User's Guide for

Ethernet SX Stack
Demo Board

Lit #: SXL-UG03-02

Revision History

REVISION	RELEASE DATE	SUMMARY
2.0	October 2 , 2000	Supports Rev 1.1 of Ethernet SX Stack Demo Board

Contents

Chapter 1
Overview

1.1 Introduction

Welcome to the world of cost-effective embedded internet devices. This user's guide for the Scenix Ethernet SX Stack demo board will guide you through the various steps of running a Web server and sending email the Scenix SX communications controller.

The Scenix SX communications controller can be used in a wide variety of applications that require Web connectivity of so called "internet enabled" devices. Applications requiring remote control and remote monitoring via the internet are most suitable for the Scenix controller since control and monitoring can be done through the use of a standard Web browser such as Internet Explorer or Netscape Navigator. The Scenix controller is powerful enough to handle the physical layer interface to the Ethernet as well as the network protocols and the Web protocol application.

The Scenix "SX Stack" software included in this kit is a collection of standard network protocols including:

- IP (Internet Protocol)
- ARP (Address Resolution Protocol)
- DHCP (Dynamic Host Configuration Protocol)
- UDP (User Datagram Protocol)
- TCP (Transmission Control Protocol)
- HTTP (Hypertext Transfer Protocol)
- SMTP (Simple Mail Transfer Protocol)

The Scenix Ethernet SX Stack demo board combined with a PC running Windows 95/98 is a powerful platform to demonstrate and evaluate the:

1. SX Web Server called the iSX (with Remote Control capability)
2. SX Send Email called the eSX
3. Auto-Configuration via DHCP

The Auto-Configuration via DHCP Demo achieves the same results as the SX Send Email Demo except that the demo board's IP address is automatically assigned. The DHCP demo should be considered an advanced demo since some knowledge regarding DHCP servers and Local Area Networks are required by the user.

1.2 Kit Contents

The Scenix Ethernet SX Stack Kit contains the following components:

1. Demo board (board marked SX Ethernet Rev 1.1)
2. AC power supply
3. PC COM port serial cable (IDC-10 female to BD-9 female)
4. UTP (Unshielded Twisted Pair) cross-over Ethernet cable
5. CD-ROM containing source code, HTML files, and documentation
6. This User's Guide

1.3 Demo Board Hardware Description

The Scenix Ethernet SX Stack demo board is divided into distinct functional sections to enable you see the cost-effective hardware implementation. Looking at the board in Figure 1-1, the following sections are outlined:

- The power supply “PWR SUPPLY”
- The SX and Ethernet controller “ETHERNET”
- The serial port “RS232 PORT”
- The Java Virtual Machine Port “JVM PORT” (Contact sales@scenix for more information)

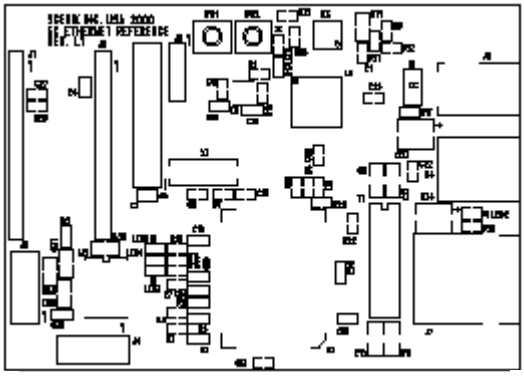

Figure 1-1. The Scenix Ethernet SX Stack Demo Board

1.4 Demo Board Software CD-ROM Description

The CD-ROM provided with the kit contains the following software:

1. Source file

demo_2_0_0.src - The SX source code for the three demonstrations included in this kit.

E2File3.src - The SX source code for transferring Web pages to the on-board serial EEPROM memory.

2. Programs

Eserv - An optional SMTP server that may be used during the Send Email and Auto-Configuration via DHCP Demos.

e2file.exe - A Windows program that is used to transfer Web pages from a PC to the Ethernet SX Stack demo board's serial EEPROM memory.

3. Documentation

All applicable documentation such as as this User's Guide, application notes, and datasheets.

1.5 The Demo Programs

There are three demo programs described in this guide:

1. The SX Web Server & Remote Control Demo
2. The SX Send Email Demo
3. The Auto-Configuration via DHCP Demo

The Ethernet SX Stack board is pre-programmed with software to run demos 1 and 2.

The Ethernet SX Stack board will have to be re-programmed with SX In-System Programming tool (not supplied in this kit) to run demo 3.

The Auto-Configuration via DHCP Demo achieves the same result as the SX Send Email Demo except that the demo board's IP address is automatically assigned. The DHCP demo should be considered an advanced demo since some knowledge regarding DHCP servers and Local Area Networks are required by the user.

The Scenix SX Stack demo board combined with a PC running Windows 95/98 is a powerful platform to demonstrate and evaluate the:

1. SX Web Server called the iSX (with Remote Control capability)
2. SX Send Email called the eSX
3. Auto-Configuration via DHCP capability

Chapter 2
iSX Web Server & Remote Control Demo

2.1 Introduction

The iSX Web Server & Remote Control Demo demonstrates the Scenix TCP/IP stack and HTTP application in a Web server environment. This demonstration requires a PC with a 10BaseT or 10/100BaseT network card running Windows 95 or 98. The demos can also run on Windows 2000/NT but the instructions supplied in this User's Guide are anly applicable to Windows 95/98.

To run this demo you connect the Ethernet SX Stack board to the PC's network card with the supplied UTP (Unshielded Twisted Pair) cross-over cable. After setting up your PC, you can start any Web browser to view the Web pages stored on the demo board's serial EEPROM memory. You can also control the state of a LED on the board via your Web browser.

The demo board as shipped in the kit is already pre-programmed with the Web server application software.

Later in this section, we will show you how to write your own Web content into the board's EEPROM memory as well as how to restore the original Web server application software to the board.

2.2 Setting Up Your PC

Your PC must have a 10BaseT compatible network card installed to be able to run this demo, TCP/IP protocol must be installed on your computer, and TCP/IP networking must be enabled for the card as well. It is best to use a PC that is already connected to an Ethernet LAN (Local Area Network) to do this demo since TCP/IP networking will already be enabled by default.

