



FOUR FAITH

F2X16 Series IP MODEM

USER MANUAL

V2.0.1





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Chapter 1 Brief Introduction of Product

1.1 General

F2X16 series IP MODEM is a kind of cellular terminal device that provides data transfer by public cellular network.

It adopts high-powered industrial 32 bits CPU and embedded real time operating system. It supports RS232 and RS485 port that can conveniently and transparently connect one device to a cellular network, allowing you to connect to your existing serial devices with only basic configuration. It has low power consumption states in which the power consumption could be lower than 5mA@12VDC.

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.

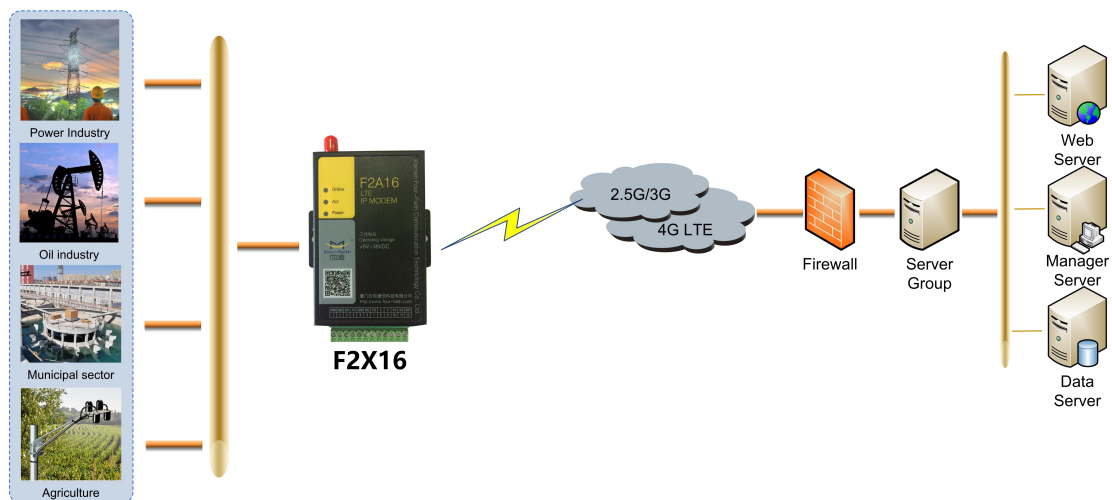


Figure 1-1 IP MODEM Application Topology

1.2 Features and Benefits

Design for Industrial Application

- ◆ High-powered industrial cellular module
- ◆ High-powered industrial 32 bits CPU
- ◆ Support low power consumption mode, including multi-sleep and trigger modes to reduce the power consumption
- ◆ Housing: iron, providing IP30 protection.
- ◆ Power range: DC 5~36V

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/UIIM 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(RS422 optional) port that can connect to serial devices directly
- ◆ TTL logic level RS232 interface can be customized
- ◆ Support intellectual mode, enter communication state automatically when powered
- ◆ Provide management software for remote management
- ◆ Support several work modes
- ◆ Convenient configuration and maintenance interface

High-performance

- ◆ Support TCP server and support multi TCP client connection(optional)
- ◆ Support double data centers, one main and another backup
- ◆ Supply 3 I/O channels, including 1 analog input(4-20mA) and 2 digital input/output
- ◆ 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 domain name and IP address as data center
- ◆ Design with standard TCP/IP protocol stack
- ◆ Support private APN

1.3 Working Principle

- ◆ The principle chart of the IP MODEM is as following.

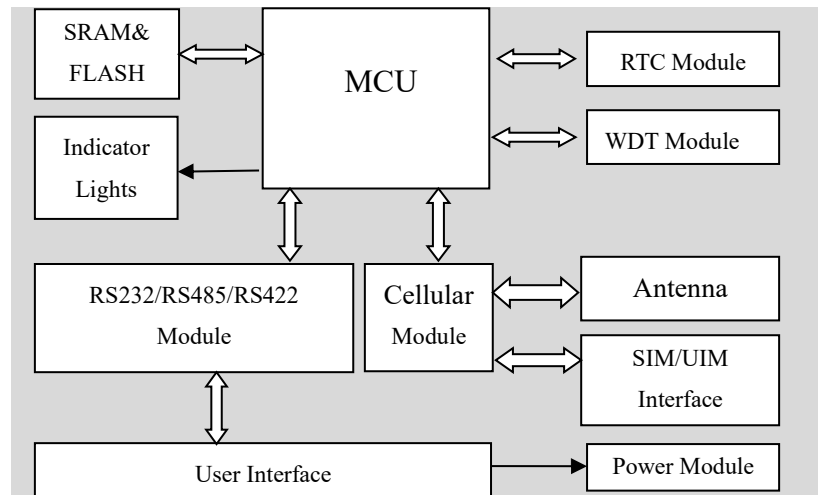


Figure1-2 IP Modem principle chart

1.4 Specifications

Cellular Specification

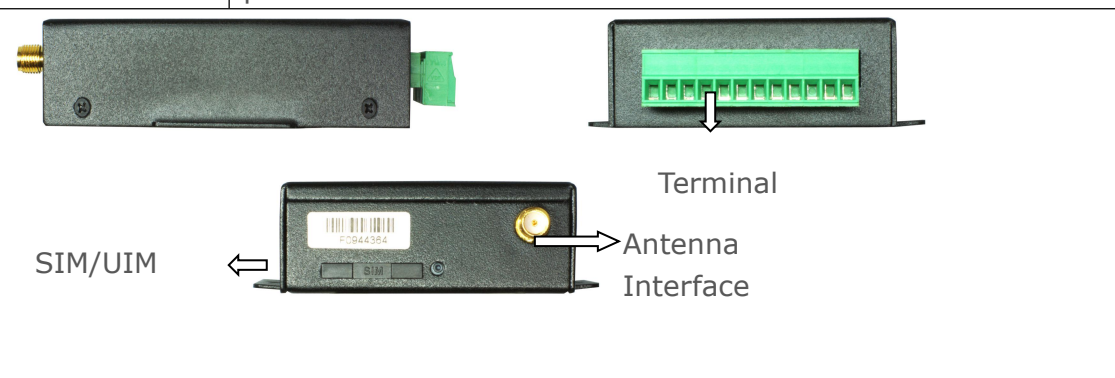
Item	Content
F2416 WCDMA IP MODEM	
Standard	UMTS/WCDMA/HSDPA/HSUPA/HSPA+ 850/1900/2100MHz, 850/900/1900/2100MHz(optional) GSM 850/900/1800/1900MHz GPRS/EDGE CLASS 12
Bandwidth	DC-HSPA+: Download 42Mbps, Upload 5.76Mbps HSPA+: Download 21Mbps, Upload 5.76Mbps HSDPA: Download 7.2Mbps, HSUPA: Upload 5.76Mbps UMTS: 384Kbps
TX power	<24dBm
RX sensitivity	<-109dBm
RX sensitivity	<-97dBm
F2816 FDD-LTE IP MODEM	
Standard	LTE/FDD 2600/2100/1800/900/800MHz, 700/1700/2100MHz(optional) DC-HSPA+/HSPA+/HSDPA/HSUPA/UMTS 850/900/2100MHz, 800/850/1900/2100MHz(optional) EDGE/GPRS/GSM 850/900/1800/1900MHz GPRS CLASS 10 GPRS CLASS 12
Bandwidth	LTE FDD: Download 100Mbps, Upload 50Mbps DC-HSPA+: Download 42Mbps, Upload 5.76Mbps HSPA+: Download 21Mbps, Upload 5.76Mbps HSDPA: Download 7.2Mbps, Upload 5.76Mbps UMTS: 384Kbps
TX power	<23dBm
RX sensitivity	<-93.3dBm

Hardware System

Item	Content
CPU	Industrial 32 bits CPU
FLASH	512KB(Extendable)
SRAM	256KB

Interface Type

Item	Content
Serial	2 RS232 and 1 RS485 , 15KV ESD protection Data bits: 5, 6 ,7, 8 Stop bits: 1, 1.5, 2 Parity: none, even, odd, space, mark Baud rate: 1200~230400 bps, (110~600bps optional)
Indicator	"Power", "ACT", "Online"
Antenna	Cellular: Standard SMA female interface, 50 ohm Lighting protection(optional)
SIM/UM	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 5~36V

Power Consumption

Working States	Power Consumption
Communication	45~165mA@12VDC (2G:45~55 mA 3G:80~165 mA 4G:75~95mA) 105~365mA@5VDC (2G:105~115 mA 3G:165~365 mA 4G:150~200mA)
Standby	35~50 mA@12VDC 55~105 mA@5VDC
Sleep	3mA@12VDC 6mA@5VDC

Physical Characteristics

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

Environmental Limits

Item	Content
Operating Temperature	-35~+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	
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)

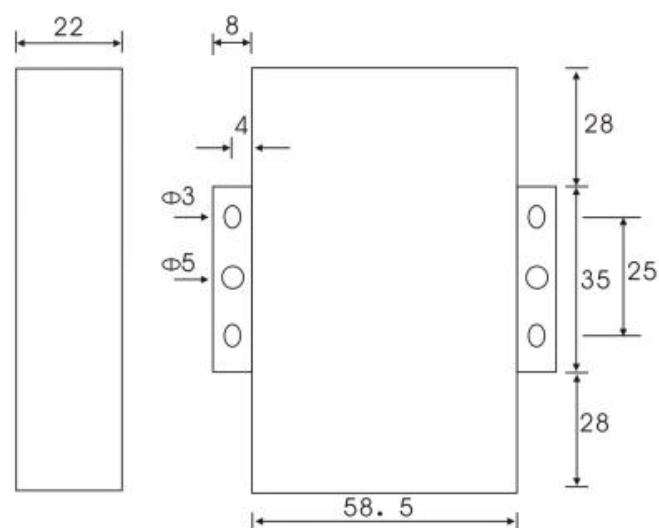


Figure 2-1 Installation Chart

Installation of SIM/UIM card

Firstly power off the IP MODEM, and press the 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 NO.	Name	Function	Extensible Function
1	PWR	Power input anode	N/A
2	GND	Power Ground	N/A
3	RX1	RS232 RX	N/A
4	TX1	RS232 TX	N/A
5	GND	System Ground	N/A
6	RX2	RS232 RX	Reserved compatible ADC and RS232 RX (TTL logic level)
7	TX2	RS232 TX	Reserved compatible ADC and RS232 TX (TTL logic level)
8	A	RS485 anode	Reserved compatible ADC
9	B	RS485 cathode	Reserved compatible ADC
10	IO1	GPIO	Reserved compatible pulse wave input counter, ADC, and pulse output
11	IO2	GPIO	Reserved compatible pulse wave input counter, ADC, and pulse output
12	ADC1	ADC	N/A



