

# **Direct–Net Serial-Ethernet Server**

## **User's Manual**

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## 1 Introduction

Direct-Net Serial Server is a RS232/RS485 to TCP/IP converter integrated with a robust system and network management features designed for serial equipment to be accessed and controlled via Intranet or Internet.

In the computer integration manufacturing or industrial automation area, the Direct-Net Ethernet Serial Server is used for field devices to direct connect to Ethernet network. Terminal Server transforms whatever data received from RS-232 or RS-485/RS-422 to TCP/UDP port then connect devices to the Ethernet network via a single application program or multiple application programs.

Many control devices provide the ability to communicate with hosts through RS-232 or RS-485/RS-422 however RS-232 or RS-485/RS-422 serial communication has its limitations. For one, it is hard to transfer data through a long distance. With Direct-Net, it is possible to communicate with a remote device in the Intranet environment or even in the Internet and thus, increases the communication distance dramatically.

The Direct-Net has a complete TCP/IP protocol stack. The Direct-Net web interface is a breeze to operate and is totally independent from the operating system platform you use.

### **Interface Features:**

- ✧ Connector Type: RJ45、DB9
- ✧ Protocol: RS-232/RS-485
- ✧ Band Rate: 1200~115200bps
- ✧ Flow control: RTS/CTS or None
- ✧ Data bits: 5、6、7、8bits
- ✧ Stop bits: 1~2bits
- ✧ Power Supply: 5V

### **Net Protocol Features:**

- ✧ Protocol: TCP/UDP/ICMP/DHCP/DNS/HTTP
- ✧ Mode: TCP server/TCP client/UDP
- ✧ Support transparent transmission mode
- ✧ Embed WEB server

### **Others:**

- ◇ Support the transparent transmission mode
- ◇ Virtual serial port driver for Windows NT/2000/XP/Vista/Win7
- ◇ Support more perfect TCP/IP protocol tack, support DHCP protocol for dynamicassignment of IP address and DNS domain name parsing.

## 1.1 HardWare Setup

### 1.1.1 Packaging

Please check ones package contains the following items:

- ◇ Direct-Net Serial Server
- ◇ Product CD
- ◇ Power Supply



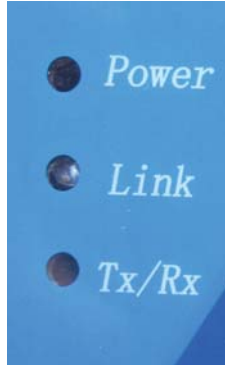
图 2-1 产品外形图

### 1.1.2 Interface

Direct-Net offers one RS-232 or RS-485/RS-422 port, one RJ45 Ethernet and LEDS.

### 1.1.2.1 LED Message

Direct-Net has 3 leds will be presented with the following view.



Power LED:

Message	Description
LED Off	Serial Server Power Off
LED On	Serial Server Power Down

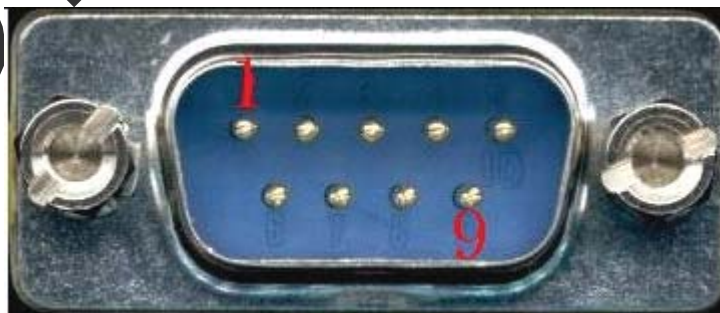
Link LED:

Message	Description
LED blinking Low frequency	Serial Server Not link
LED blinking high frequency	Serial Server Linked

TX/RX LED:

Message	Description
LED Off	No data is transmitting on COM port
LED On blinking state	Data is transmitting on COM port

### 1.1.2.2 DB9 Pin Assignments



Pin#	RS232 Full Duplex	RS-485 2-wire, Half Duplex For Direct-Net(485 series)	
1	N/C	N/C	
2	RXD	N/C	
3	TXD	N/C	
4	N/C	N/C	
5	SG	N/C	
6	N/C	Data -	
7	RTS	N/C	
8	CTS	N/C	
9	N/A	Data +	

### 1.1.2.3 Ethernet Port (RJ-45)



Pin#	Description	Direction	Others
1	TX+	Output	Tranceive Data+
2	TX-	Output	Tranceive Data-
3	RX+	Input	Receive Data +
4	N/C	N/C	N/C
5	N/C	N/C	N/C
6	RX-	Input	Receive Data -
7	N/C	N/C	N/C
8	N/C	N/C	N/C