You have two options for setting up your PC. Follow only one (1) of the following setup instructions:

1. If you plan on doing the eSX Send Email Demo right after the iSX Web Server Demo, follow the setup instructions under 2.2.1 “Give your PC a static IP address”. The eSX Send Email on the Ethernet SX Stack demo board has been pre-programmed to contact a SMTP server at IP address 10.1.1.1 and therefore your PC needs to be set up to use this IP address.
2. If you only want to be able to do the iSX Web Server Demo and do not want to change your PC’s IP address, follow the instructions under 2.2.2 “Update your PC’s routing table”.

2.2.1 Give Your PC a Static IP Address

1. Click on Start, Settings, Control Panel, Network, Configuration. Click on the TCP/IP -> network card entry and then on Properties. **WARNING** - Write down the static IP address and subnet mask already present if any so you can restore your computer’s settings later! Also, make sure to remove all gateway entries in the gateway tab, and ensure there is a binding to the Etherent network adapter.
2. Click the “Specify an IP address” radio button and enter the IP address and subnet mask as indicated in Figure 2-2. Your PC is now configured to have an IP address of 10.1.1.1.
3. Click OK and reboot your PC. Before rebooting, be sure to disconnect your PC’s network adapter from your LAN and connect it via the supplied cross-over cable to the demo board.

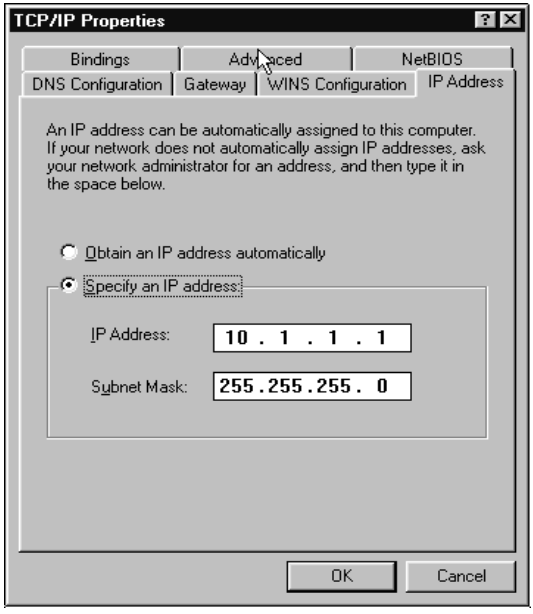

Figure 2-2. PC TCP/IP properties

2.2.2 Update Your PC's Routing Table

Your PC's routing table needs to be updated so that it knows to route Ethernet packets directly to the Ethernet SX Stack board instead of to a gateway IP address. Under 2.2.1 the routing table is automatically updated correctly, because the IP address of the demo board and the PC is on the same subnet. In this case your PC's IP address can be any value such as 168.75.232.39

1. Click on Start, Programs, MS-DOS Prompt. Type the following at the command line followed by pressing the Enter key: `ipconfig`. You should see the following (Figure 2-3):

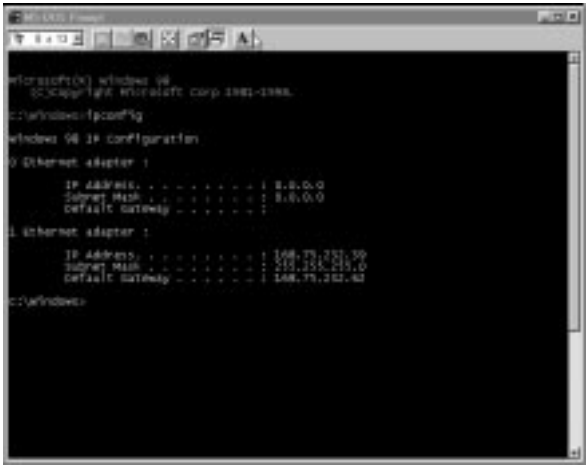

Figure 2-3. Ipconfig results MSDOS Window

Your computer's IP address will be a non-zero number. In this case the shown computer's IP address is 168.75.232.39

If your PC does not have an IP address, quit and follow the setup instructions under 2.2.1 instead.

2. Type the following at the command line followed by pressing the Enter key: route add 10.1.1.0 mask 255.255.255.0 <PC_ETHERNET_IP_ADDR>

Insert your PC's IP address into the < > field. For the above computer you would type: route add 10.1.1.0 mask 255.255.255.0 168.75.232.39

Your PC should now be set up correctly to communicate with the Ethernet SX Stack demo board.

2.3 Connect the Ethernet SX Stack Demo Board

Setting up the demo board is simply a matter of supplying power to it and connecting it to your PC's 10BaseT network card.

1. Supply power to the board by connecting the supplied AC adaptor's 9V plug to the board's J1 connector. The red power supply LED, D2 should be on once power is connected.
2. Connect the supplied cross-over cable from the demo board's jack, J7 to the jack on your PC's network card. The two sides of the cable are interchangeable.
3. Returning to the PC's DOS Command Prompt window, type the following followed by pressing the Enter key: ping 10.1.1.20 You should see the following 4 replies shown in Figure 2-4 from the SX Stack board. You will also get a message saying “Congratulations! Your Scenix Ethernet Demo Board is now talking to your PC via Etherent physical medium”.

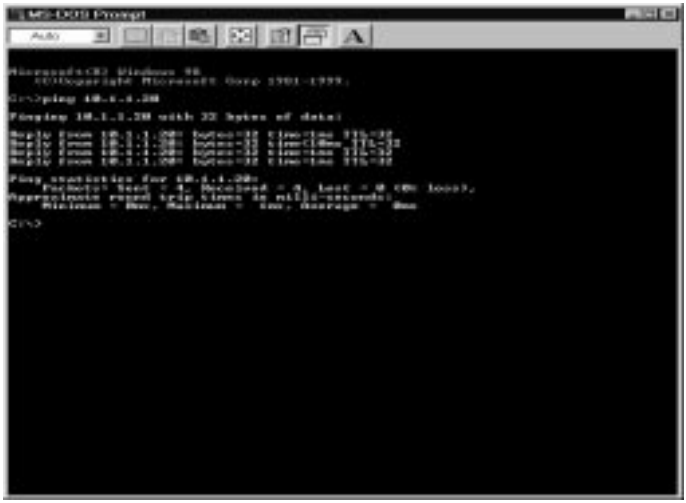

Figure 2-4. Ping results MSDOS Window

2.4 View Web Pages from the iSX Web Server

1. Start a standard Web browser such as Internet Explorer or Netscape Navigator on your PC. Type the following into the Address or Location / Go to: bar followed by pressing the Enter key:

http://10.1.1.20/index.htm

You should see the following main Web page stored on the board (Figure 2-5):

Figure 2-5. SX Stack Demo Board Main Web Page

Follow the various links on the main page. Be sure to watch the LED, D1 on the demo board when following the "Industrial control" link and controlling the LED with the Submit button provided. The “Industrial control” Web page is shown in Figure 2-6.

