# Sun GigabitEthernet/P 2.0 Adapter Installation and User's Guide

THE NETWORK IS THE COMPUTER™

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# Preface

*Sun™ GigabitEthernet/P™ 2.0 Adapter Installation and User's Guide* provides installation instructions for the Sun™ GigabitEthernet/P adapter. This manual also describes how to configure the driver software.

These instructions are designed for a system administrator with networking experience.

## Using UNIX Commands

This document may not contain information on basic UNIX® commands and procedures such as shutting down the system, booting the system, and configuring devices.

See one or more of the following for this information:

- *Solaris Handbook for Sun Peripherals*
- AnswerBook™ online documentation for the Solaris™ 2.7 software environment
- Other software documentation that you received with your system

# Typographic Conventions

**TABLE P-1** Typographic Conventions

| Typeface or Symbol | Meaning | Examples |
|---|---|---|
| `AaBbCc123` | The names of commands, files, and directories; on-screen computer output. | Edit your `.login` file.<br>Use `ls -a` to list all files.<br>`% You have mail.` |
| **`AaBbCc123`** | What you type, when contrasted with on-screen computer output. | `% su`<br>`Password:` |
| *AaBbCc123* | Book titles, new words or terms, words to be emphasized. Command-line variable; replace with a real name or value. | Read Chapter 6 in the *User's Guide.*<br>These are called *class* options.<br>You *must* be `root` to do this.<br>To delete a file, type `rm` *filename.* |

# Shell Prompts

**TABLE P-2** Shell Prompts

| Shell | Prompt |
|---|---|
| C shell | *machine_name*% |
| C shell superuser | *machine_name*# |
| Bourne shell and Korn shell | $ |
| Bourne shell and Korn shell superuser | # |

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CHAPTER 1

# Product Overview

The Sun GigabitEthernet adapter incorporates a new technology that transfers data at a rate of one gigabit per second—10 times the rate of a FastEthernet adapter. The Sun GigabitEthernet adapter targets the increased congestion experienced at the backbone and server levels by today's networks, while providing a future upgrade path for high-end workstations that require more bandwidth than FastEthernet can provide.

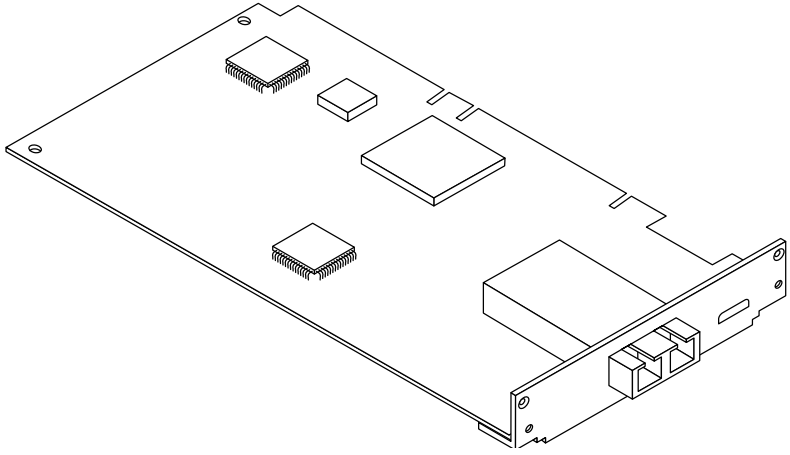

**FIGURE 1-1** Sun GigabitEthernet/P 2.0 Adapter

# Hardware and Software Requirements

Before using the Sun GigabitEthernet adapter, make sure your system meets the following hardware and software requirements:

To determine your operating environment or system architecture, use the `uname -a` command. See the manpage `uname(1)` for more information.

| Hardware and Software | Requirements |
|---|---|
| Hardware | Sun Ultra™ 5, 10, 30, 60, 250, 450[1] Sun Enterprise™ 3000, 4000, 5000, or 6500, or the Sun Ultra Enterprise™ 3x00, 4x00, 5x00, 6x00, or 10000 system with PCI I/O card. |
| OpenBoot™ PROM | Revision 3.x |
| Software | Solaris 2.5.1 Hardware: 11/97 and 2.6, and Solaris 2.7 releases |

1. The Sun GigabitEthernet/P adapter will not fit into the #9 or #10 slots of the Sun Ultra 450 because it requires a long connector socket.

## Known Incompatibilities

You may experience interoperability issues when using the Sun GigabitEthernet adapter with SunSwitch™, Alteon ACE 110 Switch, or other pre- or non- IEEE 802.3z standard compliant network equipment. If you experience difficulties, set auto-negotiation to `off` and try to manually configure through the command line.

## ▼ To Set Auto-Negotiation on Pre- or Non-Compliant Equipment

If your network equipment does not support auto-negotiation you can set auto-negotiation to `off` on the `ge` device.

1. **Select the following parameters**: `adv_1000fdx_cap`, `adv_1000hdx_cap`, `adv_pauseTX` **and** `adv_pauseRX`, **and set those values according to the user's manual that shipped with your switch. See page 18 for parameter values.**
2. **Set** `adv_1000autoneg_cap` **to** `0`.

### ▼ To Set Auto-Negotiation to `off` on a SunSwitch or Alteon ACE 110 Switch

- **Set the auto-negotiation parameter to `off` on the switch and the `ge` adapter. Refer to the user's manual, that shipped with your switch, for further switch configuration instructions. The following example is from a SunSwitch.**

```
>> Main# cfg
>> Configuration# port
Enter port number: 9

[Port 9 Menu]
.
.
>> Port 9# auto
Current Port 9 autonegotiation: on
Enter new value ["on"/"off"]:    off
>> Port 9# apply
>> Port 9# save
```

# Features

## PCI

- Fully compliant with IEEE 802.3z
- Full- and Half-duplex gigabit ethernet interface
- Standard Ethernet frame size (1518 bytes)
- Dual DMA channels
- Reduced interrupt load on system
- Hardware assists in generating TCP checksum
- Supports Full Flow Control
- Duplex SC fiber connector (850 nm, SX)
- 33/66-MHz, 32- or 64-bit bus master
- Universal dual voltage signaling (3.3V and 5V)
- PCI Local Bus Rev 2.1 compliant (6.8-inch x 4.2-inch short card)
- Single 1000Base-SX (GbE) port
- Developed by Sun Microsystems

## Key Protocols and Interfaces

The Sun GigabitEthernet adapter is interoperable with existing Ethernet equipment assuming standard Ethernet minimum and maximum frame size (64 to 1518 bytes), frame format, and compliance with the following standards and protocols:

- Logical Link Control (IEEE 802.2)
- SNMP (limited MIB)
- Ethernet (IEEE 802.3)
- Media Access Control (IEEE 802.3u)
- Flow control (IEEE 802.3x)

## Diagnostic Support

- User executable `selftest` using OpenBoot PROM
- SunVTS™ diagnostic tool

CHAPTER 2

# Installing the Adapter

This chapter describes how to install a Sun GigabitEthernet adapter in your system and how to verify that it has been installed correctly. If you have a Sun Enterprise 6x00,5x00, 4x00, or 3x00 system that supports Dynamic Reconfiguration (DR), see “Installing the Adapter (with DR)” on page 10.

