Personal System Administration Guide

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Chapter 1

Introduction

This guide is written for the person who is responsible for setting up *system software* and keeping the *IRIS®* in good running condition. You will not need to refer to this guide every day; you'll use it frequently during your first few days with the IRIS, then refer back to it only to change setup information or to troubleshoot a problem.

If you find that you need more advanced administration information than this guide covers, see the *IRIX Advanced Site and Server Administration Guide*.

Conventions

The information in this guide follows these style conventions:

- References to other documents are in *italics*.

- References to other chapters and sections within this guide are in "quotation marks."

- Names of each *button* are in *italics*.

- Names of keys on the keyboard are in Courier bold font and are surrounded by angled brackets. For example, press the **<Enter>** key.

- Names of *menu* choices are in "quotation marks."

- Numbered sentences are sequential steps you follow to complete a task. Sentences that follow a step and are preceded by a box are substeps; they describe in detail how to accomplish the step. Once you're familiar with the procedure you probably won't need to refer to the substeps. For example:

1. Open a *shell window*.

   - Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse button*.

   - Drag the cursor down the menu until "Shell" is highlighted; then release the mouse button. The outline of a window appears.

   - Position the outline where you want the window to appear; then *click* the left mouse button.

Getting Help

You can find on-line information about the functions and features of your *system* in two standard ways:

- Press a *button* in the appropriate *System Manager* tool.
- View an IRIX™ manual page (*man page*) using either the *man* command or the *xman* utility.

System Manager Help

The *System Manager* tools described in this guide include Help facilities that display on-line information about the tool you are using. To view on-line documentation for a specific tool, *click* the *Help* button displayed in the tool. When you click the *Help* button, a *window* appears displaying information about the tool and providing buttons for browsing the information.

IRIX *man* Pages

If you need information about an *IRIX* command or program, you can use the IRIX *man* command or *xman* utility to display pages of the on-line IRIX reference manual (each is called a *man page*) supplied with each IRIS *system*.

Note: The man pages are on the system software tapes or CD that you received with your IRIS, but may not be installed on your hard disk. See the *IRIS Software Installation Guide* to install the man pages.

To view man pages using the *man* command, follow these steps:

1. Open a *shell window*.

    ■   Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

    ■   Drag the cursor down the *menu* until "Shell" is highlighted; then release the mouse button. The outline of a window appears.

    ■   Position the outline where you want the window to appear; then *click* the left mouse button.

2. Position your cursor within the new window, and type the *man* command followed by the name of the IRIX command with which you need help. For example, to see the man page on the *tar* command, type:

    man tar

    Then press **<Enter>**.

    The associated man page appears in the shell window.

To view man pages using the *xman* utility that is available through the Toolchest window, see the *IRIS Utilities Guide*.

Where to Go from Here

This guide contains two types of information: how to set up *system software* for a new *IRIS* and how to maintain the IRIS over time.

Chapter 1, "Introduction," provides an introduction to the guide and explains how you can get on-line information.

Chapter 2, "Understanding System Administration," introduces the *IRIX* operating system and describes the various duties of *system administration*. If you're new to IRIX or system administration, read this chapter before using the other chapters to set up and manage your system.

Chapter 3, "Setting Up a New IRIS," explains basic *network* concepts and shows you how to set up a new IRIS as a *standalone workstation* or as a member of a network.

Chapter 4, "Adding and Managing Users," explains how to use the Users tool to set up, change, and delete a user *login account*. It also shows you how to set up and delete a user *group*.

Chapter 5, "Managing Printers," explains how to use the Printer tool (the Print Manager) to set up new printers on your *workstation*, manage the print *queue*, and delete printers you no longer use. The chapter also provides a troubleshooting section for identifying and solving printing problems.

Chapter 6, "Setting Up Other Peripherals," explains how to use the Serial Ports tool and IRIX commands to set up modems, terminals, and other peripherals on the IRIS.

Chapter 7, "Managing Disks and Files," explains how to use the Disk and File tool to access new disks that you connect to your IRIS, to access disks on remote workstations, and to set up your own disk so other users can access it. The chapter also describes how to use IRIX commands to set the *permission* for files and folders and to manage disk space use.

Chapter 8, "Managing Processes," explains how to use IRIX commands to monitor and manage system processes.

Chapter 9, "Backing Up and Restoring Files," explains how to use the Backup and Restore tool to make periodic backups of the files on your system and how to *restore* files if they get lost or corrupted. It also describes the standard IRIX tools and gives a brief introduction to *tar*.

Appendix A, "Printing with lpr," shows you how to set up your IRIS to access a printer that is connected to a system that uses *lpr* as its print spooler.

For more advanced information on *system administration* or *network* administration, contact Silicon Graphics, Inc. to order the *IRIX Advanced Site and Server Administration Guide*.

Introduction

Understanding System Administration

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Chapter 2

Understanding System Administration

This chapter provides an introduction to *system administration* and discusses the various tools and techniques you will use to perform your administrative tasks.

It contains these sections:

- "The IRIX Operating System" on page 2-1 describes the *IRIX* operating system underlying your *IRIS* and introduces the need for *system administration*.

- "IRIX and System Administration" on page 2-2 provides an overview of administrative duties on a *multiuser system* and describes the role of the *system administrator* and how it differs from the role of the *network administrator*.

- "Using System Administration Tools" on page 2-6 introduces the three main administrative tools: the Administrator's account (the *root account*), the *System Manager*, and the IRIX *shell*.

The IRIX Operating System

Underlying the applications and tools you use on your *IRIS* is the *IRIX* operating system (a version of the *UNIX®* operating system). IRIX is much more flexible and powerful than traditional personal computer operating systems due to these features:

- IRIX is a multiuser operating system, which means several users can work on the system simultaneously and maintain private files.

- IRIX makes the IRIS a *multi-tasking system*, which means the IRIS can run several applications, print files, and update files simultaneously.

- IRIX lets you connect the *system* to a *network* where you can transparently transfer files to and from another *workstation* or *peripheral* device.

- IRIX lets you add a broad range of hardware peripherals such as printers, terminals, disk drives, and modems without additional software.

Along with the advanced capabilities of the IRIX operating system comes certain responsibilities for setting up, maintaining, and troubleshooting it. This set of responsibilities is known as *system administration*.

IRIX and System Administration

UNIX, the operating system on which *IRIX* is based, was originally designed so that many users using dumb terminals could simultaneously work on a single, centralized computer. In that environment, a single person — a *system administrator* known as the *superuser* or *root* — was responsible for setting up, maintaining, and upgrading the *system*. (See also "The Administrator's (root) Account" on page 2-7) In that capacity, the administrator had access to (special *permission* to use) parts of the system and utilities that were not available to anyone else. Ordinary users each had a restricted *login account* that let them run certain applications and store data in one specific part of the *file system*.

With advances in *network* technology and wider availability of UNIX on workstations used by a small number of people (one or more), this model has changed. Most typically, there are several workstations, each running a version of UNIX (such as IRIX), all connected to a large network. Individuals who may have no experience in *system administration* are responsible for several administrative functions on their own systems, while an experienced administrator sets up, maintains, and manages the central services for the entire network as *network administrator*.

Whether or not your *workstation* is connected to a network, someone (you or another regular user of your system) must assume the role of Administrator for your particular *multiuser system* (also called a single system). This single-system Administrator keeps that system in good running order and, if the system is connected to a network, works in conjunction with the network administrator to access network services.

The sections that follow provide more detail on the multi-user environment of each IRIX system and discuss the role of a single-system Administrator in a standalone or networked environment.

Working on a Multi-user System

Any type of computer can be considered a *multiuser system* if more than one user has access to the system. Each user typically claims a part of the system for their own by creating a personal directory (usually labeled with their name), in which they store their own applications and data files. Out of common courtesy, other users do not use directories and files that clearly belong to someone else.

A true multi-user operating system such as *IRIX* provides facilities that formalize, enforce, and enrich this paradigm.

Login Accounts

The *system* maintains a small database of information about each user called a *login account*. At the very minimum, the login account consists of a unique name (the) and number (the *user ID*) for the user and a unique location in the *file system* (a *home directory*) that belongs exclusively to that user. In many cases the login account also includes a *password* that only the *owner* of the account knows.

Before you can use the system, you must identify yourself by logging in, that is, by typing your login name and password (if you have one). The system looks up your login account to identify your home directory, then gives you access to that directory so you can begin your work.

You can add many other types of information to your account to customize your home directory; set working preferences; add, change, or remove a password; and so on. The Administrator sets up this account initially, then you can change some (but not all) of it. See Chapter 4, "Adding and Managing Users."

Ownership and Permissions

Every time you create a new file, the *system* automatically identifies you as the file's *owner* and assumes that you don't want other users to change the file, but you do want others to be able to view its contents. In this way the system sets *ownership* and *permission* for that file.

Every file on the system is owned by one *login name* and has a list of who can and cannot access the file in different ways. You can set permissions on files that you own (that is, those labeled with your login name) using the "Get File Info" command on the WorkSpace *menu*. (For more information on setting permissions, see *IRIS Essentials*.)

When you see an error message that reads "Permission denied," you know that the permissions on the directory or file that you tried to access are not set to allow your action. Only the file's owner or the Administrator can change the permissions for you.

The Responsibilities of a Single-system Administrator

Once you select a regular user of your *system* to be the *Administrator*, the Administrator uses a variety of tools to perform these tasks:

- Setting up the system initially as a *standalone workstation* or as a member of an existing *network*. (See Chapter 3, "Setting Up a New IRIS.")

- Creating login accounts so all users of the *workstation* can access it. (See Chapter 4, "Adding and Managing Users.") If the system will be connected to a network, the Administrator may work in conjunction with the *network administrator*.

- Connecting any *peripheral* devices and configuring software so that the devices work properly. (See Chapter 5, "Managing Printers," Chapter 6, "Setting Up Other Peripherals," and Chapter 7, "Managing Disks and Files.")

- Installing application software and updating *system software*. (See the *IRIS Software Installation Guide*.)

- Performing regular backups of the entire *file system* and, in some cases, of individual users' data, and restoring data when it is lost. (See Chapter 9, "Backing Up and Restoring Files.")

- Monitoring and troubleshooting the system to keep it working efficiently and properly. (See Chapter 8, "Managing Processes," "Managing Disk Space" on page 7-25 and "Troubleshooting Printing Problems" on page 5-19.)

If your system will be part of a network, the single-system *Administrator* is also responsible for:

- Contacting the *network administrator* before connecting your workstation to the network. The network administrator provides information that you need to uniquely identify your workstation on the network and to ensure that the regular users of your workstation can have accounts on other workstations on the network. (See Chapter 3, "Setting Up a New IRIS.")

- Making all, some, or none of your workstation's file system available to all, some, or none of the other workstations and users on the network. (See "Exporting Individual Directories" on page 7-22 and "Automatically Protecting Directories and Files" on page 7-24.)

- Accessing file systems from other workstations so the users of your workstation can use them. (See "Accessing a Remote File System" on page 7-13.)

- Providing access to printers on other workstations so the users of your workstation can send files to them. (See "Turning On Network Printer Software" on page 5-10.)

The Network Administrator's Role

The responsibilities of a *network administrator* vary greatly from site to site. If you will be using the *network*, it's important to contact the network administrator to understand all the services that are available to you. In general, the network administrator is responsible for:

- Setting up and maintaining the network so connections are reliable and data is transferred as quickly as possible.

- Creating, maintaining, and periodically distributing a list of all systems and users so that each has a unique identity on the network.

- Setting up and maintaining network services such as electronic mail and the Network Information Services (*NIS*).

For more information on network administration, see the *IRIX Advanced Site and Server Administration Guide*.

Using System Administration Tools

As the *Administrator* you have three main tools:

- The Administrator's *login account* (the *root account*) lets you access and change *IRIX* system files.

- The *System Manager* provides a graphical interface to most administrative tasks.

- The IRIX *shell* accepts IRIX commands that you use for more advanced administrative tasks.

This guide describes how to use the System Manager to complete all administrative tasks that it supports. Some advanced tasks require you to use IRIX commands or edit system files. If you prefer to perform all administrative tasks without using the System Manager, see the *IRIX Advanced Site and Server Administration Guide*. Regardless of whether you edit system files manually or let the System Manager do it for you, you are changing the same system files.

The Administrator's (*root*) Account

To perform most administrative tasks, you use the *root account*. This account has special privileges and is reserved for the Administrator's use only. Its *home directory* is the *root (/) directory* of the *file system*. The user logged in to the root account can move, change, and delete every file and directory on the *system*, regardless of who owns them and what type of *permission* they have set. Be sure to create a *password* for this account that only the Administrator knows. (See "Assigning a root Password" on page 3-3.)

You can access the root account in one of three ways:

- *Double-click* the *root* icon rather than your own icon on the main *login screen.*

- *Click* the *Administrator* button on the main *System Manager window.* (See "The System Manager" on page 2-7.)

- After logging in to your own account, *log in* as root through a separate *shell* window. (See "Logging In as root Through a Shell Window" on page 2-11.)

Note: Some *UNIX* and *IRIX* documents refer to the user of the root account as the *superuser* rather than the Administrator.

The System Manager

The *System Manager* is a set of graphical *system administration* tools. Like the *WorkSpace window,* the System Manager gives you a simpler way to perform complex tasks.

The System Manager includes six tools:

- The Backup and Restore tool lets you *back up* information from the disk drive to a tape and *restore* it from a tape to the disk.

- The Disk and File tool lets you access disk resources that are physically connected to your *workstation* or are connected to another *host* on the *network.*

- The Networking tool lets you name your *IRIS* and set it up to communicate with other workstations on the network.

- The Printer tool lets you access printers that are connected to your IRIS or other IRISes on the network and manage the jobs that are sent to the printers.

- The Serial Ports tool lets you set up terminals and other serial *peripheral* devices to work with your IRIS.

- The Users tool lets you set up, change, and delete a *login account*.

You can use the tools as either the *Administrator* or a regular user. As the Administrator, you are logged in to the *root account*; you can use all the features of every tool to set up and maintain the *system*. As a regular user logged in to your own account, you can view some information in the tools, *back up* and *restore* your own files, and change some information in your own account. When you use the System Manager as a regular user, some buttons in the tools are hidden; this is noted in this guide.

You access the System Manager through the *System toolchest* in the upper left-hand corner of your *screen*. To use the tools, you need to know the basic *mouse* techniques summarized in *IRIS Essentials* that accompanies your workstation.

To start the System Manager, follow these steps:

1. Move the mouse so the cursor is over the word "System" in the *Toolchest window*.

2. Press and hold down the left or right mouse button.

   The System toolchest *menu* shown in Figure 2-1 appears.

3. Drag the mouse until "System Manager" is highlighted; then release the mouse button.
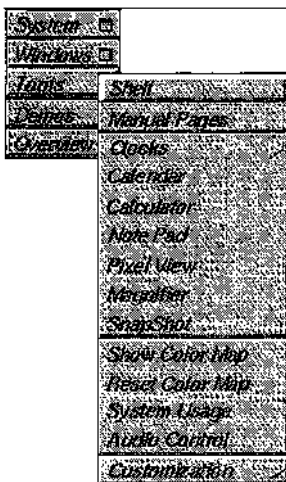
The System Manager shown in Figure 2-2 appears.
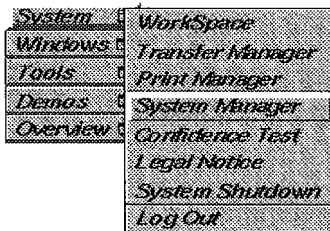
Figure 2-1
Starting the System Manager.
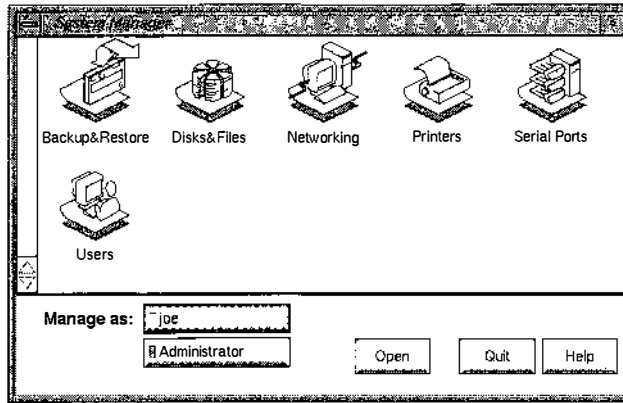
Figure 2-2 The System Manager.

4. To run the tool as the Administrator (using the *root account*) *click* the *Administrator* button. If there is a root *password*, a form appears that requests the password and asks if the user who started the System Manager will usually run it as the Administrator. If this is the case, click *yes*. The next time you start the System Manager, the *Administrator* button is already selected.

Each tool is described in detail in Chapters 3 through 9.

The IRIX Shell

The *shell* is a *window* in which you type *IRIX* commands to directly access the operating system. The correct syntax for the commands varies depending on whether you choose to use the C shell (*csh*) or the Bourne shell (*sh*). (See also the on-line *man page* for *csh* and *sh* for more information.) You specify a shell in the Users tool. (See "Viewing or Changing User Accounts" on page 4-8.)

To open a shell window, follow these steps:

1. Move the cursor over the word "Tools" in the *Toolchest window;* then press either the left or right *mouse* button.

2. Drag the cursor down the *menu* until "Shell" is highlighted; then release the mouse button. A large, red outline appears that moves as you move the cursor.

Figure 2-3
Opening a shell window.

3. Position the outline where you want the window to appear; then press and release the left mouse button.

   The shell window shown in Figure 2-4 appears.
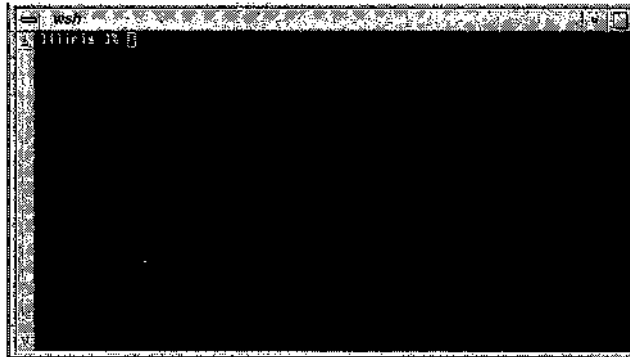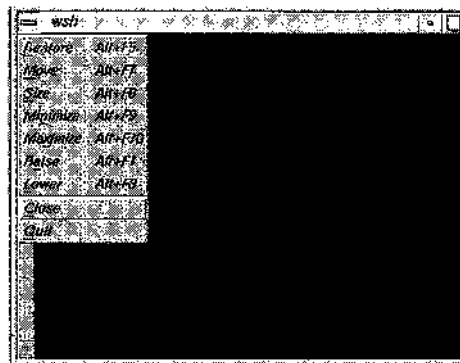
Figure 2-4 A shell window.

4. Position your cursor within the new window to type commands.

To close a shell window, follow these steps:

1. Move the cursor over the *Window menu* button; then press the left mouse button. The Window menu shown in Figure 2-5 appears.

Figure 2-5 Closing a window.

2. Drag the cursor down the *menu* until "Close" is highlighted; then release the mouse button.

The shell window disappears, and any programs running in it terminate. As a shortcut, *double-click* the left mouse button on the *Window menu* button. For more information on using the shell window, see the *IRIS Utilities Guide*.

Logging In as *root* Through a Shell Window

When you're already logged in as a regular user, you can start a *shell window* and *log in* as root by following these steps:

1. Open a shell window.

    ■   Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

    ■   Drag the cursor down the *menu* until "Shell" is highlighted; then release the mouse button. The outline of a window appears.

    ■   Position the outline where you want the window to appear; then *click* the left mouse button.

2. Position your cursor within the new window and type:

    login root

    Then press **<Enter>**.

If a prompt for a *password* appears, type the password then press **<Enter>**. If a prompt appears but the *root account* has no password, just press **<Enter>**. (See "Assigning a root Password" on page 3-3 to create, change, or remove a password.)

You are now logged in to the root account and are located in the *root* (/) directory. When you are logged in as root, the IRIX *prompt* is a pound sign (#) rather than a percent sign (%).

To *log out* of the root account, type:

logout

Then press **<Enter>**. The shell window disappears.

Understanding System Administration

Setting Up a New IRIS

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Chapter 3

Setting Up a New IRIS

After you have unpacked your *workstation* and installed it according to the instructions in your owner's guide, you need to set up the *system software*. Typically you'll follow three procedures:

*   Set up the software for basic operations.

*   Add the workstation to a *network* (if a network is available).

*   Customize the software for your particular needs, for example, set up a *login account*, add *peripheral* devices, and *mount* file systems.

This chapter covers the first two procedures:

*   "Setting Up System Basics" on page 3-2 shows how to set the date and time and create a *password* for the Administrator's login account (the *root account*).

*   "Setting Up a Networked IRIS" on page 3-7 shows you how to use the Networking tool to add your *IRIS* to a network. It also explains the basic concepts behind the standard and optional networking software.

Follow all the directions in "Setting Up System Basics" on page 3-2. Then, if you do not plan to connect your *system* to a network, use the information in "Where to Go from Here" on page 3-6 to customize your system.

If you do plan to connect your system to a network, after setting up the basics, follow all the directions in "Setting Up a Networked IRIS" on page 3-7.

Setting Up System Basics

This section shows you how to set the date and time and create a *password* for the Administrator's *login account* (the *root account*).

Setting the Date and Time

Once you set the date and time, the *system* can accurately stamp the time of events, such as when you last changed a file. On most networks, the current date and time are periodically provided to all workstations on the *network*.

You set the date and time with the IRIX *date* command, which has this format:

date *[mmddhhmm[yy]]*

mm specifies the month, *dd* the day, *hh* the hour, and *mm* the minutes. You can also specify the last two digits of a year (*yy*). For more information and options, see the *date man page*.

To set the date and time, follow these steps:

1. Log in as *root* through a *shell* window.

    ■   Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

    ■   Drag the cursor down the *menu* until "Shell" is highlighted; then release the mouse button. The outline of a *window* appears.

    ■   Position the outline where you want the window to appear; then *click* the left mouse button.

    ■   Position your cursor within the new window and type:

        login root

        Then press **<Enter>**.

If a prompt for a *password* appears, type the password and press **<Enter>**. If a prompt appears but the *root* account has no password, just press **<Enter>**.

2. Specify the date and time. For example, if today is March 17 (0317) at 2:30 p.m. (1430) in the year 1992 (92), type:

   date 0317143092

   Then press **<Enter>**.

3. To check the date and time, type:

   date

   Then press **<Enter>**. You see a line similar to this:

   ```
   Tue Mar 17 14:30 1992
   ```

4. *Log out* of the *root* account by typing:

   logout

   Then press **<Enter>**. The shell window disappears.

Assigning a *root* Password

The next step in setting up your *system* is to protect its information by assigning a *password* for the *Administrator*'s *login account* (the *root account*). Once you assign a password, only the people who know the password can *log in* as *root*. (See also "The Administrator's (root) Account" on page 2-7.)

If you are the only person who uses the system, or if system security is not important to you, you don't need to create a password for the *root* account. Without a password, any user on the system can perform administrative tasks, which is often convenient; this also means anyone can view and change all the information on your system. And, if your system is on a *network*, anyone on the network can log in as *root*.

Note: The Administrator should use the *root* account only when performing administrative tasks and should use his or her regular user account at all other times. To create a regular user account, see "Adding New Users" on page 4-5.

To assign a password, use the Users tool provided in the *System Manager*. (See "About the Users Tool" on page 4-2 for more details.)

Follow these steps:

1. Start the System Manager.

    ■   Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

    ■   Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

    ■   Manage the tool as the Administrator by clicking the *Administrator* button. If the system requests a password, type it in, then press `<Enter>`.

2. Start the Users tool.

    ■   *Double-click* the Users icon to open the tool.

        The form shown in Figure 3-1 appears.
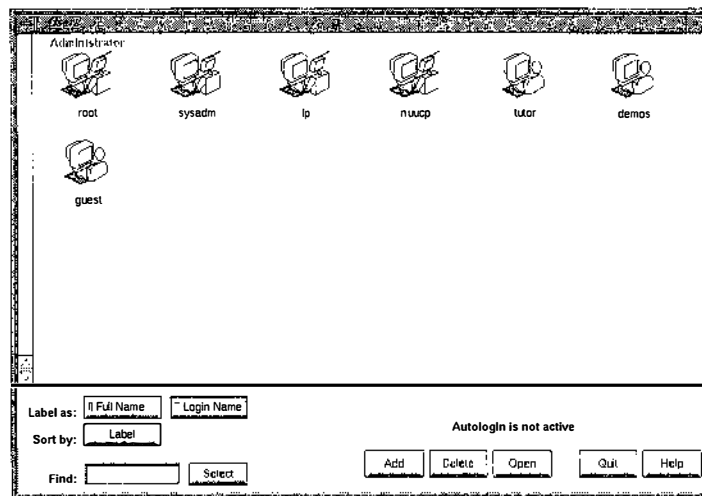
Figure 3-1   The Users tool.

> **Note:** If you don't see the *Add* and *Delete* buttons, you are
> not running the tool as the Administrator. Click the
> *Quit* button, click the *Administrator* button on the
> main System Manager *window,* then restart the User's
> tool.

3. Double-click the *Administrator* (*root*) icon.

   The form shown in Figure 3-2 appears.

Figure 3-2 Viewing the Administrator's account.

> **Note:** The fields in the form are not editable if your system
> is an NIS client. For more information on NIS, see
> "About Centralized (NIS) and Distributed (Non-NIS)
> Networks" on page 3-10.

4. Click the *Add it* button.

   The form shown in Figure 3-3 appears.
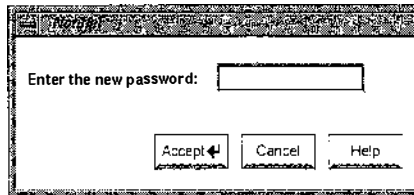
Figure 3-3   The form for adding a password to a login account.

5. Specify the password.

   The password should be between six and eight characters and contain a mixture of upper- and lowercase alphanumeric characters.

   ■ Move your cursor over the notifier, type in the password (the characters you type won't appear in the field — this keeps the password a secret), then click the *Accept* button.

   ■ When a notifier asks you to enter the password again, type in the same password, then click the *Accept* button.

     You see the buttons in the password field change to *Modify it* and *Delete it.* The new password is now in effect.

6. Click the *Accept* button to close the Administrator's form.

7. Click the *Quit* button to close the Users tool.

The next time you start the System Manager and click the *Administrator* button, the system will request the password.

Where to Go from Here

After you've set the date and time and assigned an Administrator's *password*, you can continue by adding the *workstation* to a network or configuring it as a *standalone workstation*.

To add your workstation to a *network*, skip to "Setting Up a Networked IRIS" on page 3-7 and follow the instructions for making the workstation an active member of a network.

Setting Up a New IRIS

To customize a *standalone workstation*, follow these guidelines:

- Add a *login account* for each user of this *system*. Do not use the standard system accounts (such as *guest*, *tutor*, or *root*) for your individual work; they have special *permission* and functions that you should not change. See Chapter 4, "Adding and Managing Users."

- Add all *peripheral* devices that you will use with the IRIS. See Chapter 5, "Managing Printers," Chapter 6, "Setting Up Other Peripherals," and Chapter 7, "Managing Disks and Files."

- Change the name of the workstation. This is purely optional for a standalone workstation. All new workstations are named *IRIS*; this name appears on the initial *login screen*. To change it, see "Changing the Hostname or Internet (IP) Address" on page 3-22.

Setting Up a Networked IRIS

This section shows you how to set up your *IRIS* to communicate on an existing Ethernet® *network* using *TCP/IP*, the networking software that comes standard on every IRIS. It also shows you how to turn on the Network Information Service (*NIS*) and the Network File System (*NFS*), optional software that is available from Silicon Graphics, Inc.

"Checklist for Network Setup" on page 3-8 details the hardware and information you need from your *network administrator*, then guides you through the setup process and points you to different sections of this guide to complete individual tasks. Once you complete the checklist, your *system* will be a member of the network.

For basic information on TCP/IP, NFS, and NIS, see "Understanding Network Basics" on page 3-10. For advanced information on NFS and NIS, see the *NFS and NIS Administration Guide and Man Pages* that came with the optional software.

To use other standard networking software (such as UUCP or SLIP) or to set up a network, see the *IRIX Advanced Site and Server Administration Guide*. To use other optional networking software (such as 4DDN) see the documentation that came with the software.

Checklist for Network Setup

The information and checklist in this section show you how to quickly and efficiently connect to the network and set up your *system* for network use.

1. If you're unfamiliar with networking concepts and terms, read "Understanding Network Basics" on page 3-10.

2. Physically connect your system to the network (see your owner's guide for instructions).

    If you have difficulties with the hardware connection (for example, if the cable doesn't seem to fit), contact your *network administrator*.

3. If you have the optional networking software *NFS* and *NIS*, install it on your system. See the *IRIS Software Installation Guide*.

4. Contact your network administrator to help you fill in Table 3-1. You'll refer back to this table when you turn on networking software.

    Complete the NIS column if your network runs NIS; complete the Non-NIS column if it does not. (See "Understanding Network Basics" on page 3-10 for more information on NIS and non-NIS networks.)

    Please note that a *login name* can have up to eight characters, but cannot contain any special characters (such as #, *, ;, or /) or uppercase letters. A *hostname* must begin with a lowercase letter, can have up to 64 lower- and uppercase alphanumeric characters (although less than eight is recommended), and can include periods and hyphens.

Information	NIS network	Non-NIS network
your login name		
your user ID		
your system's hostname		

Table 3-1   Information needed to set up a networked IRIS.

Information	NIS network	Non-NIS network
your system's hostname alias		
(*this is sometimes optional*)		
your system's IP address		
NIS domain name		(*not needed*)
hostnames and IP addresses	(*not needed*)	attach a list
of all hosts on the net		
login names and user IDs of all	(*not needed*)	attach a list
users who will use this IRIS		
hostname of the mail forwarder		
(needed to set up electronic mail)		

Table 3-1   Information needed to set up a networked IRIS.

5. Familiarize yourself with the Networking tool by reading "About the Networking Tool" on page 3-12.

6. Turn on standard (*TCP/IP*) and optional (*NIS, NFS*) networking software by following the instructions in"Turning On Networking Software" on page 3-15.

7. If yours is an NIS network, skip ahead to step 8.

    If yours is a non-NIS network, add each host with which you want to communicate to the list in your Networking tool by following the instructions in "Adding a Host" on page 3-19.

8. Make sure you can communicate with other hosts by following the instructions in "Testing the Network Connection" on page 3-25.

9. If you plan to use electronic mail, set it up by following the instructions in "Setting Up Electronic Mail" on page 3-27.

10. Customize your system.

   - Add a *login account* for each user of this system. Do not use the standard system accounts (such as *guest*, *tutor*, or *root*) for your individual work; they have special *permission* and functions that you should not change. See Chapter 4, "Adding and Managing Users."

   - Add all *peripheral* devices that you will use with the IRIS. See Chapter 5, "Managing Printers," Chapter 6, "Setting Up Other Peripherals," and Chapter 7, "Managing Disks and Files."

   - If you are running the optional NFS software, you can access another *file system* on the network, and you can make your own file system accessible to other hosts. See "Accessing a Remote File System" on page 7-13 and "Customizing and Exporting a Local File System" on page 7-9.

When you have completed all these steps, your system is an active member of the network. To understand all the services that are available to you, contact your network administrator.

Understanding Network Basics

A *network* is a group of computers and *peripheral* devices (such as printers and scanners) that are physically connected by cables or telephone lines and run networking software so they can share and transfer information. Typically, *IRIS* workstations use Ethernet cables to make the physical connection and use *TCP/IP* networking software to send and receive information.

About Centralized (NIS) and Distributed (Non-NIS) Networks

Each computer (or *workstation*) on the *network* is called a *host*; each host has a unique name (a *hostname*) and a unique number (an *Internet* or *IP address*). Usually the person who manages the network (the *network administrator*) maintains a master list of existing hostnames, Internet

addresses, and login accounts. (See also "Login Accounts" on page 2-3.)

When you are ready to add your workstation to the network, the network administrator gives you a unique hostname, IP address, and *login account* and adds this information to the master list; the network administrator also informs Administrators of other hosts on the network that there is a new host. You then use this information and information about other hosts on the network to set up your networked IRIS.

