

TD/TDZ-x10, InterServe x05 Series

System Reference

September 1997

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INTERGRAPH
COMPUTER SYSTEMS

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Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

CDC Statement

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Warnings

Changes or modifications made to the system that are not approved by the party responsible for compliance could void the user's authority to operate the equipment.

To reduce the risk of electrical shock, do not attempt to open the equipment unless instructed. Do not use a tool for purposes other than instructed.

There is a danger of explosion if the battery is incorrectly replaced. Replace the battery only with the same or equivalent type as recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

There are no user serviceable parts in the power supply. Refer all servicing of the power supply to qualified service personnel.

Cautions

THIS PRODUCT CONFORMS TO THE APPLICABLE REQUIREMENTS OF 21 CFR SUBCHAPTER J AT DATE OF MANUFACTURE.

Read all operating instructions before using the equipment. Keep these instructions for future reference. Follow all warnings on the equipment or in the operating instructions.

Contents

Introduction	ix
Restrictions.....	ix
Conventions.....	ix
Additional System Information	ix
Operating System Information	x
1 Accessing the System	1
Desktop System.....	1
Opening the Base Unit	1
Avoiding Electrostatic Discharge.....	2
Closing the Base Unit	3
Desktop Base Unit	4
Opening the Base Unit	4
Avoiding Electrostatic Discharge.....	7
Closing the Base Unit	8
2 Servicing the Desktop System	9
Floppy Disk Drive or Combo Drive	9
CD-ROM Drive.....	10
System Hard Disk Drive.....	11
SCSI Termination Card.....	12
Riser Card	13
System Board	14
CMOS/Clock Battery	16
Power Supply	17
3 Servicing the Desktop System	19
Internal SCSI Drives	19
Floppy Disk Drive or Combo Drive	21
RAID Section.....	22
System Hard Disk Drive.....	23
Riser Card	24
Processor Module.....	26
P6 Bus Termination Card	26
System Board	27
System Hard Disk Drive Fan.....	29
Option Board Fans	30
CMOS/Clock Battery	31
Power Supply	32
Power Distribution Board.....	33
4 Upgrading the System	35
Adding Memory	35
Adding Internal SCSI Devices	37
Adding External SCSI Devices	38
Cable Length Requirements	38
Connecting the Device	39
Disabling SCSI Sync Negotiation	40

Adding Option Boards	40
Primary PCI Slots	41
PCI Option Boards	41
ISA Option Boards	42
Using the System Configuration Utility	43
ISA Boards with a Configuration File	43
ISA Boards without a Configuration File	44
5 System Board	47
Components and Chipsets	48
Lithium Battery (CMOS/Clock Battery)	49
Graphics Chipset	49
SCSI Controller	50
I/O Controller	50
Processor Components	51
Memory Components	52
BIOS Components	53
Sound Controller	54
Cable Connectors	55
Floppy Pinout	56
Audio Pinout	56
ISA Bus J32 Pinout	56
ISA Bus J33 Pinout	57
Address Configuration	57
DMA Channels	57
Input/Output Addresses	57
Memory Address Map	58
PCI to ISA Bus Interrupt Mapping	58
PCI Bus Configuration Space	59
ISA Bus IRQ Assignments	59
External Ports	60
MIDI Pinout	60
Ethernet Pinout	60
Serial (COM) Pinout	61
Mouse and Keyboard Pinout	61
Video Pinout	61
SCSI Pinout	62
Parallel Pinout	62
6 Riser Cards	63
Desktop Riser Card (MSMT345)	63
Expansion Slots	63
Graphics Card Slot Assignments	63
Deskside Riser Card (MSMT280, MSMT463)	64
Expansion Slots	64
SCSI Controller and Connector	64
Graphics Card Slot Assignments	65
7 Power Supplies, Power Distribution Board, and Fans	67
Deskside Power Supply (MPWS131)	67
DC Output Specifications	67
Cable Connectors	68
P1 Pinout	68
P2 - P8 Pinout	68
P9 Pinout	69

Power Distribution Board (MPCBD13)	69
Cable Connectors	69
Deskside Fans.....	71
Option Board Fans (MCBLZ520 and MCBLY690)	71
RAID Fan (CFAN111).....	71
System Disk Fan (MCBL172A).....	71
Desktop Power Supplies.....	71
300 W DC Output Specifications.....	71
200 W DC Output Specifications.....	72
Cable Connectors	73
P1 Pinout.....	73
P2 Pinout.....	73
P3 Pinout.....	73
P4 Pinout.....	74
P5 Pinout.....	74
P6, P7, P8 Pinout	74
P9 Pinout.....	74
Desktop Fans	74
8 Peripherals	75
RAID Section.....	75
CD-ROM Drive.....	77
Disk Drives.....	77
CDSK111 1 GB	78
CDSK094 2 GB	78
CDSK098 4 GB	79
CDSK123 4 GB	79
Floppy Disk Drive.....	80
Combo Drive	80
A Additional System Information	83
Cleaning the System.....	83
Specifications	83
Product Model Number	84
Index.....	85

Introduction

TD/TDZ-x10, InterServe x05 System Reference provides the information necessary for servicing the following systems:

- ◆ Workstations (desktop and deskside) -- TD-310, TD-410, TDZ-310, TDZ-410, TDZ-610
- ◆ Servers (desktop and deskside) -- InterServe 305, InterServe 605, and Interserve 605UW

Restrictions

In the servicing instructions, heed all warnings and cautions. Some procedures may only be performed by trained Intergraph Field Service personnel. Personal injury and damage to equipment can occur if documented procedures are not followed.

CAUTION Use an antistatic wrist strap for all servicing and upgrade procedures to avoid the possibility of electrostatic discharge.

Conventions

Bold	Commands, words, or characters that you key in literally.
<i>Italic</i>	Variable values that you supply, or cross-references.
Monospace	Output displayed on the screen.
SMALL CAPS	Key names on the keyboard, such as D, ALT or F3. Names of files and directories. You can type filenames and directory names in the dialog boxes or the command line in lowercase unless directed otherwise.
CTRL+D	Press a key while simultaneously pressing another key; for example, press CTRL and D simultaneously.

Additional System Information

A *System Setup* is shipped with each system, and provides detailed information about:

- ◆ Setting up the system.
- ◆ Configuring the operating system and associated system software.
- ◆ Using the system.
- ◆ Using the AMIBIOS Setup program.
- ◆ Installing system software.

A *System Introduction* is delivered with the system, and provides information about:

- ◆ Intergraph Support
- ◆ System hardware features
- ◆ Available hardware options

Operating System Information

For more detailed information on the Windows NT Server 4.0 operating system, refer to the printed and online Windows NT documentation from Microsoft:

- ◆ For basic information on using and installing Windows NT Server 4.0, refer to *Start Here*, delivered in the Windows NT Server software package.
- ◆ For detailed information on using Windows NT Server 4.0, refer to Windows NT Server Help.
- ◆ Additional online Windows NT Server 4.0 documentation is delivered on CD-ROM with the operating system. You can purchase printed copies of these documents from Intergraph.

Refer to the *Late-Breaking News* shipped with your system for important hardware, software, and documentation information not covered in this document.

1 Accessing the System

This chapter describes how to access the desktop and desktside systems.

- ◆ Opening the base unit
- ◆ Avoiding electrostatic discharge
- ◆ Closing the unit

After opening the system, you need the following tools to upgrade or replace system parts:

- ◆ Quarter-inch nutdriver
- ◆ No. 1 Phillips screwdriver
- ◆ No. 2 Phillips screwdriver
- ◆ Three-sixteenth-inch nutdriver
- ◆ Five-sixteenth-inch or 8 mm nutdriver
- ◆ Small single-slot screwdriver

NOTE The parts inside the base unit are designed to fit within very tight tolerances. Some force is required to remove or insert parts. However, if you cannot remove or install a part properly, ensure there are no obstructions hindering the part.

Desktop System

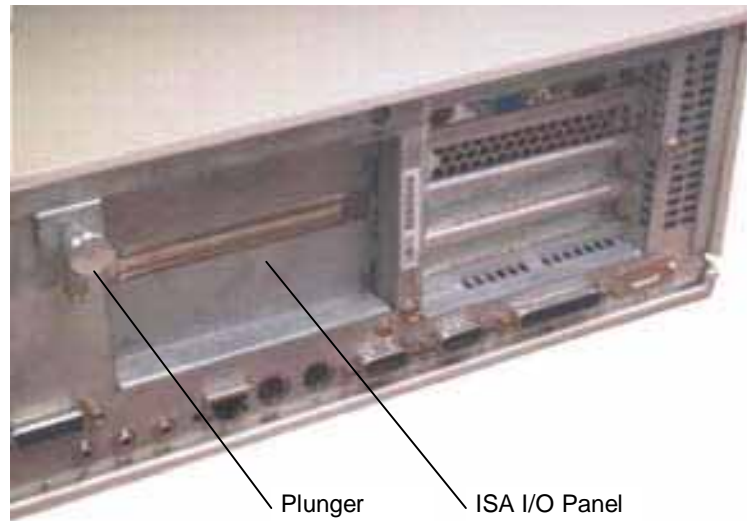
The desktop system features a tool-less entry chassis, for quick access to internal parts.

Opening the Base Unit

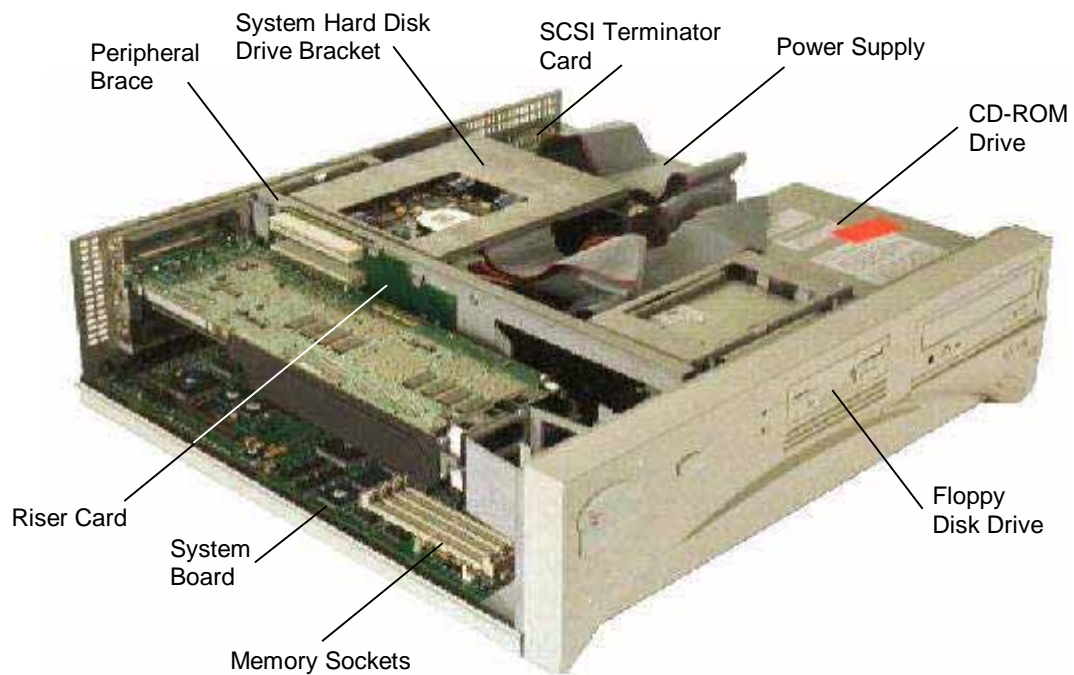
WARNING Before opening the base unit, turn the system power off. Use caution when removing the top cover to avoid injury.

To open the base unit of a desktop system:

1. Pull the plunger out and rotate it to lock it in the open position. Refer to the following figure:



2. Lift up the top cover above the ISA I/O panel and pull it up and back.
3. Set the top cover aside. The following figure shows inside the base unit.



Avoiding Electrostatic Discharge

Some of the sensitive components inside the base unit can be damaged by static electricity. To minimize this possibility, take the following precautions when working with the internal components of the system.

- ◆ To maintain ground, do not unplug the power cord from the base unit, AC outlet, or UPS.
- ◆ Touch the bare metal of the base unit to discharge any accumulated electrostatic charge.
- ◆ Do not service the system on surfaces known to have high electrostatic buildup, such as rugs and carpets. Work on a static-safe surface instead.

- ◆ Handle all printed circuit boards as little as possible and by the edges only. Leave new parts in their protective packaging until you install them.
- ◆ After opening the base unit, attach a disposable or reusable antistatic wrist strap as described following.

NOTE There is no increased risk of electrical shock when using an antistatic wrist strap. If the wrist strap does not snugly contact bare skin, static protection will not be effective.

To attach a disposable antistatic wrist strap:

1. Remove the wrist strap from the envelope.
2. Unfold the wrist strap and wrap the exposed adhesive side firmly around your bare wrist.
3. Peel the liner from the wrist strap copper foil. Attach the adhesive side of the copper foil to a bare flat metal surface (electrical ground) inside the base unit.