**Note –** Refer to the Sun Enterprise 6x00 / 5x00 / 4x00 / 3x00 Dynamic Reconfiguration User’s Guide for further information.

## Installing the Adapter (without DR)

**Note –** Refer to your system installation or service manual for detailed instructions for the following tasks.

1. **Halt and power off your system.**
2. **Open the system unit.**
3. **Attach the adhesive copper strip of the wrist strap to the metal casing of the power supply. Wrap the other end twice around your wrist, with the adhesive side against your skin.**
4. **Holding the PCI adapter by the edges, unpack and place it on an antistatic surface.**
5. **Remove the PCI filler panel from the slot in which you want to insert the PCI adapter.**

6. **Holding the PCI adapter by the edges, align the adapter edge connector with the PCI slot. Slide the adapter face plate into the small slot at the end of the PCI opening.**

7. **Applying even pressure at both corners of the adapter, push the PCI adapter until it is firmly seated in the slot.**

**Caution –** Do not use excessive force when installing the adapter into the PCI slot. You may damage the adapter's PCI connector. If the adapter does not seat properly when you apply even pressure, remove the adapter and carefully reinstall it again.

8. **Detach the wrist strap and close the system unit.**

9. **Connect fiber optic cables (850nm, SC) to the PCI adapter and to a fiber optic Ethernet network.**

# Verifying the Installation

After you have installed the Sun GigabitEthernet adapter, but *before* you boot your system, perform the following tasks to verify the installation. Refer to the *Solaris Handbook for Sun Peripherals* manual or your Solaris documentation for the detailed instructions.

**Note –** Verification is not required if your system supports Dynamic Reconfiguration (DR).

1. **Power on the system, and when the banner appears, press Stop-A to interrupt the boot process and to get to the ok prompt.**

2. **List the network devices on your system.**

```
ok show-nets
```

The `show-nets` command lists the system devices. You should see the full path name of the `network` device, similar to the example below:

```
a) /pci@1f,0/pci@1/network@3
b) /pci@1f,0/pci@1,1/network@1,1
q) NO SELECTION
Enter Selection, q to quit:
```

---

**Note –** If you do not see the device listed, check that the adapter is properly seated and, if necessary, reinstall the adapter.

---

3. **View the device that you installed.**

   Using the previous example, type:

```
cd /pci@1f,0/pci@1/network@3
```

4. **View the `.properties` file for a list of device properties.**

   It may be difficult to tell if the devices on your network are GigabitEthernet devices or other network interface cards. The `.properties` file shows specific information about which card is installed.

To make sure that the device you just installed is connected to the network, type:

```
ok .properties
mac-address              08 00 20 8e 7b 56
assigned-addresses       82021810 00000000 00200000 00000000
00009060
local-mac-address        08 00 20 06 00 02
shared-pins              serdes
board-rev                00 00 00 06
model                    SUNW,pci-gem
has-fcode
version                  1.7
device_type              network
address-bits             00 00 00 30
max-frame-size           00 00 40 00
reg                   00021800 00000000 00000000 00000000 00000000
                      02021810 00000000 00000000 00000000 00009060
gem-rev                  00 00 00 01
compatible            70 63 69 31 30 38 65 2c 32 62 61 64 00 70 63 69
name                     network
fcode-rom-offset         00000000
66mhz-capable
fast-back-to-back
devsel-speed             00000002
class-code               00020000
interrupts               00000001
max-latency              00000040
min-grant                00000040
subsystem-id             00000001
revision-id              00000001
device-id                00002bad
vendor-id                0000108e
```

**Note –** If you are going to set the `local-mac-address` property, note the `local-mac-address` of your device at this time.

## Setting the `local-mac-address` Property

**Note –** Setting the `local-mac-address` property is only required if you will be booting from the network.

The network interface of the Sun GigabitEthernet adapter has been assigned a unique MAC (Media Access Control) address, which represents the 48-bit Ethernet address for that interface. The OpenBoot firmware reports this MAC address via the `local-mac-address` property in the device nodes corresponding to the network interface.

A system is not obligated to use this assigned MAC address if it has a systemwide MAC address. In such cases, the system-wide MAC address applies to all network interfaces on the system.

The device driver, or any other adapter utility, can use the network device's MAC address (`local-mac-address`) while configuring it. In the Solaris 2.7 operating environment, you will be able to use the MAC address when booting over the network.

The `mac-address` property of the network device specifies the network address (system-wide or `local-mac-address`) used for booting the system. To start using the MAC address assigned to the network interface of the Sun GigabitEthernet adapter, set the NVRAM configuration variable `local-mac-address?` to `true`.

```
ok setenv local-mac-address? true
```

# Examining Network Activity

After you have verified the installation of the Sun GigabitEthernet adapter, but *before* booting the system, examine the network interfaces with the OpenBoot PROM `watch-net-all` command.

Make sure that the interface is connected to an active network.

- **Examine network activity and incoming network packets by typing `watch-net-all` at the `ok` prompt.**

  The `watch-net-all` command monitors network traffic on all network interfaces in the system. In the example below, the `watch-net-all` command tests the adapter's interface.

```
ok watch-net-all
/pci@1f,0/pci@1/network@3
Internal loopback test -- succeeded.
Link is  -- up
Looking for Ethernet Packets.
'.' is a Good Packet.  'X' is a Bad Packet.
Type any key to stop.
.................................. (Press any key to continue.)
```

  In addition to testing the adapter's interface, the `watch-net-all` command may also test other network devices on the system.

# Installing the Adapter (with DR)

If you have a Sun Enterprise 6x00,5x00, 4x00, or 3x00 system that supports Dynamic Reconfiguration (DR), you do not have to reboot your system. The process of adding and configuring an adapter with DR involves (1) connecting the attachment point and (2) configuring its occupant. In most cases, the `cfgadm(1M)` command can perform both steps at once.