When the network administrator maintains the master list manually and depends on single-system Administrators to set up and maintain their network information, the network is usually considered a *distributed network* (the management responsibility is distributed among individual workstations).

When the network administrator uses the optional Network Information Service (*NIS*) software, the information resides in a database on one host (the *NIS master*), and the NIS master automatically updates each host (*NIS client*) on the network at regular intervals with host and user information. This is called a *centralized network*, since the network administrator can manage all information from one centralized host. In order for NIS to work correctly, every workstation on the network should run it.

The information you need and the tasks you perform to set up your IRIS on the network are slightly different depending on whether yours is a centralized (NIS) or distributed (non-NIS) network. This is covered in "Checklist for Network Setup" on page 3-8.

About NFS

Included with the optional *NIS* software is the Network File System (*NFS*); you can run one without the other, or both at the same time. When your IRIS runs NFS, you can access and use file systems on other workstations on your *network* just as if the directories physically resided in your own IRIS; you can also allow other workstations to access your disk in the same way. The remote *file system* appears in your *WorkSpace window* as a directory that you access just like any other directory. See "Customizing and Exporting a Local File System"

on page 7-9 and "Accessing a Remote File System" on page 7-13 for
more information.

About the Networking Tool

The Networking tool lets you set up your *workstation* to communicate
quickly and easily with other hosts. It shows you all the other hosts on
the *network* and lets you see specific information about each *host*. You
access the Networking tool through the *System toolchest* in the upper
left corner of your *screen*. To use the tools, you need to know the basic
mouse techniques summarized in the tutorial and reference chapters of
IRIS Essentials.

To start the Networking tool, follow these steps:

1. Start the *System Manager.*

   ■ Move the cursor over the word "System" in the *Toolchest
     window*; then press either the left or right mouse button.

   ■ Drag the cursor down the *menu* until "System Manager" is
     highlighted; then release the mouse button.

   ■ Manage the tool as the Administrator by clicking the
     Administrator button. If the system requests a *password*, type it
     in, then press **<Enter>**.

2. Start the Networking tool.

   ■ *Double-click* the Networking icon to open the tool.

     A form like the one shown in Figure 3-4 appears.
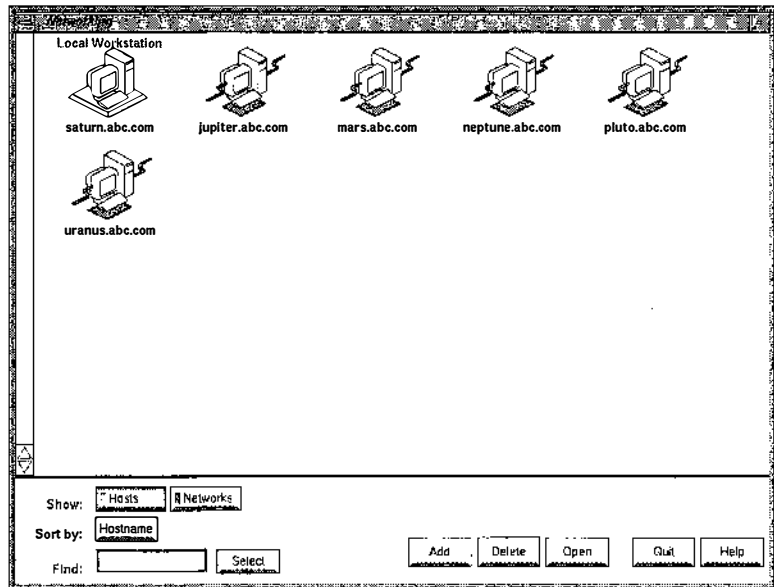
Figure 3-4   The Networking tool.

Note: The form in Figure 3-4 shows what the Networking tool
looks like when you are running the tool as the
Administrator and the *system* is already set up on the
network: you see hosts other than your own and the *Add*
and *Delete* buttons. The *Add* and *Delete* buttons don't
appear on *NIS client* workstations.

The Networking tool contains icons that represent all the hosts that
you can access on your network and buttons that let you rearrange the
icons and manage hosts. The list below describes each of the fields and
buttons in this tool.

Show   You can look at the information in the tool in two
ways: you can view the individual workstations,
or you can view all the subnetworks that make up
your network.

Sort by   You can sort the host icons in two ways: by
networks and by hosts. To sort by hostname
alphabetically, *click* the *Hosts* button next to *Show*
and click the *Hostname* button next to *Sort by*. Your

host appears in the upper left corner, and the rest of the hosts are sorted alphabetically. To sort by network name, click the *Network* button next to *Show* and then click the *Net Name* button next to *Sort by*. The icons are sorted numerically by their network numbers.

Find   To find a particular host on your network, click in the *Find* field, type the hostname or hostname alias, and click the *Select* button or press <Enter> on the keyboard. The tool highlights the icon for the specified host.

Use the *wildcard* character (*) if you know only a few letters of the hostname for which you are searching. For instance, to find the hostname that contains the string *also*, type *also* in the *Find* field. The tool sorts the icons so the hostnames that contain those letters are highlighted.

Add   To add a new host to the list of hosts that you can access, click the *Add* button. (If yours is an *NIS* network, you see this button only when the system is the *NIS master*.)

Delete   To remove a host from the list of hosts that you can access, *select* the icon and click the *Delete* button. (If yours is an NIS network, you see this button only when the system is the NIS master.)

Open   To look at networking information about one of the hosts, select its icon, and then click the *Open* button. (You can also double-click an icon as a shortcut to opening an icon.)

Quit   To close the Networking tool, click the *Quit* button.

Help   To see on-line information about the Networking tool, click the *Help* button.

Turning On Networking Software

You'll use the Networking tool to give your *system* the information that you wrote down in Table 3-1 and to turn on standard and optional networking software.

Follow these steps:

1. Complete steps 1 through 5 in "Checklist for Network Setup" on page 3-8.

2. Start the *System Manager*.

   ■ Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

   ■ Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

   ■ Manage the tool as the Administrator by clicking the *Administrator* button. If the system requests a *password*, type it in, then press **<Enter>**.

3. Start the Networking tool.

   ■ *Double-click* the Networking icon to open the tool.

4. Open the Local Workstation icon.

   ■ Double-click on the icon labeled Local Workstation.

   A form like the one shown in Figure 3-5 appears.

Personal System Administration Guide

Figure 3-5   The Local Workstation form.

> **Note:**   The message about *NFS* and *NIS* in Figure 3-5
> appears only if this optional software is installed
> on your system.

5. Specify a name for your *workstation*.

   ■   Highlight the name that's in the *Hostname* field (on a new
        system the name is *IRIS*), and type in the *hostname* you chose
        with your *network administrator* (see Table 3-1).

6. Specify your workstation's Internet Protocol (IP) address.

   ■   Highlight the number that's in the *IP address* field and type in
        the *IP address* that your network administrator assigned to
        you (see Table 3-1).

7. Specify an alias (alternate name) for your workstation.

   ■   Highlight the name that's in the *Hostname alias* field and type
        in the hostname alias if you chose one with your network
        administrator (see Table 3-1).

Setting Up a New IRIS

This is an optional field. It's useful if you want to refer to your workstation by a shorter version of its full hostname.

8. Turn on the standard networking software, *TCP/IP*.

   ■ Click the *On* button next to *TCP/IP*.

9. Confirm the information displayed in the form.

   ■ Click the *Accept* button if all the information is correct.

   The networking software is turned on. Find the Local Workstation icon in the Networking tool and make sure it is labeled with its new hostname.

   ■ Click the *Cancel* button if you decide not to turn on networking, and any changes you made will not take effect.

10. Close the Networking tool or turn on optional networking software.

    ■ If you do not have the optional *NIS* and *NFS* networking software, you are done turning on networking software. To continue network setup, add each host with which you want to communicate to the list in your Networking tool. See "Adding a Host" on page 3-19.

    ■ If you have the optional NIS and NFS networking software go on to step 11.

11. Open the Local Workstation icon again.

    ■ Double-click the icon labeled Local Workstation.

    A form like the one shown in Figure 3-6 appears.

Hostname:	saturn.abc.com
IP Address:	192.2.0.1
Hostname Alias:	saturn
TCP/IP:	☐ On ☐ Off
NFS:	☐ On ☐ Off
NIS Server:	Unknown
Domain Name:	
Network Information Service:	☐ On ☐ Off

Accept   Cancel   Help

Figure 3-6   The form for turning on NFS and NIS.

If you don't see the fields and buttons for turning on NFS and NIS and you plan to use these options, you may have this optional software but haven't yet installed it on your IRIS. See the *IRIS Software Installation Guide* to install it.

12. If you plan to access (mount) a remote *file system* or to let other hosts mount your file system, turn on NFS.

   ■ Click the *On* button next to *NFS*.

13. If your network runs NIS, specify the NIS *domain name* and turn on NIS.

   ■ Click in the *Domain name* field and type in the NIS domain name provided by your network administrator (see Table 3-1).

   ■ Click the *On* button next to *Network Information Service*.

14. Confirm the information and restart the system.

   ■ When all the information is correct, click *Accept*.

The form shown in Figure 3-7 appears.
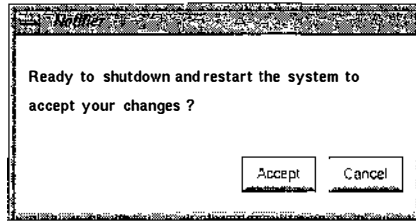
Figure 3-7   Notifier to restart the system.

■   Click the *Accept* button to restart the system.

After a few minutes you see a question about performing system maintenance. Ignore this and wait until you see the *login screen*.

■   When you see the login screen, *log in* to the system.

15. To continue network setup, make sure you can communicate with other hosts by following the instructions in "Testing the Network Connection" on page 3-25.

Adding and Deleting Hosts

As the *Administrator* you can use the Networking tool to add a new *host* to the list of hosts that you can access or to delete an existing host from the list. As a regular user you can view information about any host on the *network*, but you cannot add or delete a host.

Note: You can add or delete a host with the Networking tool if you are the Administrator on a *distributed network* (non-NIS) or if you are part of a *centralized network* (*NIS*) and your *workstation* is the *NIS master*.

Adding a Host

If you are the *Administrator* and are part of a *distributed network* (non-NIS), use the Networking tool to gain access to another *host* on the *network*. Ask your *network administrator* for the *hostname*, *IP address*, and *hostname alias* of the host, and add the host to the list of available

hosts in the Networking tool. You do this for each host on your network that you want to access.

Note: If you want to add several hosts to your list, it may be faster to ask your network administrator for a copy of the master */etc/hosts* file. This file contains a list of all hosts and IP addresses on your network. Make sure the master file contains your hostname and IP address, then remove your */etc/hosts* file and replace it with the master file. Your Networking tool then displays all the hosts.
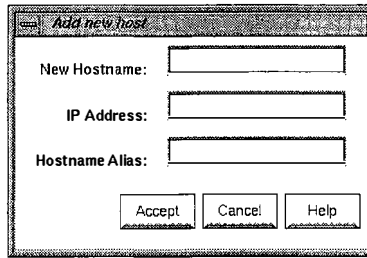
On a *centralized network* (*NIS*), you usually do not need to manually add hosts to the list in the Networking tool. When a new host joins the network, the Administrator of the NIS master (usually the network administrator) adds the host to the master list on the NIS master. The NIS master then automatically updates the host lists on every *system* on the network with the new host's information. (For more information on NIS, see "Understanding Network Basics" on page 3-10 and the *NFS and NIS Administration Guide and Man Pages* that came with the optional *NFS* and *NIS* software.)

To add a host, follow these steps:

1. Start the *System Manager*.

   - Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

   - Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

   - Manage the tool as the Administrator by clicking the *Administrator* button. If the system requests a *password*, type it in, then press **<Enter>**.

2. Start the Networking tool.

   - *Double-click* the Networking icon to open the tool.

3. Click the *Add* button.

   The form shown in Figure 3-8 appears.

Figure 3-8 Form for adding a new host.

4. Specify the hostname of the host you are adding to the list.

    ■   Click in the *Hostname* field and type the hostname.

5. Specify the host's IP (Internet Protocol) address.

    ■   Click in the IP address field and type the IP address.

6. Specify an alias (alternate name) for the host.

    ■   Click in the *Hostname alias* field and type the hostname alias.

7. Confirm the information displayed in the form.

    ■   Click the *Accept* button to add the host.

        Once you click the *Accept* button, an icon for the host
        appears in the Networking tool. If you added this host to
        the NIS master (*server*) workstation, this host also
        appears in the Networking tools on all the hosts in the
        network.

    ■   Click the *Cancel* button if you decide not to add the host. The
        changes you made will not take effect.

8. Close the tool or add more hosts.

    ■   If you're finished, click the *Quit* button.

    ■   If you have more hosts to add, go back to step 3.

9. Make sure you can access all hosts that you added by following
    the instructions in "Testing the Network Connection" on
    page 3-25.

Deleting a Host

To delete a *host* from your list, follow these steps:

1. Start the *System Manager*.

   ■ Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right mouse button.

   ■ Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

   ■ Manage the tool as the Administrator by clicking the *Administrator* button. If the system requests a *password*, type it in, then press **<Enter>**.

2. Start the Networking tool.

   ■ *Double-click* the Networking icon to open the tool.

   Note: You don't see the *Add* and *Delete* buttons on a *centralized network* unless your *workstation* is the *NIS master*.

3. Click on the host you want to delete.

4. Click the *Delete* button.

   The icon disappears from the tool and you can no longer access the host. (The host is still a member of the *network*; to regain access, see "Adding a Host" on page 3-19.)

5. Close the tool, or delete more hosts.

   ■ If you're finished, click the *Quit* button.

   ■ If you have more hosts to delete, go back to step 3.

Changing the Hostname or Internet (IP) Address

Every *workstation* is named *IRIS* and has an *IP address* of 192.0.2.1 when it is shipped from the factory.

If you do not plan to connect your workstation to a *network*, you can name it anything you like, and you can ignore the IP address. The *hostname* that you give the IRIS appears on the initial *login screen* and elsewhere, such as in a system *prompt*.

If your workstation is a member of a network, changing its hostname and/or IP address changes its identity on the network. Typically, the need to change a hostname or IP address will result from a restructuring of the network and will be requested by your *network administrator*.

On a *centralized network* (*NIS*), a single-system *Administrator* can change the hostname and IP address only if his or her workstation is the *NIS master*. On a *distributed network*, single-system Administrators can change their own hostnames and IP addresses, but should never do so without coordinating with the network administrator; single-system Administrators also cannot change the hostnames or IP addresses of other hosts.

To change the hostname or IP address, use the Networking tool to open the Local Workstation icon and edit the appropriate field. Follow these steps:

1. Start the *System Manager*.

    ■ Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

    ■ Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

    ■ Manage the tool as the Administrator by clicking the *Administrator* button. If the system requests a *password*, type it in, then press **<Enter>**.

2. Start the Networking tool.

    ■ *Double-click* the Networking icon to open the tool.

    Note: You don't see the *Add* and *Delete* buttons on a *centralized network* unless your workstation is the *NIS master*.

3. Open the icon whose hostname or IP address you want to change.

    ■ Double-click on the icon.

    A form like the one shown in Figure 3-9 appears.

Figure 3-9   Editing the hostname and IP address fields.

> **Note:**   If your workstation is the NIS master and you open a remote host's icon, the form looks different.

4. If this is the form for the local workstation and TCP/IP is turned on, turn it off.

    ■   Click the *Off* button next to *TCP/IP* so you can edit the hostname, IP address, and hostname alias.

5. Specify a hostname for the workstation.

    ■   Highlight the name that's in the *Hostname* field (on a new *system*, the name is *IRIS*), and type in the hostname you chose with your network administrator (see Table 3-1).

        The hostname must begin with a lowercase letter, can contain up to 64 upper- or lowercase alphanumeric characters, and can include periods and hyphens.

6. Change the IP address.

- Highlight the number that's in the *IP address* field, and type in the IP address that your network administrator assigned to you (see Table 3-1).

7. Specify an alias (alternate name) for the workstation.

- Highlight the name that's in the *Hostname alias* field, and type in the hostname alias if you chose one with your network administrator (see Table 3-1).

8. If your system is connected to the network and you turned off TCP/IP in step 4, turn it back on.

- Click the *On* button next to *TCP/IP*.

9. Confirm the information displayed in the form.

- Click the *Accept* button if all the information is correct.

- Click the *Cancel* button if you decide not to change the hostname, hostname alias, or IP address, and any changes you made will not take effect.

10. Close the tool, or change more hostnames or IP addresses.

- If you're finished, click the *Quit* button.

- If you have more information to change, go back to step 3.

Testing the Network Connection

You are ready to test the *network* connection once you have completed steps 1 through 7 in "Checklist for Network Setup" on page 3-8.

To test the connection, follow these steps:

1. Open a *shell* window.

- Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

- Drag the cursor down the *menu* until "Shell" is highlighted; then release the mouse button. The outline of a *window* appears.

- Position the outline where you want the window to appear;
  then click the left mouse button.

2. Use the */usr/etc/ping* command with the *hostname* of a *system* that
   appears in your Networking tool. For example, if the remote
   hostname is *mars*, type:

   /usr/etc/ping mars

   Then press **<Enter>**.

   - If your system can reach the remote system, you see
     messages similar to these:
     ```
     PING mars (192.0.2.2): 56 data bytes
     64 bytes from 192.0.2.2:icmp_seq=0 ttl=255
     time=0ms
     64 bytes from 192.0.2.2:icmp_seq=1 ttl=255
     time=0ms
     64 bytes from 192.0.2.2:icmp_seq=2 ttl=255
     time=0ms
     ```

     These messages will repeat indefinitely; to stop them,
     press **<Ctrl-C>**. Your network connection is working
     properly. If you plan to set up electronic mail, see
     "Setting Up Electronic Mail" on page 3-27; otherwise,
     return to "Checklist for Network Setup" on page 3-8.

   - If your system cannot reach the remote system, you see only
     one line similar to this:

     ```
     PING mars (192.0.2.2): 56 data bytes
     ```

     Or you may see a line similar to this:

     ```
     ping: mars: Unknown host
     ```

     Press **<Ctrl-C>**, then try the *ping* command with a
     different hostname. If this does not work, go on to the
     next step.

3. Check the *console* window for error messages.

   - Position your cursor over the console icon, click the left
     mouse button once, and look for this message:

     ```
     ec0: no carrier sense
     ```

   - If you see this message, the physical connection between
     your system and the network is not working. Make sure the

Ethernet cable is firmly connected to your system, then go back to step 2.

- If you do not see this message, go on to step 4.

4. Make sure *TCP/IP* is turned on, and, if yours is an *NIS* network, make sure NIS is also turned on.

- Start the *System Manager* and the Networking Tool (see "About the Networking Tool" on page 3-12).

- Open the Local Workstation icon.

- If the *Off* button next to *TCP/IP* is selected, click the *On* button; if the *Off* button next to *NIS* is selected, click the *On* button.

- If you made changes, click *Accept.* You see the notifier in Figure 3-7; click *Accept* to restart the system. When the *login screen* appears, *log in* and return to step 1.

- If you did not make any changes, click *Cancel.* Contact your network administrator to report that your network connection is not working correctly.

Setting Up Electronic Mail

You can set up your *system* to send and receive electronic mail (E-mail) once you have verified that the *network* connection works (see "Testing the Network Connection" on page 3-25).

The *IRIX* electronic mail system has two parts. The first is the *Mail* program that you use to read, compose, and send mail. This is covered in detail in the *IRIS Utilities Guide*, along with instructions for customizing your mail environment. The second is *sendmail*, the mechanism that interprets your mail messages and sends them to the correct location.

This section gives you a brief introduction to how *send mail* works, then shows you how to set up mail automatically or manually by editing the */usr/lib/sendmail.cf* file.

About *sendmail*

sendmail routes mail through a *network* using two pieces of information: the *domain name* of your *system* and the *hostname* of your domain's *forwarder* (the system that forwards mail from your domain to other domains).

A *domain* is a group of systems whose hostnames have the same suffix; this suffix is the *domain name*. For example, *mars.bldg1.abc* and *saturn.bldg1.abc* belong to the *bldg1.abc* domain, while *venus.bldg2.abc* belongs to the *bldg2.abc* domain.

To simplify network administration and increase network efficiency, large networks typically consist of several domains. For example, company *abc* has one large network that connects systems that are in buildings 1, 2, and 3. Its overall network is *abc* and it consists of three domains: *bldg1.abc*, *bldg2.abc*, and *bldg3.abc*. All systems that physically reside in building 1 are in the *bldg1.abc* domain, and so on. Often systems that are part of the same domain are physically close to each other. A typical hostname on this network can be *mars.bldg1.abc*.

Small networks typically consist of a single domain, or may not even use the concept of domains. For example, company *xyz* has a simple one-domain network called *xyz*; all hostnames end in *.xyz*. Because all hostnames have the same suffix, the suffix has no significance, so company *xyz* can simply drop the suffix and therefore drop the concept of domains altogether.

If the hostname that you chose with your *network administrator* and wrote down in Table 3-1 has a period (.) in it, your site uses domains. Your domain name is everything that follows the first period. For example, the domain name of host *mars.bldg1.abc* is *bldg1.abc*.

When you send mail to a system that is in your domain, *sendmail* delivers the mail directly to that system. When you send mail to a system that is in a different domain, *sendmail* delivers the mail to the forwarder host in your domain. The forwarder host knows how to reach hosts in other domains, so it forwards the mail to the correct location.

sendmail uses the information in the */usr/lib/sendmail.cf* file to identify the local domain and the forwarder host. "Automatically Configuring

sendmail" on page 3-29 shows you how to run a program to add domain and forwarder information to *sendmail.cf*. "Manually Configuring sendmail" on page Chapter 3-30 shows you how to edit *sendmail.cf* to add this information.

Automatically Configuring *sendmail*

To automatically configure *sendmail*, follow these steps:

1. *Log in* as *root* through a *shell* window.

    ■ Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

    ■ Drag the cursor down the *menu* until "Shell" is highlighted; then release the mouse button. The outline of a *window* appears.

    ■ Position the outline where you want the window to appear; then *click* the left mouse button.

    ■ Position your cursor within the new window and type:

       login root

       Then press **<Enter>**.

       If a prompt for a *password* appears, type the password then press **<Enter>**. If a prompt appears but the *root account* has no password, just press **<Enter>**.

2. Rename */usr/lib/sendmail.cf,* in case you need it later, by typing:

    mv /usr/lib/sendmail.cf /usr/lib/sendmail.cf.orig

    Then press **<Enter>**.

3. Create a copy of */usr/lib/sendmail.cf.auto* and name it */usr/lib /sendmail.cf* by typing:

    cp /usr/lib/sendmail.cf.auto /usr/lib/sendmail.cf

    Then press **<Enter>**.

4. Stop *sendmail* from running by typing:

    /etc/init.d/mail stop

    Then press **<Enter>**.

5. Run the configuration program.

- Start the program by typing:

  /usr/etc/configmail setup

  Then press **<Enter>**.

  You see a message that ends with these lines:

  ```
  Suggested setting: [domain name]
  ```

  ```
  Enter new setting: ([domain name]):
  ```

- If your *network* uses domains, type the *domain name*
  (everything after the first period in your *hostname*), then press
  <Enter>.

  If it does not use domain names, press **<Enter>**.

  You see a message that ends with these lines:

  ```
  Suggested setting: hostname
  ```

  ```
  Enter new setting (hostname):
  ```

- Type the full hostname of the forwarder (see Table 3-1), then
  press **<Enter>**.

  The configuration program is complete when you see the
  system *prompt*.

6. Restart *sendmail* by typing:

   /etc/init.d/mail start

   Then press **<Enter>**.

7. *Log out* of the *root* account by typing:

   logout

   Then press **<Enter>**. The shell window disappears.

To test the setup, try sending mail to other users on systems that are in
your own *domain* and other domains. See the *IRIS Utilities Guide* for
information on using *Mail*.

If you set up electronic mail as part of your overall network setup,
return to "Checklist for Network Setup" on page 3-8.

Manually Configuring *sendmail*

If your *network* is particularly complex, or you are not satisfied with the speed of mail delivery that you experience after configuring *sendmail* automatically, you may want to edit */usr/lib/sendmail.cf* directly.

Follow these steps:

1. *Log in* as *root* through a *shell* window.

   ■ Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

   ■ Drag the cursor down the *menu* until "Shell" is highlighted; then release the mouse button. The outline of a *window* appears.

   ■ Position the outline where you want the window to appear; then *click* the left mouse button.

   ■ Position your cursor within the new window and type:

     ```
     login root
     ```

     Then press <Enter>.

     If a prompt for a *password* appears, type the password then press <Enter>. If a prompt appears but the *root account* has no password, just press <Enter>.

2. Make a copy of */usr/lib/sendmail.cf*, in case you need it later, by typing:

   ```
   cp /usr/lib/sendmail.cf /usr/lib/sendmail.cf.orig
   ```

   Then press <Enter>.

3. Stop *sendmail* from running by typing:

   ```
   /etc/init.d/mail stop
   ```

   Then press <Enter>.

4. Edit */usr/lib/sendmail.cf*.

   ■ Open the file with a text editor such as *jot* by typing:

     ```
     jot /usr/lib/sendmail.cf
     ```

     Then press <Enter>.

- Find the five lines that contain two-letter codes (called *macros*) in the *sendmail.cf* file. They are listed below:

```
DD BAR.FOO.COM
CD
DF FORWARDHOST.BAR.FOO.COM
CF FORWARDHOST.BAR.FOO.COM FORWARDHOST
DT FOO.COM
```

Note: These lines do not appear one after the other as shown above; they are separated by blocks of comments.

- Customize the five lines for your type of network.

  The information that you add to these lines varies depending on your network's configuration. If your network has more than one *domain*, see "Editing sendmail Macros for Multiple Domains" on page 3-33; if it has one domain, see "Editing sendmail Macros for a Single Domain" on page 3-33; if it has no domain, see "Editing sendmail Macros for No Domain" on page 3-34.

- Save your changes and *quit jot*.

5. If your network uses one or more domains, go on to the next step. If your network does not use domains, you must create a new file, then add one line to it.

   - Create */usr/etc/resolv.conf* with a text editor such as *jot* by typing:

     jot /usr/etc/resolv.conf

     Then press **<Enter>**.

   - Add this as the first line:

     ```
     hostresorder local bind
     ```

   - Save your changes and quit *jot*.

6. Restart *sendmail* by typing:

   /etc/init.d/mail start

   Then press **<Enter>**.

7. *Log out* of the *root* account by typing:

   logout

Then press **<Enter>**. The shell window disappears.

To test the setup, try sending mail to other users on systems that are in your own domain and other domains. See the *IRIS Utilities Guide* for information on using *Mail*.

If you set up electronic mail as part of your overall network setup, return to "Checklist for Network Setup" on page 3-8.

Editing *sendmail* Macros for Multiple Domains

If your *network* has more than one *domain*, append the name of your system's domain to *DD* and *DT*, append all domains to which you want a direct connection to *CD*, append the full *hostname* of the forwarder to *DF*, and append the full hostname and all aliases of the forwarder to *CF*.

For example, if your system's domain is *bldg1.abc*, the forwarder's hostname is *forward.bldg1.abc* and its alias is *forwarder*, and you want a direct mail connection to the *bldg2.abc* domain, you will edit the lines to look like this:

```
DDbldg1.abc
CDbldg1.abc bldg2.abc
DFforward.bldg1.abc
CFforward.bldg1.abc forward
DTbldg1.abc
```

Editing *sendmail* Macros for a Single Domain

If your *network* has one *domain*, append the name of your domain to *DD*, *CD*, and *DT*, append the full *hostname* of your system to *DF*, and append the full hostname and all aliases of your system to *CF*.

For example, if your domain is *abc*, your system's hostname is *mars.abc*, and its alias is *mars*, you will edit the lines to look like this:

```
DDabc
CDabc
DFmars.abc
CFmars.abc mars
DTabc
```

Editing *sendmail* Macros for No Domain

If your *network* has no *domain*, append the full *hostname* of your system to *DF*, and append the full hostname and all aliases of your system to *CF*. Edit the lines that contain *DD*, *CD*, and *DT* so only the macros remain.

For example, if your system's hostname is *mars* and its alias is *martian*, you will edit the lines to look like this:

```
DD
CD
DFmars
CFmars martian
DT
```

Adding and Managing Users

4

Chapter 4

Adding and Managing Users

You must create a unique *login account* for every person who uses the *IRIS* (see also "Login Accounts" on page 2-3), whether or not the *workstation* is on a *network*. This gives the IRIS the ability to distinguish between users, which has many advantages:

- The IRIS gives each user a unique location in the *file system* in which to do work and store files and directories. This is called the user's *home directory*.

- Whenever a user creates a file, the user owns the file. This means the user can decide whether other users can access the file. This way, you can share an IRIS with several people and still maintain private information. (See also "Ownership and Permissions" on page 2-4.)

- The IRIS tracks the activity of every user. When someone accesses a file or directory, the IRIS records the information. You see this information when you *select* the file and choose "Get File Info" from the WorkSpace or Directory View menus. This is important information when you are sharing files with a group of people and want to track who is working on different files.

IRIS Essentials provides detailed explanations of these concepts.

When you *log in* to your IRIS, you type your *login name* so the IRIS knows who you are and which files and directories are yours. The IRIS uses the account name to label new files and directories that you create so you and everyone else knows to whom they belong.

This chapter tells you how to set up new user login accounts, view and modify accounts, and delete accounts with the Users tool. It also tells you how to create logical groupings of users who want to share files.

This chapter contains these sections:

- "About the Users Tool" on page 4-2 explains what the tool does, tells you how to start it, and describes all the buttons and fields in the tool.

- "Adding New Users" on page 4-5 explains how to choose a login name and takes you through the process of setting up accounts for people who want to use your IRIS.

- "Viewing or Changing User Accounts" on page 4-8 explains user account information and how to change the way an account is set up.

- "Deleting User Accounts" on page 4-12 explains how to remove user accounts you no longer need.

- "Adding and Managing User Groups" on page 4-14 explains how to create logical groups of users who want to share directories and files.

About the Users Tool

The Users tool provides information about every *login account* that's on your *system*. When you run the tool as a regular user, you can view information about all the accounts and can change some information in your own account (for example, your *password*). When you run the tool as the *Administrator,* you can also add and delete user accounts.

You access the Users tool through the *System toolchest* in the upper left corner of your *screen*. To use the tools, you need to know the basic *mouse* techniques summarized in the tutorial and reference chapters of *IRIS Essentials*.

To start the Users tool, follow these steps:

1. Start the *System Manager*.

   - Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right mouse button.

   - Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

- Manage the tool as the Administrator by clicking the *Administrator* button. If the system requests a *password*, type it in, then press **<Enter>**.

2. Start the Users tool.

- Double-click the Users icon to open the tool.

  A form like the one shown in Figure 4-1 appears.
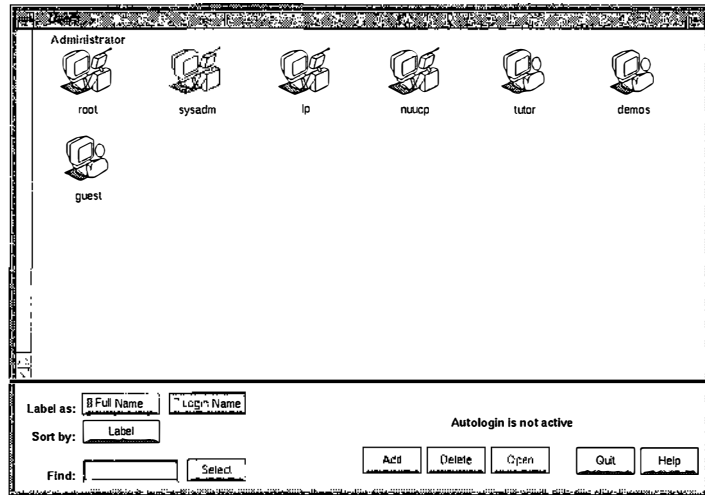
Figure 4-1 The Users tool.

Note: If you don't see the *Add* and *Delete* buttons, you are not running the tool as the Administrator. Click the *Quit* button, click the *Administrator* button on the main System Manager *window*, then restart the User's tool.

