

SunFastEthernet Adapter User Guide



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Part No.: 801-6109-11
Revision A, November 1994

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Preface

This manual provides information about the SunFastEthernet Adapter card.

Document Organization

The information in this manual is presented in six chapters and four appendixes. Manual arrangement is as follows:

Chapter 1: “Introducing the SunFastEthernet Adapter Card” describes the features of the SunFastEthernet Adapter card and provides hardware requirements.

Chapter 2: “Installing the SunFastEthernet SBus Card” provides card installation, testing and relocation procedures.

Chapter 3: “Installing SunFastEthernet Software using Solaris 1.x” provides instructions for software installation via CD-ROM using CDmanager or cdm program, instructions on bringing up the interface using loadable drivers as well as instructions on building a new kernel for diskless clients.

Chapter 4: “Installing SunFastEthernet Software using Solaris 2.x” provides instructions on installing software using pkgadd command. Includes net-install and diskless client procedures.

Chapter 5: “Network Linkups/Speed Selection” applicable to Solaris 1.x and 2.x software versions. Provides network linkup and speed selection procedures.

Appendix A: “Interface Signals” provides pinout data.

Appendix B: “SunFastEthernet Adapter Card Specifications” provides information on performance and power specifications, physical dimensions, and environmental specifications.

Appendix C: “Running Diagnostics” explains how to run diagnostic tests that verify the SunFastEthernet Adapter card is working correctly in the system.

Appendix D: “Solaris 2.x Driver Performance Tuning” explains how to tune the SunFastEthernet Adapter card for performance.

Appendix E: “Console Messages (Solaris 1.x Only)” provides a listing of Solaris 1.x console message together with explanation and/or workarounds.

When You Need Help with UNIX Commands

This manual may not include specific software commands or procedures. Instead, it names software tasks and refers 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 operating environment.
- Other software documentation that you received with your system.

What Typographic Changes and Symbols Mean

Section Table P-1, “Typographic Conventions describes the typefaces and symbols used in this book.

Table P-1 Typographic Conventions

Typeface or Symbol	Meaning	Example
AaBbCc123	The names of commands, files, and directories; on-screen computer output	Edit your <code>.login</code> file. Use <code>ls -a</code> to list all files. system% You have mail.
AaBbCc123	What you type, contrasted with on-screen computer output	<div style="border: 1px solid black; padding: 5px;">system% su Password:</div>
<i>AaBbCc123</i>	Command-line placeholder: replace with a real name or value	To delete a file, type <code>rm filename</code> .
<i>AaBbCc123</i>	Book titles, new words or terms, or words to be emphasized	Read Chapter 6 in <i>User's Guide</i> . These are called <i>class</i> options. You <i>must</i> be root to do this.
Code samples are included in boxes and may display the following:		
%	UNIX C shell prompt	system%
\$	UNIX Bourne and Korn shell prompt	UNIX Bourne and Korn shell prompt
#	Superuser prompt, all shells	Superuser prompt, all shells

Notes, Cautions, and Warnings



Warning – This equipment contains lethal voltage. Accidental contact can result in serious injury or death.



Caution – Improper handling by unqualified personnel can cause serious damage to this equipment. Unqualified personnel who tamper with this equipment may be held liable for any resultant damage to the equipment.

Individuals who remove any outer panels to access this equipment must observe all safety precautions and ensure compliance with skill level requirements, certification, and all applicable local and national laws.

Procedures contained in this document must be performed by qualified service-trained maintenance providers.

Note – Before you begin, carefully read each of the procedures in this manual. If you have not performed similar operations on comparable equipment, *do not attempt* to perform these procedures.

Introducing the SunFastEthernet Adapter Card



The information contained in this guide is organized as follows:

Table 1-1 Organization

Chapter/Appendix	Material covered	OS applicability
1	Introduction to SunFastEthernet	Both 1.x and 2.x
2	Installing SunFastEthernet SBus card	Both 1.x and 2.x
3	Solaris 1.x software installation	1.x only
4	Solaris 2.x software installation	2.x only
5	Network Linkups/Speed Selection	Both 1.x and 2.x
6	Interface Signals	Both 1.x and 2.x
A	SunFastEthernet Adapter Card Specifications	Both 1.x and 2.x
B	Running Diagnostics	Both 1.x and 2.x
C	Solaris 2.x Driver Performance Tuning	2.x only
D	Console Messages (Solaris 1.x Only)	1.x Only

The SunFastEthernet™ Adapter card is a dual mode high speed ethernet SBus card that can operate at either 10 or 100Mbps. The card provides the Media Access Control (MAC) function for either a 10 or 100Mbps CSMA/CD protocol based network interface conforming to IEEE 802.3 and the Ethernet specification.

1. Fully complies with the following standards:
 - a. ANSI/IEEE std 802.3 CSMA/CD MAC layer specification
 - i. Supports 10Base-T (twisted-pair) Ethernet. AUI (thicknet) and Coax (thinnet) can be supported via external third-party adapter boxes
 - ii. 10/100 Mbit per second transfer rate
 - b. SBus specification, Rev B.0
 - i. Single-wide SBus card
 - ii. Fully operational across all SBus clock ranges (12.5 - 25 Mhz)
 - iii. Supports parity
 - iv. Supports 16/32/64 byte burst
 - c. Fast Ethernet Alliance 100Base-X media specification
 - d. Fast Ethernet Alliance Reconciliation Sublayer and Media Independent Interface specifications

