NETGEAR®

Copper Gigabit Ethernet Card

Reference Guide

MODEL
GA 622T

Trademarks

Statement of Conditions

In the interest of improving internal design, operational function, and/or reliability, NETGEAR reserves the right to make changes to the products described in this document without notice.

NETGEAR does not assume any liability that may occur due to the use or application of the product(s) or circuit layout(s) described herein.

Certificate of the Manufacturer/Importer

It is hereby certified that the NETGEAR Model GA622T Gigabit Ethernet Cards have been suppressed in accordance with the conditions set out in the BMPT-AmtsblVfg 243/1991 and Vfg 46/1992. The operation of some equipment (for example, test transmitters) in accordance with the regulations may, however, be subject to certain restrictions. Please refer to the notes in the operating instructions.

Federal Office for Telecommunications Approvals has been notified of the placing of this equipment on the market and has been granted the right to test the series for compliance with the regulations.

VCCI Statement

This equipment is in the Class B category (information equipment to be used in a residential area or an adjacent area thereto) and conforms to the standards set by the Voluntary Control Council for Interference by Data Processing Equipment and Electronic Office Machines aimed at preventing radio interference in such residential areas.

When used near a radio or TV receiver, it may become the cause of radio interference.

Read instructions for correct handling.

Federal Communications Commission (FCC) Compliance Notice: Radio Frequency Notice

⊖ **Note:** Modifications to this device change it from the original state it was in when tested and may alter the device so that it no longer complies with FCC testing limitations for Class B digital devices. According to FCC regulations, the user could be prohibited from operating this equipment if it is modified.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.

2. This device must accept any interference received, including interference that may cause undesired operation.

⊜ **Note:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

  • Reorient or relocate the receiving antenna.

  • Increase the separation between the equipment and receiver.

  • Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

  • Consult the dealer or an experienced radio/TV technician for help.

EN 55 022 Statement

This is to certify that the NETGEAR Model GA622T Gigabit Ethernet Card are shielded against the generation of radio interference in accordance with the application of Council Directive 89/336/EEC, Article 4a. Conformity is declared by the application of EN 55 022 Class B (CISPR 22).

Compliance is dependent upon the use of shielded data cables.

Canadian Department of Communications Radio Interference Regulations

These digital apparatus (NETGEAR Model GA622T Gigabit Ethernet Card) do not exceed the Class B limits for radio-noise emissions from digital apparatus as set out in the Radio Interference Regulations of the Canadian Department of Communications.

Règlement sur le brouillage radioélectrique du ministère des Communications

Ces appareils numériques (NETGEAR Model GA622T Gigabit Ethernet Card) respectent les limites de bruits radioélectriques visant les appareils numériques de classe B prescrites dans le Règlement sur le brouillage radioélectrique du ministère des Communications du Canada.

Customer Support

For assistance with installing and configuring your NETGEAR system or with questions or problems following installation:

• Check the NETGEAR Web page at http://www.NETGEAR.com.

• Call Technical Support at the phone number listed on the Support Information Card that shipped with your switch.

• Email Technical Support at support@NETGEAR.com.

Defective or damaged merchandise can be returned to your point-of-purchase representative.

Internet/World Wide Web

NETGEAR maintains a World Wide Web home page that you can access at the universal resource locator (URL) http://www.NETGEAR.com. A connection to the Internet and a Web browser such as Internet Explorer or Netscape are required.

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CHAPTER 1: INTRODUCTION

Congratulations on your purchase of the NETGEAR® GA622T Copper Gigabit Ethernet Card. Designed especially for high-performance systems, such as servers and high-end workstations, it offers 2 gigabits per second (Gbps) of aggregate bandwidth and optimized performance while minimizing network overhead on the host system. This guide describes the installation and use of the GA622T for operation within a Microsoft® Windows 95OSR2®, Windows 98®, Windows NT®, Windows 2000®, Windows Me®, Novell NetWare®, or Red Hat Linux® environment.

This chapter provides information about the features of the GA622T. It connects your PCI-compliant server or workstation to a Gigabit Ethernet network, incorporating a new technology that transfers data at a rate of 1 Gbps or 1000 megabits per second (Mbps) over standard Category 5 cables.

Benefits

Performance is optimized and network overhead on the host system is minimized with the use of the GA622T Copper Gigabit Ethernet Card.

The GA622T has demonstrated interoperability with all major Gigabit Ethernet equipment on the market that is compliant with IEEE 802.3ab standards and should work with most non-compliant Gigabit Ethernet products. In addition, because the GA622T uses standard Ethernet frame and Media Access Control (MAC) formats, it provides full compatibility with Fast Ethernet network equipment through network switches from a variety of vendors, including NETGEAR.

Features

The key features of the GA622T Copper Gigabit Ethernet Card are:

- Full-duplex operation (2,000 Mbps: 1,000 Mbps each way) with DMA (Direct Memory Access) Gigabit Ethernet interface (IEEE 802.3ab)

- RJ-45 connector for Category 5 unshielded twisted pair (UTP) cable

- Interoperability with existing Fast Ethernet equipment compliance with the following standards and protocols:

  – IEEE 802.3ab Gigabit Ethernet

  – IEEE 802.3u Fast Ethernet

  – IEEE 802.3u Auto Negotiation

  – IEEE 802.3x Flow Control

- Standard Ethernet frame size (up to 1,518 bytes)

- Jumbo frames support

- Adaptive interrupt frequency

- Adjustable interrupt hold-off time to minimize CPU utilization, therefore maximizing PCI bus and network throughput

- 33/66 MHz, 32/64-bit PCI bus master (Local Bus Revision 2.2 compliant) with adaptive DMA channels

- Two independent DMA channels for simultaneous read and write operations; as a bus master, the network card requests access to the PCI bus instead of waiting to be polled

- Software driver support for Windows95OSR2, Windows 98, Windows NT, Windows 2000, Windows Me, NetWare 4.2, 5.0, 5.1, and Red Hat Linux 6.1 and 6.2

- Universal dual-voltage signaling (3.3 V and 5 V)

CHAPTER 2: HARDWARE INSTALLATION ──────

This chapter provides information about the package contents, system requirements, and installation of the NETGEAR GA622T Copper Gigabit Ethernet Card.

Package Contents

The product package contains:

- GA622T Copper Gigabit Ethernet Card

- *GA622T Copper Gigabit Ethernet Card Driver and Documentation CD*

- *GA622T Copper Gigabit Ethernet Card Installation Guide*

- Warranty & Registration Card

- Support Information Card

Call your reseller or customer support in your area if there are any wrong, missing, or damaged parts. Refer to the Support Information Card for the telephone number of customer support in your area.

Keep the Support Information Card, along with the original packing materials. Use the packing materials to repack the GA622T Copper Gigabit Ethernet Card if you need to return it for repair.

To qualify for product updates and product warranty registrations, fill out the registration information within 30 days of purchase. For priority service, register online on the NETGEAR Web page at:

http://www.NETGEAR.com

You can also fill out and return the Warranty & Registration Card that is included in your product package.

Requirements

Before installing the GA622T Copper Gigabit Ethernet Card, verify that your system meets the operating system and hardware requirements outlined in Table 2-1.