This tool gives you access to all the users who have accounts on this system. The three kinds of users each have an icon: *regular user* icons (the *guest* icon is an example), *system user* icons (the *root* icon is an example), and, if you are on a *network*, *network user* icons (these have a network cable running through them).

The list below describes each of the fields and buttons you see in this tool.

Sort by	To sort the icons alphabetically by each user's full name, click the *Full Name* button next to *Label as*, then click the *Label* button. Any icons that are selected won't be sorted.
	To sort each icon alphabetically by login name, click the *Login Name* button next to *Label as*, then click the *Label* button.
Label as	By default, you see the users' login names. Display the users' full names by clicking the *Full Name* button.
Find	To find a particular user, click in the *Find* field, type the login name, and click the *Select* button. The tool sorts the list and highlights the user's icon.
	Use the *wildcard* character (*) if you know only a few letters of the name for which you are searching. For instance, to find the login name that contains the string *also*, type `*also*` in the field. The tool sorts the icons and highlights the ones that contain *also*.
Add	If you are running this tool as the *Administrator*, click the *Add* button to set up an account for a new user. See "Adding New Users" on page 4-5.
Delete	If you are running this tool as the Administrator, *select* the icon for the account you want to delete; then click the *Delete* button to remove a user from the system. See "Deleting User Accounts" on page 4-12.
Open	Select the icon for the user account you want to view or change; then click the *Open* button. You see information about how the user account is set up. You can double-click icons to open them more quickly. See "Viewing or Changing User Accounts" on page 4-8.
Quit	To close the Users tool, click the *Quit* button.
Help	To see on-line information about the Users tool, click the *Help* button.

Finally, this *window* shows you which user is the *autologin user*. The autologin user is automatically logged in when you turn on the *workstation*. Only one user can be the autologin user. You determine who this is through the form you see when you open a user's icon. If you are concerned about keeping your system secure, it is best not to use the autologin feature.

Adding New Users

Every user must use a different *login account* when working on the *IRIS*. (See "Login Accounts" on page 2-3 for more information.) An account always consists of a *login name* and a *user ID* number; it sometimes has a *password*.

A login name is a combination of letters and numbers of up to eight lowercase characters that uniquely identifies each user. (Always start the login name with a letter.) People usually use short login names, such as their first or last name. Generally, everyone who uses the same IRIS knows to whom each login name belongs.

Sometimes a login account has an associated password. The password is a combination of letters, numbers, or special characters that only the user who owns the account knows. (Unlike a login name, a password can contain special characters, such as * or /.) When you log in, the IRIS first asks for your login name; then, if you have a password, it asks for it.

If your *workstation* is part of a *network*, you chose a login name for yourself with your *network administrator* and wrote it down in Table 3-1. Your network administrator also gave you the list of existing login account names and user IDs of users for whom you plan to add login accounts.

In a *centralized network* that uses *NIS*, the network administrator sets up login accounts on the *NIS master* workstation. To let a user who has an account in the NIS master database access your *system*, you just specify the login name in the Users tool. The tool then automatically checks the database and adds the rest of the account information to your system. This ensures that the account is the same on every client

workstation. You may also customize or add a local (non-NIS) account on your workstation if you choose.

In a *distributed network* you must ask your network administrator for the master list of user account information, then carefully set up the accounts on your system so they match the master list.
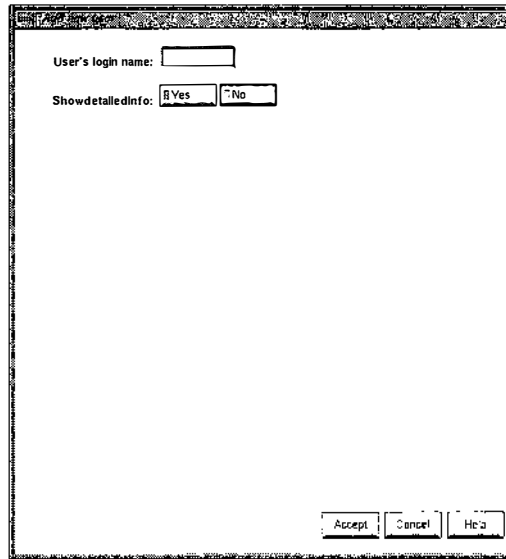
On a *standalone workstation* you can put any information you like in your account, but it is a good idea to be consistent. If you have too many different account names on different workstations, you could forget your login name or password. It's a good idea to use the same login name for each account that you set up for yourself.

To add a user account, use the Users tool to assign a login name for the user and to customize personal information. Follow these steps:

1. Start the *System Manager*.

   - Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

   - Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

   - Manage the tool as the Administrator by clicking the *Administrator* button. If the system requests a password, type it in, then press **<Enter>**.

2. Start the Users tool.

   - Double-click the Users icon to open the tool.

     Note: If you don't see the *Add* and *Delete* buttons, you are not running the tool as the Administrator. Click the *Quit* button, click the *Administrator* button on the main System Manager *window*, then restart the User's tool.

3. Click the *Add* button.

   A form like the one shown in Figure 4-2 appears.

Figure 4-2   Add New User form.

4. Enter the new user's login name.

    ■   Click in the *User's login name* field and type in the name. If the
        workstation is on a network, you got this information from
        your network administrator and wrote it down in Table 3-1.

5. Check the default settings for this account by clicking the *Yes*
    button next to *Show detailed info*.

    If your system is on an *NIS* network and this login name is
    part of the NIS database, customized information (such as
    the user's full name) will already be filled in.

    If you want to change any of this information, skip to step 5
    in "Viewing or Changing User Accounts."

6. Have the system add the user, or cancel your request for the new
    account.

    ■   If all the information is correct, click the *Accept* button.

        This takes you back to the Users Tool, where an icon for
        the new account now appears.

- If you decide that you don't want to set up a user account after all, click the *Cancel* button. This takes you back to the Users tool and doesn't add a new user.

7. Close the tool or add another login account.

   - If you're finished, click the *Quit* button.

   - If you have more users to add, click the *Add* button again.

Viewing or Changing User Accounts

Use this section to customize a new user account or to view or change information about an account that already exists.

If you change information in an account, make sure that you change the information everywhere you have a user account. If your account originates from the *NIS* database and you make changes on a local *workstation*, they affect your account only on the local workstation — the account information does not affect other workstations on the *network*. (See also the discussion of the NIS master database in "Adding New Users" on page 4-5.)

If yours is an NIS network and you want your user account to change on every workstation, you can have the *network administrator* change the information on the *NIS master*.

As the *Administrator* you can change information about any regular user account, but you cannot change information about a system user. Regular users can change only some information about their own accounts.

To open a user icon and change the information about how this user accesses the workstation, follow these steps:

1. Start the *System Manager*.

   - Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

   - Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

■ Manage the tool as the Administrator by clicking the *Administrator* button. If the system requests a *password*, type it in, then press **<Enter>**.

2. Start the Users tool.

   ■ Double-click the Users icon to open the tool.

      Note: If you don't see the *Add* and *Delete* buttons, you are not running the tool as the Administrator. Click the *Quit* button, click the *Administrator* button on the main System Manager *window*, then restart the User's tool.

3. Open the user icon whose information you want to view or change.

   ■ Double-click the icon.

4. View the detailed information about the *login account*.

   ■ Click the *Yes* button next to *Show detailed info*.

      If you opened an icon that represents a regular user, you see a form like the one shown in Figure 4-3.

User Attributes

Login: amy

User ID: 1123

amy has no password: Add

Full Name: Amy Jones

Office: Building 2 lower

Phone: 1-800-555-1212

Shell: Csh Bsh Other

Home: /usr/people/amy

Workspace: On Off

Autologin: On Off

Accept Cancel Help

Figure 4-3   A non-NIS user account.

Note: If the workstation is part of an *NIS* network and the login account information comes from the NIS master, an alternate form appears.

■ If the account information originates from the *NIS master* database and you want to change the information for the local account on your workstation, click the *Local* button next to *Description From*; *Local* and *NIS* buttons appear next to the fields that you can change.

5. Change the *user ID*.

    The user ID is the number assigned to a user account. Each user has a unique user ID. If you're on a network, use only a user ID approved by your network administrator (see Table 3-1). If yours is an NIS network, you can change user IDs only on the NIS master workstation.
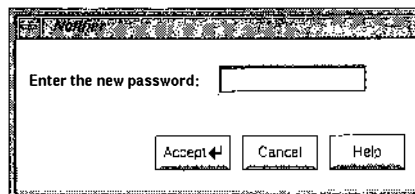
    ■ To change the user ID, highlight the number in the *user ID* field and type in the new number.

6. Change the password.

    The password should be between six and eight characters and contain a mixture of upper- and lowercase alphanumeric characters known only to the user who owns the account. When you *log in*, the IRIS first asks for your *login name* then for your *password*, if you have one.

    ■ If this is an NIS account, click the *Local* button.

    ■ If there is no password, click the *Add it* button.

    ■ If there is already a password, click the *Modify it* button to change the password; click the *Delete it* button if you don't want a password on the account, and go on to step 7.

    The form shown in Figure 4-4 appears.

Figure 4-4 Changing the password.

- Type in the new password (the characters you type won't appear in the field — this keeps the password a secret).

- Click the *Accept* button; as a shortcut, you can also press `<Enter>` on the keyboard.

  The notifier asks you to enter the password again.

- Type in the same password then click the *Accept* button.

  You see the buttons in the password field change to *Modify it* and *Delete it*. The new password is now in effect.

7. Customize the personal information.

   - If this is an NIS account, click the *Local* button.

   - Fill in the *Full name*, *Office*, and *Phone* fields. This specific information about the user is helpful if you are part of a large network.

8. Choose the IRIX *shell* for this account.

   Each new user is assigned an IRIX shell. The default is the C shell. (See also "The IRIX Shell" on page 2-9.)

   - If this is an NIS account, click the *Local* button.

   - To use the Bourne shell, click the *sh* button.

   - To use another shell, click the *Other* button, and fill in the *pathname* for the shell.

9. Choose a *home directory* for this account.

   - If this is an NIS account, click the *Local* button.

   - If you don't want the default home directory the system assigns, enter the full pathname of a different directory.

10. Specify whether WorkSpace appears each time this user logs in.

    - Each time a user logs in to the IRIS, the *WorkSpace window* appears on the *screen* — the system assigns this as the default. To disable WorkSpace so it does not appear when a user logs in, click the *Off* button.

11. Choose the *autologin user*.

    The autologin user is automatically logged in when you turn on the system. Only one person can be the autologin user. For security reasons, using this feature is not recommended.

- Click the *On* button to make this person the autologin user.

12. Confirm the information or cancel your changes.

    - When the account is set up the way you want, click the *Accept* button; the user's icon appears in the Users tool.

    - If you decide to not add this new user, or to discard the changes to an existing account, click the *Cancel* button.

13. Close the tool, or add or customize another account.

    - If you're finished, click the *Quit* button.

    - If you have more users to add, click the *Add* button, type in the login account name, and go back to step 4.

    - If you want to customize an existing account, double-click the icon to open it and go back to step 4 in this section.

Deleting User Accounts

When someone no longer uses the *IRIS*, it is a good idea to delete that person's account. This prevents former users from accessing the IRIS and lets you delete the files and directories in that person's *home directory*. Only the *Administrator* can delete a user account.

Caution: Before deleting a former user's files and directories, make a backup copy in case someone else needs them.

To delete a user's *login account*, follow these steps:

1. Start the *System Manager*.

    - Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

    - Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

    - Manage the tool as the Administrator by clicking the *Administrator* button. If the system requests a *password*, type it in, then press <Enter>.

Adding and Managing Users

2. Start the Users tool.

   ■ Double-click the Users icon to open the tool.

      Note: If you don't see the *Add* and *Delete* buttons, you are not running the tool as the Administrator. Click the *Quit* button, click the *Administrator* button on the main System Manager *window*, then restart the User's tool.

3. *Select* the icon for the login account that you want to delete.

   You cannot delete the system accounts.

4. Click the *Delete* button.

   If all the files in the user's *home directory* belong to that user, you see a form like the one shown in Figure 4-5.

Figure 4-5   Notifier for deleting a user's login account.

   If this user doesn't own all the files in the home directory, you won't see this notifier and you won't be able to delete the home directory with the Users tool. *Log in* to the system as *root* and delete the home directory from the *WorkSpace window*.

   ■ To delete the home directory and the files and directories it contains, click the *Yes* button. Shared files or files that the user creates and moves out of the home directory won't be deleted. Remaining files in a different directory will belong to the next user who inherits the deleted user's ID number.

   ■ If you don't want to delete the home directory, click the *No* button, and the system will delete the user's login account without deleting the home directory and its contents.

5. Have the system delete the account, or cancel your request for the deletion.

■ Click the *Accept* button to delete the account. That user's icon disappears from the Users tool.

■ Click the *Cancel* button to retain the account.

6. Close the tool, or delete another account.

■ If you're finished, click the *Quit* button.

■ If you have more accounts to delete, go back to step 3.

Adding and Managing User Groups

In an environment where you would like to share your work with a particular set of users, but not with everyone who has an account on your *system*, you may want to establish a *group*.

IRIX lets you specify *permission* for three types of users: the file's *owner*, the users who are members of the same group as the owner, and all others. If you set up a group that consists of a few login accounts, you can let all members of your group view or change the contents of files that you own without letting all users do so. See the section on permissions in *IRIS Essentials* to learn how to view and change permissions using the long *Get File Info* form.

When you add a new user with the *System Manager*, that user automatically belongs to the group whose name is *user* and ID number is 20. This section shows you how to add a new group and assign certain users to the group. It also shows you how to remove a group when you no longer need it.

For more detailed information on setting up and maintaining groups, see the *IRIX Advanced Site and Server Administration Guide*.

Adding a Group

You add a new *group* by editing an *IRIX* file, */etc/group.*

Note: Do not change information for any of the special system groups that were on your system when it was new (groups with ID numbers between 0 and 100 and over 900). They are critical to system operation; changing them will make the system inoperable.

Follow these steps:

1. *Log in* as *root* through a *shell* window.

   ■ Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

   ■ Drag the cursor down the *menu* until "Shell" is highlighted; then release the mouse button. The outline of a *window* appears.

   ■ Position the outline where you want the window to appear; then click the left mouse button.

   ■ Position your cursor within the new window and type:

      login root

      Then press **<Enter>**.

      If a prompt for a *password* appears, type the password then press **<Enter>**. If a prompt appears but the *root account* has no password, just press **<Enter>**.

2. Edit the file.

   ■ Open the file with a text editor such as *jot* by typing:

      jot /etc/group

      Then press **<Enter>**. For detailed information on using the *jot* text editor, see the *IRIS Utilities Guide.*

      After the last line in the file, you'll add a line that specifies the name and ID number of the new group. The entries that you see have this form:

      group name:password:group ID #:members

The password and list of members is optional. See the *IRIX Advanced Site and Server Administration Guide* for information on how and why to add these.

- Create a name for your group that consists of eight or less lowercase letters and does not match any of the group names that you see in this file. Then choose a group ID number between 101 and 899 that does not match any of the group IDs in this file. For example, to create a group named *drafting* with an ID number of 105, add this line:

  ```
  drafting::105:
  ```

- Save your changes and *quit jot*.

3. *Log out* of the *root* account by typing:

   ```
   logout
   ```

   Then press **<Enter>**. The shell window disappears.

You now have a new group that has no members. To assign users to this group, see "Assigning a User to a Group" on page 4-16.

Assigning a User to a Group

All new users whose login accounts you create with the *System Manager* belong to the group *user* whose group ID number is 20. To assign the user to a different *group*, you edit */etc/passwd*, the *IRIX* file that contains login account information. To find out what groups are available on your *system*, look in the */etc/group* file; to create a new group, see "Adding a Group" on page 4-15.

Note: Do not assign a user to any of the special system groups that were on your system when it was new (groups with ID numbers between 0 and 100 and over 900). They are critical to system operation; assigning a regular user to the groups will severely compromise stable operation.

Usually a user can belong to only one group. For information on assigning users to multiple groups, see the *IRIX Advanced Site and Server Administration Guide*.

To assign a user to a new group, follow these steps:

1. *Log in* as *root* through a *shell* window.

   - Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

   - Drag the cursor down the *menu* until "Shell" is highlighted; then release the mouse button. The outline of a *window* appears.

   - Position the outline where you want the window to appear; then click the left mouse button.

   - Position your cursor within the new window and type:

     login root

     Then press **<Enter>**.

     If a prompt for a *password* appears, type the password then press **<Enter>**. If a prompt appears but the *root account* has no password, just press **<Enter>**.

2. Edit the file.

   - Open the */etc/passwd* file with a text editor such as *jot* by typing:

     jot /etc/passwd

     Then press **<Enter>**. For detailed information on using the *jot* text editor, see the *IRIS Utilities Guide*.

     To assign a user to a new group, find that user's account information and change the user's group ID number to match that of the new group. The entries that you see have this form:

     login name: password:user ID #:groupID #:other info

   - Change the user's group ID number. For example, user *joe*'s entry currently looks like this:

     ```
     joe::1003:20::/usr/people/joe:/bin/csh
     ```

   - This shows that he belongs to group 20; you would like to switch him to group 105. Change his entry so it looks like this:

     ```
     joe::1003:105::/usr/people/joe:/bin/csh
     ```

- Assign other users to new groups.

- Save your changes and *quit jot*.

3. *Log out* of the *root* account by typing:

   logout

   Then press **<Enter>**. The shell window disappears.

4. Ask all users whose group ID numbers you changed to log out, then log back in.

   When they log in, new files and directories that they create will be labeled with the new group name; you can see this label when you view the long Get File Info form of a file or directory.

The users whose group ID numbers you changed now have read and execute *permission* on all files created by members of the new group (unless a group member changes permissions on individual files). See the section on changing permissions in *IRIS Essentials* to give members of the same group write permissions (the ability to change each other's files), or to remove read or execute permissions.

Deleting a Group

When a project ends or a particular grouping of users doesn't make sense anymore, you can assign its members to a different *group* and delete the unnecessary group. When you delete a group, you do not delete its members' login accounts; the group is simply no longer available for membership.

To delete a group, follow these steps:

1. Assign to a new group all users who belong to the group that you are deleting. See "Assigning a User to a Group" on page 4-16.

2. *Log in* as *root* through a *shell* window.

   - Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

Adding and Managing Users

- Drag the cursor down the *menu* until "Shell" is highlighted; then release the mouse button. The outline of a *window* appears.

- Position the outline where you want the window to appear; then click the left mouse button.

- Position your cursor within the new window and type:

  `login root`

  Then press `<Enter>`.

  If a prompt for a *password* appears, type the password then press `<Enter>`. If a prompt appears but the *root account* has no password, just press `<Enter>`.

3. Edit the */etc/group* file.

   - Open the file with a text editor such as *jot* by typing:

     `jot /etc/group`

     Then press `<Enter>`. For detailed information on using the *jot* text editor, see the *IRIS Utilities Guide*.

   - Find the line that describes the group you want to delete. The entries that you see have this form:

     group name:password:group ID #:members

   - Remove the line.

   - Save your changes and *quit jot*.

4. *Log out* of the *root* account by typing:

   `logout`

   Then press `<Enter>`. The shell window disappears.

5. Ask all users who previously belonged to the group to log out, then log back in.

   When they log in, new files and directories that they create will be labeled with the name of the new group to which you assigned them; you see this label when you view the long Get File Info form of a file or directory.

The group no longer exists. To create a new group, see "Adding a Group" on page 4-15.

Adding and Managing Users

Managing Printers

5

Chapter 5

Managing Printers

This chapter shows you how to manage printing from the *IRIS* using the Printer tool (also called the *Print Manager*). You'll learn to connect printers, add them to your list of available printers, send, monitor, and delete print requests, and troubleshoot if you encounter any problems.

This chapter contains these sections:

- "About the Printer Tool (Print Manager)" on page 5-2 explains what the tool does and how to start it and describes all of its buttons and fields.

- "Physically Connecting the Printer" on page 5-4 describes how to physically connect printers to your IRIS.

- "Adding New Printers" on page 5-5 explains how to turn on the software for three kinds of printers: serial, parallel, and *network*.

- "Changing Printer Setup Information" on page 5-13 explains how to change setup information for an existing printer.

- "Deleting a Printer" on page 5-13 explains how to remove a printer from your list of available printers.

- "Setting the Default Printer" on page 5-14 explains how to choose the printer for your requests when more than one printer is available on the *workstation*.

- "Printing a Test Page" on page 5-16 explains how to print a test page to make sure the printer is receiving requests properly.

- "Viewing, Managing, and Deleting Print Requests" on page 5-17 explains how to use the *queue* on a selected printer.

- "Troubleshooting Printing Problems" on page 5-19 provides guidelines on solving problems using the Printer tool and IRIX commands. It also has a step-by-step troubleshooting procedure.

About the Printer Tool (Print Manager)

You can add three kinds of printers to the *IRIS*:

- *Serial printers* are physically connected to a serial port on the IRIS.

- *Parallel printers* are physically connected to a parallel port on the IRIS.

- *Network printers* are physically connected to any port on another IRIS on the same *network* as your IRIS. You can send jobs to a network printer as if it were directly connected to your own *workstation*.

Once you know what kind of a printer you are going to add, use the Printer tool to add it to the list of printers that are available from your workstation. You also use the Printer tool to manage the printers that are already accessible from this workstation; use it to start and stop printing, delete a request, and choose the printer where users' requests will go by default.

Note: The Printer tool uses the *IRIX lp* spooling system. If you want to access a network printer that uses the *lpr* spooling system, see Appendix A, "Printing with lpr."
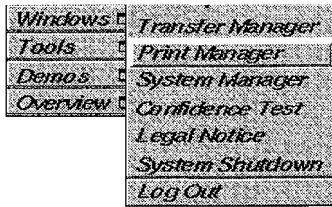
The *Administrator* has access to all the printers and print requests through this tool. As the Administrator you can delete any request in the *queue*, add and delete printers, change the *default printer* for the *system*, and change the status of any printer at any time. As a regular user you can send requests, delete the requests you send, and set the default printer for your account. You cannot add, delete, or change the status of any printer.

You can access the Printer tool in two ways:

- Choose "System Manager" from the *System toolchest* in the upper left corner of your *screen*, then double-click the Printers icon. This is most convenient when you're already using the *System Manager*.

- Choose "Print Manager" from the *System* toolchest in the upper left corner of your screen. This way you do not need to start the System Manager to work with printers. This chapter documents this method.

Managing Printers

To use the Printer tool, you need to know the basic *mouse* techniques summarized in the tutorial and reference chapters of *IRIS Essentials*.
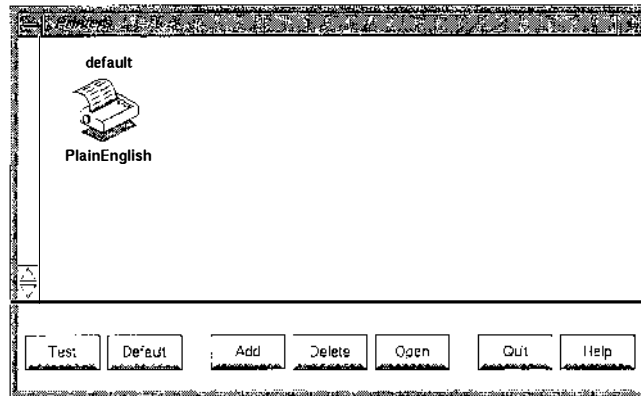
To start the Printer tool, follow these steps:

1. Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right mouse button.

2. Drag the cursor down the *menu* until "Print Manager" is highlighted; then release the mouse button. Figure 5-1

   The form shown in Figure 5-2 appears.

Windows	Transfer Manager
Tools	Print Manager
Demos	System Manager
Overview	Confidence Test
	Legal Notice
	System Shutdown
	Log Out

Figure 5-1
Starting the Print Manager.

Figure 5-2   The Printer tool.

The icons in the top portion of the tool represent the printers on this workstation. The icons appear as you add printers; if you haven't added any printers yet, no icons appear.

The bottom portion of the tool contains the buttons that let you print a test page, set the *default printer,* and add, delete, or view information about any of the available printers. The list below describes each of the buttons in the tool.

Test   Sends a test page to the designated default printer. See "Printing a Test Page" on page 5-16.

Default   Specifies the selected printer as the default printer. When you choose "Print" from the WorkSpace or Directory View *menu* (or type the *lp*

	command in a *shell*), your print job automatically goes to the default printer. See "Setting the Default Printer" on page 5-14.
Add	Click the *Add* button to add a new printer to your list of available printers. The system will request the Administrator's *password* if you are not running the tool as the *Administrator*. See "Adding New Printers" on page 5-5.
Delete	*Select* the printer that you want to delete, then click the *Delete* button. The system will request the Administrator's password if you are not running the tool as the Administrator. After you delete a printer, physically disconnect the printer from your workstation. See "Deleting a Printer" on page 5-13.
Open	Select the icon for the printer whose information you want to view, then click the *Open* button. You see information about how this printer is set up, whether it is accepting and printing requests, and which jobs are in the printer's *queue*. (You can also double-click icons to open them more quickly.)
Quit	To close the Printer tool, click the *Quit* button.
Help	To see on-line information about the Printer tool, click the *Help* button.

Physically Connecting the Printer

If you bought a printer from Silicon Graphics, the installation pamphlet that came with it shows you exactly how to connect it to the *IRIS*. If you bought a printer from another vendor, use the instructions on setting switches and wiring cables provided in the printer manual and the information on cables in the *IRIS Advanced Site and Server Administration Guide* or the owner's guide that came with your *workstation*.

Adding New Printers

After you connect a printer to the *IRIS*, use the Printer tool to turn on the software that lets the IRIS communicate with the printer. Once you turn on the software, a printer icon is added to the list of available printers in the Printer tool and the new printer is ready to use. You use the Printer tool to turn on software for three types of printers:

• printers connected to one of your serial ports

• printers connected to your parallel port

• printers physically connected to other Silicon Graphics workstations on the *network*.

To access a network printer attached to a *system* running a BSD version of the *UNIX* operating system, see Appendix A, "Printing with lpr."

Turning On Serial Printer Software

Before you turn on the software for a serial printer, make sure the printer is connected to the serial port on the back of the *IRIS*. Once the printer is connected to the IRIS, use the Printer tool to assign the printer a name, specify its *baud rate* and *handshake*, and add it to the list of available printers. (Consult the manual that came with the printer for information about the baud rate and handshake.) For more information on setting up a printer, see the documentation provided with the device.

To turn on software for a serial printer, follow these steps:

1. Start the Printer tool.

   ■ Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

   ■ Drag the cursor down the *menu* until "Print Manager" is highlighted; then release the mouse button.

   You see the Printer tool (see Figure 5-2). If printers have already been added to this *workstation*, you see printer icons; otherwise the tool is empty.

2. Click the *Add* button.

   If you are not running the tool as the *Administrator*, the system requests the *password*. Type it in, then press **<Enter>**.

   The form shown in Figure 5-3 appears.

Figure 5-3   Add New Printer form.

3. Type in a name for the printer.

   ■ Click in the *New printer name* field and type in a name.

   You can choose any name you like for the printer. The printer name can be a combination of up to 14 letters and numbers, but cannot include any spaces or special characters, such as #, &, or /. You should pick a name that describes the printer or its location. Each printer in the Printer tool must have a different name.

   If you make a typing mistake, press the **<Back Space>** key to back up, then retype the name.

4. Make sure that the *Serial* button next to *Connector type* is highlighted. (The *system* default is the *Serial* button.)

- ■ If it's not highlighted, click it once.

5. Indicate where the printer is connected.

   Depending on which IRIS workstation you are configuring, there are either two or four built-in serial ports on the IRIS. If you have a port expansion board you may see additional buttons for the additional ports.

   - ■ Click the button next to *Serial port* that shows the number of the port to which your printer is connected.

6. Indicate the type of printer you connected.

   - ■ Look through the scrollable list of printer names and models until you find the entry that describes your printer.

   - ■ Click on the printer description. (If the printer you connected is not on the list, click on *Generic printer*.)

7. Indicate the printer's *baud rate*.

   The manual included with the printer contains the speed (calculated as bits per second) at which the computer can send information to the printer. This is called the baud rate.

   - ■ Click the appropriate button once you find the baud rate information in your printer's manual.

8. Indicate the printer's *handshake*.

   The computer sends data faster than the printer can print, so you have to tell the computer to control the flow of information it sends; how fast the information is sent is determined by the printer handshake.

   A *software handshake* means the printer sends directions to the computer about starting and stopping the flow of information. Usually printer manuals refer to a software handshake as *xon-xoff* flow control. A *hardware handshake* means the printer dedicates one of the wires in the cable to transmit information.

   Printers that depend on software handshakes are frequently connected to the computer by a three-wire cable. Printers that depend on hardware handshakes are usually connected with five- or seven-wire cables.

- Click the appropriate button once you find the handshake information in your printer manual.

9. Add the new printer or cancel your request to add it.

   - If all the information on the Add New Printer form is correct, click the *Accept* button.

     This takes you back to the Printer tool, where an icon for the printer you just added appears.

   - If you decide not to add the printer, click the *Cancel* button.

10. Make sure that the printer is working correctly.

    - *Select* the printer in the Printer tool, then click the *Test* button.

    - If the test page is printed, the printer is ready for use; if not, check your printer connections and see "Troubleshooting Printing Problems" on page 5-19.

11. Click the *Quit* button to close the Printer tool.

Turning On Parallel Printer Software

Before you turn on the software for a parallel printer, make sure the printer is connected to the parallel port on the back of the *IRIS*. Then use the Printer tool to assign the printer a name and add it to the list of available printers. For more information on setting up a printer, see the manual included with the printer.

To turn on software for a parallel printer, follow these steps:

1. Start the Printer tool.

   - Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

   - Drag the cursor down the *menu* until "Print Manager" is highlighted; then release the mouse button.

   You see the Printer tool (see Figure 5-2). If printers have already been added to this *workstation*, you see some printer icons; otherwise the tool is empty.

2. Click the *Add* button.

If you are not running the tool as the *Administrator*, the
system requests the *password*. Type it in, then press **<Enter>**.

You see the default Add New Printer form (see Figure 5-3).

3. Type in a name for the printer.

    ■   Click in the *New printer name* field and type in a name.

    You can choose any name you like for the printer. The printer
    name can be a combination of up to 14 letters and numbers,
    but cannot include any spaces or special characters, such as #,
    &, or /. You should pick a name that describes the printer or
    its location. Each printer in the Printer tool must have a
    different name.

    If you make a typing mistake, press the **<Back Space>** key to
    back up, then retype the name.

4. Click the *Parallel* button next to *Connector type*.

    A scrolling list of parallel printer types appears in the form as
    shown in Figure 5-4.

Figure 5-4   Add New Printer form for parallel printers.

5. Indicate where the printer is connected to the workstation.

There's only one built-in parallel port on most IRIS workstations, so you may have only one choice for a port. If parallel ports have been added to your IRIS with an expansion card, you will see additional buttons representing ports.

- Click the button next to *Parallel Port* that shows the description of the port to which your printer is connected.

6. Indicate the type of printer you connected.

- Look through the scrollable list of printer names and models until you find the entry that describes your printer.

- Click on the printer description. (If the printer you connected is not on the list, click on *Generic printer*.)

7. Add the new printer or cancel your request to add it.

- If all the information on the Add New Printer form is correct, click the *Accept* button.

    This takes you back to the Printer tool, where an icon for the printer you just added appears.

- If you decide not to add the printer, click the *Cancel* button.

8. Make sure that the printer is working correctly.

- *Select* the printer in the Printer tool, then click *Test*.

- If the test page is printed, the printer is ready for use; if not, check your printer connections and see "Troubleshooting Printing Problems" on page 5-19.

9. Click the *Quit* button to close the Printer tool.

Turning On Network Printer Software

A *network* printer is a printer that is physically connected to another Silicon Graphics *workstation* on the network. To access a network printer attached to a *UNIX* system from a different manufacturer, see Appendix A, "Printing with lpr."

Turning on the software for a network printer is similar to turning on any other kind of printer, but you also need to know the *hostname* of the workstation to which the printer is physically connected (the remote *host*) and the name that workstation uses for its printer (the remote printer).

Once you know the names of the remote printer and remote host, use the Printer tool to assign the printer a name and add it to the list of available printers.

To turn on software for a network printer, follow these steps:

1. Start the Printer tool.

   ■ Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

   ■ Drag the cursor down the *menu* until "Print Manager" is highlighted; then release the mouse button.

