SERIAL TO ETHERNET

CONVERTER

EX-9132-2

User Manual

Table of Contents

Introduction

EX-9132-2 TCP/IP converter is designed to make your serial devices Internet ready instantly. ARM-7 Series of EX-9132-2 TCP/IP converter makes them the ideal choice for connecting your RS-232 or RS-422/485 serial devices—such as PLCs, meters, and sensors to an IP-based Ethernet LAN, making it possible for your software to access serial devices anywhere and anytime over a local LAN or the Internet.

ARM-7 Series converter ensures the compatibility of network software that uses a standard network API (Winsock or BSD Sockets) by providing TCP Server Mode, TCP Client Mode, and UDP Mode. ARM-7 Series' Virtual COM driver, software that works with COM port can be set up to work over a TCP/IP network in no time. This excellent feature preserves your software investment and lets you enjoy the benefits of networking your serial devices instantly.

ARM-7 Series converter supports manual configuration via the handy web browser console and many protocols including TCP, IP, UDP, HTTP, DHCP, ICMP, and ARP. It is the best solution to network your serial devices.

Overview

EX-9132-2 TCP/IP converter is designed to make your serial devices Internet ready instantly.   ARM-7 Series of GDI2000 TCP/IP converter makes them the ideal choice for connecting your RS-232 or RS-422/485 serial devices—such as PLCs, meters, and sensors to an IP-based Ethernet LAN, making it possible for your software to access serial devices anywhere and anytime over a local LAN or the Internet.

ARM-7 Series converter ensures the compatibility of network software that uses a standard network API (Winsock or BSD Sockets) by providing TCP Server Mode, TCP Client Mode, and UDP Mode. ARM-7 Series' Virtual COM driver, software that works with COM port can be set up to work over a TCP/IP network in no time. This excellent feature preserves your software investment and lets you enjoy the benefits of networking your serial devices instantly.

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Package Checklist

ARM-7 product is shipped with the following items:

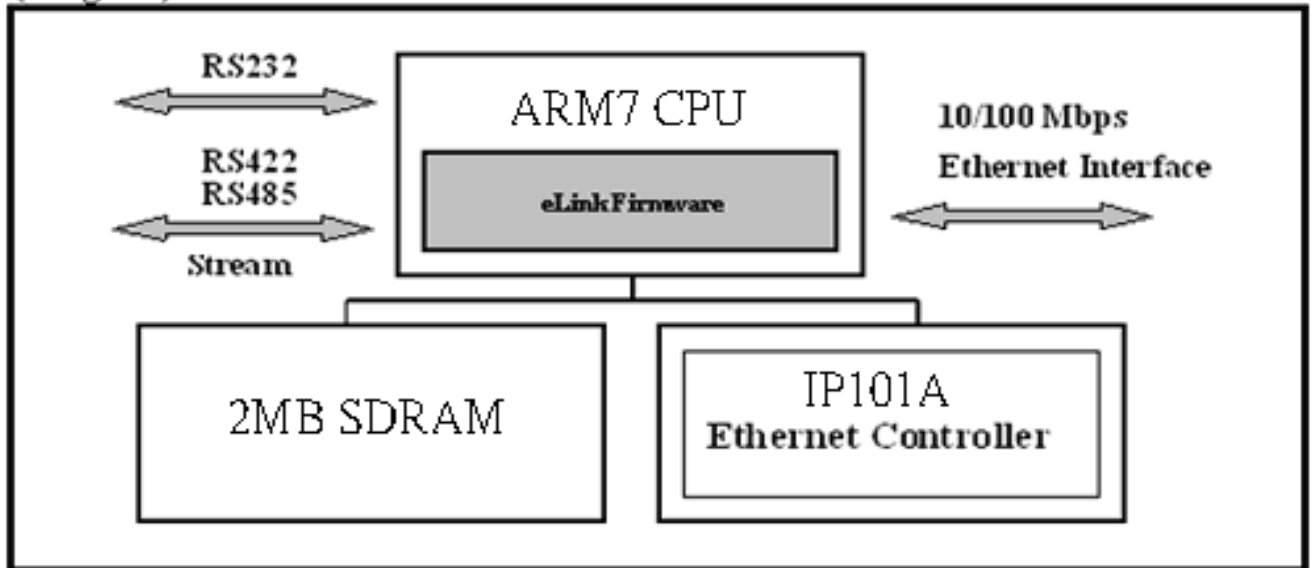1 unit of EX-9132-2 TCP/IP converter

1 unit of Power Adaptor   (9VDC 500mA)

Documentation & Software CD

NOTE: Notify your sales representative if any of the above items is missing or

damaged.

Block Diagram

(Diagram)

RS232

RS422
RS485

Stream

ARM7 CPU

eLinkFirmware

10/100 Mbps
Ethernet Interface

2MB SDRAM

IP101A
Ethernet Controller

Low-cost devices usually are equipped with low speed processors and limited memories. In reality, they are neither having the capability nor practicality to manage complicated network TCP/IP protocols. ARM-7 Series is a low cost while providing high performance network solution by converting data stream between network TCP/IP and popular serial port signals. In stead of processing TCP/IP packets directly, devices need only deal with those interface signals, which greatly simplifies the complexity of TCP/IP network in linkage.

Product Features

□ **Data Conversion between RS-232/422/485 and Ethernet**

Convert serial device (RS-232, RS-422, RS-485) data/signal into the TCP/IP packet data/signal and send them out with the Ethernet data stream or convert the TCP/IP packet data/signal into serial device data/signal.

□ **Dynamic IP Configuration**

Support DHCP client mode, simplifying network address configuration and management.

□ **Dual LAN Speed**

Support 10/100 Mbps Ethernet, auto-detected.

□ **Server / Client Dual Modes**

ARM-7 Series can be configured as network server or network client. In the client mode, it can be installed in network which is protected by NAT router or firewall, without the need of a real IP address.

□ **Web-based Setup**

Parameters setup is based on HTTP protocol by using standard browsers (IE and Netscape). No special software would be required.

□ **Built-in Security Control**

Protected by setup password to prevent intruders.

