Industrial Cellular IP Modem
TD210 Series User Guide

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About This Guide

Thank you for choosing BIVOCOM Industrial Cellular IP Modem TD210 Series.
Please thoroughly read this user guide before you configure and install the device.

This manual is compatible with below models

Model	Description
TD210-G	Industrial GPRS IP Modem
TD210-W	Industrial WCDMA IP Modem
TD210-LF	Industrial LTE/WCDMA IP Modem

Table of Contents

1. Definitions

1.1 IP Modem

Data Transfer Unit, a wireless terminal used convert the data from serial port data packet to IP data packet, or from IP data packet to serial port data packet, then transfer the data packet through cellular network.

1.2 SMS

Short Messaging Service

1.3 2G

GPRS and CMDA 1X.

1.4 3G

TD-SCDMA, WCDMA, EVDO.

1.5 4G
LTE

1.5 Center/Server

A computer for receiving data sent from IP Modem through SMS/2G/3G, and sending data to IP Modem through SMS/2G/3G.

1.6 TD210

An industrial IP Modem series manufactured by Bivocom.

2. Introduction

2.1 Overview

TR210 Series IP Modem is a type of industrial wireless IP Modem (Also called DTU, Data Transfer Unit), designed to fully meet the needs of industrial standards and industrial users. It adopts high-powered industrial 32-bits CPU, multi-layer software detection and hardware protection mechanism to ensure reliability and stability of the device. It supports worldwide carrier 4G/3G cellular network FDD-LTE, TD-LTE, and WCDMA, EVDO, TD-SCDMA, EDGE, CDMA 1X and GPRS. With rich and flexible interfaces, such as RS232, RS485 and RS422, and TTL GPIOs is also customizable.

TR210 Series IP Modem can help users to quickly access the Internet, to ensure secure and reliable data transmission. It’s ideal for IOT (Internet of Things) and M2M (Machine to Machine) applications, and has been widely used in many applications, such as Intelligent Transportation, Smart Grid, Vending Machine, Agricultural Irrigation, Environmental

Protection, Industrial Automation, Energy Saving, Smart Home, etc.

2.2 Applications

TD210 Series IP Modem utilizes cellular network for remote data acquisition and transmission, and has been used for industrial remote monitor and control.
Typical application as below.

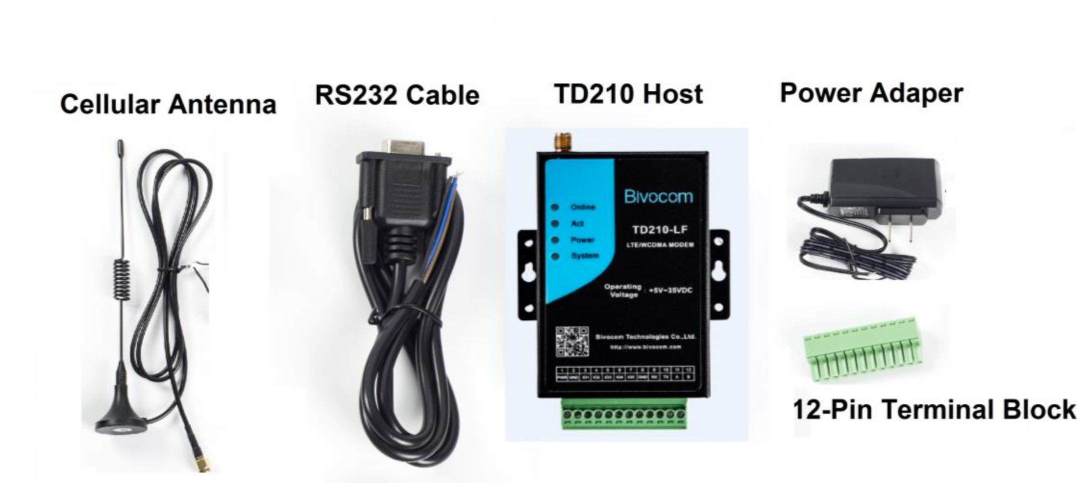
3. Getting Started

WARNING: Please make sure the device is powered off before you install and configure it.

3.1 Package Checklist

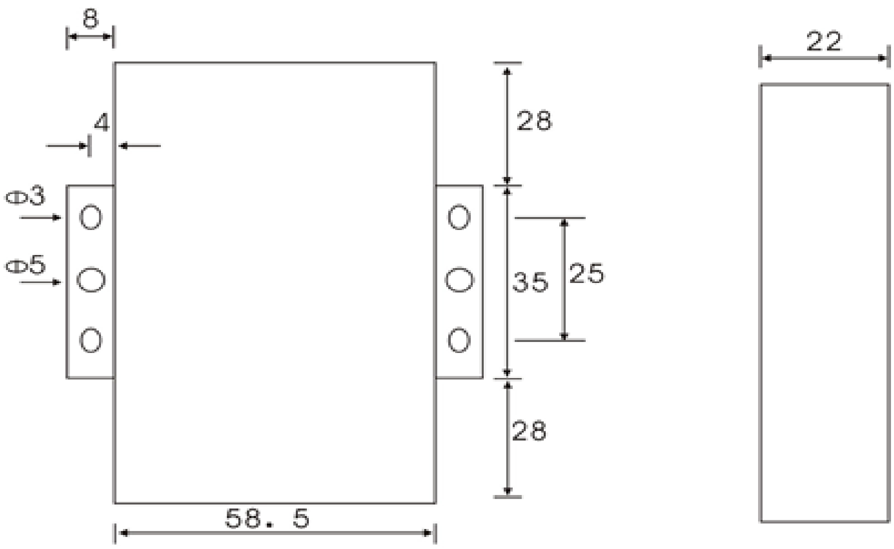
Check the package before you configure and install the device.

- TD210 IP Modem Host
- Cellular antenna(SMA Male)
- Power Adapter(12VDC/0.5A)
- 3- Pin RS232 cable with DB9 connector(female)
- 12-Pin Terminal Block



3.2 Dimensions

There are 3 holes for installation at each side of TD210 (Unit: mm)



3.3 Installation

3.3.1 SIM/UIM Card

TD210 supports normal SIM/UIM only, so if you're using a Micro SIM or Nano SIM card, you may need to use a Micro SIM or Nano SIM to Normal SIM adapter.
Make sure your IP Modem is powered off, then use a needle object(such as a pen) to push the button near the SIM/UIM card holder, it will flick out immediately. Put the SIM/UIM card to card holder with chipset upside, insert it to IP Modem and make sure it's tightly matched.
Warning: Never install SIM/UIM card when Modem is powered on.

3.2.2 Cellular Antenna

Fasten the cellular antenna.
Screw the SMA male cellular antenna to TD210 (SMA female interface), make sure it is screwed tightly to ensure the strength of signal.

3.2.3 Terminal Block, Power Cable and Console Cable

Insert the terminal block to modem correctly.

1) Definition of Terminal Block Interface

PIN No.	Signal Name	Default Function	Extended Function
1	PWR	Power input anode	NA
2	GND	Power Ground	NA
3	IO1	Reserved GPIO, able to check dry contact signal and 3.3 V switch signal, output 3.3V switch signal. NOT ENABLED BY DEFAULT	Reserved RS232 RTS and TTL RX
4	IO2	Reserved GPIO, able to check dry contact signal and 3.3 V switch signal, output 3.3V switch signal. NOT ENABLED BY DEFAULT	Reserved RS232 CTS and TTL TX
5	IO3	Reserved GPIO, able to check dry contact signal and 3.3 V switch signal, output 3.3V switch signal. NOT ENABLED BY DEFAULT	Reserved RS232 DCD
6	IO4	Reserved GPIO, able to check dry contact signal and 3.3 V switch signal, output 3.3V switch signal. NOT ENABLED BY DEFAULT	Customized pulse output, pulse counter, analog quantity input, Reserved RS232 RI
7	IO5	Reserved GPIO, able to check dry contact signal and 3.3 V switch signal, output 3.3V switch signal. NOT ENABLED BY DEFAULT	Customized pulse output, pulse counter, analog quantity input
8	GND	Power Ground	NA
9	RX	RS232 Receive Data	NA
10	TX	RS232 Transfer Data	NA
11	A	RS485 anode	Reserved RS232 DTR
12	B	RS485 cathode	Reserved RS232 DSR

2) Connect Power Cable and Console Cable

The interface of TD210 is industrial terminal block, we suggest you use 28-16AWG power cable and console cable.