NOTE After using a disposable wrist strap once, you cannot use it again.

To attach a reusable antistatic wrist strap:

1. Attach the wrist strap to the ground loop above the ISA slots on the back of the base unit.
2. Slip the elastic end of the wrist strap snugly around your bare wrist.

NOTE The metal conductor bead in the elastic must contact bare skin.

Closing the Base Unit

To close the base unit:

1. Remove the antistatic wrist strap from the ground loop inside the base unit.
2. Replace the top cover by aligning the tabs on the front of the top cover with the notches behind the faceplate.
3. Lower the back of the top cover and slide it into place.
4. Turn the plunger to lock the top cover to the base unit.

Deskside Base Unit

CAUTION The parts inside the base unit are designed to fit within very tight tolerances. Some force is required to remove or insert parts. However, if you cannot remove or install a part properly, ensure there are no obstructions hindering the part.

Opening the Base Unit

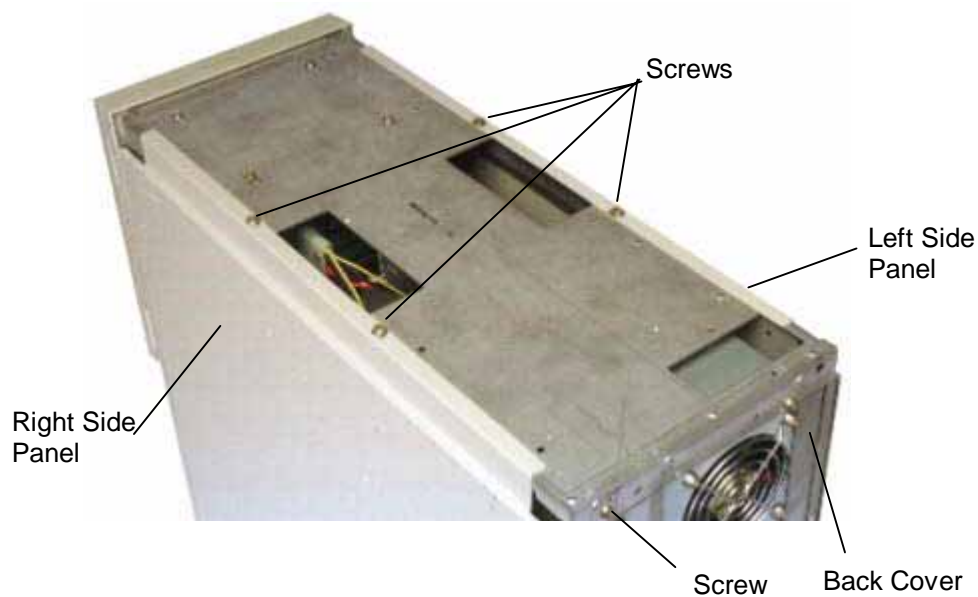
To open the base unit, you need to remove the top cover, side panels, and other parts listed depending on the part you need to service or upgrade, as follows.

To Service	Remove
Internal SCSI drives	Top cover, both side panels
Combo drive	Top cover, both side panels
Internal RAID Section	Top cover, both side panels
Riser card	Top cover, left side panel, PCI access panel, riser card brace
Processor module	Top cover, left side panel, PCI access panel
P6 bus termination card	Top cover, left side panel, PCI access panel
System board	Top cover, left side panel, PCI access panel, option board bracket
Power Supply	Top cover
Power distribution board	Top cover, left side panel
InterSite Server Monitor board	Top cover, left side panel
Memory	Top cover, left side panel, PCI access panel, PCI board guide
Option board fan assembly	Top cover, left side panel, option board bracket
System Disk Fan	Top cover
Auxiliary fan	Top cover, power supply access panel
Lithium Battery	Top cover, left side panel
To Upgrade	Remove
Processors	Top cover, left side panel
Memory	Top cover, left side panel, PCI access panel, PCI board guide
Internal SCSI drives	Top cover, both side panels
External SCSI drives	n/a
Option Boards	Top cover, left side panel, PCI access panel

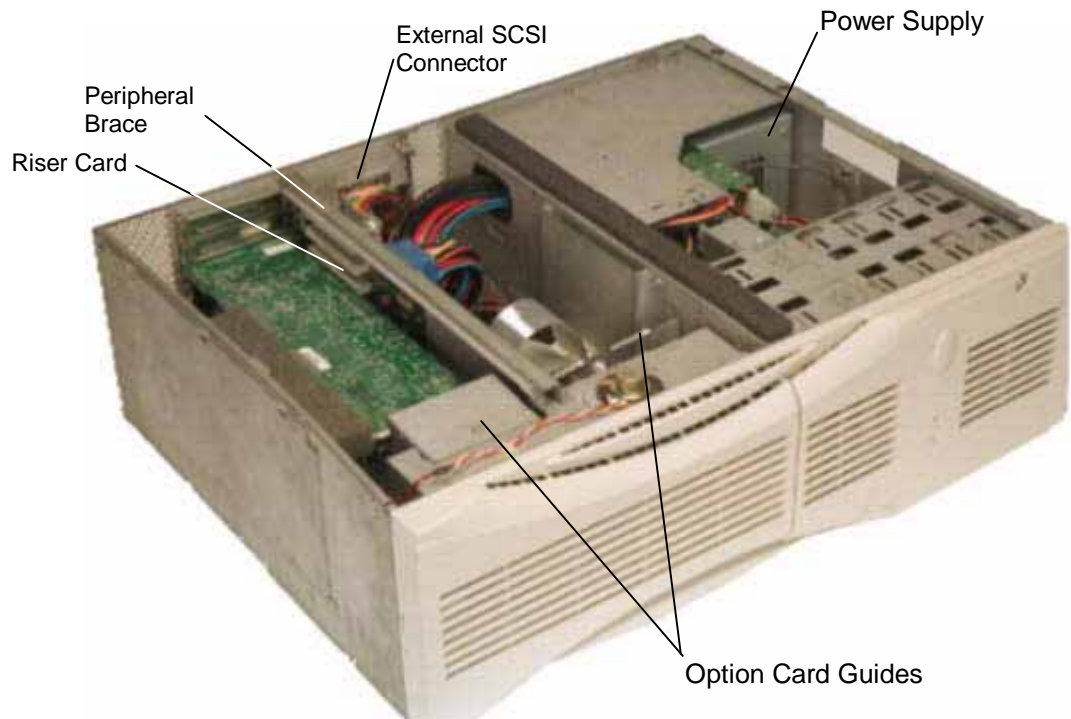
To remove the top cover and side panels:**NOTE**

The left and right side panels are identified as if you are facing the front of the base unit.

1. Remove the footstands.
2. Remove the screw on the back cover. Pull the top cover back an inch and lift it off the base unit. Refer to the following figure.
3. Remove the two screws on the left or right side panel. Then pull the panel up and out to remove it. Refer to the following figure.

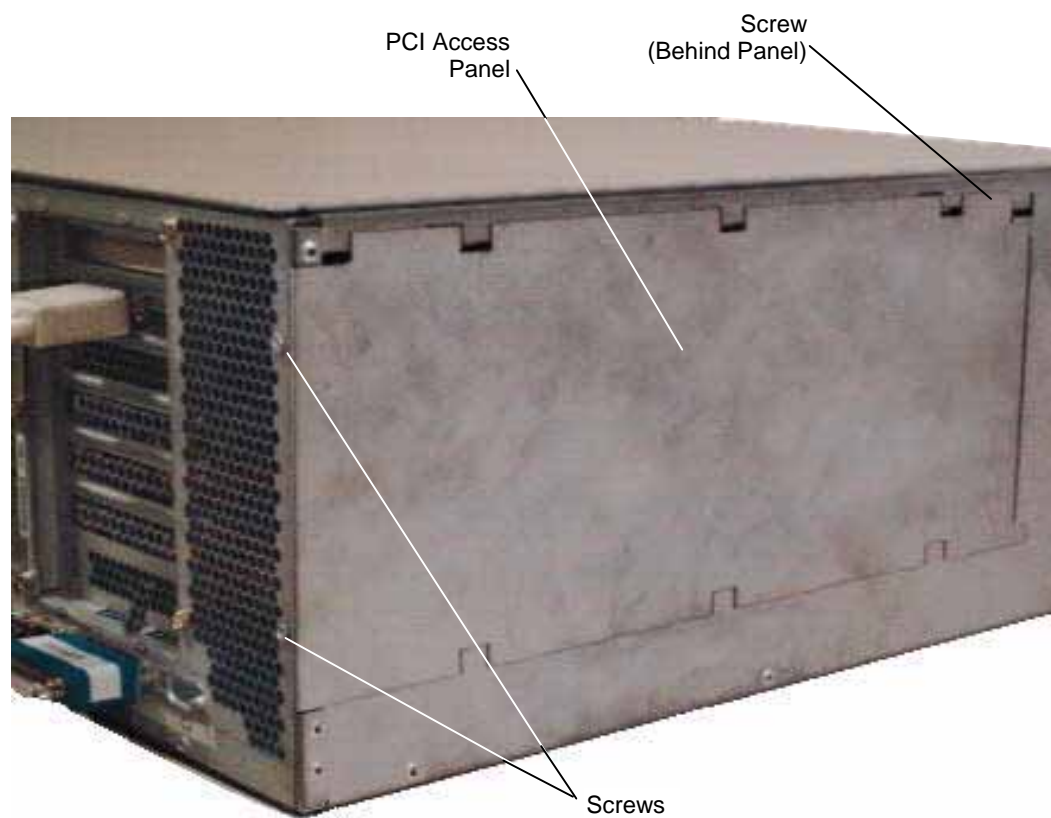


4. Set the cover and panels aside. The following figure shows inside the base unit.



To remove the PCI access panel:

1. Power off the base unit and remove the top cover and side panel. Lay the base unit on the right side.
2. Remove the two screws at the bottom of the unit and the screw behind the PCI access panel as shown in the following figure.
3. Slide the PCI access panel to the back of the base unit and remove it.



Avoiding Electrostatic Discharge

Some of the sensitive components inside the base unit can be damaged by static electricity. To minimize this possibility, take the following precautions when working with the internal components of the system.

- ◆ To maintain ground, do not unplug the power cord from the base unit, AC outlet, or UPS.
- ◆ Touch the bare metal of the base unit to discharge any accumulated electrostatic charge.
- ◆ Do not service the system on surfaces known to have high electrostatic buildup, such as rugs and carpets. Work on a static-safe surface instead.
- ◆ Handle all printed circuit boards as little as possible and by the edges only. Leave new parts in their protective packaging until you install them.
- ◆ After opening the base unit, attach a disposable or reusable antistatic wrist strap as described in the next section.

NOTE There is no increased risk of electrical shock when using an antistatic wrist strap. If the wrist strap does not snugly contact bare skin, static protection will not be effective.

To attach a disposable antistatic wrist strap:

1. Remove the wrist strap from the envelope.
2. Unfold the wrist strap and wrap the exposed adhesive side firmly around your bare wrist.
3. Peel the liner from the wrist strap copper foil. Attach the adhesive side of the copper foil to a bare flat metal surface (electrical ground) inside the base unit.

NOTE After using a disposable wrist strap once, you cannot use it again.

To attach a reusable antistatic wrist strap:

1. Attach the wrist strap to the ground loop above the ISA slots on the back of the base unit.
2. Slip the elastic end of the wrist strap snugly around your bare wrist.

NOTE The metal conductor bead in the elastic must contact bare skin.

Closing the Base Unit**To close the base unit:**

1. Remove the antistatic wrist strap from the ground loop inside the base unit.
2. Replace the PCI access panel if removed.
3. Set the base unit in the upright position.
4. Replace the left or right side panel if removed.
5. Replace the top cover. Ensure the top cover is completely installed so the safety interlock switch engages. If the cover is not properly installed, the system will not start.
6. Replace the footstands.

CAUTION After servicing or upgrading the system, always replace all panels and covers. The panels and covers ensure the system maintains proper air flow, so internal components do not overheat. Overheated components may fail prematurely and may be dangerous to touch. The panels and covers also ensure electromagnetic interference (EMI) emissions are kept to levels below the standard requirements.

