risk of burning the module; ● The power supply pin has a certain anti-surge capability, but it must not be processed without the existence of pulses higher than the maximum supply voltage; ● The power supply voltage is not recommended to be lower than the recommended value. When the power supply voltage is lower than the recommended value, the RF parameters will be affected to varying degrees.

3.2.5 Communication level

Model No.	Min	Typ	Max	Unit	Remark

E70 (915NW14S)	2.5	3.3	3.6	V DC	● The communication level is higher than the maximum value of the module communication level, there is a high risk of burning the module; ● Although there are many ways to change the communication level, it will greatly affect the power consumption of the whole machine.

3.3 RF parameters

3.3.1 Transmit power

Model No.	Min	Typ	Max	Unit	Remark
E70 (915NW14S)	13	14	15	dBm	● Since the material itself has a certain error, a single LRC component has an error of ±0.1%. However, since a plurality of LRC components are used in the entire RF loop, there is a case where error accumulation occurs, resulting in a difference in transmission current of different modules; ● Reducing the transmit power can reduce power consumption to some extent, but reducing the transmit power emissions for a number of reasons reduces the efficiency of the internal PA; ● Transmit power will decrease as the supply voltage decreases.

3.3.2 Receiving sensitivity

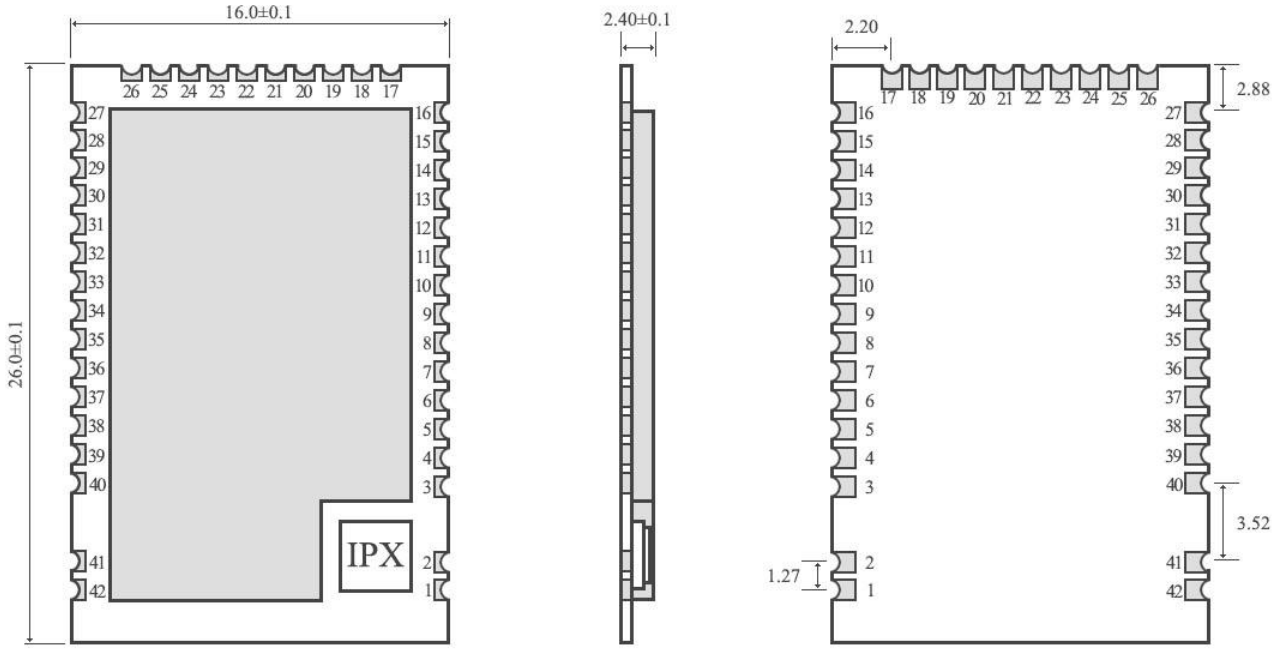
Model No.	Min	Typ	Max	Unit	Remark
E70 (915NW14S)	-109	-110	-111	dBm	● The current sensitivity is tested at an air rate of 2.5kbps. ● Since the material itself has a certain error, a single LRC component has an error of ±0.1%. However, since a plurality of LRC components are used in the entire RF loop, there is a case where error accumulation occurs, resulting in a difference in receiving sensitivity of different modules; ● After increasing the airspeed of the module, the receiving sensitivity will decrease, resulting in a decrease in communication distance.

3.4 Coverage

Model No.	Min	Typ	Max	Unit	Remark
E70 (915NW14S)	1200	1500	1800	m	● Clear and open, antenna gain is 5dBi, antenna height is 2.5 meters, and air rate is 2.5kbps; ● Each packet data interval is 2s, 100 packets of data are sent, each packet of data is 30 bytes, and the packet loss rate is less than 5% is effective communication distance; ● In order to obtain meaningful and reproducible test results, we choose to conduct tests in sunny and clear suburbs where almost has no electromagnetic interference; ● There are obstacles and electromagnetic interference, and the distance will decrease to varying degrees.

