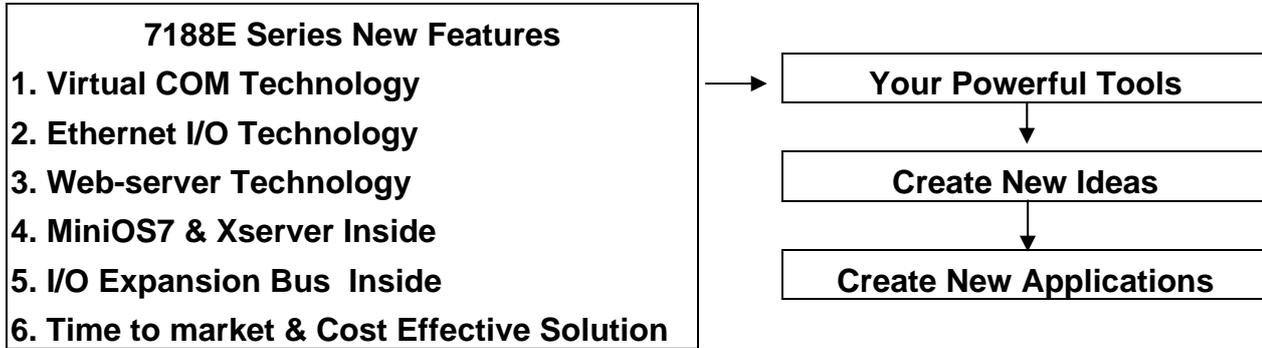


7188E Series

7188E Series Software User's Manual



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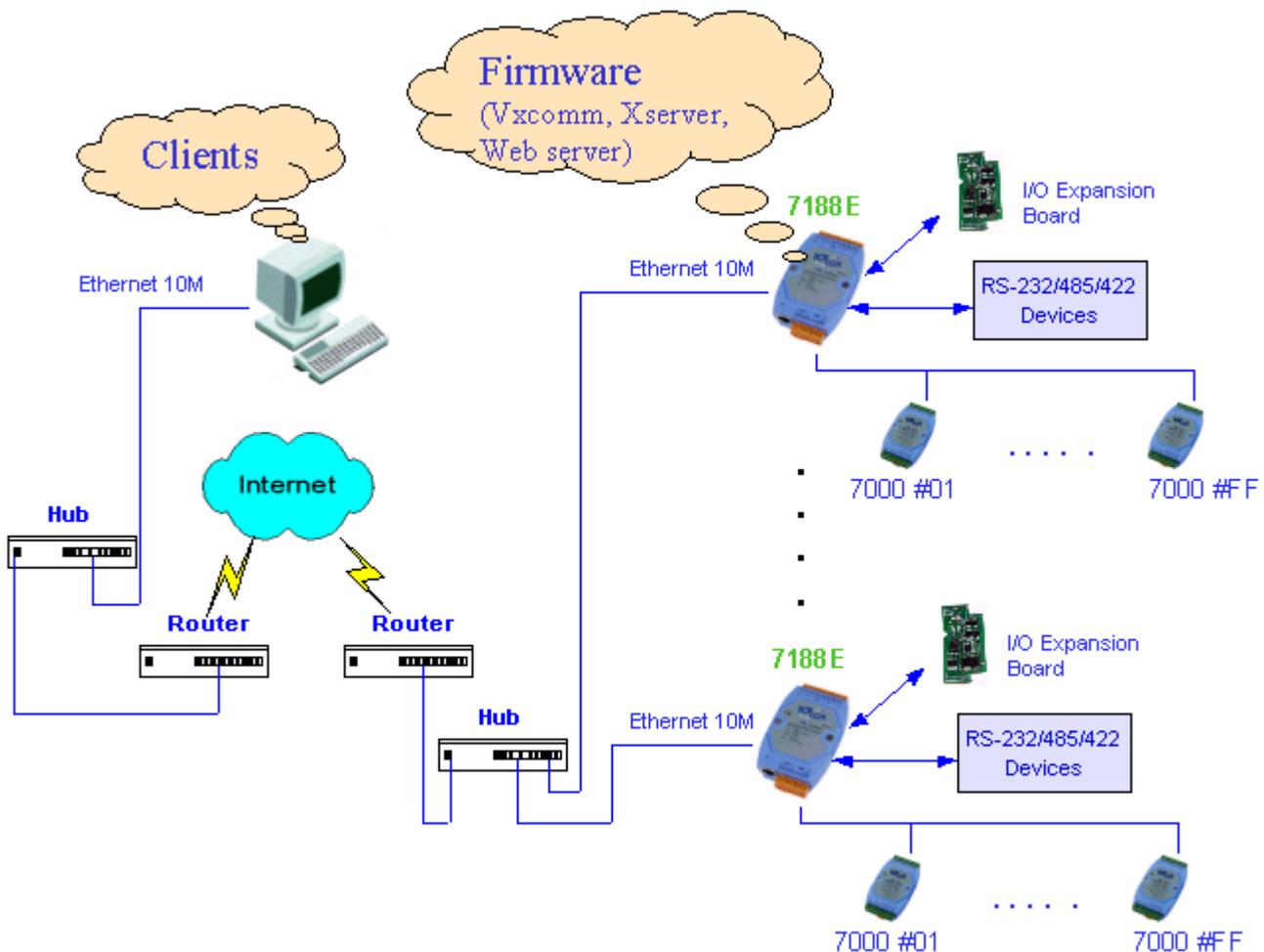
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1. Introduction

One 7188E series controller equipped with one RJ-45 connector, one I/O expansion bus and several serial COM ports. The 7188E is an embedded controller which, with aid of c language, can help you develop your own programs. Included with the 7188E are many demos and libraries. The 7188E can be used to access devices via Ethernet/Internet or RS-232/485/422. In addition, each 7188E controller has one I/O expansion bus. Our expansion boards can be mounted quickly and easily to implement various I/O functions, such as D/I, D/O, A/D, D/A, Timer/Counter, Flash memory and battery backedup SRAM.

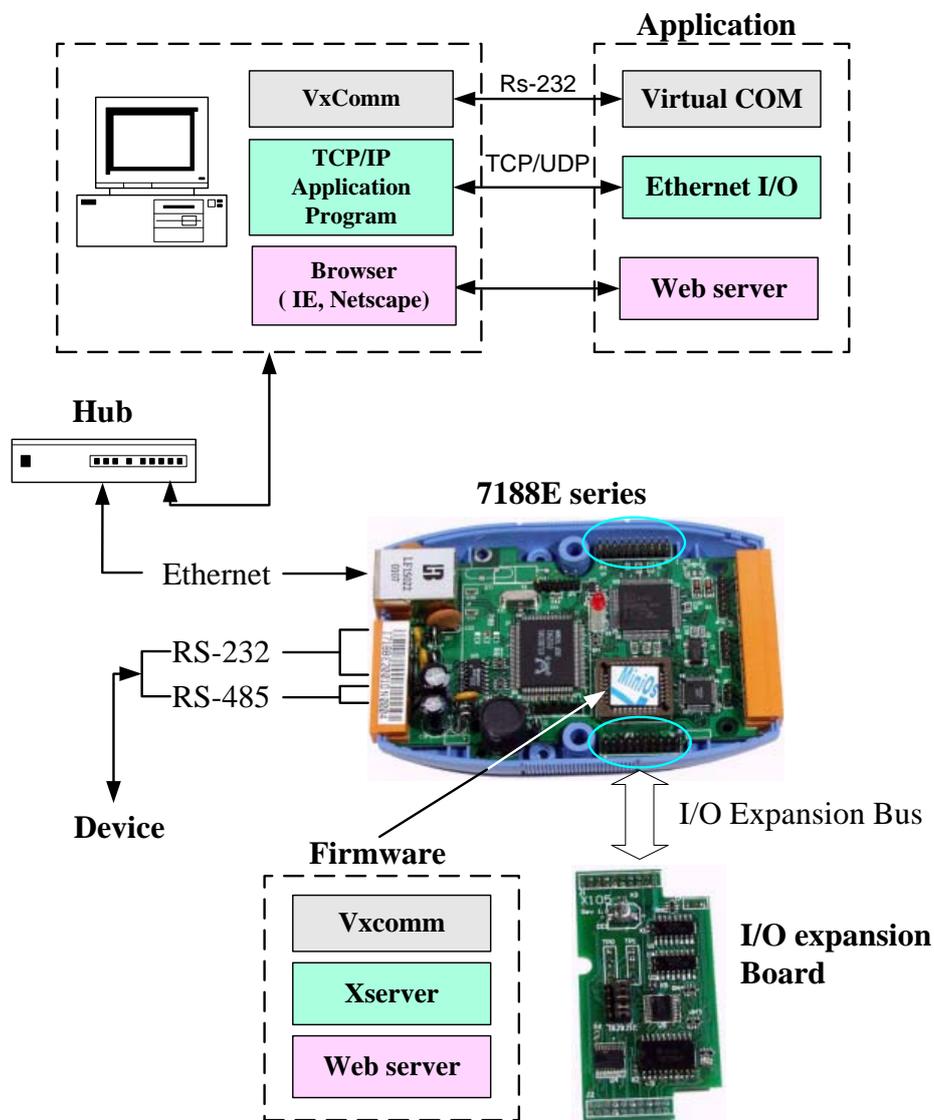


1.1 3 typical applications

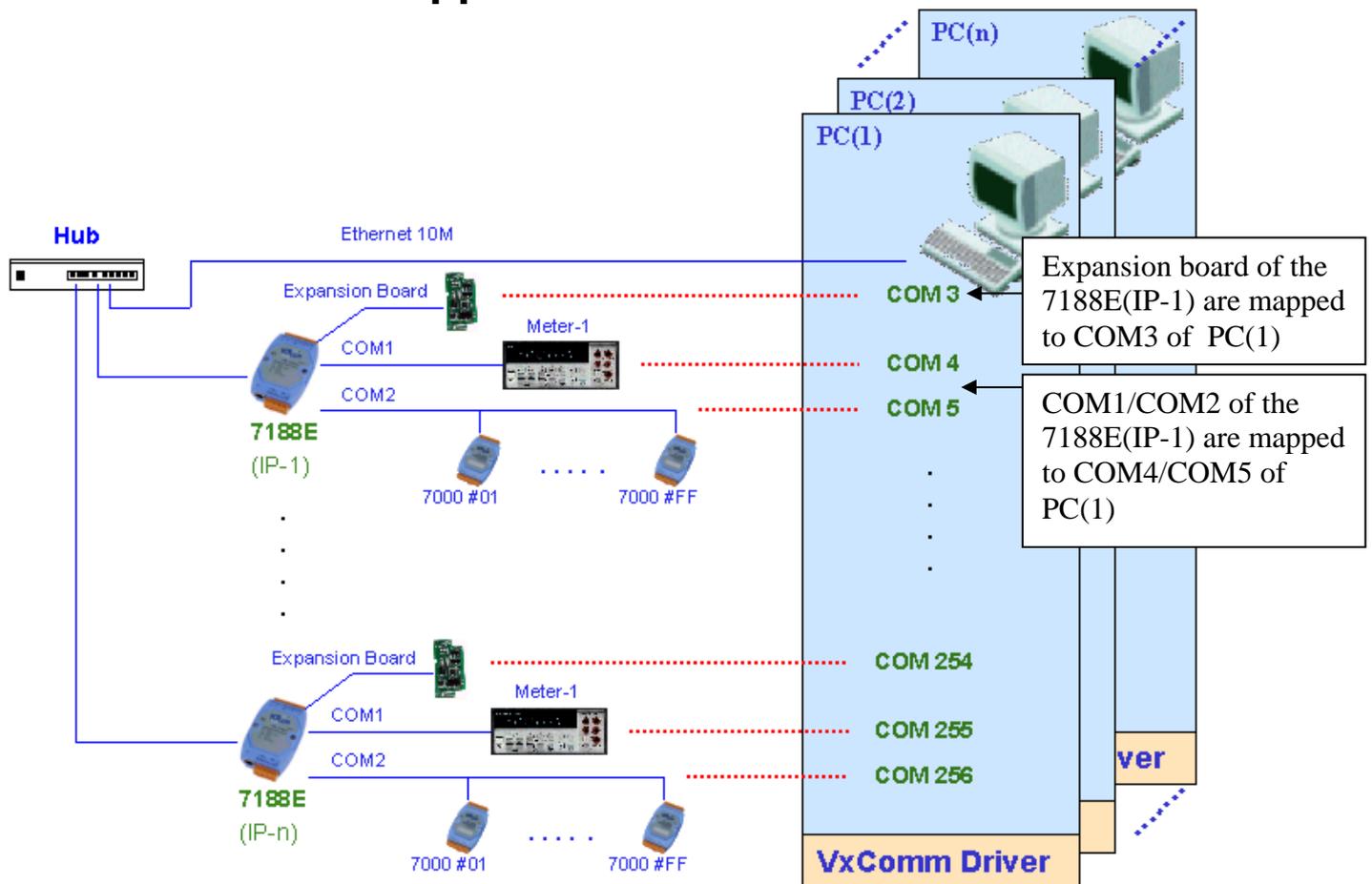
7188E series controllers have 3 typical applications (Virtual COM, Ethernet I/O and web server implementation). These applications use different firmware and program styles. Users can choose any of the 3 applications they prefer.

Using the Virtual COM application, one PC can control 256 COM ports (including real COM ports). The VxComm firmware will turn your 7188E into a RS-232 to Ethernet/Internet converter.

Using the Ethernet I/O and Web Server applications, users can program the firmware of the 7188E (Xserver, Web server).



1.1.1 Virtual COM application



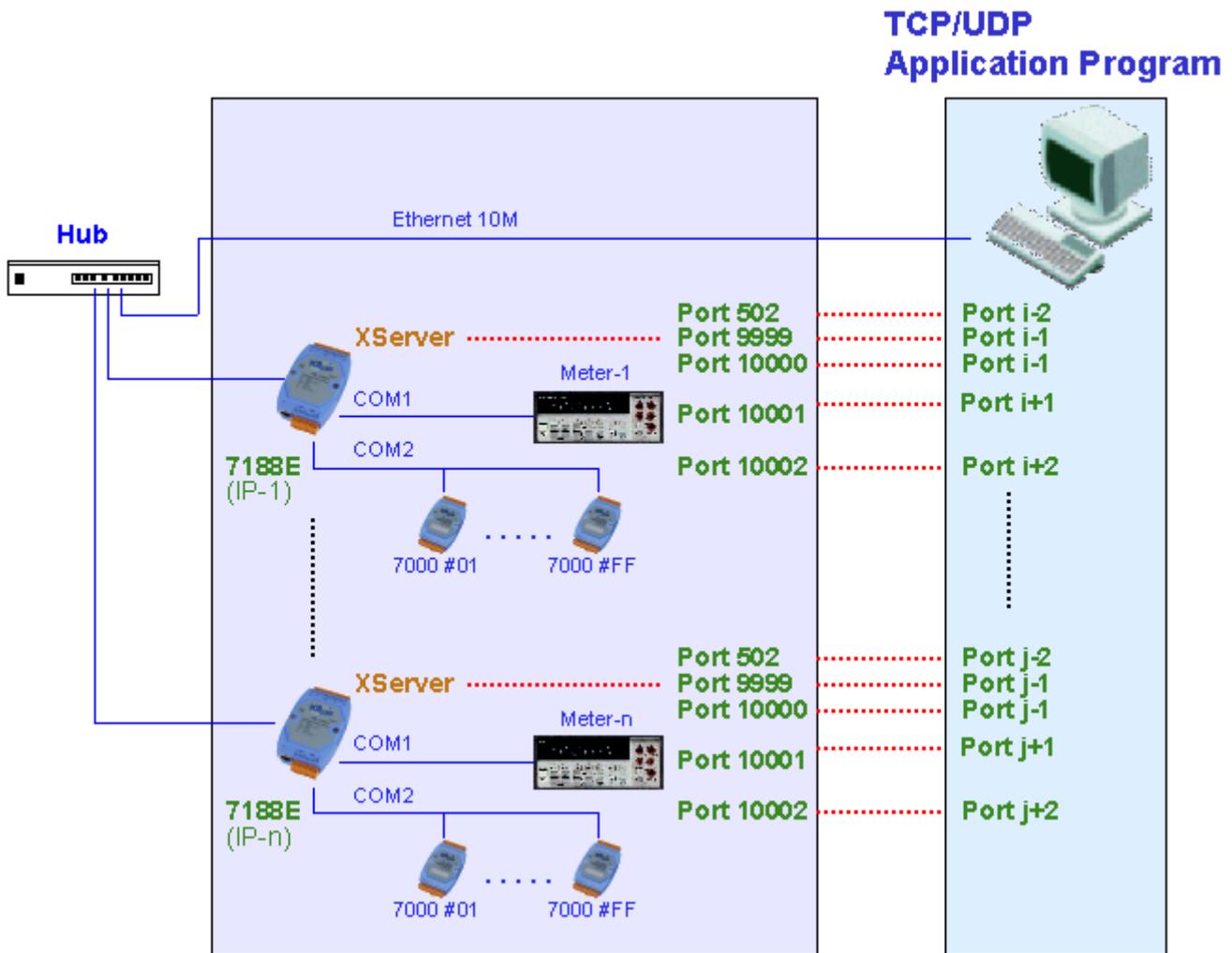
To use the Virtual COM application, first install the VxComm Driver. After installation, the VxComm Utility can map any 7188E's remote COM port. These virtualized COM ports can be used by the PC to control devices directly, just as you would use COM1 (real COM port) to control devices. When using the Virtual COM application, one PC can use a maximum of 256 COM ports. Users need not worry about network connections. The VxComm Driver will handle all Ethernet/Internet connections.

The advantages of VxComm:

1. Users can upgrade their systems to the Ethernet/Internet with increased ease as program code needs no modification.
2. The internal firmware of 7188E supports multiple clients. One 7188E can handle a maximum of 30-N socket connections simultaneously, with N being the number of the 7188E's COM ports.

For example: If one PC uses two virtual COM ports connected to COM ports of one 7188E2, the 7188E2 allows a maximum of 14 PC connections.

1.1.2 Ethernet I/O application



The Xserver is a powerful program designed for Ethernet I/O applications. It supplies the 7188E with a range of flexible options. Users can modify the Xserver to control all of the 7188E's hardware: COM ports, I/O expansion boards, a 7 Seg LED, or other relevant products.

The advantages of the Xserver:

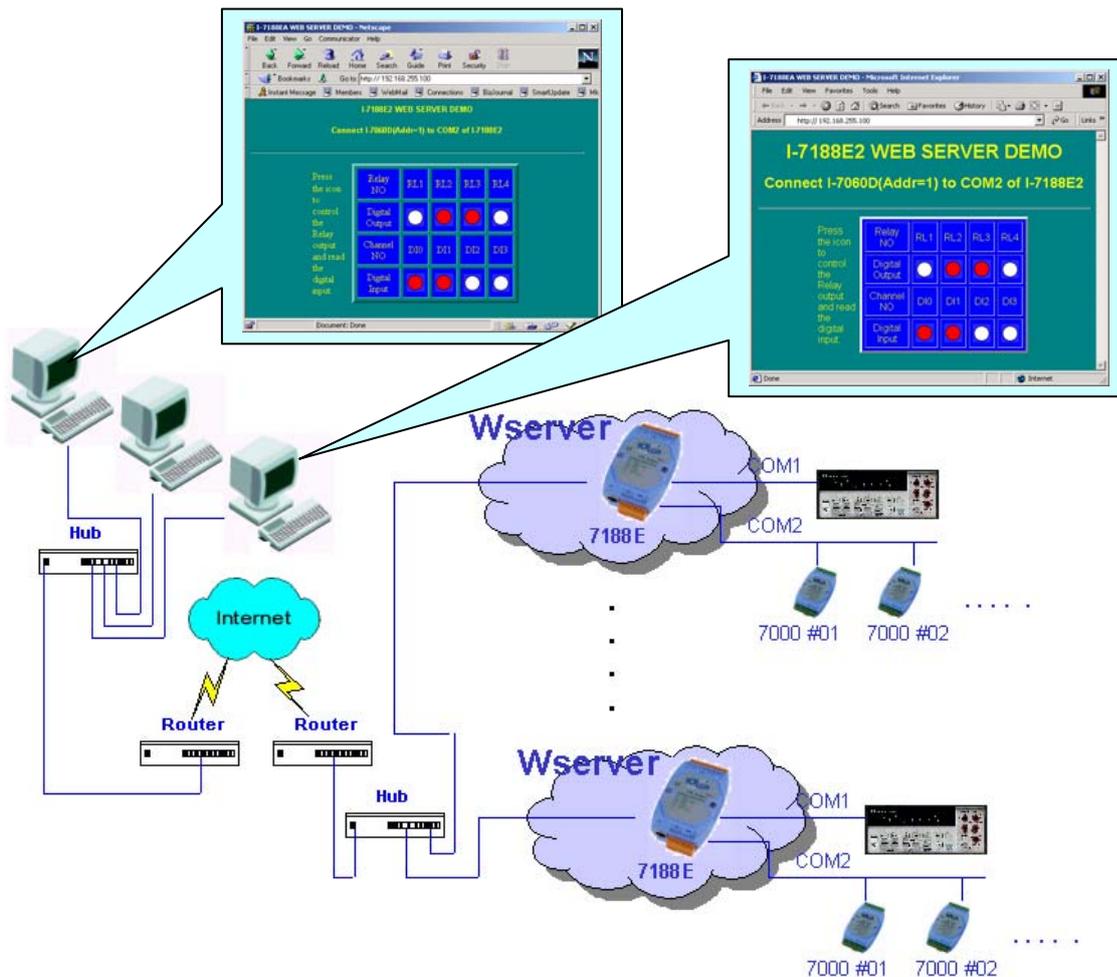
1. We design, maintain, update the Xserver for all users.
2. Xserver can be easily modified through the use of general development tools such as TC/BC/MSC. All relative libraries are coded in C language.
3. High running speed. The original Xserver (Demo4.exe) can run about 750 scan loops per second (version 2.6.14).
4. Most program code of the Xserver is finished. Ethernet/Internet communication and program loop control are all finished in VxComm.lib.

This vastly reduces user's developing time.

5. To modify Xserver, users need only to modify the 6 functions
6. The command protocol is designed to fit most of the 7188E's requirements.
7. Users can develop and extend their private command protocol very easily.
8. It supports multi-clients. The Xserver can handle a maximum of 30-N connections simultaneously, with N being the number of the 7188E's COM ports.
9. Auto wake up option. The Xserver will check on packet timeouts. If the software crashes, the Xserver will wake itself up automatically.
10. The Xserver demos (TC/BC/MS) and Client demos (VB/VC) are included.

1.1.3 Web server application

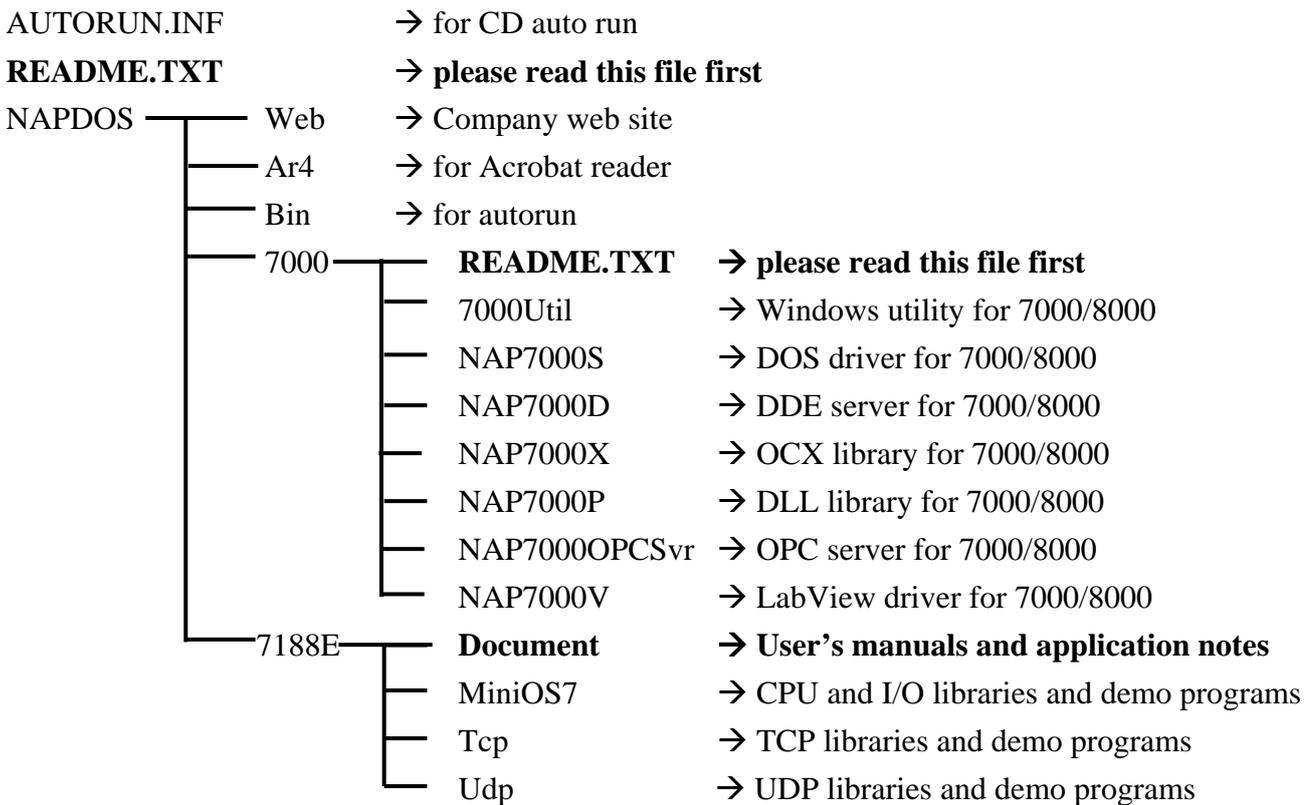
With the help of Web server, users are able to use standard browsers (such as IE or Netscape) to access the I/Os of the expansion boards or devices connected to any of the 7188E's COM port.



1.2 Directory tree of software and literature

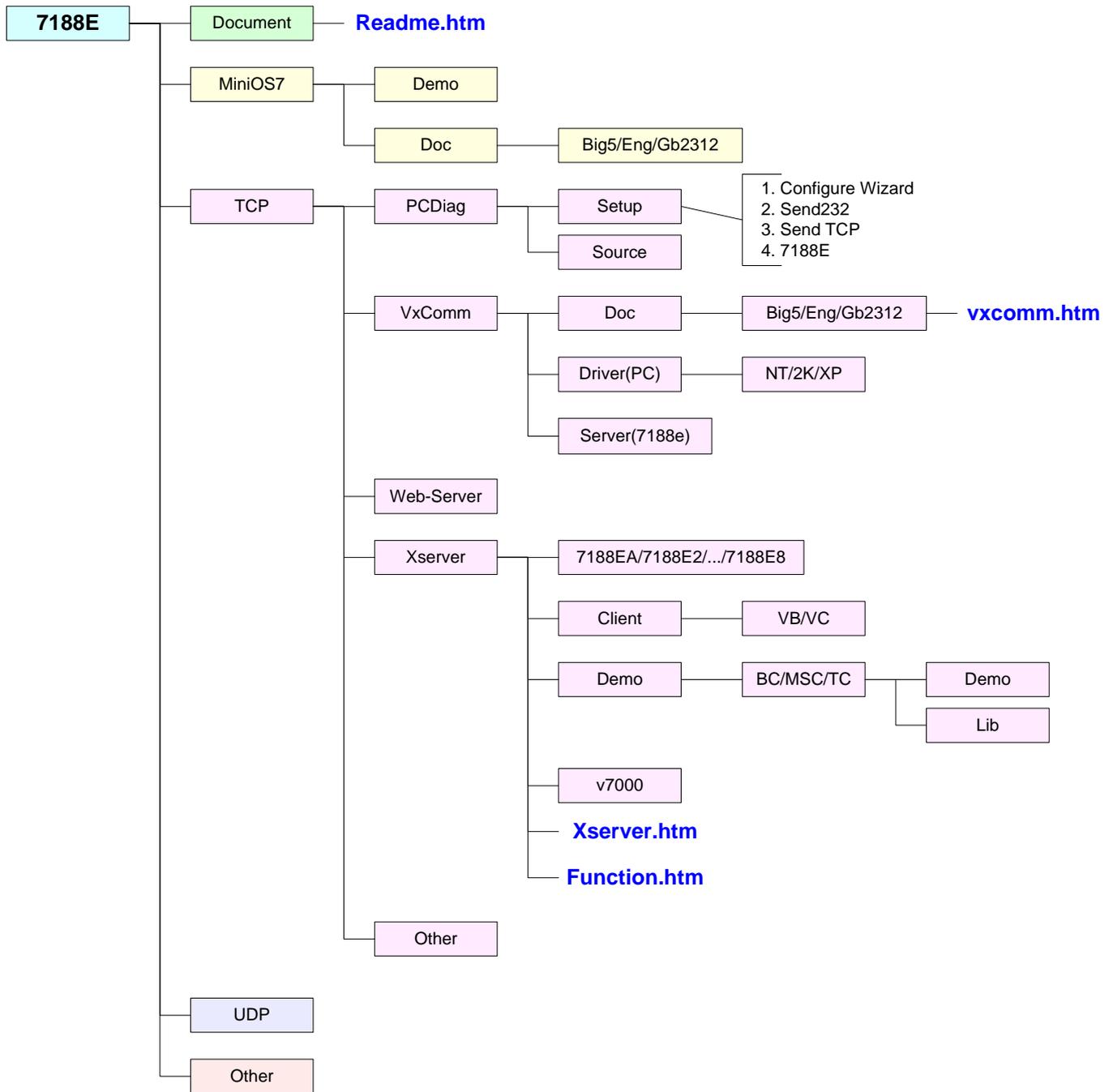
To help users reduce developing time, we support many software resources, including documents, drivers, libraries, diagnostic programs, client programs and many Xserver demos. You can quickly find which resources you need by using the directory tree.

The content of shipped CD:



Note: The software & manual are updated frequently, so the content of the companion CD is also updated frequently. The best way is to read every **README.TXT** located in every directory. All updated information is given in these files.

Sub directory tree of 7188E:



1.3 Software Installation

1.3.1 Installation Steps

The installation steps are given as follows:

Step 1: Change the directory to the destination folder as follows.

For example (CD-ROM Drive is "D:")

```
C:\>d:  
D:\>cd \NAPDOS\7188E\  
D:\NAPDOS\7188E\>_
```

Step 2: Make a new directory for the 7188E. Xcopy all files.

```
C:\>md 7188E  
C:\>cd 7188E  
C:\7188E\>xcopy d: c: /s /v
```

1.3.2 Installing 7188X.exe/7188XW.exe

The 7188X.exe/7188XW.exe is used to download and debug programs. Users should copy it to the PATH directory first. Then user can execute 7188X.exe/7188XW.exe in any directory on the host-PC. The installation steps are given as follow:

Step 1: Change the directory to the destination folder as follows.

For example (CD-ROM Drive is "D:")

```
C:\>d:  
D:\>cd \NAPDOS\7188E\MiniOS7  
D:\NAPDOS\7188E\MiniOS7\>_
```

Step 2: Copy 7188X.EXE from CD to the PATH directory (defined in PATH).