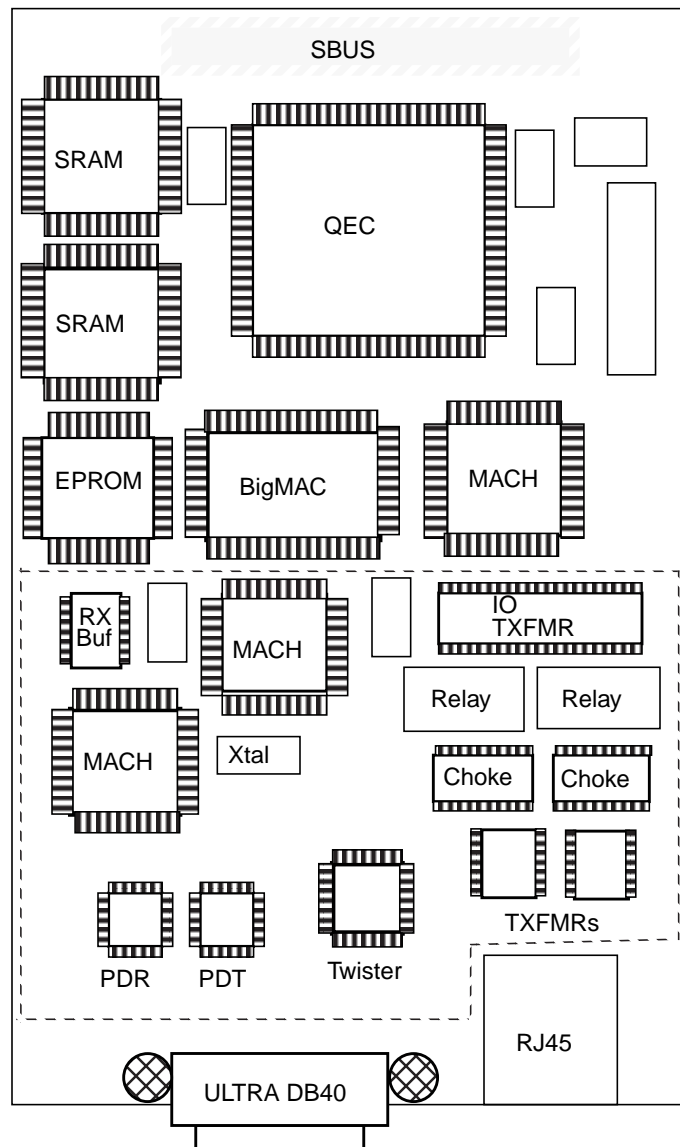


Figure 1-1 SunFastEthernet Adapter Card Components

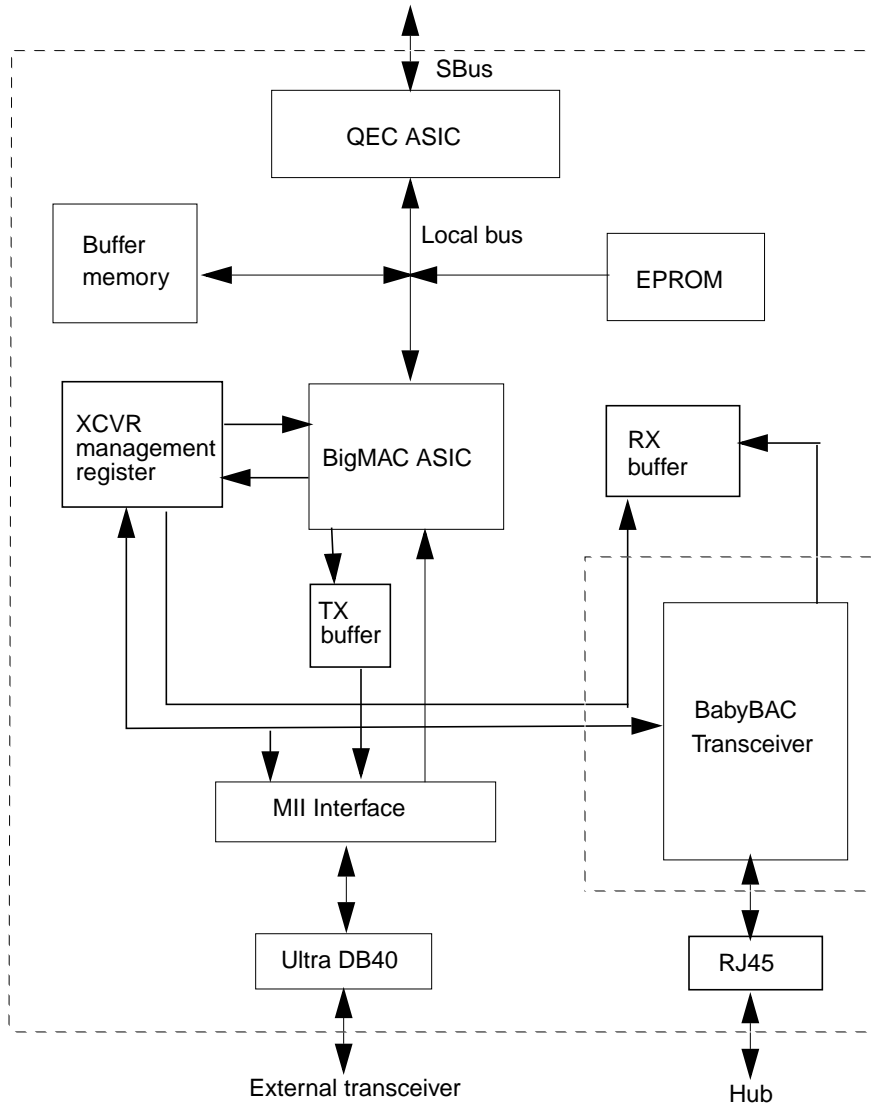


Figure 1-2 SunFastEthernet Block Diagram

The SunFastEthernet Adapter card is supported on most SBus based Sun-4c, Sun-4m, and Sun-4d system architectures that run under the Solaris® environment or other compatible operating systems.

To utilize the SunFastEthernet Adapter card, the system also needs to contain OpenBoot™ PROM (OBP) level 2.3 or later. Verify your OBP version by typing the *banner* command at the *ok* prompt. If the OBP version is earlier than 2.3 then the OBP must be upgraded.

An on-board FCode PROM provides configuration support that identifies the SunFastEthernet Adapter card to the system and contains selftest routines.

Installing the SunFastEthernet SBus Card



2.1 Card Installation

1. Remove the SunFastEthernet Adapter card from the antistatic bag and spread the bag on a firm surface to provide a protective mat.

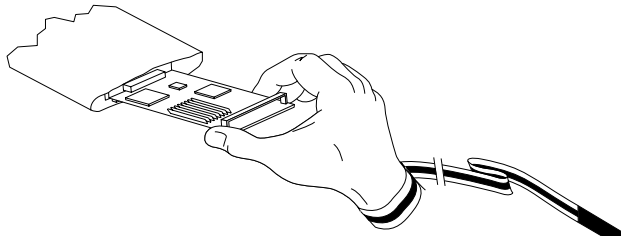


Figure 2-1 Handling the SunFastEthernet Adapter Card

2. Place the card, component side up, on the bag.
3. Install the card according to the SBus installation procedures in the hardware installation or service manual for your system.

Note – If a SunFastEthernet card is installed in a slot and you later change the location of the card, then you must perform the procedure indicated in Section 2.4, “Relocating a SunFastEthernet Card (Solaris 2.x Only)”.

4. Following card installation, connect to a network.

Use the onboard transceiver RJ45 connector for Category 5, data grade UTP wiring (100M maximum).

The external transceiver MII Interface connector can be used for Category 5, data grade UTP or for other wiring types (dependent upon the transceiver type). For example: Category 3 voice grade (UTP), fiber optic, STP, etc.

5. **Verify SunFastEthernet installation by testing the card as indicated in the following section.**

2.2 *Testing the SunFastEthernet Adapter Card Before Booting the System*

Note – To utilize the SunFastEthernet Adapter card, the system needs to contain OpenBoot™ PROM (OBP) level 2.3 or later.

After the SunFastEthernet Adapter card is installed, *and before booting the system*, verify installation by performing the following procedure:

1. **Power on the system and when the banner appears press the L1-A key to get to the ok prompt.**

2. Use `show-devs` to find out SBus card information.

The `show-devs` command used by itself shows the entire device tree. The example below shows information for a SPARCserver™ 1000 system with only one system board (board 0) and a SunFastEthernet channel installed in slot 1.

```
<#0> ok show-devs
/io-unit@f,e0200000/sbi@0,0/qec@1,20000
/io-unit@f,e0200000/sbi@0,0/lebuffer@3,40000
/io-unit@f,e0200000/sbi@0,0/dma@3,81000
/io-unit@f,e0200000/sbi@0,0/lebuffer@0,40000
/io-unit@f,e0200000/sbi@0,0/dma@0,81000
/io-unit@f,e0200000/sbi@0,0/qec@1,20000/be@0,0
/io-unit@f,e0200000/sbi@0,0/lebuffer@3,40000/le@3,60000
/io-unit@f,e0200000/sbi@0,0/dma@3,81000/esp@3,80000
/io-unit@f,e0200000/sbi@0,0/dma@3,81000/esp@3,80000/st
/io-unit@f,e0200000/sbi@0,0/dma@3,81000/esp@3,80000/sd
/io-unit@f,e0200000/sbi@0,0/lebuffer@0,40000/le@0,60000
/io-unit@f,e0200000/sbi@0,0/dma@0,81000/esp@0,80000
/io-unit@f,e0200000/sbi@0,0/dma@0,81000/esp@0,80000/st
/io-unit@f,e0200000/sbi@0,0/dma@0,81000/esp@0,80000/sd
<#0> ok
```

3. Set the `diag-switch` to true.

At the `ok` prompt type:

```
ok setenv diag-switch? true
```

Note – If the `diag` switch is not set to true reduced tests are run.

Note – The SunFastEthernet card must be connected to an active network if the `watch` commands are to provide packet data.

4. Use a `watch` command, either `watch-net-all` (OpenBoot PROM 2.6 or above) or `watch-net` (OpenBoot PROM 2.3 to 2.5), to watch net activity or watch incoming network packets.

Note – To find out the OpenBoot PROM revision level on your system, type `.version` at the `<#0> ok` prompt.

