DECstation 210

PERSONAL COMPUTER
SERVICE GUIDE

digital
MADE IN USA

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DECstation 210

DECstation 210 Service Guide

Order Number EK PC41A SV 001

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About this Guide

The DECstation 210 Service Guide is designed to help you diagnose and repair the DECstation 210 system

Guide Organization

The guide is organized as follows

- Chapter 1 provides an overview of the DECstation system series

- Chapter 2 details troubleshooting instructions

- Chapter 3 contains procedures for disconnecting from an Ethernet

- Chapter 4 contains procedures for removing and replacing field replaceable units

- Appendix A provides information about jumpers and switches, memory configuration, the Video Graphics Array (VGA), SCSI adapters, and other DIGITAL supported option boards

- Appendix B contains a detailed description of the powerup test plus background information about personal computer architecture

- Appendix C has an illustration of the block diagram

For information about network troubleshooting, refer to the *PCSA Network Troubleshooting Guide* For additional information about PC architecture, and the Digital Ethernet Personal Computer Bus Adapter (DEPCA) option board, refer to the *DEPCA Service Guide*

Intended Audience

The procedures in this guide are for service technicians trained only by DIGITAL

Conventions

This document uses the following conventions

Convention	Meaning
Warning	Provides information to prevent personal injury
Caution	Provides information to prevent damage to equipment
Note	Provides general information you should be aware of
Ctrl Alt Del	Press and hold Ctrl while you press both Alt and Del. Control key sequences have special functions
Strike the F1 key	What the screen displays as a prompt or an instruction is shown in monospaced type

The computer industry recognizes two open architectures as industry standards the IBM PC/AT bus structure and the Microsoft disk operating system, MS-DOS The term industry standard refers to compatibility with these architectures Support for MS-DOS requires a defined set of ROM-BIOS (read-only memory basic I/O system services) which the DECstation offers

Ordering Parts

Customers who maintain their own equipment can order spare parts by either phone or mail, or through any DIGITAL sales office

To order parts by phone, call 1-800-DIGITAL from 8 30 am to 8 00 pm (Eastern Standard Time)

To order parts by mail, send a purchase order to

> Digital Equipment Corporation
> P O Box CS2008
> Nashua NH 03061

Ordering Documentation

The following documents are referred to in this guide

Document	Part Number
PCSA Network Troubleshooting Guide	AA-JU54A-TH
DEPCA Service Guide	EK-DEPCB-SV
DECconnect System Stand-alone ThinWire Networks Planning and Installation Guide	EK-DECSY-TG
DECconnect System Planning and Configuration Guide	EK DECSY-CG
DECconnect System Installation and Verification Guide	EK DECSY-VG

DIGITAL personnel may order documents with part numbers beginning with EK from

> Digital Equipment Corporation
> 444 Whitney Street
> Northboro, MA 01532

Attn Publishing and Circulation Services (NRO3/W3) Order Processing Section

Digital personnel may order documents with part numbers beginning with AA from

> Digital Equipment Corporation
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Customers may order documents with part numbers beginning with either EK or AA from

> Digital Equipment Corporation
> Peripherals and Supplies Group
> P O Box CS2008
> Nashua, NH 03061

CHAPTER 1

1

Overview

1.1 Introduction

The DECstation 210 (Figure 1-1) is a desktop computer It can be used as a standalone personal computer or as a node on a network to a VAX computer or another DECstation with network server software The DECstation runs DIGITAL and other industry-standard applications

As a node on a Personal Computing System Architecture (PCSA) network, the DECstation 210 is the user's interface with the applications and services that the PCSA family of products provides As part of a network, the DECstation 210 communicates with other computers on the network and shares the various resources and services offered by DIGITAL computers and servers

Figure 1-1   DECstation
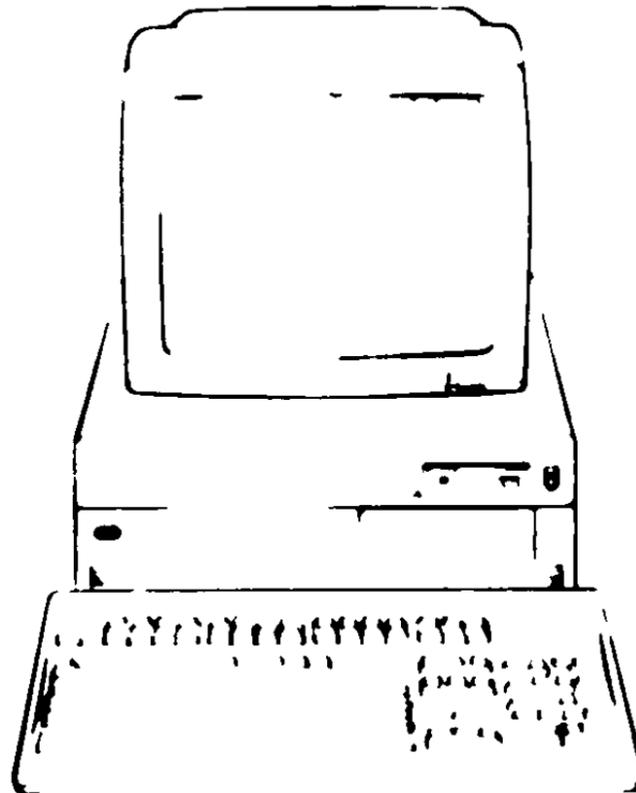
1.2 DECstation Components

The DECstation 210 consists of the following major components

- Monitor

- Enhanced 101 keyboard

- System unit containing

  - Main logic board with

      80286 processor (10 MHz)
      512 Kbyte RAM memory
      Sockets for additional 128 Kbyte RAM memory
      Serial and parallel ports
      Socket for optional 80287 coprocessor and oscillator
      Option slots for industry standard options

  - 135 Watt power supply

  - 3 5 Inch floppy drive

1.3 DECstation Options

The following are options available for the DECstation 210

- 40 Mbyte, 80 Mbyte, or 170 Mbyte SCSI hard disk drive

- 150 Mbyte SCSI streaming tape drive

- Serial/Parallel adapter board

- Video Graphics Array (VGA) board

- DIGITAL Ethernet Personal Computer Bus Adapter (DEPCA) board

- Zero K memory expansion adapter board

1.4 DECstation 210 System Configurations

The DECstation 210 is available in three basic configurations

Model Number	Description
PC401	Intel 80286-based, 10 MHz, 16-bit personal computer with 512 Kbytes RAM including all standard features and 101-key enhanced keyboard
PC410	Base system with 640 Kbytes RAM and VGA board options installed at the factory
PC415	Base system with 640 Kbytes RAM, VGA board, SCSI board, and 40 Mbyte SCSI hard disk drive options installed at the factory

1.4.1 DECstation 210 Main Logic Board

The main logic board of the DECstation 210 contains an Intel 80286 CPU chip and 512K of random access memory (RAM) There are sockets for an additional 128 Kbytes of RAM and an optional Intel 80287 math coprocessor with oscillator The main logic board also contains a floppy disk controller, serial and parallel ports, seven option slots (three 8-bit slots, four 16-bit slots), and an expanded memory slot

1.4.2 Power Supply

The DECstation 210 has a standard 135 watt power supply that has a North American power cord The power supply provides the necessary power to operate the main logic board, floppy disk drive, and any other options installed in the system

1.4.3 Monitors

The DECstation supports both color (PN PC4YV-BA) and monochrome (PN PC4YV AA) 14 inch diagonal monitors They are compatible with industry standard VGA The color monitor displays a video image from a palette of 256 colors The color monitor also supports three different scanning modes

720 dots x 350 lines (mode 1)
720 dots x 400 lines (mode 2)
640 dots x 480 lines (mode 3)

1.4.4 Video Graphics Array Board

The Video Graphics Array (VGA) board provides the video display control functions of the DECstation 210   The VGA board is compatible with the following video standards

- MCGA   Multi-color Graphics Array

- EGA - IBM Extended Graphics Adapter

- CGA   IBM Color Graphics Adapter

- MDA - IBM Monochrome Display Adapter

- Hercules graphics   Hercules graphic card

The VGA board can run software written for any of the video standards on any supported monitor For example, you can run monochrome or color software on the VGM 300 color monitor The VGA also supports 132 column text mode The text mode and color or monochrome mapping can be set by using the VGA EXE utility supplied with the system

1.4.5 Enhanced Keyboard

The keyboard is a 101 key, enhanced, sculpted keyboard This keyboard provides the industry standard key arrangement on a smaller, desktop keyboard

1.4.6 Math Coprocessor

The Intel 80287 math coprocessor chip and oscillator plug into the system board to allow the DECstation 210 to process numeric data faster

CHAPTER 2

2
Troubleshooting

This chapter provides troubleshooting instructions for the DECstation 210 system It is divided into the following sections

- Special tools

- Diagnostics

- Normal power up

- Troubleshooting procedures

- Error codes and how to use them

- Troubleshooting by symptom

- Troubleshooting during system operation

- Using the System Utilities diskette

For information about jumper settings, troubleshooting, and servicing of the DEPCA option board, DIGITAL VSXXX mouse, and related network connections refer to the *DEPCA Service Guide*

2.1 Special Tools

The following tools are needed to troubleshoot the DECstation 210

- CTI Diagnose Diagnostics - These standalone diagnostics are available separately For information on how to use these diagnostics, refer to the *CTI Diagnose User Manual and Reference*

- Serial loopback connectors

- Parallel loopback connectors

2.2 Diagnostics

As an aid to troubleshooting the DECstation 210 has internal system diagnostics These diagnostics are run at system power up and verify the operation of the machine Error messages are given in two formats beep codes and messages on the monitor These error messages are explained in Section 2 5 of this chapter

2.3 Normal Power Up

In a normal system power up the following takes place

1   Power to the monitor and system unit are turned on Both power indicators are on

2   The system executes its power-up tests, displays the BIOS ROM version, assorted copyright information, and the memory size Depending on the option(s) installed in the system additional information may be displayed

    If there is an error during any of the power up tests the system either generates a beep error code or displays an error message

3   The system generates a single beep, displays information about the operating system, and gives the date prompt Note that the actual information displayed at this time depends on the system software

2.4 Troubleshooting Procedures

This section describes three troubleshooting procedures that can be used
depending on the state of the system These procedures are described
as a series of steps The purpose of each procedure is to get the system
to a state where it can run the CTI Diagnose diagnostic package To
determine the procedure to follow perform the steps in Section 2 4 1 and
then go to the recommended procedure

CAUTION
Before troubleshooting the DECstation 210 it must be
disconnected from any network.

2.4.1 Getting Started

The following steps prepare you for troubleshooting a DECstation 210

1 Ask the customer to describe the problem You might want to find
   out

   — When the problem started

   — If any new hardware options were added to the system around the
      time the problem started and if the options are DIGITAL certified
      or third party

   — If any new software was added to the system

2 Have the customer supply you with a *copy* of the Utilities diskette and
   the MS-DOS Startup diskette that came with the system

3 Have the customer provide you with the system configuration

      Type and amount of memory

   — Type of video adapter board

      Type and number of disk drives

   — Type of disk adapter board

   — Type of serial/parallel adapter board

   — Type of monitor

   — Type of keyboard

   — Type of network adapter board

   — Type of mouse

   — Any other options installed in the system

4   Observe the problem   Based on what you observe refer to one of the following procedures

   — If the system does not power up refer to Section 2 4 2, No Power

   — If the system powers up but will not boot refer to Section 2 4 3, System Does Not Boot

   — If the system powers up and boots refer to Section 2 4 4, System Boots

2.4.2 No Power

This procedure is to help determine the cause of the problem when the DECstation 210 does not power up   Before starting this procedure be sure you have done the steps in Section 2 4 1

1   Check the system for loose cables and connections

2   Check the 115/220 V switch on the back of the system unit

3   Plug the system unit and monitor power cord into a working ac outlet

4   Turn on power to the monitor and system unit   Check for system power   The following are indications that the system and monitor have powered up

   — Power indicators on the system unit and monitor are on

   — You can hear the fan running

   — You can hear the hard disk spinning

5   If the system does not power up

   a   Turn off power to the system unit and monitor

   b   Unplug the system and monitor from the ac outlet

   c   Turn off the power to all the hard disk drives and remove all options except the VGA board   Refer to Chapter 4 for removing options

   d   Plug the monitor and system into a working ac outlet

   e   Turn the monitor and system power on   If the system powers up now there was either a faulty device, too many options installed, or another power related problem

   f   Try booting the system from the MS-DOS startup diskette

g   Replace the DIGITAL certified options one at a time and see if the
system powers up each time an option is replaced or a disk drive
is reconnected

6   If the system powers up and does not boot refer to Section 2 4 3

7   If the system powers up and boots refer to Section 2 4 4

2.4.3 System Does Not Boot

This procedure is to help determine why the DECstation 210 does not
boot Before starting this procedure be sure you have done the steps in
Section 2 4 1

1   Remove any third party options and try to reboot the system If the
system generates any beep codes refer to Section 2 5 1, Beep Code
Error Codes

2   Try booting from the MS-DOS Startup diskette

a   If the system does not boot verify that all jumpers are set correctly
(See Appendix A) Reboot the system after verifying the jumper
settings

b   Lack of beep codes and video indicate a possible bad VGA board

c   If the system still does not boot remove all options except the VGA
board and try to boot the system

d   Replace the DIGITAL certified options one at a time and see if the
system powers up and boots each time an option is replaced or a
disk drive is reconnected

3   When the system boots refer to Section 2 4 4

2.4.4 System Boots

This procedure is to help determine why the DECstation 210 boots and a
problem exists Before starting this procedure be sure you have done the
steps in Section 2 4 1

CAUTION
**The system must be disconnected from any network before
running the CTI Diagnose diagnostics.**

1   Determine what the failure is Refer to Section 2 5 for a list of
possible error messages If there are no error messages refer to
Section 2 6 for a list of symptoms and possible causes

2   Run the CTI Diagnose diagnostics

3   Replace the necessary FRU

2.5 Error Codes and Messages

During the powerup sequence, the DECstation 210 executes built-in
diagnostic and *bootstrap* routines During the first portion of powerup
testing, the system generates beep codes on the speaker if the test
program detects a fatal error The system uses the beep codes to report
test results only until screen initialization and screen retrace verification
has occurred After screen initialization and verification the built-in
diagnostic sends non fatal error messages to video memory and the
system displays the messages on the monitor

CAUTION
**Do not connect or disconnect the video cable from the monitor
or system when the monitor and/or system is on. This can cause
damage to the system. Always turn the monitor and system off,
then wait 20 seconds and disconnect the power cord before you
remove the system unit cover. Observe antistatic precautions.**

2.5.1 Beep Code Error Codes

Table 2–1 lists the beep codes and initial power up tests being performed
The beep codes indicate a main logic board failure, memory failure,
memory configuration error, or a video error If a memory failure is
indicated check the memory configuration jumpers and reseat the single-
in line memory modules (SIMMs) on the main logic board If you suspect
a bad SIMM, first replace one and then the other

Table 2 1   Powerup Test Beep Codes and Test Description

Beep Codes	Test Description or Failure
1 1 3	CMOS write/read test failure
1 1-4	BIOS ROM checksum failure
1-2-1	Programmable Interval Timer test failure
1 2 2	DMA initialization failure
1-2-3	DMA page register write/read test failure
1-3-1	RAM refresh verification failure
1-3-3	1st 64K RAM chip of data line failure - multi-bit [1]
1-3-4	1st 64K RAM odd/even logic failure
1-4-1	1st 64K RAM address line failure
1-4-2	1st 64K parity failure
2 1-1	1st 64K RAM chip or data line failure - bit 0
2-1-2	1st 64K RAM chip or data line failure - bit 1
2-1-3	1st 64K RAM chip or data line failure bit 2
2-1-4	1st 64K RAM chip or data line failure - bit 4
2 2-1	1st 64K RAM chip or data line failure - bit 4
2-2-2	1st 64K RAM chip or data line failure bit 5
2-2-3	1st 64K RAM chip or data line failure - bit 6
2 2-4	1st 64K RAM chip or data line failure - bit 7
2-3-1	1st 64K RAM chip or data line failure - bit 8
2-3-2	1st 64K RAM chip or data line failure - bit 9
2-3-3	1st 64K RAM chip or data line failure - bit A
2-3-4	1st 64K RAM chip or data line failure bit B
2-4-1	1st 64K RAM chip or data line failure bit C
2-4-2	1st 64K RAM chip or data line failure - bit D
2-4-3	1st 64K RAM chip or data line failure - bit E
2-4-4	1st 64K RAM chip or data line failure - bit F

[1] Any of the RAM failures can be caused by a SIMM not being properly seated in its socket

Table 2-1 (Cont.)   Powerup Test Beep Codes and Test Description

Beep Codes	Test Description or Failure
3-1 1	Slave DMA register test failure
3-1-2	Master DMA register test failure
3-1-3	Master interrupt mask register test failure
3-1-4	Slave interrupt mask register test failure
3-2-4	Keyboard controller test failure
3-3-4	Screen memory test failure [2]
3-4-1	Screen initialization failure
3-4-2	Screen retraces tests failure

[2]Test failures from this point on can usually be attributed to the VGA board or the slot connector Try moving the adapter to a different slot

2.5.2 Power Up Error Messages

Table 2–2 lists system error messages and suggests steps you can take
to correct the problem If the problem persists, run the CTI Diagnose
diagnostics and replace any failing FRUs

Table 2–2 Powerup Test Messages

Error Message	Possible Problem	Corrective Action
Display adapter failed	VGA board problem, incorrect CMOS RAM setup information, bad CMOS battery, or incorrect main logic board jumper setting	Check all video jumpers, system set up, and CMOS battery connection
Keyboard failure	Keyboard connection	Make sure the keyboard cable is firmly in place.
Keyboard stuck key, controller, clock line, or data line failure	Stuck key, poor connection, or main logic board keyboard buffers, clock or data line failures	Make sure the keyboard is free of obstructions and the keyboard cable is firmly in place.
Keyboard is locked	Keyboard locked, lock not working properly, or problem with the main logic board	Unlock the keyboard. Check to see if the lock mechanism has been bent
Time-of-day not set	Time not entered in setup or CMOS battery failure	Run the utility program and set the time of day. Check the CMOS battery connection, replace a failed CMOS battery.
Hard disk failure	Drive not formatted, loose cables, or incorrect jumper settings	Make sure the drive is formatted, all cables are firmly in place, and all jumpers are set correctly on the drive and SCSI board.
Diskette drive failure	Loose cables or incorrect switch setting	Make sure all drive cables are firmly in place and that the drive switch is set correctly.

Table 2-2 (Cont.)   Powerup Test Messages

Error Message	Possible Problem	Corrective Action
No boot device available	System can not get a drive to respond correctly	Check the floppy and hard drives, controllers, cables, and jumper and switch settings.
Hard disk read failure, or No boot sector on hard disk	Hardware failure in disk drive or drive not initialized with an operating system.	Make sure the drive is initialized Check all cable connections and jumper settings Run the diagnostics
Diskette subsystem reset failed	Diskette drive main logic board jumper removed or controller problem.	Make sure the switch is set at either the primary or secondary position. Run the diagnostics.
Diskette drive 0 seek failure	First diskette drive is not seeking correctly	Make sure any diskette drive is selected as DS1 and that the correct drive termination is present.
Tape drive failure	Loose cable or incorrect jumper settings	Make sure the drive cables are firmly in place and all jumpers are set correctly on the drive and SCSI board.
Invalid configuration	Incorrect setup	Check the setup information on the system Utility diskette
Configuration record bad	Incorrect setup, hard disk may be incorrectly identified	Check the setup information on the system Utility diskette Also see the hard disk drive for any labels identifying the number of heads, cylinders, bad blocks, and so on.

