NE-4000T

User's Manual

www.moxa.com/product

Second Edition, November 2003

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NE-4000T
User's Manual

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Introduction

Welcome to MOXA NE-4000T Embedded Network Enabler. This compact sized Network Enabler not only lets you network-enable your serial devices, but also comes equipped with built-in TCP/IP protocols for fast integration, saving you time and energy on programming.

The following topics are covered in this chapter:

❑ **Overview**

❑ **Package Checklist**

❑ **Product Features**

❑ **Product Specifications**

Overview

NE-4000T Embedded Network Enabler is a compact sized module, measuring only 44×31.48 mm (less than half size of your credit card). With its tiny size, it can fit in almost any kind of serial device to make the serial device 10M Ethernet ready.

NE-4000T comes with built-in TCP/IP stack for fast integration with your serial devices. In this way, engineers no longer need to spend much time on TCP/IP programming, but instead can focus on developing other major features, shortening the period of time before you release your new products. The reliable TCP/IP communication firmware that comes with NE-4000T can be easily configured with a user-friendly Window utility, Web browser, or serial console. In addition, a Windows-based NECI (Network Enabler Configuration Interface) Library is available to help you develop your own Windows utilities.

An integration kit and a compete development kit containing a development board, documents, sample code, cables and accessories are available for evaluation and development use.

Package Checklist

- 1 NE-4000T
- 1 NE-4000T-ST
- NE-4000T Document & Software CD
- NE-4000T Quick Installation Guide
- Universal Pwer Adapter Set
- Null modem cable
- Product Warranty Booklet

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

Product Features

NE-4000T products enjoy the following features:

- Supports TTL Interface (up to 115.2 Kbps)
- Supports 10M Ethernet with built-in transformer
- Ready-to-use TCP/IP firmware for fast integration
- Compact sized and Dual-in-line pin headers for easy integration
- Low power consumption
- Easy configuration with Web browser, serial console or Windows utility
- Supports NECI Library for developing your own configuration utility
- Highly expandable with up to 8 GPIOs

Product Specifications

System

CPU	8-bit MCU
RAM	32 KB
Flash	64 KB

LAN

Ethernet	10 Mbps, pin headers
Protection	Built-in transformer with 1.5 KV magnetic isolation

Serial

Interface	TTL
Port Type	Pin header
Signals	TxD, RxD, RTS, CTS, GND

Serial Communication Parameters

Parity	None, Even, Odd
Data Bits	8
Stop Bit	1, 2
Flow Control	RTS/CTS, XON/XOFF
Transmission Speed	300 bps to 115.2 Kbps

Software Features

Protocols	ICMP, ARP, IP, TCP, UDP, DHCP, HTTP
Operating Mode	TCP Server
Utilities	Configurator utility for Windows 95/98/ME/NT/2000/XP
Configuration	Web Browser, Serial Console, or Windows Utility

Power Requirements

Power Input	5 VDC, ±5%
Power Consumption	65 mA @ 5 VDC (Max.)

Environment

Operating Temperature	0 to 70°C (32 to 158°F), 5 to 95%RH
Storage Temperature	-20 to 85°C (-4 to 185°F), 5 to 95%RH

Regulatory Approvals

EMC	FCC Class B, CE Class B
WARRANTY	5 years

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Panel Layout and Pin Assignments

This chapter includes information about NE-4000T's layout and pin assignments. The second section of the chapter discusses NE-4000T-ST, the evaluation board used for evaluation and development. The following topics are covered:

❑ **Panel Layout (NE-4000T)**

  ➢ Pin Assignments

  ➢ Block Diagram

❑ **Panel Layout (NE-4000T-ST)**

  ➢ Major Components

  ➢ Ethernet Port Pinouts

  ➢ Serial Port Pinouts

  ➢ Pin Headersof PIO

  ➢ LED Indicators

Panel Layout (NE-4000T)

Top panel of NE-4000T

Pin #1

44.00 mm

31.48 mm
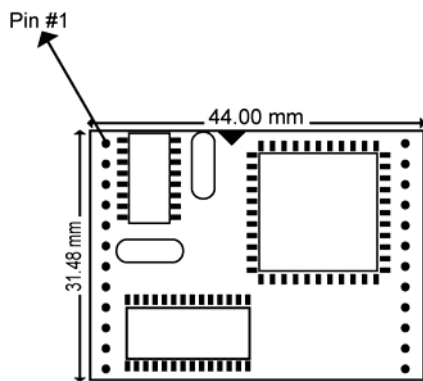
Side panel of NE-4000T

4.9 mm

4.9 mm

1.6 mm

2.5 mm

6 mm
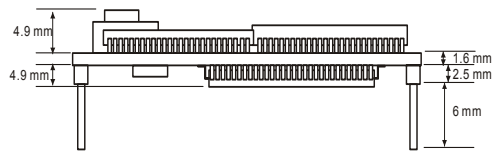
Back panel of NE-4000T

44.00 mm

31.48 mm
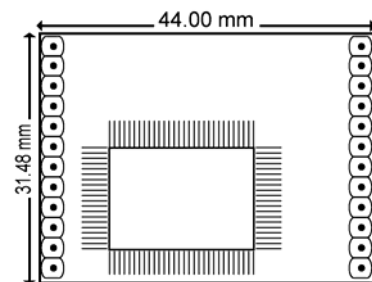
Pin Assignments

Pin	Signal	Pin	Signal
1	ETx+	13	PIO0
2	ETx-	14	PIO1
3	ERx+	15	PIO2
4	ERx-	16	PIO3
5	Link/Active LED	17	PIO4
6	TXD	18	PIO5
7	RXD	19	PIO6
8	RTS	20	PIO7
9	CTS	21	Reserved
10	Reserved	22	Ready LED
11	GND	23	Reserved
12	GND	24	+5V

NOTE

Ethernet Signals: ETx+, ETx-, ERx+, ERx-

Serial Signals: TXD, RXD, RTS, CTS

LED Names: Link/Active, Ready

Block Diagram

Panel Layout (NE-4000T-ST)

NE-4000T-ST is an evaluation and design board for use by engineers who will incorporate NE-4000T into their serial device. The size of this board is 130 × 50 mm, with its thickness of 1.6 mm.
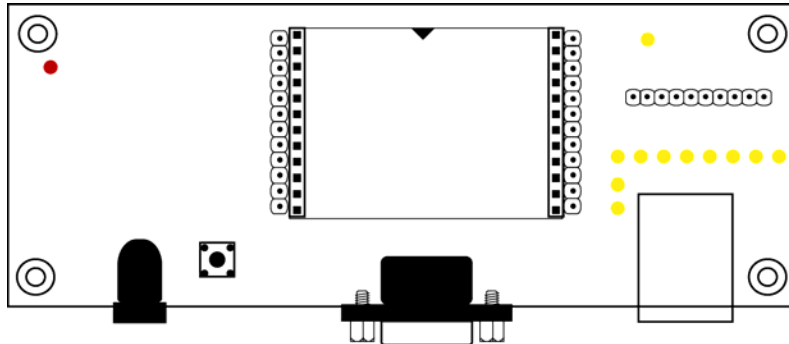
Major Components
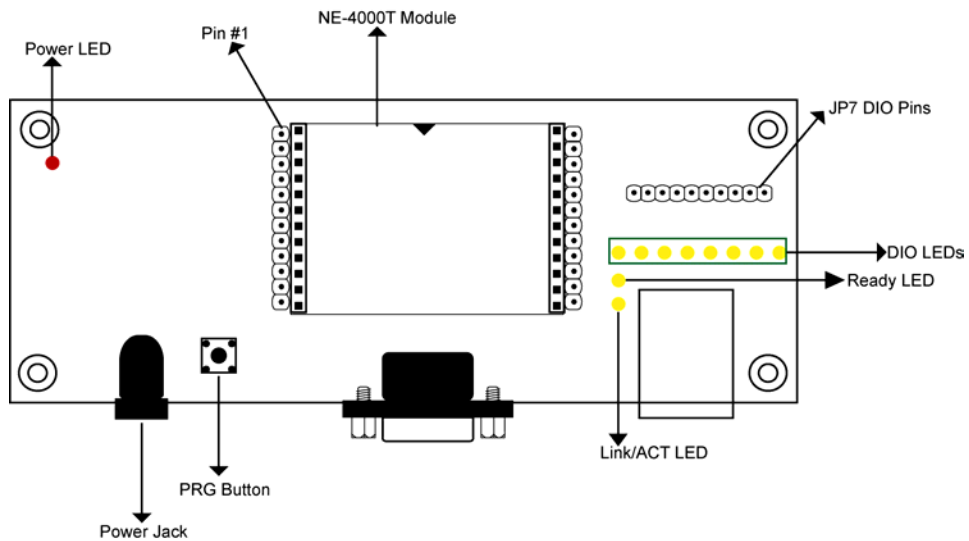
Ethernet Port Pinouts

RJ45 Port

Pin	Signal
1	Tx+
2	Tx-
3	Rx+
6	Rx-
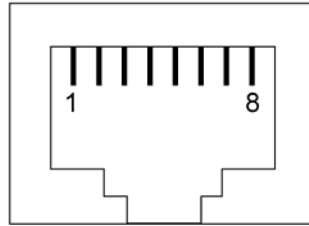
Serial Port Pinouts

DB9 Male Connector

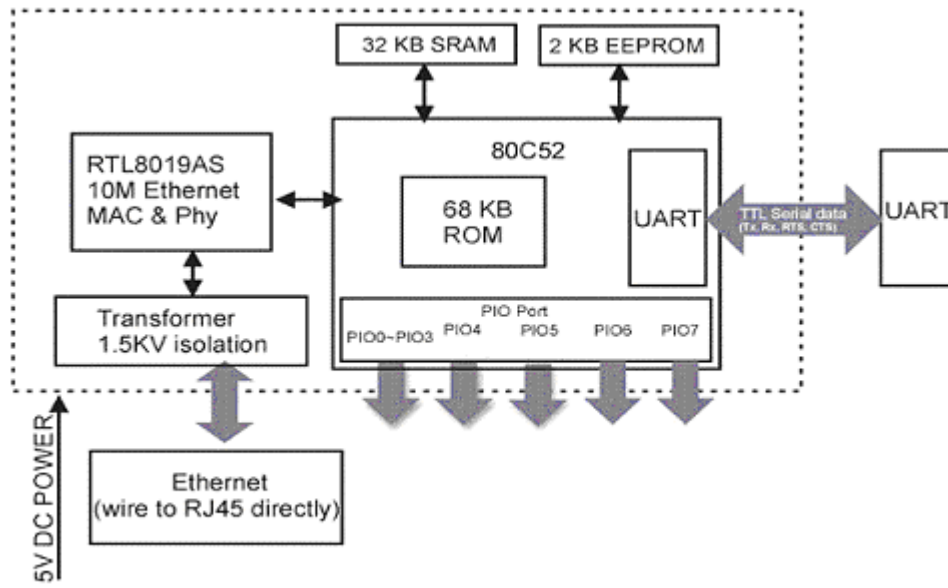| Pin	Signal
1	DCD
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
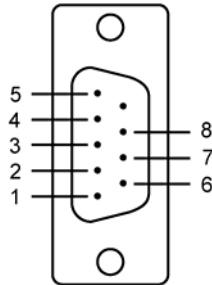
Pin Headers of PIO

Pin	Signal
1	VCC
2	PIO0
3	PIO1
4	PIO2
5	PIO3
6	PIO4
7	PIO5
8	PIO6
9	PIO7
10	GND
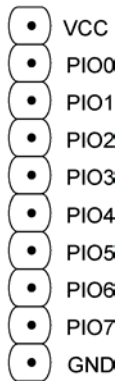
LED Indicators

LED Name	LED Color	LED Function	
Power	red	Indicates the power is on.	
Ready	green	Steady on:	Power is on and NE-4000T-ST is functioning normally.
		Blinking:	NE-4000T is in DHCP Client mode, but it cannot find the DHCP Server.
	off	Power is off, or power error condition exists.	
Link	green	10 Mbps Ethernet connection.	
	off	Ethernet cable is disconnected, or has a short.	
PIO0	green	Indicates that PIO is in "low" (0) status.	
PIO1	green	Indicates that PIO is in "low" (0) status.	
PIO2	green	Indicates that PIO is in "low" (0) status.	
PIO3	green	Indicates that PIO is in "low" (0) status.	
PIO4	green	Indicates that PIO is in "low" (0) status.	
PIO5	green	Indicates that PIO is in "low" (0) status.	
PIO6	green	Indicates that PIO is in "low" (0) status.	
PIO7	green	Indicates that PIO is in "low" (0) status.	

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Getting Started

This chapter includes information about installing NE-4000T. The following topics are covered:

- ❑ **Wiring Requirements**
- ❑ **Putting NE-4000T into NE-4000T-ST**
- ❑ **Connecting the Power**
- ❑ **Connecting to the Network**
- ❑ **Connecting to a Serial Device**
- ❑ **DI/O Settings**
    - ➢ Digital Output LED Circuit Design
- ❑ **Operating Mode**

Wiring Requirements

This section describes some points that need your attention before proceeding with any installation.

ATTENTION

⚠️

Safety First!

Be sure to disconnect the power cord before installing and/or wiring your NE-4000T-ST.

Wiring Caution!

ATTENTION

⚠️

Calculate the maximum possible current in each power wire and common wire. Observe all electrical codes dictating the maximum current allowable for each wire size.

If the current goes above the maximum ratings, the wiring could overheat, causing serious damage to your equipment.

ATTENTION

⚠️

Temperature Caution!

Please take care when handling NE-4000T-ST. When plugged in, NE-4000T-ST's internal components generate heat, and consequently the board may feel hot to the touch.

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You should also pay attention to the following points:

● Use separate paths to route wiring for power and devices. If power wiring and device wiring paths must cross, make sure the wires are perpendicular at the intersection point.

   NOTE: Do not run signal or communication wiring and power wiring in the same wire conduit. To avoid interference, wires with different signal characteristics should be routed separately.

● You can use the type of signal transmitted through a wire to determine which wires should be kept separate. The rule of thumb is that wiring that shares similar electrical characteristics can be bundled together.

● Keep input wiring and output wiring separate.

● Where necessary, it is strongly advised that you label wiring to all devices in the system.

Putting NE-4000T onto NE-4000T-ST

Before you connect your NE-4000T-ST to power supply, network and a serial device, you first need to install NE-4000T onto NE-4000T-ST. In the center of NE-4000T-ST, there is a square with one white inverted triangle (shown as black in the figure) on one of its sides, and 2 rows of female sockets on the other two sides. The NE-4000T board also has a white inverted triangle on one of its side. When plugging your NE-4000T into the NE-4000T-ST board, make sure these 2 white inverted triangles are facing the same direction, as shown in the figure.
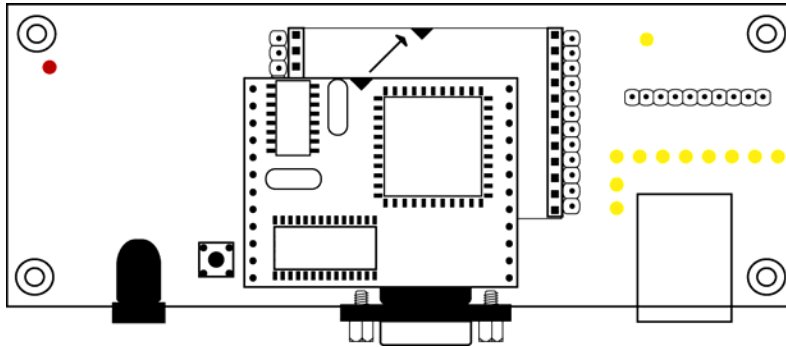
Connecting the Power

Connect the 12-30 VDC power line with NE-4000T-ST's terminal block. If the power is properly supplied, the "POWER" LED will show a solid red color until the system is ready, at which time the "Ready" LED will show a green color.

