CYBER 910-200 Maintenance

An Individualized Course
by
ES Training

Course Number: PI9102X

CONTROL DATA

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CONTENTS

APPENDICES

FIGURES

TABLES

INTRODUCTION

Welcome to PI9102X - 910-200 Maintenance. The Cyber 910-200 provides sophisticated 3-D graphics, video, and audio support at personal computer prices. It is known as the RISC PC that offers the strengths of the UNIX workstation and conveniences of the PC market. This course presents the skills and knowledge required to perform corrective maintenance on the newest member of the Control Data Cyber 910 workstation family. Products covered in this course include: 910B-230, 910B-232, 910M-216, 910D-422, 910P-4BD, and 910P-4CC.

This course combines the best of classroom and individualized courseware. First, it provides you with an actual working Cyber 910-200 for the true one-on-one hands-on experience. Second, the course materials allow you to work at your own pace. The course is divided into two modules. The first module concentrates on the maintenance tools available from power-on until the operating system is loaded and component replacement. The second module covers basic UNIX system administration tasks. The learning activities found in each module are guided labs to aid you in gaining the necessary tasks to perform corrective maintenance. Most activities have self-check questions which will allow you to monitor your progress. The actual time it will take to complete this course will depend on your present 910 and UNIX knowledge. If you are experienced in these areas, it will take you a short time to learn the new 910-200 tasks. If you are new to the 910 and/or UNIX world, you may take as much as two days to complete this course.

One final note, this is your system to use in whatever manner you feel necessary. It is recommended that you complete the activities in each module so none of the new 910-200 features are overlooked. If you want to try additional tasks, feel free to do so. The only thing training administration requires is that you do the last two activities in module 2 before shipping it back. That will set up the unit for the next student.

Appendix A contains information on safety procedures and Appendix B contains information on electrostatic discharge precautions. Read both of these appendices before working on the equipment.

Before you proceed further in this course, read through the following pages of the introduction section. The remaining pages include the Course Chart, the Course Objectives, and a list of all the materials you will be using during this course.

When you finish reading the introduction section, you will be ready to start the course. You can start by working on the learning activities in Module 1 of this manual.

COURSE CHART

MODULE 1
910-200 HARDWARE
ESTIMATED COMPLETION TIME: 7:30

LA	MEDIA	TITLE	TIME	OBJECTIVE
1A	REF/LAB	Setting Up Your 910-200	1:30	1, 2
1B	REF/LAB	PROM Monitor	1:00	3, 4
1C	REF/LAB	Changing Environment Variables	0:45	5
1D	REF/LAB	Boot Commands	1:45	6
1E	REF/LAB	Diagnostic Tests	1:30	7, 8
1F	REF/LAB	Component Replacement	1:00	9, 10, 11

MODULE 2
BASIC SYSTEM ADMINISTRATION
ESTIMATED COMPLETION TIME: 6:30

LA	MEDIA	TITLE	TIME	OBJECTIVE
2A	REF/LAB	Adding Users and Terminals	0:45	12
2B	REF/LAB	Backup, Restore, and More	4:00	13, 14, 15
2C	REF/LAB	Scratch Install	0:45	16, 17
2D	REF/LAB	Final Steps	1:00	18

OBJECTIVES

At the completion of this course you will be able to:

1. Install a 910-200.
2. Startup and shutdown the operating system.
3. Enter PROM Command Monitor.
4. Execute PROM Command Monitor commands.
5. Change bootmode, console and screen color environment variables.
6. Write boot command to load standalone programs from local and remote system disk, CD-ROM, and quarter inch tape.
7. Interrupt the power-on diagnostic error indications.
8. Load and execute ide and confidence tests.
9. Remove and replace all 910-200 FRUs.
10. Recover from a forgotten password.
11. Install memory upgrades.
12. Add users and terminals.
13. Perform any of the following backups: entire, incremental, or directory/file.
14. Add a unit to local network.
15. Recover a crashed system.
16. Format a system disk.
17. Install a basic operating system from scratch.
18. Set date and time using sysadm.

MATERIALS LIST

MATERIALS SUPPLIED BY THE COURSE

The course materials are found in three cases. If you **DID NOT** receive three cases please call Jeanelle Walker at controlnet 235-2620 or 612-235-2620 ASAP.

At this point only the black case or case 1 of 3 should be open. Do not unpack the cases at this time. One of the first steps in learning activity 1-A is to unpack the three cases and verify each item is present.

MATERIALS YOU NEED TO SUPPLY

You need to supply a properly grounded static safe mat. The only handtools needed are a #1 phillip head screwdriver and a one quarter inch nutdriver.

MODULE 1

910-200 HARDWARE

About This Module

So what is this new box from SGI? What have they done to put all that power in such a small box? Is it like the 910-400? Is it just another UNIX box? What about corrective maintenance? How many FRUs are there? Does it have the same diagnostics as other 910 units? What is the CD-ROM used for?

This module attempts to answer these and many other questions you may have concerning the exciting new 910-230 and 910-232. The activities in this module focus on the tasks you perform from power-on until the operating system is functional. Topics covered include: PROM monitor commands, boot commands, diagnostic tests, changing environment variables, and component replacement.

This module consists of six learning activities (LA). They are:

LA 1-A. Reference Reading/Lab: Setting Up Your 910-200
In this learning activity you will unpack, setup and checkout the 910-200 hardware components. Topics included are mouse basics, demos, and shutdown.

LA 1-B. Reference Reading/Lab: PROM Monitor
In this learning activity you will stop the auto boot process and enter PROM Command Monitor, and execute the various Command Monitor Commands.

LA 1-C. Reference Reading/Lab: Changing Environment Variables
In this learning activity you will see the effects of changing the bootmode, console, and color variables.

LA 1-D. Reference Reading/Lab: Boot Commands
In this learning activity you will write boot commands that will load programs from the local tape drive, local CD-ROM, local system disk, remote tape drive, remote CD-ROM, and remote system disk.

LA 1-E. Reference Reading/Lab: Diagnostic Tests
In this learning activity you will learn how to interrupt the power-on diagnostic tests, load and execute ide (integrated diagnostic environment) and select the confidence test.

LA 1-F. Reference Reading/Lab: Component Replacement
In this activity you will remove, then replace the 910-200 FRUs and insert some low-level bugs. An overview of the 910-200 memory and spare parts is also presented.

Learning Activity 1-A. Reference Reading/Lab:
Setting Up Your 910-200

In this learning activity you will setup and checkout your 910-200. You will power-on, boot the operating system, run the famous Demos and shutdown the system. This learning activity also includes two lessons that present the fundamentals of working in the world of visual computing. These lessons give you the basic skills and concepts that will be used during the remaining learning activities of this course.

UNPACK AND INVENTORY

In this section you will unpack (if you have not already done so) the 910-200 and verify that you received all the hardware components and materials required to complete the course. If any of the items listed in steps three and four are missing, call the training administrator as soon as possible. Please notice where each component was packed, it will help when you are ready to return the unit.

1. Remove all components, manuals, tapes, and CD from case 1 of 3 and 2 of 3.

Caution

This monitor weighs over 40 pounds. You should seek assistance when removing it from the shipping container.

2. Remove the monitor from case 3 of 3.

3. Verify the following hardware components were shipped with the 910-200.

___ 910-200
___ Keyboard
___ External Tape Drive
___ Black Power Cables (3 total)
___ Monitor Video Cable
___ Keyboard Cable
___ Jumper Cable
___ Surge Protector
___ CD-ROM Caddy
___ Monitor
___ System Disk
___ CD-ROM Drive
___ Monitor Power Cable (light gray)
___ Mouse
___ Mouse Pad
___ SCSI Cables (2)
___ SIMM Removal Tool
___ Two Static Bags and Wrist Strap

4. Verify you have the following manuals and media.

Manuals
___ Owner's Guide - 007-9065-010
___ WorkSpace User's Guide - 007-1342-010
___ Administration Guide - 007-1366-010
___ Software Installation Guide - 007-1364-010
___ Utilities Guide - 007-1367-010
___ Showcase User's Guide - 007-1303-010
___ Installation Poster - 007-9064-010
___ External SCSI Device Installation Guide - 007-9006-020
___ Cyber 910-200 Technical Report - 62940551

Media
___ Compact Disk containing IRIS Execution Environment 4.1.0
___ Two Installation Tapes labeled as follows:
Execution Environment, 4.0.1
Maintenance, 4.0.1
___ Four Scratch Tapes labeled as follows:
Entire Backup 1 of 2
Entire Backup 2 of 2
Incremental Backup
File Backup

Once again, if you **DO NOT** have all the components listed in steps 3 and 4 call the training administrator immediately.

SETUP

In this section you will put all the pieces together and power on the unit. Since the 910-200 is intended to be installed by the customer, the actual steps are not difficult. The steps to assemble the 910-200 basic parts are found in two places. A large wall size poster illustrates the ten basic steps to unpack and setup the unit. Chapter 2 of the Owner's Guide presents a step-by-step procedure. The steps to attach a quarter inch tape or CD-ROM drive are found in the External SCSI Device Installation Guide. To ensure proper installation follow the order listed below.

1. Using the poster as a guide, install the internal drive, attach the monitor and keyboard cables, and connect the power cords. **DO NOT** power on the unit at this time.

2. The steps found in the External SCSI Device Installation Guide are very wordy and thus become confusing in parts. The basic steps to attach the quarter inch tape and CD-ROM drive are listed below. If you need additional information reference the Owner's Guide.

   - Set the device's SCSI address. For this course the tape will be address 7 and the CD-ROM will be 5. NOTE: On the 910-200, addresses 1, 2, and 3 are reserved for the internal slots. Address 1 is on the bottom and 3 is on the top.

   - Remove the SCSI terminator (metal cap) from the SCSI connector on the rear of the 910-200.

   - Attach one SCSI cable between the CD-ROM drive and the SCSI connector on the 910-200.

   - Attach the second SCSI cable between the CD-ROM drive and the tape drive.

   - Attach the SCSI terminator to the remaining connector on the tape drive. Failure to terminate the SCSI bus can cause bus errors.

3. Check your connections. If everything looks OK, apply power as follows:

   - Power on the external devices (drives) first.

   - Set the monitor power switch to the on (1) position. Since AC power to the monitor is controlled by the workstation power switch, don't expect to see anything at this time.

   - Power on the 910-200 workstation and stand back. Your 910-200 has been shipped to automatically boot the operating system after a power on. **DO NOT** stop this process.

4. The outcome of step 3 will determine your next action.

   - If the login screen appears (a white box with four icons of people sitting at a monitor), go to the next section. (A sample login screen is shown on 2-15 of the Owner's Guide.)

   - If something other than the login screen appears (nothing at all or an error message), recheck your work. If you are unable to get a login screen, call Central Hardware Support.

SYSTEM OVERVIEW

This is good place to stop with the hands-on and find out a little about this box. A good overview and complete list of specifications are found in the Cyber 910-200 Technical Report. This is yours to keep, so put your name on it.

Read section one titled "System Overview" and review the specifications listed in section four. When you have completed reading/reviewing the material proceed to the next section in this learning activity.

WORKSPACE BASICS

The operating system that runs the 910-200 is called IRIX. Users of this system can use either the traditional UNIX commands or the visual world of icons to perform various tasks. The purist likes the command method while the occasional user prefers icons. The method you, as a CE will use, depends on the amount of 910 and/or CD4000 console time you are able to get.

For the 910-200, using the mouse to work with windows, icons, and menus are important skills you need. The Workspace User's Guide (publication number 007-1342-010) contains a two-part tutorial that introduces you to the visual world of computing. How much of these lessons you should complete depends on your previous knowledge. Follow the directions given below for what you believe is your experience level.

New or Not Sure

If you are new to this world or just want to brush-up on the basics, you will find both lessons very interesting. At the **minimum** you should complete Lesson 1 which starts on page 2-2 of the Workspace User's Guide (publication number 007-1342-010). If you feel comfortable with the information found in Lesson 1, proceed to Lesson 2 on page 2-30. The two lessons should take about 30 to 45 minutes to complete. Proceed to the next section of this learning activity when done.

Previous Hands-On

As an experienced "mouser" you will find very little new information in these lessons. You may want to scan the information found in Chapter 2 of the Workspace User's Guide (publication number 007-1342-010). Proceed to the next section of this learning activity when done.

DEMOS

A quick method to verify proper 910-200 operation is to run the Demos. These are programs written by Silicon Graphics to illustrate the various workstation features. As a CE you can use them as a quick check of the graphic section and floating point processor.

Take a few minutes at this time to run some or all of the various demos. The steps listed below are one method to access and execute a demo.

1. If you did not log out in the last section do so at this time.

2. Log in as guest.

3. Select the cube demo as follows:

   - Place the cursor over the word "Demos" in the Toolchest window; press and hold the left mouse button as you drag the cursor to the right. When "GL Demos" is highlighted; release the mouse button.

   A red outline of a window appears.

   - Using the mouse, position the upper left corner of the outline next to the right side of the Toolchest. Press and hold down the left mouse button as you drag the cursor downward. When the the outline reaches the bottom of the screen, release the left mouse button.

   A "Silicon Graphic" button will appear.

   - Position the cursor on the button, then click the left mouse button.

   Four buttons will appear.

   - Position the cursor on the "Find a Specific Demo" button; then click the left mouse button. Type *cube* in the space provided; then press <Enter>. When the "Cube" button appears, position the cursor on the button; then click the left mouse button.

   A red outline of a window will appear.

- Using the mouse, position the upper left corner of the outline just to the right of the Console icon. Press and hold down the left mouse button; then drag the cursor downward. When the outline fills the screen, release the left mouse button.

The Cube should now appear.

- Place the cursor in an empty area of the Cube window. Press and hold down the right mouse button to view the control menu. To select an option, drag the cursor over the option and release the mouse button. At a minimum try the rotate, translate, both, and reset options.

4. You can quit the Cube Demo one of two ways:

   - Position the cursor over the Window menu button (minus sign upper left corner). Press and hold down the left mouse button; then drag the cursor downward. When the word "Quit" is highlighted, release the button. This method works for all demos.

   - Press the right mouse button and select the kill option.

   The "Cube" button should now appear on the screen.

5. To return to the four button screen, position the cursor over the black area; then click the left mouse button.

6. Using the basic procedures listed in steps 3 and 4 execute Insect demo. Try each mouse button to see what happens. If you have time, try some of the other Demos. Flight and Arena may present a challenge.

7. Quit the demo(s) you have open at this time, click on the black area of each window until the "Silicon Graphics" button appears. Position the cursor over the Window menu button (minus sign upper left corner). Press and hold down the left mouse button; then drag the cursor downward. When the word "Quit" is highlighted, release the button.

8. Log out and proceed to the next section of this learning activity.

SYSTEM SHUTDOWN

Before powering-off the 910-200, you need to shutdown the operating system. Shutdown safely closes all of the files and logs you out. If you power off the workstation without shutting it down properly, files may be lost or damaged.

Since it is hard to determine if every user (local or remote) is logged out, it is only polite to inform all users of your intent. It is best to let the System Administrator perform the first shutdown. He/she will know how to determine the active users and then notify them. The "who" command is used to check which users are logged in while the "wall" command is used send a message.

To shutdown the system, you must have System Administrator's privileges, know the System Administrator's password, or have logged in as root or superuser. Without the password you will not be able to shutdown the operating system. For this 910-200 the root password is est200. Please do not change that password.

As would be expected, there is more than one way to shut the system down. This learning activity will demonstrate two methods. Use whichever is comfortable for you.

Toolchest Method

1. If you did not log out in the last section do so at this time.

2. Log in as root. When the password box appears, type the password given above and press <Enter>.

3. Select "System Shutdown" from the System Toolchest.

   - Place the cursor over the word "System" in the Toolchest window; then press and hold down the left mouse button.

   - With the left mouse button still depressed, drag the cursor to the right, then down until "System Shutdown" is highlighted; release the mouse button.

     What appeared on the screen? _____

- Click on the Yes button.

  Another Notifier window appears and in a few seconds a final message appears.

  Record the message here. _____
  _____

- Restart the system.

  What message appeared? _____
  _____

Shell Method

1. Login as root and open a shell window as described in Lesson 1.

2. Position the cursor inside the new window, execute the three commands listed below, and answer the questions found after the commands.

   Type *sync* then press the <Enter> key.
   Type *sync* then press the <Enter> key.
   Type *shutdown* then press the <Enter> key.

   What is the shutdown default time? _____

   How many messages were broadcast? _____

   Did the system shutdown without any further input from you? _____

   Did this method and the Toolchest method produce the same final message? _____

The two sync commands insured the data is returned to the system disk. This may be an overkill, but you will see many old-timers use the commands. The shutdown command starts the operating system shutdown.

Shutdown as Tutor

1. Restart the system one more time.
2. Login as tutor.
3. Attempt to shutdown the system using either method.

   What does the system ask for? _____

   Does the system shutdown if you give it the correct information? _____
4. When the "okay to power off the system now" message appears, power off the 910-200.

SUMMARY

In this learning activity you unpacked and operated the 910-200. By now you should know:

- how to install/setup 910-200
- how to login and logout
- how to shutdown the operating system
- how to select and open icons
- how to move, resize, and close windows
- what a shell window is and to how to open one
- how to execute the Demos

Use the self-check questions found on the next page to check your progress.

SELF-CHECK QUESTIONS

Answer the questions by filling in the blank or circling the correct answer choice. When complete, compare your answers with those found in Appendix C.

1. The system disk is installed in the Bottom slot.

2. The system disk SCSI address jumpers have to be set before the disk is installed.

   True or (False)

3. In the 910-200 the bottom slot is SCSI address 1 while the top slot is address 3.

4. The mouse attaches to a connector located at the rear of the unit.

   True or (False)

5. The SCSI terminator needs to be moved to the last device in SCSI bus.

   (True) or False

6. The external quarter inch tape drive's device address is set by a four position dip switch found on the backpanel.

   True or (False)

7. The external devices are powered on first.

   (True) or False

8. Describe the steps used to login as "tutor".

   _____

   _____

9. List the five buttons found in the Toolchest window.

   _____

   _____

   _____

   _____

   _____

10. To open a folder, move the cursor over the folder icon and _____ the _____ mouse button.

    A. click; left
    B. click; right
    C. double-click; left
    D. double-click; right

11. To close a folder move the cursor over the _____ button and _____ the left mouse button.

    A. Window menu; click
    B. Maximize; click
    C. Window menu; double-click
    D. Maximize; double-click

12. Describe the steps to open a Shell Window.

    _____
    _____
    _____

13. To rotate the Cube, use the left mouse button to select "rotate" from the pop down menu.

    True or False

14. With the cursor inside the Insect demo window what happens when the left or center mouse button was pressed? _____
    _____
    _____

15. What will happen if you are logged in as tutor and attempt to shutdown the system?

    _____
    _____
    _____

Learning Activity 1-B. Reference Reading/Lab: PROM Monitor

This learning activity will introduce you to the PROM monitor program. It will show how to stop the auto boot process used in learning activity 1-A, enter the System Maintenance Menu, and use the PROM Monitor commands. The basic skills learned in this activity are used to load a standalone program, reload the operating system, and recover from a crash.

INTRODUCTION

The PROM monitor is a program that resides in permanently programmed read-only memory, which controls the machine startup. The program is started whenever the system is first powered on, reset with the reset button, or shutdown by the administrator.

When the system is first powered on, the PROM runs a series of tests on the core components of the system. It then performs certain hardware initialization functions such as starting up SCSI devices, initializing graphics hardware, and clearing memory. Upon completion of these tasks, the PROM checks an environment variable to determine its next action. It can either attempt to boot the operating system kernel or display the System Maintenance Menu. Booting the system is the default setting.

The remaining sections in this activity will allow you to try the various PROM monitor options. If you are new to the 910-XXX product line, the procedures/steps used in each section should be closely followed. Failure to do so could leave you hopelessly lost. It is a good idea to completely read the steps before executing any part of it. Answers to any questions are found in Appendix C.

