SunFastEthernet™ Adapter 2.0 Installation and User's Guide

The Network Is the Computer™

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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.

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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 A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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.

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.

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

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

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This Class B digital apparatus meets all of requirements 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.

VCCI基準について

第一種VCCI基準について

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Contents

Preface

This manual describes how to install and use your SBus card.

The procedures in this manual assume that you are a system or network administrator experienced in installing similar hardware and familiar with Solaris administration.

UNIX Commands

This document may not include specific software commands or procedures. Instead, it may name software tasks and refer you to operating system documentation or the handbook that was shipped with your new hardware.

The type of information that you might need to use references for includes:

- Shutting down the system
- Booting the system
- Configuring devices
- Other basic software procedures

See one or more of the following:

- *Solaris 2.x Handbook for SMCC Peripherals* contains Solaris™ 2.x software commands.
- On-line AnswerBook™ for the complete set of documentation supporting the Solaris 2.x software environment.
- Other software documentation that you received with your system.

Typographic Conventions

The following table describes the typographic changes used in this book.

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

Shell Prompts

The following table shows the default system prompt and superuser prompt for the C shell, Bourne shell, and Korn shell.

Shell	Prompt
C shell	`machine_name%`
C shell superuser	`machine_name#`
Bourne shell and Korn shell	`$`
Bourne shell and Korn shell superuser	`#`

Related Documents

The following documents contain topics that relate to the information in the *SunFastEthernet Adapter 2.0 Installation and User's Guide.*

Title	Part Number
Your system installation or service manual	
Solaris 2.x Handbook for SMCC Peripherals	801-5488
SMCC Open Issues Supplement Solaris 2.x	
Solaris 2.x on Sun Hardware AnswerBook	
SunVTS 2.0 User's Guide	802-5331
Platform Notes: The hme Fast Ethernet Device Driver	802-5333

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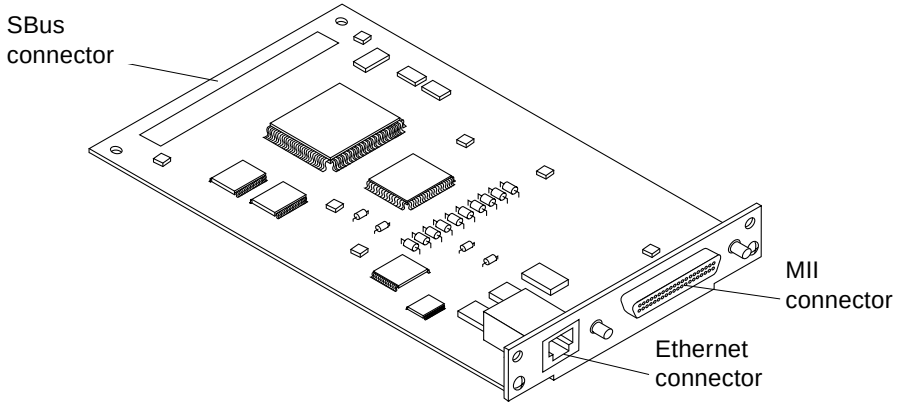
Preparing for Installation 1

The SunFastEthernet™ Adapter is an SBus card that operates at either 10 or 100 Mbps, with both an RJ-45 and an MII connector.



1.1 Features

This SBus card offers the following features:

- Switchable 10BASE-T/100BASE-TX Ethernet. Automatically sets 10/100 Mbps speed. Conforms to IEEE 802.3u Ethernet standard.
- MII complies with IEEE 802.3u standard. Connects to TX, T4, FX, AUI and all supporting transceivers. Rate of 2.5 MHz for 10 Mbps and 25 MHz for 100 Mbps.
- SBus interface to host system. Complies with IEEE 1496 SBus specification.

1.2 Requirements for Using the Adapter

Before installing the adapter, make sure your system meets the following hardware and software requirements:

Supported Operating Environments	Solaris 2.3, 2.4 and 2.5 or later Solaris releases Solaris 1.1.1 and 1.1.2 (SunOS™ versions 4.1.3_U1 and 4.1.4)
Supported Systems	**Solaris 2.3 and 2.4** SPARCstation™ 5*, SPARCstation 10, SPARCstation 20, SPARCstation LX, SPARCclassic™, SPARCserver™ 1000/1000E, SPARCcenter™ 2000/2000E, SPARCserver 6x0MP **Solaris 2.5** Sun™ Ultra™ systems, SPARCstation 5*, SPARCstation 10, SPARCstation 20, SPARCstation LX, SPARCclassic, SPARCserver 1000/1000E, SPARCcenter 2000/2000E, SPARCserver 6x0MP **Solaris 1.1.1 and 1.1.2** SPARCstation 5*, SPARCstation 10, SPARCstation 20, SPARCstation LX, SPARCclassic, SPARCserver 6x0MP
OpenBoot™ PROM (OBP)	Release 2.26 or later for SPARCserver 1000/1000E and SPARCcenter 2000/2000E systems (see section 1.2.1) Release 2.10 version 3 or later for SPARCserver 6x0MP Release 2.9 or later for all other supported systems
External Transceivers	Sun MII-AUI transceiver: order number X467A. IEEE 802.3u compliant third-party transceivers that support speeds of 10 or 100 Mbps and allow connection to fiber and Category 3, 4 and 5 UTP cable, depending on the type of MII transceiver.

*Two SBus adapters maximum.

Note – The information above is the most up-to-date as of the printing of this manual. Visit Sun on the World Wide Web at `http://www.sun.com` for more information.

1.2.1 OpenBoot PROM Release 2.26 Required

Your system OpenBoot PROM must be release 2.26 or later if you are installing the SunFastEthernet Adapter in SPARCserver 1000/1000E or SPARCcenter 2000/2000E systems. Release 2.26 is required on all installed system boards.

If *any* installed system board PROM is earlier than 2.26, you must replace its PROM before installing the SunFastEthernet Adapter in your system.