Note: The "Industrial control" demo source code (version 2.0) works better with Internet Explorer.

Figure 2-6. Industrial control Web Page

2.5 Load New Web Pages into the Demo Board

The iSX Web Server can serve any type of Web content, including Web pages, graphics, and files. The Web content is stored in a 32kB EEPROM device on the demo board.

To write your own Web content to the EEPROM, you need to run a file transfer program called E2File.exe on your Windows 95/98 PC, and at the same time, run a program called E2file3.src on the demo board's SX device. The program running on the PC transfers the Web content from your PC to the demo board, while the program running on the SX device transfers the data to the EEPROM.

Programming the SX with the file transfer program overwrites the existing Web server program. After the Web content has been written to the EEPROM, you need to re-program the Web server application into the SX device.

2.5.1 Program the SX with E2file3.src

1. In Windows 95/98, starting from My Computer, open the CD-ROM directory window. From there, open the iSX Support Files directory window.
2. Copy the E2File3.src program file to a local directory on your hard disk.
3. In the local directory window, point to the source code icon, press the right mouse button, and select properties.
4. In the E2File3.src Properties dialog box, toggle off the Read-only attribute option (if not already off), and then select OK.
5. Using your assembler and programming tools, program the SX device on the demo board. This involves connecting the programming tool to the 4-pin header of the demo board. The “OSC1” pin on the programming tool should be connected to pin “1” of J5. Refer to the documentation provided with the SX programming tool. Check to see that the file is correctly setup for your assembler, and edit if necessary.

```
    ;**************

; *** DEVICE ***
; **************

; Parallax -- uncomment the following 2 lines if,
; and only if, using Parallax's SX-Key
;       DEVICE  OSCHS2, DRT60MS
;       FREQ    48000000   ; have to debug at freq
;                            != resonant freq

; SASM -- uncomment the following line if,
; and only if, using Advance Transdata's SX-ISD
       DEVICE  SX52BD, OSCHS2, WDRT60
```

6. Connect the development tool to the board and apply the power. Then follow the following steps:
   - Remove the oscillator jumper
   - Run > Program
   - Remove power
   - Install the oscillator jumper
   - Remove the development tool
   - Apply power
   - Hit the RESET button (SW1)

2.5.2 Run the E2File.exe Program Under Windows

1. The Web content is transferred via a very simple protocol to the demo board and therefore no error checking or error correction is done during the transfer. It is extremely important to quit all active applications so that the transfer program will not be interrupted.
2. Put all of the desired Web content into a local directory of your PC. This could be just a single Web page or many hyperlinked Web pages and files. Multiple files may be organized hierarchically under subdirectories. The hierarchy will be preserved when it is transferred to the EEPROM. The user must check the total size of all the files in the download directory and subdirectories beneath that. To do this, open the root folder, do CTRL-A to select all, then right-click in the selected area -> properties. Check “size”, and ensure it is less than 30,500 bytes.
3. In the iSX Support Files directory window, find the E2File.exe program file, and copy that file to a local directory.
4. In the local directory window, double-click on the E2File.exe program icon. This opens the E2 Send dialog box.
5. In the E2 Send dialog box, set the communications port to Com1 (or whatever port you want to use). See Figure 2-7.

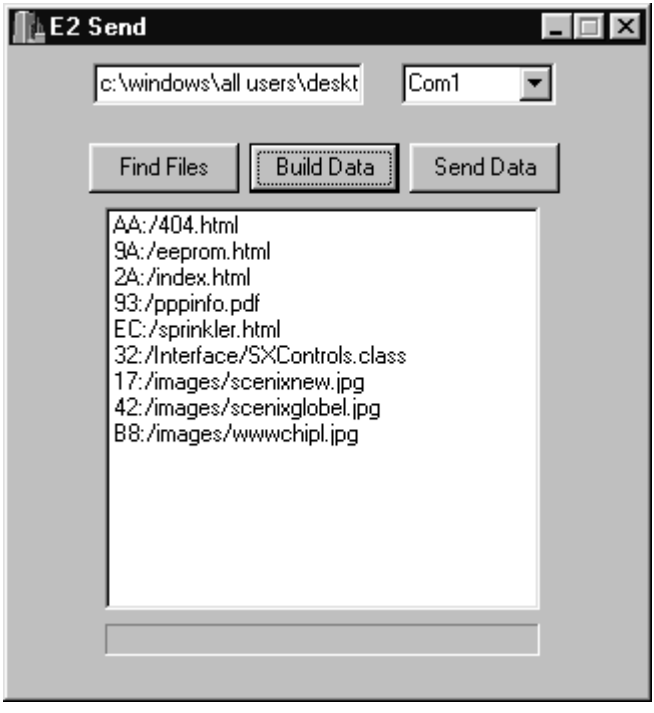

Figure 2-7. E2send Dialog Box

6. Connect the serial cable from the specified port of the PC to the RS232 PORT, J4 connector of the demo board. The ribbon cable should protrude away from the centre of the board when it is plugged in.

2.5.3 Transfer the Web Content to the EEPROM

1. In the directory path field of the E2 Send dialog box, enter the full path to the directory containing your Web content.
2. Click the Find Files button. All of the files in the specified directory path are listed, including the paths to files in lower-level directories.
3. Click the Build Data button. This builds a data packet that will be sent to the demo board. **WARNING**: Only click the Build Data button once! Quit the program and start over if you clicked the button more than once.
4. Click the Send Data button. A popup dialog box reports the size of the target EEPROM (32K bytes). The user must check the total size of all the files in the download directory and subdirectories beneath that. To do this, open the root folder, do CTRL-A to select all, then right-click in the selected area -> properties. Under “size”, it should be less than 30,500 bytes.
5. Click OK to start the download process. A new status window appears, with a moving status bar to indicate progress of the download operation.
6. When you see the message “Download Completed,” click OK. Disconnect the serial cable from the RS232 PORT, JP1 connector of the demo board.