Table 2-1. Software and Hardware Requirements

System	Requirements
Windows 95OSR2	
Hardware	A Pentium-based workstation that meets Windows 95OSR2 software requirements One open 32-bit or 64-bit PCI slot
Operating System	Windows 95OSR2
Software (loaded during driver installation)	GA622T Copper Gigabit Ethernet Card driver software, version 1.0 (or higher) for Windows, which is included on the *GA622T Copper Gigabit Ethernet Card Driver and Documentation CD* in the \Win95 directory. The necessary files are: • GA622nd4.sys (network device driver file) • Netga622.inf (information used by installation program)
Windows 98/98SE	
Hardware	A Pentium-based workstation that meets Windows 98/98SE software requirements One open 32-bit or 64-bit PCI slot
Operating System	Windows 98, Windows 98SE
Software (loaded during driver installation)	GA622T Copper Gigabit Ethernet Card driver software, version 1.0 (or higher) for Windows, which is included on the *GA622T Copper Gigabit Ethernet Card Driver and Documentation CD* in the \Win98 directory. The necessary files are: • GA622nd5.sys (network device driver file) • Netga622.inf (information used by installation program)
Windows NT	
Hardware	A Pentium-based workstation or server that meets Windows NT 4.0 software requirements One open 32-bit or 64-bit PCI slot Minimum 64 MB memory

Table 2-1. Software and Hardware Requirements (continued)

System	Requirements
Operating System	Windows NT 4.0 with Service Pack 5 or above. To download the latest Service Pack, go to the following Microsoft Web page and search for the latest service pack: http://www.microsoft.com/downloads/search.asp
Software (loaded during driver installation)	GA622T Copper Gigabit Ethernet Card driver software, version 1.0 (or higher) for Windows NT, which is included on the *GA622T Copper Gigabit Ethernet Card Driver and Documentation CD* in the \Winnt directory. The necessary files are: • GA622nd4.sys (network device driver file) • Oemsetup.inf (information used by installation program; this file is in the root directory)
Windows 2000	
Hardware	A Pentium-based workstation or server that meets Windows 2000 software requirements One open 32-bit or 64-bit PCI slot Minimum 64 MB memory
Operating System	Windows 2000 Professional, Windows 2000 Server, or Windows 2000 Advanced Server
Software (loaded during driver installation)	GA622T Copper Gigabit Ethernet Card driver software, version 1.0 (or higher) for Windows 2000, which is included on the *GA622T Copper Gigabit Ethernet Card Driver and Documentation CD* in the \Win2000 directory. The necessary files are: • GA622nd5.sys (network device driver file) • Netga622.inf (information used by installation program)
Windows Me	
Hardware	A Pentium-based workstation that meets Windows Me software requirements
Operating System	Windows Me
Software (loaded during driver installation)	GA622T Copper Gigabit Ethernet Card driver software for Windows Me, which is included on the *GA622T Copper Gigabit Ethernet Card Driver and Documentation CD* in the \Winme directory. The necessary files are: • GA622nd5.sys (network device driver file) • Netga622.inf (information used by installation program)

Table 2-1. Software and Hardware Requirements (continued)

System	Requirements
NetWare	
Hardware	A Pentium-based server that meets NetWare 4.2, NetWare 5.0, or NetWare 5.1 software requirements One open 32-bit or 64-bit PCI slot Minimum 64 MB memory

Operating System	If you are using NetWare 4.2, you must have the most recent support pack (Support Pack 8 or later). To download the latest support pack, go to the following Novell Web page:
	
	    http://support.novell.com/products/nw42/patches.htm
	
	For NetWare 5.0, download the most recent support pack (Support Pack 4 or later). To download the latest support pack, go to the following Novell Web page:
	
	    http://support.novell.com/products/nw5/patches.htm

Software (loaded during driver installation)	GA622T Copper Gigabit Ethernet Card driver software, version 1.0 (or higher) for NetWare, which is Included on the *GA622T Copper Gigabit Ethernet Card Driver and Documentation CD* in the \Netware directory. The necessary files are: • Ga622.lan (network device driver file) • Ga622.ldi (information used by installation program)
Red Hat Linux	
Hardware	A Pentium-based server that meets Red Hat Linux 6.1 or 6.2 software requirements One open 32-bit or 64-bit PCI slot
Operating System	Red Hat Linux 6.1 or 6.2
Software (loaded during driver installation)	GA622T Copper Gigabit Ethernet Card driver software, version 1.0 (or higher) for NetWare, which is included on the *GA622T Copper Gigabit Ethernet Card Driver and Documentation CD* in the \Linux directory. The necessary files are: • ga.c (Linux network OS specific module file) • ga622t.h (Driver header file) • gam.o (Driver object module for 2.2.17 kernel) • hsm.c (Hardware specific module file) • hsm.h (Hardware specific module header file) • nsm.h (HSM related data structures) • nsmtypes.h (Definition type define) • sp.c (Tunable parameters) • Makefile Rules to compile and install the driver)

Hardware Description

As illustrated in Figure 2-1, the GA622T Copper Gigabit Ethernet Card has an RJ-45 connector port and three port LEDs.
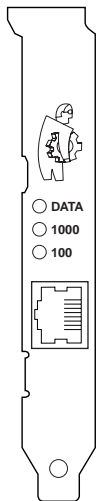

Figure 2-1. Front Panel of Model GA622T Gigabit Ethernet Card

The front panel of the GA622T has three LEDs: one for each port speed option (100 Mbps, and 1000 Mbps) to indicate which link is active, and one LED for data transfer status. Once the hardware and its driver software are properly installed on your system, the LEDs indicate the conditions described in Table 2-2.

Table 2-2. GA622T LEDs

Label	Activity	Description
DATA	Blinking	Brief bursts of data detected on the port
	On	Streams of data detected on the port
	Off	No data detected on the port
1000	On	Good 1000 Mbps Gigabit Ethernet link
	Off	No 1000 Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch
100	On	Good 100 Mbps Fast Ethernet link
	Off	No 100 Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch

Preparing to Install Your GA622T Copper Gigabit Ethernet Card

Follow the instructions provided in this section for installing the GA622T Copper Gigabit Ethernet Card in your server or workstation. For additional information about performing these tasks on your particular system, refer to the manuals included with your system hardware.

Before installing your Gigabit Ethernet Card:

1. Make sure that your system meets the hardware and software requirements provided in Table 2-1.

2. Make sure that your system uses the latest BIOS.

3. Turn off the power to your PC.
   - If you are running Windows, close all applications and click Start from the desktop menu, select Shut Down, and then select Shut down the computer.
   - If you are running NetWare, use the following commands to shut down the server functions and reach the DOS prompt:

     ```
     server_name: down
     server_name: exit
     ```

⚠	**Danger:** You are installing the card in a machine that operates with voltages that can be dangerous. Follow the steps after this warning to protect yourself and to prevent damage to the PC components.

4. Protect yourself, the card, and your server by taking these precautions:

   • Shut down the server software and turn off the power to your server.

   • Use only insulated or non-conducting tools.

   • Hold the Gigabit Ethernet Card by the edges and place it on an antistatic surface only.

   • Check the card for visible signs of damage, particularly to the connector on the edge of the card. Never attempt to install a damaged card.

Installing Your GA622T Copper Gigabit Ethernet Card

To install your GA622T Copper Gigabit Ethernet Card:

1. Remove the PC cover.

2. Choose an available 32-bit or 64-bit PCI expansion slot (PCI slots are usually the shorter slots) and remove the corresponding back plate from the PC chassis.

3. Insert the card into the PCI expansion slot.

⊖ **Note:** To avoid damaging any components on the card, handle it by the edges, using your thumbs to push it securely into the PCI slot. Do not use excessive force, but make sure the card is fully inserted into the slot to prevent the PC operating system from freezing at startup.

   The connector dock in a 32-bit PCI slot is shorter than in a 64-bit PCI slot. When installed in a 32-bit PCI slot, part of the connector edge remains undocked. This situation is normal.

4. Fasten the card to the rear of the computer chassis by tightening the screw that is on the PC.

5. Replace the PC cover and reconnect the power cord to the PC.

Connecting the Network Cables

The GA622T has one RJ-45 connector used for attaching the system to an Ethernet copper-wire segment. The card will automatically negotiate the fastest connection speed and duplex possible. If a specific speed or duplex is desired, the card can be placed into one of the supported modes: 1000 Mbps full duplex; 100 Mbps full duplex; 100 Mbps half duplex.

1. Prepare an appropriate cable.

   Table 2-3 lists the cable characteristics for connecting to 100/1000BASE-T ports.

Table 2-3. GA622T (100/1000BASE-T) Cable Characteristics

Port Type	Connector	Media	Maximum Distance
100/1000BASE-T	RJ-45	CAT 5 UTP/CAT 5e UTP	325 feet (100 meters)

⊖   **Note:** 1000BASE-T signaling requires four twisted pairs of Category 5 balanced cabling, as specified in ISO/IEC 11801:1995 and ANSI/EIA/TIA-568-A (1995) and tested using procedures defined in TIA/EIA TSB95.

