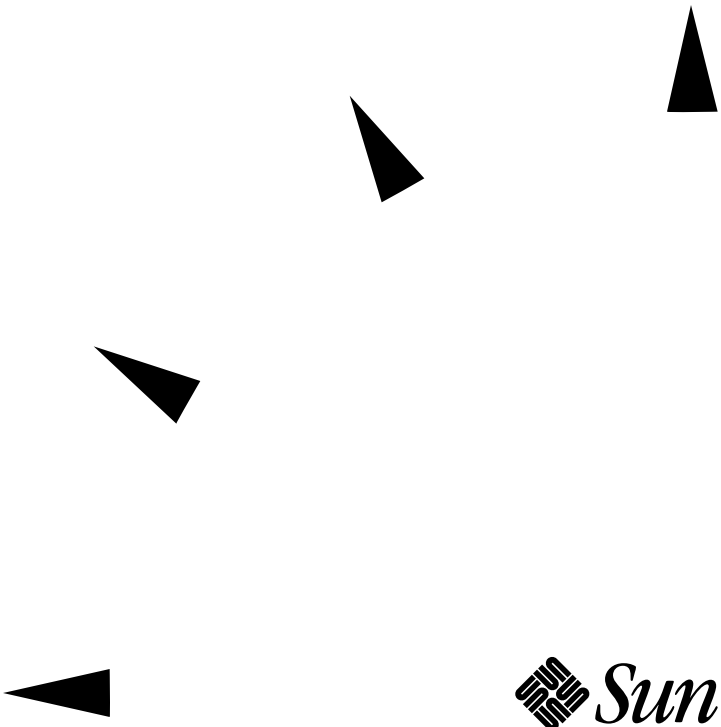
Solaris™ Handbook for SMCC Peripherals



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Preface

The instructions in this manual are designed for an experienced system administrator.

The *Solaris Handbook for SMCC Peripherals* describes how to configure Sun Microsystems peripheral devices, such as disk drives, tape drives, CD-ROM drives, and boards by using the Solaris™ operating environment.

Note – The Solaris operating environment includes the SunOS™ operating system, the OpenWindows™ operating environment, the Common Desktop Environment (CDE), compilers, and other software.

Before You Read This Book

Before you begin using the information in this book, you should:

- Read the documentation that accompanies your peripheral devices before you start to configure them.
- Install the Solaris software on your system.

For more information about how to install the Solaris operating environment on your system, refer to the *Solaris Advanced Installation Guide* manual.

Note – If you have not yet installed the Solaris operating environment on your system, do so now.

How This Book Is Organized

This book contains the following chapters:

Typographic Conventions

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

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

Shell Prompts

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

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

Related Documents

The following documents contain topics that relate to the information in the *Solaris Handbook for SMCC Peripherals.*

Application	Title	Part Number
System administration	*Solaris 1.x (SunOS 4.x) Handbook for SMCC Peripherals*	801-2424
System administration	*System Administration Guide*	802-5750
System administration	*OpenBoot 2.x Command Reference Manual*	802-3241
System administration	*OpenBoot 3.x Command Reference Manual*	802-3242

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Luxembourg	32-2-720-09-09	32-2-725-88-50
Germany	01-30-81-61-91	01-30-81-61-92
The Netherlands	06-022-34-45	06-022-34-46
Sweden	020-79-57-26	020-79-57-27
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Before You Start 1

This chapter describes the requirements and procedures that you must perform to power off or shut down your system.

This chapter contains the following information:

1

Requirements

Before you set up a peripheral device, you must:

- Turn on the power to the system.
- Install the Solaris software.

For Solaris installation instructions, refer to the *Solaris Advanced Installation Guide* documentation.

Note – This manual does not describe how to install the Solaris operating environment.

Verifying the System Environment

Verify the system environment that is installed on your system before you install a peripheral device.

♦ **Type** `uname -rs` **and press Return.**
The operating system responds by displaying the following message:

```
SunOS 5.x
```

The screen should display the SunOS version of the operating system. The Solaris system environment, to which this manual refers, includes the SunOS operating system as well as compilers and other software.

Table 1-1 shows the SunOS releases shipped with the corresponding Solaris releases.

Table 1-1 SunOS and Corresponding Solaris Releases

If you are running the following SunOS:	**You are using the following Solaris system environment:**
SunOS 5.0	Solaris 2.0
SunOS 5.1	Solaris 2.1
SunOS 5.2	Solaris 2.2
SunOS 5.3	Solaris 2.3
SunOS 5.4	Solaris 2.4

Table 1-1 SunOS and Corresponding Solaris Releases

If you are running the following SunOS:	You are using the following Solaris system environment:
SunOS 5.5	Solaris 2.5
SunOS 5.5.1	Solaris 2.5.1
SunOS 5.6	Solaris 2.6

If you are using SunOS 4.x, refer to the ***Solaris 1.x (SunOS 4.x) Handbook for SMCC Peripherals***

Note – If you are working in an environment other than Solaris 2.x, the commands and tasks described in this manual do not apply.

Shutting Down the System

Power off or shut down your system before you install a peripheral device.

See Table 1-2 on page 4 for a definition of each shutdown

When preparing to shut down a system, you need to determine which of the following shutdown commands is appropriate for the system and the task at hand:

- `/sbin/init`
- `/usr/sbin/shutdown`
- `/usr/sbin/halt`
- `/usr/sbin/reboot`

1

These commands initiate shutdown procedures, kill all running processes, write data to disk, and shut down the system software to the appropriate run level.

For more information about `rc` scripts, see chapter 10 of the *System Administration Guide*, "Boot Files and Run Levels."

Note – `init` and `shutdown` are the two most reliable ways to shut down a system because they use `rc` scripts to kill running processes and shut down the system with minimal data loss. The `halt` and `reboot` commands do not run the `rc` scripts properly and are not the preferred method for shutting down the system.

Table 1-2 describes each of the shutdown commands. The sections that follow provide more details about the `init` and `shutdown` commands as they apply to the Solaris operating environment.

Table 1-2 Shutdown Commands

Command	Function
`init`	Use the `init` command to shut down a single-user system or to change its run level. You can use `init` to place the system in power-down state (`init 0`) or into single-user state (`init 1`).
`shutdown`	Use the `shutdown` command when shutting down a system with multiple users. The `shutdown` command sends a warning message to all users who are logged in, waits for 60 seconds (the default), and then shuts down the system to single-user state.
`halt`	Use the `halt` command when the system must be stopped immediately and it is acceptable *not* to warn any current users. The `halt` command shuts down the system without any delay. It does not warn any other users on the system.
`reboot`	Use the `reboot` command to shut down a single-user system and bring it into multiuser state. `reboot` does not warn other users on the system.

The `init` *Command*

Use the `init` command to shut down single-user systems and keep the system running correctly. In addition, use the `init` command to change init states. You can also specify the init state as an argument to the `shutdown` command with the `-i` option.

See Table 1-3 on page 5 for a description of the various `init` states.

The init state in which the system is running defines what services and resources are available to users. A system can run in only one init state at a time. There are four types of init states:

- Power-down (run level 0)
- Single-user (run levels 1 and s or S)
- Multiuser (run levels 2 and 3)
- Reboot (run levels 5 and 6)

Table 1-3 Uses of `init` States

`init` **State**	**Run Level**	**Function**
Power-down state	0	Shuts down the system so that it is safe to turn off the power.
System administrator state	1	Lets you perform administrative tasks on systems requiring only single user access. `/` and `/usr` are the only file systems mounted, and you can access only minimum kernel utilities. The terminal from which you issue this command becomes the console. No other users are logged in.
Multiuser state	2	Gives multiple users access to the system and the entire file system. All daemons run except the NFS server and `syslog`.
Remote resource-sharing state	3	Lets you perform normal operations with NFS resource-sharing available.
Alternative multiuser state	4	Provides no function at this time.

Table 1-3 Uses of `init` States *(Continued)*

`init` State	Run Level	Function
Interactive reboot state	5	Prompts you for a device other than the default boot devices. You can also change to this level by using the `reboot -a` command.
Reboot state	6	Shuts down the system to run level 0, and then reboots to multiuser level (the default level in the `inittab` file).
Single-user state	s or S	Runs the system as a single user with all file systems mounted and accessible.

▼ Shutting Down a Single-User System Using `init`

This section describes how to shut down a single-user system.

Instructions about how to shut down servers is discussed in "Shutting Down a Multiuser System Using shutdown" on page 9.

1. Become superuser.

Refer to the *System Administration Guide* and the *Solaris Advanced Installation Guide* manual for instructions on adding a device driver.

2. Add a device driver, if necessary.

If a new device driver is required, use the `pkgadd` command and the Software Manager tool to perform this task.

Note – This task is optional; most device drivers are already part of the operating system. If a device driver is required, you would typically find a CD-ROM with the drive, as well as instructions on how to add the device driver. If you cannot find a CD-ROM or instructions on how to add a specific device driver, a new device driver is probably not needed. Therefore, you can skip this step.

3. **Ensure that the operating system checks for the presence of any newly installed peripheral devices when you power on or reboot your system.**

```
# touch /reconfigure
```

For information on booting your system in different modes, see Appendix A, “Booting Your System.”

Note – The `touch /reconfigure` command performs the same function as the `boot -r` command. It allows the operating system to recognize the presence of all newly installed peripheral devices.

4. **Change to the root directory.**

```
# cd /
```

5. **Shut down the system.**

```
# init 0
```

This command writes data to the disk, kills all active processes, brings the system down to power-down state, and displays the `ok` prompt.

6. **If you are asked for confirmation, type y.**

```
ok Do you want to continue? (y or n): y
```

Note – Be sure that you turned on all SCSI devices, such as disk and tape drives, before you attempt to use the `probe-scsi` or `probe-scsi-all` commands. The operating system can detect connected SCSI devices only if you turned them on.

7. **Reset the SCSI bus and kill all running processes by typing:**

```
ok reset
Immediately press <Stop-a>
```

Note – This interrupts the reboot process and clears all SCSI bus activity to ensure an effective `probe-scsi` or `probe-scsi-all` search.

8. **List the SCSI target IDs that are currently being used on the Host SCSI bus by typing:**

```
ok probe-scsi
```

   If you have more than one host bus on your system, use the `probe-scsi-all` command because it probes for all SCSI devices on every SCSI bus including the host bus.

9. **Choose an unused SCSI target ID for your device.**
   Note the target IDs that are already assigned and choose an unused target ID to set the SCSI switch or jumpers on your peripheral device.

10. **After the `ok` prompt is displayed, turn off the power to the system and then to all external peripheral devices.**

You are now ready to install the peripheral device. Refer to the documentation that accompanies your hardware, and the appropriate section in this manual:

The shutdown *Command*

Use the shutdown command to shut down servers when users must be notified of the impending shut down.

▼ Shutting Down a Multiuser System Using shutdown

Instructions about how to shut down a single-user system is covered in "Shutting Down a Single-User System Using init" on page 6.