Table 2-2 (Cont.)   Powerup Test Messages

Error Message	Possible Problem	Corrective Action
Clock chip lost power	Momentary loss of CMOS battery power, or CMOS battery is dead	Turn off the system unit. Wait 20 seconds and then try starting the system again Check the CMOS battery connection Replace the battery if necessary
DEPCA 86	Conflicting jumper settings, IRQ or memory and I/O addressing	Check all IRQ, memory, and I/O address settings See the *DEPCA Service Guide* for directions.
	A diskette generated reset after using the Utility diskette	Options 1 through 5 and 9 on the Utilities diskette generate a reset which is not satisfactory to the DEPCA board At the end of the session press [Ctrl] [Alt] [Del] at the same time (a soft reset) to properly reset the hardware
Beeps, long, short, long, short	VGA adapter missing or incorrectly installed	Make sure the adapter is firmly seated in its socket on the main logic board

2.6 Troubleshooting by Symptom

This section describes causes and corrective actions for minor system problems that you can fix The troubleshooting procedures are separated into system unit, hard disk and diskette drives, monitor, and pointing device problems

2.6.1 System Unit Problems

Table 2–3 lists some common problems with the system unit, possible cause, and a suggested corrective action If the corrective action does not work and it is possible to run the CTI Diagnose diagnostics, use them to further isolate the problem and then replace the failing FRU

Table 2-3   System Unit Troubleshooting Procedures

Problem	Possible Cause	Corrective Action
No response when the system is turned on	System is not plugged in	Turn the system off Plug in the system then turn on the system again
	No power at wall outlet	Use a working wall outlet
	Voltage select switch incorrectly set.	Make sure the 115/220 V voltage select switch is set correctly
Power is on, but there is no monitor display	Brightness and contrast controls are not set properly	Adjust brightness and contrast controls
	Monitor is off	Turn on the monitor
	Monitor cable incorrectly installed	Make sure the monitor cable is installed properly
	VGA board failure	Make sure the VGA is firmly seated in the option slot and the jumpers are set correctly
Coprocessor is present System comes up in the boot state but hangs after the memory check	Coprocessor jumper installed, oscillator missing	Remove the coprocessor jumper from the main logic board; install the oscillator

Table 2-3 (Cont.)   System Unit Troubleshooting Procedures

Problem	Possible Cause	Corrective Action
A DEPCA is installed but the node does not boot when you try to reboot after using the utility diskette	Using a diskette generated reset is not compatible with the DEPCA board	Press Ctrl Alt Del at the same time (a soft reset) to properly reset the hardware, turn system power off and on
System does not boot from the hard disk	There is no software on the partition	Install software on the partition
	System software is not on the disk	Load the system software on the hard disk
	Requested partition does not exist or is not formatted	Check the partitions Format the partition, repartition if necessary.
	Primary and secondary drives are set incorrectly	Make sure the drive jumpers are correctly set
	Hard disk is not installed properly	Check hard disk installation
Tape does not work in the tape drive	Tape is not fully inserted into the tape drive	Make sure the tape is fully inserted and the cartridge release handle is locked down
	Tape is worn or damaged	Try another tape.
System does not boot from the diskette drive	Diskette is not in the diskette drive.	Insert a diskette containing bootable system software.
	Drive switch set incorrectly	Make sure the drive switch is set correctly.
	Diskette is not bootable.	Use a diskette containing bootable system software.
	Diskette is worn or damaged	Try another diskette
	Hardware conflict (remote boot)	Make sure system is not set up for remote boot

Table 2 3 (Cont.)   System Unit Troubleshooting Procedures

Problem	Possible Cause	Corrective Action
System does not reboot when the power is turned off and on	Power was not off long enough	Turn the power off for at least 20 seconds before rebooting

2.6.2 Disk Related Problems

Table 2–4 lists some common disk related problems, possible cause, and a suggested corrective action If the corrective action does not work, run the CTI Diagnose diagnostics to further isolate the problem and then replace the failing FRU

Table 2–4   Hard Disk and Diskette Drive Troubleshooting Procedures

Problem	Possible Cause	Corrective Action
Hard disk cannot read or write information	Problem exists with the drive or drive adapter	Make sure all jumpers are set correctly
Intermittent hard disk read/write problems	Possible corrupted files	Restore disk from back-up files
Hard disk works but produces extra characters or garbled text	Hard disk is affected by static electricity	Move system away from any motors, magnetic devices, or photocopiers
		Increase the humidity in the room and use antistatic mats around the system
System won't start from the diskette drive or displays the message Abort, Retry, Ignore	The diskette has been demagnetized	Make sure the diskette drive cable is correctly installed. Replace the diskette
	Improperly formatted diskette	Reformat diskette
Diskette drive cannot read or write information	The diskette drive is empty	Insert a diskette into the diskette drive
	Diskette is not formatted	Use a preformatted diskette

Table 2-4 (Cont)   Hard Disk and Diskette Drive Troubleshooting
Procedures

Problem	Possible Cause	Corrective Action
	Diskette is worn or damaged	Try another diskette

2.6.3 Monitor Problems

Table 2-5 lists some common monitor problems, possible cause, and a
suggested corrective action If the corrective action does not work and
it is possible to run the CTI Diagnose diagnostics, use them to further
isolate the problem and then replace the failing FRU

Table 2-5   Monitor Troubleshooting Procedures

Problem	Possible Cause	Corrective Action
Monitor green LED is not on	Monitor is not turned on	Turn on the monitor and then the system
	Power cord is not connected.	Make sure the power cord is connected to the wall outlet.
	No power at wall outlet	Use another outlet.
There is no light at the F1 key when you start the system	Setup program was not run	Run the Setup program Use your monitor and adapter card manuals and utihty diskette(s)
Screen is blank and monitor LED is on	Contrast and brightness controls set to minimum	Adjust the contrast and brightness controls
	VGA board failed	Replace the VGA board and then the monitor
Screen goes blank after successful powerup, monitor LED is off	Power or Monitor failure	Turn the monitor and system off Disconnect the monitor from the system and wall Plug the monitor into an active wall outlet If the monitor LED does not turn on, there is a problem with the monitor or monitor LED
Monitor LED is off, but display is OK	Faulty LED	Replace the monitor

Table 2 5 (Cont.)   Monitor Troubleshooting Procedures _____

Problem	Possible Cause	Corrective Action
Monitor is on, but no cursor or text displays	System is not on	Turn on the system
	Contrast control is set to minimum	Turn up the contrast control
	Video subsystem is defective	Replace the VGA board and then the monitor
Screen display distorted, rolling, flickering, or wrong or uneven color	Monitor cable connector pins bent or broken	Straighten pins or replace monitor
	Electromagnetic interference exists	Move any electromechanical device away from the monitor or move the monitor
Screen displays distorted images or goes blank when you run your software	Software is not configured for, or is incompatible with the current settings of the VGA board	Reconfigure your software for VGA or set the VGA board to a standard supported by your software See your software and VGA manuals
Screen displays partially highlighted characters.	Main logic board video and VGA board jumpers incorrectly set.	Make sure the jumper setting on the main logic board match the setting on the VGA board
You have a color monitor and the display is monochrome	System was turned on *before* turning on the monitor	Turn off the monitor and system Wait at least 20 seconds Turn on the monitor, then the system unit.

2.6.4 Pointing Device Problems

Table 2-6 lists some common pointing device problems, possible cause, and a suggested corrective action If the corrective action does not work, refer to the *DEPCA Service Guide*

Table 2-6 Pointing Device Troubleshooting Procedures

Problem	Possible Cause	Corrective Action
Mouse does not track properly	The tracking ball is dirty	Clean the tracking ball
Pointing device indicator does not display on the monitor screen, or the monitor does not respond to the pointing device commands	Cable is installed incorrectly Mouse IRQ settings are incorrect Software does not operate with a pointing device or is configured incorrectly	Unplug and then reconnect the cable to reset the device Check the DEPCA mouse IRQ settings for possible conflict with other options Reconfigure the software if necessary

2.7 Troubleshooting Problems Occurring During System Operation

Sometimes problems occur during system operation   Use the following list to help isolate a problem to a specific subsystem by determining how or when the problem occurs

The problem occurs during diskette drive access.

- Check the diskette drive and the jumper setting

- Look for slightly loose cables

- Check the main logic board jumper settings

- If possible, run the diagnostics   The problem may be with the main logic board decoding, resistor pack, or faulty loading on the data bus

   See also Section 2 6

The problem occurs during hard disk drive access.

- Check the hard disk drive, including jumper and switch settings

- Check for loose drive cables

- Check the SCSI board   Make sure it is seated properly and its jumpers are set correctly

The problem occurs during parallel or serial board access.

- Check the serial/parallel board

- If two serial devices are present, make sure they are not both configured as COM1

- Run the diagnostics   The problem may be with the system interface

The problem seems to be video related.

- Check the main logic board video jumper settings

- Check the VGA board and the jumper settings

The problem seems to be keyboard related.

- Keyboard lock may be partially engaged

- Check the keyboard connection

- Run the CTI Diagnose diagnostics   The problem may be the keyboard interface on the main logic board

The problem is reproducible or intermittent.

Expansion options may be competing for interrupt request lines, I/O address range, or memory address range

The problem seems to be heat related.

- Make sure there is sufficient air flow around the system

- The system unit may be clogged with dust

2.8 Using the System Utility Diskette

The menu driven system Utility diskette is shipped with the system Ask your customer for the diskette Figure 2-1 lists the options from the Utility diskette menu The Setup program must be run anytime the following occur

- The amount of memory in the system is changed

- Diskette drives are added or removed

- A different video display board is installed in the system

- The battery backed up date and time are changed

- The CMOS battery is disconnected or changed

Figure 2 1   Utility Diskette Menu

```
1 — FORMAT DISKETTE

2 — COPY DISKETTE

3 — PREPARE SYSTEM FOR MOVING

4 — SETUP

5 — FORMAT HARD DISK


9 — END UTILITIES
```

2.8.1 Running the Setup Program

NOTE
If you have installed a new SCSI hard disk drive, format the drive before you run the Setup program. See Section 2.8.2, Formatting a Hard Disk Drive for directions.

You need the following information when you run the Setup program

* The type of diskette drive for drive A and optional drive B (usually 1 44M) Table 2–7 lists the diskette drive types

Table 2-7 Diskette Drive Types

Media		Standard Drive		High-Density Drive	
Size	Type	Read	Write	Read	Write
3-1/2 in	1 44 MB (High-Density)	No	No	Yes	Yes
3-1/2 in	720 KB (Standard)	Yes	Yes	Yes	Yes
5-1/4 in	1 2 MB (High Density)	No	No	Yes	Yes
5-1/4 in	360 KB (Standard)	Yes	Yes	Yes	Yes

* System base memory size (displayed on the screen at powerup)

* Expansion memory size (displayed on the screen at powerup; OK means no expanded memory present)

* Primary video adapter type (VGA)

* CPU and BUS clock speeds Table B–1 shows the possible settings for the DECstation 210

   CPU speed is the CPU processing speed, and BUS speed is the data bus transmission speed

Table 2-1   CPU/BUS Speed Settings

Speed Settings	CPU	BUS
Factory setting	10 MHz	10 MHz
Fast	10 Mhz	10 MHz
Medium	10 MHz	8 MHz
Slow	8 MHz	8 MHz

The Setup program is run as follows

1   Turn on power to the monitor

2   Insert the Utilities diskette in the drive and turn on power to the system

   The power-up tests run, then the system displays either the Utility diskette menu or the instruction Strike the F1 key to continue

   • If the Menu is displayed, select option 4 (SETUP), then press Enter

   • If Strike the F1 key is displayed, press the F1 function key

   The system displays a screen similar to Figure 2-2

3   Press Enter. The next two screen displays describe how to set the system date and time   Follow the instructions on the screens

4   Press Y or N in response to the prompts on the following screens then press Enter.

   If you respond Y, the system displays the next selection   If you respond N, the system displays the selection again and you can change the values

   When you finish making the selections, the Setup screen should be similar to Figure 2-3

5   Press Y or N in response to the Are these options correct prompt and press Enter.

   If you enter N, the system redisplays all the setup selections and you can correct your entries   If you enter Y the system records the date, time, and hardware information in the CMOS memory

6   Reboot the system using one of the following methods

   •   Press the Ctrl Alt Del keys simultaneously (preferred method)

   •   Press the Reset button on the front of the system unit   When
       the system displays the copyright page the setup procedure is
       complete

NOTE
**If the hard disk is not formatted, a hard disk failure message
might display on the copyright screen.**

Figure 2-2   Setup Screen 1

```
Phoenix Software Acs  Ltd
Configuration Setup Program Ver x x
(c) Copyright 198x

This program is used to store system
configuration information into battery
backed memory in your computer  It is
necessary to run this program when
any memory  disk drives  or monitors are
added to or removed from your system
or to set the battery maintained time
or dates
ERRORS FOUND
INCORRECT CONFIGURATION INFO
MEMORY SIZE MISCOMPARE
Press <enter> to continue
```

Figure 2–3 Setup Configuration

```
Diskette Drive A  is 1 44M
Diskette Drive B  is NONE
System Base Memory is  512K
Expansion Memory is  XXXXK
Prime Video Adapter is VGA
CPU Speed is  10MHz
BUS Speed is  10MHz


Are these option correct
(Reply Y or N then <enter>)

?
```

2.8.2 Formatting a Hard Disk Drive

Many hard disk drives come preformatted (A preformatted hard disk contains documentation stating that it is preformatted)

Use the following procedure to format an SCSI hard disk drive

1   Turn on power to the computer and check the BIOS ROM version number displayed on the copyright screen An SCSI hard disk requires Version 01 03 01 or higher

2   Install the MS-DOS startup diskette Ask your customer for this disk; it was shipped with the MS-DOS operating system package

3   Run FDISK Follow directions on the screen Observe all warnings

4.   Run FORMAT Use Format C /s for a bootable volume Observe all warnings and follow the directions on the screen

    If the hard disk has more than 32 Mbytes, ask your customer if they want you to partition the drive into a D partition In this case, run FDISK again for an extended partition

5   Remove the startup diskette and reboot the system from the hard disk drive

6   Copy MS-DOS to C \ DOS, if it is your responsibility, or have the customer install MS-DOS and then the software applications and data files

CHAPTER 3

3

Ethernet Connections

3.1 Introduction

This chapter discusses standard Ethernet and ThinWire Ethernet
connections and how to disconnect a DECstation 210 from a network
Figure 3–1 shows the cabling for two ThinWire Ethernet networks linking
DECstation systems that have a DEPCA option board

Figure 3–1 Two Sample ThinWire Networks
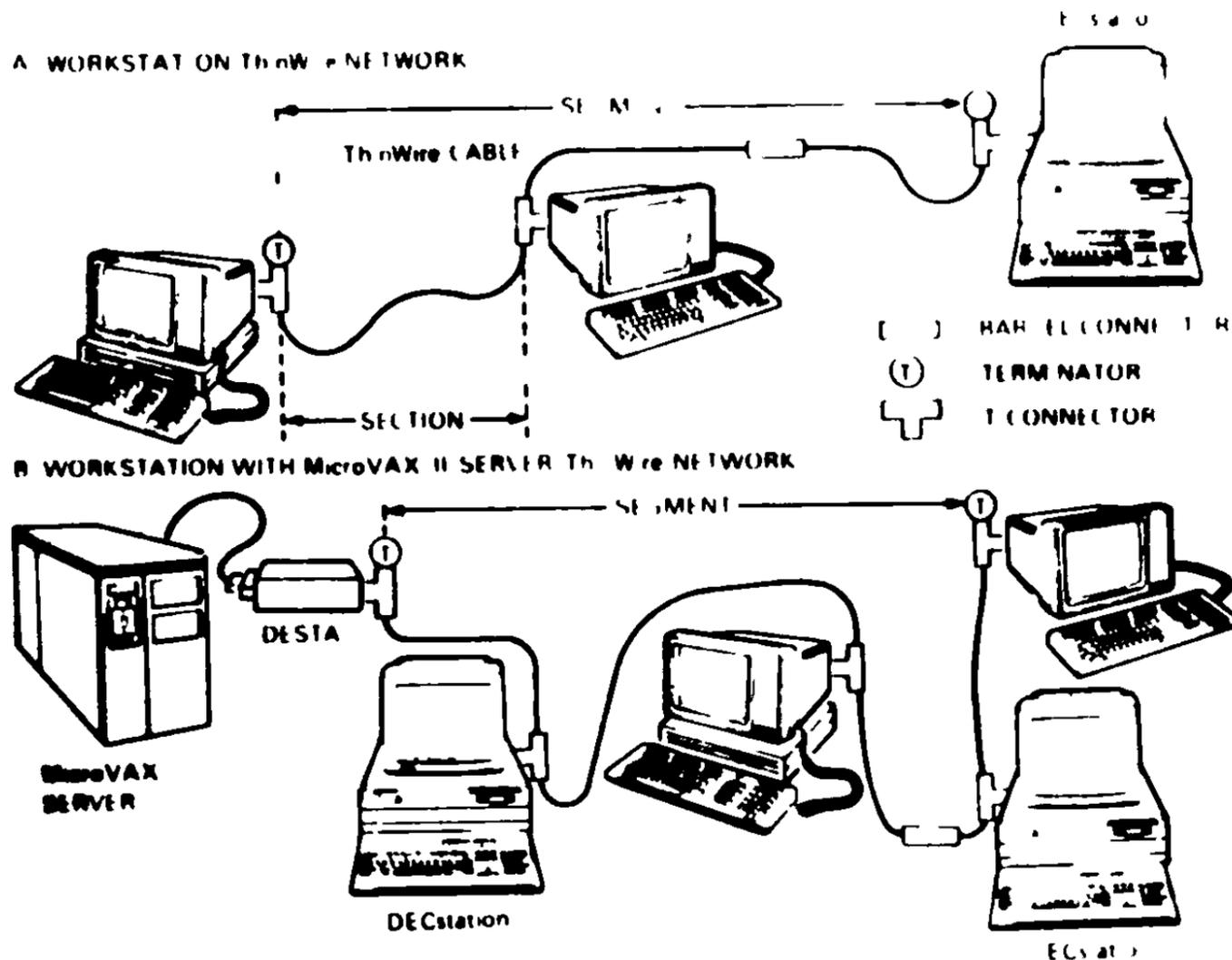
3.2 Disconnecting From Ethernet

Before servicing a DECstation 210, disconnect it from the ThinWire
network Use the following procedure to do this

1   Inform the system administrator that you are going to disconnect the
     DECstation system

2   Turn power to the system off

3   Disconnect the T-connector from the DECstation system (Figure 3-2)
     Do not disconnect the T-connector from the ThinWire Ethernet cable
     or from the terminator, if one is present

Figure 3-2   Disconnecting a T-Connector from a DECstation 210
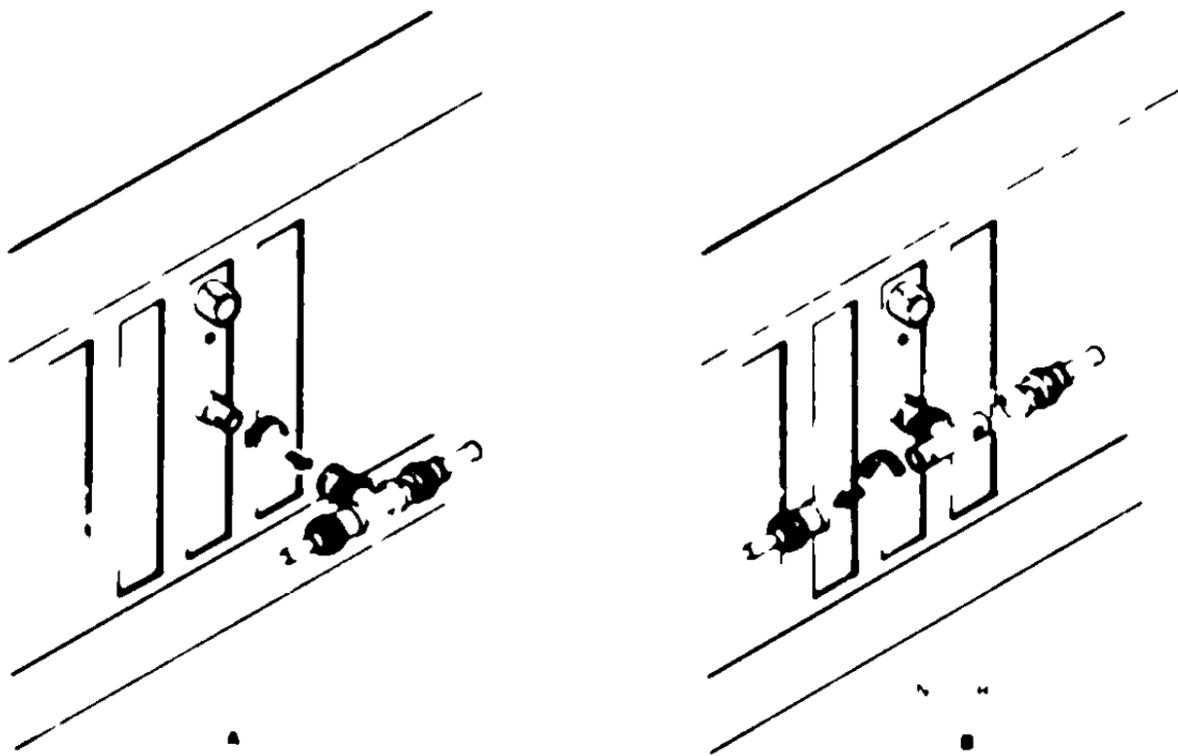
When re-connecting a DECstation system to a ThinWire network, be careful to observe the following guidelines

- Never install a cable at the stem of a T-connector **Example A in Figure 3-3 shows a correct Ethernet installation.**

- Never join two T connectors or a barrel and a T-connector together

- Never create a loop configuration (Figure 3-3, example C) There must be a terminator at both ends of a segment (Figure 3-3, example A) Only one end can be a DEMPR