## ▼ To Install an Adapter

1. **Verify that the selected board slot is ready for the adapter.**

```
# cfgadm
```

   The states and conditions should be:

   - Receptacle state—Empty
   - Occupant state—Unconfigured
   - Condition—Unknown

   or

- Receptacle state—Disconnected
- Occupant state—Unconfigured
- Condition—Unknown

2. **If the status of the slot is not “empty” or “disconnected”, enter:**

```
# cfgadm -c disconnect sysctrl#:slot#
```

3. **Physically insert the adapter into the slot and look for an acknowledgement on the console, such as, “***name* `board inserted into slot3`**.”**

   After an I/O board is inserted, the states and conditions should become:

   - Receptacle state—Disconnected
   - Occupant state—Unconfigured
   - Condition—Unknown

   Any other states or conditions should be considered an error.

4. **Connect any peripheral cables and interface modules to the adapter.**

5. **Configure the board with the command:**

```
# cfgadm -v -c configure sysctrl#:slot#
```

   This command should both connect and configure the receptacle. Verify with the `cfgadm` command.

   The states and conditions for a connected and configured attachment point should be:

   - Receptacle state—Connected
   - Occupant state—Configured
   - Condition—OK

   Now the system is also aware of the usable devices which reside on the adapter and all devices may be mounted or configured to be used.

   If the command fails to connect and configure the adapter and slot (the status should be shown as “configured” and “ok”), do the connection and configuration as separate steps:

   a. **Connect the adapter and slot by entering:**

```
# cfgadm -v -c connect sysctrl#:slot#
```

   The states and conditions for a connected attachment point should be:

- Receptacle state—Connected
- Occupant state—Unconfigured
- Condition—OK

  Now the system is aware of the adapter, but not the usable devices which reside on the adapter. Temperature is monitored and power and cooling affect the attachment point condition.

**b. Configure the adapter and slot by entering:**

```
# cfgadm -v -c configure sysctrl#:slot#
```

The states and conditions for a configured attachment point should be:

- Receptacle state—Connected
- Occupant state—Configured
- Condition—OK

Now the system is also aware of the usable devices which reside on the adapter and all devices may be mounted or configured to be used.

**6. Reconfigure the devices on the adapter by entering:**

```
# drvconfig; devlinks; disks; ports; tapes;
```

The console should display a list of devices and their addresses.

CHAPTER 3

# Configuring Driver Parameters

This chapter describes how to configure the driver parameters used by the Sun GigabitEthernet adapter.

## Installing the Driver Software

After installing the GigabitEthernet adapter, you must install the software driver package from the Sun GigabitEthernet adapter CD-ROM. Install the software driver packages as described in the CD insert.

## Configuring the GigabitEthernet Device Driver Parameters

The `ge` device driver controls the Sun GigabitEthernet adapter devices. The Sun GigabitEthernet device is identified as `SUNW,pci-gem` node. The `ge` driver is attached to the device with the *compatible* property `SUNW,pci-gem` for the Sun GigabitEthernet/P adapter. You can manually configure the `ge` device driver parameters to customize each Sun GigabitEthernet adapter device in your system. This appendix provides an overview of the capabilities of the GigabitEthernet ASIC used in the adapters, lists the available `ge` device driver parameters, and describes how you can configure these parameters.

# GigabitEthernet MAC

The GigabitEthernet MAC (GEM) provides 1000BASE-SX networking interfaces. The driver automatically sets the link speed to 1000 Mbps and conforms to the IEEE 802.3z Ethernet standard. The GEM PCI ASIC provides the PCI interface, Media Access Control (MAC) functions, and Physical Code Sublayer (PCS) functions. The External SERDES, which connects the 1000BASE-SX Compliant SC connector to the ASIC, provides the physical layer functions.

The GEM MAC and PCS are capable of all the operating speeds and modes listed in the section, “Auto-Negotiation Mode” on page 23. The PCS performs auto-negotiation with the remote end of the link (link partner) to select a common mode of operation.

The PCS also supports a forced mode of operation. You can select the speed and mode by creating a `ge.conf` file.

# Driver Parameter Values and Definitions

This section describes the parameters and settings for the `ge` device driver. TABLE 3-1 lists these parameters.

**TABLE 3-1** `ge` Driver Parameter, Status, and Descriptions

| Parameter | Status | Description |
|---|---|---|
| `link_status` | Read only | Defines the current status |
| `link_speed` | Read only | Defines the current status |
| `link_mode` | Read only | Defines the current status |
| `ipg1` | Read and write | Inter-packet gap parameter |
| `ipg2` | Read and write | Inter-packet gap parameter |
| `instance` | Read and write | Device instance |
| `lance_mode` | Read and write | Enable additional delay before transmitting a packet |
| `ipg0` | Read and write | Additional delay before transmitting a packet |
| `adv_1000autoneg_cap` | Read and write | Operational mode parameter |

**TABLE 3-1** ge Driver Parameter, Status, and Descriptions *(Continued)*

| Parameter | Status | Description |
|---|---|---|
| adv_1000fdx_cap | Read and write | Operational mode parameter |
| adv_1000hdx_cap | Read and write | Operational mode parameter |
| adv_pauseTX | Read and write | Operational mode parameter |
| adv_pauseRX | Read and write | Operational mode parameter |
| 1000autoneg_cap | Read only | PCS auto negotiation capability |
| 1000fdx_cap | Read only | PCS Full Duplex capability |
| 1000hdx_cap | Read only | PCS Half Duplex capability |
| asm_dir_cap | Read only | PCS ASM_DIR capability |
| pause_cap | Read only | PCS Symmetric PAUSE capability |
| lp_1000autoneg_cap | Read only | Link partner auto negotiation capability |
| lp_1000fdx_cap | Read only | Link partner capability |
| lp_1000hdx_cap | Read only | Link partner capability |
| lp_asm_dir_cap | Read only | Link partner capability |
| lp_pause_cap | Read only | Link partner capability |

# Defining the Current Status

The read-only parameters described in TABLE 3-2 explain the operational mode of the interface. These parameters define the current status.

**TABLE 3-2** Read-Only Parameters Defining the Current Status

| Parameter | Values | Description |
|---|---|---|
| link_status | | Current link status |
| | 0 | = Link down |
| | 1 | = Link up |
| link_speed | | Valid only if the link is up |
| | 0 | = Link is not up |
| | 1 | = 1000 Mbps |
| link_mode | | Valid only if the link is up |
| | 0 | = Half duplex |
| | 1 | = Full duplex |

# Flow Control Parameters

The GEM ASIC is capable of sourcing (transmitting) and terminating (receiving) pause frames conforming to IEEE 802.3x Frame Based Link Level Flow Control Protocol. In response to received flow control frames, the GEM can slow down its transmit rate. On the other hand, GEM is capable of sourcing flow control frames, requesting the link partner to slow down, provided that the link partner supports this feature. By default, GEM advertises Receive PAUSE capability, during auto negotiation.

