XINJE

# Industrial Ethernet Module
# T-BOX

## Operating manual

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Data NO. PC06 20080201 3.0

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# 1. Introduction

## 1-1. Summarize

As a kind of Industrial Ethernet module, T-BOX supports Modbus-RTU serial port devices, and it is used in the control system of Industrial Ethernet. According to international standards IEEE802.3, Industrial Ethernet is used in industrial unit network.

At present, T-BOX only supports industrial Ethernet LAN unit, wide-area network unit (that is, a remote landing capabilities) are being developed.

## 1-2. Compatibility

The whole Industrial Ethernet control system includes: T-BOX, networking PC,XC series PLC and upper computer software XCPpro (V3.0g available),TP series Industrial touch screen or OP series Text display, Network connectivity devices(hubs, routers, switches etc.) and transmission cable such as shielded twisted-pair cable or coaxial cable.

## 1-3. Performance characteristic

- Realize flexible distributed automation structure, simplify systems management
- Visit the Ethernet via RJ45 standard port ,based on standard TCP/IP protocol
- The adoption of Industrial Ethernet can realize system remote monitoring and diagnosis, in order to save time and funding
- Through the Ethernet data storage and manipulation of information, so as to lay the foundation for simplify the process of data processing and archiving the basis
- Ethernet enables automation control equipment and communications with each other so that these devices can be used in complex systems.
- High quality, low price ,connect Ethernet with all automatic machines and level in a simple form
- Easy to maintain and support simple user-friendly diagnostics

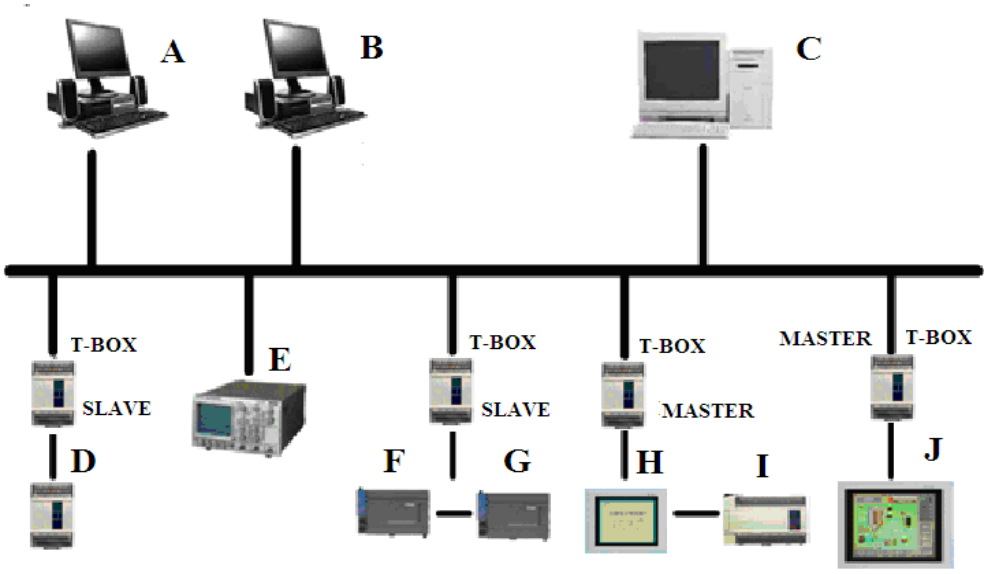
## 1-4. Applied function and field

Technically, Industrial Ethernet is electrical network which is based on the shielded coaxial cable, twisted-pair cable to establish, or is optical network which is based on fiber-optic cable to establish. It is compatible with IEEE802.3 standard, and uses ISO and TCP/IP communication protocol. As the expansion protocol of Modbus/RTU—Modbus/TCP, defines the transmission and application protocol used in TCP/IP network, and has greater flexibility and wide application. So, as an Industrial Ethernet access device, T-BOX has broken the regional restriction, and provides a reliable control and integrated solutions for various control devices to meet the needs of the Business-to-demand network of automatic control.

So, the Industrial Ethernet unit based on T-BOX has below applications:

- PLC program of IP device maintains and diagnoses with remote centralized
- PLC program of IP device monitors with remote centralized
- Traditional Modbus communication mode is one master multi-slave and slower. For multi-site large-scale device system, combined with T-BOX enables to realize data exchange function between master and slave PLC

  For example, in the below system, T-BOX supports Modbus/RTU serial device to access to Ethernet and constitutes an effective industrial control system, that realize the control system of multi-master multi-slave ,which enables control device to be applied in more complex environment and higher demands in industrial control system.

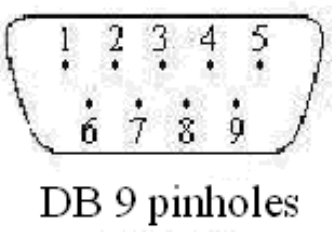


## 2. Interface and display

### 2-1. Serial port

T-BOX serial port : RS-232、RS-485 (port A, port B)

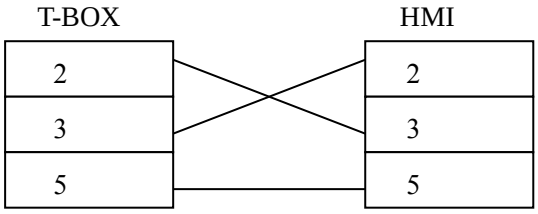
(1)RS-232 port has nine pins, as below shown:




DB 9 pinholes

| | |
|---|---|
| 2 | RXD |
| 3 | TXD |
| 5 | GND |

T-BOX and HMI cable connection figure:




XC series PLC and T-BOX cable connection figure:

(2) When use RS-485 port, port A is "+", port B is "-", and connect port A, B with PLC port A, B.

Attention: RS-232 port and RS-485 port can't be used at the same time.

T-BOX serial connection device has some differences according to its working mode.

Master mode: it can connect only one Modbus master device and many slave stations

Slave mode: it only can connect Modbus slave device, the quantity is unlimited.

### 2-2. Network interface

RJ45 standard interface

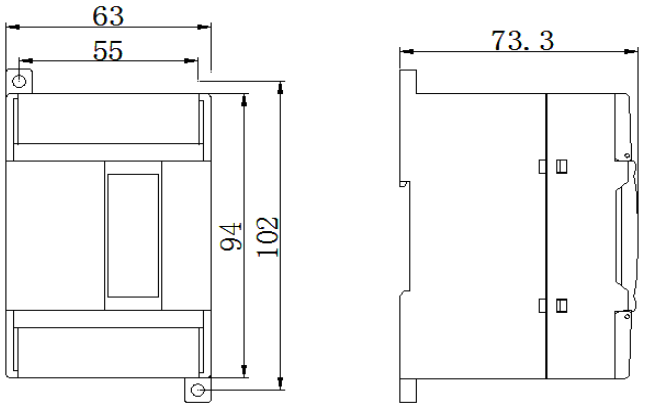
Ethernet RJ45 definition:

| Pin | Wire color | Signal definition | Direction |
|---|---|---|---|
| S1 | Orange and white | TXD+ | output |
| S2 | Orange | TXD- | input |
| S3 | Green and white | RXD+ | output |
| S4 | Blue | - | - |
| S5 | Blue and white | - | - |
| S6 | Green | RXD- | input |
| S7 | Brown and white | - | - |
| S8 | Brown | - | - |

## 2-3. Power supply

Input power: DC 24V (port 24V+、GND), it allows DC21.6V~DC26.4V.

## 2-4. External dimension and installation




External dimension is 63mm×102mm×73.3mm (width×high×deep)

Use M3 snail to fix the module or install on the DIN46277 (width 35mm) track.

Attention:

1. During installation, avoid metal bits or wire bits dropping into the module
2. Before connecting, please make sure the specs of the module and device are correct
3. Make sure the wire connection is firm. If not, some problem will occur such as data incorrect, short-circuit, etc.
4. When installing or connecting with the module, make sure the power is cut off

## 2-5. DIP switch

T-BOX has four DIP switches, as the below shown:

ON

| 1 | 2 | 3 | 4 |
|---|---|---|---|

OFF

| Button code | State | Function |
|---|---|---|
| S1 | ON | SLAVE mode |
| | OFF | MASTER mode |
| S2 | ON | Close server log on |
| | OFF | Open server log on |
| S3 | ON | IP address setting |
| | OFF | Use the static IP address (192.168.0.111) |
| S4 | ON | Undefined |
| | OFF | Undefined |

There are 2 modes for TBOX IP configurations:

(a) use static IP

(b) use the IP set by users

The priority is (a) > (b).

(a): use static IP (DIP switch S3 is OFF)

If users don't know the IP of TBOX or for initial use, please select default IP for TBOX.

IP address: 192.168.0.111

Mask code: 255.255.255.0

Gateway: 192.168.0.1

DNS: 192.168.0.1

(b): use the user's IP (DIP switch S3 is ON)

Set IP address, mask code, gateway and DNS (same as default gateway)

## 2-6. LED display

| LED | Indication | Function |
|---|---|---|
| REMOTE | Remote log on | Always ON: log on remote server |
| IP | IP checking | Shining: IP address conflict |
| PWR | Power | Always ON: normal |
| LINK | Ethernet connection | Always ON: network connection is normal |
| ACT | Ethernet data | Shining: received data |
| COM | Serial port | Shining: has connection |

## 3. Operating step

For Industry Ethernet control system, before connecting the target device into Industrial Ethernet, you have to configure the T-BOX parameters, please see the following steps:

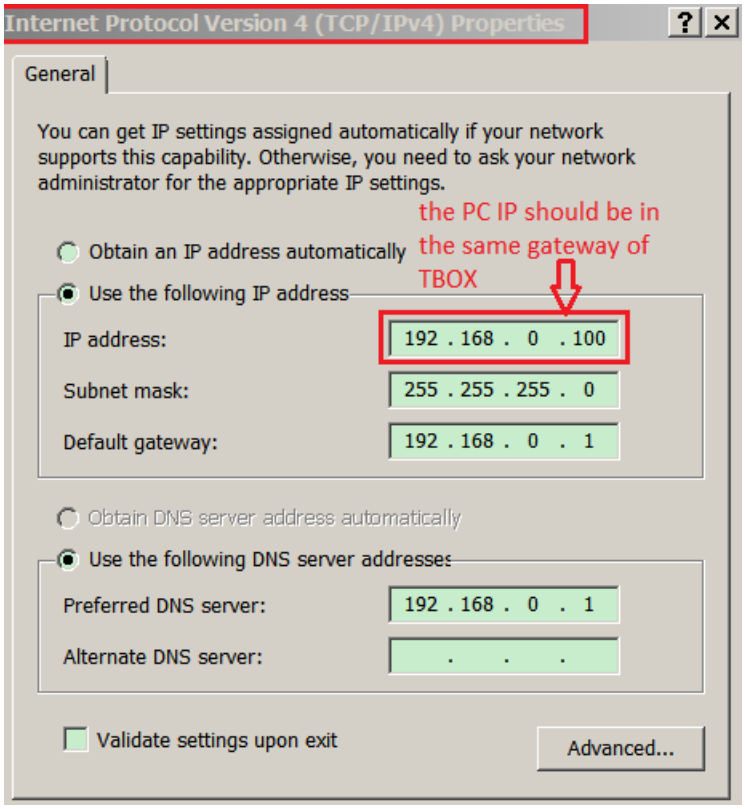
### 3-1. Hardware setting and connection

A Set the DIP switch according to user's demands

B Make sure T-BOX has been connected into the Ethernet, then power on.