### 1.1.2.4 Power Requirement

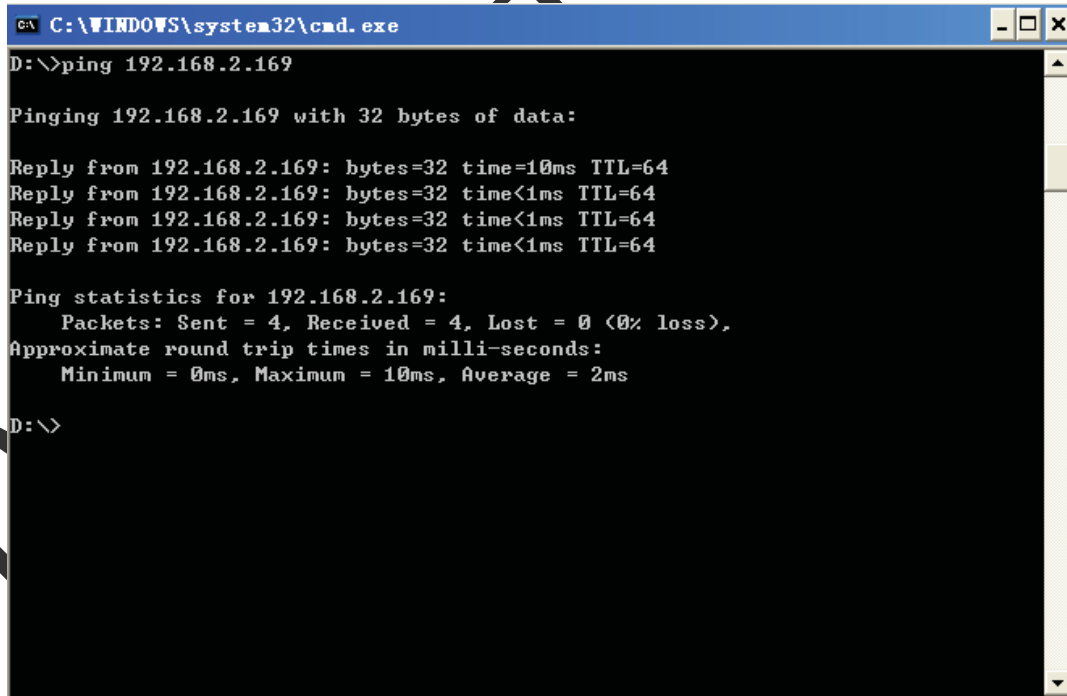
The Direct-Net Serial Server can be powered by a 5VDC supply.

## 2 Start Writing Ones Own Applications

Before one start writing ones host applications or programs to interact with Direct-Net, please make sure one have done the following.

### 2.1 Preparing the System

- 1、 Properly connect Direct-Net hardware including power, Ethernet and serial cable。
- 2、 Properly configure the parameters of PC including IP address, gateway IP address, and network mask accordingly. (The default IP address of Direct-Net Serial Server is 192.168.2.169).
- 3、 Make sure Direct-Net is running by checking the running status through LED state.
- 4、 From Windows Start menu, select Run and type in “ping 192.168.2.169”. If the connection is established, the Reply messages are displayed, otherwise it will indicate Request timed out as indicated in the following figure:



```
C:\WINDOWS\system32\cmd.exe
D:\>ping 192.168.2.169

Pinging 192.168.2.169 with 32 bytes of data:

Reply from 192.168.2.169: bytes=32 time=10ms TTL=64
Reply from 192.168.2.169: bytes=32 time<1ms TTL=64
Reply from 192.168.2.169: bytes=32 time<1ms TTL=64
Reply from 192.168.2.169: bytes=32 time<1ms TTL=64

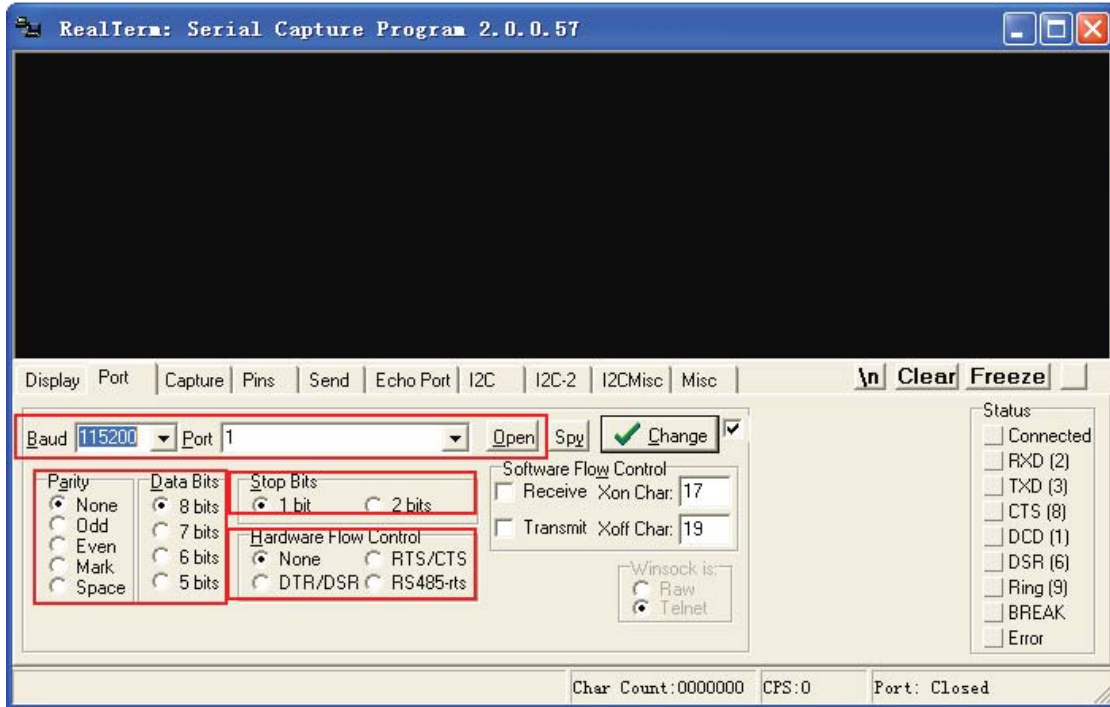
Ping statistics for 192.168.2.169:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 10ms, Average = 2ms

D:\>
```

### 2.2 Testing

- 1、 Run TCP / UDP debugging tools, create a TCP Server whose detecting port is 60000.
- 2、 Run serial debugging tools, such as RealTerm.exe in this case. Modify parameters as

indicated in the following figure:



- 3、Repower the Serial Server, and the Serial Server automatically connect to the network and TCP server. Then you can begin your transmission test between ComMaster and the TCP/UDP debugging tools.

