

# USER'S MANUAL



## PH485Ex4

#4 RS-485/RS422 OVER ETHERNET TERMINAL SERVER/CLIENT

**IPEX**

**(IP Electronix)**

14 January 2022

ipelectronix.com

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## 1. INTRODUCTION

**IPEX PH485Ex4** bidirectional communication terminal server/client is a simple solution for connecting serial devices to a network which results in having 2 RS-485 or RS-422 serial ports over Ethernet network. This converter uses transparent communicate protocol, so it is not required to understand complex Ethernet TCP/IP protocol, and no modification in serial programs is needed. It operates as a Real COM, TCP Server, TCP Client, UDP Server and UDP Client Full-Duplex converter and supports bidirectional connection.

Protection against Surge, ESD and EMI is implemented in its design and it has 3kV isolation between Ethernet and RS-485/RS-422 sides. Furthermore, all the RS-485/RS-422 ports are insulated from each other too.

**PH485Ex4** is designed for industrial usage and is useful for connecting any device with a serial interface to a computer via Ethernet supported network like LAN, WAN ... and can be used in Industrial Automation, Telecommunications, SCADA Systems, DCS Systems ....

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## 2. SPECIFICATIONS

- **Number of Ports:** #4 RS-485/RS-422 Serial Port, #1 Ethernet RJ45 (10/100 Mbps) Port;
- **Serial Standard:** Meets or Exceeds the Requirements of TIA/EIA-485/422;
- **Network Protocols:** ICMP, IP, TCP, UDP, DHCP, Telnet, DNS, ARP, HTTP;
- **RS-485 Signals:** Data+, Data-, GND, Asynchronous Half-Duplex, 2-Wire Differential;
- **RS-485 Data Direction Control:** ADDC (Automatic Data Direction Control);
- **RS-422 Signals:** Tx+, Tx-, Rx+, Rx-, GND, Asynchronous Full-Duplex, 4-Wire;
- **Baud-Rate Type:** Both Standard and Custom Baud Rates are Supported;
- **Baud-Rates:** 50, 75, 110, 150, 300, 450, 600, 900, 1200, 1800, 2400, 3600, 4800, 7200, 9600, 14400, 19200, 28800, 38400, 56000, 57600, 76800, 115200, 153600, 184320, 230400, 307200, 460800, 921600 bps; Selectable;
- **RS-485/422 Data Bits:** 5, 6, 7, 8; Selectable;
- **RS-485/422 Parity:** Even, Odd, None, Mark and Space; Selectable;
- **RS-485/422 Stop Bits:** 1, 1.5, 2; Selectable;
- **Data Buffer:** 4000 Bytes (2k Bytes Transmit, 2k Bytes Receive);
- **Power (Green)** LED Indicator;
- **Transmit (Blue)** and **Receive (Yellow)** LED Indicator for All Ports;
- **TCP Server (Green), TCP Client (Green)** and **UDP (Green)** LED Indicator;
- **ESD Protection:** RS-485 Bus-Pin ESD Protection Exceeds  $\pm 15$  kV Using Human-Body Model (HBM);
- **Dimensions:** 145mm x 118mm x 27mm (5.70in x 4.65in x 1.06in);
- **Operating Temperature:** -10°C to +70°C (+14°F to +158°F);
- **1 Year Guarantee and 5 Years Support.**

### 3. PACKAGE CHECKLIST

Before installing the PH485Ex4, verify that the package contains the following items:



1) #1 PH485Ex4 Multiport



2) #1 Quick Start Guide



3) #1 Document and Driver CD-ROM



4) #4 DB9 Female Connector



5) #1 220V AC to 12V DC Adaptor



6) #2 Din Rail Brackets with the corresponding screws

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

**4. TOP VIEW**



**5. BOTTOM VIEW**



**6. FRONT VIEW**



**7. BACK VIEW**



## 8. GENERAL INDICATORS

**POWER LED (Green):** It is turned ON, when the power supply connects to +VDC and GND correctly.

## 9. PORT INDICATORS

**TCP Server LED (Green):** Blinking this LED shows that the TCP Server mode for this port is selected and device is trying to connect in this mode. If the device connects to a client, then this LED turns on continuously.

**TCP Client LED (Green):** Blinking this LED shows that the TCP Client mode for this port is selected and device is trying to connect in this mode. If the device connects to a server, then this LED turns on continuously.

**UDP LED (Green):** Blinking this LED shows that the UDP mode for this port is selected and device is trying to connect in this mode. If the network works properly, then this LED turns on continuously.

**PE LED (Red):** It is blinking if the device detecting a Parity Error in data.

**RX LED (Yellow):** It is blinking when the device receive data on serial port.

**TX LED (Green):** It is blinking when data is transmitting from the device serial port.

**REDIRECT IN (YELLOW):** It is turned on if data from other ports are redirected to this port.

**REDIRECT OUT (GREEN):** It is turned on if data from the port are redirected to any other port.

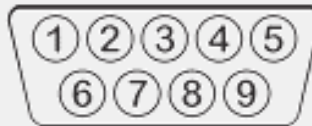
## 10. DEVICE POWER SUPPLY

To working properly, you should connect a DC Power Supply to PH485Ex4. The voltage of the Power Supply should be from +8V to +48V. For example, this device is working with a single +12V, +15V or +24V DC Adaptor as well.



**11. RS-485/RS-422 SERIAL PORTS, PIN CONFIGURATION**

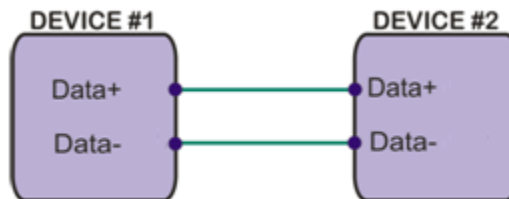
Port	Pin #	Name	Task	Type
RS-422	1	TX+	Transmit +	Output
	2	TX-	Transmit -	Output
	3	RX+	Receive +	Input
	4	RX-	Receive -	Input
	5	GND	Ground	GND
RS-485	6	NC	No Connection	-----
	7	DATA-	Data -	Bi-Directional
	8	DATA+	Data +	Bi-Directional
	9	GND	Ground	GND

**Connector Type: DB9 Male**

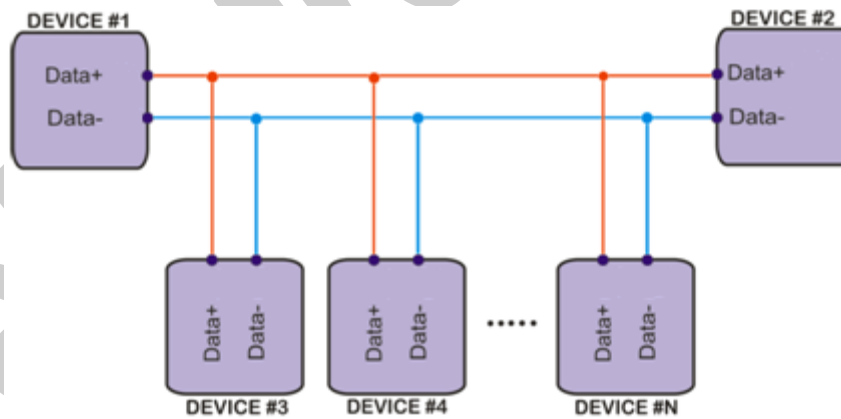
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## 12. RS-485 CONNECTING METHODS

