



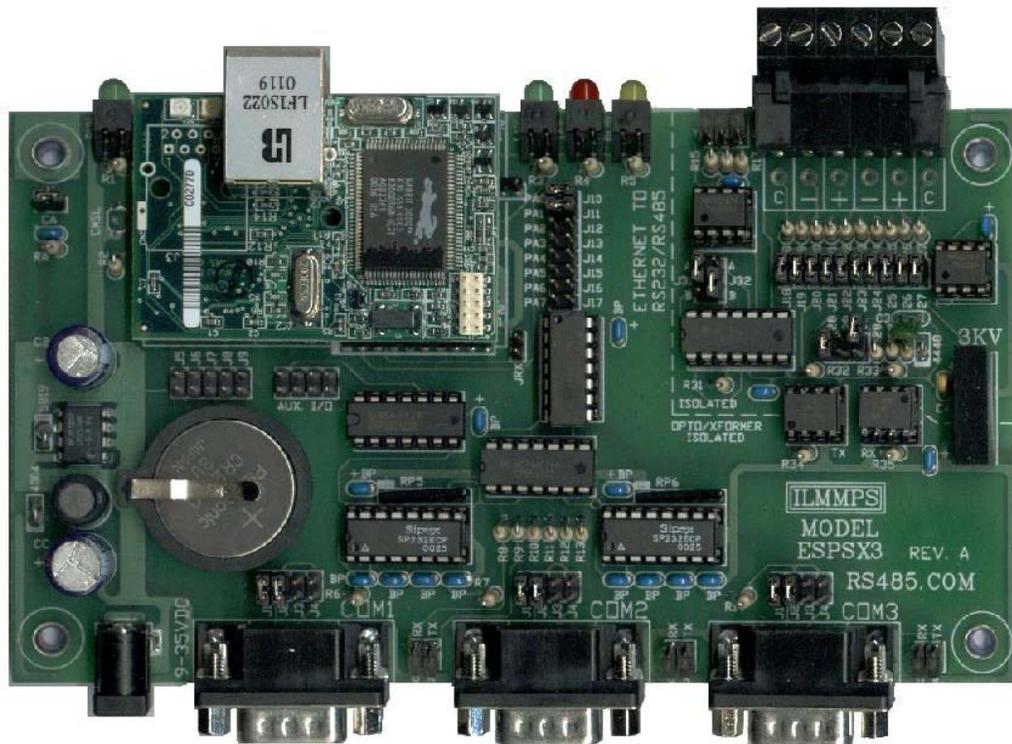
## **ESPSX3 Ethernet Serial Port Server X 3 Users Guide**

The ESPSX3 is an Ethernet Serial Port Server with two RS-232 ports and one port that can be configured for RS-232, RS-485, or RS-422. The RS-485/RS-422 port has galvanic isolation for industrial applications. You can access the ports from a local network or over the World Wide Web via the Internet. You can configure the ESPSX3 from a Web browser, a Windows application, or an RS-232 link. The board supports both static IP addressing and automatic address assignment via DHCP/BOOTP.

The ESPSX3's option for stand-alone operation enables devices with serial ports to communicate over a network with no changes to device hardware or software. The ESPSX3 converts transparently between the asynchronous serial and network protocols.

R.E. Smith provides a variety of utilities for use in configuring and testing the ESPSX3. All are available on a CD available from R.E. Smith or by downloading from [www.rs485.com](http://www.rs485.com).

This guide will show you how to get the ESPSX3 up and running on your local network and on the Internet.



## Connecting to your Network

To connect the ESPSX3 board to your network, you'll need the following:

- A standard Ethernet cable (Category 3 or higher) with RJ-45 connectors. If you're connecting the ESPSX3 directly to a PC (not to a network hub), use a crossover cable.
- A 9-35V DC, 300-milliamperere power supply with a positive-center connector.

Cables and power supplies are available from R.E. Smith.

To power up and connect the ESPSX3, do the following:

1. Plug the power supply into a 115V AC outlet and insert the power-supply plug in the jack labeled 9-35VDC on the ESPSX3.
2. Use the Ethernet cable to connect the ESPSX3's RJ-45 jack (labeled 10BASE-T Ethernet on the optional enclosure) to a network hub. If using a crossover cable, connect the ESPSX3 directly to a PC's 10BASE-T Ethernet port.