### 3 Configuration

An web Server has been in Direct-Net Serial Server, you can Configure the Serial Server using web browser (Internet Explorer for example).

#### 3.1 Login

Open a web browser (Internet Explorer for example) and enter the IP address you have set on the Direct-Net( The default IP address of Direct-Net Serial Server is 192.168.2.169).Ensure the IP address of your PC is 192.168.2.X.

For example, if you entered the address 192.168.2.169 then you should enter the text



below in the address field of the browser and press enter:

<http://192.168.2.169>

Now you should see the login screen:

The default User name of Serial Server is 'admin'.

The default Password of Serial Server is '123456'.



Note: If you have problems to log in and you are sure that your password is correct, make sure that Caps Lock is not enabled on your keyboard.

### 3.2 Current port settings

If you log in you will be presented with the following view.

## Direct-Net Module

Home

Basic Settings

Advanced Settings

### Status & Configuration

Name:	Direct-Net Serial2Ethernet Module
Firmware Revision:	F1.01
IP Address:	192.168.2.169
MAC Address:	00-1F-FA-FD-00-01

Current port settings:

	Port 0
Baud Rate:	115200 bits/second
Data Size:	8 bits/character
Parity:	None
Stop Bits:	1 bit(s)
Flow Control:	None
Local Port Number:	N/A
Remote Port Number:	60000
Mode:	Client
Protocol:	TCP
Server IP:	192.168.2.16
Tcp Link Timeout:	N/A seconds
Tcp Retry Connect Time:	10 seconds

*Outstanding in the field!*

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The page is divided in two sections, one for each Status & Configuration. All fields exist for both webs.

Name: The Name of Direct-Net is offered

Firmware Version: The Firmware version of Direct-Net.

Ip Address: The Currently Direct-Net's IP Address.

Mac Address: Mac Address of the Direct-Net.

### 3.3 Configuring the Basic settings

If you press the Basic settings you will be presented with the following view.

### Direct-Net Module

Advanced Settings

IP Address: 192.168.2.169  
 MAC Address: 00-11-22-33-44-55

**Settings:**

The current settings for Basic Settings may be changed using the form below. To make the new settings apply each time the module is reset. Check the values before pressing the "Submit" button.

	Current	Updated
Baud Rate	115200bits/second	115200 bits/S
Data Size	8 bits/character	8 bits/character
Parity	None	None
Stop Bits	1bit(s)	1 bit(s)
Flow Control	None	None
Local Port Number	N/A	0 (range +4096 , 32767-)
Remote Port Number	60000	60000
C/S Mode	Client	Client
Protocol	TCP	TCP
Server Address	192.168.2.16	192.168.2.16 Domain or IP
Tcp Link Timeout	N/A seconds	120 seconds
Tcp Retry Connect Time	10seconds	10 seconds

On this page you can view and change the Serial Server Basic settings in the module.

**Baudrate:** Sets the communication rate on the serial port. Selectable are 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200.

**Character Format:** Data Size is how many bits are used for each character. You can set 5, 6, 7 or 8 data bits. Parity is for parity configuration. Choose between No, Even or Odd parity. Stop bits is for how many stop bits to use. There can be 1 or 2.

**Flowcontrol:** For the EIA-232 port you can select if you want flow control handled by the UART. If this is selected then transmit is automatically stopped/continued when serial buffer is full/available. You can choose between NONE and Hardware. NONE disables UART flow control. If Hardware is selected the two UARTs involved uses two dedicated wires in the serial cable to control flow. Direct-Net uses RTS when it wants to transmit and gets CTS back when it is clear to send. Be sure to use a serial cable with these wires connected.

**Local Port Number:** The port is to receive a TCP/UDP package. The port is N/A when the Serial Server works in TCP client mode.

**Remote Port Number:** The port is to send a TCP/UDP package. The port is N/A when the Serial Server works in TCP Server mode.

**C/S Mode:** The Protocol is to Communication with the other side. You can select the TCP or

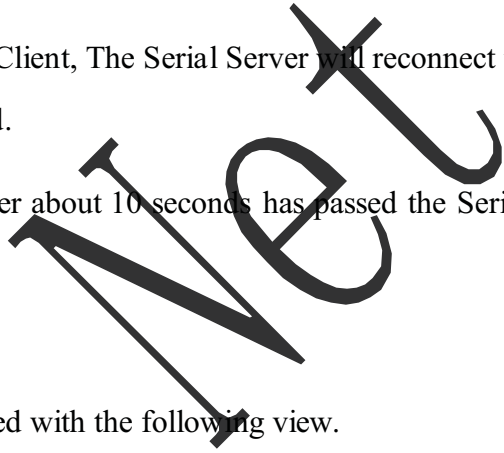
UDP.

