

IRIS Series 3000 Owner's Guide

Version 3.0

**Silicon Graphics, Inc.
2011 Stierlin Road
Mountain View, CA 94043**

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IRIS Owner's Guide, Series 3000

Version 3.0

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User Information

Please read the following information on product safety and interference potential.

Computer and CRT:

WARNING - For continued protection against risk of fire, replace fuses only with the same type and rating of fuse.

No operator-serviceable parts inside unit.

Class A Computing Device

WARNING: This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference (FCC, Part 15.818 a).

Instructions to User

This equipment generates and uses radio frequency energy and if not installed and used properly, i.e., in strict accordance with the operating instructions, reference manuals, and the service manual, may cause interference to radio or television reception. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial installation.

If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is

encouraged to try to correct the interference by one or more of the following measures:

1. Reorient the receiving antenna.
2. Relocate the equipment with respect to the receiver.
3. Move the equipment away from the receiver.
4. Plug the equipment into a different outlet so that equipment and receiver are on different branch circuits.

If necessary, consult a Silicon Graphics field engineer for additional suggestions.

Silicon Graphics is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. It is the responsibility of the user to correct such interference.

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1. Introduction

This document explains how to install hardware and configure system software on IRIS series 3000 products, including the series 3100 packages and the series 2000 Turbo products. Read this document carefully before installing your IRIS.

1.1 Installation Overview

The procedures for installing IRIS series 3000 products include:

- Installing hardware (Chapter 2)
- Booting an IRIS workstation (Chapter 3)
- Booting an IRIS terminal (Chapter 3)
- Making a bootable backup tape for the IRIS workstation (Chapter 4)
- Configuring software for the IRIS workstation (Chapter 4)
- Configuring software for the IRIS terminal (Chapter 5)
- Configuring a disk (Chapter 6)
- Installing optional peripherals, including ASCII terminals (Chapter 7)
- Installing non-standard video monitors (Chapter 8)

For basic information about UNIX commands, the UNIX text editor, and using the file system, see the pamphlet entitled *Getting Started with Your IRIS Workstation*.

1.2 IRIS Series 2000 Turbo Products

You can use this manual with the IRIS 2300T (IRIS 3010 equivalent), 2400T (IRIS 3020 equivalent), and 2500T. Early IRIS series 2000 models with the Turbo upgrade may not have the same standard peripherals described here. The 60-Hz monitor may be different from the one described in this guide. The mouse may be mechanical rather than optical. The early IRIS 2400 Turbo system required a separate junction box. For a description of these features, see the *IRIS Workstation Guide Series 2000, Version 1.0*.

1.3 IRIS Series 3100 Packages

The IRIS series 3100 products consist of the following packages:

- IRIS 3110 – a standard IRIS 3010, with z-clipping and 10-MHz Geometry Engines. You can use the IRIS 3010 documentation (e.g., hardware configuration and system administration) for the IRIS 3110.
- IRIS 3115 – an IRIS series 3000 workstation with z-clipping, 10-MHz Geometry Engines, a 72Mb disk, and 4Mb RAM (expandable to 8Mb). You can use the IRIS 3020 documentation (e.g., hardware configuration and system administration) for the IRIS 3115.
- IRIS 3120 – an IRIS 3020 with z-clipping, 10-MHz Geometry Engines, and a 72Mb disk. You can use the IRIS 3020 documentation (e.g., hardware configuration and system administration) for the IRIS 3120.
- IRIS 3120B – an IRIS 3020 with z-clipping, 10-MHz Geometry Engines, and a 170Mb disk. You can use the IRIS 3030 documentation (e.g., hardware configuration and system administration) for the IRIS 3120B.
- IRIS 3130 – a standard IRIS 3030, with a floating point board, a cartridge tape drive, 32 bitplanes, 8Mb of RAM, z-clipping, and 10-MHz Geometry Engines. You can use the IRIS 3030 documentation (e.g., hardware configuration and system administration) for the IRIS 3130.

1.4 Product Support

Silicon Graphics provides a comprehensive product support and maintenance program for IRIS products. For further information, contact Product Support through the Geometry Hotline.

Silicon Graphics Geometry Hotline	
(800) 345-0222	U.S. and Canada (toll-free)
350613	Worldwide (telex number)

1.5 Conventions

This document uses a standard UNIX convention when referring to entries in the UNIX documentation. The entry name is followed by a section number in parentheses. For example, *cc(1)* refers to the *cc* manual entry in Section 1 of the *UNIX Programmer's Manual, Volume IA*.

In examples of interaction between the user and the system, text that the system displays is in `typewriter font`; text that you type is in **bold typewriter font**.

In command syntax descriptions and examples, square brackets surrounding an argument indicate that the argument is optional. Variable parameters are in *italics*. You replace these variables with the appropriate string or value.

In hardware descriptions, labels on the machine and positions of switches and buttons are in `boxes`.

Within text, filenames and UNIX commands are in *italics*. IRIS Graphics Library routines and PROM commands are in `typewriter font`.

2. Hardware Installation

This chapter describes how to install and connect the standard components of the IRIS series 3000 systems.

2.1 Hardware Components

A typical configuration for IRIS series 3000 systems includes these components:

- Electronics cabinet with one disk drive
- Nineteen-inch tilt-and-swivel 60-Hz non-interlaced monitor or fifteen-inch tilt-and-swivel 60-Hz non-interlaced monitor
- Keyboard with right-hand and left-hand connectors for the mouse
- Optical mouse with grid pad
- Ethernet transceiver

For a more detailed description of the components, see Appendix A.

Hardware options for the IRIS series 3000 products include:

- Dial and button box
- Digitizer tablet
- Nineteen-inch 33-Hz interlaced monitor
- 8-port RS-232 controller
- Tektronix 4692 Color Plotter
- Support for Mitsubishi G500 Color Printer/Plotter

- Support for Versatec ECP42 Color Plotter
- Seiko CH-5300 Color Printer
- Software support for laser printer
- Half-inch tape drive
- Quarter-inch cartridge tape drive
- Stereo optic viewer cable
- Light pen
- Floppy disk (standard on IRIS 3010 or 3110)
- Additional hard disk
- Controller and cables for external hard disk (IRIS 3020, 3120, 3120B, 3030, 3130)

You can use this manual for the IRIS 2300T, 2400T, and 2500T. Early versions of these models may not have the same standard peripherals described here. The 60-Hz monitor may be different from the one described in this guide. The mouse may be mechanical rather than optical. The early IRIS 2400 Turbo system required a separate junction box. For a description of these features, see the *IRIS Workstation Guide Series 2000, Version 1.0*.

To install optional peripherals, see Chapter 7.

The major components have the following functions and features:

- The electronics cabinet for the standard configuration of the IRIS series 3000 is a floor-standing unit with a 20-slot backplane, a disk drive, and a power supply (see Figure 2-1). The cabinet uses forced-air cooling and is mounted on casters. A quarter-inch cartridge tape drive (internal) or a half-inch streaming tape drive (external) is optional on the IRIS workstation (see Figure 2-2). A floppy disk drive is standard on the IRIS terminal (see Figure 2-3). See Chapter 7 for tape specifications.

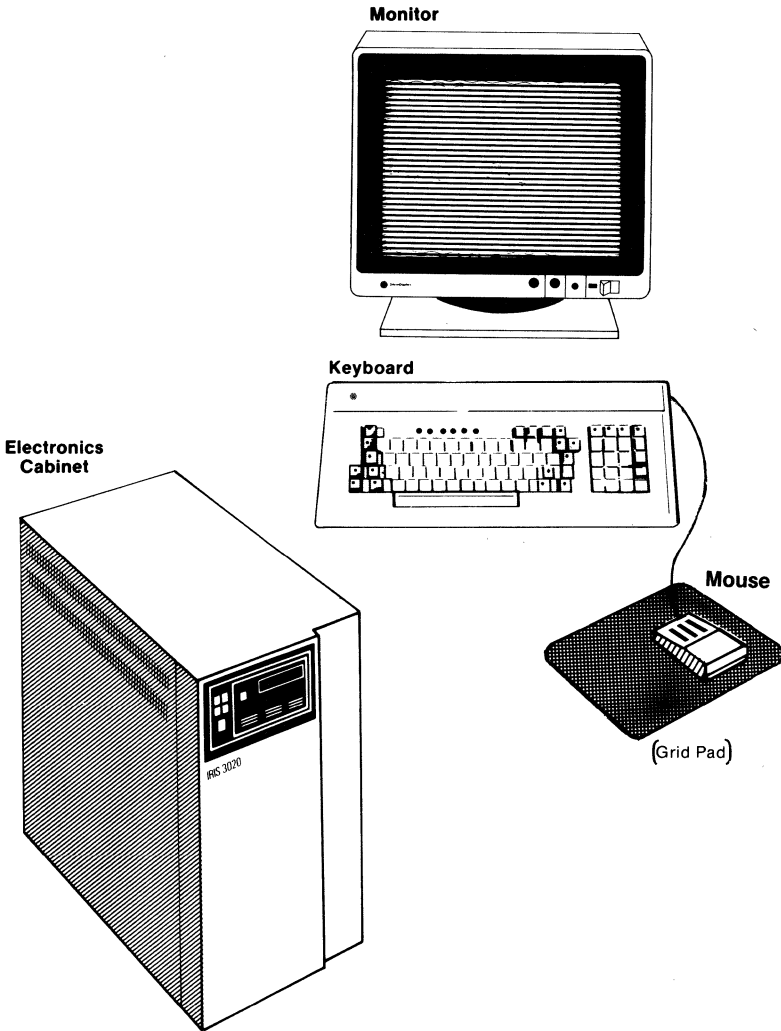


Figure 2-1: IRIS Series 3000 System

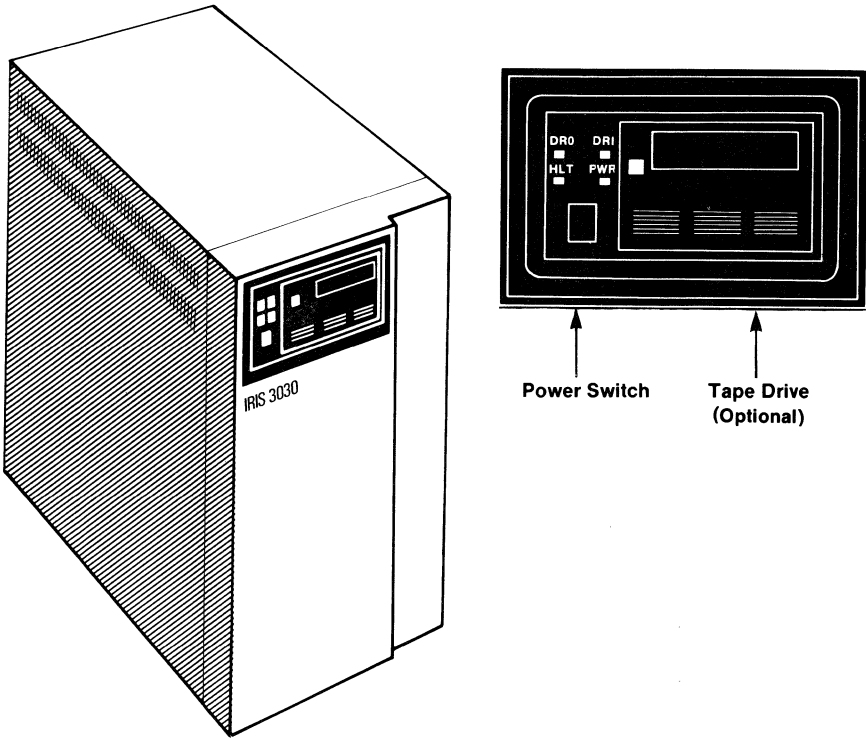


Figure 2-2: IRIS 3030 Cabinet Front Panel

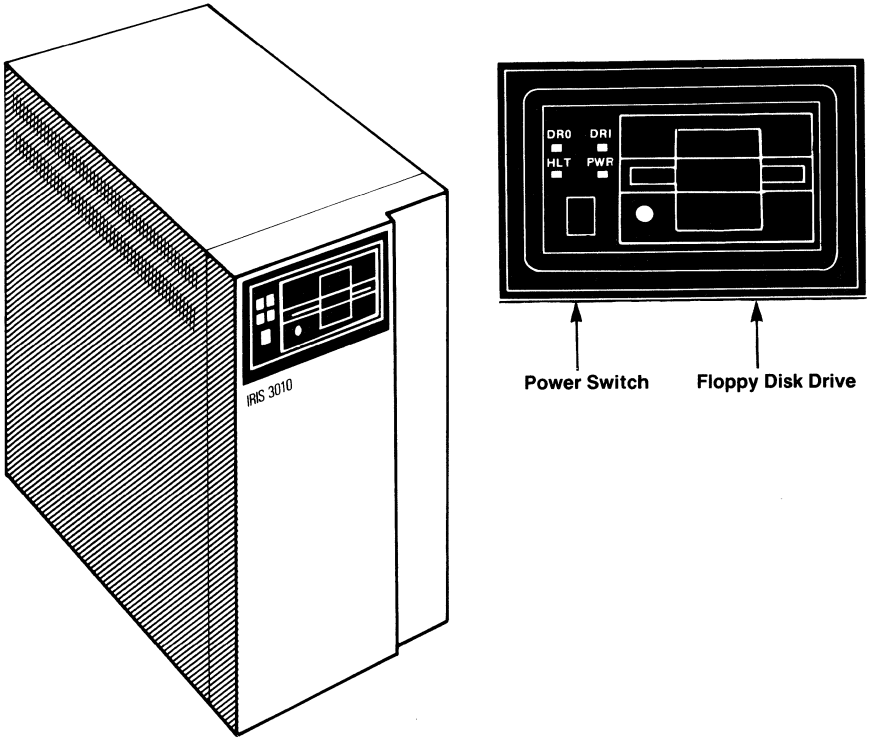


Figure 2-3: IRIS 3010 Cabinet Front Panel

- Three types of monitors are available from Silicon Graphics for the IRIS series 3000. The fifteen-inch and nineteen-inch tilt-and-swivel monitors are 60-Hz high-resolution non-interlaced RGB color monitors. Silicon Graphics also offers a 33.43-Hz nineteen-inch interlaced monitor. (This monitor is referred to as 33-Hz rather than 33.43-Hz.)

You can also order the IRIS series 3000 with drivers for other types of monitors (see Chapter 8, Video Options).

- The keyboard is an 83-key, up-down encoded keyboard, with right-hand and left-hand connectors for the optical mouse.
- The mouse is a three-button optical mouse with a grid pad.

2.2 Keyboard and Mouse Connection

Connect the mouse to the keyboard by inserting the mouse cable in the nine-pin D connector on either side of the keyboard. Secure the mouse connector to the keyboard with its two retaining screws. Then connect the keyboard to the IRIS by inserting the keyboard cable into Port 1 of the standard I/O panel on the IRIS.

2.3 Monitor to Cabinet Video Connections

The procedure for connecting the monitor to the IRIS is different for each type of monitor. The sections below describe the procedures for each type of monitor.

2.3.1 Nineteen-inch 60-Hz Non-interlaced Monitor

Connect the monitor to the cabinet using the color-coded coaxial video cables (see Figure 2-4).

1. If you are using only one monitor, plug the terminators into the *unused* video connectors. The terminators are attached to the monitor by chains.

To connect several monitors in a series (daisy chain), remove the terminators from all but the last monitor. Plug the terminators on the last monitor into the unused video input sockets.

Attach the outgoing video cables to the unused BNC connectors on the back of the monitor.

2. Connect each color-coded cable end to the corresponding input socket on the monitor back panel.

Push each cable into its connector and rotate to lock into place.

3. Connect the other end of each color-coded cable to the corresponding output socket on the standard I/O panel.

Push each cable into the connector and rotate to lock into place.

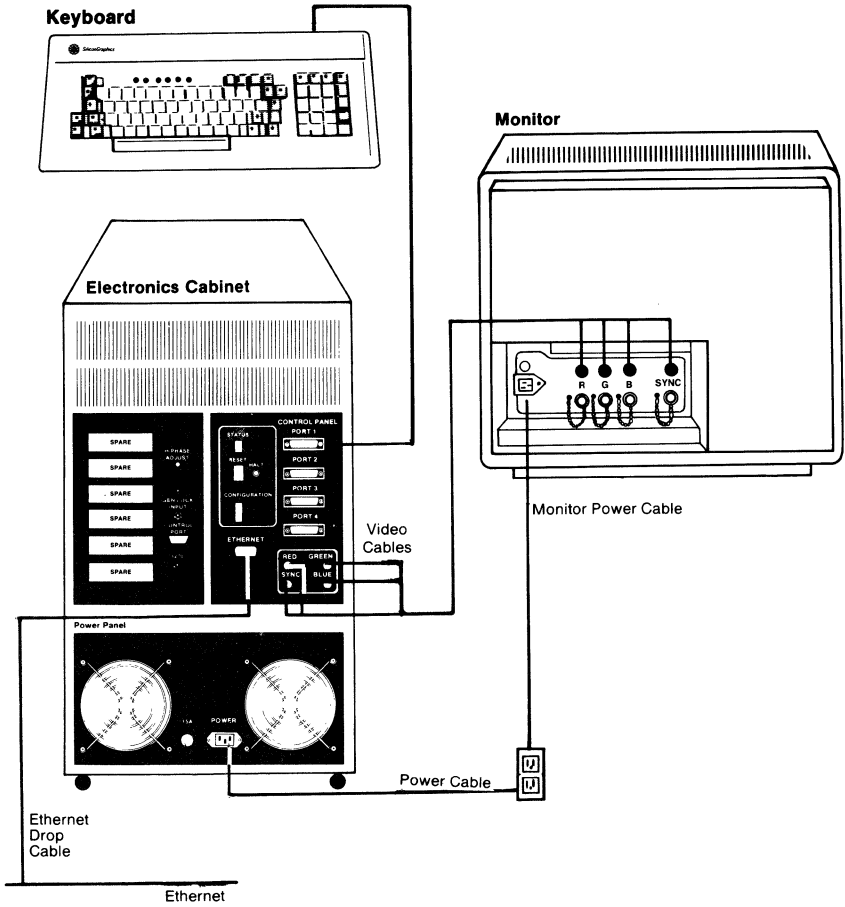


Figure 2-4: IRIS Cabinet Connections - Nineteen-inch 60-Hz Monitor

2.3.2 Fifteen-inch 60-Hz Non-interlaced Monitor

Connect the monitor to the cabinet using the color-coded coaxial video cables (see Figure 2-5).

1. If you are using only one monitor, set *all* of the input impedance switches on the back of the monitor to the $75\ \Omega$ position. The input impedance switches are push-button switches located between the input sockets. **In** is the $75\ \Omega$ position. **Out** is the **HIGH** position.

To connect several monitors in a series (daisy chain), set the input impedance switches to the **HIGH** position for all but the last monitor, which should be set to the $75\ \Omega$ position.

Attach the outgoing video cables to the unused BNC connectors on the back of the monitor.

2. Connect each color-coded cable end to the corresponding input socket on the monitor back panel.

Push each cable into its connector and rotate to lock into place.

3. Connect the other end of each color-coded cable to the corresponding output socket on the standard I/O panel.

Push each cable into the connector and rotate to lock into place.

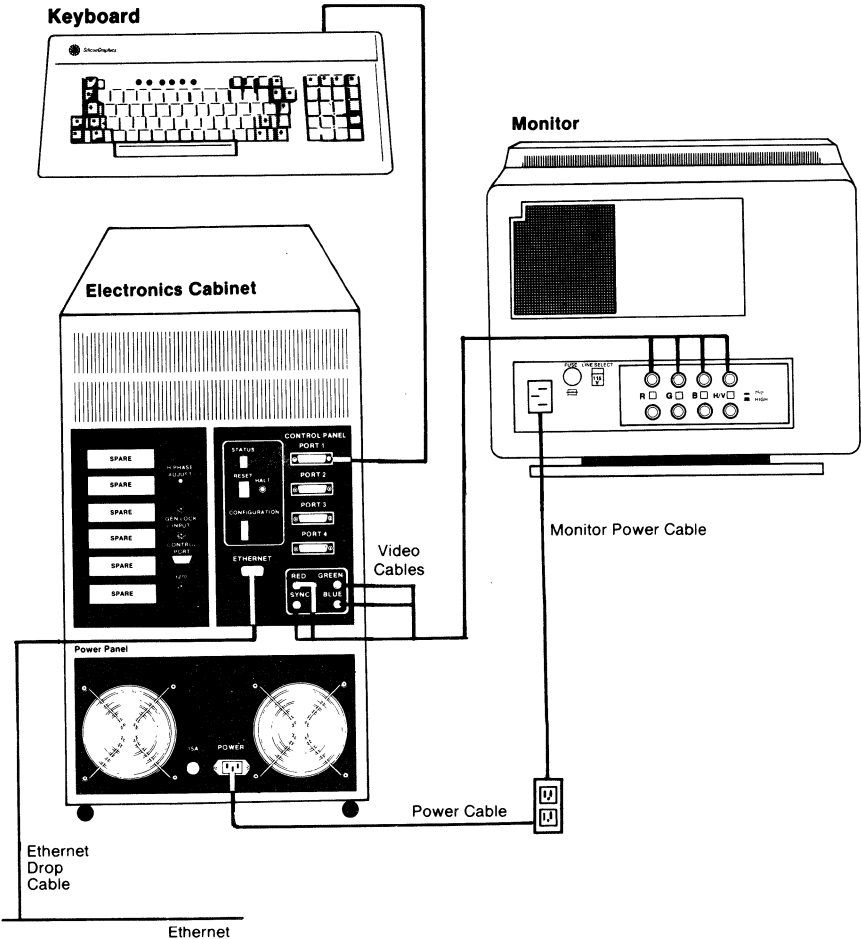


Figure 2-5: IRIS Cabinet Connections - Fifteen-inch 60-Hz Monitor

2.3.3 33-Hz Interlaced Monitor

Connect the monitor to the cabinet using the color-coded coaxial video cables (see Figure 2-6).

1. If you are using only one monitor, set *all* of the input impedance switches on the back of the monitor to the $\boxed{75 \Omega}$ position.

To connect several monitors in a series (daisy chain), set the input impedance switches to the $\boxed{\text{High}}$ position for all but the last monitor, which should be set to the $\boxed{75 \Omega}$ position.

Attach the outgoing video cables to the unused BNC connectors on the back of the monitor.

2. Connect each color-coded cable end to either one of the corresponding input sockets on the monitor back panel.

Push each cable into its connector and rotate to lock into place.

3. Connect the other end of each color-coded cable to the corresponding output socket on the standard I/O panel.

Push the cable into the connector and rotate to lock into place.

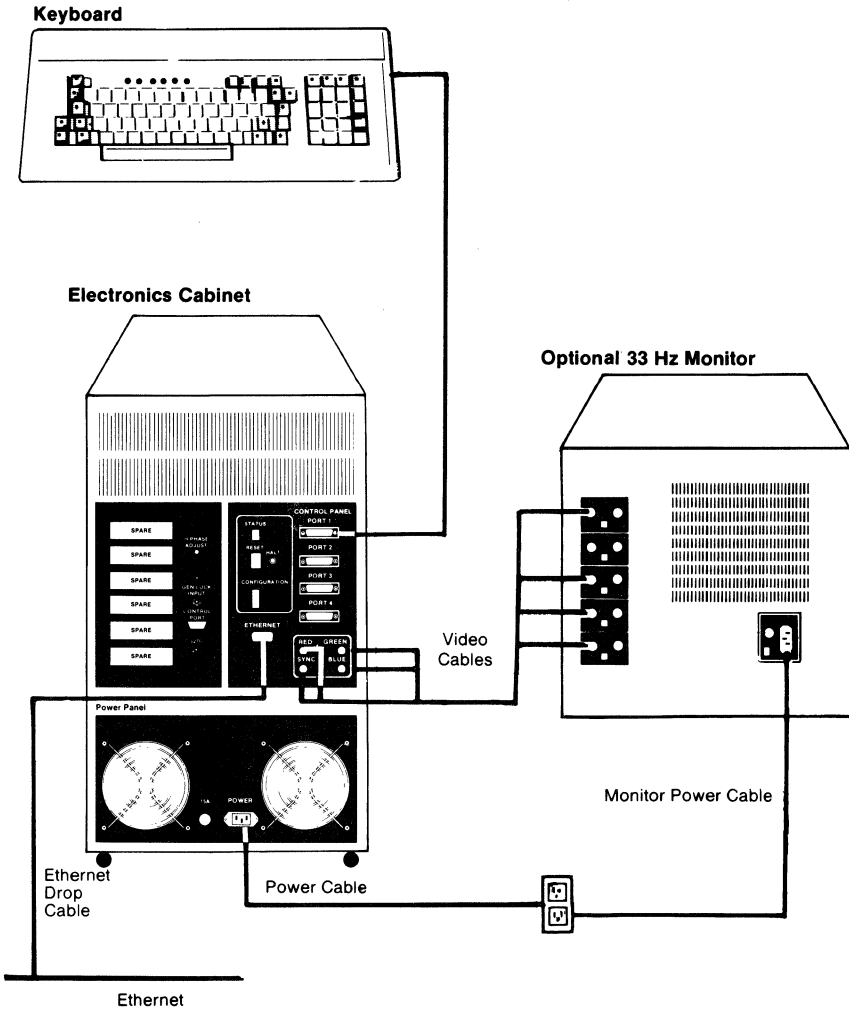


Figure 2-6: IRIS Cabinet Connections - 33-Hz Interlaced Monitor

2.4 Monitor Adjustment

The monitor control panel on the right side of the monitor allows the characteristics of the monitor to be adjusted.

The nineteen-inch monitors (60-Hz and 33-Hz) have two knobs labeled **Brightness** and **Contrast**, and a button labeled **Degauss** (see Figures 2-7 and 2-8).

The fifteen-inch monitor has two recessed dials labeled **Brightness** and **Contrast**, and a button labeled **Degauss** (see Figure 2-9).

NOTE: Color rendering and stability may drift for the first 45 minutes after powerup.

1. After the monitor has warmed up, turn the **Brightness** and **Contrast** controls to the maximum (clockwise) setting.
2. Turn the **Brightness** control down until the gray raster just disappears in relation to the black area at the edge of the screen. Lighter brightness settings impair image sharpness and color fidelity.
3. After the **Brightness** control has been set, adjustment of the **Contrast** control is a matter of personal taste.
4. If the color purity or convergence appear out of adjustment, hold down the **Degauss** button on the monitor control panel for about five seconds and then release it. The image should noticeably improve.

Once you adjust the nineteen-inch 60-Hz monitor, push in the **Brightness** and **Contrast** knobs so they are flush with the surface of the monitor.

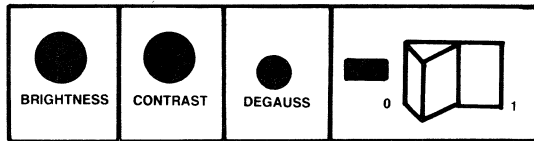
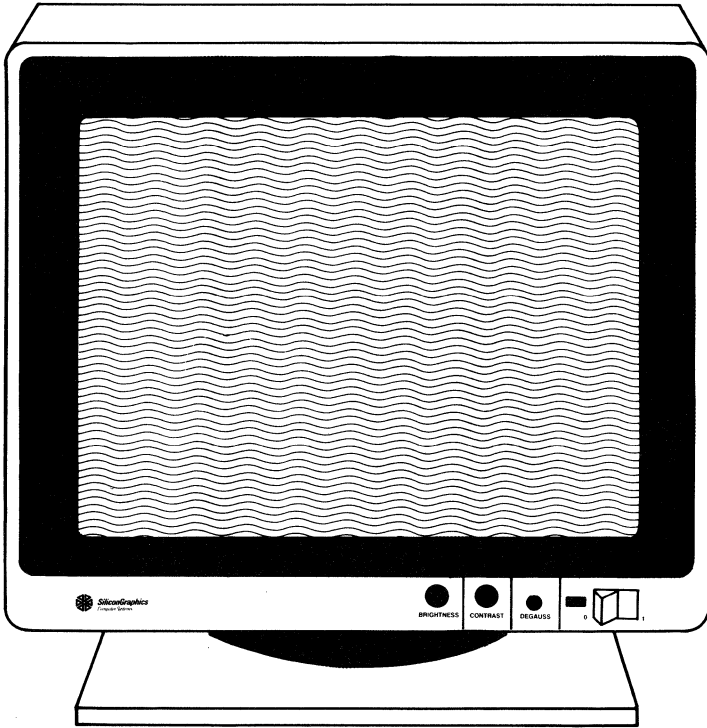


Figure 2-7: Monitor Control Panel for Nineteen-inch 60-Hz Monitor

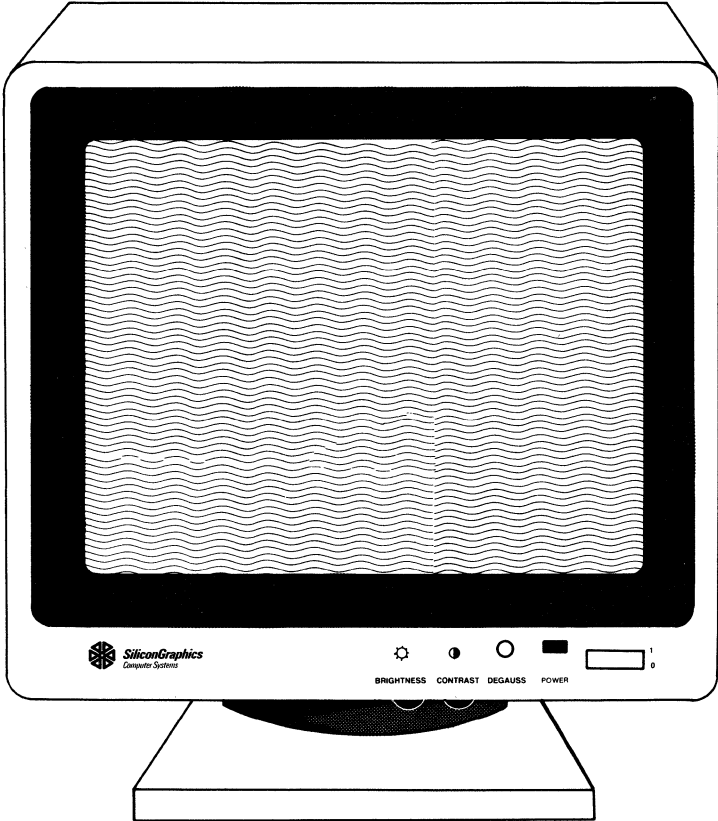


Figure 2-8: Monitor Control Panel for Fifteen-inch 60-Hz Monitor

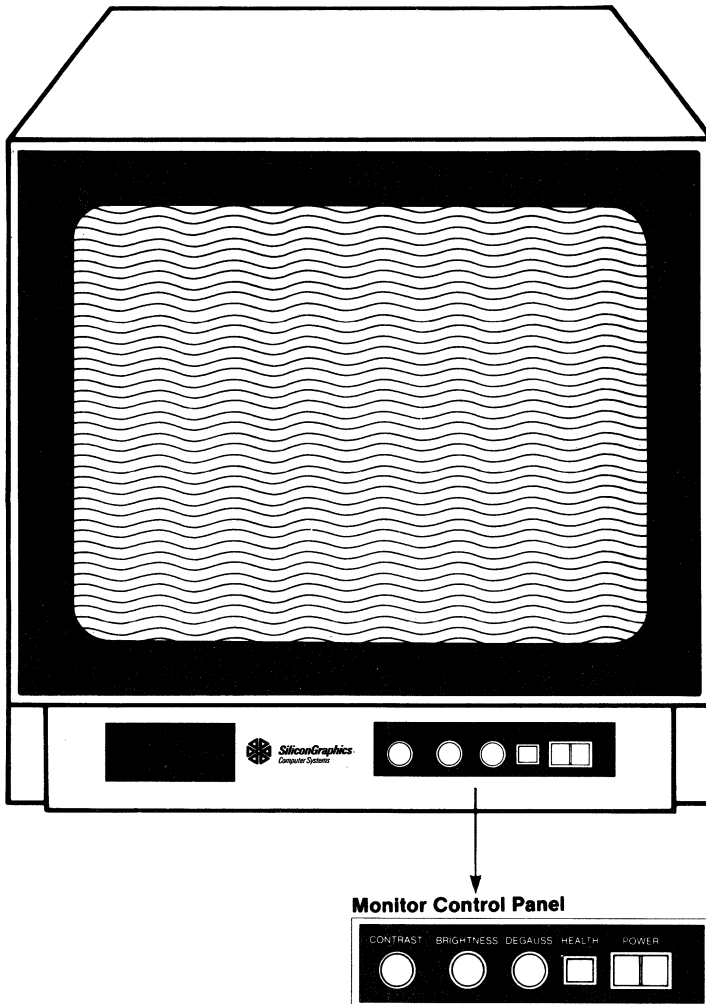


Figure 2-9: Monitor Control Panel for 33-Hz Monitor

2.5 Monitor AC Power Cable Connection

Plug the monitor into a 120/240 VAC outlet.