4. Mechanical characteristics

4.1 Size



4.2 Pin definition

No.	Pin item	Pin direction	Application
1	GND	Ground	Ground electrode

2	ANT		Antenna (50 ohm impedance)
3	NC	Reserved pin	Reserved, to be floated
4	NC	Reserved pin	Reserved, to be floated
5	NC	Reserved pin	Reserved, to be floated
6	NC	Reserved pin	Reserved, to be floated
7	NC	Reserved pin	Reserved, to be floated
8	NC	Reserved pin	Reserved, to be floated
9	NC	Reserved pin	Reserved, to be floated
10	NC	Reserved pin	Reserved, to be floated
11	NC	Reserved pin	Reserved, to be floated
12	NC	Reserved pin	Reserved, to be floated
13	NC	Reserved pin	Reserved, to be floated
14	NC	Reserved pin	Reserved, to be floated
15	NC	Reserved pin	Reserved, to be floated
16	GND	Ground	Ground electrode
17	M0	Input	M1M0 The four working modes of the module are determined by the joint combination. When in use, a 1K protection resistor shall be connected in series externally, and a 1M pull-up resistor shall be added (it shall not be suspended, otherwise, it can be grounded).
18	M1	Input	M1M0 The four working modes of the module are determined by the joint combination. When in use, a 1K protection resistor shall be connected in series externally, and a 1M pull-up resistor shall be added (it shall not be suspended, otherwise, it can be grounded).
19	RXD	Input	TTL UART inputs, connects to external TXD output pin. Can be configured as open-drain or pull-up input. For details, please refer to parameter setting.
20	TXD	Output	TTL UART outputs, connects to external RXD input pin. Can be configured as open-drain or push-pull output. For details, please refer to parameter setting.
21	TMSC	Input	JTAG TMSC
22	TCKC	Input	JTAG TCKC
23	NC	Reserved pin	Reserved, to be floated
24	NC	Reserved pin	Reserved, to be floated
25	AUX	Output	To indicate module ’ s working status & wakes up the external MCU. During the procedure of self-check initialization, the pin outputs low level. Can be configured as open-drain output or push-pull output, see parameter settings for details. A 1K protection resistor needs to be connected in series when using (it can be suspended)
26	VCC		Module power supply positive reference, voltage range: 2.2V ~ 3.8V DC
27	GND	Ground	Ground electrode
28	ACK	Output	The user indicates the data transmission result of the module, which is pulled down before transmission and pulled up after success. It can be configured as drain open circuit output or push-pull output. When it is used, a 1K protection resistor should be connected externally in series (it can be suspended).

29	NC	Reserved pin	Reserved, to be floated
30	NC	Reserved pin	Reserved, to be floated
31	NC	Reserved pin	Reserved, to be floated
32	RESET	Input	Module reset pin
33	NC	Reserved pin	Reserved, to be floated
34	NC	Reserved pin	Reserved, to be floated
35	LINK	Output	To indicate module ’ s current network connection status. Can be configured as open-drain output or push-pull output, see parameter settings for details. A 1K protection resistor needs to be connected in series when using. (it can be suspended)
36	NC	Reserved pin	Reserved, to be floated
37	NC	Reserved pin	Reserved, to be floated
38	NC	Reserved pin	Reserved, to be floated
39	NC	Reserved pin	Reserved, to be floated
40	NC	Reserved pin	Reserved, to be floated
41	GND	Ground	Ground electrode
42	GND	Ground	Ground electrode

E70 (915NW14S) series can achieve pin compatibility, Pin to Pin replacement.

5. Firmware transmitting mode

5.1 Transparent transmission

	Format	Values
When the coordinator is set to transparent transmission, the coordinator will send broadcast message. At this time, all non-dormant nodes in the entire network will receive data.		

5.2 Short address transmission

	Format	Values
Coordinator short address transmission format: short address + valid data 00 00 or FF FF are broadcast address		
Coordinator	HEX	Sending：00 01 AA BB CC
Node A address 00 01	HEX	Receiving：AA BB CC
Node B address 00 02	HEX	Null
Node C address 00 03	HEX	Null

Coordinator	HEX	FF FF AA BB CC
Node A address 00 01	HEX	AA BB CC
Node B address 00 02	HEX	AA BB CC
Node C address 00 03	HEX	AA BB CC