Server Address: The IP Address is the other side's IP that the Serial Server Communicates with. Here you can enter a Domian name of Server.

TCP Link Timeout: When it works in TCP Server, The Serial Server will disconnect with the oter side if it is not receive any package in the timeout.

TCP Retry Connect Time: When it works in TCP Client, The Serial Server will reconnect to Server in this Connect Time if the state is disconnected.

Press "Submit" to update your configuration. After about 10 seconds has passed the Serial Server will works in the configuration.



### 3.4 Advanced Settings

If you press the Basic settings you will be presented with the following view.

On this page you can view and change the IP Address of Serial Server or other settings.

Address Type: Select DHCP if you have a DHCP server on your network and you want the IP address be assigned automatically by the server. Otherwise, Please Select Static IP.

Static IP Address: The IP address of Serial Server.

Subnet Mask: The subnet mask of your network.

Default Gateway: The default Gateway of Serial Server.

DNS Server: The IP Address of Domain Name Server.

Serial Port and Password: In transparent transmission mode, all data in the serial transfers in the form of byte stream, and in the network, the data transfers at a fixed frame format, therefore, the data between the serial and network need a conversion process between a stream and a frame.

For the data transmission in the direction from the network to the serial, data conversion from a frame into a stream is very easy. but in the contrary direction, that is data is converted from the stream to frame format, it needs certain rules to restrain. The module uses two parameters to specify the conversion rules:

Data tigger length: When the data length the module received reach the length of auto framing, the module will trigger the framing operation, and send the data frame to the network.

Data tigger timeout: In certain cases, such as the data sent is little, and cause the data in buffer can fill up a data block, then the data in buffer is not normally sent. At this time timeout mechanism is needed to ensure the small amount of data can be sent, the timeout is auto framing period.

Two parameters above together form the two trigger terms of auto framing. the longer the length of auto framing, the higher the transmission performance of the system, the shorter the auto framing period, the higher real-time transmission of the system, so in practice the two parameters can be adjusted according to the needs to obtain the best effect of transmission.

Login Password: This item allows you to change the administrator password for this device. Enter the new password in the Password box. Click "Update Settings" to change the password. Password must be 6 characters.

### 3.5 Restore Defaults

You can restore all options to their factory default states, when Press "Restore Defaults".

In other way, you can press reset button to restore all options to their factory default states. The reset Button presented with the following view.

The default setting of Serial Server will be presented with the following table.

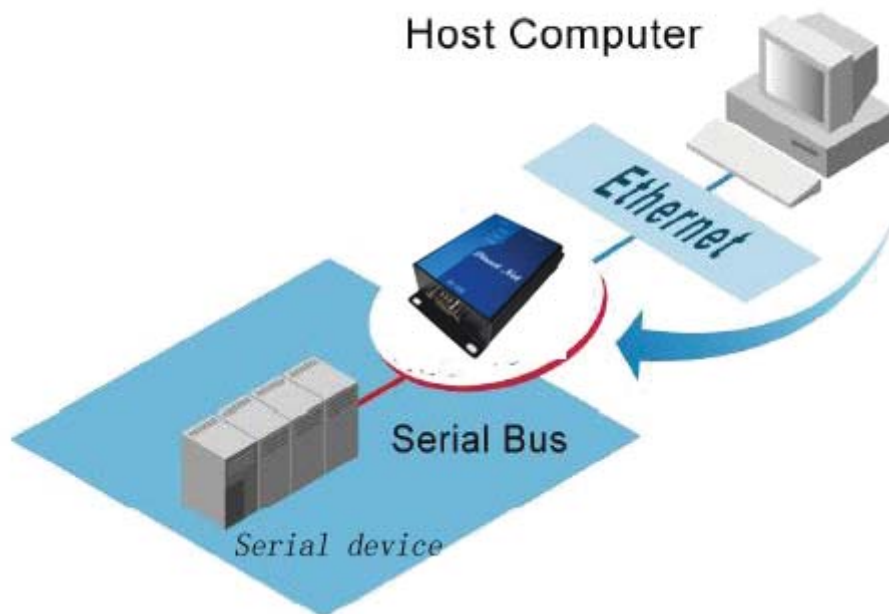
Configuration parameter	Default	description
<b>Basic Settings</b>		
Band Rate	115200	
Data Size	8	
Paity	None	
Stop bits	1	
Flow control	None	
Local Port Number	N/A	
Remote Port Number	60000	
Mode	Client	
Protocol	TCP	
Server IP	192.168.2.16	
TCP Link Timeout	120s	
TCP retry connect time	10s	
<b>Advanced Settings</b>		
Address Type	Static IP	
Static IP Address	192.168.2.169	
SubnetMask	255.255.255.0	
Default gateway	192.168.2.1	
DNS Server	192.168.2.1	
Data trigger length	64	
Data trigger Timeout	80ms	
login password	123456	User Name: admin

## 4 Application Connectivity

### 4.1 TCP Server Mode

Direct-Net can be configured as a TCP server on TCP/IP Network to wait for other applications(clients) in host computer to establish a connection with the serial device. After the connection is established between serial device and host computer, data can be transmitted in both directions.

