tDS-700 Series
User Manual

Tiny Serial-to-Ethernet Device Server

Warranty

All products manufactured by ICP DAS are warranted against defective materials for a period of one year from the date of delivery to the original purchaser.

Warning

ICP DAS assumes no liability for damages consequent to the use of this product. ICP DAS reserves the right to change this manual at any time without notice. The information furnished by ICP DAS is believed to be accurate and reliable. However, no responsibility is assumed by ICP DAS for its use, nor for any infringements of patents or other rights of third parties resulting from its use.

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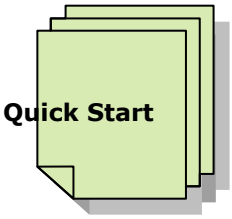
Packing List

The shipping package includes the following items:

- One tDS-700 series hardware module
- One printed Quick Start Guide
- One software utility CD



Note!!
If any of these items are missing or damaged, please contact the local distributor for more information. Save the shipping materials and cartons in case you want to ship the module in the future.

More Information

Documentation

CD:\NAPDOS\tDS-700\Document
http://ftp.icpdas.com/pub/cd/tinymodules/napdos/tds-700/document/

VxComm Driver (Virtual COM)

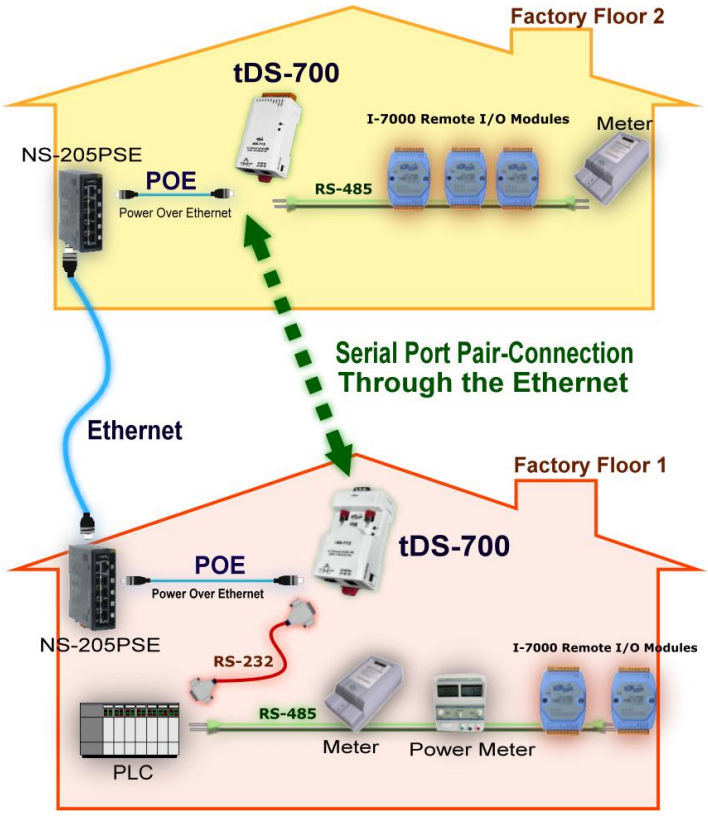
CD: \NAPDOS\Software\VxComm_Driver
http://ftp.icpdas.com/pub/cd/8000cd/napdos/driver/vxcomm_driver/

Firmware

CD:\NAPDOS\tDS-700\ Firmware
http://ftp.icpdas.com/pub/cd/tinymodules/napdos/tds-700/firmware/

1. Introduction

The tDS-700 is a series of Serial-to-Ethernet device servers that are designed to add Ethernet and Internet connectivity to any RS-232 and RS-422/485 device, and to eliminate the cable length limitation of legacy serial communications. By using the VxComm Driver/Utility, the built-in COM Port of the tDS-700 series can be virtualized to a standard PC COM Port in Windows. Therefore, users can transparently access or monitor serial devices over the Internet/Ethernet without the need for software modification.



tDS-700 device servers can be used to create a pair-connection application (as well as serial-bridge or serial-tunnel), and then route data between two serial devices via TCP/IP. This is useful when connecting mainframe computers, servers or other serial devices that do not themselves have Ethernet capability. By virtue of its protocol independence and flexibility, the tDS-700 meets the demands of virtually any network-enabled application.

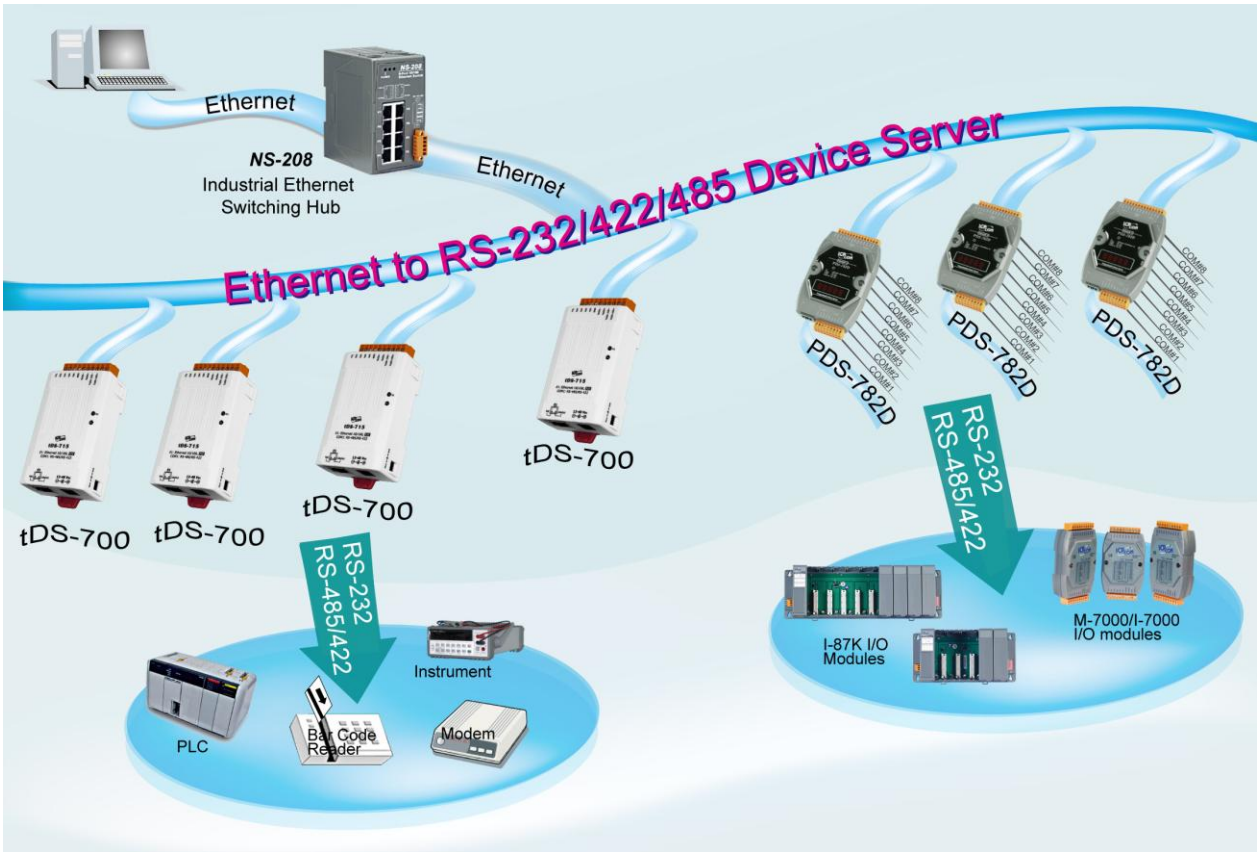
To achieve maximum space savings, the tDS-700 is offered in an amazingly small form-factor that enables it to be easily installed anywhere, even directly attached to a serial device or embedded into a machine. The tDS-700 features a powerful 32-bit MCU that allows it to efficiently handle network traffic. The tDS-700 offers true IEEE 802.3af-compliant (classification, Class 1) Power-over-Ethernet (PoE) functionality using a standard category 5 Ethernet cable that allows it to receive power from a PoE switch such as the NS-205PSE. If there is no PoE switch available on site, the tDS-700 can accepts power input from a DC adapter.

■ Comparison Table of Device Servers:

Series / Features	PPDS	PDS	DS	tDS	tGW
Virtual COM	Yes	Yes	Yes	Yes	-
Programmable	Yes	Yes	-	-	-
PoE	Yes	-	-	Yes	Yes
Modbus Gateway	Yes	-	-	-	Yes
Multi-client	about 20 Sockets			4 Sockets/port	
Remarks	Professional	Powerful	Isolation for DS-715	Cost-effective, Entry-level	Cost-effective, Entry-level

1.1 Ethernet Solutions

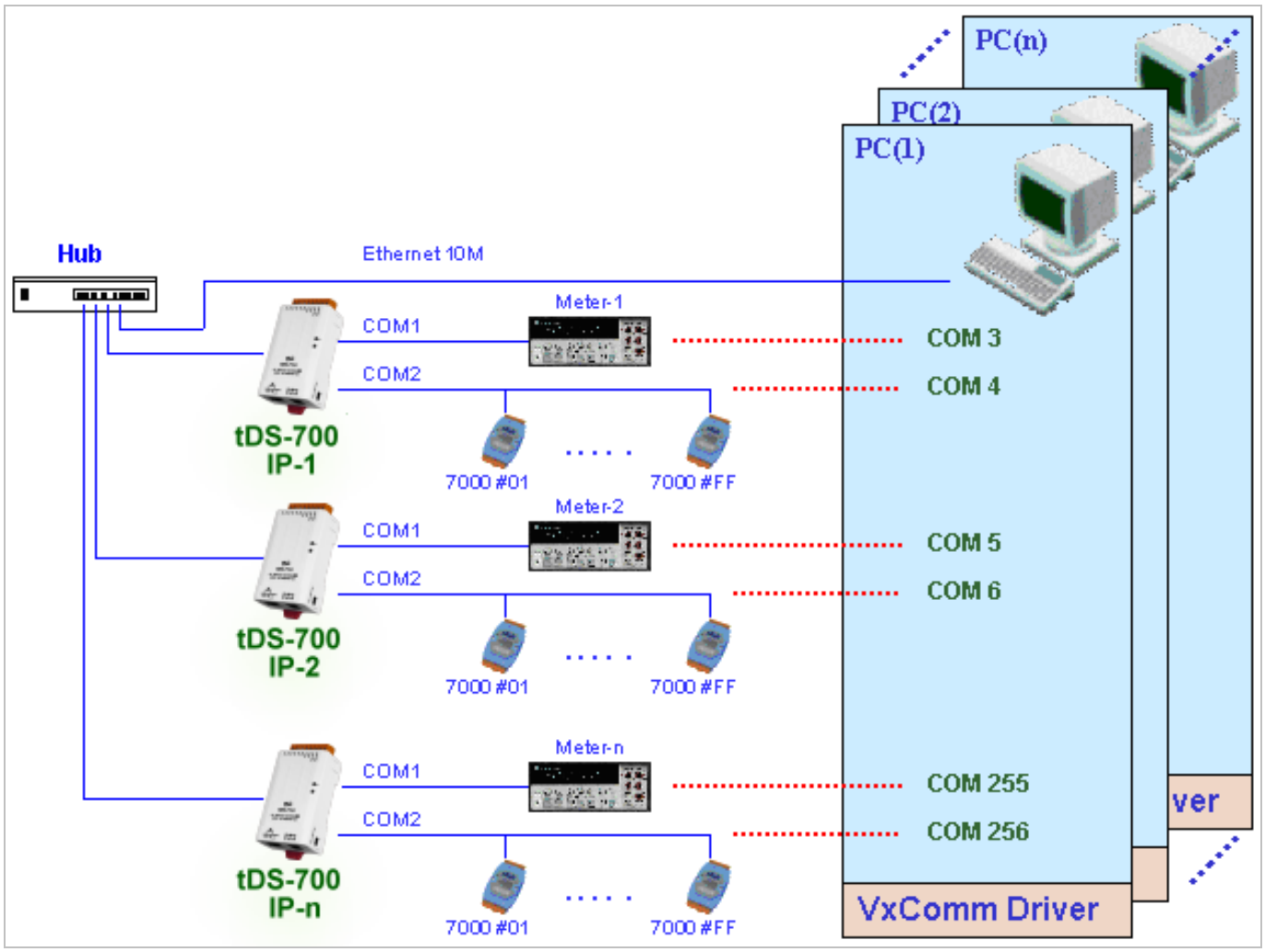
Nowadays, the Ethernet protocol has become the de-facto standard for local area networks. Connectivity via the Internet is becoming common in many applications from home appliances, to vending machines, to testing equipment, to UPS, etc. An Ethernet network can link office automation and industrial control networks, access remote systems and share data and information between multivendor machines, and also provide a cost-effective solution for industrial control networks.



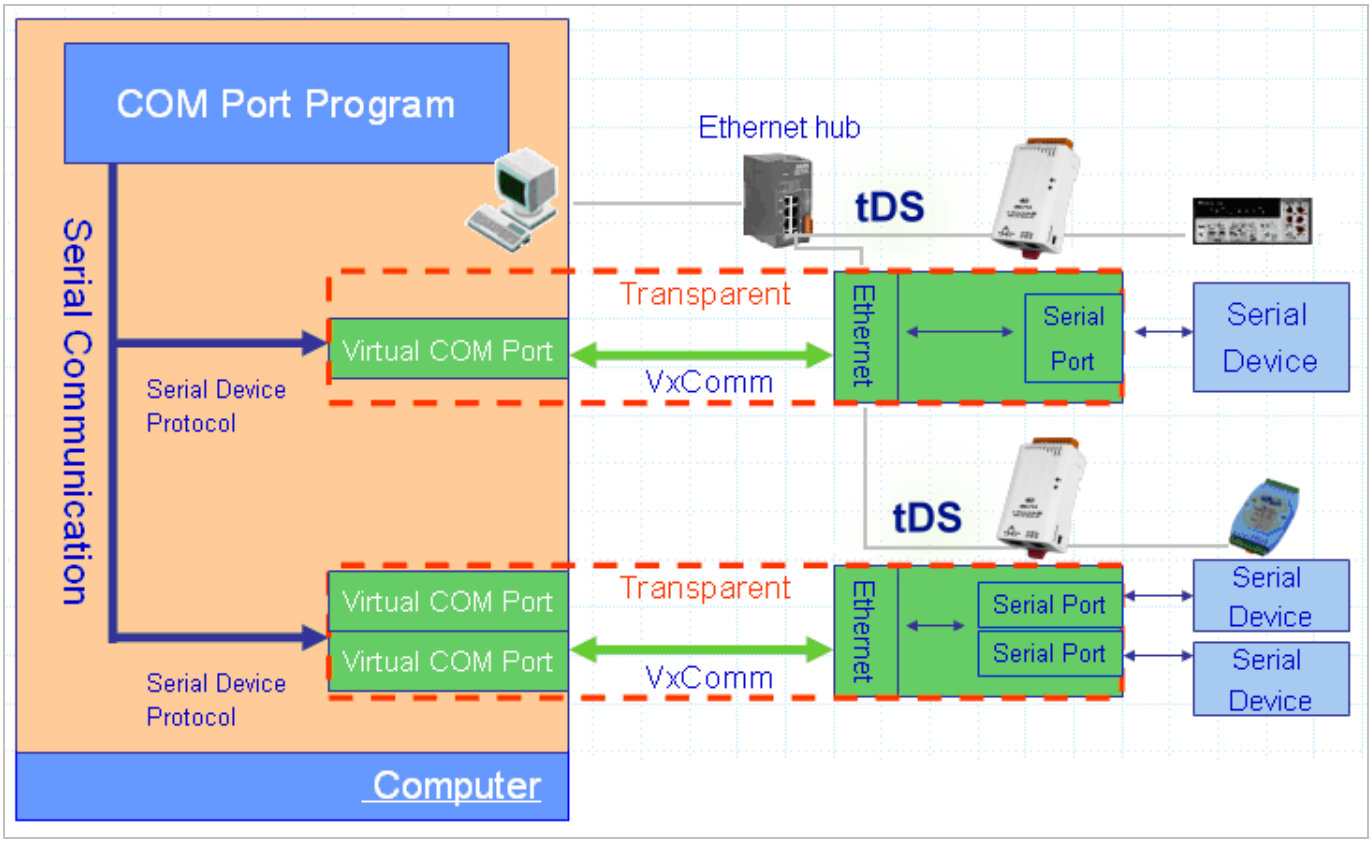
1.2 VxComm Technology

In general, writing a TCP/IP program is more difficult than writing a COM Port program. Another issue is that perhaps the existing the COM Port communication system was built many years ago and is now outdated.

As a result, a new technology, **VxComm** was developed to **virtualize the COM Ports of the tDS-700 to allow up to 256 COM Ports to be used on a central computer.** The VxComm driver saves time when accessing serial devices through the Ethernet without the need for reprogramming the COM Port software on the PC.

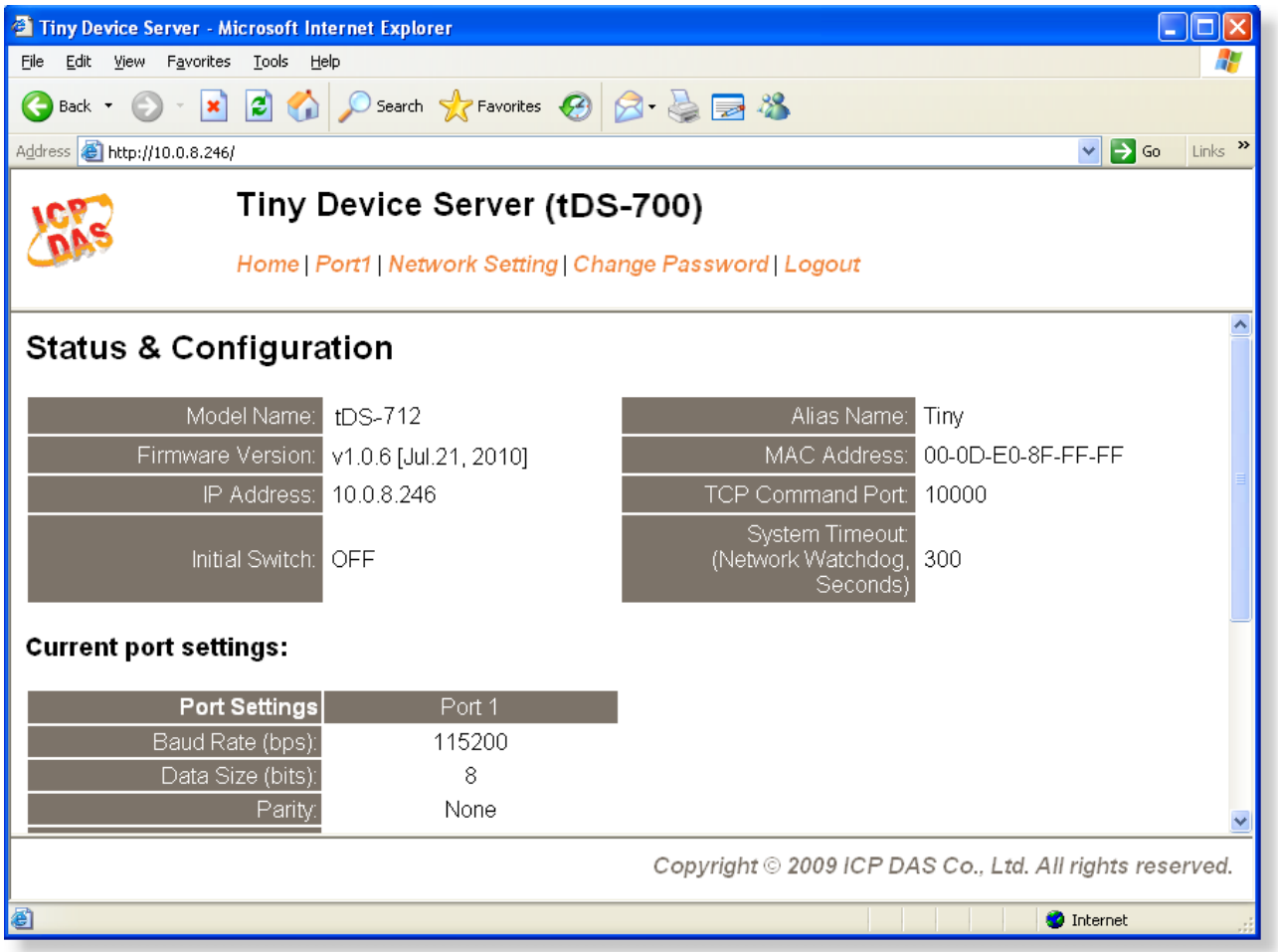


The VxComm driver controls all the details of the Ethernet TCP/IP programming technique, meaning that, with the assistance of tDS-700 and VxComm technology, your COM Port program will be able to access your serial devices through the Ethernet in the same way as through a COM Port.



1.3 Web Server Technology

Web server technology enables configuration of the tDS-700 via a standard web browser interface, e.g. Internet Explorer, FireFox or Mozilla, etc. This means that it is easy to check the configuration of the tDS-700 via an Ethernet network without needing to install any other software tools, thereby reducing the user's learning curve.



2. Hardware Information

2.1 Specifications

Model	tDS-712	tDS-722	tDS-732	tDS-715	tDS-725	tDS-735	tDS-718	tDS-724	tDS-734
System									
CPU	32-bit MCU								
Communication Interface									
Ethernet	10/100 Base-TX, 8-pin RJ-45 x 1, (Auto-negotiating, Auto-MDI/MDIX, LED indicator) PoE (IEEE 802.3af, Class 1)								
COM1	5-wire RS-232	5-wire RS-232	3-wire RS-232	2-wire RS-485 4-wire RS-422	2-wire RS-485	2-wire RS-485	3-wire RS-232 2-wire RS-485 4-wire RS-422	2-wire RS-485	2-wire RS-485
COM2	-	5-wire RS-232	3-wire RS-232	-	2-wire RS-485	2-wire RS-485		5-wire RS-232	3-wire RS-232
COM3	-	-	3-wire RS-232	-	-	2-wire RS-485		-	3-wire RS-232
Self-Tuner	-			Yes, automatic RS-485 direction control					
UART	16c550 or compatible								
COM Port Format									
Baud Rate	115200 bps Max.								
Data Bit	5, 6, 7, 8								
Parity	None, Odd, Even, Mark, Space								
Stop Bit	1, 2								
General									
Power Input	PoE: IEEE 802.3af, Class 1 DC jack: +12 ~ 48 V_{DC}								
Power Consumption	0.05 A @ 24 V_{DC}								
Connector	Male DB-9 x1	10-Pin Removable Terminal Block x 1							
Mounting	DIN-Rail								
Flammability	Fire Retardant Materials (UL94-V0 Level)								
Operating Temperature	-25° ~ 75°C								
Storage Temperature	-30° ~ 80°C								
Humidity	10 ~ 90% RH, non-condensing								
Note: COM1/COM2/COM3 = TCP port 10001/10002/10003.									

2.2 Features

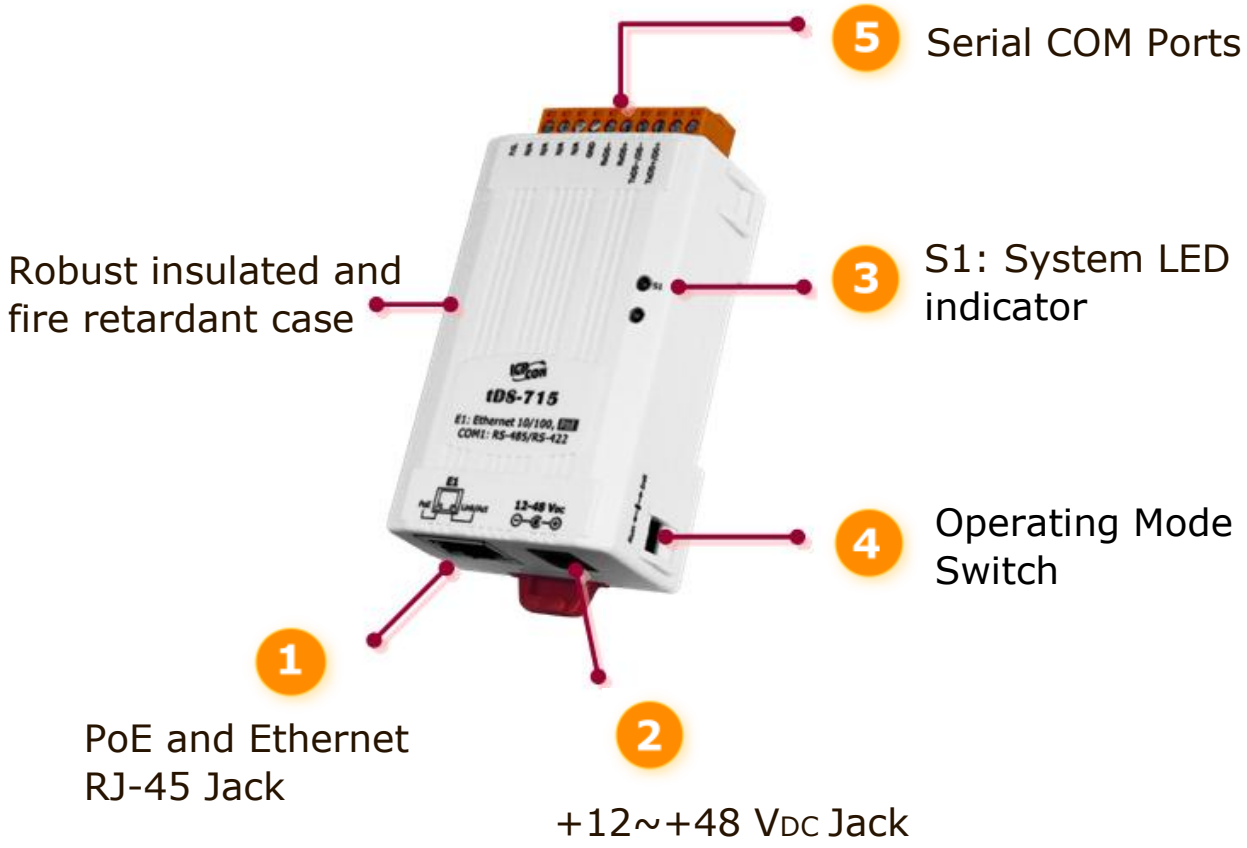
- Incorporates any RS-232/422/485 serial device in an Ethernet
- Supports pair-connection (serial-bridge, serial-tunnel) applications
- Contains a 32-bit MCU that efficiently handles efficient network traffic
- 10/100 Base-TX Ethernet, RJ-45 x1
  (Auto-negotiating, auto MDI/MDIX, LED Indicators)
- Includes redundant power inputs: PoE (IEEE 802.3af, Class 1) and DC jack
- Allows automatic RS-485 direction control
- Supports TCP, UDP, HTTP, DHCP, BOOTP and TFTP protocols
- Supports UDP responder for device discovery
- Allows easy firmware update via the Ethernet
- Tiny Built-in Web server for easy configuration
- Male DB-9 or terminal block connector for easy wiring
- Tiny form-factor and low power consumption
- RoHS compliant with no Halogen
- Made from high-grade fire retardant materials (UL94-V0 Level)
- Cost-effective Device Servers

2.3 Selection Guide

Model	CPU	Ethernet	Baud Rate	COM1	COM2	COM3
tDS-712	32-bit MCU	10/100 Base-TX, PoE	115200 bps	5-wire RS-232	-	-
tDS-722				5-wire RS-232	5-wire RS-232	-
tDS-732				3-wire RS-232	3-wire RS-232	3-wire RS-232
tDS-715				2-wire RS-485 4-wire RS-422	-	-
tDS-725				2-wire RS-485	2-wire RS-485	-
tDS-735				2-wire RS-485	2-wire RS-485	2-wire RS-485
tDS-718				3-wire RS-232	-	-
				2-wire RS-485 4-wire RS-422		
tDS-724				2-wire RS-485	5-wire RS-232	-
tDS-734				2-wire RS-485	3-wire RS-232	3-wire RS-232

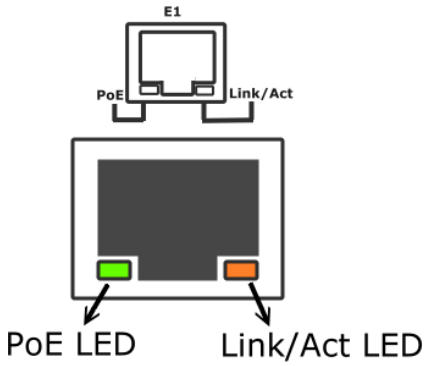
3-Wire RS-232: RxD, TxD, GND (Non-isolated)
5-Wire RS-232: RxD, TxD, CTS, RTS, GND (No-isolated)
2-Wire RS-485: DATA+, DATA-, GND (Non-isolated)
4-Wire RS-422: TxD+, TxD-, RxD+, RxD-, GND (Non-islated)

2.4 tDS-700 Front View



1. PoE and Ethernet RJ-45 Jack:

The tDS-700 is equipped with a RJ-45 jack that is used as the 10/100 Base-TX Ethernet port and features networking capability. When an Ethernet link is detected and an Ethernet packet is received, the **Link/Act LED (Orange)** indicator will be illuminated. When power is supplied via PoE (Power-over-Ethernet), the **PoE LED (Green)** indicator will be illuminated.



2. +12~+48 VDC Jack:

The tDS-700 is equipped with a +12~+48 VDC jack that is used as the power supply. If there is no PoE switch available on site, the tDS-700 will accept power input from a DC adapter.

3. S1: System LED indicator:

Once power is supplied to the tDS-700, the system LED indicator will be illuminated as follows:

Function	System LED Behavior
Running Firmware	ON
Network ready	Flashing per 3 seconds
Serial Port Busy	Flashing per 0.2 seconds

4. Operating Mode Switch:

Init Mode: Configuration mode
Run Mode: Firmware operation mode

In the tDS-700 series, the operating mode Switch is in the Run position by default. When updating the tDS-700 firmware, the switch needs to be moved from the Run position to the Init position. The Switch must be returned to the Run position after the update is complete.

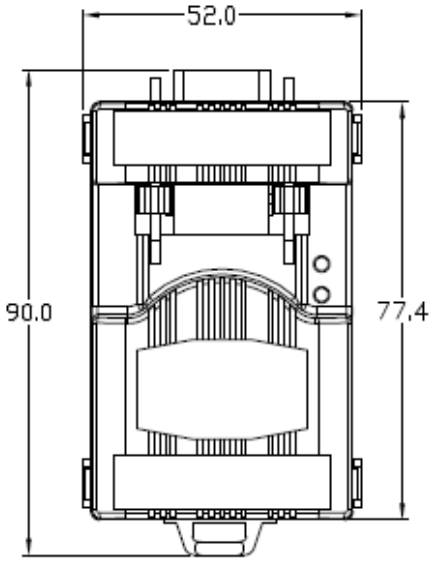
5. Serial COM Ports:

The numbers of serial COM Ports depend on the types of tDS-700 modules. For more detailed information regarding the pin assignments of the Serial COM ports, please refer to section 2.6 “Pin Assignments”.