5.3 Long address transmission

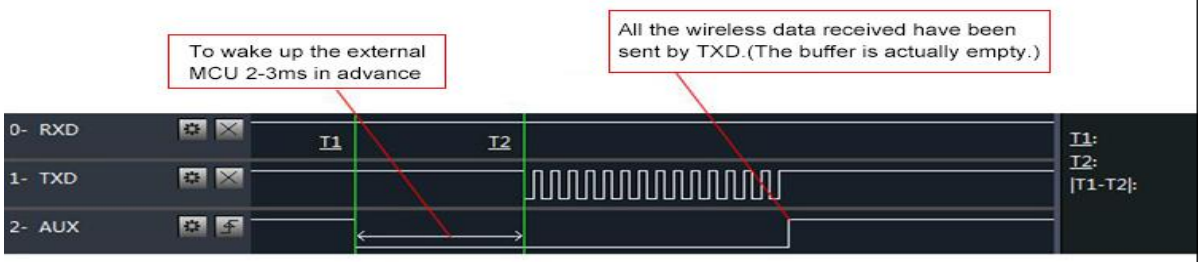
	Format	Values
Coordinator short address transmission format: short address + valid data 00 00 00 00 00 00 00 00 or FF FF FF FF FF FF FF FF are broadcast address;		
Coordinator	HEX	Sending：0A 01 AA 45 65 13 12 44 AA BB CC
Node A address: 0A 01 AA 45 65 13 12 44	HEX	Receiving：AA BB CC
Node B address： 0D 55 18 42 1A 27 29 64	HEX	Null
Node C address: A4 78 02 46 B5 1C 5A 02	HEX	Null
Coordinator	HEX	FF FF FF FF FF FF FF FF AA BB CC
Node A address: 0A 01 AA 45 65 13 12 44	HEX	AA BB CC
Node B address: 0A 01 AA 45 65 13 12 44	HEX	AA BB CC
Node C address: 0A 01 AA 45 65 13 12 44	HEX	AA BB CC

6. Device status

No	Description（STM8L MCU）
1	The UART module is TTL level, please connect with MCU of TTL level.
2	For some MCU works at 5V DC, it may need to add 4-10K pull-up resistor for the TXD & AUX pin.

6.1 AUX description

It can indicate whether there are data that are yet to send via wireless way, or whether all wireless data has been sent through UART, or whether the module is still in the process of self-check initialization.

No.	Description
1	【Indication of UART output】can be used to wake up external MCU.  **Timing Sequence Diagram of AUX when TXD pin transmits**
2	【Indication of wireless transmitting】 1.The length of the buffer is 512 bytes, and the single packet must not exceed 128 bytes, when Aux=1, users can transmit data continuously within 128 bytes. 2.When AUX = 1, it means that all the UART data of the module have been transmitted already.  Note: This diagram is a clearer reflection of the mechanism of "packet within 128 bytes and timeout to start transmission". The screenshot is not taken until the AUX level is pulled up after the transmission is completed.  **Timing Sequence Diagram of AUX when RXD pin receives serial data**

6.2 LINK description

The LINK pin indicates the current network status, after the node is connected to the network, the current pin is pulled low. The external device can query the device network status through the pin level. In the coordinator mode, the pin indicates if the module establishes the network normally.

6.3 ACK description

The ACK pin is used to indicate the status of the last user's data transmission. Before transmitting, the pin is pulled low. After the transmission is successful, the pin is pulled high. Users can use this pin state to judge if the data has arrived successfully. This pin function cannot indicate the coordinator to send broadcast message.

Note: In 802.15.4 protocol, the device will use the CSMA/MA technology to access the channel before sending data. When the receiving device receives the data, the returned ACK does not have this mechanism. This means that even if the receiving device can receive data in extreme conditions, sending device ACK pin indicates that the last data transmission failed.

7. Operating mode

	M1	M0	Description	Remarks
Coordinator mode	0	0	Set up a network to manage network node information	Transfer data according to input and output modes
Normal node	0	1	Send and receive data at any time	High real-time performance
Dormant node	1	0	Low-power reception, sending data at any time	Receive delay, send data need to wake up the serial port
Sleep mode	1	1	Cannot send and receive data, system sleeps	The fixed baud rate is 115200 8N1

7.1 Coordinator mode

If users configure the operating mode as 4, (M0=0,M1=0) or users configure the operating mode as 0, the module works in the coordinator mode. In the coordinator mode, the coordinator can set up the network, coordinator is the central node of the network, there must be a coordinator in the network.

The coordinator configurable data input mode is:

Broadcast transmission. When configured to broadcast, all non-dormant devices on the entire network will receive data. The ACK pin indicates transmission successfully all the time.

Short address transmission, when configured to short address transmission, the user must specify the short address before sending data.

Long address transmission. When configured to long address transmission, the user must specify the long address before sending data.

7.2 Normal node

If users configure the operating mode 4, （M0=0,M1=1）or users configure the operating mode as 1, the module works in the normal node mode. In the normal node mode, the data can be received and sent in real time. It is suitable for application with low power consumption but high real-time requirement.

