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# **INSTALLATION MANUAL**

**PT-SBS440A S/D SCSI-2  
FAST/WIDE Host Adapter**

**Document Number: 126A0192**

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## REVISION CONTROL

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## **NOTICE**

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## **WARNING**

THIS EQUIPMENT GENERATES, USES, AND CAN RADIATE RADIO FREQUENCY ENERGY AND, IF NOT INSTALLED AND USED IN ACCORDANCE WITH THE INSTRUCTION MANUAL, MAY CAUSE INTERFERENCE TO RADIO COMMUNICATIONS. AS TEMPORARILY PERMITTED BY REGULATION, IT HAS NOT BEEN TESTED FOR COMPLIANCE WITH THE LIMITS FOR CLASS A COMPUTING DEVICES PURSUANT TO SUBPART J OF PART 15 OF FCC RULES, WHICH ARE DESIGNED TO PROVIDE REASONABLE PROTECTION AGAINST SUCH INTERFERENCE. OPERATION OF THIS EQUIPMENT IN A RESIDENTIAL AREA IS LIKELY TO CAUSE INTERFERENCE, IN WHICH CASE THE USER, AT HIS OWN EXPENSE, WILL BE REQUIRED TO TAKE WHATEVER MEASURES MAY BE REQUIRED TO CORRECT THE INTERFERENCE.

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SBus SCSI-2 FAST/WIDE Host Adapter Installation Manual iii

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## Safety Information

This section is provided as a summary of the safety recommendations throughout this manual. Performance Technologies, Inc. (PTI) recommends that all safety precautions are followed to prevent harm to yourself or the equipment. Please follow all warnings marked on the equipment.

## Safety Precautions

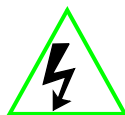
- Follow all warnings and instructions marked on the equipment.
- Ensure that the voltage and frequency of your power source matches the voltage and frequency inscribed on the equipments electrical rating label.
- Never push objects of any kind through the openings in the equipment. Dangerous voltages may be present. Conductive foreign objects could produce a short circuit that could cause fire, electrical shock, or damage your equipment.

## Symbols

The following symbols appear in this document.



**CAUTION:** There is risk of personal injury or equipment damage. Follow the instructions.



**WARNING:** Hazardous voltages are present. To reduce the risk of electric shock and danger to personal health, follow the instructions.



The product(s) described in this manual conform to the **EU 89/336/EEC Electromagnetic Compatibility Directive**, amended by **92/31/EEC** and **93/68/EEC**.

The products described in this manual are:

PT-SBS440A-S Single Ended SCSI-2 Adapter  
PT-SBS440A-D Differential SCSI-2 Adapter

The products identified above comply with the **EU 89/336/EEC Electromagnetic Compatibility Directive** by meeting the applicable EU standards as outlined in the **Declaration of Conformance**. The Declaration of Conformance is available from:

Performance Technologies, Incorporated  
315 Science Parkway  
Rochester, NY 14620 USA

or from your authorized distributor.

#### **WARNING NOTICE**

**In order to comply with the EU 89/336/EEC Electromagnetic Compatibility Directive, shielded cables must be used with both of these products.**

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**Section****1*****INTRODUCTION*****Scope**

This document provides user's information for the PT-SBS440A SBus SCSI-2 Host Adapter. Section 2 provides general information about the product. Section 3 gives information on installing the PT-SBS440A into your SPARCstation by using the supplied INSTALL software and driver to enable SunOS to use the second SCSIbus provided by the PT-SBS440A. It also includes information on installing peripherals on the SCSIbus.

**Supported Systems**

The following software architectures and systems are supported:

- SunOS 4.1.2, 4.1.3
  - SPARCstation IPC, IPX, 1+, 2, 4, 5,10, 20, LX
  - SPARCclassic
  - SPARCserver 6x0
- Solaris 2.2, 2.3, 2.4
  - SPARCstation IPC, IPX, 1+, 2, 4, 5, 10, 20, LX
  - SPARCclassic
  - SPARCserver 6x0
  - SPARCcenter 2000
  - SPARCserver 1000

## Features

The Model PT-SBS440A is an add-in SBus module that provides a second fully independent SCSI-2 port for SUNs SPARCstation line of workstations and 600/1000/2000 series multiprocessor servers. This second independent SCSIbus allows SCSI-2 Narrow/Wide (20MB/Sec.) disks and tapes to operate concurrently with the internal Sun SCSIbus subsystem at maximum efficiency.

- SCSI (Sun Common SCSI Architecture) compatible host adapter driver is fully compatible with Sun Disk (sd), Tape (st) and CD-ROM (sr) target drivers.
- Auto-Resetting TERMPWR fuse.
- Boot support under OPENproms revision 2.1 or higher.
- Supports SCSI-2 Narrow (8 bit) and Wide (16 bit) Fast data transfers (up to 20 MB/sec.).
- Supports up to 15 SCSI target devices.
- Dual Processor architecture:  
RISC Processor - Firmware  
SCSI Executive Protocol Processor
- Allows both 8 bit and 16 bit devices on the same SCSIbus.
- Tagged Command Queuing Supported Under Solaris 2.X.
- 128 KBytes of On-Board SRAM for Firmware and Command Block Storage.
- Third Generation SBus Interface support bursts up to 64 bytes.
- Differential version (PT-SBS440A-D) allows SCSI cable to extend up to 75 feet with no loss of signal quality.
- On-Board SCSIbus Monitor checks state of TERMPWR, fuse, and differential sense (DIFFSENS) every 10 seconds.
- Forced Perfect or Active (Boulay method) Termination methods insure high noise immunity in single ended applications (PT-SBS440A-S).
- ASN (Adaptive Synchronous Negotiation) dynamically adjusts data transfer rate for optimum SCSIbus performance over a wide range of cable characteristics.



- User-friendly INSTALL script configures the SunOS with minimal user intervention.

## Applicable Documents

Reference to the following documents may be useful in conjunction with this document:

- a. SCSI Implementation Guide Sun Common SCSI Architecture, Sun Microsystems, Inc. Part No. 800-4700-10
- b. Open Boot PROM Toolkit User's Guide, Sun Microsystems, Inc.
- c. ISP1000 Firmware Interface Specification. *QLogic Corporation*; 3545 Harbor Boulevard; Costa Mesa, CA 92628-5001.
- d. ISP1000 Technical Manual. *QLogic Corporation*; 3545 Harbor Boulevard; Costa Mesa, CA 92628-5001.
- e. ANSI SCSI Specification; X3.131-1986 (SCSI-1). ANSI; 1430 Broadway; New York, NY 10018.
- f. ANSI SCSI-2 Specification; X3.131-198x (SCSI-2). Global Engineering Documents; 2805 McGraw; Irvine, CA 92714.
- g. SCSI Bench Reference. ENDL Publications; 14426 Black Walnut Court; Saratoga, CA 95070.
- h. SCSI Encyclopedia. ENDL Publications; 14426 Black Walnut Court; Saratoga, CA 95070.
- i. SCSI - Understanding the Small Computer System Interface; ISBN 0-13-796855-8. Prentice Hall; Englewood Cliffs, NJ 07632.

---

Section

**2**

## ***UNPACKING and INSPECTION***

---

ELECTRONIC COMPONENTS ON MODERN PRINTED CIRCUIT BOARDS ARE EXTREMELY SENSITIVE TO STATIC ELECTRICITY. ORDINARY AMOUNTS OF STATIC ELECTRICITY GENERATED BY YOUR CLOTHING OR WORK ENVIRONMENT CAN DAMAGE ELECTRONIC EQUIPMENT. IT IS RECOMMENDED THAT, WHEN INSTALLING THE PT-SBS440A IN A SYSTEM THAT ANTI-STATIC GROUNDING STRAPS AND ANTI-STATIC MATS BE USED TO HELP PREVENT DAMAGE DUE TO ELECTROSTATIC DISCHARGE.

---

The shipping carton should be inspected for any possible damage that may have occurred during shipment. If there is any physical damage to the package you have opened, immediately contact the Shipping Carrier and/or Performance Technologies, Incorporated.

If this shipment is being received outside the United States or Canada and there is damage to the package, contact your local distributor or agent.

If there is shipping damage, failure to make an immediate claim may void any insurance coverage.

If no external damage is visible, carefully unpack contents of the shipping carton, observing anti-static precautions identified above and verify against packing list. Inspect the PT-SBS440A for any visible signs of shipping damage. If such physical damage is noted, report it immediately to Performance Technologies, Incorporated or appropriate agent. **DO NOT PROCEED** with any further configuration or installation.



---

If any damage is detected follow the Product Return Procedure described in the Appendix C.

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**Section 2** UNPACKING and INSPECTION

If no damage is visible, check that all socketed parts are firmly seated. Occasionally, parts work themselves loose or partially out of their sockets during the shipping process. Reseat any loose devices by placing the printed circuit board on a flat surface and pressing firmly down on the part. If a part has worked itself completely free of the board (a highly unlikely event) be sure to verify its position and orientation before reinsertion. Check that all mounting screws of attached assemblies are tight.

---

Section

**3**

# ***INSTALLATION***

## **Hardware Installation**

### **SPARCstation 10,20 Installation**



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The plastic board retainer on the PT-SBS440A is intended to fit against the cover and hold the SBus card in place, it is *not* a handle! Using it for board insertion or removal can break it.

---

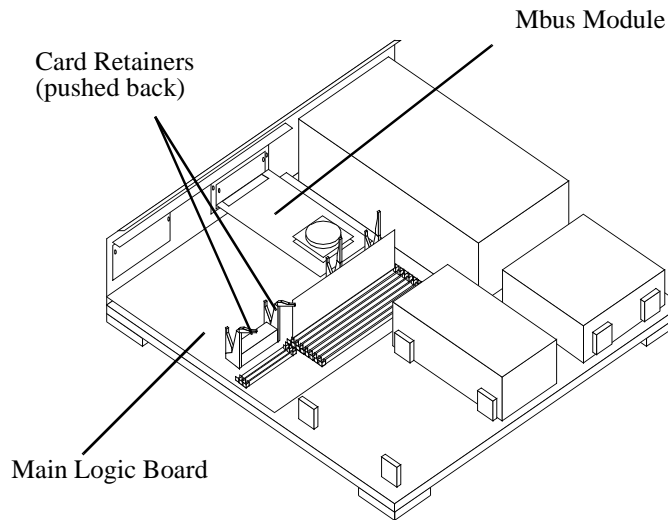
- Step 1 Power down the SPARCstation and any attached peripherals. Remove the top cover of the workstation.
- Step 2 Configure for proper SCSIbus termination. See “Termination” on page 50 for a complete description of termination issues and jumper configuration procedures.
- Step 3 Select an available slot and remove the SBus slot filler panel. It is recommended that the lowest numbered available slot is used. In this way if another board is added later the device addresses will not be effected.
- Step 4 Remove the Backplate Adapter from the PT-SBS440A Backplate.



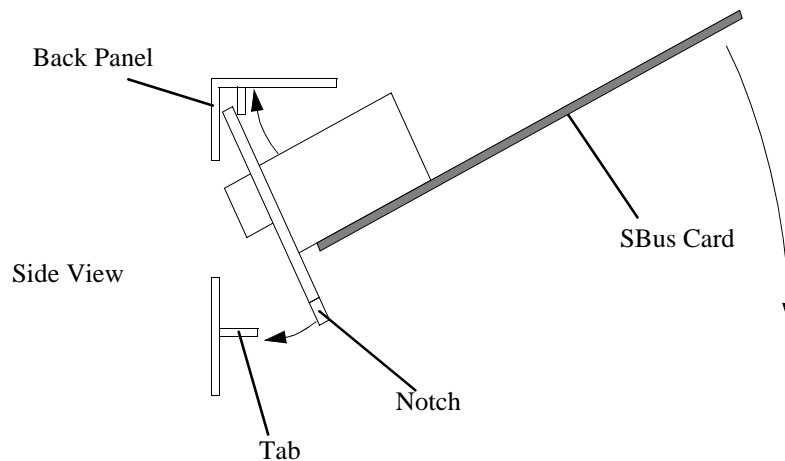
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## Section 3 INSTALLATION

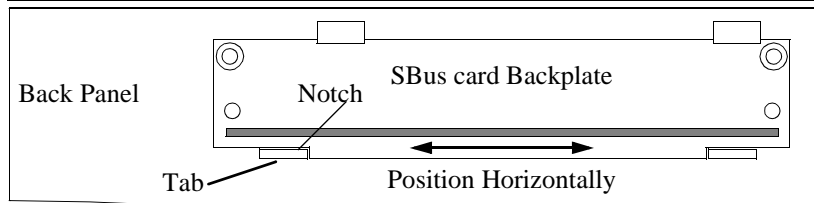
Step 5 Make sure that both retainers for the SBus slot are out of the way.