2 Servicing the Desktop System

This chapter describes how to replace parts in the desktop system, including the following items:

- ◆ Floppy disk drive or combo drive
- ◆ CD-ROM drive
- ◆ System hard disk drive
- ◆ SCSI termination card
- ◆ Riser card
- ◆ System board
- ◆ CMOS/Clock battery
- ◆ Power supply

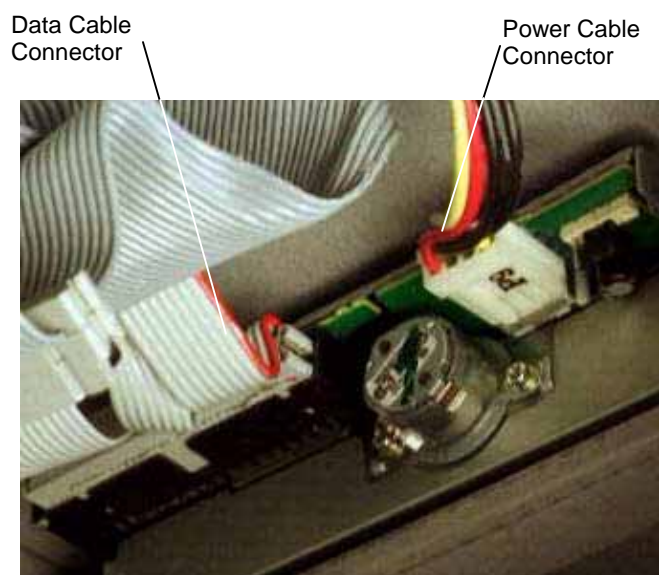
Before replacing any parts, open the base unit and take precautions against electrostatic discharge as described in Chapter 1, “Accessing the System.” After replacing system parts, close the base unit as described in Chapter 1.

CAUTION The parts inside the base unit are designed to fit within very tight tolerances. Some force is required to remove or insert parts. However, if you cannot remove or install a part properly, ensure that there are no obstructions hindering the part.

Floppy Disk Drive or Combo Drive

To replace the floppy disk drive or combo drive:

1. Disconnect the cables. The floppy drive cable on a combo drive is connected to the side of the drive. Note the position of pin 1 (identified by the red stripe) on the floppy drive cable. Refer to the following figure.

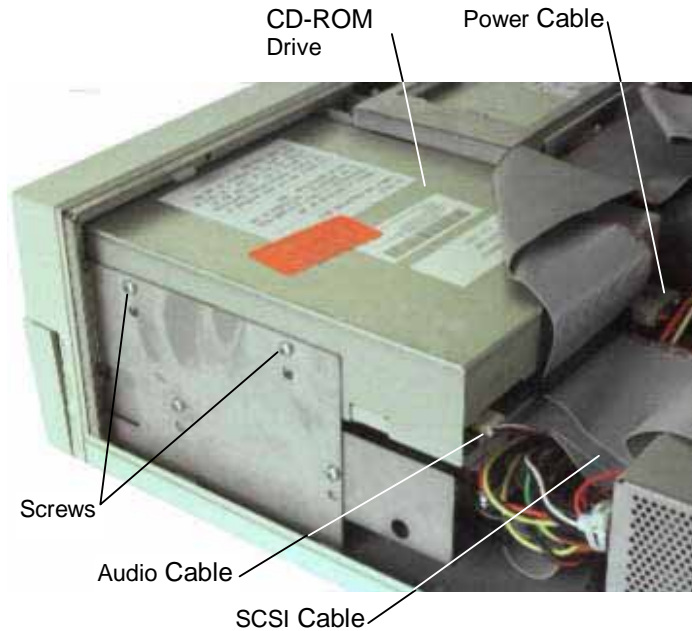


2. Remove the screws holding the drive to each side of the chassis. Slide the drive and its support bracket out of the base unit.
3. Remove the support bracket from the drive. Mount the replacement drive to the support bracket using the screws removed previously.
4. Install the drive and its support bracket into the base unit.
5. Connect the cables to the drive. On a combo drive, connect the floppy drive cable to the connector on the side of the device.

CD-ROM Drive

To replace the CD-ROM drive:

1. Remove the floppy disk drive or combo drive as described previously in step 2 of "Floppy Disk Drive or Combo Drive," leaving the cables attached.
2. Disconnect the cables from the CD-ROM drive. Refer to the following figure.



3. Disconnect the audio cable from its system board connector.
4. Remove the screws holding the CD-ROM drive to each side of the chassis.
5. Slide the CD-ROM drive forward and out of the base unit.
6. Disable SCSI termination and set the SCSI ID. Refer to the vendor's CD-ROM drive documentation for instructions.
7. Insert the new CD-ROM drive through the front panel.
8. Secure the CD-ROM drive to the chassis using the screws removed previously.
9. Connect the SCSI cable and power cable to the CD-ROM drive. The SCSI cable is keyed to ensure proper insertion, so that the red stripe (pin 1) is adjacent to the power connector.
10. If installing an Intergraph CD-ROM drive, the audio cable is already connected to the drive. Connect the loose end of the audio cable to the system board connector.

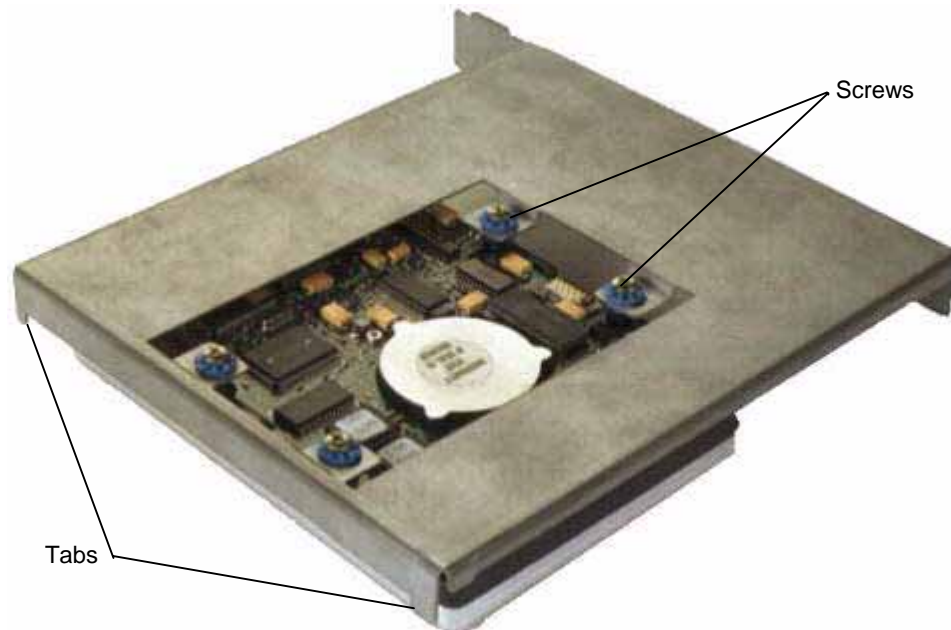
11. If installing a non-Intergraph CD-ROM drive, connect the audio cable delivered with the new CD-ROM drive to the connectors on the drive and the system board.
12. Replace the floppy disk drive or combo drive.

System Hard Disk Drive

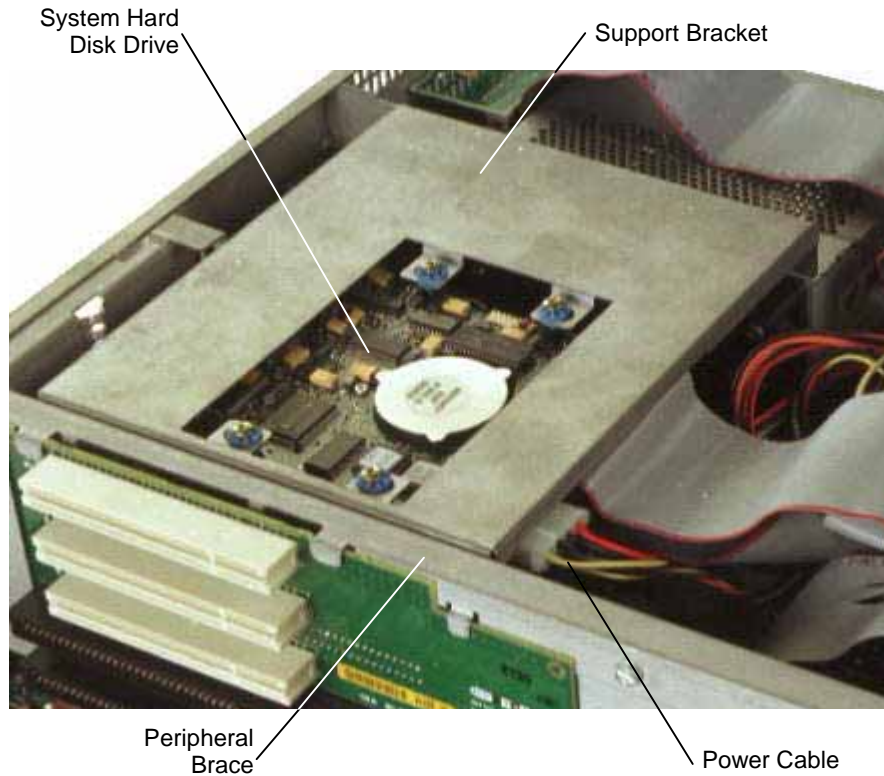
The system hard disk drive is located between the power supply and the riser card.

To replace the system hard disk drive:

1. Disconnect the SCSI and power cables from the hard disk drive.
2. Remove the drive and its support bracket; then set the drive on a flat antistatic surface.
3. Remove the screws securing the hard disk drive to the bracket. Leave the grommets in the bracket. Refer to the following figure.



4. Disable SCSI termination and set the SCSI ID to the same SCSI ID as the previous hard disk drive. Refer to the documentation delivered with the drive for instructions.
5. Secure the new drive to the support bracket using the screws removed previously.
6. Attach the cables to the new drive. The SCSI cable is keyed to ensure proper insertion, so that the red stripe (pin 1) is adjacent to the power connector.
7. Install the drive and bracket into the base unit, inserting the tabs into the slots.



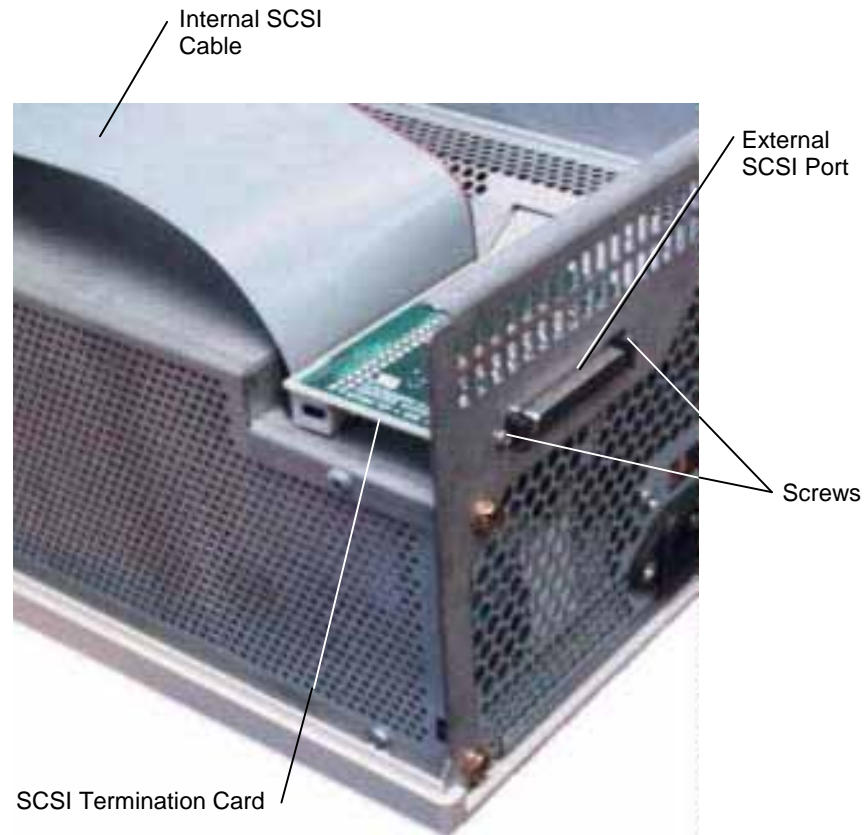
8. After closing the base unit and restarting the system, partition and format the system hard disk drive as described in the operating system documentation.

SCSI Termination Card

The SCSI termination card terminates the internal SCSI cable chain. If external SCSI devices are connected, the card disables termination and acts as a pass-through external SCSI connector.

To replace the SCSI termination card:

1. Disconnect the external SCSI cable from the external SCSI port.
2. Remove the screws securing the external SCSI port to the back panel.
3. Note how the SCSI termination card is attached. Slide the card out of the chassis and disconnect the internal SCSI cable.