1. Connect the female end of the AC power cable to the **Input** power socket on the monitor back panel.
2. Connect the male end of the monitor power cable to a wall outlet.

2.6 Cabinet AC Power Connection

The cabinet power socket is located on the cabinet power panel (see Figure A-4).

CAUTION: Do not connect the IRIS to a switched power outlet.

1. Connect the female end of the AC power cable to the power socket labeled **Power** on the cabinet power panel.
2. Connect the male end of the cabinet power cable to an appropriate outlet. See Appendix A, IRIS Specifications, for the IRIS power requirements.

2.7 IRIS to Ethernet Connection

The IRIS can communicate with other hosts and terminals through an Ethernet local area network. The other machines must have the necessary communications software. You can connect the IRIS to an Ethernet local area network while the network is operating.

To connect the IRIS to an Ethernet local area network, you need:

- An *Ethernet transceiver* to attach to the Ethernet.
- One 75-foot, 15-conductor drop cable to connect the IRIS cabinet to the Ethernet transceiver.

The Ethernet port is located on the standard I/O panel, on the back of the cabinet.

There are three Ethernet standards: Ethernet 1.0, Ethernet 2.0, and IEEE 802.3. The IRIS supports all three. The default is Ethernet 1.0; for Ethernet 2.0 or IEEE 802.3, you must change the jumpering to the Ethernet interface board. The standard for the Ethernet transceiver, drop cable, and interface board must be the same. To change standards from the default, contact your service representative.

To connect the Ethernet cable to the cabinet, follow these steps:

1. Connect the male end of the drop cable to the Ethernet port, labeled **Ethernet**, on the standard I/O panel. Use the slide lock to secure the cable in the connector.
2. Select an appropriate tap point on the Ethernet coaxial cable (instructions are included with each transceiver).

NOTE: Approved Ethernet coaxial cable is marked with rings at 2.5-meter intervals (minimum distance). Transceivers should be placed at these rings to minimize transceiver reflection, which can induce transmission errors.

3. Connect the transceiver to the Ethernet cable.
4. Connect the female end of the drop cable to the transceiver.

3. Booting the IRIS

This chapter contains step-by-step procedures for booting and checking out a new IRIS system. This chapter also describes the bootstrap options and the startup environment for the IRIS. Before following the procedures in this chapter, you must install your system as described in Chapter 2, Hardware Installation. After you complete the procedures in this chapter, see Chapter 4 for workstation system administration procedures, or Chapter 5 for terminal system administration procedures.

This chapter contains the following information:

- Workstation Booting Instructions
- Terminal Booting Instructions
- The Startup Environment
- Boot Options

3.1 Workstation Booting Instructions

To boot the default software, which is on the disk, and run the flight simulator demonstration program, follow these steps:

1. Set the **Power** switch on the display monitor to **On**.
2. Set configuration switches 1 through 9 on the cabinet back panel to **Closed** (see Figure 3-1).

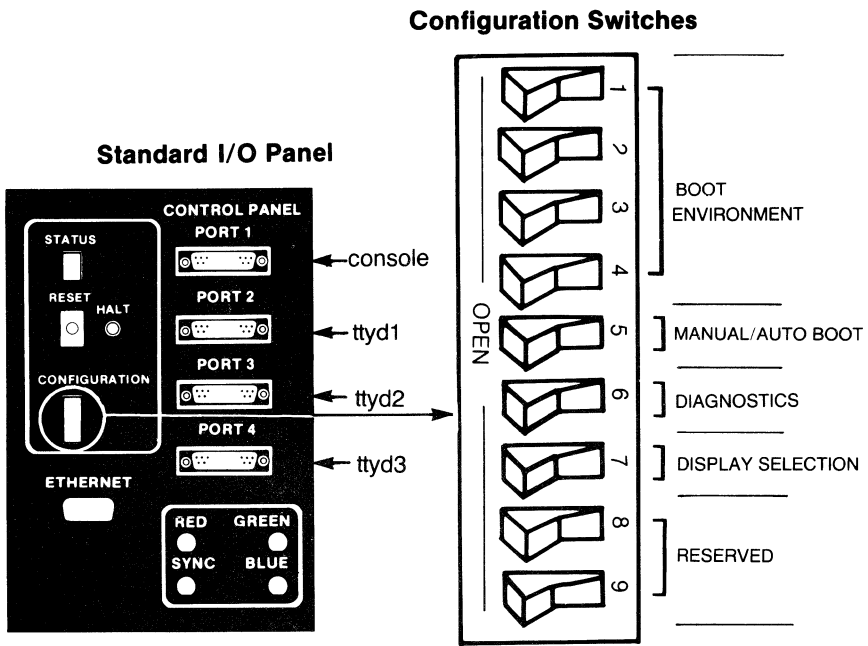


Figure 3-1: IRIS Configuration Switches

3. Set the **Power** switch on the cabinet front panel to **On**. If the power for the workstation is already on, press the **Reset** button. The workstation displays the PROM monitor prompt:

```
iris>
```

Wait 20 seconds for the disk to spin up to speed. (The boot may fail if you don't wait that long.)

4. Enter the letter **b** and press **Return**.

```
b
```

The workstation displays system information similar to that shown in Figure 3-2. The IRIS is running in UNIX *single-user mode*, which you use only for system maintenance.

At the **#** prompt, start *multi-user mode* by typing:

```
multi
```

5. When the workstation prompts for the correct date, enter the date in the requested format, as illustrated in the example below. The characters *mmddhhmm yy.ss* represent digits for month-day-hour-minute-year-seconds. Year and seconds are optional. If the date shown is incorrect, type **n** and enter the correct date.

```
Is the date Wed July 21 08:10:33 PST 1989 correct?(y or n)n
Enter the correct date (mmddhhmm[yy][.ss]):0721083089.33
```

6. When the workstation prompts for a file system check, answer **yes (y)**:

```
Do you want to check filesystem consistency?(y or n)y
```

The system now performs initializations required for multi-user mode. Once multi-user mode has been started, a login prompt appears:

```
IRIS login:
```

7. To test a newly installed system, log in to the guest account:

```
guest
```

8. To use the flight simulator, type:

```
~demos/flight
```

9. To leave the *flight* program, press ESC.
10. To log out, type:

```
logout
```

Important: Make sure you have a bootable backup tape containing the stand-alone software, the root file system, and the user file system. You should receive a bootable backup tape with your workstation. Use this tape to boot the workstation and rebuild the disk in case the file system is damaged. See Section 4.4.1, Making a Bootable Backup Tape.

For more information about system administration, such as adding new accounts, changing the time zone, and enabling network communication, see Chapter 4, System Administration.

Section 3.4, Boot Options, contains detailed information about the boot procedure, including procedures for booting from various devices. Section 3.4 also describes the PROM monitor, a command interpreter that controls the boot environment.

Kernel Number:

SYSTEM 5 UNIX #203: [Tues Nov 9 15:38:09 PST 1987]

Copyright:

(C) Copyright 1986 - Silicon Graphics Inc.

Actual Memory:

real = 4194304

Kernel Size:

kmem = 491520

Available User Memory:

user = 3702784
bufs = 819200 (max=8k)

Hardware Configuration:

dsd0 at mbio 0x7f00 ipl 1
qic0 slave 0
md0 (Priam V170 Name: IP-2) slave 1
md1 (Priam V170 Name: IP-2) slave 2
mf0 not installed
st0 not installed
nx0 (FW2.6 HW 2.0) (0800.1400.0120) at mbio 0x7ffc ipl2
fpa installed

Root File System Device Name:

root on md0a

Swap Space Device Name and Size:

swap on md0b [8865K]

Figure 3-2: Sample IRIS Boot Information

3.2 Terminal Booting Instructions

To boot the default software on the disk and run the flight simulator demonstration program, follow these steps:

1. Set the **Power** switch on the display monitor to **On**.
2. Set configuration switches 1 through 9 on the cabinet back panel to **Closed** (see Figure 3-1).
3. Set the **Power** switch on the cabinet front panel to **On**. If the power is already on, press the **Reset** button. The IRIS terminal displays the PROM monitor prompt:

```
iris>
```

Wait 20 seconds for the disk to spin up to speed. (The boot may fail if you don't wait that long.)

4. Enter the letter **b** and press **Return**.

```
b
```

5. When the terminal prompts for the correct date, enter the date in the requested format, as illustrated in the example below. The characters *mmddhhmm yy.ss* represent digits for month-day-hour-minute-year-seconds. Year and seconds are optional. If the date shown is incorrect, type **n** and enter the correct date.

```
Is the date Wed July 21 08:10:33 PST 1989 correct?(y or n)n
Enter the correct date (mmddhhmm[yy][.ss]):0721083089.33
```

6. After the startup sequence is complete, the IRIS terminal automatically runs the terminal emulator program, *wsiris*. To enter the shell, type **~!** at the first prompt:

```
TCP/IP:
```

```
Enter IRIS IP address: ~!
```

XNS or IEEE-488 option:

Connect to what host? ~!

If your IRIS has the IBM option, type in ~! to return from the *t3279* menu to the shell.

The shell prompt appears:

%

7. To use the flight simulator, type:

`~demos/flight`

8. To leave the *flight* program, press ESC.

9. To return to the terminal emulator program, type:

`exit`

See Chapter 5, IRIS 3010 System Administration, for more information on using the terminal emulator, connecting to a host, and configuring the user environment.

3.3 The Booting Environment

During the startup process, the IRIS displays a set of system information, including memory size, hardware configuration, and file system identification (see Figure 3-2).

The IRIS terminal boots into the terminal emulator program. For more information on IRIS terminal operation, see Chapter 5.

The IRIS workstation boots into single-user mode, which you use only for system maintenance. For normal operation, the workstation must be in multi-user mode. The *multi* command initiates the process of putting the workstation into multi-user mode. The details of this procedure are controlled by the file */etc/rc*, which contains commands for starting daemons

and mounting file systems. For more information, see *brc*(1). To put the IRIS in multi-user mode, follow these steps:

1. Enter the *multi* command:

```
multi
```

If the */etc/model* file is unusable, the system prompts for the model number, writing the response to */etc/model*.

2. A prompt asks to run the UNIX file system check program *fsck*.

```
Do you want to check filesystem consistency? (y or n)
```

Normally, you should answer **y**, and the *fsck* program checks the file systems. Answer **no** only if the system has been shut down with the *reboot* command, as described in Section 4.1, Basic Operation and Shutdown. Even then, you are advised to run *fsck* occasionally.

If *fsck* finds no problems, it displays one line for each test. If *fsck* finds problems, it prompts for permission to repair the file system. See the *UNIX Programmer's Manual* for more information on *fsck*.

3. When the terminal prompts for the correct date, enter the date in the requested format, illustrated in the example below.

```
Enter the correct date (mmddhhmm[.ss][yy]):07210830.3389
Is the date Wed July 21 08:30:33 PST 1989? (y or n) y
```

The characters *mmddhhmm.ssyy* represent month-day-hour-minute-seconds-year. The seconds and the year are optional. The entry above sets the date to 33 seconds past 8:30 a.m. on July 21, 1989.

The system now performs initializations required for multi-user mode. Once multi-user mode has been started, a login prompt appears:

```
IRIS login:
```


NOTE: To configure your workstation to boot automatically into multi-user mode, see Section 4.2.4, Entering Multi-user Mode Automatically.

3.4 Boot Options

You define the IRIS boot environment by setting configuration switches 1 through 4 on the cabinet back panel. The two basic boot options are automatic boot or PROM monitor boot:

- | | |
|-------------------|---|
| Automatic boot | At powerup, the IRIS boots from a file called <i>defaultboot</i> on the device specified by the configuration switches (see Table 3-1 and Section 3.4.2, Automatic Boot). |
| PROM monitor boot | At powerup, the IRIS enters the PROM monitor and waits for further boot instructions (see Section 3.4.1, PROM Monitor Boot). |

To boot from a secondary video driver, see Chapter 8, Video Options.

Since the IRIS can be booted from different devices (hard disks, tape drives, etc.), the PROM monitor provides the `ls` command, a version of the UNIX `ls(1)` command, which displays the names of the files on the attached devices. You can specify a device name and a pathname in the `ls` command (see Table 3-2).

For example, `ls /` searches the root file system (`/`) on the default device and lists its contents. If you type `ls` without an argument, the IRIS displays a list of files on the default device.

The IRIS is shipped with the configuration switches set for booting from the PROM monitor. To select automatic booting, change the settings of the configuration switches on the standard I/O panel. Table 3-1 lists the defined configuration switch settings.

<i>Switch</i>	<i>Switch Name</i>	<i>Position*</i>	<i>Meaning</i>
1 - 4	Boot environment	CCCC OCCC COCC OCCC OCOC	Hard disk boot Cartridge tape boot Floppy disk boot Network boot PROM monitor
5	Autoboot	C O	PROM Monitor boot Automatic boot
6	Quiet mode	C O	Display system information Don't display system information
7	Monitor select	C O	Display on primary monitor Display on secondary monitor
8-9	Reserved	C	

Table 3-1: IRIS Configuration Switches

*C means Closed and O means Open.

If you try to boot a nonexistent device or file from the PROM monitor, the system prints an error message and returns you to the PROM monitor. If an automatic boot fails, the system waits a few seconds and tries again.

As Table 3-1 shows, switches 1 through 4 select the device from which the IRIS is booted. Switch 5 specifies whether the IRIS should perform an automatic boot or a PROM monitor boot. Switch 6 determines whether or not system information is displayed on the screen after the IRIS is reset. Switch 7 selects the display monitor type. (For an explanation of selecting a display type, see Chapter 8.)

Device	Description
hd0	Disk drive 0 (generic)
md0	Disk drive 0 (IRIS 3010, 3020, 3110, 3115, 3120)
si0	Disk drive 0 (IRIS 3030, 3120B, 3130)
hd1	Disk drive 1 (generic)
md1	Disk drive 1 (IRIS 3020, 3115, 3120)
si1	Disk drive 1 (IRIS 3030, 3120B, 3130)
ct0	Cartridge tape drive 0 (generic)
mq0	Cartridge tape drive (IRIS 3020, 3030, 3115, 3120, 3120B, 3130)
sq0	Cartridge tape drive (IRIS 3030, 3120B, 3130)
fd0	Floppy disk 0 (generic)
mf0	Floppy disk 0 (IRIS 3020, 3030, 3115, 3120, 3120B, 3130)
sf0	Floppy disk 0 (IRIS 3030, 3120B, 3130)

Table 3-2: Boot Devices

3.4.1 PROM Monitor Boot

The PROM monitor is a command interpreter designed primarily to control the IRIS boot environment. The IRIS enters the PROM monitor when the power is turned on or the system is reset in one of two cases:

- Configuration switches 1 through 4 are set for PROM monitor boot (OCOC).
- Switch 5 is set to C, regardless of the setting of switches 1 through 4.

Table 3-2 lists the device names recognized by the PROM monitor. Table 3-3 summarizes the PROM monitor commands.

To boot through the PROM monitor, follow these steps:

1. Set the Power switch on the display monitor to On.

2. Set configuration switches 1 through 4 to the appropriate boot device setting (see Table 3-1). (The default boot device is the hard disk, which has the setting CCCC.)
3. Set switch 5 to **Closed**.
4. Set the **Power** switch on the cabinet front panel to **On**.

If the clock battery has run down, the system displays this message, which refers only to the clock:

```
Power has been lost to the machine.
```

The IRIS displays the PROM monitor prompt:

```
iris>
```

If the prompt does not appear, press the **Reset** button.

Wait 20 seconds for the disk to spin up to speed. (The boot may fail if you don't wait that long.)

5. To boot from the device specified by configuration switches 1 through 4, enter the letter **b** and press **RETURN**.

The IRIS reads the file *defaultboot* from the default device.

Command	Description
b	Boot <i>defaultboot</i> from the default boot device.
[b] file	Boot <i>file</i> on the default boot device, determined by the configuration switches (see Table 3-1).
[b] dev:	Boot file <i>defaultboot</i> from specified device.
[b] dev:file	Boot <i>file</i> on device <i>dev</i> .
h	Display a list of PROM monitor commands.
ls [dev:] [pathname]	List the contents of directory <i>pathname</i> on device <i>dev</i> . With no arguments, ls provides a list of files on the default device (see Table 3-3).
xns [.hostname] : [file]	Boot <i>file</i> over the network using XNS.
tcp [.hostname] : [file]	Boot <i>file</i> over the network using TCP.
exit	Restart the PROM monitor.

Table 3-3: PROM Monitor Commands

You can boot the IRIS from any attached device through the PROM monitor, regardless of the settings of switches 1 through 4. See Table 3-3 for a listing of the PROM monitor commands.

The examples below show how to boot from various devices using the PROM monitor. Table 3-2 lists the available device names. In all of the examples, if you enter a device name but no filename, the IRIS looks for a file with the name *defaultboot* on the specified device. If you enter only a device or filename, or both, with no specific PROM monitor command, the IRIS tries to boot from the specified device and file.

Booting from the Tape Drive

To boot from the tape drive, specify the tape drive device name and filename. For example, to boot the file *mdfex* on the tape drive, enter this command:

```
ct0:mdfex
```

To be able to boot from a tape, it must be in *cpio* format. See Section 4.4.1 for information on making a bootable backup tape.

Booting from the Disk

To boot from the disk drive, specify the disk device name and filename. For example, to boot the file *vmunix* on partition a of drive 0, *hd0*, enter this command:

```
hd0:vmunix
```

Booting over an XNS Ethernet

If you are running the XNS communications option on your IRIS, you can boot the IRIS over an XNS Ethernet. Use this command syntax:

```
xns [.hostname] :filename
```

If the hostname is omitted, the first host to recognize *filename* responds.

For example, to boot the IRIS from the file */usr/local/boot/goboot* on the host *cruncher*, enter this command:

```
xns.cruncher:/usr/local/boot/goboot
```

Booting with TCP/IP

To boot over a TCP/IP network, you need this hardware and software:

- Version 3.0.9 or later PROMs
- The network boot software on the remote machine (for the IRIS series 3000, standard with software release GL2-W3.6)
- TCP/IP communications software on the remote machine
- *Internet addresses* that have been set on both the local and remote machine, as described in Section 4.2.2, Setting Your Internet Address

To boot over a TCP/IP network, use this command syntax:

```
tcp[.hostname]:filename
```

If the hostname is omitted, the first host to recognize *filename* responds.

For example, to boot the IRIS from the file */usr/local/boot/goboot* on the host *cruncher*, enter this command:

```
tcp.cruncher:/usr/local/boot/goboot
```

3.4.2 Automatic Boot

When configuration switch 5 is set for automatic boot, the IRIS attempts to boot the file *defaultboot* on the device specified by configuration switches 1 through 4 (see Table 3-1).

To configure the IRIS to boot automatically:

1. Set the **Power** switch on the display monitor to **On**.
2. Set configuration switch 5 to **Open**.
3. Set configuration switches 1 through 4 to the appropriate settings for the boot device (see Table 3-1).
4. Set the **Power** switch on the cabinet front panel to **On**.

NOTE: If the power for the IRIS is already on, issue the */etc/reboot* command. If this fails, press the **Reset** button. Do not press the **Reset** button while the IRIS is running UNIX without first using the *etc/reboot* command.

4. Workstation System Administration

The system administrator is responsible for configuring the IRIS workstation to meet user requirements and for maintaining the installed system. This chapter covers the following procedures:

- Basic operation and shutdown
- UNIX configuration:
 - Naming the workstation
 - Setting an internet address
 - Adding user accounts
 - Booting into multi-user mode automatically
 - UNIX configuration files
 - Special device files in */dev*
- Network communication:
 - TCP/IP network commands
 - XNS network commands
 - Using multiple kernels
- Backups:
 - Making a bootable tape
 - Making a bootable tape for use over the network
 - Making periodic backups
- Recovery from a crash
 - Critical UNIX files
 - Recovery by booting from tape
 - Recovery by booting over the network

4.1 Basic Operation and Shutdown

If you have not installed and booted your workstation, see Chapter 2, Hardware Installation, and Chapter 3, Booting the IRIS. For a description of the startup environment, see Section 3.3, The Booting Environment.

The IRIS workstation boots into single-user mode, which you should use only for system maintenance. For normal operation, the workstation must be in multi-user mode, as described in Section 3.3. Section 4.2.4 explains how to configure your workstation to boot into multi-user mode automatically.

CAUTION: Do not press the `Reset` button while the IRIS workstation is running UNIX. For information on rebooting the system, see Chapter 3. If the IRIS workstation is not running UNIX and is under control of the PROM monitor, then you can use the `Reset` button or the `Power` switch.

Before turning off power to the workstation, you should perform a soft reboot of the system to ensure that all in-memory disk blocks have been written to the disk and that all directory information on the disk is current.

To shut down the workstation, follow these steps:

1. Become the superuser:

```
su
```

2. Make sure there are no other users on the system:

```
who
```

3. Save all of the information that is in the memory buffer:

```
sync
```

4. Reboot the system:

reboot

5. Set the **Power** switches on the cabinet and monitor to **Off**.

4.2 UNIX Configuration

One of the strengths of the UNIX operating system is its flexibility. The system administrator configures the workstation to the needs of the local user community, and each user can fine-tune his or her own environment.

The following subsections contain instructions for the following common system administration tasks on an IRIS workstation:

- Naming a workstation
- Setting an internet address
- Adding a new account
- Making a home directory
- Defining user groups
- Creating a password
- Creating a user environment
- Entering multi-user mode automatically

To perform these tasks, you must be logged in as *root*, or you must be the *superuser*. When you are root (superuser), you can access and change all of the files and directories on the workstation. You can become root in two different ways:

- Log in as root at the IRIS login: prompt, or
- Type **su** when you are logged in to your own account. When you want to return to your own account, type **exit**.

If you are not logged in, use the first method to become root. At the login prompt, type:

```
IRIS login: root
```

For more information on UNIX configuration, see the *UNIX Programmer's Manual* and the list of configuration files in Section 4.2.5, UNIX Configuration Files.

4.2.1 Naming an IRIS Workstation

The default name of a new IRIS workstation is *IRIS*. If you have more than one workstation on a network, you must assign each workstation a unique name. The name can be up to eight characters long and must not contain blanks.

To change the name of a workstation, edit the file */etc/sys_id*. Replace the word *IRIS* with your system's new name. Save the file, then reboot the system. To display the system name at login, edit the file */etc/gettydefs*. Replace all occurrences of *IRIS* with your new system name. To display a message at login, edit the file */etc/motd* (message of the day). The IRIS will display both the new login prompt and the new message the next time you log in. To determine the current name of the system, use the *hostname(1)* command.

4.2.2 Setting Your Internet Address

If the root file system on your disk becomes damaged, you can use a bootable backup tape to boot the workstation and rebuild the file system. If you don't have a cartridge tape drive, you can boot the damaged workstation over the network from a functional workstation with a cartridge tape drive. The damaged workstation is called the *client*; the functional workstation is called the *server*. To boot over the network, you need this hardware and software:

- Version 3.0.9 or later PROMs on the client

- The network boot software on the server (for the IRIS series 3000, standard with software release GL2-W3.6)
- TCP/IP communications software on the server
- Internet addresses that have been set on the server and on the client, as described in this section

The IRIS has two network addresses, an Ethernet address and an internet address. The Ethernet address is a unique address that is burned into a PROM on the Ethernet board inside the IRIS. It never changes unless you change the Ethernet board. The internet address is a four-byte number and is determined by your network. Your network administrator must assign an internet address for your workstation. See Chapter 2, Software Administration, in the *TCP/IP User's Guide* for more information on internet addresses.

To display the client's internet and Ethernet addresses, type **set** without an argument at the PROM monitor. You must have Version 3.0.9 or later PROMs. The IRIS displays the PROM version number on the first line of the PROM monitor display, before you boot the IRIS. To get to the PROM monitor, make sure that no one else is logged on to the workstation, then type:

```
su
who
sync
sync
reboot
```

Once an internet address has been assigned to your machine, follow these steps:

1. Enter the name of your machine, its internet address, and its Ethernet address in the */usr/etc/bootptab* file on the server or servers from which you want to boot. See the manual page *bootp(1M)* for information about the format of *bootptab*.

2. Set the internet address of your machine locally using the PROM monitor `set` command. Type:

```
set inetaddr <internet address>
```

The *internet address* is four decimal numbers separated by periods, for example, 89.0.0.1. Enter the number for the internet address assigned to you by the network or system administrator. This command stores the address, so that it is not lost when the machine is turned off or rebooted.

If the internet address of your machine is ever changed, you must reset it using the `set inetaddr` command. To check whether an internet address has been set, use the PROM monitor's `set` command.

4.2.3 Adding a New Account

The IRIS workstation is shipped with seven user accounts: *root*, *rootcsh*, *rootsh*, *guest*, *demos*, *mexdemos*, and *tutor*. The *root* and *rootcsh* accounts are superuser accounts with a C shell environment. The *rootsh* account is a superuser account with a Bourne shell environment. The *guest* account is a sample user account with a C shell environment. The *demos* and *mexdemos* accounts are for running demonstrations (see Chapter 9, Demonstration Programs and Gifts). The *tutor* account contains the software that accompanies the *IRIS Programming Tutorial, C Edition*.

The accounts shipped on a new IRIS workstation have no passwords. To establish passwords for these accounts, follow the procedure below. See the *passwd(1)* manual page for more information.

If you have the Network File System option and want to set up the Yellow Pages accounts, see Chapter 3 of the *NFS User's Guide*.

Typically, each user on an IRIS workstation is given his or her own account. The procedure for creating a new account on the IRIS workstation consists of adding the new user to the file */etc/passwd*, creating a home directory for the user, and setting up startup files to define the user's environment. The details of this procedure are presented below. You must become the superuser to create a new account (see above).

Creating New User Accounts

Add a line for the new account to the file */etc/passwd*. Figure 4-1 contains a sample */etc/passwd* file.

```
root::0:0:Superuser:/:/bin/csh
rootcsh::0:0:Superuser:/:/bin/csh
rootsh::0:0:Superuser:/:/bin/sh
daemon*:1:1::/
bin*:2:2:Binary Files:/:
adm*:5:3:Administration:/usr/adm:
iris::7:0:/:/bin/tesh
uucpadm*:8:8:UUCP Administration:/usr/lib/uucp:
lp*:9:9:Line Printer:/:
mexdemos::996:997:/:usr/people/mexdemos:/bin/csh
demos::997:997:/:usr/people/demos:/bin/csh
guest::998:998:/:usr/people/guest:/bin/csh
games*:999:999:Games:/usr/games:/bin/sh
steve::11:20:Steve Brown:/usr/people/steve:/bin/csh
```

Figure 4-1: Sample */etc/passwd* File

The file */etc/passwd* contains a line for each account on a UNIX system. Each line has seven fields separated by colons (:). Table 4-1 lists the fields in */etc/passwd*.

Field	Contents
1	Account name
2	Encrypted user password
3	User number
4	Group number
5	User's real name
6	Home directory (default /)
7	Login shell (default <i>/bin/sh</i>)

Table 4-1: Fields in the */etc/passwd* File

Be sure the new entry contains a unique account name, a unique user number, and a group number. Assign a unique user number to each user. The system uses this number to assign file ownership.

The group number is the group identification given to the user at login. When the user logs in, he or she can access any files shared by all users in the same group.

The group number corresponds to the groups in the file */etc/group* (see *group(4)*). The */etc/group* file shipped on the workstation has group number 20 set to *user*; this is a default group number to use for new users.

Leave the password field empty. The system encrypts the password and adds it to the file when the user establishes a password. In Figure 4-1, the asterisks (*) in the password fields for some accounts prevent those names from being used as login accounts.

Ordinarily, the home directory in field 6 is the user's own directory. The login shell in field 7 can be either the C shell (*/bin/csh*) or the Bourne shell (*/bin/sh*). The default is the Bourne shell.

For example, to add a new account for a user named *jim* to the sample file in Figure 4-1, enter a line like this one:

```
jim::10:20:Jim Smith:/usr/people/jim:/bin/csh
```

See *passwd(4)* for more information.

Making a Home Directory

To make a home directory for the new user, use the same name specified in field 6 of the */etc/passwd* entry. Then, set the protections and ownership of the new directory. Typically, users' home directories are subdirectories of the directory */usr/people*.

The *mkdir(1)* command creates the new directory.

```
mkdir /usr/people/jim
```


The *chgrp*(1) command changes the group to which the directory belongs. The example below adds the directory */usr/people/jim* to the group *user*.

```
chgrp user /usr/people/jim
```

The *chmod*(1) command sets the protection parameters on a file or directory. The example below sets protection codes to allow only the owner to create files in the directory. All users can read the file and search the directory. Either the superuser or the owner of the file or directory can set protection parameters.

```
chmod 755 /usr/people/jim
```

The *chown*(1) command changes the ownership of the directory. Either the superuser or the owner of the directory can set ownership for the directory. The example below establishes *jim* as the owner of the directory */usr/people/jim*.

```
chown jim /usr/people/jim
```

Defining User Groups

To include the new user in groups other than *user*, edit the file */etc/group*. Entries to this file are optional. See *group*(4) for more information.

Figure 4-2 contains an example */etc/group* file. The file contains a line for each group on the system. Each line consists of four fields separated by colons (:).

```
sys:*:0:  
system:*:0:  
daemon:*:1:  
bin:*:2:  
adm:*:3:  
sgi_use:*:4:  
uucp:*:5:uucp  
sgi_use:*:6:  
sgi_use:*:7:  
uucpadm:*:8:uucp  
lp:*:9:  
user:*:20:  
vlsi:*:21:steve
```

Figure 4-2: Sample */etc/group* File

Table 4-2 lists the fields in */etc/group*.

Field	Contents
1	Group Name
2	Encrypted Group Password
3	Group Number
4	Group Members

Table 4-2: Fields in the */etc/group* File

To add a user to a group, append the user's name to the list of group members. Separate group members with commas. For example, to add *jim* to the group *vlsi*, append the name *jim* to the line for the group *vlsi*:

```
vlsi:*:21:steve,jim
```

Creating a Password

Use the *passwd* command to establish a password for an account. For example, to set a password for your personal account, log out so that you are no longer the superuser, then log back in as yourself. Type:

```
passwd
```

The system asks you to enter and confirm a password, which it encrypts and adds to */etc/passwd*.