7.3 Dormant node

If the user configures the operating mode as 4, M0=1,M1=0, or the user configures the operating mode as 2, the module works in the dormant node mode, the device request if there is data transmitted by coordinator according to the user-configured sleep period , The non-broadcast data sent by the coordinator will be temporarily stored inside the coordinator. The device is in low power consumption during the sleep period. If the sleep node wants to send data actively, the user should send no more than two bytes to wake up the device. After the byte data is used to wake up the device and the wake-up byte is sent, the user needs to wait for more than 100ms to send the real data. After the wake-up byte is sent, the user needs to wait for 100ms to send the real data and the wake-up data will be discarded. After the device was waken up, the module will open the serial port, receiving AT command, if more than 2 seconds, there is no data input, the module will close serial port and go to sleep.The sleep node is suitable for applications where the user requires high power consumption but does not require high real-time data. The input transmission format of the coordinator cannot be broadcast mode when sending data to the sleeping node , instead, the AT + TFICFG = Value command should be used to configure its input mode to short address or long address mode. Then Communicate with the sleeping node according to the usage of this AT command.

7.4 Configuration mode

When M0=1,M1=1,the device will switch to configuration mode. In the this mode, the serial port parameters are: 115200, 8N1, and the average operating current is 4uA. In this mode, the module cannot send and receive data. When the external AT instruction is configured, needs the serial port to send no more than two bytes data to wake up the device .After the wake-up byte is sent, the user needs to wait for 100ms to send the real data and the wake-up data will be discarded. After the device was waken up, the module will open the serial port, receiving AT command, if more than 2 seconds, there is no data input, the module will close serial port and go to sleep. The next AT command requires the user to resend the wake-up byte.

7.5 Mode switching

No	Remarks
1	By default, Users can decide the operating mode by the combination of M1 and M0
2	In any operating mode, users can configure the operating mode through the AT command, refer to AT command description for details

3	In any mode, When M0=1,M1=1, it will enter the low power consumption mode. In this mode, the serial port parameters are fixed at 115200, 8N1.

8. Quick start

8.1 Communication between normal node and coordinator

Coordinator configuration

Open the serial port assistant, select the serial port corresponding to the device, and set the serial port parameters (default is 115200, 8N1)

Enter "+++" without line breaks to enter the AT command mode. When receiving "Enter AT Mode", the AT mode is successfully entered. As shown in Figure 5-1:

Enter "AT+WMCFG=0" with line breaks to and configure the device as coordinator mode. As shown in Figure 6-1:

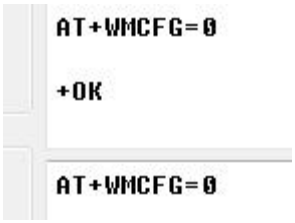


Figure 6-1

Then enter “AT+RSTART” to restart the device with a line break. The coordinator configuration is complete. As shown in Figure 6-2:

Figure 6-2

Normal node configuration

Open the serial port assistant and select the serial port corresponding to the device. Set the baud rate to 115200, the data bit to 8 bits, the parity bit to none, the stop bit to 1 bit, and the flow control is disabled, open the serial port.

Enter "+++" without line breaks to enter the AT command mode. When receiving “Enter AT Mode", the AT mode is successfully entered.

Enter "AT+WMCFG=1" with line breaks to to configure the device as normal mode. As shown in Figure 6-3:

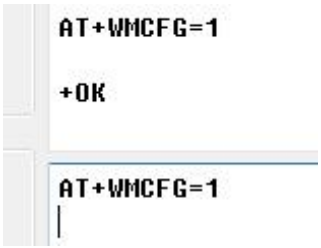


Figure 6-3

Then enter “AT+RSTART” to restart the device with a line break. The normal node configuration is complete.

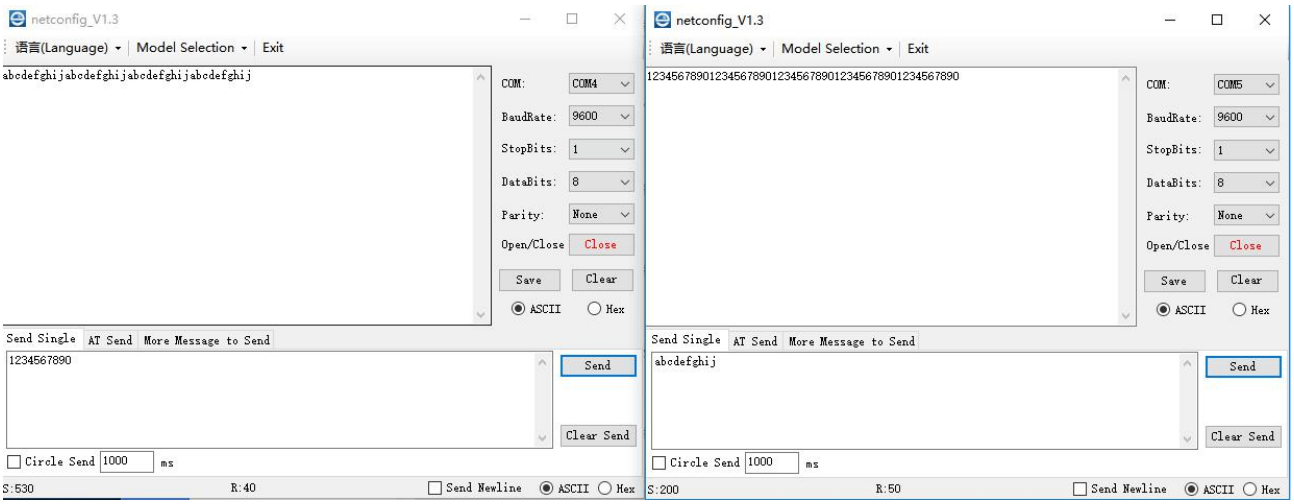
As shown in Figure 6-4:

Figure 6-4

Data transmission after network access

When the configuration is complete, the coordinator restarts and the LINK pin is set low level, indicating that the coordinator has started and is running. After an normal node device starts up, it will have a network access time of 5 to 20 seconds. When the network access is completed, the LINK pin will be set to low level, indicating that the network access is successful.

Data transmission is shown as follow:



The coordinator and node devices can communicate with each other normally.

9. AT Command

When the serial port enters AT mode, it needs to open the serial port assistant, set the serial port (default parameter) baud rate 115200, data bit 8 bit, stop bit 1 bit, input "+++" without Enter. All parameter settings will reply "\r\n+OK\r\n".

<table>
<tr><td rowspan="4">1</td><td colspan="2">“ +++” enter AT Command</td></tr>
<tr><td>+++</td><td>Parameter specification:
Null
Response:
Enter AT Mode</td></tr>
<tr><td colspan="2">Example：+++</td></tr>
<tr><td colspan="2">Note: 1. The AT command can be used only after entering the AT command mode
2. After entering the AT command mode, the AT command mode can be used again only after exiting the AT command mode, reset or restart the module
3. When writing this command, the serial debugging assistant must be set not to send new lines; writing other AT commands must be set to send new lines.</td></tr>
<tr><td rowspan="3">2</td><td colspan="2">AT+EXIT Exit AT command mode</td></tr>
<tr><td>AT+EXIT</td><td>Parameter specification:
Null
Response：
Exit AT Mode</td></tr>
<tr><td colspan="2">Example：AT+EXIT
Note: AT commands are invalid after exiting AT command mode</td></tr>
<tr><td rowspan="3">3</td><td colspan="2">AT+CNCFG Set / Query device channel</td></tr>
<tr><td>AT+CNCFG=?
AT+CNCFG=Value</td><td>Parameter specification:
Query the current working channel
Response：
Channel：0
Parameter specification:
Value：0~63 （Factory default parameter is 0）</td></tr>
<tr><td colspan="2">Note: 1. In the long-distance mode and standard transmission mode, the frequency range is (908.2MHz ~ 920.8MHz), the channel interval is 0.2MHz, and Fre = 908.2 + (Channel * 0.2);
In high-rate mode, the frequency range is 902.4MHz ~ 927.6MHz, the channel interval is 0.4MHz, and Fre = 902.4 + (Channel * 0.4);
2. After setting the channel, the network information will be cleared</td></tr>
<tr><td rowspan="4">4</td><td colspan="2">AT+ WMCFG Set / Query the device's working mode configuration (restart to take effect)</td></tr>
<tr><td>AT+ WMCFG =?</td><td>Parameter specification:
Query the current working mode
Response：
WMCFG：4</td></tr>
<tr><td>AT+ WMCFG =Value</td><td>Parameter specification:
Value：0~4
0，Coordinator；
1, Normal node;
2, Dormant Node；
3, Sleep mode；
4, Pin control (factory default)</td></tr>
<tr><td colspan="2">Example：AT+ WMCFG =4
Note: 1. After setting a new mode, it needs to be reset or power off and restart
2. After setting the mode, the network information will be cleared</td></tr>
<tr><td rowspan="2">5</td><td colspan="2">AT+DINFO Device information acquisition</td></tr>
<tr><td>AT+DINFO=SELFS</td><td>Parameter specification:
Acquire its own short address and return it through the serial port.</td></tr>
</table>

	AT+DINFO=SELFE	Parameter specification: Acquire its own long address and return it through the serial port.
	Example：AT+DINFO=SELFE	
6	**AT+ TFOCFG** Set/Query output transmission format configuration (can be saved without reboot)	
	AT+ TFOCFG=?	Parameter specification: Acquire the current output transmission format configuration Response: TFOCFG:0
	AT+ TFOCFG=Value	Parameter specification: Value：0~7 0：Output: valid data (transparent transmission, factory default) 1: Output: Valid Data +Long Address 2：Output: Valid Data +Short Address 3：Output: Valid Data+RSSI 4：Output：Valid Data+Long Address+Short Address 5：Output：Valid Data+Long Address+RSSI 6：Output：Valid Data+Short Address+RSSI 7：Output：Valid Data+Long Address+Short Address+RSSI
	Example：AT+ TFOCFG=0	
7	**AT+ TFICFG** Set/Query input transmission format configuration (can be saved without reboot)	
	AT+ TFICFG=?	Parameter specification: Acquire the current input transmission format configuration Response： TFICFG:0
	AT+ TFICFG=Value （This command is valid for coordinator only）	Parameter specification: Value：0~2 0：Input Broadcast(Factory default) 1：Input Short Address+Data (0x0000 0xfff) is broadcast address 2：Input Long Address+Data （0x000000000000 0xffffffffffffffff）is broadcast address
	Example：AT+TFICFG=0	
8	**AT+TMCFG** Set/Query transmission mode configuration (restart to take effect)	
	AT+TMCFG=?	Parameter specification: Acquire the current transmission mode configuration Response： TMCFG:0
	AT+TMCFG=Value	Parameter specification: Value：0~3 0：Long range mode，LRM 1：Standard transmission mode，GFSK（factory default） 2：High-rate mode，200kbps