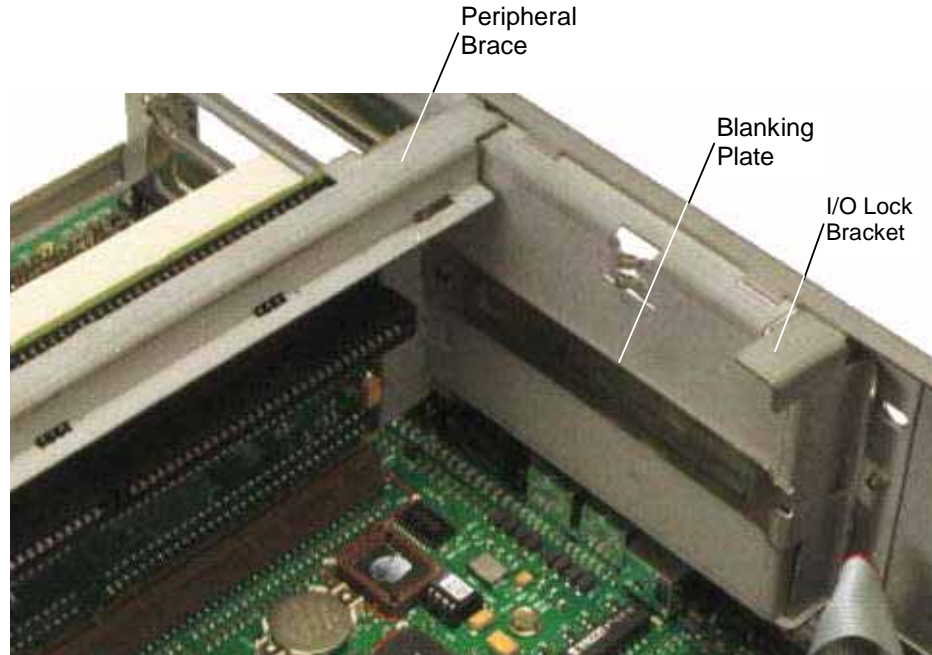


4. Connect the internal SCSI cable to the new termination card.
5. Insert the new card into the chassis and mount the external SCSI port to the back panel using the screws removed previously.
6. Close the base unit and connect the external SCSI cable to the port.

Riser Card

To replace the desktop riser card:

1. Remove the floppy disk drive as described previously in step 2 of “Floppy Disk Drive or Combo Drive” leaving the cables attached.
2. Remove the system hard disk drive as described previously in step 2 of “System Hard Disk Drive” leaving the cables attached.
3. Remove all boards connected to the riser card. Note the position of each board installed in the ISA slots. To remove the ISA boards in the ISA I/O panel, remove the I/O lock bracket (note orientation) as shown in the following figure.



4. Lift up and remove the peripheral brace as shown in the previous figure.
5. Disengage the riser card from the system board, and remove the card from the base unit.
6. Insert the new riser card into the system board slot, pushing firmly over the center of the PCI connectors to ensure it seats completely.

CAUTION Do not rock the riser card back and forth; pins inside the connector may be damaged as a result. Press firmly so the card connector slides evenly into the slot.

7. Replace the peripheral brace.
8. Replace the option boards connected to the riser card. Connect any external cables attached to the boards. ISA boards must be installed in the same slots from which they were removed.
9. Replace the ISA I/O lock bracket.
10. Connect the SCSI and power cables to the riser card, if necessary.
11. Replace the system hard disk drive and the floppy disk drive.

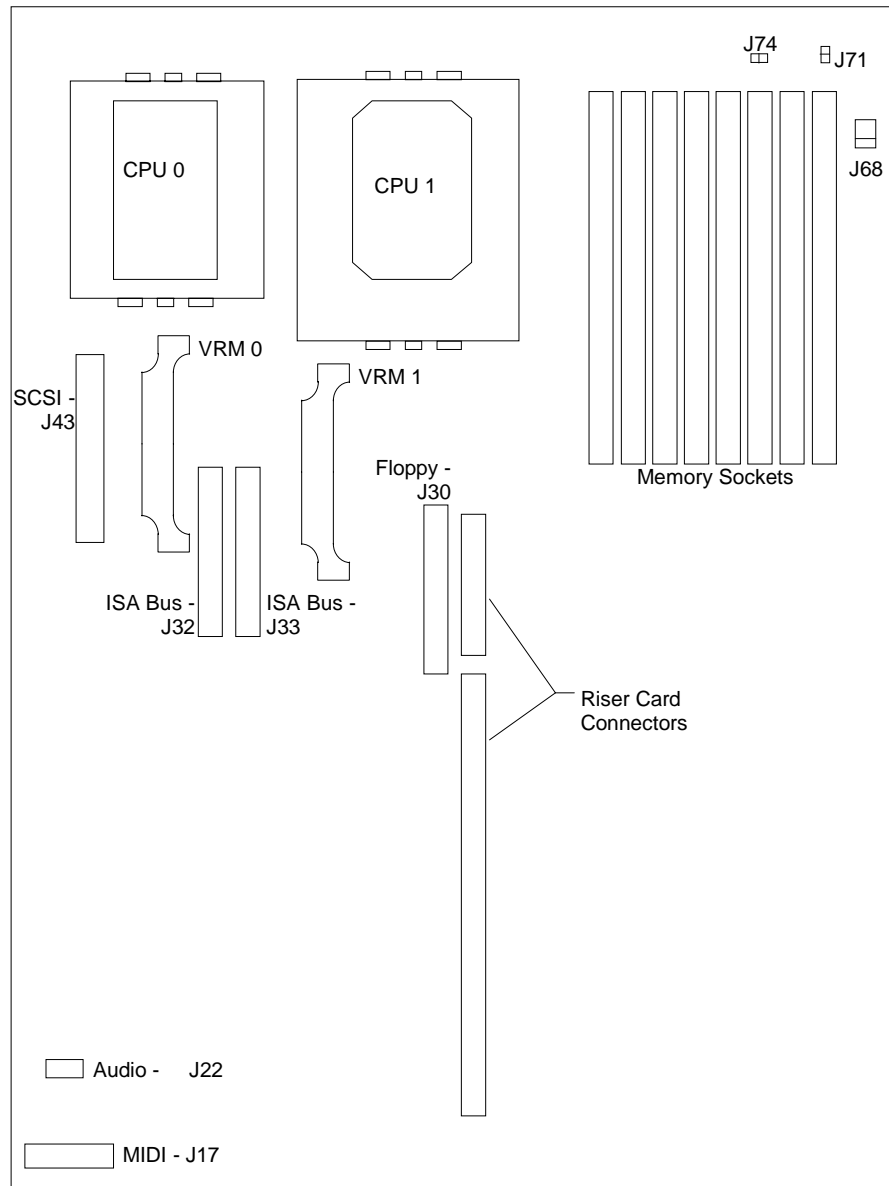
System Board

CAUTION The system board is extremely sensitive to static electricity. To prevent serious damage to the system board, wear the antistatic wrist strap while performing the following steps. Do not open the antistatic bag containing the system board until instructed.

To remove the system board:

1. In a desktop system, remove the system hard disk drive as described previously in “System Hard Disk Drive.”
2. In a desktop system, remove the floppy disk drive as described previously in “Floppy Disk Drive or Combo Drive.”
3. Remove the riser card as described previously in “Replacing the Riser Card.”

4. Note the orientation of the reset, disk activity LED, and power on LED cables; then disconnect the LED cables from the system board.
5. Disconnect all other cables from the system board. The following figure shows the cable connector locations.



6. Disconnect the cables from the external ports.
7. Remove the jackscrews from the video, parallel, and serial ports.
8. Remove the hex nuts from the audio jacks.
9. Remove the eight grounding screws from the system board.
10. Slide the system board to the front of the base unit.
11. Lift the board and remove it from the base unit. Set the board on a flat antistatic surface.
12. Remove the new system board from the antistatic bag and place it on a flat antistatic surface.

13. Remove the SIMMs from the old system board and install them onto the new one in the same configuration.
14. If a Windows RAM (WRAM) expansion module for G95 graphics is installed, remove the module and install it onto the new system board.

To install a new system board:

The new system board should have the SIMMs and WRAM module (if required) installed before placing it into the base unit.

1. Lower the new system board into the base unit. Ensure the standoff lines up with the hole in the chassis. Slide the system board to the back of the base unit so the external ports fit into the back panel.
2. Install the eight grounding screws.
3. Install the hex nuts onto the audio jacks.
4. Install the jackscrews onto the video, parallel, and serial ports.
5. Connect the MIDI (or game) and CD-ROM audio cables to the system board.
6. Connect the system power cables to the P1 through P5 connectors. The power cable connectors are labeled with the corresponding system board connector.
7. Connect the LED and Reset cables to the system board.

NOTE The orange wire for the disk activity LED cable must connect to pin 1. The white wire for the power on LED cable must also connect to pin 1. The orientation of the reset cable wires is not critical.

8. Install the riser card and the peripheral brace.

NOTE If installing ISA boards they must be placed in the same slots from which they were removed. Also replace the I/O lock bracket for the ISA boards on side two of the riser card.

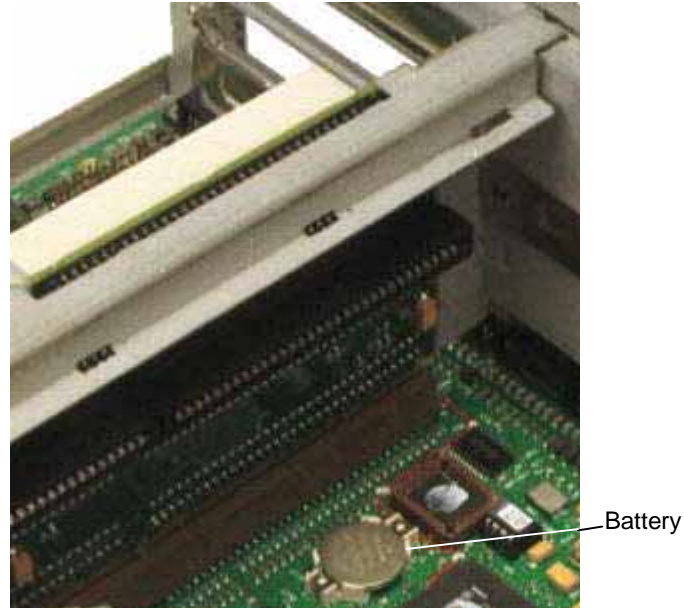
9. Install the floppy disk drive or combo drive; then connect the power cable and data cables to the system board.
10. Install the system hard disk drive and connect the SCSI cable to the system board.

CMOS/Clock Battery

WARNING There is a danger of explosion if the battery is incorrectly replaced. Replace the battery with the same or equivalent type only, as recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

To replace the CMOS/clock battery:

1. Remove the system hard disk drive as described in step 2, "System Hard Disk Drive." Leave the cables attached. The battery is located on the system board at location B1. Refer to the following figure.



2. Carefully remove the discharged battery by grasping it firmly and lifting upward.
3. Install the new battery in the same orientation as the discharged battery.
4. Replace the system hard disk drive, inserting the bracket tabs into the slots on the peripheral brace.

Power Supply

CAUTION Purchase replacement power supplies from Intergraph to ensure proper specifications are met and to guarantee safety.

WARNING Set the AC voltage switch on the back of the power supply to the correct voltage for your location, or the power supply will be irreparably damaged when power is applied. If you do not know the voltage range, call your local utilities company for assistance.

To replace the power supply:

1. Remove the AC power cord from the back of the base unit.
2. Remove the SCSI termination card as described previously in "SCSI Termination Card." It is not necessary to disconnect the card from the SCSI cable.
3. Remove the system disk drive as described in "System Hard Disk Drive."
4. Disconnect the power cable from the floppy disk drive, CD-ROM drive, and hard disk drives.
5. Disconnect the system power cables from the P1 through P5 connectors on the system board. Take note of the cable number (P_x) attached to each connector on the system board.

6. Open the clip that secures the bundle of power cables. Remove the audio cable from the power cable bundle. The audio cable connects the CD-ROM drive to the system board.
7. Remove the screws securing the power supply to the back of the base unit.
8. Slide the power supply to the front and remove it from the base unit.
9. Remove the power switch cable and grounding wire from the base unit.
10. Set the AC voltage switch on the back of the new power supply to the correct voltage for your location.
11. Slide the new power supply into place in the base unit. Mount the power supply using the screws removed previously.
12. Mount the power switch cable and grounding wire to the base unit.
13. Replace the system hard disk drive.
14. Connect the system power cables to the P1 through P5 connectors on the system board.
15. Connect the remaining power cables to the system hard disk drive, CD-ROM drive, and floppy drive.
16. Connect the audio cable to the system board and to the CD-ROM drive.
17. Secure the clip around the power cables and audio cable.
18. Replace the SCSI termination card.
19. Connect the AC power cord to the back of the base unit.

3 Servicing the Deskside System

This chapter describes how to replace parts in the deskside system, including the following devices:

- ◆ Internal SCSI drives
- ◆ Floppy disk drive or combo drive
- ◆ RAID section
- ◆ System hard disk drive
- ◆ Auxiliary drives
- ◆ Riser card
- ◆ Processor module
- ◆ P6 termination card
- ◆ System board
- ◆ System hard disk drive fan
- ◆ Option board fans
- ◆ CMOS/clock battery
- ◆ Power supply
- ◆ Power distribution board

Before replacing any parts, open the base unit and take precautions against electrostatic discharge as described in Chapter 1, “Accessing the System.” After replacing system parts, close the base unit as described in Chapter 1.

