F2X16 V4 Series IP MODEM User Manual	Version	
	V1.0.0	
	Product Name:F2X16 V4	Total page36

F2X16 V4 Series IP MODEM User Manual

This user manual is suitable for the following model:

Modem	Product Type
F2116 V4	GPRS IP MODEM
F2816 V4	LTE IP MODEM
F2C16 V4	Cat1 IP MODEM
F7916 V4	GPS+LTE IP MODEM

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Files Revised Record

Date	Version	Remark	Author
2021-07-30	V1.0.0	Original	ZDM

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Note:There may be different components and interfaces in different model,please in kind prevail.

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Chapter 1 Brief Introduction of Product

1.1General

F2X16 V4 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 design; provides 2 ADC, 3 I/O, be 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. Typical application topology is showed in Figure 1-1.

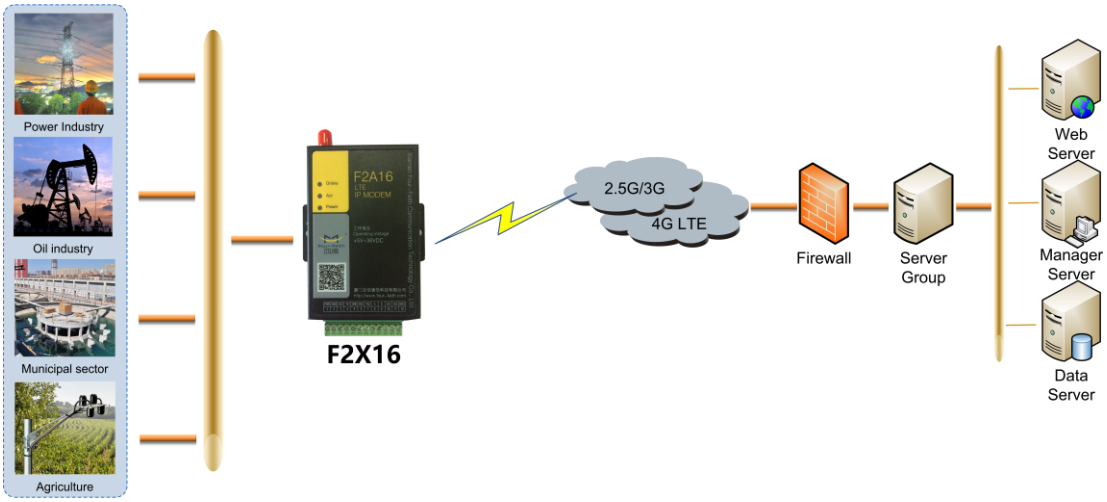

Figure 1-1 IP MODEM Application Topology

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

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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 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(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, can support digital input/output, and can customize to be pulse counting, ADC; 2 ADC channels, can support 4~20mA current input, can customize to support voltage input, DI/O, pulsing counting.
- 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 showed in Figure 1-2：

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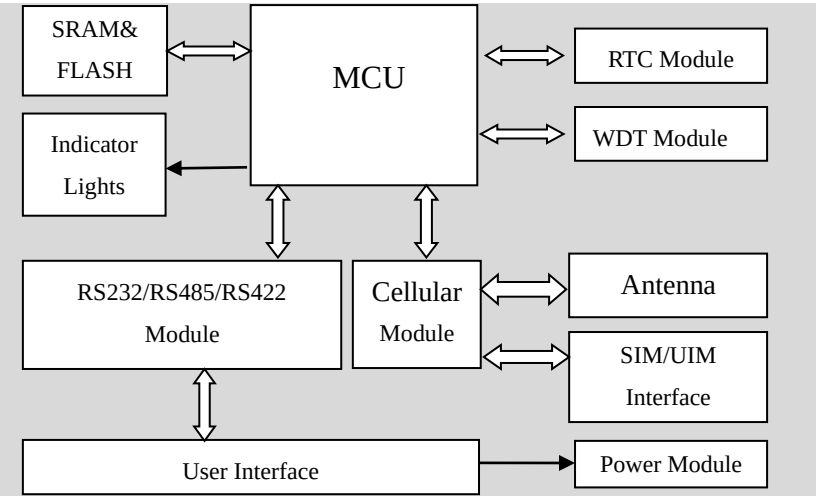

Figure 1-2 IP MODEM Principle Chart

1.4 Specifications

Hardware System

Item	Content
CPU	Industrial 32 bits CPU
FLASH	1MB
SRAM	256KB
ADC	12-bit

Interface

Item	Content
Serial	1 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
Indicator	"Power", "ACT", "Online"
Antenna	Cellular: 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

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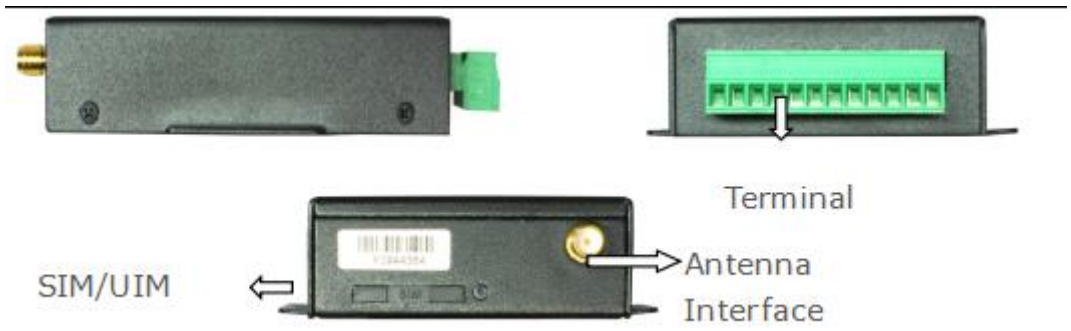

Note:There may be different components and interfaces in different model,please in kind prevail.

Power Input

Item	Content
Standard	DC 12V/0.5A
Power Range	DC 5~36V

Power Consumption（Communication power consumption differs from different modules）

Working Status	Power Consumption
Communication	20~80mA@12VDC
Standby	15~30 mA@12VDC
Sleep	1mA@12VDC

Physical Characteristics

Item	Content
Housing	Iron, providing IP30 protection
Size	91x58.5x22 mm (Antenna and Accessories are not included)
Weight	205g

Others

Item	Content
Operating Temperature	-35~+75ºC （-22~+167℉）
Storage Temperature	-40~+85ºC （-40~+185℉）
Operating Humidity	95%(Non-condensing)

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Chapter 2 Installation Introduction

2.1 General

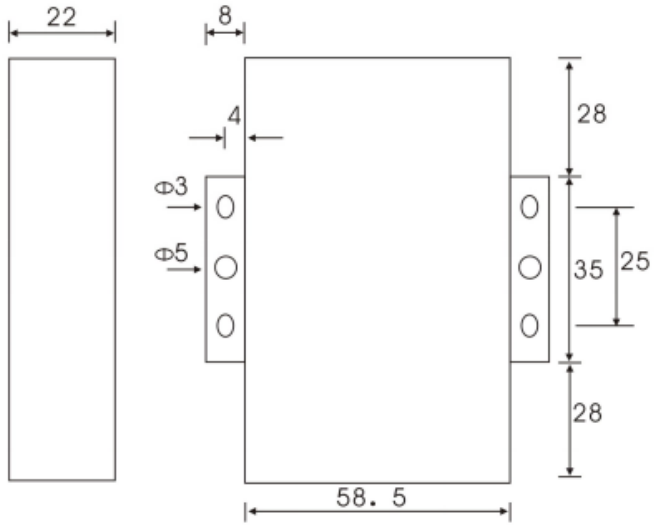
The IP MODEM must be installed correctly to make it work properly.
Warning: Forbid to install the IP MODEM when powered!