   You see the Printer tool (see Figure 5-2). If printers have already been added to this workstation, you see some printer icons; otherwise the tool is empty.

2. Click the *Add* button.

   If you are not running the tool as the *Administrator*, the system requests the *password*. Type it in, then press **<Enter>**.

   You see the default Add New Printer form (see Figure 5-3).

3. Type in a name for the printer.

   ■ Click in the *New printer name* field and type in a name.

   You can choose any name you like for the printer. The printer name can be a combination of up to 14 letters and numbers, but cannot include any spaces or special characters, such as #, &, or /. You should pick a name that describes the printer or its location. Each printer in the Printer tool must have a different name.

   If you make a typing mistake, press the **<Back Space>** key to back up, then retype the name.

4. Click the *Network* button next to *Connector type*.

   The form shown in Figure 5-5 appears.

Figure 5-5   Add New Printer form for a network printer.

5. Click in the *Remote hostname* field and type the name of the host to which the printer is physically connected.

6. Click in the *Remote printer name* field and type the name that the remote host uses to refer to the printer.

   ■ If you don't know the name of the remote printer, click *Get List* to display a list of printers and choose one from the list.

7. Add the new printer or cancel your request to add it.

   ■ If all the information on the Add New Printer form is correct, click the *Accept* button.

      This returns you to the Printer tool, where an icon for the printer you just added appears.

   ■ If you decide not to add the printer, click the *Cancel* button.

8. Make sure that the printer is working correctly.

   ■ *Select* the printer in the Printer tool, then click the *Test* button.

Managing Printers

- If the test page is printed, the printer is ready for use; if not, check your printer connections and see "Troubleshooting Printing Problems" on page 5-19.

9. Click the *Quit* button to close the Printer tool.

Changing Printer Setup Information

If you ever need to modify the basic setup information about a printer (such as its name, *baud rate*, or name of its remote *host*), you must first delete the printer (see "Deleting a Printer" on page 5-13), then add it again (see "Adding New Printers" on page 5-5) using its new information.

Deleting a Printer

You'll delete a printer from the list of available printers if you need to modify the basic setup information, or if the printer is no longer available because it has been moved or replaced. Whatever the reason, you have to tell the *system software* that the printer is no longer available.

Use the Printer tool to *select* the printer you want to remove from the list and then click *Delete*. Follow these steps:

1. Start the Printer tool.

   - Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

   - Drag the cursor down the *menu* until "Print Manager" is highlighted; then release the mouse button.

     You see the Printer tool (see Figure 5-2).

2. Select the icon that represents the printer that you want to delete.

3. Click the *Delete* button.

   If you are not running the tool as the *Administrator*, the
   system requests the *password*. Type it in, then press **<Enter>**.

   ■   If no print jobs are in the *queue*, the icon disappears from the
       Printer tool.

   ■   If you are trying to delete a printer that has print jobs in its
       queue, you see a notifier asking whether you want to delete
       the jobs in the queue or send them to another printer.

       To delete jobs in the print queue, click *Delete print jobs*. To
       send jobs to another printer set up in your Printer tool,
       click *Use other printer*. If you click *Use other printer*, type
       the name of the printer next to *Enter printer destination*,
       then click *Continue*.

   Note: If you deleted a printer because it was moved to
            another location but it is available for use, you can
            follow the instructions in "Adding New Printers" on
            page 5-5 to add it to the list of available printers
            again.

4. Click the *Quit* button to close the Printer tool.

5. If the printer you deleted was physically connected to your
   workstation, *shut down* your workstation and disconnect the
   printer. Then send electronic mail telling users it is disconnected.

Setting the Default Printer

Unless specified otherwise, the *default printer* is where all print
requests go when you choose "Print" from the WorkSpace or Directory
View *menu* (or type *lp* in a *shell*). If you have more than one printer in
the Printer tool, you can choose which printer will be the default.

Note: Many applications let you override the default printer
         and send the output to a secondary printer. See your
         application documentation for more information on
         selecting printers.

When you set a default printer as the *Administrator*, it becomes the default for all users on the *system* who have not already specified a different default printer. When you set a default printer as a regular user, it becomes the default for your user account only.

You'll use the Printer tool to highlight the printer and then click *Default*. Follow these steps:

1. Start the *System Manager*.

   ■ Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

   ■ Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

   ■ To set the default printer for your regular user account only, go on to step 2.

   ■ To set the default printer for the system, manage the tool as the Administrator by clicking the *Administrator* button. If the system requests a *password*, type it in, then press **<Enter>**.

2. Start the Printer tool.

   ■ Double-click the Printer icon to open the tool.

3. Assign the default printer.

   ■ *Select* the printer you want as the default printer and click the *Default* button.

   The word *Default* appears above this printer's icon.

4. Click the *Quit* button to close the Printer tool.

Printing a Test Page

You can use the Printer tool to send a test page to a selected printer to verify that the printer is receiving print requests. If the printer produces the test page, the *lp* print spooler is working correctly. (See "Understanding the Printing Process" on page 5-31 for more information on *lp*.)

To send a test page to a printer, follow these steps:

1. Start the Printer tool.

   ■ Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

   ■ Drag the cursor down the *menu* until "Print Manager" is highlighted; then release the mouse button. (Figure 5-1)

2. Click the icon for the printer you want to check.

3. Click the *Test* button.

   The printer *queue* form appears for the selected printer and a notifier appears informing you that a test page has been sent. Immediately afterward, the print request for the test page should appear in the printer queue listing.

   When the print request disappears from the queue listing, check the printer to see if the test page has printed properly. If the test page is printed, the printer is ready for use; if not, check your printer connections and see "Troubleshooting Printing Problems" on page 5-19.

Viewing, Managing, and Deleting Print Requests

When more than one print request is sent to a printer, each request is placed in a *queue* to await printing. The queue is a list of print requests in the order in which they are scheduled to print. You can use the Printer tool to:

- Check how many jobs are in the queue and the order in which they'll be printed.

- Check if the printer is accepting requests and control whether it is accepting requests.

- Check if the printer is actually printing accepted requests and control the printing of requests.

- Delete print requests from the queue.

To view a printer's queue and manage requests, follow these steps:

1. Start the *System Manager*.

   ■ Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

   ■ Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

   ■ To delete your own jobs only, go on to step 2.

   ■ To delete any job and control whether printers are accepting and printing requests, manage the tool as the *Administrator* by clicking the *Administrator* button. If the system requests a *password*, type it in, then press **<Enter>**.

2. Start the Printer tool.

   ■ Double-click the Printer icon to open the tool.

3. Open the icon for the printer whose queue you want to check.

   ■ Double-click on the icon to open it.

   The form shown in Figure 5-6 appears.

Figure 5-6   Printer queue form for a remote (network) printer.

The print queue identifies each print request by a job ID, not by a filename.

If the printer is a remote printer, the form displays two queues: one for the print jobs originating from your workstation and one for the print jobs awaiting printing on the remote *system* to which the printer is connected. You can change the local queue, but you cannot change the queue on the remote *host*.

4. Check to see if the printer is accepting and printing requests.

   ■ You can prevent the printer from receiving any more requests by clicking *No* next to *Accepting requests*. This temporarily prevents requests from being added to the print queue. To accept the requests again, click *Yes*.

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- To temporarily stop the printer from printing, click *No* next to *Printing requests*. This stops the local printer but holds all current requests in the queue. On a remote printer, clicking *No* stops the printing of jobs from your workstation. When you click *Yes* to reactivate *Printing requests*, the printer picks up where it left off.

5. Check to see where your print requests are in the queue.

   The queue *window* shows the job ID number, the job size (which gives you an idea of how long the job will take to print), the sender's name, and the time the job was sent.

6. Delete any requests you want to remove from the queue.

   - To delete a request, click on the request, then click the *DELETE selected jobs from the queue* button. You can delete as many requests as you want by highlighting the request lines and clicking the button.

7. Click the *Quit* button to close the Printer tool.

Troubleshooting Printing Problems

Once you've used the Printer tool to set up the printers that you want to access, printing files is usually very straightforward — you ask an application to print a file, then pick up your completed job from the printer.

The work that the *system* does to make files print, however, is fairly involved — especially when you are sending files over a *network* to printers that are not directly connected to your *workstation*. If printing problems do arise, the information in this section should help you correct them quickly.

The information applies to you only if:

- the printer you are trying to use is connected to an *IRIS* workstation;

- you are printing from within an application or from the *WorkSpace window*.

If you are printing from the command line using *lp*, see the *IRIX Advanced Site and Server Administration Guide* for more troubleshooting information on *lp*. If you're using *lpr*, see the *lpr man page* for information on basic use, and see Appendix A, "Printing with lpr,"for information on accessing a remote printer that uses *lpr*.

This section covers two main topics:

- "A Troubleshooting Roadmap" on page 5-20 gives you a brief overview of the printing process, plus step-by-step information to isolate and resolve printing problems. You'll get more out of this section if you also read "Understanding the Printing Process" on page Chapter 5-31, but, if you're anxious to resolve a problem without reading through background information, start with this section.

- "Understanding the Printing Process" on page 5-31 describes the process in detail, outlines how and when the process may fail, and describes the troubleshooting tools that are available to you.

A Troubleshooting Roadmap

A successful printing process includes these four basic steps:

- You must issue a print command and specify a printer that is set up to work with your *system*.

- Your system (the local system) must correctly process the request and send it to the system to which the printer is physically attached (the printing system).

Note: If the printer is physically attached to your system, the local system is also the printing system; if the printer is attached to another system on the *network*, that system is the remote, printing system.

- The printing system must process the print request and send it to the printer.

- The printer must be in working order; if it's out of paper or toner, it cannot print.

See "Understanding the Printing Process" on page 5-31 for a more detailed description of what the system does at each step.

The troubleshooting steps below show you how to determine which part of this process is failing. Be sure you know the Administrator's *password*; various steps require that you become the *Administrator*.

1. If you sent your job to the printer more than 30 minutes ago, send it again. This way you can monitor its progress from the start.

2. Start the Printer tool.

   ■ Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

   ■ Drag the cursor down the *menu* until "Print Manager" is highlighted; then release the mouse button. (Figure 5-1)

3. Find the icon for the printer to which you sent your job.

   ■ If the icon is there, double-click it to open it.

   ■ If you don't see the icon, that printer has not been set up to work with your system. See "Adding New Printers" on page 5-5.

4. Find your print job in the local *queue*.

   The entries in this *window* are jobs that are ready to print on this printer. If the printer is physically attached to the local system, there is only one queue (the *local queue*) that shows all print requests waiting to print on this printer. If the printer is attached to a remote system, there are two queues: the *local queue* displays all print requests that users on your system sent to this printer; the *remote queue* displays all print requests that all users on the network sent to the remote printer.

   ■ If you see your job in the local queue and the printer is attached to the local system, skip ahead to step 6.

   ■ If you see your job in the local queue and the printer is attached to a remote system, go on to step 5.

   ■ If you don't see your job, see "Job Never Appears in the Local Queue" on page 5-24.

Note: Your job may not appear in the queue immediately after you issue the print command. Wait several minutes before assuming it's not going to appear in the queue.

5. Find your print job in the remote queue.

    Your job is labeled with your *login name* and is the same size as it is in the local queue. It does *not* have the same job number or time stamp.

    ■   If you see your job in the remote queue, go on to step 6.

    ■   If you don't see your job, see "Job Never Appears in the Remote Queue" on page 5-25.

6. Watch the queue of the printing system (the system to which the printer is attached).

    ■   If your job disappears from the queue, skip ahead to step 9.

    ■   If after several minutes no jobs disappear from the queue, go on to step 7.

    ■   If all the jobs ahead of yours disappear, and jobs behind yours disappear while yours remains at the top of the queue, delete your job and try to print it again.

7. Make sure the printer is printing requests. Physically go to the system to which the printer is attached, open the printer's queue window, and click the *No* button next to the *Printing requests?* field in the printer's queue window; then click the *Yes* button next to this field.

    ■   If your job disappears from the queue, skip ahead to step 9.

    ■   If no jobs disappear from the queue, go on to step 8.

8. Check whether *lpsched*, the print spooler that controls the flow of jobs out of the queue, is running. On the printing system, open a *shell* window and type:

    ```
    lpstat -r
    ```

    Then press **<Enter>**.

    ■   If the *lpsched* spooler is running, you see this message:

        ```
        scheduler is running
        ```

        Go on to step 9.

- If the *lpsched* spooler is not running, you see this message:

  ```
  scheduler is not running
  ```

  See "Checking and Restarting lpsched" on page 5-30 to turn it on.

9. Check the physical state of the printer; for example:

   - Turn the printer off and on.

   - Make sure the paper or transparencies are properly loaded, there is enough toner, and the printer isn't physically jammed.

   - Check all status lights and panels on the printer for error messages.

   - Make sure the cable is securely connected to the correct ports on both the system and the printer. If the cable appears frayed you may need to replace it.

     Note: If you're not using a printer cable supplied by Silicon Graphics, Inc., the pinouts may not match the *workstation* ports, even though the cable seems to fit. Refer to the printer's owner's guide for details.

   - If you find a physical problem, correct it and try printing again.

   - If you find no physical problem and no jobs disappear from the queue, the job's owner (possibly you) should cancel the job and try to print it again. If the next job in the queue does not disappear, go on to step 10.

   - If you find no physical problem and your job disappears from the queue but does not print, see "Job Disappears from a Queue but Never Prints" on page 5-29.

10. Remove all jobs from the queue and click the *Test* button to send a test page.

    - If the test page prints, try printing your job again.

    - If the test page doesn't print, contact the Silicon Graphics Technical Assistance Center.

Job Never Appears in the Local Queue

Use this section if the icon to which you sent your print job appears in the Printer tool, but your job does not appear in the local *queue*. You should be looking at the printer's queue *window*.

1. Click the *Test* button to test the printer setup.

    ■   If the test job appears in the queue, try printing your job again. If your job still doesn't appear, go on to step 2.

    ■   If the test job does not appear in the queue, click the *No* buttons next to the *Accepting requests?* and *Printing requests?* fields in the printer's queue window; then click the *Yes* buttons next to these fields. Send another test job. If it still doesn't appear, contact the Silicon Graphics Technical Assistance Center.

2. Make sure you followed the correct steps to specify a particular printer for your job.

    ■   If you chose from a list of available printers and the job doesn't appear in the queue, go on to step 3.

    ■   If you typed the printer name into a field, or if the application filled in the field for you, make sure the name exactly matches that of a printer that appears in the Printer tool; then try printing again. Remember that names are case-sensitive; "Printer1" is not the same as "printer1". If it still doesn't appear, go on to step 3.

    ■   If you didn't explicitly specify a printer when you made the print request, either you or the application previously specified a *default printer*; the job may be in another printer's queue.

        See the user's guide that came with the application to find out how it specifies a default printer and how you can change it. (For example, when you *select* a file and choose "Print" from the WorkSpace *menu*, the file is automatically sent to the printer that you specified as the default in the Printer tool.) Change the default and try printing again. If it still doesn't appear, go on to step 3.

3. Make sure you gave the application all the printing information it needs.

Some applications (such as IRIS Showcase™) have both a print command and a print dialogue box. If a dialogue box appeared and you didn't notice it, didn't fill it out correctly, or didn't confirm your information (that is, click an *Accept* or *OK* button), the job will not go to the queue.

■   If there is a dialogue box, fill it out completely, then try printing again. If the job still doesn't appear in the queue, go on to step 4.

■   If there is no dialogue box, go on to step 4.

4.   Open the *console* window and check for error messages.

   Note: You must look in the console; error messages will not be reported to any other *shell* window.

■   If there are no error messages, contact the Silicon Graphics Technical Assistance Center.

■   If a message states that you're out of disk space, then there isn't enough space for the system to create a version of the file that is in the correct format for the printer. Remove files or directories that you no longer need and try to print your job again.

■   If a message specific to the application from which you are printing appears, for example, a message stating that the application couldn't find a necessary file, refer to the documentation that came with the application.

Job Never Appears in the Remote Queue

Use this section if your print job appears in your local *queue*, but does not appear in the remote queue. You should be looking at the printer's queue *window*.

1.   See if there is already a different job in the remote queue that was sent from your local queue (that is, a job that belongs to you or to another user on your local *system*).

■   If no jobs from your local queue appear in the remote queue, go on to step 2.

- If your local queue has already sent one job to the remote queue, it will not send another job to the remote queue until the first one prints. Wait until the first job disappears and, if your next job still does not appear in the remote queue, go on to step 2.

2. Make sure the local printer queue is sending print requests to the remote system.

   - Click the *No* button next to the *Printing requests?* field in the printer's queue window; then click the *Yes* button next to this field. If no jobs from your local queue appear in the remote queue, go on to step 3.

3. Make sure the information about the remote system and remote printer that is shown in the printer's queue window is accurate.

   - If someone changed the name of the printer or physically moved the printer and connected it to another *workstation*, your jobs cannot reach it. See "Deleting a Printer" on page 5-13 to delete your old information about the printer and "Adding New Printers" on page 5-5 to add the new information. Then try printing again.

   - If the information about the remote system and printer is accurate, go on to step 4.

4. Check whether *lpsched*, the print spooler that controls the flow of jobs from the local queue to the remote system, is running. On your own system, open a *shell* window and type:

   ```
   lpstat -r
   ```

   Then press `<Enter>`.

   - If the *lpsched* spooler is running you see this message:

     ```
     scheduler is running
     ```

     Go on to step 5.

   - If the *lpsched* spooler is not running you see this message:

     ```
     scheduler is not running
     ```

     See "Checking and Restarting lpsched" on page 5-30 to turn it on.

5. Test the *network* connection by opening a shell window and using the */usr/etc/ping* command with the remote system's *hostname*. For example, if the remote hostname is *mars*, type:

/usr/etc/ping mars

Then press **<Enter>**. You see some messages that will repeat indefinitely; to stop the messages, press **<Ctrl-C>**. You see a summary of the connection. Look for these lines:

```
mars PING statistics
```

```
<#>packets transmitted,<#> packets received,0%
packet loss
```

- If this line reports 0% packet loss, your connection to the remote system is working. Go on to step 6.

- If this line reports between 1% and 100% packet loss, your connection to the remote system is not stable. Physically go to the remote system to make sure both the printer and the system are turned on. If they were off, turn them on, and try to print again.

  If they were already turned on, make sure the remote system is communicating with the network; use the */usr/etc/ping* command on the remote system to try to reach a system on the network other than your system.

  If the remote system can communicate with any other system on the network, your system may not be connected to the network properly. On your own system, try the */usr/etc/ping* command with another hostname; also make sure your network cable is properly connected to your workstation. If you cannot communicate with any system over the network, contact your *network administrator*. Either your network connection or the network itself has a problem.

6. Check the access *permission* on the remote system by trying to copy a file to the remote system using the same *login account* that *lpsched* uses to copy over your job. For example, use *jot* to create a small text file named *testit*, then copy it to the remote system (*mars*) using the *lp* account; type:

rcp testit lp@mars:/usr/tmp

Then press **<Enter>**.

- If you see no error messages, the file successfully reached the remote system. Go on to step 7.

- If you see an error message saying that the login was incorrect or that permissions were denied, contact the *administrator* of the remote system; the administrator needs to make changes to the *lp* account.

7. Click the *Test* button on your own system to test the printer setup.

- If the test job appears in the remote queue, go on to step 8.

- If the test job does not appear in the remote queue, physically go to the remote system, open the queue window for the printer, and click the *No* buttons next to the *Accepting requests?* and *Printing requests?* fields; then click the *Yes* buttons next to these fields. Go back to your own system and send another test job. If the test job appears, try to print your job again.

8. Physically go to the remote system and open the *console* window to check for error messages.

   Note: You must look in the console on the remote system; error messages will not be reported to any other shell window.

- If there are no error messages, try to print your job again. If your job still does not appear in the remote queue, contact the Silicon Graphics Technical Assistance Center.

- If a message states that the system is out of disk space, then there isn't enough space for the system to accept the file or to make a copy of the file to print. Have the administrator of the remote system remove files or directories that are no longer needed and try to print your job again.

- If a message specific to the application from which you are printing appears, for example, a message stating that the application couldn't find a necessary file, refer to the documentation included with the application.

Job Disappears from a Queue but Never Prints

Use this section if your print job disappears from a local or remote
queue but the printer never prints it out.

1. Check your mail messages.

   ■ If the *administrator* of the printing *system* deletes your job, you
   receive a mail message to that effect. Contact the
   administrator to make sure you may try to print the job
   again.

   ■ If there is no such mail message, go on to step 2.

2. Check whether the printer is printing any jobs.

   ■ If the printer prints the next job in the queue, there is
   something wrong with your particular job; go on to step 3.

   ■ If all jobs are disappearing from the queue but the printer
   does not print them, skip ahead to step 4.

3. Send the job again, and check whether the printer receives it.

   Most printers have a status mechanism (a blinking light or
   digital message) that shows that the printer has received a job
   and is trying to print it.

   ■ If the status mechanism shows that it is trying to print your
   job but never does, the job is too complex; the printer either
   gave up after a specified period of time (that is, it "timed
   out"), or the printer does not have enough memory to hold
   the job. If possible, break it up into smaller jobs and try
   printing it again (for example, send only two pages of a
   ten-page document). If it still doesn't print, go on to step 4.

   ■ If the status mechanism doesn't show that it is trying to print
   a job, the printer didn't receive data that it could understand.
   This means the initial processing that your application or
   other filter did to prepare the file for printing did not produce
   a file in the correct format for this printer. You may be
   missing some filtering software. Try printing the file on a
   different type of printer. For example, if you initially sent
   your job to a color image printer connected to a parallel port,
   now send it to a black and white PostScript printer connected
   to a serial port. If it still doesn't print, go on to
   step 4.

4. Remove all jobs from the queue on the printing system and click the *Test* button to send a test page.

- If the test page prints, the printer is set up correctly, but cannot print the types of files you are sending it. Contact the Silicon Graphics Technical Assistance Center.

- If the test job disappears from the queue but doesn't print, contact the Silicon Graphics Technical Assistance Center.

Checking and Restarting *lpsched*

Use this section to check whether *lpsched* is running, and to restart it if necessary.

1. Check whether *lpsched* is running by typing:

```
lpstat -r
```

Then press **<Enter>**.

- If the *lpsched* spooler is not running, you see this message:

```
scheduler is not running
```

Go to step 2 to turn it on.

- If the *lpsched* spooler is running, you see this message:

```
scheduler is running
```

2. Turn on *lpsched* if it is not running.

- Open a *shell* window on the system where it is not running, then *log in* as *root* by typing:

```
su
```

Then press **<Enter>**.

If a prompt for a *password* appears, type the password then press **<Enter>**. If a prompt appears but the *root account* has no password, just press **<Enter>**.

- Start *lpsched* by typing:

```
/usr/lib/lpsched
```

Then press **<Enter>**.

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■ *Log out* of the *root* account by typing:

exit

Then press **<Enter>**.

3. Make sure *lpsched* is running by typing:

lpstat -r

Then press **<Enter>**.

■ If the *lpsched* spooler is running, you see this message:

```
scheduler is running
```

Jobs that were not reaching a remote *queue* because *lpsched* was not running on the local system should now reach that queue; jobs that were not disappearing from the printing queue because *lpsched* was not running on the printing system should now print out.

■ If you do not see this message, contact the Silicon Graphics Technical Assistance Center.

Understanding the Printing Process

This sequence of steps describes the process that your *system* uses to print files.

1. On your own system (*saturn*), you ask an application (IRIS Showcase) to print a file (*slide1*), and explicitly or implicitly request a particular printer (*color-seiko*).

2. Showcase (or another filter program) creates a new version of *slide1* (a new file) that is in the correct format for *color-seiko*.

3. Showcase runs the *lp* command on the file on *saturn*. *lp* assigns the file a job ID number (10), sends it to *color-seiko*'s *queue*, and alerts *lpsched* (the spooler that controls the flow of jobs out of the queue) that the file (job #10) is ready to be printed. The Printer tool displays job #10 in the local queue for *color-seiko*.

4. *color-seiko* is actually connected to another system on the *network* (*mars*) where it is named *seiko1*. When job #10 reaches the top of *color-seiko*'s queue, *lpsched* copies it across the network to the */usr/tmp* directory on *mars*.

5. *lp* on *mars* makes a copy of job #10 in */usr/spool/lp/request*. It then assigns it a new ID number (20) that doesn't conflict with other IDs on *mars*, sends it to *seiko1*'s queue, and alerts *lpsched* on *mars* that job #20 is ready to print. The Printer tool on *mars* shows job #20 in *seiko1*'s local queue; the Printer tool on *saturn* continues to show job #10 in *color-seiko*'s local queue, and adds job #20 to *color-seiko*'s remote queue. (You can tell that jobs #10 and 20 are one and the same since they are the same size.)

6. When job #20 reaches the top of the queue, *lpsched* sends the job over a cable to *seiko1*.

7. *seiko1* receives job #20 and prints out *slide1* on paper or a transparency.

8. Jobs #10 and 20 disappear from *color-seiko*'s local and remote queues; job #20 disappears from *seiko1*'s local queue. *lpsched* sends the next job in *color-seiko*'s local queue to *mars*.

Where the Process May Fail

This section shows how the process may fail at each step described in "Understanding the Printing Process" on page 5-31; it does not describe how to correct the failure. See "A Troubleshooting Roadmap" on page 5-20 for a step-by-step approach for isolating and correcting failures in the printing process.

1. When you ask an application to print a file on a certain printer:

   • The file may go to a printer other than the one you expect because a hidden default is set.

   • You may specify a printer that's not currently set up on your *system*.

   • You may not actually complete the print request.

2. When the application or filter tries to create a new version of the file:

   • There may not be enough memory or disk space in the system for the new file. If this is the problem, you see an error message in the *console* window.

   • The new file it creates may not be in the correct format for the printer (usually due to missing filter software). You will not

find out that this has happened until the printer fails to print it.

3. When the application runs *lp* on the file:

    • The printer may not be allowing new jobs to enter its *queue*, that is, the *No* button is selected next to the *Accepting requests?* field in the printer's queue *window*.

    • If *lp* tries to make a copy of the file in */usr/spool/lp/request*, there may not be enough memory or disk space in the system for the new file. If this is the problem, you see an error message in the console window.

    • *lp* may not be able to find the printer you specified. If you typed in a printer name that does not exist, *lp* cannot submit your job to that printer's queue.

    • The *permission* on the file may not be set up to allow others to read it; in this case *lp* cannot process it. If this is the problem, you see a message in the console window saying permission was denied.

4. When *lpsched* tries to copy the file to the remote system:

    • If *lpsched* is not running, it cannot direct the file to a printer or remote system. Typing *lpstat -r* determines whether *lpsched* is running.

    • The remote queue may already contain a job that came from your local queue. *lpsched* on your system waits until the job that is already in the remote queue disappears from that queue before it sends the next job.

    • The printer may not be allowing jobs to exit from its queue, that is, the *No* button is selected next to the *Printing requests?* field in the printer's queue window.

    • The *network* may be down.

    • Your system may not be communicating with the network; for example, your networking software is not working or your network cable is loose.

    • The remote system may not be communicating with the network; for example, it may be turned off.

    • The remote system may not allow your system to use the printer. See the section on registering network printers in the

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optional *IRIX Advanced Site and Server Administration Guide* for information on using the *addclient* command.

- The remote system may not have enough disk space to accept the file.

5. When *lp* on the remote system tries to process the file:

- When *lp* tries to make a copy of the file in */usr/spool/lp/request*, there may not be enough memory or disk space in the remote system for the new file.

- The remote printer may not be allowing new jobs to enter its queue, that is, the *No* button is selected next to the *Accepting requests?* field in the printer's queue window on the remote system.

- The printer on the remote system may be gone or renamed. For example, if someone changed the name of *seiko1* to *seiko2*, *lp* on the remote system cannot find *seiko1*. *lp* does not report this back to your system, so your job remains in the local queue as if it were printing, but never appears in the remote queue. *lp* does record the problem in the */usr/spool/lp/log* file on the remote system.

6. When *lpsched* sends the job over the cable to the printer:

- If *lpsched* is not running, the file will never be directed to a printer. Use the *lpstat -r* command on the remote (printing) system to check *lpsched*.

- The printer may not be allowing jobs to exit from its queue, that is, the *No* button is selected next to the *Printing requests?* field in the printer's queue window on the remote (printing) system.

- The cable may be disconnected.

- The cable may be broken or frayed.

- The cable may not have the correct pinouts to match the printer or the IRIS.

- The printer may be turned off.

7. When the printer receives the job and tries to print it:

- The printer may be jammed or out of supplies such as paper or toner.

- The printer may not have enough memory to print a complex job. In this case, the printer's status mechanism shows it is trying to print, but then the printer gives up after a specified period of time, removes the job from the queue, and prints nothing.

- The printer may not understand the format of the job because the application or filter did not convert the file correctly. In this case, the printer's status mechanism never shows that it is trying to print, and the printer removes the job from the queue but never prints it.

8. When jobs disappear from the queue:

- Jobs may disappear from the queue but never actually print as described above.

- Jobs may never disappear from the queue if the physical printer is not working correctly.

- If jobs ahead of yours in the queue disappear, then jobs behind yours disappear while yours remains at the top of the queue, there is something wrong with your job; cancel it and try to print it again.

Troubleshooting Tools

When you troubleshoot printing problems using "A Troubleshooting Roadmap" on page 5-20, you use a number of different tools and techniques. This section summarizes the tools, and suggests other sources of information on isolating and correcting problems.

Test	This button appears in the Printer tool *window* and in each individual printer's *queue* window. When you click a printer's *Test* button, you run the *lp* command on a sample file that is already in the correct format for that printer; in other words, you bypass steps 1 and 2 of the printing process described in "Understanding the Printing Process" on page 5-31.
lpstat	This *IRIX* command provides an alternate view of the queues that the Printer tool displays; it also reports whether *lpsched* is running. To see a full *lpstat* listing that includes queues for every printer on the *system* plus the status of *lpsched*, you would type: `lpstat -t`
/usr/spool/lp/log	This file contains a history of all printing activity and errors. Its messages are often difficult to understand, but you may find some useful error information that you can use for troubleshooting. For example, a "login incorrect" message that has a timestamp near a time when your job could not reach a remote queue may make you suspect that there is a *password* on the *lp* account on the remote system.

The *IRIX Advanced Site and Server Administration Guide* contains a detailed table of printing error messages and describes how to use the *lp* system from an IRIX *shell*; the *lp man page* gives a complete listing of all the command line options for *lp*.

Setting Up Other Peripherals 6

Chapter 6

Setting Up Other Peripherals

The *IRIS* supports a number of different *peripheral* hardware devices that you connect to a *serial port* on the back of the *workstation*. Once you connect a peripheral to the IRIS, use the Serial Ports tool to turn on the software that lets you access the peripheral.

This chapter contains these sections:

- "About the Serial Ports Tool" on page 6-2 explains what the tool does, tells you how to start it, and describes all of the buttons and fields in the tool.

- "Connecting Peripherals to the IRIS" on page 6-3 briefly describes how to physically connect peripherals to the IRIS.

- "Turning On Terminal Software" on page 6-4 and "Turning On Tablet, Dial and Button, or Spaceball Software" on page 6-6 explain how to turn on the software for these peripherals.

- "Setting Up Modems" on page 6-7 describes the different ways to configure modems, shows how to turn on the software for a Hayes® 2400 or Telebit™ modem, and shows you how to call a remote *host*.

The Serial Ports tool supports terminals, digitizer tablets, dial and button boxes, and spaceballs; you use *IRIX* to turn on modem software. To add a serial printer, see "Turning On Serial Printer Software" on page 5-5; to add another type of serial peripheral, see your *network administrator* or someone else who is familiar with the operating system.

About the Serial Ports Tool

You access the Serial Ports tool through the *System toolchest* in the upper left corner of your *screen*. To use the tools, you need to know the basic *mouse* techniques summarized in the tutorial and reference chapters in *IRIS Essentials*.

To start the Serial Ports tool, follow these steps:

1. Start the *System Manager*.

    ■   Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right mouse button.

    ■   Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

    ■   Manage the tool as the *Administrator* by clicking the *Administrator* button. If the system requests a *password*, type it in, then press **<Enter>**.

