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|-----------------------------|-----------------|-----------|
| F8X14 Series User Manual | Product Version | Page |
| | V1.2 | |
| | Product Name: | Total: 51 |

F8X14 Series User Manual

The user manual is suitable for the following model:

| Model | Product Type |
|-------|----------------------------|
| F8114 | ZigBee + GPRS IP MODEM |
| F8214 | ZigBee + CDMA IP MODEM |
| F8314 | ZigBee + EDGE IP MODEM |
| F8414 | ZigBee + WCDMA IP MODEM |
| F8514 | ZigBee + TD-SCDMA IP MODEM |
| F8614 | ZigBee + EVDO IP MODEM |



Xiamen Four-Faith Communication Technology Co., Ltd.

Add: J1-J3,3rd Floor,No.44,GuanRi Road,SoftWare

Park,XiaMen,China

Zip Code:361008

Tel: +86 592-5907276

Fax:+86 592-5912735

<http://en.four-faith.com>




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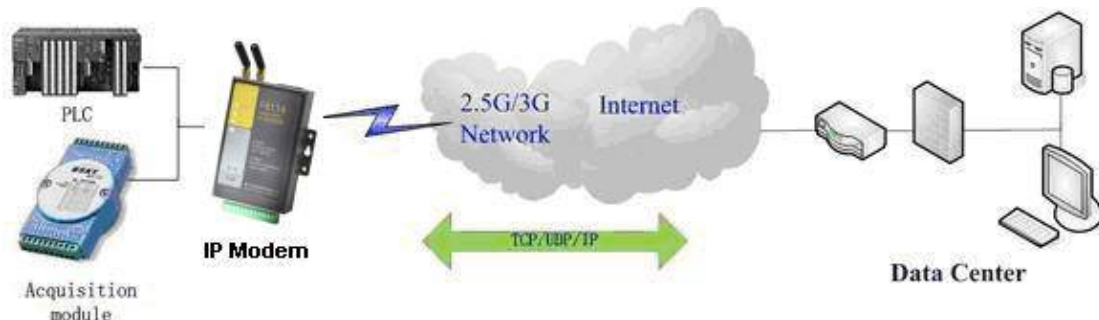
Chapter 1 Brief Introduction of Product

1.1 General

F8X14 IP MODEM is a kind of data terminal device that provides data transfer function by public cellular network and 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 could be lower than 1mA@12VDC. It has compatible digital I/O channel, ADC, input pulse counter and pulse wave output 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.



1.2 Features and Benefits

Design for Industrial Application

- ◆ High-powered industrial cellular module
- ◆ High-powered industrial ZigBee module
- ◆ High-powered industrial 32 bits CPU
- ◆ Support low power consumption mode, including multi-sleep and trigger modes to reduce the power dissipation farthest
- ◆ Embedded Real Time Clock(RTC) circuit which can realize timing online/offline function
- ◆ Housing: iron, providing IP30 protection
- ◆ Power range: DC 5~35V

Stability and Reliability

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- ◆ 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

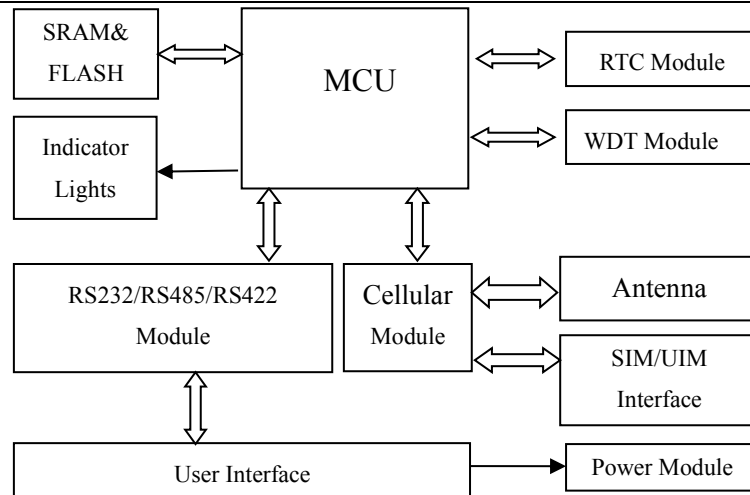
- ◆ Adopt terminal block interface, convenient for industrial application
- ◆ Support standard RS232 and RS485(or RS422) port that can connect to serial devices directly
- ◆ TTL logic level RS232 interface can be customized
- ◆ Support intellectual mode, enter into communication state automatically when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

High-performance

- ◆ Support data transfer by cellular and ZigBee network
- ◆ Support TCP server and support multi TCP client connection(optional)
- ◆ Support double data centers, one main and another backup
- ◆ Supply 5 I/O channels, compatible 2 pulse wave output channels, 2 analog inputs and one pulse input counters.
- ◆ Support multi data centers and it can support 5 data centers at the same time
- ◆ Support multi online trigger ways, including SMS, ring and data. Support link disconnection when timeout
- ◆ Support dynamic domain name(DDNS) and IP access to data center
- ◆ Design with standard TCP/IP protocol stack
- ◆ Support APN/VPDN

1.3 Working Principle

The principle chart of the IP MODEM is as following:



1.4 Specifications

Cellular Specification

F8114 Specification

| Item | Content |
|-------------------|--|
| Cellular Module | Industrial cellular module |
| Standard and Band | EGSM900/GSM1800MHz, GSM850/900/1800/1900MHz(optional) Compliant to GSM phase 2/2+ GPRS class 10, class 12(optional) |
| Bandwidth | 85.6Kbps |
| TX power | GSM850/900: <33dBm GSM1800/1900: <30dBm |
| RX sensitivity | <-107dBm |

F8214 Specification

| Item | Content |
|-------------------|--|
| Cellular Module | Industrial cellular module |
| Standard and Band | CDMA2000 1xRTT 800MHz CDMA800/1900MHz(optional) CDMA450MHz(optional) |
| Bandwidth | 153.6Kbps |
| TX power | <30dBm |
| RX sensitivity | <-104dBm |

F8314 Specification

| Item | Content |
|-------------------|---|
| Cellular Module | Industrial cellular module |
| Standard and Band | GSM850/900/1800/1900MHz GPRS/EDGE Class 12 |

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| | |
|----------------|--|
| Bandwidth | 236.8Kbps |
| TX power | GSM850/900: <33dBm GSM1800/1900: <30dBm |
| RX sensitivity | <-106dBm |

F8414 Specification

| Item | Content |
|-------------------|---|
| Cellular Module | Industrial cellular module |
| Standard and Band | UMTS/WCDMA/HSDPA/HSUPA 850/1900/2100MHz UMTS/WCDMA/HSDPA/HSUPA 850/900/1900/2100MHz(optional) GSM850/900/1800/1900MHz GPRS/EDGE CLASS 12 |
| Bandwidth | HSUPA: 5.76Mbps / HSDPA: 7.2Mbps /UMTS: 384Kbps (DL/UL) |
| TX power | <24dBm |
| RX sensitivity | <-109dBm |

F8514 Specification

| Item | Content |
|-------------------|--|
| Cellular Module | Industrial cellular module |
| Standard and Band | TD-SCDMA/HSDPA/HSUPA 1880-1920/2010-2025MHz GSM850/900/1800/1900MHz GPRS/EDGE CLASS 12 |
| Bandwidth | 2.8Mbps(down), 2.2Mbps(up) |
| TX power | <24dBm |
| RX sensitivity | <-108dBm |

F8614 Specification

| Item | Content |
|-------------------|---|
| Cellular Module | Industrial cellular module |
| Standard and Band | CDMA2000 1X EVDO Rev A 800MHz CDMA2000 1X EVDO Rev A 800/1900MHz (optional) CDMA2000 1X EVDO Rev A 450MHz (optional) IS-95 A/B 、CDMA2000 1xRTT |
| Bandwidth | 3.1Mbps(down), 1.8Mbps(up) |
| TX power | <23dBm |
| RX sensitivity | <-104dBm |

ZigBee Specification

| Item | Content |
|--------------------------|----------------------------------|
| ZigBee Chip | Industrial ZigBee Chip |
| Standard and Band | IEEE 802.15.4 ISM 2.4 ~2.5GHz |
| Indoor/Urban Range | 30m 90m(With PA) |
| Outdoor/RF Line-of-Sight | 500m |

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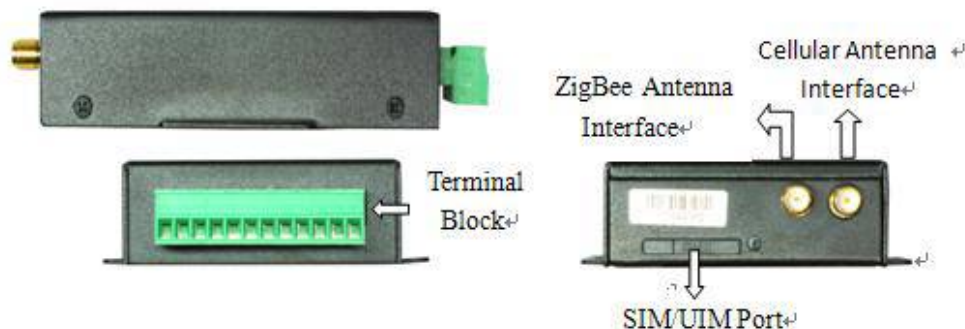
| | |
|----------------------|--|
| Range | 2000m(With PA) |
| Transmit Power | 2.82mw(+4.5dBm) 100mw(+20dBm) (With PA) |
| Bandwidth | 250Kbps |
| Receiver Sensitivity | -97dBm -103dBm(With PA) |
| Network Topologies | Point-to-Point, Point-to-Multipoint, Peer-to-Peer and Mesh |
| Number of channels | 16 Direct Sequence Channels |
| Channels | 11 to 26 |

Hardware System

| Item | Content |
|-------|------------------------|
| CPU | Industrial 32 bits CPU |
| FLASH | 2MB(Extendable) |
| SRAM | 512KB(Extendable) |

Interface Type

| Item | Content |
|-----------|---|
| Serial | 1 RS232 port and 1 RS485(orRS422) port, 15KV ESD protection Data bits: 5, 6, 7, 8 Stop bits: 1, 1.5, 2 Parity: none, even, odd, space, mark Baud rate: 110~230400 bps |
| Indicator | "Power", "ACT", "Online", "ZigBee" |
| Antenna | Cellular: Standard SMA female interface, 50 ohm GPS: Standard SMA female interface, 50 ohm lighting protection(optional) |
| SIM/UIM | Standard 3V/1.8V user card interface, 15KV ESD protection |
| 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 |
|------------------|-------------------------------|
| Communication | 50-80mA@12VDC; 115-150mA@5VDC |
| Standby | 20mA@12VDC; 35mA@5VDC |
| Sleep | 8mA@12VDC; 18mA@5VDC |
| Timing Power Off | 0.6mA@12VDC; 1mA@5VDC |

Physical Characteristics

| Item | Content |
|------------|---------------------------------|
| Housing | Iron, providing IP30 protection |
| Dimensions | 91x58.5x22 mm |
| Weight | 210g |

Environmental Limits

| Item | Content |
|--------------------------------|------------------------|
| Operating Temperature | -25~+65°C (-13~+149°F) |
| Extended Operating Temperature | -30~+75°C (-22~+167°F) |
| Storage Temperature | -40~+85°C (-40~+185°F) |
| Operating Humidity | 95% (Non-condensing) |

Chapter 2 Installation Introduction

2.1 General

The IP MODEM must be installed correctly to make it work properly.