Note – If your OpenBoot PROM is not 2.26 or later, attempting to reboot the system with the `reboot` , `sync` ➤ `sync` ➤ `halt` and `init 0` commands will cause a system reset and the following error will occur.

```
OA>. TEST FAILED - System Reconfiguration .........
OA>Swap to SBI Interrupt Status register caused trap
```

Determine the OpenBoot PROM Release of Your System Master Board

- **Use the `.version` command to check your system OpenBoot PROM release:**

```
ok .version
Release 2.26 Version 1203 created 96/04/19 09:44:48
ok
```

- **Contact your local service provider for an upgrade kit if your SPARCserver 1000/1000E or SPARCcenter 2000/2000E OpenBoot PROM release is earlier than 2.26.**

MII

The MII (Media Independent Interface) on the SunFastEthernet Adapter allows connection to external Fast Ethernet transceivers, thereby allowing compatibility with different wiring types. By default, the driver selects the MII connection. See the table on page 1-2 for compatibility standards.

Prior to proceeding, you should decide which network connection to use — either the SunFastEthernet Adapter RJ-45 or the MII, *but not both*. See Chapter 3, Section 3.6.6, “External Transceivers” or your external transceiver documentation for more detailed information.

Installing the Adapter 2

This chapter tells you how to install the adapter in your system and verify that the adapter is correctly installed.

2.1 Performing the Installation

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

1. **Power off your system, using the standard shutdown procedures described in** *Solaris 2.x Handbook for SMCC Peripherals***.**
2. **If you are replacing an SBus card with the SunFastEthernet Adapter, remove the old card now.**
3. **Install the SunFastEthernet Adapter in the selected SBus slot.**
4. **Connect the Ethernet cable to the SunFastEthernet Adapter and to the hub.**

Note – Make sure you have an Ethernet cable for each interface.

5. **Connect the MII device to the SunFastEthernet Adapter.**
6. **Connect the external transceiver to its appropriate hub.**

2.2 Verifying the Installation

After the SunFastEthernet Adapter is installed, *and before booting the system*, verify installation by performing the following tasks. Refer to the *Solaris 2.x Handbook for SMCC Peripherals* manual or your Solaris documentation for the detailed instructions.

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

2. **Use the** `show-devs` **command to list the system devices.**
   You should see a line (similar to the one in the example below) in the display, specific to the SunFastEthernet Adapter:

```
ok show-devs
...
/iommu@f,e0000000/sbus@f,e0000000/SUNW,hme@0,8c00000
...
```

- `SUNW,hme@0` identifies the adapter's Ethernet device.

Note – In the above example, the number `0` following `hme@` corresponds to the SBus slot in which the SunFastEthernet Adapter resides.

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

Diagnostics Testing

- For SunFastEthernet Adapter diagnostics testing on systems running Solaris 2.3 and 2.4, see Appendix A, "Running Diagnostics for Solaris 2.3 and 2.4."
- For SunFastEthernet Adapter diagnostics testing on systems running Solaris 2.5 and SunOS versions 4.1.3_U1 and 4.1.4, refer to the *SunVTS 2.0 User's Guide* (part number: 802-5331).

2.3 *Watching Network Activity*

Make sure that you are connected to an active network.

♦ **You can watch network activity or incoming network packets by typing** `watch-net-all`:

```
ok watch-net-all
/iommu@f,e0000000/sbus@f,e0001000/SUNW,hme@3,8c00000
Internal loopback test -- succeeded.
Transceiver check -- Using Onboard Transceiver - Link Up.
passed
Using Onboard Transceiver - Link Up.
Looking for Ethernet Packets.
'.' is a Good Packet. 'X' is a Bad Packet.
Type any key to stop.
..........
```

Note – The network speed is the same as the speed of the hub to which your system is connected. See Chapter 3, Section 3.6, “Post-Installation Procedures (Optional)” for more detailed information on speed selection.

Where to Proceed

- See Chapter 3, “Installing SunFastEthernet Adapter 2.1 Software On Solaris 2.x Systems” if your system is running Solaris 2.3, 2.4 or 2.5.
- See Chapter 4, “Installing SunFastEthernet Adapter 2.1 Software On Solaris 1.1.1 and 1.1.2 Systems” if your system is running Solaris 1.1.1 or 1.1.2 (SunOS versions 4.1.3_U1 and 4.1.4).

Installing SunFastEthernet Adapter 2.1 Software On Solaris 2.x Systems

3

This chapter describes SunFastEthernet Adapter 2.1 software installation requirements for systems running Solaris 2.3, 2.4 and 2.5 software versions only. See Chapter 4, “Installing SunFastEthernet Adapter 2.1 Software On Solaris 1.1.1 and 1.1.2 Systems” for systems running Solaris 1.1.1 and 1.1.2 software (SunOS versions 4.1.3_U1 and 4.1.4).

Note – You must have already installed the SunFastEthernet Adapter in your system prior to performing the following tasks.

3.1 Preparing for Software Installation

Note – If the CD-ROM drive that you are using for software installation is attached to a remote machine, refer to your SunOS installation guide for remote CD-ROM access.

For Solaris 2.5 Systems

Some newer systems are pre-loaded with the SunFastEthernet Adapter driver (`hme`). Before installing the driver from the CD-ROM, perform the following task.

- **As superuser, check for the `hme` driver and its revision number by using the `modinfo` command:**

```
# modinfo | grep hme
```

You should see a line similar to the example below if the driver is already installed:

```
51 50270000 9f78  7  1  hme (FEPS Ethernet Driver v 1.40)
```

- If the revision number is 1.40 or above, your system already has the SunFastEthernet Adapter driver, and loading from the CD is unnecessary.
- If the revision number is below 1.40, or nothing is displayed as a result of the `modinfo` command, install the software from the CD-ROM that came with the SunFastEthernet Adapter. (See below).

Installing Software From the CD-ROM for Solaris 2.3, 2.4 and 2.5

- **Install the software drivers from the CD-ROM that came with the SunFastEthernet Adapter. Refer to the CD-ROM documentation that came with your adapter for driver installation instructions (Part No: 804-5304-11).**

3.2 *Net-Install of Solaris 2.4 Over the* hme *Interface*

This section is *only* applicable if you are installing Solaris 2.4 on a net-install client system *over* the SunFastEthernet Adapter (hme) interface.

Note – The Solaris 2.4 CD-ROM cannot be used to perform a net-install (read only), thus the Solaris 2.4 CD image archive is required to update certain SunFastEthernet Adapter files.