Definition of power cable and console cable in this package are as below

Power Cable (Output 12VDC/0.5A)

Color of cable	Power Output Polarity
Black & White Alternate	Anode
Black	Cathode

RS232 Cable (with DB9 female interface)

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

WARNING: make sure you connect the terminal block to TD210 modem correctly before power on, or it may cause the damage of device.

3.3 Power Supply

After all the accessories and cables mentioned above are installed very well and correctly, then plug the power supply to power outlet.

TD210 adopts advanced power technology to improve the stability and adapt to complex external environment. You can use Bivocom standard power adapter(12VDC/500mA), or use DC power ranging at 5-35VDC, please make sure the power supply is stable enough(Ripple shall be less than 300Ma, and Instantaneous voltage shall not larger than 35V), meanwhile, power shall over 4W.

Note: We suggest you use Bivocom standard power adapter (500mA/12VDC).

3.4 LED Indicators

TD210 has 4 LED indicators, ‘Online’, ‘ACT’, ’Power’, ‘System’, as follows.

LED Indicators	Status	Content
Online	Off	TD210 isn’t connected to server
	On	TD210 is connected to server
ACT	Off	No data transfer
	Blink	Sending or receiving data
Power	Off	Power Off
	On	Power On
System	Off	System error
	Blink	System works

4. Configuration

4.1 Getting started

To start to configure the modem, you'll need below materials

1) A laptop or computer that has DB9 serial port(male)

Note: if your laptop or computer doesn't have a serial port, an USB to Serial port(male) adapter would be required.

2) BIVOCOM TD210 config tool.

The TD210 config tool integrated with configuration, debug and firmware upgrade functions.

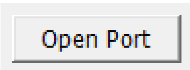
You can go to BIVOCOM website to download the config tool, like below.

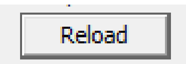
http://www.bivocom.com/index.php?m=content&c=index&a=show&catid=12&id=22

Note: The config tool only support Windows OS, IOS is not supported yet.

4.2 Serial port configuration

Connect TD210 to your laptop or computer through RS232, then open Bivocom configuration tool (TD210.exe), Click 

on the left side, and click 

to open the serial port, and choose your COM port of laptop or computer. Then Click 

, and a window will be open tell you to restart the device(Figure 2), unplug the power adapter, and power on TD210 again, then waiting for entering into configuration status, when it shows loading DTU parameters successfully(Figure 3), then you can go to next step to configure the modem, including Basic Setting(4.3), Network Setting(4.4).