If you forget your password, become the superuser and remove the encrypted password from */etc/passwd*.

You can also use the *passwd* command to change passwords. The *passwd* program queries for the old password before allowing you to set a new one.

Creating a User Environment

Startup files like *.cshrc*, *.login*, and *.profile* control the details of the user's environment. To add startup files to a user's home directory, copy them from */usr/people/guest*, and change them as necessary.

The choice of the C shell or the Bourne shell determines which files are necessary. If you choose the C shell, the user's home directory should contain the files *.login* and *.cshrc*. The C shell reads the *.cshrc* file in the user's home directory each time a shell is started. If the shell is a login shell, the C shell then reads the *.login* file in the user's home directory.

If you choose the Bourne shell, the user's home directory should contain the file *.profile*. The Bourne shell reads the *.profile* file in the user's home directory when a login shell is started. For more information on the C shell and the Bourne shell, see *csh(1)* and *sh(1)*.

Each user's shell startup file should use the *tset* command to read */etc/ttytype* and set the terminal type, so that screen editors and other programs know how to communicate with the terminal. The usual way to use *tset* with the C shell is to edit your *.login* file to contain these lines:

```
set noglob
set tmp = (`tset -S -Q`)
setenv TERM = tmp[1]
setenv TERMCAP = tmp[2]
unset tmp noglob
```

To use *tset* with the Bourne shell, edit your *.profile* file to contain this line:

```
eval `tset -s -Q`
```

For more information, see *tset(1)* and *ttytype(4)*.

4.2.4 Entering Multi-user Mode Automatically

By default, the IRIS workstation boots into single-user mode, which you should use only for system maintenance. When the system is running in single-user mode, only the root file system is mounted, none of the system daemons are started, and the terminal lines do not allow users to log in. To enter multi-user mode, become the superuser and issue the *multi* command.

You can also edit the file */etc/inittab* so that the system automatically enters multi-user mode each time it is booted. You must be the superuser to edit this file. The first line of */etc/inittab* tells *init* which mode to enter after booting UNIX:

```
is:s:initdefault:
```

Replace the *s* (for single) in the second field with *2* or *3*.

TCP/IP protocol:

```
is:3:initdefault:
```

XNS protocol:

```
is:2:initdefault:
```

The system will now enter multi-user mode each time it is rebooted. For more information on the *init* process, see *init(1M)* and *inittab(4)*.

4.2.5 UNIX Configuration Files

The directories */etc* and */usr/lib* contain the major system configuration files. Edit them as necessary to serve the needs of the local user community. If you have the NFS option, see the *NFS User's Guide* for information about the configuration files that are affected by NFS or Yellow Pages.

<i>/etc/bcheckrc</i>	This file contains commands that perform a file system check and set the date using <i>/etc/rc.getdate</i> . If it can't find <i>/etc/rc.getdate</i> , it prompts for the date.
<i>/etc/brc</i>	The <i>brc</i> procedure performs model-specific system initialization chores.
<i>/etc/cshrc</i>	The system reads this file at login for accounts that specify the C shell as the login shell. It contains commands that define the user's environment. See <i>cs(1)</i> and <i>cshrc(4)</i> .
<i>/etc/ethers</i>	This file contains information about the known (48-bit) Ethernet addresses of hosts on the internet.
<i>/etc/exports</i>	This file describes the file systems that are exported to NFS clients.

- /etc/fstab* This file describes the file systems and swap partitions on local machine. You can change *fstab* with a text editor. *fstab* is read by commands that mount, unmount, dump, restore, and check the consistency of file systems. */etc/fstab* encompasses the files */etc/checklist* and */etc/rc.fs* used in previous IRIS software releases.
- /etc/gettydefs* This file contains entries for line speeds and terminal settings used by *getty(1M)* for initializing devices. See *gettydefs(4)*.
- /etc/group* This file contains the list of groups that are used to control access to files. See Section 4.2 and *group(4)*.
- /etc/hosts* This file contains information on the known hosts on the DARPA Internet.
- /etc/hosts.equiv* This file contains a list of trusted hosts. When the system receives an *rlogin* or an *rsh* request from such a host, and the initiator of the request has an entry in */etc/passwd*, then the system does no further validity checking.
- /etc/ibtab* This file is an unordered collection of entries, each of which describes one IEEE 488 bus node. Its format is understood by the *ibtab(3N)* subroutine package, which is used by programs such as *iib(1M)*.
- /etc/inittab* This file contains the table that *init* uses to dispatch processes for initializing devices, starting daemons, and starting the shell. See *inittab(4)*, and *init(1M)*.
- /etc/model* This file contains the model number of the IRIS.

<i>/etc/motd</i>	This file contains the message of the day, which is displayed each time a user logs in to an IRIS workstation.
<i>/etc/networks</i>	This file contains information regarding the known networks that constitute the DARPA Internet.
<i>/etc/passwd</i>	This file contains information about the users with accounts on the workstation. It includes each user's name, user number, group number, home directory, and login shell. See Section 4.2.2 and <i>passwd(1)</i> .
<i>/etc/profile</i>	This file is read at login by accounts that specify the Bourne shell as the login shell. It contains commands that define the user's environment. See <i>sh(1)</i> or <i>profile(4)</i> .
<i>/etc/protocols</i>	This file contains information regarding the known protocols used in the DARPA Internet.
<i>/etc/rc</i>	<i>init(1M)</i> executes this command file at the start of multi-user mode. Typically, it starts daemons and mounts file systems. See <i>brc(1M)</i> .
<i>/etc/rc.getdate</i>	If a file with this name exists and is executable, the standard output of its execution is used as the argument to <i>date(1)</i> . Otherwise, the system prompts the user for the date.

<i>/etc/rc.local</i>	This file is for customized machine initialization procedures: local startup commands or daemons. This file does not change with each software update so that customized initialization procedures are not lost with each new software release. <i>/etc/rc</i> runs <i>/etc/rc.local</i> every time the IRIS is put into multi-user mode.
<i>/etc/rpc</i>	This file contains user-readable names that can be used in place of <i>rpc</i> program numbers.
<i>/etc/services</i>	This file contains information regarding the known services available in the DARPA Internet.
<i>/etc/sys_id</i>	This file contains the name of the system, which is always <i>IRIS</i> on a new workstation. See Section 4.2, <i>hostname(1)</i> , and <i>sys_id(4)</i> .
<i>/etc/syslogd</i>	This file reads and logs messages into a set of files described by the configuration file <i>/etc/syslog.conf</i> .
<i>/etc/termcap</i>	This file contains definitions for different terminal types. See <i>termcap(4)</i> .
<i>/etc/ttytype</i>	This file contains a mapping of the terminal types attached to each tty port on the IRIS workstation. <i>tset(1)</i> and <i>login</i> read this file to initialize the terminal (TERM) environment variable at login. See <i>tset(1)</i> and <i>ttytype(4)</i> .

/etc/TZ

This file contains an entry for the time zone. Several different utilities use this file. */etc/TZ* contains three fields:

Standard heading for time zone
Offset from Greenwich Mean Time (in hours)
Optional daylight savings time zone

The IRIS workstation is shipped with the time zone set for Pacific Standard Time:

PST8PDT

These are examples for other time zones:

EST5EDT
CST6CDT
MST7MDT

For more information, see *TZ(4)*.

/usr/lib/acct/holidays

This file contains a list of holidays. It is used by the *calendar(1)* program.

/usr/lib/crontab

This file contains entries for commands that the *cron* daemon (clock daemon) runs at fixed intervals. See *cron(1M)*.

/usr/lib/Mail.rc

This file contains *set* commands that initialize the mail system.

The next four files configure UUCP, the UNIX-to-UNIX communication system. See the *UNIX Programmer's Manual, Volume II*, for more information.

/usr/lib/uucp/L-devices

This file sets the line speeds for the ports used by *uucp(1C)*. The file contains a series of one-line entries that follow the format of this example:

```
DIR tty02 0 4800
```

This entry specifies that the device */dev/tty02* is a directly connected computer that can be used at 4800 baud.

/usr/lib/uucp/L-dialcodes

This file contains the dial-code abbreviations used in the */usr/lib/uucp/L.sys* file. The entries are in the form:

```
abb dial-sequence
```

abb is the abbreviation of a location, and *dial-sequence* is the dial sequence associated with the location. For example:

```
sf 415
```

This entry sends the sequence 415 to the dial unit.

/usr/lib/uucp/L.sys

This file contains information about sites that *uucp(1)* can communicate with.

/usr/lib/uucp/USERFILE

This file contains information that limits user accessibility. It specifies which files a user on the local machine can access, which files can be accessed from a remote computer, which login name is used by a particular remote computer, and whether a remote computer should be called back to confirm its identity.

4.2.6 Device Files

The */dev* directory contains the device files. Table 4-3 describes the contents of each file. The system administrator doesn't need to edit these files.

File	Description
drum	Paging device (used for virtual memory)
floppy	Optional floppy disk drive (generic block device)
rfloppy	Optional floppy disk drive (generic raw device)
ib[0-9]	IEEE 488 devices
kmem	Kernel memory; see <i>mem(7)</i>
md0[a-h]	Disk zero partitions (IRIS 3010, 3020, 3115, 3120 block devices): md0a contains the root (<i>/</i>) file system; md0c contains the user (<i>/usr</i>) file system (IRIS 3020, 3115, 3120), or a copy of the root file system (IRIS 3010). See <i>efs(4)</i> .
rmd0[a-h]	Disk zero partitions (IRIS 3010, 3020, 3115, 3120 raw devices)
md1[a-h]	Optional disk partitions (IRIS 3010, 3020, 3115, 3120 block devices)
rmd1[a-h]	Optional disk partitions (IRIS 3010, 3020, 3115, 3120 raw devices)
mem	Memory; see <i>mem(7)</i>
mf0a	Optional floppy disk drive (IRIS 3010, 3020, 3120 block device)
rmf0a	Optional floppy disk drive (IRIS 3010, 3020, 3120 raw device)
null	Null device (zero length on input, data sink on output) See <i>null(7)</i> .
pxd	IBM driver

Table 4-3: Special Device Files in */dev*

File	Description
rmt1	Cartridge quarter-inch magnetic tape (generic raw block device, rewinds at open and close)
rmt2	Cartridge quarter-inch magnetic tape (generic raw block device, no rewind at open or close)
rmt3	Half-inch magnetic tape (raw block device, rewinds at open and close)
rmt4	Half-inch magnetic tape (raw block device, no rewind at open or close)
sf0a	Optional floppy disk drive (IRIS 3030, 3120B, 3130 block device)
rsf0a	Optional floppy disk drive (IRIS 3030, 3120B, 3130 raw device)
ip0[a-h]	Disk zero partitions (IRIS 2500T block devices)
ip1[a-h]	Optional disk partitions (IRIS 2500T block devices)
rip0[a-h]	Disk zero partitions (IRIS 2500T raw devices)
rip1[a-h]	Optional disk partitions (IRIS 2500T raw devices)
si0[a-h]	Disk zero partitions (IRIS 3030, 3120B, 3130 block devices): si0a contains the root (<i>/</i>) file system; si0c contains the user (<i>/usr</i>) file system. See <i>efs(4)</i> .
rsi0[a-h]	Disk zero partitions (IRIS 3030, 3120B, 3130 raw devices)
si1[a-h]	Optional disk partitions (IRIS 3030, 3120B, 3130 block devices)
rsi1[a-h]	Optional disk partitions (IRIS 3030, 3120B, 3130 raw devices)
sq0	Cartridge magnetic tape (IRIS 3030, 3120B, 3130 raw block device)
nrsq0	Cartridge magnetic tape (IRIS 3030, 3120B, 3130 raw block device and no rewind at open or close)

Table 4-3: Special Device Files in */dev* (continued)

File	Description
syscon	System console (linked to <i>/dev/console</i>)
systty	System console (linked to <i>/dev/console</i>)
cent	Color graphics printer device
vers	Versatec printer device
tty	A synonym for the terminal device associated with a process. See <i>termio(7)</i> and <i>tty(7)</i> .
ttyd1	Serial Port 2 on standard I/O panel
ttyd2	Serial Port 3 on standard I/O panel
ttyd3	Serial Port 4 on standard I/O panel
ttym1	Serial Port 2 for a modem
ttym2	Serial Port 3 for a modem
ttym3	Serial Port 4 for a modem
ttyf2	Serial Port 3 flow control for a device that understands hardware flow control
ttyf3	Serial Port 4 flow control for a device that understands hardware flow control
ttyn*	XNS Ethernet network terminal devices
ttyw[0-9]	Window ttys; <i>ttyw0</i> is the console.
ptc	Pseudo tty device
ttyq*	Pseudo tty devices

Table 4-3: Special Device Files in */dev* (continued)

4.3 Network Communication

An IRIS workstation can communicate with other devices over an Ethernet local area network using the TCP/IP protocol. XNS protocol is an option. You can use only one communication protocol at one time.

If you have an IRIS 2400 Turbo, 2500 Turbo, 3020, 3030, 3115, 3120, 3120B, or 3130, you can run the Network File System optional kernel on your workstation. Sun Microsystem's Network File System (NFS) allows file sharing in a heterogeneous environment of computers, operating systems, and networks. NFS is an option that must be purchased and installed separately. See the *NFS User's Guide* for more information.

The following sections present a brief overview of the commands you use to communicate over the Ethernet. For more information about the network software for the IRIS workstation, see the manual pages for these commands in the *UNIX Programmer's Manual, Volume IA*. To make the workstation emulate a terminal, see Chapter 5.

The following two sections use these terms:

- A *network* is a collection of computers and terminals connected together.
- A *host* is a computer on a network.
- A *local* host is the computer you are using.
- A *remote* host is another computer on the same network.

4.3.1 TCP/IP Network Commands

This section describes the commands for communicating over an Ethernet local area network using TCP/IP. For a more complete description of how to use TCP/IP, see the *TCP/IP User's Guide*. You must be running the TCP/IP kernel to use TCP/IP communications (see Section 4.3.3).

Each computer to be accessed with the network communication tools must have a unique name. The file */etc/hosts* contains the names of hosts with which you communicate. It is a good idea to put the serial number of your workstation as a comment in this file, so that you can access the number easily if you need to call the Geometry Hotline.

The file */etc/hosts.equiv* contains the names of trusted hosts, which have remote access privileges. See Section 2.4, Configuring TCP/IP Software, in the *TCP/IP User's Guide* for information about */etc/hosts* and */etc/hosts.equiv*.

To communicate over a TCP/IP Ethernet local area network, the IRIS workstation uses three commands:

- rcp* Copies a file from one computer running UNIX to another computer running UNIX
- rsh* Starts a shell on a remote host running UNIX
- rlogin* Initiates a login on a remote host running UNIX

Examples of these three commands are given below. See the *TCP/IP User's Guide* for a complete list of *TCP/IP* commands, including *telnet* and *ftp*.

TCP/IP address notation changed with Software Release GL2-W3.6. With GL2-W3.6 and later software releases, use this address notation:

user@host

The old notation, shown below, is not supported by the network software as of release GL2-W3.6.

user.host

When you use the new notation, make sure that your *stty* shell does not use the at sign (@) as an erase character.

The *rcp* command copies a file from one host to another. The command line specifies the source host and file, followed by the destination host and file:

rcp [sourcehost]:pathname [destinationhost]:pathname

If you don't specify a host name, *rcp* assumes you mean the local host. In the following examples, the user must have an account with the same user name on both hosts.

This example copies the file *sqiral.c* in the current directory on the local machine to the file *sqiral.c* in the directory */oh4/doc/install* on a remote host named *olympus*.

```
rcp sqiral.c olympus:/oh4/doc/install/sqiral.c
```

The following example copies the file */usr/include/stdio.h* from the remote machine *sting* to the file *test* on the local machine.

```
rcp sting:/usr/include/stdio.h test
```

The following example copies the file *temp_vi* from the remote machine named *puppy* to a file with the same name on the remote machine named *sting*. The files are in the user's home directory on each machine.

```
rcp puppy:temp_vi sting:temp_vi
```

The command shown below is an example of recursive copying. It copies all files and directories from */usr/include* on the remote machine *sting* to the directory *localinclude* on the local host.

```
rcp -r sting:/usr/include/* localinclude
```

rsh connects your terminal to a remote host and executes the commands you specify. Like *rcp*, this network utility assumes that the user has accounts under the same user name on both the remote and local host.

If you specify a command, the *rsh* program takes the command as an argument. For example, to find the load average on another machine, enter this command:

```
rsh hostname uptime
```


rlogin initiates a login on a remote host across the network. The command takes the remote host name as an argument. For example, to log in remotely to a host named *olympus*, enter this command:

```
rlogin olympus  
login:  
...
```

If you do not specify a command to be executed, *rsh* starts a login process on the remote host.

4.3.2 XNS Network Commands

For a more complete description of XNS network commands, see the *IRIS XNS User's Guide*, and the manual pages for these commands in the *UNIX Programmer's Manual, Volume 1A*.

To communicate over an XNS Ethernet local area network, the IRIS workstation uses four commands:

<i>xcp</i>	Copies a file from one computer to another
<i>xx</i>	Runs a command on a remote host
<i>xlogin</i>	Initiates a login on a remote host
<i>xcp</i>	Copies a file from one host to another.

The command line first specifies the source host and file, followed by the destination host and file:

```
xcp [sourcehost:]pathname [destinationhost:]pathname
```

If you do not specify a host name, the network assumes you mean the local host. In these examples, the user must have an account with the same user name on both hosts, or the remote host must have a guest account.

The following example copies the file *sqiral.c* in the current directory on the local machine to the file *sqiral.c* in the directory */oh4/doc/install* on a host named *olympus*.

```
xcp sqiral.c olympus:/oh4/doc/install/sqiral.c
```

The following example copies the file */usr/include/stdio.h* from a remote machine *sting* to the file *test* on the local machine.

```
xcp sting:/usr/include/stdio.h test
```

The following example copies the file *temp_vi* from the remote machine named *puppy* to a file with the same name on a remote machine named *sting*. The files are in the user's home directory on each machine.

```
xcp puppy:temp_vi sting:temp_vi
```

The **-r** option invokes recursive copying, i.e., it copies all files in a directory. For example, it copies all files and directories from */usr/include* on the remote machine *sting* to the directory *localinclude* on the local host. The **-v** option displays the names of the files it creates. The asterisk (*) means "all files in the directory".

```
xcp -r -v sting:/usr/include/* localinclude
```

xx runs commands on a remote host. Like *xcp*, this command assumes that the user has accounts under the same user name on both the remote and local hosts. You can also log in as guest if the remote host has a guest account.

The *xx* command takes the command you want to execute as an argument. For example, to find the load average on another machine, enter this command:

```
xx hostname uptime
```

xlogin initiates a login on a remote host across the network. The command takes the remote host name as an argument. For example, to log in remotely to a host with the name *olympus*, enter this command:

```
xlogin olympus
```

For more information about the network software for the IRIS workstation, see the manuals *IRIS Communications Guide*, *TCP/IP User's Guide*, *Version 2.0*, and the *IRIS XNS User's Guide*.

4.3.3 Using Multiple Kernels

The UNIX operating system is read into memory from a disk file at boot time. The file can have any name, but there are two names that are recognized in special ways: */defaultboot* and */vmunix*. The PROM monitor recognizes the name *defaultboot* in the root directory of the disk and boots that file when no name is explicitly given. Certain UNIX commands recognize the name *vmunix* and expect it to contain a copy of the kernel currently running in memory.

New kernels are shipped in a directory called */kernels*, with names such as *3000.tcp* (the standard kernel), *3000.xns* (the XNS optional kernel), and *3000.nfs* (the NFS optional kernel). A copy of one of the kernels is installed as */defaultboot* and linked to */vmunix*. (A link is a method of giving the same file two different names — see *cp(1)*.)

When a software option includes a new kernel (for example, the NFS option), the kernel is automatically installed as */defaultboot* and */vmunix*. The PROM monitor boots that kernel by default. Kernel-dependent UNIX commands find the image of the kernel in the */vmunix* file.

Some sites switch among more than one kernel, to have access to more than one communications option. In such an environment, you need to link the kernel you are using to */vmunix* and */defaultboot*. You do this as the last step before taking the system down with the old kernel to reboot it with the new choice. Use the *kernel(1M)* program to install a new kernel.

CAUTION: Do *not* use the *cp* command to copy the new kernel to */defaultboot* or */vmunix*; you will overwrite the kernel that is currently linked.

kernel looks in the */kernels* directory for new kernels. The names of kernels in this directory have the form **foo*, where *foo* is the short name of the kernel. The argument to *kernel* is the short name of the kernel you want to install, e.g., *tcp*, *xns*, or *nfs*. Support for the IEEE 488 and IBM communications options is included in the TCP/IP and XNS kernels. With no argument, *kernel* tells you which kernel is installed. You must be the superuser to use the *kernel* command.

4.4 Backups

It is important to make backup tapes of system and user files so that you do not lose information on your disk in the unlikely event of system failure. This section tells you how to make two kinds of backup tapes: *bootable backup tapes* and *periodic backup tapes*.

When you install the IRIS workstation, make sure you have a *bootable backup tape* containing the stand-alone software, the root file system, and the user file system. You should receive a bootable backup tape with your workstation. You can use this tape to boot the system if the system can't be booted from the disk.

Make a new bootable backup tape after you install new software or change the size of the swap partition on your disk (see Section 4.4.2).

After the workstation is in use, it is very important to make *periodic backup tapes* of the entire disk or the user data stored on the disk (see Section 4.4.2).

The IRIS workstation supports two tape drives: a quarter-inch cartridge tape drive and a half-inch tape drive. You can use the cartridge tape drive to make bootable backup tapes and periodic backup tapes, and for installing software updates. You can also boot the IRIS workstation from the cartridge tape drive if the root file system on the disk is damaged (see Section 4.5.2).

You can use the half-inch tape drive to make periodic backup tapes and to transfer files, but you cannot use it to boot the workstation.

Use the standard UNIX archiving tools, *tar(1)* or *cpio(1)*, to read from and write to tapes. These two tools perform essentially the same function; however, they are *not* interchangeable. If you use *tar* to create a backup tape, you must also use *tar* to read that information back from the tape.

4.4.1 Making a Bootable Backup Tape

You can use a bootable backup tape to boot the workstation and rebuild the disk in case the file system on the disk is damaged. Make a bootable backup tape as soon as you install a new workstation, and whenever you install new software or change the size of the swap partition on your disk.

You can make a bootable backup tape only on a workstation with a quarter-inch cartridge tape drive. However, you can make a bootable backup tape for workstations both with and without cartridge tape drives. If your workstation becomes damaged and doesn't have a tape drive, you can boot the workstation over the network from a functional workstation. The damaged workstation is called the *client*; the functional workstation is called the *server*. To be able to boot over the network from the tape drive of a server, you need this hardware and software:

- Version 3.0.9 or later PROMs on the client
- The network boot software on the server (for the IRIS series 3000, standard with software release GL2-W3.6)
- TCP/IP communications software on the server
- A cartridge tape drive on the server
- A bootable backup tape made as described in this section
- Internet addresses that have been set on the server and on the client, as described in Section 4.2.2

NOTE: A bootable backup tape is dependent on the hardware and software configuration of the IRIS. Bootable backup tapes for the IRIS 3020, 3115, and 3120 are compatible with each other; bootable backup tapes for the IRIS 3030, 3120B, and 3130 are compatible with each other. However, tapes are *not* compatible between the two groups. If you have workstations from both groups at your site, make sure to make bootable backup tapes for both groups. To minimize the risk of data loss, each system should have a bootable backup tape.

This section contains two procedures:

- Making a bootable backup tape for use in a local tape drive (that is, for use on the machine that made the tape)
- Making a bootable backup tape for use over the network

Making a Bootable Backup Tape for Use in a Local Tape Drive

To make a bootable backup tape, follow these steps:

1. Become the superuser. Make sure there are no other users logged in, and reboot the system into single-user mode:

```
su
who
sync
reboot
b
fsck
```

fsck tells you if there are any problems with your file system. If so, *fsck* prompts to repair the file system. Type **y** after all of its questions.

2. Change your working directory to the root file system:

```
cd /
```

3. Mount the */usr* file system:

IRIS 2500T:

```
mount /dev/ip0c /usr
```

IRIS 3020, 3115, 3120, 2400T:

```
mount /dev/md0c /usr
```

IRIS 3030, 3120B, 3130:

```
mount /dev/si0f /usr
```

4. Check the size of your root and user file systems:

```
df
```

Add up the numbers in the *use* column. If the total is more than 40,000, you must use the 60Mb tape to store both the root (*/*) and */usr* files on one tape. You can also store the root files on one tape using the *mkboot* command (see below), and store the user files on another tape using *tar* or *cpio* (see Section 4.4.2).

5. Put a new tape into the tape drive.
 6. Retension the tape:
- ```
mt ret
```
7. Run the *mkboot* program. (If you have already backed up */usr* onto a separate tape, you don't need to use the */usr* argument.) This step takes about 30 minutes.

```
mkboot /usr
```

8. If you get an error message instead of a list of the files you copied, rewind the tape with the command `mt rewind`, and try step 7 again. If you still get an error message, call the Geometry Hotline. You may have a bad tape drive.

See Section 4.5.2 for the procedures for rebuilding a file system from the bootable backup tape.

### Making a Bootable Backup Tape for Use Over the Network

The TCP/IP network boot software allows you to make a bootable backup tape for use over the network. You could later use this tape to recover a machine that does not have a cartridge tape drive. To use this tape, you must have a functional machine available on the local network that has a cartridge tape drive and the TCP/IP network boot software (standard with Software Release GL2-W3.6). This machine is called the *server*. The machine for which the tape is created must have version 3.0.9 or later PROMs. The IRIS displays the PROM version number on the first line of the PROM monitor display, before you boot the IRIS. This machine for which the tape is created is called the *client*.

This procedure for creating a bootable tape works on any 68020-based IRIS workstation that is running TCP/IP. Make a bootable backup tape after any software installation, so that a bootable backup tape that contains the latest software is always available.

To make a bootable backup tape, follow these steps:

1. With the client running in multi-user mode, log in as root and make sure you are the only person logged in. Type:

```
IRIS login: root
who
```

The *who* command should report that you are the only user on the IRIS.



2. Insert a blank tape into the server's cartridge tape drive. (In this procedure, the server is called *servname*.) Make sure that the tape is not write-protected. To check this, hold the tape so that the open end is up, with the metal side facing away from you. Look in the upper left corner for a circle with an arrow inside it, next to the word SAFE. To make the tape writable, turn the arrow in the circle away from the word SAFE.
3. Return to the client machine and copy the latest version of the *mkboot* command and the standalone programs from the server to the client. This example assumes that the *guest* account on the server does not have a password. With release GL2-W3.6, type these commands:

```
rcp guest@servname:/etc/mkboot /etc
rcp guest@servname:/stand/"*" /stand
```

With release GL2-W3.5, type these commands:

```
rcp servname.guest:/etc/mkboot /etc
rcp servname.guest:/stand/"*" /stand
```

If the *guest* account on the server does have a password, use an account name that has no password, or use a *.rhost* entry or */etc/hosts.equiv* entry that allows root on the client machine to do *rcp* functions.

4. If the client is running release GL2-W3.6 or later TCP/IP, go to the client and type these commands:

```
cp /usr/etc/ifconfig /etc
cp /usr/bin/rsh /bin
rcp guest@servname:/etc/rc.tcp /etc
```

If the client is running release GL2-W3.5 TCP/IP, go to the client and type these commands:

```
cp /usr/etc/ifconfig /etc
cp /usr/bin/rsh /bin
rcp servname.guest:/etc/rc.tcp /etc
```

This step ensures that the root file system on the client machine has enough software to be able to run TCP/IP without using the */usr* file system. This allows you to recover the system when both the root and */usr* file systems are destroyed or absent.

5. Depending on the computer security of the server machine, you can proceed one of two ways. (Refer to Section 2.6 of the *TCP/IP User's Guide* for more information about TCP/IP security.)
  - The first case is that your server has either of these:
    - a guest account without a password, or
    - a *.rhost* or */etc/hosts.equiv* entry that allows special privileges for the client. The user root on the client must have the same privileges as the guest account on the server. This allows the client to write to the server's tape drive.

In this case, go to the client and issue this command:

```
mkboot -t servname
```

This command creates a bootable backup tape for the client, using the cartridge tape on the server.

- The second case is that you can use another account name *username* instead of the guest account. In this case, go to the client machine and issue this command:

```
mkboot -t servname -u username
```

This command works only if root on the client can access the user id *username* on the server, without specifying a password. This command creates a bootable backup tape for the client using the cartridge tape on the server, and using the account name *username* instead of the guest account.

When the root prompt (#) appears, the *mkboot* procedure is complete.

6. The bootable backup tape created by this procedure does not contain any of the data from the */usr* file system on the client. It is a good idea to have a backup of */usr* data also. To back up */usr*, place a blank tape in the server's tape drive. On the client, type the commands shown below (in this example, *serv* is the name of the server):

```
cd /usr
cpio -oa .|rsh serv -l guest dd obs=250k of=/dev/rmt1
```

Remove the */usr* tape and label it.

See Section 4.4.2 for more information about creating backup tapes.

#### 4.4.2 Making Periodic Backups

This section describes the procedure for making routine backups of the IRIS workstation disk(s). You can back up the disk(s) to a tape on a local tape drive or across a network to a tape on another workstation.

Back up each file system onto a separate tape. Table 4-4 below gives the capacity of various tapes. The *df* command tells you how much of the file systems are used. The number in the *use* column tells you how many kilobytes of information the tape must be able to store.

| Tape Width             | Tape Length | Approx. Capacity |
|------------------------|-------------|------------------|
| Quarter-inch cartridge | 450 ft.     | 45 Mb            |
| Quarter-inch cartridge | 600 ft.     | 60 Mb            |
| Half-inch (PE format)  | 2400 ft.    | 44.6 Mb          |

Table 4-4: Approximate Tape Capacities for Backups

|                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------|
| <b>Cartridge Tape</b>                                                                                                            |
| Complete Backup<br><pre>tar c . cpio -oal .</pre>                                                                                |
| Incremental Backup<br><pre>find / -local ! -type d -mtime -7 -type f -print   tar ca - find . -mtime -7 -print   cpio -oal</pre> |
| Read Tape<br><pre>tar x cpio -ihumd1</pre>                                                                                       |
| List Tape Contents<br><pre>tar tv cpio -ihtv1</pre>                                                                              |
| <b>Half-inch Tape</b>                                                                                                            |
| Complete Backup<br><pre>tar c3 . cpio -oBa3 .</pre>                                                                              |
| Incremental Backup<br><pre>find . -mtime -7 -print   cpio -oBa3</pre>                                                            |
| Read Tape<br><pre>tar x3 cpio -iBumd3</pre>                                                                                      |
| List Tape Contents<br><pre>tar tv3 cpio -iBtv3</pre>                                                                             |

Table 4-5: Sample Tape Drive Commands

Table 4-5 lists samples of the UNIX commands for making periodic backup tapes. (See *find(1)* for more information on the arguments to *find*.) A *complete backup* backs up all files in a particular directory. An *incremental backup* backs up all files in a directory that have been modified in the last seven days.