This section describes how to shut down a multiuser system, such as a server.

1. **Become superuser.**

2. **To find out if users are logged into the system, type:**

```
# who
```

A list of all logged-in users is displayed. You can send mail or broadcast a message to let users know that the system is being shut down.

3. **Add a device driver, if necessary.**

Refer to the *System Administration Guide* manual and the *Solaris Advanced Installation Guide* manual for instructions on adding a device driver.

If a new device driver is needed, use the pkgadd command and the Software Manager tool to perform this task.

Note – This task is optional; most device drivers are already part of the operating system. If a device driver is required, you would typically find a CD-ROM with the drive as well as instructions on how to add the device driver. If you cannot find a CD-ROM or instructions on how to add a specific device driver, a new device driver is probably not needed. Therefore, you can skip this step.

---

4. Ensure that the operating system checks for newly installed peripheral devices when you power on or reboot your system, type:

```
# touch /reconfigure
```

For information on booting your system in different modes, see Appendix A, “Booting Your System.”

Note – The `touch /reconfigure` command performs the same function as the `boot -r` command. It allows the operating system to recognize the presence of all newly installed peripheral devices.

5. Change to the root directory, by typing:

```
# cd /
```

6. Shut down the system, by typing:

```
# shutdown -y -g30 -i0
```

In this command,

`shutdown`	Brings a system to run level `s` (single-user mode) by default. A message is broadcast to all users. After a 60-second wait (default), you are asked to confirm that you want to shut down the system.
`-y`	Continues to shut down the system without intervention; otherwise, you are prompted to continue the shutdown process.
`-g` *grace-period*	Indicates a time (in seconds) before the system is shut down. The default is 60 seconds.
`-i` *init-state*	Allows you to bring the system to an init state that is different from the default of 2. (Refer to Table 1-3 on page 5 for init state information.)

In the following example, the system will be brought to run level 0 in 3 minutes without requiring additional confirmation.

```
# shutdown -y -g180 -i0
Shutdown started.    Fri Nov 4 11:07:33 MST 1994
Broadcast Message from root (console) on pluto Fri Nov 4 11:07:34
The system will be shut down in 3 minutes
                     .
                     .
                     .
INIT: New run level: 0
The system is coming down. Please wait.
                     .
                     .
                     .
The system is down.
syncing file systems... [11] [9] [5] done
Program terminated
Type help for more information
ok
```

7. If you are asked for confirmation, type y.

```
ok Do you want to continue? (y or n): y
```

Note – Be sure that you turned on all SCSI devices, such as disk and tape drives, before you attempt to use the `probe-scsi` or `probe-scsi-all` commands. The operating system can detect connected SCSI devices only if you turned them on.

8. Reset the SCSI bus and kill all running processes, by typing:

```
ok reset
Immediately press <Stop-a>
```

Note – This interrupts the reboot process and clears all SCSI bus activity to ensure an effective `probe-scsi` or `probe-scsi-all` search.

9. **List the SCSI target IDs that are currently being used by typing:**

```
ok probe-scsi
```

If you have more than one host bus on your system, use the `probe-scsi-all` command because it probes for all SCSI devices on every SCSI bus including the host bus

Note – `probe-scsi-all` will not see devices connected with a Soc/S adapter board, such as a SPARCstorage Array.

10. **Choose an unused SCSI target ID for your device.**
Note the target IDs that are already assigned and choose an unused target ID to set the SCSI switch or jumpers on your peripheral device.

11. **Turn off the power to the system and then to all external peripheral devices after the `ok` prompt is displayed.**

You are now ready to install your peripheral device. Refer to the documentation that accompanies your hardware, and the appropriate section in this manual:

Setting Up a Disk Drive 2

This chapter describes how to configure disk drive devices using the Solaris operating environment.

This chapter contains the following information:

2

Requirements

Before you configure the operating environment for a new disk drive, you must:

- Install the Solaris software
- Shut down the system and peripherals that are already connected, as described in "Shutting Down the System" on page 3

Note – If you did not follow the procedures in "Shutting Down the System" on page 3, the operating system may not recognize the new disk drive.

Disk Drives

For more information about disk drives, refer to "Managing Disks" in the *System Administration Guide*.

A disk drive contains a user's file systems, such as the `root` (`/`) or `/usr` file systems, or both. A system must have these file systems in order to work.

Table 2-1 shows the disks that are supported by the Solaris operating environment. For more information about which disk types are supported, along with their partition maps, see the `/etc/format.dat` file.

Note – If the Solaris operating environment is on your system, the `format` utility can automatically configure and label the SCSI disk drives, even if that specific type of drive was not previously described in the `/etc/format.dat` file. This lets you format, partition, and label any disk drive compliant with SCSI-2 without having to edit the `/etc/format.dat` file.

Note – After publication of this manual, additional combinations of hardware may be identified as supported by this Solaris release. If a combination of hardware isn't specifically listed in this chapter as being supported, contact your authorized Sun support provider to verify support.

Table 2-1 SMCC-Supported Disks and Controllers

	Controllers					
	Xylogics 450/451	Xylogics 7053	Emulex MD21	ISP-80 IPI	Embedded SCSI	SMCC Supported Embedded SCSI
Fujitsu-M2312K	◆					
Fujitsu-M2284 / M2322	◆					
Fujitsu-M2351 Eagle	◆	◆				
Fujitsu-M2333	◆	◆				
Fujitsu-M2361 Eagle	◆	◆				
Fujitsu-M2372K		◆				
CDC EMD 9720	◆	◆				
CDC 9720-850		◆				
CDC IPI 9720				◆		
CDC IPI 9722				◆		
CDC Wren VII 94601-12G					◆	
CDC Wren IV 94171-327					◆	
CDC Wren IV 94171-344						◆
Hitachi DK815-10	◆	◆				
NEC D2363	◆	◆				
Micropolis 1355			◆			
Micropolis 1558			◆			
Toshiba MK 156F			◆			

Table 2-1 SMCC-Supported Disks and Controllers *(Continued)*

	Controllers					
	Xylogics 450/451	Xylogics 7053	Emulex MD21	ISP-80 IPI	Embedded SCSI	SMCC Supported Embedded SCSI
Seagate IPI ZBR Elite				◆		
Quantum ProDrive 80S					◆	
Quantum ProDrive 105S						◆
SUN0104						◆
SUN0207						◆
SUN0327						◆
SUN0340						◆
SUN0424						◆
SUN0535						◆
SUN0669						◆
SUN1.0G						◆
SUN1.05						◆
SUN1.3G						◆
SUN2.1G						◆

▼ Adding a Disk Drive

See "Shutting Down the System" on page 3.

1. **Shut down your system.**

See Chapter 6, "Selecting Addresses" and the *System Administration Guide* for more information about SCSI address settings.

2. **Check that the address switch for the disk drive has been correctly set.**
   The first internal disk drive usually has jumper settings that were preset by the factory to SCSI target ID 3. If your system has a second internal disk drive, the factory usually sets the jumpers to SCSI target ID 1. External disk drives are usually preset to SCSI target ID 3.

Note – Because the internal disk drive has been preset to SCSI target ID 3 or 1 (SCSI target ID 0 and 1 for sun4u architectures), you must change the default SCSI setting of your external disk drive to an unused target ID.

Each SCSI target ID determines the device address that the Solaris operating environment assigns to the drive.

If you have more than one SCSI device, such as a disk drive, you must set each SCSI address switch to a different address.

Caution – Each disk drive must have a unique SCSI target ID setting, the SCSI address switches on your disk drives may need to be set to different numbers than those shown in Table 2-2. For further information on device addresses, see Chapter 6, "Selecting Addresses."

---

3. **Install the disk drive.**
   For installation information, refer to the documentation that accompanies your hardware.

4. **Turn on the power to all external peripheral devices, this includes the disk drive that you plan to configure and the system.**
   The system is booted and the Solaris operating environment configures the system by assigning a device address to the disk drive.

5. **Prepare the disk, if necessary.**

Caution – For information on how to prepare the disk drive, see “format Utility” in the following section.

Table 2-2 Sample Layout of Address Switch Settings for Disk Drives

Disk Drives	Built-In SCSI Support	First SCSI Interface Card	Second SCSI Interface Card	First IPI Interface Card	Second IPI Interface Card
First internal disk drive	c0t3				
Second internal disk drive; if you do not have a second internal disk drive, use this address for your first external disk drive.	c0t1				
First external disk drive connected to the built-in SCSI connector	c0t2				
Second external disk drive	c0t0				
First external disk drive		c1t1			
Second external disk drive		c1t2			
Third external disk drive		c1t3			
First external disk drive			c2t1		
Second external disk drive			c2t2		
Third external disk drive			c2t3		
First external disk drive				c3t1	
Second external disk drive				c3t2	
Third external disk drive				c3t3	
First external disk drive					c4t1
Second external disk drive					c4t2
Third external disk drive					c4t3

Note – You can set a disk drive’s target ID number to any value, as long as the target ID number is not being used by another device.

`format` *Utility*

Use the `format` utility to format, partition, and label a disk. You can also detect and repair bad blocks on a disk.

The `format` utility performs autoconfiguration by first checking if there is a `/etc/format.dat` entry that matches the product name it detects for the drive. If the file lacks that information, the `format` utility will determine the disk's geometry and capacity by issuing SCSI commands to the disk.

Autoconfiguration occurs at start-up time for a SCSI disk that is not already labeled. You will be prompted for permission to write that label to the disk.

You can also use the `format` utility to autoconfigure a disk at any time. In that case, when you enter `type` at the `format>` prompt, you can enter `0` as the disk type value to specify autoconfiguration.

For more information about the `format` utility, refer to the *System Administration Guide*.

If you are using the Solaris operating environment, you can use the formatting procedures in the following sections even if your SCSI drive is not already listed in the `/etc/format.dat` file.

To use the `format` utility, refer to the following sections of this manual:

▼ Formatting a Disk

Formatting your disk drive is optional, because many hard disks have already been formatted at the factory. If you need to format your disk, follow the steps below.

Note – Not all menu information appears exactly as shown. If you have a SPARCstorage Array you must load the SPARCstorage Array drivers in order to see the disk drives.

1. **Become superuser.**

2. **Access the `format` utility.**

```
# format
```

3. **Select the disk that you want to format from the list displayed on your screen.**
   If the disks are already labeled, the system displays information similar to the following:

```
Searching for disks...done
AVAILABLE DISK SELECTIONS:
    0.  c0t3d0 <SUN0207 cyl  1214 alt 2 hd 9 sec 36>
        /sbus@1,f8000000/esp@0,8000000/sd@3,0
    1.  c0t0d0 <SUN0207 cyl  1214 alt 2 hd 9 sec 36>
        /sbus@1,f8000000/esp@0,8000000/sd@0,0
    2.  c1t1d0 <SUN0207 cyl  1214 alt 2 hd 9 sec 36>
        /sbus@1,f8000000/esp@0,8000000/sd@1,0
    3.  c1t2d0 <SUN0207 cyl  1214 alt 2 hd 9 sec 36>
        /sbus@1,f8000000/esp@0,8000000/sd@2,0
Specify disk (enter its number):2
```

In the above example:

- Disk drives 2 and 3 have been added.
- Drive 2 with address `c1t1d0` is the first external hard disk that is connected to a SCSI card.