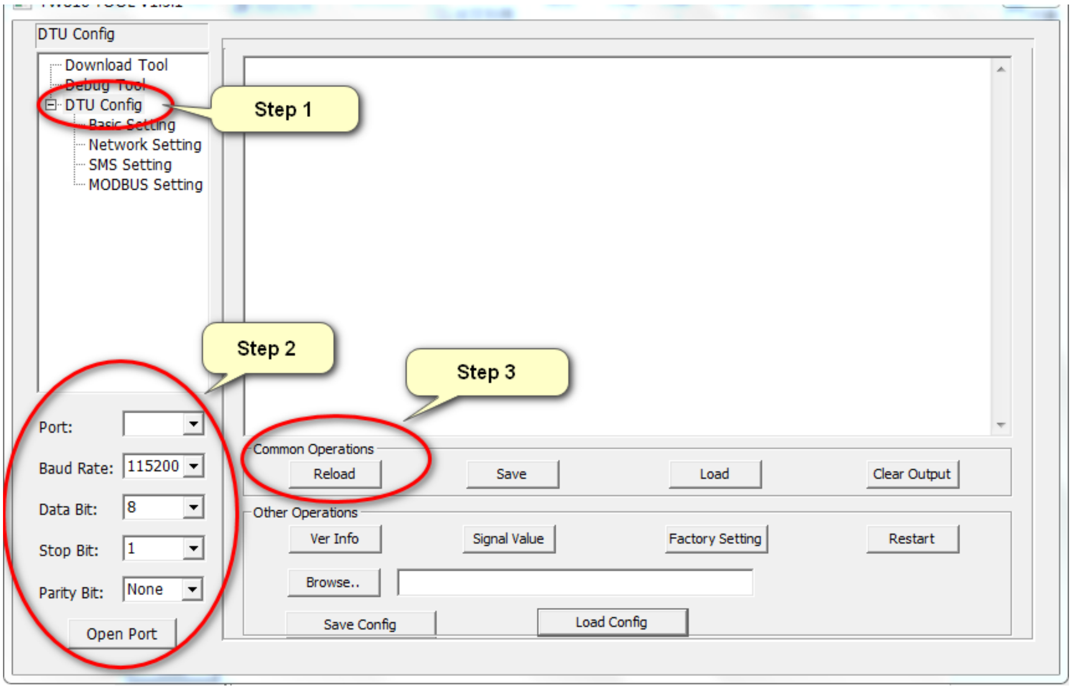


Figure 1

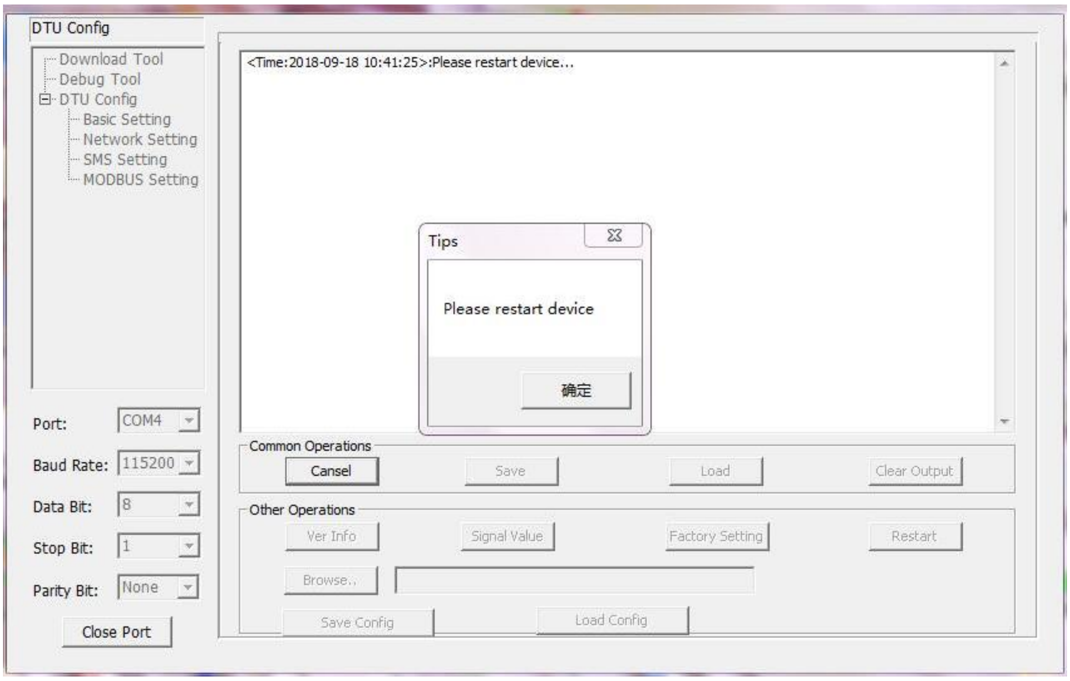


Figure 2

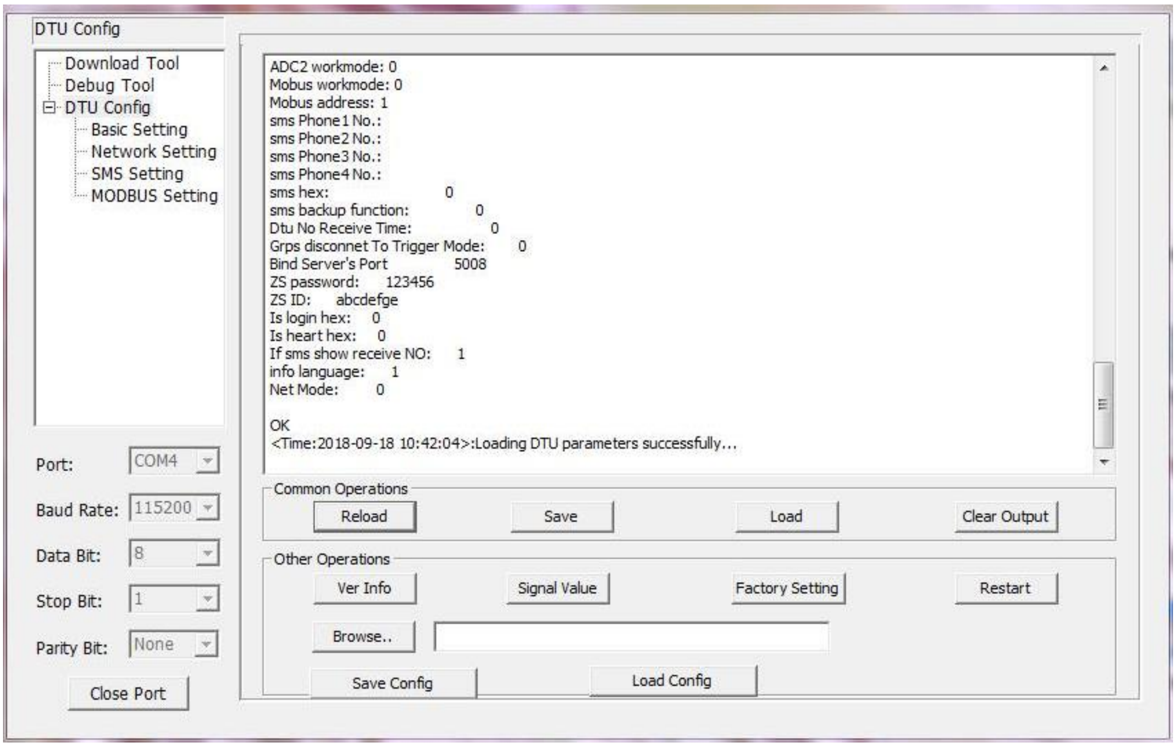
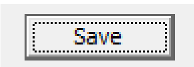


Figure 3

Below are quick instructions of Operations on the config tool, but you can go to next step.(4.3 Basic setting), if you're familiar with those parameters.

4.2.1 Save

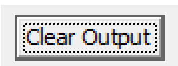


Click to save the parameters you've configured.

4.2.2 Load

Load the parameters of TD210 to config tool and display.

4.2.3 Clear Output



Clear log of config tool.

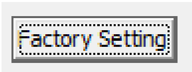
4.2.4 Version Info

Check the version info of TD210.

4.2.5 Signal Value

Check the signal strength of TD210.

4.2.6 Factory Setting

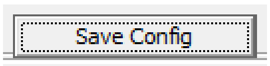


TD210 returns to factory setting.

4.2.7 Restart

Restart TD210

4.2.8 Save Config



Save configuration of TD210 in file format, which you can use it recover the config.

4.2.9 Configure via Saved Config File

Click 

, and choose the saved config file, then click 

to configure TD210.

4.3 Basic Setting

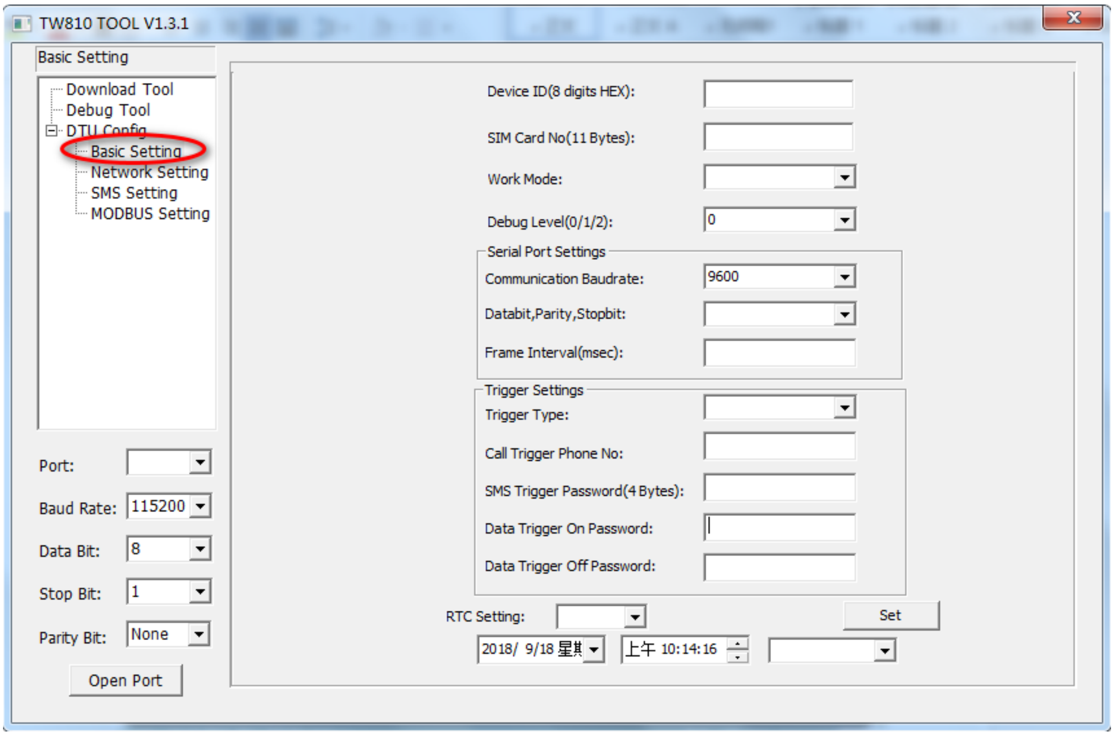
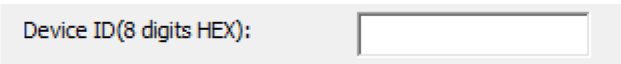


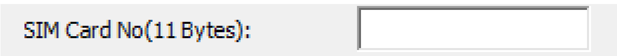
Figure 4

4.3.1 Device ID



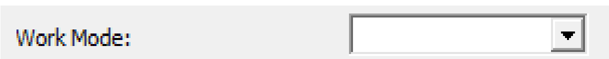
To identify the TD210 and for device management, if you have many TD210 connected to server, please make sure all the ID are different.

4.3.2 SIM Card No.

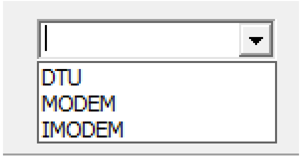


The No. of SIM inserted in this device.

4.3.3 Work Mode

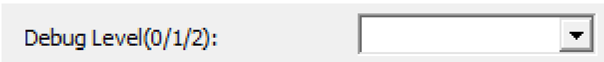


There are 3 work modes to choose from the drop-down menu, as below

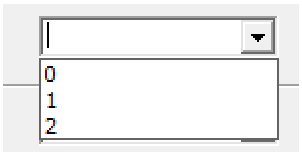


IP Modem (Transfer the data to server through GPRS/SMS)
MODEM (Normal Modem, dial up or sending SMS through AT Command)
IMODEM (Intelligent Modem, except the functions supported by normal modem mentioned above, it is always online for SMS function)

4.3.4 Debug Level

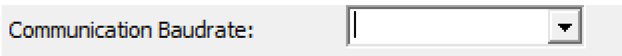


There are 3 levels to choose from the drop-down menu, as below



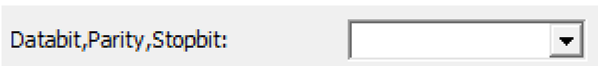
2: All logs output through RS232/RS485
1: Part of important logs output through RS232/RS485
0: No logs output

4.3.5 Communication Baud Rate

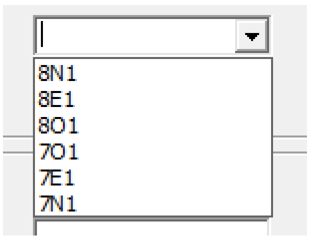


Supported baud rate: 300, 600, 1200, 2400, 4800, 9600, 14400, 19200, 38400, 56000, 57600 and 115200.

4.3.6 Databit, Parity and Stopbit



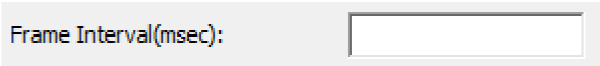
You can choose below from drop-down menu.