Updating the Solaris 2.4 Archive to Use the hme *Interface*

1. **Determine the directory where the CD image is located on the boot server.**
   For example, if the Solaris software is located within a directory named DIR, change to the root partition of the client being installed by typing:

```
# cd DIR/export/exec/kvm/<archive_of_arch>/etc
```

   The /etc/bootparams file will point you to the client's root partition.

2. **Edit the** name_to_major **file by adding an entry for the SunFastEthernet Adapter device (**hme**).**
   If the major device number for the last file entry is n then use n+1 for the hme channel major device number. As shown in the example below, if the last entry for the major device number is 108, use 109 for the hme device.

```
# llcl 107
# audiocs 108
# hme 109
```

3. **Copy the** hme **driver from the SunFastEthernet Adapter 2.1 CD-ROM to the client's root partition as follows:**

```
# cp /cdrom/sunfast_2_1/2.4/SUNWhmdl/reloc/kernel/drv/hme \
DIR/export/exec/kvm/<archive_of_arch>/kernel/drv
```

4. **On the client system, perform the tasks in Section 3.5.3, "Booting From the Network Using Solaris 2.4."**

5. **Complete the client installation. Refer to your Solaris documentation for detailed instructions.**
6. **Reboot the system.**
7. **Install the software drivers from the CD-ROM that came with the SunFastEthernet Adapter. Refer to the CD-ROM documentation that came with your adapter for driver installation instructions (Part No: 804-5304-11).**

3.3 Host File Configuration

After installing the SunFastEthernet Adapter software, you must create a `hostname.hme`<*num*> file for its Ethernet interface. You must also create both an IP address and a host name for its Ethernet interface in the `/etc/hosts` file.

To prepare your system for the SunFastEthernet Adapter:

1. **Create a `/etc/hostname.hme`<*num*> file, where** <*num*> **refers to the number of each SunFastEthernet Adapter channel you plan to use. For example, use channel `hme0` for the first card; use channel `hme1` for a second card.**

- Do not create `/etc/hostname.hme`<*num*> files for SunFastEthernet Adapter channels you plan to leave unused. The `/etc/hostname.hme`<*num*> file must contain the host name for the appropriate network 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.le0` and `/etc/hostname.hme0` cannot share the same host name.

- Following is an example of the `/etc/hostname.hme`<*num*> files required for a machine called `zardoz` that will be known as `zardoz-11` and `zardoz-12` on the networks connected to the `hme0` and `hme1` Ethernet interfaces.

```
zardoz # cat /etc/hostname.hme0
zardoz-11
zardoz # cat /etc/hostname.hme1
zardoz-12
```

2. **Create an appropriate entry in the `/etc/hosts` file for each active `hme` channel.**
   Using the example in step 1, you will have:

```
zardoz # cat /etc/hosts
...
127.0.0.1     localhost
129.144.10.57 zardoz    loghost
129.144.11.83 zardoz-11
129.144.12.41 zardoz-12
```

3.4 *Caution: Package Dependency*

Caution – There is a package dependency with the SunFastEthernet Adapter. Before proceeding, perform the following task.

♦ **As superuser, check for the adapter packages by using the `pkginfo` command:**

```
# pkginfo | grep SUNWhmd
```

- If you see lines containing SUNWhmdl and SUNWhmdlu *and* lines containing SUNWhmd and SUNWhmdu, then do not remove any of these packages from your system.

3.5 Booting

The following sections discuss various ways of booting. See the section that applies to your specific needs. Refer to the *Solaris 2.x Handbook for SMCC Peripherals* manual or your Solaris documentation if your operating environment is not detailed below.

3.5.1 Booting From the Network Using Solaris 2.5

To use the SunFastEthernet Adapter Ethernet interface as the boot device for Solaris 2.5 systems, perform the following tasks.

1. At the `ok` prompt type:

```
ok show-devs
```

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

```
/iommu@f,e0000000/sbus@f,e0001000/SUNW,hme@3,8c00000
```

2. At the `ok` prompt type:

```
ok boot (full path name of the hme device)
```

3.5.2 Diskless Client Booting for Solaris 2.4

In order to boot a diskless client with a local SunFastEthernet Adapter interface (`hme`) on a Solaris 2.4 system, the following tasks must be performed on the boot server.

1. Go to your client's root partition by typing the following:

```
# cd /export/root/<client name>/etc
```

2. **Edit the** `name_to_major` **file by adding an entry for the SunFastEthernet Adapter device (**`hme`**).**
   If the major device number for the last file entry is `n` then use `n+1` for the `hme` channel major device number. As shown in the example below, if the last entry for the major device number is `104`, use `105` for the `hme` device.

```
# qec 103
# qe 104
# hme 105
```

3. **Copy the** `hme` **driver from the CD-ROM to the client's root partition as follows:**

```
# cp /cdrom/sunfast_2_1/2.4/SUNWhmdl/reloc/kernel/drv/hme \
/export/root/<client name>/kernel/drv/hme
```

4. **Create a** `hostname.hme`*<num>* **file for the client in the** `/etc` **directory in the client's root partition.**

Proceed to Section 3.5.3, "Booting From the Network Using Solaris 2.4" for the client system.

3.5.3 Booting From the Network Using Solaris 2.4

The device name of newer SBus cards for Solaris 2.5 is identified by a "SUNW," prefix. If your system is running Solaris 2.4, it will not recognize the device. Perform the following tasks to set up your system so the device driver can recognize the SunFastEthernet Adapter.

1. At the `ok` prompt type:

```
ok setenv use-nvramrc? true
ok show-devs
```

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

```
/iommu@f,e0000000/sbus@f,e0001000/SUNW,hme@3,8c00000
```

2. Type:

```
ok nvedit
```

3. Type the following exactly as shown, spaces and quotation marks included, pressing the Return key at the end of lines `0`, `1` and `2`:

```
0: probe-all install-console banner
1: cd (full path name of the hme device)
2: " hme" nameprop
3: device-end
```

4. Press the Control-C keys after typing `device-end`.

5. At the `ok` prompt, type:

```
ok nvstore
ok reset
```

Your system will reset and the banner will appear.

