F8914 User Manual	Documentation No.	Product Version	Page
		V1.12	
	Product Name：F8914		Total: 42

F8914 User Manual

The user manual is suitable for the following model:

Model	Product Type
F8914-N	ZigBee Termianl
F8914-E	ZigBee Terminal(with PA)

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Files Revised Record

Date	Version	Remark	Author
2012-03-21	V1.0		Lake Chen
2012-10-31	V1.1	Power consumption, interface modification, etc	Harven
2013-01-18	V1.11	Add ZigBee simply description and Sleep mode description	Tady Chen
2013-03-05	V1.12	Modify the sleep method; Add work mode AT command	Tady Chen

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Online
Act
Power
F8914
ZigBee Terminal
工作电压
Operating Voltage:
+5V~35VDC
工作温度
Operating Temperature:
-25℃~65℃
Four-Faith
四信
厦门四信通信科技有限公司
http://www.four-faith.com
Xiamen Four-Faith Communication Technology Co., Ltd.

Contents

Chapter 1 Brief Introduction of Product

1.1 General

F8914 is a kind of data terminal device that provides data transfer function by ZigBee network.

It adopts high-powered industrial 32 bits CPU and embedded real time operating system. It supports RS232, RS485 (or RS422) and ZigBee port that can conveniently and transparently connect one device to a cellular network, allowing you to connect to your existing serial and ZigBee devices with only basic configuration. It has low power consumption states in which the power consumption 2.2mA@12VDC. It has compatible digital I/O channel, ADC function.

It has been widely used on M2M fields, such as intelligent transportation, smart grid, industrial automation, telemetry, finance, POS, water supply, environment protection, post, weather, and so on.

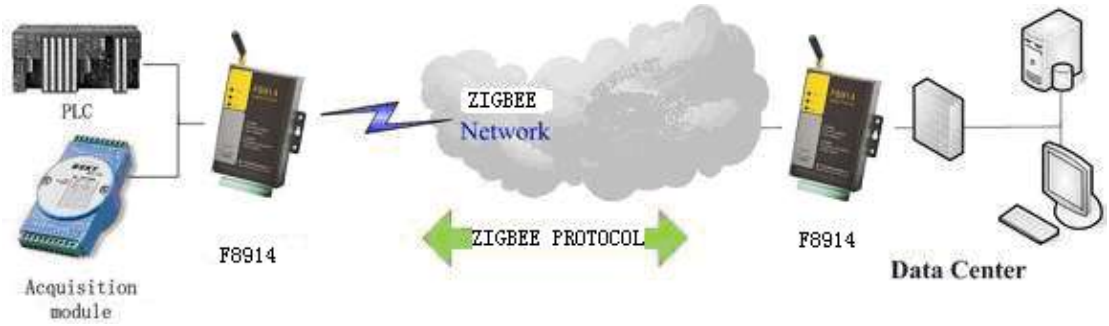


Figure 1-1 F8914 Application Topology

1.2 Features and Benefits

Design for Industrial Application

- High-powered industrial ZigBee module
- Support low power consumption mode, including multi-sleep and trigger modes to reduce the power dissipation farthest
- Housing: iron, providing IP30 protection
- Power range: DC 5~35V

Stability and Reliability

- Support hardware and software WDT
- Support auto recovery mechanism, including online detect, auto redial when offline to make it always online
- RS232/RS485/RS422 port: 15KV ESD protection
- SIM/UIM port: 15KV ESD protection
- Power port: reverse-voltage and overvoltage protection

- Antenna port: lightning protection(optional)

Standard and Convenience

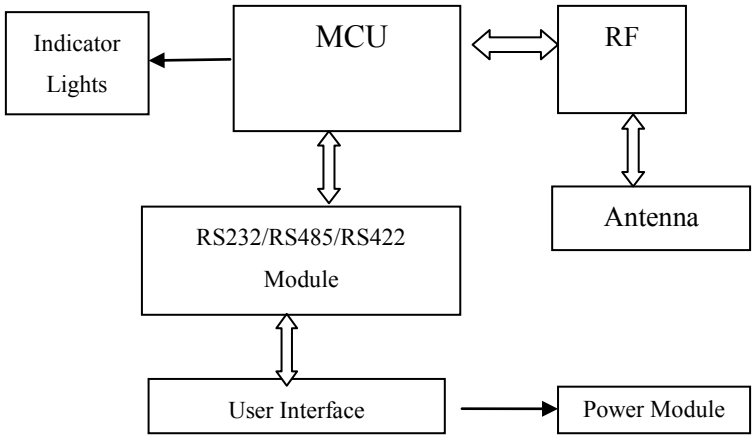
- Adopt terminal block interface, convenient for industrial application
- Support standard RS232 and RS485(or RS422) port that can connect to serial devices directly
- TTL logic level RS232 interface can be customized
- Support intellectual mode, enter into communication state automatically when powered
- Provide management software for remote management
- Support several work modes
- Convenient configuration and maintenance interface

High-performance

- Support ZigBee wireless short-distance data transmission
- Support repeater and terminal device function
- Support Point-to-Point, Point-to-Multipoint, Peer-to-Peer and Mesh network
- Support 65000 nodes
- Support center node, route node and terminal node
- Support broadcast and target address transfer
- Support wide communication range
- Supply 5 I/O channels, compatible 2pulse wave output channels, 3 analog inputs and 2 pulse input counters.

1.3 Working Principle

The principle chart of the F8914 is as following:



1.4 Specifications

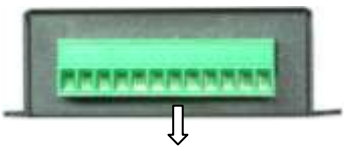
ZigBee Specification

Item	Content

ZigBee Module	Industrial ZigBee module
Standard and Band	IEEE 802.15.4 ISM 2.4 GHz
Indoor/Urban Range	30m 90m(With PA)
Outdoor/RF Line-of-Sight Range	500m 2000m(With PA)
Transmit Power	2.82mw (+4.5dBm) 100 mw (+20dBm) (With PA)
Bandwidth	250Kbps
Receiver Sensitivity	-97dBm -103dBm(With PA)
Network Topologies	Point-to-Point, Peer-to-Peer and Mesh
Channels	11 to 26
Max packge size	300 Bytes

Interface Type

Item	Content
Serial	1 RS232 port and 1 RS485(orRS422) port, 15KV ESD protection Data bits: 8 Stop bits: 1, 2 Parity: none, odd, even Baud rate: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps
Indicator	"Power", "ACT", "Online"
Antenna	Standard SMA female interface, 50 ohm, lighting protection(optional)
Power	Terminal block interface, reverse-voltage and overvoltage protection



Power Input

Item	Content
Standard Power	DC 12V/0.5A
Power Range	DC 5~35V

Power Consumption

Working States	Power Consumption

F8914-N	Coordinator	Idle Mode	13.5～13.8mA@12 VDC
		RX Mode	13.6～13.7mA@12 VDC
		TX Mode	14.0～14.4mA@12 VDC
	Router	Idle Mode	13.2～13.4mA@12 VDC
		RX Mode	13.2～13.7mA@12 VDC
		TX Mode	13.9～14.1mA@12 VDC
	EndDevice	Idle Mode	6.2～6.4mA@12 VDC
		RX Mode	7.1～7.4mA@12 VDC
		TX Mode	8.9～9.4mA@12 VDC
		Timing wake up	3.2～3.3mA@12 VDC
		Deep Sleep	2.2～2.3 mA@12 VDC
F8914-E (With PA)	Coordinator	Idle Mode	15.9～16.1mA@12 VDC
		RX Mode	16.3～16.6mA@12 VDC
		TX Mode	21.3～22.2mA@12 VDC
	Router	Idle Mode	15.9～16.3mA@12 VDC
		RX Mode	16.2～16.6mA@12 VDC
		TX Mode	21.5～22.4mA@12 VDC
	EndDevice	Idle Mode	6.6～6.9mA@12 VDC
		RX Mode	8.0～9.2mA@12 VDC
		TX Mode	13.3～14.2mA@12 VDC
		Timing wake up	4.1～4.5mA@12 VDC
		Deep Sleep	3.2～3.5 mA@12 VDC

Physical Characteristics

Item	Content
Housing	Iron, providing IP30 protection
Dimensions	91x58.5x22 mm
Weight	205g

Environmental Limits

Item	Content
Operating Temperature	-40~+85ºC（-104~+185 ºF）
Storage Temperature	-40~+125ºC（-104~+257ºF）
Operating Humidity	95% (Non-condensing)

Chapter 2 Installation Introduction

2.1 General

The F8914 must be installed correctly to make it work properly.There is need only one coordinator in a network, the other nodes should be set as routers or end devices.