Connecting to the Network

Connect one end of the Ethernet Cable to NE-4000T-ST's Ethernet port and the other end of the cable to the Ethernet network. If the cable is properly connected, NE-4000T-ST will indicate a valid connection to the Ethernet in the following ways:

● The Link LED maintains a solid green color when connected to a 10 Mbps Ethernet network.

● The Link LED will flash when Ethernet packets are being transmitted or received.

Connecting to a Serial Device

Connect the serial data cable between NE-4000T-ST and the serial device.

DI/O Settings

NE-4000T Embedded Network Enabler supports 8 Digital I/Os. Digital Output uses 2 signals to control the devices connected to the terminal block on the evaluation board (NE-4000T-ST), such as relay devices. These 2 signals are formed by changes between high and low voltages. For example, you can program your DOØ to maintain "high voltage" (in this case, the DOØ's LED will not light up), and change to "low voltage" (in this case, the DOØ's LED will light up) when you wish to trigger the relay device. With these 2 output signals, you can control the on/off status of your devices. Digital Input also uses the 2 signals mentioned above to recognize the messages coming from your device, such as a sensor. Unlike Digital Output mode, NE-4000T waits passively for incoming signals when set to Digital Input mode. For example, you can configure DIØ to "On" status, meaning when no signal is coming in, it stays in "low voltage" status. On the other hand, when there is a signal coming in, the status will change to "high voltage." Use Web Console, which we discuss in chapter 5, to configure the DI/O and the on/off status.

Digital Output LED Circuit Design

The figure shown below is the digital output LED circuit design. The design is called "Sink."

For developing your own applications, you need to be aware of the voltage limits shown below.

		Min.	Max.	Unit	Conditions
Low-level Input Voltage	Maximum voltage when DI is set to "Low" status.	-----	0.3xVCC	V	
High-level Input Voltage	Minimum voltage when DI is set to "High" status.	0.7xVCC	-----	V	
Low-level Input Voltage	Maximum voltage when DO is set to "Low" status.	-----	0.4	V	
High-level Input Voltage	Minimum voltage when DO is set to "High" status	2.4	-----	V	

Digital Output's output current carries only 1 mA.

Operation Mode

NE-4000T uses TCP Server mode to establish the Serial-to-Ethernet connection. NE-4000T provides a unique IP:Port address on a TCP/IP network. NE-4000T waits passively to be contacted by the host computer, allowing the host computer to establish a connection with and get data from the serial device. Data transmission proceeds as illustrated in the following figure:

1. The host requests a connection from the NE-4000T configured for TCP Server Mode.

2. Once the connection is established, data can be transmitted in both directions --- from the host to the NE-4000T, and from the NE-4000T to the host.

4
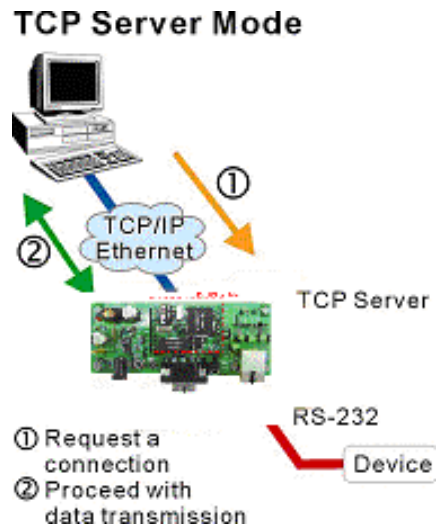
Network Enabler Utility

After installing the hardware, the next task required is to configure NE-4000T's settings. There are 3 configuration methods: Network Enabler Utility, Web Console, and Serial Console. In this chapter, we will discuss how to use Network Enabler Utility to configure your NE-4000T. This chapter includes the following sections:

❑ **Installing Network Enabler Utility**

❑ **Starting Configuration**

➢ Broadcast Search

➢ Unlock Password Protection

➢ Configuring NE-4000T

➢ Export/Import Functions

Installing Network Enabler Utility

The following procedure is for installing Network Enabler Utility.
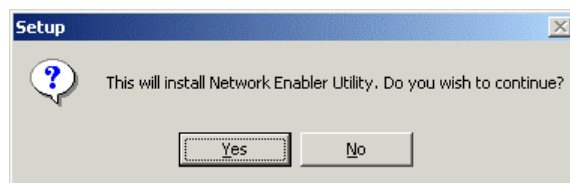
1. Insert the CD enclosed with NE-4000T into your computer, and then click on the utility_setup icon to start the installation.
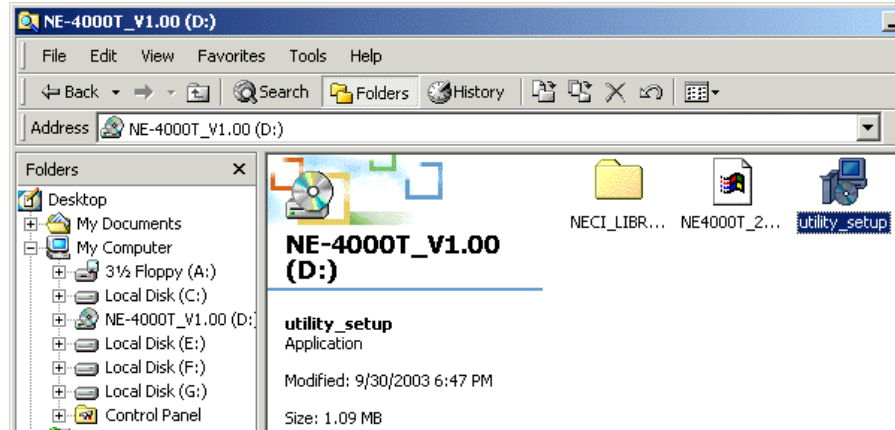
2. A **Setup** window will open asking you if you want to start the installation. Click **Yes** to continue.

3. A welcome window will open next. Click on **Next** to continue.
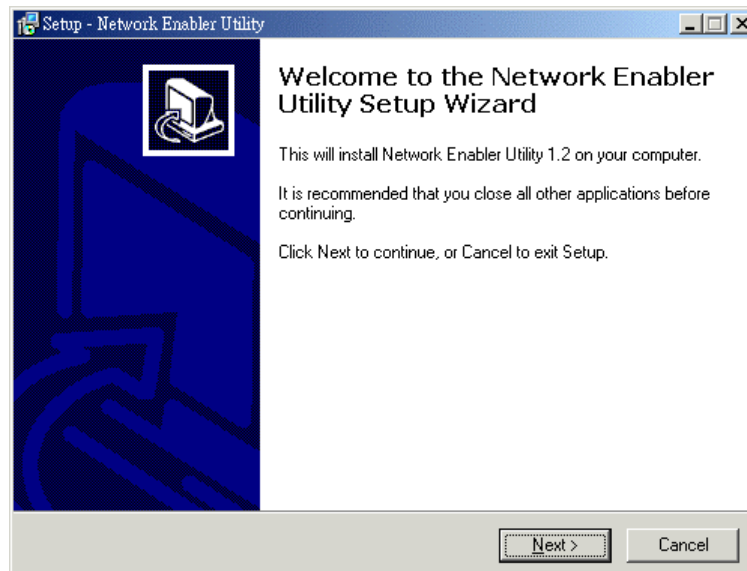
4. The next window that opens asks you to select the folder where you would like Network Enabler Utility to be installed. Click on **Next** to continue.
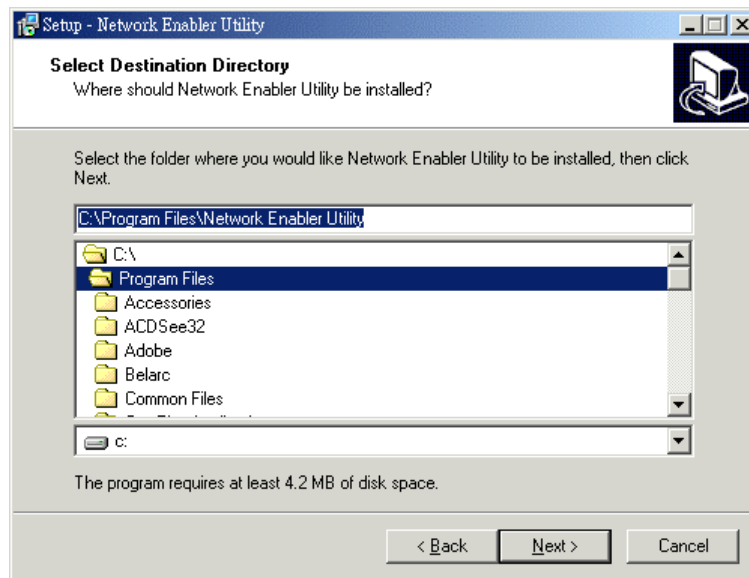
5. The **Select Additional Tasks** window will open next. Check the **Create a desktop icon** box if you would like a Network Enabler Utility icon to appear on your desktop after the installation is completed. Click on **Next** to continue.
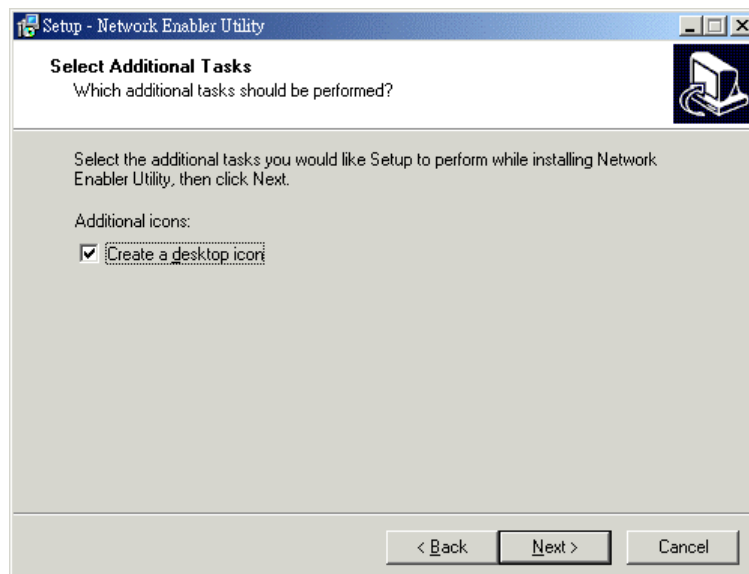
6. A **Ready to Install** window will open next showing the **Destination directory** and **Additional tasks**. Click on **Install** to continue.
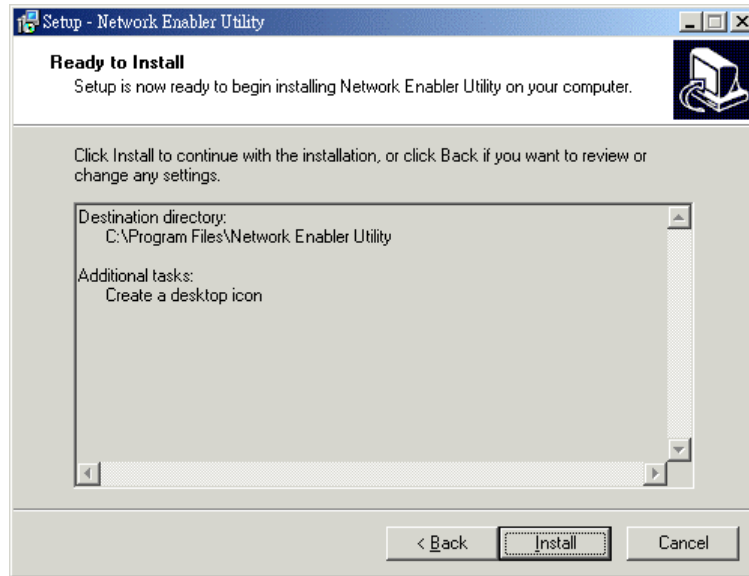
7. An **Installing** window will open showing the setup files that are being copied to your computer.
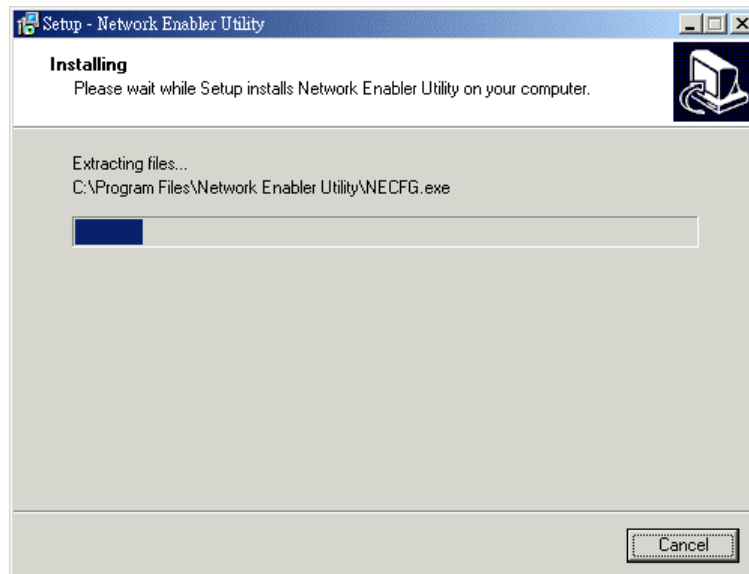
8. The window that opens next shows that the installation is completed. Check the **Launch Network Enabler Configurator** box if you would like to start this utility right away.
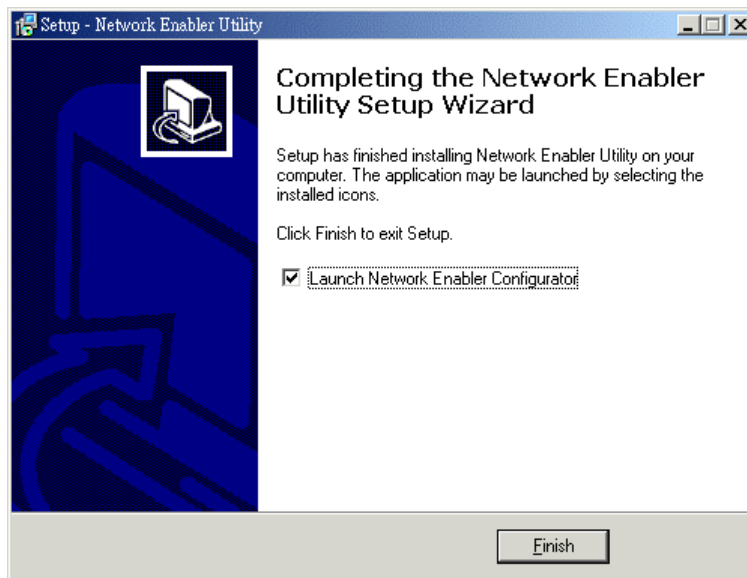
9. The setup wizard will create a **Network Enabler Configurator** icon on you desktop. You can click on the icon to start the program.
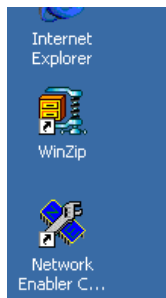
Starting Configuration

Network Enabler Configurator is divided into three parts.