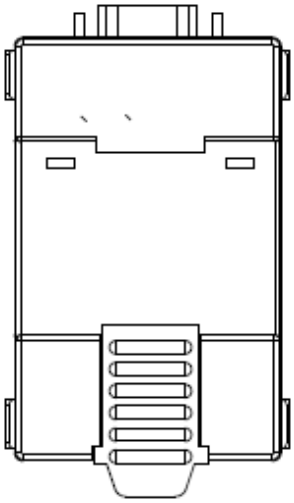
2.5 Dimensions

- tDS-712 Dimensions:

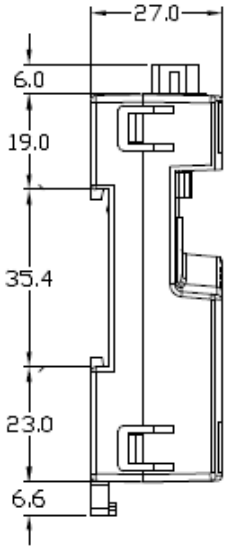
Units: mm



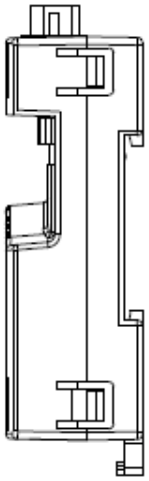
Front View



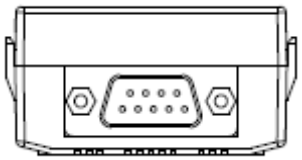
Rear View



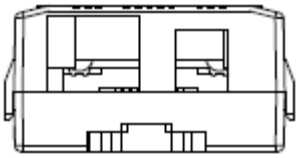
Left Side View



Right Side View



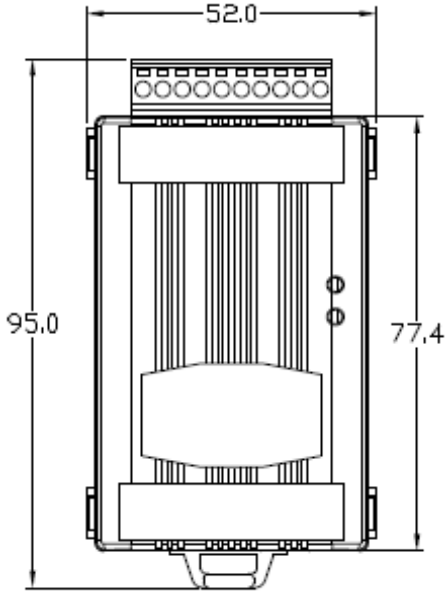
Top View



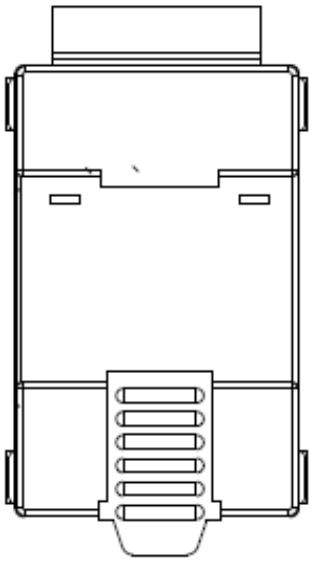
Bottom View

- tDS-722/732/715/725/735/718/724/734 Dimensions:

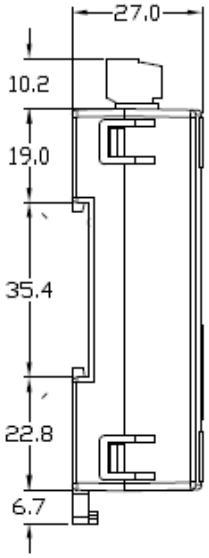
Units: mm



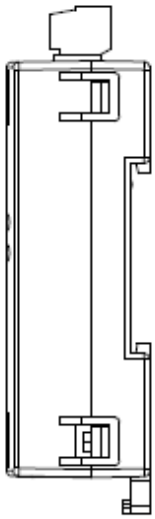
Front View



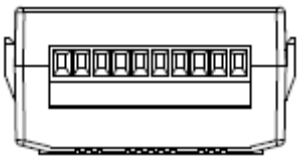
Rear View



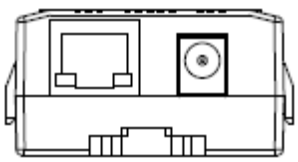
Left Side View



Right Side View



Top View

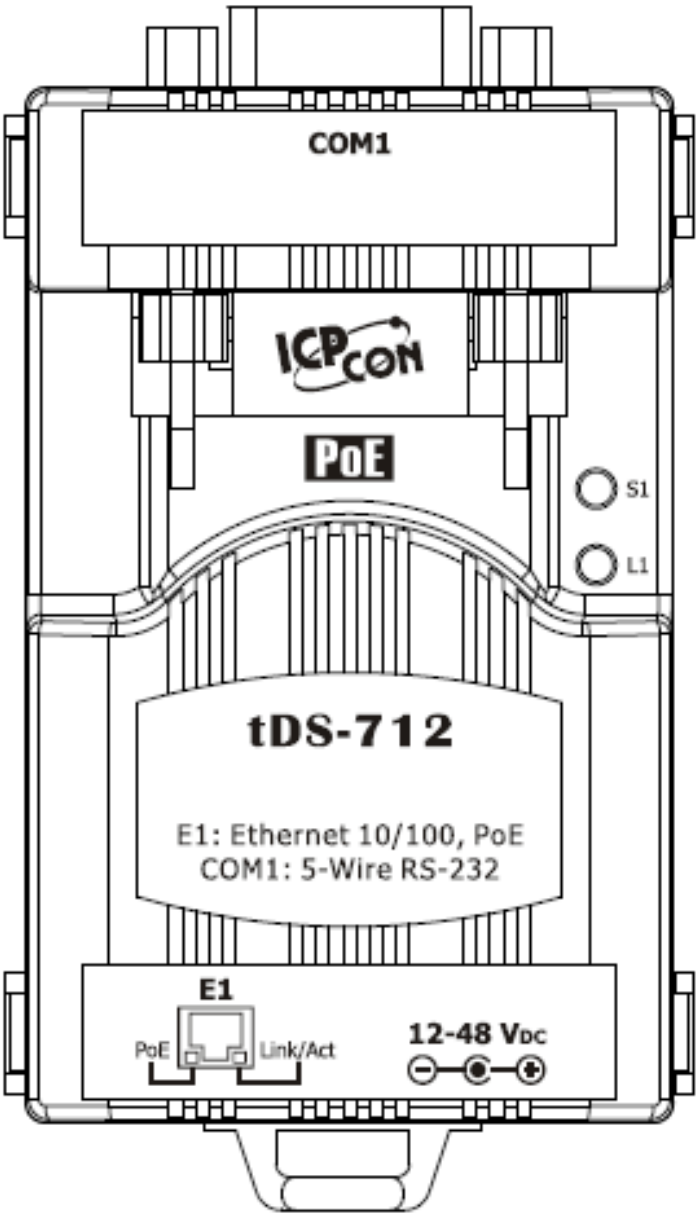


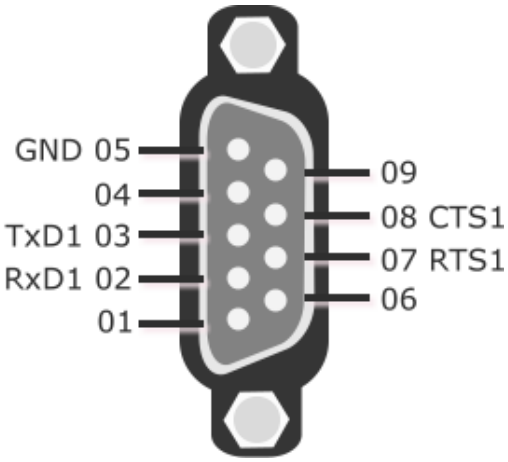
Bottom View

2.6 Pin Assignments

2.6.1 tDS-712 Pin Assignments

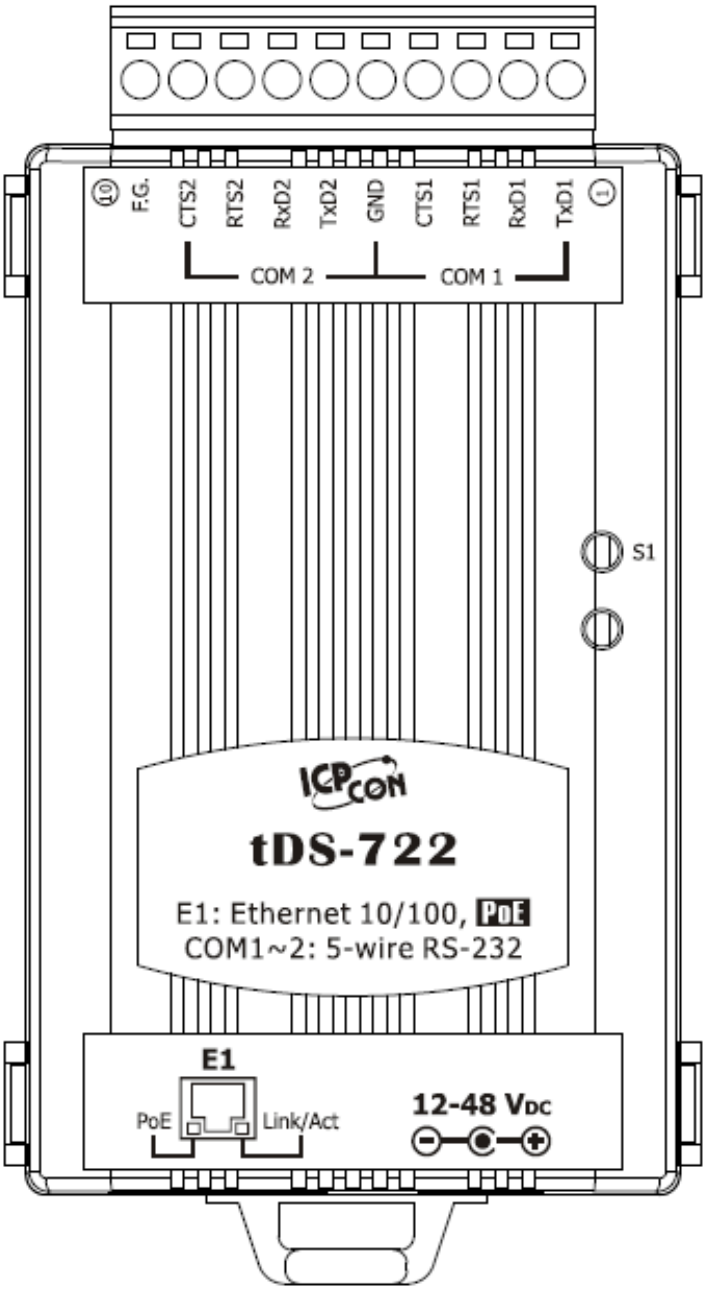
1-Port 5-wire RS-232 Module

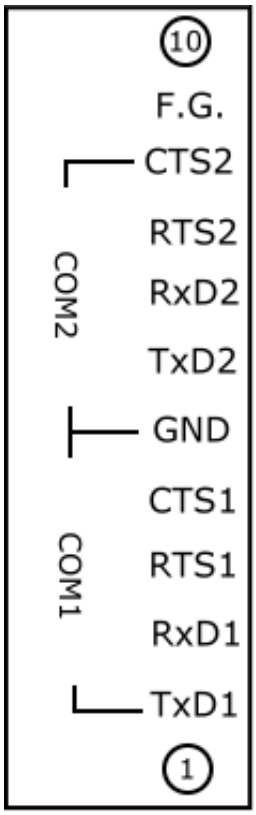




2.6.2 tDS-722 Pin Assignments

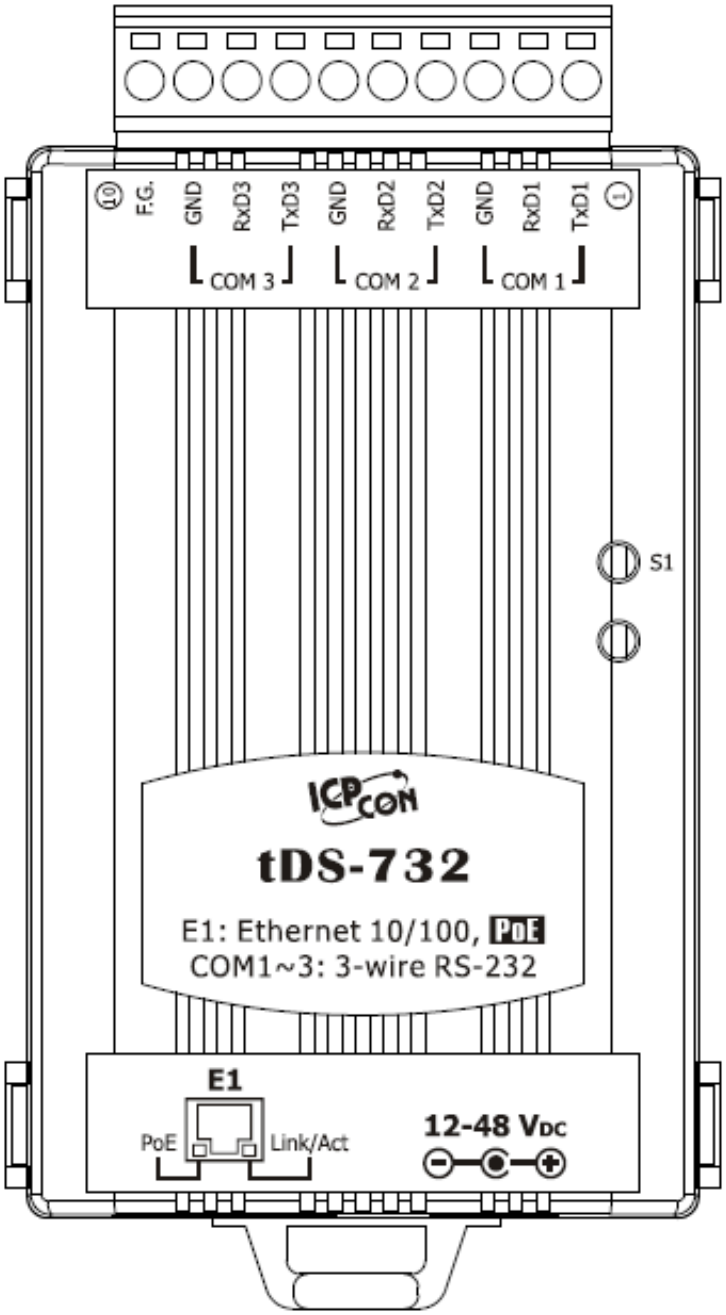
2-Port 5-Wire RS-232 Module

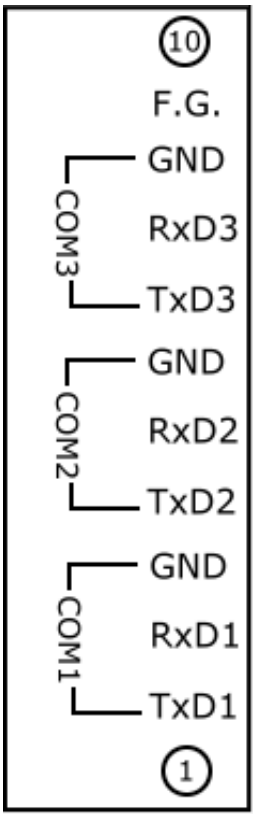




2.6.3 tDS-732 Pin Assignments

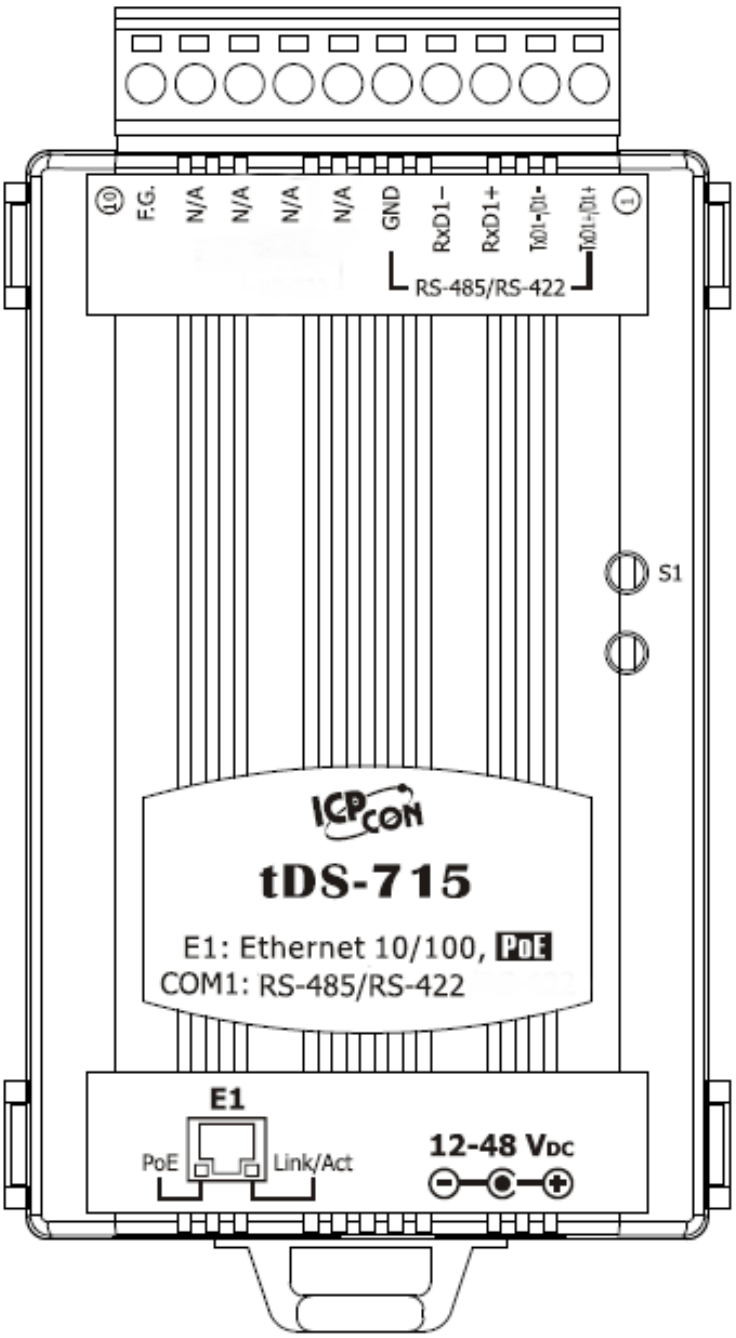
3-Port 3-Wire RS-232 Module

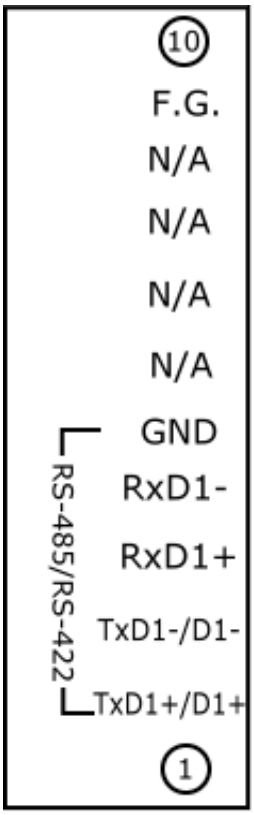




2.6.4 tDS-715 Pin Assignments

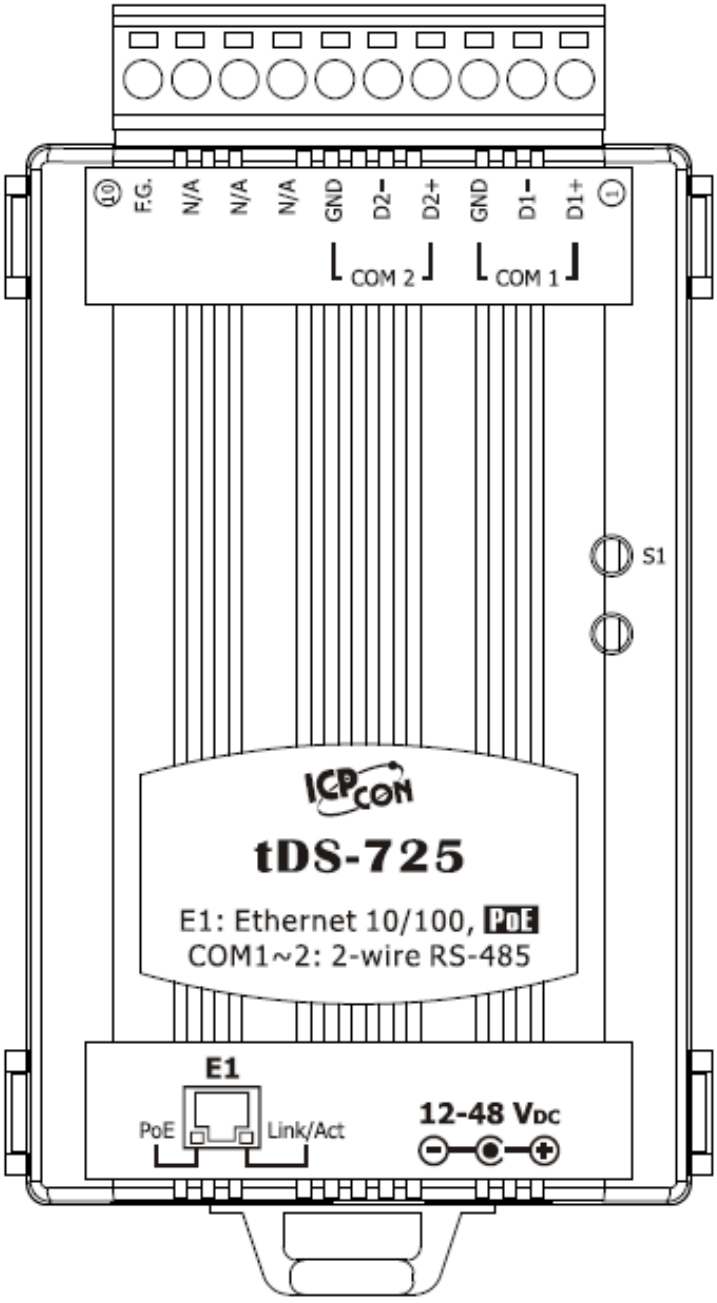
1-Port 2-Wire RS-485/4-Wire RS-422 Module