Figure 3-3 Correct and Incorrect ThinWire Segment Connections
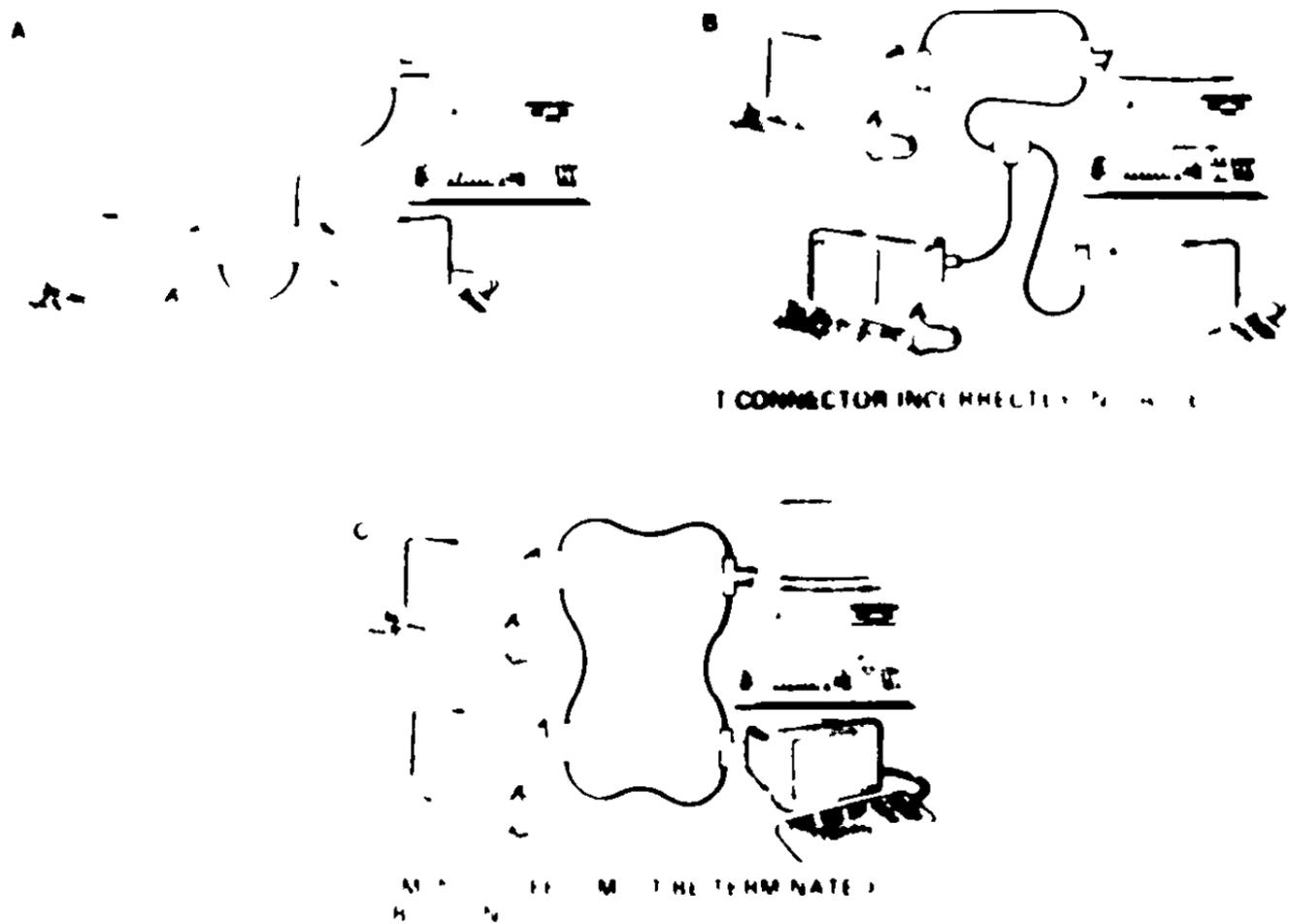
To learn how to install complex ThinWire networks, see the *DECconnect System Stand-alone ThinWire Networks Planning and Installation Guide*, the *DECconnect System Planning and Configuration Guide*, and the *DECconnect System Installation and Verification Guide*

3.3 Standard Ethernet Networks

A DECstation 210 can also be linked directly to a standard Ethernet network   A DEPCA board with the Attachment Unit Interface (AUI) can connect to a standard Ethernet network through a Digital Ethernet Local Network Interconnect (DELNI) or H4000 transceiver (Figure 3–4)

Figure 3–4   DEPCA/AUI Option Network Configurations
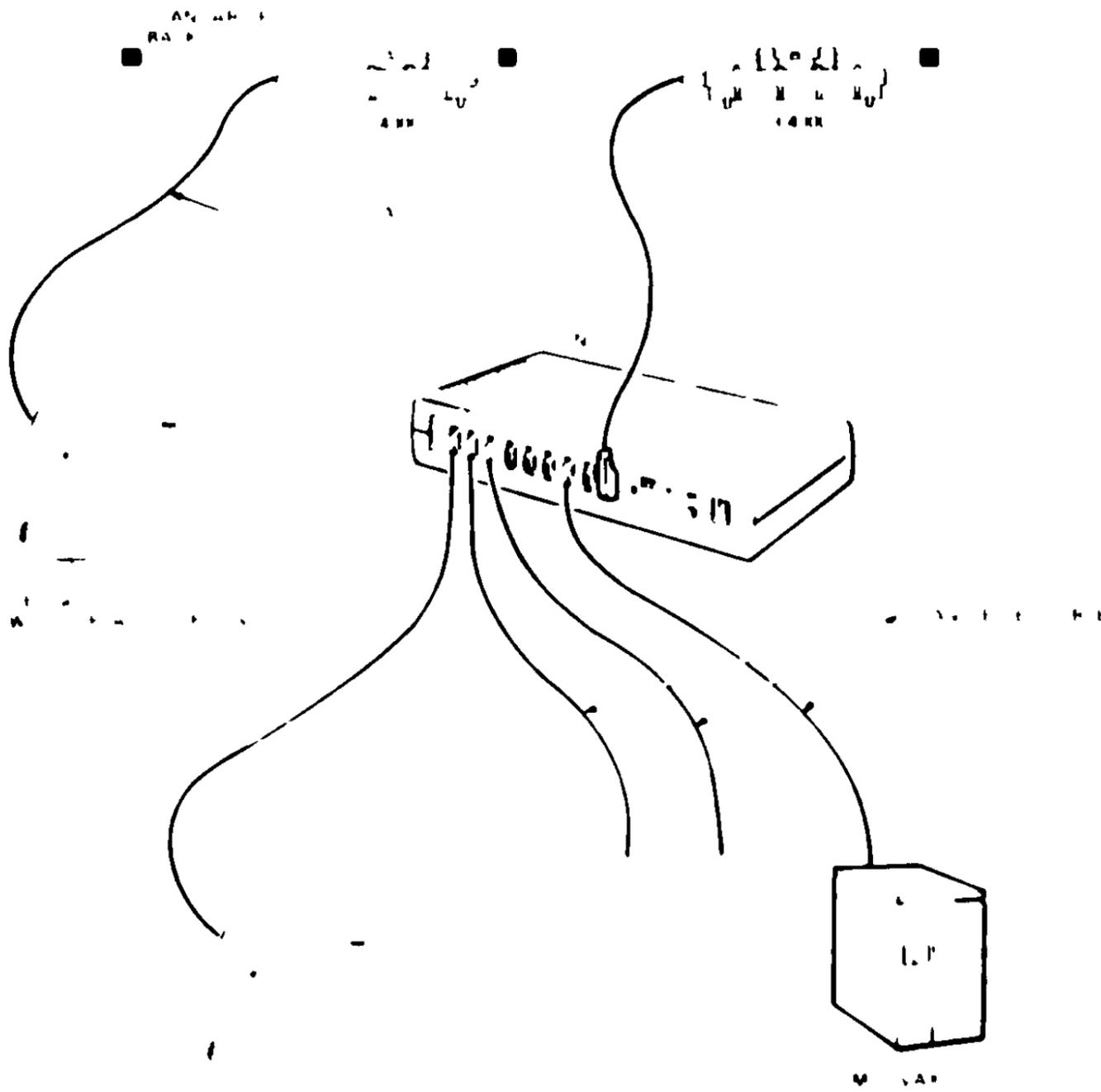
Figure 3–5 shows a network connection for a DECstation system with a DEPCA/AUI option through a DELNI

Figure 3–5   DECstation 210 Network Connection through a DELNI
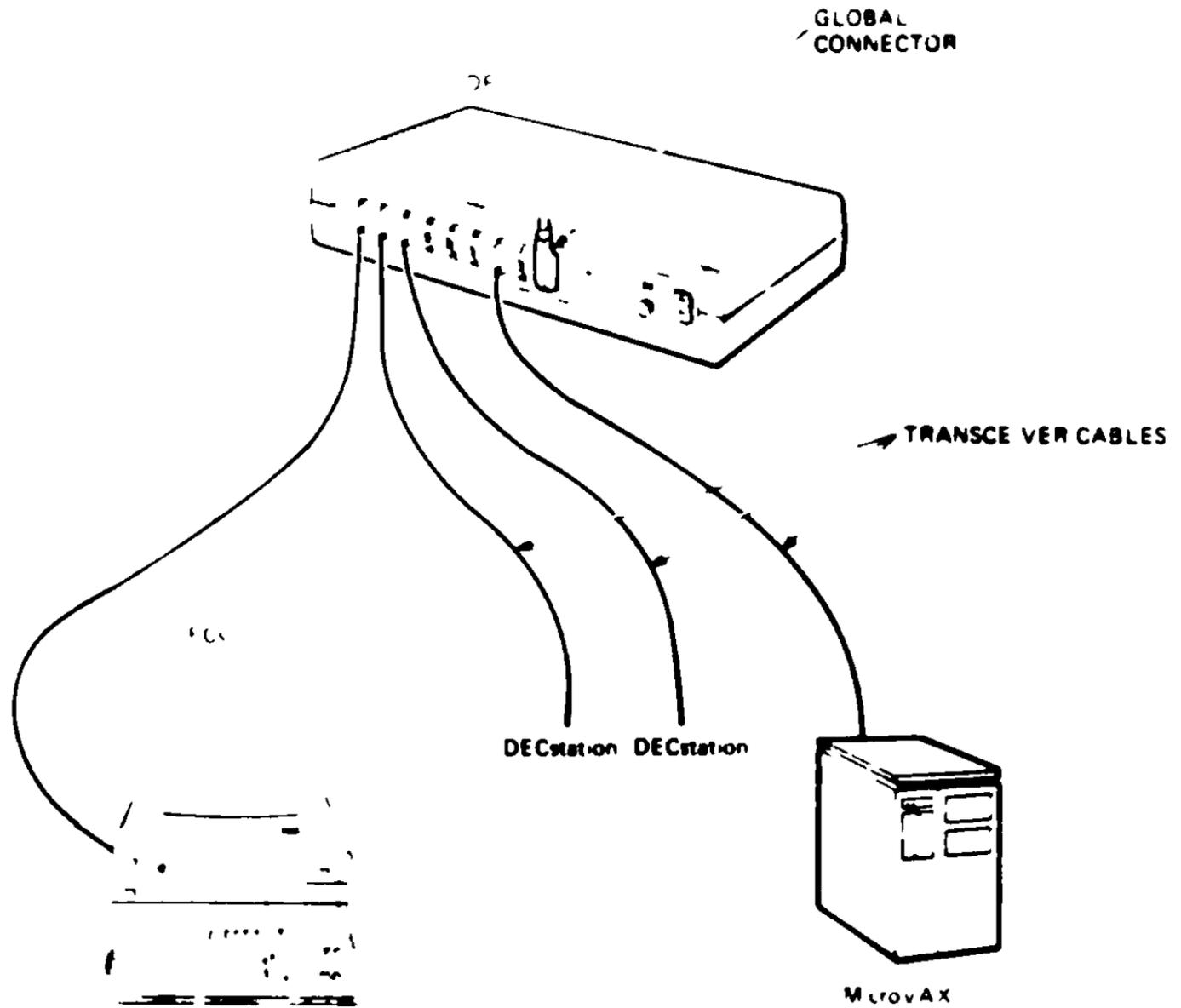
To disconnect a DECstation 210 from a standard Ethernet network, use
the following procedure

1   Inform the system administrator that you are going to disconnect the
     DECstation system

2   Turn power to the system off

3   Disconnect the transceiver cable from the connector on the
     DECstation system

To connect the DECstation 210 to a standard Ethernet network, reverse
this procedure

For more information about connecting a DECstation system to a
standard Ethernet network, see the *DECconnect System Planning and
Configuration Guide*

CHAPTER 4

4

FRU Replacement

4.1 Introduction

This chapter contains procedures for removing and replacing each DECstation 210 field replaceable unit (FRU) To install many of the FRUs perform the reverse of the procedure when it is so noted Only qualified service technicians should remove and replace FRUs Use only DIGITAL supplied spares

Table 4–1 lists the FRUs for the DECstation 210 and their part numbers

Table 4 1   DECstation 210 Field Replaceable Units

FRU	Digital Part Number
Enhanced 101 Keyboard	29-27442-01 A01
DIGITAL VSXXX Mouse	30-25322-01 A01
Color monitor	30-30901-01 A01
Monochrome monitor	30-30902 01 A01
Power supply (135W)	29-27430-01 A01
Main logic board	29-27429 01 A01
Math coprocessor (Intel 80287, 10 MHz)	19-30951-01 A01
512K SIMM (150 ns)	19-30954-01 A01
2 Mbyte SIMM (150 ns)	19-30955-01 A01
128K RAM	19-30952 01 A01
Zero Kbyte Extended memory board	20-30953 01 A01
1 44 Mbyte 3 5 inch Floppy disk drive	30-30942-01 A01
40 Mbyte 5 25 inch SCSI hard disk drive	30-30903-01 A01
80 Mbyte 5 25 inch SCSI hard disk drive	30-30904 01 A01
170 Mbyte 5 25 inch SCSI hard disk drive	30-30905-01 A01
150 Mbyte 5 25 inch SCSI tape drive	30-30906-01 A01
VGA board	20-30947 01 A01
16-bit SCSI board	20-30945-01 A01
Parallel/Serial board	20-30946-01 A01
DEPCA Adapter board	70-24252
Speaker/LED assembly and cable	29-27440-01 A01
Battery	29-27439-01 A01
SCSI drive ribbon cable	29-27441 01 A01
Floppy drive ribbon cable	29-27432 01 A01

4.1.1 Before Replacing FRUs

The following criteria apply when removing or installing DECstation 210
FRUs

CAUTION
**After you turn power off to the system, do not disconnect the
power cord from the system unit or wall outlet for at least 20
seconds.**

*   Always turn off the power to the system and monitor and disconnect
    all external cables before removing any FRU

    NOTE
    **Before disconnecting the DECstation 210 from a network,
    inform the system administrator that you are going to
    disconnect the ThinWire T-connector from the computer. Do
    not disconnect any cable or terminator from the T-connector.
    Doing so disrupts network operation.**

*   Always use a grounded wrist strap and grounded work surface when
    opening the system unit or handling any external component and its
    replacement Static electricity can damage printed circuit boards and
    mass storage devices

*   After replacing a FRU verify that it and the system function properly

4.2 Replacing FRUs

This section describes how to remove and replace the various FRUs in the
DECstation 210 Figure 4–1 shows an exploded view of the DECstation
210 chassis Figure 4–2 shows an exploded view of the DECstation 210
main logic board and options

Figure 4 1   Exploded View of DECstation 210 Chassis

(MON TOR KEYBOARD COVER
MOUSE AND CABLES NOT SHOWN)

POWER SUPPLY

1 44 MB 3 5 FLOPPY DISK DR VE

BATTERY

(B)
OPTIONAL

A)

SPEAKER

40 MB HARD DISK

SWITCH BAR

LJ   1581
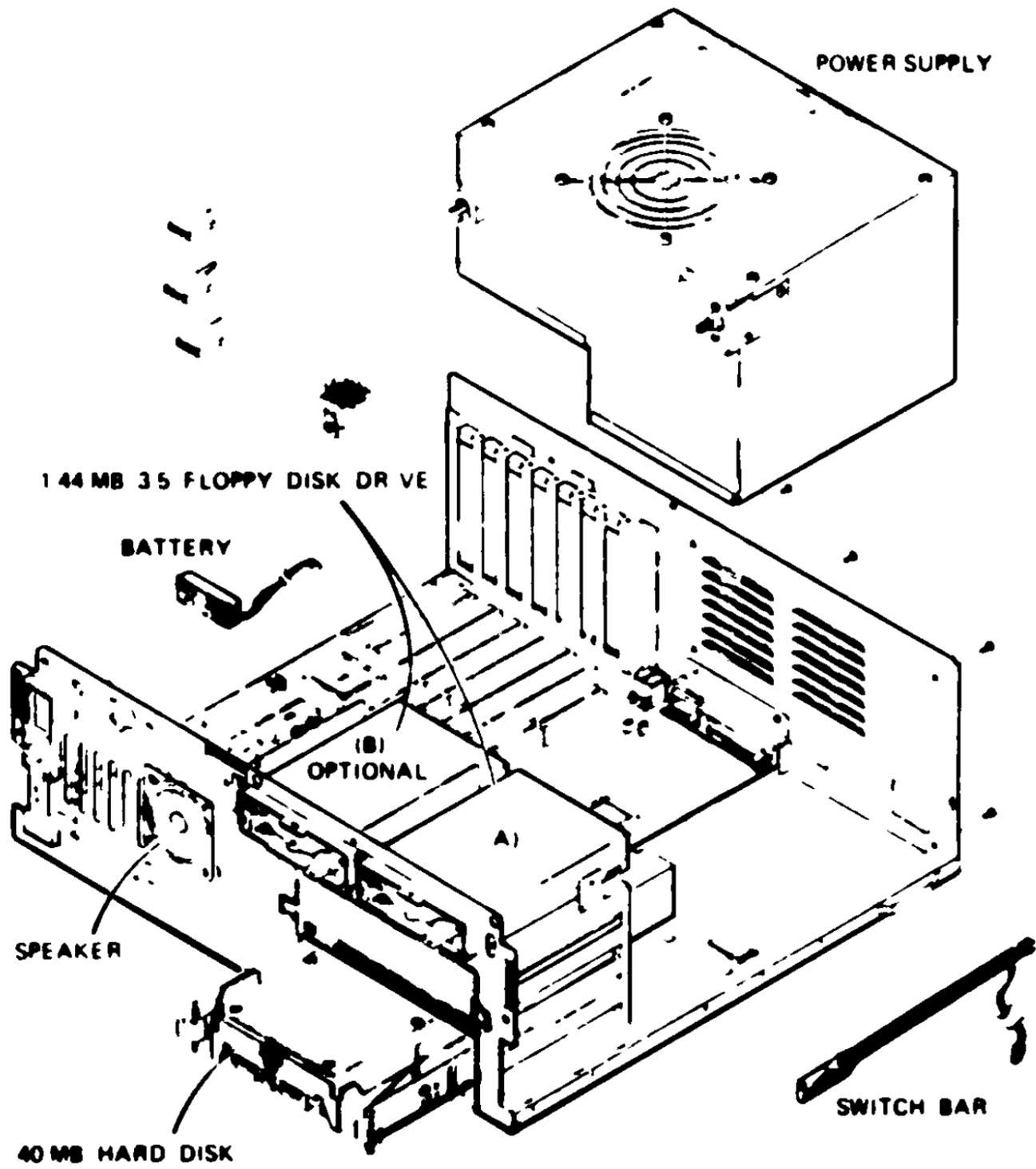
Figure 4–2 Exploded View of DECstation 210 Main Logic Board and Options