- Drive 3, with address `c1t2d0`, is the second external hard disk that is connected to a SCSI card.

  After you format the first external hard disk, you can format the second external hard disk that is connected to the SCSI card.

Caution – Do not select item 0, the system disk. Formatting your system disk deletes your operating system and any data that you may have on this disk.

If the Solaris operating system is unable to find a valid label on drive 2 with address `c1t1d0`, the system displays information similar to the following:

```
Searching for disks...done

c1t1d0:  configured with capacity of 198 MB

AVAILABLE DISK SELECTIONS:
    0.  c0t3d0 <SUN0207 cyl  1214 alt 2 hd 9 sec 36>
        /sbus@1,f8000000/esp@0,8000000/sd@3,0
    1.  c0t0d0 <SUN0207 cyl  1214 alt 2 hd 9 sec 36>
        /sbus@1,f8000000/esp@0,8000000/sd@0,0
    2.  c1t1d0 <SUN0207 cyl  1214 alt 2 hd 9 sec 36>
        /sbus@1,f8000000/esp@0,8000000/sd@1,0
    3.  c1t2d0 <SUN0207 cyl  1214 alt 2 hd 9 sec 36>
        /sbus@1,f8000000/esp@0,8000000/sd@2,0
Specify disk (enter its number):2

Selecting c1t1d0
[disk formatted]
Disk not labeled. Label it now? y
```

The `configured with capacity` message and the `Label it now?` prompt are displayed for a disk without a valid label or for a new, unlabeled disk.

4. **At the** `format>` **prompt, type** `format`**, and confirm the command by typing** `y`**.**

```
format> format

Ready to format. Formatting cannot be interrupted.
Continue? y
Beginning format. The current time is Fri Sept 11 14:56:51 1993
Formatting ...
done

Verifying media ...
pass 0 - pattern = 0xc6dec6de
pass 1 - pattern = 0x6db6db6d
total of 0 defective blocks repaired.
format>
```

▼ Partitioning a Disk

Partitioning a disk means to divide a disk so individual file systems can be created on separate slices. Refer to the *System Administration Guide.*

Caution – When creating *raw* partitions, disk drive header and geometry information may be lost if you write *raw I/O* data to cylinder 0. Start *raw* partitions at cylinder 1.

1. **Type** `partition` **at the** `format` **prompt.**
   The following menu is displayed:

```
PARTITION MENU:
       0         - change‘0-‘ partition
       1         - change‘1‘ partition
       2         - change‘2‘ partition
       3         - change‘3‘ partition
       4         - change‘4‘ partition
       5         - change‘5‘ partition
       6         - change‘6‘ partition
       7         - change‘7‘ partition
       select    - select a predefined table
       modify    - modify a predefined partition table
       name      - name the current table
       print     - display the current table
       label     - write partition map and label to the disk
       quit
partition>
```

2. **Type** `modify`**.**
   The following menu is displayed.

```
Select partitioning base:
 0. Default partition for selected drive
 1. Current partition table (original sd3)
 2. All Free Hog
Choose base (enter number) [0]?
```

Note – Not all menu information appears exactly as shown. For disk drives greater than 2.1-Gbytes there is no default partitioning table available.

3. **Type `0`.**
   The following message is displayed:

```
Part      Tag    Flag      Cylinders      Size      Blocks
 0        -      -        0 - 505        80.05MB   (506/0/0)
 1        -      -        506 - 568      9.97MB    (63/0/0)
 2        -      -        0 - 1253       198.39MB  (1254/0/0)
 3        -      -        0              0         (0/0/0)
 4        -      -        0              0         (0/0/0)
 5        -      -        0              0         (0/0/0)
 6        -      -        569 - 937      58.38MB   (369/0/0)
 7        -      -        938 - 1253     49.99MB   (316/0/0)
Do you wish to continue creating a new partition
table based on above table[yes]?
```

4. **Type `y` if you want to change the size of any partitions.**
   The following message is displayed:

```
Free Hog partition[6]?
```

5. **Select one of the 7 partitions as a *free hog* partition.**
   This partition cannot be set to 0. In the following example, you can use partition 6 as the *free hog* partition. Do not use partition 2.

   The following menu is displayed:

```
Enter size of partition ‘0‘  [163944b, 506c, 80.05mb]: 0
Enter size of partition ‘1‘  [20412b, 63c, 9.97mb]: 0
Enter size of partition ‘3‘  [0b, 0c, 0.00mb]: 0
Enter size of partition ‘4‘  [0b, 0c, 0.00mb]: 0
Enter size of partition ‘5‘  [0b, 0c, 0.00mb]: 0
Enter size of partition ‘7‘  [102384b, 316c, 49.99mb]: 80mb
```

   When you use the `format` utility to change the size of one or more disk partitions, you must designate a temporary partition that can expand and shrink to accommodate resizing. This partition frees space when you expand a partition, and receives or hogs the discarded space when you shrink a partition.

For this reason, the donor partition is sometimes called the *free hog*. The donor partition exists only during installation or whenever you execute the `format` utility. There is no permanent donor partition during day-to-day operations.

6. **Specify the size of each partition in megabytes by changing any of the displayed sizes.**
   In this example, the sizes have been changed as displayed:

```
Part      Tag    Flag     Cylinders      Size      Blocks
 0        -      -        0              0         (0/0/0)
 1        -      -        0              0         (0/0/0)
 2        -      -        0 - 1253       198.39MB  (1254/0/0)
 3        -      -        0              0         (0/0/0)
 4        -      -        0              0         (0/0/0)
 5        -      -        0              0         (0/0/0)
 6        -      -        0 - 747        118.34MB  (748/0/0)
 7        -      -        748 - 1253     80.05MB   (506/0/0)

Okay to make this the current partition table [yes]?
```

Caution – Do not change partition 2. Reducing the size of partition 2 decreases available disk space.

7. **Type** `y` **to confirm.**
   The following message is displayed:

```
Enter table name (remember quotes):
```

8. **Assign a name to the newly created table.**

9. **Type the new name of the partition table and press Return.**

You are now ready to label your disk.

▼ Labeling a Disk

To label a disk means to write back to disk the information in the partition table that you have just finished modifying.

Note – You must label a disk after it is partitioned or the operating system will not recognize the partitions or any changes that you have made.

---

1. **Type** `label` **at the** `partition>` **or** `format>` **prompt.**
   The following menu is displayed:

```
Ready to label disk?
```

2. **Type** `y` **and press Return.**
3. **Type** `q`**.**
4. **Type** `q` **again.**

▼ Creating a File System

You need to create a file system for a partition when you have:

- Added or replaced a disk drive
- Changed the existing partitioning structure

You must know the device address of the disk drive and partition for which you want to create a file system.

Note – The disk for which you plan to create a file system must already be formatted and partitioned.

---

1. **Become superuser.**
2. **Type**:

```
# newfs /dev/rdsk/cxtxdxsx
```

Caution – Make sure that you have specified the correct device name for the partition before you create a file system for the next partition. If you specify the wrong partition, you erase the contents of the partition that you specified.

3. **Press Return.**
   The operating system asks for confirmation.

```
newfs: construct a new file system /dev/rdsk/cxtxdxsx (y/n)?
```

4. **Type** `y` **to confirm.**

▼ Mounting a File System

Once you have created a file system, you need to make it available to others by mounting them. A mounted file system is attached to the system directory tree at the specified mount point, and becomes available to the system. The root file system is always mounted. Any other file system can be connected or disconnected from the root (`/`) file system.

To mount a file system, follow these steps:

For more information about writing entries in the `/etc/vfstab` file, see *man Pages(4): File Formats* and the *System Administration Guide*.

1. **Edit the** `/etc/vfstab` **file with** `vi` **or any text editor.**
   a. **Add the entry by separating each field with a space or a tab. If a field has no entry, enter a dash (`-`).**
   b. **Save the** `/etc/vfstab` **file with the modifications.**

2. **Verify that a mount point directory has been created.**
   If it does not exist, create it now with the `mkdir` command.

```
# mkdir /mount_point_directory
```

Note – The mount point directory must be created prior to mounting a file system.

3. Type:

```
# mount /dev/dsk/cxtxdxsx /mount_point_directory
```

Or, if the entry for this file system was already made in the `/etc/vfstab` file:

Type:

```
# mount /mount_point_directory
```

You also can use the `mountall`(1M) command at this point.

Note – Be sure not to mount any partition that you intend to use as swap space or as an unmounted partition.

Setting Up a Tape Drive 3

Refer to the online `man` Pages for more information. The `mt` and `st` commands are especially useful.

This chapter describes how to configure tape drive devices using the Solaris operating environment.

This chapter describes how to configure tape drive devices using the Solaris operating environment.

This chapter contains the following information:

3

Requirements

Before you start to configure the operating environment for a new tape drive, you must:

- Install the Solaris software
- Shut down the system and peripherals that are already connected, as described in “Shutting Down the System” on page 3

Note – If you did not follow the procedures in “Shutting Down the System” on page 3, the operating system may not recognize the new tape drive.

See Table 3-1 on page 33 for information on how tape device addresses are assigned.

If you are installing a third-party SCSI tape drive, refer to the *System Administration Guide* for installation information, and *man Pages(7): Device Network Interfaces* for information on how to specify tape drive configuration data.

Managing Tape Drives

For more information on managing tape drives, refer to "Managing Tape Drives," in the *System Administration Guide*.

Tape drives are used primarily to back up system data. The following commands can be used to back up data files, file systems, or restore partitions on a tape cartridge and are defined under "Performing Data Backups and Restores" on page 36:

- `cpio`
- `dd`
- `ufsdump`
- `ufsrestore`

For information on managing tape drives, refer to the following sections in this chapter:

For more information about tape drives, refer to the documentation that accompanies your hardware.

▼ Adding a Tape Drive

See “Shutting Down the System” on page 3.

1. **Shut down your system.**

Refer to Table 3-1 on page 33 for a list of address switch settings.

2. **Check that the address switch for the tape drive has been set correctly.**

   The SCSI address switch for tape drives is typically preset by the factory to SCSI target ID 4. If you have more than one tape drive, you must set the SCSI address switch of the second tape drive to an address other than SCSI target ID 4 or any other target ID present on the bus.

   If you have more than one SCSI device, such as tape drive, you must set each SCSI address switch to a different target ID.

   You can connect any number of tape drives to a single SCSI bus provided that the total cable length does not exceed 6 meters and SCSI addresses are available.

Note – Connecting more than 4 tape drives to a single SCSI bus can cause slower system performance. If you have disk drives on the SCSI bus, only 2 tape drives can be added.