**TABLE 3-3** Read-Write Flow Control Parameters Values and Descriptions

| Parameter | Values (on/off) | Description |
|---|---|---|
| adv_pauseTX | 0, 1 | Transmit PAUSE Capable (default: not capable) |
| adv_pauseRX | 0, 1 | Receive Pause Capable (default: capable) |

For normal operations, GEM doesn't need to source flow control frames. However, if GEM is operating on a slow bus (for instance, 33 MHz PCI bus slot), and there is a lot of frame reception activity, there could be a performance degradation due to Receive FIFO overflow. If the link partner is capable of terminating PAUSE flow control frames, the performance of GEM could be improved by enabling adv_pauseTX and restarting auto-negotiation.

# Inter-Packet Gap Parameters

The GEM ASIC supports the programmable Inter-Packet Gap (IPG) parameters `ipg1` and `ipg2`. The total IPG is the sum of `ipg1` and `ipg2`. The total IPG is 0.096 microseconds for the link speed of 1000 Mbps.

TABLE 3-4 lists the default values and allowable values for the inter-packet gap (IPG) parameters, `ipg1` and `ipg2`.

**TABLE 3-4** Read-Write Inter-Packet Gap Parameter Values and Descriptions

| Parameter | Values (Byte-time) | Description |
|---|---|---|
| `ipg1` | 0, 255 | `ipg1` = 8 (default at initialization) |
| `ipg2` | 0, 255 | `ipg2` = 4 (default at initialization) |

By default, the driver sets `ipg1` to 8-byte time and `ipg2` to 4-byte time, which are the standard values. (Byte time is the time it takes to transmit one byte on the link, with a link speed of 1000 Mbps.)

If your network has systems that use longer IPG (the sum of `ipg1` and `ipg2`) and if those machines seem to be slow in accessing the network, increase the values of `ipg1` and `ipg2` to match the longer IPGs of other machines.

# Defining an Additional Delay Before Transmitting a Packet Using `lance_mode` and `ipg0`

The GEM ASIC supports a programmable mode called `lance_mode`. The `ipg0` parameter is associated with `lance_mode`.

After a packet is received with `lance_mode` enabled (default) an additional delay is added by setting the `ipg0` parameter before transmitting the packet. This delay, set by the `ipg0` parameter, is in addition to the delay set by the `ipg1` and `ipg2` parameters. The additional delay set by `ipg0` helps to reduce collisions. Systems that have `lance_mode` enabled might not have enough time on the network.

If `lance_mode` is disabled, the value of `ipg0` is ignored and no additional delay is set. Only the delays set by `ipg1` and `ipg2` are used. Disable `lance_mode` if other systems keep sending a large number of back-to-back packets.

You can add the additional delay by setting the `ipg0` parameter from 0 to 31, which is the media byte time delay.

TABLE 3-5 defines the `lance_mode` and `ipg0` parameters.

**TABLE 3-5** Parameters Defining `lance_mode` and `ipg0`

| Parameter | Values | Description |
|---|---|---|
| `lance_mode` | 0<br>1 | `lance_mode` disabled<br>`lance_mode` enabled (default) |
| `ipg0` | 0-31 | Additional IPG before transmitting a packet (after receiving a packet) |

# Operational Mode Parameters

TABLE 3-6 describes the operational mode parameters and their default values.

**TABLE 3-6** Operational Mode Parameters

| Parameter | Values | Description |
|---|---|---|
| `adv_1000autoneg_cap` | | Local PCS capability advertised by the hardware |
| | 0 | = Forced mode |
| | 1 | = Auto-negotiation (default) |
| `adv_1000fdx_cap` | | Local PCS capability advertised by the hardware; |
| | 0 | = Not 1000Mbit/sec full-duplex capable |
| | 1 | = 100Mbit/sec full-duplex capable (default) |
| `adv_1000hdx_cap` | | Local PCS capability advertised by the hardware; |
| | 0 | = Not 1000Mbit/sec half-duplex capable |
| | 1 | = 1000Mbit/sec half-duplex capable (default) |
| `adv_pauseTX` | | Local PCS capability advertised by the hardware; |
| | 0 | = Not Pause TX capable (default) |
| | 1 | = Pause TX capable |
| `adv_pauseRX` | | Local PCS capability advertised by the hardware; |
| | 0 | = Not Pause RX capable |
| | 1 | = Pause RX capable (default) |

# Reporting Local PCS Capabilities

TABLE 3-7 describes the read-only PCS capabilities. These parameters define the capabilities of the hardware. The GEM PCS supports all of the following capabilities.

**TABLE 3-7** Read-Only PCS Capabilities

| Parameter | Values | Description (Local PCS Capabilities) |
|---|---|---|
| `1000autoneg_cap` | 0 | = Not capable of auto-negotiation |
| | 1 | = Auto negotiation capable |
| `1000fdx_cap` | | Local PCS Full Duplex Capability |
| | 0 | = Not 1000Mbit/sec full-duplex capable |
| | 1 | = 1000Mbit/sec full-duplex capable |
| `1000hdx_cap` | | Local PCS Half Duplex Capability |
| | 0 | = Not 1000Mbit/sec half-duplex capable |
| | 1 | = 1000Mbit/sec half-duplex capable |
| `asm_dir_cap` | | Local PCS Flow Control Capability |
| | 0 | = Not Asymmetric Pause capable |
| | 1 | = Asymmetric Pause (from Local Device) capable |
| `pause_cap` | | Local PCS Flow Control capability |
| | 0 | = Not Symmetric Pause capable |
| | 1 | = Symmetric Pause capable |

# Reporting the Link Partner Capabilities

TABLE 3-8 describes the read-only link partner capabilities.

**TABLE 3-8** Read-Only Link Partner Capabilities

| Parameter | Values | Description |
|---|---|---|
| `lp_1000autoneg_cap` | 0 | = No auto-negotiation |
| | 1 | = Auto-negotiation |
| `lp_1000fdx_cap` | 0 | = No 1000Mbit/sec full-duplex transmission |
| | 1 | = 1000Mbit/sec full-duplex |
| `lp_1000hdx_cap` | 0 | = No 1000Mbit/sec half-duplex transmission |
| | 1 | = 1000Mbit/sec half-duplex |
| `lp_asm_dir_cap` | 0 | = Not Asymmetric Pause capable |
| | 1 | = Asymmetric Pause towards link partner capability |
| `lp_pause_cap` | 0 | = Not Symmetric Pause capable |
| | 1 | = Symmetric Pause Capable |

If the link partner is not capable of auto-negotiation (when `lp_1000autoneg_cap` is 0) the remaining information described in TABLE 3-8 is not relevant and the parameter value = 0.