Warning: Forbid to install the IP MODEM when powered!

2.2 Encasement List

| Name | Quantity | Remark |
|---------------------|----------|----------|
| IP MODEM host | 1 | |
| 2.4G ZigBee Antenna | 1 | |
| Cellular Antenna | 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)

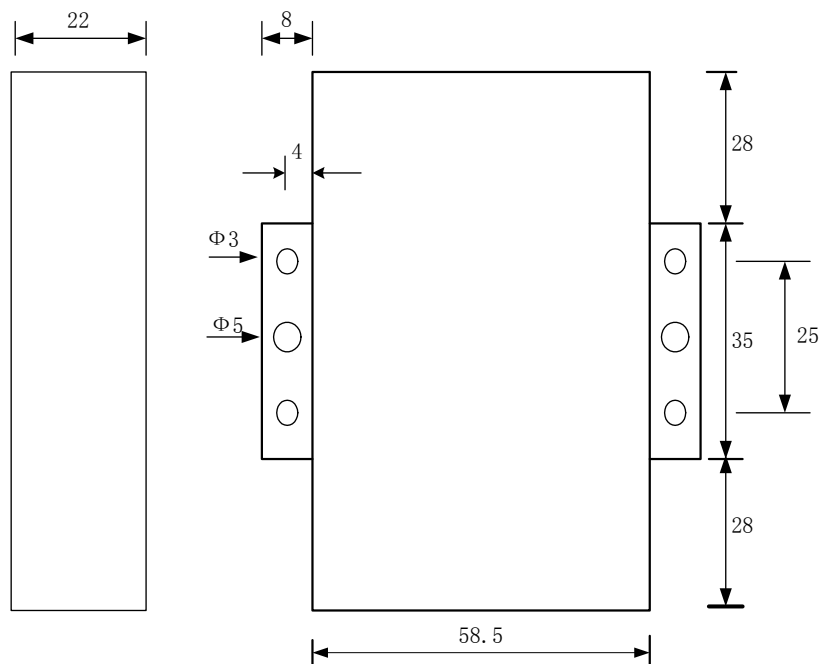


Figure 2-1 Installation Chart

Installation of SIM/UM card:

Firstly power off the IP MODEM, and press the out button of the SIM/UM card outlet with a needle object. Then the SIM/UM card sheath will flick out at once. Put SIM/UM card into the card sheath (Pay attention to put the side which has metal point outside), and insert card sheath back to the SIM/UM card outlet.

Warning: Forbid to install SIM/UM card when powered!

Installation of antenna:

Screw the SMA male pin of the antenna to the female SMA outlet of the IP MODEM tightly. Warning: The antenna must be screwed tightly, or the signal quality of antenna will be influenced!

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 | GPIO | Reserved compatible DCD |

| | | | |
|----|-----|------|---|
| 11 | IO4 | GPIO | Reserved compatible RI,ADC, and pulse output |
| 12 | IO5 | GPIO | Reserved compatible pulse wave input counter, ADC, and pulse output |



Installation of cable:

F8X14 adopts industrial terminal block interface. The recommendatory cable is 28-16AWG. The detail description of standard layout adapter and communication cables as is following:

Adapter (Rating Output 12VDC/0.5A):

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

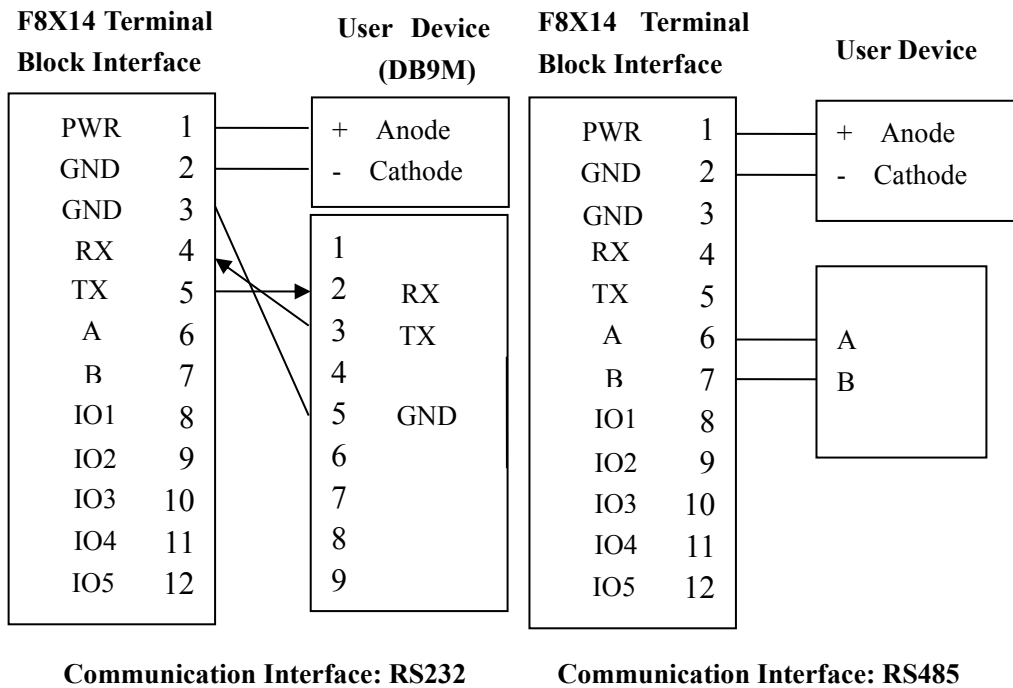
RS232 Cable:

| 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:



2.4 Power

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

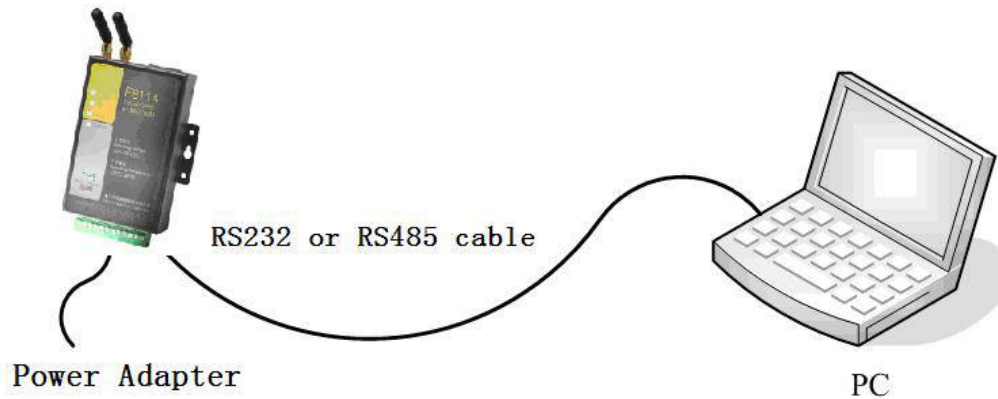
The IP MODEM provides three indicator lights: “Power”, “ACT”, “Online”.

| Indicator Light | State | Introduction |
|-----------------|-------|-----------------------------------|
| Power | ON | IP MODEM is powered on |
| | OFF | IP MODEM is powered off |
| ACT | BLINK | Data is communicating |
| | OFF | No data |
| Online | ON | IP MODEM has logged on network |
| | OFF | IP MODEM hasn't logged on network |
| ZigBee | ON | ZigBee Transport data |
| | OFF | No data |

Chapter 3 Configuration

3.1 Configuration Connection

Before configuration, It's necessary to connect the IP MODEM with the configure PC by the shipped RS232 or RS232-485 conversion cable as following.



3.2 Configuration Introduction

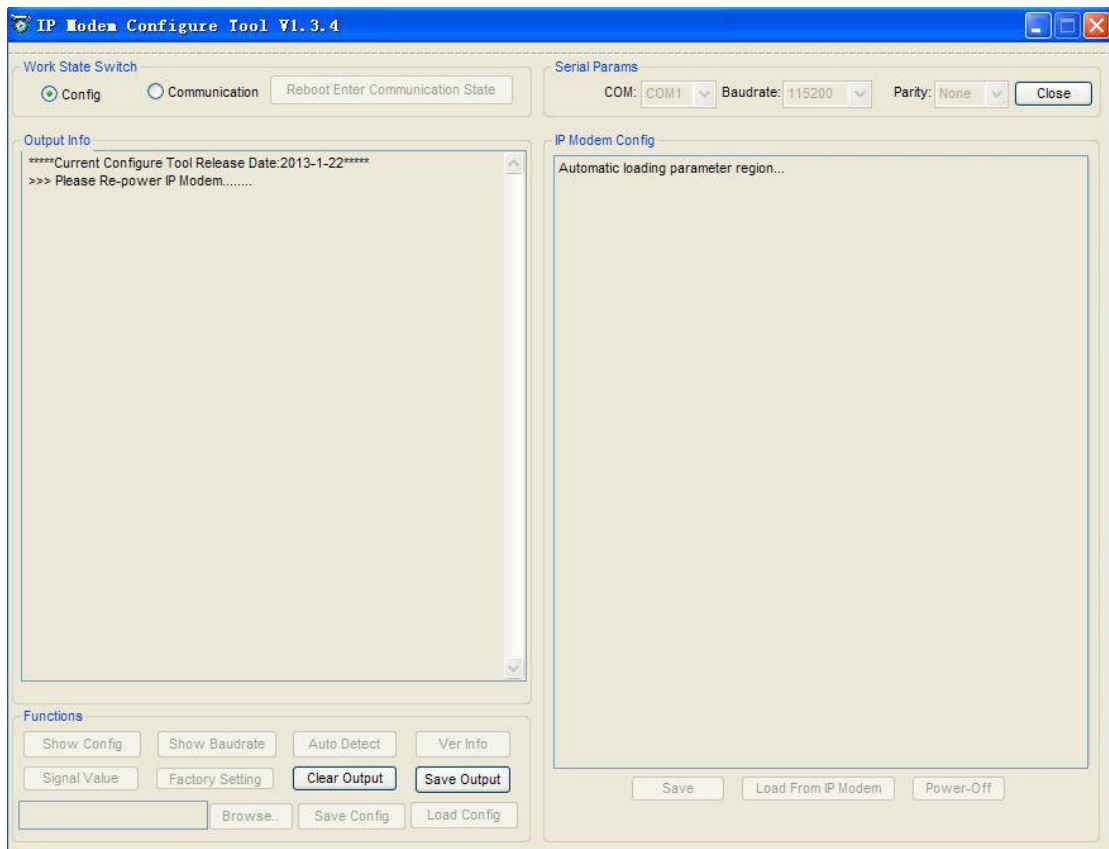
There are two ways to configure the IP MODEM:

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 extended AT command, you should make IP MODEM enter configure state. The steps how to make IP MODEM enter configure state, please refer to appendix.

