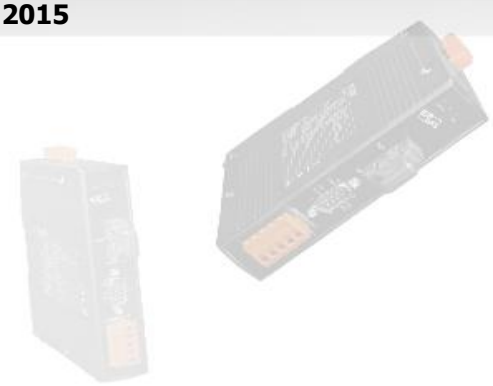
PDS-220Fx Series
User Manual

Version 1.2, April 2015



Service and usage information for

PDS-220FT

PDS-220FC

PDS-220FCS

PDS-220FCS-60

Warranty

All products manufactured by ICP DAS are under warranty regarding defective materials for a period of one year, starting from the date of delivery to the original purchaser.

Warning

ICP DAS assumes no liability for damages resulting from 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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If you have any question, please feel free to contact us.
We will give you quick response within 2 workdays.

Email: service@icpdas.com , service.icpdas@gmail.com

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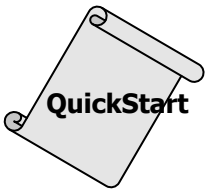
Packing List

The package includes the following items:

- One PDS-220Fx Series hardware module
- One software utility CD
- One Quick Start Guide



Note:
If any of these items are missed or damaged, contact the local distributors for more information. Save the shipping materials and cartons in case you want to ship in the future.

More Information

Documentations

CD: Napdos\PDS\PDS-220Fx\Document
http://ftp.icpdas.com/pub/cd/8000cd/napdos/pds/pds-220fx/document/

VxComm Driver (Virtual COM)

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

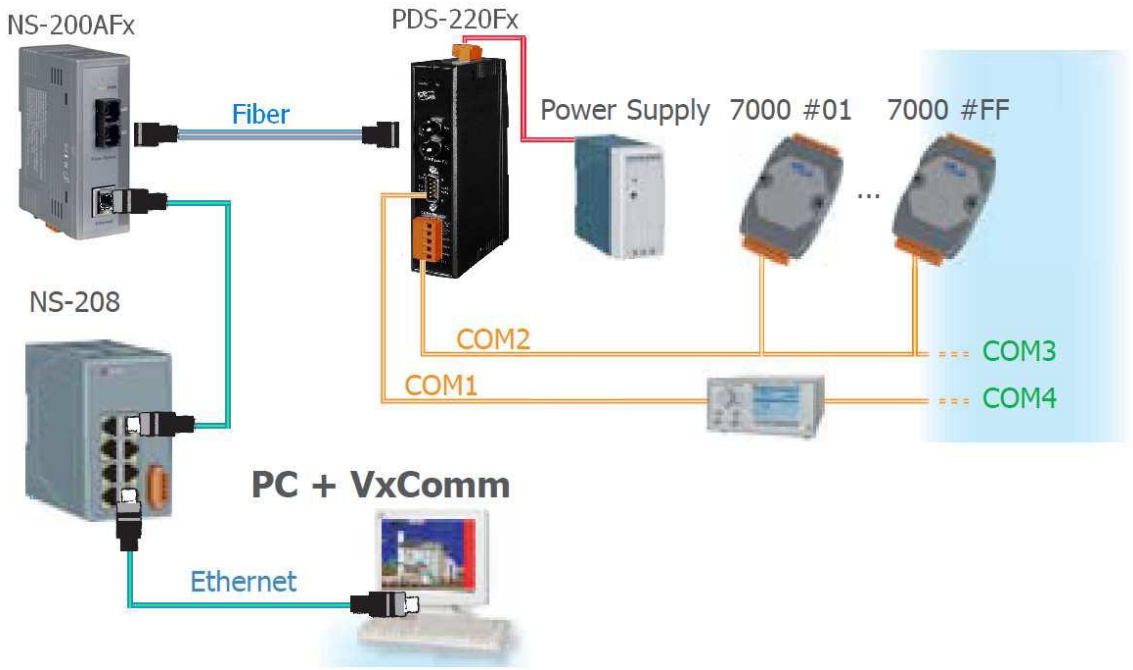
Firmware

CD:\ Napdos\PDS\PDS-220Fx\VxComm\Server(PDS)\
http://ftp.icpdas.com/pub/cd/8000cd/napdos/pds/pds-220fx/vxcomm/server(pds)/

MiniOS7

CD:\NAPDOS\PDS\PDS-220Fx\OS_image
http://ftp.icpdas.com/pub/cd/8000cd/napdos/pds/pds-220fx/os_image/

1. Introduction



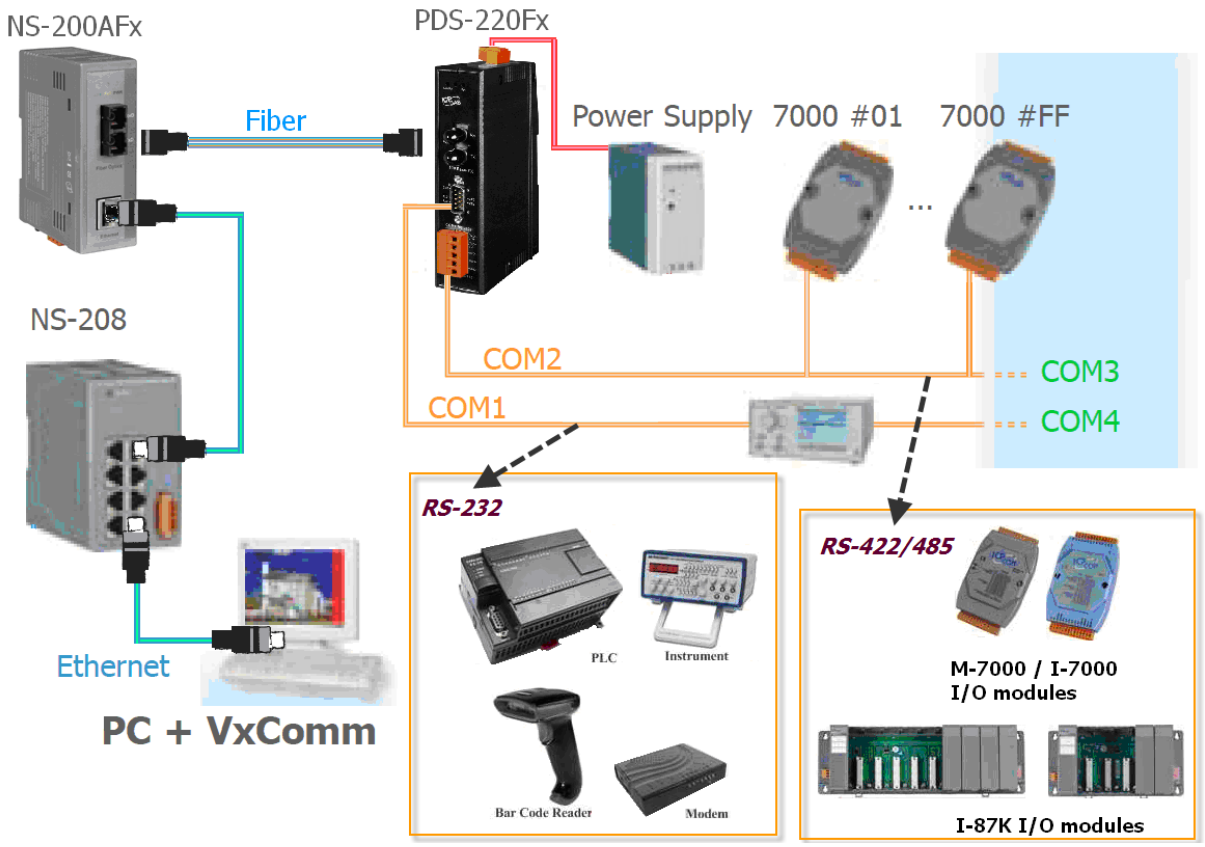
The PDS-220Fx series is a family of Programmable Device Servers, also known as "Serial-to-Ethernet gateway", that are designed for adding optical fiber connectivity to RS-232/422/485 devices.

The user-friendly VxComm Driver/Utility allows users to easily turn the built-in COM ports of the PDS-220Fx series into standard COM ports on a PC. By virtue of its protocol independence, a small-core OS and high flexibility, the PDS-220Fx series is able to meet the demands of every network-enabled application.

The PDS-220Fx series includes a powerful and reliable Xserver programming structure that allows you to design your robust Ethernet applications in one day. The built-in, high-performance MiniOS7 boots the PDS-220Fx up in just one second and gives you fastest responses.

The PDS-220Fx is equipped with 1 RS-232 port and 1 RS-485/422 port. The removable on-board terminal block connector is designed for easy and robust wiring in industrial situations.

1.1 Why Fiber Optic Solutions?



The fiber-optic communications permits transmission over longer distances than other forms of communications because of the signals travel along them with less loss and no crosstalk. It has following important features: Immunity to electromagnetic interference (EMI) — Motors, relays, welders and other industrial equipment generate a tremendous amount of electrical noise that can cause major problems with copper cabling.

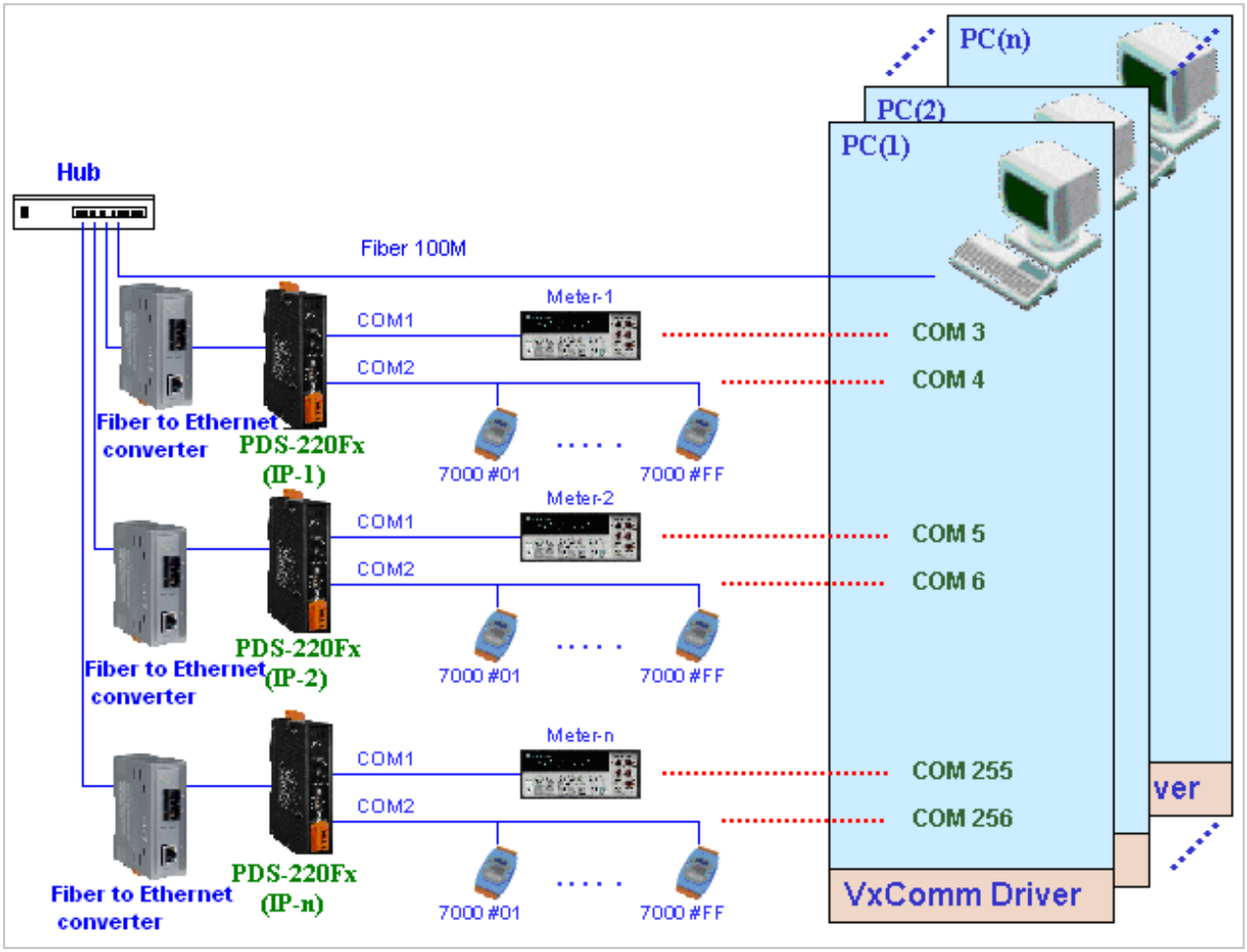
- High electrical resistance, making it safe to use near high-voltage equipment or between areas with different earth potentials.
- No sparks — important in flammable or explosive gas environments.
- Not electromagnetically radiating, and difficult to tap without disrupting the signal — important in high-security environments.
- Because of these reasons, optical fibers have largely replaced copper wire communications in core networks in the developed world.

Because of these reasons, optical fibers have largely replaced copper wire communications in core networks in the developed world.

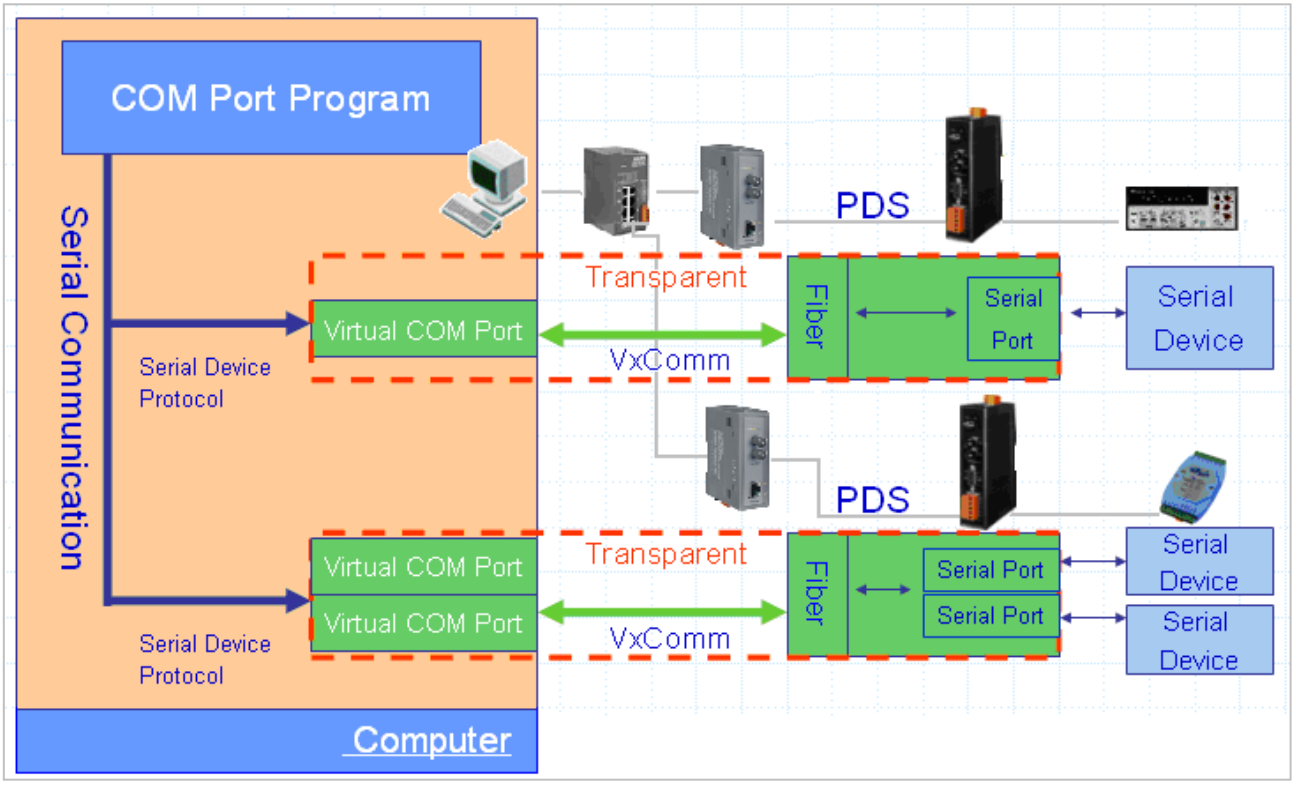
1.2 Why VxComm Technology?

In general, writing a TCP/IP program is more difficult than a COM port program, or the COM port communication system was built many years ago.

As a result, a new technology, **VxComm** was developed to **virtualize the COM ports of the PDS to allow up to 256 COM Ports to be used on the 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.

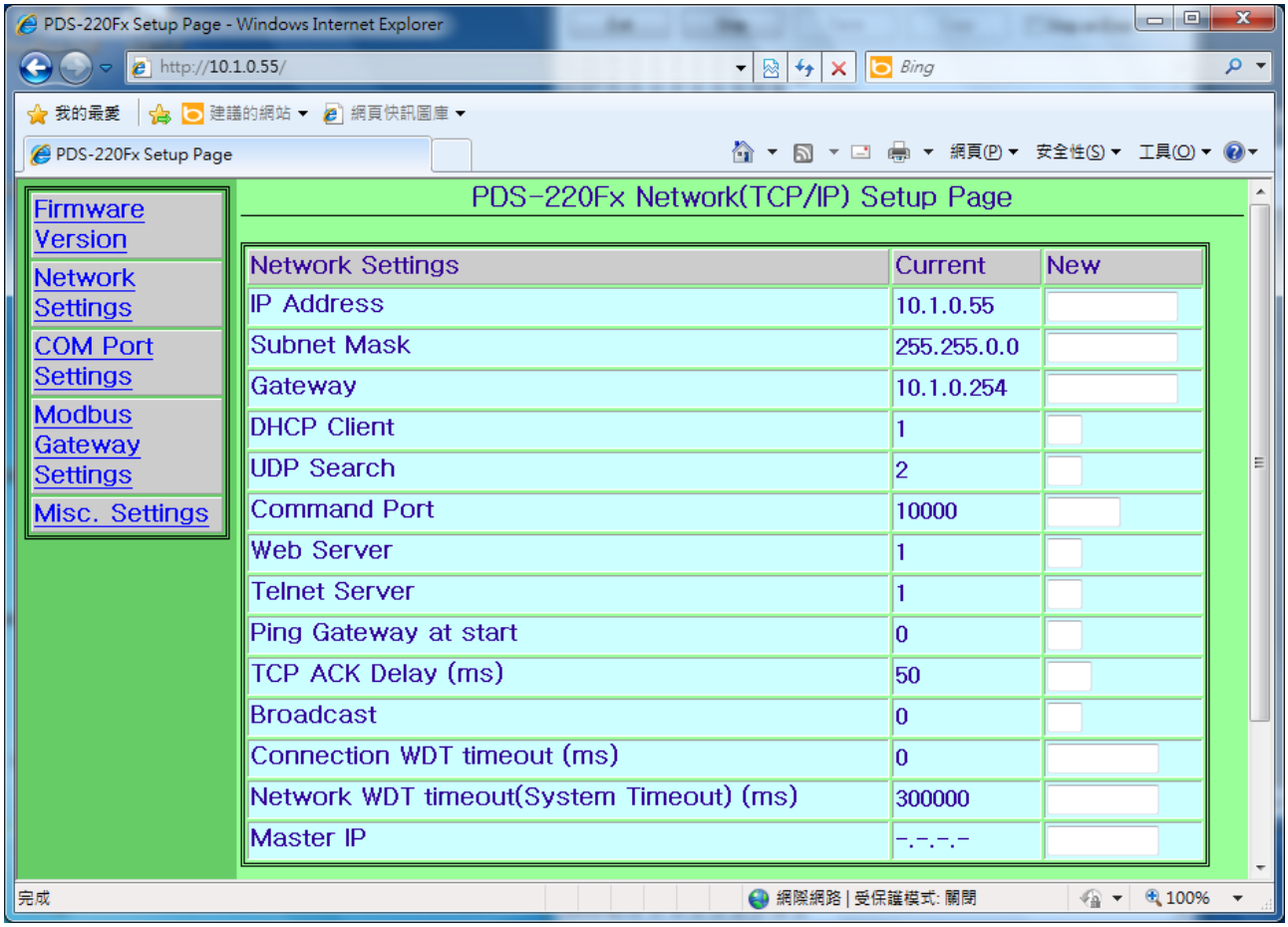


The VxComm driver controls all the details of the Ethernet TCP/IP programming technique; your COM port program will be able to access your serial devices through Ethernet in the same way as through COM port with the assistance of PDS-220Fx and VxComm technology.



1.3 Why Web Server Technology?

Web server technology enables configuration of the PDS-220Fx series 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 PDS-220Fx series via an Ethernet network without needing to install any other software tools; thereby reducing the user's learning carve.

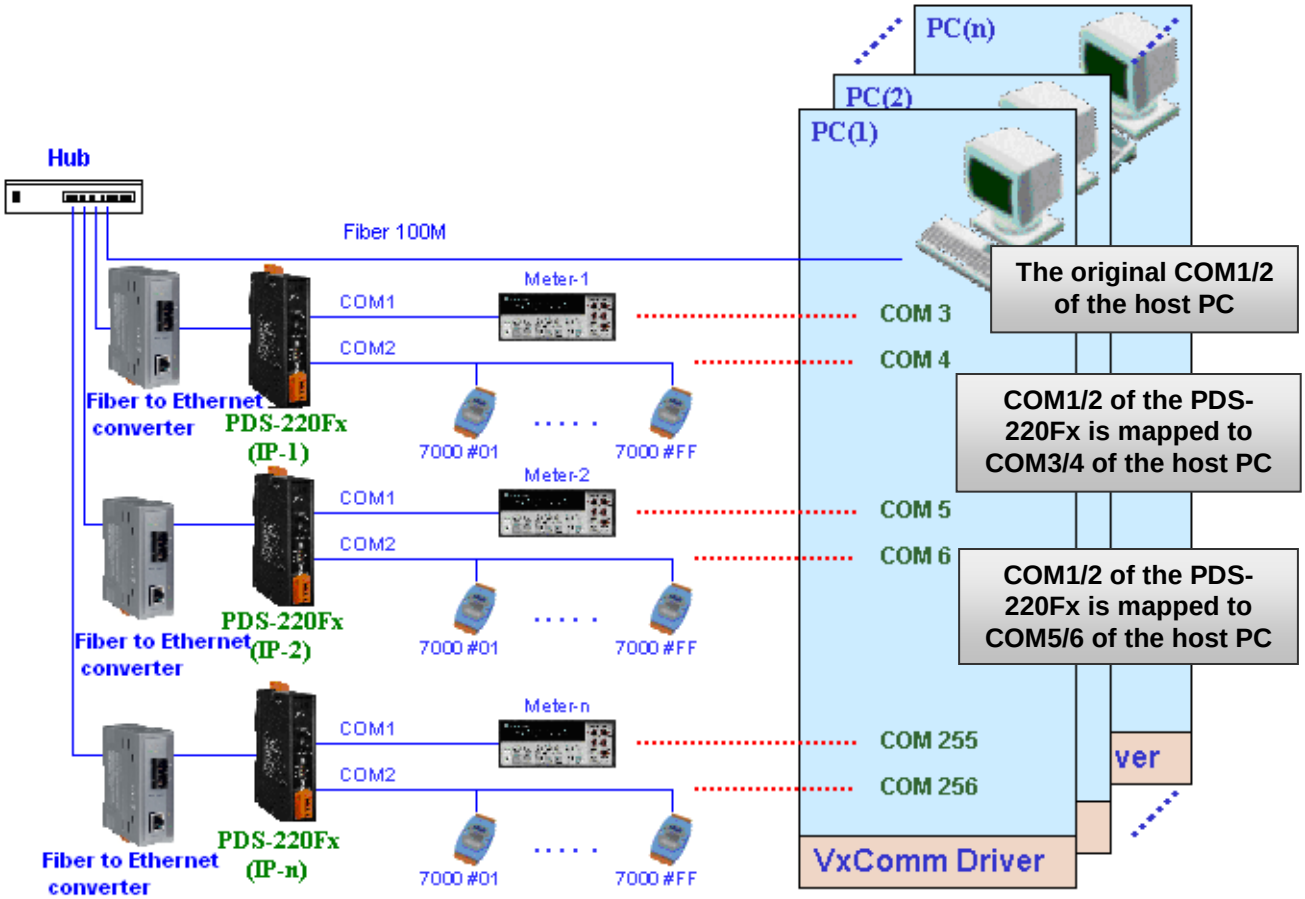


2. Typical Applications for the PDS

2.1 RS-232/485/422 Device Networking

--- Using Virtual COM Technology ---

The PDS-220Fx series is designed to link RS-232/485/422 devices to an Ethernet network. The VxComm utility allows the built-in PDS-220Fx COM Port to be virtualized to a standard COM Port of the host PC as shown below:



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

2.2 Fiber I/O Applications

The PDS-220Fx series provides fiber optic I/O solution:

Linking to I-7000 series modules

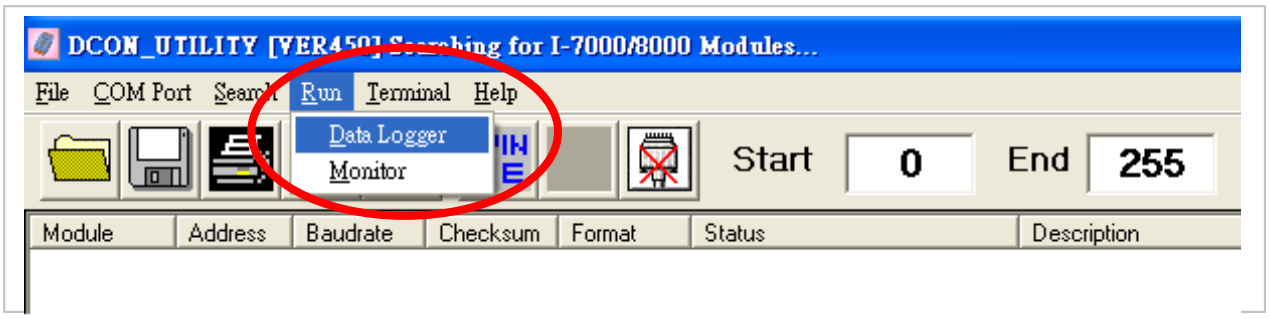
The I-7000 series provides a variety of I/O operations, such as D/I, D/O, A/D, D/A, Counter and Frequency Measurement, etc. The I-7000 series was originally designed to be used with RS-485 networks, so COM2 on the PDS-220Fx can be used to link to I-7000 series modules. They are very robust and work well under the harsh industrial environments.

By using VxComm technology, programs that on the host PC support serial devices can be upgraded from a RS-485 network to a fiber optic network without requiring any modifications to the program. Refer to Sec. 2.1 for more information.

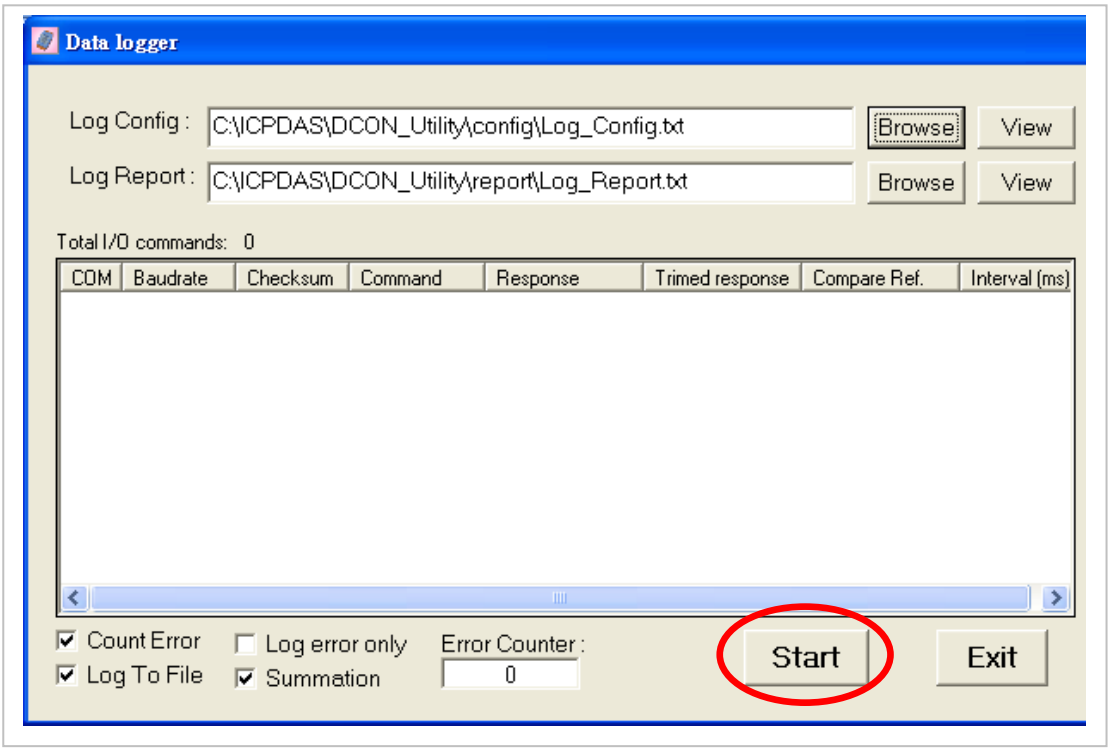
2.3 Configurable Fiber Optic Data Logger

Using the VxComm driver, PDS-220Fx + I-7000 modules can be virtualized to become COM Port + I-7000 modules located on the host-PC, and then the Data Logger in the DCON Utility can be used to access data of I-7000 from the fiber optic. 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 Excel to read the log data as shown in the example below:

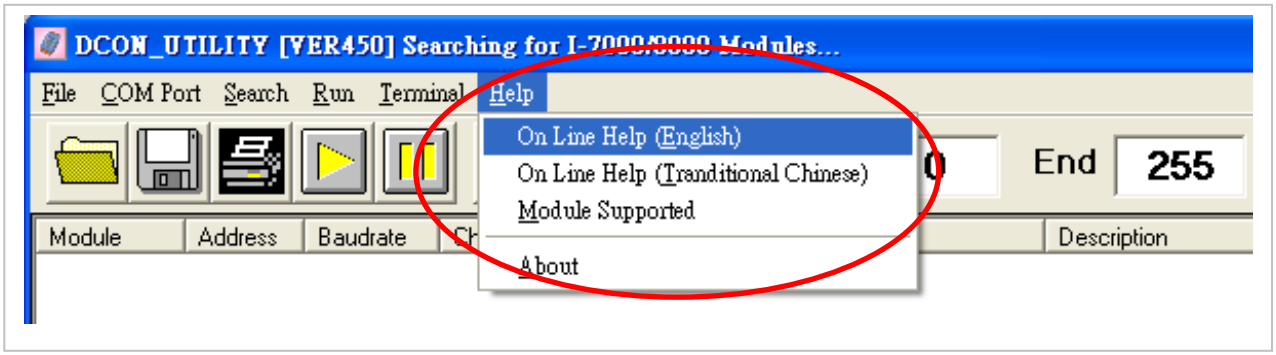
Microsoft Excel - report.log

File Edit View Insert Format Tools Data Window Help

A1 = Start log at

	A	B	C	D	E	F	G	H	I	J
1	Start log at	11/26/01	##########							
2	14:36:1:0	2	9600	0	#010	>+000.00	>+000.62	1000		
3	14:36:2:40	2	9600	0	#010	>+000.00	>+000.65	1000		
4	14:36:3:30	2	9600	0	#010	>+000.00	>+000.65	1000		
5	14:36:4:20	2	9600	0	#010	>+000.00	>+000.60	1000		
6	14:36:5:10	2	9600	0	#010	>+000.00	>+000.66	1000		
7	14:36:6:0	2	9600	0	#010	>+000.00	>+000.66	1000		
8	14:36:7:40	2	9600	0	#010	>+000.00	>+000.66	1000		
9	14:36:8:30	2	9600	0	#010	>+000.00	>+000.71	1000		
10	14:36:9:20	2	9600	0	#010	>+000.00	>+000.69	1000		
11	14:36:10:1	2	9600	0	#010	>+000.00	>+000.67	1000		
12	14:36:11:0	2	9600	0	#010	>+000.00	>+000.71	1000		
13	14:36:12:4	2	9600	0	#010	>+000.00	>+000.65	1000		
14	14:36:13:3	2	9600	0	#010	>+000.00	>+000.72	1000		
15	14:36:14:2	2	9600	0	#010	>+000.00	>+000.66	1000		
16	14:36:15:1	2	9600	0	#010	>+000.00	>+000.60	1000		
17	14:36:16:0	2	9600	0	#010	>+000.00	>+000.70	1000		
18	14:36:17:4	2	9600	0	#010	>+000.00	>+000.65	1000		
19	14:36:18:3	2	9600	0	#010	>+000.00	>+000.72	1000		
20	14:36:19:2	2	9600	0	#010	>+000.00	>+000.73	1000		

By using the I-7000 DCON utility and MS Excel in conjunction with the **VxComm technology**, the signal data of I-7000 modules from the fiber optic 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.