<table>
<tr><td></td><td colspan="2">Example：AT+TMCFG=0
Note：1.The coordinator and node should have the same transmission mode before they can access the network.
2. E70 (915NW30S) has no standard transmission mode. Configure AT + TMCFG = 0 or AT + TMCFG = 1, and their modes are long-distance mode.)
3. After setting the transmission mode, the network information will be cleared</td></tr>
<tr><td rowspan="4">9</td><td colspan="2">AT+ PIDCFG Set/Query PANID configuration（restart to take effect）</td></tr>
<tr><td>AT+PIDCFG=?</td><td>Parameter specification:
Acquire the current device’s PANID configuration
Response：
PIDCFG:65535</td></tr>
<tr><td>AT+PIDCFG=Value</td><td>Parameter specification:
Value:0~65535，Factory default PANID parameter is 65535</td></tr>
<tr><td colspan="2">Example：AT+PIDCFG=65535
Note：1. The node can only join the same network as its PANID (any network can be added when it is configured as 65535)
2. After setting PANID，the network information will be cleared</td></tr>
<tr><td rowspan="4">10</td><td colspan="2">AT+ DMCFG Set/Query device sleep time configuration(restart to take effect)</td></tr>
<tr><td>AT+DMCFG=?</td><td>Parameter specification:
Acquire the current device sleep time configuration
Response：
DMCFG:0 or 2~30</td></tr>
<tr><td>AT+DMCFG=Value</td><td>Parameter specification:
Value：Sleep time, unit（S），Can be set to 0 or 2~30 seconds，Factory default parameter is 6（S）</td></tr>
<tr><td colspan="2">Example：AT+DMCFG=0
Note: When set to 0, the sleep node can never receive data from the coordinator and can only upload data to the coordinator, but the sleep node cannot automatically determine that it is disconnected from the network, it can only determine that it is disconnected from the network after ten failed communications.</td></tr>
<tr><td rowspan="4">11</td><td colspan="2">AT+RSCFG Set / Query device auto restart parameter configuration(restart to take effect)</td></tr>
<tr><td>AT+RSCFG=?</td><td>Parameter specification:
Acquire the current device auto restart parameter configuration
Response：
RSCFG:0</td></tr>
<tr><td>AT+RSCFG=Value</td><td>Parameter specification:
Value： 60~65535（S），Factory default parameter is 60（S）</td></tr>
<tr><td colspan="2">Example：AT+RSCFG=60</td></tr>
<tr><td></td><td colspan="2">Note: This parameter can be used for node disconnection detection.</td></tr>
<tr><td rowspan="4">12</td><td colspan="2">AT+UBCFG Set / Query serial baud rate parameter configuration(restart to take effect)</td></tr>
<tr><td>AT+UBCFG=?</td><td>Parameter specification:
Acquire the current device serial baud rate parameter configuration
Response：
UBCFG:7</td></tr>
<tr><td>AT+UBCFG=Value</td><td>Parameter specification:
Value:0~7
0：1200
1：2400
2：4800
3：9600
4：19200
5：38400
6：57600
7：115200（Factory default）</td></tr>
<tr><td colspan="2">Example：AT+UBCFG=7</td></tr>
</table>

13	**AT+UPCFG** Set / Query serial parity bit(restart to take effect)	
	AT+UPCFG=?	Parameter specification: Acquire the current device serial parity bit parameter configuration Response： UPCFG:0
	AT+UPCFG=Value	Parameter specification: Value:0~2 0：None（Factory default） 1：Odd parity 2：Even parity
	Example：AT+UPCFG=0	
14	**AT+PWCFG** Set / Query device power parameter configuration(restart to take effect)	
	AT+PWCFG=?	Parameter specification: Acquire the current device power parameter configuration Response： PWCFG:3
	AT+PWCFG=Value	Parameter specification: Value:0~3 0：Ultra-high（Factory default） 1：High 2：Medium 3：Low
	Example：AT+ PWCFG=3	
15	**AT+IOCFG** Set/Query IO port parameter configuration(restart to take effect)	
	AT+IOCFG=?	Parameter specification: Acquire the current device IO port parameter configuration Response： IOCFG:0
	AT+IOCFG=Value	Parameter specification: Value：0 or 1 1：Push-pull（Factory default） 0：Open-drain
	Example：AT+IOCFG=0	
16	**AT+DFCFG** Restore device default parameters	
	AT+DFCFG	Parameter specification: Null Restore device system default parameters
	Example：AT+DFCFG	
17	**AT+RSTART Restart device**	
	AT+RSTART	Parameter specification: Null **Restart hard device**
	Example：AT+RSTART	
18	**AT+ECHO** Set whether AT command turns off echo	
	AT+ECHO=Value	Parameter specification: Value:0 or 1 1：Turn on the echo（Factory default） 0：Turn off the echo
	Example：AT+ECHO=1	
	Note：The echo is turned on by default.	
19	**AT+VER** Read software version number	
	AT+VER	Parameter specification: Null
	Example：AT+VER	