Notes: when you use it at the first time, make sure DIP switch S3 is OFF for the network to recognize TBOX, set it to static IP address 192.168.0.111, and then connect it with the Ethernet. The IP of PC must be in the same gateway of the TBOX (192.168.0.xxx, but cannot conflict with other devices). TBOX has the same IP when out of the factory, so cannot configure them together. You have to configure them one by one. Otherwise the IP address will conflict with each other.

In your PC (suppose the OS is windows 7), click control panel/network connection, right click the local area connection/properties/Internet protocol version 4 (TCP/IPv4):




C Make sure the PC has been connected in the network.

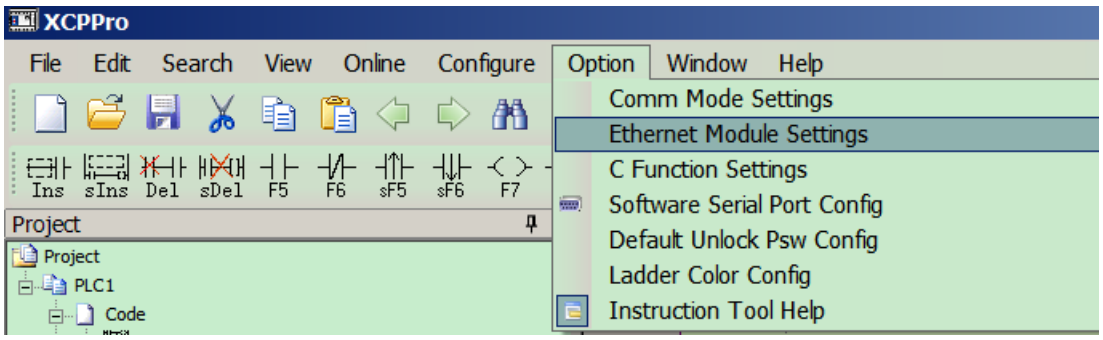
D XC series PLC software XCPpro version requirements:

For TBOX hardware v2.10, please use XCPpro v3.3

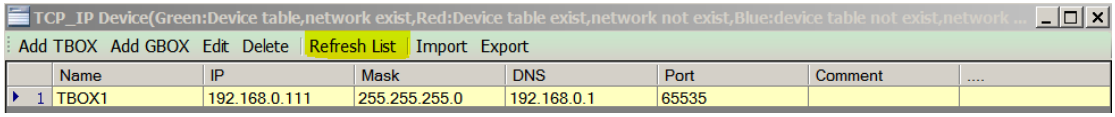
For TBOX hardware v2.0, please use XCPpro v3.0f

## 3-2. Software setting

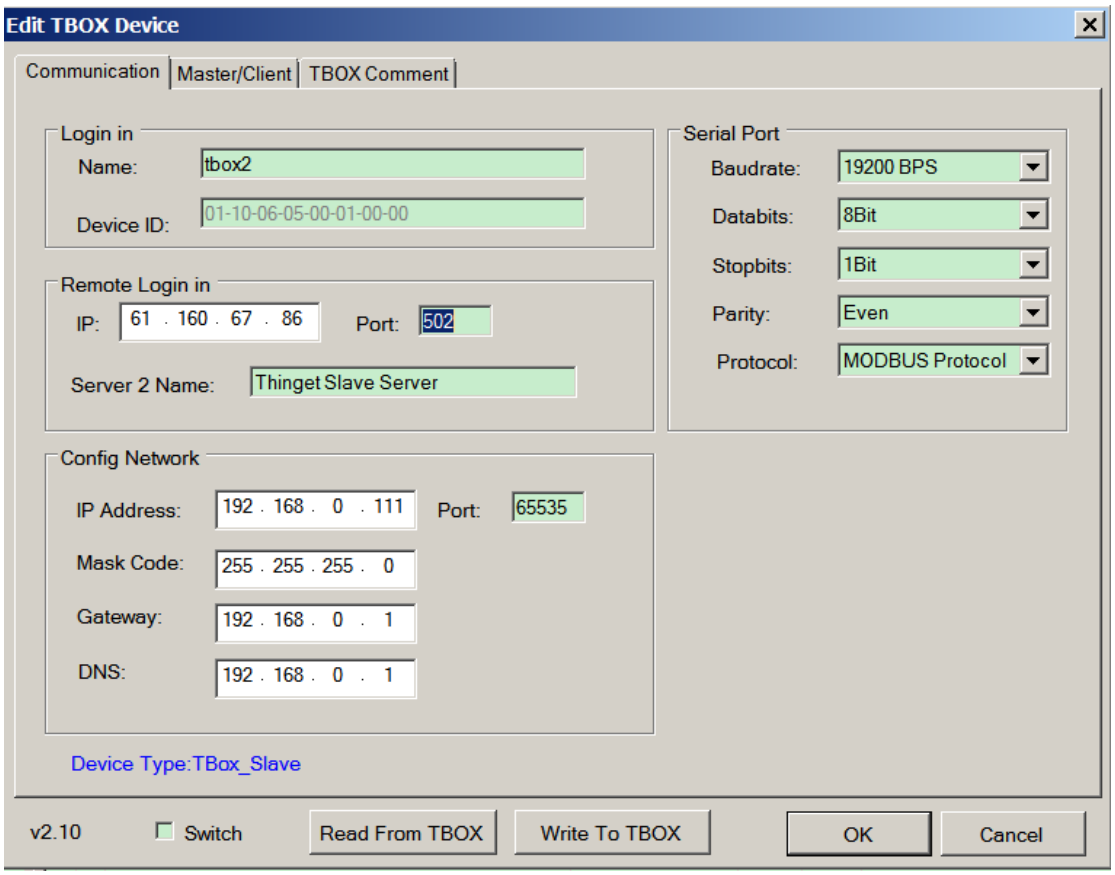
A Open the software XCPpro v3.3, click option/Ethernet module settings.




B It shows the TCP_IP device window, click Refresh List:




C double click the target TBOX, it shows the Edit TBOX device window:




**Parameters explanation:**

- **Communication**

**Log in**

Name: defined by user

Device ID: no need set, use default value

**Remote log in**

The aim of this part is to connect TBOX and its device to the WAN. It can remote maintenance the machine by remote server of TBOX.

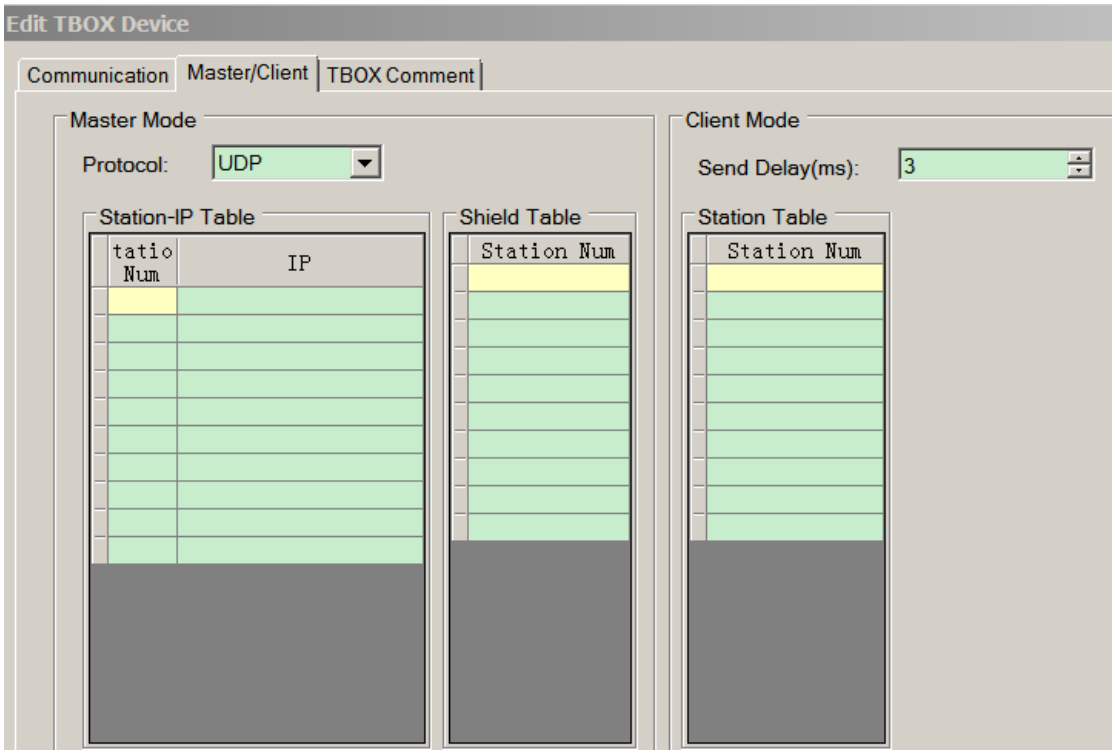
IP, Port, Server 2 name: If user uses XINJE company server, no need to set these parameters. If user can build his own server, input these parameters according to his server.

**Config network:**

When the DIP switch 3 is OFF, users can set parameters of the IP device including IP address, mask code, gateway, DNS (the same as default gateway). Then turn ON DIP switch 3, the network will recognize this TBOX.

**Serial port:**

Baud rate, databits, stopbits, parity, protocol can be modified. Please note the baud rate must be the same as the connected device.




- **Master/client**

The Edit TBOX device window will show the device type and version. When TBOX is in master mode, it will show TBOX_Master, the master mode parameters are effective. The client mode parameters will be ineffective. When TBOX is in slave mode, it will show TBOX_Slave, the client mode parameters are effective, the master mode parameters will be ineffective.