□ **Firmware Remote Update**

Firmware can be updated directly via Ethernet network to keep up with latest network standards.
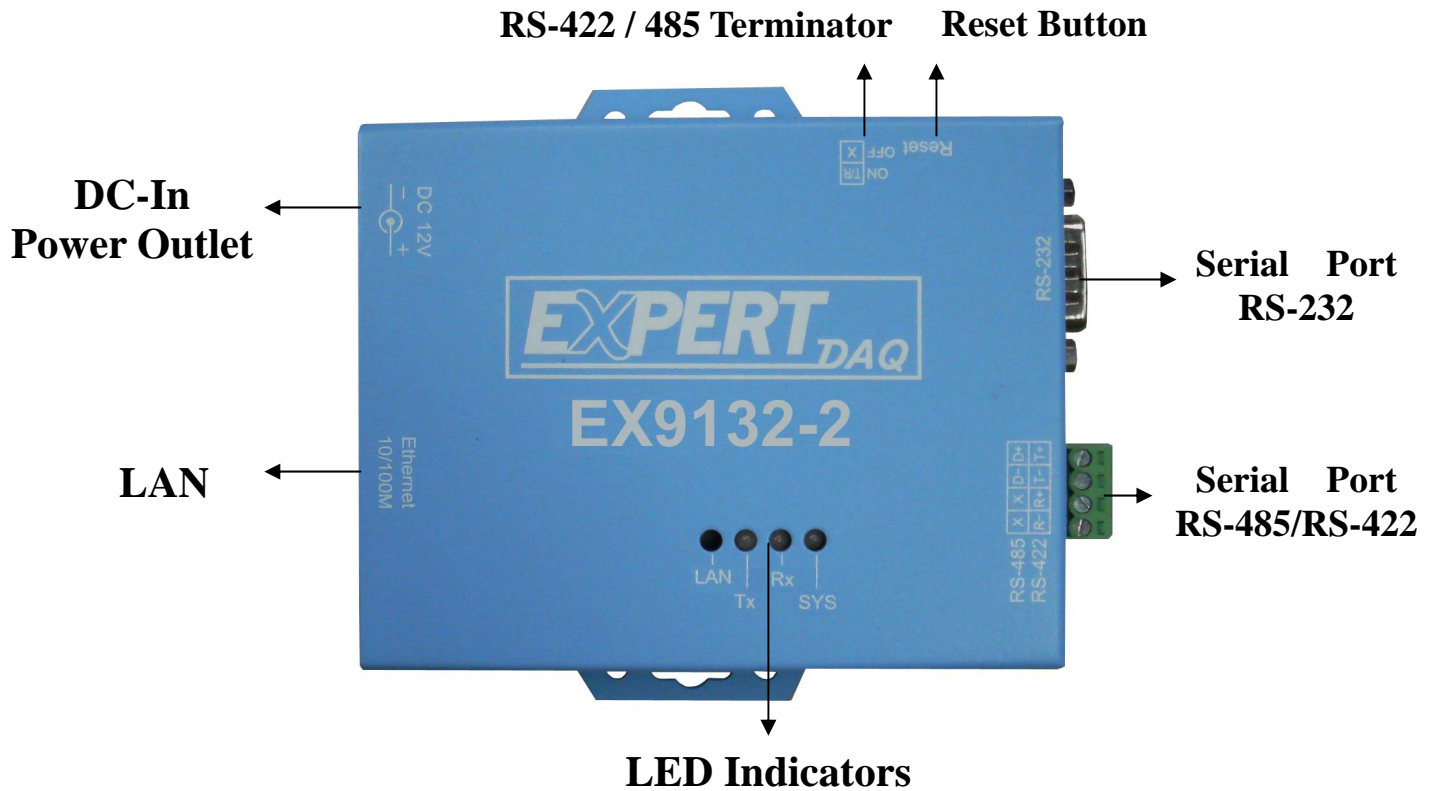
Product Specifications

- CPU : 32-bits ARM-7 CPU , 25 MHz

- RAM : 2 M Bytes SDRAM (1 M * 16Bits)

- ROM : 128 K Bytes Flash ROM

- Ethernet

  - Port Type : RJ-45 Connector

  - Speed : 10 /100 M bps (Auto Detecting)

  - Protocol : ARP , IP , ICMP , UDP , TCP , HTTP , DHCP

  - Mode : TCP Server / TCP Client / UDP

  - Setup : HTTP Browser Setup (IE & Netscape) , RS-232 Console

  - Security : Setup Password

  - Protection : Built-in 1.5KV Magnetic Isolation

- Serial Port

  - Port : RS-232 * 1 Port   RS-422/RS-485 * 1 Port

  - Speed   300 bps~230.4 K bps

  - Parity   None , Odd , Even , Mark , Space

  - Data Bit   5 , 6 , 7 , 8

  - Stop Bit : 1 , 2

  - RS-232 Pins : Rx , Tx , GND , RTS , CTS , DTR , DSR , DCD

  - RS-422 : Rx+ , Rx- , Tx+ , Tx- (Surge Protect)

  - RS-485 : Data+ , Data- (Surge Protect)

- ✧ Built –in RS-422/RS-485 Terminal Resistor

- ✧ 15KV ESD for all signals

- ✧ Watch Dog Function

- ✧ Power : DC 9 – 12 V , 500mA

- ➢ Led Lamp :   SYS (PWR) , LAN , Rx , Tx

- ➢ Environment :   Operating Temperature: 0   50

  Storage Temperature : -10   70

- ➢ Dimensions : 110 * 90 * 30 mm (W * D * H)
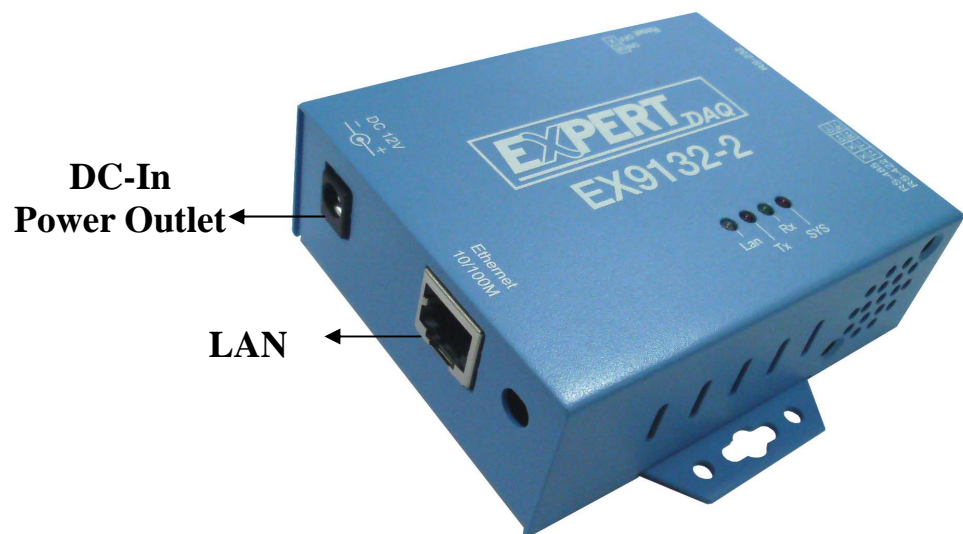
  Weight :   146 gm