Step 6 Slide the SBus cards at an angle into the back panel of the system unit and push it against the back panel. Make sure the mounting plate on the SBus card hooks upward into the back panel of the system unit. As you swing the card down, the tabs sticking out of the back panel will align the SBus card vertically and horizontally in the back panel cutout.

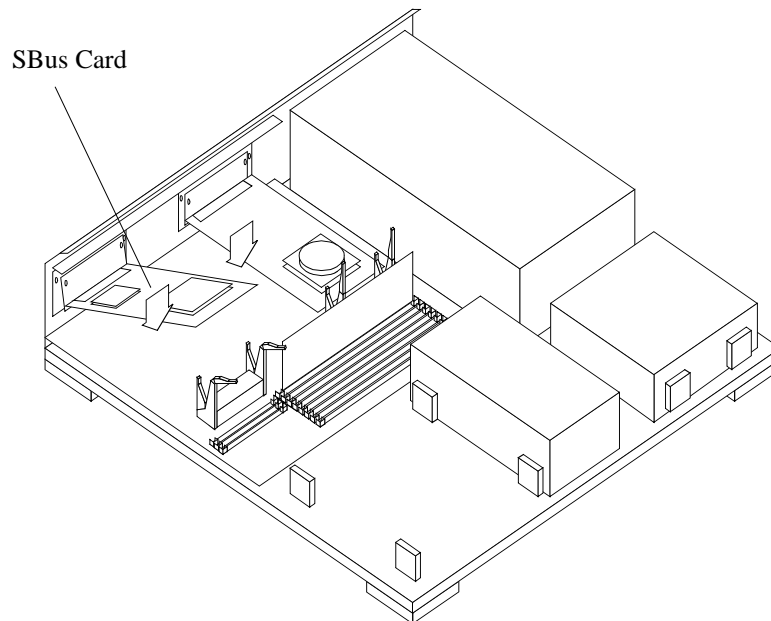


**NOTE:** If the card does not swing easily into position, make sure that the 'notches' on the SBus card line up with the tabs on the back panel by adjusting the horizontal position of the SBus card.



View from inside Chassis

- Step 7 Align the plug with the socket of the SBus slot and gently push the plug into the socket by pressing with your fingers on the corners of the SBus card.

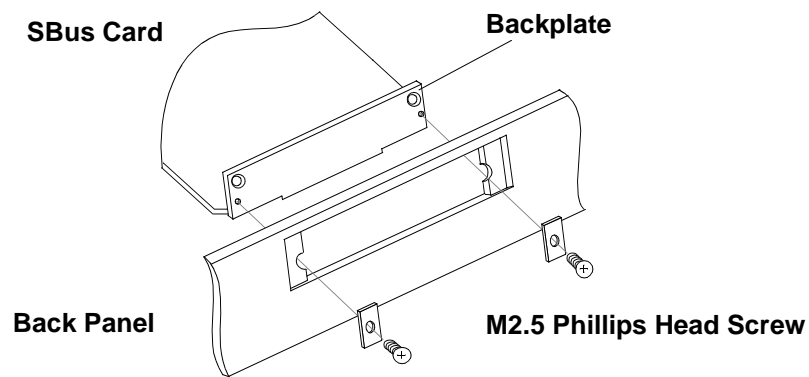


**CAUTION:** Using excessive force may bend or damage pins.

---

## Section 3 INSTALLATION

- Step 8 Lock the Arms of the card retainers on the SBus card by pushing the arms over the edge of the card.
- Step 9 Install a washer and a M2.5 Phillips Head screw into the hole adjacent to the SBus card on the rear panel each at two places. The long side of the rectangular washer should be oriented vertically.



- Step 10 Replace the top cover.
- Step 11 Re-connect any cables from the peripheral devices. When installing external SCSI devices to the PT-SBS440A, disks should be addressed as SCSI Target ID's 0 through 3, and tapes should be addressed as SCSI Target ID's 4 and 5.



Make sure that the last SCSI device on the bus is properly terminated and all devices in the middle are *NOT*!

This completes the hardware installation. At this point, power up the SPARCstation 10 and proceed to the Software Installation.

## All other SPARCstations



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The plastic board retainer on the PT-SBS440A is intended to fit against the cover and hold the SBus card in place, it is *not* a handle! Using it for board insertion or removal can break it.

---

- Step 1 Power down the SPARCstation and any attached peripherals. Remove the top cover of the workstation.
- Step 2 Configure for proper SCSIbus termination. See “Termination” on page 50 for a complete description of termination issues and jumper configuration procedures.
- Step 3 Select an available slot and remove the SBus slot filler panel. It is recommended that the lowest numbered available slot is used. This way, if another board is added later the device addresses will not be affected.



---

For the SPARCstation 1+, insert the PT-SBS440A in either SBus slot 1 or 2. Do not use slot 3 since this slot supports slave devices only. For all other SPARCstations any available slot may be used.

---

- Step 4 Install the PT-SBS440A into the SBus slot by sliding the board at an angle into the back panel, aligning the plug to the slot and gently pressing the plug into the slot by pressing on the corners of the board.
- Step 5 Replace the top cover.
- Step 6 Re-connect any cables from the peripheral devices. When installing external SCSI devices to the PT-SBS440A, disks should be addressed as SCSI Target ID's 0 through 3, and tapes should be addressed as SCSI Target ID's 4 and 5.

---

**Section 3** INSTALLATION

---

Make sure that the last SCSI device on the bus is properly terminated and all devices in the middle are *NOT*!

---

This completes the hardware installation. At this point, power up the SPARCstation and proceed to the Software Installation.

## SPARCserver Installation

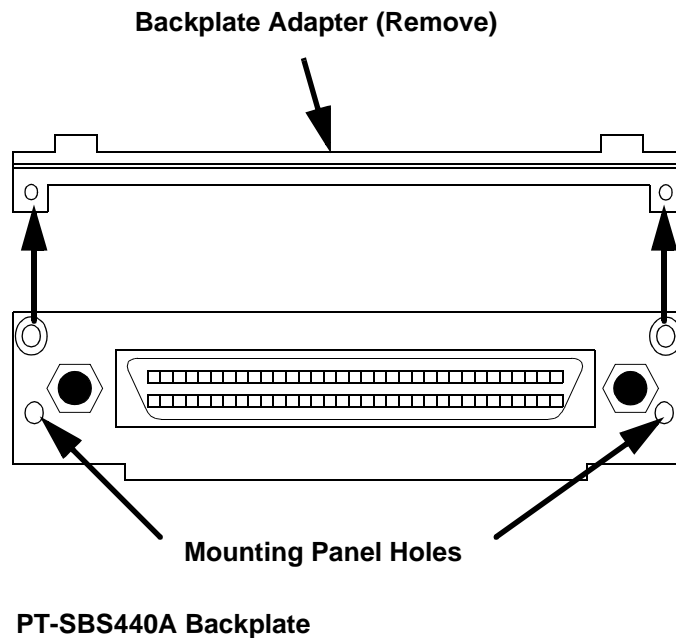
The following steps should be followed to install the PT-SBS440A into your SPARCserver:

- Step 1 Perform a system shutdown (i.e. `/etc/shutdown -h now`) after logging in as root.
- Step 2 Power down the SPARCserver and any attached peripherals.
- Step 3 Remove all the cables attached to the Main CPU board. This includes the Ethernet, Monitor and SCSIbus internal cables. Remove the Main CPU board and set it on an anti-static mat or table.

Step 4 Most SPARCstations use a pair of ears or tabs on the top edge of the Backplate to align the SBus card in its slot. The SPARCserver and SPARCstation 10 and 20 use a different mechanical design. The ears are replaced by two screws that secure the backplate to the mounting panel. To accommodate the two designs, PTI provides a small Backplate Adapter that can be removed when the tabs are not needed.

When installing the PT-SBS440A in a SPARCserver or a SPARCstation 10 or 20, remove the Backplate Adapter and use two m2.5 Phillips Head screws to secure the SBus card Backplate to the mounting panel.

**Figure 1: PT-SBS440A Backplate in a 600MP SPARCserver**

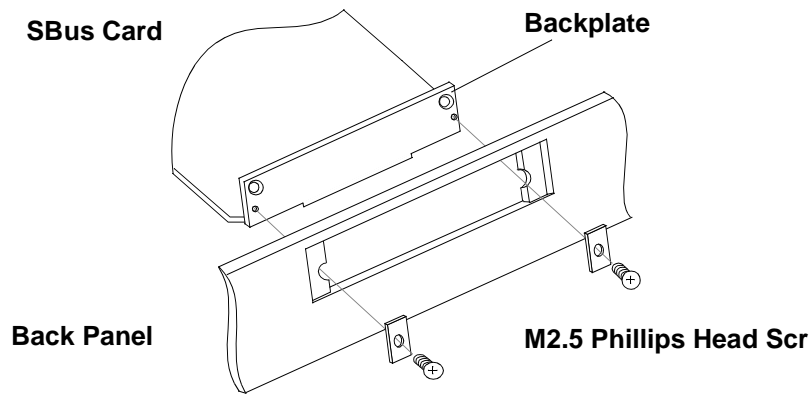


---

## Section 3 INSTALLATION

Using a Phillips screwdriver, remove the Backplate Adapter on the PT-SBS440A. This is located on the top edge of the backplate (the SCSIbus connector) on the PT-SBS440A. Also remove the plastic SBus Retainer located over the SBus connector on the PT-SBS440A as shown below.

**Figure 2: SPARCserver SBus Module Installation**



Step 5 Configure for proper SCSIbus termination. See “PT-SBS440A-S Single Ended Host Adapter” on page 51 and “PT-SBS440A-D Differential Host Adapter” on page 53 for a complete description of termination issues and jumper configuration procedures for the respective boards.

Step 6 Select an available SBus slot and remove the slot cover using a small Phillips screwdriver. The PT-SBS440A can be installed in any available SBus slot on the Main CPU board. It is recommended that the lowest numbered available slot is used. This way, if another board is added later the device addresses will not be affected.

- Step 7 Remove the 2 nylon screws on the SBus connector on the Main CPU board. Save the 2 M2.5 and nylon screws for later use.
- Step 8 Install the PT-SBS440A into the SBus slot by sliding the board at an angle into the back panel, aligning the plug to the slot and gently pressing the plug into the slot by pressing on the corners of the board.
- Step 9 Using the nylon screws removed in step 7, secure to the SBus connector. Using the 2 M2.5 screws removed in step 6, line up the SBus backplate with the MP panel and secure with the 2 screws. Refer to Figure 2: on page 22 in this manual.
- Step 10 Re-install the Main CPU into the SPARCserver backplane and re-attach the associated cables (Ethernet, Monitor, etc.)
- Step 11 Re-connect any cables from the peripheral devices. When installing external SCSI devices to the PT-SBS440A, disks should be addressed as SCSI Target ID's 0 through 3, and tapes should be addressed as SCSI Target ID's 4 and 5. Configure SCSI cables and devices for proper termination based on the SCSI settings performed in step 5.
- Step 12 Configure for proper SCSIbus termination. See "Termination" on page 50 for a complete description of termination issues and jumper configuration procedures.



---

Make sure that the last SCSI device on the bus is properly terminated and all devices in the middle are *NOT*!