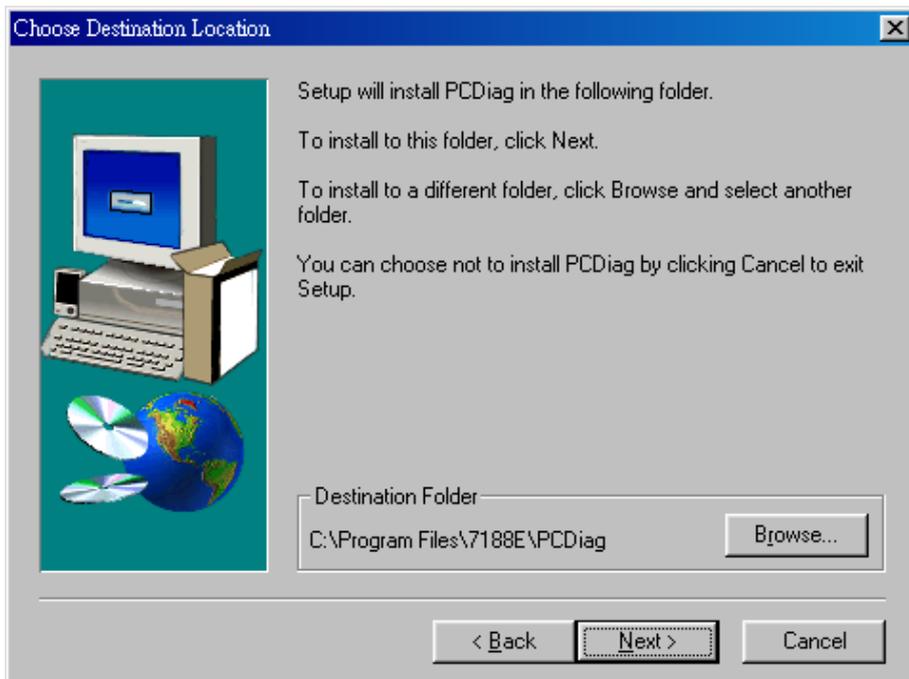
```
C:\>cd windows  
C:\windows\>copy d:7188x.exe
```

Note: 7188XW.exe is designed for win32 system. So it can be used for USB-RS232 or PCMCIA-RS232 port.

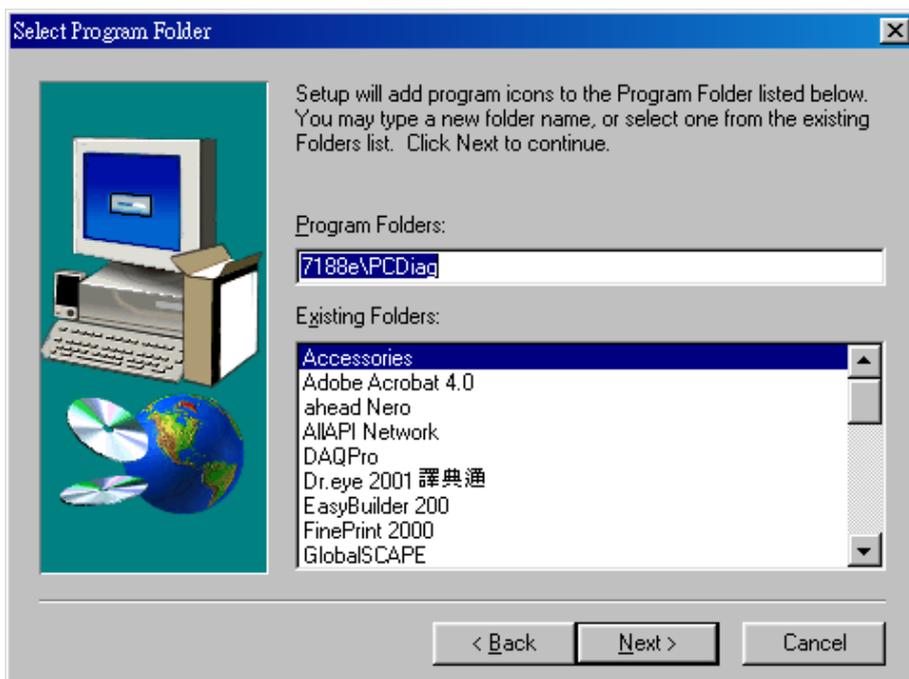
1.3.3 Installing PC diagnostic tools

Step1: Run Setup.exe from the 7188e\TCP\PCDiag\Setup directory.

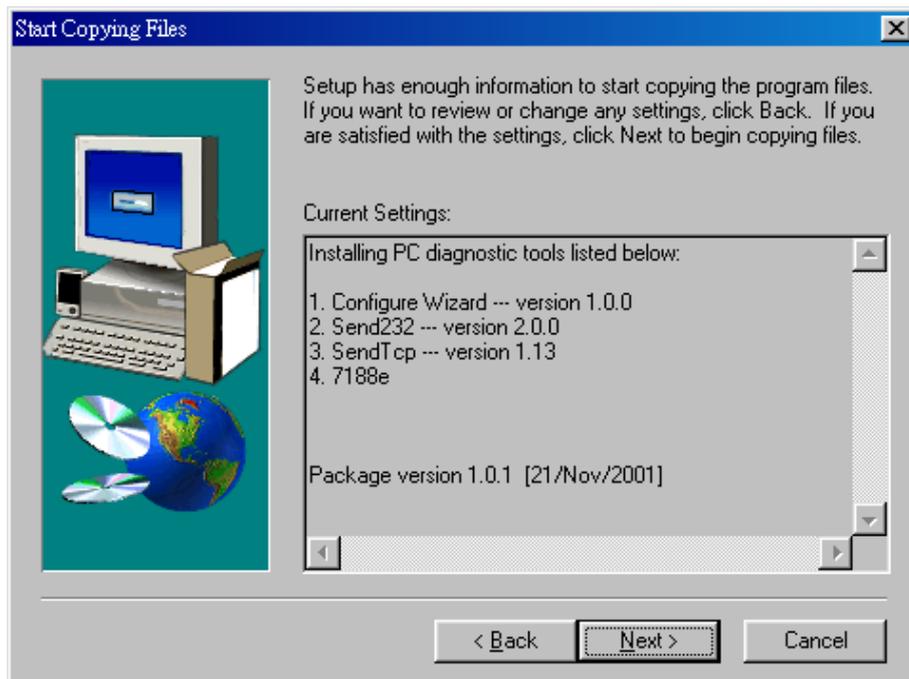
Setp2: Choose destination folder.



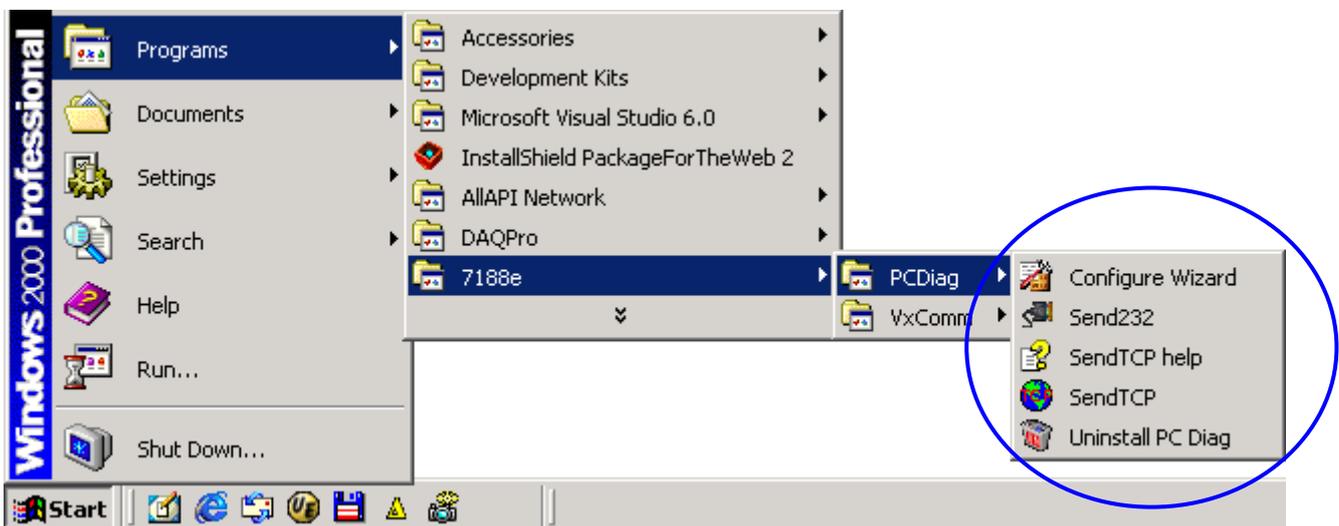
Step3: Select program folder.



Step4: Start copying files.



After finished installing, 5 items can be found in the PCDiag group.



1.4 Software Utilities

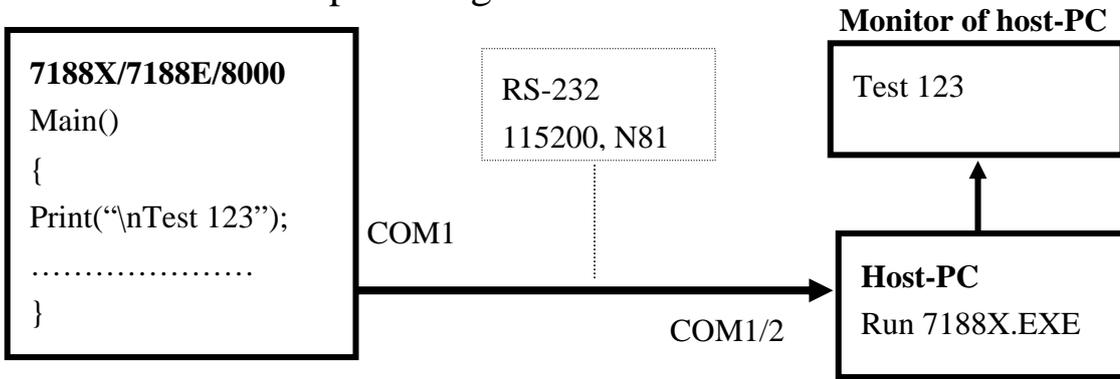
1.4.1 7188X.EXE Utility for Host-PC

The utility program, 7188X.EXE, can be used as follows:

- **Downloads user's programs from host-PC into 7188, 7188X, 7188E and 8000 families.**

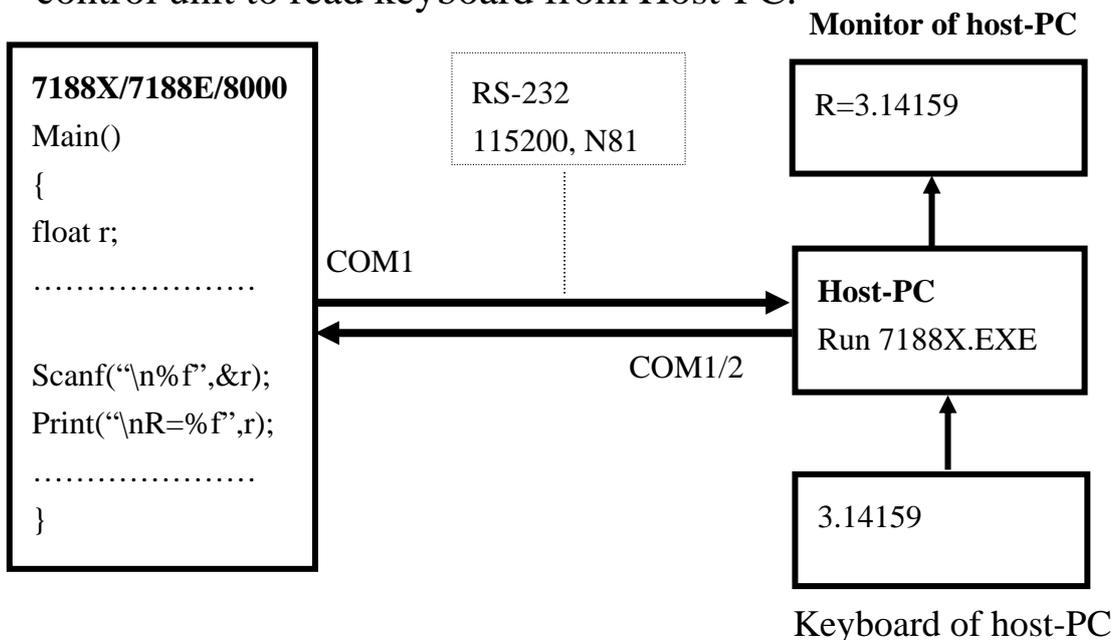
- **Shows debug string to monitor of host-PC**

Three standard output libraries, Putch, Print & Puts, will allow main control unit to send output string to monitor of Host-PC.



- **Keys-in test data from keyboard of host-PC**

Three standard input libraries, Getch, Scanf & LineInput, will allow main control unit to read keyboard from Host-PC.



Hot-key of 7188x.exe:

Command	Description
F1	Shows help messages of 7188x.exe
Alt_1	Uses PC's COM1
Alt_2	Uses PC's COM2
Alt_C	Switches to command mode to change PC COM port's baudrate and data format. Press ENTER to confirm the setting. Press LEFT/RIGHT arrow key to select different field. Press Any key to switch different values. Press ENTER in the last field will stop this operation.
Alt_D	Sets the date of RTC to the PC's date.
Alt_T	Sets the time of RTC to the PC's time
Alt_E	For downloading files into memory. Only after the message " Press ALT_E to download file! " is shown on screen, can users press Alt_E.
Alt_L	Switches normal/line mode. In line-mode, all characters-pressed will not send to COM until the ENTER is pressed. It is designed for testing the 7000 series.
Alt_X	Quits 7188X.EXE.
F2	Sets the file name for download (without download operation).
Alt_F2	Sets multiple filenames for download. (10 files maximum. If set less than 10 files, add '*' to end.)
Ctrl_F2	Shows COM1 & COM2 messages (for easily COM port testing). Press ALT_X to return to the original mode. Press TAB to switch the cursor between these two windows.
F5	Runs the program specified by F2 and arguments set by F6.
F6	Sets the arguments of the execution file set by F2. (10 arguments maximum. If set less than 10 arguments, add '*' to end).
F8	F8=F9+F5.
F9	Downloads the file specified by F2 into FLASH memory.
Alt_F9	Downloads all files specified by ALT_F2 into FLASH memory.
F10	Downloads the file specified by F2 into SRAM and execute it.
F12	For 7521/7522/7523 to test RS-232.
... more more ...

1.4.2 7188XW.EXE Utility for Host-PC

7188xw.exe is **the Win32 version of 7188x.exe**. The difference between 7188x.exe and 7188xw.exe is:

7188x.exe: Uses standard COM ports (COM1/COM2).

7188xw.exe: Supports RS-232 COM ports using USB and PCMCIA interfaces.

Command line options of 7188xw.exe:

Option	Description
/c#	Uses PC's COM#
/b#	Sets baudrate of PC's COM port (default is 115200)
/s#	Sets screen's display-rows (default is 25, max. is 50)

Hot-key of 7188xw.exe:

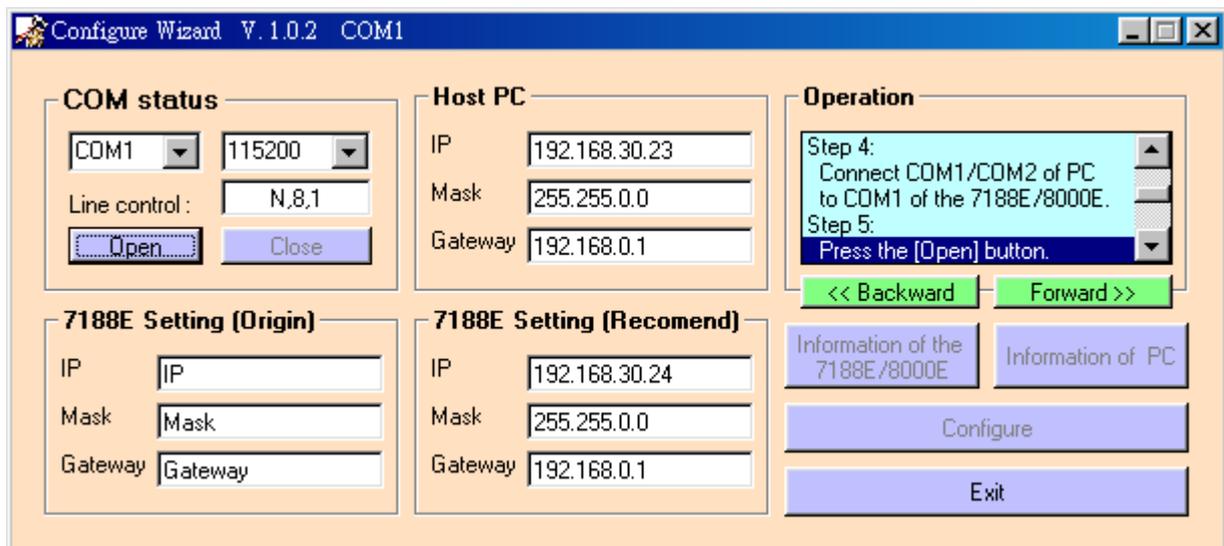
Command	Description
F1	Shows help messages of 7188xw.exe
Alt_F1	Shows the Chinese (Big5) help messages of 7188xw.exe
Ctrl_F1	Shows the Chinese (GB2312) help messages of 7188xw.exe
Alt_1	Uses PC's COM1
Alt_2	Uses PC's COM2
Alt_3	Uses PC's COM3
Alt_4	Uses PC's COM4
Alt_5	Uses PC's COM5
Alt_6	Uses PC's COM6
Alt_7	Uses PC's COM7
Alt_8	Uses PC's COM8
Alt_9	Uses PC's COM9
Alt_A	Switches between normal mode and ANSI-Escape-code-support mode
Alt_C	Switchs to command mode. Supports commands: b#: sets new baudrate of PC's COM ports. c#: Uses PC's COM#. n/e/o: sets parity to none/even/odd. 5/6/7/8: sets data bits to 5/6/7/8. p#: sets PC's working directory. q: quits command mode.

Alt_D	Sets the date of RTC to the PC's date.
Alt_T	Sets the time of RTC to the PC's time
Alt_E	For downloading files into memory. Only after the message "Press ALT_E to download file!" is shown on screen, can users press Alt_E.
Alt_H	Switches Hex/ASCII display mode.
Alt_L	Switches normal/line mode. In line-mode, all characters-pressed will not send to COM until the ENTER is pressed. It is designed for testing the 7000 series.
Alt_X	Quits the 7188X.EXE.
F2	Sets the file name for download (without download operation).
F5	Runs the program specified by F2 and arguments set by F6.
Alt_F5	Runs the program stored in SRAM.
F6	Sets the arguments of the execution file set by F2. (10 arguments maximum. If set less than 10 arguments, add '*' to end).
Ctrl_F6	Clears screen.
F8	F8=F9+F5.
F9	Downloads the file specified by F2 into FLASH memory.
Alt_F9	Downloads all files specified by ALT_F2 into FLASH memory.
F10	Downloads the file specified by F2 into SRAM and execute it.
Alt_F10	Downloads the file specified by F2 into SRAM memory.
Ctrl_B	Sends a BREAK signal to the PC's COM port that is used by 7188xw.exe.
... more more ...

1.5 PC Diagnostic tools

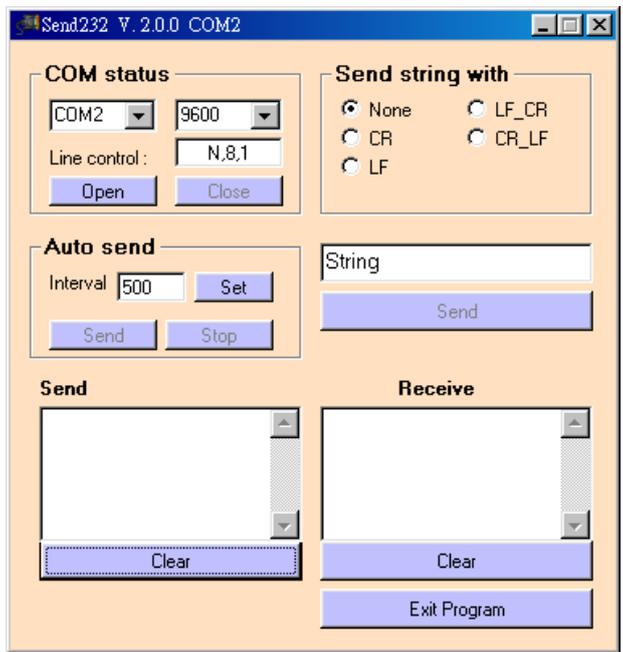
The PC Diagnostic tools include:

- **Configure Wizard:** guides users step by step in configuring the 7188E/8000E's network setting.



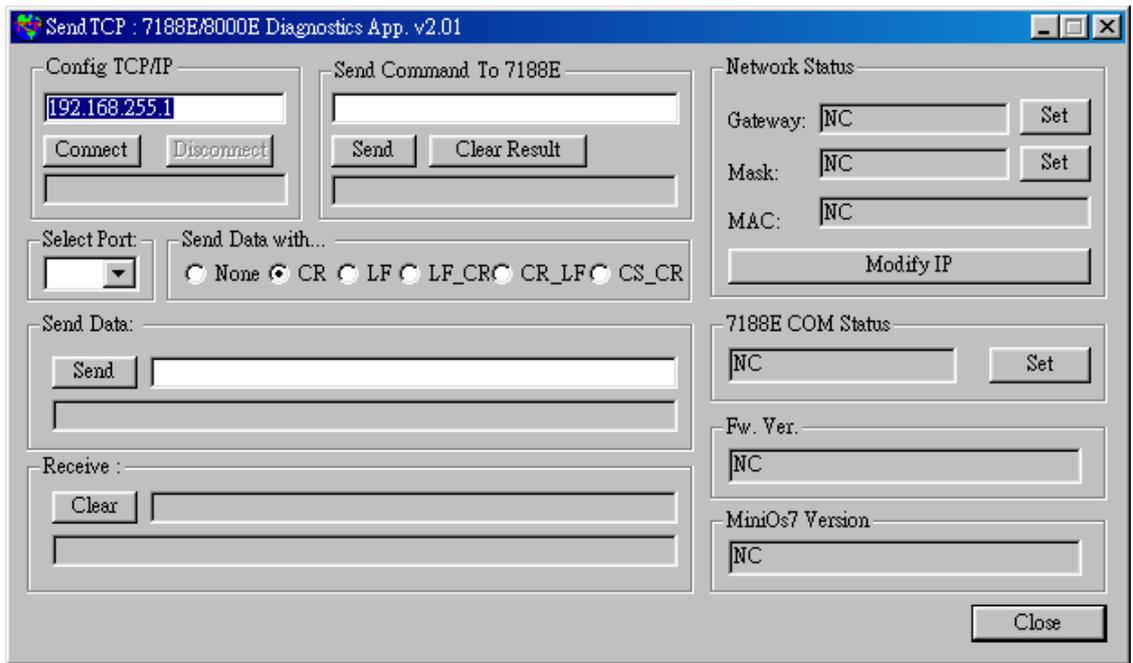
Please refer to sec. 3.3 of “7188E Series Hardware user’s manual” for more operating details.

- **Send232:** uses serial port (RS-232) interface to communicate with devices. Can be used to test the Virtual COM technology.



Please refer to sec. 3.6 for more operating details.

- **SendTCP:** uses TCP protocol to communicate with the 7188E/8000E and devices which are connected to the 7188E/8000E’s COM ports.



Please refer to sec. 4.6 for more operating details.

- **7188e**: Command-prompt mode program, used to send data to specific machines using TCP protocol.

Usage:

7188e [-S:IP] [-P:Port] → Connect to a device by using TCP protocol.

*Q → Quit program and disconnect.

Commands

```
C:\Program Files\7188E\PCDiag>7188e -s:192.168.30.24 -p:10000
Connect to 192.168.30.24:10000
01
v3.0.01[11/19/2001]
10
7188E2
*q
C:\Program Files\7188E\PCDiag>
```

2. MiniOS7 of the 7188E Series

2.1 MiniOS7 for the 7188E Series

The MiniOS7 is an embedded O.S. designed for the following families:

- 7188XA/7188XB/7188XC series
- 7521/7522/7523 series
- 7188EA/7188EX series
- 7188E1/7188E2/7188E3/7188E4/7188E5/7188E8 series
- 8000 series.
- Iview-100 series
- More new embedded controller families
-

It is used to replace the ROM-DOS used in the 7188 series. Several brands of DOS have been created by various companies. In all cases, DOS, whether PC-DOS, MS-DOS, or ROM-DOS, is a set of commands or code which tells the computer how to process information. DOS runs programs, manages files, controls information processing, directs input and output, and performs many other related functions. The MiniOS7 provides equivalent functions of ROMDOS and provides more specific functions for the 7188X/7521/8000 family.

Comparison between MiniOS7 and ROM-DOS:

Function	MiniOs7	RomDos
Power up time	0.1 sec	4 ~ 5 sec
Supports I/O expansion bus	Yes	No
Supports AsicKey	Yes	No
Supports hardware unique serial number	Yes	No
Supports MMI, Iview-100 series	Yes	No
Supports Ethernet 10M interface, 7188E & 8X3X series	Yes	No
Directly downloads executable programs into Flash ROM	Yes	No
O.S. updateable (downloadable)	Yes	No
Built-in hardware diagnostic functions	Yes	No
Directly controls 7000 series modules	Yes	No
Customers ODM functions	Yes	No
Free of charge	Yes	No

Note: We reserve the right to change the specifications of MiniOS7 without notice.

Command Set of MiniOS7:

Command	Description
LED5 pos value	Shows a HEX value in the specified position of 5-digit LED.
USE NVRAM	Into the service routine for read/write NVRAM.
USE EEPROM	Into the service routine of read/write EEPROM.
USE Flash	Into the service routine of read/write Flash-ROM.
USE COM2 /option	Into the service routine of send/receive to/from COM2 (RS-485).
DATE [mm/dd/yyyy]	Sets the date of RTC.
TIME [hh:mm:ss]	Sets the time of RTC.
MCB	Tests current memory block.
UPLOAD	The first step to update the MiniOs7.
BIOS1	The last step to update the MiniOs7.
LOAD	DOWNLOADs the user program into the Flash-Memory.
DIR [/crc]	Shows the information of all files download in the Flash-Memory.
RUN [fileno]	Runs the file with file-number=fileno, no filene→the last file.
Name	Runs the file with file-name=name.
DELETE (or DEL)	Deletes all files stored in the Flash-Memory. It will delete all files.
RESET	Resets the CPU.
DIAG [option]	Hardware Diagnostic.
BAUD baudrate	Sets the new value of communication-baudrate to baudrate.
TYPE filename [/b]	Lists content of the file.
REP [/#] command	Repeats executing the same command # times.
RESERVE [n]	Reserves n Flash Memory sectors for USER's programs.
LOADR	Downloads a file into SRAM.
RUNR [param1 [param2...]]	Runs a program saved into SRAM (downloaded by command LOADR).
I/INP/IW/INPW port	Reads data from the hardware PORT.
O/OUTP/OW/OUTP W port value	Outputs to hardware PORT.
... more more ...

*** Refer to **7188E\MiniOS7\DOC\Index.htm** for user's manual & demo programs for the MiniOS7 ***

There are some of the libraries included with the 7188E.

7188EL.LIB: CPU & I/O related library (Large model)

TCPIPL.LIB: TCP/IP related library (Large model)

VComNNNN.LIB: Xserver related library (Large model), with NNNN being the version of library.

Some of the libraries supported by 7188E.LIB are given as follows:

Function description	Example
COM port	InstallCom1, InstallCom2,, InstallCom5, InstallCom36, InstallCom47, InstallCom58 IsCom1, IsCom2,....., IsCom7, IsCom8 ToCom1, ToCom2,, ToCom7, ToCom8 ReadCom1, ReadCom2,, ReadCom7, ReadCom8
EEPROM	WriteEEP, ReadEEP, EnableEEP, ProtectEEP
NVRAM & RTC	ReadNVRAM, WriteNVRAM, GetTime, SetTime, GetDate, SetDate
LED & 5DigitLed	LedOn, LedOff, LedToggle, Init5DgitLed, Show5DigitLed, Show5DigitLedWithDot
Flash Memory	FlashReadId, FlashErase, FlashRead, FlashWrite
Timer & Watchdog Timer	TimerOpen, TimerClose, TimerResetValue, TimerReadValue StopWatchReset, StopWatchRead, StopWatchStop InstallUserTimer EnableWDT, DisableWDT, RefreshWDT
File	GeFileNo, GetFileName, GetFilePositionByNo, GetFilePositionByName
Connects to 7000	SendCmdTo7000, ReceiveResponseFrom7000
Programmable I/O	SetDio4Dir, SetDio4High, SetDio4Low, GetDio4
Others	Kbhit, Getch, Putch, LineInput, Scanf

Refer to **7188e\document\TCPIPLib.pdf** & **7188e\minios7\doc\index.htm** & **7188e\document\WebLib.pdf** for more information.

Refer to **7188e\document\TCPIPLib.pdf** for how to compile & link.

2.2 Demo Programs for the 7188E Series

We provide hundreds of demo programs for users. The source codes are all in the shipped CD. It is recommended to edit & modify these demo programs when starting user's special applications. The demo programs can be classed as follows:

Some of the demo programs designed for MiniOS7 are given as follows:

Demo	Description
Hello	Can run on PC or 8000, just use Print() to print: "*** Hello 8000 ***"
Hello1	Demo for using functions: Is8000, GetLibVersion, Print
Hello2	Demo for using C++ compiler.
FILE	Demo information in obtaining file information and file position in Flash memory. All file data is stored in Flash Memory. In MiniOS7, cannot use C's functions: fopen, fclose, fread, fwrite.
BATCH	An example of BATCH files (*.BAT).
SCANF	Demo for using LineInput and Scanf.
RUNPROG	Uses Ungetch to send commands to MiniOS7 to run another program
DEMO90-98	Demos for using TIMER functions.

Location: 7188e\MiniOS7\Demo*.*

Some typical TCP/IP demo programs are given as follows:

Typical TCP/IP demo	7188E	PC
Ping demo	Client, ping.exe	None
Telnet server demo	Server, telserv.exe	Client, telnet.exe
Telnet server demo2	Server, telserv2.exe	Client, telnet.exe
Demo1: TCP/IP demo	Server, demo1.exe	Client, Client1.exe
Demo2: TCP/IP demo	Server, demo2.exe	Client, Client1.exe
Demo3: TCP/IP demo	Server, demo3.exe	Client, Client1.exe

Location: 7188e\TCP\Other*.*

Refer to Sec. 4.7 for more TCP/IP demo program designed for Xserver.

Refer to **7188e\document\TCPIPLib.pdf**,

7188e\minios7\doc\index.htm and

7188e\document\WebLib.pdf for more information.

Refer to **sec. 5.2** for how to compile and link.