2.5.4 Reprogram the Web Server Application

1. From the top-level directory window of the CD-ROM, copy the Web server source file, iSX _x_x_x.src, to a local directory.
2. In the local directory window, point to the source code icon, press the right mouse button, and select Properties.
3. In the iSX _x_x_x.src Properties dialog box, toggle off the Read-only attribute option, and then click OK.
4. Check to see that the file is correctly set up for your assembler, and edit it if necessary. A snapshot of the source code is as follows:

```
; **************
; *** DEVICE ***
; **************

; Parallax -- uncomment the following 2 lines if,
; and only if, using Parallax's SX-Key
;       DEVICE  OSCHS2, DRT60MS
;       FREQ    48000000   ; have to debug at freq
;                            != resonant freq

; SASM -- uncomment the following line if,
; and only if, using Advance Transdata's SX-ISD
       DEVICE  SX52BD, OSCHS2, WDRT60
```

5. Using your assembler and programming tools, program the SX device on the demo board. If the assembler generates an error when the programming cycle is initiated, follow the instructions in the highlighted source area to correct the problem. Connect the development tool to the board and apply the power. Then follow the following steps:
   - Remove the oscillator jumper
   - Run > Program
   - Remove power
   - Install the oscillator jumper
   - Remove the development tool
   - Apply power
   - Hit the RESET button (SW1)

6. Ping the demo board with ping 10.1.1.20 and once successful, view the new Web content using your Web browser.

2.5.5 Restore the Original Scenix Web Content

Writing any new Web content to the EEPROM erases the previous Web content. If you want to restore the original Scenix Web pages to the EEPROM, perform the following steps.

1. Reprogram the SX device with the E2file3.src program, removed the programming tool, reset the device, and leave the SX in the running state.
2. Start the E2File.exe program under Windows 95/98. For the directory path in the E2 Send dialog box, enter the path to the iSX Support Files/html directory on the CD-ROM. Click Find Files and Build.
3. Connect the serial cable to the RS232 PORT, JP1 connector of the demo board, and then click Send.
4. When the download operation is complete, disconnect the serial cable from the RS232 PORT, JP1 connector.
5. Reprogram the SX device with the Web server program, iSX vx_x_x.src, and verify that you can access the Scenix Web content.

2.6 Frequently Asked Questions

Here are some frequently asked questions about the iSX Web server application.

Does it matter which Web browser I use?

The demo should work the same for any Web browser, such as Netscape Navigator or Internet Explorer. However, with the Web server demo, the best performance is achieved with the Internet Explorer.

How is the Web content stored in the EEPROM?

The Web content is stored as raw data. There is no encryption or encoding. Text is stored as ASCII text and graphics files are stored as binary data.

How much Web content can be stored?

The EEPROM on the demo board is 32K bytes. The program uses a 16-bit pointer, which allows a maximum EEPROM size of 64K bytes.

I tried to download 32K bytes of Web content and it failed. Why?

There is a certain amount of overhead associated with each downloaded file, so the actual limit is a little bit less than 32K bytes of Web content.

What is the IP address of the board?

The IP address is 10.1.1.20. You can change this address by modifying the source code.

The E2 Send dialog box creates a file called test.dat. What is it for?

The test.dat file is generated when you click Build Data. E2 Send (E2File.exe) sends this file to the demo board and the program running on the SX writes the data to the EEPROM.

I do not get a response back from the SX Stack demo board when I ping it?

Check if the link-up LED available on most 10BaseT cards on your PC is on while pinging the board. If not, your card may have an auto-

detect feature shutting it down because your network card is not connected to a terminated hub. Try and disable the card's autodetect feature in the properties of the network card setup or else you will have to connect the network card to a hub with a regular cable and the SX Stack demo board to the hub as well with another regular cable. The supplied cross-over cable cannot be used when connecting to a hub.

I connected the SX Stack demo board to a local hub on my LAN instead and I still can't ping it?

If you can see the hub, make sure the link-up LED on the hub lights up when you plug the SX Stack demo board in. If not, power the board down and power it up again. If you pinged the SX Stack board before updating your PC's routing table your PC's ARP cache is probably corrupted. Type arp -a at the MS-DOS command prompt to see the contents of the ARP cache. If you see a listing for IP address 10.1.1.20 other than the following, your ARP cache is corrupted:

Internet Address	Physical Address
10.1.1.20	00-00-00-00-00-01

To clear the cache, type arp -d 10.1.1.20

Update your PC's routing table now as described in 2.2.1 “Update your PC’s routing table” and try to ping the board again.

Chapter 3
eSX Send Email Demo

3.1 Introduction

The eSX Send Email Demo demonstrates the Ethernet SX Stackboard's ability to send email messages. Typical applications include remote metering devices sending logging data via email to a central collecting station.

This demonstration requires a PC with a 10BaseT compatible network card running Windows 95 or 98.

To run this demo you connect the Ethernet SX Stack board to the PC's network card with the supplied UTP (Unshielded Twisted Pair) cross-over cable. After setting up a supplied SMTP (Simple Mail Transfer Protocol) server on your PC, you can send an email to yourself by pressing a button on the Ethernet SX Stack demo board.

The demo board is pre-programmed with the Send Email application software and will work correctly if you have not overwritten the software already to do the auto-configuration via DHCP Demo.

Later in this section, we will show you how to change the code and use your LAN or ISP's (Internet Service Provider) SMTP server so that you can send an email to any email address you wish.

3.2 Email Principles

Internet email uses two protocols to deliver email to and receive from an email . These protocols are called the Post Office Protocol (POP) and the Simple Message Transfer Protocol (SMTP). Version 3 of POP, known as POP3, is the current and most widely used version of POP.

An email is typically a program that sends, receives, and processes email messages for the user. Eudora, Netscape Messenger, and Microsoft Outlook are some examples of email clients. A client uses POP3 to receive email and SMTP to send email.

