Installing SunOS™ 4.1.2 System Software

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Preface

This manual is your guide to installing Release 4.1.2 of the SunOS™ system software. It will guide you through planning your installation and performing the procedures to accomplish it.

Installing SunOS 4.1.2 System Software has been organized to minimize the amount of information which must be read and understood in order to successfully complete a workstation or server installation.

- The first chapter provides an overview of the installation process. It guides you through gathering information that helps you determine what sort of installation to perform. At the end of this introductory chapter, you can turn to a specific chapter that provides the installation procedure that's appropriate for your system.
- For users of systems now running SunOS 4.1.1 or SunOS 4.1.1. Rev. B, the second chapter explains how to use a new upgrade utility to install SunOS 4.1.2 without performing a full installation.
- For users of standalone workstations, there are individual chapters describing *preinstalled systems* (including how a system administrator can perform quick configuration of a preinstalled system on the network), *quick installation* with SunInstall™, and *custom installation* with SunInstall.
- For system administrators of servers, there are chapters about custom installation of a *homogeneous server*, a *heterogeneous server*, and a *dataless workstation*.

In most cases, you need only read Chapter 1 and then the chapter that is appropriate to your particular configuration.

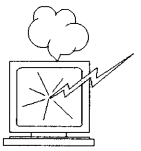
The *Appendixes* include a collection of blank worksheets that assist in performing any custom installation with SunInstall. Other appendixes provide information that you'll need only in specific circumstances. You will be referred to these appendixes when they are appropriate.

1

Introduction

Chapter 1 includes general information about the manual as a whole, and details the first steps required for all installations.

- It will help you determine if your computer has a hard disk pre-installed with SunOS system software
- It will help you decide whether to install your system as a *standalone*, *server*, or *dataless* workstation.
- It will also help you decide what installation method to use: *SunOS Preinstalled*, *Quick Install*, or *Custom Install*. The chapter will also lead you through information collection and decision making common to the installation of all workstations.



Don't skip the remainder of Chapter 1. It includes important information and procedures appropriate to *all* installations.

1.1. Document Conventions

The information in this section will help you use this manual more effectively by explaining the document conventions used.

Type Styles

This manual uses different type styles, or fonts, to distinguish between information you type from the keyboard, information the system displays, and variables (items that must be replaced by a value).

- `listing`

  Represents the system response that is displayed on your monitor or terminal screen. Listing font is also used for literal values (such as the names of files or utility programs) and for file listings and session output.

- **`bold listing`**

  Represents characters you type from the keyboard.

- *italic*

  Represents variables, for which you must substitute values. Also used for emphasis, particularly when introducing new terms.

Boxes

Boxes are used to display information as it appears on your video display.

- Boxes represent screen displays, system responses, or file listings.

```
...
standard daemons: update cron.
starting network daemons: inetd printer.
Sat Feb 17 13:40:15 PDT 1990

gemini login:
```

- When a box represents a *dialog* between you and the system, your entries are shown in **`bold listing font`**, while system responses are shown in `regular listing font`.

```
 >b st()
Size: 523400+110912+144632 bytes
Copyright (c) 1990 by Sun Microsystems, Inc.
Available mem = 7348224
 . . .
```

Icons

Icons are used as visual signposts.

- **Light Bulb**

  Illuminates information that is nice to know, but not essential to the installation.

  May provide background information, or explain *why* you are performing a procedure.

- **Pointing Hand**

  Points to information that requires close attention.

- **Exploding Workstation**

  Marks information that is *imperative* for you to read. If you skip over this material, you may damage your system or jeopardize the installation.

Command Name Nomenclature

This manual follows SunOS convention when referring to commands and programs that are documented in the *SunOS Reference Manual*, commonly known as the "man pages." As an example, the `passwd` command is written as "`passwd(1)`," the numeral `1` indicating that the command is explained in section 1 of the man pages.

1.2. Related Documents

Required Documents

The following documents *must* be read before beginning your installation.

- *SunOS 4.1.2 Open Issues* (this group of chapters may already be incorporated into your copy of the Release Manual)
- *SunOS 4.1.2 Release Manual*

Helpful Reference Documents

The following are manuals that you should have available for reference while planning and performing your installation. You may find them useful for a more complete understanding of the decisions you will be making and the procedures you will be performing.

- *System and Network Administration*
- *SunOS Reference Manual*

1.3. Preliminaries to Installing Your Workstation

First you must determined your workstation's or server's configuration. Then determine which method you will use to perform the installation.

Determining Workstation Configuration

Sun workstations are typically installed in groups connected by a *network*. This connection allows each workstation to share resources of various kinds, including disk storage space. Workstations fall into the general categories of *servers*, which provide services to other workstations, and *clients*, which use those services.

Choose one of the configuration below that applies to the workstation you will be installing. **This decision is fundamental and will affect every phase of the installation.**

Diskless Client

If your system has no disk drive, it must be configured as a *diskless client* —a system that relies on other systems on the network for all services. Diskless clients require no software installation themselves. Rather, their resources are defined by the installation of the system which serves them.

Dataless Client

A dataless client has a disk drive on which it maintains its own root filesystem and swap space, but mounts its `/usr` and `/home` filesystems from a server. This configuration can

- Improve client and network performance (by swapping to its local disk)
- Minimize overall disk space requirements (by sharing the large `/usr` filesystem on the server rather than maintaining a copy on every system)
- Simplify system administration (by requiring only the server, not the clients, to be backed up on a regular basis)

Standalone System

A *standalone system* has one or more disks on which it maintains its own root (/) filesystem, swap space, `/usr` filesystem, and home directory. A standalone system does not require a server in order to boot and can function even if a network it is connected to is down. If your system will **not** be part of a network, you **must** install it as a standalone system.

Server

A *server* provides services and file storage over the network to client systems that require those services in order to function. A client of a server is classified as *dataless* or *diskless,* depending on whether or not has its own local disk.

A server is classified as either *homogeneous* or *heterogeneous*. This classification is determined by the *architectures* of the clients which the server will support.

- A server is *homogeneous* if all of its clients have the *same* kernel architecture as it does.
- A server is *heterogeneous* if any of its clients has a *different* kernel architecture than the server does.

A workstation's architecture is determined strictly by its hardware. See Table 1-1 — *Sun System Architectures*, to determine the architectures of your server and client machines.

The Next Step

If you are going to install your system as a heterogeneous server, a homogeneous server, or as a dataless client proceed to Section 1.4, "Gathering Preliminary Information — Hardware." Each of these configurations requires that you perform a SunInstall *Custom Installation.*

If you have chosen to install as a standalone workstation, read the next section.

Standalone Installation: Which Method Should I Use?

You can install SunOS on a standalone workstation by one of three methods. The first two (using a *Preinstalled SunOS or performing a Quick Install with SunInstall) are easier to perform and designed for workstations with a single disk drive. If you have more than one disk drive attached to your workstation, you may want to perform a SunInstall Custom Install and should proceed to Section 1.4, "Gathering Preliminary Information — Hardware." If your workstation has just one disk, read on.*

SunOS Preinstalled?

Desktop SPARCstation™ systems are shipped from the factory with SunOS already installed on their internal (or external) disks. If you are installing one of these workstations you should turn immediately to the *Installation Guide* that was packed with the workstation.

If your workstation originally arrived pre-installed with an earlier release of SunOS you will have to install release 4.1.2 using either the *upgrade* utility (described in Chapter NumberOf(upgrade) or the Quick Install or Custom Install options of SunInstall. **Be sure that you back up your personal files prior to beginning the installation of SunOS 4.1.2.**

Quick Installation?

If your workstation has a local CD-ROM drive), you have the option of using the *Quick Install* option of SunInstall. Quick installation offers a choice of standard installations, each tailored to different needs and applications. In preparation, you need do little more than choose a hostname, IP address, and NIS domain name for your workstation.

Determine whether a standard installation will meet your needs by referring to the "Quick Install" chapter of this manual.

Custom Installation?

Custom installation lets you customize each phase of the installation—from setting up the filesystems to selecting exactly which software categories to load onto your disk. (You may have used this method if you've installed other SunOS releases.)

Proceed to Section 1.4, "Gathering Preliminary Information — Hardware," below to begin a custom installation.

1.4. Gathering Preliminary Information — Hardware

Some of the information to be gathered while planning your installation is common to all workstation configurations. In Appendix E you will find Worksheets on which to record information about your installation so that you will have it at your fingertips when it is needed.

The hardware information to be recorded includes your system's architecture and the types of peripheral devices attached to it. Use a copy of the Preliminary Information Worksheet to record information as you work through this section.

System Architectures

Each Sun system has an *application architecture* and a *kernel architecture*. *Application architecture* refers to the way in which systems interpret the binary code generated by application software. Two systems have the same application architecture if they can both run the same application *binaries*. All Sun-4 systems share the same application architecture; similarly, all Sun-3 systems have the same application architecture. Sun-3 and Sun-4 systems have different application architectures. Application binaries that run on a Sun-3 will not run on a Sun-4, and vice versa.

This SunOS release does not support Sun-3 systems.

Kernel architecture refers to the hardware-specific portion of a SunOS kernel. Two systems have the same kernel architecture if the same SunOS kernel will run on both of them. Not all Sun-4 systems have the same kernel architecture. For example, the SunOS kernel that runs on the SPARCstation 1 (a type of Sun-4 system) will not run on a Sun-4/100 series system. The SPARCstation 1 has a *sun-4c* kernel architecture. Systems in the Sun-4/100 series have a *sun-4* kernel architecture. Systems in the SPARCsystem 600MP series have a *sun-4m* kernel architecture.

This manual refers to system architectures as *a-arch* (application architecture) and *k-arch* (kernel architecture). These are often combined as *a-arch.k-arch* pairs, for example: *sun4.sun4c*. Find your system model in Table 1-1, identify the architecture pair that describes it, and record the information on the

Preliminary Information Worksheet. (If you are installing a server, record this information for each client workstation as well.)

Table 1-1 *Sun System Architectures*

System	a-arch.k-arch
SPARCstation 1 (4/60)	sun4.sun4c
SPARCstation 1+ (4/65)	sun4.sun4c
SPARCstation SLC (4/20)	sun4.sun4c
SPARCstation IPC (4/40)	sun4.sun4c
SPARCstation 2 (4/75)	sun4.sun4c
SPARCstation 330 and 370	sun4.sun4
SPARCserver 300 and 400 series	sun4.sun4
Sun-4/100 Series	sun4.sun4
Sun-4/200 Series	sun4.sun4
Sun-4/300 Series	sun4.sun4
SPARCsystem 600MP series	sun4.sun4m

Determining Sun Peripheral Device Abbreviations

You will need to know the device name and number of the CD-ROM drive; and device name and partition_designator for your system disk drive. Refer to the following tables and record the information on the Preliminary Information Worksheet.

Table 1-2 *Media Devices*

Abbreviation	Media Device No.	Description
cdrom	sr0 (sd for booting)	CD-ROM drive for open boot PROM
sr	sr0	CD-ROM drive for other systems

Media devices have a device number, usually zero (`0`). If your workstation has multiple SCSI media devices, each will have its own number: `0`, `1`, `2`, or `3`. The media device number is appended to the device name, so, for example, a SCSI SunCD drive would most often be known as `sr0`.

Table 1-3 *Disk Devices*

Abbreviation	Disk Device No.	Description
sd	sd0 sd1 sd2 sd3 sd4 sd6	SCSI disk
xy	xy0 xy1 xy2 xy3	Xylogics 450/451 SMD disk
xd	xd0 through xd15	Xylogics 7053 SMD disk
id	id000 through id0374	IPI disk

Table 1-4 *Boot Syntax for Sun System Architecture*

Device	Sun-4	SPARCstation 1, 1+, IPC, SLC	SPARCstation 2, IPX, ELC, and 600MP-Series
st0	st(0,0,0)	st(0,0,0)	tape or tape0
st1	st(0,28,0)	st(0,1,0)	tape1
sr	sd(0,30,1)	sd(0,6,2)	cdrom
xt	xt(0,0,0)	Not supported	Not supported
mt	mt(0,0,0)	Not supported	Not supported

You need only determine the device name of your *system disk*; that is, the disk drive that your system will boot from. (SunInstall will automatically determine the device names of other disks for you.) The system disk will be device **6** for internal SCSI disks in SPARCstation 300 series workstations. For all others the system disk will be device **0**.

If you are unsure about the device name of your system disk, it is displayed when you boot MUNIX, as shown in the following examples.

The display:

```
xd0: <Fujitsu-M2372K cyl 743 alt 2 hd 27 sec 67>
```

indicates that the system disk is **xd0**. The display:

```
sd6:  <SUN0669 cyl 1614 alt 2 hd 15 sec 54>
```

indicates system disk **sd6**.

System Console

Most Sun workstations are equipped with a graphics oriented bit mapped display as system console. If this is the case with your workstation record the console type *sun* on the Preliminary Information Worksheet. (Whether the monitor is a monochrome or color type makes no difference.)

Some systems, most often servers, use some type of non-graphics terminal as system console. In this case, record the `/etc/termcap` name for your terminal type (perhaps `wyse50` or `tvi925`) on the Preliminary Information Worksheet. Full instructions for determining the `/etc/termcap` name are given in Section E.1.1, "Preliminary Information Worksheet."

1.5. Gathering Preliminary Information — Software

Software information required for all systems, regardless of configuration, is described in the following sections. Record the information you discover on the Preliminary Information Worksheet or Host Form Worksheet, as instructed. (Your site's System or Network Administrator, if you have one, will be able to assist you with determining system names and addresses.)

Choosing a Time Zone

SunOS understands the concept of world time zones and will automatically adjust the system clock for Daylight Savings time when and where appropriate. Time zones are specified by name, such as `US/Central` or `Eire`. (If you are unsure of the correct time zone name for your region, wait until you begin the installation and use the help function of the SunInstall TIME ZONE screen. It will provide you with all of the valid time zone names.) Record the time zone name on the Preliminary Information Worksheet.

Choosing a Hostname

A system on a network is often called a *host* —its *hostname* is the name that uniquely identifies the system. You can use the `hostname(1)` command to display this information on an installed system, for example:

```
% hostname
alcatraz
```

If you need to choose a hostname, make sure the name you select is not already in use. The name must be unique within both your local area network and, if applicable, your NIS domain. (Refer to the "Sun's Network Information Service" section later in this chapter for a brief description of NIS.)

In many networks the choice of a hostname is left up to the owner of the workstation (subject to the requirement of uniqueness). Workstation names often reflect some special interest of the owner, often with a touch of whimsy.

A hostname can be up to 64 characters long. Choose a name that starts with a lowercase letter, followed by any combination of lowercase letters, numbers, or hyphens (-). Record your hostname on the Host Form Worksheet.

Determining Your IP Address

If your workstation is going to be attached to a network you will need an IP address. Your network administrator can assign you an IP address or you can refer to Chapter 13 of *System and Network Administration*.

Sun's Network Information Service

If your workstation is attached to a network, that network may use Sun's Network Information Service (NIS) in order to centrally administer information including hostnames, IP addresses, and user login names. Contact your network administrator to find out if your installation uses NIS, and if so, what domain name you must use. For complete documentation refer to Chapter 16 of *System and Network Administration*.

Please note that prior to SunOS Release 4.1 the Network Information Service was known as "yellow pages" or "yp."

If your network uses NIS you must also determine whether your workstation is to be configured as an NIS *client*, *master*, or *slave*. Most workstations are NIS clients, simply using NIS services. One system in each domain is designated the NIS master, the central point of administration for the domain. There may also be one or more NIS slave systems, essentially backup systems to provide NIS services should the master be temporarily unavailable.

Record all of the appropriate information on the Host Form Worksheet.

Which Optional Software Should I Load?

The SunOS software is divided into five *required categories* and a variety of *optional categories*. Each category contains software that supports a particular need or application. By selecting among the optional categories you can tailor your system to your needs, including support for those functions that you will need while not wasting disk storage on software that you will never use.

If you are installing your system as a dataless client there is no need to select software. A dataless client has access to whatever software is loaded on its server. If you are installing your workstation as a dataless client, turn directly to Section 1.10, "Pre-Installation Checklist," below.

It is important to note that some "optional" categories may be *required* in common situations, for example:

- If your system is on a network (Networking category)
- If you plan to use SunView™ or other window-based applications. (SunView_Users category)
- If you plan to use OpenWindows™ (OpenWindows_Users and SunView_Users categories)
- If you need access to programming tools and debuggers (Debugging category)
- If you want access to the on-line manual pages so you can display formatted information from the *SunOS Reference Manual* on your screen (Text and Manual categories)

To install all of the software from the SunOS release media requires about 150 megabytes of disk space (in addition to required swap space). Software categories that you choose not to include now can be added after the system is installed using `add_services(8)`, *provided that there is sufficient space available.*

1.6. Category Classifications

To help you determine your software needs, the following tables classify each software category as one of the following types: Required, Desirable, Common, or Optional.

Required

The required categories *must* be installed for basic system functions.

Example: root, usr, Kvm, Install, and Networking

These categories provide the SunOS kernel and root filesystem. SunInstall automatically installs all of the required software categories.

Desirable

Desirable categories are essential for many applications.

Example: Sys

The Sys category enables you to build a custom kernel for your machine.

Common

Common categories provide software that is commonly needed.

Example: SunView_Users

The SunView_Users category enables you to use SunView window-based tools and applications. (It is also a prerequisite for the OpenWindows_Users common category.

Optional

Optional categories are ones you can consider installing based solely on your specific needs

Examples: Manual and Text

These two optional categories provide an on-line version of the *SunOS Reference Manual*. Whether you choose to install these categories that provide on-line manual pages depends on how useful you feel they'll be and whether your system disk has the space to accommodate them.

1.7. Choosing Your Software

The Software Form Worksheet lists software categories you can install. The following tables describe the software categories and notes their approximate sizes. Read the description of each category and decide whether you wish to load it. On a copy of the Software Form Worksheet, check off each category you choose to install.

If you want to see a list of the categories generated directly from the CD-ROM containing this release of the operating system, refer to the next section.

Note that some categories, if chosen, also require that another category or categories (as noted in the "Prerequisites" column in the following tables be loaded as well in order for them to be used. These categories are noted in the "Prerequisites" column of the following tables. For example, the Manual category (which provides the manual pages) also requires that the Text category (which provides the text formatting utilities) be loaded.

Table 1-5 *Required Software Categories with Descriptions*

Category	Size in MBytes	Description	Prerequisites
root	**1.8**	Contents of `/`, the root filesystem, including the SunOS kernel.	
usr	**25.8**	Required portions of `/usr`. Includes standard utilities, system programs, and library routines.	
Kvm	**5.3**	Kernel-architecture-dependent programs, such as `ps(1)`, `vmstat(8)`, and others.	
Install	**1.0**	Installation software and tools such as `add_services(8)`, used to add software to an installed system in multiuser mode.	
Networking	**1.2**	(Required for all networked systems.) Essential NFS software including programs such as `rlogin(1C)` and `rcp(1C)`, and tools for network administration.	

Table 1-6 *Desired Software Categories with Descriptions*

Category	Size in MBytes	Description	Prerequisites
Debugging	**3.3**	Debugging tools for programmers including `dbxtool(1)`, a source-level debugger for C, Pascal, and Fortran-77 programs that runs in a windowed environment.	SunView_Users
RFS	**1.1**	Remote File System, an alternative to NFS in a System-V environment.	TLI, Sys
Sys	**5.2**	Software for building kernels and kernel configuration files for common configurations.	

Table 1-6 *Desired Software Categories with Descriptions— Continued*

Category	Size in MBytes	Description	Prerequisites
System_V	**4.1**	Selected programs, include files, and libraries for UNIX System-V compatibility and compliance with X/Open Portability Guide standards. (UNIX is a registered trademark of AT&T.)	
TLI	**0.1**	Transport Layer Interface, a communications protocol used by RFS, an alternative to NFS in a System-V environment.	Sys

Table 1-7 *Common Software Categories with Descriptions*

Category	Size in MBytes	Description	Prerequisites
SunView_Users	**3.0**	Provides an environment to run SunView window-based tools, such as `mailtool(1)`, `dbxtool(1)`, `sun-diag(8)`, and many others.	
OpenWindows_Users	**25.8**	Provides an environment to run OpenWindows window-based tools, such as `mailtool(1)`, `filemgr(1)`, `cm(1)`, and many others.	SunView_Users
OpenWindows_Fonts	**8.2**	Provides fonts for OpenWindows_Users.	

Table 1-8 *Optional Software Categories with Descriptions*

Category	Size in MBytes	Description	Prerequisites
Demo	**5.5**	Miscellaneous demonstration programs (selected source code and binaries).	SunView_Users, SunView_Programmers, OpenWindows_Users, OpenWindows_Programmers

Table 1-8 *Optional Software Categories with Descriptions— Continued*

Category	Size in MBytes	Description	Prerequisites
Games	**3.7**	Computer games, such as `adventure(6)`, `boggle(6)`, `chesstool(6)`, and many others.	SunView_Users
Graphics	**2.1**	Software for programmers who wish to develop graphics-based applications in a SunView environment. (Includes CGI and SunCore.)	SunView_Users, SunView_Programmers
Manual	**7.7**	Source files for the on-line man pages. (The large size and relatively low usage of the manual pages may suggest installing them on just one or two servers on your network. Other workstations can then mount the `/usr/share` directory from a "man page server" to gain access to the manual pages.)	Text
OpenWindows_Demo	**8.2**	Miscellaneous demonstration programs (selected source code and binaries).	OpenWindows_Users
OpenWindows_Programmers	**10.2**	Software for programmers who wish to develop window-based applications in an OpenWindows environment.	OpenWindows_Users, OpenWindows_Fonts
Security	**0.4**	Software to provide enhanced password security and event-specific auditing, as specified for C2-level security. (See *System and Network Administration Manual*, Chapter 19 — Administering C2 Security.)	
Shlib_Custom	**1.6**	Software for programmers who wish to build their own shared libraries.	
SunView_Demo	**0.6**	SunView demonstration programs (selected source code and binaries).	SunView_Users, SunView_Programmers

Table 1-8 *Optional Software Categories with Descriptions— Continued*

Category	Size in MBytes	Description	Prerequisites
SunView_Programmers	**2.1**	Software for programmers who wish to develop window-based applications in a SunView environment. **Most Sun graphics products require this category.**	SunView_Users
Text	**0.8**	Text-processing software, including the `nroff(1)` and `troff(1)` formatting programs, standard macro packages, and preprocessors such as `eqn(1)` and `tbl(1)`.	
User_Diag	**7.2**	Diagnostic programs, including `sundiag(8)`, a window-based tool used to test system devices and peripherals.	SunView_Users
uucp	**0.7**	Files to support `uucp(1C)`, for system-to-system, serial-line network communications.	
Versatec	**6.7**	Spooling support for Versatec V-80 plotters.	

1.8. Listing Software Categories on a CD-ROM

This section tells how to find out which categories are on the SunOS release CD-ROM and how to use the `list_files` command to display all the files within a category.

Extracting the Table of Contents from a CD-ROM

To list the table of contents on a CD-ROM:

1. Log on as root.
2. Mount the CD-ROM with the command:

```
# mount -rt hsfs /dev/sr0 /usr/etc/install/tar
```

3. Change directories to the release for which you want a table of contents:

```
# cd /usr/etc/install/tar/export/exec/kvm/k-arch_sunos_4_1_2
```

– Replace *k-arch* with the kernel architecture for which you want contents listed

4. Display the table of contents:

```
# /usr/etc/install/xdrtoc xdrtoc
```

The table of contents displayed is similar to that shown for a desktop system in the following example:

Figure 1-1 *Contents for Sun4c Kernel Architecture (Desktop SPARCsystems)*

```
ARCH sun4c
VOLUME -1
 Vol File             Name       Size   Type
   1    0            munix    3022848   image
   1    1           XDRTOC       4096   toc
   1    2        mini-root    7168000   image
   1    3             root      74247   tarZ
   1    4              usr   11283903   tarZ
   1    5              Kvm    2654129   tarZ
   1    6          Install     460015   tarZ
   1    7       Networking     464665   tarZ
   1    8         System_V    1898363   tarZ
   1    9              Sys    2272839   tarZ
   1   10    SunView_Users    1159329   tarZ
   1   11     SunView_Demo     196749   tarZ
   1   12             Text     348141   tarZ
   1   13             Demo    1849348   tarZ
   1   14 OpenWindows_Users   11608481  tarZ
   1   15 OpenWindows_Demo    2365443   tarZ
   1   16 OpenWindows_Fonts    7185071  tarZ
   1   17        User_Diag    1754777   tarZ
   1   18           Manual    2651509   tarZ
   1   19              TLI      22333   tarZ
   1   20              RFS     399127   tarZ
   1   21        Debugging    1567287   tarZ
   1   22        Copyright       1536   image
   2    0           XDRTOC       4096   toc
   2    1           XDRTOC       4096   toc
   2    2 SunView_Programmers     865509        tarZ
   2    3     Shlib_Custom     786881   tarZ
   2    4         Graphics     836845   tarZ
   2    5             uucp     286777   tarZ
   2    6            Games    1788080   tarZ
   2    7         Versatec    2398415   tarZ
   2    8         Security     247673   tarZ
   2    9 OpenWindows_Programmers    4683885    tarZ
   2   10        Patch_IPC     139264   tarZ
   2   11    Patch_C++_2.0    2953216   tarZ
   2   12       Patch_TAAC      20480   tarZ
   2   13        Copyright       1536   image
```

`list_files`

Use the `list_files`(8) command to list all the files in a specific category on a CD-ROM or tape. As `root`, enter:

```
#cd /usr/etc/install
#list_files devicenumber category [-a kernel arch] [-r release]
```

- *devicenumber* is the device number of your tape or CD–ROM.
- Replace *category* with the category whose files you want listed.
- `-a` is optional and used only with CD-ROM; if not entered, files belonging to the system's own kernel architecture are listed; if entered, you must follow it with the name of the kernel architecture for which files are to be listed.
- `-r` is optional and used only with CD-ROM; if not entered, files belonging to the system's SunOS release are listed; if entered you must follow it with the name of the release whose files are to be listed.

For example, to list the files in the category "Text" on a CD-ROM in device `sr0`, you enter:

```
#cd /usr/etc/install
#list_files sr0 Text
```

The following example lists the files in "Text" for the client of a server with a CD-ROM in device `sr0`. The client has sun4c kernel architecture; the server can be of any architecture.

```
#cd /usr/etc/install
#list_files sr0 Text -a sun4c
```

1.9. Software Selection Guidelines

Some further suggestions to help you choose your optional software.

- Whether you need these categories depends entirely on your system hardware:

  OpenWindows_Users
  SunView_Users
  uucp
  Versatec

  SunView_Users or OpenWindows_Users is very desirable if you have a bit mapped display.

- These categories depend on whether you need to access System-V network protocols:

RFS
TLI

- The system administrator typically decides which of the following categories to install. (The choice is yours if you're responsible for maintaining your own system.)

  Security
  Sys
  User_Diag

  Sys is strongly recommended. Without it, you'll be unable to build a new, more efficient kernel on your machine after installing your system. Security, on the other hand, is needed only to provide the C2-level security features described in Chapter 19 of *System and Network Administration*.

- The following categories are of particular interest to programmers and application developers:

  Debugging
  Graphics
  OpenWindows_Programmers
  Shlib_Custom
  SunView_Programmers
  System_V

  Select both SunView_Users and SunView_Programmers if you plan to add Sun graphics products to your system.

- These categories are of general interest to the average system user:

  Demo
  Games
  Manual
  OpenWindows_Demo
  OpenWindows_Fonts
  SunView_Demo
  System_V
  Text

  In determining your need for demonstration programs (Demo), note that most programs come in source code format as well as executable binaries. To recompile programs from source code, you must first load the prerequisite categories on your system.

1.10. Pre-Installation Checklist

Complete the steps in the following checklist before you begin the installation.

Before you install a new system

___ **Make sure the system hardware is functional.**

- ☐ Verify that all cables and connectors are hooked up and that the machine is plugged into a power supply of the proper voltage.
- ☐ Turn the machine on and verify a successful system self-test.
- ☐ As a final check, type a few characters to make sure the system responds to keystrokes.

Before you reinstall a previously installed system

Note: Not all of the commands and files listed here are applicable to all installations. For example, the `/export/swap` directory will be found only on servers.

___ **Save to tape or diskette the output of each command (you may also print output from commands marked with an *):**

__ `mount`
__ `mount -p`
__ `dkinfo` for each drive
__ `grep 'hostname' /etc/hosts`
__ `grep` *client_name* `/etc/hosts` for each client
__ `ls -ls /export/swap`
__ `ls -ls /etc/hostname*`
__ `cat /etc/hostname.`*interface* for each hostname file
__ `domainname` if you are using NIS

___ **Save to tape or diskette a copy of each of:**

__ `/.profile`
__ `/.rhosts`
__ `/etc/crontab`
__ `/etc/exports`
__ `/etc/printcap`
__ `/etc/group`
__ `/etc/host.equiv`
__ `/etc/rc`
__ `/etc/rc.local`
__ `/etc/ttytab`
__ `/etc/uucp/*`
__ `/usr/spool/cron/crontabs/*`
__ `/.cshrc`
__ `/etc/fstab`
__ `/etc/passwd`
__ `/etc/bootparams`
__ `/etc/gettytab`
__ `/etc/hosts`
__ `/etc/networks`
__ `/etc/rc.boot`
__ `/etc/remote`
__ `/etc/aliases`
__ `/usr/local/*`

___ **If you are upgrading from a release prior to 4.1, some formatting changes are required; see the** `ttytab(4)` **and** `ttysoftcar(8)` **man pages for more information.**

___ **If you're installing a server, halt each of its clients.**

___ **Boot the system in single user mode and run `fsck(8)` on each filesystem.**

___ **Perform a full system back-up (level 0 dumps). (See Chapter 6, Section 6.1 of *System and Network Administration*.)**

Before you install *any* system

___ **Locate all required software.**

Under some circumstances, you'll need more than just the SunOS 4.1.2 release CD-ROM.

- To install a heterogeneous server, for example, you'll need additional media for client architectures not supported by SunOS 4.1.2. (The SunOS 4.1.2 release CD-ROM includes all supported architectures on a single disk.)
- You must reinstall or extract from backups unbundled software and third-party applications after you do a full install of the new SunOS release.

___ **Gather all necessary documentation.**

In addition to this manual, have available the *Release Manual* for this SunOS release. Be sure to read the "Open Issues" section of that manual for information about special handling of your hardware and software within this SunOS release.

You also may find the manual for operating your SunCD drive and the *System and Network Administration* manual to be useful.

___ **Schedule sufficient time for the installation.**

Installation typically takes from 1/2 to 2-1/2 hours, depending on a combination of factors:

- Machine Performance
- Installation Complexity/Number of Clients
- Software Categories Selected
- Installation Method (local or remote)

Allow additional time if you are reinstalling a previously installed system. If the system is running unbundled or third-party software, for example, you will need to reinstall the software or restore it from backups after you install Release 4.1.2.

Turn now to the chapter of this manual that matches your chosen system configuration:

Chapter 2: Upgrading to SunOS 4.1.2
Chapter 3: Configuring a Preinstalled Standalone Workstation
Chapter 4: Installing a Standalone Workstation with Quick Install
Chapter 5: Installing a Standalone Workstation with Custom Install
Chapter 6: Installing a Homogeneous Server
Chapter 7: Installing a Heterogeneous Server
Chapter 8: Installing a Dataless Workstation

2

Upgrading to SunOS 4.1.2

Use `sunupgrade` to upgrade SunOS 4.1.1 or SunOS 4.1.1 Rev B to SunOS 4.1.2. You can upgrade the following types of Sun-4 or Sun-4c systems with `sunupgrade`:

- Standalone or dataless SPARCsystem
- SPARCserver and diskless SPARC clients

The procedures for the two types of upgrades are similar, but they are described separately, for the sake of clarity. Only SunOS 4.1.1 or SunOS 4.1.1 Rev B can be upgraded; you must do a full install with `suninstall` if you have a previous version of the operating system.

See Section 2.6 for a list of all optional flags to the `sunupgrade` command.

2.1. Summary of Upgrade Process

The details of upgrading to SunOS 4.1.2 are described in "Standalone or Dataless Upgrade" and "Server and Diskless SPARC Client Upgrade" below. The basic process consists of the following steps:

1. Back up your current system(s).
2. Determine that you have enough disk space to complete the upgrade.
3. Mount the SunOS 4.1.2 CD-ROM.
4. [Optional] Run dummy `sunupgrade` to determine that the proper software categories will be upgraded.
5. Run `check_perm` to see which SunOS 4.1.1 files that are going to be replaced by SunOS 4.1.2 files have been changed since SunOS 4.1.1 was installed.
6. Analyze results of `check_perm` and decide which volatile file list you wish to use.
7. If you are upgrading a server, halt all client machines.

   Note: upgrade all dataless clients and halt them before you upgrade the server.
8. Shut down the machine to be upgraded, bringing it down to single-user mode. (If you are going to do the upgrade remotely, first mount the SunOS 4.1.2 CD-ROM from the machine to be upgraded.)

9. [Optional] Run `fsck` on `/`, `/usr`, and `/export` (if it exists) file systems.

   Fix any file system problems before continuing.

10. Run `sunupgrade`.

    If you upgrade the server of dataless clients, upgrade each of the dataless clients *before* you upgrade the server and halt them before you upgrade the server.

11. [Optional] Reboot each upgraded system: server first, then clients.

    Because rebooting makes standard editors and other functions available, you may find it easier to customize volatile files and the kernel after you have rebooted; however, your system may not reboot automatically if you have a non-standard booting process. In this case, you may have to customize `rc.local` and/or `rc.boot`, and the kernel configuration file before booting.

12. Customize volatile files (`rc.local`, `format.dat`, etc.), if necessary. Restore or edit any files that need to be restored or edited.

13. Customize and rebuild the kernel(s), if necessary.

When you run `config` to prepare to make a kernel, you designate a *config_file* which describes the kernel to be made; `config`'s output goes into the directory named *../config_file*. Because of differences in time stamps, if the directory *../config_file* already exists when you run `config`, your kernel may not be buildable. In this case, you will have to remove the directory before running `config`.

14. Reboot each system modified in the previous two steps: server first, then clients.

Remote Upgrades

You can run `sunupgrade` directly, from an attached CD-ROM drive, or remotely, from a CD-ROM drive on another machine on the network. Suppose you have a machine named "withcdrom" that has a CD-ROM drive and a machine named "nocdrom" that you want to upgrade. Do the following as root:

1. **On "withcdrom," insert the CD-ROM into the drive and mount the SunOS 4.1.2 CD-ROM:**

```
# mount -rt hsfs /dev/sr0 /mnt
```

   If the CD-ROM drive is currently in use, you may have to unmount it and eject the current CD-ROM.

2. **On "withcdrom," add the following line to `/etc/exports`:**

```
/mnt            -ro
```

3. **On "withcdrom," export the mounted CD-ROM:**

```
# /usr/etc/exportfs /mnt
```

You may have to start `rpc.mountd` manually; see the `man` page for `mountd(8C)` for details.

4. **On "nocdrom," mount the CD-ROM from "withcdrom":**

```
# mount -r withcdrom:/mnt /usr/etc/install/tar
```

5. **Perform the upgrade on "nocdrom," as described in Section 2.4 or Section 2.5 below.**

Do *not* mount the CD-ROM as instructed in Step 4 of the upgrade procedure; you will get an error condition if you attempt it.

6. **After the upgrade, unmount the SunOS 4.1.2 CD-ROM, remove the line from `/etc/exports`, and run `/usr/etc/exportfs -u /mnt`.**

Note that you *cannot* do a remote server upgrade from a client of the server (since the client must be halted before the upgrade is performed).

Disk Space Requirements

In general, `sunupgrade` requires an additional two megabytes in the `root` (/) partition (for the server and each client or for a standalone system) and nine megabytes in the user partition (`/usr`). These are general guidelines, and should be sufficient for all cases.

If `sunupgrade` abnormally terminates during the upgrade procedure (typically from lack of disk space), the system may be in an inconsistent state, at which point a full installation of SunOS may become necessary. Be sure enough space is available before running `sunupgrade`.

If you think you do not have enough free space available to perform an upgrade, consider the following:

- If you are upgrading from SunOS 4.1.1 Rev B, or if the system does *not* currently have OpenWindows loaded, approximately 2.7 MB of disk space can be subtracted from the nine-megabyte guideline.
- If you are upgrading from SunOS 4.1.1 Rev B, approximately .36 MB can be subtracted from the nine-megabyte guideline.
- If `usr.diag` is not loaded, 4.4 MB can be subtracted from the nine-megabyte guideline.

Other space-saving ideas to consider, especially if the `root` partition (/) is short on space, include the following;

- Be sure all `core` files have been deleted.
- Make sure `/tmp` is "clean."
- Move any unneeded kernels (`/vmunix.old, /vmunix.generic`, etc) to a different file system or remove them.
- Use the `small (-s)` option when running `sunupgrade`.
- Use the `no backup (-nb)` option when running `sunupgrade` (this will save about 1.2 MB of space).

If the user partition (`/usr`) is short of space, it might be necessary to remove some software categories prior to sunupgrade. For example, if `/usr/man` is located on another machine, it may not be necessary to include it locally. If these software categories are removed, ***be sure*** to update `/etc/install/media_file.sun4.sun4[c].sunos.4.1.1` before running `sunupgrade`; otherwise, the SunOS 4.1.2 versions of the software will be loaded.

No Partial Upgrades

You *cannot* do partial upgrades with `sunupgrade`. A partial upgrade is any upgrade that does not include the server and all of its SPARC clients.

2.2. Upgrade Workaround: C2 Security Bug

The SunOS 4.1.2 C2 security bug fixes require that two pseudouser `passwds` be added. This can be done by using `C2conv` in 4.1.2.

However, if you are running `C2` in 4.1.1 and wish to use `sunupgrade` to upgrade to SunOS 4.1.2, these `passwd` entries must be added before the machine is rebooted with 4.1.2 or you will not be able to log in. Note that this is a problem *only* when you use `sunupgrade`; once the upgrade is complete, `C2conv` will work correctly.

You may either add these `passwd` entries manually before the system is rebooted with 4.1.2, or you may run `C2unconv` before running `sunupgrade` and `C2conv` after running `sunupgrade` and rebooting.

If the file `/etc/security/passwd.adjunct` exists, then you are running `C2` security and you should perform one of the following procedures.

Method 1

One method for working around the C2 security problem is to edit the `passwd` entries manually.

1. Edit `/etc/passwd` and add these entries:

```
AUpwdauthd:##AUpwdauthd:27:10:AUpwdauthd pseudo user::
AUyppasswdd:##AUyppasswdd:28:10:AUyppasswdd pseudo user::
```

2. Edit `/etc/security/passwd.adjunct` and add these entries:

```
AUpwdauthd:*:::::
AUyppasswdd:*:::::
```

Method 2

A second method for working around the C2 security problem is to run `C2unconv` before running `sunupgrade` and `C2conv` after the upgrade.

1. Run `C2unconv` in single-user mode, before running `sunupgrade`:

```
# /usr/etc/C2unconv
```

2. Run `C2conv` in single-user mode, after running `sunupgrade` and rebooting the system:

```
# /usr/etc/C2conv
```

3. Remove duplicate entries in `/etc/fstab` and `/etc/exports`.

   Duplicate entries from the first time `C2conv` was installed under SunOS 4.1.1 or SunOS 4.1.1 Rev B should be removed after `C2conv` is run again.

2.3. Sun-3 Client Workaround

Sun-3 clients will not be upgraded by `sunupgrade` (SunOS 4.1.2 does not support Sun-3 systems). But your Sun-3 clients can continue to run a previous release of SunOS. If you want Sun-3 clients to continue to access the same `man` pages and if you want to be able to add more Sun-3 clients, you must do the following for Sun-3 clients of a server being upgraded:

1. **Before the upgrade, back up the following two directories:**

```
/export/share/sunos.4.1.1
/export/exec/proto.root.sunos.4.1.1
```

   These directories will be renamed with "4.1.2" as their suffixes during the upgrade. Note that you cannot use `cp` to back up the directories, because they contain linked files; use `tar` or `cpio`.

2. **Restore backed-up files after upgrade.**

   After running `sunupgrade`, restore the backed-up `/export/share/sunos.4.1.1` directory to `/export/share`, and the backed-up `proto.root.sunos.4.1.1` directory to `/export/exec`.

   Note that only `man` pages change in the `/export/share` directory during the upgrade. Note also that the `proto.root.sunos.4.1.1` directory is needed only when you add Sun-3 clients to your system.

2.4. Standalone or Dataless Upgrade

Any standalone or dataless SPARC (Sun-4 or Sun-4c) system running SunOS 4.1.1 or SunOS 4.1.1 Rev B can be upgraded to SunOS 4.1.2 by using the `sunupgrade` utility supplied on the SunOS 4.1.2 release CD-ROM.

See the instructions for the C2 security bug in Section 2.2 before performing the upgrade.

Upgrade Dataless Client Before Server

You must upgrade all dataless clients of a server ***before*** you upgrade the server. Each of the clients should be halted after they are upgraded. After the upgrade, reboot the server first, then each of the dataless clients.

Note that only the `root` software category is upgraded for a dataless client.

Upgrade Procedure

Do the following to perform the upgrade:

1. **Perform a level 0 dump of your system.**

   NOTE: if you are not satisfied with your system after the upgrade, you can return to the original state of your system by performing a full restore.

2. **Check for sufficient disk space.**

   Be sure your root partition (/) has at least two (2) free megabytes, and that `/usr` has at least nine (9) free megabytes (necessary if you upgrade the full set of software categories). See "Disk Space Requirements" above for ways to save disk space.

   The files that might be replaced (depending on what software categories are installed on your system) during the upgrade are listed in the following directory, sorted by category:

   ```
   /usr/etc/install/tar/sunupgrade/incld
   ```

3. **Become super-user**:

   ```
   % su
     [Enter root password]
   #
   ```

4. **Mount the SunOS 4.1.2 CD-ROM.**

   Insert the SunOS 4.1.2 CD-ROM into your CD-ROM drive, and mount it on `/usr/etc/install/tar`:

   ```
   # mount -rt hsfs /dev/sr0 /usr/etc/install/tar
   ```

   See "Remote Upgrades" above for instructions for upgrading remotely, from a machine with a CD-ROM drive.

5. **Change to the directory where `sunupgrade` is located:**

```
# cd /usr/etc/install/tar/sunupgrade/shell
```

6. **Run `check_perm`:**

```
# check_perm -v
```

Basically, `check_perm` lists those SunOS 4.1.1 files which will be replaced by SunOS 4.1.2 files *if* you have modified the SunOS 4.1.1 file. These are files which you might want to customize after the upgrade is complete. The output of `check_perm` is two output files:

```
/usr/tmp/volatile_candidates
/usr/tmp/volatile_file
```

It will take between two and 10 minutes to run `check_perm`, depending on your system configuration. See Section 2.8 in this chapter for details about `check_perm`.

7. **Analyze the results of `check_perm` and decide which volatile file list to use.**

You can use the default volatile file list, `/usr/tmp/volatile_file`, as your volatile file list, or you can create your own volatile file list. See Section 2.7 for instructions for creating and using your own volatile file list. By default `sunupgrade` will use the Sun-supplied volatile file list.

8. **[Optional] Run `sunupgrade` with `-dummy` option:**

```
% sunupgrade -d
```

Note that you do not have to be the super-user to run the dummy upgrade and you do not have to be in single-user mode. See Section 2.6 for a list of all optional flags to the `sunupgrade` command.

The output of the dummy upgrade will tell you which software categories and volatile files are going to be upgraded. You can include the `-x` flag and your own volatile file list, if you wish.

9. **If you are not satisfied with the software categories that are going to be upgraded, edit the following file before running `sunupgrade`:**

`/etc/install/media_file.sun4.sun[4,4c].sunos.4.1.1`

NOTE: you can only upgrade software categories which are already on your system. Please check that the file shows "mf_loaded=no" for software categories you do NOT wish to upgrade and "mf_loaded=yes" for software categories you wish to upgrade. This restriction does not apply to the `kvm` and `root` categories; even if you set "mf_loaded" to "no," these directories will be overwritten.

If you have installed a software category *manually* — using `extract_files(8)` or `tar`, for example — it will not be shown as loaded; change the "no" to "yes" for such software categories, being sure the software category is installed in the standard SunInstall location. If it is not in the standard location, it will not be upgraded.

Also, if you have manually *removed* a software category (`/usr/games` or `/usr/man`, for instance), and you do not wish to have it re-installed, you will have to change the "yes" to "no" in the media file.

If you have OpenWindows Version 3 on your system, it will *not* be overwritten by OpenWindows Version 2 during the upgrade.

10. **Become super-user, warn anyone logged in that you are going to halt the system, and shut down the system, bringing it down to single-user mode.**

    Include whatever options are appropriate for the `shutdown(8)` command, letting users know when the system will go down:

```
% su
  [Enter root password]
# /usr/etc/shutdown [ -fhknr ] time [warning-message ...]
```

11. **[Optional] Run `fsck` on `/`, `/usr`, and `/export` (if it exists) file systems.**

    Fix any file system problems before continuing.

12. **Change to the directory where `sunupgrade` is located:**

```
# cd /usr/etc/install/tar/sunupgrade/shell
```

13. **Start `sunupgrade`.**

    When you are satisfied with the software categories and files that are going to be upgraded, run `sunupgrade` without the `-dummy` option:

```
# sunupgrade -v
 (if you wish to see the list of the upgraded files, and if you want to use the
 Sun-supplied volatile file list)
                    or
# sunupgrade -x/usr/tmp/volatile_file
 (if you do not wish to see the list of the upgraded files and if you wish to use
 volatile_file, output from check_perm, for your volatile file list
```

The upgrade will start. See Section 2.9 at the end of this chapter for an example of an upgrade. See Section 2.6 for a list of all optional flags to the `sunupgrade` command.

14. **Respond to system queries.**

    The upgrade will be performed if you respond "yes" or "y" to all queries. Depending on the configuration of your system, which categories you have on your system, and how many clients you have, the upgrade will take about 15 to 30 minutes.

15. **[Optional] For a standalone system: reboot the system. For a dataless client system: `halt` the system.**

    Leave all dataless client systems halted until after the server has been upgraded and rebooted; then reboot each dataless client, customize volatile files and the kernel, if necessary, and reboot again.

    Because rebooting makes standard editors and other functions available, you may find it easier to customize volatile files and the kernel after you have rebooted; however, your system may not reboot automatically if you have a non-standard booting process. In this case, you may have to customize `rc.local` and/or `rc.boot`, and the kernel configuration file before booting.

16. **For standalone system: customize volatile files (`rc.local`, `format.dat`, etc.), if necessary.**

    See the file `/usr/tmp/coalesce_list` for a list of the files that might need to be customized; these are "volatile" files that have been backed up with a .411 or .412 suffix.

17. **For standalone system: restore or edit any other files that need to be restored or edited.**

18. **For standalone system: customize and rebuild the system kernel, if necessary.**

When you run `config` to prepare to make a kernel, you designate a *config_file* which describes the kernel to be made; `config`'s output goes into the directory named `../`*config_file*. Because of differences in time stamps, if the directory `../`*config_file* already exists when you run `config`, your kernel may not be buildable. In this case, you will have to remove the directory before running `config`.

19. **For standalone system: reboot the system, if you modified the kernel or volatile files such as `rc.local` after the upgrade.**

2.5. Server and Diskless SPARC Client Upgrade

You can upgrade a SPARCserver and *all* diskless SPARC clients running SunOS 4.1.1 or SunOS 4.1.1 Rev B to SunOS 4.1.2 with `sunupgrade`. As noted earlier, partial upgrades are not supported: the SPARCserver and all SPARC clients will be upgraded when you run `sunupgrade`.

See the instructions for the C2 security bug in Section 2.2 before performing the upgrade. If you have any Sun-3 clients, see the Sun-3 workaround in Section 2.3, also.

If you are upgrading dataless clients, upgrade them before you upgrade the server.

Do the following to upgrade the server and all diskless clients:

1. **Perform a level 0 dump on your server.**

   NOTE: if you are not satisfied with your system after the upgrade, you can return to the original state of your system by performing a full restore.

2. **Check for sufficient disk space.**

   Be sure the root partition for the server has at least two (2) free megabytes, that there are two (2) free megabytes in the root partition for each client, and that `/usr` has at least nine (9) free megabytes (necessary if you upgrade the full set of software categories). See "Disk Space Requirements" above for ways to save disk space.

   The files that might be replaced (depending on what software categories are installed on your system) during the upgrade are listed in the following directory, sorted by software category:

   ```
   /usr/etc/install/tar/sunupgrade/incld
   ```

3. **Become super-user**:

```
% su
  [Enter root password] #
```

4. **Mount the SunOS 4.1.2 CD-ROM.**

   Insert the SunOS 4.1.2 CD-ROM into your CD-ROM drive and mount it on `/usr/etc/install/tar`:

```
# mount -rt hsfs /dev/sr0 /usr/etc/install/tar
```

   See "Remote Upgrades" above for instructions for upgrading remotely, from a machine with a CD-ROM drive.

5. **Change to the directory where `sunupgrade` is located:**

```
# cd /usr/etc/install/tar/sunupgrade/shell
```

6. **Run `check_perm`:**

```
# check_perm -v
```

   Basically, `check_perm` lists those SunOS 4.1.1 files which will be replaced by SunOS 4.1.2 files ***if*** you have modified the SunOS 4.1.1 file.

These are files which you might want to customize after the upgrade is complete. The output of `check_perm` is two output files:

```
/usr/tmp/volatile_candidates
/usr/tmp/volatile_file
```

It will take between two and 10 minutes to run `check_perm`, depending on your system configuration. See Section 2.8 in this chapter for details about `check_perm`.

7. **Analyze the results of `check_perm` and decide which volatile file list to use.**

   You can use the default volatile file list, `/usr/tmp/volatile_file`, as your volatile file list, or you can create your own volatile file list. See Section 2.7 for instructions for creating and using your own volatile file list. By default `sunupgrade` will use the Sun-supplied volatile file list.

8. **[Optional] Run `sunupgrade` with `-dummy` option:**

```
% sunupgrade -d [-xmyvolatile_list]
```

   Note that you do not have to be the super-user to run the dummy upgrade and you do not have to be in single-user mode. See Section 2.6 for a list of all optional flags to the `sunupgrade` command.

   The output of the dummy upgrade will tell you which software categories and volatile files are going to be upgraded. You can include the `-x` flag and your own volatile file list, if you wish.

9. **If you are not satisfied with the software categories that are going to be upgraded, edit the following file before running `sunupgrade`:**

   `/etc/install/media_file.sun4.sun[4,4c].sunos.4.1.1`

   NOTE: you can only upgrade software categories which are already on your system. Check that the file shows "mf_loaded=no" for software categories you do NOT wish to upgrade and "mf_loaded=yes" for software categories you wish to upgrade.

   If you have installed a software category *manually* — using `extract_files(8)` or `tar`, for example — it will not be shown as loaded; change the "no" to "yes" for such software categories, being sure the software category is installed in the standard SunInstall location. If it is not in the standard location, it will not be upgraded.

   Also, if you have manually *removed* a software category (`/usr/games` or `/usr/man`, for instance), and you do not wish to have it re-installed, you will have to change the "yes" to "no" in the media file.

   If you have OpenWindows Version 3 on your system, it will *not* be overwritten by OpenWindows Version 2 during the upgrade.

10. **Halt *all* clients, including diskless, dataless, Sun-3, Sun-4, Sun-4c.**

11. **Become super-user, warn anyone logged in that you are going to halt the system, and shut down the system, bringing it down to single-user mode:**

    Include whatever options are appropriate for the `shutdown(8)` command, letting users know when the system will go down:

```
% su
  [Enter root password]
# /usr/etc/shutdown [ -fhknr ] time [ warning-message ...]
```

12. **[Optional] Run `fsck` on `/`, `/usr`, and `/export` (if it exists) file systems.**

    Fix any file system problems before continuing.

13. **Change to the directory where `sunupgrade` is located:**

```
# cd /usr/etc/install/tar/sunupgrade/shell
```

14. **Start `sunupgrade`.**

    When you are satisfied with the software categories and files that are going to be upgraded, run `sunupgrade` without the `-dummy` option:

```
# sunupgrade -v
 (if you wish to see the list of the upgraded files, and if you want to use the
 Sun-supplied volatile file list)
                    or
# sunupgrade -x/home/server/mylist
 (if you do not wish to see the list of the upgraded files and if you wish to use your own
 volatile file list, which is in /home/server and is called mylist, in this case)
```

    The upgrade will start. See Section 2.9 at the end of this chapter for an example of an upgrade. See Section 2.6 for a list of all optional flags to the `sunupgrade` command.

15. **Respond to system queries.**

    The upgrade will be performed if you respond "yes" or "y" to all queries. Depending on the configuration of your system, which categories you have on your system, and how many clients you have, the upgrade will take between 20 minutes and two hours.

16. **[Optional] Reboot the system.**

    Because rebooting makes standard editors and other functions available, you may find it easier to customize volatile files and the kernel after you have rebooted; however, your system may not reboot automatically if you have a

non-standard booting process. In this case, you may have to customize `rc.local` and/or `rc.boot`, and the kernel configuration file before booting.

17. **Customize volatile files (`rc.local, format.dat`, etc.), if necessary.**

    See the file `/usr/tmp/coalesce_list` for a list of the files that might need to be customized; these are "volatile" files that have been backed up with a .411 or .412 suffix.

18. **Restore or edit any other files that need to be restored or edited.**

19. **Customize and build the system kernel, if necessary.**

When you run `config` to prepare to make a kernel, you designate a *config_file* which describes the kernel to be made; `config`'s output goes into the directory named `../`*config_file*. Because of differences in time stamps, if the directory `../`*config_file* already exists when you run `config`, your kernel may not be buildable. In this case, you will have to remove the directory before running `config`.

20. **Reboot the system, if you modified the kernel or volatile files such as `rc.local` after the upgrade.**

21. **Boot all clients.**

    You may want to customize files and the kernel for dataless clients; if so, boot the clients, customize the files and the kernel, and reboot.

2.6. Options to `sunupgrade` Command

The options to `sunupgrade` are listed below. Note that you should not include any space after the `-x` and `-w` flags.

`-d | -dummy`
No actual upgrade will be performed.

`-v | -verbose`
Prints the list of actually untarred files. By default, the replaced files will not be listed; they will be included in `/etc/install/sunupgrade.log`, however.

`-q | -quiet`
No screen output. Log will be recorded anyway.

`-n | -noninteractive`
No questions asked. Assumes always "yes".

`-wOPENWINHOME`
Full path of OpenWindows on the users system. The default is `/usr/openwin`.

`-xVOLATILE_LIST`
Full path to user's volatile list. By default, Sun's list is used.

`-nb | -nobackup`
If `-nb` or `-nobackup` is specified, the script will not back up `/vmunix` with the name `/vmunix.orig`. By default, the backup is performed, if `/vmunix.orig` does not exist.

`-s | -small`
Install `/vmunix_small` rather then `/vmunix`, which is the default.

For a server upgrade, the three last options (`-xVOLATILE_LIST`, `-nobackup`, and `-small`) are applicable to the server and all its diskless SPARC clients.

Using the options `-nobackup` and/or `-small` will save some space in the `root` directory.