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

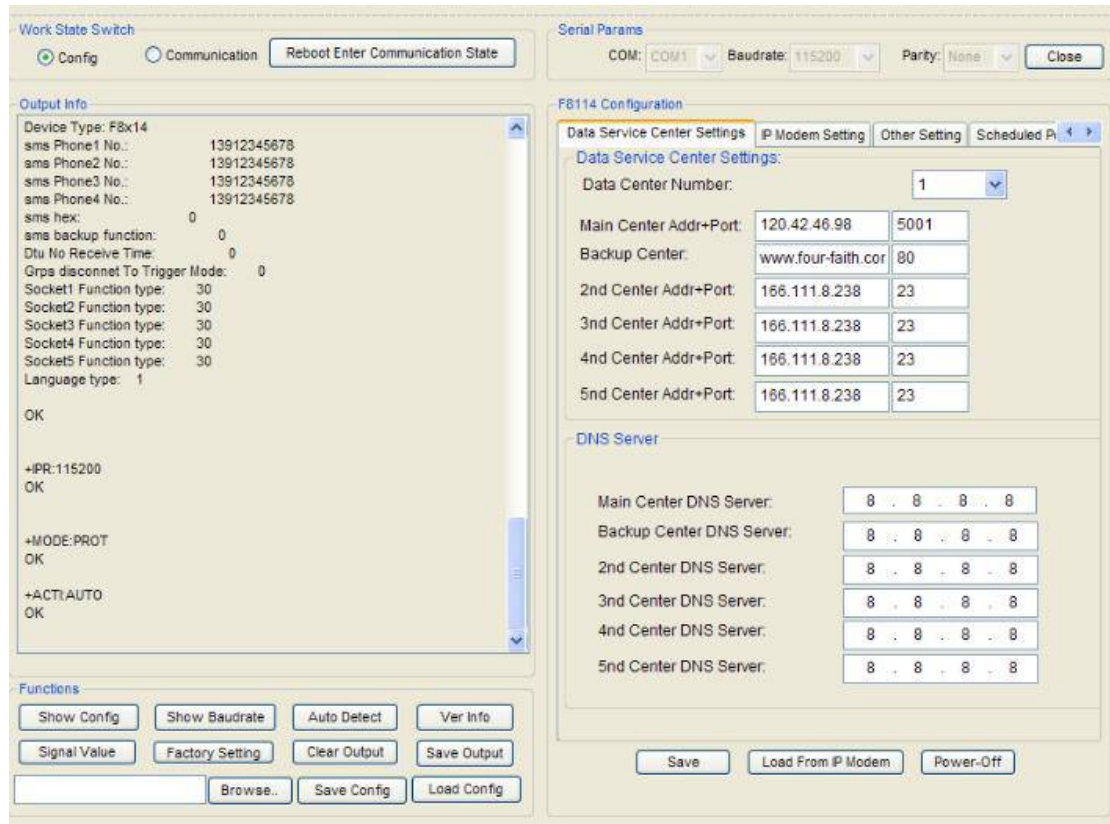
3.3 Run the configure Tool: IP Modem Configure.exe



The “Serial Parameters” column shows the current serial port settings. To configure IP MODEM, please choose the correct serial port which connects to IP MODEM, and the baud-rate is 115200 with no parity, 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 the port opened, the “Output Info” column will display

“Port(COM1) Has Opened, Please Re-Power the IP MODEM,
Waiting IP MODEM Enter Configure State...”

3.4 Re-power IP MODEM



After Re-power IP MODEM, The configure tool will make it enter configure state. At the same time, the software will load current settings from IP MODEM and displays on the right configure columns. It's now ready to configure.

3.5 Configuration(F8114 for example)

3.5.1 Data Service Center Settings

Settings on this page are the parameters related to Data Service Center (DSC).

◆Data Center Number

IP MODEM support two Data Service Center methods to transmit data.

Main and Backup: IP MODEM always tries to connect with the Main DSC. If fails to connect with Main DSC, it will connect with Backup DSC at once

Attention: If no Backup DSC exists, please configure the Backup DSC same as Main DSC.

Multi Data Service Center: IP MODEM can connect with at most five DSC at the same time.

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All the multi DSC can receive the same application data .

| | | |
|---------------------|---|---|
| Data Center Number: | 1 | ▼ |
|---------------------|---|---|

If the Data Center Number is 0, there is no DSC working. If the Data Center Number is 1, IP MODEM work in Main and Backup DSC method. When “Data Center Number” is greater than 1, IP MODEM works in Multi Data Service Center method.

AT command:

AT+SVRCNT=x

x: Data Service Center number, 1~5.

Attention: Every AT command is terminated with a enter character!

◆ Main Center Addr+Port:

IP Address and Port of the Main DSC, It's better to set the port greater than 1024.

| | | |
|------------------------|--------------|------|
| Main Center Addr+Port: | 120.42.46.98 | 5001 |
|------------------------|--------------|------|

AT command of the Main DSC IP address or domain name:

AT+IPAD=xxx

xxx: The IP address or domain name.

AT command of the Main DSC port:

AT+PORT=xxx

xxx: The port value

◆ Backup Center Addr+Port:

IP address and port of the Backup DSC

| | | |
|----------------|--------------------|----|
| Backup Center: | www.four-faith.cor | 80 |
|----------------|--------------------|----|

AT command of the Backup DSC IP address or domain

AT+IPSEC=xxx

xxx: The IP address or domain name

AT command of the Backup DSC port

AT+PTSEC=xxx

xxx: The port value

◆ Multi DSC Configuration

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| | | |
|-----------------------|---------------|----|
| 2nd Center Addr+Port: | 166.111.8.238 | 23 |
| 3rd Center Addr+Port: | 166.111.8.238 | 23 |
| 4nd Center Addr+Port: | 166.111.8.238 | 23 |
| 5nd Center Addr+Port: | 166.111.8.238 | 23 |

When “Data Center Number” is greater than 1, this setting is valid. For example , setting the “Data Center Number” as 3, Main Center, 2nd Center, 3rd Center work as these three DSC

AT Command of the 2~5 DSC IP address or domain name

AT+IPADn=xxx

n is 1~4 correspond to center 2~5

xxx: The IP address or domain name

AT Command of the 2~5 DSC port

AT+PORTn=xxx

n is 1~4 correspond to port of center 2~5

xxx: The port value

Example:

Set IP address of center 3 as 166.111.8.238, and port 5001, the AT command is as following:

AT+IPAD2=166.111.8.238

AT+PORT2=5001

◆ Main and Backup Center DNS Server

| | |
|---------------------------|---------------|
| Main Center DNS Server: | 8 . 8 . 8 . 8 |
| Backup Center DNS Server: | 8 . 8 . 8 . 8 |

When the DSC Internet access uses domain name, It’s necessary to set DNS server resolving the DSC domain name. When the Data Center Number is 1, Main and Backup Center DNS Server is used to resolve the Main center and Backup center correspondingly.

AT command of Main Center DNS server:

AT+DNSSVR=aaa.bbb.ccc.ddd

aaa.bbb.ccc.ddd: The DNS server IP address(must be IP address) .

AT command of Backup Center DNS server:

AT+DNSSV2=aaa.bbb.ccc.ddd

aaa.bbb.ccc.ddd: the DNS server IP address

◆ Center 2~5 DNS Server

When the IP MODEM work in Multi Data Service Center method and the centers use domain name, 2~5 DNS server is used to resolve center 2~5 correspondingly.

| | |
|------------------------|---------------|
| 2nd Center DNS Server: | 8 . 8 . 8 . 8 |
| 3rd Center DNS Server: | 8 . 8 . 8 . 8 |
| 4nd Center DNS Server: | 8 . 8 . 8 . 8 |
| 5nd Center DNS Server: | 8 . 8 . 8 . 8 |

AT command of 2~5 DNS Server

AT+DNSSVRn=aaa.bbb.ccc.ddd

n is 1~4 correspond to center 2~5 DNS server.

aaa.bbb.ccc.ddd is the DNS server IP address

3.5.2 IP MODEM Settings

◆ IP MODEM WorkMode

| | |
|-----------|------|
| WorkMode: | PROT |
|-----------|------|

According to different application requirements, there are several protocol workmode to choose.

PROT: Heartbeat packet with TCP protocol, Data transmission with TCP protocol, heartbeat packet and application data transmission are in the same TCP connection.

TRNS: IP MODEM work as a common GPRS MODEM, It can be used in SMS, CSD, Dial-up applications.

TTRN: Heartbeat packet with UDP protocol, Data transmission with TCP protocol

TLNT: IP MODEM work as a telnet client

LONG: Heartbeat packet with UDP protocol, Data transmission with TCP protocol, It can transmit at most 8192 bytes data one time through extra application protocol.

LNGT: Heartbeat with UDP protocol, Data transmission with TCP protocol, It can transmit at most 8192 bytes data one time through extra application protocol.

TCST: User can set custom register and heartbeat string, Data transmission with TCP protocol.

TCPSVR: No heartbeat packet or register packet in the same TCP connection.

SUDP: User can set custom register and heartbeat string, Data transmission with UDP protocol, Heartbeat packet and application data are in the same UDP connection.

PUDP: No heartbeat packet or register packet in the same UDP connection.

AT command:

AT+MODE=xxxx

xxxx: one of the above workmode

◆ Trigger Type

Trigger Type(Default Auto):

Normally, IP MODEM always keeps online and always be ready for data transmission. But in some circumstances, it's important to reduce wireless data flow. To realize this function, the software can makes IP MODEM into sleep state in idle time. When there is application data to transmit, IP MODEM can be triggered online ready for data transmission. There are total five methods to make IP MODEM online:

AUTO: IP MODEM always keeps online

SMSD: send a special short message to make IP MODEM online

CTRL: make IP MODEM online through a phone call to IP MODEM

DATA: send special serial data to make IP MODEM online

MIXD: the combination of SMSD, CTRL, DATA. IP MODEM will be online when meet one of these three trigger methods.

AT Command:

AT+ACTI=xxxx

xxxx: one of the above trigger methods

◆ Disconnect to Trigger Mode

Disconnect to Trigger Mode:

If the Trigger Type is not **AUTO** and the Disconnect to Trigger Mode is enable, the modem will go to trigger mode when the modem disconnect to the server.

AT Command:

AT+ISTRIGMODE=x

x = 0/1

0: Disable disconnect to Trigger Mode

1: Enable disconnect to Trigger Mode

◆ Debug Level

Debug Level(0/1/2):

Debug information is used to debug software when there is software problem.