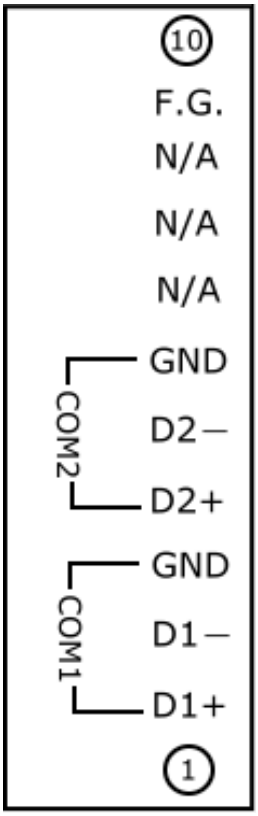




2.6.5 tDS-725 Pin Assignments

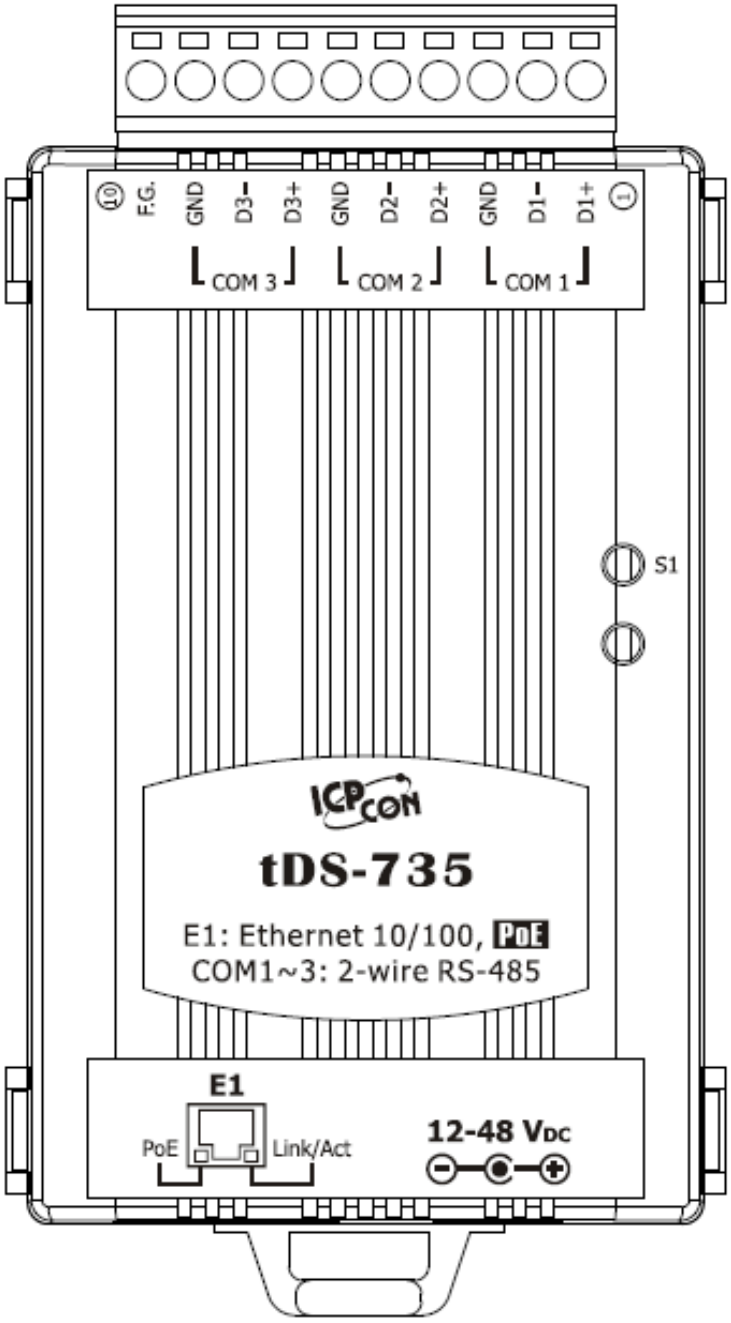
2-Port 2-Wire RS-485 Module

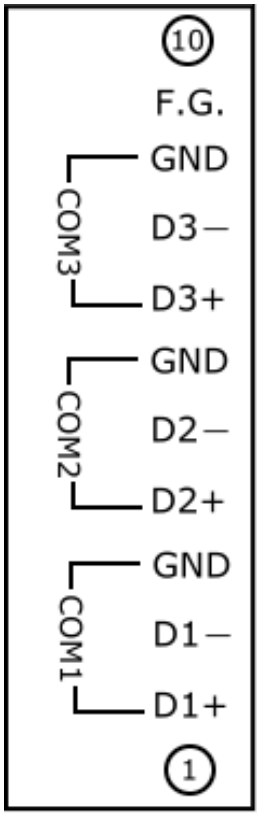




2.6.6 tDS-735 Pin Assignments

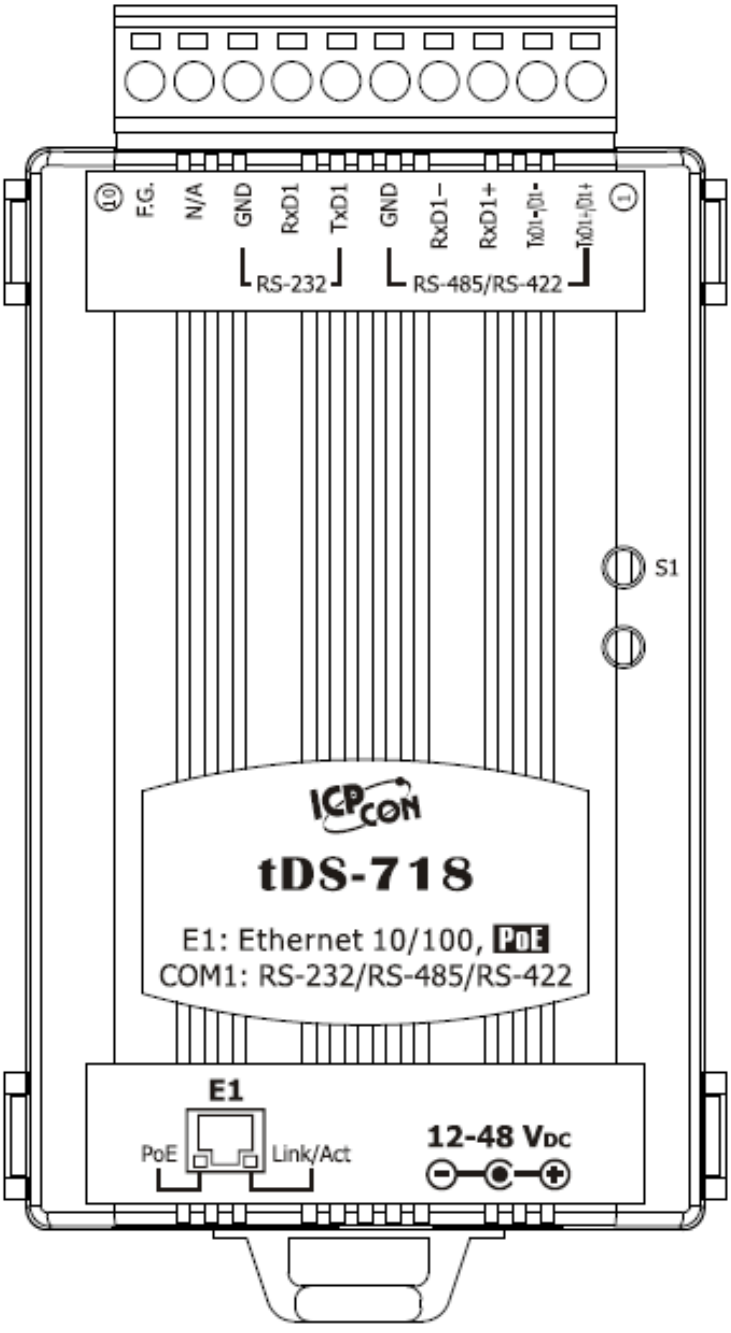
3-Port 2-Wire RS-485 Module

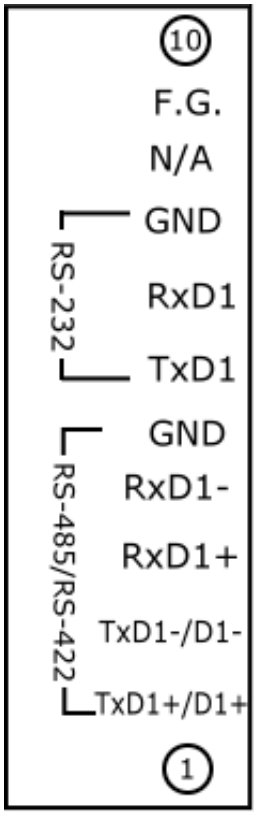




2.6.7 tDS-718 Pin Assignments

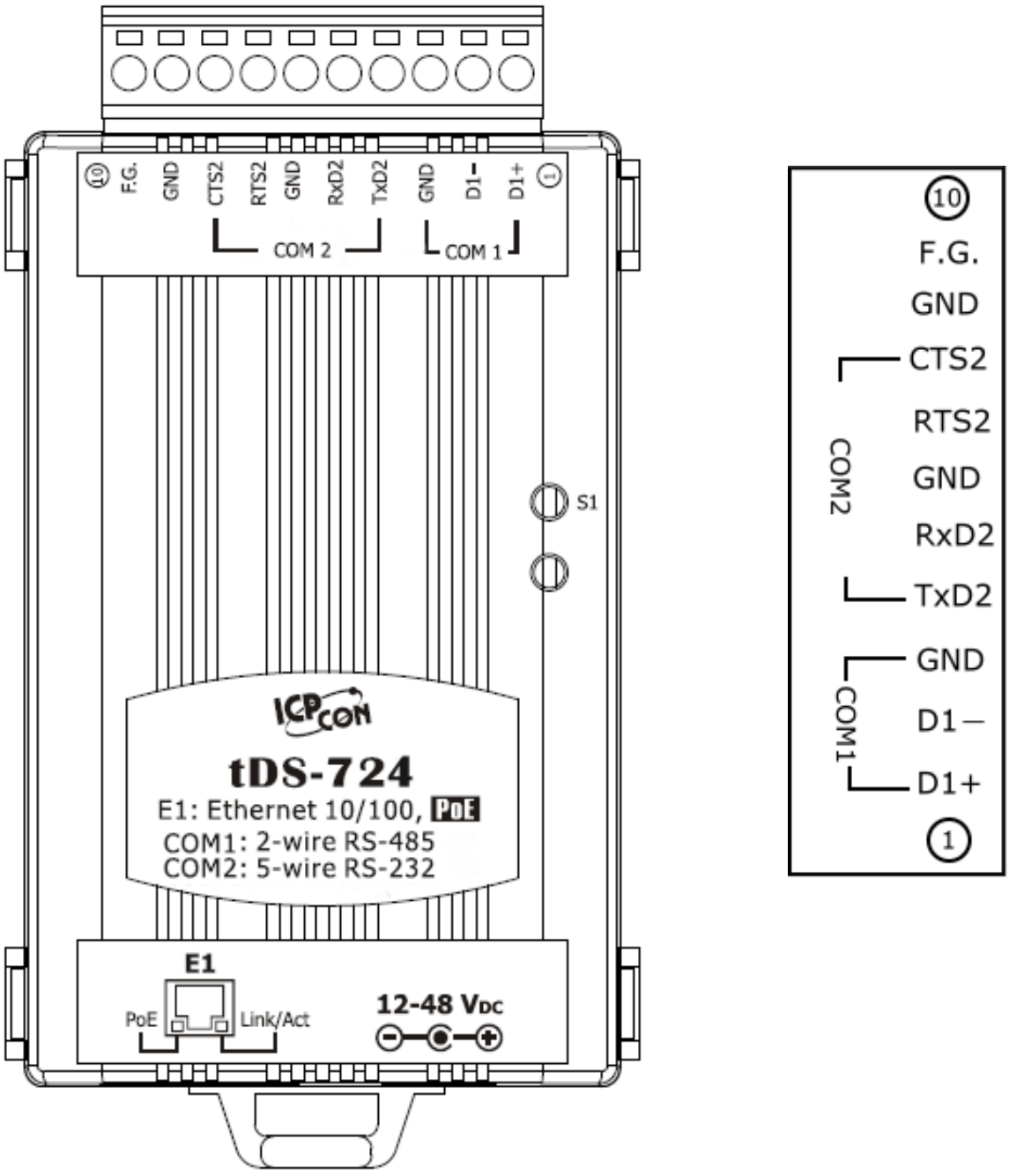
1-Port 3-Wire RS-232 and 2-Wire RS-485/4-Wire RS-422 Module





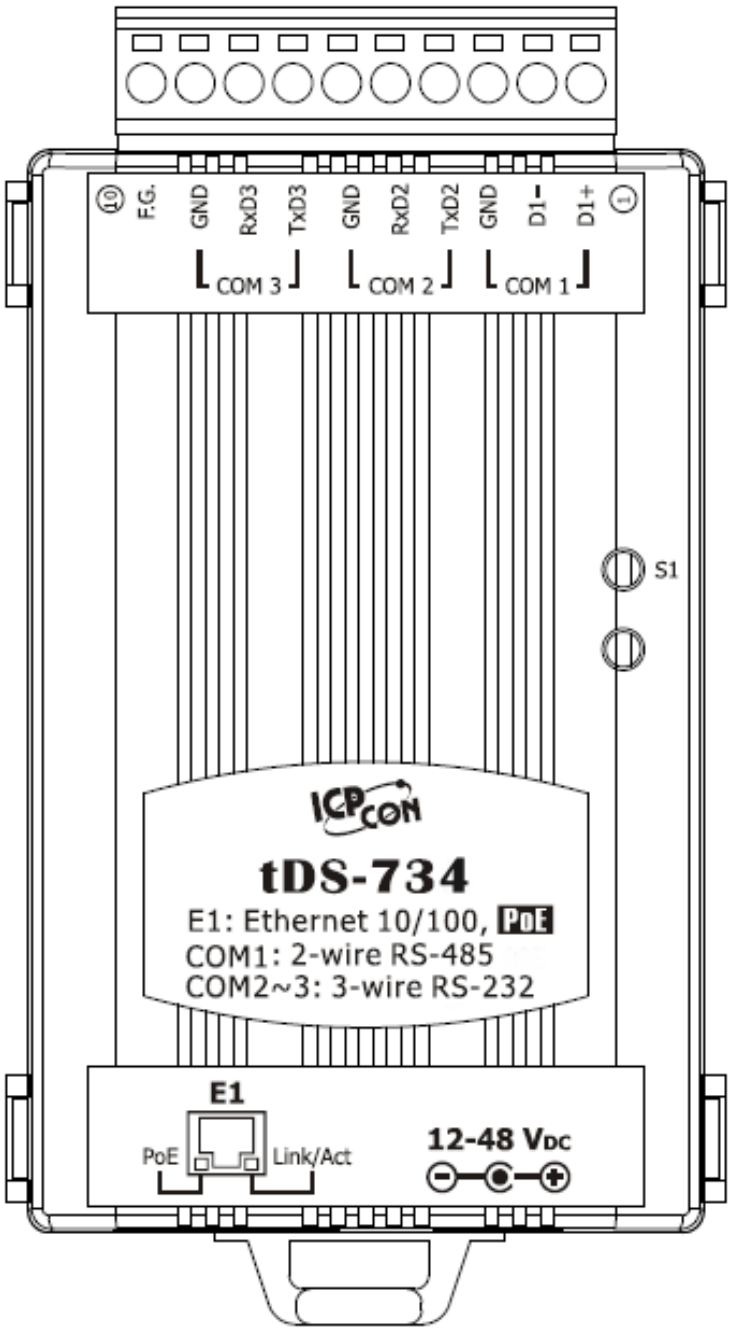
2.6.8 tDS-724 Pin Assignments

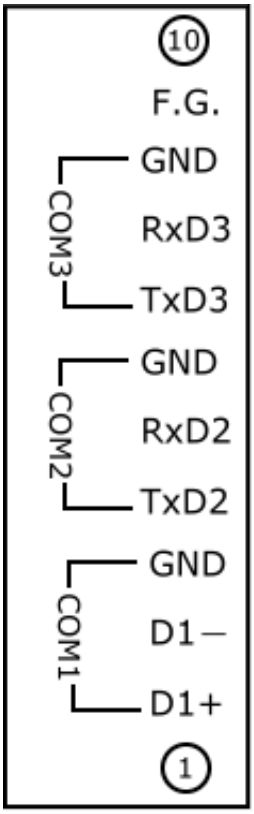
1-Port 2-Wire RS-485 and 1-Port 5-Wire RS-232 Module



2.6.9 tDS-734 Pin Assignments

1-Port 2-Wire RS-485 and 2-Port 3-Wire RS-232 Module

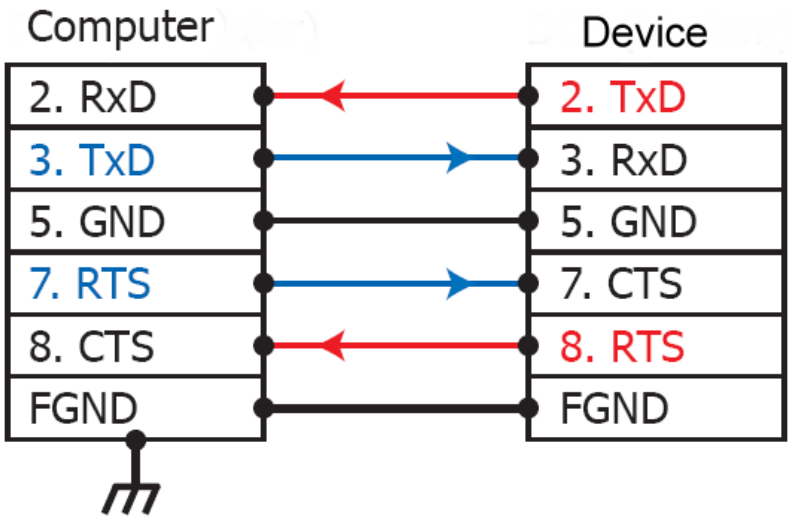




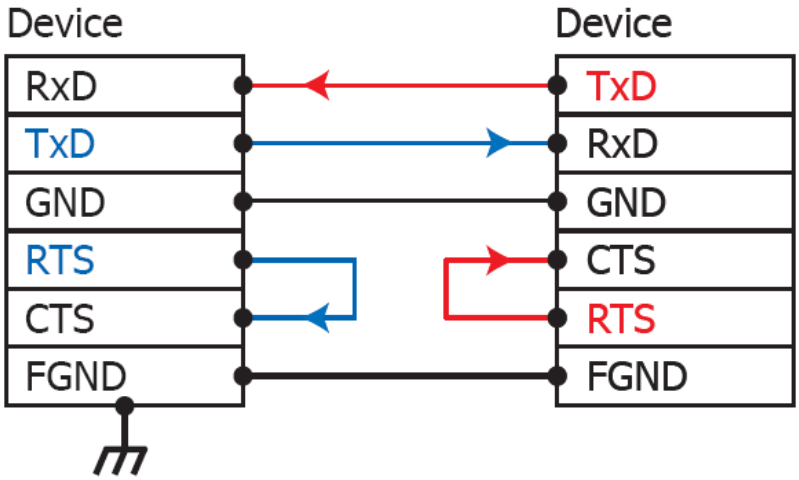
2.7 Wiring Notes

2.7.1 RS-232 Wiring Connections

5-wire RS-232 Connection (DB-9)



3-wire RS-232 Connection
(Shorts unused signals RTS/CTS)

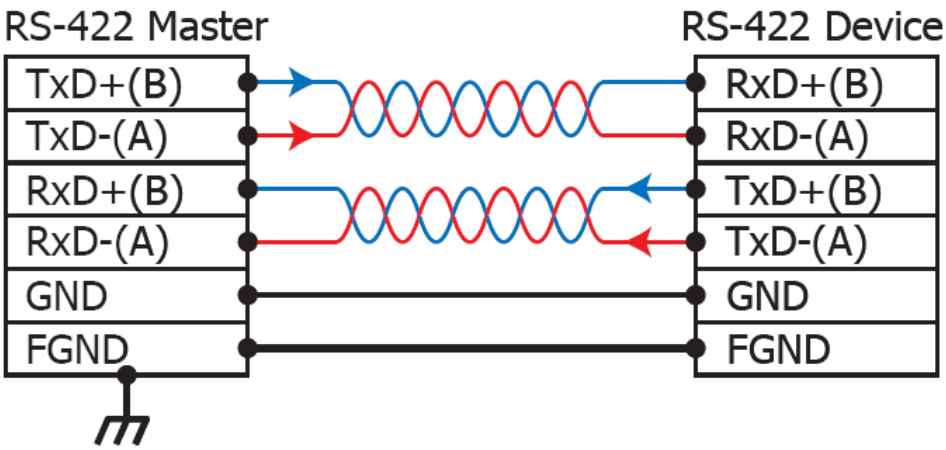


Note!!

1. **For 3-Wire RS-232 connections, it is recommended that unused signals such as RTS/CTS and DTR/DSR are shorted, since some systems may still check the status of CTS and DSR.**
2. **FGND is the frame ground that is soldered to the DB9 metal-shield.**

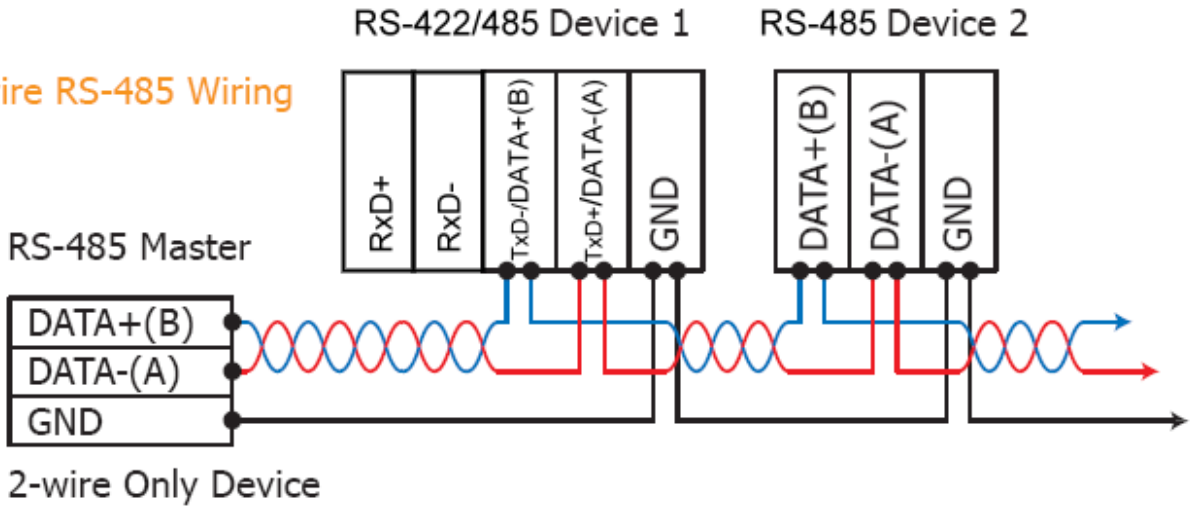
2.7.2 RS-422 Wiring Connections

4-wire RS-422 Wiring



2.7.3 RS-485 Wire Connections

2-wire RS-485 Wiring



Note

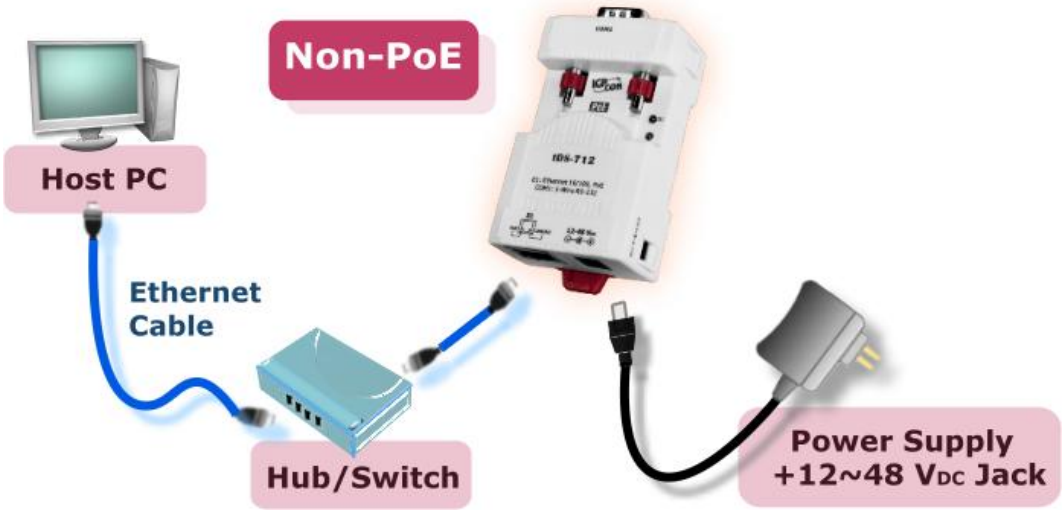
For non-isolated RS-422/485 ports, you should connect all signal grounds of RS-422/485 devices together. This reduces the common-mode voltage between devices.

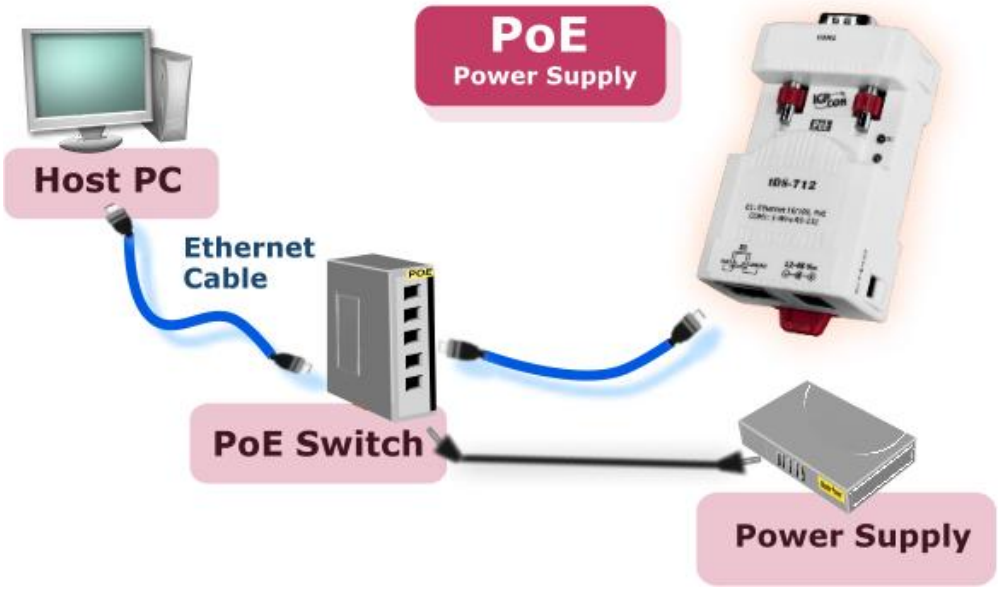
3. Setting up the tDS-700 module

Step 1: Connecting the power and Host PC

1. Make sure the network settings on your PC are functioning correctly.
2. Disable or correctly configure the Windows firewall and any Anti-Virus software firewall first or else the "**Search Servers**" function in the VxComm Utility may not work. (Contact your System Administrator for more details of how to do this.)
3. Check Init/Run switch is on **Run** position.

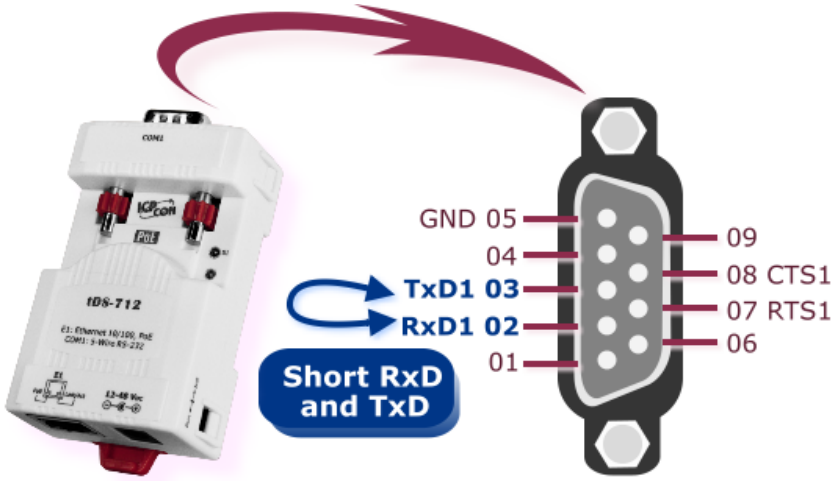
4. Connect both the tDS-700 and your computer to the same sub-network or the same Ethernet Switch and power on the tDS-700.
5. Make sure the System LED indicator is flashing.



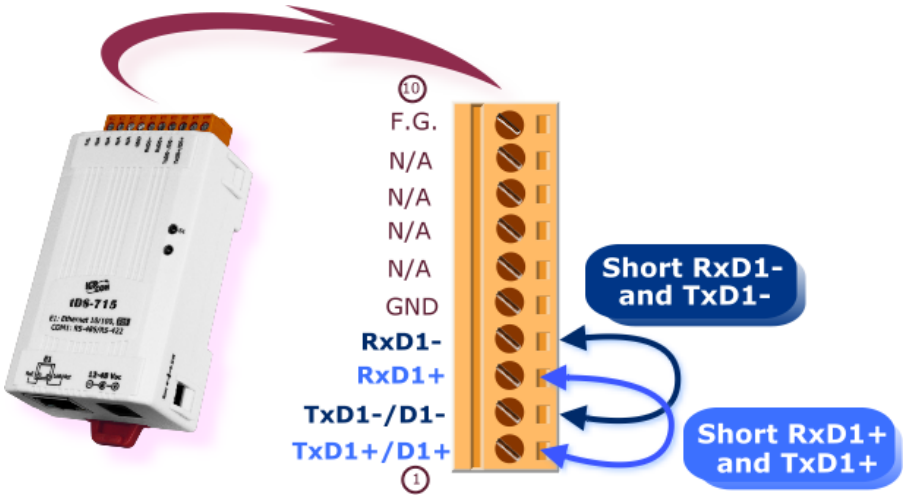


6. Perform a Self-test wiring check as follows:

- RS-232 Wiring of COM1



- RS-422 Wiring of COM1:



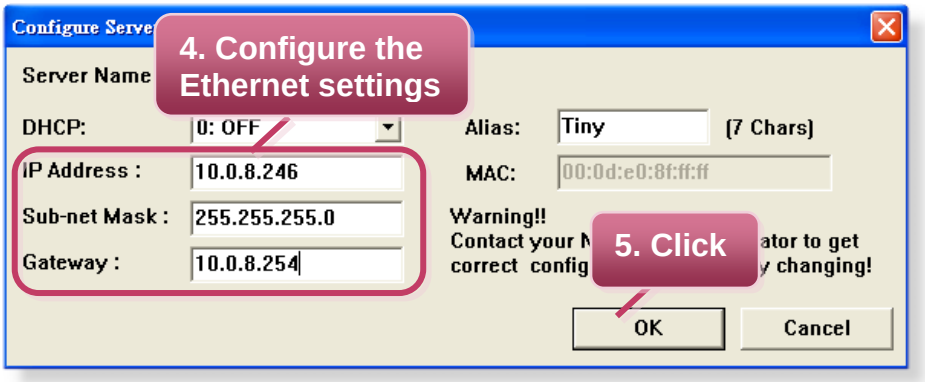
Step 2: Installing the VxComm Utility on your PC

The software is located at:
CD: \NAPDOS\Software\VxComm_Driver
http://ftp.icpdas.com/pub/cd/tinymodules/napdos/software/vxcomm_driver/

Step 3: Search for the tDS-700 on the Ethernet network

1. Double click the VxComm Utility shortcut on the desktop.
2. Click the "**Search Servers**" button to search for your tDS-700.
3. Double click the name of the tDS-700 to open the **"Configure Server"** dialog box.

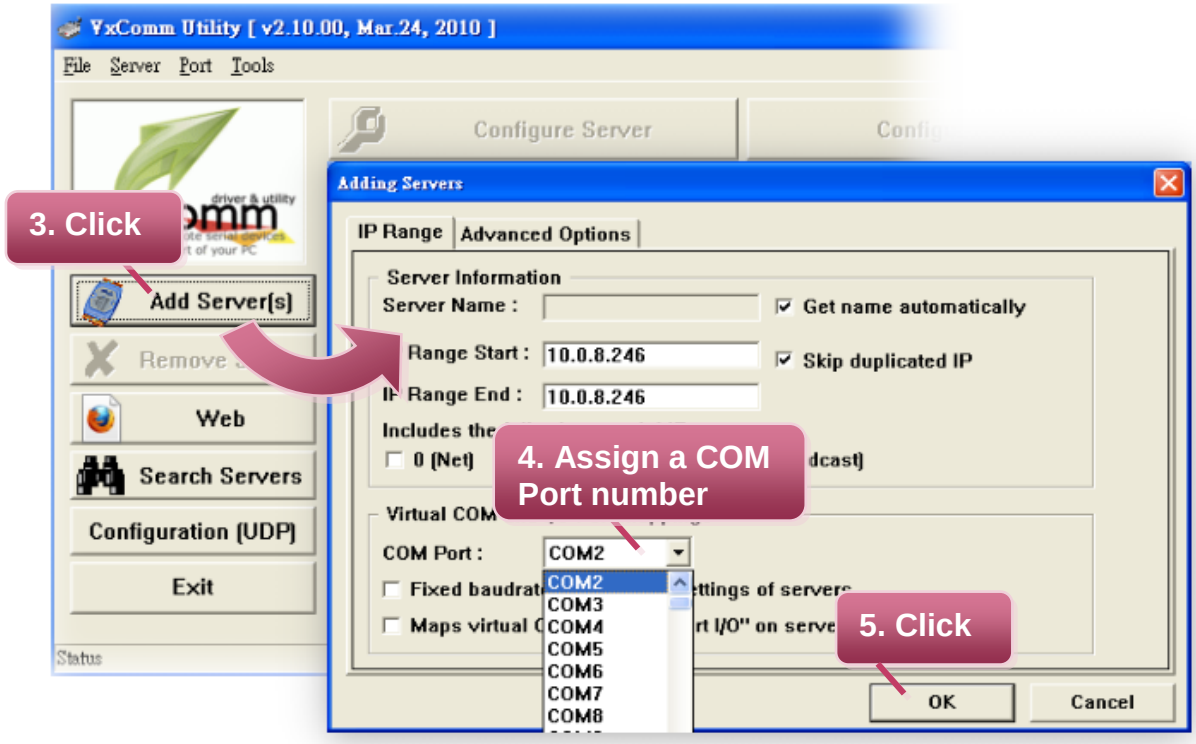
4. Contact your Network Administrator to obtain the correct network configuration information such as **IP/Mask/Gateway**. Enter the network settings and then click **"OK"**. The tDS-700 will use the new settings within 2 seconds.



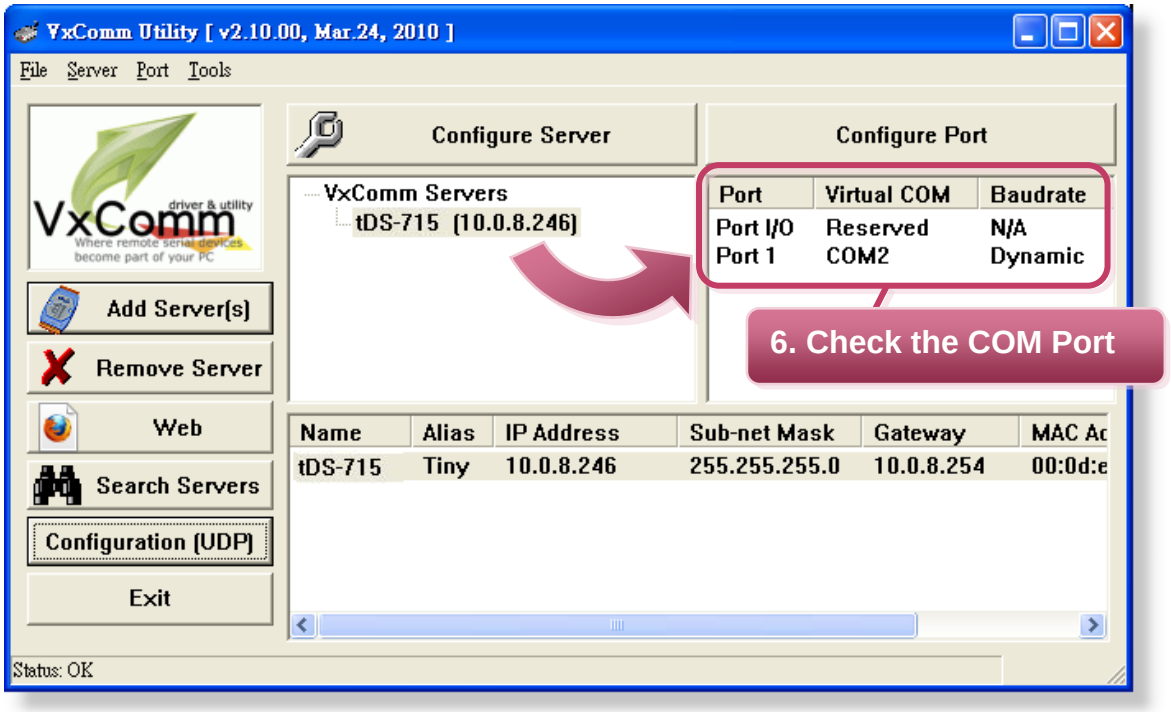
Step 4: Configuring the Virtual COM Ports

1. Wait 2 seconds and then click the "**Search Servers**" button again to ensure that the tDS-700 is working correctly with the new configuration.