2. Connect one end of the cable to the GA622T Copper Gigabit Ethernet Card.

3. Connect the other end of the cable to an RJ-45 Ethernet network port.

4. Turn on power to the PC and then to the connected device.

5. Verify that one of the two link speed LEDs is on, indicating that there is a good link to the card.

⊖   **Note:** See Table 2-2 for a description of port LED operation. See Chapters 3 through 7 for driver installation and configuration instructions.

CHAPTER 3: WINDOWS 95OSR2/98/ME DRIVER SOFTWARE ━━━

This chapter provides information about the Microsoft Windows 95OSR2/98/Me driver software.

This chapter also describes how to:

• Install the driver software in the Windows 98 environment

• Move the card to a different slot

⊖ **Note:** The specific steps and screen shots used in this chapter refer to a computer with Windows 98 installed, but the information and procedures shown here apply to computers with Windows 95OSR2 and Windows Me.

Installing the Driver Software

A network driver must be installed before the card can be used with your Windows 98 system.

⊖ **Note:** The Gigabit Ethernet card must be physically installed in your system prior to installing the driver software. See Chapter 2 " Hardware Installation," for details.

When the Windows 98 System first boots up after installing a new hardware device, such as a GA622T Copper Gigabit Ethernet Card, the system automatically detects the new hardware and prompts you to install the driver software for the device.

To install the GA622T Copper Gigabit Ethernet Card software for Windows 98, perform the following procedure:

1. When you boot up the Windows 98 system after installing the Gigabit Ethernet card, a series of Found New Hardware Wizard dialog boxes opens.
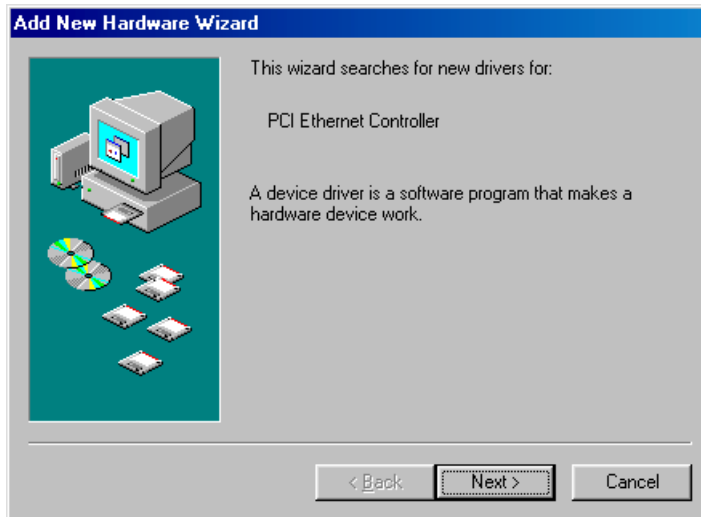
2. When the following dialog box opens, click Search for the best driver for your device (recommended), and then click Next.
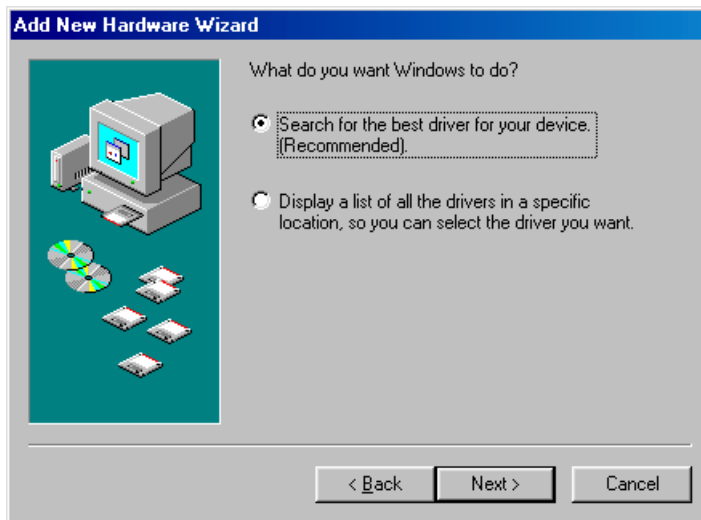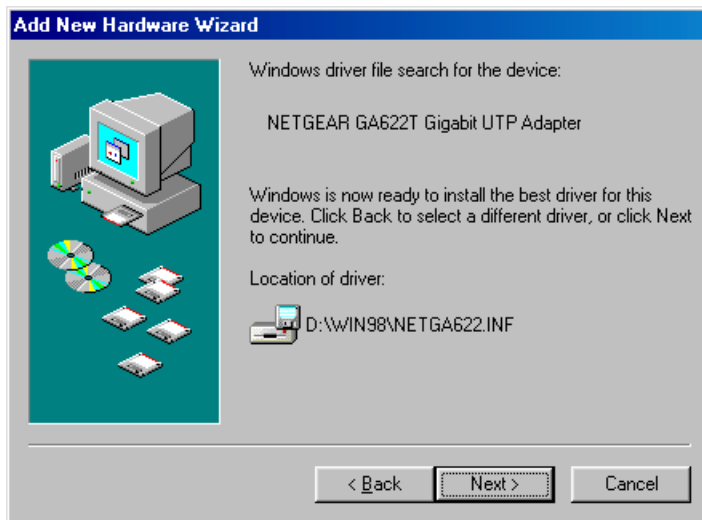

3. In the next dialog box, check the "Specify a location" box.

⊖ **Note:** Windows Me drivers are found at d:\winMe and Windows 95 drivers are found at d:\win95, assuming that d: is the drive letter for the CD-ROM drive.

4. When Windows returns its search results in the following dialog box, verify that the correct path to the driver software is shown, and then click Next.

Add New Hardware Wizard

Windows driver file search for the device:

NETGEAR GA622T Gigabit UTP Adapter

Windows is now ready to install the best driver for this device. Click Back to select a different driver, or click Next to continue.

Location of driver:

D:\WIN98\NETGA622.INF

< Back   Next >   Cancel

5. The driver is copied onto your system, and the GA622T Gigabit UTP Adapter Properties dialog box opens.
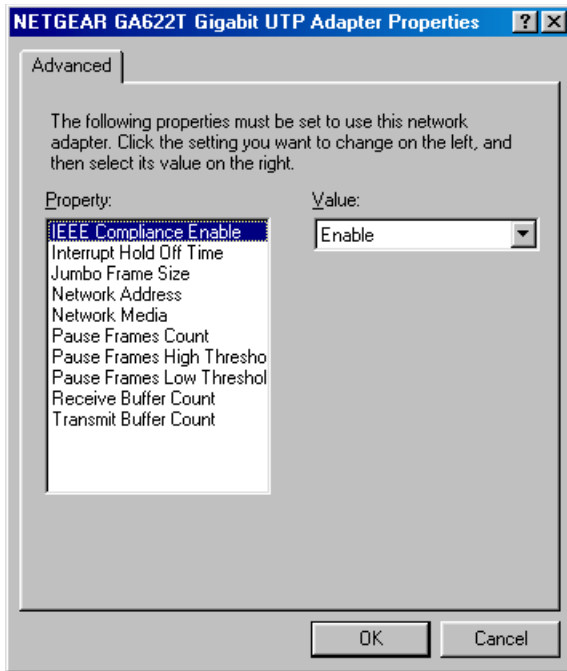
6. Click OK to accept the default settings.