3. VxComm Applications

- Overview
- Installing the VxComm Driver
- Adding a 7188E/8000E server and configuring the VxComm Driver
- Removing a 7188E/8000E server
- Uninstalling the VxComm Driver
- Diagnostics and Trouble Shooting
- FAQ

3.1 Overview

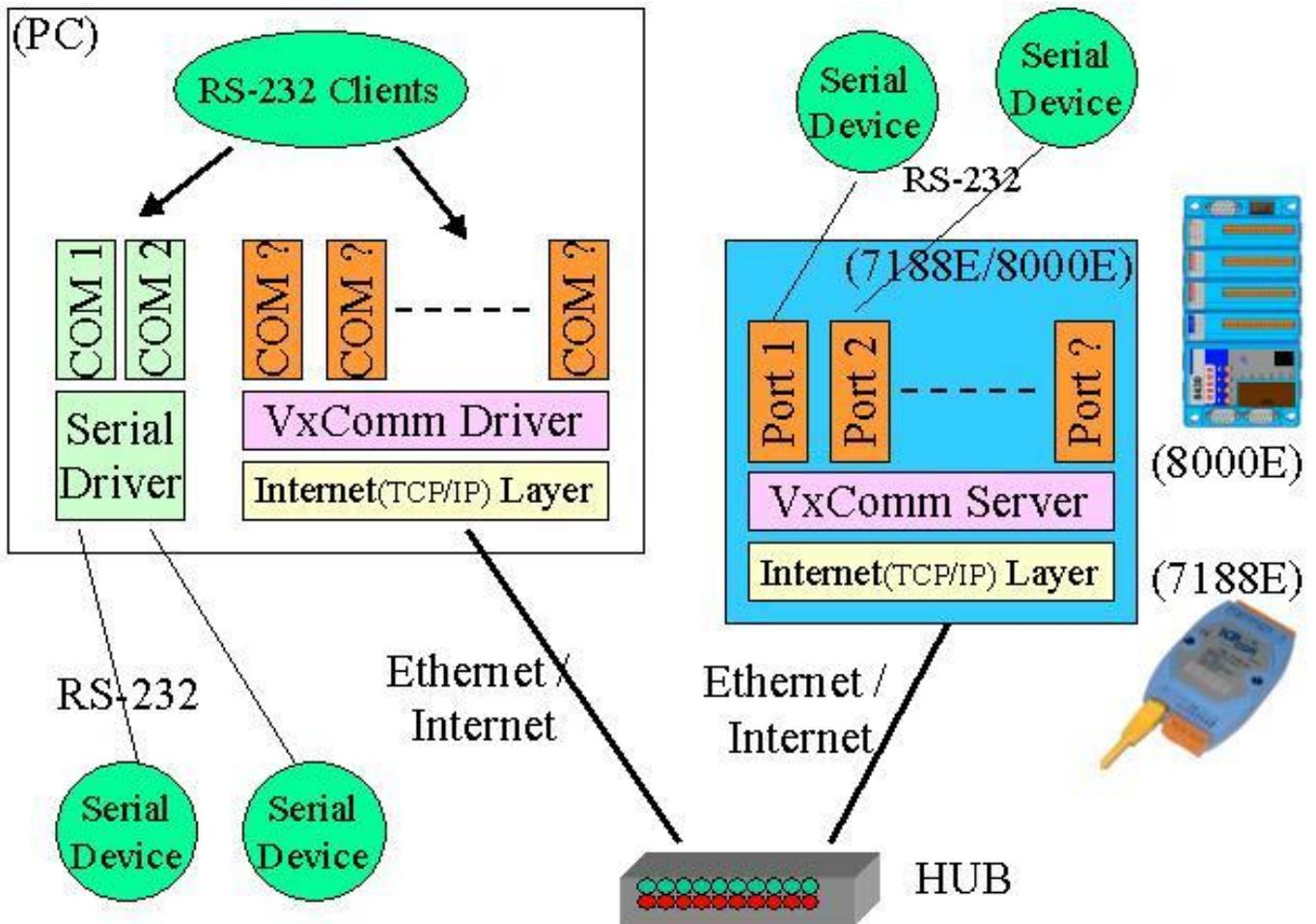
The [VxComm \(Virtual Comm\) Driver](#) and [VxComm Utility](#) are very easy to install and use. The first thing to do is to find the installation file in the included CD. The directory is:

- 7188e\TCP\VxComm\NT\VxCommNT.exe
(for Windows NT 4.0) or
- 7188e\TCP\VxComm\2K\VxComm2K.exe
(for Windows 2000, Windows XP).

This document shows how to install and configure the driver correctly. There are three parts to the quick start manual. The first part instructs users how to install the software. The second part shows how to add a [7188E/8000E](#) server and configure a COM port. Finally, the third part teaches you how to remove a [7188E/8000E](#) server.

3.1.1 Architecture

The **VxComm Driver** creates COM port(s) and maps them to the COM port(s) of the **7188E/8000E**. The user's RS-232 client programs need only to change to the different COM port to access the serial devices that are allocated to the Internet or Ethernet network via the **7188E/8000E**.



3.1.2 Ports mapping

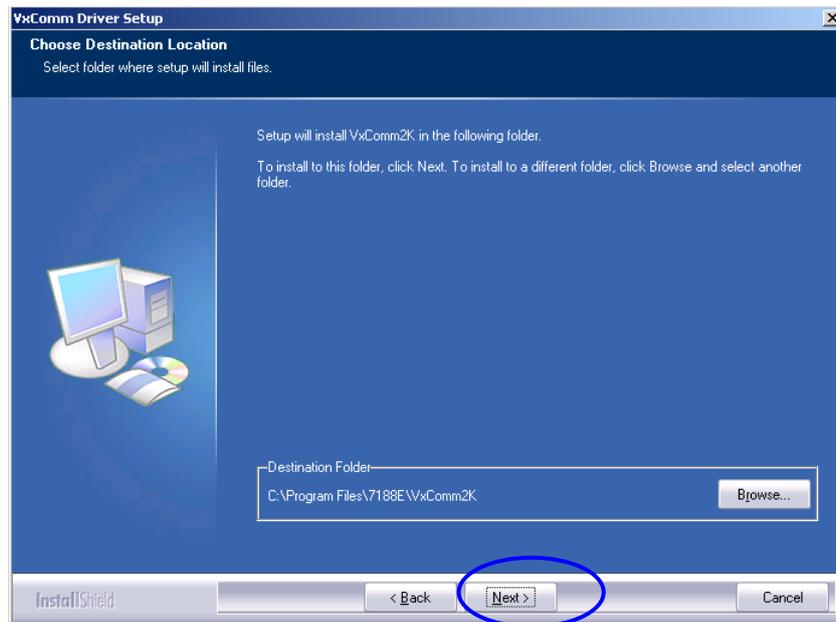
Vxcomm Driver/Utility supports Port 1 to Port 8 in accessing COM1 to COM8 of the 7188E/8000E. Another Port I/O is designed to access the I/O boards mounted on 7188E or 8000E.

With the help of the [VxComm Driver/Utility](#), users can map remote COM port and I/O boards to become a virtual COM port of PC. One PC can control a maximum of 256 COM ports (including COM1 and COM2).

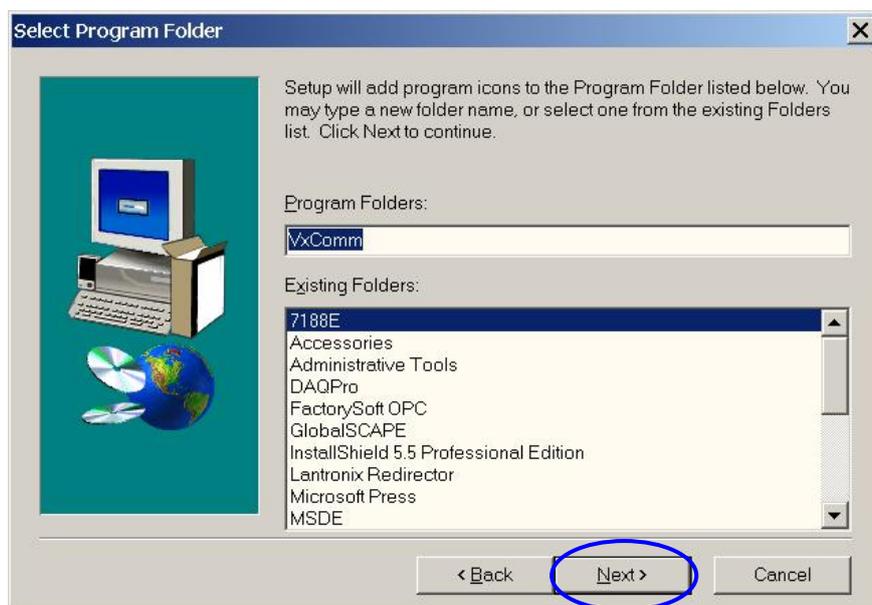
Local COM Port (PC)	VxComm Driver/Utility (PC)	Remote COM port (7188E/8000E)
COM ?	Port 1	COM1
COM ?	Port 2	COM2
COM ?	Port 3	COM3
COM ?	Port 4	COM4
COM ?	Port 5	COM5
COM ?	Port 6	COM6
COM ?	Port 7	COM7
COM ?	Port 8	COM8
COM ?	Port I/O	I/O board

3.2 Installing the VxComm Driver

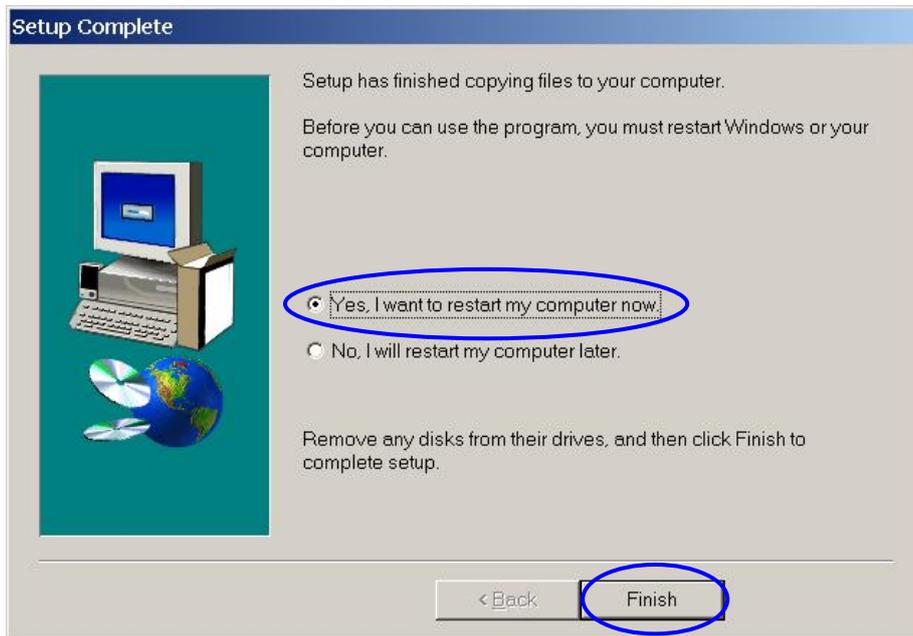
Step 1: Run VxComm2K.exe (for Windows2000, Windows XP) or VxCommNT.exe (WindowsNT4.0) or VxComm98.exe from the \Napdos\7188e\Tcp\VxComm\driver (pc)\2k or NT or 9x directory.
Step2: Choose a destination folder.



Step 3: Choose a program folder.



Step 4: Select the "Yes, ..." option and click the "Finish" button to reboot your computer.



Step 5: After rebooting the computer, the **VxComm Utility** will ask you to configure the virtual COM port(s). Please refer to the next section for more information.

Note:

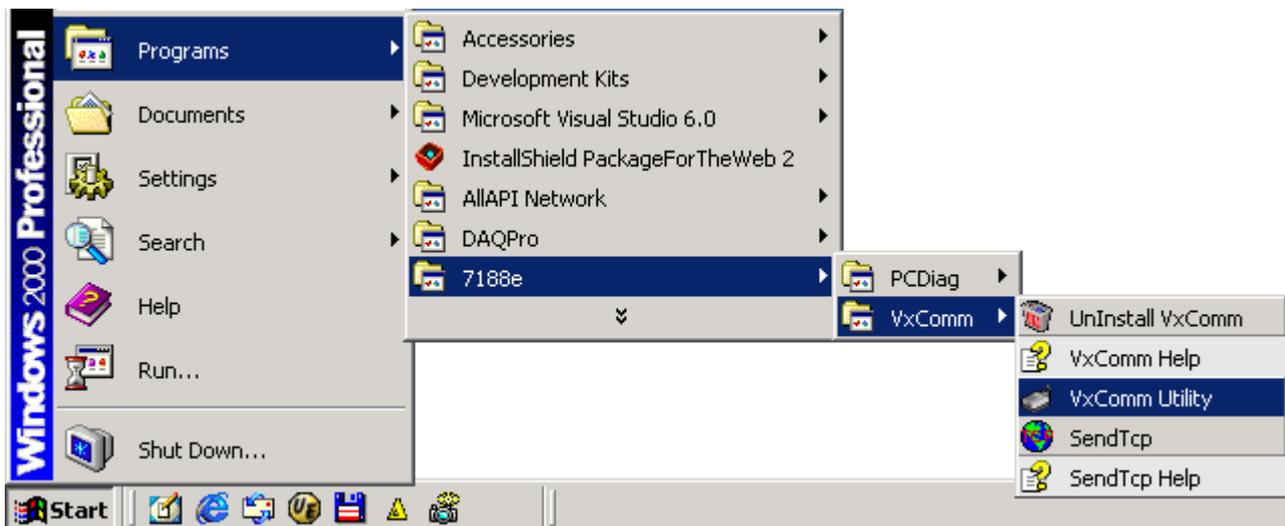
The Vxcomm driver is located on 7188e\Tcp\VxComm\driver (pc)

3.3 Adding a 7188E/8000E server and configuring the VxComm Driver

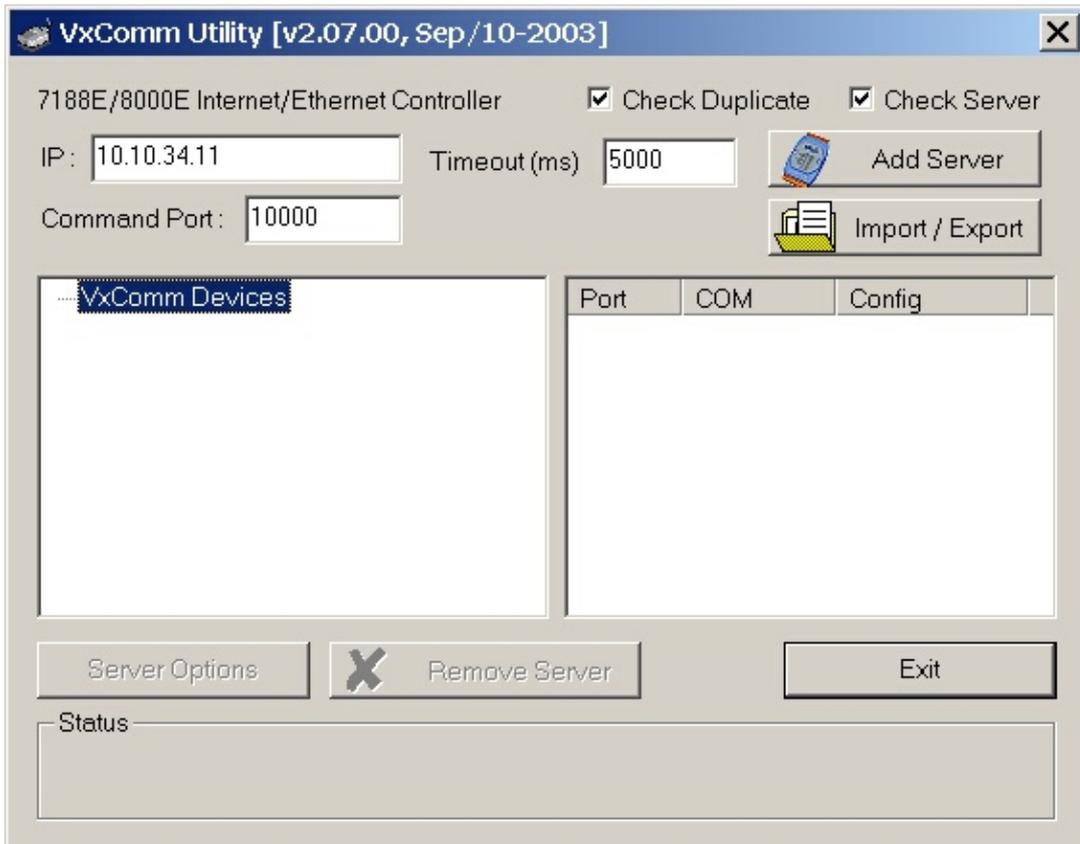
7188E/8000E's default IP address is 192.168.255.1.

Step1: Obtain the IP address of the 7188E/8000E. Either 7188x.exe, 7188xw.exe or Configure wizard can help you in obtaining the IP address of the 7188E/8000E. Refer to Sec. 3 of “7188E hardware user’s manual” for information regarding the use of these three tools.

Step 2: Select the "[VxComm Utility](#)".



Step 3: Enter the IP address of the 7188E/8000E server and press the "Add Server" Button.



Note:

"Check Duplicate" option:

Enable this option to check whether the IP address is already listed in the server window (left-hand window). Default is automatically checked. The following window pops up if IP address is duplicated.



"Check Server" option:

Enable this option to connect to the 7188E/8000E and get the device's name before adding to the server window (left-hand window). Default is automatically checked. The following window pops up if host/server fails to connect.



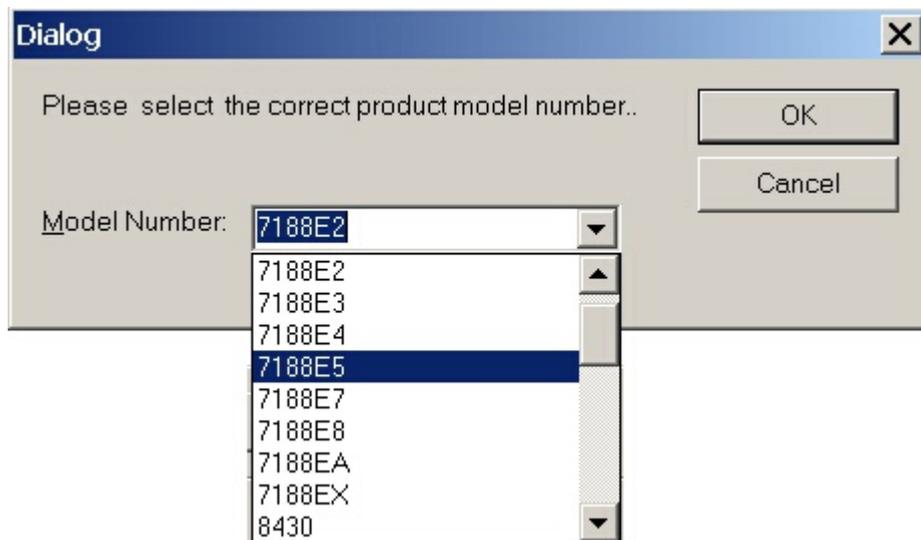
"[Timeout \(ms\)](#)" field:

This timeout value is used for Connecting, disconnecting and sending/receiving data in the [VxComm Utility](#), and is used for Connecting and Disconnecting in the [VxComm Driver](#).

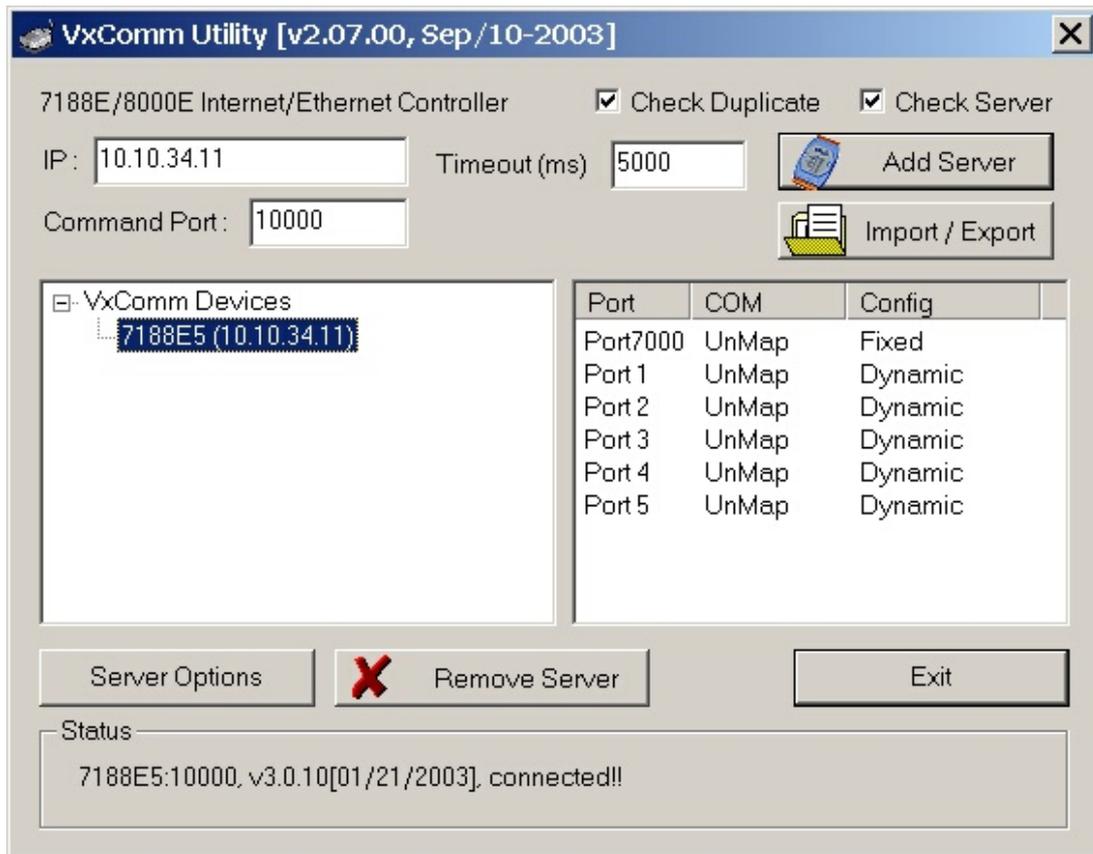
"[Command Port](#)" field:

By default, the Command/Configuration TCP port is 10,000. If you change the setting of 7188E/8000E, then you must assign the correct one in this field to let the VxComm Utility and Driver to get access to the device.

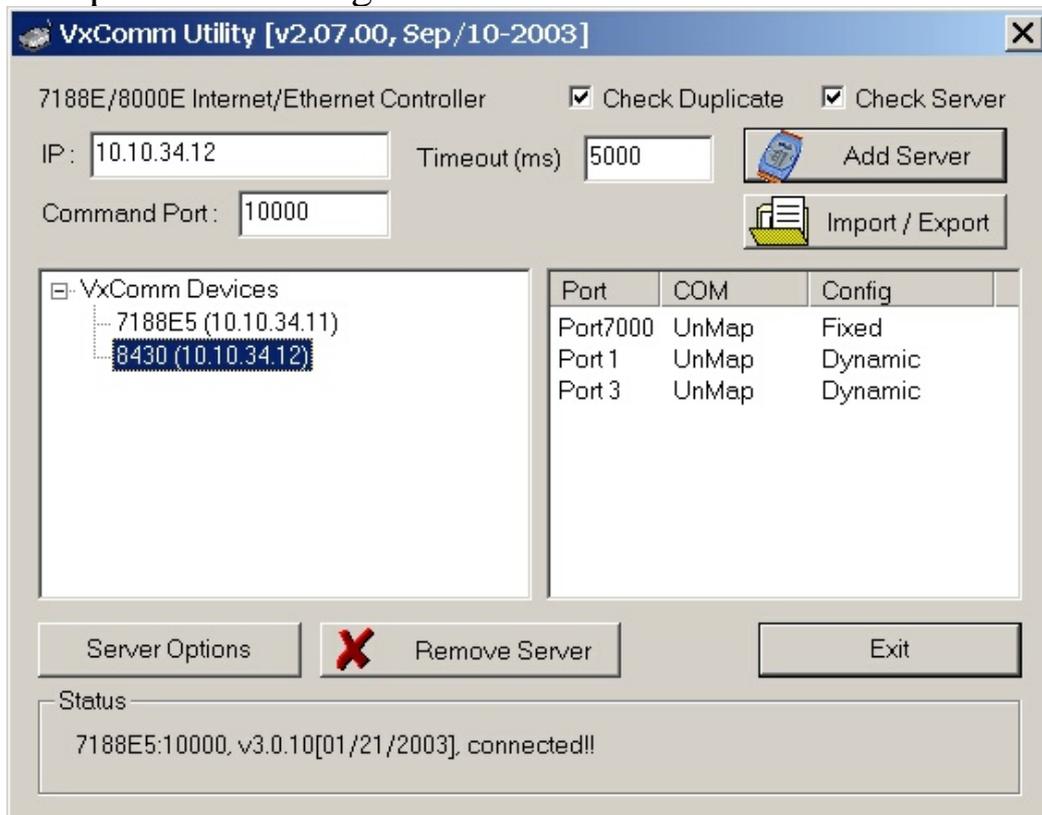
Step 4: The following window pops up if you uncheck the "[Check Server](#)" option before pressing the "[Add Server](#)" button. Please choose a suitable "[Model Number](#)" of 7188E/8000E and then click the "OK" button.



Step 5: Select one of the [7188E/8000E](#) devices and configure the virtual COM port(s) by double clicking "[Port1](#)" or "[Port2](#)". (Port7000 is reserved.)

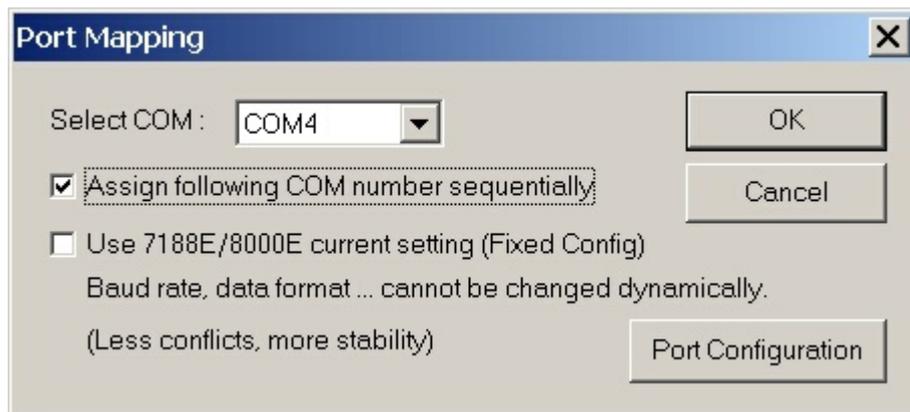


Another example when adding the 8430 at IP address 10.10.34.12.



Step 6: Select an appropriate COM port number, and then click the "OK"

button.



Note:

"Assign following COM number sequentially" option:

This option will assign the following ports with the available COM port number sequentially and automatically.

For example: If Port1 = COM4, then Port2 = COM5, Port3 = COM6

"Use 7188E/8000E current setting (Fixed Config)" option:

You can click the "Port Configuration" button to configure this port's Baud rate and Data format settings. After the configuration, you can then check this option.

Fixed Configuration (Use 7188E/8000E's current setting):

By using this feature, the VxComm Driver would not change the 7188E/8000E's settings dynamically. This is proper when you have multi-clients to access the same 7188E/8000E server.

Dynamic Configuration (This's the default method):

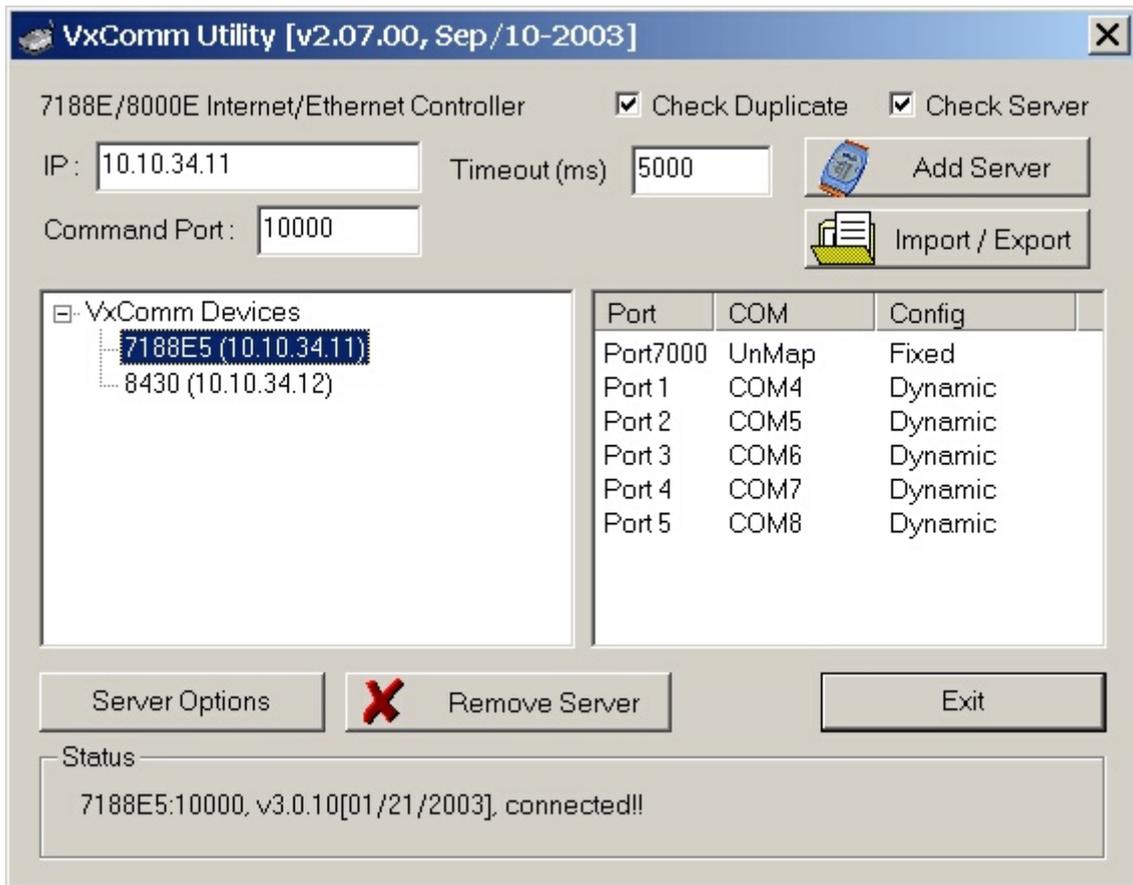
The VxComm Driver always change the 7188E/8000E's settings dynamically. It is proper for working with several different baud rate and data format.

For example, you may need to use 7000 Utility to make a search with several baud rates on the RS-485 network.

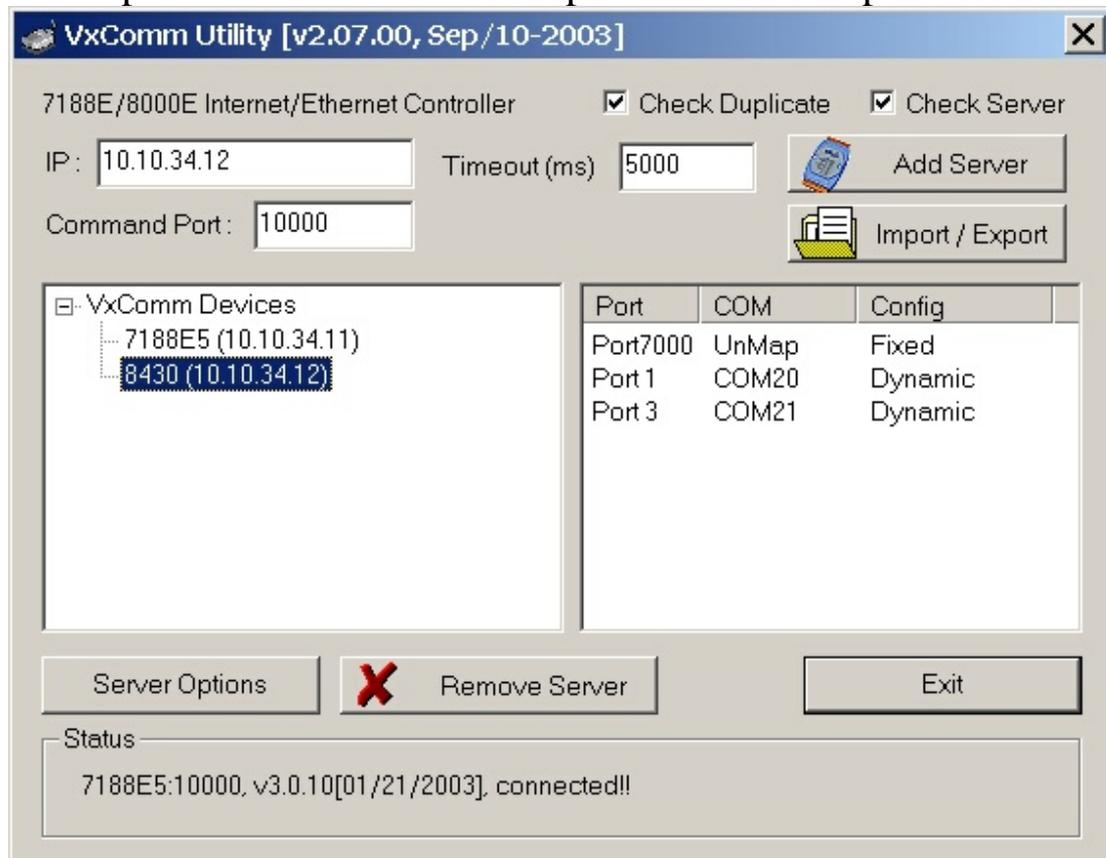
Please also refer to "[Configuring COM port of the 7188E/8000E server](#)".