Install the coordinator first, then install the routers or end devices from near to distant.

Warning: Forbid to install the F8914 when powered!

2.2 Encasement List

Name	Quantity	Remark
F8914 host	1	
Power adapter	1	
RS232 data cable	1	optional
RS485 data cable	1	optional
Manual CD	1	
Certification card	1	
Maintenance card	1	

Table 2-1 Encasement List

2.3 Installation and Cable Connection

Dimension: (unit: mm)

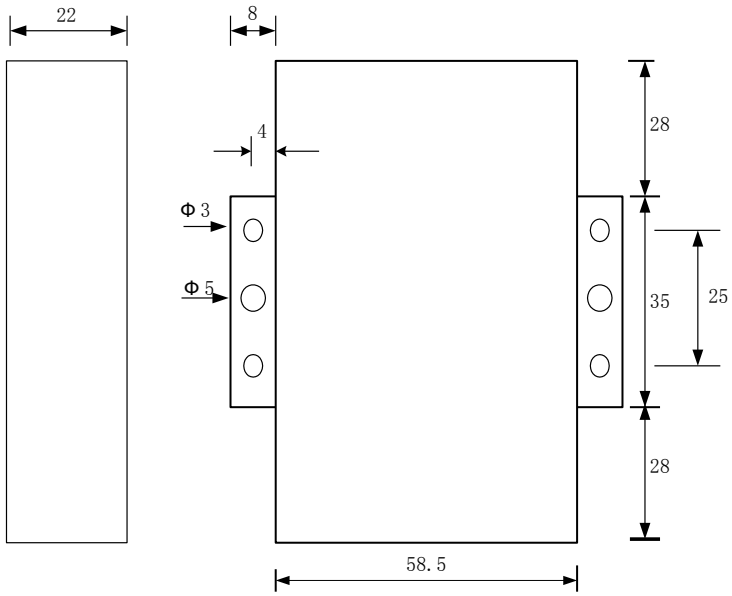


Figure 2-1 Installation Chart

Installation of antenna:

Screw the SMA male pin of the antenna to the female SMA outlet of F8914 tightly.

Warning: The antenna must be screwed tightly, or the signal quality of antenna will be influenced!

Antenna install note:

1, Install the antenna far away from the large area metal and ground.

2, Keep the antennas visual.

3, Minimize obstructions between the antennas.

4, Reduce the extension cords of the antenna.

The performance of different antenna installation types, as the figure 2-2.

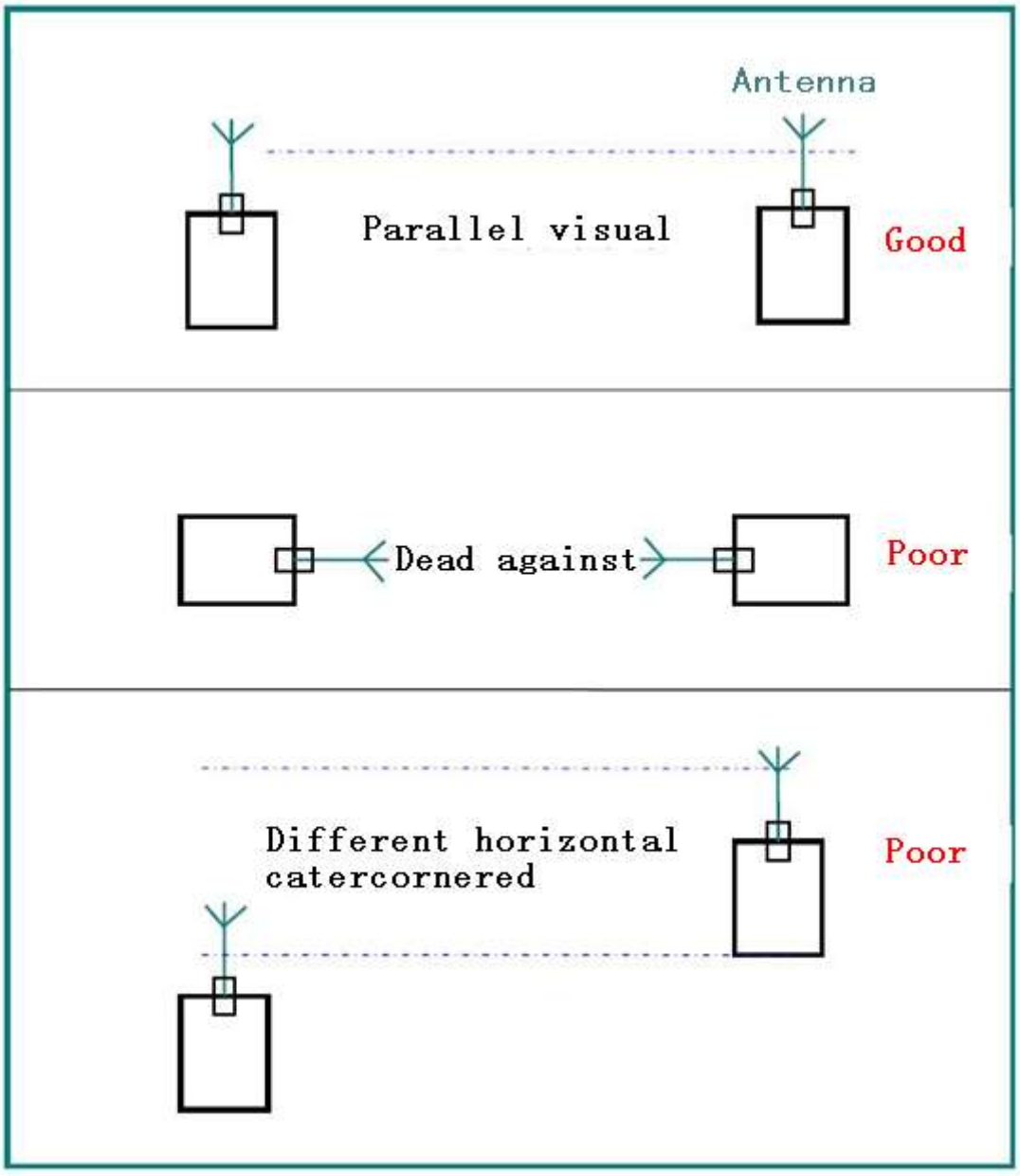


Figure 2-2 Installation antenna mode

User Interface Signal Definition

Pin Number	Signal Name	Default Function	Extensible Function
1	PWR	Power input anode	N/A
2	GND	Power Ground	N/A
3	GND	Power Ground	N/A
4	RX	RS232 RX	N/A
5	TX	RS232 TX	N/A
6	A	RS485 anode	Reserved compatible DTR
7	B	RS485 cathode	Reserved compatible DSR
8	IO1	GPIO	Reserved compatible RTS and RS232 RX (TTL logic level)
9	IO2	GPIO	Reserved compatible CTS and RS232 TX (TTL logic level)
10	IO3	ADC, analog input function (voltage acquisition 0 ~ 5 V)	GPIO, pulse output, pulse counting. Reserve compatible RS232 DCD
11	IO2	ADC, analog input function (current collection 0 ~ 20 mA)	GPIO, pulse output, pulse counting. Reserve compatible RS232 RI
12	IO1	ADC, analog input function (current collection 0 ~ 20 mA)	GPIO, pulse output, pulse counting.