Installation of cable

F2X16 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	Anode
Black	Cathode

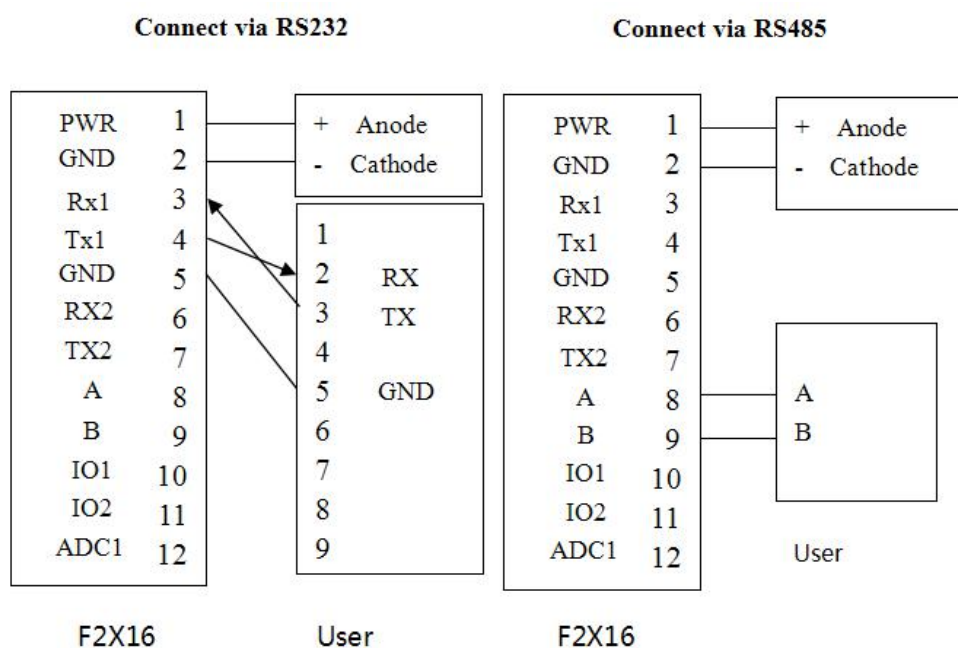
RS232 Cable

Cable Color	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



2.4 Power

The power range of the IP MODEM is DC 5~36V

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

Warning: When we use other power, we should make sure that the power

can supply power above 4W.

2.5 Indicator Lights Introduction

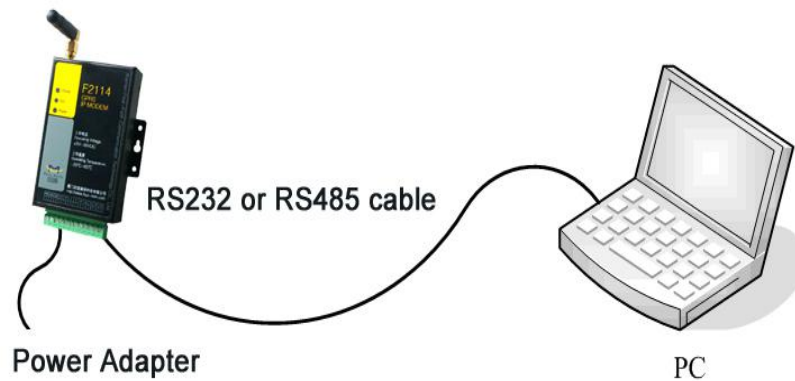
The IP MODEM provides three indicator lights: "Power", "ACT", "Online".

Indicator	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

Chapter 3 Configuration

3.1 Connection

Before configuration, It's necessary to connect the IP MODEM with the 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.

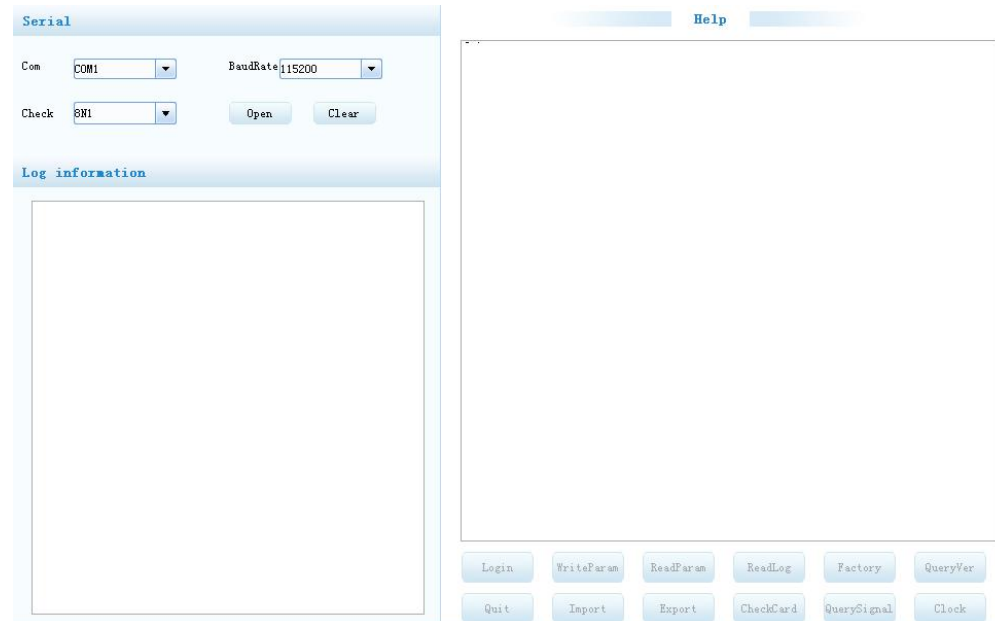
Before configuration with extended AT command, you should make IP MODEM enter configure state.

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 IP Modem's Parameters Configuration

3.3.1 Run the Configure Tools



The "Serial" area 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..."

3.3.2 Re-Power IP Modem

Serial

Com: COM1
BaudRate: 115200

Check: 8N1
Close
Clear

Log information

```

DIO3 workmode: 6
DIO3 interface:
DIO3 SMS number:
DIO3 reported methods: 0
DIO3 protocol: 255
DIO3 reported times: 0
The DIO3 data format:
DIO3 query command: 0
DIO3 high level information:
DIO3 low level information:
DIO3 output control result:
DIO3 and mapping center: 0
DIO3 upper threshold: 0
DIO3 lower threshold: 0
ADCI workmode: 0
Modbus workmode: 0
Modbus address: 1
sms Phone1 No.: 12345678901
sms Phone2 No.: 12345678901
sms Phone3 No.: 12345678901
sms Phone4 No.: 12345678901
sms Phone5 No.: 12345678901
sms hex: 0
sms backup function: 0
Show Phone NO: 0
Encode Hex SMS: 0
Btu No Receive Time: 0
Grps disconnect To Trigger Mode: 0
ZS password: 123456
ZS ID: abcdefg
Enable UDP Log: 0
OK

```

Configure

WorkMode
Data Center
SerialPort
I/O
Dial
GlobalParam
DeviceManage

Protocol

Protocol: PROT
DeviceID: 74657374
Phone No.: 13912345678
Transfer Meaning: Yes

Trigger Setting

Trigger Type: Auto

Debug

Debug Level: Level 1
Debug Port: COM1

Login
WriteParam
ReadParam
ReadLog
Factory
QueryVer
Quit
Import
Export
CheckCard
QuerySignal
Clock

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.

Note: To enter configure state for 4G device may need more time. It is about 40 seconds.

3.3.3 Work Mode

3.3.3.1 App protocol

The IP Modem can be configured many communication protocols to adapt for different applications.

Note : The tool will show the reference parameters according to the communication protocols setting.

PROT

It uses TCP Protocol to send or receive data. In this mode, ID and phone number MUST be set.

<div> <div>Protocol Setting</div> <div> Work Mode: PROT Device ID: Phone No.: Character Escapes: </div> </div>	
Device ID	ID number for the device. 8 characters
Phone No.	Phone number
Character Escapes	This item is only valid when the Work Mode is PROT. If this item is set to No, 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 Yes, all the transmission is transparent.
--	--

DCTCP

This protocol is used in electric power field, with TCP protocol.

<div> <p>App Protocol</p> <p>App Protocol <input type="text" value="DCTCP"/></p> <p>Phone No. <input type="text" value="13912345678"/></p> </div>	
PhoneNo.	Phone number

DCUDP

This protocol is used in electric power field, with UDP protocol

<div> <p>App Protocol</p> <p>App Protocol <input type="text" value="DCUDP"/></p> <p>Phone No. <input type="text" value="13912345678"/></p> </div>	
PhoneNo.	Phone number

TRNS

The device work as MODEM for sending/receiving SMS, CSD and GPRS dialing.

<div> <p>App Protocol</p> <p>App Protocol <input type="text" value="TRNS"/></p> </div>	
---	--

SMSCLI

IP MODEM work as a SMS DTU. All data will send to binding phone number via SMS. The SMS from the binding phone number will send to Serial port.

Protocol Setting	
Work Mode	SMSCLI
Phone No 1st Group	12345678901
Phone No 2nd Group	12345678901
Phone No 3rd Group	12345678901
Phone No 4th Group	12345678901
Phone No 5th Group	12345678901
Show Phone Number	Hide
Hex To Text	Disable
Send SMS Hex	Yes

Pone No 1st Group Pone No 2nd Group Pone No 3rd Group Pone No 4th Group Pone No 5th Group	Bind phone number. Max phone number is 5 for one group
Show Phone Number	If send phone number to serial port or not
Hex To Text	If convert HEX data to ASCII data or not
Send SMS Hex	If send SMS with Hex format or not

SMSSER

IP MODEM work as a SMS DTU. All the data paced with special format send to any phone number. The SMS from phone number will send to serial port.