8N1 (8 Databit, No Parity, 1 Stopbit)
8E1 (8 Databit, Even Parity, 1 Stopbit)
8O1 (8 Databit, Odd Parity, 1 Stopbit)

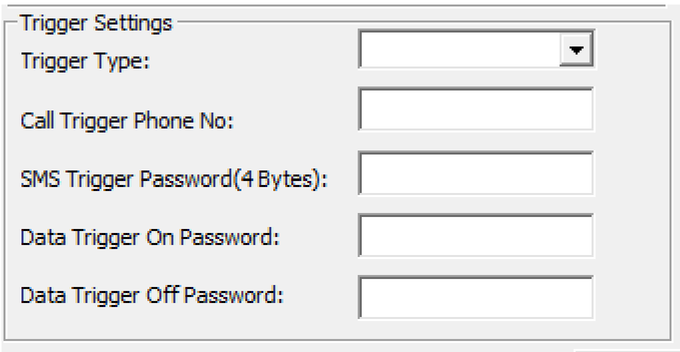
7O1 (7 Databit, Odd Parity, 1 Stopbit)
7E1 (8 Databit, Even Parity, 1 Stopbit)
7N1 (7 Databit, No Parity, 1 Stopbit)

4.3.7 Frame Interval (Unit: Millisecond)

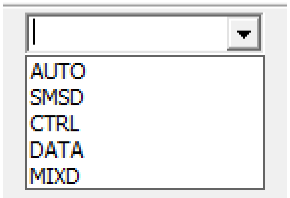


When IP Modem receives packet slicing, increase the value, while for packet merging, lower the value, 20ms for 115200 baud rate, 50ms for 9600 baud rate and 200ms for 1200 baud rate.

4.3.8 Trigger Settings

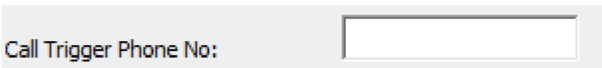


1) Trigger Type



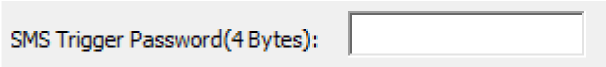
AUTO: Always online
SMSD: SMS trigger mode, sending specific SMS to trigger TD210 online.
CTRL: Make call to trigger TD210 online.
DATA：Sending specific data to trigger TD210 online or offline.
MIXD: Support SMSD, CTRL and DATA trigger mode, you can use any of them to trigger TD210.

2) Call Trigger Phone NO.



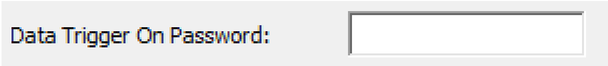
You can add a phone number in the blank, once the trigger mode is CTRL or MIXD, and TD210 receives the call from this number, it will get online.

3) SMS Trigger Password



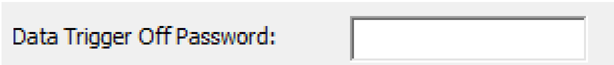
You can set up a code in the blank, once the trigger mode is SMSD and MIXD, and TD210 receives a SMS text with ‘DAIL+code’, it will get online.
For example, your code is 123456, you can trigger TD210 by sending SMS text ‘DAIL123456’.

4) Data Trigger On Password



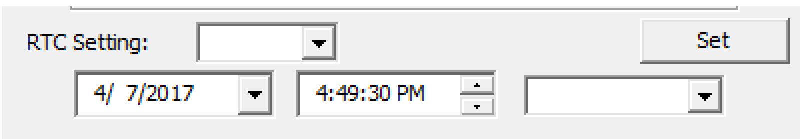
You can set up trigger data in the blank, once the trigger mode is DATA and MIXD, and TD210 receives the trigger data through RS232/RS485 serial port, it will get online.

5) Data Trigger Off Password



You can set up trigger data in the blank, once the trigger mode is DATA and MIXD, and TD210 receives the trigger data through RS232/RS485 port, it will get offline.

6) RTC Setting



You can set up the system time for your TD210.

4.4 Networking Setting

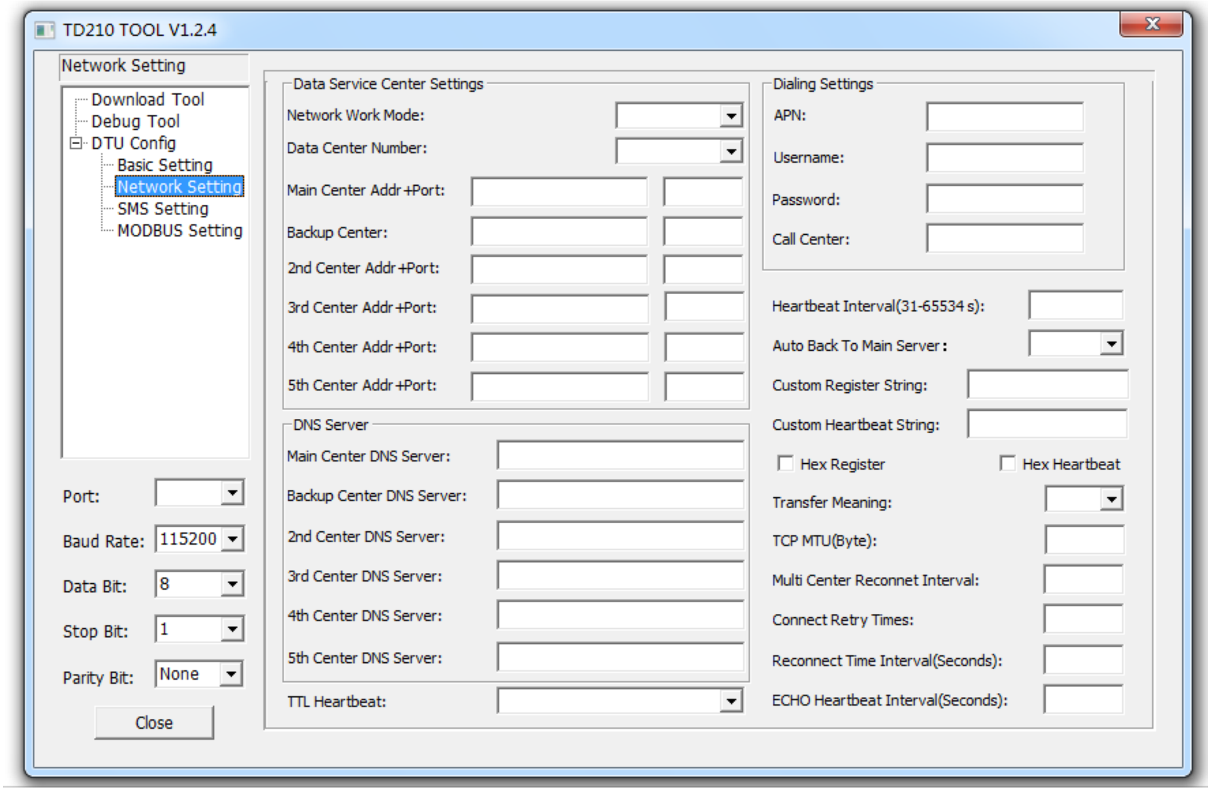
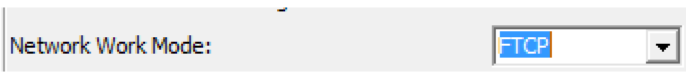


Figure 5

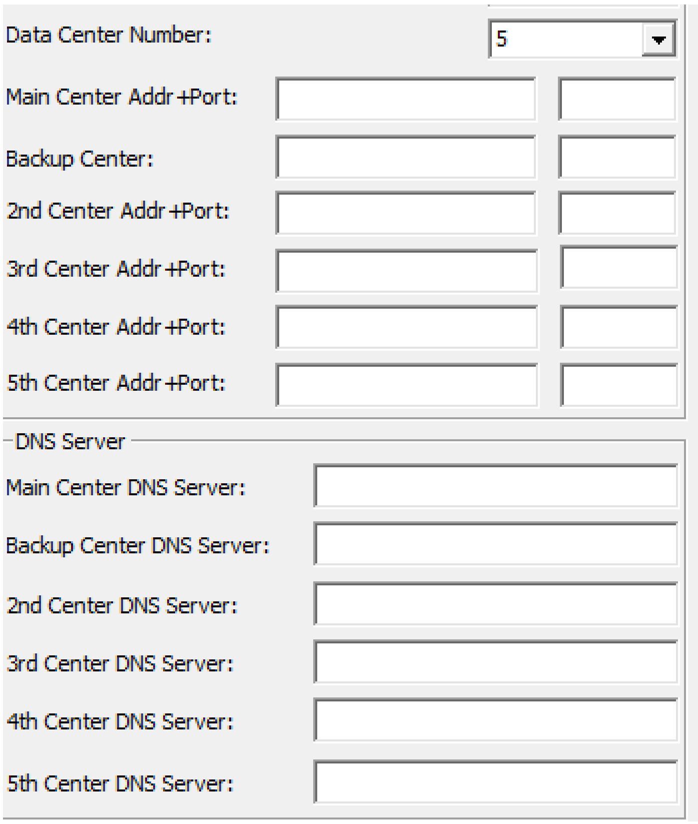
4.4.1 Network Work Mode



There are 8 network work modes, including FTCP, HTCP, CTCP, NUDP, CUDP, HUDP, TCPSVR and UDPSVR.