0 --- no debug information output

- 1 --- simple prompt information output
- 2 --- detail debug information output

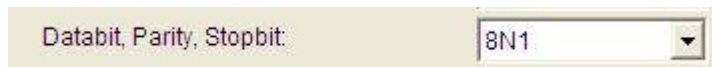
AT Command:

AT+DEBUG=x

x : the debug level value

Attention: Only there is some problem to the IP MODEM, It's necessary to set this value as 2, In normal applications, this value should set to 0 or 1, the default value is 1.

◆ Databit, Parity, Stopbit



- 8N1 --- 8 Databit, No parity, 1 Stopbit
- 8E1 --- 8 Databit, Even parity, 1 Stopbit
- 8O1 --- 8 Databit, Odd parity, 1 Stopbit
- 7O1 --- 7 Databit, Odd parity, 1 Stopbit
- 7E1 --- 7 Databit, Even parity, 1 Stopbit
- 7N1 --- 7 Databit, No parity, 1 Stopbit
- 8N2 --- 8 Databit, No parity, 2 Stopbit
- 8E2 --- 8 Databit, Even parity, 2 Stopbit
- 8O2 --- 8 Databit, Odd parity, 2 Stopbit
- 7O2 --- 7 Databit, Odd parity, 2 Stopbit
- 7E2 --- 7 Databit, Even parity, 2 Stopbit
- 7N2 --- 7 Databit, No parity, 2 Stopbit

AT Command:

AT+SERMODE=xxx

xxx: one of the above serial mode

◆ Communication Baudrate



- 110 --- 110 bps
- 300 --- 300 bps
- 600 --- 600 bps
- 1200 --- 1200 bps
- 2400 --- 2400 bps
- 4800 --- 4800 bps
- 9600 --- 9600 bps
- 14400 --- 14400 bps
- 19200 --- 19200 bps

| | | |
|--------|-----|------------|
| 38400 | --- | 38400 bps |
| 56000 | --- | 56000 bps |
| 57600 | --- | 57600 bps |
| 115200 | --- | 115200 bps |

AT Command:

AT+IPR=xxx

xxx : one of the above baudrate

◆ Offline detect interval

Offline detect interval:

When the modem is online, if the modem has not received any data from server or serial for offline detect interval, the modem will offline itself. But if the offline detect interval is 0, the modem will not offline anymore.

AT Command:

AT+DTUNORECMINU=x

x= 0~65535 (Unit: Minute)

◆ Auto Back To Main Server

Auto Back To Main Server: 
(1/0-Yes/No)

0 --- No

1 ---Yes

This item is only valid when you set “Data Center Number” as 1. In this mode, IP MODEM will switch to backup center when main center have problems. If this item is set to 1 , IP MODEM will check whether the main center work fine timely. When it detects the main server work fine, it will return back to the main server at once.

AT Command:

AT+RETMMAIN=x

x : 0 or 1

◆ Device ID

Device ID(8 Bytes Hex-Decimal):

The identity number of IP MODEM, the value should be 8 bytes hex-decimal characters.

AT Command:

AT+IDNT=aabbccdd

aabbccdd: the identity number of IP MODEM

◆ SIM Card No

SIM Card No(11 Bytes):

The phone number of the SIM card .

AT Command:

AT+PHON=xxxxxxxxxx

xxxxxxxxxx: the SIM card phone number

◆ Bytes Interval

Bytes Interval(Default 20ms):

The time interval used to determine whether the serial data frame transmission has completed, IP MODEM will send the serial data to the center when two bytes transmit time interval larger than this item value.

AT Command:

AT+BYTEINT=xxx

xxx: bytes interval time value (millisecond)

◆ Custom Register String

Custom Register String:

This item is only valid when the WorkMode is TCST. It's the self defined register string. It can be empty, the maximum length is 70 bytes.

AT Command:

AT+CONNRGST=xxx

xxx: self defined register string

◆ Custom Heartbeat String

Custom Heartbeat String:

This item is only valid when the WorkMode is TCST. It's the self defined heartbeat string, It can

be empty, the maximum length is 70 bytes.

AT Command:

AT+LINKRGST=xxx

xxx: self defined heartbeat string

Connect Retry Times, Reconnect Time Interval

| | |
|-------------------------------|------|
| Connect Retry Times(2-65535): | 8640 |
| Reconnect Time | 10 |

In normal applications, IP MODEM will always try to connect with the center even if the center has problems or closed. To reduce these unnecessary wireless data flow, you can configure the “Connect Retry Times” and “Reconnect Time Interval” items. When IP MODEM fail to connect to the center with the configured Retry Time, It will sleep “Reconnect Time Interval” time, then start next retry.

“Connect Retry Times” AT Command:

AT+RETRY=xxx

xxx: times try to connect to the center

“Reconnect Time Interval” AT Command:

AT+RDLWT=xxx

xxx: the sleep time until next retry.

◆ Transfer meaning

| | |
|-------------------------------|---|
| Transfer Meaning(0/1-Yes/No): | 0 |
|-------------------------------|---|

0 --- Yes, enable transfer meaning

1 --- No, disable transfer meaning

This item is only valid when the WorkMode is PROT. If this item is set to 0, IP MODEM will transfer meaning to 0xfd and 0xfe. To know detail transfer meaning method, please refer <<IP MODEM Transfer Meaning Explanation In the PROT work mode>>. If this item is set to 1, all the transmission is transparent.

AT Command:

AT+STRAIGHT=x

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x: 0 or 1

3.5.3 Other Settings

◆ Network

| | |
|--------------|----------|
| APN: | cmnet |
| Username: | |
| Password: | |
| Call Center: | *99***1# |

APN: access point name.

Username: username to login the ISP network.

Password: password to login the ISP network

Call Center: the call center phone number

| Model | APN | Username and password | Call center |
|-------|-------|-----------------------|-------------|
| F8114 | Cmnet | null | *99***1# |
| F8214 | null | card | #777 |
| F8314 | cmnet | null | *99***1# |
| F8414 | 3gnet | null | *99# |
| F8514 | cmnet | null | *98*1# |
| F8614 | null | card | #777 |

AT Command of APN:

AT+APN=xxxx

xxxx: access point name

AT Command of Username:

AT+USERNAME=xxx

xxx: username

AT Command of Password:

AT+PASSWORD=xxx

xxx: password

AT Command of Call Center:

AT+CEN=xxx

xxx: call center phone number of ISP

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◆ SMS Center

SMS Center:

Your local SMS center number

AT Command:

AT+SMSC=xxx

xxx: your local SMS center number

◆ Heartbeat Interval

Heartbeat Interval(31 ~ 65535):

60

Time interval sent heartbeat packet. (unit is second)

AT Command:

AT+POLLTIME=xxx

xxx: heartbeat packet time interval

◆ Call Trigger Phone No

Call Trigger Phone No:

This item is only valid when the “Trigger Type” is CTRL or MIXD. In this trigger type, IP MODEM will keeps in idle state until it receives the trigger phone call, then it will connect to the center.

AT Command:

AT+CTRLNO=xxx

xxx : trigger phone number

◆ SMS Trigger Password

SMS Trigger Password(4 Bytes):

This item is valid only when the “Trigger Type” is SMSD or MIXD, IP MODEM will keeps in idle state until it receives the trigger short message, Then it will connect to the center.

AT Command:

AT+SMSDPSWD=xxx

xxx : SMS content to trigger IP MODEM online

◆ Data Trigger Password

| | |
|----------------------------|-----------------------------------|
| Data Trigger On Password: | <input type="text" value="don"/> |
| Data Trigger Off Password: | <input type="text" value="doff"/> |

This item is valid only when the “Trigger Type” is DATA or MIXD, IP MODEM will keeps in idle state until it receives the trigger on data, then it will connect to the center, It will return to the idle state when receives trigger off data.

AT Command of Data Trigger On Password:

AT+DONPSWD=xxx

xxx : data trigger on password

AT Command of data trigger off password:

AT+DOFFPSWD=xxx

xxx :data trigger off password

◆ TCP MTU

| | |
|--------------------------|-----------------------------------|
| TCP MTU(256-1450 Bytes): | <input type="text" value="1450"/> |
|--------------------------|-----------------------------------|

The maximum transmission unit of TCP packet

AT Command:

AT+TCPMTU=xxx

xxx : the MTU value

◆ Multi Center Reconnect Interval

| | |
|----------------------------------|---------------------------------|
| Multi Center Reconnect Interval: | <input type="text" value="90"/> |
|----------------------------------|---------------------------------|

This item is valid only when the “Data Center Number” is greater than 1.

When one of the configured data center lost connection, IP MODEM will try to reconnect after the configured reconnect interval

AT Command:

AT+MCONTIME=xxx

xxx : reconnect time interval (unit is second)

◆ SMS Configure

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SMS configure function:

The SMS configure function should be set **Enable** if you want to configure the para of IP MODEM by means of sms. The specific format of the configure message is in the part of [3.6 SMS Config Setting](#).

AT Command:

AT+SMSCF=x

x = 0/1 0: Disable SMS configure function

 1: Enable SMS configure function

Example: AT+SMSCF=1

SMS configure password:

AT Command:

AT+SMSCPW=xxx

xxx: SMS configure password.(Max length is 6)

Example: : AT+SMSCPW=123456

3.5.4 Scheduled Power On/Off Setting

◆ RTC(Real Time Clock) Time Setting

RTC timeset: 2012/08/10 11:43:41

Click "Set" to ensure the setting

AT Command:

AT+EXCCLK="yyyy/mm/dd,HH:MM:SS",W

For example:

If the current time is at 12:30 on September 1st,2010, Wednesday, the corresponding at command:

AT+EXCCLK="2010/09/01,12:30:00",3

3.5.5 ZigBee Setting

1、 It is quite straight-forward to configure your F8X14 devices into a full-mesh-capable device.