### - RS-485: Point to Point Connection

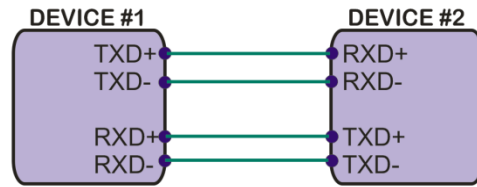


### - RS-485: Multipoint Network

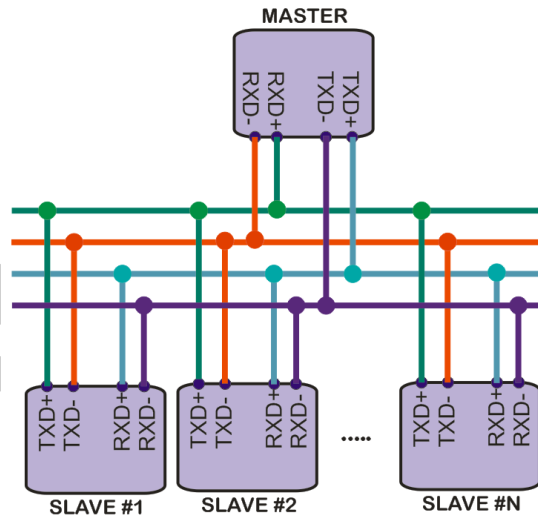


### 13. RS-422 CONNECTING METHODS

- **RS-422: Point to Point**



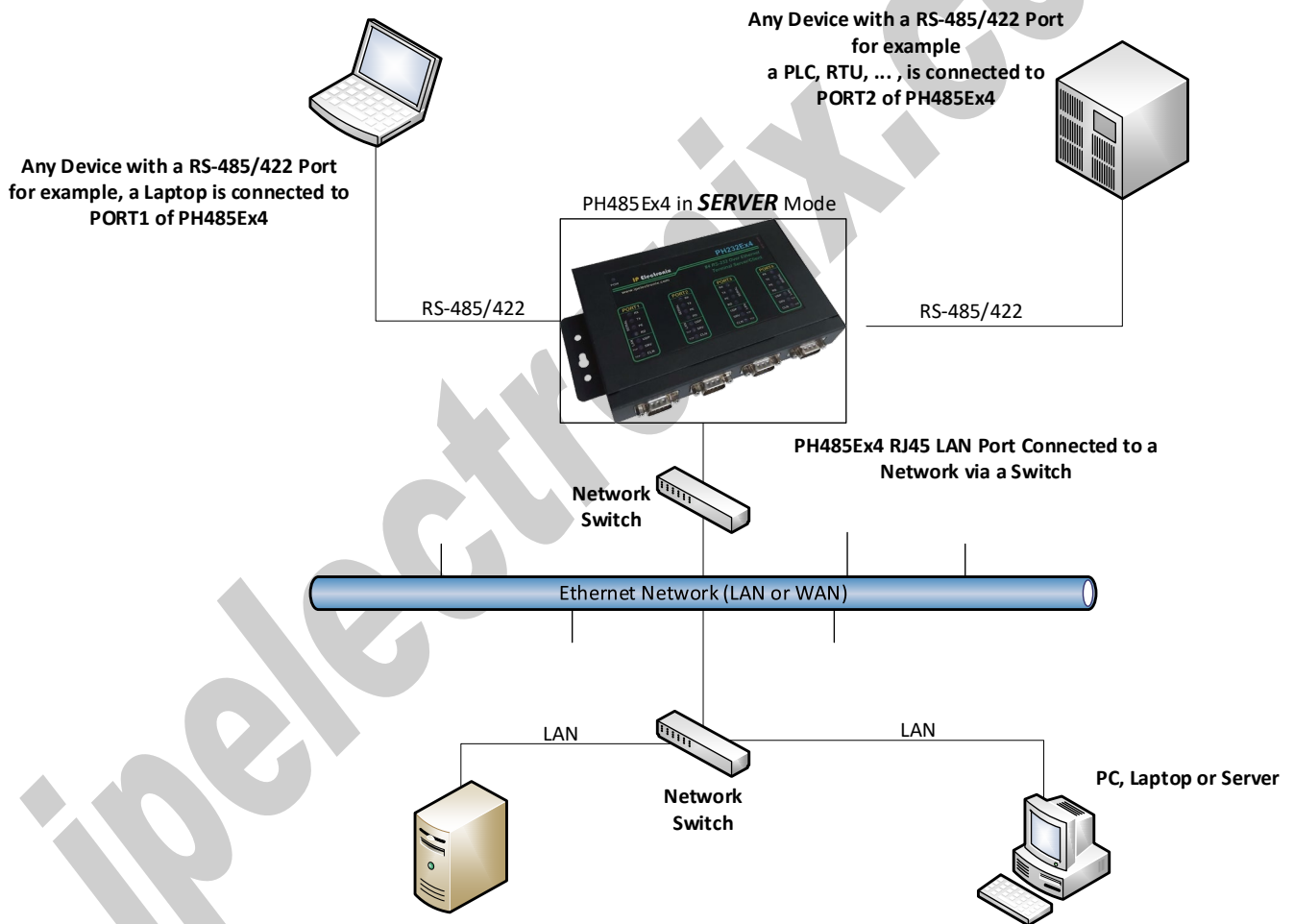
- **RS-422: Multi-Drop Network**



### 14.CONNECTION DIAGRAM

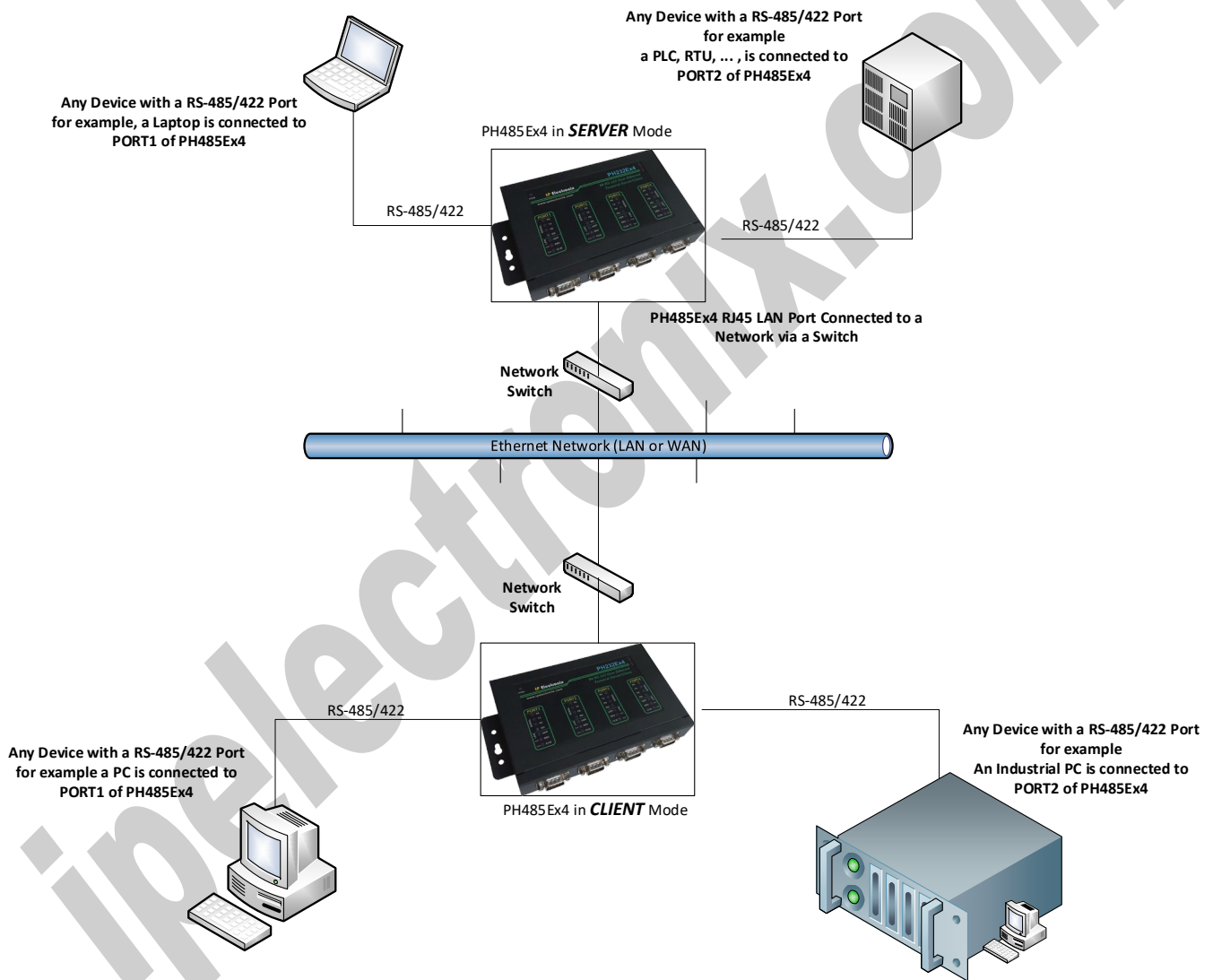
#### - PH485Ex4 as a Terminal Server

The below diagram is a typical connection configuration of PH485Ex4. You can connect a device with a RS-485/422 serial port to RS-485/422 serial port of the PH485Ex4, then you can connect to the device behind the network by any application software you want by opening a TCP or UDP Socket without need of any auxiliary driver.