3. Hardware Information

3.1 Features

- Adds optical fiber connectivity to serial devices
- Virtual COM extends the PC COM Ports
- Virtual COM supports Windows NT 4.0, 32-bit/64-bit 2000/XP/2003/Vista/7
- Watchdog Timer suitable for use in harsh environments
- Powerful programmable device server
- Power reverse polarity protection
- Serial Port +/-4 kV ESD Protection Circuit
- Self-Tuner ASIC Controller on the RS-485 Port
- RoHS Compliant with no Halogen
- Built-in High Performance MiniOS7 from ICP DAS
- 10/100 Base-FX (SC/ST connectors)
- Low power consumption
- Made from fire-retardant materials (UL94-V0 Level)
- ODM service is available

3.2 PDS-220Fx Series Selection Guide

Model	CPU	SRAM	Flash	Fiber Port	Mode	Distance	COM1	COM2
PDS-220FT	80 MHz	512 KB	512 KB	100 Base-FX, ST Connector	Multi-mode	2 km	5-wire RS-232	RS-422 RS-485
PDS-220FC				100 Base-FX, SC Connector	Multi-mode	2 km		
PDS-220FCS				100 Base-FX, SC Connector	Single-mode	30km		
PDS-220FCS-60				100 Base-FX, SC Connector	Single-mode	60 km		

5-wire RS-232: RxD, TxD, CTS, RTS, GND
4-wire RS-422: TxD+, TxD-, RxD+, RxD-
2-wire RS-485: Data+, Data-

3.3 Specifications

System:

CPU	80186, 80MHz or compatible
SRAM	512 KB
Flash Memory	Flash ROM: 512 KB; Erase unit is one sector (64 KB); 100,000 erase/write cycles
Built-in Watchdog Timer	Yes
LED Indicators	Sys, Link/Act
Init Pin	Yes

Serial Port:

COM1	Male DB-9, 5-wire RS-232 (RxD, TxD, CTS, RTS, GND) Note: +/- 4 kV ESD Protection
COM2	Removable Terminal Block, 2-wire RS-485 (D+, D-, GND) with Self-tuner ASIC or 4-wire RS-422 (TxD+, TxD-, RxD+, RxD-, GND) Note: +/- 4 kV ESD Protection

COM Port Format:

UART	16c550 or compatible
Baud rate	115200 bps Max.
Data bits	7, 8
Parity	None, Odd, Even, Mark, Space
Stop bits	1, 2

LED Indicators:

Link/Act	Green
System	Red

■ Interface:

Models	PDS-220FT	PDS-220FC	PDS-220FCS	PDS-220FCS-60
Fiber Port	100 Base-FX, (ST connector)	100 Base-FX, (SC connector)	100 Base-FX, (SC connector)	100 Base-FX, (SC connector)
Mode	Multi-mode fiber cables: 50/125, 62.5/125 or 100/140 µm Wavelength : 1300 or 1310nm Min. TX Output:- 20 dBm Max. TX Output: -14 dBm Max. RX Sensitivity: -32 dBm Max. RX Overload: -8 dBm Budget: 12 dBm		Single-mode fiber cables: 8.3/125, 8.7/125, 9/125 or 10/125µm Wavelength: 1300 or 1310nm Min. TX Output: - 15 dBm, Max. TX Output: -8 dBm Max. RX Sensitivity: -34 dBm, Max. RX Overload: -5 dBm Budget: 19 dBm	Single mode fiber cables: 8.3/125, 8.7/125, 9/125 or 10/125µm Wavelength: 1300 or 1310nm Min. TX Output: - 5 dBm, Max. TX Output: 0 dBm Max. RX Sensitivity: -35 dBm, Max. RX Overload: -5 dBm Budget: 30 dBm
Distance	2 km, (62.5/125 µm recommended) for full duplex		30 Km, (9/125 µm recommended) for full duplex	60 Km, (9/125 µm recommended) for full duplex

■ Fiber Port Connector:

Models	PDS-220FT	PDS-220FC	PDS-220FCS	PDS-220FCS-60
Pictures	 (ST connector)	 (SC connector)		

Power:

Protection	Power reverse polarity protection
Input Range	+12 ~ +48 VDC (non-regulated)
Power Consumption	0.14A @ 24 VDC
Frame GND	Yes, for EMS Protection.

Mechanism:

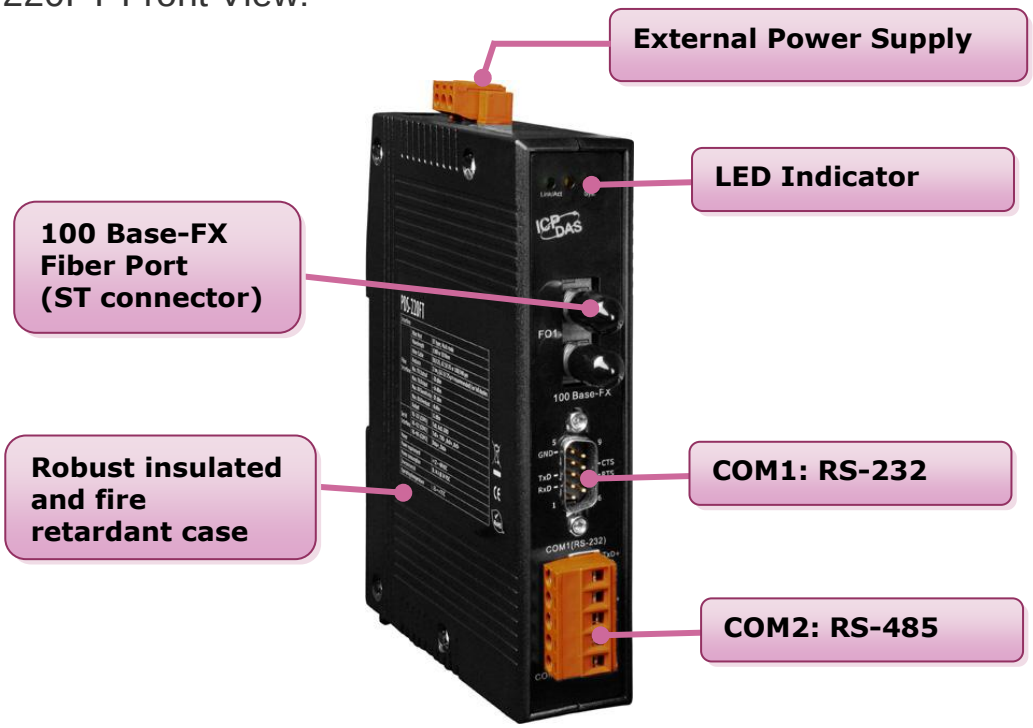
Models	**PDS-220FT**	**PDS-220FC**	**PDS-220FCS**	**PDS-220FCS-60**
Flammability	Fire Retardant Materials (UL94-V0 Level)			
Dimensions (W x L x H)	31 mm x 121 mm x 157 mm	31 mm x 123 mm x 157 mm		
Casing	Fire Retardant Plastic (UL94-V0 level)			
Installation	DIN-Rail mounting			

Environment:

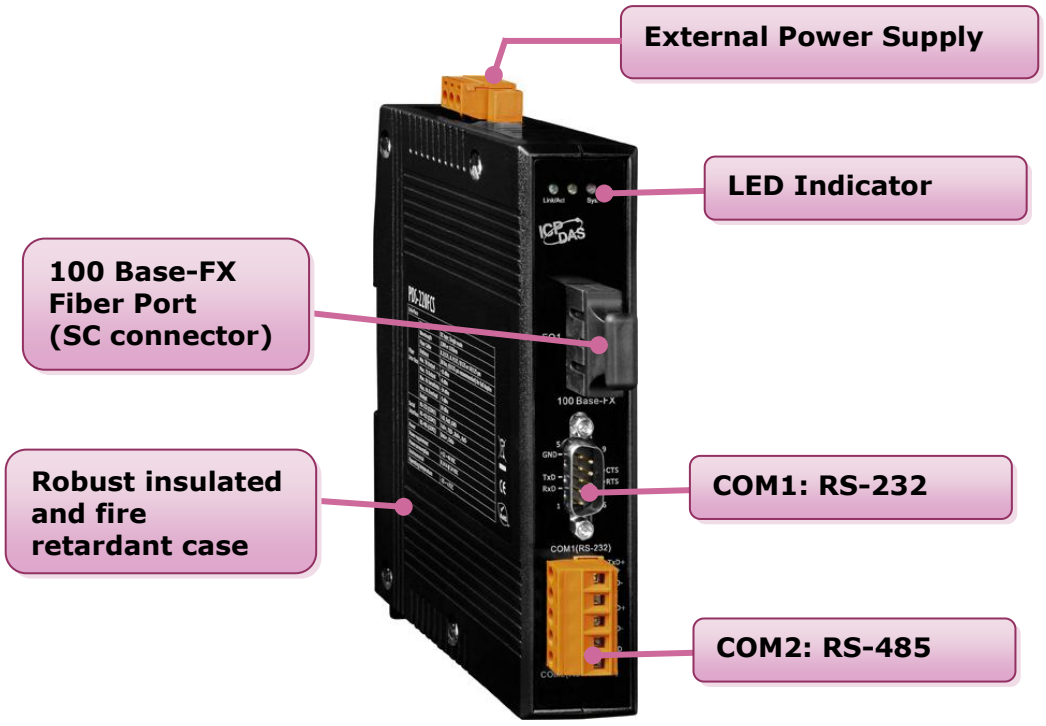
Operating Temperature	-25°C ~ +75°C
Storage Temperature	-30 ~ +85°C
Humidity	10% ~ 90% RH, non-condensing

3.4 Front View

- PDS-220FT Front View:

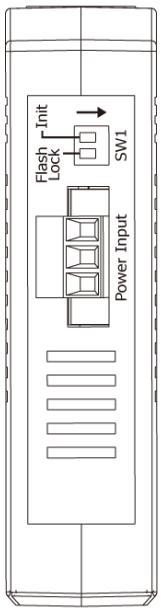


- PDS-220FC/PDS-220FCS/PDS-220FCS-60 Front View:



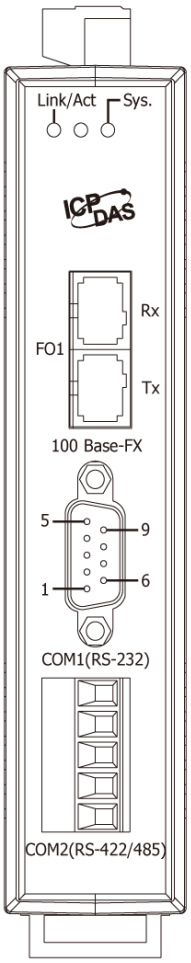
3.5 Pin Assignments

- Pin Assignments for PDS-220Fx Series models:

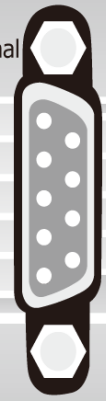


Terminal No.	Pin Assignment
03	PWR
02	P.GND
01	F.G.

Power Input: Removable Terminal Block



Pin Assign-ment	Terminal No.		Pin Assign-ment
GND	05	09	--
--	04	08	CTS
TxD	03	07	RTS
RxD	02	06	--
--	01		



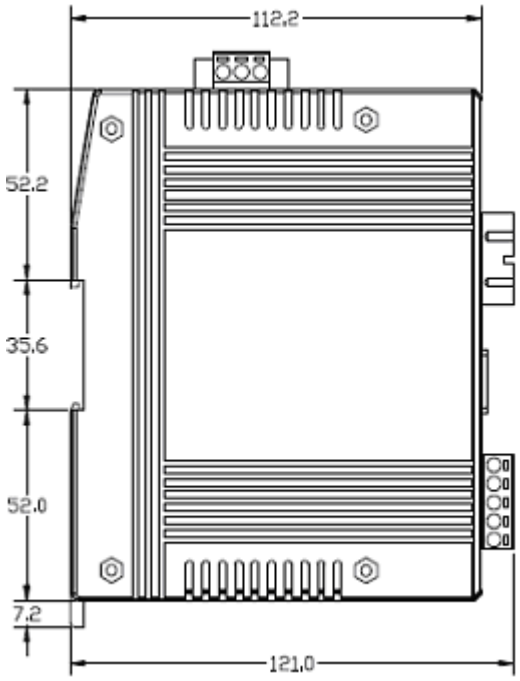
COM1: Male DB-9 Connector

Terminal No.	Pin Assignment
01	TxD+/D+
02	TxD-/D-
03	RxD+
04	RxD-
05	GND

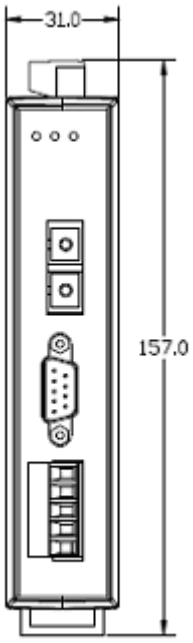
COM2: Removable Terminal Block

3.6 Dimensions

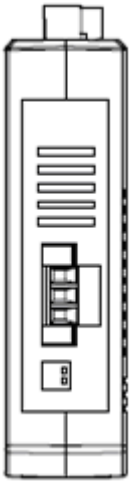
- Dimensions for PDS-220Fx Series models:



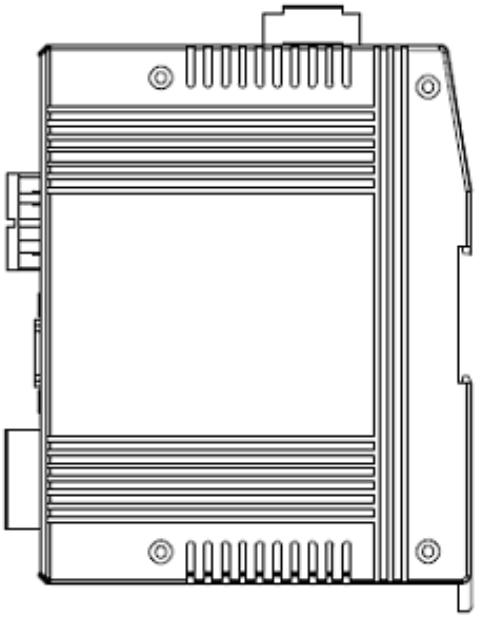
Left Side View



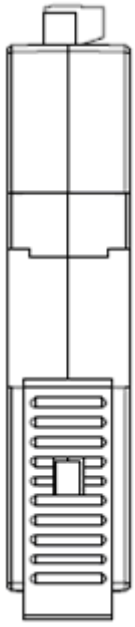
Front View



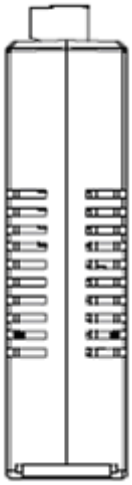
Top View



Right Side View



Back View



Bottom View

4. Setting up the PDS-220Fx Module

Step 1: Connect the PDS-220Fx to the Ethernet Network

Before connecting the PDS-220Fx module to a fiber optic network, the following items are needed:

1: Power Supply: 12 ~ 48 V_{DC} (eg: DP-665)
http://www.icpdas.com/products/Accessories/power_supply/power_list.htm

2: Fiber to Ethernet (eg: NS-200AFT)

http://www.icpdas.com/products/Switch/industrial/industrial_list.htm

3: Ethernet Hub (eg: NS-208)

http://www.icpdas.com.tw/product/solutions/industrial_ethernet_switch/ns-208.html

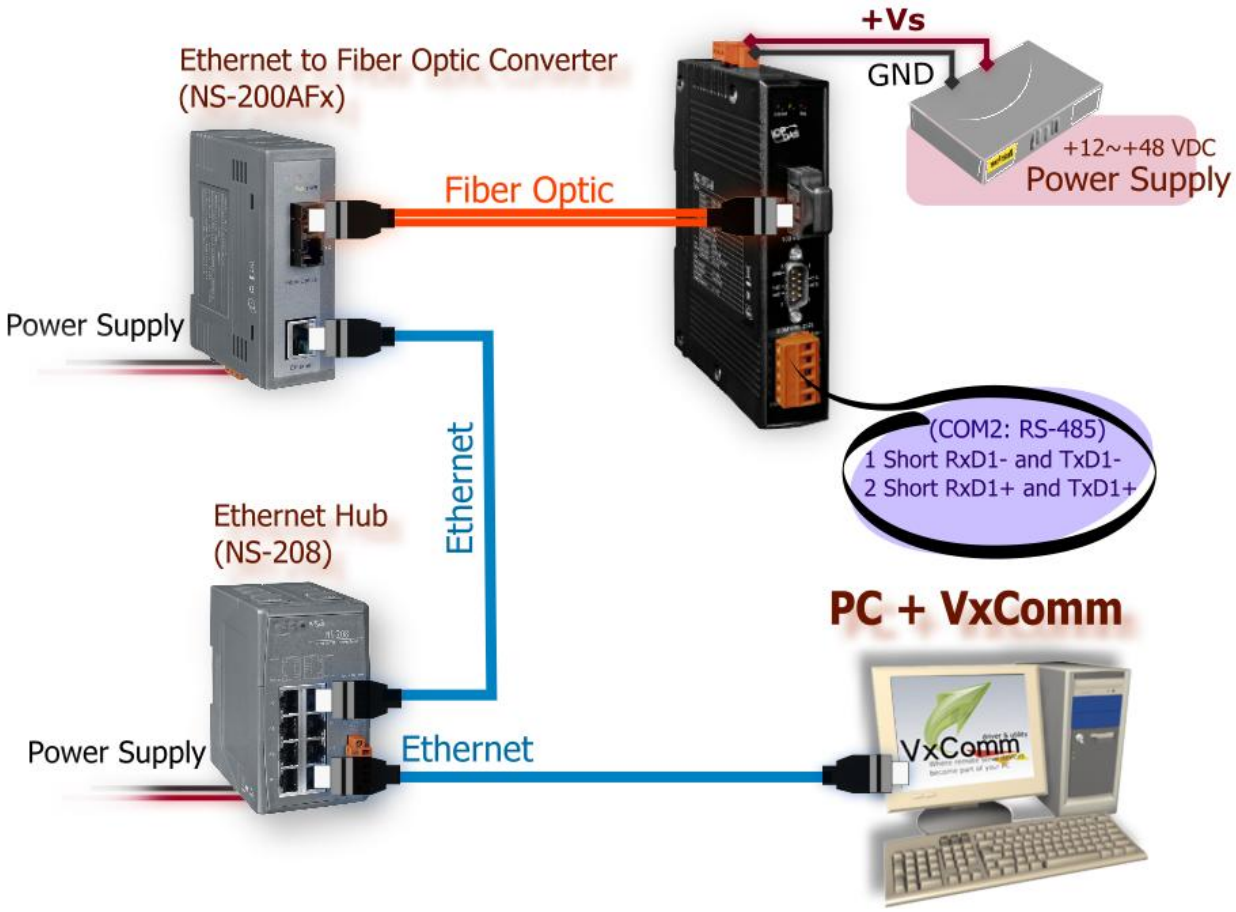
4: The network settings in the PC are correctly configured and the Ethernet connection is functioning normally.

5: 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.)

6: Connect the PDS-220Fx module to the fiber optic as shown on the following page and switch on the power.

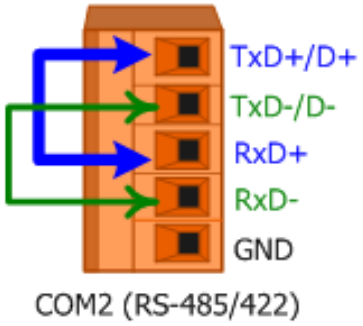
7: Make sure the indicator LED of PDS-220Fx modules flashing.

8: Install VxComm Utility on your PC
The software is located at：
CD: \Napdos\Driver\VxComm_Driver\
http://ftp.icpdas.com/pub/cd/8000cd/napdos/driver/vxcomm_driver/



- Connect both the NS-200AFx module and your computer to the same sub network or the same Switch.

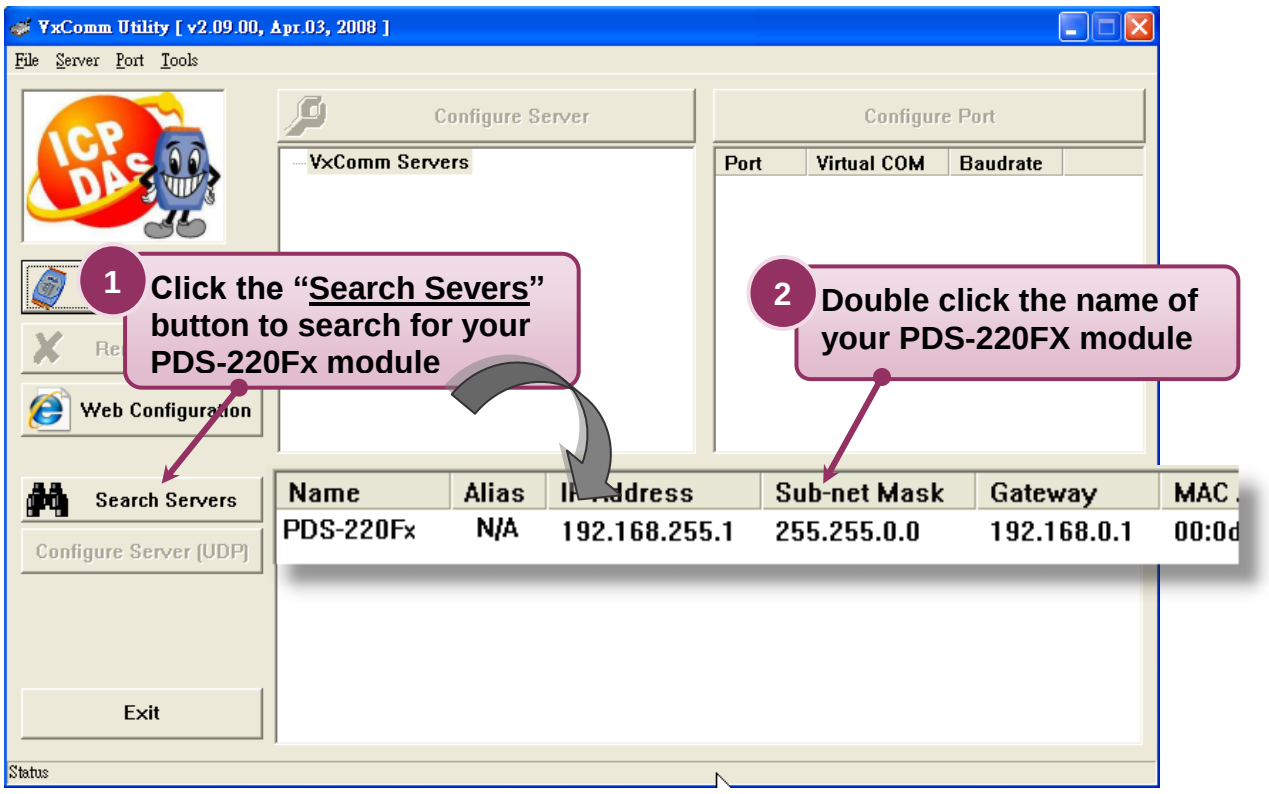
- Short the RXD and TXD pins of the PDS-220Fx module for execute a self-test.



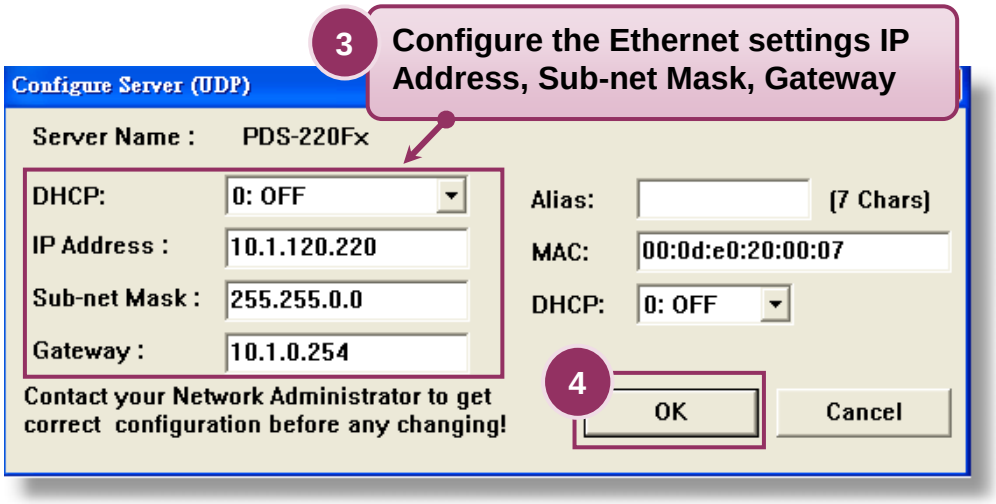
- Supply 24 VDC (12 ~ 48 VDC) power to the PDS-220Fx module.

Step 2: Search for the PDS-220Fx on the Ethernet network

1. Execute the VxComm Utility and then search for your PDS-220Fx series module.
2. Double click the name of the PDS-220Fx to open the configuration settings dialog box.

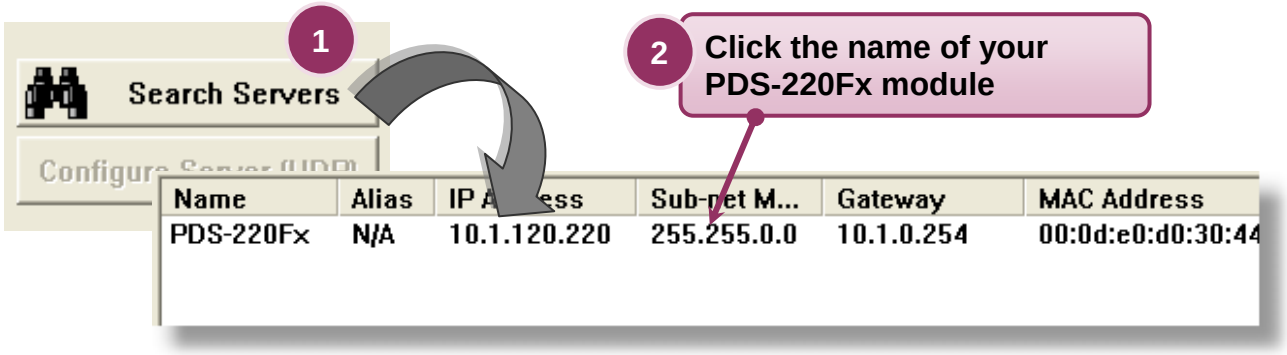


3. Contact your Network Administrator to obtain the correct network configuration details (such as IP/Mask/Gateway). Enter the network settings and then click "**OK**". The PDS-220Fx series module will be restarted itself immediately.

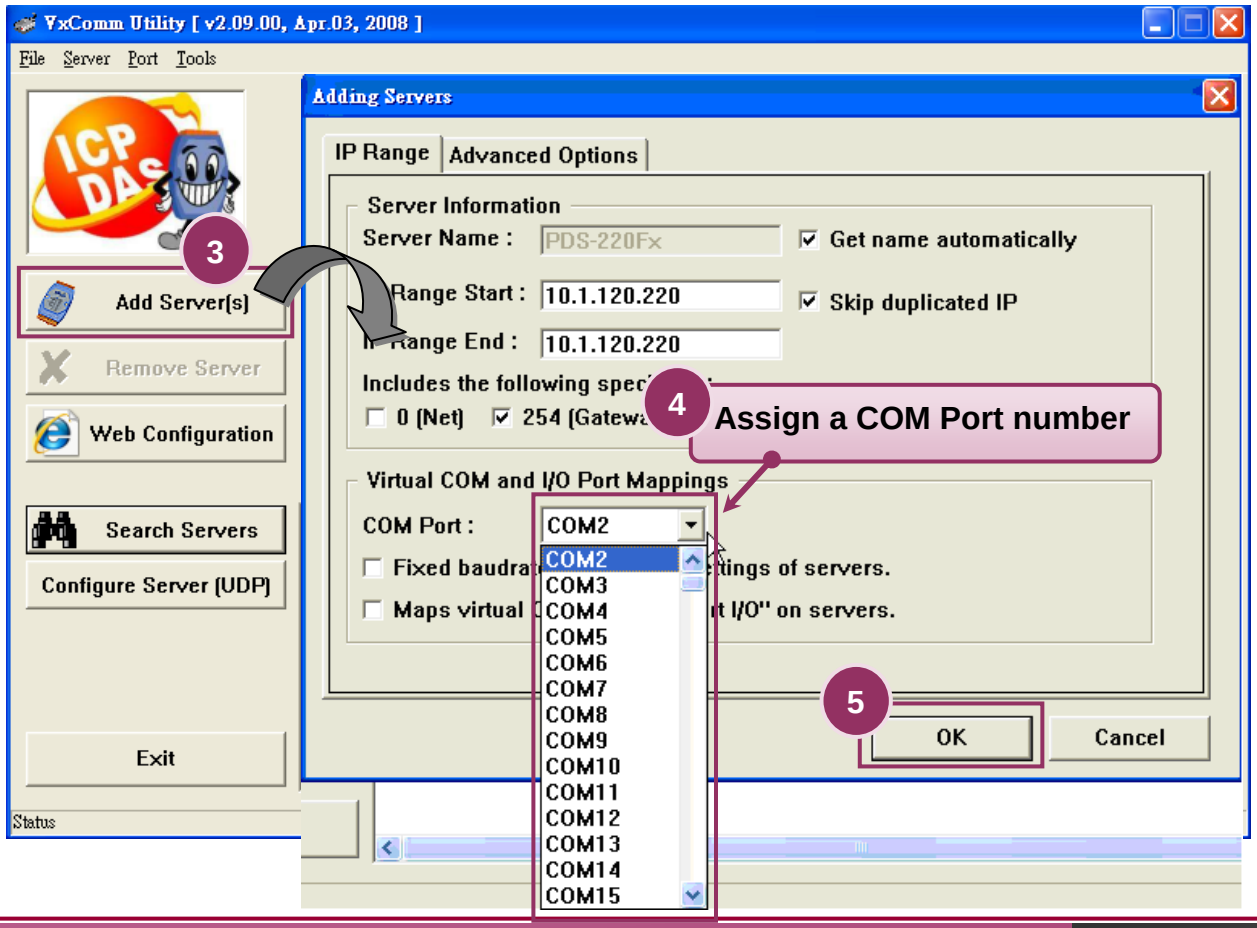


Step 3: Configuring Virtual COM Ports

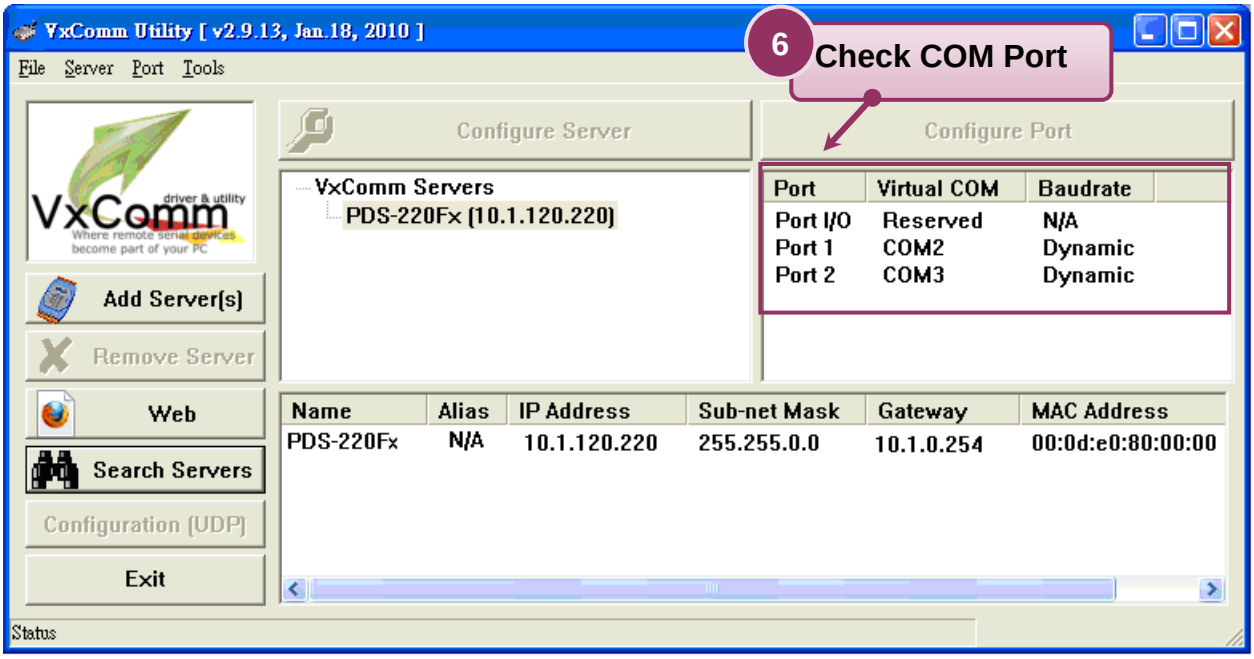
1. Click the "**Search Servers**" button again to search for your PDS-220Fx series module to make sure that the new IP/Mask/Gateway settings have been saved, then click the name of your PDS-220FX series module once to select it.



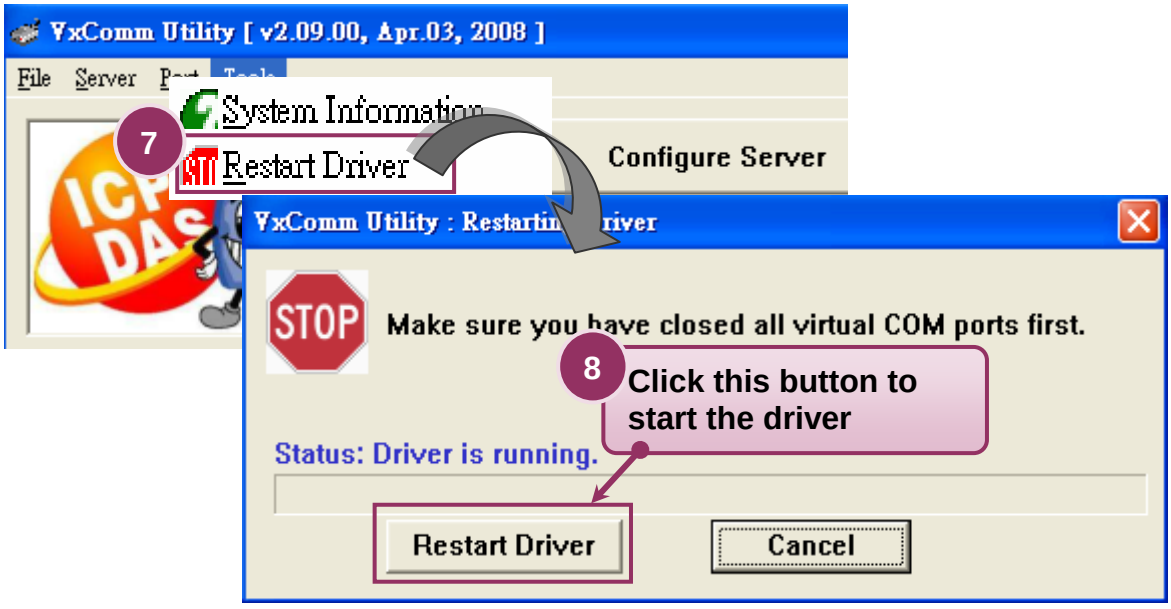
2. Click the "**Add Server[S]**" button, then assign a COM Port number and click "**OK**" to save your settings.