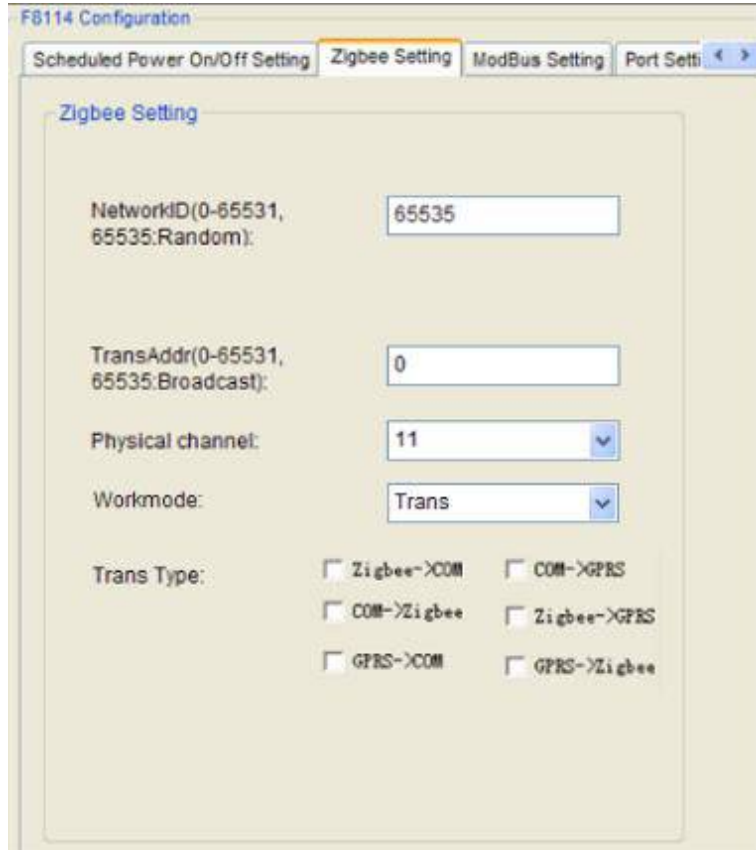
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- You should prepare to setup every node with the following common configurations:
- An identical RF Channel
 - An identical MAC Layer Network Identifier (from 0 to 65531, 65535: Random)
- Now provision a unique MAC Node Identifier into each module. The unique Node Identifier can be selected from the range of 0 to 65531, 65535: Random . Note that Node 0 in a full mesh network does not have any supremacy over other nodes any more. A full mesh network can operate even without Node 0.
 - Turning on devices: For a full mesh network, devices can be turned on at any arbitrary order.
 - Validating connection: you can via any node to start querying the entire crew in the network.



F8114 Setting Space

◆ NetworkID Setting

The Device has Same Network ID can work in the same Mesh Network.

AT Command:

AT+PID=n

n = 0~65531, 65535: Random



◆ Transparent Addr Setting

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TransAddr(0-65531, 65535:Broadcast):

AT Command:

AT+TID =n

n = 0~65531, 65535:Broadcast

Command “AT+TID =65535” means the message transfer with broadcasting mode.

◆ Workmode Setting

Workmode:

Sets of Transfer mode of device.

The information of Trans mode is Transparent transmission.

API mode has protocol format.

AT mode, configuration and sending data by AT command.

AT Command:

AT+ZTXXTYPE=n

n=0/1/2. 0: Trans

1: API (Data format see appendix a)

2: AT

◆ Physical Channel Setting

Physical channel:

AT Command:

AT+CHA=n

n = 11~26

◆ Trans Type Setting

There are six directions for data transferring as follows,

- (1)Zigbee to COM, data from Zigbee module will transfer to serial port
- (2)COM to Zigbee, data from serial port will transfer to Zigbee module
- (3)GPRS to COM, data from remote center will transfer to serial port
- (4)COM to GPRS, data from serial port will transfer to remote center
- (5)Zigbee to GPRS, data from Zigbee module will transfer to remote center
- (6)GPRS to Zigbee, data from remote center will transfer to Zigbee module

AT Command:

AT+ZDATCHAN=dir

Tab3.1 zigbee transfer direction

| dir | description |
|-----|-------------|
| 0 | NONE |
| 1 | Zigbee->COM |

| | |
|--------------------------|--------------|
| 2 | COM->Zigbee |
| 4 | GPRS->COM |
| 8 | COM->GPRS |
| 16 | Zigbee->GPRS |
| 32 | GPRS->Zigbee |
| 255 | ALL |
| dir default value is 255 | |

3.5.6 ModBus Setting

◆ Modbus work mode

ModBus work mode:

When the modbus's work mode is NetworkRTU, the IP MODEM can distinguish the modbus data sent from server. The modem will gather the data or set the state of port according to the modbus commomd consisted in the data. Then the modem will tranfer the result in modbus protocol form to the server.

AT Command:

AT+MBMODE=x

x = 0/1

0 : Disable MODBUS

1 : Network RTU

◆ Modbus address

ModBus address<1-247>:

ModBus address represents the MODBUS device address of IP MODEM itself. The server will find the modem on the basis of this address. Modbus address will work when the Modbus Work mode is Network RTU.

AT Command:

AT+MBADDRESS=x

x= 1~247

3.5.7 Port Setting

◆ Digital quantity work mode

| | |
|-------------------------------|---------|
| Digital quantity 1 work mode: | Input |
| Digital quantity 2 work mode: | Output |
| Digital quantity 3 work mode: | Disable |

The IP MODEM has 3 digital quantity ports in all, IO1, IO2, IO3. These ports are corresponding with pin 8,9,10. IP MODEM will operate these ports accord to the MODBUS command received if the Modbus work mode is Network RTU.

AT Command:

AT+DIOWORKMODE n = x

| | | | |
|-----------|---------------|-----------|------------|
| n = 1/2/3 | 1: IO1(Pin8) | x = 0/1/2 | 0: Disable |
| | 2: IO2(Pin9) | | 1: Input |
| | 3: IO3(Pin10) | | 2: Output |

◆ Analog quantity work mode

| | |
|------------------------------|---------------------|
| Analog quantity 1 work mode: | One-time collection |
| Analog quantity 2 work mode: | Disable |

The IP MODEM has 2 analog quantity ports in all, IO4, IO5. These ports are corresponding with pin 11, pin 12. IP MODEM will gather the data of the analog quantity port as the MODBUS command when the analog quantity work mode is One-time collection and the Modbus work mode is Network RTU.

AT Command:

AT+ADCMODEn=x

| | |
|---------|----------------|
| n = 1/2 | 1: IO4 (Pin11) |
| | 2: IO5 (Pin12) |

| | |
|---------|------------------------|
| x = 0/1 | 0: Disable |
| | 1: One-time collection |

3.5.8 SMS Setting

◆SMS Sending Number

SMS Sending Number Setting(5 Number per group,divided by',')

| | |
|-------------|-------------------------|
| SMS Sending | 13912345678,13812345678 |
| SMS Sending | 13912345678 |
| SMS Sending | 13912345678 |
| SMS Sending | 13912345678 |

If the network connection fail, IP MODEM will send the data which come from serial port As the content of the messages to the SMS Sending number. (This function is called SMS backup function.) Each group can set 5 numbers at most, divided by ','. Every phone number' length is 15 characters at most.

AT Command:

AT+PHONE n =xxx

n = 1/2/3/4 1: SMS Sending group 1
 2: SMS Sending group 2
 3: SMS Sending group 3
 4: SMS Sending group 4

xxx: SMS Sending Number

Example: AT+PHONE1=13912345678,13812345678

◆SMS Sending Format

SMS Sending Format

As a general rule, the content of the message is Visible characters or Chinese character. If the SMS Sending Format is HEX SMS, the IP MODEM can send any hexadecimal number of 0x00 to 0xff. HEX sms is Very suitable for the transmission of Industrial control data in the porcess of monitoring to the Industrial control device.

AT Command:

AT+HEXSMS= x

x = 0/1 0: Common SMS
 1: HEX SMS

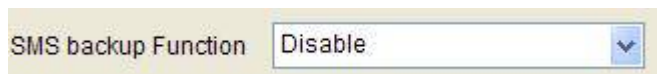
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◆ SMS backup Function



SMS backup function : If the network connection fail, IP MODEM will send the data which come from serial port in messages to the SMS Sending number.

AT Command:

AT+OPENSMSBCKP=x

x = 0/1 0: Disable SMS backup Function
 1: Enable SMS backup Function

◆ UDP mode lost package instructions

When the udp server disconnect or be shut down, IP MODEM will find the disconnection after some time, 35 seconds at least. In this period of time, the data send to IP MODEM through serial port will not send out in sms. This will cause lost package. So we suggest you use TCP connection.

3.6 SMS Config Setting

If the length of the Configuration messages is more than 140 characters, Please use multiple SMS messages to send configuration content.

Format of sms configuration:

<Password;Command 1;Command 2>

Password: The password should be the same with the SMS configure password in 3.5.3.

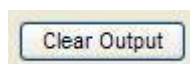
Command: The command is the AT command in the 3.5 Configuration and remove the “AT+”. Multiple commands are divided by semicolons.

Example: <123456;IPAD=120.42.46.98;PORT=5007>

Comment: password 123456, ip address 120.42.46.98, port 5007

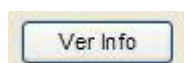
3.7 Functions

◆ Clear Output



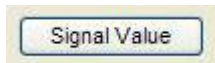
Clear the output information

◆ Version Display



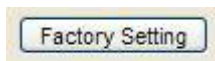
Show the software and hardware version

◆ Signal Value



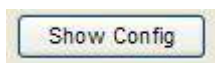
Display current wireless signal value

◆ Factory setting



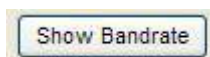
Restore to factory settings

◆ Show Config



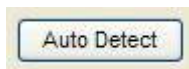
Show current IP MODEM settings

◆ Show Baudrate



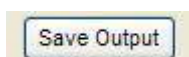
Display the communication baudrate

◆ Auto Detect



Simple way to determine whether IP MODEM work fine

◆ Save Output



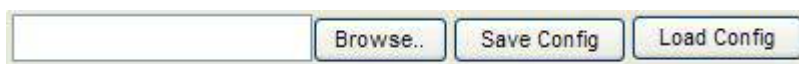
Save the output info to a file

◆ Save Config



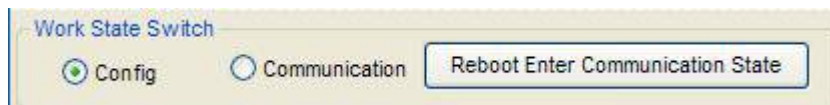
Save the current settings to a file, you can restore it from this file later

◆ Load Config



Load settings from a previous saved configure file

3.8 Work State Switch



This tool can work in two states, “Config” and “Communication”

Config:

This state is used to configure parameters of IP MODEM.

Communication:

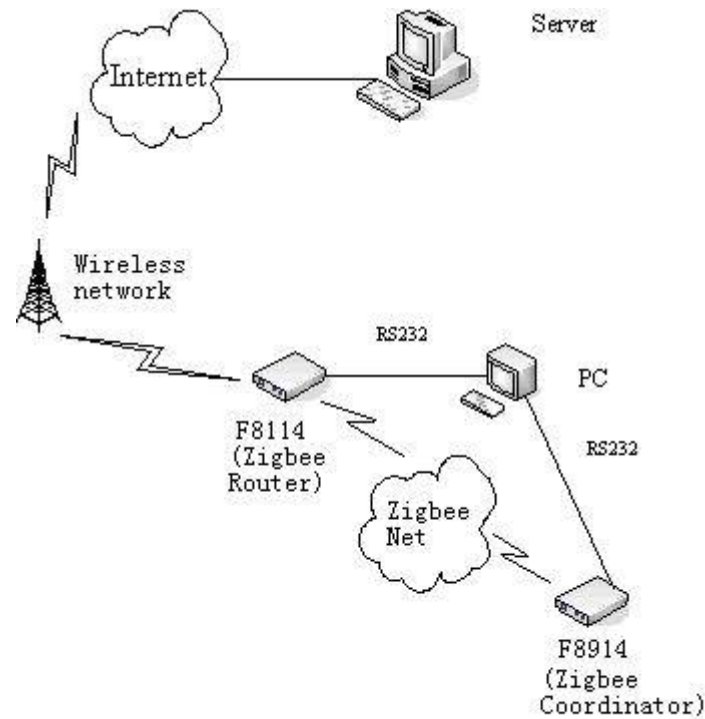
This state is used as a common serial communication tool

Reboot Enter Communication State:

This function button is used to reboot IP MODEM and make the software switch to Communication state

Chapter 4 Data Transfer Testing

4.1 Testing Environment



Server: Data server, run the Server Demo on data server.