7. You can change operating parameters as desired. Refer to Table 3-1 for help in configuring these parameters.

Table 3-1. Parameter Descriptions

Property	Description
IEEE Compliance Enable	Disabled is used for non-compliant switches. Enabled requires that the attached network devices fully complies with 802.3ab.
Interrupt Hold Off Time	Specifies the amount of time between adapter interrupts. Under normal operation, the adapter generates an interrupt every time a frame is received. Reducing the number of interrupts improves CPU utilization.
Jumbo Frame Size	Enables sending larger Ethernet packets on Gigabit. Jumbo Frames can increase throughput and decrease CPU utilization by putting more data in each packet, thereby sending out fewer packets. Jumbo Frames are not a part of the IEEE standard and can be used only if supported by the other network equipment.
Network Address	Allows you to change the network address.
Network Media	Duplex is a performance option that lets you choose how the card transmits and receives packets over the network.
Offload Rx IP Checksum	When enabled, this option allows the card to verify the IP checksum of incoming packets. This will improve IP receive performance by offloading this operation from the CPU. (Windows 2000, Me)
Offload Rx TCP Checksum	When enabled, this option allows the card to verify the TCP checksum of incoming packets. This will improve TCP receive performance by offloading this operation from the CPU. (Windows 2000, Me)
Offload Rx UDP Checksum	When enabled, this option allows the card to verify the UDP checksum of incoming packets. This will improve UDP receive performance by offloading this operation from the CPU. (Windows 2000, Me)
Offload Tx IP Checksum	When enabled, this option allows the card to compute the IP checksum of outgoing packets. This will improve IP transmit performance by offloading this operation from the CPU. (Windows 2000, Me)
Offload Tx TCP Checksum	When enabled, this option allows the card to compute the TCP checksum of outgoing packets. This will improve TCP transmit performance by offloading this operation from the CPU. (Windows 2000, Me)
Offload Tx UDP Checksum	When enabled, this option allows the card to compute the UDP checksum of outgoing packets. This will improve UDP transmit performance by offloading this operation from the CPU. (Windows 2000, Me)

Table 3-1. Parameter Descriptions (continued)

Property	Description
Pause Frames Count	IEEE 802.3x flow control settings help fine-tune network performance by preventing dropped packets.
Pause Frames High Threshold	IEEE 802.3x flow control settings help fine-tune network performance by preventing dropped packets.
Pause Frames Low Threshold	IEEE 802.3x flow control settings help fine-tune network performance by preventing dropped packets.
Receive Buffer Count	Specifies hardware resources in memory used to receive packets.
Transmit Buffer Count	Specifies hardware resources in memory used to send packets. Increasing this value may increase transmit performance.

Moving the Network Card to a Different Slot

Windows 98 automatically detects the installation and removal of hardware. To move a GA622T Copper Gigabit Ethernet Card to a different slot in the same system:

1. Shut down the system and remove the card from the PCI slot.

2. Install the card in its new PCI slot (see "Installing Your Copper Gigabit Ethernet Card" on page 2-7).

3. When the system is powered on, reinstall the driver software (see "Installing the Driver Software" on page 3-1).

CHAPTER 4: WINDOWS NT DRIVER SOFTWARE ━━━━━

This chapter provides information about the Microsoft Windows NT driver software.

This chapter also gives directions for performing the following procedures:

• Installing the driver software

• Updating or reinstalling the driver software

• Moving the network card and removing the driver software

Installing the Driver Software

Your GA622T Copper Gigabit Ethernet Card must be physically installed in the server before installing the software driver. If you are installing more than one GA622T Copper Gigabit Ethernet Card, you must perform the following procedure for each card.

To install the driver software if you are operating in a Windows NT environment:

1. Start your Windows NT system and log in.

   You must have Network Administrator privileges to install the driver software.

2. On the Windows taskbar, click the Start button, point to Settings, and then click Control Panel.
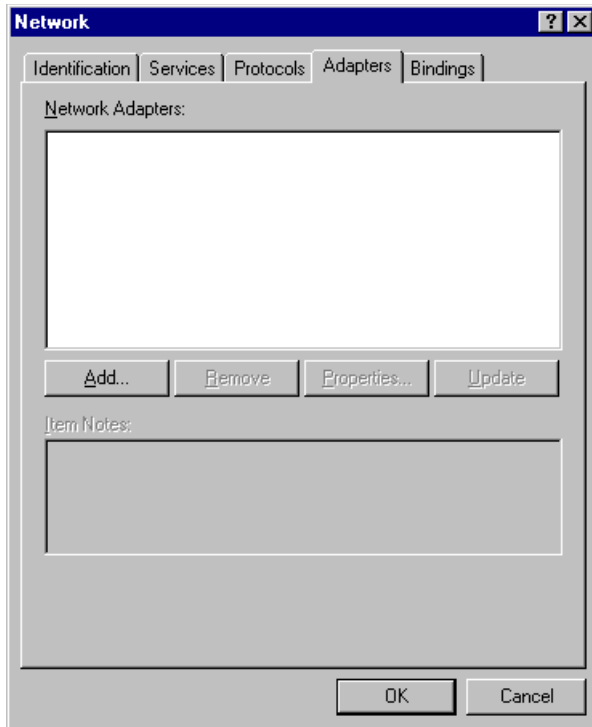
   The Control Panel window opens, displaying a group of icons including the Network icon.

Network

3. Double-click the Network icon.
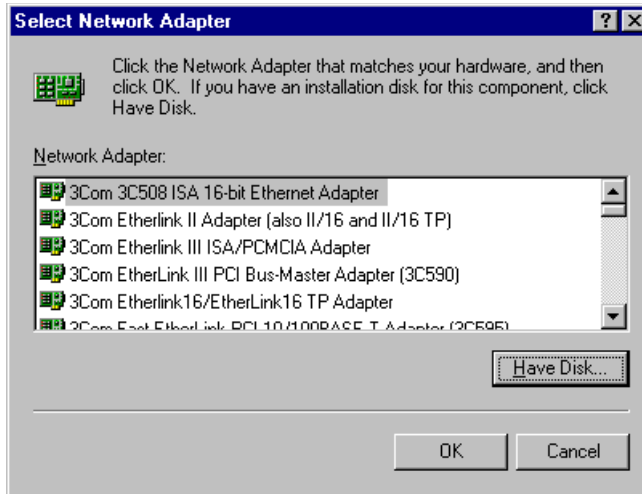
   The Network dialog box opens.

If there are any previously installed GA622T Copper Gigabit Ethernet Card drivers listed, the drivers must be updated before installing another driver for a new card. For directions on upgrading the driver for an existing card, see "Updating the Driver Software" on page 4-8.

If there are no previously installed drivers, that require updating, proceed to step 4.
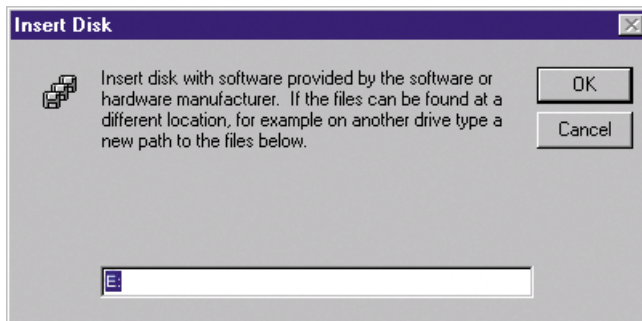
4. Click on the Adapters tab, and then click Add.

The Select Network Adapter dialog box opens.

5. Click Have Disk.

The Insert Disk dialog box opens.

6. Insert the *GA622T Copper Gigabit Ethernet Card Driver and Documentation CD* into the CD-ROM drive in your PC, type the path to the driver that matches your system, and then click OK.

   For example, enter the following path:
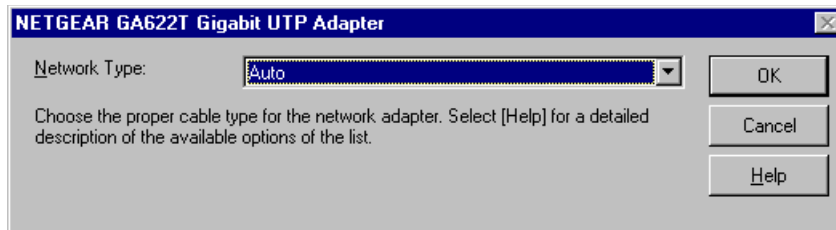
   ```
   E:\
   ```

   In this example, the letter E: is the CD-ROM drive.