3. Check the Virtual COM port numbers on the PC.



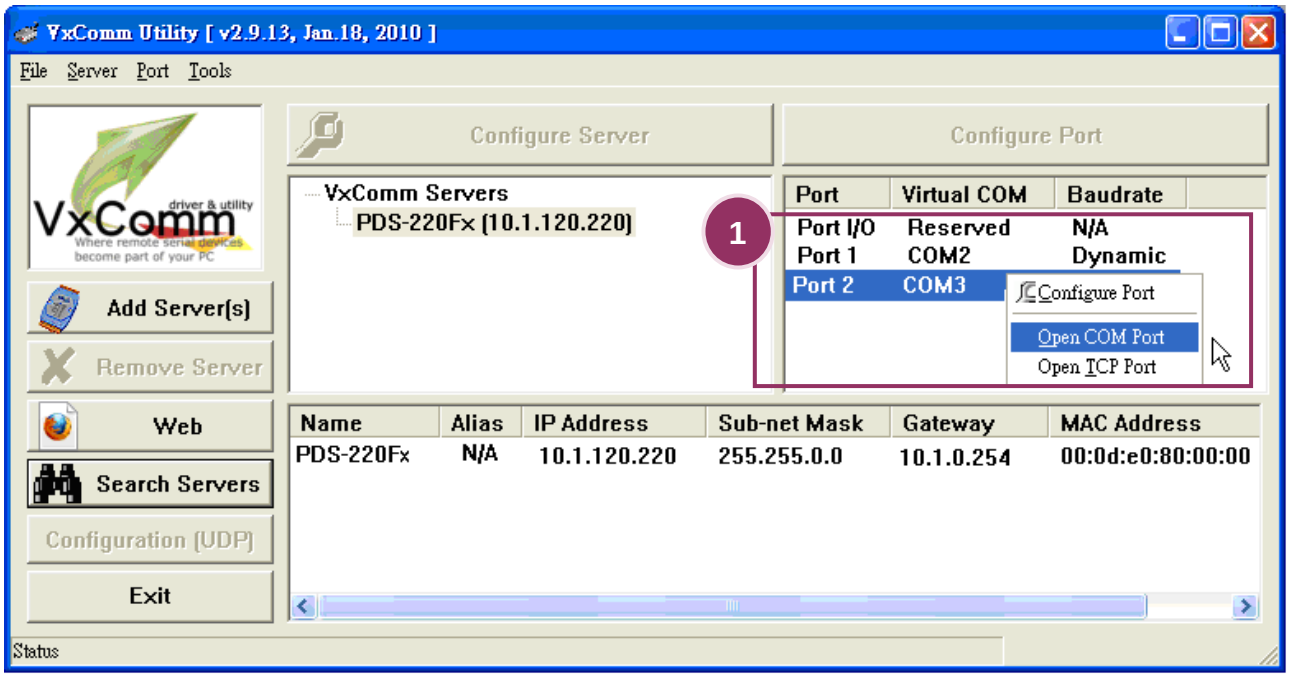
4. Click "**Restart Driver**" from the "**Tools**" menu, and then click the "**Restart Driver**" button to start the driver.



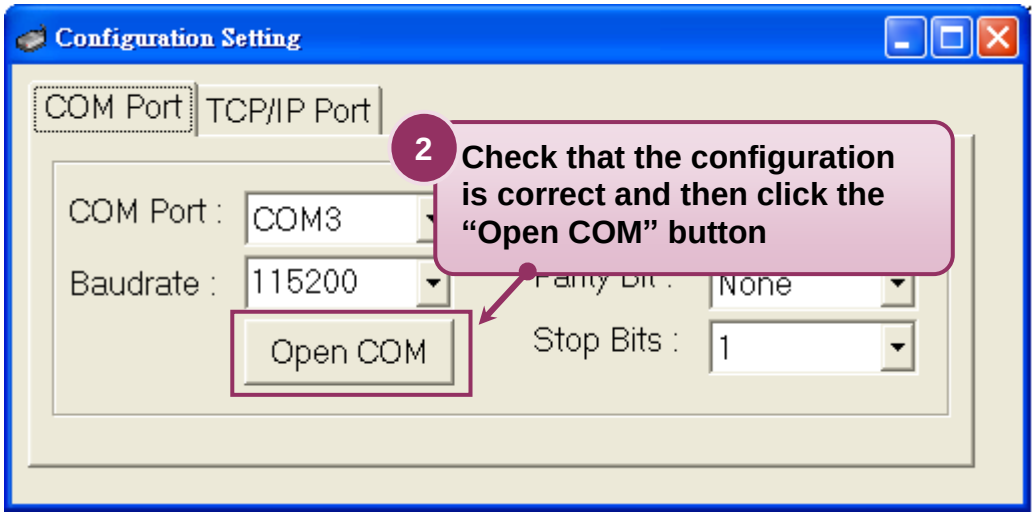
Step4: Testing your PDS-220Fx

1. Connect the "**RxD**" and the "**TxD**" of the COM2 on the PDS-220Fx module, as shown in the diagram in Step1.

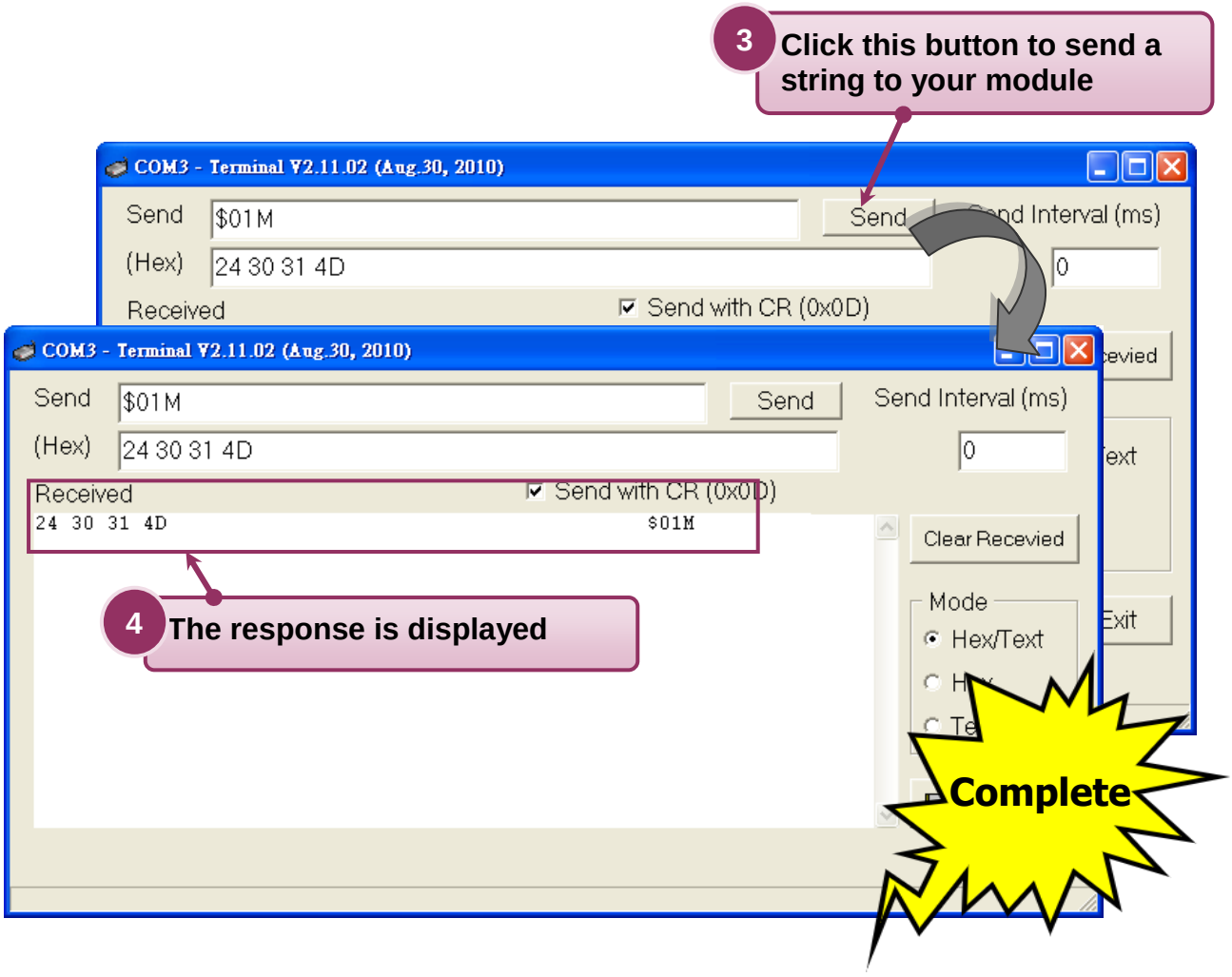
2. Right click Port 1 and then choose the "**Open COM Port**" option.



3. Check that the configuration of the COM Port is correct and then click the "**Open COM**" button.



4. 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. If the test is successful, the COM port program will be able to work directly by setting the Virtual COM Port number.

5. Configuration with Web Browser

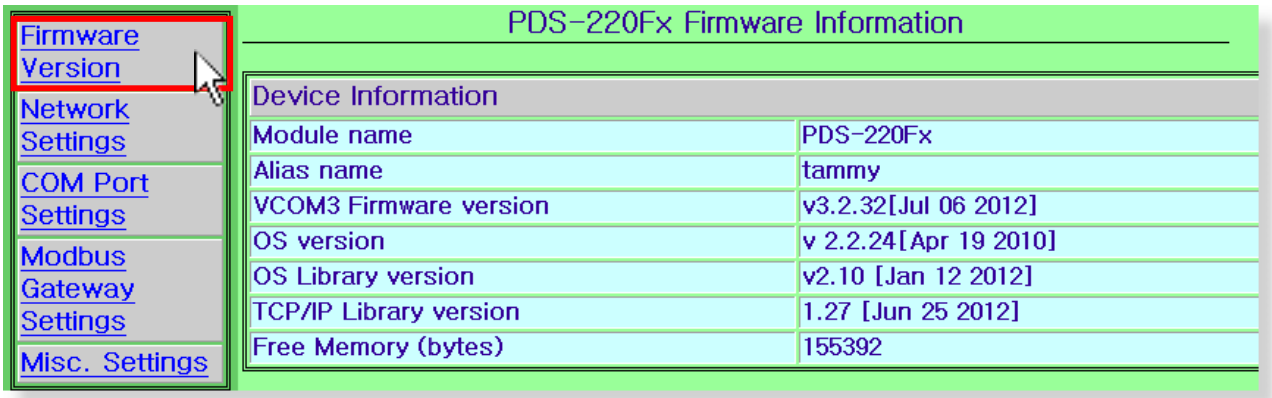
Once the PDS-220Fx series module has been correctly configured and is networking normally, the configuration details can be retrieved or amended using either the VxComm Utility or a standard web browser, such as IE, FireFox, or Mozilla, etc.

5.1 Connecting to the PDS-220Fx Module

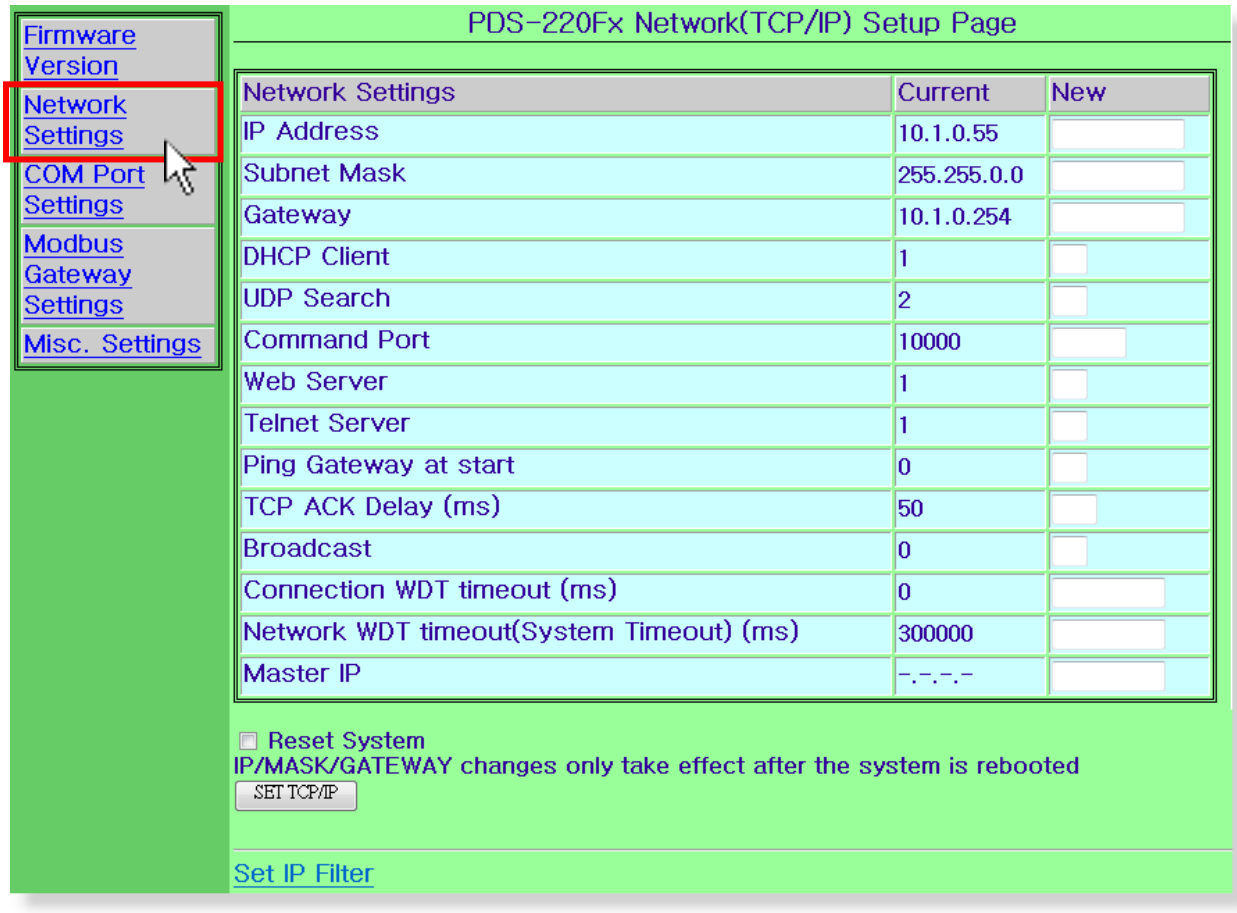
If the COM port program is operating with a PDS module, changing the configuration will cause a program error.

- Enter the IP address of the PDS-220Fx series module in the Address field and press "**Enter**" to connect to the PDS-220Fx series module.

- When the browser connects to the PDS-220Fx series module, the first page that will be display is the Firmware Information page.



5.2 Network Settings



Network (TCP/IP) Setup page:

- **IP Address**
- **Subnet Mask**
- **Gateway**

The above three items are the most important network settings and should always correspond to the LAN definition. If they do not match, the PDS-220Fx series 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.

- **DHCP Client** : 0 = disabled, 1 = enabled

It is recommended that the DHCP Client setting is kept as disabled, and using static network settings. This ensures your PDS-220Fx series always using a fixed IP address, and you don't need to configure the virtual COM mappings again and again.

- **UDP Search**: 0 = disabled, 1 = always enabled.

2 = enable the UDP Search function until another client is connected. (Default = 2)

By keeping the UDP search setting as 2, the PDS-220Fx loading will be reduced. The VxComm Utility will not be able to search for this module until this module's clients are all disconnected.

- **Command Port:**

The default Command Port is 10000.

- **Web Server**
- **Telnet Server**

0 = disabled, 1 = enabled

- **Ping Gateway at start**: 0 = disabled, 1 = enabled.

If the setting is 1 (enabled), the PDS-220Fx series module will send a ping packet to the gateway during the power-on stage. It is used to inform the gateway that a PDS-220Fx (itself) has joined the network.

- **TCP ACK Delay (ms)**, default = 50.

PDS-220Fx does not want to send an empty ACK followed by a TCP data packet 1ms later, every time. So it delays a little (TCP ACK Delay), and then can combine the ACK and data packet into one. This efficiency reduces the number of packets and reduces network loadings.

- **Broadcast**

  1 = receive UDP broadcast packets

  0 = reject UDP broadcast packets

- **Connection WDT timeout (ms)**: default = 0 (disabled), min. = 10000.

If the PDS-220Fx series module does not receive any data from a client PC within the period of the "Connection WDT timeout", the module will close the connection to the client.

- **Network WDT timeout (ms)**: 0 = disabled, min. = 30000.

If the PDS-220Fx series module does not receive any data from any of the clients within the period of the “Network WDT timeout”, the module will reboot itself. The default setting should be 300000ms (= 300 seconds).

This setting is the same as “SystemTimeout” setting (unit: ms) on Console/Telnet command, and is the same as “/STxxx” in command line parameter (unit: seconds).

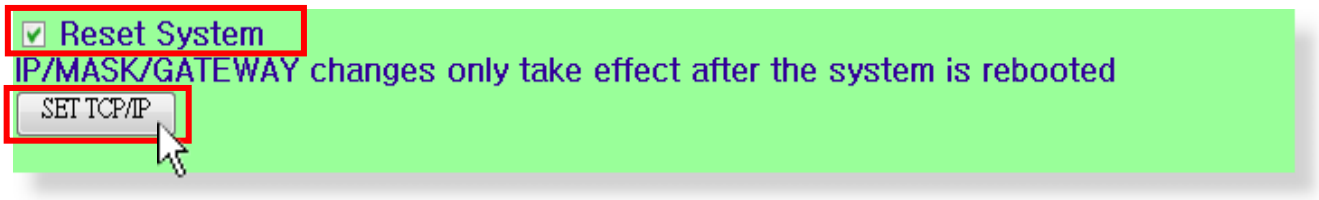
When user uses “config=RESET” Console/Telnet command to clear the EEPROM, the “Network WDT timeout” (SystemTimeout, /ST) setting will also be cleared to 0.

Users have to configure this setting again by “SystemTimeout” Console/Telnet command.

- **Master IP**: default = empty (disabled).

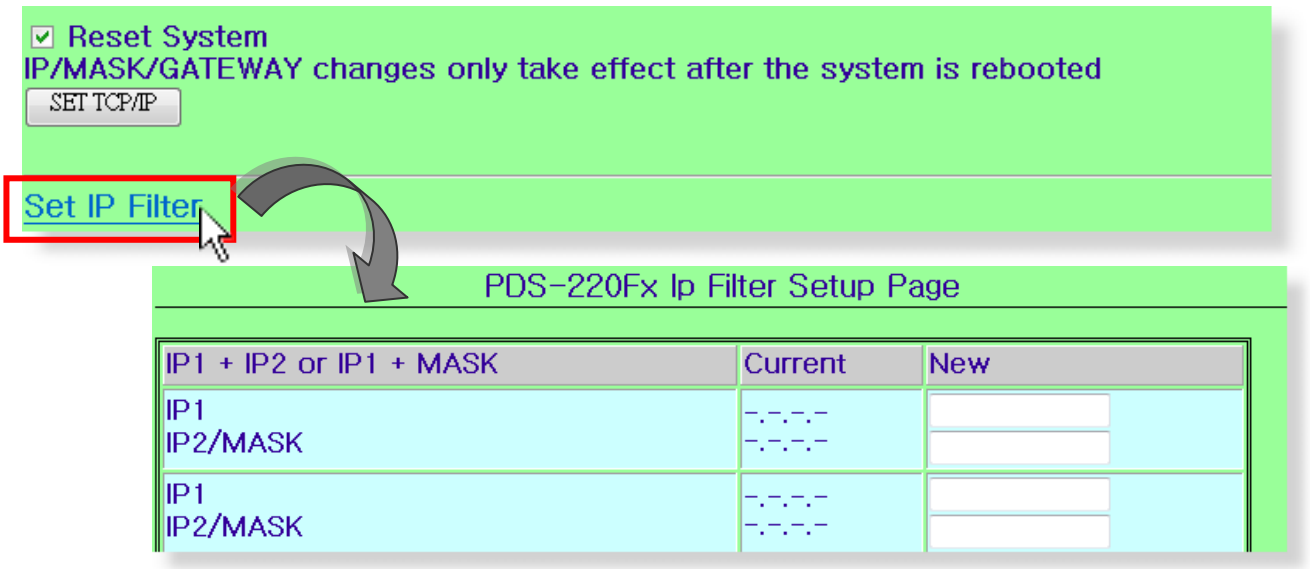
If the Master IP is set, only the client using Master IP can change the COM Port configuration. It is to prevent the COM Port configuration changed by other clients.

After setting the new configuration, click the “**Set TCP/IP**” button to save the new settings to the PDS-220Fx series module. If the “**Reset System**” option is checked, the PDS-220Fx series module will reboot itself after the saving operation is complete, otherwise the original settings will still be valid until the next power-on.

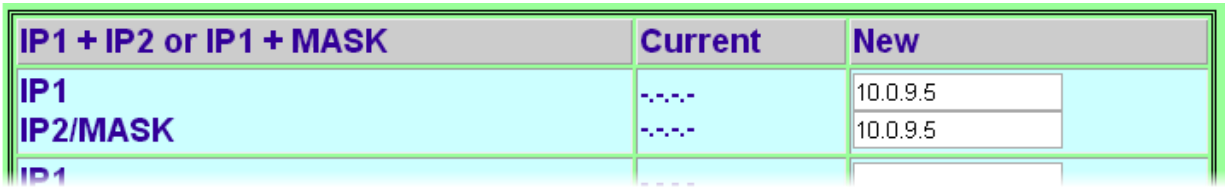


5.3 IP filter Settings

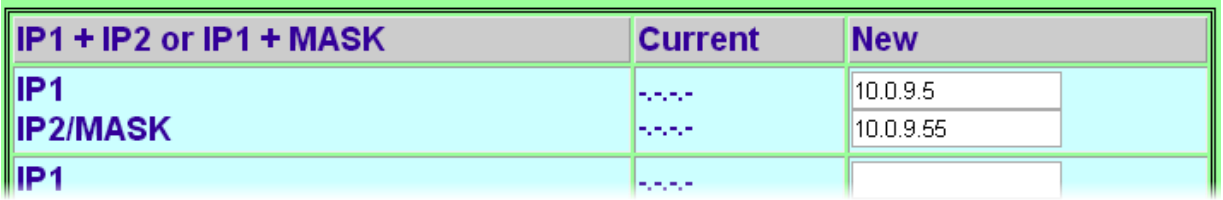
The IP filter setting limits which client PCs are able to link to the PDS-220FX series module via specific IP addresses. When one or more IP addresses are set in the filter table, only client PCs where the IP address is included in the range listed of the filter table will be able to connect to the PDS-220Fx series module. Any requests from other PCs will be rejected



- **Set IP1 only**: Set a single IP address, the IP address entered in the **"IP1"** and **"IP2/MASK"** text fields will be the same, as the image below shows. Only clients who's IP address is included in the filter table are able to connect to the PDS-220Fx series module.

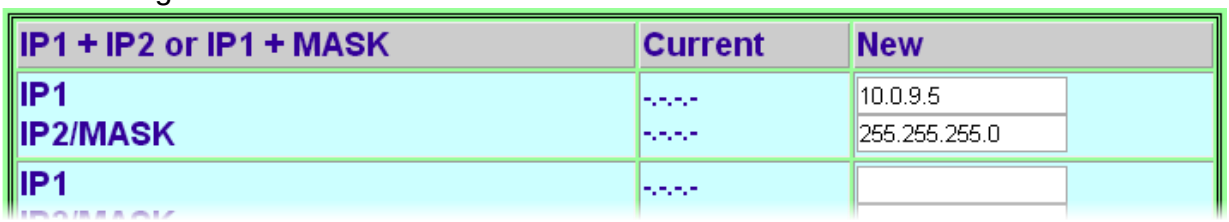


- **Set IP1 + IP2**: Set a range of IP address as a starting and ending point. The initial IP address must be entered in the **"IP1"** text field and final IP address must be entered in the **"IP2/MASK"** text field, as the image below shows.



This allows clients who's IP address is included in the range of **10.0.9.5 to 10.0.9.55** are able to connect to the PDS-220Fx series module.

- **Set IP1+Mask**: Set the IP Filter (Available IP) range, the IP address must be entered in the **"IP1"** text field and Mask address must be entered in the **"IP2/MASK"** text field, as the image below shows.



This allows clients who's IP address is included in the range of **10.0.9.0 to 10.0.9.255** are able to connect to the PDS-220Fx series module.

Note that how to get the IP address range 10.0.9.0 to 10.0.9.255? It's calculated as follows:

Formula: (IP1 & MASK) to (IP1 & Mask) + (~MASK)

↓

(10.0.9.5 & 255.255.255.0) to (10.0.9.5 & 255.255.255.0) + (0.0.0.255)

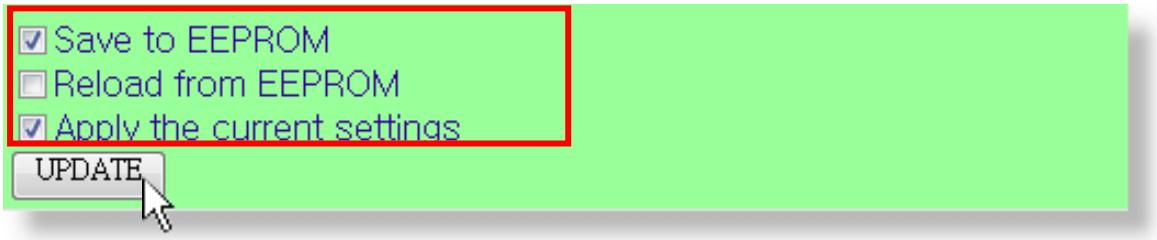
↓

(10.0.9.0) to (10.0.9.0) + (0.0.0.255)

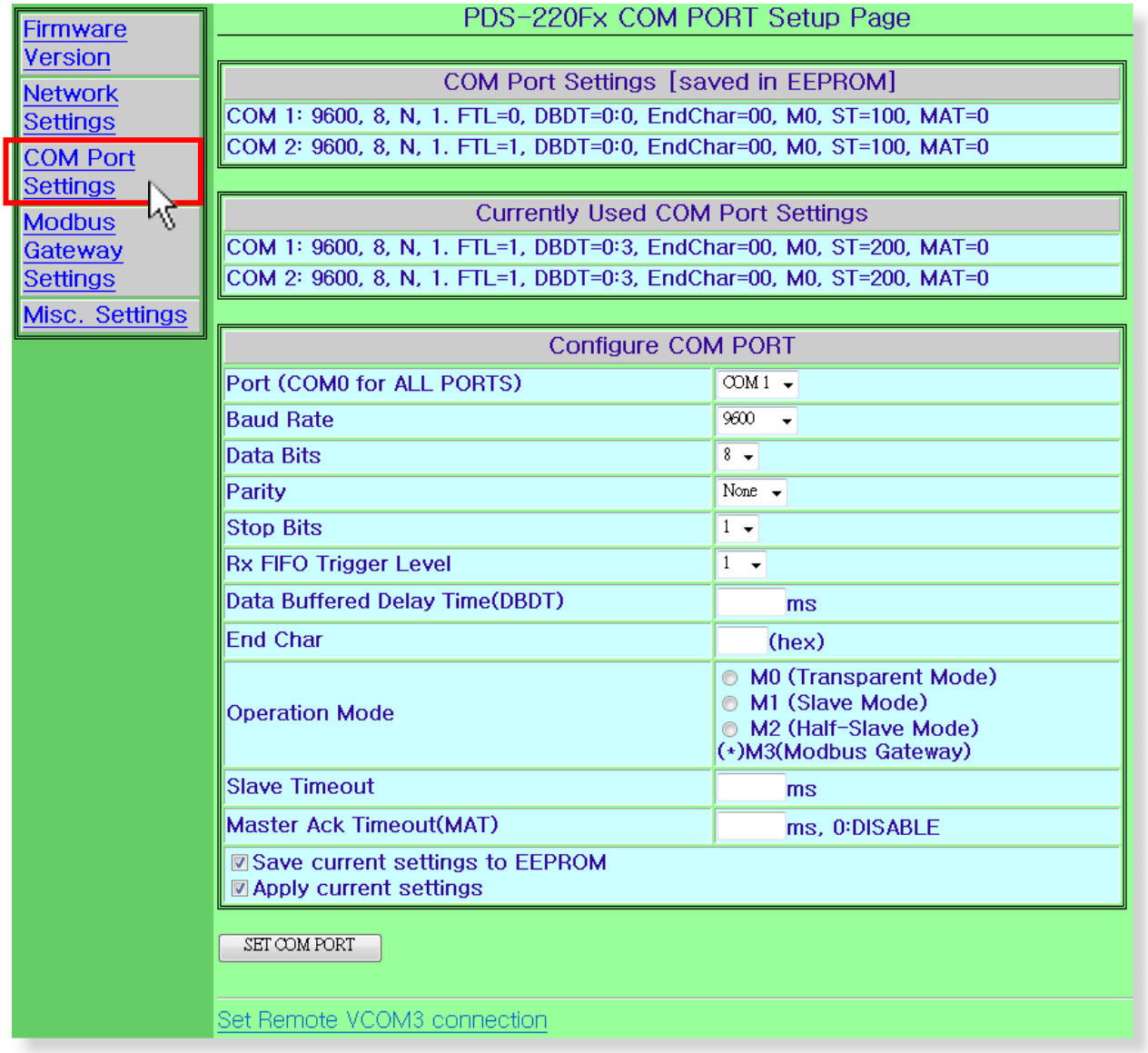
↓

10.0.9.0 to 10.0.9.255

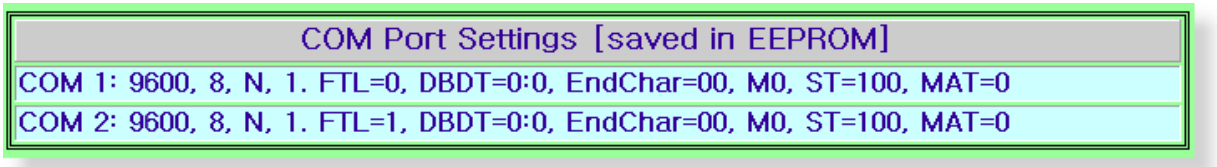
- Check the "**Save to EEPROM**" and "**Apply the current settings**", and then click the "**Update**" button to validate the settings.



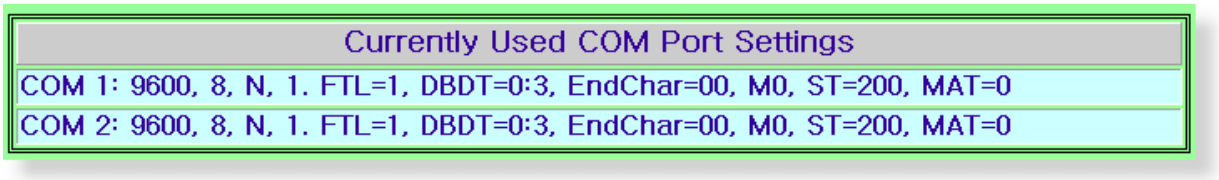
5.4 COM Port Settings



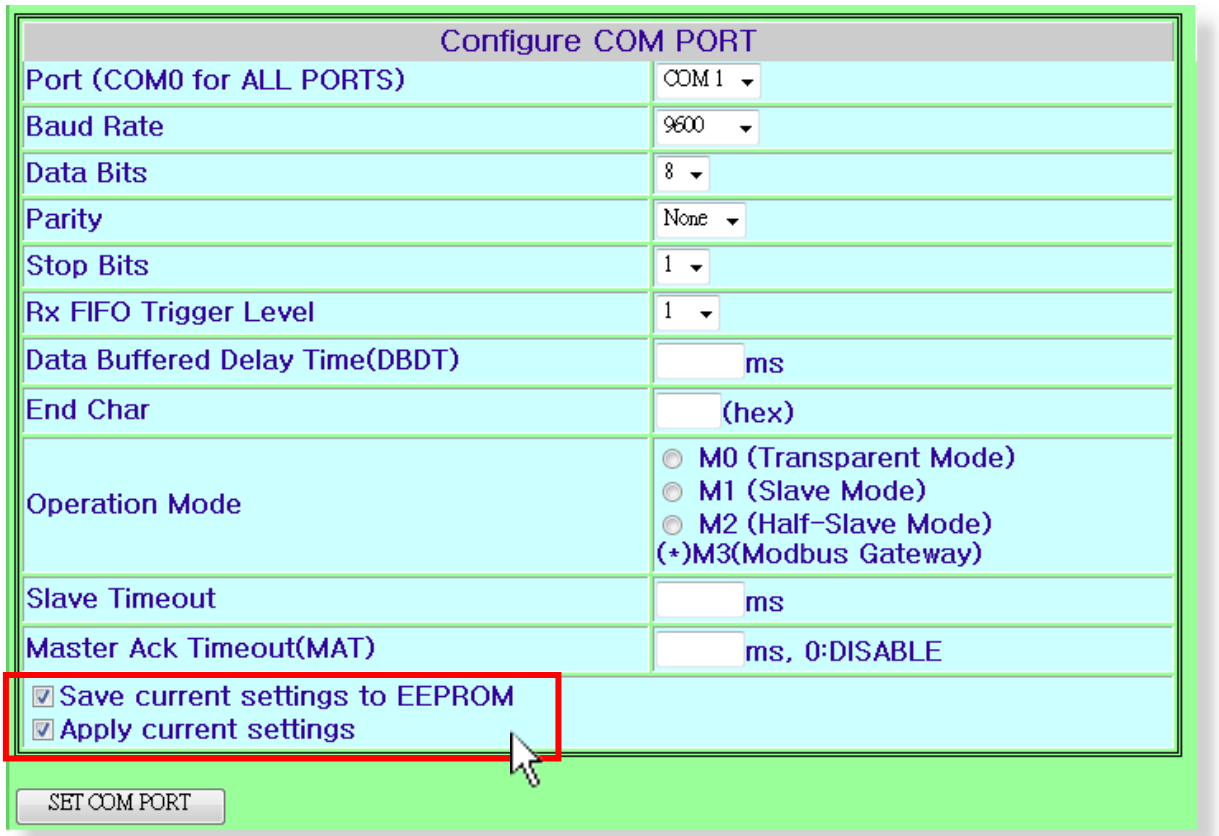
- The COM Port Settings list is saved in the EEPROM on the PDS-220Fx series module.