LAB STEPS

Stopping the Boot Process

By default, PROM attempts to boot the operating system when the unit is powered on or reset. Before doing so, it gives you a chance to stop the process. If the <Esc> (escape) key is pressed within ten seconds, PROM displays the System Maintenance Menu menu which presents alternate boot up operations. Your chance to stop the boot operation is when this message appears on the screen.

Starting up the system . . .
To perform system maintenance instead, press <Esc>

I'm sure you saw this message many times in learning activity 1-A, and you may have pressed <Esc> just to see what would happen. Well even if you did, this is the starting point for this lab.

1. Power on the 910-200. Press <Esc> to stop the boot process.

2. PROM now presents the System Maintenance Menu. List the five options:

   1 _____

   2 _____

   3 _____

   4 _____

   5 _____

Command Monitor

Option 5 puts the PROM into a manual mode of operation which allows additional functions to be performed from an interactive monitor. The PROM Command Monitor has its own commands.

3. Enter Command Monitor <5>. What is displayed on the screen?

   _____

   _____

Notice the >> prompt. It is telling us that this machine is at PROM Command Monitor level, which is the lowest level the machine can be at.

4. At >> prompt type: *help*
   then press <Enter>.
   List the commands. (Left column) _____

   _____

   _____

   _____

5. What happens if you type *?* instead of *help*? _____

   _____

Password Protection

The 910-200 has added a password feature to the command monitor. This was needed to increase workstation security. If your site uses this feature, it will present you with another concern at corrective maintenance time. Often times you need to start at Command Monitor prompt. Thus, besides asking for the operating system password, you must check to see if they have assigned PROM Command Monitor mode password.

For this unit use est200 as the password. Let's see how it works.

6. At >> prompt type: *passwd*
   then press <Enter> and follow the screen prompts. Use est200 as the password.

7. At >> prompt type: *exit*
   then press <Enter>.
   What is displayed on the screen now? _____

8. Enter Command Monitor
   What happened this time? Asked for PW

If the password needs to be changed, just enter the *passwd* command again. If the password is to be removed, use the *resetpw* command. But remember, you cannot get the Command Monitor prompt to execute either command if you do not know the original password.

Since having a password adds an additional step every time you enter Command Monitor, let's clear the password before continuing any further.

9. At >> prompt type: *resetpw*
   then press <Enter>.
   What response did PROM provide? Password cleared

10. To ensure you cleared the password, exit Command Monitor mode and attempt to enter it again. You should not be asked for a password this time.

Since the password is stored in non-volatile random access memory (NVRAM), it is saved when the machine is reset or powered off. Okay, what happens if the only person who knows the password drops dead? I'll cover that problem in a later learning activity.

Maintenance Commands

The PROM Command Monitor has four maintenance related commands: *hinv*, *version*, *list*, and *eaddr*. Of the four, *hinv* or hardware inventory is used most often. This command gives a snap shot of the internal hardware and all SCSI devices that are recognized. It is used to see if a newly attached peripheral device or a memory update is being seen by PROM. The list or *ls* command can be used to see what files exist on the disk volume header.

Let's execute each command to see the results. Position the 910-200 at PROM Command Monitor prompt if it is not already there. Execute each step listed below and answer all questions.

11. At >> prompt type: *hinv*
    then press <Enter>.
    How much memory does this unit have? 16 M
    What is the processor speed and type? 33 MHz IP 12
    List the SCSI address of each peripheral.
    disk - 0-1
    CD-ROM - 0-5
    quarter inch tape - 0-7
    What name is given to the graphics? LG1

12. At >> prompt type: *eaddr*
    then press <Enter>.
    What is the ethernet address of the machine? 08006906289

13. At >> prompt type: *version*
    then press <Enter>.
    What is the version level and date of PROM Monitor found in this unit? 4.0 Rev A
    7-18-91

14. At >> prompt type: *ls*
    then press <Enter>.
    The contents of file was listed? (Give the path name) dksc(0,1,8)
    What is in that file? SCI (Ethernet, TAPE, SASH

Keep these four commands, especially *hinv*, in the back of your mind. They are good aids to have when working with any 910-XXX unit.

Environment Variable Commands

The PROM Command Monitor maintains environment variables that are passed to booted programs. The variables also affect hardware operation when the unit is at the PROM Command Monitor level. Some of the variables are maintained in NVRAM, so when you reset the machine or power it down, the Monitor still maintains these values.

There are four PROM Command Monitor commands that work with the environment variables: *printenv*, *setenv*, *resetenv*, and *unsetenv*. As a CE, the *printenv* and *setenv* commands are used most often. As you will see later, there are two or three environment variables that you might have to change when performing corrective maintenance. You must be able to execute the steps required to change these or any other variable.

The objective of this section is to use the commands that affect the environment variables. Later activities will investigate the possible values for the key variables and how each value effects machine operation. Therefore, please follow the directions given so you get the most from this and future lessons.

Let's execute each command to see the results. Position the 910-200 at PROM Command Monitor prompt if it is not already there. Execute each step listed below and answer all questions.

15. At >> prompt type: *printenv*
    then press <Enter>.
    Record each variable and its value. You will need this data later.

    _____
    _____
    _____
    _____
    _____
    _____
    _____

To set a variable, use the *setenv* command. The command format has three parts: the command, variable to be changed, and the new value. There is a space between each part.

Example: *>>setenv console G* ↵

Notice there is **no = sign** between the variable name and the value. This is the most common mistake made when trying to set a variable value.

16. At >> prompt type: *setenv volume 255* 128
then press <Enter>.
Check the environment variables.
Did volume's value change and where did it appear in the list? bottom

17. At >> prompt type: *setenv console = G*
then press <Enter>.
How did PROM respond? _____
What does this mean? _____

18. Set the following variables to the value listed:

    console G
    bootmode d c
    rbaud 9600 1200

    Check the environment variables to verify all changes were made.

19. At >> prompt type: *resetenv*
then press <Enter>.
Check the environment variables.
Compare the present values to those recorded in step 15. Are they the same? yes

20. At >> prompt type: *unsetenv volume*
then press <Enter>.
Check the environment variables.
What did this command do? took volume out

    Execute the *unsetenv* command without a variable.
    Same response as seen in step 17? _____

21. Execute the *resetenv* command and verify the variable values are the same as those recorded in step 15.

In the last seven steps you learned how to print, set and reset the PROM Command Monitor environment variables. Not a difficult task, but an important one during corrective maintenance. Remember, don't use the = sign in the *setenv* command.

Load Commands

The PROM Command Monitor has three boot or load commands: *auto*, *boot*, and *single*.

The *auto* command does just as it implies. It attempts to boot the operating system into a normal operation, also called multi-user mode, without any additional input from you. This would be the same as pressing <1>"Start System" on the System Maintenance Menu or letting PROM perform the boot operation after a power on or reset.

The *boot* command, referred to as the manual load method, is used to load a standalone program or the operating system. This command requires a pathname. The pathname includes the device type, controller address, device address, partition or file number, and the name of the program to be loaded. A common usage of the *boot* command to load the disk format program from either quarter inch tape, CD-ROM, or the network.

The *single* command is like the *auto* command except it boots the operating system into single user mode. This command is useful when doing backups and you do not want all file systems mounted.

Obviously there is more to the *boot* command than given above. Keep in mind the objective of this learning activity is to show you what commands are available under the PROM Command Monitor and what they look like when executed. A later learning activity will look at the entire boot process, including the pathname required for the boot command. Position the 910-200 at PROM Command Monitor prompt, execute each step listed below, and answer all questions.

22. At >> prompt type: *auto*
    then press <Enter>.
    What is being displayed when this process stops? Starting The SYS

23. Login as root and do a system shutdown.
    Restart the system and return to Command Monitor prompt.
    At >> prompt type: *boot dksc(0,1,0)unix*
    then press <Enter>.
    What is being displayed when this process stops? Icons

24. Login as root and do a system shutdown.
    Restart the system and return to Command Monitor prompt.
    At >> prompt type: *single*
    then press <Enter>.
    What is the last line being displayed when this process stops?
    S.U. Mode Transfer #1

25. Use the method shown in learning activity 1-A under the shell method section to shutdown the operating system. Don't forget the *sync, sync.*
    What new run level does the screen indicate the system will go to? 0

That completes a quick look at the three load PROM Command Monitor commands. You should now be aware of the format used by the commands and the end result of executing each.

Miscellaneous Commands

If you have been keeping count there are only two commands that have not been covered yet. They are the *exit* and *init* command.

The *exit* command exits the Command Monitor mode and returns you to the five entry System Maintenance Menu.

The *init* command causes a partial restart of the PROM. It is used after you change an environment variable value and you want that value to take affect immediately. The *init* command restarts PROM at which time the new value is used. The console environment variable is the only one that requires the use of the *init* command.

Before you leave this lesson, let's take a look at what happens when these two commands are executed. Position the 910-200 at PROM Command Monitor prompt, execute each step listed below, and answer all questions.

26. At >> prompt type: *init*
    then press <Enter>.
    Where did PROM end up at? _____

27. Position the unit at PROM Command Monitor prompt once again.
    At >> prompt type: *exit*
    then press <Enter>.
    What happened? _____

At this time executing the *init* and *exit* commands appears to produce the same effect. The next learning activity will demonstrate there is a difference.

SUMMARY

That concludes a look the PROM and Command Monitor mode. You now should be able to:

- stop the power on or reset auto boot process
- enter PROM Command Monitor mode
- execute the PROM Command Monitor commands

Use the self-check questions found on the next page to measure your progress.

SELF-CHECK QUESTIONS

Answer the questions by filling in the blank or circling the correct answer choice. When complete, compare your answers with those found in Appendix C.

1. Support has asked you to boot a special program from CD-ROM. List in correct order the keys you must press to stop the auto boot process and display the >> prompt. Also indicate what happens after you press the key.

   _____

   _____

2. Which command is used to remove a PROM Command Monitor password?

   _____

3. Which command is used to change the PROM Command Monitor password?

   _____

4. Removing power from the 910-200 deletes the PROM Command Monitor password.

   True or False

5. The customer is unable to do a tape backup. What PROM Command Monitor command can be used to check if the tape drive is present? _____

6. Write the command to set the bootmode environment variable value to d.

   _____

7. What happens when the *resetenv* command is executed? _____

   _____

8. Which *env* command removes the entire environment variable? _____

9. How do you know the *auto* command worked correctly? _____

   _____

10. What menu was displayed when the *exit* command was executed at the >> prompt?

    _____.

Learning Activity 1-C. Reference Reading/Lab:
Changing Environment Variables

In this learning activity you will see the affects of changing certain environment variable values. Changing variable values is not a common event, but there may be times when you need or want to change the power on sequence. It is also nice to know how the various values do affect the units operation at power on or after a reset.

INTRODUCTION

In the previous learning activity, you learned how to print, set and reset the environment variables. In this activity you will use these skills to see how the the various values affect the unit. The lesson will start with the simple volume variable, move to the bootmode variable, cover the potentially dangerous console variable and end on the lighter side with some color changes. DO NOT skip over the lesson on changing the console variable. It will provide you with the answer to that password problem presented in learning activity 1-B.

Once again, please do not deviate from the steps/procedures found in each section. Not following the steps could leave you with a non-functional unit. It is a good idea to completely read the step before executing any part of it. Answers to any questions are found in Appendix C.

LAB STEPS

Volume Variable

This variable sets the speaker volume during boot up. This controls the volume of the startup tune generated on machines with integral audio hardware. The variable can range from 0 to 255, with a default of 128.

Using what you learned in activity 1-B, position the unit at the PROM Command Monitor >> prompt and execute the following steps.

1. Change the volume variable value to 0.
   Press the RESET button on the 910-200.
   Stop the auto boot process by pressing <Esc>.
   Did you hear any boot tune? yes

2. Change the volume variable value to 128.
   Press the RESET button on the 910-200.
   Listen for the boot tune; then stop the auto boot process by pressing <Esc>.

3. Change the volume variable value to 255.
   Press the RESET button on the 910-200.
   Listen for the boot tune; then stop the auto boot process by pressing <Esc>.
   Was the tune louder this time? yes

4. This time change the volume variable value to a 525.
   Press the RESET button on the 910-200.
   Listen for the boot tune; then stop the auto boot process by pressing <Esc>.
   Did boot tune get louder or was it about the same level as when the variable was set to 128? _____

As you can see, changing this variable has no great earth shuddering effects on 910-200 operation. It may help to save your nerves or the customer's nerves if the boot tune is unwanted. A setting of 0 produces no tune, while 255 delivers the loudest tune. Anything greater than 255 defaults to 128. Let's move to a variable that you will be changing.

Bootmode Variable

This variable determines the default mode of operation after you turn on power to the system. The variable has three values: "c", "d", and "m".

Instead of spending a lot of time telling you about what these value do, position the unit at the PROM Command Monitor >> prompt, execute the following steps and answer all questions.

5. Set the bootmode variable value to "m".
   Press the RESET button.
   Where did PROM stop at with this value? At Maint Menu

6. Position the unit at the >> prompt.
   Set the bootmode variable value to "d".
   Press the RESET button.
   Did PROM stop at the same place as it did in step 5? yes
   As compared to a value of "m", what was different this time?
   Showed devices

7. Position the unit at the >> prompt.
   Set the bootmode variable value to "c".
   Press the RESET button.
   Where does boot stop? At Icons for login

8. If necessary, shutdown the operating system and position the unit at the >> prompt.
   Set the bootmode variable value to "d"
   Press the RESET button.

As these four steps demonstrated, a bootmode variable value of "m" causes PROM to stop at the System Maintenance Menu and wait for a command, while a value of "c" causes the system to be automatically booted. Setting bootmode to "d" has the same affect as "m" with the addition of more verbose power-on diagnostics.

Console Variable

This variable determines the system console. It has three possible values: "g", "G" and "d". If set to "g" or "G" the console is assumed to be the graphics display. If the variable is set to "d" , then the console is assumed to be a terminal connected to serial port 1. The paragraphs that follow discuss how to change consoles, what can go wrong, and how to recover.

Changing Consoles

To change the system console, you would start at the graphics display by setting the console variable value to "d" and execute the *init* command. This causes PROM to re-initialize which makes the terminal attached to serial port 1 the system console and stops all communications with the graphics display.

That seems straight forward. So where is the big pit fall? Read on.

What Can Happen

What if you have a bad or no terminal, a bad or wrong cable, or the wrong settings in your terminal. In either case the 910-200 is unable to communicate with that terminal and is no longer communicating with the graphics display. Yes, you now have a 910-200 without a system console.

Since the variable is set to "d" and is stored in NVRAM, powering off or resetting the unit has no affect. You need to change the value in NVRAM, but have no way to access that memory.

How To Recover

Obviously, the way to prevent this situation is to never change the console variable value to "d" or know that the path from serial port 1 to the terminal is good before you change the value. This can be done by using the operating system to add a terminal and a user to ensure you can communicate to that terminal through serial port 1. If login prompt appears, then the path is OK. How to add a terminal and user will be covered in Module 2.

The only way to recover after the fact is to find a cable and terminal that can be connected to serial port 1. A 3-wire standard Macintosh® to Imagewriter® cable gives you the DIN-8 connector to DB-25 connector needed to get started. You may need a gender bender and null-modem cable to complete the path. The console should be set as follows: 9600 baud, 8 bits no parity, and 1 stop bit. That should be enough to get started. Once in, then change console back to "g".

910-200 verses 910-400

The 910-400 has another way of solving this problem. In that unit, the NVRAM is mounted on a separate PC card with a blue ribbon cable connecting it to the electronics module. You would power off the unit, pull the blue cable, and then power on. The PROM now uses default environment values from the processor board. The graphics display is now active and you are able to enter Command Monitor. Without powering off the unit, attach the blue cable and then set console back to "g" or do a *resetenv*. This changes the value(s) in NVRAM which will be used during the next power on or reset and the problem is solved.

The same idea is used on the 910-200, but the method to accomplish the task is different. In the 910-200 the NVRAM chip is mounted on the backplane thus there is no cable between the processor and the chip. Since it is impossible to replace the chip with the power on, an alternative method must be used. The method used is to place a jumper between a resistor on the backplane and chassis to ground the data signal. When power is applied, the transfer of NVRAM data to the HP1 board is blocked; which will cause a set of default environment variables from PROM to be used. Removing the jumper from ground and executing a *resetenv* at >> prompt will return the environment variables to their default values. If this all sounds complex don't worry, you will get a chance in learning activity 1-F to perform the actual steps.

Forgotten Command Monitor Password

Since the Command Monitor password is also saved in the same NVRAM chip, a forgotten password presents about the same problem. But remember, in this case you can still boot the operating system and make the unit functional for the customer. The problem surfaces only when someone requires the >> prompt to perform an operation.

What Next

This is a good point to at least find out where that chip is and see what is the difference between "g" and "G". Please do not change the console variable to "d" at this time unless you have a terminal that will work on serial port 1.

9. Once again position the unit at Command Monitor >> prompt.
   Set the console variable to "G".
   Execute the *init* command.
   What is displayed? SGI Logo
   What has changed? _____

10. Power off the unit.
    Remove the front cover.
    Open the front metal panel.
    From the front side locate the backplane.
    In the lower left corner you will see three components: R1, R2, and U1. U1 is the location of the NVRAM chip.

The console variable, more than any other variable, demonstrates what can happen if you don't know what you are doing. With a few harmless key strokes you could render the entire system useless. So, once again don't change the value to "d" unless you know the path from serial port 1 to the terminal is working.

Color Variables and Final Setup

There are three environment variables that control color when at PROM. They are: screencolor, pagecolor, and logocolor. They are not listed when a *printenv* command is executed but nevertheless are present and do control the color for the screen, page, and logo.

The variable value sets the amount of red, green, and blue used to make the color for each item. The value is six hex digits in length, two for red, two for green, and two for blue. Each color can vary from 00 to ff. 00 is no color and ff is full saturation.

Example 1: 000000 No red, green or blue is used and the final color is black.

Example 2: ff0000 Full red, no green or blue for a final color of red.

Example 3: 0000ff No red or green, but full blue for a dark blue.

Example 4: ffffff Full red, green and blue for the color white.

As you can see it is possible to select 16 million colors (256 x 256 x256). Some of these colors are not pleasant to look at.

Take a few minutes to change at least the screen and page colors. Don't worry about what color you create, a *resetenv* restores the default values for these three variables.

11. Power on and position the unit the Command Monitor >> prompt.
    Change screencolor and/or pagecolor. (*setenv* command)
    Press the RESET button to view your new color(s).
    Repeat as often as necessary.

12. Reset the environment variable values. (*resetenv*)
    Press RESET button to verify if the standard colors returned.

13. Change bootmode to "m". We will use this value for the rest of this course.

The color variables are fun to play with but have little to do with system or PROM operation. Knowing they exist and how to change them may be important if a customer would want a unique color combination.

SUMMARY

That concludes a look at the affects of changing the volume, bootmode, console, screencolor, pagecolor and logocolor environment variable values. You now should be able to describe what will happen when:

- volume variable value is changed
- bootmode variable is set to "d", "m", or "c"
- console variable is set to "G", "g", or "d"
- screencolor, pagecolor or logocolor variable value is changed

You should also know what has to be done to recover from:

- console set to "d" and no terminal connected to serial port 1
- a forgotten Command Monitor password

Use the self-check questions on the next page to measure your progress.

SELF-CHECK QUESTIONS

Answer the questions by filling in the blank or circling the correct answer choice. When complete, compare your answers with those found in Appendix C.

1. Your customer does not like the startup tune. To prevent them from hearing the tune you set the volume variable to 0.
2. What happens if the volume variable is set to 635? Reverts to 128
3. Which bootmode variable value, automatically boots the operation system? c
4. Which bootmode variable value, displays the results of the power on diagnostics? d
5. What is the difference between console variable "g" and "G"? Case
6. What precautions should you take before changing the console variable to "d"? Term gw Working Port
7. What must be done if the password is forgotten? Disable NVRam XTOR
8. What part of the screen did the variable screencolor affect? Border
9. Which variable changed the color of the text? Page color

TO PRESENT THE MATERIAL IN THIS MODULE IN A STRUCTURED FORMAT,
THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK.