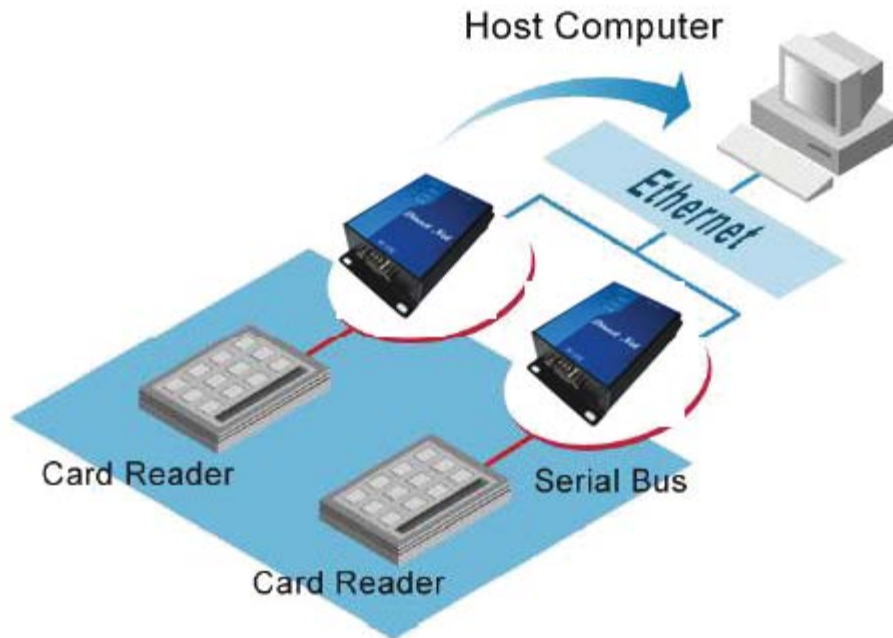
### TCP Server Mode



### 4.2 TCP Client Mode

Direct-Net can be configured as a TCP client on TCP/IP Network to establish a connection with other applications (server) in host computer actively. After the connection is established, data can be transmitted between serial device and host computer in both directions.

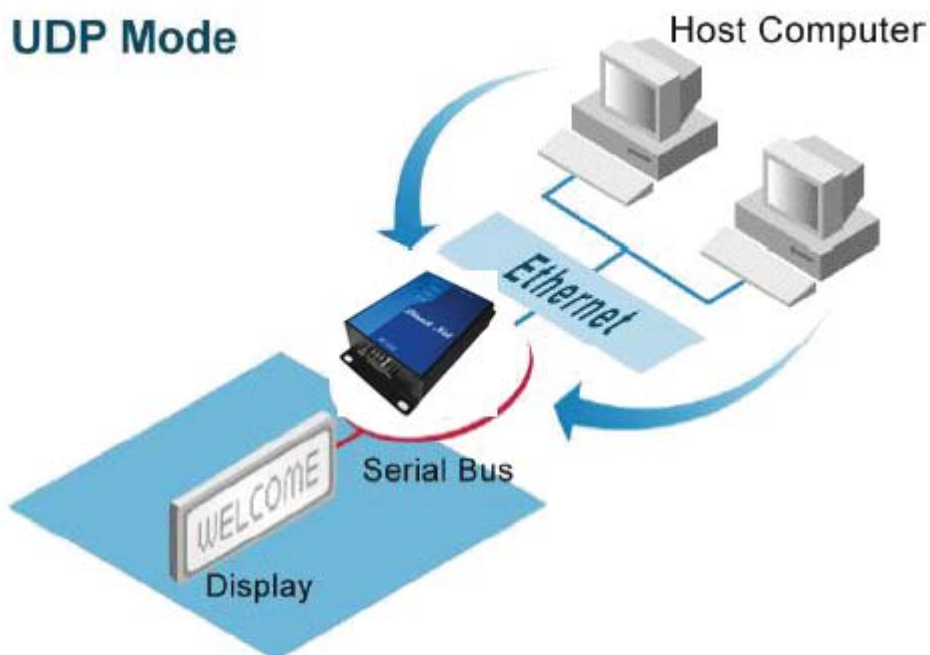
## TCP Client Mode



### 4.3 UDP Mode

UDP is a faster but non-guaranteed datagram delivery protocol. Direct-Net can be configured as a UDP mode on TCP/IP Network to establish a connection using unicast or multicast data from the serial device to one or multiple host computers. Vice versa is also true.