   The Select OEM Option dialog box opens, and NETGEAR GA622T Copper Gigabit Ethernet Card is highlighted.
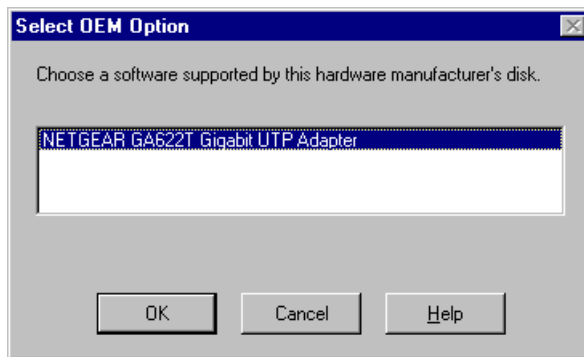
7. Click OK.

   The driver is copied onto your system, and the NETGEAR GA622T Gigabit UTP Adapter properties dialog box opens.

8. Refer to Table 4-1 to set the parameters in the entry fields.

Table 4-1. Parameter Descriptions

Property	Description
IEEE Compliance Enable	Disabled is used for non-compliant switches. Enabled requires that the attached network device fully complies with 802.3ab.
Interrupt Hold Off Time	Specifies the amount of time between adapter interrupts. Under normal operation, the adapter generates an interrupt every time a frame is received. Reducing the number of interrupts improves CPU utilization.
Jumbo Frame Size	Enables sending larger Ethernet packets on Gigabit. Jumbo Frames can increase throughput and decrease CPU utilization by putting more data in each packet, thereby sending out fewer packets. Jumbo Frames are not a part of the IEEE standard and can be used only if supported by the other network equipment.
Network Address	Allows you to change the network address.
Network Media	Duplex is a performance option that lets you choose how the card transmits and receives packets over the network.
Offload Rx IP Checksum	When enabled, this option allows the card to verify the IP checksum of incoming packets. This will improve IP receive performance by offloading this operation from the CPU. (Windows 2000, Me)
Offload Rx TCP Checksum	When enabled, this option allows the card to verify the TCP checksum of incoming packets. This will improve TCP receive performance by offloading this operation from the CPU. (Windows 2000, Me)
Offload Rx UDP Checksum	When enabled, this option allows the card to verify the UDP checksum of incoming packets. This will improve UDP receive performance by offloading this operation from the CPU. (Windows 2000, Me)
Offload Tx IP Checksum	When enabled, this option allows the card to compute the IP checksum of outgoing packets. This will improve IP transmit performance by offloading this operation from the CPU. (Windows 2000, Me)
Offload Tx TCP Checksum	When enabled, this option allows the card to compute the TCP checksum of outgoing packets. This will improve TCP transmit performance by offloading this operation from the CPU. (Windows 2000, Me)
Offload Tx UDP Checksum	When enabled, this option allows the card to compute the UDP checksum of outgoing packets. This will improve UDP transmit performance by offloading this operation from the CPU. (Windows 2000, Me)

Table 4-1. Parameter Descriptions (continued)

Property	Description
Pause Frames Count	IEEE 802.3x flow control settings help fine tune network performance by preventing dropped packets.
Pause Frames High Threshold	IEEE 802.3x flow control settings help fine tune network performance by preventing dropped packets.
Pause Frames Low Threshold	IEEE 802.3x flow control settings help fine tune network performance by preventing dropped packets.
Receive Buffer Count	Specifies hardware resources in memory used to receive packets.
Transmit Buffer Count	Specifies hardware resources in memory used to send packets. Increasing this value may increase transmit performance.

9. Click OK to accept the changed parameters.

    The Network dialog box opens.
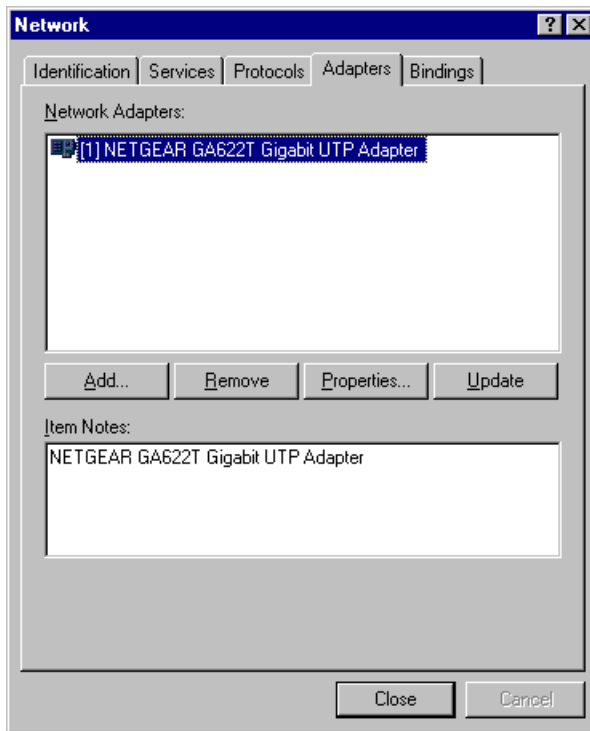
10. Click Close.

    If other cards in your system use TCP/IP bindings, the Microsoft TCP/IP Properties dialog box opens. Set any necessary TCP/IP configurations, and click OK when finished.

11. When prompted to restart your computer, click Yes.

    The system restarts using the new driver and configuration settings.

Updating the Driver Software

To replace old driver software with a newer version:

1. Start your Windows NT system and log in.

    You must have Network Administrator privileges to install the driver software.

2. On the Windows taskbar, click the Start button, point to Settings, and then click Control Panel.

    The Control Panel window opens.

3. Double-click the Network icon.

4. Click on the Adapters tab.

    Any previously installed software drivers are listed in the Network Adapters list.

5. Click on the adapter that you want to update.

6. Click Update.

    The Select Network Adapter dialog box opens.

7. When prompted, insert the *GA622T Copper Gigabit Ethernet Card Driver and Documentation CD* into the CD-ROM drive in your PC.

8. Type the path that matches the CD-ROM drive on your system, and then click OK.

    For example, enter the following path:

    ```
    E:\
    ```

    In this example, the letter E: is the CD-ROM drive.

9. Click Close in the Network Dialog box when the copying process is complete.

10. When prompted to restart your computer, click Yes.

The system restarts using the new driver and the default configuration settings.

Moving the Network Card to a Different Slot

Before moving your GA622T Copper Gigabit Ethernet Card to a different slot in the same system, you must first remove the card driver software. After removing the driver software, you can move the card to a different slot and reinstall the driver software.

To remove the driver software:

1. Start your Windows NT system and log in.

   You must have Network Administrator privileges to remove the driver software.

2. On the Windows taskbar, click the Start button, point to Settings, and then click Control Panel.

   The Control Panel window opens.

3. Double-click the Network icon.

   The Network dialog box opens.

4. Click on the Adapter tab.

   Any previously installed driver is listed in the Network Adapters list.

5. Click on the network card you want to remove, and then click Remove.

   Repeat step 5 for each network card that you want to remove.

6. Click Close.

7. When prompted to restart your computer, click No.

8. Shut down your computer.

Install the network card in a new slot by following the instructions in " Installing Your Copper Gigabit Ethernet Card" on page 2-7, and then install the network drivers by following the instructions in " Installing the Driver Software" on page 4-1.

CHAPTER 5: WINDOWS 2000 DRIVER SOFTWARE

This chapter provides information about the Microsoft Windows 2000 driver software.

This chapter also describes how to:

- Install the driver software in the Windows 2000 environment

- Move the card to a different slot

- Remove the driver software

⊖ **Note:** The GA622T Copper Gigabit Ethernet card must be physically installed in your server or workstation prior to installing the driver software. See Chapter 2 "Hardware Installation" for details.

Installing the Driver Software

When the Windows 2000 system first boots up after installing a new hardware device, such as a GA622T Copper Gigabit Ethernet Card, the system automatically detects the new hardware and prompts you to install the driver software for the device.