- The Currently Used COM Port Settings list.



- The COM Port Settings area:



- **Save current settings to EEPROM:** If the "**Set COM Port**" button is clicked without checking "**Save current settings to EEPROM**", option the new settings will be saved to the PDS-220Fx series only and the new settings will be valid after the next power-on.

- **Apply current settings:** If the "**Apply current setting**" checked when the "**Set COM Port**" button is clicked, the new settings will be valid immediately.

.

Note: After configuring COM Port settings, please confirm that the "Save current settings to EEPROM" and "Apply Current settings" items are checked, and then click the "SET COM PORT" button.

- **Port**: The COM Port number on the PDS-220Fx series module.
- **Baud Rate, Data Bits, Parity**
- **Stops Bits, End Char**:
  The configuration settings should match the serial device used.

- **Rx FIFO Trigger Level**:

This option is used to set the number of characters that the COM Port can receive at once time, the PDS-220Fx will move the data from the COM Port FIFO to the PDS-220Fx. If the amount of data transferred is large and uses a transfer speed (115200 bps), setting a smaller value is helpful in preventing data loss.

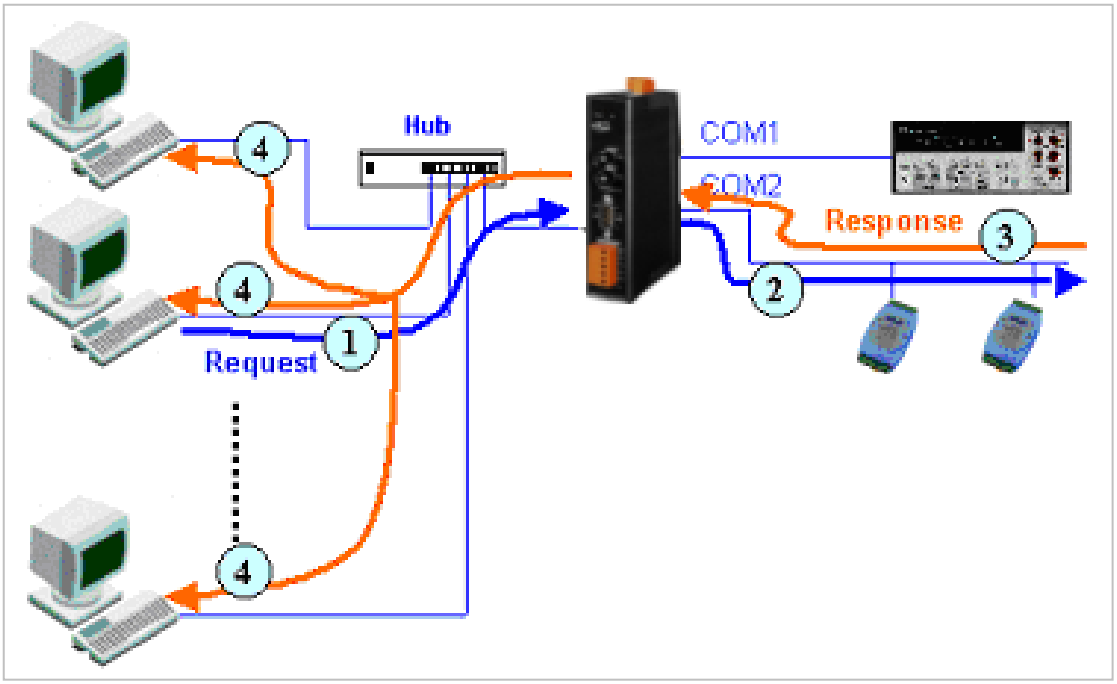
- **Data Buffered Delay Time (DBDT)**:

When the COM port does not receive data from devices connected over the period of DBDT setting, the PDS-220Fx will determine that the data transfer is over and return to process next tasks.

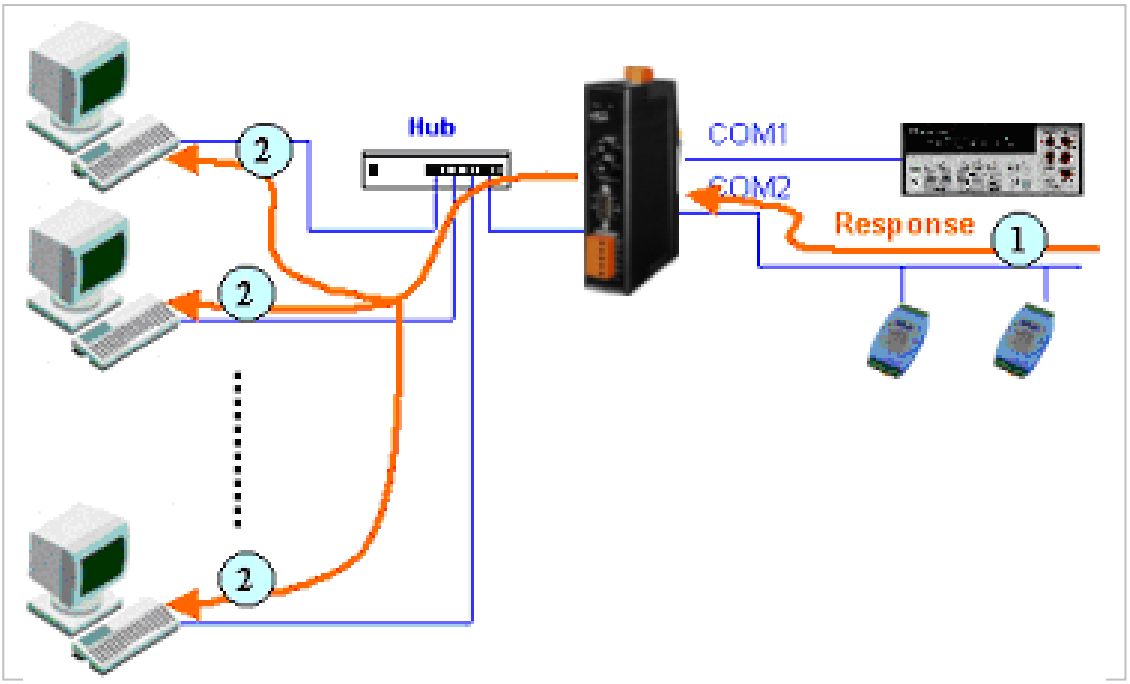
- **Operation Mode**: M0 (Transparent Mode), M1 (Slave Mode), M2 (Half-Slave Mode), M3 (Modbus Gateway)

M0: Transparent Mode (Multi-echo mode)

Condition 1: One client sends a request to the PDS-220Fx series module to access each device. The PDS-220Fx series module echoes the data from each device to each connected client.

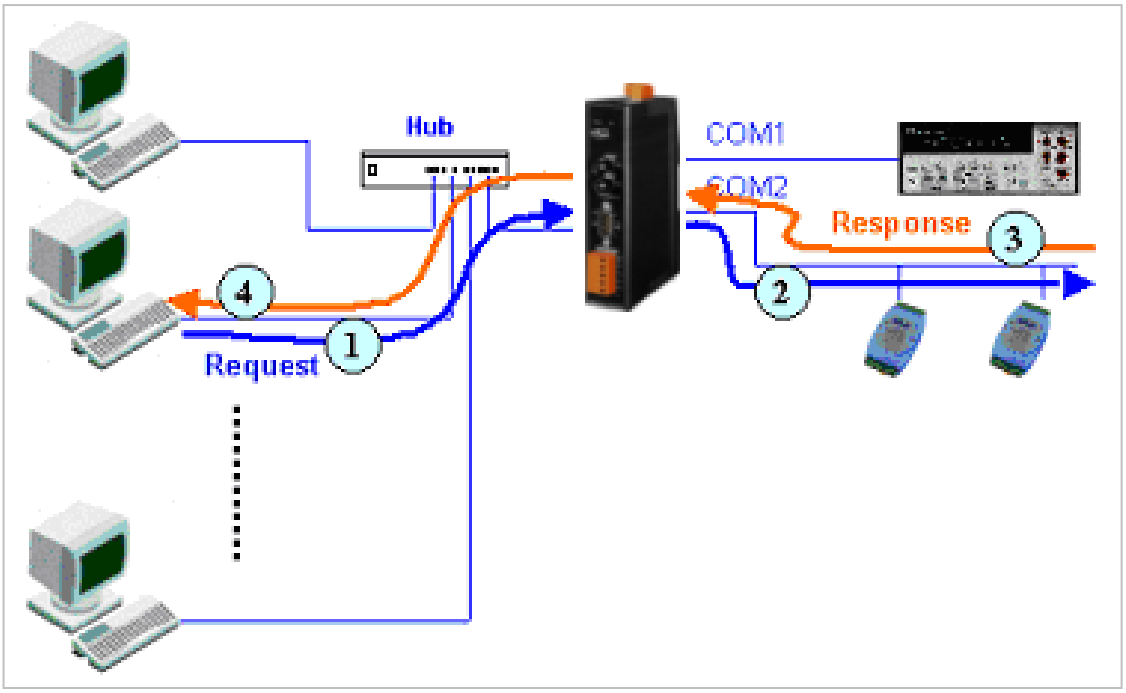


Condition 2: No clients send any requests to the PDS-220Fx series module. The PDS-220Fx series module echoes data from the devices to each connected client.

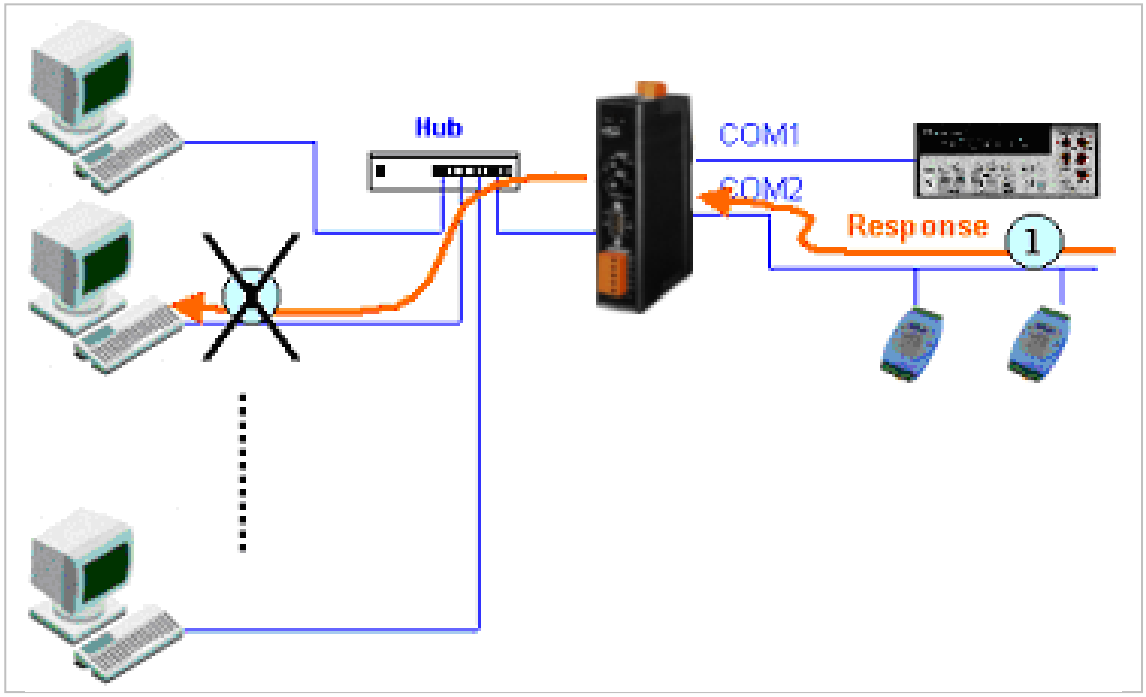


- **M1: Slave Mode (Single-echo mode)**

Condition 1: One client sends a request to the PDS-220Fx series module to access the other devices. The PDS-220Fx series module echoes data from the devices to the client that requested the service.



Condition 2: No clients send any requests to the PDS-220Fx series module. The PDS-220Fx series module doesn't echo any data from the devices to any client.



- **M2: Half-Slave Mode**

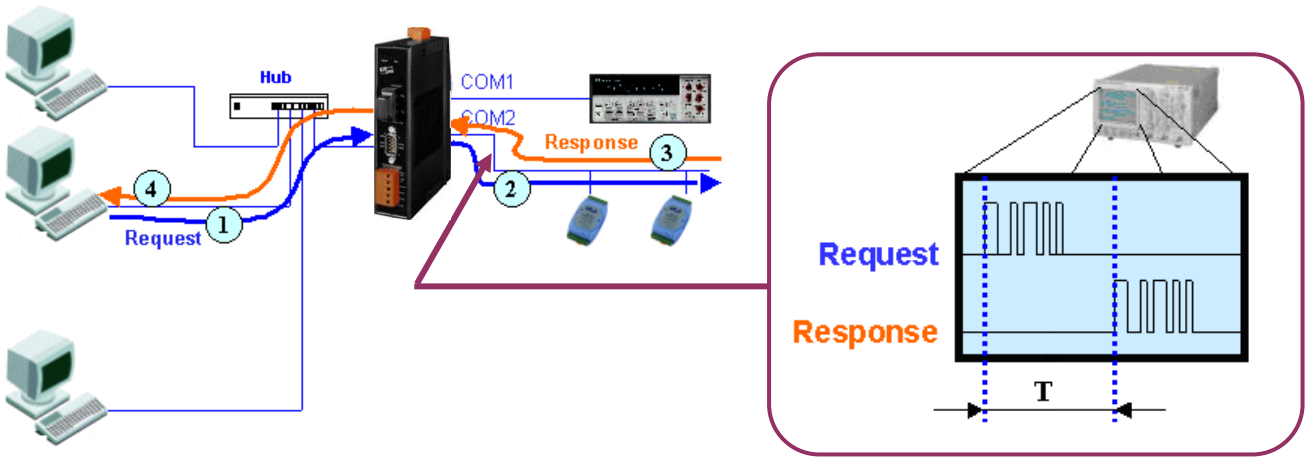
If only one client connects to the PDS-220Fx module, the operation mode same as M0 mode, please refer to page 36 (**M0: Transparent Mode**); and if there are two or more clients connecting to the PDS-220Fx module, the operation mode same as M1 mode please refer to page 37 (**M1: Slave Mode**).

- **M3: Modbus Gateway**

The more detailed information regarding Modbus Gateway applications settings, please refer to Section 6 "Modbus Testing and Protocol".

Slave Timeout (ms):

In M1 mode, the slave mode timeout setting is use to set the waiting time after last character of the request sent to the device. If the device does not respond within the timeout value, the PDS-220Fx series module will return a timeout error and process next request.

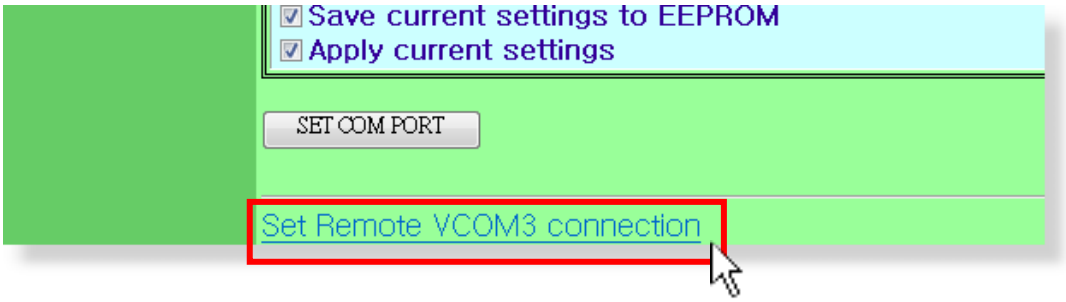


Master Ack Timeout (MAT): (ms) (0: DISABLE)

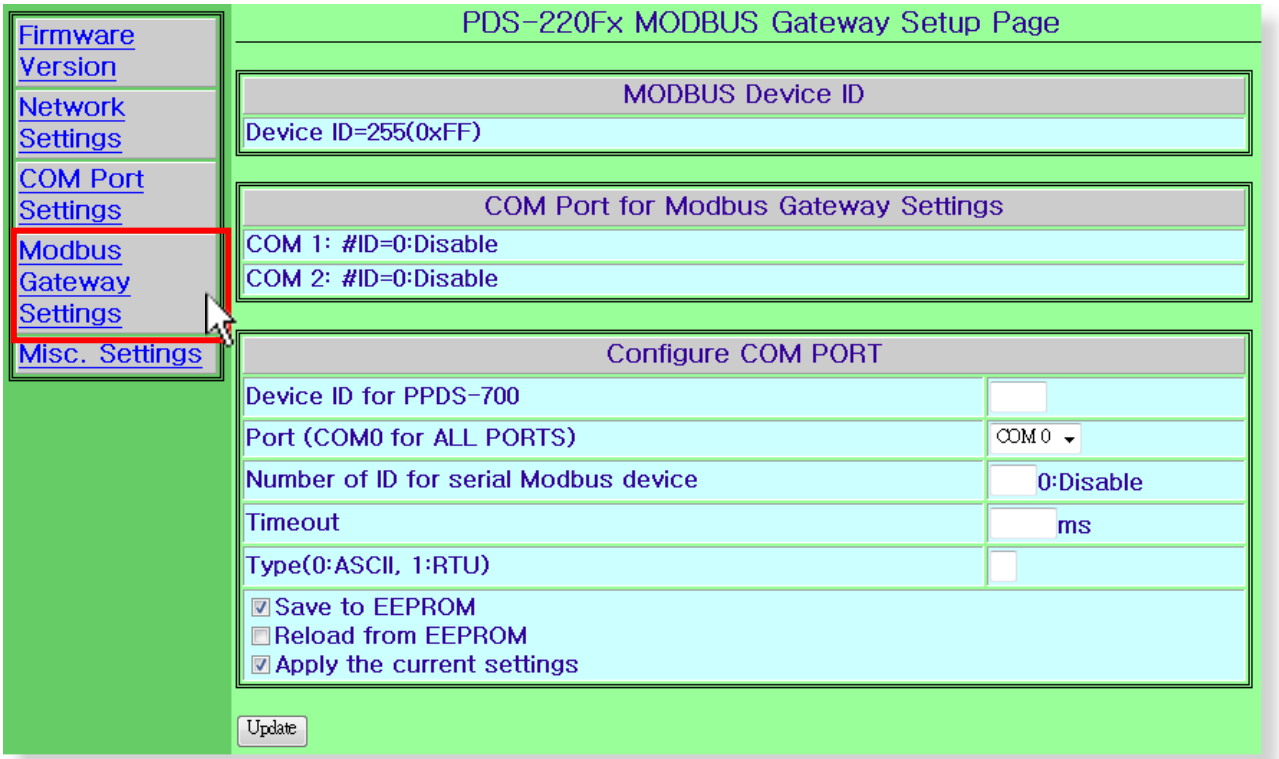
If the PDS-220Fx module does not receive any data from Slave for a certain period, the PDS-220Fx module will return an ACK character to Master and process next request based on the configured timeout value.

Set Remote VCOM3 connection:

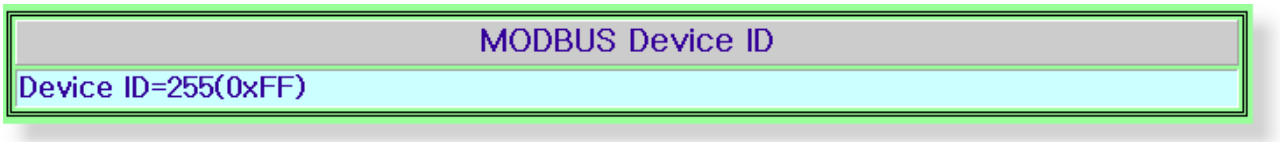
Sets the pair-connection functions, the more detailed information regarding pair-connection applications settings, please refer to the Section 5.7 Pair Connection Settings.



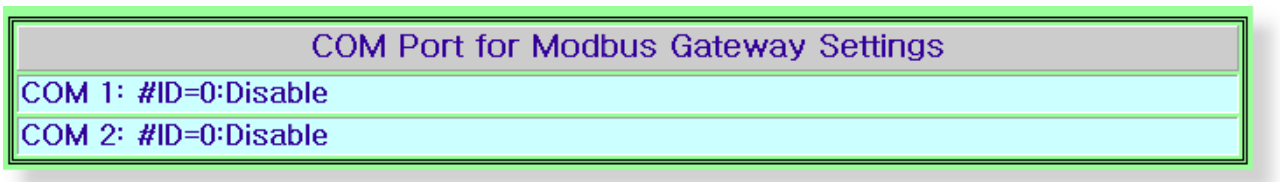
5.5 Modbus Gateway Settings



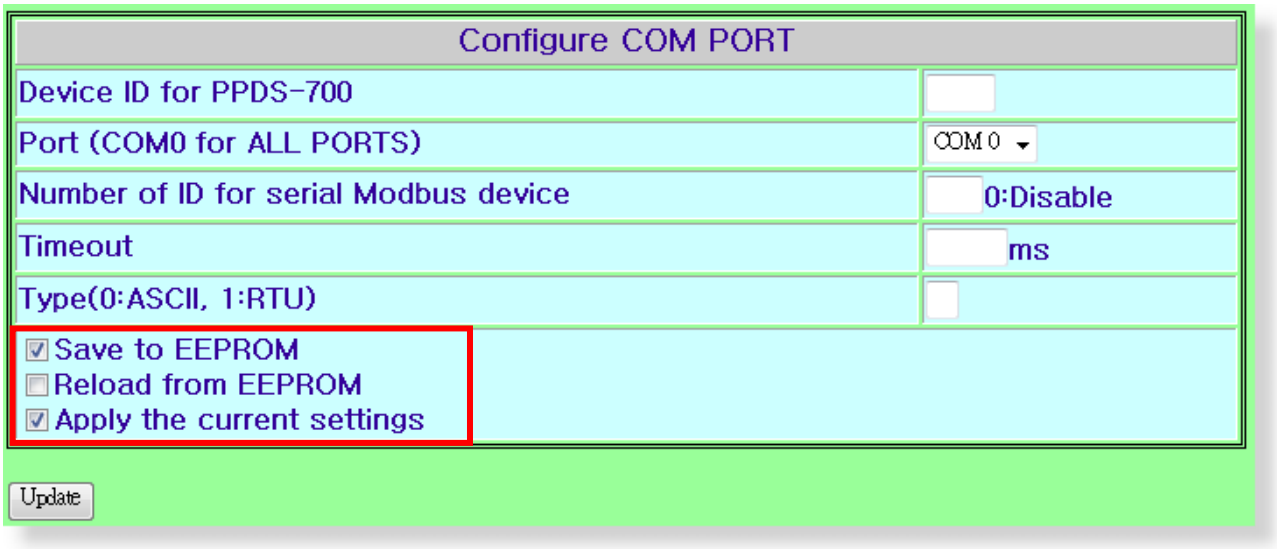
- Check the Modbus Device ID of PDS-220Fx module:



- Check the COM Port for Modbus Gateway settings:



- The COM Port Settings area:



- **Device ID**: Sets the device ID of PDS-220Fx module.
- **Port (COM0 for ALL Ports):** Select the COM port by you used for PDS-220Fx module.

- **Number of ID for serial Modbus device**: Sets the device ID of serial Modbus device. (0: Disable)

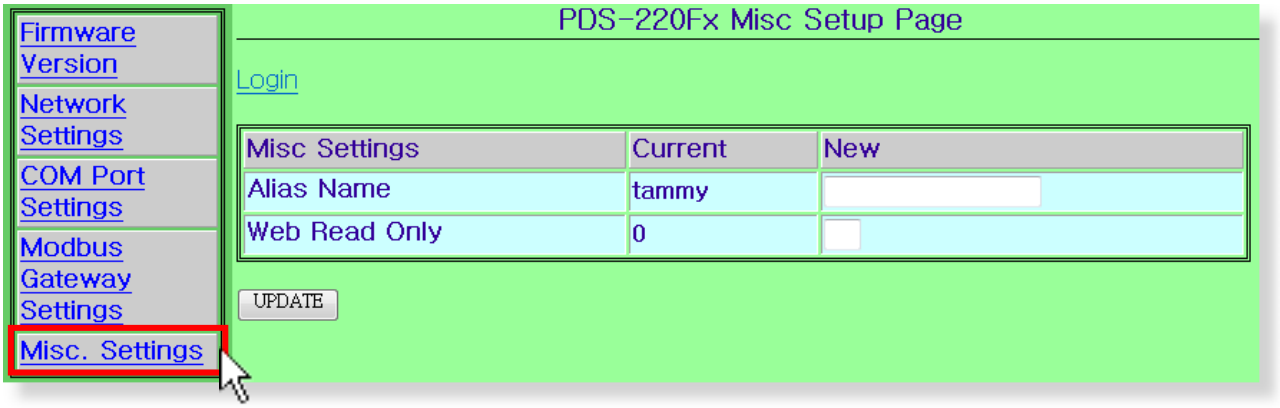
- **Timeout**: If the PDS-220Fx module does not receive any data from RTU Slave for a certain period, the PDS-220Fx module will return a timeout error to PC based on the configured timeout value.

- **Type (0: ASCII, 1:RTU):** Sets the Modbus type. (Modbus ASCII or Modbus RTU)

The more detailed information regarding Modbus Gateway applications settings, please refer to Section 6 “Modbus Testing and Protocol”.

Note: After configuring COM Port settings, please confirm that the “Save current settings to EEPROM” and “Apply Current settings” items are checked, and then click the “Update” button.

5.6 Miscellaneous Settings

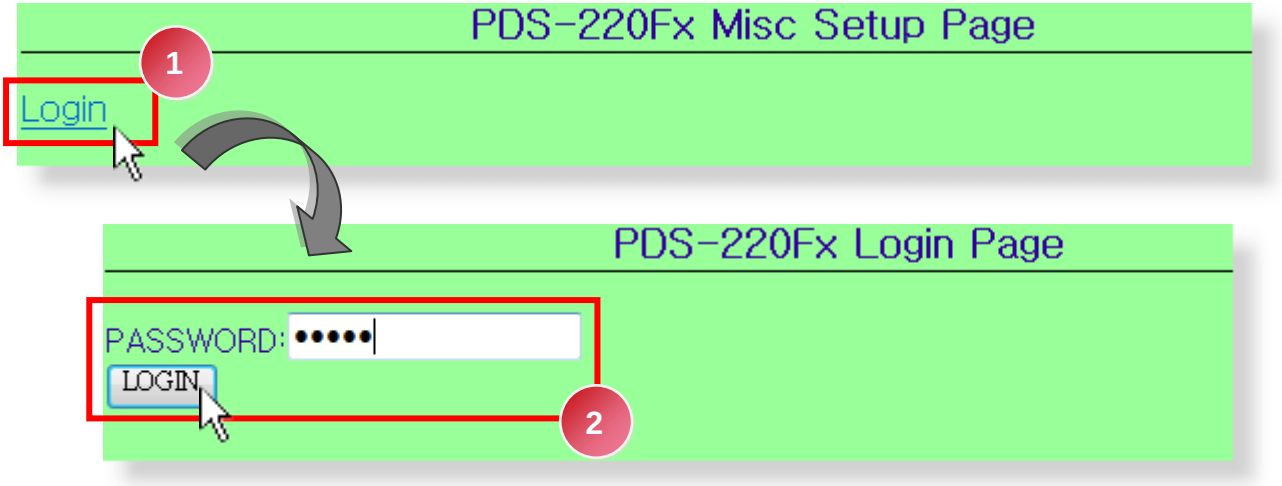


- **Alias Name:** allocates and alias to the PDS-220Fx series module.
- **Web Read Only**: 0 = disabled, 1 = enabled

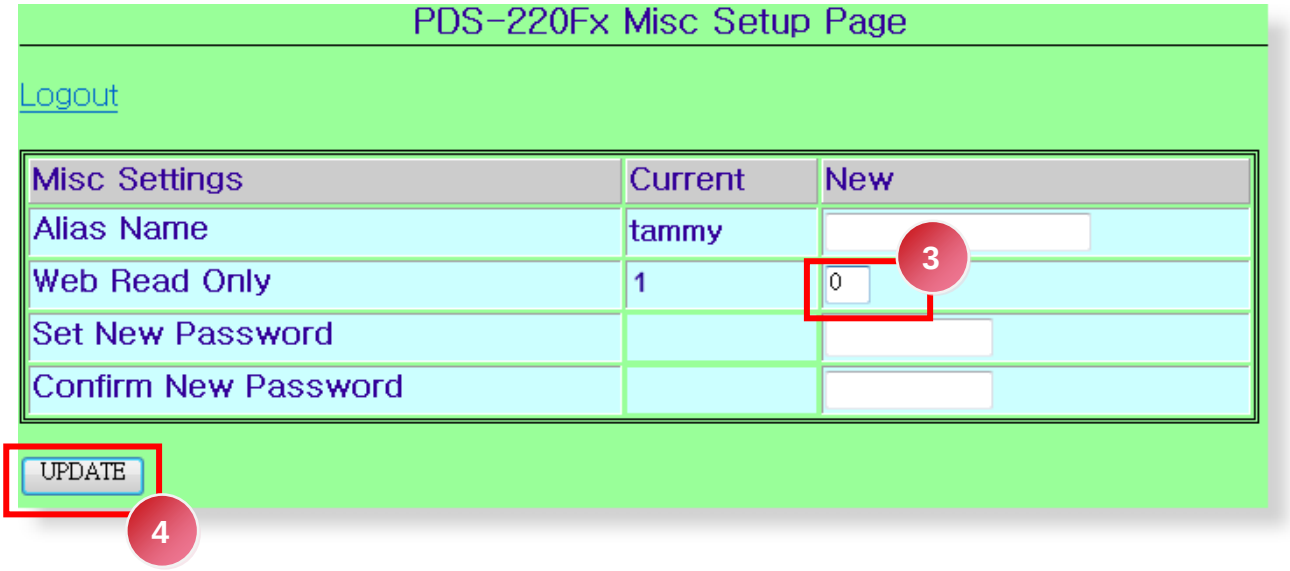
*If the "**Web Read Only**" properly is set to 1, enabled, the web server will **not** be able to save any new configurations to the PDS-220Fx series module. To disable the "**Web Read Only**" property, refer to the information below.*

- **Login**: used to disable the "**Web Read Only**" property or to set a new password.

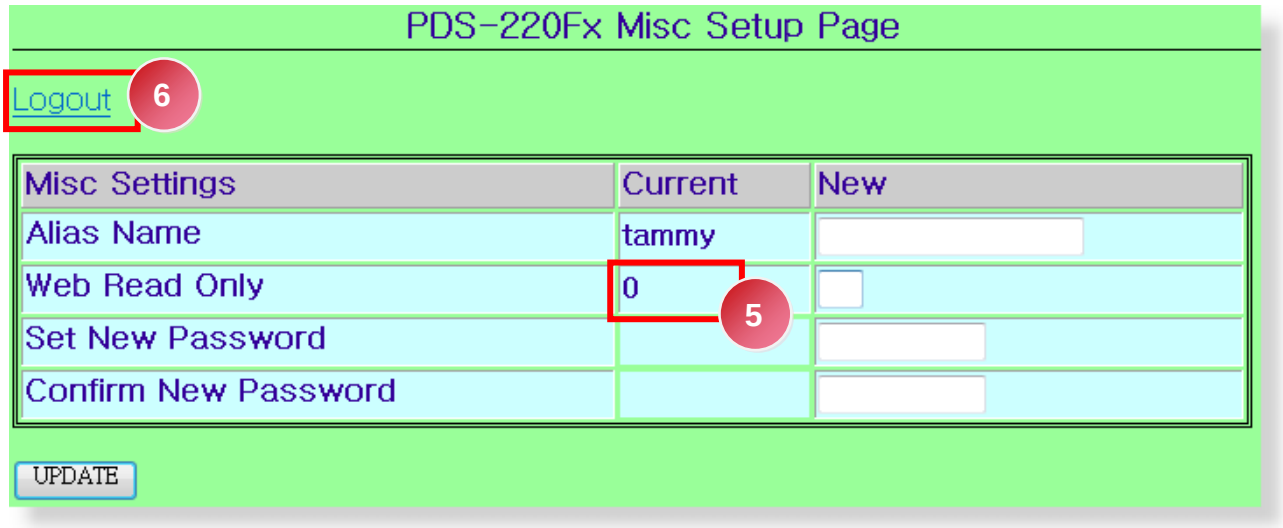
1. Enter the password (default is **admin**) and click the "**LOGIN**" button to proceed to the settings page.



2. Set the new "**Web Read Only**" properly = 0 and click the "**UPDATE**" button.

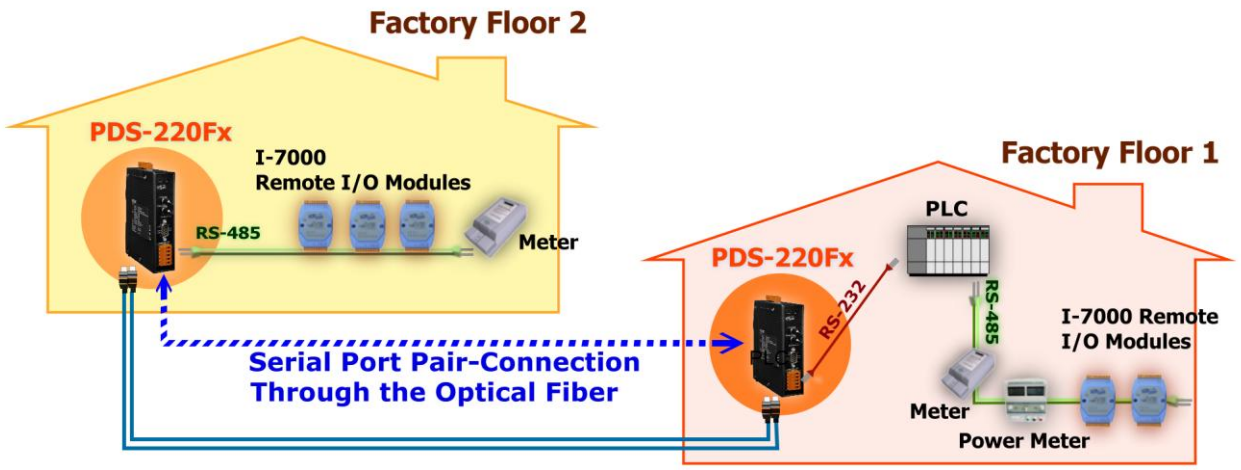


3. Check that the current the "**Web Read Only**" = 0 and then click "**Logout**" to complete the operation.



4. User can restore PDS-220Fx password to default value "**admin**" by using "config=RESET" console command (refer to section Console/Telnet Commands List). This command sets most configurations of PDS-220Fx to factory setting. It requires rebooting the PDS-220Fx for loading new configuration (includes default password).