- Custom register string and heartbeat packet is required when work mode is CTCP and CUDP.
- TD210 will act as a TCP client when choose FTCP, HTCP and CTCP, but the register string and heartbeat string will be different.
- TD210 will act as a UDP client when choose NUDP, CUDP and HUDP, but the register string and heartbeat string will be different.
- When choose TCPSVR, TD210 acts as a TCP Server.
- When choose UDPSVR, TD210 acts as a UDP server.

4.4.2 Data Center Number



1) You can configure up to 5 data centers.

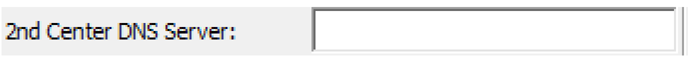
- 0 means TD210 will not connect to cellular network, such as 4G/3G/2G networks.
- 1 means TD210 only supports 1 data center, TD210 will connect to main center, once it couldn't connect to backup center, it will continue to connect to main center till it's connected.
- 2-5 means TD210 supports multi centers, and all the other centers will get sync data.

Note: if there is not backup center, please set up the same address and port for main center and backup center

2) Center Addr.+Port

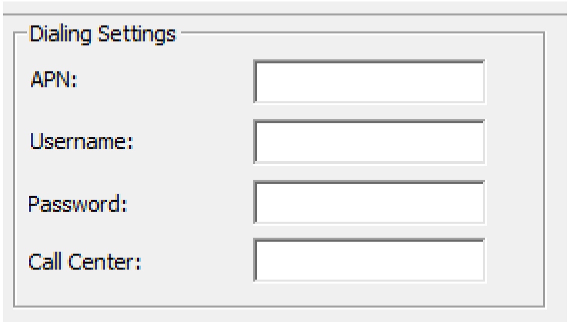
It can be configured as DNS or IP address.

3) Center DNS Server



When you use DNS for center, a DNS server is required to analytic the corresponding IP address.

4.4.3 Dialing Settings



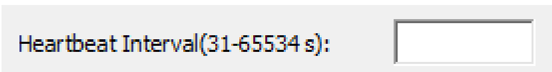
- APN: cellular network access code
- Username: authentication username of cellular network
- Password: authentication password of cellular network
- Call center: dial number of call center for cellular network

Below are some examples of APN, Username, Password and call center of Chinese mobile carriers.

Model	APN	Username & Password	Call Center
TD210-G	Cmnet(China Mobile) Uninet(China Unicom)	Null	*99***1#
TD210-C	Null	card	#777
TD210-W	3gnet	Null	*99#
TD210-T	cmnet	Null	*98*1#
TD210-E	Null	card	#777

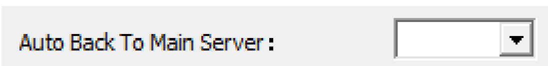
Note: Different carriers may have different APN, Username, Password and Call Center, please ask your mobile carriers for those info if you have any questions.

4.4.4 Heartbeat Interval



Heartbeat time, we suggest you set up 60 seconds for TCP, and 31 seconds for UDP.

4.4.5 Auto Back to Main Server



- Y

Auto back to main server.

- N

Don't auto back to main server.
This setting will only work when both main and backup center are enabled, under this work mode, if main center fails, TD210 will auto connect to backup center. If you choose 'Y', TD210 will check whether main center is recovery or not, if yes, it will switch to main center, and disconnect with backup center. While if choose 'N', TD210 will not check whether main center is recovery or not.

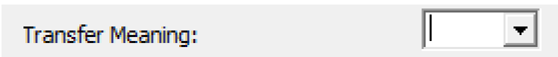
4.4.6 Custom Register String

You can configure it when network word mode is configure as CTCP and CUDP, but you can also choose not to configure it, which means register string won't be sent.
Note: the length of register string is up to 70 bytes.

4.4.7 Custom Heartbeat String

You can configure it when network word mode is configure as CTCP and CUDP, but you can also choose not to configure it, which means register string won't be sent.
Note: the length of register string is up to 70 bytes.

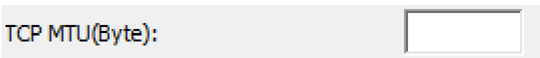
4.4.8 Transfer Meaning



- Y means Yes
- N means No

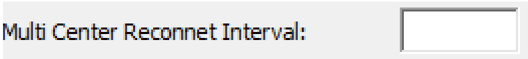
When network work mode configured as FTCP, if choose Y, then TD210 will transfer meaning '0xfd' to '0xfd' and '0xfe', and '0xfe' to '0xfd' and '0xee'. If choose N, it is transparent transfer.

4.4.9 TCP MTU



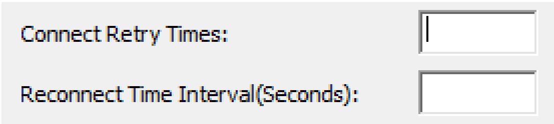
Set up the maximum number of data transmission for each TCP data packet.

4.4.10 Multi Center Reconnect Interval



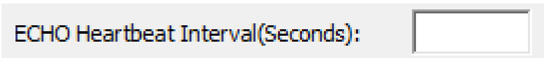
Only available when data center number is 2-5.

4.4.11 Reconnect



In real application, the data center may be shut down or have issue, and that will cause TD210 disconnects from data center, while in order to keep TD210 always online, it will try to reconnect the data center, and that will cause unnecessary data flow. So you can configure those 2 functions to save the data flow, when Reconnect Time Interval enabled, TD210 will try to reconnect data center, and if Connect Retry Times exceed the value you set, while TD210 is still unable to reconnect to data center, TD210 will do exception handling.

4.4.12 ECHO Heartbeat Interval



- 0 means disables ECHO Heartbeat.
- 1-65535 means heartbeat interval, 60 seconds is suggested.

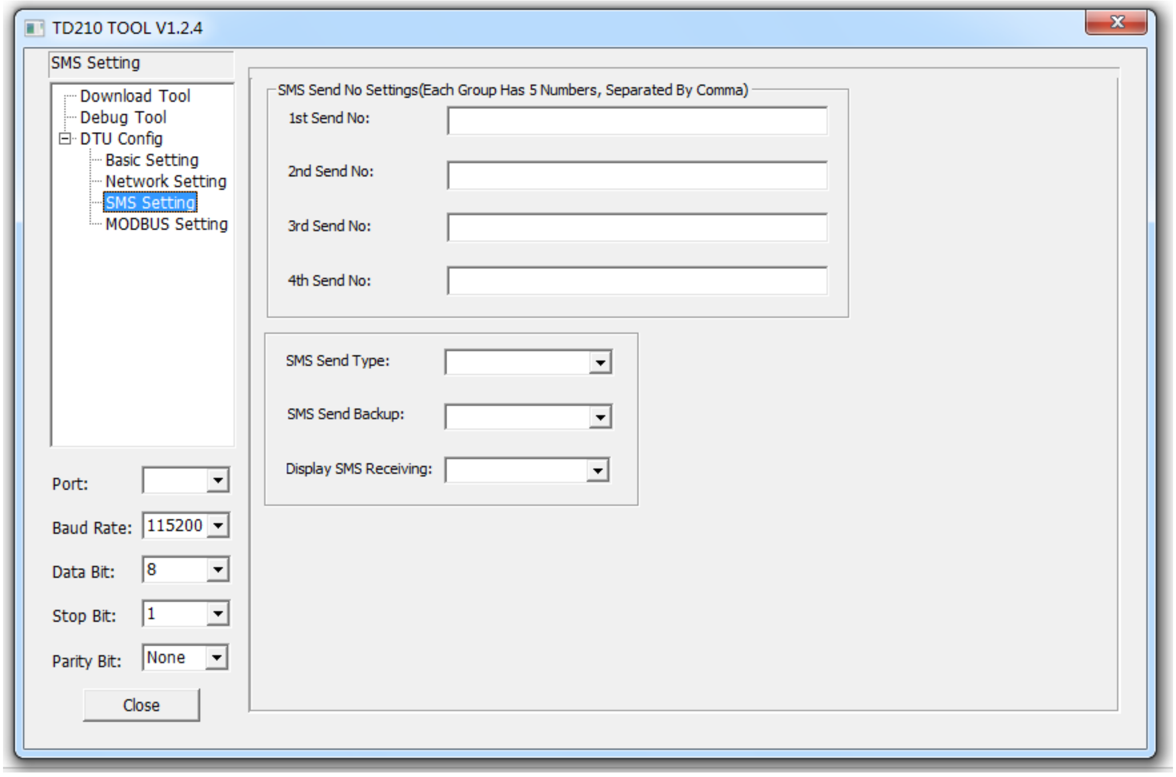
This helps to maintain connection of PPP layer and mobile carrier's network, to avoid being forced to sleep, and helps to check the stability of connection.