Step 7: Select one of the 7188E/8000E devices and then click the "Server Options" button to configure the options.

(Note: VxComm Utility 98 does not support the "Server Options" function yet!)



Another example shown as follow: The port1 of 8430 map to COM20.



Step 8: Key in the value and then click the "OK" button to exit.

Server Options

Server: 7188E5 (10.10.34.11)

Keep Alive Time (ms): 7000

Recommend: 7188E's System Timeout * 1/3

Connection Broken (ms): 180000

Connect Timeout (ms): 5000

Command TCP Port: 10000

Port7000 TCP Port: 9999 (Reserved)

OK

Cancel

Notes:

Keep Alive Time (ms) field:

After connecting to the 7188E/8000E, the VxComm Driver will automatically and periodically send commands to keep the 7188E/8000E alive. The timer will be reset after each send/receive command/data success. The Keep-Alive mechanism won't work until the next timeout. The default setting of Keep-Alive time is about 7000 ms. It's recommended setting is (7188E/8000E's System Timeout * 1 / 3) or smaller value.

Connection-Broken (ms) field:

The VxComm Driver will try to re-connect if the connection is broken. When the client is sending a message to the 7188E/8000E, the internet (TCP/IP) layer may respond with a "Disconnect" event to the VxComm Driver if it fails to send the message after 20 seconds or more. Users can set a smaller Connection-Broken time [for example : 10000 ms(10 seconds)] to force the VxComm Driver to re-connect again and get a quicker response. If the connection has no sending/receiving signal before the Connection-Broken time has timed out, the connection will be marked as broken. The VxComm Driver will also re-connect it again. Thus, the Keep-Alive Time should be smaller than the Connection-Broken time to make the connection come on-line.

(Note: VxComm Driver 98 does not support the auto-reconnection mechanism yet!)

The default System Timeout (/STxxx) value of the 7188E/8000E is about 300 seconds. After client programs have connected to the 7188E/8000E, clients have to send command to keep the 7188E/8000E alive before it times out, otherwise the 7188E/8000E will reset itself and clients will have

to reconnect to the 7188E/8000E again.

Users can set the **Keep-Alive Time** and **Connection-Broken** time to 0 to disable this mechanism. The System Timeout will have to be set to 0 to disable the reset mechanism.

Connect Timeout (ms) field:

The timeout value will be passed into MS TCP/IP driver for reference when connecting and disconnecting.

Command TCP Port field:

By default setting, the 7188E/8000E use TCP port 10000 as the Command / Configuration port. If you change the 7188E/8000E's setting, you must assign the correct one in the field. So the **VxComm Driver** can connect to the right TCP port.

This TCP port is used to configure the Baud rate, data format, CTS/RTS control mode and Break, etc.

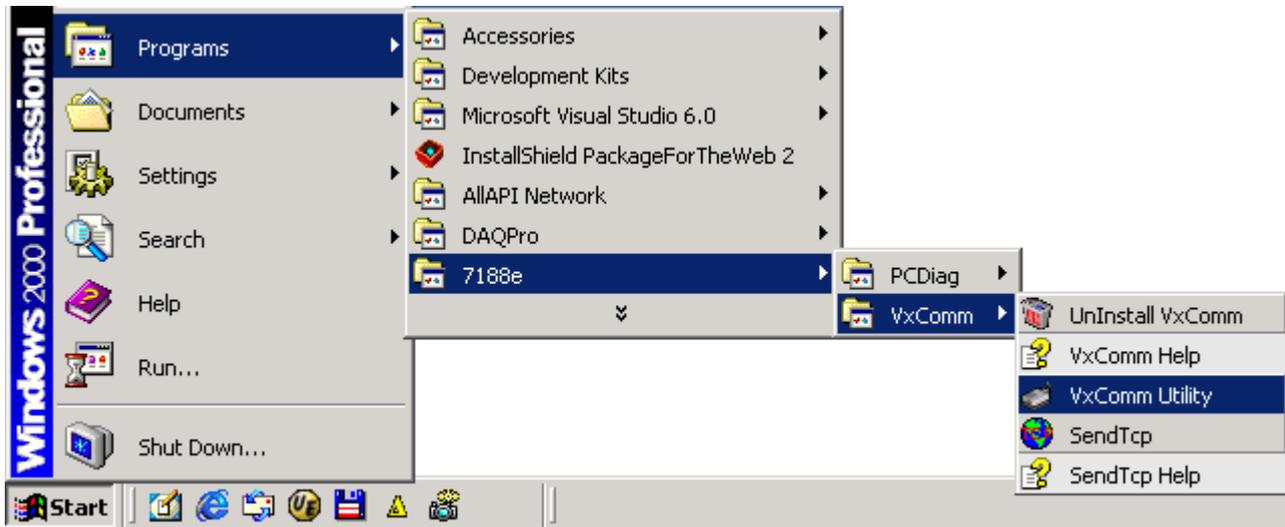
Port7000 Port field:

By default setting, the 7188E/8000E use TCP port 9999 as the Port7000 port. This TCP port is reserved.

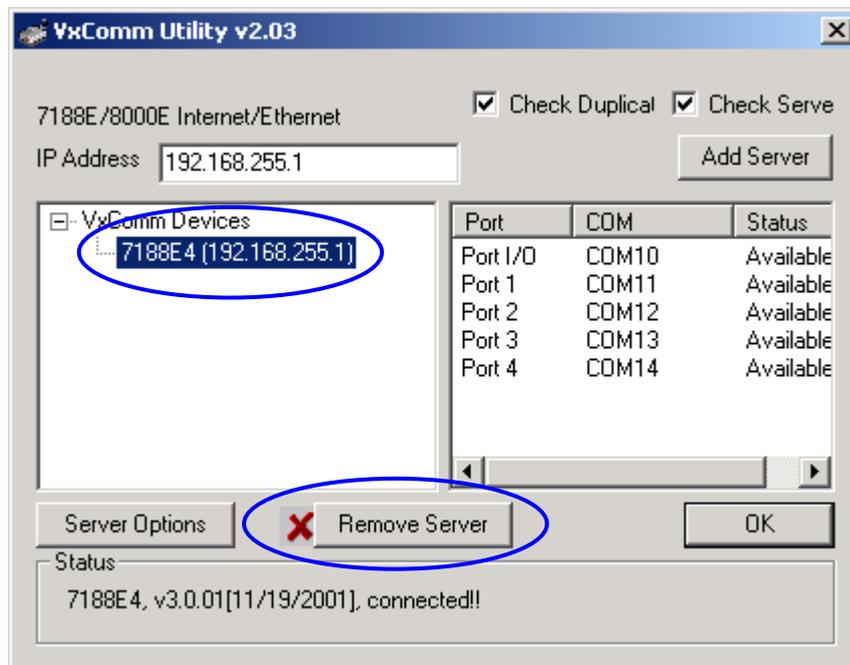
Step9: Press the 'Exit' button to save the settings and exit the VxComm Utility.

3.4 Removing a 7188E/8000E server

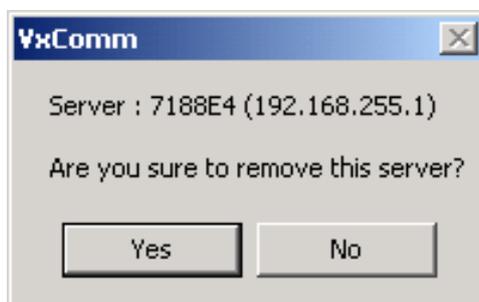
Step 1: Select the "VxComm Utility".



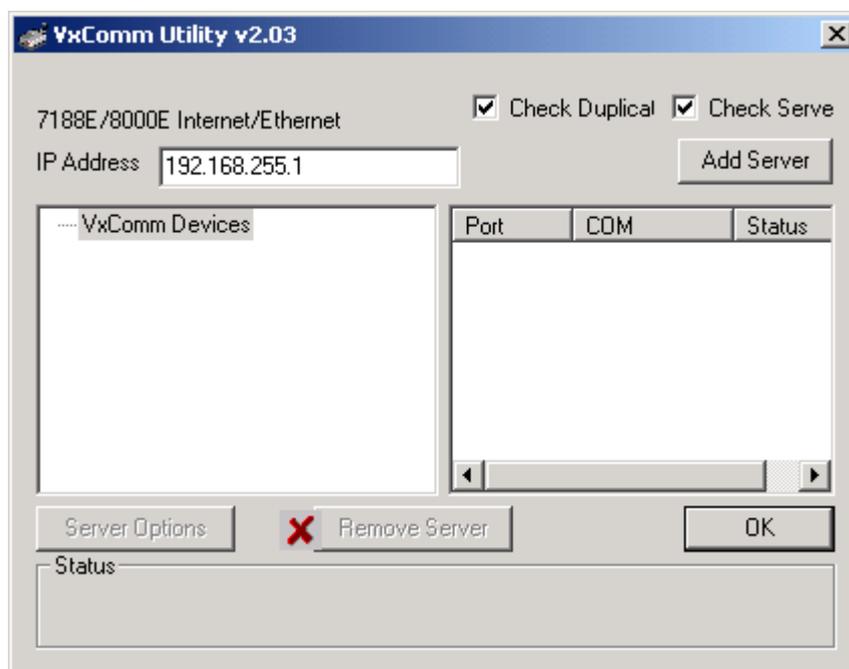
Step 2: Click the server name you want to remove and press the "Remove Server" button.



Step 3: The following window will pop up, please make sure of your choice and press the "Yes" button to remove it.

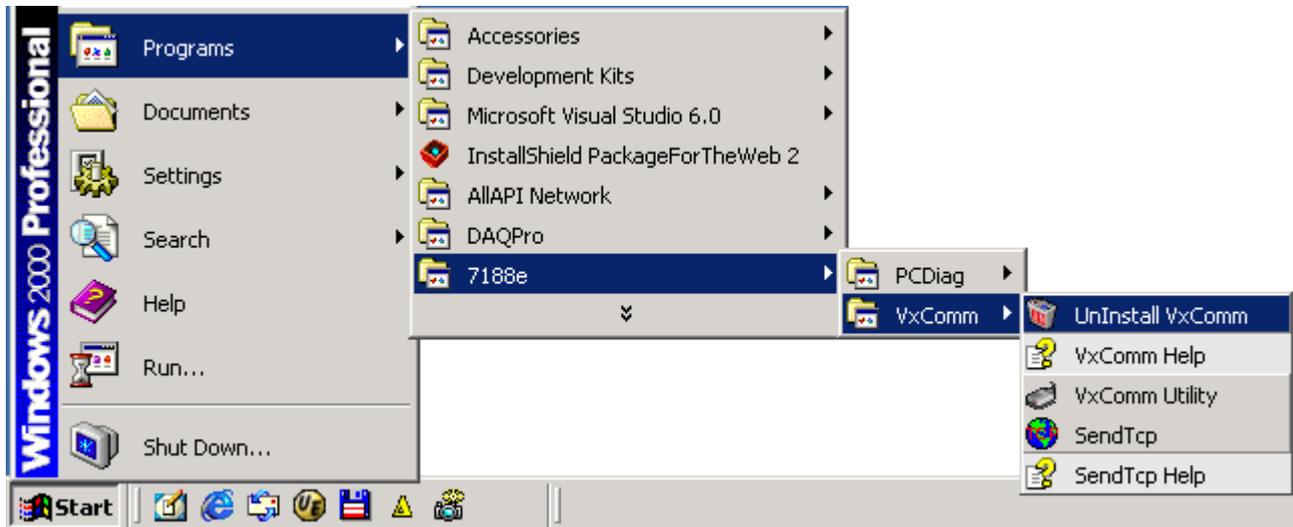


Step 4: Press the "OK" button to finish this utility.



3.5 Uninstalling the VxComm Driver

Step 1: Select the "UnInstall VxComm".



Step 2: Click the "Yes" button.



Step 3: Click the "OK" button.



3.6 Diagnostics and Trouble Shooting

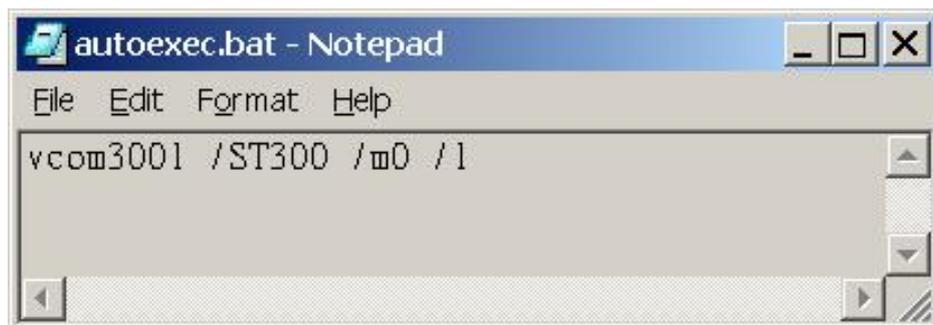
3.6.1 Diagnostics

After configuring the [VxComm Driver](#) by using the [VxComm Utility](#), the [VxComm Driver](#) should work without error. However, users can use a simple test to make sure it's working properly.

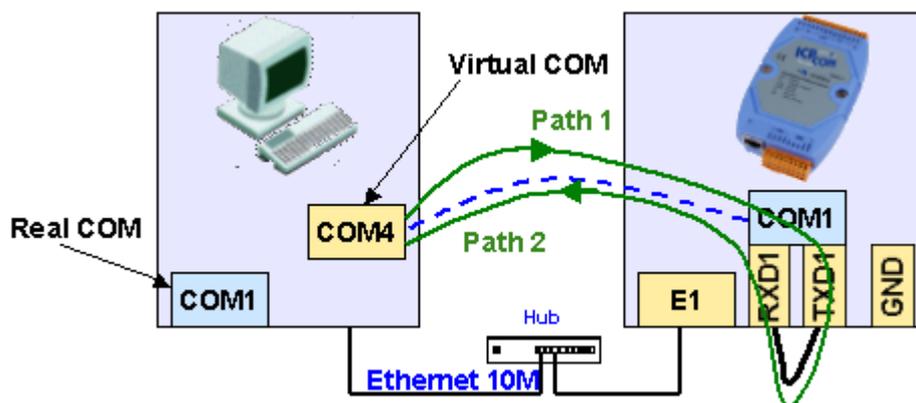
Note: The test method depends on the user's devices and client programs.

■ Example 1: Loop-Back Testing

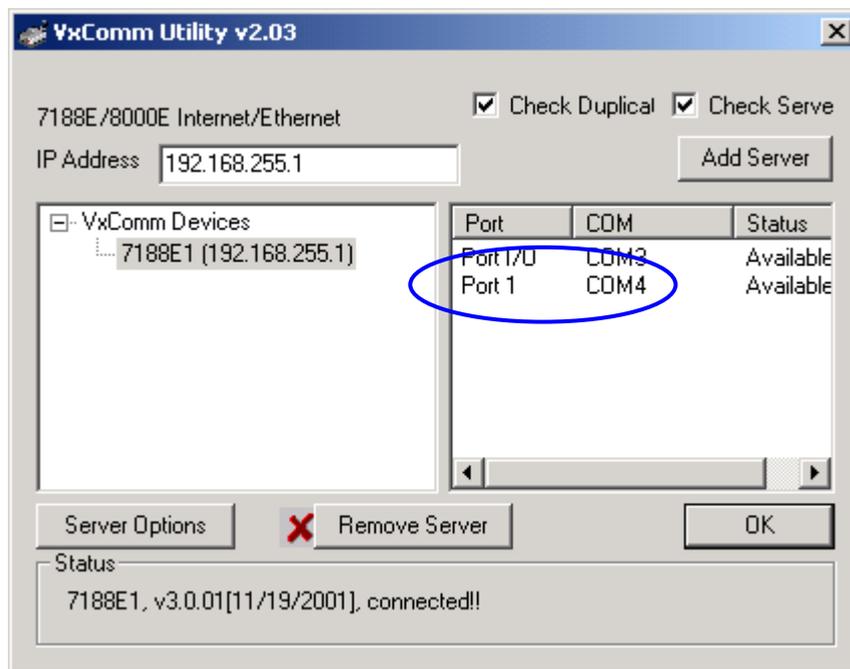
Step 1: Make sure the [VxComm Server](#) is working in `/m0` mode.
(Please refer to sec. 4.2.3 “Options of command line”)



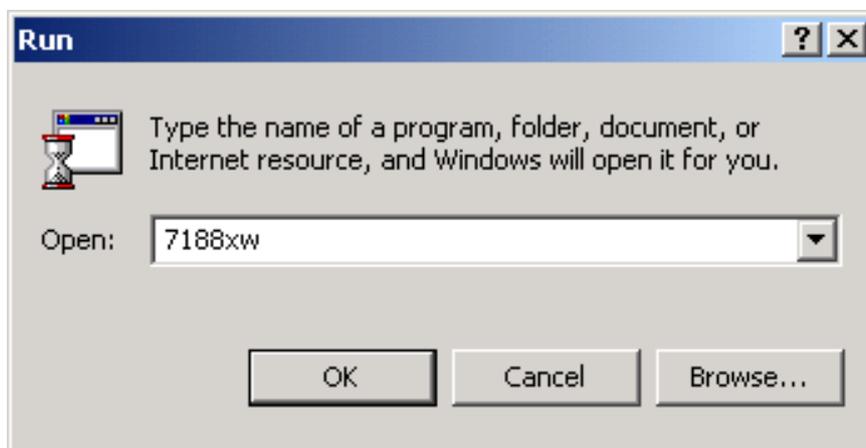
Step 2: Wire the [TXD1](#) with the [RXD1](#) (COM1) of the [7188E/8000E](#).



Step 3: Virtualize 7188E/8000E's COM1 to become PC's COM4 by using the VxComm Utility.

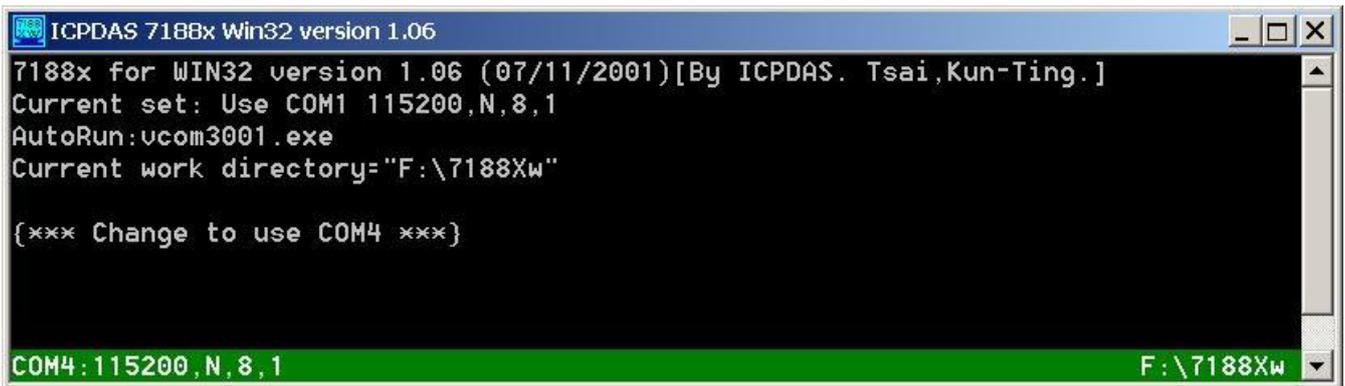


Step 4: Run the 7188xw.exe from the "Start / Run..." menu.



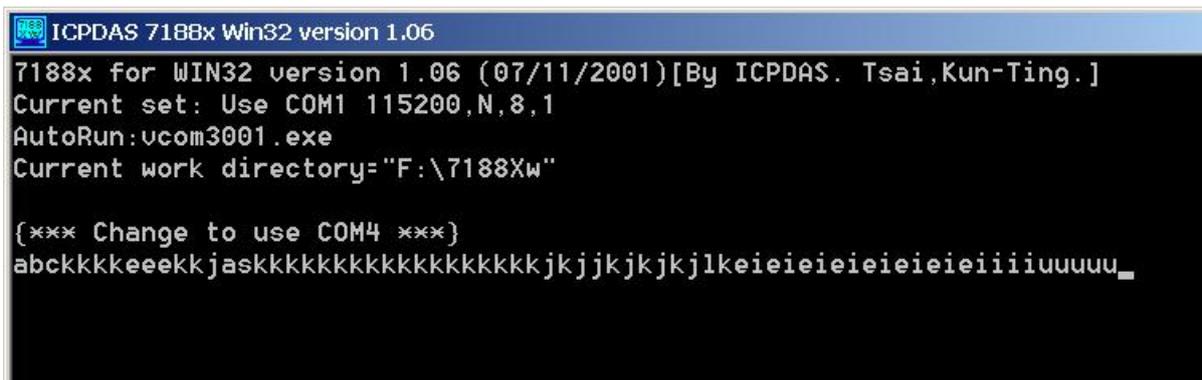
Step 5: Press the <Alt> + <4> keys to use PC's COM4.

It will show "{*** Change to use COM4 ***}" message after changed.



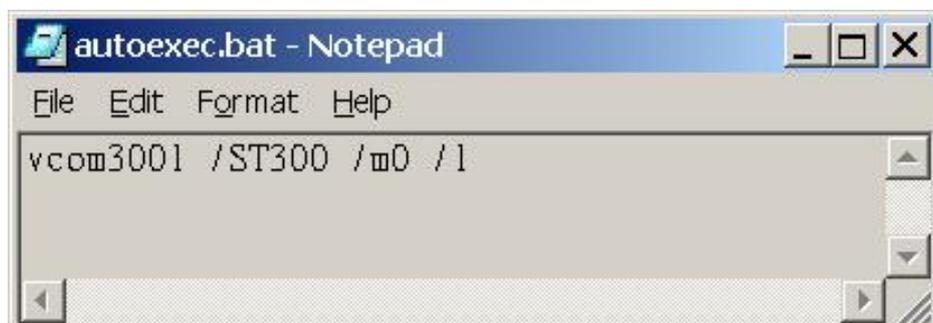
Step 6: Type some characters in the [7188xw.exe](#) window.

The characters will be sent from PC's COM4 to 7188E/8000E's COM1 (through Path1), and immediately returned from the 7188E/8000E's COM1 to the PC's COM4 (through Path2) then shown on the PC's monitor.

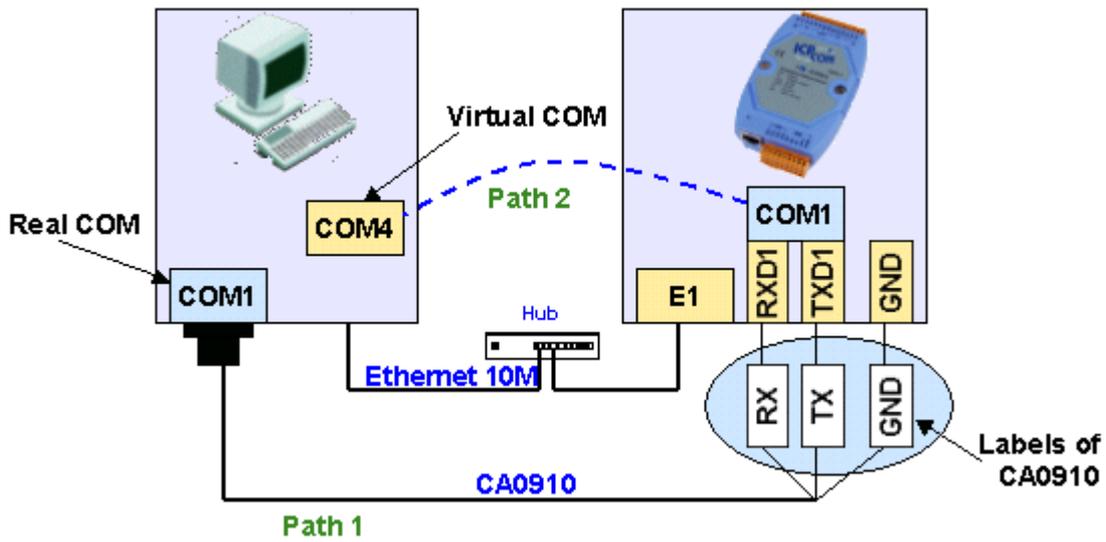


■ Example 2: Close-Loop Testing

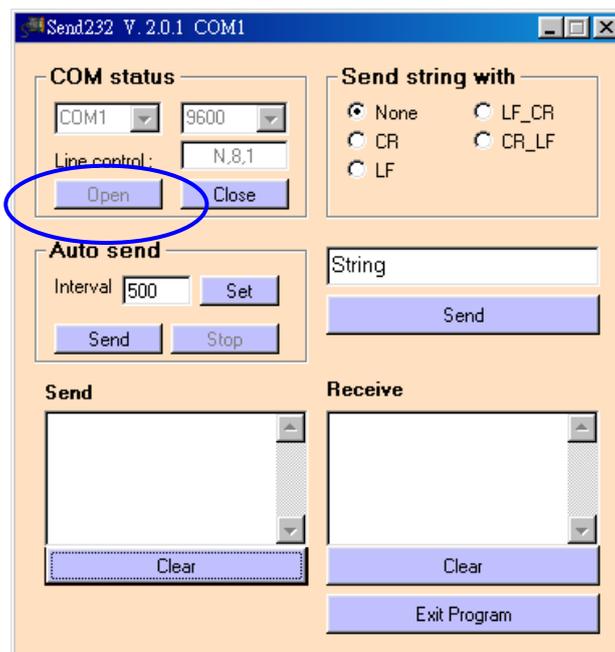
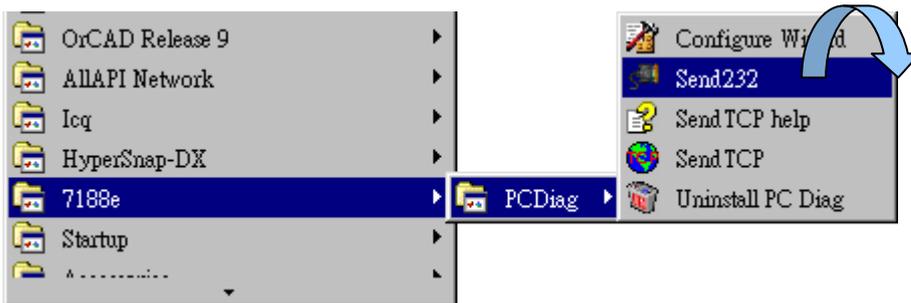
Step 1: Make sure the [VxComm Server](#) is working in `/m0` mode.
(Please refer to sec. 4.2.3 “Options of command line”)



Step 2: Build connection as follows:



Step 3: Run Send232 and then open PC's COM1.

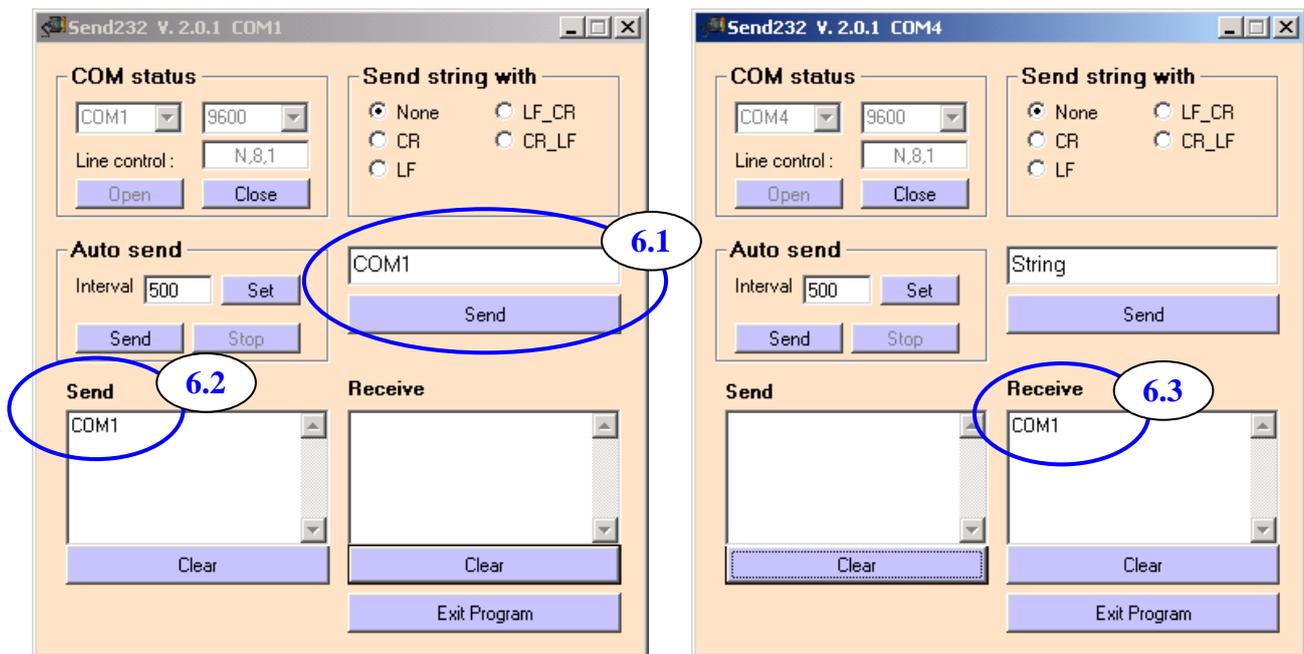


Step 4: Virtualize 7188E/8000E's COM1 to become PC's COM4 by using the VxComm Utility.

Step 5: Run another Send232 and open PC's virtual COM4.

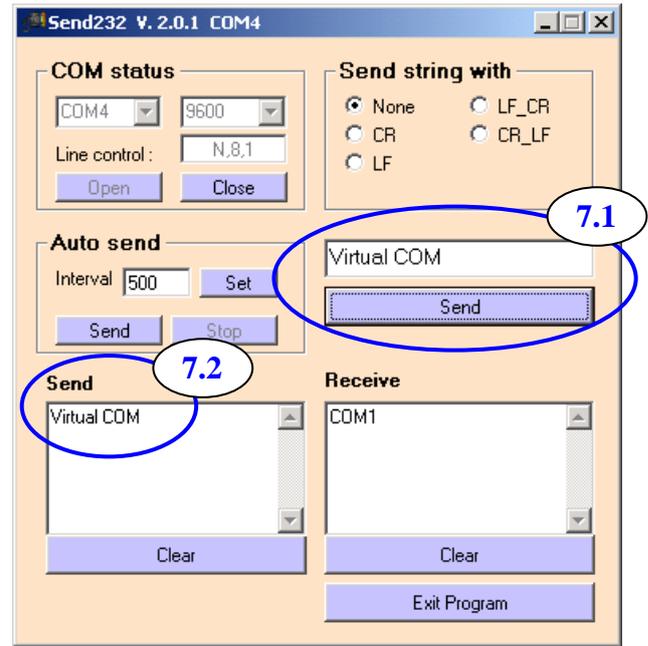
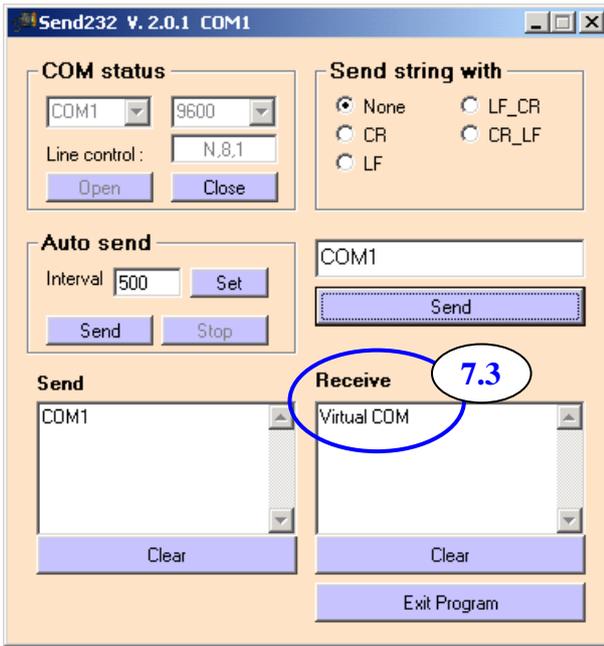
Step 6: Type "COM1" in left hand window, and press "Send".