## Using the TCP/IP Configuration Utility

Our TCP/IP Configuration Utility enables you to configure and test the ESPSX3's network and serial-port interfaces.

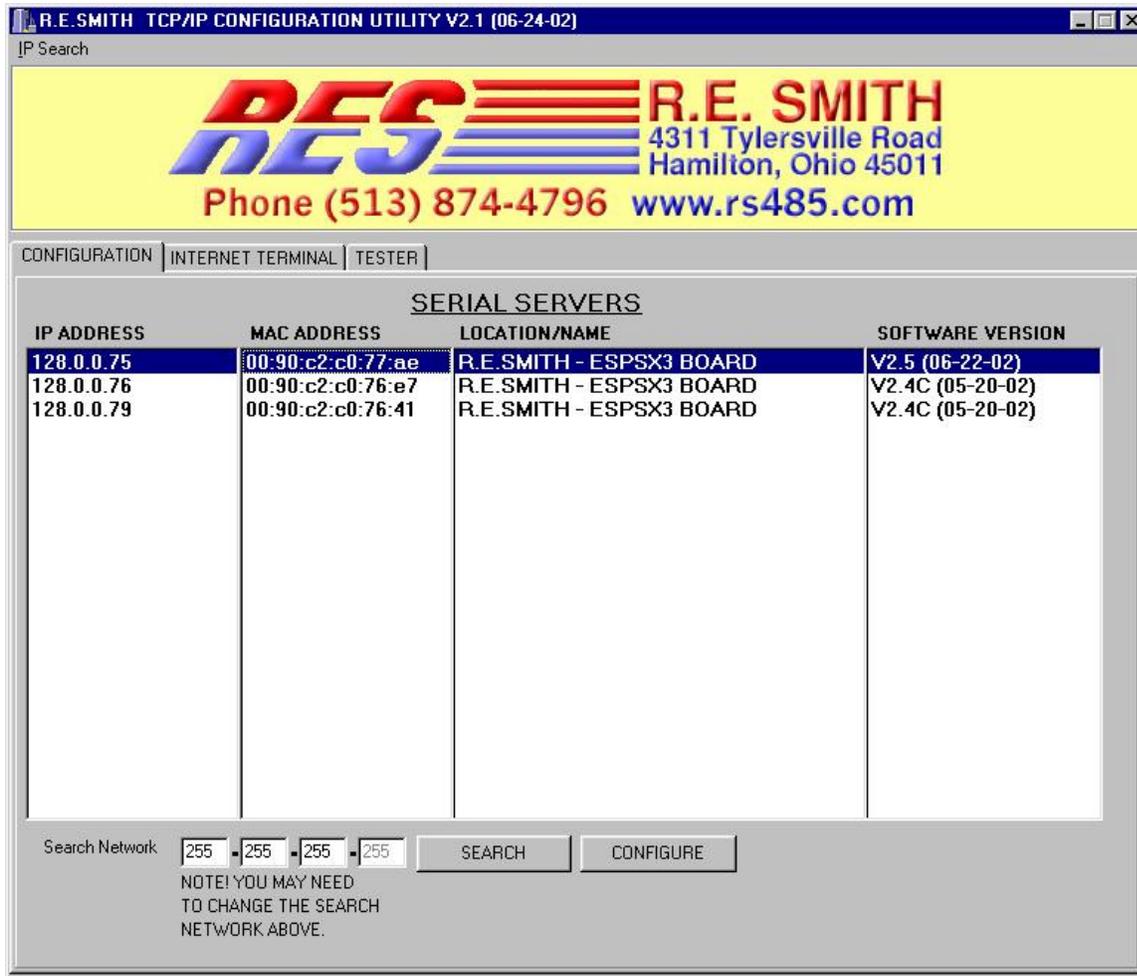
### Running the Utility

Use Configuration Utility provided on CD in the ConfigurationUtilities folder or download the latest edition from [www.rs485.com](http://www.rs485.com). The filename is *espsx3config\*.exe*, where \* is a series of numbers and letters that indicate the version. (For example, *espsx3config2p0-06-07-02.exe*.)