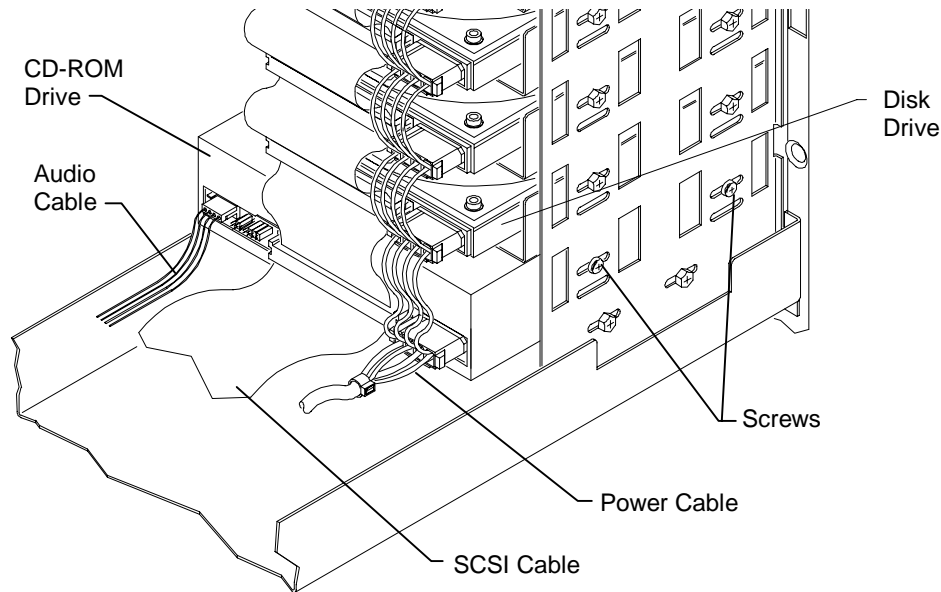
CAUTION The parts inside the base unit are designed to fit within very tight tolerances. Some force is required to remove or insert parts. However, if you cannot remove or install a part properly, ensure that there are no obstructions hindering the part.

Internal SCSI Drives

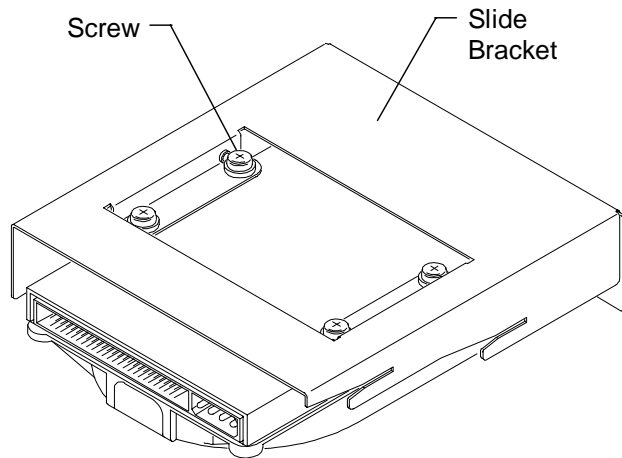
This section applies to CD-ROM drives, fixed disk drives, and tape drives.

To replace an internal SCSI drive:

1. Open the base unit and remove the necessary parts as described in Chapter 1.
2. Disconnect the power cable and SCSI cable from the drive. If removing the CD-ROM drive, also remove the audio cable. Refer to the following figure.



3. Remove the screws from both sides of the SCSI drive.
4. Slide the SCSI drive out of the front of the base unit.
5. If replacing a disk drive (located above the CD-ROM drive), remove the bracket from the drive. Refer to the following figure.

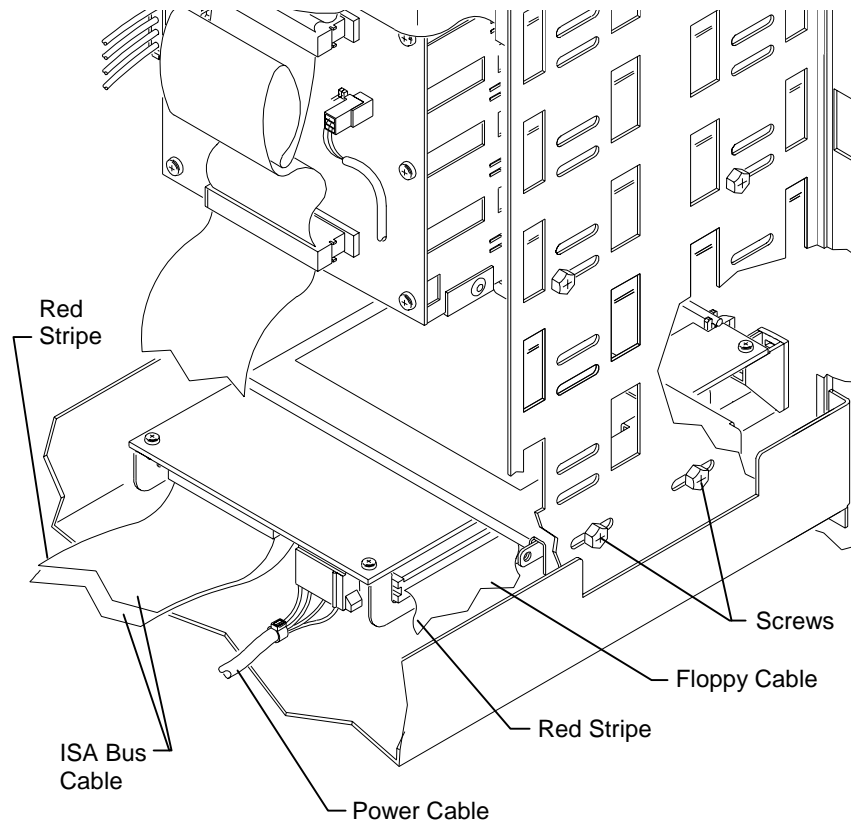


6. Disable SCSI termination and set the SCSI ID on the back of the drive to the same ID as the drive being replaced. If necessary, refer to the documentation delivered with the SCSI drive for instructions.
 7. If installing a hard disk drive, attach the drive to the bracket.
 8. Insert the new SCSI drive through the front panel.
 9. Secure the SCSI drive using the screws removed previously.
 10. Connect the SCSI cable, power cable, and audio cable (CD-ROM drive only). The SCSI cable red stripe (pin 1) must be adjacent to the power connector.
- NOTE** If installing a non-Intergraph CD-ROM drive, use the audio cable delivered with the new CD-ROM drive.
11. Close the base unit.

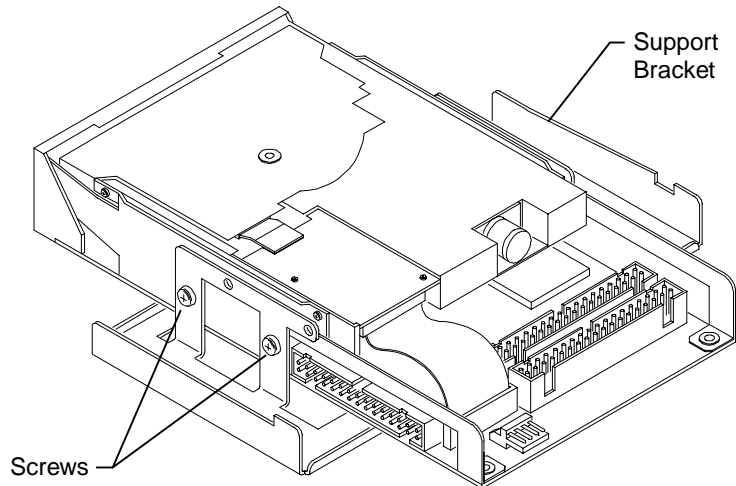
Floppy Disk Drive or Combo Drive

To replace the floppy disk drive or combo drive:

1. Open the base unit and remove the necessary parts as described in Chapter 1.
2. Remove the CD-ROM drive as described previously in steps 2 through 4 of “Internal SCSI Drives.”
3. Using a quarter-inch nutdriver, remove the screws from both sides of the drive as shown in the following figure. Then slide the drive out of the base unit.



4. Disconnect the floppy cable, and power cable from the floppy disk drive. Note the position of the red stripe on the floppy cable and ISA bus cable. If replacing the combo drive, also disconnect ISA bus cable.
5. Remove the four screws from the support bracket (two on each side) as shown in the following figure.



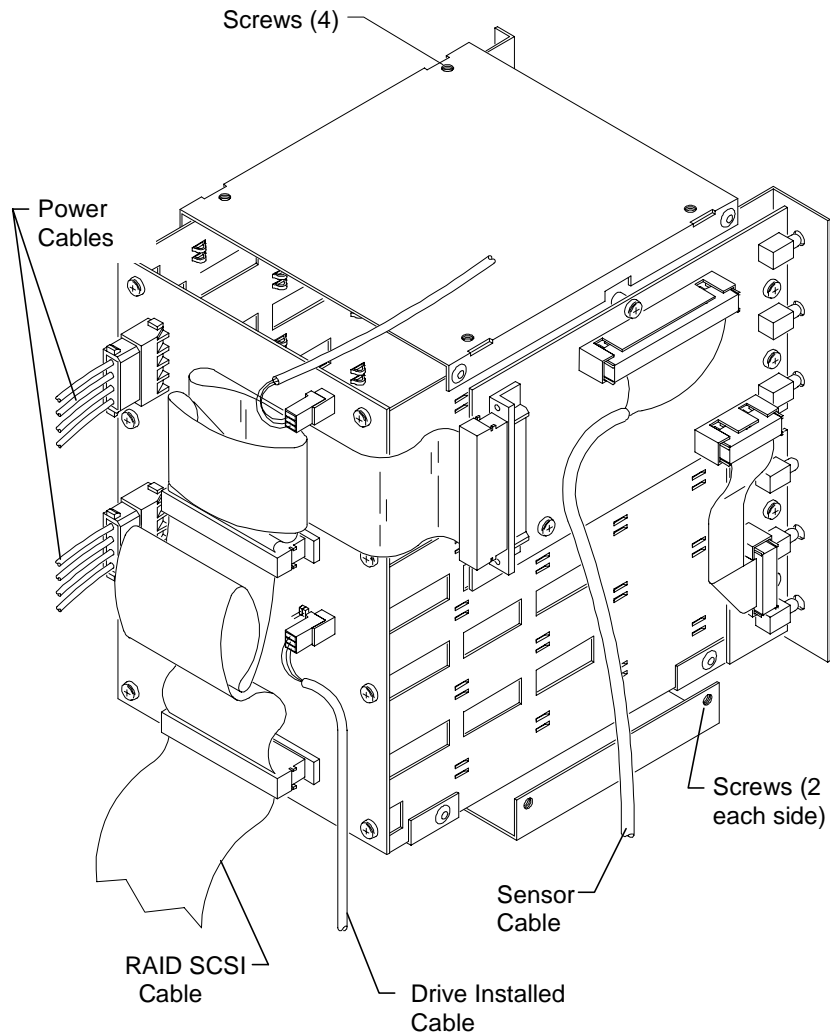
6. Secure the replacement drive to the support bracket using the screws removed previously.
7. Connect the cables to the drive.
8. Install the drive into the base unit, and secure it using the screws removed previously.
9. Replace the CD-ROM drive and secure it to the chassis.
10. Close the base unit.

RAID Section

The RAID section is used in TDZ-610 workstations and some InterServe 605 servers.

To replace the RAID section:

1. Before opening the base unit, remove the RAID disk drives from the slots in the RAID section. Note the order in which the drives are installed.
2. When opening the base unit, remove both left and right side panels.
3. Disconnect the cables attached to the RAID section. Keep track of where each cable was connected. Refer to the following figure.
4. Remove the screws from the top and both sides of the RAID section. Refer to the following figure.