2.7. Volatile File List

The default volatile file list, `volatile_list`, lists those files that changed between SunOS 4.1.1 and SunOS 4.1.2, and that are most likely to be customized by a user. The file is found in `/usr/etc/install/tar/sunupgrade`. This file is read, by default, when you run `sunupgrade`. You may designate a different volatile file list by including the full path name to the file after the `-x` flag; see "Using Your Own Volatile File List" below for instructions.

How to Use `check_perm` Output

Run `check_perm` to get a list of the SunOS 4.1.1 files that are changed in SunOS 4.1.2 *and* that you have modified in some way; the output of `check_perm` is the following files:

```
/usr/tmp/volatile_file
/usr/tmp/volatile_candidates.
```

You can use `/usr/tmp/volatile_file` as your volatile file list by including it after the `-x` flag with `sunupgrade`:

```
# sunupgrade -v -x/usr/tmp/volatile_file
```

If you do not wish to save all of the files in `/usr/tmp/volatile_file` with a .411 tag, you can edit the file before running `sunupgrade`. Or you can create your own volatile file list, as described in Section 2.8 below. Or you could copy those files to a different location or with a different name so that they are not replaced by `sunupgrade`.

Note that it is *not* necessary to include files in your own volatile file list *unless* they appear in `/usr/tmp/volatile_file`; only those files listed in `/usr/tmp/volatile_file` will be replaced during the upgrade.

After you have run `sunupgrade`, you can edit the new files, using the saved versions of the files to add whatever customization is necessary.

Using Your Own Volatile File List

By default `sunupgrade` uses the Sun-supplied volatile file list, `/usr/etc/install/tar/sunupgrade/volatile_list`, reading the symbol at the start of the line to determine what to do with the files on the list:

+ = replace 4.1.1 file with 4.1.2 file, saving a copy of the 4.1.1 file with a .411 tag

– = retain 4.1.1 file, saving a copy of the 4.1.2 file with a .412 tag*

& = replace 4.1.1 file with 4.1.2 file.

* Note: if the SunOS 4.1.1 file is the same as the SunOS 4.1.2 file, no copy of the file is created.

You could use `/usr/tmp/volatile_file`, an output of `check_perm`, as your volatile file list when running `sunupgrade`. You could also copy the Sun-supplied list from the CD-ROM and amend it, or you could create a whole new list, using the symbols +, –, or & to tell `sunupgrade` what to do with the files.

If you use `/usr/tmp/volatile_file` or if you create your own list, you may wish to change the symbol by a file. You may also wish to add files to the list before performing the upgrade. If you want a 4.1.1 file replaced by the 4.1.2 file and you do *not* want the 4.1.1 file saved with the .411 tag, change the + to a & before doing the upgrade.

To use a volatile file list you created, include its full path name after the `-x` flag. To use the file `/home/server/username/mylist`, for instance, enter the following:

```
# sunupgrade -x/home/server/username/mylist
```

Default Volatile File List

The Sun-supplied volatile file list is shown below. Note that most files listed are preceded by a plus sign (+), indicating that the SunOS 4.1.1 file will be replaced and saved with a ".411" tag.

```
#
#  @(#)volatile_list 1.2 91/07/30 SMI
#
# Volatile file list
#
# key:
#    - 4.1.1 file is retained; 4.1.2 file added with .412 tag.
#    + 4.1.2 file replaces 4.1.1 file; 4.1.1 file saved with .411 tag.
#    & 4.1.1 file replaced by 4.1.2 file.
#
+ /.cshrc
- /etc/aliases.pag
+ /etc/fbtab
+ /etc/format.dat
+ /etc/magic
+ /etc/rc.boot
+ /etc/rc.local
+ /var/spool/cron/crontabs/root
+ /usr/kvm/sys/conf.common/files.cmn
+ /usr/kvm/sys/conf.common/param.c
+ /usr/kvm/sys/netinet/in_proto.c
+ /usr/kvm/sys/os/init_sysent.c
+ /usr/kvm/sys/os/vfs_conf.c
+ /usr/kvm/sys/scsi/conf/scsi_confdata.c
+ /usr/kvm/sys/scsi/targets/sd_conf.c
+ /usr/kvm/sys/scsi/targets/st_conf.c
+ /usr/kvm/sys/sun/conf.c
+ /usr/kvm/sys/sun/stubs.c
+ /usr/kvm/sys/sun/swapgeneric.c
+ /usr/kvm/sys/sun4/conf/devices
+ /usr/kvm/sys/sun4/conf/files
+ /usr/kvm/sys/sun4c/conf/devices
+ /usr/kvm/sys/sun4c/conf/files
+ /usr/kvm/sys/sun4c/openprom_xxx.c
+ /usr/kvm/sys/sundev/sc_conf.c
+ /usr/kvm/sys/sunif/ie_conf.c
+ /usr/kvm/sys/sunif/le_conf.c
```

2.8. About `check_perm`

The utility `check_perm` checks every SunOS 4.1.1 file that is changed in SunOS 4.1.2 and lists those files that you have modified on your SunOS 4.1.1 system. Files are checked for changes in permissions, ownership, size, and date created. This comparison should take between two and 10 minutes, depending on your system configuration. Basically, `check_perm` gives you a list of SunOS 4.1.1 files that are not *pure* SunOS 4.1.1 files

One output of `check_perm` is `/usr/tmp/volatile_candidates`, which is a list of SunOS files that will be changed on your system after the upgrade, with an indication of the differences between the two files. See the example of a `volatile_candidates` file below for more about this file.

The other output of `check_perm` is `/usr/tmp/volatile_file`, which is a list of the same files, in the format of the default volatile file list (`volatile_list`). See the example of `volatile_file` below for more about this file.

You can either save your files manually, or you can make your own version of the volatile file list and let the `sunupgrade` script do it for you. See Section "2.7" above for more information about the volatile file list and its use.

Installed Applications and Patches: How `check_perm` Helps

Run `check_perm` to determine if any system files have been customized for an installed application or for a system patch; these files will show up in `/usr/tmp/volatile_candidates` and `/usr/tmp/volatile_file`, which are described below.

For patches, check the README files included with the patch to determine what files are modified when the patch in installed. See "CTE Escalations Fixed in SunOS 4.1.2" in Chapter 6 of the *SunOS 4.1.2 Release Manual* for a list of SunOS 4.1.1 patches that were incorporated into SunOS 4.1.2. If your patch is not in the list, do ***not*** re-apply it after the upgrade; call your local Sun Support to see if a SunOS 4.1.2 version of the patch exists.

What Files Changed in SunOS 4.1.2

All of the files that might be replaced (depending on what software categories are installed on your system) during the upgrade are listed in the following directory, sorted by software category:

```
/usr/etc/install/tar/sunupgrade/incld
```

Example: `volatile_file` File

The file `/usr/tmp/volatile_file`, produced by running `check_perm`, is a ready-made volatile file list, which can be used by including it after the `-x` flag when running `sunupgrade`. You can edit the `/volatile_file` if you do not want to save all the files listed with a .411 tag, or if you want to change the + to a – or a &. Shown below is a sample `volatile_file`; note that all the files listed are in the default volatile file list.

```
# Suggested volatile file list
#
# key:
#       - 4.1.1 file is retained; 4.1.2 file added with .412 tag.
#       + 4.1.2 file replaces 4.1.1 file; 4.1.1 file saved with .411 tag.
#       & 4.1.1 file replaced by 4.1.2 file.
#
+ /etc/aliases.pag
+ /etc/fbtab
+ /etc/format.dat
+ /etc/magic
+ /etc/rc.boot
+ /etc/rc.local
```

Example: `volatile_candidates` File

The file `/usr/tmp/volatile_candidates`, produced by running `check_perm`, lists the file or directory and tells you what differences the compare found, in group, owner, size, or permissions. An example of the file, showing some of the changed files, follows. Note that "local" refers to what is on your disk — a modified SunOS 4.1.1 file — and "media" refers to a *pure* SunOS 4.1.1 file.

```
/etc/chown      # group: local -> 10 media -> 1
/etc/chroot     # group: local -> 10 media -> 1
/etc/fasthalt   # group: local -> 10 media -> 1
/etc/filetype   # size: local -> 2027 media -> 2011
/etc/fstab      # size: local -> 224 media -> 195
/etc/update     # group: local -> 10 media -> 1
/home   # permissions: local -> rwxr-xr-x media -> rwxr-sr-x
/home   # owner: local -> 0 media -> 3
/home   # group: local -> 0 media -> 10
 . . .
```

In the example above, the `group` for the file `/etc/chown` is 10 on your customized SunOS 4.1.1 system ("local"); the `group` for the file `/etc/chown` is 1 on a *pure* SunOS 4.1.1 system ("media").

The `size` of the file `/etc/filetype` is 2027 on your ("local") system and 2011 on a *pure* SunOS 4.1.1 system ("media").

2.9. Upgrade Example: Server & Diskless Clients

In this example, the server `rope` and the diskless clients, `bikram` and `skull` are upgraded.

```
-------- Starting sunupgrade Thu Sep 5 14:12:43 PDT 1991 --------

Checking for writability of /usr partition...

sunupgrade will perform an upgrade by extracting 4.1.2 files from the
media and overwriting the the 4.1.1 files on server rope.  sunupgrade
will only upgrade software categories which are currently installed.

No OpenWindows versions later than OpenWindows Version 2
will be overwritten.

The list of installed software categories to upgrade will be generated
from the following file on your system :

/etc/install/media_file.sun4.sun{4, 4c}.sunos.4.1.1

Please check that the file shows "mf_loaded=no" for software
categories you do NOT wish to upgrade and "mf_loaded=yes" for software
categories you wish to upgrade. If you have installed a software
category "manually" -- without using SunInstall -- it will not be
shown as loaded; change the "no" to "yes" for such software
categories, being sure the software category is installed in the
normal SunInstall location.

Please check the README file in /usr/etc/install/tar/sunupgrade for more
information about the upgrade process.

Continue    [yes|no] ?  yes
bikram is at 4.1.1 release and is an UPGRADE CANDIDATE
skull is at 4.1.1 release and is an UPGRADE CANDIDATE

All listed clients will be upgraded. Continue    [yes|no] ? yes


Examining table of contents on release media...
------------------------------------------------------------------------------
The following software categories are currently installed on rope :
install   kvm   manual   networking   root   sunview_users   sys   system_v
usr
------------------------------------------------------------------------------

(continued on next page)
```

```
(continued from previous page)

The following software categories are NOT currently installed on rope :
debugging   demo   games   graphics   openwindows_demo   openwindows_fonts
openwindows_programmers   openwindows_users   rfs   security   shlib_custom
sunview_demo   sunview_programmers   text   tli   user_diag   uucp   versatec
-------------------------------------------------------------------------------
The following software categories will be upgraded on rope :
install   kvm   manual   networking   root   sunview_users   sys   system_v
usr

Start upgrade on server rope     [yes|no] ? yes

UPGRADING CLIENTS
Fixing kvm & sys files for the sun4 clients
The kvm & sys software categories of the sun4 clients files will be upgraded with the server upgrade.
Fixing kvm & sys files for the sun4c clients
Upgrading software category kvm ...
Software category kvm upgraded.

Upgrading software category sys ...
Software category sys upgraded.

Rename /export/exec/sun4.sunos.4.1.1 to /export/exec/sun4.sunos.4.1.2
Rename /export/exec/proto.root.sunos.4.1.1 to /export/exec/proto.root.sunos.4.1.2
Upgrading software category root ...
Software category root upgraded.
Some 4.1.1 files from the software category root unused in 4.1.2 will be deleted

Upgrading client bikram ...
Fixing root files
Upgrading software category root ...
Software category root upgraded.
Running /export/root/bikram/dev/MAKEDEV...
Some 4.1.1 files from the software category root unused in 4.1.2 will be deleted

    Updating fstab
    /export/root/bikram/etc/fstab SAVED TO
    /export/root/bikram/etc/fstab.411
    Updating /tftpboot links
    client : bikram (sun4c)
    BOOT : boot.sun4c.sunos.4.1.2
    INET : 81904296.SUN4C
    Updating installation records

(continued on next page)
```

```
(continued from previous page)

Upgrading client skull ...
Fixing root files
Upgrading software category root ...
Software category root upgraded.
Running /home/root/skull/dev/MAKEDEV...
Some 4.1.1 files from the software category root unused in 4.1.2 will be deleted

    Updating fstab
    /home/root/skull/etc/fstab SAVED TO
    /home/root/skull/etc/fstab.411
    Updating /tftpboot links
    client : skull (sun4)
    BOOT : boot.sun4.sunos.4.1.2
    INET : 81904202.SUN4
    Updating installation records
Rename /etc/install/client_list.sun4.sun4.sunos.4.1.1 to /etc/install/client_list.sun4.sun4.sunos.4.1.2
Rename /etc/install/client_list.sun4.sun4c.sunos.4.1.1 to /etc/install/client_list.sun4.sun4c.sunos.4.1.2

UPGRADING SERVER
Upgrading software category install ...
Software category install upgraded.

Upgrading software category kvm ...
Software category kvm upgraded.

Upgrading software category manual ...
Software category manual upgraded.

Upgrading software category networking ...
Software category networking upgraded.

Upgrading software category root ...
Software category root upgraded.
Running //dev/MAKEDEV...
Some 4.1.1 files from the software category root unused in 4.1.2 will be deleted

Upgrading software category sunview_users ...
Software category sunview_users upgraded.
Some 4.1.1 files from the software category sunview_users unused in 4.1.2 will
 be deleted

Upgrading software category sys ...
Software category sys upgraded.

Upgrading software category system_v ...
Software category system_v upgraded.

Upgrading software category usr ...
Software category usr upgraded.
Some 4.1.1 files from the software category usr unused in 4.1.2 will be deleted

(continued on next page)
```

```
(continued from previous page)
You may need to coalesce the following files / directories manually:
///var/yp
/etc/aliases.pag
/etc/fbtab
/etc/format.dat
/etc/magic
/etc/rc.boot
/etc/rc.local
/export/exec/kvm/sun4c/sys/conf.common/files.cmn
/export/exec/kvm/sun4c/sys/conf.common/param.c
/export/exec/kvm/sun4c/sys/os/init_sysent.c
/export/exec/kvm/sun4c/sys/scsi/conf/scsi_confdata.c
/export/exec/kvm/sun4c/sys/scsi/targets/st_conf.c
/export/exec/kvm/sun4c/sys/sun/conf.c
/export/exec/kvm/sun4c/sys/sun/stubs.c
/export/exec/kvm/sun4c/sys/sun/swapgeneric.c
/export/exec/kvm/sun4c/sys/sun4c/conf/files
/export/exec/kvm/sun4c/sys/sun4c/openprom_xxx.c
/export/exec/kvm/sun4c/sys/sunif/le_conf.c
/export/exec/proto.root.sunos.4.1.2/etc/aliases.pag
/export/exec/proto.root.sunos.4.1.2/etc/fbtab
/export/exec/proto.root.sunos.4.1.2/etc/format.dat
/export/exec/proto.root.sunos.4.1.2/etc/magic
/export/exec/proto.root.sunos.4.1.2/etc/rc.boot
/export/exec/proto.root.sunos.4.1.2/etc/rc.local
/export/root/bikram//var/yp
/export/root/bikram/etc/aliases.pag
/export/root/bikram/etc/fbtab
/export/root/bikram/etc/format.dat
/export/root/bikram/etc/fstab
/export/root/bikram/etc/magic
/export/root/bikram/etc/rc.boot
/export/root/bikram/etc/rc.local
/home/root/skull//var/yp
/home/root/skull/etc/aliases.pag
/home/root/skull/etc/fbtab
/home/root/skull/etc/format.dat
/home/root/skull/etc/fstab
/home/root/skull/etc/magic
/home/root/skull/etc/rc.boot
/home/root/skull/etc/rc.local
/usr/kvm/sys/conf.common/files.cmn
/usr/kvm/sys/conf.common/param.c
/usr/kvm/sys/os/init_sysent.c
/usr/kvm/sys/sun/conf.c
/usr/kvm/sys/sun/stubs.c
/usr/kvm/sys/sun/swapgeneric.c
/usr/kvm/sys/sun4/conf/files
/usr/kvm/sys/sunif/le_conf.c
(continued on next page)
```

```
(continued from previous page)
Fixing release records ...
Fixing /etc/install/arch_info
Fixing /etc/install/arch_list
Fixing /etc/install/sys_info
Fixing /etc/install/soft_info.sun4.sun4.sunos.4.1.2
Fixing /etc/install/soft_info.sun4.sun4.sunos.4.1.2
Fixing /etc/install/media_file.sun4.sun4.sunos.4.1.2
Fixing /etc/install/soft_info.sun4.sun4c.sunos.4.1.2
Fixing /etc/install/soft_info.sun4.sun4c.sunos.4.1.2
Fixing /etc/install/media_file.sun4.sun4c.sunos.4.1.2
Fixing /etc/install/appl_media_file.sun4.sunos.4.1.2
Fixing /etc/exports for sun4
Fixing /etc/exports for sun4c
Fixing links in /export/exec, /export/exec/kvm, /export/share ...

  Installing kernel and kadb on client bikram
  Installing /export/root/bikram/vmunix
  Copy /export/exec/kvm/sun4c.sunos.4.1.2/stand/kadb to /export/root/bikram/kadb
  Upgrade sbin on client bikram
  Copying /sbin commands...

  Installing kernel and kadb on client skull
  Installing /home/root/skull/vmunix
  Copy /usr/kvm/stand/kadb to /home/root/skull/kadb
  Upgrade sbin on client skull
  Copying /sbin commands...
Create the /tftpboot/boot.sun4.sunos.4.1.2 for the sun4 clients
Create the /tftpboot/boot.sun4c.sunos.4.1.2 for the sun4c clients
Installing vmunix...
Installing kadb ...
Installing bootblock ...
Primary boot: bootid
Secondary boot: /boot
Boot device: /dev/rid000a
Boot size: 0x22660
Boot checksum: 0x29965379
Boot block installed
Copying /sbin commands...
Delete unused 4.1.1 files
Log is recorded in the file /etc/install/sunupgrade.log
List of actually updated volatile files / directories :
/usr/tmp/coalesce_list
-------- Exiting sunupgrade Thu Sep 5 14:39:20 PDT 1991 --------

You may halt and reboot rope now.
```

3

Configuring a Preinstalled Standalone Workstation

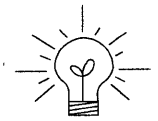
This chapter describes a workstation with a disk preinstalled with SunOS 4.1.2. If you have such a workstation, you can use this chapter to determine if you want to install SunOS differently, using SunInstall.

This chapter also describes how to restore the system software on your disk to its original, preinstalled state by using the `re-preinstall` command.

If you decide to accept SunOS 4.1.2 in its preinstalled form, your workstation can be configured on the network easily by using the Quick Configuration feature. In that situation, an NIS master server must be prepared with information about the new workstation before you turn on that workstation. The reference card provided with your workstation, *Quick Configuration of Desktop SPARC on the Network*, explains this process, which is treated in greater detail at the end of this chapter.

3.1. Preinstalled Systems

All new Desktop SPARCsystems with a disk come with a preinstalled version of SunOS 4.1.2. Preinstalled SunOS 4.1.2 is intended only for standalone workstations, including networked standalones. It provides a selection of software categories that makes efficient use of disk space and meets the basic requirements of users who are not programmers.



Software *categories* are sets of related files that have been grouped together for purposes of installation and system administration. SunOS 4.1.2 is made up of many such categories, not all of which are required by all systems.

Alternatives to Preinstalled SunOS

If you need categories that your preinstalled system does not provide, you can use the Quick Installation option of the SunInstall program, which provides additional software configurations that are tailored to different user needs.

The following sets of software categories are available through Quick Installation:

- `Typical_user`

  For the "average" user, who is not a programmer and primarily wants to run SunView applications, edit files, and use e-mail. This option is very similar to preinstalled SunOS 4.1.2.

- `Programmer`

  For the programmer who wants to develop and test programs in a SunView environment.

- `Full_install`

  This option contains all of the SunOS 4.1.2 release categories.

- `Mini_install`

  Only for the most basic system and network uses; it does not include SunView.

If you think one of these sets of software categories is better for your workstation than the preinstalled set of categories, see Chapter 4, which provides more details about the sets of software categories that you can select through the Quick Install option of SunInstall.

3.2. The `re-preinstall` Command

re-preinstall is a SunOS 4.1.2 program that can install (or reinstall) the preinstalled version of SunOS 4.1.2 on any formatted disk attached to a Desktop SPARCsystem. The benefits of using re-preinstall are:

- Disks on systems that came with preinstalled SunOS 4.1.2 can have the original contents restored after moves or other disruptions
- It provides the easiest method of loading release software
- It comes with enhanced system configuration screens for simplified installation of system as part of a network

Software Categories Installed by `re-preinstall`

The following table shows the SunOS 4.1.2 categories installed by re-preinstall. Disks over 130 megabytes receive added categories. (For a full listing and description of SunOS categories, see Chapter 1 in this manual.)

The smaller set of software categories provided by `re-preinstall` is designed for a standalone system and does not include categories used in software development. To include those categories, you must run `suninstall`.

Table 3-1 *SunOS 4.1.2 Software Categories Installed by re-preinstall*

Categories Included on All Preinstalled Disks	
Category	**Description**
root	Contents of root (/) filesystem, including the SunOS kernel.
usr	Required portions of `/usr` filesystem (utilities, system programs, library routines.
Kvm	Kernel-architecture dependent programs.
Install	Installation software and tools such as `add_services`(8).
Networking	Network software required for NFS and tools for network administration.
Sys	Software for customizing kernels and kernel configuration files.
System_V	Files & libraries for System-V compatibility and X/Open standards compliance.
SunView_Users	Provides environment for SunView tools (`mailtool`(1), `dbxtool`(1), `sundiag`(8)).
Demo	Miscellaneous demo programs.
SunView_Demo	SunView demonstration programs.
Text	Text-processing software (`nroff`(1), `troff`(1), macro packages, `eqn`(1), `tbl`(1)).
Categories Added to Preinstalled Disks Larger than 130MB	
Category	**Description**
OpenWindows_Users	Software for running OpenWindows Version 2.
OpenWindows_Fonts	Software for OpenWindows Version 2 fonts.
OpenWindows_Demos	Software for OpenWindows Version 2 demos.
User_Diag	Diagnostic programs, including `sundiag`(8).
Manual	Source files for the online man pages.

Running `re-preinstall`

Before you can run `re-preinstall` you must "boot the miniroot" as you would for running the SunInstall installation program. For detailed instructions on booting the miniroot, see the chapter in this manual covering Quick Installation.

When you run `re-preinstall` all previous contents on the disk are overwritten. You will need to back up any files you want to preserve and restore them after running `re-preinstall`.

At the miniroot prompt (#) enter:

```
#/usr/etc/install/re-preinstall
```

3.3. Quick Configuration of Desktop SPARC on the Network

SunOS 4.1.2 comes preinstalled on Desktop SPARCsystems. A reference card, *Quick Configuration of Desktop SPARC on the Network*, which is included in the Country Kit for Desktop SPARCsystems, summarizes the steps to be performed by the user and the system administrator in order to configure the system onto a network.

The remainder of this chapter is an expanded version of the *Quick Configuration of Desktop SPARC on the Network* card, which Desktop SPARCsystem owners should find in their Country Kit. Note that this procedure only applies to preinstalled Desktop SPARCsystems.

The remainder of this chapter is intended to assist a system administrator who is setting up systems on a network.

If a user has a new, diskful Desktop SPARCsystem and wants to install it on an network supporting NIS services, the quick configuration procedures will make initial system setup easier and quicker. Once the system administrator has followed the steps detailed on the card, a user only has to answer one question regarding a root password prior to being presented with the login prompt.

A system that boots its kernel from a local disk is called a "diskful system". In SunOS releases prior to SunOS 4.1.1 Rev B, to add a diskful system to the network, you typically entered configuration information both on a server and at the workstation. Now, for new Desktop SPARCsystems with SunOS 4.1.2 preinstalled, you just enter the configuration information on an NIS server. When the diskful system first boots, the quick configuration software on its disk retrieves the information from the server. You don't have to go to the workstation to configure it.

Quick configuration introduces a method for adding diskful systems to a network that resembles the way diskless systems are added. However, this method does not use the `add_client` script.

Quick configuration makes startup easy for a user. A user turns on his or her system and gets to the superuser password prompt without having to enter any information. The user does not have to enter a hostname, IP address, time zone, or domain name.

If a user doesn't meet the new, diskful, and NIS criteria, installation will default to the standard system configuration screens.

Quick configuration is optional. If you don't want to use it, refer to the *Installation Guide* that comes with a new system.

Other Ways to Use Quick Configuration

In addition to network configuration of preinstalled systems, quick configuration functionality can be used in two other circumstances:

- following installation of a system using the Quick Install option of `suninstall`
- the first time a system is booted after `sys-unconfig`(8) has been run

The second option allows you to perform a custom installation of a workstation, run `sys-unconfig` on it, and then deliver it to the user for connection and

quick configuration on the network.

Automatically Mounting User Home Directories

As a complement to quick configuration, you can set up your network so that a user can log in and begin using the system as soon as quick configuration completes. This function is an application of existing SunOS features (`automount`), minor enhancements to the user initialization files (`.cshrc` and `.login`), and the new OpenWindows tutorial delivered with SunOS 4.1.2. Implementation of automatically-mounted home directories is optional, and it can be done at the same time as quick configuration — or it can be done later.

See Section 3.8, "Automounting home Directories," for a full discussion of this topic and procedures for implementation.

3.4. What Does Quick Configuration Require?

You need the following to use quick configuration on the network:

- A network running the network information service (NIS)
- NIS servers running SunOS 4.0 or later
- Desktop SPARCsystems with SunOS 4.1.2 system software preinstalled on their disks

3.5. How Quick Configuration Works

When the new system is turned on for the first time, the `rc.boot` script preinstalled on the system's disk runs the `ifconfig` program, which issues a Reverse Address Resolution Protocol (RARP) request. The RARP packet includes the new system's Ethernet address, which is retrieved from the hardware. The RARP daemon looks in the ethers NIS database on the master server for the local system's Ethernet address.

If the address is found, the RARP daemon looks in the hosts NIS database for the system's IP address. If the system's IP address is returned by the RARP daemon, a bootparams `whoami` request is issued from the `hostconfig` program in `rc.boot`. The bootparams daemon returns the hostname, NIS domain name, and the name of the default router. The `ifconfig` and `hostconfig` programs set the hostname, IP address, NIS domain name, and default router name in the kernel on the local system.

The correct time zone for the system is obtained from the new NIS map, `timezone.byname`; the current date and time are obtained from a server named "timehost."

What You Have to Do to Set Up the Network

In summary, to set up the network for quick configuration, you will do the following before you turn on a new Desktop SPARCsystem:

- Once for each domain, set up one or more new NIS maps on the NIS master server and install the new maps on any slave servers. You also may need to start or restart some services (daemons) on one or more systems.
- Once for each new system, add entries to the hosts, ethers, timezone (in some cases), and bootparams NIS maps on the master server.

The procedures for setting up the network are described in Sections 3.6 and 3.7 below. See Section 3.8 to read about automounting users' home directories.

3.6. Do the Following Once for Each NIS Domain

Log in as root on the NIS master server and perform the following steps once for each domain in the network.

Task 1: Verify the requirements for quick configuration

1. **To verify NIS is running, type `ypwhich` on any system.**

   The name of a hostname is returned if NIS is running.

2. **To verify the NIS master and slave servers are running SunOS 4.0 or later, run `more /etc/motd` on each NIS server.**

Task 2: Get the SunOS 4.1.2 files and put them on the NIS master server

The NIS makefile (`/usr/lib/NIS.Makefile`) delivered with SunOS 4.1.2 defines three NIS maps:

- `timezone`
- `auto.master`
- `auto.home`.

(These three maps were first introduced in SunOS 4.1.1 Rev. B.)

The `timezone` map allows Desktop SPARCsystems installed at the factory (preinstalled) with SunOS 4.1.2 to determine their correct time zone from NIS when they are booted up. The `auto.master` and `auto.home` maps allow you to have users' home directories automatically mounted from a server.

(The `auto.master` and `auto.home` maps will not actually be created unless the files `/etc/auto.master` and `/etc/auto.home` exist on the NIS master; see Section 3.8 for more information.)

In addition to this `Makefile`, SunOS 4.1.2 includes versions of the default `.cshrc` and `.login` files (as `/usr/lib/Cshrc` and `/usr/lib/Login`) that invoke OpenWindows immediately when the user logs in.

Listings of the complete `Login` and `Cshrc` files are included in Section 3.13 at the end of the this chapter.

1. **Check the version of SunOS running on the master server.**

```
master# showrev
```

   If the `showrev` command displays a release number earlier than SunOS 4.1.2, continue with the next step. (If the `showrev` command is not found, the release running on the server is earlier than SunOS 4.1.1, so continue with the next step.)

   If the master server for a domain is running SunOS 4.1.1 Rev B or later, you already have the correct versions of the files; go to "Task 3: Set up the services used for quick configuration."

2. **Save the current NIS makefile and the setup files (`Cshrc` and `Login`).**

```
master# cd /var/yp
master# cp Makefile Makefile.SunView
master# cd /usr/lib
master# cp Cshrc Cshrc.SunView
master# cp Login Login.sv
```

3. **Get the new NIS makefile and the new setup files delivered with SunOS 4.1.2.**

   You can get the SunOS 4.1.2 files either from the CD-ROM release media or from a new Desktop SPARCsystem preinstalled with SunOS 4.1.2 software. Alternatively, you may edit your current files and make the SunOS 4.1.2 changes to them. See Section 3.13 at the end of the this chapter for listings of the `Cshrc` and `Login` files and a listing of `Makefile` differences. Also see the chapter on upgrading a system to SunOS 4.1.2.

   Use either Option 1 or Option 2 to get the files from the SunOS 4.1.2 software or use Option 3 to manually edit your current files.

Option 1 — Get the files from the SunOS 4.1.2 release CD-ROM

If you have SunOS 4.1.2 release media available and you're running SunOS 4.1.1 or later, do the following:

a. Insert the CD-ROM into your SunCD drive.

b. Extract the files from the CD-ROM:

```
master# cd /tmp
master# /usr/etc/install/extract_files sr0 usr -f \
 ./lib/NIS.Makefile ./lib/Cshrc ./lib/Login
```

This command is for the CD-ROM called (`sr0`). It takes a few minutes to extract the files.

c. Move the files to their correct locations.

```
master# cd /tmp/lib
master# mv NIS.Makefile /var/yp/Makefile
master# mv Cshrc /usr/lib
master# mv Login /usr/lib
```

d. Check that you have the correct version of the makefile on the master server.

```
master# egrep timezone.time /var/yp/Makefile
timezone.time: $(DIR)/timezone
```

If any line returned refers to `timezone`, as in the example above, you have the correct file.

e. Check that you have version 1.6 of the `Cshrc` file on the master server:

```
master# what /usr/lib/Cshrc
/usr/lib/Cshrc:
    Cshrc 1.6 91/09/05 SMI
```

f. Check that you have version 1.14 of the `Login` file on the master server:

```
master# what /usr/lib/Login
/usr/lib/Login
    Login 1.14 90/11/01 SMI
```

g. If you previously customized any of these files, re-enter your changes in the new SunOS 4.1.2 version of the file.

When you have completed Option 1 (Get the files from the SunOS 4.1.2 release CD-ROM), continue with "Task 3 — Edit the current files to make the SunOS 4.1.2 changes."

Option 2 — Get the files from a new Desktop SPARC

If you did not get the files using Option 1, you can manually set up a new Desktop SPARC workstation that is preinstalled with SunOS 4.1.2 and get the files from its disk. The system that you get the files from doesn't benefit from quick configuration. But it provides the files you need to set up the network for the quick configuration of other new systems.

To set up the system, perform the following steps. (For additional information, see the *Installation Guide* that came with the system.)

a. Turn on a Desktop SPARC workstation that has SunOS 4.1.2 preinstalled.

You can tell that a workstation has this software preinstalled if it comes with the card, *Quick Configuration of Desktop SPARC on a Network*, which is a shorter version of this chapter.

When you turn on the workstation, you should be aware that some of the bootup messages reflect the system's failed attempt to automatically configure itself and as such do not indicate an unexpected problem; for example, you may ignore any message about RARP timing out.

b. Wait for the INSTALLATION MESSAGES screen, then select option 2 to manually configure the system.

c. Supply the required information as prompted.

Be sure to specify that the new system is an NIS client.

d. Log in as root after the system boots up.

e. On the new system, edit (create) /.rhosts and enter the name of the NIS master server.

For example, for a server "turbo," enter the following line:

```
turbo
```

f. On the NIS master server, edit /etc/hosts and enter the IP address and hostname for the new system in the following format:

```
IP_address  hostname
```

For example, for a host "mirage," at IP address "199.9.200.20" enter the following line:

```
199.9.200.20    mirage
```

g. On the NIS master server, remake the NIS maps.

```
master# cd /var/yp; make
```

h. On the NIS master server, remote copy the SunOS 4.1.2 files from the new host to the master server:

```
master# rcp hostname:/usr/lib/NIS.Makefile /var/yp/Makefile
master# rcp hostname:/usr/lib/Cshrc /usr/lib/Cshrc
master# rcp hostname:/usr/lib/Login /usr/lib/Login
```

Replace *hostname* with the name of the host you entered in Step f of Option 2.

i. Check that you have the correct version of the makefile on the master server.

```
master# egrep timezone.time /var/yp/Makefile
timezone.time: $(DIR)/timezone
```

If any line returned refers to timezone, as in the example above, you have the correct file.

j. Check that you have version 1.6 of the Cshrc file on the master server:

```
master# what /usr/lib/Cshrc
/usr/lib/Cshrc:
    Cshrc 1.6 91/09/05 SMI
```

k. Check that you have version 1.14 of the `Login` file on the master server:

```
master# what /usr/lib/Login
/usr/lib/Login
    Login 1.14 90/11/01 SMI
```

l. If you previously customized any of these files, re-enter your changes in the new SunOS 4.1.2 version of the file.

When you have completed Option 2 (Get the files from a new Desktop SPARC), continue with "Task 3 — Edit the current files to make the SunOS 4.1.2 changes."

Option 3 — Edit the current files to make the SunOS 4.1.2 changes

If you can't use Option 1, which is the easiest method, you'll have to choose between Option 2 and Option 3. While the second method is always available it does take some time. If you are experienced at editing the NIS makefile and the setup files, you may find it easier and quicker to just edit them as follows:

a. On the NIS master server, edit `/var/yp/Makefile`.

b. Add `timezone auto.master auto.home` to the line starting with the word "all." For example:

```
all: passwd group hosts ethers networks rpc services protocols \
    netgroup bootparams aliases publickey netid netmasks \
    c2secure timezone auto.master auto.home
```

Entries in this line can be in any order. Continuation lines must begin with tabs.

c. Add the following lines at the end of the file to define aliases and to indicate no dependencies for the new entries:

```
timezone: timezone.time
auto.master: auto.master.time
auto.home: auto.home.time
$(DIR)/timezone:
$(DIR)/auto.master:
$(DIR)/auto.home:
```

d. Add this exact `timezone.time` entry after the other `*.time` entries:

```
timezone.time:  $(DIR)/timezone
    -@if [ -f $(DIR)/timezone ]; then \
        sed -e "/^#/d" -e s/#.*$$// $(DIR)/timezone \
        | awk '{for (i = 2; i<=NF; i++) print $$i, $$0}' \
        | $(MAKEDBM) - $(YPDBDIR)/$(DOM)/timezone.byname; \
        touch timezone.time; \
        echo "updated timezone"; \
        if [ ! $(NOPUSH) ]; then \
            $(YPPUSH) timezone.byname; \
            echo "pushed timezone"; \
        else \
        : ; \
        fi \
    else \
        echo "couldn't find $(DIR)/timezone"; \
    fi
```

You may choose to copy and edit a similar `*.time` entry. The indented lines must begin with tabs. If you cut and paste using the mouse, be sure to reinsert the tabs (cutting and pasting may convert them to spaces).

e. Copy the `timezone.time` entry twice.

f. Delete the `awk` command line from each copy.

g. Substitute auto.master for `timezone` in one copy and auto.home for `timezone` in the other copy.

h. Delete the `.byname` suffixes from each copy.

See Section 3.13 for a listing of the `Makefile` additions to check your work.

i. Save the modified makefile.

j. Edit your SunOS 4.1.2 `/usr/lib/Cshrc` file.

See Section 3.13 at the end of this chapter for a listing of the SunOS 4.1.2 version of the file.

Replace the following three lines:

```
# uncomment the window system of your choice
#set mychoice=sunview
#set mychoice=openwin
```

with these two lines:

```
# Set openwin as my default window system
set mychoice=openwin
```

Delete the section of text from `/usr/lib/Cshrc` starting with the first six lines below and ending with the last four lines:

```
# if "mychoice" isn't set, then ask - unless openwin is not there
if ( 'tty' == "/dev/console" && $TERM == "sun" && ${?mychoice} == 0 ) then
        if ( -x /usr/openwin/bin/openwin ) then
            while ( 1 )
                echo ""
                echo "Which do you want as your default window system?"

 . . .
 . . .

        ) | ed -s $HOME/.cshrc > /dev/null
        #
        if ( ${remake_read_only} == "true" ) chmod u-w $HOME/.cshrc
        unset remake_read_only
endif
```

k. Edit your `/usr/lib/Login` file.

See Section 3.13 at the end of this chapter for a listing of the SunOS 4.1.2 version of the file.

l. When you complete Option 3, continue with "Task 3: Set up the services used for quick configuration."

Task 3: Set up the services used for quick configuration

Quick configuration uses a few new or changed NIS maps and network services.

- The new timezone map allows NIS to supply the correct time zone for new systems.
- The ethers and bootparams NIS maps allow quick configuration to retrieve the information needed to configure the new system on the network. Previously these maps applied only to diskless systems.
- The reverse arp, bootparams, and time services are used to support quick configuration.

To set up the services used for quick configuration, perform the following steps. (In most cases, you should use tabs and not spaces when editing the `/etc` files.)

1. **Create (edit) `/etc/timezone` to specify the default time zone for the domain (the one in which most or all of the systems are located). Enter a line in the following format:**

```
timezone    NIS_domain_name
```

For example, for a domain "mktg.Acme" in the Central time zone of the United States:

```
US/Central  mktg.Acme
```

You can check the name of the domain with the `domainname`(1) command. If your network is on the Internet or you are using the domain naming service (DNS), or both, your domain name will be hierarchical (for example, Ecd.East.Sun.COM). For a list of time zones, see *System and Network Administration*, Appendix C.

2. **Edit `/etc/hosts` to specify the server that you want to supply the time and date for the new systems. Add the nickname (alias) `timehost` to the line for the server, in the following format:**

```
IP_address  server_name nickname1 nickname2
```

For example, for a server "turbo," at IP address "192.9.200.1," also nicknamed "loghost":

```
192.9.200.1 turbo loghost timehost
```

The server you identify as the timehost must run the `inetd` daemon and have a time service entry in `/etc/inetd.conf`. You shouldn't have to do anything to meet these requirements. To check, `grep` for "time" in `/etc/inetd.conf`, as follows:

```
server# grep -iw time /etc/inetd.conf
# Time service is used for clock syncronization.
time    stream  tcp nowait  root    internal
time    dgram   udp wait    root    internal
```

3. **Create (update) `/etc/ethers` if it does not exist:**

```
master# touch /etc/ethers
```

The `touch` command creates a new empty file or changes the time and date of an existing file. This file will exist if there are any diskless clients in the domain. If the file does not exist yet, you should create it (using `touch`), so the NIS maps can be made and pushed out to any slave servers, before you add entries for new systems. Previously this file was used for diskless systems only. Now it is also used for quick network configuration of diskful systems.

4. **Create (update) `/etc/bootparams` if it does not exist:**

```
master# touch /etc/bootparams
```

This file will exist if there are any diskless clients in the domain. If the file does not exist yet, you should create it now so the NIS maps can be made and pushed out to any slave servers, before you add entries for new systems. Previously this file was used for diskless systems only. Now it is also used for quick network configuration of diskful systems.

Task 4: Make the NIS maps

Use either Option 1 or Option 2 to make the NIS maps, but not both. You can ignore messages about not being able to make some of the maps.The first time you push new maps to slave servers, you must use the `ypxfr` command.

Option 1 — If the domain has NIS slave servers

1. **On the NIS master server, make the new NIS maps without pushing them to the slave servers:**

```
master# cd /var/yp; make NOPUSH=1
```

2. **On each slave server, install the new maps:**

```
slave# /usr/etc/yp/ypxfr -h master timezone.byname
slave# /usr/etc/yp/ypxfr -h master ethers.byaddr
slave# /usr/etc/yp/ypxfr -h master ethers.byname
slave# /usr/etc/yp/ypxfr -h master bootparams
```

Replace *master* with the name of your NIS master server.

Option 2 — If the domain does not have NIS slave servers

On the NIS master server, make the NIS maps:

```
master# cd /var/yp; make
```

Task 5: Start services (daemons) as required for quick configuration

The RARP (Reverse Address Resolution Protocol) and bootparams daemons must be running on a server in the network (and, if the network has subnets, on a server in each subnet) in order for quick configuration to work. If your network has any diskless clients, these daemons will be running already, so you can go to the steps in the next section. If you are not sure, perform the following steps.

1. **Check for the RARP and bootparams daemons:**

```
server# ps -aux | egrep 'rarpd|bootparamd'
```

You will see lines such as the following if the daemons are running. Note that the RARP daemon spawns two processes:

```
root 108 0.0 0.0 56 0   IW Nov 19 0:00 rarpd -a
root 109 0.0 0.0 40 0   IW Nov 19 0:00 rarpd -a
root 113 0.0 0.0 64 0   IW Nov 19 0:00 rpc.bootparamd
```

To be absolutely sure these daemons are not running, you would have to check every system in the network (or subnet). You may find it easier to just start them as instructed in the next step. It doesn't hurt to have these daemons running on more than one system.

2. **Start the daemons if they are not running:**

```
server# rarpd -a
server# rpc.bootparamd
```

You may start them on any host; however, it is recommended that you start them on an NIS server.

3. **Create the `/tftpboot` directory on the server.**

The `rc.local` script looks for this directory and starts the daemons if the directory is found. You don't create any entries in the directory for diskful systems, as you do for diskless clients.

3.7. Do the Following Once for Each New System

For each new system, you get its Ethernet address and add an entry to the hosts, ethers, bootparams, and (in some cases) timezone maps. For the sake of clarity, the following procedure shows how to add a single system. If you have a number of new Desktop SPARCsystems preinstalled with SunOS 4.1.2 to be added to the network, you can make the entries for all of them at once.

Task 1: Get the Ethernet address for each new system

Get the Ethernet address for a new system in one of the following three ways:

- Get the address recorded on the first page of the Quick Configuration card given to you by the system's user.
- Look for the Customer Information sheet in the plastic bag attached to the system carton.
- Turn on the machine and get the Ethernet address from the screen.

  As soon as the address appears at the top of the screen, hold down the L1/(Stop) key and press A; write down the address and turn off the power. Alternatively, you can wait until the INSTALLATION MESSAGES screen appears (as described in "Troubleshooting" below) and select the third choice, "Stop the configuration procedure and halt the system." Then turn off the power.

Task 2: Enter information into the `/etc` files on the master server

To add a new system to a domain, log in as root on the NIS master server for the domain and perform the following edits on the `/etc` files. In most cases, you should use tabs instead of spaces to separate fields.

1. **Edit `/etc/hosts` and add a line with the system's IP address and `hostname` in the following format:**

```
IP_address  hostname
```

For example, you would add the following line for a host "astro" at IP address "192.9.200.21":

```
192.9.200.21    astro
```

2. **Edit `/etc/ethers` and add a line with the system's Ethernet address and `hostname` in the following format:**

```
Ethernet_address    hostname
```

For example, you would add the following line for a host "astro" at Ethernet address "8:0:20:9:3a:1e":

```
8:0:20:9:3a:1e  astro
```

3. **If the system is not in the time zone specified as the default for the domain, edit `/etc/timezone` to specify the time zone for the system. Use the following format:**

```
timezone    hostname
```

For example, you would add the following line for a host "astro" in the Eastern time zone of the United States:

```
US/Eastern  astro
```

This type of entry is required *only* when a domain spans multiple time zones. If that is not the case, the timezone file only needs an entry defining the default time zone for the entire domain.

4. **Edit (create) `/etc/bootparams` and add a line with the system's `hostname` in the following format:**

```
hostname
```

For example, you would add the following line for a host "astro":

```
astro
```

This type of entry for diskful systems contains only the hostname. This differs from entries for diskless systems, which appear as follows:

```
offcampus    root=homeserver:/export/root/offcampus
    swap=homeserver:/export/swap/offcampus
```

You may have both types of entries in the same file. Because the entries for diskful systems contain only a keyname, you must use the -k option with the ypmatch or ypcat command to display such entries. For example:

```
master# ypmatch -k astro bootparams
astro
```

Although there is no reason for this file to have a line containing a "+", make sure you put the entries for new systems before such a line, if one exists. The bootparams file determines which domain the system will join; the system joins the domain whose master server has a bootparams file that lists the system.

Task 3: Tell the users to turn on their systems

Now that the network is set up for quick configuration, new systems boot up and then prompt the users to provide a superuser password. If you have set up user accounts that automatically mount the home directory (as described in Section 3.8), users can then log in and will immediately use OpenWindows. If you have not set up the user accounts that way, create the accounts using the method you choose and then tell the users to log in to their systems.

3.8. Automounting home Directories

This section will help a system administrator decide whether to implement automounting of home directories for users.

Automounting user home directories from designated home directory servers can have several advantages for system administrators:

- Routine backup procedures are simplified
- Users have immediate home directory access regardless of the workstation they log in to.
- All users see their home directory path the same way: `/home/username`.
- You can create a user's account to be created before his/her personal workstation is installed. Then, in conjunction with quick configuration, at the time a user's workstation arrives, is installed physically, and is first powered on, the user can immediately log into his personal account and home directory.

- It will be easier to move a user's home directory to another server when necessary.

Before you decide to take advantage of this opportunity, you should be aware of its implications, particularly in an existing network. Read the background sections which follow carefully before going on to the procedures section.

How Automounting Works

The specific method of automounting home directories presented here is just one of several methods which can be used. Once you understand how this one works you may decide to use it as is or to implement your own. In summary, automounting home directories works as follows:

- The auto.master NIS map instructs `automount`(8) to root home directories at `/home`. (Since SunOS 4.1, `automount` has run automatically on systems so long as `/usr/etc/automount` exists and either an `auto.master` NIS map or `/etc/auto.master` file is available to provide configuration information.)
- When a user logs in, the NIS passwd map is accessed to determine the path to the user's home directory. This path is of the form `/home/`*username*.
- The automounter uses the second element of the home directory path (*username*) as a key for a lookup into the `auto.home` NIS map.
- The `auto.home` map entry specifies the home directory (including server hostname) to mount at `/home/`*username*.

Important Concerns About Automounting

Two important issues should be noted:

- Since it is instructed to root home directories at `/home`, the automounter will "cover" any local partition or directory rooted at `/home`. Information in these directories and partitions is not lost but *does* become inaccessible so long as the automounter is running. Therefore, before automounting home directories, you should convert local partitions on diskful systems that mount `/home` to use some other mount point.

  If you have been using another convention (such as `/home/`*servername/username*), you may be able to mix conventions as long as usernames and servernames are not identical. It is up to you to choose a convention suitable to your network, if you want new users to have immediate access to their home directories and to OpenWindows.

  You should also be aware that preinstalled diskful systems come with a `/home` partition. The disk space allocated to this partition will be unavailable unless you change the mount point for the partition.

- Unlike common practice, the home directory path specified in the NIS passwd map (and seen by the user) and the actual path to that home directory on disk *are not the same* under this scheme. The `auto.home` map provides the translation between the two.

  For more information on the automounter, refer to Chapter 15 of *System and Network Administration*.

3.9. Do the Following Once for Each NIS Domain

To set up the new automounter maps defined in the SunOS 4.1.2 NIS `Makefile`, perform the following steps. (You should already have the new NIS `Makefile` and default `.cshrc` and `.login` files, as described in Section 3.6.)

Task 1: Create (edit) `/etc/auto.master`

Create or edit `/etc/auto.master` and enter the following line

```
/home    auto.home        -intr,nosuid
```

Be careful not to put a space between the modifiers `-intr` and `nosuid`; include a comma only.

This entry tells the automounter to mount the home directories, which are indirectly pointed to by the `auto.home` map, under the `/home` mount point on the local systems. The `auto.home` map will tell the automounter where to get the home directory for a given user.

Task 2: Create (update) `/etc/auto.home`

Create `/etc/auto.home` if it does not already exist:

```
master# touch /etc/auto.home
```

The `touch` command creates a new empty file or changes the time and date of an existing file. If the file does not exist yet, you should create it now so the NIS maps can be made and pushed out to any slave servers. Subsequently, you will add entries to it for individual users as instructed in Section 3.10 below.

Task 3: Make the NIS maps

Use either Option 1 or Option 2 below to make the NIS maps, but not both. You can ignore messages about not being able to make some of the maps. The first time you push new maps to slave servers, you must use the `ypxfr` command.

Option 1 — If the domain has NIS slave servers

1. **On the NIS master server, make the new NIS maps without pushing them to the slave servers.**

```
master# cd /var/yp; make NOPUSH=1
```

2. **On each slave server, install the new maps.**

```
slave# /usr/etc/yp/ypxfr -h master auto.master
slave# /usr/etc/yp/ypxfr -h master auto.home
```

Option 2 — If the domain does not have NIS slave servers

On the NIS master server, make the NIS maps.

```
master# cd /var/yp; make
```

3.10. Do the Following Once for Each User

Task 1: Create user accounts

On the NIS master server for the domain where you want the users' accounts:

1. **Edit `/etc/passwd` using `vipw`(8) and add an entry for each user.**

   In the `home-dir` field (the next to the last field), specify the home directory as `/home/`*username*. This specifies the home directory as it appears on the local system for the given user, not the identity of the directory that is exported by the server.

2. **Edit `/etc/auto.home` and add an entry for each user in the following format:**

```
username        server_name:/home_directory_pathname
```

   This entry specifies the actual directory on the server to be mounted on the local system as *username* under `/home`. For performance sake, the *home_directory_pathname* should have a colon before the lowest level subdirectory. This permits the automounter to mount the parent directory once and then just make symbolic links to subdirectories as needed when they are mounted.

   For example, you would add the following line for a user "thomas," whose home directory is defined as "/usr/dept1/thomas" on the server "acme1."

```
thomas  acme1:/usr/dept1:thomas
```

   You can put the home directory wherever you want, but it can't be rooted at `/home`. The *username* key in `auto.home` is suffixed to the mount point `/home` specified in the master map `auto.master`. Consequently, user thomas sees his automounted home directory as `/home/thomas`.

3. **Re-make the NIS maps.**

```
# cd /var/yp; make
```

4. **Log in to the server (for example, acme1) where you want the user's home directory.**

5. **Create the user's home directory; for example:**

```
acme1# mkdir /usr/dept1/thomas
```

6. **Change to the user's home directory; for example**

```
acme1# cd /usr/dept1/thomas
```

7. **Copy the generic setup files from the master server to the user's home directory; for example:**

```
acme1# rcp masterserver:/usr/lib/Cshrc .cshrc
acme1# rcp masterserver:/usr/lib/Login .login
```

As you copy the files, you also rename them to be "dot" files.

8. **Change the ownership of the home directory (for example, thomas) to the user (for example, to thomas).**

```
acme1# cd ..
acme1# chown -R thomas thomas
```

9. **Change the group id of the home directory and its contents to that of the user (for example, 20).**

```
acme1# chgrp -R 20 thomas
```

10. **Edit (create) `/etc/exports` and add a path name to the parent directory (`/usr` or `/usr/dept1`), if the path is not already there.**

```
/usr
```

11. **If `/etc/exports` was created or changed in step 10, export or re-export the file systems.**

```
acme1# exportfs -a
```

3.11. Check System and Network Services

The automounter must run on those systems which will mount their users' home directories from a server. The NFS and mount daemons must run on the server from which the directories will be mounted.

Task 1: Start or restart the automounter

The automounter must be restarted only if it was already running when you first created the new automounter maps (`auto.home` and `auto.master`). Thereafter you can add entries to the `auto.home` map without having to restart the automounter. The automounter needs to be running on any system which will automount its home directories.

Before starting the automounter with the new maps, be sure to convert any local disk partitions using the /home mount point.

1. **Check if the automounter is running on a desired system.**

```
system# ps -aux | grep automount
```

2. **If the automounter is running, kill it.**

```
system# kill process_id
```

3. **Start or restart the automounter on a desired system by typing `automount` or by rebooting the system.**

```
system# /usr/etc/automount
```

Task 2: Start or restart services (daemons) as required for NFS-mounting home directories

Do the following on the home directory server:

1. **Check if the mount daemon is running:**

```
server# ps -aux | grep mountd
```

2. **Start the mount daemon if it is not already running:**

```
server# rpc.mountd -n
```

3. **Check if the NFS daemons are running:**

```
server# ps -aux | grep nfsd
```

4. **Start the NFS daemons if they are not already running:**

```
server# nfsd 8
```

Task 3: Have users log into their systems

Preinstalled systems can now be turned on; users can immediately log in and begin using their systems.

3.12. Troubleshooting

When a system is turned on, if the software cannot retrieve the system's configuration information from the network, the following screen appears:

```
                    INSTALLATION MESSAGES

The automatic installation procedure did not find all of the
information needed to set up this system on the network.

You may:
1. Review the reasons the automatic installation was not
   completed.
2. Continue the installation by supplying the needed
   information manually.
3. Stop the installation procedure and halt the system.

If you are installing a non-networked system or are attempting
network installation without using the network information
service, select option 2 to continue the installation.

Enter choice (1, 2, or 3) and press the RETURN key.
```

New systems attempt to retrieve their configuration information whether you have set up the network for quick configuration or not. If you choose not to set up the network for quick configuration, this screen is to be expected. When you see it, you should select the second choice to manually configure the system.

If you have set up the network for quick installation and this screen still appears, you know something went wrong. To resolve the problem:

1. **Select the first choice and read the messages to investigate.**
2. **Select the third choice to stop the setup procedure, halting the system.**
3. **Fix the problem on the NIS master, or RARP servers.**

   Make sure the requirements for quick installation are met. Make sure the NIS maps have been made successfully and that all the required daemons are running. Double check the `/etc` files to see if all the information you entered is correct.
4. **Try bringing up the system again by typing b (or boot) and pressing Return at the > (or OK) prompt.**

3.13. Listings of `Login` and `Cshrc` Files

Refer to this section for a listing of the SunOS 4.1.2 `Cshrc` and `Login` files.