Caution – Each tape drive must have a unique SCSI target ID setting, the SCSI address switches on your tape drives may need to be set to different numbers than those shown in Table 3-1. For further information on device addresses, see the *System Administration Guide.*

Table 3-1 Example of Address Switch Settings for Tape Drives

Tape Drives	SCSI Address Switch or Jumper Setting (Target ID)	Device Address for Built-In SCSI Support
First external tape drive	4*	`/dev/rmt/0l` or `/dev/rmt/0m` or `/dev/rmt/0h` or `/dev/rmt/0u` or `/dev/rmt/0c`
Second external tape drive	5	`/dev/rmt/1l` or `/dev/rmt/1m` or `/dev/rmt/1h` or `/dev/rmt/1u` or `/dev/rmt/1c`

*Can be any unique address on the bus.

3. **Install the tape drive.**
   For installation information, refer to the documentation that accompanies your hardware.

4. **Turn on the power to all external peripheral devices, this includes the tape drive that you plan to configure and the system.**
   The system is booted (using the `boot -r` command) and the Solaris operating environment configures the system by assigning a device address to the tape drive.

5. **Prepare the tape drive if necessary.**

See “Managing Tape Drives” on page 31 for information on how to prepare the tape drive.

▼ Tensioning a 1/4-inch Tape Cartridge

When you insert a *blank* tape cartridge into a 1/4-inch tape drive, you should perform a tensioning pass. This procedure runs the tape from one end to the other and ensures an even distribution of tension throughout the new tape.

Note – The retensioning command is not supported for Digital Data Storage (DDS) or 8mm devices.

To run a tensioning pass:

1. **Insert the new blank tape cartridge into the tape drive.**
2. **Type:**

```
% mt -f /dev/rmt/unit number retension
```

and press Return.

▼ Rewinding a Tape

To rewind a tape:

♦ **Type:**

```
% mt -f /dev/rmt/unit number rewind
```

▼ Cleaning a Tape Drive

Tape drives must be cleaned periodically. To clean a tape drive:

♦ **Insert a cleaning cartridge into the tape drive.**
Consult your hardware documentation for details.

▼ Displaying the Status of a Tape Drive

1. Insert the tape into the tape drive and wait for the load to complete.

Note – Loading is complete when ALL LEDs are illuminated.

2. Enter:

```
% mt -f /dev/rmt/unit number status
```

For more information about the `mt` command, see *man Pages(1): User Commands*.

This command looks for and locates the tape drive with the `/dev/rmt/0` device address or device name. It then displays the status of the tape drive. (See the examples below.)

Note – If you have more than one tape drive connected to your system, execute the same command but change the device name from `/dev/rmt/0` to `/dev/rmt/1`, `/dev/rmt/2`, and so on.

- Your system is able to access the tape drive and a tape cartridge is present, if the following status is displayed:

```
Archive QIC-150 tape drive:
  sense key(0x0)= nosense      residual= 0 retries= 0
  file no= 0    block no= 0
```

`sense key= nosense` indicates that your system was able to access the tape and there were no errors. You can then use any of the backup commands described in the following sections.

- The following information tells you that the tape drive was just reset, powered on, or a tape cartridge was recently installed.

```
Archive QIC-150 tape drive:
  sense key(0x6)= unit attention      residual= 0 retries= 0
  file no= 0    block no=0
```

In this case, execute the `mt -f /dev/rmt/0 status` command again until the `sense key(0x6)= unit attention` advisory message is replaced with the `sense key(0x0)= nosense` message.

- If the following status is displayed, your system is unable to access the tape.

```
/dev/rmt/0: no tape loaded or drive offline
```

In this case, insert a tape and execute the `mt -f /dev/rmt/0 status` command again.

- If the following status is displayed, your system is unable to communicate with the tape drive.

```
no such file or directory
```

In this case, verify the tape drive is powered on and is properly connected to the system.

Performing Data Backups and Restores

Although you can use any backup command, the `ufsdump` and `ufsrestore` commands are easier to use.

Before using these commands, determine whether the tape is ready to receive data by displaying the status of the tape drive. Refer to “Displaying the Status of a Tape Drive” on page 35.

Note – If you have a 5.0 Gbyte 4mm DDS device, use a blocking factor of 96 instead of the default factor of 20 to optimize performance. The blocking factor of 96 translates to 48 Kbytes per transfer.

For the 150 Mbyte 1/4-inch tape drive, the 2.3 Gbyte 8mm tape drive, the 5.0 Gbyte 8mm tape drive, and the Front-Load 1/2-inch tape drive, use a blocking factor of 126 instead of the default factor of 20 to optimize performance.

`cpio` *Command*

The `cpio` command copies files from a hard disk to a tape as well as from a tape to a hard disk.

If you need more than one tape to back up files that are on your hard disk, use this command. This feature of the `cpio` command is referred to as *multiple-volume interchange.*

If you need to back up only a few files, use the `tar` command or the `ufsdump` command. The `tar` command supports only *single-volume interchange.* The `ufsdump` command supports *multi-volume interchanges.*

Example 1:

The following example shows how to copy the files in your working directory called `/work` and all subdirectories to a tape drive with the device address or device name of `/dev/rmt/0`.

```
example# cd /work
example# ls -R | cpio -ocB > /dev/rmt/0
```

Example 2:

The next example explains how to copy the files that are located on your tape back to your hard disk:

```
example# cd /work
example# cpio -icdB < /dev/rmt/0
```

- The `c` option indicates that header information has been written in ASCII format for portability.
- The `d` option indicates that as many directories as needed will be created.
- The `B` option, which you must use whenever you copy files or files systems to and from a tape drive, indicates that the input has a blocking factor of 5120 bytes to the record.

Note – You must use the same blocking factor when you retrieve or copy files from the tape to the hard disk as you did when you copied files from the hard disk to the tape. Therefore, you must specify the `B` option.

`dd` *Command*

This command converts and copies files with different data formats. The most common usage of this command is to transfer a file system or partition from your hard disk to a tape. You can also use it to copy files from one hard disk to another. If you use a device with a variable block size, you need to make sure that you use the same block size for copying the files from a hard disk to a tape and from a tape to a hard disk.

The following example shows how to write the file system or partition `/user/sunsystem` to a 4mm tape drive with device address or device name of `/dev/rmt/0`. The blocking factor is 96 in this example. This example has been optimized for a 5.0 Gbyte 4mm DDS device.

Example:

```
example# dd if=/dev/dsk/c0t0d0s7 of=/dev/rmt/0 bs=96k
```

`ufsdump` *Command*

The `ufsdump` command copies a file system that is on a hard disk to a tape. For more information about dump levels and schedules, see the *System Administration Guide*.

Note – All files must be part of one file system or one partition. If you want to copy files from different file systems or partitions, use the `ufsdump` command with the `n` option (no rewind); this allows you to use the same tape again.

Example:

The following example explains how to copy all files that are located on a disk drive in partition `/dev/rdsk/c0t3d0s2` to a file (often referred to as a *dump file*) called `/dev/rmt/2c` in compressed mode.

```
example# ufsdump 0ubf 96 /dev/rmt/2c /dev/rdsk/c0t3d0s2
```

- The `0` option represents the dump level. A level 0 dump copies the entire file system to a dump file, which in this case is called `/dev/rmt/2`. You can specify any number between 0 and 9.
- The `u` option updates the dump record by adding an entry to the file `/etc/dumpdates` for each file system that is successfully copied. It updates the `/etc/dumpdates` file by adding the name of every file system, the date the file system was copied, and the dump level that was specified at that time.
- The *b* option specifies the blocking factor that is used when the files are copied to the tape. The default blocking factor is 20. The blocking factor is 96 in this example. This example has been optimized for a 5.0 Gbyte 4mm DDS device. In general, the largest value (126) is best.
- The `f` option specifies the device address or device name of the tape drive, which is `/dev/rmt/2` in this example.
- The `l` option specifies the loader mode. This causes the autoloader and library units to load in the next piece of media.
- `/dev/rdsk/c0t3d0s2` is the device name or address of the source device where you want to copy files. In this example, it is the *second* partition on the *third* hard disk that is connected to your system.

3

`ufsrestore` *Command*

The `ufsrestore` command copies file systems from a tape to a hard disk. It can only copy file systems that were previously copied from a hard disk to a tape with the `ufsdump` command.

Example:

The following example explains how to copy all files that are located on a tape drive in the `/man` directory to a hard disk with the device address or device name of `/dev/rmt/0`. However, you must first go to the directory into which you wish to copy the file systems or partitions before you retrieve or extract files. In this example, the directory into which all files systems or partitions are copied is `disk2`, and the blocking factor is 96. This example has been optimized for a 5.0Gbyte 4mm DDS device.

```
example# cd /disk2
example# ufsrestore ibf 96 /dev/rmt/0
```

Note – You must use the same blocking factor (or larger) when you retrieve or copy files from the tape to the hard disk as you did when you copied files from the hard disk to the tape. Therefore, you must specify the `b` option.

The system responds with a `ufsrestore` prompt. If you type a question mark, a list of available arguments is displayed:

```
Available commands are:
  ls [arg] - list directory
  cd arg - change directory
  pwd - print current directory
  add [arg] - add ‘arg’ to list of files to be extracted
  delete [arg] - delete ‘arg’ from list of files to be extracted
  extract - extract requested files
  setmodes - set modes of requested directories
  quit - immediately exit program
  what - list dump header information
  verbose - toggle verbose flag (useful with “ls”)
  help or ‘?’ - print this list
IF no ‘arg’ is supplied, the current directory is used
```

You can now list the directories that are resident on the tape by typing `ls`.

```
ufsrestore > ls
4lib/      dict        mail     openwin      spool
5bin       games       man/     preserve     src
adm        include/    net      pub          tmp
```

You can now select the directories or files by using the `add` argument.

```
ufsrestore > add man
```

You can copy the `man/` directory from the tape to the hard disk. An asterisk is displayed next to the `man/` directory.

```
ufsrestore > ls
4lib/      dict        mail     openwin      spool
5bin       games      *man/     preserve     src
adm        include/    net      pub          tmp
```

Now you can extract or copy the files in the `man/` directory onto the tape.

```
ufsrestore > extract
```

This completes the extraction or copying of the files in the `man/` directory located on the tape.

3

`tar` *Command*

The `tar` command copies file systems or individual files from a hard disk to a tape (writing to tape) or from a tape to a hard disk (reading from tape). If you need more than one tape to back up files that are on your hard disk, use the `cpio` command or the `ufsdump` command. The `tar` command only supports *single-volume interchange*.

Example 1:

The following example explains how to copy files from a hard disk to a tape.

```
example# tar cvbf 96 /dev/rmt/1 filename
```

In this example, the `tar` command copies files to a tape drive with the device name or address of `/dev/rmt/1`.

- The `f` option designates the device name or address of the source drive, which is the tape drive in this example.
- The `v` option displays information about each file it copies.
- The `b` option designates the blocking factor, which in this example is 96. This example has been optimized for a 5.0 Gbyte 4mm DDS device.
- The `c` option creates the tarfile.