5.7 Pair Connection Settings

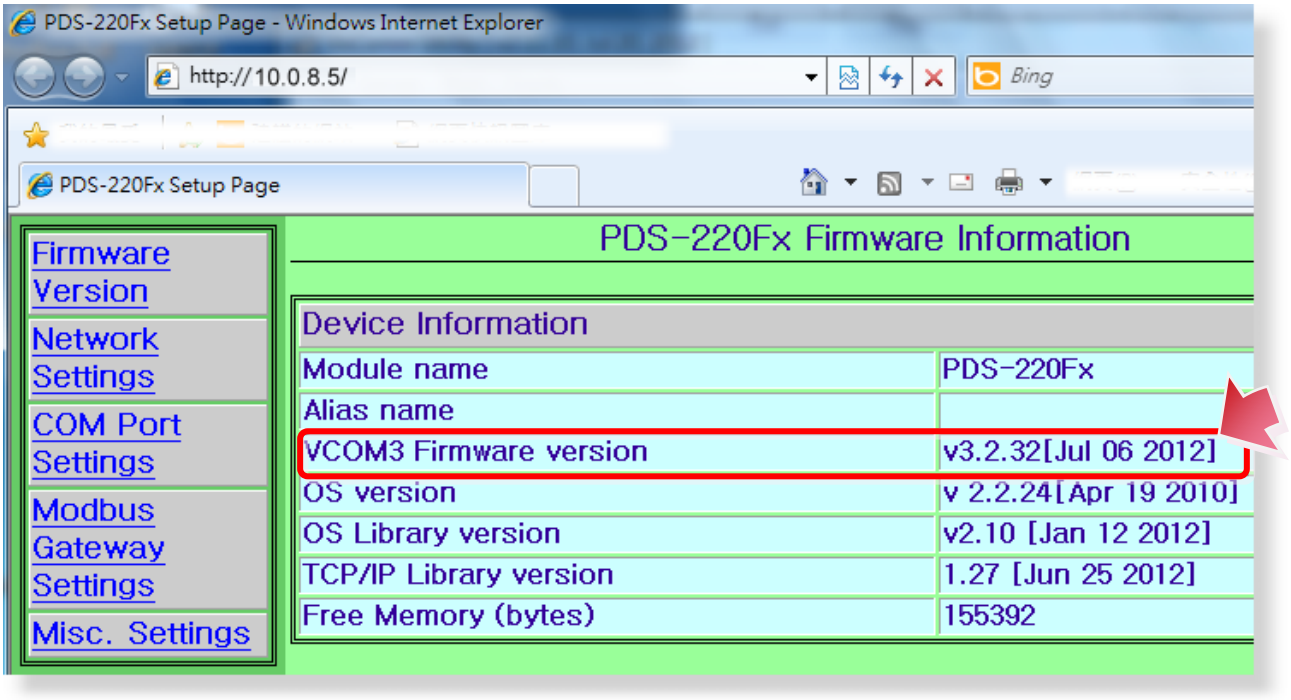


For example:

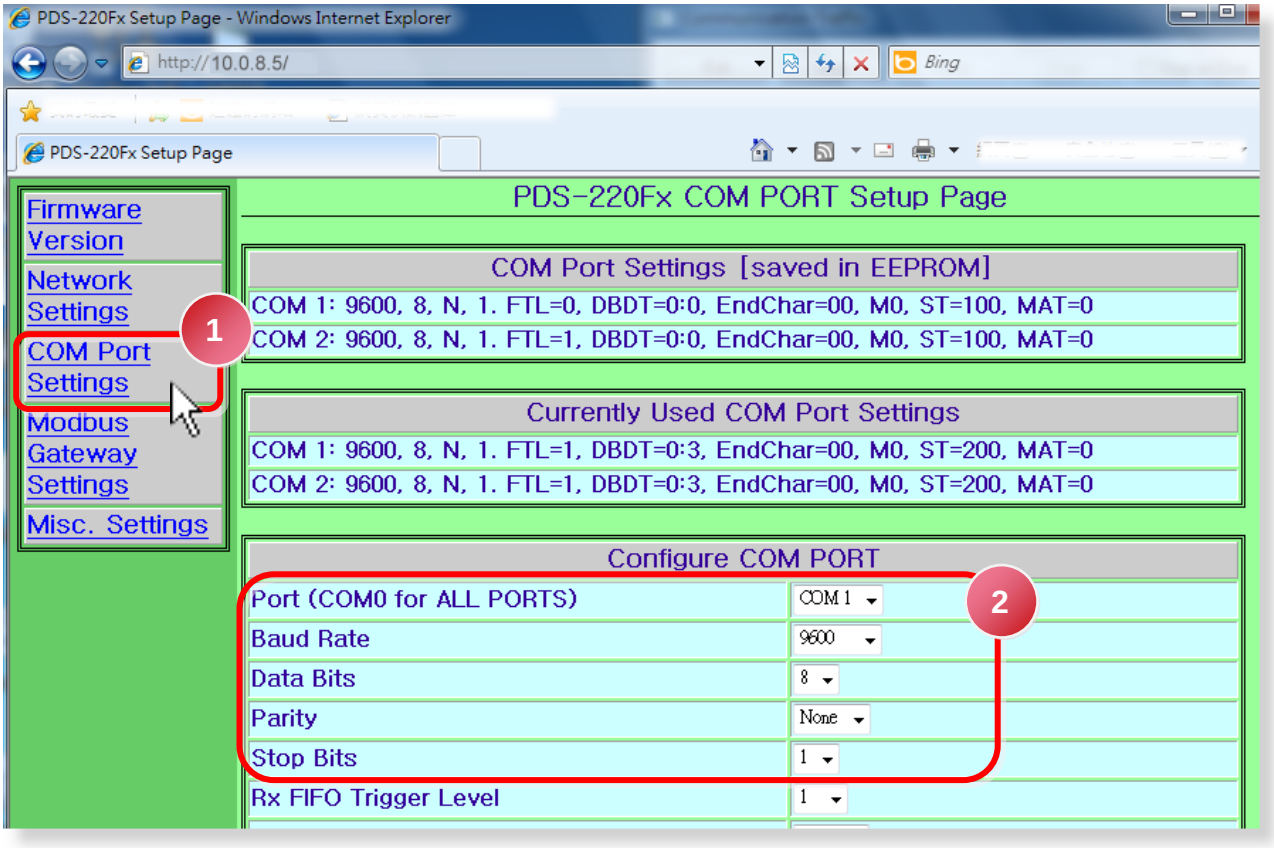
Item	Model Name	Server mode	Configuration IP Address
PDS-220Fx #1	PDS-220FT	Client	10.0.8.5
PDS-220Fx #2	PDS-220FT	Server	10.0.8.6

1. Contact your Network Administrator to obtain a correct and workable network configuration (such as IP/Mask/Gateway) for PDS-220Fx series modules. Please also refer to Section 4 Setting up the PDS-220Fx module.

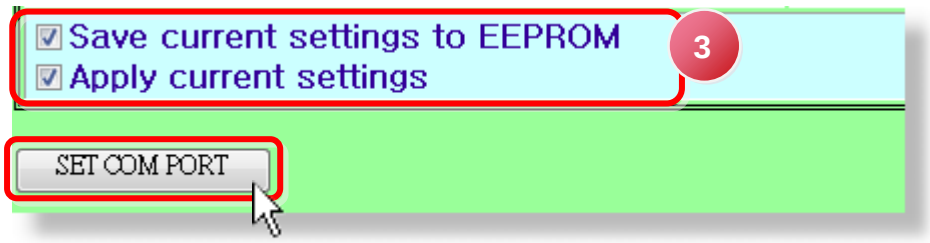
2. Enter the configuration of PDS-220Fx #1(Client) web server and then check your firmware version is **v3.2.31[Jun 19 2009] or later.**



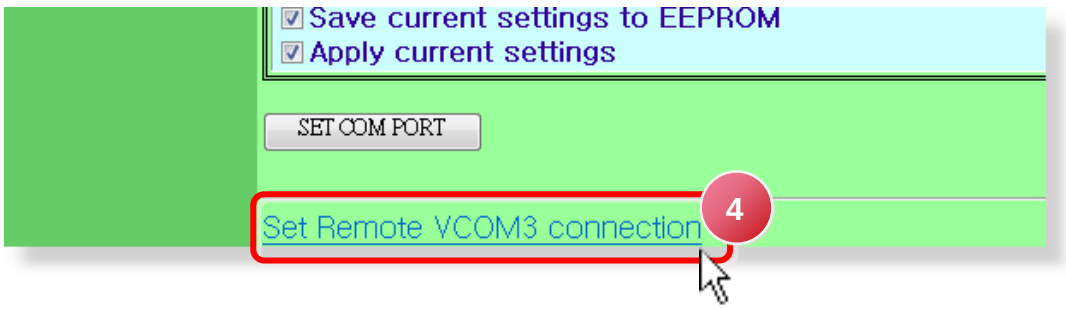
3. Click the "**COM Port Setting**" tag to enter the settings page, and select the "**115200**" in Baud Rate field and "**8, None, 1**" in data format field for example.



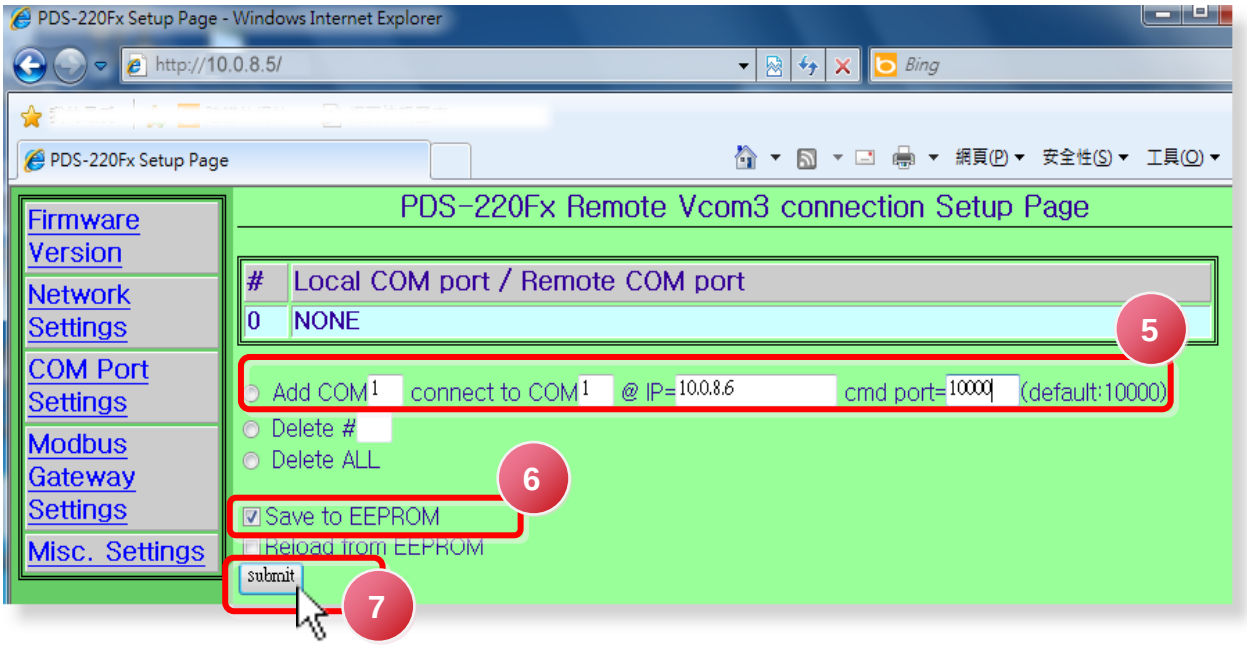
4. Check the "**Save current settings to EEPROM**" and "**Apply Current settings**" items, and then click the "**SET COM PORT**" button to finish configuration.



5. Click "**Set Remote VCOM3 connection**" at the PDS-220Fx #1 (Client) COM PORT setup page.



6. Select "**Add COM**" and type in the COM port of the PDS-220Fx #1 (Client) which you want to use.
7. Type in the COM port, IP and cmd port (default: 10000) of the **PDS-220Fx #2 (Server)**, and then check the "**Save to EEPROM**" and click "**submit**" button.



8. Reboot your PDS-220Fx #1(Client) and then setting is complete.
9. Enter the configuration page of PDS-220Fx #2 (Server) web server.
10. Click the "**COM Port Setting**" tag to enter the settings page of PDS-220Fx #2 (Server), and then set the Baud Rate "**115200**" and data format **"8, None, 1**".
11. Click "**Set Remote VCOM3 connection**" at the PDS-220Fx #2 (Server) COM PORT setup page.
12. Confirm that the Local COM port/Remote COM port field of the PDS-220Fx #2 (Server) is "**None**".

Note!!

1. **The baud rate and data format settings of the client and server (PDS-220Fx #1 and #2) are depending on COM ports of the connected device. The serial port settings can be different between the PDS-220Fx #1 and #2.**
2. **PDS-220Fx Pair-connection:** Built-in serial software buffer, baud rate and data format must be configured on PDS-220Fx first.
3. **I-2541 Pair-connection:** No serial software buffer, baud rate and data format cannot be configured on I-2541.

6. Modbus Testing and Protocol

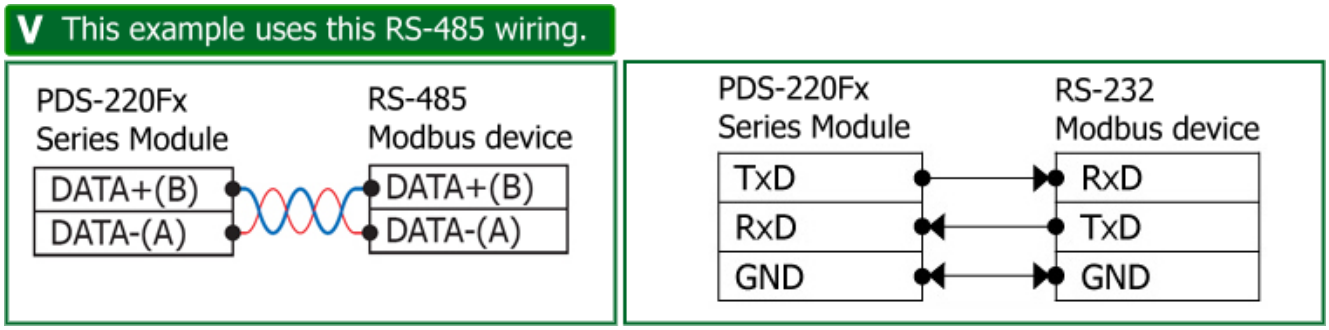
Step1: Install Modbus Utility on your PC

The software is located at:
CD: \NAPDOS\Modbus\modubs_utility
http://ftp.icpdas.com/pub/cd/8000cd/napdos/modbus/modbus_utility/

Step2: Connecting the Modbus device to PDS-220Fx

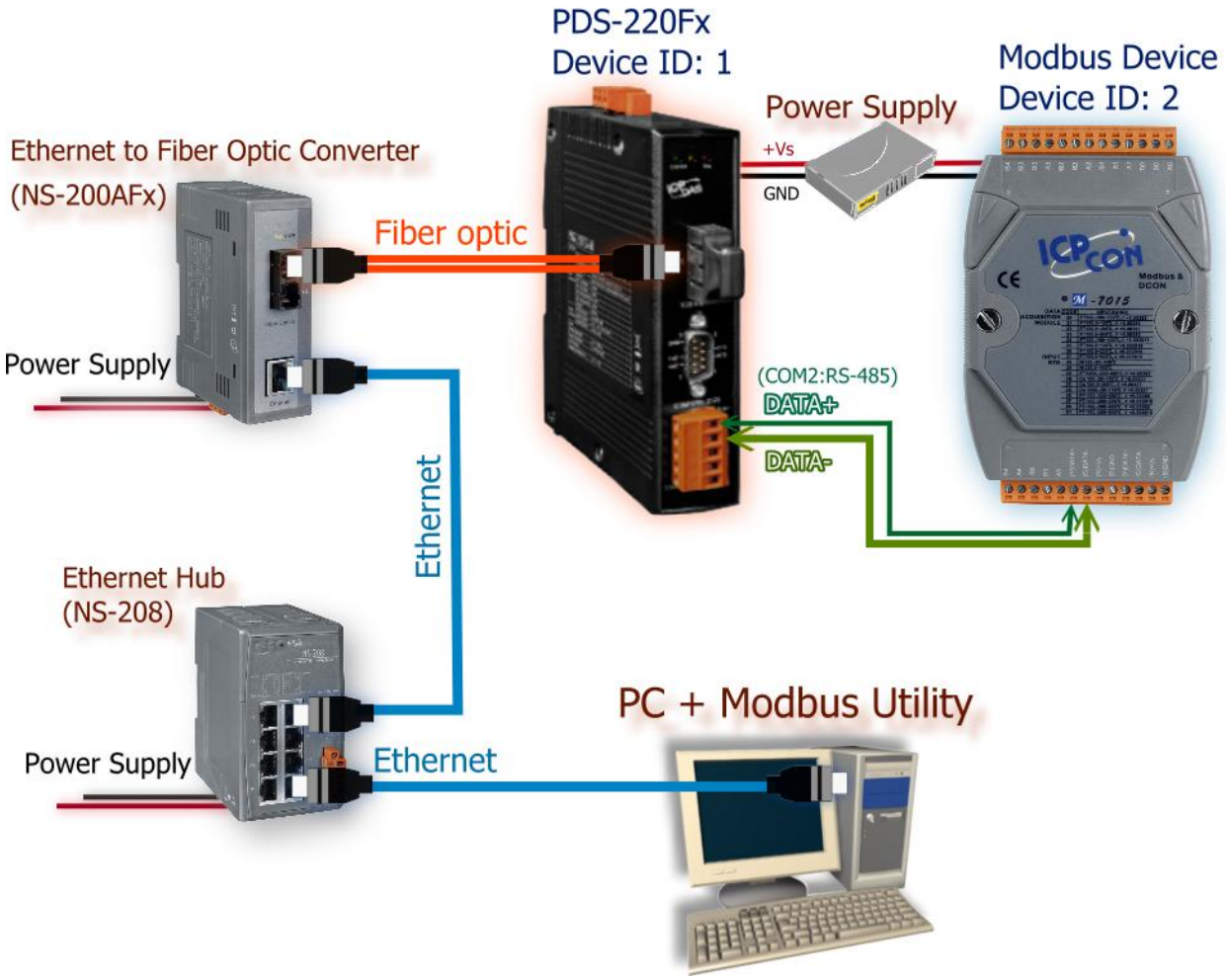
1. Prepare for device:
   - Fiber to Ethernet. (Ex. NS-200AFT, optional)
   - Ethernet Hub. (Ex. NS-208, optional)
   - Modbus device. (Ex. M-7015, optional)
   - Exterior power supply device. (Ex. DP-665, optional)

2. Keep up network connection status for your PDS-220Fx series Module, or refer to Section 4 Setting up the PDS-220Fx Module.
3. Connect the Modbus device (Ex. M-7015) to PDS-220Fx series module on COM2 (RS-485 bus).



4. Supply power to the Modbus device. (Ex, M-7015, Device ID: 2, +10~+30 V_{DC} Power used)

5. For example of Modbus test wiring as follows:

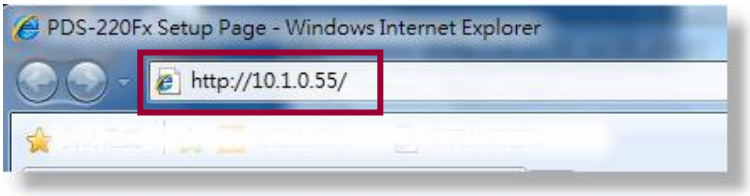


6.1 Modbus/TCP to Modbus/RTU Gateway

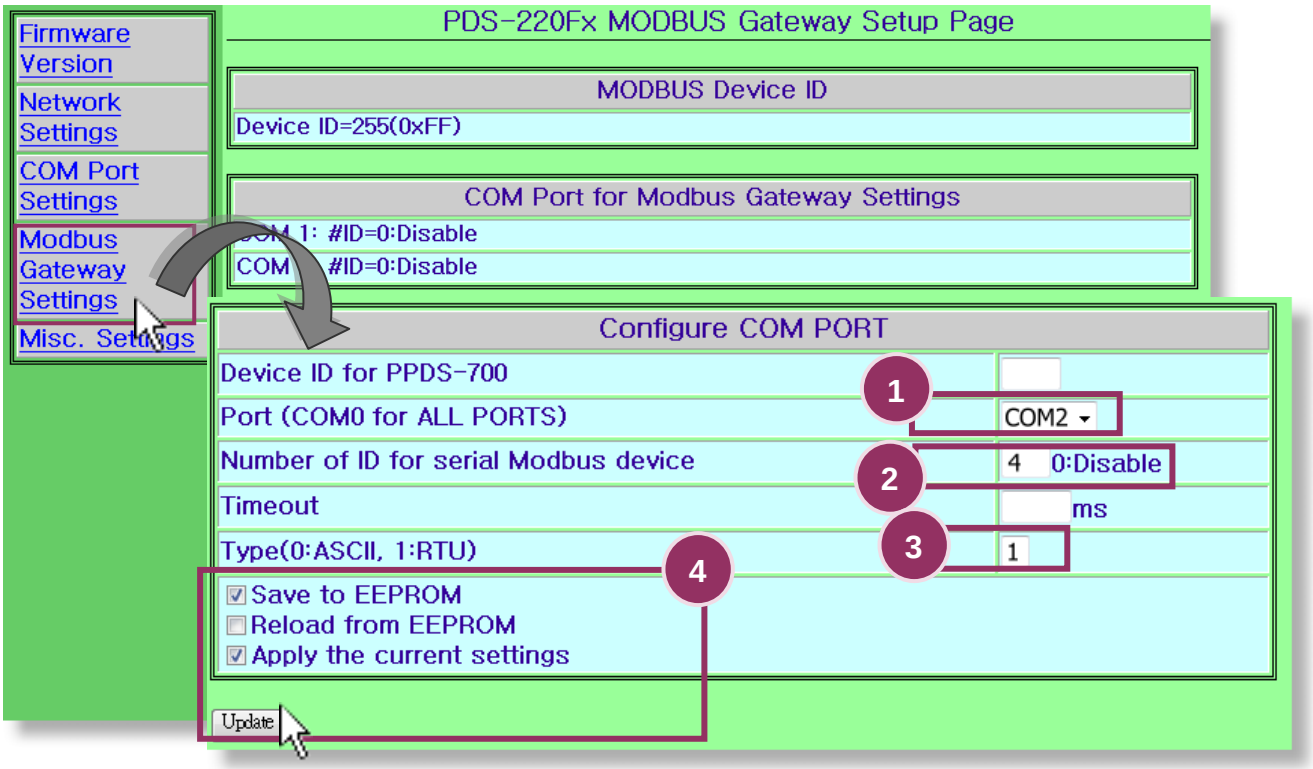
PDS-220Fx series module can work as a Modbus/TCP to Modbus/RTU gateway that supports most SCADA/HMI communications based on the Modbus/TCP protocol.

Step1: Configuring COM Ports for Modbus Gateway

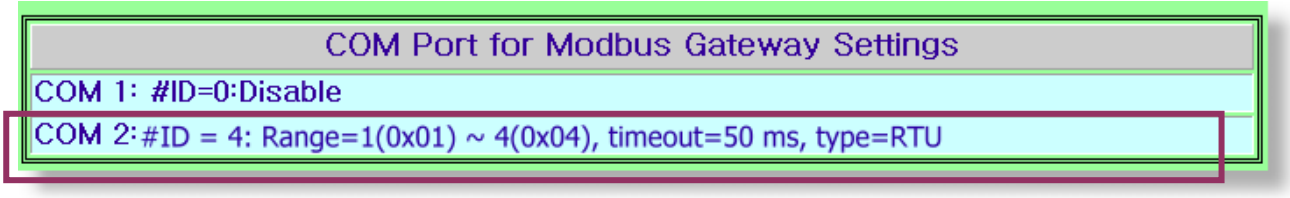
1. Enter the IP address of the PDS-220Fx series module in the address field and press "**Enter**" to connect to the PDS-220Fx series module.



2. Enter the configuration of PDS-220Fx web server and then check your firmware version is **v3.2.32[Jul 06 2012] or later,** please also refer to Section 5.1 Connecting to the PDS-220Fx module.
3. Click the "**Modbus Gateway Setting**" in the web page to configure the COM ports, as follows:
   - **1:** Select **appropriate COM Port** from the "**Port (COM0 for ALL PORTS)**" drop down options, for example "**COM2**".
   - **2:** Assign a **Numbers of Modbus device** in the "**Number of ID for serial Modbus device**" field, for example "**4**".
   - **3:** Select **Modbus type** from the "**Type (0: ASCII, 1: RTU)**" field, for example "**1(Modbus RTU)**".
   - **4:** Check the "**Save to EEPROM**" and "**Apply the current setting**" and then "**Update**" button to update it to PDS-220Fx series module.

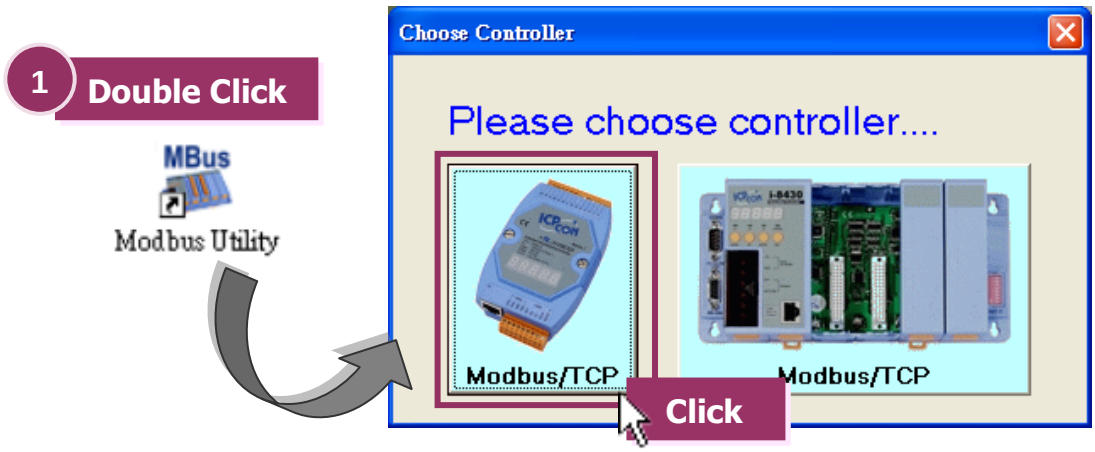


4. Check the COM Port for Modbus gateway setting.

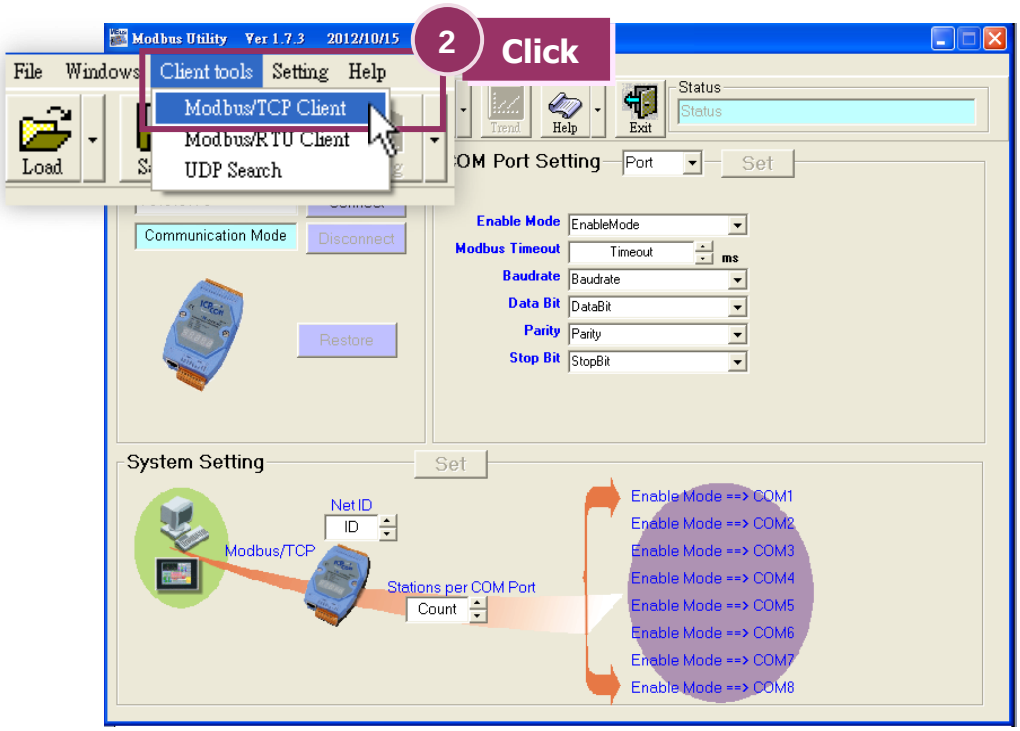


Step2: Test Modbus/TCP to Modbus/RTU Gateway

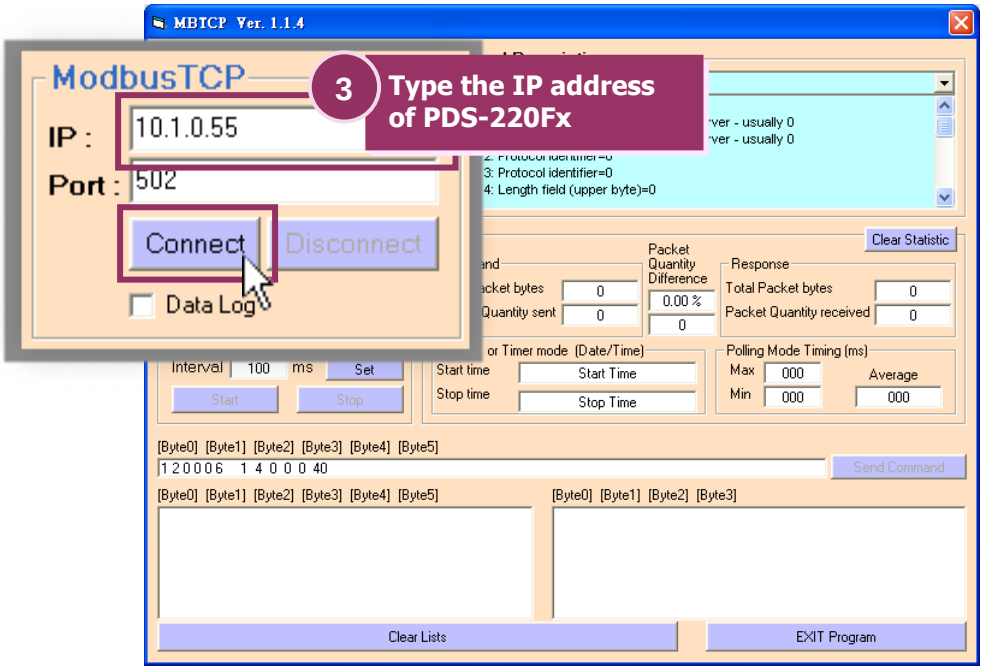
1. Run the Modbus Utility program and then click the **"Modbus/TCP"** button.



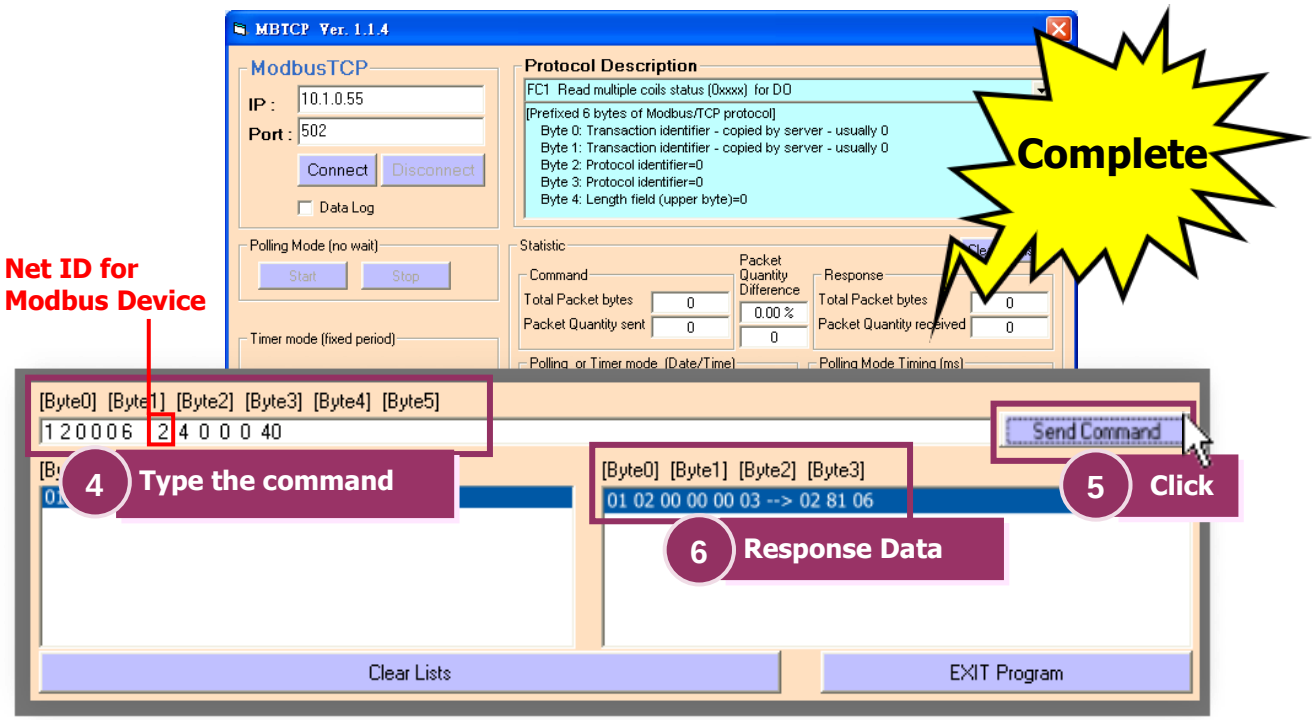
2. Click on "**Client tools**" → "**Modbus/TCP Client**".