Converter   Description

Product Panel View

RS-422 / 485 Terminator   Reset Button

DC-In
Power Outlet

Serial   Port
RS-232

LAN

Serial   Port
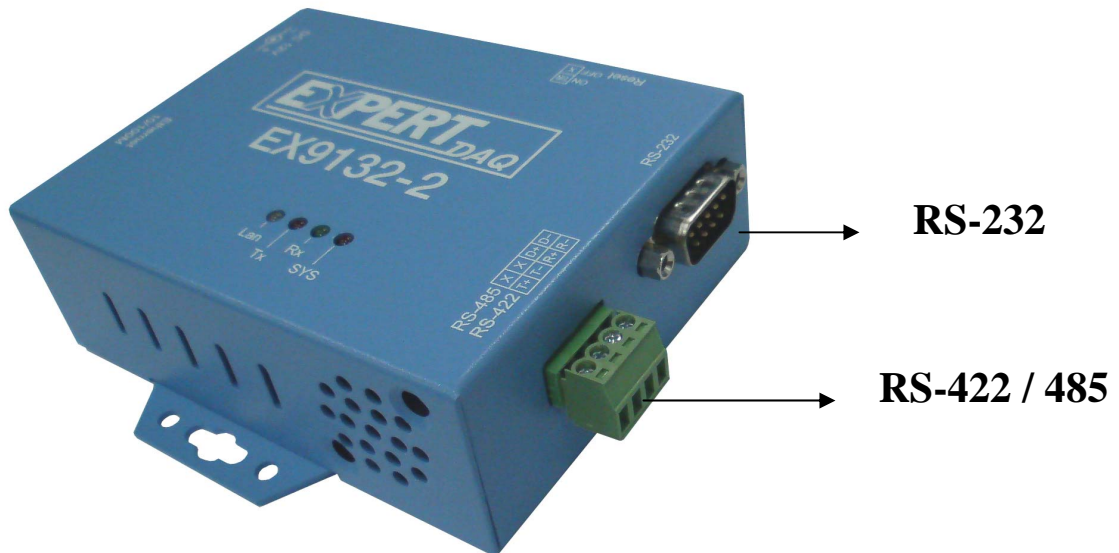RS-485/RS-422

LED Indicators

Left Side

Power Supply

The EX-9132-2 TCP/IP converter is powered by a single 9　12V DC(Inner positive/outer negative) power supply and 500mA of current. A suitable power supply adapter is part of the packaging. Connect the power line to the power outlet at the left side of EX-9132-2 TCP/IP converter and put the adapter into the socket. If the power is properly supplied, the "SYS" red color LED will be blink each time in one second.

LAN Port

The connector for network is the usual RJ45. Simply connect it to your network switch or Hub. When the connection is made, the LAN LED indicator will light. When data traffic occurs on the network, red Tx & Rx LED indicator will blink during data transferring and receiving.
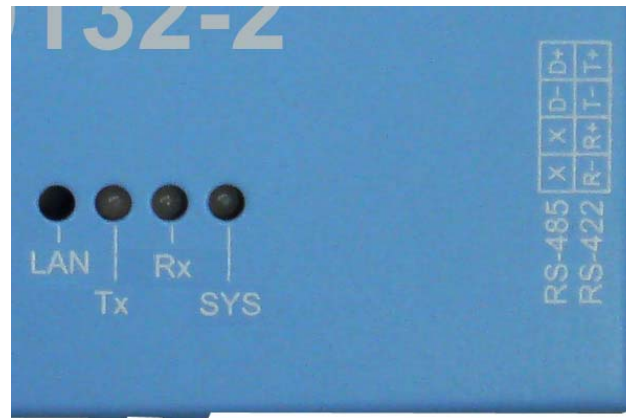
Right Side

RS-232

RS-422 / 485

Serial Port of RS-232/RS-422/RS-485

Connect the serial data cable between the converter and the serial device. Follow the setup procedure to configure the parameters of the converter. (see the following chapters).
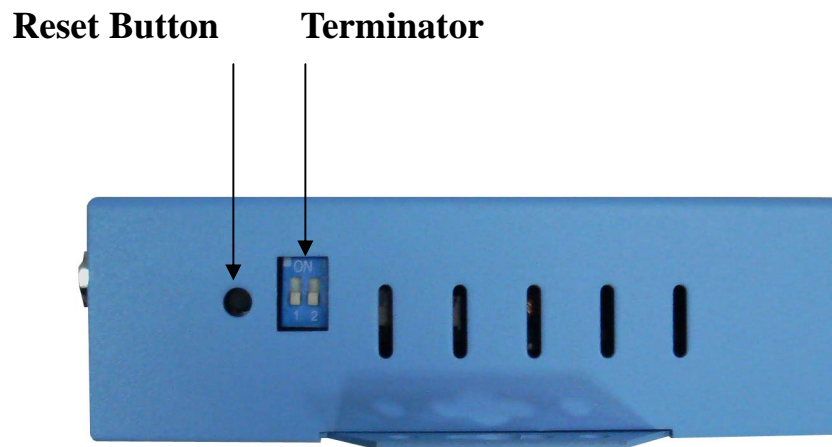
LED Indicators

SYS "Red LED": Power indicated (when the power is on the LED will flash each time in one second)

Rx "Green LED": Network signal receiving indicated (when receive any signal form network the LED will flash)

Tx "Red LED": Network signal transforming indicated (when transmit any signal to network the LED will flash)

LAN "LED": On-line indicated (when converter link to LAN then the LED will keep on)100M- Green LED   10M- Red LED

Terminator & Reset button

Reset Button   Terminator

Resent Button
Press the button then turn on the power and waiting for 3 seconds.
Converter will reset to factory default.

Terminator
There is terminator resistor built in. If the switch 1 & 2 are set in "ON"
position , 120 Ohm resistor is connected between the signals.