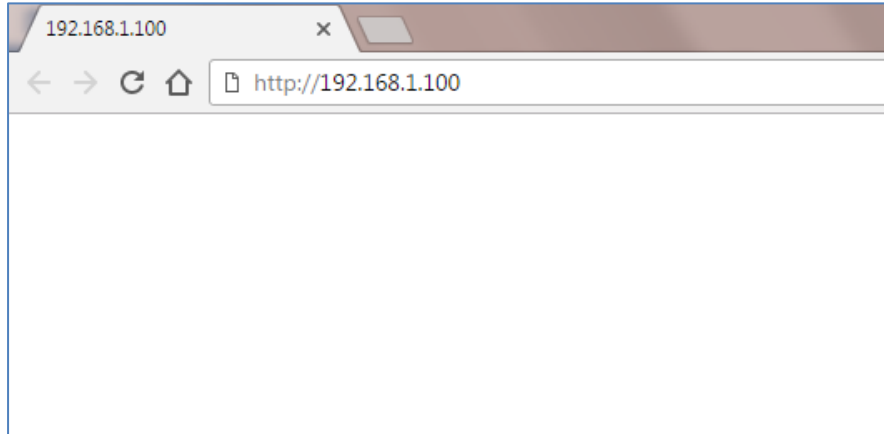
## - Client/Server, Peer to Peer Connection

If you want to connect two devices which have only RS-485/422 Ports to each other via Ethernet network, you can use this connecting method. Take two PH485Ex4. Set one PH485Ex4 as Server and another one as Client with adding Remote Server IP and Port Number on it. These two converters are connecting automatically via network to each other, so RS-485/422 PORT of Server, connects to RS-485/422 PORT of Client via network. Now you can connect your RS-485/422 devices to COM Ports as shown in the following diagram.



## 15. DEVICE CONFIGURATION WEBPAGE

To open device configuration webpage, enter the device IP on your web browser address bar like this figure:

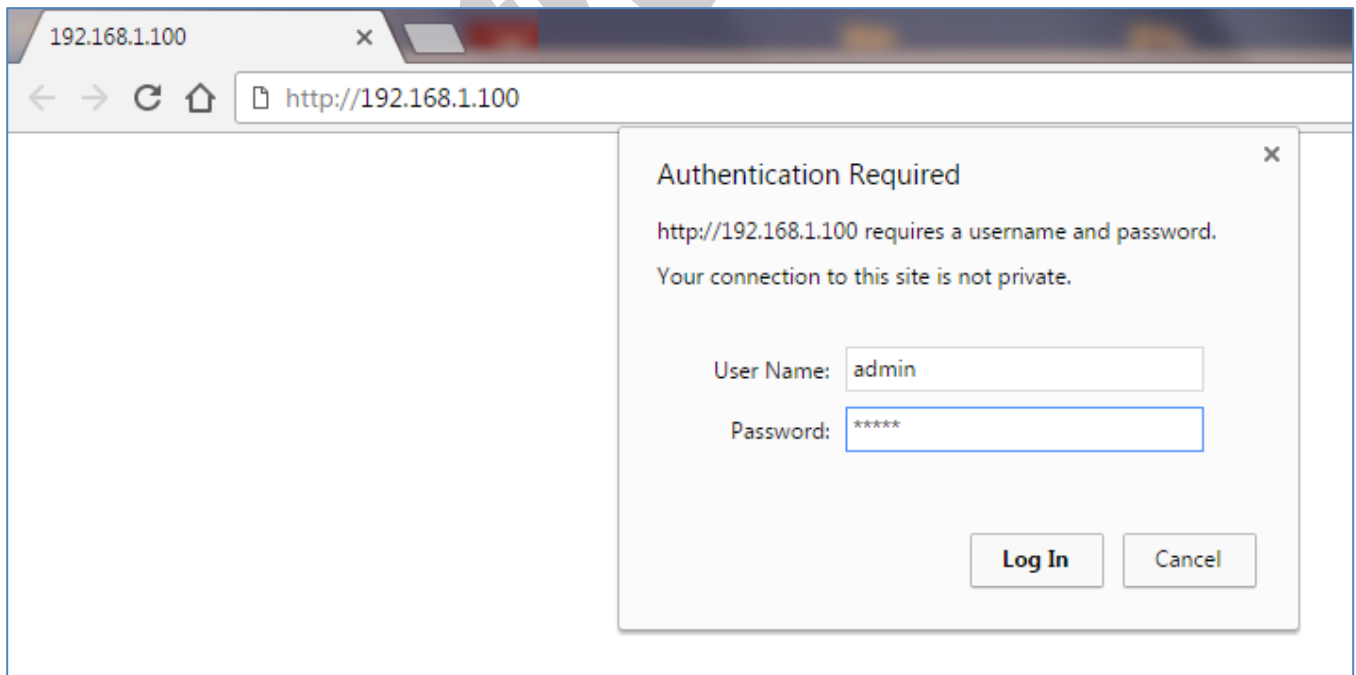


The Default device IP Address is **192.168.1.100** and the default Subnet Mask is: **255.255.255.0**

Now enter user name and password to pass the authentication procedure. Default User Name is **admin** and default password is **admin** too.