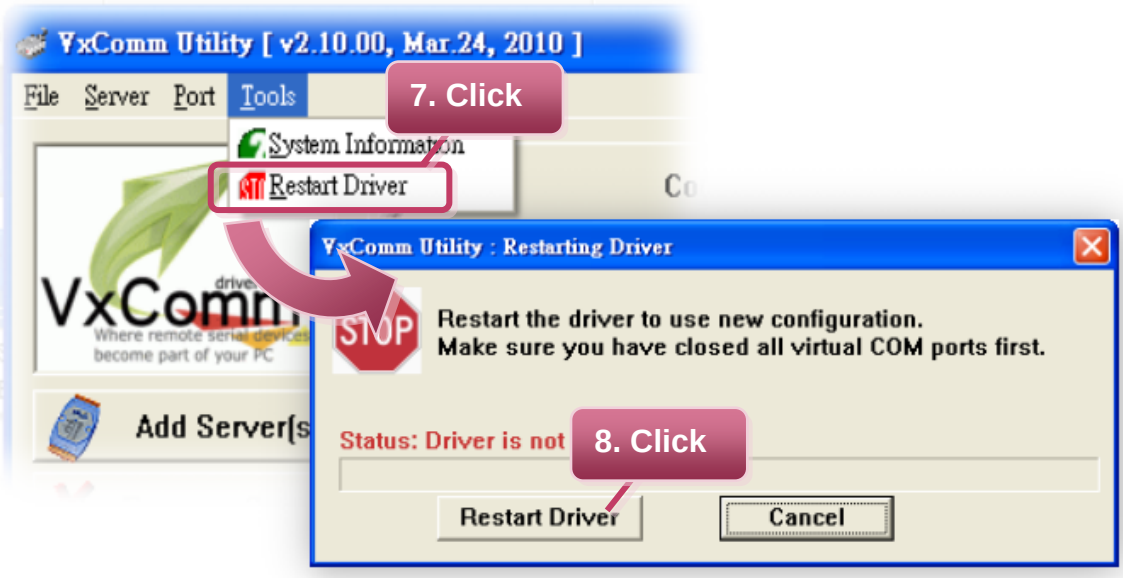
2. Click the "**Add Server[s]**" button. Assign a COM Port number and click "**OK**" to save your settings.



3. Click on tDS-700 name and check the virtual COM port mappings on the PC.

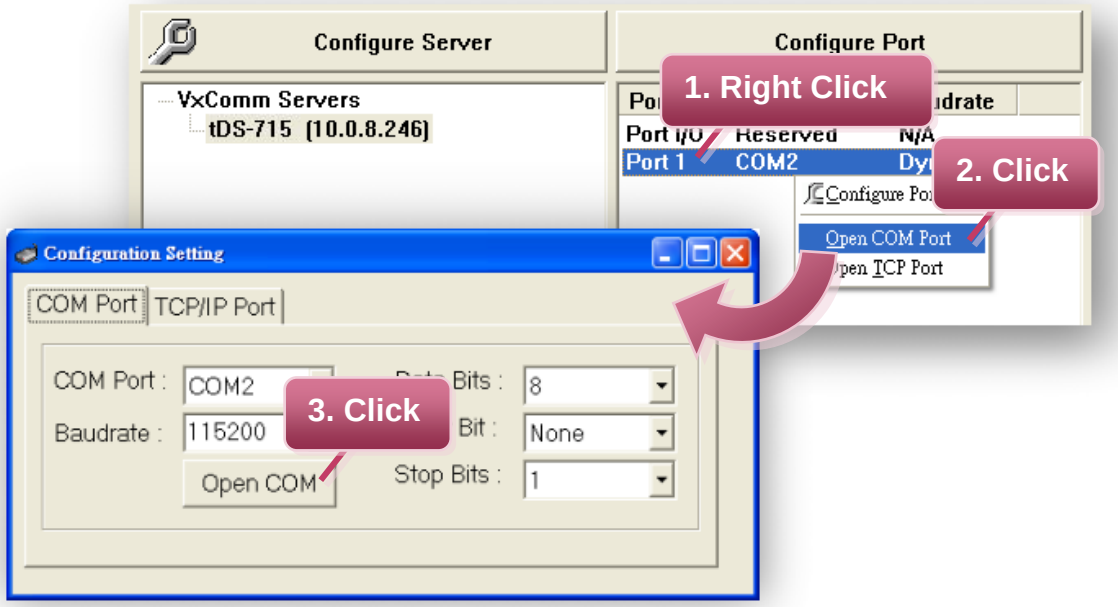


4. Click "**Tools**" >> "**Restart Driver**", and then click the "**Restart Driver**" button.

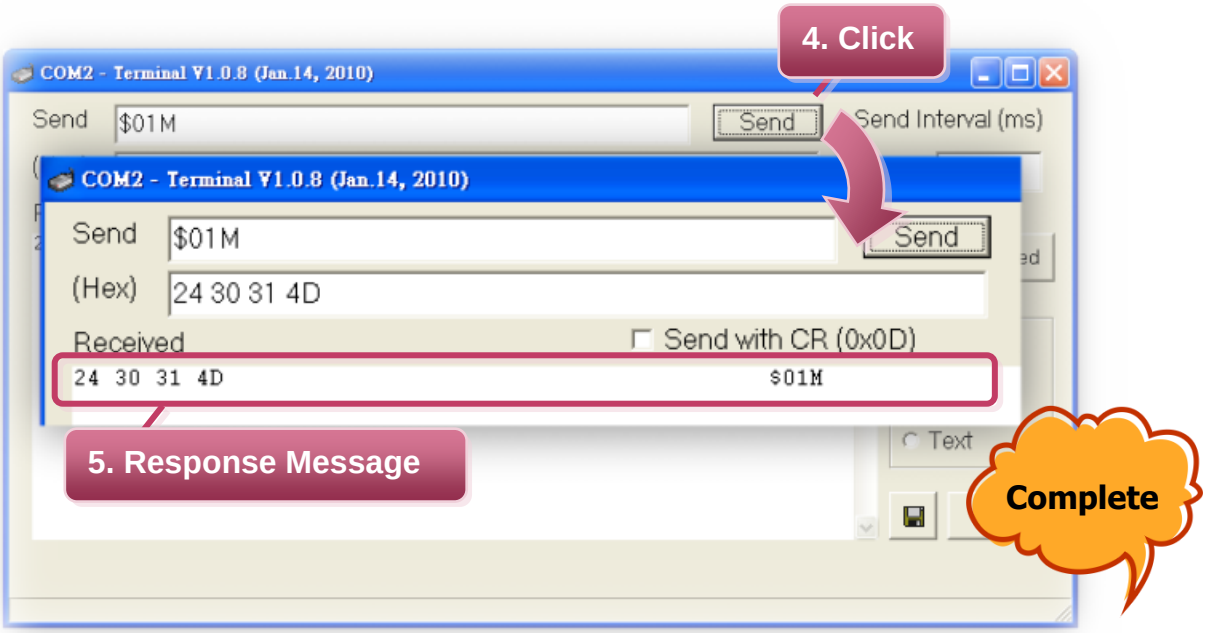


Step 5: Testing your tDS-700

1. Right click Port 1 and then choose the "**Open COM Port**" item.
2. Check that the configuration of the COM Port is correct and then click the "**Open COM**" button.



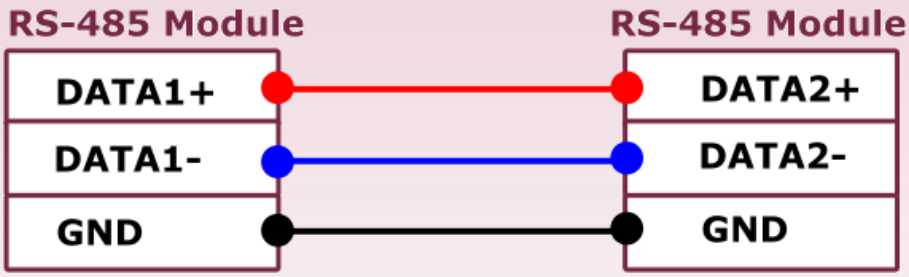
3. Type a string in the send field then click the "**Send**" button. If a response is received, it will be displayed in the received field.



4. If the test is successful, then your COM port program should now be able to work with this Virtual COM Port.

Note!!

While using RS-485 modules (Ex, tDS-725), you should wire the Data1+ and Data2+ signals, and wire the Data1- and Data2- signals when performing a self-test.



Open the first two COM Ports and use one to send data to and the other to receive data.

4. Web Configuration

Once the tDS-700 module has been correctly configured and is functioning on the network normally, the configuration details can be retrieved or modified using either the VxComm Utility or a standard web browser.

4.1 Logging on to the tDS-700 Web server

You can log on to the tDS-700 web server from any computer that has Internet access.

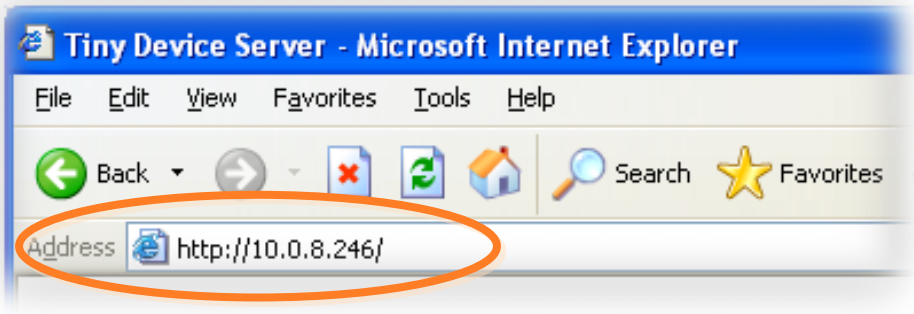
Step 1: Open a browser

Mozilla Firefox, Google Chrome and Internet Explorer, for example are reliable and popular internet browsers that can be used to configure tDS-700 modules.

If using IE, disable the cache to prevent browser access errors. For detailed settings information refer to "Appendix: FAQ 1".

Step 2: Type the URL address of the tDS-700

Make sure you have correctly configured the network settings for the tDS-700, or refer to section 3 "Setting up the tDS-700 module".

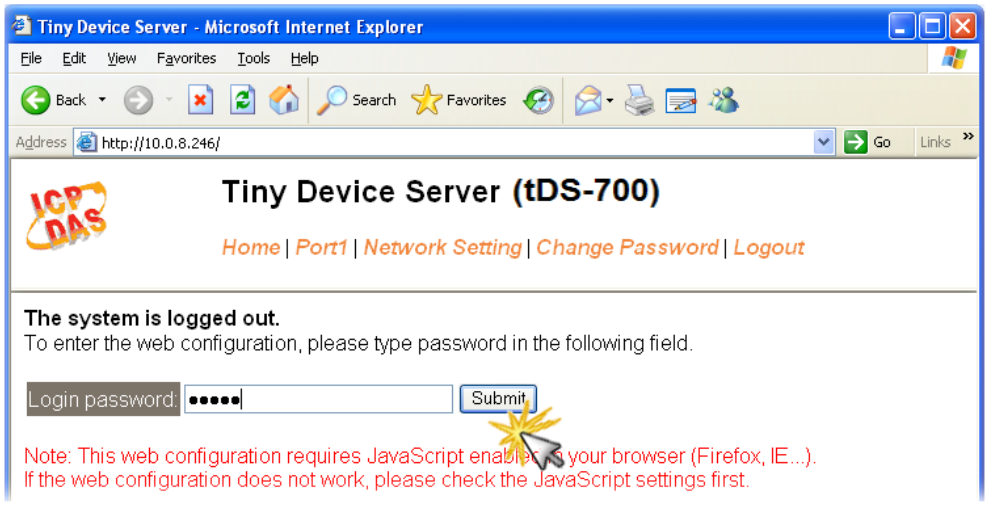


Step 3: Enter the Password

After entering the IP address, the login dialog page will be displayed. Enter the password, and then click the **"Submit"** button to enter the configuration web page.

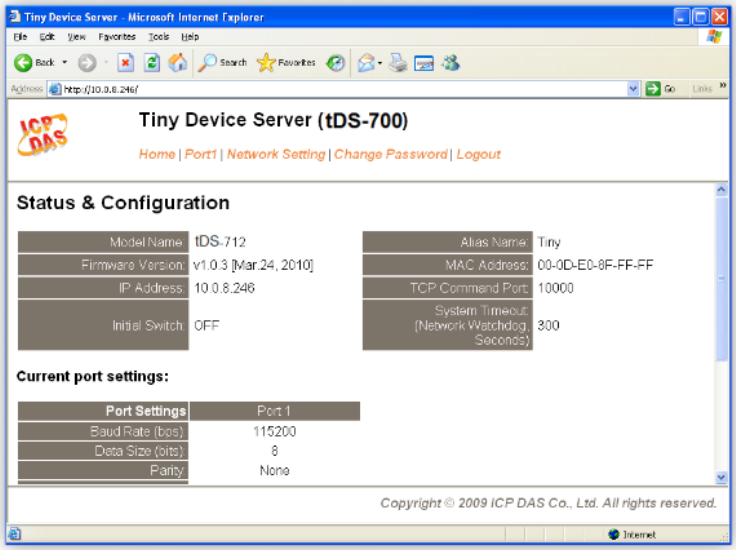
The factory default password is:

Item	Default
Login password	**admin**



Step 4: Welcome to tDS-700 web server

After logging onto the tDS-700 web server, the main page will appear.



4.2 Home Page

The Home link connects to the main page, which contains two parts.

- The first part of this page provides basic information about the tDS-700 hardware and software.

Status & Configuration

Model Name:	tDS-725	Alias Name:	Tiny
Firmware Version:	v1.2.8 [Oct.18, 2012]	MAC Address:	00-0d-e0-8f-77-88
IP Address:	10.0.8.100	TCP Command Port:	10000
Initial Switch:	OFF	System Timeout: (Network Watchdog, Seconds)	300

- The second part of this page provides the status of the port settings and pair-connection settings.

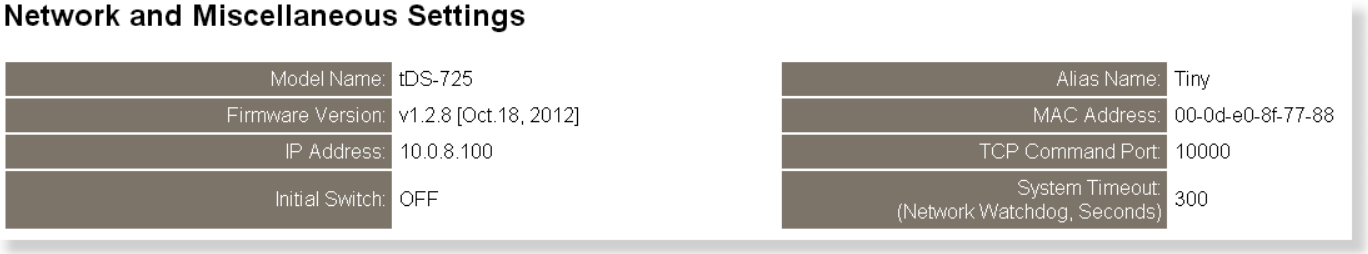
Current port settings:

Port Settings	Port 1	Port 2
Baud Rate (bps):	115200	115200
Data Size (bits):	8	8
Parity:	None	None
Stop Bits (bits):	1	1
Flow Control:	None	None
Dynamic Serial Settings:	Enable	Enable
Local TCP Port:	10001	10002
TCP Timeout (Seconds):	180	180
Serial Data Packing	Port 1	Port 2
Slave Timeout (ms)	1000	1000
Packing Length (bytes)	0	0
Serial Ending Chars: (Number[,char1][,char2])	0	0
Timeout Between Chars (ms)	10	10
Pair-Connection Settings	Port 1	Port 2
Server Mode:	Server	Server
Remote Server IP:	Disable	Disable
Remote TCP Port:	Disable	Disable

4.3 Network Setting

4.3.1 Network and Miscellaneous Settings

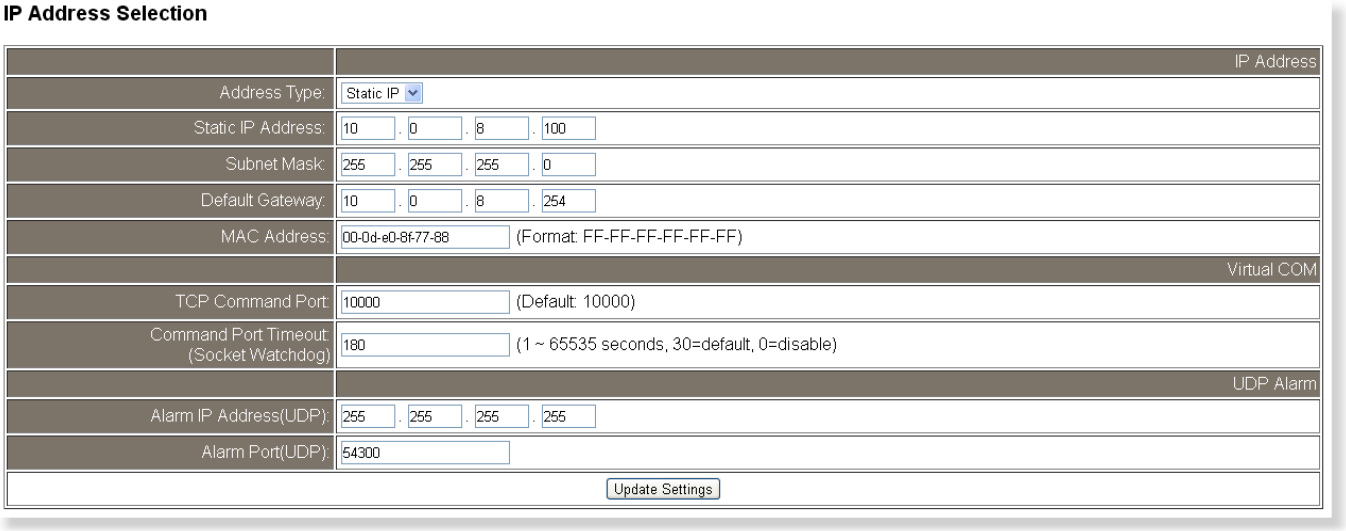
- Check the model name and the software information.
- The software information includes the following items:
  Firmware Version, Model Name, IP Address, Initial Switch, MAC Address, and System Timeout.



After updating the tDS-700 firmware, you can check the version information on this page.

4.3.2 IP Address Selection

The Address Type, Static IP Address, Subnet Mask and **Default Gateway** items are the most important network settings and should always correspond to the LAN definition. If they do not match, the tDS-700 module will not operate correctly. If the settings are changed while the module is operating, any links to Virtual COM Port based applications currently in use will be lost and an error will occur.



- Item Descriptions:

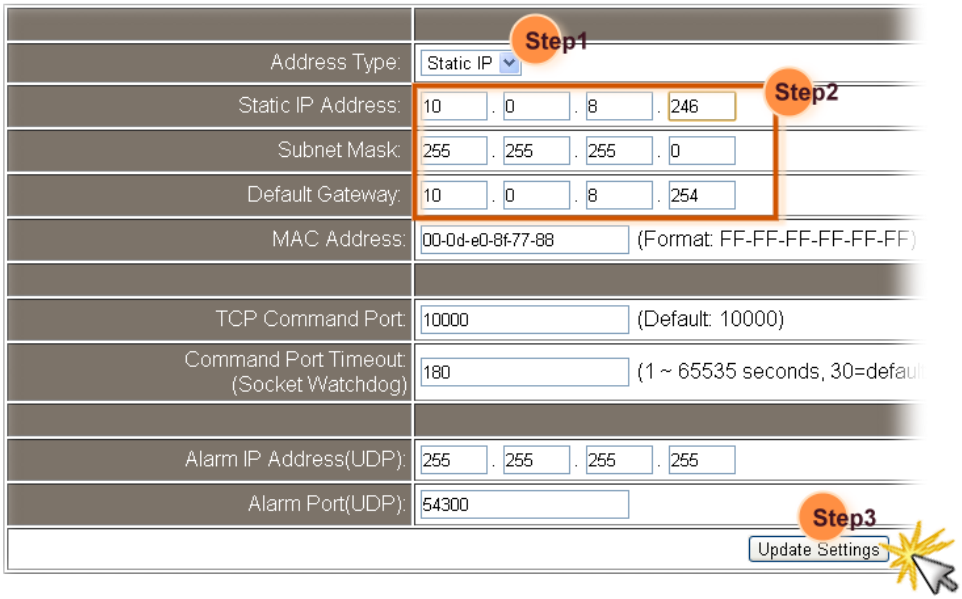
Item	Description
Address Type	**Static IP:** If you don't have a DHCP server in your network, you can configure the network settings manually. Please refer to the section "4.3.2.1 Manually Configuration"
	DHCP: Dynamic Host Configuration Protocol (DHCP) is a network application protocol that automatically assigns an IP address to each device. Please refer to Section 4.3.2.2 "Dynamic Configuration"
Static IP Address	Each tDS-700 on the network must have a unique IP address. This item used to assign specific IP address.
Subnet Mask	The Subnet Mask indicates which portion of the IP address is used to identify the local network or subnet.
Default Gateway	A gateway (or router) is a system that is used to connect an individual network with one or more additional networks.
MAC Address	The User-defined MAC address.
TCP Command Port	The default Command Port is 10000.
Command Port Timeout (Socket Watchdog)	If the command port does not receive any data from the TCP/IP socket for a certain period, the tDS-700 can disconnect the socket. Settings range value: 1 ~ 65535 (seconds); Default value: 30 (seconds); Disabled: 0;
Alarm IP Address(UDP)	The tDS-700 can send and UDP package (include alarm message) to specified network location (Alarm IP Address/Port).
Alarm Port(UDP)	
Update Settings	Click this button to save the new settings to the tDS-700.

4.3.2.1 Manual Configuration

When using manual configuration, you have to assign all the network settings in the following manner: Step 1: Select "**Static IP**" as the address type

Step 2: Enter the appropriate **network settings**

Step 3: Click the "**Update Settings**" button to finish the configuration

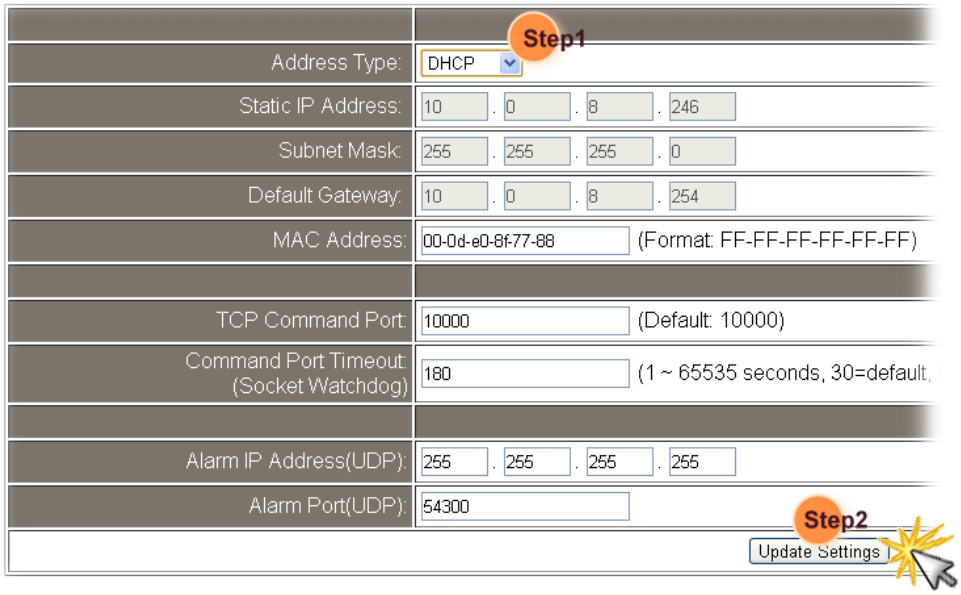


4.3.2.2 Dynamic Configuration

Dynamic configuration is very easy to perform. If you have a DHCP server, the network address can be dynamically configured in the following manner:

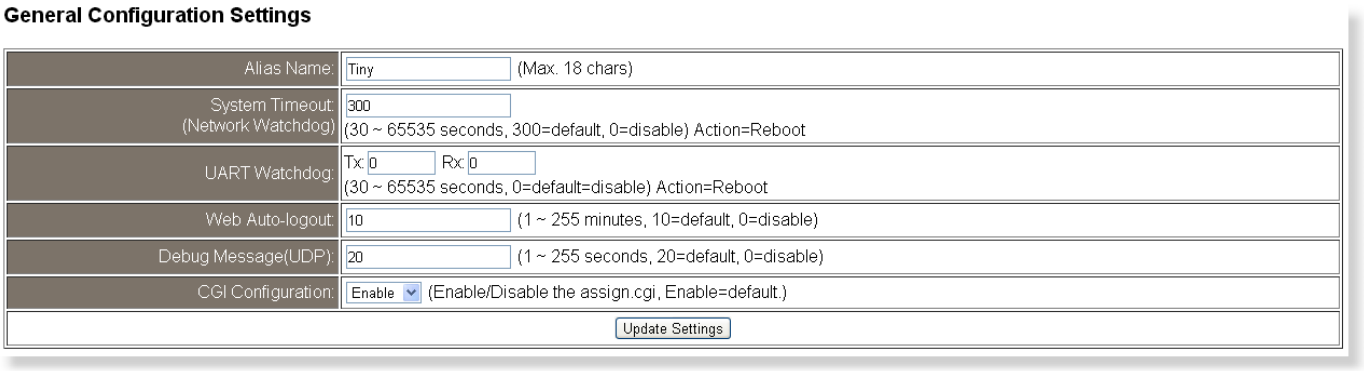
Step 1: Select "**DHCP**" as the address type

Step 2: Click the "**Update Settings**" button to finish the configuration



4.3.3 General Configuration Settings

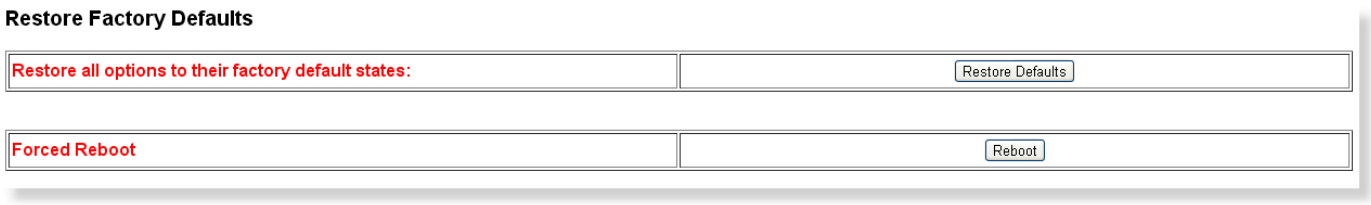
The General Configuration Settings provides functions allowing items such as the Alias Name, System Timeout value, UART Watchdog value, Auto-logout value, Debug Message and CGI Configuration to be configured.



- Item Descriptions:

Item	Description	Default
Alias Name	Each tDS-700 can be allocated a unique Alias name so that it can be identified the network.	Tiny
System Timeout (Network Watchdog)	If no network communication occurs for a certain period, the system will be rebooted based on the configured system timeout value. Settings range: 30 ~ 65535 (seconds); Disabled: 0;	300
UART Watchdog	If the serial port does not communication occurs for a certain period, the system will be rebooted based on the UART Watchdog value. Settings range: 30 ~ 65535 (seconds); Disable: 0;	0
Web Auto-logout	If there is no action for a certain period in the web server, user account will be logout. Settings range: 1 ~ 255 (minutes); Disabled: 0;	10
Debug Message(UDP)	Reserved.	20
CGI Configuration	The tDS-700 can be configured by CGI command. For detailed CGI command and configuration information, refer to section 6 “CGI Configuration” Enable/Disable the assign.cgi.	Enable
Update Settings	Click this button to save the new settings to the tDS-700.	

4.3.4 Restore Factory Defaults

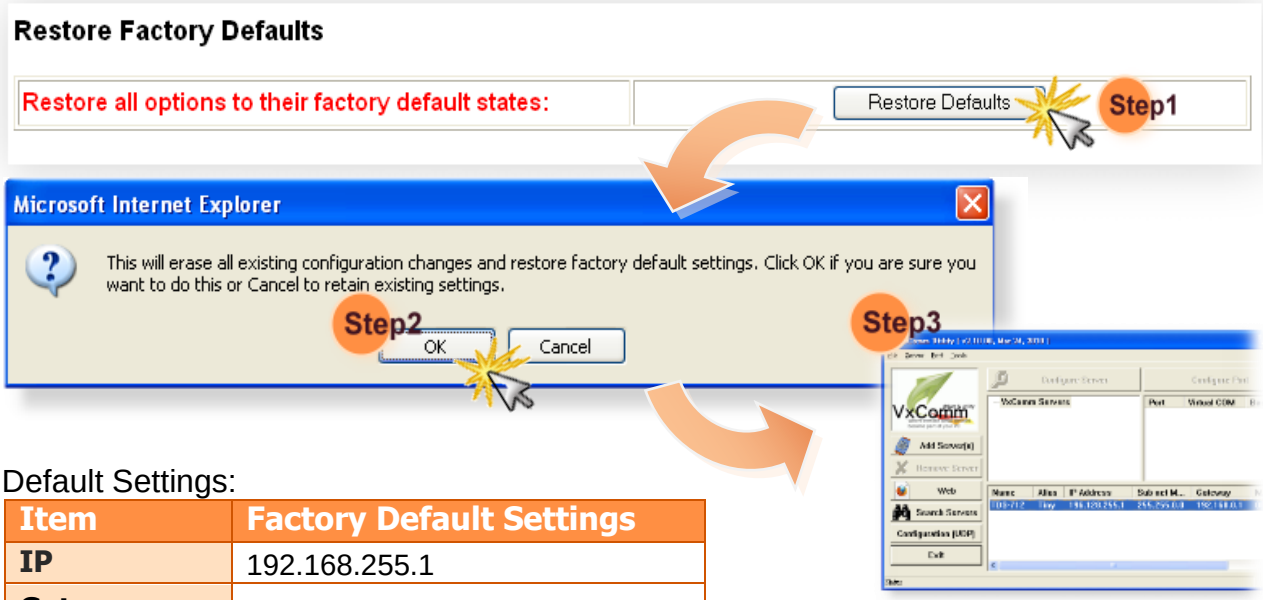


- To reset the settings to their factory defaults, follow these steps:

  Step 1: Click the "**Restore Defaults**" button to reset the configuration.

  Step 2: Click the "**OK**" button in the message dialog box.

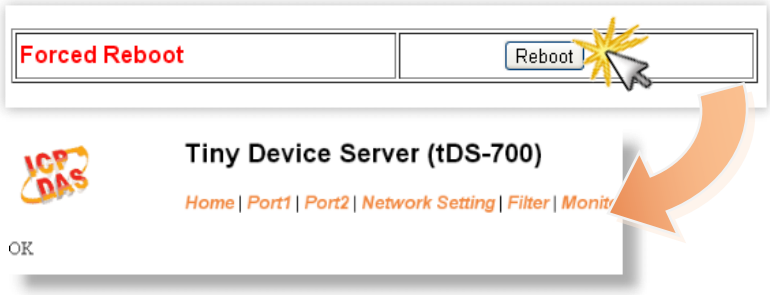
  Step 3: Check whether the tDS-700 is reset to factory default settings for use with the VxComm Utility. Refer to section 3 "Setting up the tDS-700 Module"



Default Settings:

Item	Factory Default Settings
IP	192.168.255.1
Gateway	192.168.0.1
Mask	255.255.0.0

- Forced Reboot: Can use this function to force reboot or remote reboot for tDS-700.