Supposed the Server's IP address is **120.42.46.98**, Server Demo listen on port **5007**.

PC: Send data to F8114 and F8914 through RS232, run Serial debug tool.

F8914: As the Coordinator in Zigbee net, it will Build a zigbee network and collect data.

Attention: If there's other F8914 devices in the same zigbee net, please set their device type as Router or Terminal equipment!

The data flow from PC to F8114 (zigbee Router) through F8914 (zigbee Coordinator) is:

PC serial port 2 data → F8914 serial port → F8914's Zigbee protocol stack encapsule the data → send to Zigbee net → Zigbee net to F8114.

The data flow from F8114 to PC through F8914 (zigbee Coordinator) is the reverse transmission process above.

The data flow from PC to Server through F8114 (zigbee Router) is:

PC serial port 2 data → F8114 serial port → F8114 TCP/IP protocol stack encapsule the data

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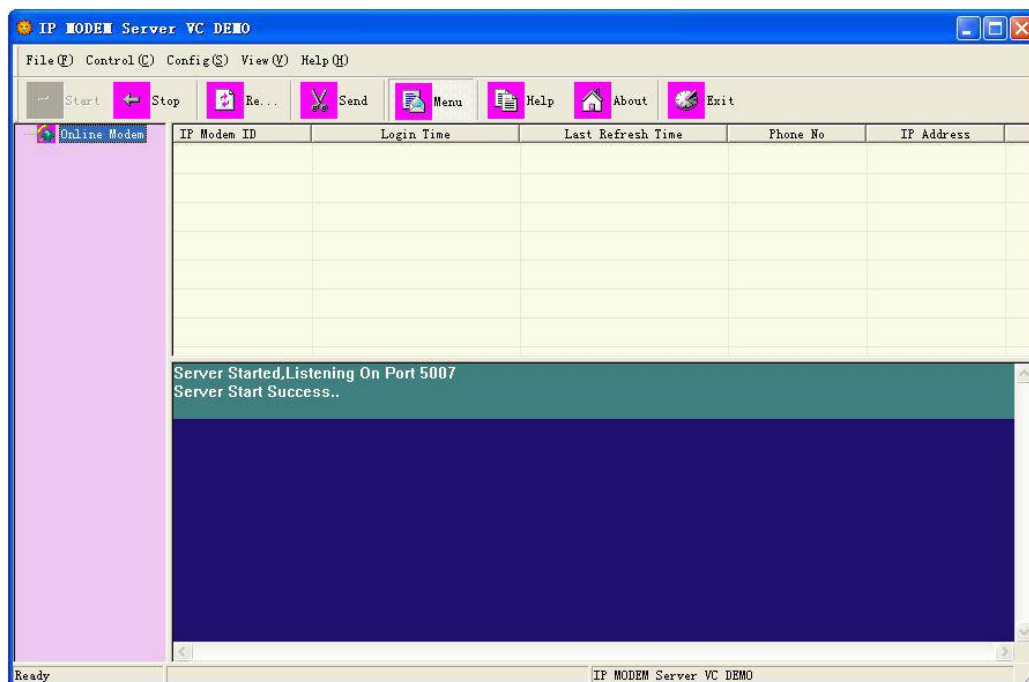
→ send data to wireless network → wireless network to INTERNET →INTERNET send data to Server.

The data flow from Server to PC through F8114 (zigbee Router) is the reverse transmission process above.

4.2 Testing steps

1. Run the Demo on the Server, click “Start” button on toolbar.

The demo is listening on port 5007.



2. Config the para of IP MODEM, the data server's ip address is **120.42.46.98**, port is **5007** shown in the red frame below:

Work State Switch: ☒ Config ☐ Communication

Serial Params: COM: COM1 Baudrate: 115200 Parity: None

Output Info:

```

Socket1 Function type: 4
Socket2 Function type: 4
Socket3 Function type: 4
Socket4 Function type: 4
Socket5 Function type: 4

OK

+IPR:115200
OK

+MODE:PROT
OK

+ACT: AUTO
OK
Saving IPAD.....[AT+IPAD]
Save IPAD.....OK...
Saving PORT.....[AT+PORTD]
Save PORT.....OK...
Saving IPSEC.....[AT+IPSEC]
Save IPSEC.....OK...
Save PTSEC.....OK...
at+sav
Save Success
  
```

F8114 Configuration

Data Service Center Settings | IP Modem Setting | Other Setting | Scheduled P...

Data Service Center Settings:

Data Center Number: 1

| | | |
|------------------------|---------------|------|
| Main Center Addr+Port: | 120.42.46.98 | 5007 |
| Backup Center: | 120.42.46.98 | 5007 |
| 2nd Center Addr+Port: | 166.111.8.238 | 23 |
| 3rd Center Addr+Port: | 166.111.8.238 | 23 |
| 4nd Center Addr+Port: | 166.111.8.238 | 23 |
| 5nd Center Addr+Port: | 166.111.8.238 | 23 |

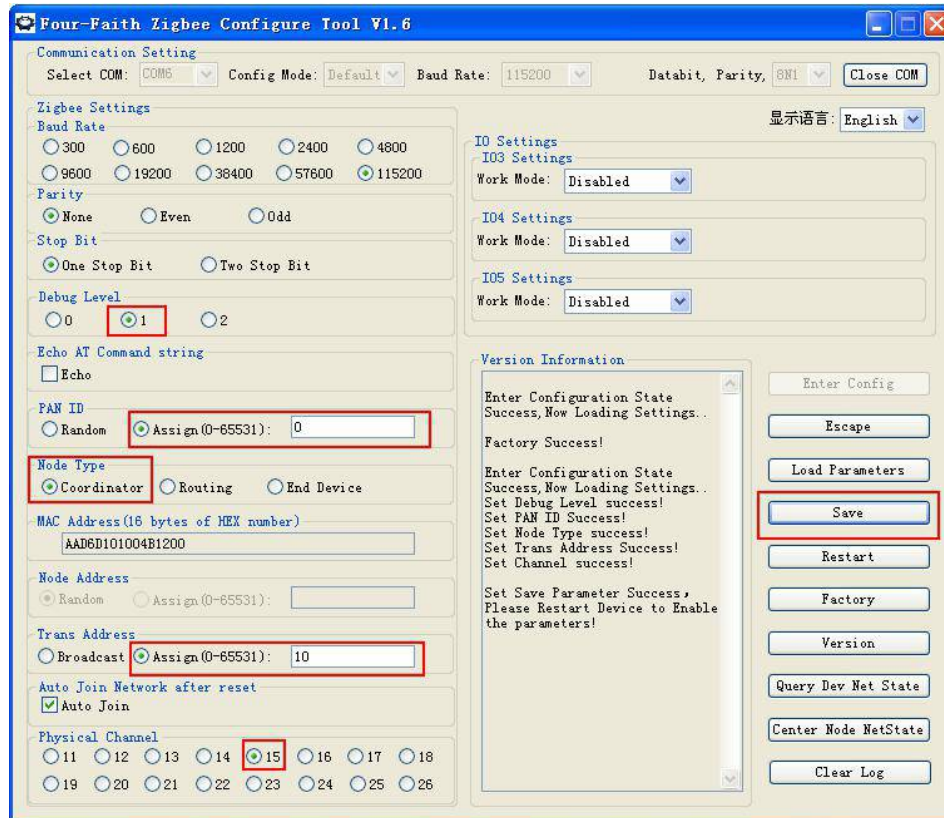
DNS Server

| | |
|---------------------------|---------------|
| Main Center DNS Server: | 8 . 8 . 8 . 8 |
| Backup Center DNS Server: | 8 . 8 . 8 . 8 |
| 2nd Center DNS Server: | 8 . 8 . 8 . 8 |
| 3nd Center DNS Server: | 8 . 8 . 8 . 8 |
| 4nd Center DNS Server: | 8 . 8 . 8 . 8 |
| 5nd Center DNS Server: | 8 . 8 . 8 . 8 |

3. Config ZigBee Para

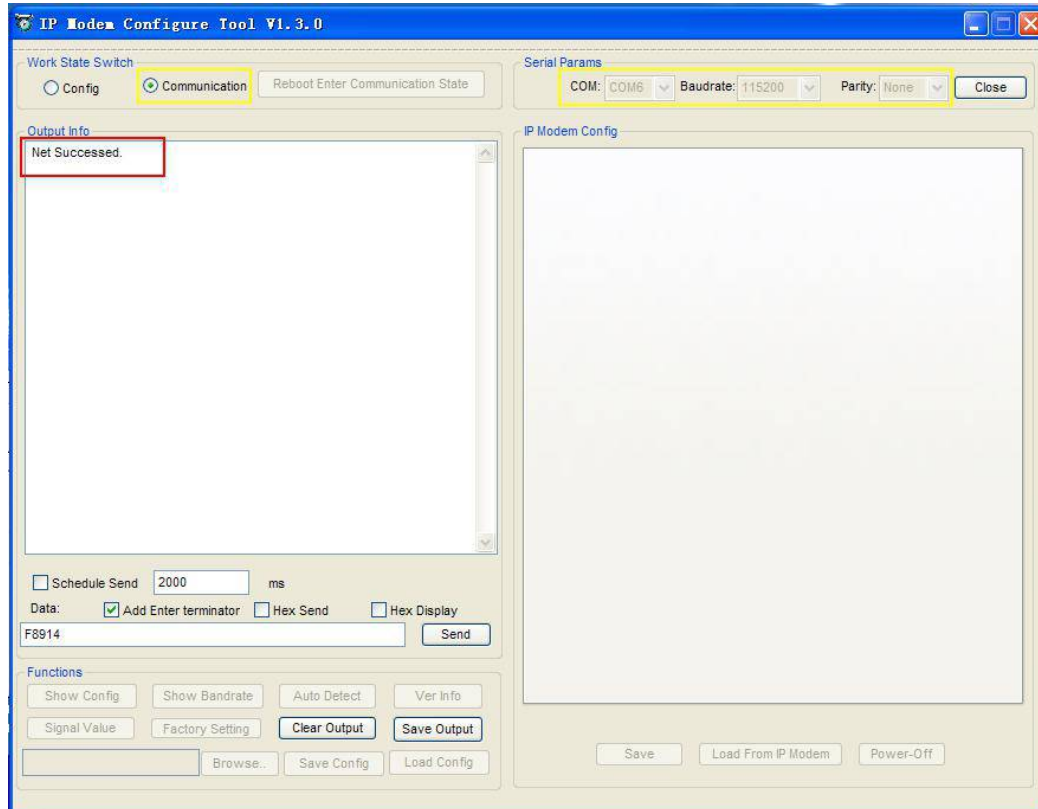
Set F8114 device type as **Coordinator**, PanID 10, TransAddr 65535 (Broadcast), Physical channel 15, Trans Type choose all the direction,