- The top part includes menus and icons for often-used functions.
- The middle part is the NE-4000T list. Select items from the list to do configurations or other actions for that item.
- The bottom part is the Log area, which shows useful messages that record the user's processing history.
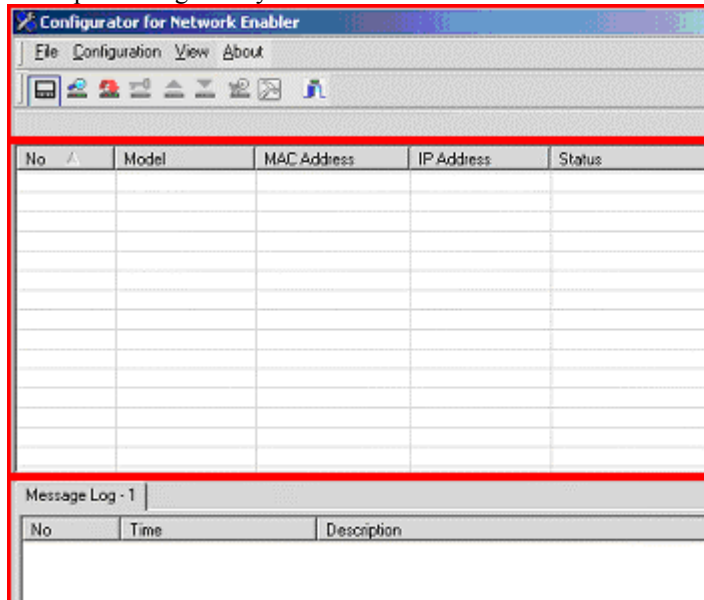
Broadcast Search

The Broadcast Search function is used to locate all NE-4000Ts that are connected to the same LAN as your computer. Since the Broadcast Search function searches by MAC address and not IP address, all NE-4000Ts connected to the LAN will be located, regardless of whether or not they are part of the same subnet as the host.

1. Click on the **Network Enabler Configurator** icon or click on **Start→Programs→Network Enabler Utility→Network Enabler Configurator** to start the Network Enabler Utility program.
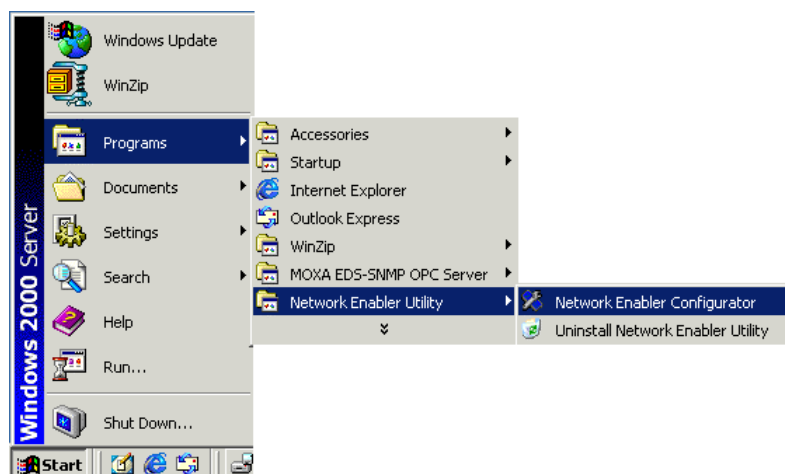
2. Click on **Configuration** from the menu bar, and then select **Broadcast Search** from the drop-down menu.
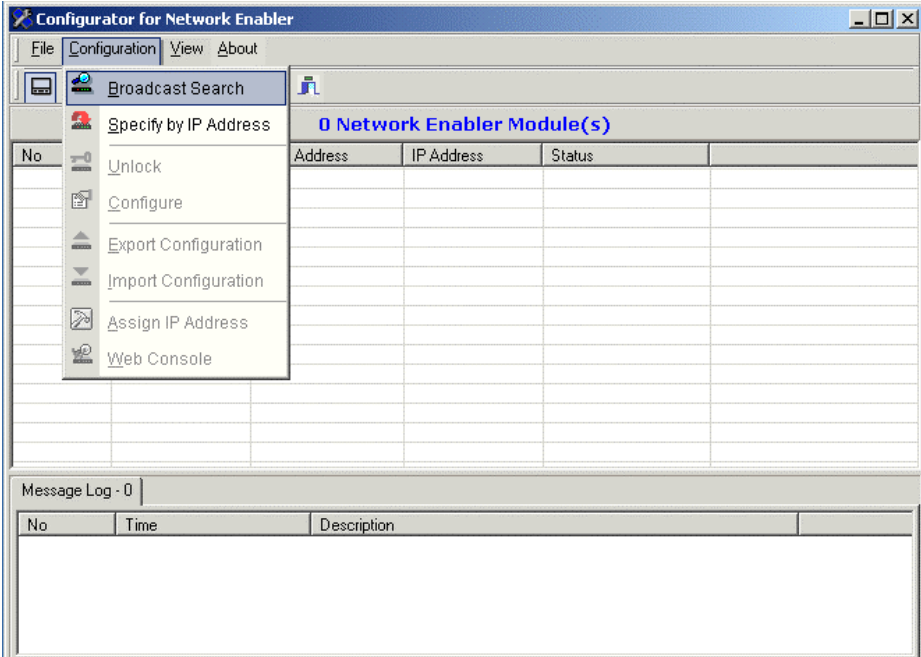
3. A **Searching** window will open, showing that the program is search for NE-4000Ts connected to this network.
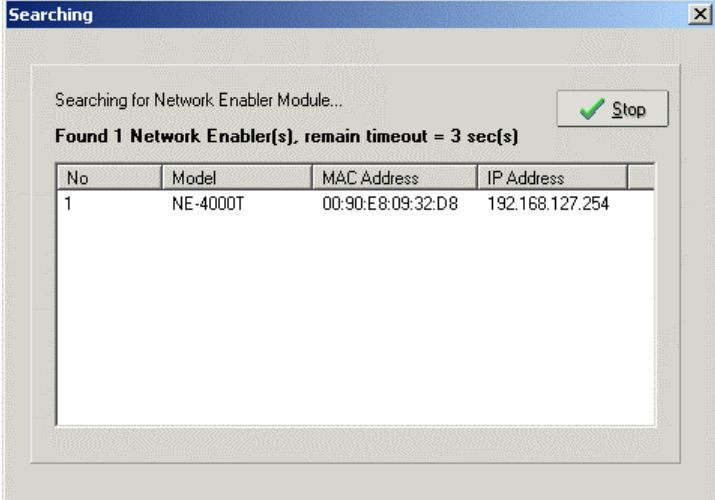
4. After the search is finished, all NE-4000Ts found will be shown in the **Configurator for Network Enabler** window.
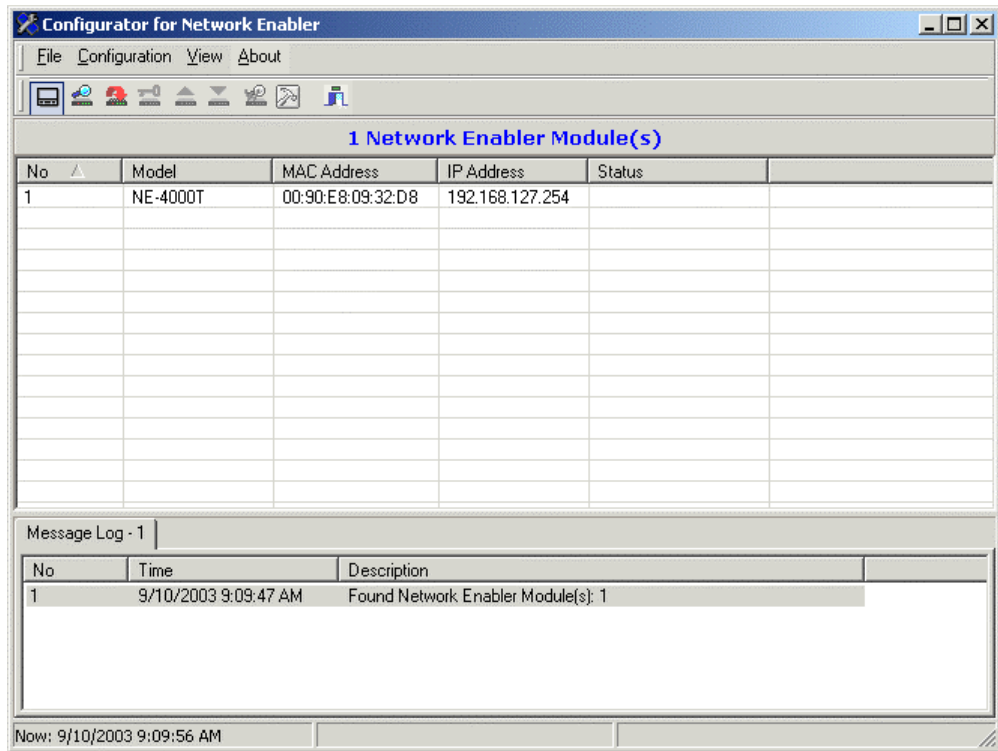
5. If you already know a specific NE-4000T's IP address, you can also use the Specify by IP address function to locate the NE-4000T.
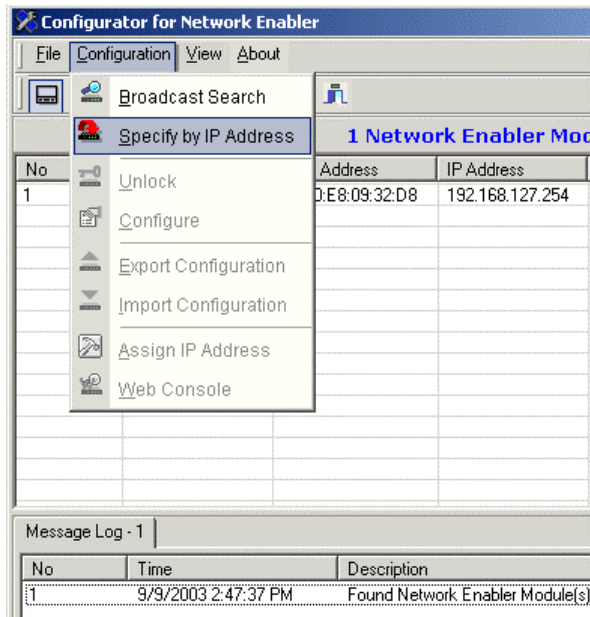
ATTENTION

Before modifying an NE-4000T's configuration, use **Broadcast Search** or **Specify by IP Address** to locate NE-4000Ts connected to the LAN.

Unlock Password Protection

If the NE-4000T is password protected, then you will not be able to use double click method to open the configuration page. Before you can make any modifications to the NE-4000T's configuration, you need to unlock the NE-4000T.
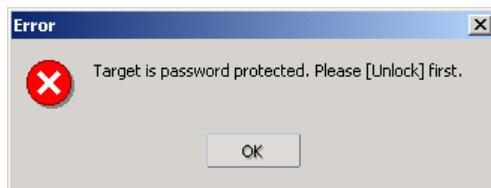
1. Select the NE-4000T that you would like to unlock, and click the right mouse button. Select **Unlock** from the drop down list.
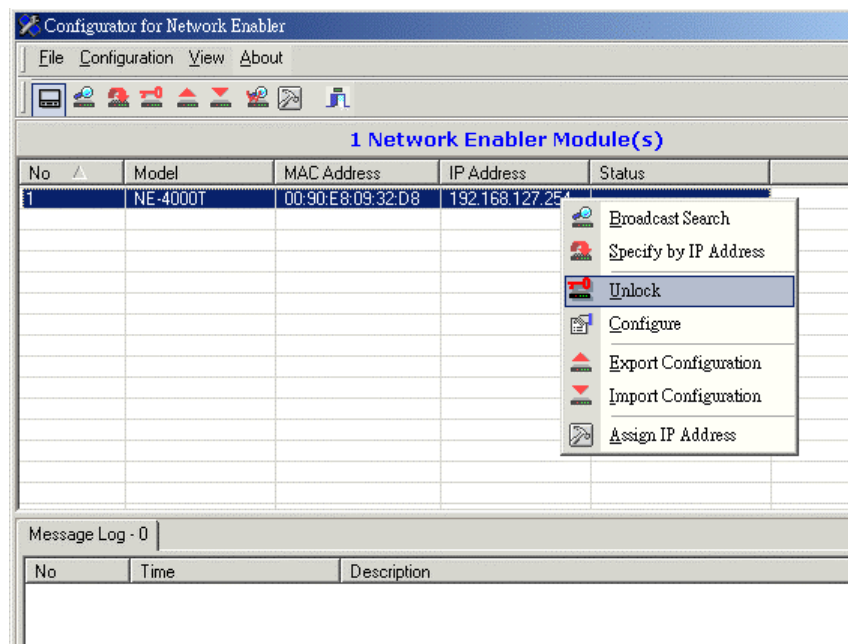
2. After inputting the correct password, an Information window will display as shown here.
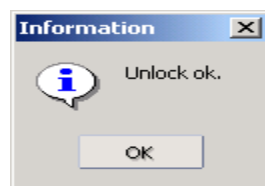
The meanings of the six states are as follows (note that the term Fixed is borrowed from the standard fixed IP address networking terminology):

Lock

The NE-4000T is password protected, "Broadcast Search" was used to locate it, and the password has not yet been entered from within the current Configurator session.

Unlock

The NE-4000T is password protected, "Broadcast Search" was used to locate it, and the password has been entered from within the current Configurator session. Henceforth during this Configurator session, activating various utilities for this NE-4000T will not require re-entering the

server password.

Blank
The NE-4000T is not password protected, and "Broadcast Search" was used to locate it.

Fixed
The NE-4000T is not password protected, and "Search by IP address" was used to locate it.

Lock Fixed
The NE-4000T is password protected, "Specify by IP address" was used to locate it, and the password has not yet been entered from within the current Configurator session.

Unlock Fixed
The NE-4000T is password protected, "Specify by IP address" was used to locate it, and the password has been entered from within the current Configurator session. Henceforth during this Configurator session, activating various utilities for this NE-4000T will not require re-entering the server password.