Wiring Architecture
RS-232 Wiring Architecture

RS-232 Wiring

Serial Device	Converter
TX	RX
RX	TX
GND	GND

RS-232 (RTS/CTS) Wriing

Serail Device	Converter
RX	TX
TX	RX
GND ———	GND
RTS	CTS
CTS	RTS

RS-232 (RTS/CTS,DTR/DSR) Wriing

Serail Device	Converter
RX	TX
TX	RX
GND	GND
RTS ———	CTS
CTS	RTS
DTR	DSR
DSR	DTR

RS-422 / RS-485 Wiring Architecture

RS-422 Wiring

Serial Device	Converter
T +	R+
T -	R -
R+	T+
R-	T-

HUB

RS-485 Wiring

Serial Device	Converter
D+	D+
D -	D -

HUB

When you finish the steps mentioned above and the LED indicators are as shown, the converter is installed correctly. You can use the Setup Tool "EXPERTDAQETM.exe" to setup the IP Address.

To proceed the advanced parameters setup, please use a web browser (IE or Netscape) to continue the detailed settings.

Converter Configuration

Initial IP Configuration

When setting up your converter for the first time, the first thing you should do configure the IP address. This chapter introduces the method to configure the device server's IP address.   For more details about network settings, see "Web Console Configuration". in next sub section.

For quick setup of converter , We suggest you to reference "Quick Installation Guide" manual.

The following topics are covered in this chapter:

       Device Management Utility

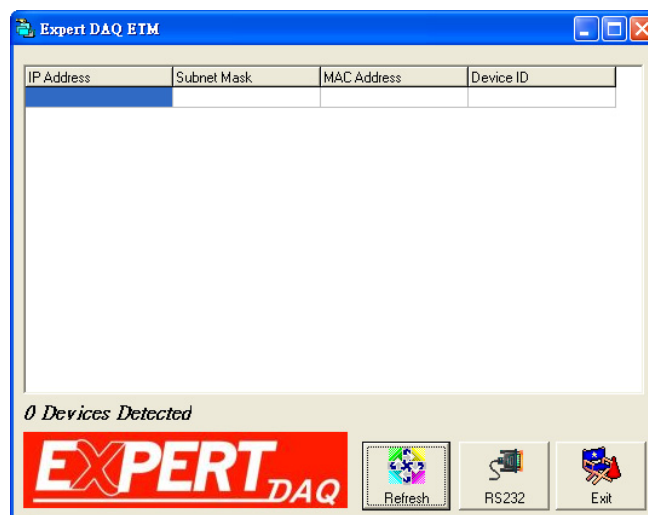   **Menu "View"**

       Menu "Config"

Device Management Utility

On PC we provide a Device Management Utility named ExpertDAQETM which is an executable program in Windows 32 bit environments. ExpertDAQETM Setup Tool is used to detect and setup the installed converters. It uses UDP broadcast packets to query and configure converters on the network.

When you activate the tool, it will detect the existence of the installed converters and depict the converters' status such as IP address, Subnet Mask, MAC Address, and Device ID (see Figure 3.1). The Setup Tool only can setup one converter at a time. Thus if there are more than one converter on the network, please shut down or disconnect other converters. Otherwise the ExpertDAQETM can not detect the converter. Other similar issues, you may reference to Q&A in Appendix A.

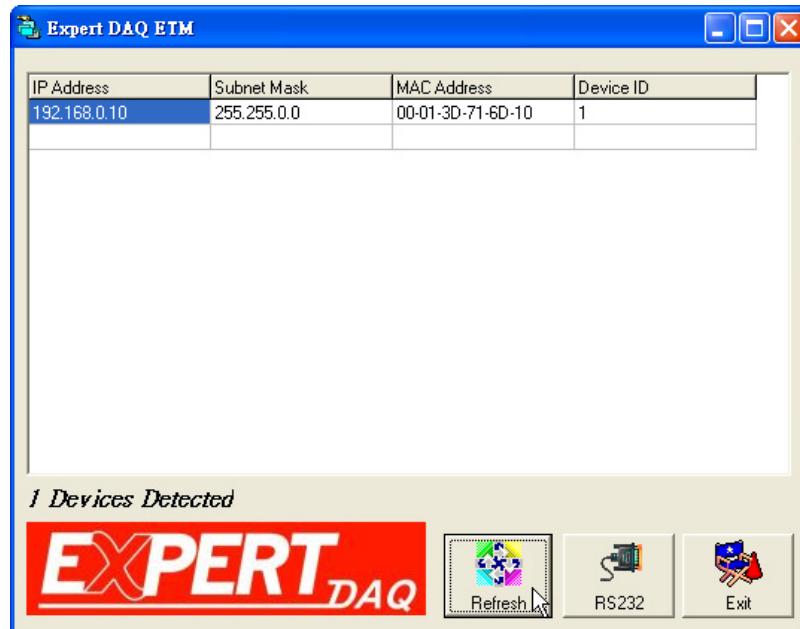Due to the nature of broadcast UDP packets, ExpertDAQETM has following characteristics:

- Broadcast packets aren't limited by subnet. Even if the IP address of the converters and the computer running ExpertDAQETM do not belong to the same subnet, it still works fine.
- Broadcast packets can not pass routers. ExpertDAQETM can only be used to monitor devices with computer running ExpertDAQETM in the same segment of local area network

Refresh

Refresh the status. ExpertDAQETM will send another query to get updated information.

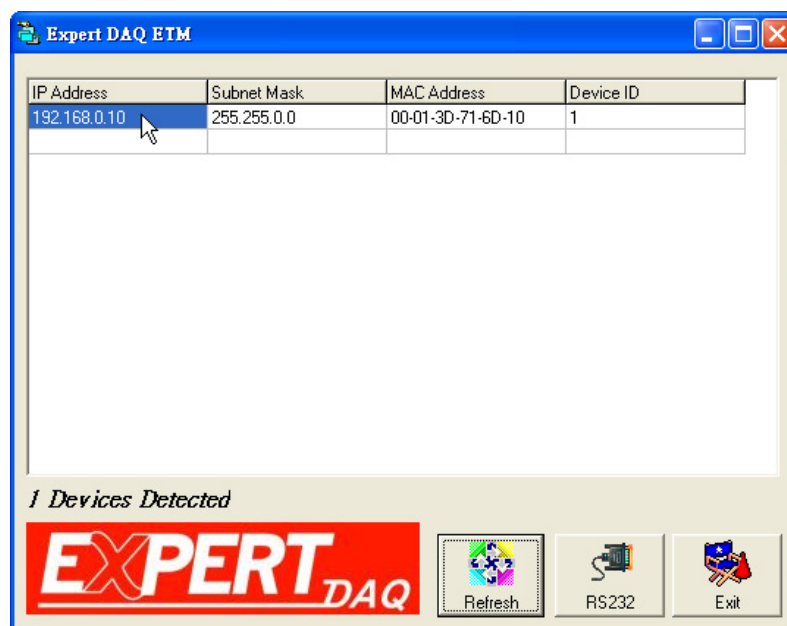Note: Always run the "View-> Refresh" after any data change.