Example 2:

The next example explains how to copy files from a tape to the current working directory on a hard disk.

```
example# tar xvbf 96 /dev/rmt/1
```

In this example, the `tar` command copies files to the working directory located on the hard disk by using the *x* option.

- The `f` option designates the device name or address of the destination drive, which are all the files on the tape cartridge in this example.
- The `v` option displays information about each file it copies.
- The `b` option designates the blocking factor, which in this example is 96. This example has been optimized for a 5.0 Gbyte 4mm DDS device.

Note – You must use the same blocking factor (or larger) when you retrieve or copy files from the tape to the hard disk as you did when you copied files from the hard disk to the tape.

3

Setting Up Removable Media Devices

4

This chapter describes how to configure removable media devices using the Solaris operating environment. Devices commonly referred to as removable media devices include:

- CD-ROM drives
- Diskette drives
- PCMCIA memory cards

This chapter contains the following information:

4

Requirements

Before you start to configure the operating environment for a new CD-ROM, diskette drive, or PCMCIA memory card, you must:

- Install the Solaris software
- Shut down the system and peripherals that are already connected, as described in “Shutting Down the System” on page 3

Note – If you did not follow the procedures in “Shutting Down the System” on page 3, the operating system may not recognize the new removable media device.

CD-ROM Drives

CD-ROMs provide large data capacity and have quickly become today’s medium of choice for software distribution. CD-ROM drives allow you to add both operating system and application packages quickly and easily to the workstations you administer.

For more information about CD-ROMs, refer to “Managing CDs and Diskettes” in the *System Administration Guide*.

Most CD-ROM drives conform to the Small Computer Systems Interface (SCSI) protocol. As a result, getting a CD-ROM drive up and running on your workstation usually involves little more than plugging in the cables and, if applicable, setting the jumpers or SCSI target switch to 6 (or another number if it is a secondary drive). Refer to the documentation that accompanies your hardware for information about physical connections.

▼ Adding a CD-ROM Drive

See “Shutting Down the System” on page 3.

1. **Shut down your system.**

Refer to the documentation that accompanies your hardware and Table 6-2 on page 71 to set the physical SCSI switch or jumpers on your CD-ROM drive.

2. **Check that the address switch for the CD-ROM drive has been correctly set.**
   The SCSI address switch for CD-ROM drives is usually preset by the factory to SCSI target ID 6.

Note – If you have more than one SCSI device, you must set each SCSI address switch to a different target ID.

3. **Install the CD-ROM drive.**
   For installation information, refer to the documentation that accompanies your hardware.

4. **Turn on the power to all external peripheral devices, this includes the CD-ROM drive that you plan to configure and the system.**
   The system is booted and the Solaris operating environment configures the system by assigning a device address to the CD-ROM drive.

You are now ready to mount the CD-ROM drive. Refer to “How Solaris Manages CD-ROM and Diskette Devices” on page 52.

▼ Adding an Additional CD-ROM Drive

Note – Be sure that the target number you select is not already used by a peripheral device attached to your system. Use the `probe-scsi` or `probe-scsi-all` command to list the existing devices and their addresses. You can connect no more than seven CD-ROM drives to a single SCSI bus provided that the total cable length does not exceed 6 meters.

For more information, refer to "How Solaris Manages CD-ROM and Diskette Devices" on page 52.

1. **Edit the `/etc/vold.conf` file to add the CD-ROM drive to the list of devices managed by Volume Management.**
   Copy the default CD-ROM line under "Devices to use" and change the device address and mount location.

```
# Devices to use
use cdrom drive /dev/dsk/c0t6 dev_cdrom.so cdrom0
use cdrom drive /dev/dsk/c0t5 dev_cdrom.so cdrom1
```

Example:

In this example, a new entry was added for a CD-ROM drive with a target number of 5. When a CD-ROM containing a file system is inserted into this secondary CD-ROM drive, it is automatically mounted as `/cdrom/cdrom1`. If the CD-ROM does not contain a file system, it can be accessed at `/vol/dev/dsk/c0t5/unnamed_cdrom` as a block device.

See "Shutting Down the System" on page 3.

1. **Shut down your system.**

2. **Install the additional CD-ROM drive.**
   For installation information, refer to the documentation that accompanies your hardware. Turn on the power to all external peripheral devices, this includes the second CD-ROM drive that you plan to configure and the system.

   The system is booted and the Solaris operating environment configures the system by assigning a device address to the CD-ROM drive.

You are now ready to mount the CD-ROM drive. Refer to "How Solaris Manages CD-ROM and Diskette Devices" on page 52.

Diskette Drives

Diskette drives provide small amounts of data storage and are typically used to transfer files to a non-networked personal computer or to store individual user files.

▼ Adding a Diskette Drive

See “Shutting Down the System” on page 3.

1. **Shut down your system.**

2. **Check that the address switch for the diskette drive has been correctly set.**
   Refer to the documentation that accompanies your hardware to set the physical switch or jumpers on your diskette drive.

3. **Install the diskette drive.**
   For installation information, refer to the documentation that accompanies your hardware.

4. **Turn on the power to the system.**
   The system automatically boots and configures the new diskette drive.

You are now ready to mount the diskette drive. Refer to “How Solaris Manages CD-ROM and Diskette Devices” on page 52.

4

PCMCIA Memory Cards

Personal Computer Memory Card International Association (PCMCIA) cards are rugged, credit card-sized, user-installable devices. You can use PCMCIA memory cards in the same way as a diskette, but you can store much larger amounts of data on a PCMCIA memory card.

PCMCIA serial and modem cards provide a convenient way to add an RS-232 interface or data/fax modem functionality to your SPARCstation. PCMCIA cards are available from many vendors. Check with your SunService provider or the PCMCIA card vendor to determine if a device is compatible with your SPARCstation.

▼ Formatting a PCMCIA Memory Card

Before using a PCMCIA memory card, you may need to format it. Use the `fdformat` utility to format diskettes and PCMCIA memory cards.

Caution – Formatting deletes any data that may already be resident on a PCMCIA memory card. (See Table 4-1.)

♦ **Format the PCMCIA memory card using the `fdformat` command:**

```
% fdformat option device_name
```

Table 4-1 lists the available options for the `fdformat` utility.

Table 4-1 `fdformat` Utility Options

Option	Description
`-U`	Unmounts the PCMCIA memory card
`-d`	Installs an MS-DOS file system (UNIX file system is the default)
`-f`	Does not display confirmation messages before starting to format
`-q`	Disables print status messages
`-x`	Installs a Solaris label or an MS-DOS file system; it does not format the PCMCIA memory card
`-b` *label*	Specifies a UNIX or MS-DOS label on a PCMCIA memory card
`-t dos`	Installs an MS-DOS file system (UNIX file system is the default)
`-B` *filename*	Installs a special boot loader

Note – There is no option in the `fdformat` utility for installing a NEC-DOS file system on a PCMCIA memory card.

If you want to format a PCMCIA memory card, you must specify a device name for the PCMCIA memory card. Otherwise, the `fdformat` utility automatically specifies the diskette drive as the default device.

The format for a device name of a PCMCIA memory card is `/dev/rdsk/c`*n*`t`*n*`d`*n*`s`*n* or `/dev/dsk/c`*n*`t`*n*`d`*n*`s`*n*. For example, the device name `/dev/dsk/c1t6d0s2` represents a PCMCIA SRAM memory card with the logical socket controller number `1`, the technology number `6`, and the slice number 2.

Table 4-2 lists the available device name options for the `fdformat` utility.

Table 4-2 `fdformat` Utility Device Name Options

Device Name Option	Description
n	= a decimal number
c*n*	= controller *n*
t*n*	= technology region *n* 0x1 ROM, 0x2 OTPROM, 0x3 EPROM, 0x4 EEPROM, 0x5 FLASH, 0x6 SRAM, 0x7 DRAM
d*n*	= technology region in type *n*
s*n*[1]	= slice *n*

1. This release supports only one partition on the PCMCIA memory card. Therefore, the partition number `sn` for the device name must be `s2`.

How Solaris Manages CD-ROM and Diskette Devices

This section describes how to manage CD-ROM and diskette device information using the Solaris operating environment.

Volume Management

Volume Management automates the interaction between you and your CD-ROMs and diskettes. For example, in previous Solaris releases (Solaris 2.1 or earlier), to mount and access data on a CD-ROM you had to follow these steps:

```
# cd /
# mkdir /cdrom
# mount -F ufs -o ro /dev/dsk/c0t6d0s2 /cdrom
```

If you attempt to follow these instructions while using a Solaris release later than Solaris 2.1, you may see one or both of these messages:

```
# mkdir /cdrom
mkdir:  Failed to make directory “/cdrom”; File exists
# mount -F ufs -o ro /dev/dsk/c0t6d0s0 /cdrom
mount: /dev/dsk/c0t6d0s0 is already mounted, /cdrom is busy,
        or allowable number of mount points exceeded
```

You will also see the following messages when you attempt to use the `/dev/diskette` path to access or eject diskettes:

```
% tar cvf /dev/diskette proposal status reviewers
tar: cannot open /dev/diskette.
% eject /dev/diskette
/dev/rdiskette is busy (try /vol name?)
```

In the Solaris operating environment, Volume Management automatically mounts CD-ROMs and diskettes with file systems at `/cdrom/`*cdrom_name* and `/floppy/`*floppy_name* respectively. It also keeps track of CD-ROM and diskette file systems during a workstation session (rebooting will clear the in-memory database). To view the media that has been inserted during a workstation session, list `/vol/dsk`:

```
% ls /vol/dsk
solaris_2_1/   unnamed_cdrom#1
unnamed_cdrom  unnamed_floppy
```

Volume Management uses the configuration file `/etc/vold.conf` to determine which devices it manages. The default `/etc/vold.conf` file contains the following information:

```
# @(#)vold.conf 1.13     92/10/28 SMI
#
# Volume Daemon Configuration file
#

# Database to use (must be first)
db db_mem.so

# Labels supported
label dos label_dos.so floppy
label cdrom label_cdrom.so cdrom
label sun label_sun.so floppy

# Devices to use
use cdrom drive /dev/dsk/c0t6 dev_cdrom.so cdrom0
use floppy drive /dev/fd0 dev_floppy.so floppy0

# Actions
insert /vol*/dev/fd[0-9]/* user=root /usr/sbin/rmm
insert /vol*/dev/dsk/* user=root /usr/sbin/rmm
eject /vol*/dev/fd[0-9]/* user=root /usr/sbin/rmm
eject /vol*/dev/dsk/* user=root /usr/sbin/rmm
notify /vol*/rdsk/* group=tty /usr/lib/vold/volmissing -c

# List of file system types unsafe to eject
unsafe ufs hsfs pcfs
```

- Before you add secondary CD-ROM and diskette drives to a system, update the `/etc/vold.conf` file by adding the new devices to the “Devices to use” list. The syntax for a “Devices to use” entry is:

```
use device type special shared_object symname options
```

Each variable item in the device control line is defined in Table 4-3.