Data will be sent from PC's COM1 through Path1 to 7188E/8000E's COM1 and immediately returned through Path2 to PC's COM4.



Step 7: Type "Virtual COM" in right hand window, and press "Send".

Data will be sent from PC's COM4 through Path2 to 7188E/8000E's COM1 and immediately returned through Path1 to PC's COM1.

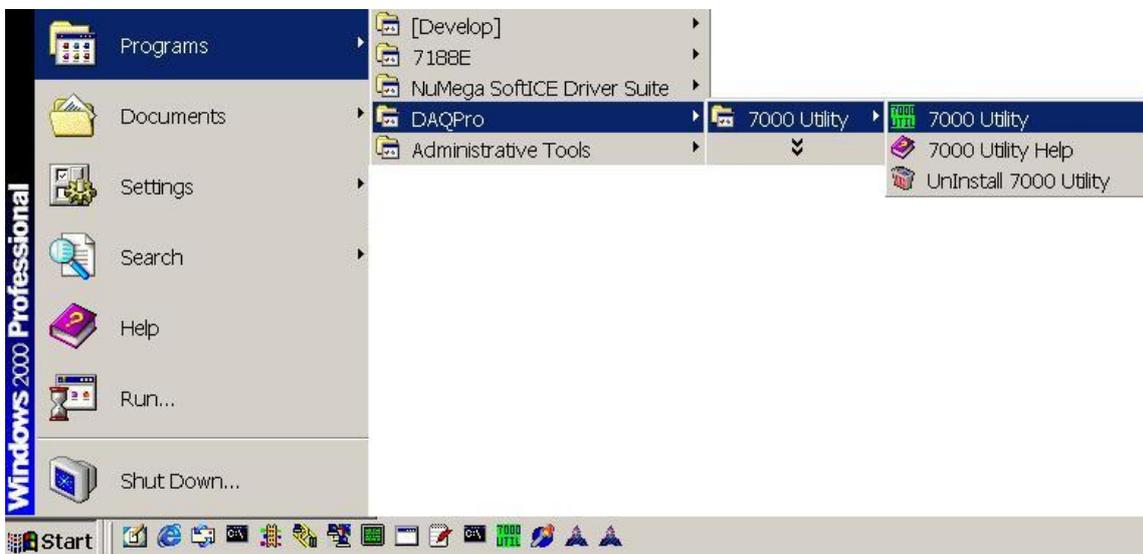


Example 3: External-Devices Testing

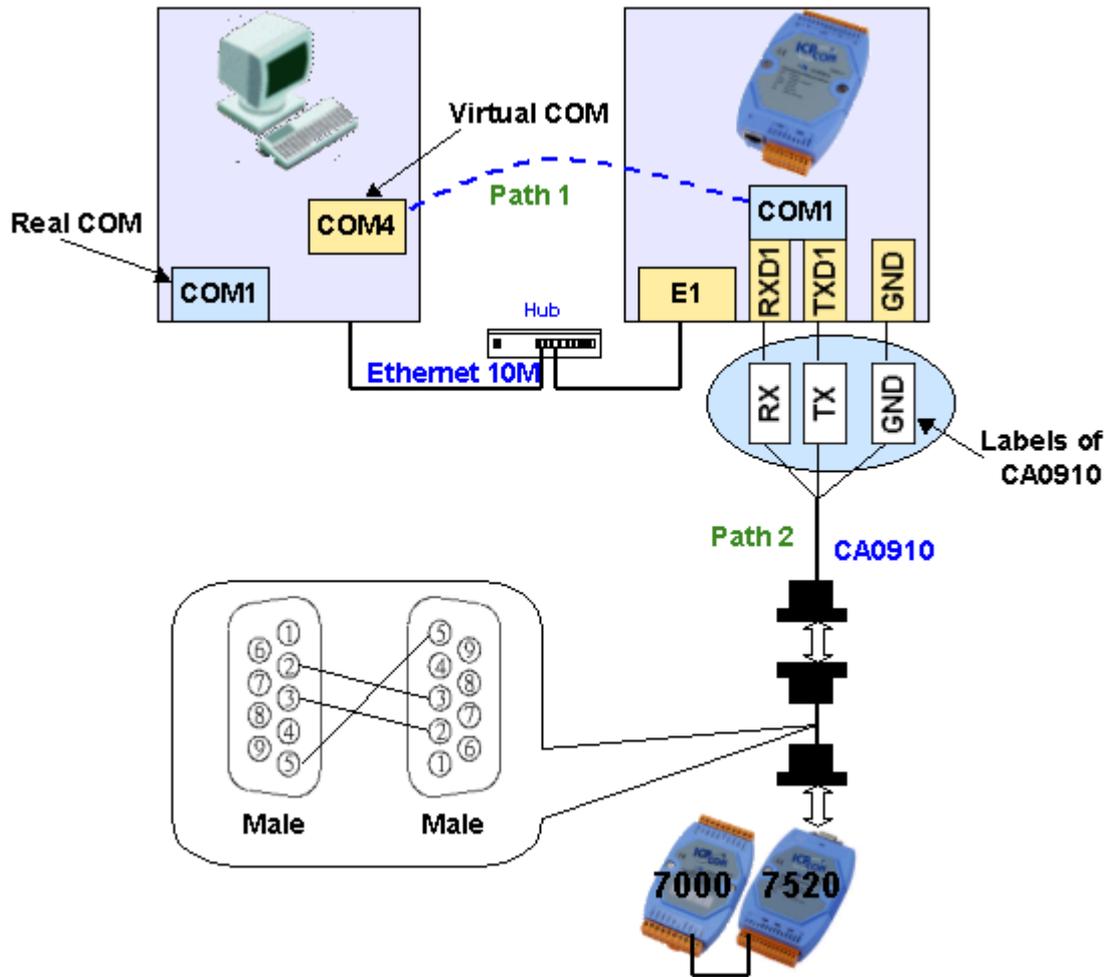
Connect 7000 series modules to 7188E/8000E's COM1. Use VxComm Driver to virtualize the 7188E/8000E's COM1 to become PC's COM10. Thus, we can use the 7000 Utility to search the 7000 series module through COM10.

Note: Users must install the 7000 Utility first by running
 CD-ROM Drive:\Napdos\7000\7000Util\setup.exe

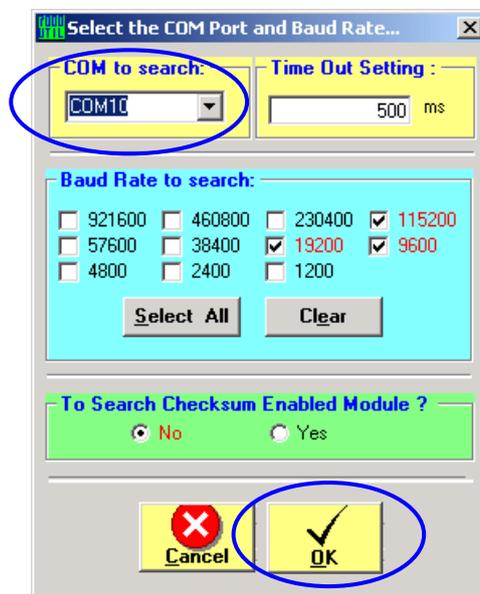
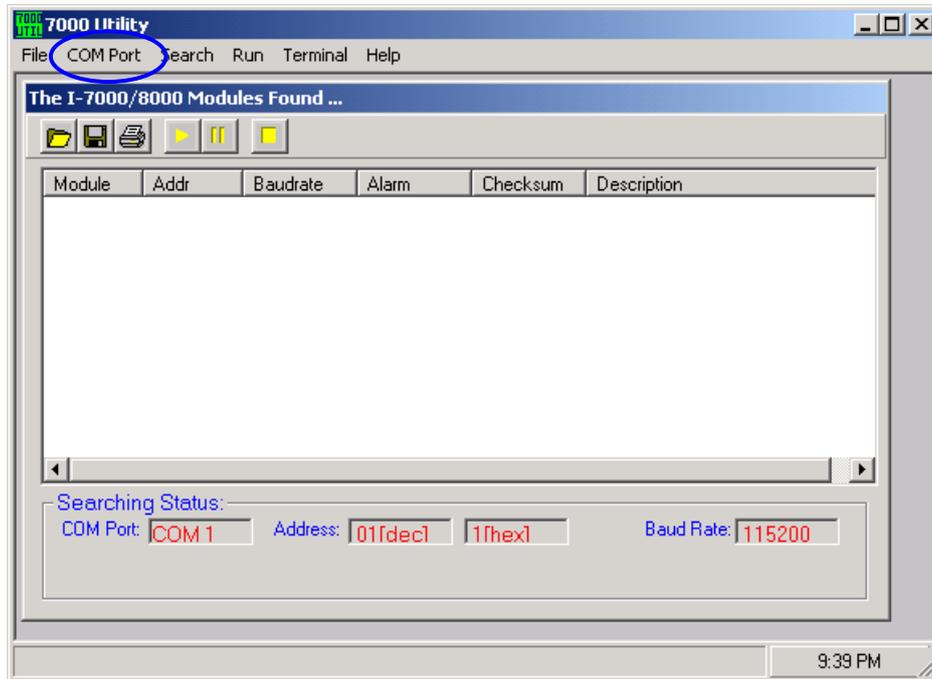
Step 1: Run the 7000 Utility.



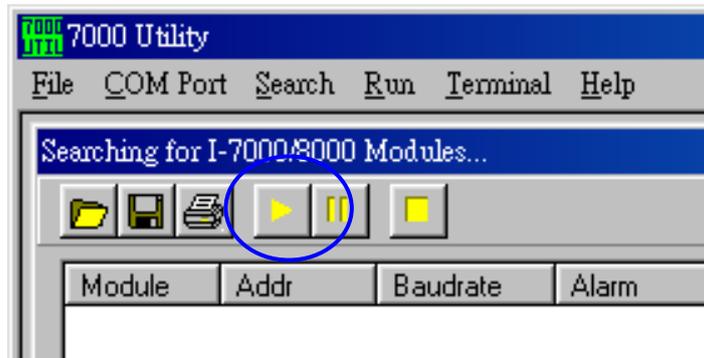
Step 2: Build connection as follows:



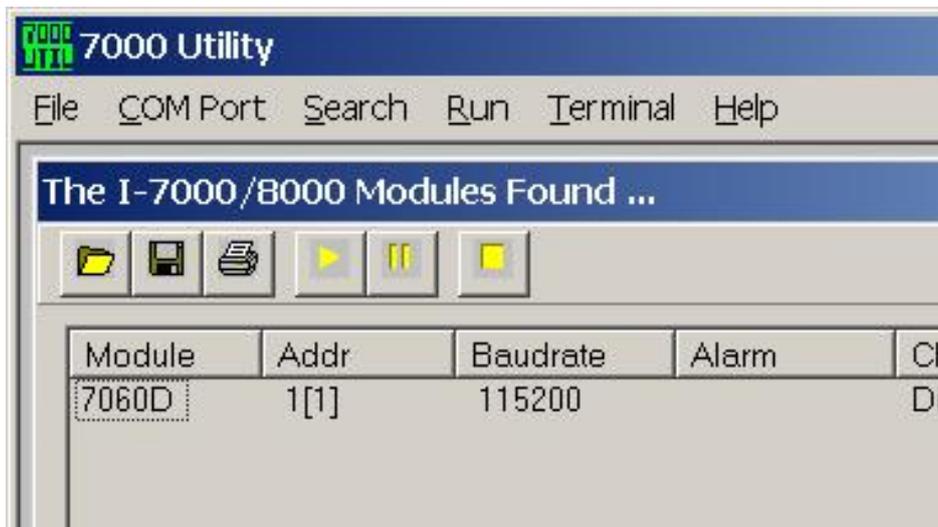
Step 3: Click the menu item "COM Port" to choose the COM port number, baudrate, and checksum. For example: COM10, 115200, 19200, 9600 and No-Checksum. (These settings depend on the 7000 series module's settings.)



Step 4: Click the  search icon.



Step 5: If the [VxComm Driver](#) works well, the 7000 Utility can search the module(s) connected to the 7188E/8000E's COM1.



3.6.2 Trouble Shooting

Problem: Client program fails to open the COM port that was created by the [VxComm Driver](#).

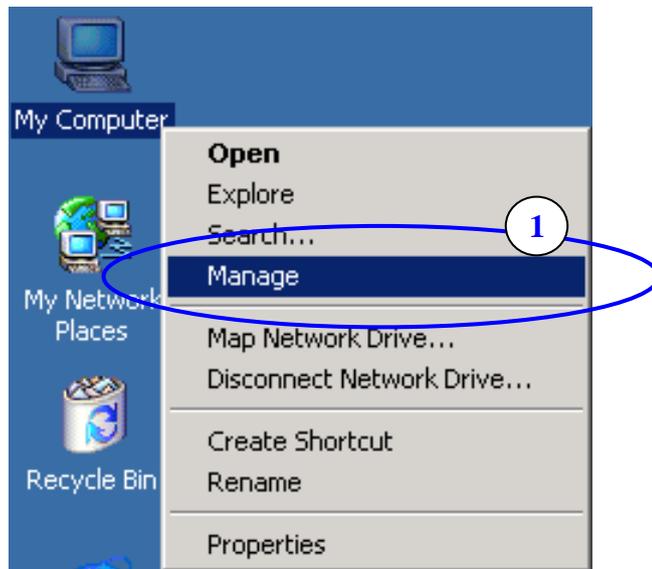
Check:

7188E/8000E's Power supply, Network cable, IP address, subnet-mask and gateway. (Please refer to the [7188E/8000E](#) user's manual for more information.)

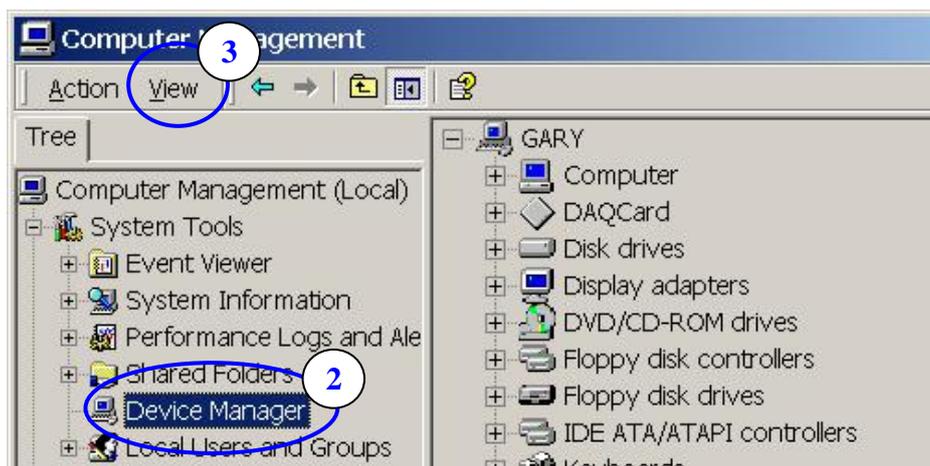
Problem: Client program still fails to open the COM port.

Check:

Step 1: Right click the "My computer" icon and select the "Manage" option.

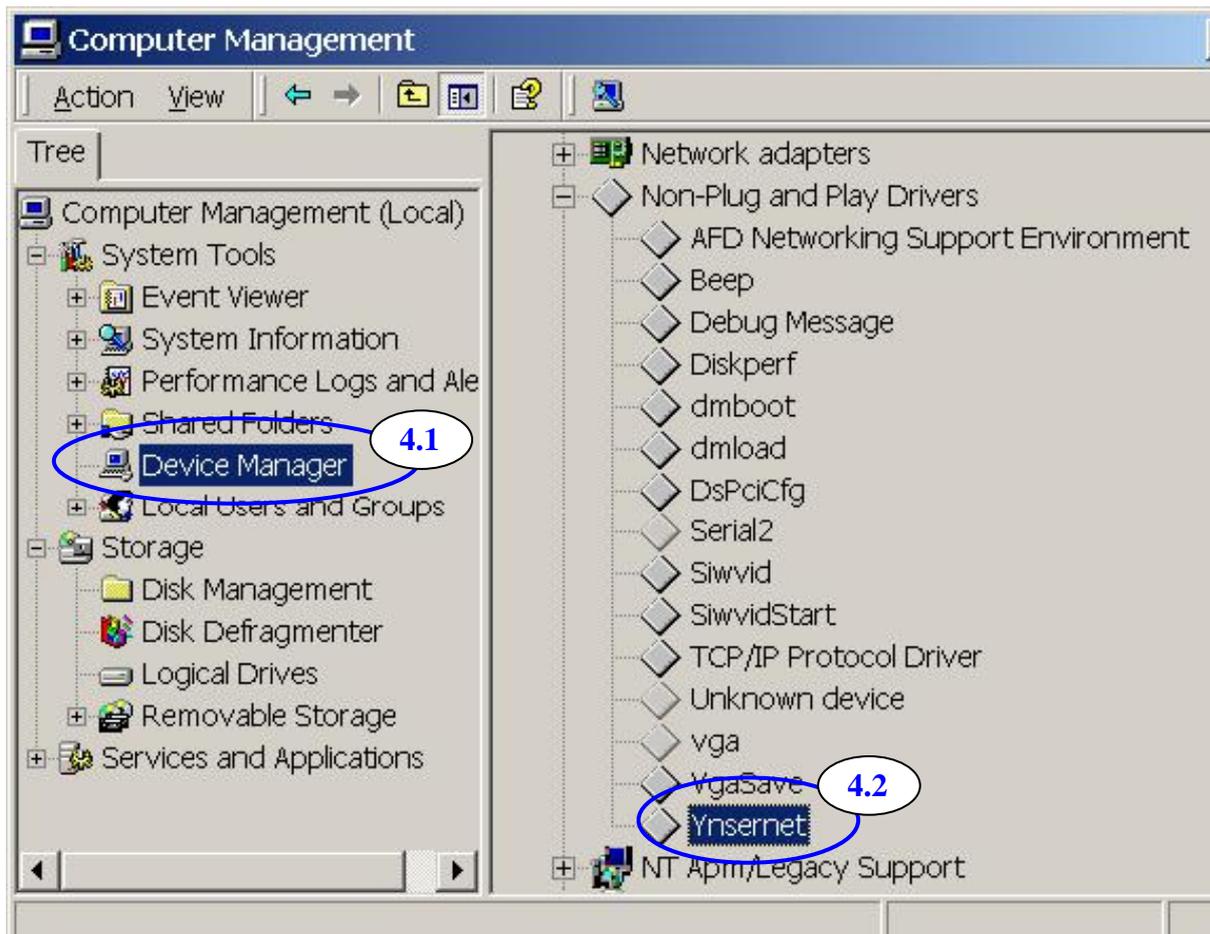


Step 2: Select the "Device Manager" icon from the "Computer Management" program.



Step 3: Click the menu item "View / Show hidden devices".

Step 4: Select the item "Non-Plug and Play Drivers / Ynsernet".

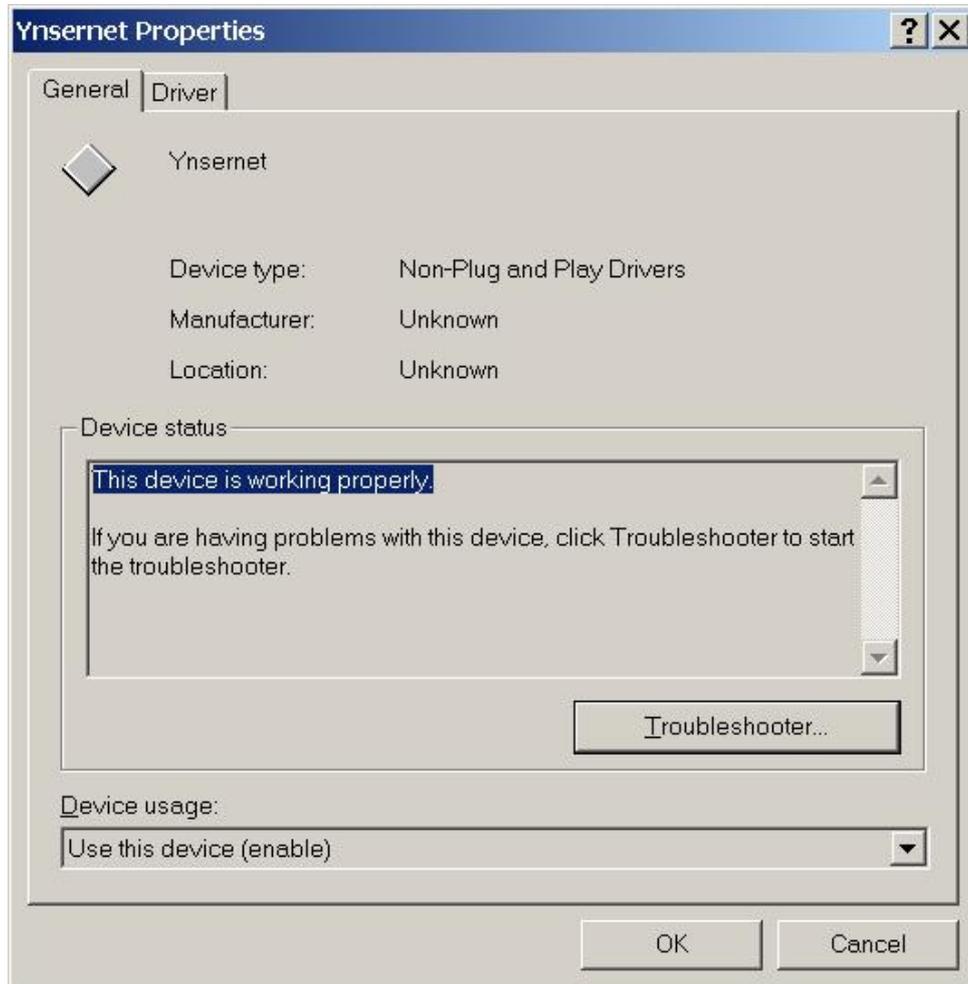


Step 5: Right click the mouse button on the "Ynsernet" item and select the "Properties" menu item.



Step 6: Check if it shows the message "**This device is working properly.**"

If the driver does not work properly, please remove it and then re-install and configure it again.



Problem: Client programs open the COM port with success, but fail to access the device.

Check:

Check the device's power supply and wiring (RS-232: RXD, TXD; RS-485: D+, D- ; GND).

3.7 FAQ

Q: Which modules are supported by VxComm Driver(PC) ?

A: 7188EA, 7188EX, 7188E1 ~ 7188E8, 8430, 8431, 8830 and 8831(after version 2.0.0 Beta 6).

Q: VxComm Driver(PC) v2.00 does not work with VxComm Server (7188E/8000E) v2.6.00 ?

A: Yes, please upgrade the **VxComm Server** to version 2.6.14 or later version.

The **VxComm Server(7188E/8000E)** v2.6.00 uses the "06" and "07" command to change the baudrate and the data format and then saves these configurations into the EEPROM. The newer version adds the "02" and "03" command to change the baudrate and data format without saving. These two commands improve the performance when changing baudrate and data format. The **VxComm Driver(PC)** also changes the operation when using the "02" and "03" commands. Thus, users have to upgrade their **VxComm Server(7188E/8000E)** to the later version.

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

A: Yes, the **VxComm Driver (PC)** supports the auto-reconnection mechanism after version 2.00.

The **VxComm Utility** allows users to set the server-options that include Keep-Alive Time (ms) and Connection-Broken time (ms). Please refer to the section: Adding a 7188E/8000E server and configuring the VxComm driver.

4. Ethernet I/O Applications

4.1 Operation Principle of the Xserver

The typical TCP/IP mechanism is a standard tool but very complicated for a software engineer. It takes long time for a software engineer to develop a programs using TCP/IP protocol.

The command protocol designed for a TCP/IP system can be based on user's applications without any limitations. So every software engineer can design his special protocol without any pre-defined standard. This will cause some of the troubles given as follows:

- Is this protocol reliable?
- Does this protocol fit all requirements?
- How to maintain protocol created by another software engineer?
- Time to market?
- Engineering cost to design & debug this protocol?

The Xserver is designed to solve all problems mentioned above as follows:

- We design & maintain the reliable, original Xserver for all users.
- The protocol is designed to fit all requirements of the 7188E series.
- The protocol is OPEN & expandable to reduce user's design cost.
- An easy-use interface is designed for user's special applications.
- Standard design and maintaince for all engineers using this protocol.

The features of the Xserver are given as follows:

- **The Xserver, VComNNNN.EXE**, is an embedded firmware designed for the 7188E series in the default shipping
- Supports Virtual COM applications
- Supports Ethernet I/O applications
- Supports I/O expansion bus
- Supports 7188E1/2/3/4/5/8, 7188EX & 7188EA and etc.
- TCP/IP protocol & command protocol is open & expandable.
- Provides easy-use interface for user's special programs.

With the help of Xserver, a software engineer can design a robust Xserver in one day. We will provide about 50 ~ 100 typical real world applications for user's reference. From these demos, a software engineer can start easily with a cost-friendly time to market. Refer to Sec. 4.3 for more information.

4.2 Command Protocol of Xserver

4.2.1 IP and port configuration

Before developing Ethernet I/O applications for your PC, you must first know the IP address and the Ethernet port number. The 7188E/8000E and all COM ports of the 7188E/8000E use the same IP address, but different Ethernet port number. They are listed below:

Function	IP address	Port number
Modbus TCP	192.168.255.1	502
Virtual 7000 (I/O boards)	192.168.255.1	9999
7188E/8000E configuration	192.168.255.1	10000
COM1 of the 7188E/8000E	192.168.255.1	10001
COM2 of the 7188E	192.168.255.1	10002
COM3 of the 7188E/8000E	192.168.255.1	10003
COM4 of the 7188E/8000E	192.168.255.1	10004
COM5 of the 7188E	192.168.255.1	10005
COM6 of the 7188E	192.168.255.1	10006
COM7 of the 7188E	192.168.255.1	10007
COM8 of the 7188E	192.168.255.1	10008

192.168.255.1 is the default IP address of the 7188E/8000E. You can change the IP address to suit your requirements. Contrary to the IP address, the Ethernet port is fixed. You must use the port number as defined above.

4.2.2 Command set of the Xserver

Cmd	Explain	Instruction Format	Example: Sends to Xserver	Example: Receives from Xserver
01	Version	<01>	01	V2.6.14[10/04/2001]
02	Sets baudrate (Doesn't store the setting to EEPROM)	<02,Port(1),Baud>	02138400	OK
03	Sets data format (doesn't store the setting to EEPROM)	<03,Port(1),LineControl(3)>	0328N1	OK
04	Gets system reset status	<04,Client(2)>	0414	141(First asking from client) 14 after system reset) 140(Not first asking from client 14 after system reset)

05	RTS	<05,Port(1),Set(1)> 1:On 0:Off	0511	OK(COM Port RTS on)
06	Sets baudrate (Stores the setting to EEPROM)	<06,Port(1),Baud>	06138400	OK
07	Sets data format (Stores the setting to EEPROM)	<07,Port(1),LineControl(3)>	0728N1	OK
08	Sets IP	<08,IP(12)>	08192168255001	OK. Reconnect
09	Received Timeout (Modified from Vcom3008)	<09,Port(1),tttt> Port:1~8 tttt: 0~99999, unit ms. If set as 'a', 'A' or -1 the tttt is Decided by system.	093 0910020	30 120
10	Server Name	<10>	10	7188E2
11	Diag	<11,String(<=80)>	11Hello	Hello
12	Sets Gateway	<12,GatewayIP(12)>	12192168000001	OK. Reconnect
13	Gets Gateway	<13>	13	192.168.0.1
14	Sets Mask	<14,Mask(12)>	14255255000000	OK. Reconnect
15	Gets Mask	<15>	15	255.255.0.0
16	Gets COM Status	<16,Port(1)>	161	9600,8,N,1
17	Digital Input	<17,Addr_Hex(4)>	1703f8	F8
18	Digital Output	<18,Addr_Hex(4),Data_Hex(2)>	1803f855	OK
19	Bypass User Defined Command	<19,Command>	19(User defined)	(User defined)
20	Enables 5 DigitLED	<20,Enable(1)> 1:Enable 5DigitLed 0:Disable 5DigitLed	201	OK (Enable 5 Digital LED show information)
21	Gets Mac	<21>	21	00:80:30:39:9f:e2 xx: Hexadecimal value
22	Gets MiniOS Version	<22>	22	v2.0.1(2003/8/22)
23	Calls VcomUserCmd	<23,String>	23(User defined)	(User defined)
24	Sets feedback command No.	<24,Enable(1)>	240 241	OK 24OK
25	Inquires the parameter or system.	<25,m> m='S': Inquire the timeout value of system (/ST) m='W': Inquire the timeout value of socket (/W) m='N': Inquire the Max number of socket m='M': Inquire the Work option:/M0 or /M1 m='B': Enable/Disable the Broadcast mode B1:Enable Broadcast mode, B0: Disable Broadcast mode (Default:B0) m='E': Inquire the command echo mode, E1:Enable echo mode, E0: Disable echo mode (Default:E0) m='L': Inquire the 7-SEG LED status, L1: Enable LED to show, L0: Disable LED to show. (Default:L1) m='I': Inquire the NAME/IP/MASK/GATEWAY/MAC	25M	M0

		of 7188E		
26	Sets the system parameter	<p><26,mn> m='M': set the work option /M (n:0 n:1) m='B': Set the Broadcast mode. ("26B0") ("26B1") m='S': Set the system TIMEOUT /ST ("26S300) m='W': Set the socket TIMEOUT /W ("26W86400000") m='I': Set IP, MASK, GATEWAY, or MAC (IP/GATEWAY/MASK/MAC must be UPPERCASE)</p>	26M0	OK
27	Sends Break signal to COM Port of 7188E/8000E	<p><27,Port(1), Set(1)> Port 1~8 Set:1 Break enable 0 Break Disable</p>	2711 2710	OK OK
28	Sets/Inquires the CTS/RTS mode of the flow control	<p><28,Port(1), m,n> Port:Only support COM1/3/4/5 M: Set the CTS mode N: Set the RTS mode 0: Disable 1: Enable (RTS must control by users Program) 2: Enable, auto control by Hardware. 3: Enable, auto control by Software library. For CTS, mode '1' and mode '3' are same. If the command doesn't add the mn arguments, the turn value is the previous value of the First once.</p>	28111 281	111 111
29	Inquires the CTS status	<p><29,Port(1)> COM port (Only support COM1/3/4/5)</p>	291	CTS1=0
30	Sends the string and receives the data which is the same as the string of Sending	<p><30, String> String: Any string (The max length of string is 1460 bytes)</p>	30123456789 30	30123456789 30
31	Set the trigger level of COM port of 16550 (Support COM3~8 only, It didn't support COM1~2)	<p><31,Port(1),[LL]> Port: 3~8 [LL], "1", "4", "8", "14" Choice one only from four items.</p>	31314 313	314 (COM3, triggerlevel = 14) 38 (COM3, triggerlevel = 8)
32	Set the trigger level of COM port buffer (Bytes).	<p>(32,Port(1),[nnnn]> Port: COM port 1~8 Nnnn:"0"~"1460"</p>	321 322	11460 21460
34	Reads the library version and date of Vcomnnn.exe(Include 7188el.lib & tcpipl.lib)	<34>	34	7188el.lib Ver. 2.1[Aug 02 2004], tcpipl.lib Ver. 1.3[Apr 08 2004]

- Note 1:** The number inside () of instruction format is parameter size (byte).
- Note 2:** Don't insert any space between parameters (except user defined command).
- Note 3:** All command (except user defined command) responses will add a terminal char CR (0x0d).
- Note 4:** Refer to vxcomm.htm to get more information about Xserver command protocol and parameter setting in **7188e\Tcp\Vxcomm\Doc**