VGA BOARD

DEPCA BOARD

SCSI BOARD

SCSI CABLE
HARD DISK TAPE DRIVES

RED STRIPE

EXTENDED
MEMORY
BOARD

BLUE
STRIPE

MAIN BOARD

FLOPPY
DISK DRIVE
CABLE

LJ 1582
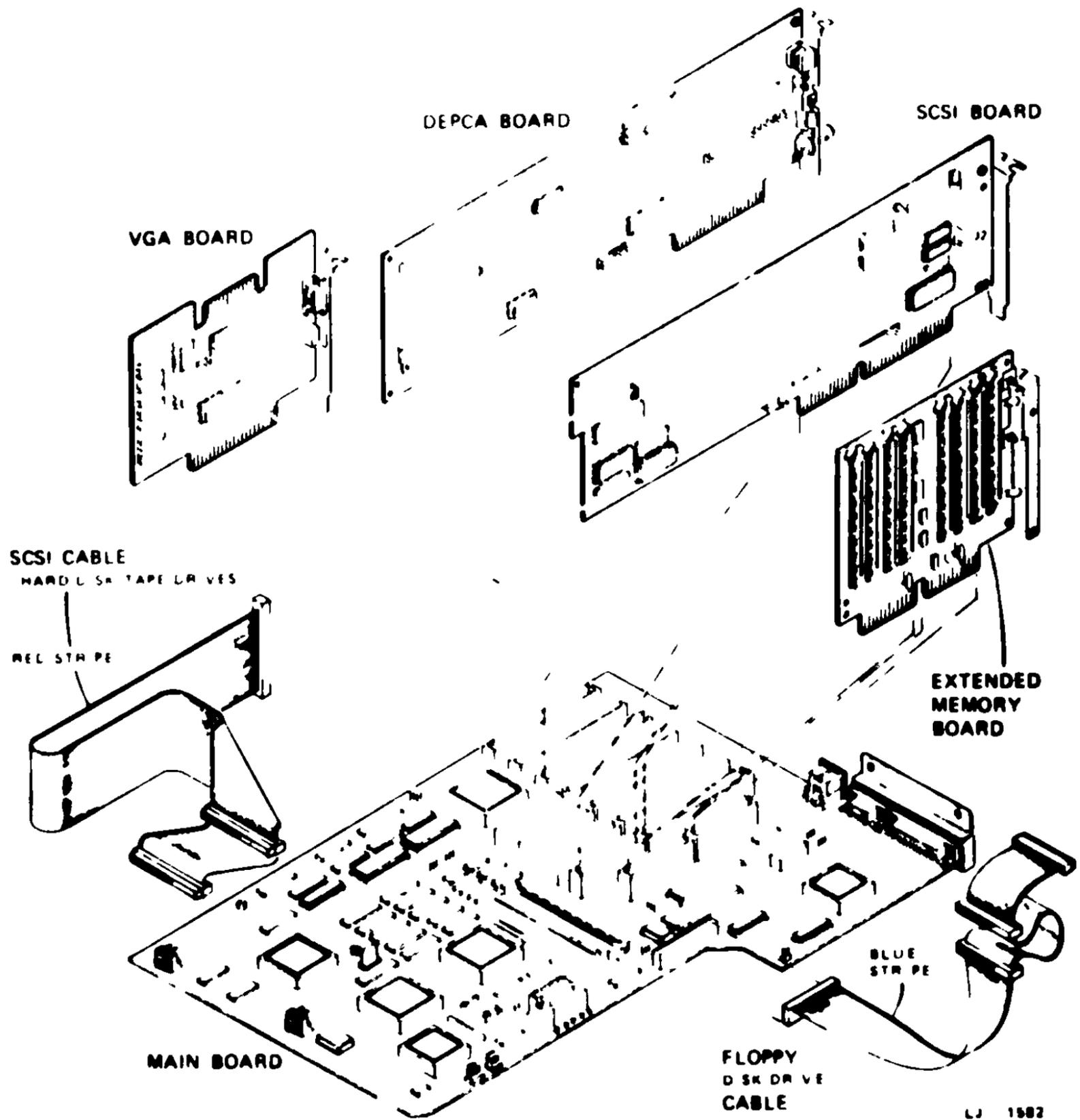
4.2.1 Keyboard Replacement

Replace the keyboard as follows

1   Turn off power to the system unit and monitor

2   Disconnect the keyboard cable from the system unit

3   Connect the cable from the new keyboard to the system unit

4   Turn the power on again

4.2.2 Monitor Replacement

Replace the monitor as follows

1   Turn off power to the system unit and monitor

2   Unplug the power cord to the monitor from the wall outlet

3   Disconnect the monitor cable from the system unit

4   Connect the cable from the new monitor to the system unit

5   Plug the power cord from the new monitor into the wall outlet

6   Turn the power on again

4.2.3 VSXXX Mouse Replacement

Replace the mouse as follows

1   Turn off power to the system unit and monitor

2   Disconnect the mouse cable from the system unit

3   Connect the cable from the new mouse to the system unit

4   Turn the power on again

4.2.4 System Cover Removal

Use the following procedure to remove the system cover

1 Turn off power to the system unit and monitor

2 Disconnect all cables from the back of the system unit

3 Remove the three screws that secure the cover to the back of the system unit (Figure 4–3)

4 Remove the cover as shown in Figure 4–3

Figure 4 3 Removing the System Cover
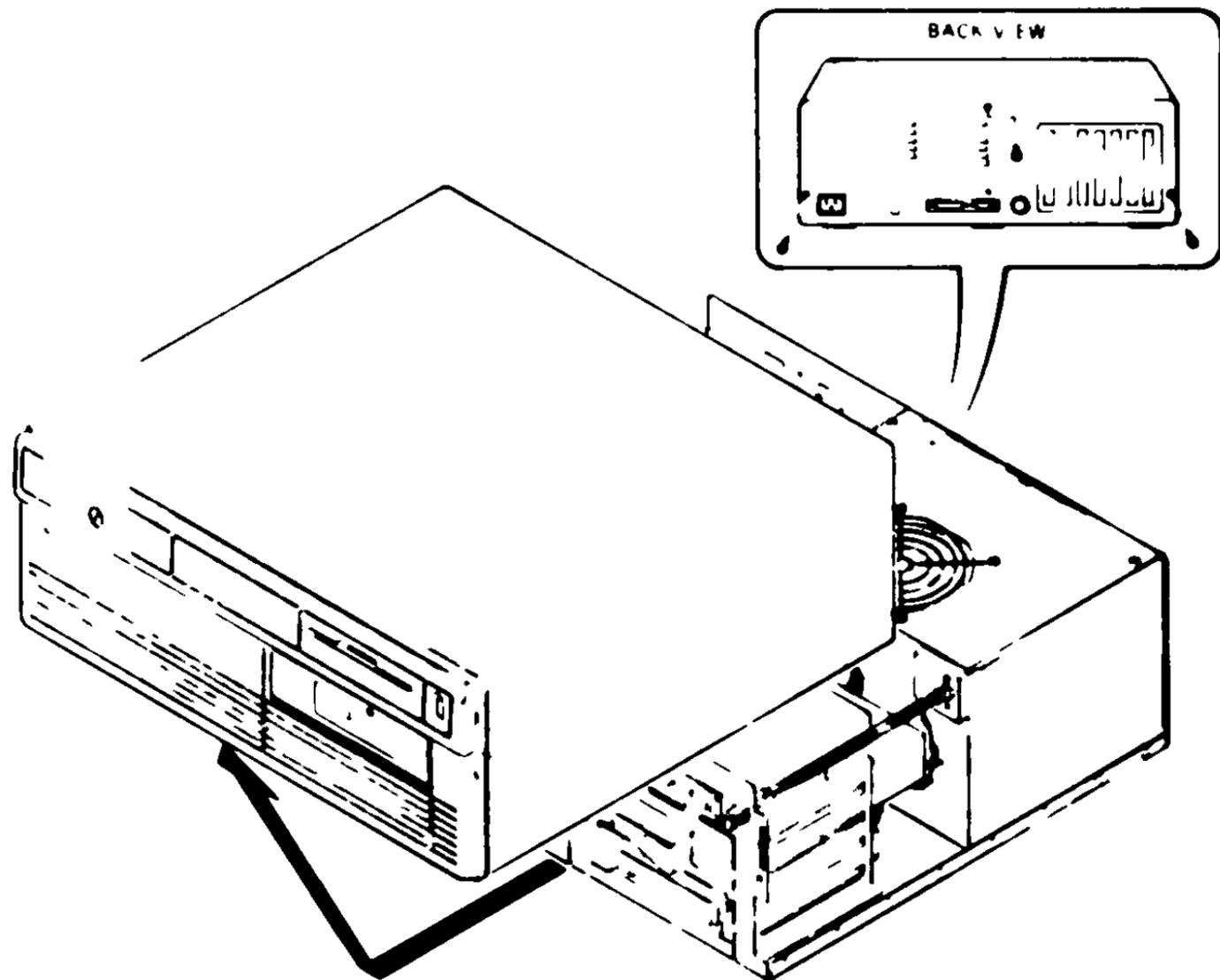
4.2.5 Floppy Drive Replacement

Replace the floppy disk drive as follows (Figure 4-4)

1   Remove the system cover (Figure 4-3)

2   Identify the drive to be replaced and remove it

   •   If floppy drive A needs to be replaced, see Section 4 2 5 1

   •   If floppy drive B needs to be replaced, see Section 4 2 5 2

3   After replacing the drive(s) reconnect all system cables

4   Verify the operation of the replaced drive

5   Reinstall the system cover

4.2.5.1 Removing Floppy Drive A

1   Remove the power switch extender (Figure 4-12)

2   Remove the ribbon cable from the back of drive A

3   Remove drive B if installed (Section 4 2 5 2)

4   Remove the three mounting screws that hold drive A in place and
     remove the drive

5   Set the switch on the replacement drive to match that of the removed
     drive

6   Install the replacement drive using the three mounting screws

7   Reinstall floppy drive B if necessary

8   Reconnect the ribbon cable to the floppy drive and the power switch
     extender to the switch on the power supply (Figure 4-12)

4.2.5.2 Removing Floppy Drive B

1   Remove the ribbon cable from the back of the drive

2   Remove the two mounting screws that hold the mounting tray in
     place

3   Remove the mounting tray from the system unit

4   Remove the mounting screws that hold the drive in the mounting
     tray Note the location of the mounting holes used on the drive and
     the mounting tray

5   Set the switch on the replacement drive to match that of the removed drive

6   Install the replacement drive in the mounting tray

7   Install the mounting tray in the system unit using the two mounting screws

8   Reconnect the ribbon cable to the drive

Figure 4–4   Removing a Floppy Disk Drive

OPTIONAL DRIVE B

DRIVE A

LJ   1584
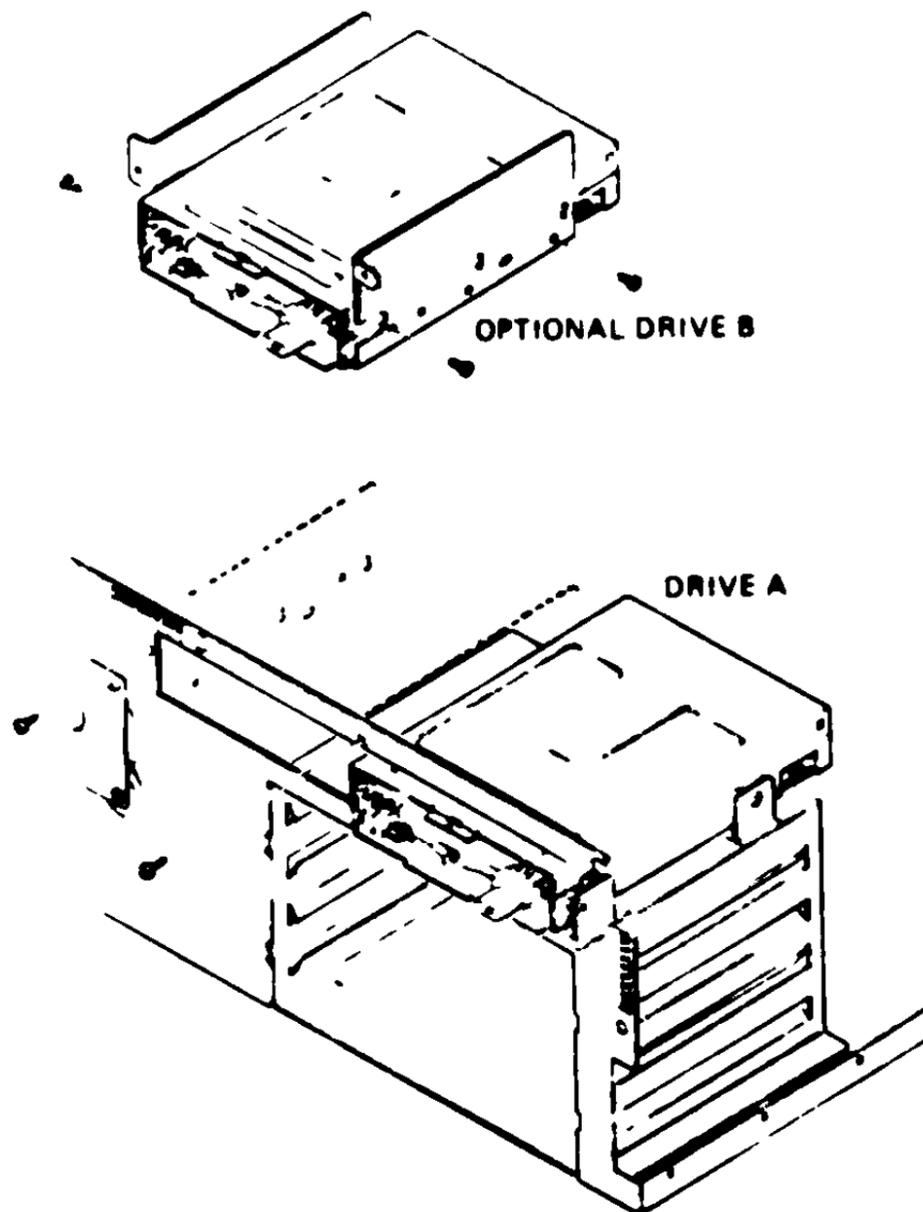
4.2.6 Hard Disk/Tape Drive Replacement

Replace the SCSI hard disk and tape drive as follows (Figure 4–5)

1   Remove the system cover (Section 4 2 4)

2   Identify the drive to be replaced

3   Disconnect the power cable from the drive

4   Remove the drive by pressing both catches in toward the drive and
     sliding the drive out of the unit If a second hard disk or a tape drive
     is installed it may be necessary to partially remove that unit

5   Disconnect the ribbon cable from the drive

6   Note the location of the mounting screws and orientation of the
     grounding tabs on the drive Remove the mounting slides and
     grounding tabs from the bad drive

7   Install the mounting slides and grounding tabs on the new drive
     Make sure the location of the mounting screws and orientation of the
     grounding tabs are the same as on the bad drive

8   Set any jumpers or switches on the drive to match those on the
     bad drive Refer to Appendix A for the location of the jumpers and
     switches

9   Connect the ribbon cable to the new drive

10   Slide the replacement drive and any other drives into the system unit

11   Connect the power cable

12   Verify the operation of the replaced drive

13   Close the system unit

Figure 4-5   Remov   j the Hard Disk/Tape Drive
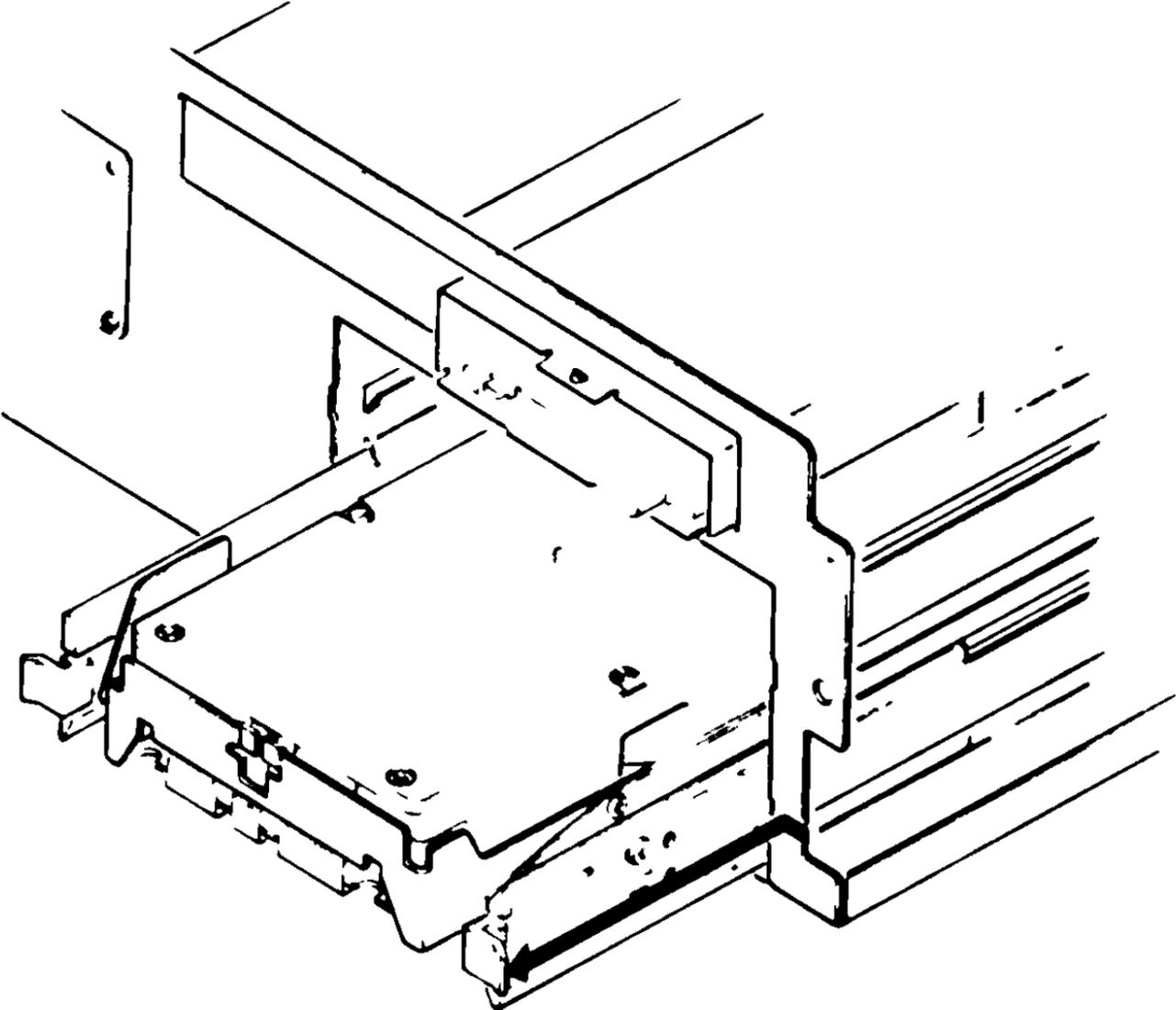
4.2.7 Option Board Replacement

The procedure for replacing an option board in the DECstation 210 is
similar for the different options in the system   Figure 4–6 shows the
recommended location of DIGITAL supplied options

1   Remove the system cover (Section 4 2 4)

2   Locate the option board to be replaced

3   Note the position of any cables connected to the board and disconnect
    them

4   Remove the mounting screw that secures the option board to the
    chassis (Figure 4–7)

5   Note the slot that the board is in

6   Remove the board by pulling it up and out of the expansion slot
    connector

7   Configure the jumpers and switches on the new board to match those
    on the old board

8   Install the new board in the slot from which the bad board was
    removed   Make sure the board is firmly seated in the connector(s) on
    the main logic board

9   Secure the board to the chassis with the mounting screw

10 Reconnect any cables you removed

11 Verify the operation of the replaced board

12 Reinstall the system cover

Figure 4 6   Recommended Option Locations
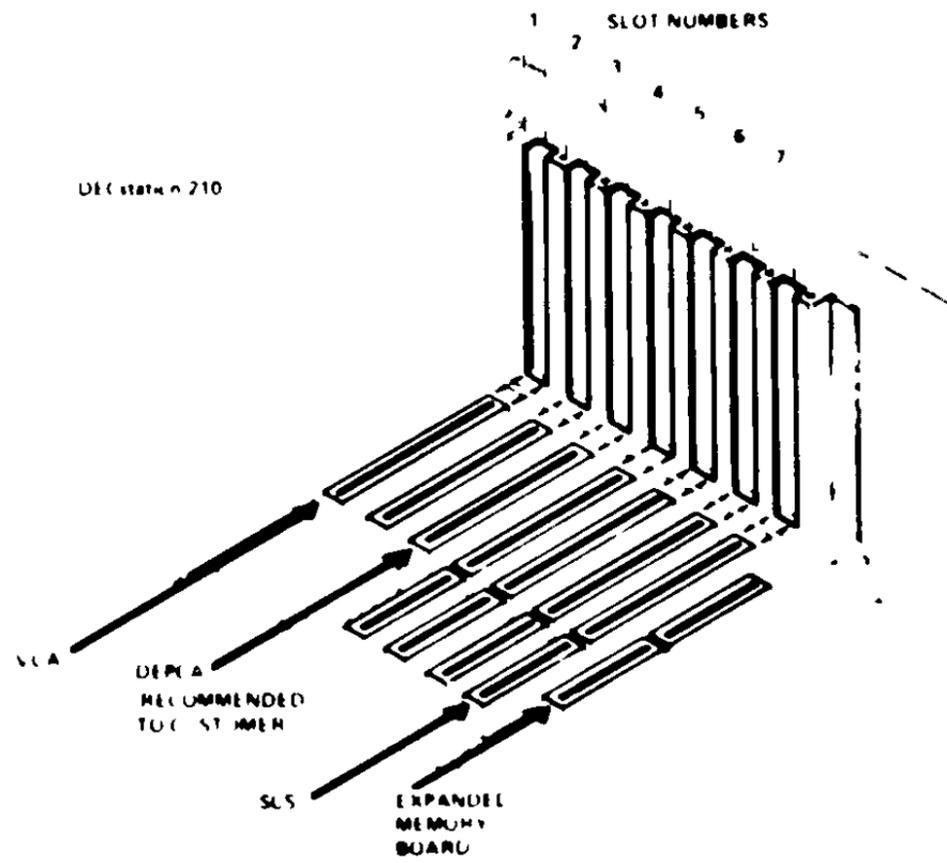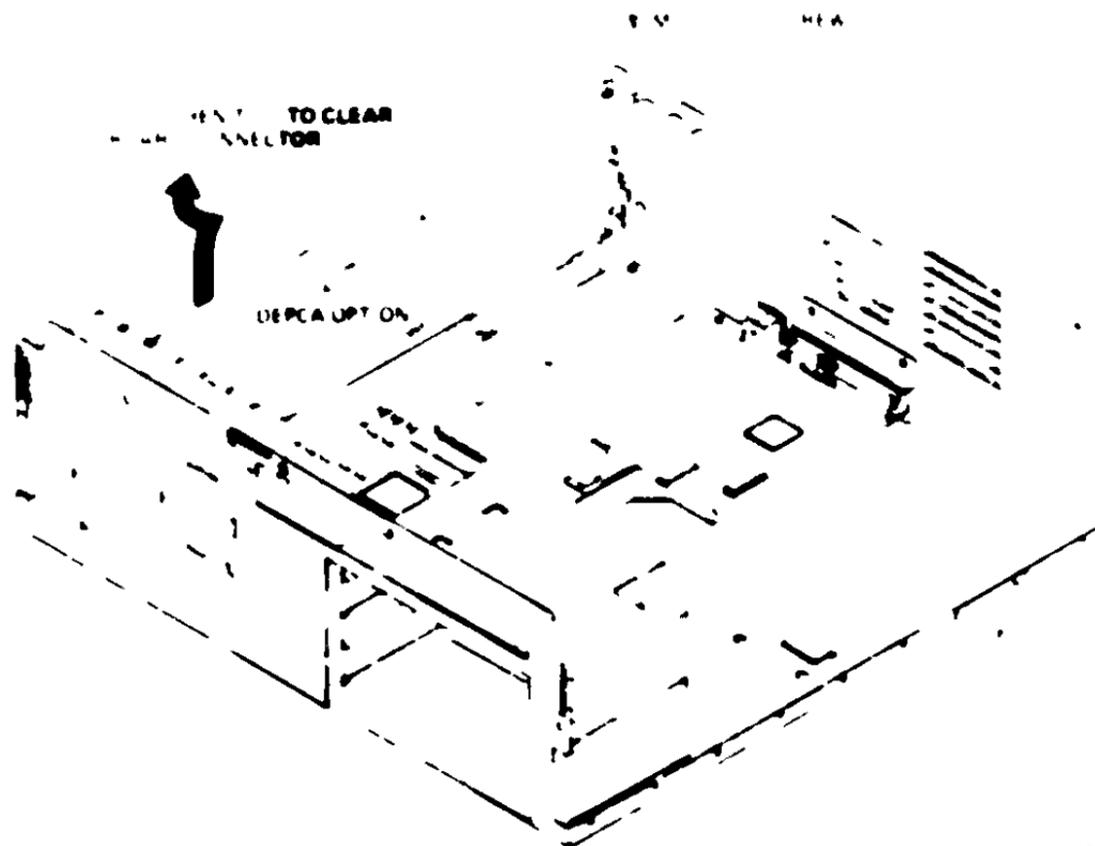