### Viewing and Changing Configuration Settings

To view and change configuration settings using the Configuration Utility, do the following:

1. Tell the utility where to search for the board. The screen below shows the utility's Configuration tab:



The values in the text boxes next to *Search Network* tell the utility what block of IP addresses to search. Entering 255.255.255.255 will cause the utility to search your entire network for ESPSX3 boards.

To search a portion of the network, enter the appropriate address in the leftmost three text boxes. For example, to search all addresses from 192.168.111.1 through 192.168.111.254, enter 192, 168, and 111. The fourth text box is always 255.

2. Search for the ESPSX3. Click Search and the utility will display the IP address, MAC address, location/name, and software version for any detected ESPSX3 boards. To view additional information and change the board's configuration, select the board by clicking its listing in the window and click CONFIGURE to display a window like this:

**CHANGE CONFIGURATION**

**SERIAL PORT CONFIGURATION**

	PORT ADDRESS	BAUD	COMM SPEC
PORT 1	9101	9600	8-N-1
PORT 2	9102	9600	8-N-1
PORT 3	9103	9600	8-N-1

**CONFIG PROTOCOL**

DHCP

STATIC

**DEFAULT IP PARAMETERS**

IP ADDRESS: 128.0.0.75

NETMASK: 255.255.255.0

GATEWAY: 128.0.0.200

**STANDALONE OPERATION**

**PORT 1**

MODE: DISABLE

\* DEST IP: 0.0.0.0

\* DEST PORT: 0

**PORT 2**

MODE: DISABLE

\* DEST IP: 0.0.0.0

\* DEST PORT: 0

**PORT 3**

MODE: MASTER

\* DEST IP: 10.1.7.71

\* DEST PORT: 9103

**DEST IP/PORT FOR MASTER ONLY\***

UNIT ID: R.E.SMITH - ESPSX3 BOARD

MAC ADDRESS: 00:90:c2:c0:77:ae

SAVE Cancel

SERIAL PORT CONFIGURATION contains settings for each of the ESPSX3's three serial ports. You can select a port address for TCP and UDP communications, a baud value, and the number of data bits, parity, and Stop bits for each port.

CONFIG PROTOCOL enables you to select static addressing or address selection using your network's DHCP server.

DEFAULT IP PARAMETERS enables you to enter an IP address, netmask, and gateway address for the ESPSX3. In the 4-byte netmask value, bits equal to 1 are common to all interfaces in the subnet and bits equal to 0 are unique to a specific interface in the subnet. For example, if an interface has an IP address of 128.9.9.75 and

a netmask of 255.255.255.0, the leftmost three bytes (128, 9, 9) are the same for all of the interfaces in the subnet, and the rightmost byte (75) is unique to the interface. The gateway value is the IP address of a host that routes traffic to other networks, such as the Internet.

STANDALONE OPERATION contains settings for the standalone option described later.

UNIT ID describes the board and matches the contents of the LOCATION/NAME field in the utility's Configuration tab.

MAC ADDRESS is the hardware address of the board's Ethernet controller.

## Testing Serial-port Communications with the Internet Terminal

For testing serial-port communications, you can use the Configuration Utility along with our I/O Commander application. The Configuration Utility provides a user interface for network communications, while the I/O Commander does the same for serial-port communications.

Use the I/O Commander provided on CD in the *OtherUtilityPrograms* folder or download the latest edition from [www.rs485.com](http://www.rs485.com). The filename is *rescomdrv\*.exe*, where \* is a series of numbers and letters that indicates the version. (For example, *rescomdrV3P1a.exe*.)

To test serial-port communications, do the following:

1. Power up the ESPSX3 and connect it to your network as described above.

2. Connect a serial-port cable between COM1 on the ESPSX3 and any available COM port on a PC. The PC can be the same one that will run the Configuration Utility or a different PC. The PC that runs the I/O Commander doesn't need a network connection. The ESPSX3 and most PCs have 9-pin male DB-9 connectors, which means that you'll need a cable with two 9-pin female DB-9 connectors. Cables are available from R. E. Smith.

If you're using a straight-across, or one-to-one, serial cable, install J3 and J4 at COM1 and leave J1 and J2 open. If you have a cross-over (null modem) serial cable, install J1 and J2 and leave J3 and J4 open.

3. On a PC in the same local network as the ESPSX3, run the TCP/IP Configuration Utility. From the Configuration tab, select the board and click Configure to display the CHANGE CONFIGURATION window.