**TBOX_Master parameters:**

Protocol: UDP: effective, fast

TCP: receiving/sending data is stable, occupy more sources

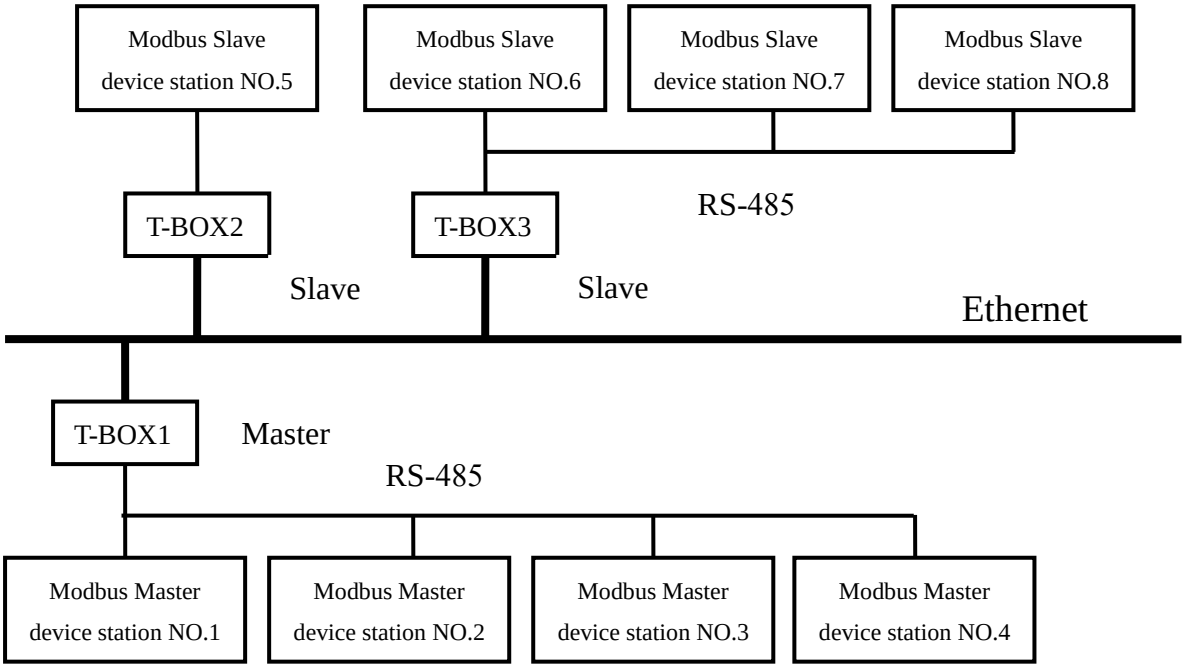
Station IP table: station num: the station numbers controlled by master device in the Ethernet (slave station)

IP: slave IP address

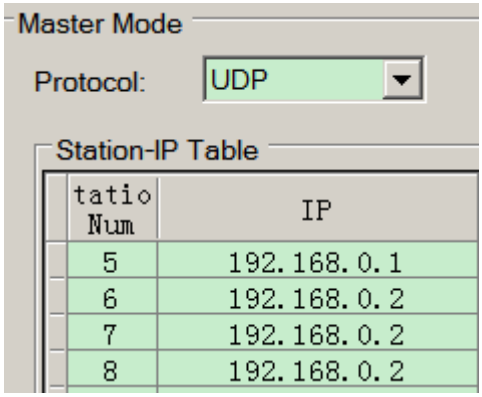
**TBOX_Slave parameters:**

Send delay: TBOX will send the next command when received the answer from the slave station. Add delay between the answer and command to decrease the possibility of losing the command pack.
Station table: the slave station in the Ethernet, support direct access.

For example, in the following Industrial Ethernet, T-BOX1 is Master mode, T-BOX2 and T-BOX3 are all slave mode, the settings of T-BOX1 and T-BOX3 are as follows:

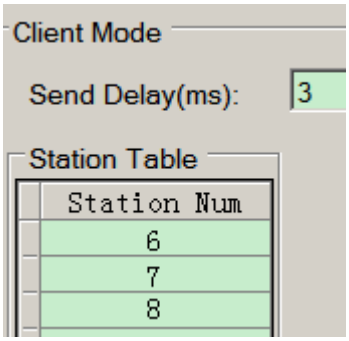



The setting of T-BOX1:




Station IP table: station NO.5, NO.6 No.7 and NO.8 are slave station numbers. IP is the slave device IP address.

The setting of T-BOX3:

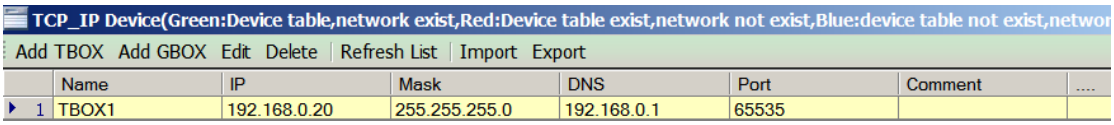



Station number table: station NO.6, NO.7 and NO.8, the purpose is to record the Modbus Slave device station numbers in the T-BOX.

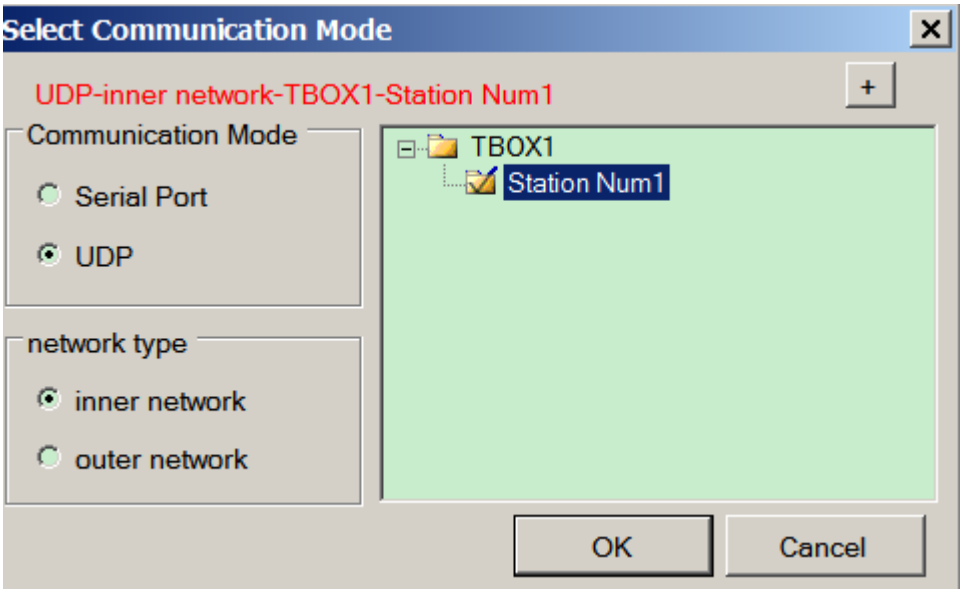
- **TBOX comment**

It includes device name and content. They can be modified according to user's demands, then click "OK".

D Click "Write to TBOX", the click "OK". All the parameters are effective. The existed device will be listed in the TCP_IP device window. Close this window.




E Click option /comm. Mode settings, it shows "select communication mode" window, please select "UDP" for communication mode, network type can be "outer network" or "inner network". If there are many TBOX, only the target station works. Now, you can monitor and upload, download program of PLC via Ethernet.



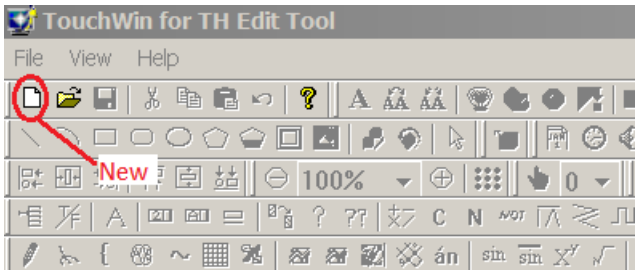

F Click "OK" to finish the TBOX parameters setting.

## 4. The connection between TBOX and SCADA

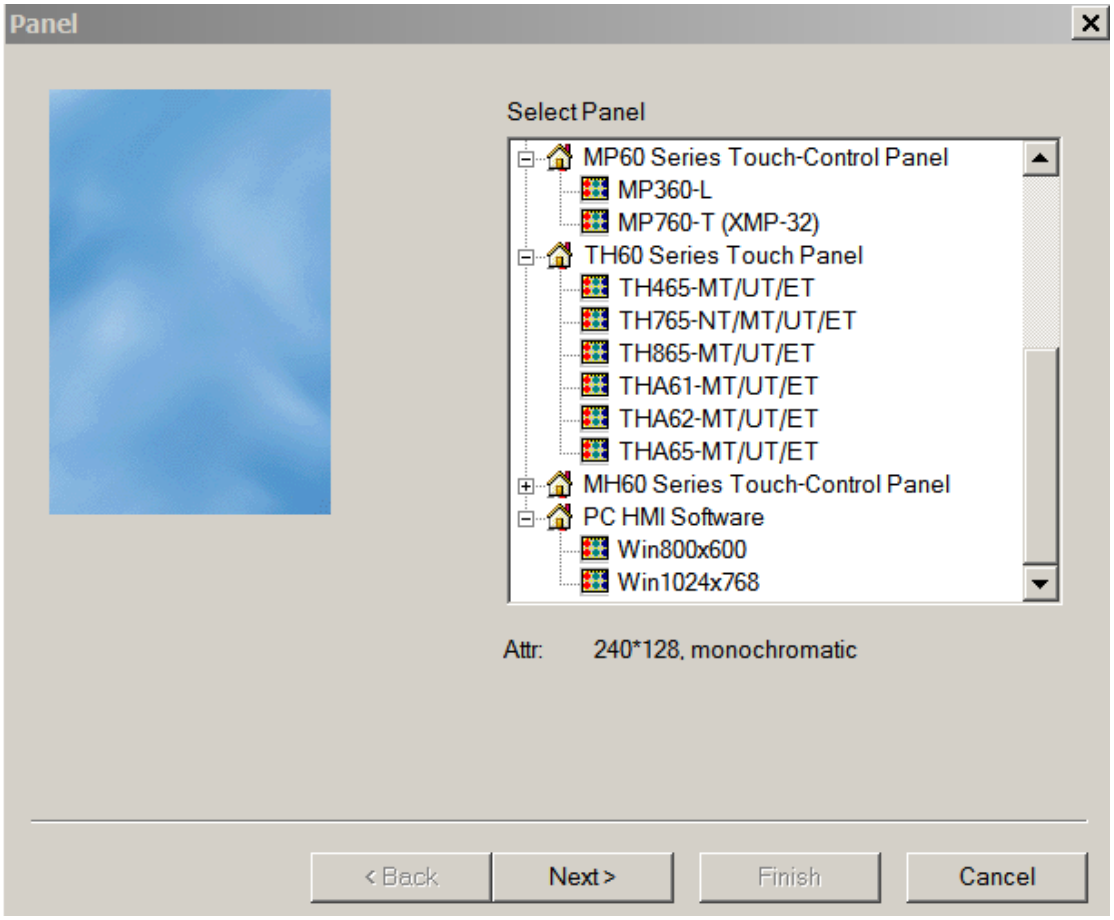
When use WAN, TBOX can connect with Touchwin SCADA (version 2.c.5 and higher).