Installation of cable:

F8914 adopts industrial terminal block interface. The recommended cable is 28-16AWG. The detail description of standard layout adapter and communication cables as the following:

Adapter（Rating Output 12VDC/0.5A）:

Cable Color	Power Output Polarity
Black &White Alternate	Anode
Black	Cathode

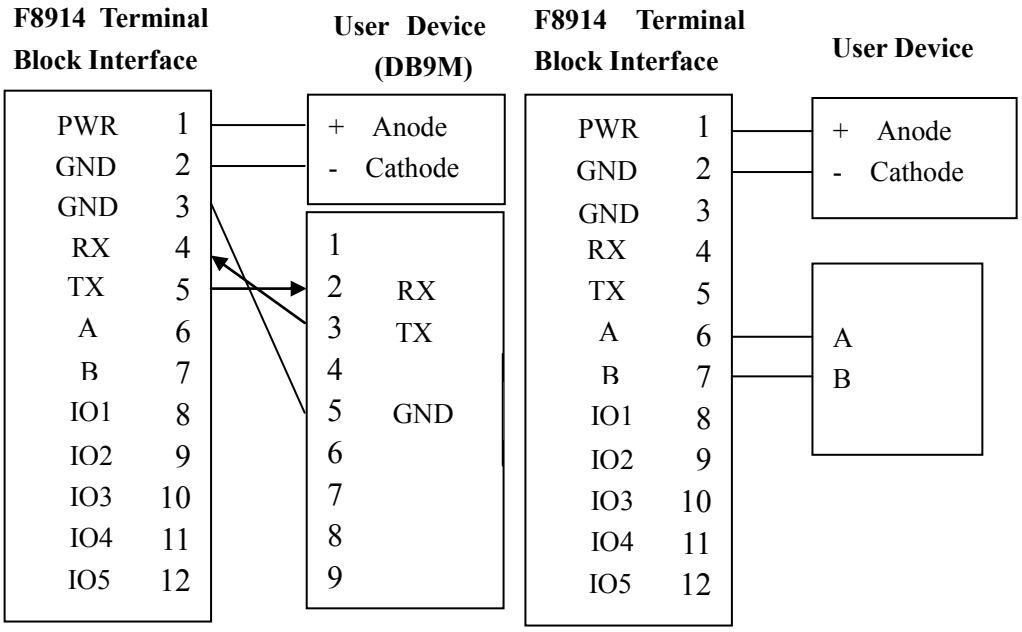
RS232 Cable：

Cable Color	Corresponding DB9-M Pin Number
Brown	Pin 2
Blue	Pin 3
Black	Pin 5

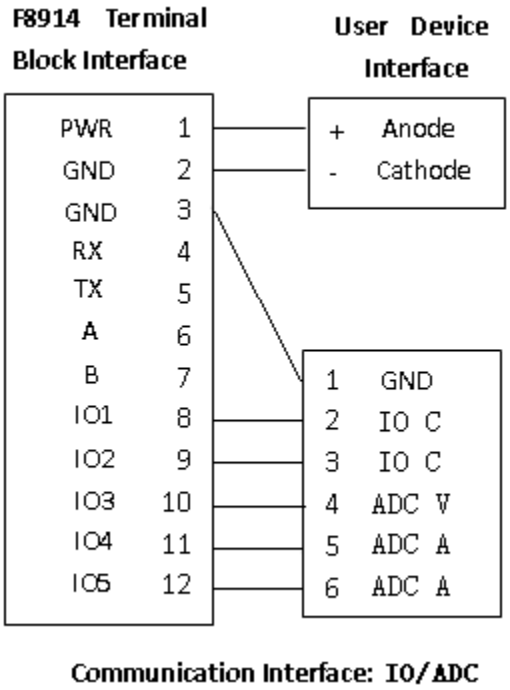
RS485 Cable：

Cable Color	Signal definition
Red	RS485(A)
Black	RS485(B)

Power adapter and communication cable connection chart as following:



Communication Interface: RS232 **Communication Interface: RS485**



Communication Interface: IO/ADC

2.4 Power

The power range of the IP MODEM is DC 5~35V

Warning: *When we use other power, we should make sure that the power can supply power above 4W.*

We recommend user to use the standard DC 12V/0.5A power adaptor.

2.5 Indicator Lights Introduction

The F8914 provides three indicator lights: “Power”, “ACT”, “Online”.

Indicator Light	State	Introduction
Power	ON	F8914 is powered on
	OFF	F8914 is powered off
ACT	BLINK	Serial Data is communicating
	OFF	No data
Online	ON	F8914 has logged on network
	OFF	F8914 hasn’t logged on network
	FLASH	Joinning or establishing a network

Chapter 3 Zigbee Description

3.1 Device Type Description

ZigBee device has three types：coordinator,router and end device.They all can transmit and receive data.

3.1.2 Coordinator

This is the device that “starts” a ZigBee network. It is the first device on the network. The coordinator node scans the RF environment for existing networks, chooses a channel and a network identifier (also called PAN ID) and then starts the network.

Note that the role of the Coordinator is mainly related to starting up and configuring the network. Once that is accomplished, the Coordinator behaves like a Router node (or may even go away). The continued operation of the network does not depend on the presence of the Coordinator due to the distributed nature of the ZigBee network.

3.1.2 Router

A Router performs functions for (i) allowing other devices to join the network (ii) multi-hop routing (iii) assisting in communication for its child battery-powered end devices.

In general, Routers are expected to be active all the time and thus have to be mains-powered.

3.1.3 End Device

An end-device has no specific responsibility for maintaining the network infrastructure, so it can sleep and wake up as it chooses. Thus it can be a battery-powered node.

3. 2 ZigBee Network Description

3.2.1 Form a ZigBee Network Procedure

（1）The coordinator node scans the RF environment for existing networks, chooses a channel and a network identifier (also called PAN ID) and then starts the network.

（2）Router or end device also scans the RF environment for existing networks, chooses a channel and a network identifier (also called PAN ID) and then join the network.

（3）The coordinator’s node address fixed to 0x0000，router’s or end device’s node address can be assigned randomly or configured previously.

（4）The nodes in the network can use node address transmit or receive data.。

NOTE：In a Zigbee network，just only one coordinator

3.2.2 Physical Channel

ZigBee is based on IEEE 802.15.4 that has defined the MAC layer and physical layer. IEEE 802.15.4 also defined 3 work band 2.5GHz(global),868MHz(Europe) and 915MHz(USA),they respectively has highest 250kbit/s, 40kbit/s, 20kbit/s transmission rate. On the three band has 27 work channels in total. 2.4GHz has 16 channels, 915MHz has 10 channels, 868MHz has only one channel.

F8914 works on 2.4GHz band. In AT command mode ,we send “AT+CHA=N”,(N=11~26) to configure the channel. We recommend 15 ,20 ,25 ,26 channel .

3.2.3 Pan ID

ZigBee network also calls personal area network, every personal area network has unique Pan ID.This Pan ID is used on every device in a same ZigBee network.

F8914 can preconfigure a Pan ID and randomly select a Pan ID. In AT command mode ,we send “AT+PID=N”,(N=0-65531),if PID=65535 ,it will randomly select a Pan ID.