Any email transaction requires a client and a server. The server is a point of exchange for different email clients. The server is usually located at an Internet Service Provider (ISP). To send email, the client uses SMTP to connect to the ISP's mail server. To receive email, the client uses the POP3 protocol to ask the ISP's mail server if there are any email messages waiting, and to retrieve any such messages.

If a client is sending email to another client connected to the same ISP (for example, between two users within the same company), as soon as the first client sends the message to the server using STMP, the second client can retrieve the message using POP3. Typically, however, the destination address of an email is not on the local server. In that case, a feature called “SMTP relay” is required.

When an SMTP server relays a message, it sends the message to another server on behalf of the requesting client. The SMTP relay feature is often restricted or disabled. Otherwise, it could be used by an outside spammer to send thousands of messages, tying up the server.

Both SMTP and POP3 are client-server, transaction-oriented, text-based protocols. They proceed lock-step, with the client sending requests to the server and modifying its behavior based upon the response codes received from the server.

3.3 Setting Up Your PC

If you have already completed the iSX Web Server Demo, you can continue to 3.3.1 and install the EServ SMTP server since your PC can already communicate with the Ethernet SX Stack demo board. If you have not done the iSX Web Server Demo, you will have to follow the instructions to set up your PC under 2.2 “Setting up your PC” and return to this section.

In order to demonstrate the ability of the eSX Send Email Client to send an email message, we need to find a way to route the email message from the demo board through the host PC used for demonstration, and from there to the final destination.

There are several ways that you could route email messages sent by the eSX Send Email :

1. Have the host PC perform packet forwarding to an SMTP server somewhere else in the network (such as a connected ISP).
2. Install an SMTP server on the PC itself, and have this local server relay the message to the destination address somewhere else in the network.
3. Install an SMTP server on the PC itself, and have a local email client on the PC retrieve the message.

Method number 1 is the most likely method to be used in a real application. However, it requires an operating system that supports IP packet forwarding, and needs a system administrator to modify the network routing tables.

For this demonstration, we will use method number 3 because it does not require an external network connection. The network in this case consists of just the demo board and applications running under Windows 95/98. To use this method, you need to install an SMTP server on the PC. A server application called EServ, version 2.5, is provided on the CD-ROM for this purpose.

Note: If you would like to obtain the latest version of EServ, you can download it from the Web site “http://www.eserv.ru/”. The EServ software is available on a “free trial” basis. Using the software beyond a 30-day evaluation period requires a payment to the software provider, E-Type Co.

3.3.1 Install and Run EServ on the PC

1. In Windows 95/98, open the CD-ROM directory window. From there, open the eSX Support Files directory window.
2. Double-click the Eserv250.exe icon. This starts the installation process.
3. Read the License Agreement and then click Yes. Read the “readme” file and then click OK. Click OK to accept the default destination directory, c:\eserv2. Installation should then proceed to completion.
4. Click Start, Programs, Eserv2, Run Eserv2 Server. This opens the Eserv/2.50 application window. See Figure 3-8.

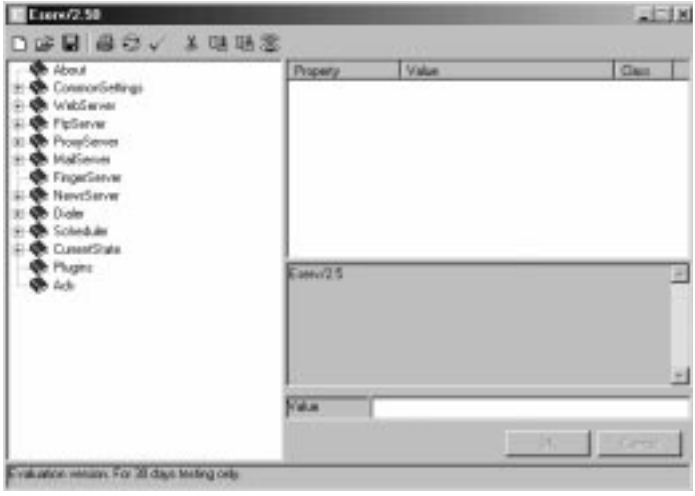

Figure 3-8. EServ Application Window

Eserv is now running and can process email messages. Unlike some SMTP servers that are invoked automatically upon start-up of the computer, Eserv only operates when you explicitly run the program.

3.3.2 Configure Eserv for the eSX Demo

In order to send and receive email locally, you need to create a local domain and a local user to communicate with the demo board. You will create a new email address, joe@demo.sx, where “joe” is the user name and “demo.sx” is the local domain name. The user password will also be “joe”.

To allow the demo board to send email messages that are handled by the local server, you will create a user “eSX” and an email address eSX@demo.sx. The user password will also be “eSX”.

1. The left side of the Eserv window has a list of purple books. Double-click MailServer, SMTPserver, and LocalDomains. The right side of the window lists the local domains that have been defined. See Figure 3-9.