The steps are as below:

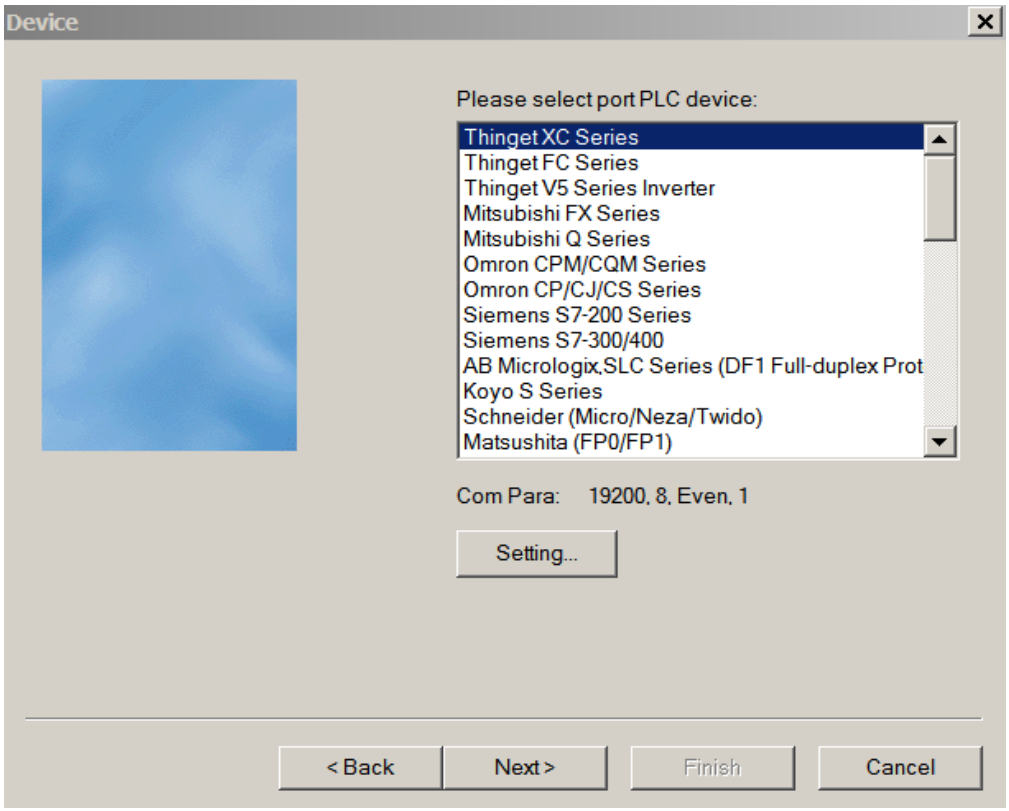
(1) Open Touchwin software, build a new file



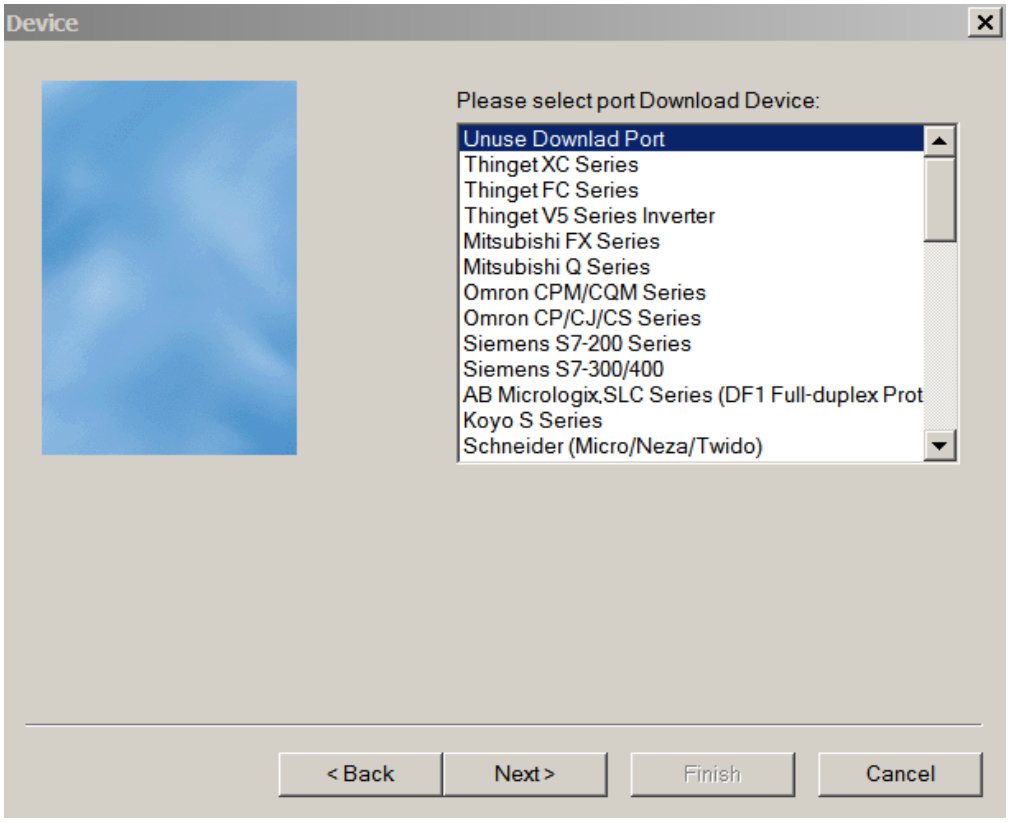

(2) Select PC HMI software/Win800*600 or Win 1024*768 (according to your PC screen size).




(3) Click “Next” , then PLC port device select “Thinget XC series”



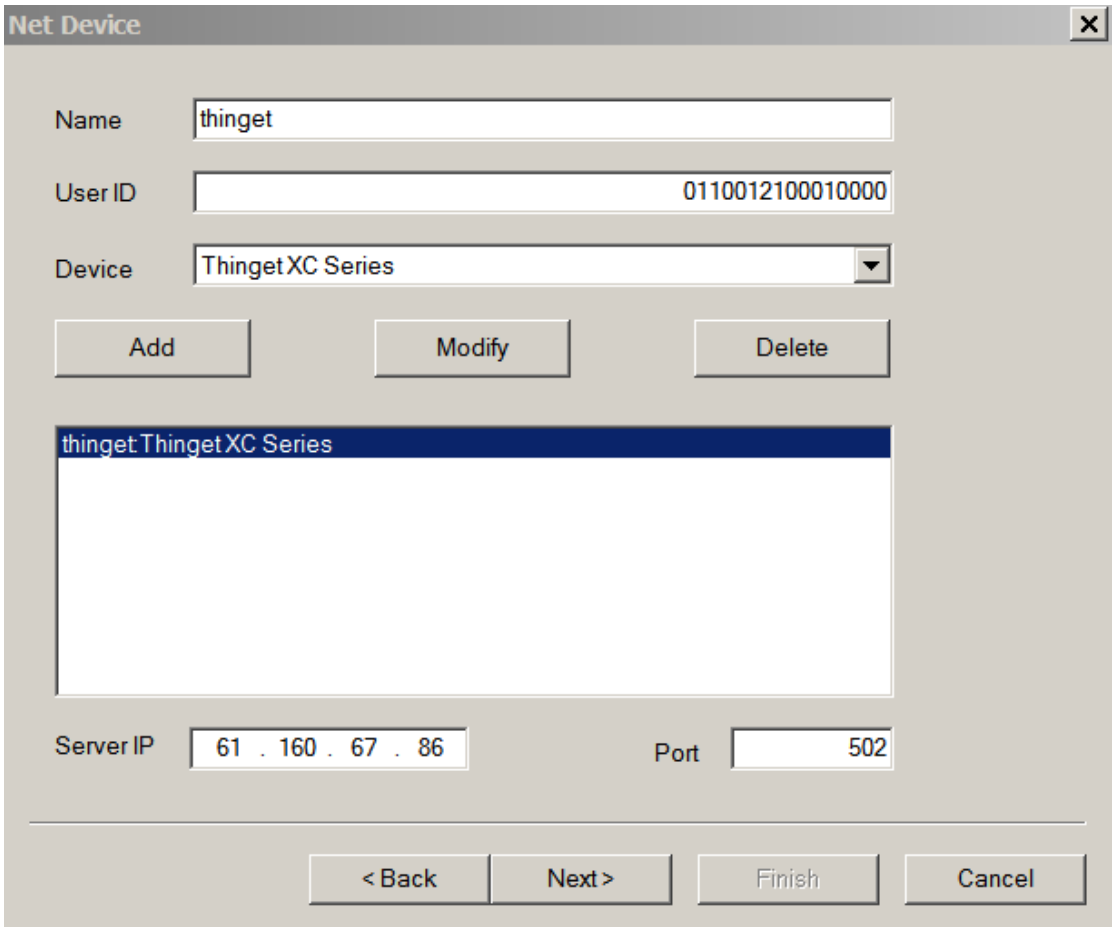

(4) Download port device select “unused download port” then click “Next”