6. **Press the Stop-A keys to get to the** `ok` **prompt.**

7. **At the** `ok` **prompt, type** `show-devs` **to list your system devices and verify that the name property was changed correctly.**
   You should see the full path name of the `hme` device, *excluding* `SUNW,` prior to `hme`, similar to the example below:

```
/iommu@f,e0000000/sbus@f,e0001000/hme@3,8c00000
```

8. **At the** `ok` **prompt, type**:

```
ok boot (full path name of the hme device)
```

3.6 Post-Installation Procedures (Optional)

Perform the tasks in the following sections to verify and customize the performance of the SunFastEthernet Adapter.

3.6.1 Using Hubs That Do Not Send Link Pulses

Certain hubs are not compliant with the IEEE 802.3 Ethernet standards for link pulses, therefore do not send link pulses. To connect your system to these non-compliant hubs, you need to disable your system from looking for link pulses.

1. At the `ok` prompt type:

```
ok show-devs
```

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

```
/iommu@f,e0000000/sbus@f,e0001000/SUNW,hme@3,8c00000
```

2. Type:

```
ok nvedit
```

3. Type the following, pressing the Return key at the end of line `0`:

```
0: probe-all install-console banner
1: apply disable-link-pulse (full path name of the hme device)
```

4. Press the Control-C keys after typing *(full path name of the hme device)*.

5. At the `ok` prompt, type:

```
ok nvstore
ok setenv use-nvramrc? true
```

6. Reboot your system.

3.6.2 Configuring Driver Parameters

The hme device driver, which is loaded from the CD-ROM, controls the SUNW,hme Ethernet device. The device driver automatically selects the link speed using the auto-negotiation protocol with the link partner. (See Section 3.6.5, "Auto-Negotiation.")

You can manually configure the hme device driver parameters to customize each SUNW,hme device in your system in one of three ways:

- Configure the hme driver parameters generally for all SUNW,hme devices in the system by entering the parameter variables in the /etc/system file.
- Set a parameter on a per-device basis by creating the hme.conf file in the /kernel/drv directory.
- Use the ndd utility to *temporarily* change a parameter. This change is lost when you reboot the system.
  Refer to the *Platform Notes: The hme Fast Ethernet Device Driver* document (Part No: 802-5333) for more information.

3.6.3 Increasing TCP/IP Performance

The TCP/IP performance of the SunFastEthernet Adapter can be increased by changing the TCP high water mark to 64K. This can be done with the ndd utility as follows.

1. As superuser type:

```
# ndd -set /dev/tcp tcp_xmit_hiwat 65535
# ndd -set /dev/tcp tcp_recv_hiwat 65535
# ndd -set /dev/tcp tcp_cwnd_max 65534
```

The changes will take effect immediately. These changes affect all the networking interfaces in the system.

3.6.4 Forcing Network Speed Between 10 Mbps and 100 Mbps

1. **At the** `ok` **prompt, use the** `show-devs` **command to list the system devices.** You should see the full path name of the `hme` device, similar to the example below:

```
/iommu@f,e0000000/sbus@f,e0001000/SUNW,hme@3,8c00000
```

2. **Type:**

```
ok nvedit
```

3. **Type the following, pressing the Return key at the end of line** `0`**:**

```
0: probe-all install-console banner
1: apply transfer-speed=10 (full path name of the hme device)
```

4. **Press the Control-C keys after typing** *(full path name of the hme device)***.**

Note – In the above example, the speed is forced to 10 Mbps. To force the speed to 100 Mbps, replace 10 with 100.

---

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

```
ok nvstore
ok setenv use-nvramrc? true
```

6. **Reboot your system.**

Refer to the *Platform Notes: The hme Fast Ethernet Device Driver* document (Part No: 802-5333) for more information on the `hme` device driver and forcing network speed. This document is also available on the Solaris 2.5 and the Solaris 2.5: 1/96 AnswerBook.

3.6.5 *Auto-Negotiation*

A key feature of the SunFastEthernet Adapter is auto-negotiation. The *auto-negotiation* protocol, as specified by the 100BASE-T standard, automatically selects the operation mode (half-duplex or full-duplex) and speed (10 Mbps or 100 Mbps) for the adapter.

The `hme` device driver operates the `SUNW,hme` device by default in half-duplex mode only.

If the SunFastEthernet Adapter is connected to a remote system or interface that is not capable of auto-negotiation, your system automatically selects the speed and half-duplex mode.

If the SunFastEthernet Adapter is connected to a link partner with which the auto-negotiation protocol fails to operate successfully, you can configure the device to not use this protocol and force the driver to set up the link in the mode and speed of your choice.

Refer to the *Platform Notes: The hme Fast Ethernet Device Driver* document (Part No: 802-5333) for more information on the `hme` device driver and auto-negotiation. This document is also available on the Solaris 2.5 and the Solaris 2.5: 1/96 AnswerBook.

3.6.6 External Transceivers

Some external transceivers support multiple link capabilities, such as 100BASE-T4, 100BASE-TX, and 10BASE-T, but not auto-negotiation. In this case, the driver attempts to bring-up the link in the highest priority capability in the following descending order of priority:

- 100BASE-T4
- 100BASE-TX
- 10BASE-T

To bring-up your external transceiver in a lower priority capability, you must configure the driver parameters to force the link to the desired mode.

Refer to your external transceiver documentation or the *Platform Notes: The hme Fast Ethernet Device Driver* document (Part No: 802-5333) for more information on forcing the link mode.

Note – When using an external transceiver with the SunFastEthernet Adapter, your system may not report the speed at which the link is operating, either 10 or 100 Mbps.

Installing SunFastEthernet Adapter 2.1 Software On Solaris 1.1.1 and 1.1.2 Systems

4

This chapter describes the SunFastEthernet Adapter installation requirements for systems running Solaris 1.1.1 and 1.1.2 software versions only (SunOS 4.1.3_U1 and 4.1.4).

There is a restriction of 32 SunFastEthernet Adapter cards that can be installed in one system. The name of the SunFastEthernet interface is `hme`.

After installing the SunFastEthernet Adapter (see Chapter 2, “Installing the Adapter”), you can install the software that is located on the CD-ROM that came with your adapter.

If you will be running the software on a diskless workstation, install the product software on the boot server for that diskless machine, see Section 4.3, “Setting Up Diskless Clients,” on page 4-12. Section 4.2, “Installing from the CD-ROM,” covers installation from a CD-ROM.

Note – The SunFastEthernet interface will not function in a network that uses Ethernet trailers.