---

This completes the hardware installation. At this point, power up the SPARCserver and proceed to the Software Installation.



## Solaris 1.x (SUNOS 4.1.x) Installation

There are **two** ways of installing the *ptisp* driver for the PT-SBS440A. The first method utilizes the Performance Technologies INSTALL software to automatically copy the various files, reconfigure your kernel configuration file and re-build a new Unix kernel. The second method is to manually copy the supplied files and modify the required system file. When installing the first PT-SBS440A in a system, it is **recommended that you use the INSTALL** software.

If you have more than one add-in SCSI Host Adapter card, you must use the manual installation procedure.

### Loading the PT-SBS440A Software

For floppy distribution, the first step of the software installation is to copy the files on the supplied diskette to a directory on your SPARCstation. Perform the following steps to load the software.

Step 1 Select the 3<sup>1</sup>/<sub>2</sub> floppy labeled “SBus Module Software & Accessories” to install. The media is in the “bar” compressed format.

Step 2 Login as root.

Step 3 Change directory to /tmp

```
$ cd /tmp
```

Step 4 Insert the PT-SBS440A INSTALL floppy into the SPARCstation floppy drive and read the files in using the “bar” command:

```
$ bar xvfZ /dev/rfd0
```

Remember the “Z” option to the bar command!

Step 5 The INSTALL script, configuration files, and text files will be read into a subdirectory named “pt.install” After the files have been extracted, “cd” to the “pt.install” directory:

```
$ cd pt.install
```



At this point, you can run the INSTALL program.

## Using the PTI INSTALL Software

The Performance Technologies software installation script (INSTALL) will check and modify the SunOS kernel to use the PT-SBS440A. The INSTALL script will check various system files, copy the ptisp driver and re-configure a new kernel to support the PT-SBS440A.



The INSTALL software should only be used when installing the first add-on SCSIbus Host Adapter (i.e. PT-SBS440A). If you have more than 1 add-on SCSIbus Host Adapter, use the manual installation. **IT IS STRONGLY RECOMMENDED THAT THE "INSTALL" PROGRAM BE USED FOR NORMAL INSTALLATIONS.**

The INSTALL script must be executed as root since it reads and modifies various files that are only accessible by root.

Step 1 At this point, run the INSTALL program by entering its name at the shell prompt:

```
$ INSTALL
```

Step 2 The INSTALL script will then begin execution and prompt you for various input.

Step 3 After the INSTALL script has finished successful execution, you may remove the pt.install directory by performing the following:

```
$ cd /tmp
$ rm -rf pt.install
```

This completes the software installation. If you encounter any problems, contact Performance Technologies customer support.

## Manual Software Installation

Manual installation should only be used if you already have an add-on SCSIbus Host Adapter in your system and are installing another. If this is a first time installation, use the INSTALL program provided.

To install the supplied software manually you must be logged on as root.

- Step 1 Determine the system architecture with the *arch -k* command

```
$ arch -k
```

Substitute the resulting value for “**arch -k**” in the steps to follow.

- Step 2 Change directory to sbs440A.sun and copy the *ptisp.o* driver and configuration file (*ptisp\_conf.c*):

```
$ cd sbs440a.sun
$ cp ptisp."arch -k".o /usr/sys/"arch -k"/OBJ/ptisp.o
$ cp ptisp_conf.c /usr/sys/scsi/adapters/ptisp_conf.c
```

- Step 3 Edit the file “/usr/sys/“**arch -k**”/conf/files” and add the following 2 lines:

```
scsi/adapters/ptisp.c optional ptisp scsibus device-driver
scsi/adapters/ptisp_conf.c optional ptisp scsibus
```

- Step 4 You must now create a new “config\_file” for the new Unix kernel. This is normally based on the present “config\_file” of the kernel you are now running. In the following example, the “config\_file” GENERIC is used. If your present kernel has been generated using a different file, use that one in place of GENERIC. Also, the name of the new “config\_file” will be PTISP. For an example of the changes required, refer to the supplied “PTISP” config\_file.

```
$ cd /usr/sys/"arch -k"/conf
$ cp GENERIC PTISP
```

- Step 5 Edit the new “config\_file” and make the following additions/changes. /

- a) add the following line:



```
device-driver ptisp #PT-SBS440A SCSI-2 Device Driver
```

- b) Define the new scsibus. If “scsibus1” is already defined (using “esp”) then just change the line:

```
change      scsibus1 at esp
to          scsibus1 at ptisp
```

If there is a SCSI card already using scsibus1, then define a new scsibus for the second board by adding the following 8 lines:

```
scsibus2 at ptisp
disk sd8 at scsibus2 target 3 lun 0
disk sd9 at scsibus2 target 1 lun 0
disk sd10 at scsibus2 target 2 lun 0
disk sd11 at scsibus2 target 0 lun 0
tape st4 at scsibus2 target 4 lun 0
tape st5 at scsibus2 target 5 lun 0
disk sr2 at scsibus2 target 6 lun 0
```

This will define scsibus2 as using the ptisp driver and allow 4 disks, 2 tape drives and a CD-ROM.

If you are adding additional PT-SBS440A boards, repeat this step for each PT-SBS440A installed. Change the “scsibus2” definition for each one, incrementing the last digit (i.e. scsibus3, scsibus4, etc.) Also increment the “sd”, “st”, and “sr” definitions (i.e. sd12, sd13, st6 etc.).

- Step 6 Now, run the “config” program using the new config\_file. This will create a directory with all the required files needed to generate a new kernel.

```
$ /usr/etc/config PTISP
```

- Step 7 After config is done, run “make”.

```
$ cd ../PTISP
$ make
```

---

## Section 3 INSTALLATION

Step 8 When “make” is done, you must copy and check the new kernel to the system root directory. Remember to make a copy of the old kernel in case there is a problem with the new version.

```
$ cp /vmunix /vmunix.old
$ cp vmunix /vmunix
```

Step 9 Now, re-boot the system. The new kernel will now be used. To verify that the ptisp driver is running, you should see the following line during the boot process:

```
ptisp0 at SBus slot n 0x800000 pri x
```

where: *n* is the slot number of the PT-SBS440A and *x* is the SPARC priority level.

If you encounter any problems, contact Performance Technologies Customer support.

### Configuration File *ptisp\_conf.c* (SunOS 4.1.X)

Under SunOS 4.1.X, the file *ptisp\_conf.c* is used to change various parameters used by the *ptisp* driver. Usually the default settings of the parameters are sufficient for normal operation. These parameters can be changed to assist in debugging new peripherals, changing interrupt priority of the PT-SBS440A etc. The following are the parameters presently supported. Some parameters should ONLY BE CHANGED on the advice of PTI Technical Support. These parameters are noted in each case in the file:

**ptisp\_sbus\_int** - this parameter defines the SBus interrupt used by the PT-SBS440A. This parameter is set by the driver and the end-user normally should not need to change it.



**ptisp\_default\_speed** - this parameter is an array of 16 values that define the maximum synchronous transfer rate used by the PT-SBS440A and the selected target (i.e. disk). When the ptisp driver performs the initial synchronous transfer negotiation with the target, it uses this value as the maximum speed. The value defines the clock speed in megahertz. For 8 bit SCSI targets, this value is 10 MHz, which implies a transfer rate of 10 MBits/sec. For 16 bit targets, the same clock speed translates to twice the transfer rate--that is, the 10 MHz clock speed implies a transfer rate of 20 MBits/sec. The default setting for all targets is 10, indicating a default clock speed of 10 MHz. As per the SCSI specification, the target may request a slower transfer rate. Setting the value to 0 disables synchronous mode.

**ptisp\_scsi\_id** - this parameter defines the SCSIbus I.D. of the PT-SBS440A. The default setting is I.D. 7. The valid range is 0-15. Keep in mind that if 8 bit SCSI devices are going to be on the SCSIbus, then the SCSI ID of the PT-SBS440A MUST be in the 0 to 7 range.

**ptisp\_cap\_wide** - this parameter is an array of 16 bytes that identify whether a SCSI Target is capable of wide (16) bit transfers. The default is for all targets to be capable. If a target device cannot handle the message negation, set this flag to **0**.

This completes the SunOS 4.1.X (Solaris 1.1) software installation

## Booting From a Device - Solaris 1.x (SunOS 4.1.x)

In order to boot from a device attached to the PT-SBS440A, first ensure that the Open Boot PROM in the system is at revision 2.2 or greater and that the FCode PROM on the PT-SBS440A is at revision 2.0 or higher. You will then need to re-configure your kernel and set the PT-SBS440A as the first scsibus controller.

### Preparing a device for booting

To prepare a device for booting under SunOS 4.1.X, follow the steps below.

- Step 1 Attach the SunOS 4.1.X Installation CD-ROM to the internal SCSI port of your Sun system.
- Step 2 Attach the hard disk device that you intend to boot from to the internal SCSI port, chaining, if needed, with the CD-ROM using a wide-to-narrow cable converter. As the SunOS 4.1.X Installation CD-ROM has no built in support for Fast/Wide controllers, the OS **cannot** be installed onto the desired device via the PT-SBS440A SCSI card. The bootable hard disk device **must** be connected and prepared through the built in Sun SCSI controller.
- Step 3 Boot from the CD-ROM and run the Sun Install on the desired device.
- Step 4 Once the operating system has been installed onto the desired disk, the PT-SBS440A SunOS 4.1.X driver (revision 1.4 or greater) must also be installed onto the new disk using the Performance Technologies software installation script (See “Using the PTI INSTALL Software” on page 25.)



- Step 5 Once the PT-SBS440A driver has been successfully installed, edit the kernel config\_file (`/usr/sys/arch-k/conf/PTISP`) on the new disk and make the following changes/additions

```
change      scsibus0 at esp
to          scsibus0 at ptisp
```

Make sure to move the esp driver declaration to another scsibus (1,2,3) that is not being used by another sbus SCSI controller.

- Step 6 Run config and rebuild the new kernel:

```
$ /usr/etc/config PTISP
$ cd ../PTISP
$ make
```

- Step 7 Rename the old kernel and copy the new one to the root directory:

```
$ cp /vmunix /vmunix.esp
$ cp vmunix /vmunix
```

Once the new kernel has been made, the NVRAM configuration parameter `sbus-probe-list` must be changed as follows:

- Step 1 Enter the monitor mode by typing L1,A (Stop A).
- Step 2 At the ok prompt, change the configuration parameter `sbus-probe-list` such that the PT-SBS440A controller in SBus slot 1 is probed **first**. Use the command "printenv" to determine the current parameter setting. Then set the `sbus-probe-list` such that #1 is probed first. If the PT-SBS440A is in a slot other than slot 1, use that slot number in place of 1. See examples below:



---

## Section 3 INSTALLATION

Example 1: PT-SBS440A installed in slot 1; “printenv” shows *sbus-probe-list* 0123. In this example, set the *sbus-probe-list* as follows

```
ok> setenv sbus-probe-list 1230
```

Example 2: PT-SBS440A installed in slot 2; “printenv” shows *sbus-probe-list* 540123. In this example, set the *sbus-probe-list* as follows

```
ok> setenv sbus-probe-list 254013
```

Step 3 Perform a RESET to incorporate the changes made in step 2. Changes to the NVRAM configuration parameter need only be made once.

Step 4 Attach the device with the new kernel to the PT-SBS440A. Boot from the device as shown below.

### Booting Syntax

With the PT-SBS440A running in “PTI” mode (switch #1 of on board DIP switch OFF), use the syntax described below to boot from a device attached to the PT-SBS440A.

The following syntax should be used when booting from a **disk** or **CD-ROM** attached to the PT-SBS440A. (NOTE: The older-style, single speed CD-ROMs are **NOT** supported. Use the newer-style, double speed CD-ROM only).

For Sun4c:

```
ok> boot /sbus/ptisp/sd@X,x filename
```

For Sun4m:

```
ok> boot /iommu/sbus/ptisp/sd@X,x filename
```

where: *X* = SCSI Target ID

*x* = SCSI Lun

optional: *filename* can be vmunix, etc.



The following syntax should be used when booting from a **tape** attached to the PT-SBS440A.