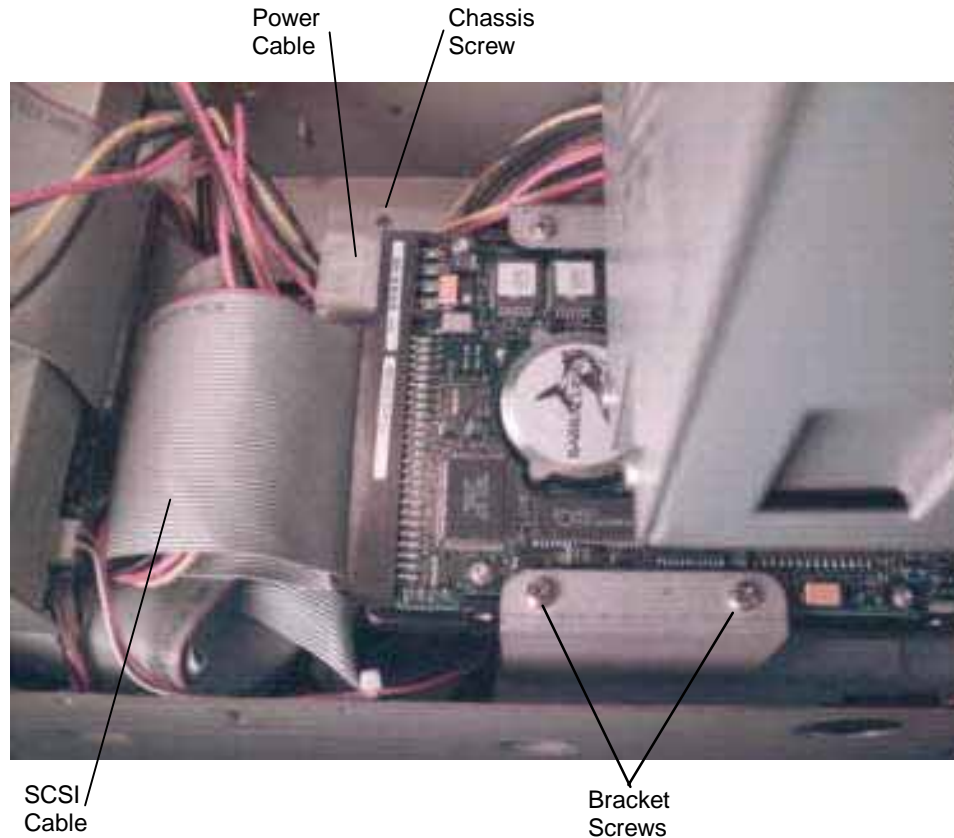


5. Slide the RAID section out of the base unit.
6. Slide the new RAID section into the base unit.
7. Secure the RAID section using the eight screws removed previously.
8. Connect the cables to the RAID section.
9. After closing the base unit, install the RAID disk drives into the same slots in the RAID section from which they were removed.

System Hard Disk Drive

To replace the system hard disk drive:

1. Disconnect the cables and remove the bracket screws from the hard disk drive, as shown in the following figure.
2. Remove the chassis screw shown in the following figure.

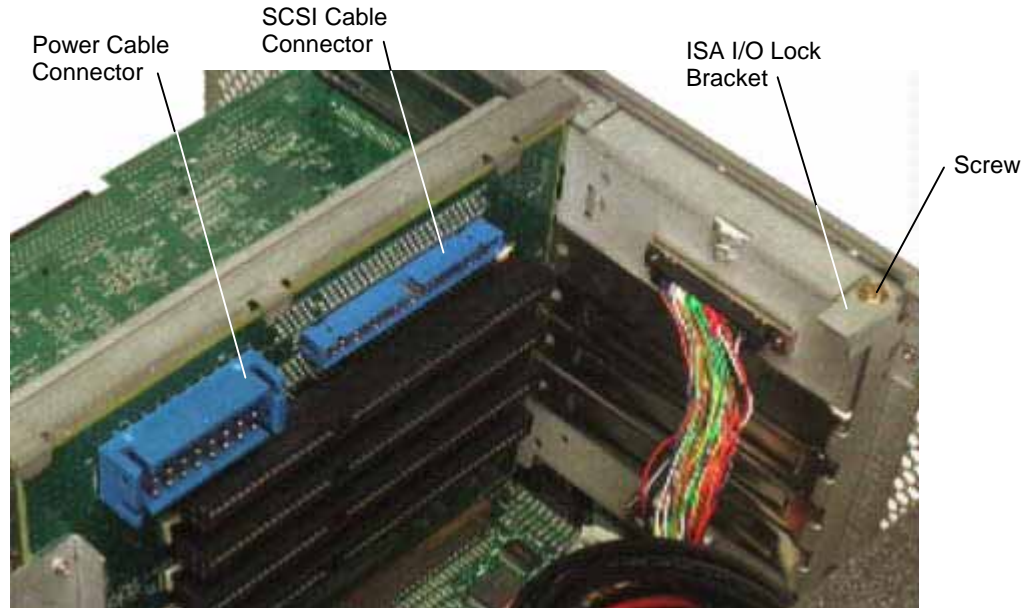


3. Pull the drive forward and lift it out of the base unit, then set the drive on a flat antistatic surface.
4. Remove the bracket from the disk drive.
5. Secure the new disk drive to the bracket.
6. Install the disk drive into the base unit and secure it to the chassis using the chassis screw removed previously.
7. Connect the SCSI and power cables to the disk drive.
8. Close the base unit.

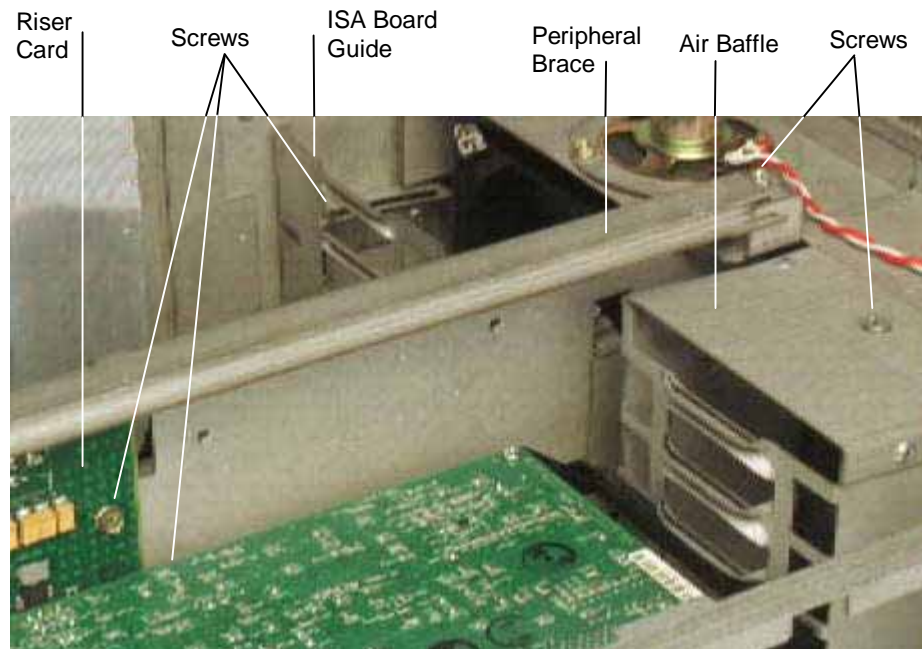
Riser Card

To remove the riser card:

1. Remove the PCI access panel.
2. Remove the PCI boards connected to the riser card.
3. If ISA option boards are installed, disconnect the SCSI cable and power cables from the top of the riser card, and remove the ISA I/O lock bracket. Refer to the following figure.



4. Remove the screw on the pivoting ISA board guide as shown in the following figure.
5. Remove the ISA boards connected to the riser card. Note the position of each board in the ISA slots.
6. Remove the screws shown in the following figure from the peripheral brace. Slide the peripheral brace to the back of the base unit and remove it.
7. Remove the screw for the air baffle as shown in the following figure; then remove the air baffle.



8. Disengage the riser card from the system board, and remove the card from the base unit.

To install a new riser card:

1. Insert the riser card into its system board slot, pushing firmly over the center of the PCI connectors to ensure it seats completely.

CAUTION Do not rock the riser card back and forth; pins inside the connector may be damaged as a result. Press firmly so the card connector slides evenly into the slot.

2. Replace the peripheral brace. Do not tighten the pivoting ISA board guide until the ISA boards have been installed.
3. Replace the option boards connected to the riser card. Connect any external cables attached to the boards. ISA boards must be installed in the same slots from which they were removed.
4. Replace the ISA I/O lock bracket and the PCI access panel.
5. Connect the SCSI and power cables to the riser card, if necessary.
6. Close the base unit.

Processor Module

The processor module contains two CPUs and a Voltage Regulator Module (VRM) for each CPU. The processor module is replaced as one unit.

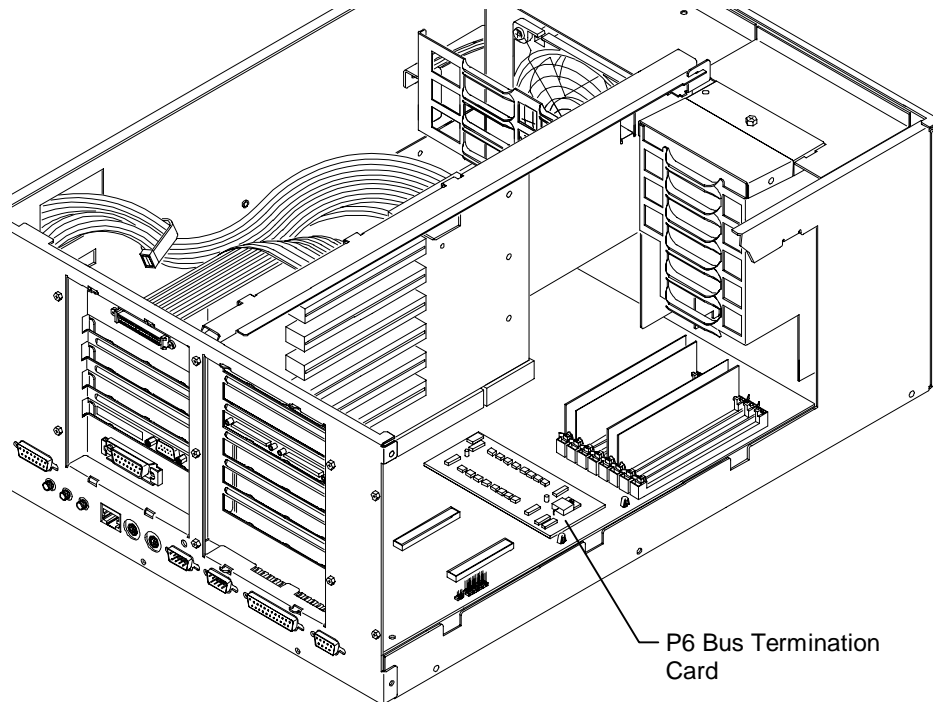
To replace the processor module:

1. When opening the base unit, remove the left side panel, and lay the base unit on its right side.
2. Remove the PCI option boards.
3. Remove the screws from the perimeter of the processor module.
4. Disengage the module from the system board connectors.
5. Align the new processor module over the connectors and firmly press it onto the connectors.
6. Secure the module using the screws removed previously.
7. Replace the PCI option boards. They must be installed in the same slots as before.
8. Close the base unit.

P6 Bus Termination Card

To replace the P6 bus termination card:

1. Open the base unit and remove the parts as described in Chapter 1.
2. Ensure the AC power cable is disconnected and the antistatic strap is properly connected.
3. Lay the system on its right side.
4. Remove the installed PCI option boards.
5. Remove the screws that secure the termination card to the system board.



6. Carefully disengage the termination card from the connectors.
7. Install the new termination card. The connectors are keyed to ensure proper orientation. Carefully but firmly push the termination card into the connectors.
8. Secure the termination card with the screws removed previously.
9. Replace the option boards in the same slots from which you removed them.
10. Close the base unit.

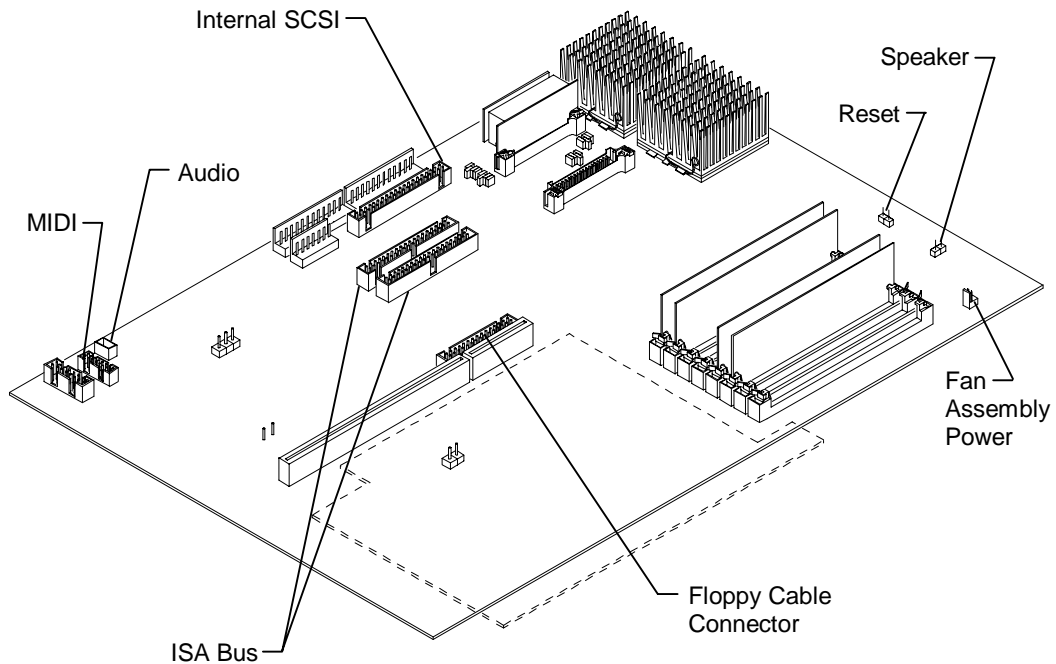
System Board

CAUTION The system board is extremely sensitive to static electricity. To prevent serious damage to the system board, wear the antistatic wrist strap while performing the following steps. Do not open the antistatic bag containing the system board until instructed.