Exit

Exit from the program

ExpertDAQETM Config

Moving the mouse cursor onto the desired device that displaying in information window

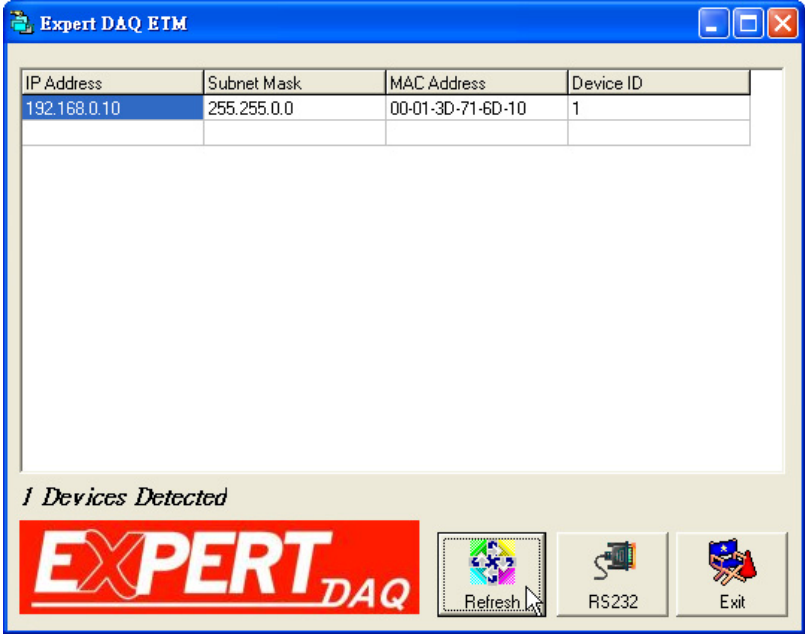Clicking the left button of mouse to invoke the ExpertDAQETM Config.

Note : Because ExpertDAQETM uses broadcast UDP packets, for the sake of security, it allows configuration **only when device's setup password is empty**.

Assign an IP Address with the same Subnet Mask of your computer, avoiding any IP conflict with other network devices.

When you **press [Setup]** button, the IP address will be refreshed in 2~3 seconds.

Web Console Configuration

In addition to basic IP address and subnet mask, specific device settings can be set through HTTP protocol with popular browsers, e.g. Internet Explorer, Netscape, etc.   Setup of the converter is as easy as surfing on WWW, no special software will be required. **Press [Alt]+[Enter] or select [Device Settings] in the [Config] menu, will open a new window in browser to login into the device**. Alternatively, if the IP address of the converter is already known, you can connect to the converter directly by providing its IP address in the URL field of browser.

The following topics are covered in this chapter:

Controller Status

- **The Login Page**
- **Field Description**

Controller Setup

- **The Setup Page**
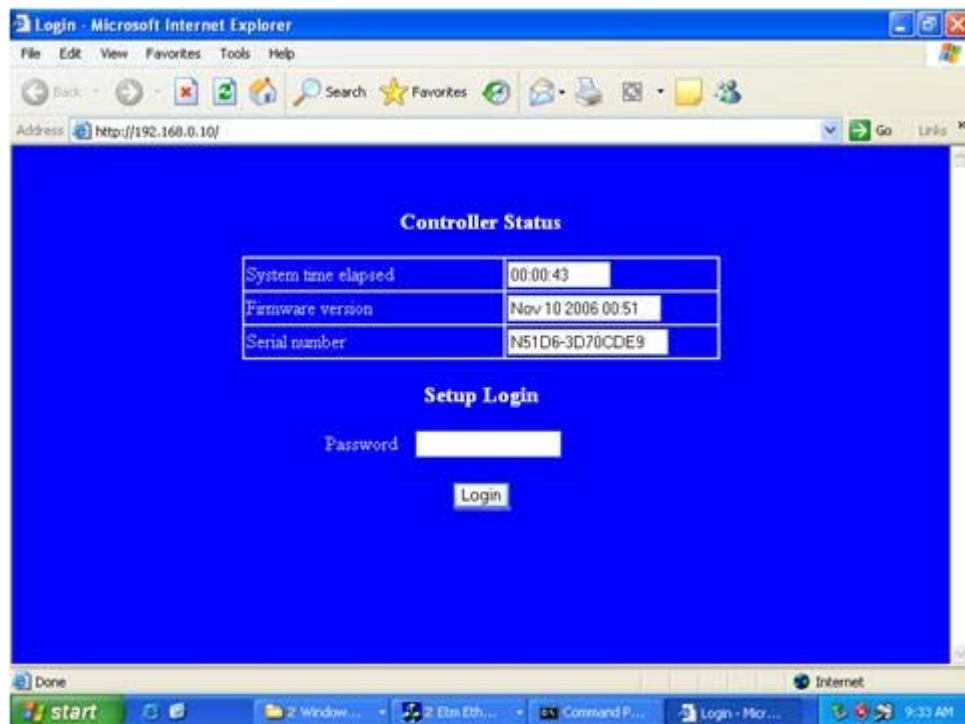- **Field Description**

Controller Updated

Factory Default Setting

Controller Status

The Login Page

Setup of EX-9132-2 TCP/IP converter is as easy as surfing on WWW, no special software will be required. Popular Browsers, such as IE or Netscape, can easily do the setup process. In the browser URL field, set the IP address of device directly, To enter the "Controller Status" page, please follow the steps below.

☐ Open your browser. This chapter will use IE as an example.

☐ In the browser URL field, type the IP address of the converter directly and press ENTER. (The IP address is what you set using the Device Management Utility.)

☐ The "Controller Status" page will be shown (see Figure 3.6).