## UDP Mode



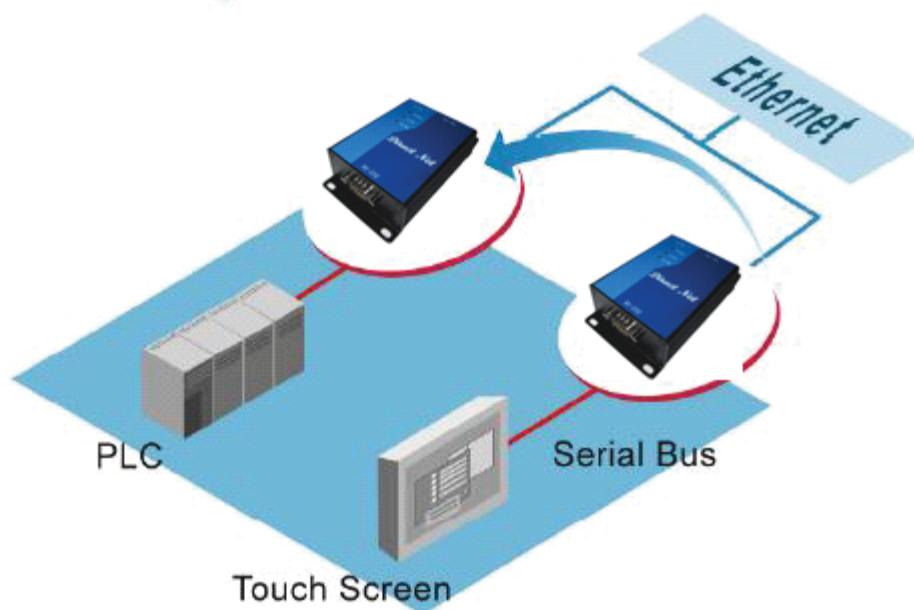


Note: Direct-Net can be configured as a UDP Server mode on TCP/IP Network to establish a connection using Broadcast data

#### 4.4 Tunneling Mode

In the case of the serial connection is established with two or more Direct-Net to send data over TCP/IP Network .It can avoid RS-232 interface 15 meter distance.

### Tunneling Mode



#### 5 Using Virtual COM

Virtual COM driver mode for windows converts COM data to LAN data to control the RS-232 port on a Direct-Net via the LAN. By creating virtual COM ports on the PC, the Virtual COM driver redirects the communications from the virtual COM ports to an IP address and port number on a Direct-Net that connects the serial line device to the network. The following figure is Virtual COM connection diagram.

##### 5.1 Introduction

Virtual Serial Ports emulator (VSPE) is intended to help people to deal with such a thing as a serial port.

- Virtual device: connector (Kernel mode)

- Virtual device: data splitter (Kernel mode)
- Virtual device: pair (Kernel mode)
- Kernel mode device: Mapper
- User mode device: TcpServer
- User mode device: TcpClient
- User mode device: Serial Redirector
- User mode device: UDP Manager
- User mode device: Bridge
- Data monitoring and recording
- Embedded HTTP server
- x86 and x86\_64 processor architecture support
- Embedded Lua script language
- VSPE API (C/C++ header and static library) for native language developers
- VSPE API Python bindings for Python developers
- VSPE API COM interface

## 5.2 Setup of a Virtual COM Driver

### 5.2.1 Pre-installation Requirements

Please check the operation system on ones PC complied with the following requirements:

Operating system: Microsoft Windows 2000, XP, Vista

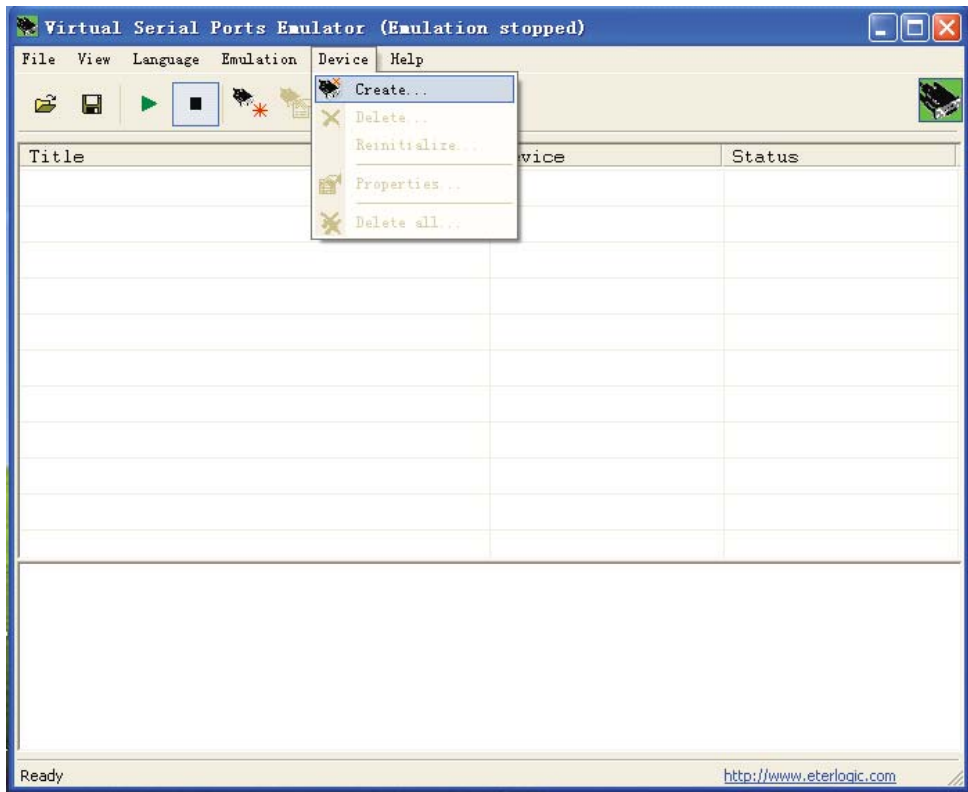
### 5.2.2 Installation

Make sure one have turned off all anti-virus software before beginning the installation. Run the Virtual COM setup file included in the CD to install Virtual COM driver for ones operating system.