Figure 4 7   Removing an Option Board

4.2.8 Single-In-Line Memory Module Replacement

Use the following to replace Single In Line Memory Modules (SIMMs)·

1   Remove the system cover (Section 4 2 4)

2   Locate the SIMM to be replaced This can be on the main logic board
    (Figure 4–8) or the extended memory board (Figure 4–9)

3   If the SIMM to be replaced is on the main logic board, remove the
    options necessary to gain access to the SIMM If the SIMM is on the
    extended memory board, remove the memory board from the system
    (Figure 4–9)

4   To remove a SIMM use both hands to spread the retaining clips that
    hold the SIMM in place (Figure 4–10) If the SIMM to be replaced is
    the bottom one in a pair it will be necessary to remove the top one
    first and then the bottom one

5   Move the SIMM forward to the vertical position

6   Use your index fingers to pull the SIMM away from the retaining
    brackets

7   To install a SIMM, grasp it at both ends and insert it into the socket
    as shown in Figure 4–10 Make sure the SIMM is fully seated in the
    connector

8   Press backward and down on the SIMM to lock it into place

Figure 4–8 Location of Components on the Main Logic Board

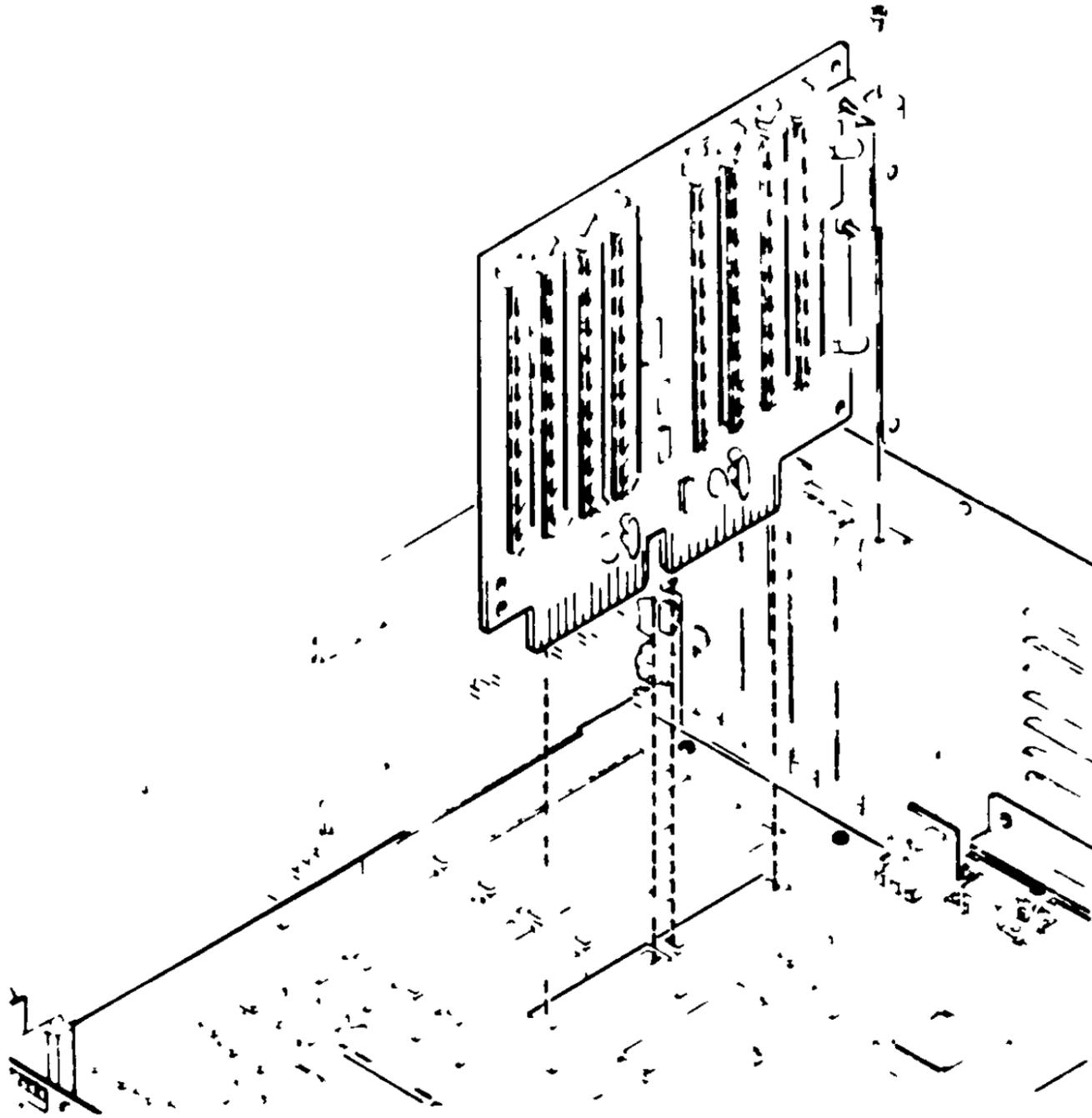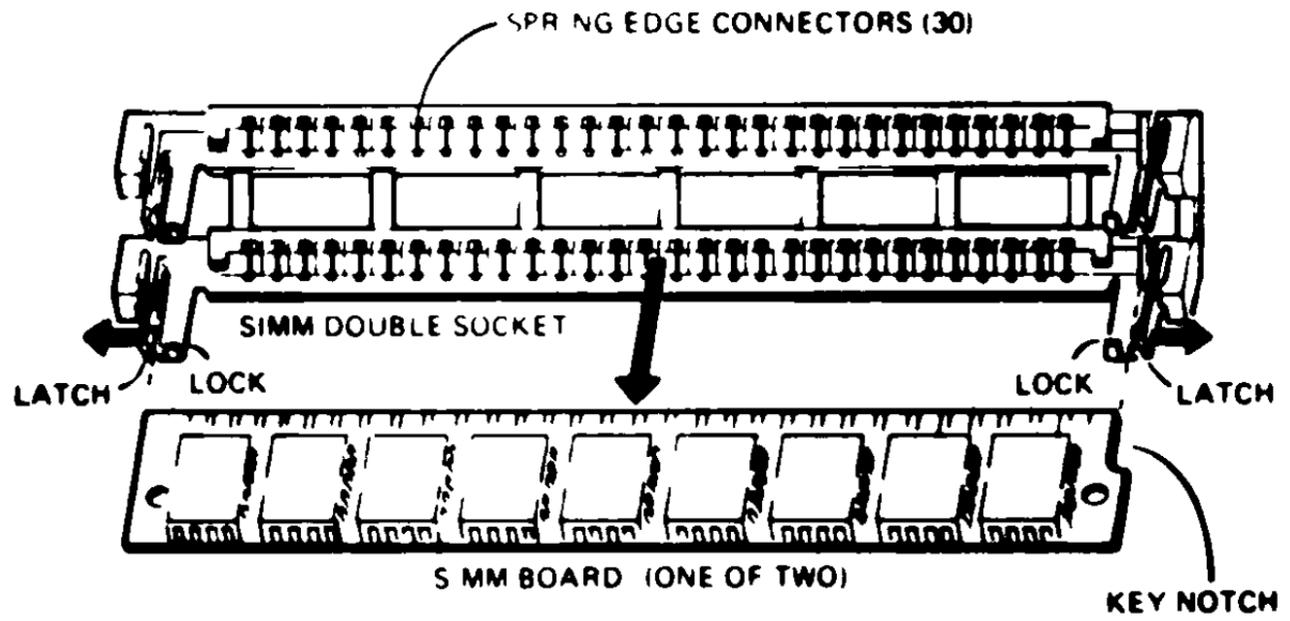**Figure 4 9   Removing the Zero KByte Extended Memory Module**

Figure 4-10   SIMM Removal and Replacement

SPRING EDGE CONNECTORS (30)

SIMM DOUBLE SOCKET

LATCH   LOCK   LOCK   LATCH

S MM BOARD (ONE OF TWO)

KEY NOTCH

LJ   1588

4.2.9 RAM Chip Replacement

Replace the RAM chip(s) as follows

1 Locate, on the main logic board, the RAM chip(s) to be replaced
(Figure 4-8)

2 Remove any option modules that block access to the RAM chip(s)

3 Remove the chip(s) using a small, flat blade screwdriver to alternately
lift each end of the chip While lifting the chip out of the socket be
careful not to damage the socket and chip or bend any of the pins on
the chip

4 Before installing the new RAM chip, straighten any pins so they align
with the holes in the socket

5 Make sure pin one of the RAM chip is aligned with pin one of the
socket

6 Install the RAM chip in the socket by alternately pressing each end of
the chip into the socket Do this until the chip is firmly seated in the
socket

4.2.10 Math Coprocessor Removal and Replacement

The math coprocessor and oscillator are removed and replaced as follows
(Figure 4-11)

1 Locate, on the main logic board, the math coprocessor and oscillator
(Figure 4-8)

2 Remove any option modules that block access to the math coprocessor
and oscillator

3 Remove the chip(s) using a small, flat blade screwdriver to alternately
lift each end of the chip While lifting the chip out of the socket be
careful not to damage the socket and chip or bend any of the pins on
the chip

4 Before installing the new math coprocessor or oscillator, straighten
any pins so they align with the holes in the socket

5 Make sure pin one of the chip is aligned with pin one of the socket

6 Install the chip in the socket by alternately pressing each end of the
chip into the socket Do this until the chip is firmly seated in the
socket

7   Install the chip in the socket by alternately pressing each end of the chip into the socket Do this until the chip is firmly seated in the socket

Figure 4-11   Removing the Math Coprocessor
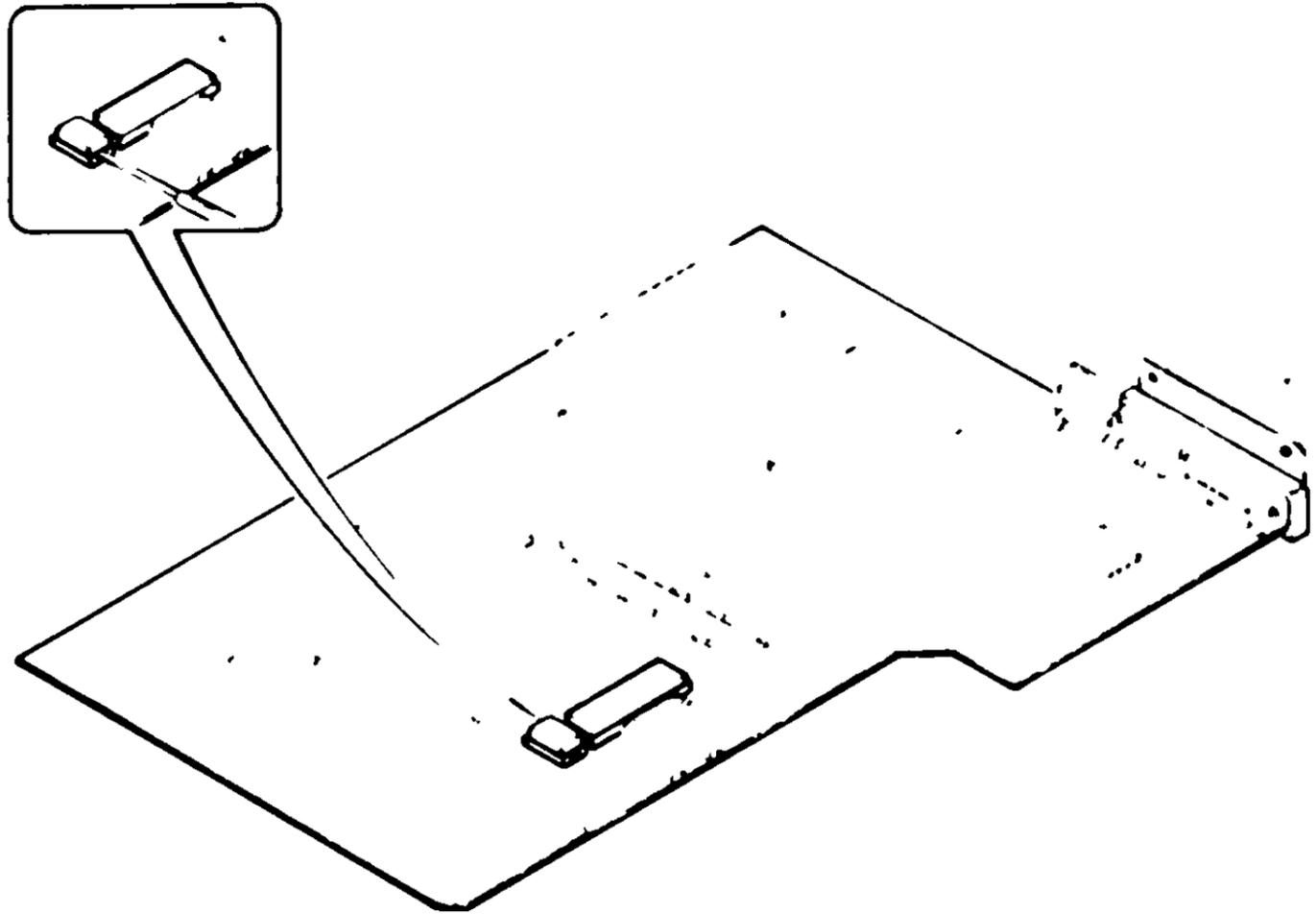
4.2.11 Power Supply Removal and Replacement

Remove the power supply as follows (Figure 4-12)

CAUTION
After you turn power off to the system, do not disconnect the power cord from the system unit or ac outlet for at least 20 seconds.

1   Remove the cover from the system unit (Section 4 2 4)

2   Remove the power switch extension from the power supply

3   Disconnect the power supply cables from the main logic board and disk drives

4   Remove the four mounting screws that hold the power supply in the system unit

5   Slide the power supply unit toward the front of the system unit to disengage it from the catch on the bottom of the system unit

6   Remove the power supply unit from the system unit by lifting it up

7   To replace the power supply unit perform the previous steps in reverse order

Figure 4–12 Removing the Power Supply

POWER SUPPLY

SWITCH

HANDLE WITH CARE

SWITCH EXTENSION (BAR)

LJ 1590
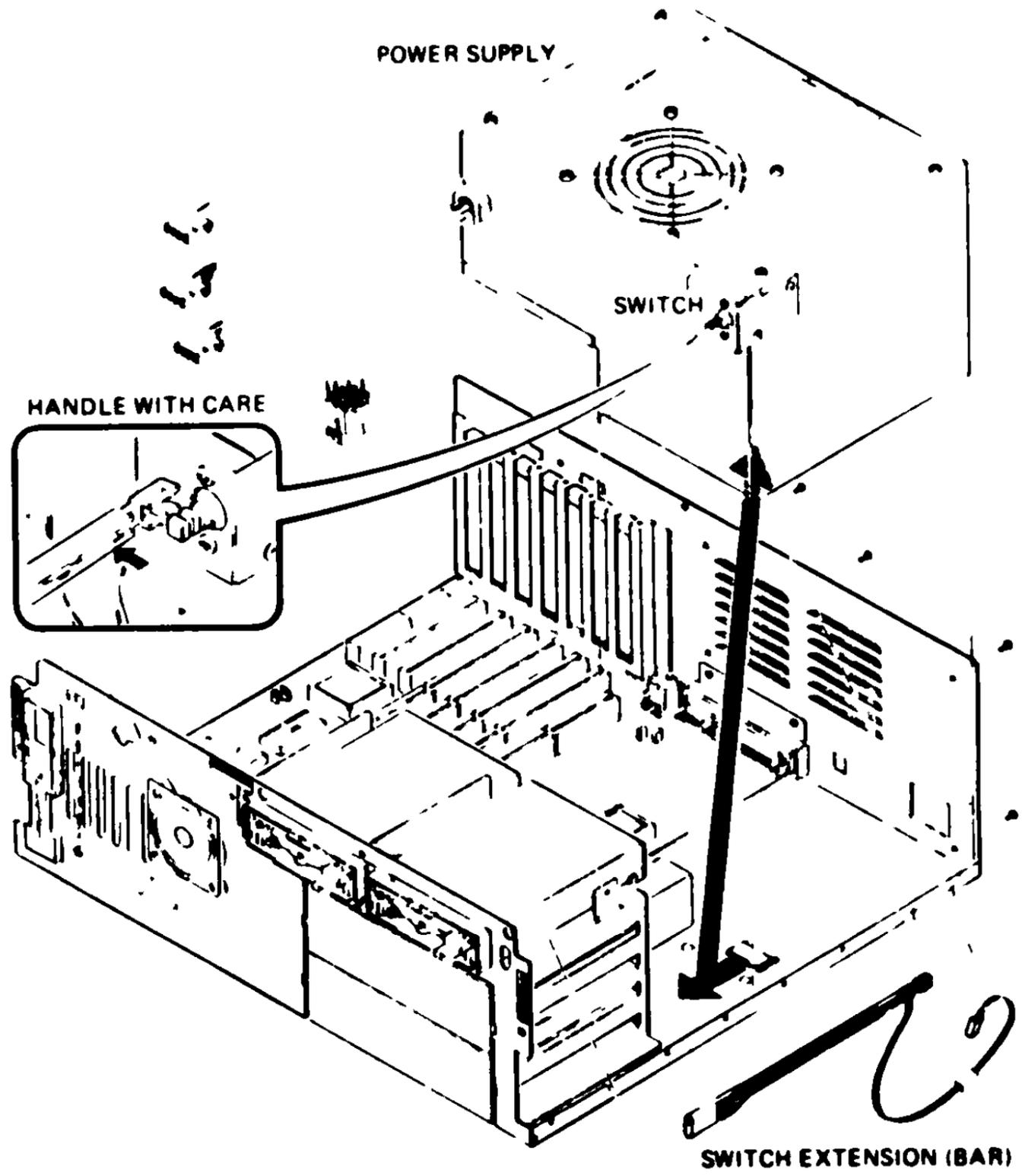
4.2.12 Main Logic Board Removal

Use the following procedure to remove and replace the main logic board
Refer to Figure 4–13 during the removal process

1   Remove the system cover (Section 4 2 4)

2   Remove all option boards from the system board When removing
    each board note its location and the location and routing of any cables
    attached to the option Disconnect any cables attached to the option
    board (if necessary) Remove the board Do this for each option board
    in the system

3   Remove the power supply from the system (Figure 4–12)

4   Disconnect all cables connected to the main logic board and note their
    location and routing

5   Remove the mounting tray for floppy drive B by removing the two
    mounting screws that secure the tray to the front of the system
    chassis