4.4.13 TTL Heartbeat

- Disable, to disable TTL heartbeat
- Enable, to enable TTL heartbeat

This helps to maintain connection of Application layer and mobile carrier's network, to avoid being forced to sleep, and helps to check the stability of connection.

4.5 SMS Setting



4.5.1 SMS Send No. Settings

Each group supports up to 5 cell phone No., divided by comma, and each cell phone length shall not exceed 15 numbers.
When TD210 receives data from serial port, while if the network disconnects, and data will be sent to preset cell phone through SMS.(SMS data backup)

4.5.2 SMS Send Type

- Char Format
- HEX Format

Normally, SMS will be sent in format of character or Chinese, while when you choose HEX Format, it will be sent under hexadecimal number 0x00-0xff, which is ideal for industrial automation.

4.5.3 SMS Send Backup

- Enable
- Disable

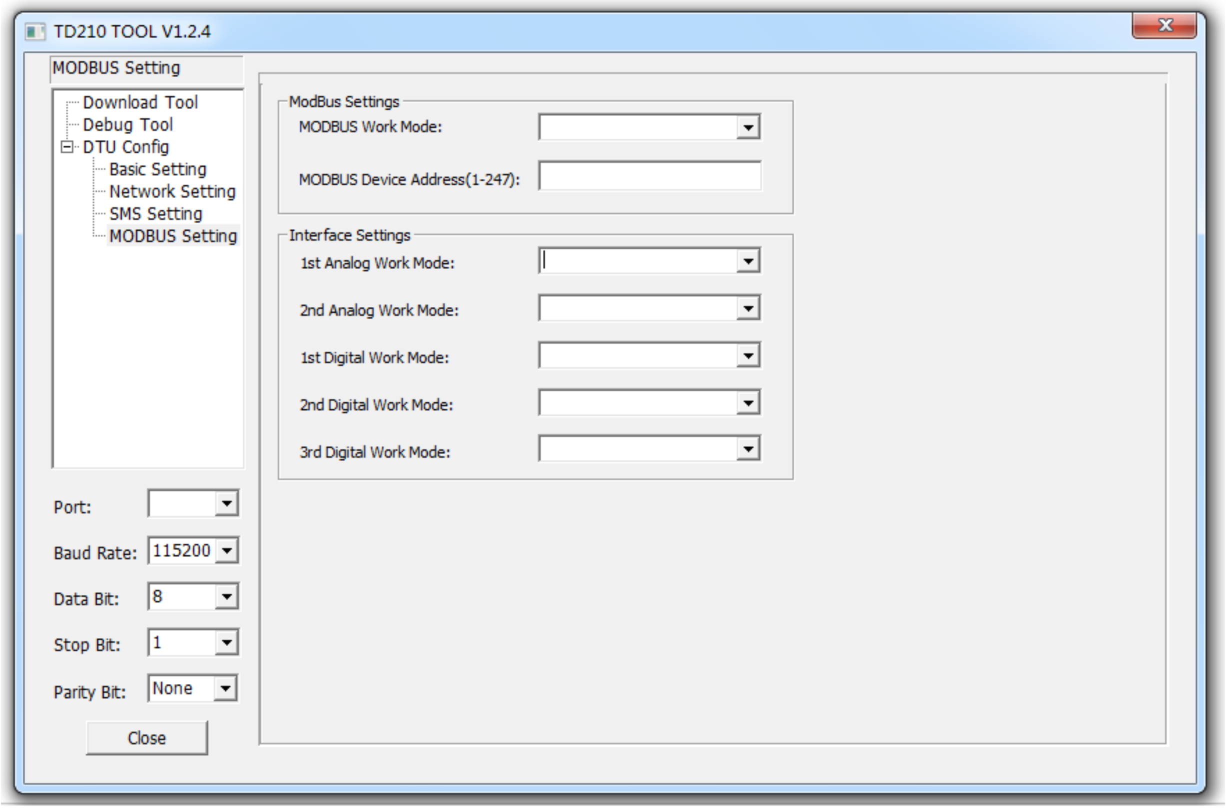
When TD210 receives data from serial port, while if the network disconnects, and data will be sent to preset cell phone through SMS (SMS data backup).

4.5.4 Display SMS Receiving

- Enable
- Disable

When TD210 receives SMS, you can choose whether to transfer the cell phone number and SMS to serial port or not.

4.6 MODBUS Setting



4.6.1 MODBUS Work Mode

- MODBUS Disable
- Network RTU
- Serial Port RTU

When enables MODBUS RTU mode, once TD210 gets online, it can identify the MODBUS protocol command data from center, and collect data or set up terminal port based on the sent command data, then transfer the collected data and terminal port to center, that means TD210 act as a MODBUS device.

4.6.2 MODBUS Device Address

Modbus device address means the MODBUS device address of TD210, center will identify MODBUS device according to this address. The address works when TD210 is enabled RTU mode.

4.6.3 Interface Settings

1) 1st Analog Work Mode and 2nd Analog Work Mode

- Disable
- Collect Once

There are 2 analog quantity ports, IO4 and IO5, with corresponding port are 6 and 7. When MODBUS is set as RTU mode, analog work mode is normally set as Collect Once, TD210 will collect the data through corresponding terminal port after receiving MODBUS command.

2) 1st Digital Work Mode, 2nd Digital Work Mode and 3rd Digital Work Mode

- Disable
- Input
- Output

There are 3 digital quantity ports, IO1, IO2 and IO3, with corresponding port 3, 4 and 5. When MODBUS is set as RTU mode, digital work mode is set as input or output, TD210 will operate the corresponding terminal port after receiving MODBUS command.