(Figure 3.6)

Field Description

☐ **System time elapsed**

The time elapsed since start of this device in [Day Hour : Minute : Second] format. This information can be useful in identifying the reliability of system.

☐ **Firmware version**

Converter firmware is identified by date code. This information will be required in looking for technical support.

☐ **Serial number**

Converter is consisted "Type Number (5 digits) and an unique MAC (Media Access Control) address used by Ethernet in hex format, 8 digits.

☐ **Password (Setup Login)**

This field is the administration password for authentication. Factory default is "**empty**". However, it is not recommended to leave it empty in field operation. If you could not login, it means you have to key in the password. If you do not know the password you can turn off the power and then use any point tip to press "Reset" button and hold it to turn on the power**.**   The password will be reset to the factory default as **"empty".**

EX-9132-2 TCP/IP converter uses the same password protection mechanism commonly used in Windows NT or UNIX. If there are more than **"3 consecutive failures"** in password check during login, the login function will be disabled for **"15 minutes"**. During this 15 minutes period, if you supply correct password, login will not proceed. This prevents intruders from finding the password by computer generated program.

Controller Setup

□ The Setup Page

Type the correct password in the "Password" field and click the [Login] button in the "Controller Status" page, then the "Controller Setup" page will appear (see Figure 3.7).

Note: If you forget the password or can't login successfully, please contact the manufacturer directly.

Controller Setup

IP address	192.168.0.10
Subnet mask	255.255.0.0
Gateway address	0.0.0.0
Network link speed	Auto
DHCP client	Disable
Socket port of HTTP setup	80
Destination IP address / socket port (TCP client and UDP)	0.0.0.0 0
Connection	Auto
TCP socket inactive timeout (minutes)	10
Packet mode of serial input	Disable
Device ID	1
Report device ID when connected	Disable
Setup password	

Serial Port 1

Socket port	100 TCP Server
Interface	RS 232
Baud rate, parity, data and stop bits	9600 None 8 1

Serial Port 2

Socket port	101 TCP Server
Interface	RS 485 (Half Duplex)
Baud rate, parity, data and stop bits	9600 None 8 1

Digital I/O Port

Socket port	102 TCP Server
Configuration	IO1 Input IO2 Input IO3 Input IO4 Input IO5 Input IO6 Input IO7 Input IO8 Input

Update

(Figure 3.7)

☐ **Field Description**

☐ **IP Address**

The IP address of EX-9132-2 TCP/IP converter, 4 digits separated by Don't let it conflict with the other devices on the network.

If DHCP client mode is enabled and there's a DHCP server on the network, this field will be assigned by DHCP server automatically.

☐ **Subnet mask**

Subnet mask of the network EX-9132-2 TCP/IP converter has connected to. "255.255.255.0" is usually used for small network, "255.255.0.0" for larger network, 4 digits separated by '.'

If your IP address is provided by an ISP or the internal network administrator, please inquire of them that information and type it correctly.

If DHCP client mode is enabled and there's a DHCP server on the network, this field will be assigned by DHCP server automatically.

☐ **Gateway address**

Gateway or Router IP address.   'Gateway' is a device which connects local network to external network.   If you need to communicate with other networks or your device owns a real IP address on the internet, please inquire of them that information and type it correctly.   If there's no gateway on the network, just leave it as "0.0.0.0".

If DHCP client mode is enabled and there's a DHCP server on the network, this field will be assigned by DHCP server automatically.

□ **Network link speed**

Ethernet physical link speed. "Auto" means the speed is automatically selected by the converter. You can also specify "10Mbps" or "100Mbps" to match the speed of the HUB.

□ **DHCP client**

DHCP client mode could be enabled/disabled statues. If DHCP is enabled, there should be a DHCP server on the network. If DHCP is disabled, [IP address], [Subnet mask], and Gateway address] should be manually assigned.

□ **Socket port of HTTP setup**

The socket port used to conduct the browser setup. Normally, HTTP protocol use TCP port "80" for communication. If the field is changed to "81", the port "80" will be reserved for user's own Web.

To enter the browser setup page, "http://x.x.x.x:81" should be typed for socket port "81" and "http://x.x.x.x" for socket port "80", where "x.x.x.x" is the converter's IP address..

□ **Destination IP address**

The server IP address and socket port would be connected in TCP Client and UDP mode for a certain server IP address.

□ **Destination socket port**

The server socket port would be connected in TCP Client and UDP mode for a certain socket port.

□ **Connection**

The connection can be selected in 2 modes.

" Auto function for connect Automatic of converter"

"Manual function for program control of converter "

☐ **TCP socket inactive timeout imput**

we add a mechanism - "inactive timeout" to identify whether the socket is active or dead. If there is no any data transferred (send / receive) within the defined timeout period (1 to 99 minutes), then it is probably a dead socket, and the socket will be closed automatically, thus a new connection can be accepted again. The timeout period can be set by users to fit different kinds of application.

☐ **Packet mode of serial input**

Packet mode could be in enabled/disabled mode. If packet mode is enabled, the data input from UART will be deferred until the input buffer is full, or the converter detects a 10-character packet gap and no more character arrived. The block waiting time is extended to avoid the splitting of the complete packet.

☐ **Device ID**

User assigned ID number for the converter.   Available ID is "0 ~ 65535".

☐ **Report device ID when connected**

In TCP mode, if this parameter is enabled, every time when the socket is connected, EX-9132-2 TCP/IP converter will immediately report its device ID in the following formats:

Serial #1	nnnnnA[LF][CR]
Serial #2	nnnnnB[LF][CR]
Digital I/O	nnnnnC[LF][CR]

The total length is 8 bytes, where "nnnnn" is a 5-digit device ID assigned by the user; [LF] is decimal 10; [CR] is decimal 13.

☐ **Setup password**

Administration password used to login the "Controller Setup" page. It may be empty or up to 15 characters long.

□ **Serial Port 1**

The first serial port of EX-9132-2 series is RS-232.

□ **Socket port**

□ **Port number**

A socket port assigned for the serial port. It's a 16-bit number , ranging from 1 to 65535. Because the numbers below 1000 are used for specific purposes (e.g. 80 is for HTTP protocol), we suggest you use the numbers larger than 1000. Generally the port number 4660 is used for the serial communication. However you should specify different port number for each serial port.

□ **Socket type**

TCP Server: TCP protocol, passive open, to be connected from the TCP client**s**.

TCP Client: TCP protocol, active open, connect to the TCP server.