Login Listing

```
# @(#)Login 1.14 90/11/01 SMI
#######################################################################
#
#         .login file
#
#         Read in after the .cshrc file when you log in.
#         Not read in for subsequent shells.  For setting up

#         terminal and global environment characteristics.
#
#######################################################################


#         terminal characteristics for remote terminals:

#         Leave lines for all but your remote terminal commented
#         out (or add a new line if your terminal does not appear).

if ($TERM != "sun") then
#eval 'tset -sQ -m dialup:?925 -m switch:?925 -m dumb:?925 $TERM'
#eval 'tset -sQ -m dialup:?h19 -m switch:?h19 -m dumb:?h19 $TERM'
#eval 'tset -sQ -m dialup:?mac -m switch:?mac -m dumb:?mac $TERM'
#eval 'tset -sQ -m dialup:?vt100 -m switch:?vt100 -m dumb:?vt100 $TERM'
#eval 'tset -sQ -m dialup:?wyse-nk -m switch:?wyse-nk -m dumb:?wyse-nk $TERM'
#eval 'tset -sQ -m dialup:?wyse-vp -m switch:?wyse-vp -m dumb:?wyse-vp $TERM'
endif

#         general terminal characteristics

#stty -crterase
#stty -tabs
#stty crt
#stty erase '^h'
#stty werase '^?'
#stty kill '^['
#stty new

#         environment variables

#setenv EXINIT 'set sh=/bin/csh sw=4 ai report=2'
#setenv MORE '-c'
#setenv PRINTER lw

#         commands to perform at login
```

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```
#w          # see who is logged in
#
# If possible, start the windows system.  Give user a chance to bail out
#
if ( 'tty' != "/dev/console" || $TERM != "sun" ) then
     exit # leave user at regular C shell prompt
endif

if ( ${?OPENWINHOME} == 0 ) then
  setenv OPENWINHOME /usr/openwin
endif

if ( ! -e $OPENWINHOME/bin/openwin ) then
     set mychoice=sunview
endif

echo ""
#click -n # click -n turns off key click

echo ""
switch( $mychoice )
case openwin:
     unset mychoice
     echo -n "Starting OpenWindows (type Control-C to interrupt)"
     sleep 5
     $OPENWINHOME/bin/openwin
     clear_colormap # get rid of annoying colourmap bug
     clear     # get rid of annoying cursor rectangle
     echo -n "Automatically logging out (type Control-C to interrupt)"
     sleep 5
     logout          # logout after leaving windows system
     breaksw
     #
case sunview:
     unset mychoice
     echo -n "Starting SunView (type Control-C to interrupt)"
     sleep 5
     # default sunview background looks best with pastels
     sunview
     clear     # get rid of annoying cursor rectangle
     echo -n "Automatically logging out (type Control-C to interrupt)"
     sleep 5
     logout          # logout after leaving windows system
     breaksw
     #
endsw
```

Cshrc Listing

```
# @(#)Cshrc 1.6 91/09/05 SMI
#####################################################################
#
#         .cshrc file
#
#         initial setup file for both interactive and noninteractive
#         C-Shells
#
#####################################################################


# Set openwin as my default window system
set mychoice=openwin

#         set up search path

# add directories for local commands
set lpath = ( )
if ( ${?mychoice} != 0 ) then
     if ( ${mychoice} == "openwin" ) then
          set lpath = ( /usr/openwin/bin/xview /usr/openwin/bin $lpath )
     endif
endif

set path = (. ~ $lpath ~/bin /usr/local /usr/ucb /usr/bin /usr/etc)

#         cd path

#set lcd = ( )  #  add parents of frequently used directories
#set cdpath = (.. ~ ~/bin ~/src $lcd)

#         set this for all shells

set noclobber

#         aliases for all shells

alias cd            'cd *;echo $cwd'
alias cp            'cp -i'
alias mv            'mv -i'
alias rm            'rm -i'
alias pwd           'echo $cwd'
#alias del          'rm -i'
#umask 002

#         skip remaining setup if not an interactive shell
```

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```
if ($?USER == 0 || $?prompt == 0) exit

#          settings  for interactive shells

set history=40
set ignoreeof
#set notify
#set savehist=40
#set prompt="% "
#set prompt="'hostname'{'whoami'}: "
#set time=100

#          commands for interactive shells

#date
#pwd

#         other aliases

#alias a            alias
#alias h            'history * | head -39 | more'
#alias u            unalias

#alias             clear
#alias list         cat
#alias lock          lockscreen
#alias m             more
#alias mroe          more
#alias type         more

#alias .             'echo $cwd'
#alias ..            'set dot=$cwd;cd ..'
#alias ,             'cd $dot '

#alias dir          ls
#alias pdw           'echo $cwd'
#alias la            'ls -a'
#alias ll            'ls -la'
#alias ls           'ls -F'

#alias pd           dirs
#alias po           popd
#alias pp           pushd

#alias +w            'chmod go+w'
#alias -w            'chmod go-w'
#alias x             'chmod +x'
```

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```
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#alias j            'jobs -l'

#alias bye          logout
#alias ciao         logout
#alias adios        logout

#alias psg          'ps -ax | grep * | grep -v grep'
#alias punt         kill

#alias r           rlogin
#alias run         source

#alias nms 'tbl * | nroff -ms | more'                 # nroff -ms
#alias tms 'tbl * | troff -t -ms >! troff.output &'   # troff -ms
#alias tpr 'tbl * | troff -t -ms | lpr -t &'          # troff & print
#alias ppr 'lpr -t * &'                               # print troffed

#alias lp1          'lpr -P1'
#alias lq1          'lpq -P1'
#alias lr1          'lprm -P1'

#alias sd          'screendump | rastrepl | lpr -v &'

#alias edit        textedit

#alias help         man
#alias key          'man -k'

#alias mkae         make
```

4

Installing a Standalone Workstation with Quick Install

4.1. Introduction

The SunInstall program provides a Quick Install option for standalone workstations. All users who are installing a standalone system are encouraged to use the Quick Install option. A standalone system has one or more disks on which it maintains its own root (/) file system, swap space, /usr filesystem, and home directory. A standalone system does not require a server to boot and can function when the network is down. If your system will not be part of a network, you must install it as a standalone system.

If you have a standalone workstation, you may be able to choose to use a preinstalled form of SunOS. You can also use the Custom Install option of SunInstall to install a standalone workstation. That process is described in the next chapter.

SunOS is preinstalled on all Desktop SPARC systems with a factory-installed hard disk drive. Systems with disks smaller than 130 MB are installed with SunOS and SunView, but do not provide OpenWindows. Systems with disks bigger than 130 MB also include OpenWindows. (See "Returning to a Preinstalled Configuration" at the end of this chapter for a description of the programs included in the two preinstallation configurations.)

Remember, if you have a Desktop SPARCsystem, you do not need to install SunOS. You only need to install SunOS on systems that are not factory preinstalled or when you choose a different installation configuration.

Use this chapter to perform the following tasks:

- Install SunOS 4.1.2 quickly from CD-ROM (compact disc)
- Configure your system
- Prepare your system for reconfiguration
- Return your system to its original preinstalled configuration

This chapter contains the following sections:

- "What is Quick Install?" provides background information about the quick install feature of the suninstall program.
- "Before You Begin" tells you the information you need to know before you begin the installation.
- "Installation Procedure" guides you through a quick installation of SunOS 4.1.2.

- "Reconfiguration Procedure" describes how to prepare your system for reconfiguration.
- "Returning to a Preinstalled Configuration" tells you how to run the `re-preinstall` program.

4.2. What Is Quick Install?

SunInstall offers you a Custom Install and a Quick Install method for installing a Sun workstation as a standalone system. The instructions here are specifically for the Quick Install method.

To perform a Quick Install, you must have a local hard disk and a local CD-ROM drive. You can only configure one Ethernet interface with Quick Install.

You can choose one of four Quick Install options, depending on disk size:

Systems with up to a 104 MB disk can use these Quick Install options:

- Typical_user provides all of the programs a typical user needs to run SunView applications. It does not include OpenWindows.
- Programmer provides typical user programs plus programmer writing and debugging software. It does not include OpenWindows.
- Mini_install installs the most minimal workable system and does not include SunView or OpenWindows.

Systems with a 130 MB disk or larger can use this Quick Install option, or any of the three previous options:

- Full_install installs everything on the SunOS installation media, including OpenWindows.

(See the section on "SunOS Installation" for a complete list of the programs in each category.)

If you have a Desktop SPARCstation, you can restore it to its factory preinstalled state with a SunInstall utility called `re-preinstall`. There are two factory installation configurations: one for disks smaller than 130 MB, and one for disks larger than 130 MB. These configurations are different from the four Quick Install options. The last section in this chapter, "Returning to a Preinstalled Configuration" tells you how to run `re-preinstall`.

4.3. Before You Begin

Before you begin a quick installation, your disk must be formatted and labeled. In most cases, your disk will already be formatted and have an assigned label. The format command, which allows you to format and/or label the disk, is described in Appendix A of Installing the SunOS. You can choose the format command as part of the miniroot installation described in the next section, "Installation Procedure."

If you are reinstalling system software, be sure to back up your system before you proceed.

CAUTION **Quick Install overwrites the disk files in partitions `a` and `g` for all systems. All data on system disks smaller than 130 MB will be overwritten because all of the data is in partitions `a` and `g`. Many Desktop SPARCsystems have**

disks that are smaller than 130 MB.

You may need the following information from your system administrator prior to completing the Quick Install:

- A unique hostname for your workstation
- Your Internet address
- Your NIS domain name, if you want to use the NIS name service. If your system is already running, you can find out your domain name from a command line prompt by typing `domainname` and pressing Return.
- The media device number for the media and local disk you will use for the installation. Tables 4-1 and 4-2 list the standard device abbreviations, numbers, and descriptions.
- The command used to boot from the appropriate media for your system architecture. Table 4-3 lists the corresponding boot command for each type of Sun system architecture.

Table 4-1 *Media Devices*

Abbreviation	Media Device No.	Description
cdrom	sr0 (sd for booting)	CD-ROM drive for open boot PROM
sr	sr0	CD-ROM drive on for other systems

The device name of the CD-ROM is sr for everything except when you install SunOS from the boot PROM. Use the device name `sd`, as you would for all other SCSI disk devices when you install SunOS from the boot PROM.

Table 4-2 *Disk Devices*

Abbreviation	Disk Device No.	Description
sd	sd0 sd1 sd2 sd3 sd4 sd6	SCSI disk
xy	xy0 xy1 xy2 xy3	Xylogics 450/451 SMD disk
xd	xd0 through xd15	Xylogics 7053 SMD disk
id	id000 through id0374	IPI disk

Table 4-3 *Boot Syntax for Sun System Architecture*

Device	Sun-4	SPARCstation 1, 1+, IPC, SLC	SPARCstation 2, IPX, ELC, and 600MP-Series
st0	st(0,0,0)	st(0,0,0)	tape or tape0* (either command works)
st1	st(0,28,0)	st(0,1,0)	tape1
sr	sd(0,30,1)	sd(0,6,2)	cdrom
xt	xt(0,0,0)	Not supported	Not supported
mt	mt(0,0,0)	Not supported	Not supported

Abort Sequences

You may want to abort the installation to obtain more information before you proceed or to check with your system administrator as you perform the procedures in the next section.

CAUTION **Do not type Control-C while disk operations are in progress.**

Once the miniroot is loaded and the prompt is displayed, you can abort the procedure in the following ways:

- You can abort the installation by typing L1-A to return to the PROM monitor prompt during Steps 1 through 3 of SunOS installation.
- You can type Control-C at any time while the Quick Install forms are displayed to stop the installation and return to the monitor prompt.

4.4. Installation Procedure

The Quick Install procedure has three parts:

First, you copy the miniroot from CD-ROM to a formatted disk. Second, you install the release software onto the disk. Finally, when installation is complete and the system reboots, a set of interactive screens are displayed to assist you in configuring the system with a hostname, time zone, and network information (if appropriate), and assigning a superuser password.

If your system is not on a network, interactive screens are displayed to assist you in setting up a user account and assigning it a user password.

NOTE *Make sure that only the release CD-ROM is loaded into your drive during installation. If SunInstall finds another tape, floppy, or CD-ROM in a drive, it may try to install from that medium.*

To install release 4.1.2 with Quick Install, follow these steps:

1. Become superuser and halt your machine by typing `/etc/halt` and then pressing Return.

   When the system halts, the PROM monitor prompt that is displayed depends on your system architecture. The PROM monitor prompt is always displayed as > on non-SPARC Sun-4 systems. The prompt may be displayed as either > or `ok` on Desktop SPARCsystems (Sun-4c). The `ok` prompt provides you with additional PROM commands. (See the Release Notes for more information.) You can install from either prompt.

Type **n** or **new-mode** and press Return to switch from the > prompt to the `ok` prompt. Type **o** or **old-mode** and press Return to switch from the `ok` prompt to the > prompt.

If the > prompt is displayed, type the **b** boot command. If the `ok` prompt is displayed, type **boot**.

Miniroot Installation

The miniroot is a small version of the operating system that includes the kernel `vmunix`, plus a few essential utilities such as `cat` and `ed`. The miniroot does not include common programs such as `more` or `vi`. You must use `ed`, the SunOS line editor, if you need to use an editor while in the miniroot. An editor is *not* required to install the release software.

1. To boot the miniroot from CD-ROM, enter one of the following commands at the PROM monitor prompt:

- For Sun4 systems:

```
> b sd(0,30,1)
```

- For Sun4c systems prior to the SPARCstation 2 (such as the SPARCstation 1, IPC, and SLC):

```
> b sd(0,6,2)
          or
ok boot sd(0,6,2)
```

- For Sun4m and Sun4c systems beginning with the SPARCstation 2:

```
ok boot cdrom
        or
> b cdrom
```

When the miniroot is ready to be installed, the following menu is displayed:

```
What would you like to do?
    1 - install SunOS mini-root
    2 - exit to single user shell
Enter a 1 or 2:
```

2. Type **1** and press Return to continue the installation.

The miniroot is copied to the disk if your system has only one SCSI disk. If your system has more than one disk, you must specify the disk number after the following message is displayed:

```
Enter a 1 or 2:
Beginning system installation - probing for disks.
Which disk do you want to be your miniroot system disk?
    1 - sd0: disk description
    2 - sd1: disk description
    3 - exit to single user shell

Enter a 1, 2, or 3:
```

3. Type the appropriate number to select the disk and press Return.

   Quick Install installs the system software on the disk you choose for miniroot.

   You can choose to reformat and/or relabel the disk. If you have a new disk, suspect your disk has lost its formatting, or want to change the disk layout by repartitioning it, choose `1 - yes, run format` from the list of choices:

```
Enter a 1, 2, or 3:2
selected disk unit "sd1".
Do you want to format and/or label disk "sd1"?
    1 - yes, run format
    2 - no, continue with loading miniroot
    3 - no, exit to single user shell

Enter a 1, 2, or 3:
```

4. Type the appropriate number (**1** to format the disk, **2** to continue) and press Return.

   If you choose 1 to format the disk, the format menu is displayed. (See Appendix A for information on how to use the `format` command.)

   The miniroot is copied to the disk after the disk is formatted (option 1), or you chose not to format the disk (option 2). The reboot menu is then displayed: Mini-root installation is complete.

```
What would you like to do?
1 - reboot using the just-installed miniroot
2 - exit into single user shell

Enter a 1 or 2:
```

5. Type **1** and press Return to reboot the miniroot.

   The next section describes SunOS installation, step-by-step.

Running SunInstall

After the miniroot is rebooted, start the installation.

You can get online help for some screen prompts while you are doing a Quick Install. To display the help messages, type "**?**"

1. Type **suninstall** and press Return at the # prompt to start SunInstall.

   A number of screens are displayed, prompting you for information that is needed to complete the installation. The last screen displays the information you entered. You can then make corrections and changes before you proceed with the installation.

   The following screen is displayed after you type **suninstall**:

```
                        Welcome to SunInstall

Remember:  Always back up your disks before beginning an installation.

SunInstall provides two installation methods:

1 Quick installation

  This option provides an automatic installation with a choice of
  standard installations, and a minimum number of questions asked.

2 Custom Installation

  Choose this method if you want more freedom to configure your
  system.  You must use this option if you are installing your system as
  a server.

  Your choice (or Q to quit) >>
```

2. Type **1** and press Return to select the quick installation method.

   SunInstall checks for the type of terminal you are using. If you are using a terminal with a Sun bit-mapped display, SunInstall assigns the terminal type and checks the media devices. This can take from 10 to 60 seconds, and the Preserve Data Partitions screen is displayed, which appears later in this section.

If you are using a terminal that does not use a Sun bit-mapped display, you must designate a terminal type when the following screen is displayed:

```
SysConfA0              SYSTEM CONFIGURATION
                         TERMINAL TYPE

Select a terminal type and press RETURN:

   1) Sun Workstation
   2) Televideo 925
   3) Wyse Model 50
   4) Other

Selection =>
```

SunInstall checks the media devices, which takes from 10 to 60 seconds, and displays the Preserve Data Partitions screen after you enter a terminal type.

You can use the Preserve Data Partitions screen to preserve data in existing partitions `b, d, e, f,` and `h` on the disk on which you are installing SunOS:

```
                    PRESERVE DATA PARTITIONS
-------------------------------------------------------------------------

Quick Install gives you the option of saving data partitions that
already exist on the installation disk.  If additional disks are
attached to the system, Quick Install does not affect them.

If you enter 'n', Quick Install will not preserve any partitions on
the installation disk.  The contents of the disk will be erased before
installation begins.

If you enter 'y', Quick Install will install software in the a: and g:
partitions, but preserve the other partitions.  Only the contents of
the a: and g: partitions will be erased before installation begins.

- If your home directory is currently in the g: partition, it
  will be lost.  This commonly applies to small disks (130 MB
  or less). Back up your home directory so you can restore
  it from media later.

- If your home directory is currently in the h: partition, it
  will be preserved.  This commonly applies to large disks (over
  130 MB).

Do you want to preserve the existing data partitions? [y/n]:
```

Type **y** and press Return if you want to preserve any existing data in partitions `b, d, e, f,` and `h`. You should back up your entire disk, if not already done, before proceeding with the installation.

Type **n** and press Return in the following circumstances:

- You are installing Release 4.1.2 on a new disk.
- All of the data is in partitions `a` and `g`.
- You do not want to preserve the data in partitions `b, d, e, f,` and `h`.

If you have not backed up your disk and you want to do so now, type Control-C to exit from Quick Install. Back up your disk and begin the installation procedure again.

1. Type **n** to overwrite the data or **y** to preserve the data in partitions `b, d, e, f,` and `h`, as appropriate. Then press Return.

   The Standard Installations screen is displayed. It provides you with choices for a typical networked environment; if you have a non-networked

environment, other choices are displayed.

```
                    STANDARD INSTALLATIONS

------------------------------------------------------------------------
Select the standard installation that best suits your needs.  Press
<Return> or <Space> to move forward a choice or <Control-B> to move
backward.  Type 'x' to make a selection or '?' to display more
information about a choice.  The menu scrolls up if additional choices
are available.

Select <none of the above> if none of the installations apply.

INSTALLATION DESCRIPTION
------------------------------------------------------------------------
Typical_user   Typical user running SunView applications
ProgrammerProgrammer writing and debugging software
Full_install   Installs everything on the SunOS installation media
Mini_install   Installs smallest workable system (no SunView)
<none of the above>
```

Choose one of the following types of installation:

- Typical_user is suited to the user who is not a programmer but wants to run SunView applications, edit files, use mail, and so on.
- Programmer is suited to programmers who want to develop and test programs in a SunView environment.
- Full_install contains the complete Release 4.1.2 software.
- Mini_install is suited to the user who requires basic network functions but does not need to run SunView applications.

- If you want to quit, choose <none of the above>.

  An information message is displayed if you choose an installation type that is too large to fit on your system disk. For example, Full_install will not fit on a 104 MB system disk. You can either quit or choose another type of installation from the Standard Installations screen.

  If you want more information about the programs included in a particular type of installation, press Return or the space bar to highlight the item, and then type **?**. The software for each corresponding installation is displayed. A list of this information follows:

  Typical_user: root, usr, Kvm, Install, Networking, System_V, Sys, SunView_Users, Text, Manual, Debugging

  Programmer: root, usr, Kvm, Install, Networking, System_V, Sys, TLI, RFS, Debugging, SunView_Users, SunView_Programmers, SunView_Demo, Text, Graphics, Manual

Full_install: root, usr, Kvm, Install, Networking, System_V, Sys, TLI, RFS, Debugging, SunView_Users, OpenWindows_Users, OpenWindows_Fonts, SunView_Programmers, OpenWindows_Programmers, SunView_Demo, Shlib_Custom, Text, User_Diag, Graphics, uucp, Manual, Demo, OpenWindows_Demo, Games, Versatec, Security

Mini_install: root, usr, Kvm, Install, Networking

2. Press Return or the space bar to move the cursor down the list of displayed choices. Type **x** to select an installation.

   A confirmation screen shows you the choices you made. An example of a confirmation screen follows:

```
                              CONFIRMATION
------------------------------------------------------------
Preserve data partitions:  Yes
Standard Installation:  Typical_user
          (Typical user running SunView applications)

Enter 'n' if you want to change some information; enter 'q' if you
want to cancel Quick installation.

Start the installation? [y/n]: y
```

3. Choose one of the following options:

   a. If you want to change any information, type **n** and press Return.

   b. If you want to quit SunInstall and return to miniroot, type **q** and press Return.

   If you quit, Quick Install will not remember the information you entered.

   c. If the information is correct, press Return and begin the installation.

   The software installation proceeds and takes from 20 minutes (for a minimal installation on a fast machine) to about an hour and a half (for a full install on a slow system). Information messages are displayed as the media files are installed.

4. After the software is loaded, you are asked whether you want to reboot the system. Type **y** and press Return.

   The system reboots and displays informational messages, including screens with menus that allow you to configure your system as part of the installation process. The configuration screens are described in the next section.

4.5. Configuration Screens

The system displays several screens and prompts you to provide information that is used to configure the system so that you can use it. The configuration screens appear whenever you boot a Quick Install, preinstalled, or re-preinstalled system for the first time. If your 4.1.2 quick installation does not succeed, you may see one or more screens informing you of the process failure.

```
                    INSTALLATION MESSAGES

The automatic installation procedure did not find all of the
information needed to set up this system on the network.

You may:
  1. Review the reasons the automatic installation was not completed.
  2. Continue the installation by supplying the needed
     information manually.
  3. Stop the installation procedure and halt the system.

If you are installing a non-networked system or are attempting network
installation without using the network information service, select
option 2 to continue the installation.

Enter choice (1, 2, or 3) and press the RETURN key.
```

In Option 1, your system administrator will review the reasons the installation was not completed. One or more screens come up. If, for example, the system could not find the Internet address, the following screen appears:

```
INTERNET ADDRESS NOT FOUND

An Internet address could not be obtained from a server on the network
due to one of the following reasons:

  -The Ethernet cable is not connected correctly.
  -The rarp daemon is not running on a server in this subnet.
  -NIS is not running on the network.
  -No NIS servers are functioning.
  -There is no entry for this system in the NIS ethers and hosts
   databases.
```

Select Option 2 of the Installation Messages screen if you want to configure the system manually. If you choose option 2, the first screen you see informs you of the information you will need for the manual setup.

Be prepared to supply a hostname, user name and id, user password, and superuser password. You will need the Internet address of the system, whether you will be using NIS, and your domain name, all of which may be obtained from your system administrator.

Select Option 3 from the Installation Message screen to stop the installation procedure and halt the system.

Manual Configuration

Do the following if you want to configure the system manually:

1. To begin the manual setup, type **2** and press Return.
2. Enter the information on the Manual Setup screen (shown below).

```
                              MANUAL SETUP

You can set up this system manually by entering the following
information as prompted:

?    o Terminal type (if  this is not a bit-mapped Sun terminal)
?    o Hostname
?    o Time zone
?    o Date and time
?    o Internet address (if installing on a network)
?    o NIS domain name (if using NIS on a network)

If you are installing your system on a network, but you do not have
your Internet address or NIS domain name, contact your system
administrator.

Make sure your system administrator adds this system to the network
databases so that this system can communicate with others on the
network.

Press RETURN to begin the manual setup or
press the ESC key to return to the previous menu.
```

3. Press Return.

   If you are using a terminal that does not use a Sun bit-mapped display, the Select Terminal Type screen is displayed:

```
SysConfA0              SYSTEM CONFIGURATION
                          TERMINAL TYPE

Select a terminal type and press RETURN:

    1) Sun Workstation
    2) Televideo 925
    3) Wyse Model 50
    4) Other

Selection =>
```

4. Enter the number for your terminal type and press Return. The Hostname screen is displayed.

   If your terminal is a Sun bit-mapped display, the Hostname screen is the first screen that is displayed:

```
SysConfA1    SYSTEM CONFIGURATION
                              HOSTNAME

If this system is connected to the network, the hostname must be
unique to the local area network.  Confirm this with your system
administrator.

Enter a name to assign to this workstation and press RETURN:

     Hostname =>

[?] = Help
```

5. Type your hostname and press Return.

   The Time Zone screen is displayed:

```
SysConfB1    SYSTEM CONFIGURATION
                              TIME ZONE

Press <Return> or <Space> to move forward to your choice and type x.

                 x  *   United States

                    *   Canada

                    *   Mexico

                    *   South America

                    *   Europe

                    *   Asia

                    *   Australia and New Zealand

                    *   Greenwich Mean Time

[?] = Help  [Control-B] = Previous screen     [Control-F] = First Screen
```

   Review the time zone instructions displayed on your screen. Select the time zone for your region.

6. Press Return or the space bar to the move the cursor to the desired category. Type **x** to choose a country time zone. A submenu of time zones for that category is displayed. Type **?** if you need more information about choosing a time zone.

   The following screen shows the time zones that are available for the United States:

```
SysConfC1              SYSTEM CONFIGURATION
                          UNITED STATES

Press <Return> or <Space> to move forward to your choice and type x.

     TIME ZONE NAME              AREA

     US/Eastern                  Eastern time zone, USA

     US/Central                  Central time zone, USA

     US/Mountain                 Mountain time zone, USA

   X US/Pacific                  Pacific time zone, USA

     US/Pacific-New              Pacific time zone, USA
                                 with proposed changes to Daylight
                                 Saving Time near election time

     US/Alaska                   Alaska time zone, USA

     US/East-Indiana             Eastern time zone, USA
                                 no Daylight Saving Time

     US/Hawaii                   Hawaii, USA

 [?] = Help    [Control-B] = Previous screen  [Control-F] = First Screen
```

7. Press Return or the space bar to move the cursor to the desired category. Type **x** to choose the time zone category and to display the System Time screen.

   The System Time screen is displayed, as shown in the following example:

```
SysConfD1                  SYSTEM CONFIGURATION
                            SYSTEM TIME

The system time is "Sat Apr  1 01:01:01 1990 PST".
   Enter selection and press RETURN:

1) Yes, accept that as current time.
2) No, prompt me to input current time.

   Selection =>

 [?]=Help [Control-B]=Previous screen    [Control-F]=First Screen
```

8. Choose one of the following options:

   a. If the time is correct, type **1** and press Return.

   b. If the time is incorrect, type **2** and press Return.

   The Set Time screen is displayed, as shown in the next example. The format for the Set Time screen that is displayed depends on the time zone you selected.

```
SysConfD2    SYSTEM CONFIGURATION
                              SET TIME

Enter the current date and local time and press RETURN:

   Current date (mm/dd/yy = month/day/year) =>

   Local time (hh:mm:ss = hours:minutes:seconds) =>

[?] = Help[Control-B] = Previous screen [Control-F] = First Screen
```

Use the format displayed on the Set Time screen to specify the date and time. In this example, the format is `mm/dd/yy` and `hh:mm:ss am/pm`. For other time zones, the date and time may be displayed with a different format. Use the format that is displayed for your time zone to enter the correct date and time. Press Return. The System Time screen is displayed again.

c. If the time displayed on the System Time screen is correct, type **1** and press Return.

The Network screen is displayed:

```
SysConfE1    SYSTEM CONFIGURATION
                              NETWORK

Enter selection for whether workstation is attached to A network
and press RETURN:

1) Yes, prompt for additional network questions to configure into network.
    (Verify Ethernet cable is attached to workstation.)

2) No, workstation is NOT attached to a network.

Selection =>

 [?] = Help    [Control-B] = Previous screen [Control-F]=First Screen
```

9. If you are not connected to a network, type **2** and skip to Step 10. If you are connected to a network, type **1** and press Return.

   The Network Address screen is displayed:

```
SysConfE2                    SYSTEM CONFIGURATION
                           NETWORK ADDRESS

You must assign a network address to your workstation.  Contact your
system administrator for the unique network address of your system.
Do not use the displayed address (192.9.200.1) if your workstation
is being connected to the Internet network.  Do not enter an address
unless you are sure it is correct.

Enter the network address to be assigned to this workstation and
press RETURN:

   Network Address (e.g. 192.9.200.1) =>

 [?] = Help     [Control-B = Previous] screen [Control-F] = First Screen
```

CAUTION **If your workstation is connected to the Internet network, do not use the sample Internet address on this screen. You must first obtain a valid Internet address from your system administrator.**

Type your Network Address and press Return.

The NIS Name Service screen is displayed:

```
SysConfE3    SYSTEM CONFIGURATION
                        NIS NAME SERVICE

NIS is the network information service.

Enter the selection that applies and press RETURN:

  1) Yes, the network uses NIS.  Confirm this with your system
     administrator.
  2) No, the workstation will not be using NIS.

Selection=>

 [?] = Help     [Control-B = Previous] screen [Control-F] = First Screen
```

1. You have the following choices:

   a. If your system does not use NIS (network information service), type **2** and press Return.

   The Confirmation Screen is displayed, as shown in Step 9.

   b. If your system is using NIS, type **1** and press Return.

   The Domain Name screen is displayed:

```
SysConfE4    SYSTEM CONFIGURATION
                          DOMAIN NAME

A domain name uniquely identifies your part of the network. Contact
your system administrator for your domain name.

Enter the domain name and press RETURN:

  Domain name=>

 [?] = Help     [Control-B = Previous] screen [Control-F] = First Screen
```

2. Type your domain name and press Return.

   The Confirmation screen is displayed, as shown in the following example:

```
SysConfF1                SYSTEM CONFIGURATION
                          CONFIRMATION

 Hostname          : zapper
 Timezone          : US/pacific
 Network address   : xxx
 Domain name       : xxx

   Accept the information as correct (y/n)?

 [?] = Help [Control-B] = Previous screen
```

3. Verify that the hostname, time zone, Network address, and NIS domain name information is correct.

   If you have a networked system but are not running NIS, only the hostname, time zone, and Network address information is displayed.

   – To start over, type **n** and press Return. The Hostname screen is displayed, and you can change it and subsequent screens as they appear.

   – To confirm the information, enter **y** and press Return. The Installation screen is displayed, as shown in the following example:

```
SysConfG1              SYSTEM CONFIGURATION
                         INSTALLATION

  Hostname          : zapper
  Timezone          : US/Pacific
  Network address   : xxx
  Domain name       : xxx
```

   The system briefly displays the configuration information you chose for your machine on the Installation screen, then prompts for a root password.

   The Superuser Password screen is displayed:

```
SysConfH1    SYSTEM CONFIGURATION
                        SUPERUSER PASSWORD

For security reasons it is important to give a password to
the superuser (root) account.  A password should be six to
eight characters long.  To give a password to the root account,
enter the password below.  The password will not appear on the
screen as you type it.

Enter Superuser password and press RETURN, or press RETURN to continue:

   Password=>

[?] = Help
```

4. Type a password and press Return.

   You should choose a password for your root account at this time. However, if you do not want to assign a password, you can press Return without typing a password.

5. Type the same password a second time at the confirmation prompt and press Return.

   If your system uses NIS, SunInstall completes the installation process without asking you to set up a user account, and reboots.

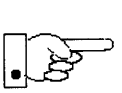
   If your system does not use NIS (it is either not networked or is networked but not with NIS), the User Account screen is displayed so you can set up a user account:

```
SysConfI1    SYSTEM CONFIGURATION
                            USER ACCOUNT

To use the system, a user account must be set up.  You can set up the
account now or separately after configuration.

The following information is needed prior to setting up the account:
      User full name - the common name of the user, e.g. John Doe
      User name - the login name of the user, e.g. jdoe
      User id - the system numerical id of the user
Do you want to set up a user account (y/n)?

[?] = Help
```



The user name and password are very important. Use them to log into your system. If you choose not to set up a user account at this time, you must manually create the user account at a later date.

1. If you do not want to set up a user account, type **n** and press Return. The system then reboots. If you want to set up a user account, type **y** and press Return to proceed.

The User Account - Full Name screen is displayed:

```
SysConfI2    SYSTEM CONFIGURATION
                    USER ACCOUNT - FULL NAME

The User's full name is a more verbose form to be used by some
programs like mailers.

Enter the user's full name and press RETURN:
   User full name =>

[?] = Help                        [Control-B] = Previous screen
```

2. Type your full name and press Return.

   The User Account - User Name screen is displayed:

```
SysConfI3    SYSTEM CONFIGURATION
                    USER ACCOUNT - USER NAME

The user name (up to 8 lower case letters, no spaces) is the name
the user is known by on the system.

Enter the user name and press RETURN:

   User name =>

[?] = Help[Control-B] = Previous screen
```

3. Type your user name and press Return.

   The User Account - User ID screen is displayed. The User ID must be a unique whole number between 10 and 60000. Always check with your system administrator to be sure you do not duplicate an existing User ID number.

```
SysConfI4    SYSTEM CONFIGURATION
                     USER ACCOUNT - USER ID

The user id is a number between 10 and 60000 that is unique in the
network. The system administrator can help confirm its uniqueness.

Enter the user id number and press RETURN:
   User id =>

[?] = Help[Control-B] = Previous screen
```

4. Type your User ID number and press Return.

   The User Password screen is displayed:

```
SysConfiS    SYSTEM CONFIGURATION
                          USER PASSWORD

Passwords are used for security reasons but are not required. You can enter a
password now or you can also add one later.

Enter the user password and press RETURN or press RETURN to continue:

   Password =>

[?] = Help
```

5. Type your password and press Return.

   If you do not want to assign a password to your user account, press Return without typing a password.

6. Type the same password a second time at the confirmation prompt and press Return.

   The system finishes the booting process and displays the login prompt.

```
Automatic reboot in progress...
 ...
nevada login:
```

You can now log into the system with your account name and password. (Refer to the information about logging in and logging out in the *Sun System User's Guide*, if you have a desktop SPARCstation. See *Getting Started with SunOS: Beginner's Guide* if you have another type of machine.)

4.6. Reconfiguration Procedure

If you want to change the name of a system, or if you configured it incorrectly, use the `sys-unconfig` program to unconfigure the following settings:

- Hostname
- Time zone
- Network address
- Domain name

Running `sys-unconfig` returns your system to its original state. It does not, however, remove any user accounts that you set up with the User Accounts screens. You must be root to use `sys-unconfig`. You can run `sys-unconfig` on any architecture from a root prompt by typing **`/usr/etc/install/sys-unconfig`** and pressing Return.

Two confirmation screens are displayed to be sure you really want to unconfigure your system. If you answer **`y`** to both questions, the system is unconfigured and halted.

The configuration screens are displayed the next time you boot the system. You can then enter new configuration information.

4.7. Returning to a Preinstalled Configuration

The `re-preinstall` utility within SunOS 4.1.2 SunInstall can be used on Desktop SPARCstations in two ways:

- To create a preinstalled configuration on a standalone system that has not been factory installed
- To reconfigure a system to its preinstalled factory configuration.

When you run `re-preinstall`, it checks the disk size and decides which of two configurations to install. It installs the following software categories for systems smaller than 130 MB:

```
root, usr, Kvm, Install, Networking, System_V, Sys,
SunView_Users, SunView_Demo, Text, Demo.
```

The following additional software categories are installed for systems larger than 130 MB:

```
OpenWindows_Users, OpenWindows_Fonts,
OpenWindows_Demo, User_Diag, Manual.
```

Note that neither of these configurations match the four Quick Install configurations.

You must boot the miniroot in the same way you would to run the SunInstall installation program in order to use `re-preinstall`.

Caution: All previous disk contents are overwritten when you use the `re-preinstall` program. Be sure to back up any files you want preserved before you begin the reinstallation, and restore them when the installation is complete.

Booting Miniroot for re-preinstall

For your convenience, the steps for booting miniroot are repeated here. Use the information from Table 4-4 to determine the boot syntax that is appropriate for your machine.

1. To copy and boot the miniroot, type the boot command (**`b`** from the > prompt, **`boot`** from the `ok` prompt) followed by the appropriate boot device syntax from Table 4-4.

Table 4-4 *Boot Syntax for Desktop SPARCstation Machines*

Device	SPARCstation 1, SLC 1+, IPC (Without open boot PROM)	SPARCstation 2, ELC, IPX (With open boot PROM)
sr	sd(0,6,2)	cdrom
st0	st(0,0,0)	tape or tape0*
st1	st(0,1,0)	tape1

* Either command works.

The syntax for tape or CD-ROM on systems without the open boot PROM is

```
>b sd(0,6,2)
```

For example, to boot from a CD-ROM on a SPARCstation 1 (which doesn't have the open boot PROM), type the preceding command and press Return.

The syntax for CD-ROM on systems with the open boot PROM is

```
>b cdrom
```

The `ok` prompt may be displayed instead of the > prompt. If `ok` is displayed as the prompt, type **`boot`** ***devicename*** (instead of **`b`** ***devicename***) and press Return to boot a device.

When the system is ready to install the miniroot, the following menu is displayed:

```
What would you like to do?
    1 - install SunOS mini-root
    2 - exit to single user shell
Enter a 1 or 2:
```

2. Type and press Return to continue the installation.

   The miniroot is copied to the disk if your system has only one SCSI disk. If your system has more than one disk, you must specify the disk number after the following message is displayed:

```
Enter a 1 or 2:1
Beginning system installation - probing for disks.
Which disk do you want to be your miniroot system disk?
    1 - sd0: disk description
    2 - sd1: disk description
    3 - exit to single user shell

Enter a 1, 2, or 3:
```

3. Type the appropriate number to select the disk and press Return.

   `re-preinstall` installs the system software on the disk you choose for miniroot.

   You can choose to reformat and/or relabel the disk. If you have a new disk, suspect your disk has lost its formatting, or want to change the disk layout by repartitioning it, choose `format` from the following menu.

```
Enter a 1, 2, or 3:2
selected disk unit "sd1".
Do you want to format and/or label disk "sd1"?
    1 - yes, run format
    2 - no, continue with loading miniroot
    3 - no, exit to single user shell

Enter a 1, 2, or 3:
```

4. Type the appropriate number (**1** to format the disk, to continue) and press Return

   If you choose 1 to format the disk, the format menu is displayed. (See Appendix A for information on how to use the `format` command.)

   The miniroot is copied to the disk after the disk is formatted (option 1), or you chose not to format the disk (option 2). The reboot menu is then displayed:

```
Mini-root installation complete.

What would you like to do?
1 - reboot using the just-installed miniroot
2 - exit into single user shell

Enter a 1 or 2:1
```

5. Type **1** and press Return to reboot the miniroot.

   After miniroot is rebooted, type **`re-preinstall`** at the # prompt and press Return. `re-preinstall` requires two confirmations. You must answer y twice before the software is installed. The system redisplays the monitor prompt (either > or `ok`) when installation is complete.

   When you reboot the system by typing **b** from the > prompt (or **`boot`** from the `ok` prompt) the configuration screens appear so you can configure the system. (See "Configuration Screens" earlier in this chapter for information and examples.

5

Installing a Standalone Workstation with Custom Install

Chapter 5 details the steps required to complete the installation of a Standalone Workstation using the Custom Installation method.

There are four general tasks to be completed:

- **Planning Your Installation**

  Final planning, including determining the layout of your system disk(s).

- **Performing Preliminary Software Procedures**

  Formatting and labeling your disk(s) (if necessary) and loading the software necessary to execute SunInstall.

- **Running SunInstall**

  Executing the SunInstall software installation program to actually install the operating system software on your workstation.

- **Deciding What Still Needs to be Done**

  Primary system administration procedures which you should carry out as soon as your system is installed.

5.1. Planning Your Installation — Disk Partitioning

Much of the planning required before you begin the actual installation of your workstation was completed as you worked through Chapter 1. At this point you should already have completed the following worksheets:

- Preliminary Information Worksheet
- Host Form Worksheet
- Software Form Worksheet

This section will help you complete the remaining worksheets:

- Partition Planning Worksheet
- Disk Form Worksheet

(The Client Form Worksheet is not used for installing a standalone workstation.)

Go to Appendix E and pull out a copy of the Partition Planning Worksheet and the Disk Form Worksheet for each disk drive on your workstation. Refer to and fill in the Worksheets as you work through this section.

Disk drives used with Sun workstations are divided into as many as eight sections called *partitions* (labeled `a` through `h`). Each disk partition appears to the operating system and the user as though it were a separate disk drive, and each can be used for a specific purpose. An individual partition may be used in its *raw* state, most often as swap and paging space for the SunOS virtual memory system. Most partitions, however, will be structured as *filesystems* and used to store UNIX† files.

Individual filesystems are designated to store various broad classes of files including operating system software, user data files, and perhaps such things as database files for application software. This section will help you to decide what partitions you should define for your disk(s), how to use each partition, and what size each partition should be.

If you are unfamiliar with computer disk drives and such terms as *partition, cylinder, sector,* and *head*, please refer to Appendix D, "Disk Structure and Disk Space Terminology."

The SunInstall program provides a default disk layout for standalone systems that you can use "as is" or modify as needed. This layout only addresses the system disk and will have to be modified if your system has more than one disk drive.

If your system was previously installed as a standalone system, you may wish to base disk partitions on the existing disk layout.

Disk Layout — Default Partitions

The number of default partitions depends upon the capacity of your system disk. Table 5-1 shows the default layouts for standalone configurations.

Table 5-1 *Default Partitions for Standalone Systems (Release 4.1.2)*

Small Disks (130 MB or less)		Large Disks (over 130 MB)	
a:	/	a:	/
b:	(swap)	b:	(swap)
c:	(whole disk)	c:	(whole disk)
d:	—	d:	—
e:	—	e:	—
f:	—	f:	—
g:	`/usr`	g:	`/usr`
h:	—	h:	`/home`

The default size (as shipped from the factory) of the root (`/`) and swap partitions varies depending on the type and capacity of the disk. Table 5-2 shows the default sizes.

† UNIX is a registered trademark of AT&T.

Table 5-2 *Default root and swap Partition Sizes*

Disk Type	Disk Size	Root Size	Swap Size
sd	<130 MB	8 MB	16 MB
sd	>130<300 MB	8 MB	32 MB
sd	>300 MB	16 MB	32 MB
xd, xy and id	<600 MB	8 MB	16 MB
xd, xy and id	>600 MB	16 MB	32 MB

NOTE *On SPARCsystem 600MP machines, swap size is 64 MB.*

The root (/) Filesystem

Every SunOS *system disk* must have its `a` partition defined as the root (/) filesystem. The root filesystem consists of `/`, the root directory, and subdirectories such as `/etc`, `/dev`, `/tmp`, and `/var`.

The default root partition size should be usable for nearly all installations. About 3.5 MB of this space will be used by operating system files. The remainder is available for use by 'scratch' files created in the `/tmp` directory, and temporary log and spool files created in the `/var` directory.

The swap Partition

This area of the disk (normally the `b` partition of the system disk) is reserved to implement the virtual memory feature of SunOS. The default size will be adequate in many circumstances, but the following issues should be considered.

- Workstations with color monitors

  A minimum of 24 MB of swap space is recommended if your workstation has a color monitor.

- Workstations with large main memories

  Your swap space **must** be larger than the size of the memory installed in your workstation. For example, if your workstation has 32 MB of main memory, designate at least 34 MB for your swap area. If your workstation has 64 MB of main memory, designate at least 66 MB for your swap area.

- Application programs

  Some application programs require large amounts of swap space. As an example, LISP applications can require 40 MB or more of swap.

The `c` Partition

Every disk drive used with the SunOS operating system must, by convention, have a `c` partition defined. This partition is used by the operating system to reference the entire disk. It is defined automatically by Sun's `format(8S)` and `suninstall(8)` programs and should not be altered.

The /usr Filesystem

This filesystem is assigned, by convention, to the g partition of the system disk. It contains the bulk of the operating system files, including executable programs, program libraries, and documentation. It is also frequently used to hold unbundled application programs from Sun, application programs from other vendors, and locally developed programs. Some free space should be available in /usr in which to build a custom kernel for your workstation and to allow for the addition of new programs over time.

The partition size needed for /usr varies widely from installation to installation. Several factors should be examined to choose an appropriate size for your installation.

- Operating system software

  Operating system files will require a minimum of about 35 MB to a maximum of about 150 MB, depending on which optional software categories you chose for your workstation in Chapter Introduction. Don't bother to add up the individual sizes listed in Table 1-5 exactly. SunInstall will do this for you during the installation process.

- Sun unbundled products

  If you will be adding other Sun products to your workstation (programming languages, office automation, databases, etc), check the installation literature they provide to find the amount of space each will require in /usr. Total this figure and record it on the Partition Planning Worksheet.

- Products from other vendors

  Again, refer to the literature provided with these products and record the total space required.

- Locally developed programs

  Allow space for locally developed programs, if any.

- Free space

  You should allow an additional 3 MB of space for use in building a custom kernel for your workstation. Still more free space over and above this is an excellent idea if the total disk space available allows. On most workstations programs and files get added to /usr from time to time and the filesystem slowly fills up, so plan ahead. **Running out of space in /usr after the system is installed is very inconvenient. Be as generous as you can within the constraints of the total disk space available to you. Figure all of your expected needs and then add some more, perhaps 20%, for good measure.**

To allow users to more easily manage free space, the standard layout for smaller disks does not provide a separate /home partition. This layout accommodates user home directories within the /usr filesystem in the subdirectory /usr/export/home. On larger disks where space available is not quite so critical /home is given its own partition. (The advantage of a separate /home partition is that it simplifies back up and system upgrade procedures.)

If your system disk size is less than 130 megabytes and a `/home` partition is not defined you do not need to calculate a size for the `/usr` filesystem. `/usr` will use all of the space not taken by the root and swap partitions, and be automatically sized for you by SunInstall.

The `/home` Filesystem

The `/home` filesystem is used for your personal home directory, will be empty when the installation completes, and will begin to fill as you establish your account (personal work area) and begin to use your workstation. An overall goal of disk partitioning strategy should be to maximize the space available to the user, commensurate with the resource needs of the operating system and application programs to support the user. To this end, in the default disk partitioning scheme (large disk) `/home` is automatically sized by SunInstall to encompass all of the space not claimed by the other partitions.

Disk Layout — Optional Partitions

In addition to the default partitions you may wish to define some others. These may be considered 'fine tuning.' Nearly all systems will operate just fine without them.

The `/tmp` Filesystem

The `/tmp` directory is, by default, contained within the root filesystem. It is intended for use as system 'scratch' file space; for example, intermediate files are created and deleted in `/tmp` by the C compiler as it runs. All files in `/tmp` are deleted each time the workstation is rebooted.

A new feature since SunOS release 4.1, *tmpfs*, allows a temporary filesystem to be made in operating system virtual memory. This has performance advantages, especially for short-lived scratch files, and allows some of the system swap partition to be used for file space on demand. As such, it is an excellent way to support `/tmp`, reducing the demand for space in the root filesystem and, at the same time, providing a potential performance improvement.†

NOTE: Files and directories created in a tmpfs filesystem are truly temporary. They disappear without recourse upon a `umount(8)` of the filesystem and each time the workstation is rebooted.

Using tmpfs to implement the `/tmp` directory may eliminate any need to expand the root partition from its default size. Tmpfs is defined after your system has been installed. You need do nothing right now. Section 5.5, "Deciding What Still Needs to Be Done" at the end of this chapter includes instructions for configuring tmpfs at that time.

The `/var` Filesystem

The `/var` directory is, by default, contained within the root filesystem. It contains files that tend to vary in size; for example:

The `/var/tmp` directory provides a workspace for users and temporary storage for programs such as the `vi(1)` editor.

† See *System and Network Administration* and `tmpfs(4S)` for details.

Spooling programs create files in subdirectories of `/var/spool`, such as `/var/spool/mail` for incoming mail, `/var/spool/lpd` for queued print jobs, and so on.

System accounting information and log messages are collected in the `/var/adm` and `/var/log` directories.

Depending on system use, activity in `/var` can consume excessive amounts of space in the root filesystem. It may be appropriate to provide additional space in the root filesystem or, as an alternative, to create a separate `/var` filesystem. Asking yourself the following questions will help you decide if your system needs a `/var` partition and, if so, how big you should make it.

- Is your system a mail server?

  Consider the number of users served and the anticipated amount of mail.

- Is your system a print server?

  Consider the number of attached printers and the anticipated number and size of the print jobs.

- Is your system a uucp host?

  Files will be stored in `/var` while waiting to be transmitted to remote systems.

- Is your system an NIS server?

  Allow space for the NIS maps.

- Will your system use process-level accounting?

  If not carefully maintained the accounting files quickly become very large.

- Will you use applications that create large temporary files in `/var`?

  Consider the needs of all such programs.

- Will core files be dumped in `var` by default?

  The size of the core file is equal to the size of memory.

It's unlikely that you need a separate partition for `/var` if you answered no to each of the preceding questions. If you choose to define a `/var` partition, 10 MB would be a minimum size. You might need considerably more space depending on the factors noted above.

Filesystems For Use By Applications

Some application software packages may recommend the creation of separate filesystems for their exclusive use. Check the literature received with any application software for possible requirements.

Disk Layout — Multiple Disk Drives

If your workstation hardware includes more than one disk drive you will need to decide what partitions and filesystems to define on each drive. (If you have only one disk drive skip ahead to Section 5.2, "Preliminary Software Procedures.")

The overall goals here are to make efficient use of the disk space available and to maximize performance by balancing the amount of activity on each of the disks as much as possible. Some guidelines follow. (For purposes of discussion we will suppose a system with two drives named `sd0` and `sd1`.)

What Should Stay on the System Disk?

The root and `/usr` filesystems and the swap partition should remain on the system disk. This will allow the workstation to be booted even if the first drive is the only one running, an advantage should a failure occur on one of the other drives.

Should You Define Multiple swap Partitions?

The SunOS operating system allows more than one partition to be defined for use as swap area. The system interleaves the use of multiple partitions, attempting to make equal use of each partition, thus improving performance. The amount of disk space that you have determined to use for swap can be split between partitions located on different disk drives. For example, if you have decided that you want 40 MB of swap area, you might specify two 20 MB swap partitions, one on `sd0b`, the other on `sd1b`. (Use of the `b` partition for swap space is not a requirement except on drive 0. We use `sd1b` here just for the sake of convention.)

Procedures for designating multiple swap partitions will be presented later in this chapter. For now, simply note the partitions and sizes on your Disk Form Worksheets.

Should You Move One or More Partitions?

The `/home` partition is a prime candidate for moving to the second drive. Just make the proper notations on your Partition and Disk Form Worksheets.

If you have decided to designate a separate partition for the `/var` filesystem, put it on drive 1. Availability of a second drive may make creation of a `/var` filesystem attractive from a performance standpoint.

Sample Layout For Two Disks

Table 5-3 suggests a layout for a workstation with two disk drives. An "*" in the *size* column indicates that the partition will be allocated whatever space is left on the disk after the other partitions have been defined.

Table 5-3 *Sample Partition Layout — Two Disk Standalone Workstation*

Disk Drive sd0		
partition	*designation*	*size (MB)*
a	/	8
b	(swap)	20
c	-	105
d	-	-
e	-	-
f	-	-
g	/usr	*
h	-	-

Disk Drive sd1		
partition	*designation*	*size (MB)*
a	/var	15
b	(swap)	20
c	-	105
d	-	-
e	-	-
f	-	-
g	-	-
h	/home	*

Assigning partitions to certain partition letters (moving `/home` from `sd0h` to `sd1h`, for example) is not required. Maintaining the convention does, however, help to reduce confusion.

5.2. Preliminary Software Procedures

Now it's time to begin using the software tools provided for installing your workstation.

Selecting the Correct Media

First you'll need to select the correct CD-ROM) with which to install your workstation. The label on the CD-ROM should specify the same kernel architecture that you noted for your workstation on Preliminary Information Worksheet.

Mount the CD-ROM in the drive you will be installing from.

Should You Format Your Disk?

You *format* a disk by using the utility program `format(8S)` to write control information used by the disk drive hardware onto a disk. Disk drives provided by Sun are formatted and labeled at the factory. Desktop SPARCstation systems are shipped with SunOS preinstalled, as well.

If you have a preinstalled disk, it is recommended that you check it in a nondestructive way to verify that the performance of your disk hasn't been affected by head movement that may have occurred during shipment.

To check the disk by using the `format` command, follow these steps:

1. Select "Run Format" from the install script.
2. Choose `analyze` from the `format` menu.
3. Choose `read` from the `analyze` menu.

   The `read` option tries to read every block on the disk, but does not destroy any information.

If you have new disks without preinstalled software, it is recommended that you reformat them. To format your disk(s), select "Run Format" in the MINIROOT install script. See Appendix A of this manual for instructions on running the `format` command. You can also run `format` manually from MINIROOT.

Resizing the root and swap Partitions

If you decided to size your root partition differently from the default, or to size the swap partition on your system disk **smaller** than the default (see your entries on the Partition Planning Worksheet) you must run the `format` program before running SunInstall. Refer to Appendix A for the necessary instructions.

If you do not plan to alter the size of the root partition or decrease the size of the swap partition, continue with "Loading and Booting the Miniroot," below. (You can use the SunInstall program without running `format` to make all other adjustments to partition sizes.)

5.3. Loading and Booting the Miniroot

SunInstall will be executed from a minimal version of the operating system called the *miniroot*. The miniroot is designed to be copied into the swap (`b`) partition of the system disk, thereby leaving the remaining partitions available for loading of the full operating system.

The miniroot copied to the swap area is temporary; as soon as the workstation is booted from the installed operating system it will be over-written by normal paging and swapping activity. If you need to use it again, it will have to be copied into the swap area again.

Miniroot load and boot procedures are given here for those systems which will be installed from an attached CD-ROM drive (that is, local installation). If you are loading the miniroot from a remote CD-ROM, refer to Appendix B — "Loading and Booting the Miniroot from a Remote CD-ROM."

In any case, once the miniroot is booted, continue with "Running SunInstall," Section 5.4 below.

At this time your workstation should be powered on and displaying the `>` or `ok` PROM monitor prompt.*

Newer boot PROMS, particularly in the SPARCstation 1, may display the `ok` prompt. Others will display the `>` prompt.

If the workstation is not displaying the PROM monitor prompt, hold down the L1/STOP key and press the A key and it should appear.

To boot the miniroot from CD-ROM, enter one of the following commands at the PROM monitor prompt:

- For Sun4 systems:

```
> b sd(0,30,1)
```

- For Sun4c systems prior to the SPARCstation 2:

```
> b sd(0,6,2)
          or
ok boot sd(0,6,2)
```

- For Sun4m and Sun4c systems beginning with the SPARCstation 2:

```
ok boot cdrom
    or
> b cdrom
```

After you successfully begin installing the miniroot, your system should display the following messages:

```
What would you like to do?
  1 - install SunOS mini-root
  2 - exit to single user shell
Enter a 1 or 2:
```

Follow these steps to continue the installation:

1. Enter **1** to indicate that you want to continue the installation.

   If your system has only one disk, the miniroot is copied to that disk. If your system has more than one disk, you are asked to specify a disk number as illustrated in the following display:

```
Beginning system installation - probing for disks.
Which disk do you want to be your miniroot system disk?
  1 - sd0:  disk description
  2 - sd1:  disk description
  3 - exit to single user shell
Enter a 1, 2, or 3:
```

   Enter **1** to select the system disk.

2. Before the miniroot is copied to the specified disk, you are given an opportunity to format and relabel the disk.