A network driver must be installed before the GA622T Copper Gigabit Ethernet Card can be used with your Windows 2000 system. You must have Network Administrator privileges to install the driver software.

To install the card software for Windows 2000, perform the following procedure:

1. When you boot up the Windows 2000 system after installing the GA622T Copper Gigabit Ethernet Card, a series of Found New Hardware Wizard dialog boxes are displayed.
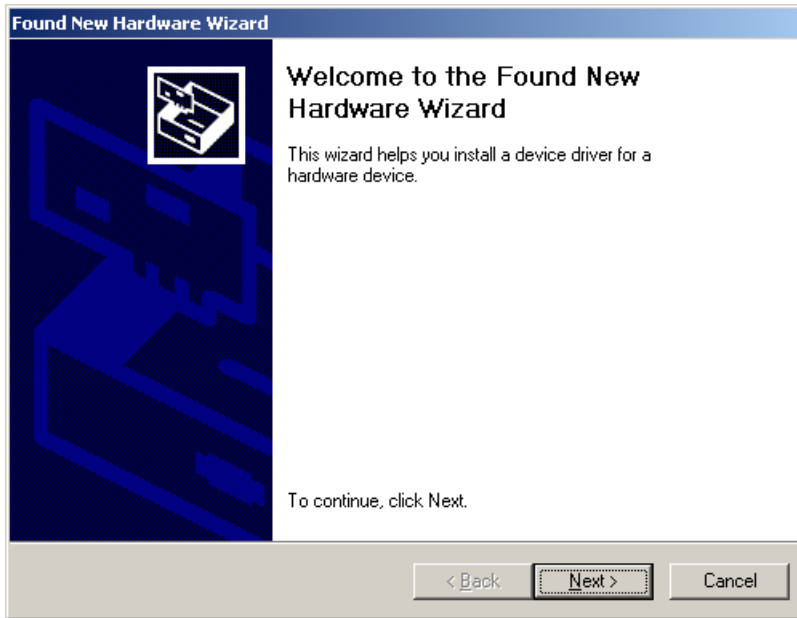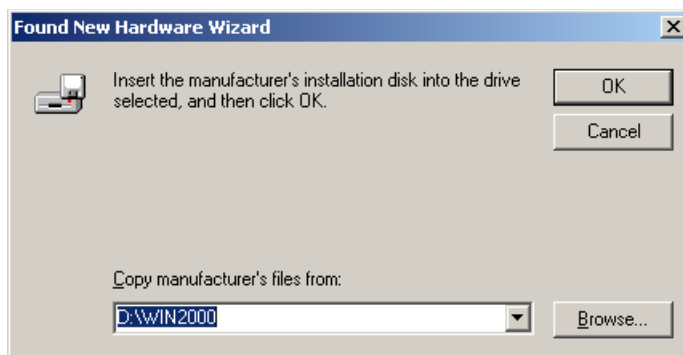
2. In the Install Hardware Device Drivers dialog box, click "Search for a suitable driver for my device (recommended)," and then click Next.
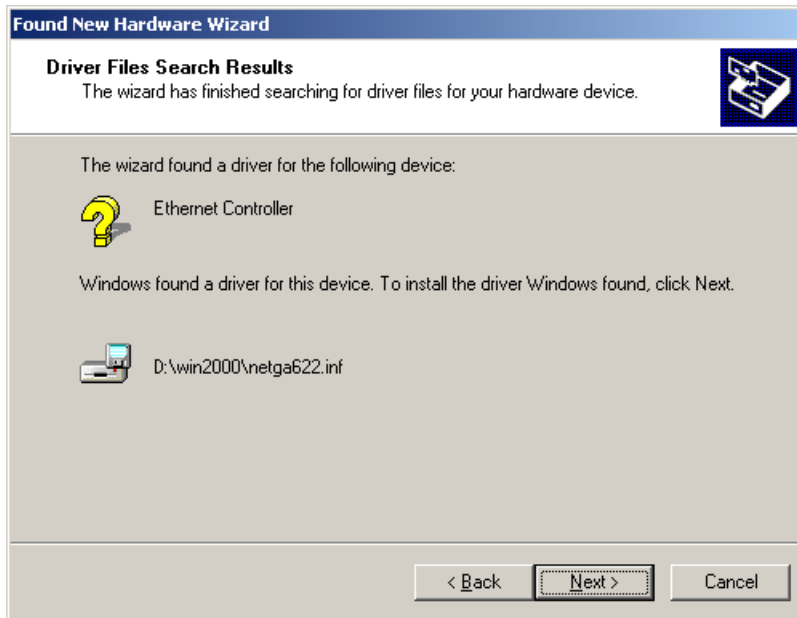
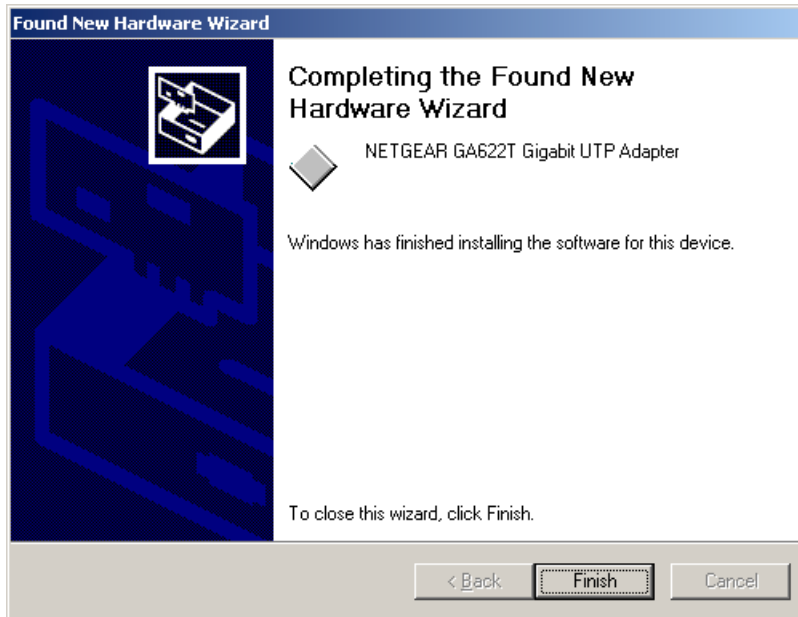3. In the Locate Driver Files dialog box, check the "Specify a location" box.
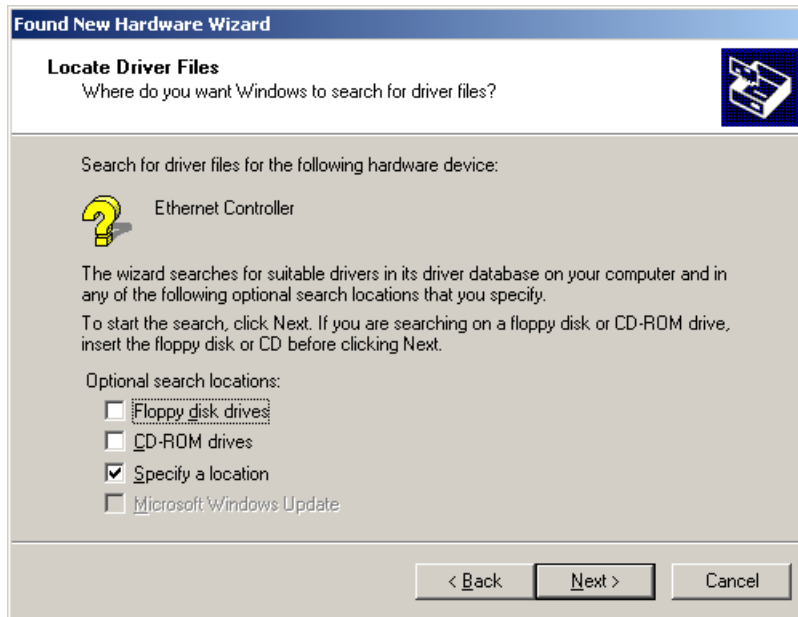
4. Insert the *GA622T Copper Gigabit Ethernet Card Driver and Documentation CD* into your CD-ROM drive and click OK.