3. Enter the IP address of PDS-220Fx series module and then click "**Connect**" button to connect the PDS-220Fx series module.



4. Refer to "**Protocol Description**" and type command in the command field then click the "**Send Command**" button. If the response data is correct, it means the test is success.

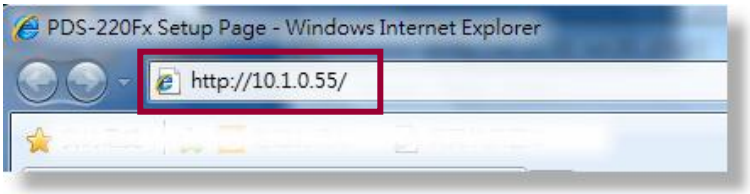


6.2 Testing Modbus Device through Virtual COM Ports

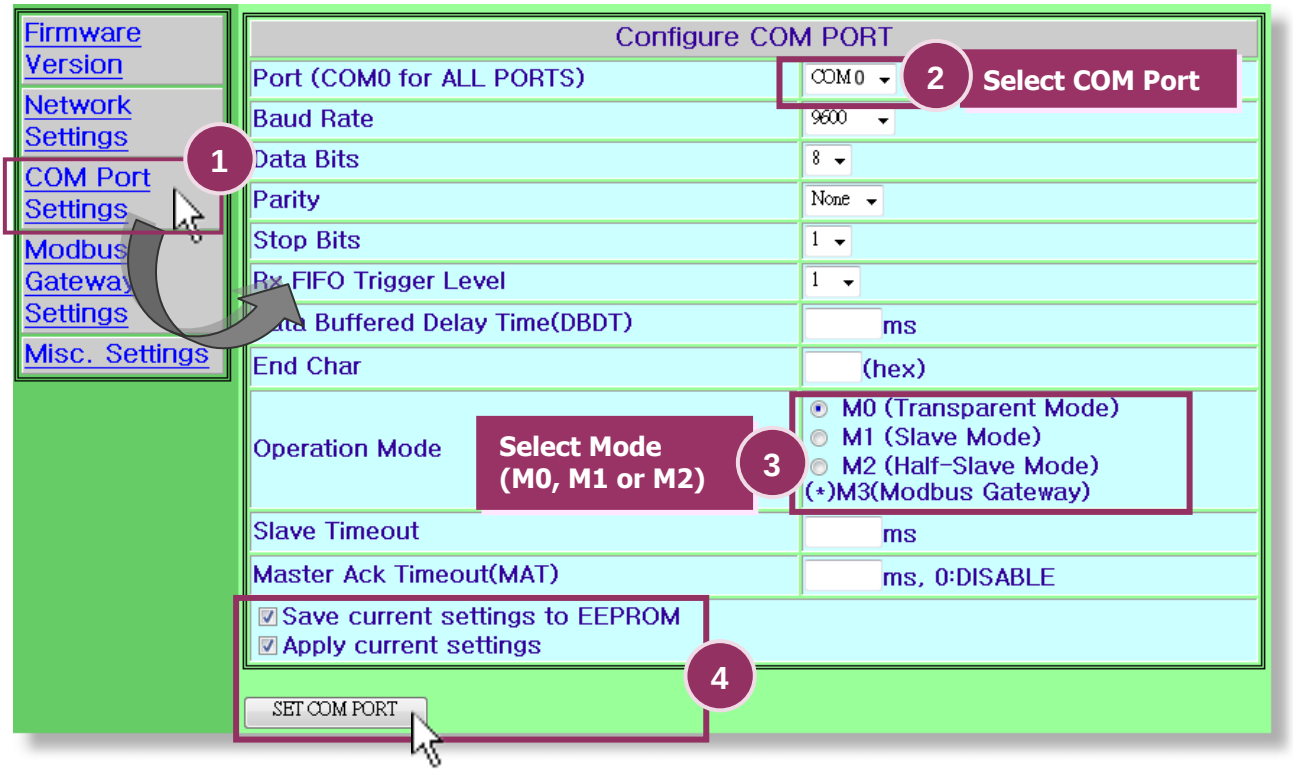
If want to use Modbus/RTU through Virtual COM Ports, you can refer to below steps.

Step1: Configuring COM Ports for Virtual COM

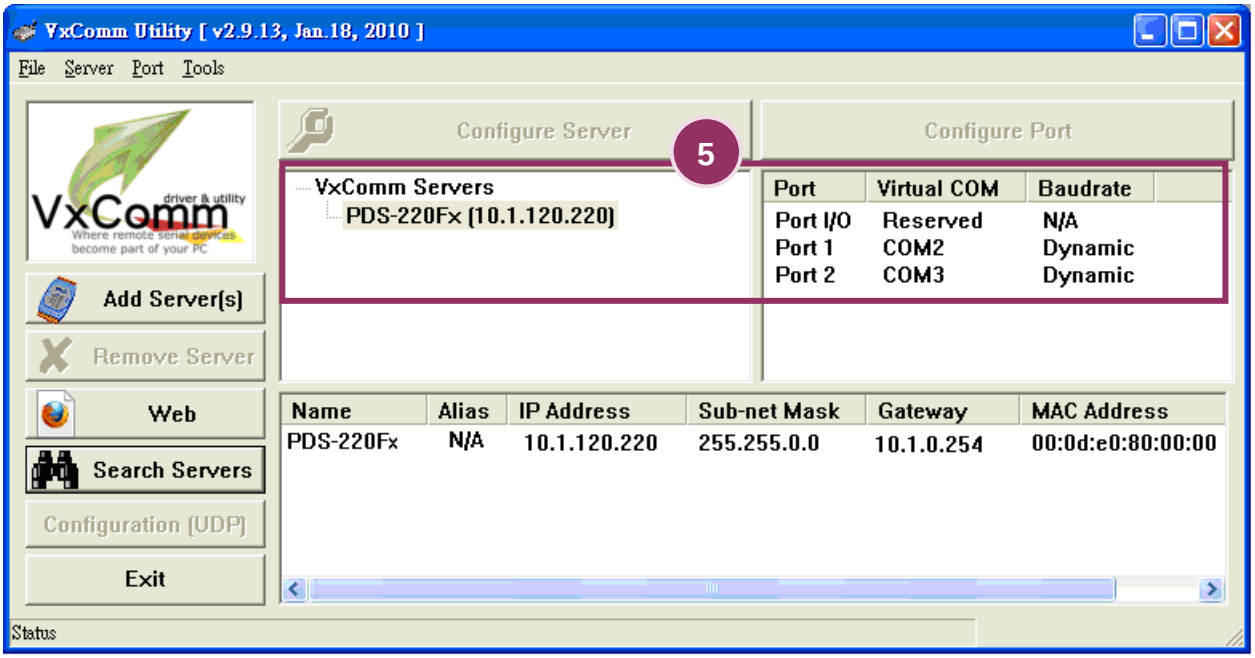
1. Enter the IP address of the PDS-220Fx series module in the address field and press "**Enter**" to connect to the PDS-220Fx series module.



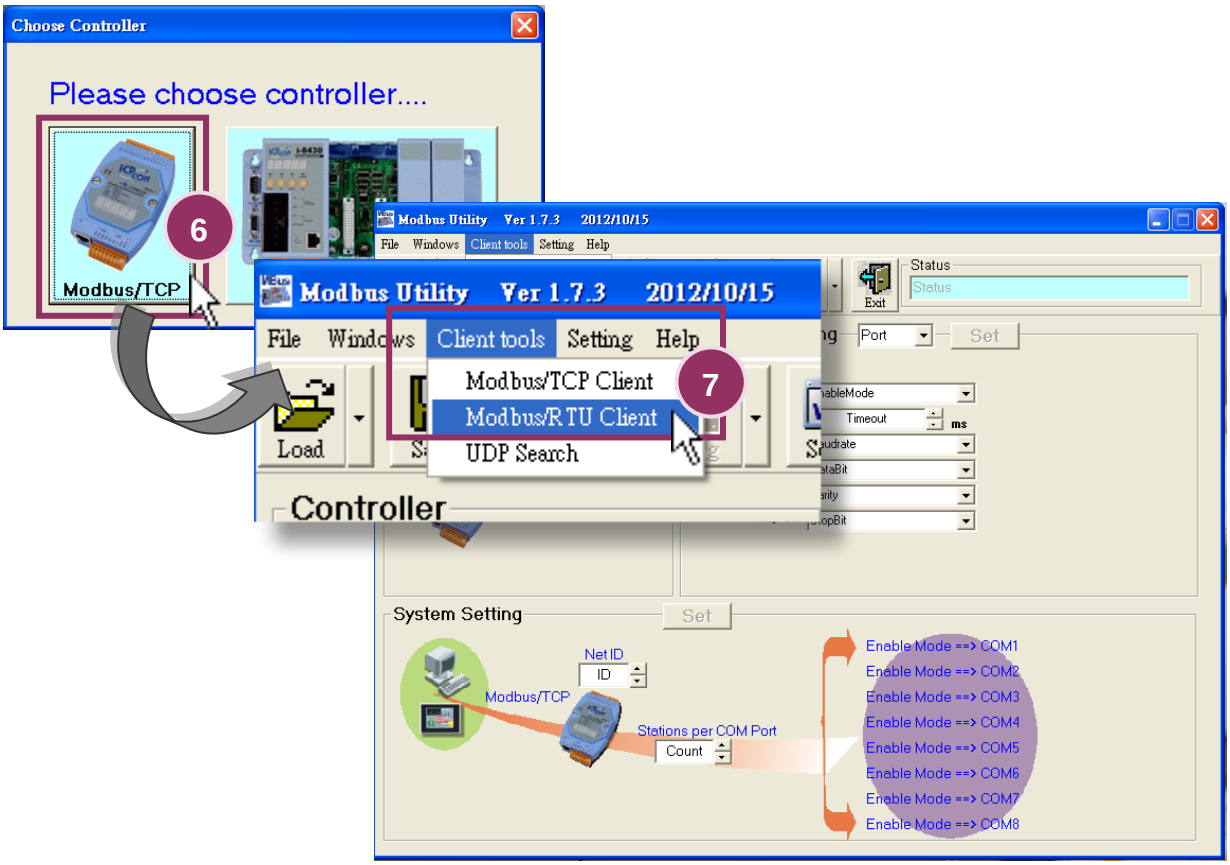
2. Enter the configuration of PDS-220Fx web server and then check your firmware version is **v3.2.32[Jul 06 2012] or later,** please also refer to Section 5.1 Connecting to the PDS-220Fx module.
3. Make sure your COM Ports of PDS-220Fx series module which aren't in the M3 mode. Select "**COM Port Setting**" in the web configuration and set the "**Operation Mode**". Check the "**Save current settings to EEPROM**", "**Apply current setting**" and then click the "**SET COM PORT**" button to complete the settings.



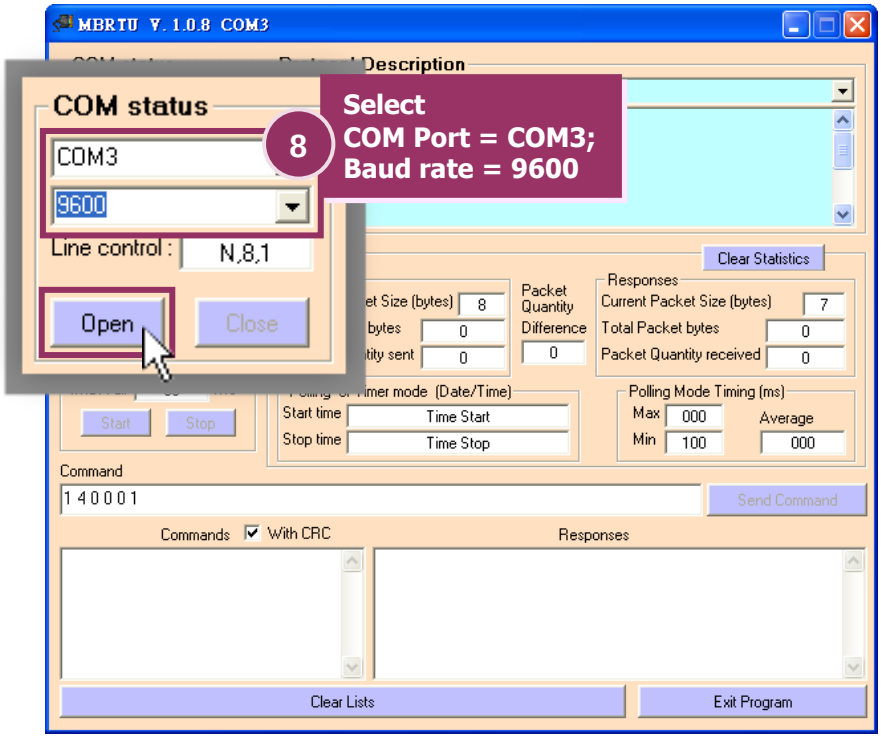
4. Add Server(s) in the VxComm Utility, please refer to Section 4 Setting up the PDS-220Fx Module.



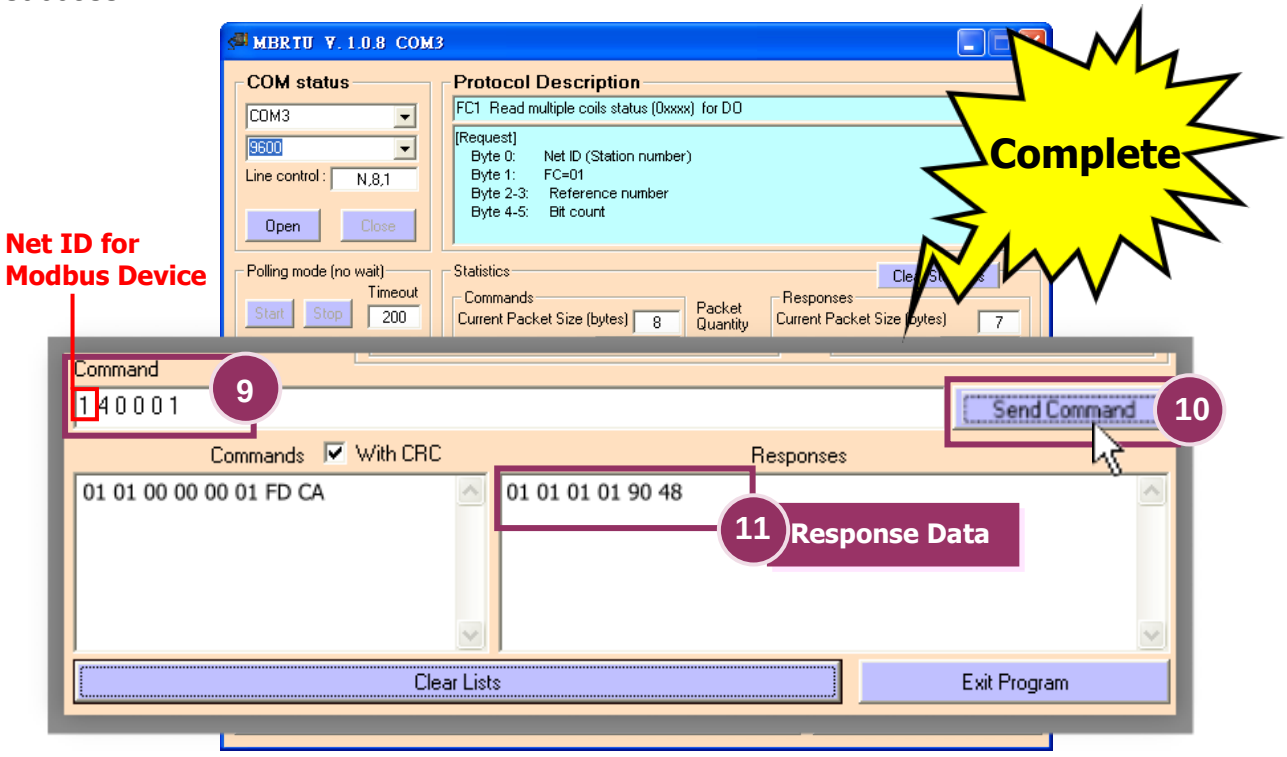
5. Run Modbus Utility program and click the **"Modbus/TCP"** button and then click on "**Client tools**" → "**Modbus/RTU Client**".



6. Select your virtual COM port and baud rate (Default: 9600) on PDS-220Fx series module and then click the "**Open**" button.

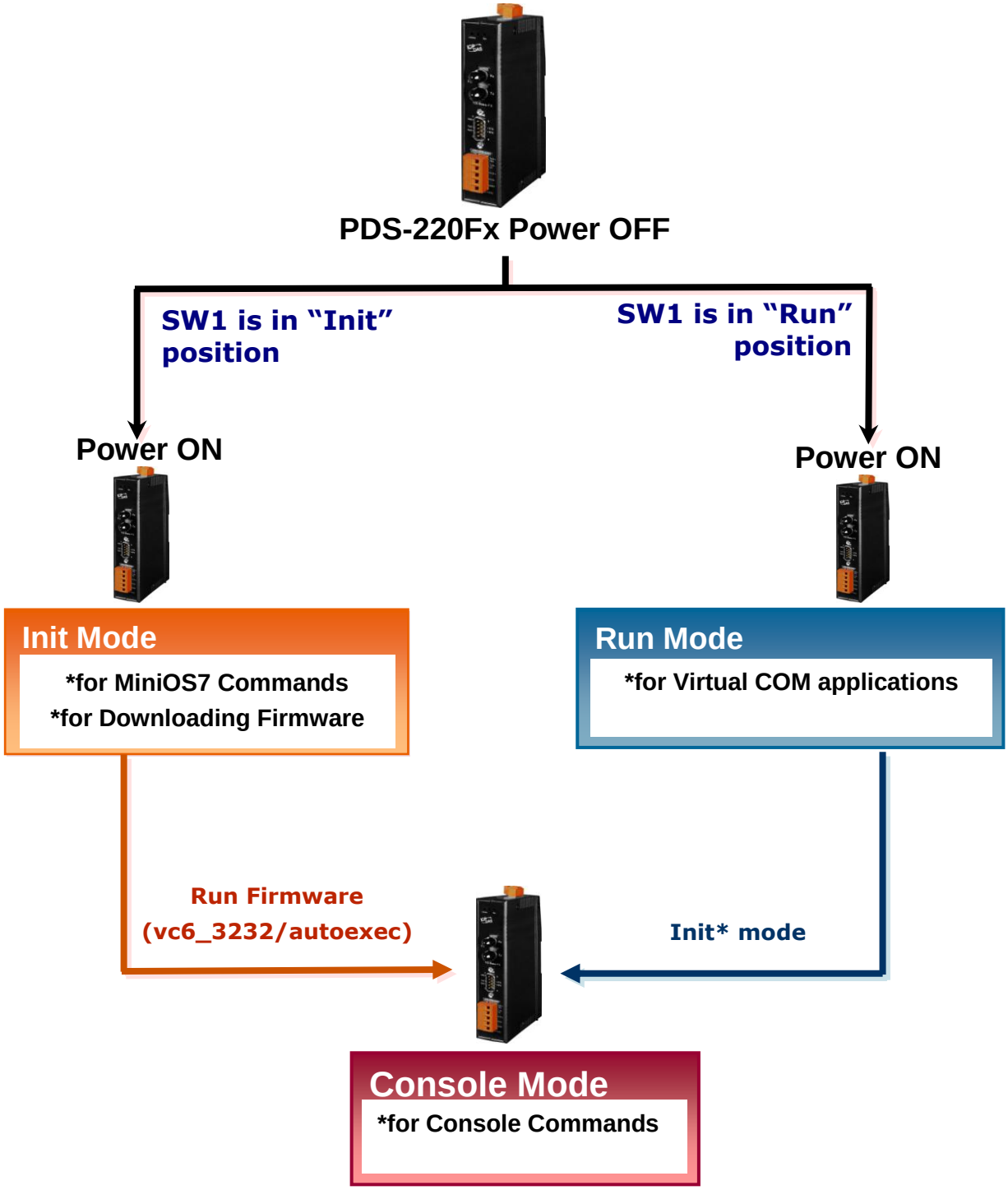


7. Refer to "**Protocol Description**" and type the command in the command field then click the "**Send Command**" button. If the response data is correct, it means the test is success.

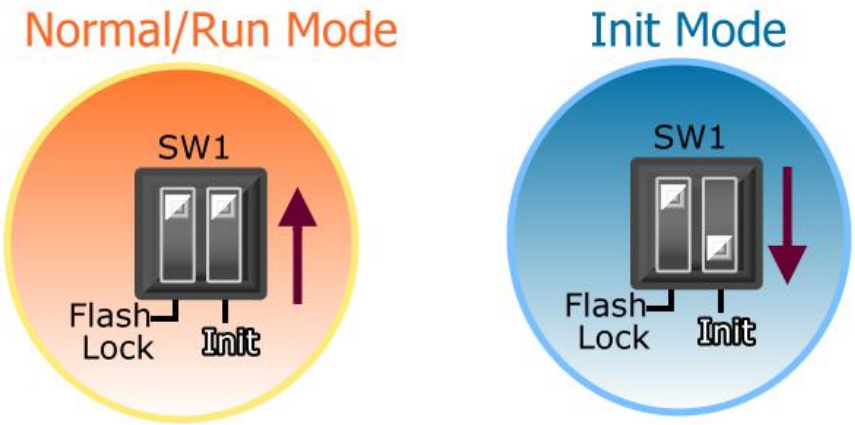


7. Console / Telnet Commands List

7.1 Operation Flowchart



7.2 Regulate Init/Normal(Run) Mode



■ Comparison Sheet (Init/Run Modes)

Mode	Firmware	VCOM Commands	Telnet Commands	Console Commands
Init	*Stop*	*No*	*No*	*No*
	Init Mode is used to upgrade firmware and accepts MiniOS7 commands (from PDS.COM1) only.			
Run	*Running*	***Yes***	***Yes***	*No*
	Run Mode is used for Virtual COM applications, and accepts Virtual COM commands (TCP port 10000) and Telnet commands (TCP port 23).			
Console	*Running*	***Yes***	***Yes***	***Yes***
	Console Mode is used to configure the Virtual COM. PDS.COM1 is the console port that accepts console commands while other ports are still working with Virtual COM applications.			

7.3 Command List

Sec.	Command	Description
7.3.1	IPFILTER	Retrieves/Sets the IP addresses that are allowed to access the PDS-220Fx.
7.3.2	IPCONF	Queries the network configuration. (IP/Mask/Gateway/MAC addresses).
7.3.3	SOCKET	Lists all the status of sockets (Listen/Not Used Yet) together with the type of each socket (TCP Server: Port No./UDP/Unused).
7.3.4	COM	Queries or sets the configuration of the COM Ports (Baud Rate/Parity /Stop Bits)
7.3.5	Broadcast	Queries or sets the Broadcast parameter, which determines whether or not the module can receive Broadcast packets.
7.3.6	SystemTimeout (ms)	If PDS-220Fx has no network communications during the SystemTimeout period, the PDS-220Fx will reboot it-self automatically.
7.3.7	SocketTimeout (ms)	If there is no data send/receive on the connection during the SocketTimeout period, the PDS-220Fx will close the connection automatically.
7.3.8	M	Gets/Sets the echo mode. /M0: Transparent Mode, Multi-Echo, Data-Shared. /M1: Slave Mode, Single-Echo, None-Shared.
7.3.9	EchoCmdNo	Queries or sets the EchoCmdNo parameter that enables or disables adding Command Number before response.
7.3.10	EndChar	Sets a character that determines the end of a response string.
7.3.11	IP	Queries or sets the IP address.
7.3.12	MASK	Queries or sets the subnet Mask value.
7.3.13	GATEWAY	Queries or sets the Gateway address.
7.3.14	MAC	Queries the MAC address.
7.3.15	NAME	Queries the module name.
7.3.16	ALIAS	Sets the alias for a PDS-220Fx.
7.3.17	DHCP	Enables/Disables the DHCP client.
7.3.18	UDP	Sets whether to reply to a UDP search command.
7.3.19	VER	Queries the version information
7.3.20	SAVE	Determines whether or not backup copies of the "autoexec.bat" and "vcom.ini" files are saved when using the “load” command.
7.3.21	LOAD	Loads file to the built-in flash disk on PDS-220Fx. It should be used to update firmware only.
7.3.22	CONFIG	Restores the factory default settings.
7.3.23	RESET	Reboots the PDS-220Fx module.
7.3.24	QUIT	Exits the running firmware.

7.3.1 IPFILTER

Description: This command is used to query or edit IP filter table. The IP filter table restricts the access of packets based on the IP header. If one or more IP addresses are saved into the IP filter table, only clients whose IP is specified in the IP filter table can access the PDS-220Fx.

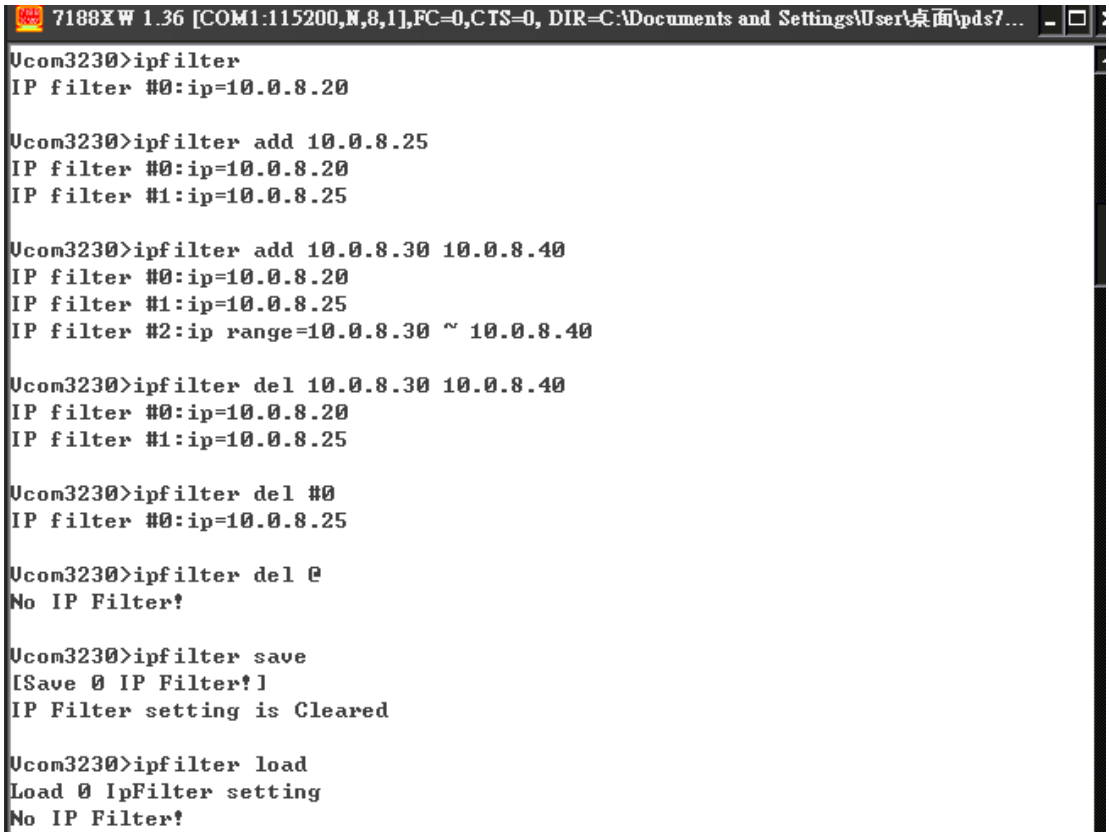
Effect: Immediate

Command	Arguments	Description
ipfilter		Queries the IP filter table.
ipfilter	ADD ip1 ADD ip1 ip2	Adds an IP address to the IP filter table. Adds a range of IP addresses (ip1 ~ ip2) to the IP filter table.
ipfilter	DEL ip1 DEL ip1 ip2	Deletes an IP address (ip1) from the IP filter table. Deletes a range of IP addresses (ip1 ~ ip2) from the IP filter table. The IP address that follows the DEL command should already be listed in the IP filter table.
ipfilter	DEL #n	Deletes item “n” from the IP filter table.
ipfilter	DEL @	Deletes all items from the IP filter table.
ipfilter	SAVE	Saves the IP filter table to the EEPROM. If the IP filter table is empty, the data in EEPROM will be cleared.
ipfilter	LOAD	Loads the IP filter table from the EEPROM.

※ The IP filter table is loaded automatically when the PDS-220Fx is booted.

※ Use the “ipfilter save” command to save a new IP filter table to the EEPROM.

Example:



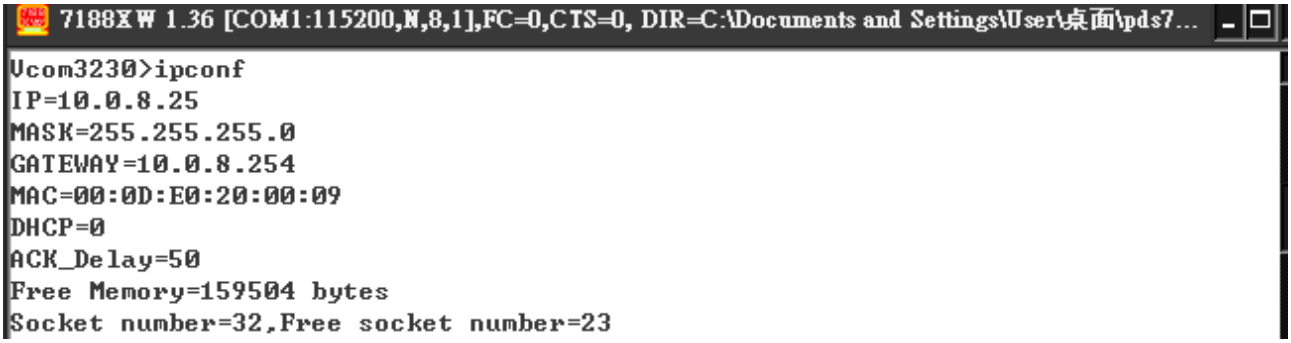
7.3.2 IPCONF

Description: This command is used to display the network configuration information, such as IP/Mask/Gateway/MAC addresses and the status of DHCP/ACK_Delay/Free Memory/Socket status.

Effect: Immediate

Command	Argument	Description
ipconf		Queries the network configuration.

Example:



7.3.3 SOCKET

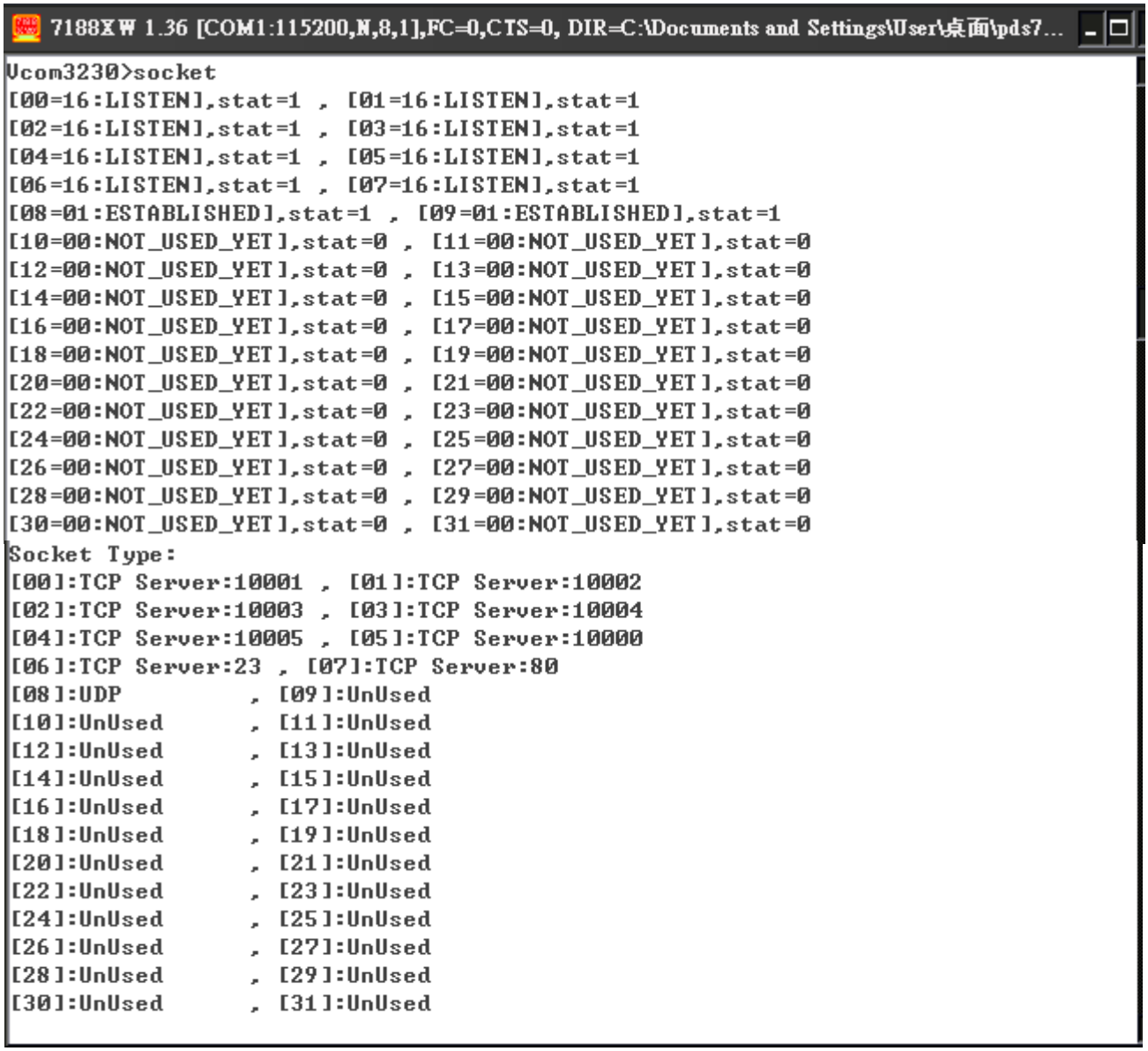
Description: This command lists the status of all sockets (Listen/Not Used Yet) together with the type of each socket (TCP Server: Port No./UDP/Unused)

If stat = 1, the socket is used. If stat = 0, the socket is not yet used.