4.4 Serial Port Settings

4.4.1 Port1 Settings

Check the tDS-700 hardware and software information.

Port 1 Settings

Model Name:	tDS-725	Alias Name:	Tiny
Firmware Version:	v1.2.8 [Oct.18, 2012]	MAC Address:	00-0d-e0-8f-77-88
IP Address:	10.0.8.100	TCP Command Port:	10000
Initial Switch:	OFF	System Timeout: (Network Watchdog, Seconds)	300

4.4.2 Port Settings

The port settings provide the following functions:

Port Settings	Current	Updated
Baud Rate (bps):	115200	115200 bits/S
Data Size (bits):	8	8 bits/character
Parity:	None	None
Stop Bits(bits):	1	1
Flow Control:	None	None
Dynamic Serial Setting:	Enable	Enable
Operation Mode:	0	0 (0=Data-sharing, 1=Non-sharing)
Local TCP Port:	10001	(=TCP Command Port +1)
TCP Timeout (seconds):	180	180 (1 ~ 65535, 180=default, 0=disable)

- Item Descriptions:

Item	Description	Default
Baud Rate (bps)	Sets the Baud Rate for the COM ports.	115200
Data Size (bits)	Sets the Data Size for the COM ports.	8
Parity	Sets the Parity for the COM ports. The tDS-700 does not support the Mark and Space functions.	None
Stop Bits (bits)	Sets the Stop Bits for the COM ports.	1
Flow Control	Sets the Flow Control for the COM ports.	None
Dynamic Serial Setting	Enable client (VxComm Driver) to dynamically change the data format and baud rate settings.	Enable
Operation Mode	**M0/Multi-echo**: Share received serial data between clients. **M1/Single-echo**: Send received serial data to the requested client only. 0 = Data-sharing; 1 = Non-sharing	0
Local TCP Port	TCP Command Port +1 Note: COM1/COM2/COM3 = TCP port 10001/10002/10003	10001
TCP Timeout (seconds)	If the Local TCP port does not receive any data via the TCP/IP for a certain period, the tDS-700 will disconnect the socket based on the TCP timeout value. Settings range: 1 ~ 65535 (seconds); Disabled: 0;	180

4.4.3 Serial Data Packing

The serial data packing provide the following functions:

- Item Descriptions:

Item	Description	Default
Slave Timeout (ms)	Set the waiting time after last Tx of the request sent to the device. If the device does not respond within the timeout value, the tDS-700 will return existing data via TCP package and process next request.	1000
Packing Length (bytes)	When the input serial data length reaches to the value, it will be sent out. Settings range: 0 ~ 1024; Disabled: 0;	0
Serial Ending Chars (Number[,char1][,char2])	The tDS-700 outputs an Ethernet packet immediately after the ending-chars pattern is identified from the incoming serial data. The number of ending-chars can be 0 (disabled), 1 or 2 chars. Disabled=0; 1 char: **1,0x0D**; 2 chars: **2,0x0D,0x0A**	0
Timeout Between Chars (ms)	Set the waiting time after Rx of the response sent from the device. If the device does not respond within the timeout value, the tDS-700 will process this response. Settings range: 10 ~ 65535; Disabled: 0;	10

4.4.4 Pair-Connection Settings

The pair-connection provides the following functions:

- Item Descriptions:

Item	Server Settings	Client Settings
Server Mode	**Server**	**Client**
Remote Server IP	Disabled	IP address of the remote device
Remote TCP Port	Disabled	TCP Port number of the remote device
Submit	Click this button to save the new settings to the tDS-700.	

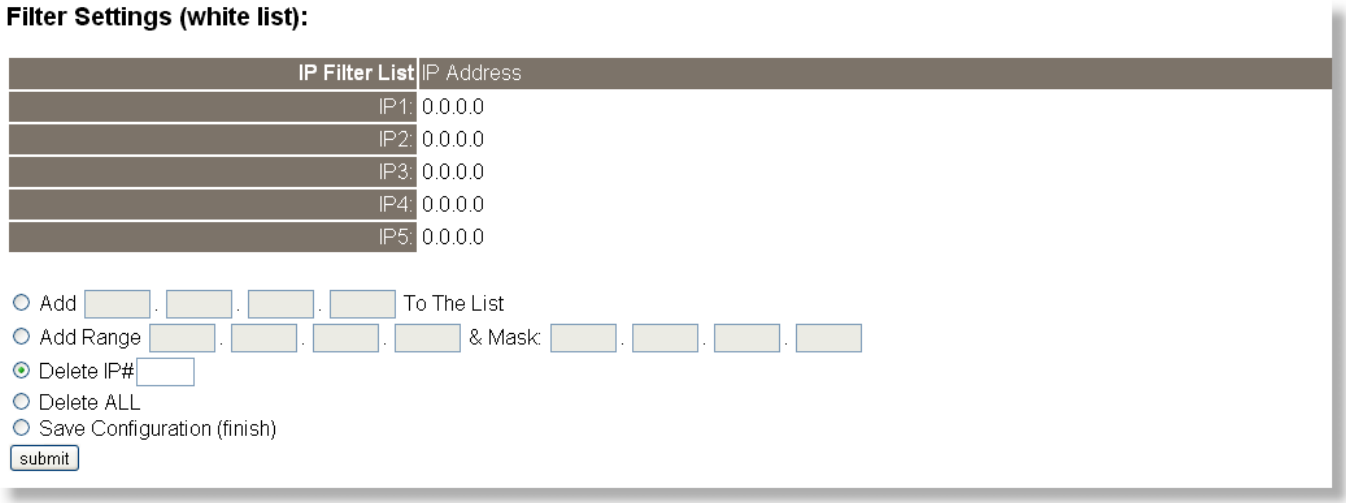
The more detailed information regarding pair-connection applications settings, please refer to the section 5.4 “Pair-Connection Applications".

4.5 Filter

For detailed network and miscellaneous settings description, refer to section 4.3.1 “Network and Miscellaneous Settings”.

4.5.1 Filter Settings (white list)

This filter settings page is used to query or edit IP filter list. The IP filter list restricts the access of packets based on the IP header. If one or more IP address are saved into the IP filter table, only clients whose IP is specified in the IP filter list can access the tDS-700.



- Item Descriptions:

Item	Description
Add “IP” to the list	Adds an IP address to the IP filter list
Add Range IP & Mask	Adds an IP range to the IP filter list
Delete IP# “number”	Deletes IP# from the IP filter list
Delete All	Deletes all items from the IP filter list
Save Configuration (finish)	Save a new IP filter list to the Flash
Submit	Click this button to save the new settings to the tDS-700

4.6 Monitor

- Display detailed information regarding serial port socket and UART status setting list for tDS-700.

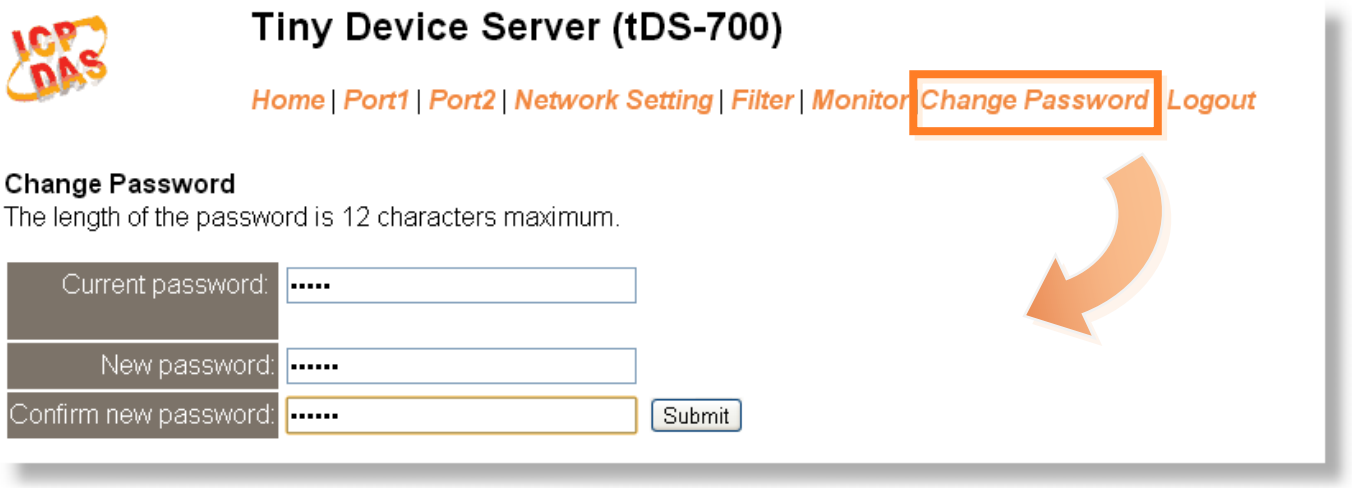
Current Status(Socket):

Port Number	Port 1	Port 2
OP Mode:	Server	Server
IP1:	0.0.0.0	0.0.0.0
IP2:	0.0.0.0	0.0.0.0
IP3:	0.0.0.0	0.0.0.0
IP4:	0.0.0.0	0.0.0.0

Current Status(UART):

Port Number	Port 1	Port 2
Last Tx Count (bytes):	0	0
Last Rx Count (bytes):	0	0
Total Tx Count (bytes):	0	0
Total Rx Count (bytes):	0	0

4.7 Change Password

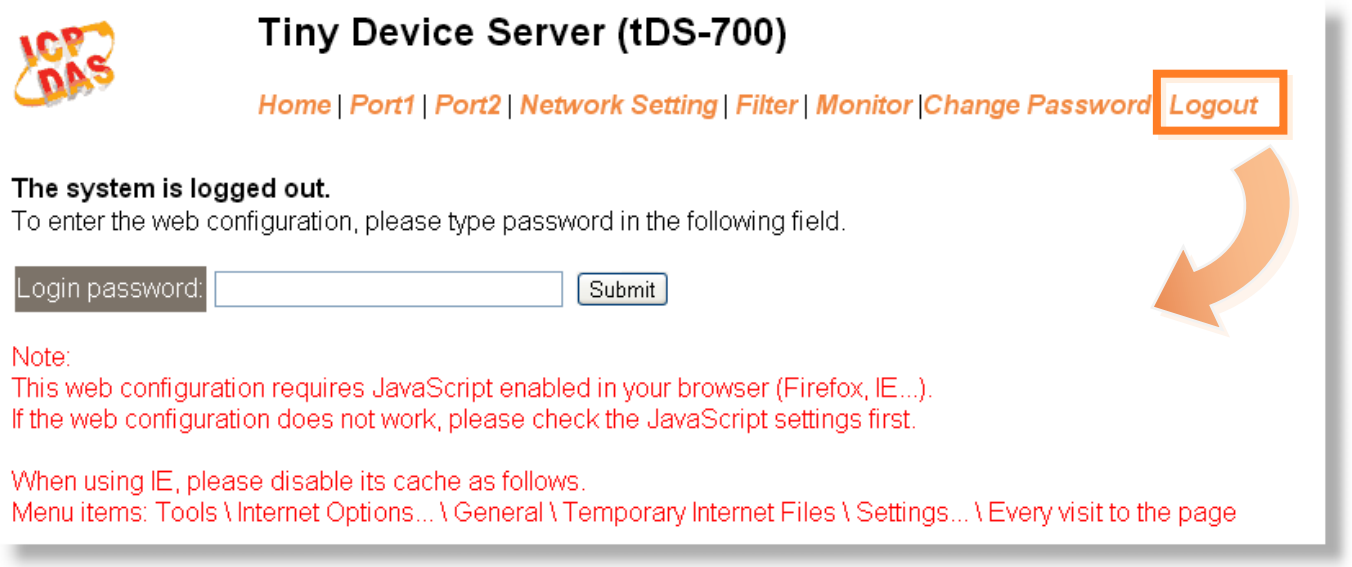


- Item Descriptions:

Item	Description
Current password	Enter the old password (**default is admin**)
New password	Enter the new password
Confirm new password	Enter the new password again
Submit	Click this button to save the new settings to the tDS-700.

4.8 Logout

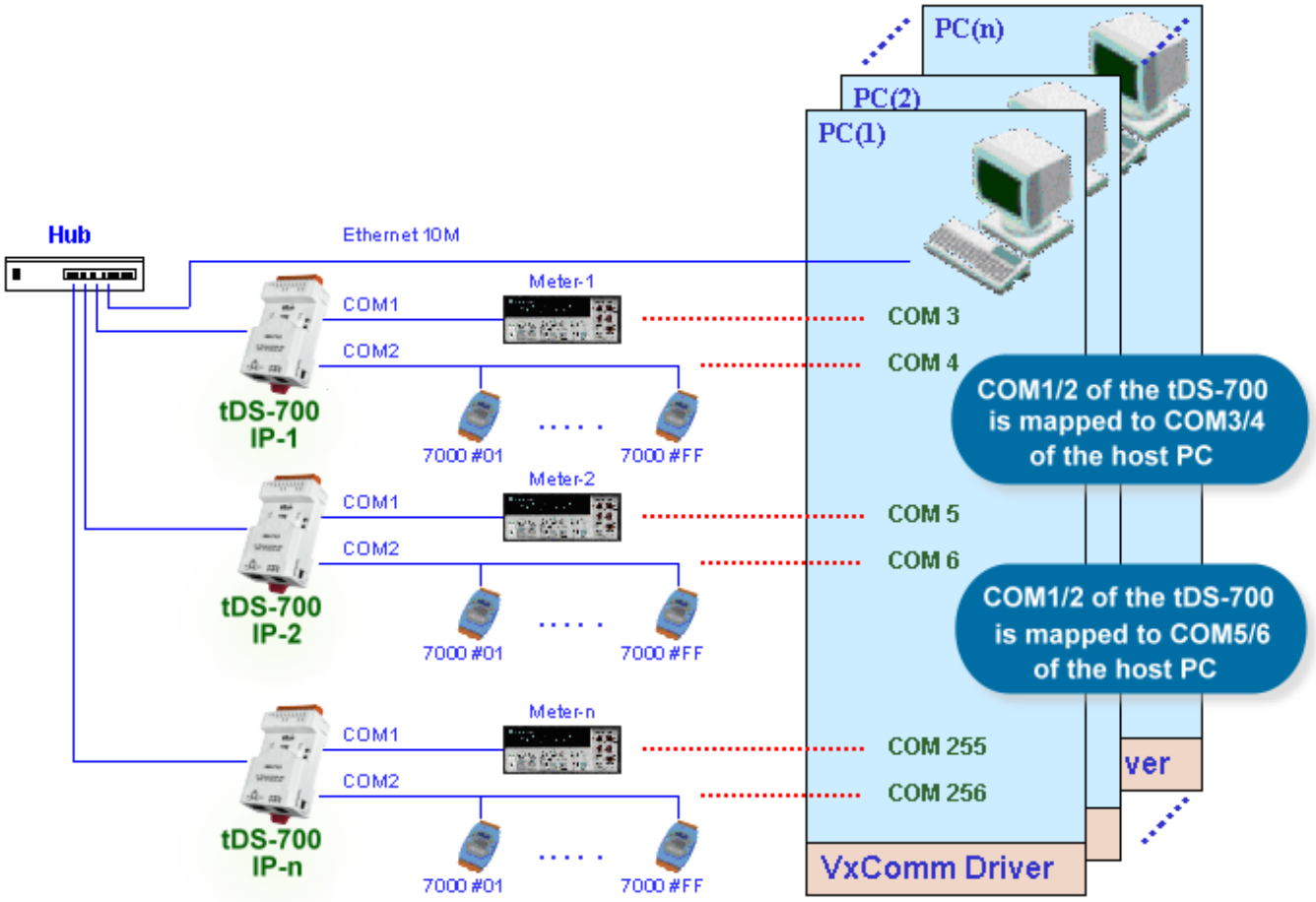
Click the **"Logout"** tag to log out from the system and return to the login page.



5. Typical Applications for the tDS-700

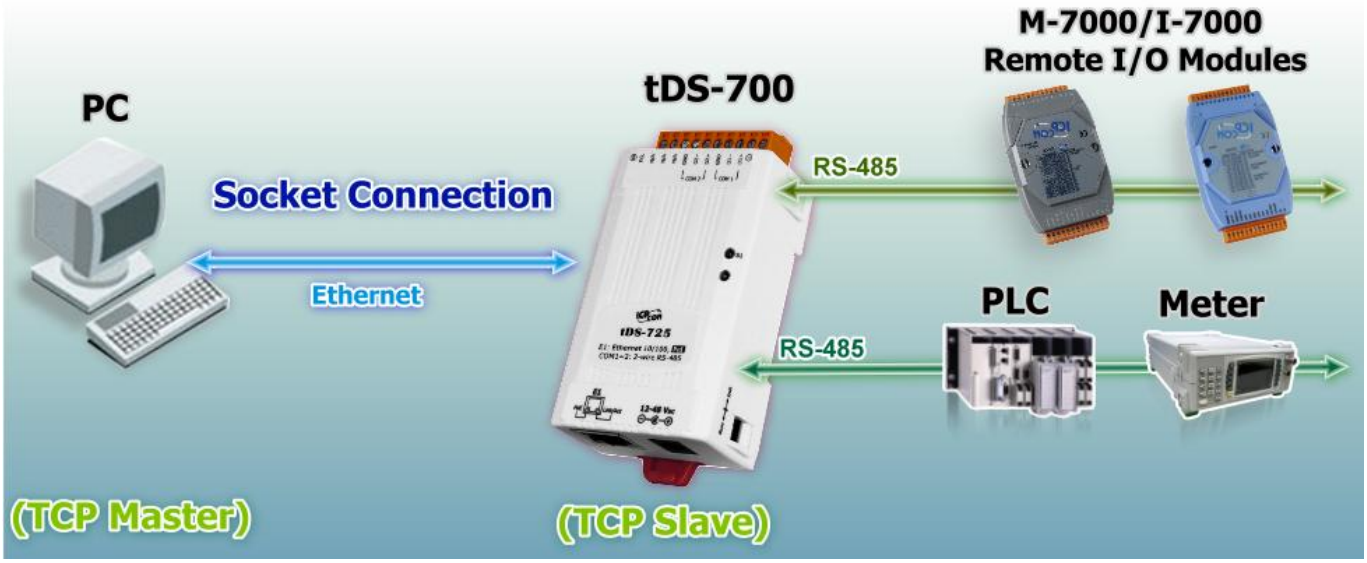
5.1 Virtual COM Application

The tDS-700 series is designed to link RS-232/422/485 devices to an Ethernet network. The VxComm utility allows the built-in tDS-700 COM Port to be virtualized to a standard COM Port of a host PC, as shown below:



In the configuration above, Meter-1 is virtualized to link to COM3 of the host PC. Therefore, a program originally designed for the MS-COMM standard can access the meter without the need for any modification.

5.2 Direct Socket Connection Applications



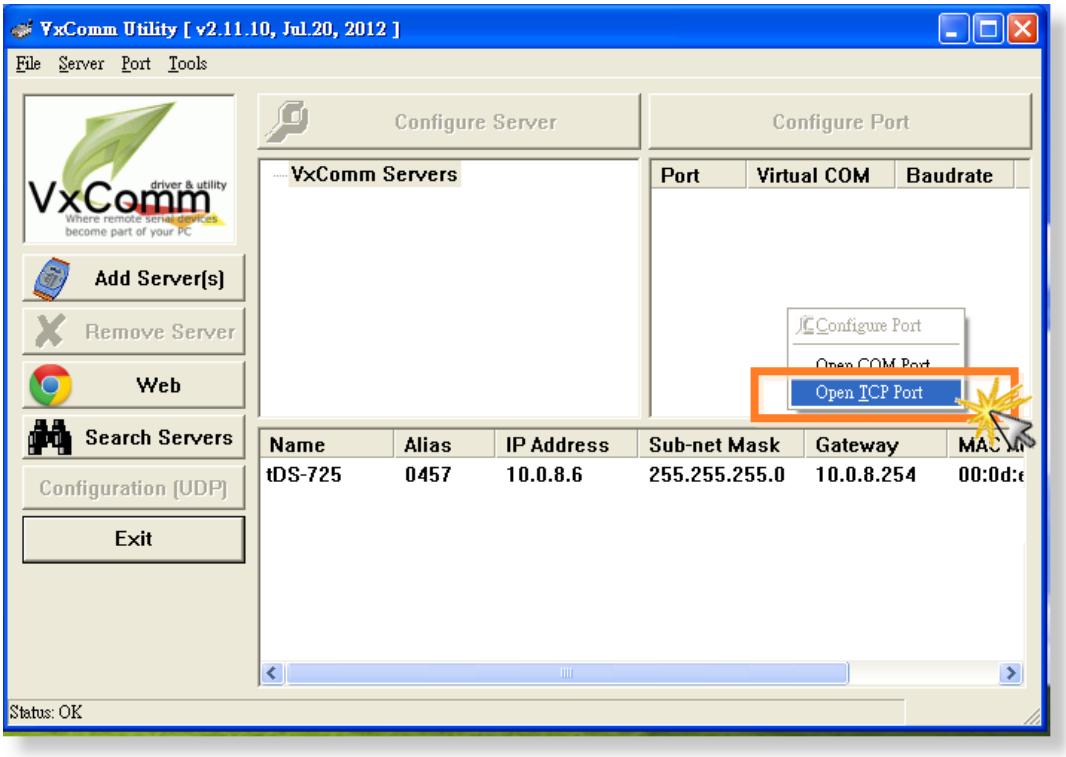
tDS-700 series module can accept the TCP connection (include raw data) directly, it also can communicate with TCP client and Serial Device in this way.

For examples of socket connection test as follows:

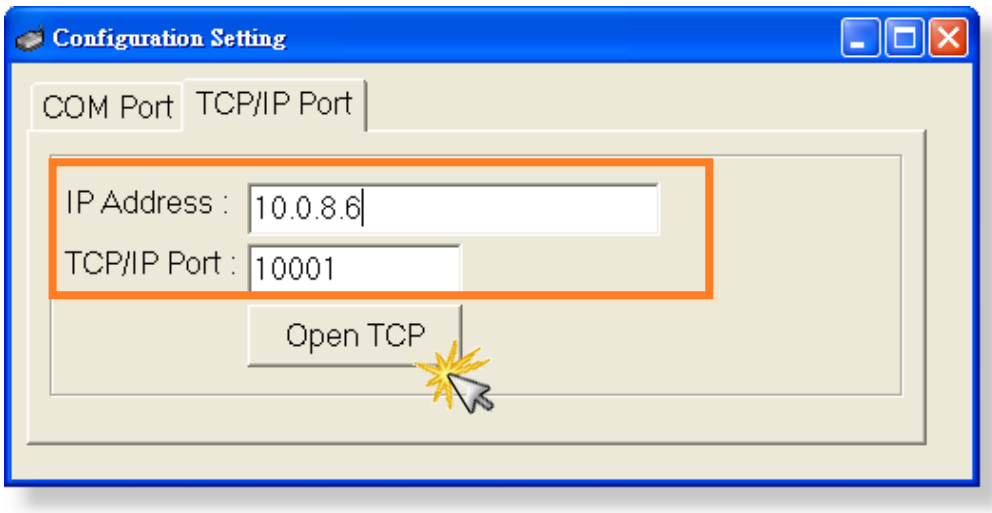
1. Confirm that the tDS-700 modules are functioning correctly. Refer to section 3-1 “Connecting the power and Host PC” for more details.
2. Wire the slave device (Ex: M-7015, optional) with your tDS-700. For detailed RS-422/485 wiring information, refer to section 2.7 “Wiring Notes”.
3. Supply power to the slave device (Ex, M-7015, Device ID: 2, +10~+30 VDC power used.)
4. Install VxComm utility, and then configuration Ethernet setting (**such as IP/Mask/Gateway details)** for tDS-700 series module; refer to section 3.3 “Search the tDS-700 on the Ethernet network”.
5. Confirm the serial port settings (**baud Rate and data format**) must be the same between the tDS-700 and slave device (M-7015).
   For example:

Model	Port Settings		TCP Port
	Baud Rate	Data Format	
tDS-700	9600	8,N,1	10001
Slave Device (M-7015)	9600	8,N,1	-

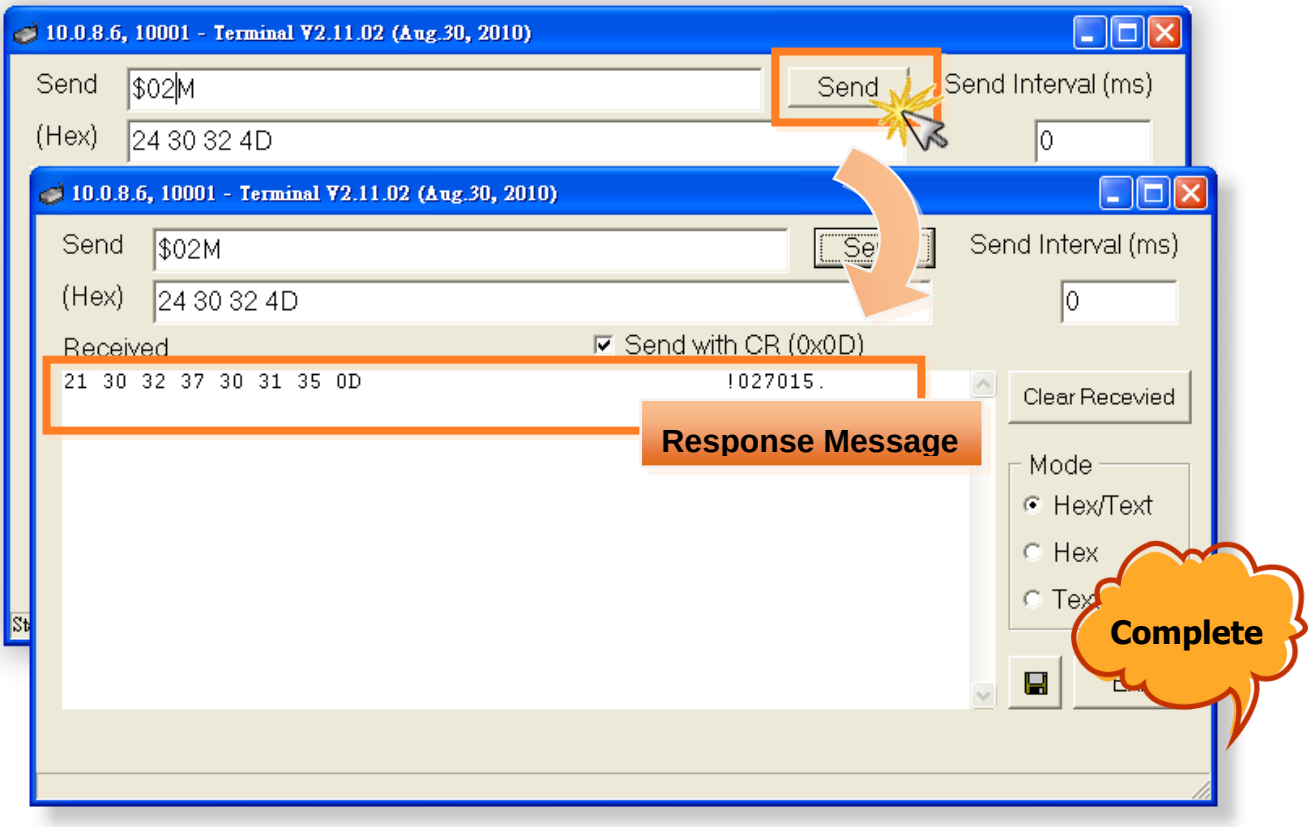
6. Right click in the “**Configure Port**” area and then choose the **“Open TCP Port”** item under the VxComm utility.



7. Type the **IP address of tDS-700** in the IP Address field and assign a **TCP/IP port of tDS-700**, and then click the "**Open TCP**" button.



8. Type a string in the send field then click the **"Send"** button. If a response is received, it will be displayed in the received field.



5.3 Ethernet I/O Applications

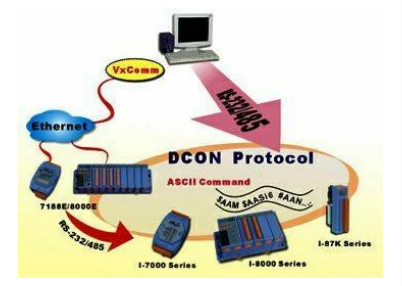
Linking to I-7000 series modules

The I-7000 series provides a variety of I/O operations, such as D/I, D/O, A/D, D/A, Counter and Frequency Measurement, etc. The I-7000 series was originally designed to be used with RS-485 networks, so the RS-485 of COM on the tDS-700 can be used to link to I-7000 series modules.

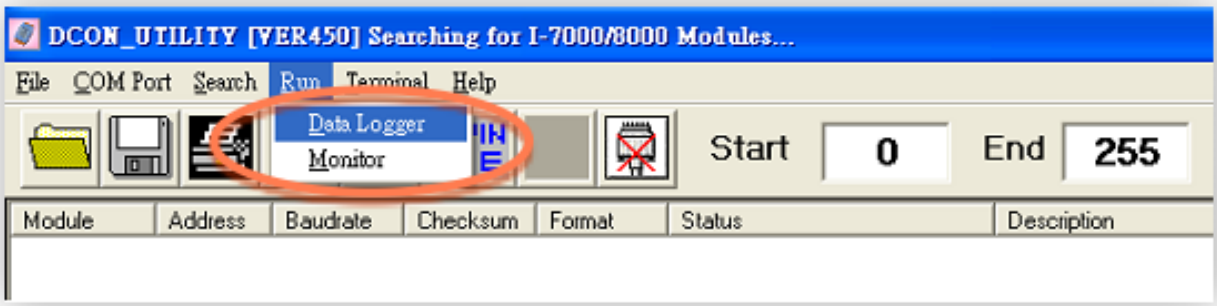
By using VxComm technology, programs that support serial devices on the host PC can be upgraded from an RS-485 network to an Ethernet network without requiring any modifications to the program.