For Sun4c:

```
ok> boot /sbus/ptisp/st@X,x filename
```

For Sun4m:

```
ok> boot /iommu/sbus/ptisp/st@X,x filename
```

where: *X* = SCSI Target ID

*x* = SCSI Lun

optional: *filename* can be vmunix, etc.

## Booting from the PT-SBS440A as the Default Device

Once you have determined that the desired device can be booted successfully from the PT-SBS440A, this device can be made the default boot device by changing the appropriate configuration parameter for your system.

Enter the monitor mode by typing L1,A (Stop A). At the ok prompt, change the configuration parameter to reflect the booting syntax used above. Please note that there could be more than one type of boot-from parameter used in the NVRAM area. Some examples are *boot-dev*, *boot-from* and *boot-device*. For example:

For Sun4c:

```
ok> setenv boot-from /sbus/ptisp/sd@X,x
```

where: *X* = SCSI Target ID

*x* = SCSI Lun

For Sun4m:

```
ok> setenv boot-from /iommu/sbus/ptisp/sd@X,x
```

where: *X* = SCSI Target ID

*x* = SCSI Lun

## Solaris 2.X Installation

The Solaris 2.X driver is distributed as a 3<sup>1</sup>/<sub>2</sub> floppy disk labeled “Solaris™ 2.X SBus Device Drivers”. The media is stored in the standard Solaris 2.X software distribution format. This driver can control any number of PT-SBS440As connected to the system.

### Adding the ptisp Driver

The *pkgadd* utility loads the ptisp package onto the system from the distribution media. Because the package contains scripts which are executed with super-user permission during the installation process, you must be logged in as root.

Insert the supplied diskette into the SPARCstation floppy drive and enter the *pkgadd* command.

If the vol daemon is running you will need to run the volcheck command and use the “/vol/dev/rdiskette0/unlabeled” device:

```
$ volcheck
$ pkgadd -d /vol/dev/rdiskette0/unlabeled PTIptisp
```

If you are **not** running with the vol daemon, enter the following:

```
$ pkgadd -d /dev/rfd0a PTIptisp
```

This utility will install the driver, using the settings in the *pkginfo* file and the system defaults.

Because the installation software must modify various system files such as /kernel/drv/classes, the *pkgadd* program will ask you if you want to “install these conflicting files [y,n,?,q]”. The correct response is “y”. Also, *pkgadd* will warn that some scripts must be executed with super-user permissions. Again, the correct response is “y”.



Once the driver is installed, you must re-boot the system using the “reconfigure” option to boot. First, halt the system to enter the monitor mode:

```
$ /etc/sync
$ /etc/halt
```

Once the system is in the monitor, perform the boot command with the “-rv” option:

```
ok> boot -rv
```

The system will create the required device nodes for the equipment plugged into the SCSIbus on the PT-SBS440A.

If you boot the system with the “-v” verbose flag, the *ptisp* driver will print the firmware revision, its SCSI ID, and the SBus burst size.

## Removing the ptisp Driver

To remove the ptisp driver package, use the *pkgrm* command:

```
$ pkgrm PTIptisp
```

This will remove the driver object and configuration files and inform the kernel. Again, you should re-boot the system

## Upgrading the ptisp Driver

If it becomes necessary to upgrade to a newer version of the ptisp driver, the following steps should be taken:

- Step 1 Make sure that any disks attached to the SCSIbus on the PT-SBS440A are not mounted.
- Step 2 Remove the old version of the ptisp driver by running *pkgrm*:

```
$ pkgrm PTIptisp
```

---

## Section 3 INSTALLATION

Step 3 Because the ptisp driver is a “bus nexus”, the system MUST BE RE-BOOTED before adding the new driver package:

```
$ /etc/reboot
```

Step 4 Use the *pkgadd* utility to load the new ptisp driver. Refer to the previous section on running the *pkgadd* utility.

### Other Package Utilities

There are other useful utilities that can be run. The *pkgparam* command displays the packages parameter settings:

```
$ pkgparam -v -d /dev/rfd0a PTIptisp
```

This will read the distribution floppy and display various information such as the release level, installation directory, etc.

Another utility, *pkginfo*, can be used to determine whether the PTISP driver was fully installed:

```
$ pkginfo -l PTIptisp
```

### Installing SCSI Devices under Solaris 2.X

Solaris 2.X performs automatic configuration of attached SCSI devices. To add devices (at any time) perform the following steps:

Step 1 Halt and power down the system.

Step 2 Plug in the SCSI devices, terminate and configure them.

Step 3 Power up the SCSI devices and the system

Step 4 Boot Solaris, using the “re-configure” and the “verbose” flag (-rv)

```
ok> boot -rv
```



Step 5 The Solaris kernel will probe the attached SCSI devices and build the appropriate device nodes/information for each one (i.e. /dev/sd4a).

## Configuration Under Solaris 2.X

When running Solaris 2.X, various parameters used by the PT-SBS440A can be modified. The parameters are changed by setting them in the */etc/system* file. This is done using the following syntax:

```
set ptisp:variable = value
```

For example, to change the SCSI ID of the PT-SBS440A, the following line would be added to the */etc/system* file:

```
set ptisp:ptisp_scsi_id = 7
```

The following variables are presently supported by the ptisp Solaris 2.X driver when running in PTI mode:

**ptisp\_scsi\_id** - this sets the SCSIbus ID of the PT-SBS440A board. The default value is 7. The valid range is 0-15. Keep in mind that if 8 bit devices are going to be used on the SCSIbus controlled by the PT-SBS440A, then the SCSIbus ID must be in the 0-7 range.

---

## Section 3 INSTALLATION

**ptisp\_default\_speedn** - this variable sets the default maximum data transfer rate on a per target basis. The “n” in the variable defines which target device (SCSI ID range 0 to 15) you’re setting. The “value” is the maximum clock speed in MegaHertz; therefore, the range is 0 to 10. Setting the value to 0 disables synchronous mode. For narrow 8 bit devices this would imply a range of 1 to 10 MB/sec. in steps of 1. For wide 16 bit devices, the range is 2 to 20 MB/sec. in steps of 2. The value 0 implies async operation only. The default value is 10MHz. In the following example definition,

```
int ptisp_default_speed2 = 10;
    2 is the target device's SCSI ID.
    10 is the clock speed (MHz) for the target device
    whose SCSI ID is 2.
```

The maximum number you can enter for the clock speed is 10. The clock rate of 10 implies a transfer rate of 10 Mbits/sec for narrow 8 bit devices, and 20 Mbits/sec for wide 16 bit devices.

**ptisp\_notag** - this bit field (See “Bit Fields” section on page 39) is used to disable Tagged Command Queueing on an individual target basis. A 1 indicates that Tagged Command Queueing is disabled for the selected target.

**ptisp\_nowide** - this bit field (See “Bit Fields” section page 39) is used to disable SCSI Wide message negotiation with an individual target (or targets). A 1 indicates that Wide message negotiation is disabled for the selected target

**ptisp\_log\_arqstatus** - this variable enables/disables printing of auto request sense data by the ptisp driver. If set to 1, the ptisp driver will output the request sense data bytes (in hex format).

---

**NOTE:** If you are having problems with a particular 8-bit SCSI device such as a tape drive or CD-ROM, try disabling Wide negotiation to that device with **ptisp\_nowide**.

---

## Bit Fields

A Bit Field variable allows multiple controls to be combined in a single command. In the cases identified above (**ptisp\_notag** and **ptisp\_nowide**), specific functions can be disabled on any combination of SCSI Targets using the encoding provided in Table 1.

**Table 1: Target ID Bit Field encoding**

SCSI Target ID	Hex Value	SCSI Target ID	Hex Value
0	0x0001	8	0x0100
1	0x0002	9	0x0200
2	0x0004	10	0x0400
3	0x0008	11	0x0800
4	0x0010	12	0x1000
5	0x0020	13	0x2000
6	0x0040	14	0x4000
7	0x0080	15	0x8000

For instance, to disable Wide negotiation on Targets 2, 4 and 6, OR together the Hex Values for the respective SCSI Target IDs in Table 1. The resulting value would be 0x0004 | 0x0010 | 0x0040 or 0x0054 hex.

---

**NOTE:** Selecting the PT-SBS440A's Initiator ID will be ignored.

---

This completes the Solaris 2.X software installation.



## Sun Fast/Wide SCSI Emulation (Solaris 2.x)

In order to run the PT-SBS440A in Sun emulation mode, you must first ensure that the FCode PROM on the PT-SBS440A is at revision 2.0 or higher. The PT-SBS440A can then emulate Sun's Fast/Wide SCSI card by setting an on board switch to ON. This switch is at location U20-1 on the differential board (PT-SBS440A-D) and at U16-1 on the single-ended board (PT-SBS440A-S). See Figure 4: on page 55.

After an SBus reset, if the on board switch #1 is ON, the PT-SBS440A will initialize and declare itself as a "SUNW, isp" controller. As such, it will attach itself to and use the built in isp drivers in Solaris 2.3 or Solaris 2.4. **You cannot run in this mode under SunOS 4.1.X (Solaris 1.1) or Solaris 2.2.** The earlier versions of Solaris (pre 2.3) and SunOS 4.1.X (Solaris 1.1.X) have no built in support for the isp controller. For systems running these operating systems, use the PTI mode (switch 1 OFF) and supplied device drivers as described in the previous sections.

**NOTE:** To utilize the "Wide SCSI" feature of the PT-SBS440A on a Solaris 2.3 system, you must have Sun patch 101378 installed.

**Also note that, when running in Sun emulation mode, the supplied ptisp device driver does not need to be installed.**

## Booting From a Device - Solaris 2.x

In order to boot from a device attached to the PT-SBS440A, first assure that the Open Boot PROM in the system is at revision 2.2 or greater and that the FCode PROM on the PT-SBS440A is at revision 2.0 or higher. The PT-SBS440A SCSIbus ID **MUST** remain at the default value of 7.

### Preparing a Device for Booting under Solaris 2.x

In order to boot from a device attached to the PT-SBS440A under Solaris 2.x, you must be in Sun Fast/Wide SCSI Emulation mode (See “Sun Fast/Wide SCSI Emulation (Solaris 2.x)” on page 40.)

- Step 1 Attach the Solaris 2.X Installation CD-ROM to the internal SCSI bus.
- Step 2 Install the PT-SBS440A with switch #1 ON (location U20 on the differential board; location U16 on the single-ended board) for Sun Fast/Wide SCSI Emulation mode (See “Sun Fast/Wide SCSI Emulation (Solaris 2.x)” on page 40.)
- Step 3 Attach the desired boot device to the PT-SBS440A.
- Step 4 Boot from the CD-ROM and install the OS onto the desired device using Sun Install software. The ISP driver on the CD-ROM should recognize the devices attached to the PT-SBS440A, and the installation script should allow the desired device to be selected.

Once the operating system has been installed onto the desired device, the following modification must be made to the system configuration parameters before booting can take place.

- Step 1 Enter the monitor mode by typing L1,A (Stop A).
- Step 2 At the ok prompt, change the configuration parameter *sbus-probe-list* such that the PT-SBS440A controller in SBus slot 1 is probed **before slot 0**. Use the command “printenv” to determine the current parameter setting. Then set the *sbus-probe-list* such that #1 is in place of #0, and #0 is probed last. If the PT-SBS440A is in a slot other than slot 1, use that slot number in place of 1. See examples below:

---

## Section 3 INSTALLATION

Example 1: PT-SBS440A installed in slot 1; “printenv” shows *sbus-probe-list* 0123. In this example, set the *sbus-probe-list* as follows:

```
ok> setenv sbus-probe-list 1230
```

Example 2: PT-SBS440A installed in slot 2; “printenv” shows *sbus-probe-list* 540123. In this example, set the *sbus-probe-list* as follows:

```
ok> setenv sbus-probe-list 254013
```

Step 3 Perform a RESET to incorporate the changes made in step 2. Changes to the NVRAM configuration parameter need only be made once.