4.2.3 Options of command line

Command Line Options

VcomNNNN.exe [/Option] (NNNN denotes the Vxcomm.Lib version)

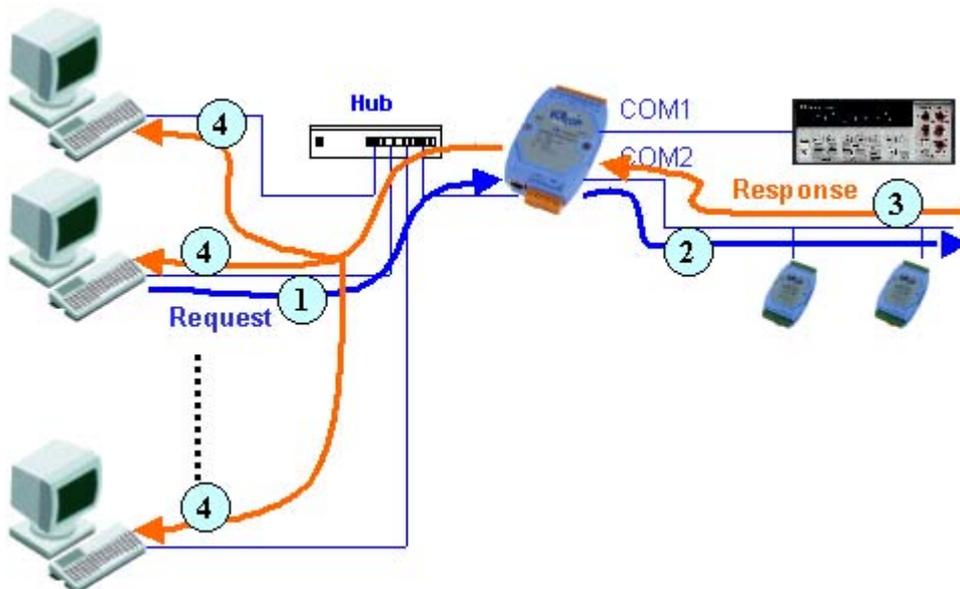
Options	Explanations	Notes
/1	Recognizes 7188E1	
/2	Recognizes 7188E2	
/3	Recognizes 7188E3	v3.0.0 and above
/4	Recognizes 7188E4	v3.0.0 and above
/5	Recognizes 7188E5	v3.0.0 and above
/8	Recognizes 7188E8	v3.0.0 and above
/X	Recognizes 7188EX	v3.0.0 and above
/A	Recognizes 7188EA	v3.0.0 and above
/MO	Multi-echo mode. Echoes data from the 7188E/8000E COM ports to each client connected to the 7188E/8000E. (It's the default mode in 7188E firmware)	
/M1	Single-echo mode. Echoes data from the 7188E/8000E COM ports to the specific client requested the service. (It's default mode in the Xserver program)	v2.6.12 and above
/Wxxx	Sets the timeout value for building a socket connection. If the timeout expires, Vxcomm.exe/Xserver releases the connection. xxx: timeout Time unit: sec Default: 0 xxx=0: disables option /W	
/STxxx	Sets the system timeout value between two packets sent from the network to 7188E/8000E. If the timeout expires, Vxcomm.exe/Xserver will automatically	

	reboot system itself. XXX: timeout Time unit: sec Default: 0 xxx=0: disable option /ST	
/Txxx	Sets a timeout value for the interval between the completion of a command being sent from the 7188E/8000E to the COM ports, and the start of the data being received from the COM port. If the timeout expires, Vxcomm.exe/Xserver gives up this data. Time unit: ms Default: 100 ms xxx=0: disable option /T	Acts in M1 (Single-echo mode)
/FCnnnnn	Sets the CTS control mode. nnnnn depends on the setting value and represents COM1-5 respectively. n:0~3 please refer to parameters of command "28" for more details.	v3.0.07 and above
/FRnnnnn	Sets the RTS control mode nnnnn depends on the setting value and represents COM1-5 respectively. n:0~3 please refer to parameters of command "28" for more details	v3.0.07 and above
/Ehh	Sets the terminal character. When the last character of the receiving data matches the terminal character, the receiving data will be returned immediately. hh is a hexadecimal value, The default value is 0 EX:0x0A is set as "/E0A" 0xFF is set as "/EFF", 0 denotes no terminal character.	v3.0.09 and above
/Pxxxxx	Changes the command port (default is 10000). If Command Port 10000 is changed to 200, the TCP/IP mapped COM port will be 201~208.	v3.0.09 [07/23/2003] or later

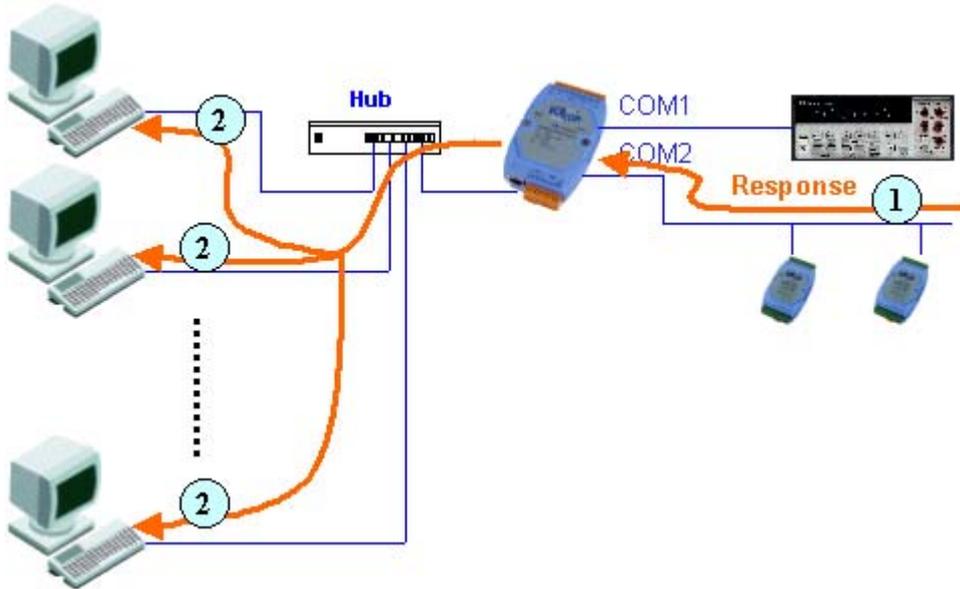
/S1	The Command port and each TCP/IP mapped COM port only allows one TCP/IP connection, Other connection will not be accepted.	v3.0.09[10/29/2003] or later
/L0	Adds the "/L0" command to the command line , allowing LED5 to be disabled/enabled.. It economizes the running time for no 5DigitLed modules)	v3.0.09 or later
/Zxxx	This command is used to set ACK delay time. [2004/04/19] Defalut : 1000 ms	3.2.0[03/24/2004] or later
/Y	The command is used for 8KE4/8KE8 module.	3.2.0[2004/04/19] or later

/M0: Multi-echo mode

Condition 1: One client sends a request to Xserver to access devices. The Xserver echoes data from devices to every client which is connected to the 7188E/8000E.

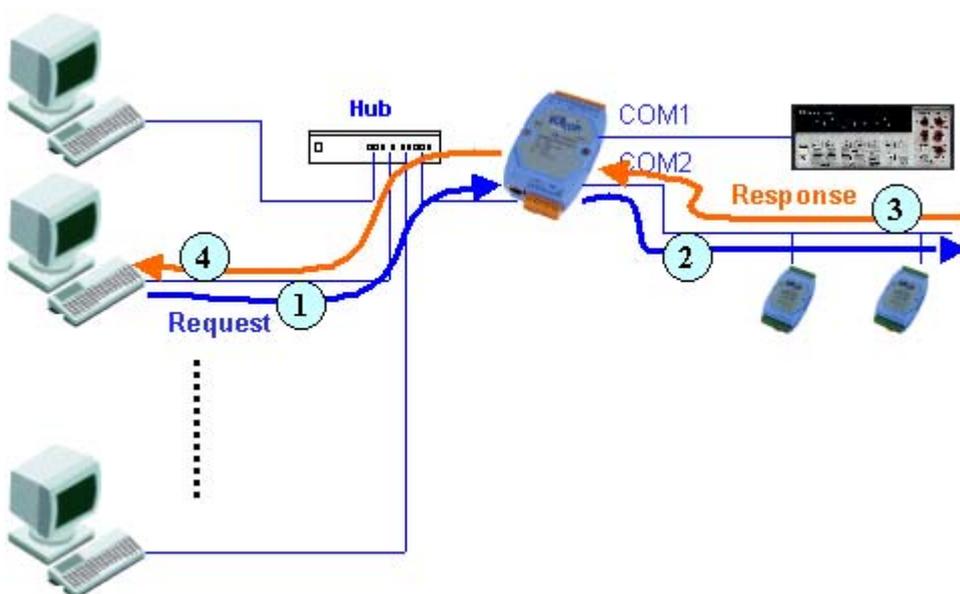


Condition 2: No clients send a request to Xserver to access devices. The Xserver echoes data from devices to every client which are connected to the 7188E/8000E.

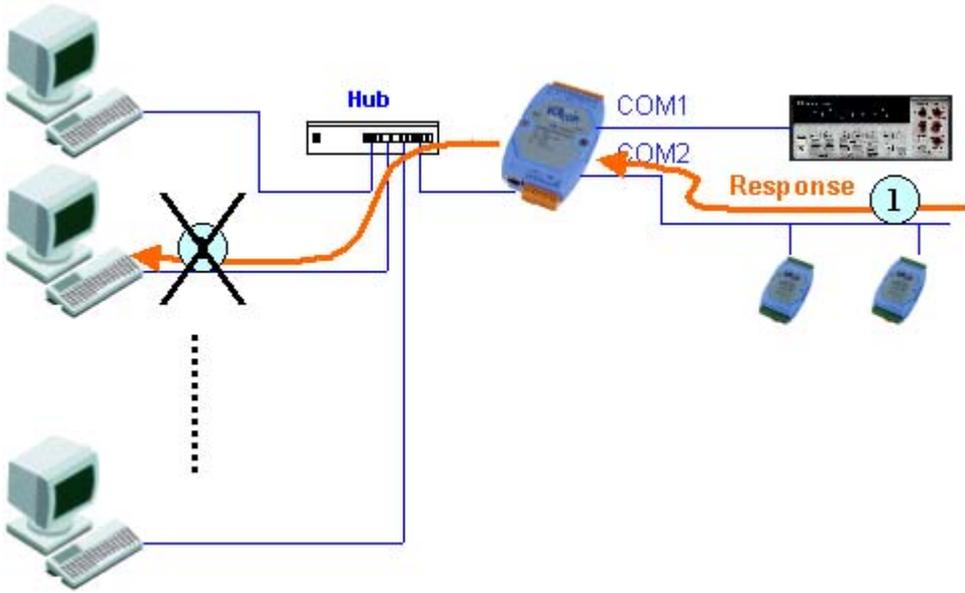


/M1: Single-echo mode

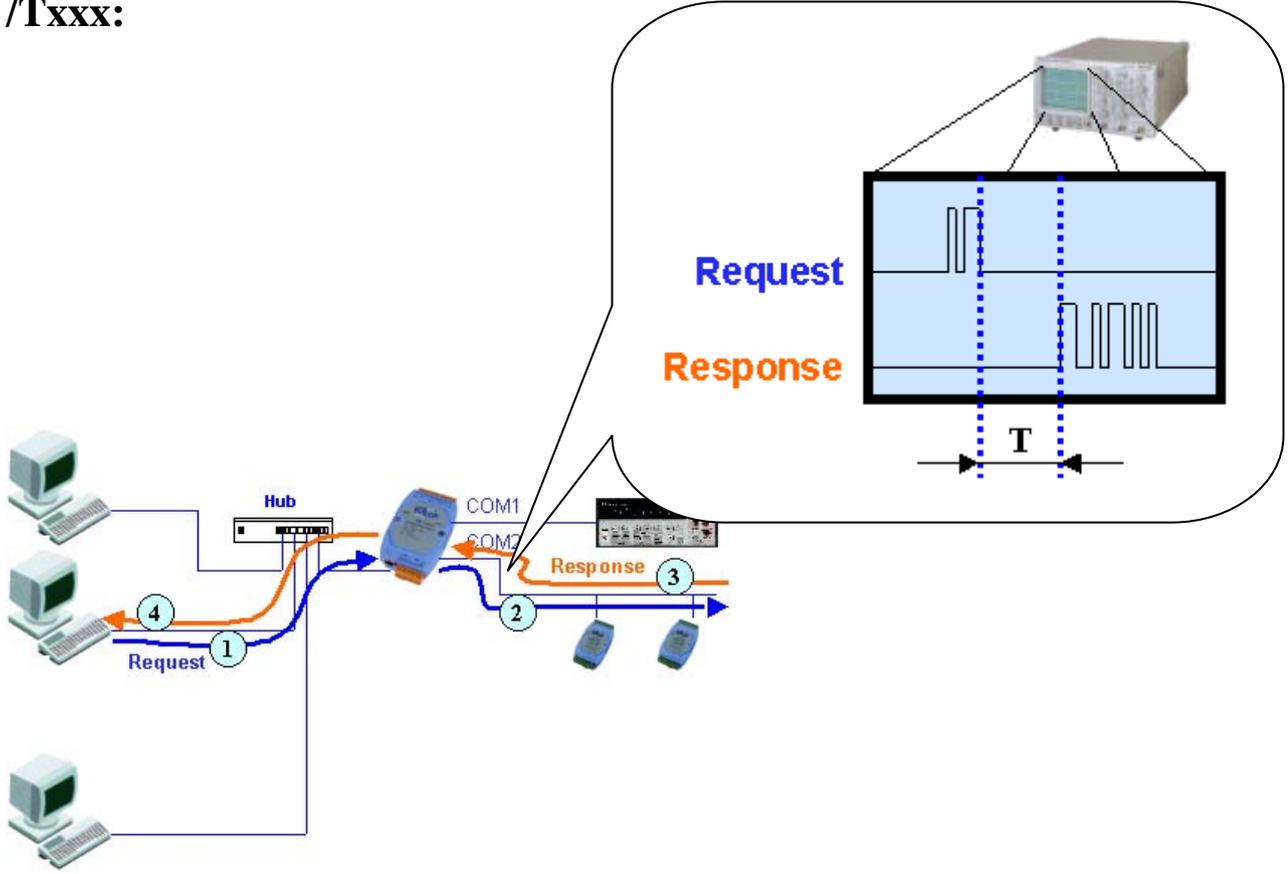
Condition 1: One client sends a request to Xserver to access devices. The Xserver echoes data from devices to the client which requested the service.



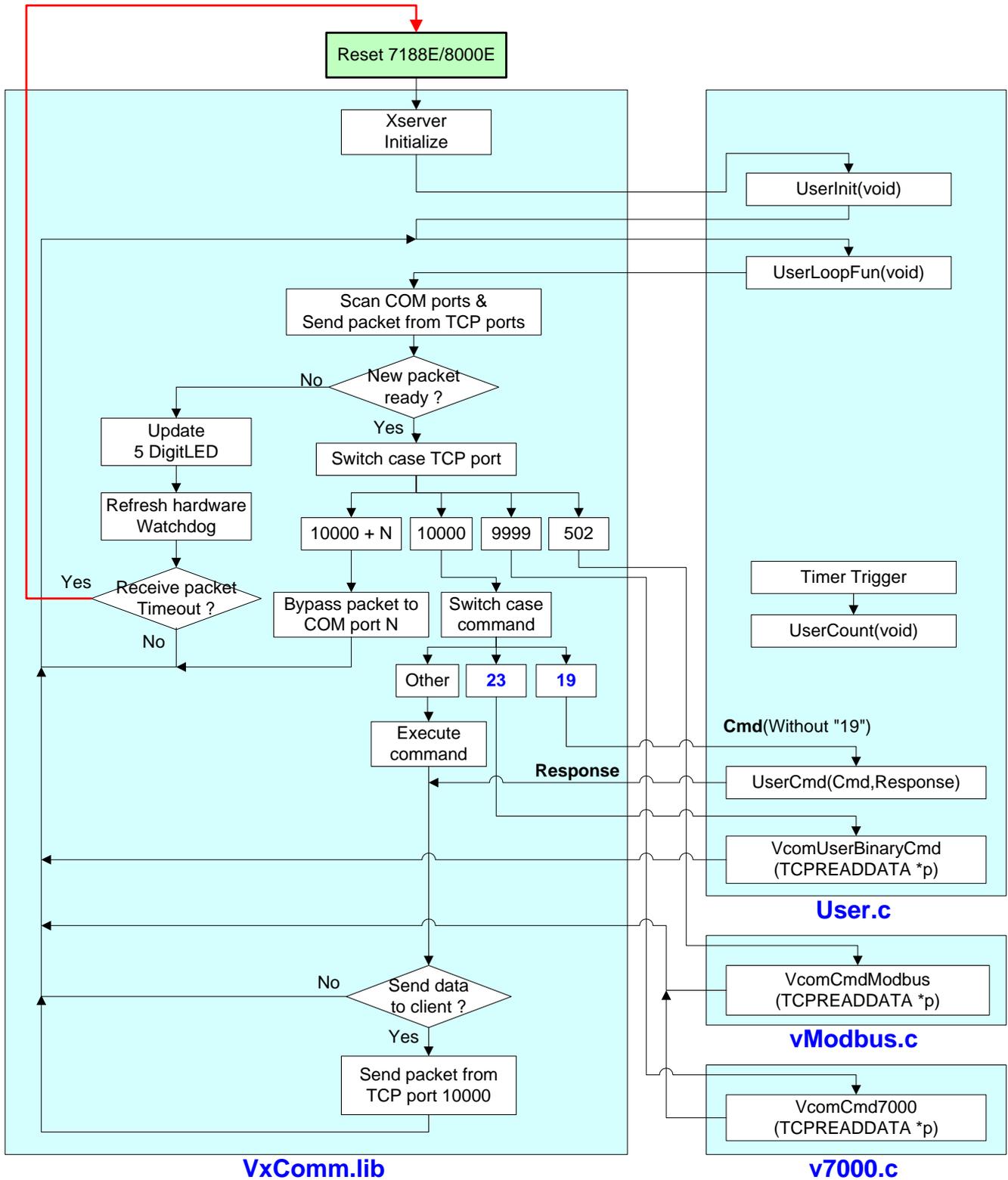
Condition 2: No clients send any request to Xserver to access devices. The Xserver doesn't echo data from devices to any client.



/Txxx:



4.2.4 Flow chart of Xserver



It is very difficult to develop an embedded controller program with Ethernet/Internet communication. But by using the Xserver, users can do that quickly and easily. Users need only modify 7 functions in User.c, vModbus and v7000.c. Users build their own code in the 7 functions to make the Xserver work as they desire. The features of the 7 functions are listed below:

➤ **UserInit (void):**

Xserver executes this function once as soon as the 7188E/8000E is turned on. Therefore all variables of initial values or initial status must be set in this function.

➤ **UserLoopFun (void):**

Xserver executes this function every scan loop. One Xserver scan loop completes in a short time, so real time work should be executed by this function. [See Demo12.](#)

➤ **UserCount (void):**

This function will be triggered when the time interval, set in AddUserTimerFunction, is up. For best result, call AddUserTimerFunction in UserInit to let the Xserver call the UserCount period. Longest time interval is 65.535 seconds ($2^{16}-1$ ms). [See Demo9.](#)

➤ **UserCmd (Cmd, Response):**

Xserver executes this function when client program sends the command “19” to port 10000 of the Xserver. This command is defined in UserCmd function by users. When the Xserver receives packets from **port 10000**, the Xserver checks the data. If the data begins with “19”, the Xserver trims “19” and passes the other data (not including “19”) to be the first parameter **Cmd** of function UserCmd.

User can define his own command protocol in UserCmd. For example, define <19,Read/Write(1),address(4),[value(2)]> to replace command 17 and 18, then one can send “19R03f8” to read values form address 03f8; sends “19W03f85a” to write 5a to address 03f8.

Users can decide whether or not any other characters are needed between parameters. Any command protocol format will be accepted, because it is user defined.

At the end of UserCmd, copy the results to the second parameter **Response**

Then the XServer will send the string to the Client program by port 10000.
[See Demo4.](#)

➤ **VcomUserBinaryCmd (TCPREADDATA *p):**

Xserver executes this function when client program sends command “23” to port 1000 of the Xserver. This function is similar to UserCmd. When the client program sends command “23”, VcomUserCmd will receive TCPREADDATA type information. The TCPREADDATA is declared as below:

```
Type define t_TcpReadData{  
Int Comport;  
int Socket;  
int Length;  
char* ReadUartChar;  
} TCPREADDATA;
```

p->ReadUartChar: the buffer where command data is stored(include “23”)

p->Length: the command data length (include “23”)

p->Socket: the Xserver assigns a socket number to index when client sends command “23” to the 7188E. So, the socket number can used to return messages to a specific client. Send message to specific client, and call VcomSendSocket (int skt, char * data, int cnt). The first parameter should be the socket number. [See Demo23.](#)

➤ **VcomCmdModbus (TCPREADDATA *p):**

Xserver executes this function when client program sends commands to port 502 of the Xserver. This function is used to implement Modbus TCP protocol to access devices. [See Demo27.](#)

➤ **VcomCmd7000 (TCPREADDATA *p):**

Xserver executes this function when client program sends commands to port 999 of the Xserver. This function is used to implement 7000 series-compatible commands to access expansion boards.

[See 7188e\TCP\Xserver\v7000*.*](#)

4.3 Demo program list of Xserver

After developing the Xserver program, users must download the program into the 7188E/8000E and execute one client program to test if all functions run properly.

Demo	Function	Explanation	Client
Demo4 (Original X-Server)	Echoes command string		Client1
Demo5	Echoes special string to clients	Xserver will echo "7188_Series." or "8000_Series." to clients.	Client1
Demo6 (7E only)	Reads/writes the I/O port of the 7188E	This demo shows how to use command 19 to replace command 17, 18	Client1
Demo7	Uses printCom1 to debug programs	You can use "Print" or "printCom1" to send a Debug string to PC monitor by 7188E/8000E's COM1. If you want to use "Print", you must use "DisableCom" and "RestoreCom" to disable "printCom1".	Client1
Demo8	Uses Print to debug programs	You can use "Print" or "printCom1" to send a Debug string to PC monitor by 7188E/8000E's COM1. If you want to use "Print", you must use "DisableCom" and "RestoreCom" to disable "printCom1".	Client1
Demo9	Timer trigger demo	UserCount will be executed every second. Count value will be increased in UserCount. PC can read count value to know how many seconds after count value be cleared.	Client1
Demo10	Refreshes Watchdog demo	If user's function cost more than 1.6 seconds. User must insert RefreshWDT	Client1

		function to refresh WDT avoid the OS restarting itself in 1.6 second.	
Demo11 (7E only)	Real- time I/O controlling	This demo shows complex real time DI/DO operation in UserLoopFun.	Client1
Demo12	Scan-time evaluation	UserLoopFun will increase count value every scan loop. PC can read how many scan loops there are after clear count value. So user can use this demo to test Xserver performance.	Client2
Demo13 (7E only)	Pulse width measurement	LoopFun reads the D/I signal. If signal is changed, records time ticks and calculates signal width.	Client1
Demo14	Controls 7-SEG LED	Show5DigitLed, Show5DigitLedWithDot can show 5 digits to 7-SEG LEDs The two functions can show '0' ~ '9' 'a' ~ 'f' 'A' ~ 'F' '-', '-', '!'	Client4
Demo15 (7E only)	Reads channel values from 7017/7018	This demo shows how to send command to read channel value from 7017 or 7108 which is connected to 7188E's COM2.	Client4
Demo17 (7E only)	Pulse width measurement	This demo is similar to demo13 and detects signal change and measures signal width.	Client5
Demo18	Reads I-7000 series module's ID	This demo shows how to communication with the 7000 series which are connected to COM2 of 7188E or COM3 of 8000E.	Client4
Demo19	Reads 64 bits unique hardware serial number	Unique serial number is used to protect user's software. Using 7188xw.exe to enter 7188E, MiniOS7 will show a number. User can check the number at first, then decide to execute Xserver from the point on.	Client4

Demo20	Reads/Writes/Clears NVRAM	NVRAM's characteristic is short response time, limitless erasure and the battery backup for 10 years.	Client4
Demo21	Controls hardware in UserCount	Actions concerning hardware control in UserCount is prohibited. If user want to control hardware in UserCount, they must use flag variable to pass the command to UserLoopFun. Function of hardware can be executed correctly in UserInit, UserLoopFun, UserCmd. This demo will increase numbers every second and show the value to LEDs in UserCount function.	Client4
*Demo22 (7E only)	Data Acquisition & Compression & Averaging	ODM for Contec company	CheckValue
**Demo23	Echoes all data (including "23") to specific clients.	Uses VcomSendSocket to echo all data (including "23") to specific clients.	Client4
Demo24	Uses countdown timer	There are 8 countdown timer (channel 0 to channel 7). This demo uses channel 0. The countdown timer initial value is 1000 ms. When the countdown timer value become 0, the value of the LED will increase.	None
*Demo25 (7E only)	Data Acquisition, Compression, & Averaging		CheckValue
Demo27 (7E only)	Uses Modbus TCP protocol to D/I/O		

We will provide **50 ~100 demo programs** for the Xserver in the future. Please refer to 7188E\TCP\Xserver\[Xserver.htm](#) and [Function.htm](#) for more information of demo programs.

4.4 Client program list for Xserver

● 7188E2

Client programs	Explanation	Special Demo
Config	Host Configuration	All simple demos
E2	Full features demo	All simple demos
SendCmd	Sends command/data to 7188E2	All simple demos
SendCom	Sends command/data to 7188E2's COM port	
..... More client programs		

Client programs are located at 7188e\TCP\Xserver\7188E2

● 7188E3

Client programs	Explanation	Special Demo
7188E3	Full features demo	All simple demos
..... More client programs		

Client programs are located at 7188e\TCP\Xserver\7188E3

● 7188E4

Client programs	Explanation	Special Demo
7188E4	Full features demo	All simple demos
..... More client programs		

Client programs are located at 7188e\TCP\Xserver\7188E4

● **7188EA**

Client programs	Explanation	Special Demo
7188EA	D/I/O operation	All simple demos
..... More client programs		

Client programs are located at 7188e\Tcp\Xserver\Client\Module\7188EA

● **Common clients**

Client programs	Explanation	Special Demo
Client1	Used to test all simple Xserver demos	All demos
Client2	Sends "19 0", then delay n ms and send command "19 1".	Demo12
Client4	Similar to Client1, just adds sending string with "CR" function.	All demos
Client5	Sends period step function signals to I/O port of the 7188E.	Demo17
***CheckValue	CheckValue main functions: <ol style="list-style-type: none"> 1. Catches below errors: <ol style="list-style-type: none"> a. Winsock error b. Receive data from Xserver timeout 2. Checks received data out of range 3. Automatic reconnect ability. 	Demo22, Demo25 or demos which return value (total 7 characters)
***CheckString	CheckString with main functions: <ol style="list-style-type: none"> 1. Catch below errors: <ol style="list-style-type: none"> a. Winsock error b. Receive data from Xserver timeout 2. Check received data <ol style="list-style-type: none"> a. Full compare b. Part compare 	All demos

	3. Automaticly reconnect ability.	
***GetString	GetString with main functions: 1. Catch below errors: a. Winsock error b. Receive data from Xserver timeout 2. Automaticly reconnect ability. 3. Large text box can show 1600 bytes at one page.	All demos
..... More client programs		

Common client programs are located at 7188e\TCP\Xserver\[Client](#)

Note:

- You can run all 7188E special clients (7188E2, 7188E3, 7188E4, 7188EA, etc.) from 7188e\Tcp\Xserver\Client\Module.
- You can install all common clients (Client1, Client2, Client4, Client5, CheckValue, CheckString, GetString, etc.) by executing \7188e\Tcp\Xserver\Client\Common\Setup\Setup.exe.
- Please refer to 7188E\TCP\Xserver\[Xserver.htm](#) and [Function.htm](#) for more information of demo programs.

4.5 Programming of Xserver

To develop the Xserver, you must have the 9 files listed below:

Item	Files	Location
Head file	7188E.h, TCPIP.h, Vxcomm.h	7188E\TCP\Xserver\Demo\BC\Lib
Library	7188EL.Lib, TCPIPL.Lib, VcomNNNN.Lib	
User's file	User.c, vModbus.c, V7000.c	7188E\TCP\Xserver\Demo\BC\Demo4

Note: The NNNN of VcomNNNN.Lib is the lib file's version.

4.5.1 Original Xserver

All **user.c** files are divided into two parts. One is the explanation head, the other one is the program body.

● Explanation head:

```

/* DEMO4: Echoes command string
Compiler: BC++ 3.1 ,TC++ 3.0, TC++ 1.01, TC 2.0
Compile mode: large
Project: user.c
       v7000.c
       vModbus.c           [after Vcom_3002]
       ..\Lib\7188EL.Lib
       ..\Lib\TCPIPL.Lib
       ..\Lib\VcomNNNN.Lib, with NNNN being the lib file's version.

19~!@#$ -> Any non-null command will be accepted.

This demo is the original user.c
User can modify their own Xserver from this file.

Hardware: 7188E

Refer 7188e\TCP\Doc\[Big5\Eng\Gb2312]\Vxcomm.htm
       7188e\TCP\Xserver\Xserver.htm
       7188e\TCP\Xserver\Function.htm
to get more information.

[17/Nov/2001] by TCK
  
```

Content of the project file.

Client programs use this command protocol to communicate with the Xserver.

Explanation of this demo program.

Some addition hardware devices will listed here.

Last modified date.

● Program body:

```
#include<string.h>
#include "..\lib\7188e.h"
#include "..\lib\vxcomm.h"
void UserCount(void)
{
/*
    // user's timer trigger function
    //
    // In this function, user cannot use any function that will use the hardware signal "clock",
    // Such as:
    // 1. ClockHigh(),ClockLow(), ClockHighLow(),
    // 2. Any EEPROM functions.
    // 3. Any 5DigitLed functions.
    // 4. Any NVRAM function.
    // 5. Any RTC function.(GetTime(),SetTime(),GetDate(),SetDate())
    //
    // refer to demo9 for example code
*/
}

void UserInit(void)
{
/*
    // user's initial function
    // timer initialized for UserCount()
    // I/O or variables initialized for UserLoopFun()
    // I/O or variables initialized for User's functions in this file
    // refer to demo9 & demo11 for example code
*/
}

void UserLoopFun(void)
{
/*
    // VxComm.exe will call this function every scan time
    // refer to demo11 for scan-time evaluation
*/
}
```

```

int UserCmd(unsigned char *Cmd,unsigned char *Response)
{
/*
// user's command interpreter
// refer to all demo
*/
if (Cmd[0])          /* Not Null command */
{
strcpy(Response,Cmd); /* echo user's command back */
return 1;           /* return OK */
}
return 0;          /* return ERROR */
}

int VcomUserBinaryCmd(TCPREADDATA *p)
{
/* VXCOMM.EXE 2.6.12(09/04/2001) or later will support this function.

TCP PORT 10000, command 23 will call this function.
user can get the following message:
p->ReadUartChar : the buffer store the command data(include "23")
p->Length : the command data length(include the two byte "23")
p->Socket : the socket number that receives the command, that is, when the user function wants
to return a message to the client, just use the socket to send data.
use: VcomSendSocket(p->Socket,pdata,datalength);
*/
return 1; /* any value will be accept */
}

```

Note:

- We will enhance the Xserver continually. Please refer to 7188E\Document\[Readme.htm](#) and
- 7188e\TCP\Vxcomm\Doc\[Big5|Eng|Gb2312]\[Vxcomm.htm](#) to get new version information.