4 Firmware Upgrade

4.4 Please open the Bivocom Config Tool, as below,

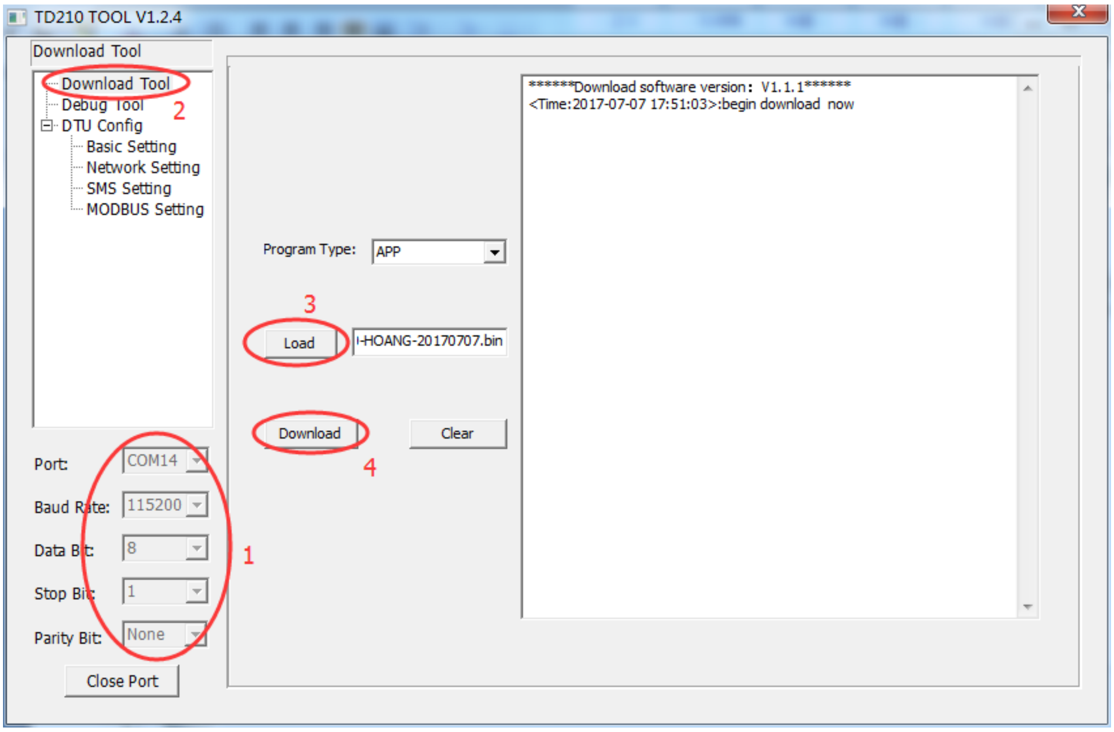
1) Configure Serial Port parameters

- Baud Rate: 115200
- Data Bit: 8
- Stop Bit: 1
- Parity Bit: None

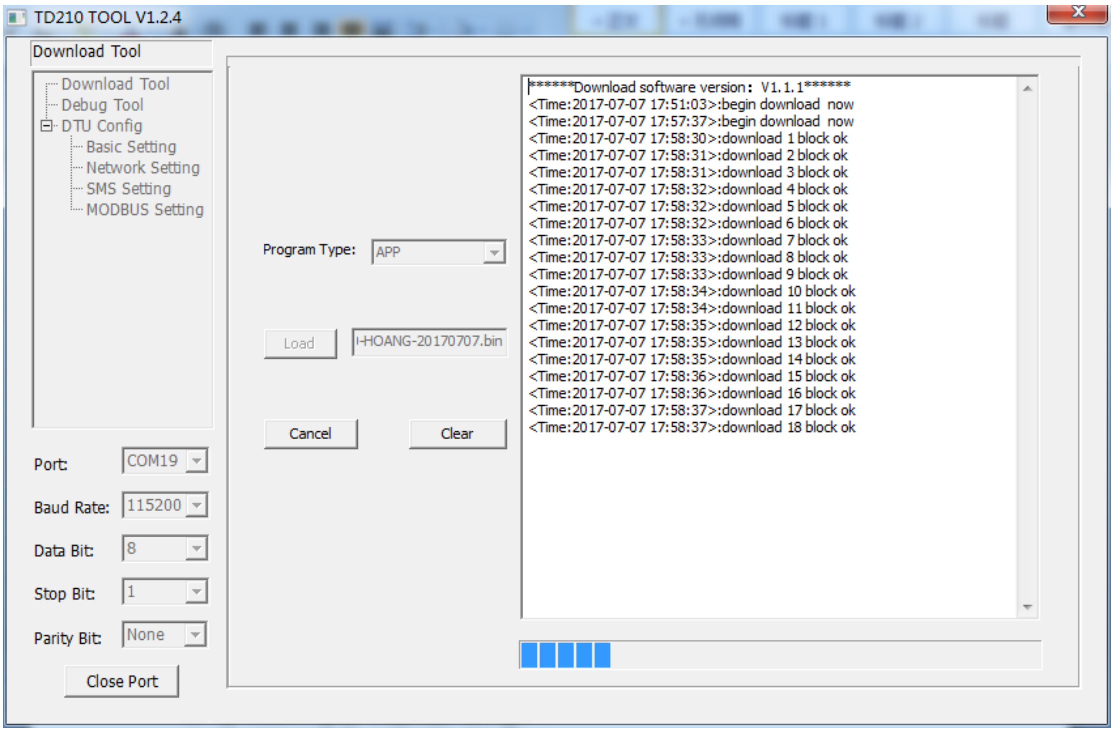
2) Click ‘Download Tool’

3) Click ‘Load’, choose the firmware you want to upgrade

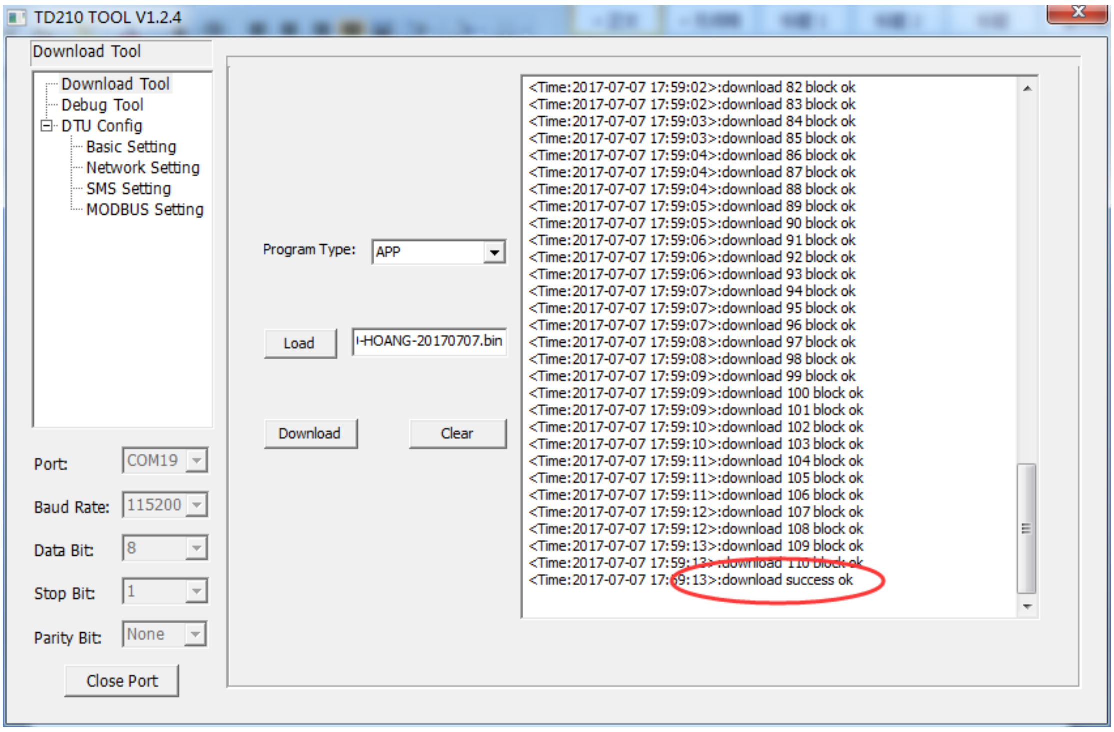
4) The click ‘Download’