2.2 Encasement List

Name	Quantity	Remark
IP MODEM host	1	
Cellular Antenna	1	
Power adapter	1	
RS232 data cable	1	(Or RS485 cable)
Manual CD	1	
Certification card	1	
Maintenance card	1	

2.3 Installation and Cable Connection

Dimension: (unit: mm)



Installation of SIM/UIM card

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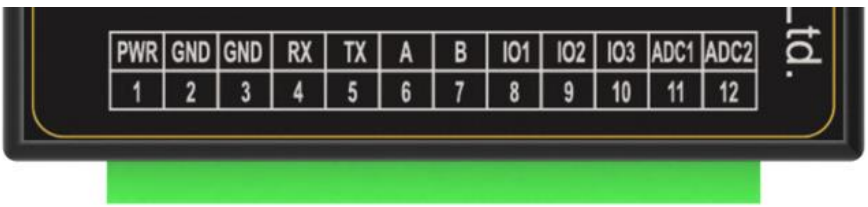
Firstly power off the IP MODEM, and press the button of the SIM/UIM card outlet with a needle object. Then the SIM/UIM card sheath will flick out at once. Put SIM/UIM card into the card sheath (Pay attention to put the side which has metal point outside), and insert card sheath back to the SIM/UIM card outlet. Warning: Forbid to install SIM/UIM 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	GND	System Ground	N/A
4	RX	RS232 RX	N/A
5	TX	RS232 TX	N/A
6	A	RS485 anode	N/A
7	B	RS485 cathode	N/A
8	IO1	GPIO	Reserved compatible pulse wave input counter, ADC, and pulse output
9	IO2	GPIO	Reserved compatible pulse wave input counter, ADC, and pulse output
10	IO3	GPIO	Reserved compatible pulse wave input counter, ADC, and pulse output
11	ADC1	ADC	N/A
12	ADC2	ADC	N/A



Installation of cable

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F2X16 V4 adopts industrial terminal block interface, the recommendatory cable is 28-16AWG.

Adapter（Rating Output 12VDC/0.5A）

Cable Color	Power Output Polarity
Black&White	Anode
Black(with letters)	Cathode

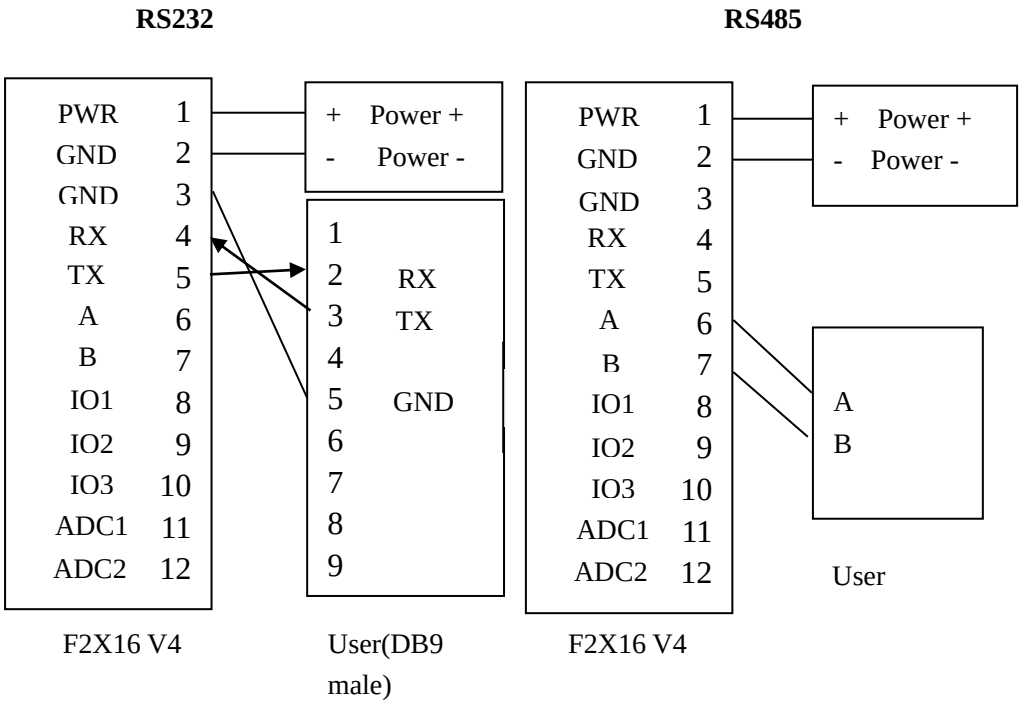
RS232 Cable

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

RS485 Cable(optional)

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

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supply power above 6W.(Ripple is less than 300mV, and ensure that the instantaneous voltage does not exceed 36V)

2.5 Indicator Lights Introduction

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

Indicator	Status	Introduction
Power	off	IP MODEM is powered off
	on	IP MODEM is powered on
ACT	off	No data communication
	Blink	Data is communicating
Online	off	IP MODEM hasn’t logged on network
	on	IP MODEM has logged on network

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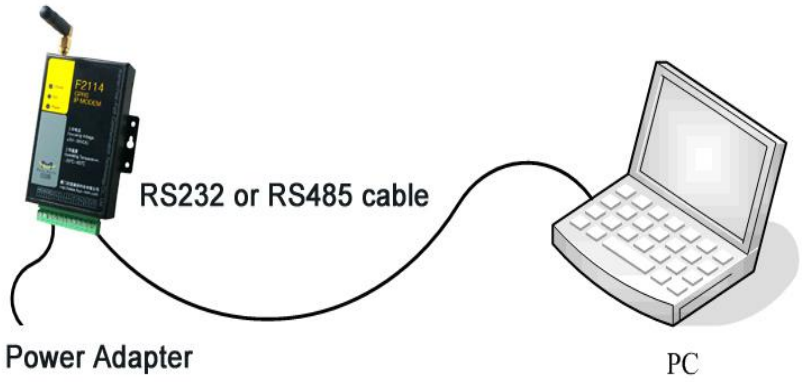
Chapter 3 Configuration

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.