4.5.2 Setting of compiler (BC++ 3.1)

To develop programs for 7188/7188X/7188E/8000 series, you can use the compilers below:

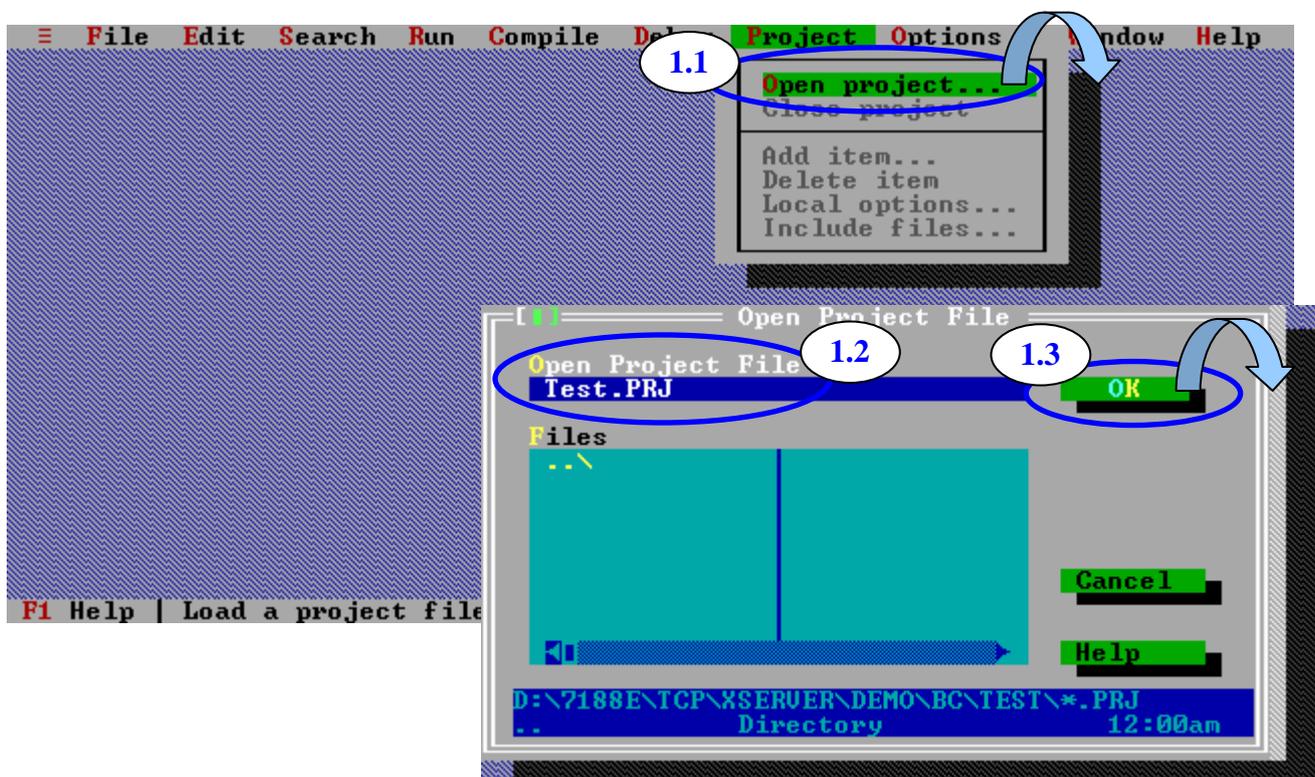
1. BC++ 3.1~5.02
2. MSC
3. MSVC (before version 1.52)
4. TC 2.01
5. TC++ 1.01

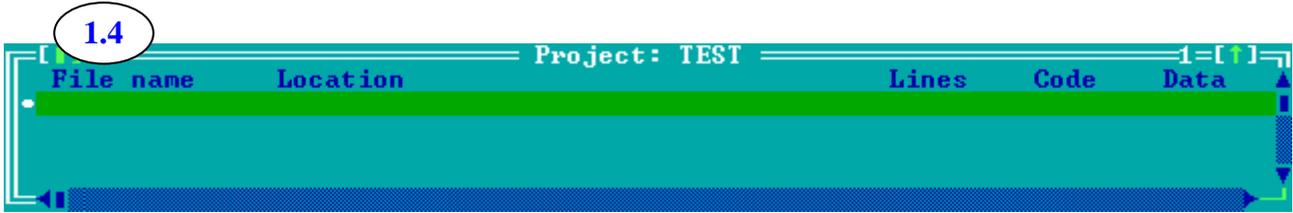
From Borland's web site, you can download the free TC 2.01 and TC++ 1.01 compilers.

Web site: <http://community.borland.com/museum/>

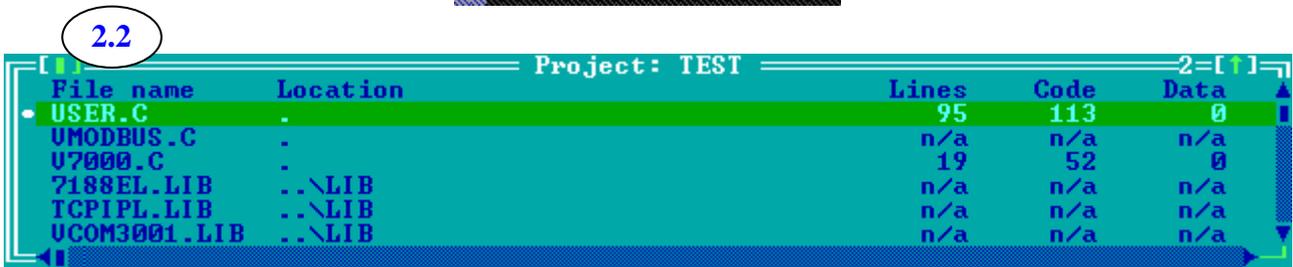
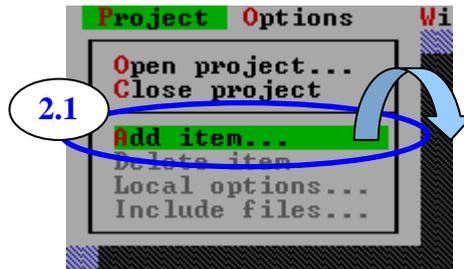
How to use BC++ 3.1's IDE to compile projects? Please follow the steps below:

Step 1: Create a new project.

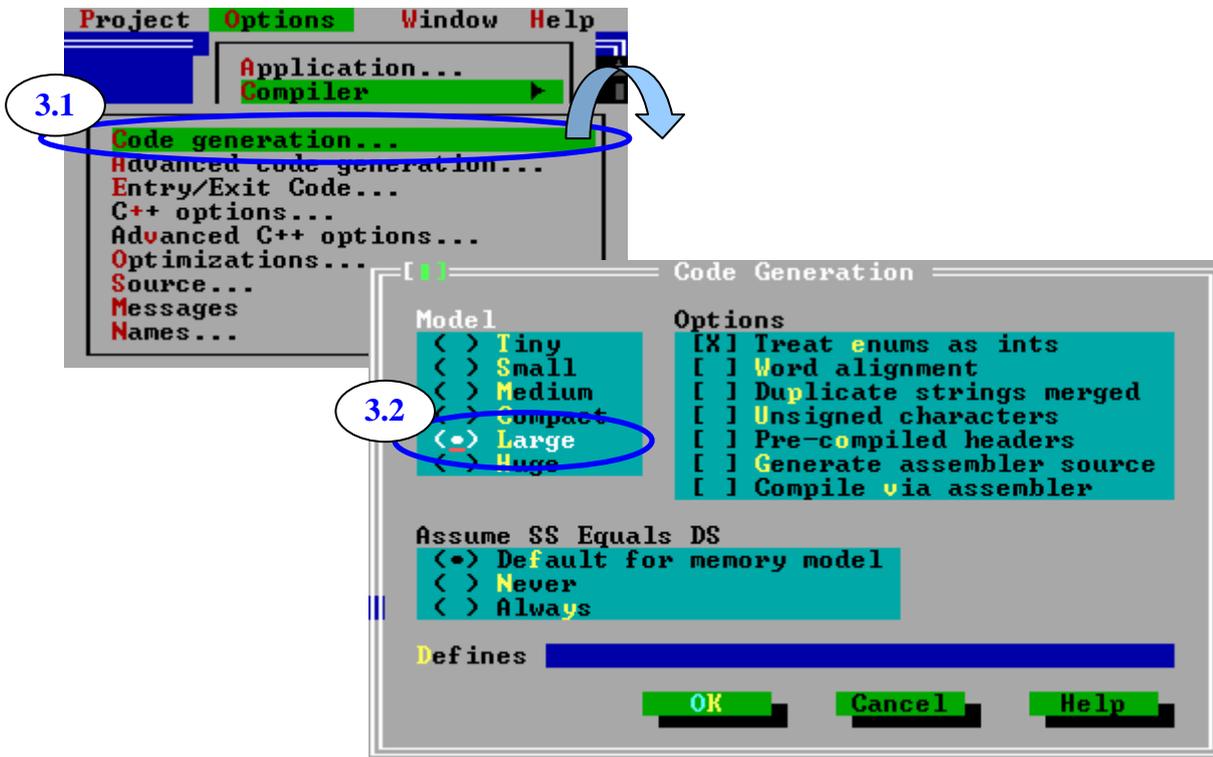




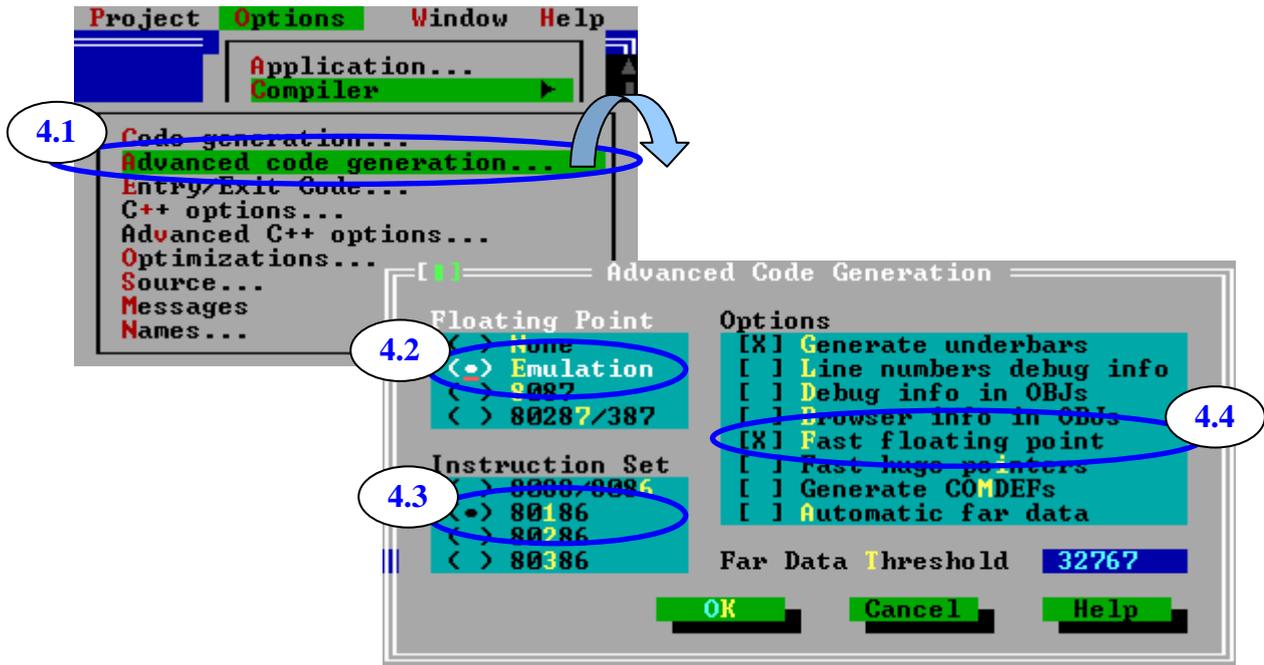
Step 2: Add all necessary files into the project.



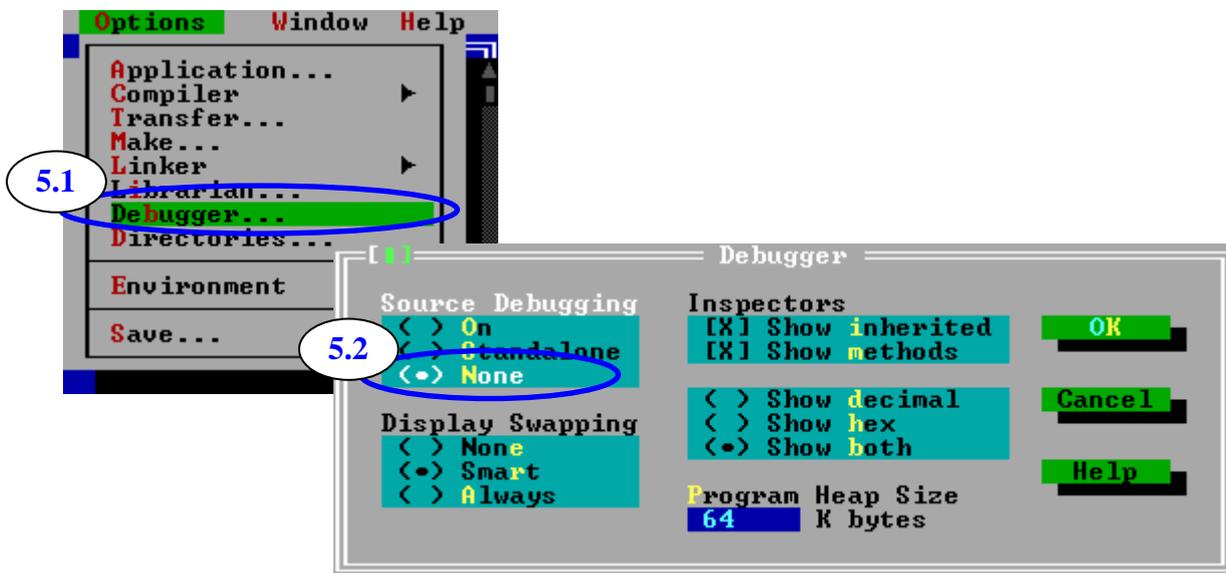
Step 3: Set Code generation options.



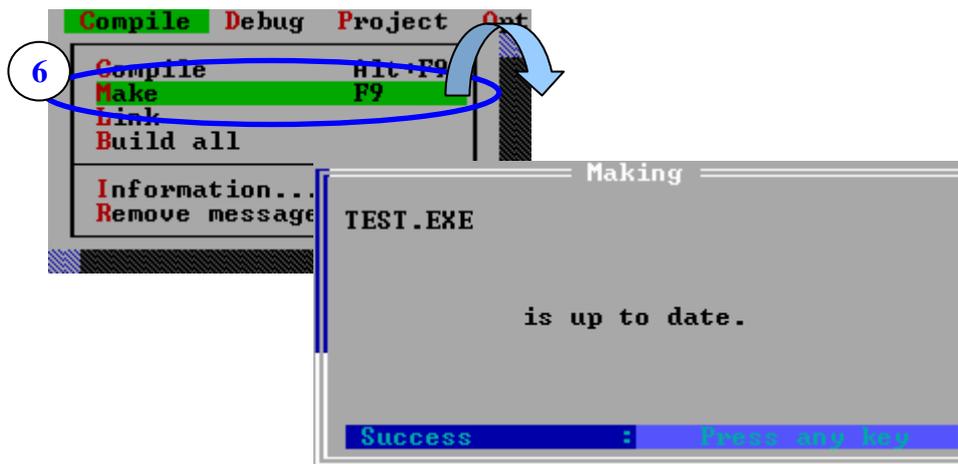
Step 4: Set **A**dvanced code generation options.



Step 5: Set **D**ebugger options.



Step 6: Make the project.



Note:

Please refer to 7188e\Document\TCPLib.pdf to get more information about settings of other compilers.

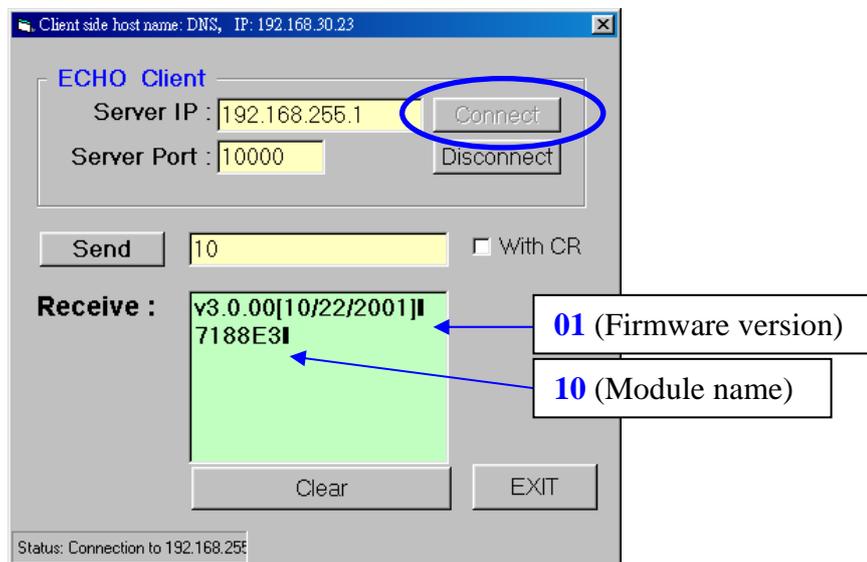
4.6 Using client programs

To test functions of Xserver, you must run a client program. We support many Quick Start documents for specific modules, like 7188E3_Quick_Start.pdf, 7188E4_Quick_Start.pdf. Please refer to documents in 7188E\Document.

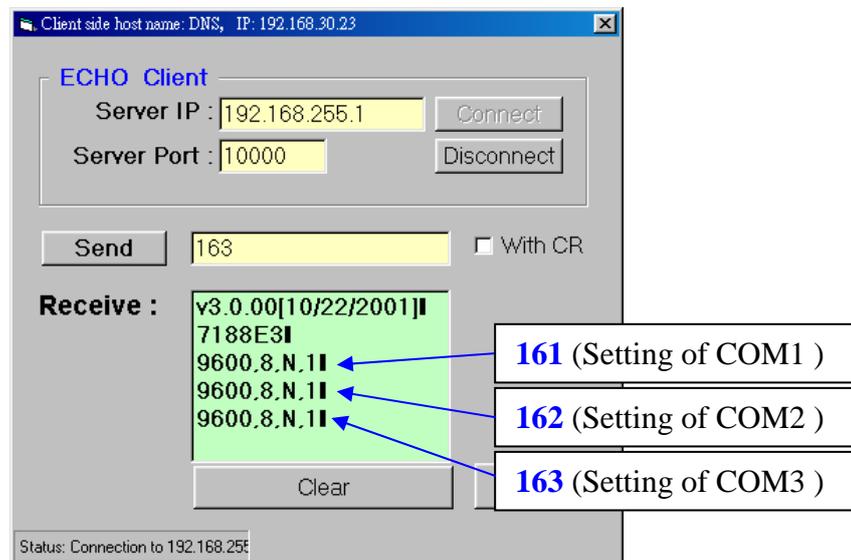
4.6.1 Using Client4.exe to link 7188E3

Step 1: Run 7188e\Tcp\Xserver\Client\Common\VB5\Client4\Client4.exe in host-PC. Press “**Connect**” button to connect to 7188E3.

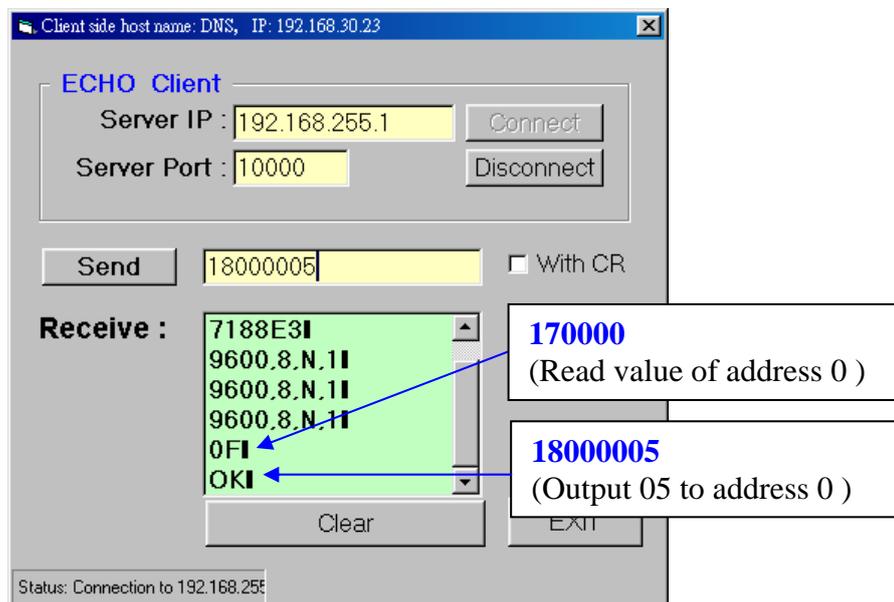
Send command “**01**”, “**10**”.



Step 2: Send “**161**”, “**162**” and “**163**” to readout COM port setting.

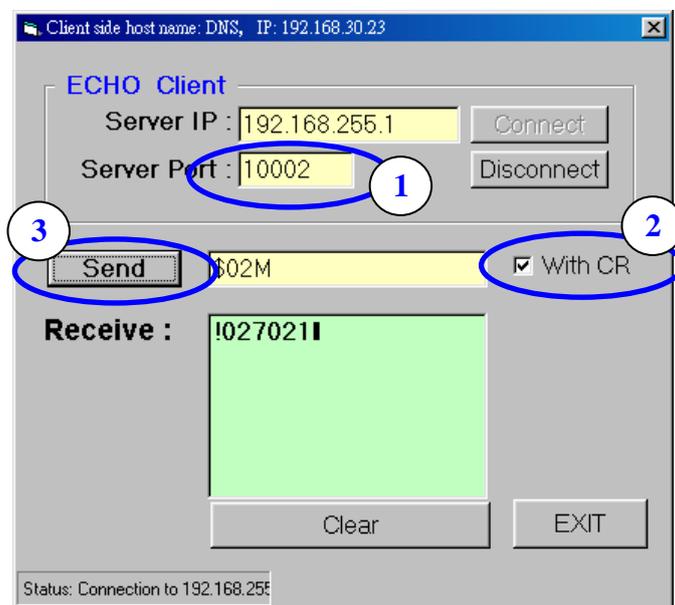


Step 3: Send “170000” and “18000005” to access D/I/O of 7188E3.



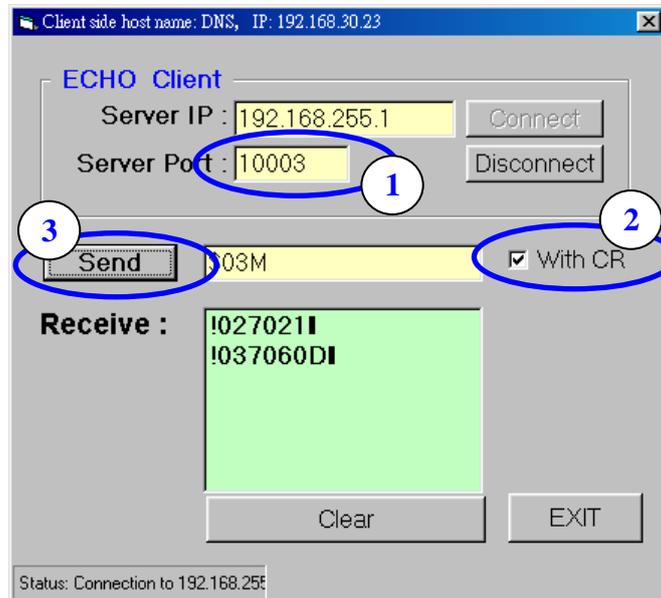
Step 4: Disconnect and then reconnect at port 10002.

Step 5: Select “**With CR**” and then send “**\$02M**” to read 7000 module’s ID which is connected to 7188E3’s COM2.



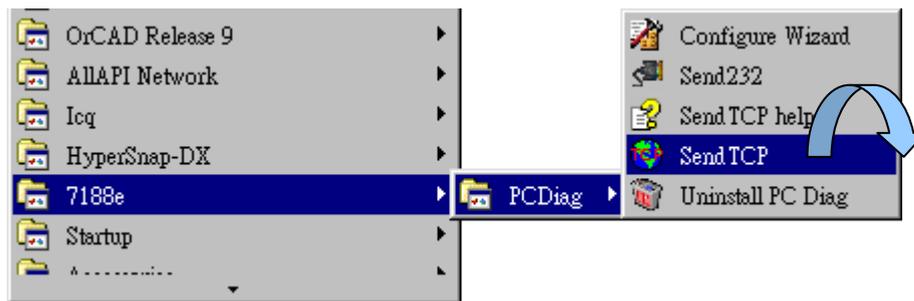
Step 6: Disconnect and then reconnect at port 10003.

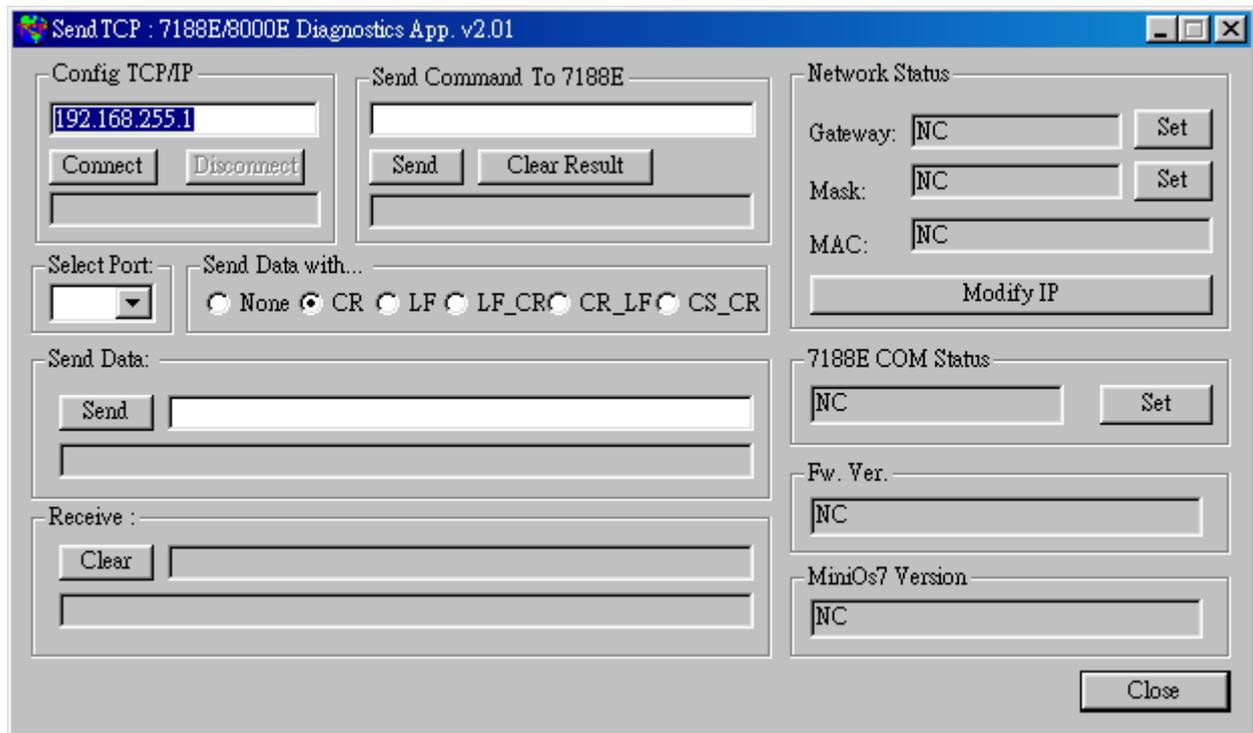
Step 7: Select “**With CR**” and then send “**\$03M**” to read 7000 module’s ID which is connected to 7188E3’s COM3.



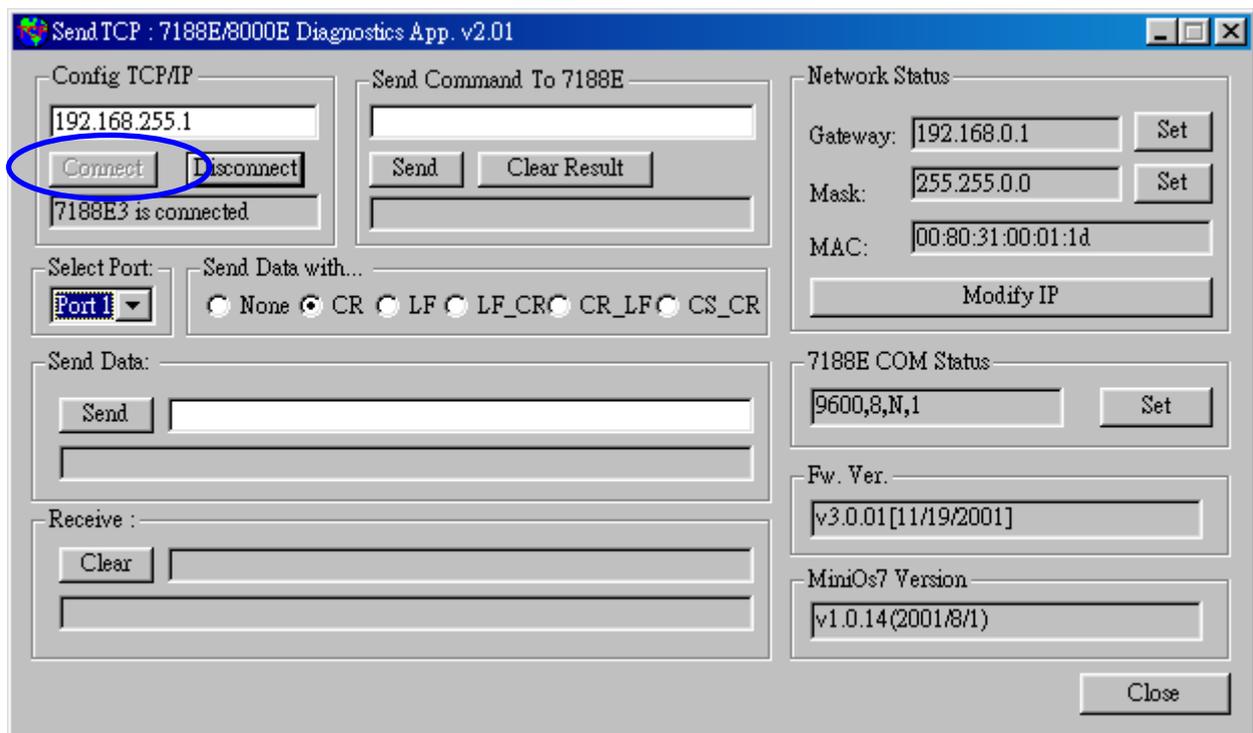
4.6.2 Using SendTCP to link 7188E3

Step 1: Run SendTCP in host-PC.