5. In the Driver Files Search Results dialog box, verify that the correct path to the driver software is shown, and then click Next.

6. Click Finish to complete the installation.

Moving the Network Card to a Different Slot

Windows 2000 automatically detects the installation and removal of hardware.
To move a GA622T Copper Gigabit Ethernet Card to a different slot in the same
system, you need to do the following:

1. Shut down the system and remove the card from the PCI slot.

2. Install the card in its new PCI slot (see "Installing Your Gigabit Ethernet Card"
   on page 2-7).

3. When the system is powered on, reinstall the driver software (see "Installing the
   Driver Software" on page 5-1).

Removing the Driver Software

Under Windows 2000, the driver software is automatically uninstalled when its hardware is removed. To remove a card, do the following:

1. Shut down the system and remove the card from the PCI slot.

2. When the system is powered on, the driver will be automatically uninstalled.

CHAPTER 6: NETWARE DRIVER SOFTWARE ———

This chapter provides information about the Novell NetWare driver software.

This chapter also describes how to:

• Verify the NetWare pre-installation requirements

• Install the driver software in the NetWare environment

• Modify Driver properties during the driver software installation

Because network administrators can use more than one method to install device drivers on a NetWare server, this chapter does not provide detailed installation instructions for each method. Each method is briefly described in Table 6-1.

Table 6-1. NetWare Device Installation Methods

Method/Program	O/S support	Advantage	Drawback
AUTOEXEC.NCF	NetWare 5.0/5.1, NetWare 4.2	Quick, efficient	Text file interface requires you to accurately enter parameters, using correct syntax. Cannot be used for initial installation of NetWare 5.0 on a server.
nwconfig/install	NetWare 5.0/5.1, NetWare 4.2	Graphical user interface enables you to enter all card parameters	Doesn't allow you to modify parameters. To do so requires you to remove the driver software and re-install it on the server. If you are installing Netware 5.0 for the first time on the server, Netware uses the nwconfig program to install the card driver during the installation of the operating system.

⊖ **Note:** If you are installing NetWare 5.0 for the first time on the server, NetWare uses the nwconfig program to install the card driver during the installation of the operating system.

Pre-Installation Requirements

Before you can use the Gigabit Ethernet card in your NetWare system, you must install the network device driver.

First, make sure that the Gigabit Ethernet card is physically installed on your system. Typically, NetWare OS software must already be running on the server. Make sure that your server meets the hardware and operating system software requirements described in Table 2-1, which starts on page 2-2.

Install the NIC into a PCI slot of a NetWare server and note the slot number (slots are generally numbered top/front to bottom/back of the machine). You may need to know the slot number later, when you configure the driver.

Install the latest support pack files to ensure the GA622T Copper Gigabit Ethernet Card will correctly function. The Support pack or patch file(s) needed for the operating system running on your server are indicated in Table 6-2.

Table 6-2. NetWare Support Files

NetWare O/S	File Name	File(s) to Install
Version 5.0/5.1	Support Pack 4 (or the latest support pack)	NW5SP4.EXE (or latest file)
Version 4.2	Support Pack 8 (or the latest support pack)	NW4SP8A.EXE (or latest file)

Installing the Driver Software

To use the floppy drive to install the drivers, copy the Ga622.lan and Ga622.ldi files from the *GA622T Copper Gigabit Ethernet Adapter Driver and Document CD* onto a floppy disk.

Insert the *GA622T Copper Gigabit Ethernet Adapter Driver and Documentation CD* into the CD-ROM drive.

To install the NetWare driver software:

1. At the System Console, type:

   ```
   load nwconfig
   ```

   The NetWare Configuration Options dialog box opens.

2. Select the "Driver Options (load/unload disk and network drivers)" option.

   The Driver Options dialog box opens.

3. Select the "Configure network drivers" option.

   The Additional Driver Actions dialog box opens.

4. Select the "Load an additional driver" option.

   The Select a driver dialog box opens.

5. Press the Insert key to install an unlisted driver.

   An instruction window opens.

6. Press the F3 key to specify a different path.

   The Specify a directory path dialog box opens.

7. Make sure the *GA622T Copper Gigabit Ethernet Adapter Driver and Documentation CD* is inserted in the CD-ROM drive and type in the path to the driver directory on the CD. (For example, if your CD-ROM's drive letter is "D", you would type the following:

   ```
   D:\Netware\
   ```

   The Scanning for available drivers window appears for a short period of time, and then the "Select a driver to install" dialog box opens with "GA622.LAN NETGEAR GA622T Gigabit UTP Adapter" selected.

8. Press the Enter key to select the listed driver.

9. At the "Do you want to copy driver GA622.LAN?" prompt, select Yes.

    The "Board GA622_1 (Driver GA622) Actions" dialog box opens.

10. Select the "Save parameters and load driver" option.

    The Network number to bind dialog box opens.

11. Press Enter to accept random network number or Esc to not accept binding.

    The system examines the network for net number conflicts.

12. The system will prompt you for the network number to bind the adapter card for various frame types. Repeat this step until the system has prompted you for all four frame types.

    After examining the net number conflicts, the "Do you want to select an additional Network driver?" dialog box opens.

13. Specify whether you have an additional adapter to install.

    The Selected Network Drivers windows opens with message "GA622 (currently loaded)."

The GA622T software driver installation is complete.

⊖ **Note:** The AUTOEXEC.NCF is automatically modified after the above process is complete. Whenever the system is restarted in the future, the GA622T drivers are automatically loaded.

Modifying Driver Properties

⊖ **Note:** The driver properties can be modified only during the driver software installation. If you want to modify these properties after the driver has already installed, you must first remove the driver, and then reinstall it.

1. Repeat steps 1–9 from the above procedure.

2. In the Board GA622_1 (Driver GA622) Actions dialog box, click Select/Modify driver parameters and protocols.

3. Use the Tab and Arrow keys to move the cursor to GA622T_1 Parameters dialog box, where you can change driver parameters. Refer to Table 6-3 for help in configuring these parameters.

Table 6-3. Parameter Descriptions

Parameter	Descriptions
Slot Number	Supported values: any decimal number with a maximum length of 8 figures.
	Select the slot number that corresponds to the expansion slot where the board is installed.
	Caution: If this parameter is not correctly supplied and there is more than one card installed in the server, the installation program may crash the system.
Node Address	Supported values: any hexadecimal number (digits 0 to F allowed) with a maximum length of 12 figures.
	DO NOT change this address unless you are prepared to administer local addresses according to IEEE 802.2 specifications. The driver defaults to the node address on the board (whether factory-set or manually set).
Receive Buffer Count	Supported values: 50–150. Default value: 150
	This is the number of receive descriptors to use.
Transmit Buffer Count	Supported values: 50–150. Default value: 150
	This is the number of transmit descriptors to use.

Table 6-3. Parameter Descriptions (continued)

Parameter	Descriptions
Duplex Option	Full or half duplex option.
CheckSum Off-load	Allows you to enable/disable hardware CheckSum.
Line Speed Option	Force line speed to 100/1000 Mbps.
Driver Version	This information field displays the version of the driver software. This field cannot be edited.

Installation Troubleshooting

If you are installing multiple cards, sometimes the second instance of the driver may fail to load due to memory shortage. If this happens, edit the following line in the C:\nwserver'\startup.ncf file as follows:

```
SET MAXIMUM PHYSICAL RECEIVE PACKET SIZE=1500 (or more)
```

CHAPTER 7: LINUX DRIVER SOFTWARE

This chapter provides information about the Red Hat Linux 6.1 or Red Hat Linux 6.2 driver software.