- a. **If the system has OpenBoot PROM 2.6 or above, use `watch-net-all`.** This example shows output when a be channel is connected to a 10Mbps network.

Note – Activity may also be displayed for the `le0` interface if it is connected.

```
<#0> ok  watch-net-all
/io-unit@f,e0200000/sbi@0,0/qec@1,20000/be@0,0
Qe register test -- succeeded.
Internal loopback test -- succeeded.
Transceiver check -- 100 mbps Link Down, 10 mbps Link Up, passed.
Tx/Rx enable/disable test--succeeded
Frame counter test--succeeded
Address detection test--succeeded
Address hash test--succeeded
Looking for Ethernet packets.
`.` is a good packet.  `X' is a bad packet.
Type any key to stop.
.....
.....
.....
<#0> ok
```


- b. If the system has OpenBoot PROM 2.3 to 2.5, use the `watch-net` command.**

```
<#0> ok watch-net
Qe register test -- succeeded.
Internal loopback test -- succeeded.
Transceiver check -- 100 mbps Link Down, 10 mbps Link Up, passed.
Tx/Rx enable/disable test--succeeded
Frame counter test--succeeded
Address detection test--succeeded
Address hash test--succeeded
Looking for Ethernet packets.
`.` is a good packet. `X` is a bad packet.
Type any key to stop.
.....
.....
.....
<#0> ok
```

5. Set the diag-switch to false.

At the `ok` prompt type:

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

2.3 Booting From SunFastEthernet Devices

To get information about valid SunFastEthernet device path names for your machine use the *show-devs* command as shown in the following example:

```
<#0> ok show-devs
/io-unit@f,e0200000/sbi@0,0/qec@1,20000
/io-unit@f,e0200000/sbi@0,0/lebuffer@3,40000
/io-unit@f,e0200000/sbi@0,0/dma@3,81000
/io-unit@f,e0200000/sbi@0,0/lebuffer@0,40000
/io-unit@f,e0200000/sbi@0,0/dma@0,81000
/io-unit@f,e0200000/sbi@0,0/qec@1,20000/be@0,0
/io-unit@f,e0200000/sbi@0,0/lebuffer@3,40000/le@3,60000
/io-unit@f,e0200000/sbi@0,0/dma@3,81000/esp@3,80000
/io-unit@f,e0200000/sbi@0,0/dma@3,81000/esp@3,80000/st
/io-unit@f,e0200000/sbi@0,0/dma@3,81000/esp@3,80000/sd
/io-unit@f,e0200000/sbi@0,0/lebuffer@0,40000/le@0,60000
/io-unit@f,e0200000/sbi@0,0/dma@0,81000/esp@0,80000
/io-unit@f,e0200000/sbi@0,0/dma@0,81000/esp@0,80000/st
/io-unit@f,e0200000/sbi@0,0/dma@0,81000/esp@0,80000/sd
<#0> ok
```

Look for the *be* node in the device paths. For the preceding example, the device boot path for the SunFastEthernet channel would be:

```
/io-unit@f,e0200000/sbi@0,0/qec@1,20000/be@0,0
```

Note – Servers must be setup prior to booting as indicated in the following step. Refer to Chapter 3 for Solaris 1.x and Chapter 4 for Solaris 2.x.

To boot from the OPB *ok* prompt, type *boot* and then the device path. In this example, board 0, slot 1:

```
<#0> ok boot /io-unit@f,e0200000/sbi@0,0/qec@1,20000/be@0,0
```

2.4 Relocating a SunFastEthernet Card (Solaris 2.x Only)

If a SunFastEthernet card is installed in an sbus slot and you later change the location of the card, then you must perform the following procedure or the driver will not be recognized within the system:

1. Use the *pkgrm* command to remove the driver SUNWbmac as shown in the following example:

```
# pkgrm SUNWbmac
```

2. Edit the file(s) */etc/path_to_inst* and */etc/name_to_major* by removing any references to the *be* channel that you are changing from.

For example:

```
# grep be /etc/path_to_inst
/io-unit@f,e0200000/sbi@0,0/qec@1.20000/be@0,0
```

and:

```
# grep be /etc/name_to_major
be 111
```

In both the above examples, the results of the *grep* command for the *be<num>* channel you are moving the card from, should be deleted.

3. Move the SunFastEthernet card to the new slot location and then reboot the system.
4. Add the SUNWbmac package using the *pkgadd* command as indicated in Section 4.2.3, “Adding SUNWbmac Using *pkgadd* Command”.

Installing SunFastEthernet Software Using Solaris 1.x



The Solaris 1 software version of the SunFastEthernet driver is supported on Solaris 1.1 (SunOS 4.1.3) and later releases. To utilize the SunFastEthernet Adapter card, the system also needs to contain OpenBoot™ PROM (OBP) level 2.3 or later. There is no restriction on the number of SunFastEthernet SBus cards that can be installed in one system. The name of the SunFastEthernet interface is “be”.

Note – Be sure and read the README file on the CD-ROM for late breaking information.

After installation of the SunFastEthernet card (see Chapter 2, “Installing the SunFastEthernet SBus Card”), you can install the software which is located on CD-ROM part number 704-4885-10.

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 3.4, “Setting Up Diskless Clients,” on page 3-16. The Section 3.3, “Installing from CD-ROM“, covers installation from a CD-ROM.

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

3.1 Hardware Requirements

Table 3-1 lists systems supported under the Solaris 1.x software versions for Sun -4m architectures:

Note – The SunFastEthernet is not supported on the SBus Expansion Subsystem under Solaris 1.x.

Table 3-1 Solaris 1.x Platform Architecture with Systems

Platform Architecture	System Type
Sun-4m	SPARCserver 630MP
	SPARCserver 670MP
	SPARCserver 690MP
	SPARCclassic
	SPARCstation 5
	SPARCstation 10
	SPARCstation 20
	SPARCstation LX

3.2 Preparing for Software Installation

Before loading the SunFastEthernet software:

- Ensure that the system is running SunOS Version 4.1.3 or later. 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 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 1 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 500kbytes 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`.

3.3 Installing from CD-ROM

3.3.1 Access to Remote CD-ROM

If the CD-ROM player 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 that follow.

3.3.2 Using *cdm*

When installing the SunFastEthernet 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`.

3.3.3 Mounting the CD-ROM

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

```
hostname # mkdir /cdrom
hostname # mount -r /dev/sr0 /cdrom
```

For a remote machine enter the following:

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

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

```
hostname # cd /cdrom
```

3.3.4 Install Script Using cdm

3. **Enter ./cdm at a shell prompt. You will then 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 then see the following display:

```
Applications available:
  1. SBus Quad Ethernet Controller Driver
  2. SunFastEthernet Driver
Please enter a number or q to quit:
```

5. Enter 2 to select SunFastEthernet.

You will then see the following display:

```
* "SunFastEthernet" Driver 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 then see the following display:

```
Begin installation now?
```

7. Enter y to begin installation.

You will then see the following display:

Executing installation file...

The following product will be installed:

Product Name: 1.1 FCS SunFastEthernet and
SBus Quad Ethernet Controller Driver
Sun Platforms: Sun-4m SUNBIN
Media type/format: CD-ROM (UFS file system format) 1 of 1
Part Number: 258-4882
Compatible with the Solaris(R) 1.1, 1.1.1, and 1.1.2 releases

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

```
extract_unbundled : Extracting Installation Scripts

extract_unbundled : Begin Install Script Execution
Invoking /usr/tmp/unbundled/install_BQE; log file is
/usr/tmp/unbundled/1.0_BQE.log
```

9. The script will then query: *Do you want to see a description of this installation script [y/n]?*

Follow by entering *n*. You will then see the following display:

```
Install the SunFastEthernet driver.
```

```
Installation should take approximately 2 minutes.
```

```
Here is the Current Free Disk space:
```

Filesystem	kbytes	used	avail	capacity	Mounted on
/dev/sdla	30807	3854	23873	14%	/
/dev/sdlg	185351	162989	3827	98%	/usr
/dev/slld	276263	3725	244912	1%	/export
/dev/sdle	45959	16401	24963	40%	/export/swap
/dev/sdlh	323735	10	291352	0%	/home
/dev/sdlf	37863	131	33946	0%	/var

```
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 then see the following display:

```
The destination directory for SunFastEthernet is: /export/exec
a sun4/BQE/install/install_bqe 25 blocks
a sun4/BQE/install/deinstall_bqe 8 blocks
a sun4/BQE/usr/bin/be_speed 208 blocks
a sun4/BQE/usr/man/man4/be.4s 17 blocks
a sun4/BQE/usr/man/man4/qe.4s 16 blocks
a sun4/BQE/usr/man/man4/qec.4s 6 blocks
a sun4/BQE/4.1.3/sys/sunif/if_bmac.h 19 blocks
a sun4/BQE/4.1.3/sys/sunif/if_bqe.h 15 blocks
a sun4/BQE/4.1.3/sys/sunif/if_mace.h 17 blocks
a sun4/BQE/4.1.3/sys/sunif/if_qec.h 28 blocks
a sun4/BQE/4.1.3/sys/sun4m/OBJ/if_bqe.o 57 blocks
a sun4/BQE/4.1.3/sys/sun4m/OBJ/if_qec.o 9 blocks
a sun4/BQE/4.1.3_U1/sys/sunif/if_bmac.h 19 blocks
a sun4/BQE/4.1.3_U1/sys/sunif/if_bqe.h 15 blocks
a sun4/BQE/4.1.3_U1/sys/sunif/if_mace.h 17 blocks
a sun4/BQE/4.1.3_U1/sys/sunif/if_qec.h 28 blocks
a sun4/BQE/4.1.3_U1/sys/sun4m/OBJ/if_bqe.o 58 blocks
a sun4/BQE/4.1.3_U1/sys/sun4m/OBJ/if_qec.o 9 blocks
Software successfully extracted.
4.1.3_U1
```

Note – The install script assumes you have assigned the hostname for the SunFastEthernet. 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.

11. The script will then query:

What host name do you wish to use for be0 [Don't Configure]:

Respond by typing the assigned hostname. If there is more than one hardware device installed the script will then query: *What host name do you wish to use for be1 [Don't Configure]:*, and so on until the script has prompted

you for a hostname for every SunFastEthernet hardware device installed. Once all devices have been given a hostname, you will then see the following display:

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

- 12. The default is *n*, if you want to change the official hostname respond by entering *y*.**
Once the hostname is changed or the default *n* is selected, you will then 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!
    Then you must halt the system and reboot using the new
    kernel.
```

- 13. The script will then query: *Do you wish to continue with this script (y/n) [y]:***
Enter *y* to continue. The script will then 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 then see the following prompt:

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


If you want to change the *new system config file* from the default [BQE], then enter the new file name now or press RETURN to accept the default.

You will then see the following display:

```

File protection on files and BQE adjusted ....
Doing a "make depend"

/etc/config BQE  run successfully ....

Issuing make ...

cc -sparc -c -O -Dsun4m -DGENERIC -DSUN4M_35 -DSUN4M_50 -
DSUN4M_690 -DWINSVJ -DVDDRV -DASYNCHIO -DLWP -DVFSSTATS -DRFS -
DCRYPT -DTCPDEBUG -DIPCshmEM -DIPCSEMAPHORE -DIPCMESSAGE -
DSYSAUDIT -DSYSACCT -DPCFS -DHSFS -DTMPFS -DTFS -DLOFS -
DNFSSERVER -DNFSCLIENT -DUFSS -DQUOTA -DINET -DMULTIPROCESSOR -
DKERNEL -I. -I.. -I... ..../netinet/in_proto.c
cc -sparc -c -O -Dsun4m -DGENERIC -DSUN4M_35 -DSUN4M_50 -
DSUN4M_690 -DWINSVJ -DVDDRV -DASYNCHIO -DLWP -DVFSSTATS -DRFS -
DCRYPT -DTCPDEBUG -DIPCshmEM -DIPCSEMAPHORE -DIPCMESSAGE -
DSYSAUDIT -DSYSACCT -DPCFS -DHSFS -DTMPFS -DTFS -DLOFS -
DNFSSERVER -DNFSCLIENT -DUFSS -DQUOTA -DINET -DMULTIPROCESSOR -
DKERNEL -I. -I.. -I... ..../netinet/tcp_debug.c
cc -sparc -c -g -Dsun4m -DGENERIC -DSUN4M_35 -DSUN4M_50 -
DSUN4M_690 -DWINSVJ -DVDDRV -DASYNCHIO -DLWP -DVFSSTATS -DRFS -
DCRYPT -DTCPDEBUG -DIPCshmEM -DIPCSEMAPHORE -DIPCMESSAGE -
DSYSAUDIT -DSYSACCT -DPCFS -DHSFS -DTMPFS -DTFS -DLOFS -
DNFSSERVER -DNFSCLIENT -DUFSS -DQUOTA -DINET -DMULTIPROCESSOR -
DKERNEL -I. -I.. -I... ..../os/init_dbx.c
cc -sparc -c -O -Dsun4m -DGENERIC -DSUN4M_35 -DSUN4M_50 -
DSUN4M_690 -DWINSVJ -DVDDRV -DASYNCHIO -DLWP -DVFSSTATS -DRFS -
DCRYPT -DTCPDEBUG -DIPCshmEM -DIPCSEMAPHORE -DIPCMESSAGE -
DSYSAUDIT -DSYSACCT -DPCFS -DHSFS -DTMPFS -DTFS
(deleted for brevity)
loading vmunix
rearranging symbols
text  data  bss  dec  hex
1531904 463064 215088 2210056 21b908

'make' ran successfully ....

```

Followed by:

```
*****  
The SunFastEthernet has been successfully installed.  
  
To use the new kernel, do the following:  
  
    # mv vmunix vmunix.org  
    # mv vmunix.bqe vmunix  
    # /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.org* in the above example. Thus, type: *boot vmunix.org*.

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
```

3.3.5 SunFastEthernet Directories

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

Table 3-2 `/export/exec/sun4/BQE` Subdirectories

Subdirectory	Description
4.1.3/sys 4.1.3_u1/sys	Kernel and system configuration files
install	Product specific installation scripts
usr/bin	Utilities
usr/man	Product manual pages

3.3.6 Installation Verification

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

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

```
hostname # netstat -ia
Name      Mtu  Net/Dest  Address  Ipkts  Ierrs  Opkts  Oerrs  Collis  Queue
leo       1500  mtnview-en  avon     197315  0      160609  0      3       0
beo       4428  mtnview-en  avon-bf0 184858  0      177808  0      0       0
be1*     4428  mtnview-en  avon-bf1 0        0      0        0      0       0
leo       1536  loopback   localhost 11418  0      11418   0      0       0
```

An asterick (*) following an interface name, such as `be1` as shown in the previous 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 be0
be0: flags=63<UP,BROADCAST,NOTRAILERS,RUNNING>
      inet <IP_address> netmask <netmask> broadcast <address>
```

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

3.4 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. This setup includes building a kernel that supports the SunFastEthernet interface.

3.4.1 Setting Up to Write to the Server's /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’s operating system, to find out how to export the /usr filesystem read/write to the diskless client.

3.4.2 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_bqe* on the client machine to configure a new kernel containing a linkable driver for the SunFastEthernet. Depending upon the size of the kernel on which you are basing the new kernel, you need about 2MB 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 3.3, “Installing from 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 you diskless client, use whatever path is right for you in place of SYS.