3.2.4 Node address

ZigBee device has two address types: 64 bit MAC address and 16 bit node address. 64 bit MAC address is unique in the world, and used in the product life. 16 bit node address usually assigned when the device joined in the network. It’s unique in a same Pan ID network. We use node address to send and receive data.

F8914 can preconfigure a node address and randomly assigned a node address. In AT command mode ,we send “AT+NID=N”,(N=0-65527), if NID=65535, it will randomly assigned a node address.

Note that : the coordinator’s node address is fixed on 0.

Chapter 4 Configuration

4.1 Configuration Connection

Before configuration, It's necessary to connect the device with the configure PC by the shipped RS232 or RS232-485 conversion cable.As showing in the figure 4-1.

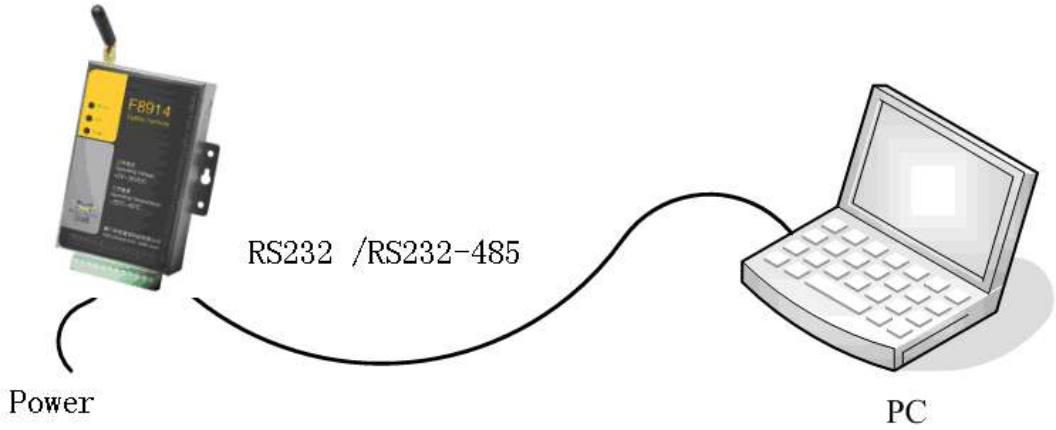


Figure 3-1 F8914 connect with PC

4.2 Configuration Introduction

There are two ways to configure the F8914:

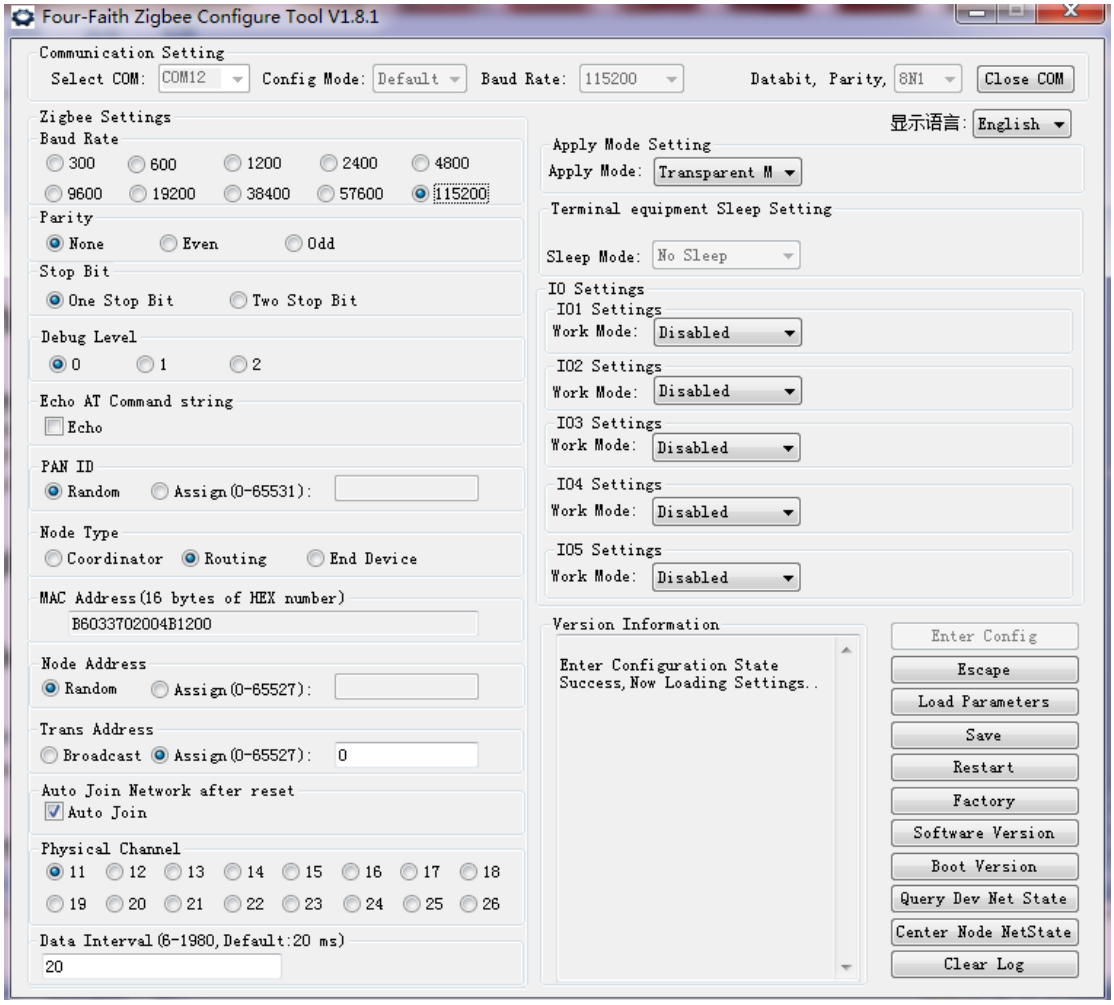
Configuration software tool: All the settings are configured through the shipped software tool. It's necessary to have one PC to run this tool.

Extended AT command: All the settings are configured through AT command, so any device with serial port can configure it. Before configuration with AT command, you should make F8914 enter configure state.

The following describes how to configure F8914 with AT command .At the same time, it gives out the corresponding the configure software tool of each configuration item.

Note: When F8914 powers up, it has three second configuration time。During this time, the serial's baudrate is 115200,no parity, 1 stop bit. Send the 3-character command sequence"+++"twice through serial port.Then it goes into AT command configuration.

4.3 Run the configure Tool: ZigbeeConfigure.exe



The “Communication Setting” column shows the current serial port settings. To configure ZigBee modules, please choose the correct serial port parameters ,then open the serial port. If the button text is“Close”, it shows the serial port now has been opened. If the text is “Open”, you should open the port first.

When you had configure the correct serial port，please press the

bottom, and follow the prompt，the node will enter configuration state。

4.4 Modes of Operation

F8914 supports three modes of Operation：Transparent Mode，AT Command Mode and API (Application Programming Interfaced) Mode.

4.4.1 Transparent mode

When operationg in transparent mode the modules act as a serial line replacement. All UART data received through the DIN pin is queued up for RF transmission. When data is received, the data is sent out through the DOUT pin.

Re-power module enter the transparent mode by default。

To enter transparent mode：

- In the AT command mode，send “AT+ESC**<CR><LF>**”through serial port.
- In the API mode, send “FE 01 21 2A 00 0A” through serial port.

4.4.2 AT command mode

AT command mode is a multiple function operation. This mode can configure the modules parameters,send data and recive data.

To enter AT command mode:

- In the transparent mode，send the 3-character command sequence“+++”twice through serial port.
- In the API mde,send “FE 01 21 2A 00 0A” through serial port.