Protocol Setting	
Work Mode	SMSSER
Show Phone Number	Hide
Hex To Text	Disable
Send SMS Hex	Yes

Show Phone Number	If send phone number to serial port or not
Hex To Text	If convert HEX data to ASCII data or not
Send SMS Hex	If send data with Hex format or not

HTTP

When IP modem connected to the HTTP server address, serial port data will be packeted with Http format and sent to server.

Protocol Setting	
Work Mode	HTTP
HTTP Request Mode:	GET
Trigger Setting	POST

HTTP Request Mode	Can select GET and POST Mode
-------------------	------------------------------

MTCP/MRTU

IP MODEM will convert data from Modbus TCP to modbus RTU when receive data from server,also will convert data from Modbus RTU to Modbus TCP when sending data to server via the serial port in device.

<div> Protocol Setting </div> <div> Work Mode <input type="text" value="MTCP/MRTU"/> </div> <div> Device ID <input type="text" value="123456"/> Phone No. <input type="text" value="13912345678"/> </div> <div> Character Escapes <input type="text" value="Yes"/> </div>	
--	--

MQTT

IP MODEM will work as MQTT client,when configured and connected to MQTT server,it can communicate with other MQTT client.(you can check the test guide in the appendix.)

<div> Protocol Setting </div> <div> Work Mode <input type="text" value="MQTT"/> </div> <div> Client ID: <input type="text" value="IamClientID"/> </div> <div> User Name: <input type="text" value="admin"/> </div> <div> Password: <input type="text" value="paulyeah"/> </div> <div> Receive Topic: <input type="text" value="IamRecTopic"/> </div> <div> Send Topic: <input type="text" value="IamSendTopic"/> </div> <div> KEY: <input type="text"/> </div>	
---	--

Custom protocol: Client mode

It support TCP and UDP protocol with custom heart and login packet.

Protocol Setting	
Work Mode	Custom
Device Mode	Client Mode
Protocol	TCP
RegisterHeartbeat	Enable
Data Format	Text
Register Packet	
Register Reply	
Heartbeat Packet	
Heartbeat Reply	

Base Protocol	TCP or UDP
DeviceMode	Client Mode: the IP Modem work as a client.
Login&Heartbeat	Enable: custom login and heart packet Disable: no login and heart packet. The flowing items can be ignored.
Data Format	Text: the flowing items are Text format Hex: the flowing items are Hex format
Login Packet	Login packet
Login Reply	Login packet respond
Heartbeat Packet	Heart packet
Heartbeat Reply	Heartbeat packet respond

Custom protocol: Server mode

It supports TCP and udp server.

Protocol Setting	
Work Mode	Custom
Device Mode	Server Mode
Protocol	TCP
Listen Port	5001

Base Protocol	TCP or UDP
Listen Port	Listen port for service

3.3.3.2 Trigger mode

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

<div>Trigger Setting Trigger Type <input type="text" value="Auto"/></div>
--

SMSD

Send a special short message to make IP MODEM online.

Any phone number's SMS can wake up IP Modem, if the trigger number is empty.

Otherwise only the trigger phone number's SMS can trigger the IP Modem.

<div>Trigger Setting Trigger Type <input type="text" value="SMSD"/> SMS Phone No. <input type="text"/> SMS Password <input type="text"/></div>	
SMS Phone No.	Trigger phone number. If it is empty, sms received from any phone no. can trigger the device
SMS Password	The content of SMS to trigger. If it is empty, any content of sms can trigger the device

CTRL

Make IP MODEM online through a phone call to IP MODEM.

Any phone number call can wake up IP Modem, if the trigger number is empty.

Otherwise only the trigger phone number call can trigger the IP Modem.

Note: if the trigger phone was set, the sim card in IP Modem Must have "caller ID display" function.

<div>Trigger Setting Trigger Type <input type="text" value="CTRL"/> CALL Phone No. <input type="text"/></div>	
CALL Phone No.	Trigger phone number

DATA

Send special serial data to make IP MODEM online

<div> Trigger Setting <div> Trigger Type <input type="text" value="DATA"/> </div> <div> Data Trigger On <input type="text" value="don"/> Data Trigger off <input type="text" value="doff"/> </div> <div> Trigger Port <input type="text" value="COM1"/> Data Format <input type="text" value="Text"/> </div> </div>	
Data Trigger On	<p>If it was empty, any data form serial can trigger the IP Modem. The first frame data will be discarded because the IP modem was in deep sleep state.</p> <p>If it is not empty, only the data matching to the "online data" can trigger the IP Modem.</p>
Data Trigger Off	<p>If it was empty, the IP Modem kept online.</p> <p>If it is not empty, only the data matching to the "offline data" can made the IP Modem offline.</p>
Trigger Port	Set the trigger data source from PORT1 or PORT2
Data Format	Format of the trigger data: Text or HEX

I/O: Sleep and Wake up

Made the IP Modem sleep or wake up via I/O level. If the I/O was in high level or suspend, the IP Modem was sleep. Otherwise, It would trigger the IP Modem wake up.

<div> Trigger Setting <div> Trigger Type <input type="text" value="I/O"/> </div> <div> I/O type <input type="text" value="Sleep/Wakeup"/> </div> <div> I/O Port <input type="text" value="I/O1"/> </div> </div>	
Sleep/Wakeup	Made the IP Modem sleep or wake up depended on the I/O state
I/O	Set I/O port to trigger the IP Modem to sleep or wake up

MIXD

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

Trigger Setting	
Trigger Type	MIXD
CALL Phone No.	
SMS Phone No.	
Data Trigger On	don
Data Trigger off	doff
Trigger Port	COM1
Data Format	Text
I/O1 Control	ALL
I/O2 Control	ALL
I/O3 Control	ALL
SMS Password	

CALL Phone No.	Any phone number call can wake up IP Modem, if the trigger number is empty. Otherwise only the trigger phone number call can trigger the IP Modem.
SMS Phone No.	Any phone number's SMS can wake up IP Modem, if the trigger number is empty. Otherwise only the trigger phone number's SMS can trigger the IP Modem.
Data Trigger On	Online data
Data Trigger Off	Offline data
Trigger Port	Set the trigger data source from PORT1 or PORT2
Data Format	Format of the trigger data: Text or HEX

3.3.3.3 Debug Level

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

Debug	
Debug Level	Level 1
Debug Port	COM1

Debug Level	Close: no debug information output Level 1: simple prompt information output Level 2: detail debug information output
Debug Port	Port 1: debug info send to port 1 Port 2: debug info send to port 2 485: debug info send to RS485

3.3.3.4 Clear Serial Buffer

When open "clearing Serial buffer" function, serial port data before connecting to the network will not be sent to the center

Other	
Clear Serial Buffer	open

3.4 Data Service Center Settings

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

3.4.1 Data Service Center

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

Note: 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. All the multi DSC can receive the same application data .

Data Service Center Settings
Data Center Number
Main Center Port
Backup Center Port

Main Backup Param
Reconnect Int. (s)
Connect Retry Times
Back To Main Server

Reconnect Int.(s)	reconnect time interval in second
Connect Retry Times	reconnect times
Back To Main Server	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.

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. The back center is invalid. The IP Modem will connect to mulit Data Center and transmit data.

Data Service Center Settings

Data Center Number

Main Center	<input type="text" value="120.42.46.98"/>	Port	<input type="text" value="19000"/>
2nd Center	<input type="text" value="120.42.46.98"/>	Port	<input type="text" value="19001"/>
3rd Center	<input type="text" value="120.42.46.98"/>	Port	<input type="text" value="19002"/>
4th Center	<input type="text" value="120.42.46.98"/>	Port	<input type="text" value="19003"/>
5th Center	<input type="text" value="120.42.46.98"/>	Port	<input type="text" value="19004"/>

3.4.2 Multi-Center Connection Check

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

Muilt-Center Connection Param

Reconnect Int. (s)

Connect Retry Times

Reconnect Int.(s)	reconnect time interval in second
Connect Retry Times	reconnect times

3.4.3 ICMP Link Check

ICMP link check send to server a icmp packet and wait reply to check the link status. If the reply is lost, it means that the link may be broken.

ICMP Check

ICMP Check

Dest Address Check Interval (s)

Check Times

ICMP Check	Enable or Disable
Dest Address	The destination address of ICMP packet to send
Check Interval(s)	The interval should not be too small. 60 is recommended(in second)
Check Times	>= 3 times

3.5 Serial port

IP MODEM support three individual serial ports, Port1, Port2 and RS485. All the three ports can enter configuration state. The default parameters of the port with baudrate 115200, data property 8N1

The data from the three port can bind to Data center.