Configurable Ethernet Data Logger

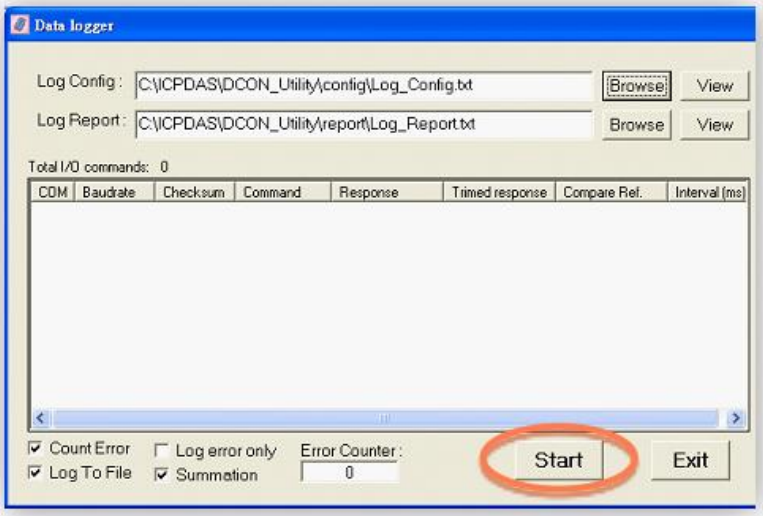
Using the VxComm driver, the tDS-700 + 7000 modules can be virtualized to become COM Port + 7000 modules located on the host PC, and then the Data Logger in the DCON Utility can be used to access data related to the I-7000 from the Ethernet. Signal data originating from the I-7000 modules can be analyzed using MS Excel without the need to write any custom programs.



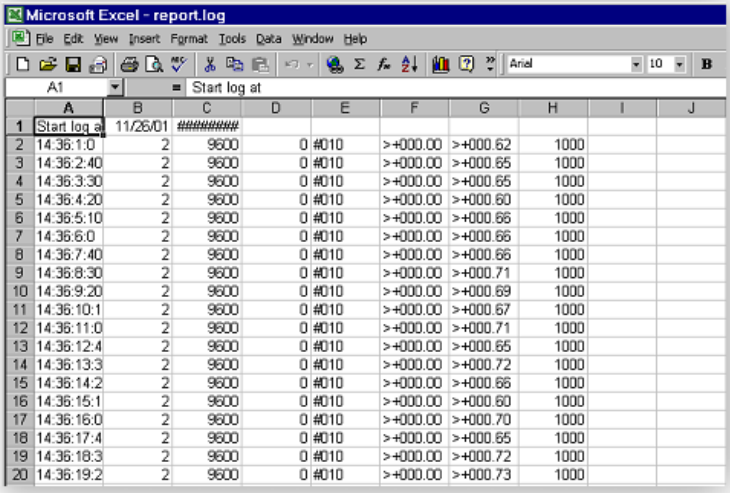
1: The DCON utility includes a log function, as show below:



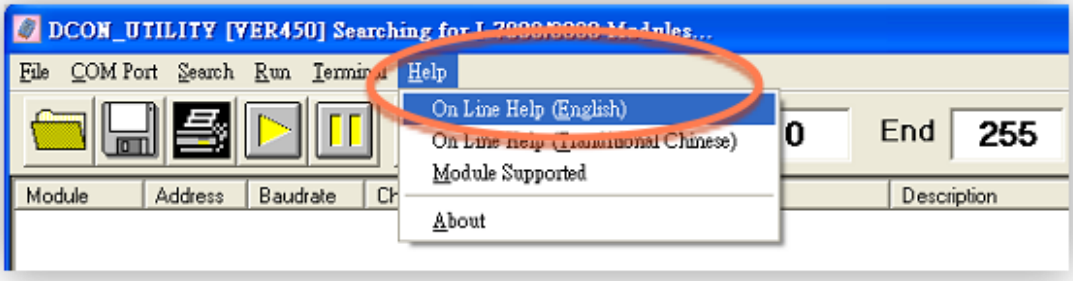
2: Configure the system connection as shown below and click the **"Start"** button to begin logging data.



3: Open the log file in MS Excel to view the log data as shown in the example below:



By using the I-7000 DCON utility and MS Excel in conjunction with **VxComm technology**, the signal data originating from I-7000 modules via the Ethernet network can be analyzed without the need to write custom programs. For more information about the **log function**, refer to the online help feature (English and Traditional Chinese) of the DCON utility.



5.4 Pair-Connection Applications

tDS-700 device servers can be used to create a pair-connection application (as well as serial-bridge or serial-tunnel), and then route data between two serial devices via TCP/IP, which is useful when connecting mainframe computers, servers or other serial devices that do not themselves have Ethernet capability.

For examples of pair-connection test as follows:

Pair-Connection Settings Table:

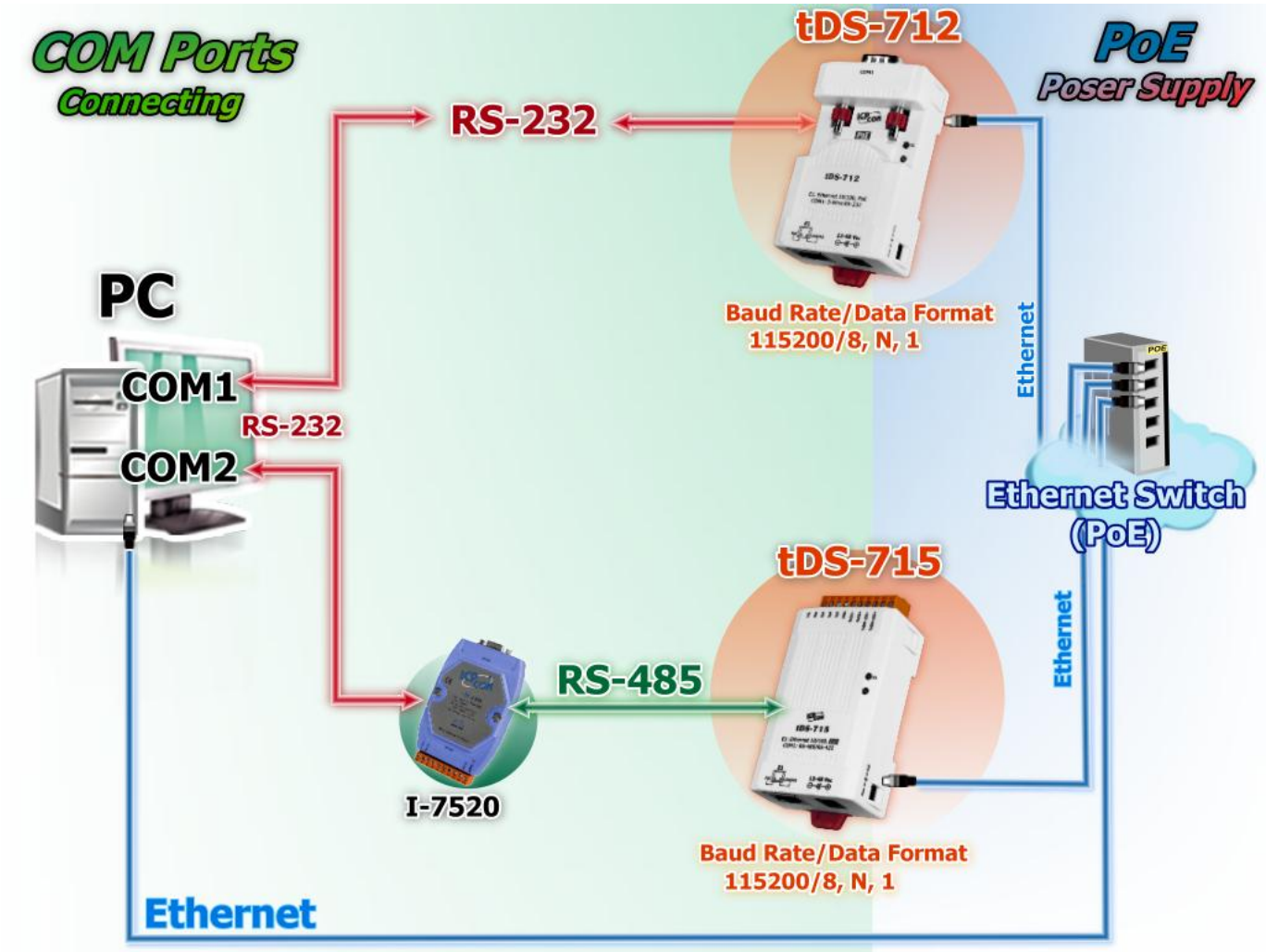
Model	Port Settings (default)		Pair-connection settings		
	Baud Rate	Data Format	Server Mode	Remote Server IP	Remote TCP Port (default)
tDS-700 #1	115200	8,N,1	Client	IP Address of the tDS-700 #2	10001
tDS-700 #2	115200	8,N,1	Server	-	-

Note!!
The Baud Rate and data format settings of the client and server (tDS-700 #1 and #2) depend on the COM ports of the PC (or the connected device). The serial port settings can be different between the tDS-700 #1 and #2.

Step 1: Connecting to a network, PC and Power supply

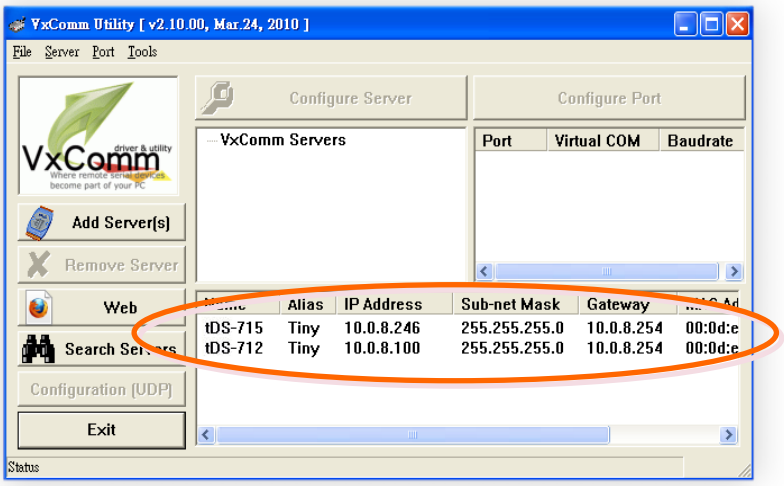
1. Confirm that the tDS-700 modules are functioning correctly. Refer to section 3-1 "Connecting the power and Host PC" for more details.
2. Use a DN-09-2F wiring terminal board to connect COM1 of the PC to COM1 of the tDS-700 #1. For detailed RS-232 wiring information, refer to section 2.7 "Wiring Notes".
   (DN-09-2F Web site: http://www.icpdas.com/products/DAQ/screw_terminal/dn_09_2.htm)
3. Use a i-7520 module to connect COM2 of PC to COM1 of the tDS-700 #2. For detailed RS-422/485 wiring information, refer to section 2.7 "Wiring Notes".
   (i-7520 Web site: http://www.icpdas.com/products/Remote_IO/i-7000/i-7520.htm)

For wiring diagram as follows:



Step 2: Configuring Ethernet Settings

Contact your Network Administrator to obtain a correct and functioning network configuration for tDS-700 modules. Please also refer to section 3.3 “Search the tDS-700 on the Ethernet network”.



Step 3: Configuring Pair-Connection on tDS-700 #1 web server

1. Enter the password (**default: admin**) in the Login password field, and then click the **"Submit"** button to enter the configuration page.

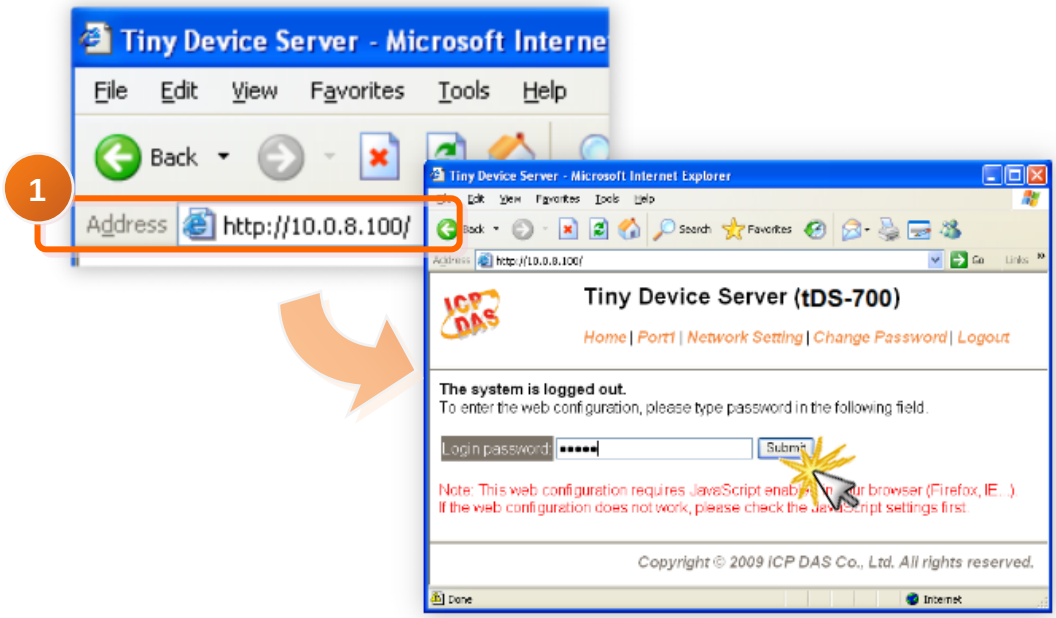


Figure 5-1

2. Click the **"Port1**" link to enter the settings page.

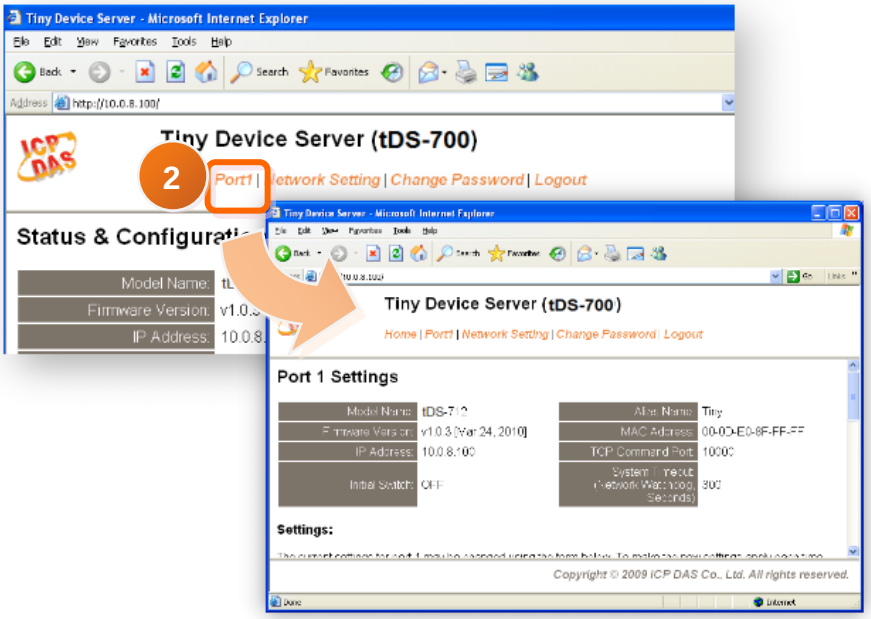


Figure 5-2

3. Select the appropriate **Baud Rate and Data Format** settings from the relevant drop down options, for example "**115200**" , "**8", "None"** and **1**" .

4. The pair-connection settings area as follows:
    1. Select "**Client**" from the "**Server Mode**" drop down options
    2. Type the **IP address of the tDS-700 #2** in the "**Remote Server IP**" field.
    3. Assign a **TCP port for the tDS-700 #2** in the "**Remote TCP Port**" field.

5. Click the "**Submit**" button to complete the configuration.

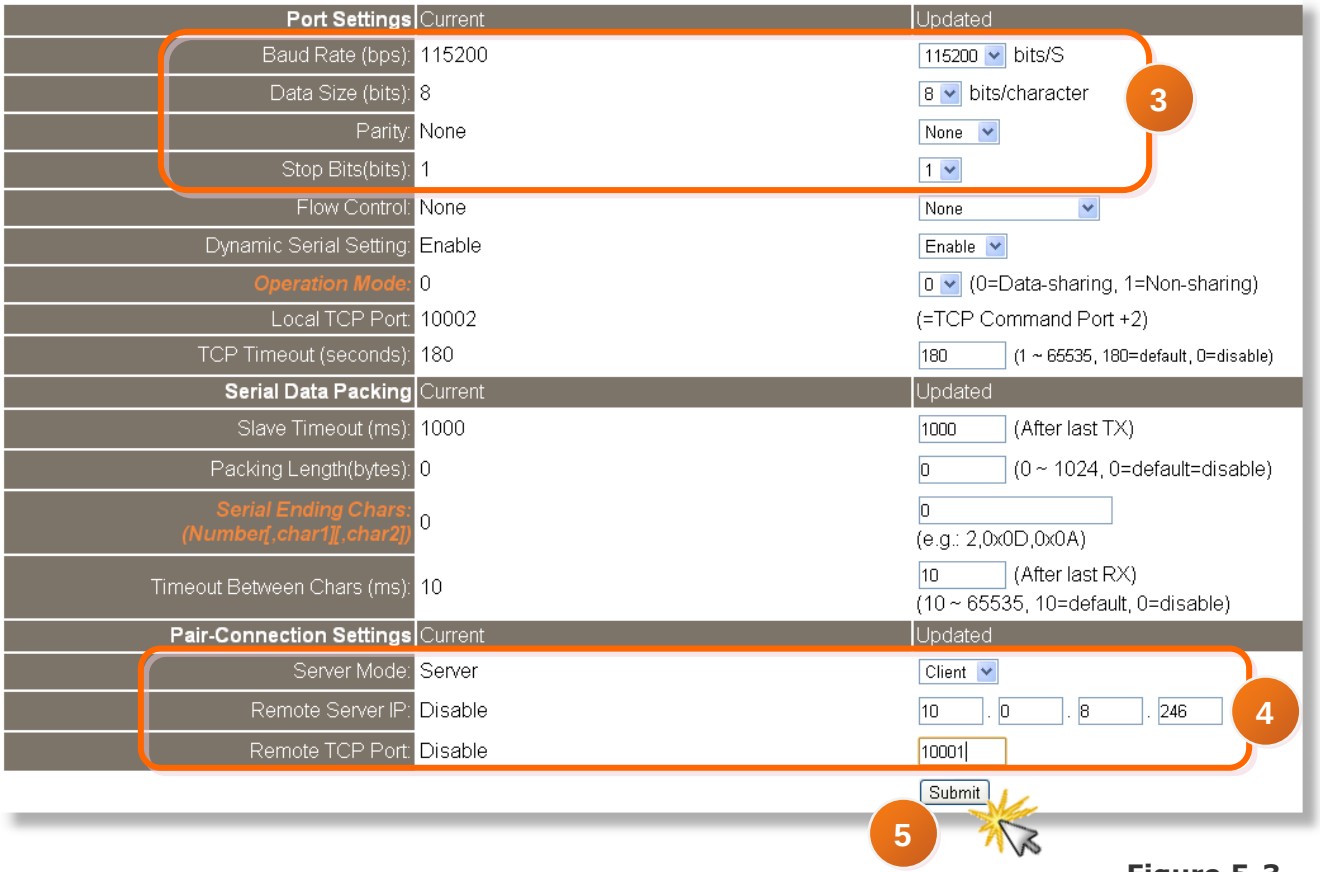
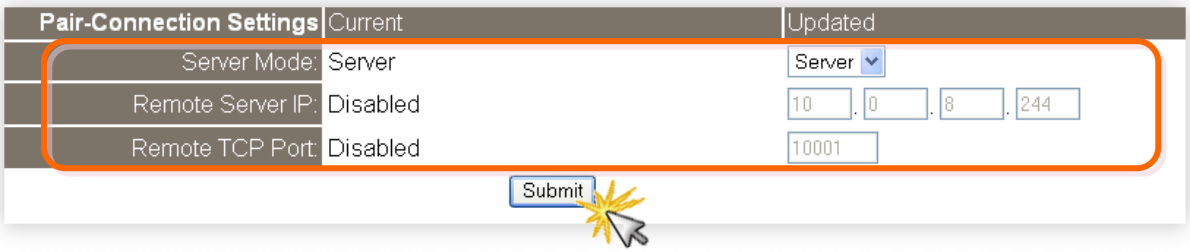


Figure 5-3

Step 4: Configuring Pair-Connection on tDS-700 #2 web server

1. Enter the configuration page for the tDS-700 #2 web server.
2. Click the **"Port1**" link to enter the settings page of the tDS-700 #2.
3. Set the Baud Rate to "**115200"** and the Data Format to "**8, None, 1"**.
   (Refer to Figures 5-1~5-3 for illustrations of how to perform the above steps.)
4. Select "**Server**" from the "**Server Mode**" drop down options and then click the "**Submit**" button to complete the configuration.

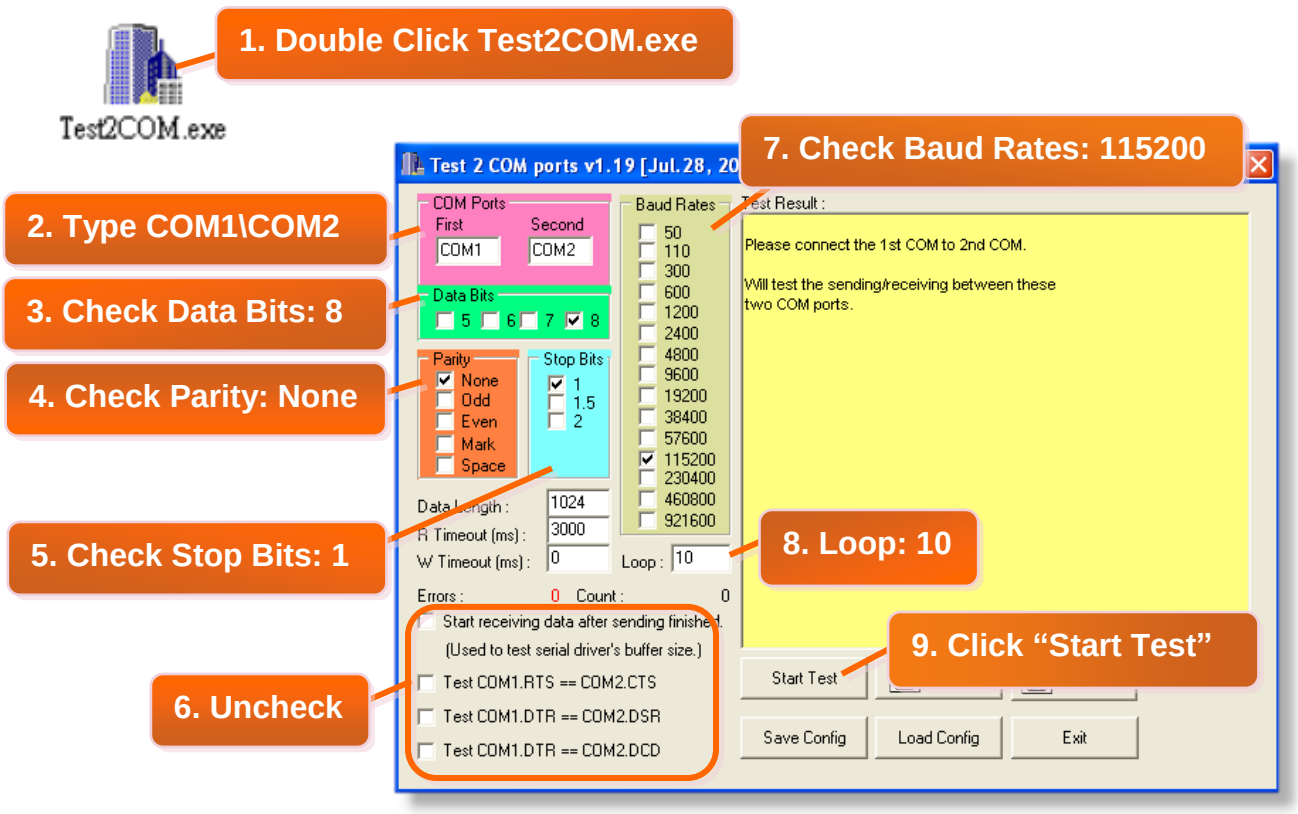


Step 5: Testing the Pair-Connection Function

1. The Test2COM.exe program is located at:

- CD:\Napdos\multiport\utility
- http://ftp.icpdas.com/pub/cd/iocard/pci/napdos/multiport/utility/

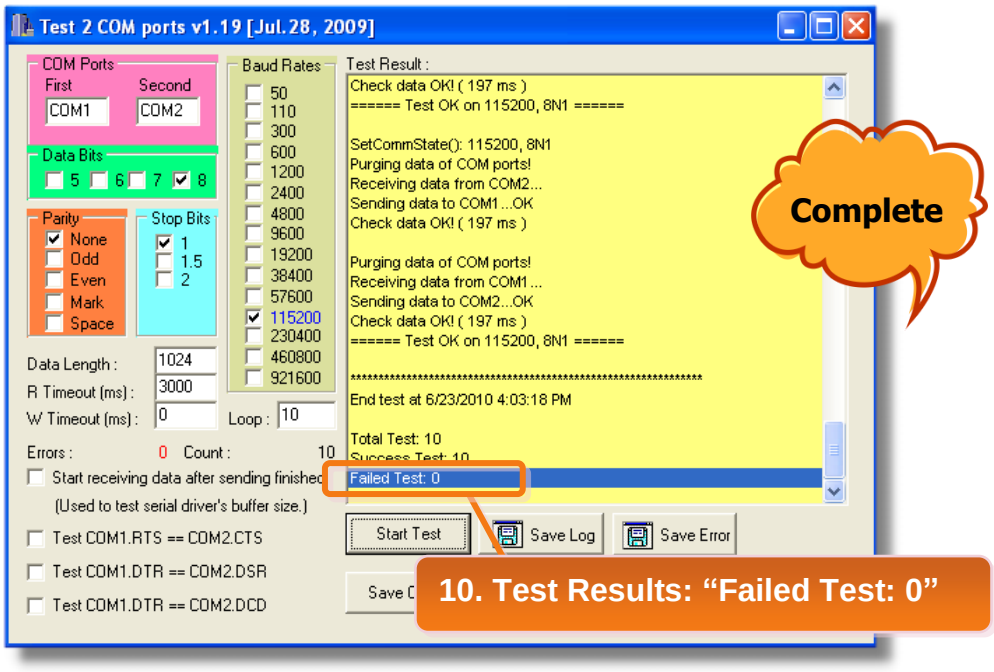
2. Execute the Test2COM.exe program.



Note!!

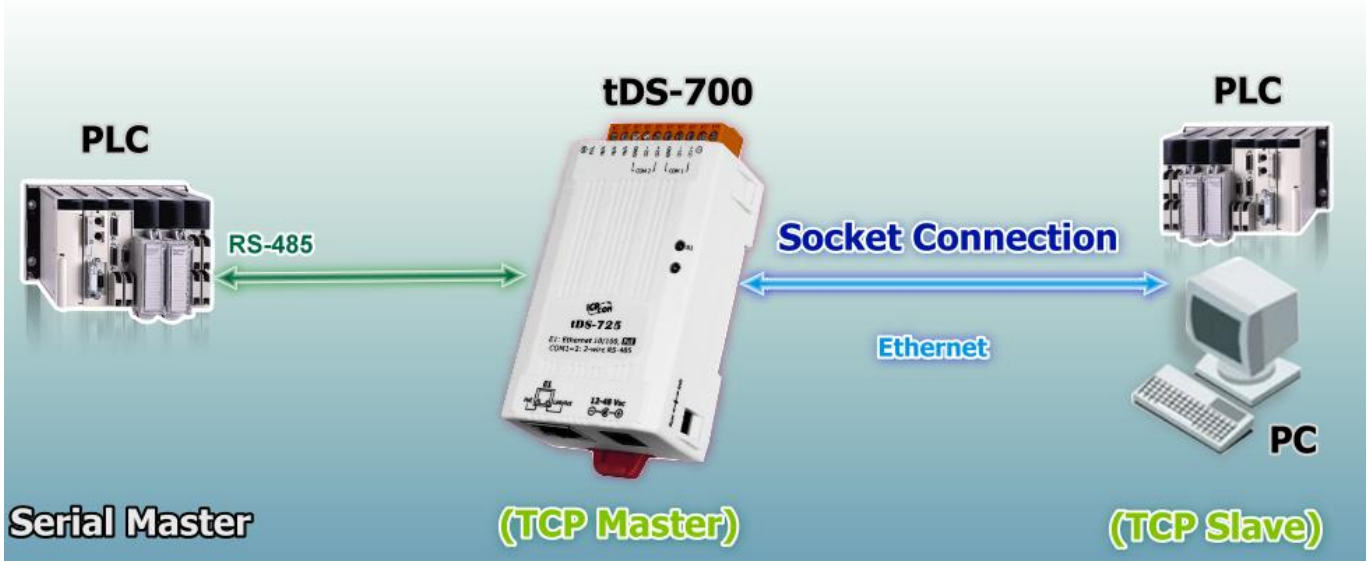
The Baud Rate and data format depend on the serial port settings for the web configuration above.