Issue the commands in Table 4-5 when you are in the directory that you want to back up. To back up a directory other than your own, you must be the superuser. For example, to make a complete backup of the directory */usr* by copying it to a quarter-inch tape using *tar*, type:

```
su
cd /usr
tar c .
```

Periodically, make complete backup tapes of everything on the disk. You may want to make complete backups of parts of the file system that change frequently, such as the user files. To simplify this process, you can store files that change most frequently in one directory, so they can be backed up independently. For example, you can store user files in the directory */usr/people*, and back it up daily.

Each *tar* or *cpio* command generates a single output file, which is written to tape. To put several of these output files on one tape, use tape devices that do not automatically rewind.

To use the no-rewind tape devices, replace the *tar* and *cpio* commands in steps 4 and 8 below with these lines:

```
tar c2 . # non-rewind cartridge tape device
tar c4 . # non-rewind half-inch tape device
cpio -oh2 . # non-rewind cartridge tape device
cpio -oh4 . # non-rewind half-inch tape device
```

## Backing Up a System with a Local Tape Drive

To back up the disk on a workstation with a local tape drive, follow these steps:

1. Become the superuser:

```
su
```

If you are backing up only the */usr* file system, go to step 6.

2. Reboot the system into single-user mode, and check the file system:

```
who
sync
reboot
b
fsck
```

Correct any errors reported by *fsck*.

3. Put a tape into the tape drive.
4. Back up the root file system using one of these commands:

*Using tar:*

```
tar c . # rewind cartridge tape device
tar c3 . # rewind half-inch tape device
```

*Using cpio:*

```
cpio -oh1 . # rewind cartridge tape device
cpio -oh3 . # rewind half-inch tape device
```

5. Verify that the files you copied are indeed on the tape:

```
tar tv or cpio -ihtv1
tar tv3 cpio -iBtv3
```

If they were copied successfully, you see a list of files scroll by. If you get an error message instead of a list of the files you copied, issue the command `mt rewind` and try to back up the files again. If this still doesn't work, call the Geometry Hotline. You may have a bad tape drive.

6. Mount the `/usr` file system:

*IRIS 2500T:*

```
mount /dev/ip0c /usr
```

*IRIS 3020, 3115, 3120, 2400T:*

```
mount /dev/md0c /usr
```

*IRIS 3030, 3120B, 3130:*

```
mount /dev/s10f /usr
```

7. Change directories to `/usr`:

```
cd /usr
```

8. Put another tape into the tape drive.
9. Back up the `/usr` file system using one of these commands:

*Using tar:*

```
tar c . # rewind cartridge tape device
tar c3 . # rewind half-inch tape device
```

*Using cpio:*

```
cpio -oh1 . # rewind cartridge tape device
cpio -oh3 . # rewind half-inch tape device
```

10. Verify that the files you copied are on the tape.

```
tar tv or cpio -ihumd1
tar tv3 cpio -iBtv3
```

If they were copied successfully, you see a list of files scroll by. If you get an error message instead of a list of the files you copied, issue the command `mt rewind` and try to back up the files again. If this still doesn't work, call the Geometry Hotline. You may have a bad tape drive.

11. Mount any additional file systems and back them up following the same procedure.

## Backing Up a System without a Local Tape Drive

You can back up an IRIS workstation with no tape drive across a TCP/IP or XNS Ethernet onto a tape on another workstation. Both systems must have network communication capabilities. The system with a tape drive must have a host name (*hostA* in the examples below), and must be in multi-user mode.

To back up a disk onto a tape in a remote workstation, follow the procedure for backing up a system with a local tape drive in the previous section, but use the command lines below for steps 4 and 9. Replace *rmt1* with *rmt2*, *rmt3*, or *rmt4* depending on your backup device (see Table 4-3).

4. Back up the root file system:

*Using tar and TCP/IP:*

```
tar caBf - . | rsh hostA dd ibs=10k obs=200k of=/dev/rmt1
```

*Using tar and XNS:*

```
tar caBf - . | xx hostA dd ibs=10k obs=200k of=/dev/rmt1
```



*Using cpio and TCP/IP:*

```
cpio -oha . | rsh hostA dd ibs=10k obs=250k of=/dev/rmt1
```

*Using cpio and XNS:*

```
cpio -oha . | xx hostA dd ibs=10k obs=250k of=/dev/rmt1
```

9. Back up the *usr* file system:

*Using tar and TCP/IP:*

```
tar caBf - . | rsh hostA dd ibs=10k obs=200k of=/dev/rmt1
```

*Using tar and XNS:*

```
tar caBf - . | xx hostA dd ibs=10k obs=200k of=/dev/rmt1
```

*Using cpio and TCP/IP:*

```
cpio -oha . | rsh hostA dd ibs=10k obs=250k of=/dev/rmt1
```

*Using cpio and XNS:*

```
cpio -oha . | xx hostA dd ibs=10k obs=250k of=/dev/rmt1
```

## 4.5 Crash Recovery

Depending on the cause, a system crash can require some software repair. This section describes the steps you should take immediately after a workstation crash and the procedures for repairing the disk if the software is damaged. This section includes a list of files critical to UNIX operation and the procedures recovering from a system crash.

See Appendix B for a list of system error messages and their probable causes. See also *crash(8)*.

A number of problems can render an IRIS workstation unable to boot from any of its local disks. Several examples of such problems are:

1. The disk is physically damaged. In this case you often replace the damaged disk with a new disk that contains no software.
2. Critical files that the system uses to boot are inadvertently damaged or deleted. If files */etc/init* and */dev/console* are removed or damaged, for example, the system is unbootable.
3. The file system on the root partition of the system disk is destroyed. One way this can happen is if you issue a *mkfs* command for the root device.

If the IRIS workstation stops running, follow this recovery sequence:

1. Try to reboot the workstation:

```
su
who
sync
reboot
b
```

2. If the system does not respond, wait one minute, and press the **Reset** button located on the back panel of the cabinet.

The system should attempt to follow the normal boot sequence.

3. Boot the system in single-user mode and check the file system:

```
b
fsck
```

4. *fsck* may identify problems with the file system (see Section 3.3 and *fsck* in the *UNIX Programmer's Manual, Volume II*).
5. If *fsck* runs without any problems, enter multi-user mode:

`multi`

If rebooting and running *fsck* does not solve the problem, see Sections 4.5.2 and 4.5.3 for identifying the problem and recovering the system.

These sections describe how to recover a system that does not boot. You use a bootable backup tape to load a new root file system onto the disk. You can use either a local cartridge tape drive, or a cartridge tape drive that your machine can access over a network with TCP/IP. If you don't have a bootable backup tape, you can copy the root partition from a disk on a functional machine to the disk on an unbootable machine. These procedures delete any data that was on the root file system of the disk.

### 4.5.1 Critical UNIX Files

Accidental changes to the files critical to UNIX operation can prevent the UNIX operating system from booting. Table 4-6 lists some of the files that are most likely to cause serious problems.

| Critical Files      |                                                            |
|---------------------|------------------------------------------------------------|
| <i>File</i>         | <i>Purpose</i>                                             |
| <i>/</i>            | Root directory                                             |
| <i>/vmunix</i>      | Kernel                                                     |
| <i>/defaultboot</i> | Kernel used by default in booting                          |
| <i>/dev</i>         | Device directory                                           |
| <i>/dev/console</i> | Console tty device                                         |
| <i>/dev/syscon</i>  | System console device                                      |
| <i>/dev/systty</i>  | System tty device                                          |
| <i>/dev/ip0a</i>    | Root file system device (IRIS 2500T)                       |
| <i>/dev/rip0a</i>   | Raw root file system device (IRIS 2500T)                   |
| <i>/dev/md0a</i>    | Root file system device (IRIS 2400T, 3020, 3115, 3120)     |
| <i>/dev/rmd0a</i>   | Raw root file system device (IRIS 2400T, 3020, 3115, 3120) |
| <i>/dev/si0a</i>    | Root file system device (IRIS 3030, 3120B, 3130)           |
| <i>/dev/rsi0a</i>   | Raw root file system device (IRIS 3030, 3120B, 3130)       |
| <i>/dev/drum</i>    | Paging device for virtual memory                           |
| <i>/etc</i>         | Miscellaneous file directory                               |
| <i>/etc/init</i>    | Program that starts other user processes                   |
| <i>/etc/inittab</i> | Table for <i>init</i>                                      |
| <i>/etc/passwd</i>  | Table of user login names, passwords, and shells           |
| <i>/bin</i>         | Commands directory                                         |
| <i>/bin/su</i>      | Used to set environment before <i>execing</i> shell        |
| <i>/bin/sh</i>      | Bourne shell                                               |
| <i>/bin/csh</i>     | C shell                                                    |

Table 4-6: Files Critical to UNIX Operation

## 4.5.2 Recovery by Booting from a Tape in the Local Tape Drive

If the root (/) or /usr file system on the workstation's disk is damaged, you can rebuild the system from a bootable backup tape made for this purpose (see Section 4.4.1). You must have a quarter-inch cartridge tape to follow this procedure.

**NOTE:** Bootable backup tapes for the IRIS 3020, 3115, and 3120 are compatible with each other; bootable backup tapes for the IRIS 3030, 3120B, and 3130 are compatible with each other. However, tapes are *not* compatible between the two groups. For example, you cannot use a tape made on an IRIS 3020 to recover an IRIS 3030.

If the bootable backup tape does not contain the most recent /usr file system, update the /usr file system from the periodic backup tapes after rebuilding the disk.

**CAUTION:** You must follow all instructions exactly when you use the *flex* programs. Failure to follow instructions could result in serious damage to your file system.

To restore a disk from a backup tape, follow these steps:

1. Set configuration switches 1 through 5 for booting from the PROM monitor (see Table 3-1).
2. Reset the workstation by pressing the **Reset** button. The IRIS displays the PROM monitor prompt:

```
iris>
```

3. Put the bootable backup tape into the tape drive.

4. Boot the *mdfex*, *ipfex* or *sifex* program.

*IRIS 2500T:*

```
b ct0:ipfex
```

*IRIS 3020, 3115, 3120, 2400T:*

```
b ct0:mdfex
```

*IRIS 3030, 3120B, 3130:*

```
b ct0:sifex
```

The *mdfex*, *ipfex*, or *sifex* initial screen and prompt appear.

```
SGI Formatter/Exerciser Version :x Date
Drive: 0, Name: name, Serial: serial number
```

*IRIS 2500T:*

```
ipfex x>
```

*IRIS 3020, 3115, 3120, 2400T:*

```
mdfex x>
```

*IRIS 3030:*

```
sifex x>
```

**NOTE:** If an error message appears instead, call the Geometry Hotline (see Chapter 1).

5. Instruct *mdfex*, *ipfex*, or *sifex* to create the root file system:

```
t
```

6. Accept the *mdfex*, *ipfex* or *sifex* defaults for tape file and unit numbers by pressing **RETURN** after each of these prompts:

```
Tape file (2)?
Unit (0)=
```

7. Confirm file system *a* by pressing **RETURN** in response to the file system prompt:

```
File System (a)?
```

The *fex* program displays a message about the block sizes it will use for the copy. When it is ready it displays the message:

```
Type 'go<return>' to begin...
```

8. Type:

```
go
```

then press **RETURN**.

The system displays these messages:

```
Started
rewinding...
*** Copy started...
1 2 3 4....
Tape to Disk Copy complete
```

Then, you see the *fex* program prompt.

9. Set the configuration switches on the cabinet back to their previous positions.

10. Re-enter the PROM monitor by entering the quit command:

**q**

Confirm your intention to quit by entering **y**.

11. Boot the disk:

**b**

UNIX should come up in single-user mode. Run *fsck* to check your files. If the */usr* file system was not damaged, go to step 15.

If the */usr* file system suffered major damage, perform the remaining steps in this section to restore it.

If you made a separate backup tape for */usr*, remove the bootable backup tape and put the */usr* tape in the tape drive.

12. Make a clean user file system:

*IRIS 2500T:*

```
mkfs /dev/rip0c
labelit /dev/rip0c usr sgi
```

*IRIS 3020, 3115, 3120, 2400T:*

```
mkfs /dev/rmd0c
labelit /dev/rmd0c usr sgi
```

*IRIS 3030, 3120B, 3130:*

```
mkfs /dev/rsi0f
labelit /dev/rsi0f usr sgi
```



13. Mount the new user file system and change to that directory:

*IRIS 2500T:*

```
mount /dev/ip0c /usr
cd /usr
```

*IRIS 3020, 3115, 3120, 2400T:*

```
mount /dev/md0c /usr
cd /usr
```

*IRIS 3030, 3120B, 3130:*

```
mount /dev/si0f /usr
cd /usr
```

14. Rewind the tape and copy */usr* from the tape to the disk.

If you have */usr* on its own tape, do not issue the command `mt fsf 2` as shown below. This command positions the tape to the third file, which is where */usr* is located when you put both the root (*/*) and */usr* file systems on the same tape. Use this command only if you made your bootable backup tape with the command `mkboot /usr`.

```
sync
mt rewind
mt fsf 2 (if both /usr and / are on this tape)
cpio -ivhmud2
```

15. To recover the root and */usr* file systems, use any backup tapes that are more current than the bootable backup tape.

### 4.5.3 Recovering by Booting Over the Network

This section explains how to recover a system by using the network booting software. Recovering using the TCP/IP network boot software is useful when the damaged machine does not have a working tape drive.

This section contains two subsections:

- Recovering over the network using a bootable backup tape
- Recovering over the network without using a bootable backup tape

#### Recovering Over the Network Using a Bootable Tape

This section shows you how to recover a client machine without a tape drive using a quarter-inch bootable backup tape and the network. See the note in Section 4.5.2 about the compatibility of bootable backup tapes to different models of IRIS workstations.

The client must have PROM version 3.0.9 or greater. The IRIS displays the PROM version number on the first line of the PROM monitor display, before you boot the IRIS. Verify that this version number is 3.0.9 or greater. If it is not, then you cannot do a network boot using TCP/IP.

The client machine must use the TCP/IP boot protocol. This means that the client machine's Ethernet address and internet address must be entered in the server's boot configuration database, or that the client machine already knows its internet address. See Section 4.2.2 for information on setting the internet address.

Follow these procedures to recover over the network using a bootable backup tape:

1. Put the bootable backup tape into the server's tape drive. Make sure the tape is write-protected. To check this, hold the tape so that the open end is up, with the metal side facing away from you. Look in the upper left corner for a circle with an arrow inside it next to the word SAFE. To write-protect the tape, turn the arrow in the circle toward the word SAFE.
2. On the client, close configuration switch 5 (see Figure 3-1). Then, press the reset button on the back panel of the machine. This restarts the PROM monitor.
3. Issue the appropriate TCP/IP boot commands (shown below) as determined by the model number of the client machine:

**NOTE:** If you have added a 170Mb disk or replaced the 70Mb disk with a 170Mb disk on the IRIS 3020, use the command for the IRIS 3030.

Issue one of these commands from the client:

*IRIS 3020, 3115, 3120, 2400T:*

```
iris> tcp.servname:/dev/rmt1(mdfex)
```

*IRIS 2500T:*

```
iris> tcp.servname:/dev/rmt1(ipfex)
```

*IRIS 3030, 3120B, 3130:*

```
iris> tcp.servname:/dev/rmt1(sifex)
```

This loads the appropriate program. You see the *fex* program prompt; for example, the IRIS 3030 displays this prompt:

```
sifex 2.5>
```

- Copy the image of the root partition from the bootable backup tape in the server's tape drive to the client's disk by entering the `n` command. The following example assumes you are using an IRIS 3030, 3120B, or 3130. The process for the IRIS 2500T is the same except the message on the screen begins with *ipfex* and the remote file is */dev/ip0a*. The message for the IRIS 3020, 3115, 3120, or 2400T begins with *mdfex* and the remote file is */dev/md0a*.

```
sifex 2.5> n
Remote File to Disk Copy
Name of remote host? servname <return>
Name of remote file? /dev/rmt2 <return>
Is the remote file a tape (y/n)? y <return>
Tape file (2)? <return>

Disk Unit(0)? <return>
File system (a)? <return>

Copying nnnnn blks in chunks of mmmm blks
From remote file servname:/dev/rmt2 To si0a
type 'go' <return> to begin... go
```

Press RETURN after typing `go`.

This process takes up to ten minutes, depending on the type of client and other factors, such as the amount of activity on the server and the network. When the copy is complete, you see the *fex* program prompt. Exit the *fex* program by typing `q` and confirming with `y`; for example:

```
sifex 2.5> q
Quit
--confirm quit with 'y' y
```

You see the system prompt:

```
iris>
```

5. You now have a bootable root partition on the local disk. Boot from this root using the command:

```
iris> b
```

The system comes up in single-user mode. If the bootable backup tape was built from a system other than the one that is being recovered, you must now adjust any configuration files that do not correspond to this system. The primary file is */etc/sys\_id* which determines the host name of the client machine. Edit this file with an editor or use the *echo* command to reset the name contained in this file. In this example, *hostname* is the name of the client system. Type:

```
echo hostname > /etc/sys_id
```

6. See if your */usr* file system is intact and run a file system check. Type:

```
fsck
```

If *fsck* aborts before it displays this message:

```
Phase 1 - Check Blocks and Sizes
```

then the */usr* file system is absent or destroyed. Go to step 7 in this case. If *fsck* completes its normal five phases with only harmless errors, such as incorrect link counts, and missing free blocks, then mount the */usr* file system and check its contents. Type:

```
mount /usr
cd /usr
ls
```

If the results of the *ls* command show your subdirectories, skip steps 7 and 8.

7. The next step is to restore the */usr* file system, if necessary. If the */usr* file system is absent or destroyed, start by issuing a *mkfs* command to create the file system structure. See Section 6.2, IRIS Workstation Disk Configuration, and the manual page *mkfs(1)* for more information about *mkfs*.

**WARNING:** The *mkfs* command completely overwrites the contents of the */usr* file system. Use this command only if the */usr* file system is empty.

First unmount the */usr* file system if it is mounted. Type:

```
umount /usr
```

Use the following commands to create the */usr* file system:

*IRIS 3030, 3120B, 3130:*

```
mkfs /dev/si0f
```

*IRIS 3020, 3115, 2400T:*

```
mkfs /dev/md0c
```

*IRIS 2500T:*

```
mkfs /dev/ip0c
```

8. If you have a *cpio* backup tape for the */usr* file system, insert that tape in the server's tape drive. Then mount the client's */usr* file system and initialize TCP/IP on the client machine. Issue the following command from the client:

```
mount /usr
hostname `cat /etc/sys_id`
/etc/rc.tcp
```

This script will probably print some error messages about programs with names starting with */usr/etc* not being found. This is because the */usr* file system has not yet been restored. The absence of these programs does not prevent the rest of this procedure from working.

9. Read the files from the *cpio* tape on the server. On the client, issue these commands (in this example, *serv* is the name of the server):

```
cd /usr
rsh serv -l guest dd if=/dev/rmt1 ibs=250k|cpio -ivdum
```

This command may take as much as half an hour to run, depending upon how much data is on the tape. If there are more tapes, read all of them using the command shown above.

10. The disk should now be completely recovered. Reboot the system and bring it up in multi-user mode. Type:

```
reboot
b
multi
IRIS login: root
```

11. If the client had customized configuration files, check them to make sure they are applicable to the client. Examine these files:

```
/etc/fstab
/etc/rc.tcp
/etc/rc.rfs
```

For more information about what these files should contain, consult your system or network administrator.

## Recovering Over the Network Without a Bootable Tape

If you do not have a bootable backup tape for the client machine that needs to be recovered, you can copy the root partition directly from the disk of a server machine. The server machine must be a TCP/IP boot server and must be the same model number (i.e., 3030, 3020) as the client machine. The client must have PROM version 3.0.9 or greater. The IRIS displays the PROM version number on the first line of the PROM monitor display, before you boot the IRIS. Verify that this version number is 3.0.9 or greater. If it is not, you cannot do a network boot using TCP/IP.

The client machine must use the TCP/IP boot protocol. This means that the client machine's Ethernet address and internet address must be entered in the server's boot configuration database, or that the client machine already knows its internet address. See Section 4.2.2 for more information on setting your internet address.

Follow these steps:

1. Make sure the appropriate net addresses are set (see Section 4.2.2).
2. Become the superuser and allow read/write of the root partition on the server machine.

```
su
cd /dev
chmod 666 md0a
```

You will need to change the mode back to 600 after you finish copying information.

3. Reboot the client into the PROM monitor (resetting configuration switches, if required).

```
reboot
b
```



You see the prompt:

```
iris>
```

4. Now boot the appropriate disk formatter program from the disk of the server.

**NOTE:** If you have added a 170Mb disk or replaced the 70Mb disk with a 170Mb disk on the IRIS 3020, use the command for the IRIS 3030.

*IRIS 3030, 3120B, 3130 client:*

```
iris> tcp.servname:/stand/sifex
```

*IRIS 3020, 3115, 3120, 2400T client:*

```
iris> tcp.servname:/stand/mdfex
```

*IRIS 2500T client:*

```
iris> tcp.servname:/stand/ipfex
```

The *fex* program prompts with its name and version number. The examples below show the prompt for an IRIS 3030, 3120B, or 3130. The process for the IRIS 2500T is the same except the message on the screen begins with *ipfex* and the remote file is */dev/ip0a*. The message for the IRIS 3020, 3115, 3120, or 2400T begins with *mdfex* and the remote file is */dev/md0a*.

```
sifex 2.5>
```

5. Type **n** after the *fex* program prompt and provide the answers shown below:

```
sifex 2.5> n
Remote File to Disk Copy
Name of remote host? servname <return>
Name of remote file? /dev/si0a <return>
Is the remote file a tape (y/n)? n <return>

Disk Unit (0)? <return>
File system (a)? <return>
Copying nnnnn blks in chunks of mmmm blks
From remote file servname:/dev/si0a To si0a
Type 'go<return>' to begin... go
```

Press **RETURN** after typing **go**. This begins the copy of the root partition, which takes about five minutes. When the copy is complete, you see the *fex* program prompt. Exit the *fex* program by typing **q** and confirming with **y**; for example:

```
sifex 2.5> q
Quit
--confirm quit with 'y' y
```

You see the system prompt:

```
iris>
```

6. Return to the remote machine and restore the mode of the device:

```
chmod 600 /dev/md0a
```

7. You now have a bootable root partition on the local disk. Follow steps 5 through 11 in the previous subsection, entitled *Recovering Over the Network Using a Bootable Tape*.

## 5. IRIS 3010 System Administration

This chapter contains operation and configuration procedures for the IRIS 3010, 3110, and 2300T. In this chapter, references to the IRIS 3010 apply to the IRIS 3110 and 2300T as well. This chapter covers these topics:

- Installing the host software
- Connecting to the host
- Issuing commands to the terminal emulator
- Running a demonstration program
- Shutting down the IRIS terminal
- Recovering from a boot failure
- Configuring the startup environment
- Configuring XNS
- Configuring TCP/IP
- Configuring miscellaneous UNIX files

### 5.1 Installing the Host Software

This section contains instructions for installing the host-resident IRIS 3010 support software in a VAX UNIX 4.2BSD environment. The entry name for the workstation host-resident software is *host*. Instructions for installing host software in other environments are shipped with the software.

The software is delivered on a 1600 bpi half-inch magnetic tape in *tar(1)* format.

The software can be stored anywhere on the host file system. The procedure below assumes that the distribution software is installed in a directory called */usr/iris*. (Before doing this procedure, install and boot your IRIS workstation.)

To install the host software, follow these steps:

1. Log on to the host from a terminal that is already attached to the host.
2. Create a directory to hold the distribution software:

```
mkdir /usr/iris
```

3. Change to the directory you just created:

```
cd /usr/iris
```

4. Load the distribution tape onto a tape drive and read the distribution software into the new directory, using the *tar* command:

```
tar xv
```

5. Add the *TERMCAP* entry for the IRIS Terminal in */usr/iris/c/iris.termcap* to the terminal description data base in */etc/termcap*. (See the *termcap(4)* manual page in the *UNIX Programmer's Manual, Volume 1B* for more information on *TERMCAP*.)
6. Change directories to */usr/iris/c*:

```
cd /usr/iris/c
```

7. Compile the C language remote host Graphics Library (*librgl2.a*), the IRIS 3010 configuration tools, and the demonstration programs, using the */usr/iris/c* makefile:

```
make all
```

8. To install the library in */usr/lib*, issue this command:

```
make install
```

9. If a FORTRAN language remote host Graphics Library (*libfrgl2.a*) is desired, change directories to */usr/iris/f77* and compile it:

```
cd /usr/iris/f77
make all
```

The FORTRAN demonstration programs are also compiled.

To install the library in */usr/lib* on a VAX, issue this command:

```
make install
```

To install the library in */usr/lib* on an IRIS, issue this command:

```
make demos
```

For a terminal with network communication capabilities, the host must also be equipped with the network communication support software and hardware. See *VAX 4.2BSD UNIX XNS Release N1.0 Installation Guide* for the hardware and software installation procedures for a host running 4.2BSD UNIX.

## 5.2 Operation

The IRIS 3010 automatically runs a terminal emulation program, *wsiris(1C)*, after booting. It causes the IRIS to behave like a regular character terminal, with two additional capabilities:

- Setting up communication with the host
- Interpreting graphics command sequences from the host

The terminal emulator program can execute an interactive subshell from which UNIX commands can be issued. A complete UNIX operating system is not provided on the IRIS 3010.

It includes only those commands necessary to boot and perform basic system administration.

With the IBM option installed, the IRIS 3010 runs a different terminal emulator, *t3279(1C)*. Its user interface is completely different from the one described below.

### 5.2.1 Connecting to the Host

This section describes the terminal emulator interface used to connect with the host. (See Section 3.2, Terminal Booting Instructions, for the procedures for booting the terminal emulator program. See Section 5.3.2, Configuring the Startup Environment, for the procedure for configuring the terminal emulator program for the needs of a specific host. See Section 5.2.2, Issuing Commands to the Terminal Emulator, for the commands recognized by *wsiris*.)

When *wsiris* first comes up on the IRIS, it displays the startup message:

```
IRIS GL2 Terminal Emulator
```

The terminal then prompts for instructions regarding the connection to the host. The prompt varies, depending on the configuration of the system.

#### IRIS 3010 with XNS Ethernet

An IRIS 3010 with no Ethernet controller, with only XNS Ethernet communication software, or with previously configured TCP/IP communication software prompts for the name of the host computer:

```
Connect to what host?
```

To establish communication over the serial line, enter **serial**.

To establish communication over an Ethernet, enter the name of the host.

For Ethernet communication, the host must have network support software installed. For XNS communication, the host must be running the *xnsd(1M)* daemon. For TCP/IP communication, the host must be running the

*telnetd*(1C) daemon. If you do not know the name of a UNIX host, enter the *hostname*(1) command on a terminal that is already logged onto such a host.

The IRIS establishes a connection with the host, which should display its usual login prompt.

## IRIS 3010 with TCP/IP

An unconfigured IRIS 3010 with TCP/IP communication capabilities prompts for the internet addresses of the IRIS and the host:

**Enter IRIS IP address:**

**Enter host IP address:**

It accepts only internet addresses consisting of four numbers separated by periods (*n.n.n.n*). To set an internet address, see Section 4.2.2, Setting Your Internet Address.

To convert a two-field internet address to the correct format, insert two fields of zeros in the middle of the address. For example, if the representation of a host name in the */etc/hosts* table on a 4.2BSD UNIX system is 42.2, enter the address as 42.0.0.2.

The IRIS establishes a connection with the host, which should display its usual login prompt.

Once communication with the TCP/IP host has been established, you can copy an internet host table onto the terminal's hard disk (see Section 5.3.4, TCP/IP Configuration). You can then connect to a TCP/IP host by entering the name of the host when prompted. See the documentation that accompanies the communications software.

### 5.2.2 Issuing Commands to the Terminal Emulator

After a connection with the host has been established, the terminal emulator program recognizes some local commands, which are stripped from the data stream and processed locally instead of being transmitted to the host. The commands begin with the escape character ~ (tilde).

To issue a command to the terminal emulator, enter the escape character at the beginning of a line, followed by the rest of the command. The character before ~ (tilde) must have been a `RETURN` or a `LINEFEED`. *wsiris* examines the next few characters to see if they are any of the following commands:

- ~ Send a single ~.
- ~. Force *wsiris* to exit. Ethernet connections are closed, but serial connections can remain open.
- ~! Escape to a C shell on the IRIS 3010. The shell allows the user to run programs from the local disk, such as the flight simulator:

`~demos/flight`

If you are familiar with the UNIX editor *vi*, you can edit the configuration files from the local C shell.

To return to communication with the remote host, exit the C shell by entering the `exit` command.

You can also enter ~! in response to the hostname prompts before a connection is established.

- `DEL` Reboot the IRIS with `etc/reboot`. The system asks you for confirmation. You must be the superuser to use this command.
- `BREAK` If using serial communications, send a break character.
- ~%D*n* Toggle the value of the `-d n` debugging option (see Section 5.3.2). ~%D1 interactively turns the writing of the log file on and off. When you turn logging on, log output is appended to the current log file. If *n* is 3, the new logfile name consists of all characters following the 3 until terminated by a `RETURN`. If logging is on, the current log file is closed and the newly named one is opened. Subsequent log output is appended to it. If you specify a null file name, the name of the current log file is displayed. ~%D2 is ignored.



- %M*n*** Set the monitor type to *n*. *n* has one of the following values:
- |   |       |
|---|-------|
| 0 | 30 Hz |
| 1 | 60 Hz |
| 2 | NTSC  |
| 3 | 50 Hz |
| 9 | PAL   |
- %P** Toggle the value of the **-p** option (see Section 5.3.2). The **-p** option controls whether textport output is printed when the textport is off.
- %R** Reset the display by forcing a `ginit` and a `tpon` to be executed. This loads the default color map and turns on the textport. If the window manager is running, the terminal also executes any `mapcolor` commands stored in the window manager configuration file (see Section 5.3.2).
- %S*speed*** Change the serial communications baud rate to *speed*. The parameter *speed* can have these values:
- 75 110 134 150 300 600 1200 2400 4800 9600 19200
- The default is 9600 baud.
- %T** Toggle the textport; turn it on or off.
- The textport does not automatically disappear when it is turned off. If the remote system isn't echoing input, especially after a graphics program has been interrupted, the textport has been turned off. Issue this command to turn it back on.
- %U** Unlock the keyboard. Whenever the IRIS is accepting graphics commands, the keyboard is locked and any input from it is thrown away. Use this command to force characters through to the remote system, such as the interrupt character to kill the remote program. The keyboard will be locked again at the next switch back into graphics mode.

- ~\*x Toggle the value of the `-x` option (see Section 5.3.2). This option determines whether the handling of XON ( `CTRL-q` ) and XOFF ( `CTRL-s` ) is done locally.
- ~\*zn Toggle the value of the `-z n` option (see Section 5.3.2). Currently, the only valid value for *n* is 1.

You can change the escape character from ~ (tilde) with the `-e` option specified in the *wsiris* configuration file (see Section 5.3.2). If you specify `-e none`, there is no escape character and none of the above interpretations occur. In this case, if the window manager is not running, there is no way to force *wsiris* to exit.

If the remote program queues the keyboard, all keystrokes will normally accumulate in the event queue. To divert them to *wsiris*—for example, to issue one of the ~ (tilde) commands described above—hold down the `SETUP` key while typing. The events from individually queued keyboard keys are also not placed in the queue while `SETUP` is down. See the *IRIS User's Guide* for further information on queuing the keyboard and the event queue.