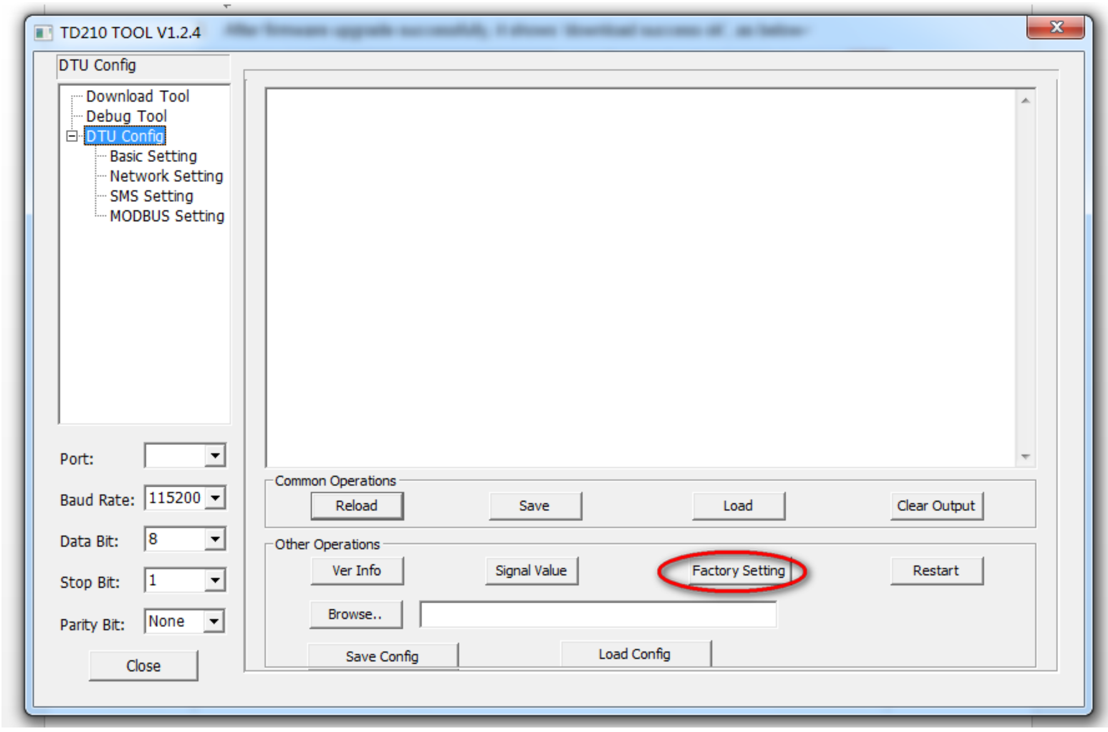
4.5 Power on the TD210, then device will start to upgrade the firmware, as below



4.6 After firmware upgrading successfully, it shows 'download success ok', as below



4.7 Then use the Config Tool to enter into the configuration status, set up the device to factory setting, and restart to configure the parameters.



5 Configure TD210 via SMS

If config command exceeds 140 bytes, please send the command through multi SMS
Note: Long SMS is not supported.
SMS Config format:
<password; command 1; command 2>
Password: 123456(default)
Command: Please refer to command after ‘AT+’ of Appendix 1, AT Command
Example: <123456;IPAD=121.204.221.34;PORT=9999>
Explanation: password: 1234546, IP address: 121.204.221.34, Port: 9999

Appendix 1: AT Command

Note: XX means parameter you’d like to set only, not command.

Description	AT Command	Parameter
Debug Level	AT+DEBUG=XX	XX: 0 (No logs) 1 (Simple logs) 2 (Detailed logs)
Baud Rate	AT+IPR=XX	XX: from 300 to 115200
Data bit, stop bit and Parity	AT+SERMODE=XX	XX: 8N1,8E1,8O1,7N1,7E1, 7O1
Frame Interval (ms)	AT+BYTEINT=XX	XX: unit(millisecond)
Trigger Type	AT+ACTI=XX	XX: AUTO (Always Online) SMSD (SMS Trigger) CTRL (Call Trigger) DATA (Data Trigger) MIXD (Mixed Trigger)
Call Trigger Phone No.	AT+CTRLNO=XX	XX: Preset call trigger phone No.
SMS Trigger Password	AT+SMSDPSWD=XX	XX: Preset SMS trigger password
Data Trigger On Password	AT+DONPSWD=XX	XX: Trigger on data
Data Trigger Off Password	AT+DOFFPSWD=XX	XX: Trigger off data
Network Word Mode	AT+MODE=XX	XX: FTCP,HTCP,CTCP, NUDP,CUDP,HUDP
Data Center Number	AT+SVRCNT=XX	XX: number of data center

Main Center Addr.	AT+IPAD=XX	XX: Main center IP address or DNS
Main Center Port	AT+PORT=XX	XX: Main center port
Backup Center Addr.	AT+IPSEC=XX	XX: Backup center IP address or DNS
Backup Center Port	AT+PTSEC=XX	XX: Backup center port
2nd Center Addr.	AT+IPAD1=XX	XX: 2nd center IP address or DNS
2nd Center Port	AT+PORT1=XX	XX: 2nd Center Port
3rd Center Addr.	AT+IPAD2=XX	XX: 3rd center IP address or DNS
3rd Center Port	AT+PORT2=XX	XX: 3rd Center Port
4th Center Addr.	AT+IPAD3=XX	XX: 4th center IP address or DNS
4th Center Port	AT+PORT3=XX	XX: 4th Center Port
5th Center Addr.	AT+IPAD4=XX	XX: 5th center IP address or DNS
5th Center Port	AT+PORT4=XX	XX: 5th Center Port
Main Center DNS Server	AT+DNSSVR=XX	XX: Main Center DNS Server
Backup Center DNS Server	AT+DNSSV2=XX	XX: Backup Center DNS Server
2nd Center DNS Server	AT+DNSSVR1=XX	XX: 2nd Center DNS Server
3rd Center DNS Server	AT+DNSSVR2=XX	XX: 3rd Center DNS Server
4th Center DNS Server	AT+DNSSVR3=XX	XX: 4th Center DNS Server
5th Center DNS Server	AT+DNSSVR4=XX	XX: 5th Center DNS Server
APN	AT+APN=XX	XX: APN
APN Username	AT+USERNAME=XX	XX: APN Username
APN Password	AT+PASSWORD=XX	XX: APN Password
APN Call Center	AT+CENT=XX	XX: APN Call Center
Heartbeat Interval	AT+POLLTIME=XX	XX: Heartbeat Interval
Auto Back to Main Server	AT+RETMAIN=XX	XX: 1, Yes 0, No
Custom Register String	AT+CONNRGST=XX	XX: Custom Register String
Custom Heartbeat String	AT+LINKRGST=XX	XX: Custom Heartbeat String
Transfer Meaning	AT+STRAIGHT=XX	XX：0, Transfer meaning 1, No transfer meaning
TCP MTU	AT+TCPMTU=XX	XX: TCP Data Maximum Transmission Unit
Multi Center Reconnect Interval	AT+MCONTIME=XX	XX: Second(Unit)
Connect Retry Times	AT+RETR=XX	XX: Connect Retry Times

Reconnect Time Interval	AT+RDLWT=XX	XX: Reconnect Time Interval
TTL Heartbeat	AT+EXFUN=XX	XX: 0, Disable 1, Enable, 1 time per 60 seconds
ECHO Heartbeat Interval	AT+ECHOINT=XX	XX: 0, Disable Other value means seconds you set
1st SMS Send Phone No.	AT+PHONE1=XX	XX: Use comma for multi phone number
2nd SMS Send Phone No.	AT+PHONE2=XX	XX: Use comma for multi phone number
3rd SMS Send Phone No.	AT+PHONE3=XX	XX: Use comma for multi phone number
4th SMS Send Phone No.	AT+PHONE4=XX	XX: Use comma for multi phone number
SMS Send Type	AT+HEXSMS=XX	XX: 0, Normal SMS 1, HEX SMS
SMS Send Backup	AT+OPENSMSBCKP=XX	XX: 0, NO Backup 1, YES, to Backup
Display SMS Receiving	AT+SMSDIS=XX	XX: 0, No, SMS is not displayed at serial port 1, Yes, SMS display at serial port
MODBUS Work Mode	AT+MBMODE=XX	XX: 0, Disable 1, Network MODBUS 2, Serial Port MODBUS
MODBUS Device Address	AT+MBADDRESS=XX	XX: Address ranging from 1-247
1st Analog Work Mode	AT+ADCMODE1=XX	XX: 0, Disable 1, Collect Once
2nd Analog Work Mode	AT+ADCMODE2=XX	XX: 0, Disable 1, Collect Once
1st Digital Work Mode	AT+DIOWORKMODE1=XX	XX: 0, Disable 1, Input 2, Output
2nd Digital Work Mode	AT+DIOWORKMODE2=XX	XX: 0, Disable 1, Input 2, Output
3rd Digital Work Mode	AT+DIOWORKMODE3=XX	XX: 0, Disable 1, Input 2, Output

Appendix 2: FAQ

1. Power light is off

Check if the power supply range is 5~35V, and make sure the polarity is correct.

2. Online light is off

1) Make sure SIM card is the card holder and locked correctly, and antenna is fasten.
2) Check the IP address and port of server in the configuration tool is correct.
3) Check whether the server is working.
4) Check if the SIM is out of service (charges owed) and function of data is on.

3. The device couldn’t enter into configuration mode.

1) Check the connection of RS232/RS485 is correct.
2) Is the RS232/RS485 connected to your computer or laptop and serial port of computer or laptop is working.
3) Check whether the baud rate of computer or laptop is the same as IP Modem.