6   Remove the card guide by removing the two mounting screws that
    secure it to the front of the system chassis

7   Remove the main logic board by performing the following steps

    a   Remove the two screws that secure the keyboard/serial connector
        to the back of the chassis

    b   Remove the 10 screws that secure the main logic board to the
        chassis

    c   Remove the main logic board as shown in Figure 4–13

8   Before installing the replacement module, the coprocessor and
    oscillator (if present) need to be removed from the bad board and
    installed on the replacement board as described in Section 4 2 10

9   Set the jumpers and switches on the replacement board to match
    those on the bad board

10 Install the new board by reversing the steps used to remove the board.

Figure 4–13   Removing the Main Logic Board

MA N LOG C (MOTHER) BOARD

SCREW (1 OF 10)

CHASSIS

LJ   1591
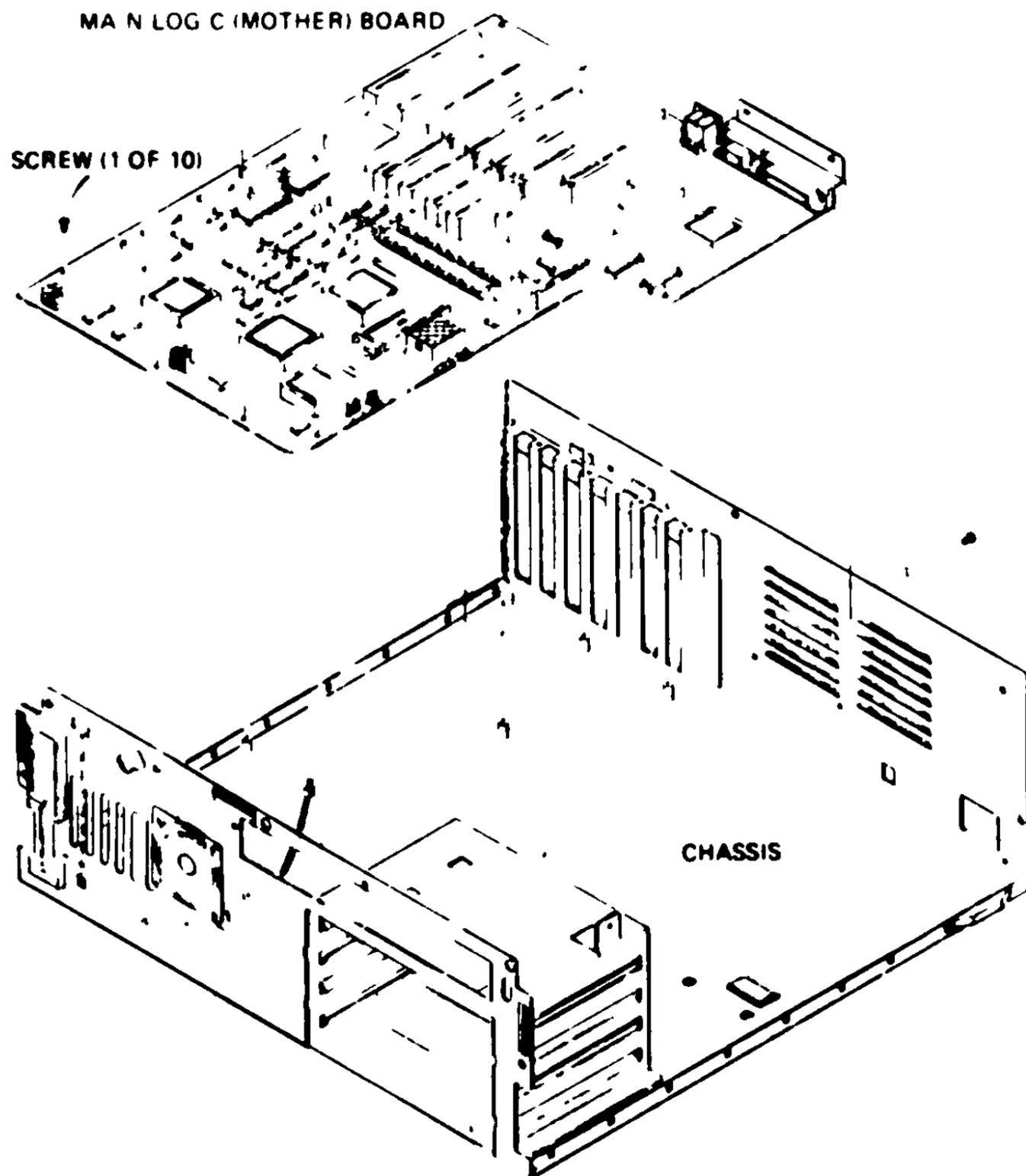
4.2.13 Speaker Replacement

Replace the speaker by performing the following steps (Figure 4-1)

1   Remove the system cover (Section 4 2 4)

2   Disconnect the speaker cable from the main logic board

3   Remove the two screws securing the speaker to the front of the chassis

4   Remove the speaker

5   Installation of the speaker is the reverse of its removal

4.2.14 Battery Replacement

Replace the battery by performing the following steps

1   Remove the system cover (Section 4 2 4)

2   Disconnect the battery from the main logic board (Figure 4-14)

3   Remove the battery from the system by pulling it off of the velcro mounting strip

   WARNING
   Do not dispose of the battery at the customer site. Do not burn the battery or take it apart.

4   Replace the battery and connect it to the main logic board

Figure 4 14   Removing the Battery

BATTERY
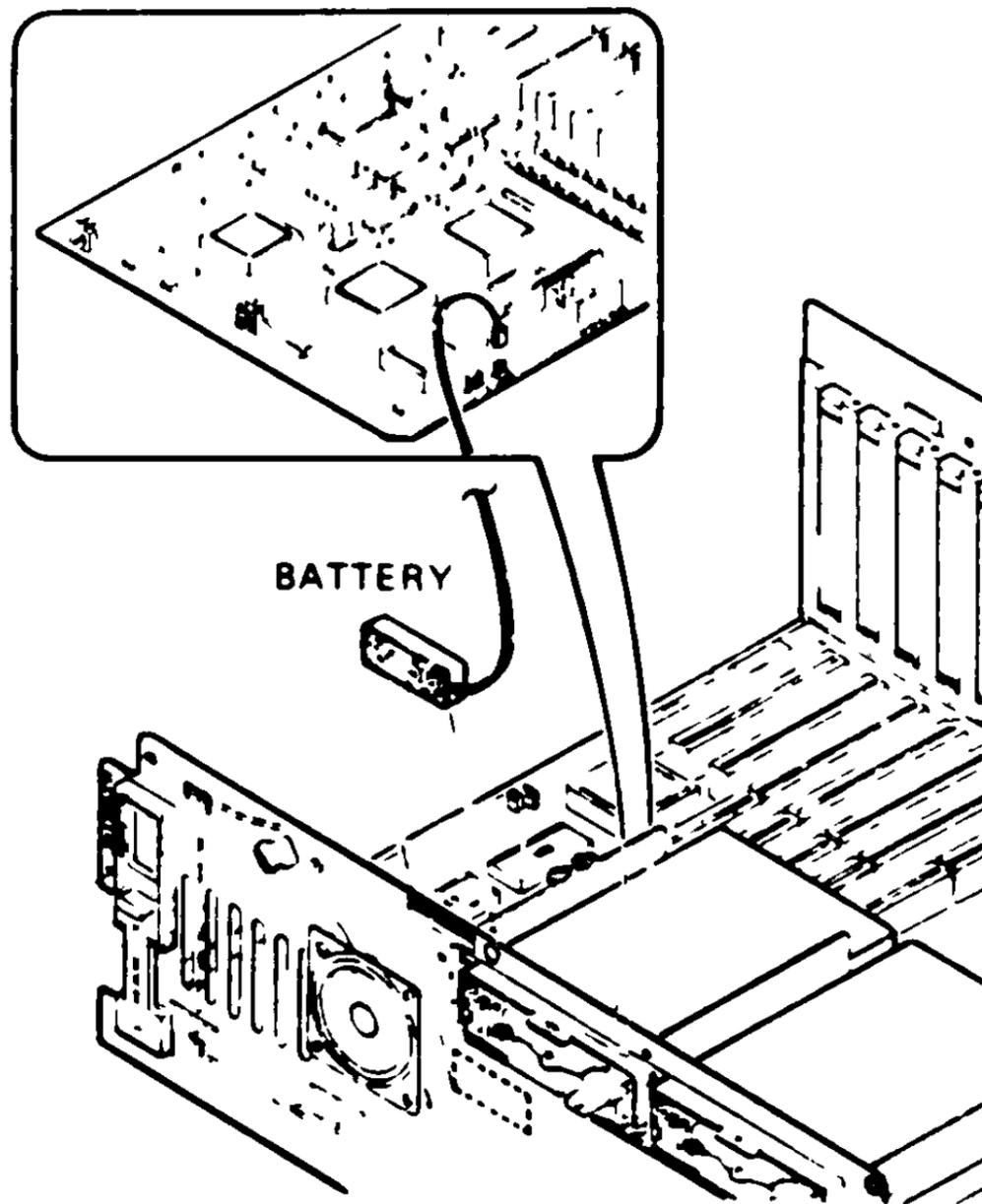
LJ   1592

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APPENDIX A

A
Jumpers and Switches

This appendix shows the location and describes the function of the jumpers and switches on the following boards used in the DECstation 210

- Main logic board

- VGA option board

- Serial/Parallel board

- 16 bit SCSI board

- 40/80 Mbyte SCSI hard disk

- 170 Mbyte SCSI hard disk

- 150 Mbyte tape drive

A recommended default setting for the jumpers and switches is also provided

A.1 DECstation 210 Main Logic Board

Figure A-1 shows the jumper locations on the DECstation 210 main logic board Table A-1 lists the jumper and switch configurations for the DECstation 210 main logic board

Figure A 1   DECstation 210 Main Logic Board Jumper Locations
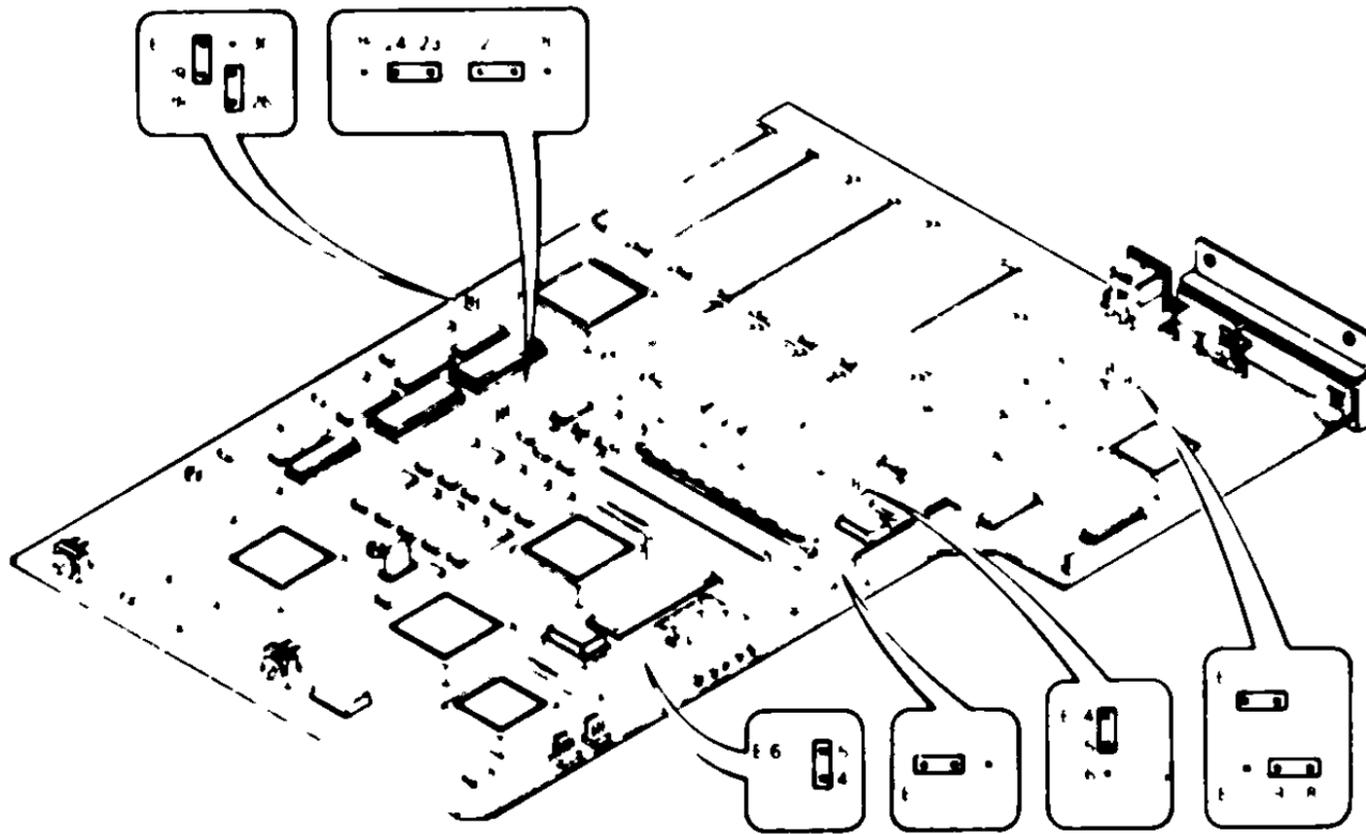
Table A 1   DECstation 210 Jumper and Switch Configurations

Configuration	Jumper Setting	Dip Switch
Monitor		
Color	E15-E16*	
Monochrome	E14-E15	
BIOS ROM Type		
128K (16K x 8)	E26-E27 E29-E31*	
256K (32K x 8)	E26-E27 E28-E29	
512K (64K x 8)	E27 E30 E28-E29	
DRAM Bank Select		
Bank 0 On-board (512K)	E23-E24*	
Bank 0 on Local Memory ExBd (512K/2M)	E24-E25	
Bank 1 On-board (128K)	E21 E22*	
Bank 1 on Local Memory ExBd (512K/2M)	E20-E21	
On-board Parallel Port		
Port One Enabled		SW1 = ON*
		SW2 = ON*
Parallel Port Interrupt = IRQ7	E12 E13*	
Port Two Enabled		SW1 = ON
		SW2 = OFF
Parallel Port Interrupt = IRQ5	E11 E12	
On-board Parallel Port Disabled		SW1 = OFF
On-board Serial Port		
Port One Enabled		SW3 = ON*
		SW4 = ON*
Serial Port Interrupt = IRQ4	E8-E9*	
Port Two Enabled		SW3 = ON

*Default Setting

Table A-1 (Cont.)   DECstation 210 Jumper and Switch Configurations

Configuration	Jumper Setting	Dip Switch
		SW4 = OFF
Serial Port Interrupt = IRQ3	E9-E10	
On board Serial Port Disabled		SW3 = OFF
On-board Floppy		
Primary Port		SW5 - ON˙
Secondary Port		SW5 = OFF
Math Coprocessor		
10MHz Option Kit	E2-E3 E4 E6˙	
8MHz Option Kit	E1 E2 E6-E7	
Coprocessor Not Present	No Jumper	

˙Default Setting

A.2 DECstation 210 Memory Configuration

Table A 2 lists the jumper settings for the different memory
configurations available on the DECstation 210 In the table, the
abbreviation for main logic board is MBd and the abbreviation for the
memory expansion board is ExBd

Table A 2   DECstation 210 Memory Configuration

Total Memory	Bank 0 MBd	Bank 0 ExBd	Bank 1 MBd	Bank 1 ExBd	Bank 2 MBd	Bank 2 ExBd	Bank 3 MBd	Bank 3 ExBd	Jumper Settings
512K	512K	·		·		·		·	E23-E24 E21-E22
				Standard amount of memory No ExBd					
640K	512K		128K	·		·		·	E23-E24 E21-E22
				128K RAM Upgrade No ExBd					
1 MB·	512K		512K	·		·		·	E24-E25 E20-E21
				Move two 256K SIMMs to ExBd Add two more					
1.64 MB	512K		128K	·		512K		512K	E24-E25 E21-E22
				Add 128K Upgrade Move two 256K SIMMs to ExBd Add four more.					
2 MB·	512K	·		512K	512K			512K	E24-E25 E20-E21
				Move two 256K SIMMs to ExBd Add six more					
4.64 MB	512K		128K	·		2MB		2MB	E24-E25 E21-E22
				Add 128K Upgrade Move two 256K SIMMs to ExBd Add four 1 MB SIMMs					
5 MB·	512K			512K	2MB	·		2MB	E24-E25 E20-E21
				Move two 512K SIMMs to ExBd Add two more Add four 1 MB SIMMs					

·These memory configurations are the most efficient because they can use page mode Page
mode can be used because they have the same amount of memory in Banks 0 and 1 and
the same amount of memory in Banks 2 and 3

Table A 2 (Cont)   DECstation 210 Memory Configuration

Total Memory	Bank 0		Bank 1		Bank 2		Bank 3		Jumper
	MBd	ExBd	MBd	ExBd	MBd	ExBd	MBd	ExBd	Settings
8 MB*	2MB		2MB	-	2MB	-	2MB		E24 E25 E20-E21

Remove 512K SIMMs from main board Add eight 1 MB SIMMs to ExBd

*These memory configurations are the most efficient because they can use page mode Page mode can be used because they have the same amount of memory in Banks 0 and 1 and the same amount of memory in Banks 2 and 3

A.3 VGA Adapter

Figure A-2 shows the location of the jumpers and switches on the VGA board Table A-3 lists the jumper settings for the VGA board
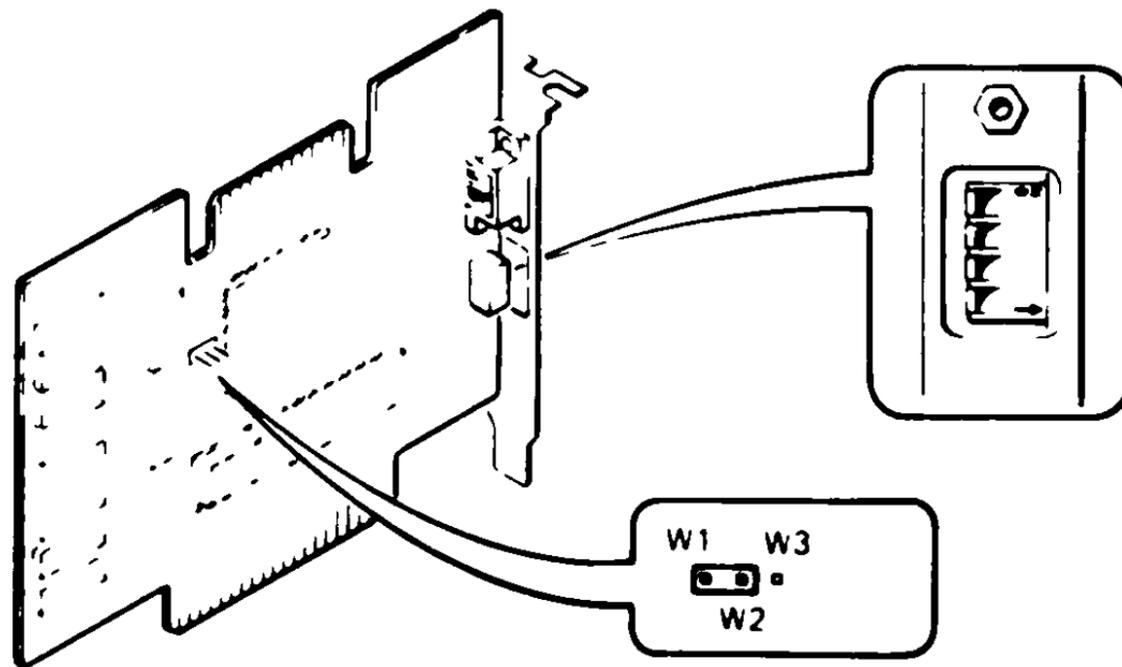
NOTE
Verify that the dip switches on the VGA board are all OFF.