If the link partner is capable of auto-negotiation (when `lp_autoneg_cap` is 1) then the speed and mode information is displayed when you use auto-negotiation and get the link partner capabilities.

# Setting ge Driver Parameters

You can set the `ge` device driver parameters in two ways (`ndd` and `ge.conf`), depending on your needs. To set parameters that are valid until you reboot the system, use the `ndd` utility. Using `ndd` is a good way to test parameter settings.

To set parameters so they remain in effect after you reboot the system create a `/kernel/drv/ge.conf` file and add parameter values to this file when you need to set a particular parameter for a device in the system.

## Setting Parameters Using the ndd Utility

Use the `ndd` utility to configure parameters that are valid until you reboot the system. The `ndd` utility supports any networking driver, which implements the Data Link Provider Interface (DLPI).

The following sections describe how you can use the `ge` driver and the `ndd` utility to modify (with the `-set` option) or display (without the `-set` option) the parameters for each `ge` device.

### Identifying Device Instances

Before you use the `ndd` utility to get or set a parameter for a `ge` device, you must specify the device instance for the utility.

## ▼ To Specify the Device Instance for the ndd Utility

1. **Check the** `/etc/path_to_inst` **file to identify the instance associated with a particular device.**

```
# grep ge /etc/path_to_inst
"/pci@4,4000/network@4" 2 "ge"
"/pci@6,2000/network@1" 1 "ge"
"/pci@4,2000/network@1" 0 "ge"
```

   In the example above, the three GigabitEthernet instances are from the adapters installed in perspective PCI slots.

2. **Use the instance number to select the device.**

```
# ndd -set /dev/ge instance instance#
```

   The device remains selected until you change the selection.

### Non-Interactive and Interactive Modes

You can use the ndd utility in two modes:

- Non-interactive
- Interactive

In non-interactive mode, you invoke the utility to execute a specific command. Once the command is executed, you exit the utility. In interactive mode, you can use the utility to get or set more than one parameter value. (Refer to the ndd (1M) man page for more information.)

#### *Using the* ndd *Utility in Non-Interactive Mode*

This section describes how to modify and to display parameter values.

- **To modify a parameter value, use the `-set` option.**

  If you invoke the `ndd` utility with the `-set` option, the utility passes *value*, which must be specified down to the named `/dev/ge` driver instance, and assigns it to the parameter:

```
# ndd -set /dev/ge parameter value
```

- **To display the value of a parameter, specify the parameter name (and omit the value).**

  When you omit the `-set` option, a query operation is assumed and the utility queries the named driver instance, retrieves the value associated with the specified parameter, and prints it:

```
# ndd /dev/ge parameter
```

### *Using the* `ndd` *Utility in Interactive Mode*

- **To modify a parameter value in interactive mode, specify `ndd /dev/ge`, as shown below.**

  The `ndd` utility then prompts you for the name of the parameter:

```
# ndd /dev/ge
name to get/set? (Enter the parameter name or ? to view all
parameters)
```

  After entering the parameter name, the `ndd` utility prompts you for the parameter value (see TABLE 3-1 through TABLE 3-8).

- **To list all the parameters supported by the** `ge` **driver, type** `ndd /dev/ge \?`**.**
  (See TABLE 3-1 through TABLE 3-8 for parameter descriptions.)

```
# ndd /dev/ge \?
?                               (read only)
link_status                     (read only)
link_speed                      (read only)
link_mode                       (read only)
ipg1                            (read and write)
ipg2                            (read and write)
instance                        (read and write)
lance_mode                      (read and write)
ipg0                            (read and write)
adv_1000autoneg_cap             (read and write)
adv_1000fdx_cap                 (read and write)
adv_1000hdx_cap                 (read and write)
adv_pauseTX                     (read and write)
adv_pauseRX                     (read and write)
1000autoneg_cap                 (read only)
1000fdx_cap                     (read only)
1000hdx_cap                     (read only)
asm_dir_cap                     (read only)
pause_cap                       (read only)
lp_1000autoneg_cap              (read only)
lp_1000fdx_cap                  (read only)
lp_1000hdx_cap                  (read only)
lp_asm_dir_cap                  (read only)
lp_pause_cap                    (read only)
#
```

## Auto-Negotiation Mode

By default, auto-negotiation is set to `on`. This means that the adapter will communicate with its link partner to determine a compatible network speed, duplex mode, and flow control capability.

## Forced Mode

If your network equipment does not support auto-negotiation, or if you want to specify your network speed, you can set auto-negotiation to `off` on the `ge` device.

### ▼ To Set Forced Mode

1. **Select the following parameters**: `adv_1000fdx_cap`, `adv_1000hdx_cap`, `adv_pauseTX` **and** `adv_pauseRX`, **and set those values according to the user's manual that shipped with your link partner device (i.e., switch). See** TABLE 3-6 **for parameter values.**
2. **Set** `adv_1000autoneg_cap` **to** `0`.

## Setting Parameters Using the `ge.conf` File

You can also specify the properties described in the section, on a per-device basis by creating a `ge.conf` file in the `/kernel/drv` directory. Use a `ge.conf` file when you need to set a particular parameter for a device in the system. The parameters you set are read and write parameters that are listed in "Driver Parameter Values and Definitions" on page 14.

The man pages for `prtconf` (1M) and `driver.conf` (4) include additional details. The next section shows an example of setting parameters in a `ge.conf` file.

### Setting Driver Parameters Using a `ge.conf` File

- **Obtain the hardware path names for the** `ge` **devices in the device tree.**

  Typically the path names and the associated instance numbers will be present in the `/etc/path_to_inst` file.

```
# grep ge /etc/path_to_inst
"/pci@4,4000/network@4" 2 "ge"
"/pci@6,2000/network@1" 1 "ge"
"/pci@4,2000/network@1" 0 "ge"
```

  - In the above lines:
    - The first part within the double quotes specifies the hardware node name in the device tree.
    - The second number is the instance number.
    - The last part in double quotes is the driver name.
  - In the device path name, the last component after the last `/` character and before the `@` character is the device name.
  - The path name before the last component is the parent name.
  - The comma separated numbers after the `@` character at the end represent the device and function numbers, which are together referred to as unit-address.

To identify a PCI device unambiguously in the `ge.conf` file, use the name, parent name, and the unit-address for the device. Refer to the `pci`(4) man page for more information about the PCI device specification.