### 5.2.3 Running a Demonstration Program

After booting a new IRIS 3010 and connecting to a host, you should test the system by running a demonstration program. The hard disk that comes with the IRIS 3010 contains a non-bootable copy of the *flight* demonstration program. To run *flight* from the hard disk, you must first boot UNIX on the terminal, then escape to the C shell and run the program from the shell.

1. Boot the terminal from the hard disk, as described in Section 3.2.
2. When the *wsiris* terminal emulator is running, enter the sequence `~!` to enter the C shell:

```
Connect to what host? ~!
```

The terminal displays the C shell prompt:

%

3. To run the demonstration program, enter the pathname:

`~demos/flight`

The first screen of the *flight* program appears.

4. To leave the *flight* program, press the **ESC** key.

The IRIS again displays the C shell prompt.

5. To return to the terminal emulator program, issue the *exit* command.

## 5.2.4 Shutting Down the IRIS 3010

To shut down an IRIS 3010 running *wsiris*, follow these steps:

1. Issue the **DEL** command.
2. Set the **Power** switch on the front of the cabinet to the **Off** position.

## 5.2.5 Recovering from a Boot Failure

If a critical file on the IRIS 3010 disk becomes corrupted, the boot procedure fails and the terminal emulator does not run. If this happens, use the procedure in this section to restore the file system from the copy stored on the backup partition of the disk.

1. Turn control of the IRIS over to the PROM monitor by setting configuration switches 1 through 5 to OCOCC and resetting the terminal (see Section 3.4, Boot Options).

2. Boot the recovery system:

```
iris> b md0c:recover
```

This boots a copy of the UNIX kernel on the backup partition and runs a program to copy the backup partition onto the normal operating partition. After this program is finished, it returns control of the IRIS to the PROM monitor, which displays its prompt:

```
iris>
```

3. Boot the terminal normally from the local disk (see Section 3.2).
4. Repeat the configuration sequence described in Section 5.3, Configuring the Software.

If this procedure fails to return the IRIS to its former working state, contact Silicon Graphics Product Support at the Geometry Hotline number listed in Chapter 1, Introduction.

If you are familiar with UNIX, you can use a 9600 baud ASCII terminal connected to Port 2 of the IRIS 3010 to log in as root. This may be useful for diagnostic purposes in case the standard console textport is not functioning properly. To connect an ASCII terminal to the IRIS, see Section 7.2, Installing an ASCII Terminal.

## 5.3 Configuring the Software

The IRIS 3010 software is based on the same System V UNIX kernel used on the IRIS 3020 and 3030. IRIS 3010 users do not necessarily interact with UNIX because the terminal emulator program running on top of UNIX provides an interface almost identical to the one on IRIS terminals. The terminal emulator interface is described in Section 5.2, Operation.

Because the IRIS 3010 is UNIX-based, the IRIS window manager, *mex*, runs on it. The window manager is described in the *IRIS User's Guide, Version 2.1* or later.

An IRIS 3010 can have both XNS and TCP/IP Ethernet communication capabilities. Configuration of the IRIS 3010 for network communication is not necessary for normal operation, but some configuration can simplify the process of communicating over the network and increase the terminal's communication capabilities.

### 5.3.1 Configuration Tools

A number of files stored on the hard disk of the IRIS 3010 allow for three kinds of configuration:

- Startup environment configuration (see Section 5.3.2).
- Network communication configuration (see Sections 5.3.3 and 5.3.4).
- Miscellaneous UNIX configuration (see Section 5.3.5).

The following subsections describe these files in detail. Samples of the configuration files are duplicated in the host software distribution.

If you are familiar with UNIX and its utilities, you can edit these files locally on the IRIS 3010, using the *wsiris* shell escape command (~!) and the *vi* editor. If you prefer, you can edit the files on the host, using whatever text editor is most familiar to you, then transfer the files to the disk on the IRIS 3010. This strategy has the advantage of leaving backup copies of the customized configuration files on the host.

To support configuration of the IRIS 3010 from a host, the host software distribution includes two utility programs: *iftp* and *irsh*. Both programs are available when you are logged on to the remote host from the IRIS 3010. These commands are run from the host while the IRIS 3010 is running *wsiris*.

## File Transfer Program

The *iftp* program transfers files between the host and the IRIS 3010. The command takes three arguments:

```
iftp mode hostfile 3010file
```

*Mode* has the following values:

- w** Write *hostfile* to *3010file*. A temporary file on the IRIS 3010 is written to and then renamed.
- o** Overwrite. It is the same as **w**, but the temporary file is not made.
- r** Read from *3010file*, write to *hostfile*.

*3010file* must be an absolute pathname (i.e., it must start with /).

## Local Execution Program

The *irsh* program issues commands to the UNIX operating system running on the IRIS 3010 from the host. The program takes the IRIS 3010 UNIX command and arguments as its arguments:

```
irsh 3010cmd arg ...
```

The main uses of *irsh* are renaming and removing files on the IRIS 3010 disk.

To rename the file *oldname* to *newname*, enter this sequence:

```
irsh mv oldname newname
```

To remove *file*, enter:

```
irsh rm file
```

## Configuration from a UNIX Host

After the distribution software has been installed on the UNIX host, you can use this procedure to configure the IRIS 3010 from the host:

1. Boot the IRIS 3010 from its local disk and log in to the host (see Section 3.2).
2. Change directories to */usr/iris/c*.

```
cd /usr/iris/c
```

3. Edit the configuration files as described in the remainder of this chapter.
4. Transfer the files to the IRIS 3010 by invoking the *iftp* program for each file. To transfer all files in a single step, use the makefile argument *install-config-files*.

```
make install-config-files
```

### 5.3.2 Configuring the Startup Environment

You can configure the startup environment on the IRIS 3010 in the following ways:

- Custom-configuring the terminal emulator program, *wsiris*.
- Causing the window manager to start automatically during bootstrap.
- Installing your own startup program.

The three sections below describe these procedures.

## Terminal Emulator Configuration

The terminal emulator program, *wsiris*, is customized through the file *.wsirisrc*. The working copy of *.wsirisrc* is stored on the IRIS 3010 hard disk. The file contains any number of the option flags listed below, separated by white space (spaces, tabs, and newlines), and possibly followed by a hostname. Arguments to individual option flags are separated from their options by white space.

The file may contain any of these options:

**-d *n***      Debug. You may use multiple **-d** options. The legal values for *n* are:

- 1      Generate a logfile, named */LOGFILE.0*, of the communication between the IRIS 3010 and the host. Graphics commands and data are interpreted and written to the logfile as a command name and a series of arguments. The arguments are shown as *type=value*, where *type* is a single character representing the argument type:

|      |                   |
|------|-------------------|
| a, A | array             |
| b, B | byte (8 bits)     |
| c, C | character string  |
| f, F | float (32 bits)   |
| l, L | long (32 bits)    |
| s, S | short (16 bits)   |
| o    | logical (8 bits)  |
| O    | logical (32 bits) |

If the character is uppercase, then the argument was sent by the IRIS; otherwise, it was sent by the remote system. The *value* of array types is always *array*.

- 3      Use the next argument for the name of the logfile created by the **-d 1** option in place of */LOGFILE.0*.

**-e *c***      Set the escape character from the default *~* to *c*. Lines beginning with the escape character can be commands to *wsiris*. If *c* is **none**, there will be no escape character.



- h** Use half-duplex serial communications. The default is full-duplex.
- i** Try the TCP/IP communication protocol first. When using Ethernet communications in the absence of the **-i** option, the system first attempts a connection to *hostname* using XNS protocols. If that fails, it attempts a connection using TCP/IP.
- l *line*** Use device *line* for the serial connection. The device names of the three available serial ports of the IRIS 3010 are:

|        |       |
|--------|-------|
| Port 2 | ttyd1 |
| Port 3 | ttyd2 |
| Port 4 | ttyd3 |

The default *line* is ttyd2.

- p** Print textport output even when the textport has been turned off. By default, after the receipt of a `tpoff` command from the remote system, all textport output is thrown away until a `tpon` is received. (See the *IRIS User's Guide* for information on `tpoff` and `tpon`.) The **-p** option inhibits this, and characters written to the textport appear when it is turned on again.
- s *speed*** Use *speed* baud for serial communications. The legal values for *speed* are:

75 110 134 150 300 600 1200 2400 4800 9600 19200

The default is 9600.

- x** Enable local XON/XOFF flow control. Normally, when read from the standard input, the characters XON ( `CTRL-q` ) and XOFF ( `CTRL-s` ) are sent to the remote system. Specifying this option causes them to be used locally to stop and restart the display of text. When using serial communications, this option also enables the use of these characters by the serial driver of the IRIS for automatic flow control of data being received from the host. This automatic flow control is normally disabled; it does not work correctly if there are two independent sources of these characters.

- y** If using serial communications, interpret XON and XOFF characters from the remote host as output flow control commands. By default, they are treated as ordinary data. You must not give this flag if you are using eight-bit (fast mode) communications.
- z n** Special instructions. Multiple **-z** options can be given. The legal values for *n* are:
- 1 Interpret `ginit` commands as `gbegin` commands. (See the *IRIS User's Guide* for information on `ginit` and `gbegin`.)
  - 2 Execute a `ginit` immediately upon startup. This is useful when *wsiris* has had to be restarted and the remote program is still sending graphics commands.
  - 3 When attempting a connection using Ethernet communications, try only one network protocol instead of both. TCP/IP is tried if the **-i** flag is given, and XNS if it isn't.
  - 4 Emulate a Tektronix 4010. In Tektronix 4010 emulation mode, the keyboard recognizes two additional local keyboard commands: `[ESC-P]` causes a hardcopy and `[ESC-R]` does a screen clear.

You can specify a hostname following the option flags. This causes *wsiris* to connect to the specified host, without prompting for a host connection.

The IRIS 3010 is shipped with a default `./wsirisrc` file that contains these options:

```
-z 3 -x
```

The host distribution contains a copy of this file named *wsirisrc*. To configure the IRIS 3010 from the host, edit the host copy of the file, then transfer it to the IRIS with this command:

```
iftp w wsirisrc /.wsirisrc
```

The default configuration file may not work for some serial communications environments, e.g., if half-duplex is required. In this case, you must edit */.wsirisrc* locally on the IRIS 3010.

If an invalid */.wsirisrc* is put on the IRIS 3010 disk, it does not boot correctly. If this happens, use the boot failure recovery procedure described in Section 5.2.5, Recovering from a Boot Failure.

## Window Manager Configuration

The IRIS 3010 can be configured to start the window manager, *mex*, automatically. The window manager options are controlled through the file */.mexrc*. The *IRIS User's Guide* contains a description of what *mex* expects to find in this file. The default configuration file on the IRIS 3010 is different from the one described in the *IRIS User's Guide*.

The boot sequence checks for the existence of */.mexrc*. *mex* starts only if */.mexrc* is found. The IRIS 3010 is shipped with the default window manager configuration file with the name */mexrc*, which means that *mex* is not started up during bootstrap. To have *mex* start automatically, change the filename to */.mexrc* by issuing this command on the host:

```
irsh mv /mexrc /.mexrc
```

To disable *mex* once it's been enabled, issue this command:

```
irsh mv /.mexrc /mexrc
```

The host distribution contains a copy of *mexrc*. After editing this file, you can copy it to the IRIS with this command:

```
iftp o mexrc /.mexrc
```

## Installing Your Own Startup Program

The program that the IRIS 3010 runs after booting can be changed from *wsiris* to a custom startup program. To do this, edit the file */bin/tesh* and find the line:

```
set termemul = /bin/wsiris
```

Replace */bin/wsiris* with the pathname of the program you want to run.

With the IBM option, the IRIS runs *t3279* instead of *wsiris*, and you must change this line in */bin/tesh*:

```
set termemul = /bin/t3279
```

Replace */bin/t3279* with the pathname of the program you want to run.

If you add custom files to the root partition, you should duplicate them on the backup partition so that they can be restored in case of boot failure. Before copying these files, make sure that the IRIS boots and runs your startup program correctly. The disk contains a script, */etc/rootcopy*, which copies the entire root partition to the backup partition. Run *rootcopy*, specifying the argument *ok*:

```
rootcopy ok
```

### 5.3.3 XNS Configuration

Operation of the IRIS 3010 using XNS requires no configuration. The IRIS does not need a hostname, since it initiates all connections, and the XNS protocol does not require that both ends of a circuit have a name.

You can configure the terminal emulation program to connect to a single host automatically every time it is started up (see Section 5.2.1, Connecting to the Host).

### 5.3.4 TCP/IP Configuration

The TCP/IP option to the IRIS 3010 is configured with the hostname file */etc/sys\_id*, and the host tables */etc/hosts* and */etc/hosts.equiv*. The hostname file contains the hostname of the IRIS 3010. The information that goes into the host tables is described in the documentation that accompanies the communications software.

A sample hostname file, *sys\_id*, is included in the host distribution. To give the IRIS 3010 a hostname, edit this file so it includes the desired name, and then enter the command:

```
iftp w sys_id /etc/sys_id
```

Hostnames must not be more than eight characters.

Next, create the two host table files on the host. Then transfer them to the IRIS 3010 disk. If, for example, the two files on the host are named *hosts* and *hosts.equiv*, enter these commands:

```
iftp w hosts /etc/hosts
iftp w hosts.equiv /etc/hosts.equiv
```

Until these files exist on the IRIS 3010, the terminal emulator always prompts for the internet addresses of the IRIS and the host. Once the terminal emulator knows the local address, it prompts only for the host address.

You can configure the terminal emulator to connect to a single host automatically each time it is started up (see Section 5.2.1).

If the IRIS 3010 disk contains an invalid */etc/hosts* file, the IRIS will probably not be able to communicate with the host. To recover from this situation, use one of these strategies:

- Edit */etc/hosts* locally on the IRIS 3010.
- Transfer a valid copy from the host over the serial communications line.
- Use the boot failure recovery procedure described in Section 5.2.5 to start over.

### 5.3.5 Miscellaneous UNIX Configuration

The time zone and automatic date setting features should be included in your UNIX configuration. They are described in detail in the sections below.

#### Time Zone

Several UNIX utilities need to know the time zone to be able to display the time correctly. The file */etc/TZ* contains the time zone entry. The file has three fields:

1. A three-character abbreviation for the time zone.
2. The offset in hours of the time zone from Greenwich Mean Time.
3. A three-character abbreviation for the time zone when in daylight savings time. If you don't use daylight savings time, omit this field.

The IRIS 3010 is shipped with the time zone set for Pacific Standard Time:

```
PST8PDT
```

The file *TZ* in the host distribution contains a sample time zone file. After you edit it, transfer it to the IRIS 3010 disk with this command:

```
iftp w TZ /etc/TZ
```

#### Automatic Date Setting

By default, the IRIS 3010 prompts you to check the date each time it is booted.

```
Enter the correct date (mmdhmm[yy][.ss]):
```

If the system finds an executable file */etc/rc.getdate*, the result of its execution is used, and the IRIS doesn't prompt you for the date.

The host distribution includes a sample version of this file, called *rc.getdate*. It is a shell script that gets the date from an IRIS workstation designated to be the network date server. Edit this file, changing `host` to the name of the date server machine. Then, issue these commands:

```
iftp w rc.getdate /etc/rc.getdate
irsh chmod a+w /etc/rc.getdate
```

To disable automatic date setting, remove */etc/rc.getdate* by issuing this command:

```
irsh rm /etc/rc.getdate
```

## 6. Disk Configuration

This chapter describes how to configure a second disk, how to change the swap partition on a disk, and how to make a set of floppy disks for backing up or rebuilding the disk.

This chapter contains two sections:

- IRIS Workstation Disk Configuration
- IRIS Terminal Disk Configuration

The disks on the IRIS 3010, 3020, 3110, 3115, and 3120 are called `md`; the disks on the IRIS 3030, 3120B, and 3130 are called `si`; the disks on the IRIS 2500T are called `ip`. An SMD disk is called `ip`, no matter which model it is attached to. Supported SMD disks are the CDC 9766 and the Fujitsu Eagle. A first disk is disk zero; a second disk is disk 1. Disks are divided into units called *partitions*; the number of partitions depends on the brand and size. The partitions are labeled with lowercase letters `a` through `g`.

The commands `mkfs(1M)` and `labelit(1M)` enable you to configure a second disk. In this procedure you create and label file systems, then modify configuration files so that the file systems are mounted and checked by `fsck(1)`.

### 6.1 IRIS Workstation Disk Configuration

The two subsections below describe these procedures:

- Changing the swap partition size on an IRIS series 3000 workstation. This procedure applies to the IRIS 3020, 3030, 3115, 3120, 3120B, and 3130.



- Configuring a second disk on an IRIS series 3000 workstation. This procedure applies to the IRIS 2500T, 3020, 3030, 3115, 3120, 3120B, and 3130.

If you have an IRIS 3010, 3110, or 2300T, see Section 6.2.

### 6.1.1 Changing the Swap Partition Size

On an IRIS series 3000 workstation, disk zero is divided into three partitions: the root partition, which contains the root (/) file system; the swap partition, which is used by UNIX for paging; and the user partition, which contains the */usr* file system.

To find out the size of the swap partition on your workstation, become the superuser and issue the command:

*IRIS 3020, 3115, 3120:*

```
sgilabel md0
```

*IRIS 3030, 3120B, 3130:*

```
sgilabel si0
```

The *sgilabel* command prints out the disk drive label. The label includes the brand of disk drive and the size of each partition.

On an IRIS 3020, 3115, or 3120, the root partition is device **md0a** and the swap partition is **md0b**. On an IRIS 3030, 3120B, or 3130 the root partition is device **si0a** and the swap partition is **si0b**. To find out which partition is the */usr* partition, examine the file */etc/fstab*. This file shows the correspondence between disk partitions and file systems. There is an entry for the root (/) file system, and an entry for the */usr* file system.

The size of the swap partition determines the maximum amount of virtual memory that can be used. At any moment in time, the sum of the sizes of all the processes known to UNIX cannot exceed the size of the swap partition.

If the simultaneous processes running on your workstation require more space on the swap partition, you can make it larger at the expense of some of the free space in the */usr* file system. You can increase the space available for user files by reducing the swap partition size, but this reduces the total of the process sizes that can exist simultaneously on the system.

To change the size of the swap partition on an IRIS series 3000 workstation, follow the steps below. For simplicity, the procedure describes a specific, although arbitrarily chosen, change: an increase of 100 cylinders.

1. Log in as root or become the superuser by issuing the *su* command.
2. Back up the */usr* file system and make sure you have a bootable backup tape in case the root file system is unintentionally corrupted (see Section 4.4).
3. Issue the *sgilabel* command (see above) to see the size of the swap partition and the brand of the disk.
4. Examine */etc/fstab* to determine which partition is the */usr* partition.
5. Reboot the workstation:

```
who
sync
reboot
```

6. Boot the disk formatter program:

*IRIS 3020, 3115, 3120:*

```
b stand/mdfex
```

*IRIS 3030, 3120B, 3130:*

```
b stand/sifex
```

**CAUTION:** You must follow all instructions exactly when you use the *fex* disk formatter programs. Failure to follow instructions could result in serious damage to your file system.

7. When you use the *fex* programs, the monitor doesn't display the letters that you type, and usually you don't have to press **RETURN**. Immediately after you type a letter, *fex* responds. When the *mdfex* prompt appears, type:

s

8. You see a new prompt. Type the letter 1:

Set ? 1

9. You see this message:

File Systems info: lba or cylinder entry?

Press **RETURN**.

10. You see this entry:

a: base: (1)

Press **RETURN** to accept this entry.

11. Now the IRIS displays additional information about partition a, for example:

a: base: (1)      size: (150)

This entry indicates that partition a begins at cylinder 1 and has a size of 150 cylinders. The numbers in this entry may be different on your workstation.

Partition a is the root partition and does not change.

- To add 100 cylinders to the swap partition **b**, you must subtract 100 cylinders from the user partition. The base, or beginning, of the user partition changes by 100 cylinders. Press **RETURN** to make the IRIS display the base and size entries. You type the new base and size entries next to the old entries that are in parentheses. Examples are shown below for Vertex and Maxtor drives, as well as for a sample IRIS 3030, 3120B, or 3130 drive. The new entries are printed in **bold typewriter font** below.

**CAUTION:** Make sure you correctly change the size of the swap partition, and the base and size of the user partition on your machine. The examples below may not match your disk exactly.

*Vertex:*

```
b: base: (151) size: (149)249
c: base: (300)400 size: (586)486
```

*Maxtor:*

```
b: base: (151) size: (149)249
c: base: (300)400 size: (670)570
```

*Sample IRIS 3030, 3120B, or 3130 drive:*

```
b: base: (60) size: (100)200
c: base: (160) size: (200)
d: base: (360) size: (446)
f: base: (160)260 size: (646)546
```

- Continue to press **RETURN** until the workstation displays the Set? prompt.
- Type **q** to quit the *set* function:

**q**

15. The workstation displays the *mdfex* or *sifex* prompt. Type **q** again to exit from the *fex* program.

**q**

16. You see this message:

```
Quit
Label on drive 0 needs updating... do it?
```

Give permission to update the drive label:

**y**

17. You see this message:

```
-- confirm quit with 'y':
```

Quit the *fex* program:

**y**

18. After a few seconds, the PROM monitor prompt appears. Boot the system in single-user mode:

**b**

19. Make the new, smaller user file system.

**CAUTION:** Make sure to make the new file system on the partition that contains */usr* on your machine. The examples below may not match your machine exactly.

For the IRIS 3020, 3115, and 3120, the file system name has the form */dev/rmd0?*, where ? (question mark) is the letter of the */usr* partition. For the IRIS 3030, 3120B, and 3130, the file system name has the form */dev/rsi0?*, where ? (question mark) is the letter of the */usr* partition.

*IRIS 3020, 3115, 3120:*

```
mkfs /dev/rmd0c
```

*IRIS 3030, 3120B, 3130:*

```
mkfs /dev/rsi0f
```

20. Name the file system and give it a volume name with the *labelit* command, for example:

*IRIS 3020, 3115, 3120:*

```
labelit /dev/rmd0c usr sgi
```

*IRIS 3030, 3120B, 3130:*

```
labelit /dev/rsi0f usr sgi
```

21. Mount the */usr* file system, for example:

*IRIS 3020, 3115, 3120:*

```
mount /dev/md0c /usr
```

*IRIS 3030, 3120B, 3130:*

```
mount /dev/si0f /usr
```

22. Restore the */usr* files from tape:

```
cd /usr
tar xv or cpio -ihmudlv
```

23. Return to the root (/) directory and unmount /usr:

```
cd /
umount /usr
```

24. Check the file system, for example:

*IRIS 3020, 3115, 3120:*

```
fck /dev/rmd0c
```

*IRIS 3030, 3120B, 3130:*

```
fck /dev/rmd0f
```

25. Make a new bootable backup tape (see Section 4.4.1).
26. Begin multi-user mode:

```
multi
```

### 6.1.2 Configuring a Second Disk

If your workstation has two disks, you are responsible for configuring the second disk. Follow these steps:

1. Plan a strategy for configuring your second disk. Second disk configuration typically involves making and mounting file systems on the partitions available on your disk. To determine which partitions are available, become the superuser and issue the *sgilabel* command. See *sgilabel(1M)* for an explanation of *sgilabel* output. If you are configuring an SMD disk, follow the instructions for that disk, not for the model to which the disk is connected. In this procedure, 'SMD disk' refers to the two SMD disks that Silicon Graphics supports: the CDC 9766 and the Fujitsu Eagle.

*IRIS 3020, 3115, 3120:*

```
sgilabel mdi
```

*IRIS 3030, 3120B, 3130:*

```
sgilabel sil
```

*SMD disk:*

```
sgilabel ip1
```

There are basically two ways to configure your second disk: as one file system, or as several file systems. If you want as much space as possible for an extra file system, configure the second disk as one large file system. You can also configure your second disk as several files systems.

If you plan to configure your second disk as one large file system, examine the output of the *sgilabel* command to determine which partition represents the entire disk minus one or two cylinders. This partition is the only other partition besides partition **a** that has its base at 1. Use this partition to configure your disk.

If *sgilabel(1M)* shows that no partition represents the entire disk minus one or two cylinders, see *sgilabel(1M)*. An option to this command allows you to change the partitions on your disk label.

**CAUTION:** Do *not* use the partition that represents the entire disk to configure your second disk. This partition has its base at 0 and has the largest size of all the partitions. This partition includes valuable header information that you must not overwrite. If you change partitions on your disk label, do not use the space between 0 and the base of partition **a**; this space is reserved for the disk header.



If you plan to configure your second disk as several file systems, examine the output of the *sgilabel* command to determine which partitions are available. Sometimes the output of *sgilabel* shows that partitions overlap each other. The reason for the overlap is that the disk label is a table used by other commands, not a physical representation of the disk.

**CAUTION:** You cannot use any two partitions that overlap each other when you configure a second disk; you must choose between overlapping partitions.

It is a good idea to draw a diagram of your disk based on *sgilabel* output. This diagram can help you visualize the possibilities for configuration.

Once you have decided on a configuration plan, write down the device names for the file system(s) you plan to create. You will use these device names in the steps that follow. For the IRIS 3020, 3115, and 3120, the device names have the form:

```
/dev/md1[a-g]
```

where *[a-g]* represents the letter of the partition on which the new file system will reside. This example represents */dev/md1a*, */dev/md1b*, and so on, up to */dev/md1g*. For the IRIS 3030, 3120B, 3130, the device names have the form:

```
/dev/si1[a-g]
```

For the SMD disk, the device names have the form:

```
/dev/ip1[a-g]
```

These names are called *block device names*; some commands require block devices, and others require *raw devices names*. Raw device names have the form */dev/rmd1[a-g]* for the IRIS 3020, 3115, and 3120; */dev/rsi1[a-g]* for the IRIS 3030, 3120B, and 3130, and */dev/rip1[a-g]* for the SMD disk. The procedure below tells you when to use raw device names; otherwise, use block devices names.

Make a list of the names of the block and raw devices you will use, and the file systems you will create; for example:

| block devices:         | raw devices:            | file systems:   |
|------------------------|-------------------------|-----------------|
| <code>/dev/md1a</code> | <code>/dev/rmd1a</code> | <code>n</code>  |
| <code>/dev/md1b</code> | <code>/dev/rmd1b</code> | <code>n1</code> |
| <code>/dev/md1c</code> | <code>/dev/rmd1c</code> | <code>n2</code> |

When your strategy is complete, continue to the next step.

2. Log in as root or become the superuser by issuing the `su` command.
3. Check to see that no other users are on the system. Then, reboot the workstation into single-user mode.

```
who
sync
reboot
b
```

4. Create a directory in / (root) for each file system you want to create on your disk. File system names must be six characters or less. This example:

```
cd /
mkdir n
```

makes a directory for a file system called “n”.

5. Make each new file system. `[a-g]` represents the letter, from `a` to `g`, of the partition on which the new file system will reside (see Step 1). Issue one `mkfs` command for each file system you are creating.

*IRIS 3020, 3115, 3120:*

```
mkfs /dev/md1[a-g]
```

*IRIS 3030, 3120B, 3130:*

```
mkfs /dev/sil[a-g]
```

*SMD disk:*

```
mkfs /dev/ipl[a-g]
```

6. Issue the *labelit* command to put the new file system name(s) into the superblock. Use raw devices. The *labelit* command has this form:

*IRIS 3020, 3115, 3120:*

```
labelit /dev/rmd1[a-g] n sgi
```

*IRIS 3030, 3120B, 3130:*

```
labelit /dev/rsil[a-g] n sgi
```

*SMD disk:*

```
labelit /dev/ripl[a-g] n sgi
```

In this example, *n* is the file system name; *sgi* is the volume name. Issue one *labelit* command for each file system you are creating.

7. Edit */etc/fstab*, adding a line for each file system. This line automatically mounts the new file system(s) at the start of multi-user mode. */etc/fstab* is also a list of file systems that *fsck* checks as you enter multi-user mode. Entries in */etc/fstab* require both the block and raw device, in this format:

*IRIS 3020, 3115, 3120:*

```
/dev/md1[a-g] /n efs rw,raw=/dev/rmd1[a-g] 0 0
```

*IRIS 3030, 3120B, 3130:*

```
/dev/sil[a-g] /n efs rw,raw=/dev/rsil[a-g] 0 0
```

*SMD disk:*

```
/dev/ipl[a-g] /n efs rw,raw=/dev/ripl[a-g] 0 0
```

Include one such line for each file system you are creating.

8. Issue the *sync* command to flush the new information to the disk.

```
sync
```

9. Reboot the workstation to put the changes into effect.

```
reboot
b
multi
```

## 6.2 IRIS Terminal Disk Configuration

This subsection describes three procedures:

- Changing the swap partition size on an IRIS 3010
- Configuring a second disk on an IRIS 3010
- Creating and using a backup floppy set

In this section, references to the IRIS 3010 apply also to the IRIS 2300T and 3110.

### 6.2.1 Changing the Swap Partition Size on an IRIS Terminal

The disk is divided into three partitions:

- the root partition (**md0a**), which contains the file system
- the swap partition (**md0b**), which is used by the kernel for paging
- the backup partition (**md0c**), which is a copy of the root partition.

The size of the swap partition determines the maximum amount of virtual memory that can be used. At any moment in time, the sum of the sizes of all the processes known to UNIX cannot exceed the size of the swap partition. To find out the size of the swap partition on your terminal, escape from the *wsiris* terminal emulator with `~!`. If you are using the IBM terminal emulator, *t3279*, escape to the shell by following the instructions in *IBM Terminal Emulation, Escaping to the Shell*.

In response to the shell prompt, enter:

```
sgilabel md0
```

The *sgilabel* command prints out the disk drive label. The label includes the brand of disk drive and the size of each partition.

If the simultaneous processes running on your IRIS require more space on the swap partition, you can make it larger. If your IRIS uses less virtual memory than is currently available, you can create more storage room on the disk by reducing the size of the swap partition.

The backup partition is an exact copy of the root partition. To keep the two partitions the same size, divide the space reclaimed from the swap partition equally between the root and backup partitions.

To change the sizes of the partitions, follow these steps:

1. Configure the terminal for PROM monitor boot (i.e., set configuration switches 1 through 5 to **Closed**).

2. Boot the system:.

```
b
```

3. Escape from the terminal emulator by typing:

```
~!
```

4. Become the superuser:

```
su
```

5. Ensure that the backup partition is up to date:

```
rootcopy ok
```

6. Mount the backup partition:

```
mount /dev/md0c /mnt
```

7. Edit */mnt/etc/inittab* to suppress automatic recovery when booting from the backup partition. Find this line:

```
rr::sysinit:/etc/rootcopy >/dev/console 2>&1
```

Put an **x** between the two colons:

```
rr:x:sysinit:/etc/rootcopy >/dev/console 2>&1
```

8. Verify that the backup partition is bootable:

```
reboot
b md0c:recover
```

9. Reboot the terminal into the disk formatter/exerciser, *mdfex*:

```
b stand/mdfex
```

**CAUTION:** You must follow all instructions exactly when you use the *fex* disk formatter programs. Failure to follow instructions could result in serious damage to your file system.

The system displays the *mdfex* opening screen and prompt.