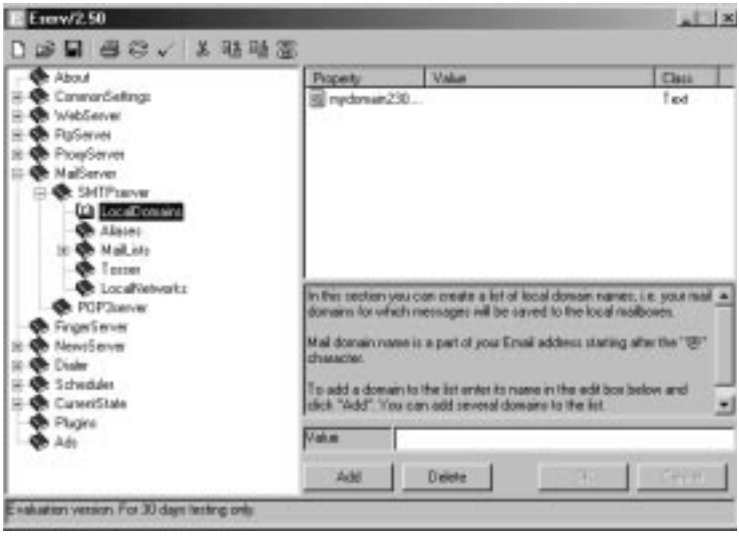

Figure 3-9. Eserv Application Window - Local Domains

2. In the Value field, enter the new domain name, demo.sx. Click Add to add this domain to the list.

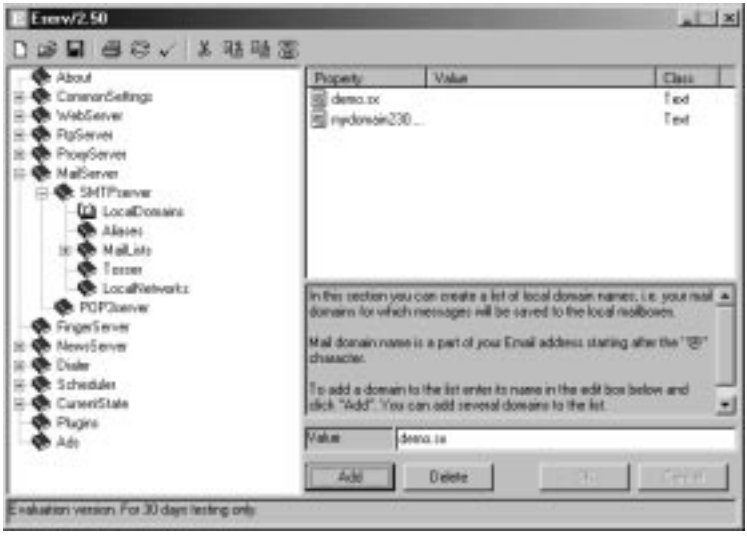

Figure 3-10. Eserv Application Window - New Domain Name

3. On the left side of the Eserv window, double-click Common Settings and Users. The list of users currently supported is shown below Users.

4. In the Value field, enter the first new user name, joe. Click Add to add this user to the list of supported users.

5. On the left side of the Eserv window, click joe.

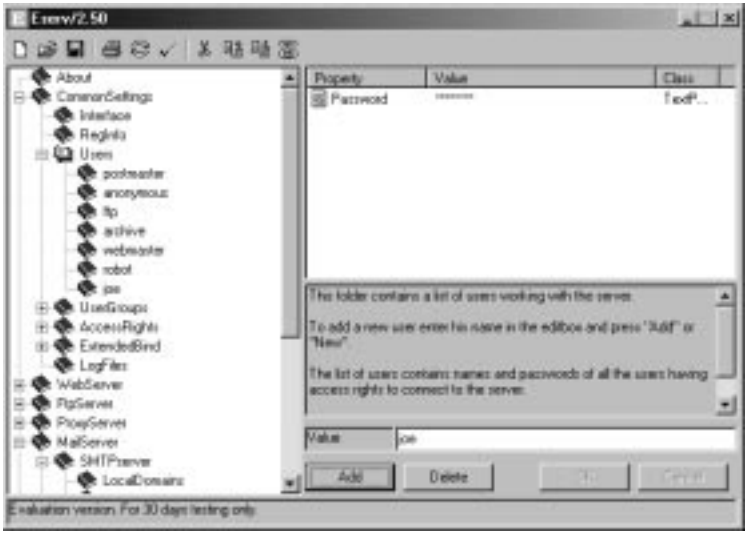

Figure 3-11. Eserv Application Window - Adding User

6. On the right side of the Eserv Window, double-click Password. In the Password field at the bottom, enter “joe” (which is displayed as three asterisks) and then click OK.

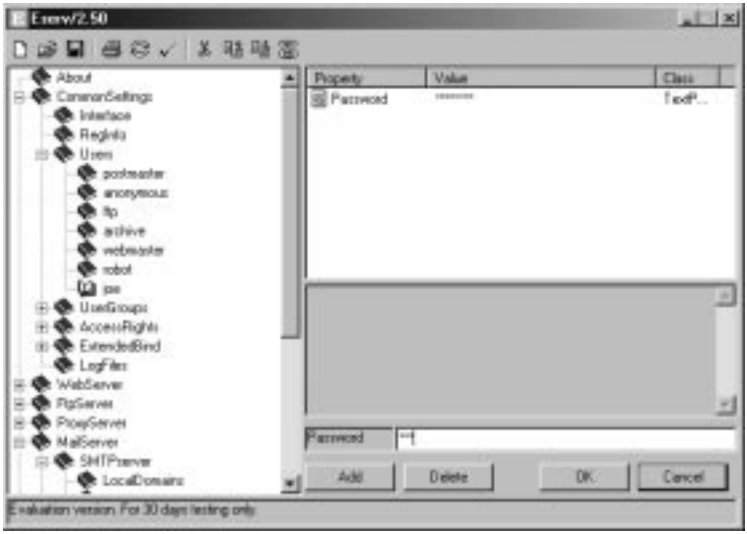

Figure 3-12. Eserv Application - Entering Password

7. Repeat steps 3 through 6 to create a user called “eSX” with a password “eSX”.

For the eSX Send Email demonstration, it is not necessary for Eserv to gain access to the Internet. However, if you want Eserv to be able to send email to and receive email from any address throughout the Internet, you can tell Eserv how to gain access to the SMTP server and POP3 server of the ISP that you normally use for Internet access. For more information on this topic, double-click Scheduler, Tasks, and SMTPSEND or POP3RECV.

3.3.3 Configure Your PC's Email Client Software

For the eSX Send Email demonstration, you need to configure your PC's email client (such as Microsoft Outlook, Eudora, Netscape Messenger or Pegasus Mail) to use Eserv rather than your usual SMTP server. The exact procedure for doing this depends on your PC's email client. For specific commands, see the documentation or on-line help for your email client.

This is the general procedure:

1. To avoid changing your existing email setup, create a new email user account. For example, for Eudora, create new shortcut to the Eudora executable, open the Properties dialog box for the shortcut, and add a second directory path to the Target field.
2. Execute the email client's setup command (such as Tools > Options or Edit > Preferences) and set the options as follows:
   - User name = joe
   - Password = joe
   - Return address = joe@demo.sx
   - POP account = joe@localhost
   - POP (incoming mail) server = localhost
   - SMTP (outgoing mail) server = localhost

   (The sever name is literally the string "localhost".)

3.4 Connect the Ethernet SX Stack Demo board

Setting up the demo board is simply a matter of supplying power to it and connecting it to your PC's 10BaseT network card.