2. Start the Serial Ports tool.

    ■   Double-click the Serial Ports icon to open the tool.

        The form shown in Figure 6-1 appears.
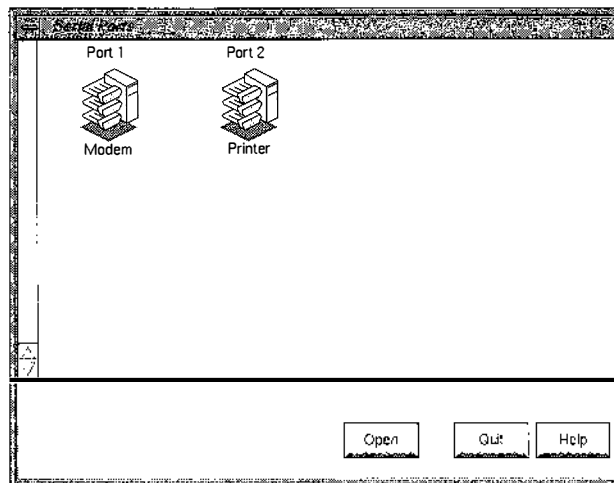
Figure 6-1   The Serial Ports tool.

If you are using this tool as a regular user, you can view information about how the port is set up, but you cannot add a *peripheral* or change the setup of an existing peripheral.

Depending on the model of your *IRIS* workstation there are either two or four built-in serial ports; the tool shows an icon for each port. If you are using a six-port expansion card, you see additional fields for each additional port. If you have more than two serial ports, you may want to reserve port 1 for connecting a monitor for diagnostics and troubleshooting.

The Serial Ports tool gives you access to all the serial ports on this *workstation*. If peripherals are already set up on the *system*, the icons are labeled. For instance, if you have a dial and button box on serial port 2, the icon is labeled *dial and button*.

The list below describes each of the buttons you see in this tool.

Open	*Select* the icon for the *serial port* you want to open; then click the *Open* button. You see a form that you fill in to turn on software for a peripheral. You can also double-click an icon to open it more quickly.
Quit	To close the Serial Ports tool, click the *Quit* button.
Help	To see on-line information about the Serial Ports tool, click the *Help* button.

Connecting Peripherals to the IRIS

The *peripheral* devices that you buy from Silicon Graphics come with instructions on how to connect them to the *IRIS*. If you buy a peripheral from another vendor, make sure you are using the correct kind of cable. (Use a null modem cable to connect a terminal to the IRIS.) See the owner's guide supplied with your *workstation* or the *IRIX Advanced Site and Server Administration Guide* for more information on connecting peripheral devices to your IRIS.

Turning On Terminal Software

Sometimes more than one person will need to use the *IRIS* on a steady basis. To accommodate more than one user at a time, you can set up a terminal using a *serial port* on the *system*.

Adding a terminal is a two-step process. First, connect the terminal to the IRIS using a null modem cable; then turn on the software so the IRIS and the terminal can communicate.

You'll use the Serial Ports tool to specify the port to which you connected the terminal and the terminal's model name and *baud rate*. The baud rate is the speed (calculated as bits per second) at which the computer sends information to the terminal. You can find this information in the manual that accompanies the terminal.

To turn on the software for a terminal, follow these steps:

1. Start the *System Manager*.

    ■   Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

    ■   Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

    ■   Manage the tool as the *Administrator* by clicking the *Administrator* button. If the system requests a *password*, type it in, then press **<Enter>**.

2. Start the Serial Ports tool.

    ■   Double-click the Serial Ports icon to open the tool.

3. Open the icon that's labeled with the number of the serial port to which you connected the terminal. For example, if you connected the terminal to serial port 1, open the icon labeled Port 1.

    ■   Double-click the icon to open it.

        The form for this port appears.

4. Click the *Terminal* button.

    The form shown in Figure 6-2 appears.
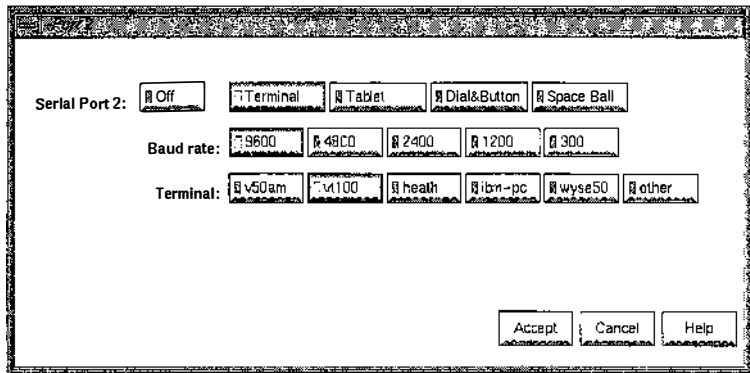
Figure 6-2 Serial Ports form for a terminal connection.

5. Click the button that shows the correct *baud rate*.

6. Specify the type of terminal you are adding.

    ■   Click the entry that matches your terminal type.

    ■   If the terminal you are adding is not on the list, click the *Other* button. Fill in the model name of the terminal in the field that appears.

7. Instruct the *system* to turn on the software, or cancel the request.

    ■   Click the *Accept* button to turn on the software.

        This takes you back to the Serial Ports tool, where the port's icon is labeled Terminal.

    ■   Click the *Cancel* button to keep the serial port free.

        This takes you back to the Serial Ports tool, where the port's icon is labeled Off.

8. Close the Serial Ports tool, or turn on more software.

    ■   If you're finished, click the *Quit* button to close the Serial Ports tool.

    ■   To turn on more terminal software, return to step 3 of this procedure.

Personal System Administration Guide

Turning On Tablet, Dial and Button, or Spaceball Software

See the instructions included with the digitizer tablet, dial and button box, or spaceball to connect the hardware to a *serial port* on the *IRIS*; then follow the instructions below to turn on the software.

You use the Serial Ports tool to specify the port to which you connected the *peripheral* and the name of the peripheral. Follow these steps:

1. Start the *System Manager*.

    ■ Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

    ■ Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

    ■ Manage the tool as the *Administrator* by clicking the *Administrator* button. If the system requests a *password*, type it in, then press **<Enter>**.

2. Start the Serial Ports tool.

    ■ Double-click the Serial Ports icon to open the tool.

3. Open the icon that's labeled with the number of the serial port to which you connected the peripheral. For example, it you connected it to serial port 1, open the icon labeled Port 1.

    ■ Double-click the icon to open it.

    The form shown in Figure 6-3 appears.
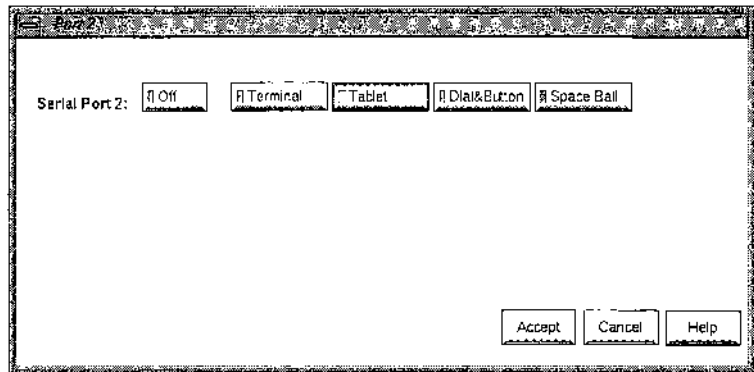
Figure 6-3   Serial Ports form for a tablet connection.

4. Click the *Tablet*, *Dial and Button*, or *Spaceball* button.

5. Instruct the *system* to turn on the software, or cancel the request.

    ■   Click the *Accept* button to turn on the software.

        This takes you back to the Serial Ports tool, where the port is labeled with the peripheral whose software you turned on.

    ■   Click the *Cancel* button to keep the serial port free.

        This takes you back to the Serial Ports tool, where the port's icon is labeled Off.

6. Close the Serial Ports tool, or turn on more software.

    ■   If you're finished, click the *Quit* button to close the tool.

    ■   To turn on more peripheral software, return to step 3.

Setting Up Modems

Silicon Graphics, Inc. supports Hayes 2400 and Telebit modems. This section gives you the information you need to set up only these two types of modems; it does not provide the in-depth information necessary to set up a Hayes-compatible modem. For more

information, see the sections on *uucp* in the *IRIX Advanced Site and Server Administration Guide*.

You can use the standard *system software* to set up a modem in three different ways:

- As a *dial-in modem*, other users can call your modem to *log in* to your IRIS.

- As a *dial-out modem*, you use the modem to call another modem to log in to the *system* to which that modem is connected.

- As a *dial-in/dial-out modem*, other users can call your modem and you can call other modems.

To set up a modem, follow these steps:

1. Physically connect the modem to a *serial port* on the IRIS, and connect the modem to a telephone jack. See the owner's guide included with your IRIS and the installation guide included with your modem for instructions and cabling information.

   Note: Do not connect the IRIS to the modem with an ordinary telephone cable or a cable that you used to connect the modem to a PC; it will not transmit information correctly.

2. Install the *eoe2.sw.uucp* software. It is shipped with every IRIS on tape or CD, but is not necessarily installed on your disk. Check whether it's installed by typing **versions** in a *shell* window and checking the listing for this line:

   ```
   I eoe2.sw.uucp uucp utilities.
   ```

   If the line is not there, *eoe2.sw.uucp* is not installed. See the *IRIS Software Installation Guide* to install it.

3. Use the documentation included with your modem to determine the modem's *baud rate* (the speed at which the modem can send and receive information).

4. Turn on the correct software. See "Turning On Dial-in Modem Software" on page 6-9, "Turning On Dial-out Modem Software" on page 6-12, or "Turning On Dial-in/Dial-out Modem Software" on page 6-15.

Setting Up Other Peripherals

5. If you set up the modem for dial-out or dial-in/dial-out service, try calling up another modem. See "Dialing Out to Another Modem" on page 6-20.

   If you set up the modem for dial-in or dial-in/dial-out service, have another user try to dial in to your modem.

Turning On Dial-in Modem Software

You turn on dial-in modem software by editing the */etc/inittab* file. You can use the mouse-based editor, *jot*, or a text-based editor such as *vi*.

Note: If you connected the modem to a port expansion board, follow these directions, but make the changes to the line that corresponds to the port you are using.

To turn on the software so users in another location can call your modem to *log in* to your IRIS, follow these steps:

1. Make sure the *eoe2.sw.uucp* software is installed and the modem is connected to a *serial port* on the IRIS (see "Setting Up Modems" on page 6-7).

2. Turn on the modem.

3. Log in as *root* through a *shell* window.

   ■ Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

   ■ Drag the cursor down the *menu* until "Shell" is highlighted; then release the mouse button. The outline of a *window* appears.

   ■ Position the outline where you want the window to appear; then click the left mouse button.

   ■ Position your cursor within the new window and type:

     `login root`

     Then press **<Enter>**.

     If a prompt for a *password* appears, type the password then press **<Enter>**. If a prompt appears but the *root account* has no password, just press **<Enter>**.

4. Edit */etc/inittab* to turn off the port to which you connected the modem so you can set up the port correctly.

   ■ Open the file with a text editor such as *jot* by typing:

     ```
     jot /etc/inittab
     ```

     Then press **<Enter>**. For detailed information on using the *jot* text editor, see the *IRIS Utilities Guide*.

   ■ Find the line in the file that corresponds to the port to which you connected the modem.

     Most of the lines start with t*portnumber*, where *portnumber* is the number of a serial port. If you connected your modem to port 2, you are looking for this line:

     ```
     t2:23:off:/etc/getty ttyd2 co_9600 #port 2
     ```

   ■ If the word after the second colon in the line is something other than off (for example, it may be respawn), change it to off; if it already says off, do not change it.

     For more information, see the *man page* for *inittab* and for *gettydefs*.

   ■ Save your changes and *quit jot*.

5. Inform the system of the changes. At the system *prompt* (#) type:

   ```
   telinit q
   ```

6. Optimize performance for your particular brand of modem.

   ■ If you have a Hayes 2400 modem, use the *fix-hayes* command and specify a dial-in modem (**-i**) and the port number to which it is connected (for example, port 2). Type:

     ```
     /usr/lib/uucp/fix-hayes -i d2
     ```

     Then press **<Enter>**. Go on to the next step when you see the # prompt.

   ■ If you have a Telebit modem, use the *fix-telebit* command and specify a dial-in modem (**-i**) and the port number to which it is connected (for example, port 2). Type:

     ```
     /usr/lib/uucp/fix-telebit -i d2
     ```

     Then press **<Enter>**. Go on to the next step when you see the # prompt.

7. Edit */etc/inittab* so the system recognizes which port is set up for a modem (as opposed to a terminal), sets the correct *baud rate*, and lets users log in to the port to which you connected your modem.

- Open the file with an editor such as *jot* by typing:

  jot /etc/inittab

  Then press **<Enter>**. For detailed information on using the *jot* text editor, see the *IRIS Utilities Guide*.

- Find the line in the file that corresponds to the port to which you connected the modem.

  Most of the lines start with t*portnumber*, where *portnumber* is the number of a serial port. If you connected your modem to port 2, you are looking for this line:

  ```
  t2:23:off:/etc/getty ttyd2 co_9600 #port 2
  ```

- Change the word after the second colon in the line from off to respawn.

- If you are setting up a Hayes 2400 modem, change ttyd*portnumber* to ttym*portnumber*, and change co_9600 to du_2400; this lets the modem run at 2400, 1200, or 300 baud.

  For example, if you connected a Hayes 2400 modem to serial port 2, find this line:

  ```
  t2:23:off:/etc/getty ttyd2 co_9600 #port 2
  ```

  Change it so it looks like this:

  ```
  t2:23:respawn:/etc/getty ttym2 du_2400 #Modem
  ```

- If you are setting up a Telebit modem, change ttyd*portnumber* to ttyf*portnumber*, change co to dx, and specify the baud rate.

  For example, if you connected a Telebit modem that runs at 19200 baud to serial port 2, find this line:

  ```
  t2:23:off:/etc/getty ttyd2 co_9600 #port 2
  ```

  Change it so it looks like this:

  ```
  t2:23:respawn:/etc/getty ttyf2 dx_19200 #Modem
  ```

- Save your changes and *quit jot*.

8. Inform the system of the changes. At the system prompt (#) type:

   `telinit q`

   Then press **<Enter>**.

9. *Log out* of the *root* account by typing:

   `logout`

   Then press **<Enter>**. The shell window disappears.

To test the setup, have someone try to dial in to the IRIS through this modem. If the login *prompt* is garbled or does not appear, the caller should press the **<Break>** key and try again. If it still does not work, check all cable connections and make sure you edited the file correctly. For more information, see the *IRIX Advanced Site and Server Administration Guide*.

Turning On Dial-out Modem Software

You turn on dial-out modem software by editing two files: */usr/lib/uucp/Devices* and */etc/inittab*. You can use the mouse-based editor, *jot*, or a text-based editor such as *vi*.

Note: If you connected the modem to a port expansion board, follow these directions, but make the changes to the line that corresponds to the port you are using.

To turn on the software so you can call another modem and *log in* to the *system* to which that modem is connected, follow these steps:

1. Make sure the *eoe2.sw.uucp* software is installed and the modem is connected to a *serial port* on the IRIS (see "Setting Up Modems" on page 6-7).

2. Turn on the modem.

3. *Log in* as root through a *shell* window.

   ■ Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

   ■ Drag the cursor down the *menu* until "Shell" is highlighted; then release the mouse button. The outline of a *window* appears.

- Position the outline where you want the window to appear; then click the left mouse button.

- Position your cursor within the new window and type:

    login root

    Then press **<Enter>**.

    If a prompt for a *password* appears, type the password then press **<Enter>**. If a prompt appears but the *root account* has no password, just press **<Enter>**.

4. Edit */etc/inittab* so the system keeps users from logging in to the port to which you connected your modem.

    - Open the file with a text editor such as *jot* by typing:

        jot /etc/inittab

        Then press **<Enter>**. For detailed information on using the *jot* text editor, see the *IRIS Utilities Guide*.

    - Find the line in the file that corresponds to the port to which you connected the modem.

        Most of the lines start with t*portnumber*, where *portnumber* is the number of a serial port. If you connected your modem to port 2, you are looking for this line:

        ```
        t2:23:off:/etc/getty ttyd2 co_9600 #port 2
        ```

    - If the word after the second colon in the line is something other than off (for example, it may be respawn), change it to off; if it already says off, do not change it.

    - Save your changes and quit *jot*.

5. Inform the system of the changes by typing:

    telinit q

    Then press **<Enter>**.

6. Optimize performance for your particular brand of modem.

- If you have a Hayes 2400 modem, use the *fix-hayes* command and specify a dial-out modem (**-o**) and the port number to which it is connected (for example, port 2). Type:

  ```
  /usr/lib/uucp/fix-hayes -o d2
  ```

  Then press **<Enter>**. Go on to the next step when you see the system *prompt* (#).

- If you have a Telebit modem, use the *fix-telebit* command and specify a dial-out modem (**-o**) and the port number to which it is connected (for example, port 2). Type:

  ```
  /usr/lib/uucp/fix-telebit -o d2
  ```

  Then press **<Enter>**. Go on to the next step when you see the # prompt.

7. Edit */usr/lib/uucp/Devices* to specify the port to which the modem is connected and set the correct *baud rate*.

- Open the file with a text editor such as *jot* by typing:

  ```
  jot /usr/lib/uucp/Devices
  ```

  Then press **<Enter>**.

- Add one or more lines to specify the port number and baud rate for the modem. The line has this form:

  ```
  ACU ttyhi/lowportnumber null baud 212 x modem
  ```

  If your modem runs at 2400 baud or less, *hi/low* is m; if it runs faster than 2400 baud, *hi/low* is f. *portnumber* is the number of the serial port to which the modem is connected. *baud* is the baud rate at which you will run the modem.

  For a Hayes 2400 connected to port 2 that accepts and sends data at 2400, 1200, and 300 baud, add these lines:

  ```
  ACU ttym2 null 2400 212 x hayes24
  ACU ttym2 null 1200 212 x hayes24
  ACU ttym2 null 300 212 x hayes24
  ```

  For a Telebit modem connected to port 2 that accepts and sends data at 19200 baud, add this line:

  ```
  ACU ttyf2 null 19200 212 x telebit
  ```

Setting Up Other Peripherals

- Save your changes and quit *jot*.

8. Change the owner of the port you are using from *sys* to *uucp* since the *uucp* software can use only those ports that are owned by *uucp*.

   - For a Hayes 2400 connected to port 2, type:

     chown uucp /dev/ttym2

     Then press **<Enter>**.

   - For a Telebit connected to port 2, type:

     chown uucp /dev/ttyf2

     Then press **<Enter>**.

9. *Log out* of the *root* account by typing:

   logout

   Then press **<Enter>**. The shell window disappears.

Try to dial out through this modem to verify the dial-out setup. See "Dialing Out to Another Modem" on page 6-20.

Turning On Dial-in/Dial-out Modem Software

You turn on dial-in/dial-out modem software by editing two files: */etc/inittab* and */usr/lib/uucp/Devices*. To edit the files, you can use the mouse-based editor, *jot*, or a text-based editor such as *vi*.

Note: If you connected the modem to a port expansion board, follow these directions, but make the changes to the line that corresponds to the port you are using.

After you turn on this software, you can use your modem to:

- call another modem and *log in* to the *system* to which that modem is connected

- accept calls from other users and let them log in to your IRIS

To turn on dial-in/dial-out software, follow these steps.

1. Make sure the *eoe2.sw.uucp* software is installed and the modem is connected to a *serial port* on the IRIS (see "Setting Up Modems" on page 6-7).

2. Turn on the modem.

3. Log in as *root* through a *shell* window.

    ■ Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

    ■ Drag the cursor down the *menu* until "Shell" is highlighted; then release the mouse button. The outline of a *window* appears.

    ■ Position the outline where you want the window to appear; then click the left mouse button.

    ■ Position your cursor within the new window and type:

        login root

        Then press **<Enter>**.

        If a prompt for a *password* appears, type the password then press **<Enter>**. If a prompt appears but the *root account* has no password, just press **<Enter>**.

4. Edit */etc/inittab* to turn off the port to which you connected the modem so you can set up the port correctly.

    ■ Open the file with a text editor such as *jot* by typing:

        jot /etc/inittab

        Then press **<Enter>**. For detailed information on using the *jot* text editor, see the *IRIS Utilities Guide*.

    ■ Find the line in the file that corresponds to the port to which you connected the modem.

        Most of the lines start with t*portnumber*, where *portnumber* is the number of a serial port. If you connected your modem to port 2, you are looking for this line:

        ```
        t2:23:off:/etc/getty ttyd2 co_9600 #port 2
        ```

- If the word after the second colon in the line is something other than `off` (for example, it may be `respawn`), change it to `off`; if it already says `off`, do not change it.

- Save your changes and quit *jot*.

5. Inform the system of the changes. At the system *prompt* (#) type:

   `telinit q`

6. Optimize performance for your particular brand of modem.

   - If you have a Hayes 2400 modem, use the *fix-hayes* command and specify a dial-in/dial-out modem (`-io`) and the port number to which it is connected (for example, port 2). Type:

     `/usr/lib/uucp/fix-hayes -io d2`

     Then press `<Enter>`. Go on to the next step when you see the # prompt.

   - If you have a Telebit modem, use the *fix-telebit* command and specify a dial-in/dial-out modem (`-io`) and the port number to which it is connected (for example, port 2). Type:

     `/usr/lib/uucp/fix-telebit -io d2`

     Then press `<Enter>`. Go on to the next step when you see the # prompt.

7. Edit */usr/lib/uucp/Devices* to specify the port to which the modem is connected and set the correct *baud rate*.

   - Open the file with a text editor such as *jot* by typing:

     `jot /usr/lib/uucp/Devices`

     Then press `<Enter>`.

   - Add one or more lines to specify the port number and baud rate for the modem. The line has this form:

     ACU tty*hi/lowportnumber* null *baud* 212 x *modem*

     If your modem runs at 2400 baud or less, *hi/low* is m; if it runs faster than 2400 baud, *hi/low* is f. *portnumber* is the number of the serial port to which the modem is connected. *baud* is the baud rate at which you will run the modem.

For a Hayes 2400 connected to port 2 that accepts and sends data at 2400, 1200, and 300 baud, add these lines:

```
ACU ttym2 null 2400 212 x hayes24
ACU ttym2 null 1200 212 x hayes24
ACU ttym2 null 300 212 x hayes24
```

For a Telebit modem connected to port 2 that accepts and sends data at 19200 baud, add this line:

```
ACU ttyf2 null 19200 212 x telebit
```

- Save your changes and quit *jot*.

8. Edit */etc/inittab* so the system recognizes which port is set up for a modem (as opposed to a terminal), sets the correct *baud rate*, and lets users log in to the port to which you connected your modem.

   - Open the file with a text editor such as *jot* by typing:

     jot /etc/inittab

     Then press **<Enter>**. For detailed information on using the *jot* text editor, see the *IRIS Utilities Guide*.

   - Find the line in the file that corresponds to the port to which you connected the modem.

     Most of the lines start with t*portnumber*, where *portnumber* is the number of a serial port. If you connected your modem to port 2, you are looking for this line:

     ```
     t2:23:off:/etc/getty ttyd2 co_9600 #port 2
     ```

   - If you are setting up a Hayes 2400 modem, change off to respawn, change /etc/getty to /usr/lib/uucp/uugetty, change ttyd*portnumber* to ttym*portnumber*, and change co_9600 to du_2400 (this lets the modem run at 2400, 1200, or 300 baud). Also add a few options to specify dial-in/dial-out.

     For example, if you connected a Hayes 2400 modem to serial port 2, find this line:

     ```
     t2:23:off:/etc/getty ttyd2 co_9600 #port 2
     ```

     Change it so it looks like this:

     ```
     t2:23:respawn:/usr/lib/uucp/uugetty -Nt60 \
     -ihayes24in,conn ttym2 du_2400 #Modem
     ```

- If you are setting up a Telebit modem, change `off` to `respawn`, change `/etc/getty` to `/usr/lib/uucp/uugetty`, change `ttyd`*portnumber* to `ttyf`*portnumber*, change `co` to `dx`, and specify the baud rate. Also add a few options to specify dial-in/dial-out.

  For example, if you connected a Telebit modem that runs at 19200 baud to serial port 2, find this line:

  ```
  t2:23:off:/etc/getty ttyd2 co_9600 #port 2
  ```

  Change it so it looks like this:

  ```
  t2:23:respawn:/usr/lib/uucp/uugetty -Nt60 \
  -itelebitin,conn ttyf2 dx_19200 #Modem
  ```

- Save your changes and quit *jot.*

9. Inform the system of the changes by typing:

   telinit q

   Then press **<Enter>**.

10. *Log out* of the *root* account by typing:

    logout

    Then press **<Enter>**. The shell window disappears.

Try to dial out through this modem to verify the dial-out setup. See "Dialing Out to Another Modem" on page 6-20.

To test the dial-in setup, have someone try to dial in to the IRIS through this modem. If the login *prompt* is garbled or does not appear, the caller should press the **<Break>** key and try again. If it still does not work, check all cable connections and make sure you edited the files correctly. For more information, see the *IRIX Advanced Site and Server Administration Guide.*

Dialing Out to Another Modem

You use the *cu* utility to dial out to another modem. Follow these steps:

1. Make sure the modem is connected to both the IRIS and a working telephone line.

2. Make sure the modem is turned on.

3. Dial out to another modem using *cu* and the telephone number.

   ■ If you have a Hayes modem you must use the *-s* option to specify the *baud rate* of the modem you are calling. To call a modem running at 1200 baud at 1-800-555-1212, type:

   ```
   cu -s1200 18005551212
   ```

   Then press **<Enter>**.

   ■ If you have a Telebit modem, to call another modem at 1-800-555-1212, type:

   ```
   cu 18005551212
   ```

   Then press **<Enter>**.

   ■ If everything is working, you hear the modem dialing. After a few moments you see this message:

   ```
   Connected
   ```

   Go on to step 4.

   ■ If you do not hear dialing or see the Connected message, press **<Ctrl-C>**. Then try calling again, adding the *-d* (debug) option to the *cu* command line. For example, if you have a Hayes modem, retry the connection by typing:

   ```
   cu -d -s1200 18005551212
   ```

   Then press **<Enter>**.

   The *-d* option reports all the activities of the modem. Look for error messages, and check the edits you made to turn on modem software. Also check all cable connections.

4. If you do not see the login *prompt*, press **<Enter>**.

   ■ If the login prompt is garbled or does not appear, press the **<Break>** key and try again.

5. When you see the login prompt, *log in* to the *system*.

6. When you have finished using the remote system, *log out*. Often this breaks the connection to the remote modem (that is, it hangs up the telephone). You know the connection is broken when you see these messages:

```
Lost Carrier
```

```
Disconnected
```

If logging out does not break the connection, try these methods:

- press **<Enter> <Enter>**

- press **<Ctrl-C>**

- type ~.

Setting Up Other Peripherals

Managing Disks and Files

7

Chapter 7

Managing Disks and Files

The chapter shows you how to use the Disk and File tool to:

- access a disk that you physically connect to your own *workstation*
- let other users access the contents of your disk
- gain access to disks on other workstations

Note: You must be running the optional *NFS* networking software to share the contents of your disk with others or to access disks on other hosts. For more information on running NFS, see "Understanding Network Basics" on page 3-10.

This chapter contains these sections:

- "About the Disk and File Tool" on page 7-2 describes file systems then explains what the tool does, tells you how to start it, and describes all the buttons and fields in the tool.

- "Accessing a Local File System" on page 7-5 explains how to *mount* a new *file system* on either a hard disk, *CD-ROM disk (CD)*, or floppy disk that is physically connected to your workstation. It also explains how to customize and *export* the file system.

- "Accessing a Remote File System" on page 7-13 explains how to mount and customize a file system on a remote workstation's disk.

- "Deleting Disk Resources and File Systems" on page 7-20 explains how to remove file systems and disks.

- "Exporting Individual Directories" on page 7-22 explains how to prepare specific directories for mounting on remote workstations.

- "Automatically Protecting Directories and Files" on page 7-24 explains how to use the IRIX *umask* command to specify *permission* for your directories and files.

- "Managing Disk Space" on page 7-25 tells you how to determine the amount of disk space you have and provides suggestions for using your disk space most efficiently.

About the Disk and File Tool

Your *IRIS* can access the contents of a physical disk (such as a hard disk, a *CD-ROM disk (CD)*, or a floppy disk) that is connected to either your own *workstation* or another workstation that you can reach across the *network*. Accessing these disks is a two-step process.

First, you inform your workstation that a physical disk is available for use. When you connect a disk to the workstation (a local *disk resource*), this happens automatically; the workstation registers the disk's presence when you turn on the disk *drive* and the workstation. When you want to access a disk that's physically connected to another workstation (a remote disk resource), you use the Disk and File tool to specify the *hostname* of the *system* to which the disk is connected.

Second, you use the tool to create a directory on your workstation from which you will access (*mount*) all or part of the disk. Optional hard disks (those that do not contain the operating system) that you purchase from Silicon Graphics, Inc. are partitioned so that they contain either one *file system* or two; in other words, they appear to have one or two large directories in which you can create subdirectories. Remote disks may be partitioned into several file systems. When a disk resource contains more than one file system, the Disk and File tool shows each file system as a separate, unmounted disk. You *select* the unmounted disk, assign it a directory on your system from which you will access it (the *mount point*), then instruct the system to access (mount) it.

Once mounted, a remote disk resource becomes a remote *file system* and a local disk resource becomes a local file system; you then have the option of giving another *host permission* to access your local file system (this is called *exporting* the file system).
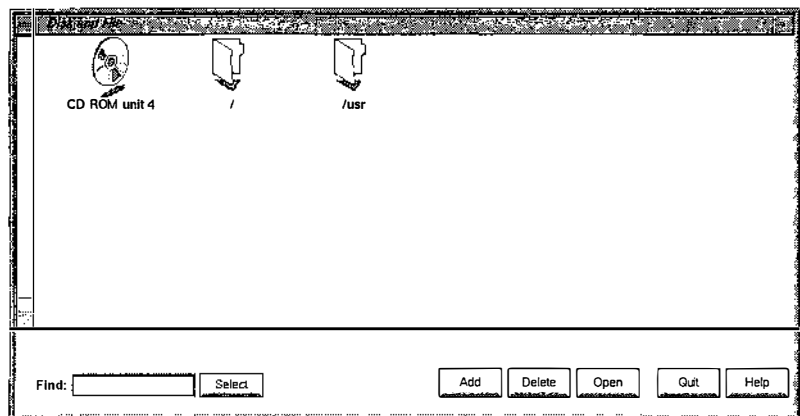
Note: You can access remote disk resources and export local file systems only if your workstation and the remote host are running the optional *NFS* software.

You access the Disk and File tool through the *System toolchest* in the upper left corner of your *screen*. To use the tools, you need to know the basic *mouse* techniques summarized in the tutorial and reference chapters in *IRIS Essentials*.

To start the Disk and File tool, follow these steps:

1. Start the *System Manager*.

    ■ Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right mouse button.

    ■ Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

    ■ Manage the tool as the *Administrator* by clicking the *Administrator* button. If the system requests a *password*, type it in, then press **<Enter>**.

2. Start the Disk and File tool.

    ■ Double-click the Disk and File icon to open the tool.

    The form shown in Figure 7-1 appears.

Figure 7-1   The Disk and File tool.

Note: If you don't see the *Delete* button, you are not running the tool as the *Administrator*. Click the *Quit* button; then become the Administrator. If you don't see the *Add* button, your *system* is not running the optional NFS software.

Different types of icons appear in the Disk and File Tool: unmounted hard disk, floppy drive, and CD-ROM icons, and mounted file system icons (see Figure 7-1). Unmounted hard disk icons appear when you physically install a new disk on the workstation, or when you set up access to a disk on a remote host. Unmounted CD-ROM and floppy drive icons appear when you physically install a CD-ROM drive or floppy drive on your workstation.

Before you mount a disk, it is called a *disk resource*. After you mount a disk, it is called a *file system* and its icon changes to a file system icon.

Note: Some remote file systems are restricted so that you can read the file system, but you cannot change any of the information on it.