Under Serial Port Configuration for PORT 1, note the BAUD value and select 8-N-1 for COM SPEC. PORT ADDRESS should be 9101. Click SAVE.

4. On the PC that connects to COM1 on the ESPSX3, run the I/O Commander. At the bottom of the window, select the PC's COM port that connects to the ESPSX3 and a baud to match the BAUD value displayed by the Configuration Utility.

Click the Terminal Emulator tab and click Connect. You should see a Port Open message that displays the serial-port settings, such as *Port Open - COM1,9600,N.8.1*

5. In the Configuration Utility, click the Internet Terminal tab. Verify that the Address and Port values match the IP address and port that you want to communicate with. Change the values if needed. Click Connect. You should see the message STATUS: CONNECTED along with the requested IP address and port number:



6. To send data on the network to the ESPSX3's COM1, type in the main window of the Configuration Utility's Internet Terminal. The message you type will display in red. The message also appears in green in the I/O Commander's Terminal Emulator window.

To receive data on the network from the ESPSX3's COM1, type in the Terminal Emulator window of the I/O Commander. The message you type displays in red in the I/O Commander and in green at the Configuration Utility's Internet Terminal.

7. To test the ESPSX3's other ports, repeat steps 2-6 substituting COM2 or COM3 for COM1.

### ***Testing Serial-port Communications with the Tester***

The Configuration Utility's Tester tab is intended for use with R.E. Smith's custom test fixtures, which return replies to received commands.

### **Other Ways to Configure the ESPSX3**

In addition to the TCP/IP Configuration Utility, there are two other ways to configure the ESPSX3: via a Web browser or via a console interface using COM3 or network port 9000.

#### ***Configuring from a Web Browser***

You can view and change the ESPSX3's configuration settings from any Web browser. The ESPSX3 functions as a Web server whose home page displays configuration options. To view the home page, in the Address window of Internet Explorer or another Web browser, enter *http://* followed by the ESPSX3's IP address, for example: *http://128.0.0.75*. The ESPSX3 responds by sending a page like this to your browser:

ETHERNET SERIAL PORT SERVER - RS232/RS485/RS422  
MODEL ESPSX3 HOME PAGE

TCP/IP ADDRESS CONFIGURATION  
SOFTWARE VERSION : V2.5 (06-22-02)

CONFIGURATION PROTOCOLS			STATIC IP ADDRESS PARAMETERS			
ENABLE DHCP: <input type="checkbox"/> STATIC ADDRESS: <input checked="" type="checkbox"/>			TCP/IP ADDRESS: (if static operation selected) <input type="text" value="128"/> . <input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="75"/>			
HTTP (Web Browser) PORT: <input type="text" value="80"/>			SUBNET MASK: <input type="text" value="255"/> . <input type="text" value="255"/> . <input type="text" value="255"/> . <input type="text" value="0"/>			
CONSOLE PORT: <input type="text" value="9000"/>			DEFAULT GATEWAY: <input type="text" value="128"/> . <input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="200"/>			
CONNECTION TIMEOUT ENABLE: <input type="checkbox"/> TIMEOUT <input type="text" value="300"/> sec.						
COMMUNICATION PORT SETUP			STANDALONE OPERATION SETUP			
COM PORT	BAUD RATE	COM SPEC	NETWORK PORT	STANDALONE MODE	DESTINATION IP ADDRESS	DEST PORT
1	<input type="text" value="9600"/>	<input type="text" value="8-N-1"/>	<input type="text" value="9101"/>	<input type="text" value="DISABLE"/>	<input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/>	<input type="text" value="0"/>
2	<input type="text" value="9600"/>	<input type="text" value="8-N-1"/>	<input type="text" value="9102"/>	<input type="text" value="DISABLE"/>	<input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/>	<input type="text" value="0"/>
3	<input type="text" value="9600"/>	<input type="text" value="8-N-1"/>	<input type="text" value="9103"/>	<input type="text" value="DISABLE"/>	<input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/>	<input type="text" value="0"/>
<input type="button" value="Submit"/>						
ENTER PASSWORD AND PRESS SUBMIT TO UPDATE CONFIGURATIONS SETTINGS PASSWORD: <input type="text"/>						

If you don't know the board's IP address, you can learn it from the Configuration Utility or by communicating with COM3 as described below.