Table 4-3 Device Control Syntax Descriptions

Syntax	Description	Supported and Default Values
device	The type of removable media device to be used	`cdrom`, `diskette`
type	The class of device—multiple or single media support	`drive`
special	Pathname of the device to be used. Path usually begins with `/dev`	Default support is for the devices `/dev/dsk/c0t6` and `/dev/diskette`
shared object	The location of the code that manages this device	The default location is `/usr/lib/vold/`*name_ of_shared_object*
symname	The symbolic name that refers to this device; the *symname* is placed in the device directory, either `/cdrom` or `/floppy`	Default values are `cdrom0`, `floppy0`
options	The user, group, and mode permissions for the media inserted	Default values are `user=nobody`, `group=nobody`, `mode=0666`

After updating the `/etc/vold.conf` file, attach the drive and reboot your system with a reconfiguration boot.

For information on booting your system in different modes, see Appendix A, “Booting Your System.”

- **To attach the drive and reboot your system with a reconfiguration boot, enter either** `boot -r` **or** `touch /reconfigure`**.**

For more information about Volume Management, see *man Pages(4): File Formats* and the *System Administration Guide*.

Note – Volume Management controls the `/dev/dsk/c0t6d0s0` path to a CD-ROM drive and the `/dev/diskette` path to a diskette drive. An attempt to access a CD-ROM or diskette using these paths will result in an error message.

Comparing Automatic Versus Manual Mounting

Figure 4-1, below, compares the steps for manual mounting (without Volume Management) and automatic mounting (with Volume Management). Volume Management performs many of the tasks previously required to manually mount and work with CDs and diskettes.

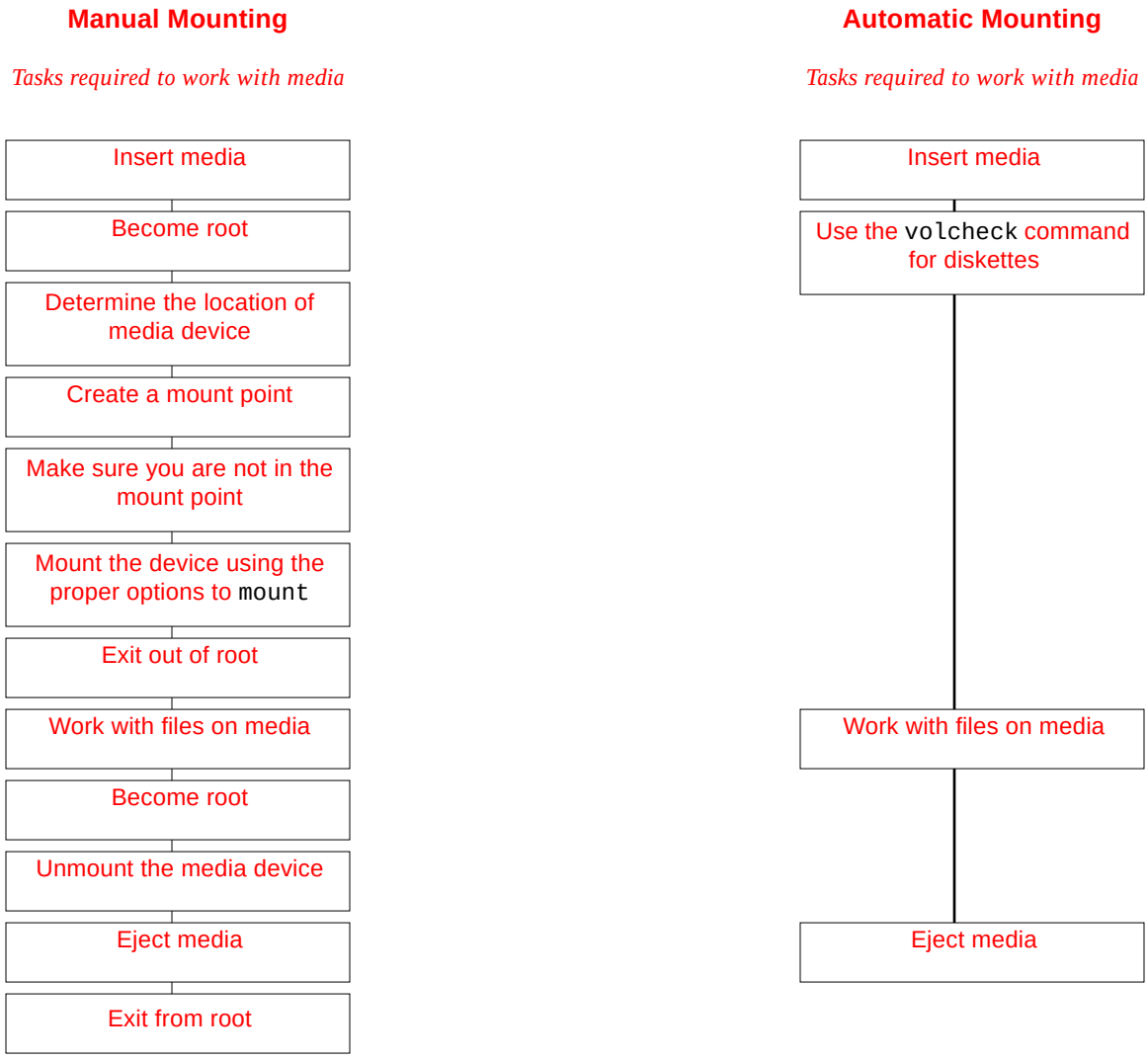

Figure 4-1 Comparison of Manual and Automatic Mounting

Reference Material for CD-ROM and Diskette Devices

CD-ROM and diskette file systems are mounted in default locations by Volume Management when the media is inserted. See Table 4-4 for more information. These mount points are only created and mounted if a file system is already resident on the diskette.

Table 4-4 CD-ROM and Diskette File System Mount Points

Media type	Mount location	State of media
Diskette	`/floppy/floppy0`	Symbolic link to mounted diskette in local diskette drive
Diskette	`/floppy/`*floppy_name*	Mounted named diskette
Diskette	`/floppy/unnamed_floppy`	Mounted unnamed diskette
CD-ROM	`/cdrom/cdrom0`	Symbolic link to mounted CD-ROM in local CD-ROM drive
CD-ROM	`/cdrom/`*CD-ROM_name*	Mounted named CD-ROM
CD-ROM	`/cdrom/`*CD-ROM_name*`/`*partition*	Mounted named CD-ROM with partitioned file system
CD-ROM	`/cdrom/unnamed_cdrom`	Mounted unnamed CD-ROM

For more information about these commands, see *man Pages(1): User Commands* and the *System Administration Guide*.

To inform Volume Management that a diskette with a file system has been inserted into the drive, use `volcheck`(1). You do not need to use this command if you are going to use the commands `fdformat`(1) or `eject`(1).

If no file system exists on the media, Volume Management provides block and character devices in the `/vol` file system. See Table 4-5 for the location of diskette and CD-ROM media in the `/vol` file system.

Note – All releases provide a symbolic link in `/vol/dev/aliases`.

Table 4-5 CD-ROM and Diskette Device Locations in `/vol` with No File System Present

Media Type	**Device Location: Solaris 2.2**	**State of Media**
Diskette	`/vol/dev/fd0/unnamed_floppy`	Formatted unnamed diskette—block device access
Diskette	`/vol/dev/rfd0/unnamed_floppy`	Formatted unnamed diskette—raw device access
Diskette	`/vol/dev/fd0/unlabeled`	Unlabeled diskette—block device access
Diskette	`/vol/dev/rfd0/unlabeled`	Unlabeled diskette—raw device access
CD-ROM	`/vol/dev/dsk/c0t6/unnamed_cdrom`	CD-ROM—block device access
CD-ROM	`/vol/dev/rdsk/c0t6/unnamed_cdrom`	CD-ROM—raw device access
Media Type	**Device Location: Solaris 2.3 or higher**	**State of Media**
Diskette	`/vol/dev/diskette0/unnamed_floppy`	Formatted unnamed diskette—block device access
Diskette	`/vol/dev/rdiskette0/unnamed_floppy`	Formatted unnamed diskette—raw device access
Diskette	`/vol/dev/diskette0/unlabeled`	Unlabeled diskette—block device access
Diskette	`/vol/dev/rdiskette0/unlabeled`	Unlabeled diskette—raw device access
CD-ROM	`/vol/dev/dsk/c0t6/unnamed_cdrom`	CD-ROM—block device access
CD-ROM	`/vol/dev/rdsk/c0t6/unnamed_cdrom`	CD-ROM—raw device access

Using CDs and Diskettes

Table 4-6 shows the various tasks you can perform using CDs and diskettes. See the *System Administration Guide*, for details.

Table 4-6 What You Can Do With CDs and Diskettes

Media Type	Task	Available with File Manager?	Available through Command Line?
CD	• How to load a CD	Yes	Yes
	• How to examine the contents of a CD	Yes	Yes
	• How to copy information from a CD	Yes	Yes
	• How to find out if a CD is still in use	No	Yes
	• How to eject a CD	Yes	Yes
	• How to access CDs on other systems	No	Yes
	• How to make local CDs available to other systems	No	Yes
	• How to configure a system to play musical CDs	No	Yes
	• How to stop Volume Management	No	Yes
	• How to restart Volume Management	No	Yes
Diskette	• How to format a UFS diskette	No	Yes
	• How to place a UFS file system on a diskette	No	Yes
	• How to format a DOS diskette	No	Yes
	• How to load a diskette	Yes	Yes
	• How to examine the contents of a diskette	Yes	Yes
	• How to copy or move information *from* a diskette	Yes	Yes
	• How to copy or move information *to* a diskette	Yes	Yes
	• How to find out if a diskette is still in use	No	Yes
	• How to eject a diskette	Yes	Yes
	• How to access diskettes on other systems	No	Yes
	• How to make local diskettes available to other systems	No	Yes

4

Setting Up a Board 5

This chapter describes how to configure a board using the Solaris software environment.

This chapter contains the following information:

5

Requirements

Before you start to configure the operating environment for a new board, you must:

- Install the Solaris software
- Shut down the system and peripherals that are already connected, as described in “Shutting Down the System” on page 3

Note – If you did not follow the procedures in “Shutting Down the System” on page 3, the operating system may not recognize the new board.

Adding a Board

See “Shutting Down the System” on page 3.

1. **Shut down your system.**

For more information, refer to the documentation that accompanies your hardware. For information on how to select device addresses, go to Chapter 6, “Selecting Addresses.”

2. **Determine the address selection scheme of the system and board.**
   In many cases jumpers and switches on a board are preset appropriately in the factory.

3. **Set any jumpers or switches that require different settings.**
   For example, if your system has an SBus and if you are adding an Ethernet card, you may need to change one jumper on that card related to the Link Integrity Test.

4. **Install the board.**
   For installation information, refer to the documentation that accompanies your hardware.