Configuring NE-4000T

1. Select the NE-4000T you wish to configure, and click the right mouse button. Select **Configure** from the drop down list.
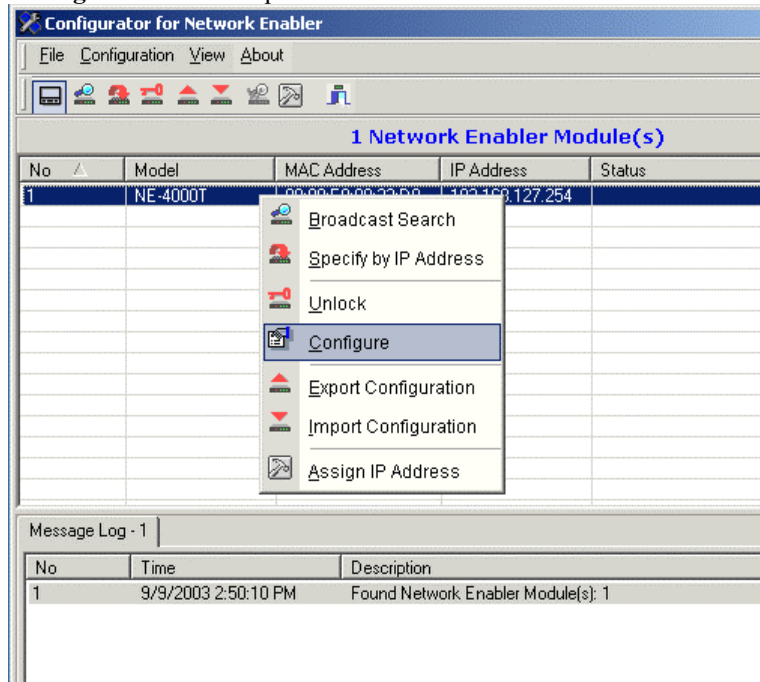
2. The next window to open shows that Configurator is processing the configuration of that NE-4000T.
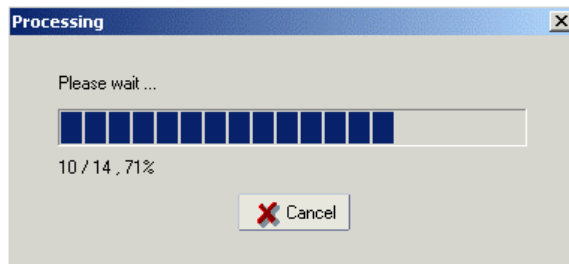
3. After the processing is done, the Configurator window will open.
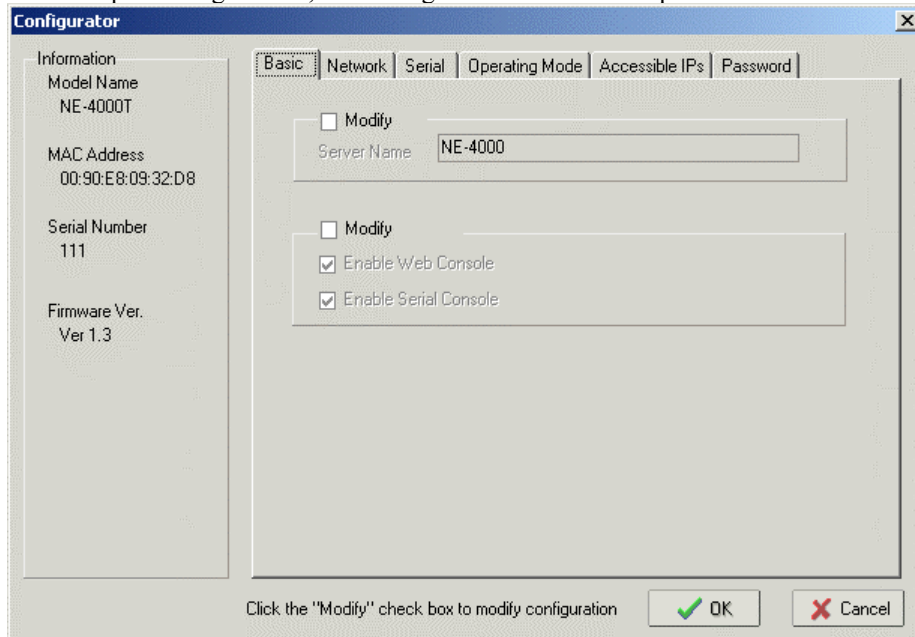
The Configurator window has six tabs—Basic, Network, Serial, Operating Mode, Accessible IPs, and Password—that allow the user to view and modify basic parameters related to the NE-4000T operation.

Basic

1. To change server name, check the **Modify** box located above **Server Name**, and enter a name for the NE-4000T.

Setting	Factory Default	Necessity
1 to 15 characters	NE-4000	Optional

This option is useful for specifying the location or application of different NE-4000Ts.
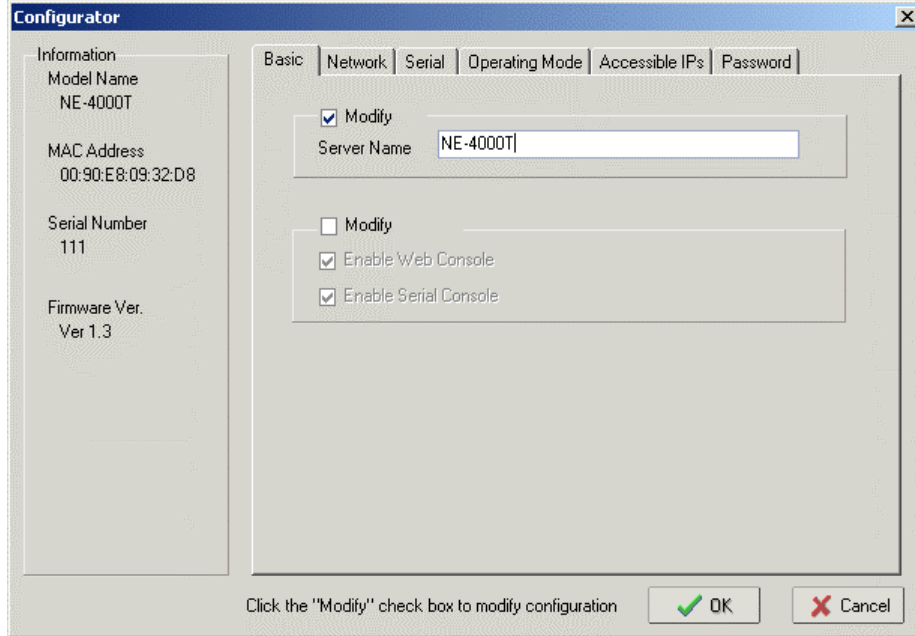
2. To change the console settings, check the **Modify** box located above **Enable Web Console**. The factory default for both **Web Console** and **Serial Console** is **Enable**. You may want to **Disable** one or both of these Console utilities as an extra precaution to prevent unauthorized users from accessing your NE-4000T. To do so, uncheck the box(es) next to **Enable Web Console** or **Enable Serial Console**.

Setting	Factory Default	Necessity
Enable or Disable	Enable	Required
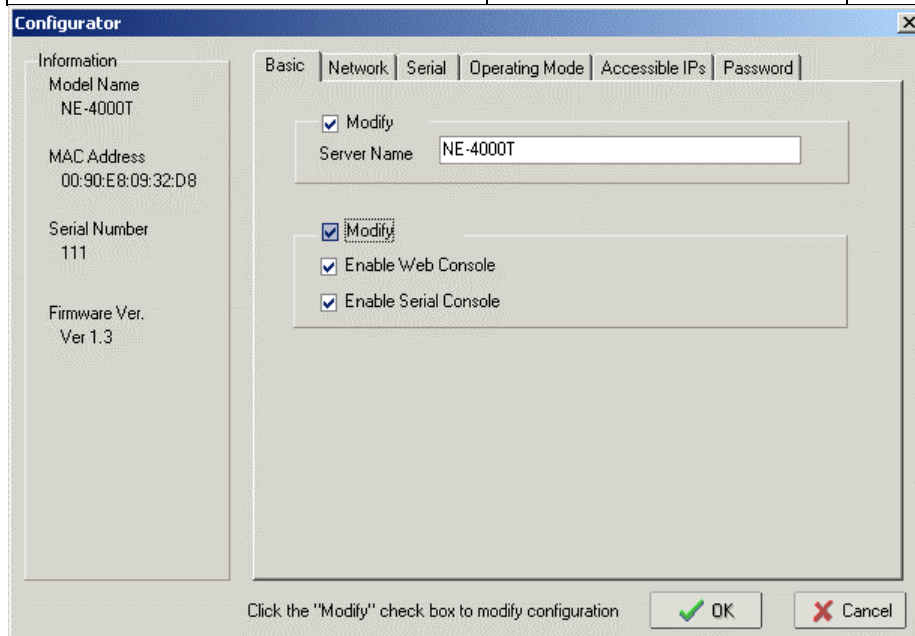
Network

1. To change the IP address, check the **Modify** box located above **IP Address**, and then enter the assigned IP address.

Setting	Factory Default	Necessity
E.g., 192.168.1.1 (IP addresses of the form *x.x.x*.0 and *x.x.x*.255 are invalid.)	192.168.127.254	Required

An IP address is a number assigned to a network device (such as a computer) as a permanent address on the network. Computers use the IP address to identify and talk to each other over the network. Choose a proper IP address that is unique and valid in your network environment.
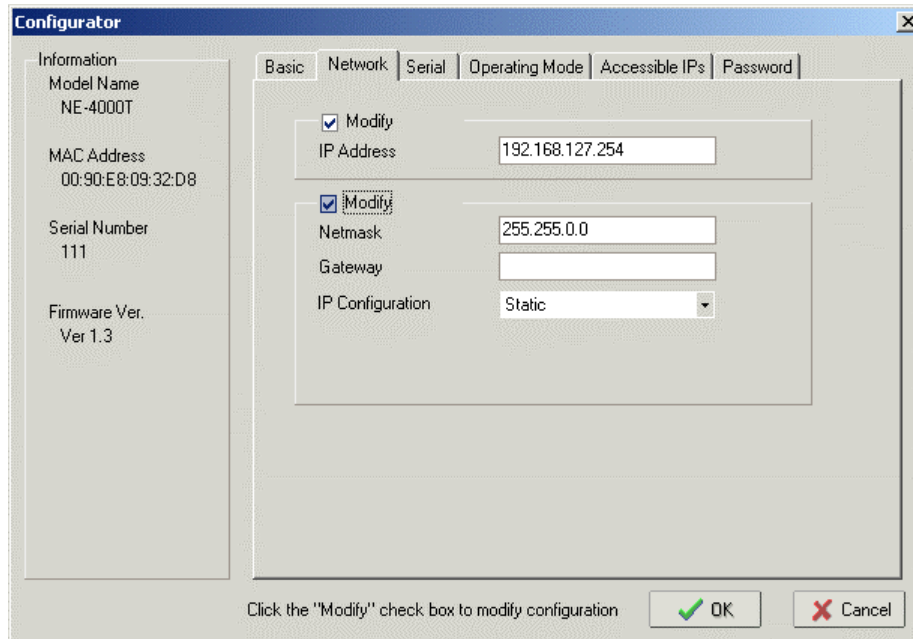
2. To change the **Netmask** and **Gateway** settings, check the **Modify** box of located above **Netmask**, and then enter the settings.

Setting	Factory Default	Necessity
Ex. 255.255.255.0	255.255.0.0	Required

A subnet mask represents all network hosts at a geographic location, in one building, or on the same local area network. When a packet is sent out over the network, the NE-4000T will use the subnet mask to check whether the desired TCP/IP host specified in the packet is on the local network segment. If the address is on the same network segment as the NE-4000T, a connection is established directly from the NE-4000T. Otherwise, the connection is established through the given default gateway.

Setting	Factory Default	Necessity
Ex. 192.168.1.1	None	Optional

A gateway is a network gateway that acts as an entrance to another network. Usually, the computers that control traffic within the network or at the local Internet service provider are gateway nodes. NE-4000T needs to know the IP address of the default gateway computer in order to communicate with the hosts outside the local network environment. For correct gateway IP address information, consult the network administrator.

Serial

1. Select the NE-4000T that you would like to modify, check the **Modify** box, and then click on **Settings**.

2. The Serial Settings window will open, allowing you to make necessary changes to the serial parameters.

Baud Rate

Setting	Factory Default	Necessity
300 bps to 115.2 Kbps	115200 bps	Required

Data Bits

Setting	Factory Default	Necessity
8	8	Required

Stop Bits

Setting	Factory Default	Necessity
1, 2	1	Required

Parity

Setting	Factory Default	Necessity
None, Even, Odd,	None	Required

Flow Control

Setting	Factory Default	Necessity
None, RTS/CTS, XON/XOFF	None	Required

ATTENTION

Check the serial communication parameters in your Serial Device's user's manual. You should set up NE-4000T's serial parameters with the same communication parameters used by your serial devices.

Operating Mode

1. Select the NE-4000T that you would like to modify, and then click on **Settings**.
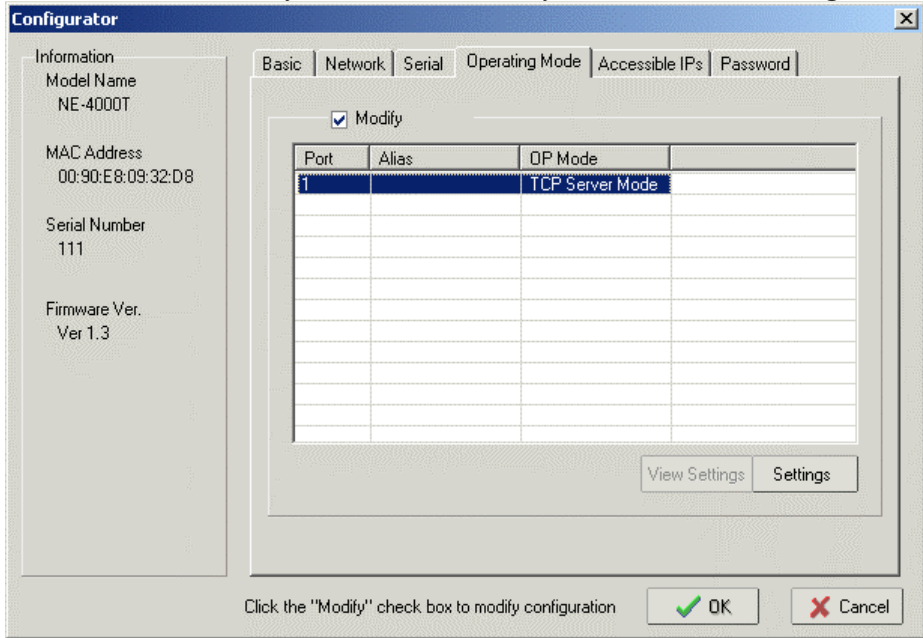
2. NE-4000T only supports TCP Server Mode, but you can make changes to TCP Server Mode Settings by entering the proper figures.
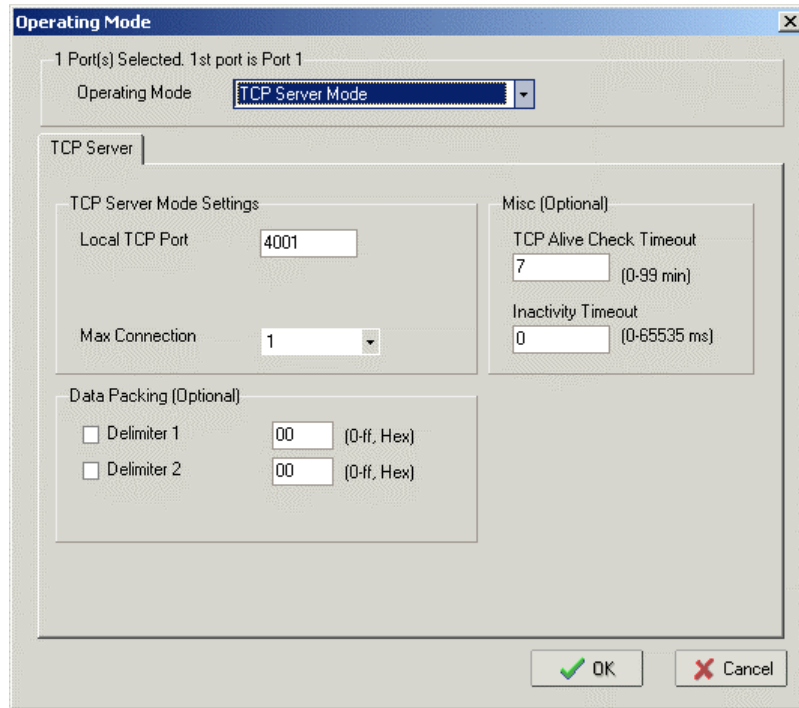
TCP Alive Check Timeout

Setting	Factory Default	Necessity
0 to 99 min	7 min	Optional

0 min: TCP connection is not closed due to an idle TCP connection.
1 to 99 min: NE-4000T automatically closes the TCP connection if there is no TCP activity for the given time. After the connection is closed, NE-4000T starts listening for another host's TCP connection.

Inactivity Timeout

Setting	Factory Default	Necessity
0 to 65535 ms	0 ms	Optional

0 ms: TCP connection is not closed due to an idle serial line.
0-65535 ms: NE-4000T automatically closes the TCP connection if there is no serial data activity for the given time. After the connection is closed, NE-4000T starts listening for another host's TCP connection.
This parameter defines the maintenances status as Closed or Listen on the TCP connection. The connection is closed if there is no incoming or outgoing data through the serial port during the specific Inactivity time.
If the value of the inactivity time is set to 0, the current TCP connection is maintained until there is a connection close request. Although inactivity time is disabled, the NE-4000T will check the connection status between the NE-4000T and remote host by sending "keep alive" packets periodically. If the remote host does not respond to the packet, it assumes that the connection was closed down unintentionally. NE-4000T will then force the existing TCP connection to close.