10. Type **s**. The system displays a new prompt:

```
Set ?
```

Respond with the letter **l** to set the disk's label. You see this message:

```
File Systems info: lba or cylinder entry?
```

Press **RETURN**. The system displays the size of the root partition (partition **a**):

```
a: base: (1) size: (123)
```

The numbers in parentheses are the current values. The size is expressed in cylinders; each cylinder is 34Kb. Before pressing **RETURN**, enter the new size for partition **a**. For example, if you are reducing the swap partition by 2Mb, increase the size of partition **a** by 1Mb, which represents 30 cylinders. Respond to the size prompt with the new figure:

```
a: base: (1) size: (123)153
```

Press **RETURN** to enter the new size and to display the base cylinder for partition **b**:

```
b: base: (124)
```

Change the base for partition **b** to the cylinder immediately following the last cylinder in partition **a**. For example, if you have added 30 cylinders to partition **a**, the new base for partition **b** is 154.

b: base: (124)154

Press **RETURN** to enter the new base and to display the size of partition **b**. Enter the new size:

b: base: (124)154 size: (360)300

- 11. Continue to press **RETURN** until the workstation displays the *Set?* prompt.
- 12. Type **q** to quit the *set* function:

q

- 13. The workstation displays the *mdfex* prompt. Type **q** again to exit from the *fex* program.

q

- 14. You see this message:

Quit  
Label on drive 0 needs updating... do it?

Give permission to update the drive label:

y

- 15. You see this message:

-- confirm quit with 'y':



Exit the *fex* program:

**y**

16. After a few seconds, the PROM monitor prompt appears. Boot the *recover* program, create a file system on the newly sized root partition, and copy the backup partition to it:

```
md0c:recover
mkfs /dev/rmd0a
labelit /dev/md0a root sgi
cd /
mount /dev/md0a /mnt
sh # you must use the Bourne shell for the tar command
tar cfB - [!m][!n][!t]* .??* | (cd /mnt ; tar xvfpB -)
exit
```

The copy takes about eight minutes.

17. Reboot and change the base and size of the backup partition. Follow the procedure described in step 10, but change the values for partition **c**. Increase the size of partition **c** by the same amount as partition **a**. For the example in step 10, you would enter these figures:

```
c: base: (484)424 size: (123)153
```

Exit from the *set* routine, update the disk label, and exit from *mdfex*.

18. Boot from the root partition and undo the change to */etc/inittab* you made in step 7.
19. Copy the root partition to the backup partition:

```
rootcopy ok
```

## 6.2.2 Creating and Using a Backup Floppy Set

The IRIS 3010 includes several tools for making a set of floppies for backup and using them to build a file system on the hard disk. The two procedures below describe how to create the floppies and how to build the disk from them.

The floppy set is to be used only in extraordinary circumstances. There is no need for the typical user to create the floppy set; you can use the backup partition on the disk if there is a problem with the file system.

### Creating the Floppy Set

1. Become the superuser.

```
su
```

2. Format eight floppies using *flp*:

```
flp format
```

3. Put *mdfex* on one of the formatted floppies:

```
mkfs -G 1 1 /dev/rfloppy 1280
mount /dev/floppy /mnt
cp /stand/mdfex /mnt/mdfex
umount /dev/floppy
```

4. Insert a new floppy and issue the *mkbootflp* command to make it a bootable UNIX floppy:

```
mkbootflp
```

5. Create a set of *tar* floppies containing the complete system:

```
cd /
tar cvfb /dev/rfloppy 80 .
```

Insert a new (formatted) floppy each time the system prompts for a new tape.

## Using the Floppy Set

1. Turn on the power or reboot the terminal to enter the PROM monitor.
2. Boot *mdfex* off the *mdfex* floppy:

```
b mf:mdfex
```

**CAUTION:** You must follow all instructions exactly when you use the *fex* disk formatter programs. Failure to follow instructions could result in serious damage to your file system.

3. Format the hard disk by typing **f**. The system displays a warning and the message:

```
Type 'go <return>' to start...
```

Type:

```
go
```

followed by RETURN.

4. To set the label, enter the letters **s**, then **1**. The system prompts for the name, serial number, and type of drive. Type **3010** after the Name prompt. Press RETURN to continue to the next item.

The serial number is shown on the hard disk drive. Enter the type of drive after the `#?` prompt. Type `21`, the number corresponding to Tandon TM262. Continue to press the `RETURN` key until the `Set?` prompt appears.

5. Enter `q` twice to quit both the `set` function and `mdfex`. The workstation displays the `mdfex` prompt and the message:

```
Quit
Label on drive 0 needs updating... do it?
```

6. Confirm your intention to update the drive label by typing `y`. The workstation displays the message:

```
--confirm quit with 'y':
```

7. Type `y` to confirm your intention to quit `mdfex` and return to the PROM monitor. The PROM monitor prompt appears.
8. Boot `defaultboot` from the bootable UNIX floppy:

```
b mf:
```

The system prompts for run level. Type `s`. If the following messages appear, ignore them:

```
INIT: cannot open /etc/inittab errno: 2
INIT: execlp of /bin/sh failed; errno = 2
```

9. Transfer the contents of the floppy to partition `a` of the hard disk:

```
/etc/flpuxfer md0a
```

10. Shut down the system and boot *defaultboot* off the hard disk:

```
/etc/reboot
b
```

The system prompts for run level. Answer **s**.

11. Move a few files:

```
/bin/mv /bin/tar /bin/sh /etc/init /tmp
```

12. Insert the first of the six *tar* floppies. Read the complete system onto the disk:

```
cd /
/tmp/tar xvfb /dev/rfloppy 80
```

Insert the subsequent floppies as the system prompts for additional tapes. Insert the floppies in order; otherwise *tar* fails.

13. Copy the system to the backup partition:

```
/etc/rootcopy ok
```

14. Reboot the system:

```
/etc/reboot
```

## 7. Optional Peripherals

This chapter describes the installation and operation of optional peripherals that you can use with the IRIS. Appendix D has information on cabling and pin signals supported on the IRIS serial ports. If you purchased an optional color printer, see the document *Using the Color Printer* for installation instructions. If you purchased an Apple LaserWriter, see the document *Using the Laser Printer* for installation instructions.

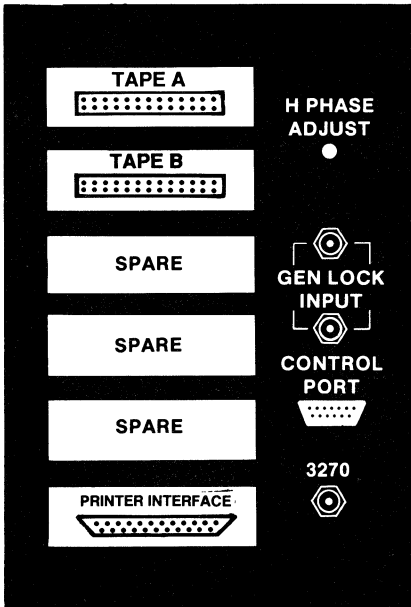
This chapter covers these topics:

- System console
- ASCII terminal
- Dial and button box
- Modem
- Digitizer tablet
- Tape drive
- Floppy disk drive
- Stereo optic viewer
- Dumb serial printer

The procedures in this chapter assume that your IRIS is booted and that you know how to use the *vi* text editor. If your system is not booted, see Chapter 3, *Booting the IRIS*. If you do not know how to use a text editor, see *Getting Started with Your IRIS Workstation*.

For reference in the following sections, Figure 7-1 shows the standard I/O panel and auxiliary I/O panel on the back of the IRIS.

Auxiliary I/O Panel



Standard I/O Panel

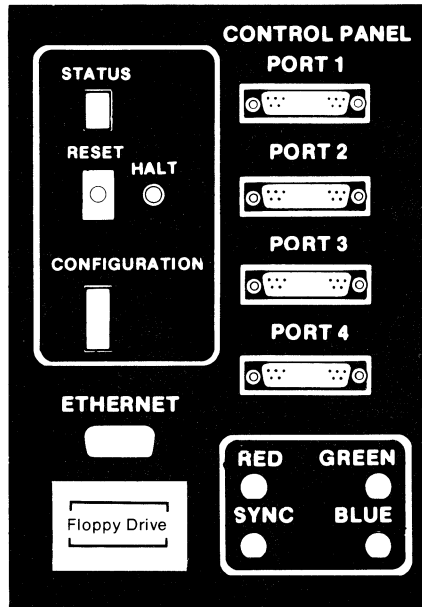


Figure 7-1: Auxiliary I/O Panel and Standard I/O Panel

## 7.1 Installing the System Console

To install the system console, you can use only **Port 1** of the IRIS workstation. Use the cable supplied with your IRIS to connect the system console to the I/O panel.

## 7.2 Installing an ASCII Terminal

This section describes the procedures for connecting and configuring an ASCII terminal.

### 7.2.1 Connecting the Hardware

You can connect the ASCII terminal to **Port 2**, **Port 3**, or **Port 4** on the I/O panel. Use a cable that swaps pins 2 and 3 (a null modem cable) and connects pin 7 to pin 7. See Appendix D for cable specifications.

### 7.2.2 Configuring the Software

To configure the software for using an ASCII terminal with the IRIS, follow these steps:

1. *IRIS terminal:*

Escape from the *wsiris* terminal emulator by entering `~!` and become the superuser by entering the *su* command.

*IRIS workstation:*

Log in as root or become the superuser by entering the *su* command.

2. The */etc/termcap* file describes different terminal models, their capabilities, and how they operate. Examine */etc/termcap* by typing:

```
more /etc/termcap
```



For most ASCII terminal models, you do not need to edit */etc/termcap*. Check */etc/termcap* to see whether it contains your terminal model. If not, or if your terminal does not work properly after you follow this procedure, put an entry for your terminal model in */etc/termcap*. Refer to the manual pages for *termcap(4)*, *tset(1)*, *ttytype(4)*, and *stty(1)* in the *UNIX Programmer's Manual, Volume IA and IB*.

For example, if your terminal is a Visual 50, the entry looks like this:

```
vj|v50am|v50 with automatic margins:\
```

The data in the second field (v50am) corresponds to the model of your terminal. In the next step, you will enter this terminal model name in the file */etc/ttytype*.

- 3. */etc/ttytype* defines the type of terminal being used and the port to which it is connected. Edit */etc/ttytype* by typing:

```
vi /etc/ttytype
```

This is a sample */etc/ttytype*:

```
wsiris systty
wsiris console
wsiris syscon
?du ttyd1
?du ttyd2
?du ttyd3
```

In the line that corresponds to the port you are using, replace `du` with the terminal model name from `/etc/termcap`. `ttyd1` is `Port 2`, `ttyd2` is `Port 3`, and `ttyd3` is `Port 4`. For example, to connect a Visual 50 to `Port 2`, edit `/etc/ttytype` to look like this:

```
wsiris systty
wsiris console
wsiris syscon
?v50am ttyd1
?du ttyd2
?du ttyd3
```

The `?` (question mark) causes `tset` to prompt for the kind of terminal you are using when you log on through that port. You normally call `tset` in your login startup script (`~/.cshrc` or `~/.profile`). `tset` commands use information from `/etc/ttytype` and `/etc/termcap` to initialize the terminal. These files also provide information on setting up environment variables so that editors and other programs know how to communicate with the terminal. See Chapter 4 and the `tset(1)` manual page.

4. Edit `/etc/inittab` so that you can log in to the IRIS ports. (See the `inittab(4)` manual page for more information.) This is a sample `/etc/inittab`:

```
is:s:initdefault:
s0::sysinit:/etc/rc.s0 1>/dev/console 2>&1
b0::bootwait:/etc/brc </dev/console >/dev/console 2>&1
b1::bootwait:/etc/bcheckrc </dev/console >/dev/console 2>&1
rc::wait:/etc/rc 1>/dev/console 2>&1
pf::powerfail:/etc/powerfail 1>/dev/console 2>&1
co::respawn:/etc/getty console co_9600 none LDISCO
d1:x:respawn:/etc/getty ttyd1 dx_9600 none LDISCO
d2:x:respawn:/etc/getty ttyd2 dx_9600 none LDISCO
d3:x:respawn:/etc/getty ttyd3 dx_9600 none LDISCO
```

Here is an example of one entry, with an explanation of each field in the entry:

```
d1:x:respawn:/etc/getty ttyd1 dx_9600 none LDISCO
```

|         |                                                                                                                                                                                                                                                                                                                                                                       |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| d1      | uniquely identifies the entry.                                                                                                                                                                                                                                                                                                                                        |
| x       | defines the run level in which this entry is to be processed.<br>An <i>x</i> in this field means “never do this”; nothing in this field means “always do this”; an <i>s</i> means “do this when switched to single-user mode”; a <i>2</i> means “do this in run-level 2”; a <i>3</i> means “do this in run-level 3”; a <i>23</i> means “do this in run-level 2 or 3”. |
| respawn | defines the action on the process field of <i>init</i> . See <i>inittab(4)</i> for a description of all possible actions.                                                                                                                                                                                                                                             |

```
/etc/getty ttyd1 dx_9600 none LDISC0
```

runs the *getty* process on Port 2 at the baud rate and options specified in the `dx_9600` entry in the file */etc/gettydefs*.

To enable you to log in to the terminal you connected to Port 2, remove the `x` in the second field of the entry for Port 2 and add a `23`. Find this line:

```
d1:x:respawn:/etc/getty ttyd1 dx_9600 none LDISC0
```

Edit it so that it looks like this:

```
d1:23:respawn:/etc/getty ttyd1 dx_9600 none LDISC0
```

*/etc/inittab* refers to */etc/gettydefs* for information about the terminal baud rate. In the example from */etc/inittab* above, `dx_9600` refers to the name of an entry in */etc/gettydefs*. This entry defines a 9600 baud setting. If you don't plan to run the terminal at 9600 baud, replace `dx_9600` in */etc/inittab* with the correct entry name from */etc/gettydefs*. Examine */etc/gettydefs* to see which entries are defined. The entries in */etc/gettydefs* look like this:

```
dx_9600# B9600 # B9600 SANE TAB3 #\r\n\n$HOSTNAME login: #dx_9600
dx_4800# B4800 # B4800 SANE TAB3 #\r\n\n$HOSTNAME login: #dx_4800
dx_2400# B2400 # B2400 SANE TAB3 #\r\n\n$HOSTNAME login: #dx_2400
dx_1200# B1200 # B1200 SANE TAB3 #\r\n\n$HOSTNAME login: #dx_1200
du_1200# B1200 # B1200 SANE TAB3 #\r\n\n$HOSTNAME login: #du_300
du_300# B300 # B300 SANE TAB3 #\r\n\n$HOSTNAME login: #du_2400
du_2400# B2400 # B2400 SANE TAB3 #\r\n\n$HOSTNAME login: #du_1200
```

The entries beginning with `dx` are for terminals; those beginning with `du` are for modems. See the manual page *gettydefs(4)* for more information on the fields of each entry.

When the terminal is powered on, the workstation sends a login prompt to the terminal screen. If the login prompt doesn't appear, press `[Return]`. If the prompt still doesn't appear or is garbled, check `/etc/inittab` to make sure the default line speed is correct.

5. Inform `init` of the change to `/etc/inittab` and start a `getty` process for the port:

```
telinit q
```

## 7.3 Installing the Dial and Button Box

The dial and button box has eight continuous rotation dials, 32 function switches, 32 programmable indicator lights, and an 8-character display.

### 7.3.1 Installing the Hardware

To install the dial and button box, follow these steps:

1. Connect the dial box to the button box with the 37-pin cable assembly supplied.
2. Find the cable with a DB9 connector at one end and a DB25 connector at the other end. Attach the DB9 connector to the button box and the DB25 connector to `[Port 1]`, `[Port 2]`, or `[Port 3]` of the IRIS workstation.
3. Plug the 3-wire power cord from the button box into a 3-wire AC power outlet.

### 7.3.2 Configuring the Software

To configure the dial and button box software, follow these steps:

1. *IRIS terminal:*

Escape from the *wsiris* terminal emulator by entering `~!` and become the superuser by entering the *su* command.

*IRIS workstation:*

Log in as root or become the superuser by entering the *su* command.

2. Edit the file */etc/inittab* to disable logins on the port to which the dial and button box is connected. For example, if you connected the dial and button box to `Port 3`, find the line for *ttyd2*, and make sure it has an `x` in the second field. (Note the hardware and software names for the ports: hardware `Port 2` is software device *ttyd1*, hardware `Port 3` is software device *ttyd2*, and hardware `Port 4` is software device *ttyd3*.)

```
d2:x:respawn:/etc/getty ttyd2 dx_9600 none LDISCO
```

The `x` in the second field disables logins by preventing a *getty* process from being run for the port.

3. Inform *init* of the changes to */etc/inittab* by typing:

```
telinit q
```

This command tells *init* to read */etc/inittab* and kill the *getty* process for the port.

4. To connect the dial and button box to `Port 3`, issue the *devport* command:

```
devport -d 2
```

5. Edit the file */etc/rc.local*. Add the *devport* command shown in the previous step. This ensures that the port for the dial and button box is specified automatically each time you boot the IRIS.
6. To give all users permission to access the port, issue the *chmod* command:

```
chmod 666 /dev/ttyd2
```

7. Change the owner of the device to **root** and its group to **sys**:

```
chown root /dev/ttyd2
chgrp sys /dev/ttyd2
```

To use the dial and button box and the digitizer tablet simultaneously, see *devport(1)* in the *UNIX Programmer's Manual, Volume 1A*, and *devport(3G)* in the *IRIS User's Guide*.

## 7.4 Installing the Modem (IRIS Workstation Only)

This section describes the procedures for installing the modem hardware, configuring a port for a dial-in modem and configuring a port for a dial-out modem.

### 7.4.1 Installing the Hardware

The IRIS workstation supports all 110 through 2400 baud modems. The Bell 212, 103, and 113 models; the VADIC 3400; the CCITT Recommendation V.25 and V.22, and the Hayes Smartmodem are all examples of modems that the IRIS supports. Connect any of these modems to either **Port 2**, **Port 3**, or **Port 4** of the IRIS with an RS-232 cable.

Only some of the ports support *data carrier detect* and *data terminal ready*. See the tables in Appendix D for information on the IRIS port signals.

### 7.4.2 Configuring the Software for a Dial-out Modem

This section describes the configuration procedures for a dial-out modem. Refer to “*uucp Administration*”, in the *UNIX Programmer's Manual, Volume IIB*.

The following example shows how to connect and configure the software for a modem.

1. Log in as root or become the superuser by entering the *su* command.
2. Edit the file */usr/lib/uucp/L-devices*. This file contains line speed entries for each port.

The first field of this entry defines the connection as direct (DIR).

The second field is the device name. *ttym1* corresponds to Port 2, *ttym2* corresponds to Port 3, and *ttym3* corresponds to Port 4.

The third field is a place holder.

The fourth field is the baud rate of the connection. Use a baud rate that works for both the local modem and the modem on the other end of the telephone line.

If you are connecting the modem to Port 2, add this line for *ttym1*:

```
DIR ttym1 ttym1 baudrate
```

For example, if your modem is operating at 2400 baud, add this line:

```
DIR ttym1 ttym1 2400
```



If you connected the modem to **Port 3**, add this line for *ttym2*:

**DIR ttym2 ttym2 baudrate**

If you connected the modem to **Port 4**, add this line for *ttym3*:

**DIR ttym3 ttym3 baudrate**

3. Edit the file */usr/lib/uucp/L.sys*. This file has information about sites that *uucp* can communicate with. Entries in this file have these fields:

*system\_name time device class phone login*

|                    |                                                                                 |
|--------------------|---------------------------------------------------------------------------------|
| <i>system_name</i> | The name of the remote system; must be unique in the first seven characters.    |
| <i>time</i>        | When the remote system can be accessed; ANY means any day of the week.          |
| <i>device</i>      | The device used for the call.                                                   |
| <i>class</i>       | The baud rate for the device.                                                   |
| <i>phone</i>       | The dialer sequence the modem will use to call the remote system.               |
| <i>login</i>       | The login password and special character sequence needed to complete the login. |

For example, if you are attaching a 1200-baud modem to `Port 4`, and you want it automatically to call a host named *omachine* at 415-555-1212, you could edit `/usr/lib/uucp/L.sys` to contain these lines:

```
Name of company
#talk to (415)555-1212, Tom Jones.
#mail to omachine!him
#incoming=Upyramid, password cube
omachine Any ttyd3 1200 ttyd3 "" \rATS2=128\r\c
OK atdt4155551212\r 1200
\r\c ogin:-\b\d-ogin:--ogin:--ogin:
Username ssword: PaSsWoRd
```

**NOTE:** The line that begins with `omachine` and ends with `PaSsWoRd` is actually one line. Do *not* type any carriage returns. The system wraps the line when it reaches the edge of the screen.

4. To configure the port for the modem, type these commands:

```
cd /dev
./MAKEDEV duart
```

This step automatically makes a directory entry for the modem, gives users permission to access the port, and changes the owner of the device to `root` and its group to `sys`.

5. Edit `/etc/inittab` to disable logins on the port connected to the modem. Find the line that corresponds to the port you chose for the modem. `ttyd1` corresponds to `Port 2`, `ttyd2` corresponds to `Port 3`, and `ttyd3` corresponds to `Port 4`. For example, if you connected the Hayes modem to `Port 3`, find this line:

```
d2:x:respawn:/etc/getty ttyd2 dx_9600 none LDISC0
```

and make sure it has an `x` in the second field. The `x` in the second field disables logins by preventing a `getty` process from being run for the port.

6. Inform *init* of the change to */etc/inittab* by typing the command:

```
telinit q
```

7. Test the serial line with *cu*:

```
cu -sbaudrate -ldevice
```

The IRIS should connect to the direct line specified by the *-l* option. See *cu(1C)* in the *UNIX Programmer's Manual, Volume IA*, for more information.

### 7.4.3 Configuring the Software for a Dial-in Modem

This section describes the configuration procedures for a dial-in modem. Refer to “*uucp Administration*”, in the *UNIX Programmer's Manual, Volume IIB*.

1. Log in as root or become the superuser by entering the *su* command.
2. To configure the port for the modem, type these commands:

```
cd /dev
./MAKEDEV duart
```

This step automatically makes a directory entry for the modem, gives users permission to access the port, and changes the owner of the device to *root* and its group to *sys*.

3. Edit the file */etc/inittab* to disable logins on the port connected to the modem, and to specify that the modem device driver be used with that port. Find the line that corresponds to the port you chose for the modem. *ttyd1* corresponds to Port 2, *ttyd2* corresponds to Port 3, and *ttyd3* corresponds to

**Port 4**. Edit the line, changing `ttyd1` to `ttym1`, `ttyd2` to `ttym2`, or `ttyd3` to `ttym3`. For example, if you connected the Hayes modem to **Port 3**, find this line:

```
d2::respawn:/etc/getty ttyd2 dx_9600 none LDISC0
```

and modify it to read:

```
d2:23:respawn:/etc/getty ttym2 du_1200 none LDISC0
```

The 23 in the second field enables logins to the port.

4. Inform *init* of the change to */etc/inittab* by typing the command:

```
telinit q
```

The `du` entries in */etc/gettydefs* toggle between 1200 and 300 baud. If *getty* is listening at the wrong baud rate when you log in, the prompt can be garbled or may not appear. Select another line speed by pressing the **BREAK** key after the login message is displayed. See *gettydefs(4)* and *getty(1M)*.

## 7.5 Installing the Digitizer Tablet

The IRIS supports the Hitachi digitizer tablet, which converts graphics information into digital form. The resolution of the digitizer is 200 points per inch. The tablet has a serial interface and is shipped configured for 9600-baud communication.

### 7.5.1 Installing the Hardware

To install the digitizer tablet, follow these procedures:

1. Locate the three dip switches labeled **DSW1**, **DSW2**, and **DSW3** on the back of the digitizer tablet. Up means on and down means off. Make sure that the switches match the settings in this list:

| DSW1 | Status | Meaning                        |
|------|--------|--------------------------------|
| 1    | On     | Unit selection - English(inch) |
| 2    | Off    | Mode selection - run           |
| 3    | Off    | Mode selection - run           |
| 4    | Off    | Incremental mode - normal      |
| 5    | On     | Rate selection - 1/20          |
| 6    | Off    | Rate selection - 1/20          |
| 7    | Off    | Reset - normal                 |
| 8    | Off    | Not used                       |

| DSW2 | Status | Meaning                            |
|------|--------|------------------------------------|
| 1    | Off    | Baud rate - 9600                   |
| 2    | Off    | Baud rate - 9600                   |
| 3    | On     | Baud rate - 9600                   |
| 4    | On     | Not used                           |
| 5    | Off    | Serial data transfer - 2 stop bits |
| 6    | On     | Word composition - odd parity      |
| 7    | On     | Bit pad compatible mode            |
| 8    | Off    | Digitize/test - digitize           |

| DSW3 | Status | Meaning                                   |
|------|--------|-------------------------------------------|
| 1    | Off    | Binary/ASCII                              |
| 2    | Off    | Not used                                  |
| 3    | Off    | Cursor button code - 4-button cursor      |
| 4    | Off    | Not used                                  |
| 5    | Off    | ASCII format selected - L/F code attached |
| 6    | On     | Buzzer disable                            |
| 7    | On     | Resolution - 200 points per inch          |
| 8    | Off    | Resolution - 200 points per inch          |

2. The *tablet cable* is a null modem cable that also joins pins 4, 5, 6, 20, and 8 at the tablet end. Attach the end labeled `tablet` to the port on the digitizer tablet labeled `PORT`. Connect the other end to the IRIS I/O panel. You can use `Port 2`, `Port 3`, or `Port 4`. This example uses `Port 4`.
3. Connect the four-button cursor to the port labeled `STYLUS` on the back of the tablet. Plug the tablet power cable into an AC outlet.

## 7.5.2 Configuring the Software

To configure the digitizer tablet software, follow these steps:

1. *IRIS terminal:*

Escape from the *wsiris* terminal emulator by entering `~!` and become the superuser by entering the *su* command.

*IRIS workstation:*

Log in as root or become the superuser by entering the *su* command.

2. Edit the file `/etc/inittab` to disable logins on the port you chose for the digitizer tablet. This example uses `Port 4`, device `ttyd3`. (Note the hardware and software names for the ports: hardware `Port 2` is software device `ttyd1`, hardware `Port 3` is software device `ttyd2`, and hardware `Port 4` is software device `ttyd3`.) Find the line for `ttyd3`, and make sure it has an `x` in the second field:

```
d3:x:respawn:/etc/getty ttyd3 dx_9600 none LDISCO
```

The `x` in the second field disables logins by preventing a *getty* process from being run for the port.

3. Inform *init* of the changes to `/etc/inittab` by typing:

```
telinit q
```

This command tells *init* to read */etc/inittab* and kill the *getty* process for the port.

4. Enter the *devport* command to assign a port to the digitizer tablet:

```
devport -t 3
```

5. Edit the file */etc/rc.local*. Add the *devport* command shown in the previous step. This ensures that the port for the digitizer tablet is specified automatically each time you boot the IRIS.
6. To give all users permission to access the port, issue the *chmod* command:

```
chmod 666 /dev/ttyd3
```

7. Change the owner of the device to **root** and its group to **sys**:

```
chown root /dev/ttyd3
chgrp sys /dev/ttyd3
```

## 7.6 Installing the Tape Drive (IRIS Workstation Only)

The sections below describe how to install both half-inch and quarter-inch tape drives on the IRIS workstation.

### 7.6.1 Half-inch Tape Drive

The half-inch PE tape unit writes data in PE (Phase Encoded) mode at 1600 bpi (bits per inch). Data is written on the tape by positively or negatively magnetizing sections of the oxide on the tape. A change in direction from positive to negative represents 1 bit and a change in direction from negative to positive represents 0 bit.

## Connecting the Stand-alone Tape Drive to the Workstation

The half-inch tape drive is a stand-alone unit. The tape drive is connected to the electronics cabinet on the auxiliary I/O panel with two 50-pin cables. Figure 7-1 shows the two connectors on the auxiliary I/O panel, labeled **Tape A** and **Tape B**, for connecting the half-inch tape drive to the electronics cabinet. For instructions on connecting the tape unit to the electronics cabinet, see the *PE Tape Unit Operator's Guide* that came with your optional tape drive.

## Using the Tape Drive with the Workstation

You can use the tape drive for backing up the disk, but you cannot boot from the half-inch tape drive.

For information on the operator panel, error conditions, loading tapes, and cleaning the tape unit, see the *PE Tape Unit Operator's Guide*.

See Section 4.4 for instructions on backing up the disk to the tape drive. The half-inch tape device with rewind is device `/dev/rmt3`; the half-inch tape drive without rewind is device `/dev/rmt4`.

### 7.6.2 Quarter-inch Cartridge Tape Drive

The quarter-inch cartridge tape drive is installed in the workstation at the factory if the workstation is ordered with this option. Table 7-1 shows the specifications for the quarter-inch tape drive.



| Cartridge Tape Drive Specifications |                                                                     |
|-------------------------------------|---------------------------------------------------------------------|
| Device Names:                       | <i>/dev/rmt1</i> (with rewind)<br><i>/dev/rmt2</i> (without rewind) |
| Density:                            | 10,000 flux changes per inch<br>100K per foot                       |
| Speed:                              | 90 inches per second                                                |
| Tape Lengths:                       | 450 and 600 feet                                                    |
| Capacity (450 ft.)                  | 45Mb                                                                |
| (600 ft.)                           | 60Mb                                                                |
| Tape Suppliers:                     | 3M/Scotch<br>Data Electronics, Inc.<br>Control Data Corporation     |

Table 7-1: Cartridge Tape Drive Specifications

## 7.7 Using the Floppy Disk Drive

The floppy disk drive is installed at the factory if the IRIS is ordered with this option. It is standard on the IRIS terminal. The floppy disk drive is device */dev/floppy*.

The floppy disk drive has an unformatted capacity of 1Mb per disk. It has a data transfer rate of 250K bits per second, 96 tracks per inch, and 160 tracks per drive.

To create and use a set of backup floppies for IRIS terminals, see Section 6.2, IRIS Terminal Disk Configuration.

## 7.8 Installing the Stereo Optic Viewer

Silicon Graphics supports a stereo viewer manufactured by Stereo-Optic Systems, Inc. (model number SDS-100). The stereo viewer is not available from Silicon Graphics.

### 7.8.1 Connecting the Stereo Optic Viewer to the IRIS

To connect the stereo viewer with the IRIS, use the 9-pin D to BNC adapter cable provided by Silicon Graphics (product number C-STV).

1. Connect the BNC connector to the port labeled `TTL Trigger Input` on the stereo viewer back panel.
2. Connect the 9-pin D connector to the port labeled `Control Port` on the auxiliary I/O panel on the IRIS (see Figure 7-1).

### 7.8.2 Using the Stereo Optic Viewer

The IRIS sends a pulse through the cable each time the color map is cycled or the front and back buffers are swapped. If both cycling and swapping are taking place, the pulses follow the cycle rate and ignore the swap rate. (For more information, see the descriptions of the `cyclemap` and `swapbuffers` commands in the *IRIS User's Guide*.)

## 7.9 Attaching a Dumb Serial Printer

Silicon Graphics, Inc., does not currently support the use of dumb printers with the IRIS Series 3000 workstation. You can attach dumb printers to the IRIS through any of the serial ports, but you need to configure and interface such a printer on your own. Only users who are familiar with printer interfacing should try to connect a dumb printer.

### 7.9.1 General Procedure

The following set of procedures gives a general outline for adding a dumb printer to the UNIX line printer (LP) spooler.

1. Log in as root, or become the superuser by entering the `su` command.
2. To avoid unwanted output from non-LP processes and to ensure that LP can write to the device, enter the following commands.