Step 4 Attach the device with the new kernel to the PT-SBS440A. Boot from the device in the SUNW,isp mode as shown on the next page.

### Booting Syntax - Solaris 2.x

With the PT-SBS440A running in Sun Fast/Wide SCSI Emulation mode (switch #1 of on board DIP switch ON), you must first determine the system architecture with the *arch -k* command

```
$ arch -k
```

Use the appropriate syntax below for your system architecture.

The following syntax should be used when booting from a **disk** or **CD-ROM** attached to the PT-SBS440A. (NOTE: The older-style, single speed CD-ROMs are **NOT** supported. Use the newer-style, double speed CD-ROM only).

For Sun4c:

```
ok> boot /sbus/SUNW,isp/sd@X,x filename -rv
```

For Sun4m:

```
ok> boot /iommu/sbus/SUNW,isp/sd@X,x filename -rv
```

where: *X* = SCSI Target ID

*x* = SCSI Lun

optional: *filename* can be vmunix, etc.



The following syntax should be used when booting from a **tape** attached to the PT-SBS440A.

For Sun4c:

```
ok> boot /sbus/SUNW,isp/st@X,x filename -rv
```

For Sun4m

```
ok> boot /iommu/sbus/SUNW,isp/st@X,x filename -rv
```

where: *X* = SCSI Target ID

*x* = SCSI Lun

optional: *filename* can be vmunix, etc.

## Booting from the PT-SBS440A as the Default Device

Once you have determined that the desired device can be booted successfully from the PT-SBS440A, this device can be made the default boot device by changing the appropriate system configuration parameter.

Enter the monitor mode by typing L1,A (Stop A). At the ok prompt, change the configuration parameter to reflect the booting syntax used above. Please note that there could be more than one type of boot-from parameter used in the NVRAM area. Some examples are *boot-dev*, *boot-from* and *boot-device*. For example:

For Sun4c:

```
ok> setenv boot-from /sbus/SUNW,isp/sd@X,x
```

where: *X* = SCSI Target ID

*x* = SCSI Lun

For Sun4m:

```
ok> setenv boot-from /iommu/sbus/SUNW,isp/sd@X,x
```

where: *X* = SCSI Target ID

*x* = SCSI Lun

## Probing for Attached SCSI Devices

The “probe-scsi” and “probe-scsi-all” commands are meant for Sun controllers and are **not** supported. Use these commands at your own risk. To probe for SCSI devices attached to a PT-SBS440A, use the “show-children” command as shown below. This command is based on the SCSI Host Adapter Package Informative Annex for the IEEE Draft Std P1275.0-19XX, *Standard for Boot Firmware* (See “APPENDIX J: Informative Annex” on page 81.) This command can be performed at the ok prompt **only once after a reset**.

### Show-Children Command

Step 1 Set the *auto-boot* parameter in the system configuration parameters such that the system will not boot *vmunix* upon reset.

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

Step 2 Reset the machine. **Do not skip this step.** You must reset the machine each time *show-children* is run.

```
ok> reset
```

Step 3 Probe attached SCSI devices.

```
PTISP Mode -
Sun4c: ok> " /sbus/ptisp" select-dev
Sun4m: ok> " /iommu/sbus/ptisp" select-dev
         ^space (Please note the space after the first
         double quote)
```



```
SUNW,isp Mode -
Sun4c: ok> " /sbus/SUNW,isp" select-dev
Sun4m: ok> " /iommu/sbus/SUNW,isp" select-dev
           ^space (Please note the space after the first
           double quote)
```

```
ok> show-children
```

The PT-SBS440A boot PROM will display each target that responds to a SCSI inquiry command. In addition, it will display the manufacturer's model number, controller firmware revision as well as other SCSI capabilities of the device.

Step 4 Re-set the *auto-boot* parameter in the system configuration so that the system will once again boot upon reset.

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

## Diagnose Command

The "diagnose" command is a useful Forth word that can be used to check a SCSI device attached to the PT-SBS440A. The "diagnose" command will attempt to issue a "Test Unit Ready" command to an attached SCSI device and, if successful, a "Send Diagnostics" command. Run the command by entering the Target ID and Lun of the desired device. For example, to check a disk drive attached to the PT-SBS440A at Target 3, logical unit (Lun) 0, run the "diagnose" command as follows:

Step 1 Set the *auto-boot* parameter in the system configuration parameters such that the system will not boot *vmunix* upon reset.

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

---

## Section 3 INSTALLATION

Step 2 Reset the machine. **Do not skip this step.**

```
ok> reset
```

Step 3 Run the “diagnose” command.

PTISP Mode -

Sun4c:

```
ok> " /sbus/ptisp" select-dev
```

Sun4m:

```
ok> " /iomm/sbus/ptisp" select-dev
```

*^space (Please note the space after the first double quote)*

SUNW,isp Mode -

Sun4c:

```
ok> " /sbus/SUNW,isp" select-dev
```

Sun4m:

```
ok> " /iomm/sbus/SUNW,isp" select-dev
```

*^space (Please note the space after the first double quote)*

```
ok> 3 0 diagnose
```

Step 4 Re-set the *auto-boot* parameter in the system configuration so that the system will once again boot upon reset.

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

## Show-ver Command

Step 1 Set the *auto-boot* parameter in the system configuration parameters such that the system will not boot vmunix upon reset.

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

Step 2 Set the path for the SBS440A card to be selected.

PTISP Mode -

```
Sun4c: ok> " /sbus/ptisp" select-dev
Sun4m: ok> " /iommu/sbus/ptisp" select-dev
         ^space (Please note the space after the first
         double quote)
```

SUNW,isp Mode -

```
Sun4c: ok> " /sbus/SUNW,isp" select-dev
Sun4m: ok> " /iommu/sbus/SUNW,isp" select-dev
         ^space (Please note the space after the first
         double quote)
```

```
ok> show-ver
```

The PT-SBS440A boot PROM will display its revision.

```
SBS440A FCode Boot PROM ver. X.x
```

Step 3 Re-set the *auto-boot* parameter in the system configuration so that the system will once again boot upon reset.

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



## Peripherals Installation

The following sections provide operation tips when using the PT-SBS440A and various SCSIbus device configurations.

### Installing Disk Drives

SCSI disk drives should be addressed as Target I.D.s 3 thru 0. This is consistent with the device declaration in the SunOS kernel. If the disk drive has never been formatted or “labeled” by the SunOS, consult the “man” page for the “format” command and also the Sun Network and Systems Administrator Manual.

### Installing Other Devices

The supplied PT-SBS440A INSTALL script supports 4 disk drives (SCSI I.D. 0-3), 2 tape drives (SCSI I.D. 4 and 5), and one CD-ROM (SCSI I.D. 6). If other types of devices are to be supported, Sun provides a SCSI Implementation Guide with the SBus Developers Kit II. This document and the supplied sample driver can save a great deal of time when implementing unusual or custom SCSI devices with the SPARCstation. The Developers Kit Rev II can be purchased through Sun.

### Cable Requirements

The PT-SBS440A connects to the SCSIbus using a high density 68 pin connector. This style of connector is compatible with all Sun and most third party peripherals used with the SPARCstation line of products. For custom applications, various manufacturers can provide a high density 68 pin to high density 50 pin. In all cases, the length of the cable should never exceed 6 meters for the single ended (3 meters for single ended “fast mode” devices) PT-SBS440A-S or 25 meters for the differential PT-SBS440A-D.



---

PTI recommends that if 4 or more devices are going to be attached to the single-ended SCSI bus or the total cable length is greater than 3 meters, the PT-SBS440A-D and differential devices be used. If this is not possible then PTI offers the following recommendations:

---

- Minimize the cable length
- Make sure that the cable has an overall shield
- When using the SCSI synchronous fast option (> 5 MB/Sec), the following cable characteristics will minimize bus related problems:

Characteristic Impedance: 90 to 132 Ohms  
Signal Attenuation: 0.095 dB maximum per meter at 5 MHz  
Pair-to-Pair Propagation Delay Delta: 0.20 ns maximum per meter  
DC Resistance 0.230 Ohms maximum per meter at 20 degrees C  
Minimum Conductor Size: 0.08042 square MM (28 AWG)

## SCSI Cable and Terminator Vendors

Aeronics (FPT and Active Terminators)

Fujitsu (Active Terminators)

Cables

Available through:

CS Electronics  
1342 Bell Ave.  
Tusin, CA 92680  
Phone Number (714) 259-9100  
FAX (714) 259-0911

Methode (FPT and Active Terminators)

Available through:

Newark Electronics  
4801 North Ravenswood  
Chicago, IL 60640  
Phone Number: (312) 784-5100  
FAX (312) 907-5217

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**Section 3** INSTALLATION

## AMP (Active Terminators and Cables)

AMP Incorporated  
P.O. Box 3808  
Harrisburg, PA 17105-3608  
Phone Number: (717) 564-0100

## TEMP-FLEX (Cables)

TEMP-FLEX Cable, Inc.  
11 Depot Street  
So. Grafton, MA 01560  
Phone Number: (508) 839-5987  
FAX: (508) 839-4128

## Termination

There are currently a number of single-ended termination options proposed to the ANSI SCSI-2 committee. The reason for this is that some combinations of “fast” single-ended cables and drives do not work reliably<sup>1</sup>. The perfect solution has yet to be found. PTI has employed a number of techniques to maximize throughput and reliability.

The PT-SBS440A-S offers a choice of “active” or “Forced Perfect Termination” (FPT). Active Termination compensates for voltage drops and always maintains a stable voltage to the terminating resistor. The result is a circuit which minimizes the influence of noise. Forced Perfect Termination attempts to remove reflections at the end points by automatically matching itself to the line. A Forced Perfect Terminator uses the high speed switching capability of a Hot Carrier Schottky diode to approximate the “Perfect” termination.

The rate at which data is moved over the SCSI bus is negotiated between the controller and devices at initialization time. If this rate is greater than 5 MB/Sec the PT-SBS440A will enable the “fast synchronous” timing

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<sup>1</sup> The SCSI-2 Working Draft Proposal, Revision 9, page 4-1, states: “IMPLEMENTORS NOTE: Use of single-ended drivers and receivers with the fast synchronous data transfer option is not recommended.”



option defined in the SCSI-2 specification. When an error occurs, due to improper or poor termination, the firmware will negotiate a slower rate and continue operation. Some systems drop in to asynchronous operation when a failure occurs. PTI employs an adaptive algorithm (ASN) which operates to maximize the data transfer rate.

For single ended applications it is **strongly** recommended that both ends of the SCSIbus be terminated using a Forced Perfect Termination circuit. Depending on how the PT-SBS440A-S is configured (Active or Forced Perfect Termination) it is up to the user to verify the presence of matching termination technology on the other end of the SCSIbus. Various third party manufacturers provide external Active or Forced Perfect Terminators for use with Sun style “shoeboxes”. (See “ SCSI Cable and Terminator Vendors” on page 49.)

Lastly, when mixing devices with different bus widths, care must be taken to insure that ALL DATA LINES ARE TERMINATED. This can usually be accomplished by making sure the PT-SBS440A is on one physical end of the SCSIbus AND a 16 bit device (or 16 bit terminator) is on the other. Eight bit devices and terminators do not terminate the additional 8 data and parity bit of SCSI-2 Wide mode.

## Termination Power Source

The PT-SBS440A provides +5V TERMPWR to the SCSIbus as per the ANSI SCSI spec. TERMPWR Short-Circuit protection is provided by a Positive Temperature Coefficient (PTC) resistor. This device acts as a self-resetting circuit breaker. If a short is detected the device “opens.” Upon removal of the shorting condition, the device “closes” and restores +5V to the TERMPWR circuit.

## PT-SBS440A-S Single Ended Host Adapter

The PT-SBS440A-S provides a 16-Bit, Single Ended SCSI interface over an unshielded, P-Cable SCSIbus connector.

The configuration shipped from PTI assumes that the PT-SBS440A is at the end of the SCSI cable, providing termination and terminator power. Terminator power, enabled by installing resistor packages RP1, RP2, and RP3, is provided through CR1 and F1 from the board’s +5V supply.