1. Supply power to the board by connecting the supplied AC adaptor's 9V plug to the board's J1 connector. The red power supply LED, D3 should be on once power is connected.
2. Connect the supplied cross-over cable from the board's jack, J2 to the jack on your PC's network card. The two sides of the cable are interchangeable.
3. Returning to the PC's DOS Command Prompt window, type the following followed by pressing the Enter key: ping 10.1.1.20

You should see the following 4 replies from the Ethernet SX Stack board (Figure 3-13):

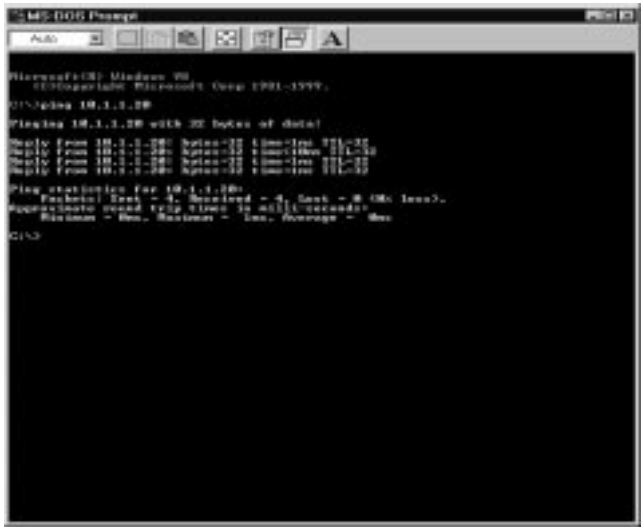

Figure 3-13. Ping 10.1.1.20 MSDOS Window

3.5 Sending an Email

The eSX STMP application sends an email message each time you press SW2 on the demo board. The content of the message is “hard-wired” in the eSX source code.

1. Press SW1 on the demo board and an email will be sent to you.
2. Go to your PC’s email client program and check your email. You should get an incoming email message like the following:

```
From: SX
To: Joe
Subject: Warning!

Over-temperature condition in router.
```

If you did not receive this email message, check to see whether the message is waiting in Eserv to be retrieved. In that case, there is some kind of setup problem between Eserv and your email client. To check for messages waiting in Eserv, look for any files in the following directory:

```
c:\eserv2\mail\in
```

If there is no file in that directory, it indicates some kind of setup problem between Eserv and the demo board.

3.6 Frequently Asked Questions

Here are some frequently asked questions about the eSX Send Email Demo.

How do I change the user password in Eserv?

To change the user password for user “joe,” go to the Eserv window, click CommonSettings, Users, and joe. Double-click Password, enter the new password into the Password field, and click OK. Remember to change the password in your email client as well.

I got the message “Cannot bind socket to port 110” message. What does this mean?

You should have only one email server on the PC. This message appears when you already have an SMTP server installed and running on your PC. Perhaps you have accidentally installed Eserv twice.

I got an “SMTP send” message for the status of Eserv. What does this mean?

*** I never saw this message, even when I tried to make it appear. Where and when does it appear? ***

It means that there is an email message waiting in Eserv to be relayed to another server. It is caused by a request to send email to a non-local domain. Perhaps you have not yet added “demo.sx” as a local domain in Eserv.

3.7 Send Email to any Email Address

To send email to any email address you want to, you will have to have an Internet Service Provider and an already established email account. You will need to do the following:

1. Find the following section in the isx source file:

```
; For both demos, fill in your SMTP server's IP ad-
dress here:
SMTP_SERVER_IP3 = 10
SMTP_SERVER_IP2 = 1
SMTP_SERVER_IP1 = 1
SMTP_SERVER_IP0 = 1

; Create an email account for the board.
; For both demos, fill in your email and the recip-
ient's email addresses and
; your domain name by going to the following func-
tions:
; _senderDomainName
; _mailFrom
; _mailTo
; The text from these names are stored in program
memory and are
; located at specific memory locations.
```

2. Fill in your ISP or LAN's SMTP server's IP address. You can easily find that by pinging mail.yourdomain or smtp.yourdomain. Example: If your email address is joe@acme.com type ping mail.acme.com or ping smtp.acme.com in a DOS command window.

Note: If an error message occurs, the user needs to find the IP address of email server and insert that address in the code shown in this section.

3. Go to the indicated sections in the source file and fill in your email account's domain name, mail from and mail to email addresses. Example: If your email address is joe@acme.com you will have:

Sender Domain Name = acme.com

Mail From = '<joe>'

Mail To = any email address you want such as support@acme.com

Also go to _mailData and you may change the To and From fields as well as the email message. **NOTE**: Only a limited amount of memory is available for email message data. A too long message will result in an program memory overflow / overwrite error when the source file is assembled.

4. Assemble and program the file to the Ethernet SX Stack Demo Board using the appropriate tools.

5. Connect demo board to the network through which you can access the mail server (use regular CAT5 cable instead of cross-over). Run the Send Email Demo again.

Chapter 4
Extra: Auto-Configuration via DHCP Demo

4.1 Introduction

The Auto-Configuration via DHCP Demo demonstrates the DHCP Protocol of the Scenix TCP/IP stack.

The Auto-Configuration via DHCP Demo achieves the same result as the SX Send Email Demo except that the demo board's IP address is automatically assigned. The DHCP demo should be considered an advanced demo since some knowledge regarding DHCP is required by the user.

This allows internet devices such as remote monitoring or remote metering devices to be easily connected to an existing Ethernet LAN. In most cases it is simply a matter of connecting the device to the LAN without having to edit and configure settings such as the device's assigned IP address in the source code

To run this demo you connect the Ethernet SX Stack demo board either to a Local Area Network or to a workstation that can serve as a DHCP server. After setting up a SMTP (Simple Mail Transfer Protocol) server or using your LAN's SMTP server, you can send an email to yourself by pressing a button on the Ethernet SX Stack demo board.

The demo board is pre-programmed with software to demonstrate the normal Send Email Client and iSX Web Server applications. The supplied source file (isx.src) will have to be edited and the board re-programmed to run this demo.

4.2 DHCP Principles

The Dynamic Host Configuration Protocol was developed to allow network administrators to dynamically configure hosts to be connected to a LAN. Hosts may be PC's connected to a LAN or any device that may be termed a "network node". DHCP runs on top of IP in the network protocols stack and use the User Datagram Protocol (UDP) as its carrier.