Learning Activity 1-D. Reference Reading/Lab:
Boot Commands

At this point in the course you have already booted and shutdown the operating system more times than you may ever do in the field. I'm sure some of those boots were unwanted and you must feel what more can you learn about boot. This activity will look at what happens during a boot process and show you how to boot programs from local and remote devices. Having the confidence that you can boot from literally any device attached to your 910-200 is hard to measure. Keep in mind what you see in the field may vary anywhere from a standalone unit with disk, tape and CD-ROM to a diskless, tapeless unit attached to a network. The goal of this activity is to give you that confidence.

INTRODUCTION

When it come to talking about the boot process, four terms seem to surface: local, remote, auto, and manual. The material in this activity will be divided into the two major headings of local and remote.

In the local area we will first look at the processes that take place when you or PROM does the auto boot. Then we'll see how that information pertains to the manual boot and how to boot programs from all locally attached devices.

In the remote area we will use the knowledge obtained in the local boots to build commands that boot across the network.

This activity assumes that you have completed activities 1-B and 1-C or can perform the tasks covered by them. As in those activities if you are new to the 910-200 product line, follow the steps found so you get the most from this activity. It is still a good idea to read completely the step before executing any part of it, that way you can figure out what the step is trying to accomplish. Answers to any questions are found in Appendix C.

LOCAL MODE

This section is divided into two major areas. The first will take a look at the auto boot process and what is called the pathname. The second area will have you build the commands to boot from local devices.

Auto Boot Process

Auto boot can be accomplished one of three ways. Can you list them? You answer should look like this:

A. Set bootmode to "c". Let PROM do the work after reset or a power on. A hands-off method.

B. Set bootmode to "d" or "m". When PROM stops at System Maintenance Menu press <1> "Start System" to start the boot process.

C. Set bootmode to "d" or "m". When PROM stops at System Maintenance Menu press <5> to enter Command Monitor. At >> prompt type *auto*. Pressing <Enter> starts the boot process.

The process which starts with PROM will normally end with the multi-user login menu. The major steps are: PROM loads sash (standalone shell), sash loads the unix kernel, and kernel takes control.

Load sash

Sash is a standalone loader program that is used as an intermediary when booting from disk. This bootstrap program is located in the volume header which is the first partition on the system disk. The program is loaded by PROM.

How does PROM know where sash is? Remember the bootfile environment variable?

1. Position the 910-200 at the Command Monitor >> prompt and execute *printenv*. What is bootfile set to? dksc(0,1,8)sash

What you just wrote down is known as a pathname. It has the following parts:

device type(controller address, device address, file or partition) file name

The device type is dksc (which stands for disk SCSI), controller address is 0, drive address is 1, partition number is 8, and the file to be loaded is named sash. This is the path to a standalone program located on the disk you installed in the bottom slot. During the auto sequence PROM uses this path to load sash.

2. For this step don't take your eyes off the screen when you press <Enter>.
   At >> prompt type: *auto*
   then press <Enter>.
   Did a message indicating the loading of sash appear on the screen? yup

3. Shutdown to >>.
   Change bootfile to: dksc(0,1,0)sash
   then press <Enter>.
   At >> prompt type: *auto*
   then press <Enter> and record the results below:
   cannot find V.H. on device

4. Change bootfile to: dksc(0,1,8)Sash
   then press <Enter>.
   At >> prompt type: *auto*
   then press <Enter> and record the results below:
   bootfile not found

The messages seen in steps 3 and 4 are also similar to what you may get if the volume header gets destroyed or you are unable to access the disk.

Why doesn't PROM load the kernel? If it can load sash from the disk, why can't it load UNIX? These are good questions. The PROM loader program is only intelligent enough to read the first partition on the disk. It is unable to understand the file structure required to load the UNIX/IRIX kernel from other parts of the disk. The standalone loader program sash has this ability.

Load Unix Kernel

The next step is for sash to build a pathname that it can use to load the unix kernel. This is done in two steps.

First sash assumes the unix kernel is on the same disk identified by bootfile. This gives the disk type, controller address, and disk address portion of the pathname.

The rest of the pathname is actually found on the volume header of the disk used by the bootfile variable. The volume header contains what is called the disk label. The label contains the following sections: magic number, root partition identifier, swap partition identifier, boot filename, device parameters, partitions, and volume directory. The root partition identifier and boot filename complete the pathname.

The final pathname is: dksc(0,1,0)unix.

With this complete pathname, sash loads the operating system which then takes control.

Kernel Control

Once loaded the kernel initializes the system as follows:

- checks the CPU and PFU
- sizes memory
- loads drivers and locates equipment
- checks file system consistency
- mounts file systems
- starts utility programs and network daemons
- prints the login header (login screen)

These steps are done in quiet mode. SGI does not display any information on the screen as it performs these tasks. Other UNIXmachines (CD4000) do show the results.

Let's take one more look at the auto boot. This time watch the screen and also listen (if the room is quiet) to the disk drive from the time you press <Enter> until the login screen is displayed.

5. Position the 910-200 at the Command Monitor >> prompt.
   Type *auto*
   Keeping your eyes on the screen and ear tuned on the disk, press <Enter>

You should have seen a copyright header and the following two messages from the time you pressed <Enter> until the login screen appears.

> The system is coming up. Please wait.
>
> The system is ready

During that time you should have heard a lot of disk seek action. These are the normal sights and sounds of a good load.

This concludes a look at the auto boot process. The key points were:

- PROM loads the standalone loader program sash. The pathname to sash is read from the environment variable bootfile.
- Sash loads the unix (IRIX) kernel. This pathname is built by taking parts of the environment variable bootfile value and information stored in the disk label found in the disk's volume header.
- The kernel takes control and initializes the system.

Next we will use this basic knowledge to build manual boot commands.

Manual Boot Operation

The term "manual" is used because you must now determine the information (mainly the pathname) that PROM and sash did during the auto process. The main purpose of the manual boot command is to allow you to control the boot process or boot programs from other devices. The following command will accomplish the same results as the auto process.

>> *boot dksc(0,1,0)unix*

This command has two basic parts: command and pathname. Once again the pathname defines the path to and the name of the program we are to load. But wait, if we start at Command Monitor >> prompt doesn't sash have to be loaded to boot from disk? Yes, that is what the boot command will accomplish. It loads the program/file specified by the value found in the bootfile variable. Normally this is sash.

Let's see if it works that way. Position the unit at the Command Monitor >> prompt and complete the following steps.

6. At >> prompt type: *boot*
   then press <Enter>.
   What was loaded? sash
   What is the new prompt? sash:

7. Press <Ctrl-d>
   What is now displayed? Smm.

8. To ensure this isn't some type of magic, change sash to SASH in the bootfile variable.
   At >> prompt type: *boot*
   then press <Enter>.
   List the error message you got.

   _____

Once loaded, sash looks at the pathname for the information it needs to complete the load.

9. Return bootfile variable to the correct value.
   At >> prompt type: *boot dksc(0,1,0)unix*
   then press <Enter> and observe what happens.
   Did the screen displays look like those seen when the auto command was used? Yes

10. Shut down the system and return to the >> prompt.
    Check the results from executing this command: *boot dksc(0,1,8)sash*
    See the next paragraph for a short explanation on what happened.

As was demonstrated in steps 6 and 8, the command *boot* attempts to load whatever program is specified by environment variable bootfile which in most cases will be sash. Thus the command executed in step 10 really tried to load sash twice. Once by the command boot and then again from the pathname. Sash does not allow that to happen and responds with a message which only flashed on the screen before the System Maintenance Menu appeared. That message read as follows:

attempt to overlay sash test, data, or bss
Unable to load dksc(0,1,8)sash: no such device

If sash is not needed something must be added to the command string to block the loading of sash. This is done with the -f (minus f) option. The quarter inch tape drive and the network are both devices that do not use sash.

11. Return to >> and execute this command: *boot -f dksc(0,1,8)sash*
    What happened this time? OK Sash:

What the -f option does is negate what the command "boot" attempts to do first; that is load the file specified by the value found in the bootfile variable.

12. Starting at sash, write a command that will boot UNIX from disk.
    boot -f dksc(0,1,0)unix

    If you are unable to write this command, review the last two pages.
    If still unable see Appendix C.
    Execute that command to ensure it works.

As shown by the last seven steps boot command execution is a two step operation. The first is to load the program indicated by the variable bootfile, which is normally a standalone program like sash. The second is to pass the pathname portion to the loader program which then completes the load. The -f option blocks the first step.

With this basic boot command knowledge, we are ready to move on to loading from other local devices.

Booting From Other Local Devices

The main reason to use the manual boot command is to boot standalone programs. These programs may be on tape, CD-ROM, or system disk. As the last few pages have demonstrated defining the pathname is going to be the only difficult part about the boot command. This section will demonstrate some ways you can use the unit to help build the pathname.

During the auto boot, sash used a two step approach to build a pathname to the kernel. As a CE you can also use that same concept. The two steps are: determine the device type, controller address, and device address from bootfile; then get the file/partition from the device. Let's see if we can use this same idea.

13. Position the unit at the >> prompt and execute the *hinv* command.
    Record the device type, controller address, and device address for each SCSI device:
    Disk dksc(0,1)
    CD-ROM Controller 0, ID 5
    Tape TPSC(0,7)

For local devices, the first part was simple. The rest of the pathname is not as easy. In most cases you will have to know the file/partition number and program's name. A program that I'm sure you will be loading at one time or another is format/exerciser or fx. Since fx is found on tape, CD-ROM, and the system disk, we will use it to demonstrate the boot process. Please don't format the disk at this time, you can do that in module 2. When the below message appears, enter a <Ctrl-d> to abort.

> Currently in safe read-only mode.
> Do you require extended mode with all options available? (no)

14. fx is found in directory /stand/fx on the system disk partition 0.
    Write the command to boot fx from this disk. boot boot dksc(0,1,0)/STAND/FX
    If you are unable to write this command, review the last three pages.
    If still unable see Appendix C.
    Execute that command to ensure it works.
    Enter <Ctrl-d> to abort.

On the quarter inch distribution tape, there will be three or four different versions of fx, one for each processor type (that IP number the *hinv* command displayed). Once again you need to know the file number and correct name to use.

15. Execute the *hinv* command to verify your IP number. 12
    Write the boot command to load a file called help from file 0 of the tape.
    boot TPSC(0,7,0)*help*
    Compare your command with that given in Appendix C.
    Insert tape titled "Execution Environment, 4.0.1" and execute that command.

Your display should have indicated the file "help" not found, then a nice list of all the known files. The list contains versions of sash, ide (integrated diagnostic environment), and fx.

16. Using both the *hinv* output and list of known files, write the command to boot fx from tape.
    boot -f TPSC(0,7,0)fx.IP12
    Compare your command with that given in Appendix C.
    Execute that command.
    Press <Ctrl-d> to abort fx.

17. Write the command to boot sash from tape.
    boot -f TPSC(0,7,0)sash.IP12
    Compare your command with that given in Appendix C.
    Execute that command.
    Press <Ctrl-d> to abort sash.

On to our last local load device, the CD-ROM. Well, it is really just another disk to the system with the same device type as any other SCSI disk, dksc. The *hinv* command will list the controller and ID address. All that is needed is the partition number, program name, and UNIX path.

The program is fx.IP12, found in the stand directory which is in root partition 7 of the disk.

18. Locate the IRIS Execution Environment 4.0.1 disk
    If the CD caddy is in the drive, press the eject button to release it.
    Place the disk into the caddy with the label up and push the caddy into the drive.
    Write the command to boot fx from CD-ROM.
    boot dksc(0,5,7)/stand/fx.IP12
    Compare your command with that given in Appendix C.
    Execute the command.
    Press <Ctrl-d> to abort fx.

Since the CD-ROM is a new device try one more command before moving on. Like the system disk, the CD-ROM has a volume header which is also known as partition 8. You can also use the Command Monitor command *ls* to see what standalone programs are contained in the volume header. All the *ls* command requires is a path.

19. Position the 910-200 at the >> prompt.
    Write the command to list the contents of the volume header.
    ls _____
    Compare your command with that given in Appendix C.
    Correct if necessary, then execute the command.
    List the programs, don't misplace any periods. You need this data for the next step.
    _____
    _____
    _____

Hands-On Self-Check

Before looking at network boot commands, let's try one additional exercise. The following situation generated one of the first 910-200 calls to CSS. See if you have learned enough to handle it.

Your customer ordered a diskless 910-200 with a CD-ROM drive. He/she has now decided to add a system disk. Your job is to load fx so a volume header can be written on the disk.

Using the actual hardware and what you have learned so far, see if you can load fx from the CD-ROM. To create a more real life situation the first step will have you remove the internal system drive. This will give you about the same indications as having a newly installed drive without a volume header. It will also ensure you will not accidentally format the drive.

20. Power off the system and remove the system disk from slot 1.
    Power on the system.

21. Boot fx. There is more than one method, but only two commands are needed.
    Record the two commands you used to load fx.
    Once again Appendix C does list the commands.

    _____

    _____

Cleanup

Before moving on take a few minutes to return the unit to our starting point. Do the following:

- Power off the unit and insert the system disk.
- Power on and position the unit at >> prompt.
- Reset the environment variables (*resetenv*).
- Set bootmode to "d".
- Initialize PROM and check the variables.

REMOTE MODE

This section will look at what is needed to boot a program across the network. Since your 910-200 is not connected to a network, this activity will create a paper network to illustrate booting from a remote tape, CD-ROM, and system disk. Once again the standalone program fx or sash will be used in these examples.

To boot across the network, you need three basic elements: Internet address, boot command, and a server that supports the operation.

The Internet address is a number assigned by the network administrator of the network to which the local/client/requester unit is attached. Each unit on the network has its own unique number or address which must appear in the appropriate files on each machine. Format of the number is four decimal numbers between 0 and 255, separated by periods. An example is: 179.129.110.3 This number/address must be the value found in the netaddr environment variable. The address is used to establish the initial handshaking.

The boot command needs the same basic elements found in the other boot commands you were using, mainly a device type and a pathname. The format will look like this:

boot -f bootp()hostname:path

Since sash is not needed to boot across the network, the -f option is used. Bootp defines the Ethernet controller as the device type to boot from. The () indicates all addresses (controller, device and file/partition) are zero. The entire pathname must now include both the hostname and complete pathname to the desired file.

The last element is in the host/server/remote unit. Don't lose track of the big picture. You will be sitting in front of a unit that is at Command Monitor >> prompt trying to get files from a remote unit in which the operating system is up and running. That operating system in the remote unit runs a server daemon called bootp that really does most of the work. If the remote unit does not support bootp or does not have it running, the initial request from the local unit will go undetected.

Without going into the world of communications or generating a twenty page document, the basic operation is as follows:

A. The *boot* command causes the client machine to broadcast a request packet on the network. The packet contains:

   - Client's Internet address (taken from netaddr variable)
   - Desired server's name (taken from the command)
   - Complete bootfile name (taken from command)

B. If the server supports bootp, it then looks up the client's Internet address in its configuration file to see if the client is known. If the server is unable to identify the client, it will not respond to the request. If it can identify the client, the server checks additional files to get more data on the client.

C. The server checks for the presence of the file being requested. If the file is found, the server will send a response packet with the following information:

   - Client's Internet address
   - Server's Internet address
   - Server's name

   If the file is not found, additional messages (which vary depending on what was requested and what was found) will be sent.

D. The actual file transfer is now done by a simple file transfer protocol called TFIP. Once complete, control is then turned over to the booted program.

Well, that completes a very simple explanation of what happens during a remote boot. What you should have noticed is how the three elements are needed to start the communication and transfer the data. Keep these three elements in mind when you attempt a remote boot. Missing any one of the elements can abort the operation.

The next page will list the commands used to boot fx from the network.

I have elected to use three CSS units, found at Arden Hills, that are part of the Control Data worldwide network. The three units are illustrated in figure 1-1.

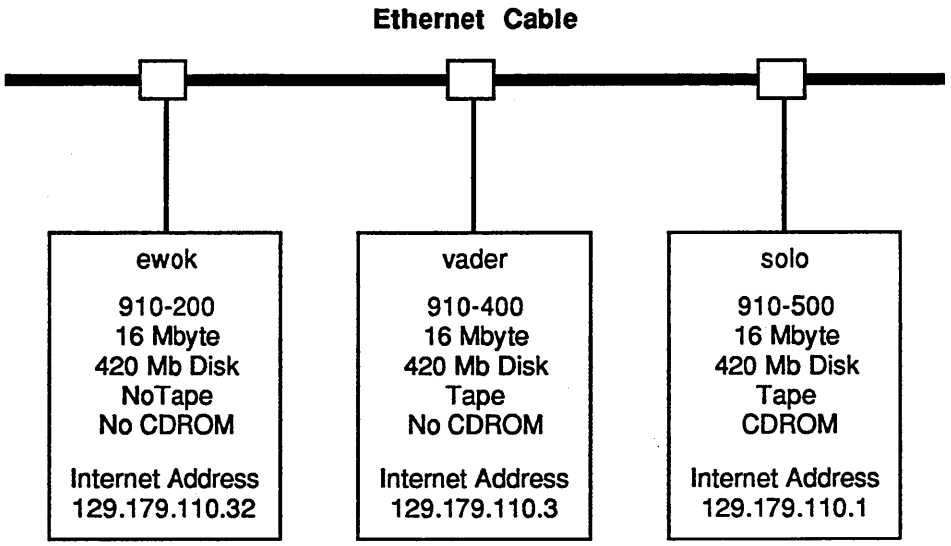

Figure 1-1. Sample Network

Defining the pathname is the hardest part of this boot command. As stated before, UNIX is running in the server, thus the pathname must be something the operating system can understand. The paths used when at >> will not always work. Complete the following questions. Compare your answers/commands with those given in Appendix C.

22. What should "ewok's" netaddr environment variable value be set to? _____

23. Normally fx is found in the stand directory of the root file system in all operating systems. Write the command to boot fx from this location on "vader".

_____

This is not the best way to get fx when the units are not the same model. There may be a problem with the processor type. The fx version you get may not run on your IP.12 910-200. The best way is to load the correct version from either the distribution tape or CD-ROM.

The only unknown is the path to the tape, which in most operating systems is /dev/tape. To complete the path, include the name of the program you want including the version (IP number for fx).

24. Write the command to boot fx to "ewok" from a distribution tape installed in vader.

    _____

    Compare your answer with that found in Appendix C.

Booting from CD-ROM works the same way, you need to know the path name used by "solo" to talk with the device. For our example, the site administrator said they mounted the device at /CDROM. After further questioning it was learned that fx.IP12 is found in directory "dist" file"sa".

25. This is a hard one, but try to write the command to boot fx to "ewok" from the CD-ROM attached to "solo". _____
    Compare your answer with the one given in Appendix C.

As you can see booting across the network is not as easy as may be implied. If your attempt fails, remember to check one of the following:

- The local/client/requester environment variable netaddr is set to its Internet address assigned by the network administrator.
- The host/server/remote unit recognizes the local/client/requester unit and is running the bootp server.
- A file name that includes device and program name. The device path must be the one used by the operating system in the host/server/remote unit.

SUMMARY

That concludes a look at the boot process. You should be able to:

- boot UNIX kernel using the auto or boot command
- list auto boot process steps
- boot standalone programs from local tape, disk, and CD-ROM
- boot standalone programs from remote tape, disk, and CD-ROM

Use the self-check questions on the next page to measure your progress.

SELF-CHECK QUESTIONS

Answer the questions by filling in the blank or circling the correct answer choice. When complete, compare your answers with those found in Appendix C.

Use the following information to answer questions 1 through 11.