---

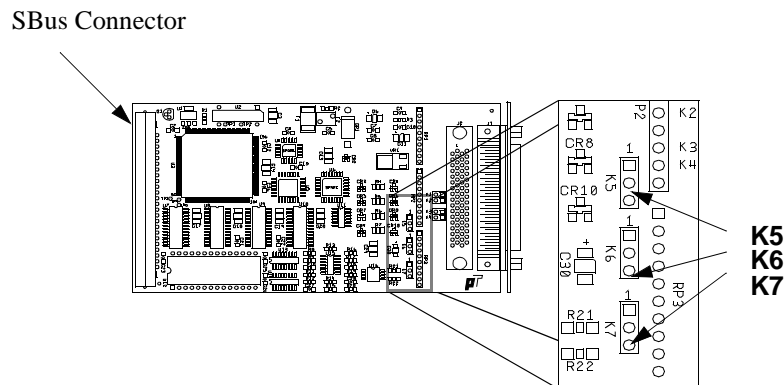
## Section 3 INSTALLATION

If the PT-SBS440A-S does not need to terminate the SCSI cable then see “Disabling Termination” below. You might want to review the section “Termination Power Source” if you are going to be bringing the SPARCstation with the PT-SBS440A installed up and down and there are other SCSI devices attached to the SCSIbus.

### Disabling Termination

If the PT-SBS440A is not at one end of the SCSI cable, then termination must be supplied by another SCSI device. To disable SCSI Termination, resistor packages RP1, RP2, and RP3 (See “Figure 4: Terminator/Connector Placement” on page 55.) must be removed and pins 1 and 2 of Jumper Blocks K1, K2, and K3 must be shunted as shown below.

**Figure 3: PT-SBS440AS Jumper Positions**



### Selecting Termination Type

The PT-SBS440A-S offers standard Active Termination or Forced Perfect Termination (FPT, the factory default). Jumper Blocks K5,



K6, and K7 allow the user to select between the termination approaches. To select the FPT option, place the jumper shunts across pins 2 and 3 of jumpers K5 through K7. To select Active Termination, place the jumper shunts across pins 1 and 2 of jumpers K5 through K7. In either case the resistor packages RP1, RP2, and RP3 must also be inserted.

## **PT-SBS440A-D Differential Host Adapter**

The PT-SBS440A-D provides a 16-Bit, Differential SCSI interface over a shielded, P-Cable SCSIbus connector.

The configuration shipped from PTI assumes that the PT-SBS440A is at the end of the SCSI cable, providing termination and terminator power. Terminator power is provided from the board's +5V supply. When the resistor packages RP1, RP2, and RP3 are installed, SCSI Termination is enabled.

If the PT-SBS440A does not need to terminate the SCSI cable then see "Disabling Termination" below. You might want to review the section "Termination Power Source" if you are going to be bringing the PT-SBS440A up and down and there are other SCSI Initiators attached to the SCSIbus.

### **Disabling Termination**

If the PT-SBS440A-D is not at one end of the SCSI cable, then the termination will be supplied by another SCSI device. To disable SCSI Termination, resistor packages RP1, RP2, and RP3 must be removed. See PT-SBS440AD drawing in Figure 4 on page 55 for the positions of the Termination Resistor Packages.

## PT-SBS440A SCSIbus Monitor

The PT-SBS440A uses an active circuit to monitor the voltage levels of the TERMPWR signal, active terminator regulator output, the DIFF-SENS line and TERMPWR fuse. If any problem is sensed, the *ptisp* driver will report the problem to the console. This circuit is checked every 10 seconds while the SunOS is running. The following are the messages output, and recommended action if they are reported:

**Error: TERMPWR Fuse opened - check**

This error is reported when the resetable TERMPWR fuse on the **PT-SBS440A** controller opens. This indicates that a short exists on the TERMPWR line on the SCSIbus cable. Find the source of the short and remove from the cable.

**Error: TERMPWR shorted or missing -**

The TERMPWR line is a source of +5 volts. It is used to power the terminators on the SCSIbus. If the **PT-SBS440A** detects that the voltage is missing (actually less than .7 volts) then the **ptisp** driver will report using this message.

**NOTE:** This could also be the result of an on-board regulator failure.

**Single Ended SCSI device detected on**

This warning indicates that a single ended SCSI device was detected on the bus of a **PT-SBS440A-D** differential controller. The SCSIbus will not operate in this condition. Find which device is the wrong type and remove.

**TERMPWR Fuse Returned to Normal (Ok)**

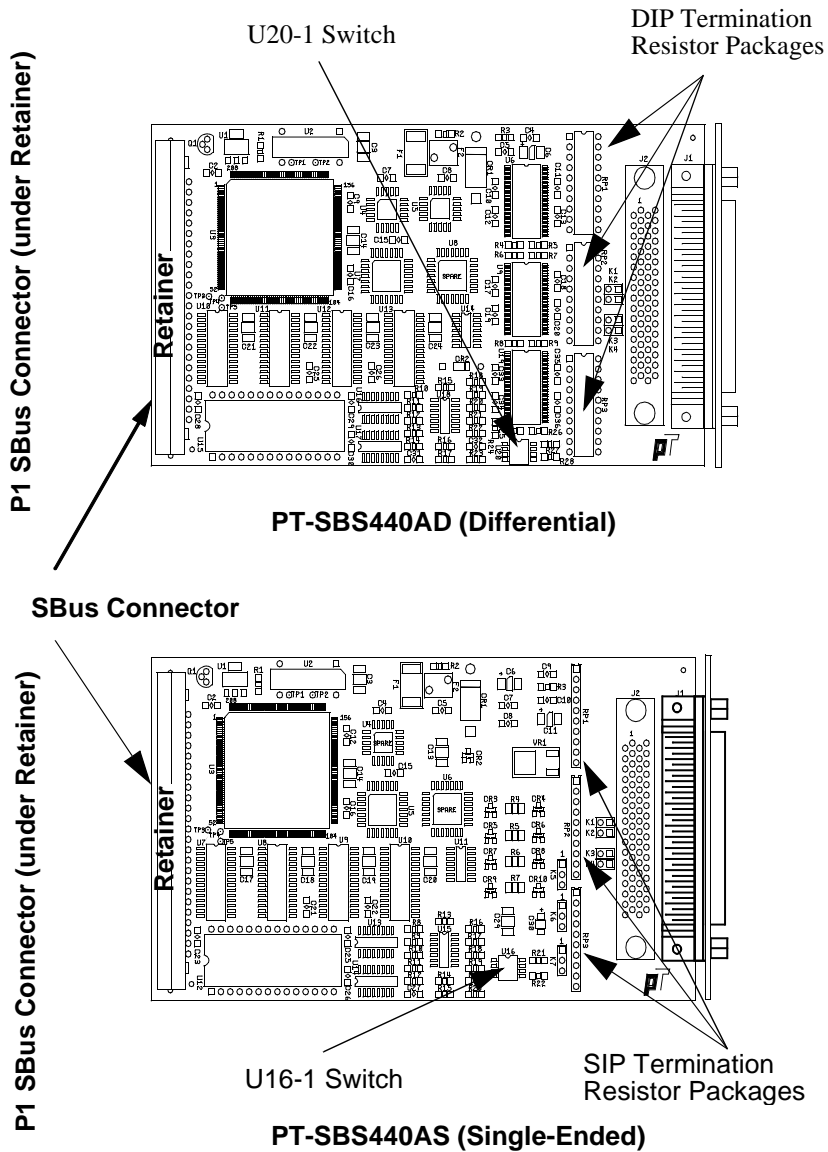
This is printed when the fuse on the **PT-SBS440A** returns to the “normal” or operational condition.

**TERMPWR Returned to Normal (Ok)**

This is printed when the TERMPWR voltage level returns to approx. +5 volts.

## Jumper/Connector Placement

Figure 4: Terminator/Connector Placement





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**Section 3** INSTALLATION

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Section

# 4

## *APPENDICES*

### **APPENDIX A: UNIX Commands**

The following Unix commands provide useful information when using the PT-SBS440A. Consult the manual pages on your Unix system for more in-depth descriptions.

- ptisp - PTISP Performance Technologies SCSI Host Bus Adapter Driver
- config - build system configuration files
- dkinfo - report information about a disk's geometry and partitioning
- format - disk partitioning and maintenance utility
- sd - driver for SCSI disk devices
- sr - driver for CDROM SCSI controller
- st - driver for SCSI tape devices

## **APPENDIX B: Product Warranty**

Performance Technologies Inc. (hereinafter “PTI”) warrants that its products sold hereunder will at the time of shipment be free from defects in material and workmanship and will conform to PTI’s applicable specifications or, if appropriate, to Buyer’s specifications accepted by PTI in writing. If products sold hereunder are not as warranted, PTI shall, at its option, refund the purchase price, repair, or replace the product provided proof of purchase and written notice of nonconformance are received by PTI within 12 months of shipment, or in the case of software and integrated circuits within ninety (90) days of shipment and provided said nonconforming products are returned F.O.B. to PTI’s facility no later than thirty days after the warranty period expires. Products returned under warranty claims must be accompanied by an approved Return Material Authorization number issued by PTI and a statement of the reason for the return. Please contact PTI, or its agent, with the product serial number to obtain an RMA number. If PTI determines that the products are not defective, Buyer shall pay PTI all costs of handling and transportation. This warranty shall not apply to any products PTI determines to have been subject to testing for other than specified electrical characteristics or to operating and/or environmental conditions in excess of the maximum values established in applicable specifications, or have been subject to mishandling, misuse, static discharge, neglect, improper testing, repair, alteration, parts removal, damage, assembly or processing that alters the physical or electrical properties. This warranty excludes all cost of shipping, customs clearance and related charges outside the United States. Products containing batteries are warranted as above excluding batteries.

**THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESS, IMPLIED OR**



STATUTORY INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS. IN NO EVENT SHALL PTI BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES DUE TO BREACH OF THIS WARRANTY OR ANY OTHER OBLIGATION UNDER THIS ORDER OR CONTRACT.

## APPENDIX C: Product Return Procedure and Form

If you find that your Performance Technologies (PTI) product must be returned for repair, please use a copy of the following form and include it with the returned product:

**1 To return any equipment, you need to obtain a Return Material Authorization (RMA) number. PTI will not accept returns without an RMA number.**

To obtain an RMA number, please contact the PTI's Customer Service Group at (716) 256-0248, FAX: (716) 256-0791). Outside of North America, customers should contact their PTI agent.

PTI will request the serial number of the unit and the reason for the return at the time the RMA is issued. RMA# = \_\_\_\_\_

**2 What product are you returning?**

What address do you want us to return the product to? If you do not give us an address it will be shipped back to the Ship To Address as listed on the invoice. Model Number: \_\_\_\_\_

**3 What is the problem with the product?**

Please enter in the information that the PTI Technical Support representative has given you for the reason for return of this product.

Description of problem: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**4 Ship to:**

Return products should be shipped in the original packaging if possible. Ship via a traceable carrier and properly insure the package. No C.O.D.s are accepted and any shipping charges are non-refundable. Send your returns to:

Performance Technologies, Inc.  
Attn: RMA# (Your RMA# goes here)  
315 Science Parkway  
Rochester, N.Y. 14620, U.S.A.



(Customers outside of North America, should follow the return shipment instructions issued by your PTI agent.) The RMA number should be clearly marked on the outside of the shipping box to expedite correct handling at the PTI factory.

Repairs will be performed only on complete units. Return of incomplete equipment may delay the repair.

Please note that removal of original parts or product modification by a customer can void the warranty. (This does not apply to jumpers or socketed user programmable parts.)

“Out of warranty repairs” cannot proceed without a Purchase Order to cover estimated cost of the repair.

PTI will supply repair information on all returns and warrants all repairs for 90 days after product is returned to the user.

## APPENDIX D: Product Support



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IF YOU ENCOUNTER DIFFICULTY IN USING THIS PERFORMANCE TECHNOLOGIES, INC. SBus PRODUCT, YOU CAN CONTACT OUR SUPPORT PERSONNEL IN ONE OF THREE WAYS.