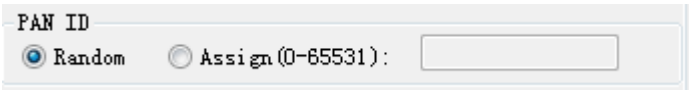
CHECK the AT command mode，send “AT**<CR><LF>**” through serial port, it will return “OK”.

All AT command line should begin with “AT” or “at” and end with “**<CR><LF>**”.In general, the AT command includes three forms, as shown in table 3-1.

Table 3-1 AT command forms

Form	Description	Instance
Set	Set the custom parameters	AT+XXX=<……>
Query	Query the current parameters value	AT+XXX?
Execute	Execute the command	AT+XXX

4.4.2.1 Set the PAN ID : AT+PID



Form	Command	Return
Set	AT+PID=<number strings>	0K
		ERROR

Query	AT+PID?	+PID: number strings OK

Parameter description :

number strings Range：0～65531，Set unique PAN ID

65535, System will assign a stochastic PAN ID

Default:65535

4.4.2.2 Query current PAN ID: AT+PCD

Form	Command	Return
Query	AT+PCD?	+PCD: number strings OK

Attention: This command is different from “AT+PID”. When the PAN ID is assigned by system and the node joined in the network , we can use this command to query the current PAN ID.

4.4.2.3 Set the physical channel : AT+CHA

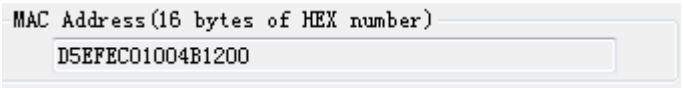
Form	Commad	Return
Set	AT+CHA=<number strings>	0K
		ERROR
Query	AT+CHA?	+CHA: number string OK

Parameter description :

number string Range: 11～26

Default: 11

4.4.2.4 Query the node MAC address : AT+MID



Form	Command	Return
Query	AT+MID?	+MID: hexadecimal strings OK

Attention: This command is read only. It will return 16 hexadecimal strings.
For example: 051B9B01004B1200

4.4.2.5 Set the node type: AT+TYP

Form	Command	Return
Set	AT+TYP=<number string>	0K
		ERROR
Query	AT+TYP?	+TYP: number string OK

Parameter description :
number string Range: 0 = Coordiantor
1 = Routerr
2 = End Device
Default:1

4.4.2.6 Set node address : AT+NID

Form	Command	Return
Set	AT+NID=<number strings>	0K
		ERROR
Query	AT+NID?	+NID: number strings OK

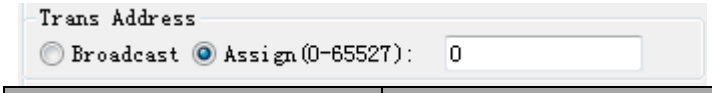
Parameter description :
number string Range: 0～65527，Set unique node address
65535, System will assign a stochastic node address
Default:65535
Attention : When coordiantor form a network, its node address is fixed to 0, the router and end device's node address must be non-zero.

4.5.2.7 Query node current address : AT+NCD

Form	Command	Return
Query	AT+NCD?	+NCD: number strings OK

Attention: This command is different from “AT+NID”. When the node address is assigned by system and the node joined in the network , we can use this command to query the current node address.

4.4.2.8 Set the transparent address : AT+TID

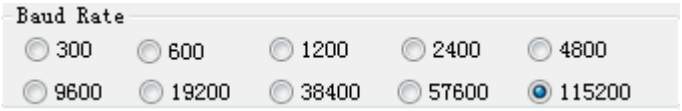


Form	Command	Return
Set	AT+TID=<number strings>	0K
		ERROR
Query	AT+TID?	+TID: number strings OK

Parameter description :

number strings Range: 0～65527，Set unique node trans address
65535, broadcast address
Default:0

4.4.2.9 Set the node baudrate : AT+IPR, AT+PAR, AT+STO



Form	Command	Return
Set	AT+IPR=<number string>	0K
		ERROR
Query	AT+IPR?	+IPR: number string OK

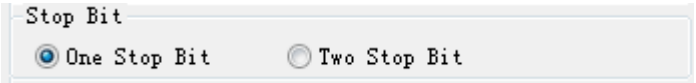
Parameter description :

number strings Range: 0 = 300,1 = 600,2 = 1200,3 = 2400,4 = 4800,5 = 9600,6 = 19200,
7 = 38400,8 = 57600,9 = 115200
Default:9

Form	Command	Return
Set	AT+PAR=<number string>	0K
		ERROR
Query	AT+PAR?	+PAR: number string OK

Parameter description :

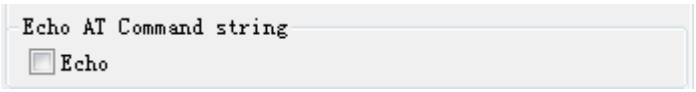
number strings Range: 0 = none, 1 = even , 2 = odd
Default:0



Form	Command	Return
Set	AT+STO=<number string>	0K
		ERROR
Query	AT+STO?	+STO: number string OK

Parameter description :
number strings Range: 0 = ONE stop bit, 1 = TWO stop bit
Default: 0

4.4.2.10 Set the AT command echo : AT+ECH



Form	Command	Return
Set	AT+ECH=<number string>	0K
		ERROR
Query	AT+ECH?	+ECH: number string

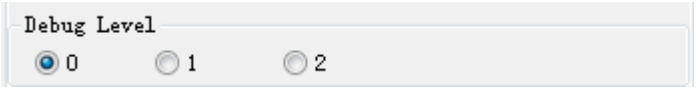
Parameter description :
number strings Range: 0 = non-echo, 1 = echo
Default:0

4.4.2.11 Set node to get acknowledge : AT+ACK

Form	Command	Return
Set	AT+ACK=<number string>	0K
		ERROR
Query	AT+ACK?	+ACK: number string OK

Attention : whether or not to get the acknowledge data
Parameter description :
number strings Range: 0 = no , 1 = yes
Default:0

4.4.2.12 Set debug level : AT+DBL



Form	Command	Return
Set	AT+DBL=<number string>	0K
		ERROR
Query	AT+DBL?	+DBL: number string OK

Parameter description :

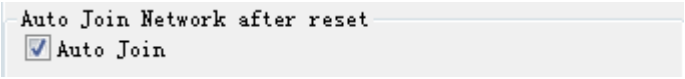
number strings Range: 0 = close all debug messages

1 = info the important debug messages

2 = info all debug messages

Default: 0

4.4.2.13 Set the node auto joins in the network : AT+AST



Form	Command	Return
Set	AT+AST=<number string>	0K
		ERROR
Query	AT+AST?	+AST:number string OK

Parameter description :

number strings Range: 0 = not auto join, 1 = auto join

Default:1

4.4.2.14 Start the network : AT+STA

Form	Command	Return
Execute	AT+STA	OK
		ERROR

Attention : When “AT+AST = 0”,this command can start the network.

4.4.2.15 Set the RF data output the serial port: AT+PRF

Form	Command	Return
Set	AT+PRF=<number string>	0K
		ERROR
Query	AT+PRF?	+PRF: number string OK

Parameter description :

number strings Range: 0 = not output, 1 = output

Default:1

Attention : This command parameter don't save in flsah.

4.4.2.16 Query the softwarte version : AT+VER

Version

Form	Command	Return
Execute	AT+VER	Four-Faith Zigbee Standard Ver: V1.10 Time: Jul 24 2012 11:21:04

4.4.2.17 Query the nodes network state : AT+NWS

Center Node NetState

Form	Command	Return
Execute	AT+NWS	OK +NWS: <state>,<node address>,<MAC address >,<node type> … … …

Command description :

When this command executed, it will recive Asynchronous response.