```
selected disk unit "sd0".
Do you want to format and/or label disk "sd0"?
    1 - yes, run format
    2 - no, continue with loading miniroot
    3 - no, exit to single user shell
Enter a 1, 2, or 3:
```

You do not need to run `format` unless you believe that something is wrong with the disk or you have chosen to resize the root or decrease the swap partition, or it is a new unlabeled disk from a third-party vendor.

3. Enter **2** to continue.

   Messages such as those that follow are displayed:

```
checking writability of /dev/rsd0b
0+1 records in
1+0 records out
Extracting miniroot ...
```

   Additional media-specific messages are displayed. This process may take several minutes to complete.

   When the process is complete, the following message is displayed:

```
Mini-root installation complete.

What would you like to do?
   1 - reboot using the just-installed miniroot
   2 - exit into single user shell
Enter a 1 or 2:
```

4. Enter **1** to boot the miniroot.

   Additional messages are displayed as the system boots.

```
syncing file systems... done
rebooting...
Booting from: sd(0,0,1)
root on sd0b fstype 4.2
Boot: vmunix
Size: 811008+114720+60112 bytes
SunOS Release 4.1.2(MINIROOT) #4: Wed Feb 13 01:10:16 PDT
Copyright (c) 1991 by Sun Microsystems, Inc.
 .
 .
 .
WARNING: CLOCK GAINED 14 DAYS -- CHECK AND RESET THE DATE!
root on sd0b fstype 4.2
swap on sd0b fstype spec size 04070K
dump on sd0b fstype spec size 14056K
#
```

   The process is complete when the root prompt (#) is displayed.

Now you are ready to invoke the SunInstall program, and continue with Section 5.4, "Running SunInstall," below.

5.4. Running SunInstall

SunInstall is an interactive, menu-driven program that operates in the following way:

1. You invoke the program and use its preliminary menus to set the system clock and to specify your console display device (Sun workstation or other terminal).
2. Next, you fill out a series of forms each describing a different aspect of the installation.
3. Then, upon confirmation from you, SunInstall begins the actual installation of your system, loading operating system software onto your disk(s).

If you are using a terminal (not a Sun bit mapped display) as system console and have not yet determined the `/etc/termcap` name for the terminal, now is the time to do it. See E.1.1 "Preliminary Information Worksheet" for complete instructions.

Starting the SunInstall Program

Invoke the SunInstall program from the miniroot as follows:

```
# suninstall
```

You are ready to use the program when this screen is displayed:

```
                    Welcome to SunInstall

    Remember:  Always back up your disks before beginning an installation.

SunInstall provides two installation methods:

    1. Quick installation:

       This option provides an automatic installation with a choice
    of standard installations, and a minimum number of questions asked.

    2. Custom installation:

       Choose this method if you want more freedom to configure your
       system.  You must use this option if you are installing your
       system as a server.


       Your choice (or Q to quit) >>
```

Entering Initial Information

The following steps will provide SunInstall information about your system's console terminal, the time zone you are in, and the current date and time.

These steps employ a simple convention.

- *enter*
  denotes keyboard input with an ending Return (the ensuing action takes place when you press the Return key).
- *type*
  denotes keyboard input without a Return following. (The ensuing action takes place as soon as you type a character.)

1. Enter **2** in response to the SunInstall Welcome screen, selecting a custom installation.

   SunInstall automatically checks for your terminal type. If you are using a Sun bit-mapped display, SunInstall does not ask for your terminal type and skips to the next step.

   If you are not using a Sun bit-mapped display, SunInstall prompts you for your terminal type, as shown in Step 2.

```
Select your terminal type:
        1) Televideo 925
        2) Wyse Model 50
        3) Sun Workstation
        4) Other

>>
```

2. Enter a number from `1` to `3` to specify your terminal type from those listed, or `4` if your terminal is of some other type.

   If you choose `4` (Other) SunInstall asks you to enter the name of your terminal as it appears in the `/etc/termcap` file. Refer to the Preliminary Information Worksheet for this information.

   After you enter your terminal type SunInstall will ask for your local time zone name:

```
Enter the local time zone name (enter ? for help):
```

3. Although you can enter time zone information from the keyboard, it's easiest to use the on-line help facility:

   Enter **?** to display the TIMEZONE menu.

```
TIMEZONE MENU                                                    [?=help]
-------------------------------------------------------------------------

             Select one of the following categories to display
               a screen of time zone names for that region

                      _ United States

                        Canada

                        Mexico

                        South America

                        Europe

                        Asia

                        Australia and New Zealand

                        Greenwich Mean Time


Are you finished with this menu [y/n] ?
 [RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

4. Move the cursor to the appropriate region name (by typing Return) and then type **x** to display a corresponding menu of time zones.

   The UNITED STATES menu is shown here.

```
UNITED STATES MENU                                                [?=help]
------------------------------------------------------------------------
        TIME ZONE NAME              AREA

       _ US/Eastern                  Eastern time zone, USA

         US/Central                  Central time zone, USA

         US/Mountain                 Mountain time zone, USA

         US/Pacific                  Pacific time zone, USA

         US/Pacific-New              Pacific time zone, USA
                                     with proposed change to Daylight
                                     Savings Time near election time

         US/Alaska                   Alaska time zone, USA

         US/East-Indiana             Eastern time zone, USA
                                     no Daylight Savings Time

         US/Hawaii                   Hawaii


Are you finished with this menu [y/n] ?
 [RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

5. Move the cursor to the appropriate time zone name and type **x**.

   SunInstall prompts:

```
Are you finished with this menu [y/n] ?
```

6. Enter **y** to exit this menu and redisplay the TIMEZONE menu.
7. Enter **y** again to exit the TIMEZONE menu.

SunInstall now asks you to confirm the current date and time, as in the following example:

```
Is this the correct date/time: Thu Feb 22 17:10:15 PDT 1990
   [y/n] >>
```

8. Enter **y** if the displayed information is correct. Otherwise, enter **n** and press the Return key. The Set Time screen appears. The format for the Set Time screen display depends on which time zone you selected. Press Delete, Control-U or the Backspace key to erase the sample response. Then enter the correct date and time using the format that is displayed for your time zone, and press the Return key.

   As an example, on the third day of June, 1990 at three o'clock in the afternoon you could enter:

```
>> 03/06/90 03:00 pm
```

   After you press the Return key, SunInstall would respond:

```
Is this the correct date/time: Sun Jun 3 15:00:12 PDT 1990
   [y/n] >>
```

   Enter **y** if the displayed information is correct and **n** if you want to try again. (Note that SunInstall displays in twenty-four hour time, thus three o'clock in the afternoon is displayed as 15:00.)

   SunInstall sets the system clock and displays the Main Menu.

Figure 5-1 *SunInstall Main Menu: First Appearance*

```
MAIN MENU                                                          [?=help]
-------------------------------------------------------------------------
                Sun Microsystems System Installation Tool

                  ( + means the data file(s) exist(s) )

                    _ assign host information



                      exit SunInstall


[RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

Now you are ready to begin filling out the SunInstall forms.

The Main Menu

The core of the installation process involves completing several *forms*, each one relating to a specific aspect of your configuration.

You select forms from the SunInstall Main Menu. When first displayed, the menu is as shown above, with just one menu item, `assign host information`, displayed. This is the current item, the one that is selected if you simply type **x** or **X** at this point.

The main menu will reflect your progress as you work your way through the forms. When, for example, you've completed the HOST Form to assign host information, SunInstall marks that item with a plus sign (+) and requests disk information.

Figure 5-2 *SunInstall Main Menu: After Completing the Host Information Form*

```
MAIN MENU                                                        [?=help]
-------------------------------------------------------------------------
                Sun Microsystems System Installation Tool

                  ( + means the data file(s) exist(s) )

                    + assign host information

                    _ assign disk information
```

The information on each completed form is automatically recorded in an installation database. A "+" before a menu item means the database contains the corresponding information. On the Form shown below all required forms have been completed.

Figure 5-3 *SunInstall Main Menu: After All Forms Are Completed*

```
MAIN MENU                                                        [?=help]
-------------------------------------------------------------------------
                Sun Microsystems System Installation Tool

                  ( + means the data file(s) exist(s) )

                    + assign host information

                    + assign disk information

                    + assign software information


                    _ start the installation

                      exit SunInstall

[RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

Using the Main Menu

The SunInstall Main Menu allows you to use the following control keys:

[SPACE] / [RETURN] move forward, by item, as far as the prompt line

[Control–F] / [Control–N] move forward through the menu items

[Control–B] / [Control–P] move backward through the menu items

The cursor-movement keys are noted on the message line at the bottom of the screen. In addition, this control key is available:

[Control–L] repaint the screen should it become garbled

The choices on the Main Menu allow you to:

display a form

Move the cursor to the corresponding form name, and type **x** or **X**.

exit SunInstall

Move the cursor to `exit SunInstall`, and type **x** or **X**.

display general information about the menu use

Type **?** at any time to display an *On-Line Help Screen*. See Figure 5-4 below for one example. Press [Return] to redisplay the Main Menu when you are through viewing the help text.

start the installation

When you have completed the last required form, the Main Menu displays:

```
start the installation
```

Type **x** or **X** to begin the installation of your system.

Figure 5-4 *On-Line Help Screen*

```
                    ON-LINE HELP FOR MENUS
    ------------------------------------------------------------

    ------------------------------------------------------------
           KEYS                          PURPOSE
    ------------------------------------------------------------
           CONTROL B                      move to previous item
           CONTROL P                      move to previous item
           CONTROL F                      move to next item
           CONTROL N                      move to next item
           <RETURN>                       move to next item
           <SPACE>                        move to next item

           x or X                         select an item

           CONTROL L                      repaint screen
           CONTROL C                      abort

  Press <return> to continue ...
```

The following sections explain how to fill out each of the onscreen forms that SunInstall requires.

Completing the HOST Form

From the SunInstall Main Menu, complete the HOST Form as follows:

1. Select `assign host information`.
2. Complete the form, referring to your Host Form Worksheet and using the following example as a guide. (Here italicized items are example values for variables.)

```
HOST FORM                [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Workstation Information :
     Name : diphthong
     Type :  x[standalone]  [server]  [dataless]


   Network Information :
        Ethernet Interface :  [none] x[le0]

        Internet Address   : 195.5.2.15
        NIS Type           :  [none]  [master]  [slave] x[client]
        Domain name        : em_city.oz.com

   Misc Information :
       Reboot after completed :  [y] x[n]


 Are you finished with this form [y/n] ?
    [x/X=select choice] [space=next choice] [^B/^P=backward] [^F/^N=forward]
```

This example form is the first of many to appear in this procedure. Each uses the same conventions.

- System-specific items are italicized.
- User entries are boldfaced.

Thus, the example Ethernet interface *(le0)* is system-specific information SunInstall displayed, while the example hostname (***diphthong***) and IP address (***195.5.2.15***) are system-specific information the user entered.

When you have completed the last screen field, SunInstall prompts:

```
Are you finished with this form [y/n] ?
```

3. Enter **y** to exit the form.

   The message `updating databases ...` is briefly displayed, followed by the Main Menu.

Completing the DISK Form

From the SunInstall Main Menu complete the DISK Form as follows:

1. Select `assign disk information`.

   SunInstall polls the disk drives and lists their device numbers in the `Attached Disk Devices` field. The form will look like this for most systems with one SCSI disk:

```
 DISK FORM            [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Attached Disk Devices :
   [sd0]
```

2. Select the system disk from among the devices listed. (The system disk will usually be the first one listed.)

   SunInstall then expands the DISK Form:

```
 DISK FORM            [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
 Attached Disk Devices :
    x[sd0]


 Disk Label:  [default]  [use existing]  [modify existing]
 Free Hog Disk Partition :  [d]  [e]  [f]  [g] x[h]
 Display Unit            : x[Mbytes]  [Kbytes]  [blocks]  [cylinders]
```

   Steps 3 through 5 explain how to complete the new fields.

3. In the `Disk Label` field, choose a starting disk label. The choices are:

   - `default`
     Displays the standard partitions for your system configuration. This is the correct choice for new installations and most installations of existing systems as well.

   - `use existing`
     Displays the partitions already defined on the disk but does not allow them to be changed. If you are reinstalling a previously installed system, and you don't want to modify the existing disk partitions, select

this option. Note that only the partition sizes are filled in; you must enter the MOUNT PT fields by hand.

- `modify existing`
  Displays the existing partitions on the selected disk and allows them to be changed. Again, the MOUNT PT fields must be entered by hand.

4. SunInstall will choose the partition normally associated with users' home directories as the default for the *Free-Hog Disk Partition*. In most cases this will be correct.

If you have a small disk (under 130 MB), partition `g` will be marked as the free-hog partition. The example forms in this procedure assume that you are installing SunOS Release 4.1.2 on a large disk, therefore partition `h` is the free-hog partition.

The *Free-Hog*

The SunInstall program will help you prepare a disk layout that it will use later to define physical disk partitions. As you refine the layout, the program automatically sees that the total amount of disk space in use by the defined partitions equals the total space available on the disk. SunInstall does so by automatically adjusting the size of one partition on each disk: the *free-hog* partition.

As the other partitions are increased or decreased in size the free-hog is decreased or increased to maintain the correct total. It is common to designate the partition that will hold the users' personal directories (usually `/home`) as the free-hog. This results in the users having as much disk space as possible for doing their work commensurate with the specific disk space needs of the operating system.

The term *free-hog* only refers to the special role the partition plays while you're using the SunInstall program. **There is no free-hog partition on an installed system; the concept is meaningless apart from the SunInstall program.**

Also note that since the size of the free-hog is relative to that of the other partitions it is not possible to directly change the size of the free-hog. (That is, you cannot type in the SIZE field for the free-hog on the DISK Form).

5. In the **Display Unit** field, specify how you want partition sizes displayed in the SIZE column. The example forms display partition sizes in Mbytes (the default), but you can also use Kbytes, blocks, or cylinders. (Refer to

Appendix D — "Disk Structure and Disk Space Terminology" for general information about blocks and cylinders.)

Only the integer portion of the partition size is displayed. The displayed size of a 35.75 MB partition, for example, is 35, not 35.7 or 35.8. **The actual size will be rounded to the nearest cylinder when SunInstall physically relabels the disk.**

When you make your choice, SunInstall displays a partition table that reflects the selected label. If you selected `default` at step 3, the MOUNT PT and PRESERVE columns will be filled in. (The columns will otherwise be empty.)

If you type **y** in the PRESERVE(Y/N) column, SunInstall will not re-make the filesystem in that partition. This provides a means to retain existing data in user partitions such as `/home`. **If the START_CYL or SIZE of a partition changes, it *cannot* be preserved. SunInstall will notify you if you attempt to preserve a partition that does not meet these criteria.**

Following is a possible default partition table for a standalone system.

```
PARTITION START_CYL BLOCKS    SIZE     MOUNT PT            PRESERVE(Y/N)
=============================================================================
    a     0         32025     16       /                         n
    b     61        59850     30
    c     0         639450    327
    d     0         0         0
    e     0         0         0
    f     0         0         0
    g     175       90300     45       /usr                      n
    h     347       457275    228      /home                     n
```

6. To implement your disk plan, complete the SIZE, MOUNT PT, and PRESERVE column for each required filesystem and any others you have chosen to define. If a column already contains a value, you can type Return to use the displayed value. Leave the MOUNT PT columns blank for all `c` partitions and for any partitions which will be used for swap space.

If you've chosen to use the existing disk partitions, you might wish to preserve the `home` partition so you won't have to restore user home directories from tape after you install Release 4.1.2. **Do not preserve the `/` and `/usr` partitions!**

The root (/) Partition

The size displayed for your root partition (the `a` partition of your system disk) will reflect the current size of the partition on the disk. If you used `format` to adjust the size of the root this is a good opportunity to check your work, verifying that the partition is the size you intended. **Remember: you cannot change the size of the `a` partition on the system disk within SunInstall.**

The swap Partition

The size displayed for your swap partition (the `b` partition of your system disk) will also reflect the current size of the partition on the disk. If you need to *increase* the size of the partition, do so now. Press [Return] until the cursor is next to the swap partition's `SIZE` field, backspace over the current size, and enter the new size you desire. Note that at the same time SunInstall will automatically decrease the size of the designated free-hog partition by a similar amount. **Remember: you cannot *decrease* the size of the `b` partition of the system disk within SunInstall.**

The `/usr` Partition

How you size the `/usr` partition is perhaps the most important part of your disk plan. In order to let SunInstall automatically calculate the size of `/usr` necessary to accommodate the SunOS operating system software intentionally *undersize* the partition at this time. To do so, press [Return] until the cursor is next to the SIZE field for the `/usr` partition. Then type [Delete] to backspace over the current SIZE and enter `5`. Note that, at the same time that the size of `/usr` is decreased, the size of the designated free-hog partition will increase by a like amount.

Later on, when software selection has been completed, `/usr` will be almost *exactly* the size needed to accommodate the SunOS software chosen. Then you will return to the DISK Form to expand `/usr` as per your Partition Planning Worksheet.

```
PARTITION START_CYL BLOCKS    SIZE     MOUNT PT            PRESERVE(Y/N)
=============================================================================
    a     0         32025     16       /                        n
    b     61        59850     30
    c     0         639450    327
    d     0         0         0
    e     0         0         0
    f     0         0         0
    g     175       9975      5        /usr                     n
    h     194       537600    269      /home                    n
```

The size of the `/usr` partition need not and cannot be directly changed if `/usr` is the free-hog.

When you complete the table, SunInstall prompts

```
O.K. to use this partition table [y/n] ?
```

7. Enter **y** to use the displayed table or **n** if you wish to change it.

   When you accept the table, SunInstall prompts

   ```
   Are you finished with this form [y/n]?
   ```

8. Enter **y** if you are defining only one disk. Otherwise, enter **n** and fill out additional DISK Forms until you have completed one for each of your disk drives. Then enter **y**, indicating that you are finished with the DISK Forms.

Completing the SOFTWARE Form

From the SunInstall Main Menu, complete the SOFTWARE Form as follows:

1. Select `assign software information` from the Main Menu.

   SunInstall displays the SOFTWARE form.

```
SOFTWARE FORM          [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
    [add new release]  [edit existing release]
```

2. Select `add new release`.

   SunInstall requests the device name and location of the device on which the Release 4.1.2 media resides.

```
SOFTWARE FORM          [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
   x[add new release]  [edit existing release]

 Media Information:
    Media Device     : [st0] [st1] [st2] [st_]* [xt0] [mt0] [fd0] [sr0]
    Media location   :  [local]  [remote]
```

3. Complete the **Media Information** fields, using the following examples as a guide.

---

* Selecting `[st_]` will allow you to specify the `st` device number manually. This feature allows selection of SCSI devices 3–7 when necessary.

Example for CD-ROM in Local SunCD Drive:

```
SOFTWARE FORM          [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
   x[add new release]  [edit existing release]


 Media Information:
    Media Device     :  [st0] [st1] [st2] [st_] [xt0] [mt0] [fd0] x[sr0]
    Media Location   :  x[local]  [remote]
```

Example for CD-ROM in Remote SunCD Drive:

When reading from a media device attached to a remote system make sure that the hostname of the system being installed is included in the `/.rhosts` file of the remote system.

Note that including the hostname of the system being installed in the `/.rhosts` file allows superuser (root) access to the remote system from your workstation. For increased security, be sure to remove the hostname from the `/.rhosts` file once you have completed the installation.

```
SOFTWARE FORM          [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
   x[add new release]  [edit existing release]


 Media Information:
    Media Device     : [st0] [st1] [st2] [st_] [xt0] [mt0] [fd0] x[sr0]
    Media location   :  [local]  x[remote]
    Media Host       :  persephone
    Media Host's Internet Address :  195.5.2.16
```

Having gathered the information needed to access the Release 4.1.2 media, SunInstall prompts:

```
Ok to use these values to read the table of contents [y/n] ?
```

4. Enter **y** if the values are correct or **n** if you need to change any of them.

   When you elect to use the displayed information, SunInstall expands the form as shown below.

```
SOFTWARE FORM            [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
   x[add new release]  [edit existing release]


 Media Information:
    Media Device    : [st0] [st1] [st2] [st_] [xt0] [mt0] [fd0] x[sr0]
    Media location  :  x[local]  [remote]

Choice:   [all]  [default]  [required]  [own choice]
  Executables path:  /usr
  Kernel executables path: /usr/kvm
```

5. Specify your software selection method by choosing one of the following:

   `all` — Automatically selects all SunOS software categories.

   `default` — Automatically selects the *default* software categories, and then asks you to pick the other software you want.

   `required` — Automatically selects the *required* categories, without allowing you to pick additional software.

   `own choice` — Automatically selects the *required* categories, and then asks you to pick the other software you want.

   (The default software selection includes all required categories and selected common and desirable categories as shown in Table 5-4. See Table 1-5 for detailed information about the listed categories.)

Table 5-4 *Default Software for Networked Systems*

Required Categories	Common and Desirable Categories
root	Debugging
usr	RFS
Kvm	SunView_Users
Install	Sys
Networking	System_V
	TLI

6. Press Return in the following fields to use the standard paths to executable files.

   ```
   Executables path:
   Kernel executables path:
   ```

SunInstall prompts:

```
Ok to use these values to select Software Categories [y/n] ?
```

Software selection will begin when you answer this prompt. Read the remainder of this step to preview the selection process *before* responding to this prompt.

Unless you selected `all` or `required` at step 5, you'll be able to pick exactly which optional software to install. SunInstall will display category names, one by one, and prompt:

```
Select this media file [y/n] ?
```

Software selection is in progress in the following example.

```
SOFTWARE FORM            [?=help] [DEL=erase one char] [RET=end of input data]
------------------------------------------------------------------------------
Software Architecture Operations:
     x[add new release]  [edit existing release]


 Media Information:
    Media Device      : [st0] [st1] [st2] [st_] [xt0] [mt0] [fd0] x[sr0]
    Media location    : x[local]  [remote]


Choice:   [all]  [default]  [required]  x[own choice]
    Executables path:  /usr
    Kernel executables path: /usr/kvm

Destination fs:  /usr (sd0g)                                      47210496
                                                        Hog: sd0h  31334400
Name: SunView_Programmers (optional)                       Size :  2150400



Select this media file [y/n] ? _                        status: not selected
[RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

In the example, "SunView_Programmers" is the software category presented. Answering **y** to the `Select this media file [y/n] ?` prompt will mark this category for installation on your system. Answering **n** will skip it. In either case, SunInstall will then go on to present the next category for your consideration.

A variety of disk space parameters are also presented, as the following details show:

```
Choice:  [all]  [default]  [required]  x[own c
    Executables path:  /usr
    Kernel executables path:  /usr/kvm

Destination fs:  /usr (sd0g)

Name:  SunView_Programmers  (optional)
```

The destination filesystem is `/usr`.

The software category and its type.

Indicators at the right-hand side of the screen show—**in bytes**—the size of the software category, the current size of the free-hog partition, and the changing state of the destination filesystem. The following detail examines this region more closely.

```
]  x[own choice]
usr
ath:  /usr/kvm

                                            47210496
                                Hog:  sd0h   31334400
                                     Size:   2150400
```

Available space in destination filesystem.‡
Current size of the free-hog partition.
Size of the displayed software category.

7. Unless you wish to change your software selection method, enter **y** to use the displayed values and begin software selection.

‡ Pay particularly close attention to this value if your `/usr` partition is the designated free-hog. When software selection is complete it will represent the space available in `/usr` for Sun unbundled products, products from other vendors, locally developed programs, and general free space.

After all of the categories have been presented and responded to, SunInstall summarizes the selected categories for you:

```
SOFTWARE FORM          [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
     x[add new release]  [edit existing release]


 Media Information:
    Media Device     : x[st0] [st1] [st2] [st_] [xt0] [mt0] [fd0] [sr0]
    Media location   : x[local]  [remote]


Choice:   [all]  [default]  [required]  x[own choice]
    Executables path:  /usr
    Kernel executables path: /usr/kvm


Media Filenames:
root             SunView_Users
usr              SunView_Programmers
Kvm              Text
Install          Manual
Networking


Ok to use this architecture configuration [y/n] ?
[RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

8. Enter **y** to use the configuration or **n** if you wish to go back and try again.

   When you elect to use the configuration, SunInstall prompts:

   ```
   Are you finished with this form [y/n] ?
   ```

9. Enter **y** to exit the form and redisplay the Main Menu.

Rechecking Partition Sizes

The Main Menu should now be displayed, with the cursor next to the item:

```
start the installation
```

Before you select `start the installation` follow these steps to check and adjust the current partition sizes.

1. Press Control–B to move the cursor back through the menu items.
2. Select `assign disk information`.

   The DISK Form is displayed once more.

```
DISK FORM            [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------
Attached Disk Devices :
   [sd0]
```

3. Select each disk in turn.

   The **Disk Label** field contains a new item, `data file`. This item displays the disk label from the installation database, where all of the information you've entered so far is stored.

```
DISK FORM            [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------
Attached Disk Devices :
   x[sd0]

Disk Label:  [default]  [use existing]  [modify existing]  [data file]
Free Hog Disk Partition :  [d]  [e]  [f]  [g] x[h]
Display Unit             : x[Mbytes]  [Kbytes]  [blocks]  [cylinders]
```

4. Select `data file` to display the new partition sizes. Since you last viewed the form, two partitions should have changed:

   - The `/usr` partition should be larger.
   - The free-hog partition should be smaller.

   SunInstall took space from the free-hog partition to expand the `/usr` partition when you selected software. The `/usr` partition is now just the size needed to accommodate the software you selected.

   If partition sizes have not changed (perhaps `/usr` was the free-hog) skip to step 6. Otherwise, adjust the partition size as described in the step 5.

5. Finish sizing the `/usr` partition:

   Refer to your Partition Planning Worksheet to find the amount of space you have decided to allow above and beyond that required by the operating system files (space for other files and free space for expansion). Add that space to the current size of `/usr` and edit the `SIZE` field accordingly.

6. Unless you want to make additional changes to the table, press Return enough times to reach the prompt line:

```
Ok to use this partition table [y/n] ?
```

and enter `y`.

7. SunInstall will display:

```
Are you finished with this form [y/n] ?
```

If you have more disk drives to check answer `n` and repeat steps 3 through 6 for each drive. When all disks have been checked enter **`y`** to redisplay the Main Menu.

Letting SunInstall Run

The Main Menu should now be displayed. Move the cursor to:

```
start the installation
```

Type **`x`** to begin the installation.

Your screen will reflect the progress of the installation as SunInstall labels the disk, creates the specified filesystems, and loads software from the Release 4.1.2 media. Depending on the software categories you chose earlier, you may be asked to load additional media, as shown in the following example:

```
System Installation Begins:
Label disk(s):
        sd0
Create/check filesystems:
Creating new filesystem for / on sd0a
newfs /dev/rsd0a >> /etc/install/suninstall.log 2> &1
. . .
Extracting sunos.4.1.2.sun4c 'root' media file ...
Extracting sunos.4.1.2.sun4c 'usr' media file  ...
Extracting sunos.4.1.2.sun4c 'Kvm' media file  ...
Extracting sunos.4.1.2.sun4c 'Install' media file ...
Extracting sunos.4.1.2.sun4c 'Networking' media file ...
Please mount sun4.sunos.4.1.2 release media #2
Press <return> to continue
```

If There's a Problem

If SunInstall should, for some reason, fail or have to be aborted during its run, it will save the data files that were created as you filled in the forms. You can remedy the problem and then re-invoke SunInstall, going directly to "`start the installation`." SunInstall may prompt:

```
Some software has already been loaded.
Are you sure you want to restart the installation (y/n) ?
```

Answering "`y`" will have SunInstall restart its run using the data you have already entered.

When SunInstall Completes

What happens after SunInstall extracts the last software category depends on how you filled in the `Reboot after completed` field on the HOST Form.

- If you selected **y**, your system boots automatically. Booting messages appear, followed by a `login` prompt. Refer to Section 5.5, "Deciding What Still Needs to Be Done" for further instructions.
- If you selected **n**, the # prompt reappears. Your system is still running the miniroot.

Installing a Small Kernel

Pre-configured small kernels are available for various configurations. See the *SunOS 4.1.2 Release Manual* for tables that describe available `GENERIC_SMALL` kernel configuration files.

If you want to install an appropriate pre-configured kernel do so by executing:

```
# install_small_kernel
```

The utility is self-explanatory and will ask you for confirmation before making any changes to the system.

Configuring an NIS master or slave

NIS masters and slaves should be configured before they are booted in multi-user mode. See Chapter 16 of the *System and Network Administration* manual for details.

Booting Up Your Workstation

To boot your new operating system from the # prompt do the following:

```
# sync;sync;reboot
```

5.5. Deciding What Still Needs to Be Done

Several basic system administration tasks should be completed following the installation of your system.

Logging In and Setting the root Password

As supplied the SunOS operating system does not have a password protecting the superuser (root) login. Login as "**root**" and then use the `passwd(1)` command to set the password of your choice.

Configuring for Multiple swap Partitions

If you have defined multiple swap partitions, you must add a line to the `/etc/fstab` file for each additional swap area. For example, you define `sd1b` as a swap partition by adding the following line in the `/etc/fstab` file:

```
/dev/sd1b swap swap rw 0 0
```

Then enter:

```
# swapon -a
```

(From now on `swapon` will be executed automatically each time the system is booted.)

Configuring for tmpfs

If you have decided to use the tmpfs virtual file system for the `/tmp` directory do the following:

- Add this line to the file `/etc/fstab`:

```
swap /tmp tmp rw 0 0
```

- Enter:

```
# mount /tmp
```

- In the file `/etc/rc.local` find the line:

```
#mount /tmp
```

and remove the sharp sign (#):

```
mount /tmp
```

From now on, the `/tmp` directory will be mounted automatically each time the system is booted.

- When you build and install a custom kernel include the following line in the kernel configuration file:

```
options TMPFS  # tmp (anonymous memory) file system
```

(The tmpfs facility is included in the `GENERIC` kernel.)

Building and Installing a Custom Kernel

For best workstation performance you should make and install a custom operating system *kernel*. The kernel is a program which is loaded into memory when your workstation is booted and which then controls all aspects of system operation. The default kernel is called the *GENERIC* kernel. This kernel includes the software necessary to access all of Sun's peripheral hardware. While this is useful during installation it also means that the kernel includes much more software, and is therefore much larger, than is required for any specific system. This excessive size means an inefficient kernel which uses up memory that can be put to better use and provide improved performance.

Complete instructions for creating and installing a custom kernel for your workstation are given in Chapter 9, "Reconfiguring the System Kernel", of *System and Network Administration*.

If you chose to install a `GENERIC_SMALL` kernel at the conclusion of running SunInstall, that kernel will provide improved performance as compared to the `GENERIC` kernel. You may still, however, see some further improvement by creating a kernel matched to your specific configuration.

Setting Up Your Personal Account

Refer to the manuals *Getting Started with SunOS: Beginner's Guide* and *Setting Up Your SunOS Environment: Beginner's Guide* for assistance.

For Desktop SPARCstations, refer to your Owner's Set for information on setting up your personal account.

Customizing Your Environment

Refer to Chapter 8 of *System and Network Administration Manual*, Administering Workstations, Section 8.1. Here you will find the information you need for setting up user home directories, enabling electronic mail, etc.

Backing Up Your New System

Once you have customized your system to suit your needs it should be *backed up*. This means recording the information contained on your disks onto a different media, usually tape, for safekeeping. Chapter 6, Section 6.1 of *System and Network Administration* contains the information you will need.

5.6. Example Worksheets for Standalone Workstation

This section presents a sample scenario illustrating installation of a Standalone configuration. Background information for this scenario is presented, followed by facsimiles of Worksheets completed to support the installation process.

Examining this set of completed Worksheets will help you understand the correct use of the Worksheets, provide ideas for implementing similar installation configurations, and generally clarify installation planning.

You can find sets of blank worksheets, along with detailed explanations of the worksheets themselves, in Appendix E, "Installation Worksheets."

Completed Worksheets: Standalone Workstation

Scenario: aslan

aslan is a Sun-4/330 (also known as a SPARCstation 330) which will be installed as a networked standalone workstation. The system has 24 Mbytes of main memory, and a GX (cgsix) graphics accelerator supporting a bit mapped color monitor.

Peripheral equipment includes a 327 Mbyte internal SCSI disk drive and a 150 Mbyte Quarter Inch Cartridge (QIC–150) tape drive.

Standalone Scenario:
aslan

Preliminary Information Worksheet

Name: aslan

Hardware Information:

Workstation Model: sun-4/330 1

Workstation Architecture: sun4 . sun4 2

Media Device Type: sr 3 and Number: 0 4

Media Device Name: sr0 5

System Disk Name: sd6 6

Other Disk Devices (if any): 7

Name: _____ Name: _____

Name: _____ Name: _____

Name: _____ Name: _____

System Console Device: sun 8

Miscellaneous Information:

Local Timezone: Pacific 9

Standalone Scenario:
aslan

Host Form Worksheet

Workstation Information:

Name : aslan [1]

Type : ☒[standalone] ☐[server] ☐[dataless] [2]

Network Information:

Internet Address : 192 . 9 . 11 . 6 [3]

NIS Type : ☐[none] ☐[master] ☐[slave] ☒[client] [4]

Domain name : SW-support [5]

Miscellaneous Information:

Reboot after completed : ☐[y] ☒[n] [6]

Dataless Configuration Information:

Server name : _____ [7]

Server Internet Address : _____ . _____ . _____ . _____ [8]

Path of the executables on server: `/export/exec/`*app_arch* [9]

Path of the kernel executables on server: `/export/exec/kvm/`*kernel_arch* [10]

Standalone Scenario:
aslan

Partition Planning Worksheet

	Partition/Filesystem	Size	Position
–Required–			
◙	/ (root)	16	sd6a
◙	swap	32	sd6b
◙	/usr*	--------	sd6g
	Sun unbundled	Ø	----------
	other vendors	+ Ø	----------
	Local software	+ Ø	----------
	Free Space	+ 10	----------
	Total over and above	= 15	----------
–Common–			
☒	/home	*	sd6h
–Optional–			
☐	/tmp		
☐	/var		
☐	second swap		
–Servers–			
☐	/export	--------	
	Sun unbundled†		----------
	other vendors†	+	----------
	Local software†	+	----------
	Free Space	+	----------
	Total over and above	=	----------
☐	/export/swap	+	
–Custom–			
☐			
☐			
☐			
☐			
☐			

* /usr is required for all configurations *except dataless*.

† Only for software to support clients of an *application architecture* different from the server's.

Disk Form Worksheet

Standalone Scenario:
aslan

Disk Drive: sd6

PARTITION	SIZE	MOUNT PT	PRESERVE
a	16	/	N
b	32	(swap)	
c	327	----------	----------
d			
e			
f			
g	15	/usr	N
h	*	home	

Software Form Worksheet

Standalone Scenario:
aslan

a-arch.k-arch: sun4 . sun4

	Category	Prerequisites
◉	**root**	–
◉	**usr**	–
◉	**Kvm**	–
◉	**Install**	–
◉	**Networking***	–
☒	**Debugging**	SunView_Users
☐	**RFS**	TLI, Sys
☒	**Sys**	–
☒	**System_V**	–
☐	**TLI**	–
☐	**OpenWindows_Users**	SunView_Users
☐	**OpenWindows_Fonts**	OpenWindows_Users
☒	**SunView_Users**	–
☒	**Demo**	SunView_Users, SunView_Programmers, OpenWindows_Users, OpenWindows_Programmers
☐	**OpenWindows_Demo**	OpenWindows_Users, OpenWindows_Fonts
☒	**Games**	SunView_Users
☐	**Graphics**	SunView_Users, SunView_Programmers
☐	**Manual**	Text
☐	**Security**	–
☐	**Shlib_Custom**	–
☒	**SunView_Demo**	SunView_Users, SunView_Programmers
☒	**SunView_Programmers**	SunView_Users
☐	**OpenWindows_Programmers**	OpenWindows_Users, OpenWindows_Fonts
☒	**Text**	–
☐	**User_Diag**	SunView_Users
☐	**uucp**	–
☐	**Versatec**	–

* Only required if the system is connected to a network.

6

Installing a Homogeneous Server

Chapter 6 details the steps required to complete the installation of a Homogeneous Server System using the Custom Installation method.

There are four general tasks to be completed:

- **Planning Your Installation**

  Final planning, including determining the layout of your system disk(s) and the configuration of each of the Diskless Client workstations which the server will support.

- **Performing Preliminary Software Procedures**

  Formatting and labeling your disk(s) (if necessary) and loading the software necessary to execute SunInstall.

- **Running SunInstall**

  Executing the SunInstall software installation program to actually install the operating system software on your workstation.

- **Deciding What Still Needs to be Done**

  Primary system administration procedures which you should carry out as soon as your system is installed.

6.1. Planning Your Installation — Disk Partitioning

Much of the planning required before you begin the actual installation of your workstation was completed as you worked through Chapter 1. At this point you should already have completed the following worksheets:

- Preliminary Information Worksheet
- Host Form Worksheet
- Software Form Worksheet

This section will help you complete the final worksheets:

- Partition Planning Worksheet
- Disk Form Worhsheet
- Client Form Worksheet

Go to Appendix E and pull out one copy of the Partition Planning Worksheet. Also get a copy of the Disk Form Worksheet for each disk drive attached to your system, and a copy of the Client Form Worksheet for each Diskless Client workstation that will be supported by the server. Refer to and fill in the Worksheets as you work through this section.

Disk drives used with Sun workstations are divided into as many as eight sections called *partitions* (labeled `a` through `h`). Each disk partition looks to the operating system and the user as though it were a separate disk drive, and each may be used for a specific purpose. An individual partition may be used in its *raw* state, most often as swap and paging space for the SunOS virtual memory system. Most partitions, however, will be structured as *filesystems* and used to store UNIX files.

Individual filesystems are designated to store various broad classes of files including operating system software, user data files, and perhaps such things as database files for application software. This section will help you to decide what partitions you should define for your disk(s), how to use each partition, and what size each partition should be.

If you are unfamiliar with computer disk drives and such terms as *partition, cylinder, sector,* and *head*, please refer to Appendix D, "Disk Structure and Disk Space Terminology."

The SunInstall program provides a default disk layout for homogeneous server systems that you can use "as is" or modify as needed. This layout only addresses the system disk and will have to be modified if your system has more than one disk drive.

If your system was previously installed as a homogeneous server, you may wish to base disk partitions on the existing disk layout.

Disk Layout — Default Partitions

The number of default partitions depends upon the capacity of your system disk. Table 6-1 shows the default layouts for homogeneous server configurations.

Table 6-1 *Default Partitions for Homogeneous Servers (Release 4.1.2)*

Partition	Assignment
a:	/
b:	(swap)
c:	(whole disk)
d:	/export
e:	/export/swap
f:	—
g:	/usr
h:	/home

The default size (as shipped from the factory) of the root (/) and swap partitions varies depending on the type and capacity of the disk. Table 6-2 shows the default sizes.

Table 6-2 *Default root and swap Partition Sizes*

Disk Type	Disk Size	Root Size	Swap Size
sd	<130 MB	8 MB	16 MB
sd	>130<300 MB	8 MB	32 MB
sd	>300 MB	16 MB	32 MB
xd, xy and id	<600 MB	8 MB	16 MB
xd, xy and id	>600 MB	16 MB	32 MB

NOTE *On SPARCsystem 600MP machines, swap size is 64 MB.*

The root (/) Filesystem

Every SunOS *system disk* must have its a partition defined as the root (/) filesystem. The root filesystem consists of /, the root directory, and subdirectories such as /etc, /dev, /tmp, and /var.

The default root partition size should be usable for nearly all installations. About 3.5 MB of this space will be used by operating system files. The remainder is available for use by 'scratch' files created in the /tmp directory, and temporary log and spool files created in the /var directory.

The swap Partition

This area of the disk (normally the `b` partition of the system disk) is reserved to implement the virtual memory feature of SunOS. (Note: This area is used only by the server system. Swap space for its clients is provided elsewhere.) The default size will be adequate in many circumstances, but the following issues should be considered.

- Workstations with color monitors

  A minimum of 24 MB of swap space is recommended if your workstation has a color monitor.

- Workstations with large main memories

  Your swap space **must** be larger than the size of the memory installed in your workstation. For example, if your workstation has 32 MB of main memory, designate at least 34 MB for your swap area. If your workstation has 64 MB of main memory, designate at least 66 MB for your swap area.

- Application programs

  Some application programs require large amounts of swap space. As an example, LISP applications can require 40 MB or more of swap.

The `c` Partition

Every disk drive used with the SunOS operating system must, by convention, have a `c` partition defined. This partition is used by the operating system to reference the entire disk. It is defined automatically by Sun's `format(8S)` and `suninstall(8)` programs and should not be altered.

The `/export` Filesystem

This filesystem is assigned, by convention, to the `d` partition of the system disk. In its `/export/root` subdirectory it will contain the root (`/`) filesystems of the diskless clients supported by the server, each in its own subdirectory. (That is, `/export/root/`*client1* for the diskless client *client1*, `/export/root/`*client2* for the diskless client *client2*, and so on.) These subdirectories will include the `/etc`, `/dev`, `/tmp`, and `/var` subdirectories of each client.

A good rule of thumb is to allow approximately 5 MB of space in the `/export` partition for each client supported by the server or *planned* for in the near future. About 3 MB of this space per client will be used by operating system files. The aggregate space remaining will be shared by the clients.

The `/export/swap` Filesystem

This filesystem is assigned, by convention, to the `e` partition of the system disk. It holds the files used by the server's diskless clients for swap space. Each client has its own swap file. For example, the diskless client *client1* would use the swap file `/export/swap/`*client1*.

To choose a size for the `/export/swap` partition, determine the required swap space for each individual client using the same criteria as you did for the server itself (see "The Swap partition" above). (Record these at this time on a Client Form Worksheet for each client.) Then add up a total for all of the clients. Remember to allow space for clients that you plan to add to the server in the near

future. The default is 16 MB per client.

The /usr Filesystem

This filesystem is assigned, by convention, to the g partition of the system disk. It contains the bulk of the operating system files, including executable programs, program libraries, and documentation. It is also frequently used to hold unbundled application programs from Sun, application programs from other vendors, and locally developed programs. The content of /usr is shared by the homogeneous server with its clients. Some free space should be available in /usr in which to build a custom kernel for your workstation and to allow for the addition of new programs over time.

The partition size needed for /usr varies widely from installation to installation. Several factors should be examined to choose an appropriate size for your installation.

- Operating system software

  Operating system files will require a minimum of about 35 MB to a maximum of about 150 MB, depending on which optional software categories you chose for your workstation in Chapter 1. Don't bother to add up the individual sizes listed in Table 1-5 exactly. SunInstall will do this for you during the installation process.

- Sun unbundled products

  If you will be adding other Sun products to your workstation (programming languages, office automation, databases, etc), check the installation literature they provide to find the amount of space each will require in /usr. Total this figure and record it on the Partition Planning Worksheet.

- Products from other vendors

  Again, refer to the literature provided with these products and record the total space required.

- Locally developed programs

  Allow space for locally developed programs, if any.

- Free space

  You should allow an additional 3 MB of space for use in building a custom kernel for your workstation. Still more free space over and above this is an excellent idea if the total disk space available allows. On most workstations programs and files get added to /usr from time to time and the filesystem slowly fills up, so plan ahead. **Running out of space in /usr after the system is installed is very inconvenient. Be as generous as you can within the constraints of the total disk space available to you. Figure all of your expected needs and then add some more, perhaps 20%, for good measure.**

The /home Filesystem

The /home filesystem is used for user home directories, will be empty when the installation completes, and will begin to fill as you establish user accounts (personal work areas). An overall goal of disk partitioning strategy should be to maximize the space available to users, commensurate with the resource needs of the operating system and application programs to support the users. To this end, in the default disk partitioning scheme /home is automatically sized by SunInstall to encompass all of the space not claimed by the other partitions.

Disk Layout — Optional Partitions

In addition to the default partitions you may wish to define some others. These may be considered "fine tuning." Nearly all systems will operate just fine without them.

The /tmp Filesystem

The /tmp directory is, by default, contained within the root filesystem. It is intended for use as system 'scratch' file space; for example, intermediate files are created and deleted in /tmp by the C compiler as it runs. All files in /tmp are deleted each time the workstation is rebooted.

A new feature since SunOS 4.1, *tmpfs*, allows a temporary filesystem to be made in operating system virtual memory. This has performance advantages, especially for short-lived scratch files, and allows some of the system swap partition to be used for file space on demand. As such, it is an excellent way to support /tmp, reducing the demand for space in the root filesystem and, at the same time, providing a potential performance improvement.†

NOTE: Files and directories created in a tmpfs filesystem are truly temporary. They disappear without recourse upon a umount(8) **of the filesystem and each time the workstation is rebooted.**

Planning on using tmpfs to implement the /tmp directory may eliminate any need to expand the root partition from its default size. Tmpfs is defined after your system has been installed. You need do nothing right now. Section 6.6, "Deciding What Still Needs to Be Done" at the end of this chapter includes instructions for configuring tmpfs at that time.

The /var Filesystem

The /var directory is, by default, contained within the root filesystem. It contains files that tend to vary in size; for example:

The /var/tmp directory provides a workspace for users and temporary storage for programs such as the vi(1) editor.

Spooling programs create files in subdirectories of /var/spool, such as /var/spool/mail for incoming mail, /var/spool/lpd for queued print jobs, and so on.

System accounting information and log messages are collected in the /var/adm and /var/log directories.

† See *System and Network Administration* and tmpfs(4S) for details.

The `/var/yp` directory holds NIS database information on NIS master and slave systems.

Depending on system use, activity in `/var` can consume excessive amounts of space in the root filesystem. It may be appropriate to provide additional space in the root filesystem or, as an alternative, to create a separate `/var` filesystem. Asking yourself the following questions will help you decide if your system needs a `/var` partition and, if so, how big you should make it.

- Is your system a mail server?

  Consider the number of users served and the anticipated amount of mail.

- Is your system a print server?

  Consider the number of attached printers and the anticipated number and size of the print jobs.

- Is your system a uucp host?

  Files will be stored in `/var` while waiting to be transmitted to remote systems.

- Is your system an NIS server?

  Allow space for the NIS maps.

- Will your system use process-level accounting?

  If not carefully maintained the accounting files quickly become very large.

- Will you use applications that create large temporary files in `/var`?

  Consider the needs of all such programs.

It's unlikely that you need a separate partition for `/var` if you answered no to each of the preceding questions. If you choose to define a `/var` partition, 10 MB would be a minimum size. You might need considerably more space depending on the factors noted above.

Filesystems For Use By Applications

Some application software packages may recommend the creation of separate filesystems for their exclusive use. Check the literature received with any application software for possible requirements.

Disk Layout — Multiple Disk Drives

If your workstation hardware includes more than one disk drive you will need to decide what partitions and filesystems to define on each drive. (If you have only one disk drive skip ahead to Section 6.3, "Preliminary Software Procedures.")

The overall goals here are to make efficient use of the disk space available and to maximize performance by balancing the amount of activity on each of the disks as much as possible. Some guidelines follow. (For purposes of discussion we will suppose a system with two drives named `sd0` and `sd1`.)

What Should Stay on the System Disk?

The root and `/usr` filesystems and the swap partition should remain on the system disk. This will allow the workstation to be booted even if the first drive is the only one running, an advantage should a failure occur on one of the other drives.

Should You Define Multiple swap Partitions?

The SunOS operating system allows more than one partition to be defined for use as swap area. The system interleaves the use of multiple partitions, attempting to make equal use of each partition, thus improving performance. The amount of disk space that you have determined to use for swap can be split between partitions located on different disk drives. For example, if you have decided that you want 40 MB of swap area, you might specify two 20 MB swap partitions, one on `sd0b`, the other on `sd1b`. (Use of the `b` partition for swap space is not a requirement except on drive 0. We use `sd1b` here just for the sake of convention.)

Procedures for designating multiple swap partitions will be presented later in this chapter. For now, simply note the partitions and sizes on your Disk Form Worksheets.

Should You Move One or More Partitions?

The `/home` partition is a prime candidate for moving to the second drive. Just make the proper notations on your Partition and Disk Form Worksheets.

Moving the `/export` partition off of the system drive will likely help performance by evening out the activity on your disks.

If you have decided to designate a separate partition for the `/var` filesystem, put it on drive 1. Availability of a second drive may make creation of a `/var` filesystem attractive from a performance standpoint.

Sample Layout For Two Disks

Table 6-3 suggests a layout for a workstation with two disk drives. An "*" in the *size* column indicates that the partition will be allocated whatever space is left on the disk after the other partitions have been defined.

Table 6-3 *Sample Partition Layout — Two Disk Homogeneous Server*

Disk Drive sd0		
partition	*designation*	*size (MB)*
a	/	15
b	(swap)	20
c	-	327
d	-	-
e	/export/swap	128
f	-	-
g	/usr	*
h	-	-

Disk Drive sd1		
partition	*designation*	*size (MB)*
a	/var	15
b	(swap)	20
c	-	327
d	/export	35
e	-	-
f	-	-
g	-	-
h	/home	*

Assigning partitions to certain partition letters (moving `/home` from `sd0h` to `sd1h`, for example) is not required. Maintaining the convention does, however, help to reduce confusion.

6.2. Planning Your Installation — Diskless Clients

Complete a Client Worksheet for each of your Diskless Clients. As noted on the Worksheet, most of the information required will be filled in by SunInstall automatically. Record the information requested in boldface type for all clients.

Record information for the other fields only if you plan a somewhat unusual configuration. As an example; if you will be supporting a large number of clients and have several disk drives you might choose to distribute their swap files between two or more filesystems (perhaps named `/export/swapA` and `/export/swapB`) rather than in the more conventional `/export/swap`.

6.3. Preliminary Software Procedures

Now it's time to begin using the software tools provided for installing your workstation.

Selecting the Correct Media

First you'll need to select the correct CD-ROM) with which to install your workstation. The label on the disc should specify the same kernel architecture as you have noted for your workstation on Preliminary Information Worksheet.

Mount the selected CD-ROM in the drive you will be installing from.

Should You Format Your Disk?

You *format* a disk by using the utility program `format(8S)` to write control information used by the disk drive hardware onto a disk. Disk drives provided by Sun are formatted and labeled at the factory. Desktop SPARCstation systems are shipped with SunOS preinstalled.

For preinstalled disks, it is recommended that you check the disk in a nondestructive way to verify that any head movement that may have occurred during

shipment has not affected the performance of your disk.

To check the disk, using the `format` command, follow these steps:

1. Select "Run Format" from the install script.
2. Choose `analyze` from the `format` menu.
3. Choose `read` from the `analyze` menu.

   The `read` option tries to read every block on the disk, but does not destroy any information.

For new disks without preinstalled software, it is recommended that you reformat them. To format your disk(s), select "Run Format" in the MINIROOT install script. See Appendix A of this manual for instructions on running the `format` command. You can also run `format` manually from MINIROOT.

Resizing the root and swap Partitions

If you decided to size your root partition differently from the default, or to size the swap partition on your system disk **smaller** than the default (see your entries on the Partition Planning Worksheet) you must run the `format` program before running SunInstall. Refer to Appendix A for the necessary instructions.

If you do not plan to alter the size of the root partition or decrease the size of the swap partition, continue with "Loading and Booting the Miniroot," in the next section. (You can use the SunInstall program without running `format` to make all other adjustments to partition sizes.)

6.4. Loading and Booting the Miniroot

SunInstall will be executed from a minimal version of the operating system called the *miniroot*. The miniroot is designed to be copied into the swap (b) partition of the system disk, thereby leaving the remaining partitions available for loading of the full operating system.

The miniroot copied to the swap area is temporary; as soon as the workstation is booted from the installed operating system it will be over-written by normal paging and swapping activity. If you need to use it again, it will have to be copied into the swap area again.

Miniroot load and boot procedures are given here for those systems which will be installed from an attached CD-ROM drive (local installation). Procedures for loading the miniroot from a remote CD-ROM, are given in Appendix B — "Loading and Booting the Miniroot from a Remote CD-ROM."

Local Procedure from CD-ROM

At this time your workstation should be powered on and displaying the `>` or `ok` PROM monitor prompt. If the workstation is not displaying the PROM monitor prompt, hold down the L1/STOP key and press the A key and it should appear.

To boot the miniroot from CD-ROM, enter the following command at the PROM monitor prompt:

- For Sun4 systems:

```
> b sd(0,30,1)
```

- For Sun4c systems prior to the SPARCstation 2 (such as the SPARCstation 1, IPC, and SLC):

```
> b sd(0,6,2)
          or
ok boot sd(0,6,2)
```

- For Sun4m and Sun4c systems beginning with the SPARCstation 2:

```
ok boot cdrom
        or
> b cdrom
```

After you successfully begin installing the miniroot, your system should display the following messages:

```
What would you like to do?
  1 - install SunOS mini-root
  2 - exit to single user shell
Enter a 1 or 2:
```

Follow these steps to continue the installation:

1. Enter **1** to indicate that you want to continue the installation.

   If your system has only one disk, the miniroot is copied to that disk. If your system has more than one disk, you are asked to specify a disk number as illustrated in the following display:

```
Beginning system installation - probing for disks.
Which disk do you want to be your miniroot system disk?
  1 - sd0:  disk description
  2 - sd1:  disk description
  3 - exit to single user shell
Enter a 1, 2, or 3:
```

   Enter **1** to select the system disk.

2. Before the miniroot is copied to the specified disk, you are given an opportunity to format and relabel the disk.

```
selected disk unit "sd0".
Do you want to format and/or label disk "sd0"?
    1 - yes, run format
    2 - no, continue with loading miniroot
    3 - no, exit to single user shell
Enter a 1, 2, or 3:
```

You do not need to run `format` unless you believe that something is wrong with the disk, or you have chosen to resize the root or decrease the swap partition, or it is a new unlabeled disk from a third-party vendor.

1. Enter **2** to continue.

   Messages such as those that follow are displayed:

```
checking writability of /dev/rsd0b
0+1 records in
1+0 records out
Extracting miniroot ...
```

Additional, media-specific messages are displayed. This process may take several minutes to complete, at which point the following message is displayed:

```
Mini-root installation complete.

What would you like to do?
   1 - reboot using the just-installed miniroot
   2 - exit into single user shell
Enter a 1 or 2:
```

2. Enter `1` to boot the miniroot.

   Additional messages are displayed as the system boots.

```
syncing file systems... done
rebooting...
Booting from: sd(0,0,1)
root on sd0b fstype 4.2
Boot: vmunix
Size: 811008+114720+60112 bytes
SunOS Release 4.1.2(MINIROOT) #4: Wed Feb 13 01:10:16 PDT
Copyright (c) 1991 by Sun Microsystems, Inc.
 .
 .
 .
WARNING: CLOCK GAINED 14 DAYS -- CHECK AND RESET THE DATE!
root on sd0b fstype 4.2
swap on sd0b fstype spec size 04070K
dump on sd0b fstype spec size 14056K
#
```

The process is complete when the root prompt (#) is displayed.

Now you are ready to invoke the SunInstall program, and continue with Section 6.5, "Running SunInstall," below.

6.5. Running SunInstall

SunInstall is an interactive, menu-driven program that operates in the following way:

1. You invoke the program and use its preliminary menus to set the system clock and to specify your console display device (Sun workstation or other terminal).
2. Next, you fill out a series of forms each describing a different aspect of the installation.
3. Then, upon confirmation from you, SunInstall begins the actual installation of your system, loading operating system software onto your disk(s).

If you are using a terminal (not a Sun bit mapped display) as system console and have not yet determined the `/etc/termcap` name for the terminal, now is the time to do it. See E.1.1 "Preliminary Information Worksheet" in Appendix F for complete instructions.

Starting the SunInstall Program

Invoke the SunInstall program from the miniroot as follows:

```
# suninstall
```

You are ready to use the program when this screen is displayed:

```
                    Welcome to SunInstall

    Remember:  Always back up your disks before beginning an installation.