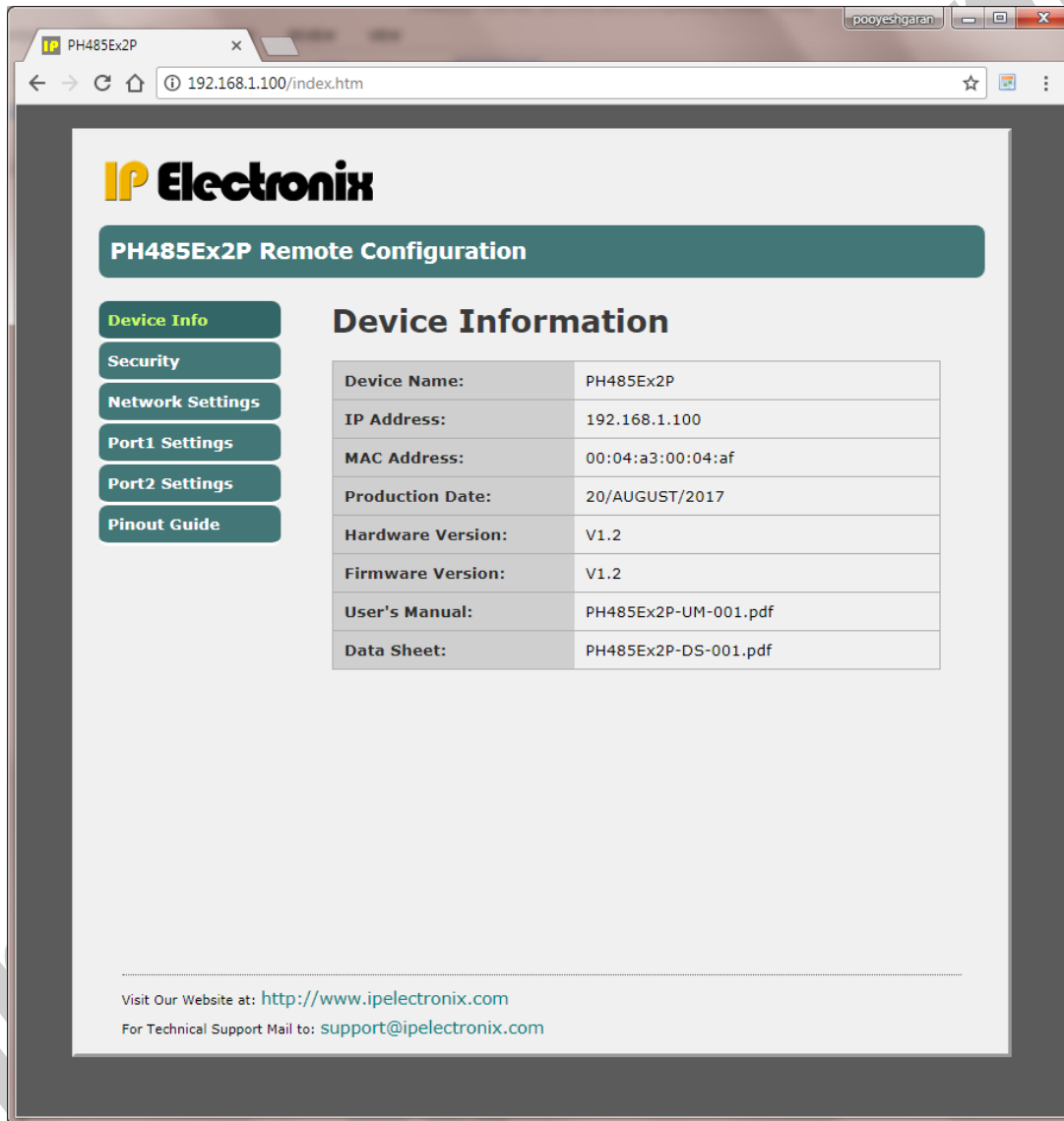
User Name: **admin**

Password: **admin**



## - Device Information Webpage

You can see some general information about the device such as MAC address, Firmware and Hardware version and ... in this page.



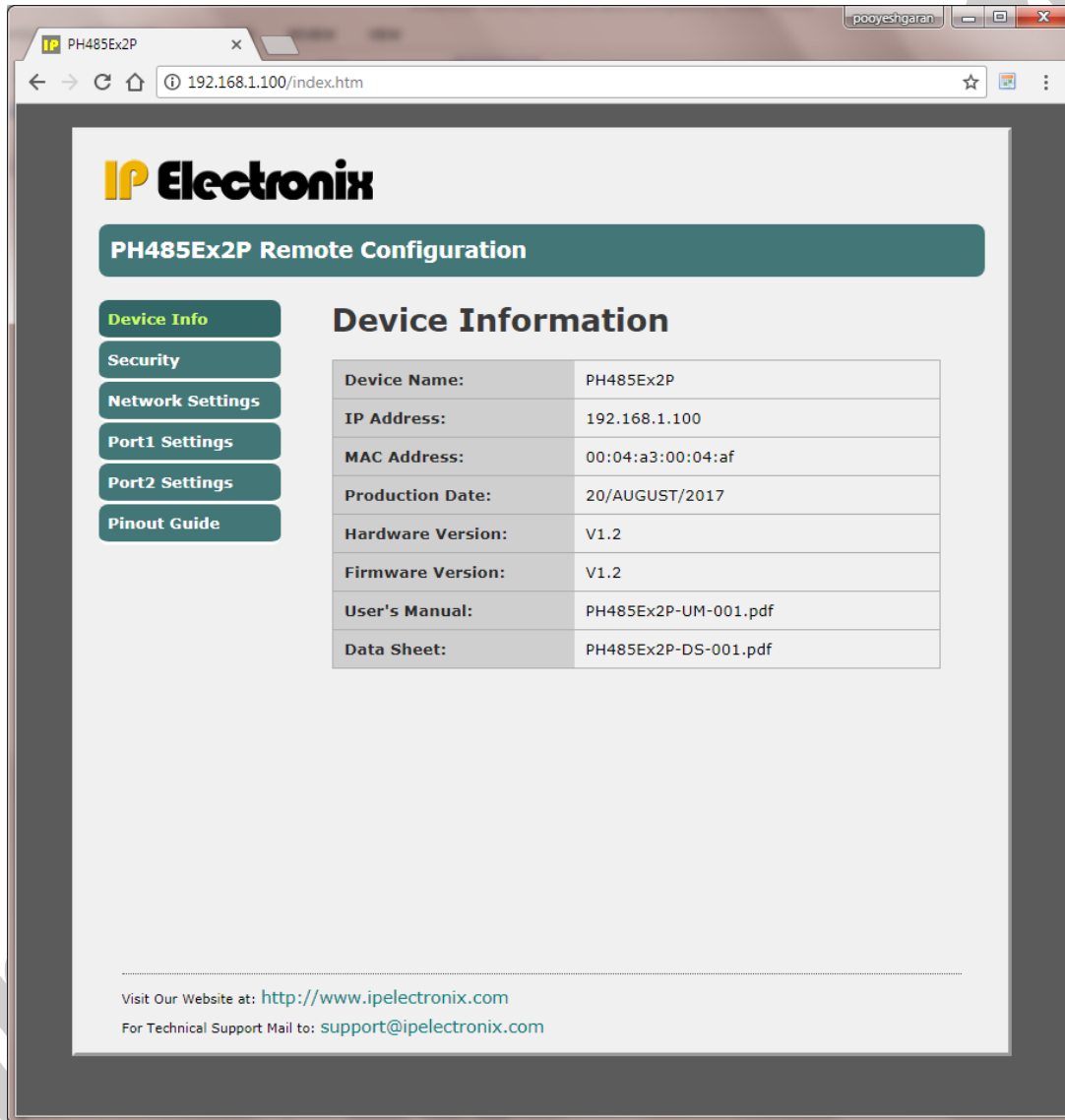
The screenshot shows a web browser window displaying the PH485Ex2P Remote Configuration page. The page features the IP Electronix logo and a navigation menu on the left with options: Device Info, Security, Network Settings, Port1 Settings, Port2 Settings, and Pinout Guide. The main content area is titled "Device Information" and contains a table with the following data:

Device Name:	PH485Ex2P
IP Address:	192.168.1.100
MAC Address:	00:04:a3:00:04:af
Production Date:	20/AUGUST/2017
Hardware Version:	V1.2
Firmware Version:	V1.2
User's Manual:	PH485Ex2P-UM-001.pdf
Data Sheet:	PH485Ex2P-DS-001.pdf

At the bottom of the page, there is a footer with the following text:  
Visit Our Website at: <http://www.ipelectronix.com>  
For Technical Support Mail to: [support@ipelectronix.com](mailto:support@ipelectronix.com)

## - Security

You can change device configuration webpage user name and password in this page.





## - Network Settings

You can change all the network settings, such as device IP Address in this page.

It is important to enter valid data in this section. If you are not sure about your network settings such as DNS address and ..., you should consult to your network administrator before any changing in these settings.

The screenshot shows a web browser window with the URL [192.168.1.100/network.htm](http://192.168.1.100/network.htm). The page title is "PH485Ex2P Remote Configuration". On the left, there is a sidebar with navigation buttons: "Device Info", "Security", "Network Settings" (highlighted in green), "Port1 Settings", "Port2 Settings", and "Pinout Guide". The main content area is titled "Network Settings" and contains a form with the following fields:

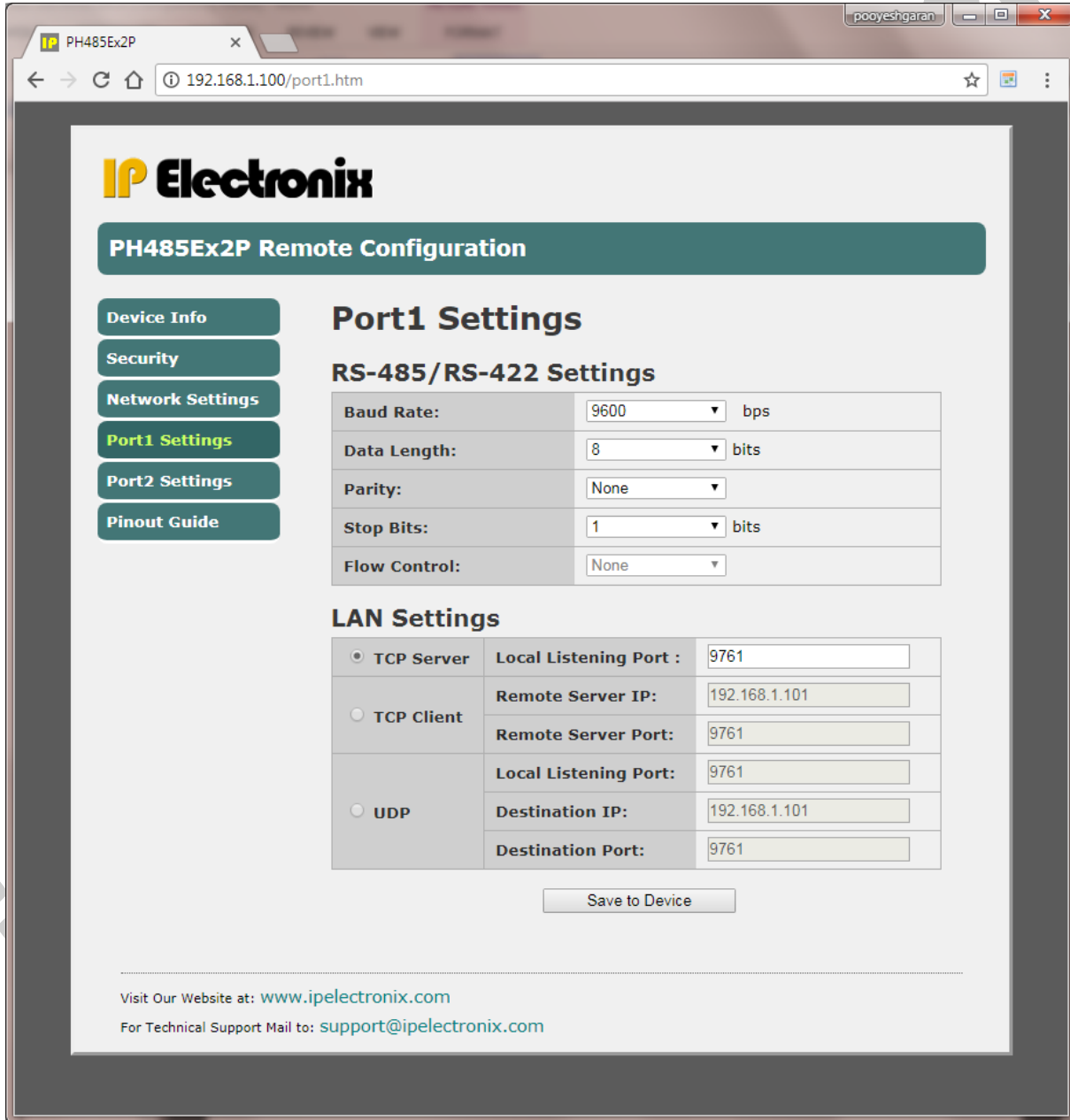
Host Name:	<input type="text" value="PH485EX2P"/>
MAC Address:	<input type="text" value="00:04:a3:00:04:af"/>
IP Type:	<input checked="" type="radio"/> Static <input type="radio"/> DHCP
IP Address:	<input type="text" value="192.168.1.100"/>
Subnet Mask:	<input type="text" value="255.255.255.0"/>
Gateway Address:	<input type="text" value="0.0.0.0"/>
Primary DNS Address:	<input type="text" value="0.0.0.0"/>
Secondary DNS Address:	<input type="text" value="0.0.0.0"/>

Below the form is a "Save To Device" button. At the bottom of the page, there is a footer with the following text:

Visit Our Website at: [www.ipelectronix.com](http://www.ipelectronix.com)  
For Technical Support Mail to: [support@ipelectronix.com](mailto:support@ipelectronix.com)

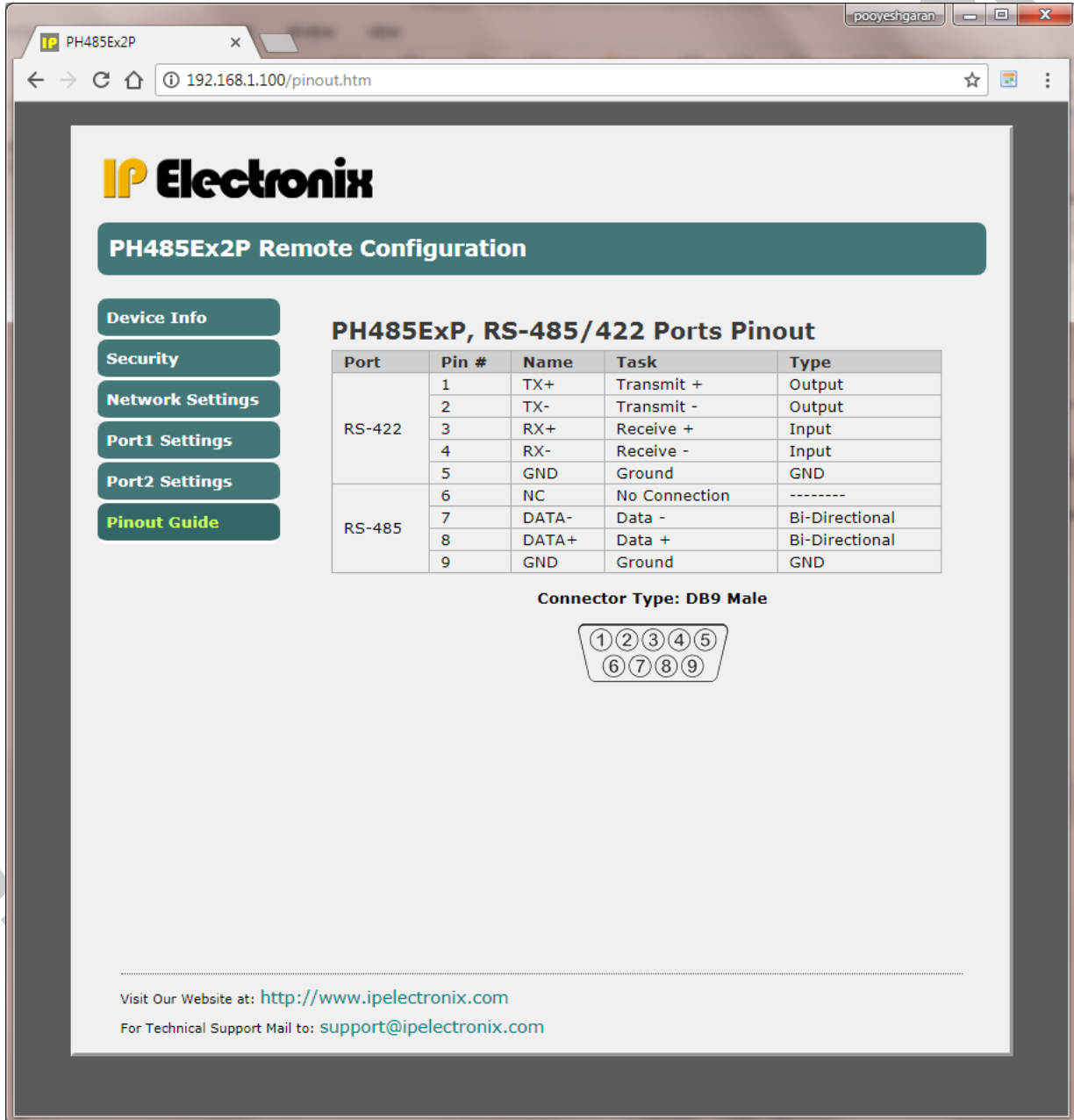
- **PORT Settings**

You can see and change all the port settings in this page.



- **Pinout Guide**

RS-485/422 Port pinout is seen in this page.