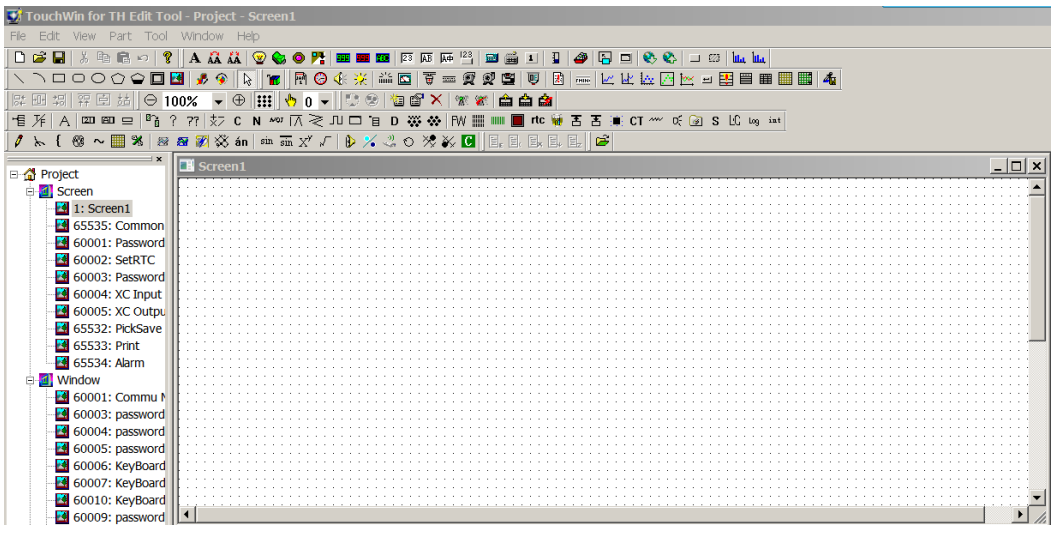
(5) The parameters in below window:

- Name: TBOX log in name
- User ID: TBOX log in device ID. Please delete the "-" when input the ID. For example: ID 01-10-02-21-00-01-00-00 will be 0110012100010000.
- Device: select the device in the drop-down list, then click "Add".
- Server IP and port: TBOX remote log in IP and port.

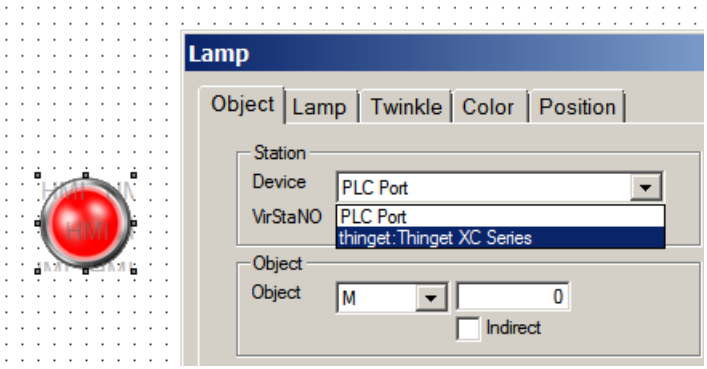
Click "Next" to finish the configuration.



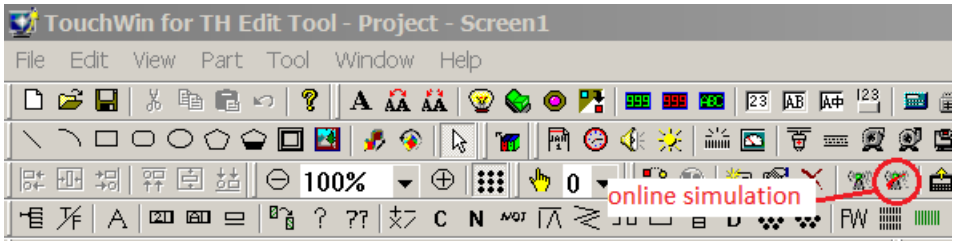

(6) Make the project in below window:



Please note: for all the objects in the project, please change the “PLC port” to network device. For example: the lamp button, change “PLC port” to “thinget XC series”.

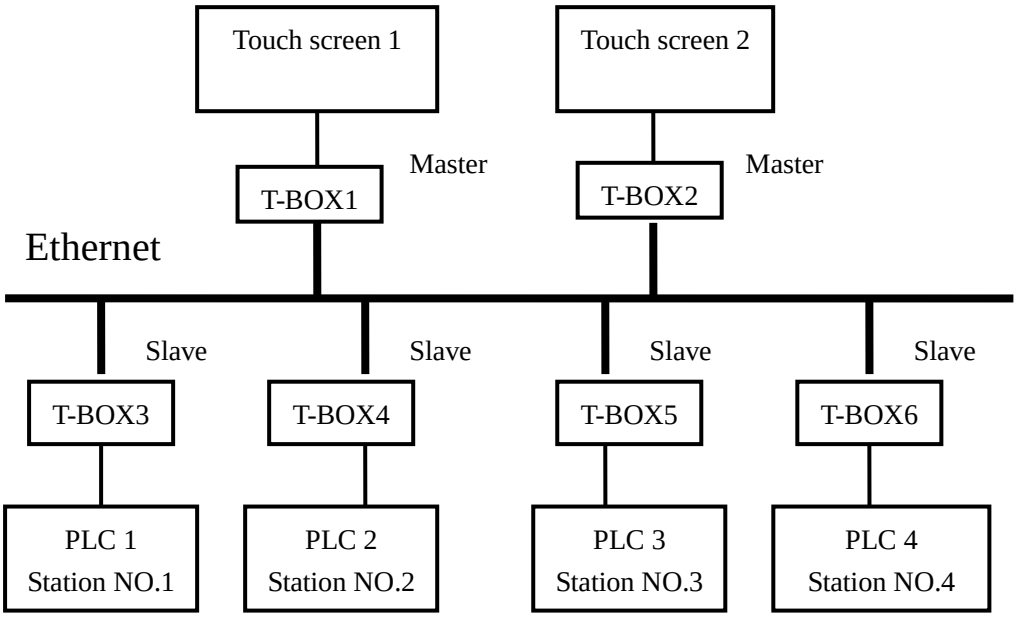



(7) After finishing the editing of project, click online simulation button to monitor the remote device.



## 5. Application examples

In the practical application, it can make the complicated system by connecting the devices into the industrial Ethernet.




In this system, there are 6 T-boxes, T-BOX1 and T-BOX2 are master mode, others are Slave T-BOX. Touch screen 1 and touch screen 2 are master device, PLC1, PLC2, PLC3 and PLC4 are all slave devices.

The aim of this control system is to realize multi-master control multi-slave devices.

Then, the detailed steps are shown as following:

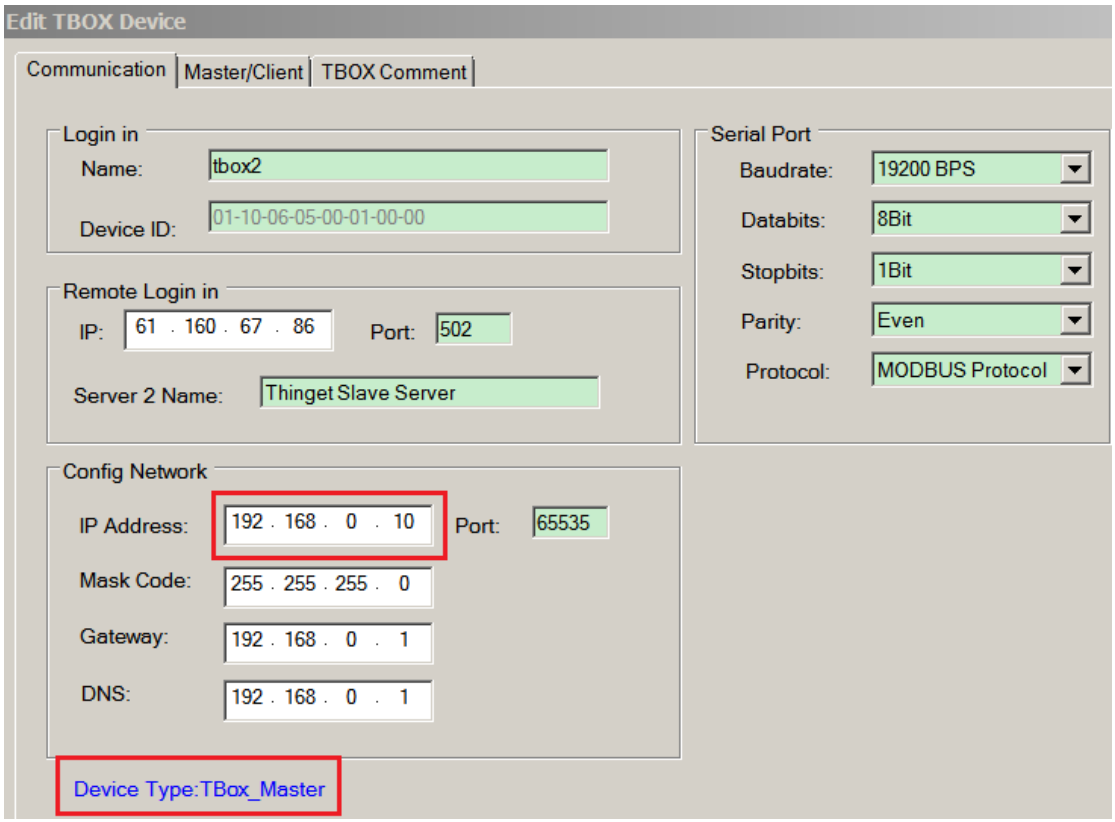
1) Set 4 PLC station NO. to 1, 2, 3, 4 individually via XCPpro software.