4.1 Preparing for Software Installation

Before loading the SunFastEthernet software:

- Ensure that the system is running SunOS Version 4.1.3_U1 or 4.1.4. Use the `uname` command with the `-r` argument to determine your SunOS version as shown in the following example:

```
hostname% uname -r
```

- Verify that the `/export/exec` directory contains a symbolic link from `/export/exec/sun4` to the `/usr` directory on your machine. The link allows the script to place the SunFastEthernet Adapter files in your `/usr` rather than your `/(root)` partition.
- To confirm the existence of the link in the `/export/exec` directory, use the commands shown in the following example:

```
hostname # cd /export/exec
hostname # ls -l sun4
lrwxrwxrwx l root 4 Apr 9 03:27 sun4 -> /usr
```

The example response from command `ls -l` shows that the `sun4` and `/usr` directories are symbolically linked. If the link does not exist, create one while still in the directory `/export/exec`, by entering the `ln -s` command as shown in the following example:

```
hostname # ln -s /usr sun4
```

- You need approximately 500 Kbytes of free space in the destination partition. You can check the amount of free space by using the `df` command in the directory `/export/exec/sun4`.

4.2 Installing from the CD-ROM

4.2.1 Access to Remote CD-ROM

If the CD-ROM drive that you are using for software installation is attached to a remote machine, refer to your SunOS installation guide for remote CD-ROM access and proceed with the installation procedures in the sections that follow.

4.2.2 Using `cdm`

When installing the SunFastEthernet Adapter software from a CD-ROM, you can use the `cdm` program. The `cdm` program has a command-line interface that allows you to install applications directly onto a machine that does not have a bit-mapped display. The following text presents instructions for `cdm`.

4.2.3 Mounting the CD-ROM

1. **Mount the CD-ROM from either a local or remote machine. For example, for a local machine type:**

```
hostname # mkdir /cdrom
hostname # mount -rt hsfs /dev/sr0 /cdrom
```

For a remote machine type:

```
hostname # mkdir /cdrom
hostname # mount -rt hsfs <remote machine>:/cdrom /cdrom
```

2. **After successfully mounting the CD-ROM filesystem, change directories to `/cdrom` as follows:**

```
hostname # cd /cdrom/1.1.x
```

4.2.4 *Installing Script Using* `cdm`

3. Enter `./cdm` in a shell tool. You will see the following display:

```
----->>>>>CDM<<<<<-----
   1. Select Application
   2. Show Current Application
   3. Install Application
   4. Display Application Text File
   5. Print Application Text File
   6. List Applications
   7. List Categories
   8. Change Current Category
   9. Change Current Directory
   10. Show Program Environment
Please enter a number or q to quit:
```

4. Enter `1` to select an application.
You will see the following display:

```
Applications available:
       1. SunFastEthernet Driver 2.1
Please enter a number or q for the main menu:
```

5. Enter `1` to select SunFastEthernet Driver 2.1.
You will see the following display:

```
* “SunFastEthernet Driver 2.1” selected as new application.
----->>>>>CDM<<<<<-----
   1. Select Application
   2. Show Current Application
   3. Install Application
   4. Display Application Text File
   5. Print Application Text File
   6. List Applications
   7. List Categories
   8. Change Current Category
   9. Change Current Directory
   10. Show Program Environment
Please enter a number or q to quit:
```

6. Enter 3 to initiate the installation.
You will see the following display:

```
Begin installation now?
```

7. Enter y to begin installation.
You will then see the following display, followed by copyright information:

```
Executing installation file ...

The following product will be installed:
Product Name:           2.1 SunFastEthernet Controller Driver
Sun Platforms:          Sun-4m SUNBIN
Media type/format:      CD-ROM (UFS file system format) 1 of 1
Part Number:            704-5304-11
Compatible with the Solaris(R) 1.1.1 and later releases
```

8. The script will then query: `Do you want to continue [y|n]?`
Enter y to continue. You will see the following display:

```
extract_unbundled : Extracting Installation Scripts

extract_unbundled : Begin Install Script Execution
Invoking /usr/tmp/unbundled/install_HME; log file is
/usr/tmp/unbundled/2.1_SunFastEthernet.log
```

9. **The script will then query:** `Do you want to see a description of this installation script [y|n]?`
   Follow by entering `y`. You will see the following display:

```
Install the SunFastEthernet Controller driver.

Installation should take approximately 2 minutes.


Here is the Current Free Disk space:
Filesystem            kbytes    used   avail capacity  Mounted on
/dev/sd0a              30807    8921   18806    32%    /
/dev/sd0g              93935   66834   17708    79%    /usr
/dev/sd0h             775774      10  698187     0%    /home

This software requires 500 kbytes of disk space
```

10. **The script will then query:** `Do you want to continue [y|n]?`
    Follow by entering `y`. You will see the following display:

```
The destination directory for SunFastEthernet is: /export/exec
a sun4/HME/install/install_hme 24 blocks
a sun4/HME/install/deinstall_hme 9 blocks
a sun4/HME/sys/sunif/if_hme.h 34 blocks
a sun4/HME/sys/sunif/hme_ioctl.h 4 blocks
a sun4/HME/sys/sunif/hme_mac.h 51 blocks
a sun4/HME/sys/sunif/hme_phy.h 27 blocks
a sun4/HME/sys/sun4m/OBJ/if_hme.o 24 blocks
a sun4/HME/sys/sun4m/OBJ/hme_.o 70 blocks
a sun4/HME/usr/man/man4/hme.4s 19 blocks
a sun4/HME/usr/bin/hmespeed 48 blocks
a sun4/HME/usr/bin/hmestats 48 blocks
Software successfully extracted.

Installing SunFastEthernet 2.1 driver software on SunOS version:
4.1.3_U1
```

SunOS version 4.1.4 will display if your system is running that version.

Note – The install script assumes you have assigned the host name for the SunFastEthernet interface. For example, if you want to call the SunFastEthernet system5, then system5 should exist in the `/etc/hosts` file or NIS hosts maps (if you are running NIS), otherwise the script exits, and you will have to restart `cdm` again.