UDP Client: UDP protocol, connectionless

□ **Interface**

RS232: TxD, RxD for data stream, no flow control

RS232 (RTS/CTS): TxD, RxD for data stream, RTS/CTS for flow control

RS232 (RTS/CTS, DTR/DSR): TxD, RxD for data stream, RTS/CTS

for flow control. DTR for socket status, DSR for socket open/close control

□ **Baud rate, parity, data bits, stop bits**

Baud Rate: 300 ~ 230400 bps

Parity: None, Even, Odd

Data Bits: 5, 6, 7, 8

Stop Bit: 1 or 2

☐ **Serial Port 2**

The second serial port is RS-422/485.

☐ **Socket port**

☐ **Port number**

A socket port assigned for the serial port.　It's a 16-bit number , ranging from 1 to 65535.　Because the numbers below 1000 are used for specific purposes (e.g. 80 is for HTTP protocol), we suggest you use the numbers larger than 1000.　Generally the port number 4660 is used for the serial communication.　However you should specify different port number for each serial port.

☐ **Socket type**

TCP Server: TCP protocol, passive open, to be connected from the TCP client**s**.

TCP Client: TCP protocol, active open, connect to the TCP server.

UDP Client: UDP protocol, connectionless

☐ **Interface**

RS485 (Half duplex): Half duplex RS-485 interface, RTS for driver enable/disable

RS422 (Full duplex): Full duplex RS-422 interface

☐ **Baud rate, parity, data bits, stop bits**

Baud Rate: 300 ~ 230400 bps

Parity: None, Even, Odd

Data Bits: 5, 6, 7, 8

Stop Bit: 1 or 2

Controller Updated

Press "Update" Button After you finish the detailed parameter setting. The converter will save all parameters into internal non-volatile memory and then reboot (see Figure 3.8).   It takes about 5 seconds to complete the whole process, and a new login page will be presented (see Figure 3.1).

(Figure 3..8)

You can re-login and check if all parameters have been correctly saved. If everything is ok, you can close the browser now.

Note : If the domain of the converter is different from that of the computer running the browser, the login page won't appear unless the converter's "Gateway Address" has been correctly set.

Factory Default Setting

If by chance, you forget the setup password, or have incorrect settings making the converter inoperable, there are two ways to reset the setting and the following procedures can be used to reset all settings to factory default:

A:

1. Turn off the power of the converter.
2. Press the reset button of the converter.
3. Turn on the power of the converter and wait for 3 seconds.
4. The password will reset to the factory default. (empty).

B:

1. Log in the web page.
2. Press the reset button of the converter.
3. Select the update button.
4. After Tx & Rx light flashing then unclasp the reset button.
5. The password will reset to the factory default. (empty)

Self-Testing

After completing the wiring and parameter setting, we should verify if the setting is correct or not. This chapter will introduce how to use a single computer to test if the converter behaves well.

The operating system can be Windows 95, 98, ME, XP, 2000. The "Hyper Terminal" utility should be installed on your PC (see Figure 4.1). It can be found in your Windows installation CD.

The wiring architecture is similar to "RS-232 Wiring" in chapter 2, and the "Serial Device" is replaced by the PC's COM 1. The same PC also plays the roll of the Remote Host.

The following topics are covered in this chapter:

Hyper Terminal for TCP/IP WinSock

Hyper Terminal for COM Port

Data Transmission

Hyper Terminal for TCP/IP WinSock

Initiate a Hyper Terminal from the Start Menu in Windows (see Figure 4.1),
give a terminal name, choose an icon, and press "OK" button (see Figure
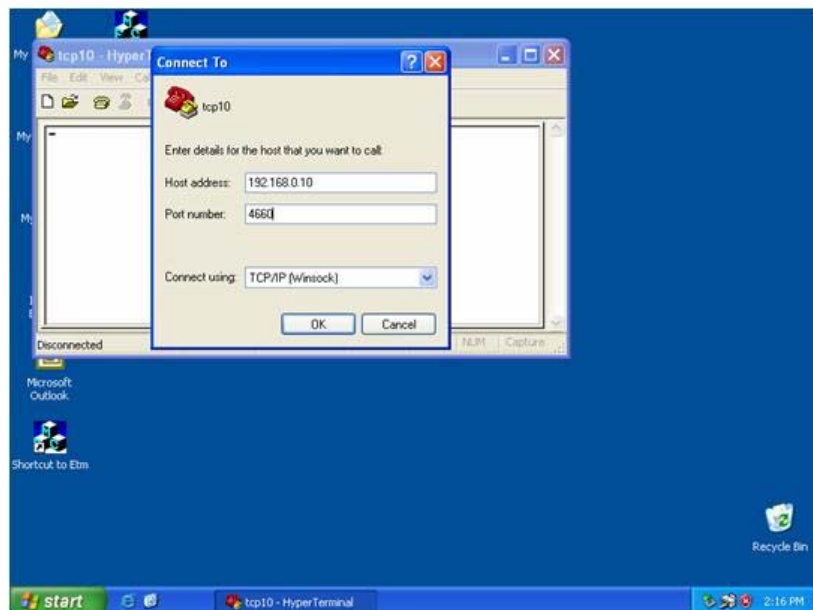4.2).

(Figure 4.1)

(Figure 4.2)

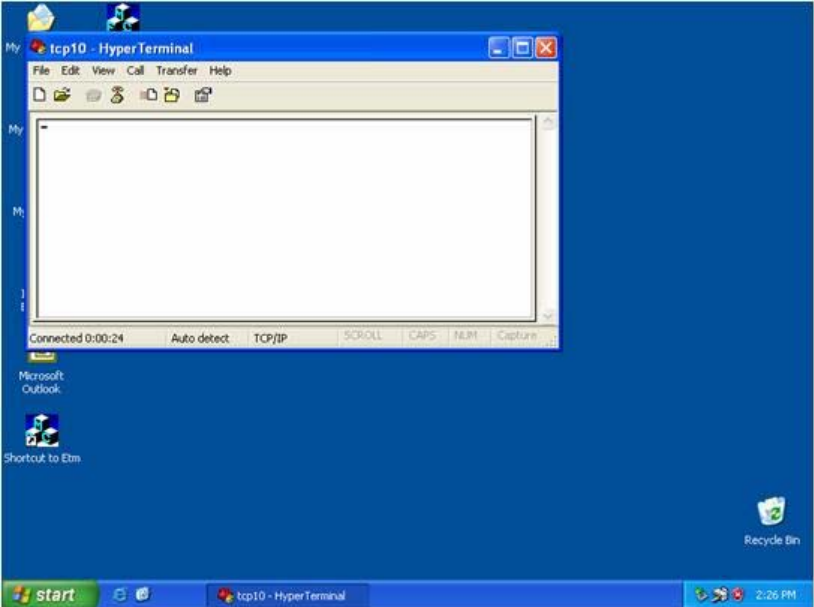Select "TCP/IP(Winsock)" option at the "Connect using:" field (see Figure 4.3)