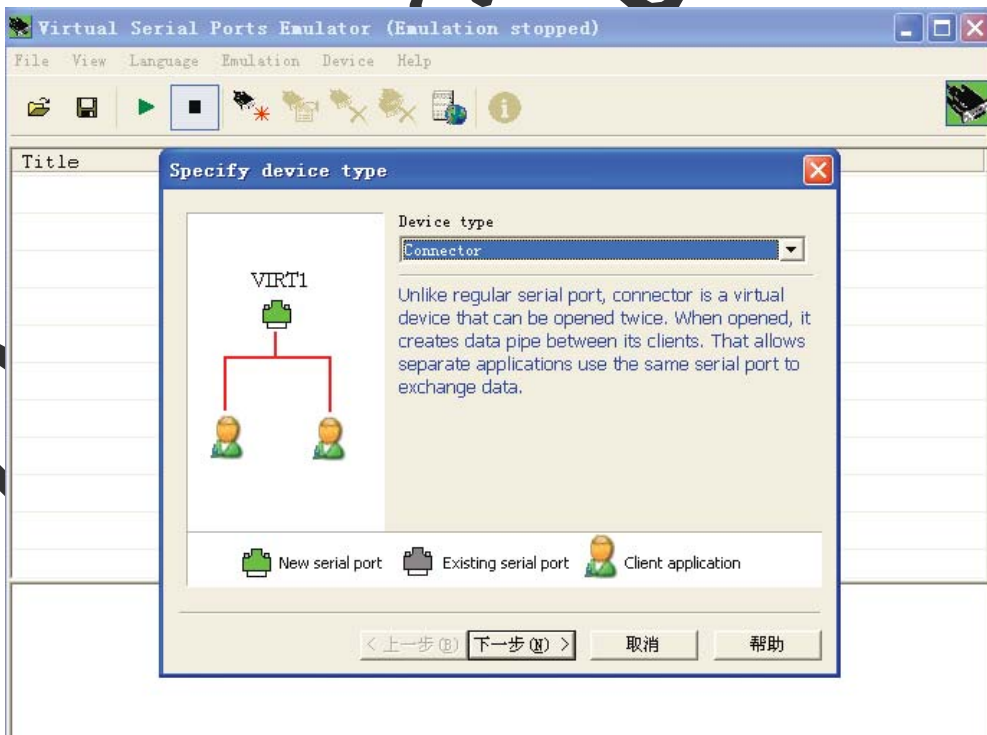
### 5.2.3 Virtual COM Communication

Step1. When Run VSPE software, you will be presented with the following view.

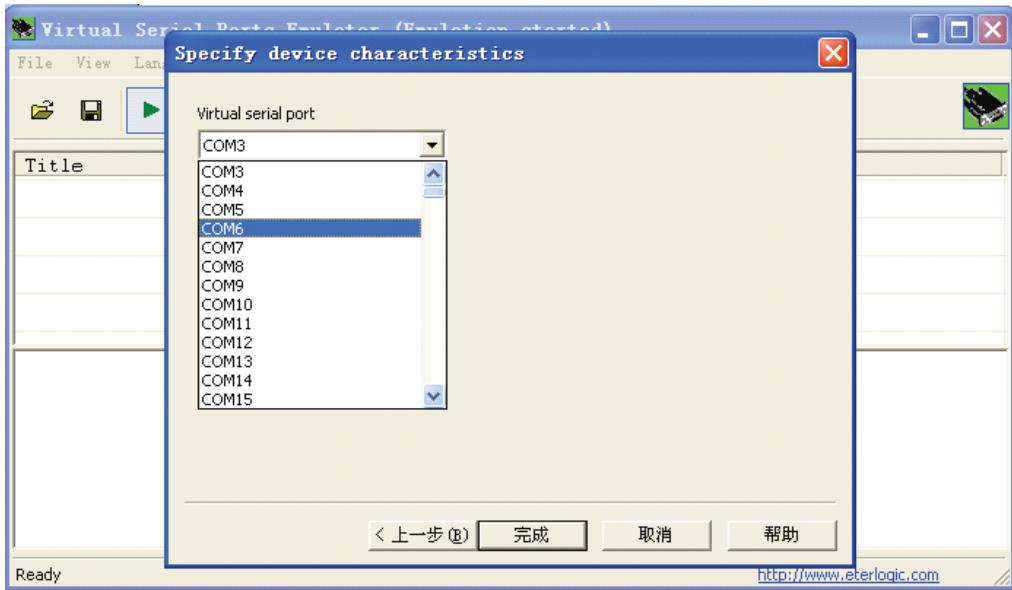
Step2. Press 'Create...' to create new device as indicated in the following figure:



Step3. Select Connector device type as indicated in the following figure:



Step4. Select a Number for virtual com as indicated in the following figure:



Step5. Press 'Finish'.