Table A-3 VGA Configuration

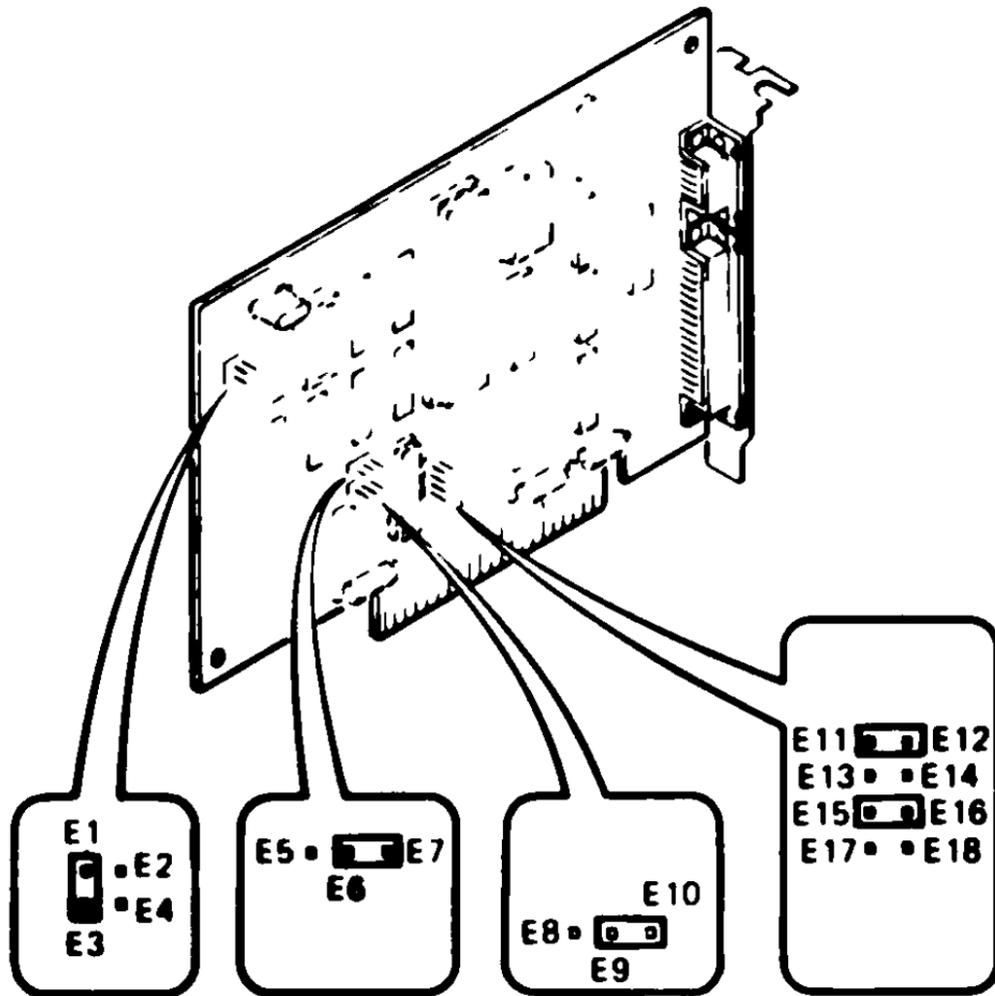| Configuration	Jumper Setting
Feature Connector	
132 Column Text Mode Enabled	W1 W2·
132 Column Text Mode Disabled	W2-W3

·Default Setting

Figure A-2 VGA Jumper and Switch Locations

LJ 1594

A.4 Serial/Parallel Board

Figure A–3 shows the location of the jumpers on the Serial/Parallel board.
Table A–4 describes the function of each jumper

Figure A–3   Serial/Parallel Board Jumper Locations

LJ   1595

Table A–4 Serial/Parallel Board Jumper Settings

Configuration	Jumper Setting
Serial Port	
Port 1	E9 E10*
Port 2	E8 E9
Interrupt for Serial Port	
Interrupt 4 for Serial Port 1	E15 E16*
Interrupt 3 for Serial Port 2	E17 E18
Baud Rate Generator	
USA Standard	E1-E3*
International	E1-E2, E3 E4
Parallel Port	
Port 1	E6 E7*
Port 2	E5-E6
Interrupt for Parallel Port	
Interrupt 7 for Parallel Port 1	E11 E12*
Interrupt 5 for Parallel Port 2	E13 E14

*Default Setting
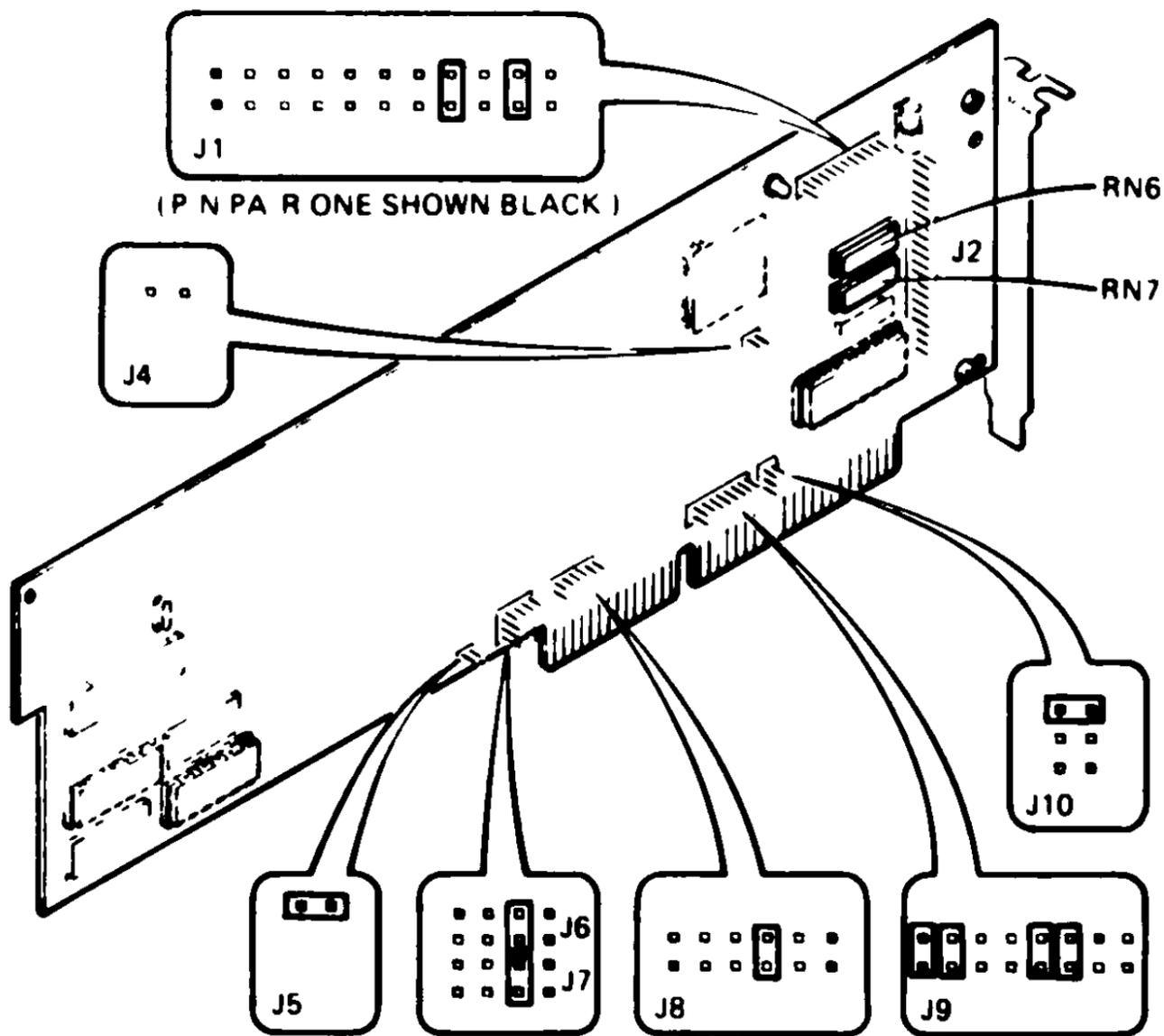
A.5 16-Bit SCSI Host Adapter

Figure A–4 shows the locations of the jumpers and bus terminators on
the 16-Bit SCSI host adapter Table A–5 describes the function of each
jumper The jumpers in the table are referred to as pin pair numbers

NOTE
**The pins at some locations are numbered from left to right, at
other locations from right to left.**

Figure A–4   16-Bit SCSI Host Adapter Jumper Locations

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Table A 5 16-Bit SCSI Host Adapter Configurations

Configuration	Jumper Setting		
SCSI Address	J1, Pair 4	J1, Pair 5	J1, Pair 6
Address 0	X	X	X
Address 1	–	X	X
Address 2	X		X
Address 3	–		X
Address 4	X	X	
Address 5	–	X	
Address 6	X	–	
Address 7*	–	–	
SCSI Parity			
Parity checking enabled*	No jumper		
Parity checking disabled	J1, Pair 3		
SCSI Terminators			
Installed*	RN6, RN7		
Removed	No Jumper		
SCSI Terminator Power			
Installed*(Host adapter supplies the terminator power)	F1		
Removed	No Jumper		
SCSI Synchronous Negotiation			
Disabled*	No jumper		
Enabled	J1, Pair 1		
DMA Channel Selection	J1, Pair 7	J1, Pair 8	
DMA Channel 0	X	X	
DMA Channel 5*		X	
DMA Channel 6	X		
DMA Channel 7			

*Default Setting

Table A-5 (Cont)   16-Bit SCSI Host Adapter Configurations

Configuration	Jumper Setting		
DMA Acknowledge			
DMA Channel 0	J7, Pair 1		
DMA Channel 5*	J7, Pair 2		
DMA Channel 6	J7, Pair 3		
DMA Channel 7	J7, Pair 4		
DMA Request			
DMA Channel 0	J6, Pair 1		
DMA Channel 5*	J6, Pair 2		
DMA Channel 6	J6, Pair 3		
DMA Channel 7	J6, Pair 4		
Interrupt Channel	J1, Pair 9	J1, Pair 10	J1, Pair 11
Not Defined	X	X	X
Not Defined	X	X	X
Interrupt Channel 15	X		X
Interrupt Channel 14			X
Interrupt Channel 12	X	X	
Interrupt Channel 11*		X	
Interrupt Channel 10	X		
Interrupt Channel 9			—
Interrupt Channel 9	J8, Pair 1		
Interrupt Channel 10	J8, Pair 2		
Interrupt Channel 11*	J8, Pair 3		
Interrupt Channel 13	J8, Pair 4		
Interrupt Channel 14	J8, Pair 5		
Interrupt Channel 15	J8, Pair 6		
Port Address	J9		
Address Bit	Pair		

*Default Setting

Table A–5 (Cont.) 16-Bit SCSI Host Adapter Configurations

Configuration	Jumper Setting		
Address Bit 004H	1	LSB	
Address Bit 008H	2		
Address Bit 010H	3		
Address Bit 020H	4		
Address Bit 040H	5		
Address Bit 080H	6		
Address Bit 100H	7		
Address Bit 200H	8	MSB	

NOTE

The default port address is 0330H. The jumper installed deasserts the bit.

BIOS Address	J10, Pair 1	J10, Pair 2	J10, Pair3
Address 0C0000H	X	X	X
Address 0D0000H		X	X
Address 0C8000H	X		X
Address 0D8000H			X
Address 0C4000H	X	X	
Address 0C8000H	X		X
Address 0D4000H		X	
Address 0CC000H *	X		
Address 0DC000H			
BIOS Wait State			
No Wait State *	No Jumper		
Wait State	J4		
Computer Configuration Jumper			
DECstation 210	J5		
DECstation 3XX	No Jumper		

Table A 5 (Cont.)   16-Bit SCSI Host Adapter Configurations

Configuration	Jumper Setting
Reserved Jumpers	
Normal operation*	No Jumper
Normal operation prevented	J1, Pair 2

*Default Setting
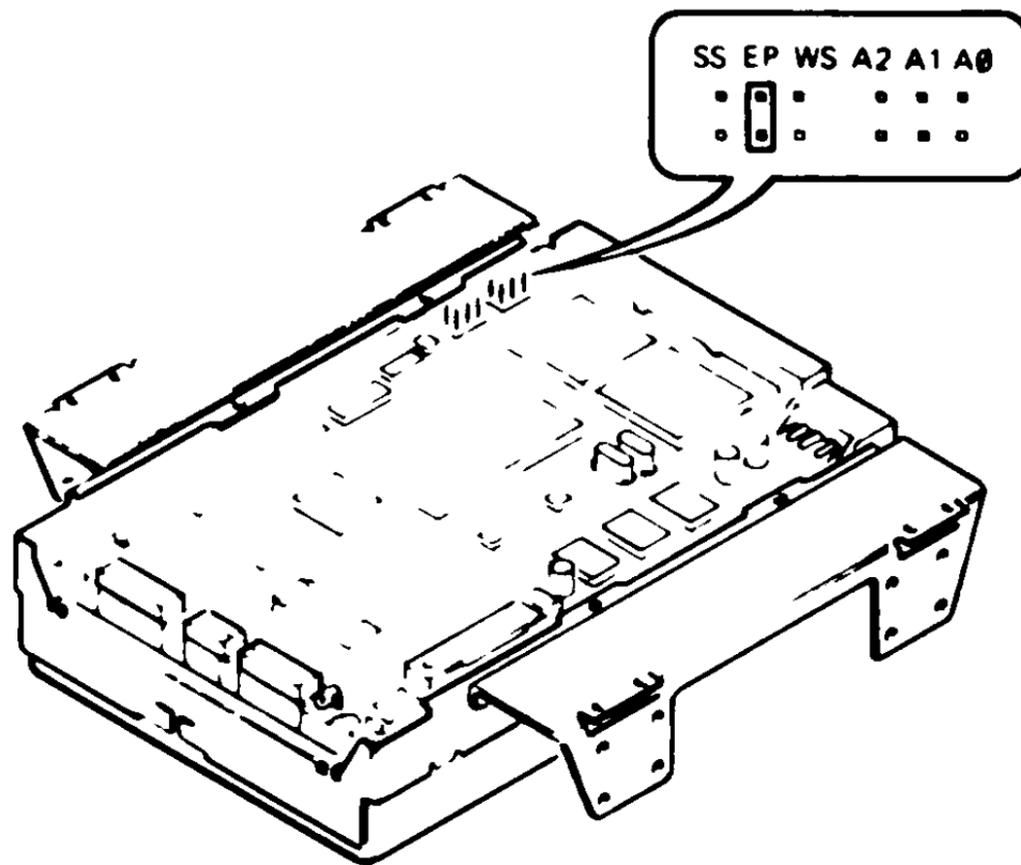
A.6 40/80 Mbyte Internal SCSI Hard Disk Drive

Figure A–5 shows the location of the jumpers and terminators on the 40/80 Mbyte SCSI hard disk drive   Table A–6 lists the jumper settings for the 40/80 Mbyte SCSI hard disk drive

The selection of the SCSI ID number is done with pin pairs A0, A1, and A2   These pins form a 3 bit binary number, with A2 the most significant bit and A0 the least significant bit   An installed jumper represents a logical one and an uninstalled jumper represents a logical zero

NOTE
Jumpers are partially installed on A1 and A2 for shipping purposes only. Remove these jumpers before installation.

Figure A–5   40/80 Mbyte SCSI Hard Disk Jumper Locations

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Table A-6   40 80 Mbyte Internal SCSI Hard Disk Drive

Configuration	Jumper Setting		
SCSI ID number	Pair A0	Pair A1	Pair A2
SCSI ID 0*			
SCSI ID 1	X		
SCSI ID 2		X	
SCSI ID 3	X	X	
SCSI ID 4			X
SCSI ID 5	X		X
SCSI ID 6		X	X
SCSI ID 7	X	X	X
Enable Parity Option (EP)			
Parity Enabled	EP installed*		
Parity Disabled	EP not installed		
Bus Terminators			
Terminate bus	Terminators installed (if primary drive)		
Do not terminate bus	Terminators removed (if secondary drive)		
Wait Spin (WS) Option			
Motor spin at power up	WS not installed*		
Wait Spin (WS), Motor spins after host sends start/stop command across the SCSI bus	WS installed		
Self Seek (SS) Option			
No Self-Seek test	SS Not installed*		
Self Seek test, Drive performs random seek patterns and cuts off communication with SCSI bus	SS installed		

*Default Setting

A.7 170 Mbyte Internal SCSI Hard Disk Drive

Figure A-6 shows the location of the jumpers and terminators on the 170
Mbyte SCSI hard disk drive Table A-7 lists the jumper settings for the
170 Mbyte SCSI hard disk drive

The selection of the SCSI ID number is done with pin pairs 1, 2, and 4
These pins form a 3 bit binary number, with pair 4 the most significant
bit and pair 1 the least significant bit An installed jumper represents a
logical one and an uninstalled jumper represents a logical zero

NOTE
**Jumpers are partially installed on pair 1 and pair 2 for shipping
purposes only. Remove these jumpers before installation.**

Figure A-6 170 Mbyte SCSI Hard Disk Jumper Locations
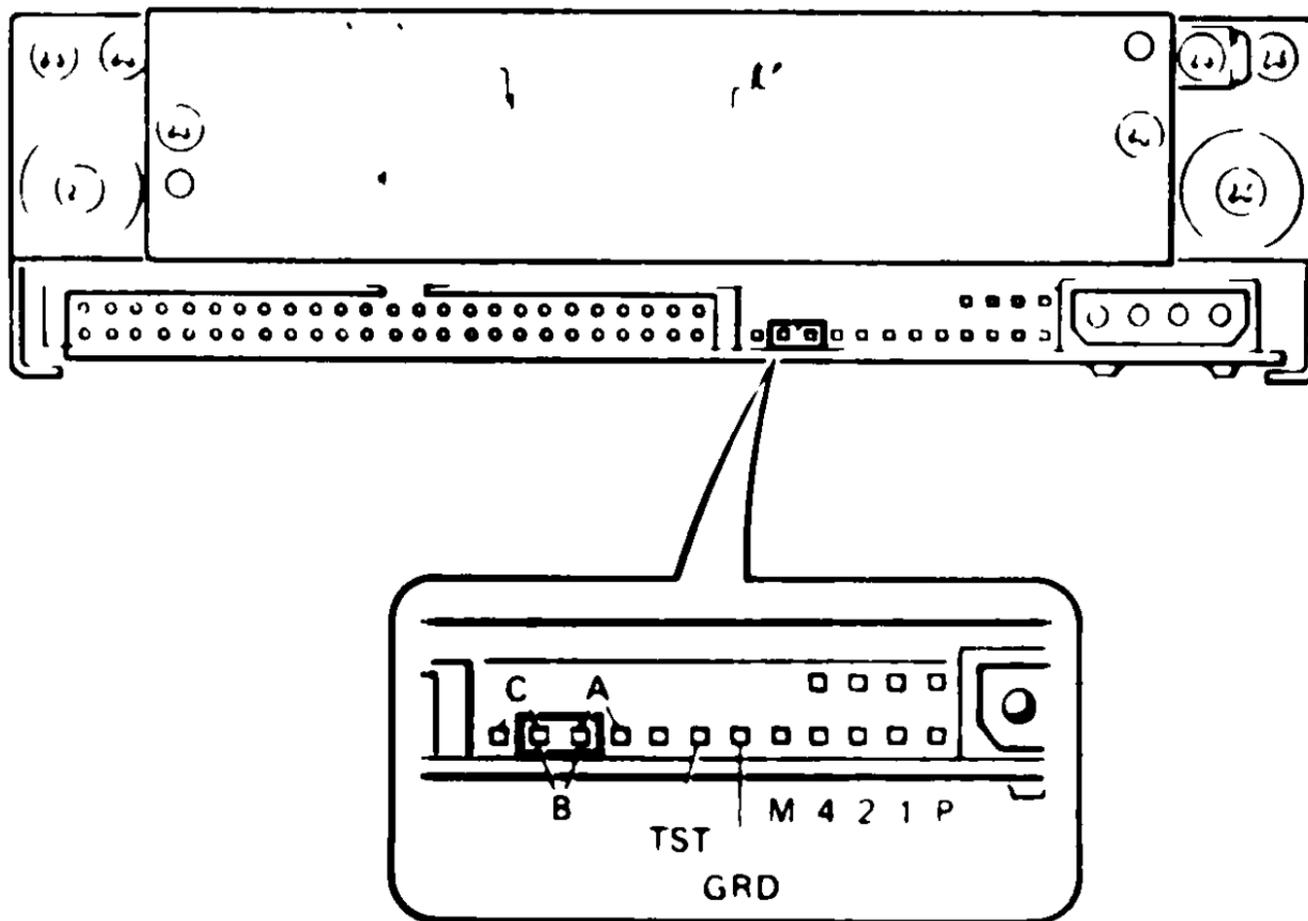
Table A 7   170 Mbyte Internal SCSI Hard Disk Drive

Configuration	Jumper Setting		
SCSI ID number	Pair 4	Pair 2	Pair 1
SCSI ID 0*			
SCSI ID 1			X
SCSI ID 2		X	
SCSI ID 3		X	X
SCSI ID 4	X		
SCSI ID 5	X		X
SCSI ID 6	X	X	
SCSI ID 7	X	X	X
Enable Parity Option (P)			
Parity Disabled	P not installed*		
Parity Enabled	P installed		
Terminator Power Option			
Jumper in A position	Terminator power supplied		
Jumper in B position	No Terminator power supplied		
Motor Start (M) Option			
Motor spin at power-up	M not installed*		
Wait Spin. Motor spins after host sends start/stop command across the SCSI bus	M installed		
Test Seek Option			
No Test Seek	TST Not installed*		
Test Seek. Drive performs continuous seeks to random cylinders	TST installed		

*Default Setting

A.8 150 Mbyte SCSI Tape Cartridge System

Figure A–7 shows the location of the jumpers and bus terminators on the 150 Mbyte SCSI tape drive. Table A–8 lists the jumper settings for the 150 Mbyte SCSI tape drive

The selection of the SCSI ID number is done with pins 3, 4, and 5 on J4 These pins form a 3 bit binary number, with Pin 3 the most significant bit and pin 5 the least significant bit. An installed jumper represents a logical one and an uninstalled jumper represents a logical zero