SunInstall provides two installation methods:

    1. Quick installation:

   This option provides an automatic installation with a choice
      of standard installations, and a minimum number of questions asked.

    2. Custom installation:

       Choose this method if you want more freedom to configure your
       system.  You must use this option if you are installing your
       system as a server.


       Your choice (or Q to quit) >>
```

Entering Initial Information

The following steps will provide SunInstall information about your system's console terminal, the time zone you are in, and the current date and time.

These steps employ a simple convention.

- *enter*
  denotes keyboard input with an ending Return (the ensuing action takes place when you press the Return key).
- *type*
  denotes keyboard input without a Return following. (The ensuing action takes place as soon as you type a character.)

1. Enter **2** in response to the SunInstall Welcome screen, selecting a custom installation.

SunInstall automatically checks for your terminal type. If you are using a Sun bit-mapped display, SunInstall does not ask for your terminal type and skips to the next step.

If you are not using a Sun bit-mapped display, SunInstall prompts you for your terminal type, as shown in Step 2.

```
Select your terminal type:
        1) Televideo 925
        2) Wyse Model 50
        3) Sun Workstation
        4) Other

>>
```

2. Enter a number from `1` to `3` to specify your terminal type from those listed, or `4` if your terminal is of some other type.

   If you choose `4` (Other) SunInstall asks you to enter the name of your terminal as it appears in the `/etc/termcap` file. Refer to the "Preliminary Information Worksheet" for this information.

   After you enter your terminal type SunInstall will ask for your local time zone name:

```
Enter the local time zone name (enter ? for help):
```

3. Although you can enter time zone information from the keyboard, it's easiest to use the on-line help facility:

   Enter **?** to display the TIMEZONE menu.

```
TIMEZONE MENU                                                    [?=help]
-------------------------------------------------------------------------

             Select one of the following categories to display
               a screen of time zone names for that region

                      _ United States

                        Canada

                        Mexico

                        South America

                        Europe

                        Asia

                        Australia and New Zealand

                        Greenwich Mean Time


Are you finished with this menu [y/n] ?
 [RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

4. Move the cursor to the appropriate time zone name (by typing Return) and then type **x** to display a corresponding menu of time zones.

   The UNITED STATES menu is shown here.

```
UNITED STATES MENU                                                [?=help]
-------------------------------------------------------------------------
        TIME ZONE NAME              AREA

       _ US/Eastern                  Eastern time zone, USA

         US/Central                  Central time zone, USA

         US/Mountain                 Mountain time zone, USA

         US/Pacific                  Pacific time zone, USA

         US/Pacific-New              Pacific time zone, USA
                                     with proposed change to Daylight
                                     Savings Time near election time

         US/Alaska                   Alaska time zone, USA

         US/East-Indiana             Eastern time zone, USA
                                     no Daylight Savings Time

         US/Hawaii                   Hawaii


Are you finished with this menu [y/n] ?
 [RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

SunInstall prompts:

```
Are you finished with this menu [y/n] ?
```

5. Enter **y** to exit this menu and redisplay the TIMEZONE menu.
6. Enter **y** again to exit the TIMEZONE menu.

SunInstall now asks you to confirm the current date and time, as in the following example:

```
Is this the correct date/time: Thu Feb 22 17:10:15 PDT 1990
   [y/n] >>
```

7. Enter **y** if the displayed information is correct. Otherwise, enter **n** and press the Return key. The Set Time screen appears. The format for the Set Time screen display depends on which time zone you selected. Press Delete, Control-U or the Backspace key to erase the sample response. Then enter the correct date and time using the format that is displayed for your time zone, and press the Return key.

   As an example, on the third day of June, 1990 at three o'clock in the afternoon you could enter:

```
>> 03/06/90 03:00 pm
```

   After you press the Return key, SunInstall would respond:

```
Is this the correct date/time: Sun Jun 3 15:00:12 PDT 1990
   [y/n] >>
```

   Enter **y** if the displayed information is correct and **n** if you want to try again. (Note that SunInstall displays in twenty-four hour time, thus three o'clock in the afternoon is displayed as 15:00.)

   SunInstall sets the system clock and displays the Main Menu.

Figure 6-1 *SunInstall Main Menu: First Appearance*

```
MAIN MENU                                                          [?=help]
-------------------------------------------------------------------------
                Sun Microsystems System Installation Tool

                  ( + means the data file(s) exist(s) )

                    _ assign host information



                      exit SunInstall


[RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

Now you are ready to begin filling out the SunInstall forms.

The Main Menu

The core of the installation process involves completing several *forms*, each one relating to a specific aspect of your configuration.

You select forms from the SunInstall Main Menu. When first displayed, the menu is as shown above, with just one menu item, `assign host information`, displayed. This is the current item, the one that is selected if you simply type **x** or **X**.

The main menu will reflect your progress as you work your way through the forms. When, for example, you've completed the HOST Form to assign host information, SunInstall marks that item with a plus sign (+) and requests disk information.

Figure 6-2 *SunInstall Main Menu: After Completing the Host Information Form*

```
MAIN MENU                                                        [?=help]
-------------------------------------------------------------------------
                Sun Microsystems System Installation Tool

                  ( + means the data file(s) exist(s) )

                    + assign host information

                    _ assign disk information
```

The information on each completed form is automatically recorded in an installation database. A "+" before a menu item means the database contains the corresponding information. On the Form shown below all required forms have been completed.

Figure 6-3 *SunInstall Main Menu: After All Forms Are Completed*

```
MAIN MENU                                                        [?=help]
-------------------------------------------------------------------------
                Sun Microsystems System Installation Tool

                  ( + means the data file(s) exist(s) )

                    + assign host information

                    + assign disk information

                    + assign software information

                    + assign client information


                    _ start the installation

                      exit SunInstall

[RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

Using the Main Menu

The SunInstall Main Menu allows you to use the following keys to move the cursor about the screen:

SPACE RETURN	move forward, by item, as far as the prompt line
Control–F Control–N	move forward through the menu items
Control–B Control–P	move backward through the menu items

(The cursor-movement keys are noted on the message line at the bottom of the screen.)

Control–L repaint the screen should it become garbled

The choices on the Main Menu allow you to:

display a form

Move the cursor to the corresponding form name, and type **x** or **X**.

exit SunInstall

Move the cursor to `exit SunInstall`, and type **x** or **X**.

display general information about the menu use

Type **?** at any time to display an *On-Line Help Screen*. See Figure 6-4 below for one example. Press Return to redisplay the Main Menu when you are through viewing the help text.

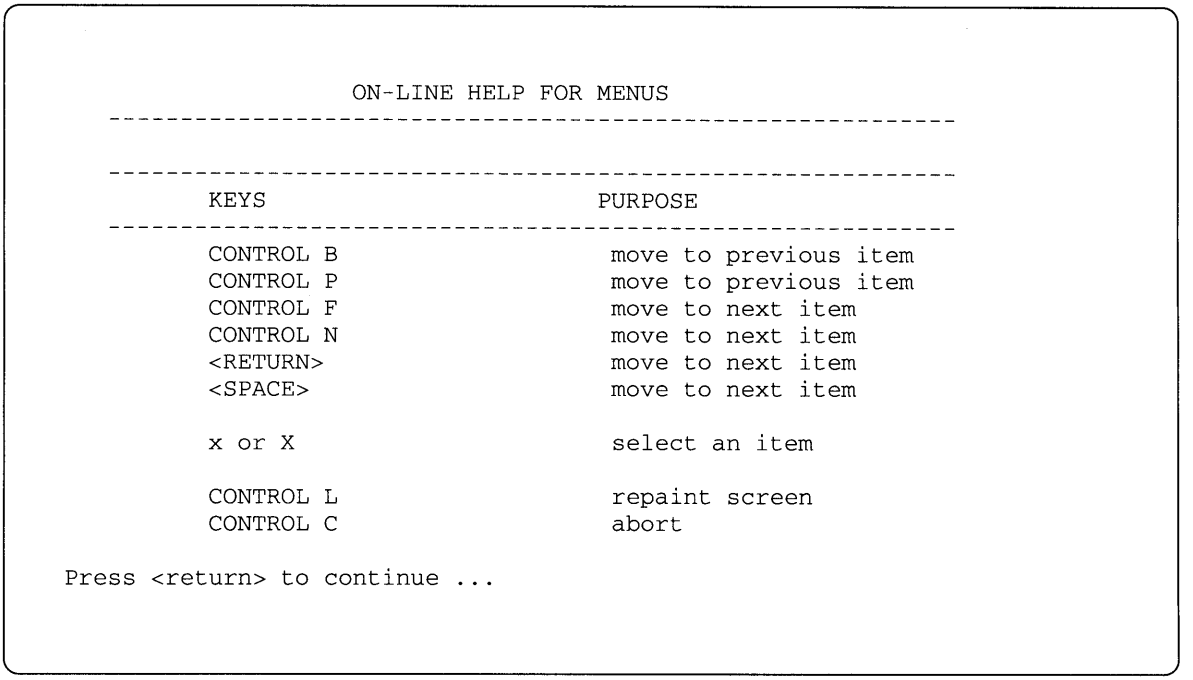
start the installation

When you have completed the last required form, the Main Menu displays:

```
start the installation
```

Type **x** or **X** to begin the installation of your system.

Figure 6-4 *On-Line Help Screen*



```
                    ON-LINE HELP FOR MENUS
-------------------------------------------------------------

-------------------------------------------------------------
        KEYS                          PURPOSE
-------------------------------------------------------------
        CONTROL B                      move to previous item
        CONTROL P                      move to previous item
        CONTROL F                      move to next item
        CONTROL N                      move to next item
        <RETURN>                       move to next item
        <SPACE>                        move to next item

        x or X                         select an item

        CONTROL L                      repaint screen
        CONTROL C                      abort

Press <return> to continue ...
```

Completing the HOST Form

From the SunInstall Main Menu, complete the HOST Form as follows:

1. Select `assign host information`.
2. Complete the form, referring to your Host Form Worksheet and using the following example as a guide.

```
HOST FORM                [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Workstation Information :
     Name : diphthong
     Type :  [standalone]  x[server]  [dataless]


   Network Information :
        Ethernet Interface :  [none] x[le0]

        Internet Address   : 195.5.2.15
        NIS Type           :  [none]  [master]  [slave] x[client]
        Domain name        : em_city.oz.com

   Misc Information :
       Reboot after completed :  [y] x[n]


 Are you finished with this form [y/n] ?
    [x/X=select choice] [space=next choice] [^B/^P=backward] [^F/^N=forward]
```

This example form is the first of many to appear in this procedure. Each uses the same conventions.

- System-specific items are italicized.
- User entries are boldfaced.

Thus, the example Ethernet interface *(le0)* is system-specific information SunInstall displayed, while the example hostname (***diphthong***) and IP address (***195.5.2.15***) are system-specific information the user entered.

When you have completed the last screen field, SunInstall prompts:

```
Are you finished with this form [y/n] ?
```

3. Enter **y** to exit the form.

   The message `updating databases ...` is briefly displayed, followed by the Main Menu.

Completing the DISK Form

From the SunInstall Main Menu complete the DISK Form as follows:

1. Select `assign disk information`.

   SunInstall polls the disk drives and lists their device numbers in the `Attached Disk Devices` field. The form will look like this for most systems with one SCSI disk:

```
DISK FORM            [?=help] [DEL=erase one char] [RET=end of input data]
------------------------------------------------------------------------------
Attached Disk Devices :
   [sd0]
```

2. Select the system disk from among the devices listed. (The system disk will usually be the first one listed.)

   SunInstall then expands the DISK Form:

```
DISK FORM            [?=help] [DEL=erase one char] [RET=end of input data]
------------------------------------------------------------------------------
Attached Disk Devices :
   x[sd0]

Disk Label:  [default]  [use existing]  [modify existing]
Free Hog Disk Partition :  [d]  [e]  [f]  [g] x[h]
Display Unit             : x[Mbytes]  [Kbytes]  [blocks]  [cylinders]
```

Steps 3 through 5 explain how to complete the new fields.

3. In the `Disk Label` field, choose a starting disk label. The choices are:

   - `default`
     Displays the standard partitions for your system configuration. This is the correct choice for new installations and most installations of existing systems as well.

   - `use existing`
     Displays the partitions already defined on the disk but does not allow them to be changed. If you are reinstalling a previously installed system, and you don't want to modify the existing disk partitions, select this option. Note that only the partition sizes are filled in; you must enter the `MOUNT PT` fields by hand.

   - `modify existing`
     Displays the existing partitions on the selected disk and allows them to be changed. Again, the `MOUNT PT` fields must be entered by hand.

4. SunInstall will choose the partition normally associated with users' home directories as the default for the *Free-Hog Disk Partition*. In most cases this

will be correct.

If you have a small disk (under 130 MB), partition `g` will be marked as the free-hog partition. The example forms in this procedure assume that you are installing SunOS Release 4.1.2 on a large disk, therefore partition `h` is the free-hog partition.

The *Free-Hog*

The SunInstall program will help you prepare a disk layout that it will use later to define physical disk partitions. As you refine the layout, the program automatically sees that the total amount of disk space in use by the defined partitions equals the total space available on the disk. SunInstall does so by automatically adjusting the size of one partition on each disk: the *free-hog* partition.

As the other partitions are increased or decreased in size the free-hog is decreased or increased to maintain the correct total. It is common to designate the partition that will hold the users' personal directories (usually `/home`) as the free-hog. This results in the users having as much disk space as possible for doing their work commensurate with the specific disk space needs of the operating system.

The term *free-hog* only refers to the special role the partition plays while you're using the SunInstall program. **There is no free-hog partition on an installed system; the concept is meaningless apart from the SunInstall program.** Also note that since the size of the free-hog is relative to that of the other partitions it is not possible to directly change the size of the free-hog. (That is, you cannot type in the SIZE field for the free-hog on the DISK Form).

5. In the **Display Unit** field, specify how you want partition sizes displayed in the `SIZE` column. The example forms display partition sizes in Mbytes (the default), but you can also use Kbytes, blocks, or cylinders. (Refer to Appendix D — "Disk Structure and Disk Space Terminology" for general information about blocks and cylinders.)

Only the integer portion of the partition size is displayed. The displayed size of a 35.75 MB partition, for example, is 35, not 35.7 or 35.8. **The actual size will be rounded to the nearest cylinder when SunInstall physically relabels the disk.**

When you make your choice, SunInstall displays a partition table that reflects the selected label. If you selected `default` at step 3, the `MOUNT PT` and

PRESERVE columns will be filled in. (The columns will otherwise be empty.)

If you type **y** in the PRESERVE(Y/N) column, SunInstall will not re-make the filesystem in that partition. This provides a means to retain existing data in user partitions such as /home. **If the START_CYL or SIZE of a partition changes, it *cannot* be preserved. SunInstall will notify you if you attempt to preserve a partition that does not meet these criteria.**

Following is a default partition table for a homogeneous server system.

```
PARTITION START_CYL BLOCKS    SIZE     MOUNT PT           PRESERVE(Y/N)
=============================================================================
    a     0         32025     16       /                        n
    b     61        59850     30
    c     0         639450    327
    d     175       12075     6        /export                  n
    e     198       64050     32       /export/swap             n
    f     0         0         0
    g     320       90300     45       /usr                     n
    h     492       381150    190      /home                    n
```

6. To implement your disk plan, complete the SIZE, MOUNT PT, and PRESERVE column for each required filesystem and any others you have chosen to define. If a column already contains a value, you can type Return to use the displayed value. Leave the MOUNT PT columns blank for all c partitions and for any partitions which will be used for swap space.

If you've chosen to use the existing disk partitions, you might wish to preserve the /home partition so you won't have to restore user home directories from tape after you install Release 4.1.2. **Do not preserve the /, /usr, and /export partitions!**

The root (/) Partition

The size displayed for your root partition (the a partition of your system disk) will reflect the current size of the partition on the disk. If you used format to adjust the size of the root this is a good opportunity to check your work, verifying that the partition is the size you intended. **Remember: you cannot change the size of the a partition on the system disk within SunInstall.**

The swap Partition

The size displayed for your swap partition (the b partition of your system disk) will also reflect the current size of the partition on the disk. If you need to *increase* the size of the partition, do so now. Simply press Return until the cursor is next to the swap partition's SIZE field, backspace over the current size, and enter the new size you desire. Note that at the same time SunInstall will automatically decrease the size of the designated free-hog partition by a similar amount. **Remember: you cannot *decrease* the size of the b partition of the system disk within SunInstall.**

The /export Partition

By default, the /export partition is sized to fit two clients. For the time being, however, you can leave it as it is regardless of the number of clients you will support. Later on, as you define your diskless clients, SunInstall will automatically expand the partition, allowing approximately 5 MB for each client defined. We'll return to the Disk Form to review the size of this and the other partitions after client definition has been completed.

If your disk plan calls for moving the /export partition to another disk drive, begin to do so at this time. For now, just enter "**0**" (zero) in the SIZE field of the partition. When you do so the MOUNT PT and PRESERVE fields will automatically be erased, and the disk space that had been assigned to /export will be added the free-hog partition. When you move on to defining the partition tables on your other disk drives you'll re-define the partition there.

The /export/swap Partition

Like /export the /export/swap partition is initially sized to fit two typical clients. SunInstall will automatically total the swap space sizes that you assign for your clients and expand the partition as appropriate.

Like the /export partition, if you have decided to move /export/swap to another disk drive, prepare to do so by changing the SIZE field to 0 (zero) MB on this disk.

The /usr Partition

How you size the /usr partition is perhaps the most important part of your disk plan. In order to let SunInstall automatically calculate the size of /usr necessary to accommodate the SunOS operating system software intentionally *undersize* the partition at this time. To do so, press Return until the cursor is next to the SIZE field for the /usr partition. Then type Delete to backspace over the current SIZE and enter **5**. Note that, at the same time that the size of /usr is decreased, the size of the designated free-hog partition will increase by a like amount.

Later on, when software selection has been completed, /usr will be almost *exactly* the size needed to accommodate the SunOS software chosen. Then you will return to the DISK Form to expand /usr as per your Partition Planning Worksheet.

```
PARTITION START_CYL BLOCKS    SIZE     MOUNT PT           PRESERVE(Y/N)
=============================================================================
    a     0         32025     16       /                        n
    b     61        59850     30
    c     0         639450    327
    d     175       12075     6        /export                  n
    e     198       64050     32       /export/swap             n
    f     0         0         0
    g     320       9975      5        /usr                     n
    h     339       461475    231      /home                    n
```

The size of the `/usr` partition need not and cannot be directly changed if `/usr` is the free-hog.

The `/home` Partition

If a `/home` partition is defined and is intended to remain on the system disk you can leave it as is, defined as the free-hog and adjusting automatically as changes are made to the other partitions on the disk.

If your disk plan calls for moving `/home` to another disk, remove it from the system disk now. Since `/home` is currently designated as the free-hog it is not possible to directly specify its SIZE. To do so, back up through the DISK Form by typing Control–B until the cursor enters the **Free Hog Disk Partition** field. Use the space bar to move to the `[g]` field and then select that partition by typing **x**. Now press Return to move down through the Form. Notice that the cursor will skip the `g` partition SIZE field (it is now the free-hog) but will enter the SIZE field for partition `h`, the `/home` partition. Press Delete to backspace over the field and then enter **0** to delete the partition.

When you complete the table, SunInstall prompts

```
O.K. to use this partition table [y/n] ?
```

7. Enter **y** to use the displayed table or **n** if you wish to change it.

   When you accept the table, SunInstall prompts

   ```
   Are you finished with this form [y/n]?
   ```

8. Enter **y** if you are defining only one disk. Otherwise, enter **n** and fill out additional DISK Forms until you have completed one for each of your disk drives. Then enter **y**, indicating that you are finished with the DISK Forms.

Completing the SOFTWARE Form

From the SunInstall Main Menu, complete the SOFTWARE Form as follows:

1. Select `assign software information` from the Main Menu.

SunInstall displays the SOFTWARE form.

```
SOFTWARE FORM          [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
    [add new release]  [edit existing release]
```

2. Select `add new release`.

   SunInstall requests the device name and location of the device on which the Release 4.1.2 media resides.

```
SOFTWARE FORM          [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
   x[add new release]  [edit existing release]

 Media Information:
    Media Device     :  [st0] [st1] [st2] [st_]* [xt0] [mt0] [fd0] [sr0]
    Media location   :  [local]  [remote]
```

3. Complete the **Media Information** fields, using the following examples as a guide.

* Selecting `[st_]` will allow you to specify the `st` device number manually. This feature allows selection of SCSI devices 3–7 when necessary.

Example for CD-ROM in Local SunCD Drive:

```
SOFTWARE FORM          [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
   x[add new release]  [edit existing release]


 Media Information:
    Media Device     :  [st0] [st1] [st2] [st_] [xt0] [mt0] [fd0] x[sr0]
    Media Location   :  x[local]  [remote]
```

Example for CD-ROM in Remote SunCD Drive:

When reading from a media device attached to a remote system make sure that the hostname of the system being installed is included in the `/.rhosts` file of the remote system.

Note that including the hostname of the system being installed in the `/.rhosts` file allows superuser (root) access to the remote system from your workstation. For increased security, be sure to remove the hostname from the `/.rhosts` file once you have completed the installation.

```
SOFTWARE FORM          [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
   x[add new release]  [edit existing release]


 Media Information:
    Media Device     :  [st0] [st1] [st2] [st_] [xt0] [mt0] [fd0] x[sr0]
    Media location   :  [local]  x[remote]
    Media Host       :  persephone
    Media Host's Internet Address :  195.5.2.16
```

After you have provided the information needed to access the Release 4.1.2 media, SunInstall prompts:

```
Ok to use these values to read the table of contents [y/n] ?
```

4. Enter **y** if the values are correct or **n** if you need to change any of them.

When you elect to use the displayed information, SunInstall expands the form as shown below.

```
SOFTWARE FORM            [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
   x[add new release]  [edit existing release]


 Media Information:
    Media Device      : x[st0] [st1] [st2] [st_] [xt0] [mt0] [fd0] [sr0]
    Media location    :  x[local]  [remote]

Choice:   [all]  [default]  [required]  [own choice]
  Executables path:  /usr
  Kernel executables path: /usr/kvm
```

5. Specify your software selection method by choosing one of the following:

   `all` — Automatically selects all SunOS software categories.

   `default` — Automatically selects the *default* software categories, and then asks you to pick the other software you want.

   `required` — Automatically selects the *required* categories, without allowing you to pick additional software.

   `own choice` — Automatically selects the *required* categories, and then asks you to pick the other software you want.

   (The default software selection includes all required categories and selected common and desirable categories as shown in Table 6-4. See Table 1-5 for detailed information about the listed categories.)

Table 6-4 *Default Software for Networked Systems*

Required Categories	Common and Desirable Categories
root	Debugging
usr	RFS
Kvm	SunView_Users
Install	Sys
Networking	System_V
	TLI

6. Press Return in the following fields to use the standard paths to executable files.

```
Executables path:
Kernel executables path:
```

SunInstall prompts:

```
Ok to use these values to select Software Categories [y/n] ?
```

Software selection will begin when you answer this prompt. Read the remainder of this step to preview the selection process *before* responding to this prompt.

Unless you selected `all` or `required` at step 5, you'll be able to pick exactly which optional software to install. SunInstall will display category names, one by one, and prompt:

```
Select this media file [y/n] ?
```

Software selection is in progress in the following example.

```
SOFTWARE FORM            [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
     x[add new release]  [edit existing release]


 Media Information:
    Media Device      : x[st0] [st1] [st2] [st_] [xt0] [mt0] [fd0] [sr0]
    Media location    : x[local]  [remote]


Choice:   [all]  [default]  [required]  x[own choice]
    Executables path:  /usr
    Kernel executables path: /usr/kvm

Destination fs:  /usr (sd0g)                                    47210496
                                                  Hog: sd0h     31334400
Name: SunView_Programmers (optional)                 Size :     2150400



Select this media file [y/n] ? _                        status: not selected
[RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

In the example, "SunView_Programmers" is the software category presented. Answering **y** to the `Select this media file [y/n] ?` prompt will mark this category for installation on your system. Answering **n** will skip it. In either case, SunInstall will then go on to present the next category for your consideration.

A variety of disk space parameters are also presented, as the following details show:

```
Choice:  [all]  [default]  [required]  x[own c
    Executables path:  /usr
    Kernel executables path:  /usr/kvm

Destination fs:  /usr (sd0g)

Name:  SunView_Programmers  (optional)
```

The destination filesystem is `/usr`.

The software category and its type.

Indicators at the right-hand side of the screen show—**in bytes**—the size of the software category, the current size of the free-hog partition, and the changing state of the destination filesystem. The following detail examines this region more closely.

```
]  x[own choice]
usr
ath:  /usr/kvm

                                   47210496
                  Hog:  sd0h     31334400
                       Size:    2150400
```

Available space in destination filesystem.‡
Current size of the free-hog partition.
Size of the displayed software category.

7. Unless you wish to change your software selection method, enter **y** to usr the displayed values and begin the selection.

‡ Pay particularly close attention to this value if your `/usr` partition is the designated free-hog. When software selection is complete it will represent the space available in `/usr` for Sun unbundled products, products from other vendors, locally developed programs, and general free space.

After all of the categories have been presented and responded to, SunInstall summarizes the selected categories for you:

```
SOFTWARE FORM            [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
     x[add new release]  [edit existing release]


 Media Information:
    Media Device      : x[st0] [st1] [st2] [st_] [xt0] [mt0] [fd0] [sr0]
    Media location    : x[local]  [remote]


Choice:   [all]  [default]  [required]  x[own choice]
    Executables path:  /usr
    Kernel executables path: /usr/kvm


Media Filenames:
root              SunView_Users
usr               SunView_Programmers
Kvm               Text
Install           Manual
Networking


Ok to use this architecture configuration [y/n] ?
[RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

8. Enter **y** to use the configuration or **n** if you wish to go back and try again.

   When you elect to use the configuration, SunInstall prompts:

   ```
   Are you finished with this form [y/n] ?
   ```

9. Enter **y** to exit the form and redisplay the Main Menu.

Completing the CLIENT Form

(If the client and server share the same architecture, then completing this form is optional.) From the SunInstall Main Menu complete the CLIENT Form as follows:

1. Select `assign client information`.

   SunInstall will display the CLIENT Form.

```
CLIENT FORM              [?=help] [DEL=erase one char] [RET=end of input data]
 ------------------------------------------------------------------------------
 Architecture Type : _[sun4.sunos.4.1.2]
 Client name       :
 Choice            :  [create]  [delete]  [display]  [edit]



 Are you finished with this form [y/n] ?
    [x/X=select choice] [space=next choice] [^B/^P=backward] [^F/^N=forward]
```

2. The **Architecture Type** field will display the name of the SunOS 4.1.2 release and the kernel architecture type of your server (and clients). Type **x** to accept the **Architecture Type**.
3. The cursor will move into the **Client name** field. Enter the hostname of your first diskless client.
4. As the cursor moves into the **Choice** field select `[create]`. SunInstall will display a form like the this:

```
CLIENT FORM              [?=help] [DEL=erase one char] [RET=end of input data]
------------------------------------------------------------------------------
Architecture Type : x[sun4.sunos.4.1.2]
Client name       : squid-lips
Choice            : x[create]  [delete]  [display]  [edit]
Root fs : /export/root (sd1d)              6291456       Hog : sd1h 284164096
Swap fs : /export/swap (sd0e)              33554432      Hog : sd0g 256901120

Client Information :
     Internet Address            : 195.5.2._
     Ethernet Address            : 8:0:20:1:00:00
     NIS Type                    :  [none] x[client]
     Domain name                 : em_city.oz.com
     Swap size (e.g. 8B, 8K, 8M) : 16M
     Path to Root                : /export/root/squid-lips
     Path to Swap                : /export/swap/squid-lips
     Path to Executables         : /usr
     Path to Kernel Executables  : /usr/kvm
     Path to Home                : /home/diphthong
     Terminal type               : sun


Ok to use these values [y/n] ?
   [x/X=select choice] [space=next choice] [^B/^P=backward] [^F/^N=forward]
```

The `Root fs` and `Swap fs` lines provide partition size and associated free hog information similar to that displayed by the SOFTWARE Form. The partitions monitored here will vary depending on the partitions defined by the `Path to Root` and `Path to Swap` fields.

5. Each line of *Client Information* should be checked and, perhaps, edited. An explanation of each line follows:

   - `Internet Address`

     The network portion of the client's internet address has already been filled in for you. Just append the correct host number to complete the address, for example; `195.5.2.` might become `195.5.2.20`.

   - `Ethernet Address`

     Backspace over and fill in the correct Ethernet address for this client.

   - `NIS Type`

     Diskless workstations can be NIS clients, or not use NIS at all. SunInstall will pick the reasonable default depending on whether or not you are configuring the server for NIS (in the HOST Form).

   - `Domain name`

     The same as for the server, if NIS is being used.

   - `Swap size (e.g. 8B, 8K, 8M)`

     The size of the swap file that will be assigned to this client. A reasonable default is provided. Refer back to your Client Form Worksheet to see if you've planned something different.

     If you choose to change the **Swap size** you can specify the new size in bytes (`B`), kilobytes (`K`) or megabytes (`M`). (As you change the swap file size you may see the sizes of the `/export/swap` partition and its associated free-hog partition automatically adjust.)

   - `Path to Root`

     This is the directory on the server that will form the client's root (`/`) directory. The default is `/export/root/`*clientname*.

   - `Path to Swap`

     This is the file on the server that the client will use for swap space. The default is `/export/swap/`*clientname*.

   - `Path to Executables`

     The server's directory that the client will mount as its `/usr`. Should not need to be changed.

   - `Path to Kernel Executables`

     The server's directory that the client will mount as its `/usr/kvm`. Should not need to be changed.

- `Path to Home`

  Where users' home directories will reside.

- `Terminal type`

  The console terminal type of the client. Will need to be changed only if the client does not have a Sun bit mapped monitor.

6. When you are satisfied with the client information that you have entered, move the cursor down to `Ok to use these values [y/n] ?` and enter **`y`**.
7. The CLIENT Form will display again, this time with the name of the newly defined client noted.

```
CLIENT FORM              [?=help] [DEL=erase one char] [RET=end of input data]
------------------------------------------------------------------------------
Architecture Type : x[sun4.sunos.4.1.2]
Client name       : squid-lips
Choice            : x[create]  [delete]  [display]  [edit]


sun4.sunos.4.1.2 Clients:

squid-lips


Are you finished with this form [y/n] ?
   [x/X=select choice] [space=next choice] [^B/^P=backward] [^F/^N=forward]
```

If you have more clients to define enter **`n`**. You can then create another client the same way you did the first. You also have the option (in the **`Choice`** field) to delete, display or edit clients that you've already defined.

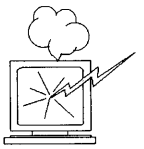
8. Continue to cycle through the CLIENT Form creating clients until you've taken care of all those that your server is intended to support. Finally, enter **`y`** in response to the `Are you finished with this form [y/n] ?` prompt.

If you will be adding more diskless clients to your server in the near future you may find it convenient to define those workstations now in order to "pre-allocate" space in the appropriate partitions. Even if you use hostnames like *dummy1* and *dummy2* and the default Ethernet address when defining these clients it will still be relatively easy to complete their configuration when the new workstations become available.

Rechecking Partition Sizes

The Main Menu should now be displayed, with the cursor next to the item:

```
start the installation
```



Before you select `start the installation` follow these steps to check and adjust the current partition sizes.

1. Press Control–B to move the cursor back through the menu items.
2. Select `assign disk information`.

   The DISK Form is displayed once more.

```
DISK FORM            [?=help] [DEL=erase one char] [RET=end of input data]
------------------------------------------------------------------------------
Attached Disk Devices :
   [sd0]
```

3. Select each disk in turn.

   The **Disk Label** field contains a new item, `data file`. This item displays the disk label from the installation database, where all of the information you've entered so far is stored.

```
DISK FORM            [?=help] [DEL=erase one char] [RET=end of input data]
------------------------------------------------------------------------------
Attached Disk Devices :
   x[sd0]

Disk Label:  [default]  [use existing]  [modify existing] x[data file]
Free Hog Disk Partition :  [d]  [e]  [f]  [g] x[h]
Display Unit             : x[Mbytes]  [Kbytes]  [blocks]  [cylinders]
```

4. Select `data file` to display the new partition sizes. Since you last viewed the form, several partitions have likely changed in size:
   - The `/usr` partition may be larger.
   - The `/export` partition may be larger.
   - The `/export/swap` partition may be larger.
   - The free-hog partition should be smaller.

   SunInstall took space from the free-hog partition to expand the `/usr` partition when you selected software. The `/usr` partition is now just the size

needed to accommodate the software you selected.

If partition sizes have not changed (perhaps `/usr` was the free-hog) skip to step 6. Otherwise, adjust the partition size as described in the step 5.

5. Finish sizing your partitions:

   - `/usr`
     Refer to your Partition Planning Worksheet to find the amount of space you have decided to allow above and beyond that required by the operating system files (space for other files and free space for expansion). Add that space to the current size of `/usr` and edit the `SIZE` field accordingly.
   - `/export`
     Check the size of the `/export` partition. Add an appropriate amount of space if you expect to be adding more clients to the server soon.
   - `/export/swap`
     Check the size of the `/export/swap` partition. Add space for additional clients, if planned.

6. Finally, press Return enough times to reach the prompt line:

   ```
   Ok to use this partition table [y/n] ?
   ```

   and enter `y`.

7. SunInstall will display:

   ```
   Are you finished with this form [y/n] ?
   ```

   If you have more disk drives to check answer `n` and repeat steps 3 through 6 for each drive. When all disks have been checked enter **`y`** to redisplay the Main Menu.

Letting SunInstall Run

The Main Menu should now be displayed. Move the cursor to:

```
start the installation
```

Type **`x`** to begin the installation.

Your screen will reflect the progress of the installation as SunInstall labels the disk, creates the specified filesystems, and loads software from the Release 4.1.2 media. Depending on the software categories you chose earlier, you may be asked to load additional media, as shown in the following example:

```
System Installation Begins:
Label disk(s):
        sd0
Create/check filesystems:
Creating new filesystem for / on sd0a
newfs /dev/rsd0a >> /etc/install/suninstall.log 2> &1
. . .
Extracting sunos.4.1.2.sun4 'root' media file ...
Extracting sunos.4.1.2.sun4 'usr' media file  ...
Extracting sunos.4.1.2.sun4 'Kvm' media file  ...
Extracting sunos.4.1.2.sun4 'Install' media file ...
Extracting sunos.4.1.2.sun4 'Networking' media file ...
Please mount sun4.sunos.4.1.2 release media #2
Press <return> to continue
```

If There's a Problem

If SunInstall should, for some reason, fail or have to be aborted during its run, it will save the data files that were created as you filled in the forms. You can remedy the problem and then re-invoke SunInstall, going directly to "`start the installation`." SunInstall may prompt:

```
Some software has already been loaded.
Are you sure you want to restart the installation (y/n) ?
```

Answering "`y`" will have SunInstall restart its run using the data you have already entered.

When SunInstall Completes

What happens after SunInstall extracts the last software category depends on how you filled in the `Reboot after completed` field on the HOST Form.

- If you selected **`y`**, your system boots automatically. Booting messages appear, followed by a `login` prompt. Refer to Section 6.6, "Deciding What Still Needs to Be Done" for further instructions.
- If you selected **`n`**, the # prompt reappears. Your system is still running the miniroot.

Installing a Small Kernel

Pre-configured small kernels are available for various configurations. See the *SunOS 4.1.2 Release Manual* for tables that describe available `GENERIC_SMALL` kernel configuration files.

If you want to install an appropriate pre-configured kernel do so by executing:

```
# install_small_kernel
```

The utility is self-explanatory and will ask you for confirmation before making any changes to the system. It is capable of installing small kernels for your diskless clients as well as for your server.

Configuring an NIS master or slave

NIS masters and slaves should be configured before they are booted in multi-user mode. See Chapter 16 of the *System and Network Administration* manual for details.

Booting Up Your Workstation

To boot your new operating system from the # prompt do the following:

```
# sync;sync;reboot
```

6.6. Deciding What Still Needs to Be Done

Several basic system administration tasks should be completed following the installation of your system.

Logging In and Setting the root Password

As supplied the SunOS operating system does not have a password protecting the superuser (root) login. Login as "**root**" and then use the `passwd(1)` command to set the password of your choice.

Configuring for Multiple swap Partitions

If you have defined multiple swap partitions, you must add a line to the `/etc/fstab` file for each additional swap area. For example, you define `sd1b` as a swap partition by adding the following line in the `/etc/fstab` file:

```
/dev/sd1b swap swap rw 0 0
```

Then enter:

```
# swapon -a
```

(From now on `swapon` will be executed automatically each time the system is booted.)

Configuring for tmpfs

If you have decided to use the tmpfs virtual file system for the `/tmp` directory do the following:

- Add this line to the file `/etc/fstab`:

```
swap /tmp tmp rw 0 0
```

- Enter:

```
# mount /tmp
```

- In the file `/etc/rc.local` find the line:

```
#mount /tmp
```

and remove the sharp sign (#):

```
mount /tmp
```

From now on, the `/tmp` directory will be mounted automatically each time the system is booted.

- When you build and install a custom kernel include the following line in the kernel configuration file:

```
options TMPFS  # tmp (anonymous memory) file system
```

(The tmpfs facility is included in the `GENERIC` kernel.)

Building and Installing a Custom Kernel

For best workstation performance you should make and install a custom operating system *kernel*. The kernel is a program which is loaded into memory when your workstation is booted and which then controls all aspects of system operation. The default kernel is called the *GENERIC* kernel. This kernel includes the software necessary to access all of Sun's peripheral hardware. While this is useful during installation it also means that the kernel includes much more software, and is therefore much larger, than is required for any specific system. This excessive size means an inefficient kernel which uses up memory that can be put to better use and provide improved performance.

Complete instructions for creating and installing a custom kernel for your workstation are given in Chapter 9 of the *System and Network Administration Manual*, Reconfiguring the System Kernel.

If you chose to install a `GENERIC_SMALL` kernel at the conclusion of running SunInstall that kernel will provide improved performance as compared to the `GENERIC` kernel. You may still, however, see some further improvement by creating a kernel matched to your specific configuration.

Setting Up User Accounts

Refer to the manuals *System and Network Administration*, *Getting Started with SunOS: Beginner's Guide*, and *Setting Up Your SunOS Environment: Beginner's Guide* for assistance.

Customizing Your Environment

Refer to Chapter 8 of *System and Network Administration Manual*, Administering Workstations, Section 8.1. Here you will find the information you need for setting up user home directories, enabling electronic mail, etc.

Backing Up Your New System

Once you have customized your system to suit your needs it should be *backed up*. This means recording the information contained on your disks onto a different media, usually tape, for safekeeping. Chapter 6, Section 6.1 of *System and Network Administration* contains the information you will need.

Booting Up Your Clients

Once the server is up and running you can begin to boot your client workstations over the net. Refer to *System and Network Administration* for complete information on administering your network.

6.7. Example Worksheets for Homogeneous Server

This section presents a sample scenario illustrating installation of a Homogeneous Server configuration. Background information for this scenario is presented, followed by facsimiles of Worksheets completed to support the installation process.

Examining this set of completed Worksheets will help you understand the correct use of the Worksheets, provide ideas for implementing similar installation configurations, and generally clarify installation planning.

You can find sets of blank worksheets, along with detailed explanations of the worksheets themselves, in Appendix E, "Installation Worksheets."

Completed Worksheets: Homogeneous Server

Scenario: proton

proton is a Sun SPARCserver 690MP that will be installed as a homogeneous server. The system has 64 Mbytes of main memory, and a monochrome bit mapped monitor.

Peripheral equipment includes two 1.3 Gbyte IPI disk drives on an `id` controller, and a 150 Mbyte Quarter Inch Cartridge (QIC–150) tape drive.

Two diskless clients will be defined, and space in `/export` and `/export/swap` will be reserved for two more clients.

Proton will act as a print server (*SunTranscript* unbundled software) and will have computer assisted publishing ("DocPubs") and relational database ("DataBase") software installed.

Homogeneous Scenario:
proton

Preliminary Information Worksheet

Name: proton

Hardware Information:

Workstation Model: 690MP [1]

Workstation Architecture: sun4 . sun4m [2]

Media Device Type: sr [3] and Number: 0 [4]

Media Device Name: sr0 [5]

System Disk Name: id0000 [6]

Other Disk Devices (if any): [7]

Name: id0001 Name: _____

Name: _____ Name: _____

Name: _____ Name: _____

System Console Device: sun [8]

Miscellaneous Information:

Local Timezone: Eastern US [9]

Homogeneous Scenario:
proton

Host Form Worksheet

Workstation Information:

Name : proton [1]

Type : ☐[standalone] ☒[server] ☐[dataless] [2]

Network Information:

Internet Address : 192 . 9 . 11 . 3 [3]

NIS Type : ☐[none] ☐[master] ☒[slave] ☐ [client] [4]

Domain name : SW-support [5]

Miscellaneous Information:

Reboot after completed : ☐[y] ☒[n] [6]

Dataless Configuration Information:

Server name : _____ [7]

Server Internet Address : _____ . _____ . _____ . _____ [8]

Path of the executables on server: `/export/exec/`*app_arch* [9]

Path of the kernel executables on server: `/export/exec/kvm/`*kernel_arch* [10]

Homogeneous Scenario:
proton

Partition Planning Worksheet

	Partition/Filesystem	Size	Position
–Required–			
■	/ (root)	16	id 0 0 0 a
■	swap	32	id 0 0 0 b
■	/usr*	--------	id 0 0 0 g
	Sun unbundled Transcript	10	----------
	other vendors	+ 90	----------
	Local software	+ 10	----------
	Free Space	+ 30	----------
	Total over and above	= 140	----------
–Common–			
☒	/home	*	id 0 0 0 h
–Optional–			
☐	/tmp		
☒	/var print spooling	20	id 0 0 1 a
☒	second swap	32	id 0 0 1 b
–Servers–			
☐	/export	--------	id 0 0 1 d
	Sun unbundled†	0	----------
	other vendors†	+ 0	----------
	Local software†	+ 0	----------
	Free Space (For 2 clients)	+ 15	----------
	Total over and above	= 15	----------
☒	/export/swap (For 2 clients)	+ 60	id 0 0 0 e
–Custom–			
☒	/database		id 0 0 1 f
☐			
☐			
☐			
☐			

* /usr is required for all configurations *except dataless*.

† Only for software to support clients of an *application architecture* different from the server's.

Disk Form Worksheet

Homogeneous Scenario:
proton

Disk Drive: id0d0

PARTITION	SIZE	MOUNT PT	PRESERVE
a	16	/	N
b	32	(swap)	
c	656	----------	----------
d			
e	160	/export/swap	N
f			
g	*	/usr	N
h			

Disk Form Worksheet

Homogeneous Scenario:
proton

Disk Drive: id001

PARTITION	SIZE	MOUNT PT	PRESERVE
a	20	/var	N
b	32	(swap)	
c	665	----------	----------
d	+15	/export	N
e			
f	200	/database	N
g			
h	*	/home	N

Software Form Worksheet

Homogeneous Scenario:
proton

a-arch.k-arch: sun4 . sun4m

	Category	Prerequisites
◉	**root**	–
◉	**usr**	–
◉	**Kvm**	–
◉	**Install**	–
◉	**Networking***	–
☒	**Debugging**	SunView_Users
☐	**RFS**	TLI, Sys
☒	**Sys**	–
☒	**System_V**	–
☐	**TLI**	–
☐	**OpenWindows_Users**	SunView_Users
☐	**OpenWindows_Fonts**	OpenWindows_Users
☒	**SunView_Users**	–
☒	**Demo**	SunView_Users, SunView_Programmers, OpenWindows_Users, OpenWindows_Programmers
☐	**OpenWindows_Demo**	OpenWindows_Users, OpenWindows_Fonts
☒	**Games**	SunView_Users
☒	**Graphics**	SunView_Users, SunView_Programmers
☒	**Manual**	Text
☐	**Security**	–
☒	**Shlib_Custom**	–
☒	**SunView_Demo**	SunView_Users, SunView_Programmers
☒	**SunView_Programmers**	SunView_Users
☐	**OpenWindows_Programmers**	OpenWindows_Users, OpenWindows_Fonts
☒	**Text**	–
☐	**User_Diag**	SunView_Users
☐	**uucp**	–
☐	**Versatec**	–

* Only required if the system is connected to a network.

Homogeneous Scenario:
proton

Client Form Worksheet

4/60

Client name: neutron [1]

Architecture Type: sun4 . sun4c [2]

Root fs: */export/root* [3]

Swap fs: */export/swap* [4]

Client Information :

Internet Address: *net* . *net* . *net* . 37 [5]

Ethernet Address: 8 : 0 : 20 : 1 : 6A : EA [6]

NIS Type: ☐[none] ☒[client] [7]

Domain name: *server_domainname* [8]

Swap size (e.g. 8B, 8K, 8M): 16 M [9]

Path to Root: /export/root/*client_name* [10]

Path to Swap: /export/swap/*client_name* [11]

Path to Executables: /usr [12]

Path to Kernel Executables: /usr/kvm [13]

Path to Home: /home/*server_name* [14]

Terminal type: sun [15]

Homogeneous Scenario:
proton

Client Form Worksheet

4/60

Client name: electron [1]

Architecture Type: sun4 . sun4c [2]

Root fs: */export/root* [3]

Swap fs: */export/swap* [4]

Client Information :

Internet Address: *net . net . net .* 40 [5]

Ethernet Address: 8 : 0 : 20 : 6 : 6C : 20 [6]

NIS Type: ☐[none] ☒[client] [7]

Domain name: *server_domainname* [8]

Swap size (e.g. 8B, 8K, 8M): 24 M [9]

Path to Root: /export/root/*client_name* [10]

Path to Swap: /export/swap/*client_name* [11]

Path to Executables: /usr [12]

Path to Kernel Executables: /usr/kvm [13]

Path to Home: /home/*server_name* [14]

Terminal type: sun [15]

7

Installing a Heterogeneous Server

Chapter 7 details the steps required to complete the installation of a Heterogeneous Server System using the Custom Installation method.

There are four general tasks to be completed:

- **Planning Your Installation**

  Final planning, including determining the layout of your system disk(s) and the configuration of each of the Diskless Client workstations which the server will support.

- **Performing Preliminary Software Procedures**

  Formatting and labeling your disk(s) (if necessary) and loading the software necessary to execute SunInstall.

- **Running SunInstall**

  Executing the SunInstall software installation program to actually install the operating system software on your workstation.

- **Deciding What Still Needs to be Done**

  Primary system administration procedures which you should carry out as soon as your system is installed.

Since the release of SunOS 4.0.3 it has been necessary to draw a distinction between the *kernel architecture* and the *application architecture* of a workstation. Similarly, there is a distinction to be made between heterogeneous servers that support clients of differing kernel architectures (but like application architectures) and those that support clients of differing application architectures.

The most obvious consequence of this distinction is in the amount of disk space required to implement each configuration. Workstations of like application architecture can share nearly all SunOS software. The exception is the content of the `/usr/kvm` directory tree, about 8 megabytes of files approximately half of which is the content of `/usr/kvm/sys`, the Sys files used to build custom kernels. Thus, servers which support clients of the same application architecture, but of differing kernel architectures, will require only 4 to 8 MB more disk space to install than a comparable homogeneous server.

When a server supports clients of a differing application architecture considerably more disk space is required. Nearly the entire content of the `/usr`

filesystem must be duplicated in order to provide programs which can be run by the clients of the differing application architecture. The only files which are shared by all workstations, regardless of architecture, are those in the `/usr/share` directory tree. These total about 9 MB, the most significant portion of which is the man pages (about 7 megabytes) located in `/usr/share/man`.

To illustrate, a heterogeneous server supporting four Sun architectures and including all optional software categories would require the following (very approximate) amount of disk space for SunOS files:

Table 7-1 *Disk Requirements for a Server Supporting Several Client Architectures*

	Architectures				
	sun4.sun4	sun4.sun4c	sun3.sun3	sun3.sun3x	Totals
`/usr`*	108 MB		104 MB		212 MB
`/usr/kvm`†	9 MB	9 MB	8 MB	8 MB	34 MB
`/usr/share`‡	9 MB		9 MB		18 MB
				Grand total	264 MB

The type of heterogeneous server you are installing has an affect on your choice of optional software categories.

- When choosing software for the server also consider the needs of clients of the same application architecture.
- For clients of the same application architecture as the server, but differing kernel architectures, the Kvm category is required. The only optional category is Sys, which you should choose if you want to be able to build custom kernels for those clients. (Highly recommended.)
- If you will support clients of an application architecture different from that of the server (typically sun3 clients of a sun4 server), you will need to choose optional software for that architecture. Get a second copy of the Software Form Worksheet and fill it out, keeping in mind the needs of all clients of the second application architecture. (Don't be concerned about duplication. If, for example, you choose the man pages twice, SunInstall will recognize that the category is sharable by all architectures and load it only once.)

---

* Files sharable by systems of like *application* architecture.

† Files *not* sharable across differing architectures.

‡ Sun3 and Sun3x clients require a /usr/share for SunOS 4.1.1.

- If your server will support more than one kernel architecture of the differing application architecture (perhaps sun3.sun3 and sun3.sun3x clients on a sun4.sun4 server) fill out just one Software Form Worksheet which covers the optional software needs of all clients of that application architecture. Then decide whether you will load the optional Sys files for each kernel architecture individually.

7.1. Planning Your Installation — Disk Partitioning

Much of the planning required before you begin the actual installation of your workstation was completed as you worked through Chapter 1. At this point you should already have completed the following worksheets:

- Preliminary Information Worksheet
- Host Form Worksheet
- Software Form Worksheet

This section will help you complete the final worksheets:

- Partition Planning Worksheet
- Disk Form Worksheet
- Client Form Worksheet

Go to Appendix E and pull out one copy of the Partition Planning Worksheet. Also get a copy of the Disk Form Worksheet for each disk drive attached to your system, and a copy of the Client Form Worksheet for each Diskless Client workstation that will be supported by the server. Refer to and fill in the Worksheets as you work through this section.

Disk drives used with Sun workstations are divided into as many as eight sections called *partitions* (labeled `a` through `h`). Each disk partition looks to the operating system and the user as though it were a separate disk drive, and each may be used for a specific purpose. An individual partition may be used in its *raw* state, most often as swap and paging space for the SunOS virtual memory system. Most partitions, however, will be structured as *filesystems* and used to store UNIX files.

Individual filesystems are designated to store various broad classes of files including operating system software, user data files, and perhaps such things as database files for application software. This section will help you to decide what partitions you should define for your disk(s), how to use each partition, and what size each partition should be.

If you are unfamiliar with computer disk drives and such terms as *partition, cylinder, sector,* and *head*, please refer to Appendix D, "Disk Structure and Disk Space Terminology."

The SunInstall program provides a default disk layout for heterogeneous server systems that you can use "as is" or modify as needed. This layout only addresses the system disk and will have to be modified if your system has more than one disk drive.

If your system was previously installed as a heterogeneous server, you may wish to base disk partitions on the existing disk layout.

Disk Layout — Default Partitions

The number of default partitions depends upon the capacity of your system disk. Table 7-2 shows the default layouts for heterogeneous server configurations.

Table 7-2 *Default Partitions for Heterogeneous Servers (Release 4.1.2)*

Partition	Assignment
a:	/
b:	(swap)
c:	(whole disk)
d:	/export
e:	/export/swap
f:	—
g:	/usr
h:	/home

The default size (as shipped from the factory) of the root (/) and swap partitions varies depending on the type and capacity of the disk. Table 7-3 shows the default sizes.

Table 7-3 *Default root and swap Partition Sizes*

Disk Type	Disk Size	Root Size	Swap Size
sd	<130 MB	8 MB	16 MB
sd	>130 <300 MB	8 MB	32 MB
sd	>300 MB	16 MB	32 MB
xd, xy and id	<600 MB	8 MB	16 MB
xd, xy and id	>600 MB	16 MB	32 MB

NOTE *On SPARCsystem 600MP machines, swap size is 64 MB.*

The root (/) Filesystem

Every SunOS *system disk* must have its a partition defined as the root (/) filesystem. The root filesystem consists of /, the root directory, and subdirectories such as /etc, /dev, /tmp, and /var.

The default root partition size should be usable for nearly all installations. About 3.5 MB of this space will be used by operating system files. The remainder is available for use by 'scratch' files created in the /tmp directory, and temporary log and spool files created in the /var directory.

The swap Partition

This area of the disk (normally the `b` partition of the system disk) is reserved to implement the virtual memory feature of SunOS. (Note: This area is used only by the server system. Swap space for its clients is provided elsewhere.) The default size will be adequate in many circumstances, but the following issues should be considered.

- Workstations with color monitors

  A minimum of 24 MB of swap space is recommended if your workstation has a color monitor.

- Workstations with large main memories

  Your swap space **must** be larger than the size of the memory installed in your workstation. For example, if your workstation has 32 MB of main memory, designate at least 34 MB for your swap area. If your workstation has 64 MB of main memory, designate at least 66 MB for your swap area.

- Application programs

  Some application programs require large amounts of swap space. As an example, LISP applications can require 40 MB or more of swap.

The `c` Partition

Every disk drive used with the SunOS operating system must, by convention, have a `c` partition defined. This partition is used by the operating system to reference the entire disk. It is defined automatically by Sun's `format(8S)` and `suninstall(8)` programs and should not be altered.

The `/export` Filesystem

This filesystem is assigned, by convention, to the `d` partition of the system disk. In its `/export/root` subdirectory it will contain the root (`/`) filesystems of the diskless clients supported by the server, each in its own subdirectory. (That is, `/export/root/`*client1* for the diskless client *client1*, `/export/root/`*client2* for the diskless client *client2*, and so on.) These subdirectories will include the `/etc`, `/dev`, `/tmp`, and `/var` subdirectories of each client.

A good rule of thumb is to allow approximately 5 MB of space in the `/export` partition for each client supported by the server or *planned* for in the near future. About 3 MB of this space per client will be used by operating system files. The aggregate space remaining will be shared by the clients.

On a heterogeneous server `/export` also contains, by default, the `/export/exec` directory tree. This tree stores the files required to support the heterogeneous architectures. The `/usr` files for the differing application architecture (if any) are stored in `/export/exec`. Files for the various kernel architectures as stored in `/export/exec/kvm`.

The files necessary to support clients of the same application architecture but different kernel architecture from the server (`/usr/kvm`) will add only 4 to 8 MB to the size of `/export`. The files necessary to support clients of a different application architecture may require considerable space in `/export`, depending on the optional software chosen.

The /export/swap Filesystem

This filesystem is assigned, by convention, to the e partition of the system disk. It holds the files used by the server's diskless clients for swap space. Each client has its own swap file. For example, the diskless client *client1* would use the swap file /export/swap/*client1*.

To choose a size for the /export/swap partition, determine the required swap space for each individual client using the same criteria as you did for the server itself (see "The Swap partition" above). (Record these at this time on a Client Form Worksheet for each client.) Then add up a total for all of the clients. Remember to allow space for clients that you plan to add to the server in the near future. The default is 16 MB per client.

The /usr Filesystem

This filesystem is assigned, by convention, to the g partition of the system disk. It contains the bulk of the operating system files, including executable programs, program libraries, and documentation. It is also frequently used to hold unbundled application programs from Sun, application programs from other vendors, and locally developed programs. The content of /usr is shared by the heterogeneous server with clients of its own application architecture. Some free space should be available in /usr in which to build a custom kernel for your workstation and to allow for the addition of new programs over time.

The partition size needed for /usr varies widely from installation to installation. Several factors should be examined to choose an appropriate size for your installation.

- Operating system software

  Operating system files will require a minimum of about 35 MB to a maximum of about 150 MB, depending on which optional software categories you chose for your workstation in Chapter 1. Don't bother to add up the individual sizes listed in Table 1-5 exactly. SunInstall will do this for you during the installation process.

- Sun unbundled products

  If you will be adding other Sun products to your workstation (programming languages, office automation, databases, etc), check the installation literature they provide to find the amount of space each will require in /usr. Total this figure and record it on the Partition Planning Worksheet.

- Products from other vendors

  Again, refer to the literature provided with these products and record the total space required.

- Locally developed programs

  Allow space for locally developed programs, if any.

- Free space

  Allow an additional 3 MB of space for use in building a custom kernel for your workstation. Still more free space is an excellent idea if the total disk space available allows. On most workstations programs and files get added

to `/usr` from time to time and the filesystem slowly fills up, so plan ahead. **Running out of space in `/usr` after the system is installed is very inconvenient. Be as generous as you can within the constraints of the total disk space available to you. Figure all of your expected needs and then add some more, perhaps 20%, for good measure.**

The `/home` Filesystem

The `/home` filesystem is used for user home directories, will be empty when the installation completes, and will begin to fill as you establish user accounts (personal work areas). An overall goal of disk partitioning strategy should be to maximize the space available to users, commensurate with the resource needs of the operating system and application programs to support the users. To this end, in the default disk partitioning scheme `/home` is automatically sized by SunInstall to encompass all of the space not claimed by the other partitions.

Disk Layout — Optional Partitions

In addition to the default partitions you may wish to define some others. These may be considered 'fine tuning.' Nearly all systems will operate just fine without them.

The `/tmp` Filesystem

The `/tmp` directory is, by default, contained within the root filesystem. It is intended for use as system 'scratch' file space; for example, intermediate files are created and deleted in `/tmp` by the C compiler as it runs. All files in `/tmp` are deleted each time the workstation is rebooted.

A new feature since SunOS 4.1, *tmpfs*, allows a temporary filesystem to be made in operating system virtual memory. This has performance advantages, especially for short-lived scratch files, and allows some of the system swap partition to be used for file space on demand. As such, it is an excellent way to support `/tmp`, reducing the demand for space in the root filesystem and, at the same time, providing a potential performance improvement.†

NOTE: Files and directories created in a tmpfs filesystem are truly temporary. They disappear without recourse upon a `umount(8)` of the filesystem and each time the workstation is rebooted.

Planning on using tmpfs to implement the `/tmp` directory may eliminate any need to expand the root partition from its default size. Tmpfs is defined after your system has been installed. You need do nothing right now. Section 7.6, "Deciding What Still Needs to Be Done" at the end of this chapter includes instructions for configuring tmpfs at that time.

The `/var` Filesystem

The `/var` directory is, by default, contained within the root filesystem. It contains files that tend to vary in size; for example:

The `/var/tmp` directory provides a workspace for users and temporary storage for programs such as the `vi(1)` editor.

† See *System and Network Administration* and `tmpfs(4S)` for details.

Spooling programs create files in subdirectories of `/var/spool`, such as `/var/spool/mail` for incoming mail, `/var/spool/lpd` for queued print jobs, and so on.

System accounting information and log messages are collected in the `/var/adm` and `/var/log` directories.

The `/var/yp` directory holds NIS database information on NIS master and slave systems.

Depending on system use, activity in `/var` can consume excessive amounts of space in the root filesystem. It may be appropriate to provide additional space in the root filesystem or, as an alternative, to create a separate `/var` filesystem. Asking yourself the following questions will help you decide if your system needs a `/var` partition and, if so, how big you should make it.

- Is your system a mail server?

  Consider the number of users served and the anticipated amount of mail.

- Is your system a print server?

  Consider the number of attached printers and the anticipated number and size of the print jobs.

- Is your system a uucp host?

  Files will be stored in `/var` while waiting to be transmitted to remote systems.

- Is your system an NIS server?

  Allow space for the NIS maps.

- Will your system use process-level accounting?

  If not carefully maintained the accounting files quickly become very large.

- Will you use applications that create large temporary files in `/var`?

  Consider the needs of all such programs.

It's unlikely that you need a separate partition for `/var` if you answered no to each of the preceding questions. If you choose to define a `/var` partition, 10 MB would be a minimum size. You might need considerably more space depending on the factors noted above.

Filesystems For Use By Applications

Some application software packages may recommend the creation of separate filesystems for their exclusive use. Check the literature received with any application software for possible requirements.

Disk Layout — Multiple Disk Drives

If your workstation hardware includes more than one disk drive you will need to decide what partitions and filesystems to define on each drive. (If you have only one disk drive skip ahead to Section 7.3, "Preliminary Software Procedures.")

The overall goals here are to make efficient use of the disk space available and to maximize performance by balancing the amount of activity on each of the disks as much as possible. Some guidelines follow. (For purposes of discussion we will suppose a system with two drives named `sd0` and `sd1`.)

What Should Stay on the System Disk?

The root and `/usr` filesystems and the swap partition should remain on the system disk. This will allow the workstation to be booted even if the first drive is the only one running, an advantage should a failure occur on one of the other drives.

Should You Define Multiple swap Partitions?

The SunOS operating system allows more than one partition to be defined for use as swap area. The system interleaves the use of multiple partitions, attempting to make equal use of each partition, thus improving performance. The amount of disk space that you have determined to use for swap can be split between partitions located on different disk drives. For example, if you have decided that you want 40 MB of swap area, you might specify two 20 MB swap partitions, one on `sd0b`, the other on `sd1b`. (Use of the `b` partition for swap space is not a requirement except on drive 0. We use `sd1b` here just for the sake of convention.)

Procedures for designating multiple swap partitions will be presented later in this chapter. For now, simply note the partitions and sizes on your Disk Form Worksheets.

Should You Move One or More Partitions?

The `/home` partition is a prime candidate for moving to the second drive. Just make the proper notations on your Partition and Disk Form Worksheets.

Moving the `/export` partition off of the system drive will likely help performance by evening out the activity on your disks.

If you have decided to designate a separate partition for the `/var` filesystem, put it on drive 1. Availability of a second drive may make creation of a `/var` filesystem attractive from a performance standpoint.

Sample Layout For Two Disks

Table 7-4 suggests a layout for a workstation with two disk drives. An "*" in the *size* column indicates that the partition will be allocated whatever space is left on the disk after the other partitions have been defined.

Table 7-4 *Sample Partition Layout — Two Disk Heterogeneous Server*

Disk Drive sd0		
partition	*designation*	*size (MB)*
a	/	15
b	(swap)	20
c	-	327
d	-	-
e	/export/swap	128
f	-	-
g	/usr	*
h	-	-

Disk Drive sd1		
partition	*designation*	*size (MB)*
a	/var	15
b	(swap)	20
c	-	327
d	/export	35
e	-	-
f	-	-
g	-	-
h	/home	*

Assigning partitions to certain partition letters (moving `/home` from `sd0h` to `sd1h`, for example) is not required. Maintaining the convention does, however, help to reduce confusion.

7.2. Planning Your Installation — Diskless Clients

Complete a Client Worksheet for each of your Diskless Clients. As noted on the Worksheet, most of the information required will be filled in by SunInstall automatically. Record the information requested in boldface type for all clients.

Record information for the other fields only if you plan a somewhat unusual configuration. As an example; if you will be supporting a large number of clients and have several disk drives you might choose to distribute their swap files between two or more filesystems (perhaps named `/export/swapA` and `/export/swapB`) rather than in the more conventional `/export/swap`.

7.3. Preliminary Software Procedures

Now it's time to begin using the software tools provided for installing your workstation.

Selecting the Correct Media

First you'll need to select the correct CD-ROM) with which to install your workstation. The label on the media should specify the same kernel architecture as you have noted for your workstation on Preliminary Information Worksheet.

Mount the selected CD-ROM in the drive you will be installing from.

Should You Format Your Disk?

You *format* a disk by using the utility program `format(8S)` to write control information used by the disk drive hardware onto a disk. Disk drives provided by Sun are formatted and labeled at the factory. Desktop SPARCsystems are shipped with SunOS preinstalled.

For preinstalled disks, it is recommended that you check the disk in a nondestructive way to verify that any head movement that may have occurred during

shipment has not affected the performance of your disk.

To check the disk, using the `format` command, follow these steps:

1. Select "Run Format" from the install script.
2. Choose `analyze` from the `format` menu.
3. Choose `read` from the `analyze` menu.

   The `read` option tries to read every block on the disk, but does not destroy any information.

For new disks without preinstalled software, it is recommended that you reformat them. To format your disk(s), select "Run Format" in the MINIROOT install script. See Appendix A of this manual for instructions on running the `format` command. You can also run `format` manually from MINIROOT.

Resizing the root and swap Partitions

If you decided to size your root partition differently from the default, or to size the swap partition on your system disk **smaller** than the default (see the Partition Planning Worksheet) you must run the `format` program before running SunInstall. Refer to Appendix A for the necessary instructions.

If you do not plan to alter the size of the root partition or decrease the size of the swap partition, continue with "Loading and Booting the Miniroot" in the following section. (You can use the SunInstall program without running `format` to make all other adjustments to partition sizes.)

7.4. Loading and Booting the Miniroot

SunInstall will be executed from a minimal version of the operating system called the *miniroot*. The miniroot is designed to be copied into the swap (`b`) partition of the system disk, thereby leaving the remaining partitions available for loading of the full operating system.

The miniroot copied to the swap area is temporary; as soon as the workstation is booted from the installed operating system it will be over-written by normal paging and swapping activity. If you need to use it again, it will have to be copied into the swap area again.

Miniroot load and boot procedures are given here for those systems which will be installed from an attached CD-ROM drive (local installation). Procedures for loading the miniroot from a remote CD-ROM are given in Appendix B — "Loading and Booting the Miniroot from a Remote CD-ROM." At this time your workstation should be powered on and displaying the `>` or `ok` PROM monitor prompt.

Newer boot PROMS, particularly Desktop SPARCsystems, may display the `ok` prompt. Others will display the `>` prompt.

If the workstation is not displaying the PROM monitor prompt, hold down the [L1/STOP] key and press the [A] key and it should appear.

To boot the miniroot from CD-ROM, enter the following command at the PROM monitor prompt:

- For Sun4 systems:

```
> b sd(0,30,1)
```

- For Sun4c systems prior to the SPARCstation 2 (such as the SPARCstaion 1, IPC, and SLC):

```
> b sd(0,6,2)
          or
ok boot sd(0,6,2)
```

- For Sun4m and Sun4c systems beginning with the SPARCstation 2:

```
ok boot cdrom
        or
> b cdrom
```

After you successfully begin installing the miniroot, your system should display the following messages:

```
What would you like to do?
  1 - install SunOS mini-root
  2 - exit to single user shell
Enter a 1 or 2:
```

Follow these steps to continue the installation:

1. Enter **1** to indicate that you want to continue the installation.

   If your system has only one disk, the miniroot is copied to that disk. If your system has more than one disk, you are asked to specify a disk number as illustrated in the following display:

```
Beginning system installation - probing for disks.
Which disk do you want to be your miniroot system disk?
  1 - sd0:  disk description
  2 - sd1:  disk description
  3 - exit to single user shell
Enter a 1, 2, or 3:
```

   Enter **1** to select the system disk.

2. Before the miniroot is copied to the specified disk, you are given an opportunity to format and relabel the disk.

```
selected disk unit "sd0".
Do you want to format and/or label disk "sd0"?
    1 - yes, run format
    2 - no, continue with loading miniroot
    3 - no, exit to single user shell
Enter a 1, 2, or 3:
```

You do not need to run `format` unless you believe that something is wrong with the disk, or you have chosen to resize the root or decrease the swap partition, or it is a new unlabeled disk from a third-party vendor.

3. Enter **2** to continue.

   Messages such as those that follow are displayed:

```
checking writability of /dev/rsd0b
0+1 records in
1+0 records out
Extracting miniroot ...
```

   Additional, media-specific messages are displayed. This process may take several minutes to complete, at which point the following message is displayed:

```
Mini-root installation complete.

What would you like to do?
   1 - reboot using the just-installed miniroot
   2 - exit into single user shell
Enter a 1 or 2:
```

4. Enter **1** to boot the miniroot.

Additional messages are displayed as the system boots.

```
syncing file systems... done
rebooting...
Booting from: sd(0,0,1)
root on sd0b fstype 4.2
Boot: vmunix
Size: 811008+114720+60112 bytes
SunOS Release 4.1.2(MINIROOT) #4: Wed Feb 13 01:10:16 PDT
Copyright (c) 1991 by Sun Microsystems, Inc.
 .
 .
 .
WARNING: CLOCK GAINED 14 DAYS -- CHECK AND RESET THE DATE!
root on sd0b fstype 4.2
swap on sd0b fstype spec size 04070K
dump on sd0b fstype spec size 14056K
#
```

The process is complete when the root prompt (#) is displayed.

Now you are ready to invoke the SunInstall program, and continue with Section 7.5, "Running SunInstall," below.

7.5. Running SunInstall

SunInstall is an interactive, menu-driven program that operates in the following way:

1. You invoke the program and use its preliminary menus to set the system clock and to specify your console display device (Sun workstation or other terminal).
2. Next, you fill out a series of forms each describing a different aspect of the installation.
3. Then, upon confirmation from you, SunInstall begins the actual installation of your system, loading operating system software onto your disk(s).

If you are using a terminal (not a Sun bit mapped display) as system console and have not yet determined the `/etc/termcap` name for the terminal, now is the time to do it. See Section E.1.1 "Preliminary Information Worksheet" for complete instructions.

Starting the SunInstall Program

Invoke the SunInstall program from the miniroot as follows:

```
# suninstall
```

You are ready to use the program when this screen is displayed:

```
                    Welcome to SunInstall

    Remember:  Always back up your disks before beginning an installation.

SunInstall provides two installation methods:

    1. Quick installation:

   This option provides an automatic installation with a choice
      of standard installations, and a minimum number of questions asked.

    2. Custom installation:

       Choose this method if you want more freedom to configure your
       system.  You must use this option if you are installing your
       system as a server.


       Your choice (or Q to quit) >>
```

Entering Initial Information

The following steps will provide SunInstall information about your system's console terminal, the time zone you are in, and the current date and time.

These steps employ a simple convention.

- *enter*
  denotes keyboard input with an ending Return (the ensuing action takes place when you press the Return key).
- *type*
  denotes keyboard input without a Return following. (The ensuing action takes place as soon as you type a character.)

1. Enter **2** in response to the SunInstall Welcome screen, selecting a custom installation.

SunInstall automatically checks for your terminal type. If you are using a Sun bit-mapped display, SunInstall does not ask for your terminal type and skips to the next step.

If you are not using a Sun bit-mapped display, SunInstall prompts you for your terminal type, as shown in Step 2.

```
Select your terminal type:
        1) Televideo 925
        2) Wyse Model 50
        3) Sun Workstation
        4) Other

>>
```

2. Enter a number from `1` to `3` to specify your terminal type from those listed, or `4` if your terminal is of some other type.

   If you choose `4` (Other) SunInstall asks you to enter the name of your terminal as it appears in the `/etc/termcap` file. Refer to the Preliminary Information Worksheet for this information.

   After you enter your terminal type SunInstall will ask for your local time zone name:

```
Enter the local time zone name (enter ? for help):
```

3. Although you can enter time zone information from the keyboard, it's easiest to use the on-line help facility:

   Enter **?** to display the TIMEZONE menu.

```
TIMEZONE MENU                                                    [?=help]
-------------------------------------------------------------------------

             Select one of the following categories to display
               a screen of time zone names for that region

                      _ United States

                        Canada

                        Mexico

                        South America

                        Europe

                        Asia

                        Australia and New Zealand

                        Greenwich Mean Time


Are you finished with this menu [y/n] ?
 [RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

Move the cursor to the appropriate region name (by typing Return) and then type **x** to display a corresponding menu of time zones.

The UNITED STATES menu is shown here.

```
UNITED STATES MENU                                                    [?=help]
-------------------------------------------------------------------------------
        TIME ZONE NAME                AREA

       _ US/Eastern                    Eastern time zone, USA

         US/Central                    Central time zone, USA

         US/Mountain                   Mountain time zone, USA

         US/Pacific                    Pacific time zone, USA

         US/Pacific-New                Pacific time zone, USA
                                       with proposed change to Daylight
                                       Savings Time near election time

         US/Alaska                     Alaska time zone, USA

         US/East-Indiana               Eastern time zone, USA
                                       no Daylight Savings Time

         US/Hawaii                     Hawaii


Are you finished with this menu [y/n] ?
 [RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

1. Move the cursor to the appropriate time zone name and type **x**.

   SunInstall prompts:

```
Are you finished with this menu [y/n] ?
```

2. Enter **y** to exit this menu and redisplay the TIMEZONE menu.
3. Enter **y** again to exit the TIMEZONE menu.

SunInstall now asks you to confirm the current date and time, as in the following example:

```
Is this the correct date/time: Thu Feb 22 17:10:15 PDT 1990
   [y/n] >>
```

4. Enter **y** if the displayed information is correct. Otherwise, enter **n** and press the Return key. The Set Time screen appears. The format for the Set Time screen display depends on which time zone you selected. Press Delete, Control-U or the Backspace key to erase the sample response. Then enter the correct date and time using the format that is displayed for your time zone, and press the Return key.

   As an example, on the third day of June, 1990 at three o'clock in the afternoon you could enter:

```
>> 03/06/90 03:00 pm
```

   After you press the Return key, SunInstall would respond:

```
Is this the correct date/time: Sun Jun 3 15:00:12 PDT 1990
   [y/n] >>
```

   Enter **y** if the displayed information is correct and **n** if you want to try again. (Note that SunInstall displays in twenty-four hour time, thus three o'clock in the afternoon is displayed as 15:00.)

   SunInstall sets the system clock and displays the Main Menu.

Figure 7-1 *SunInstall Main Menu: First Appearance*

```
MAIN MENU                                                        [?=help]
-------------------------------------------------------------------------
                Sun Microsystems System Installation Tool

                  ( + means the data file(s) exist(s) )

                    _ assign host information



                      exit SunInstall


[RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

Now you are ready to begin filling out the SunInstall forms.

The Main Menu

The core of the installation process involves completing several *forms*, each one relating to a specific aspect of your configuration.

You select forms from the SunInstall Main Menu. When first displayed, the menu is as shown above, with just one menu item, `assign host information`, displayed. This is the current item, the one that is selected if you simply type **x** or **X**.

The main menu will reflect your progress as you work your way through the forms. When, for example, you've completed the HOST Form to assign host information, SunInstall marks that item with a plus sign (+) and requests disk information.

Figure 7-2 *SunInstall Main Menu: After Completing the Host Information Form*

```
MAIN MENU                                                          [?=help]
-------------------------------------------------------------------------
                Sun Microsystems System Installation Tool

                  ( + means the data file(s) exist(s) )

                    + assign host information

                    _ assign disk information
```

The information on each completed form is automatically recorded in an installation database. A "+" before a menu item means the database contains the corresponding information. On the Form shown below all required forms have been completed.

Figure 7-3 *SunInstall Main Menu: After All Forms Are Completed*

```
MAIN MENU                                                          [?=help]
-------------------------------------------------------------------------
                Sun Microsystems System Installation Tool

                  ( + means the data file(s) exist(s) )

                    + assign host information

                    + assign disk information

                    + assign software information

                    + assign client information


                    _ start the installation

                      exit SunInstall

[RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

Using the Main Menu

The SunInstall Main Menu allows you to use the following keys to move the cursor about the screen:

[SPACE] [RETURN] move forward, by item, as far as the prompt line

[Control–F] [Control–N] move forward through the menu items

[Control–B] [Control–P] move backward through the menu items

(The cursor-movement keys are noted on the message line at the bottom of the screen.)

[Control–L] repaint the screen should it become garbled

The choices on the Main Menu allow you to:

display a form

Move the cursor to the corresponding form name, and type **x** or **X**.

exit SunInstall

Move the cursor to `exit SunInstall`, and type **x** or **X**.

display general information about the menu use

Type **?** at any time to display an *On-Line Help Screen* . See Figure 7-4 below for one example. Press [Return] to redisplay the Main Menu when you are through viewing the help text.

start the installation

When you have completed the last required form, the Main Menu displays:

```
start the installation
```

Type **x** or **X** to begin the installation of your system.

Figure 7-4 *On-Line Help Screen*

```
                    ON-LINE HELP FOR MENUS
-------------------------------------------------------------

-------------------------------------------------------------
       KEYS                          PURPOSE
-------------------------------------------------------------
       CONTROL B                      move to previous item
       CONTROL P                      move to previous item
       CONTROL F                      move to next item
       CONTROL N                      move to next item
       <RETURN>                       move to next item
       <SPACE>                        move to next item

       x or X                         select an item

       CONTROL L                      repaint screen
       CONTROL C                      abort

Press <return> to continue ...
```

Completing the HOST Form

From the SunInstall Main Menu, complete the HOST Form as follows:

1. Select `assign host information`.
2. Complete the form, referring to your Host Form Worksheet and using the following example as a guide.

```
HOST FORM                [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Workstation Information :
     Name : diphthong
     Type :  [standalone]  x[server]  [dataless]


   Network Information :
        Ethernet Interface :  [none] x[le0]

        Internet Address   : 195.5.2.15
        NIS Type           :  [none]  [master]  [slave] x[client]
        Domain name        : em_city.oz.com

   Misc Information :
       Reboot after completed :  [y] x[n]


 Are you finished with this form [y/n] ?
    [x/X=select choice] [space=next choice] [^B/^P=backward] [^F/^N=forward]
```

This example form is the first of many to appear in this procedure. Each uses the same conventions.

- System-specific items are italicized.
- User entries are boldfaced.

Thus, the example Ethernet interface *(le0)* is system-specific information SunInstall displayed, while the example hostname (***diphthong***) and IP address (***195.5.2.15***) are system-specific information the user entered.

When you have completed the last screen field, SunInstall prompts:

```
Are you finished with this form [y/n] ?
```

3. Enter **y** to exit the form.

   The message `updating databases ...` is briefly displayed, followed by the Main Menu.

Completing the DISK Form

From the SunInstall Main Menu complete the DISK Form as follows:

1. Select `assign disk information`.

   SunInstall polls the disk drives and lists their device numbers in the `Attached Disk Devices` field. The form will look like this for most systems with one SCSI disk:

```
DISK FORM            [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------
Attached Disk Devices :
   [sd0]
```

2. Select the system disk from among the devices listed. (The system disk will usually be the first one listed.)

   SunInstall then expands the DISK Form:

```
DISK FORM            [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------
Attached Disk Devices :
   x[sd0]

Disk Label:  [default]  [use existing]  [modify existing]
Free Hog Disk Partition :  [d]  [e]  [f]  [g] x[h]
Display Unit             : x[Mbytes]  [Kbytes]  [blocks]  [cylinders]
```

   Steps 3 through 5 explain how to complete the new fields.

3. In the `Disk Label` field, choose a starting disk label. The choices are:

   - `default`
     Displays the standard partitions for your system configuration. This is the correct choice for new installations and most installations of existing systems as well.

   - `use existing`
     Displays the partitions already defined on the disk but does not allow them to be changed. If you are reinstalling a previously installed system, and you don't want to modify the existing disk partitions, select this option. Note that only the partition sizes are filled in; you must enter the `MOUNT PT` fields by hand.

   - `modify existing`
     Displays the existing partitions on the selected disk and allows them to be changed. Again, the `MOUNT PT` fields must be entered by hand.

4. SunInstall will choose the partition normally associated with users' home directories as the default for the *Free-Hog Disk Partition*. In most cases this

will be correct.

If you have a small disk (under 130 MB), partition `g` will be marked as the free-hog partition. The example forms in this procedure assume that you are installing SunOS Release 4.1.2 on a large disk, therefore partition `h` is the free-hog partition.

The *Free-Hog*

The SunInstall program will help you prepare a disk layout that it will use later to define physical disk partitions. As you refine the layout, the program automatically sees that the total amount of disk space in use by the defined partitions equals the total space available on the disk. SunInstall does so by automatically adjusting the size of one partition on each disk: the *free-hog* partition.

As the other partitions are increased or decreased in size the free-hog is decreased or increased to maintain the correct total. It is common to designate the partition that will hold the users' personal directories (usually `/home`) as the free-hog. This results in the users having as much disk space as possible for doing their work commensurate with the specific disk space needs of the operating system.

The term *free-hog* only refers to the special role the partition plays while you're using the SunInstall program. **There is no free-hog partition on an installed system; the concept is meaningless apart from the SunInstall program.** Also note that since the size of the free-hog is relative to that of the other partitions it is not possible to directly change the size of the free-hog. (That is, you cannot type in the SIZE field for the free-hog on the DISK Form).

5. In the **Display Unit** field, specify how you want partition sizes displayed in the `SIZE` column. The example forms display partition sizes in Mbytes (the default), but you can also use Kbytes, blocks, or cylinders. (Refer to Appendix D — "Disk Structure and Disk Space Terminology" for general information about blocks and cylinders.)

Only the integer portion of the partition size is displayed. The displayed size of a 35.75 MB partition, for example, is 35, not 35.7 or 35.8. **The actual size will be rounded to the nearest cylinder when SunInstall physically relabels the disk.**

When you make your choice, SunInstall displays a partition table that reflects the selected label. If you selected `default` at step 3, the `MOUNT`

PT and PRESERVE columns will be filled in. (The columns will otherwise be empty.)

Following is a default partition table for a heterogeneous server system.

If you type **y** in the PRESERVE(Y/N) column, SunInstall will not re-make the filesystem in that partition. This provides a means to retain existing data in user partitions such as /home. **If the START_CYL or SIZE of a partition changes, it *cannot* be preserved. SunInstall will notify you if you attempt to preserve a partition that does not meet these criteria.**

```
PARTITION START_CYL BLOCKS    SIZE     MOUNT PT            PRESERVE(Y/N)
=============================================================================
    a     0         32025     16       /                        n
    b     61        59850     30
    c     0         639450    327
    d     175       12075     6        /export                  n
    e     198       64050     32       /export/swap             n
    f     0         0         0
    g     320       90300     45       /usr                     n
    h     492       381150    190      /home                    n
```

6. To implement your disk plan, complete the SIZE, MOUNT PT, and PRESERVE column for each required filesystem and any others you have chosen to define. If a column already contains a value, you can type Return to use the displayed value. Leave the MOUNT PT columns blank for all c partitions and for any partitions which will be used for swap space.

If you've chosen to use the existing disk partitions, you might wish to preserve the /home partition so you won't have to restore user home directories from tape after you install Release 4.1.2. **Do not preserve the /, /usr, and /export partitions!**

The root (/) Partition

The size displayed for your root partition (the a partition of your system disk) will reflect the current size of the partition on the disk. If you used format to adjust the size of the root this is a good opportunity to check your work, verifying that the partition is the size you intended. **Remember: you cannot change the size of the a partition on the system disk within SunInstall.**

The swap Partition

The size displayed for your swap partition (the b partition of your system disk) will also reflect the current size of the partition on the disk. If you need to *increase* the size of the partition, do so now. Simply press Return until the cursor is next to the swap partition's SIZE field, backspace over the current size, and enter the new size you desire. Note that at the same time SunInstall will automatically decrease the size of the designated free-hog partition by a similar amount. **Remember: you cannot *decrease* the size of the b partition of the system disk within SunInstall.**

The /export Partition

By default, the /export partition is sized to fit two clients. For the time being, however, you can leave it as it is regardless of the number of clients you will support. Later on, as you select software for and define your diskless clients, SunInstall will automatically expand the partition, taking the space necessary to store the software to support heterogeneous clients and allowing approximately 5 MB for each client defined. We'll return to the Disk Form to review the size of this and the other partitions after client definition has been completed.

If your disk plan calls for moving the /export partition to another disk drive, begin to do so at this time. For now, just enter "**0**" (zero) in the SIZE field of the partition. When you do so the MOUNT PT and PRESERVE fields will automatically be erased, and the disk space that had been assigned to /export will be added the free-hog partition. When you move on to defining the partition tables on your other disk drives you'll re-define the partition there.

The /export/swap Partition

Like /export the /export/swap partition is initially sized to fit two typical clients. SunInstall will automatically total the swap space sizes that you assign for your clients and expand the partition as appropriate.

Like the /export partition, if you have decided to move /export/swap to another disk drive, prepare to do so by changing the SIZE field to 0 (zero) MB on this disk.

The /usr Partition

How you size the /usr partition is perhaps the most important part of your disk plan. In order to let SunInstall automatically calculate the size of /usr necessary to accommodate the SunOS operating system software intentionally *undersize* the partition at this time. To do so, press Return until the cursor is next to the SIZE field for the /usr partition. Then type Delete to backspace over the current SIZE and enter **5**. Note that, at the same time that the size of /usr is decreased, the size of the designated free-hog partition will increase by a like amount.

Later on, when software selection has been completed, /usr will be almost *exactly* the size needed to accommodate the SunOS software chosen. Then you will return to the DISK Form to expand /usr as per your Partition Planning Worksheet.

```
PARTITION START_CYL BLOCKS    SIZE     MOUNT PT            PRESERVE(Y/N)
=============================================================================
    a     0         32025     16       /                        n
    b     61        59850     30
    c     0         639450    327
    d     175       12075     6        /export                  n
    e     198       64050     32       /export/swap             n
    f     0         0         0
    g     320       9975      5        /usr                     n
    h     339       461475    231      /home                    n
```

The size of the `/usr` partition need not and cannot be directly changed if `/usr` is the free-hog.

The `/home` Partition

If a `/home` partition is defined and is intended to remain on the system disk you can leave it as is, defined as the free-hog and adjusting automatically as changes are made to the other partitions on the disk.

If your disk plan calls for moving `/home` to another disk, remove it from the system disk now. Since `/home` is currently designated as the free-hog it is not possible to directly specify its SIZE. To do so, back up through the DISK Form by typing Control–B until the cursor enters the **Free Hog Disk Partition** field. Use the space bar to move to the `[g]` field and then select that partition by typing **x**. Now press Return to move down through the Form. Notice that the cursor will skip the `g` partition SIZE field (it is now the free-hog) but will enter the SIZE field for partition `h`, the `/home` partition. Press Delete to backspace over the field and then enter **0** to delete the partition.

When you complete the table, SunInstall prompts

```
O.K. to use this partition table [y/n] ?
```

7. Enter **y** to use the displayed table or **n** if you wish to change it.

   When you accept the table, SunInstall prompts

   ```
   Are you finished with this form [y/n]?
   ```

8. Enter **y** if you are defining only one disk. Otherwise, enter **n** and fill out additional DISK Forms until you have completed one for each of your disk drives. Then enter **y**, indicating that you are finished with the DISK Forms.

Completing the SOFTWARE Form

From the SunInstall Main Menu, complete the SOFTWARE Form as follows:

1. Select `assign software information` from the Main Menu.

   SunInstall displays the SOFTWARE form.

```
SOFTWARE FORM          [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
    [add new release]  [edit existing release]
```

2. Select `add new release`.

   SunInstall requests the device name and location of the device on which the Release 4.1.2 media resides.

```
SOFTWARE FORM          [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
   x[add new release]  [edit existing release]


 Media Information:
    Media Device     :  [st0] [st1] [st2] [st_]* [xt0] [mt0] [fd0] [sr0]
    Media location   :  [local]  [remote]
```

3. Complete the **Media Information** fields, using the following examples as a guide.

* Selecting `[st_]` will allow you to specify the `st` device number manually. This feature allows selection of SCSI devices 3–7 when necessary.

Example for CD-ROM in Local SunCD Drive:

```
SOFTWARE FORM          [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
   x[add new release]  [edit existing release]


 Media Information:
    Media Device     :  [st0] [st1] [st2] [st_] [xt0] [mt0] [fd0] x[sr0]
    Media Location   :  x[local]  [remote]
```

Example for CD-ROM in Remote SunCD Drive:

```
SOFTWARE FORM          [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
   x[add new release]  [edit existing release]


 Media Information:
    Media Device     :  [st0] [st1] [st2] [st_] [xt0] [mt0] [fd0] [sr0]
    Media location   :  [local]  x[remote]
    Media Host       :  persephone
    Media Host's Internet Address :  195.5.2.16
```

When reading from a media device attached to a remote system make sure that the hostname of the system being installed is included in the `/.rhosts` file of the remote system.

Note that including the hostname of the system being installed in the `/.rhosts` file allows superuser (root) access to the remote system from your workstation. For increased security, be sure to remove the hostname from the `/.rhosts` file once you have completed the installation.

Having gathered the information needed to access the Release 4.1.2 media, SunInstall prompts:

```
Ok to use these values to read the table of contents [y/n] ?
```

4. The release media appropriate to the kernel architecture of the server should be loaded in the media device. Enter **y** if the values are correct or **n** if you need to change any of them.

When you elect to use the displayed information, SunInstall expands the form as shown below.

```
SOFTWARE FORM            [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
   x[add new release]  [edit existing release]


 Media Information:
    Media Device     : [st0] [st1] [st2] [st_] [xt0] [mt0] [fd0] x[sr0]
    Media location   :  x[local]  [remote]

Choice:   [all]  [default]  [required]  [own choice]
  Executables path:  /usr
  Kernel executables path: /usr/kvm
```

5. Specify your software selection method by choosing one of the following:

   `all` — Automatically selects all SunOS software categories.

   `default` — Automatically selects the *default* software categories, and then asks you to pick the other software you want.

   `required` — Automatically selects the *required* categories, without allowing you to pick additional software.

   `own choice` — Automatically selects the *required* categories, and then asks you to pick the other software you want.

   (The default software selection includes all required categories and selected common and desirable categories as shown in Table 7-5. See Table 1-5 for detailed information about the listed categories.)

Table 7-5 *Default Software for Networked Systems*

Required Categories	Common and Desirable Categories
root	Debugging
usr	RFS
Kvm	SunView_Users
Install	Sys
Networking	System_V
	TLI

6. Press Return in the following fields to use the standard paths to executable files.

```
Executables path:
Kernel executables path:
```

SunInstall prompts:

```
Ok to use these values to select Software Categories [y/n] ?
```

Software selection will begin when you answer this prompt. Read the remainder of this step to preview the selection process *before* responding to this prompt.

Unless you selected `all` or `required` at step 5, you'll be able to pick exactly which optional software to install. SunInstall will display category names, one by one, and prompt:

```
Select this media file [y/n] ?
```

Software selection is in progress in the following example.

```
SOFTWARE FORM            [?=help] [DEL=erase one char] [RET=end of input data]
------------------------------------------------------------------------------
Software Architecture Operations:
     x[add new release]  [edit existing release]


 Media Information:
    Media Device     : x[st0] [st1] [st2] [st_] [xt0] [mt0] [fd0] [sr0]
    Media location   : x[local]  [remote]


Choice:   [all]  [default]  [required]  x[own choice]
    Executables path:  /usr
    Kernel executables path: /usr/kvm

Destination fs:  /usr (sd0g)                                      47210496
                                                        Hog: sd0h  31334400
Name: SunView_Programmers (optional)                       Size :  2150400



Select this media file [y/n] ? _                        status: not selected
[RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

In the example, "SunView_Programmers" is the software category presented. Answering **y** to the `Select this media file [y/n] ?` prompt will mark this category for installation on your system. Answering **n** will skip it. In either case, SunInstall will then go on to present the next category for your consideration.

A variety of disk space parameters are also presented, as the following details show:

```
Choice:  [all]  [default]  [required]  x[own c
    Executables path:  /usr
    Kernel executables path:  /usr/kvm

Destination fs:  /usr (sd0g)

Name:  SunView_Programmers  (optional)
```

The destination filesystem is `/usr`.

The software category and its type.

Indicators at the right-hand side of the screen show—**in bytes**—the size of the software category, the current size of the free-hog partition, and the changing state of the destination filesystem. The following detail examines this region more closely.

```
]  x[own choice]
usr
ath:  /usr/kvm

                                    47210496
                Hog:  sd0h          31334400
                      Size:         2150400
```

Available space in destination filesystem.‡
Current size of the free-hog partition.
Size of the displayed software category.

‡ Pay particularly close attention to this value if your `/usr` partition is the designated free-hog. When software selection is complete it will represent the space available in `/usr` for Sun unbundled products, products from other vendors, locally developed programs, and general free space.

7. Unless you wish to change your software selection method, enter **y** to usr the displayed values and begin the selection.

   After all of the categories have been presented and responded to, SunInstall summarizes the selected categories for you:

```
SOFTWARE FORM          [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
     x[add new release]  [edit existing release]


 Media Information:
    Media Device     : x[st0] [st1] [st2] [st_] [xt0] [mt0] [fd0] [sr0]
    Media location   : x[local]  [remote]


Choice:   [all]  [default]  [required]  x[own choice]
    Executables path:  /usr
    Kernel executables path: /usr/kvm


Media Filenames:
root            SunView_Users
usr             SunView_Programmers
Kvm             Text
Install         Manual
Networking


Ok to use this architecture configuration [y/n] ?
[RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

8. Enter **y** to use the configuration or **n** if you wish to go back and try again.

   When you elect to use the configuration, SunInstall prompts:

   ```
   Are you finished with this form [y/n] ?
   ```

9. Enter **n** to redisplay the SOFTWARE Form.

Now is the time to select software for your heterogeneous clients. If you have clients of the same application architecture (but different kernel architecture) as the server, select their software first. The "status:" field will note which categories have already been selected for this application architecture. For these categories answer **n** to `Select this media file [y/n] ?`. Answer **y** to the Sys category if you want to be able to build custom kernels for the clients. Then continue on to select software for clients of application architecture

different from the server.

Note that the form is flexible about the location of the media for each architecture. You can select software for each architecture from a different device (and, for that matter, different media type) if you desire. Note also that if you are loading software from CD-ROM SunInstall will display a screen allowing you to specify which of the software architectures available on the CD-ROM you want to select.

10. As explained above, select software for each client kernel architecture, repeating steps 2 through 9 for each one in turn.

    Repeat the software selection procedure until software for all application and kernel architectures is accounted for. Then answer `y` to

    ```
    Are you finished with this form [y/n] ?
    ```

    and continue on to "Completing the CLIENT Form."

Completing the CLIENT Form

From the SunInstall Main Menu complete the CLIENT Form as follows:

1. Select `assign client information`.

   SunInstall will display the CLIENT Form.

```
CLIENT FORM              [?=help] [DEL=erase one char] [RET=end of input data]
 ------------------------------------------------------------------------------
 Architecture Type : _[sun4.sunos.4.1.2] _[sun3x.sunos.4.1.1]
 Client name       :
 Choice            :  [create]  [delete]  [display]  [edit]



 Are you finished with this form [y/n] ?
    [x/X=select choice] [space=next choice] [^B/^P=backward] [^F/^N=forward]
```

2. The **Architecture Type** field will display the name of the SunOS 4.1.2 release and the kernel architecture types for which you have selected software. **Clients can only be defined if you have previously selected Kvm software that matches their kernel architecture.** Select the **Architecture Type** for the first client you need to define.
3. The cursor will move into the **Client name** field. Enter the hostname of your first diskless client.
4. As the cursor moves into the **Choice** field select `[create]`. SunInstall will display a form like the this:

```
CLIENT FORM              [?=help] [DEL=erase one char] [RET=end of input data]
--------------------------------------------------------------------------------
Architecture Type : x[sun4.sunos.4.1.2]
Client name       : squid-lips
Choice            : x[create]  [delete]  [display]  [edit]
Root fs : /export/root (sd1d)              6291456       Hog : sd1h 284164096
Swap fs : /export/swap (sd0e)              33554432      Hog : sd0g 256901120

Client Information :
     Internet Address            : 195.5.2._
     Ethernet Address            : 8:0:20:1:00:00
     NIS Type                    :  [none] x[client]
     Domain name                 : em_city.oz.com
     Swap size (e.g. 8B, 8K, 8M) : 16M
     Path to Root                : /export/root/squid-lips
     Path to Swap                : /export/swap/squid-lips
     Path to Executables         : /usr
     Path to Kernel Executables  : /usr/kvm
     Path to Home                : /home/diphthong
     Terminal type               : sun


Ok to use these values [y/n] ?
   [x/X=select choice] [space=next choice] [^B/^P=backward] [^F/^N=forward]
```

The `Root fs` and `Swap fs` lines provide partition size and associated free hog information similar to that displayed by the SOFTWARE Form. The partitions monitored here will vary depending on the partitions defined by the `Path to Root` and `Path to Swap` fields.

5. Each line of *Client Information* should be checked and, perhaps, edited. An explanation of each line follows:

   - `Internet Address`

     The network portion of the client's internet address has already been filled in for you. Just append the correct host number to complete the address, for example; `195.5.2.` might become `195.5.2.20`.

   - `Ethernet Address`

     Backspace over and fill in the correct Ethernet address for this client.

   - `NIS Type`

     Diskless workstations can be NIS clients, or not use NIS at all. SunInstall will pick the reasonable default depending on whether or not you are configuring the server for NIS (in the HOST Form).

   - `Domain name`

     The same as for the server, if NIS is being used.

   - `Swap size (e.g. 8B, 8K, 8M)`

The size of the swap file that will be assigned to this client. A reasonable default is provided. Refer back to your Client Form Worksheet to see if you've planned something different.

If you choose to change the **Swap size** you can specify the new size in bytes (B), kilobytes (K) or megabytes (M). (As you change the swap file size you may see the sizes of the `/export/swap` partition and its associated free-hog partition automatically adjust.)

- `Path to Root`

  This is the directory on the server that will form the client's root (`/`) directory. The default is `/export/root/`*clientname*.

- `Path to Swap`

  This is the file on the server that the client will use for swap space. The default is `/export/swap/`*clientname*.

- `Path to Executables`

  The server's directory that the client will mount as its `/usr`. Should not need to be changed.

- `Path to Kernel Executables`

  The server's directory that the client will mount as its `/usr/ kvm`. Should not need to be changed.

- `Path to Home`

  Where users' home directories will reside.

- `Terminal type`

  The console terminal type of the client. Will need to be changed only if the client does not have a Sun bit mapped monitor.

6. When you are satisfied with the client information that you have entered, move the cursor down to `Ok to use these values [y/n] ?` and enter **`y`**.
7. The CLIENT Form will display again, this time with the name of the newly defined client noted.

```
CLIENT FORM              [?=help] [DEL=erase one char] [RET=end of input data]
------------------------------------------------------------------------------
Architecture Type : x[sun4.sunos.4.1.2]
Client name       : squid-lips
Choice            : x[create]  [delete]  [display]  [edit]


sun4.sunos.4.1.2 Clients:

squid-lips


Are you finished with this form [y/n] ?
   [x/X=select choice] [space=next choice] [^B/^P=backward] [^F/^N=forward]
```

If you have more clients to define enter **n**. You can then create another client the same way you did the first. You also have the option (in the **Choice** field) to delete, display or edit clients that you've already defined.

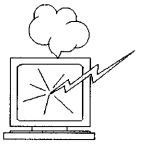
8. Continue to cycle through the CLIENT Form creating clients until you've taken care of all those that your server is intended to support. Finally, enter **y** in response to the `Are you finished with this form [y/n] ?` prompt.

If you will be adding more diskless clients to your server in the near future you may find it convenient to define those workstations now in order to "pre-allocate" space in the appropriate partitions. Even if you use hostnames like *dummy1* and *dummy2* and the default Ethernet address when defining these clients it will still be relatively easy to complete their configuration when the new workstations become available.

Rechecking Partition Sizes

The Main Menu should now be displayed, with the cursor next to the item:

```
start the installation
```



Before you select `start the installation` follow these steps to check and adjust the current partition sizes.

1. Press Control–B to move the cursor back through the menu items.
2. Select `assign disk information`.

   The DISK Form is displayed once more.

```
 DISK FORM            [?=help] [DEL=erase one char] [RET=end of input data]
------------------------------------------------------------------------------
Attached Disk Devices :
   [sd0]
```

3. Select each disk in turn.

   The **Disk Label** field contains a new item, `data file`. This item displays the disk label from the installation database, where all of the information you've entered so far is stored.

```
 DISK FORM            [?=help] [DEL=erase one char] [RET=end of input data]
------------------------------------------------------------------------------
 Attached Disk Devices :
    x[sd0]


 Disk Label:  [default]  [use existing]  [modify existing]  [data file]
 Free Hog Disk Partition :  [d]  [e]  [f]  [g] x[h]
 Display Unit            : x[Mbytes]  [Kbytes]  [blocks]  [cylinders]
```

4. Select `data file` to display the new partition sizes. Since you last viewed the form, several partitions have likely changed in size:
   - The `/usr` partition may be larger.
   - The `/export` partition may be larger.
   - The `/export/swap` partition may be larger.
   - The free-hog partition should be smaller.

   SunInstall took space from the free-hog partition to expand the `/usr` partition when you selected software. The `/usr` partition is now just the size needed to accommodate the software you selected.

   If partition sizes have not changed (perhaps `/usr` was the free-hog) skip to step 6. Otherwise, adjust the partition size as described in the step 5.

5. Finish sizing your partitions:

   - `/usr`
     Refer to your Partition Planning Worksheet to find the amount of space you have decided to allow above and beyond that required by the operating system files (space for other files and free space for expansion). Add that space to the current size of `/usr` and edit the `SIZE` field accordingly.

- `/export`
  Check the size of the `/export` partition. Add an appropriate amount of space if you expect to be adding more clients to the server soon. You may also need to add space to hold application software if you have clients of a different application architecture from the server's.
- `/export/swap`
  Check the size of the `/export/swap` partition. Add space for additional clients, if planned.

6. Finally, press Return enough times to reach the prompt line:

   ```
   Ok to use this partition table [y/n] ?
   ```

   and enter `y`.

7. SunInstall will display:

   ```
   Are you finished with this form [y/n] ?
   ```

   If you have more disk drives to check answer `n` and repeat steps 3 through 6 for each drive. When all disks have been checked enter **y** to redisplay the Main Menu.

Letting SunInstall Run

The Main Menu should now be displayed. Move the cursor to:

```
start the installation
```

Type **x** to begin the installation.

Your screen will reflect the progress of the installation as SunInstall labels the disk, creates the specified filesystems, and loads software from the Release 4.1.2 media. Depending on the software categories you chose earlier, you may be asked to load additional media, as shown in the following example:

```
System Installation Begins:
Label disk(s):
        sd0
Create/check filesystems:
Creating new filesystem for / on sd0a
newfs /dev/rsd0a >> /etc/install/suninstall.log 2> &1
. . .
Extracting sunos.4.1.2.sun4 'root' media file ...
Extracting sunos.4.1.2.sun4 'usr' media file  ...
Extracting sunos.4.1.2.sun4 'Kvm' media file  ...
Extracting sunos.4.1.2.sun4 'Install' media file ...
Extracting sunos.4.1.2.sun4 'Networking' media file ...
Please mount sun4.sunos.4.1.2 release media #2
Press <return> to continue
```

If There's a Problem

If SunInstall should, for some reason, fail or have to be aborted during its run, it will save the data files that were created as you filled in the forms. You can remedy the problem and then re-invoke SunInstall, going directly to "`start the installation`." SunInstall may prompt:

```
Some software has already been loaded.
Are you sure you want to restart the installation (y/n) ?
```

Answering "`y`" will have SunInstall restart its run using the data you have already entered.

When SunInstall Completes

What happens after SunInstall extracts the last software category depends on how you filled in the `Reboot after completed` field on the HOST Form.

- If you selected **`y`**, your system boots automatically. Booting messages appear, followed by a `login` prompt. Refer to Section 7.6, "Deciding What Still Needs to Be Done" for further instructions.
- If you selected **`n`**, the # prompt reappears. Your system is still running the miniroot.

Installing a Small Kernel

Pre-configured small kernels are available for various configurations. See the *SunOS 4.1.2 Release Manual* for tables that describe available `GENERIC_SMALL` kernel configuration files.

If you want to install an appropriate pre-configured kernel do so by executing:

```
# install_small_kernel
```

The utility is self-explanatory and will ask you for confirmation before making any changes to the system. It is capable of installing small kernels for your diskless clients as well as for your server.

Configuring an NIS **master** or **slave**

NIS masters and slaves should be configured before they are booted in multi-user mode. See Chapter 16 of the *System and Network Administration* manual for details.

Booting Up Your Workstation

To boot your new operating system from the # prompt do the following:

```
# sync;sync;reboot
```

7.6. Deciding What Still Needs to Be Done

Several basic system administration tasks should be completed following the installation of your system.

Logging In and Setting the root Password

As supplied the SunOS operating system does not have a password protecting the superuser (root) login. Login as "**root**" and then use the `passwd(1)` command to set the password of your choice.

Configuring for Multiple swap Partitions

If you have defined multiple swap partitions, you must add a line to the `/etc/fstab` file for each additional swap area. For example, you define `sd1b` as a swap partition by adding the following line in the `/etc/fstab` file:

```
/dev/sd1b swap swap rw 0 0
```

Then enter:

```
# swapon -a
```

(From now on `swapon` will be executed automatically each time the system is booted.)

Configuring for tmpfs

If you have decided to use the tmpfs virtual file system for the `/tmp` directory do the following:

- Add this line to the file `/etc/fstab`:

```
swap /tmp tmp rw 0 0
```

- Enter:

```
# mount /tmp
```

- In the file `/etc/rc.local` find the line:

```
#mount /tmp
```

and remove the sharp sign (#):

```
mount /tmp
```

From now on, the `/tmp` directory will be mounted automatically each time the system is booted.

- When you build and install a custom kernel include the following line in the kernel configuration file:

```
options TMPFS  # tmp (anonymous memory) file system
```

(The tmpfs facility is included in the GENERIC kernel.)

Building and Installing a Custom Kernel

For best workstation performance you should make and install a custom operating system *kernel*. The kernel is a program which is loaded into memory when your workstation is booted and which then controls all aspects of system operation. The default kernel is called the *GENERIC* kernel. This kernel includes the software necessary to access all of Sun's peripheral hardware. While this is useful during installation it also means that the kernel includes much more software, and is therefore much larger, than is required for any specific system. This excessive size means an inefficient kernel which uses up memory that can be put to better use and provide improved performance.

Complete instructions for creating and installing a custom kernel for your workstation are given in Chapter 9 of the *System and Network Administration Manual*, Reconfiguring the System Kernel.

If you chose to install a GENERIC_SMALL kernel at the conclusion of running SunInstall that kernel will provide improved performance as compared to the GENERIC kernel. You may still, however, see some further improvement by creating a kernel matched to your specific configuration.

Setting Up User Accounts

Refer to the manuals *System and Network Administration*, *Getting Started with SunOS: Beginner's Guide*, and *Setting Up Your SunOS Environment: Beginner's Guide* for assistance.

Customizing Your Environment

Refer to Chapter 8 of *System and Network Administration Manual*, Administering Workstations, Section 8.1. Here you will find the information you need for setting up user home directories, enabling electronic mail, etc.

Backing Up Your New System

Once you have customized your system to suit your needs it should be *backed up*. This means recording the information contained on your disks onto a different media, usually tape, for safekeeping. Chapter 6, Section 6.1 of *System and Network Administration* contains the information you will need.

Booting Up Your Clients

Once the server is up and running you can begin to boot your client workstations over the net. Refer to *System and Network Administration* for complete information on administering your network.

7.7. Multi-Release Support

This section describes how to configure a server to support clients running under a different operating system release than the server. This feature is available for servers running SunOS 4.1 or a later release. Sun recommends that you use multiple releases on a server only as a transitional measure and that eventually you upgrade all of your servers as well as clients to the most recent release.

If you have sufficient space free in `/export/exec`, you can add SunOS 4.1.2 as a new release for clients with the `add_services` utility. Refer to the *System and Network Administration* manual, Chapter 8 ("Using the `add_services` utility") for a detailed description. Note that the `add_services` utility will prompt you to confirm the release you are installing after you have specified the media information.

After you have loaded SunOS 4.1.2 onto the server, you can then create new clients of this additional release by using the `add_client` utility. Refer to the *System and Network Administration* manual, Chapter 8 ("Using the `add_client` utility") for a detailed description. Be sure to select the correct release for the client from the *Architecture Type* menu in the client form.

7.8. Example Worksheets for Heterogeneous Server

This section presents a sample scenario illustrating installation of a Heterogeneous Server configuration. Background information for this scenario is presented, followed by facsimiles of Worksheets completed to support the installation process.

Examining the completed Worksheets will help you understand the correct use of the Worksheets, provide ideas for implementing similar installation configurations, and generally clarify installation planning.

You can find sets of blank worksheets, along with detailed explanations of the worksheets themselves, in Appendix E, "Installation Worksheets."

Completed Worksheets: Heterogeneous Server

Scenario: estoril

estoril is a Sun-4/280 which will be installed as a heterogeneous server. The system has 96 Mbytes of main memory, and a Wyse 50 console terminal.

Peripheral equipment includes three 892 Mbyte SMD disk drives on an `xd` controller, and an `xt` Half Inch open reel tape drive.

Four diskless clients will be defined, and space in `/export` and `/export/swap` will be reserved for two more clients.

The sun3 and sun3x clients must use the SunOS 4.1.1 release; later releases do not support those architectures.

Estoril will act as a print server (*SunTranscript* unbundled software) and will have SunPHIGS graphics, Sun Communications, computer assisted publishing ("DocPubs") and relational database ("DataBase") software installed. Estoril will be an NIS master.

Heterogeneous Scenario:
estoril

Preliminary Information Worksheet

Name: estoril

Hardware Information:

Workstation Model: 4/280 1

Workstation Architecture: sun4 . sun4 2

Media Device Type: sr 3 and Number: 0 4

Media Device Name: sr0 5

System Disk Name: xd0 6

Other Disk Devices (if any): 7

Name: xd1 Name: xd2

Name: _____ Name: _____

Name: _____ Name: _____

System Console Device: wyse50 8

Miscellaneous Information:

Local Timezone: CET 9

Heterogeneous Scenario:
estoril

Host Form Worksheet

Workstation Information:

Name : estoril [1]

Type : ☐[standalone] ☒[server] ☐[dataless] [2]

Network Information:

Internet Address : 192 . 3 . 11 . 2 [3]

NIS Type : ☐[none] ☒[master] ☐[slave] ☐ [client] [4]

Domain name : ehq.engineering [5]

Miscellaneous Information:

Reboot after completed : ☐[y] ☒[n] [6]

Dataless Configuration Information:

Server name : _____ [7]

Server Internet Address : _____ . _____ . _____ . _____ [8]

Path of the executables on server: `/export/exec/`*`app_arch`* [9]

Path of the kernel executables on server: `/export/exec/kvm/`*`kernel_arch`* [10]

Heterogeneous Scenario:
estoril

Partition Planning Worksheet

Phigs 15
Comm 20
Transcript 10
TOTAL 45 →

	Partition/Filesystem	Size	Position
-Required-			
☒	/ (root)	16	xd0a
☒	swap	40	xd0b
☒	/usr*	--------	xd0g
	Sun unbundled	45	----------
	other vendors	+ 90	----------
	Local software	+ 30	----------
	Free Space	+ 50	----------
	Total over and above	= 215	----------
-Common-			
☒	/home1	*	xd0h
-Optional-			
☒	/tmp	30	xd1a
☒	/var	50	xd2a
☒	second swap	40	xd1b
-Servers-			
☒	/export	--------	xd1d
	Sun unbundled† Transcript	10	----------
	other vendors† database-45, docpubs-45	+ 90	----------
	Local software†	+ 30	----------
	Free Space (w/2 clients)	+ 40	----------
	Total over and above	= 170	----------
☒	/export/swapA (1 client)	+ 40	xd1e
-Custom-			
☒	third swap	40	xd2b
☒	/home2	*	xd1h
☒	/export/swapB	+40	xd2e
☐	/database	*	xd2f
☐			

* /usr is required for all configurations *except dataless*.

† Only for software to support clients of an *application architecture* different from the server's.

Disk Form Worksheet

Heterogeneous Scenario:
estoril

Disk Drive: xd0

PARTITION	SIZE	MOUNT PT	PRESERVE
a	16	/	N
b	40	(swap)	
c	892	----------	----------
d			
e			
f			
g	+215	/usr	N
h	*	/home1	N

Heterogeneous Scenario:
estoril

Disk Form Worksheet

Disk Drive: xd1

PARTITION	SIZE	MOUNT PT	PRESERVE
a	30	/tmp	N
b	40	(swap)	
c	892	----------	----------
d	+170	/export	N
e	+40	/export/swapA	N
f			
g			
h	*	/home2	N

Heterogeneous Scenario:
estoril

Disk Form Worksheet

Disk Drive: xd2

PARTITION	SIZE	MOUNT PT	PRESERVE
a	50	/var	N
b	40	(3rd swap)	
c	892	----------	----------
d			
e	+40	/export/swapB	N
f	*	/database	N
g			
h			

Software Form Worksheet

Heterogeneous Scenario:
estoril

a-arch.k-arch: sun4 . sun4

Add Kvm and Sys for sun4.sun4c

	Category	Prerequisites
◉	**root**	–
◉	**usr**	–
◉	**Kvm**	–
◉	**Install**	–
◉	**Networking***	–
☒	**Debugging**	SunView_Users
☒	**RFS**	TLI, Sys
☒	**Sys**	–
☒	**System_V**	–
☒	**TLI**	–
☐	**OpenWindows_Users**	SunView_Users
☐	**OpenWindows_Fonts**	OpenWindows_Users
☒	**SunView_Users**	–
☒	**Demo**	SunView_Users, SunView_Programmers, OpenWindows_Users, OpenWindows_Programmers
☐	**OpenWindows_Demo**	OpenWindows_Users, OpenWindows_Fonts
☒	**Games**	SunView_Users
☒	**Graphics**	SunView_Users, SunView_Programmers
☒	**Manual**	Text
☐	**Security**	–
☒	**Shlib_Custom**	–
☒	**SunView_Demo**	SunView_Users, SunView_Programmers
☒	**SunView_Programmers**	SunView_Users
☐	**OpenWindows_Programmers**	OpenWindows_Users, OpenWindows_Fonts
☒	**Text**	–
☒	**User_Diag**	SunView_Users
☒	**uucp**	–
☐	**Versatec**	–

* Only required if the system is connected to a network.

Heterogeneous Scenario:
estoril

Software Form Worksheet

a-arch.k-arch: sun3 . sun3

	Category	Prerequisites
☒	**root**	–
☒	**usr**	–
☒	**Kvm**	–
☒	**Install**	–
☒	**Networking***	–
☒	**Debugging**	SunView_Users
☒	**RFS**	TLI, Sys
☒	**Sys**	–
☒	**System_V**	–
☒	**TLI**	–
☐	**OpenWindows_Users**	SunView_Users
☐	**OpenWindows_Fonts**	OpenWindows_Users
☒	**SunView_Users**	–
☒	**Demo**	SunView_Users, SunView_Programmers, OpenWindows_Users, OpenWindows_Programmers
☐	**OpenWindows_Demo**	OpenWindows_Users, OpenWindows_Fonts
☒	**Games**	SunView_Users
☒	**Graphics**	SunView_Users, SunView_Programmers
☐	**Manual**	Text
☐	**Security**	–
☒	**Shlib_Custom**	–
☒	**SunView_Demo**	SunView_Users, SunView_Programmers
☒	**SunView_Programmers**	SunView_Users
☐	**OpenWindows_Programmers**	OpenWindows_Users, OpenWindows_Fonts
☒	**Text**	–
☐	**User_Diag**	SunView_Users
☐	**uucp**	–
☐	**Versatec**	–

* Only required if the system is connected to a network.

Heterogeneous Scenario:
estoril

Client Form Worksheet

Client name: Vienna [1] SPARCstation 1+ Color

Architecture Type: sun4 . sun4c [2]

Root fs: */export/root* [3]

Swap fs: */export/swap* [4]

Client Information :

Internet Address: *net* . *net* . *net* . 22 [5]

Ethernet Address: 8 : 0 : 20 : 1 : 6C : 98 [6]

NIS Type: ☐[none] ☒[client] [7]

Domain name: *server_domainname* [8]

Swap size (e.g. 8B, 8K, 8M): 24 M [9]

Path to Root: /export/root/*client_name* [10]

Path to Swap: ~~/export/swap/client_name~~ [11] /export/swapA/vienna

Path to Executables: /usr [12]

Path to Kernel Executables: /usr/kvm [13]

Path to Home: ~~/home/server_name~~ [14] /home1/estoril

Terminal type: sun [15]

Heterogeneous Scenario: estoril

Client Form Worksheet

Client name: Zurich [1] SPARCstation 1+ monochrome monitor

Architecture Type: sun4. sun4c [2]

Root fs: */export/root* [3]

Swap fs: */export/swap* [4]

Client Information :

Internet Address: *net . net . net .* 7 [5]

Ethernet Address: 8 : 0 : 20 : 1 : 3e : 1e [6]

NIS Type: ☐[none] ☒[client] [7]

Domain name: *server_domainname* [8]

Swap size (e.g. 8B, 8K, 8M): 16 M [9]

Path to Root: /export/root/*client_name* [10]

Path to Swap: ~~/export/swap/*client_name*~~ [11] /export/swapA/zurich

Path to Executables: /usr [12]

Path to Kernel Executables: /usr/kvm [13]

Path to Home: ~~/home/*server_name*~~ [14] /home1/estoril

Terminal type: sun [15]

Heterogeneous Scenario: estoril

Client Form Worksheet

Client name: lyon [1] Sun-4/110 color monitor

Architecture Type: sun4 . sun4 [2]

Root fs: */export/root* [3]

Swap fs: */export/swap* [4]

Client Information :

Internet Address: *net . net . net .* 25 [5]

Ethernet Address: 8 : 0 : 20 : 0 : 18 : AB [6]

NIS Type: ☐[none] ☒[client] [7]

Domain name: *server_domainname* [8]

Swap size (e.g. 8B, 8K, 8M): 30M [9]

Path to Root: /export/root/*client_name* [10]

Path to Swap: ~~*/export/swap/client_name*~~ [11] /export/swapB/lyon

Path to Executables: /usr [12]

Path to Kernel Executables: /usr/kvm [13]

Path to Home: ~~/home/*server_name*~~ [14] /home2/estoril

Terminal type: sun [15]

Heterogeneous Scenario:
estoril

Client Form Worksheet

Client name: bagshot [1] Sun-3/60 monochrome

Architecture Type: sun3 . sun3 [2]

Root fs: */export/root* [3]

Swap fs: */export/swap* [4]

Client Information :

Internet Address: *net . net . net .* 31 [5]

Ethernet Address: 8 : 0 : 20 : 1 : 0 : 93 [6]

NIS Type: ☐[none] ☒[client] [7]

Domain name: *server_domainname* [8]

Swap size (e.g. 8B, 8K, 8M): 12 M [9]

Path to Root: /export/root/*client_name* [10]

Path to Swap: ~~*/export/swap/client_name*~~ [11] /export/swapB/bagshot

Path to Executables: /usr [12]

Path to Kernel Executables: /usr/kvm [13]

Path to Home: ~~*/home/server_name*~~ [14] /home/estoril

Terminal type: sun [15]

8

Installing a Dataless Workstation

Chapter 8 details the steps required to complete the installation of a Dataless Workstation using the Custom Installation method.

There are four general tasks to be completed:

- **Planning Your Installation**

  Final planning, including determining the layout of your system disk.

- **Performing Preliminary Software Procedures**

  Formatting and labeling your disk (if necessary) and loading the software necessary to execute SunInstall.

- **Running SunInstall**

  Executing the SunInstall software installation program to actually install the operating system software on your workstation.

- **Deciding What Still Needs to be Done**

  Primary system administration procedures which you should carry out as soon as your system is installed.

8.1. Planning Your Installation — Server Designation

A dataless workstation, by definition, requires that executables and a user home area be made available to it by a server. The server chosen **must** have executables suitable for the kernel architecture of the dataless client. The executables will be present if the server has the same kernel architecture as the client. The executables will also be present if the server is already supporting diskless or dataless clients of the same kernel architecture as the one you are installing.

If your chosen server does *not* have the correct executables for your workstation, they can be installed using the `add_services(8)` utility.

8.2. Planning Your Installation — Disk Partitioning

Much of the planning required before you begin the actual installation of your workstation was completed as you worked through Chapter 1. At this point you should already have completed the following worksheets

- Preliminary Information Worksheet
- Host Form Worksheets

This section will help you complete the final worksheets:

- Partition Planning Worksheet
- Disk Form Worksheet

Go to Appendix E and pull out one copy of the Partition Planning Worksheet. Also get a copy of the Disk Form Worksheet for each disk drive attached to your workstation. Refer to and fill in the Worksheets as you work through this section.

Disk drives used with Sun workstations are divided into as many as eight sections called *partitions* (labeled `a` through `h`). Each disk partition looks to the operating system and the user as though it were a separate disk drive, and each may be used for a specific purpose. An individual partition may be used in its *raw* state, most often as swap and paging space for the SunOS virtual memory system. Most partitions, however, will be structured as *filesystems* and used to store UNIX files.

Individual filesystems are designated to store various broad classes of files including operating system software, user data files, and perhaps such things as database files for application software. This section will help you to decide what partitions you should define for your disk, how to use each partition, and what size each partition should be.

If you are unfamiliar with computer disk drives and such terms as *partition, cylinder, sector,* and *head*, please refer to Appendix D, "Disk Structure and Disk Space Terminology."

The SunInstall program provides a default disk layout for dataless workstations that you can use "as is" or modify as needed.

If your system was previously installed as a dataless workstation, you may wish to base disk partitions on the existing disk layout.

Disk Layout — Default Partitions

Table 8-1 shows the default layout for dataless configurations.

Table 8-1 *Default Partitions for Dataless Workstations (Release 4.1.2)*

Partition	Assignment
a:	/
b:	(swap)
c:	(whole disk)
d:	—
e:	—
f:	—
g:	—
h:	—

The default size (as shipped from the factory) of the root (/) and swap partitions varies depending on the type and capacity of the disk. Table 8-2 shows the default sizes.*

Table 8-2 *Default root and swap Partition Sizes*

Disk Type	Disk Size	Root Size	Swap Size
sd	<130 MB	8 MB	16 MB
sd	>130 <300 MB	8 MB	32 MB
sd	>300 MB	16 MB	32 MB
xd, xy and id	<600 MB	8 MB	16 MB
xd, xy and id	>600 MB	16 MB	32 MB

NOTE *On SPARCsystem 600MP machines, swap size is 64 MB.*

The root (/) Filesystem

Every SunOS *system disk* must have its `a` partition defined as the root (/) filesystem. The root filesystem consists of `/`, the root directory, and subdirectories such as `/etc`, `/dev`, `/tmp`, and `/var`.

The default root partition size should be usable for nearly all installations. About 3.5 MB of this space will be used by operating system files. The remainder is available for use by 'scratch' files created in the `/tmp` directory, and temporary log and spool files created in the `/var` directory.

The swap Partition

This area of the disk (normally the `b` partition of the system disk) is reserved to implement the virtual memory feature of SunOS. In practice, since a dataless workstation has, by definition, only a root and a swap partition all of the space not used by the root can be assigned to swap. Check the following issues, however, to be sure that you will have sufficient swap space.

- Workstations with color monitors

  A minimum of 24 MB of swap space is recommended if your workstation has a color monitor.

- Workstations with large main memories

  Your swap space **must** be larger than the size of the memory installed in your workstation. For example, if your workstation has 32 MB of main memory, designate at least 34 MB for your swap area. If your workstation has 64 MB of main memory, designate at least 66 MB for your swap area.

* Disk drives used with dataless workstations are typically of fairly small capacity; usually less than 200 megabytes.

- Application programs

  Some application programs require large amounts of swap space. As an example, LISP applications can require 40 MB or more of swap.

The `c` Partition

Every disk drive used with the SunOS operating system must, by convention, have a `c` partition defined. This partition is used by the operating system to reference the entire disk. It is defined automatically by Sun's `format(8S)` and `suninstall(8)` programs and should not be altered.

8.3. Preliminary Software Procedures

Now it's time to begin using the software tools provided for installing your workstation.

Selecting the Correct Media

First you'll need to select the correct CD-ROM) with which to install your workstation. The label on the media should specify the same kernel architecture as you have noted for your workstation on Preliminary Information Worksheet.

Mount the selected CD-ROM in the drive you will be installing from.

Should You Format Your Disk?

You *format* a disk by using the utility program `format(8S)` to write control information used by the disk drive hardware onto a disk. Disk drives provided by Sun are formatted and labeled at the factory. Desktop SPARCstation systems are shipped with SunOS preinstalled.

For preinstalled disks, it is recommended that you check the disk in a nondestructive way to verify that any head movement that may have occurred during shipment has not affected the performance of your disk.

To check the disk, using the `format` command, follow these steps:

1. Select "Run Format" from the install script.
2. Choose `analyze` from the `format` menu.
3. Choose `read` from the `analyze` menu.

   The `read` option tries to read every block on the disk, but does not destroy any information.

For new disks without preinstalled software, it is recommended that you reformat them. To format your disk(s), select "Run Format" in the MINIROOT install script. See Appendix A of this manual for instructions on running the `format` command. You can also run `format` manually from MINIROOT.

Resizing the root and swap Partitions

If you decided to size your root partition differently from the default, or to size the swap partition on your system disk **smaller** than the default (see your entries on the Partition Planning Worksheet) you must run the `format` program before running SunInstall. Refer to Appendix A for the necessary instructions.

If you do not plan to alter the size of the root partition or decrease the size of the swap partition, continue with "Loading and Booting the Miniroot" in the

following section. (You can use the SunInstall program without running `format` to make all other adjustments to partition sizes.)

8.4. Loading and Booting the Miniroot

SunInstall will be executed from a minimal version of the operating system called the *miniroot*. The miniroot is designed to be copied into the swap (`b`) partition of the system disk, thereby leaving the remaining partitions available for loading of the full operating system.

The miniroot copied to the swap area is temporary; as soon as the workstation is booted from the installed operating system it will be over-written by normal paging and swapping activity. If you need to use it again, it will have to be copied into the swap area again.

Miniroot load and boot procedures are given here for those systems which will be installed from an attached CD-ROM drive (local installation). Procedures for loading the miniroot from a remote CD-ROM are given in Appendix B — "Loading and Booting the Miniroot from a Remote CD-ROM."

At this time your workstation should be powered on and displaying the `>` or `ok` PROM monitor prompt.* If the workstation is not displaying the PROM monitor prompt, hold down the L1/STOP key and press the A key and it should appear.

To boot the miniroot from CD-ROM, enter the following command at the PROM monitor prompt:

For Sun4 systems:

```
> b sd(0,30,1)
```

For Sun4c systems prior to the SPARCstation 2:

```
> b sd(0,6,2)
        or
ok boot sd(0,6,2)
```

For Sun4m and Sun4c systems beginning with the SPARCstation 2:

```
ok boot cdrom
        or
> b cdrom
```

* Newer boot PROMS, particularly Desktop SPARCsystems, may display the `ok` prompt. Others will display the `>` prompt.

After you successfully begin installing the miniroot, your system should display the following messages:

```
What would you like to do?
  1 - install SunOS mini-root
  2 - exit to single user shell
Enter a 1 or 2:
```

Follow these steps to continue the installation:

1. Enter **1** to indicate that you want to continue the installation.

   If your system has only one disk, the miniroot is copied to that disk. If your system has more than one disk, you are asked to specify a disk number as illustrated in the following display:

```
Beginning system installation - probing for disks.
Which disk do you want to be your miniroot system disk?
  1 - sd0:  disk description
  2 - sd1:  disk description
  3 - exit to single user shell
Enter a 1, 2, or 3:
```

   Enter **1** to select the system disk.

2. Before the miniroot is copied to the specified disk, you are given an opportunity to format and relabel the disk.

```
selected disk unit "sd0".
Do you want to format and/or label disk "sd0"?
    1 - yes, run format
    2 - no, continue with loading miniroot
    3 - no, exit to single user shell
Enter a 1, 2, or 3:
```

You do not need to run `format` unless you believe that something is wrong with the disk, or you have chosen to resize the root or decrease the swap partition, or it is a new unlabeled disk from a third-party vendor.

3. Enter **2** to continue.

   Messages such as those that follow are displayed:

```
checking writability of /dev/rsd0b
0+1 records in
1+0 records out
Extracting miniroot ...
```

   Additional, media-specific messages are displayed. This process may take several minutes to complete, at which point the following message is displayed:

```
Mini-root installation complete.

What would you like to do?
   1 - reboot using the just-installed miniroot
   2 - exit into single user shell
Enter a 1 or 2:
```

4. Enter **1** to boot the miniroot.

   Additional messages are displayed as the system boots.

```
syncing file systems... done
rebooting...
Booting from: sd(0,0,1)
root on sd0b fstype 4.2
Boot: vmunix
Size: 811008+114720+60112 bytes
SunOS Release 4.1.2(MINIROOT) #4: Wed Feb 13 01:10:16 PDT
Copyright (c) 1991 by Sun Microsystems, Inc.
 .
 .
 .
WARNING: CLOCK GAINED 14 DAYS -- CHECK AND RESET THE DATE!
root on sd0b fstype 4.2
swap on sd0b fstype spec size 04070K
dump on sd0b fstype spec size 14056K
#
```

   The process is complete when the root prompt (#) is displayed.

Now you are ready to invoke the SunInstall program, and continue with Section 8.5, "Running SunInstall," below.

8.5. Running SunInstall

SunInstall is an interactive, menu-driven program that operates in the following way:

1. You invoke the program and use its preliminary menus to set the system clock and to specify your console display device (Sun workstation or other terminal).
2. Next, you fill out a series of forms each describing a different aspect of the installation.
3. Then, upon confirmation from you, SunInstall begins the actual installation of your system, loading operating system software onto your disk(s).

If you are using a terminal (not a Sun bit mapped display) as system console and have not yet determined the `/etc/termcap` name for the terminal, now is the time to do it. See E.1.1 "Preliminary Information Worksheet" for complete instructions.

Starting the SunInstall Program

Invoke the SunInstall program from the miniroot as follows:

```
# suninstall
```

You are ready to use the program when this screen is displayed:

```
                    Welcome to SunInstall

    Remember:  Always back up your disks before beginning an installation.

SunInstall provides two installation methods:

    1. Quick installation:

   This option provides an automatic installation with a choice
      of standard installations, and a minimum number of questions asked.

    2. Custom installation:

       Choose this method if you want more freedom to configure your
       system.  You must use this option if you are installing your
       system as a server.


       Your choice (or Q to quit) >>
```

Entering Initial Information

The following steps will provide SunInstall information about your system's console terminal, the time zone you are in, and the current date and time.

These steps employ a simple convention.

- *enter*
  denotes keyboard input with an ending Return (the ensuing action takes place when you press the Return key).
- *type*
  denotes keyboard input without a Return following. (The ensuing action takes place as soon as you type a character.)

1. Enter **2** in response to the SunInstall Welcome screen, selecting a custom installation.

   SunInstall automatically checks for your terminal type. If you are using a Sun bit-mapped display, SunInstall does not ask for your terminal type and skips to the next step.

   If you are not using a Sun bit-mapped display, SunInstall prompts you for your terminal type, as shown in Step 2.

```
Select your terminal type:
        1) Televideo 925
        2) Wyse Model 50
        3) Sun Workstation
        4) Other

>>
```

2. Enter a number from `1` to `3` to specify your terminal type from those listed, or `4` if your terminal is of some other type.

   If you choose `4` (Other) SunInstall asks you to enter the name of your terminal as it appears in the `/etc/termcap` file. Refer to the Preliminary Information Worksheet for this information.

   After you enter your terminal type SunInstall will ask for your local time zone name:

```
Enter the local time zone name (enter ? for help):
```

3. Although you can enter time zone information from the keyboard, it's easiest to use the on-line help facility:

   Enter **?** to display the TIMEZONE menu.

```
TIMEZONE MENU                                                    [?=help]
-------------------------------------------------------------------------

             Select one of the following categories to display
               a screen of time zone names for that region

                      _ United States

                        Canada

                        Mexico

                        South America

                        Europe

                        Asia

                        Australia and New Zealand

                        Greenwich Mean Time


Are you finished with this menu [y/n] ?
 [RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

4. Move the cursor to the appropriate region name (by typing Return) and then type **x** to display a corresponding menu of time zones.

   The UNITED STATES menu is shown here.

```
UNITED STATES MENU                                                [?=help]
-------------------------------------------------------------------------
        TIME ZONE NAME              AREA

       _ US/Eastern                  Eastern time zone, USA

         US/Central                  Central time zone, USA

         US/Mountain                 Mountain time zone, USA

         US/Pacific                  Pacific time zone, USA

         US/Pacific-New              Pacific time zone, USA
                                     with proposed change to Daylight
                                     Savings Time near election time

         US/Alaska                   Alaska time zone, USA

         US/East-Indiana             Eastern time zone, USA
                                     no Daylight Savings Time

         US/Hawaii                   Hawaii


Are you finished with this menu [y/n] ?
 [RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

5. Move the cursor to the appropriate time zone name and type **x**.

   SunInstall prompts:

```
Are you finished with this menu [y/n] ?
```

6. Enter **y** to exit this menu and redisplay the TIMEZONE menu.
7. Enter **y** again to exit the TIMEZONE menu.

SunInstall now asks you to confirm the current date and time, as in the following example:

```
Is this the correct date/time: Thu Feb 22 17:10:15 PDT 1990
   [y/n] >>
```

8. Enter **y** if the displayed information is correct. Otherwise, enter **n** and press the Return key. The Set Time screen appears. The format for the Set Time screen display depends on which time zone you selected. Press Delete, Control-U or the Backspace key to erase the sample response. Then enter the correct date and time using the format that is displayed for your time zone, and press the Return key.

   As an example, on the third day of June, 1990 at three o'clock in the afternoon you could enter:

```
>> 03/06/90 03:00 pm
```

   After you press the Return key, SunInstall would respond:

```
Is this the correct date/time: Sun Jun 3 15:00:12 PDT 1990
   [y/n] >>
```

   Enter **y** if the displayed information is correct and **n** if you want to try again. (Note that SunInstall displays in twenty-four hour time, thus three o'clock in the afternoon is displayed as 15:00.)

   SunInstall sets the system clock and displays the Main Menu.

Figure 8-1 *SunInstall Main Menu: First Appearance*

```
MAIN MENU                                                        [?=help]
-------------------------------------------------------------------------
                Sun Microsystems System Installation Tool

                  ( + means the data file(s) exist(s) )

                    _ assign host information



                      exit SunInstall


[RET/SPACE=next choice] [x/X=select choice] [^B/^P=backward] [^F/^N=forward]
```

Using the Main Menu

The SunInstall Main Menu allows you to use the following control keys:

[SPACE] / [RETURN] move forward, by item, as far as the prompt line

[Control–F] / [Control–N] move forward through the menu items

[Control–B] / [Control–P] move backward through the menu items

(The cursor-movement keys are noted on the message line at the bottom of the screen.)

[Control–L] repaint the screen should it become garbled

The choices on the Main Menu allow you to:

display a form

Move the cursor to the corresponding form name, and type **x** or **X**.

exit SunInstall

Move the cursor to `exit SunInstall`, and type **x** or **X**.

display general information about the menu use

Type **?** at any time to display an *On-Line Help Screen*; see the figure below for an example. Press [Return] to redisplay the Main Menu when you are through viewing the help text.

start the installation

When you have completed the last required form, the Main Menu displays:

```
start the installation
```

Type **x** or **X** to begin the installation of your system.

Figure 8-2 *On-Line Help Screen*

```
                    ON-LINE HELP FOR MENUS
-------------------------------------------------------------

-------------------------------------------------------------
       KEYS                          PURPOSE
-------------------------------------------------------------
       CONTROL B                      move to previous item
       CONTROL P                      move to previous item
       CONTROL F                      move to next item
       CONTROL N                      move to next item
       <RETURN>                       move to next item
       <SPACE>                        move to next item

       x or X                         select an item

       CONTROL L                      repaint screen
       CONTROL C                      abort

Press <return> to continue ...
```

Completing the HOST Form

From the SunInstall Main Menu, complete the HOST Form as follows:

1. Select `assign host information`.
2. Complete the form, referring to your Host Form Worksheet and using the following example as a guide.

```
HOST FORM                [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Workstation Information :
     Name : beaujolais
     Type :   [standalone]  [server] x [dataless]
      Server name :  sonoma
      Server Internet Address :  195.5.2.3
      Path of the executables on server : /export/exec/sun4
      Path of the kernel executables on server : /export/exec/kvm/sun4

   Network Information :
        Ethernet Interface :  [none] x[le0]

        Internet Address    : 195.5.2.15
        NIS Type            :  [none]  [master]  [slave] x[client]
        Domain name         : em_city.oz.com

   Misc Information :
       Reboot after completed :  [y] x[n]


 Are you finished with this form [y/n] ?
    [x/X=select choice] [space=next choice] [^B/^P=backward] [^F/^N=forward]
```

This example form is the first of many to appear in this procedure. Each uses the same conventions.

- System-specific items are italicized.
- User entries are boldfaced.

Thus, the example Ethernet interface *(le0)* is system-specific information SunInstall displayed, while the example hostname (***beaujolais***) and IP address (***195.5.2.15***) are system-specific information the user entered.

When you have completed the last screen field, SunInstall prompts:

```
Are you finished with this form [y/n] ?
```

3. Enter **y** to exit the form.

   The message `updating databases ...` is briefly displayed, followed by the Main Menu.

Completing the DISK Form

From the SunInstall Main Menu complete the DISK Form as follows:

1. Select `assign disk information`.

   SunInstall polls the disk drives and lists their device numbers in the `Attached Disk Devices` field. The form will look like this for most systems with one SCSI disk:

```
DISK FORM            [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------
Attached Disk Devices :
   [sd0]
```

2. Select the system disk.

   SunInstall then expands the DISK Form:

```
DISK FORM            [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------
Attached Disk Devices :
   x[sd0]


Disk Label:  [default]  [use existing]  [modify existing]
Free Hog Disk Partition :  [d]  [e]  [f]  [g] x[h]
Display Unit            : x[Mbytes]  [Kbytes]  [blocks]  [cylinders]
```

   Steps 3 through 5 explain how to complete the new fields.

3. In the `Disk Label` field, choose a starting disk label. The choices are:

   - `default`
     Displays the standard partitions for your system configuration. This is the correct choice for new installations and most installations of existing systems as well.

   - `use existing`
     Displays the partitions defined on the disk but does not allow them to be changed. If you are reinstalling a previously installed system, and you don't want to modify the existing disk partitions, select this option. Note that you must enter the `MOUNT PT` fields by hand.

   - `modify existing`
     Displays the existing partitions on the selected disk and allows them to be changed. Again, the `MOUNT PT` fields must be entered by hand.

   When installing a dataless workstation `default` is the best choice.

4. SunInstall will choose the partition normally associated with users' home directories (`g` or `h`) as the default for the *Free-Hog Disk Partition*.

If you have a small disk (under 130 MB), partition `g` will be marked as the free-hog partition. The example forms in this procedure assume that you are installing SunOS Release 4.1.2 on such a disk.

The *Free-Hog*

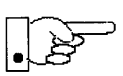
The SunInstall program will help you prepare a disk layout that it will use later to define physical disk partitions. As you refine the layout, the program automatically sees that the total amount of disk space in use by the defined partitions equals the total space available on the disk. SunInstall does so by automatically adjusting the size of one partition on each disk: the *free-hog* partition.

As the other partitions are increased or decreased in size the free-hog is decreased or increased to maintain the correct total. It is common to designate the partition that will hold the users' personal directories (usually `/home`) as the free-hog. This results in the users having as much disk space as possible for doing their work commensurate with the specific disk space needs of the operating system.

The term *free-hog* only refers to the special role the partition plays while you're using the SunInstall program. **There is no free-hog partition on an installed system; the concept is meaningless apart from the SunInstall program.** Also note that since the size of the free-hog is relative to that of the other partitions it is not possible to directly change the size of the free-hog. (That is, you cannot type in the SIZE field for the free-hog on the DISK Form).

5. In the **Display Unit** field, specify how you want partition sizes displayed in the `SIZE` column. When defining partitions for a dataless workstation display in *cylinders* is most convenient. The example forms below will display partition sizes in cylinders. (Refer to "Disk Structure" in Appendix D — "Disk Structure and Disk Space Terminology" for general information about blocks and cylinders.)

   When you make your choice, SunInstall displays a partition table that reflects the selected label. If you selected `default` at step 3, the `MOUNT PT` and `PRESERVE` columns will be filled in. (The columns will otherwise be empty.)



Since a dataless workstation has, by definition, no user data on its local disk *no* filesystem should be set to PRESERVE(Y/N) **y**.

Following is a default partition table for a standalone system.

```
PARTITION START_CYL BLOCKS    SIZE    MOUNT PT            PRESERVE(Y/N)
=============================================================================
    a     0         16170     77       /                        n
    b     77        28140     134
    c     0         204540    974
    d     0         0         0
    e     0         0         0
    f     0         0         0
    g     211       160230    763
    h     0         0         0
```

Remember that for the dataless workstation we have chosen to display SIZE in *cylinders* rather than in the more common *megabytes*.

The root (/) Partition

The size displayed for your root partition (the `a` partition of your system disk) will reflect the current size of the partition on the disk. If you used `format` to adjust the size of the root this is a good opportunity to check your work, verifying that the partition is the size you intended. **Remember: you cannot change the size of the `a` partition on the system disk within SunInstall.**

The swap Partition

The size displayed for your swap partition (the `b` partition of your system disk) will also reflect the current size of the partition on the disk.

6. Since our goal is to give all of the space not assigned to the root (/) to the swap partition, subtract the SIZE (in cylinders) of the root partition from the SIZE of the entire disk (the `c` partition.) For the example given above: 974–77=897.

Press Return until the cursor is next to the swap partition's `SIZE` field, backspace over the current size, and enter the new size just calculated. Note that SunInstall automatically decreases the size of the designated free-hog partition to zero (0.)

```
PARTITION START_CYL BLOCKS    SIZE    MOUNT PT            PRESERVE(Y/N)
=============================================================================
    a     0         16170     77       /                        n
    b     77        188370    897
    c     0         204540    974
    d     0         0         0
    e     0         0         0
    f     0         0         0
    g     0         0         0
    h     0         0         0
```

When you complete the table, SunInstall prompts

```
O.K. to use this partition table [y/n] ?
```

7. Enter **y** to use the displayed table or **n** if you wish to change it.

   When you accept the table, SunInstall prompts

   ```
   Are you finished with this form [y/n]?
   ```

8. Enter **y** since you are defining only one disk.

Completing the SOFTWARE Form

From the SunInstall Main Menu, complete the SOFTWARE Form as follows:

1. Select `assign software information` from the Main Menu.

   SunInstall displays the SOFTWARE form.

```
SOFTWARE FORM          [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
    [add new release]  [edit existing release]
```

2. Select `add new release`.

   SunInstall requests the device name and location of the device on which the Release 4.1.2 media resides.

```
SOFTWARE FORM          [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
   x[add new release]  [edit existing release]

 Media Information:
    Media Device     : [st0] [st1] [st2] [st_]* [xt0] [mt0] [fd0] [sr0]
    Media location   :  [local]  [remote]
```

* Selecting `[st_]` will allow you to specify the `st` device number manually. This feature allows selection of SCSI devices 3–7 when necessary.

The following prompt appears:

```
Please insert the release media that you are going to install
Press <Return> to continue
```

3. Complete the **Media Information** fields, using the following examples as a guide.

Example for CD-ROM in Local SunCD Drive:

```
SOFTWARE FORM            [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
   x[add new release]  [edit existing release]


 Media Information:
    Media Device     :  [st0] [st1] [st2] [st_] [xt0] [mt0] [fd0] x[sr0]
    Media Location   :  x[local]  [remote]
```

Example for CD-ROM in Remote SunCD Drive:

When reading from a media device attached to a remote system make sure that the hostname of the system being installed is included in the `/.rhosts` file of the remote system.

Note that including the hostname of the system being installed in the `/.rhosts` file allows superuser (root) access to the remote system from your workstation. For increased security, be sure to remove the hostname from the `/.rhosts` file once you have completed the installation.

```
SOFTWARE FORM          [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
   x[add new release]  [edit existing release]


 Media Information:
    Media Device     : [st0] [st1] [st2] [st_] [xt0] [mt0] [fd0] x[sr0]
    Media location   :  [local]  x[remote]
    Media Host       :  persephone
    Media Host's Internet Address :  195.5.2.16
```

After you provide the information needed to access the Release 4.1.2 media, SunInstall prompts:

```
Ok to use these values to read the table of contents [y/n] ?
```

4. Enter **y** if the values are correct or **n** if you need to change any of them.

   When you elect to use the displayed information, SunInstall expands the form as shown below.

```
SOFTWARE FORM          [?=help] [DEL=erase one char] [RET=end of input data]
-------------------------------------------------------------------------------
Software Architecture Operations:
   x[add new release]  [edit existing release]


 Media Information:
    Media Device    : [st0] [st1] [st2] [st_] [xt0] [mt0] [fd0] x[sr0]
    Media location  :  x[local]  [remote]

Choice:   [all]  [default]  [required]  [own choice]
  Executables path:  /usr
  Kernel executables path: /usr/kvm
```

5. Specify *required* by typing SPACE to move the cursor and then typing **x**.
6. Press Return in the following fields to use the standard paths to executable files.

   ```
   Executables path:
   Kernel executables path:
   ```

   SunInstall prompts:

```
Ok to use these values to select Software Categories [y/n] ?
```

7. Enter **y** to use the displayed values and begin software selection.

   SunInstall will automatically select the "root" software category, and nothing else. (Root is all that is needed on a dataless workstation.)

8. Enter **y** to use the configuration.

   When you elect to use the configuration, SunInstall prompts:

   ```
   Are you finished with this form [y/n] ?
   ```

9. Enter **y** to exit the form and redisplay the Main Menu.

Letting SunInstall Run

The Main Menu should now be displayed. Move the cursor to:

```
start the installation
```

Type **x** to begin the installation.

Your screen will reflect the progress of the installation as SunInstall labels the disk, creates the specified filesystems, and loads software from the Release 4.1.2 media. Depending on the software categories you chose earlier, you may be asked to load additional media, as shown in the following example:

```
System Installation Begins:
Label disk(s):
        sd0
Create/check filesystems:
Creating new filesystem for / on sd0a
newfs /dev/rsd0a >> /etc/install/suninstall.log 2> &1
. . .
Extracting sunos.4.1.2.sun4c 'root' media file ...
```

If There's a Problem

If SunInstall should, for some reason, fail or have to be aborted during its run, it will save the data files that were created as you filled in the forms. You can remedy the problem and then re-invoke SunInstall, going directly to "`start the installation`." SunInstall may prompt:

```
Some software has already been loaded.
Are you sure you want to restart the installation (y/n) ?
```

Answering "y" will have SunInstall restart its run using the data you have already entered.

When SunInstall Completes

What happens after SunInstall extracts the root software category depends on how you filled in the `Reboot after completed` field on the HOST Form.

- If you selected **y**, your system boots automatically. Booting messages appear, followed by a `login` prompt. Refer to Section 8.6, "Deciding What Still Needs To Be Done" for further instructions.
- If you selected **n**, the # prompt reappears. Your system is still running the miniroot.

Booting Up Your Workstation

To boot your new operating system from the # prompt do the following:

```
# sync;sync;reboot
```

8.6. Deciding What Still Needs To Be Done

Several basic system administration tasks should be completed following the installation of your system.

Logging In and Setting the root Password

As supplied the SunOS operating system does not have a password protecting the superuser (root) login. Login as "**root**" and then use the `passwd(1)` command to set the password of your choice.

Installing a Small Kernel

Pre-configured small kernels are available for various configurations. See the *SunOS 4.1.2 Release Manual* for tables that describe available `GENERIC_SMALL` kernel configuration files.

If you want to install an appropriate pre-configured kernel do so by executing:

```
# install_small_kernel
```

The utility is self-explanatory and will ask you for confirmation before making any changes to the system.

Building and Installing a Custom Kernel

For best workstation performance you should make and install a custom operating system *kernel*. The kernel is a program which is loaded into memory when your workstation is booted and which then controls all aspects of system operation. The default kernel is called the *GENERIC* kernel. This kernel includes the software necessary to access all of Sun's peripheral hardware. While this is useful during installation it also means that the kernel includes much more software, and is therefore much larger, than is required for any specific system. This excessive size means an inefficient kernel which uses up memory that can be put to better use and provide improved performance.

Complete instructions for creating and installing a custom kernel for your workstation are given in Chapter 9 of the *System and Network Administration Manual*, Reconfiguring the System Kernel.

If you chose to install a GENERIC_SMALL kernel at the conclusion of running SunInstall that kernel will provide improved performance as compared to the GENERIC kernel. You may still, however, see some further improvement by creating a kernel matched to your specific configuration.

Setting Up Your Personal Account

Refer to the manuals *Getting Started with SunOS: Beginner's Guide* and *Setting Up Your SunOS Environment: Beginner's Guide* for assistance.

For Desktop SPARCsystems, refer to your Owner's Set for information on setting up your personal account.

Customizing Your Environment

Refer to Chapter 8 of *System and Network Administration Manual*, Administering Workstations, Section 8.1. Here you will find the information you need for setting up user home directories, enabling electronic mail, etc.

8.7. Example Worksheets for Dataless Workstation

This section presents a sample scenario illustrating installation of a Dataless Workstation configuration. Background information for this scenario is presented, followed by facsimiles of Worksheets completed to support the installation process.

Examining this set of completed Worksheets will help you understand the correct use of the Worksheets, provide ideas for implementing similar installation configurations, and generally clarify installation planning.

You can find sets of blank worksheets, along with detailed explanations of the worksheets themselves, in Appendix E, "Installation Worksheets."

Completed Worksheets: Dataless Workstation

Scenario: helsinki

helsinki is a SPARCstation 1+ which will be installed as a dataless workstation. The system has 16 Mbytes of main memory, and a monochrome monitor.

Peripheral equipment includes a 105 Mbyte internal SCSI disk drive. Since the workstation does not have a SunCD drive, it will be installed using the remote method explained in Appendix B.

Dataless Scenario:
helsinki

Preliminary Information Worksheet

Name: helsinki

Hardware Information:

Workstation Model: 4/65 [1] SPARCstation 1+

Workstation Architecture: sun4 . sun4c [2]

Media Device Type: _____ [3] and Number: _____ [4]

Media Device Name: _____ [5]

System Disk Name: sd0 [6]

Other Disk Devices (if any): [7]

Name: _____ Name: _____

Name: _____ Name: _____

Name: _____ Name: _____

System Console Device: sun [8]

Miscellaneous Information:

Local Timezone: CET [9]

Dataless Scenario:
helsinki

Host Form Worksheet

Workstation Information:

Name : helsinki [1]

Type : ☐[standalone] ☐[server] ☒[dataless] [2]

Network Information:

Internet Address : 193 . 3 . 11 . 4 [3]

NIS Type : ☐[none] ☐[master] ☐[slave] ☒[client] [4]

Domain name : ehg.engineering [5]

Miscellaneous Information:

Reboot after completed : ☐[y] ☒[n] [6]

Dataless Configuration Information:

Server name : estoril [7]

Server Internet Address : 192 . 3 . 11 . 2 [8]

Path of the executables on server: `/export/exec/`*`app_arch`* [9]

Path of the kernel executables on server: `/export/exec/kvm/`*`kernel_arch`* [10]

Dataless Scenario:
helsinki

Partition Planning Worksheet

	Partition/Filesystem	Size	Position
–Required–			
◙	/ (root)	16	sd0a
◙	swap	*	sd0b
◙	/usr*	---------	
	Sun unbundled		----------
	other vendors	+	----------
	Local software	+	----------
	Free Space	+	----------
	Total over and above	=	----------
–Common–			
□	/home		
–Optional–			
□	/tmp		
□	/var		
□	second swap		
–Servers–			
□	/export	---------	
	Sun unbundled†		----------
	other vendors†	+	----------
	Local software†	+	----------
	Free Space	+	----------
	Total over and above	=	----------
□	/export/swap	+	
–Custom–			
□			
□			
□			
□			
□			

* /usr is required for all configurations *except dataless*.

† Only for software to support clients of an *application architecture* different from the server's.

Disk Form Worksheet

Dataless Scenario:
helsinki

Disk Drive: sd0

PARTITION	SIZE	MOUNT PT	PRESERVE
a	16	/	N
b	*	(swap)	
c	105	----------	----------
d			
e			
f			
g			
h			

A

Using *format* to Reformat Your System Disk and Change Partition Sizes

This appendix describes how to invoke and use the `format(8S)` program to

- format a disk.
- label a disk with partition information

To format your system disk, or to increase the `root` partition or decrease the `swap` partition, you must use `format` from the MUNIX miniroot install menu. To format any other disk, or to re-size partitions `d` through `h` on the system disk, you can use `format` from the miniroot install menu or manually invoke it from the miniroot.

Before proceeding further, you should consider carefully whether either type of activity is necessary:

- **Formatting a disk** is a time-consuming procedure that erases all data from the disk. If your disk has data on it, you should not reformat it unless you have definite reason to believe that problems you are having are a result of the disk itself.
- **Partitioning a disk** with the `format` program requires considerable care. Examine your disk requirements carefully to make sure you need either to change the size of your root partition or decrease your swap partition. (Depending on your system's role as standalone workstation, homogenous server, heterogeneous server, or dataless workstation, see the first section in Chapter 5, 6, 7, or 8 for a discussion of disk partitioning.) Note that you should use the SunInstall program, **not** `format(8S)` to *increase* the size of the swap partition or change the size of any other partition, except for the root partition.

A.1. Formatting and Relabeling Your Disk

When you manually invoke the `format` program, a list of available disks is displayed. The first disk is number 0, the second number 1, and so on, for each active disk. In the following example, `format` found one `xy` disk (`xy0`). When you invoke format with the MUNIX miniroot install script, the disk is selected for you.

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


  AVAILABLE DISK SELECTIONS:
         0. xy0 at xyc0 slave 0
         xy0: <Fujitsu-M2333 cyl 821 alt 2 hd 10 sec 67>
Specify disk (enter its number):
```

Note: Sample display; contents may vary, depending on user input and the system used.

You should now see a similar display on your screen, with a prompt asking for a disk number.

1. Enter the number of the disk you wish to format.

   The Format Menu is displayed:

```
Specify disk (enter its number): 0

Format Menu:
        disk       - select a disk
        type       - select (define) a disk type
        partition  - select (define) a partition table
        current    - describe the current disk
        format     - format the disk
        repair     - repair a defective sector
        show       - show a disk address
        label      - label the disk
        analyze    - surface analysis
        defect     - defect list management
        backup     - search for backup labels
        quit
format>
```

2. At the `format>` prompt, enter **`type`**.

   If the disk type cannot be derived, the screen displays a selection of disk types:

```
format> type
        0. Fujitsu-2351 Eagle
        1. Fujitsu-M2333
        2. Fujitsu-2361 Eagle
        3. CMD EMD 9720
        4. Other
```

3. Enter the number corresponding to your disk.

The specified disk is selected:

```
Specify disk type (enter its number): 1
selecting xd0 <Fujitsu-M2333>
```

4. Enter **format**:

```
format> format
```

A message reminds you that formatting a disk can be a lengthy procedure, and asks if you want to continue:

```
format> format
Ready to format. Formatting cannot be interrupted
and takes a long while. Continue?
```

5. Enter **y** to initiate formatting.

When formatting is completed, the screen displays a sequence of messages and returns to the format> prompt:

```
format> format
Ready to format. Formatting cannot be interrupted
and takes a long while. Continue? y
Beginning format. The current time is
        Wed Feb 21 16:58:05 1990

Formatting...done

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

Note: Sample display; contents may vary, depending on user input and the system used.

You should now relabel your disk.

6. Enter **label** at the format> prompt.

The display asks if you want to proceed with the labeling:

```
format> label
Ready to label disk, continue?
```

7. Enter **y**.

```
format> label
Ready to label disk, continue? y
```

When the screen redisplays the `format>` prompt, labeling is completed. Your disk is now formatted and labeled. If you want to go on to resize the root partition or reduce the swap partition, proceed to Step 3 in the next section. If you are finished with `format`, enter **q**:

```
format> q
```

If you invoked format from the MUNIX miniroot install script, the script now continues. If you ran format manually, you may now refer to the applicable chapter to run Suninstall.

A.2. How to Change the Root Partition or Decrease the Swap Partition of Your System Disk

The following procedure is used only for changing the size of the root partition (partition `a`) or reducing the size of the swap partition (partition `b`). All other partitioning is carried out with the SunInstall program.

To change the size of a partition, you will need to enter a starting cylinder for the partition and specify the partition's size, in 512-byte blocks. If you are not familiar with disk structure and the terminology used in setting up partitions, refer to Appendix D, Disk Structure and Disk Space Terminology.

To use the `partition` option of the `format` program:

1. Invoke `format`, as described in Section A above. (If you have just finished reformatting your system disk and the `format>` prompt is on your screen, skip Step 1 and proceed directly to Step 3.)

   When you invoke `format`, a list of available disks is displayed. The first disk is number 0, the second number 1, and so on, for each active disk. In the following example, `format` found one disk, `sd0`.

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


AVAILABLE DISK SELECTIONS:
        0. sd0 at sw0 slave 0
           sd0: <Micropolis 1558 cyl 1218 alt 2 hd 15 sec 35>
Specify disk (enter its number):
```

Note: Sample display; contents may vary, depending on user input and the system used.

You should now see a similar display on your screen, with a prompt asking for a disk number.

2. Enter the number of your system disk.

   The system verifies selection of the disk and displays the Format Menu:

```
Specify disk (enter its number): 0
selecting sd0: <Micropolis 1558>
[disk formatted, defect list found]


Format Menu:
        disk       - select a disk
        type       - select (define) a disk type
        partition  - select (define) a partition table
        current    - describe the current disk
        format     - format the disk
        repair     - repair a defective sector
        show       - show a disk address
        label      - label the disk
        analyze    - surface analysis
        defect     - defect list management
        backup     - search for backup labels
        quit
format>
```

Note: Sample display; contents may vary, depending on user input and the system used.

3. At the `format>` prompt, enter `partition`.

   The Partition Menu is displayed:

```
PARTITION MENU:
        a      - change 'a' partition
        b      - change 'b' partition
        c      - change 'c' partition
        d      - change 'd' partition
        e      - change 'e' partition
        f      - change 'f' partition
        g      - change 'g' partition
        h      - change 'h' partition
        select - select a predefined table
        name   - name the current table
        print  - display the current table
        label  - write partition map and label to the disk
        quit
partition>
```

4. Enter **a** to change the root partition, or enter **b** to decrease the swap partition. You can only work on one partition at a time. The examples in this and the following steps show a sequence of repartitionings based on

changing the size of the root partition.

```
partition> a
```

The screen will now look similar to this:

```
partition> a

        partition a - starting cyl      0, # blocks    32025 (61/0/0)

Enter new starting cyl [0]:
```

Note: Sample display; contents may vary, depending on user input and the system used.

5. Enter the appropriate starting cylinder (cylinder *0* for partition `a`).

   The screen prompts for the size of the partition in blocks.

```
Enter new starting cyl [0]: <Return>
Enter new # blocks [32025, 61/0/0]:
```

Note: Sample display; contents may vary, depending on user input and the system used.

6 Enter the size in 512-byte blocks.*

The following screen shows entries for allocating 16MB to the `a` partition. After partition size is entered, the `partition>` prompt is displayed.

```
Enter new # blocks [32025, 61/0/0]: 32768
partition>
```

Note: Sample display; contents may vary, depending on user input and the system used.

Partition `a` is now sized to contain exactly 16MB. However, the space it occupies on disk will not fill an exact number of cylinders. Although this is not necessary, it is a highly desirable convenience. The next steps resize the `a` partition to fill out the last cylinder it occupies.

7. Enter **a** at the `partition>` prompt.

The screen displays the block size previously entered and the cylinders/tracks/blocks occupied. In the example, the partition takes up between 62 and 63 cylinders.

---

* To convert megabytes to blocks, multiply the number of megabytes by 2048. (One megabyte equals 1048576 bytes. This, divided by 512 bytes, equals 2048.) A partition of exactly 16MB contains 16 X 2048 = 32,768 blocks.

```
partition> a

        partition a - starting cyl      0, # blocks    32768 (62/6/8)

Enter new starting cyl [0]:
```

Note: Sample display; contents may vary, depending on user input and the system used.

8. Press **<Return>**.

   The screen prompts you to enter the new partition size.

```
partition> a

        partition a - starting cyl      0, # blocks    32768 (62/6/8)

Enter new starting cyl [0]: <Return>
Enter new # blocks [32768, 62/6/8]:
```

Note: Sample display; contents may vary, depending on user input and the system used.

9. Enter the new partition size in cylinders/tracks/blocks, instead of as a fixed number of blocks. Round up to the next whole cylinder.

   After receiving the new partition size, the system returns you to the `partition>` prompt.

```
Enter new starting cyl [0]: <Return>
Enter new # blocks [32768, 62/6/8]: 63/0/0
partition>
```

Note: Sample display; contents may vary, depending on user input and the system used.

The `a` partition now occupies 63 cylinders, from cylinder 0 through cylinder 62.

If you change the size of the `a` partition, you also need to change the size of the `b` partition so that `b` starts where `a` ends. The next steps illustrate both decreasing the size of the `b` partition and adjusting it to immediately follow the `a` partition.

10. Enter **b** at the `partition>` prompt to change the size of partition `b`.

    The screen displays the current size and location of partition `b`, and prompts for the new starting cylinder:

```
partition> b

        partition b - starting cyl     61, # blocks    59850 (114/0/0)

Enter new starting cyl [61]:
```

Note: Sample display; contents may vary, depending on user input and the system used.

In the example, partition `b` currently starts at cylinder 61. This means that if it is not changed, it will overlap the boundaries defined for partition `a`, which extends through cylinder 62.

11. Enter **63** as the new starting cylinder.

    The screen prompts for the partition size in blocks.

```
Enter new starting cyl [61]: 63
Enter new # blocks [59850, 114/0/0]:
```

Note: Sample display; contents may vary, depending on user input and the system used.

12. Enter the block size for partition `b`.

    The `partition>` prompt is redisplayed.

```
Enter new # blocks [59850, 114/0/0]: 49152
partition>
```

Note: Sample display; contents may vary, depending on user input and the system used.

In the example, partition `b`, the swap partition, has been decreased to 24MB (24 X 2048 = 49152).

Once again, after entering a partition size in number of blocks, the partition should be adjusted to consist of whole cylinders.

13. Enter **b** at the `partition>`, followed by Return at the `new starting cylinder` prompt.

    The display now shows the current partition size in number of blocks and cylinders/tracks/blocks and prompts for the new size.

```
Enter new # blocks [49152, 93/9/12]:
```

Note: Sample display; contents may vary, depending on user input and the system used.

14. Enter the new partition size in cylinders/tracks/blocks. Round up to the next whole cylinder.

    The `prompt>` is displayed.

```
Enter new # blocks [49152, 93/9/12]: 94/0/0
partition>
```

Note: Sample display; contents may vary, depending on user input and the system used.

Check the results of your repartitioning to see that your partitions are sized in whole cylinders.

15. Enter **print** at the partition>.

```
partition> print
Current partition table (unnamed):
        partition a - starting cyl      0, # blocks    33075 (63/0/0)
        partition b - starting cyl     63, # blocks    49350 (94/0/0)
        partition c - starting cyl      0, # blocks   639450 (1218/0/0)
        partition d - starting cyl      0, # blocks        0 (0/0/0)
        partition e - starting cyl      0, # blocks        0 (0/0/0)
        partition f - starting cyl      0, # blocks        0 (0/0/0)
        partition g - starting cyl    175, # blocks   235725 (449/0/0)
        partition h - starting cyl    624, # blocks   311850 (594/0/0)
```

Note: Sample display; contents may vary, depending on user input and the system used.

16. After altering the size and position of the b partition, you must adjust the g partition to compensate, making sure that no overlap or gap occurs. Calculate the new starting cylinder for the g by adding the number of cylinders in the b partition to the starting cylinder number (for example, 94 + 63 = 157). Calculate the new size of the g partition by subtracting the new starting cylinder number (for example, 157) from the total number of cylinders available on the disk; this total number is the same as the size shown for the c partition. (In our example, 1,218 - 157 = 1061.)

17. Adjust the size of the g partition by entering g at the partition prompt and then entering the starting cylinder and number of cylinders calculated in the preceding step. Remember to enter the number of cylinders in cylinder format: c/0/0.

```
partition> g
    partition g - starting cyl 175, # blocks 235725 (449/0/0)

Enter new starting cyl [61]: 157
Enter new # blocks [235725, 449/0/0]: 1061/0/0
partition>
```

Note: Sample display; contents may vary, depending on user input and the system used.

18. Any partitions other than a, b, c, and g should be deleted (Other partitions are most easily created when you run *Suninstall*). For example:

```
partition> h
        partition h - starting cyl 624, # blocks 311850 (594/0/0)

Enter new starting cyl [624]: 0
Enter new # blocks [311850, 594/0/0]: 0
```

Note: Sample display; contents may vary, depending on user input and the system used.

19. You can check your work by entering a `print` command:

```
partition> print
Current partition table (unnamed):
        partition a - starting cyl      0, # blocks    33075 (63/0/0)
        partition b - starting cyl     63, # blocks    49350 (94/0/0)
        partition c - starting cyl      0, # blocks   639450 (1218/0/0)
        partition d - starting cyl      0, # blocks        0 (0/0/0)
        partition e - starting cyl      0, # blocks        0 (0/0/0)
        partition f - starting cyl      0, # blocks        0 (0/0/0)
        partition g - starting cyl    157, # blocks   557025 (1061/0/0)
        partition h - starting cyl      0, # blocks        0 (0/0/0)
```

Note: Sample display; contents may vary, depending on user input and the system used.

20. Label the disk by entering `label` at the `partition>` prompt. You will be queried to confirm, and then the `partition>` prompt is re-displayed.
21. Enter **q** to exit from the `partition` program.

    The `Format Menu` and the `format>` prompt are displayed.
22. To exit from the `format` program, enter **q** at the `format>` prompt.

If you invoked `format` from the MUNIX miniroot install script, the script will now continue. If you ran `format` manually, you can now refer to the applicable chapter to run Suninstall.

B

Loading and Booting the Miniroot from a Remote CD-ROM

B.1. Booting the Miniroot from a Remote CD-ROM

If your system does not have local CD-ROM capabilities, you will need to boot the miniroot from a remote system using its CD-ROM drive. This section covers booting the miniroot from a CD-ROM attached to a remote system.