3. Test Successful.



5.5 TCP Client Mode Applications

In TCP Client Mode, the tDS-700 can establish a TCP connection to a specific TCP slave device actively by TCP server program. The whole system should operate like this:



For examples of TCP Client Mode test as follows:

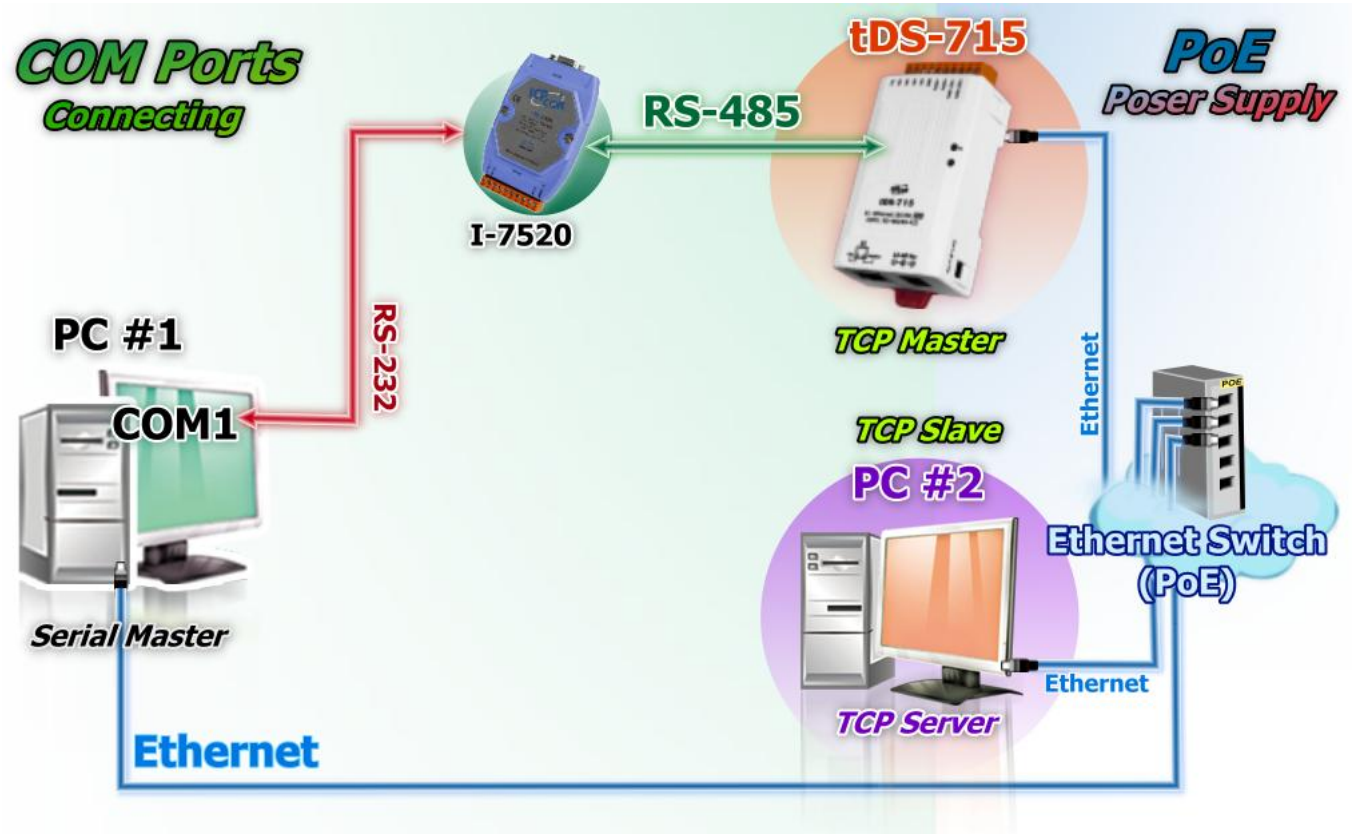
TCP Client Mode Settings Table:

Model	Port Settings (default)		Pair-connection settings		
	Baud Rate	Data Format	Server Mode	Remote Server IP	Remote TCP Port
tDS-700	115200	8, N, 1	Client	10.0.8.21	500
				IP address and TCP port of the PC#2 (TCP Server)	
PC#2 (TCP Server)	-	-	-	-	-
PC#1 (Serial Master)	115200	8, N, 1	-	-	-

Step 1: Connecting to a network, PC and Power supply

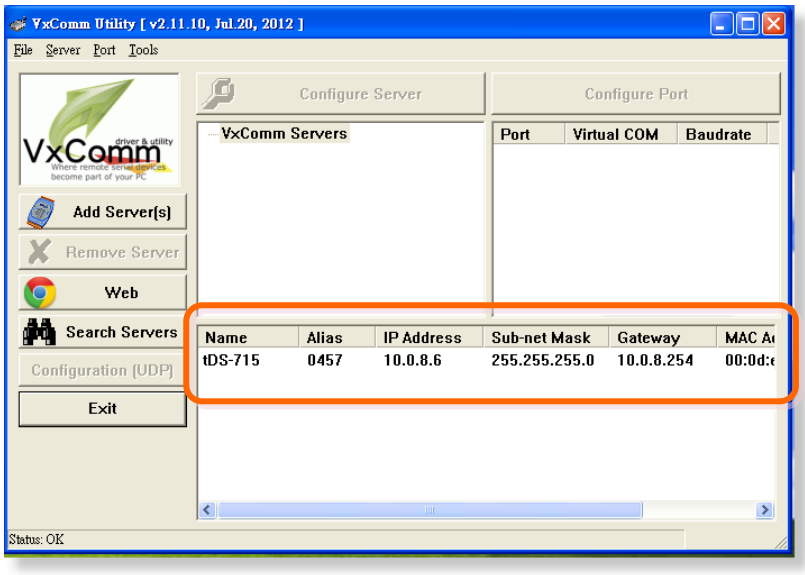
1. Confirm that the tDS-700 module is functioning correctly. Refer to section 3-1 “Connecting the power and Host PC” for more details.
2. Connect both the tDS-700, TCP server (PC #2) and hyper terminal (PC #1) to the same sub network or the same Ethernet Switch. For detailed RS-232/RS-422/485 wiring information, refer to section 2.7 “Wiring Notes”.

For wiring diagram as follows:



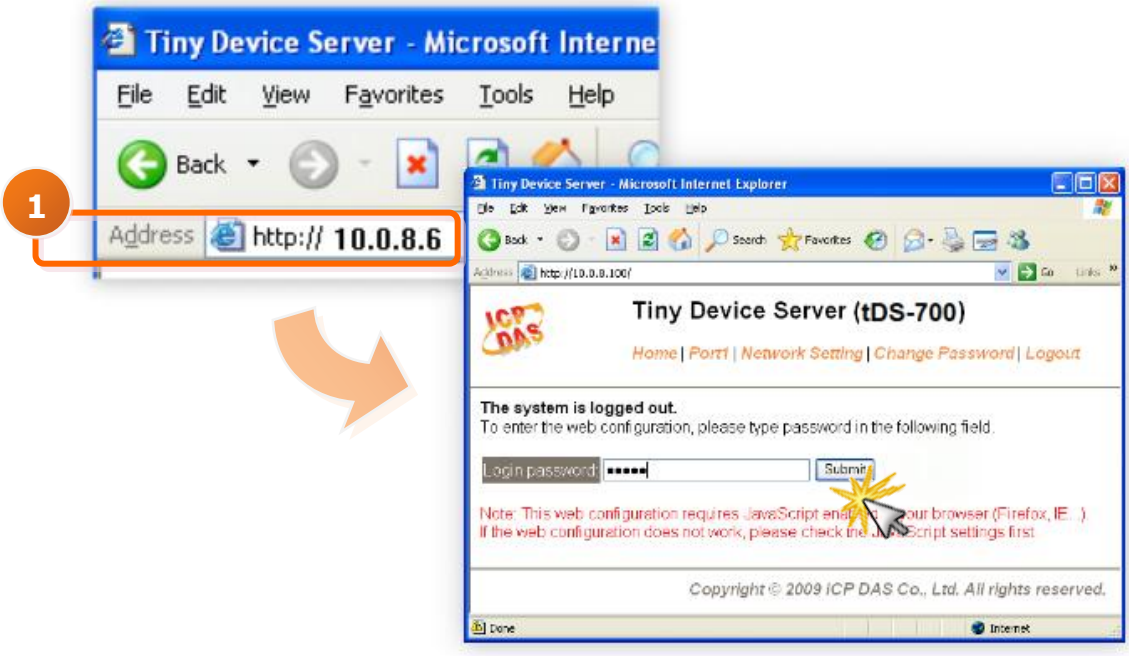
Step 2: Configuring Ethernet Settings

Contact your Network Administrator to obtain a correct and functioning network configuration for tDS-700 modules. Please also refer to section 3.3 "Search the tDS-700 on the Ethernet network".

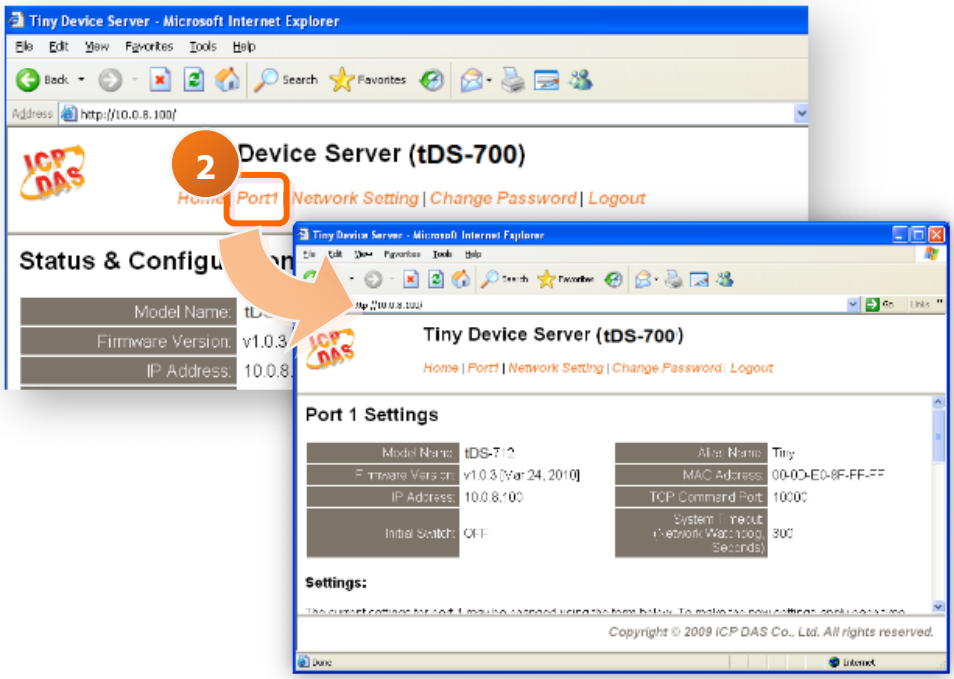


Step 3: Configuring Pair-Connection (TCP Client Mode) on tDS-700 web server

1. Enter the password (**default: admin**) in the Login password field, and then click the **"Submit"** button to enter the configuration page.



2. Click the **“Port1**” link to enter the settings page.

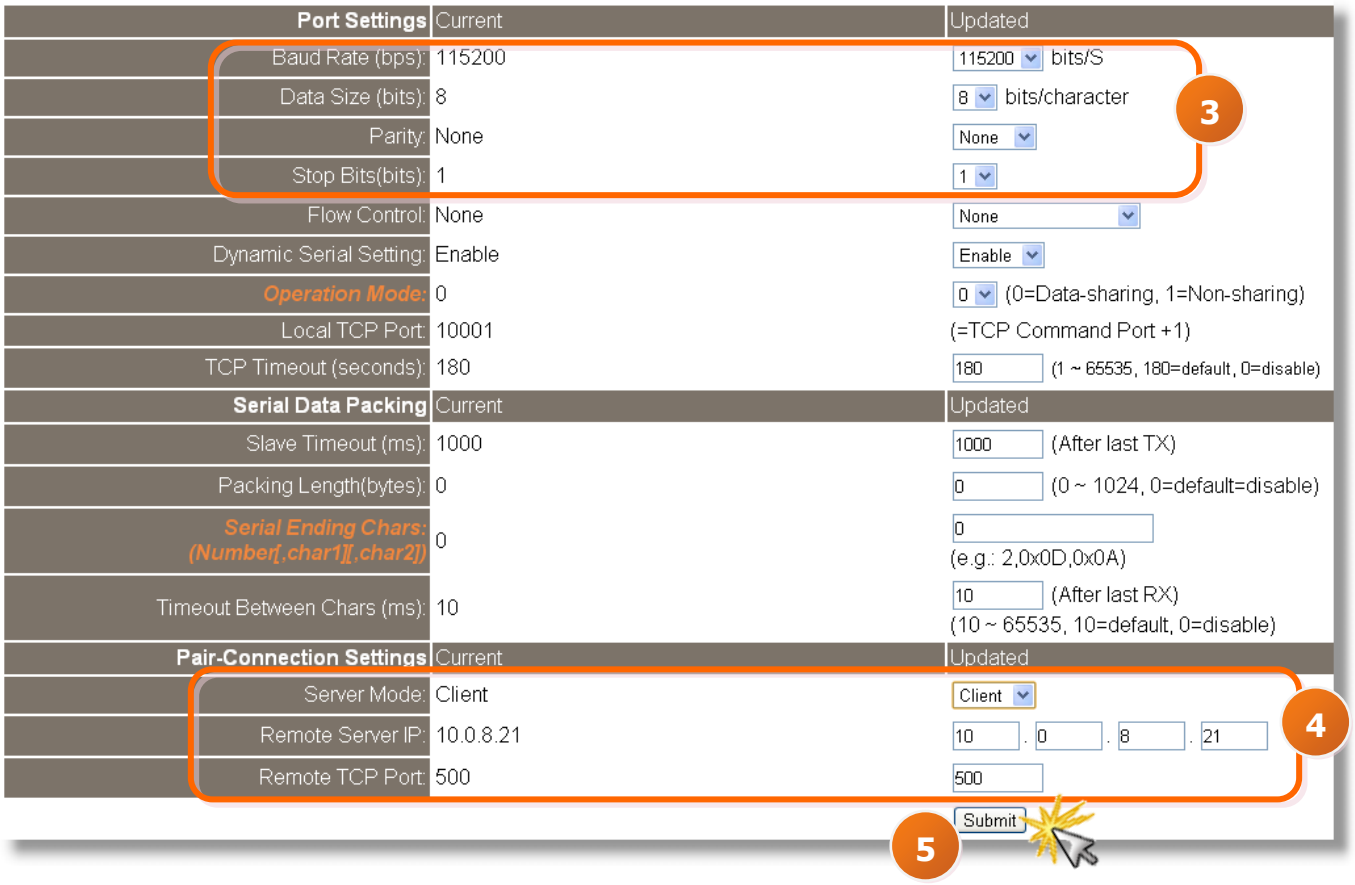


3. Select the appropriate **Baud Rate and Data Format** settings from the relevant drop down options, for example “**115200**” , “**8”, “None”** and **1**” .

4. The pair-connection settings area as follows:
   4.1 Select “**Client**” from the “**Server Mode**” drop down options
   4.2 Type the **IP address of the TCP Server (PC #2)** in the “**Remote Server IP**” field.
   4.3 Assign a **TCP port for the TCP Server (PC #2)** in the “**Remote TCP Port**” field.

5. Click the “**Submit**” button to complete the configuration.

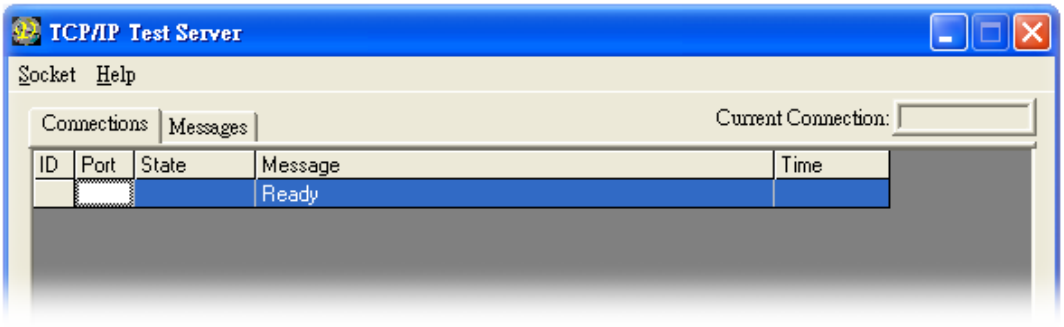
The Steps 3 ~ 5, please refer to the following illustration.



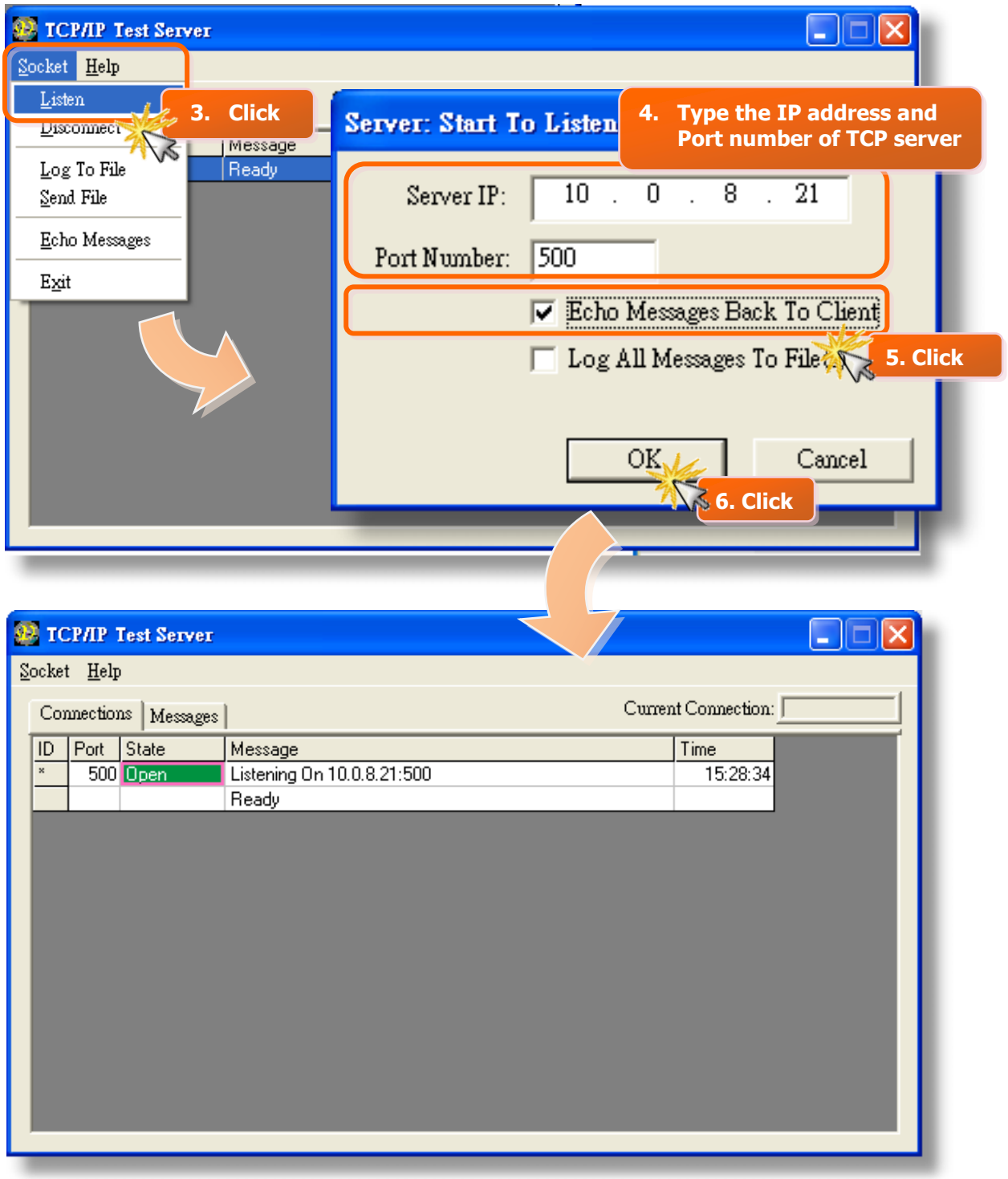
Step 4: Testing the Pair-Connection (TCP Client Mode) Function

1. Install TcpIpEcho.exe (TCP/IP Test Server program) on your PC.
   The software is located at:
   http://www.brothersoft.com/tcp-ip-test-server-27898.html

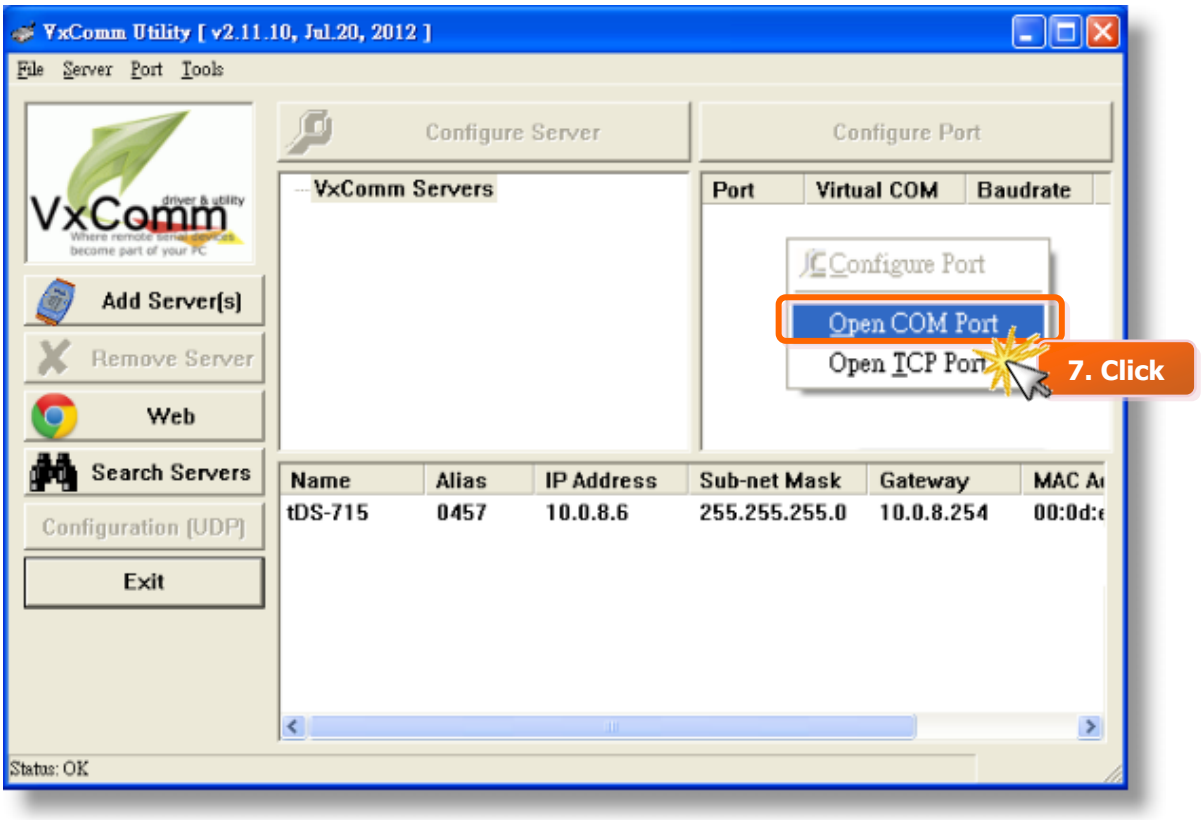
2. Run the TCPIPEcho.exe program.



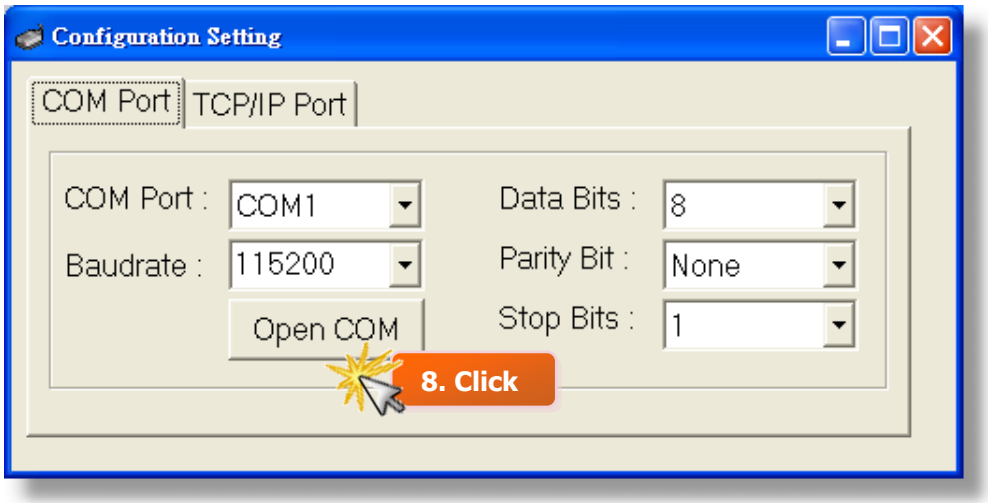
3. Click on **"Socket" → "Listen"**.
4. Type the **IP address** and **port number** of the TCP Server (PC#2) in the "**Server IP**" and "**Port Number**" field (for example "**10.0.8.21" and "500**").
5. Click the **"Echo Messages Back To Client"** check box.
6. After clicking the **"OK"** button, the server will begin listening on the specific IP/Port. This will be indicated an "Open" line in the TCP/IP Test Server dialog box.



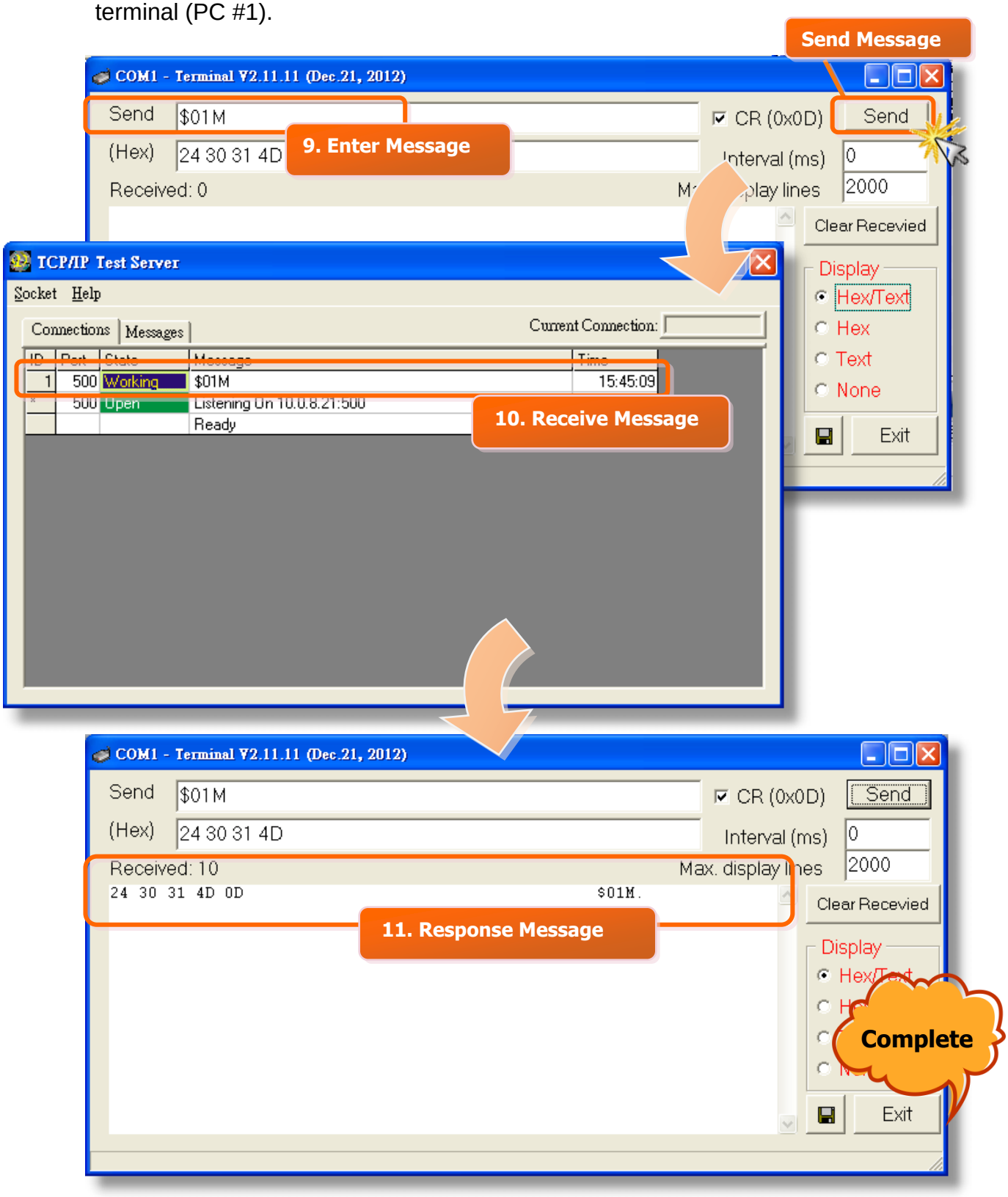
7. Right click in the "**Configure Port**" area and then choose the **"Open COM Port"** item under the VxComm utility.



8. Select the appropriate **COM Port**, **Baud Rate and Data Format** settings from the relevant drop down options (for example "**COM1**", "**115200**" , "**8", "None"** and **1**"), and then click the "**Open COM**" button.



9. Type a string in the send field and then click the "**Send**" button on the COM1 terminal (PC #1).
10. Confirm that TCP server (PC #2) will receive this string under the TCP/IP Test Server.
11. When a response is received, it will be displayed in the received field on the COM1 terminal (PC #1).

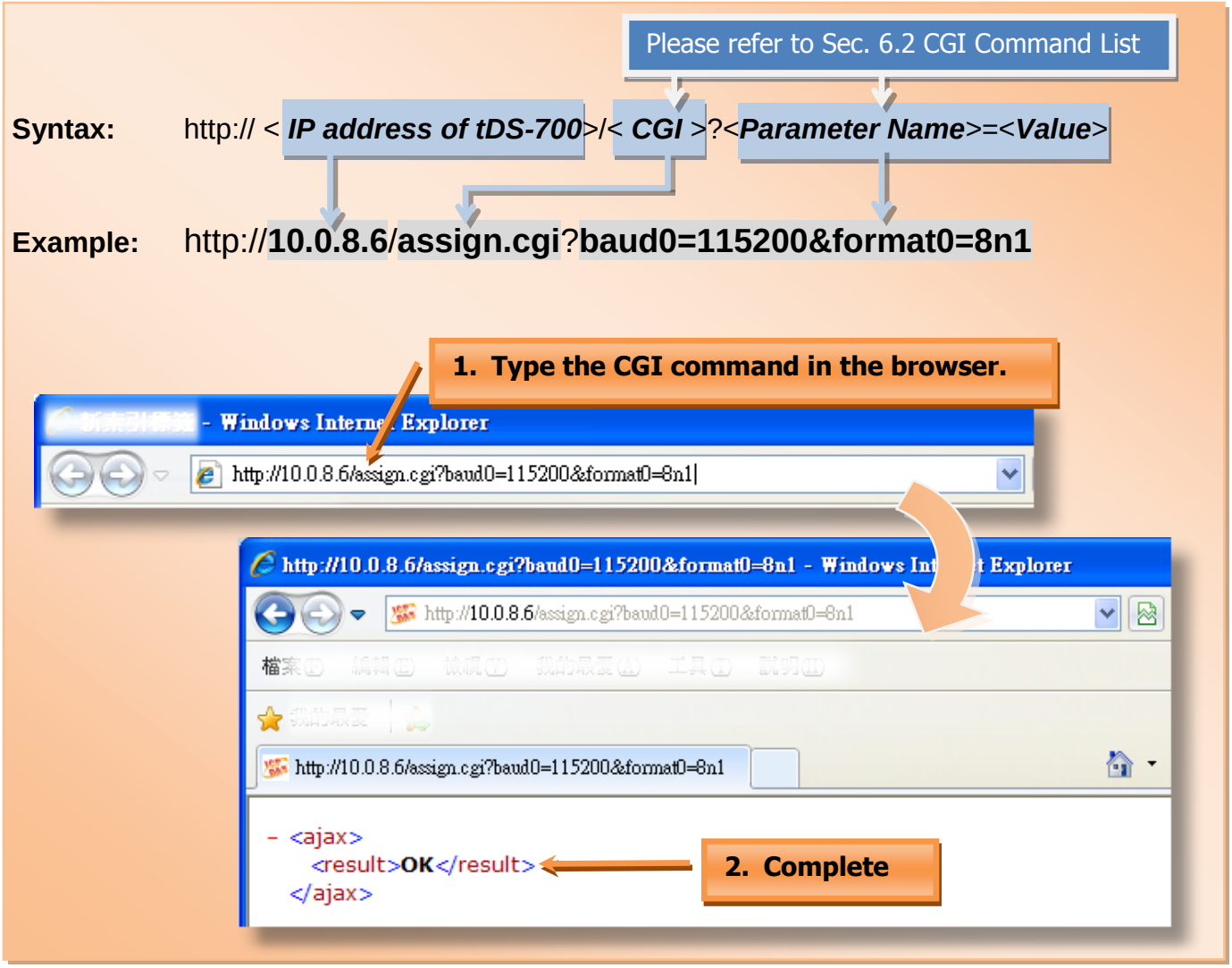


6. CGI Configuration

The tDS-700 series can be configured via convenient URL commands. This section lists the commands in URL format corresponding to the basic functions of tDS-700. Please make sure you have correctly configured the network settings for the tDS-700 before using CGI configuration. (Please refer to section 3 "Setting up the tDS-700 module" about the Ethernet settings.)