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3.3 IP Modem's Parameters Configuration

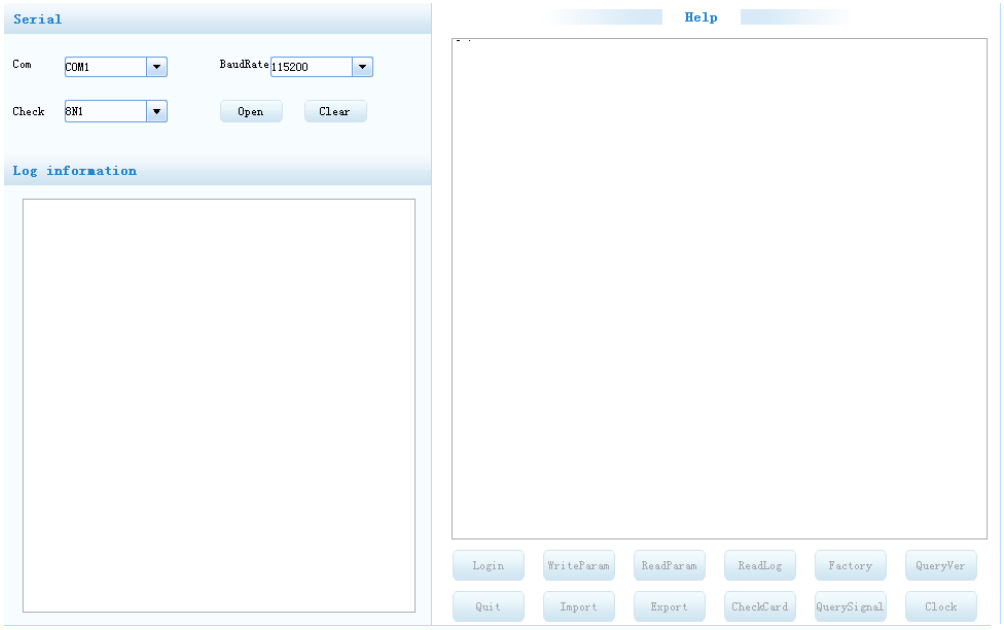
There are data settings in HEX format in the parameters,
for the HEX format, the data must be hexadecimal characters, and the number of characters cannot be an odd number.

For example, "12AB" is in the correct format

"12A" format error, the number of characters is odd

"12G" format error, non-hexadecimal character

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..."

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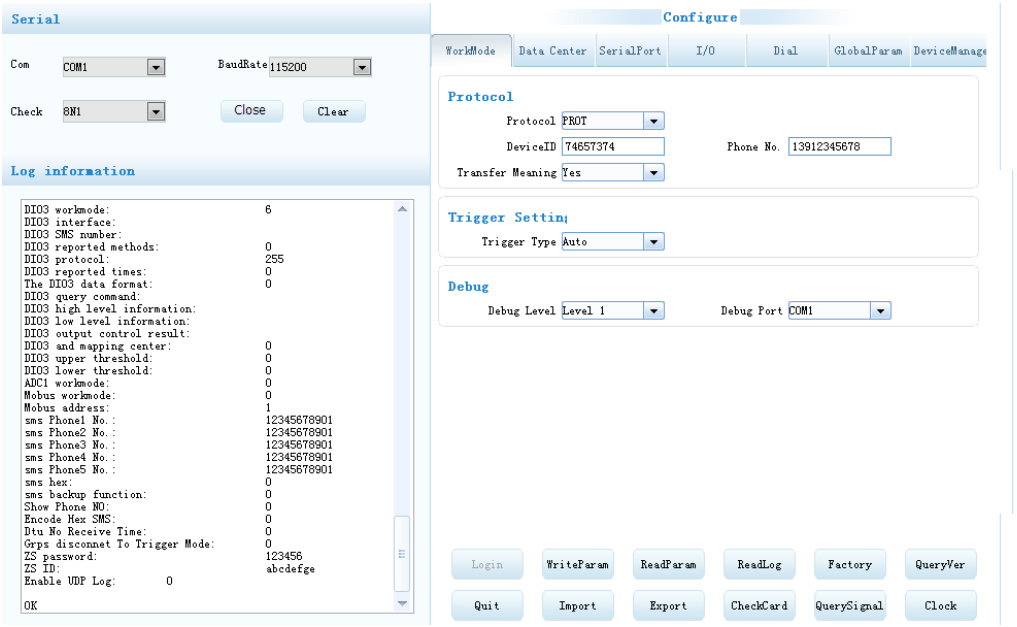
3.3.2 Re-Power IP Modem



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.

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.

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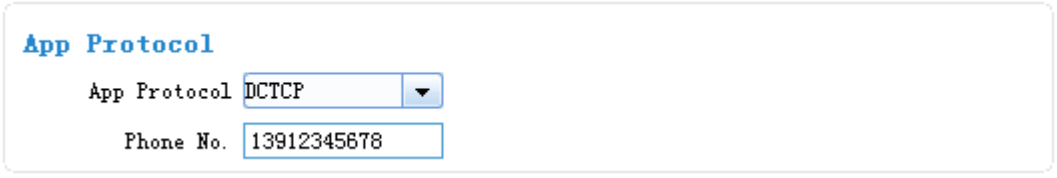
Device ID	ID number for the device. 8 characters
Phone No.	Phone number
Character Escapes	This item is only valid when the Work Mode is PROT. If this item is set to No, IP MODEM will transfer meaning to 0xfd and 0xfe. To know detail transfer meaning method, please refer “IP MODEM Transfer Meaning Explanation In the PROT work mode”. If this item is set to Yes, all the transmission is transparent.

DCTCP

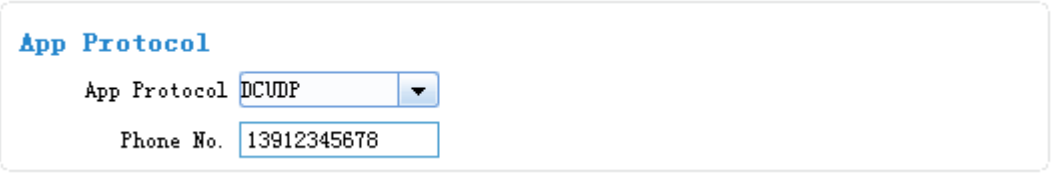
This protocol is used in electric power field, with TCP protocol.