5. **Turn on the power to all external peripheral devices and then the system.**
   The system automatically boots and configures the new board.

For more information on the OpenBoot command, refer to the *OpenBoot 2.x Command Reference Manual* and the *OpenBoot 3.x Command Reference Manual*.

If you want to display a list of all the devices on your system, use the `show-devs` OpenBoot command by typing `show-devs` at the `ok` prompt.

```
ok show-devs
/fd@1,f7200000
/virtual-memory@0,0
/memory@0,0
/sbus@1,f8000000
/auxiliary-io@1,f7400003
/interrupt-enable@1,f5000000
/memory-error@1,f4000000
/counter-timer@1,f3000000
/eeprom@1,f2000000
/audio@1,f7201000
/zs@1,f0000000
/zs@1,f1000000
/openprom
/aliases
/options
/packages
/sbus@1,f8000000/cgsix@3,0
/sbus@1,f8000000/le@0,c00000
/sbus@1,f8000000/esp@0,800000
```

5

Selecting Addresses 6

This chapter describes how to determine the names and addresses of internal and external peripheral devices. Internal peripheral devices can be disk drives and interface cards. External peripheral devices can be disk drives, printers, modems, and plotters that are cabled to connectors on the rear panel of a Sun system.

This chapter contains the following information:

6

Determining the Interface of a Peripheral Device

Refer to the documentation that accompanies your hardware to determine the interface of the device. Peripheral devices typically use one of the following interfaces:

- Small Computer System Interface (SCSI)
- Intelligent Peripheral Interface (IPI)

In many cases, an external device is cabled to a connector that is part of a SCSI card. However, in some cases an external peripheral device is cabled to an onboard (built-in) SCSI connector. An onboard SCSI connector is usually part of the main logic board.

Determining Peripheral Buses of a Sun System

You must determine the type of peripheral bus that your Sun™ system supports. As shown in Table 6-1, there are two types of peripheral buses:

Table 6-1 Supported Interfaces and Peripheral Buses

Peripheral Bus	SCSI	IPI
SBus	Built-in and cards	Not supported
VMEbus	Boards	Boards

Your Sun system may have one or both types of peripheral buses. For information on the type of peripheral bus that your system has, refer to the documentation that accompanies your hardware.

Typically, your sales representative provides you with the right interface card to fit the peripheral bus of your system and the type of interface that the peripheral device supports. Many systems have built-in SCSI support, and you would not need to install any additional cards.

Determining the Interface of a Sun System

You must determine the type of interface that your peripheral device requires before you can continue. If you have a peripheral device, such as a disk drive, that requires a SCSI interface, then your Sun system must also have a SCSI interface.

Note – Your Sun system may not support these interfaces unless you install additional SCSI or Interface Controller boards. The documentation that accompanies your hardware provides information on the types of interfaces that your system can support.

If the particular interface that your peripheral device needs requires you to install a card in your Sun system, make sure that you use a SCSI, IPI, serial, or parallel interface card that is designed for the peripheral bus of your Sun system.

Determining Address Selection Schemes

To configure disk drives, tape drives, CD-ROM drives, printers, and modems, you need to understand the *address selection scheme* that your system uses for the specific peripheral device that you want to configure. Address selection schemes for disk drives differ from address selection schemes for tape drives. This section discusses the address selection schemes for different types of peripheral devices.

Determining the Address Selection Scheme for Disk Drives

Make sure that your Sun system supports the interface that your drive requires. As most external drives require a SCSI interface, you may be able to connect them to the built-in SCSI connector of your Sun system. If your Sun system does not have built-in SCSI support, you have to install an additional SCSI card in your SBus or VMEbus. If you plan to connect a drive that requires IPI support, you must install an Interface Controller board in the VMEbus.

Note – The Solaris operating environment supports up to seven disk drives or CD-ROM drives on one narrow SCSI bus, provided the cable does not exceed 6 meters. However, the Solaris operating environment supports up to fifteen drives or CD-ROM drives on one wide SCSI bus provided the cable does not exceed 25 meters and has a differential interface.

Your Sun system uses logical controller ID Numbers, logical bus target ID numbers, logical disk ID numbers, and logical slice (often referred to as "partition") numbers to access specific areas on a given disk drive. A combination of all these ID numbers make up a *device address* for the drive. (This is sometimes called a *logical name*.)

A typical device address for a disk drive assigned by the Solaris operating system would be:

```
c0t1d0s0
```

A typical device address for a CD-ROM drive assigned by the Solaris system would be:

```
c0t6d0s0
```

The address selection scheme for disk drives that the Solaris system uses is shown in Figure 6-1.

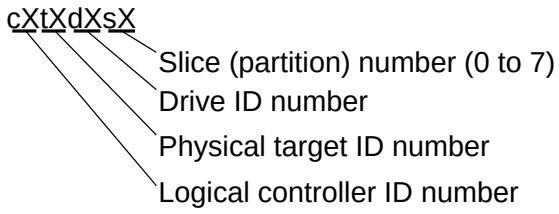

Figure 6-1 Address Selection Scheme for Disk Drives

The Solaris operating environment automatically assigns a device address to each internal and external disk drive connected to your Sun system based on the target ID number of the device and the controller board to which it is connected.

Caution – Before the Solaris system can assign a device address to an external disk drive, the disk drive must have been connected to your Sun system and powered on. If you have connected the external disk drive to your Sun system but have not powered it on, the Solaris operating system cannot detect the presence of this disk drive. Therefore, the operating system is unable to assign a device address to that external disk drive. Internal disk drives are automatically detected.

Logical Controller ID Number

Logical controller ID numbers, such as `c0`, `c1`, `c2`, etc., are automatically assigned in sequential order to each interface card to which disk drives are connected. The interface cards can be located in either an SBus or a VMEbus.

The operating system probes and polls the interface cards one by one. If your Sun system has built-in SCSI support, the operating system automatically assigns 0 to that “card.” Therefore, any disk drives that are connected to the built-in SCSI “card” have a device address that starts with `c0`.

Note – If you move an SBus card to another slot or replace a card with a different type of card at the same location, the logical controller ID number might not be as you expected. A number that was in use earlier might be skipped when ID numbers are assigned to controllers in their new locations. (This situation is sometimes called *persistent instance numbering*.)

Because of the persistence of old logical controller ID numbers, you must update the `/etc/vfstab` file after changing the location or type of cards in SBus slots. For more about editing the `/etc/vfstab` file, see *man Pages(4): File Formats* and the *System Administration Guide* manual.

Logical Target ID Number

Logical target ID numbers, such as `t0`, `t1`, `t3`, correspond to the address switch setting that you select for each disk drive. All external disk drives have an address switch that is located on the rear panel. The default switch setting for Sun CD-ROM drives is 6. Internal SCSI disk drives usually have jumper settings that have been preset by the factory to 3, as shown in Table 6-2 on page 71. If your system has a second internal SCSI disk drive, it is usually set to 1 by the factory.

Note – Jumper settings serve the same purpose as address switch settings. They provide a unique address for a disk drive.

If you want to find out the current switch or jumper settings, you can use the `probe-scsi` or the `probe-ipi` commands at the `ok` prompt. The `probe-scsi` command returns the drive's logical target number and device type (name). The `probe-ipi` command returns similar information about disk drives that have an IPI interface.

The `probe-scsi-all` command provides information on devices that are connected to any SBus located on a server other than the on-board SBus, provided this command is supported by the boot PROM on your system.

You must set the address switch on all external disk drives. As you can have up to seven devices daisy-chained to each SCSI or Interface Controller board, you must assign and set a unique address (number) for each disk drive.

Caution – The logical controller ID numbers are automatically assigned by the Solaris operating system. However, you set the logical target ID numbers. They are detected or polled on each disk drive by the operating system.

You *must* have unique addresses selected for each device in each daisy chain. If you accidentally select the same address on two different disk drives that are connected to the same interface card, the Solaris system will *not* be able to poll correctly. Therefore, you will not have access to that drive and may not be able to load the system. If this happens, reset the address switch on one of the disk drives.

Table 6-2 on page 71 provides an example of how the Solaris system assigns device names to internal and external disk drives in a Sun system that has both an SBus and a VMEbus. In the example shown in Table 6-2 on page 71, the Sun system has built-in SCSI support for three attached hard disk drives and one CD-ROM player; it also has two additional SCSI interface cards that are located in the SBus. Each of the SCSI cards has three external disk drives attached. In addition, this system has two IPI cards that are located in the VMEbus. Each of the IPI cards has three external disk drives attached.

Table 6-2 Sample Layout of Address Switch Settings for Disk Drives

Disk Drives	Built-In SCSI Support	First SCSI Interface Card	Second SCSI Interface Card	First IPI Interface Card	Second IPI Interface Card
First internal disk drive	c0t3				
Second internal disk drive; if you do not have a second internal disk drive, you can use this address for your first external disk drive.	c0t1				
First external disk drive that is connected to the built-in SCSI connector	c0t2				
Second external disk drive	c0t0				
CD-ROM player	c0t6				
First external disk drive		c1t1			
Second external disk drive		c1t2			
Third external disk drive		c1t3			
First external disk drive			c2t1		
Second external disk drive			c2t2		
Third external disk drive			c2t3		
First external disk drive				c3t1	
Second external disk drive				c3t2	
Third external disk drive				c3t3	

Table 6-2 Sample Layout of Address Switch Settings for Disk Drives *(Continued)*

Disk Drives	Built-In SCSI Support	First SCSI Interface Card	Second SCSI Interface Card	First IPI Interface Card	Second IPI Interface Card
First external disk drive					c4t1
Second external disk drive					c4t2
Third external disk drive					c4t3

Note – If you have an SBus-based Sun system, only the SCSI information applies.

Logical Disk ID Number

Logical disk ID numbers, such as `d0`, are assigned by the Solaris system as follows:

- The logical disk ID number is set to 0 for any disk drive that is attached to a target controller that doesn't support multiple logical units.
- A target controller that supports multiple logical units assigns the logical disk ID numbers as d0, d1, etc.

Logical Slice (Partition) Number

Logical slice, or partition, numbers range from 0 to 7. To specify an entire disk, use slice 2. If you have a disk drive that has a logical bus target number of 1 and is supported by the built-in SCSI interface, the Solaris operating system assigns logical slice or partition numbers as follows:

```
c0t1d0s0
c0t1d0s1
c0t1d0s2
c0t1d0s3
c0t1d0s4
c0t1d0s5
c0t1d0s6
c0t1d0s7
```

Displaying Addresses of Connected Disk Drives

Use the `format` utility to display addresses of connected disk drives. This section provides two examples:

- Addresses in an SBus system
- Addresses in a system that has both types of peripheral buses:
  - SBus
  - VMEbus

▼ Displaying Addresses of Disk Drives in an SBus

To display addresses of connected and powered-on disk drives in an SBus system:

♦ **Type:**

```
# format
Searching for disks...done
```

If you only want to display the disks that are connected to a specific controller, for example, `c2`, type:

```
# format /dev/rdsk/c2*
Searching for disks...done
```

The following display is based on an SBus-based system with built-in SCSI support. No additional SCSI cards have been installed. The system has one internal and one external hard disk drive.