## 16. DEFAULT SETTINGS

**Default IP Address:** 192.168.1.100

**Default Subnet Mask:** 255.255.255.0

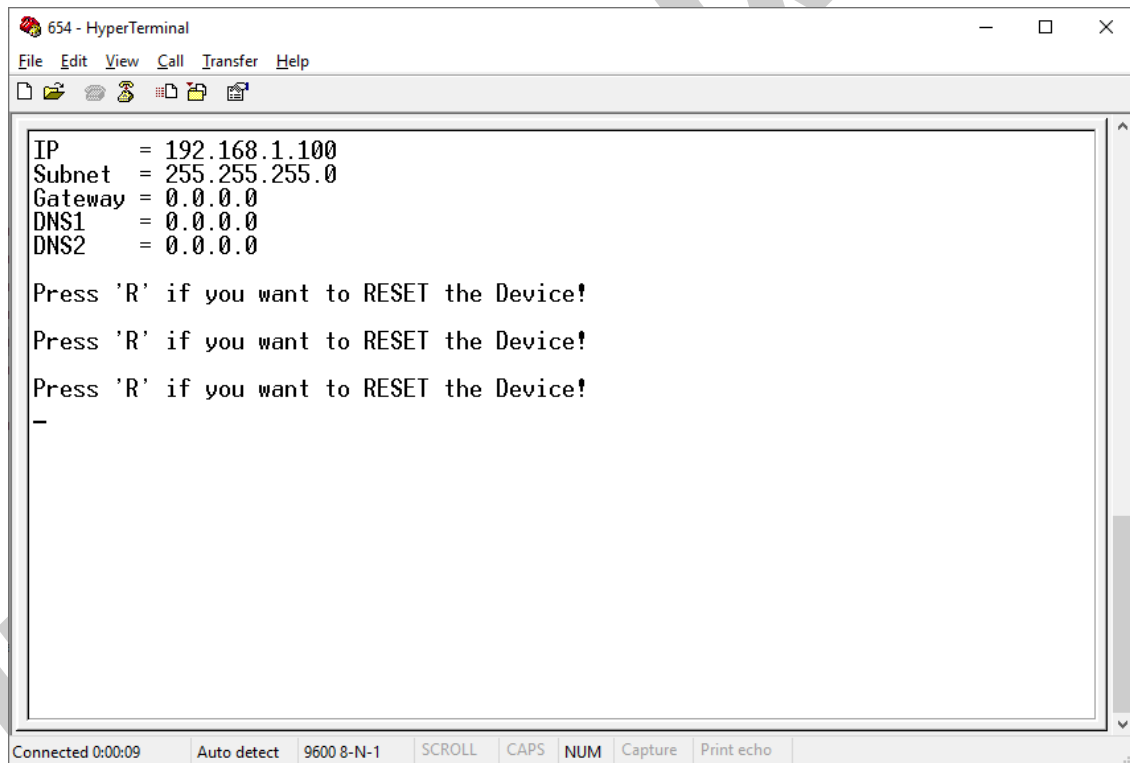
**Default User Name:** admin

**Default Password:** admin

### IMPORTANT NOTICE:

If you change the device IP and forget it, you can see the new IP Address on the serial port. Whenever you turn on the device, it sends its IP Address and Subnet Mask to the RS-485/422 PORT1. The port settings for watching device IP are fixed to 9600, 8, n, 1. You can easily see this IP Address and Subnet Mask by using a Terminal Emulation Software such as Microsoft Hyper Terminal.

You can also Reset the device to its Factory Default Settings in this page if necessary.



The screenshot shows a HyperTerminal window titled "654 - HyperTerminal". The window contains the following text:

```
IP      = 192.168.1.100
Subnet  = 255.255.255.0
Gateway = 0.0.0.0
DNS1    = 0.0.0.0
DNS2    = 0.0.0.0

Press 'R' if you want to RESET the Device!
Press 'R' if you want to RESET the Device!
Press 'R' if you want to RESET the Device!
-
```

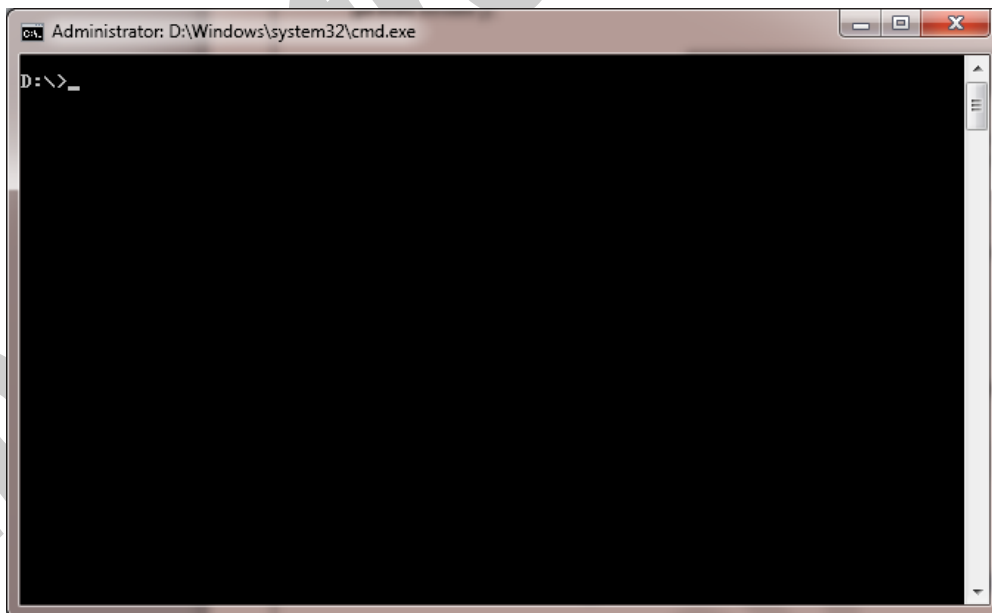
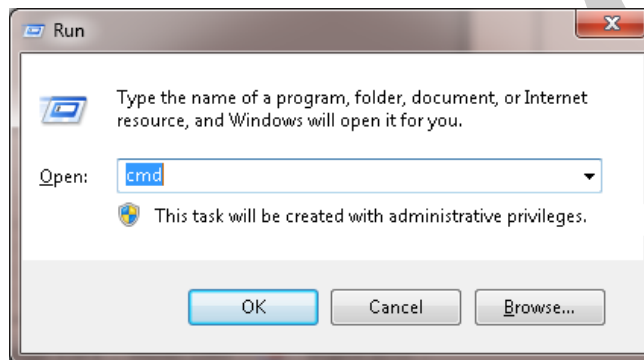
The status bar at the bottom of the window shows: "Connected 0:00:09", "Auto detect", "9600 8-N-1", "SCROLL", "CAPS", "NUM", "Capture", and "Print echo".

## 17. NETWORK CONNECTION TESTING

Connect PH485Ex4 to the Ethernet based network by connecting RJ45 LAN socket to network via a switch or Hub by an ordinary CAT5 or CAT6 cable. If everything is set properly, the green and yellow LEDs on the PH485Ex4's **RJ45 socket** will blink.

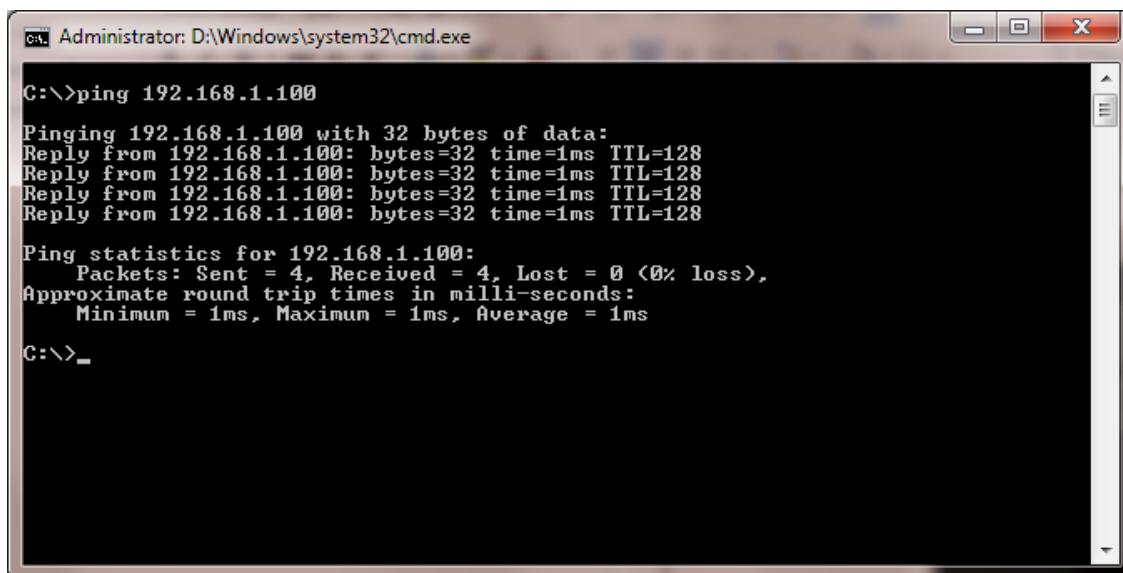
Now it is important to check the network wiring topology and testing all the cables, routers, switches ... in the route from PH485Ex4 to the computer. This test is done simply by using PING command from computer.