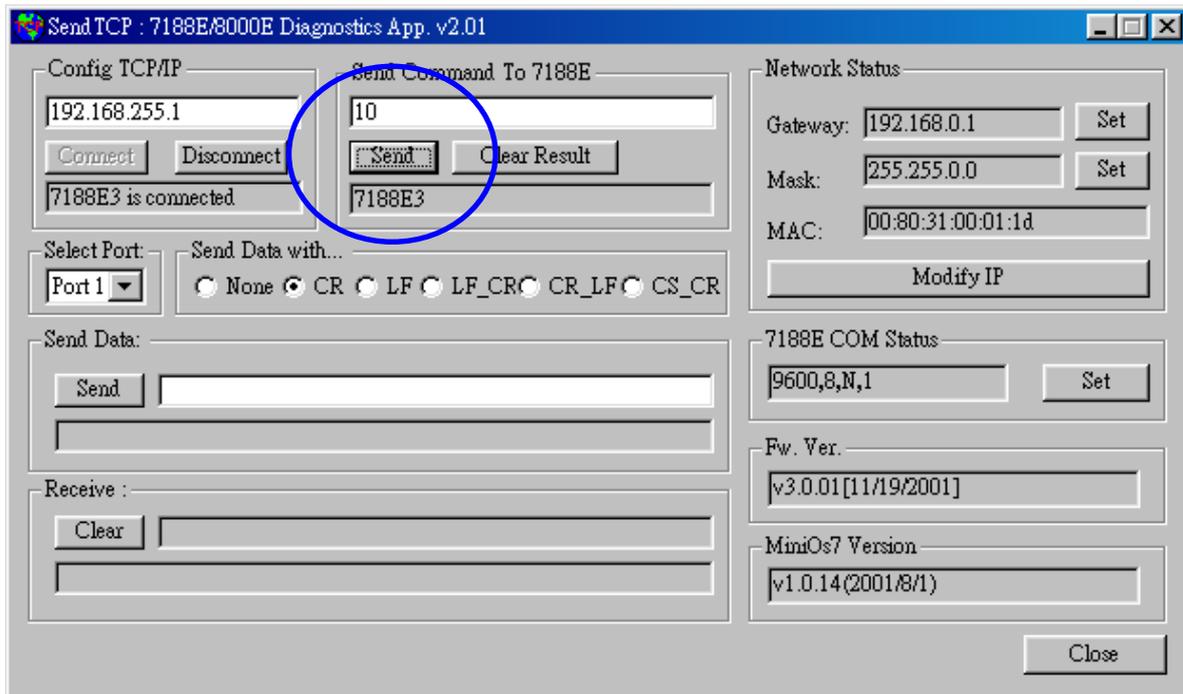




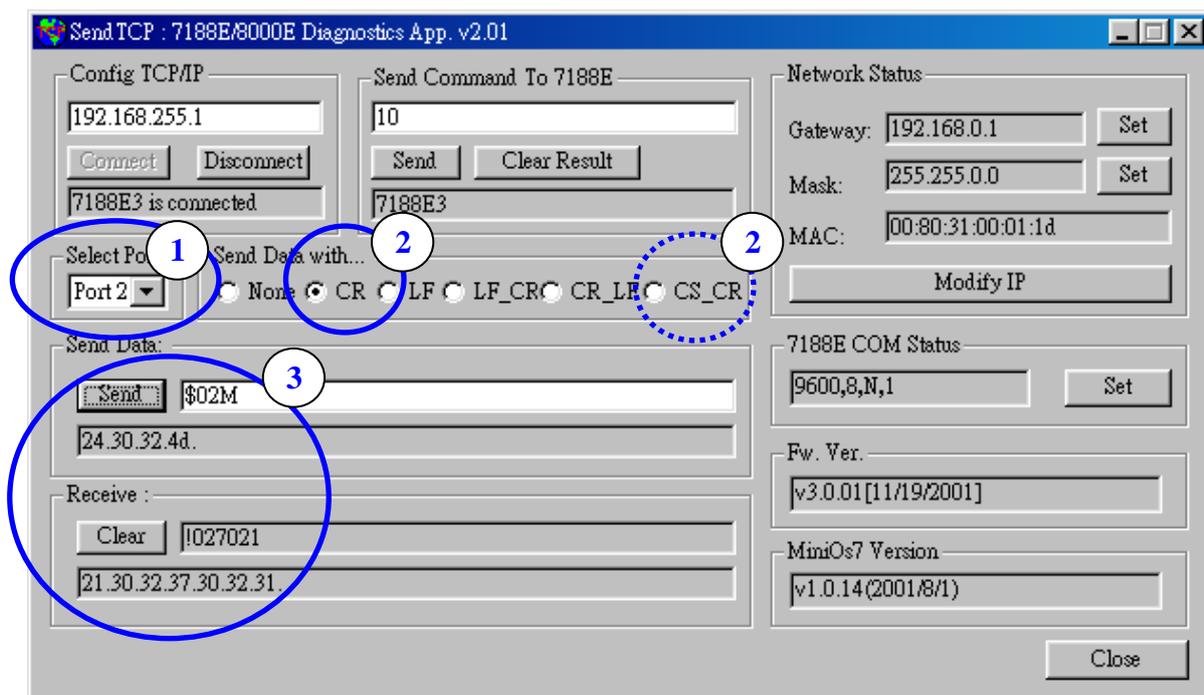
Step 2: Press “**Connect**” button to connect to 7188E3.



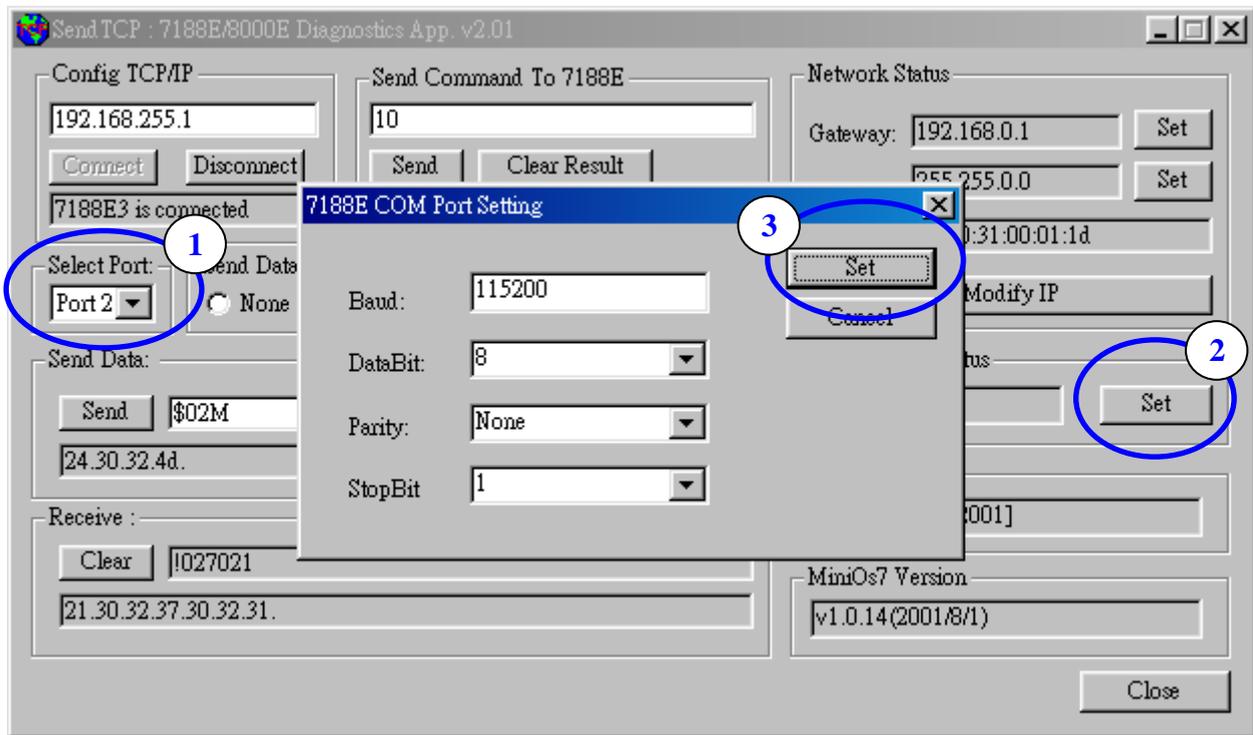
Step 3: Send command “10” to 7188E3.



Step 4: Select “Port 2” and “CR”. Then send “\$02M” to read 7000 module’s ID which is connected to 7188E3’s COM2. If you enable 7000 module’s checksum function, select “CS_CR”. The “CS_CR” option will add two checksum bytes, then adds “CR”.



If you want to change the 7188E's COM ports settings, click **“Set”** to change them. The 7188E's COM port that you want to configure is specified by **“Select Port”** combo list. Port 2 means you want to configure the 7188E's COM2.

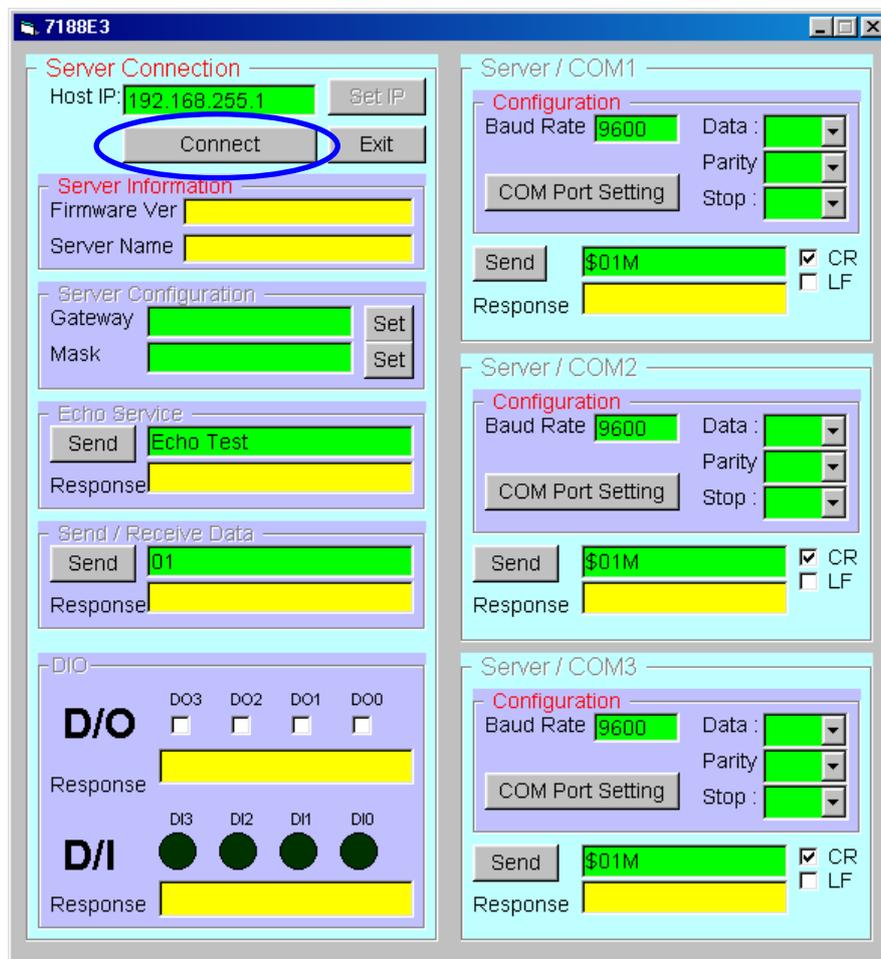


Please refer to SendTCP's help document for more information.

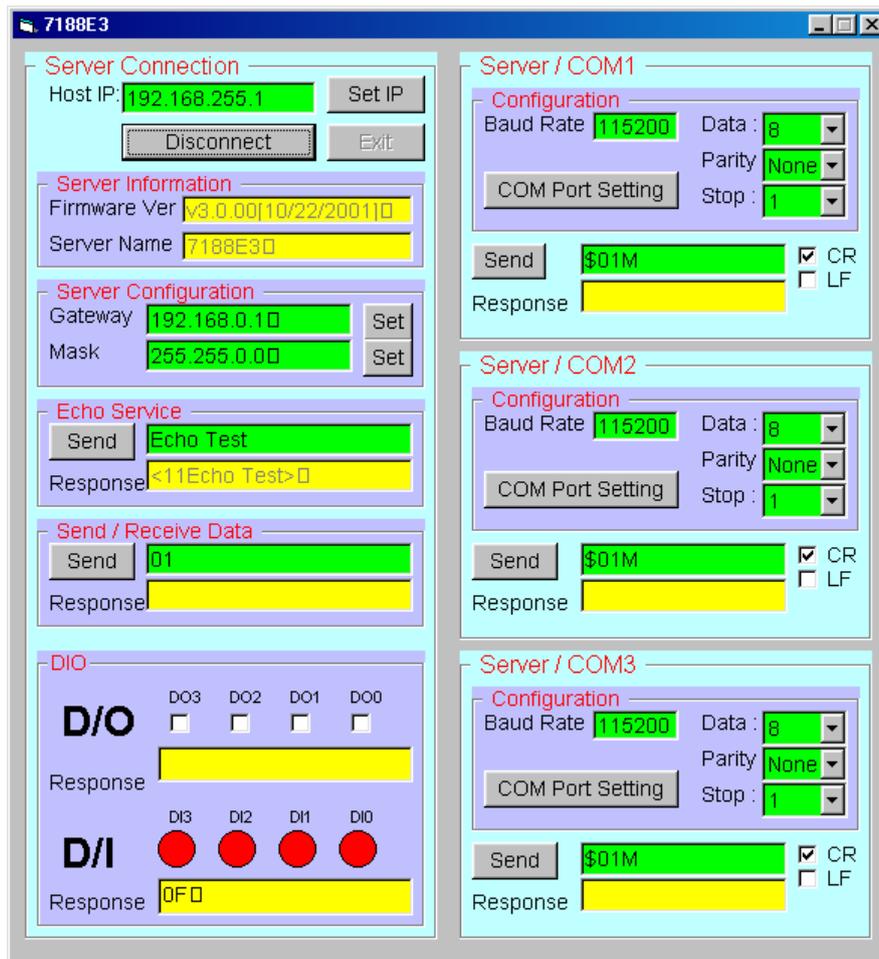


4.6.3 Using 7188E3.exe to link 7188E3

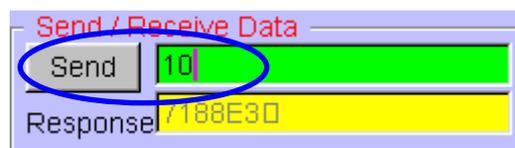
Step 1: Run 7188e\Tcp\Xserver\Client\Module\7188e3\Vb5\7188E3.exe in host-PC.



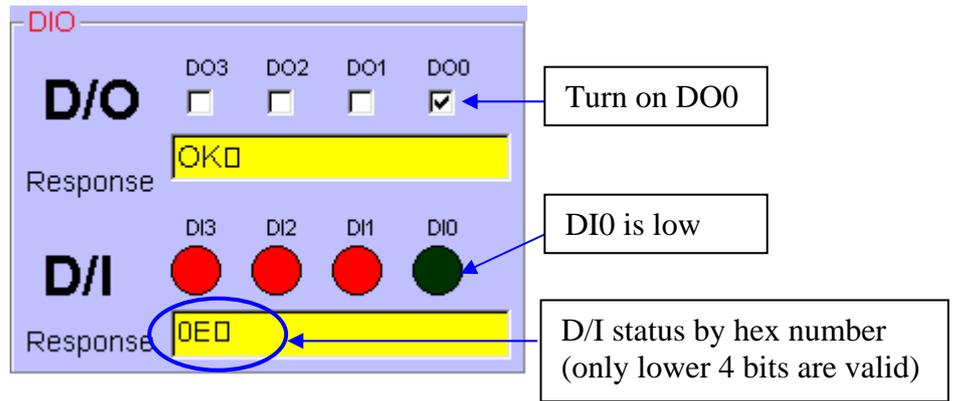
Step2: Press “**Connect**” button, and then the program will readout relative information concerning the 7188E3 and start scanning the DI of the 7188E3.



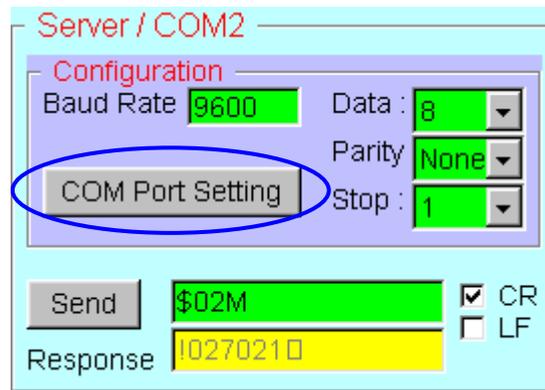
Step 3: Send “10” to readout the module name.



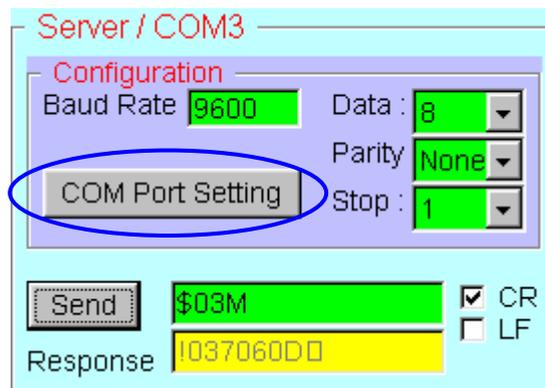
Step 4: Connect 7188E3’s DI0 and DO0 and then select check box to turn on D/O channel. 7188E3.exe will auto scan D/I status every 500 ms (determined in program code).



Step 5: Send "\$02M" to read 7000 module's ID which is connected to 7188E3's COM2.



Step 6: Send "\$03M" to read 7000 module's ID which is connected to 7188E3's COM3.



4.7 Demo Programs of Xserver

Demo5: Echoes special string to clients

Part of the program body:

```
int UserCmd(unsigned char *Cmd,unsigned char *Response)
{
    // user's command interpreter
    // refer to all demo

    strcpy(Response,"7188_Series."); // return "7188_Series." string to clients
    return 1;           // return OK
}
```

Demo6: Reads/writes the I/O port of 7188E

Part of the explanation head:

```
// 19i n, 19I n      -> read D/I value (hex) from address n(hex)
// 19o add val, 19O add val  -> output D/O value (hex) to address n(hex)
// 19 o add val, 19 O add val

// This demo shows how to use command 19 to replace command 17, 18

// Hardware: [7188EA] or [7188EX + D/I/O expansion board]
//          Note: Base address of 7188EA's DI is 1.
```

Part of the program body:

```
char cAddr[80],cVal[80];

int UserCmd(unsigned char *Cmd,unsigned char *Response)
{
    // user's command interpreter
    // refer to all demo

    int j,iVal,iAddr;
```

```

if (Cmd[0]) // Not Null command
{
    switch(Cmd[0])
    {
        case 'i': // inp command: i 0 or IO
        case 'I':
            sscanf(Cmd+1,"%x",&j);
            iVal=inp(j);
            sprintf(cVal,"%x",iVal);
            break;
        case 'o': // outp command: O0 5A or o 0 AB
        case 'O':
            sscanf(Cmd+1,"%x %x",&iAddr,&iVal);
            sprintf(cVal,"%x",iVal);
            outp(iAddr,iVal);
            break;
        default:
            return 0; // return error
    };
    strcpy(Response,cVal); // return I/O value
    return 1; // return OK
}
return 0; // return ERROR
}

```

Demo7: Uses printCom1 to debug programs

Part of the explanation head:

```

// 19~!@#$ -> Any non-null command will be accepted.
// You can use "Print" or "printCom1" to send Debug string to PC monitor by 7188E's COM1.
// "printCom1" is the default function of Xserver.
// If you want use "Print", you must use "DisableCom" and "RestoreCom"
// to disable "printCOM1".
// Hardware: [7188E]

```

Part of the program body:

```
int UserCmd(unsigned char *Cmd,unsigned char *Response)
{
    // user's command interpreter
    // refer to all demo

    if (Cmd[0]) // Not Null command
    {
        printCom1("%s\n\r",Cmd); // Send debug string to PC monitor by 7188E's COM1
        strcpy(Response,Cmd);
        return 1; // return OK
    }
    return 0; // return ERROR
}
```

Demo9: Timer trigger demo

Part of the explanation head:

```
// 19c, 19C -> clear count value
// 19r, 19R -> read count value

// UserCount will be executed every second.
// Count value will be increased in UserCount.
// PC can read count value to know number of seconds
// after count value is cleared.

// Hardware: 7188E
```

Part of the program body:

```
unsigned int cnt;
char c_cnt[20];
void UserCount(void)
{
    // user's timer trigger function
    // refer to demo9 for example code
    // printCom1("\n\rUserCount %d",cnt);
    cnt++;
}
```

```

void UserInit(void)
{
    // user's initial function
    // timer initialized for UserCount()
    // I/O or variables initialized for UserLoopFun()
    // I/O or variables initialized for User's functions in this file
    // refer to demo9 & demo11 for example code
    cnt=0;
    AddUserTimerFunction(UserCount,1000); // call UserCnt every 1000 ms
}

int UserCmd(unsigned char *Cmd,unsigned char *Response)
{
    // user's command interpreter
    // refer to all demo

    int i;
    if (Cmd[0]) // Not Null command
    {
        switch(Cmd[0])
        {
            case 'c': // 19c, 19C --> clear count
            case 'C':
                cnt=0;
                break;
            case 'r': // 19r, 19R --> read count
            case 'R':
                break;
            default:
                return 0; // Command Error
        }

        sprintf(c_cnt,"%d",cnt);
        strcpy(Response,c_cnt); // return count value
        return 1; // return OK
    }
    return 0; // return ERROR
}

```

Demo11: Real-time I/O control

Part of the explanation head:

```
// 19i, 19I -> read D/I form address 0
// 19o, 19O -> D/O to address 0

// This demo show complex real time DI/DO operation in UserLoopFun

// Hardware: [7188EA] or [7188E + D/I/O expansion board]
// Note: Base address of 7188EA's DI is 1.
```

Part of the program body:

```
unsigned char DI,DO;
char cVal[80];

void UserLoopFun(void)
{
    // VxComm.exe will call this function in every scan time
    // real-time I/O control function
    // DO0=!DI0, DO1=(DI1+DI2), DO2=(DI3)
    // DO3 ~ DO6: control by host-pC

    DI=inportb(0);                // read DI

    if (DI&1) DO=DO&0xfe;        // DO0=!DI0
    else DO=DO | 1;

    if ((DI&2) || (DI&4)) DO=DO | 2; // DO1=(DI1+DI2)
    else DO=DO & 0xfd;

    if (DI&8) DO=DO | 4;         // DO2=DI3
    else DO=DO & 0xfb;

    outportb(0,DO);             // write to DO0, DO1, DO2
}
```

```

int UserCmd(unsigned char *Cmd,unsigned char *Response)
{
    int iAddr=0;
    char DoVal;
    switch(Cmd[0])
    {
        case 'i':
        case 'I':
            DI=inportb(iAddr);
            sprintf(cVal,"%x",DI);
            break;
        case 'o':
        case 'O':
            sscanf(Cmd+1,"%x",&DoVal);
            sprintf(cVal,"%x",DoVal);
            DoVal=DoVal&0x78;
            DO=DO | DoVal;
            outportb(0,DoVal); break;
        default:
            return 0;                // return Error
    };
    strcpy(Response,cVal);
    return 1;                        // return OK
}

```

Note: The key points of this demo are given as follows:

- Host PC controls DO3 ~ DO6 of the hardware.
- The Xserver controls DO0 ~ DO2 of the hardware independently.
- The UserLoop describes above acts as a typical emergency event control application.

Demo12: Scan-time evaluation

Part of the explanation head:

```
// 19c, 19C -> clear count value
// 19r, 19R -> read count value

// UserLoopFun will increase count value every scan loop.
// PC can read how many scan loops after clear count value.
// So user can use this demo to test the Xserver's performance.

// Hardware: 7188E
```

Part of the program body:

```
unsigned long cnt;

void UserInit(void)
{
    cnt=0;
}

void UserLoopFun(void)
{
    cnt++;
}

int UserCmd(unsigned char *Cmd,unsigned char *Response)
{
    int i,j;
    if (Cmd[0]) // Not Null command
    {
```

```

switch(Cmd[0])
{
    case 'c':      // "19c" "19C" --> clear
    case 'C':
        cnt=0;
        break;
    case 'r':      // "19r" "19R" --> read count
    case 'R':
        break;
    default:
        return 0; // Command Error
}
sprintf(Response,"%d",cnt); // return count value
return 1;           // return OK
}
return 0;           // return ERROR
}

```

Demo14: Controls 7-SEG LEDs

Part of the explanation head:

```

// 1912345, 19abcde -> Show 5 digits to 7-SEG LED

// Show5DigitLed, Show5DigitLedWithDot can show 5 digits to 7-SEG LEDs
// The two functions can show '0' ~ '9'
//                               'a' ~ 'f'
//                               'A' ~ 'F'
//                               ',', '-', '!'

// Hardware: 7188E

```

Part of the program body:

```
extern int bLedControl; // key variable,
                        // 0: disable LED control.
                        // Xserver will not show default information on LED.
                        // 1: enable LED control.
                        // Xserver will show default information on LED.

void UserInit(void)
{
    Init5DigitLed();
    bLedControl=0;
}
char cLED[6];

int UserCmd(unsigned char *Cmd,unsigned char *Response)
{
    // user's command interpreter
    int i;

    // set default LED char is blank.
    for(i=0;i<5;++i)
        cLED[i]=16;

    strcpy(cLED,Cmd);

    for(i=0;i<5;++i){
        if (cLED[i]>='0' && cLED[i]<='9')
            cLED[i]=cLED[i]-'0';
        if (cLED[i]>='a' && cLED[i]<='f')
            cLED[i]=cLED[i]-'a'+10;
        if (cLED[i]>='A' && cLED[i]<='F')
            cLED[i]=cLED[i]-'A'+10;
        if (cLED[i]== ' ')
            cLED[i]=16;
        if (cLED[i]== '-')
            cLED[i]=17;
    }
}
```

```

    if (cLED[i]!='.')
        cLED[i]=18;
    Show5DigitLed(i+1,cLED[i]);
}
strcpy(Response,Cmd);
return 1;
}

```

Demo17: Pulse width measurement

Part of the explanation head:

```

// 19~!@#$ -> Any non-null command will be accepted.

// This demo is similar to demo13 to detect signal change
// and measure signal width.

// Hareware: [7188EA] or [7188EX + D/I expansion board]
//           Note: Base address of 7188EA's DI is 1.

```

Part of the program body:

```

unsigned long up_t;      // timetick of signal from low becomes high
unsigned long down_t;   // timetick of signal form high becomes low
unsigned high_width;    // width of signal stay at high
unsigned low_width;     // width of signal stay at low
char now,old;

void UserInit(void)
{
    up_t=0;
    down_t=0;

    if (inportb(0)&1)
        old=1;      // initial DIO is High
    else
        old=0;      // initial DIO is Low
}

```

```

void UserLoopFun(void)
{
    // VxComm.exe will call this function every scan time

    now=(inportb(0) & 1); // read DI0
    if (now != old)      // DI0 signal changed
    {
        if (now == 1)    // Low become High
        {
            up_t>(*TimeTicks);
            low_width=up_t-down_t;
        }
        else             // High become Low
        {
            down_t>(*TimeTicks);
            high_width=down_t-up_t;
        }
        old=now;
    }
}

char cVal[80];

int UserCmd(unsigned char *Cmd,unsigned char *Response)
{
    // user's command interpreter
    // refer to all demo

    if (Cmd[0])         // Not Null command
    {
        sprintf(cVal,"High:%ld Low:%ld Now:%d",high_width,low_width,now);
        strcpy(Response,cVal); //return High and Low time
        return 1;        // return OK
    }
    return 0;          // return ERROR
}

```

Demo18: Reads I-7000 series module's ID.

Part of the explanation head:

```
// 19 -> Any command will be accepted.

// This demo shows how to communication with the 7000 series which are connected
// to COM2 of the 7188E.

// Hardware: 7188E + any 7000 series module whose address is 01,
//                                     baudrate is 9600,
//                                     checksum is disable.
```

Part of the program body:

```
char cStr[9];           // Receive data from 7000: "!017021" + 0x0c
char cModuleID[5];     // Store module ID: "7021" + 0x00

void UserCount(void)
{
    int i;

    SendCmdTo7000(2,"$01M",0);
    ReceiveResponseFrom7000(2,cStr,1000,0);

    // cut "!01" and cr
    strcpy(cModuleID,cStr+3);
    cModuleID[4]=0;

    // Show moduleID to PC monitor
    printCom(1,"Address: 01, ModuleID:%s\n\r",cModuleID);
}

void UserInit(void)
{
    AddUserTimerFunction(UserCount,1000);
    InstallCom(2,9600,8,0);
    SetBaudrate(1,115200L);
}
```

Demo19: Reads system serial number.

Part of the explanation head:

```
// 19 -> Any command will be accepted.

// Unique hardware serial number is used to protect user's software.
// Using 7188xw.exe to enter 7188E and then execute command 'ver'.
// MiniOS7 will show the serial number.
// User can check the number at first, then decide to execute
// Xserver forward.

// Hardware: [7188EA] or [7188EX]
//           Note: Base address of 7188EA's DI is 1.
```

Part of the program body:

```
int bSerialNumOk;
char cID[8]={0x9,0x31,0xa4,0x39,0x3,0,0,0x5};

void UserInit(void)
{
    char cSerialNumber[8];

    GetSerialNumber(cSerialNumber);
    if(!strcmp(cSerialNumber,cID))
        bSerialNumOk=1;           // Matching !
    else
        bSerialNumOk=0;          // Unmatched !
}

int UserCmd(unsigned char *Cmd,unsigned char *Response)
{
    if (bSerialNumOk)
        strcpy(Response,"ID ok.");
    else
        strcpy(Response,"ID error.");

    return 1;           // return OK
}
```

Demo23: Echoes all data (include "23") to specific clients.

Part of the explanation head:

```
// 23 -> Any command will be accepted.

// This demo illustrates how to use command 23 to send
// messages to specific client.
// Xserver will echo all data (included "23") to client.

// Hardware: 7188E
```

Part of the program body:

```
int VcomUserBinaryCmd(TCPREADDATA *p)
{
/* VXCOMM.EXE 2.6.12(09/04/2001) or later will support this function.

    TCP PORT 10000, command 23 will call this function.
    user can get the following message:
    p->ReadUartChar : the buffer store the command data(include "23")
    p->Length : the command data length(include the two byte "23")
    p->Socket : the socket number that receive the command, that is when the user function
                want return message to the client, just use the socket to send data.
    use: VcomSendSocket(p->Socket,pdata,datalength);

*/

// echoes all data (include "23") to specific client.
VcomSendSocket(p->Socket,p->ReadUartChar,p->Length);

return 1; /* any value will be accept */
}
```

5. Glossary

1. 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 technology today. Ethernet is a best-effort delivery system that uses CSMA/CD technology. It recognizes hosts using 48-bit MAC address.

2. Internet:

Physically, 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. Internet recognizes hosts using 32-bit IP address.

3. TCP/IP:

Transmission Control Protocol (TCP) and 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 network.

4. TCP (Transmission Control Protocol):

TCP provides a reliable flow of data between two hosts. It is connected with things 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.

5. 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 reach the destination host.

6. Gateway:

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

7. 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.

8. 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 Ethernet interface hardware. Thus, no two hardware interfaces have the same MAC address.

9. Subnet Mask:

Subnet mask is often simply called 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, (2) on a different network. If (1), the packet will be delivered directly; else, will be delivered by gateways or routers.

10. ARP (Address Resolution Protocol):

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

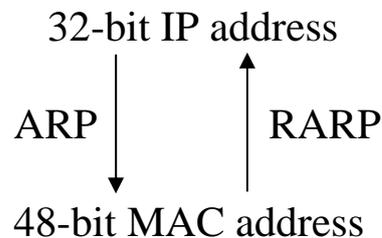
Suppose machine A wants to send a packet to machine B across a physical network to which they both are attached, but A has only B’s Internet address IP_B . The question arises: how does A map that address to B’s MAC address, MAC_B ?

ARP provides a dynamic mapping from 32-bit IP address to the corresponding 48-bit MAC address. We use the term dynamic since it happens automatically and is normally not a concern of either the

application user or the system administrator.

11. RARP (Reverse Address Resolution Protocol):

RARP provides a dynamic mapping from 48-bit MAC address to the corresponding 32-bit IP address.



12. ICMP (Internet Control Messages Protocol):

No system works correctly all the time. The ICMP provides communication 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 hosts to know what wrong with the network communication.

13. Ping:

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

14. Packet:

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

15. Socket:

Each TCP segment contains the source and destination port number 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.

16. 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 program consists of conventional application program develop tools. Each time a client program executes, it contacts a server, sends a request and awaits 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 client's request, performs the necessary computation and returns the result to the client.

17. Firmware:

Alterable programs in the semi permanent storage, e.g., ROM, EEPROM, or Flash memory.