>> printenv
netaddr=192.0.2.1
dbaud=9600
rbaud=1200
bootfile=dksc(0,1,0)sash
bootmode=c
console=g
diskless=0
volume=128
path=dksc(0,1,8)
cpufreq=33
gfx=alive

>>hinv

Memory size:	16 Mbytes
Instruction cache size:	32 KBytes
Data cache size:	32 KBytes
System Option:	Audio processor, revision 3
Graphics:	LG1
SCSI Disk:	dksc(0,1)
CD-ROM:	Controller 0, ID 4
SCSI Tape:	tpsc(0,6)
CPU board:	IP12 33 MHz, with FPU

NOTE:

Since the address of the tape and CD-ROM drive in this self-check are NOT the same as the hardware you are working on, any command you write for those devices will not execute on your unit.

1. The customer wants to stop the unit from automatically booting the operating system when power is applied. Write the command that will ensure this. _____

2. When attempting to do an auto boot, the following message is displayed. Write the command that will correct this error. _____

```
Starting the system . . . .

Loading dksc(0,1,0)sash
Error: no volume header on device
```

For the next questions, assume the commands from step 1 and 2 have been executed.

3. Write a command that will boot sash from disk. _____

4. How do you exit the sash program? _____

5. Starting at >> prompt write the command to boot UNIX.
   _____

6. Starting at >> prompt write the command to boot fx from tape.
   _____

7. Write the command to find out what is located in the volume header of the CD-ROM disk. _____

8. Starting at >> prompt write a command that will list what is contained in file 0 of the Installation tape. _____

9. Starting at >> prompt write a command that will boot sash from CD-ROM.
   _____

10. Starting at >> prompt write the command that will boot fx from the system disk.
    _____

11. Starting at sash: prompt write the command to boot UNIX.
    _____

Use the following information to answer questions 12 through 15.

ABC Engineering has decided to add another 910-200 to their network. The five units presently connected to the network are named eng0 through eng4. The new unit will be eng5 with 183.173.10.5 as its Internet address. Eng0 is the only unit with both quarter inch tape and CD-ROM.

The unit was shipped with a dead system disk. The administrator wants you to install a new disk, format it, and write the volume header. He/she has provided you with the following information: the tape has the standard path, CD-ROM is mounted as /CD, and everything in eng0 is set for a remote boot operation.

Basic information from eng5 is as follows:

>> printenv
netaddr=192.0.2.1
dbaud=9600
rbaud=1200
bootfile=dksc(0,1,8)sash
bootmode=c
console=d
diskless=0
volume=128
path=dksc(0,1,8)
cpufreq=33
gfx=alive

>>hinv

Memory size:	16 Mbytes
Instruction cache size:	32 KBytes
Data cache size:	32 KBytes
System Option:	Audio processor, revision 3
Graphics:	LG1
SCSI Disk:	dksc(0,1)
CPU board:	IP12 33 MHz, with FPU

12. One eng5 environment variable must be changed to start communications. Write the command to make that change. _____

13. Write the command to boot fx from the CD installation disk.

    _____

14. Write the command to boot fx from the quarter inch tape.

    _____

15. Write the command to boot fx from the system disk on eng0.

    _____

Learning Activity 1-E. Reference Reading/Lab: Diagnostic Tests

There are three ways to test the 910-200 workstation: power-on tests, diagnostics, and confidence tests. The objective of this activity is to select/load and execute each test method. When you complete the steps you should be able to initiate each test, list the normal test indications, and list corrective actions for an error condition.

INTRODUCTION

The lab consists of three sections: power-on tests, integrated diagnostics environment (ide), and confidence tests. Each section contains steps to be performed at the workstation. Many of the steps require you to record what happened as the step was executed. As in other activities the results or answers are found in Appendix C.

POWER-ON TESTS

The power-on tests check the major 910-200 hardware parts after power is applied or the RESET button is pressed. The unit uses the LED and/or messages to report test results.

The Owner's Guide (007-9065-010) chapter 5 lists the symptoms and probable causes of malfunctions detected during power-on diagnostics. Read pages 5-1 through 5-7, then complete the following questions. Answers are found in Appendix C.

1. Which bootmode variable value causes the power-on diagnostic test result to be displayed on the graphic console? _____

2. The power-on diagnostics use the audio system and CPU tri-state LED to report test status. List in order the visual sites and audio sounds observed after power is applied to the 910-200. Be sure to verify this on your unit.

   _____
   _____
   _____
   _____

3. No visible light from the LED indicates a possible problem with the _____.

4. A solid green LED indicates _____.

5. Solid orange LED indicates _____.

6. A blinking orange LED indicates _____.

7. A "bing" sound from the speaker indicates a failure in the _____.

8. What should be checked if you never hear the boot tune? _____

In the next learning activity we'll check how effective the power-on diagnostics are by leaving a component or two disconnected.

INTEGRATED DIAGNOSTICS ENVIRONMENT (IDE)

Integrated diagnostics environment (ide) are a series of tests that perform more extensive hardware checking than the power-on diagnostics. They consist of two main tests (IP12 and LG1) which can be run in either quiet (customer) or verbose (FE) mode. To run in verbose mode, the letters "fe" are added to the pathname used by the boot command.

Booting ide

Before starting the actual tests, let's take a look where ide can be found and how to boot it. Table 1-1 summarizes where ide is located.

Table 1-1. Location of ide

Device Type	Partition or File #	Directory or Path	Version # Needed
System Disk	8	NA	No
	0	/stand	No
Distribution Tape	0	NA	Yes
Distribution CD	8	NA	Yes

9. Using the device addresses of your hardware, write the command to boot ide **in verbose mode** from each of the following: **DO NOT execute the commands at this time.**

   System Disk: (three ways)

   >> Ide fe

   >> boot -f dksc(0,1,8) Ide fe

   >> boot dksc(0,1,2) /stand/Ide fe

   Distribution Tape:

   >> _____

   Distribution CD:

   >> _____

Customer/Quiet Mode

In customer mode the two tests, IP12 and LG1, run with no individual test messages displayed on the screen. If a problem exists, one error message appears on the screen reporting a failure in either the CPU (HP1) or graphic (LG1) board. If the tests execute without errors, the system reports "Diagnostic tests completed with no failures detected." and exits.

10. Execute ide in quiet mode by leaving off "fe" from any of the commands listed in step 9 or selecting 3 (Run Diagnostics) from the System Maintenance Menu.
    Run time is about 30 minutes.

11. Summarize the messages that were displayed. _____
    _____
    _____
    _____

12. Two conditions indicate the system is running the tests: the fault indicator and a screen display. What is the fault indicator doing? _____
    What character or characters appear on the last line of the console? _____

13. During the graphic tests the screen will go blank and may display various images. When the screen is blank, what does the fault indicator do? _____

14. Record the test completion message. _____
    _____

15. What is displayed when the <Enter> is pressed? _____

CE/Verbose Mode

CE version executes the same tests but in verbose mode (individual test results are displayed). If a problem is detected, the failing board will be reported. When the tests finish, the ide prompt is displayed. This allows the CE to run additional tests or exit the environment.

16. Initiate the verbose version of ide by using any of the methods listed in step 9.
    Record the initial messages displayed. _____
    _____
    Is the LED flashing? _____
    Did the test start automatically? YES NO

17. Does any test show an error? YES NO
    If yes, which one/ones? _____
    _____

18. After a few minutes, press:<Ctrl-c>
    What prompt is displayed? _____

19. At ide>> prompt type: *help* then press <Enter>.
    What happened? _____

20. Repeat step 19, except use <Ctrl-s> to stop the scrolling and <Ctrl-q> to start it again.

21. From the ide prompt you can initiate either the IP12 or LP1 test series.
    At ide>> prompt type: *ip12* then press <Enter>.
    Use <Ctrl-c> at any time to stop the test. Only enter <Ctrl-c> once. Some tests take a few minutes before they will terminate.

22. At ide>> prompt type: *lg1* then press <Enter>.
    What happened? _____
    How does <Ctrl-c> affect the LP1 test?_____

23. At ide>> prompt type: *help* then press <Enter>.
    Select one of the individual tests from the list and execute it. Tests like *audio, scsi*, and *led* can be executed as standalone tests. Some may report errors or hang the system. Try a few of the individual tests. Pressing the RESET button will always get you out.

24. There are two normal ways to exit ide: <Ctrl-d> or type *exit* then press <Enter>.
    If you are not presently in ide fe, reenter and use either of these two methods to exit.

CONFIDENCE TESTS

The confidence tests are on-line tests that check operation of the keyboard, mouse, monitor, tape drive, or one of the other peripherals. The Confidence Tests are found in the System toolchest.

25. Boot the operating system.
    Open the Confidence Test window. It is found in the System Toolchest.

26. Select and execute the following tests. Place a check mark in the space provided when you have executed the test. If additional help is needed, the Owner's Guide (007-9065-010) pages 5-13 through 5-19 tells you how to run each confidence test.

    ____ keyboard
    ____ mouse
    ____ monitor
    ____ tape

Quit the confidence test by placing the cursor over the Quit button in the confidence test window and pressing the left mouse button.

SUMMARY

This concludes a look at the three methods used to test the 910-200. You should now be able to:

- interpret power-on diagnostic error messages
- boot and execute ide in quiet or verbose mode
- use the confidence test to test the mouse, monitor, keyboard, and peripheral devices

Use the self-check items on the next page to measure your progress.

SELF-CHECK QUESTIONS

Answer the questions by filling in the blank or circling the correct answer choice. When complete, compare your answers with those found in Appendix C.

1. Successful execution of the power-on diagnostics is indicated by a _____ LED.

2. What should be checked/replaced if the power-on diagnostics stop with a blinking orange LED? _____

3. If ide is booted from any distribution media, the IP number is needed.

   True False

4. To stop ide test execution press _____.

5. What command is used to boot ide from CD-ROM? _____

6. Which test(s) indicated errors when ide was executed? _____
   _____

7. How do you quit the mouse confidence test? _____

8. How do you quit the keyboard confidence test? _____

Learning Activity 1-F. Reference Reading/Lab: Component Replacement

The time has come to dismantle the little box. Chances are you have already figured out how to replace the two logic boards and any plug-in internal peripherals. The only item that presents any real challenge is the backplane.

INTRODUCTION

This activity consists of three sections: FRU removal/replacement, SIMMs, and bugs. In the first section you will completely disassemble and then reassemble the 910-200. The second section will present information about locating, removing, and replacing a SIMM. The last section will allow you to see the affects of some self-induced bugs.

COMPONENT REMOVAL AND REPLACEMENT

The Owner's Guide (007-9065-010) chapter 5 contains procedures to remove and replace all components except the backplane. The goal of this section is to remove and replace the backplane. To accomplish this requires that you remove all other components.

There are only eight screws or nuts in this entire box, of which seven secure the backplane to the metal chassis. Metal tab, pop-rivets, and spring steel have taken the place of standard mounting hardware. The steps found on the next three pages provide you with some helpful hints when dealing with the tabs and sheet metal. Trust me, following the steps will make taking this box apart a piece of cake.

WARNING

Be sure to use proper ESD procedures when handling the circuit boards in this unit. Do not proceed any further until you have a tested wrist strap, static shielded bags, and properly grounded static safe mat.

Removal Steps

___ 1. If necessary shutdown the operating system, then Power off the 910-200.

___ 2. Disconnect all power and signal cables from the back of the unit.

___ 3. Position the unit on a properly grounded static safe mat.

___ 4. Remove the plastic cover and open the hinged logic compartment metal cover.

___ 5. Remove the HP1 (CPU board) and place it in a static shielded bag. (Left most board.)

___ 6. Remove the LG2 (Graphics board) and place it in a static shielded bag.

___ 7. Remove the system disk and place it in a static shielded bag.

___ 8. Remove the power supply as follows:

- From the rear, remove the phillip head screen located along the top edge.
- Using your thumbs, press on the two power plugs until the supply disconnects from the backplane.
- Slide the power supply from out of the front.

___ 9. Remove the three plastic drive trays as follows:

- Locate the three metal tabs (two on the right and one on the left) that hold the tray in place.
- Starting with the top tray, use a screwdriver to push the tabs on the right until they are flush with the sheet metal.
- Do the same with the tab on the left.
- After checking the tray's orientation (which end is the front), lift it from the chassis.
- Remove the other two trays using the same technique.

___ 10. Separate the plastic shell from the inner metal chassis as follows:

- On the bottom, locate the square hole found in front of each rear rubber pad.
- The inner chassis is held in place by a metal tab attached to the chassis that catches one edge of the hole. Using your finger or a screwdriver, push down on the tabs as you pull the chassis from the front.
- Separate the chassis from the shell.
- If the logic compartment metal cover has not come off yet, remove it at this time.

___ 11. Remove the peripheral compartment metal shield as follows:

- Locate the shiny metal shield on the peripheral compartment side. The shield is held in place only by its own spring tension.
- Slide your hand down the left side of the center divider until you can touch the back side of the shield.
- Gently push the shield to the right. When it clears the tabs that held the plastic trays in place, pull up until it springs loose.
- Lift the shield free of the chassis.

___ 12. At this point the backplane should be fully exposed. Most students do not feel the need to go any further. What you do is up to you, but at least locate the screws that must be removed to replace the backplane. On the component side there are three philip heads screws. On the rear outside of the metal chassis there are two phillip head screws by the SCSI connector and two 1/4 inch nuts by the Ethernet connector. Use caution not to damage the SCSI connector metal lock down clips as the backplane is removed from the metal chassis.

Replacement Steps

___ 13. If you removed the backplane, replace it at this time. Once again, use caution not to damage the SCSI connector metal clips as the backplane is replaced.

___ 14. Replace the metal shield. It works best to reverse the procedure used in step 11.

___ 15. Locate the nine metal tabs that held the peripheral trays in place. Using your finger, slightly bend them in toward the center of the compartment. Don't over do it, an eighth of an inch is about right.

___ 16. Replace the plastic drive trays. Start with the bottom tray first. It also works best to insert the right side first, then slide the left in place.

___ 17. Replace the logic compartment cover. Tighten the thumb screw to prevent cover from flopping around during the next two steps.

___ 18. Using your finger or a screwdriver, bend out the two bottom tabs. An eighth of an inch is good enough.

___ 19. Using caution not to damage the SCSI connector metal locking tabs, slide the metal chassis into the plastic shell.

___ 20. Insert the power supply and secure with the phillip screw.

___ 21. Replace the system disk.

___ 22. Open the logic compartment cover and replace the LG2 and HP1 board.

___ 23. Close the logic compartment cover and replace the plastic cover.

___ 24. Attach all power and signal cables to the rear of the unit.

___ 25. Apply power and verify that power-on diagnostics pass.

___ 26. Boot the operating system and execute the "Cube" demo.

If either steps 25 or 26 did not produce the normal indications, recheck your work. If the problem continues, call CHS.

SIMMS

First let's set the record straight on SIMM size, option size, and total memory size. The following table illustrates the possible values.

Table 1-2. Memory Size Relationships

SIMM Size	Option Size	Total Size*
2MB	8MB	24MB
4MB	16MB	48MB
8MB	32MB	96MB

* Not mixing SIMM sizes.

SIMM size is capacity in Mbytes of a single board. Since SIMMs are always inserted in groups of four, four times the SIMM size equals the option size. The HP1 has room for three groups (also called banks) thus the total size is three times the option size if the same SIMM size is used in all groups. Maximum memory size is 96 Mb.

Can you mix option sizes? Yes, as long as only one 16MB option is used.

On the HP1 board the groups/banks are labeled as A, B, and C. Each socket in the group/bank is numbered, thus the sockets are labeled A1 through A4, B1 through B4, and C1 through C4.

___ 27. Shutdown the operating system and power off the unit.

___ 28. Using proper ESD precautions, disconnect the cables from HP1, then remove the board.

___ 29. Locate the 12 SIMM sockets on the HP1 board and verify the identification scheme listed above.

When possible, the power-on diagnostics will identify the socket (letter-number) where it believes the faulty SIMM is located.

___ 30. A special tool (black L shaped plastic item) has been provided to aid in SIMM removal. To select and remove a SIMM is as follows: (Don't replace it.)

- Slip the notched edge of the removal tool under the white lever found on one end of the socket.
- Pull straight up to lift one side of the SIMM free from the socket.
- Use your fingers to pull up on the other side of the SIMM.

Does the first four SIMMs have to start in bank A? If you are adding a second option to a unit that has four SIMMs in bank A, does the option have to installed in bank B? The answer to both of these questions is NO. The logic determines what is available and assigns addresses accordingly.

___ 31. Move all four SIMMs to another bank.
Replace the HP1 board and apply power.
Do a hardware inventory check to see if you have 16 MB.

That concludes a look at the 910-200 SIMMs. Key points to remember: installed in groups of four, letter number identification method, SIMM tool aids in removal, and not bank sensitive. The next section demonstrates the results of installing a bad SIMM and leaving one out.

HARDWARE OVERVIEW

If you are interested to know a little more about what the hardware components do, read section two "The Hardware" in the Cyber 910-200 Technical Report. It presents a fairly detailed description of what the logic is doing.

Locate the section; then review/read as much as you feel necessary. Proceed to next section of this learning activity when you have finished.

BUGS

In this section you will see the result of a few self-induced bugs. Sorry we don't have any bad boards, disks etc. to use, but these bug will allow you to see some symptoms. Follow the directions given in each step, then complete all questions. Answers are found in Appendix C.

Initial Checkout

Before inserting any kind of bug, checkout the unit one more time to ensure it is working correctly.

1. Position the unit at >> prompt.
   Verify environment variables are set as follows:

   bootmode - "d"
   volume - "128"
   bootfile - "dksc(0,1,8)sash"
   console - "g"

2. Turn 910-200 power off.
   Power on the external tape and CD-ROM drive.
   Power on the 910-200 and verify the unit passes power-on diagnostics.

3. Using one of the many boot methods, load the operating system.
   Run the "Cube" demo.

4. Shutdown the operating system.
   Power off the 910-200.

You are now ready for the first bug.

Bug 1: Keyboard Cable

5. At the keyboard, remove the cable that connects the keyboard to the HP1 board.
   Power on the unit.
   Did the boot tune play? yes
   What color did the HP1 LED stop at? Green
   Did the system disk activity LED light? for awhile
   List the last two messages displayed on the screen.
   error gfx KB not post
   error cant open console

For this problem, control has been transferred to the console attached to serial port 1. If you had a terminal attached to the port, the System Maintenance Menu would be displayed.

6. Attach the keyboard cable and press RESET button.
   Verify unit passes power-on diagnostics.

Bug 2: SCSI Terminator (NOTE: This bug may not produce the indicated results. Additional testing at ARH is needed. 2/28/92.)

7. Power off the unit.
   Remove the SCSI terminator.
   Power on the unit.
   Did the boot tune play? yes
   What color did the HP1 LED stop at? green
   Did the system disk activity LED light? yes
   According to the message displayed, which test failed and what action should be taken.
   None

8. Press any key to continue.
   Attempt to load the operation system. Record your result below:

9. Return to the >> prompt.
   Type: *boot* then press <Enter>.
   Record the error message.

   _____

   _____

10. Power off the unit and attach the SCSI terminator.

Bug 3: System Disk

11. Slide the system disk out a couple of inches.
    Power on the unit.
    Did the boot tune play? Yes
    Did the system disk activity LED light? NP
    What color did the HP1 LED stop at? Green
    Did the power-on diagnostics see the disk? no
    Where did the power-on diagnostics stop at? _____

12. Attempt to boot the system. Record the error messages below:
    boot device not responding

    _____

13. Power off the unit and insert the system disk.

Bug 4: LG2 Board

14. Slide the LG2 board out a couple of inches.
    Power on the unit.
    Did the boot tune play? Yes
    Did the system disk activity LED light? yes
    What color did the HP1 LED stop at? off
    Is the graphic console screen blank? yes

Once again the diagnostics detected a problem in the graphics area and switched control to serial port 1. If there was a terminal attached to that port, it would display the power-on diagnostic results in which only one error is indicated.

Error-- cannot open console "gfx(0)"

The last item displayed is the System Maintenance Menu. Pressing <1> starts the system and after a few seconds a login message appears.