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- A) Preferred - If you have Internet services - email us at support@pt.com. Outline your problem in detail. Please include your return email address, and a telephone number.
- B) FAX - If you have FAX service, contact us at U.S. Area Code 716, FAX Number 256-0791. Mark you FAX to Attention: SBus Product Support. Outline your problem in detail. Please include your return FAX number and a telephone number.
- C) Contact us via telephone at U.S. Area Code 716-256-0248. Request SBus Product Support. Our offices are open between 8:00 am and 5:00 pm Eastern Time, Monday through Friday.

If you are located outside North America, we encourage you to contact the local PTI distributor or agent for support. Many of our distributors or agents maintain technical support staffs.

## APPENDIX E: Troubleshooting Tips

Troubleshooting tips and updated drivers can be obtained via internet mail from the PTI MAILSERVER. To use the mailserver, send an empty mail message to *mailserver@pt.com*. The mailserver will respond with instructions and a list of available options.

The following is a list of the most common problems/solutions encountered when using the PT-SBS440A. If additional service is needed, contact Sbus Product Support (see “APPENDIX D: Product Support” on page 62).

- 
- 1) **PROBLEM:**  
WARNING: ptisp: TERMPWR not detected, check fuse, SCSI bus cable, etc., slic status 0x20
- SOLUTION:**  
Check the SCSI bus cables, fuse, terminators and make sure that there are SCSI devices connected to the SCSI bus.
- 
- 2) **PROBLEM:**  
WARNING: F code sequence resulted in a netstack depth change of -1.
- SOLUTION:**  
Check EPROM (U12 for Single-ended version and U15 for Differential version) firmware revision. Firmware should be 810P0224XX, where XX is the firmware revision. If firmware revision is 11 or below, send your name, shipping address and brief description of the problem to support@pt.com. A new EPROM will be shipped to you.
- 
- 3) **PROBLEM:**  
Need to format a disk larger than 2 GIG under SunOS 4.1.X.
-



**SOLUTION:**

DON'T! Unless the disk is trashed, do not format it. If the disk is brand new and you are installing it for the first time then the disk is pre-formatted at the factory. Use the format command to label and partition the disk into sizes appropriate for your system (Sun O/S 4.x limit is 2 Gig.). Then mount the disk and complete the installation.

An unformatted disk presents a problem under Sun O/S 4.x. The SCSI device driver (sd) that is provided by Sun will timeout format commands after 2 hours. While this may be long enough to format small disks, 2 GIG will generally require much more time. One solution for increasing the format timeout value is as follows:

Edit the "/usr/sys/scsi/targets/sddef.h" file. Locate and change the line:

```
change #define SD_FMT_TIME 120*60
to      #define SD_FMT_TIME 240*
```

In order for this change to take effect, you must then run config and make a new kernel. This will allow the format command to run 4 hours before timing out. This should give the disk enough time to format.

---

**4) PROBLEM:**

Failure of the adapter software to recognize more than 4 targets on the SCSI bus under SunOS 4.1.X.

**SOLUTION:**

Step 1 Check to see if any target ID can be seen. For example, if targets 0,1,2 and 3 are recognized, but targets 4,5 and 6 are not, try removing targets 0,1,2 and 3. Deter-



mine whether targets 4,5 and 6 can now be seen. If no, first check that the SCSI IDs are properly set on each device. Secondly, note that the INSTALL script defines the SCSIbus to allow 4 disks (targets 0,1,2,3), 2 tape drives (targets 4,5) and 1 CD-ROM (target 6). If you have, for instance, 6 disks and no tape drives, you must alter the SCSIbus definition to reflect this. Do this by editing the kernel config file /usr/sys/sun4X/conf/PTISP (substitute 'c' or 'm' for X as is appropriate for your system architecture; substitute the kernel name for PTISP if needed). Edit the kernel config file SCSIbus definition to reflect your set up. You must run config and remake the kernel to incorporate these changes. In the above example (6 disks at targets 0-5, no tape drives, no CD-ROM) the SCSIbus would look similar to the following:

```
scsibus1 at ptisp                # declare second scsi bus
disk sd8 at scsibus1 target 3 lun 0 # ninth hard SCSI disk
disk sd9 at scsibus1 target 1 lun 0 # tenth hard SCSI disk
disk sd10 at scsibus1 target 2 lun 0 # eleventh hard SCSI disk
disk sd11 at scsibus1 target 0 lun 0 # twelfth hard SCSI disk
disk sd12 at scsibus1 target 4 lun 0 # thirteenth SCSI disk
disk sd13 at scsibus1 target 5 lun 0 # fourteenth SCSI disk
disk sr5 at scsibus1 target 6 lun 0 # sixth CD-ROM device
```

**Step 2** If, after removing targets 0,1,2 and 3, targets 4,5 and 6 **are** recognized, then the allocation problem is not a problem with device ID's but is a problem with the overall number of devices.

To increase the overall number of device allocations allowed by the system, try changing the value of the scsi\_ncmds\_per\_dev to a larger value. Do this by editing the file /usr/sys/scsi/conf/autoconf.h. Change the value of the variable "scsi\_ncmds\_per\_dev" to a larger value, such as 32.

---

**Section 4** APPENDICES

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- 5) **PROBLEM:**  
Drvconfig: System call 'modctl\_modconfig' failed: No such device or address under Solaris 2.X.

**SOLUTION:**

The install software is trying to find the SBus card and can not find it. Make sure that the SBus card is installed into the computer system. Be sure to power down the system and install the card before performing the reconfiguring boot (boot -rv).

- 
- 6) **PROBLEM:**  
Data stream error while using the "pkgadd -d /dev/rfd0" command under Solaris 2.x.

**SOLUTION:**

This error is most likely due to the vol daemon under Solaris 2.x. To resolve the problem, use the following command:

```
$ volcheck
$ pkgadd -d /vol/dev/rdiskette0/unlabeled PTIptisp
```

- 
- 7) **PROBLEM:**  
Message is displayed - "ptisp already in use as a driver or alias". The command "pkgrm" will not completely remove the package under Solaris 2.x.

**SOLUTION:**

The "pkgadd" command was apparently run more than once. In order to remove all traces of the ptisp package, check/edit the files below. Be VERY careful when editing these files. Make backup copies of ALL files before editing; otherwise, if an error is made, you may not be able to boot again and may need to reload the OS from CD-ROM.



There are three files that should be checked. The first two are in the /etc directory. Start by making a backup of these two files:

```
cd /etc
cp name_to_major    name_to_major.save
cp driver_aliases  driver_aliases.save
```

Edit the "name\_to\_major" file by deleting the line(s):

```
ptisp ###
      (where ### is the major number)
```

Edit the "driver\_aliases" file by deleting the line(s):

```
ptisp PTI,ptisp
```

Change directories to the /kernel/drv and make a backup of the third file:

```
cd /kernel/drv
cp classes    classes.save
```

Edit the "classes" file by deleting the line(s):

```
ptisp scsi
"PTI,ptisp"    scsi
```

Once all of the ptisp entries have been deleted from the files above, you must do a "reboot -rv". This should remove all of the unwanted entries. You should now be able to add the latest driver using the "pkgadd" command (be sure to do it only **once!**).

---

## 8) PROBLEM

Disk drives not attaching to all the targets on the SCSI chain.

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**Section 4** APPENDICES

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**SOLUTION:**

- Step 1 Halt and power down the system
- Step 2 If there are multiple devices attached, disconnect all but one of the devices.
- Step 3 Reboot the system ("boot -rv" on Solaris 2.x machines).
- Does the system find this drive ok? If not, check the termination. Does the drive have internal termination as well as an external terminator? If so, remove the internal termination option for all of the drives. Use the external terminator only.
- Step 4 If the drive is found then check for internal/external termination issues as stated above for the next next disk to be tested.
- Step 5 Halt and power down the system
- Step 6 Add the second disk to the SCSI chain and check for proper termination.
- Step 7 Reboot the system ("boot -rv" on Solaris 2.x machines).

Cycle through each one of the disks until they are all attached to the system. If you are still having problems, email a copy of the "dmesg" command output to support@pt.com along with a description of the problem.

- 
- 9) **PROBLEM:**  
No floppy disk drive available to load software under Solaris 2.x.



SOLUTION:

**For SPARCstations with no floppy drive available,** insert the supplied diskette into the floppy drive of another system on the network and use the “dd” command to copy the contents of the disk to a file:

```
$ dd if=/dev/rfd0a of=SBS440a.dd bs=8192
```

Move the file to the desired system and enter the pkgadd command:

```
$ pkgadd -d /pathname/SBS440a.dd
```

(where *pathname* is the path to the SBS440a.dd file)

---

10) PROBLEM:

When booting from a device attached to the PT-SBS440A, cannot mount /usr, etc. Error: “Cannot assemble drivers SUN,isp...”.

SOLUTION:

Step 1 For SunOS 4.1.X - assure that the ptisp driver is installed.

For Solaris 2.X - assure that the board is running in Sun Fast/Wide emulation mode.

Step 2 Use the complete path to the boot device. Determine this from the ‘ok’ prompt as follows:

```
ok> cd /sbus
ok> ls
```

This should display the full path name.

Step 3 Assure that the Operating System was loaded from the CD-ROM as described in the manual (do not copy from another disk).

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**Section 4** APPENDICES

- Step 4 During the installation of the OS, when asked “do you want to boot now?” answer “no” and continue with the install.

## APPENDIX F: Error Message Summary

The messages described below are some that may appear on the system console, as well as being logged.

This first set of messages may be displayed while the **ptisp** driver is first trying to attach. All of these messages mean that the **ptisp** driver was unable to attach. These messages are preceded by “ptisp%d”, where %d is the instance number of the PT-SBS440A controller.

### **Device in slave-only slot, unused**

The SBus device has been placed in a slave-only slot and will not be accessible; move to non-slave-only SBus slot.

### **Device is using a hilevel intr,**

The device was configured with a interrupt level that cannot be used with this **ptisp** driver, check the SBus device.

### **Failed to alloc soft state**

Driver was unable to allocate space for the internal state structure. Driver did not attach to device, SCSI devices will be inaccessible.

### **Bad soft state**

Driver requested an invalid internal state structure. Driver did not attach to device, SCSI devices will be inaccessible.

### **Unable to map registers;**

Driver was unable to map device registers; check for bad hardware. Driver did not attach to device, SCSI devices will be inaccessible.

### **Cannot add intr**

Driver was not able to add the interrupt routine to the kernel. Driver did not attach to device, SCSI devices will be inaccessible.



**Unable to attach**

Driver was unable to attach to the hardware for some reason that may be printed. Driver did not attach to device, SCSI devices will be inaccessible.

This next set of messages can be displayed at any time, they will be printed with the full device pathname followed by the shorter form described above.

**Firmware should be < 0x%x bytes**

Firmware size exceeded allocated space; will not download firmware. This could mean that the firmware was corrupted somehow; check the **ptisp** driver.

**Firmware checksum incorrect**

Firmware has an invalid checksum and will not be downloaded.

**Chip reset timeout**

ISP1000 failed to reset in the time allocated, may be bad hardware.

**Stop firmware failed**

Stopping the firmware failed, may be bad hardware.

**Load ram failed**

Unable to download new firmware into the ISP1000 chip

**DMA setup failed**

The DMA setup failed in the host adapter driver on a **scsi\_pkt**; this will return TRAN\_BADPKT to a SCSI target driver.

**Bad request pkt**

The ISP Firmware rejected the packet as being setup incorrectly. This will cause the **ptisp** driver to call the target completion routine with the reason of CMD\_TRAN\_ERR set in the **scsi\_pkt**. Check the target driver for correctly setting up the packet.

**Bad request pkt header**

The ISP Firmware rejected the packet as being setup incorrectly. This will cause the **ptisp** driver to call the target



completion routine with the reason of CMD\_TRAN\_ERR set in the **scsi\_pkt**. Check the target driver for correctly setting up the packet.