In the first line of the previous example:

- Name = pci108e,2bad
- Parent = `/pci@4,4000`
- Unit-address = `4`

In the second line in the previous example:

- Name = pci108e,2bad
- Parent = `/pci@6,2000`
- Unit-address = `1`

In the third line in the previous example:

- Name = pci108e,2bad
- Parent = `/pci@4,2000`
- Unit-address = `1`

1. **Set the `ipg1` and `ipg2` parameters for the above devices in the `kernel/drv/ge.conf` file.**

```
name="pci108e,2bad" parent="/pci@4,4000" unit-address="4" ipg1=20
ipg2=10;
name="pci108e,2bad" parent="/pci@6,2000" unit-address="1" ipg1=20
ipg2=10;
name="pci108e,2bad" parent="/pci@4,2000" unit-address="1" ipg1=20
ipg2=10;
```

2. **Save the `ge.conf` file.**
3. **Save and close all files and programs, and exit the windowing system.**
4. **Halt and reboot the system by typing the `init 6` command at the superuser prompt.**

CHAPTER 4

# Network Configuration

This chapter describes how to configure the driver software after it has been installed on your system. To install the software, follow the installation instructions in the CD-Insert.

## Configuring the Host Files

After installing the Sun GigabitEthernet adapter driver software, you must create a `hostname.ge`<*num*> file for the adapter's Ethernet interface. You must also create both an IP address and a host name for its Ethernet interface in the `/etc/hosts` file.

1. **At the command line, use the `grep` command to search the `/etc/path_to_inst` file for `ge` interfaces.**

```
# grep ge /etc/path_to_inst
"/pci@1f,4000/network@1" 0 "ge"
```

In the example above, the device instance is from a Sun GigabitEthernet/P adapter installed in slot 1. For clarity, the instance number is bold.

2. **Create an `/etc/hostname.ge`<*num*> file, where** <*num*> **corresponds to the instance number of the `ge` interface you plan to use.**

If you wanted to use the adapter's `ge` interface in the Step 1 example, you would need to create a `/etc/hostname.ge0` file, where `0` is the number of the `ge` interface. If the instance number were *1*, the filename would be `/etc/hostname.ge1`.

- Do not create an `/etc/hostname.ge`<*num*> file for a Sun GigabitEthernet adapter interface you plan to leave unused.

- The `/etc/hostname.ge<num>` file must contain the hostname for the appropriate `ge` interface.
- The host name should have an IP address and should be entered in the `/etc/hosts` file.
- The host name should be different from any other host name of any other interface, for example: `/etc/hostname.ge0` and `/etc/hostname.ge1` cannot share the same host name.

The following example shows the `/etc/hostname.ge<num>` file required for a system called `zardoz` that has a Sun GigabitEthernet adapter (`zardoz-11`).

```
# cat /etc/hostname.ge0
zardoz
# cat /etc/hostname.ge1
zardoz-11
```

3. **Create an appropriate entry in the /etc/hosts file for each active `ge` interface.**

   For example:

```
# cat /etc/hosts
#
# Internet host table
#
127.0.0.1     localhost
129.144.10.57 zardoz    loghost
129.144.11.83 zardoz-11
```

4. **If your system does not support Dynamic Reconfiguration, then reboot.**

# Setting Up a Diskless Client

This chapter describes how to set up a server so that you can boot and run diskless clients across a GigabitEthernet network.

### ▼ To Set Up a Diskless Client on a Server

1. **Determine the client's root directory that you want to install the GigabitEthernet driver on.**

   For the following example, the root directory is

```
# /export/root/<client_name>
```

2. **Use** `pkgadd` **to install the GigabitEthernet driver in the root partition of the diskless client on the server, where** *x* **is 5.1+ for Solaris 2.5.1+, 6 for Solaris 2.6, or 7 for Solaris 2.7.**

```
# pkgadd -R /export/root/<client_name> –d  \
/cdrom/sun_gigabitethernet_2_0/Sol_2.x
```

3. **Set up the** `/export/root/<client_name>/hostname.ge<num>` **file. See "Configuring the Host Files" on page 27.**

4. **Set up the** `/export/root/<client_name>/hosts` **file. See "Configuring the Host Files" on page 27.**

# Performing a Net-Install of the Solaris Environment Over the ge Interface

This section is only applicable if you are installing the Solaris operating environment, over the network, using the GigabitEthernet (ge) interface.

---

**Note –** The Solaris CD-ROM cannot be used to perform a net-install since it is a read-only medium. Therefore, the Solaris CD image archive is required so you can update certain software files.

---

1. **Determine the root directory of the system that will be net-installed.**

   For example, if the Solaris software is located within a directory named DIR and the system being net-installed is already configured, then find the root directory with the `/etc/bootparams` file.

```
# grep <client_name> /etc/bootparams
```

   If the system being net-installed is not already configured, refer to the Solaris documentation that shipped with your system for configuration instructions.

2. **Install the appropriate OS driver support in the client's root directory.**

   For example, if you are adding the `ge` driver to the Solaris 2.5.1+ net-install client's root directory, type:

```
# pkgadd -R /DIR/export/exec/kvm/sparc.Solaris_2.5.1+ -d \
/cdrom/sun_gigabitethernet_2_0/Sol_2.x
```

   For example, if you are adding the `ge` driver to the Solaris 2.6 or 2.7 net-install client's root directory, type (where x is 6 for Solaris 2.6 or 7 for Solaris 2.7):

```
# pkgadd -R /DIR/Sol_2.x/etc/Tools/Boot -d \
/cdrom/sun_gigabitethernet_2_0/Sol_2.x
```

3. **At the `ok` prompt type:**

```
ok show-nets
```

   The `show-nets` command lists the system devices. You should see the full path name of the `network` device, similar to the example below:

```
a) /pci@1f,0/pci@1/network@3
b) /pci@1f,0/pci@1,1/network@1,1
q) NO SELECTION
Enter Selection, q to quit:
```

4. **At the `ok` prompt type `boot` *full path name of the* `network` *device.***

   In this example, you would type:

```
ok boot /pci@1f,0/pci@1/network@3
```

5. **Proceed with the OS installation, according to the instructions provided with your Solaris CD-ROM.**

APPENDIX **A**

# Specifications

## Performance Specifications

| Feature | Specification |
|---|---|
| PCI clock | 33/66 MHz max |
| PCI data burst transfer rate | up to 64-byte bursts |
| PCI data/address width | 32/64 -bit |
| PCI modes | Master/slave |
| 1 GBit/s, 850 nm | 1000 Mbps (full duplex) |

## Physical Characteristics

| Dimension | Measurement |
|---|---|
| Length | 6.8 inches |
| Width | 4.2 inches |

# Power Requirements

| Specification | Measurement |
|---|---|
| Maximum power consumption | 10 watts |
| Voltage | 3.3V and 5V |

APPENDIX **B**

# Sun GigabitEthernet Adapter Connectors

FIGURE B-1 shows the connector for the Sun GigabitEthernet/P adapter.