15. Power off the unit and insert the LG2 board.

Bug 5: Remove a SIMM

16. Slide the HP1 board out and remove one of the four SIMMs.
    Insert the HP1 board.
    Power on the unit.
    Did the boot tune play? no
    Did the system disk activity LED light? for a second
    What color did the HP1 LED stop at? blank amber
    Is the graphic console screen blank? yes

Once again the diagnostics switched control to serial port 1. If there was a terminal attached to that port, it would display the following:

Memory diagnostic (memory probe) *FAILED*

No usable memory found. Make sure you have a full bank (4 SIMMs).

17. Power off the unit and replace the SIMM removed in step 16.
    DO NOT INSERT THE HP1 BOARD AT THIS TIME.

Bug 6: Bad SIMM

The symptom created by a bad SIMM varies depending on which component on the SIMM fails. The problem caused by this faulty component is very interesting. I would hate to have this one as my first 910-200 service call.

18. Locate the four additional SIMMs. They should be in case 1.

19. Insert the four SIMMs in either of the two unused banks.
    Insert the HP1 board.
    Power on the unit.
    Did the boot tune play? NO
    Did the system disk activity LED light? Yes
    What color did the HP1 LED stop at? Blue
    Is the graphic console screen blank? yes

Once again the diagnostics switched control to serial port 1. If there was a terminal attached to that port, it would display the following:

```
Memory address test                                          *FAILED*
Address: A1FFFFF4,   Expected: A1FFFFF4,   Received: A1FFFFFC

Memory diagnostic (address test)                             *FAILED*
        Memory is not usable. Change or replace all SIMMs.
```

This problem affects either the address or data bus. It make no difference in which bank or slot this bad SIMM is placed. The symptom and data reported to the serial port console is always the same. For other SIMM malfunctions, the power-on diagnostics may give you a message on the graphic terminal. The message will give you a SIMM number or to just replace all SIMMs.

I'm still looking for additional faulty SIMMs. If you get one, call Stuart Thorson at 612-482-2946 or controlnet 235-2946. We will find a method to transfer any costs involved.

20. Power off the unit.
    Remove the four SIMMs installed in step 19.
    Insert the HP1 board and attach all cables.
    Power on the unit.

Bug 7: Reset NVRAM

Learning activity 1-C described a method to reset the environment variables in NVRAM to their factory default values. A forgotten password or setting console to "d" with no terminal attached to serial port 1 were the two main reasons to perform the reset. Use the following steps to verify the procedure really works.

21. Position the unit at >> prompt.
    Using the *passwd* command, assign a password to Command Monitor.
    Verify the password works (exit Command Monitor and try to entry again).

22. Power off the unit.
    Remove all cables from HP1 and LG2; then remove HP1 and LG2.
    Attach one end of a jumper to the right side of R2. See Figure 1-2.
    Replace HP1 and LG2; then attach all cables removed from HP1 and LG2.

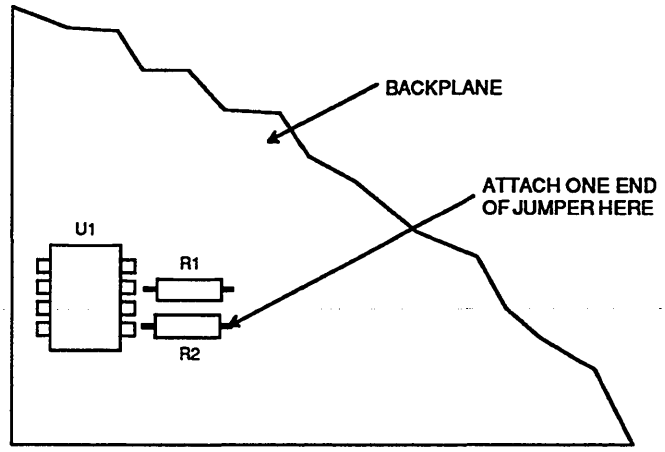

Figure 1-2. R2 Location

23. Attach the other end of the jumper to the metal chassis.

DO NOT power on until you have read the next paragraph.

When power is applied, two messages are seen. First the diagnostics reports the NVRAM write error. Second, because bootmode is set to "c", PROM reports that the system is being started. Here is where you must press <Esc> to stop the load and enter System Maintenance Menu.

First Screen:

Running power-on diagnostics . . .

Non-volatile ram write error
Non-volatile ram write error
Non-volatile ram write error
Non-volatile ram write error
Non-volatile ram write error
Non-volatile ram write error
Non-volatile ram write error
Non-volatile ram write error
set_nvvalid failed.

Second Screen:

Starting the system . .

To perform system maintenance instead, press <Esc>

24. Apply power; when the second message appears, press <Esc>.
    When the System Maintenance Menus appears, press <5>.
    Remove the jumper from the chassis.
    At >> prompt type *resetenv* ; then press <Enter>.
    Check the variables with the *printenv* command.
    For this course, change bootmode to "d".
    In the field, ensure your customers netaddr is correct.

25. Press the RESET button on the 910-200.
    Verify the graphic console is active and Command Monitor is no longer password protected.

26. Power off the unit.
    Remove all cables from HP1 and LG2; then remove HP1 and LG2.
    Remove the jumper from R2.
    Replace HP1 and LG2 and attach all necessary cables.

Final Checkout

27. Power on the 910-200 and verify the unit passes power-on diagnostics.

28. Using one of the many boot methods, load the operating system.
    Run the "Cube" demo.

29. Shutdown the operating system.
    Power off the 910-200.

This concludes our bug finding section of this learning activity. As you can see, finding malfunctions will not be too difficult. The power-on diagnostics do a good job of locating hard failures. The low FRU count should make finding any other failures very easy. Having a terminal attached to serial port is handy, but not necessary. It does help when the graphic screen is blank. If you have a portable device take some time in Module 2 to connect it to serial port 1, then record the values. That way you will look good at the customer's site.

PRODUCT NUMBERS

This section was originally titled "Part Numbers". Its goal was to give you a complete list of 910-200 part numbers. Since part numbers for new products often change, the 910-200 maintenance planner pointed out that giving the actual numbers may only lead you astray. He suggested the best way to get an up-to-date part or maintenance kit number is to pull the ORMIC for the product. The following is a partial list of 910-200 product numbers.

Product Number	Description
910B-230	Base system with 8MB memory
910B-232	Base system with 16MB memory
910D-222	236MB SCSI 3.5" system disk
910D-244	432MB SCSI 3.5" system disk
910P-222	236MB SCSI 3.5 add-on disk
910D-244	432MB SCSI 3.5" add-on disk
910M-216	16" Sony monitor
910M-219	19" Sony monitor
910P-2BF	3.5" floppy disk
910P-2BG	3.5" DAT tape
910P-4BD	1/4" SCSI 150MB external tape drive
910P-4BE	1/2" SCSI 9 track tape drive
910P-4CC	CDROM external disk drive
910P-4BR	8MB memory upgrade
910P-4BU	32MB memory upgrade

SUMMARY

This concludes our look at the actual 910-200 hardware components. You should now be able to:

- remove/replace all 910-200 FRUs
- determine the failing component for power-on detected malfunctions
- install memory upgrade options
- recover from a forgotten password or console set to "d"

Due to the nature of the material presented in this activity there is no self-check questions.

MODULE 2

BASIC SYSTEM ADMINISTRATION

About This Module

As seen in module 1, installation of 910-200 hardware was a very straight forward procedure which can be done by most customers. But, there are still some customers that just don't want to touch anything that has to do with electricity and electronics. There are also some that are not familiar with the system administration portion of the UNIX operation system.

An option being considered is to offer a little more than just connecting the cables, turning on the power, and then leaving. This option would include showing the customer how to add users, additional terminals to serial ports, backup and restore files, and add the workstation to a network. These are not difficult tasks, but to someone new to the UNIX operating system these seem like very huge tasks. The learning activities in this module allow you to practice these basic administration tasks.

This module consists of four learning activities (LA) which are very inter-related. To obtain maximum benefit from this module, you must perform each section of each activity in chronological order. The activities are:

LA 2-A. Reference Reading/Lab: Adding Users and Terminals
In this learning activity you will add a user and enable a serial port. You will also create a text and graphic file to be used in a later learning activity.

LA 2-B. Reference Reading/Lab: Backup, Restore, and More
In this learning activity you will do a file, entire, add more users, add the unit to a network, crash the system, recover from the crash, and restore all files.

LA 2-C. Reference Reading/Lab: Scratch Install
In this learning activity you will format the system disk and install the operating system from CD-ROM.

LA 2-D. Reference Reading/Lab: Final Steps
In this learning activity you will setup the system for the next student. In case you forgot, the activity contains directions on how to pack the shipping containers.

TO PRESENT THIS MATERIAL IN THIS MODULE IN A STRUCTURED FORMAT, THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK.

Learning Activity 2-A. Reference Reading/Lab: Adding Users and Terminals

Adding users and terminals to a UNIX system is one of the basic functions performed by the System Administrator. This learning activity will use the world of icons to add a user and a terminal to the 910-200.

INTRODUCTION

This activity has three major sections: adding a user, creating a text and graphic file, and adding a terminal.

In the first section you will create a login for a user called **student1** using the System Manager tool. This tool uses icons and windows to get the information needed to create the login.

The second section is titled creating files but really covers five topics. The section starts by exploring directories which allows you to look at the root and usr file structure. The second topic is using the tools to look at SYSLOG. Next, you will use "jot" to create a text file, then use "showcase" to create a graphic file. The final topic shows an alternative method to view SYSLOG.

The last section enables serial port 1 so a terminal can be added.

This activity assumes you have completed the basic mouse techniques learned in learning activity 1-A. You should be able to do the following:

- login and logout
- start and shutdown the operating system
- double click to open a utility tool
- click to select an item
- close or quit a window

When you are ready, turn the page and start with the first section of this activity.

ADDING A USER

In this section you will add a user named **student1**. Information about adding and managing users is found in Chapter 4 of the Personal System Administration Guide, document number 007-1366-010. The chapter presents a good overview on why users are needed, how to operate the users tool, how to add a user, and how to delete a user. Read/review as much of this material as necessary. When you are ready to add **student1** follow these steps:

1. Power on the unit, load the operating system, and login as root.

2. Start the System Manager.

3. Double-click the User icon to open the User window.
   Click the "Add" button to open the Add new user window.
   Add **student1** as a user in the User's login name field.
   Answer **Yes** to "Show detailed info:" statement. Then complete the following:

   - Assign a password.
   - Fill in your full name, office, and phone number (any information is fine).
   - Ensure "Csh" shell is selected.
   - Ensure WorkSpace is on and autologin is off.

   Record student1's home directory here. /usr/people/student1

4. Quit the Users tool and then the System Manager tool.

5. Logout.

6. Check the login screen for a new icon with student1 under it.

   If the icon is not on the login screen, login as root, and repeat steps 2 through 4.

   If the icon is, turn the page and start the next section. **Congratulations!!!!**

CREATING FILES

The main purpose of this section will be to create a text and graphic file in student1's home directory. These files will be used during the backup and restore sections of the next learning activity. Besides creating the files, this section will spend a little time exploring the UNIX file system.

Exploring Directories

7. Login as **student1**. After a few seconds student1's WorkSpace will appear.

If there are lines between the white folders, skip step 8.

8. Position cursor anyplace in the WorkSpace. Press and hold the right mouse button to display the WorkSpace menu. Drag through the items until the arrange submenu appears. Drag through the submenu until show path is highlighted. Release the mouse button.

The little folders, which is the symbol used for a directory, should now be connected by lines. This illustrates the path to student1's directory. This also can be written as: /usr/people/student1 In other words, student1's WorkSpace is found in student1 directory, which is found in the people directory, which is found in usr directory, which is found in the / or root directory. Let's see what is in some of these directories.

9. Position the cursor over the root directory (top one) and double-click the left mouse button. A new window illustrating the contents of root directory should appear.

10. Position the cursor over the stand directory and double-click the left mouse button. What three files are found in this directory?

    _____

11. Close the stand directory as follows: position the cursor over the minus sign found in the upper left corner and double-click the left mouse button.

12. Close the / directory using the same method.

13. Open the usr directory. (Use the same procedure as you did in step 9).
    Locate and open the adm directory.
    Continue with the next step.

LOOKING AT SYSLOG

One item of interest in this directory is SYSLOG, which logs system activity. Since it does log errors seen while the operating system is running, it can be a useful fault isolation tool.

14. Open the SYSLOG file.
    Position the red box outline so it fills the screen, then press the left mouse button.
    Use the scroll bar on the right to move through the file.
    Check the last activity. It should be your login.

A nice feature is "find". It allows you to search the entire log for an expression. That expression could be the word "error" or some other key word that will help you find some information about a malfunction. To use this feature follow the directions in the next steps.

15. Position the cursor over the word "find". It will turn blue.
    Press and hold the left mouse button.
    Drag down until "Regular expression..." is highlighted, then release the mouse button.

16. Type **student1** login name in the space provided and click the "Search" button.

17. Click the "Cancel" button to close the find regular expression window.
    Close the SYSLOG file by double-clicking the minus sign in the upper left corner.
    Close the adm directory.
    Close the usr directory.

There is another way to examine the SYSLOG, but it requires that you know the complete path name. Record the path at this time: /usr/adm/sys log, you will use it later.

There are many interesting items in the file system that one could spend a lot more time looking at, but you need to move on. To create the two files certain applications are required. Use the steps on the next page to see if they are part of your WorkSpace.

FINDING JOT AND SHOWCASE

To create a text and graphic file you need the "jot" and "showcase" applications. Check your WorkSpace for those two icons. They should be positioned along the right side. If they both appear, go to step 20. If either application is missing, execute steps 18 and 19.

18. Position the cursor anyplace in the WorkSpace. Press and hold the right mouse button to display the WorkSpace menu. Drag through the items until the "Fetch Icon" is highlighted, then release the mouse button. A Fetch Command window will appear.

19. To add jot to your WorkSpace type: /usr/sbin/jot then click "Accept button.
    To add showcase to your WorkSpace type /usr/sbin/showcase then click Accept" button.

When both applications are present, continue with step 20 found on the next page.

Creating a Text File

20. Position the cursor over the "jot" icon and double-click the left mouse button. A red outline of a window will appear.

21. Position the outline to fill the window, then press the left button. You are now ready to type your text file. Go ahead enter anything, one or two sentences are fine. Go to the next step when you are ready to save.

22. Position the cursor over the word "File". It will turn blue.
    Press and hold the left mouse button.
    Drag down until "Save" is highlighted, then release the mouse button.
    A "Save File As...." window appears.

This window allows you to control two key elements of the save: file and directory. The directory is the space at the top that indicates the pathname to the location where this file will be stored. It should be pointing to the WorkSpace in your home directory. The file is the space located toward the bottom that contains the name you will assign to this file. At this time the word "untitled" is in that space. Use the next step to change that to "text1".

23. Position the cursor over the blue bar that appears in front of the letter u in "untitled".
    Press and hold the left mouse button.
    Drag to the right until the entire space is gray, then release the mouse button.
    Type: *text1* , then click the "Save" button.

24. Close the file as follows:
    Position the cursor over the word "File". It will turn blue.
    Press and hold the left mouse button.
    Drag down until "Quit" is highlighted, then release the mouse button.

You should now see a new icon titled "text1" on your WorkSpace. The complete pathname to that file is: /usr/people/student1/WorkSpace/text1. Repeat steps 20 through 24 if the icon did not appear. If the icon is there, draw a picture using the steps found on the next page.

Creating a Graphic File

25. Position the cursor over the "showcase" icon and double-click the left mouse button.

26. Since this is your first time using showcase, a getting started window will appear. Double click the minus sign in the upper left corner to close the help window and expose the Master Gizmo window.

27. Draw a rectangle as follows:
    Position the cursor over the rectangle symbol in the Master Gizmo window.
    Press the left mouse button once. The symbol should be highlighted.
    Move the cursor over the drawing area.
    Press and hold the left mouse button
    Drag down and toward the right to form a rectangle.
    Release the mouse button.
    Move the cursor away from your new rectangle and press the left mouse button.

Try some other features from the Master Gizmo menu. Since it is not important what you draw, go ahead and have fun. When complete, save the graphic as follows:

28. Position the cursor over the word "File".
    Press and hold the left mouse button.
    Drag down until "Save" is highlighted, then release the mouse button.
    A window asking for the file name appears.

29. Type: *graphic1*, then click the "Accept" button.

30. Close the file as follows:
    Position the cursor over the word "File".
    Press and hold the left mouse button.
    Drag down until "Quit" is highlighted, then release the mouse button.

You should now see another icon titled "graphic1" on your WorkSpace. The complete pathname to that file is /usr/people/student1/WorkSpace/graphic1. Repeat steps 25 through 30 if the icon did not appear. If the icon is there, proceed to the next step.

Second Method to View SYSLOG

Let's take a look at the second method to view the system log. I'm sure by now you have noticed that the neat WorkSpace window doesn't always appear. When this happens you need to execute a UNIX command which will view the contents of SYSLOG. Try the following steps.

31. Logout. If you forgot how to use these steps:
    Move the cursor to a location outside of your WorkSpace.
    Press and hold the right mouse button.
    Drag down until "Logout" is highlighted, then release the button.

32. Login as "root".
    Open either a new shell window or the console.

33. Position the cursor inside the new window.
    At # prompt type: *more /usr/adm/SYSLOG*
    then press <Enter>.

The SYSLOG contents are now displayed. Press <space> until the # prompt appears. You can now use the scroll bar along the side and bottom to view the entire log. Try the bars at this time. Look for the last time student1 logged in.

Using the UNIX command *grep* is one method to search the file for a pattern. Try the example shown in the next step.

34. At # prompt type: *grep student1 /usr/adm/SYSLOG*
    then press <Enter>.

This command outputs to the display all lines which contain the pattern **student1.**

35. At # prompt type: *exit*
    then press <Enter>.

ADDING A TERMINAL

As promised in learning activity 1-C, here is your chance to add a terminal. Execute the steps even if you don't have a terminal you can attach to serial port 2.

36. Open the port window as follows:
    If you are not logged in as root, do so at this time.
    Select "System Manager" from the System Toolchest.
    Double-click the "Serial Ports" icon to open the serial port window.
    Double-click "port 2" icon to open the port window.

37. Enable the port as follows:
    Position the cursor over the Terminal button.
    Click the left mouse button once.
    Select the baud rate and terminal type. (9600 and vt100 are the defaults)
    Press the "Accept" button.

The word "Terminal" should now appear under "port 2" icon. If it is, use step 38 to logout; otherwise repeat steps 36 and 37.

38. If you have not already done so, click the "quit" button on both the serial port and system manager window.
    Logout.

SUMMARY

This concludes your exercise in adding users, creating a text and graphic file and adding a terminal. You should know how to:

- add a user
- check the contents of SYSLOG
- create a simple text and graphic file
- add a terminal

Proceed to the next learning activity, where you will backup your two new files.

Learning Activity 2-B. Reference Reading/Lab:
Backup, Restore, and More

Anyone who has spent more than twenty minutes re-entering lost data knows the importance of a backup. I'm sure you have been involved with more than one customer who has lost hours and maybe even days because regular backups were not performed. Everyone knows you should backup, but for some reason they just don't. When you complete this activity you should be able to assist the customer in file system backups and restores and understand the importance of doing regular backups. This activity will take about 4 hours.

INTRODUCTION

Before starting the actual steps of this activity let's take a short look at the backup/restore tools, strategies, and levels.

As a 910-200 user you can select one of three backup/restore tools: System Manager, System Administration, or UNIX commands. Under the System Manager, the system uses icons and multiple windows to guide you through backup and restore. System Administration or sysadm uses a menu method to complete the operation. Both these tools take the information you provide to build the UNIX commands necessary to accomplish the backup and/or restore. The last tool is to use a shell and write the complete command yourself. This method is preferred by those individuals who know their UNIX commands and system administration.