Figure A 7   150 Mbyte SCSI Tape Drive Jumper and Bus Terminator Locations
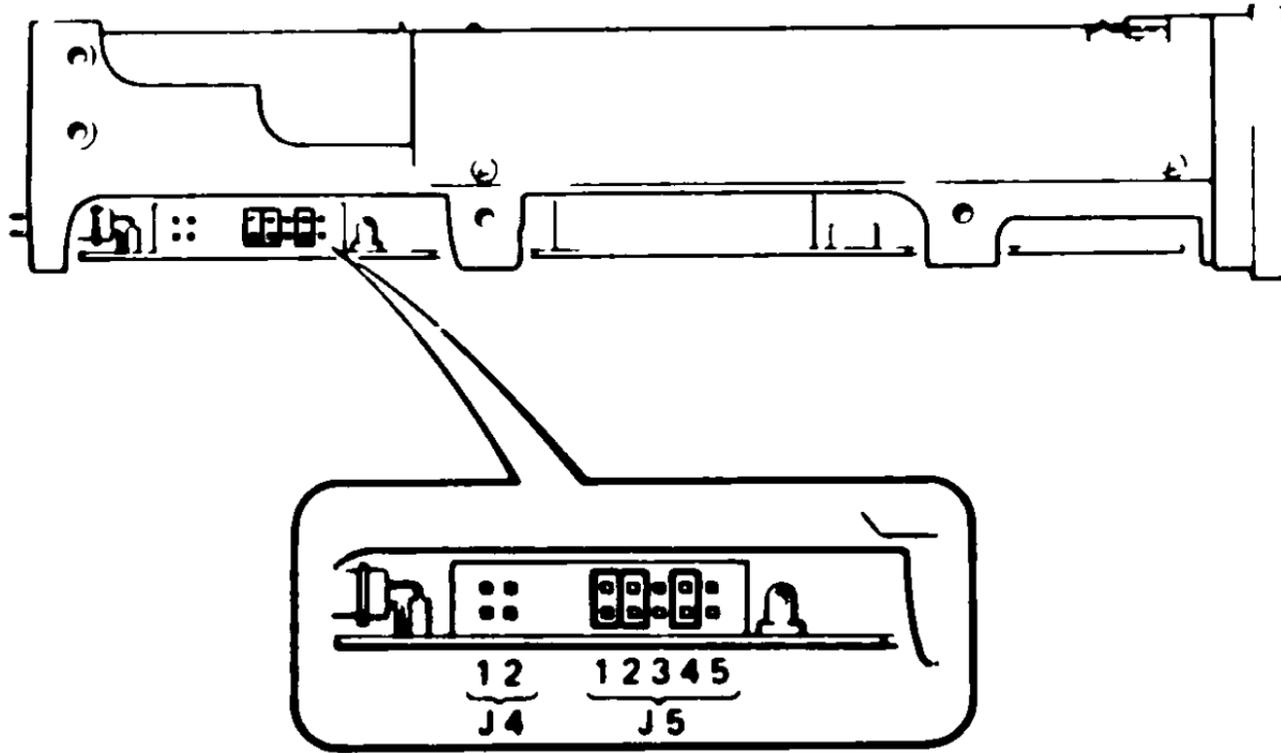
LJ   1600

Table A-8   150 Mbyte SCSI Tape Cartridge Configuration

Configuration	Jumper Setting		
SCSI ID number	**J4, Pin 3**	**J4, Pin 4**	**J4, Pin 5**
0			
1			X
2 *		X	
3		X	X
4	X		
5	X		X
6	X	X	
7	X	X	X
Enable Parity Option			
Parity Enabled	J4, Pin 2 *		
Parity Disabled	No jumper		
Terminator Power Option			
Power supplied to the terminators	J4, Pin 1 *		
Power not supplied to the terminators	No jumper		
Autoload Option			
Drive automatically loads cartridge	No jumper *		
Drive does not automatically load cartridge, a Load command must be issued before any other commands can be executed	J5, Pin 2		
Terminators			
One SCSI device installed	Terminators installed *		
More than one SCSI device installed	Remove terminators.		

*Default Setting

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APPENDIX B

B.1 DECstation Powerup Self Testing

When you turn on power to the DECstation 210 system, a power up self-test (sometimes referred to as POST) and system initialization occur When you supply power

1   The 80286 CPU starts program execution A jump instruction tells the CPU to go to the powerup test routines located in the BIOS ROM

2   The CPU executes the powerup test routines and initializes the screen The routines test just enough to determine if the screen can be used to display error messages during further testing Basic testing of the following major subsystems is performed· the CPU, interrupt timer, RAM circuitry, RAM, DMA, and interrupt controllers, and the video board Video verification tests are the last operations to take place during the first phase of powerup testing The powerup test "beep codes give you some diagnostic information in case a fatal error occurs *before* screen initialization See Chapter 2 for a list of beep codes

3   The CPU attempts to determine what peripheral devices are available in the system, for example, serial ports, parallel ports, diskette and hard drives, and expansion memory

4   The CPU displays the BIOS version message on the screen and further tests system RAM The CPU displays on the screen any RAM error found during testing

5   The CPU compares the devices found to those in the CMOS RAM setup and reports any miscompares with an Invalid configuration information message The system can display a variety of other messages during this process The messages are partially determined by the option boards that are installed in the system See Chapter 2 for a partial list of these messages

6   The CPU checks for the presence of expansion ROMs in the system
    For example, expansion ROMs are found associated with SCSI hard
    drive controllers and video options Where appropriate, the system
    turns over test execution to the expansion ROM These expansion
    ROMs can display messages about the status of the hardware with
    which they are associated

7   The CPU attempts to start the boot drive and load the operating
    system The system attempts to boot from the diskette drive first (a
    floppy disk must be present) If a bootable diskette is not present,
    the system then attempts to boot from the hard disk drive Failure
    to boot from the diskette drive can indicate that a system diskette is
    not present, or that there is a problem with the drive, drive setting,
    or drive cables Failure to boot from the hard disk can indicate that
    the drive has not been initialized, or that there is a problem with the
    drive, drive and/or controller settings, or drive cables

B.2 PC Microcomputer Architecture

The PC microcomputer architecture consists of the CPU, bus structure,
instructions, memory, I/O, CPU registers, arithmetic/logic unit (ALU),
control circuitry, and addressing modes

B.2.1 The Parts of a Microcomputer

The DECstation is technically a microcomputer A microcomputer is a
system of one or more very large scale integrated circuit (VLSI) devices
and associated control logic that are used to provide large computer
functionality on a smaller scale

A microcomputer has a central processing unit (CPU), memory, and
input/output (I/O) ports (Figure B–1)

B.2.2 The CPU Function

The CPU does the actual work numeric processing, logical operations,
and timing *Programs* stored in memory contain sequences of instructions
These programs tell the CPU what to do Programs also contain
instructions for processing data that is stored in memory

The I/O ports let the CPU communicate with the outside world through
I/O devices such as printers, disk drives, terminals, and modems. I/O
devices are called peripherals

Figure B 1 Microcomputer Diagram
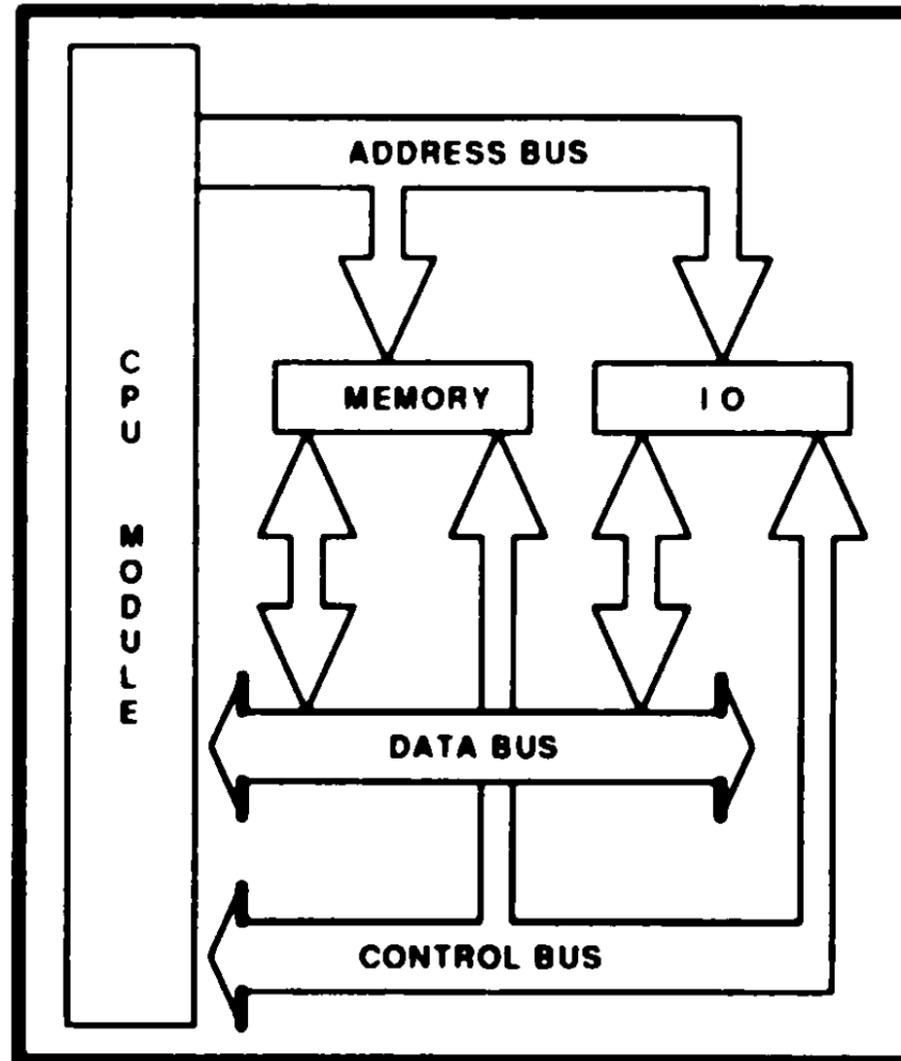
The CPU executes one instruction at a time The speed of execution depends on the type of instruction and speed of memory or I/O device The CPU receives data and control signals through the input ports; it sends data or control signals through the output ports

B.2.3 Data, Address, and Control Busses

The CPU is physically connected to memory and I/O devices by the bus interface A bus interface is a connection of parallel wires (lines) that perform similar functions A microcomputer has a data bus, address bus, and control bus (Figure B-1) Table B-1 describes the function of each bus

The number of lines in each bus varies between CPUs.

- An 8-bit CPU has eight data lines A 16-bit CPU has 16 data lines These are sometimes referred to as an 8-bit wide data path or a 16-bit wide data path

- An address bus can have 16, 20, or 24 lines; sometimes referred to as 16-bits wide (64 Kbytes), 20 bits wide (one Mbyte) or 24 bits wide (16 or more Mbytes)

- The number of lines in a control bus depends on the design of the particular CPU

Table B-1 Data, Address, and Control Bus Function

Bus	Function
Data bus	A set of lines used to transfer data between the CPU, memory, and I/O Data can be instructions for the CPU or information that the CPU passes to or from memory or the I/O ports
Address bus	A set of lines used by the CPU to decode and locate the unique address that corresponds to memory or I/O elements in the system
Control bus	A set of lines that carry control signals to and from the CPU to various system components The signals determine which function is to be performed and when it is to be executed

B.2.4 Machine Cycles, Interrupts, and Direct Memory Access

B.2.4.1 Machine Cycle

When a program is running, data is transferred to and from memory and I/O devices Each time the CPU transfers data between itself and another part of the system is called a *machine cycle* Machine cycles include instructions for such things as memory read/write and I/O read/write

At the completion of a machine cycle, the next one starts Here is what happens in a machine cycle

1 The CPU issues a code to the *address bus* to identify the memory location or I/O device to be accessed

2 The CPU issues an activity command on the *control bus*

3 The CPU receives or sends data over the *data bus*

The CPU has a program counter or instruction pointer register which it uses to keep track of the instruction sequence in a program The program counter or register contains the address of the next instruction located in memory

The CPU executes the instructions in sequence until the program ends or until special instructions tell the CPU to execute instructions in other parts of program memory

Sometimes memory or I/O devices can not respond quickly enough to give valid data to a fast processor during a normal machine cycle In these cases, the system hardware must be designed so that it can impose a *wait state* in the machine cycle When the data is available, the wait state is released and the CPU resumes the machine cycle

B.2.4.2 Interrupts

Interrupts temporarily suspend a program sequence and switch the CPU to a service routine When the service routine is completed the CPU returns to the main program sequence where it left of

For example, the computer is processing a program Part of the program needs to be printed on the printer The CPU is capable of sending the parts to be printed to the printer in one machine cycle But, the printer takes the equivalent of many machine cycles worth of time to print the data

With interrupts, the CPU can temporarily suspend the program and send data to the printer when the printer signals the CPU it is ready to receive data While the data is being printed, the CPU returns to processing the program until it receives an interrupt from the printer for the next data byte

Here is how an interrupt works

- The external device needing service sends an interrupt request to the interrupt controller

- The interrupt controller sends the request to the CPU

- The CPU "acknowledges" the interrupt request

- The interrupt controller then sends a vector to the CPU The vector tells the CPU where to look in memory to find the address of the unique service routine for the device requesting the interrupt

- The CPU gets the service routine and provides the requested service to the device

In systems like the DECstation, many devices may use the interrupt for service In these cases a method exists for establishing which device has priority for service See the appendices in *The DEPCA Service Guide* for more information about interrupt requests

B.2.4.3 Direct Memory Access

Direct memory access (DMA) allows for high speed data transfers between devices such as that required for data transfer to and from diskette and hard disk drives and memory

In ordinary I/O operations, the CPU supervises all data transfer operations from a device to memory But some peripheral devices transfer data faster than the CPU can do it under program control In a DMA operation, the DMA device

1 Takes control of the data and address busses temporarily suspending processor operation

2 Transfers the data without involving the CPU

3 Returns control of the busses to the CPU which then resumes normal operation

B.2.5 CPU

The CPU typically contains registers, the arithmetic/logic unit (ALU), and control circuitry (Figure B-2)

Figure B-2   Inside the CPU
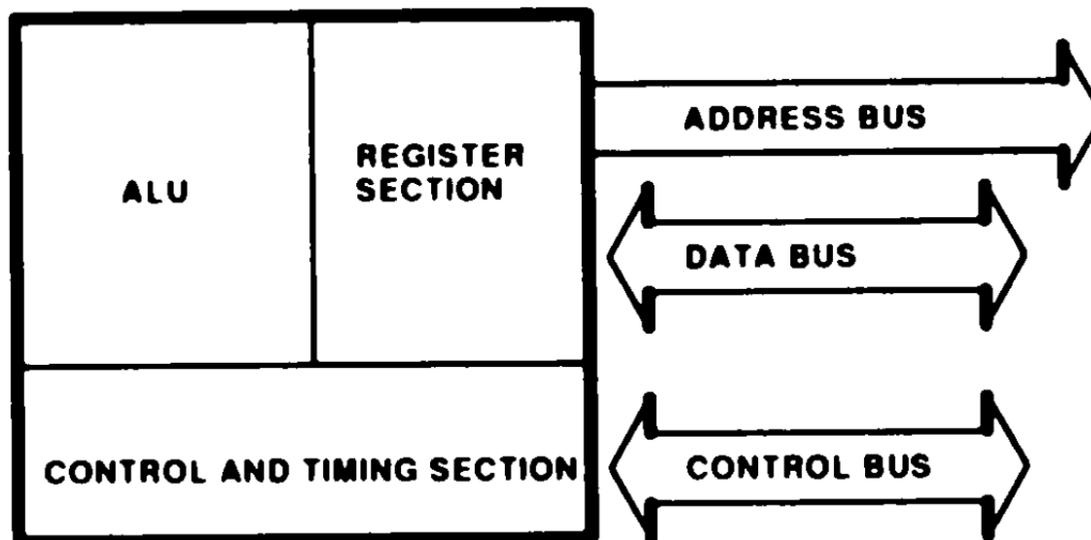
B.2.5.1 CPU Registers

Registers are for temporary storage for data, addresses, status codes, and other information useful to the CPU The size and number of registers varies between CPUs

B.2.5.2 CPU Arithmetic/Logic Unit

The arithmetic/logic unit (ALU) is the hardware in the CPU for performing arithmetic and logical manipulation of binary data The ALU contains an adder for arithmetic operations on data from registers, memory locations, and other sources

B.2.5.3 CPU Control Circuitry

The control circuitry coordinates all CPU activity The control circuitry uses clock inputs to maintain the proper sequence of events for any processing task and

- Issues control signals for CPU internal and external units

- Responds to external control signals such as wait, interrupt, and bus requests

B.2.6 Addressing Modes

The address that the CPU sends on the address bus lines selects one specific memory or I/O device from all the available devices This address can be generated in different ways, called *addressing modes* The addressing mode depends on the operation being performed

Table B-2 Addressing Modes

Mode	Way Generated
Simple	The desired data is contained within the instruction being executed
Complex	The instruction contains the memory address of the desired data or the instruction references a CPU register containing the address of the desired data
Indexed	A logical address is added to a base address located in a specified CPU register

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APPENDIX C

C
CPU Block Diagram

Figure C-1 shows a block diagram of the DECstation 210 CPU

Figure C-1   DECstation 210 Block Diagram
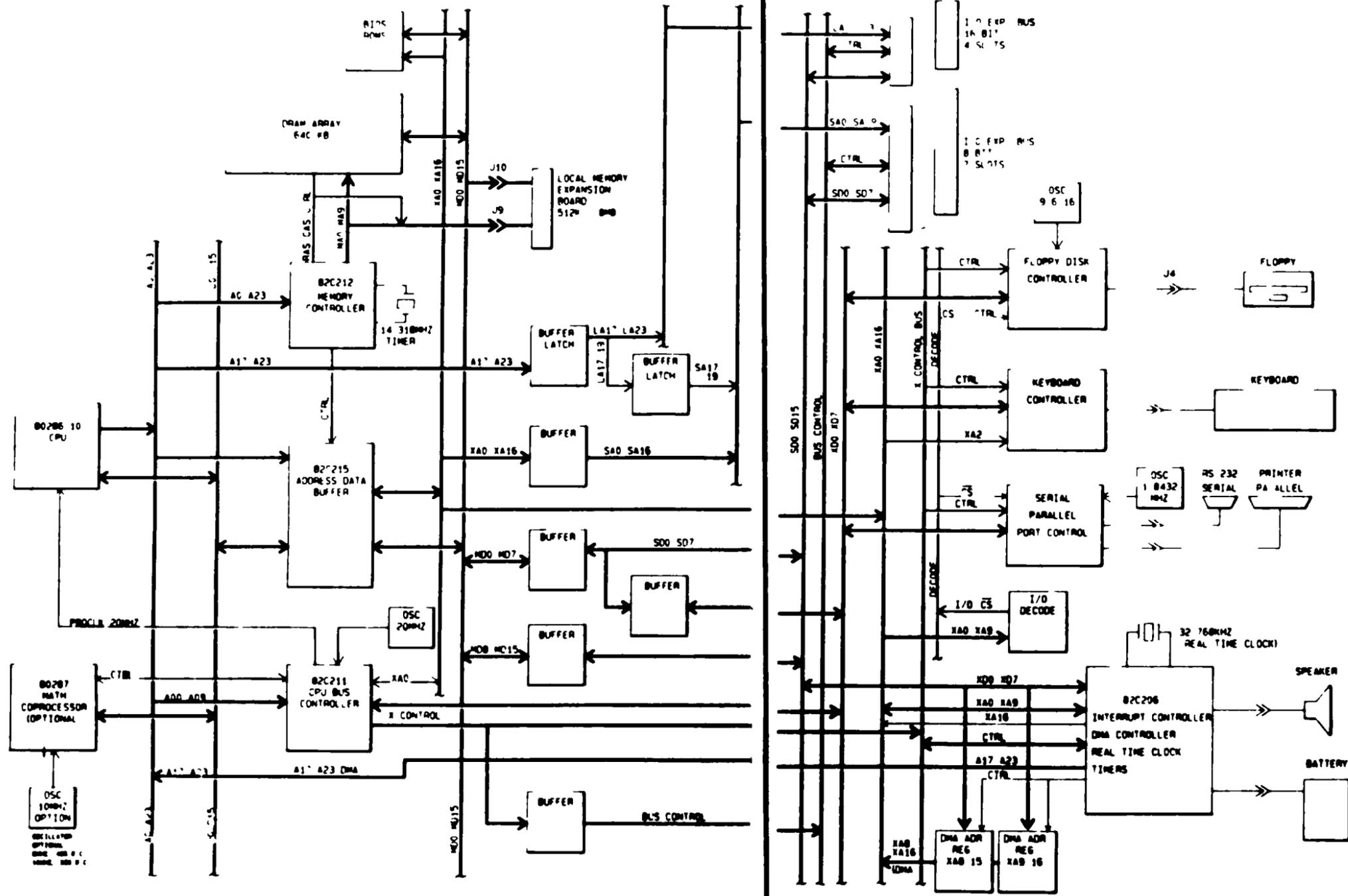
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