PhoneNo.	Phone number

DCUDP

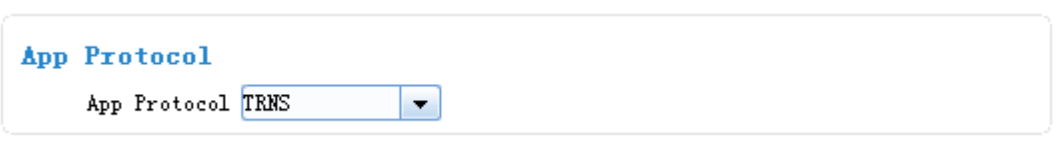
This protocol is used in electric power field, with UDP protocol



PhoneNo.	Phone number

TRNS

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



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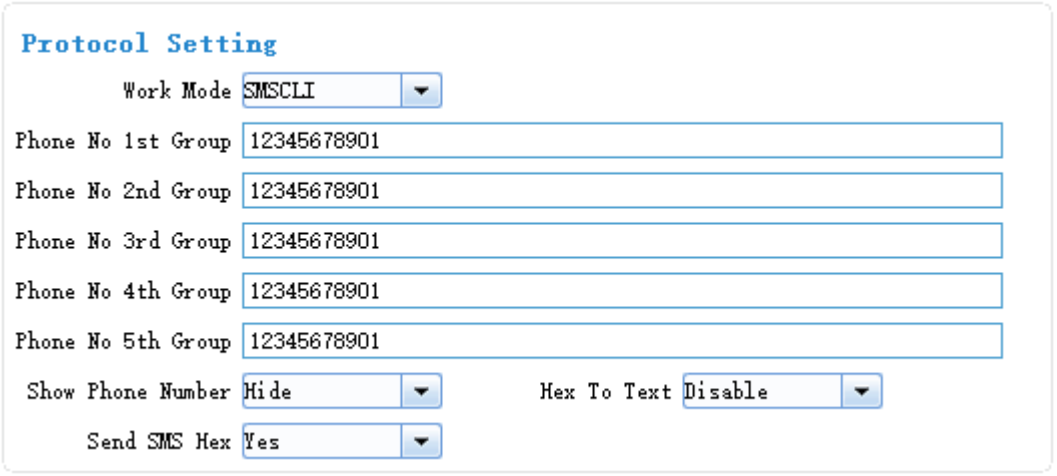
SMSCLI

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.



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.

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

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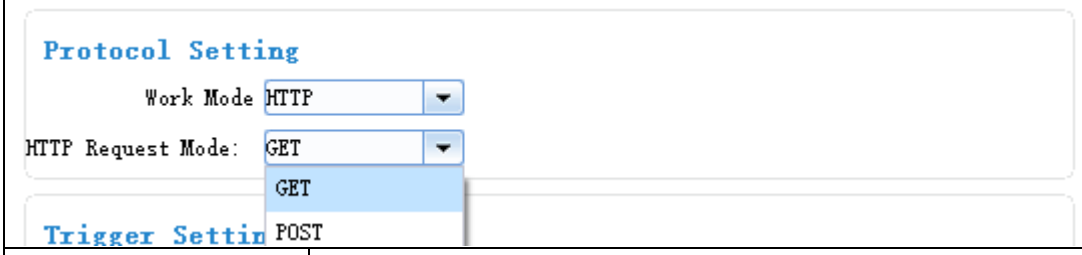
be packeted with Http format and sent to server.



HTTP Request Mode	Can select GET and POST Mode

MTCP/MRTU

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

Device ID	ID number for the device. 8 characters
Hex To Text	If convert HEX data to ASCII data or not
Send SMS Hex	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.

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.)

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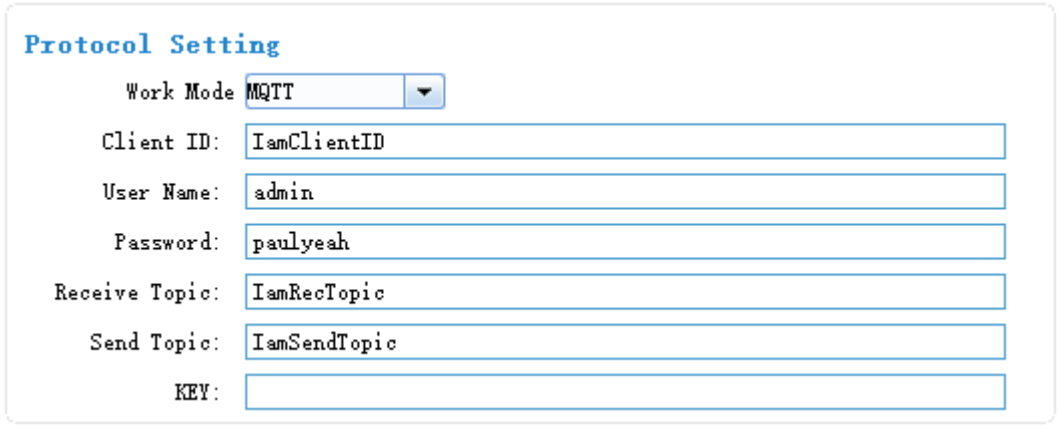
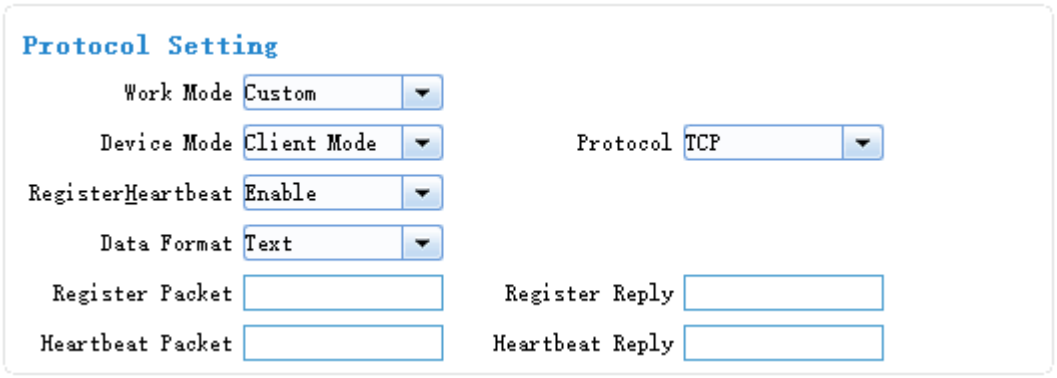


Client ID	ID of MQTT client,can be Configured to the required string
User name and password	The usename and password of server(if need)
Receive Topic	It should be configured with the send topic of another client
Send Topic	It should be configured with the recieve topic of another client

Custom protocol：Client mode

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



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

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Custom protocol：Server mode

It supports TCP and udp server.

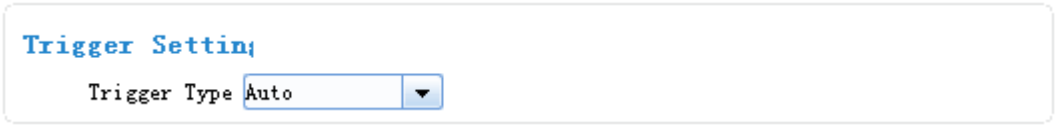
Base Protocol	TCP or UDP
Listen Port	Listen port for service

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



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.