Delimiter 1

Setting	Factory Default	Necessity
00 to FF	None	Optional

Delimiter 2

Setting	Factory Default	Necessity
00 to FF	None	Optional

Once the NE-4000T receives both delimiters, it immediately packs all data currently in its buffer and sends it to the Ethernet port.

ATTENTION

Delimiter 2 is optional. If left blank, then Delimiter 1 alone trips clearing of the buffer. If the size of the serial data received is greater than 1K, the NE-4000T will automatically pack the data and send it to the Ethernet. However, to use the delimiter function, you must at least enable Delimiter 1. If Delimiter 1 is left blank and Delimiter 2 is enabled, the delimiter function will not work properly.

Local TCP port

Setting	Factory Default	Necessity
1 to 65535	4001	Required

The TCP port that NE-4000T uses to listen to connections, and that other devices must use to contact NE-4000T. To avoid conflicts with well known TCP ports, the default is set to 4001.

Accessible IPs

1. To change Accessible IPs settings, check the **Modify** box and then enter the proper figures.

NE-4000T has an IP address-based filtering method to control access to the NE-4000T.

Accessible IP Settings allows you to add or remove "Legal" remote host IP addresses to prevent unauthorized access. Access to NE-4000Ts is controlled by IP address. That is, if a host's IP address is in the accessible IP table, then the host will be allowed to access the NE-4000T. You can allow one of the following cases by setting the parameters accordingly.

● **Only one host with a specific IP Address can access the NE-4000T**
   Enter the specific IP address (e.g., 192.168.1.1) and enter 255.255.255.255 for Netmask.

● **Hosts on the specific subnet can access the NE-4000T**
   Enter IP address (e.g., 192.168.1.0) and enter 255.255.255.0 for Netmask.

● **Any host can access the NE-4000T**
   Disable this function by not entering any IP address or Netmask settings. Refer to the following table for more details about the configuration example.

Allowable Hosts	IP Address	Netmask
Any host	Disable	
192.168.1.120	192.168.1.120	255.255.255.255

192.168.1.1 to 192.168.1.254	192.168.1.0	255.255.255.0
192.168.0.1 to 192.168.255.254	192.168.0.0	255.255.0.0
192.168.1.1 to 192.168.1.126	192.168.1.0	255.255.255.128

Password

1. To change the password, check the **Modify** box and then enter the new password. Leave the password boxes blank to erase the password. In this case, the NE-4000T will not have password protection.
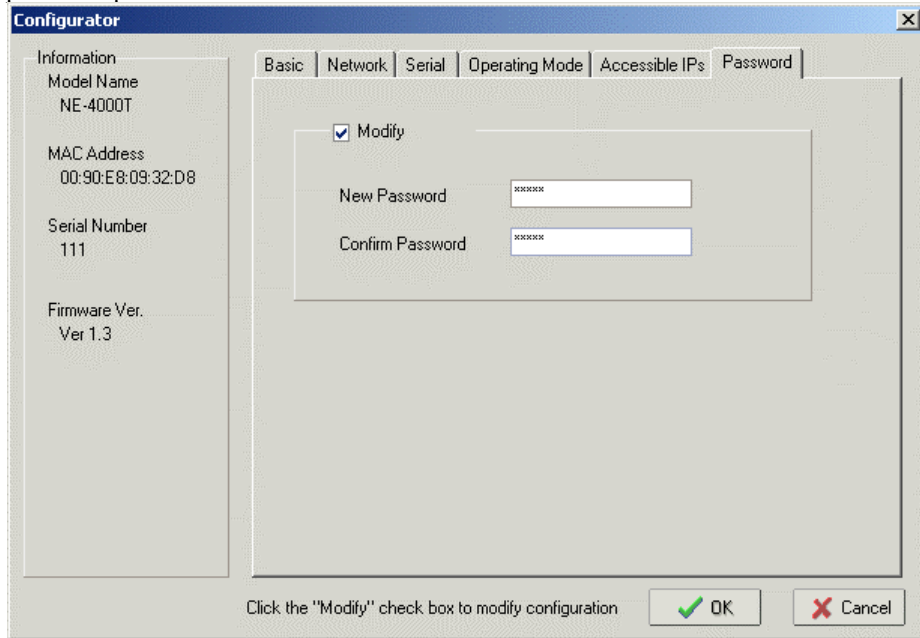
Applying modifications

1. After you make all necessary changes, click on **OK** to close the window.
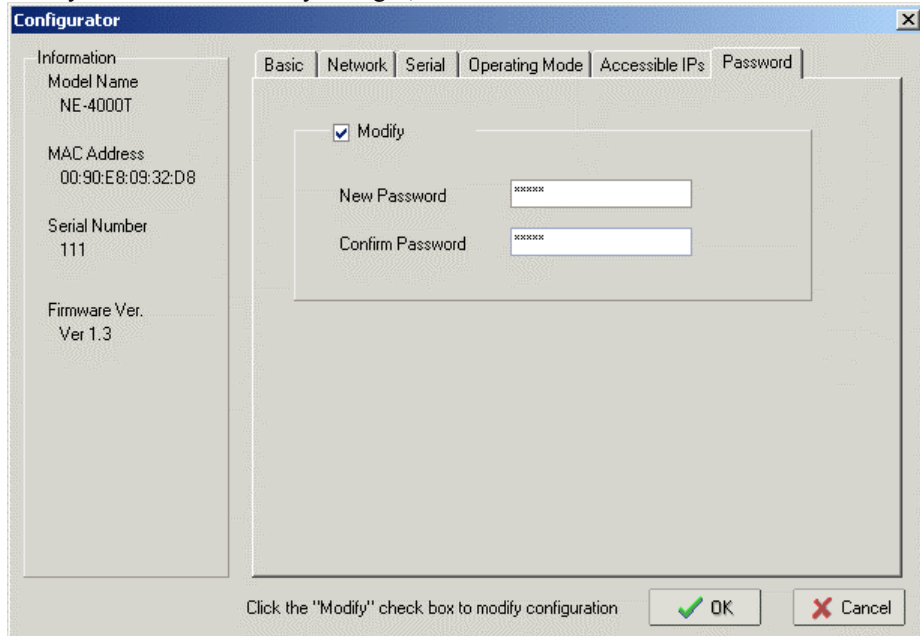
2. Then window to open shows that Configurator is processing the modifications.
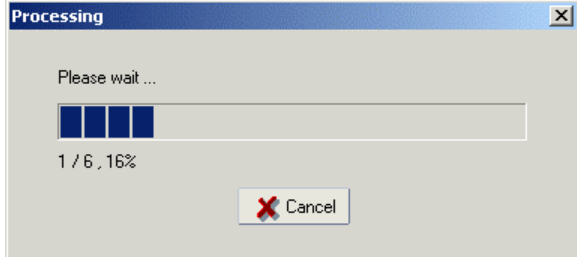
3. An **Information** window will open once the changes are applied. Click on **OK** to the **Configurator** window.
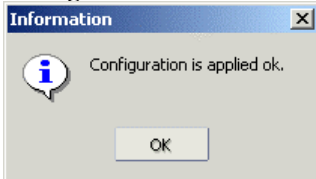
Export/Import Functions

1. To export a configuration, select the NE-4000T whose configuration you would like to export, click the right mouse button, and then select **Export Configuration** from the drop down menu.
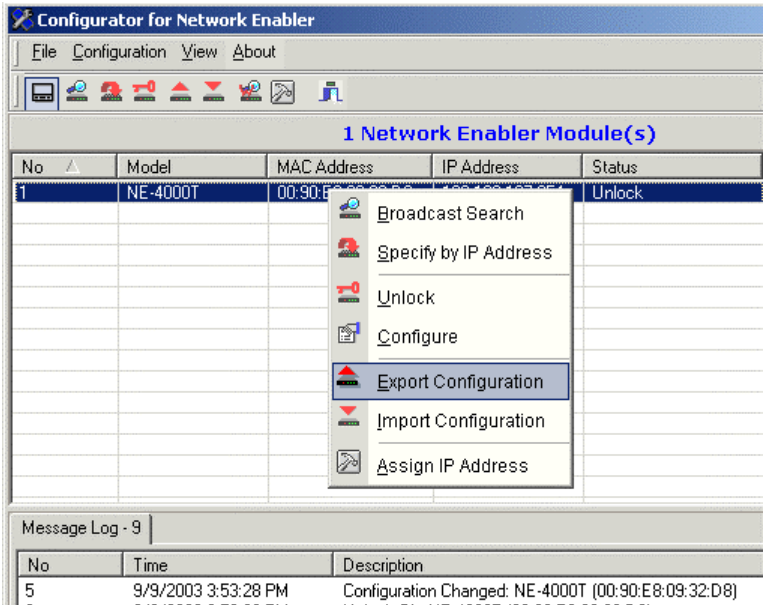
2. A **Select File** window will open next. Enter the directory where you would like to export the configuration file to or click on **Browse** to search. Click on **OK** to go back to the **Configurator** window.
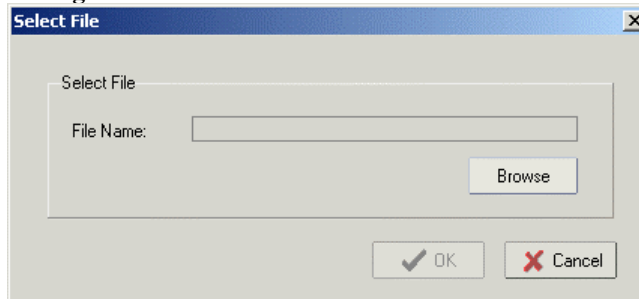
3. To import a configuration, select the NE-4000T to which you would like to import configuration, click the right mouse button, and then select **Import Configuration** from the drop down menu.
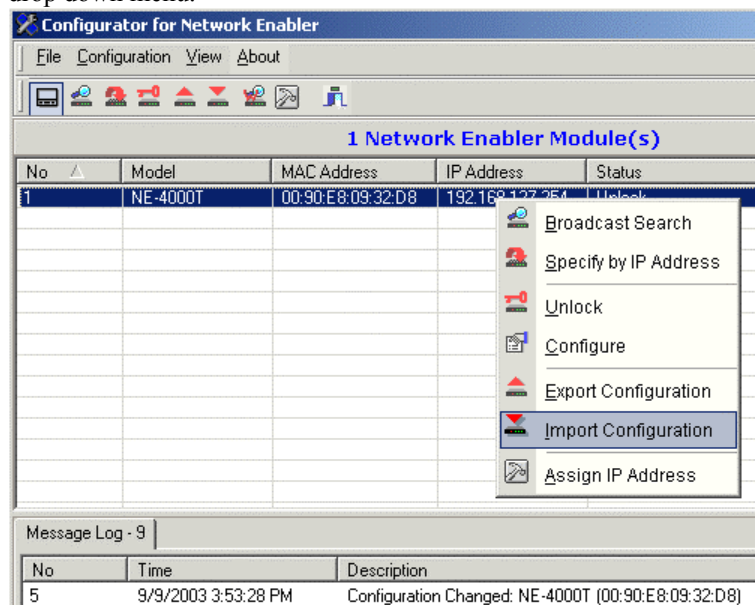
4. A **Select File** window will open next. Enter the directory where you would like to import the configuration file from or click on **Browse** to search. Click on **OK** to go back to the **Configurator** window.
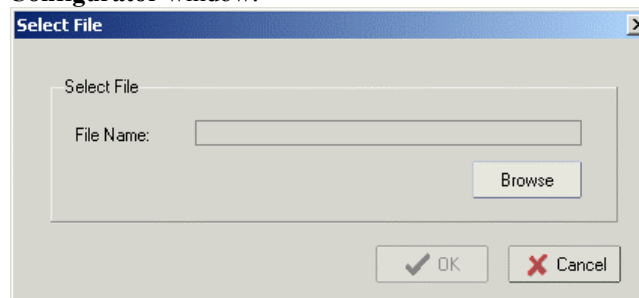
5

Web Console Configuration

The Web Console is the most user-friendly way to configure NE-4000T. This chapter will introduce the Web Console function groups and function definitions.

- ❑ **Opening Your Browser**
- ❑ **Network Settings**
- ❑ **Serial Settings**
- ❑ **Operation Mode**
- ❑ **DIO Settings**
- ❑ **Accessible IP Settings**
- ❑ **Restore Factory Default Settings**
- ❑ **Change Password**
- ❑ **Log out/Restart**

Opening Your Browser

1. Open your browser with the cookie function enabled. (To enable your browser for cookies, right click on your desktop Internet Explorer icon, select Properties, click on the Security tab, and then select the three Enable options as shown in the figure below.)
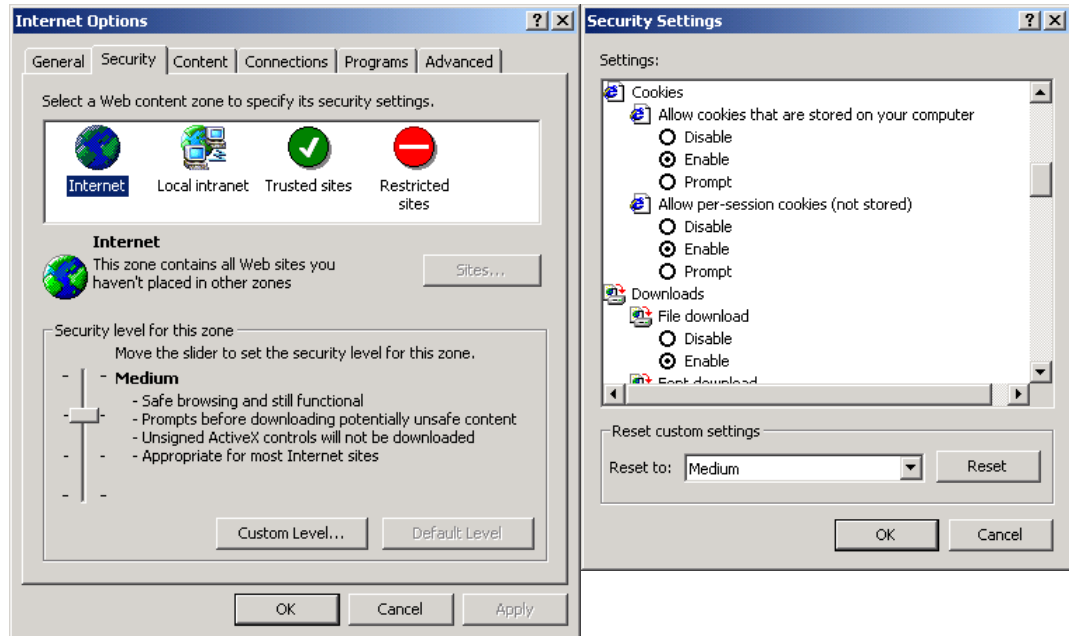
2. Type 192.168.127.254 in the **Address** box (use the correct IP address if different from the default), and then press **Enter**. A screen will open, displaying detailed information about NE-4000T.
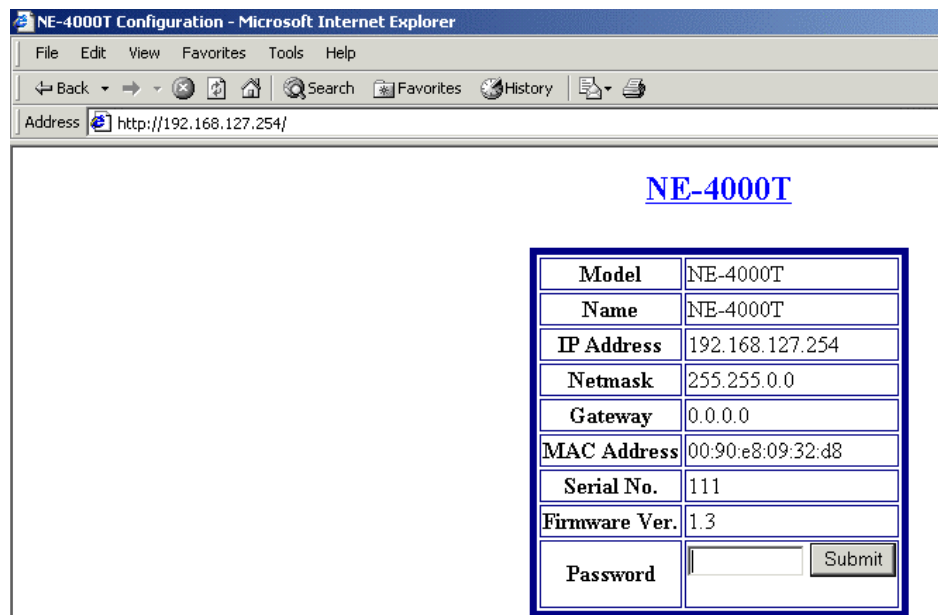
3. Input the password if prompted. The password will be transmitted without MD5 encryption over the Ethernet. Note that you will not be prompted to enter the password if the NE-4000T is not currently password protected.