The script will then query:

```
The current official hostname is: (current official hostname)

Do you wish to change the official hostname? (y|n) [n]:
```

11. **The default is `n`. If you want to change the official host name, respond by entering `y`.**
    Once the host name is changed or the default `n` is selected, you will see the following display:

```
This script is designed to continue the
SunFastEthernet installation by:

    Creating a System Config File based on a source Config File
    Changing protections on various files
    Running sys_install
    Modifying the system config file
    Configuring and building the new kernel
    Setting up the new Kernel image for booting
    FOLLOW THE STEPS IN THE MANUAL *PRIOR* TO REBOOTING!
    Please be sure to create /etc/hostname.hme<num> entries
    prior to rebooting.
   Then you must halt the system and reboot using the new kernel.
```

12. **The script will then query:** `Do you wish to continue with this script (y/n) [y]:`
    Enter `y` to continue. The script will query:

```
Source System Config File [GENERIC]:
```

If you want to change the `source system config` file from the default `[GENERIC]` then enter the change now. Otherwise press Return to accept the default.

You will see the following prompt:

```
New System Config File [HME]:
```

If you want to change the `new system config file` from the default `[HME]`, enter the new file name now. If you have a previously created copy of a config file by the same name, press Return to accept the default.

You will see the following display if you have previously configured a kernel by the name of `HME`:

```
File already exists, OK to overwrite (y/n) [y]:
        File protection on files and HME adjusted ....
```

Enter y to continue. You will see the following display:

```
Doing a “make depend”

        /etc/config HME   run successfully ....

        Issuing make ...

(deleted for brevity)

loading vmunix
rearranging symbols
text    data    bss     dec     hex
1572864 467712  209448  2250024 225528

        ’make’ ran successfully ....
```

Followed by:

```
*************************************************************
The SunFastEthernet 2.1 driver has been
successfully installed.

 To use the new kernel, do the following:

     # cd /
     # mv vmunix vmunix.orig
     # mv vmunix.hme vmunix
     # (Please be sure to create /etc/hostname.hme<num> entries
     # /etc/reboot

*************************************************************
```

Note – If there are problems with the preceding procedure (moving vmunix / rebooting), then you need to boot the old vmunix which is `vmunix.orig` in the above example. Thus, type: `boot vmunix.orig`.

The install script will then return you to `cdm` and the following display:

```
----->>>>> CDM <<<<<-----

        1.  Select Application
        2.  Show Current Application
        3.  Install Application
        4.  Display Application Text File
        5.  Print Application Text File
        6.  List Applications
        7.  List Categories
        8.  Change Current Category
        9.  Change Current Directory
        10. Show Program Environment

Please enter a number or q to quit: q
```

4.2.5 *Host File Configuration*

After installing the SunFastEthernet Adapter software, you must create a `hostname.hme`<*num*> file for its Ethernet interface. You must also create both an IP address and a host name for its Ethernet interface in the `/etc/hosts` file.

To prepare your system for the SunFastEthernet Adapter:

1. **Create a `/etc/hostname.hme`<*num*> file, where** <*num*> **refers to the number of each SunFastEthernet Adapter channel you plan to use. For example, use channel `hme0` for the first card; use channel `hme1` for a second card.**

- Do not create `/etc/hostname.hme`<*num*> files for SunFastEthernet Adapter channels you plan to leave unused. The `/etc/hostname.hme`<*num*> file must contain the host name for the appropriate network 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 hostname of any other interface, for example: `/etc/hostname.le0` and `/etc/hostname.hme0` cannot share the same host name.

- Following is an example of the `/etc/hostname.hme`<*num*> files required for a machine called `zardoz` that will be known as `zardoz-11` and `zardoz-12` on the networks connected to the `hme0` and `hme1` Ethernet interfaces.

```
zardoz # cat /etc/hostname.hme0
zardoz-11
zardoz # cat /etc/hostname.hme1
zardoz-12
```

2. **Create an appropriate entry in the `/etc/hosts` file for each active `hme` channel.**
   Using the example in step 1, you will have:

```
zardoz # cat /etc/hosts
...
127.0.0.1     localhost
129.144.10.57 zardoz    loghost
129.144.11.83 zardoz-11
129.144.12.41 zardoz-12
```

4.2.6 SunFastEthernet Directories

The following are the major subdirectories of the directory that receives SunFastEthernet files, `/export/exec/sun4/HME`. Note that `/export/exec/sun4` is a symbolic link to `/usr`.

Subdirectory	Description
`sys`	Kernel and system configuration files
`install`	Product specific installation scripts
`usr/bin`	Utilities
`usr/man`	Product manual pages

4.2.7 Installation Verification

Note – The SunFastEthernet Adapter interface will not function in a network that uses network trailers.

Use the `netstat` (8c) utility to check for `hme<num>` interfaces. For example:

```
hostname # netstat -ia
Name      Mtu   Net/Dest     Address    Ipkts     Ierrs      Opkts    Oerrs   Collis   Queue
le0      1500   mtnview-en    avon       197315      0        160609     0       3         0
hme0     1500   mtnview-en    avon-bf0   184858      0        177808     0       0         0
hme1*    1500   mtnview-en    avon-bf1   0           0        0          0       0         0
lo0      1536   loopback      localhost  11418       0        11418      0       0         0
```

An asterisk (*) following an interface name, such as `hme1` as shown in the above example, indicates that the interface is down, that is, you have not used `ifconfig` to bring the interface up.

You can also use `ifconfig` to check on a particular interface, for example:

```
hostname # ifconfig hme0
hme0: flags=63<UP,DROADCAST,NOTRAILERS,RUNNING>
    inet <IP_address> netmask <netmask> broadcast <address>
    ether <MAC_address>
```

The string `<UP,BROADCAST,NOTRAILERS,RUNNING>` indicates that the SunFastEthernet Adapter interface is correctly installed and configured.

4.3 Setting Up Diskless Clients

This section tells you how to set up a server so that you can boot and run diskless client workstations over the SunFastEthernet Adapter. This setup includes building a kernel that supports the SunFastEthernet Adapter interface.

4.3.1 Setting Up to Write to the Server `/usr` Partition

If your server exports `/usr` read-only to the diskless client, then you need to refer to the *"System Administrators Guide"* for the server operating system, to find out how to export the `/usr` filesystem read / write to the diskless client.

4.3.2 Building a New Kernel

The following instructions are a supplement to the instructions in Chapter 8, "Administering Workstations," in the SunOS manual, "System and Network Administration."