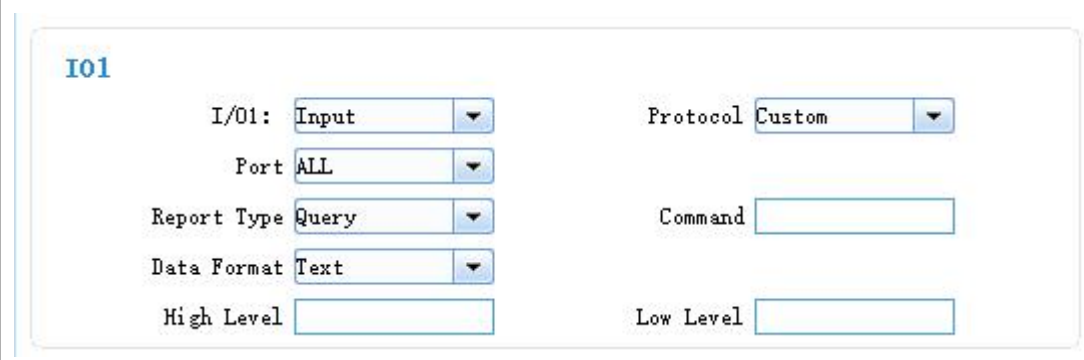
<div>COM1 BaudRate 115200 Check 8N1 Map Center ALL</div>	
<div>COM2 BaudRate 115200 Check 8N1 Map Center ALL</div>	
<div>RS485 BaudRate 9600 Check 8N1 Map Center ALL</div>	
COM1	<p>baud: the baud rate of the PORT</p> <p>1200 --- 1200 bps 2400 --- 2400 bps 4800 --- 4800 bps 9600 --- 9600 bps 14400 --- 14400 bps 19200 --- 19200 bps 38400 --- 38400 bps 56000 --- 56000 bps 57600 --- 57600 bps 115200 --- 115200 bps</p> <p>Property: Databit, Parity, Stopbit</p> <p>8N1 --- 8 Databit, No parity, 1 Stopbit 8E1 --- 8 Databit, Even parity, 1 Stopbit 8O1 --- 8 Databit, Odd parity, 1 Stopbit</p> <p>Bind:</p> <p>Center1: the data from the port send to center 1</p>

	Center2: the data from the port send to center 3 Center3: the data from the port send to center 3 Center4: the data from the port send to center 4 Center5: the data from the port send to center 5 ALL: the data from the port send to all centers Close: send to none
COM2	The same as above
RS485	The same as above

3.6 IO function

IP MODEM support 2 digital I/O and 1 Analog input,can custom data string to query data or trigger IO state.

3.6.1 Digital I/O

	
I/O1	Input:work as digital input port Output:work as digital output port Indication:will output low level when IP Modem connect data center;output high level when disconnect from data center
Port	support COM/GPRS/ SMS
Protocol	Modbus:you can query or control IO status through modbus tcp command Custom:you can custom command to query IO status
Report Type	Query/Time/IO Trigger
Command	Random string
Data Format	Text or Hex
High leve	Status indicator string,when port is high level,will report it to DSC
Low level	Status indicator string,when port is low level,will report it to DSC

3.6.2 Analog input

ADC Setting

ADC

ADC

Port

ALL

ADC type

voltage 5V

Top Limit

0

Low Limit

0

ADC	Disable or enable ADC
Port	support COM/GPRS/ SMS
ADC type	Electricity:support 4~20MA current input Voltage:support 0~5V,can customize to support 10V/15V
Report Type	Query/Time/IO Trigger
Top Limit	Sensor measurement range upper limit
Low Limit	Sensor measurement range lower limit

3.7 Dial

3.7.1 PPP Dial

PPP Dial

DialNo

*99#

QueryNetMode

WCDMA

APN

3gnet

UserName

Password

PPP Auth

AUTO

net mode

AUTO

DialNo	Network	Dial number	
	GPRS/WCDMA/LTE	*99***1#、*99#、*98*1#	
	CDMA/EVDO	#777	
APN	Network	APN	
	GPRS/WCDMA/LTE	cmnet、uninet	
	CDMA/EVDO	empty	
Username/password	Network	User name/password	
	GPRS/WCDMA/LTE	empty	
	CDMA/EVDO	card/card	
PPP Auth	AUTO,PAP and CHAP		
QueryNetMode	Search the network mode for the 4G network		

Net Mode		Net Mode
		AUTO
		EVDO
		WCDMA
		TD-SCDMA
		CDMA
		GSM

3.7.2 PPP Redial

<div> PPP Re-dial Re-dial Interval(s) <input type="text" value="30"/> Dial Retry Times <input type="text" value="2"/> </div>	
Re-dial Interval(s)	The interval between ppp dial in second
Dial Retry Times	max times of ppp dial failure

3.7.3 DNS Parameters

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.

<div> DNS Setting Main DNS <input type="text" value="8.8.8.8"/> Backup DNS <input type="text" value="8.8.8.8"/> </div>	
Main DNS	The DNS server IP address(must be IP address)
Backup DNS	The DNS server IP address(must be IP address)

3.8 Global Parameters

3.8.1 Data Frame Parameters

<div> Data Frame Setting Bytes Interval (MS) <input type="text" value="20"/> MTU <input type="text" value="1450"/> </div>	
Bytes Interval(MS)	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.(in milliseconds)
MTU	TCP Max packet length

3.8.2 Action for data send fail

When data send to server fail(there are not response from server),IP modem will take a failed action after setting delay.

<div> Action for Data Send Fail </div> <div> Re-send Int. (MS) <input type="text" value="1000"/> Re-send Times <input type="text"/> Failed Action <input type="text" value="Dial Again"/> Delay Before Action <input type="text" value="20"/> </div>	
Re-send int	The time interval if re-send fail
Re-Times	The max times of sending data failure
Fail Action	You can decide what action to take if sending data fail,including Dia again ,reconnect,reboot.
Delay before action	The time delay before Modem takes actions if sending data fail

3.8.3 Other Parameters

<div> Others </div> <div> SMS Center <input type="text"/> Heartbeat Int. (s) <input type="text" value="60"/> </div>	
SMS Center	The local SMS center number. It should set according to the local operation.
Heartbeat Int.(s)	Time interval sent heartbeat packet. (in second)

3.9 Device Manage

3.9.1 Device Manage Center Parameters


The IP Modem send device status information to the Device Manage Center. The information include network signal, network status, traffic flow and so on. The Device Manage Center also query and configure the device parameters.

<div> Device Manage Setting </div> <div> Device Manage <input type="text" value="Enable"/> </div> <div> Dev ID For Manage <input type="text"/> Protocol <input type="text" value="TCP"/> Service Address <input type="text" value="120.42.46.98"/> Port <input type="text" value="44002"/> </div>	
Device Manage	Enable or Disable
Dev ID For Manage	Device ID for manage center. 8 character

Protocol	TCP or UDP
Service Address	manage center server address
Port	manage center server port

3.9.2 Manage by SMS

Configure the IP Modem by SMS

SMS Manage SMS Configure <input type="text" value="Enable"/>  Configure Password <input type="text" value="123456"/> Manage Phone No <input type="text"/>	
SMS Configure	Enable or Disable
Configure Password	The password for SMS Configure
Manage Phone No.	If it is empty, any number can configure the IP Modem Parameters. Otherwise, only the "Administrator Number" can configure the IP Modem Parameters.

3.10 Operation

<div> Common operations <div> <div>SIM Check</div> <div>Signal</div> <div>TimeSetting</div> <div>Log</div> <div>Factory</div> <div>Ver Info</div> <div>Reset</div> <div>IMEI</div> </div> </div>	
SIM Check	To check if simcard inserted or install ok?
Signal	Inquery the signal strength of simcard network
Time Setting	Synchronize local time
Log	Read log information of IP Modem
Factory	Factory the IP Modem's parameters
Ver Info	Query the version of IP Modem
Reset	Reset modem to factory
IMEI	Inquery IMEI of IP Modem

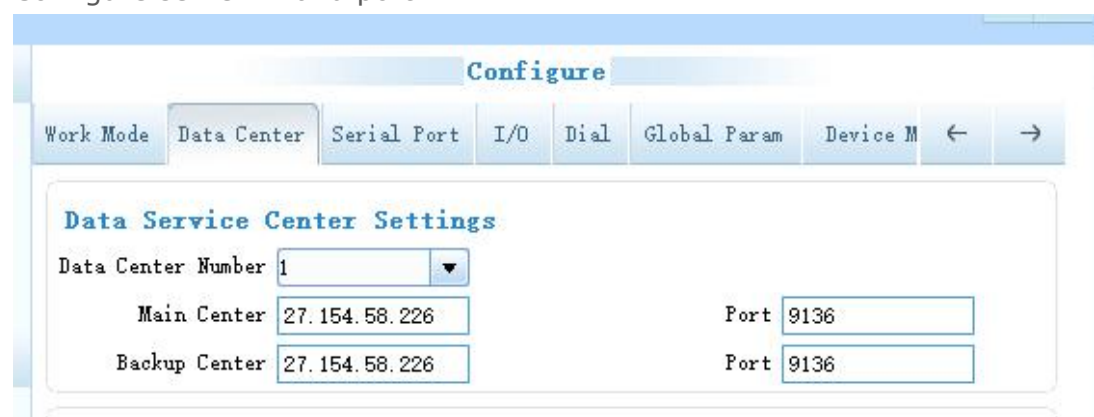
Chapter 4 Application Case

4.1 Modem connect to data center

In this application, the client can communicate with the server side by gprs network.

IP modem configuration

Configure server IP and port:



The screenshot shows a 'Configure' window with a tabbed interface. The 'Data Center' tab is selected. The 'Data Service Center Settings' section contains the following fields:

Field	Value	Field	Value
Data Center Number	1	Port	9136
Main Center	27.154.58.226	Port	9136
Backup Center	27.154.58.226		

Fill in the APN from your simcard provider:



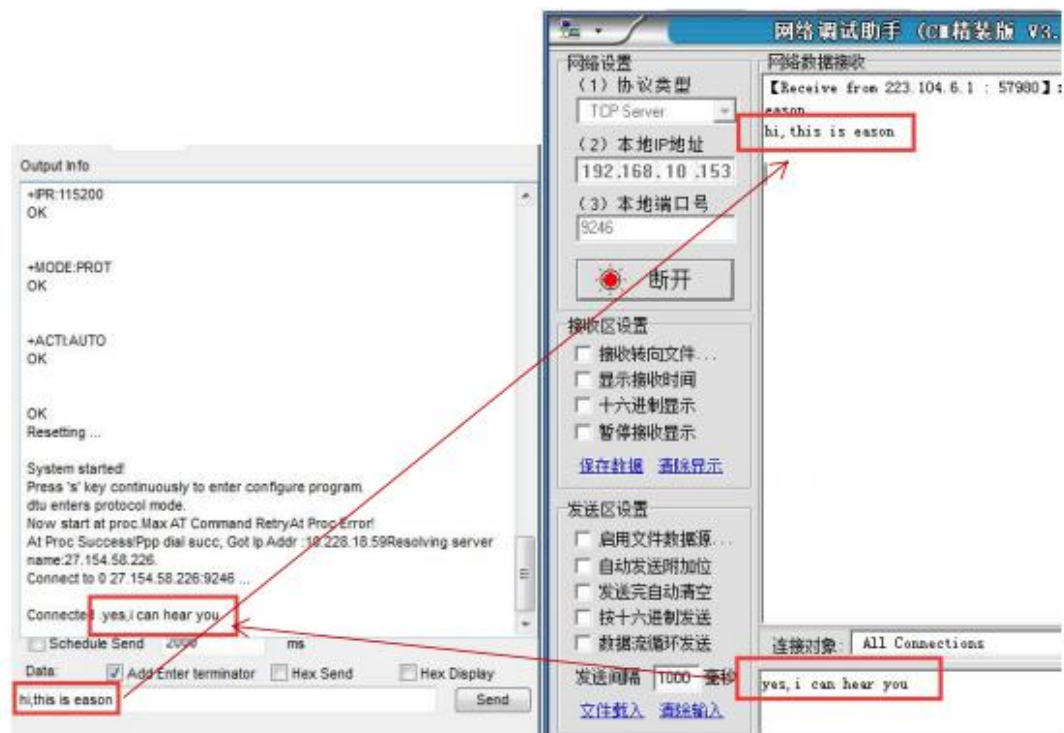
The screenshot shows the 'Configure' window with the 'Dial' tab selected. The 'PPP Dial' section contains the following fields:

Field	Value	Field	Value
DialNo	*99#	QueryNetMode	
APN	3gnet	UserName	
Password		PPP Auth	AUTO
net mode	AUTO		

Repower modem, wait it connected to server.