`ttydport` is the software device for the hardware port to which the printer is connected. (Note the hardware and software names for the ports: hardware `Port 2` is software device `ttyd1`, hardware `Port 3` is software device `ttyd2`, and hardware `Port 4` is software device `ttyd3`.)

```
chown lp /dev/ttydport
chmod 600 /dev/ttydport
```

3. To prevent the IRIS from sending a login prompt to the printer, edit the file `/etc/inittab`. Find the line corresponding to the serial port your printer is connected to. It looks something like this:

```
dport::respawn:/etc/getty ttydport dx_9600
```

Add an `x` after the first colon, changing the line to the following:

```
dport:x:respawn:/etc/getty ttydport dx_9600
```

4. Turn off the scheduler with the `lpshut` command.

```
/usr/lib/lpshut
```

5. Introduce the printer to the LP system with the `lpadmin` command. This command assigns a printer to a filter. You need to specify a *printer* name, a *device* file, and an interface program or *filter*.

The *printer* name must conform to the following rules:

- It must be no longer than ten characters.
- It must consist solely of alphanumeric characters and underscores.
- It must be unique within the LP system.

*device* is the software device file associated with the printer: */dev/ttyd1*, */dev/ttyd2*, or */dev/ttyd3*.

Choose the *filter* with either the `-m` or `-i` option.

Use `-m` if you want to use one of the “model” filters supplied with the LP system in */usr/spool/lp/model*.

```
/usr/lib/lpadmin -pprinter -vdevice -mmodel
```

See the following subsection, “Printer Filters”, for more on the model filters.

Use `-i` if you want to use a filter that you have written yourself:

```
/usr/lib/lpadmin -pprinter -vdevice -ifilter
```

*filter* is your own filter.

You may also want to use the `-h` option, which tells LP that the printer is hardwired to the IRIS. `-h` does not take any arguments, and may appear anywhere after the `-p` option on the command line.

6. Start the LP scheduler with the *lpsched* command.

```
/usr/lib/lpsched
```

7. Allow the printer to accept requests to its queue with the *accept* command.

```
/usr/lib/accept
```

8. Enable the printer with the *enable* command.

```
enable printer
```

### 7.9.2 Printer Filters

Printers that are used with the LP system must have a printer interface program, or *filter*. Every print request made with the *lp* command is routed through an appropriate filter before it is printed, as illustrated in Figure 7-2.

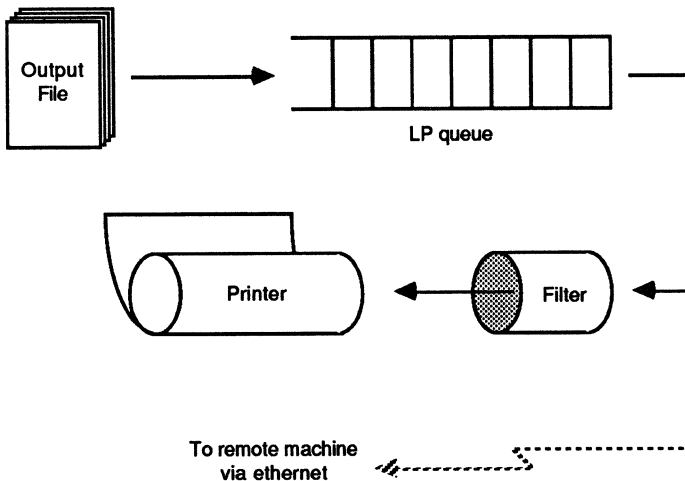


Figure 7-2: Printer Filter

A number of “model” interface programs in the form of shell scripts are provided in */usr/spool/lp/model*, including a generic dumb printer interface, *dumb*. Edit this script to meet the particular needs of your printer. The following information should help you to create your own printer filter.

When LP routes an output request to a printer, the filter for the printer is invoked by LP in the directory */usr/spool/lp* as follows:

```
interface printer id user title copies options file
```

The filter takes the following arguments:

*printer* Printer name  
*id* Request ID returned by *lp*  
*user* Login name of the user who made the request  
*title* Optional title specified by the user  
*copies* Number of copies requested by the user  
*options* List of class- and printer-dependent options specified by the user  
*file* Full pathname of a file to be printed

When you invoke the filter, its standard input comes from */dev/null*, and both the standard output and standard error output are directed to the printing device.

Filters format their output by using command line arguments. Your filter must have the proper terminal characteristics (such as baud rate) included in its command lines. Add lines containing the *stty* command in the following form:

```
stty options <&1
```

This command takes the standard input for *stty* from the device. For more information on the *stty* command, see *stty(1)*. Since different printers have different numbers of columns, make sure that the header and trailer for your filter correspond to your printer's specifications.

When printing is complete, it is the responsibility of your filter to exit with a code that shows the status of the print job.

Exit codes are interpreted by *lpsched* as follows:

- 0        The print job has completed successfully.
- 1–127    A problem was encountered in printing the request. *lpsched* notifies the sender by mail that there was a printing error. Subsequent jobs are not affected.
- > 127    These codes are reserved for internal use by *lpsched*.

When problems occur that are likely to affect subsequent print jobs, you should have your filter disable the printer so that requests are not lost. When a busy printer is disabled, the filter exits with code 15.

## 8. Video Options

The IRIS workstation supports seven video options:

- 60-Hz non-interlaced monitor (fifteen-inch or nineteen-inch)
- 33-Hz interlaced monitor
- RS-170A video (genlockable and non-genlockable)
- European video standard (genlockable and non-genlockable)

**NOTE:** Early versions of the IRIS 2300T, 2400T, and 2500T may not have the same monitors described here.

Each IRIS workstation contains drivers for two video options, one *primary* video option and one *secondary* video option. Table 8-1 lists the possible combinations of primary and secondary video options.

| Primary Video        | Secondary Video         |
|----------------------|-------------------------|
| 60-Hz Non-interlaced | 33-Hz Interlaced        |
| 60-Hz Non-interlaced | RS-170A                 |
| 60-Hz Non-interlaced | European Video Standard |
| 33-Hz Interlaced     | 60-Hz Non-interlaced    |
| 33-Hz Interlaced     | RS-170A                 |
| 33-Hz Interlaced     | European Video Standard |

Table 8-1: Primary and Secondary Video Options



**NOTE:** The RS-170A and European video standard monitors are not available from Silicon Graphics.

The configuration for the primary and secondary video drivers is specified when an IRIS workstation is ordered. See below for the procedures for using the IRIS Graphics Library with different video options.

## **8.1 Supported Video Options**

The sections below describe the video options supported by the IRIS workstation.

### **8.1.1 60-Hz Non-interlaced Monitor**

The 60-Hz non-interlaced high-resolution monitor has a visible resolution of 1024 pixels by 768 lines. These monitors are available in two sizes: fifteen-inch and nineteen-inch. For more information on these monitors, see Chapter 2, Hardware Installation.

### **8.1.2 33-Hz Interlaced Monitor**

The 33-Hz interlaced high-resolution monitor has a visible resolution of 1024 pixels by 768 lines. For more information, see Chapter 2.

### **8.1.3 RS-170A**

The RS-170A option has a visible resolution of 636 pixels by 485 lines and a frame rate of 30 Hz.

The IRIS workstation provides red, green, blue, and sync video outputs (RGSB). The RGB outputs from the IRIS are noncomposite 0.7 V p-p into 75 ohms, positive bright. The sync output is TTL, low active, and is capable of driving a 75-ohm load. It meets RS-170A timing with one exception: the oscillator that determines horizontal scanning frequency stability in the IRIS differs from the frequency stability of the RS-170A color television timing standard ( $\pm 0.005\%$  versus  $\pm 0.000279\%$ ). This stability is adequate for most applications but not for broadcasting. For broadcast applications, use either the genlockable RS-170A option or a timebase corrector.

The IRIS RGSB output can be encoded into an NTSC signal with a stand-alone NTSC color encoder or an NTSC color encoder connected to a sync generator genlocked to the IRIS sync output. This NTSC signal can be connected to video tape recorders or an NTSC-type monitor.

#### **8.1.4 European Video Standard**

The European video standard has a visible resolution of 780 pixels by 575 lines, a frame rate of 25 Hz, and a total vertical resolution of 625 lines.

The IRIS workstation provides red, green, blue, and sync video outputs (RGSB). The RGB outputs from the IRIS are noncomposite 0.7 V p-p into 75 ohms, positive bright. The sync output is TTL, low active, and is capable of driving a 75-ohm load. It meets European low-resolution video timing, with one exception: the oscillator that determines horizontal scanning frequency stability in the IRIS differs from the frequency stability of the European color television timing standards ( $\pm 0.005\%$  versus  $\pm 0.0001\%$ ). This stability option is adequate for most applications but not for broadcasting. For broadcast applications, use the genlockable European low-resolution video or a timebase corrector.

The IRIS RGSB output can be encoded into a PAL signal by a stand-alone PAL color encoder or a PAL color encoder connected to a sync generator genlocked to the IRIS sync output. This PAL signal can be connected to a video tape recorder or a PAL-type monitor.

### 8.1.5 Genlockable RS-170A or European Video Standard

The genlockable RS-170A or European video option synchronizes the IRIS RGB outputs with those of an external sync master.

The IRIS RGBS output can be encoded into an NTSC or PAL signal with a stand-alone color encoder or a PAL color encoder connected to a genlockable sync generator which is also genlocked to the sync master.

The genlockable RS-170A or European video option provides operation with commercially available video tape recorders and mixing/keying equipment (when color encoded with external equipment). If a genlockable video option is ordered, two BNC connectors are provided with the IRIS workstation system. These connectors are located on the auxiliary I/O panel and are labeled **Genlock Input** (see Figure 7-1). If the IRIS is not used in a daisy chain, a 75-ohm terminator is required on one of the two BNC connectors.

Operation of the genlockable RS-170A or genlockable European Video Standard options are identical. The IRIS must be operating in its supported low-resolution mode (RS-170A or European Video Standard) to genlock. Genlock provides for vertical and horizontal alignment of the IRIS RGB and Sync outputs to an external composite sync reference input presented to the **Genlock Input** on the auxiliary I/O panel (see Figure 7-1). This input is a loop-through connection requiring external 75-ohm termination.

The genlocking process takes approximately two seconds. When a genlock reference input is connected, the genlocking process is initiated automatically. If no composite sync reference input is connected, the appropriate output (RS-170A or European Video Standard) runs referenced to an internal timing source. Genlocking takes place whenever the IRIS is reset, the genlock reference input is disconnected and reconnected, or an out-of-lock condition is detected. An out-of-lock condition typically results from a discontinuity on the genlock reference input, such as a power interruption or a source switch.

When genlocked, the IRIS output can be adjusted horizontally to compensate for external equipment delays. To do this, use the horizontal phase adjust potentiometer, labeled **HPhase Adjust**, which is reached through an access hole on the auxiliary I/O panel (see Figure 7-1). This potentiometer provides an adjustment range of  $\pm 1.5$  microseconds on the IRIS RGBS output with respect to the genlock reference input.

## 8.2 Booting with the Secondary Video Driver

Configuration switch 7 on the cabinet I/O panel controls which video driver is initialized when you boot the workstation in PROM monitor boot configuration.

To boot using the secondary display, follow these steps:

1. Set switch 7 to **Open** to initialize the video hardware to drive the secondary display. (Setting switch 7 to **Closed** causes the PROM monitor to initialize the hardware to drive the primary display.)
2. Set the **Power** switch on the cabinet front panel to **On**.

The PROM monitor prompt appears on the screen:

```
iris>
```

If the prompt does not appear, press the **Reset** button.

3. Boot UNIX. To boot from the default device, type:

```
b
```

See Table 3-3 for a list of PROM monitor commands.

Instead of booting from the PROM monitor, you can select the secondary display using the `setmonitor` command (see below).

**NOTE:** Although the RS-170A monitor option can be used as the secondary display, it cannot be used as the boot display.

### 8.3 Using the Graphics Library with the Video Options

The `setmonitor` command in the IRIS Graphics Library specifies the video compatibility of the IRIS workstation display output. To change the active video driver through the Graphics Library, issue the command:

```
setmonitor (type)
```

Specify one of these types: **HZ60** (60-Hz non-interlaced monitor), **HZ30** (33-Hz interlaced monitor), **NTSC** (RS-170A monitor), or **PAL** (European video standard).

The include file `set.h` defines these monitor types. The command `getmonitor`, which returns the current display controller mode, returns one of these types. (For more information, see the *IRIS User's Guide*.)

With a low-resolution monitor, reduce the size of the viewport, using the `viewport` command:

```
viewport (left, right, bottom, top)
```

To map the graphics output to the entire screen, specify the exact available pixel range:

*NTSC monitor:*

```
viewport (0, 635, 0, 484)
```

*PAL (European video standard) monitor:*

```
viewport (0, 779, 0, 574)
```

The `ortho` commands control the mapping of graphics coordinates to screen coordinates. Used with the `viewport` command, the `ortho2` command lets you program in screen coordinates on low-resolution monitors. To establish a one-to-one mapping of graphics coordinates to screen coordinates, use parallel ranges in the two commands:

*NTSC monitor:*

```
ortho2 (-0.5, 635.5, -0.5, 484.5)
```

*PAL monitor:*

```
ortho2 (-0.5, 779.5, -0.5, 574.5)
```

If the graphics programs are run on a low-resolution monitor with the default viewport specifications, only the lower left portion of the image will be visible on the screen. UNIX does not work in NTSC or PAL mode because it requires more pixel area. To run UNIX, switch to a high-resolution monitor with `setmonitor`.

If you design a program to run on both high-resolution and low-resolution monitors, keep in mind that fonts have a fixed pixel width. This means that text on one monitor will not look the same on another monitor.

## 9. Demonstration Programs and Gifts

The IRIS workstation is shipped with a set of demonstration programs, programming examples, and other miscellaneous tools. This chapter tells how to operate the demonstration programs. The demonstration programs that run under the window manager are described in detail in Section 9.1.3.

### 9.1 Demonstration Programs

You can run demonstration programs any time after the system is booted. They are located in the directories */usr/people/demos* and */usr/people/mexdemos*. The directory *mexdemos* contains demonstration programs that run with the window manager; the programs in *demos* do not work correctly if the window manager is running.

#### 9.1.1 Running Demonstration Programs

To run demonstration programs outside the window manager, follow these steps:

1. Boot the workstation into multi-user mode (see Chapter 3, Booting the IRIS).
2. Log in as *demos*.

```
IRIS login: demos
```

3. Do not issue the *startup* command, as this invokes the window manager.

4. Display a listing of the available programs with the *ls* command:

```
ls
```

5. Enter the name of the program you want to run. For example, to run the flight simulator, enter the word *flight*, followed by RETURN.

```
flight
```

To run demonstration programs under the window manager, follow these steps:

1. Boot the workstation into multi-user mode.
2. Log in as *mexdemos*.

```
IRIS login: mexdemos
```

3. To invoke the window manager, issue this command:

```
startup
```

The textport is labeled with a banner, which indicates it is the console window.

4. Display a listing of the available programs with the *ls* command:

```
ls
```

5. Enter the name of the program you want to run. For example, to use the *arch* demonstration program, enter the word *arch*, followed by RETURN.

```
arch
```



Some of the demonstration programs exit automatically when they finish running. To exit the open-ended demonstration programs or to interrupt a program, press `[ESC]`. If this doesn't work, follow these steps:

1. Move the cursor outside of all windows, that is, over the background area of the screen.
2. Press and hold the right mouse button. The *mex* menu appears.
3. Move the cursor over the *attach* entry, and release the button.
4. Move the cursor over the window you want to exit.
5. Press and hold the right mouse button. The window menu appears.
6. Move the cursor over the *kill* entry, and release the button. The confirmation menu appears.
7. Move the cursor over the *Do it. I'm sure* entry, and press and release the button.

To clear the screen of graphics "leftovers" if you are not running the window manager demonstrations, issue the command `gclear(1G)`.

More information on the demonstration programs is included in Section 1 of the *UNIX Programmer's Manual, Volume 1A*. Manual pages for the window manager commands are labeled 1W; other demos are labeled 1D.

### 9.1.2 Using the Mouse with the Window Manager

The mouse has three buttons: the left, middle, and right mouse buttons. Almost all the window manager functions can be controlled by the mouse *x-y* valuator and the right mouse button.

Before continuing, make sure you understand how to use the mouse to communicate with windows. See the *IRIS User's Guide*, or *Getting Started with Your IRIS Workstation*.

### 9.1.3 Window Manager Demonstration Programs

The demonstration programs described in this section fall into three main groups:

- *2D* demonstration programs illustrate how the window manager works and provide instruction on the color-handling capabilities of the IRIS.
- *3D object manipulation* demonstration programs include *arch*, *flow*, *heme*, *jet*, and *shuttle*. These programs move 3D objects around. The IRIS can perform simultaneous manipulation of different 3D objects in independent windows.
- *Shaded object* and *curved surface* demonstration programs illustrate shading and surface treatment on the IRIS.

Window manager demonstration programs require a large number of bitplanes. *flow* requires 12; *arch*, *heme*, *jet*, *shuttle*, and surface editors require 24; *zshade* requires 32.

### 2D Window Manager Demonstration Programs

A set of 2D programs is included in the collection of demonstration programs. These tools include the following programs: *bckgrnd*, *showmap*, *demomakemap*, *showramp*, *gamma*, *cedit*, *interp*, and *mag*. These tools fall into three categories: backgrounds, color manipulation programs, and pixel access programs. To start any of these tools, type the name of the tool in the console window.

#### *Backgrounds*

*bckgrnd* is a non-interactive, textured wallpaper with art deco designs. A particular background fills all available space that is not covered with another window.

### *Color Manipulation Programs*

*showmap* is a window filled with up to 1024 little squares. It displays the current colors in the color map, counting from color 0 at the lower left corner up to the largest color index at the top right. (For more information on color maps, see the *IRIS User's Guide* and the *makemap* (1W) command in the *UNIX Programmer's Manual, Volume IA.*)

*demomakemap* makes and remakes the color map for the demonstration programs. Before you execute other graphics programs, run *demomakemap* to build the default color map for the demonstration package. To see the effect of changing the color map using *demomakemap*, run *showmap* in a separate window. (At any time during the demonstration session, you can restore the original color map with *demomakemap*.)

*demomakemap* also works with the *gamma* program. *demomakemap* reads the value from the file *.gamma* in your home directory and uses it to calculate its shade scales (see below).

*showramp* is a window with three Gouraud-shaded rectangles. The rectangles are colored smoothly using physical, chromatical adjacent color indices that form a color ramp in the color map.

*gamma* uses a technique called gamma-correction to change the smoothness of the transitions between the color intensities in a color map. The physical characteristics of the CRT phosphor, the ambient lighting, and the vision and preference of the viewer affect the perception of the color map. A strictly linear color ramp often appears too dark, especially towards the middle of the ramp. *gamma* allows the increments from color to color to be exponential, and thus, the middle of the color ramp can be brighter or darker than in a linear color ramp.

*gamma* accepts a single floating-point argument. A value of 1.0 creates a strictly linear color ramp. Values above 1.0 increase the brightness in the middle of a color ramp; values below 1.0 decrease the brightness. Values between 1.0 and 3.0 are typical.

*gamma* does not immediately affect the color map. It stores its argument in a file called *.gamma* in your home directory. When a program such as *demomakemap* makes a color ramp, this file is referenced for a value for *gamma*. The *gamma* program itself does not open a window.

To run the programs described above, follow these steps:

1. Bring up the windows *showmap* and *showramp*.
2. Set the *gamma* correction value and use it to change the color map:

```
gamma 0.5
demomakemap
```

Wait a moment for the colors to change. Observe the effects on the object and the brightness and smoothness of the color ramps in the *showmap* and *showramp* windows. (*demomakemap* does not open a window.)

3. Repeat the experiment with a different *gamma* value:

```
gamma 3.0
demomakemap
```

Remember that the value you select for *gamma* is saved until you change it.

*cedit* is an interactive color editor in a graphics window. To use *cedit*, follow these steps:

1. Bring up the *cedit* window and select it for input.
2. Move the cursor to a pixel outside the *cedit* window itself, to select a color index for editing.
3. To choose the color index of the pixel, press the left mouse button and release it.

*cedit* paints the selected color index on the sample chip on the right of the *cedit* window, and sets the color sliders to the red, green, and blue values of that color.

4. To change the intensity of the color value of the sample chip, press the left mouse button while the cursor is located on one of the three color sliders, and move the sliders up and down.

Try picking a color from *showmap* and editing it with *cedit*.

*interp* displays and changes a region of the color map. Use *interp* to make color ramps for depth-cued or smooth-shaded objects. *interp* makes a color ramp of any size between any two color indices, interpolating the red, green and blue intensities of all indices between the two prescribed extremes. Two squares show the extreme colors of a color ramp and a long rectangle shows the intermediate color range.

To use *interp*, *showmap*, and *cedit* to create a user-defined color ramp, follow these steps:

1. Attach to the *cedit* window. Use *cedit* to edit any two color indices displayed by *showmap*.
2. Detach from *cedit* and attach to *interp*. Point to one of the extreme colors from *showmap* that you have edited and press the left mouse button.
3. Point to the other extreme color and again press the left mouse button. The colors appear as two large squares in the *interp* window. (If you make a mistake while choosing extreme colors, for example, the cursor is over an incorrect color index, then continue picking colors with the left mouse button until both extreme colors are visible in the *interp* window.)
4. Press the middle mouse button; the system interpolates between the colors you have chosen and places the new values into the color map.

### *Pixel Access Program*

*mag* is an interactive program that magnifies or enlarges a pixel region on the screen. To use *mag*, follow these steps:

1. Attach to the *mag* window.

2. Place the cursor on some image on the screen, then press and release the left mouse button. A magnified image of the area around the cursor fills the *mag* window. Pressing the middle mouse button toggles the outlining of the magnified pixels.

### 3D Object Manipulation Demonstration Programs

This section describes the fast 3D demonstration programs. They illustrate 3D transformations, polygon fill, depth-cueing, hidden surface removal, and overlapping windows. These demonstration programs are double-buffered for smooth motion.

#### *arch, flow, heme, jet and shuttle*

*arch* is a simulated architectural model in which the eye perceives a 3D environment. One building (the white one) is always displayed. Several other buildings can be displayed in wire frame or as solid objects.

Once you select a window for input, you interact with the program through both the keyboard and the mouse. Each mouse button or combination of mouse buttons causes a different motion of the eye within the environment. The **[F]** key toggles the other buildings; **[S]** toggles the polygon fill on the buildings. The **[M]** key starts a constant motion that continues even after the window is no longer selected for input (detached).

*flow* is an array of nearly 20,000 data points in a frame. The data was calculated at NASA-Ames Research Center on the Illiac-IV computer. *flow* presents some solutions to the Navier-Stokes equations for flow in a turbulent fluid. The left mouse button controls viewer altitude and azimuth. The middle mouse button controls distance and twist (rotation on the z-axis). The right mouse button starts a sequence of small rotations. The sequence continues even if the window is detached.

*heme* is a depth-cued molecular model made up of 1022 points and 549 vectors. It is controlled by a pop-up menu. To see the menu, hold down the middle mouse button. To select or de-select an entry, position the cursor on the entry and press and release the left mouse button. Two menus appear. The left column of menu entries independently turns off and on each of the five parts of the molecule. The right column of menu entries controls the

transformations of the molecule. The menu entries in the right column are graphical icons.

Pressing the left mouse button changes the color of a menu entry and starts that motion. Pressing the left mouse button again restores the initial state. Simultaneously specified opposite motions cancel each other out, leaving no motion in the specified direction. The **[ENTER]** or **[M]** key causes current motion to continue even after the program's window is detached.

The bungalow icon (shaped like a house) resets the program back to the center of the window (especially helpful if the molecule has been dragged out of sight). The stop sign icon exits the program and cancels the window.

*jet* is a wire frame model of a fighter plane. The image includes 660 vectors and can be displayed with constant intensity or depth-cueing. Pressing one of the three mouse buttons enables rotation about one of the three axes. The amount of rotation is determined by the left-to-right motion of the mouse. Other combinations of mouse buttons allow *x-y* translation controlled by the mouse and scaling at fixed positive and negative rates. The **[ENTER]** button enables and disables depth-cueing. Press the **[M]** key to start or stop a continuous motion that continues after the window is detached.

The commands to manipulate the *shuttle* and control depth-cueing are the same as those for *jet*. Any alphanumeric key starts or stops the doors flopping open and closed. The motion does not continue after the program is detached.

## Shaded Object and Curved Surface Demonstration Programs

The IRIS uses special microcode and hardware to draw Gouraud-shaded, z-buffered images rapidly. The Geometry Engines provide the capability to manipulate splines in real-time. The surface design and rendering demonstration package shows off these features. It allows you to modify the basis points that determine a curved, wire frame surface in one window and pass them to another window that displays a smooth-shaded, z-buffered rendering of the surface. The package consists of two programs: a surface editor and a rendering program.

### *Surface Editor*

Start the surface editor window by using any of these commands: *surfcar*, *surfegg*, *surfabstract*, or *surfjet*. Any of these commands runs the same program with different sets of basis points. Before you can interact with the surface editor, select the window for input.

The surface editor has two parts. The upper part of the display is the wire frame surface and the control points that define it. The bottom of the window is a menu of seven screen iconic buttons.

The simplest use of the surface editor lets you edit the displayed surface by manipulating its basis points. Follow these steps:

1. Move the cursor (now shaped like the mouse) clear of the window.
2. Press the mouse buttons one at a time and observe the glyphs. The left mouse button gives a stylized arrow in the  $x$  direction, the middle mouse button gives one in the  $y$  direction, and the right mouse button gives one in the  $z$  direction.
3. Move the cursor into the top half of the display. Pick a basis point with the mouse, select a direction to move it, press the corresponding mouse button, and move the mouse from left to right to move the point. As the basis point moves, the portion of the surface directly affected by the point is modified in real-time.
4. Now look at the menu which is lower in the display. The leftmost two screen buttons are for viewing the surface. The rightmost five screen buttons are for editing the surface. The leftmost screen button, the one showing three mutually perpendicular axes, is for rotating the surface 90 degrees around a particular axis. Move the cursor over the leftmost screen button and press and release the left mouse button. The surface rotates 90 degrees around the  $x$ -axis.
5. Press the middle mouse button while the cursor is over the same button. The surface rotates around the  $y$ -axis.



6. Press the right mouse button for the same motion around the z-axis. Do not try to start a second rotation until the first one is complete and the hourglass cursor has been replaced by the arrow.
7. Now select the second screen button, the bloodshot eye. Press and release the left mouse button. Mouse motions now rotate the surface. Press the right mouse button to exit this mode and return the surface to its original spot.
8. Pick the eye icon button again and press and release the right mouse button. Now the surface, along with the array of index planes, rotates as guided by the mouse. The right mouse button gets you out of the rotate mode and leaves the display at its new position.
9. Use the third and fourth buttons (counting from left to right) to further subdivide the basis points comprising the surface, so that there are twice as many basis points as before. More basis points allow for more precise editing of the surface, but also increase the complexity of the model and therefore slow it down.
10. Use the two rightmost screen buttons to make more modifications to the surface. The fifth screen button is unused. Each of the two rightmost buttons, the cubes with slices down the middle, selects a plane of symmetry (in a different axis) across the surface. When you choose a plane (by pressing a mouse button as the cursor lies over one of the iconic buttons), half of the wire frame surface becomes invisible. After you choose a plane of symmetry, any change to a basis point on the visible side is also made to a corresponding point on the invisible side.

To make both sides visible again, move the cursor over the button corresponding to the present axis of symmetry and press a mouse button.

### *Rendering Program*

After you have manipulated the basis points of an object as outlined above, follow the steps below to render the surface as a Gouraud-shaded, z-buffered image in another window.

1. Move the cursor over the second menu button, the bloodshot eye. Press and release the right mouse button. Previously, you used this mode to rotate the surface and the index planes with the mouse.
2. Press and release the left mouse button. The cursor changes shape to prompt you to anchor this newly created window to the screen.

A wire frame outlining the basis points appears. The database of basis points is sent to the new window. The surface is subdivided into small quadrilaterals and an illumination model is calculated. The surface is displayed as an array of dots.

3. Detach from the surface editor window and select the rendering window for input. Rotate the object by pressing the mouse button corresponding to the axis of rotation and moving the mouse from left to right. Because the operation is double-buffered, the motion seems smooth.
4. To switch the display to splines, type **s**. To return to the point array, type **p**. To turn depth-cueing off or on, type **d**. Use **z** to Gouraud-shade the object.

When you switch from the point or spline array to the shaded picture, the system switches itself from double to single buffering to accommodate z-buffering. Z-buffering is used for general-purpose hidden-surface removal.

5. Type **c** to select a new color ramp to smooth shade all objects on the screen. Another way to change the surface color is to bring up the *cedit*, *showmap* and *interp* graphics windows and use them to alter the color ramp that shades the surface.

You can also execute the rendering program directly without going through the surface editor stage to modify the database. To do this, type: *zshadecar*, *zshadeegg*, *zshadeabstract* or *zshadejet*.

**NOTES:** Hardware z-buffering is only available on machines with at least 32 bits of image memory per pixel. Do not try to use the rendering window without a 32 bitplane system.

If a double-buffered program not set up to work with the rendering demonstration programs is currently open, the rendering program does not shade the object. It prints a warning message in the console window. Kill the outstanding double-buffer windows and try again to shade the object.

## 9.2 Gifts

The contents of the directory */usr/people/gifts* varies with the current software release. Gifts are provided as interesting and possibly useful examples, but they are not supported and are often not documented.

At the time of this printing, */usr/people/gifts* contained programming examples, window manager demonstration programs, and sample image files. For more information on the window manager programs, see Appendix E, Window Manager Programs, in the *IRIS User's Guide*. Some of the window manager tools are also documented in the *UNIX Programmer's Manual, Volume 1A*. Manual pages for window manager commands are labeled 1W.

To determine what is currently available in */usr/people/gifts*:

1. Change your working directory to the directory containing the programs:

```
cd /usr/people/gifts
```

2. Display a listing of the directories contained in this directory:

```
ls
```

## **Appendix A: IRIS Specifications**

The standard configuration for IRIS series 3000 systems includes these components:

- Electronics cabinet with one disk drive
- Fifteen-inch or nineteen-inch tilt-and-swivel 60-Hz non-interlaced monitor
- Keyboard with right-hand and left-hand connectors for the mouse
- Optical mouse with grid pad
- Ethernet transceiver

The size specifications for each of these components is listed in Table A-1.

IRIS series 3000 systems can also be ordered with these hardware options:

- Dial and button box
- Digitizer tablet
- Nineteen-inch 33-Hz interlaced monitor
- 8-port RS-232 controller
- Tektronix 4692 Color Plotter
- Support for Mitsubishi G500 Color Printer/Plotter
- Support for Versatec ECP42 Color Plotter
- Seiko CH-5300 Color Printer
- Software support for laser printer

- Half-inch tape drive
- Quarter-inch cartridge tape drive
- Stereo optic viewer cable
- Light pen
- Floppy disk (standard on IRIS 3010 or 3110)
- Additional hard disk
- Controller and cables for external hard disk (IRIS 3020, 3120, 3120B, 3030, 3130)

Early IRIS series 2000 models with the Turbo upgrade may not have the same standard peripherals described here. The 60-Hz monitor may be different from the one described in this guide. The mouse may be mechanical rather than optical. The early IRIS 2400 Turbo system required a separate junction box. For a description of these features, see the *IRIS Workstation Guide Series 2000, Version 1.0*.