You can use the script `install_hme` on the client machine to configure a new kernel containing a linkable driver for the SunFastEthernet Adapter. Depending upon the size of the kernel on which you are basing the new kernel, you need about 2 Mbytes of free space in your root partition. You can use the install script to build a new kernel for each client individually. Follow the directions in Section 4.2, "Installing from the CD-ROM."

If you have a lot of diskless clients, installing the clients one by one may not be practical. You can build the kernels manually by following the steps below. SYS is assumed to be the directory where you build kernels for your diskless client. Use whatever path is right for you in place of SYS.

1. Type:

```
# cp /usr/HME/sys/sunif/* SYS/sunif
# cp /usr/HME/sys/sun4m/OBJ/* SYS/sun4m/OBJ
# cp SYS/sun4m/conf/files SYS/sun4m/conf/files.prehme
```

2. Add the following lines to `SYS/sun4m/conf/files`:

```
#
#  SunFastEthernet Controller
#
sunif/if_hme.c       optional hme
sunif/hme_.c         optional hme
```

3. Add the following lines to the configuration file that you use for building diskless client kernels:

```
#
# SunFastEthernet Controller
#
device-driver     hme
```

4. **Use the `config` command to rebuild the system configuration files for the diskless client. You can now copy the new kernel over to the diskless clients.**

You need to remember to add the SunFastEthernet Adapter interface names to `/etc/hosts` for each diskless client, and add the names of all the new interfaces to NIS if you are using it. The name of the SunFastEthernet Adapter interface will become the official host name for the diskless clients. If you do not want this to happen, then use the SunFastEthernet Adapter install script to do an install on one machine and copy the changes made to `/etc/rc.boot` to the other diskless clients.

4.4 *Getting the Diskless Client(s) Ready*

Perform the following tasks to set up your system so the device driver can recognize the SunFastEthernet Adapter.

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

```
ok setenv use-nvramrc? true
ok show-devs
```

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

```
/iommu@f,e0000000/sbus@f,e0001000/SUNW,hme@3,8c00000
```

2. **Type:**

```
ok nvedit
```

3. **Type the following exactly as shown, spaces and quotation marks included, pressing the Return key at the end of lines** `0`**,** `1` **and** `2`**:**

```
0: probe-all install-console banner
1: cd (full path name of the hme device)
2: " hme" nameprop
3: device-end
```

4. **Press the Control-C keys after typing** `device-end`**.**

5. **At the** `ok` **prompt, type:**

```
ok nvstore
ok reset
```

Your system will reset and the banner will appear.

6. **Press the Stop-A keys to get to the** `ok` **prompt.**

7. **At the** `ok` **prompt, type** `show-devs` **to list your system devices and verify that the name property was changed correctly.**
You should see the full path of the `hme` device, *excluding* `SUNW,` prior to `hme`, similar to the example below:

```
/iommu@f,e0000000/sbus@f,e0001000/hme@3,8c00000
```

8. **At the** `ok` **prompt, type:**

```
ok boot (full path name of the hme device)
```

Running Diagnostics for Solaris 2.3 and 2.4

A

Note – For SunFastEthernet Adapter diagnostics testing on systems running Solaris 2.5 and SunOS versions 4.1.3_U1 and 4.1.4, refer to the *SunVTS 2.0 User's Guide* (part number: 802-5331).

A.1 Sundiag

Sundiag is an on-line system exerciser that runs diagnostic hardware tests. It is used primarily with the OpenWindows software interface that enables you to quickly and easily set test parameters to run tests.

Note – Sundiag does not probe for SunFastEthernet devices by default. For Sundiag to acknowledge an `hme`<*num*> channel, the `.usertest` file must be edited before bringing up Sundiag, as described in the following section.

A.1.1 Editing `.usertest` File

1. **Login as superuser and then type the following:**

```
zardoz# cd /opt/SUNWdiag/bin
```

2. **Edit the file `.usertest` by adding the following line wherein the format is test label, test name, and command-line arguments.**
   The example given is for a single `hme0` interface; for multiple channels add an additional line for each channel using `hme1`, `hme2`, etc.:

   ```
   hme0, nettest, IF=hme0 v
   ```

   Because testing the SunFastEthernet Adapter card is user defined, default options are not displayed in Sundiag. Test options for an `hme`<*num*> channel can be defined in the `.usertest` file using the command `nettest`. Type the command `nettest` without arguments for a list of options, for example:

```
zardoz# nettest
Usage: nettest [TARGET=h1+h2...] [IF=interface] {TEST=0..7}
N=nopkts} {P=pattern} [T=seconds]
```

A.1.2 The Sundiag Window

Note – Examples in this section show Sundiag running in the OPEN LOOK® environment. Sundiag run in the SunView™ environment will look different.

To start Sundiag, `cd` to the Sundiag directory (`/opt/SUNWdiag/bin/sundiag`) and then type the `sundiag` command. After you enter the `sundiag` command, the Sundiag window is displayed on your screen, refer to Figure A-1. This window is the primary interface for running Sundiag. Refer to the Sundiag manual that came with your operating system for further details.

The Sundiag window is divided into four small windows:

- The system status window at the upper-left of the screen displays the status of the tests.
- The performance monitor panel in the upper-middle of the screen displays the performance statistics for the system that is under test.
- The control panel is located at the right. The panel includes buttons, exclusive choice, toggle, and pop-up menus that allow you to select test parameters and options.
- The console window at the bottom-left displays test messages, and allows you, as a superuser, to use operating system commands.