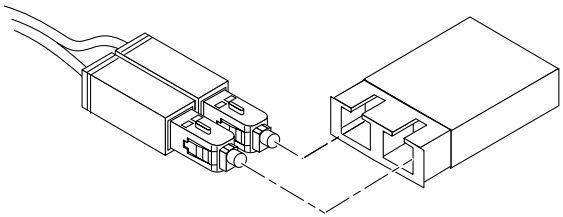

**FIGURE B-1** Connector for the Sun GigabitEthernet/P Adapter

TABLE B-1 lists the characteristics of the SC Connector (850 nm).

**TABLE B-1** SC Connector Link Characteristics (IEEE P802.3z)

| Description | 62.5 Micron MMF | 50 Micron MMF |
|---|---|---|
| Operating range | Up to 260 meters | Up to 550 meters |

APPENDIX **C**

# Diagnostic Software

## SunVTS Diagnostic Software

This appendix contains an overview of the SunVTS diagnostic tool/application.

The SunVTS software executes multiple diagnostic hardware tests from a single user interface and is used to verify configuration and functionality of most hardware controllers and devices. SunVTS operates primarily from a graphical user interface, enabling test parameters to be set quickly and easily while a diagnostic test operation is being performed.

The `nettest` diagnostic checks all the networking interfaces on a system, including the Sun GigabitEthernet adapter.

To use the `nettest` diagnostic, you must have the SunVTS software installed on your system.

---

**Note –** You must have Classical IP up and running on an interface for the `nettest` diagnostic test to work.

---

Refer to the SunVTS User's Guide for more information on how to run the `nettest` diagnostic test.

The SunVTS documents are listed in TABLE C-1. Refer to them for detailed information about SunVTS. These documents are available on the Solaris on Sun Hardware AnswerBook. The Solaris on Sun Hardware AnswerBook is provided on the SMCC Updates CD for the Solaris release on your system.

**TABLE C-1** SunVTS Documentation

| Title | Description |
|---|---|
| SunVTS User's Guide | Describes the SunVTS environment; starting and controlling various user interfaces |
| *SunVTS Test Reference Manual* | Describes each SunVTS test; provides various test options and command-line arguments |
| SunVTS Quick Reference Card | Provides overview of vtsui interface features |

The main features of the SunVTS environment include:

- SunVTS kernel

The SunVTS kernel (vtsk) diagnostic tool controls all testing and operates in the OpenWindows background. When activated, vtsk probes the hardware configuration of the system tested and responds to vtsui. vtsk coordinates execution of individual tests and manages the messages sent by these tests.

- SunVTS user interface

The SunVTS user interface (vtsui) diagnostic tool operates in the OpenWindows background. Upon activation, vtsui provides vtsk control, various user options, tests, and read-log files.

- SunVTS TTY

The Sun VTS TTY (vtstty)diagnostic tool controls the vtsk from either a command shell or a terminal attached to a serial port. Most options available in

vtstty have equivalent options in vtsui. vtstty is applicable to server configurations only.

# Using the SunVTS `gemtest` Diagnostic

The `gemtest` diagnostic provides functional coverage of the Sun GigabitEthernet adapter. The `gemtest` diagnostic runs in loopback (external/internal) mode and must be selected mutually exclusive of the `nettest` diagnostic. Use the `gemtest` diagnostic for the most efficient fault isolation detection.

To run the `gemtest` diagnostic, you must have a loopback connector, a Sun GigabitEthernet adapter, and the `ge` device driver. Network configuration is not required.

For the purpose of this test, a packet is defined as an Ethernet header followed by the Ethernet data payload (refer to IEEE 802.3z). The test generates and sends out the desired number of packets (a tunable parameter) and expects to receive the same number of packets through the loopback interface, external or internal. If an error occurs (for example, packet mismatch or timeout), an error message indicating the type of error, its probable cause(s), and recommended action(s) is displayed on the SunVTS console.

The test data is generated by a random number generator, and put into a data buffer. Each packet sent is selected from a different starting point in the data buffer, so that two consecutively transmitted packets will never be the same.

---

**Note –** Do NOT run `nettest` and `gemtest` at the same time.

---

---

**Note –** To run `gemtest`, you must have a loopback connector connected to the Sun GigabitEthernet adapter. `gemtest` cannot run if the network interface is connected to a live network, however the link must be up. A loopback connector provides the network interface driver the necessary link for testing, while maintaining isolation from a live network. The loopback connector is required for both the internal and external tests.

---

## `gemtest` Test Modes

The `gemtest` can only be executed in Functional test mode. It is assumed that the host is not connected to the network through the intended test device(s).

## gemtest Options

**TABLE C-2** gemtest Options

| gemtest **Options** | **Description** |
|---|---|
| Configuration | Specifies the Port Address, Host ID and Domain Name of the system under test. |
| Total Packets | Specifies the total number of the packets to send. The default number of packet is 1000. |
| Packet size | Determines the size (in bytes) of the packets to be transmitted. 60 <= packet size <= 1514. The default packet size is 1000 bytes. |
| Loopback | Determines the external and internal loopback mode. The default setting is internal loopback mode. |
| Print_Warning | Enables or disables the printing of warning messages. The default setting is Disable. |
| Processor Affinity | Binds the test to a specific processor. If no processor is specified, the test migrates between processors. This option is only available on multiprocessor systems. |

## gemtest Command Line Syntax

**/opt/SUNWvts/bin/gemtest** *standard_arguments*
**-o dev=***device*,**tpkts=***n*,**pksz=***pkt_size*,**lb=***Internal*
,**warn=***Disable*

**TABLE C-3** gemtest Command Line Syntax

| **Argument** | **Explanation** |
|---|---|
| **dev=***device_name* | Specifies the device to test such as ge0 |
| **tpkts=***n* | [1..100000], count of packets to loopback |
| **pksz=***pkt_size* | [60 ... 1514], packet size in bytes |
| **lb=***Internal* | select internal (or external) loopback mode |
| **warn=***Disable* | enable or disable printing of warning messages |

**Note –** 64-bit tests are located in the sparcv9 subdirectory: /opt/SUNWvts/bin/sparcv9/*testname*. If a test is not present in this directory, then it may only be available as a 32-bit test.

## gemtest Error Messages

If an error occurs during the gemtest diagnostic, one or more of the following messages will be displayed. Probable causes and recommended actions are also displayed, when available.