Configure another Zigbee device (For example: F8914) as **Router** in the zigbee net, PAN ID 10, Physical channel 15, Debug level 1, as shown in the red frame below:

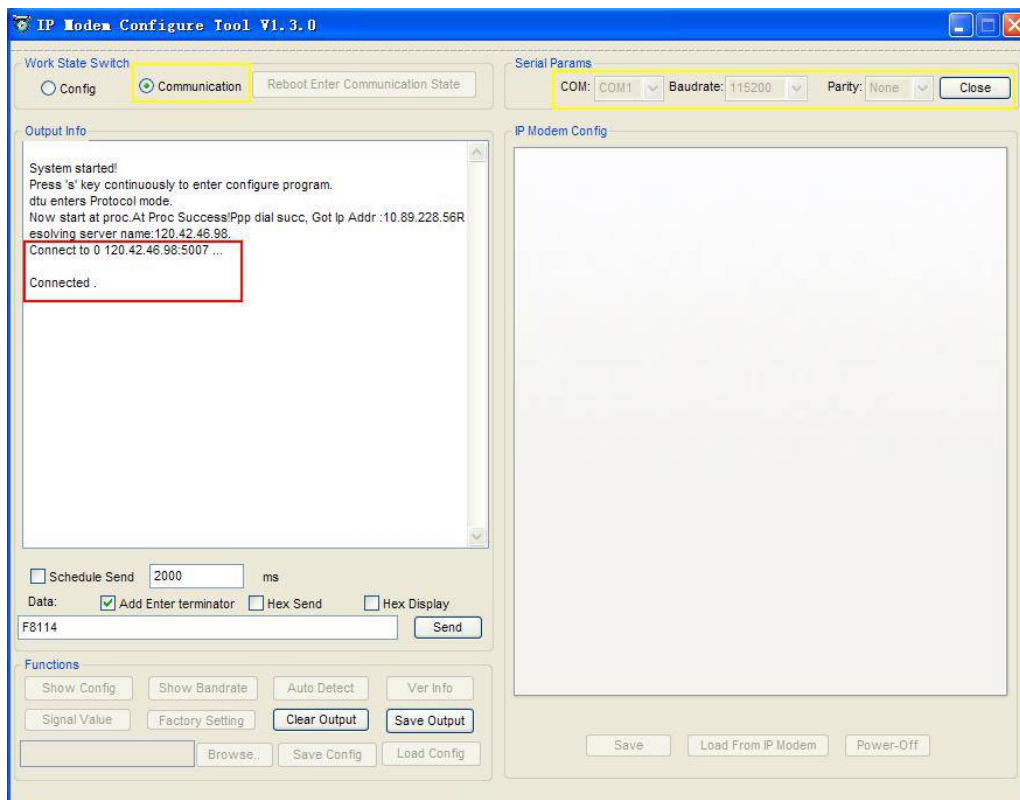


4. Close the config tools of F8914 and IP MODEM, run two **IP Modem Configure Tool** on the PC, connect F8914 to COM6, connect F8114 to COM1.

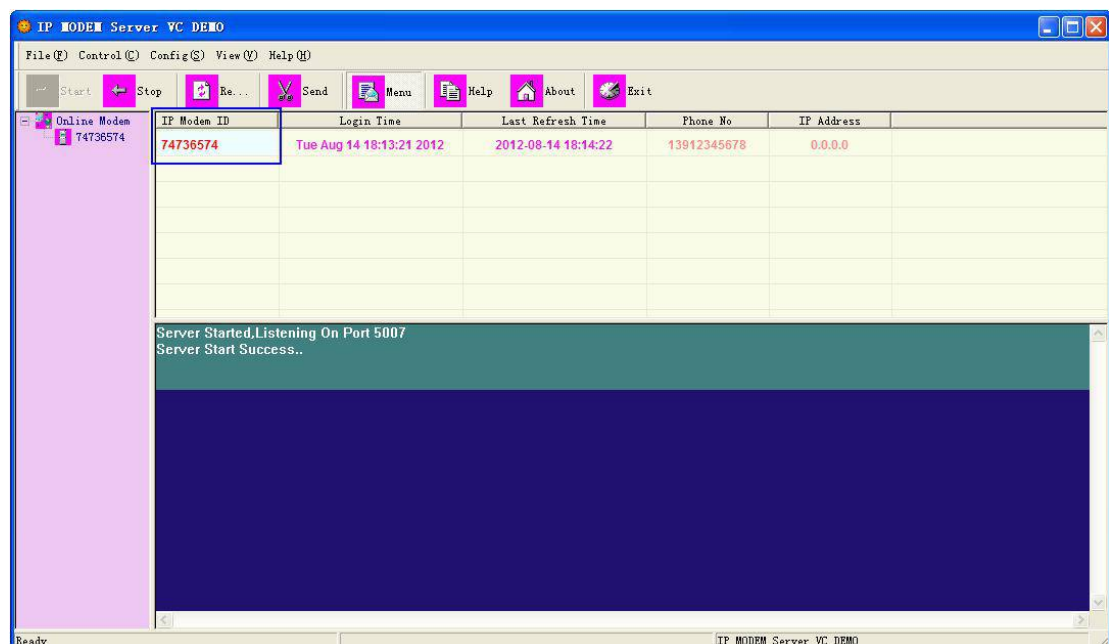
Attention: Please power on the Zigbee Coordinator device (in this testing is F8914) first. After the info of “Net Succeeded” is shown on the IP Modem Configure Tool of COM6 and the Online light of F8914 is on, then power on the IP MODEM as Zigbee Router (in this testing is F8114)!!!



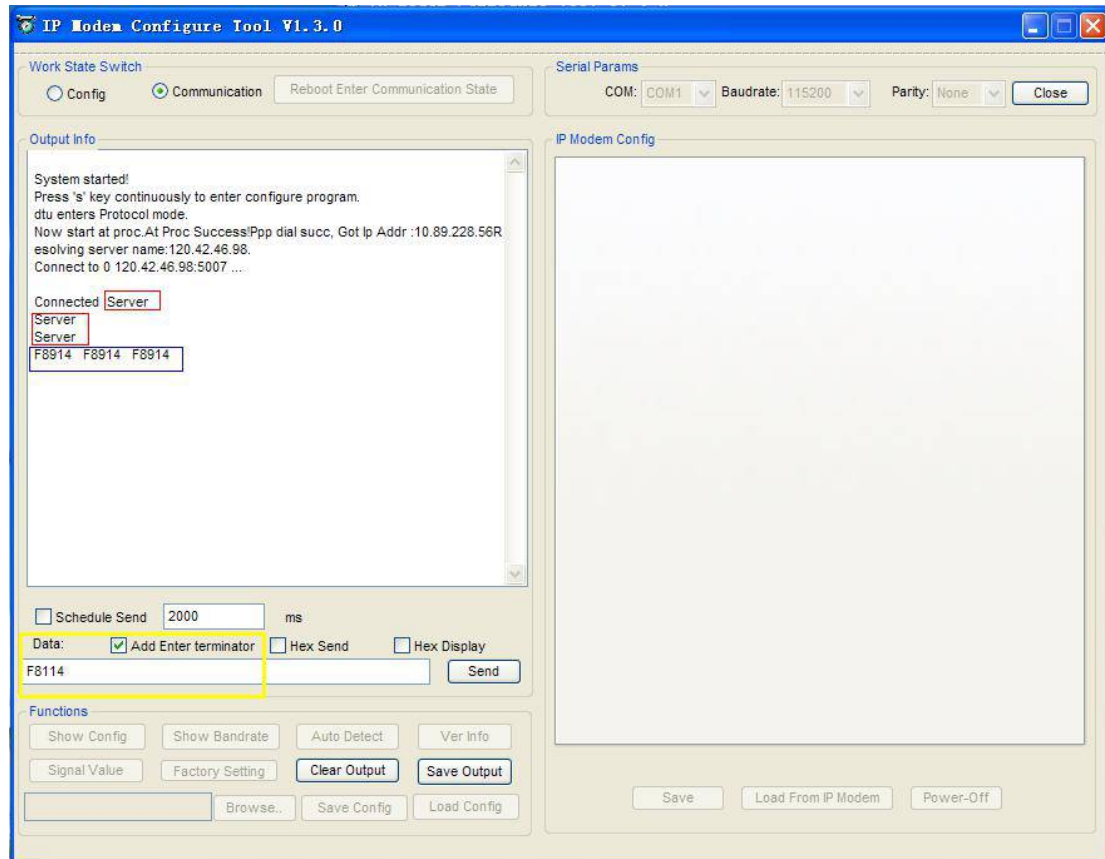
5. Confirmed that the IP Modem has installed an usable SIM card, then power on the IP Modem again. If the IP Modem has connected with the Server, it will output the info in the red frame below. The Ip Modem online will appear on the DEMO. The ID number of F8114 is **74736574**.



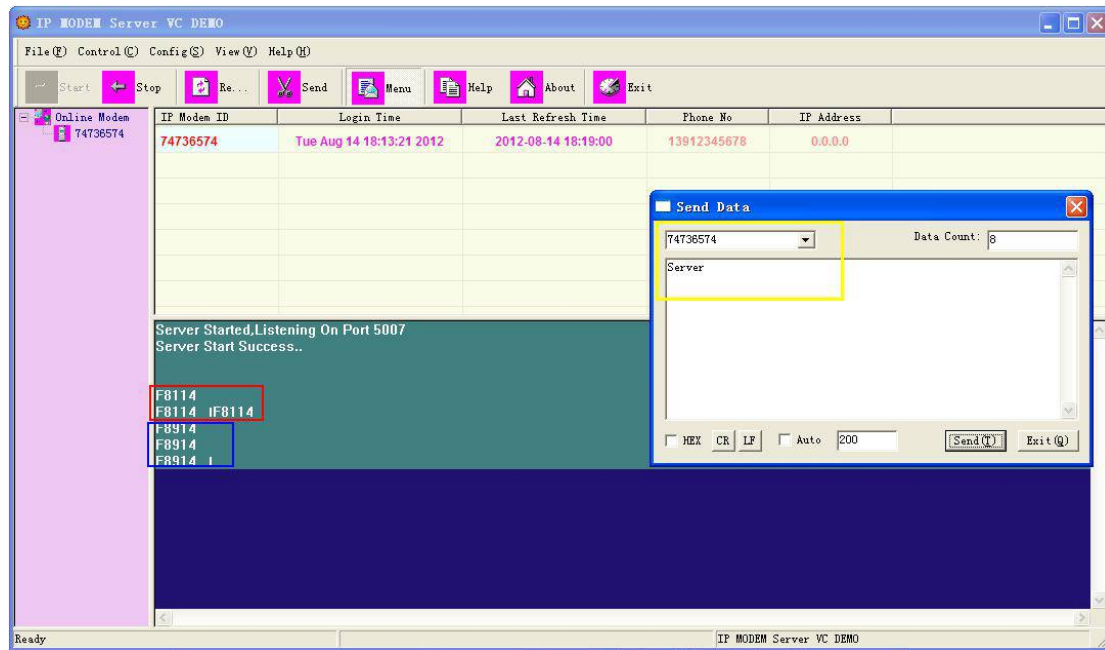
6. DEMO has shown the IP MODEM online, as shown in the blue frame below. The ID number of IP MODEM online is **74736574**. F8114 has logged on the Server successfully.