+NWS: <state>,<node address>,<MAC address >,<node type>

For example:

+NWS:0,0,1122334455667788,0

+NWS:0,2,1122334455667799,1

+NWS:0,8,1122334455667732,2

Attention: In order to avoid blocking, every node recived the command will delay for a period of time and send the message itself to the sender. This time range from 0 to 66 seconds.

Table 3-2 State information

0	Normal
1	Not in the net
2	Don't exist the node address
3	Opposite don't response
4	Reserve
5	Invaild value

4.4.2.18 Query the node address : AT+QNA

Form	Command	Return
Set	AT+QNA=<MAC address>	SRSP：OK AREQ： +NWS: <state>,<node address>,<MAC address >,<node type>
		SRSP：ERROR

Parameter description :

MAC Address : the required 16 hexadecimal strings

4.4.2.19 Query the node MAC address : AT+QMA

Form	Command	Return
Set	AT+QNA=<node address>	SRSP：OK AREQ： +NWS: <state>,<node address>,<MAC address >,<node type>
		SRSP：ERROR

Parameter description :

Node Address : the required node address

4.4.2.20 Query local node address net state: AT+SNS

Query Dev Net State

Form	Command	Return
Execute	AT+SNS	+SNS：as shown table 3-3 OK

Table 3-3 DEV NETWORK STATE:

00	Initialized - not started automatically
01	Initialized - not connected to anything
02	Discovering PAN's to join
03	Joining a PAN
04	ReJoining a PAN, only for end devices
05	Joined but not yet authenticated by trust center
06	Started as device after authentication
07	Device joined, authenticated and is a routerr
08	Started as Zigbee Coordinator
09	Started as Zigbee Coordinator
10	Device has lost information about its parent.

4.4.2.21 Send data (HEX mode): AT+TXH

Form	Command	Return
Set	AT+TXH=<node address><content>	OK
		ERROR

Parameter description :

Node Address: two byte hexadecimal，the lowest byte comes first

Content: the hexadecimal data.

For example:

AT+TXH=0123383838383838**<CR><LF>**

The node address is 0x2301 and the content is “888888”.

Attention : The content length can’t be longer than 160 character.

4.4.2.22 Send data (ASCII mode) : AT+TXA

Form	Command	Return
Set	AT+TXA=<node address>，<content>	OK
		ERROR

Parameter description :

Node Address: decimal address

Content: ASCII data.

For example:

AT+TXA=12245,123456789

12245 is the reciver node address，123456789 is the ASCII content.

Attention : The content length can't be longer than 80 character.

4.4.2.23 Node recive data

Form	Command	Return
		+RCV:<source address>,<data strings>

Parameter description :

Source Address: the sender node address

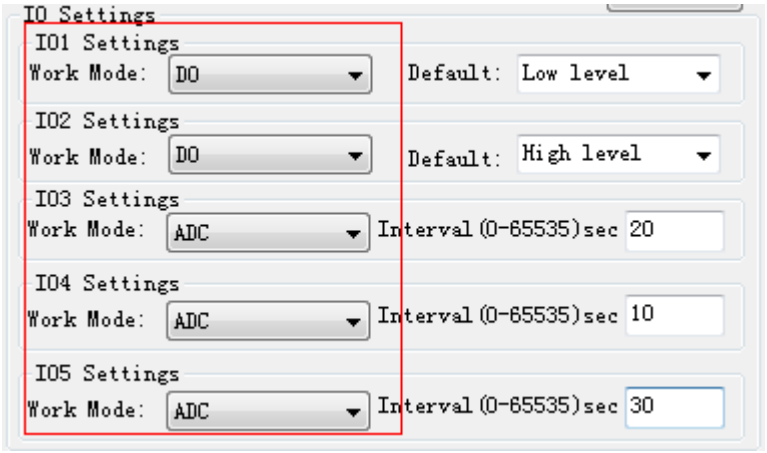
Content: ASCII data strings

4.4.2.24 Node IO pins command

Attention： The return value from IO pins should be read in AT command mode or API MODE.

4.5.2.24.1 Set IO pin mode : AT+DMn, (n :0~4)

Attention： n refer to the IO pin



Pins And Commands Relationship

n	IOs
0	IO5
1	IO4
2	IO3
3	IO2

4	IO1

Form	Command	Return
Set	AT+DMn=<number string>	0K
		ERROR
Query	AT+DMn?	+DMn: number string OK

Parameter description :

number string Range: 0 = Disabled

1 = ADC Analog to Digital Converter

2 = DI digital input

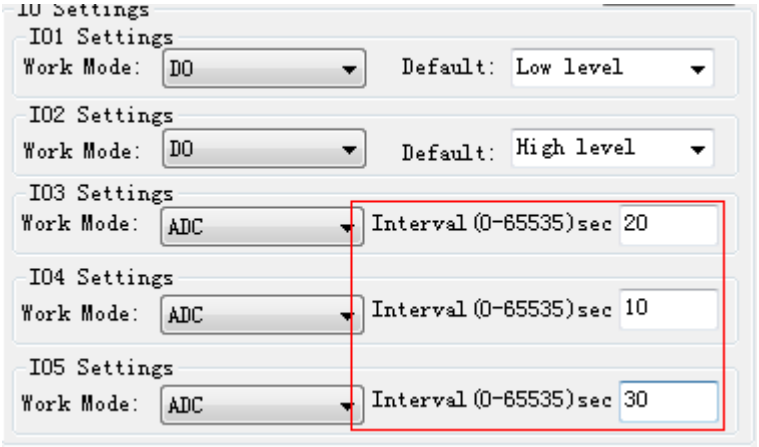
3 = DO low digital output low

4 = DO high digital output high

Default:0

For example: AT+DM0=1 set the IO1 Analog to Digital Converter

4.4.2.24.2 Set IO pin data acquisition time interval : AT+DTn, (n :0~4)



Form	Command	Return
Set	AT+DTn=<number strings>	0K
		ERROR
Query	AT+DTn?	+DTn: number strings OK

Parameter description :

number string Range: 0～65535 seconds，set the report time interval

0,not report

Default:0

Attention : 1.Take effect in IO pin ADC and DI mode.

2.When configure EndDevice and Sleep mode,it doesn't work.

3.The collected data will send to the trans address node.

For example : in AT command mode

+NVn:<state>,<node address>,<pin>,<value>

3. ADC value converte voltage or electric current value formula

voltage： （ADC value）*3.3*20.16/(2047*12.1) (V)

electric current： （ADC value）*3.3*1000/(2047*150) （mA）

4.4.2.24.3 Query IO pin value : AT+DVn, (n :0~4)

Form	Command	Return
Query	AT+DVn?	+DVn: number string OK

Description :

Get local IO pin value (ADC or GPIO)

4.4.2.24.4 Query the net node IO pin value: AT+NVn, (n :0~4)

Form	Command	Return
Query	AT+NVn=<node address>	SRSP: OK AREQ +NVn:<state>,<node address>,<pin>,<value>
		SRSP: ERROR

Parameter description :

Node Address : the required node address

4.4.2.24.5 Set remote node IO pin value : AT+NSn, (n :0~4)

Form	Command	Return
Set	AT+NSn=<node address>,<configure value>	SRSP: OK AREQ +NVn:<state>,<node address>,<pin>,<state>
		SRSP: ERROR

Parameter description :

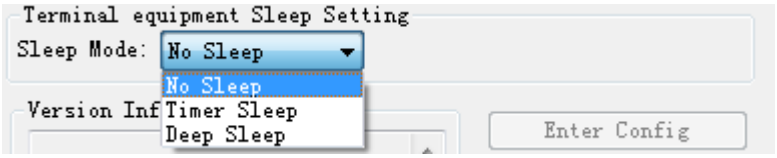
State : the first is the command execute state, the second is the command set state.