Then you can send data to test the communication between modem with data sever(here use Netassit software to simulate data server)



4.2 Remote management platform

Four-Faith provide RMS for customer to manage device,you need enable Device management setting in modem,do simple configuration following the next picture (Note that ID for platform should be same with the Device code in platform)

Configure

Work Mode
Data Center
Serial Port
I/O
Dial
Global Param
Device M
←
→

Device Management Setting

Device Management Enable

ID for Platform 12345678

Protocol TCP

Service Address 27.154.58.226

Port 20117

You can get platform account from Four-Faith:

DTU Platform address: <http://27.154.58.226:20116> (pls contact engineer from four faith to get your own account)

Fill in username and passform to login plattform:

→ ↺ ↻
27.154.58.226:20116/Device/Account/Login
☆

Four-Faith
Device Management
Language

Remote Device Maintenance

User Login

👤

🔒

Login

In Device tab,you can add your device in platform,then repower device to wait to connected to platfrom.

Four-Faith
Device Management

🏠 Overview
📶 Device
📊 Report

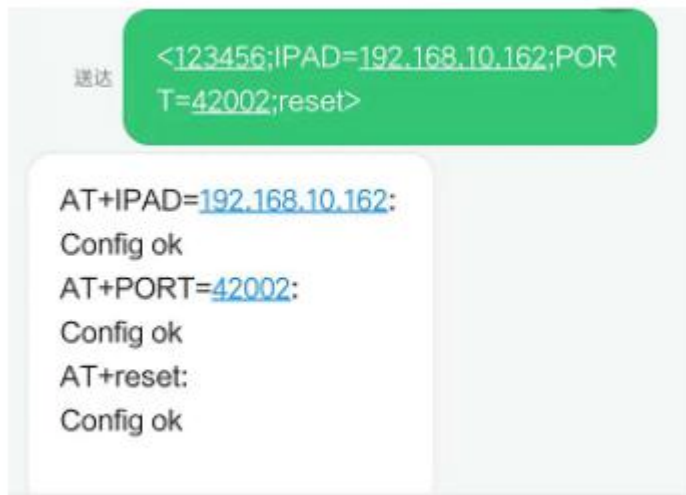
yonghuceshi1

Add Device
Batch Operate

➕ Add
➡ Move
🗑 Delete
📁 Import
📄 Export
🔄 Operate
🔄 Refresh
👤 Online: 1/49/50
Code/Name/Sim Card No

List
Card
Map

	State	Device Code	Device Name	Device Model	Protocol	Sim Card No	Operator	IMEI	Install Address	Last Online Time
<input type="checkbox"/>	🟢	03201271	fon_18091135202_studio_berra	F2X14	2.0		Mobile			2019-11-12 14:33:17
<input type="checkbox"/>	🔴	00200010	leon	F2X14	2.0		移动			2018-07-05 14:19:00
<input type="checkbox"/>	🔴	03201269	magazzino4	F2X14	2.0		Mobile			2018-07-09 21:37:50
<input type="checkbox"/>	🔴	03201270	fon_delta_tex_934	F2X14	2.0		Mobile			2019-10-31 11:29:59
<input type="checkbox"/>	🔴	03201272	fon_alansari_5521	F2X14	2.0		Mobile			2019-05-06 16:25:35
<input type="checkbox"/>	🔴	03201273	magazzino1	F2X14	2.0		Mobile			2018-07-09 21:14:18



Detail AT command pls check in Appendix 2.

4.4 Update firmware via download tool

If you need upgrade firmware,pls contact Four-Faith sale or technical support to get the download tool and latest firmware file.

Download tool:



Follow the steps to upgrade:

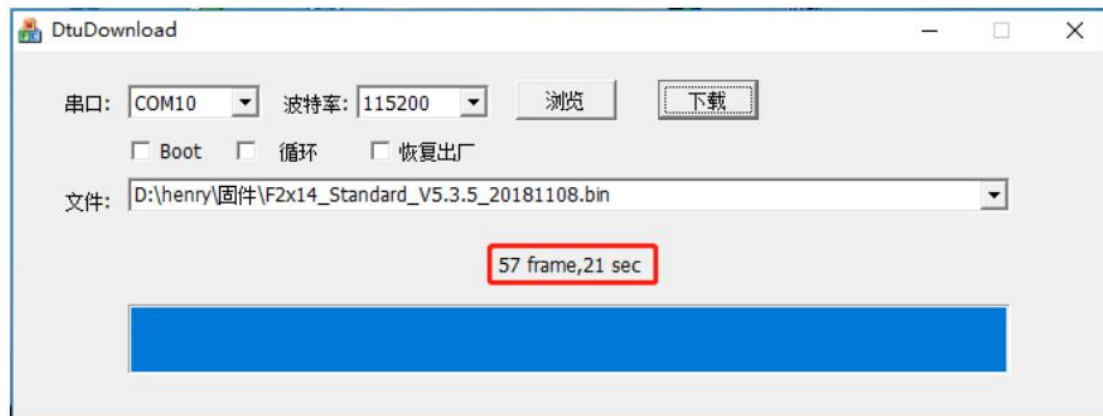
connect your laptop with modem via serial cable

choose the com and set correct baudrate, and find the firmware version you save in

your laptop, then click download, as the following show:



Finally,repower modem, you can see the download progress.

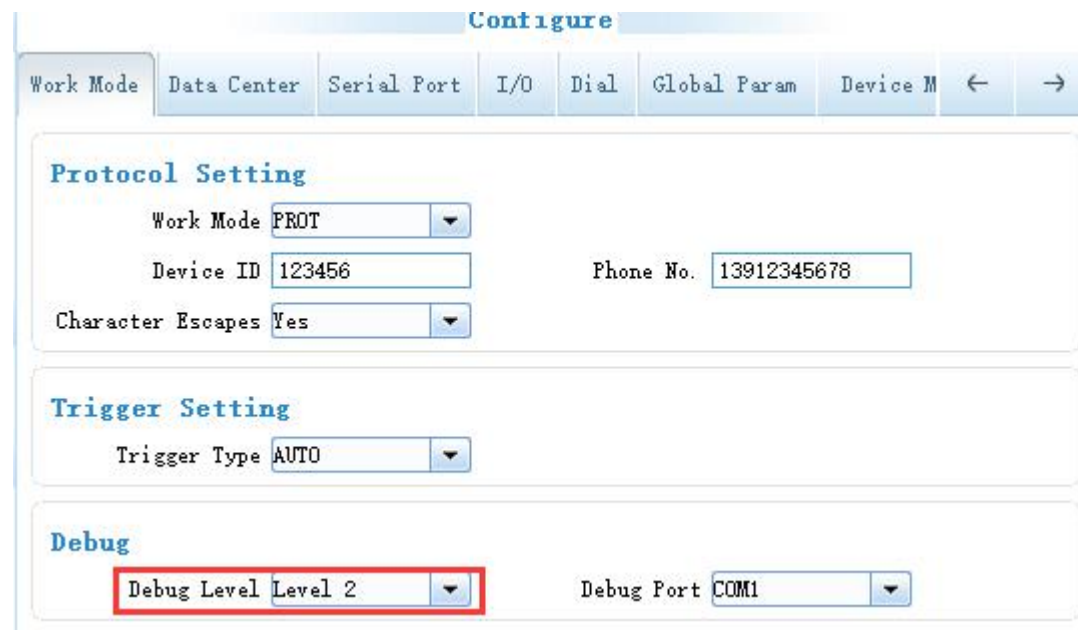


When download is complete, you will find the cost time (21 sec).

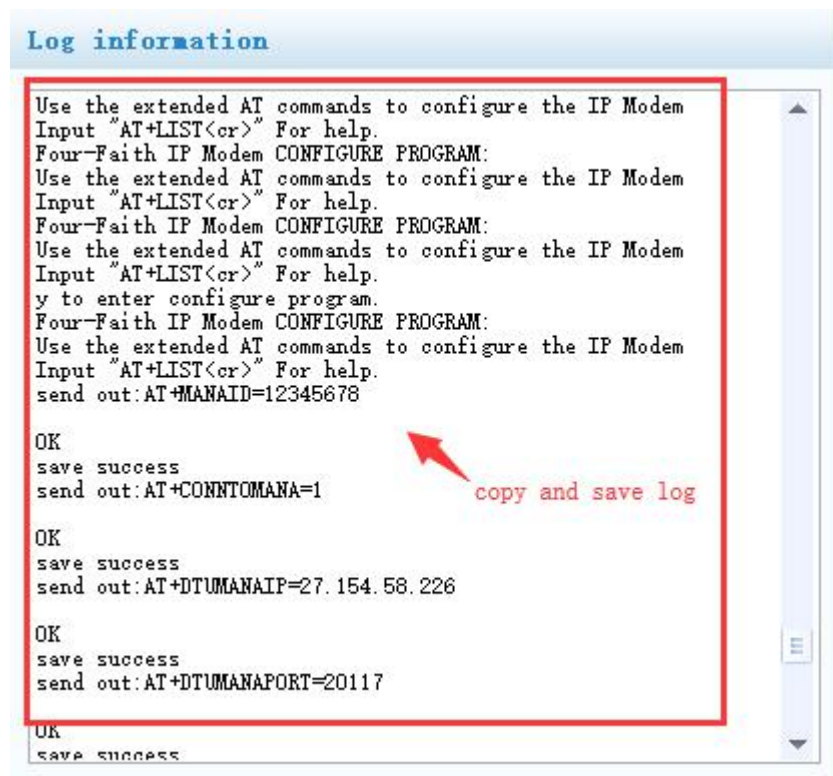
4.5 Save modem logs

When using modem and meet any problems, you can save logs and send it to Four-Faith technical support.