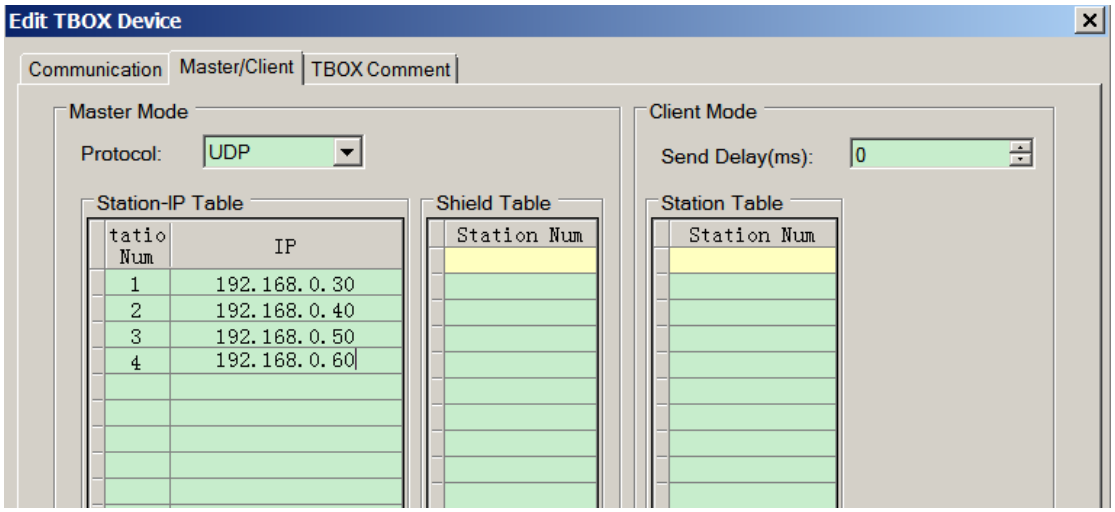
2) Connect the T-boxes which are in Master mode and Slave mode with corresponding control devices. If it is the first time to use T-BOX, it can't be recognized. Please turn the DIP switch S3 off, use the static IP address and connect the T-boxes into the Industrial Ethernet in turn. After setting T-BOX in the XCPpro software, turn the DIP switch S3 on so as to set next T-BOX. If T-BOX has IP address, multi-T-BOX can be connected into the network at the same time and configured in the software.

3) In this example, set the IP address of each T-BOX, the IP address of T-BOX1 ~ T-BOX6 are 192.168.0.10, 192.168.0.20, 192.168.0.30, 192.168.0.40, 192.168.0.50, 192.168.0.60.

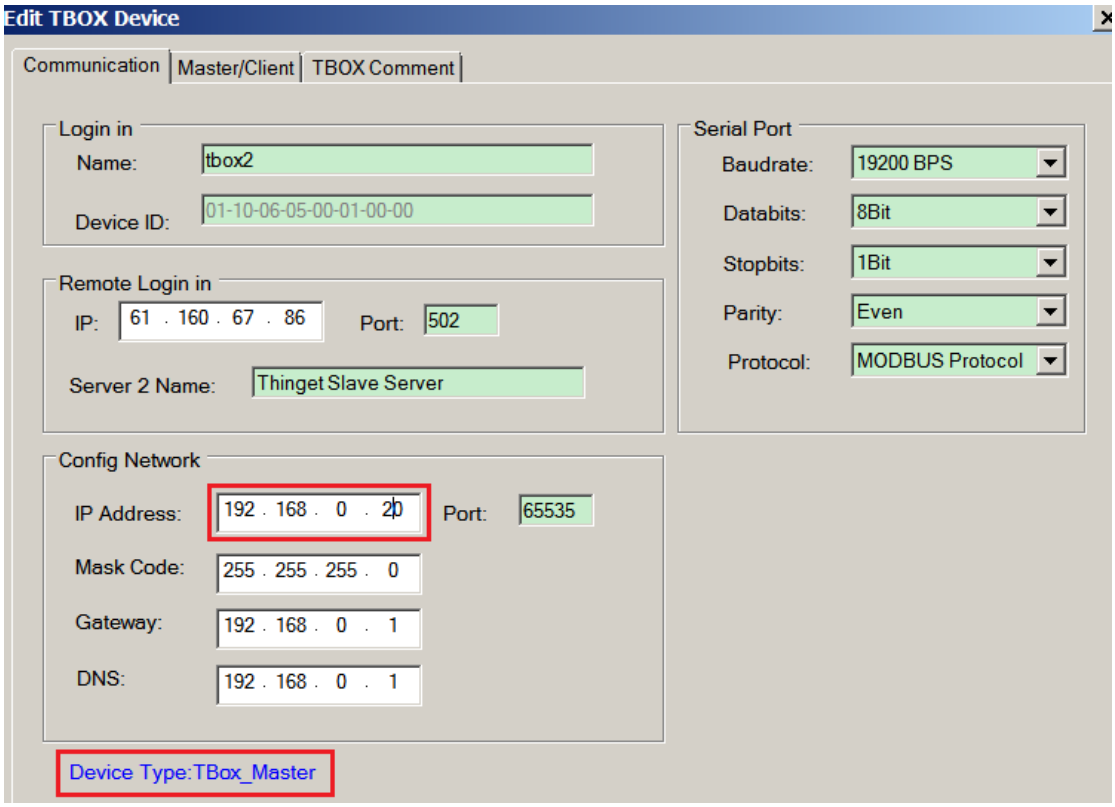
In the "edit TBOX device", please see the following detailed configuration:

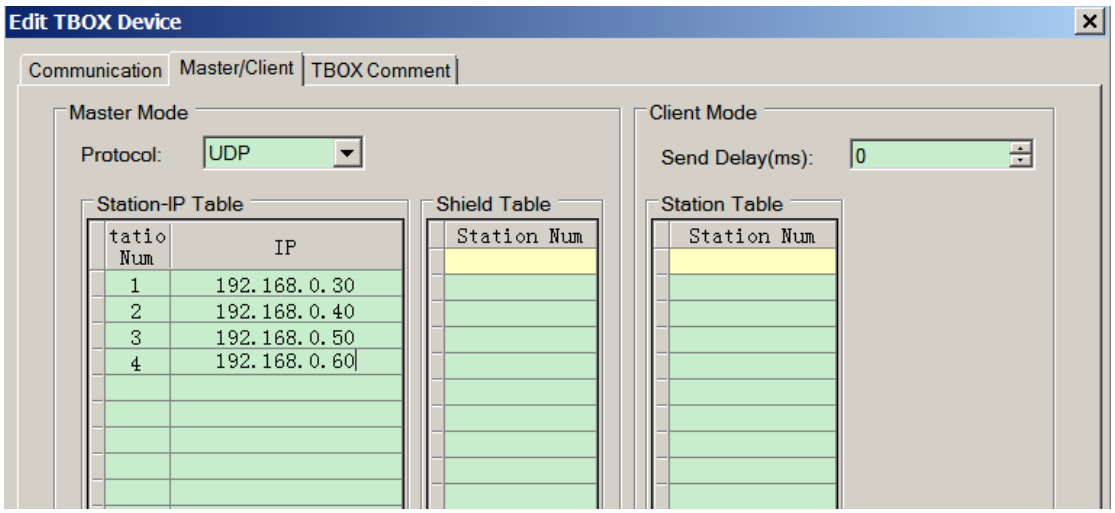
T-BOX1 parameters setting: (Turn off DIP switch 1)



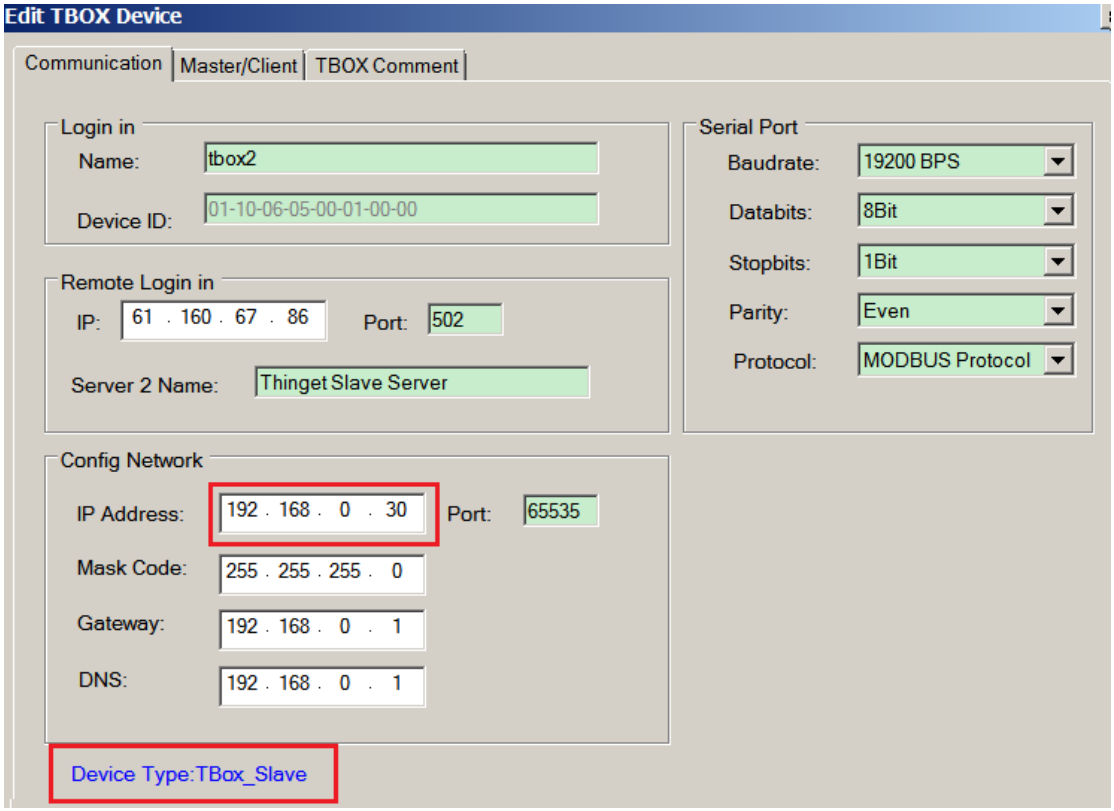



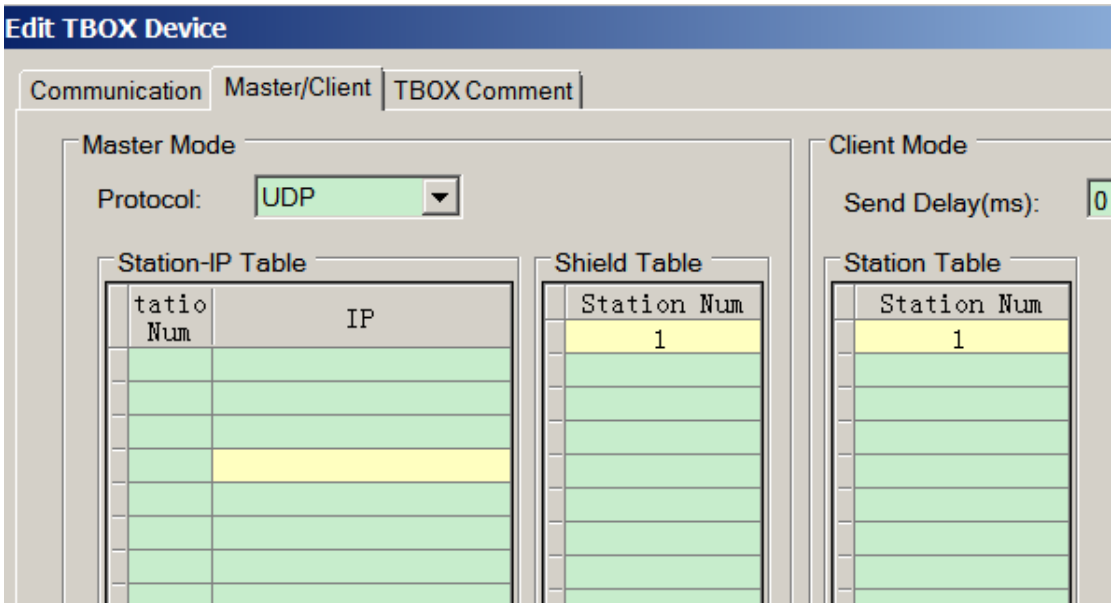

T-BOX2 parameters setting: (Turn off DIP switch 1)