Take Effect: Immediately

Command	Argument	Description
socket		Lists the status of all sockets.

Example:



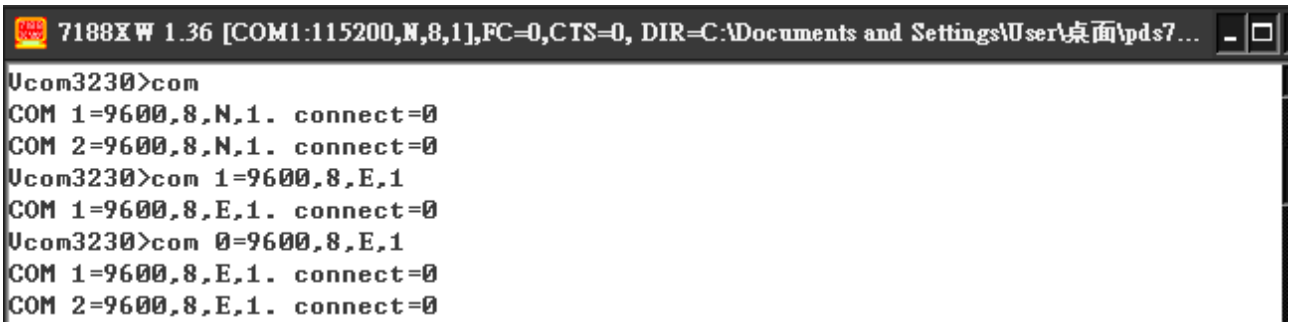
7.3.4 COM

Description: This command queries or sets the configuration of the COM Ports (Baud Rate/Parity/Stop bits).

Effect: Immediate

Command	Arguments	Description
com		Queries the configuration of all COM Ports.
com	n	Queries configuration of COM Port “n”. If n = 0, the configuration of all COM Ports will be listed in the same way as using the command “com” above.
com	N = BaudRate, DataBits, Parity,StopBit(s)	Sets the configuration of COM Port “n”. If n = 0, the settings will be valid for all Com Ports on the PDS-220Fx.

Example:



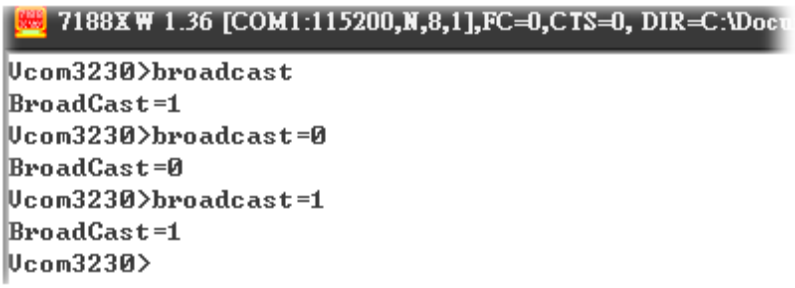
7.3.5 Broadcast

Description: This command is used to Enable/Disable listening broadcast packets on PDS-220Fx.

Effect: Immediate

Command	Arguments	Description
Broadcast		Queries the Broadcast settings.
Broadcast	= 1	Sets Broadcast = 1. The system is able to receive broadcast packets.
Broadcast	= 0	Sets Broadcast = 0. The system will ignore broadcast packets.

Example:



7.3.6 SystemTimeout (ms)

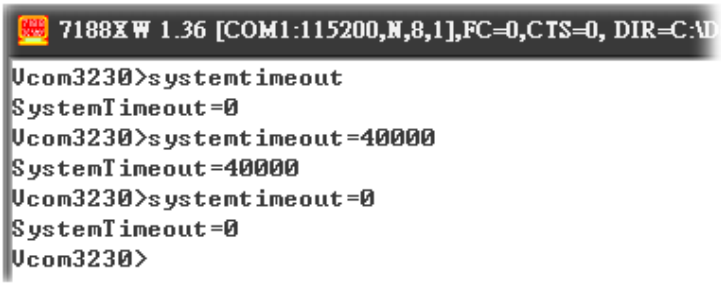
Description: This command queries or sets the system timeout value.

If the SystemTimeout is greater than zero, and the PDS-220Fx does not receive any packets from any client for longer than the SystemTimeout period, the PDS-220Fx will reboot itself.

Effect: Immediate

Command	Arguments	Description
SystemTimeout		Queries the SystemTimeout settings.
SystemTimeout	= nnnnn	Sets the SystemTimeout. (Unit : ms) Default factory setting is 300000 ms (= 300 seconds = 5 minutes), min. value is 30000 ms (= 30 seconds)

Example:



7.3.7 SocketTimeout (ms)

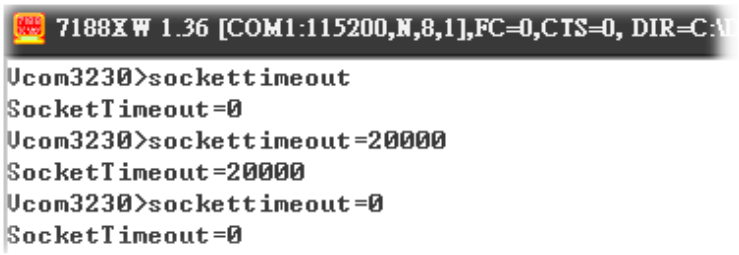
Description: This command is used to query or set the SocketTimeout parameter.

If the SocketTimeout is greater than zero, and the PDS-220Fx does not receive any data from a client PC for longer than the SocketTimeout period, the PDS-220Fx will close the socket connection between itself and the client PC.

Effect: Immediate

Command	Arguments	Description
SocketTimeout		Queries the SocketTimeout settings.
SocketTimeout	= nnnnn	Sets the SocketTimeout. (Unit : ms) default = 0 (disable), min = 10000

Example:



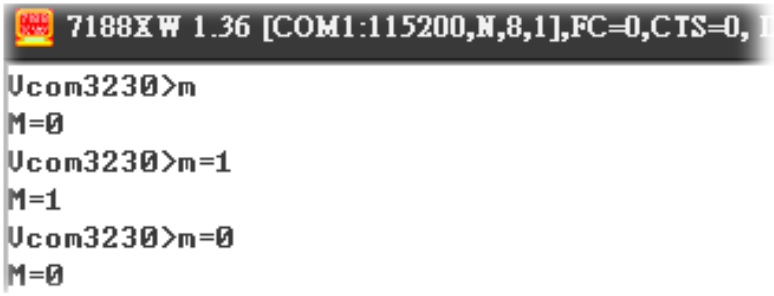
7.3.8 M

Description: This command is used to query or set the echo mode.

Effect: Immediate

Command	Arguments	Description
M		Queries the echo mode settings.
M	= 0	Sets the multi-echo mode to enable. When set to multi-echo mode, the PDS-220Fx echoes data from a device to all clients that are connected.
M	= 1	Sets the single-echo mode to enable. When set to single-echo mode, the PDS-220Fx echoes data from a device to the client that requested the service.

Example:



7.3.9 EchoCmdNo

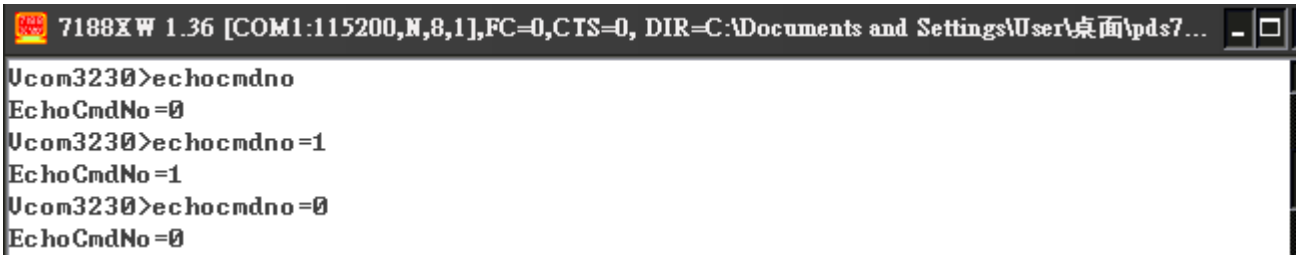
Description: This command is used to query or set the EchoCmdNo parameter.

The EchoCmdNo parameter is used to set whether the PDS-220Fx prefixes the Virtual COM command to the corresponding response. (Virtual COM commands are used to configure a PDS-220Fx through TCP port 10000)

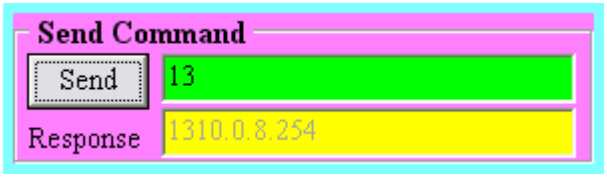
Effect: Immediate

Command	Arguments	Description
EchoCmdNo		Queries the EchoCmdNo settings.
EchoCmdNo	= 0	If EchoCmdNo = 0, a Virtual COM command number will not be prefixed to the corresponding response.
EchoCmdNo	= 1	If EchoCmdNo = 1, a Virtual COM command number will be prefixed to the corresponding response.

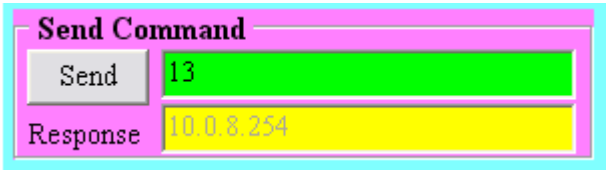
Example:



EchoCmdNo = 1



EchoCmdNo = 0



7.3.10 EndChar

Description: This command is used to query or set the EndChar parameter.

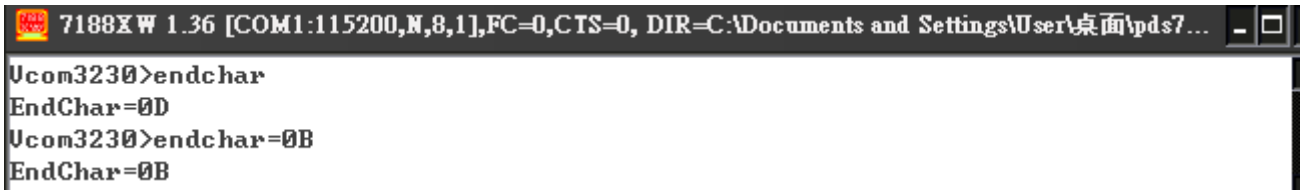
PDS-220Fx sends out the response string from serial port to TCP client immediately when it received a char on the response string that matching the EndChar.

Set EndChar = 00 to disable the EndChar feature.

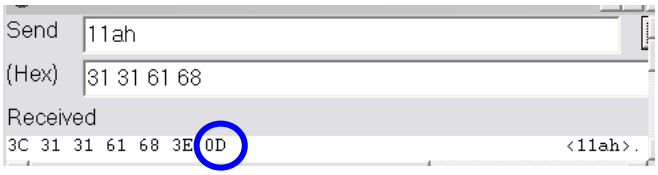
Effect: Immediate

Command	Arguments	Description
Endchar		Queries the endchar setting.
Endchar	= HH	Sets the endchar.

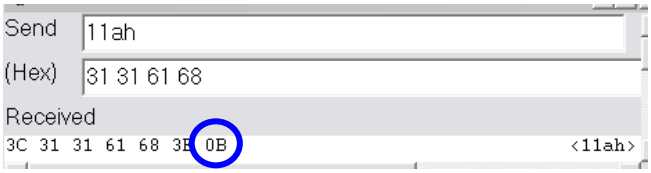
Example:



EndChar = 0D



EndChar = 0B



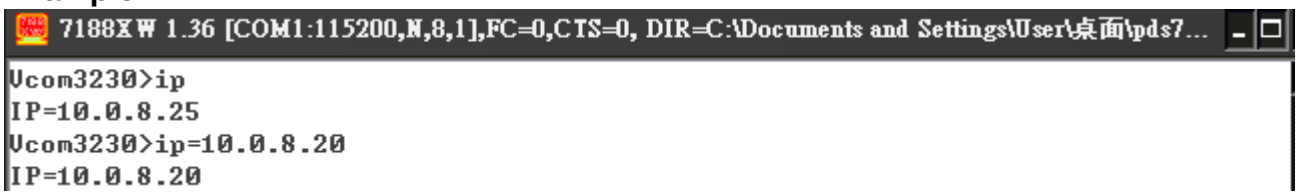
7.3.11 IP

Description: This command is used to query or set the IP address.

Effect: After the next reboot.

Command	Arguments	Description
IP		Queries the IP address.
IP	= xxx.xxx.xxx.xxx	Sets the IP address.

Example:



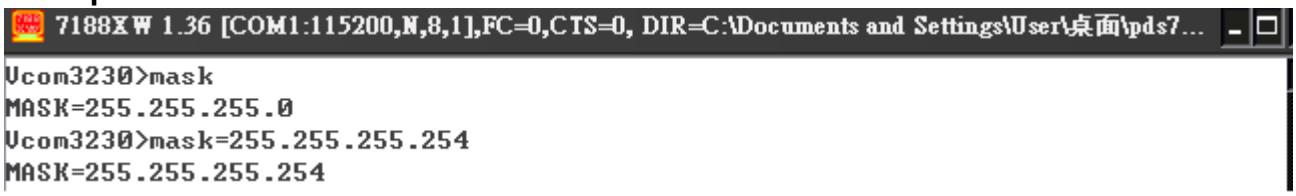
7.3.12 MASK

Description: This command is used to query or set the subnet Mask value.

Effect: After the next reboot.

Command	Arguments	Description
mask		Queries the subnet Mask value.
mask	= xxx.xxx.xxx.xxx	Sets the subnet Mask value.

Example:



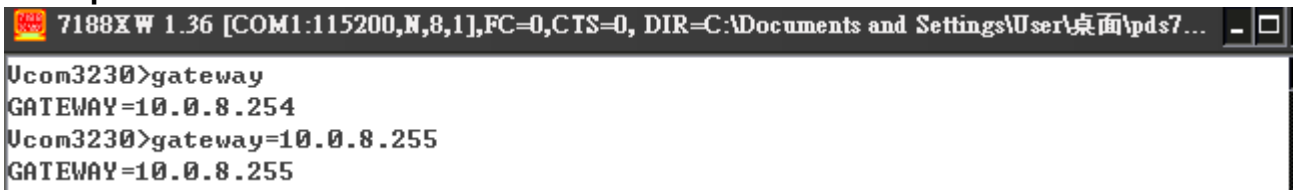
7.3.13 GATEWAY

Description: This command is used to query or set the outgoing Gateway address of the subnet.

Effect: After the next reboot.

Command	Arguments	Description
Gateway		Queries the Gateway address.
Gateway	= xxx.xxx.xxx.xxx	Sets the Gateway address

Example:



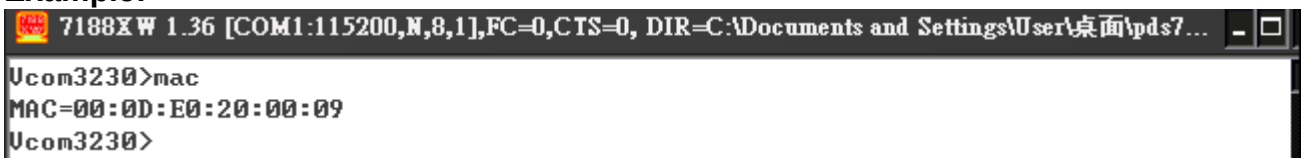
7.3.14 MAC

Description: This command is used to query the MAC address.

Effect: Setting the address is not allowed.

Command	Arguments	Description
Mac		Queries the MAC address.(Setting the address is not allowed)

Example:



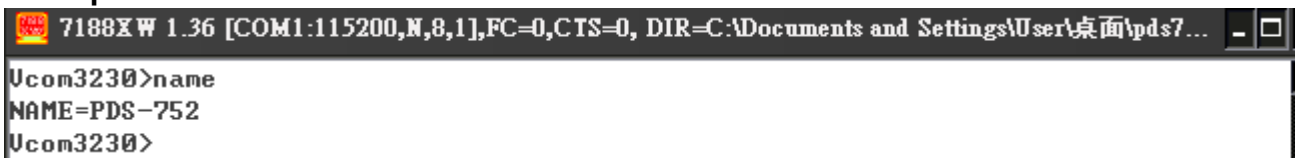
7.3.15 NAME

Description: This command is used to query the name of a PDS-220Fx module.

Effect: Setting the name is not allowed.

Command	Arguments	Description
name		Queries the name of a PDS-220Fx module.

Example:



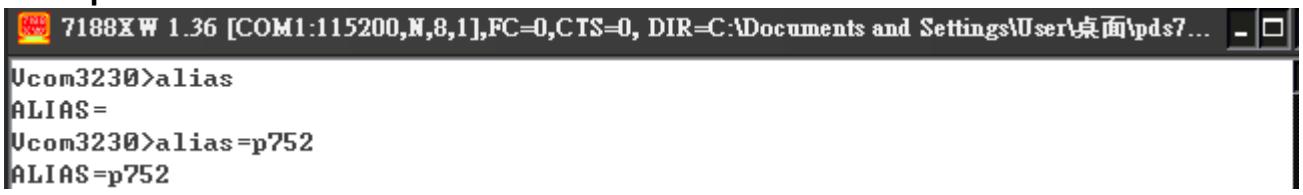
7.3.16 ALIAS

Description: This command is used to query or set the alias of a PDS-220Fx module.
The maximum character length of PDS-220Fx alias name is 16 bytes.

Effect: Immediate

Command	Arguments	Description
alias		Queries the alias.
alias	= xxxx	Sets the alias of a PDS-220Fx module to “xxxx”.

Example:



7.3.17 DHCP

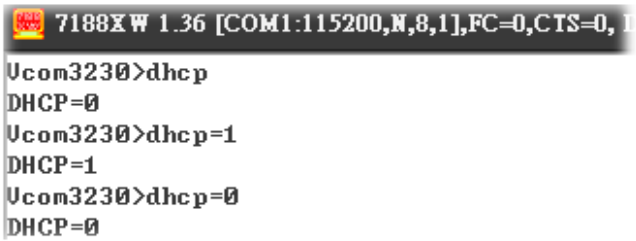
Description: This command is used to set the DHCP client to either enabled or disabled.

DHCP function will get a dynamic IP address setting for PDS-220Fx automatically. Thus it's recommended to disable DHCP function and use a static IP address setting. This prevents you to configure virtual COM mappings again and again.

Effect: Immediate

Command	Arguments	Description
DHCP	= 0	Disables the DHCP client.
DHCP	= 1	Enables the DHCP client.

Example:



7.3.18 UDP

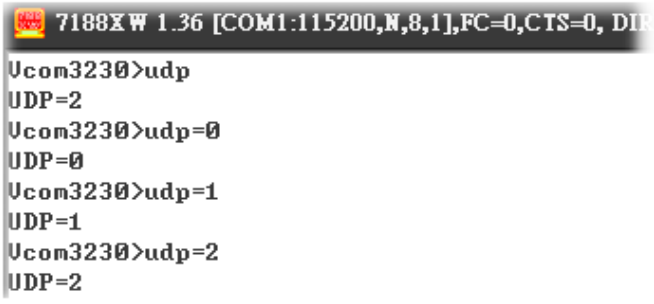
Description: This command is used to configure the UDP Search function.

UDP is used to set the action mode for when a PDS-220Fx module receives a UDP search command.

Effect: Immediate

Command	Arguments	Description
UDP	= 0	Rejects UDP search commands. The PDS-220Fx will not reply to the UDP search command, and can not be searched again.
UDP	= 1	Replies to UDP search commands. The PDS-220Fx modules will reply to the UDP search command, and can be searched.
UDP	= 2 (Default)	Replies to UDP search commands till a client is connected.

Example:



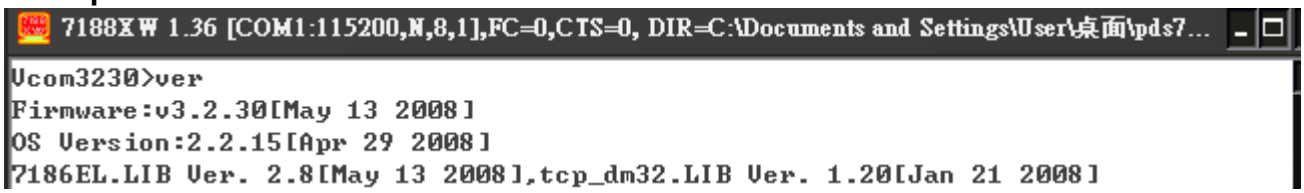
7.3.19 VER

Description: This command is used to query the version information for a PDS-220Fx module.

Effect: Setting the version information is not allowed.

Command	Argument	Description
VER		Queries the version information.

Example:



7.3.20 SAVE

Description: This command is used to set the PDS-220Fx module to backup or no-backup “autoexec.bat” and “vcom.ini” files when using “load” command.

Effect: Immediate

Command	Arguments	Description
save	= 1	When the “load” command is used, backup copies of the "autoexec.bat" and "vcom.ini" files will be saved.
save	= 0 (Default)	When the “load” command is used, backup copies of the "autoexec.bat" and "vcom.ini" files will NOT be saved.

Example: see images [21-1] and [21-2] below.

7.3.21 LOAD

Description: This command is used to loads file to the built-in flash disk on PDS-220Fx module. It should be used to update firmware only.

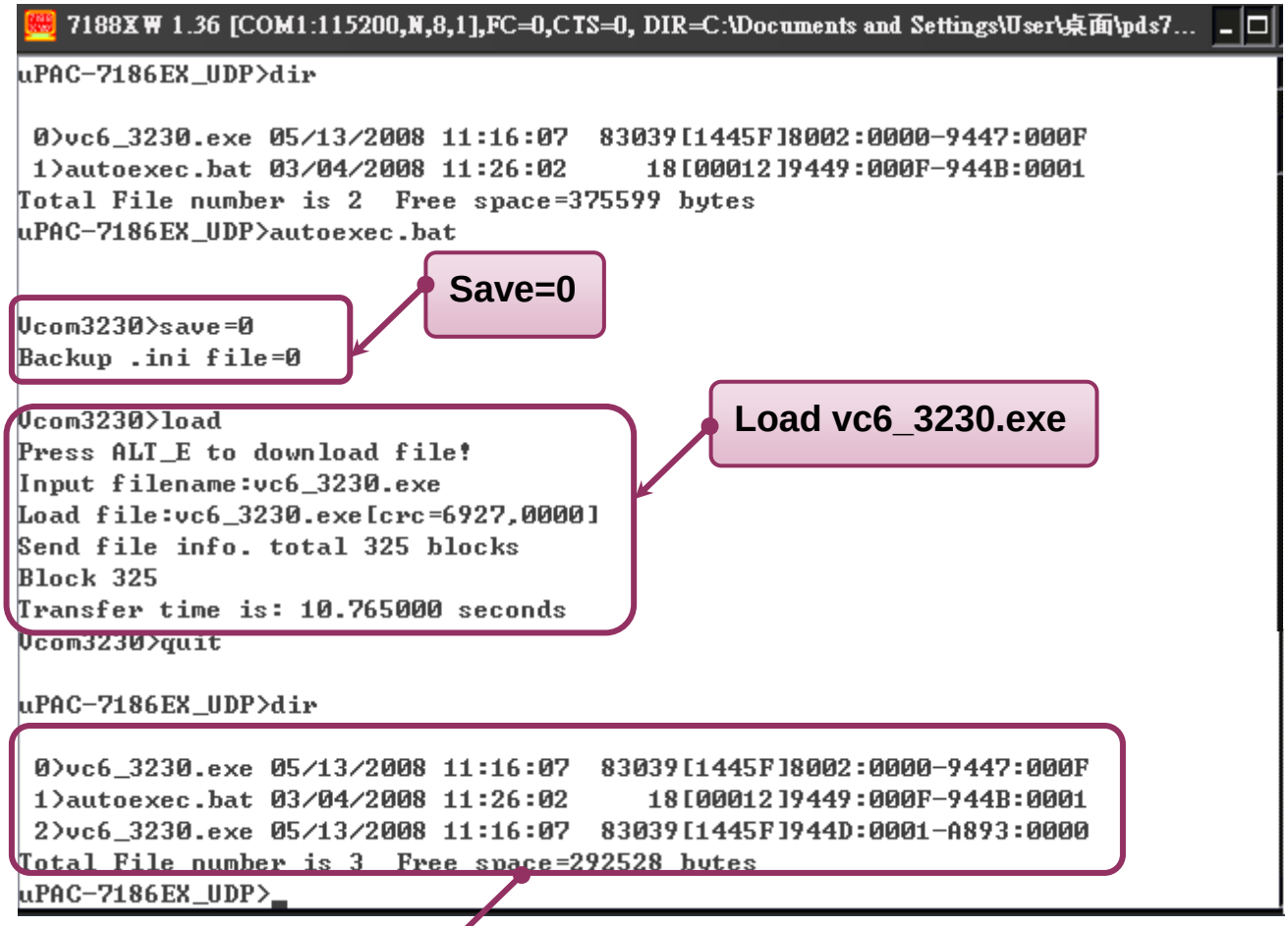
Effect: Immediate

Command	Argument	Description
load		The command is coordinated with the MiniOS7 “load” command and can be used to renew the “vcom3230.exe,” “vcom.ini” or “autoexec.bat” file(s).

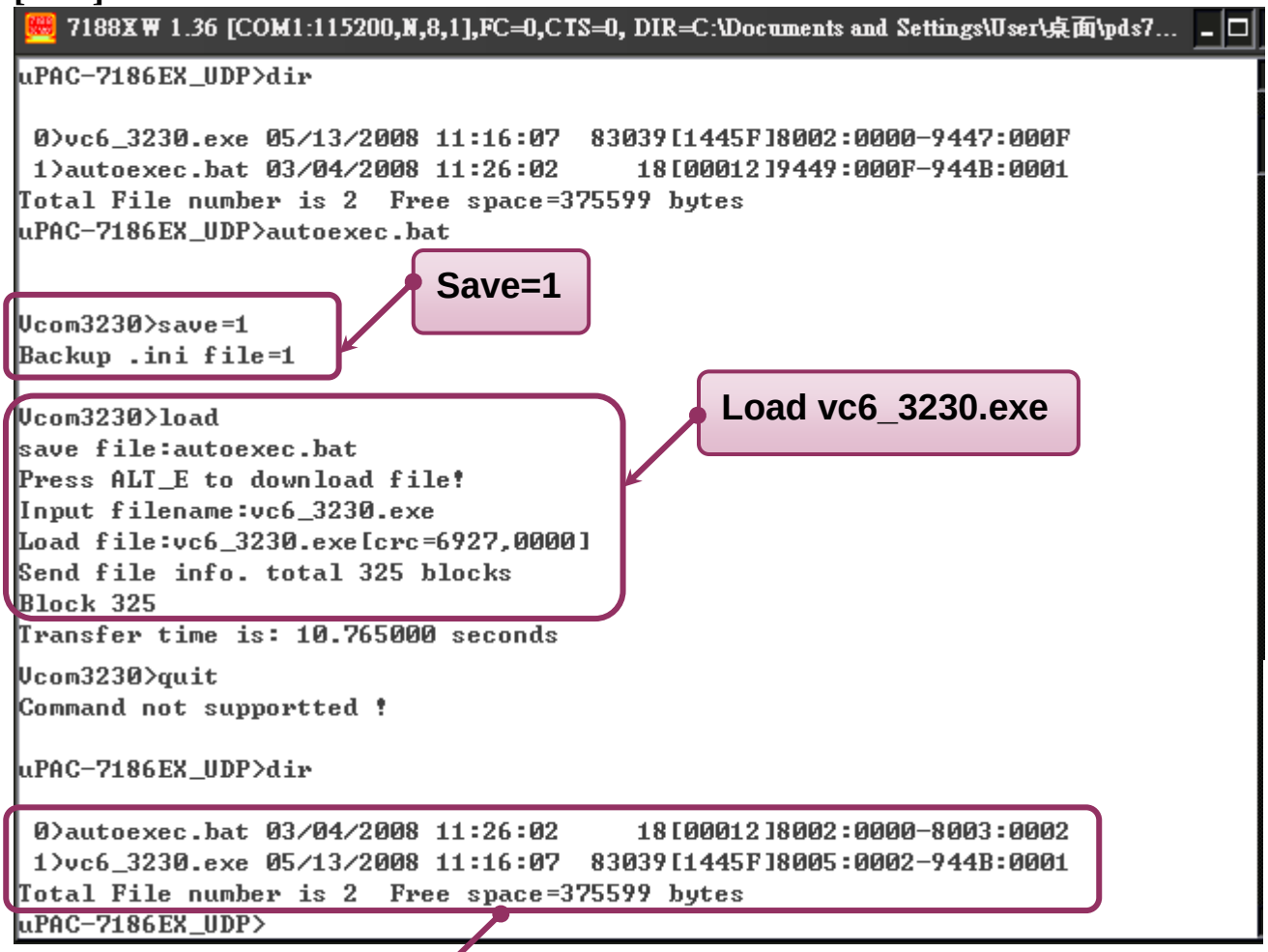
※”Load” is not a Telnet command.

Example:

[21-1]



[21-2]



※ When save = 1, system will back up the "autoexec.bat" and "vcom.ini" files to memory first, clear all files in the flash disk, and then load the "autoexec.bat" and "vcom.ini" files from memory and run the “load” command to load the specified file(s).

7.3.22 CONFIG

Description: This command is used to clear the settings in the EEPROM.

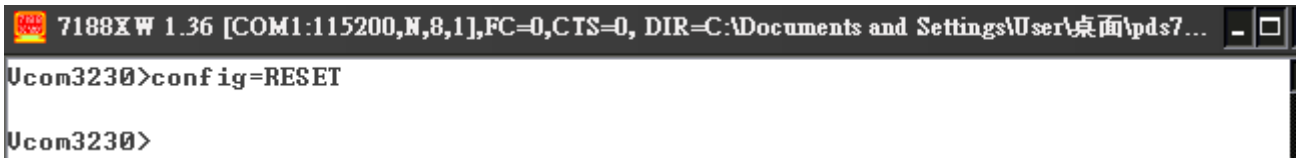
Effect: Immediate

Command	Argument	Description
config	= RESET	Clears the settings in the EEPROM. After reboot, the firmware will use the new (default) settings on EEPROM. Note: ("RESET" MUST be in capital letters.)

※When “Config=RESET” is used, the Password, Alias and IPFILTER settings will also be cleared, but the IP/MASK/GATEWAY addresses will not.

※The SystemTimeout setting is also cleared to 0 by the "config=RESET" command, you have to configure the SystemTimeout value again. The default factory setting of SystemTimeout value should be 300000ms (= 300 seconds).

Example:



7.3.23 RESET

Description: This command is used to reboot the PDS-220Fx module.

Effect: Immediate

Command	Argument	Description
reset		Reboot the PDS-220Fx series module.

Example:

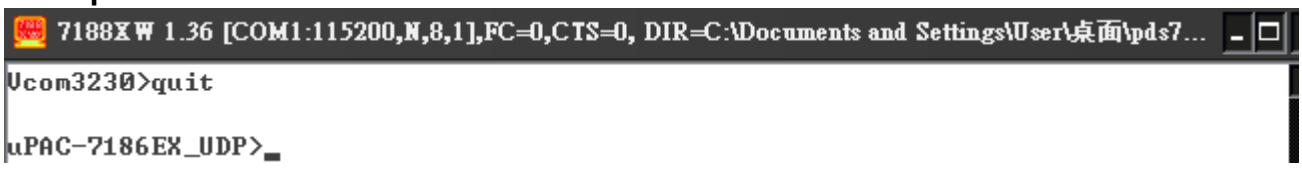
7.3.24 QUIT

Description: This command is used to stop and quit the firmware of PDS-220Fx series module.

Effect: Immediate

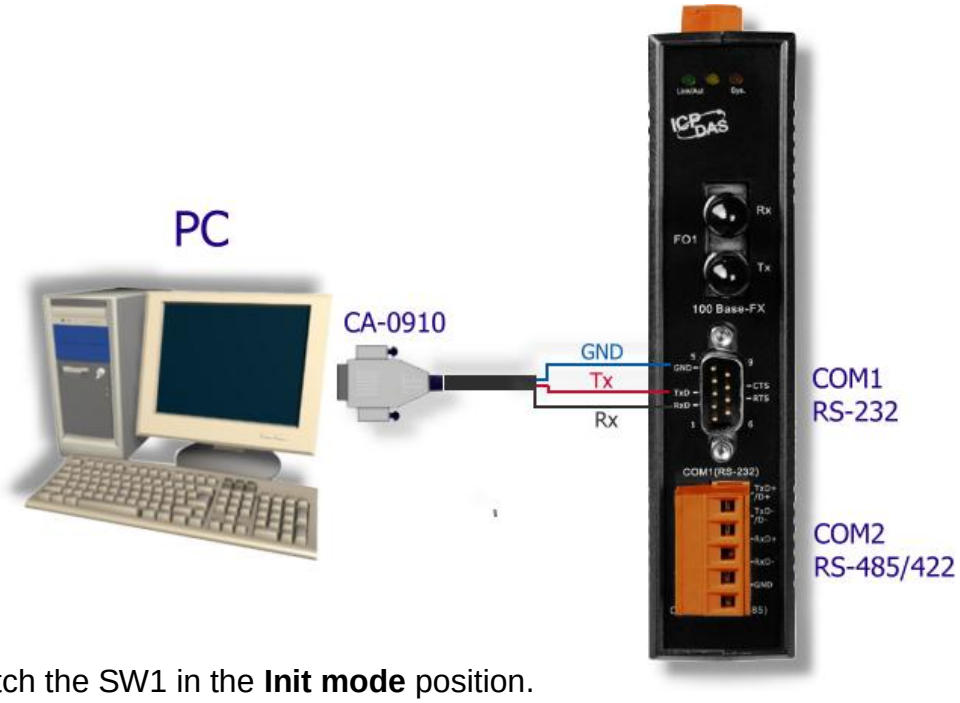
Command	Argument	Description
quit		Quits the firmware.