SMS Phone No.	Trigger phone number. If it is empty, sms received from any phone no. can trigger the device

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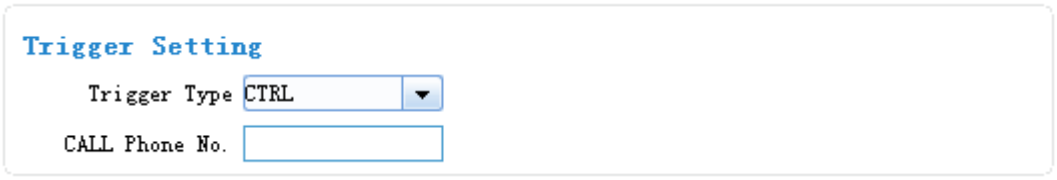
SMS Password	The content of SMS to trigger. If it is empty, any content of sms can trigger the device

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.



CALL Phone No.	Trigger phone number

DATA

Send special serial data to make IP MODEM online

Data Trigger On	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. If it is not empty, only the data matching to the “online data” can trigger the IP Modem.
Data Trigger Off	If it was empty, the IP Modem kept online. If it is not empty, only the data matching to the “offline data” can made the IP Modem offline.
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.

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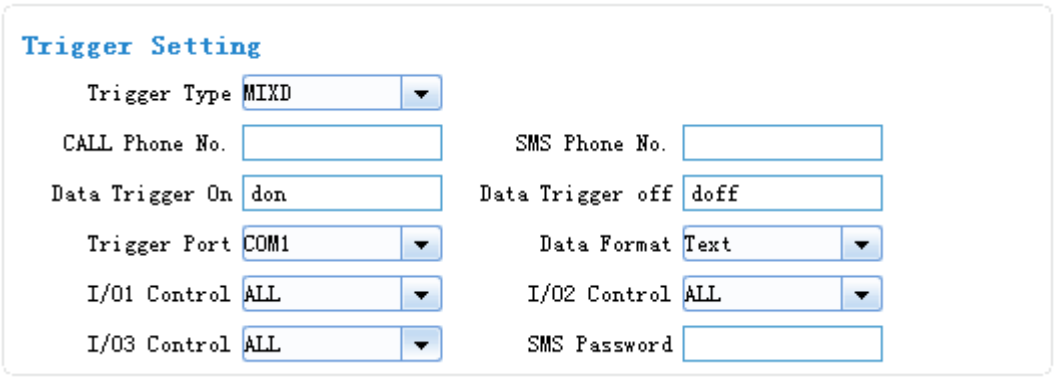
Sleep/Wakeup	Made the IP Modem sleep or wake up depended on the I/O state
I/O	Set I/O port to trigger the IP Modem to sleep or wake up

MIXD

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



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.

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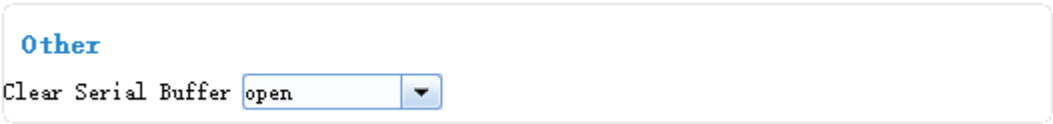
Debug Level	Close：no debug information output Level 1：simple prompt information output Level 2：detail debug information output
Debug Port	Port 1：debug info send to port 1 Port 2：debug info send to port 2 485：debug info send to RS485

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



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:

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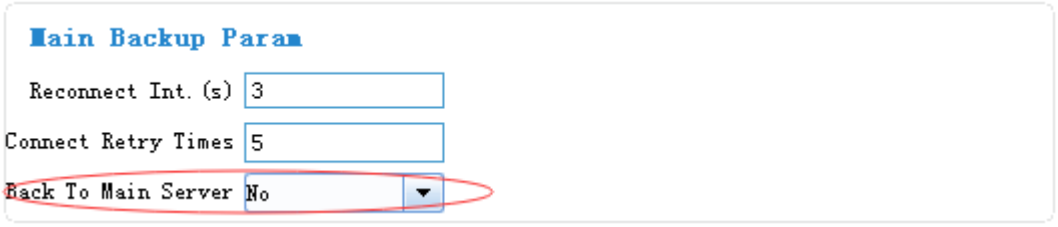
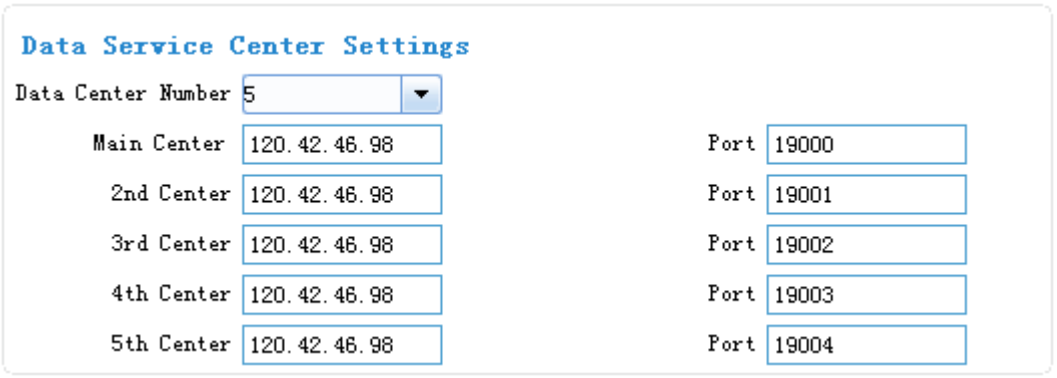
IP MODEM can connect with at most five DSC at the same time. All the multi DSC can receive the same application data .



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.



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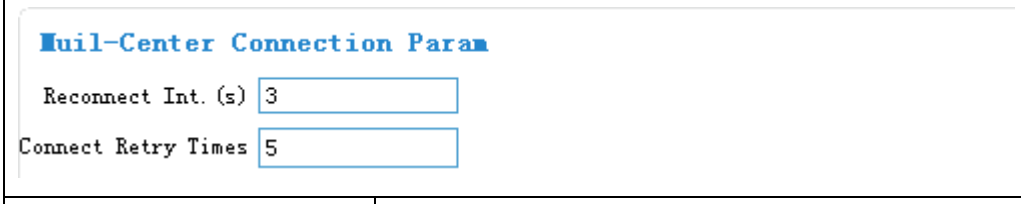
3.4.2 Multi-Center Connection Check

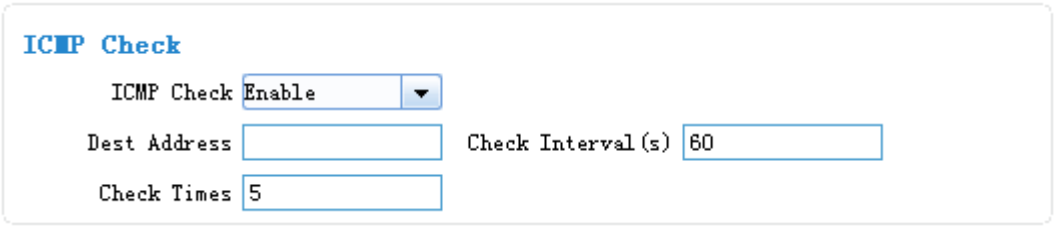
This item is valid only when the “Data Center Number” is greater than 1. When one of the configured data center lost connection, IP MODEM will try to reconnect after the configured reconnect interval



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	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 two individual serial ports, RS232 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.