In order to get detail log information, you should set debug level to " level 2" first:



Then you can reproduce the problem and save the log to us:



4.6 Modbus Protocol for GPIO&ADC Acquisition

4.6.1 The Way of Cable Connection.

Analog input

- Single-cable: Connect the analog output of the sensor to the analog input(ADC) of F2X16 directly.
- Double-cable: Connect the positive of analog output of the sensor to the analog input(ADC) of F2X16, and connect the ground wire to GND(PIN2) of F2114.

Digital input

- Low level input: Connect the input of contact switch to GND of F2x16 and connect the output of contact switch to the digital output of F2X16(IO1/IO2).
- High level input: Connect 3.3V voltage output to IO1/IO2, and connect the ground wire to GND of F2X16.

4.6.2 Modem setting:

Configure

Work ModeData CenterSerial PortI/O DialGlobal ParamDevice M←→

IO1
I/O1: Input
Port Disable
Report Type Input
Protocol Modbus
Command

IO2
I/O2: Input
Port ALL
Report Type Query
Protocol Modbus
Command

ADC Setting
ADC ADC
Port ALL
ADC type voltage 5V
Top Limit 0
Low Limit 0

IO1: Digital input/output 0---3.3V

IO2: Digital input/output 0---3.3V

ADC: current input 4--20MA

*Changes can be made in hardware to make ADC as voltage input.

For IO1&IO2:

Disable---- Don't use IO port

Input--- Use IO as digital input port.

Output---Use IO as digital output port.

Indication---When connect to data center, it will output a high level to indicate data transmission

You can choose the port for each port:

RS232-1----The value will be sent to com1, you can check the value in RS232-1.

RS232-2----The value will be sent to com2, you can check the value in RS232-2.

GPRS----The value will be sent to net, you can check the value in data center.

SMS----The value will be sent as a sms.

RS485----The value will be sent to RS485 port, you can check the value in RS485

I01		I/01: <input type="text" value="Input"/>	Protocol <input type="text" value="Modbus"/>
		Port <input type="text" value="ALL"/>	Command <input type="text"/>
Report Type		<div style="border: 2px solid red; padding: 2px;"> COM1 COM2 GPRS SMS RS485 ALL </div>	
I02		I/02: <input type="text"/>	Protocol <input type="text" value="Modbus"/>
		Port <input type="text"/>	Command <input type="text"/>
Report Type			

You can choose the protocol, and you also need set the query commands.
Modbus--you can use our modbus to query the value.
Custom---you can use the command of your own.

Set modbus address in Global param:

Work Mode	Data Center	Serial Port	I/O	Dial	Global Param	Device M	←	→
Data Frame Setting								
Bytes Interval (MS) <input type="text" value="0"/>			MTU <input type="text" value="1450"/>					
Action for Data Send Fail								
Re-send Int. (MS) <input type="text" value="1000"/>			Re-send Times <input type="text"/>					
Failed Action <input type="text" value="Dial Again"/>			Delay Before Action <input type="text" value="20"/>					
Others								
SMS Center <input type="text"/>			Heartbeat Int. (s) <input type="text" value="60"/>					
MODBUS								
MODBUS NO <input type="text" value="1"/>								

4.6.3 The modbus command for F2X16 IO& ADC:

Query digital Input

To read IO1 status(digital input)

Request: 01 02 00 00 00 01 B9 CA

Response:01 02 01 01 60 48 (IO1 is high level)

Response:01 02 01 00 A1 88 (IO1 is low level)

To read IO2 status(digital input)

Request: 01 02 00 01 00 01 E8 0A

Response:01 02 01 01 60 48 (IO2 is high level)

Response:01 02 01 00 A1 88 (IO2 is low level)

Notes of the modbus commands. Take the command 01 02 00 02 00 01 18 0A for example.

Modbus addr.	Function code	Register addr.		Register number		CRC checksum	
01	02	00	02	00	01	18	0A

Response 01 02 01 01 60 48

Modbus addr.	Function code	bytes	Register status	CRC checksum	
01	02	01	01(high level)	60	48
01	02	01	00 (low level)	A1	88

Set digital output

To set IO1 status(digital output)

Request: 01 05 00 00 FF 00 8C 3A(set IO1 high level)

Response: 01 05 00 00 FF 00 8C 3A

Request: 01 05 00 00 00 00 CD CA(set IO1 low level)

Response: 01 05 00 00 00 00 CD CA

To set IO2 status(digital output)

Request: 01 05 00 01 FF 00 9C 0A(set IO2 high level)

Response: 01 05 00 01 FF 00 9C 0A

Request: 01 05 00 01 00 00 AC 0A(set IO2 low level)

Response: 01 05 00 01 00 00 AC 0A

Notes of the modbus commands. Take the commmand 01 05 00 00 FF 00 8C 3A for example.

Modbus addr.	Function code	Register addr.		Set high/low level		CRC checksum	
01	05	00	00	FF	00	8C	3A
				00	00	CD	CA

Query ADC

To read ADC status(current input)

Request: 01 04 00 02 00 01 90 0A

Response:01 04 02 00 64 B8 DB

Notes of the modbus commands. Take the command 01 04 00 01 00 01 60 0A for example.

Modbus addr.	Function code	Register addr.		Register number		CRC checksum	
01	04	00	01	00	01	60	0A

Response 01 04 02 00 B8 B9 42

Modbus addr.	Function code	Bytes	Acquisition value		CRC checksum	
01	04	02	04	B8	B9	42

The acquisition value in HEX. You need to convert it to DEC and calculate with the formula below.

Current type: $3.3/1023 * \text{acquisition value}/150 * 1000 = (\text{mA})$

Voltage type: $3.3/1023 * \text{acquisition value}/12.1 * 20.16 = (\text{V})$

(The acquisition value should be converted to DEC)

4.7 MQTT Test

Modem can work as MQTT client.you need set work mode in MQTT,Client ID can be configured to the required string,username and password are from the MQTT server (some servers dont need). Receive topic is the Send topic in another MQTT client, Send topic is the Receive topic in another MQTT client,as shown in the figure:

Configure

Work Mode
Data Center
Serial Port
I/O
Dial
Global Param
Device M
←
→

Protocol Setting

Work Mode MQTT

Client ID: IamClientId

User Name: admin

Password: pauyeeahn

Receive Topic: IamRecTopic

Send Topic: IamSendTopic

KEY:

You can download MQTTBox as another client, parametersconfiguration as the following:

MQTTBox Edit Help

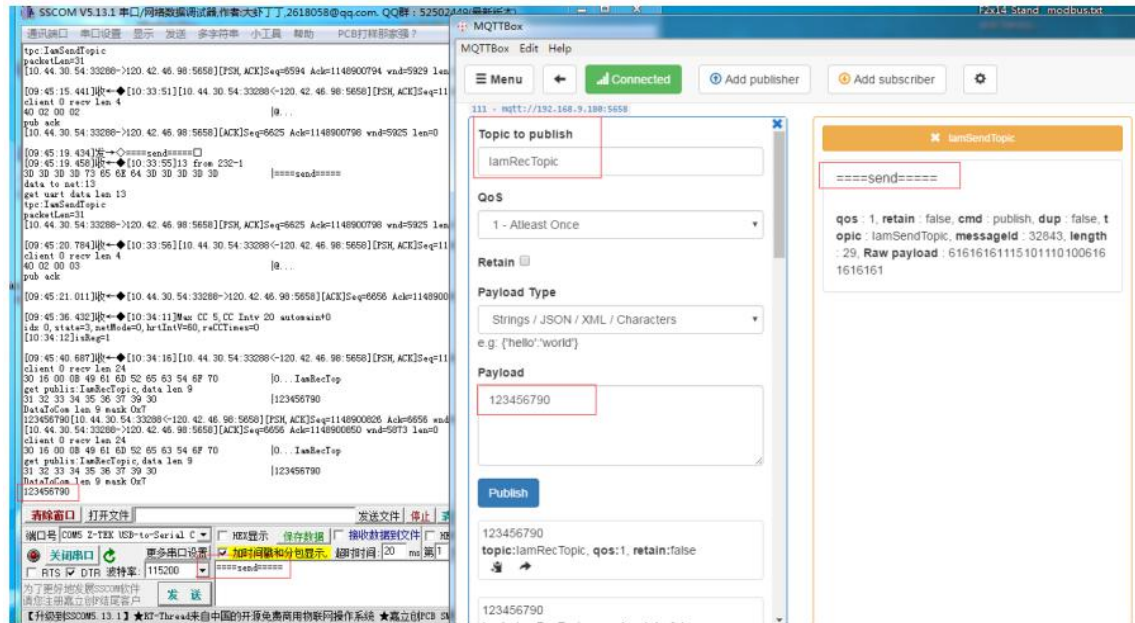
Menu
← MQTT CLIENT SETTINGS
Client Settings Help