**TABLE C-4** gemtest Error Messages

| | Error Message | Probable Cause(s) | Recommended Action |
|---|---|---|---|
| 6000 | Timed out for receiving pkt *number* | Card and/or driver not configured properly. | Configure driver or reseat card. Check loopback connector. If the problem persists, contact your authorized Sun service Provider. |
| 6001 | system error | System may have run out of memory. | Reduce the number of processes currently running or increase system memory. |
| 6002 | Data mismatch between transmitted and received pkt data | Link loss,<br>CRC error,<br>Alignment Error. | If the frequency of errors is large, replace the card and/or contact your authorized Sun service Provider. |
| 8000 | *errmsg* for device | Card not present | Check for card. |
| 8001 | Memory allocation failure | System ran out of memory. | Reduce the number of processes currently running. Increase system memory. |
| 8002 | No card found | No card found. | Install card. |
| 8003 | Failed to get the link up | Loopback connector not connected. | Faulty loopback connector. Check it an replace it if necessary. If problem persists, contact your authorized Sun service Provider |
| 8004 | Transmit failed *error* | STREAMS was unable to accept more data, perhaps due to insufficient STREAMS memory resources. | Reduce the system load. |
| 8005 | Receive failed, error for pkt *number* | | Try again, if the problem persists, then it is a system error. Contact your authorized Sun service provider. |
| 8006 | DLPI error for device *string* | Wrong Instance<br>number X specified in geX | Specify<br>correct instance number. |

# Using the OpenBoot PROM FCode Selftest

The following tests are available to help identify problems with the Sun GigabitEthernet adapter if the system does not boot.

You can invoke the FCode `selftest` diagnostics by using the OpenBoot user interface `test` or `test-all` commands. If you encounter an error while running diagnostics, appropriate messages will be displayed. Refer to the appropriate *OpenBoot Command Reference Manual* for more information on the `test` and `test-all` commands.

`selftest` exercises most functionality sub-section by sub-section and ensures the following:

- Connectivity during adapter card installation
- Verification that all components required for a system boot are functional

## ▼ Running the Ethernet FCode Selftest Diagnostic

To run the Ethernet diagnostics, you must first bring the system to a stop at the OpenBoot prompt after issuing a reset. If you do not reset the system, the diagnostic tests may cause the system to hang.

For more information about the OpenBoot commands in this section, refer to the appropriate *OpenBoot Command Reference* manual.

1. **Shut down the system.**

   Use the standard shutdown procedures described in *Solaris Handbook for Sun Peripherals*.

2. **At the `ok` prompt, set the `auto-boot?` configuration variable to false.**

```
ok setenv auto-boot? false
```

3. **Reset the system.**

   Refer to the appropriate *OpenBoot Command Reference* manual for more information.

4. **Type** `show-nets` **to display the list of devices.**

   You should see a list of devices, similar to the example below, specific to the Sun GigabitEthernet/P adapter:

```
show-nets
a) /pci@1f,0/pci@1/network@3
b) /pci@1f,0/pci@1,1/network@1,1
q) NO SELECTION
Enter Selection, q to quit:
```

5. **Type the following to run the selftest using the** `test` **command:**

```
ok test <device path>
```

   The following tests are run when the `test` command is executed:

   - `gme` registers test
   - serdes internal loopback test
   - link up/down test

   If the `test` passes, you will see these messages:

```
ok test /pci@1f,0/pci@1/network@3
gme register test --- succeeded.
Internal loopback test -- succeeded.
Link is  -- up
```

   If the card is not connected to a network, you will see the following messages:

```
ok test /pci@1f,0/pci@1/network@3
gme register test --- succeeded.
Internal loopback test -- succeeded.
Link is  -- down
ok
```

6. **After testing the adapter, type the following to return the OpenBoot PROM to standard operating mode:**

```
ok setenv diag-switch? false
```

7. **Set the** `auto-boot?` **configuration parameter to true.**

```
ok setenv auto-boot? true
```

8. **Reset and reboot the system.**

   Refer to the appropriate *OpenBoot Command Reference* manual for more information.

APPENDIX **D**

# Regulatory Compliance Statement

Your Sun product is marked to indicate its compliance class:

- Federal Communications Commission (FCC) — USA
- Department of Communications (DOC) — Canada
- Voluntary Control Council for Interference (VCCI) — Japan

Please read the appropriate section that corresponds to the marking on your Sun product before attempting to install the product.

## FCC Class B Notice

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/television technician for help.

*Shielded Cables:* Connections between the workstation and peripherals must be made using shielded cables in order to maintain compliance with FCC radio frequency emission limits. Networking connections can be made using unshielded twisted pair (UTP) cables.

*Modifications:* Any modifications made to this device that are not approved by Sun Microsystems, Inc. may void the authority granted to the user by the FCC to operate this equipment.

## DOC Class B Notice - Avis DOC, Classe B

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

## 第二種VCCI基準について

第二種VCCIの表示  があるワークステーションおよびオプション製品は、第二種情報装置です。これらの製品には、下記の項目が該当します。

この装置は、第二種情報装置(住宅地域または住宅地域に隣接した地域において使用されるべき情報装置)で住宅地域での電波障害防止を目的とした情報処理装置等電波障害自主規制協議会(VCCI)基準に適合しております。しかし、本製品を、ラジオ、テレビジョン受信機に近接してご使用になりますと、受信障害の原因となることがあります。

取り扱い説明書に従って正しくお取り扱いください。

# Declaration of Conformity

Compliance ID: GEM PCI

Product Name: SunGigabitEthernet PCIadaptor

This product has been tested and complies with:

## EMC

### USA—FCC Class B

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, including interference that may cause undesired operation.

### European Union—EC

This device complies with the following requirements of the EMC Directive 89/336/EEC:

| | | |
|---|---|---|
| EN55022 / CISPR22 (1985) | | Class B |
| EN50082-1 | IEC801-2 (1991) | 4 kV (Direct), 8 kV (Air) |
| | IEC801-3 (1984) | 3 V/m |
| | IEC801-4 (1988) | 1.0 kV Power Lines,<br>0.5 kV Signal Lines |
| EN61000-3-2/IEC1000-3-2(1994) | | Pass |

## Safety

This equipment complies with the following requirements of the Low Voltage Directive 73/23/EEC:

EC Type Examination Certificates:

- EN60950/IEC950 (1993)

## Supplementary Information

This product was tested and complies with all the requirements for the CE Mark when connected to a Sun workstation or server.

| | |
|---|---|
| / S / | / S / |
| Dennis P. Symanski DATE | John Shades DATE |
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