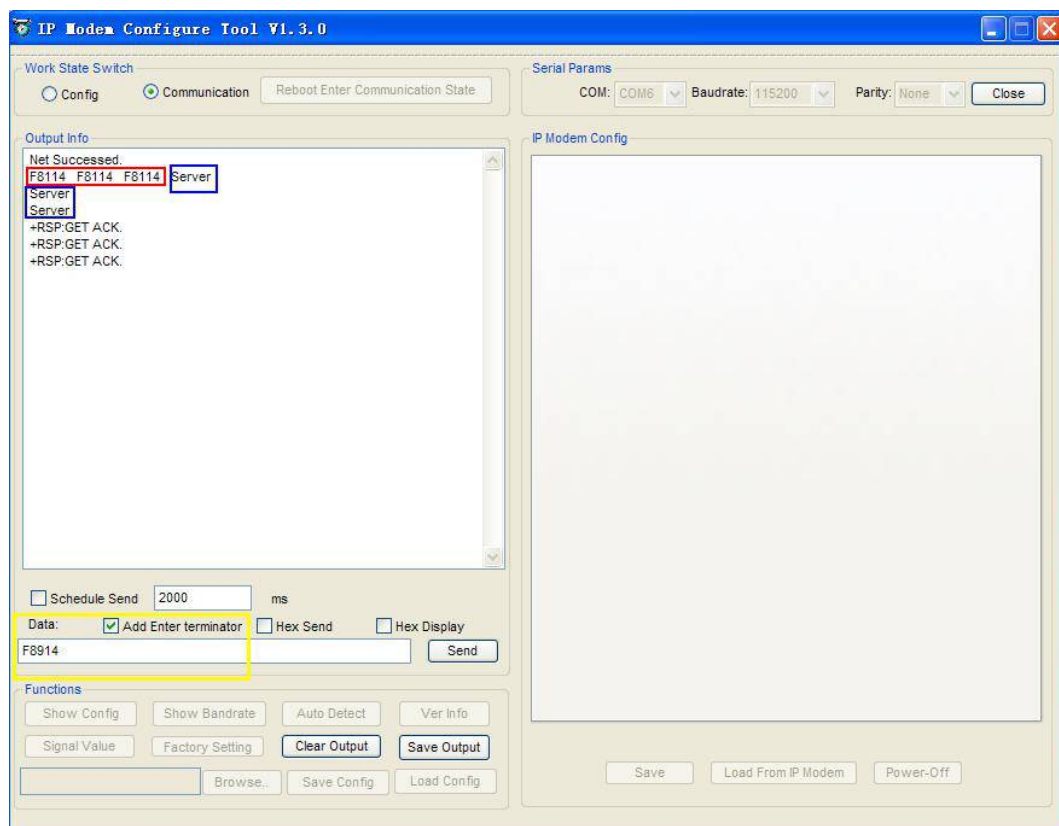
7. F8114 has sended “F8114” to Server and F8914 from COM1 as show in the yellow frame below. The data “Server” in the red frame below comes from data server Demo. The data “F8914” in the blue frame below comes from F8914(Zigbee Coordinator).



8. DEMO has sended “Server” to F8114 and F8914 as show in the yellow frame below. The data “F8114” in the red frame below comes from F8114(Zigbee Router). The data “F8914” in the blue frame below comes from F8914(Zigbee Coordinator).



9. F8914 has sended “F8914” to F8114 and server as show in the yellow frame below. The data “F8114”in the red frame below comes from F8114(Zigbee Router). The data “Server” in the blue frame below comes from data server DEMO.



10. In this testing, it has shown that the data server DEMO, F8114 and F8914 can communicate with the two others.

Appendix

The following steps describe how to make IP MODEM enter configure state with the Windows XP Hyper Terminal.

1. Press “Start”→”Programs”→”Accessories”→”Communications”→”Hyper Terminal”



2. Input connection name, choose “OK”
3. Choose the correct COM port which connect to IP MODEM, choose “OK”



4. Configure the serial port parameters as following, choose “OK”

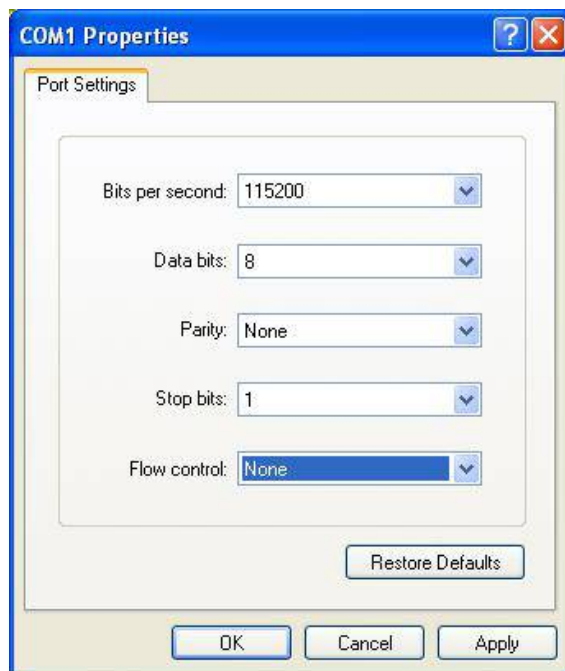
Bits per second: 115200

Data bits: 8

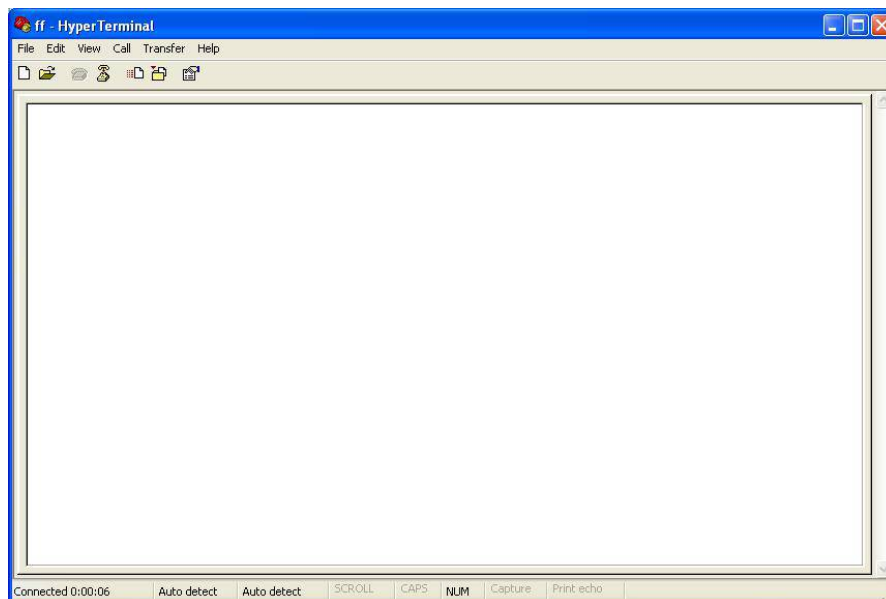
Parity: None

Stop bits: 1

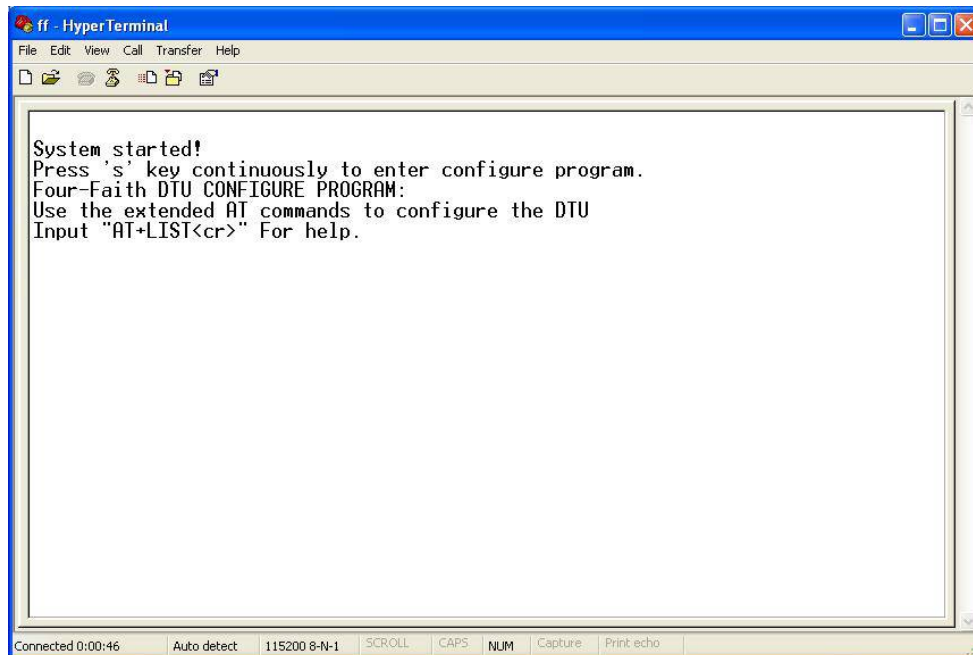
Flow control: None



5. Complete Hyper Terminal operation, It runs as following



6. Re-power IP MODEM, put mouse focus on the Hyper Terminal and press “s” key continuously until IP MODEM enter configure state as following



7. IP MODEM has entered configure state, you can configure the parameters through AT command.

Appendix A Accord Format

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. Data send command

Send data:

| 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 |

Synchronous response:

| Fields | Sub field | Offset | Example | Description |
|---------|-----------|--------|---------|---------------------------------|
| SOF | | 1 | FE | 0xFE |
| Length | | 1 | 01 | The length of data |
| Command | Send | 2 | 64 01 | 64 01 or 64 03 |
| Data | State | 1 | 00 | 00 = success, Others = error |
| FCS | | 1 | 64 | Frame check sequence |

2. Data receive command

Receive Data:

| Fields | Sub field | Offset | Example | Description |
|---------|-----------|--------|-------------|--|
| SOF | | 1 | FE | 0xFE |
| Length | | 1 | 06 | The length of data |
| Command | Recive | 2 | 44 5F | Fixed to 44 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 |