Go to Windows command prompt, (press WINDOWS KEY + R to going to run dialog and then type CMD and press enter):



Type ping with the device IP address, for example “ping 192.168.1.100” and press Enter.

Now you should see the ping response from the device.



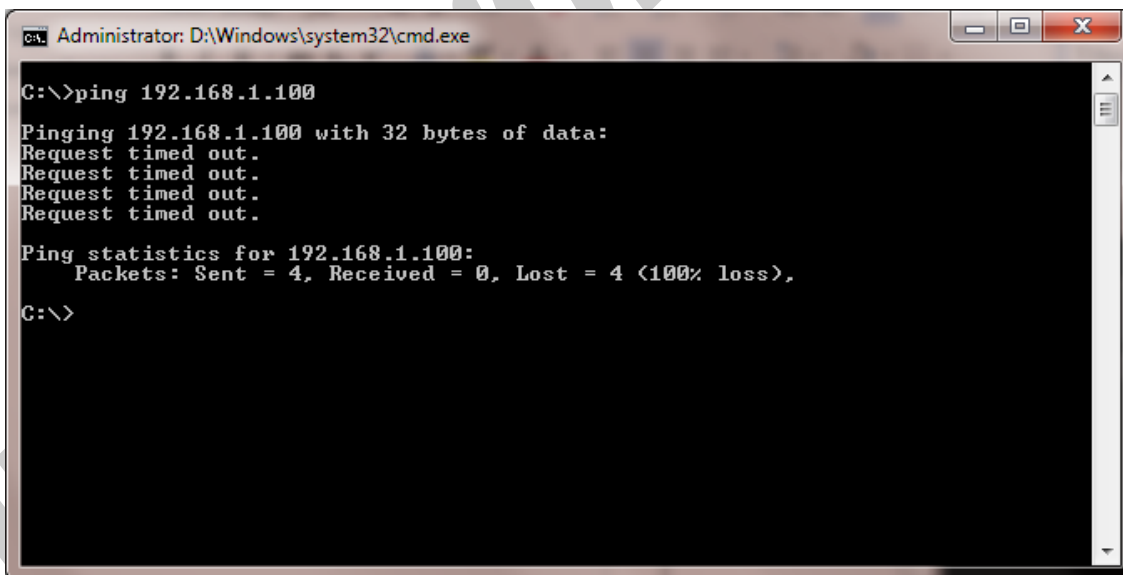
```
Administrator: D:\Windows\system32\cmd.exe
C:\>ping 192.168.1.100

Pinging 192.168.1.100 with 32 bytes of data:
Reply from 192.168.1.100: bytes=32 time=1ms TTL=128
Reply from 192.168.1.100: bytes=32 time=1ms TTL=128
Reply from 192.168.1.100: bytes=32 time=1ms TTL=128
Reply from 192.168.1.100: bytes=32 time=1ms TTL=128

Ping statistics for 192.168.1.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\>_
```