If you are on a SunOS 4.1.3 machine use 4.1.3 in place of OSVER, for releases later than SunOS 4.1.3 use 4.1.3_U1 in place of OSVER. Enter the following commands:

```
# cp /usr/BQE/OSVER/sys/sunif/* SYS/sunif
# cp /usr/BQE/OSVER/sys/sun4m/OBJ/* SYS/sun4m/OBJ
# cp SYS/sun4m/conf/files SYS/sun4m/conf/files.prebqe
```

Add the following lines to SYS/sun4m/conf/files:

```
#
# SunFastEthernet and SBus Quad Ethernet Controller
#
sunif/if_qec.c      optional qec
sunif/if_bqe.c     optional bqe
```

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

```
#
# SunFastEthernet and SBus Quad Ethernet Controller
#
device-driver      qec
device-driver      bqe
```

Now 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 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 interface will become the official hostname for the diskless clients. If you do not want this to happen, then use the SunFastEthernet install script to do an install on one machine and copy the changes made to */etc/rc.boot* to the other diskless clients.

Installing SunFastEthernet Software Using Solaris 2.x



This chapter describes SunFastEthernet installation requirements for Solaris 2.x software versions only.

The SunFastEthernet Adapter card is supported on most SBus based Sun-4c, Sun-4m, and Sun-4d system architectures that run under the Solaris® environment — or other compatible operating systems. To utilize the SunFastEthernet Adapter card, the system also needs to contain OpenBoot™ PROM (OBP) level 2.3 or later. An on-board FCode PROM provides configuration support that identifies the SunFastEthernet Adapter card to the system and contains selftest routines.

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

4.1 Hardware Requirements

Table 4-1 lists systems supported under the Solaris 2.x software versions for Sun-4c, -4d, and -4m architectures:

Note – The SunFastEthernet is not supported on the SBus Expansion Subsystem under Solaris 2.x.

Table 4-1 Solaris 2.x Platform Architecture with Systems Supported

Platform Architecture	System Type
Sun-4c	SPARCstation 2 SPARCstation IPX
Sun-4d	SPARCserver 1000 SPARCcenter 2000
Sun-4m	SPARCserver 630MP SPARCserver 670MP SPARCserver 690MP SPARCclassic SPARCstation 5 SPARCstation 10 SPARCstation 20 SPARCstation LX

4.2 *Solaris 2.3 Hardware: 5/94 Software Requirements*

Solaris 2.3 Hardware: 5/94 is the first Solaris 2 release supporting the SunFastEthernet. The driver for the SunFastEthernet is installed from the package SUNWbmac. You will find this package on the Solaris 2.3 Hardware: 5/94 CD. Follow the installation instructions that come with the CD.

4.2.1 *Mandatory Patch Requirements*

Patch ID number 101820-01 is required for a SunFastEthernet Adapter when used with Solaris 2.3 Hardware: 5/94 only. Contact your local Sun provider.

4.2.2 *Disk Capacity Considerations*

The Solaris 2.3 Hardware: 5/94 software is shipped on a single CD. The Solaris CD software for this distribution is divided into four software packages or clusters (see following table). The driver for the SunFastEthernet card is bundled on the *Entire Distribution plus OEM Support* cluster which

automatically installs SUNWbmac. If disk space is a concern, and you choose to install another cluster, use the *pkgadd* command to add the SunFastEthernet driver as described in the following procedure:

Table 4-2 Solaris 2.3 Hardware: 5/94 CD

Cluster	Size
Entire Distribution plus OEM Support	298.80 MByte
Entire Distribution	298.1 MByte
End User System Support	125.37 MByte
Core System Support	59.88 MByte

4.2.3 Adding SUNWbmac Using *pkgadd* Command

1. Verify that SUNWbmac is not already installed by typing the following at the prompt:

```
# pkginfo | grep SUNWbmac
```

If no information is displayed then it is not installed.

2. Ensure that the Solaris CD is mounted (refer to your software manuals for detailed information on the use of the CD).

When the CD is started Solaris_2.3 is automatically mounted on the default path (/cdrom) as shown in the following example:

```
# cd /cdrom/sol_2_3_hw594_sparc/s0/Solaris_2.3
```

3. Use the *pkgadd* command to install the SunFastEthernet driver as follows:

```
# pkgadd -d `pwd` SUNWbmac
```

4. Verify that the driver is installed as follows:

```
# pkginfo | grep SUNWbmac
system          SUNWbmac      SunFastEthernet Device
```

5. Once you verify that the driver has been installed, proceed to the following section, “Host File Configuration”.

4.2.4 Host File Configuration

Complete the host file configuration before you install the SunFastEthernet Adapter card. By creating and configuring the system files before installing the card, you will have to reboot your system only once.

To prepare your system for the SunFastEthernet Adapter card:

- 1. Create an appropriate `/etc/hostname.be<num>` file where `<num>` refers to the number of each SunFastEthernet channel you plan to use. For example, use channel `be0` for the first card; use channel `be1` for a second card.**
 - Do not create `/etc/hostname.be<num>` files for SunFastEthernet channels you plan to leave unused. The `/etc/hostname.be<num>` file must contain the host name for the appropriate network interface.
 - The hostname should have an IP address and should be entered in `/etc/hosts`.
 - The hostname should be different from any other hostname of any other interface, for example: `/etc/hostname.le0` and `/etc/hostname.be0` cannot share the same hostname.
 - Following is an example of the `/etc/hostname.be<num>` files required for a machine called *zardoz* that will be known as *zardoz-11* and *zardoz-12* on the nets connected to the *be0* and *be1* Ethernet interfaces.

```
zardoz# cat /etc/hostname.be0
zardoz-11
zardoz# cat /etc/hostname.be1
zardoz-12
```

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

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

Once `/etc/hostname.be<num>` files and `/etc/hosts` files are created/updated:

3. Halt the system using the `shutdown -i0` command.
4. Once the system has been halted, proceed to Chapter 2, “Installing the SunFastEthernet SBus Card”.

4.3 Solaris 2.3 Hardware: 8/94 Software Requirements

Solaris 2.3 Hardware: 8/94 is the second Solaris 2 release supporting the SunFastEthernet. The driver for the SunFastEthernet is installed from the package SUNWbmac. You will find this package on the Solaris 2.3 Hardware: 8/94 CD. Follow the installation instructions that come with the CD.

The Solaris 2.3 Hardware: 8/94 software is shipped on a single CD. The CD software for this distribution is divided into five software packages or clusters (see following table). The driver for the SunFastEthernet Adapter (SUNWbmac) is bundled on the “*Entire Distribution plus OEM Support*” cluster which automatically installs the driver SUNWbmac. In this instance you should then proceed directly to Chapter 2, Section 2.2, “Testing the SunFastEthernet Adapter Card Before Booting the System”.

For the “*Entire Distribution*”, “*Programmer*” and “*End User Support*” clusters, the driver is installed only if SunFastEthernet Adapter hardware is installed in the system. If this is the case (hardware already installed) then proceed to Chapter 2, Section 2.2, “Testing the SunFastEthernet Adapter Card Before Booting the System”.

Table 4-3 Solaris 2.3 Hardware: 8/94 CD

Cluster	Size
Entire Distribution plus OEM Support	298.80 MByte
Entire Distribution	298.1 MByte
Programmer	220Mbyte
End User System Support	125.37 MByte
Core System Support	59.88 MByte

If SunFastEthernet hardware *was not installed* when the Solaris 2.3 Hardware: 8/94 software distribution was installed using one of the last four clusters, then the driver is not automatically installed via suninstall, instead, the driver must be installed using the *pkgadd* command. Refer to Section 4.2.3, “Adding SUNWbmac Using pkgadd Command,” on page 4-3”.

4.3.1 Net-Install Servers

Note – The Solaris CD cannot be used to do a net-install (read only), thus the following section is applicable only when the Solaris CD image is archived to a disk.