Backup strategies vary from none to very complex, in which a month's worth of backups may be saved. To understand strategies you need to consider what is being backed up. Most systems consist of a root (/) and one or more usr (/usr) file systems. The root file system is fairly static. It changes when users are added, networking is changed, or a software package is added. The usr file system, which contains user accounts, changes on a daily basis. This leads to the basic strategy of backing up the entire file system (root and all usr) once a week and then doing daily backup on the usr file system for the next six days. On the eighth day, start the sequence over again with another set of tapes. This is repeated for an additional three or four weeks. In total, 28 backups will be made, 4 entire and 24 daily. How long tapes are kept depends on the user.

There are three levels of backup: entire, incremental/daily, and file or directory. As indicated above, an entire backup saves all file systems (root and usr). An incremental backup saves only those files that have changed since the last backup. A file or directory backup saves only a specific file or directory.

The activity will simulate (at a simple level) the same situation that customers face when

backing up files. The situation created will allow you to do a file, entire, and incremental backup. Once the backups are complete, you will crash the system and then use the backup tapes to restore the file systems.

This activity consists of these eight sections:

- backup text1 and graphic1 file; then delete files from system
- entire system backup
- add more users and add system to a network
- incremental backup
- crash the system
- recover from crash using entire backup
- incremental restore
- file restore

Since the recover/restore sections require the backup tapes from the first sections, these steps must be done in order. Although the backups and restores are the main objective of this activity, adding more users, and adding the unit to a network will all help to create a more realistic simulation.

The steps found in each section are not difficult if you know the basic mouse techniques learned in learning activity 1-A. If you have performed a task in a previous learning activity, the individual steps to completing the task will not be given. If the task is new, detailed steps will be provided.

Before starting the first section ensure you have the following items:

- tape titled "Entire Backup 1 of 2"
- tape titled "Entire Backup 2 of 2"
- tape titled "Incremental Backup"
- tape titled "File Backup"
- CD titled IRIX Execution plus Maintenance 4.0.1

If you have all of the above items, start section 1 now.

SECTION 1: BACKUP BY DIRECTORY or FILE

In this section you will backup only the text and graphic files created in the last learning activity. When the backup is complete, you will purge the files from the system.

1. Insert the quarter inch tape labeled "File Backup" into the tape drive.

2. Record below the complete pathname for the text and graphic files created in the last learning activity. The system is case sensitive, so don't change those capital letters to lower case.

   text file pathname: _____

   graphic file pathname: _____

3. Login as root and start the System Manger as follows:

4. Double-click the "Backup & Restore" icon.

5. Verify the tape drive information is correct and backup is selected.
   Click the "Accept" button.
   If a caution window appears, follow any directions given; then click the "Accept" button.

6. Click the "by Directory" button.

7. In the space provided, type the complete pathname to both files. Put a space between the two pathnames. The field provided will only show the last pathname entered, but both will be backed up.

8. Click the "Start backup" button.

This backup will take only seconds. It is complete when the "End backup" button is highlighted and the files backed up are displayed in the window above the three backup control buttons. If both the text1 and graphic1 files are displayed, go to the next step. If not, repeat steps 7 and 8.

9. When the backup is complete, click the "Quit" button to close both the Backup and System Manager windows.

10. Logout as "root" and login as **student1.**

11. When the WorkSpace appears, remove your files as follows:

    - Position the cursor on "text1" file icon; then click the left mouse button. (icon turns yellow)

    - Move the cursor to an unused position inside the WorkSpace window.

    - Press and hold the right mouse button. Drag through the WorkSpace menu until "Remove" is highlighted; then release the mouse button. (text1 icon disappears)

    - Repeat the same three steps to remove "graphic1" file.

12. Logout.

Remove the tape and put it in a safe place. You will use it during section 8.

SECTION 2: ENTIRE BACKUP

This backup is normally done after the customer has loaded a new operating system, customized it and is ready for production. This way all the work of adding users, terminals, networks, etc. is saved. For the system you are working on, this backup will take about 30 minutes. Follow the steps below to complete this backup.

1 Insert the quarter inch tape labeled "Entire Backup 1 of 2" into the tape drive.

2. Login as "root" and start the System Manger.

3. Double-click the "Backup & Restore" icon.

4. Verify the tape drive information is correct and backup is selected.
   Click the "Accept" button.
   If a caution window appears, follow any directions given; then click the "Accept" button.

5. Verify the "All" button is selected; then click the "Start backup" button.

This backup will take approximately 30 minutes. When tape 1 is full, a notifier window will ask you to change tapes. Remove tape 1 and insert the tape labeled "Entire Backup 2 of 2" into the tape drive; then click the "Continue" button. When the "End backup" button is highlighted, continue with the next step.

6. Click the "Quit" button to close only the Backup window.

Remove tape 2 from the tape unit. Place both tape 1 and 2 in a safe place. You will need these after you crash the system.

SECTION 3: ADD MORE

The adding of more users and adding the unit to a simulated network will fulfill two objectives. First, the addition of these items will change various files in the system and thus give you a reason for an incremental backup. Second, the act of adding this unit to even a make-believe network will help you understand the information required to do the task.

Adding More Users

This is the same procedure used in learning activity 2-A. For these users, you do not need to supply any detailed information.

1. Login as "root" and start the System Manger.
2. Double-click the "Users" icon.
3. Add three more users. Use: **student2, student3,** and **student4** as the login names. You **DO NOT** need to supply the detailed information for these users.
4. Quit the Users window.

This section continues on the next page.

Adding Unit to a Network

The steps that follow will demonstrate what must be done to add this unit to a distributed network. In this type of network you can access other units on the network, but are responsible for managing your own workstation. For more detailed information about networks see chapter 3 of the Personal System Administration Guide (document number 007-1366-010).

For this simulation the network consists of three units:

Hostname	IP Address	Hostname Alias
bill.est.cdc.com	129.179.45.1	bill
jim.est.cdc.com	129.179.45.2	jim
jean.est.cdc.com	129.179.45.3	jean

The unit you are working on has a host name of "trainer.est.cdc.com", IP address of "129.179.45.4", and a hostname alias of "trainer".

The following steps will add your unit to this network. Since the unit is not attached to a real network, you will see Notifier windows that indicate the system could not get a response from the network. Always click the button that allows you to continue.

5. Double-click the "Networking" icon.

6. Double-click on the "Local Workstation" icon.

7. If a notifier window appears, click the "Continue" button.

8. When the Local Workstation form appears, verify the host name, IP address, alias is correct. If correct, go to the next step. If incorrect, do the following:

   - If the "Off" is not highlighted, click on it.
   - Click on the item to be changed.
   - Use <Backspace> to remove unwanted items.
   - Type in new data.
   - When all items have been changed, click the "On" button.

9. Click the "Accept" button.

Click the "Cancel" button if this message appears: "Are you ready to shutdown and restart the system to accept your changes."

10. When the Networking window appears, click the "Networks" button.

A new window appears with a 129.179 network icon. The next steps will add the hosts that "trainer" can access on the network.

11. Double-click the 129.179 network icon to open the 129.179 window.

12. Click the "Add" button to open the Add new host window.

13. Complete the three fields using the information give about each host.

14. When complete, click the "Accept" button.

15. A Caution window stating you are unable to communicate with the selected host should appear. Click "Accept" button to continue. Repeat steps 12 through 14 to add the other two hosts.

16. When all hosts have been added, click the "Cancel" button to close the 129.179 window.

17. When the Networking window appears, click the "Hosts" button. Verify that all three hosts appear. If they do, go to step 18. If they do not appear, repeat steps 10 through 15.

18. Quit the Networking window and the System Manager window.
    Shutdown the system.

19. Boot the system.
    Verify that the new users appear on the login screen.

Before going to the next section, let's reflect on what you have done and where you are in relation to the overall objective of this activity. What you did in this section is very typical of a site administrator, add users, add this unit to a network, and identify other hosts on that network. What you did was not that complex, but I'm sure you would rather backup this data, than enter it again. You are now in the prefect place to do an incremental backup, which will save all changes made since you did the entire backup. The next section will do the incremental backup.

SECTION 4: INCREMENTAL BACKUP

You have just made some changes to the system, and need to save those modifications. Use the steps below to create an incremental backup.

1 Insert the quarter inch tape labeled "Incremental Backup" into the tape drive.

2. Login as "root" and start the System Manger.

3. Double-click the "Backup & Restore" icon.

4. Verify the tape drive information is correct and backup is selected.
   Click the "Accept" button.
   If a caution window appears, follow any directions given; then click the "Accept" button.

5. Click the "by Date" button.

The date that appears should be the date you made the entire backup in section 2.

6. Click the "Start backup" button.

This backup will take three or four minutes. The system is searching the disk looking for those files that have changed since the last backup. When one is found, only that file is written to tape. You should see a lot of disk activity while the tape stops and starts.

7. When the "End backup" button is highlighted, click the "Quit" button to close the Backup window.

8. Close the System Manager window.

Remove the tape from the tape unit and place with tape 1 and 2 from section 2. You will need this tape in a later section.

You have now created the following backups: file, entire, and incremental. The next section will crash the system.

SECTION 5: CRASH THE SYSTEM

Now that you have all the backup tapes in a safe place, the time has come to crash the system and see if your backups are any good. In this section you will destroy a few lines of a file called "inittab", which is read by the operating system as it comes up. What you remove, will prevent the system from coming up. You will be using the vi editor to remove these lines. If you have never used or are not sure how to use vi, just follow the steps below.

1. Login as "root".
   Open the console window. (Click the console icon)
   Move the cursor inside the new window.
   At the prompt type: *vi /etc/inittab* then press <Enter>.

2. Using the down arrow key, move the cursor down to this line:

   is:2:initdefault

3. Press <d> twice to delete the line.

4. Repeat step 3 nine times. When you finish the cursor will be positioned on a # symbol.

5. To write your changes and quit the vi editor follow these steps exactly as listed. Remember what appears inside the < > is a key.

   Press and hold <Shift>; then press <:>.

   Press <w>; then <q>.

   Press and hold <Shift>; then press <!>.

   Press <Enter> to write the file and quit.

6. Try to shutdown the system. Since you have removed the code needed to do a shutdown, the actual shutdown will not happen. If the system shuts down repeat steps 1 through 5. If it does not shutdown, power off the unit.

7. Power on and attempt to boot the operating system. When it asks you to ENTER RUN LEVEL: type <2>, then press <Enter>. If the operating system comes up, repeat steps 1 through 5 . If nothing happens (system is hung), you are ready for the next section. Power off the unit and turn the page.

SECTION 6: RECOVERING FROM A CRASHED SYSTEM

Time to see if your backups are good. The recover has two major steps. First a program called Miniroot, is copied to the swap partition on the disk. Control is then turned over to Miniroot which will recover the system. The steps are not complex, but there are a few pitfalls. Follow these steps to recover the system.

1. Before you start, locate the backup tapes (all four) and the CD titled "IRIX Execution plus Maintenance 4.0.1". Place the CD in the caddy at this time.

2. If you did not remove power from the 910-200 in the last section, do so now.

3. Ensure both the external drives are powered on.
   Power on the 910-200 and enter System Maintenance Menu.

4. Press <4> to select Recover System option.

The message on the screen should be prompting you to select the installation device that contains the Miniroot program. The program is located on the distribution media, which for you is CDROM.

5. Press <1> to select CDROM, then press <Enter>.

6. When this message appears:

   Insert the installation tape, then press <enter>:

   Insert the caddy into the CDROM drive and the "Entire Backup 1 of 2 " into the tape drive.
   Press <enter>

7. When a second message asking for the installation device appears, press <1>;
   then press <Enter>.

Miniroot is now being copied to the swap partition on the disk. The disk activity LED should be blinking and dots appear on the screen. This will take about ten minutes. Once loaded, control is turned over to Miniroot which provides prompts to complete the procedure. If this is your first time follow the steps starting on the next page.

8. If you inserted the first Backup tape in step 6, press <Enter> for the first two prompts asked by the installation program. The prompts are:

   Restore will be from /dev/tape. OK? [y]es, [n]o: [y]

   Insert the first Backup tape in the drive, then press (<enter>, [q]uit, [r]estart:

After the pressing <Enter> the second time, the installation program reads the entire tape. This will take about 22 minutes. Notice there is no disk activity. It appears that the program is only checking the files on the tape. When done with tape 1, it will ask for tape 2.

9. When the prompt asking for the second tape appears, remove tape 1 and insert tape 2; then press <Enter>.

If this was a full tape, it would take another 30 minutes. It will take about 5 minutes to read tape 2. You would repeat step 9 if you had more tapes. When all tapes have been read, the message shown below is displayed.

Erase all of filesystems and make new ones (y, n, help): [n]

DO NOT PRESS ANY KEYS UNTIL
YOU HAVE COMPLETELY READ THE NEXT PARAGRAPH.
START AGAIN WITH STEP 10.

Here is where many people go astray. It is best to answer this question with <Enter>, which selects the default of no. An answer of "no", will preserve any filesystems (not files) created after the backup was made. When <Enter> is pressed, the act of recovering the system from the tape will start. The installation program assumes tape 1 is now in the drive. If you forget to remove the last tape and insert tape 1, a very hard to interpret message is displayed. To recover from this message, insert tape 1 and press <r> to reload.

10. Remove tape 2 and insert tape 1;
    then press <Enter> to start the recovery.

Tape 1 will take about 30 minutes. This section continues on the next page.

11. When prompted, remove tape 1, insert tape 2; then press <Enter>.

Repeat step 11 until all tapes have been loaded. When done, these messages appear:

Restoring the disk volume header.
Volume header restored.

Restore incremental backups ([y]es, [q]uit): [q]

If there were incremental backup tapes you would insert them at this time and press <y>. The same message appears after each tape is loaded. You have an incremental tape backup, but don't load it at this time.

12. Press <q> to quit restore.

This causes miniroot to do some final work, shut itself down, and reboot the real operation. A few of the messages that appear during this time period are shown below. No response is required.

Running MAKEDEV in case devices have changed since backup.

Recovery complete, restarting the system.

After a few seconds, the familiar login screen should appear. If it does, go to the next section to recover the files that were changed since the entire backup was made.

SECTION 7: INCREMENTAL RESTORE

You have just restored from a crash by using the entire backup tape. Use the steps below to restore the incremental backup.

1 Insert the quarter inch tape labeled "Incremental Backup" into the tape drive.

2. Login as "root" and start the System Manager.

3. Open the "Users" icon.
   Verify that users **student2, student3,** and **student4** are not there.
   Close the Users window.

4. Open the "Networking" icon.
   Verify hosts bill, jim, and jean are not there.
   Close the Networking window.

5. Open the "Backup & Restore" window.

6. Click the "Restore" button.
   Click the "Accept" button.
   If a caution window appears, follow any directions given; then click the "Accept" button.

A Wait window appears over the Restore window as the tape header is read.

7. In the "Restore these directories and files:" field, type /

The / entry is like a wild card. It causes all files starting with / to be restored. Since all files have / as the first directory in their pathname, all files on this tape get restored. Another method is to select list, then highlight the files in the listing that you want restored.

8. Click the "Start restore" button.

9. When the "End restore" button is highlighted, close the Restore window.

10. Check the Users window to see if the users (**student2, student3,** and **student4**) have been restored.
    Check the Networking window to see if the hosts (bill, jim, and jean) have been restored.

11. Close all the windows and logout; then go to the next section.

SECTION 8: RESTORING THE FILES

You have restored the system to the state it was before the crash. All users are present and all hosts have been added. Student1 would like the text1 and graphic1 files restore. These are works of art that need a little modification.

1. Login as student1.
   Verify "text1" and "graphic1" are not in the work space.
   Logout.

2. Login as root and start the System Manager.
   Open the "Backup and Restore" icon.

3. When the Backup and Restore window appears, click the "Restore" button; then click the "Accept" Button.

4. When the Caution window appears, insert the tape labeled "File Backup" tape in the drive; then click the "Accept" button.

A Wait window appears over the Restore window as the tape header is read.

5. When the Wait window disappears, enter the exact pathname for "text1" file in the space provided. See step 2 on page 2-15 if you forgot the pathname.

6. Click the "Start restore" button.

7. When the "End restore" button is highlighted, type the pathname for "graphic1" file in the space provided; then click the "Start restore" button.

8. When the "End restore" button is highlighted, close the Restore window; then close the System Manager window.

9. Logout; then login as **student1.**
   Verify the two files are now present.

If the files are present, **CONGRATULATIONS** you did it, logout and continue on to the next page. If the files did not get restored, try steps 2 through 8 again.

SUMMARY

This concludes a very long activity on backup and restore. You should now know how to:

- backup an individual file or directory
- backup an entire system
- backup only changes made to the file system
- install a unit on a network
- recover from a crashed system
- restore an incremental backup
- restore an individual file

If you were able to complete all sections of this activity, **CONGRATULATIONS.** If you were not, don't worry, in the next activity you will format the disk and install a new operating system.

Learning Activity 2-C. Reference Reading/Lab: Scratch Install

It sure would be nice if we lived in a perfect environment where disks never fail and software installed at the factory never needs to be updated. Disks do fail a lot less often than they did in the past, but they are not perfect yet. And what can you say about software? It seems that a new version, release or update always needs to be installed. Let's face it, it is hard to escape from disk formats and software installations all your life. In this learning activity you will format the system disk and install the base operating system from CD-ROM.

INTRODUCTION

Before starting the steps of this activity, let's cover/review the software installation terminology used by most system administrators. (It is always nice to talk the language).

A good starting point is to realize that what we are talking about is products. A product is a collection of files that can be installed in your unit to perform a given task. For SGI, things like eoe1 (execution only environment one), eoe2, showcase, Fortan 77 compiler, Network, and NFS are all products. When a product or products are placed on a media (tape or CD) for distribution, a software distribution has been created. When this tape or CD is inserted into a drive, a software distribution source has been created.

There are six possible software distribution sources: local and remote tape, local and remote CD-ROM, and local and remote distribution directory. After the long boot activity in module 1, the first four sources are self-explanatory. Distribution directories are created by copying software distributions from tape or CD to a directory on a disk. If the drive or directory is on the same unit you are installing software, it is a local distribution source. When the drive or directory is on another unit that is accessed across the network, it is remote.

Some software distributions also contain installation tools. These are a set of files that are copied into the swap partition of the system disk to create an installation environment called miniroot.

There are two types of software releases: Software Product Releases and Maintenance Releases. A Software Product Release is a software distribution that contains all of the files in that product. Since not all files of a released product are bug free, a device is needed to distribute only those files of a product which require fixes. A Maintenance Release is that device. It usually contains fixes or updates for more than one product. They are commonly named maint. If more than one media is needed, they would be called maint1, maint2, etc.

The last item for discussion is the order of installation. Most of the time there will be more than one software distribution to install. Because some products require that other products be installed first, the distributions must be installed in the correct order. The basic order is: installation tools, Software Product Releases, and then Maintenance Releases. A sequence number is placed on the tape or CD label to help you put the media in the correct order. Once sequenced, start the installation process using the media with the lowest number. If two tapes or CDs have the same sequence number, their order of installation does not matter. If a single tape or CD has two numbers, then that media is used twice during the installation.

Take a look at the sequence numbers on the software distribution disk shipped with your system. You will find three numbers on it: 200, 300, and 800. 200 is the standalone program like sash, and miniroot, 300 is eoe1, eoe1 and other products needed for the operating system, and 800 is the fix/update files of maint1. If there were other software distribution CDs they could be numbered 500, 600, 600, and 700. The order of installation is therefore obvious, 200, 300, 500, 600, 600, 700, then 800. Thus the one CD is used three times in this example.

This completes a look at a few of the commonly used installation terms and an overview of the installation process. Having read these paragraphs does not make you a master installer. The first six chapters of the IRIS Software Installation Guide, document number 0077-1364-010 cover the installation procedures. They present examples of different installation situations. When you get involved with an installation, refer to the appropriate chapters for help.

In this activity, you will format the disk and then perform an installation of the operation system from local CD-ROM. The software distribution is the CD titled "IRIX Execution plus Maintenance 4.0.1", therefore the distribution source is the CD-ROM drive. Since there is only one CD, the order of installation is: installation tool miniroot (200), then the Software Product Release (300).