If there are any problems in the network, you could not see response from the device:



```
Administrator: D:\Windows\system32\cmd.exe
C:\>ping 192.168.1.100

Pinging 192.168.1.100 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.1.100:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

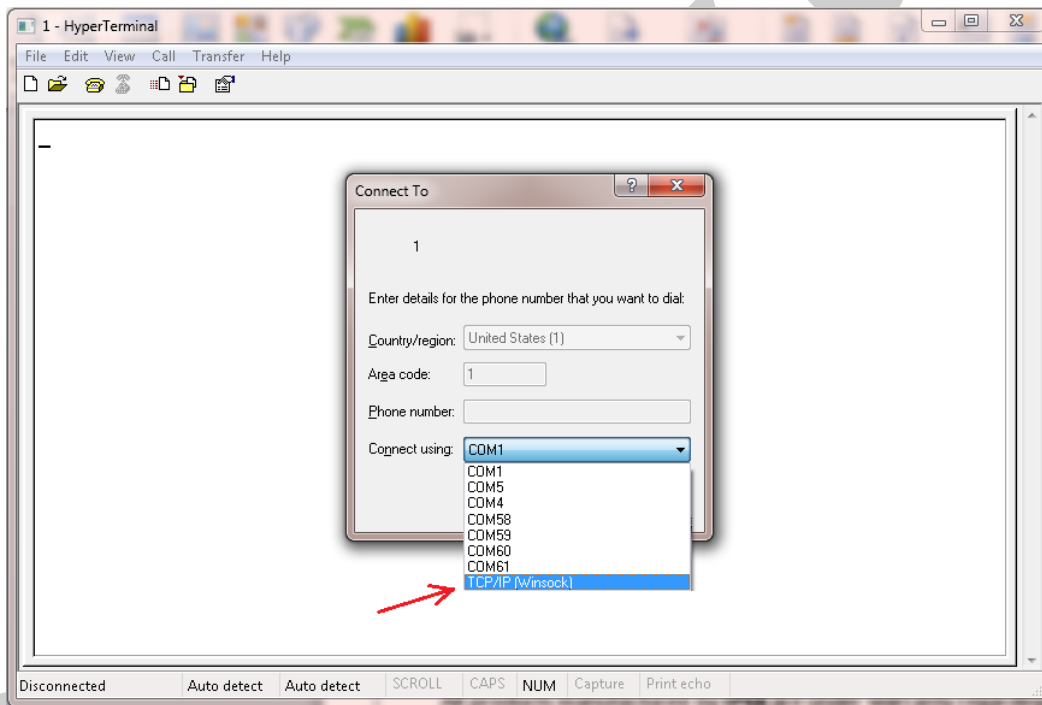
If you see this timeout window, you can't continue installation and first you should solve network problem by consulting your network administrator.

## 18. CONNECTING TO DEVICE VIA TCP SOCKET

It is possible to directly connect to PH485Ex4 RS-485/422 Serial Ports from any node of the network by using socket programming. This is simply done if you know only PH485Ex4 IP Address and socket port number for each Port. The default port numbers are as follow:

- Port 1: 9761
- Port 2: 9762
- Port 3: 9763
- Port 4: 9764

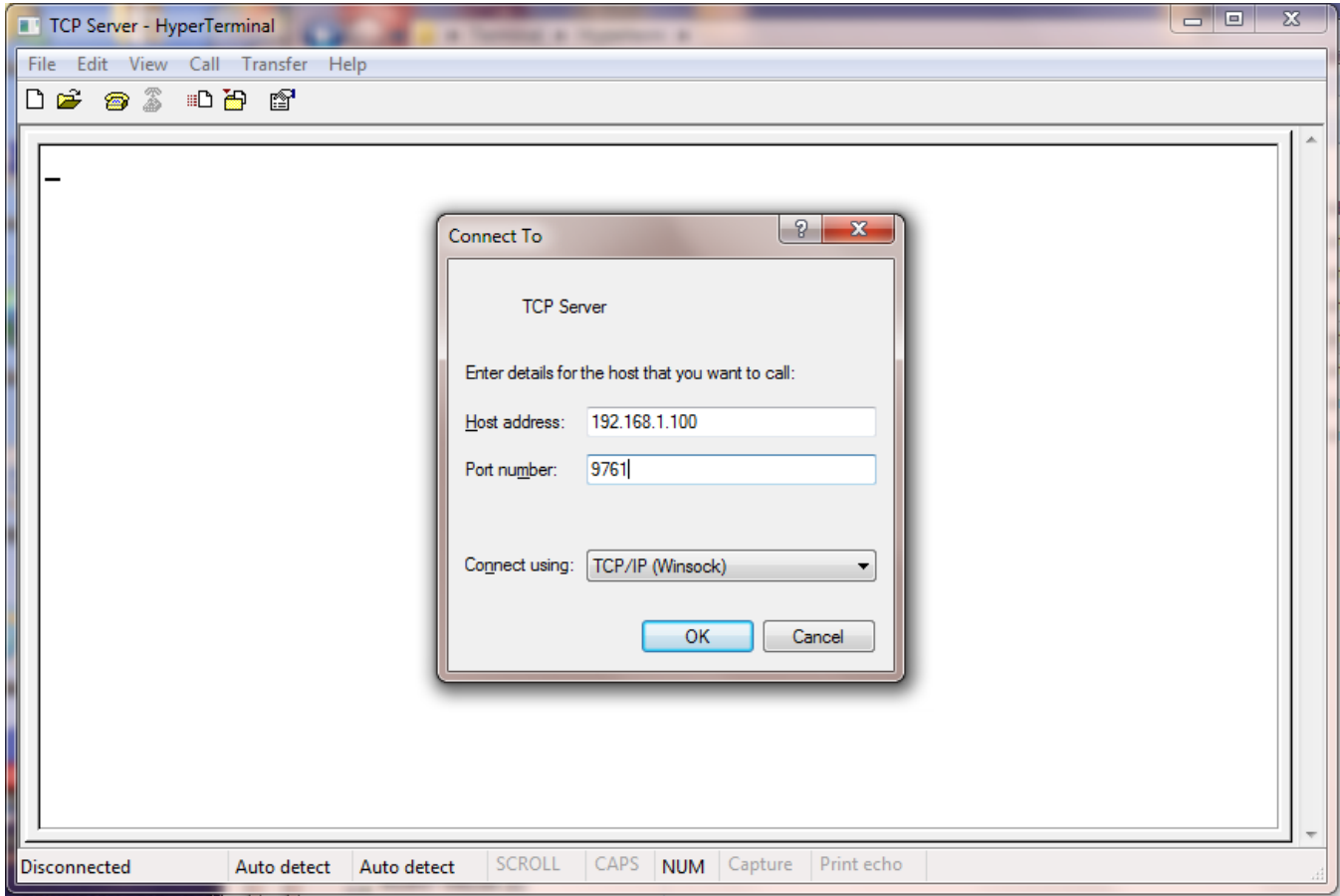
For example, we connect to Port 1 by means of Hyper Terminal. Run Hyperterm.exe and from properties dialog box, select "TCP/IP (Winsock)":



Enter device IP Address in the "Host address:" section, for example 192.168.1.100 and the port number in the "Port Number:" section (port number for Port 1 is 9761), then click on OK.

Now if you type some characters, you can see that port 1 TX Blue LED is blinking that means the data is sent to PH485Ex4 port 1.

NOTICE: Don't forget to set PH485Ex4 in **SERVER Mode** for this method of connection.



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## 19. REDIRECTING

All the Terminal Servers produced by **IP Electronix** have Redirecting ability. It means you can re-transmit all the received data from one serial port input (RxD) to any other serial port[s] output (TxD).

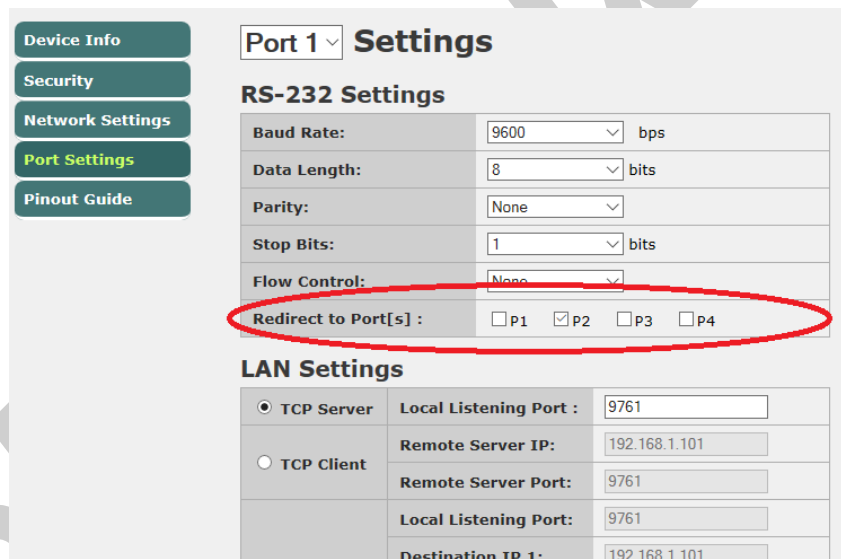
For example, if your device has more than two ports and you redirect one port to two other ports, you can simply make a Y-Switch.

If one serial port is redirected to itself, you have a LOOP line that is very useful for testing a communication line.

There are two ways to set redirect for each port, setting in main configuration webpage of the device by a web-browser or sending network command line via UDP packets.

### - Setting Redirect by Web-Browser

As it is shown in the picture below, go to the device configuration page by means of a web-browser such as Google-Chrome or Fire-Fox and choose Port Settings:



The screenshot shows the 'Port 1 Settings' page. On the left, there is a navigation menu with buttons for 'Device Info', 'Security', 'Network Settings', 'Port Settings' (highlighted in green), and 'Pinout Guide'. The main content area is titled 'Port 1 Settings' and is divided into two sections: 'RS-232 Settings' and 'LAN Settings'. The 'RS-232 Settings' section includes fields for Baud Rate (9600 bps), Data Length (8 bits), Parity (None), Stop Bits (1 bits), and Flow Control (None). The 'Redirect to Port[s]' field is circled in red and contains four checkboxes: P1, P2 (checked), P3, and P4. The 'LAN Settings' section includes radio buttons for 'TCP Server' (selected) and 'TCP Client', and fields for Local Listening Port (9761), Remote Server IP (192.168.1.101), Remote Server Port (9761), and Destination IP 1 (192.168.1.101).

Now select destination port which you want to redirect current port to it. You can select more than one port for redirecting and also can redirect a port to itself.

### - Setting Redirect by UDP Network Command

To send redirect command from a remote workstation or software to the device, we need IP number or Host-Name and the UDP Port-Number. The default UDP Port-Number is 9765 and you can change this port number if necessary. We also need to know the device Remote Command Password which is a Four-Digit number that you can see it in Network Settings and also can change it there if necessary.

The screenshot shows the 'Network Settings' page of a device's web interface. On the left, there is a navigation menu with buttons for 'Device Info', 'Security', 'Network Settings' (highlighted in green), 'Port Settings', and 'Pinout Guide'. The main content area is titled 'Network Settings' and contains a table of configuration fields. The 'Net Command Code' field, containing the value '1111', and the 'UDP Command Port' field, containing the value '9765', are circled in red. Below these fields is a 'Save To Device' button.

Network Settings	
Host Name:	PH232EX4-00057D
MAC Address:	00:04:a3:00:05:7d
IP Type:	<input checked="" type="radio"/> Static <input type="radio"/> DHCP
IP Address:	192.168.1.100
Subnet Mask:	255.255.255.0
Gateway Address:	0.0.0.0
Primary DNS Address:	0.0.0.0
Secondary DNS Address:	0.0.0.0
Net Command Code:	1111
UDP Command Port:	9765
<input type="button" value="Save To Device"/>	

The Command Frame and Device Response as follows:

**1) Change Redirect Setting Command**

This command consists of 6 bytes as follows:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
0x01	CODE-MSB	CODE-LSB	'W'	pn	status

And the device response consists of 6 bytes as follows:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
0x01	CODE-MSB	CODE-LSB	'S'	pn	status

These bytes are:

0x01: constant binary value = 0x01

CODE-MSB: Most Significant 8 bits of Security Code

CODE-LSB: Least Significant 8 bits of Security Code

'W': ASCII Character 'W', Write Command

pn: Port Number, a binary value from 0x00 to 0x03 for PORT1 to PORT4

status: Redirect Status Byte that is consists of 8 bits as follow:

**Status Byte:**

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X	X	X	X	P4	P3	P2	P1

X: Don't Care

P[i] = 1, means redirect to this port i is enabled

P[i] = 0, means redirect to this port i is disabled

Security Code is a 16-Bits Integer password that can be a number from 1000 to 9999 (decimal). The default value is 1111 decimal (0x0457 Hexadecimal).

For example, if the device password is 1111 and we want to redirect the port number 4 to the ports number 1 & 3, we should send this six-byte frame to the device: 0x01 0x04 0x57 0x57 0x03 0x05

**2) Read Redirect Status Command**

This command is same as the change command, but we should send character 'R' instead of 'W', and status byte is not required.

1	2	3	4	5
0x01	CODE-MSB	CODE-LSB	'R'	Pn

The device response is similar to the previous one.

## 20. GUARANTEE

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

## 21. TECHNICAL SUPPORT

If you have any technical question or need any technical support, please contact us using this Email address: [support@ipelectronix.com](mailto:support@ipelectronix.com).

ipelectronix.com