Do not start the booting procedure described below until you have completed Section 1.10, "Pre-Installation Checklist."

This appendix uses the terms *target* and *mediahost* as they were defined in the main text: The system without local CD-ROM that is booting the miniroot from a remote source is the *target* system; the remote system with local CD-ROM that is used to boot the miniroot is the *mediahost*.

Booting the miniroot from remote CD-ROM requires:

- copying the miniroot to the mediahost
- booting the target system as a temporary diskless client of the mediahost
- copying the miniroot to the target system's disk
- booting the miniroot

B.2. Copying the Miniroot from CD-ROM to the Mediahost

The mediahost you use for remote booting must be a server running SunOS 4.1.2 (If the *target* system is a SPARCstation 2, then you must have SunOS 4.1.2 available on the mediahost). You must have root user-privileges on the server. The server must meet the following space requirements:

- 17 MB in /export/swap
- 5 MB in /export/root
- 7 MB in /export/exec (for the miniroot)

You cannot use a symbolic link to an area with more space to meet these requirements.

To copy the miniroot to the mediahost:

1. Log onto the mediahost, make yourself superuser, and change directories to `/usr/etc/install`:

```
% su
Password:
# cd /usr/etc/install
```

– Enter the *root* password at `Password:`

2. Now make the target system be a client of the mediahost. The procedure you use at this point depends on whether your site uses NIS, a network information service

Before you carry out the following steps, it is suggested that you review the `add_client` command in *System and Network Administration* and consider consulting with a System Administrator, especially if you are using NIS.

Sites Using NIS If your site uses NIS, make the target system a client of the mediahost as follows:

```
# add_client -a k-arch client
```

– *k-arch* stands for the kernel architecture of the target system. You must type a literal "." at the end of entries for systems with Sun4 kernel architecture:
sun4., Sun4c, Sun4m
– *client* is the name of the target system

Example

For a Sun4c target system named *xyz*, you would enter:

```
# add_client -a sun4c xyz
```

When you make the target system a client of the mediahost, it is entered in the mediahost's boot parameter database (`/etc/bootparams`). Make sure that an entry for the target system is also added to the master NIS `bootparams` database.

Proceed to step 3.

Sites Not Using NIS

2. If your site does not use NIS, make the target system a client of the mediahost as follows:

```
# add_client -a k-arch -y none client
```

– *k-arch* stands for the kernel architecture of the target system. You must type a literal "." at the end of entries for systems with Sun4 kernel architecture:

Sun4., Sun4c, Sun4m
– *client* is the name of the target system

Example

For a Sun4 target system named *xyz*, you would enter:

```
# add_client -a sun4. -y none xyz
```

3. Copy the miniroot from CD to the mediahost's `/export/exec/kvm/`*k-arch*`.sunos.`*release* directory, as shown below— **in the command lines, note the use of underscores (rather than periods) as separators in CD-ROM entries.**

```
# mount -rt hsfs /dev/sr0 /usr/etc/install/tar
# cd /usr/etc/install/tar/export/exec/kvm/k-arch_sunos_release
# cp miniroot_k-arch /export/exec/kvm/k-arch.sunos.release/miniroot
```

– *k-arch* stands for the kernel architecture of the target system
– *release* stands for the release level of the target system

Example

For a Sun-4c target system, you would enter the following:

```
# mount -rt hsfs /dev/sr0 /usr/etc/install/tar
# cd /usr/etc/install/tar/export/exec/kvm/sun4c_sunos_4_1_2
# cp miniroot_sun4c /export/exec/kvm/sun4c.sunos.4.1.2/miniroot
```

Copying the miniroot takes several seconds. When the # returns, the miniroot is loaded on the host and the remaining procedures are carried out on the target system.

B.3. Booting the Target System from the Mediahost

To boot the target system from the mediahost:

1. If your workstation is not displaying the PROM monitor prompt (>, or on some Sun-4c systems, `ok`), simultaneously press the L1-Stop key and **a**. Note that instead of typing `b` at the `ok` prompt, you must type `boot`.
2. Enter the command for booting the miniroot over the network:

   For Sun4:

```
>b enet() -a
```

For Sun4c systems prior to SPARCstation 2:

```
ok boot enet() -a
    or
> b enet() -a
```

– *enet* stands for the abbreviation for your Ethernet controller, either `le` (newer systems) or `ie` (for a few older systems). If you enter the wrong abbreviation, an error message is displayed, and you can re-enter the correct abbreviation.

For Sun4m and Sun4c systems beginning with SPARCstation 2:

```
ok boot net -a
    or
> b net -a
```

Example

For a mediahost that has an `le` Ethernet controller and is the only boot server on the network, you would enter:

```
> b le() -a
```

The command for booting over the network is followed by a number of booting messages which lead to the first of a series of prompts:

```
> b le() -a

EEPROM boot device...le(0,0,0)le0 -a
Using IP Address 195.5.2.62 = 81900E8D
booting from tftp server @ 195.5.2.22
...
root filesystem type ( 4.2 nfs ):
```

Note: Sample display; contents may vary, depending on user input and the system used.

3. Respond to the prompts that follow as shown:

```
root filesystem type ( 4.2 nfs ): nfs
...
root name:<Return>
...
Boot:<Return>
...
root filesystem type ( spec 4.2 nfs ):nfs
...
root name:<Return>
...
swap filesystem type ( spec nfs ):nfs
swap name:<Return>
...
login:
```

Note: Sample display; contents may vary, depending on user input and the system used.

4. Log in as `root`, change directories to `dev`, and use `MAKEDEV` to create a device entry for your system disk.

   Example

   Using `sd0` as your system disk, you would enter:

```
login:root
# cd /dev
# MAKEDEV sd0
```

   After a series of messages, you are returned to the `#` prompt.

5. Copy the miniroot to the swap partition (partition `b`) of your system disk as follows:

```
# dd if=/usr/kvm/miniroot bs=63k of=/dev/rdevnumb
```

   – Note that **`bs=63k`** is a fixed value, to be entered as shown
   – *devnum* is the device number of your system disk, such as `rsd0b`

   After a series of messages, the `#` prompt is returned.

B.4. Booting the Target System from the Miniroot

Now the miniroot that had been loaded onto the disk of the target system must be booted. For Desktop SPARC systems (sun4c), refer to step 9. Otherwise, refer to step 6.

6. Halt the target system as shown:

```
# /etc/halt
```

After a series of messages, the PROM monitor prompt (> or ok) is displayed.

7. At the PROM monitor prompt, enter the following command to boot the miniroot from your system disk.

```
>b e-net()-asw
```

– *e-net* stands for the abbreviation for your Ethernet controller. Enter the abbreviation, le or ie, used at step 2.

For example:

```
> b le() -asw
```

After a number of booting messages, the first of a series of prompts is displayed:

```
> b le() -asw

EEPROM boot device...le(0,0,0)le0 -asw
Using IP Address 195.5.2.62 = 81900E8D
booting from tftp server @ 195.5.2.22
...
root filesystem type ( 4.2 nfs ):
```

Note: Sample display; contents may vary, depending on user input and the system used.

8. Respond to the prompts that follow as shown, substituting the device number of your disk for sd0, if it is different:

```
root filesystem type ( 4.2 nfs ):  4.2
root device ( xy%d[a-h] sd%d[a-h] xd%d[a-h] ):  sd0b
root on sd0b fstype 4.2
Boot: vmunix
...
root filesystem type ( spec 4.2 nfs ):  4.2
root device ( sd%d[a-h] ):  sd0b
...
swap filesystem type (spec 4.2 nfs):  spec
swap device ( sd%d[a-h] ): sd0b
Swapping on root device, OK? y
...
#
```

Now refer to step 10.

9. For Desktop SPARC systems (sun4c), enter the following command, substituting the device number of your disk for `sd0`, if it is different. Note carefully the position of the quotes, especially the single back quotes.

```
# reboot "'/usr/kvm/unixname2bootname sd0b' -sw"
SunOS Release 4.1.2 (MINIROOT) ...
.
.
.

#
```

10 Booting the miniroot is completed when the root prompt (#) is displayed.

Your system is now running under the miniroot. You can proceed with Section 5.4, 6.5, 7.5, or 8.5, "Running SunInstall" as appropriate to your system configuration.

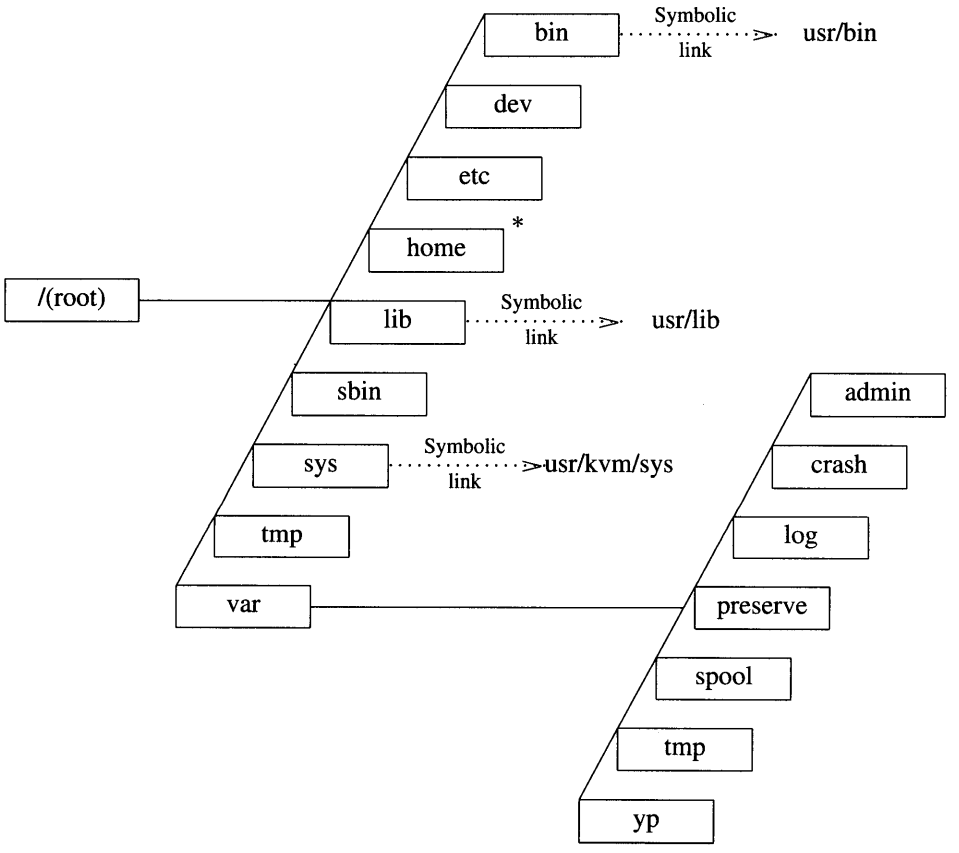
C

The SunOS Filesystem

C.1. The root Filesystem

The root filesystem (/) contains files and directories concerned with system and device operation. For example, `vmunix`, the SunOS kernel, is a file in /(root). Figure C-1 shows directories in the root filesystem for Release 4.1.2.

Figure C-1 *Directories in the Root Filesystem*



* On smaller disks (under 130MB), `/home` is a symbolic link to `/usr/export/home`.

The following table describes some of the important directories in the root filesystem.

`/dev`	Contains device files and the `MAKEDEV` shell script. `MAKEDEV` is used to add devices to an installed system.
`/etc`	Contains data files and subdirectories used in system administration.
`/tmp`	Contains temporary files, such as those created by the C compiler. The contents of all files in `/tmp` are automatically cleared whenever you boot the system.
`/var`	Contains some temporary files and files that vary in size. Spooling programs create files in subdirectories of `/var/spool`, such as `/var/spool/mail` for incoming mail, and `/var/spool/lpd` for queued print jobs.

Prior to Release 4.0, the directory `/bin` contained UNIX executables. It is now a symbolic link to `/usr/bin` (see Section C.2, "The **`/usr`** Filesystem").

Changes to the Root Filesystem Since Release 4.0

In order to consolidate kernel-architecture-dependent software, the `/sys` directory, formerly a symbolic link to `/usr/share/sys`, is now a symbolic link to `/usr/kvm/sys`, which contains files for building and reconfiguring a kernel.

C.2. The `/usr` Filesystem

The `/usr` filesystem contains executable commands, system programs, and library routines. Figure C-2 shows the `/usr` filesystem for Release 4.1.2. Some of the important directories in `/usr` are described below.

`/usr/bin`
Contains basic SunOS commands, such as `ls`, `cat`, `chmod`, and others.

`/usr/etc`
Contains commands used for system administration and maintenance.

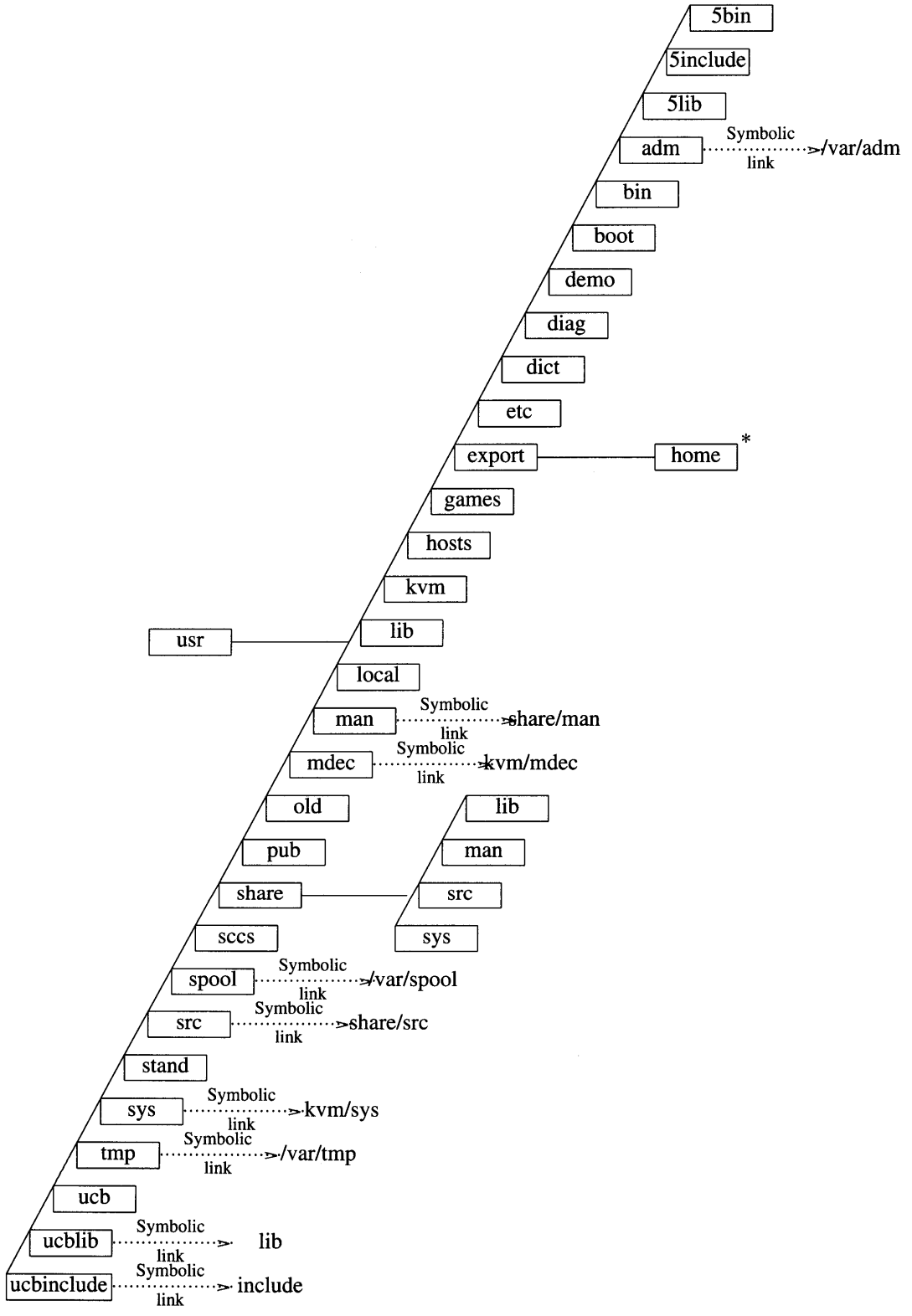
`/usr/lib`
Contains miscellaneous utilities, system libraries, macro packages, line-printer filters, and more.

`/usr/local`
Empty on a newly installed system; can be used to store third-party software added after installation.

`/usr/kvm`
Contains kernel-architecture-dependent software.

`/usr/share`
Contains software that is independent of system architecture. The `man` pages, for example, are located in `/usr/share`.

Figure C-2 *Release 4.1.2* `/usr` *Filesystem*



* On larger disks (over 130MB), `/usr/export/home` is a symbolic link to `/home`.

Changes to the /usr Filesystem Since Release 4.0

Kernel-architecture-dependent software is now consolidated in `/usr/kvm`. The following are now symbolic links to subdirectories of `/usr/kvm`:

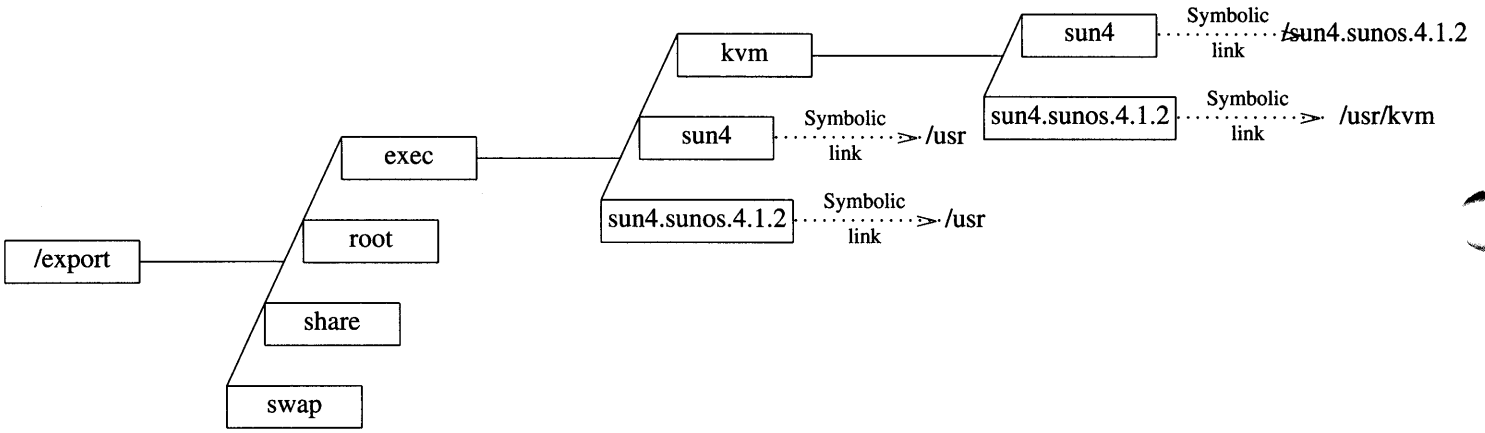
```
/usr/boot
/usr/stand
/usr/mdec
```

In addition, `/usr/share/sys` is now a symbolic link to `/usr/kvm/sys`, which contains files for building and reconfiguring a kernel.

C.3. The /export Filesystem

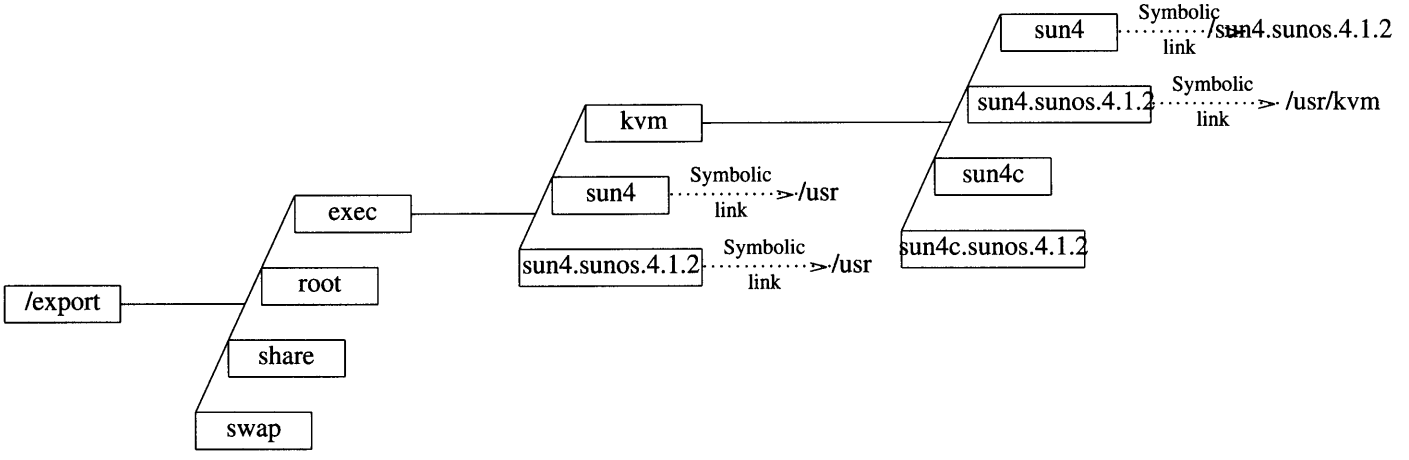
On a server that runs Release 4.1.2, the `/export` filesystem contains directories that the server exports to clients. Figure C-3 shows the `/export` filesystem of a homogeneous server. In the example, both server and clients have **sun4.sun4** system architectures.

Figure C-3 `/export` *Filesystem of a Homogeneous Server*



The `/export` filesystem of a heterogeneous server is shown in Figure C-4. In the example, a **sun4.sun4c** client has been added to the **sun4.sun4** server of the previous figure.

Figure C-4 `/export` *Filesystem of a Heterogeneous Server*



Some of the important directories in the `/export` filesystem are described below.

`/export/root`	Contains client root directories.
`/export/swap`	Contains client swap areas.
`/export/share`	Contains software that is independent of system architecture. The client mounts the server's `/export/share` as its `/usr/share`.
`/export/exec/`*a-arch.rel*	Contains executables that run on all systems sharing the same application architecture. The client mounts the server's `/export/exec/`*a-arch.rel* as its `/usr`.
`/export/exec/kvm/`*k-arch.rel*	Contains executables that only run on systems sharing the same kernel architecture. The client mounts `/export/exec/kvm/`*k-arch.rel* as its `/usr/kvm`.

The `export` Filesystem: Changes Since Release 4.0

The `/export` filesystem is new since Release 4.1. It contains `/export/exec`, which previously was a separate filesystem, and `/export/root`, which contains client root directories.

D

Disk Structure and Disk Space Terminology

D.1. Disk Partitions

The SunOS operating system divides a disk into eight partitions, designated `a` through `h`. Depending on your system's network role, all or only some of these partitions will be needed. On your system disk, most of the partitions are intended for individual directory trees, but two are reserved for other purposes:

- Partition `b` is designated as the swap partition. It provides *virtual* memory space for processes and information that the operating system temporarily stores on disk when there is not enough room in main memory.
- Partition `c` covers the entire disk. It allows the operating system to carry out functions that affect the disk as a whole.

In this manual, the full directory tree contained within a single partition has been referred to as a *filesystem.* Examples of filesystems are the `/(root)` and `/usr` directory trees illustrated in Appendix C, *The SunOS Filesystem.*

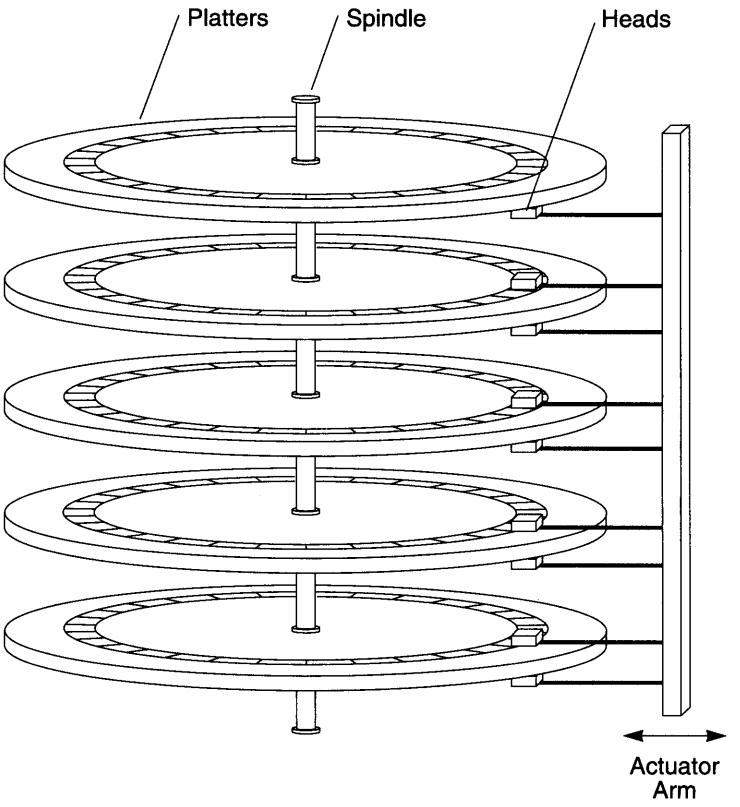
`/(root)` resides in partition `a`, `/usr` makes up partition `g`. The term *directory* has been used to refer to the directories within a filesystem.

When you install the SunOS operating system, each partition your system is going to use must be allocated disk space in terms of *tracks*, *cylinders*, and *sectors*, or *blocks*. The following section describes the way disks are physically structured and explains these terms.

D.2. Disk Structure and Terminology

Data on a hard disk is stored on flat, magnetically coated platters. The platters are mounted on a spindle, as shown in Figure D-1 While the disk spins rapidly, read/write heads on an actuator arm move in tandem, toward the disk's center and back, reading and writing data.

Figure D-1 *Disk Structure—Platters, Spindle, and Read/Write Heads*

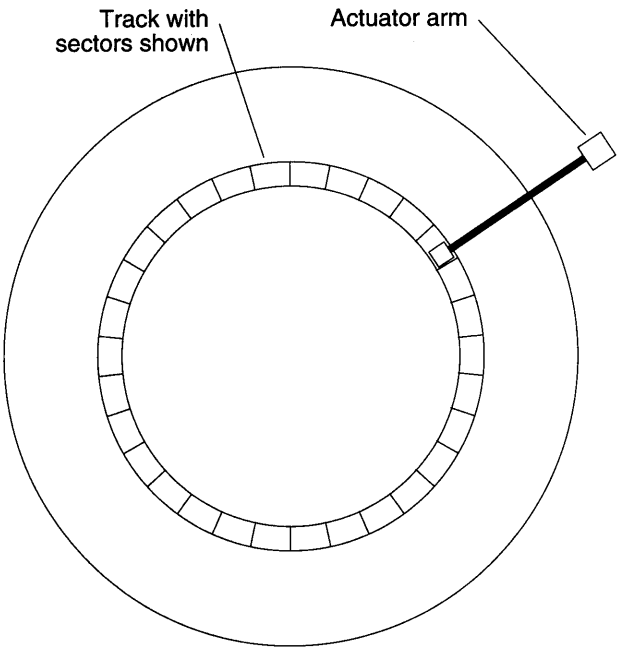


The top and bottom surfaces of most platters (bottom only, for the top platter; top only, for the bottom platter) are divided into circular *tracks*. There may be several thousand tracks on a single platter.

Tracks are divided into *sectors*, or *blocks*, each of which contains 512 bytes. (These are disk *hardware* blocks. In other contexts involving UNIX, the term *block* means two sectors that contain a total of 1,024 bytes.) The number of blocks on a track can vary, depending on properties of the platter, but is likely to be in the area of 35 or 40.

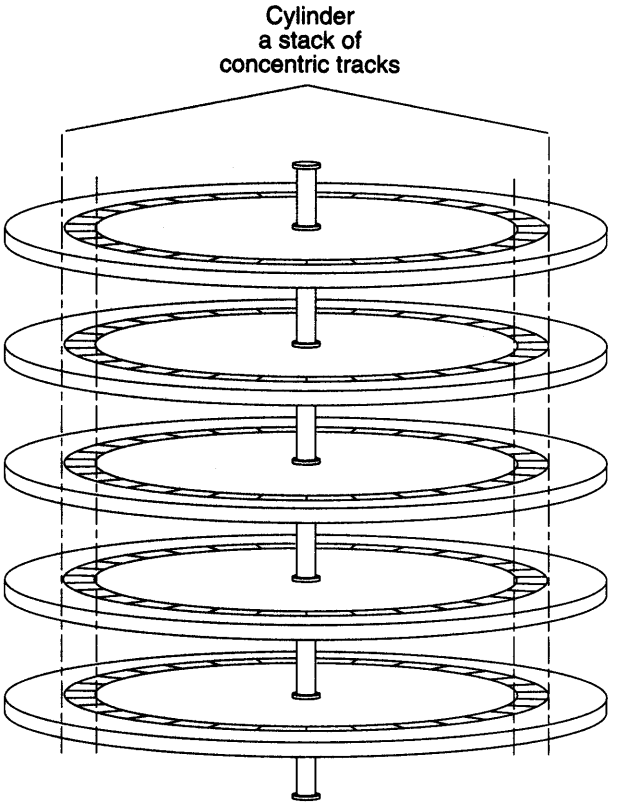
All the platters making up a given disk will have the same number of tracks and blocks, but different disks may vary in both of these respects. Figure D-2 shows a platter divided into tracks and sectors.

Figure D-2 *Disk Platter with Tracks and Sectors*



The tracks on each platter are numbered, starting with the outermost track as number zero and moving inward. All the tracks of a given number, across all platters, make up a *cylinder*. For example, cylinder number five is made up of track number five on all the platters belonging to a disk. This is illustrated in Figure D-3.

Figure D-3 *Disk Platter with Tracks Making Up a Cylinder*



Once the actuator arm is positioned with its read/write heads at a given cylinder, all of the blocks contained in the cylinder can be read without having to move the arm again.

Disk Label

Every disk provided by Sun is preformatted and labeled. The label contains a partition table showing the starting cylinder for each disk partition and the number of blocks it contains. When a disk is repartitioned or partition sizes are changed, the partition table is updated. An example of a partition table is given in Figure D-4.

Figure D-4 *Partition Table*

```
Current partition table:

partition a - starting cyl    0, #blocks   16048 (59/0/0)
partition b - starting cyl   59, #blocks   33456 (123/0/0)
partition c - starting cyl    0, #blocks  276896 (1018/0/0)
partition d - starting cyl    0, #blocks       0 (0/0/0)
partition e - starting cyl    0, #blocks       0 (0/0/0)
partition f - starting cyl    0, #blocks       0 (0/0/0)
partition g - starting cyl  182, #blocks  227392 (836/0/0)
partition h - starting cyl    0, #blocks         (0/0/0)
```

The partition table shows the starting cylinder of each partition, partition size in 512-byte blocks, and in parentheses, partition size in cylinders/tracks/sectors. For example, in Figure D-4, partition `b` (the swap partition) starts at cylinder 59 and contains 33,456 blocks. At 512 bytes per block, this is equivalent to 16.3 Mbytes. The information in parentheses tells us that the swap partition occupies exactly 123 cylinders.

E

Installation Worksheets

This Appendix consists of worksheets for use while planning your installation.

Section E.1, "Annotated Worksheets" provides a sample of each worksheet type with explanatory notes. Use these notes for reference and clarification as you complete Worksheets for your installation.

Section E.2, "Scratch Worksheets" contains several 'scratch' copies of each Worksheet. Remove the ones you need for your installation from the manual for ease of use. For some installations you will need more than one copy of some Worksheets. You may need to make photocopies if there are not enough worksheets provided to implement your configuration.

The chapters covering custom installations each conclude with a set of completed worksheets illustrating a scenario of that system configuration. Refer to those examples to help understand the correct use of the worksheets, the implementation of some common installation configurations, and the process of installation planning.

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E.1. Annotated Worksheets

The Worksheets are:

- **Preliminary Information Worksheet**

This Worksheet helps you gather information about the hardware which comprises your workstation, and miscellaneous other information about your installation.

- **Host Form Worksheet**

This Worksheet helps you gather the information necessary to complete the SunInstall HOST Form.

- **Partition Planning Worksheet**

This Worksheet assists you in planning how you will lay out partitions on your disk drive(s) and how you will size each of the partitions.

- **Disk Form Worksheet**

This Worksheet specifies the partition layout for an individual disk drive. You will need one Worksheet for each disk drive attached to your system.

- **Software Form Worksheet**

This Worksheet lets you record which optional operating system software categories you will install on your system. *Standalone* workstations and those to be installed as *homogeneous servers* will need to use one copy of this Worksheet. *Heterogeneous servers* will need one copy for each application architecture to be supported by the server. *Dataless* workstations will not use this Worksheet at all.

- **Client Form Worksheet**

Client Form Worksheets are used only when installing *server* systems. They help you record information concerning the *clients* which the server will support. You will need one Worksheet for each planned client.

Preliminary Information Worksheet

1. Your Sun Workstation Model. Example: Sun-4/330.
2. Your workstation architecture as an *a-arch.k-arch* pair. Example: **sun4.sun4c**.
3. Media device type. Example: **sr** for SCSI SunCD drive. See Table 1-2.
4. Media device number. Zero (0) unless there are multiple SCSI devices.
5. Media device name, the concatenation of type and number. Example: **mt0**.
6. System disk name. Example: **xd0**. See Table 1-3.
7. Other disk device names. Examples: **xd1**, **xd2**, and **xd3**. If you are unsure of the correct names, watch the messages displayed as the miniroot (or MUNIX) loads and boots. The display:

```
xd1: <Fujitsu-M2372K cyl 743 alt 2 hd 27 sec 67>
```

   for example, indicates disk drive **xd1**.

8. Console device. Most Sun workstations have a bit-mapped graphics display, which is console type "sun". If you are using a bit-mapped console, SunInstall automatically sets the console type for you.

   Some systems may be equipped with a non-graphics terminal. SunInstall provides menu-item choices for two common types: The Wyse Model 50 and the Televideo 925.

   If your terminal is another type determine its name in the `termcap(5)` terminal capability data base. Wait until you have loaded and booted the miniroot, immediately before executing SunInstall, then execute:

```
# grep -i "terminal_type" /etc/termcap
```

   where ***terminal_type*** is all or part of the name of your terminal. As an example, if you have a Tektronix 4014 type terminal:

```
# egrep -i "Tektronix 4014" /etc/termcap
Xc|tek4014|4014|tektronix 4014:\
Xe|tek4014-sm|4014-sm|tektronix 4014 in small font:\
```

   The names are separated by vertical bars (`|`). You can use any one of `Xc`, `tek4014`, or `4014`. (If your first try doesn't succeed, try searching for portions of the terminal type. Searching for "Tektronix" would have found seventeen entries to examine; searching for "4014" would have found five.)

9. Local timezone. Once SunInstall is running you can use the timezone help screen (organized by region) to select the correct name for your timezone.

Preliminary Information Worksheet

Name: _____

Hardware Information:

Workstation Model: _____ [1]

Workstation Architecture: _____ . _____ [2]

Media Device Type: _____ [3] and Number: _____ [4]

Media Device Name: _____ [5]

System Disk Name: _____ [6]

Other Disk Devices (if any): [7]

Name: _____ Name: _____

Name: _____ Name: _____

Name: _____ Name: _____

System Console Device: _____ [8]

Miscellaneous Information:

Local Timezone: _____ [9]

Host Form Worksheet

1. Name. The *hostname* that you have chosen for your workstation. It must be unique in your network. The hostname can be a maximum of 64 characters long, must start with a lowercase letter and can contain any combination of lowercase letters, numbers, underscores (_), hyphens (-), and periods (.).

   Hostnames of personal workstations are often chosen to reflect some special interest of the owner, often with a touch of whimsy. A few examples: *windsurf, snowskier, stargazer, anyspeed, mousetrap, poohbear, thelinks,* and *nowhere.*

2. The installation configuration you have chosen.

3. Internet Address. The address must be unique on your network, and preferably unique in the world. Your system administrator should assign you your internet address. For more information refer to Chapter 13 of *System and Network Administration.*

4. NIS type. If your workstation will not use Sun's Network Information Service (formerly known as "yellow pages" or "YP") check "none." If you **will** use NIS, check whether you will be an NIS *master*, *slave*, or *client.*

5. NIS Domain name. This entry is only required if your workstation will use NIS. Your system administrator should supply the Domain name. If you need more information refer to Chapter 16 of *System and Network Administration.*

6. Choose the action that will be taken immediately after SunInstall completes the installation of your workstation. Answering "y" instructs the system to reboot itself as soon as the installation is complete. If you answer "n" (the default) the # prompt will re-appear when SunInstall exits, allowing you to reboot manually.

7. *Dataless only:* The hostname of the server that will provide `/usr`, `/usr/kvm`, and `/home` filesystems.

8. *Dataless only:* The Internet address of the server.

9. *Dataless only:* The directory (on the server) in which application architecture executables for the client will be found. The default will be correct in nearly all cases.

10. *Dataless only:* The directory (on the server) in which kernel architecture executables for the client will be found. The default will be correct in nearly all cases.

Host Form Worksheet

Workstation Information:

Name : _____ [1]

Type : ☐[standalone] ☐[server] ☐[dataless] [2]

Network Information:

Internet Address : _____ . _____ . _____ . _____ [3]

NIS Type : ☐[none] ☐[master] ☐[slave] ☐ [client] [4]

Domain name : _____ [5]

Miscellaneous Information:

Reboot after completed : ☐[y] ☐[n] [6]

Dataless Configuration Information:

Server name : _____ [7]

Server Internet Address : _____ . _____ . _____ . _____ [8]

Path of the executables on server: `/export/exec/`*app_arch* [9]

Path of the kernel executables on server: `/export/exec/kvm/`*kernel_arch* [10]

Partition Planning Worksheet

This Worksheet will assist you with planning your overall disk partitioning strategy prior to filling out Disk Form Worksheets for each individual disk drive.

Do the following:

1. Check off the partitions and filesystems that you've decided to create on your disk(s). (Note that `/`, swap, and `/usr` are already checked off for you: they are required partitions for every installation.)
2. Fill in the filesystem mount point names for custom partitions. (`/usr/frame`, for example.)
3. Fill in Positions for each partition; that is, the disk name and partition letter indicating where the partition will reside. Example: If the system disk name is `xd0`, the `/` (root) partition position will be `xd0a`. (Available partition letters are `a, b, d, e, f, g,` and `h.`)
4. By placing an asterisk (*) in the "Size" column, identify which partition on each disk drive will be given all of the space not specifically assigned to the other partitions on that drive. Example: If a single system disk will be configured with `/` (root) on `xy0a`, swap on `xy0b`, `/usr` on `xy0g`, and `/home` on `xy0h` we will specify sizes for the `/`, swap, and `/usr` partitions, and then give the `/home` partition all the space that is left.
5. In the "Size" columns for the `/usr` partition fill in the space requirements you've determined for Sun unbundled software, software from other vendors, Local Software, and Free Space. Sum these on the "Total over and above" line. This is the amount of space you will add to the `/usr` partition over and above what's required for SunOS software. The space required for SunOS software will be computed automatically by SunInstall.
6. If you have an `/export` partition, fill in its "Size" columns much as you did for the `/usr` partition. Note the following:
   - Allow space for Sun unbundled, Other vendor, and Local software *only* if it is for clients of a *different* application architecture from the server. (Clients of the same application architecture will use the software already accounted for in `/usr`.)
   - Allow Free Space for the `/` (root) filesystems of any clients which are planned for the near future but which will not be configured for during the installation.
   - As with `/usr`, SunInstall will automatically account for the space needed for SunOS software, and will also keep track of the space needed for `/` filesystems for clients that you define during the installation.
7. If you have an `/export/swap` partition, note only "above and beyond" space, that is, space for planned clients that you are not defining during the installation.
8. Fill in the sizes you have chosen for your remaining defined partitions.

Partition Planning Worksheet

	Partition/Filesystem	Size	Position
–Required–			
◙	/ (root)		
◙	swap		
◙	/usr*	---------	
	Sun unbundled		----------
	other vendors	+	----------
	Local software	+	----------
	Free Space	+	----------
	Total over and above	=	----------
–Common–			
☐	/home		
–Optional–			
☐	/tmp		
☐	/var		
☐	second swap		
–Servers–			
☐	/export	---------	
	Sun unbundled†		----------
	other vendors†	+	----------
	Local software†	+	----------
	Free Space	+	----------
	Total over and above	=	----------
☐	/export/swap	+	
–Custom–			
☐			
☐			
☐			
☐			
☐			

* /usr is required for all configurations *except dataless*.

† Only for software to support clients of an *application architecture* different from the server's.

Disk Form Worksheet

Disk Form Worksheets bring together the information you'll want at hand while completing the SunInstall DISK form. Fill out one Worksheet for each disk drive attached to your system. Refer to your completed Partition Planning Worksheet for SIZE and MOUNT PT information.

A few notes:

1. As noted on your Partition Planning Worksheet, one partition on each disk drive should have its SIZE noted as "*". This partition will simply "hog" all of the space not explicitly assigned to the other partitions on the disk. It will be sized automatically by SunInstall.
2. Some partitions on your Partition Planning Worksheet (notably `/usr`) may be designated for "over and above" sizing (indicated by "+ *N*" in the Size column). Transfer the size information to the SIZE column of the Disk Form Worksheet with a "+" as well. You will add this space to the partition *after* SunInstall has automatically determined the space needed to accommodate SunOS software.
3. MOUNT PT designations for filesystems must always begin with a "/". Examples: `/usr`, `/export/swap`, `/usr/frame`.
4. MOUNT PT column entries for swap partitions are for planning purposes only. When running SunInstall and completing the DISK form the MOUNT PT column for swap partitions **must be left blank**.
5. In nearly all cases the PRESERVE(Y/N) column for each partition should be set to "n". This is **required** for partitions which contain SunOS software: `/`, `/usr`, `/var`, `/export`, and `/export/swap`. Setting PRESERVE to "n" instructs SunInstall to execute `newfs(8)` on the partition, creating a new, empty filesystem in it.

   User data already existing in other partitions can be saved by setting PRESERVE to "y", thus *preventing* SunInstall from executing `newfs(8)` on the partition. Note the following, however:
   - If the STARTING CYLINDER of the partition has been changed, it **cannot** be preserved.
   - If the SIZE of the partition has been changed, it **cannot** be preserved.

Be *certain* that you have a valid backup of any partition that you elect to preserve. Consider the consequences of *losing* that information should the filesystem, for any reason, not be preserved.

Disk Form Worksheet

Disk Drive: _____

PARTITION	SIZE	MOUNT PT	PRESERVE
a			
b			
c		----------	----------
d			
e			
f			
g			
h			

Software Form Worksheet

The Software Form Worksheet is used to record which software categories you have chosen to install on your system. Check off each category you want to load. (The required categories are already marked for you.) Note any prerequisite categories associated with your chosen categories and check them off as well. (The Manual pages, for example, will not be usable unless the Text category is also selected.)

One Software Form Worksheet should be filled out for a Standalone Workstation or Homogeneous Server. Dataless Workstations don't need to select optional software, they have access to the software loaded on their servers.

For a Heterogeneous Server more than one Worksheet may be necessary:

- Prepare a single Worksheet to cover the software needs of the server itself and of any clients of the same *application* architecture as the server.
- If the server supports clients of its own *application* architecture but a different *kernel* architecture decide whether you want to load the Sys category for the other *kernel* architecture. (The kvm category is required, all other categories are shared with the server.)
- If the server supports clients of an *application* architecture other than its own, prepare a Worksheet to cover the software needs of those clients.
- Lastly, if there will be clients of more than one *kernel* architecture of the non-server *application* architecture, decide whether or not to load the Sys category for each. (Again, the kvm category is **required** for every *kernel* architecture.)

Software Form Worksheet

a-arch.k-arch: _____ . _____

	Category	Prerequisites
◉	**root**	–
◉	**usr**	–
◉	**Kvm**	–
◉	**Install**	–
◉	**Networking***	–
☐	**Debugging**	SunView_Users
☐	**RFS**	TLI, Sys
☐	**Sys**	–
☐	**System_V**	–
☐	**TLI**	–
☐	**OpenWindows_Users**	SunView_Users
☐	**OpenWindows_Fonts**	OpenWindows_Users
☐	**SunView_Users**	–
☐	**Demo**	SunView_Users, SunView_Programmers, OpenWindows_Users, OpenWindows_Programmers
☐	**OpenWindows_Demo**	OpenWindows_Users, OpenWindows_Fonts
☐	**Games**	SunView_Users
☐	**Graphics**	SunView_Users, SunView_Programmers
☐	**Manual**	Text
☐	**Security**	–
☐	**Shlib_Custom**	–
☐	**SunView_Demo**	SunView_Users, SunView_Programmers
☐	**SunView_Programmers**	SunView_Users
☐	**OpenWindows_Programmers**	OpenWindows_Users, OpenWindows_Fonts
☐	**Text**	–
☐	**User_Diag**	SunView_Users
☐	**uucp**	–
☐	**Versatec**	–

* Only required if the system is connected to a network.

Client Form Worksheet

A Client Form Worksheet should be completed for each client to be supported by a server. Despite its apparent complexity, most of the fields on the CLIENT Form will have defaults supplied by SunInstall. Few installations will require changes to these defaults. A few fields, however, must be filled in by the installer. Those fields are printed in bold type on the Client Form Worksheet to identify them for you.

1. The client's hostname. This name is subject to the same rules as the server's hostname. (See Section 1.5, "Gathering Preliminary Information — Software.)
2. The client's application and kernel architectures (a_arch.k_arch). See Table 1-1 — *Sun System Architectures.*
3. `/export/root/` is the default filesystem (on the server) to hold client root files. This field is not directly changeable. Rather, it will change if *Path to Root* (item 10) is edited.
4. */export/swap/* is the default filesystem (on the server) to hold client swap files. This field is not directly changeable. Rather, it will change if *Path to Swap* (item 11) is edited.
5. The client's Internet address. SunInstall will fill in the first three fields (the *network* number) to match that of the server. You must assign a unique *host* number (the last field) for each client.
6. The Ethernet address of the client *must* be correctly entered. To determine a workstation's Ethernet address, examine the banner displayed immediately after the system is powered on. (Each workstation has a unique and permanent Ethernet address defined by its hardware.)
7. The NIS type will be chosen by SunInstall to match the server. If the server's HOST Form specifies it to be an NFS client, master, or slave, its diskless clients will be defined as NIS clients.
8. The client's NIS domainname will, by default, match the server's, if any.
9. Swap file sizes for diskless clients should be chosen just as they are for Standalone workstations. See "The swap partition" in Section 5.1, "Planning Your Installation — Disk Partitioning. SunInstall supplies a default swap file size, change it if necessary.
10. "Path to Root" specifies the directory on the server that the client will mount as its root directory. The default will be correct in nearly all cases. (The most likely exception would be for definition of multiple filesystems to hold root directories on a large server.)
11. "Path to Swap" specifies the file on the server that the client will mount as its swap file. Like "Path to Root", the default is almost always correct.
12. "Path to Executables" will be set by SunInstall. It is the server directory from which the client will mount its application architecture specific executables.
13. "Path to Kernel Executables" will also be set by SunInstall. It is the server directory from which the client will mount its kernel architecture specific executables.
14. The server directory which the client will mount as `/home`. The default is normally correct, you may want to change it if you define more than one `/home` partition on the server. For example, `/home2/`*server_name*.
15. The terminal type "sun" is most common (a Sun bit-mapped monitor). Change this if the client uses some other type of terminal. Use a name given in the `/etc/termcap` file, as described in item 9 of the Preliminary Information Worksheet notes earlier in this section.

Client Form Worksheet

Client name: _____ [1]

Architecture Type: _____ . _____ [2]

Root fs: */export/root* [3]

Swap fs: */export/swap* [4]

Client Information :

Internet Address: *net* . *net* . *net* . _____ [5]

Ethernet Address: _____:_____:_____:_____:_____:_____ [6]

NIS Type: ☐[none] ☐[client] [7]

Domain name: *server_domainname* [8]

Swap size (e.g. 8B, 8K, 8M): _____M [9]

Path to Root: /export/root/*client_name* [10]

Path to Swap: /export/swap/*client_name* [11]

Path to Executables: /usr [12]

Path to Kernel Executables: /usr/kvm [13]

Path to Home: /home/*server_name* [14]

Terminal type: sun [15]

E.2. Scratch Worksheets

The pages that follow are multiple 'scratch' copies of the Worksheets for your use while planning your installation. Remove the sheets you need from the binder, and fill them as your work your way through the manual.

Preliminary Information Worksheet

Name: _____

Hardware Information:

Workstation Model: _____ [1]

Workstation Architecture: _____ . _____ [2]

Media Device Type: _____ [3] and Number: _____ [4]

Media Device Name: _____ [5]

System Disk Name: _____ [6]

Other Disk Devices (if any): [7]

Name: _____ Name: _____

Name: _____ Name: _____

Name: _____ Name: _____

System Console Device: _____ [8]

Miscellaneous Information:

Local Timezone: _____ [9]

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Preliminary Information Worksheet

Name: _____

Hardware Information:

Workstation Model: _____ [1]

Workstation Architecture: _____ . _____ [2]

Media Device Type: _____ [3] and Number: _____ [4]

Media Device Name: _____ [5]

System Disk Name: _____ [6]

Other Disk Devices (if any): [7]

Name: _____ Name: _____

Name: _____ Name: _____

Name: _____ Name: _____

System Console Device: _____ [8]

Miscellaneous Information:

Local Timezone: _____ [9]

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Host Form Worksheet

Workstation Information:

Name : _____ [1]

Type : ☐[standalone] ☐[server] ☐[dataless] [2]

Network Information:

Internet Address : _____ . _____ . _____ . _____ [3]

NIS Type : ☐[none] ☐[master] ☐[slave] ☐ [client] [4]

Domain name : _____ [5]

Miscellaneous Information:

Reboot after completed : ☐[y] ☐[n] [6]

Dataless Configuration Information:

Server name : _____ [7]

Server Internet Address : _____ . _____ . _____ . _____ [8]

Path of the executables on server: `/export/exec/`*app_arch* [9]

Path of the kernel executables on server: `/export/exec/kvm/`*kernel_arch* [10]

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Host Form Worksheet

Workstation Information:

Name : _____ [1]

Type : ☐[standalone] ☐[server] ☐[dataless] [2]

Network Information:

Internet Address : _____ . _____ . _____ . _____ [3]

NIS Type : ☐[none] ☐[master] ☐[slave] ☐ [client] [4]

Domain name : _____ [5]

Miscellaneous Information:

Reboot after completed : ☐[y] ☐[n] [6]

Dataless Configuration Information:

Server name : _____ [7]

Server Internet Address : _____ . _____ . _____ . _____ [8]

Path of the executables on server: `/export/exec/`*app_arch* [9]

Path of the kernel executables on server: `/export/exec/kvm/`*kernel_arch* [10]

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Partition Planning Worksheet

	Partition/Filesystem	Size	Position
–Required–			
◙	/ (root)		
◙	swap		
◙	/usr*	---------	
	Sun unbundled		----------
	other vendors	+	----------
	Local software	+	----------
	Free Space	+	----------
	Total over and above	=	----------
–Common–			
□	/home		
–Optional–			
□	/tmp		
□	/var		
□	second swap		
–Servers–			
□	/export	---------	
	Sun unbundled†		----------
	other vendors†	+	----------
	Local software†	+	----------
	Free Space	+	----------
	Total over and above	=	----------
□	/export/swap	+	
–Custom–			
□			
□			
□			
□			
□			

* /usr is required for all configurations *except dataless*.

† Only for software to support clients of an *application architecture* different from the server's.

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Partition Planning Worksheet

	Partition/Filesystem	Size	Position
–Required–			
◉	/ (root)		
◉	swap		
◉	/usr*	---------	
	Sun unbundled		----------
	other vendors	+	----------
	Local software	+	----------
	Free Space	+	----------
	Total over and above	=	----------
–Common–			
☐	/home		
–Optional–			
☐	/tmp		
☐	/var		
☐	second swap		
–Servers–			
☐	/export	---------	
	Sun unbundled†		----------
	other vendors†	+	----------
	Local software†	+	----------
	Free Space	+	----------
	Total over and above	=	----------
☐	/export/swap	+	
–Custom–			
☐			
☐			
☐			
☐			
☐			

* /usr is required for all configurations *except dataless*.

† Only for software to support clients of a *different application architecture* different from the server's.

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Disk Form Worksheet

Disk Drive: _____

PARTITION	SIZE	MOUNT PT	PRESERVE
a			
b			
c		----------	----------
d			
e			
f			
g			
h			

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Disk Form Worksheet

Disk Drive: _____

PARTITION	SIZE	MOUNT PT	PRESERVE
a			
b			
c		----------	----------
d			
e			
f			
g			
h			

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Disk Form Worksheet

Disk Drive: _____

PARTITION	SIZE	MOUNT PT	PRESERVE
a			
b			
c		----------	----------
d			
e			
f			
g			
h			

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Disk Form Worksheet

Disk Drive: _____

PARTITION	SIZE	MOUNT PT	PRESERVE
a			
b			
c		----------	----------
d			
e			
f			
g			
h			

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Software Form Worksheet

a-arch.k-arch: _____ . _____

	Category	Prerequisites
☒	**root**	–
☒	**usr**	–
☒	**Kvm**	–
☒	**Install**	–
☒	**Networking***	–
☐	**Debugging**	SunView_Users
☐	**RFS**	TLI, Sys
☐	**Sys**	–
☐	**System_V**	–
☐	**TLI**	–
☐	**OpenWindows_Users**	SunView_Users
☐	**OpenWindows_Fonts**	OpenWindows_Users
☐	**SunView_Users**	–
☐	**Demo**	SunView_Users, SunView_Programmers, OpenWindows_Users, OpenWindows_Programmers
☐	**OpenWindows_Demo**	OpenWindows_Users, OpenWindows_Fonts
☐	**Games**	SunView_Users
☐	**Graphics**	SunView_Users, SunView_Programmers
☐	**Manual**	Text
☐	**Security**	–
☐	**Shlib_Custom**	–
☐	**SunView_Demo**	SunView_Users, SunView_Programmers
☐	**SunView_Programmers**	SunView_Users
☐	**OpenWindows_Programmers**	OpenWindows_Users, OpenWindows_Fonts
☐	**Text**	–
☐	**User_Diag**	SunView_Users
☐	**uucp**	–
☐	**Versatec**	–

* Only required if the system is connected to a network.

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Client Form Worksheet

Client name: _____ [1]

Architecture Type: _____ . _____ [2]

Root fs: */export/root* [3]

Swap fs: */export/swap* [4]

Client Information :

Internet Address: *net* . *net* . *net* . _____ [5]

Ethernet Address: _____:_____:_____:_____:_____:_____ [6]

NIS Type: ☐[none] ☐[client] [7]

Domain name: *server_domainname* [8]

Swap size (e.g. 8B, 8K, 8M): _____**M** [9]

Path to Root: /export/root/*client_name* [10]

Path to Swap: /export/swap/*client_name* [11]

Path to Executables: /usr [12]

Path to Kernel Executables: /usr/kvm [13]

Path to Home: /home/*server_name* [14]

Terminal type: sun [15]

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