(Figure 4.3)

After "OK" button is pressed, Figure 4.4 appears.　Enter the converter's IP address (e.g. 192.168.0.10) at the "Host address:" field, and the Socket port number set for the Serial Port 1 at the "Port number:" field (e.g 4660).　(The Socket type of the Serial Port 1 should be "TCP Server".)
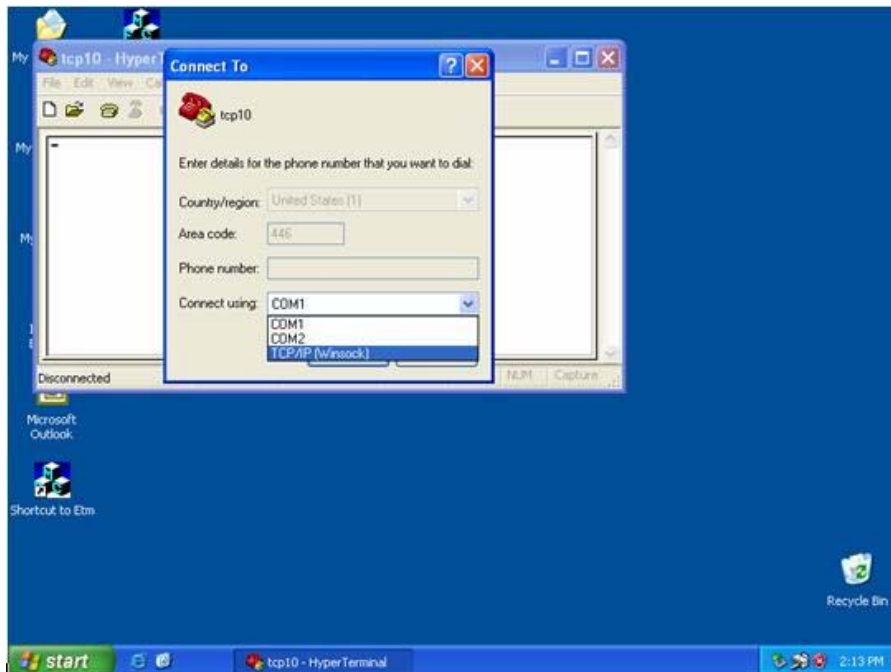

(Figure 4.4)

After "OK" button is pressed, Figure 4.5 appears. If the Hyper Terminal connects with the converter successfully, the time clock at the "left lower" corner "Connected hh:mm:ss" will start counting.

(Figure 4.5)

Hyper Terminal for COM Port

Initiate another Hyper Terminal as a COM Port Terminal (in Figure 4.3, select COM 1 or other COM port instead of "TCP/IP (Winsock)").   Set the COM port Properties to be the same as those set for the Serial Port of the converter (9600.N.8.1).

(Figure 4.3)

Data Transmission

When all steps described above are finished, type any characters on the COM Port Terminal and check if the typed characters are also displayed on the TCP/IP Winsock Terminal.   Alternatively, check if the characters typed on the TCP/IP Winsock Terminal are also displayed on the COM Port Terminal.   If yes, then all settings are correct and the converter can operate properly.

Append FAQ

Q. Why can't the EXPERTDAQETM.exe detect the converter on the network?

A. Please check

1. Power is properly plugged to the converter. (Please refer "SYS' LED)

2. Network cable is properly connected between the converter and the Hub.
   (Please refer LAN LED)

3. Close Windows or antivirus program firewall.
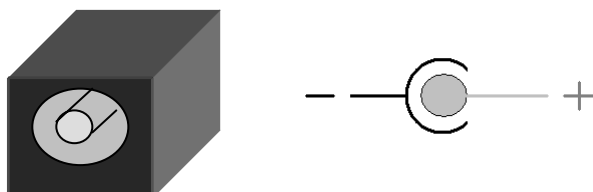   (Please refer Device Management Utility of EXPERTDAQETM)

Q. Why can't I use IE to setup the converter?

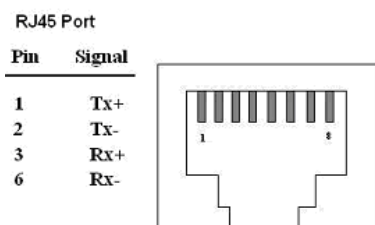A. Please check if the network domain of your PC is the same as that of the converter.

Appendix B

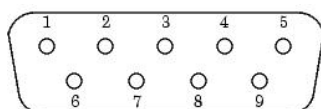# Pin outs and Cable Wiring

☐ **DC Power outlet**

☐ **RJ-45 Pin Assignment**

RJ45 Port

Pin	Signal
1	Tx+
2	Tx-
3	Rx+
6	Rx-

☐ **RS-232 Pin Assignment**

The pin assignment scheme for a 9-pin male connector on a DTE is given below.
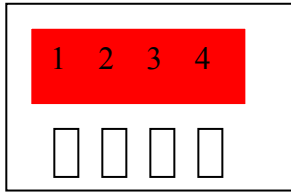
PIN 1 : DCD   PIN 2 : RXD   PIN 3 : TXD   PIN 4 : DTR
PIN 5 : GND   PIN 6 : DSR   PIN 7 : RTS   PIN 8 : CTS
PIN 9 : X

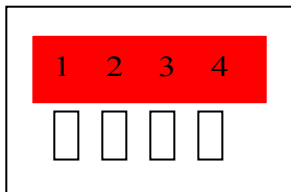□ **RS-422 Pin Assignment**

The pin assignment scheme for a 4-pin RS-422 is given below.

PIN 1 : T+   PIN 2 : T-   PIN 3 : R+   PIN 4 : R-

□ **RS-485 Pin Assignment**

The pin assignment scheme for a 4-pin RS-485 is given below.

PIN 1 : X   PIN 2 : X   PIN 3 : D+   PIN 4 : D-