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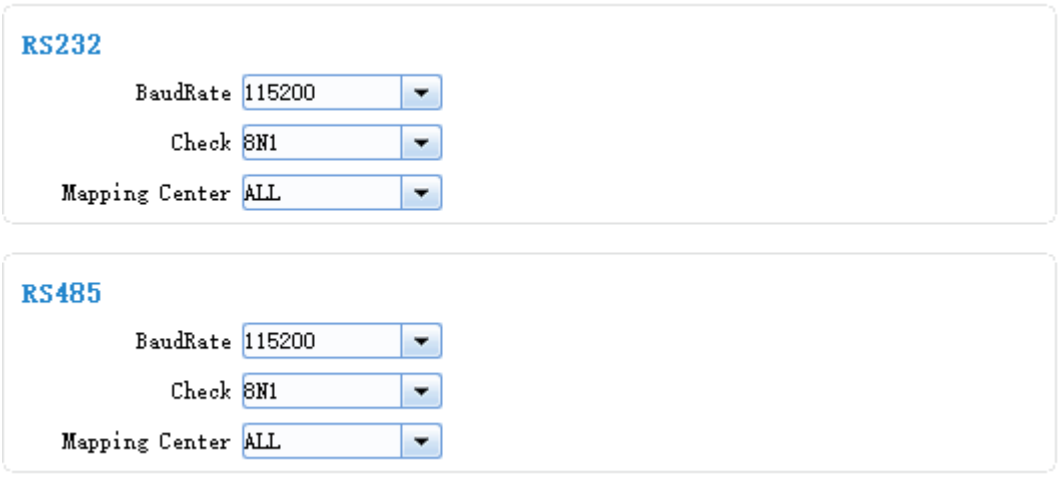

RS232	baud：the baud rate of the PORT 1200 --- 1200 bps 2400 --- 2400 bps 4800 --- 4800 bps 9600 --- 9600 bps 14400 --- 14400 bps 19200 --- 19200 bps 38400 --- 38400 bps 56000 --- 56000 bps 57600 --- 57600 bps 115200 --- 115200 bps Property：Databit, Parity, Stopbit 8N1 --- 8 Databit, No parity, 1 Stopbit 8E1 --- 8 Databit, Even parity, 1 Stopbit 8O1 --- 8 Databit, Odd parity, 1 Stopbit Bind： Center1: the data from the port send to center 1 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
RS485	Same as above

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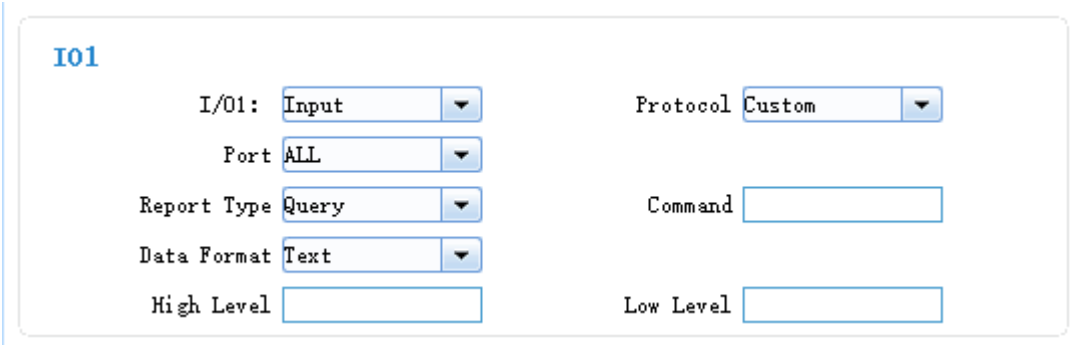
3.6 IO function

IP MODEM support 3 digital I/O and 2 Analog input,can custom data string to query data or trigger IO state.

3.6.1 Digital I/O



I/01	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
IO2	Same as above
IO3	Same as above

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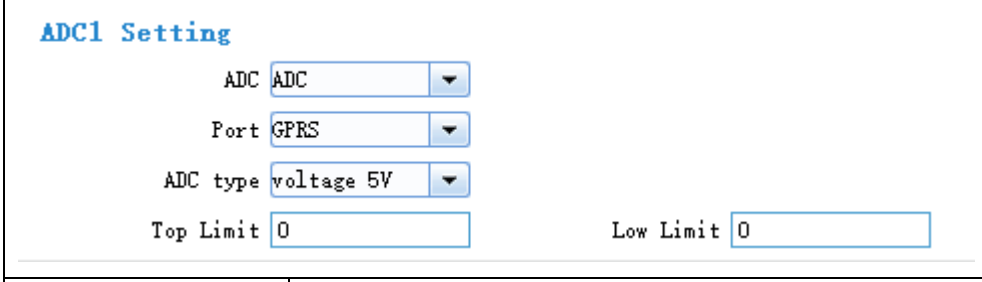
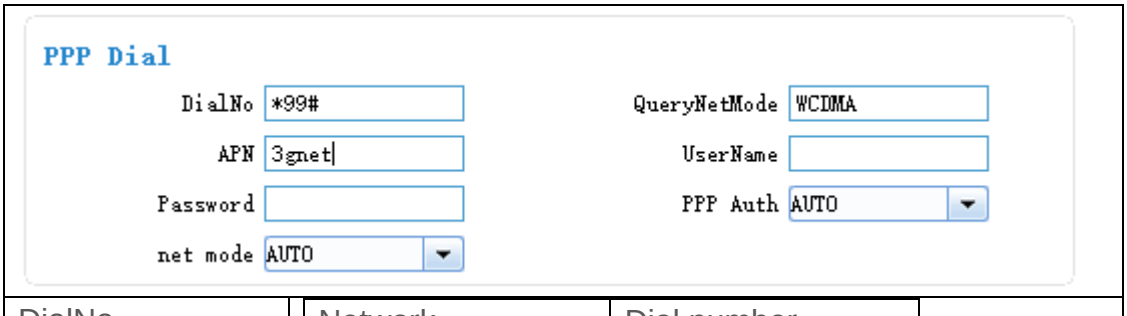
3.6.2 Analog Input



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
ADC2	Same as above

3.7 Dial

3.7.1 PPP Dial



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/passw	Network	User name/password
	GPRS/WCD	empty