See Chapter 7, *Optional Peripherals*, for more information on optional peripherals.

| <b>Component</b> | <b>Height</b> | <b>Width</b> | <b>Depth</b> |
|------------------|---------------|--------------|--------------|
| Cabinet          | 30.0"         | 18.0"        | 27.0"        |
| 15" Monitor      | 14.2"         | 14.4"        | 15.9"        |
| 19" Monitor      | 21.9"         | 19.9"        | 21.3"        |
| Keyboard         | 1.5"          | 19.0"        | 8.5"         |
| Mouse            | 1.0"          | 2.0"         | 3.0"         |
| Transceiver      | 2.0"          | 7.0"         | 4.0"         |

**Table A-1: IRIS Component Specifications**

## A.1 Cables

The IRIS is supplied with the following cables for connecting components:

- Four bundled, color-coded, coaxial video cables connect the video output of the cabinet to the monitor.
- Two 10-foot, 3-wire, grounded AC power cables provide power for the IRIS monitor and cabinet.

## A.2 Keyboard

The keyboard is an 83-key, up-down encoded keyboard, with right-hand and left-hand connectors for the mouse. The `SET UP` and `NO SCRL` keys have no function. In Tektronix 4010 emulation mode, the keyboard recognizes two additional local keyboard commands: `ESC-P` causes a hardcopy and `ESC-R` does a screen clear.

## A.3 Monitor

The IRIS can drive several types of monitors. See Chapter 8, Video Options, for a discussion of all possible video options. The monitors available from Silicon Graphics are high-resolution 60-Hz non-interlaced or 33-Hz interlaced. A single system can support two video options. The video display configuration for each system is specified when the system is ordered.

### A.3.1 60-Hz Non-interlaced Monitors

The 60-Hz non-interlaced monitors have a monitor control panel on the lower right front. On the back of the monitors are several ports for receiving video signals and a power socket. These monitors are available in two sizes, nineteen-inch and fifteen-inch (see Figures A-1 and A-2).

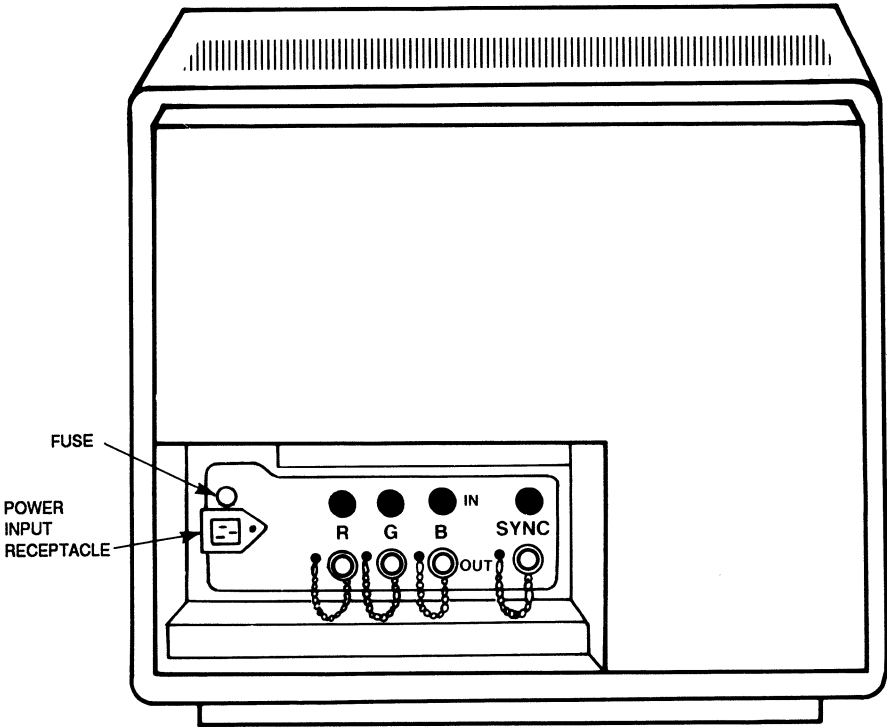


Figure A-1: Monitor Back Panel for Nineteen-inch 60-Hz Monitor

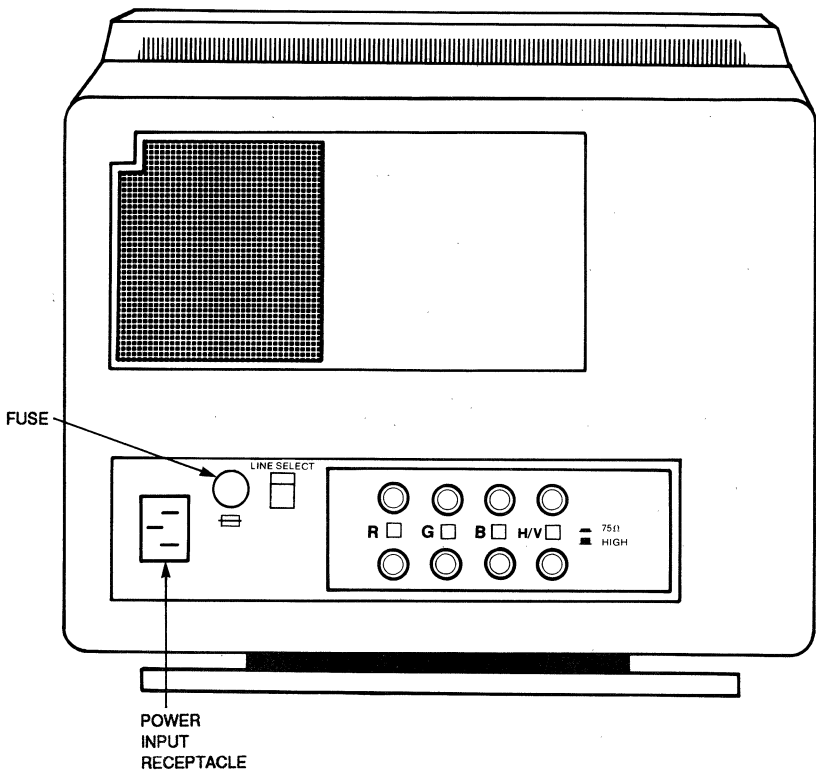


Figure A-2: Monitor Back Panel for Fifteen-inch 60-Hz Monitor



### A.3.2 33-Hz Interlaced Monitor

A 33-Hz interlaced monitor is an optional monitor for the IRIS system. This monitor has a monitor control panel on the right front. On the back of the monitor are several ports for receiving video signals and a power socket (see Figure A-3).

### A.3.3 Monitor Control Panel

The monitor control panel has adjustment controls and a **Power** switch.

#### Nineteen-inch Monitor (60-Hz Non-interlaced)

The control panel on this monitor is shown in Figure 2-7.

- The button labeled **Brightness** adjusts the DC levels of the red, green, and blue signals equally. Turning this button clockwise increases the monitor's brightness. You can push the button into the monitor once the brightness is adjusted.
- The button labeled **Contrast** adjusts the AC gain levels of the red, green, and blue signals. Turning this dial clockwise increases the monitor's contrast. Once the contrast is adjusted, you can push the button in so that it is flush with the surface of the monitor.
- The button labeled **Degauss** demagnetizes the monitor screen.
- The rocker switch labeled **Power** controls power to the monitor.
- The power light indicates that the monitor power is on.

#### Fifteen-inch Monitor (60-Hz Non-interlaced)

The control panel on this monitor is shown in Figure 2-8.

- The recessed dial labeled **Brightness** adjusts the DC levels of the red, green, and blue signals equally. Turning this knob clockwise increases the monitor's brightness.

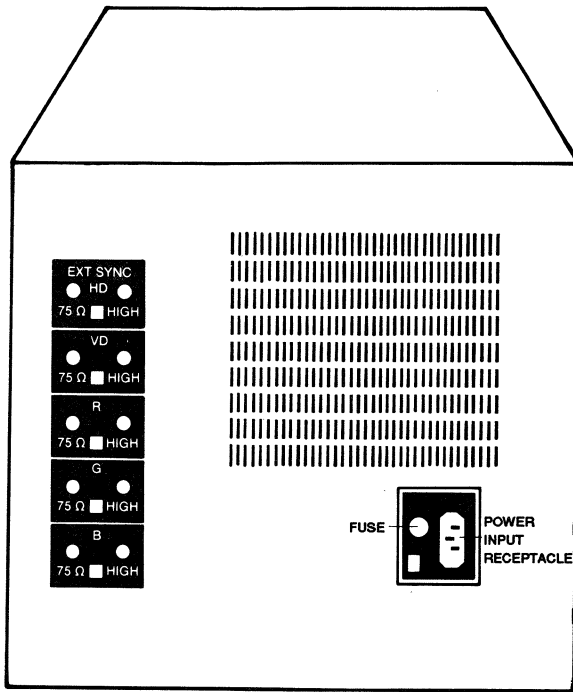


Figure A-3: Monitor Back Panel for 33-Hz Monitor

- The recessed dial labeled **Contrast** adjusts the AC gain levels of the red, green, and blue signals. Turning this dial clockwise increases the monitor's contrast.
- The button labeled **Degauss** demagnetizes the monitor screen.
- The button labeled **Power** controls power to the monitor.
- The power light indicates that the monitor power is on.

### 33-Hz Interlaced Monitor

The control panel on the 33-Hz interlaced monitor is shown in Figure 2-9.

- The knob labeled **Brightness** adjusts the DC levels of the red, green, and blue signals equally. Turning this knob clockwise increases the monitor's brightness.
- The knob labeled **Contrast** adjusts the AC gain levels of the red, green, and blue signals. Turning this knob clockwise increases the monitor's contrast.
- The button labeled **Degauss** demagnetizes the monitor screen.
- The switch labeled **Power** controls power to the monitor.
- The light labeled **Health** lights when power to the monitor is switched on.

#### A.3.4 Monitor Back Panel

The monitor back panel has several connectors for the cables that connect the monitor to the cabinet (see Figures A-1, A-2, and A-3).

### Nineteen-inch Monitor (60-Hz Interlaced)

- Either of the two BNC sockets labeled **Sync** receives the video sync signal from the cabinet.
- Either of the two BNC sockets labeled **R**, **G**, and **B** receives the red, green, or blue video signal from the cabinet.
- The fuse protects the circuit. See the information printed next to the fuse for type and rating requirements. (See Figure A-1.)
- The power selector switch selects the power voltage.
- The power input receptacle attaches to the power cable. See the information printed next to the receptacle for power requirements. (See Figure A-1.)
- The four 75  $\Omega$  terminators attached to the monitor by chains control the impedance of the video signals. When a single monitor is used, the terminators plug into the unused BNC sockets. When more than one monitor is used in a daisy-chain, the terminators are removed from the sockets on all but the last monitor.

### Fifteen-inch Monitor (60-Hz Non-interlaced)

- Either of the two BNC sockets labeled **Sync** receives the video sync signal from the cabinet.
- Either of the two BNC sockets labeled **R**, **G**, and **B** receives the red, green, or blue video signal from the cabinet.
- The fuse protects the circuit. See the information printed next to the fuse for type and rating requirements. (See Figure A-2.)
- The power selector switch selects the power voltage. See the information printed on the switch for power requirements. (See Figure A-2.)
- The power receptacle attaches to the power cable.

- The four impedance switches control the impedance of the video signals. When the switch is **In**, it is in the **75 Ω** position. When the switch is **Out**, it is in the **HIGH** position.

### **33-Hz Interlaced Monitor**

- Either of the two BNC sockets labeled **Ext Sync** receives the video sync signal from the cabinet.
- The two BNC sockets labeled **V D** are not used.
- Either of the two BNC sockets labeled **R**, **G**, and **B** receives the red, green, or blue video signal from the cabinet.
- The circuit protector is either a 5-amp fuse (100-125 VAC) or a 2-amp fuse (200-240 VAC).
- The 120/240 volt power receptacle connects to the power cable.
- The 25-pin plug connects the control cable from the cabinet to the monitor.
- The four impedance switches control the impedance of the video signals.

## **A.4 IRIS Electronics Cabinet**

There are three panels on the back of the IRIS cabinet: a standard I/O panel, an auxiliary I/O panel, and a power panel (see Figure A-4). On the front of the IRIS is a cartridge tape drive (optional) and a **Power** switch that controls power for the IRIS system.

### **A.4.1 Power Switch**

The **Power** switch for the IRIS is located on the front upper left corner of the cabinet. This switch controls power for the cabinet.

## A.4.2 Optional Tape Drives

Both a 60 Mb quarter-inch cartridge tape drive and a half-inch tape drive are offered as optional components on the IRIS.

### Quarter-inch Cartridge Tape Drive

The cartridge tape drive is located on the front upper left of the cabinet. See Chapter 7 for information on using the tape drive.

### Half-inch Tape Drive

The half-inch tape drive is housed in an enclosure that is separate from the electronics cabinet.

## A.4.3 Standard I/O Panel

The standard I/O panel is located on the upper right rear of the cabinet (see Figure A-4). This panel has ports for connecting the monitor, a network drop cable, a floppy disk drive, and various RS-232 devices.

- The RS-232 connector labeled **Port 1** attaches to the keyboard.
- The RS-232 connectors labeled **Port 2**, **Port 3**, and **Port 4** are available for RS-232 or RS-423 serial lines.

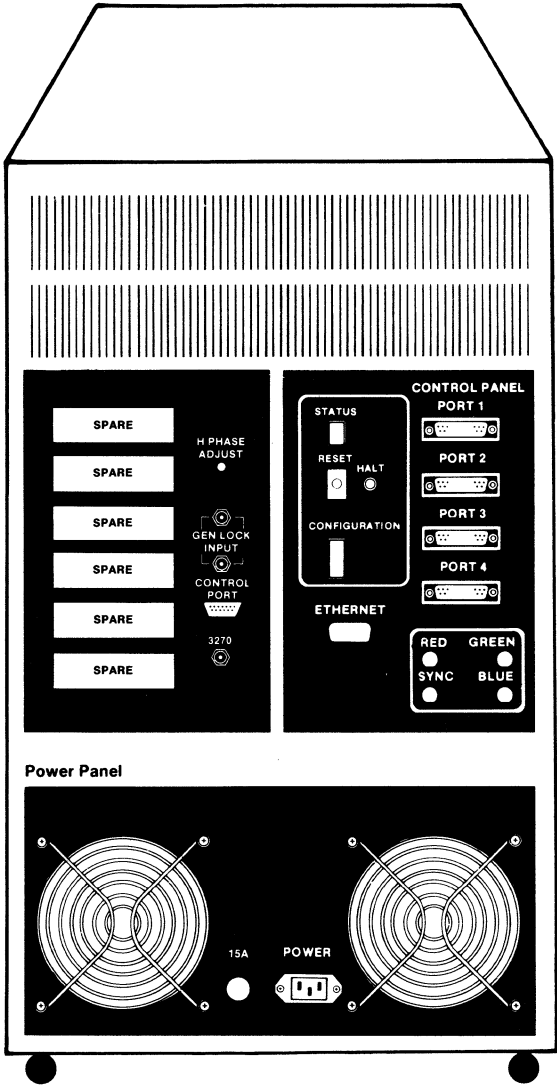


Figure A-4: IRIS Cabinet Back Panel

- The 15-pin D socket labeled **Ethernet** connects the IRIS to an Ethernet drop cable.
- The BNC socket labeled **Sync** provides the video sync signal for the monitor.
- The three BNC sockets labeled **Red**, **Green**, and **Blue** provide the red, green, and blue video signals for the monitor.
- The **Reset** button resets the processor, which in turn resets the rest of the system. After the **Reset** button has been pressed, the IRIS either reboots automatically or waits for boot instructions.

**CAUTION:** Do not press the **Reset** button while the IRIS is running UNIX. For information on rebooting the system, see Chapter 3, Booting the IRIS. If the IRIS is not running UNIX and is under control of the PROM monitor, then the **Reset** button or the **Power** switch may be used. See the discussion on Crash Recovery in Chapter 4, System Administration.

- The LED labeled **Halt** lights when the processor is in a halt state.
- The alphanumeric diagnostic LED labeled **Status** indicates system status and displays startup diagnostics.
- The 9-element DIP switch labeled **Configuration** controls the IRIS' startup diagnostics, and the boot environment.

#### A.4.4 Cabinet Power Panel

The cabinet power panel has a power inlet receptacle (see Figure A-4).

- The male 3-pin input power receptacle labeled **Power** accepts power for the IRIS system.
- For operation in the US, a 20 amp, 250V, 3AB normal-blow ceramic tube fuse protects the circuit. For European operation, a 6.3 amp, 250V, type T slow-blow fuse protects the circuit.



## **A.5 Site Selection**

Table A-2 contains a list of guidelines for site selection for your IRIS. Although site selection is the customer's responsibility, Silicon Graphics' representatives will provide consulting services upon request.

|                                          |                                                                                                                                                     |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature                              | 50 — 86°F (operating)<br>32 — 122°F (non-operating)                                                                                                 |
| Relative humidity                        | 20 — 80%                                                                                                                                            |
| Minimum clearance                        | 3" all sides                                                                                                                                        |
| Monitor desk space                       |                                                                                                                                                     |
| Nineteen-inch                            | 30" width<br>30" depth                                                                                                                              |
| Fifteen-inch                             | 22" width<br>22" depth                                                                                                                              |
| Cabinet space                            | 24" width<br>33" depth<br>33" height                                                                                                                |
| System power requirement                 | single phase<br>line, neutral, ground                                                                                                               |
| 115 VAC configuration<br>operating range | 93-132 VAC<br>47-63 Hz                                                                                                                              |
| 220 VAC configuration<br>operating range | 186-264 VAC<br>47-63 Hz                                                                                                                             |
| System power consumption                 | Cabinet 1250 VA/1000 W<br>Nineteen-inch 60-Hz Monitor 225 VA/150 W<br>Fifteen-inch Monitor 185 VA/100 W<br>Nineteen-inch 33-Hz Monitor 170 VA/116 W |
| Heat dissipation                         | Cabinet 3412 BTU/hr<br>Nineteen-inch 60-Hz Monitor 512 BTU/hr<br>Fifteen-inch Monitor 341 BTU/hr<br>Nineteen-inch 33-Hz Monitor 395 BTU/hr          |
| Card Slots                               | 20                                                                                                                                                  |

**Table A-2: IRIS Environmental Specifications**

## Appendix B: System Messages

When the UNIX kernel on an IRIS workstation reaches an unrecoverable error condition, it displays an error message preceded by the word `panic:`.

If the error message includes one of the abbreviations listed in Table B-1, the condition is probably caused by a hardware problem. Table B-1 lists the devices associated with each abbreviation. The abbreviated device names are usually followed by a digit indicating a physical unit or letters referencing the function that lead to the problem.

| Abbreviation | Device                                            |
|--------------|---------------------------------------------------|
| si           | IRIS 3030, 3120B, 3130 hard disk drive            |
| md           | IRIS 3010, 3020, 3110, 3115, 3120 hard disk drive |
| mt           | tape drive (any type)                             |
| qic          | quarter-inch cartridge tape                       |
| mf           | floppy disk drive                                 |
| dsd          | tape, small disk, and floppy disk controller      |
| nx           | Ethernet                                          |

Table B-1: Device Abbreviations

If the panic message does not indicate one of the devices listed in Table B-1, there may be a hardware problem with another part of the system (processor board, memory board, or backplane, for example) or a software problem in the kernel.

Anytime you get a panic message, try to run *sync* and reboot (see Section 3.1, Workstation Booting Instructions, or Section 3.2, Terminal Booting Instructions). Run *fsck* to check the file system. If the message reappears, call the Geometry Hotline (see Chapter 1, Introduction).

## B.1 Hardware Error Messages

The following sections describe hardware error messages.

### B.1.1 General Hardware Error Messages

- `IO err in swap`

While swapping a user process, a hard error occurred on the swap disk.

- `parity error`

A parity error occurred in the system memory. Another message preceding this error message indicates where in physical memory the error occurred. UNIX cannot diagnose the memory failure.

- `iinit`

The system was unable to read the root file system. Either the disk drive or the root file system is damaged.

## B.1.2 Disk Controller Messages

### IRIS 3010, 3020, 3110, 3115, 3120 Disk Controller Messages

- A. The following messages result from a bad disk controller.
- `md[0-1][a-h]: couldn't start!`
  - `dsd: zero status on command`
  - `dsd: ccb timeout, "command" dev=0 unit=[0-1]`
  - `dsd: ccb timeout during init`
  - `dsd: cib timeout, "command" dev=0 unit=[0-1]`
- B. This message indicates that no label is installed on the disk.
- `(***No label***)`
- C. The following error probably results from a bad connection from the disk to the controller, a bad disk, or hard disk errors encountered when one reads or writes to the disk.
- `dsd0: hard error, "command" dev=0 unit=[0-1]`

### IRIS 3030, 3120B, 3130 Disk Controller Messages

- A. The following message indicates that no label is installed on the disk.
- `(***No label***)`
- B. The following messages indicate that a hard disk error has occurred and recovery may not be possible.
- `"Read" or "Write" on si[0-4], slice [a-h]`
  - `siintr: sitab.b_active == 0`
  - `siintr hard error NN: "error" block: NN cmd: command`

- C. The following messages occur in non-interrupt mode and could mean a faulty controller, a bad set of disk cables, or incorrect jumpering of the controller.
- sicmd: timeout wait for status
  - sicmd: timeout waiting for cmd "command" to complete
  - sicmd: status error: "error"
  - sicmd: error stat "status" err "error"  
iostat "iostat"
- D. The following error indicates a recoverable problem with the disk. This message may appear when there is a bad track on the disk. If this message appears repeatedly, contact Customer Service through the Geometry Hotline (see Chapter 1).
- soft error "error" on block NN

### B.1.3 Tape Drive Messages

- A. The following are general messages for the tape drive.
- qic0: no cartridge in drive  
The cartridge isn't inserted properly.
  - qic0: unit not ready
  - qic0: write protected  
The dial on the cartridge needs to be twisted to enable writing on the tape.
- B. The following error message indicates that the tape drive has no power or that the control cable for the tape drive is disconnected or reversed.
- qic0: can't get status during init

- C. The following error messages indicate that there is a problem with the tape drive that inhibits its operation. The operation using the tape drive must be restarted.

- qic0: couldn't start
- qic0: hard error during "Read or Write"  
status= XX
- qic0: "command" failed

### B.1.4 Floppy Controller Messages

- A. The following are general messages.

- mf0: write protected
- mf0: disk formatted
- Reading on mf0
- Writing on mf0

- B. The following message indicates a problem with the floppy disk controller.

- mf0a:hard error,cmd='command',error='error'

## B.2 System Software Messages

The following error messages are system software messages.

- A. The following error messages indicate a problem with the Ethernet hardware or software.

- nxpresent cleared
- xns\_ttstart

- B. The following message occurs while the system is booting. This message indicates that the system attempted to configure a disk drive with no entry in the *bdevsw[]* array (the array of block devices). The system was incorrectly configured.
- getmajor
- C. The following messages indicate that there is a problem with the buffer cache/inode tables.
- devtab
  - no fs
  - no imt
- D. The following message indicates that the *init* process was killed. If the process was killed through a user program or the shell *kill* command, then this message may not reflect a problem. If the *init* process was killed during the boot procedure, then this message indicates a problem with the root file system.
- init died!
- E. The following message occurs when the system attempts to put a time-driven event on its queue, and there is no room remaining. If this occurs frequently, then the system has been incorrectly configured.
- timeout table overflow.
- F. The following messages indicate problems with the kernel.
- trap
  - kernel address error
  - kernel bus error
  - ksyscall



- G. The following messages are related to graphics consistency checks.
- duplicate gr\_getshmem
  - gr\_unlockmem
- H. The following messages indicate problems occurring while trying to swap some portion of a user process to disk.
- IO err in push
  - hard IO err in swap
- I. The following message occurs during the autoconfiguration process if no disk was found that supports a swap area.
- no swap device.
- J. The following message indicates that all available swap space has been used.
- swkill.
- K. Error messages not listed above are related to internal kernel consistency checks.

## Appendix C: IRIS Serial Ports and Cabling

This appendix outlines the serial support on series 2000 Turbo and series 3000 workstations.

### C.1 Defining the Serial Interface

The IRIS workstation provides an RS-232 serial interface that drives between +4.4 and -4.4 Vdc. All RS-232 cables that you connect to the IRIS should be shielded. The IRIS easily drives and receives signals on a 50-foot cable, and it typically drives and receives signals on an RS-232 cable up to 200 feet long.

There are two types of serial interface equipment: *Data Terminal Equipment (DTE)* and *Data Communications Equipment (DCE)*. The primary difference between DTE and DCE is the designation of several pins on the connector. For example, DTEs transmit on pin 2 and receive on pin 3. DCEs transmit on pin 3 and receive on pin 2. You can connect a DTE interface directly to a DCE interface.

To connect either a DCE to a DCE, or a DTE to a DTE, use a null modem cable. A null modem cable has the wires to pins 2 and 3 swapped in one connector, and may have other swapped wires as well. A signal on pin 2 at one end appears on pin 3 at the other end, and vice versa.

The IRIS workstation serial ports are all configured as DTE. Most terminals are also configured as DTE. Therefore, to connect a terminal to the workstation, use a cable that has pins 2 and 3 swapped in one connector. To connect a modem to the workstation, use a cable that connects each pin of the IRIS serial port to the corresponding pin of the modem. No signals need to be swapped. Connect other peripheral devices according to the configuration data provided with the device.

Silicon Graphics provides three kinds of special files, which determine which driver is used on each port. The special files *ttyd1*, *ttyd2*, and *ttyd3* are used for devices such as terminals; the files *ttym1*, *ttym2*, and *ttym3* are used for modems; and *ttyf2* and *ttyf3* are used for flow control to devices that understand hardware flow control.

Table C-1 shows the signals the IRIS supports on each port.

| Port | Pin Number | Abbreviation | Signal              |
|------|------------|--------------|---------------------|
| 2    | 2          | TD           | Transmit Data       |
|      | 3          | RD           | Receive Data        |
|      | 8          | DCD          | Data Carrier Detect |
|      | 20         | DTR          | Data Terminal Ready |
| 3, 4 | 2          | TD           | Transmit Data       |
|      | 3          | RD           | Receive Data        |
|      | 4          | RTS          | Request To Send     |
|      | 5          | CTS          | Clear To Send       |
|      | 8          | DCD          | Data Carrier Detect |
|      | 20         | DTR          | Data Terminal Ready |

Table C-1: Signals Supported on IRIS Serial Ports

Table C-2 shows the pins and devices the IRIS supports on each port of the I/O panel.

| Hardware Port | Device       | Pins            |
|---------------|--------------|-----------------|
| 2             | <i>ttyd1</i> | 2,3,7,20        |
| 3             | <i>ttyd2</i> | 2,3,7,20*       |
| 4             | <i>ttyd3</i> | 2,3,7,20*       |
| 2             | <i>ttym1</i> | 2,3,4,7,8,20    |
| 3             | <i>ttym2</i> | 2,3,4*,7,8,20   |
| 4             | <i>ttym3</i> | 2,3,4*,7,8,20   |
| 2             | -            | -               |
| 3             | <i>ttyf2</i> | 2,3,4†,5,7,8,20 |
| 4             | <i>ttyf3</i> | 2,3,4†,5,7,8,20 |

Table C-2: IRIS Series 3000 and 2000 Turbo Device Types and Pins

NOTE: Pin 20 is positive when the device is open.

\*Pin 4 is the same as pin 20 for *ttyd*[2,3] and *ttym*[2,3].

†Pin 4 means "O.K. to send" for *ttyf*[2,3].

Use Port 1 only for the system console.

## C.2 Cabling the Serial Ports

This chapter describes the cables typically used to connect the IRIS to terminals, printers, and modems.

Serial devices are connected through Port 2, Port 3, or Port 4 on the cabinet I/O panel.

The serial ports on the IRIS are designed to connect directly to *Data Communications Equipment* (DCE) devices, such as modems, via a modem cable. Table C-3 shows the pin definitions for the IRIS and for the modem cable. These pin definitions are supported for devices *ttym1*, *ttym2*, or *ttym3*.

| IRIS | Modem | Signals             |
|------|-------|---------------------|
| 1*   | -     | Chassis Ground      |
| 2    | 2     | Transmit Data       |
| 3    | 3     | Receive Data        |
| 4    | 4     | Request To Send     |
| 5    | 5     | Clear To Send       |
| 7    | 7     | Signal Ground       |
| 8    | 8     | Data Carrier Detect |
| 20   | 20    | Data Terminal Ready |

Table C-3: Pin Definitions for a Modem Cable

\*Chassis Ground is connected on one end only.

Connecting the IRIS to *Data Terminal Equipment (DTE)* devices, such as terminals and printers, requires a different cable arrangement, a null modem cable. A null modem cable has the wires for pin 2 and pin 3 swapped in one connector, and may have other wires swapped as well. Table C-4 lists the pin definitions for an example of a null modem cable. Connect the pins that are separated by commas (,) in the 'DTE Device' column. Then connect these pins to the pin shown in the 'IRIS' column.

| IRIS | DTE Device | Signals                                                      |
|------|------------|--------------------------------------------------------------|
| 1    | -          | Chassis Ground                                               |
| 2    | 3          | Transmit Data                                                |
| 3    | 2          | Receive Data                                                 |
| 4    | 5          | Request To Send, Clear To Send                               |
| 5    | 4          | Clear To Send, Request To Send                               |
| 7    | 7          | Signal Ground                                                |
| 8    | 20         | Data Carrier Detect, Data Terminal Ready                     |
| 20   | 6,8*       | Data Terminal Ready,<br>Data Set Ready + Data Carrier Detect |

Table C-4: Pin Definitions for a Null Modem Cable

\*These connections may be necessary on the terminal side.

Most terminals do not require the various handshaking lines such as *Clear To Send* or *Data Set Ready*, and work with a three-wire null modem cable. You need to swap the signals for pins 2 and 3, and you need to connect pin 7 of the IRIS to pin 7 of the terminal. Table C-5 lists the pin definitions for a three-wire null modem cable.

| IRIS | Terminal | Signals       |
|------|----------|---------------|
| 2    | 3        | Transmit data |
| 3    | 2        | Receive data  |
| 7    | 7        | Signal ground |

Table C-5: Sample of a Three-wire Null Modem Cable for Terminals

Table C-6 shows pin signals for the IRIS and printer. Table C-7 shows the pins typically used by printers. Refer to your printer manual for pin specifications for printer cabling, since many printers are different.

| Pin | Abbreviation | Signal                                                                         |
|-----|--------------|--------------------------------------------------------------------------------|
| 1   | PG           | Chassis Ground                                                                 |
| 2   | TD           | Transmit Data                                                                  |
| 3   | RD           | Receive Data                                                                   |
| 4   | RTS          | “I’m caught up” for <i>tyff</i> [2,3]<br>“I’m here” for <i>ttym</i> [2,3]      |
| 5   | CTS          | “O.K. to send”                                                                 |
| 7   | SG           | Signal Ground                                                                  |
| 8   | DCD          | The other end is alive (if it’s not connected, assumes the other end is alive) |
| 20  | DTR          | “I’m here”                                                                     |

Table C-6: Pin Signals for the IRIS and Printer

| Pin            | Signal                         |
|----------------|--------------------------------|
| 2              | Transmit data to printer       |
| 3              | Optional XON/XOFF flow control |
| 4, 6, 8, or 20 | “I'm alive”                    |
| 5, 6, or 20    | “I'm caught up”                |
| 7              | Ground                         |

Table C-7: Pin Signals Typically Used by Printers

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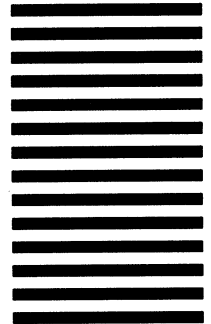
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