MQTT Client Name <input style="width: 90%;" type="text" value="111"/>	MQTT Client Id <input style="width: 90%;" type="text" value="pauyeeahn_id"/>	Append timestamp to MQTT client id? <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes	Broker is MQTT v3.1.1 compliant? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Protocol mqtt / tcp	Host <input style="width: 90%;" type="text" value="192.168.9.180:5658"/>	Clean Session? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Auto connect on app launch? <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes
Username <input style="width: 90%;" type="text" value="admin"/>	Password <input style="width: 90%;" type="password" value="*****"/>	Reschedule Pings? <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes	Queue outgoing QoS zero messages? <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes
Reconnect Period (milliseconds) <input style="width: 90%;" type="text" value="1000"/>	Connect Timeout (milliseconds) <input style="width: 90%;" type="text" value="30000"/>	KeepAlive (seconds) <input style="width: 90%;" type="text" value="10"/>	Will - Payload <input style="width: 90%;" type="text"/>
Will - Topic <input style="width: 90%;" type="text" value="/ftsafopic"/>	Will - QoS 0 - Almost Once	Will - Retain <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes	

Save
Delete

Clients will connect to MQTT server if parameters are configured correctly,you can send data to test communication from MQTT Box:

The send topic of the MQTTBOX is set to the Receive topic of the terminal, and the Receive topic is set to the send topic of the modem, and data can be sent to each other at this time. As shown below:



4.8 MTCP/MRTU

When modem work in MTCP/MRTU mode, can support converting data from modbus RTU to modbus TCP. This working mode is based on PROT mode (transparent transmission)



Modbus RTU frame format:



Slave ID:

1 bytes, used to identify modbus frame transmitted on the TCP/IP stack

Function Code: 1 bytes, coding range 1-255

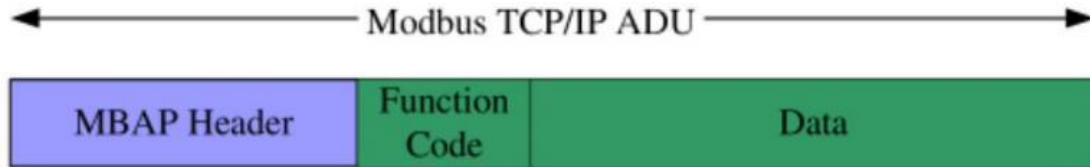
Data:

N*1 bytes, length and content are determined by the type of Function code

Error Check:

2 bytes, CRC check, used to check whether the received data is correct.

Modbus TCP frame format:

**MBAP Header:**

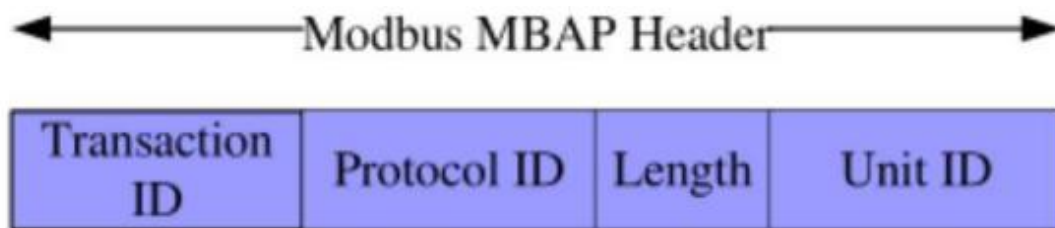
7 bytes, Modbus application protocol header. used to identify the modbus frame transmitted on the TCP/IP stack.

Function Code:

1 bytes, coding range 1-255

Data: N*1 bytes, based on the types of the function code.

MBAP Header:



Transaction ID: 2 bytes, Modbus request/respond transaction identifier.

Protocol ID: 2 bytes, 0=Modbus protocol

Length: follow-up bytes, include Unit ID and data field

Unit ID: 1 bytes, the ID of remote slave station

Example 1:

Modbus TCP(Data Center send to modem):

00 01 00 00 00 06 01 04 00 00 00 01 (06 length, 01 is modbus address, 04 is function code, 00 00 00 01 is the register start address 2 bytes + the number of registers 2 bytes)

Modbus RTU(recieve in serial port of modem):

01 04 00 00 00 01 31 CA (31 CA is CRC code)

Response data from serial:

01 04 02 00 B8 B9 42 (02 is length, 00 B8 is data)

Data center will recieve modbus TCP data:

00 01 00 00 00 05 01 04 02 00 B8 (05 is data length)

Example 2:

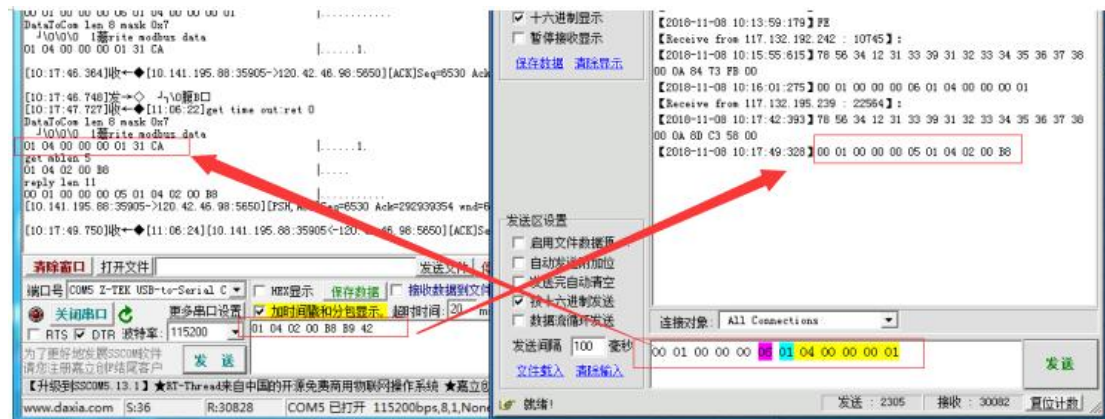
Data center send: 00 01 00 00 00 06 01 04 00 08 00 01

Display in serial: 01 04 00 08 00 01 B0 08

Response in serial: 01 04 04 00 08 00 B8 7A 34

Data center receive: 00 01 00 00 00 07 01 04 04 00 08 00 B8

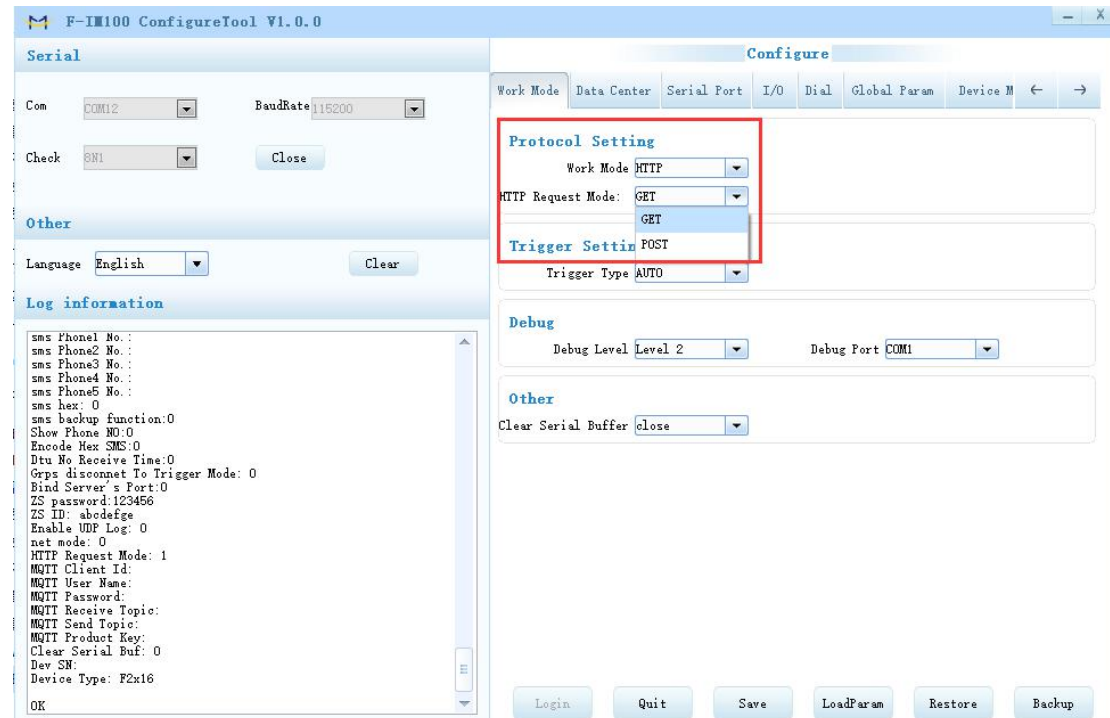
The communication test as the below picture:



4.9 HTTP Protocol Test

Modem can work in HTTP mode, HTTP request mode you can choose GET or POST as the following setting.

You need configure data center address before test.



POST mode:

If Modem dial successfully and connected to http server, Serial data will be packaged with HTTP format then sent to the server.

HTTP data:

```
POST HTTP/1.1
Host: 120.42.46.98:5650
User-Agent: Go-http-client/1.1
Content-Length: 9
Content-Type: application/json
```

6666666

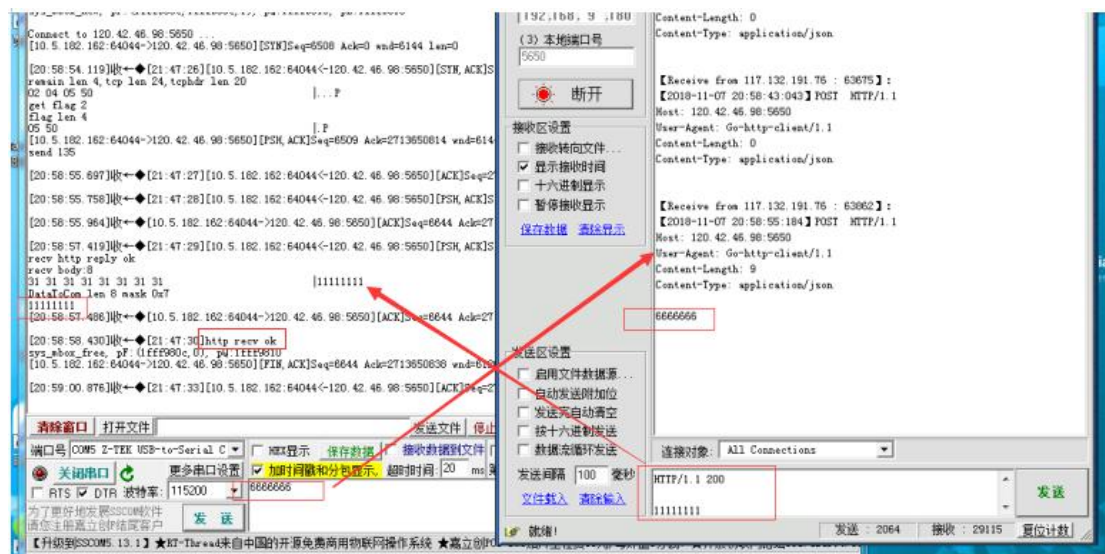
After sending data, modem should receive response within 5 second, response format as:

```
HTTP/1.1 200
```