Example:



Appendix A: Linking to a Development PC

Step 1: Connect the download-cable, CA0910, between the PDS-220Fx series module and COM 1 (or COM 2) of the development PC as per below the diagram.



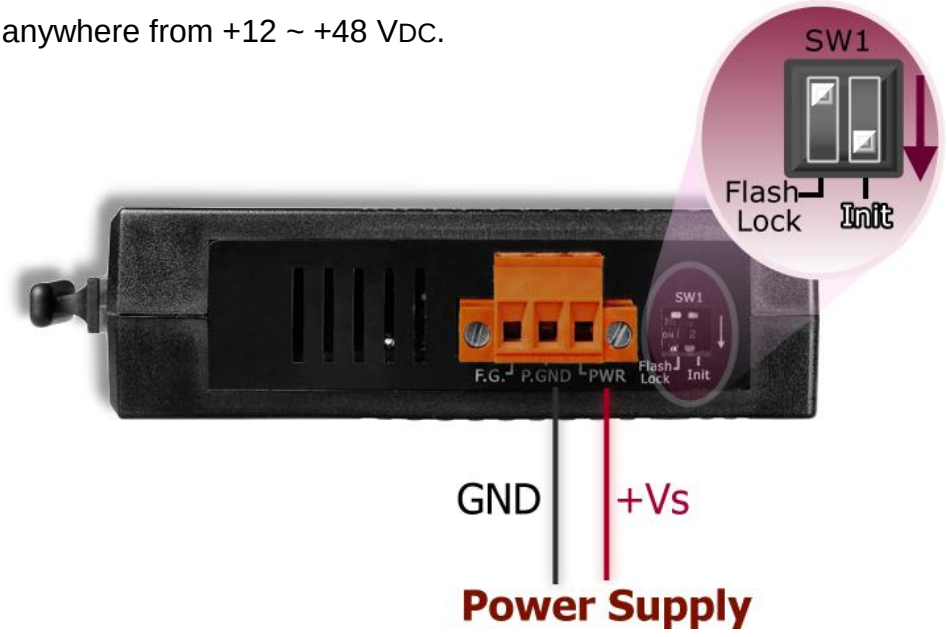
Step 2: Switch the SW1 in the **Init mode** position.

Step 3: Unzip the "**7188XW_yyyymmdd.zip**" file on the PC.

The file is located in the CD:\Napdos\MiniOS7\utility folder.

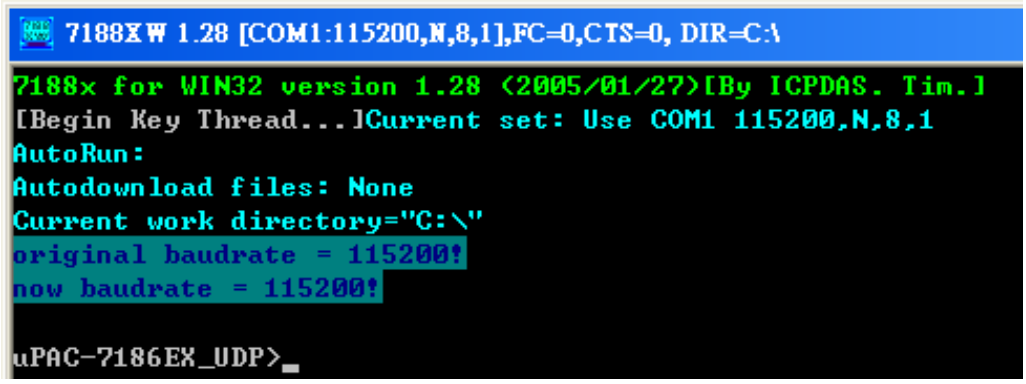
http://ftp.icpdas.com/pub/cd/8000cd/napdos/minios7/utility/

Step 4: Apply power (+Vs, GND) to the PDS-220Fx series module. The +Vs can be anywhere from +12 ~ +48 VDC.



Step 5: Execute 7188XW.EXE/C#, and change the Baud Rate to 115200 bps, N81. "/C#" is the COM Port of the development PC.

Step 6: Press **[Enter]** twice on the development PC:



Step 7: Read the configuration of the PDS-220Fx:

```
uPAC-7186EX_UDP>ip
IP=10.0.8.20
uPAC-7186EX_UDP>mask
MASK=255.255.255.0
uPAC-7186EX_UDP>gateway
Gateway=10.0.8.254
uPAC-7186EX_UDP>mac
Ethernet Address = 00:0d:e0:20:00:07
uPAC-7186EX_UDP>setcom 1
Current set is: 9600,8,0,1
```

Read configuration command

- **ip**
- **mask**
- **gateway**
- **mac**
- **setcom port**

Note: The configuration of the PDS-220Fx as follows can be changed:

```
uPAC-7186EX_UDP>ip 192.168.41.1
Set IP=192.168.41.1
[ReadBack]IP=192.168.41.1
uPAC-7186EX_UDP>mask 255.255.255.0
Set MASK=255.255.255.0
[ReadBack]MASK=255.255.255.0
uPAC-7186EX_UDP>gateway 192.168.41.4
Set GATEWAY=192.168.41.4
[ReadBack]Gateway=192.168.41.4
uPAC-7186EX_UDP>setcom 1 115200,n,8,1
Current set is: 9600,8,0,1
Set to: 115200,8,0,1 [checksum:CC]
```

Settings configuration command

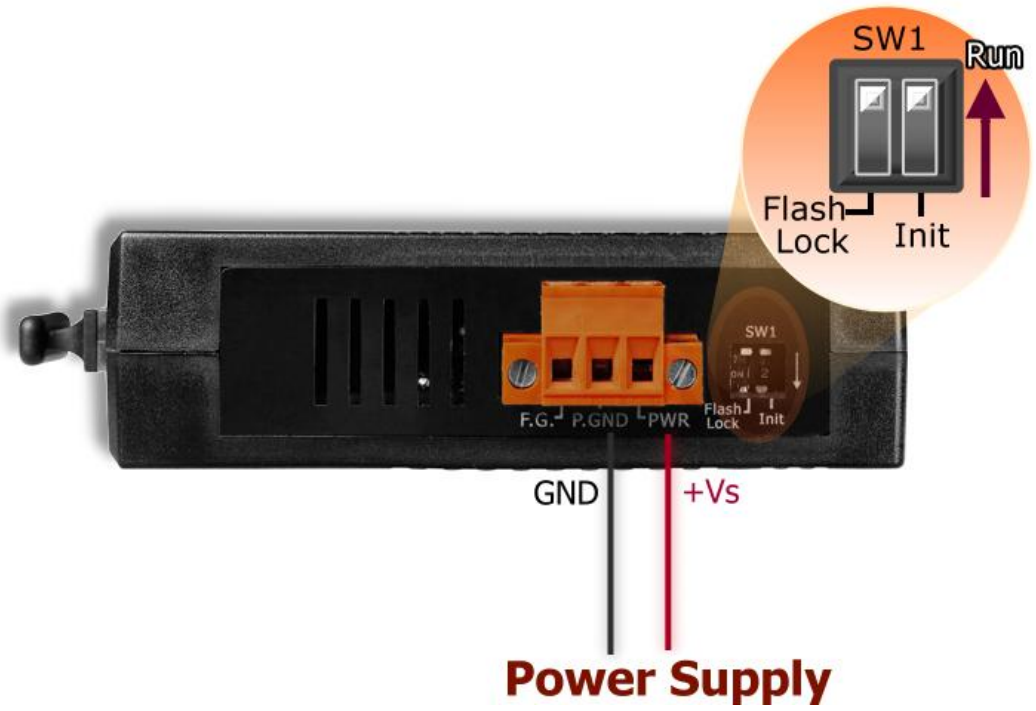
- **ip [new ip]**
- **mask [new mask]**
- **gateway [new gateway]**
- **mac [new mac]**
- **setcom port [baud][data_bit][parity][stop_bit]**

“setcom” parameters are as follows:

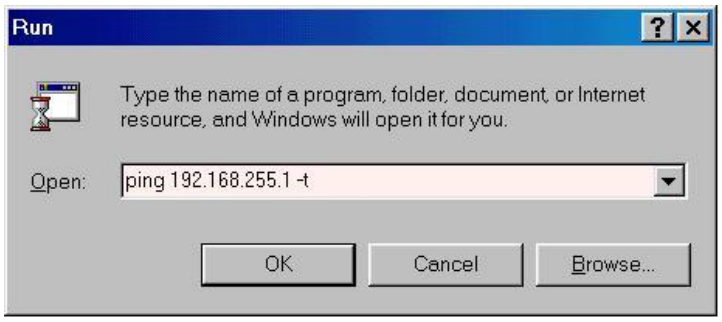
Port	1 - 8
Baud	2 - 921600
DataBit	7, 8
Parity	N, n : None parity E, e : Even parity O, o : Odd parity M, m : Mark, parity = 1 S, s : Space, parity = 0
StopBit	1

Step 8: Switch the SW1 in the **Run mode** position, as shown in the below diagram.

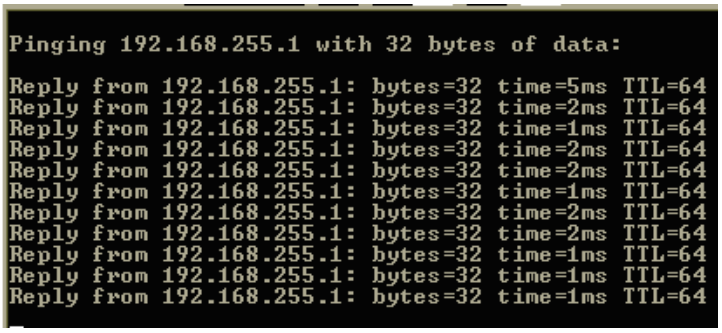
Step 9: Power-off the module then power on again.



Step 10: Execute **ping 192.168.255.1 –t** using a run command as follows:



← Execute Ping 192.168.255.1 on the PC client.



← The ping results should be smooth and continuous

Note:

- **192.168.255.1** is the default IP of the PDS-220Fx series module. The IP address can be changed using the instructions in step 7.
- If the PDS-220Fx cannot be successfully pinged from the PC, refer to step 7 to change the configuration of the PDS-220Fx series module. (The mask and gateway addresses of PDS-220Fx series module and the PC should make the network definition.)
- The MAC address of the PDS-220Fx series module should be unique on the same network. Refer to step 7 for details of how to change the MAC address of the PDS-220Fx series module.
- Each PDS-220Fx MAC address is unique in the default shipping.

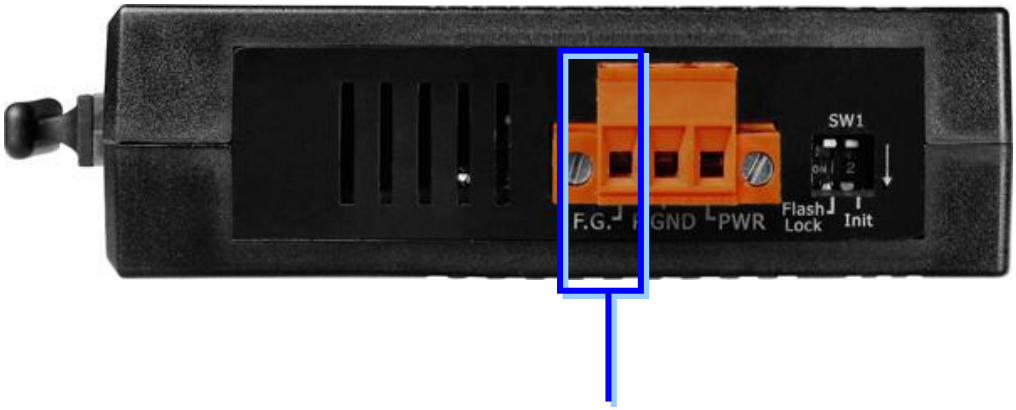
In general, if the host PC can ping the PDS-220Fx series module smoothly and continuously, all other software and drivers for the PDS-220Fx series module will operate correctly. Therefore, users should ensure that the development PC is able to ping the PDS-220Fx series module smoothly before any further testing is carried out.

Appendix B: Frame Ground

Electronic circuits are constantly vulnerable to Electro Static Discharge (ESD), which becomes worse in a continental climate area. PDS-220Fx series modules feature a new design for the frame ground, which provides a path for bypassing ESD, allowing enhanced static protection (ESD) capability and ensures that the module is more reliable.

It is recommended that the Frame Ground of the PDS-220Fx series module is corrected to the earth ground, such as the ground of an AC power supply, to provide better ESD protection for the module.

The PDS-220Fx module is designed with a Frame Ground contact points, Frame-Ground as shown in the figure below.



Frame Ground

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 the 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 develop 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 along with TCP/IP protocol that 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 an 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

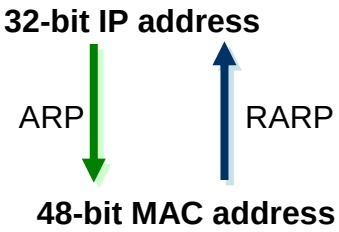
A packet is the unit of data sent across a physical network. It consists of a series of bits containing data and control information, including the source and the destination node (host) address, and is formatted for transmission from one node to another.

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

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 if, will be delivered via gateways or routers.

15.TCP (Transmission Control Protocol)

TCP provides a reliable flow of data between two hosts. It 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

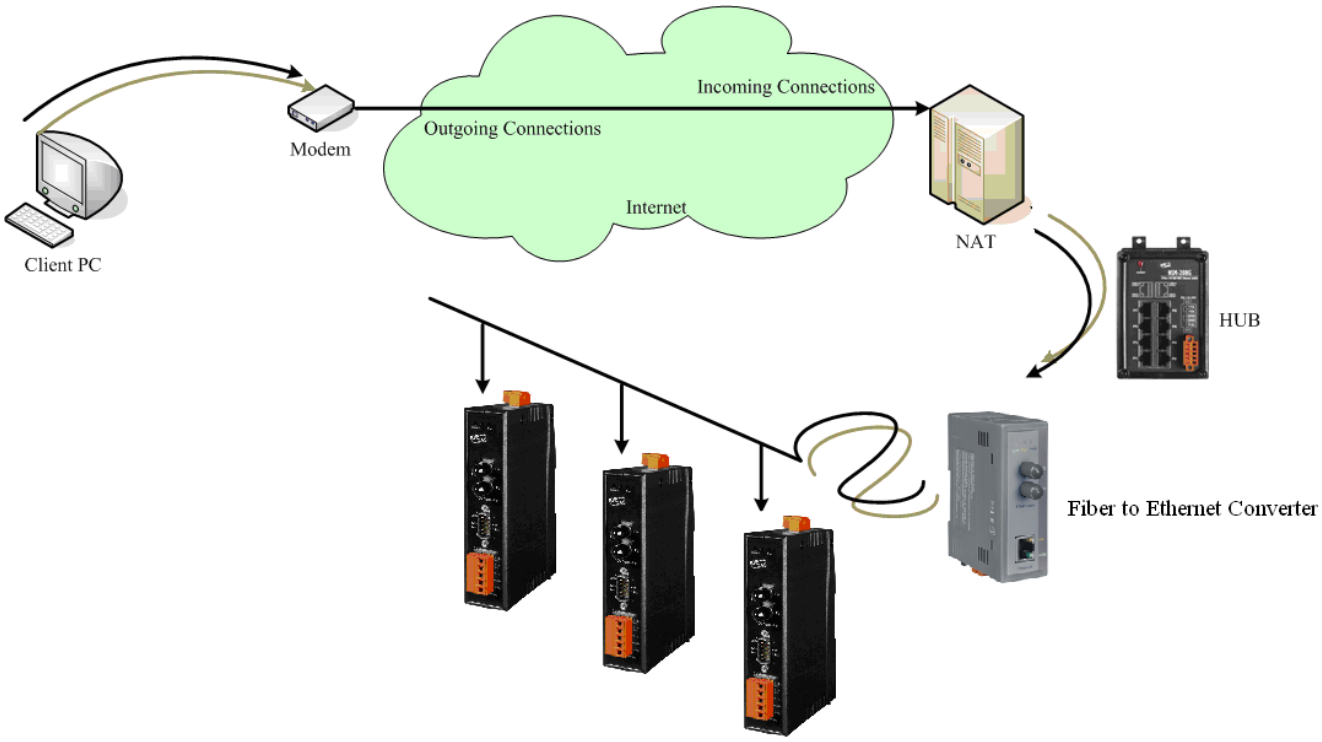
The transmission Control Protocol (TCP) and the Internet Protocol (IP) are the standard network protocols. They are almost always implemented and used together and called TCP/IP. TCP/IP can be used to communicate across any set of interconnected networks.

17.UDP (User Datagram Protocol)

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

FAQ

1. How to access the remote PDS-220Fx that placed behind an NAT or firewall?



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

By using (configuring) the NAT server, NAT can forward (bypass) all specified TCP port connection to specified PDS devices.

For example:
NAT: 10000 ~ 10002 maps to 192.168.1.101: 10000 ~ 10002
NAT: 10010 ~ 10012 maps to 192.168.1.102: 10000 ~ 10002

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

For example:
TCP port includes 10000 ~ 10002 and 10010 ~ 10012 of NAT.

In the VxComm Utility, you have to add PDS-220Fx by using NAT's address and NAT's TCP ports instead of PDS-220Fx's setting.

For example:
To add first PDS-220Fx, it's IP: Port should be NAT: 10000.
To add second PDS-220Fx, it's IP: Port should be NAT: 10010.

2. How to open a virtual COM port that larger than "COM 9" by calling CreateFile() Win32 API?

If you want to open "COM 10", the correct way to call the CreateFile() is as follows:

```
CreateFile(
        "\\\\. \\COM10",        // address of name of the communications device
        fdwAccess,              // access (read-write) mode
        0,                      // share mode
        NULL,                   // address of security descriptor
        OPEN_EXISTING,          // how to create
        0,                      // file attributes
        NULL                    // handle of file with attributes to copy
        );
```

NOTES:

1. This syntax also works for ports COM 1 through COM 9. See more... MS Q115831.
2. Maximum COM port number for VxComm Driver is COM 256.
3. Valid COM port number for MSCOMM.OCX is between 1 to 16. Please refer to MSComm.CommPort.
4. The "\\.\" prefix must be add to the COM port name (device name) when it is larger than "COM 9". But please note that the "\" character is a special escape symbol in C\C++ language, thus you have to use "\\\\.\\" prefix in C\C++ language.

3. Does 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.

4. Why doesn't the VxComm Driver (PC) receive data from the PDS-220Fx series module?

Make sure that the PDS-220Fx series module is operating in mode 0 (/M0). PDS-220Fx series module has the following two communication modes:

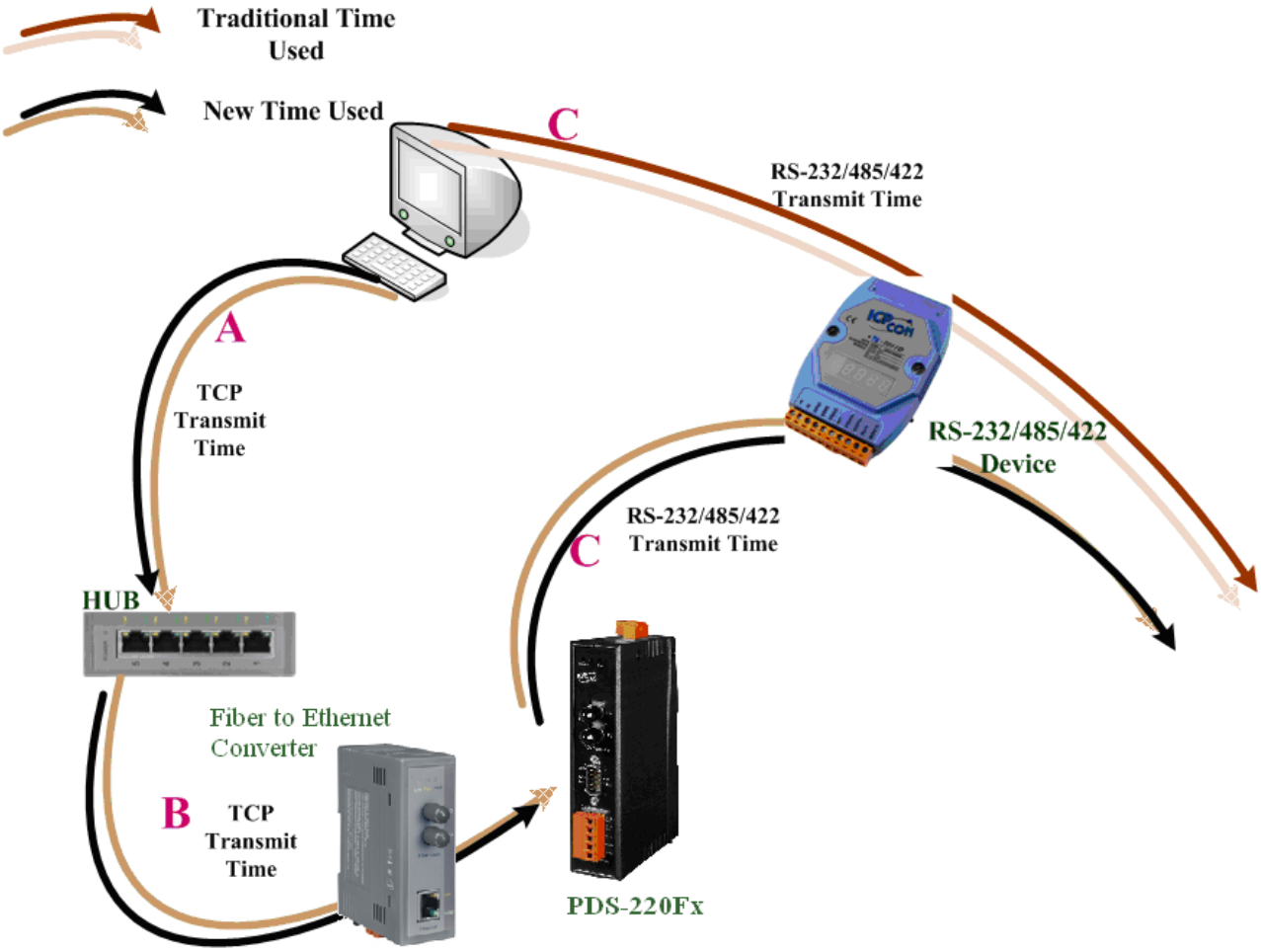
/M0	**Transparent Mode (Multi-echo, shared).** In this mode, data is echoed from the COM Ports of the PDS-220Fx series module to each client that is connected to the PDS-220Fx series module.	
/M1	**Slave Mode (Single-echo, Non-Shared).** In this mode, data is echoed from the COM Ports of the PDS-220Fx series module to the specific client that requested the service.	Version 2.6.12 and above

In /M1 mode, if the client does not send a request to the COM port of the PDS-220Fx series module, then the module won't return any data to it. For more information, please refer 5.4 ”COM Port Settings” section.

Other reasons causing the problem may be: incorrect wiring, power supply problems IP conflicts, MAC conflicts, an incorrect subnet mask or an invalid IP address. For more details, refer to the "Diagnostics and Troubleshooting" section of the VxComm Driver/Utility User Manual.

5. Does the transmission speed become faster when the serial device working with Serial to Ethernet device servers?

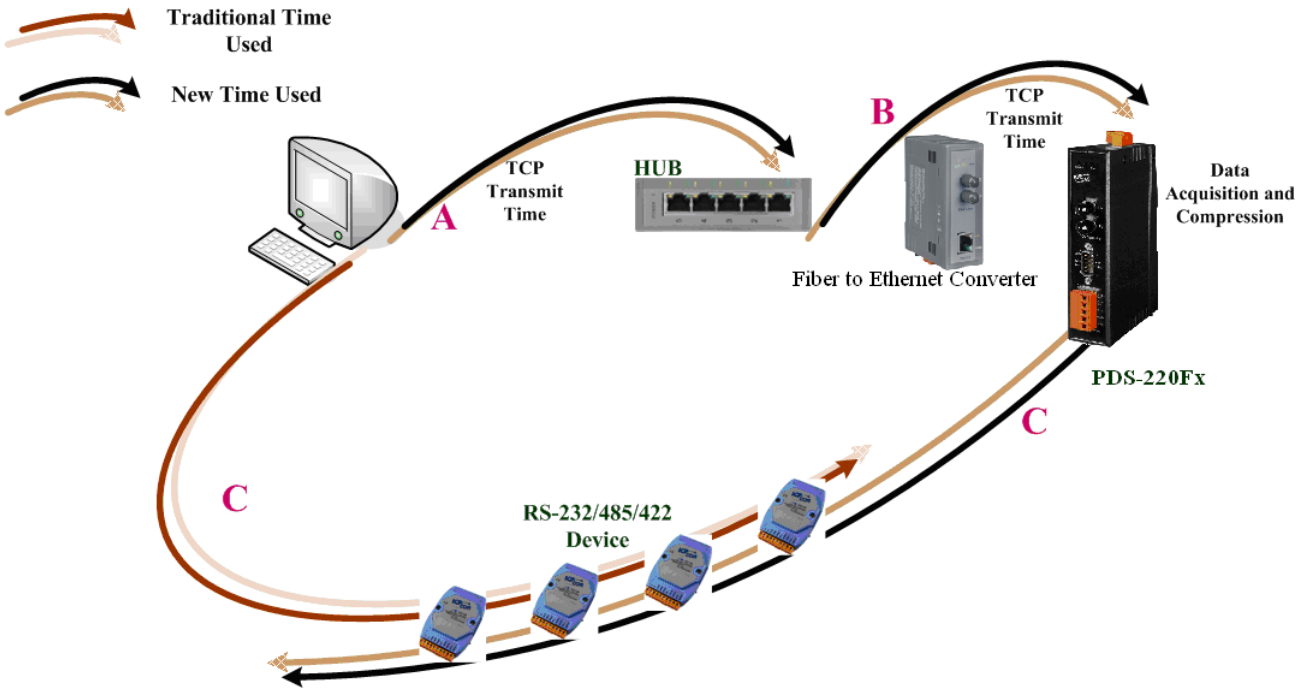
The speed depends on the applications. For transparent applications, it includes Ethernet latency in transmission and may get slower. But you can improve the communication speed by increasing the baud rate since you placing the device server more close to serial device and reduce the communication distance. The higher baud rate should be able to be used in short cable (distance) without communication problem.



Traditional time used	RS-232/485/422 transmit time (C)
New time used	Internet/Ethernet transmit time + RS-232/485/422 transmit time (A+B+C)

(All TCP packets need an extra ACK packet to commit the transmit action. This also causes a little additional delay in communication).

For Xserver applications, it can become faster. User can write their own Xserver applications to acquire data automatically, and then compress and transmit this large amount data at one time. Your application can reach high performance by pre-acquire data before asking by client and then response immediately.



Traditional time used	RS-232/485/422 transmit time (C * n modules)
New time used	Internet/Ethernet transmit time (A + B + C)

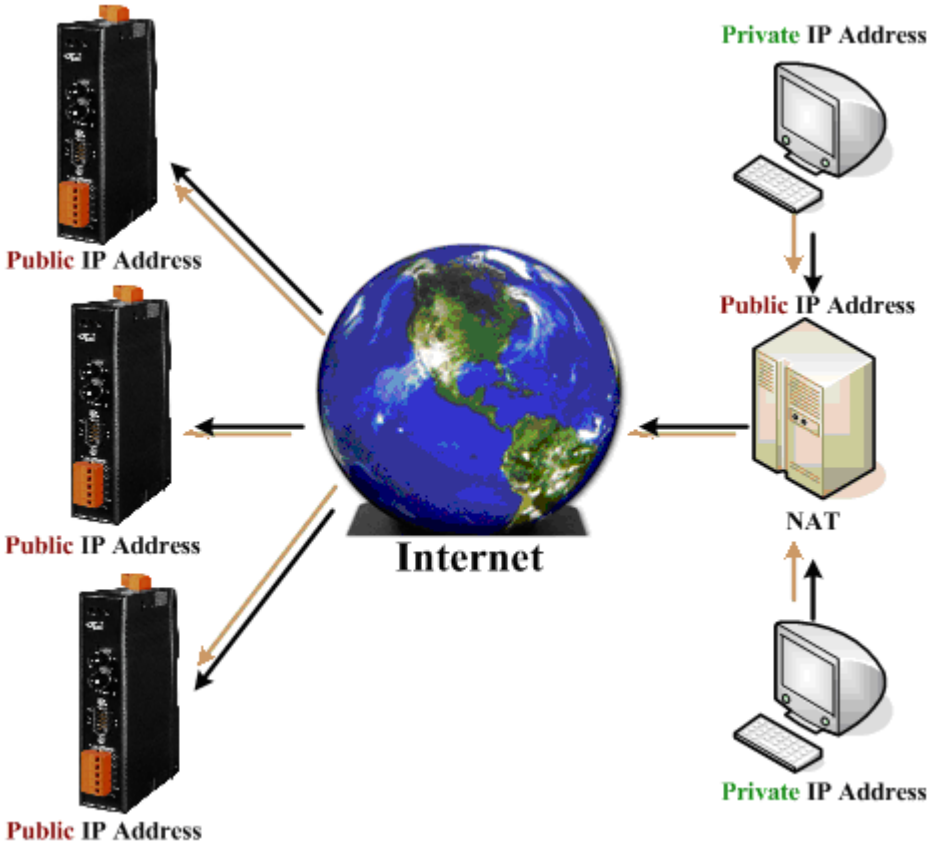
6. Why does the PDS-220Fx series module fail on a (public) Internet connection?

The default IP address of the PDS-220Fx 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 PDS-220Fx 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)

The PDS-220Fx series module can operate 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 (PDS-220Fx 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

7. How many PCs can be connected to a single PDS-220Fx device?

This depends on how many serial ports are available on the PDS-220Fx series module and how many serial ports which can be connected to each PC of PDS-220Fx.

The PDS-220Fx series module has 32 sockets in total includes some reserved listening sockets. The PDS-220Fx series module provides a single command port for configuring the data (serial) ports. Thus, no matter how many data (serial) ports on the PDS-220Fx are used, one more socket connection is needed for the command port in order to configure them.

	Data Ports	Listening Sockets	Available Sockets	Max. PCs when using all data ports	Max. PCs when using 1 data port
PDS-220Fx	2	6	32 - 6 = 26	29/3 =9	29/2 = 14

Notes:

1. CMD Port = Command Port (TCP port 10000). The CMD Port is used to configure the data ports (TCP port 10001 ~ 10008) of a PDS series module, such as BaudRate, and data format, etc.
2. The data port (TCP port 10001 ~ 10008, which are mapped to serial ports 1 ~ 8 of 7188E/8000E/PDS-220Fx), is only used to send/receive data.
3. The Listening Sockets (for PDS-220Fx series modules) = Number of Data ports + 1 CMD port + IO port + Web + Telnet + UDP Search.
4. The number of Available Sockets (for PDS-220Fx series modules) = max. (32) sockets - Listening sockets.
5. The maximum number of PCs when using all data ports of PDS = Available sockets/(data ports + 1 command port).
6. The maximum number of PCs when using 1 data port of PDS = Available sockets/(1 data port + 1 command port).
7. The web uses the TCP port 80. (It can be disabled.)
8. The telnet uses the TCP port 23. (It can be disabled)
9. The UDP search function will occupy one socket.

    - UDP = 0 → Doesn't support UDP search
    - UDP = 1 → Support UDP search and always occupy one socket
    - UDP = 2 → Support UDP search but while has the connection in that UDP search will be stopped.

8. Can I use the SetCommState ( ) API to changes the Baud Rate/data format settings of a virtual COM port?

Yes. In a Win32 environment, the CreateFile( ) API should be called to open the COM Port(s) and then the SetCommState( ) API can be used to configure the settings.

Third-party tools may provide an OpenCom( ) function for accessing a COM port. In actuality, the CreateFile( ) and SetCommState( ) APIs must be used to implement these kinds of functions.

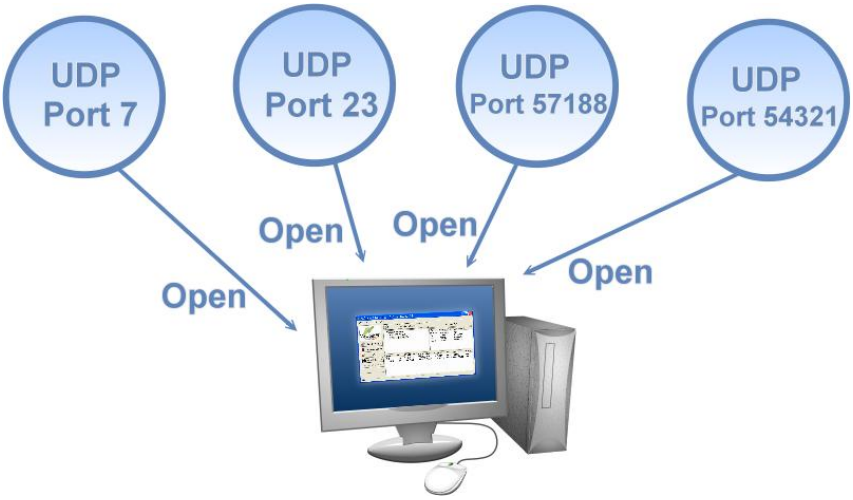
9. Can I search or connect to PDS-220Fx when my PC's IP address is not in the IP filter list of PDS-220Fx? How can I solve it?

No, you cannot search or connect to PDS-220Fx when the PC's IP address is not in the IP filter list of PDS-220Fx. You can solve the problem by:

1. Add your PC's IP address into the IP filter table of PDS-220Fx by using console command "IPFILTER" in section 7.3.1.
2. Or change your PC's IP address to one of the IP addresses listed in IP filter table.
3. Or disable the IP filter function of the PDS-220Fx by using console command. Refer to section 7.3.1.
4. Or clear all configuration setting on PDS-220Fx by using "config=RESET" command on section 7.3.22. It also clears the IP filter table, password, alias... setting. You have to reboot the PDS-220Fx for loading new configuration.

10. Why cannot computer ping or search the PDS-220Fx 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 23, 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)
999	DCON Port
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)
23	Command Port
57188	Request of UDP search
54321	Response of UDP search

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