To allow net-install over the *be* interface the *be* minor-device- number must be added to your particular architecture’s *name_to_major* file. To determine the *be* minor-device-number proceed as follows:

1. Determine the directory where the Solaris CD image is loaded.

For example, if the Solaris software is located within a directory named DIR, then type the following:

```
# cd DIR/export/exec/kvm
```

2. Use the *ls* command to list the directory contents.

Different directories for supported architectures will be listed.

3. Use the `cd` command and go to the directory containing your particular architecture.
4. Type the following line to get a listing for the minor device number for the `be0` device:

```
# ls -l devices/pseudo/clone@0:be
```

The resultant listing will have the following format:

```
crw-rw-rw 1 root sys 11,<minor-device number> <date>  
/devices/pseudo/clone@0:be
```

5. For the above example the minor-device-number should be added to the `etc/name_to_major` file as follows:

```
be <minor-device-number>
```

4.3.2 Diskless Clients

For support of diskless client booting do the following:

1. Go to your clients root partition and use your favorite editor to add an entry for the `be` device to your clients `name_to_major` file as follows:

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

2. Edit the `name_to_major` file by adding an entry for the `be` device.
If the major device number for the last file entry is “*n*” then use “*n+1*” for the `be` channel major device number. As shown in the example, if the last entry is `qe 104` then use `be 105`.

```
qec 103  
qe 104  
be 105
```

3. Copy *be* driver to clients root partition as follows:

```
# cd /export/root/<client name>/kernel/drv
```

then:

```
# cp /kernel/drv/be .
```

4.4 *Solaris 2.4 Hardware: 11/94 Software Requirements*

Note – The patch described in the following paragraph is mandatory for Solaris 2.4.

You can find the Solaris 2.4 software for the SunFastEthernet adapter card on the Solaris 2.4 Hardware: 11/94 Software CD. In addition, you must also install patch ID # 102001-03 located on the SMCC Updates CD. Refer to the patch *README* file for instructions on installing the patch.

Network Linkups/Speed Selection

5 

The information presented in this chapter is applicable to both Solaris 1.x and 2.x software versions.

5.1 Network Link Ups

5.1.1 10/100Mbps Link Up Using RJ45 Connector

If your SunFastEthernet channel is connected to a 10 or 100Mbps network through the RJ45 connector you will receive a *Link Up* message whenever you boot the system or disconnect and then reconnect to the network.

For 10Mbps the message is:

```
# be<num>: Using Onboard Transceiver  
10 Mbits/sec Link Up
```

For 100Mbps the message is:

```
# be<num>: Using Onboard Transceiver  
100 Mbits/sec Link Up
```

Note – If you do not see a “10 or 100Mbps/sec Link Up” message, then the link is down and the probable cause could be a disconnected cable, transceiver or hub.

5.1.2 10/100Mbps Link Up Using MII interface Connector

If your SunFastEthernet channel is connected to a 10 or 100 Mbps network through the MII interface connector you will receive a *Link Up* message whenever you boot the system or disconnect and then reconnect to the network.

For 10Mbps the message is:

```
# be<num>: Using External Transceiver
10 Mbits/sec Link Up
```

For 100Mbps the message is:

```
# be<num>: Using External Transceiver
100 Mbits/sec Link Up
```

Note – If you do not see a “10 or 100Mbps/sec Link Up” message, then the link is down and the probable cause could be a disconnected cable, transceiver or hub.

5.1.3 Link Integrity Test

The link integrity test feature is always enabled on SunFastEthernet cards. The link integrity test feature is a requirement of the IEEE 10Base-T standard. The purpose of the test feature is to enable a 10Base-T node to detect a link failure. The standard requires that on a periodic basis, each station on the net transmit link pulses whenever it is *not* transmitting valid packets. Sampling the link pulses, the receiver will assume that the network connection (link) is intact and assumes a link pass state.

5.2 Speed Selection

If you receive the following messages after connecting to a 10 or 100Mbps network then more than likely the external hub and the SunFastEthernet are out of sync. In these instances speed selection may be done manually using the *be_speed* utility as indicated in the procedure that follows:

```
# be<num>: 100 Mbps Link Up
Link Down
10 Mbps Link Up
Link Down
```

This utility is available in the directory `/usr/sbin` only if patch ID 101820-01 is installed. This patch is mandatory for the Solaris 2.3 Hardware: 5/94 release; for the Solaris 2.x Hardware: 8/94 release the patch is needed only if the *be_speed* utility is required.

To use the utility for Solaris 1.x, type the following at the prompt:

```
# /usr/bin/be_speed be<num> <arguments>
```

To use the utility for Solaris 2.x, type the following at the prompt:

```
# /usr/sbin/be_speed be<num> <arguments>
```

Wherein *<num>* is the SunFastEthernet Adapter card number and the arguments are:

- auto (automatic speed selection)
- 100 (forces 100 Mbps mode)
- 10 (forces 10 Mbps mode)

If no arguments are selected then the current mode (auto or forced) and speed (10 or 100Mbps) of the interface will be printed.

Interface Signals



Table A-1 lists SBus interface signals and their corresponding pin numbers.

Table A-1 SBus Interface Signals

Pin No.	Description	Pin No.	Description	Pin No.	Description
1	GND	16	INT (4)*	31	PA (4)
2	BR*	17	D (19)	32	LERR*
3	SEL*	18	D (21)	33	PA (6)
4	INT (1)*	19	D (23)	34	PA (8)
5	D (0)	20	INT (5)*	35	PA (10)
6	D (2)	21	D (25)	36	ACK (0)*
7	D (4)	22	D (27)	37	PA (12)
8	INT (2)*	23	D (29)	38	PA (14)
9	D (6)	24	INT (6)*	39	PA (16)
10	D (8)	25	D (31)	40	ACK (1)*
11	D (10)	26	SIZ (0)	41	PA (18)
12	INT (3)*	27	SIZ (2)	42	PA (20)
13	D (12)	28	INT (7)*	43	PA (22)
14	D (14)	29	PA (0)	44	ACK (2)*
15	D (16)	30	PA (2)	45	PA (24)

Table A-1 SBus Interface Signals (Continued)

Pin No.	Description	Pin No.	Description	Pin No.	Description
46	PA (26)	63	D (17)	80	+5V
47	DP	64	+5V	81	PA (7)
48	-12V	65	D (18)	82	PA (9)
49	CLK	66	D (20)	83	PA (11)
50	BG*	67	D (22)	84	GND
51	AS*	68	GND	85	PA (13)
52	GND	69	D (24)	86	PA (15)
53	D (1)	70	D (26)	87	PA (17)
54	D (3)	71	DA (28)	88	+5V
55	D (5)	72	+5V	89	PA (19)
56	+5V	73	D (30)	90	PA (21)
57	D (7)	74	SIZ (1)	91	PA (23)
58	D (9)	75	RD	92	GND
59	D (11)	76	GND	93	PA (25)
60	GND	77	PA (1)	94	PA (27)
61	D (13)	78	PA (3)	95	RST*
62	D (15)	79	PA (5)	96	+12V

Table A-2 lists SunFastEthernet Adapter Media Independent Interface signals and their corresponding pin numbers.

Table A-2 SunFastEthernet Adapter Media Independent Interface Signals (Ultra DB40)

Pin Number	Description	Pin Number	Description
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

SunFastEthernet Adapter Card Specifications



B.1 Performance Specifications

Table B-1 Performance Specifications

Feature	Specification
SBus Clock	12.5MHz to 25MHz
Max SBus Burst Transfer Rate	12.5Mbytes/sec
Max Ethernet Transfer Rate	10/100Mbps
SBus Data/Address Lines	D <31:0>/PA <18:0>
SBus Modes	Master/Slave
Capacitance per SBus Signal Line	≤20 pF
SBus Parity	Yes
SBus Version	Conforms to IEEE 1496
SBus Burst Sizes	16/32/64

B.2 Power Specifications

Table B-2 Power Specifications

Specification	Measurement
Power Dissipation	9.5 Watt max.
Voltage Tolerance	+/- 5%
Ripple	≤ 100 mV
Operational Current	5V, 2.0 Amps

B.3 Physical Dimensions

Table B-3 Overall Physical Dimensions

Dimension	Measurement
Length	5.78 in. (147.70 mm)
Width	3.3 in. (83.82 mm)
Weight	5.52 oz. (158g)

B.4 Environmental Specifications

Note – Specifications shown are for Sun Fast Ethernet Adapter Card in SPARCstation 10.