Step6. Press 'Create...' to create new device as indicated in the step2 and Select TcpServer device type and Press 'Next' as indicated in the following figure:

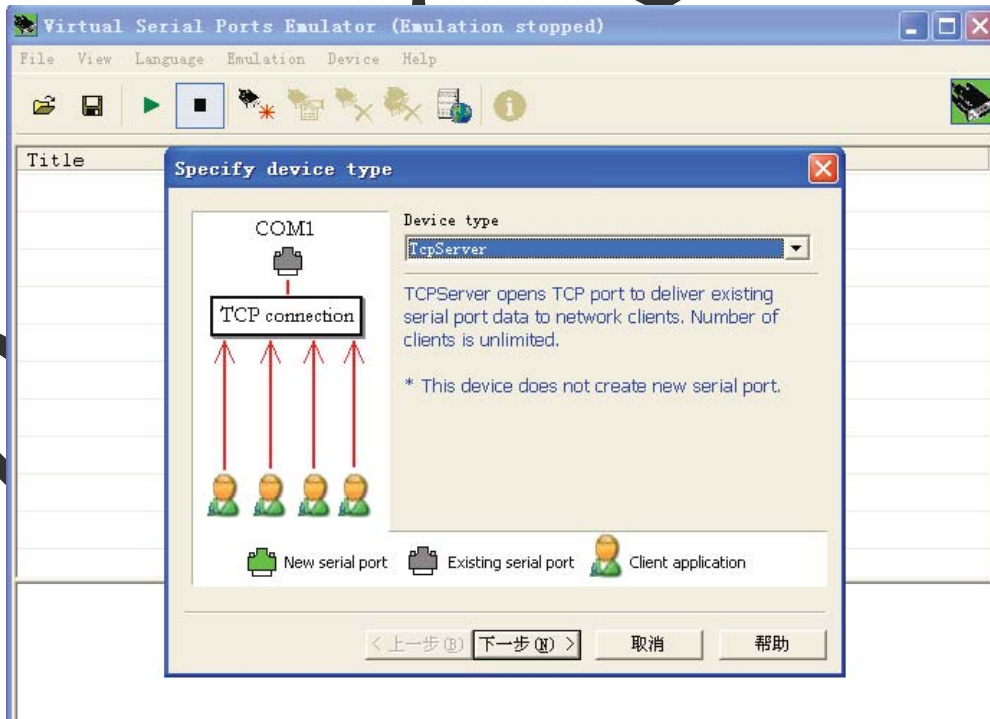
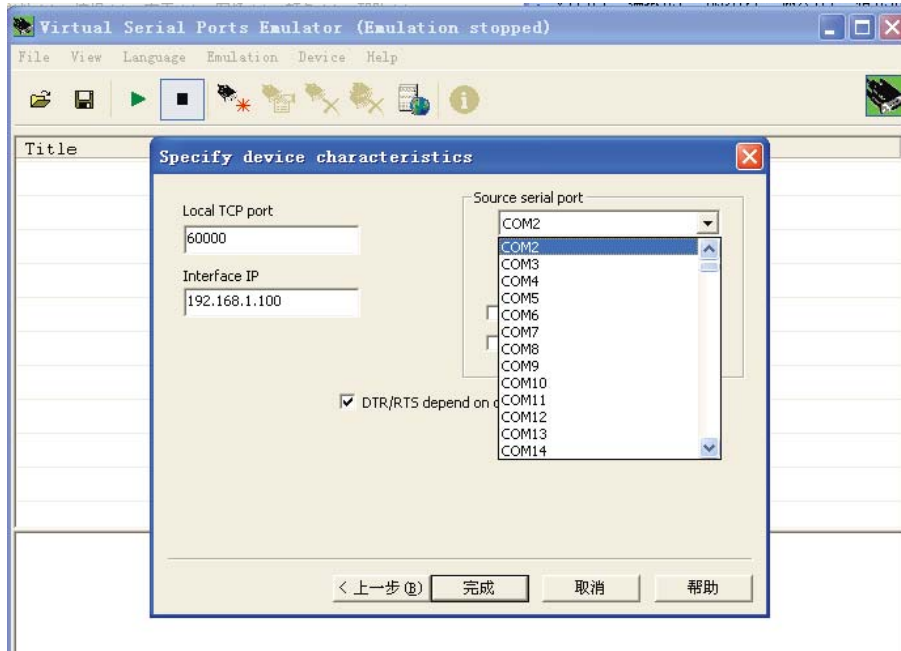


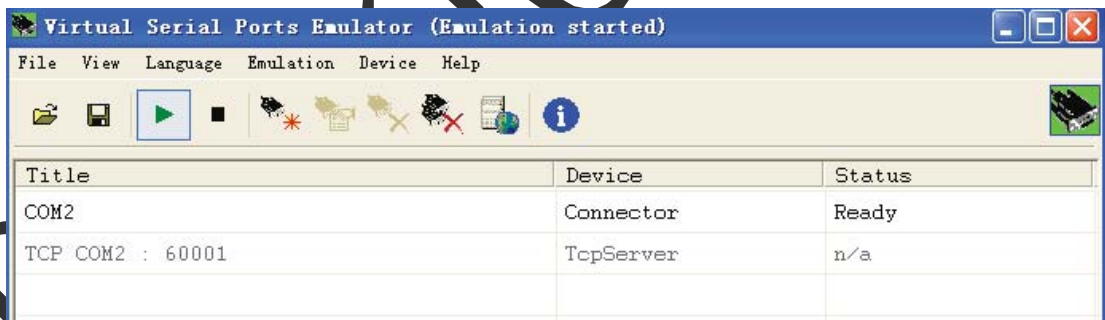
图 6-4 创建 TcpServer

Step7. Enter the IP Adress of your PC in the Interface ip Box and local port number in the Local TCP Port box. Select the proper com number that it has been create in step4. as indicated in the following figure:



Step8. Press 'Finish'.

Step9. Press 'Start' button for using Virtual com as indicated in the following figure:



## Appendix A Revision History of the document

Version	Revised scope	Date
1.00	Draft	2010-10-29

DirectNet

DirectNet