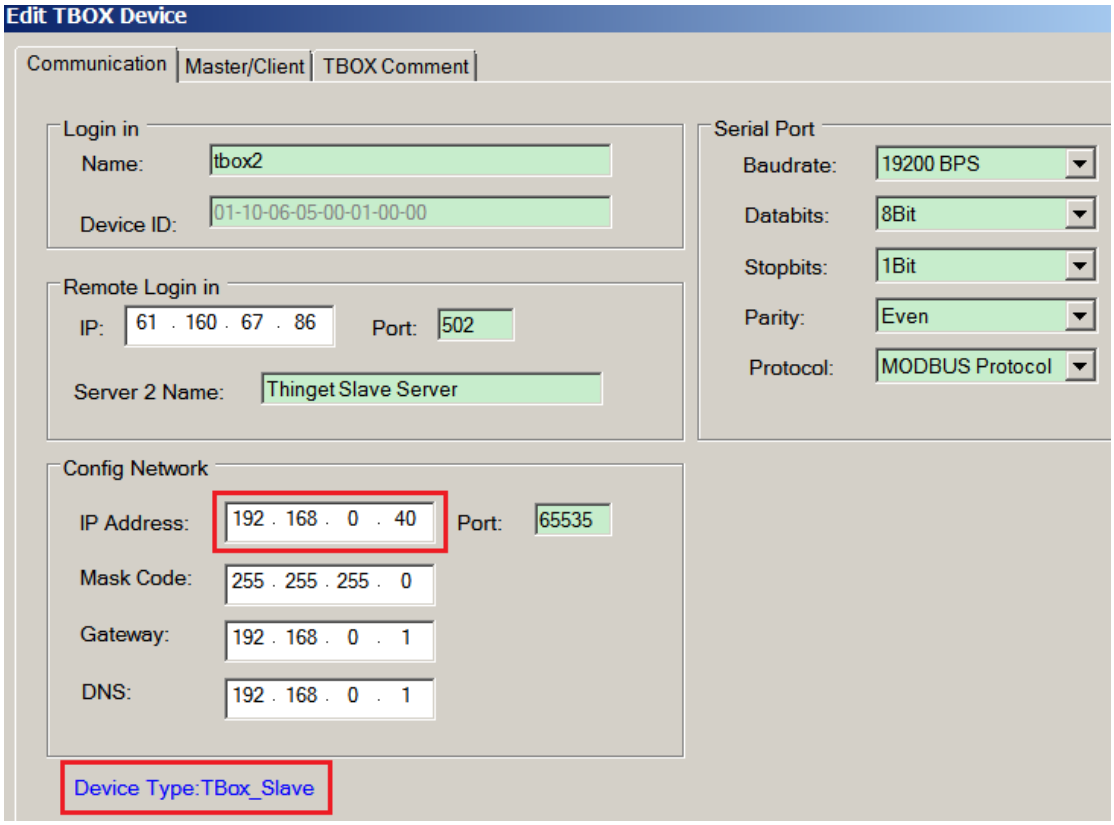



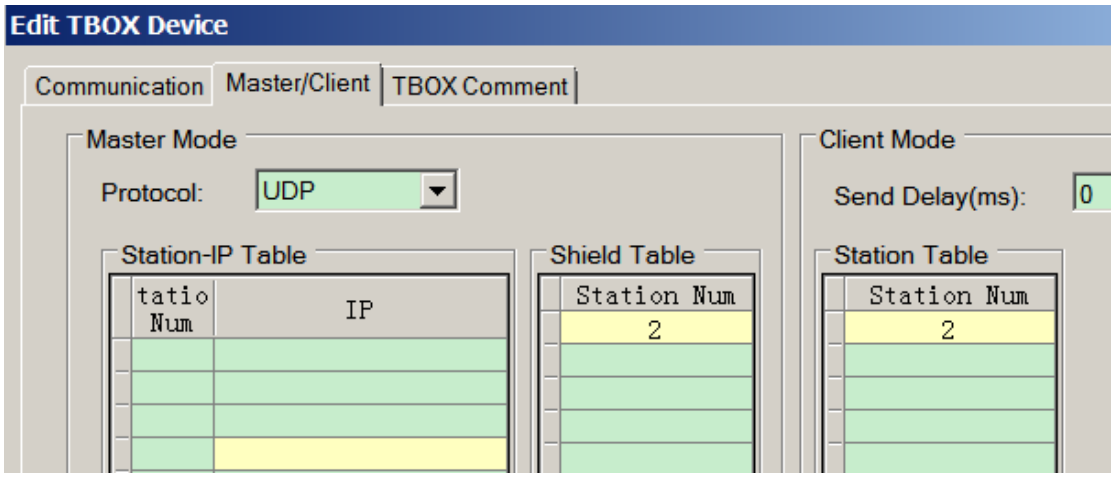

T-BOX3 parameters setting: (turn on DIP switch 1)



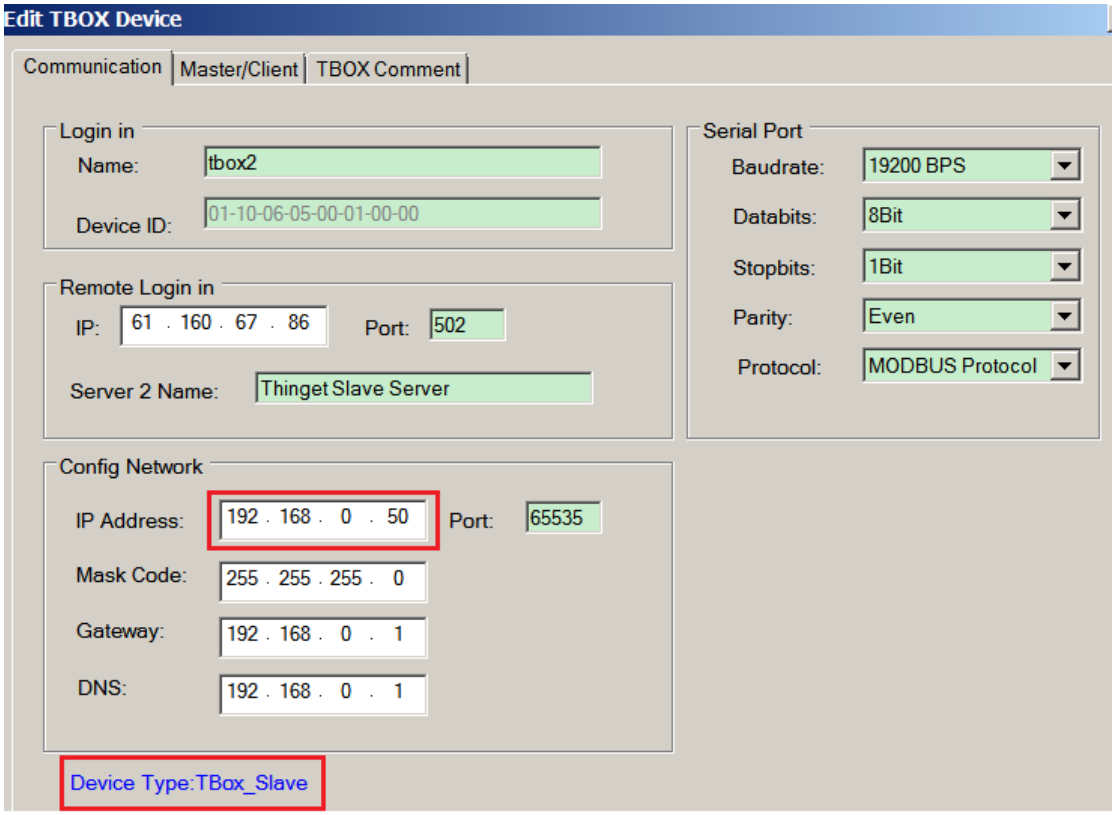



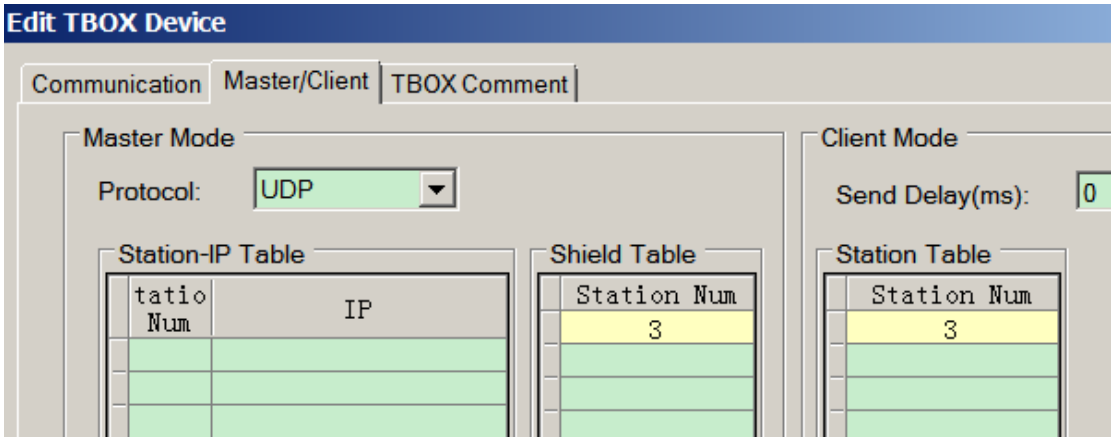

T-BOX4 parameters setting: (turn on DIP switch 1)