4. The NE-4000T **Networking Settings** screen will open.
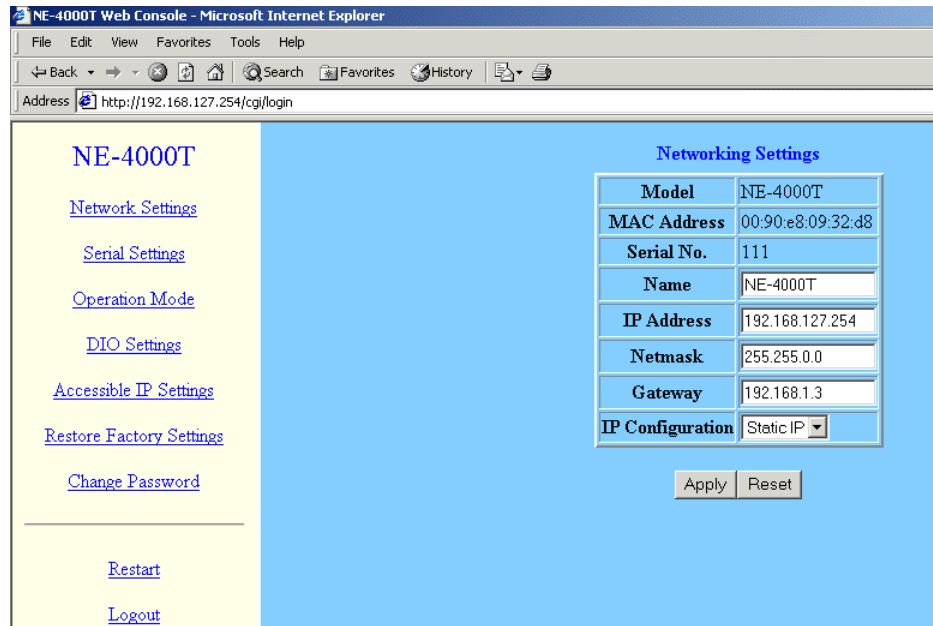
ATTENTION If you use other web browsers, remember to enable the functions to "allow cookies that are stored on your computer" or "allow per-session cookies."

NE-4000T only uses cookies for the "password" transmission.

Network Settings

Click on the **Network Settings** link on the left side of the screen to open the **Networking Settings** screen. Make necessary changes to the settings and click on **Apply** to validate the modifications.
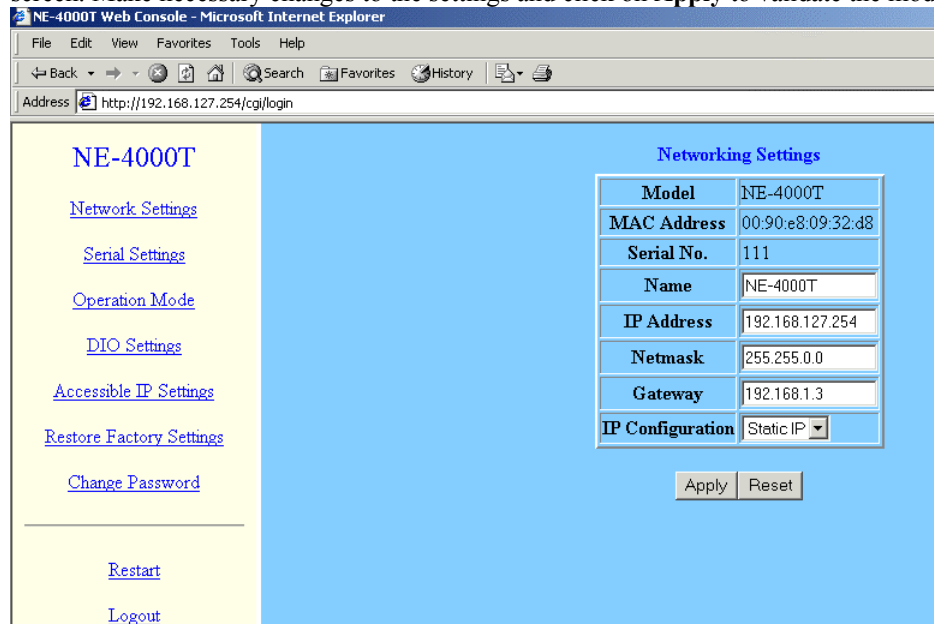
ATTENTION

If your NE-4000T application requires using password protection, you must enable the cookie function in your browser. If the cookie function is disabled, you will not be allowed to enter the Web Console Screen.

Server Name

Setting	Factory Default	Necessity
1 to 15 characters	NE-4000T	Optional

This option is useful for specifying the locating or application of different NE-4000Ts.

IP Address

Setting	Factory Default	Necessity
E.g., 192.168.1.1 (IP addresses of the form *x.x.x*.0 and *x.x.x*.255 are invalid.)	192.168.127.254	Required

An IP address is a number assigned to a network device (such as a computer) as a permanent address on the network. Computers use the IP address to identify and talk to each other over the network. Choose a proper IP address which is unique and valid in your network environment.

Netmask

Setting	Factory Default	Necessity
Ex. 255.255.255.0	255.255.0.0	Required

A subnet mask represents all the network hosts at one geographic location, in one building, or on the same local area network. When a packet is sent out over the network, the NE-4000T will use the subnet mask to check whether the desired TCP/IP host specified in the packet is on the local network segment. If the address is on the same network segment as the NE-4000T, a connection is established directly from the NE-4000T. Otherwise, the connection is established through the given default gateway.

Gateway

Setting	Factory Default	Necessity
Ex. 192.168.1.1	None	Optional

A gateway is a network gateway that acts as an entrance to another network. Usually, the computers that control traffic within the network or at the local Internet service provider are gateway nodes. NE-4000T needs to know the IP address of the default gateway computer in order to communicate with the hosts outside the local network environment. For correct gateway IP address information, consult the network administrator.

IP Configuration

Setting	Factory Default	Necessity
Static DHCP	Static	Required

Serial Settings

Click on the **Serial Settings** link on the left side of the screen to display serial settings. Make necessary changes to the settings and click on **Apply** to validate the modifications.

ATTENTION

Check the serial communication parameters in your Serial Device's user's manual. You should set up NE-4000T's serial parameters with the same communication parameters used by your serial devices.

Baud Rate

Setting	Factory Default	Necessity
300 bps to 115.2 Kbps	115.2 Kbps	Required

Data Bits

Setting	Factory Default	Necessity
7, 8	8	Required

Stop Bits

Setting	Factory Default	Necessity
1, 2	1	Required

Parity

Setting	Factory Default	Necessity
None, Even, Odd,	None	Required

Flow Control

Setting	Factory Default	Necessity
None, RTS/CTS, Xon/Xoff	RTS/CTS	Required

Operation Mode

Click on the **Operation Mode** link on the left side of the screen to display operating settings. Make necessary changes to the settings and then click on **Apply** to validate the modifications.

TCP Alive Check Time

Setting	Factory Default	Necessity
0 to 99 min	7 min	Optional

0 min: TCP connection is not closed due to an idle TCP connection.
1 to 99 min: NE-4000T automatically closes the TCP connection if there is no TCP activity for the given time. After the connection is closed, NE-4000T starts listening for another host's TCP connection.

Inactivity Time

Setting	Factory Default	Necessity
0 to 65535 ms	0 ms	Optional

0 ms: TCP connection is not closed due to an idle serial line.

0-65535 ms: NE-4000T automatically closes the TCP connection if there is no serial data activity for the given time. After the connection is closed, NE-4000T starts listening for another host's TCP connection.

This parameter defines the maintenances status as Closed or Listen on the TCP connection. The connection is closed if there is no incoming or outgoing data through the serial port during the specific Inactivity time.

If the inactivity time value is set to 0, the current TCP connection is maintained until there is a connection close request. Although inactivity time is disabled, the NE-4000T will check the connection status between the NE-4000T and remote host by sending "keep alive" packets periodically. If the remote host does not respond to the packet, it assumes that the connection was closed down unintentionally. NE-4000T will then force the existing TCP connection to close.

Delimiter 1

Setting	Factory Default	Necessity
00 to FF	None	Optional

Delimiter 2

Setting	Factory Default	Necessity
00 to FF	None	Optional

Once the NE-4000T receives both delimiters, it immediately packs all data currently in its buffer and sends it out the NE-4000T-ST's Ethernet port.

ATTENTION

Delimiter 2 is optional. If left blank, then Delimiter 1 alone trips clearing of the buffer. If the size of the serial data received is greater than 1K, the NE-4000T will automatically pack the data and send it to the Ethernet. However, to use the delimiter function, you must at least enable Delimiter 1. If Delimiter 1 is left blank and Delimiter 2 is enabled, the delimiter function will not work properly.

TCP port

Setting	Factory Default	Necessity
1 to 65535	4001	Required

The TCP port that NE-4000T uses to listen to connections, and that other devices must use to contact NE-4000T. To avoid conflicts with well known TCP ports, the default is set to 4001.

DIO Settings

Click on the **DIO Settings** link on the left side of the screen to open the **DIO Settings** window. There are 2 options for selecting DIO modes: **IN** and **OUT**. When you set the mode to be **IN**, you will not be able to set the **Status** to be **H** or **L**. You can only monitor the DIOs' status. But when you set the mode to **OUT**, you can configure the **Status** to be **H** or **L**. Make necessary changes to the settings and click on **Apply** to validate the modifications.
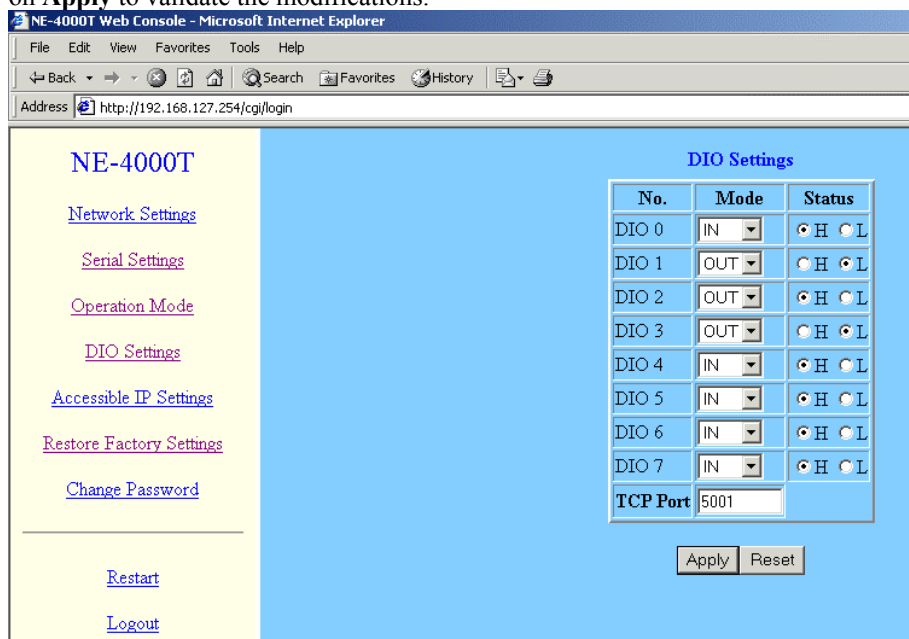
Accessible IP Settings

Click on **Accessible IP Settings** link on the left side of the screen to open the **Accessible IP Settings** window. Make necessary changes to the settings and click on **Apply** to validate the modifications.

NE-4000T has an IP address-based filtering method to control access to the NE-4000T.

Accessible IP Settings allows you to add or remove "Legal" remote host IP addresses to prevent unauthorized access. Access to NE-4000Ts is controlled by IP address. That is, if a host's IP address is in the accessible IP table, then the host will be allowed to access the NE-4000T. You can allow one of the following cases by setting the parameters accordingly.

- **Only one host with a specific IP Address can access the NE-4000T**
  Enter the specific IP address (e.g., 192.168.1.1) and enter 255.255.255.255 for Netmask.

- **Hosts on the specific subnet can access the NE-4000T**
  Enter IP address (e.g., 192.168.1.0) and enter 255.255.255.0 for Netmask.

- **Any host can access the NE-4000T**
  Disable this function by not entering any IP address or Netmask settings. Refer to the following table for more details about the configuration example.

Allowable Hosts	IP Address	Netmask
Any host	Disable	
192.168.1.120	192.168.1.120	255.255.255.255
192.168.1.1 to 192.168.1.254	192.168.1.0	255.255.255.0
192.168.0.1 to 192.168.255.254	192.168.0.0	255.255.0.0
192.168.1.1 to 192.168.1.126	192.168.1.0	255.255.255.128

Restore Factory Default Settings

To load the factory default settings, click on the **Restore Factory Settings** link on the left side of the screen and then click on **Apply** to restore the factory default settings. Note that by doing so the modifications you made before will be lost.
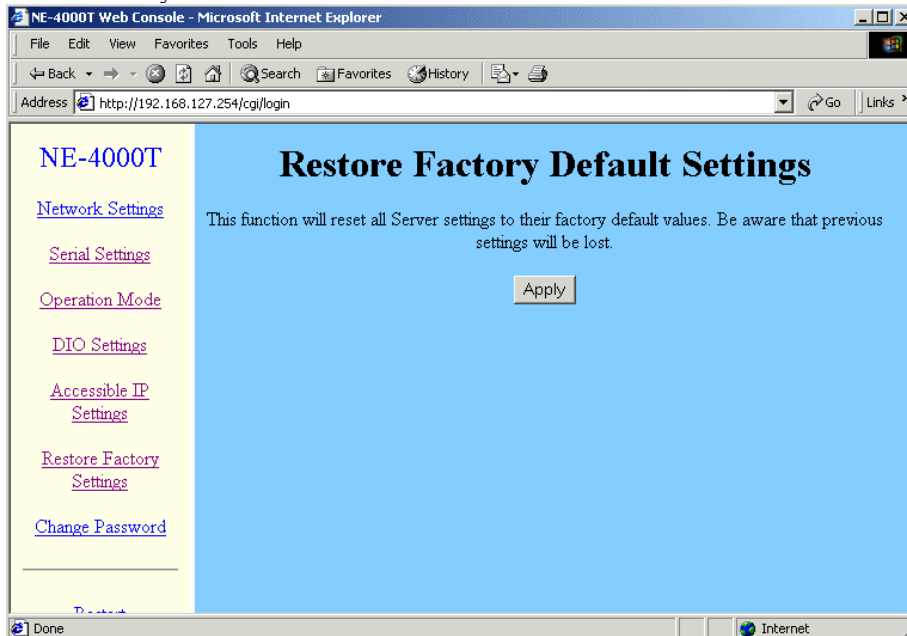
After applying this function, a screen will open displaying NE-4000T's detailed factory default settings.
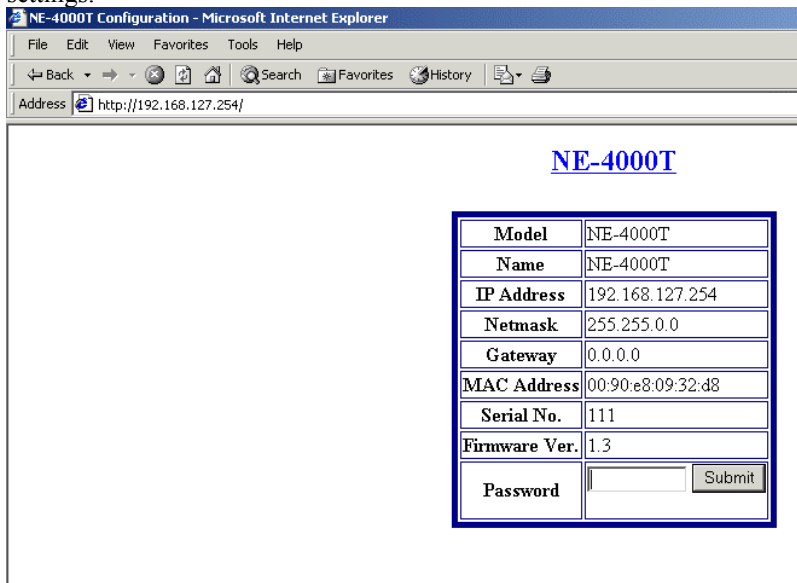
Change Password