Node Address : the required node address

Configure value : 0 = low level , 1 = high level

Attention : Wireless set the node IO pin value, only take effect on digital IO output mode.

4.4.2.25 Set the End Device sleep mode:AT+SLE



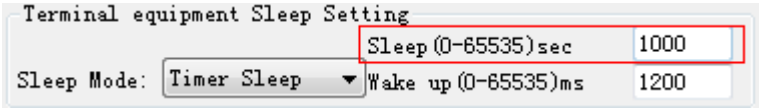
Form	Command	Return
Set	AT+SLE=<Number String>	0K
		ERROR
Query	AT+SLE?	+SLE: Number String OK

Parameter description :

number string ： 0 = no sleep
1 = timer sleep
2 = deep sleep

Default: 0

4.4.2.26 Set the End Device sleep time:AT+STC



Form	Command	Return
Set	AT+STC=<number strings>	0K
		ERROR
Query	AT+STC?	+STC: number strings OK

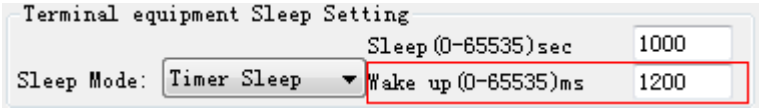
Parameter description :

number string Range: 0～65535 seconds，when AT+SLE =1, set the sleep time

Default:0

Note: When sleep time is zero ,the module doesn't go to sleep.

4.4.2.27 Set the End Device wake time:AT+WTC



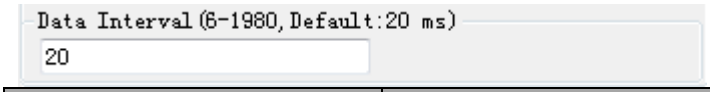
Form	Command	Return
Set	AT+WTC=<number strings>	0K
		ERROR
Query	AT+WTC?	+WTC: number strings OK

Parameter description :

number string Range: 0～65535 millisecond，when AT+SLE =1, set the wake time

Default:0

4.4.2.28 Set the Data Interval:AT+ITV



Form	Command	Return
Set	AT+ITV=<number strings>	0K
		ERROR
Query	AT+ ITV?	+ ITV: number strings OK

Parameter description :

number string Range: 6-1980 millisecond

Default:20

Note: Data Interval is used to judge if the serial has recived the data . If data interval greater than the setting ,the program will process the serial data. The lower baudrate ,the longer data interval.

4.4.2.29Query the bootload version :AT+BTL

Form	Command	Return
Execute	AT+BTL	Four-Faith Zigbee BootLoad Ver: V1.01

4.4.2.30 Set device work mode：AT+MOD

Form	Command	Return
Set	AT+ MOD =<Number String>	0K
		ERROR
Query	AT+ MOD?	+ MOD: Number String OK

Parameter description :

number string ： 0 = Transparent Mode
1 = AT command Mode
2 = API mode

Default: 0

Attention: The command set device start up work mode,when configure and save ,it need restart.

4.4.2.31 Other execute command

Command	Return	Description
AT+SAV Save	OK	Save parameters
AT+ESC Escape	OK	Escape AT command mode Then enter transparent mode
AT+API	OK	Enter API mode
AT+FAC Factory	OK	Factory
AT+SRS Restart	OK	Restart

Note: every configure item is set, it should send save command.

4.4.3 API mode

API operation requires that communication with the module be done through a structured interface (data is communicated in frames in a defined order). The API specifies how
commands, command responses and module status messages are sent and received from the

module using a UART Data Frame.

To enter API mode :

- In the transparent mode，send the 3-character command sequence“= = =”twice through serial port.
- In the AT command mode，send “AT+API<CR><LF>” through serial port.

The UART data frame structure is defined as follows:

SOF	Length	Command	Frame data	Frame check sequence
1 Byte	1 Byte	2 Bytes	xx Bytes (xx<250)	1 Byte

SOF (Start of Frame): This is a one byte field with value equal to 0xFE that defines the start of each general serial packet.

Length : 1 byte length of the actual data.

Command : 2 byte command Id.

Frame data : the data ranging from 0-250 bytes.

FCS (Frame Check Sequence):

This is a one byte field that is used to ensure packet integrity. This field is computed as an XOR of all the bytes in the message starting with LEN field and through the last byte of data. The following is a sample code FCS calculation:

```
unsigned char calcFCS(unsigned char *pMsg, unsigned char len)
{
    unsigned char result = 0;
    while (len--)
    {
        result ^= *pMsg++;
    }
    return result;
}
```

Attention : The data content should be send with little-endian, the lowest byte come first.

1: SREQ: A synchronous request that requires an immediate response. For example, a function call with a return value would use an SREQ command.

2: AREQ: An asynchronous request. For example, a callback event or a function call with no return value would use an AREQ command.

3: SRSP: A synchronous response. This type of command is only sent in response to a SREQ command. For an SRSP command the subsystem and ID are set to the same values as the corresponding SREQ. The length of an SRSP is generally nonzero, so an SRSP with length=0 can be used to indicate an error.

4.4.3.1 data send command

SREQ:

Fields	Sub field	Offset	Example	Description
SOF		1	FE	0xFE
Length		1	06	The length of data
Command	Send	2	24 5F	Fixed to 24 5F
Data	Destination	2	00 00	Destination node address
	Content	<80	41 41 41 41	The content to be send
FCS		1	7D	Frame check sequence

SRSP:

Fields	Sub field	Offset	Example	Description
SOF		1	FE	0xFE
Length		1	01	The length of data
Command	Send	2	64 5F	Fixed to 64 5F
Data	State	1	00	00 = success, Others = error
FCS		1	3A	Frame check sequence

4.4.3.2 data recive command

AREQ

Fields	Sub field	Offset	Example	Description
SOF		1	FE	0xFE
Length		1	06	The length of data
Command	Recive	2	44 5F	Fixed to 24 5F
Data	Source	2	10 0E	The sender node address（little-endian）
	Content	<80	41 41 41 41	The content to be recived
FCS		1	03	Frame check sequence

4.4.3.3 Set the node current operating mode

SREQ :

Fields	Sub field	Offset	Example	Description
SOF		1	FE	0xFE
Length		1	01	The length of data

Command	Set	2	21 2A	Fixed to 21 2A
Data	Mode	1	00	00 = transparent mode 01 = AT command mode 02 = API mode
FCS		1	0A	Frame check sequence

SRSP

Fields	Sub field	Offset	Example	Description
SOF		1	FE	0xFE
Length		1	01	The length of data
Command	Set	2	61 2A	Fixed to 61 2A
Data	State	1	00	00 = success, Others = error
FCS		1	4A	Frame check sequence

4.4.3.4 OTA IO pin data acquisition

SREQ

Fields	Sub field	Offset	Example	Description
SOF		1	FE	0xFE
Length		1	04	The length of data
Command	Send	2	24 5E	Fixed to 24 5E
Data	Destination	2	10 0E	Destination node address
	Read command	1	00	Fixed to 00
	IO pin address	1	02	IO pin address(00 - 02)
FCS		1	62	Frame check sequence

SRSP

Fields	Sub field	Offset	Example	Description
SOF		1	FE	0xFE
Length		1	01	The length of data
Command	Send	2	64 5E	Fixed to 64 5E
Data	State	1	00	00 = success, Others = error
FCS		1	3B	Frame check sequence

AREQ:

Fields	Sub field	Offset	Example	Description
SOF		1	FE	0xFE
Length		1	06	The length of data
Command	send	2	44 5E	Fixed to 44 5E

Data	State	1	00	00 = success, Others = error
	Destination	2	10 0E	Destination node address
	IO pin address	1	02	IO pin addres
	Pin value	n	00 00	Attention : it shows little-endian,such as 12 34,equale to 0x3412
FCS		1	00	Frame check sequence

4.4.3.5 OTA Set remote node IO pin value

Attention : IO pin is set digital output mode.