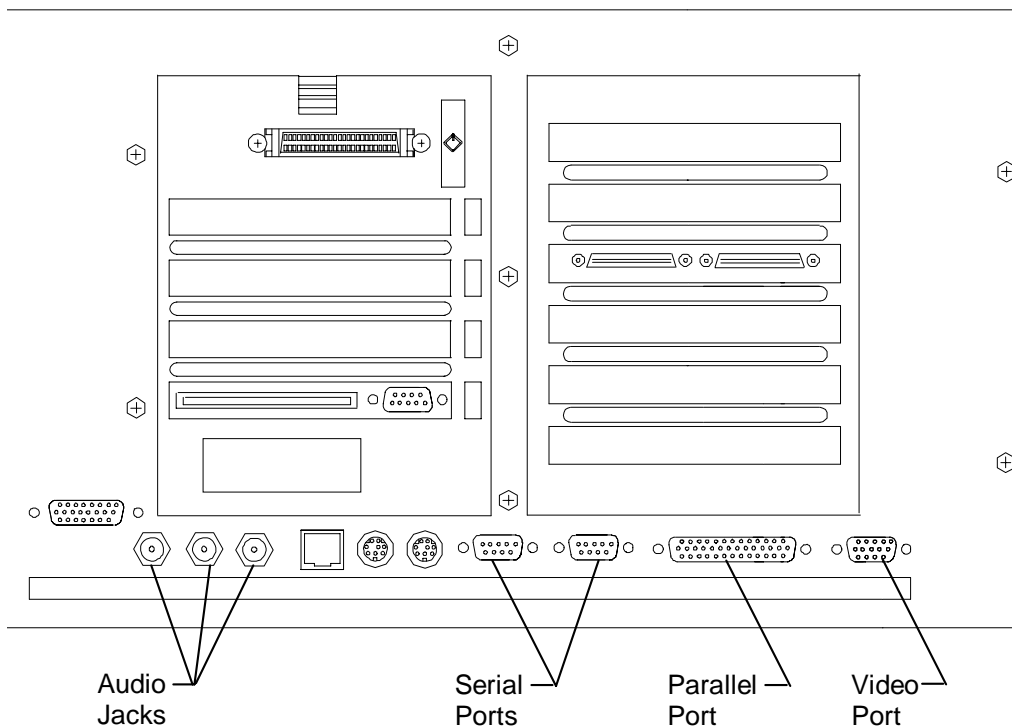
NOTE Before opening the base unit, run the AMIBIOS Setup program and record all the custom settings for your system. After replacing the system board, you must run the System Configuration Utility for the ISA boards. Ensure you have the necessary ISA board configuration files on diskette before you begin.

To replace the system board:

1. Open the base unit and remove the necessary parts as described in Chapter 1.
2. Ensure the AC power cable is disconnected and the antistatic strap is properly connected.
3. Remove the riser card as described previously in “Riser Card.”
4. Remove the processor module as described previously in steps 1 through 4 of “Processor Module” or the P6 bus termination card as described in steps 1 through 6 of “P6 Bus Termination Card.”
5. Remove the option board fan assembly as described later in “Option Board Fans.”
6. Disconnect all cables attached to the system board. Refer to the following figure for cable connector locations.



7. Disconnect the cables from the external ports.
8. Using a three-sixteenth-inch nutdriver, remove the jackscrews from the video, parallel, and serial ports.
9. Using an 8 mm or five-sixteenth-inch nutdriver, remove the hex nuts from the audio jacks.



10. Using a quarter-inch nutdriver, remove the eight grounding screws from the system board.
11. Slide the system board to the front of the base unit.
12. Lift the board and remove it from the base unit. Set the board on a flat antistatic surface.

13. Remove the new system board from the antistatic bag and place it on a flat antistatic surface.
14. Remove the SIMMs from the old system board and install them onto the new system board in the same configuration.
15. Remove the G95 WRAM module, if installed, and install it onto the new system board.
16. Lower the system board into the base unit. Ensure the standoffs line up with the holes in the chassis. Slide the system board so the external ports fit into the back panel.
17. Install the jackscrews onto the video, parallel, and serial ports.
18. Install the hex nuts onto the audio jacks.
19. Install the eight ground screws.
20. Install the processor module (or P6 bus termination card).
21. Connect the cables to the system board.
22. Replace the option board fan assembly.
23. Replace the riser card, option board bracket, option boards, and SCSI and power cables.
24. Replace the PCI access panel.
25. Connect the external system cables to the external ports.
26. Close the base unit.
27. Run the AMIBIOS Setup utility and change the parameters to your required settings. Refer to the *System Setup*.
28. If you have ISA option boards installed, run the System Configuration Utility. Refer to the *System Setup*.

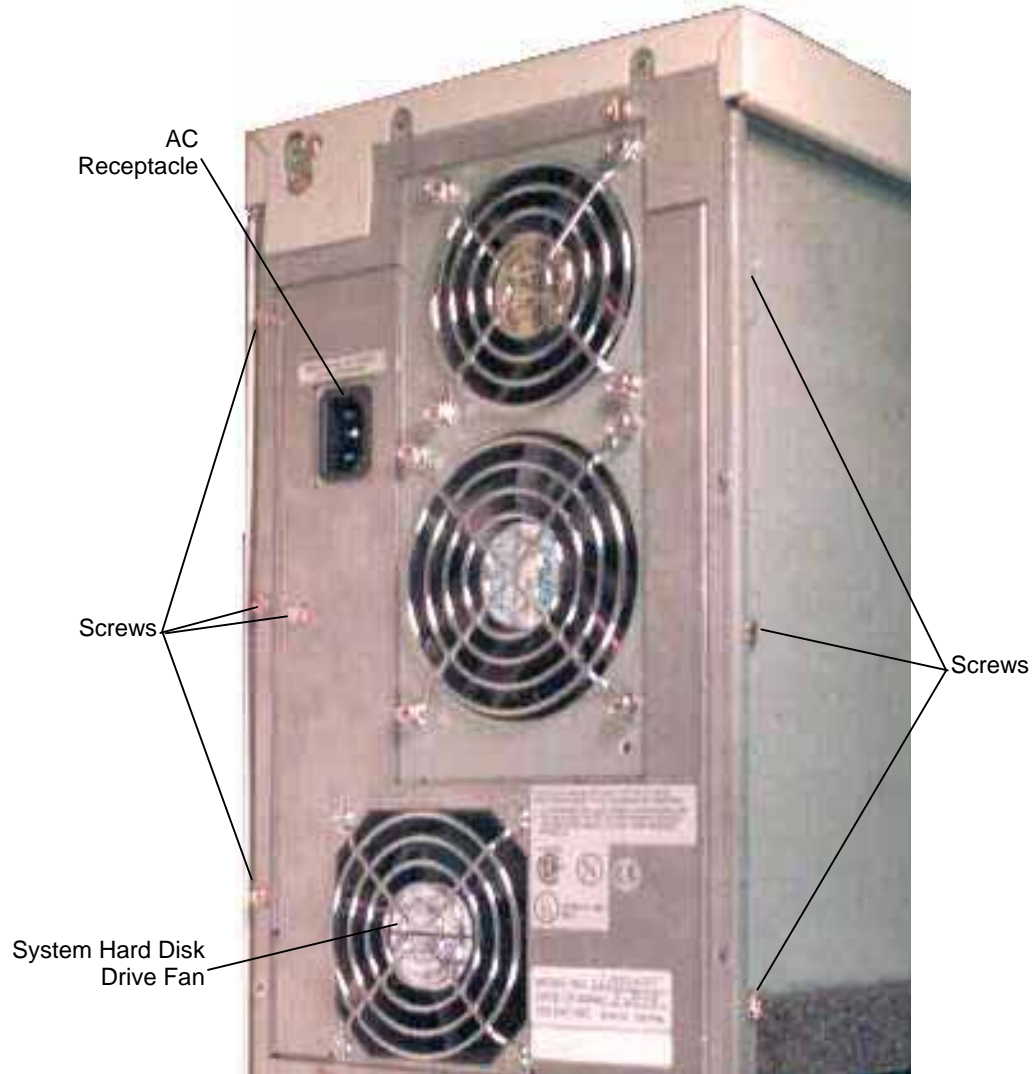
System Hard Disk Drive Fan

For systems without the internal RAID subsystem, a small fan beneath the power supply provides cooling to the system hard disk drive.

To replace the system hard disk drive fan:

1. When opening the base unit, remove the top cover and left side panel.
2. Remove the screws shown in the following figure from the back cover. Pull on the side of the cover opposite the AC receptacle to disengage it.

CAUTION Do not remove the two screws at the top of the chassis. The power supply could fall, causing damage inside the base unit.

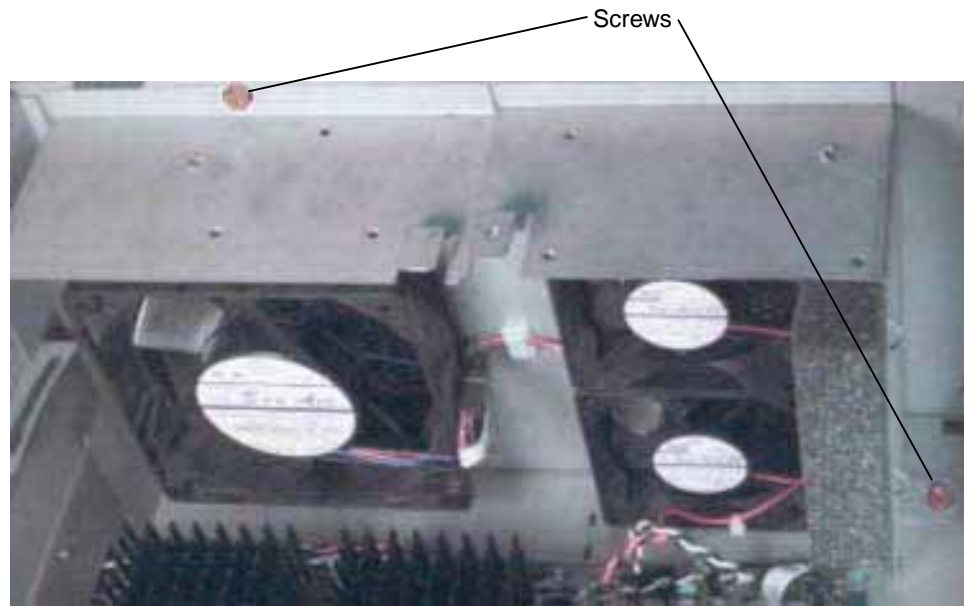


3. Disconnect the fan power cable from the system board.
4. Remove the fan from the back panel.
5. Attach the new fan to the back panel.
6. Connect the fan power cable to the system board.
7. Replace the back and side panels and the top cover
8. Close the base unit.

Option Board Fans

To replace the option board fans:

1. Remove the peripheral brace.
2. Disconnect the power cables from the system board.
3. The option board fans are removed as a single, self-contained assembly. Remove the fan assembly screws shown in the following figure; then remove the fan assembly.



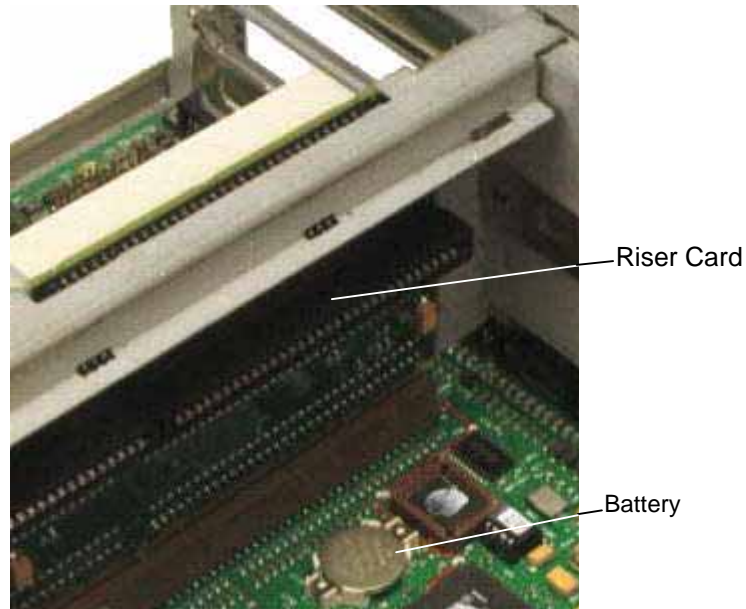
4. The option board fans are installed as a single, self-contained assembly. Install the new fan assembly into the chassis and connect the power cables to the system board.
5. Replace the peripheral brace.
6. Close the base unit.