Table B-4 Environmental Specifications

Condition	Operating Specification	Storage Specification
Temperature	0 to 40 ⁰ C	-40 to 75 ⁰ C
Relative Humidity	5 to 85% RH, 40 ⁰ C non-condensing	95% RH, 40 ⁰ C non-condensing
Shock	8 G's, 11 msec	25 G's, 11 msec
Vibration, peak acceleration	.35 G's, 5 - 500 Hz	1.25 G's, 5 - 500 Hz

Running Diagnostics



Note – The SunFast Ethernet Adapter is not supported in Sundiag for Solaris 1.x.

The tests available for this device consist of a selftest and SunDiag.

C.1 Selftest

The SunFastEthernet selftest is a test that verifies correct operation of the SBus card. The selftest consists of a suite of tests that reside in the FCcode PROM on the card. The code is written in Forth programming language and can only be run under OBP version 2.3 or later.

The SunFastEthernet Selftest does not automatically run after power on or reset, but can be invoked by the user as necessary to acquire status of the hardware.

As a Sun SPARCstation machine is powered up, the following banner will appear. Check that the PROM version is 2.3 or later. If the system is set up to automatically boot, press key combination L1-A to stop it. If the system is not already at the *ok* prompt, select *n* for the new command mode to get to the *ok* prompt.

```
SPARCstation 2, Type 4 keyboard
Rom Rev 2.4, 16MB memory installed
Ethernet address 8:0:20:8:42:7, Host ID 51000007

Type b (boot), c (command), n (new command)
>n
ok
```

To check that the system has a SunFastEthernet Adapter card installed and in which SBus slot, look for the *be* device in the following command:

```
ok show-devs
...
/sbus@1,f8000000/qec@1,20000/be@0,0
...
ok
```

To display the OBP set of environment variables, type the following command:

```
ok printenv
selftest-#megs      1
...
auto-boot?          true
...
fcode-debug          false
...
ok
```

To change an OBP environment variable, for example *auto-boot?* to *false*, use the *setenv* command as follows, then type *reset* for the change to take effect:

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

To browse the OBP device tree, use the *cd* command to get to a specific working directory, and *words* to find all the Forth words available in that directory:

```
ok cd /sbus/qec@1,20000/be
ok words
read      write      load      close
open      seek       reset     selftest
ok
```

To examine the definition of a word, use the *see* command as follows:

```
ok see selftest
: selftest
  (ffd988d0) (ffd98c28) (ffd99564) (ffd98c60) swap (ffd5fb9c)
(ffd988d0)
  if
    (ffd995ec)
  else
    -1
  then
;
ok
```

For more information on using the OBP commands, refer to the Open Boot Command Reference manual, part no. 800-6076-11.

C.1.1 Selftest Description

The Selftest can be invoked from the *ok* prompt on a Sun machine that has OBP 2.x or later as follows:

1. Set the diag-switch to true.

At the *ok* prompt type:

```
ok setenv diag-switch? true
```

Note – If the diag switch is not set to true reduced tests are run.

```
ok test /iommu/sbus/qec/be@0,0
Qe register test--succeeded
Internal loopback test--succeeded
Transceiver check -- 100 mbps Link Down, 10 mbps Link Up, passed.
Tx/Rx enable/disable test--succeeded
Frame counter test--succeeded
Address detection test--succeeded
Address hash test--succeeded
ok
```

2. Set the diag-switch to false.

At the *ok* prompt type:

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

As each test is executed, the resulting status of either *pass* or *fail* will be displayed. The tests will be run sequentially that will stop when any test encounters an error. A description of each test is given in the following sections.

C.1.1.1 Register Test

This test performs write, read, and compare on the QEC, bmac, and transceiver registers. The test will then issue a reset to make sure that the appropriate register contents are reset.

C.1.1.2 Internal Loopback Test

This test will check the internal loopback data path.

C.1.1.3 Transceiver Test

This test will check the onboard transceiver connection and the link status.

C.1.1.4 Tx/Rx Enable/Disable Test

This test will verify that the Tx and Rx state machines work properly when disabled or enabled.

C.1.1.5 Frame Counter Test

This test will verify the Rx Frame, Length Error, and FCS Error counters. The test will also verify the counter expiration status. Rx Frame can be tested by sending good packets, Length Error can be tested by sending packets with length exceeding max size, and FCS Error can be tested by sending packets without FCS.

C.1.1.6 Address Detection Test

This test will verify the broadcast addressing mode, promiscuous modes, and filter my own packet mode.

C.1.1.7 Address Hash Test

This test will verify the address hash table logic.

C.1.2 Debug using Selftest

For debugging under selftest refer to “Writing FCode Programs, Revision A, November 1993” (Sun Part Number 801-5123-10).

C.2 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 a beX channel the .usertest file must be edited before bringing up Sundiag as described in the following section.

C.2.1 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 be0 interface; for multiple channels add an additional line for each channel using be1, be2 etc.:

```
be0, nettest, IF=be0 v
```

Because testing the SunFastEthernet card is user defined, default options are not displayed in Sundiag. Test options for a beX 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]
```


C.2.2 The Sundiag Window

Note – The SunFast Ethernet Adapter is not supported in Sundiag for Solaris 1.x.

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 C-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.

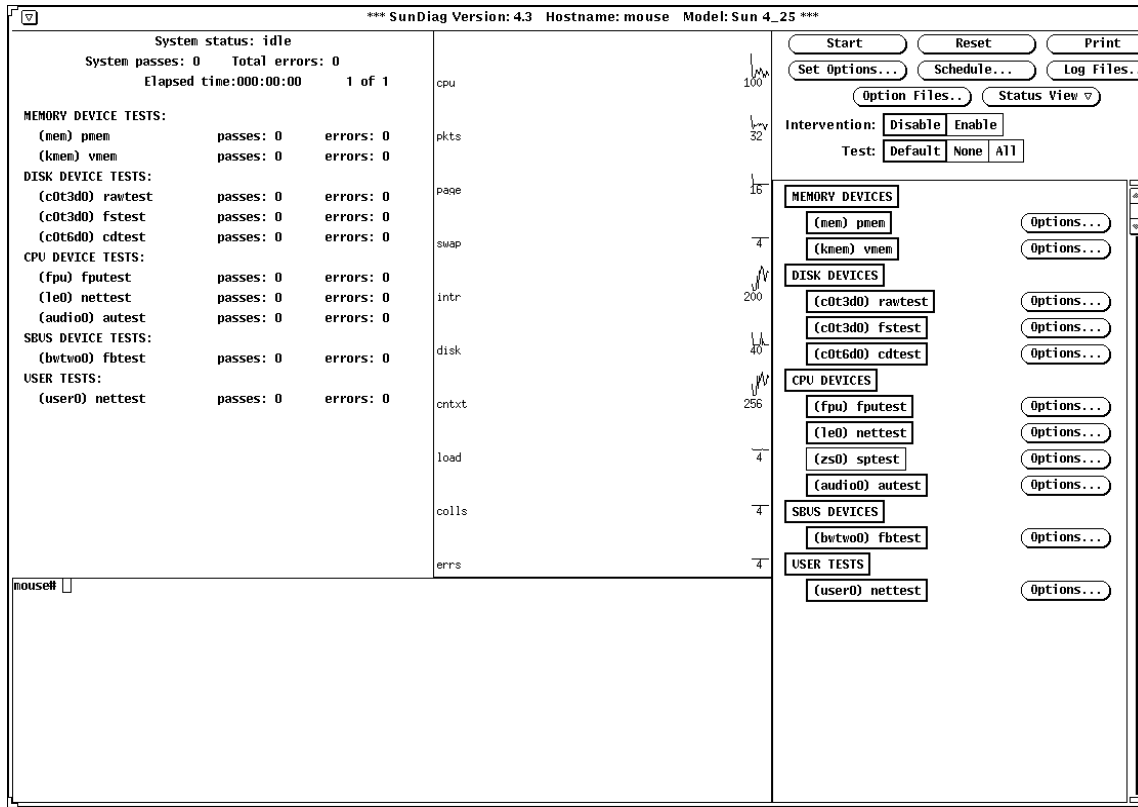


Figure C-1 Sundiag Window

C.2.3 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 card is ready for operation in your system. Click on the *Quit* button to exit Sundiag.

Solaris 2.x Driver Performance Tuning



If your system is a server which serves clients with heavy traffic and you experience numerous RPC errors, you may fine tune your system for performance by changing the buffer default settings in the `/etc/system` file as follows.

Table D-1 depicts the buffer default settings; each buffer requiring 1.5 kbyte of memory.

Table D-1 Buffer Default Settings

Buffer	Quantity	Description
benbufs	256	Number of free buffers for Tx and Rx
berpending	32	Number of Rx descriptors
	288	Total number of buffers allocated

Go to the `/etc/system` file and change the buffer default values to the recommended values as follows:

```
# set be:benbufs=1024
# set be:berpending=64
```

Note - The maximum setting for *berpending* is 248

Console Messages (Solaris 1.x Only)



The SunFastEthernet software can output the messages listed below. Each message is accompanied by an explanation and/or workaround.

Some of the messages indicate normal operation of the product, while others indicate an error condition. In the latter category, certain messages indicate a transitory condition, while others indicate a condition fatal to the operation of the SunFastEthernet device.

```
be<num>: Cannot find 100Mbit tcvr, using 10Mbit
```

The device cannot find a 100 Mbps transceiver and is switching to 10 Mbps mode.

```
be<num>: Cannot free unit -- still running
```

An attempt was made to unload the driver when the interface was still up. Use *ifconfig be<num> down* to bring the interface down before unloading the driver.

```
be<num>: Cannot reset
```

Cannot reset the device. This is most likely due to a bad device.

```
be<num>: No carrier-cable problem or hub link test disabled?
```

The *no carrier* portion of this message indicates that the device may have lost the carrier detect signal. The driver has a test feature that verifies the Ethernet cable connection between the device and the Ethernet hub. In order for this feature to function correctly, the Ethernet hub must support the link test feature and it must be turned on in the hub. If the hub doesn't support the link test or if the link test is disabled in the hub, you will see this error message during the system boot.

The *cable problem or hub link test disabled* portion of this message indicates possible cable problems. Check the cable, if no cable problem can be found then check for a link integrity mismatch. If there is a link integrity mismatch, you may enable the link test feature in your Ethernet hub (usually by turning a switch on), or you may disable the link test in your SPARC system.

To enable/disable the link test: at the OBP's *ok* prompt enter the OBP command *help ethernet* and then press RETURN to receive more information.

```
be<num>: No transceiver found!
```

The device did not find a transceiver. Check cabling and the transceiver.

```
be<num>: SBus rx derror ack
```


and

```
be<num>: SBus tx derror ack
```

The DMA engine encountered an error which indicates a potential hardware or driver problem.

```
be<num>: SBus rx late error
```

```
be<num>: SBus tx late error
```

```
be<num>: SBus rx parity error
```

and

```
be<num>: SBus tx parity error
```

The DMA engine encountered an error which typically indicates a hardware problem.

```
be<num>: bechanstop: global reset failed
```

```
be<num>: bechanstop: gec init failed
```

and

```
be<num>: bechanstop: TDMD did not clear
```

These errors indicate a hardware failure. The device is most likely bad.

```
be<num>: bqeallocthings: Not enough system memory
```

The driver cannot allocate sufficient memory for resources. These messages occur when attempting to load the driver. You will be unable to load the driver until sufficient memory becomes free. Terminating unnecessary processes or unloading unused drivers are ways to free memory.

```
be<num>: bqeallocthings: berpending and qerpending are too large
```

The values for the berpending and qerpending combined are too large. This should not happen unless you try to adjust these values. Reduce the values until the driver will load.

```
be<num>: bqeread: mbuf alloc failed
```

There is a resource shortage in the operating system most likely due to the system being too busy. As a result, a received packet has been dropped. This condition should be transitory.

```
be<num>: beinit failed: out of buffers
```

The driver could not allocate enough receive buffers for the interface. The interface will not be usable.

```
be<num>: beinit: unit not on the list
```

and

```
be<num>: bestart: unit not on the list
```

An invalid device unit number was passed into the specified routine. This

error is usually symptomatic of trouble elsewhere in the operating system.

```
be<num>: map_regs for qec per-channel reg failed
```

```
be<num>: map_regs for bmac reg failed
```

```
be<num>: map_regs for bmac transceiver reg failed
```

and

```
be<num>: mb_nmapalloc for QMD and buffers failed
```

The driver cannot allocate sufficient address space for resources. These messages occur when attempting to load the driver. You will be unable to load the driver until sufficient address space becomes free. Unloading unused drivers is one way to free up address space.

```
be<num>: out of tmds - packet dropped
```

The driver has run out of transmit message descriptors needed to queue a packet to the device and discarded the packet. This error usually indicates that the upper protocol layers are generating packets faster than the driver can transmit them on the Ethernet and is usually selfcorrecting.

```
be<num>: pkt missed/drop error
```

The device has dropped an incoming packet because it had no buffer space for it. This is most likely due to the driver being under a heavy networking load.

```
be<num>: rx crc error
```

The driver has received a packet with an incorrect checksum field.

```
be<num>: rx fifo overflow
```

Indicates that the device receive FIFO has overflowed. This is most likely due to the system being under a heavy load.

```
be<num>: rx framing/alignment error
```

The driver has received a packet containing a noninteger multiple of eight bits and there was a CRC error.

```
be<num>: rx late collision error
```

A packet collision has occurred after the channel's slot time has elapsed. This error usually indicates faulty hardware elsewhere on the net.

```
be<num>: rx pkt buff error
```

Indicates that the buffer posted to the device was smaller than the actual packet received. This error is usually symptomatic of trouble in the operating system or driver.

```
be<num>: rxmac did not reset
```

Cannot reset the receiver state machine. This is most likely due to a bad device

```
be<num>: tx chained packet descriptor error
```

The DMA engine encountered a packet that it did not own during the

transmission of a chained packet. This indicates a problem in the driver. The device will reset itself and continue normal operation.

```
be<num>: tx babble
```

A packet larger than 1518 bytes was passed to the device. This indicates an error in the driver.

```
be<num>: tx fifo underflow
```

Indicates that the device transmit FIFO has underflowed. This is most likely due to the system being under a heavy load.

```
be<num>: tx jabber
```

Indicates that the device attempted to transmit for an excessive time period. This is most likely due to a bad device or transceiver.

```
be<num>: tx late collision error
```

A packet collision has occurred after the channel's slot time has elapsed. This error usually indicates faulty hardware elsewhere on the net.

```
be<num>: tx retry error
```

The driver tried to retransmit the packet 16 times without any success. The packet is dropped. This could be caused by a bad cable, bad transceiver, or a very busy network.

```
be<num>: txmac did not reset
```

Cannot reset the transmitter state machine. This is most likely due to a bad

device.

```
bqeattach: bad number of regs
```

The SBus card has reported an invalid number of device registers. The device may be bad, or there may be a problem in the operating system or driver.

```
bqeattach: driver has no parent
```

The driver doesn't have a parent driver. This error is usually symptomatic of trouble elsewhere in the operating system.

Revision History

Revision	Dash	Date	Comments
A	11	November 1994	Included Solaris 1.x support.

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