The disk that contains the IRIX operating system (the *system disk*) has two file folders (/ and */usr*), showing that the disk is partitioned into two file systems. The *root* (/) file system contains all the system files that IRIX needs to run properly; the */usr* file system is largely free disk space where you create home directories in which users store their data. For more information on hierarchical file systems, see *IRIS Essentials*.

The list below describes each of the fields and buttons you see in the tool.

Find   To find a particular icon, click in the *Find* field, type the name, and click the *Select* button or press **<Enter>** on the keyboard. The tool highlights the icons that match the text you entered and places them at the end of the form.

                    Use the *wildcard* character (*) if you know only a few letters of the name for which you are searching. For instance, to find the icons that contain the string *also*, type ***also*** in the field.

The tool highlights the icons that match the string
you entered and places them at the end of the
form.

Add   If you are running this tool as the *Administrator*
               and your system is running NFS, click the *Add*
               button to access a remote *disk resource* over the
               network. See "Accessing a Remote File System"
               on page 7-13.

Delete   If you are running this tool as the Administrator,
               you can remove access to a *file system* or disk
               resource you no longer need. Select the icon and
               click the *Delete* button, and the icon disappears.
               See "Deleting Disk Resources and File Systems"
               on page 7-20.

Open   Select the icon for the file system you want to
               view; then click the *Open* button.

Quit   To close the Disk and File tool, click the *Quit*
               button.

Help   To see on-line information about the Disk and File
               tool, click the *Help* button.

Accessing a Local File System

A local *file system* resides on a local *disk resource*—such as a hard disk
or CD-ROM disk—that is physically connected to your *workstation*.
After you connect the disk, you specify a directory (a *mount point*) on
your workstation from which you will access it, then instruct the
system to access (*mount*) the disk. Once it is mounted, you can decide
whether to *export* (allow another *host* to access) your file system. (See
also "About the Disk and File Tool" on page 7-2.)

Note: MS DOS® floppy disks contain only directories, but the
            IRIS mounts these disks as if they contained true file
            systems.

Mounting a Local File System from a Hard Disk, CD-ROM, or Floppy Drive

This section provides instructions on mounting a local *file system* from a hard disk, CD-ROM drive, or floppy drive installed in your *workstation*. For more information on physically installing a *drive* in your particular *IRIS*, see the owner's guide that came with the IRIS.

To set up a local file system, follow these steps:

1. Start the *System Manager*.

    ■   Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

    ■   Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

    ■   Manage the tool as the Administrator by clicking the *Administrator* button. If the system requests a *password*, type it in, then press **<Enter>**.

2. Start the Disk and File tool.

    ■   Double-click the Disk and File icon to open the tool.

3. Open the unmounted icon (see Figure 7-1).

    ■   Double-click the appropriate icon.

    The form shown in Figure 7-2 appears.

Figure 7-2 Mount resource form for a CD-ROM drive.

> **Note:** If both the *Add* and *Delete* buttons are not shown, you
> are not running the tool as the *Administrator*. Click the
> *Quit* button, click the *Administrator* button on the
> main System Manager *window,* then restart the tool. If
> only the *Add* button is not shown, *NFS* is not installed
> on your system.

4. Enter the *pathname* of the directory on your workstation from
    which you want to access the new drive. For example, if you plan
    to use this drive mainly to store images, you might like to access
    it from a directory called */usr/images*.

    This directory is called the *mount point* and will display the
    contents of the mounted disk. It should be an empty
    directory on your workstation that is set up specifically for
    accessing a disk. If the directory doesn't already exist, the
    Disk and File tool creates it for you.

- Click in the field labeled *Mount files at this directory*, then type in the pathname.

5. Prepare the system to *mount* the disk.

   - Click the *Mounted* button to prepare the system to add the directory. (The system doesn't actually mount the disk until you click the *Accept* button.)

   - Click the *Unmounted* button if you want to retain the mount point information (the name of the directory from which you will access it) but do not want the system to mount the disk at this time.

   - At this time you can request more information and the opportunity to further customize the drive or export the file system by clicking the *Yes* button next to *Show detailed info?* To modify any of the detailed information, see "Customizing and Exporting a Local File System" on page 7-9.

6. Have the system mount the disk.

   - Click the *Accept* button if all of the information is correct. You return to the Disk and File tool, and the unmounted icon changes into a mounted icon that's labeled with the mount point (directory) that you specified.

   Note: If the unmounted *disk resource* icon does not turn into a mounted file system icon, the system was unable to mount the file system.

   - Click the *Cancel* button if you decide not to mount the disk at this time. You return to the Disk and File tool and the system discards all your changes.

7. Try to access the file system.

   - If you set up a CD-ROM or floppy drive, insert either a CD or an MS DOS floppy disk into the drive.

   - Look for the new directory (the mount point that you specified in step 4) in your *WorkSpace window* (see *IRIS Essentials* for detailed instructions).

   - Double-click the directory icon to open it.

   - If this is a CD drive, you should see the contents of the CD in the Directory View *window*.

- If this is a hard disk or a floppy disk, try to copy a simple test file to the directory.

  If the copy succeeds, the file system is mounted properly.

  If you see a message reporting that you do not have *permission* to write to the directory, use the information in *IRIS Essentials* to use the Long File Info sheet to give the correct users permission to write to the directory.

- To eject a floppy disk from the drive, open a *shell* window and type:

  `eject`

  Then press `<Enter>`.

Customizing and Exporting a Local File System

You can customize your access to a *file system* or *export* the file system when you *mount* it for the first time, and you can modify information about existing mounted file systems. This section shows you how to customize and export a local file system. (See also "About the Disk and File Tool" on page 7-2 for more background information.)

The Disk and File tool lets you export full file systems only. To export individual directories, see "Exporting Individual Directories" on page 7-22.

You see the customization form shown in Figure 7-3 when you click the *Yes* button next to *Show detailed info?* on a particular file system's form.
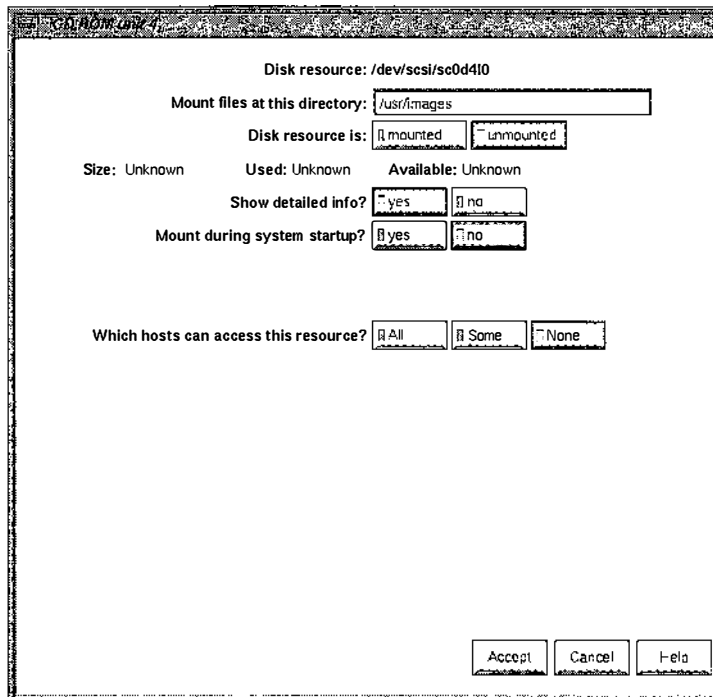
Figure 7-3 Detailed information about a local file system.

1. Specify when and how you want your *system* to mount the local
   file system by responding to *Mount during system startup?*

   ■ Click *Yes* to mount the local file system each time you start
     your system.

   ■ Click *No* to stop your IRIS from mounting the local file
     system the next time you start your *workstation*. This lets you
     mount a local file system on a temporary basis.

     Note: If this is a file system on the system disk, you
     must respond *Yes* to this question.

2. Specify whether you want the system to automatically check the
   file system for consistency each time it starts up by responding to
   Check files during system startup?

   Note: If this is a CD-ROM drive, this question does not
   appear.

- Click *Yes* to check the file system. This ensures that if you ever experience a system failure while using this file system, the system will automatically check and correct inconsistencies in the file system when you restart it.

- Click *No* to disable this feature and speed up system startup.

3. Specify whether you want to add or change data on this file system by responding to *Allow <hostname> to write to this resource?*

   Note: If this is a CD-ROM drive, this question does not appear.

   - Click *Yes* to create new files and change existing files on this file system.

   - Click *No* to prevent the writing of data to the local file system.

4. Allow all, some, or no hosts to view this file system (in other words, specify whether you will export this file system) by responding to *Which hosts can access this resource?*

   - Click *All*, *Some*, or *None*. If you click *Some*, you see the field shown in Figure 7-4.

Hosts allowed access? [   ]

Figure 7-4   Hosts allowed access? field.

   - Click in the field, then type the names of the hosts. Separate hostnames with commas.

   - If this is a CD-ROM drive, go on to step 8.

5. Allow all, some, or no hosts to change or create information in this file system by responding to *Which of these hosts can write?*

   - Click *All*, *Some*, or *None*. If you click *Some*, you see the field shown in Figure 7-5.

Hosts allowed to write? [   ]

Figure 7-5   Hosts allowed to write? field.

- Click in the field, then type the names of the hosts. Separate hostnames with commas.

6. Allow some or no hosts to access this file system using the *root account*; this gives users on a remote host the same privileges as the *Administrator* of your system, which can seriously compromise the integrity and security of your data (see also "The Administrator's (root) Account" on page 2-7). Respond to *Allow some hosts to have root permission?*

   - Click *No* to deny *root* access from all remote hosts.

   - Click *Yes* to see a field in which you can specify the names of the hosts that have *root* access to this file system; type in the hostnames, separating them with commas.

7. Restrict access to files owned by unknown users.

   If an Administrator on a remote host tries to access a file owned by an unknown *user ID*, let the Administrator access the file as a user with limited access *permission*. The default is the *nobody* account. To specify a different account, *select nobody*, then type in a new account (for example, *guest*).

8. Have the system mount the file system using this information, or cancel your request to mount it.

   - Click the *Accept* button if all the information is correct. You return to the Disk and File tool, and the unmounted icon changes into a mounted icon that's labeled with the *mount point* (directory) that you specified.

   Note: If the unmounted *disk resource* icon does not turn into a mounted file system icon, the system was unable to mount the file system.

   - If you decide that you don't want to set up a mount point using this information, click the *Cancel* button. The system discards your changes and the file system still appears as an unmounted disk resource icon in the Disk and File tool.

9. Close the Disk and File tool or customize additional file systems.

   - If you're finished, click the *Quit* button.

   - If you have more file systems to customize, open the file system's icon and return to step 1.

10. If you exported any file systems, ask a user on one of the hosts to which you granted access to try to mount the file system.

Accessing a Remote File System

A *remote file system* is an entire disk or a partition on a disk that resides on a remote *host* that you can access across the *network*. When you *mount* a remote file system, that file system appears in your directory structure and is available as if it were a disk connected to your *workstation*. (See also "About the Disk and File Tool" on page 7-2 for more background information.)

You can mount remote file systems only if your *system* and the remote hosts whose file systems you want to access are running the optional *NFS* software. (See also "About NFS" on page 3-11.)

You can mount remote file systems only on hosts where the *Administrator* has exported the file systems and specified that your particular workstation may access them. You can *export* your own file systems or directories by following the instructions in "Customizing and Exporting a Local File System" on page 7-9 and "Exporting Individual Directories" on page 7-22.

Mounting a Remote File System

This section shows you how to *mount* a remote *file system* residing on another *host*. Before mounting a remote file system, ask the *Administrator* on the remote host to *export* the appropriate file system or directory for your use.

To mount a remote file system, follow these steps:

1. Start the *System Manager*.

   ■ Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

   ■ Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

- Manage the tool as the *Administrator* by clicking the *Administrator* button. If the system requests a *password*, type it in, then press <Enter>.

2. Start the Disk and File tool.

- Double-click the Disk and File icon to open the tool.

3. Click the *Add* button.

   Note: If both the *Add* and *Delete* buttons are not shown, you are not running the tool as the Administrator. Click the *Quit* button, click the *Administrator* button on the main System Manager *window,* then restart the tool. If only the *Add* button is not shown, NFS is not installed on your system.

   You see the form shown in Figure 7-6.
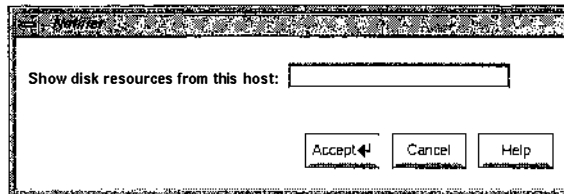
Figure 7-6   Form for specifying the host whose file system you want to access.
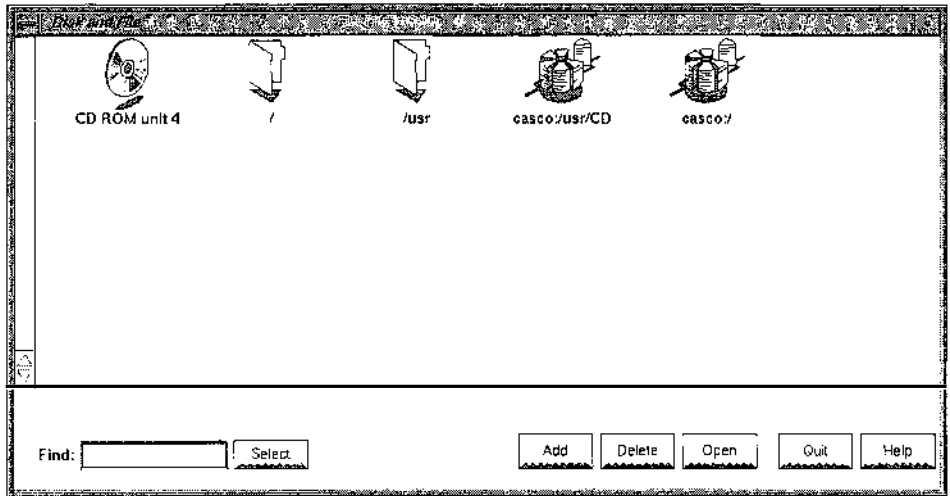
4. Type the name of the host where the remote file system is located.

   If you know the exact *pathname* of the file system you want to mount, enter it here. For example, to mount */usr* from the host *casco*, type `casco:/usr`. This gives you access to the */usr* file system on host *casco*.

   If you don't know the exact pathname, enter only the *hostname*.

5. Click *Accept* or press <Enter>.

   A new disk icon appears for each file system that the host allows others to access. Figure 7-7 shows that *casco* has two file systems available: */usr/CD* and */*. It also shows that the local *workstation* has an unmounted CD-ROM drive.
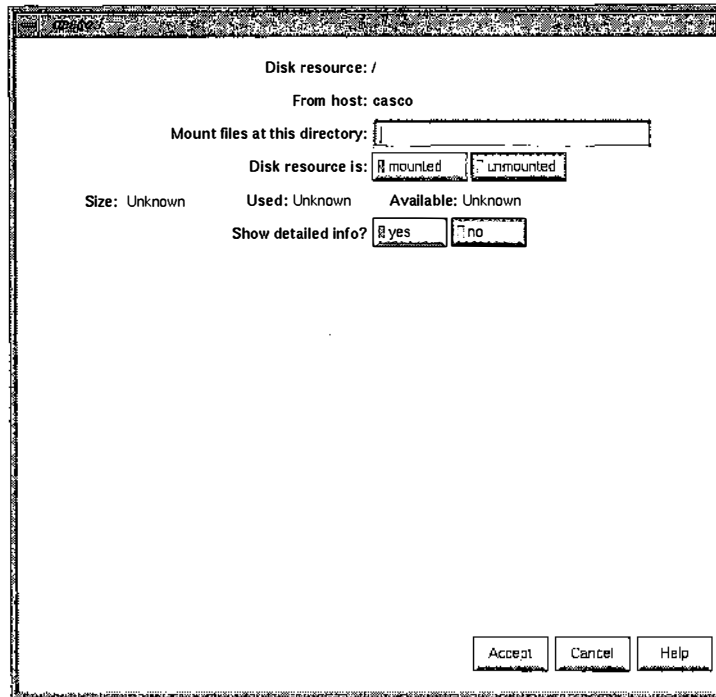
Figure 7-7 New remote disk resource icons in the Disk and File tool.

You can now set up the new file system(s).

6. Double-click the new disk icon to open it.

The form shown in Figure 7-8 appears.

Figure 7-8 Setting up a remote file system.

7. Click in the field next to *Mount files at this directory* and type in the pathname of the directory on your workstation from which you want to access the new file system. This directory is called the *mount point* and will display the contents of the mounted remote file system.

For example, if you specify the file system */usr/CD* on the *casco* workstation as a remote *disk resource*, and you want to access it as */usr/images* on your own IRIS, you enter */usr/images* in the field. Afterward, any files located on the remote */usr/CD* file system will be available in the */usr/images* directory on your own system.

The mount point should be an empty directory on your workstation that is set up specifically for mounting a disk. If the directory doesn't already exist, the Disk and File tool creates it for you.

8. Prepare the system to mount the disk.

- Click the *Mounted* button to prepare the system to add the directory. (The system doesn't actually mount the file system until you click the *Accept* button.)

- Click the *Unmounted* button if you want to retain the mount point information (the name of the directory from which you will access it) but do not want the system to mount the file system at this time.

- Now you can request more information and the opportunity to further customize your access to the file system by clicking the *Yes* button next to *Show detailed info?* To modify any of the detailed information, see "Customizing a Remote File System" on page 7-17.

9. Have the system mount the file system.

- If all the information is correct, click the *Accept* button. The unmounted disk icon changes into a mounted file system icon labeled with the mount point you specified.

- If you decide that you don't want to set up a mount point after all, click the *Cancel* button. This takes you back to the Disk and File tool and discards your entries.

10. Close the Disk and File tool or mount additional file systems.

- If you're finished, click the *Quit* button.

- If you have more remote file systems to mount, return to step 3.

Customizing a Remote File System

You can customize your access to a remote *file system* when you *mount* it for the first time, or you can modify access information about existing mounted file systems. This section tells you how to customize your access to a remote file system residing on another *host*. (To customize a local file system, see "Customizing and Exporting a Local File System" on page 7-9.)

You see the customization form shown in Figure 7-9 when you click the *Yes* button next to *Show detailed info?* on a particular remote file system's form.

Disk resource: /

From host: casco

Mount files at this directory: /usr/images

Disk resource is: [mounted] [unmounted]

Size: Unknown   **Used:** Unknown   **Available:** Unknown

Show detailed info? [yes] [no]

Mount during system startup? [yes] [no]

Allow mainiac to write to this resource? [yes] [no]

During system startup, retry mounts in: [Foreground] [Background]

Wait until host responds? [yes] [no]

Allow interrupts? [yes] [no]

[Accept] [Cancel] [Help]

Figure 7-9   Detailed information about a remote file system.

1. Specify when and how you want your *system* to mount the remote file system by responding to *Mount during system startup?*

    ■   Click the *Yes* button to mount the remote file system each time you start your system, then click the *Background* button that appears.

        Your system tries for 60 seconds to mount the remote file system. If it cannot mount it, it gives up, then tries again for another 60 seconds; it continues trying indefinitely. When you click the *Background* button, the system retries the mount in the background while allowing the system to start up and run processes as usual. It continues trying to mount, but doesn't send messages to the *console*.

If you click *Foreground*, the retries occur in the foreground and the system won't start until it successfully mounts the remote file system. This means if the host where the remote file system resides is not running, or the *network* is down, you won't be able to bypass the mount to *log in* to your system. In other words, it disables your system.

■ Click the *No* button to keep your IRIS from mounting the remote file system the next time you start your *workstation*.

This means that every time you restart your workstation and decide you want to access the remote file system, you must re-mount it by following the steps in "Mounting a Remote File System" on page 7-13.

2. Specify whether you need to be able to make changes (write) to the remote file system by responding to *Allow <hostname> to write to this resource?*

■ Click *Yes* to let yourself write to the remote file system from your local mount point.

■ Click *No* to prevent the writing of data to the remote file system.

If *No* appears as the default, the remote host already has restricted access to the file system. If you need to modify or create files on the file system, ask the *Administrator* on the remote host to modify the access restrictions for you.

3. Respond to *Wait until host responds?*

This feature is important when the connection between your system and the remote system is interrupted.

■ Click the *Yes* button if you want the *window* where you are accessing the remote host to freeze until it can access the remote file system. In this situation you won't be able to continue working in that window until the remote host is accessible again. If you click *Yes*, the form displays a question asking whether you want to allow system interrupts. Go on to the next step.

■ Click the *No* button if you want your system to try to access the remote host once more in 60 seconds. If the remote host

still doesn't respond, your system doesn't try again. In this situation you can continue to do your work in that window.

4. Respond to *Allow interrupts?*

   This feature is important when the connection between your system and the remote system is interrupted.

   - Click the *Yes* button if you want to be able to use `<Ctrl-C>` (the break command) to *quit* the process or command running in the window where you were accessing the remote file system before it went down.

5. Have the system mount the file system using this information, or cancel your request to mount it.

   - If all the information is correct, click the *Accept* button. The unmounted *disk resource* icon turns into a mounted file system icon.

   - If you decide that you don't want to set up a mount point using this information, click the *Cancel* button. The system discards your changes and the file system still appears as an unmounted disk resource icon in the Disk and File tool.

6. Close the Disk and File tool or customize additional file systems.

   - If you're finished, click the *Quit* button.

   - If you have more file systems to customize, open the file system's icon and return to step 1.

Deleting Disk Resources and File Systems

If you no longer need to access data from a disk that appears as either a *disk resource* (an unmounted disk or CD) or a *file system* in your directory structure, you may want to remove it from the list of available resources.

Note: The files in / and */usr* are required by the *IRIX* system and cannot be deleted.

1. Start the *System Manager*.

   ■ Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

   ■ Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

   ■ Manage the tool as the Administrator by clicking the *Administrator* button. If the system requests a *password*, type it in, then press **<Enter>**.

2. Start the Disk and File tool.

   ■ Double-click the Disk and File icon to open the tool.

3. Specify the disk resource or file system you want to delete.

   ■ Select the icon and click the *Delete* button.

4. Respond to the notifier.

   ■ If you are deleting an unmounted remote file system, a notifier tells you that a resource is about to be removed. Click the *Accept* button to remove the resource. The icon disappears from the Disk and File tool. Click the *Cancel* button to retain the unmounted resource.

   ■ If you are deleting a mounted file system, a notifier appears and asks if you also want to delete the directory *mount point*. Leave the default *No* highlighted to retain the mount point, or click *Yes* to delete the mount point. Then click the *Accept* button to delete both the file system and disk resource. Click the *Cancel* button to retain the mounted resource.

5. Close the Disk and File tool or delete additional file systems or disk resources.

   ■ If you're finished, click the *Quit* button.

   ■ If you have more file systems or disk resources to delete, return to step 3.

Exporting Individual Directories

The Disk and File tool lets you *export* and set access *permission* only for an entire *file system,* such as / or */usr.* Sometimes, however, a user may want to *mount* only a particular directory within the large file system that you have exported; similarly, you may not want to mount someone else's large file system when you're interested in only one directory.

To let other users mount an individual directory, you must edit */etc/exports* (a file of *export* parameters) on the *host* where the directory resides to specify the mountable directories and the names of the hosts permitted access to those directories.

To edit the */etc/exports* file, you can use the mouse-based editor, *jot*, or a text-based editor such as *vi.* After you edit the */etc/exports* file, you give the *exportfs* command to activate the settings in the file.

To specify a directory for export, follow these steps:

1. *Log in* as *root* through a *shell* window.

   ■ Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

   ■ Drag the cursor down the *menu* until "Shell" is highlighted; then release the mouse button. The outline of a *window* appears.

   ■ Position the outline where you want the window to appear; then click the left mouse button.

   ■ Position your cursor within the new window and type:

     `login root`

     Then press `<Enter>`.

     If a prompt for a *password* appears, type the password then press `<Enter>`. If a prompt appears but the *root account* has no password, just press `<Enter>`.

2. Edit the file */etc/exports* by adding a line specifying the export directory, the hosts who can access it, and what permission they have.

- Open the file with a text editor such as *jot* by typing:

  jot /etc/exports

  Then press **<Enter>**. For detailed information on using the *jot* text editor, see the *IRIS Utilities Guide*.

- Add a line in this format:

  export_directory -access=*host:host:host*,ro

  For example, to export the */usr/people/mills/work* directory so hosts *mars* and *venus* can access it with read-only permissions, add this line:

  /usr/people/mills/work -access=mars:venus,ro

  The values after -access= identify the hosts that are permitted to mount the directory (*mars*, *venus*). You can specify as many hosts as you like, separating hostnames with colons. The ro indicates that read-only access only will be accorded the hosts. See the *man page* for *exportfs* to find out about other permissions you can set.

- Save your changes and *quit jot*.

3. At the system *prompt* (#), type:

   exportfs -a

   Then press **<Enter>**.

   The specified directory is now available for mounting by the hosts identified in the */etc/exports* file.

   Additional parameters in the *exportfs* command line will provide variations on exporting directories. For example, the command *exportfs -u* reverses an export command, "unexporting" directories indicated in the */etc/exports* file. For more information on the *exportfs* command, see the man page for *exportfs*.

4. *Log out* of the *root* account by typing:

   logout

   Then press **<Enter>**. The shell window disappears.

Automatically Protecting Directories and Files

Because other users can freely access files and directories across a *network*, it is important that you manage access to your files and directories by specifying the *permission* allowed each user or *host*. Permissions govern whether other users can read, write, or execute (in the case of applications) files. You can use the *WorkSpace window* to set permissions on any files or directories you own. For more information on setting permissions, see *IRIS Essentials*.

While it is relatively simple to set permissions for files and directories, you can make the task easier by creating a file-creation mode mask with the IRIX *umask* command. Basically, the *umask* command specifies a template for automatically setting permissions on newly created files and directories. Typically, you will use *umask* to deny write permission to other users, preventing them from modifying your files.

To specify a mask for setting file permissions, follow these steps:

1. *Log in* as *root* through a *shell* window.

   - Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

   - Drag the cursor down the *menu* until "Shell" is highlighted; then release the mouse button. The outline of a *window* appears.

   - Position the outline where you want the window to appear; then click the left mouse button.

   - Position your cursor within the new window and type:

     ```
     login root
     ```

     Then press `<Enter>`.

     If a prompt for a *password* appears, type the password then press `<Enter>`. If a prompt appears but the *root account* has no password, just press `<Enter>`.

2. From the shell, type the *umask* command with parameters indicating the permissions to be accorded. For example, to specify that only the file's owner will have permission to change all new files, type:

   umask 022

   Then press **<Enter>**.

3. *Log out* of the *root* account by typing:

   logout

   Then press **<Enter>**. The shell window disappears.

Additional parameters in the *umask* command line provide variations on the permission mask. For example, the command *umask 026* specifies that users outside of a user group will be unable to read, write or execute files. For more information on the *umask* command, see the *man page* for *umask*.

Managing Disk Space

It is important to make sure your disk does not accumulate too much information. A disk that is too full can behave erratically and prevent you from using the *WorkSpace window, System Manager*, or *IRIX* commands. You should periodically check how much of the disk is being used, and regularly remove unneeded files and directories.

If your disk becomes too full to complete a command, you'll see an error message in the *console* window that says the *system* is out of disk space; see "Freeing Up Disk Space" on page 7-27.

If you ever see an error message that says the system was unable to allocate swap space, you may have space on your disk, but the space is not available on the correct part of the disk for your particular application. See the section on increasing swap space in the *IRIX Advanced Site and Server Administration Guide*.

About the System Disk and Optional Disks

The *system disk* (the disk that contains *IRIX*) is divided into two file systems: the *root (/) file system* contains all the system files and directories that your *system* needs to operate; the */usr* file system is available for you to store your own information. The partition of the disk allocated to the *root* file system is large enough to hold the system files and status files that IRIX creates; if this partition ever fills up, remove all files in the */tmp* and */lost+found* directories.

Optional disks usually contain only one file system, and the entire disk is dedicated to storing your information; no system files are on the disk.

Checking Disk Use

There are several ways to check how much of the disk is being used (contains information) and how much information is contained in specific directories.

To check *disk use* with the *System Manager*, use the Disk and File tool to open the icon that represents the disk, then look for this line:

```
Size: 584415 KBytes Used: 7% Available: 545510 KBytes
```

This tells you that the disk can hold up to 584415 kilobytes (*Kb*) of information; right now only 7% of the disk contains information; 545510 kilobytes are available for storing more information.

To check disk use with IRIX, use the *df -k* command. Open a *shell* window and type:

```
df -k
```

Then press <Enter>. If you have only a *system disk* installed, you see a listing similar to this:

```
Filesystem Type    kbytes use   avail %use  Mounted on
/dev/root  efs     15275 10011 5264   66%   /
/dev/usr   efs     584415 38905 545510 7%    /usr
```

This gives you the same information as the System Manager, but shows all file systems that are available to you at once. In both listings, the most important information is in the %use column. Try to keep this number below 95%. If it ever exceeds 95%, use the information in "Freeing Up Disk Space" on page 7-27 to remove some files and directories.

You can also check how much information is stored in particular directories on the disk with the *du -k* command. For example, to check the */usr/people/joe* directory, open a shell window and type:

```
du -k /usr/people/joe
```

Then press <Enter>. You see a listing similar to this:

```
1000    /usr/people/joe/projects
200     /usr/people/joe/notes
1400    /usr/people/joe
```

This shows that */usr/people/joe* contains 1400 kilobytes of information; the */usr/people/joe/projects* directory contains 1000 of those kilobytes, and the */usr/people/joe/notes* directory contains 200. The listing shows only directories; you can tell from the numbers that some files in */usr/people/joe* take up an additional 200 kilobytes
(1400 – 1000 – 200 = 200).

Freeing Up Disk Space

You can free up disk space in two ways:

- remove files and directories
- remove all or part of a *software option*

Note: Before you remove any information, make a full backup of the *file system*.

This section provides guidelines for deciding which files and directories to remove. If you want to remove all or part of a software option, see the section that describes removing software in the *IRIS Software Installation Guide*.

Before you start looking for information to delete, check with the users of your system; they may be working with some large files temporarily. Then start your search with these directories and files:

/tmp or */usr/tmp*	Because of the relaxed *permission* for these directories, users and some IRIX commands often copy files to them. Check these directories and remove files that you do not need.
/lost+found	When an application or *system software* fails, the system tries to salvage files that had not been saved recently. It places these files in */lost+found*. Check the files and remove those that you do not need.
/usr/adm/SYSLOG	This file records system activity since the last time you started up the system. It can become very large if a runaway process keeps reporting error conditions to the file. If the file seems very large, remove all but a few lines of the file; do not remove the file itself.
home dir/mbox	If a user doesn't remove mail messages after reading them, the mail messages are placed in the *mbox* file in that user's *home directory*. If the file seems very large, ask the user to remove some messages.
home dir/dumpster	When you drag files to the *dumpster*, the IRIS does not automatically remove those files from the disk. To remove them, *select* the dumpster and choose "Empty Dumpster" from the WorkSpace *menu*. To change this behavior so the IRIS automatically removes files from the disk when you drag them to the dumpster, choose "Set Preferences" from the WorkSpace menu and click *No* next to *Retain removed files*.

Managing Processes

8

Chapter 8

Managing Processes

IRIX is a multi-tasking operating system. This means that your *IRIS* can perform many operations simultaneously. For example, you can run an application, print a file, and read your mail at the same time, without having to wait for each operation to complete before beginning the next one.

Every program that you run on the IRIS is assigned a process ID that allows IRIX to keep track of what it is doing. By identifying the process numbers assigned to tasks you can manage your operations more effectively.

About Processes

When you are working at your IRIS, the IRIX process that you are currently working with, either from the keyboard or with the *mouse*, is known as the *foreground process*. Any other *IRIX processes* running on the IRIS are known as *background processes*.

Monitoring Processes

While many of the processes you are performing may be readily identifiable within WorkSpace, many others including printing and some complex graphics operations may be hidden from you. To identify quickly all the processes running on your IRIS, you can enter the IRIX *ps* (processor status) command in an IRIX *shell*. (For more information on IRIX shells, see "The IRIX Shell" on page 2-9.)

To monitor processes, follow these steps:

1. Open a shell *window*.

   ■ Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

   ■ Drag the cursor down the *menu* until "Shell" is highlighted; then release the mouse button.