This chapter also describes:

- The files included with the driver

- Installing the driver software in the Linux environment

- Testing the driver

- Configurable parameters

File Listing

The following files are included in the /Linux directory:

Table 7-1. Linux files

File Name	Description
ga.c	Linux network OS specific module file
ga622t.h	Driver header file
gam.o	Driver object module for 2.2.17 kernel
hsm.c	Hardware specific module file
hsm.h	Hardware specific module header file
nsm.h	HSM related data structures
nsmtypes.h	Definition type define
sp.c	Tunable parameters
Makefile	Rules to compile and install the driver

Installing the Driver Software

Your Copper Gigabit Ethernet Card must be physically installed in the server before installing the software driver. If you are installing more than one Copper Gigabit Ethernet Card, you must perform the following procedure for each card.

This version of the driver requires a base Red Hat Linux 6.1 or Red Hat Linux 6.2 with Linux kernel version 2.2.12, basic utilities, and the C development system.

To install the driver software:

1. Login as root, insert the floppy disk with the GA622T driver, and mount the disk into the system with the following command:

    ```
    # mount -t msdos /dev/fd0 /mnt
    ```

2. Copy the files from floppy into an appropriate directory.

    ```
    # mkdir ga622t

    # cd ga622t

    # cp /mnt/linux/* .
    ```

3. To create a new driver object module and install the current driver object module in the file system, run the following command:

    ```
    # make gam.o

    # cp gam.o /lib/modules/2.2.12-20/net
    ```

⊖ **Note:** You may need to enter a different pathname than what is shown on the last line, above, depending on the Linux kernel version number you have. To find out the exact version number of the Linux kernel, use this command:

    ```
    ls -al /lib/modules
    ```

4. Add the following lines to any of the startup scripts like `/etc/rc.d/rc.local` or `/etc/rc.d/init.d/network` so that the driver will load when the system boots up:

```
# /sbin/insmod /lib/modules/2.2.12-20/net/gam.o

# /sbin/ifconfig <interface-name> <ip-addr>
```

⊖ **Note:** You may need to enter a different pathname than what is shown on the first line, above, depending on the Linux kernel version number you have. To find out the exact version number of the Linux kernel, use this command:

```
ls -al /lib/modules
```

You can dynamically load and unload the driver from a running kernel with the following commands:

```
# insmod gam.o

# rmmod gam.o
```

Testing the Driver Software

To install and test the driver, shut down the network stack, install the driver, and re-start the stack again with these commands:

```
# sh /etc/rc.d/init.d/network stop

# insmod gam.o

# sh /etc/rc.d/init.d/network start
```

When the driver is loaded into the system with the `insmod` command, the driver probes the PCI bus to locate all GA622T devices, and creates control structures for each. The driver logs a couple of messages available in the `/var/log/messages` file for each device with information about its PCI geographic location, IRQ, IO address, and some basic debug information (addresses of some important structures).

All the devices on the PCI bus can be listed by running the following command:

```
# cat /proc/pci
```

IRQ and IO address information from this can be correlated with the information displayed by the driver in the `/var/log/messages` file.

When the TCP/IP stack is initialized, it opens all configured Ethernet devices, and initializes them for use. At this time, the driver will perform auto-negotiation and log information about the link status. You can then test the driver by running utilities like ping, telnet, ftp, and NFS.

Configurable Parameters

The tunable parameters of the driver (for example, the Receive and Transmit buffers) are put in the file nsm.h under the "Tunable parameters" heading. The default value of RX_QUEUE_SZ is 100; on a high-end system, you may want to adjust that value to 200 for better performance.

To try jumbo frames, increase the mtu size using the ifconfig utility:

```
# ifconfig <interface-name> mtu <mtu-size>
```

For example:

```
ifconfig eth0 mtu 3000
```

The BUF_SIZE_MAX value in nsm.h (located in the "Tunable parameters" section) should be changed to 4096.

You can increase the <mtu-size> value up to 4000 bytes for the same operation.

CHAPTER 8: TROUBLESHOOTING

This chapter provides troubleshooting information for the NETGEAR GA622T Copper Gigabit Ethernet Card.

Checking the Port LEDs

GA622T Copper Gigabit Ethernet Card

The front panel of the GA622T has three LEDs: one for each port speed option (100 Mbps and 1000Mbps) to indicate which link is active, and one LED for data transfer status (see Figure 2-1 on page 2-5).

Before the port LEDs can provide troubleshooting information, the card must be connected to the network (see Chapter 2), and the network drivers for your particular operating system must be installed (see Chapter 3 through Chapter 7).

1. Verify that the card driver software has been installed and that the card is connected to a network.

2. Verify that the card status LEDs operate as described in the Table 8-1.

Table 8-1. GA622T (100/1000BASE-T) Port LED Activity

LED	State	Description
Data	Blinking	Brief bursts of data detected on the port.
	On	Streams of data detected on the port.
	Off	No data detected on the port.
100	On	Good 100 Mbps Fast Ethernet link.
	Off	No 100 Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch.
1000	On	Good Gigabit Ethernet link.
	Off	No 1000 Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch.

Using a Troubleshooting Checklist

If you need to test the network card further, check the following items:

- Inspect all cables and connections. Check the length and rating of the cable. Make sure that the cable segment is compliant with the requirements shown in Table 2-3 on page 2-8.

- Connect the network card to a different network port and run the tests again. If successful, the original network port may be defective or improperly configured.

- Check the network card installation by reviewing Chapter 2, " Hardware Installation." Make sure that the network card is properly seated in a PCI slot.

- Check for specific hardware problems, such as broken traces or loose/broken solder connections.

- Check the configuration settings and change them if they are in conflict with another device.

- Make sure that your system is using the latest BIOS.

Check the PCI BIOS parameters for proper configuration of the slot where the card is installed. Table 8-2 shows several possible PCI BIOS parameters. (These parameters may not all be available on every system.)

Table 8-2. PCI BIOS Parameters

Parameter	Setting
Bus-Master	Enabled.
Interrupt number	Set to any IRQ that does not conflict with another device.
Latency timer	Recommended range is between 20 and 255. This parameter is typically set to 64.

- Try inserting the network card in another slot. If the new position works, the original slot in your system may be defective.

- Replace the failed network card with one that is known to work properly. If the second card works in the slot where the first one failed, the original card is probably defective.

- Install the network card in another functioning system and run the tests again. If the card passed the tests in the new system, the original system may be defective.

- Remove all other network cards from the system and run the tests again. If the card passes the tests, the other cards might be causing conflict.

APPENDIX A: SPECIFICATIONS

This appendix provides specifications for the NETGEAR GA622T Copper Gigabit Ethernet Card.

Cable Specifications GA622T (100/1000BASE-T)

Port Type	Connector	Media	Maximum Distance
100/1000BASE-T	RJ-45	CAT 5 UTP/CAT 5e UTP	325 feet (100 meters)

⊖ **Note:** 1000BASE-T signaling requires four twisted pairs of Category 5 balanced cabling, as specified in ISO/IEC 11801:1995 and ANSI/EIA/TIA-568-A (1995) and tested for additional performance using testing procedures defined in TIA/EIA TSB95.

Technical Specifications

General Specifications	NETGEAR GA622T Copper Gigabit Ethernet Card
Standards Compatibility	IEEE 802.3ab Gigabit Ethernet IEEE 802.3u Fast Ethernet IEEE 802.3u Auto Negotiation IEEE 802.3x Flow Control
GA622T Network Connection	RJ-45 connector for Category 5 UTP cable Full-duplex 2000 Mbps (1000 Mbps each way) Gigabit Ethernet
Host Connection	Single slot, short form factor, PCI card with 32-bit connectors Single slot, long form factor, PCI card with 64-bit connectors PCI rev 2.2 compliant Clock speed up to 66 MHz
DC Operating Voltage	+5V +/- 5%
Power Consumption	14 watts, maximum 2.8A @ + 5VDC

General Specifications	NETGEAR GA622T Copper Gigabit Ethernet Card
Dimensions	6.6 x 3.7 in. (16.8 x 9.5 cm)
Weight	3.8 oz. (104 g)
Operating Temperature	0 to 40ºC
Operating Humidity	10 to 90% noncondensing
Agency Compliance	CE mark, commercial VCCI, Class 2 FCC, Part 15, Class B EN 55 022 (CISPR 22), Class B Canada ICES-003, Class B

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