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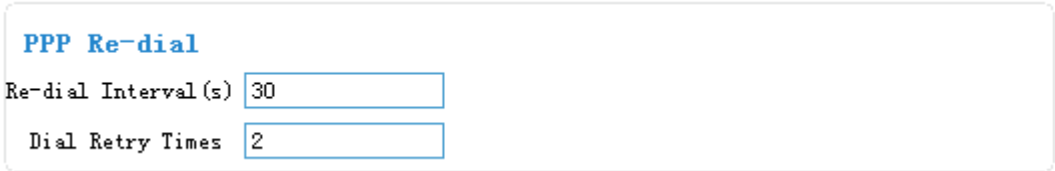
ord	MA/LTE	
	CDMA/EVDO	card/card
PPP Auth	AUTO,PAP and CHAP	
QueryNetMode	Search the network mode for the 4G network	
Net Mode	Net Mode AUTO EVDO WCDMA TD-SCDMA CDMA GSM	

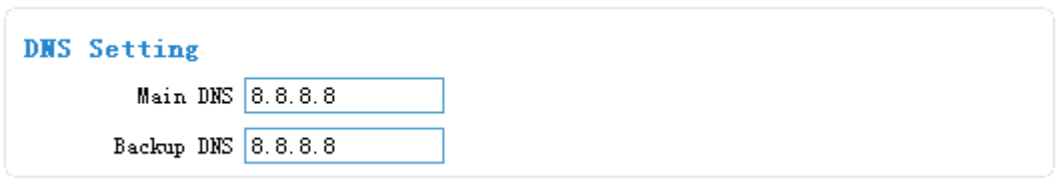
3.7.2 PPP Redial



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.



Main DNS	The DNS server IP address(must be IP address）

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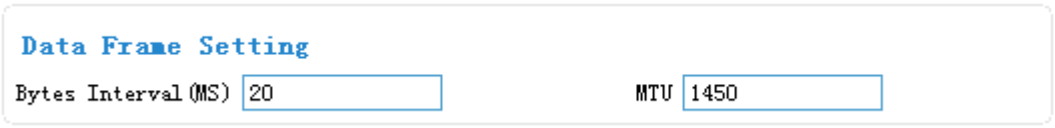
Backup DNS	The DNS server IP address(must be IP address）

3.8 Global Parameters

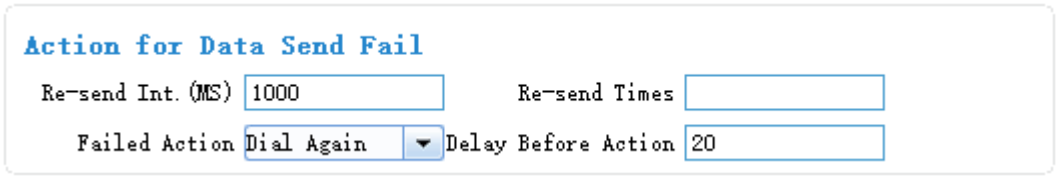
3.8.1 Data Frame Parameters



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.



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

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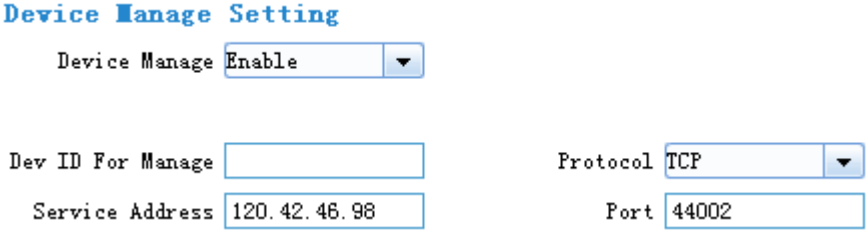
3.8.3 Other Parameters

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.



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

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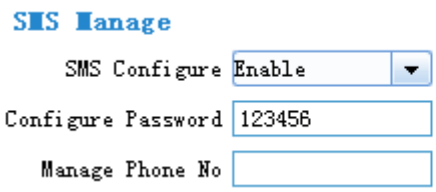
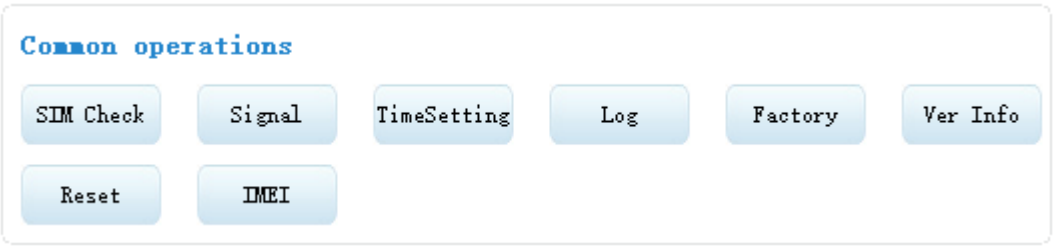


SMS Configure	Enable or Disable
Configure Password	The password for SMS Configure
Manage Phone No.	If it is empty, any number can configure the IP Modem Parameters. Otherwise, only the “Administrator Number” can configure the IP Modem Parameters.

3.10 Operation



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
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

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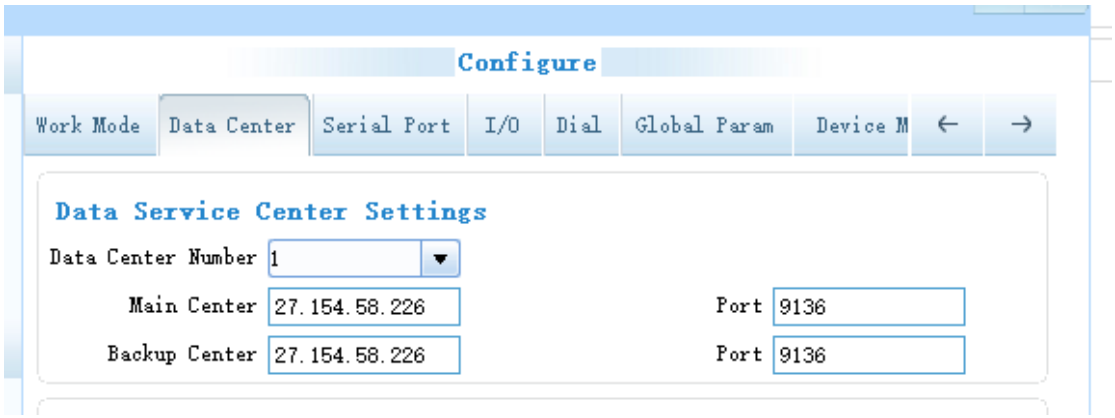
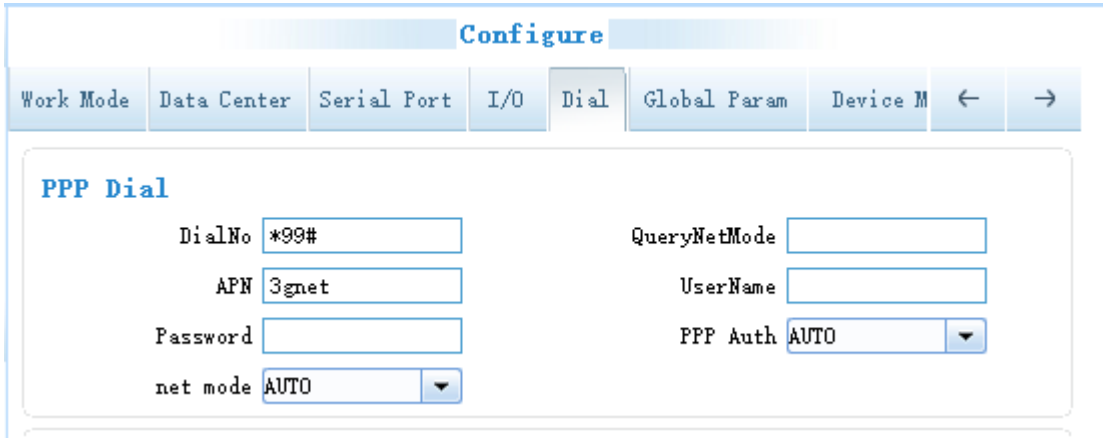
Chapter 4 Application Case