You can change the settings by selecting or entering new values. If password protection has been enabled via the console interface, enter the password in the text box. Click Submit to send the changes to the ESPSX3, and the server will return a page informing you that the changes have been saved.

### ***Configuring using the Console with COM3 or Port 9000***

You can also configure the ESPSX3 via a console interface that enables you to send commands to the board. You can access the console interface by communicating with Port 9000 on the network or with a direct connection to the board's COM3.

To use Port 9000, do the following:

1. Connect the ESPSX3 to the network, run the TCP/IP Configuration Utility, and search for the board.

2. Click the INTERNET TERMINAL tab. The Address text box should contain the board's IP address. In the Port box, enter 9000. Click Connect.

To use COM3, do the following:

1. Remove jumper J11. (for software versions prior to 2.0D, remove J10.)

2. Connect a cable between the ESPSX3's COM3 and any available COM port on a PC. If using a straight-across serial cable, install J3 and J4 at COM3 and leave J1 and J2 open. If you have a cross-over (null modem) serial cable, install J1 and J2 and leave J3 and J4 open at COM3.

3. Run the I/O Commander and click the Terminal Emulator tab. Select the COM port to use on the PC and a baud rate of 9600.

4. Press Enter to send a carriage return to the ESPSX3's COM3.

With either method, connecting causes this message to display:

```
Welcome to R.E.Smith - ESPSX3 Configuration Console
```

```
>
```

For a list of available commands, type

```
help
```

and you should see a display like this:

```
Available Commands Include:
```

```
help  
set  
show  
reboot  
status
```

For additional help for a specific command, type `help` followed by the command, such as:

```
help show
```

which results in a display like this:

```
logging          - show setting  
ip               - show current ip address  
netmask          - show current netmask  
gateway          - show current gateway address  
dhcp             - show dhcp setting  
static           - show static setting
```

```
time          - show the time format mm/dd/yy hh:mm:ss 24hr
clock
psswd        - show password enable setting
```

For example, typing the command:

```
show ip
```

results in a display of the board's IP address:

```
CURRENT IP          192.168.111.2
```

## Connecting Your Serial-port Devices to the ESPSX3

To connect a device with an RS-232, RS-422, or RS-485 interface to the ESPSX3, do the following:

1. Obtain a cable of the desired length. For RS-232 interfaces, the end that connects to the ESPSX3 must have a female DB-9 connector. For RS-422/RS485 interfaces, the ESPSX3 has screw terminals for two 2-wire differential lines and two ground lines. If you're facing the edge of the board with the screw terminals, the terminals from left to right are:

```
RXD ground
RXD +
RXD -
TXD +
TXD -
TXD ground
```

RXD+ and RXD- receive data from the device attached to the ESPSX3. TXD+ and TXD- send data to the device attached to the ESPSX3.

2. Connect the cable between your device and the selected port. A device with an RS-232 interface may use COM1, COM2, or COM3. A device with an RS-422 or RS-485 interface must use the screw terminals. If your cable has just one ground wire, connect it to either RXD ground or TXD ground. The screw terminals use COM3 on the board, so the 9-pin COM3 connector is unavailable when the screw terminals are in use.

Each port on the ESPSX3 has four jumpers: J1 through J4. If using a straight-across (one-to-one) cable, install J3 and J4 and leave J1 and J2 open. If using a cross-over (null modem) cable, install J1 and J2 and leave J3 and J4 open.

3. As described earlier, use the ESPSX3's Configuration Utility, the home page, or the console interface to set the IP address for the ESPSX3 and the port number, baud, number of data and Stop bits, and parity for the COM port that connects to your device.

4. Repeat steps 1-3 for up to two additional devices.

Your device(s) can now use serial ports to communicate over the network. For example, if the ESPSX3's IP address is 192.168.111.5 and your device uses port 9101, the device's serial port will receive any data sent to port 9101 at IP address 192.168.111.5. Any TCP segments, UDP datagrams, or other communication that your device transmits out its serial port will travel on the network to the destination specified in the communication. For transparent serial-port communications between ESPSX3s in a network, use standalone operation, described below.

## **Internet Communications**

With an Internet connection, an ESPSX3 can communicate over the Internet in the same way that it communicates over a local network.