20	**AT+CLINFO** Clear module internal network information	
	AT+CLINFO	Parameter specification: Null
	Example：AT+CLINFO	
	Note: After clearing the network, the module cannot communicate and needs to re-establish the network (this command allows users to clear all the information when the number of coordinator node devices reaches 200)	
21	**AT+TLCFG** Set / Query module concurrent performance parameter configuration (restart to take effect)	
	AT+TLCFG=?	Parameter specification: Acquire the current module concurrent performance parameter configuration Response： TLCFG:0
	AT+TLCFG=value	Parameter specification: Value:0~3 0：Low concurrency 1：Medium concurrency 2：High concurrency（Factory default） 3：Highest concurrency
	Example：AT+ TLCFG =0 (Note: This parameter mainly configures the module's concurrency performance, that is, when multiple nodes concurrently transmit data, the maximum number of nodes is supported. The higher the performance, the greater the maximum number of concurrent systems supported, but the delay in sending data and the average power consumption of the nodes will increase; the lower the performance, the higher the real-time performance of the data sent the by nodes, but the data may be lost when the environment has large interference or multiple nodes transmit simultaneously.)	

10. Notes

1. In the sleep mode, the serial baud rate format is 115200, 8N1. If users forget the current baud rate, they can use AT command to reconfigure in this mode.
2. After the node is associated with the coordinator, the node's information will be saved, and the information still exists after the node is disconnected from the network. This mechanism has two advantages:

A. When the same node joins the network established by the coordinator, increase the network access speed;

B. After a node enters the network, as long as the current network exists, the short address will never change;

If the coordinator has associated more than 200 devices and wants to continue to associate new devices, it needs to call the AT + CLINFO command to clear the current network information

3. The average power consumption of a low-power node depends on the wake-up period configured by the user. The larger the period, the lower the power consumption.
4. Low power consumption nodes cannot receive broadcast data from the coordinator.
5. When using the default parameters, if the node is powered on for more than 60 seconds and has not yet entered the network, the system reset will be initiated.
6. When the node PANID is set to 0Xffff (65535), the node can join any network, otherwise it will only join the network with the same PANID.
7. E70 (915NW30S) configure parameters AT + TMCFG = 0 and AT + TMCFG = 1, their modes are long-distance mode.