When you are ready, start with the format procedure found on the next page.

FORMAT DISK

In this section you will use the fx (format exerciser) program loaded from the software distribution source to format the system disk. Since the program is menu driven, the actual steps to format the drive are not complex. But what is important is the sequence.

1. A good starting point is to record some required data.

   pathname to fx on CDROM: _____
   disk drive device type name: _____
   controller address number: _____
   drive address/ID number: _____

2. If the 910-200 and CDROM drive are not powered on, do so at this time. Position the unit at the >> prompt.

3. Place the CD titled "IRIX Execution plus Maintenance 4.0.1" in the caddy. Insert the caddy in the drive.

If you are installing a new disk, sash is not located in the volume header of the disk. Thus you need to write two boot commands: one to boot sash from CDROM and a second to boot fx from CDROM. If you forgot, check learning activity 1-D.

4. Boot sash from the CDROM.

5. When the sash prompt appears boot the fx program.

After a few seconds this message appears on the screen.

   Currently in safe read-only mode.
   Do you require extended mode with all options available? (no)

The program is asking if you want write capability. Since you will be formatting which is a write function, you will need all options available.

6. Type <y>; then press <Enter>.

7. Check the device-name. If correct press <Enter>; otherwise type correct name, then press <Enter>.

8. Check the controller address number. If correct press <Enter>; otherwise type correct number, then press <Enter>.

9. Check the drive address number. If correct press <Enter>; otherwise type correct number, then press <Enter>.

After a few messages, fx top menu appears. Because you answered yes to the extended mode question, there should be eight options available. Some of these options have sub-menus, which will have sub-menus. To move back a level or menu type <..>; then press <Enter>. To select a menu choice, type the shortest unique prefix then press <Enter>.

CDC Engineering Services has developed a four step approach that usually ensures the format operation is successful. The major steps are: create and write label, format, write the label again, then exit. The next steps list the actions required to complete each of these tasks.

10. Create and write the label as follows:
    - At fx> prompt select "label".
    - At fx/label> prompt select "create".
    - At fx/label/create> prompt select "all".
    - After four messages the fx/label/create menu will appear.
    - Return to the fx/label menu.
    - At fx/label> prompt select "sync" to write the label to disk.
    - When the write is complete, the fx/label menu appears.
    - Return to the fx menu.

11. Format the disk as follows:
    - At fx> prompt select "format".
    - Press <Enter> to select current drive parameters in formatting.
    - A warning message about destroying data should appear next.
    - Type: *yes* ; then press <Enter>.
    - A message indicating the process will take about 15 minutes appears.

At this point the disk activity LED should be a solid green and nothing new appears on the screen. When the format is complete the fx menu will be displayed. Continue with the next step.

12. Write the label again as follows:
    - At fx> prompt select "label".
    - At fx/label> prompt select "sync" to write the label to disk.
    - When the write is complete, the fx/label menu will appear.
    - Return to the fx menu.

13. Exit fx as follows:
    - At fx> prompt select "exit".

When <Enter> was pressed for that exit command, fx terminated and control was given to PROM, which displays the System Maintenance Menu. Your disk is now blank. Try to load the system or try to boot sash from >> prompt.

This section only used the fx choices required to format a disk. I'm sure you noticed there were many other options that may be useful. The program does contain a very good disk exercise option and a method to view the partition information. Since there is no way you can damage the drive at this point, reload fx and try some of the other menu choices.

When you feel comfortable with using fx, proceed to the next section.

INSTALL SYSTEM SOFTWARE

Time to install the IRIX system software. Remember this is not done that often. Most of the time your customer can recover using the backup tapes. If that fails or there are no backups, an installation is required. Like the Recover System procedure used in learning activity 2-B, software installation is a two step operation. First miniroot is loaded. After miniroot checks for file systems, control is turned over to the install program (also called inst) to install the software. For this section you will use the CDROM drive as your load device. The steps that follow will guide you through the installation.

14. Ensure the CD titled "IRIX Execution plus Maintenance 4.0.1" is in the drive.
    Position the unit at System Maintenance Menu.
    Select option 2, "Install System Software".
    Select CDROM as the installation device.
    Press <Enter> to the insert installation tape message.
    Again, select CDROM as the installation device.

The miniroot program is being copied to the system disk's swap partition. You should see the disk activity LED blink during this process and dots appearing on the screen. After about 3 minutes, control is turned over to miniroot, which will ask a few questions. The next steps indicate how you should respond to these questions.

15. The first prompt asks if a new file system should be made on /dev/dsk/dks0d1s0. This is the UNIX pathname for partition zero of your system disk, which is where the root file system will reside. As long as the d (device) address matches the drive the software is to be installed on, type yes; then press <Enter>.

16. The next prompt asks if a new file system should be made on /dev/dsk/dks0d1s6. This is the unix pathname for partition six of your system disk, which is where the usr file system will reside. Again, as long as the d (device) address matches the drive the software is to be installed on, type yes; then press <Enter>.

When <Enter> was pressed miniroot built a file system on the two partitions and then started the installation script.

17. When the Inst Maint Menu appears,. type: *go* at the inst> prompt; then press <Enter> to start the installation.

At this point "Inst" takes over and does the work. You should see a product description list displayed and then a message indicating installation of selected subsystems. Both the CDROM and system disk activity LEDs should be blinking. For this installation there are 26 or 27 of the installation messages. The installation of this CD is complete when this message appears:

> Installation and/or removal succeeded.
> You can insert another tape or CD-ROM now.

If there were additional tapes or CDs insert them and give the "go" command again. Since you have only one CD, exit the installation program using step 18.

18. At the Inst> prompt type: *quit* ; then press <Enter>.

A message indicating "exit commands are being run" is displayed and with some dots that indicate progress. You should also notice a lot of system disk activity. After about 40 plus dots and a please wait message, this message appears.

> Ready to restart the system. Restart? [y, n]

Remember the unit has been running a limited operating system called miniroot, that was loaded in the swap partition of the disk. Restart here means shutdown miniroot and boot the new operating system you just installed.

19. Type *y*; then press <Enter> to boot the new system.

After various messages appear on the screen, the famous login screen with icons should appear. Notice the system name is IRIS. The next learning activity will use the "sysadm" tool to perform the steps to setup system basics, like name and date.

SUMMARY

This concludes the exercise in formatting a disk and installing software from scratch. You should now be able to do the following:

- format a disk using fx
- install system software from a local distribution source

Proceed to the next learning activity.

Learning Activity 2-D. Reference Reading/Lab:
Final Steps

Well it's time to put an end to all this fun. I'm sure you have done enough logins, logouts, open windows/tools, close windows, backups, restores, shutdowns, and startups to last a lifetime. This activity has you return the unit to the same condition as you received it and pack the unit for shipping.

INTRODUCTION

When a customer gets a new 910-200 or after a Software Product Release installation, the first order of business is to set date and time, name the unit, and add the unit to a network. These all seem like straight forward tasks that should have no "gotchas". Well, like most things in UNIX that is not always true. Also, there always seems to be more than one way to do a task in UNIX.

The software installation done in the last learning activity left the time and time zone equal to Pacific Standard Time (PST) and a unit name of IRIS. For this activity you will use the sysadm tool to set time and time zone, and the unit's nodename.

Setting date and time should be run once when the machine is first setup. At this time there should be no users on the system, thus only minimum amount of files will be open. Also, be careful when setting time on a unit that is connected to a network. In that situation, the time for your unit may be controlled by a program running in one of the other units. "Playing" around with time and date in that case may affect all units on the network. Sysadm is the best tool to set time and date, because it provides an easy to follow step-by-step procedure to change time, time zone, and date. The unit must be turned off and turned back on again to guarantee that all times will be reported correctly.

The unit's name or nodename (sysadm's term) can also be set by sysadm, but it seems to work better to use the System Manager Networking tool.

Setting date and time, naming the unit, and resetting environment variables will place the unit in the same state as you received it. Training administration will be ***very happy*** if you would do this and nothing else. Unique passwords, extra logins, other applications, etc. will only cause someone to install the system and setup the unit again. We want all students to start at the same point. For the fine work done so far and are about to do:

THANK YOU

FINAL SETUP

Use the next steps to check and set (if necessary) the date, time and change the unit's name.

1. Login as "root". (Notice no password was required).
   Open the console window. (Click on the console icon).

2. Position the cursor inside the window.
   At the IRIS 1# prompt type: *sysadm* ; then press <Enter>.

3. When the SYSTEM ADMINISTRATION menu appears, select option 3 "syssetup".

4. When the SYSTEM SETUP menu appears, select option 3 "nodename".

5. Following the prompts change the name to "trainer". When done return to the syssetup menu.

6. When the SYSTEM SETUP menu appears, select option 2 "datetime".

7. Following the prompts, set the correct date, time, and time zone for where you live. When done return to the syssetup menu.

8. When the SYSTEM SETUP menu appears, select option 5 "syspasswd".

9. Following the prompts set only the root password to est200. When done return to the syssetup menu.

10. Quit the sysadm tool; then logout.

11. Check that the system is now called "trainer".
    Login as root to verify the password.

Changing the name in sysadm did not do the complete job. Execute the next steps to inform the networking tool about this unit.

12. Start the System Manager.
    Open the Networking tool (double-click the Network icon).

13. When a window indicating that this machine is in an inconsistent state appears, click the "Continue" button.

14. There should be only one icon (labeled IRIS) displayed in the window. Double-click the icon to open another window.

15. In the fields provided, enter the following values:

    - Hostname to: trainer.est.cdc.com
    - IP Address to: 129.179.45.4
    - Hostname Alias: trainer

    Click the "Accept" button

16. Close the Networking window.
    Close the System Manager window.

17. Shutdown the Operating System for the final time.

Before you power off the system, set the environment variables to the default values. If you forgot, use steps 18 and 19.

18. Position the unit at >> prompt.
    Type *resetenv*; then press <Enter>.

19. When the >> prompt returns, type *exit* ; then press <Enter>.

20. Press the 910-200 RESET button.

If the following message appears, power off the unit and continue with the next section.

Starting up the system . .
To perform system maintenance instead, press <Esc>

If the System Maintenance Menu appears repeat steps 18 and 19.

PACK IT UP

Here is the final test. Can you successfully repack all the items in the right shipping containers. This student manual and the Technical Report are the only two items you should have left when everything is packaged for shipment. Your care is really needed in packing these components in the shipping containers to ensure nothing gets damaged during shipment.

Disassemble

Follow these six steps to prepare the components for shipping.

1. Remove the system disk and place it in a static shielded bag.

2. Remove the disk caddy from the CD-ROM player.

3. Remove tape cartridge from the quarter inch tape drive and insert the head protection shipping material. Place the drive in the static shielded bag and place it in the shipping carton.

4. Disconnect all power and signal cables.
   - power cord between the 910-200 and surge protector
   - power cord between the CD-ROM and surge protector
   - power cord between the quarter inch tape drive and surge protector
   - power cord between the 910-200 and color monitor
   - SCSI cable between the 910-200 and CD-ROM drive
   - SCSI cable between the CD-ROM and quarter inch tape drive
   - SCSI terminator from the quarter inch tape drive
   - mouse from the keyboard
   - cable between the keyboard and HP1 board
   - cable between monitor and LG2 board

5. Attach the SCSI terminator to the SCSI connector on the 910-200.

6. If you have not already done so, replace the front cover of the 910-200. Open the front drive door, insert the lockbar, then close the door.

Continued On The Next Page

Packing the Components

Use the following steps to ensure the components are packed in the correct shipping container.

7. Group the equipment and cables as follows:

Group 1	Group 2	Group 3
CD-ROM drive	910-200	Monitor
quarter inch tape drive	system disk	
two SCSI cables	keyboard cable	
surge protector	monitor cable	
seven manuals & poster	four AC power cords	
four backup tape cartridges	keyboard	
software distribution CD	mouse pad	
CD-ROM caddy	mouse	
two software distribution tapes	jumper cable	
four SIMMs for Bug 6	SIMM removal tool	
	two static shield bags	
	wrist strap	
	static safe mat	

Continued On The Next Page

Caution

This monitor weighs over 40 pounds. You should seek assistance when placing it in the shipping container.

8. Carefully position the monitor in case 3 of 3 as illustrated in figure 2-1. Position the packing material over the monitor; then close and latch the case.

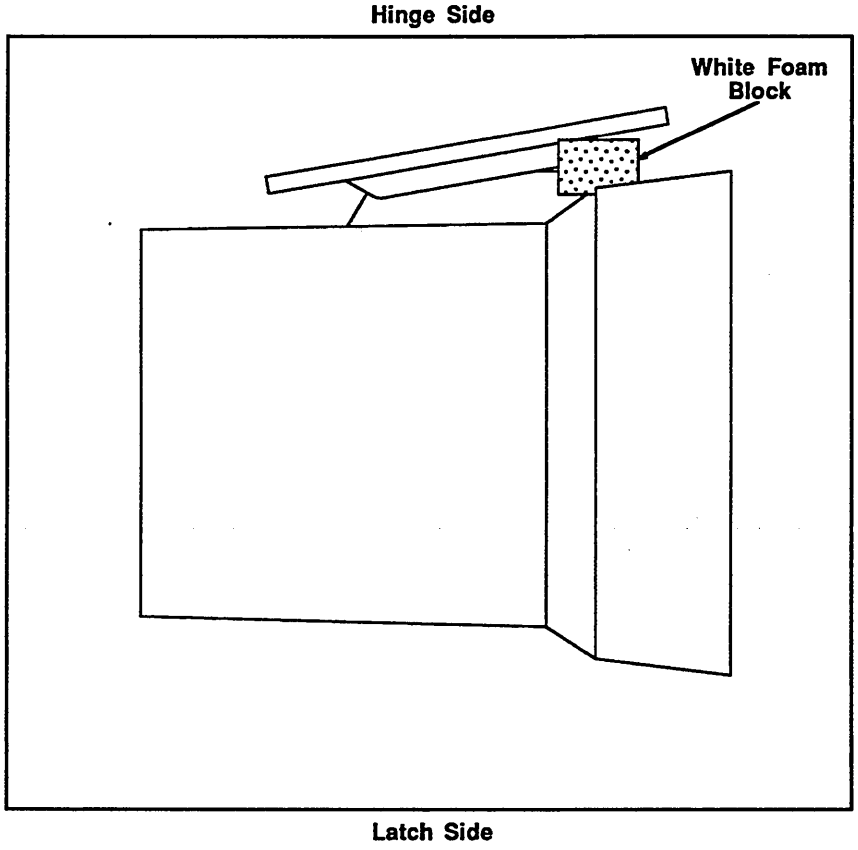

Figure 2-1. Position of Monitor in Case 3 of 3

Continued On The Next Page

9. For group 1, place the installation CD in a static shielded bag and the CD caddy in the protective shipping material. Remove the return shipping document. Pack group 1 items in case 1 of 3 as illustrated below; then close and latch the case.

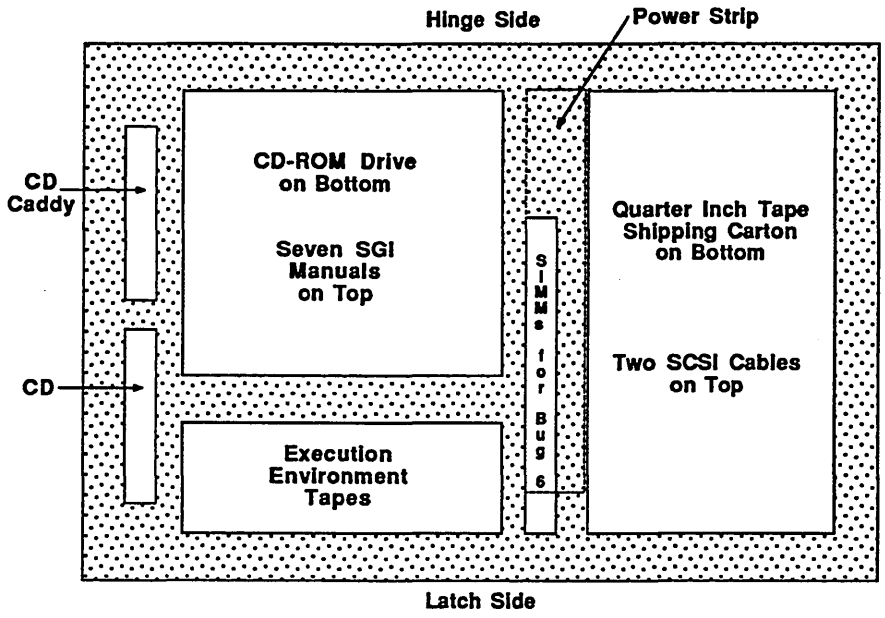

Figure 2-2. Case 1 of 3, Bottom Layer

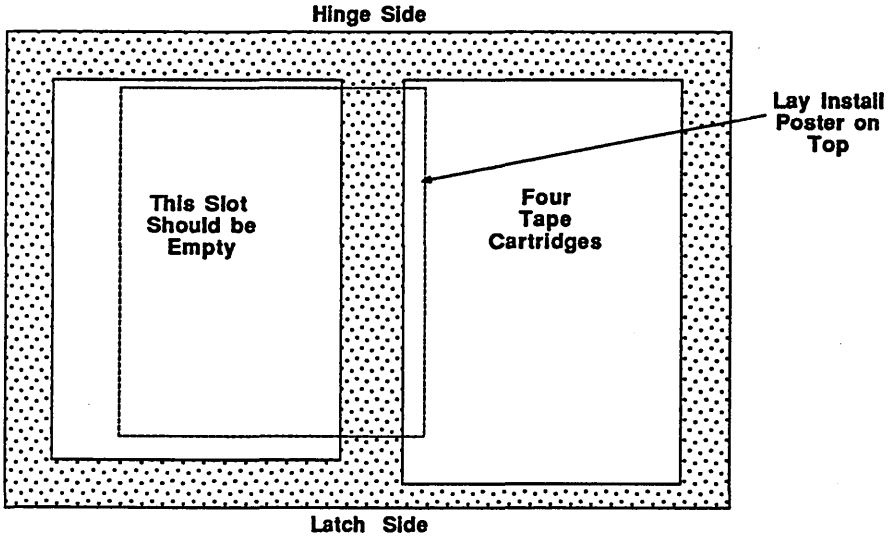

Figure 2-3. Case 1 of 3, Top Layer

Continued On The Next Page

10. For group 2, place the jumper cable, SIMM removal tool, and mouse in a small static shielded bag. Pack group 2 items in case 2 of 3 as illustrated below; then close and latch the case.