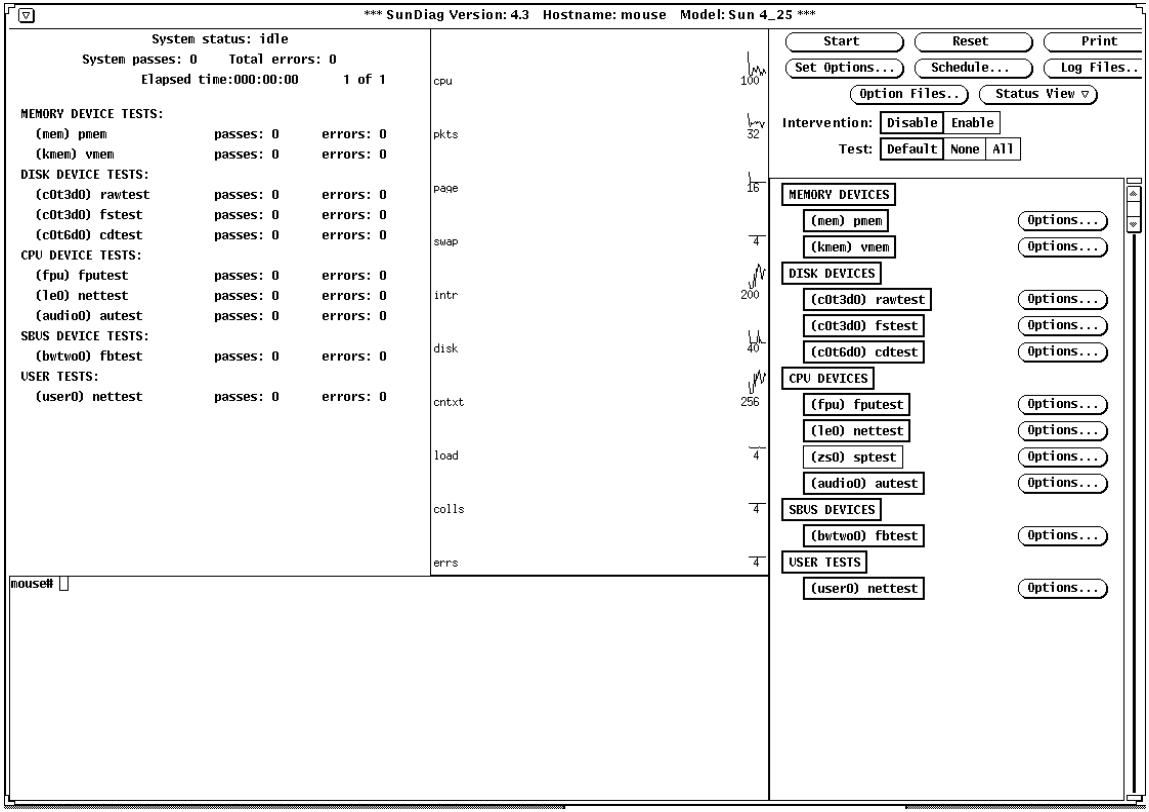


Figure A-1 Sundiag Window

A.1.3 Starting the Test

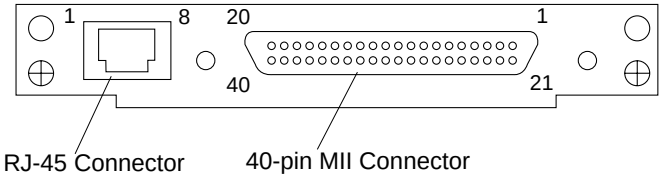
1. **Review the information in the control panel, which identifies the devices that are available for testing.**
   Click on the device that you want to test, in this case *(USER 0)* `nettest`.Your selection is confirmed with the display of a highlighted box next to the device name.
2. **Click on the Start button.**
3. **Watch the console window for messages.**
4. **To interrupt a test or to stop after a test is completed, click on the Stop button.**

If no problems are identified during the testing, the SunFastEthernet Adapter card is ready for operation in your system. Click on the Quit button to exit Sundiag.

Interface Signals

B

B.1 SunFastEthernet Adapter Connectors



B.2 RJ-45 Connector Signals

Pin	Signal
1	Transmit+
2	Transmit-
3	Receive+
4	No Connection
5	No Connection
6	Receive-
7	No Connection
8	No Connection

B.3 MII Connector Signals

Pin	Signal	Pin	Signal
1	+5V	21	+5V
2	MDIO	22	GND
3	MDC	23	GND
4	RXD<3>	24	GND
5	RXD<2>	25	GND
6	RXD<1>	26	GND
7	RXD<0>	27	GND
8	RX_DV	28	GND
9	RX_CLK	29	GND
10	RX_ER	30	GND
11	TX_ER	31	GND
12	TX_CLK	32	GND
13	TX_EN	33	GND
14	TXD<0>	34	GND
15	TXD<1>	35	GND
16	TXD<2>	36	GND
17	TXD<3>	37	GND
18	COL	38	GND
19	CRS	39	GND
20	+5V	40	+5V

Specifications B

B.1 Physical Dimensions

Dimension	Measurement
Length	5.78 in. (147.70 mm)
Width	3.3 in. (83.82 mm)
Weight	4.0 oz. (113.40 g)

B.2 Power Requirements

Specification	Measurement
Maximum Power Dissipation	9.5 Watts
Maximum Power Consumption	1.9 Amps @ 5V
Voltage Tolerance	5V +/- 5%
Ripple	Maximum 100 mV
Operational Current	1.4 Amps

B.3 Performance Specifications

Specification	Performance
Maximum Ethernet Transfer Rate	10/100 Mbps
Host Interface	240-pin ASIC that handles SBus interface as well as local and external transceiver interfaces via Media Independent Interface (MII) IEEE 1496 SBus master interface with support for 64-bit mode accesses IEEE 1496 SBus slave interface, at 32-bit mode only Runs at 16.67 MHz to 25 MHz on the SBus
MII	25 MHz rate for 100 Mbps; 2.5 MHz rate for 10 Mbps Conforms to IEEE 802.3u Connects to TX, FX, AUI or any other MII-compatible external transceivers
Network Interface	100BASE-TX using Category 5 (data-grade) cable; 10BASE-T using Category 3 (voice-grade) cable or better Single UTP RJ-45 for both 10 and 100 Mbps
Ethernet Version	Conforms to IEEE 802.3u
SBus Burst Sizes	16/32/64 bytes
SBus Parity	Yes

Reader Comment Card

Your comments and suggestions are important to us. Please let us know what you think about the *SunFastEthernet Adapter 2.0 Installation and User's Guide*, part number 802-6022-11.

1. Were the procedures well documented? Yes ❑ No ❑

   Please explain: _____

   _____

2. Were the tasks easy to follow? Yes ❑ No ❑

   Please explain: _____

   _____

3. Were the illustrations clear? Yes ❑ No ❑

   Please explain: _____

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5. Do you have additional comments about the SunFastEthernet Adapter 2.0 Installation and User's Guide?
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