To enable Internet communications, the ESPSX3 must have the following:

- A connection to the Internet. The connection may be via dial-up, a broadband service such as cable modem or DSL, or another connection to an Internet Service Provider (ISP).
- A public IP address that computers on the Internet can use to access the ESPSX3. The address must be unique. No other computer on the Internet can use the same address. Your ISP normally assigns one or more IP addresses to your connection.

To enable a computer in a local network to communicate over the Internet, one option is to use a router that supports Network Address Translation (NAT). The router has a public IP address and handles Internet communications for devices that attach to the router in a local network. The router uses NAT to convert as needed between the local addresses of the computers that connect to the router and the router's public address.

Many networks have hardware or software firewalls that block incoming traffic that may be harmful to the network. A device that functions as a client that requests resources from computers on the Internet can generally communicate through a firewall with no problems. If you want the ESPSX3 to function as a server that receives and responds to requests for Web pages or other resources, you may need to configure your firewall to allow receiving the requests. See your firewall's documentation for details.

If you want to access the ESPSX3 by specifying a domain name such as [www.rs485.com](http://www.rs485.com), rather than an IP address, you'll need a registered domain name associated with the board's IP address. If your ISP uses dynamic IP addresses, you may need to subscribe to a service that updates the domain's name servers automatically when the address changes. One provider of this service is [tzo.com](http://tzo.com).

## **Using Standalone Operation**

In standalone operation, devices attached to COM ports on ESPSX3s can communicate the same as if they connected directly via a serial cable. The ESPSX3

converts between the serial and Ethernet interfaces. The devices don't have to know or care that there is an Ethernet connection between them. Unlike direct links between COM ports, the ports' baud values, number of data bits, and number of Stop bits don't have to match. Using Ethernet, devices can communicate over very long distances.

In standalone operation, one ESPSX3 functions as a master that requests to open communications between one of its ports and a port on a target ESPSX3.

You can enable standalone operation from the TCP/IP Configuration Utility or the ESPSX3's home page.

In the Configuration Utility, in the Configuration tab, select the IP address of the device to use as the master and click CONFIGURE to display the CHANGE CONFIGURATION window. In the STANDALONE OPERATION area of this window, in the MODE list box, select MASTER. In the DEST IP box, enter the IP address of the target. In the DEST PORT box, enter the port number to communicate with on the target. Click SAVE.

In a similar way, from the Configuration tab, select the IP address of the device to use as the target and click CONFIGURE. In the STANDALONE OPERATION area, in the MODE list box, select TARGET. Don't enter anything in the DEST IP or DEST PORT boxes. Click SAVE.

You can also enter this information using the ESPSX3's home page.

When communications are established, anything the master sends on the specified port will be received at the specified port at the target. Anything a target sends on its specified port will be received at the master's port.

## **Using Visual Basic For Network Communications**

Visual-Basic applications can use the Winsock control to access the ESPSX3 over a local network or the Internet. Here is a basic Visual Basic 6 project that shows how to use the Winsock control for TCP communications:

1. Open a new standard EXE project.
2. Add the Winsock control to the Toolbox by clicking Project, then Components. In the window that opens, check Microsoft Winsock Control and click OK. The Winsock icon should appear in the Toolbox.
3. Add the Winsock component to the project's main form by double-clicking the Winsock icon in the toolbox.
4. Add a text box to the form by double-clicking the TextBox icon in the toolbox.
5. Add a command button by double-clicking the CommandButton icon in the toolbox.
6. To use the Winsock control to open communications with COM1 on the ESPSX3, add the following code to the Form\_Load routine:

Set the RemoteHost property equal to the ESPSX3's IP address:

```
Winsock1.RemoteHost = "128.0.0.206"
```

Set the RemotePort property equal to the port assigned to COM1 on the ESPSX3:

```
Winsock1.RemotePort = "9101"
```

Invoke the Connect method to request a TCP connection to the port:

```
Winsock1.Connect
```

7. To send data to the port over the network, use the SendData method. To enable sending the data in the text box to the ESPSX3, add the following to the Command1\_Click routine:

```
Winsock1.SendData Text1.txt
```

8. To receive data from the port, use the DataArrival event: To display received data in the text box, add the following to the Winsock1\_DataArrival routine:

```
Dim strData As String  
Winsock1.GetData strData, vbString  
Text1.Text = Text1.Text & strData
```

9. To close the connection when the application ends, add the following to the Form\_Unload routine:

```
Winsock1.Close
```

To test communications with the application, connect a PC's RS-232 port to a port on the ESPSX3 and run the I/O Commander. Click Connect to connect to the PC's port. Run the Visual Basic application and click the command button to send the text in the text box to the ESPSX3. The I/O Commander's Terminal Emulator should display the received text. The Visual Basic application's text box will also display any text you type in the I/O Commander.