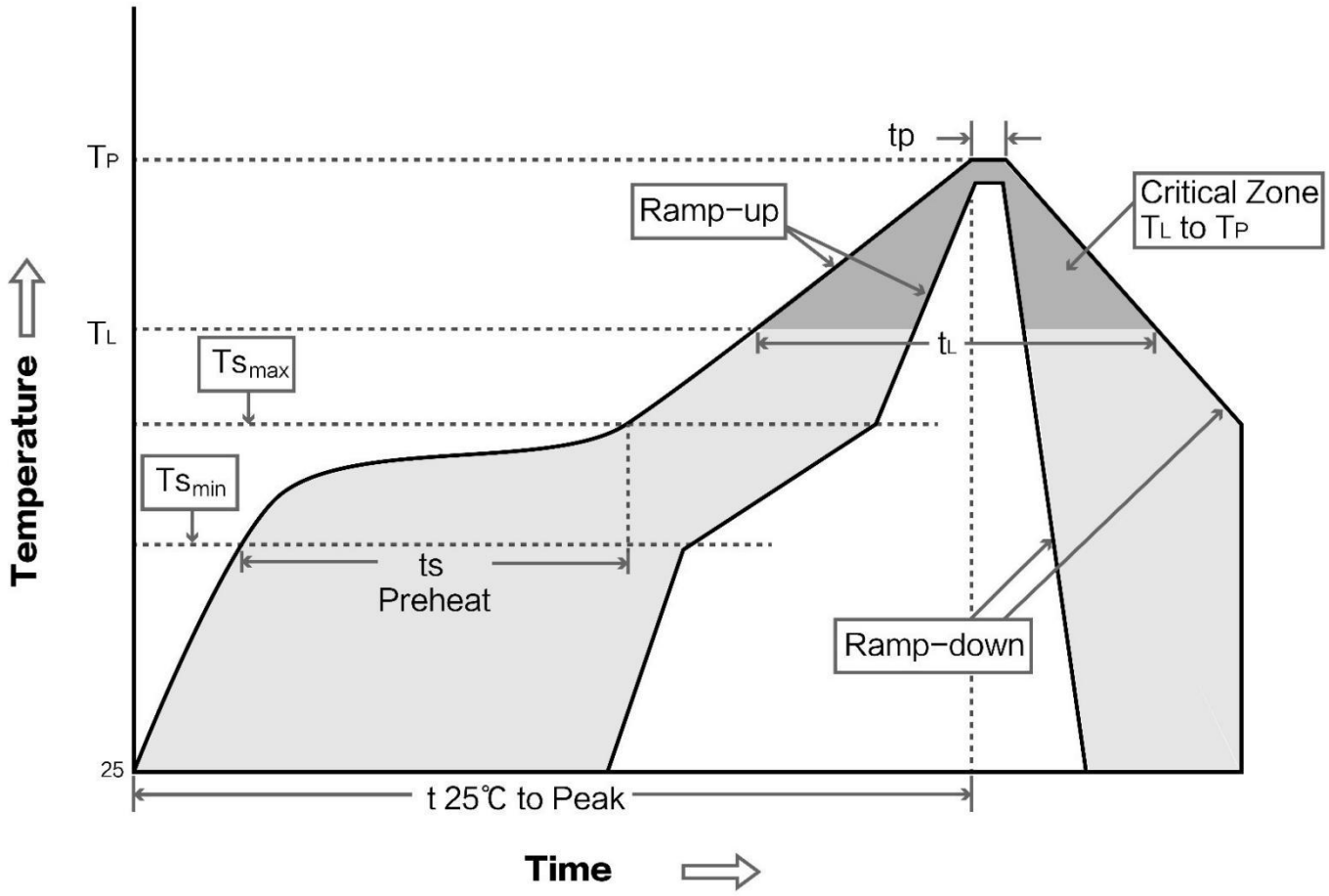
8. When using AT + TFICFG = value to set the input transmission format configuration and AT + TFOCFG = value to set the output transmission format configuration, parameters can be saved without restarting.

11. Welding guidance

11.1Reflow Soldering Temperature

Profile Feature	Curve feature	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	Solder paste	Sn63/Pb37	Sn96.5/Ag3/Cu0.5
Preheat Temperature min （Tsmin）	Minimum preheating temperature	100℃	150℃
Preheat temperature max (Tsmax)	Maximum preheating temperature	150℃	200℃
Preheat Time (Tsmin to Tsmax)(ts)	Preheating time	60-120 sec	60-120 sec
Average ramp-up rate(Tsmax to Tp)	Average rising rate	3℃/second max	3℃/second max
Liquidous Temperature (TL)	Liquid phase temperature	183℃	217℃
Time（tL）Maintained Above（TL）	Time above liquidus	60-90 sec	30-90 sec
Peak temperature（Tp）	Peak temperature	220-235℃	230-250℃
Aveage ramp-down rate（Tp to Tsmax）	Average descent rate	6℃/second max	6℃/second max

11.2Reflow Soldering Curve



12.FAQ

12.1 Communication range is too short

- The communication distance will be affected when obstacle exists.
- Data lose rate will be affected by temperature, humidity and co-channel interference.
- The ground will absorb and reflect wireless radio wave, so the performance will be poor when testing near ground.
- Sea water has great ability in absorbing wireless radio wave, so performance will be poor when testing near the sea.
- The signal will be affected when the antenna is near metal object or put in a metal case.
- Power register was set incorrectly, air data rate is set as too high (the higher the air data rate, the shorter the distance).
- The power supply low voltage under room temperature is lower than 2.5V, the lower the voltage, the lower the transmitting power.
- Due to antenna quality or poor matching between antenna and module.

12.2 Module is easy to damage

- Please check the power supply to ensure that it is between the recommended power supply voltage. If the maximum value is exceeded, the module will be permanently damaged.
- Please check the stability of power supply, the voltage cannot fluctuate too much.
- Please make sure anti-static measure are taken when installing and using, high frequency devices have electrostatic susceptibility.
- Please ensure the humidity is within limited range, some parts are sensitive to humidity.
- Please avoid using modules under too high or too low temperature.

13. Important statement

- EByte reserves the right of final interpretation and modification of all contents in this manual.
- As the hardware and software of the product are continuously improved, this manual may be changed without further notice. The latest version of the manual shall prevail.
- Users who use this product need to pay attention to product dynamics on the official website so that users can get the latest information of this product in time.

Revision history

Version	Date	Description	Issued by
1.00	2019-09-18	Initial version	huaa
1.10	2019-10-09	Format adjustment	Ren
1.20	2021-2-21	Image optimization	Linson

About us

Sales hotline: 4000-330-990 Tel: 028-61399028
Support: support@cdebyte.com Website: www.ebyte.com
Address: Innovation Center B333~D347, 4# XI-XIN road,High-tech district (west), Chengdu, Sichuan, China

Chengdu Ebyte Electronic Technology Co.,Ltd.