   ■ Position the window outline where you want the window to appear; then click the left mouse button.

2. Position your cursor within the new window and type:

   ps -a

   Then press **<Enter>**.

   When you enter the *ps -a* command, IRIX lists a process ID number (PID), a terminal ID (TTY), time, and name of each process currently running on your *system*. For example:

   ```
   PID    TTY    TIME    COMMAND

   7662   ttyq1  4:54    csh

   7668   ttyq1  15:04   ps

   7670   ttyq1  15:14   cedit
   ```

   Additional parameters in the *ps* command line will provide more comprehensive listings. For example, the command *ps -ef* generates a full listing with greater detail about each process running on the system. For more information on the command, see the *man page* for *ps*.

Killing Processes

Occasionally you may want to stop a process—for example, a PostScript® printing process that measurably slows down *system* operations. In many cases, you can use an application command to terminate a process from the WorkSpace. But in some instances, you will need to terminate the process from the *shell* by using the *kill* command. A regular user can use the command only to kill his or her own processes; a user logged in as the *Administrator* can kill any process running on the *workstation*.

Note: If a system process is killed by an Administrator, the termination may cause the system to hang or crash. Always save your current work before killing a system process as the Administrator.

To kill a process, follow these steps:

1. Open a shell *window*.

    ■   Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

    ■   Drag the cursor down the *menu* until "Shell" is highlighted; then release the mouse button.

    ■   Position the window outline where you want the window to appear; then click the left mouse button. If you want to kill a process that you started while logged in as a regular user, go on to step 2.

    ■   To kill a process started by the Administrator, or to kill processes started by several different users, *log in* as *root* by typing:

        login root

        Then press **<Enter>**.

        If a prompt for a *password* appears, type the password then press **<Enter>**. If a prompt appears but the *root* account has no password, just press **<Enter>**.

2. Position your cursor within the new window and type:

   `ps -ef`

   Then press **<Enter>**.

   The listing provides a full listing, including the process ID (PID), of all processes that are currently running. Find the one that you want to terminate.

3. Use the *kill* command with the PID as the parameter. For example, to kill process number 754, type:

   `kill 754`

   Then press **<Enter>**.

   Additional parameters in the *kill* command line will provide variations on process terminations. For example, the command *kill -9* is a "sure-kill," terminating almost any type of process. For more information on the *kill* command, see the *man page* for *kill*.

Backing Up and Restoring Files

9

Chapter 9

Backing Up and Restoring Files

An important part of managing your *IRIS* is developing a strategy for saving your data. This chapter describes how to use the Backup and Restore tool to make a *backup tape* of user data and then to *restore* that data to the *system* if it is ever lost or compromised. It also describes standard *IRIX* backup and restoration tools.

This chapter contains these sections:

- "Developing a Backup Strategy" on page 9-2 explains how to make a schedule for regular backups and describes how to select the right kind of tape on which to make your backup.

- "About the Backup and Restore Tool" on page 9-2 explains what the tool does, shows how to start it, and describes all the buttons in the tool.

- "About Tape Formats and Capacities" on page 9-5 describes the different available formats and discusses compatibility issues.

- "Backing Up Files Using a Local Tape Drive" on page 9-6 explains how to make a backup tape using a tape *drive* installed on your IRIS.

- "Backing Up Files Using a Remote Tape Drive" on page 9-10 explains how to make a backup using a tape drive on another system on the *network*.

- "Restoring Files from a Tape" on page 9-14 explains how to use a tape you made with the Backup and Restore tool to restore files to your system.

- "Using Other Tools to Back Up and Restore Files" on page 9-19 describes other standard IRIX tools for backing up and restoring information. It also explains how to use the IRIX *tar* utility.

Developing a Backup Strategy

The first step toward ensuring the safety of your *system* is to develop a backup strategy. You should plan on performing incremental backups each day and backing up the entire system at least once a week. See your *network administrator* to coordinate your backup strategy with the overall scheme of *network* backups.

Note: Always make a new backup of the entire system after you work on user accounts, add *peripheral* devices, or install new software. Otherwise, in the event of a system failure, customized system information will be lost.

Make sure all users agree to and are aware of the set time for the weekly backup. Try to schedule it for a time when the system is not usually being used, such as early on Monday morning or late Friday afternoon.

Always use at least two sets of backup tapes between which you alternate the weekly backup. When you start a backup, the system copies this new information over the old, which effectively deletes the old information. If you use last week's *backup tape* to perform this week's backup, you run the risk of having a system failure when the tape contains some combination of new and old information.

Finally, the tape *drive* is an option on the *IRIS*. If you do not have a tape drive, you can *back up* your IRIS using the tape drive of another IRIS that is part of your network.

About the Backup and Restore Tool

The Backup and Restore tool lets you *back up* and *restore* the entire contents of a disk or selected directories and files onto a tape in either a local tape *drive* (one that is physically connected to your *IRIS*) or a remote tape drive (one that is physically connected to another IRIS on the *network*).

Note: This tool is based on the standard *IRIX* utility called *bru*. For more information on *bru*, see "Using Other Tools to Back Up and Restore Files" on page 9-19.

You access the Backup and Restore tool through the *System toolchest* in the upper left corner of your *screen*. To use the tools, you need to know the basic *mouse* techniques summarized in the tutorial and reference chapters in *IRIS Essentials*.

To start the Backup and Restore tool, follow these steps:

1. Start the *System Manager*.

   - Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right mouse button.

   - Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

   - Manage the tool as the *Administrator* by clicking the *Administrator* button. If the system requests a *password*, type it in, then press **<Enter>**.

2. Start the Backup and Restore tool.

   - Double-click the Backup and Restore icon to open the tool.

     The form shown in Figure 9-1 appears.
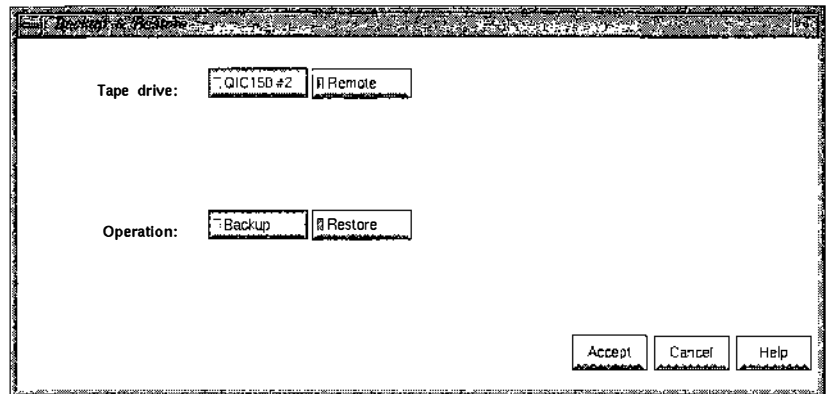
Figure 9-1 The Backup and Restore tool.

For each local tape drive installed on your *workstation*, the form displays a button showing the tape drive type and *SCSI address*. If your *system* is on a network, the form also displays a button for using a remote drive. If only a *Remote* button appears in the form, your workstation does not have a tape drive connected to it. (See also "Backing Up Files Using a Remote Tape Drive" on page 9-10.)

If you don't have a tape drive connected to your system and the system is not connected to a network, you see a notifier (instead of the form in Figure 9-1) telling you that you don't have access to a tape drive. If an existing Ethernet network is available, follow the instructions in "Setting Up a Networked IRIS" on page 3-7 to become a member of the network where you can access a remote tape drive. If there is no network available, contact Silicon Graphics to order a tape drive for your workstation.

The list below describes each of the buttons you see in this tool.

QIC 150 #2   This button appears next to the *Tape drive* field only if you have a tape drive connected to your workstation. The label on this button varies depending on the *SCSI address* and type of your local tape drive. For example, *QIC 150 #2* shows that you have a QIC 150 drive whose address is 2. (See also "About Tape Formats and Capacities" on page 9-5.)

Click this button to *back up* or *restore* information using the local tape drive.

Remote   This button appears next to the *Tape drive* field only if your system is connected to a network. Click this button to back up or restore information using a remote tape drive. A field appears in which you type the name of the *host* to which the tape drive is connected.

Backup   Click this button to back up information onto a tape.

Restore   Click this button to restore information from a tape.

Accept	After specifying either a local or remote tape drive and indicating whether you are backing up or restoring information, click *Accept*.
Cancel	To close the Backup and Restore tool without backing up or restoring information, click the *Cancel* button.
Help	To see on-line information about the Backup and Restore tool, click the *Help* button.

About Tape Formats and Capacities

Silicon Graphics supplies two different types of SCSI tape drives:

- QIC 24 drives can read and write to only low-density tapes. These tapes can store up to 60 Mb of information.

- QIC 150 drives can read both low- and high-density tapes, but can write to only high-density tapes. These tapes can store up to 150 Mb of information.

If you try to copy to the wrong type of tape using a *SCSI device*, you will see error messages and the copy will not work.

Note: Do not use the software tapes that came with your *IRIS* for your backups.They contain installation tools and *system software* that you need should your system ever have a serious software failure.

Silicon Graphics also supplies 4mm and 8mm tape drives:

- 4mm (*DAT*) drives use the DDS (not DataDAT) format. 60-meter (60-minute) tapes can store up to 1300 Mb and 90-meter (90-minute) tapes can store up to 2000 Mb of information.

- 8mm drives write the NTSC (US) format to P6 tapes and the PAL (European) format to P5 tapes. 112-meter (120-minute) P6 tapes can store up to 2093 Mb and 122-meter (90-minute) P5 tapes can store up to 2279 Mb of information.

When you purchase additional tapes, be sure to specify which type of drive you have. To check which type you have, start up the Backup and Restore tool as described in "About the Backup and Restore Tool" on page 9-2. The button next to the *Tape drive* field is labeled with the drive type.

You also insert and lock tapes into the drive differently depending on the type of drive. See the installation guide included with the drive or your *workstation* owner's guide for this information.

Backing Up Files Using a Local Tape Drive

Use these instructions to *back up* your data onto a tape *drive* that is physically connected to your own workstation (a local drive). See the owner's guide provided with your *IRIS* for more information on the tape drive installed in your workstation.

You use the Backup and Restore tool to specify which tape drive you want to use and which files you want to back up. To use the tools, you need to know the basic *mouse* techniques summarized in the tutorial and reference chapters of *IRIS Essentials*.

To back up files onto a tape in a local drive, follow these steps:

1. Start the *System Manager*.

    ■   Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right mouse button.

    ■   Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

    ■   Manage the tool as the *Administrator* by clicking the *Administrator* button. If the system requests a *password*, type it in, then press **<Enter>**.

2. Start the Backup and Restore tool.

    ■   Double-click the Backup and Restore icon to open the tool.

        The Backup and Restore tool shown in Figure 9-1 appears.

For each local tape drive installed on your workstation, the form displays a button showing the tape drive type and address. The form also displays a button for using a remote drive.

If only a *Remote* button appears in the form, your workstation does not house a tape drive, but your workstation is set up on a *network*. See "Backing Up Files Using a Remote Tape Drive" on page 9-10 for information on backing up to another system on the network.

Note: If you see a notifier (instead of the form in Figure 9-1) telling you that you don't have access to a tape drive, contact your *network administrator* and see "Setting Up a Networked IRIS" on page 3-7 to access the network, or contact Silicon Graphics to order a tape drive for your workstation.

3. Select the tape drive that you want to use.

   ■ Click the button for the tape drive that you want to use.

4. Specify that you want to copy files onto a tape in the selected drive.

   ■ Click the *Backup* button next to *Operation*.

5. Confirm the information displayed in the form.

   ■ Click the *Accept* button.

   The form shown in Figure 9-2 appears.

Insert a tape in the drive and click Accept.

Accept   Cancel
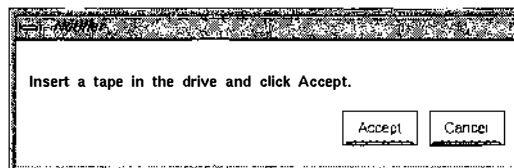
Figure 9-2   Notifier for inserting a tape.

6. Insert the proper type of tape in the drive.

- Insert a tape that matches the type you selected in step 3. (For example, QIC 150, QIC 24, or DAT; see also "About Tape Formats and Capacities" on page 9-5.)

- Click the *Accept* button.

  The form shown in Figure 9-3 appears.

Figure 9-3   The Backup form for a local tape drive.

7. Choose the parts of the *file system* you want to back up.

   - To back up all files on the system, leave *All* highlighted.

   - To back up only those files modified since a certain date, click *by Date*. You see the field shown in Figure 9-4.

Backup files modified since: 01/01/92

Figure 9-4   Date of modification field.

The date you made the last full backup appears in the form. You can either back up the files that were modified since that date, or click in the field and type in a different date. Make sure the date you enter is in the same format as the one that first appeared in the field (that is, month/day/year).

- To back up a specific directory, click *by Directory.* You see the field shown in Figure 9-5.

Backup these **directories** and files: [/_____]

Figure 9-5   Directories and files field.

Click in the field and type the full *pathname* of the directory or directories you want to back up to a tape. Separate the full pathnames with a comma and a space. For instance, to back up the directories */usr/people/joe* and */usr/people/bill*, you would type:

```
/usr/people/joe, /usr/people/bill
```

8. Start the backup.

- Click the *Start backup* button.

  Once the backup starts, the names of the files scroll through the *window* and a small red message next to the words *Backup is* says *Active.*

  The file names appear in this format:

  ```
  c 250k of 376k [1] usr/people/joe/projects
  ```

  This means that the file */usr/people/joe/projects* is taking up 250K of 376K already copied onto tape number 1.

- To pause the backup before it is complete, click the *Pause backup* button. To restart it, click the *Start backup* button.

- To cancel the backup before it is complete, click the *End backup* button. You see a notifier asking whether you really want to end the backup before it's complete. Click the *Accept* button to end the session without making a backup, or click *Cancel* and the system continues making the backup from where it left off.

9. When the backup is complete, the *End backup* button is highlighted.

Remove the tape from the drive, label it with the backup date and contents, and store it in a safe place. If the tape has a write-protect mechanism (such as a plastic dial), enable it.

Backing Up Files Using a Remote Tape Drive

Use these instructions to *back up* files onto a tape in a *drive* that is connected to another workstation on your *network* (a remote tape drive). To back up files using a remote drive, you need the name of the workstation to which the drive is connected and a tape onto which the drive can copy information. See also "About Tape Formats and Capacities" on page 9-5.

To back up files onto a tape in a remote drive, follow these steps:

1. Start the *System Manager*.

   - Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

   - Drag the cursor down the *menu* until "System Manager" is highlighted; then release the mouse button.

   - Manage the tool as the *Administrator* by clicking the *Administrator* button. If the system requests a *password*, type it in, then press <Enter>.

2. Start the Backup and Restore tool.

   - Double-click the Backup and Restore icon to open the tool.

     The Backup and Restore tool shown in Figure 9-1 appears.
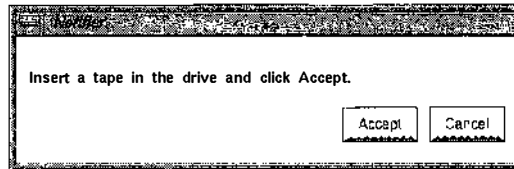
   Note: If a tape drive is installed on your *system* and your system is connected to a network, you see two buttons in the tape drive field: one for a local drive, labeled with the type of tape drive, and one for a remote drive that says *Remote*.

3. Select the tape drive that you want to use.

   - Click the *Remote* button.

     You see the *Remote hostname* field.

- Click in the field and type the name of the *host* where the tape drive is located.

4. Specify that you want to copy files onto a tape in the selected drive.

- Click the *Backup* button next to *Operation*.

5. Confirm the information displayed in the form.

- Click the *Accept* button.

The form shown in Figure 9-6 appears.

Insert a tape in the drive and click Accept.

Accept   Cancel

Figure 9-6   Notifier for inserting a tape.

6. Insert the proper type of tape in the drive at the remote host.

- Insert a tape that matches the type of drive that is connected to the remote host. (For example, QIC 150, QIC 24, or DAT; see also "About Tape Formats and Capacities" on page 9-5.)

- Click the *Accept* button.

The form shown in Figure 9-7 appears.
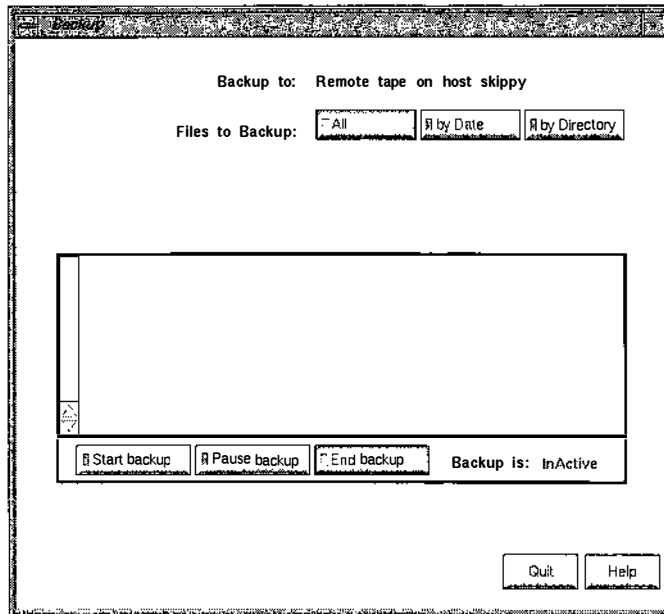
Figure 9-7   The Backup form for a remote tape drive.

7. Choose the parts of the *file system* you want to back up.

    ■   To back up all files on the system, leave *All* highlighted.

    ■   To back up only those files modified since a certain date, click *by Date*. You see the field shown in Figure 9-8.

Backup files modified since: 01/01/92

Figure 9-8   Date of modification field.

The date you made the last full backup appears in the form. You can either back up the files that were modified since that date, or click in the field and type in a different date. Make sure the date you enter is in the same format as the one that first appeared in the field (that is, month/day/year).

    ■   To back up a specific directory, click *by Directory*. You see the field shown in Figure 9-9.

Backing Up and Restoring Files

Backup these directories and files: [/_____]

Figure 9-9   Directories and files field.

Click in the field and type the full *pathname* of the directory or directories you want to backup to a tape. Separate the full pathnames with a comma and a space. For instance, to back up the directories */usr/people/joe* and */usr/people/bill*, you would type:

```
/usr/people/joe, /usr/people/bill
```

8. Start the backup.

   - Click the *Start backup* button.

     Once the backup starts, the names of the files scroll through the *window* and a small red message next to the words *Backup is* says *Active*.

     The file names appear in this format:

     ```
     c 250k of 376k [i] usr/people/joe/projects
     ```

     This means that the file */usr/people/joe/projects* is taking up 250K of 376K already copied onto tape number 1.

   - To pause the backup before it is complete, click the *Pause backup* button. To restart it, click the *Start backup* button.

   - To cancel the backup before it is complete, click the *End backup* button. You see a notifier asking whether you really want to end the backup before it's complete. Click the *Accept* button to end the session without making a backup, or click *Cancel* and the system continues making the backup from where it left off.

9. When the backup is complete, the *End backup* button is highlighted.

   Remove the tape from the drive, label it with the backup date and contents, and store it in a safe place. If the tape has a write-protect mechanism (such as a plastic dial), enable it.

Restoring Files from a Tape

If you accidentally remove a file or directory, or something goes wrong with the *system*, you can use your *backup tape* to *restore* your files and information. Make sure you have the most recent backup tape when you restore files. (You can also restore an old version of a file.)

If you do not have a local tape *drive*, you can restore files using a tape drive connected to a remote *host* on the *network*. If possible, use the same remote tape drive to *back up* and restore information. That way you'll be sure the drive can read your backup tape. (For more information on tape formats, see "About Tape Formats and Capacities" on page 9-5.)

You can use the tool only to restore files that you backed up with the Backup and Restore tool. To restore files archived with *tar*, see "An Introduction to Using tar" on page 9-21.

Caution: If you restore files to a directory in which files of the same name exist, the files on the hard disk will be replaced with the files from the tape.

Note: In the event of a serious system failure, you may need to restore the entire operating system. See your owner's guide or the *IRIS Software Installation Guide*.

To restore a file or *file system*, follow these steps:

1. Start the *System Manager*.

   - Move the cursor over the word "System" in the *Toolchest window*; then press either the left or right *mouse* button.

   - Drag the cursor down the *menu* until "System Manager" is highlighted; then release the *mouse* button.

   - Manage the tool as the *Administrator* by clicking the *Administrator* button. If the system requests a *password*, type it in, then press <Enter>.

2. Start the Backup and Restore tool.

   - Double-click the Backup and Restore icon to open the tool.

     You see the Backup and Restore tool shown in Figure 9-1.

If a tape drive is installed on your system, you see two buttons in the tape drive field: one for a local drive, labeled with the type of drive, and one for a remote drive that says *Remote*. If you don't have a local drive on your workstation, you see a *Remote* button and a field labeled *Remote Hostname*.

Note: If you see a notifier (instead of the form in Figure 9-1) telling you that you don't have access to a tape drive, contact your *network administrator* and see "Setting Up a Networked IRIS" on page 3-7 to access the network, or contact Silicon Graphics to order a tape drive for your workstation.

3. Select the drive you want to use to restore your information.

   ■ Click the local drive button to restore files from a drive installed on your workstation. The button is already selected if you have a tape drive installed on your workstation.

   ■ Click the *Remote* button to restore files using a tape drive from a workstation on your network. The *Remote* button is already selected if you don't have a local tape drive.

   ■ Click in the *Remote Hostname* field and type the name of the host housing the tape drive that you will use.

4. Specify that you want to restore information.

   ■ Click the *Restore* button next to *Operation*.

5. Confirm the information displayed in the form.

   ■ Click the *Accept* button.

   The form shown in Figure 9-6 appears.
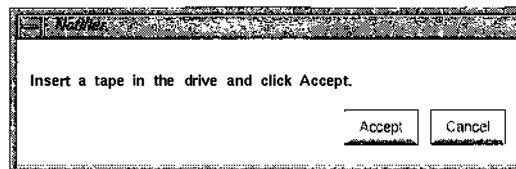
Figure 9-10 Notifier for inserting a tape.

Remember, you can restore files only from backups made with the Backup and Restore tool.

6. Insert the tape that contains the information that you want to restore.

- Click the *Accept* button.

  A form like the one shown in Figure 9-11 appears.

- If an error message states that the system cannot read the tape, either the tape was not created with the Backup and Restore tool, or the drive you are using cannot read the format of the tape (such as QIC 150, QIC 24, or DAT). Click the *Terminate* button.

  If the tape was created using the IRIX *tar* utility, see "Restoring Files from a Tape Using tar" on page 9-24.

  If the drive cannot read the format of the tape, find another workstation on the network that has the correct type of drive, and go back to step 2.

Figure 9-11 The Restore form for a tape drive.

7. Select the directories and files that you want to restore.

- ■ If you know the full *pathname* of the file(s) you want to restore, click in the field labeled *Restore these directories and files* and type in the pathname(s). Be sure to separate pathnames with commas or spaces.

- ■ To choose the files from a list, click *Yes* next to *List Contents of tape*.

The *window* shown in Figure 9-12 appears.

```
┌─────────────────────────────────────────────────────┐
│        List files, then  select files to restore     │
│ │                                                     │
│                                                       │
│                                                       │
│                                                       │
│                                                       │
│                                                       │
│ ▲                                                     │
│ ▼                                                     │
├─────────────────────────────────────────────────────┤
│ ▣ Start listing   ▣ Pause listing   ▢ End listing     Listing is:  InActive │
│                                                       │
│ Find:  ▒▒▒▒▒▒▒▒▒▒▒▒▒    Go to                         │
└─────────────────────────────────────────────────────┘
```
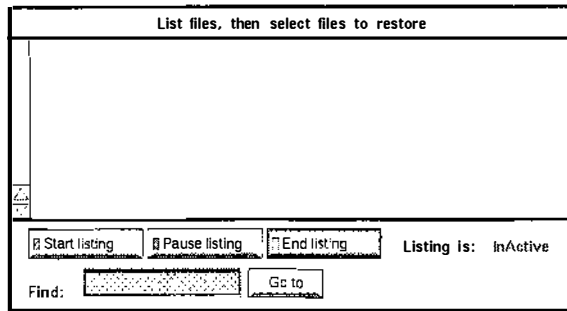
Figure 9-12 The Restore form window for listing the tape's contents.

- Click the *Start listing* button and then *select* (highlight) the files to restore. To select more than one file at a time, press and hold down the `<Shift>` key and click on the additional files.

- To find a specific file, list the contents of the tape, then type the full pathname of the file you are looking for in the *Find* field. Click the *Go to* button, and the tool displays the file you are looking for in the window.

8. Choose an option to restore files to the same directory from which they came.

- Click the *Yes* button to replace the files on your hard disk with files of the same name that are on the tape. If you click *Yes*, the files in the directory will be overwritten by the files on the tape.

- Click the *No* button if you don't want the tape to replace the files in the directory from which they came. You click *No* if you've been working on files in that directory since the time you made the backup, or if you want to compare old and new files. If you click the *No* button, you see the field shown in Figure 9-13.

Restore files to this directory: `⌐ /                                              `

Figure 9-13 Field for specifying a different directory.

- Click in the field and type the full pathname of a different directory to which you want the files restored.

9. Start the restoration.

- Click the *Start restore* button once you select the information you want restored to the disk. A small red message next to the *Restore is* field says *Active*, and file names begin to scroll through the window. When the restoration is finished, the message says *InActive*.

- To pause the restoration, click *Pause restore*. File names scroll through the window until the memory buffer is empty, and then the restoration stops. To restart the restore operation, click the *Start restore* button again.

- To cancel the restoration before it is complete, click the *End restore* button. You see a notifier asking whether you really want to end the restoration before it's complete. Click the *Accept* button to end the session without restoring files, or click *Cancel* and the system continues restoring files from where it left off.

10. When the restoration is complete, the *End restore* button is highlighted.

- Remove your tape from the drive and store it in a safe place.

Using Other Tools to Back Up and Restore Files

IRIX provides several tools for backing up and restoring files. This section describes each tool and shows you how to use *tar*, one of the most widely used tools.

For more detailed information on using a particular tool, see the *man page* for the tool and the *IRIX Advanced Site and Server Administration Guide*.

About the Standard Tools

The tools described in this section come standard on every *IRIS*.

bru   *bru* (backup/restore utility) can back up and
                restore an entire *file system* or individual
                directories and files. It can compress and
                decompress files, find and back up files based on
                modification date, check space requirements, and
                verify whether a backup was successful.

                The System Manager's Backup and Restore tool
                is based on *bru*, as are the *Backup* and *Restore*
                commands. For more information, see "About
                the Backup and Restore Tool" on page 9-2 and the
                man pages for *bru*, *Backup*, and *Restore*.

tar   *tar* (tape archiver) backs up specific files and
                directories. You can copy files to tape, create *tar*
                files, compare files on tape to files on disk, read
                standard input, and pipe the output of *tar* to other
                processes. See also "An Introduction to Using
                tar" on page 9-21.

                The *Transfer Manager* that you access through the
                System toolchest lets you add certain *tar* functions
                to WorkSpace and Directory View menus. For
                more information, see *IRIS Essentials* and the *man
                page* for *tar*.

cpio   Like *tar*, *cpio* (copy in/out) archives files and
                directories. With *cpio* you can copy files to tapes
                or disks, archive empty directories, swap byte
                order, create portable ASCII archives, and read
                from and write to standard output.

                The Transfer Manager also lets you add *cpio*
                functions to WorkSpace and Directory View
                menus. For more information, see *IRIS Essentials*
                and the man page for *cpio*.

dump/restore　　*dump* and *restore* are standard file system backup and restore utilities available on most *UNIX* systems. *dump* makes incremental backups of entire file systems; *restore* retrieves files from archives created by *dump*. *restore* can restore an entire file system or individual files and lets you browse the contents of an archive and select specific files for restoration.

For more information, see the man pages for *dump* and *restore*.

An Introduction to Using *tar*

tar is a very portable, general purpose backup and restore tool. Most systems that run the *UNIX* operating system support *tar*. This section gives you a brief introduction to using the basic features of *tar*. For more information, see "About the Standard Tools" on page 9-20 and the *man page* for *tar*.

Only the owner of a directory or file can back it up with *tar*. You must be logged in as *root* if you're backing up files that belong to multiple users.

Note:　The *Transfer Manager* that you access through the *System toolchest* lets you add certain *tar* functions to WorkSpace and Directory View menus. This way you can use *tar* without typing commands in a *shell* window. For more information, see *IRIS Essentials*.

Copying Files to a Tape with *tar*

To copy files to a tape in a local or remote *drive*, follow these steps:

1. Open a *shell* window.

   ■　Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

   ■　Drag the cursor down the *menu* until "Shell" is highlighted; then release the mouse button. The outline of a *window* appears.

- Position the outline where you want the window to appear; then click the left mouse button. If you want to back up files that are owned by your regular user account, go to step 2.

- To back up files that are owned by several different users, *log in* as *root* by typing:

  ```
  login root
  ```

  Then press **<Enter>**. If a prompt for a *password* appears, type the password then press **<Enter>**. If a prompt appears but the *root account* has no password, just press **<Enter>**.

2. Make sure that a tape is in the tape drive. (See "About Tape Formats and Capacities" on page 9-5 to make sure you have the correct type of tape for your drive.)

3. Issue the *tar* command.

   The command has this format:

   tar *options device pathname*

   options are letters that describe how you want to use tar, for example, c specifies copy to tape, and v (for "verbose") specifies that tar should list the files while copying them. device is the name and location of the tape drive; you do not need to specify the device when you're copying to the default local drive. *pathname* is the full *pathname* of a file or directory.

   - To copy the */usr/charts* directory to a tape in a local drive and to view the contents of the directory while it's being copied, type:

     ```
     tar cv /usr/charts
     ```

     Then press **<Enter>**. *tar* replaces any information on the tape with the contents of the */usr/charts* directory.

   - To copy the same directory to a tape in a remote drive, add the f option before the tape device name (the device name consists of a *login name*, remote *hostname*, and device file, which is usually */dev/tape*). To copy */usr/charts* to the tape drive connected to the *host* mars through the *guest* account, type:

     ```
     tar cvf guest@mars:/dev/tape /usr/charts
     ```

     Then press **<Enter>**.

Backing Up and Restoring Files

Note: This example uses the *guest* account because it usually does not have an associated password. If yours is a very secure environment, this account may have a password. If so, work with the *Administrator* of the remote host or the *network administrator* to set up an account through which you can access the drive.

While *tar* copies the directory you see a listing similar to this:

```
a /usr/charts/north 83 blocks
a /usr/charts/south 102 blocks
a /usr/charts/east 124 blocks
a /usr/charts/west 86 blocks
```

The copy is complete when you see the system prompt.

Viewing the Contents of a Tape Using *tar*

To view the contents of a tape created with *tar*, follow these steps:

1. Open a *shell* window.

   ■ Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

   ■ Drag the cursor down the *menu* until "Shell" is highlighted; then release the mouse button. The outline of a *window* appears.

   ■ Position the outline where you want the window to appear; then press and release the left mouse button.

2. Insert the tape in the drive.

3. Position your cursor in the shell window and issue the *tar* command.

   ■ To list the contents of a tape in a local drive, type:

   tar tv

   Then press **<Enter>**.

- To list the contents of a tape in a remote drive, for example, the drive connected to the host *mars*, type:

```
tar tvf guest@mars:/dev/tape
```

Then press **<Enter>**.

```
rwxr-xr-x dir  Feb 11 08:41 1992 /usr/charts
rwxr-xr-x 42004Feb 11 08:41 1992 /usr/charts/north
rwxr-xr-x 51869Feb 11 08:41 1992 /usr/charts/south
rwxr-xr-x 63217Feb 11 08:41 1992 /usr/charts/east
rwxr-xr-x 43554Feb 11 08:41 1992 /usr/charts/west
```

The listing is complete when you see the system prompt.

Restoring Files from a Tape Using *tar*

To copy files onto your disk that you previously archived to tape using *tar*, follow these steps:

1. Open a *shell* window.

   - Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

   - Drag the cursor down the *menu* until "Shell" is highlighted; then release the mouse button. The outline of a *window* appears.