Note – Device addresses for CD-ROM drives are not displayed by the `format` utility because the CD-ROM disk drive is a read-only device.

The Solaris system has assigned `c0` as the logical controller ID number to all SCSI disks because they are supported by the built-in SCSI interface. The jumpers on the first internal hard disk have been set to 3 by the factory, resulting in a logical bus target ID number of 3 (`t3`).

The address switch on the first external hard disk has been set to 0, resulting in a logical bus target ID number of 0 (`t0`). The address switch on the CD-ROM drive has been set to 6 by the factory and was not changed resulting in a logical bus target ID number of 6 (`t6`).

The following information is displayed:

```
AVAILABLE DISK SELECTIONS:
    0.      c0t3d0 <SUN0207 cyl  1214 alt 2 hd 9 sec 36>
            /sbus@1,f8000000/esp@0,8000000/sd@3,0
    1.      c0t0d0 <SUN0207 cyl  1214 alt 2 hd 9 sec 36>
            /sbus@1,f8000000/esp@0,8000000/sd@0,0
Specify disk (enter its number):
```

Table 6-3 shows the device name and path for each disk drive and the CD-ROM drive in this example.

Table 6-3 Device Name and Path for SCSI Disk Drives

Type of Device	Device Name	Device Path
First internal disk (built-in SCSI support)	`c0t3d0s0...7`	`/devices/sbus@1,f8000000/esp@0,8000000/sd@3,0:..`
First external disk (built-in SCSI support)	`c0t0d0s0...7`	`/devices/sbus@1,f8000000/esp@0,8000000/sd@0,0:..`
CD-ROM player (built-in SCSI support)	`c0t6d0s0...7`	`./devices/sbus@1,f8000000/esp@0,8000000/sd@6,0:..`

▼ Displaying Addresses in an SBus and in a VME Bus

To display the current setup of connected and powered-on disk drives in a Sun system with an SBus and a VMEbus:

♦ **Type:**

```
# format
Searching for disks...done
```

The following display provides an example of a system with an SBus and a VMEbus:

```
AVAILABLE DISK SELECTIONS:
    0.      c0t1d0 <SUN0669 cyl 1614 alt 2 hd 15 sec 54>
            /iommu@f,e0000000/sbus@f,e0001000/dma@f,81000/esp@f,800000/sd@1,0
    1.      c0t2d0 <SUN0669 cyl 1614 alt 2 hd 15 sec 54>
            /iommu@f,e0000000/sbus@f,e0001000/dma@f,81000/esp@f,800000/sd@2,0
    2.      c1t0d0 <Seagate IPI ZBR Elite cyl 1893 alt 1 hd 17 sec 78>
            /iommu@f,e0000000/vme@f,df010000/SUNW,pn@4,d,1080000/ipi3sc@0,0/id@0,0
    3.      c1t1d0 <Seagate IPI ZBR Elite cyl 1893 alt 1 hd 17 sec 78>
            /iommu@f,e0000000/vme@f,df010000/SUNW,pn@4,d,1080000/ipi3sc@0,0/id@1,0
    4.      c2t0d0 <Seagate IPI ZBR Elite cyl 1893 alt 1 hd 17 sec 78>
            /iommu@f,e0000000/vme@f,df010000/SUNW,pn@4,d,1080000/ipi3sc@1,0/id@0,0
    5.      c2t1d0 <Seagate IPI ZBR Elite cyl 1893 alt 1 hd 17 sec 78>
            /iommu@f,e0000000/vme@f,df010000/SUNW,pn@4,d,1080000/ipi3sc@1,0/id@1,0
    6.      c2t2d0 <Seagate IPI ZBR Elite cyl 1893 alt 1 hd 17 sec 78>
            /iommu@f,e0000000/vme@f,df010000/SUNW,pn@4,d,1080000/ipi3sc@1,0/id@2,0
    7.      c2t3d0 <Seagate IPI ZBR Elite cyl 1893 alt 1 hd 17 sec 78>
            /iommu@f,e0000000/vme@f,df010000/SUNW,pn@4,d,1080000/ipi3sc@1,0/id@3,0
Specify disk (enter its number):
```

This example shows a server with built-in SCSI support (`c0`) to which two internal hard disk drives (`sd@1,0` and `sd@2,0`) are connected. This system has two additional IPI cards (`c1` and `c2`). The SCSI jumper switches on the disk drives have been set to 1 and 2 (`t1` and `t2`).

There are two external disk drives (`id@0,`0 and `id@1,0`) connected to the first IPI card (`c1`). The IPI address switches on the disk drives have been set to 0 and 1 (`t0` and `t1`).

There are four external disk drives (`id@0,0`, `id1@1,0`, `id@2,0`, and `id@3,0`) connected to the second IPI card (`c2`). The IPI address switches on the disk drives have been set to 0, 1, 2, and 3 (`t0`, `t1`, `t2`, and `t3`).

Table 6-4 shows the device name and path for each disk drive.

Table 6-4 Device Name and Path for SCSI and IPI Disk Drives

Type of Device	Device Name	Device Path (actual path will differ with system type)
First internal disk (built-in SCSI support)	`c0t1d0s0...7`	`/iommu@f,e0000000/sbus@f,e0001000/dma@f,81000/esp@f,800000/sd@1,0:a...h`
Second external disk (built-in SCSI support)	`c0t2d0s0...7`	`/iommu@f,e0000000/sbus@f,e0001000/dma@f,81000/esp@f,800000/sd@2,0:a...h`
First external disk attached to first IPI card in VMEbus	`c1t0d0s0...7`	`/iommu@f,e0000000/vme@f,df010000/SUNW,pn@4d,1080000/ipi3sc@0,0/id@0,0:a...h`
Second external disk attached to first IPI card in VMEbus	`c1t1d0s0...7`	`/iommu@f,e0000000/vme@f,df010000/SUNW,pn@4d,1080000/ipi3sc@0,0/id@1,0:a...h`
First external disk attached to second IPI card in VMEbus	`c2t0d0s0...7`	`/iommu@f,e0000000/vme@f,df010000/SUNW,pn@4d,1080000/ipi3sc@1,0/id@0,0:a...h`
Second external disk attached to second IPI card in VMEbus	`c2t1d0s0...7`	`/iommu@f,e0000000/vme@f,df010000/SUNW,pn@4d,1080000/ipi3sc@1,0/id@1,0:a...h`
Third external disk attached to second IPI card in VMEbus	`c2t2d0s0...7`	`/iommu@f,e0000000/vme@f,df010000/SUNW,pn@4d,1080000/ipi3sc@1,0/id@2,0:a...h`
Fourth external disk attached to second IPI card in VMEbus	`c2t3d0s0...7`	`/iommu@f,e0000000/vme@f,df010000/SUNW,pn@4d,1080000/ipi3sc@1,0/id@3,0:a...h`

Booting Your System

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For more information about how to boot your system, refer to ***Booting a SPARC System***, in the *System Administration Guide*.

This appendix describes how to boot your system in different modes.

If a system is powered off, turning it on starts the multiuser boot sequence. See below for procedures on how to boot to different states from the ok PROM prompt.

▼ Switching to the ok Prompt

When the system is halted, the PROM monitor prompt is either the greater than sign (>) or ok.

♦ **Switch from the > prompt to the ok prompt by typing the following command:**

```
> n
ok
```

▼ Booting After Connecting a Peripheral Device

Booting your system to recognize all newly installed peripheral devices is usually done after:

- Shutting down the operating system
- Powering on the system
- Interrupting the boot process
- When the open boot process is not set for automatic boot

♦ **Boot your system to recognize all newly installed peripheral devices by typing the `boot -r` command:**

```
ok boot -r
```

Note – The `boot -r` command adds newly installed peripheral devices if you did not perform the `touch /reconfigure` command in "Shutting Down the System" on page 3.

▼ Booting Automatically

Booting automatically is as easy as powering on the system. The system automatically loads the operating environment, recognizes all connected devices, and boots to multiuser mode.

Note – To boot automatically, the open boot PROM must be set for automatic boot.

▼ Booting to Multiuser State (Init State 3)

Booting to multiuser state is usually done after halting the system or performing some system hardware maintenance task. This is the default boot level where all resources are available and users can log into the system.

♦ **Boot to run level 3 by typing the** `boot` **command:**

```
ok boot
```

The automatic boot procedure starts, displaying a series of startup messages. The system is brought up in multiuser state.

▼ Booting to Single-User State (Run Level S)

Booting to single-user state is usually done after performing some system maintenance task such as backing up the system. At this level only some file systems are mounted and users cannot log into the system.

1. **Boot to run level S by using the** `boot -s` **command:**

   ```
   ok boot -s
   ```

   The system boots to single-user state and prompts you for the root password:

   ```
   INIT: SINGLE USER MODE
   Type Ctrl-d to proceed with normal startup,
   (or give root password for system maintenance):   xxxxxxx
   ```

2. **Enter the root password.**

3. **To bring the system up to multiuser state after the system maintenance task is performed, press Control-d.**

▼ Booting Interactively

You can boot interactively to make a temporary change to the system file or the kernel. Booting interactively lets you test your changes and recover easily if you have any problems.

This procedure assumes that the system is already shut down.

1. Boot the system interactively, by typing:

```
ok boot -a
```

2. Answer the system prompts as described in Table A-1.

Table A-1 Interactive Boot Procedure Steps

If the System Displays ...	Do the Following ...
`Enter filename [kernel/unix]:`	Provide the name of another kernel to use for booting. Or, press Return to use the default kernel (`kernel/unix`).
`Name of system file [/etc/system]:`	Provide the name of an alternate system file and press Return. Or, press Return to use the default `/etc/system` file.
`Name of default directory for modules [/kernel /usr/kernel]:`	Provide an alternate path for the modules directory and press Return. Or, press Return to use the default modules directory path.
`root filesystem type [ufs]:`	Press Return to use the default root file system type: UFS for local disk booting or NFS for diskless clients.
`Enter physical name of root device [/sbus@1,f8000000/esp@0,800000/sd@3,0:a]:`	Provide an alternate device name and press Return. Or, press Return to use the default physical name of the root device.

▼ Aborting a Booting Process

Occasionally, you may need to stop the booting process. The specific abort key sequence depends on your keyboard type. See Step 1 below.

1. **Type the abort key sequence for your system.**

   Use one of the following combination of key sequences:
   - Stop-a (type 5 keyboards)
   - L1-a (type 4 keyboards)
   - Break (tty terminals only)

   The monitor mode command prompt is then displayed on the screen:

```
ok
```

2. **To synchronize the disks, type**:

```
ok sync
```

3. **When you see the** `syncing file systems. . .done` **message, press the abort key sequence for your system again (Step 1).**

4. **Type the appropriate** `boot` **command to restart the boot process.**

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