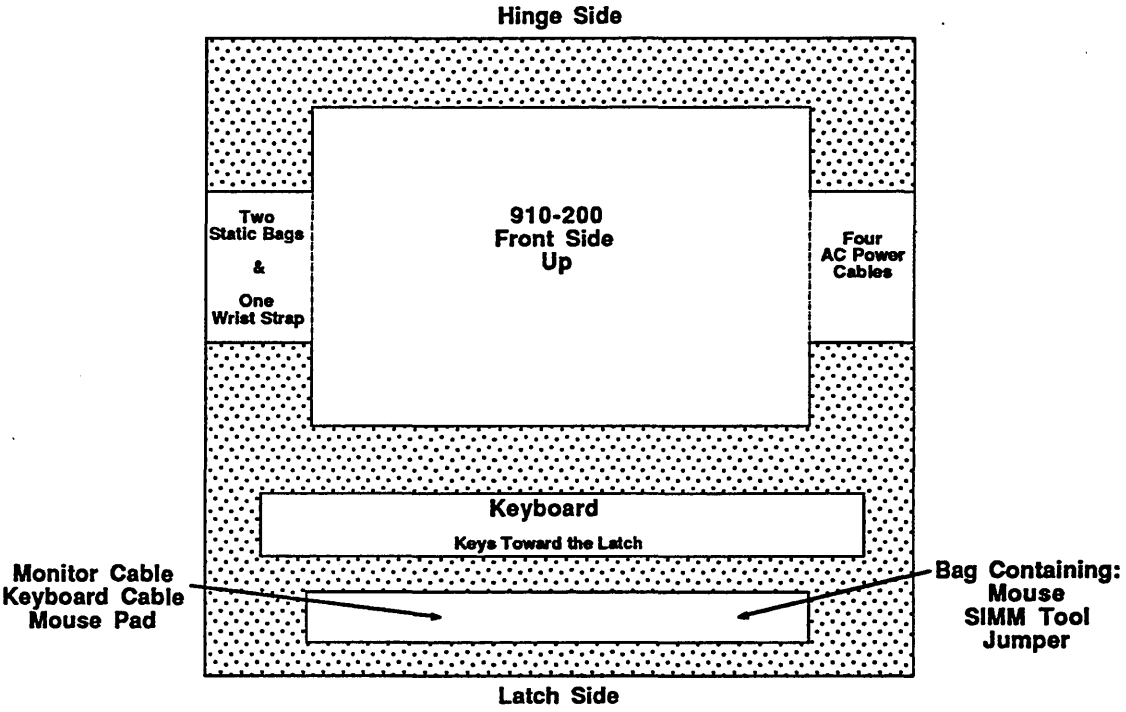

Figure 2-4. Case 2 of 3, Bottom Layer

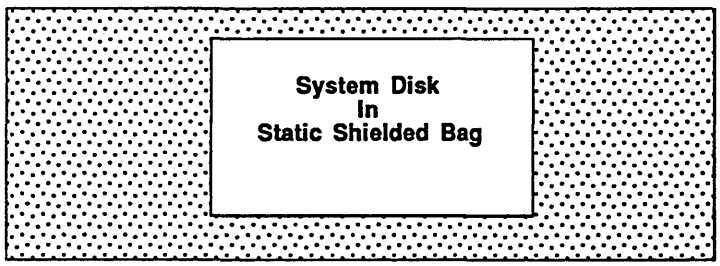

Figure 2-5. Case 2 of 3, Top Layer

Continued On The Next Page

Shipping Directions

11. Use the pre-addressed shipping document found in case 1 of 3 to ship the cases. If you did not find the document, call Jeanelle Walker at controlnet 235-2620 or 612-235-2620 for directions.

12. To help training administration track the components, please call Jeanelle as soon as the cases leave your facility.

ONCE AGAIN,

THANK YOU AND GOOD LUCK

TO PRESENT THE MATERIAL IN THIS MODULE IN A STRUCTURED FORMAT, THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK.

SAFETY PRACTICES

The safety practices outlined in this appendix serve as a reminder of some of the more common safety practices to be followed during the maintenance of equipment being taught in this course.

All customer engineers are expected to follow reasonable and appropriate precautions with respect to electrical, mechanical, and personal safety hazards while working on computer system equipment. Pay attention to all entries in the maintenance documentation labeled CAUTION and WARNING, which identify hazardous areas or procedures encountered in maintaining the system equipment. Follow these additional procedures when working on equipment.

PERSONAL

1. Ensure that no action on your part causes unsafe conditions that may expose customer personnel to hazards in any device.

2. Never work alone on equipment having exposed operating mechanical parts or exposed hazardous power components. If you must do so, notify your EIC or manager. In any case, observe the following precautions.

   a. Someone familiar with the power-off controls must be in the immediate area.

   b. Personal jewelry (rings, wristwatches, bracelets, necklaces, and so forth) shall be removed. A small box in the CE tool kit makes a good place to store these items.

   c. Avoid wearing loose articles of clothing that can be snagged and drawn into moving machinery. Wear short-sleeved shirts or roll sleeves above the elbow. Neckties should be tucked in between the second and third shirt button or fastened about 3 inches from the end with a tie tack or tie clasp, preferably nonconductive. Do not use tie-chains.

   d. Before starting equipment, make sure that no one is in a position where he/she could get hurt.

   e. While working in equipment, put red tape strips across any power controls, or use DO NOT OPERATE tags where available.

3. Keep the CE tool kit out of walkways; put them on or under a desk or table.

4. Put doors and covers removed from machinery in a safe, out-of-the-way location where nobody will trip over them or cause them to fall on top of someone. All machine covers must be restored in place before the machine is returned to the customer.

5. All safety covers, guards, shields, groundstraps, panels, and so forth shall be properly reinstalled after maintenance is finished.

6. Maintain good housekeeping practices during and following each maintenance activity. Do not permit tools, manuals, wipes, paper trash, and so forth, to accumulate in the work area and clean up after yourself.

ELECTRICAL

1. Remove all AC and DC power when removing or installing major assemblies, working inside power supplies or power control enclosures, performing detailed mechanical maintenance procedures, or doing wiring and/or module changes in the machine. If possible, turn off and lock or tag the circuit breaker in the service panel on the wall; unplug the main power supply cord.

2. Use only well-insulated pliers, screwdrivers, test leads, and so forth, when on or near live circuits.

3. Do not disconnect or otherwise disable safety grounding systems even if the equipment is powered off. These are installed for YOUR protection.

4. Avoid coming in contact with grounds, such as equipment frames, metal floor tile edgings, electrical conduits, and so forth.

MECHANICAL

1. Do not use chemicals, grease, oils, or solvents that have not been specifically approved by the equipment manufacturer for that device. These recommendations are usually based on extensive experience with the equipment in service.

2. Use the proper tools for the job. Improper use of tools can result in personal injury or equipment damage.

3. Ensure that worn parts or broken tools are replaced as quickly as possible.

4. If the machine is running, do not reach into it.

5. If using a strobelight on mechanical devices, do not reach into the device, components may be moving.

6. Safety glasses or goggles must be used if you are:

   a. Driving pins, rivetting, and similar activities.

   b. Using an electric drill, grinder, reamer, and so forth.

   c. Installing or removing springs under tension or compression.

   d. Using any type of solvent, spray, or chemical for cleaning or touch-up painting.

   e. Performing any other activity which may endanger the eyes.

7. When lifting, use a method that will not injure the spine or strain back muscles. Be realistic as to what your capacity for lifting really is.

ABOVE ALL, USE GOOD JUDGEMENT AND COMMON SENSE. A MOMENT OF THOUGHT BEFORE YOU ACT CAN SAVE HOURS OF AGONIZING AFTERTHOUGHT.

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ELECTROSTATIC DISCHARGE

This appendix contains EST's Policy and Procedure pertaining to electrostatic sensitive components.

ELECTROSTATIC DISCHARGE (ESD) POLICY 4.500

In keeping with corporate direction on electrostatic sensitive components, this policy establishes the minimum requirements and practices within Engineering Services for handling all electrostatic sensitive components.

The purpose of this policy is to minimize the impact of electrostatic discharge on components, printed wiring board assemblies and equipments, their reliability, life-cycle costs and protect the integrity of ESD control implemented at supplying divisions.

This policy is applicable to the handling, shipping, repair, and storing of microcircuits, printed wiring board assemblies, subassemblies and equipment within the scope of the manufacturing standard "1.60.010, Handling and Packaging Requirements for Electrostatic Sensitive Devices".

All semiconductors, printed wiring board assemblies, and subassemblies containing these components must be handled only by properly grounded personnel. Packaging requirements will be consistent with the practices of the supplying divisions. In most cases this will require that defective items being returned for repair be packaged in the ESD protective bags supplied with the new part and generally be subject to static safeguarding procedures detailed in CDC manufacturing standard 1.60.010. Any packaging for these parts must take place at a static safeguarding workstation. Repair and rework must be accomplished only at a static safeguarded workstation per requirements of manufacturing standard 1.60.010.

ELECTROSTATIC DISCHARGE (ESD) PROCEDURE 4.501

This procedures applies to field customer engineers handling assemblies or subassemblies containing semiconductors during equipment repair. The order of steps are only for purpose of documenting the information. In this text, the word "assembly" is used to indicate assembly, subassembly, part, module, component, pak, etc. All semi-conductors are susceptible to static discharge in varying degrees, the later technologies more than years past. Some of the old technologies, 1604, 3000, 1700, 6000 and 7000 fall into the group of low susceptibility and need not be protected with static shielded bag and wrist strap. Any assembly containing an IC

(Integrated Circuit) however, should follow the procedure and be protected regardless of age technology.

1. Assemblies must not be removed from their static shielded bag for general inspection unless it is done at a static safe workstation and the wrist strap is on and connected to the workstation.

2. Assemblies should only be handled on the edges, contact with the connectors or components should be avoided.

3. Power should be off the equipment when removing/installing ESD sensitive assemblies.

4. Assemblies must only be removed from an equipment when the wrist strap is on and connected to the equipment the assembly is being removed from.

5. Assemblies removed from an equipment to affect a repair must be placed in a static shielded bag while the wrist strap is connected to the equipment and before the assembly is laid aside.

6. A replacement assembly to affect a repair must not be removed from the static shielded bag until the wrist strap is on and connected to the equipment under repair.

7. When checking an ESD sensitive assembly in an equipment with any test device, the device leads should be first touched to ground on the equipment.

8. Assemblies received by the field in static shielded bags must be returned to GREYANX in static shielded bags.

9. Test the wrist strap monthly using an ohmmeter.

   A. Measure from the banana plug to the metal strip on the inside of the wrist strap band.

   B. The reading must be between 870K ohms and 1.5M ohms.

   C. If the value in step "B" is not in the specified range, discard the wrist strap and obtain a new one.

NOTE

The wrist strap contains a 1 Meg resistor for current limiting and user safety.

LEARNING ACTIVITY 1-A ANSWERS

System Shutdown Section

- Toolchest Method

3. Notifier window asking if you really want to shut the system down.

Okay to power off the system now.
Press any key to restart.

Starting the System. . .
To perform system maintenance instead, press<ESC>.

- Shell Method

2. 60 seconds

Two, one from adm and one from root 60 seconds apart.

It asks if you want to continue with the shutdown.

Yes, both methods produce the same "Okay to power off ....." message.

- Shutdown as Tutor

3. password

Yes, get the same "Okay to power off ....." message.

Self-check Items

1. bottom

2. False, the backplane determines the SCSI address for the slots.

3. The bottom is 1 and the top is 3.

4. False, the mouse attached to the keyboard.

5. True

6. False

7. True

8. There are three ways:
   A. Place the cursor on the tutor icon and double-click the left mouse button.

   B. Type tutor in the User Name box and press return.

   C. Place the cursor on the tutor icon and click the left mouse button.
   Press return or move the cursor to the Login Button and click the left mouse button.

9. Systems, Windows, Tools, Demos, Overview

10. C

11. C

12. Move the cursor over the Tools button in the Toolchest window.
    Press and hold the left mouse button.
    With mouse button still depressed, drag the cursor over the word "Shell".
    Release the left mouse button.
    Position the new window on the screen.

13. False, all steps are correct, except the right mouse button is used.

14. Changes the plane angle.

15. Asks for a password to continue the shutdown.

LEARNING ACTIVITY 1-B ANSWERS

Stopping the Boot Process Section

2. 1 Start System
   2 Install System Software
   3 Run Diagnostics
   4 Recover System
   5 Enter Command Monitor

Command Monitor Section

3. Command Monitor. Type "exit" to return to the menu
   >>

4. | | |
   |---|---|
   | *autoboot* | *passwd* |
   | *boot* | *printenv* |
   | *eaddr* | *resetenv* |
   | *exit* | *resetpw* |
   | *help* | *setenv* |
   | *initialize* | *single user* |
   | *inventory* | *unsetenv* |
   | *list files* | *version* |

5. Same list of commands as seen in step 4.

Password Protection Section

7. System Maintenance Menu

8. Needs a password to enter Command Monitor

9. Password cleared

Maintenance Commands Section

11. Memory Size - 16Mbytes
    Processor speed is 33MHz and a type IP12.
    Disk address is dksc(0,1)
    CD-ROM address is dksc(0,5)
    Quarter inch tape address is tqsc(0,7)

12 08:00:69:06:28:29

13. Version 4.0 Rev A, Jul 18,1991

14. dksc(0,1,8)
    sgilabel, ide, and sash

Environment Variables Commands Section

15. netaddr=192.0.2.1
    dbaud=9600
    rbaud=1200
    bootfile=dksc(0,1,8)sash
    bootmode=c
    console=g
    diskless=0
    volume=128
    path=dksc(0,1,8)
    cpufreq=33
    gfx=alive

16. New value is 255 and it was moved to the end of the list.

17. Usage: setenv setenv ENV_VAR STRING
    There are three parts to the command: the command, the variable, and the new value or string. There is **NO = sign** between the three parts, on a single space.

19. Yes, the *resetenv* returns all variable values to a default setting.

20. Remove the variable from the list.
    Yes, you get the same response.

Load Commands Section

22. The multi-user login screen.
23. The same, the multi-user login screen.
24. trainer 1# The # indicates you are in single user mode.
25. New run level: 0

Miscellaneous Commands Section

26. System Maintenance Menu
27. System Maintenance Menu

Self-Check Questions

1. <Esc> - System Maintenance Menu appears

   5 - Command Monitor >> prompt
2. *resetpw*
3. *passwd*
4. False, it is saved in NVRAM.
5. *hinv*
6. *setenv bootmode d*
7. All variable values are returned to a default setting.
8. *unsetenv*
9. The multi-user login screen appears.
10. System Maintenance Menu

LEARNING ACTIVITY 1-C ANSWERS

Volume Variable Section

1. No, tune plays but you do not hear it.
3. Yes, 255 is the max level.
4. About the same as 128.
5. System Maintenance Menu
6. Yes, it stopped at System Maintenance Menu

   Displayed results of power on diagnostics.
7. If Esc is not pressed, it stops at login screen.
9. System Maintenance Menu

   SGI logo has been added to upper left corner.

Self-Check Questions

1. 0
2. Tune plays at default level of 128.
3. "c"
4. "d"
5. "G" displays the SGI logo.
6. Ensure the console and cable connected to serial port 1 work. This can be checked by the add terminal operation, and then ensuring you can login from that console.
7. Block NVRAM to HP1 transfer during a power-on/rest procedure with jumper. Remove the jumper and execute the resetenv to restore the factory default values to NVRAM.

8. outside edges

9. No variable changes the color of the text, it is always white.

LEARNING ACTIVITY 1-D ANSWERS

Auto Boot Process Section

1. *dksc(0,1,8)sash*

2. yes

3. Loading dksc(0,1,0)sash:
   Error: no volume header on device.

4. Loading dksc(0,1,8)Sash:
   Error: boot file not found on device.

6. Standalone Shell SGI Version 4.0 IP12
   sash: is the new prompt

7. System Maintenance Menu

8. Unable to load dksc(0,1,8)SASH: file not found

9. yes

11. sash is loaded

12. sash: *boot -f dksc(0,1,0)unix*

13. disk - dksc(0,1)
    CD-ROM - Controller 0, ID5
    tape - tpsc(0,7)

14. *boot dksc(0,1,0)/stand/fx*

15. *boot -f tpsc(0,7,0)help*

16. *boot -f tpsc(0,7,0)fx.IP12*

17. *boot -f tpsc(0,7,0)sash.IP12*

18. *boot dksc(0,5,7)/stand/fx.IP12*

19. The command is *ls dksc(0,5,8)*
    Your output should look like this:
    sgilabel
    ide.IP12
    ide.IP4
    ide.IP5
    ide.IP6
    mr
    sash.IP4
    sash.IP5
    sash.IP6
    sash.IP7
    sash.IP9
    sashIP12

21. Your answer will vary depending on the method you selected to solve the problem. The main problem is that CD-ROM is a disk device which means sash is needed to load any program not found in the volume header. When you started this problem bootfile points to the sash program located on the system disk in slot 1. But, this disk has no volume header or sash program yet, thus you get errors. You need to boot sash from CD-ROM. Step 19 gave you the correct name for sash and step 18 gives the path to fx.

    Method 1
    - At >> *boot -f dksc(0,5,8)sashIP12*
    - At sash: *boot -f dksc(0,5,7)/stand/fx.IP12*

    Method 2
    - Change bootfile to: dksc(0,5,8)sashIP12
    - At >> *boot dksc(0,5,7)/stand/fx.IP12*

22. 129.179.110.32
23. *boot -f bootp()vader:/stand/fx*
24. *boot -f bootp()vader:/dev/tape(fx.IP12)*
25. *boot -f bootp()solo:/CDROM/dist/sa(fx.IP12)*

Self-Check Questions

1. *setenv bootmode d* or *setenv bootmode m*
2. *setenv bootfile dksc(0,1,8)sash*
3. *boot* or *boot -f dksc(0,1,8)sash*
4. <ctrl d>
5. *boot dksc(0,1,0)unix*
6. *boot -f tpsc(0,6,0)fx.IP12*
7. *ls dksc(0,4,8)*
8. *boot -f tpsc(0,6,0)xx* xx is program name you know is not found in the file.
9. *boot -f dksc(0,4,8)sashIP12*
10. *boot dksc(0,1,0)/stand/fx*
11. *boot -f dksc(0,1,0)unix*
12. *setenv netaddr 183.173.10.5*
13. *boot -f bootp()eng0:/CD/dist/sa(fx.IP12)*
14. *boot -f bootp()eng0:/dev/tape(fx.IP12)*
15. *boot -f bootp()eng0:/stand/fx*

LEARNING ACTIVITY 1-E ANSWERS

Power-On Tests Section

1. d

2. green LED flashes
   blinking amber LED
   tune
   solid amber LED
   solid green LED

3. power supply

4. Normal test completion.

5. Graphic or CPU board failure

6. SIMM failure

7. graphic board

8. Ensure the volume variable value is not set zero or a low number.

9. *ide fe*
   boot -f dksc(0,1,8)ide fe or *boot dksc(0,1,8)ide fe also works*
   boot dksc(0,1,0)/stand/ide fe

   boot -f tpsc(0,7,0)ide.IP12 fe

   boot -f dksc(0,5,8)ide.IP12 fe or *boot dksc(0,5,8)ide.IP12 fe*

11. Three main items were displayed:
    Message stating: Starting diagnostic program, press ESC to return to the menu
    A version label including date
    Hardware inventory

12. blinking green LED and + and *

13. solid green

14. Diagnostic tests completed with no failures detected.
    Press <Enter> to continue

15. System Maintenance Menu

ide Section

16. Same as those seen in quiet mode.
    Message stating: Starting diagnostic program, press ESC to return to the menu
    A version label including date
    Hardware inventory

    Green LED is blinking and the test did start automatically.

17. Yes, there were two listed: DUART channel 2 and 3 external loopback test.
    A loopback connector is needed to prevent this error.

18. ide>>

19. A complete list of ide commands is displayed.

22. The screen when black and only the graphic tests are being run.
    Control c will stop these tests, but since they are very short in duration you may not have entered it soon enough.

Self-Check Questions

1. green

2. SIMMs

3. True

4. control d

5. *boot -f dksc(0,5,8)ide.IP12 fe* or *boot dksc(0,5,8)ide.IP12 fe*

6. DUART external loopback

7. Press Esc key

8. Press left mouse button

LEARNING ACTIVITY 1-F ANSWERS

Bug Section

5. yes
   green
   yes
   Error-- gfx(x) keyboard not responding

   Error-- cannot open console "gfx(0)"

7. SCSI device/cable diagnostic *FAILED*

   Check or replace: Disk, Floppy, CD-ROM or SCSI Cable

8. sc0,1: SCSI parity error
   dks0d1s8: SCSI driver error 3
   error on vh read
   dksc(0,1,8)sash: is not a readable file

   Error: boot device not responding
   Unable to continue; press <enter> to return to the menu:

9. sc0,1: SCSI parity error (repeated seven times)
   Unable to load dksc(0,1,8)sash: file not found

11. yes
    no
    green
    no
    System Maintenance Menu

12. Error: boot device not responding.
    Unable to continue; press <enter> to return to the menu:

14. yes
    System disk LED flashed green, then went out.
    not on, no color
    yes

16. no
    yes
    blinking amber
    yes

19. no
    yes
    blinking amber
    yes

CONTROL DATA

4201 North Lexington Avenue, Saint Paul, Minnesota 55126-6198