SREQ:

Fields	Sub field	Offset	Example	Description
SOF		1	FE	0xFE
Length		1	06	The length of data
Command	Send	2	24 60	Fixed to 24 60
Data	Destination	2	10 0E	Destination node address
	Write	1	01	Fixed to 01
	IO pin address	1	02	IO pin address(00 - 02)
	Pin value	1	01 00	Attention : it shows little-endian,such as 01 00,equale to 0x0001
FCS		1	5E	Frame check sequence

SRSP

Fields	Sub field	Offset	Example	Description
SOF		1	FE	0xFE
Length		1	01	The length of data
Command	Send	2	64 60	Fixed to 64 60
Data	State	1	00	00 = success, Others = error
FCS		1	05	Frame check sequence

AREQ:

Fields	Sub field	Offset	Example	Description
SOF		1	FE	0xFE
Length		1	05	The length of data
Command	Send	2	44 60	Fixed to 44 60
Data	Send state	1	00	00 = success, Others = error
	Destination	2	10 0E	Destination node

				address
	IO pin address	1	02	IO pin address(00 - 02)
	Set state	1	00	00 = success, Others = error
FCS		1	3D	Frame check sequence

4.4.3.6 OTA Query MAC address

SREQ

Fields	Sub field	Offset	Example	Description
SOF		1	FE	0xFE
Length		1	03	The length of data
Command	Send	2	24 5D	Fixed to 24 5D
Data	Destination	2	10 0E	Destination node address
	Query command	1	02	Fixed to 02
FCS		1	66	Frame check sequence

SRSP

Fields	Sub field	Offset	Example	Description
SOF		1	FE	0xFE
Length		1	01	The length of data
Command	Send	2	64 5D	Fixed to 64 5D
Data	State	1	00	00 = success, Others = error
FCS		1	38	Frame check sequence

AREQ:

Fields	Sub field	Offset	Example	Description
SOF		1	FE	0xFE
Length		1	0C	The length of data
Command	Send	2	44 5D	Fixed to 44 5D
Data	State	1	00	00 = success, Others = error
	Destination	2	10 0E	Destination node address
	MAC address	8	8B D9 D1 01 00 4B 12 00	Low byte come first
	Node type	1	01	00=coordinator 01=router 02=end device

FCS		1	D1	Frame check sequence

4.4.3.7 OTA Query node address

SREQ

Fields	Sub field	Offset	Example	Description
SOF		1	FE	0xFE
Length		1	09	The length of data
Command	Send	2	24 5C	Fixed to 24 5C
Data	Query command	1	03	Fixed to 03
	MAC address	8	8B D9 D1 01 00 4B 12 00	Low byte come first
FCS		1	A9	Frame check sequence

SRSP:

Fields	Sub field	Offset	Example	Description
SOF		1	FE	0xFE
Length		1	01	The length of data
Command	Send	2	64 5C	Fixed to 64 5C
Data	State	1	00	00 = success, Others = error
FCS		1	39	Frame check sequence

AREQ:

Fields	Sub field	Offset	Example	Description
SOF		1	FE	0xFE
Length		1	0C	The length of data
Command	Send	2	44 5D	Fixed to 44 5D
Data	State	1	00	00 = success, Others = error
	Destination	2	10 0E	Destination node address
	MAC address	8	8B D9 D1 01 00 4B 12 00	Low byte come first
	Node type	1	01	00=coordinator 01=router 02=end device
FCS		1	D1	Frame check sequence

4.4.3.8 OTA Query all node address and MAC address

SREQ:

Fields	Sub field	Offset	Example	Description
SOF		1	FE	0xFE
Length		1	01	The length of data
Command	Send	2	24 5B	Fixed to 24 5B
Data	Query command	1	01	Fixed to 01
FCS		1	7F	Frame check sequence

SRSP:

Fields	Sub field	Offset	Example	Description
SOF		1	FE	0xFE
Length		1	01	The length of data
Command	Send	2	64 5B	Fixed to 64 5B
Data	State	1	00	00 = success, Others = error
FCS		1	3E	Frame check sequence

AREQ:

Fields	Sub field	Offset	Example	Description
SOF		1	FE	0xFE
Length		1	0C	The length of data
Command	Send	2	44 5D	Fixed to 44 5D
Data	State	1	00	00 = success, Others = error
	Destination	2	10 0E	Destination node address
	MAC address	8	8B D9 D1 01 00 4B 12 00	Low byte come first
	Node type	1	01	00=coordinator 01=router 02=end device
FCS		1	D1	Frame check sequence

4.5 End device sleep mode configuration description

F8914 support Timer sleep and Deep sleep

4.5.1 Timer sleep

Function description：

Timer sleep can set the sleep interval,when it wake up,the EndDevice will wake up a centain time then it goes to sleep again. If device works on AT mode ,when it wakes up the

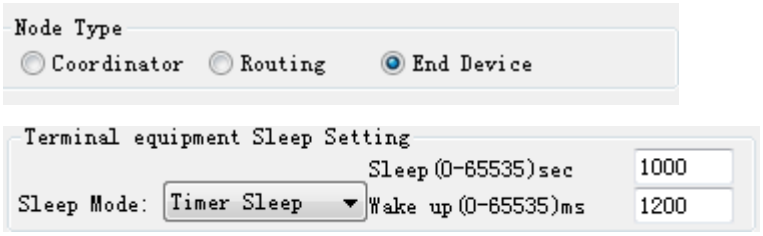
serial port will output '+WAK:1\r\n',when it enters sleep the serial port will output '+WAK:0\r\n'. If device works on API mode , when it wakes up the serial port will output FE 01 41 2B 01 6A',when it enters sleep the serial port will output 'FE 01 41 2B 00 6B'.

After EndDevice waking up, if EndDevice successfully joined in the network IO2 will output low level to indicate online. If EndDevice unsuccessfully joined in the network or went into sleep IO2 will output high level to indicate off-line.

Configuration conditions

(1)Hardware：IO1 must connect to high level (3V ~3.3V).

(2)Software：Devcie should be configured as end device and Timer Sleep.The Interval must be greater than 0.



4.5.2 Deep sleep

Function description：

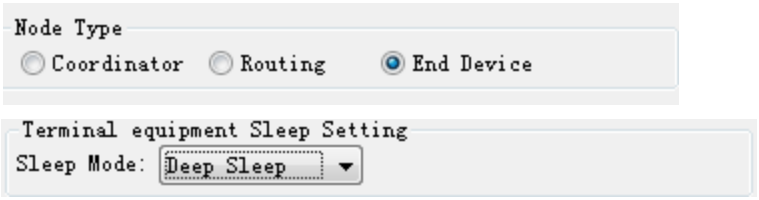
Deep sleep is waked up by extern interrupt. When IO1 is low level ,device not goes to sleep. When IO1 is high level(3V ~3.3V),device goes to deep sleep.

After EndDevice waking up, if EndDevice successfully joined in the network IO2 will output low level to indicate online. If EndDevice unsuccessfully joined in the network or went into sleep IO2 will output high level to indicate off-line.

Configuration conditions

(1) Hardware :Operate on IO1's level.

(2) Software : Devcie should be configured as end device and Deep Sleep.



Note that: 1.When device is not work on sleep mode, IO1,IO2 are used as digital input or output.

2.When device is work on sleep mode,IO1 is reused as extern interrupt.IO2 is reused to indicate on-line or off-line.