One commonly used feature of DHCP is for hosts to obtain an IP address during setup from a DHCP server on a LAN. In essence this means that you may typically just plug in your PC to a LAN and it will get an IP address automatically as opposed to you having to set it up in the TCP/IP properties of your PC's network card. This of course means that DHCP-able hosts may be moved around without manual re-configuration.

A DHCP server is commonly set up on a LAN and is configured to hold a "pool" of IP addresses out of which it will assign addresses to requesting hosts on the LAN. The process is typically as follows and is described with reference to the Ethernet SX Stack Demo Board:

Upon power-up the host (Ethernet SX Stack Demo Board in this case) sends a DISCOVER message on the LAN to look for DHCP servers. Any DHCP servers will reply with OFFERS. The offers contain an offered IP address, a renewal time and a re-binding time. A host will then send a REQUEST directly to a specific DHCP server which will either ACKNOWLEDGE or NEGATIVE ACKNOWLEDGE the REQUEST (if invalid). The REQUEST message is normally just a copy of the OFFER the DHCP server sent.

If ACKNOWLEDGED, the host will now have to periodically renew the "IP lease" offered by the DHCP server. A DHCP server may also be set up to offer permanent leases but this is not the case with this demo. IP lease times may range from 1 minute to 7 days as implemented on the Ethernet SX Stack Demo Board. The host will also have to "re-bind" at the re-binding time indicated in the OFFER message of the DHCP server. Re-binding is the process whereby the host will re-DISCOVER DHCP servers on the LAN as opposed to simply sending a renewal request to a specific DHCP server everytime. This is necessary since even DHCP server's IP addresses may be changed over time.

4.3 Setting Up a DHCP Server

You have two options on how to set up a DHCP server and the environment for this demo to work:

1. Connect the demo board with the supplied UTP cross-over cable directly to the network card of a workstation that can act as a DHCP server. Microsoft NT workstations can act as DHCP servers.

2. Connect the demo board to a hub on a Local Area Network that has a DHCP server implemented. You cannot use the supplied UTP cross-over cable to connect to the hub. You will have to use normal UTP cable.

To set up the DHCP server:

This will be dependant on your specific network setup and software. A common setup is with a Microsoft NT server. You will have to install the DHCP server from the NT server software. Follow the instructions with your specific server software. For NT you will have to create a scope after running the DHCP manager. Then assign a range of IP addresses and lease times offered. Be sure to assign IP addresses your LAN is set up for and to exclude all IP addresses used on your LAN already to avoid an IP address “clash”. The Ethernet SX Stack Demo Board can handle lease times of anywhere from 1 minute to 7 days. It is recommended that you set up an IP lease time of 1 minute so that you can see how the lease is renewed.

TIP: Try and set up a scope with only one available IP address on your DHCP server. It will be easy then to ping the Ethernet SX Stack Demo Board with this IP address when testing if the auto-configuration process was successful.

4.4 Setting up the Ethernet SX Stack Demo Board

The Ethernet SX Stack Demo Board is pre-programmed with software for the iSX Webserver and Send Email Client Demos. To run the DHCP demo you will have to edit the source file, assemble it and re-program the Demo Board.

1. Open the isx.src source file and find the following section:

```
DEMO = 2

        IF DEMO==1
; Demo1 - (Webserver and email client IP address will
be 10.1.1.20)
DHCP = 0
HTTP = 1
SMTP = 1
        ENDIF

        IF DEMO==2
; Demo2 - (email client IP address will be as as-
signed by remote DHCP server)
DHCP = 1
HTTP = 0
SMTP = 1
        ENDIF

; For both demos, fill in your SMTP server's IP ad-
dress here:
SMTP_SERVER_IP3 = 168
SMTP_SERVER_IP2 = 75
SMTP_SERVER_IP1 = 232
SMTP_SERVER_IP0 = 2

; Create an email account for the board.
; For both demos, fill in your email and the recip-
ient's email addresses and
; your domain name by going to the following func-
tions:
; _senderDomainName
; _mailFrom
; _mailTo
; The text from these names are stored in program
memory and are
; located at specific memory locations.
```

Set the DEMO variable to 2 as indicated.

2. Fill in your ISP or LAN's SMTP server's IP address. You can easily find that by pinging mail.yourdomain or smtp.yourdomain. Example: If your email address is joe@acme.com type ping mail.acme.com or ping smtp.acme.com in a DOS command window.

3. Go to the indicated sections in the source file and fill in your email account's domain name, mail from and mail to email addresses. Example: If your email address is joe@acme.com you will have:

Sender Domain Name = acme

Mail From = joe

Mail To = any email address you want such as support@acme.com

Also go to _mailData and you may change the To and From fields as well as the email message.

NOTE: Only a limited amount of memory is available for email message data. A too long message will result in a program memory overflow / overwrite error when the source file is assembled.

4. Assemble and program the file to the Ethernet SX Stack Demo Board using the appropriate tools.

5. Connect the Demo Board to your LAN or directly to the DHCP server and power-up the board.

4.5 Running the Demo

Once you connected the demo board and powered up the board, the auto-configuration process is automatically started on the Demo Board. You should be able to see if an IP lease was assigned to the demo board by opening up the DHCP manager program on your DHCP server. Refer to the instructions with your specific DHCP server's software.

Also ping the Ethernet SX Stack Demo Board by typing ping <ETH_ADDRESS> at a command prompt on any PC connected to the LAN or on the DHCP server itself. Be sure to enter the IP lease's IP address when you type the ping command. Example: If your DHCP manager indicates that IP address 168.75.232.39 was assigned you will type: ping 168.75.232.39. You should see a positive response from the Demo Board.

Press SW1 on the board to send an email to the recipient as set up in the source file.

4.6 Frequently Asked Questions

Can I do this demo with just one PC and the cross-over UTP cable connected to the demo board?

Yes, but then the PC will have to be set up as a DHCP server as well as a SMTP server. A regular PC running Windows 95/98 cannot be easily set up to be a DHCP server. Microsoft Windows NT PCs can be set up to be DHCP servers.

I cannot ping the demo board after following all the instructions?

Check in the DHCP manager software of your PC if a IP lease for the board is active. Try and make only one IP address available when setting up the lease and ping only that one IP address. Make sure that the IP lease time is between 1 minute and 7 days.