To change the password, enter the old password in the box next to **Old**, and enter a new one in the box next to **New**. Then reenter the new password in the box next to **Confirm**. Leave the password boxes blank to erase the password. In this case, the NE-4000T will not have password protection. Click on **Apply** to validate the modifications.
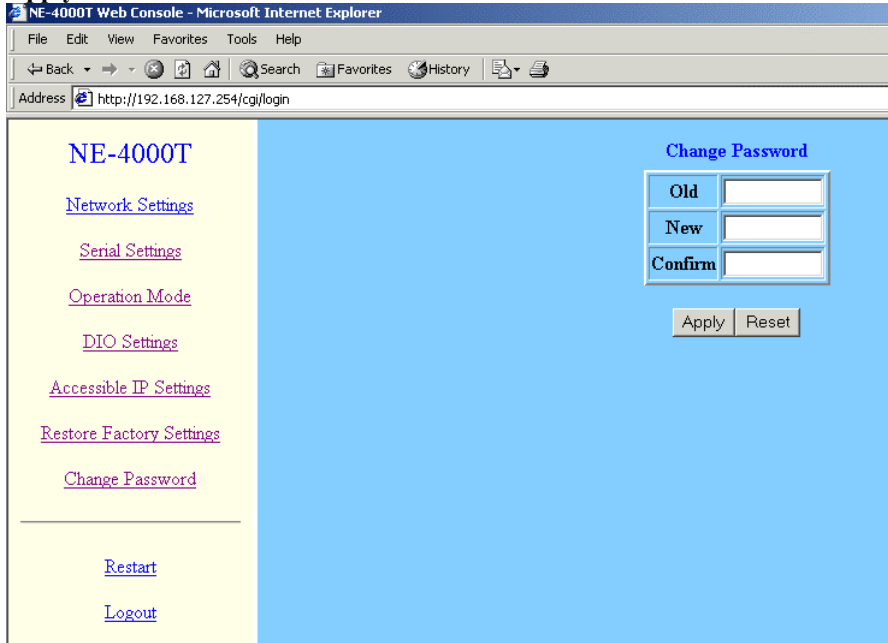
Log out/Restart

Click on the **Restart** link on the left side of the screen if you would like to start the configuration all over again. After all changes have been made and applied, click on **Logout** to exit the system.

6
Serial Console Configuration

Serial Console is one of the 3 methods available to configure NE-4000T. This chapter introduces the procedure for using Serial Console to configure your NE-4000T. This chapter uses Network Settings as an example of how to utilize Serial Console to configure your NE-4000T. The procedures for configuring other settings are the same as for configuring Network Settings.

The following topics are covered in this chapter:

❑ **Serial Console**

Serial Console

You may use the RS-232 console port to set up the IP address for NE-4000T. We suggest using MOXA PComm Terminal Emulator, which is available free of charge as part of the MOXA PComm Lite program suite, to carry out the configuration procedure. (Please go to www.moxa.com to download the installation program for PComm Lite.)

Before you start to configure the NE-4000T via serial console, turn off NE-4000T's power and connect the serial cable from NE-4000T to your computer's serial port.

1. Use a serial cable to connect NE-4000T's serial port (the DB9 Male connector is located on NE-4000T-ST) directly to your computer's serial port.

2. From the Windows desktop click on **Start→Programs→PComm Lite→Terminal Emulator**.

3. When the **PComm Terminal Emulator** window opens, first click on the **Port Manager** menu item and select **Open**, or simply click on the **Open** icon.
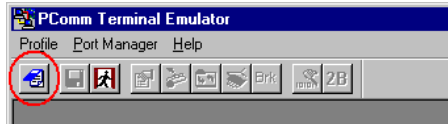
4. The **Property** window opens automatically. From the **Communication Parameter** page, select the appropriate COM port for the connection, **COM1** in this example, and **19200** for **Baud Rate**, **8** for **Data Bits**, **None** for **Parity**, and **1** for **Stop Bits**.
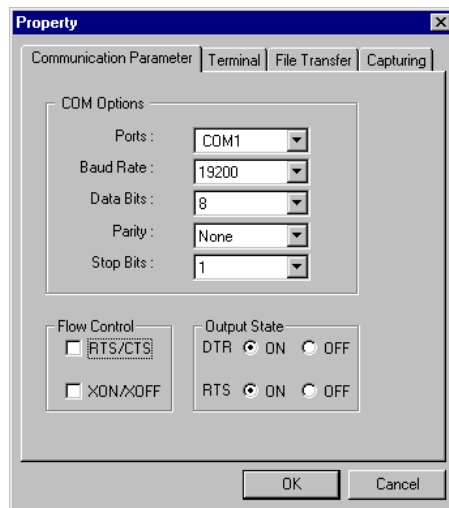
5. From the **Property** window's **Terminal** page, select **ANSI** and then click on **OK**.
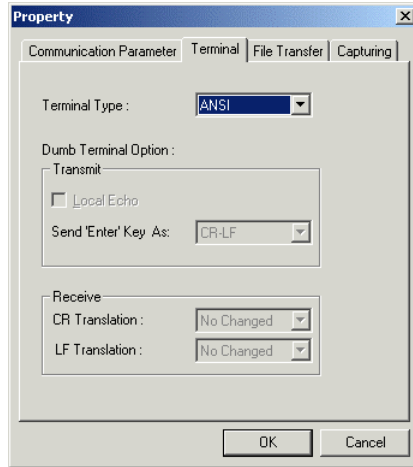
6. Power on the NE-4000T and press "0" continuously until the serial console screen opens.
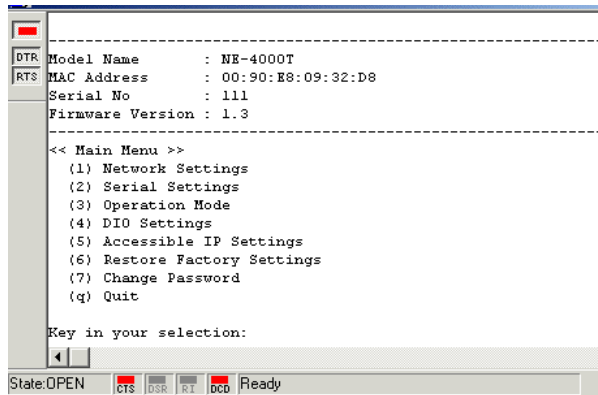
7. Under Main Menu, there are several options from which to choose. To configure **Network Settings**, input 1 and press enter.
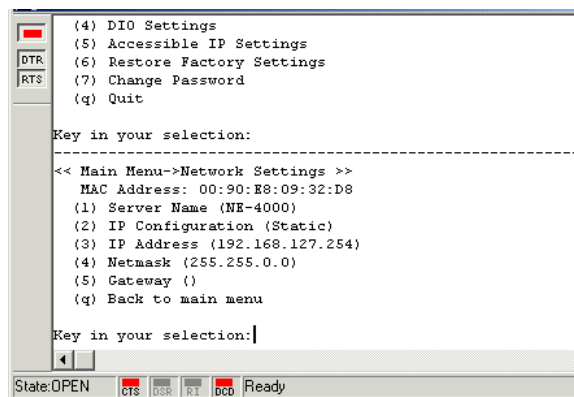
8. To change server name, input 1 and then the **Server Name** will appear at the bottom of the screen. Type in the name for the NE-4000T. If you wish to continue making changes to other settings, just key in the number shown next to that item and configure the settings. Then input **q** to go back to **Main Menu**.

```
       (5) Accessible IP Settings
       (6) Restore Factory Settings
DTR    (7) Change Password
RTS    (q) Quit

Key in your selection:
----------------------------------------------------------------
<< Main Menu->Network Settings >>
   MAC Address: 00:90:E8:09:32:D8
   (1) Server Name (NE-4000)
   (2) IP Configuration (Static)
   (3) IP Address (192.168.127.254)
   (4) Netmask (255.255.0.0)
   (5) Gateway ()
   (q) Back to main menu

Key in your selection:1
Server Name: NE-4000

State:OPEN   CTS DSR RI DCD Ready
```

9. Follow steps 7 and 8 to configure other settings, such as Serial Settings, DIO Settings, etc., until all necessary configuration is done.

ATTENTION

For more details about Network Settings, Serial Settings, Operation Mode, DIO Settings, Accessible IP Settings, and Restore Factory Settings, refer to chapter 4 or 5.

7

Upgrading the Firmware

This chapter describes the procedure for upgrading the firmware. You can download the latest version of the firmware free of charge from Moxa's website: www.moxa.com, and upgrade the firmware through the serial console port.

The following topics are covered in this chapter:

❑ **Using the PRG Button**

Using the PRG Button

1. Click on **Start→Programs→PComm Lite→Terminal Emulator**.

2. When the **PComm Terminal Emulator** window opens, first click on the **Port Manager** menu item and select **Open**, or simply click on the **Open** icon.

3. The **Property** window opens automatically. From the **Communication Parameter** page, select the appropriate COM port for the connection, **COM1** in this example, and **19200** for **Baud Rate**, **8** for **Data Bits**, **None** for **Parity**, and **1** for **Stop Bits**.

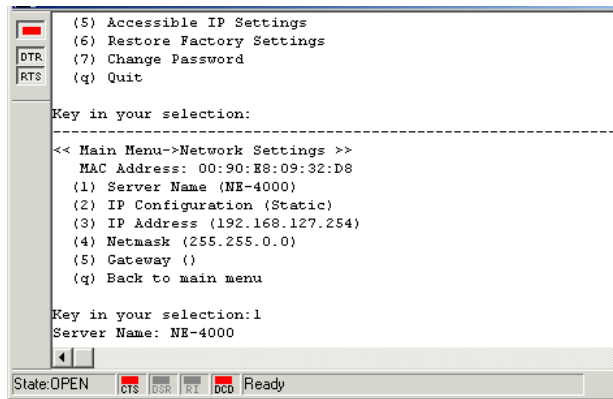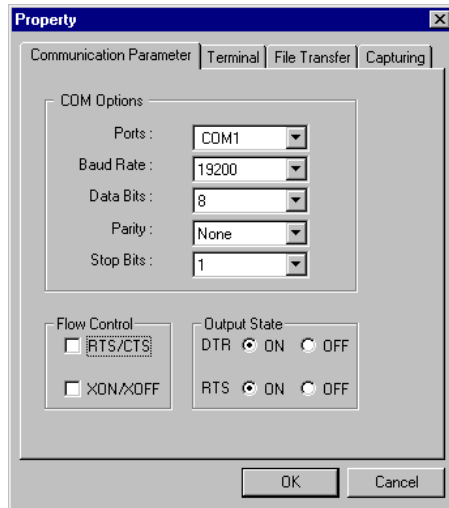4. From the **Property** window's **Terminal** page, select **ANSI** and then click on **OK**.
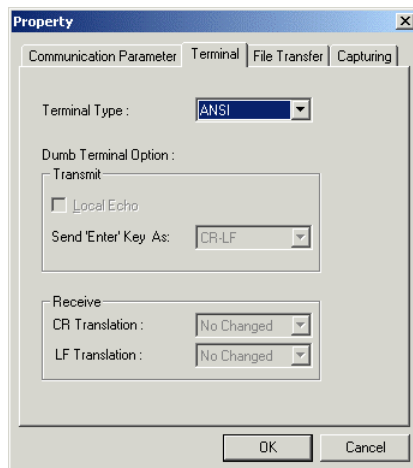
5. Disconnect the power line from NE-4000T.

6. Press the PRG button and reconnect the power line to NE-4000T. Do not let go of the PRG button at this point.

PRG Button

Power Jack
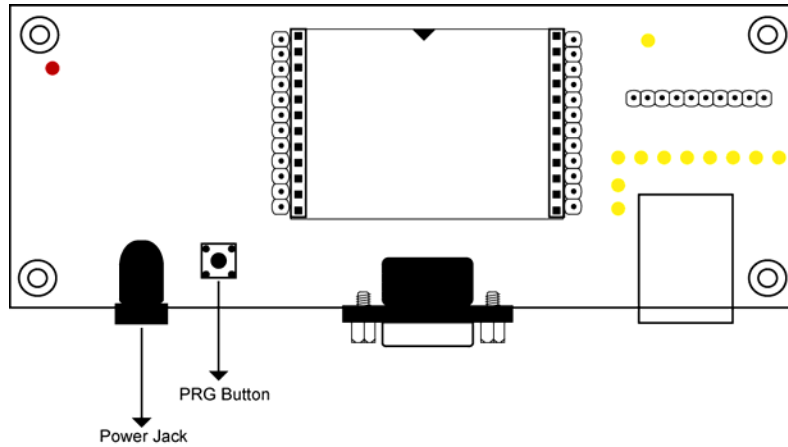
7. Keep pressing the PRG button until the following screen appears.
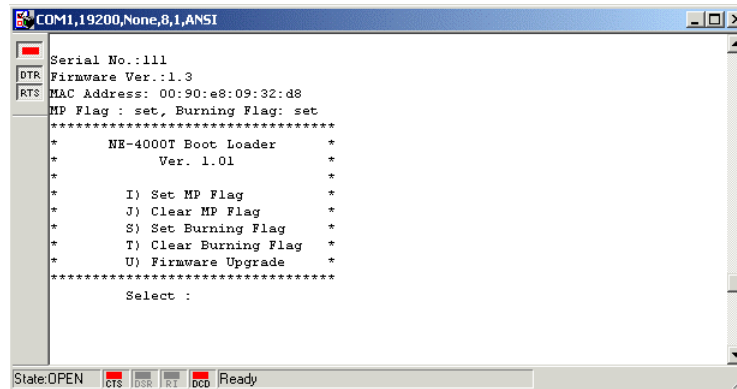
8. Type **U.** The program will start upgrading the firmware automatically.