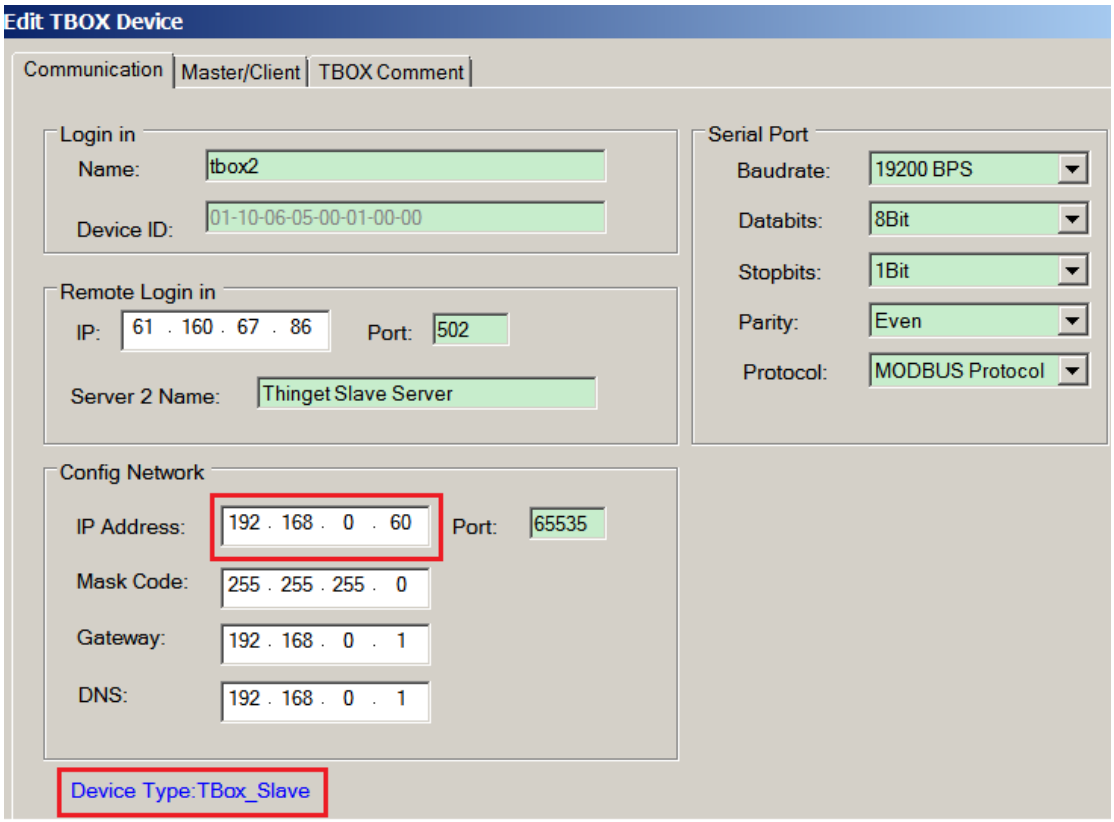



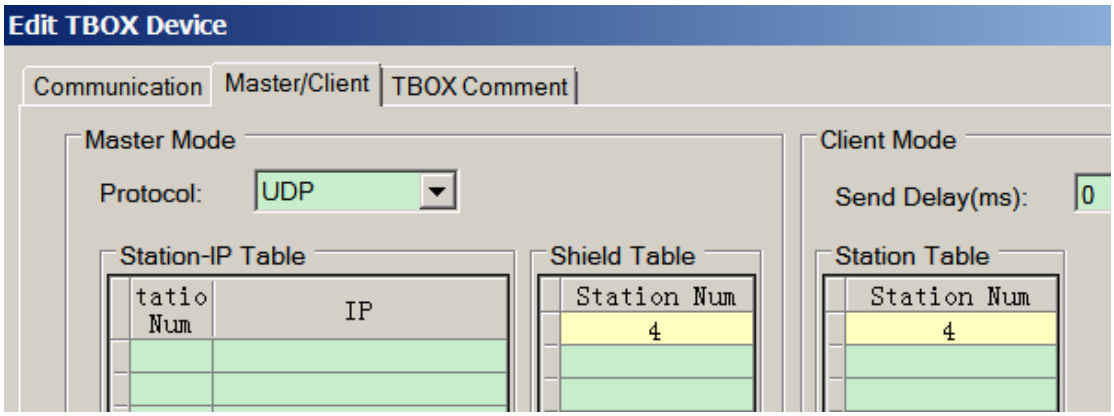

T-BOX5 parameters setting: (turn on DIP switch 1)




T-BOX6 parameters setting: (turn on DIP switch 1)

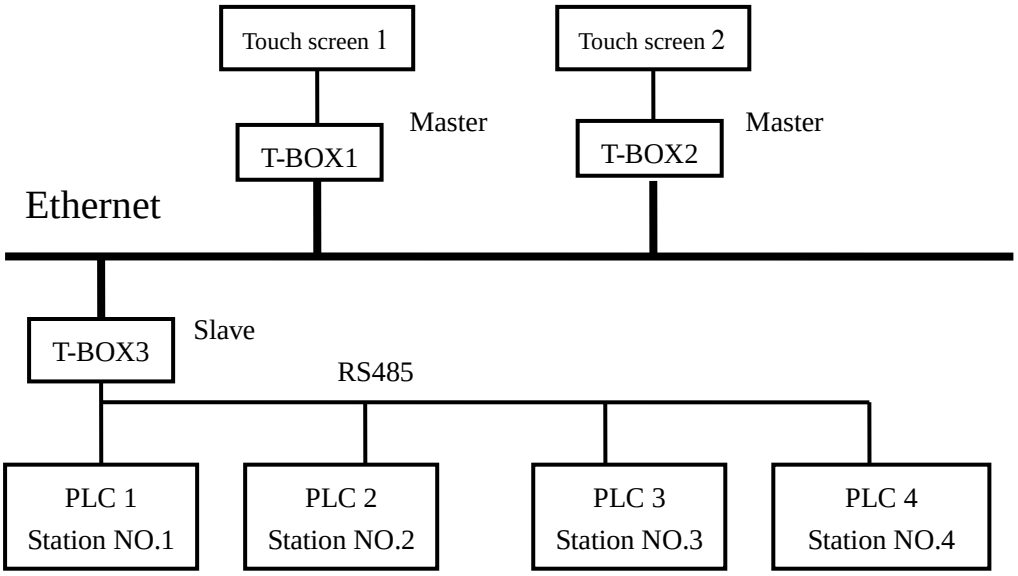


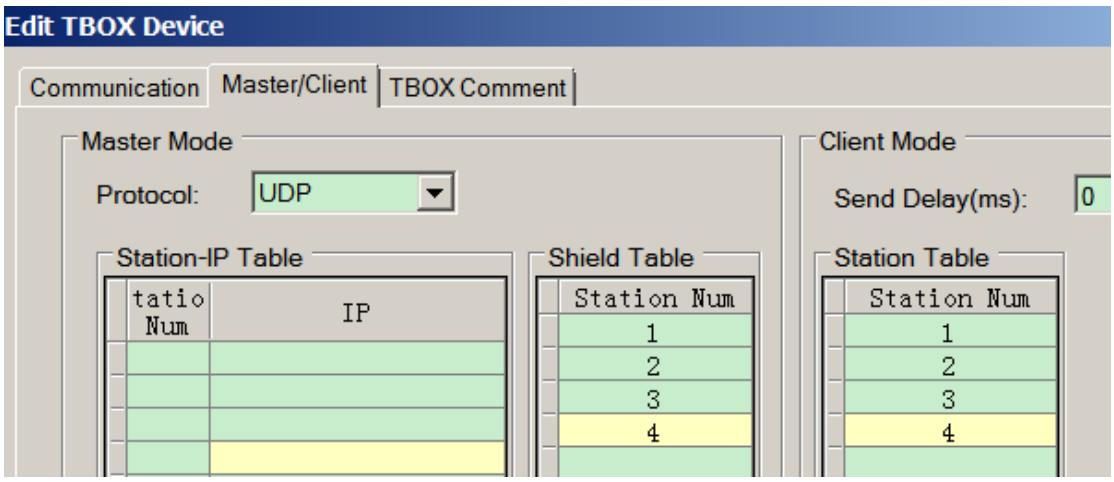

After setting, click “write to T-BOX”. The following steps please refer to “Operating step”. Now, the parameters settings of T-BOX have been finished.

If the 4 PLCs are close to each other, it can use 1 TBOX connect to 4 PLCs. The 4 PLCs connect together via RS485.

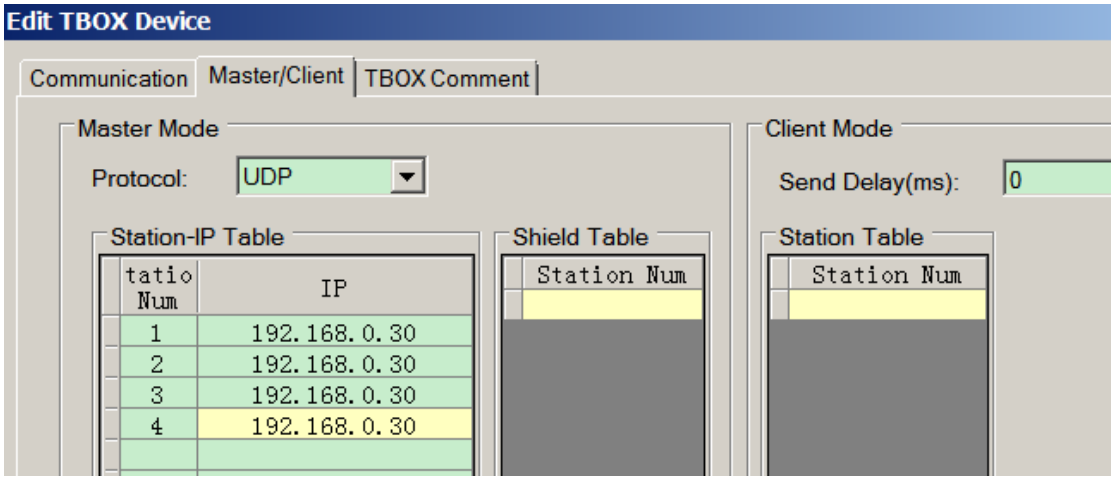
Please see the below diagram:




The settings of T-BOX3 are shown as the following: (turn on DIP switch 1)




The settings of T-BOX1 and T-BOX2 in the Master mode are shown as following: (turn off DIP switch 1)




The other steps are the same as the first example. According to actual conditions, user can select appropriate combination and communication method, so as to achieve optimal distribution

of resources, improve the productivity.

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