6.1 CGI URL Syntax

Type the CGI URL syntax in the browser, as follows:



6.2 CGI Command List

Network Settings				
No.	**Function Name**	**Parameter Name**	**Value Constraint**	**CGI**
01	Set Address Type	dhcp	0,1 0: Disable; 1: Enable;	assign.cgi
02	Set IP Address	ip	xxx.xxx.xxx.xxx	
03	Set Gateway	gway	xxx.xxx.xxx.xxx	
04	Set Net Mask	mask	xxx.xxx.xxx.xxx	
05	Set TCP Command Port	cmdport	1~65535 Default: 10000	
06	Set Command Port Timeout (Socket Watchdog)	cmdwdt	1~65535 seconds, Default: 30; Disable: 0;	
07	Set MAC Address	mac	Format: FF-FF-FF-FF-FF-FF	
08	Set Alarm IP Address(UDP)	aip	xxx.xxx.xxx.xxx	
09	Set Alarm Port(UDP)	aport	1~65535 seconds, Default: 30; Disable: 0;	

General Configuration Settings				
No.	**Function Name**	**Parameter Name**	**Value Constraint**	**CGI**
01	Set Alias Name	aliname	Max. 18 chars	assign.cgi
02	Set System Timeout	syswdt	30 ~ 65535 seconds, Default: 300; Disable: 0	

Filter Settings				
No.	**Function Name**	**Parameter Name**	**Value Constraint**	**CGI**
01	Add IP to List (white list)	fip0 ~ fip4 fipm0 ~ fipm4 (mask)	xxx.xxx.xxx.xxx	assign.cgi
02	Delete IP#	delfip	0 ~ 4	
03	Delete All	delfip	all	

Serial Port Settings

No.	Function Name	Parameter Name	Value Constraint	CGI
01	Set Baud Rate	baud0 & baud1	(bits/S)	assign.cgi
02	Set Data Format	format0 & format1	8n1 Data bits: 5 ~ 8; Parity: n, e, o, m, s; Stop bits: 1, 2;	
03	Set Flow Control	flow0 & flow1	0,1 0: None; 1: CTS/RTS	
04	Set Dynamic Serial Setting	dyna0 & dyna1	0,1 0: Disable; 1: Enable	
05	Set Serial Ending Chars	endchr0 & endchr1	Number[,char1][,char2]	
06	Set Operation Mode	opmode0 & opmode1	0,1	
07	Set Slave Timeout	slto0 & slto1	(ms)	
08	Set Data Buffer Delay Time	dbdt0 & dbdt1	(ms)	
09	Set Packing Length	Packlen0 & packlen1	0 ~ 255 bytes	
10	Set TCP Timeout	tto0 & tto1	1~65535 seconds, Default: 180; Disable: 0	

Restore Factory Defaults

No.	Function Name	Parameter Name	Value Constraint	CGI
01	Reboot	-	-	Reboot.cgi
02	Reset To Factory	-	-	Reset.cgi

Queries Setting Status

No.	Function Name	Access Method	Parameter Name	Value Constraint	CGI
01	Get module status.	-	-	-	status.cgi
02	Get the serial port configuration information.	-	-	-	conf_port.cgi
03	Get the network configuration information.	-	-	-	conf_net.cgi

Appendix: Glossary

1. ARP (Address Resolution Protocol)

Consider two machines A and B that share a physical network. Each has an assigned IP address IP_A and IP_B, and a MAC address, MAC_A and MAC_B. The goal is to devise low-level software that hides MAC addresses and allows higher-level programs to work only with the IP addresses. Ultimately, however, communication must be carried out by the physical networks using whatever MAC address scheme the hardware supplies.

Suppose machine A wants to send a packet to machine B across a physical network to which they are both attached, but A only has the Internet address for B, IP_B. The question arises: how does A map that address to the MAC address for B, MAC_B?

ARP provides a method of dynamically mapping 32-bit IP address to the corresponding 48-bit MAC address. The term dynamic is used since it happens automatically and is normally not a concern for either the application user or the system administrator.

2. Clients and Servers

The client-server paradigm uses the direction of initiation to categorize whether a program is a client or server. In general, an application program that initiates peer-to-peer communication is called a client. End users usually invoke client programs when they use network services.

Most client programs consist of conventional application program development tools. Each time a client program is executed, it contacts a server, sends a request and waits for a response. When the response arrives, the client program continues processing. Client programs are often easier to develop than servers, and usually require no special system privileges to operate.

By comparison, a server is any program that waits for incoming requests from a client program. The server receives a request from a client, performs the necessary computation and returns the result to the client.

3. Ethernet

The term Ethernet generally refers to a standard published in 1982 by Digital Equipment Corp., Intel Corp. and Xerox Corp. Ethernet is the most popular physical layer local area network (LAN) technology today. Ethernet is a best-effort delivery system that uses CSMA/CD technology. It recognizes hosts using 48-bit MAC address.

4. Firmware

Firmware is an alterable program located or stored in the semi-permanent storage area, e.g., ROM, EEPROM, or Flash memory.

5. Gateway

Computers that interconnect two networks and pass packets from one to the other are called Internet Gateways or Internet Routers. Gateways route packets that are based on the destination network, not on the destination host.

6. ICMP (Internet Control Messages Protocol)

No system works correctly all the time. ICMP provides a method of communicating between the Internet Protocol software on one machine and the Internet Protocol software on another. It allows gateways to send error or control messages to other gateways or allows a host to know what is wrong with the network communication.

7. Internet

Physically, the Internet is a collection of packet switching networks interconnected by gateways that together with TCP/IP protocol, allows them to perform logically as a single, large and virtual network. The Internet recognizes hosts using 32-bit IP address.

8. IP (Internet Protocol) address

Every interface on the Internet must have a unique IP address (also called an Internet address). These addresses are 32-bit numbers. They are normally written as four decimal numbers, one for each byte of the address such as “192.168.41.1”. This is called dotted-decimal notation.

9. MAC (Media Access Control) address

To allow a computer to determine which packets are meant for it, each computer attached to an Ethernet is assigned a 48-bit integer known as its MAC address (also called an Ethernet address, hardware address or physical address). They are normally written as eight hexadecimal numbers such as "**00:71:88:af:12:3e:0f:01**". Ethernet hardware manufacturers purchase blocks of MAC addresses and assign them in sequence as they manufacture the Ethernet interface hardware. Thus, no two hardware interfaces have the same MAC address.

10. Packet

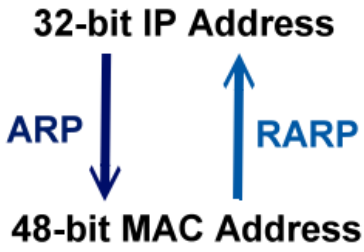
A packet is the unit of data sent across a physical network. It consists of a series of bits containing data and control information, including the source and the destination node (host) address, and is formatted for transmission from one node to another.

11. Ping

Ping sends an ICMP echo request message to a host, expecting an ICMP echo reply to be returned. Normally, if a host cannot be pinged, you won't be able to use Telnet or FTP to connect to the host. Conversely, if Telnet or FTP cannot be used to connect to a host, Ping is often the starting point to determine what the problem is.

12. RARP (Reverse Address Resolution Protocol)

RARP provides a method of dynamically mapping 48-bit MAC address to the corresponding 32-bit IP address.



13. Socket

Each TCP segment contains the source and destination port number that can be used to identify the sending and receiving application. These two values, along with the source and destination IP address in the IP header, uniquely identify each connection.

The combination of an IP address and a port number is called a socket.

14. Subnet Mask

The Subnet mask is often simply called the mask. Given its own IP address and its subnet mask, a host can determine if a TCP/IP packet is destined for a host that is (1) on its own subnet, or (2) on a different network. If (1), the packet will be delivered directly; otherwise it, will be delivered via a gateway or router.

15. TCP (Transmission Control Protocol)

TCP provides a reliable flow of data between two hosts and is associated with tasks such as dividing the data passed to it from applications into appropriately sized chunks for the network layer below, acknowledging received packets, setting timeouts to make certain that the other end acknowledges packets that are sent, and so on.

16. TCP/IP

The Transmission Control Protocol (TCP) and the Internet Protocol (IP) are the standard network protocols. They are almost always implemented and used together in a formation is known as TCP/IP. TCP/IP can be used to communicate across any set of interconnected networks.

17. UDP (User Datagram Protocol)

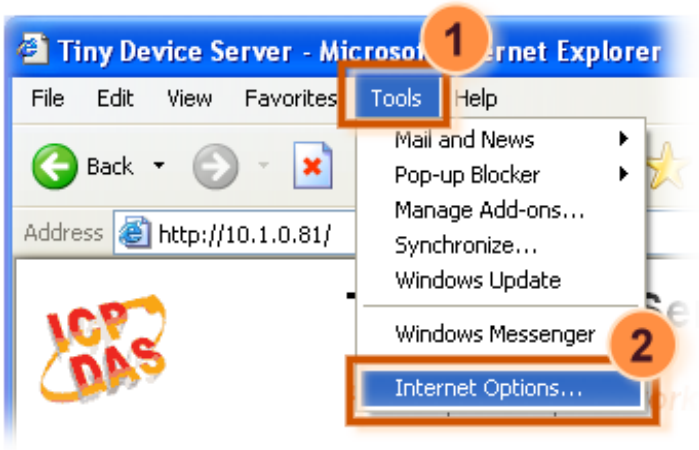
UDP provides a much simpler service to the application layer as if just sends packets of data from one host to the other, but there is no guarantee that the packets will reach the destination host.

Appendix: FAQ

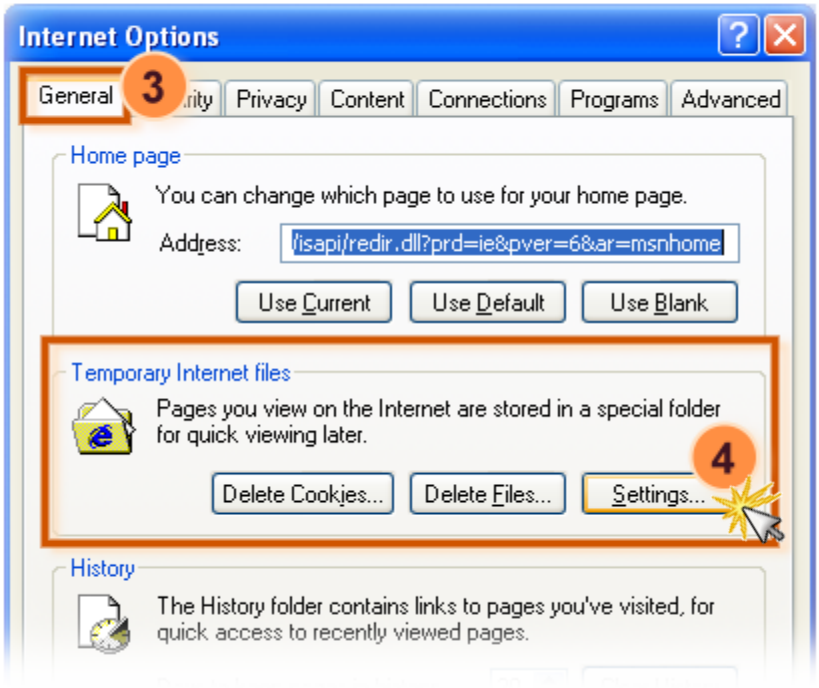
1. How to avoid browser access error that causes a blank page to be displayed when using IE?

Disable the IE cache in the following manner:

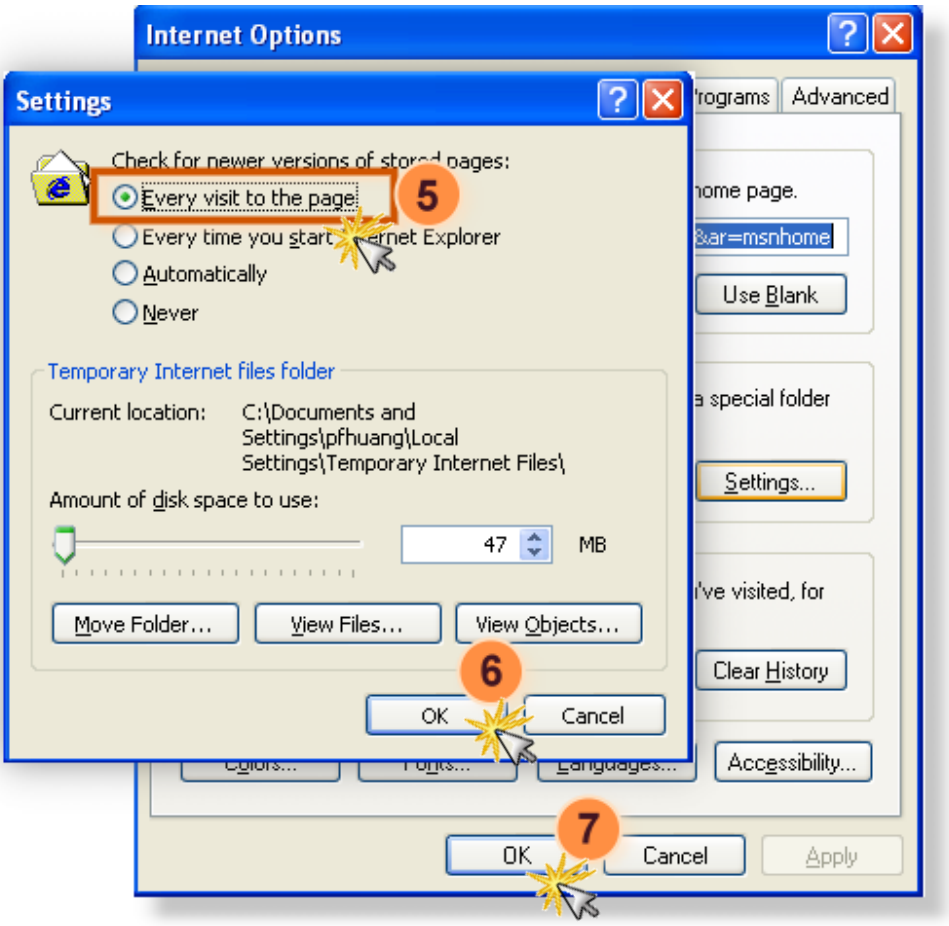
Step 1: Click **"Tools"** >> "**Internet Options...**".



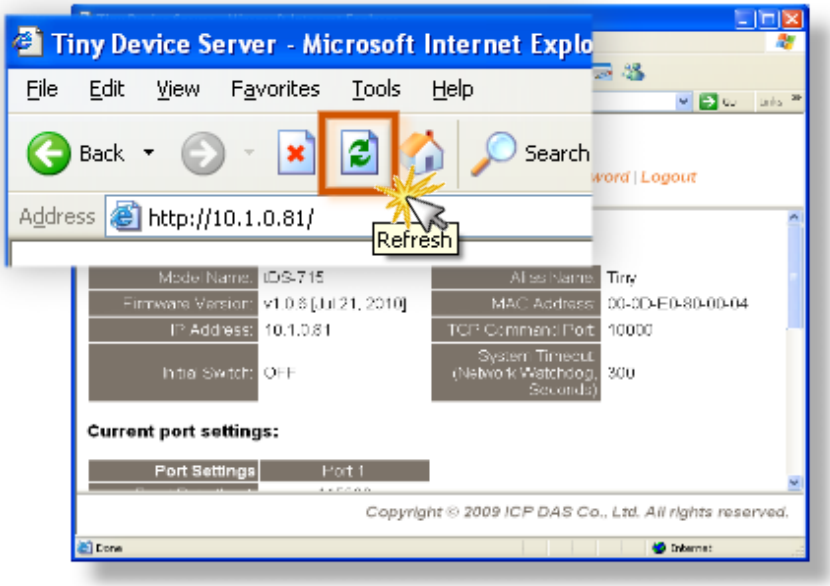
Step 2: Click the "**General**" tab and then click the "**Settings...**" button in the Temporary Internet files frame of the Internet Options dialog.



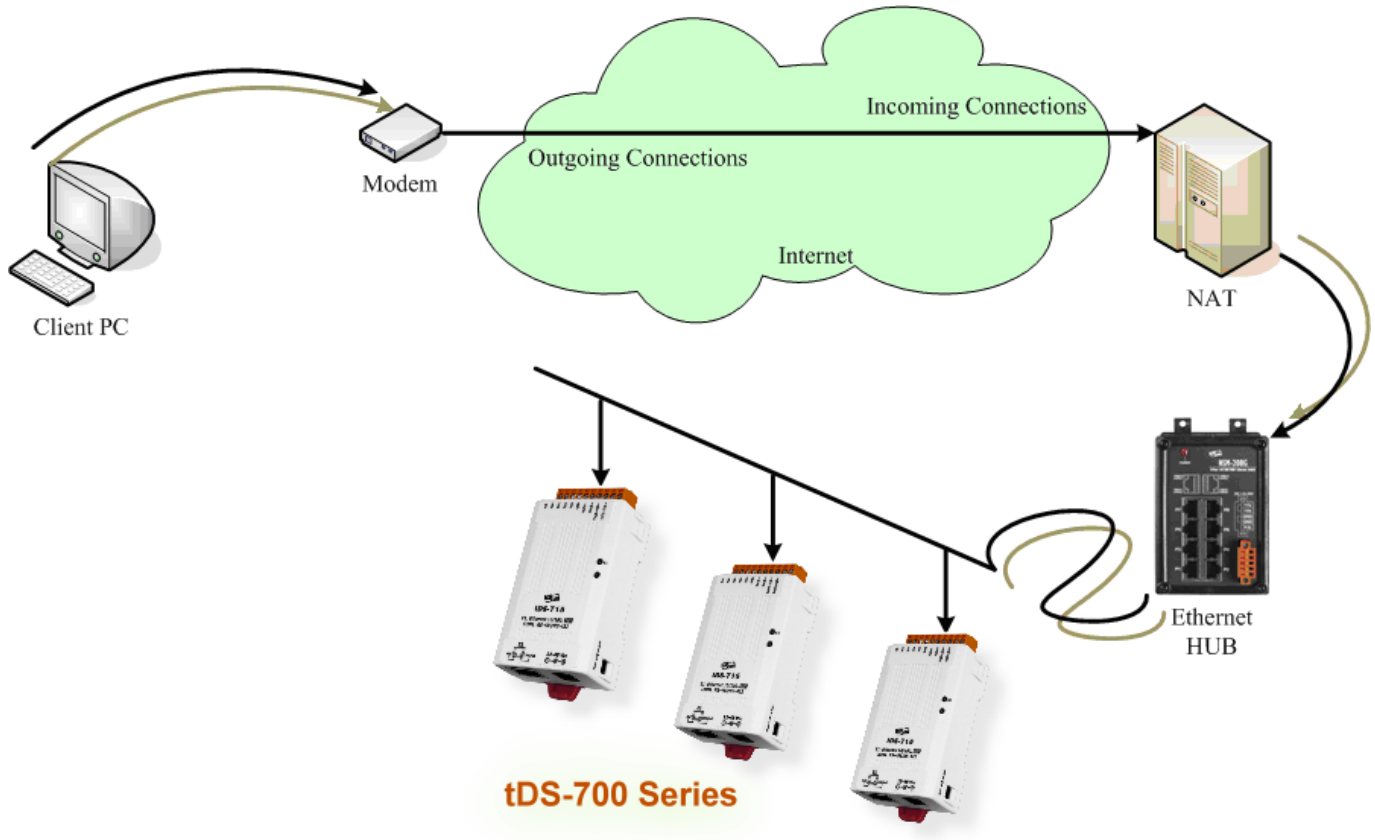
Step 3: Select the "**Every visit to the page**" option and then click the "**OK**" button in both the Settings dialog and the Internet Options dialog.



Step 4: Click the "**Refresh**" button or press F5 on your keyboard to refresh the tDS-700 web server, or re-open IE.



2. How to access a remote tDS-700 that is located behind an NAT or a firewall?



The **remote site must have an NAT** server (or a router that supports NAT). NAT stands for Network Address Translator.

By using (configuring) the NAT server, **NAT can forward (bypass) all specified TCP port connections to specified tDS-700 devices**.

> ***For example:***
>
> **NAT: 10000 ~ 10003 maps to 192.168.1.101: 10000 ~ 10003**
>
> **NAT: 10010 ~ 10013 maps to 192.168.1.102: 10000 ~ 10003**

Please note, if your NAT (router) includes a built-in firewall feature, you will have to **configure the NAT to allow incoming TCP port** connections.

> ***For example:***
>
> **TCP port includes 10000 ~ 10003 and 10010 ~ 10013 of NAT.**

In the VxComm Utility, you have to **add the tDS-700 using the NAT address and the NAT TCP ports instead** of the tDS-700's settings.

> ***For example:***
>
> **To add the first tDS-700, it's IP: Port should be NAT: 10000.**
>
> **To add a second tDS-700, it's IP: Port should be NAT: 10010.**

3. Does the VxComm Driver (PC) support auto-reconnection after fixing a network break?

Yes, the **VxComm Driver** (PC) supports the auto-reconnection mechanism in version 2.00 and above. The **VxComm Utility** allows the user to set the Keep-Alive Time (ms) and Connection-Broken Time (ms) in the server options.

For more details, refer to the **"Adding a PDS server and configuring the VxComm Driver"** section of the **VxComm Driver/Utility** User Manual.

The VxComm Driver/Utility user manual is located at:
CD: \NAPDOS\Software\VxComm_Driver/manual/
http://ftp.icpdas.com/pub/cd/tinymodules/napdos/software/vxcomm_driver/manual/

4. Why does the tDS-700 series module fail on a (public) Internet connection?

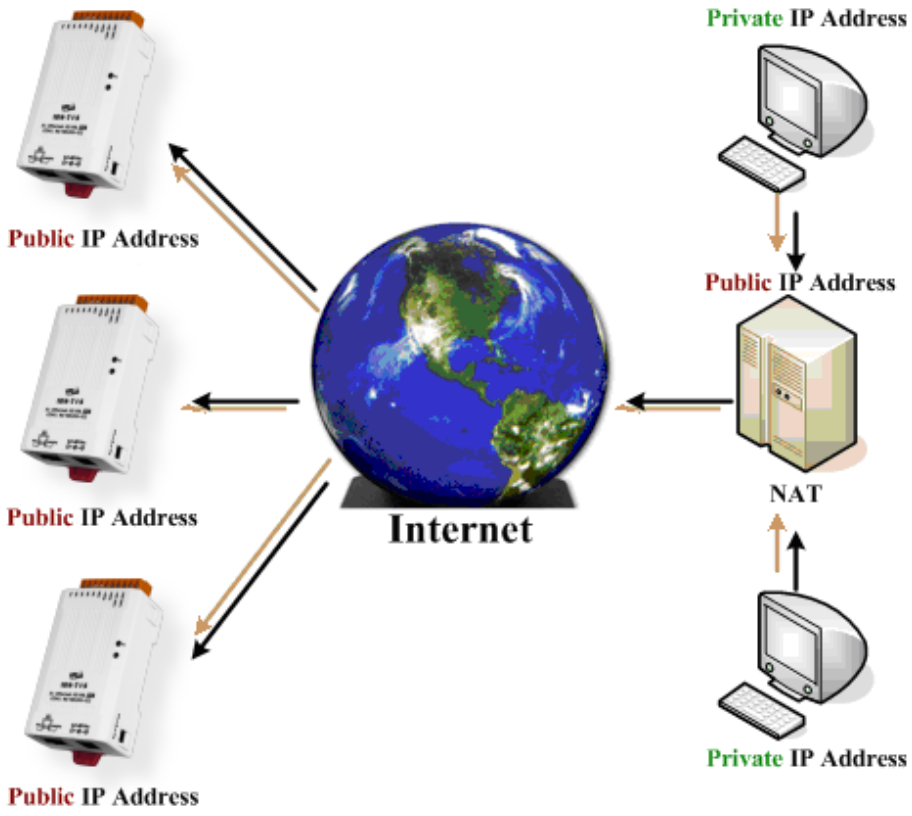
The default IP address of the tDS-700 series module is 192.168.255.1, which can be only used on a private Internet connection. A private network packet will not be routed via a (public) Internet connection, which is the reason why the tDS-700 series module failed on the Internet.

The IANA has reserved three address spaces for private internets (RFC1918).

10.0.0.0 - 10.255.255.255 (10/8 prefix)
172.16.0.0 - 172.31.255.255 (172.16/12 prefix)
192.168.0.0 - 192.168.255.255 (192.168/16 prefix)

However, tDS-700 series modules are able to be operated on the Internet using a legal public IP address. This address can be obtained from your ISP or network administrator.

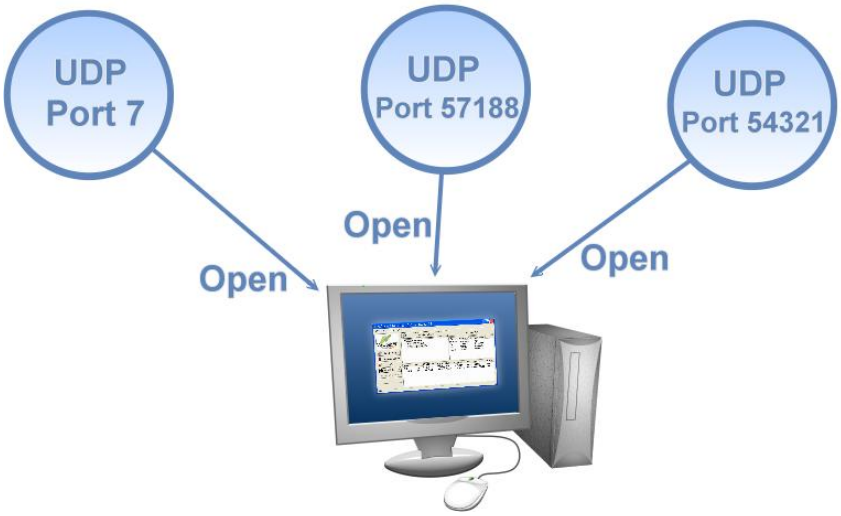
A private Internet client may communicate with a public Internet server (tDS-700 series module) only if the NAT service for the client is available.



Note!!

IANA	Internet Assigned Numbers Authority
RFC	Request for Comments
ISP	Internet Service Providers
NAT	Network Address Translator

5. Why cannot computer ping or search the tDS-700 series module?



The computer can make a communication with the module through some specific ports. Please confirm with your network administrator that UDP Port 7, Port 57188 and Port 54321 can't be denying by network device.

About the detailed information of TCP/UDP port refers to following table:

- **TCP Port:**

Port Number	Description
80	HTTP (HyperText Transport Protocol)
10000	Command Port
10001	Serial Port for COM1
10002	Serial Port for COM2
10003	Serial Port for COM3

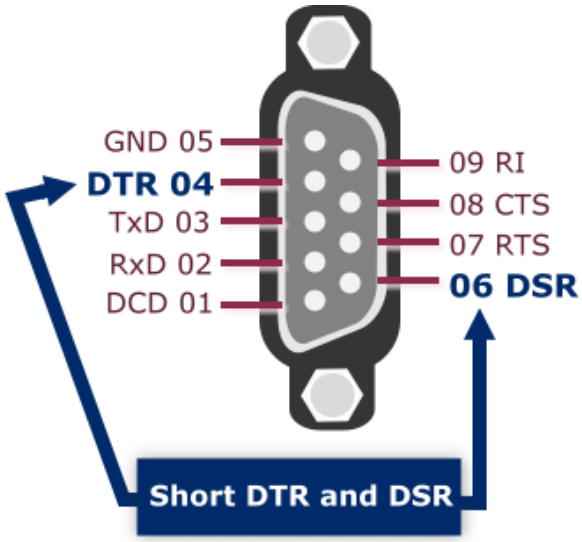
- **UDP Port:**

Port Number	Description
7	Echo (Ping)
57188	Request of UDP search
54321	Response of UDP search

6. How to wire a 5-wire tDS-712 with a 9-wire PLC?

In order to make tDS-712 have a proper wire with 9-wire PLC/device, please short DTR/DSR pin on PLC's end because tDS-712 is equipped with one 5-wire RS-232 port.

Take following standard RS-232 DB-9 for example:



The tDS-712 (5-wire RS-232) connects PLC (9-wire RS-232):

tDS-712				PLC		
Description	PIN		Short	PIN		Description
-	-	1		1	DCD	Data Carrier Detect
Receive Data	RxD	2		2	RxD	Receive Data
Transmit Data	TxD	3		3	TxD	Transmit Data
-	-	4		4	DTR	Data Terminal Ready
Signal Ground	GND	5		5	GND	Signal Ground
-	-	6		6	DSR	Data Set Ready
Request to Send	RTS	7		7	RTS	Request to Send
Clear to Send	CTS	8		8	CTS	Clear to Send
-	-	9		9	RI	Ring Indicator

7. How to avoid poor communication on the RS-485 interface in long distance transmission?

User need to consider the problem of impedance matching in this situation. It is possible to occur the poor communication or unstable issue when applying in long-distance communication of RS-485 interface. In order to eliminate or avoid the occurrence of this problem, you can choose the following two ways to a try:

1. Add termination resistors (120 Ohm) on both side of RS-485 if communication is not stable. Refer to the following figure, it can show you how to set up.

2. Reduce the Baud rate of serial port. If possible, you had better not configure the baud rate higher than 9600 kbps.

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