   - Position the outline where you want the window to appear; then click the left mouse button. If you want to *restore* files that are owned by your regular user account, go on to step 2.

   - To restore files that are owned by several different users, *log in* as *root* by typing:

     ```
     login root
     ```

     Then press **<Enter>**.

     If a prompt for a *password* appears, type the password then press **<Enter>**. If a prompt appears but the *root account* has no password, just press **<Enter>**.

2. Compare the contents of the directory to which you want to restore the files with the contents of the tape.

Caution: If files on the tape have the same name as files in the directory to which you are restoring files, the files on your hard disk will be replaced by the files on the tape.

- View the contents of the directory (for example, */usr/charts*) by typing:

  `ls -al /usr/charts`

  Then press `<Enter>`.

- View the contents of the tape using the appropriate command from "Viewing the Contents of a Tape Using tar" on page 9-23.

- Look for files in the directory that have the same names as files on the tape. If you do not want the files on the tape to replace those of the same name on your hard disk, you may want to rename or move the files on the hard disk.

3. Position your cursor in the shell window and issue the *tar* command with the *x* (for "extract") option.

- To restore the entire contents of a tape in a local drive to its original location on your hard disk, type:

  `tar xv`

  Then press `<Enter>`.

- To restore a specific file or directory (for example, */usr/charts/north*) from a tape in a local drive to its original location on your hard disk, type:

  `tar xv /usr/charts/north`

  Then press `<Enter>`.

- To restore a specific file or directory (for example, */usr/charts/north*) from a tape in a local drive to a different location on your hard disk (for example, */usr/tmp*), type:

  `cd /usr/tmp;tar xvR /usr/charts/north`

  Then press `<Enter>`. The name of this file is now */usr/tmp/usr/charts/north*.

- To restore the entire contents of a tape in a remote drive (for example, the drive connected to the host *mars*) to its original location on your hard disk, type:

```
tar xvf guest@mars:/dev/tape
```

Then press <Enter>.

- To restore a specific file or directory (for example, */usr/charts /north*) to its original location on your hard disk, type:

```
tar xvf guest@mars:/dev/tape /usr/charts/north
```

Then press <Enter>.

- To restore a specific file or directory (for example, */usr/charts/north*) from a tape in a remote drive to a different location on your hard disk (for example, */usr/tmp*), type:

```
cd /usr/tmp;tar xvRf guest@mars:/dev/tape
/usr/charts/north
```

Then press <Enter>. The name of this file is now */usr/tmp/usr/charts/north*.

While *tar* restores the file(s), you see a listing similar to this:

```
x /usr/charts/north, 42004 bytes, 83 blocks
x /usr/charts/south, 51869 bytes, 102 blocks
x /usr/charts/east, 63217 bytes, 124 blocks
x /usr/charts/west, 43554 bytes, 86 blocks
```

The restoration is complete when you see the system prompt.

For more information on the *tar* command and its options, see the *man page* for *tar*.

Appendix

Appendix A

Printing with *lpr*

When you connect a printer directly to your *IRIS* workstation and configure printing software using the Printer tool, your workstation will print with the *lp* spooling system. When you use the Printer tool to access a printer that is connected to another *host* on the *network*, the tool assumes it also is using the *lp* spooling system. However, if the remote host is not a Silicon Graphics, Inc. *system* or does not use *lp* for printing, the Printer tool cannot correctly access the printer. In this situation, if the remote host runs the BSD version of the *UNIX* operating system, it typically uses the *lpr* spooling system.

This appendix shows you how to set up your system so it can use a printer that is connected to a remote host that is running *lpr*. It also shows you how to troubleshoot *lpr*. For more information on *lpr*, see the *lpr man page*.

Silicon Graphics, Inc. does not support using *lpr* on your system to access a printer that is connected directly to your system.

Setting Up *lpr*

To set up your *system* so it can send print jobs to a remote printer whose *host* is running *lpr* (rather than *lp*), follow these steps:

1. Ask the *Administrator* of the host to which the printer is connected (the printing system) to add your system's *hostname* to the printing system's */etc/hosts.equiv* file and to add your system's hostname and *IP address* to the */etc/hosts* file. This sets the proper *permission* for your system to send jobs.

    Also ask the Administrator for the full hostname of the printing system and the name of the printer that is connected to it.

2. Make sure you can reach the printing system over the *network*. See "Testing the Network Connection" on page 3-25 for instructions.

3. Install the *eoe2.sw.bsdlpr* software. It is shipped with every IRIS on tape or CD, but is not necessarily installed on your disk. Check whether it's installed by typing *versions* in a *shell* window and checking the listing for this line:

    ```
    I eoe2.sw.bsdlpr BSD Line Printer Spooling Utilities
    ```

    If the line is not there, *eoe2.sw.bsdlpr* is not installed. See the *IRIS Software Installation Guide* to install it.

4. Edit the */etc/printcap* file and start the *lpr* daemon (*lpd*) by following the instructions in "Editing /etc/printcap" on page A-2.

5. Send a test file by following the instructions in "Testing the lpr Setup" on page A-6.

For more detailed information about *lpr* options, see the *lpr man page*. If you have any problems, see "Troubleshooting lpr" on page A-7.

Editing */etc/printcap*

lpr relies on */etc/printcap* for four pieces of information:

localname	The name(s) that you want to use on your *system* to refer to the remote printer.
:rm=*hostname*	The name of the system to which the printer is physically connected (the printing system).
:rp=*remotename*	The name that the printing system uses to refer to the printer that is connected to it.
:sd=*directory*	The name of the *spool directory*, the directory on your system that lpr uses to control print jobs. Typically it is */usr/spool/lpd*.

You must edit the */etc/printcap* file very carefully. *lpr* will not work if you make any spelling, capitalization, punctuation, or spacing errors. Specifically:

- The *localname* line must begin at the first character (the very beginning) of a line, the various names for the printer must be separated by a vertical bar (|), and the line must end with a colon and a backslash (:\). There cannot be any spaces or tabs after the backslash.

- The line that contains the three definition fields (*rm*, *rp*, and *sd*) must start with a tab and a colon (:), and the line must end with a colon. There cannot be any spaces or tabs after the final colon. (There is also an example of how to edit the definitions using multiple lines.)

To edit */etc/printcap*, follow these steps:

1. *Log in* as *root* through a *shell* window.

   - Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

   - Drag the cursor down the menu until "Shell" is highlighted; then release the mouse button. The outline of a window appears.

   - Position the outline where you want the window to appear; then click the left mouse button.

- Position your cursor within the new window and type:

```
login root
```

Then press **<Enter>**.

If a prompt for a password appears, type the password then press **<Enter>**. If a prompt appears but the *root account* has no password, just press **<Enter>**.

2. Stop the *lpr* daemon (*lpd*) by typing:

```
/etc/init.d/bsdlpr stop
```

Then press **<Enter>**.

3. Edit */etc/printcap*.

- Open the file with an editor such as *jot* by typing:

```
jot /etc/printcap
```

Then press **<Enter>**. For detailed information on using the *jot* text editor, see the *IRIS Utilities Guide*.

- At the end of the file, add a new line that contains all names that you want to use on your system to refer to the remote printer. Be sure to start at the beginning of the line, to separate the names with vertical bars only (no spaces or tabs), and end it with a colon and a backslash.

For example, if you want to refer to the printer as *color* and *rgbprinter*, add this line:

```
color|rgbprinter:\
```

- On a new line right below this line, specify the printing system's *hostname* (for example, *saturn*), the name that the printing system uses for this printer (for example, *colorful*), and the name of the spooling directory that *lpr* will use on your system (typically this is */usr/spool/lpd*). You must start this line with a tab.

Now the last two lines of */etc/printcap* should look like this:

```
color|rgbprinter:\
:lp=:rm=saturn:rp=colorful:sd=/usr/spool/lpd:
```

If you want to specify the same information but use multiple lines in */etc/printcap*, the last lines will look like this:

```
color|rgbprinter:\
```

```
:lp=:\
rm=saturn:\
rp=colorful:\
sd=/usr/spool/lpd:
```

4. If you plan to use this printer frequently, specify it as the *default printer*. This way when you type **lpr** *filename*, the job automatically goes to this printer. If you don't specify this printer as the default, each time you send a job to it you type:

   lpr -P *printername filename*

   ■ If you're using the C shell (*csh*) and want printer *color* to be the default, edit the *.cshrc* file in your *home directory* by adding this line:

   setenv PRINTER color

   Save your changes and, at the system *prompt*, type:

   source *homedirectory***/.cshrc**

   Then press **<Enter>**.

   Or, to make the printer the default only until you *log out*, at the system prompt, type:

   setenv PRINTER color

   Then press **<Enter>**.

   ■ If you're using the Bourne shell (*sh*) and want printer *color* to be the default, edit the *.profile* file in your home directory by adding this line:

   PRINTER=color; export PRINTER

   Save your changes, then *log out*. When you log back in again, printer *color* is the default.

   Or, to make the printer the default only until you log out, at the system prompt type:

   PRINTER=color; export PRINTER

   Then press **<Enter>**.

5. Start the *lpr* daemon, *lpd*, by typing:

   /etc/init.d/bsdlpr start

Then press **<Enter>**.

Now you are ready to send a test job to the printer. Go on to "Testing the lpr Setup" on page A-6.

Testing the *lpr* Setup

To make sure *lpr* can interpret the information you added to */etc/printcap*, test the setup by following these steps:

1. Print a simple test file.

   - If you set up the printer you are testing as the default (see step 4 in "Editing /etc/printcap"), print the file */etc/group* by typing:

     lpr /etc/group

     Then press **<Enter>**.

   - If you did not set up the printer you are testing as the default, specify the printer to which you want the */etc/group* file to go (for example, *color*) by typing:.

     lpr -Pcolor /etc/group

     Then press **<Enter>**.

2. Check whether the file reached the remote printer by typing:

   lpq

   Then press **<Enter>**.

   You should see messages similar to these:

   ```
   color is ready and printing
   Rank    Owner  Job    Files        Total Size
   1st     joe    110    /etc/group   850 bytes
   ```

   - If you see the messages, go on to step 3.

   - If you do not see the messages shown above, look for this message:

     lpq:*printername* unknown

     This message tells you that the printer name you specified (either by editing *.cshrc* or *.profile*, by setting the default with

a command line, or by using the *-P* option) does not match a printer name in the */etc/printcap* file. Check the print request you typed in step 1 and the edits you made to */etc/printcap* for typing errors.

- If you do not see any messages, wait a few moments, then use the *lpq* command again. If you still do not see either message, see "Troubleshooting lpr" on page A-7.

3. When your job reaches the top of the *queue* (when your job's rank is 1st), go to the printer and make sure the job prints.

- If it prints, *lpr* is set up correctly. See the *lpr man page* for more information on using *lpr* and its options.

- If the job does not print, see "Troubleshooting lpr" on page A-7.

Troubleshooting lpr

This section shows you how to diagnose and fix these common problems:

- The print request never reaches the printer's *queue*.

- The print request reaches the queue, but never disappears from the queue because it cannot reach the remote *host* (printing *system*).

- The print request reaches the printing system and disappears from the queue, but the printer either never prints it or prints something unexpected.

If the print request never reaches the printer's queue (if you don't see the request when you type *lpq*), follow these steps:

1. Make sure you entered the print command correctly.

- If you set up the printer you are trying to use as the default (see step 4 in "Editing /etc/printcap"), use this format:

    lpr *filename*

- If you did not set up the printer you are trying to use as the default, use this format:

  lpr -P*printername filename*

2. Check for error messages.

   - In the window from which you issued the *lpr* command, look for this message:

     lpq:*printername* unknown

     This tells you that the printer name you specified (either by editing *.cshrc* or *.profile*, by setting the default with a command line, or by using the *-P* option) does not match a printer name in the */etc/printcap* file. Check the print request you typed in step 1 and the edits you made to */etc/printcap* for typing errors.

   - Look in the */usr/adm/SYSLOG* file for *lpd* or *lpr* errors.

3. Send a simple file to the printer, such as */etc/group*.

   - If this file reaches the queue, *lpr* is working correctly, but there is something wrong with the file you originally sent.

   - If it does not reach the queue, type:

     /usr/etc/lpc status

     Then press **<Enter>**. You should see messages like these:

     printername:

     queuing is enabled

     printing is enabled

     jobs in queue

     no daemon present

   Note: The *no daemon present* line always appears; this is a known bug.

   - If the queue or printing is not enabled, enable these functions by typing:

     /usr/etc/lpc up all

     Then press **<Enter>**.

If it still doesn't reach the queue, contact the Silicon Graphics Technical Assistance Center.

If the print request reaches the queue, but never disappears from the queue because it cannot reach the remote host (printing system), follow these steps:

1. Check for error messages:

   ■ Open the window from which you issued the *lpr* command.

   ■ Look for this message:

   ```
   Waiting for remote queue to be enabled
   ```

   If you see this message, ask the *Administrator* of the printing system to add your system's *hostname* to the */etc/hosts.equiv* file on the printing system and your system's hostname and IP address to the */etc/hosts* file.

   ■ Look for this message:

   ```
   lpr: connection refused
   ```

   ```
   jobs queued but cannot start daemon
   ```

   If you see this message, stop the *lpr* daemon (*lpd*) by typing:

   /etc/init.d/bsdlpr stop

   Then press **<Enter>**.

   Restart the daemon by typing:

   /etc/init.d/bsdlpr start

   Then press **<Enter>**. Try printing the job again.

   ■ Look for this message:

   ```
   connection to hostname is down
   ```

   Your system cannot reach the printing system. Follow the instructions in step 2 to check the *network* connection.

2. Make sure the printing system appears in your Networking tool (see "About the Networking Tool" on page 3-12) and that its hostname and IP address are correct.

   ■ If the printing system appears in the tool, double-click its icon to open it. Make sure the hostname and IP address are correct. If they are incorrect, change them (see "Changing the

Hostname or Internet (IP) Address" on page 3-22) and try printing again. If they are correct, go on to step 3.

- If the printing system does not appear in the tool, add it to your list of hosts (see "Adding a Host" on page 3-19) and try printing again.

3. Ask the Administrator of the printing system to verify that your system's hostname is in the */etc/hosts.equiv* file on the printing system and that your system's hostname and IP address are in the */etc/hosts* file. Also ask the Administrator to verify that the printer is enabled and ready to print requests. When this is done, try printing again.

- If the job still doesn't reach the printing system, follow the instructions in "Testing the Network Connection" on page 3-25 for a more comprehensive test.

If the print request reaches the printing system and disappears from the queue, but the printer either never prints it or prints something unexpected, follow these steps:

1. *Log in* as *root* through a *shell* window.

- Move the cursor over the word "Tools" in the *Toolchest window*; then press either the left or right *mouse* button.

- Drag the cursor down the menu until "Shell" is highlighted; then release the mouse button. The outline of a window appears.

- Position the outline where you want the window to appear; then click the left mouse button.

- Position your cursor within the new window and type:

  `login root`

  Then press <Enter>.

  If a prompt for a password appears, type the password then press <Enter>. If a prompt appears but the *root account* has no password, just press <Enter>.

2. Send a test job to check whether *lpr* on your system is spooling jobs correctly.

- Cancel all jobs in printer *color*'s queue and stop it by typing:

  `/usr/etc/lpc stop color`

Printing with lpr

Then press <Enter>.

■ Send */etc/group* as a test file by typing:

```
lpr /etc/group
```

Then press <Enter>.

■ Change directories so you are in your spool directory, for example, */usr/spool/lpd*, and list its contents by typing:

```
cd /usr/spool/lpd; ls -l
```

Then press <Enter>. You see a listing similar to this:

```
-rw-rw---- 1 joe lp 25 Mar 17 14:02 cfA117mars
-rw-rw---- 1 joe lp 69 Mar 17 14:02 dfA117mars
-rwxr----- 1 joe lp 00 Mar 17 14:02 lock
-rw-rw-r-- 1 joe lp 12 Mar 17 14:02 status
```

■ Compare the copy of the file to print (the one that starts with *df* — in this example, it is *dfA117mars*) with the test file you sent (*/etc/group*) by typing:

```
diff dfA117mars /etc/group
```

Then press <Enter>. If the system *prompt* returns and you see no listing of differences, *lpr* is working correctly on your system. Go on to step 3.

If the system lists differences, *lpr* is not working correctly on your system. Repeat the steps in "Setting Up lpr" on page A-2 to make sure you set up *lpr* correctly.

3. Once you know that *lpr* is working correctly on your system, you can assume that there is a problem with the printing system. Contact the *Administrator* of the printing system; this person will have to perform some of the steps in the rest of this troubleshooting procedure.

■ On the printing system, the Administrator should log in as *root*, then cancel all jobs in printer *colorful*'s queue and stop the printer by typing:

```
/usr/etc/lpc stop colorful
```

Then press <Enter>.

■ On your system, start printer *color* by typing:

```
/usr/etc/lpc start color
```

Then press **\<Enter>**.

- On your system, send */etc/group* as a test file by typing:

```
lpr /etc/group
```

Then press **\<Enter>**.

- On the printing system, the Administrator should change directories to the spool directory, for example, */usr/spool/lpd*, and list its contents by typing:

```
cd /usr/spool/lpd; ls -l
```

Then press **\<Enter>**.

The listing should be similar to this:

```
-rw-r----x 1 joe lp 25 Mar 17 14:02 .seq

-rw-rw---- 1 joe lp 25 Mar 17 14:02 cfA117mars

-rw-rw---- 1 joe lp 69 Mar 17 14:02 dfA117mars

-rwxr----- 1 joe lp 00 Mar 17 14:02 lock

-rw-rw-r-- 1 joe lp 12 Mar 17 14:02 status
```

- On the printing system the Administrator should compare the copy of the file to print (the one that starts with *df* — in this example, it is *dfA117mars*) with the test file you sent (*/etc/group*) by typing:

```
diff dfA117mars /etc/group
```

Then press **\<Enter>**. If the system prompt returns and there is no listing of differences, *lpr* is working correctly on the printing system. Go on to step 4.

If the system lists differences, *lpr* is not working correctly on the printing system. The Administrator of the system should check the printer setup.

4. Once you know *lpr* is working correctly on the printing system, the Administrator should restart the printer (named *colorful*) on that system by typing:

```
/usr/etc/lpc start colorful
```

Then press <Enter>.

- If the test job (*/etc/group*) prints, you should be able to print other files. If you cannot print a particular file, there is a problem with the file, for example, it may be too complex or in a format that the printing filter on the printing system cannot interpret.

- If the test job doesn't print, the Administrator of the printing system should check for physical problems, such as disconnected cables.

Glossary

Glossary

4Dwm

The name of the default Window Manager. See also *Window Manager*.

account

See *login account*.

administrator

See *system administrator* and *network administrator*.

autologin user

The user who is automatically logged in to the system each time it is powered up.

back up

To copy a certain set of files and directories from your hard disk to a tape or other storage media.

backup tape

A tape that contains a copy of a set of files and directories that are on your hard disk. A full backup tape contains a copy of all files and directories, including IRIX, that are on your hard disk.

baud rate

The speed (calculated as bits per second) at which the computer sends information to a serial device, such as a modem or terminal.

button

On a mouse, a button is a switch that you press with a finger. In a window on your screen, a button is a labeled rectangle that you click using the cursor and mouse.

CD-ROM disk (CD)

A flat metallic disk that contains information that you can view and copy onto your own hard disk; you cannot change or add to its information. CD-ROM is short for *compact-disk: read-only memory*.

centralized network

A network where a central server controls services and information; the server is maintained by one or more individuals called network administrators. On a centralized network that uses NIS, this server is called the NIS master, and all other systems on the network are called NIS clients. See also *network administrator, NIS, NIS client, NIS domain,* and *NIS master*.

choose

To press the left mouse button to bring up a pop-up menu, move the cursor to highlight the command that you want to run, then release the button.

click

To hold the mouse still, then press and immediately release a mouse button.

command line option

Options that let you specify how you want to run an IRIX command. See the man page for a command for a list of the available command line options.

console

The window that appears as a stowed icon each time you log in; IRIX reports all status and error messages to this window.

DAT

A magnetic tape from which you can read and to which you can copy audio and digital information.

default printer

The printer to which the system directs a print request if you do not specify a printer when you make the request. You set the default printer using the Print Manager.

defaults

A set of behaviors that Silicon Graphics, Inc. specifies on every system. You can later change these specifications, which range from how your screen looks to what type of drive you want to use to install new software. For example, when you run IRIS Showcase, the Master gizmo opens by default You can change the default settings using the Preferences gizmo.

diagnostics

A series of tests that check all hardware components of your system.

directory

A container in the file system in which you store other directories and files.

disk use

The percentage of space on your disk that contains information.

disk resource

Any disk (hard, CD-ROM, or floppy) that you can access either because it is physically attached to your workstation with a cable, or it is available over the network using NFS.

distributed network

A network where there is no automated central control of services or information. Each system's administrator must work with the network administrator to keep each system's network information up to date.

domain

A group of hosts on a network whose hostnames have the same suffix. See also *NIS domain*.

domain name

The common suffix found in all hostnames that are in the same domain on a network. See also *NIS domain*.

double-click

To hold the mouse still, then press and release it twice, very rapidly. When you double-click an icon it opens into a window; when you double-click the *Window menu* button the window closes.

drive

A hardware device that lets you access information on various forms of media, such as hard, floppy, and CD-ROM disks, and magnetic tapes.

drive address

See *SCSI address*.

dumpster

The icon you drag files onto when you want to delete them. The dumpster icon appears in your home directory and the WorkSpace window.

external device

Any piece of hardware that is attached to the workstation with a cable.

export

To use NFS software to make all or part of your file system available to other users and systems on the network.

field

An area in a window in which you can type text.

file

A container in which you store information such as text, programs, or images you create using an application.

file hierarchy

See *file system*.

file system

A hierarchy of directories and files. Directories contain other directories and files; files cannot contain directories. The *root* (/) directory is at the top of the hierarchy.

form

A window that contains buttons that you must click and/or editable fields that you must fill in.

forwarder

The host that forwards mail from one domain to another.

group

A collection of users that can set more relaxed permissions on files owned by each other.

handshake

The protocol that controls the flow of information between a workstation and a printer. A hardware handshake uses only cable wires and pins to control the flow. A software handshake (also called *xon/xoff* flow control) uses a combination of pins, wires, and software.

highlight

To change the color of an item on the screen by positioning the cursor over it (locate-highlight) or by positioning the cursor over it and pressing a mouse button.

home directory

The directory into which IRIX places you each time you log in. It is specified in your login account; you own this directory and, typically, all its contents.

host

Any system connected to the network.

hostname

The name that uniquely identifies each host (system) on the network.

hostname alias

An optional, alternate hostname for a host (system) on the network.

IP address

The number that uniquely identifies each host (system) on the network.

IRIS

Any graphics workstation manufactured by Silicon Graphics, Inc.

IRIX

Silicon Graphics, Inc.'s version of the UNIX operating system. See also *system software*.

IRIX processes

Tasks that IRIX carries out to keep the system running correctly or to complete an explicit command. Each process has a unique process ID number.

icon

A small picture that represents a stowed or closed file, directory, application, or IRIX process.

inst

The software tool that you use to install system software, software options, and maintenance releases that come from Silicon Graphics, Inc.

jot

The text editor that comes as a standard utility on every IRIS.

Kb (Kilobyte)

A standard unit for measuring the information storage capacity of disks and memory (RAM and ROM); 1000 bytes make one Kilobyte.

LED (Light Emitting Diode)

A light on a piece of hardware that indicates status or error conditions.

launch

To start up an application, often by double-clicking an icon.

linked copy

A pointer to a file or directory that exists in a different location in the file system. When you make a linked copy of a file, you are not creating another instance of the file; you are creating another location from which you can access the original file.

local workstation, drive, disk, file system, or printer

The physical workstation whose keyboard and mouse you are using, all hardware that is connected to that workstation, and all software that resides on that hardware or its removable media.

log in

To give the system your login name so you can start a session on the IRIS.

log out

To end a session on the IRIS.

login account

A database of information about each user that, at the minimum, consists of login name, user ID, and a home directory.

login name

A name that uniquely identifies a user to the system.

login screen

The window that you see after powering on the system, before you can access files and directories. The window contains one icon for each login account on the system.

Mb (Megabyte)

A standard unit for measuring the information storage capacity of disks and memory (RAM and ROM); 1000 Kilobytes make one Megabyte.

man page

An online document that describes how to use a particular IRIX command.

menu

A list of operations or commands that the IRIS can carry out on various objects on the screen.

minimize

To shrink a window and display it as a stowed icon on the screen. Applications that you have minimized continue to run.

monitor

A hardware device that displays the images, windows, and text with which you interact to use the system. It is also called a video display terminal (VDT).

mount point

The directory on your workstation from which you access information that is stored on a local or remote disk resource.

mount

To make a file system that is stored on a local or remote disk resource accessible from a specific directory on your workstation.

mouse

A hardware device that you use to communicate with windows and icons. You move the mouse to move the cursor on the screen, and you press its buttons to initiate operations. An optical mouse must always be on the mouse pad for the IRIS to interpret its movements; a mechanical mouse works on any clean, flat surface.

mouse pad

For an optical mouse, this is the rectangular, metallic surface that reads the movements of the mouse. For a mechanical mouse, this is a clean, soft rectangular surface that makes the mouse's track ball roll efficiently.

multi-tasking system

A system that can run several processes (such as running applications, printing files, and updating files) simultaneously.

multiuser system

A system that several users can work on simultaneously and maintain private files.

NFS

A networking software option that lets you access files and directories that reside on the disks of other workstations as if they resided on a local disk in your own workstation. NFS stands for Network File System.

NIS

A networking software option that lets you control network information and services from a central server called the NIS master. NIS stands for Network Information Service. See also *centralized network*, *NIS client*, *NIS domain*, and *NIS master*.

NIS client

Any system on a centralized network that runs NIS other than the NIS master. The NIS client receives services and information from the NIS master.

NIS domain

The unique name of a network (or sub-network) that runs NIS. All hostnames in the NIS domain have the NIS domain name as their suffix.

NIS master

The server that stores the complete database of information about all the hosts (systems) and users on a centralized NIS network. The NIS master periodically updates host information on all other systems on the network (NIS clients); its user information is always available to every host. The network administrator is responsible for setting up, maintaining, and troubleshooting the NIS master.

network

A group of computers and other devices (such as printers) that can all communicate with each other electronically to transfer and share information.

network administrator

The individual(s) responsible for setting up, maintaining, and troubleshooting the network, and for supplying setup information to system administrators of each system.

notifier

A form that appears when the system requires you to confirm an operation that you just requested, or when an error occurs.

open

To double-click an icon, or to select an icon then choose "Open" from a menu in order to display a window that contains the information that the icon represents.

owner

The user who created a particular file or directory and can specify which other users of the system can access the file.

PROM monitor

The interface that you use to communicate with the system after it is powered up, but before it is booted up and running IRIX.

Print Manager

A tool that you use to set up printer software and monitor jobs that you send to the printer. You access it through either the System toolchest or the System Manager, where it is called the Printer tool.

password

A combination of letters and/or numbers that only you know; it is an optional element of your login account. If you specify a password for your account, you must type it after you type your login name before the system lets you access files and directories.

pathname

The list of directories that leads you from the *root* (/) directory to a specific file or directory in the file system.

peripheral

A hardware device that adds more functionality to the basic workstation, such as a tape drive. See also *external devices* and *internal drives*.

permission

The information attached to each directory and file that specifies which users can access it and to what degree.

permissions mask

A system setting that specifies the default permissions that the system assigns to newly created files and directories. The owners of those files and directories can later change the permissions.

power cable

The cable that connects the workstation to a grounded electrical outlet.

power down

To turn off the power switches on the workstation chassis and the monitor.

power up

To turn on the power switches on the workstation chassis and the monitor.

prompt

A character or word that the system displays in an IRIX shell that indicates the system is ready to accept commands. The default prompt for regular user accounts is %; the default prompt for the *root* account is #.

queue

A list of print jobs waiting to be printed on a particular printer.

quit

To stop running an application.

remote workstation, drive, disk, file system, or printer

A hardware device or the information or media it contains that you can access across the network; they are not physically connected to your workstation.

reset button

A physical button on the workstation that you press to cut off then immediately restore power to the workstation. You should never press this button while IRIX is running, unless all attempts to shut down the system using software fail. See also *shut down*.

restore (files)

To copy files that once resided on your hard disk from another disk or a tape back onto your hard disk.

root account

The standard IRIX login account reserved for use by the system administrator. This account's home directory is the *root* (/) directory of the filesystem; the user of the *root* account has full access to the entire filesystem (that is, can change and delete any file or directory). The user of this account is sometimes referred to as the *superuser*.

root (/) directory

The directory at the top of the file system hierarchy.

SCSI address

A number from one to seven that uniquely identifies a SCSI device to a system. No two SCSI devices that are physically connected to the same workstation can have the same SCSI address.

SCSI cable

A cable that connects a SCSI device to a SCSI port on a workstation.

SCSI device

A hardware device that uses the Small Computer System Interface (SCSI) protocol to communicate with the system. Hard disk, floppy disk, CD-ROM, and tape drives are all SCSI devices.

System Manager

A set of tools that the administrator uses to set up and manage the IRIS. You access the System Manager through the System toolchest.

System toolchest

The toolchest in the upper left-hand corner of the screen labeled System. You start system tools such as the WorkSpace and System Manager using its menu.

screen

The portion of the monitor that displays information.

select

To position the cursor over an icon then click the (left) mouse button. Once an icon is selected, it is the object of whatever operation you select from a menu.

serial device

Any hardware device that requires a serial cable connection to communicate with the workstation.

serial port

An outlet on the workstation to which you connect external serial devices.

server

A system that other systems on the network access to use its disk space, software, or services.

shell

A window into which you type IRIX commands. The syntax of the commands depends on the type of IRIX shell you're using, such as the C shell or the Bourne shell.

shell script

A program that issues and interprets a sequence of IRIX commands.

shut down

To safely close all files, log out, and bring the workstation to a state where you can safely power it down. You choose "System Shutdown" from the System toolchest menu to do this.

software option

Any software product that you buy from Silicon Graphics, Inc. other than the standard system software that comes on your system disk.

standalone workstation

A workstation that is not connected to a network.

superuser

An alternate name for the user of the *root* login account. See also *system administrator*.

system

All the hardware and software that makes up the IRIS.

system administration

The tasks associated with setting up, maintaining, and troubleshooting a networked or standalone IRIS system.

system administrator

The individual responsible for setting up, maintaining, and troubleshooting an IRIS system. The system administrator uses the *root* login account to perform most administrative tasks.

system crash

When the IRIX operating system fails and the system will not accept any keyboard or mouse input.

system disk

The physical disk that contains the standard IRIX operating system software — the software that makes your workstation run.

system software

The standard IRIX operating system software and Silicon Graphics tools that come on the system disk and on the tape or CD-ROM that you use in the event of a system crash.

TCP/IP

The standard networking software that's included in the system software.

Transfer Manager

A tool that you access through the System toolchest that you use to copy files to and from local and remote tapes or disks.

Toolchest window

The window that contains the five toolchests. It appears in the upper left corner of the screen.

UNIX

A multiuser, multi-tasking operating system from AT&T upon which Silicon Graphics Inc.'s IRIX operating system is based.

unmount

To make a file system that is accessible from a specific directory on your workstation temporarily unaccessible.

user ID

A number that uniquely identifies a user to the system.

WorkSpace window

The main window for working with icons and customizing your view of the file system. You place files and directories from all over the file system here for easy access; placing them in the WorkSpace does not change their actual location in the file system.

wildcard

A character, usually an asterisk (*), that you use alone to specify all files and directories that are available, or with a few other letters to specify a group of files and directories that have a common element in their names. For example, to specify all files and directories that begin with the letters "ch", you would type: `ch*`

window

A portion of the screen that you can manipulate that contains text or graphics.

window manager

The system program that draws and controls windows. It lets you create and manipulate windows —move them, resize them, and close them.

workstation

The physical hardware that contains the CPU and graphics boards, a system disk, and a power supply. You connect it to a monitor, keyboard, and mouse to configure a working system. It is also sometimes referred to as the chassis.

xon-xoff

A protocol that uses a combination of hardware and software signals to control the flow of information between a workstation and a printer. It is also referred to as a *software handshake*.

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