For more about using the Winsock control, see Visual Basic's documentation.

## Updating the ESPSX3's Firmware

On occasion, R. E. Smith offers updates to the firmware that controls the ESPSX3's Rabbit microprocessor. To load new firmware, you need the following:

- A RabbitCore programming cable. This is a special ribbon cable with embedded circuits, available from R. E. Smith.
- The Rabbit Field Utility. Use the version provided on CD in the *RabbitFlashUtility* folder or download the latest edition from [www.rs485.com](http://www.rs485.com).

To update the firmware, do the following:

1. Download the .bin file containing the new firmware from [www.rs485.com](http://www.rs485.com).

2. Connect the programming cable to the ESPSX3. At one end of the cable are two 10-pin headers labeled PROG and DIAG. Mounted on the ESPSX3 is a RabbitCore 2000 board that contains a Rabbit 2000 microprocessor and a 10-pin socket. Connect the header labeled PROG to the socket so that the cable's red stripe is next to the dot indicating the socket's pin 1. When the cable is attached correctly, the long end of the cable is routed away from the RabbitCore board, not across it.

The DIAG connector is unused here.

3. Connect the other end of the programming cable to a PC's COM port. Use of a USB/RS-232 converter isn't recommended.

4. Run the Rabbit Field Utility. Click Setup, then Communications. Under Serial Options, select the COM port the programming cable connects to. Click OK. Click Setup, then Boot Strap Loaders. Cold Loader should point to coldload.bin and Pilot BIOS should point to pilot.bin, both in the Field Utility's folder.

5. Load the firmware. Click File, then Load Flash Image. Click the "..." button to browse to the folder containing the file to load. Select the file and click Open to cause the file to load into the RabbitCore's memory.

## Jumper Configuration Tables (Software version 2.0D and newer)

**Table 2: RS-232 Device Type**

RS-232 MODE	J1	J2	J3	J4
* COMPUTER (DTE)	INSTALLED	INSTALLED	REMOVED	REMOVED
MODEM (DCE)	REMOVED	REMOVED	INSTALLED	INSTALLED

**Table 3: Reset Defaults Optional Configuration Settings**

J10	FUNCTION		
I	Normal operation		
R	On power on 1 of 3-factory default settings are restored, must be installed for normal operation.		
	J16	J17	IP Address Default Configuration on Reset
	R	R	DHCP/BOOTP Enabled
	I	R	Static IP Address 128.0.0.75 (mfg. Test)
	R	I	Static IP Address 192.168.1.1

**Table 4: Monitor Mode Enable**

J11	FUNCTION
I	Normal operation of COM3
R	Enable Monitor Configuration Via COM3 at 9600,N,8,1

**Note: Jumpers reserved for future operation include J5-J9, and J12-J15 these should not be installed.**

### Factory Default Software Settings

**Table 1: Factory Default Settings**

PORT	BAUD	TCP/IP	PORT
COM1	9600,N,8,1*	BOOTP/DHCP ENABLED	9101
COM2	9600,N,8,1	DEFAULT IP: 192.168.1.1	9102
COM3	9600,N,8,1	NETMASK: 255.255.255.0	9103

\* Communications N,8,1 = no parity, eight bits, one stop bit

## **For More Information**

Here are some sources for more information about Ethernet and Internet communications:

Schematics, updates, examples, parts, news, and more for the ESPSX3  
[rs485.com](http://rs485.com)

The Ethernet standard (802.3)  
[www.ieee.org](http://www.ieee.org)

Standards for Internet protocols, including TCP, UDP, DHCP, BOOTP  
[www.rfc-editor.org](http://www.rfc-editor.org)

Documentation for the RabbitCore board  
[www.rabbitsemiconductor.com](http://www.rabbitsemiconductor.com)