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：



Fill in the APN from your simcard provider:



Repower modem,wait it connected to server.

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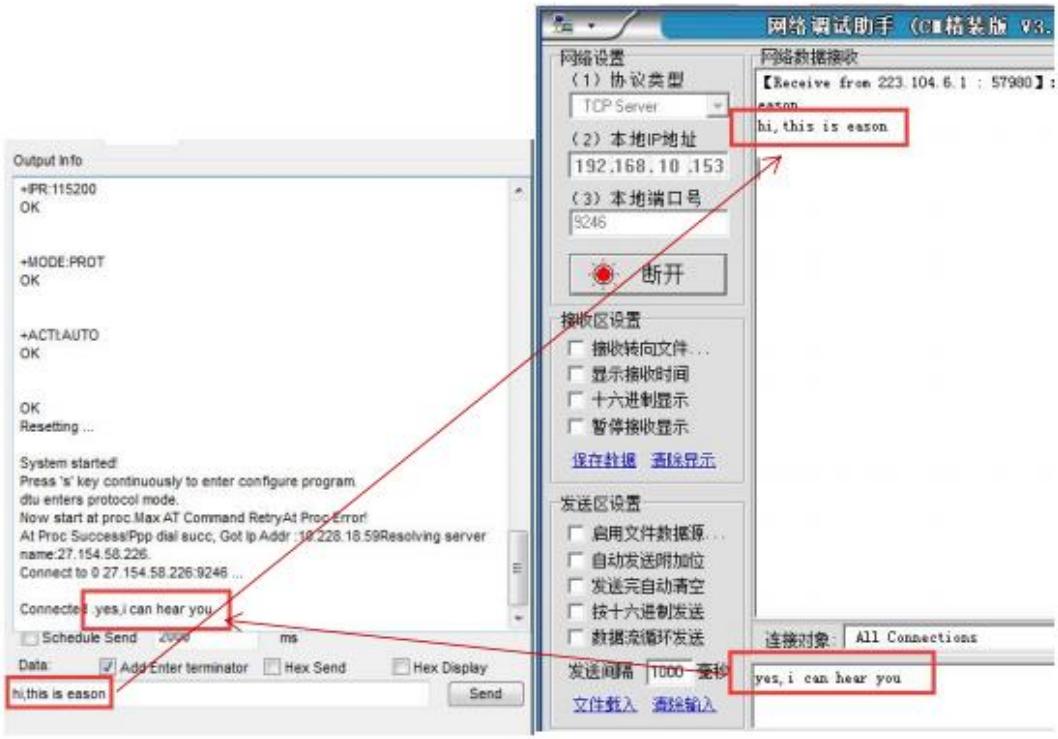
Then you can send data to test the communication between modem with data sever(here use Netassit software to simulate data server)

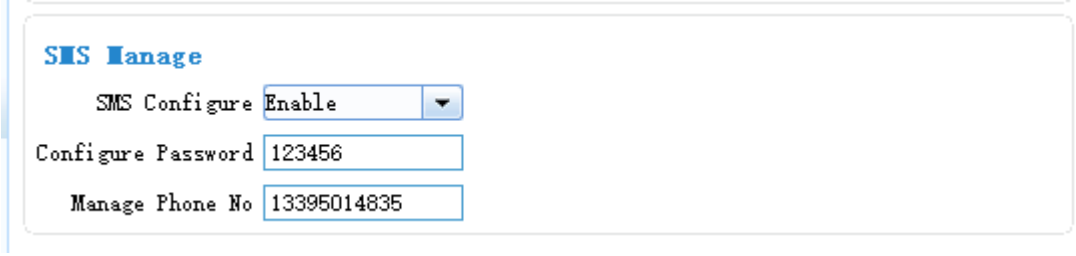


4.2 SMS to Configure Modem

You can send SMS to configure modem via mobile phone

Step one

Enable SMS Manage function in modem：set SMS sender's phone number，the password is the one set in the modem.it can be digit or letter.



Step two

Send SMS according to the following format:

The message starts with the symbol '<' and ends with '>' and is without 'AT+'.

Example,AT command for the main center is AT+IPAD=120.42.46.98,and the corresponding SMS

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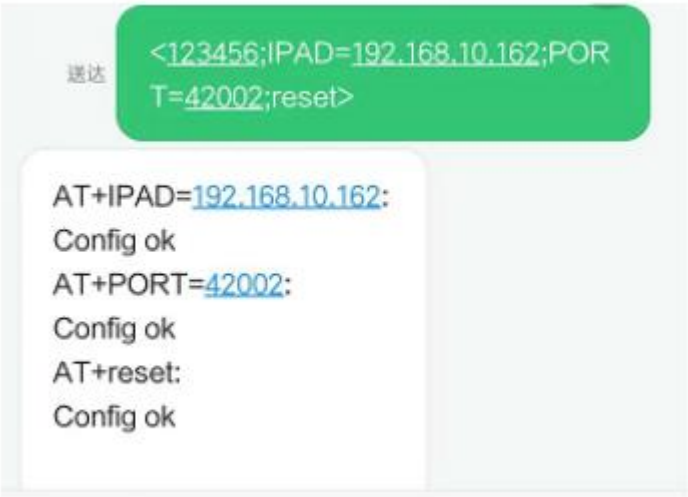
configuration should be IPAD=120.42.46.98. Add ‘reset’ at the end.
SMS format：<123456;IPAD=120.42.46.98;PORT=5007;reset>
If set succesfully,you will receive a return SMS with Config OK：



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