9. Or, click on the File Transfer icon from the tool bar to upgrade the firmware.
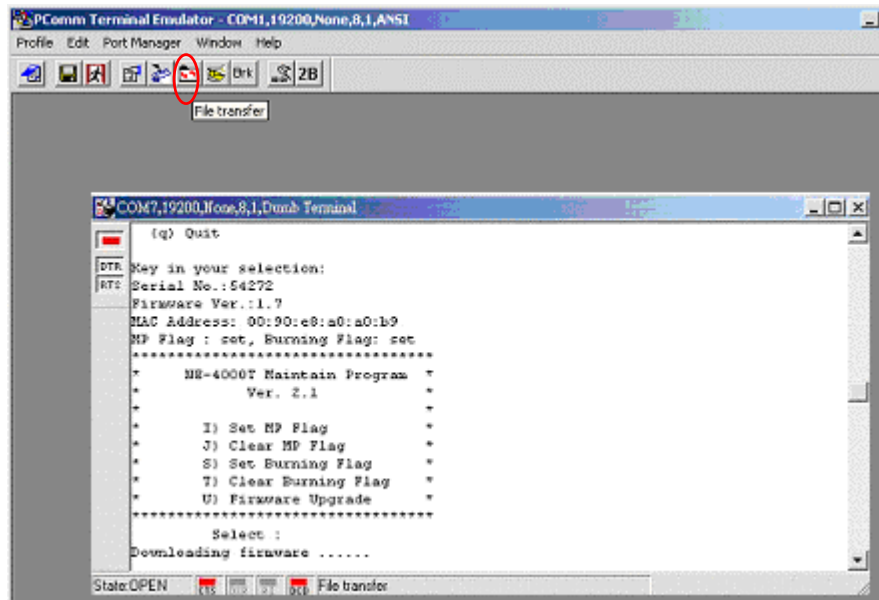
10. The File Transfer window will open next. Select Xmodem-CheckSum, and then click on OK.
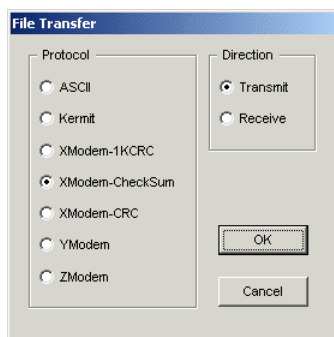
11. The Transmit File window will open next. Locate the NE-4000T.ROM file that you downloaded from Moxa's website, and then click on Open.
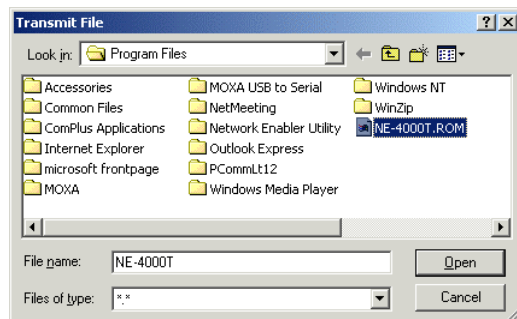
12. The next window to open shows that the program is upgrading the firmware.

Transmit File

Protocol :	XModem-CheckSum
Port :	COM1
File Name :	NE-4000T.ROM
File Size :	65536
Transmit Length :	54528

▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮

Cancel
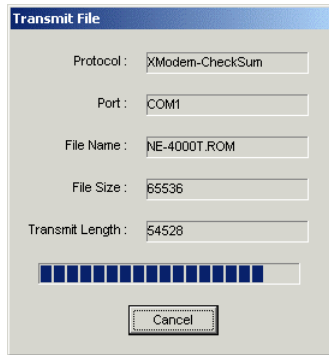
13. After the upgrading is finished, a window will open stating that the file transmission is completed. Click on OK to continue.

File Transfer ✕

(i) (COM1) Transmit file ok

OK
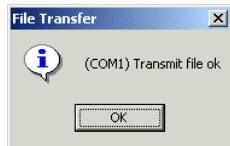
14. The window that opens next shows a message that the firmware has been upgraded. Press any key to go back to the main menu.

COM1,19200,None,8,1,ANSI

Update firmware ...OK!!
Press any key to return main menu ...

DTR
RTS

State:OPEN   CTS DSR RI DCD Ready
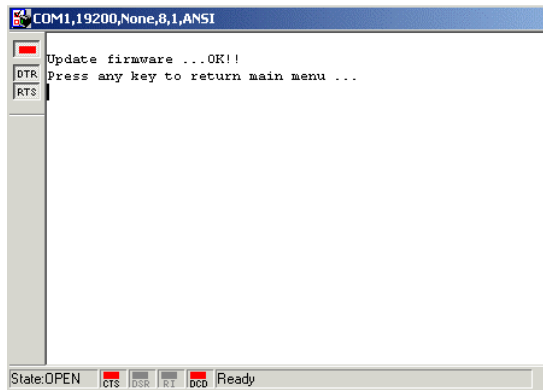
A
Well Known Port Numbers

This appendix is for your reference. Listed below are Well Known Port Numbers that may cause network problems if you configure NE-4000T for the same port. Refer to RFC 1700 for Well Known Port Numbers or refer to the following introduction from IANA.

The port numbers are divided into three ranges: the Well Known Ports, the Registered Ports, and the Dynamic and/or Private Ports.

The Well Known Ports are those from 0 through 1023.

The Registered Ports are those from 1024 through 49151.

The Dynamic and/or Private Ports are those from 49152 through 65535.

The Well Known Ports are assigned by IANA, and on most systems, can only be used by system processes or by programs executed by privileged users. The following table shows famous port numbers among the well-known port numbers. For more details, please visit the IANA website at

http://www.iana.org/assignments/port-numbers

TCP Socket	Application Service
0	reserved
1	TCP Port Service Multiplexor
2	Management Utility
7	Echo
9	Discard
11	Active Users (systat)
13	Daytime
15	Netstat
20	FTP data port
21	FTP CONTROL port
23	Telnet
25	SMTP (Simple Mail Transfer Protocol)
37	Time (Time Server)
42	Host name server (names server)
43	Whois (nickname)

TCP Socket	Application Service
49	(Login Host Protocol) (Login)
53	Domain Name Server (domain)
79	Finger protocol (Finger)
TCP Socket	**Application Service**
80	World Wibe Web HTTP
119	Netword news Transfer Protocol (NNTP)
123	Network Time Protocol
213	IPX
160 – 223	Reserved for future use

UDP Socket	Application Service
0	reserved
2	Management Utility
7	Echo
9	Discard
11	Active Users (systat)
13	Daytime
35	Any private printer server
39	Resource Location Protocol
42	Host name server (names server)
43	Whois (nickname)
49	(Login Host Protocol) (Login)
53	Domain Name Server (domain)
69	Trivial Transfer Protocol (TETP)
70	Gopler Protocol
79	Finger Protocol
80	World Wide Web HTTP
107	Remote Telnet Service
111	Sun Remote Procedure Call (Sunrpc)
119	Network news Tcanster Protocol (NNTP)
123	Network Time protocol (nnp)
161	SNMP (Simple Network Mail Protocol)
162	SNMP Traps
213	IPX (Used for IP Tunneling)

B
NECI Library

NECI (Network Enabler Configuration Interface) is a set of APIs that run in the Windows 95/98/ME/NT/2000/XP system to search, locate, and configure the NE-4000T over the network. The NE-4000T library can be found in the folder **.\NECI_LIBRARY** on the CD enclosed with NE-4000T product. For more information, refer to **svrctl.chm** in that directory.

C

DIO Commands

In this appendix, we give the reference DIO commands used to access the Digital I/O status of the NE-4000T Network Enabler from an Ethernet network. The Digital I/O status can be accessed by a specific TCP port (default 5001) on the Network Enabler.

Command Packet Format:

Length (Bytes)	1	1	1	1 – 255
Format	**Command**	**Version** (must be 1 (hex))	**Length (of data)**	**Data**

Send the Command packet to the Network Enabler. "Data" field is command specific.

ACK Packet Format:

Length (Bytes)	1	1	1	1 -255
Format	**Command**	**Command Status**	**Length (of data)**	**Data**

The Network Enabler returns by ACK packet. You can get the Digital I/O status and input/output operation mode by checking the "Data" field of the packet.

Command: This field defines the command code. For example, 1 (hex) represents "read single DIO." For more information, refer to following content.
Command Status: This field returns the status of the command.
    1 – OK
    0 – Command error; may be unknown

Data Structure Definition:

C code example:
```
//define header length of DIO Packet
#define HEADER_LEN 3        // 3 bytes
//define DIO Packet format
//Used for Command and ACK packet
typedef struct _DIO_Packet_Struct {
    char  command;
    char  version;
    char  length;
    char  data[255];
} DIOPacketStruct, *pDIOPacketStruct;
```

Command Code Usage

1. Reading Single DIO
Read the state ("high" or "low") and the mode ("in" or "out") of the single digital I/O point.
Parameters:

Command code: 1 (hex)
Version: 1 (hex)
Length of data: 1 (hex), represents one byte.
data[0]: Fill in the number for the DIO you wish to access. DIO numbers start from 0 (hex).
Return:
Command Status: Check the Command Status code on the previous page.
Length of data: 3 (hex). Must be 3 bytes of return code in this mode.
data[0]: The number for the DIO you wish to access.
data[1]: DIO mode (hex), 0 for IN, 1 for OUT
data[2]: DIO status (hex), 0 for LOW, 1 for HIGH

C code example:

```
BOOL    ReadSingleDIO(int port, int *mode, int *status)
{
        DIOPacketStruct packet;

        packet.command = 1;         // read single DIO command
        packet.version = 1;             // DIO protocol version
        packet.length = 1;               // data length
        packet.data[0] = (char)port;          // DIO Number
        send(SocketFd, (char *)&packet, HEADER_LEN+packet.length, 0); //Send TCP Packet
    // Process the returned data here.
        return TRUE;
}
```

2. Writing Single DIO Mode

Set operation mode of the single digital I/O point to "input" or "output."

Parameters:

Command code: 2 (hex)
Version: 1 (hex)
Length of data: 2 (hex); represents three bytes.
data[0]: The number for the DIO you wish to access.
data[1]: DIO mode (hex), 0 for IN, 1 for OUT
Return:
Command Status: Check the Command Status code on the previous page.
Length of data: 3 (hex). Must be 3 bytes of return code in this mode.
data[0]: The number for the DIO you wish to access.
data[1]: DIO mode (hex), 0 for IN, 1 for OUT
data[2]: DIO status (hex), 0 for LOW, 1 for HIGH

C code example:

```
void     WriteSingleDIOMode(int port, int mode)
{
        DIOPacketStruct packet;

        packet.command = 2;         // write single DIO mode command
        packet.version = 1;             // DIO protocol version
        packet.length = 2;              // data length
        packet.data[0] = (char)port;          // DIO number
        packet.data[1] = (char)mode;          // DIO mode
        send(SocketFd, (char *)&packet, HEADER_LEN+packet.lenght, 0); //Send TCP packet
    //Process the returned data here
}
```

3. Writing Single DIO Status

Set the status of the single digital output point to "high" or "low" state.

Parameters:

> Command code: 3 (hex)
> Version: 1 (hex)
> Length of data: 2 (hex); represents three bytes.
> data[0]: The number for the DIO you wish to access.
> data[1]: DIO status (hex), 0 for LOW, 1 for HIGH
> Return:
> Command Status: Check the Command Status code on the previous page.
> Length of data: 3 (hex). Must be 3 bytes of return code in this mode.
> data[0]: The number for the DIO you wish to access.
> data[1]: DIO mode (hex), 0 for IN, 1 for OUT
> data[2]: DIO status (hex), 0 for LOW, 1 for HIGH

C code example:

```
void     WriteSingleDIOStatus(int port, int status)
{
        DIOPacketStruct packet;

        packet.command = 3;        // write single DIO status command
        packet.version = 1;        // DIO protocol version
        packet.length = 2;         // data length
        packet.data[0] = (char)port;    // DIO number
        packet.data[1] = (char)status;  // DIO status
        send(SocketFd, (char *)&packet, HEADER_LEN+packet.lenght, 0); //Send TCP packet
     //Process the returned data here
}
```

4. Reading Multiple DIOs

Read the state ("high" or "low") and the mode ("in" or "out") of all digital I/O points at the same time.
Parameter:
> Command code: 4 (hex)
> Version: 1 (hex)
> Length of data: 1 (hex); represents two bytes.
> data[0]: Number of the DIO port you wish to access.
> Note:Port0 (DIO0, DIO1,…,DIO7), Port1 (DIO8,DIO9,…,DIO15), etc.
> Return:
> Command Status : Check the Command Status code on the previous page.
> Length of data: 17
> data[0]: no. of DIO Port
> data[1]: mode of 1st DIO for specific DIO port
> data[2]: status of 1st DIO for specific DIO port
> data[3]: mode of 2nd DIO for specific DIO port
> data[4]: status of 2nd DIO for specific DIO port
> ….
> data[15]: mode of 8th DIO for specific DIO port
> data[16]: status of 8th DIO for specific DIO port

C code example:

```
BOOL     ReadMultipleDIO(int port, int *mode, int *status)
{
```

```
        DIOPacketStruct packet;

        packet.command = 4;          // Read Byte DIO Commands
        packet.version = 1;        // DIO protocol command version
        packet.length = 1;       // data length
        packet.data[0] = port;          // DIO port
        send(SocketFd, (char *)&packet, HEAD_LEN+packet.length, 0); //Send TCP packet
      //Process the returned data here
      return TRUE;
}
```

Note: A utility that can be used to test the DIO access commands can be found on the CD-ROM.

D

Service Information

This appendix shows you how to contact Moxa for information about this and other products, and how to report problems.

In this appendix, we cover the following topics.

❑ **MOXA Internet Services**

❑ **Problem Report Form**

❑ **Product Return Procedure**

MOXA Internet Services

Customer satisfaction is our number one concern, and to ensure that customers receive the full benefit of our products, Moxa Internet Services has been set up to provide technical support, driver updates, product information, and user's manual updates.

The following services are provided

E-mail for technical support .... support@moxa.com.tw

World Wide Web (WWW) Site for product information:

.... http://www.moxa.com

Problem Report Form

MOXA NE-4000T

Customer name:	
Company:	
Tel:	Fax:
Email:	Date:

1. **Moxa Product:** ☐ NE-4000T
2. **Serial Number:** _____

Problem Description: Please describe the symptoms of the problem as clearly as possible, including any error messages you see. A clearly written description of the problem will allow us to reproduce the symptoms, and expedite the repair of your product.

Product Return Procedure

For product repair, exchange, or refund, the customer must:

♦ Provide evidence of original purchase.

♦ Obtain a Product Return Agreement (PRA) from the sales representative or dealer.

♦ Fill out the Problem Report Form (PRF). Include as much detail as possible for a shorter product repair time.

♦ Carefully pack the product in an anti-static package, and send it, pre-paid, to the dealer. The PRA should be visible on the outside of the package, and include a description of the problem, along with the return address and telephone number of a technical contact.

Revision History

Document Edition	Revision Date	Revision Details
2nd	November 10, 2003	1. Update the edition of this manual on the title page. 2. p. 2-7 Changed the definition for Ready LED when it's blinking. 3. p. 2-8 Deleted Reference Circuit Diagrams. 4. p. 4-9 Deleted descriptions "right click" in the first sentence under "Unlock Password Protection." 5. p. 4-15 Deleted the sentence under the "Baud Rate" table. 6. p. 4-15 Changed "Xon/Xoff" in the "Flow Control" table to "XON/XOFF." 7. p. 4-17 Deleted "NE-4000T-ST's" in the sentence under "Delimiter 2" table. 8. p. 5-5 Deleted the sentence under the "Baud Rate" table. 9. p. 5-7 Changed "Local TCP port" table to "TCP port" table above "DIO Settings." 10. p. 6-2 Deleted "Factory Default IP Address" section. 11. p. 7-4 Deleted the section title "Using the File Transfer Function," the first step and figure under it, and combined with "Using the PRG button" procedures as the 9th step. 12. p. B-1 Changed the directory "Svretl.chm" to "svrctl.chm."

		13. p. 3-3
		Added "DI/O Settings" section after "Connecting to a Serial Device."