OK

When modem receive data, will transfer application data (OK) to serial port, as

the following figure show:



GET mode:

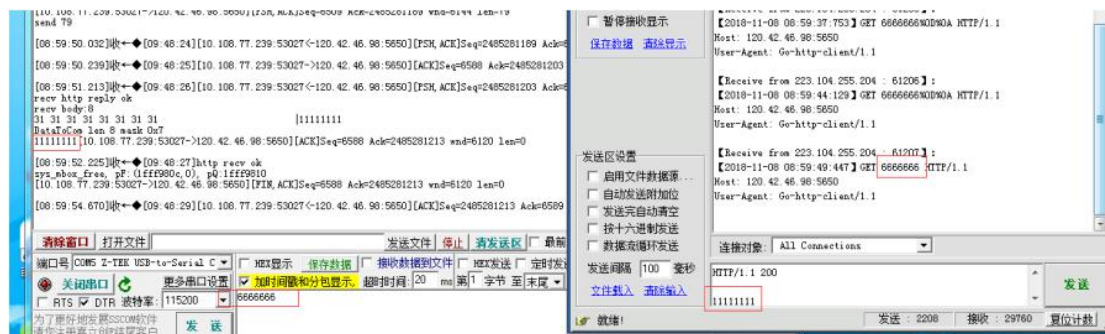
HTTP data:

GET 66666666 HTTP/1.1

Host: 120.42.46.98:5650

User-Agent: Go-http-client/1.1

If data send to server successfully, modem also will receive "ok" in serial port, as the following figure show:



If no data is sent, modem will send an HTTP request packet according to configured interval. The format is the previous format, but the application data is missing. Such as:

GET HTTP/1.1

Host: 120.42.46.98:5650

User-Agent: Go-http-client/1.1

4.10 Clear Serial Buffer

If enable Clear Serial Buffer function, the serial data will be cleared until modem connect to data center.

— X

Configure

Work ModeData CenterSerial PortI/ODialGlobal ParamDevice M←→

Protocol Setting

Work ModeMTCR/MRTU

Device ID123456Phone No.13912345678

Character EscapesYes

Trigger Setting

Trigger TypeAUTO

Debug

Debug LevelLevel 2Debug PortCOM1

Other

Clear Serial Bufferopen

Appendix 1

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"

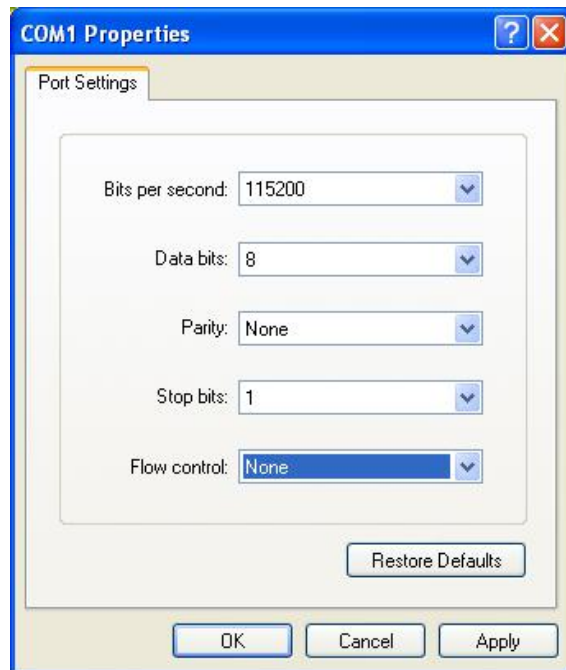
Bits per second: 115200

Data bits: 8

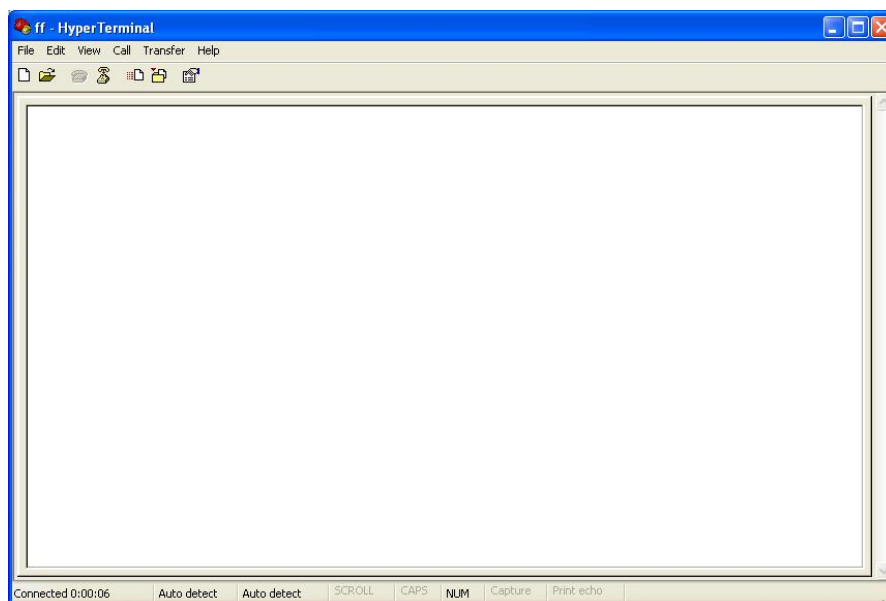
Parity: None

Stop bits: 1

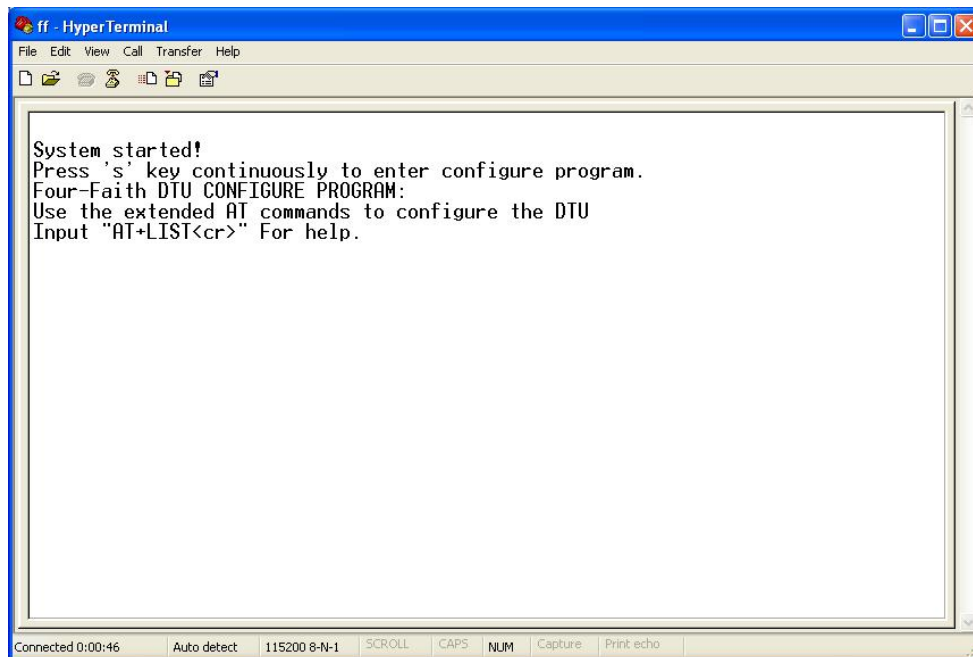
Flow control: None



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 2

AT command for DTU setting:

AT+APN=<apn> Set Access Point Name
AT+CEN=<center no.> Set Center call number
AT+USERNAME=<user id> Set PPP Authentication User
Id
AT+PASSWORD=<password> Set PPP Authentication
Password
AT+SVRCNT=< Total Servers> Set Total Servers
AT+IPAD=<Server's Ip Address> Set Server's Ip or Domain
AT+IPADn=<Aux Server's Ip Address(n=1,2..4)> Set Other Server's Ip or
Domain
AT+PORT=< Server's Port> Set Main Server's Port
AT+PORTn=<Other Server's Port(n=1,2...4)> Set Other Server's Port
AT+IPSEC=<Secondary Server's Ip Addr.> Set Secondary Server's Ip
AT+PTSEC=<Secondary Server's Port> Set Secondary Server's Port
AT+IDNT=<8-digit Hex ID No.> Set modem's ID number
AT+MODE=<Work mode> Set Work mode
AT+DEBUG=0/1/2 Set modem's debug level
AT+POLLTIME=<Poll time seconds.> Set heartbeat poll time .
AT+DNSSVR=<Dns Server's Ip.> Set Dns Server's Ip.
AT+DNSSV2=<Second Dns Server's Ip.> Set Second Dns Server's Ip.
AT+DNSSVRn=<Dns(n) Server's Ip.> Set Dns(n) Server's Ip.
AT+TCPACT=<Tcp Conn Act Poll Seconds> Set Tcp Connection Act Poll
Seconds.
AT+CTRLNO=<Control Phone No.> Set Control Phone No.
AT+SMSDPSWD=<Smsd pasword.> Set Sms Daemon
Password.
AT+STRAIGHT=0/1 Set deliver server's data
directly.
AT+QUIT Quit the at command config
program.
AT+RESET Reset the system.
AT+FACTORY Load the factory setting.
AT+VER Check SoftWare Version.
AT+IPR Set Serial Port Baudrate.
AT+CONNRGST Set Custom Register info
AT+LINKRGST Set Custom Keep OnLine info