**Polled command timeout on %d.%d**

A polled command experienced a timeout; the target device, as noted by the target lun (%d.%d) info, may not be responding correctly to the command, or the ISP1000 chip may be hung. This will cause an error recovery to be initiated in the **ptisp** driver. This could mean a bad device or cabling.

**Firmware error**

The ISP1000 Chip encountered a firmware error of some kind. This error will cause the **ptisp** driver to do error recovery by resetting the chip.

**Received unexpected SCSI Reset**

The ISP1000 chip received an unexpected SCSI Reset and has initiated its own internal error recovery, which will return all the **scsi\_pkt** with reason set to CMD\_RESET.

**Fatal timeout on target %d.%d**

The **ptisp** driver found a command that had not completed in the correct amount of time; this will cause error recovery by the **ptisp** driver. The device that experienced the timeout was at target lun (%d.%d).

**Fatal error, resetting interface**

This is an indication that the **ptisp** driver is doing error recovery. This will cause all outstanding commands that have been transported to the **ptisp** driver to be completed via the **scsi\_pkt** completion routine in the target driver with reason of CMD\_RESET and status of STAT\_BUS\_RESET set in the **scsi\_pkt**.

**Error: TERMPWR Fuse opened - check**

This error is reported when the resetable TERMPWR fuse on the **PT-SBS440A** controller opens. This indicates that a short exists on the TERMPWR line on the SCSIbus cable. Find the source of the short and

remove from the cable.

**Error: TERMPWR shorted or missing -**

The TERMPWR line is a source of +5 volts. It is used to power the terminators on the SCSIbus. If the **PT-SBS440A** detects that the voltage is missing (actually less than .7 volts) then the **ptisp** driver will report using this message.

**Single Ended SCSI device detected on**

This warning indicates that a single ended SCSI device was detected on the bus of a **PT-SBS440A-D** differential controller. The SCSIbus will not operate in this condition. Find which device is the wrong type and remove.

**TERMPWR Fuse Returned to Normal (Ok)**

This is printed when the fuse on the **PT-SBS440A** returns to the “normal” or operational condition.

**TERMPWR Returned to Normal (Ok)**

This is printed when the TERMPWR voltage level returns to approx. +5 volts.

## APPENDIX G: Single Ended SCSIbus Connector Pin Out

NOTE: 8-bit devices attached to the SCSIbus leave the following signals open:

-DB(8), -DB(9), -DB(10), -DB(11), -DB(12), -DB(13), -DB(14), -DB(15), and -DB(P1)

**Table 2: PT-SBS440A-S (Single Ended) SCSIbus Connections**

Pin	Signal	Pin	Signal
1	GROUND	35	-DB(12) <sup>a</sup>
2	GROUND	36	-DB(13)
3	GROUND	37	-DB(14)
4	GROUND	38	-DB(15)
5	GROUND	39	-DB(P1)
6	GROUND	40	-DB(0)
7	GROUND	41	-DB(1)
8	GROUND	42	-DB(2)
9	GROUND	43	-DB(3)
10	GROUND	44	-DB(4)
11	GROUND	45	-DB(5)
12	GROUND	46	-DB(6)
13	GROUND	47	-DB(7)
14	GROUND	48	-DB(P)
15	GROUND	49	GROUND
16	GROUND	50	GROUND
17	TERMPWR	51	TERMPWR
18	TERMPWR	52	TERMPWR
19	GROUND	53	GROUND
20	GROUND	54	GROUND
21	GROUND	55	-ATN
22	GROUND	56	GROUND
23	GROUND	57	-BSY
24	GROUND	58	-ACK

**Table 2: PT-SBS440A-S (Single Ended) SCSIbus Connections**

Pin	Signal	Pin	Signal
25	GROUND	59	-RST
26	GROUND	60	-MSG
27	GROUND	61	-SEL
28	GROUND	62	-C/D
29	GROUND	63	-REQ
30	GROUND	64	-I/O
31	GROUND	65	-DB(8)
32	GROUND	66	-DB(9)
33	GROUND	67	-DB(10)
34	GROUND	68	-DB(11)

- a. The hyphen preceding a signal name indicates that signal is active low.

## APPENDIX H: Differential SCSIbus Connector Pin Out

NOTE: 8-bit devices attached to the SCSIbus leave the following signals open:

-DB(8), -DB(9), -DB(10), -DB(11), -DB(12), -DB(13), -DB(14), -DB(15), -DB(P1),  
+DB(8), +DB(9), +DB(10), +DB(11), +DB(12), +DB(13), +DB(14), +DB(15), and +DB(P1)

**Table 3: PT-SBS440A-D (Differential) SCSIbus Connections**

Pin	Signal	Pin	Signal
1	+DB(12) <sup>a</sup>	35	-DB(12) <sup>b</sup>
2	+DB(13)	36	-DB(13)
3	+DB(14)	37	-DB(14)
4	+DB(15)	38	-DB(15)
5	+DB(P1)	39	-DB(P1)
6	GROUND	40	GROUND
7	+DB(0)	41	-DB(0)
8	+DB(1)	42	-DB(1)
9	+DB(2)	43	-DB(2)
10	+DB(3)	44	-DB(3)
11	+DB(4)	45	-DB(4)
12	+DB(5)	46	-DB(5)
13	+DB(6)	47	-DB(6)
14	+DB(7)	48	-DB(7)
15	+DB(P)	49	-DB(P)
16	DIFFSENS	50	GROUND
17	TERMPWR	51	TERMPWR
18	TERMPWR	52	TERMPWR
19	GROUND	53	GROUND
20	+ATN	54	-ATN
21	GROUND	55	GROUND
22	+BSY	56	-BSY

**Table 3: PT-SBS440A-D (Differential) SCSIbus Connections**

Pin	Signal	Pin	Signal
23	+ACK	57	-ACK
24	+RST	58	-RST
25	+MSG	59	-MSG
26	+SEL	60	-SEL
27	+C/D	61	-C/D
28	+REQ	62	-REQ
29	+I/O	63	-I/O
30	GROUND	64	GROUND
31	+DB(8)	65	-DB(8)
32	+DB(9)	66	-DB(9)
33	+DB(10)	67	-DB(10)
34	+DB(11)	68	-DB(11)

- a. The plus sign indicates the signal is active high.  
b. The hyphen indicates the signal is active low.

## APPENDIX I: Maximizing System Performance

There are a variety of ways to maximize system performance when using a PT-SBS440A. The following recommendations should help to tune your system for the most benefit.

1. *Keep faster devices on the same bus.*

Although the PT-SBS440A supports mixed devices (both speed and data width), keeping slower devices on a slower bus of their own will increase the data throughput of the faster bus. The main reason is that slower devices take longer to transfer the data, keeping the SCSIbus tied up. As a result, the faster devices such as 16 bit disks must wait longer for their bus time.

2. *If possible, keep I/O requests as large as possible.*

If you are writing applications that use the write() and read() system calls, attempt to keep I/O byte counts as large as practical. A request size of 8K bytes is very good at maintaining filesystem performance at its maximum.

3. *Balance the filesystem load over more than one disk.*

If you have multiple disks, try to balance the I/O load over the multiple disks. Since SCSI allows multiple commands to devices, one disk can be moving its heads to retrieve data while another disk is performing its data I/O. For example, if one filesystem is used heavily, don't put it on the same disk that also has the swap partition.

4. *Use the system utility **tunefs** to optimize the filesystem parameters of the particular device.*

The utility `/etc/tunefs` is designed to change the dynamic parameters of a filesystem which affect disk layout and filesystem clustering. The parameters `maxcontig` and `rotdelay` are the ones that will result in increased performance. Typically their default parameters are not ideal for the newer SCSI disks. Consult the systems "man" pages for information on running tunefs. The parameter `rotdelay` should be set to 0. The following shell script can be run to find the optimum setting for `maxcontig`:



---

**Section 4** APPENDICES

```
# for /bin/sh
# /dev/sdXx is the SCSI disk partition that will
be tested
# replace the Xx with the proper SCSI device number
# (i.e. sd1a, sd2g) of a valid disk partition
#
for i in 4 5 6 7 8 9 10 11 12 13 14 15
do  umount /dev/sdXx
    echo Maxcontig $i
    tune2fs -d 0 -a $i /dev/sdXx
    mount /dev/sdXx /mnt
    dd if=/dev/zero of=/mnt/XXX bs=8k count=1000
    umount /dev/sdXx; mount /dev/sdXx /mnt
    time dd of=/dev/null if=/mnt/XXX bs=8k
done
```

The above shell script will output the value of `maxcontig` and then the amount of time to read a large file off the disk being tested. When completed, the value that gives the shortest time should be used as the default for `maxcontig`.

## APPENDIX J: Informative Annex

### Informative Annex SCSI Host Adapter Package

(This Informative Annex is not a part of IEEE Draft Std P1275.0-19XX,  
*Standard for Boot Firmware*, but is included for information only.)

#### **B.1 Overview and References**

This annex describes the application of P1275 Boot Firmware to the SCSI Bus. This annex addresses nodes representing SCSI host adapters.

##### **B.1.1 Definition of Terms**

bus node: a device node that represents the interface, or “host adapter”, between an SCSI Bus and its parent (which may be another bus).

child node: a device node that represents an SCSI “target” device.

##### **B.1.2 References**

SCSI (Small Computer Systems Interface) is a peer-to-peer I/O bus defined by the standard ISO/IEC 10288, which replaces ISO/IEC 9316:1989.

#### **B.2 Bus Characteristics**

##### **B.2.1 Physical Address Formats and Representations**

SCSI devices are addressed with a 4-bit “target” number and a 3-bit “unit” number. The numerical representation on an SCSI Bus physical address consists of the target number in the *high* number and the unit number in the *low* number. The text string representation is *target, unit*, where *target* and *unit* are both hexadecimal numbers. Future SCSI extensions have proposed target address spaces greater than 4 bits and unit address spaces larger than 3 bits. The given address representation allows for up to 32 bits for each of the target and unit addresses.

SCSI is not a memory-mapped bus. Operations on target devices are performed by executing a transaction consisting of multiple phases, including selecting a particular target device, sending multi-byte commands to the target, possibly transferring multiple data bytes to or from the target, and returning status.

##### **B.2.2 Bus-Specific Configuration variables**

None.

**B.2.3 Format of a Probe List**

None.

**B.2.4 Interrupt Specification Format**

None (SCSI has no interrupts).

**B.2.5 FCode Interpretation Semantics**

None (SCSI has no provision for device identification via FCode).

**B.3 Bus Nodes**

**B.3.1 Properties**

**B.3.1.1 P1275-defined Properties for Bus Nodes**

The following standard properties, as defined in P1275, have special meanings or interpretations for SCSI.

“device-type”

Standard *prop-name* to specify the implemented interface.

The meaning of this property is defined in P1275. A package conforming to this specification and corresponding to a device that implements an SCSI bus *shall* implement this property with the string value “scsi-2”.

**B.3.1.2 Bus -specific Properties for Bus Nodes**

None.

**B.3.2 Methods**

**B.3.2.1 P1275-defined Methods for Bus Nodes**

A package implementing the “scsi-2” device type *shall* implement the following standard methods as defined in P1275, with physical address s representations as specified in section 2.1 of this standard.

**B.3.2.2 Bus-specific Methods for Bus Nodes**

A package implementing the “scsi-2” device type *shall* implement the following bus-specific methods.

max-transfer                               (--n)

Returns the maximum DMA transfer length supported by the hardware.



- set-address (unit# target# --)  
Sets the SCSI target number (0x0..0xf) and unit number (0..7) to which subsequent commands apply.
- set-time out (msecs --)  
Sets the maximum length of time in milliseconds that the driver will wait for the completion of a command. The default value of zero means to wait indefinitely. A hardware error result is reported for a command that times out.
- show-children (--)  
Searches the SCSI bus for attached target devices and their associated units. Displays the information that the SCSI "Inquiry" command reports for those devices.

#### **B.4.1.2 Bus-specific Properties for Child Nodes**

None.

#### **B.4.2 Methods**

None.

#### **B.5 User Interface Extensions**

None.



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