CMOS/Clock Battery

WARNING There is a danger of explosion if the battery is incorrectly replaced. Replace the battery with the same or equivalent type only, as recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

To replace the CMOS/clock battery:

1. Remove the ISA option boards. The battery is located next to the riser card. Refer to the following figure.
2. Note the orientation of the battery.



3. Carefully remove the discharged battery by grasping it firmly and lifting upward.
4. Install the new battery in the same orientation as the discharged battery.
5. Replace the ISA option board.
6. Close the base unit.

Power Supply

CAUTION Purchase replacement power supplies from Intergraph to ensure proper specifications are met and to guarantee safety.

To replace the power supply:

1. Remove the AC power cord from the back of the base unit.
2. Disconnect the power cables from the riser card, hard disk drives (or internal RAID subsystem and DC distribution board), floppy disk drive, and CD-ROM drive.
3. Open the clip that secures the bundle of power cables. Remove the audio cable (connecting the CD-ROM drive to the system board) from the power cable bundle.
4. Remove the screws securing the power supply to the back of the base unit. Refer to the following figure.

CAUTION Support the bottom of the power supply with your hand as you remove the screws. Otherwise, the power supply could fall and cause damage inside the base unit.



5. Push the power supply out the side of the base unit.
6. Remove the power switch cable and grounding wire from the chassis.
7. Remove the new power supply from its packaging. On a desktop system, set the AC voltage switch on the back of the new power supply to the correct voltage for your location.
8. Slide the new power supply into place in the base unit. Mount the power supply using the screws removed previously.
9. Slide the power cable bundle through the opening; then connect the main power cable to the riser card.
10. Connect the remaining power cables to the hard disk drives (or internal RAID subsystem and DC distribution board), CD-ROM drive, and floppy disk drive.
11. Secure the clip around the power cable bundle.
12. Close the base unit.
13. Connect the AC power cord to the back of the base unit.

Power Distribution Board

NOTE The power distribution board is used only in systems which feature the internal RAID section.

To replace the power distribution board:

1. Open the base unit and remove the necessary parts as described in Chapter 1.
2. Remove the power supply as described previously in steps 1 through 7 of "Power Supply ."
3. Disconnect the fan power cable from the system board.

4. Using a quarter-inch nutdriver, remove the screw (next to the power distribution board) securing the fan assembly to the base unit.
5. Push the fan assembly towards the internal RAID subsystem and lift the assembly out of the base unit.
6. Disconnect the cables from the power distribution board. Keep track of the cables which attach to the various connectors.
7. Using a No. 1 Phillips screwdriver, remove the screws securing the power distribution board to the base unit.
8. Remove the board from the base unit.
9. Attach the new power distribution board to the base unit.
10. Replace the fan assembly.
11. Connect the cables to the power distribution board.

NOTE

Refer to Chapter 7, "Power Supplies, Power Distribution Board, and Fans," if you need details about cable connections to the power distribution board.

12. Replace the power supply.
13. Close the base unit.

4 Upgrading the System

This chapter describes upgrading your system by adding memory, internal or external SCSI devices, and option boards. When adding ISA option boards, see also the instructions for using the System Configuration Utility (SCU).

Adding Memory

Intergraph's memory upgrade kit contains two Single Inline Memory Modules (SIMMs) and a disposable antistatic wrist strap.

CAUTION System memory modules available from Intergraph have been certified for use with Intergraph computers at extremes of temperature and system load to ensure reliable performance. System memory modules available from other vendors may function improperly or unreliably in your Intergraph computer.

To avoid damaging the SIMMs and voiding the warranty, take the following precautions.

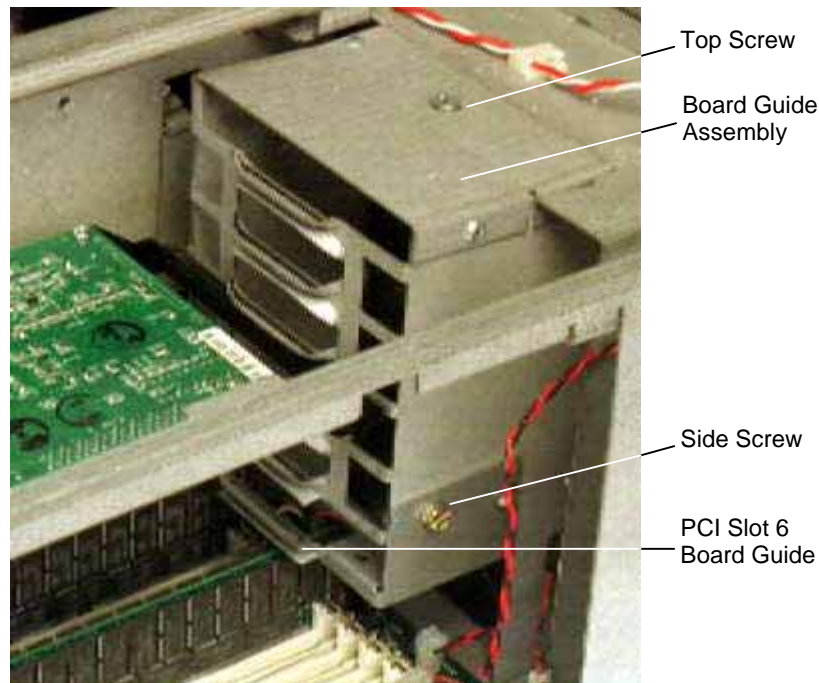
- ◆ Do not bend, twist, drop, or otherwise handle the SIMMs carelessly.
- ◆ Do not expose the SIMMs to moisture or extreme temperatures.
- ◆ Do not remove the SIMMs from the antistatic bag until instructed.

Follow these SIMM population rules to correctly install the SIMMs.

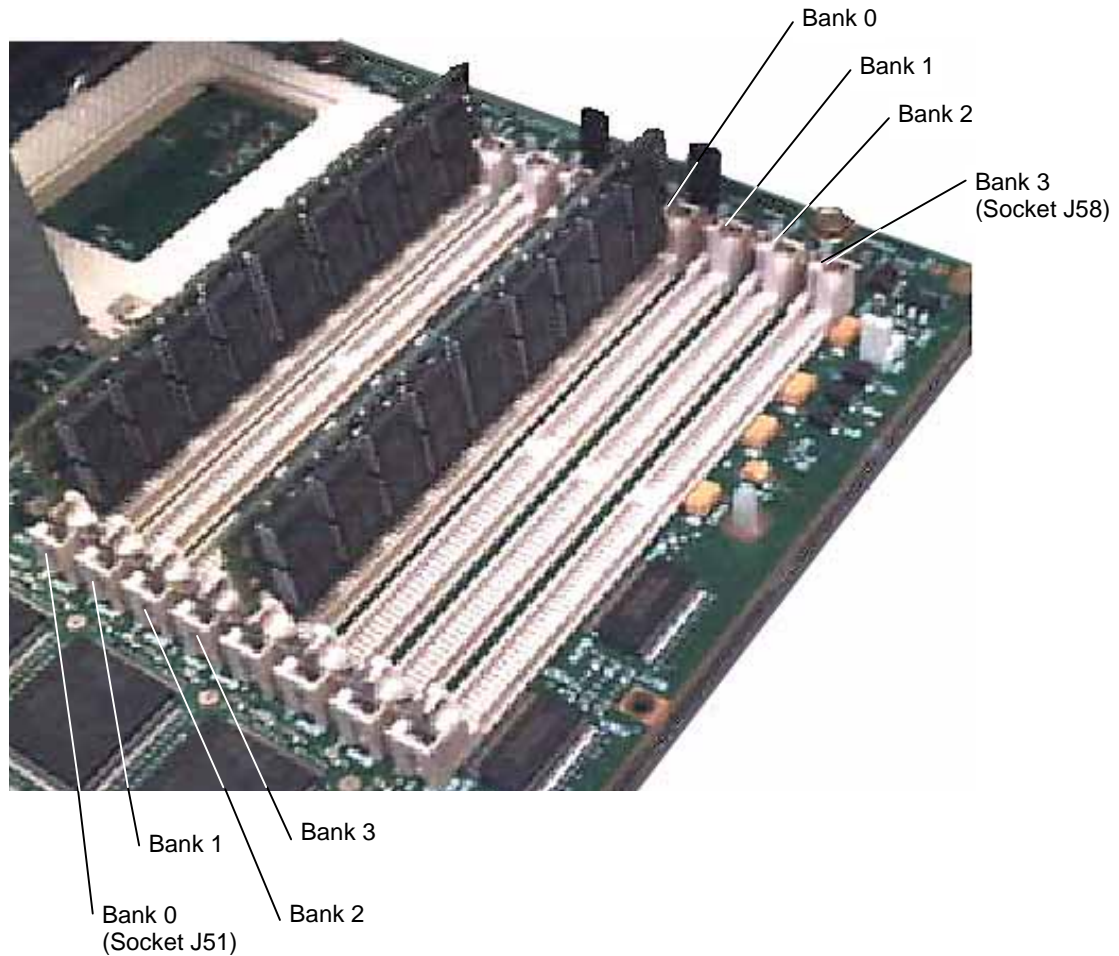
- ◆ All SIMMs in the sockets must be the same memory size.
- ◆ Two, four, or eight SIMMs must be installed in the sockets. The system will not configure itself if only three, five, six, or seven SIMMs are installed in the sockets.

To install a memory upgrade:

1. Remove the graphics boards and the installed PCI option boards.
2. If installing 128 MB SIMMs in a desktop system, remove the board guide for PCI slot 6 to allow for the extra height of these large SIMMs. Remove the top screw from the board guide assembly, then remove the assembly from the chassis. Refer to the following figure.
3. Remove the side screw securing the slot 6 board guide to the board guide assembly; then remove the board guide. Refer to the following figure.



4. Remove the existing SIMMs from their sockets before adding new ones.
5. Remove the SIMMs from their antistatic bag and install them in this order:
 - ◆ If you are installing two SIMMs, install them in the Bank 0 sockets.
 - ◆ If you are installing four SIMMs, install them in the Bank 1 sockets first, and then in the Bank 0 sockets.
 - ◆ If you are installing eight SIMMs, install the first SIMM in Bank 3 socket J58. Install each remaining SIMM in the next empty socket until Bank 0 socket J51 is the last socket populated.



6. Position the SIMM in the next available socket so that the notch faces the back of the base unit.
7. Insert the SIMM at a 60 degree angle, pressing it firmly into the socket.
8. Push on the top edge of the SIMM until it snaps into the metal clips and locks into the vertical position. The socket tabs must fit inside the mounting holes of the SIMM.
9. Repeat steps 5 through 7 for each SIMM.
10. If you installed 128 MB SIMMs in a deskside system, replace the board guide assembly (without the slot 6 board guide).
11. Replace the graphics boards and PCI option boards.
12. After you close the base unit, restart the system. The new memory is recognized automatically.

Adding Internal SCSI Devices

Desktop systems are equipped with an Ultra SCSI controller for all SCSI devices. You can install internal Ultra SCSI devices in the drive bays located on the right front side of the base unit. The device must be a 1-inch high device to fit in these bays. You can install a replacement hard disk drive in the system hard disk drive bracket between the riser card and power supply. If the hard disk drive is more than 1-inch high you will not be able to use ISA slot 1. If you install a non-Ultra SCSI device, data transfer rates are limited to the specification of the device.

Deskside systems are equipped with an Ultra SCSI controller for internal SCSI devices. The internal drive bays are located above the floppy disk drive bay. These bays are designed to accommodate 1.0-inch and 1.6-inch high devices. If you install a non-Ultra SCSI device, data transfer rates are limited to the specification of the device.

CAUTION Connecting a non-compliant SCSI-1 device to a TD/TDZ-x10 or InterServe x05 system may cause your system to stop working, or lead to other unpredictable results.

To install an internal SCSI device:

1. If a device already occupies the location in which you are adding the new device, remove the existing device. If installing the device into an empty drive bay, remove the support or slide bracket from the drive bay.
2. Mount the device to the support or slide bracket, if necessary.
3. If installing a non-bracketed device, slide the device through the faceplate and secure it directly to the chassis.

If installing a bracketed device, slide the bracket through the faceplate, if installing into one of the forward drive bays; then secure the bracket to the chassis.

4. If installing into the system hard disk drive bracket in a desktop system, replace the bracket, ensuring the bracket tabs engage the slots on the peripheral brace.

NOTE ISA Slot 1 can be used only if the system hard disk drive is less than 1.6-inches high.

5. Connect the SCSI cable and power cable to the device. The SCSI cable is keyed to ensure proper insertion, so that the red stripe (pin 1) is adjacent to the power connector.
6. After closing the base unit, install the device drivers and configure the device according to the vendor's instructions, if necessary.

Adding External SCSI Devices

You can add single-ended SCSI devices to the system by connecting them to the SCSI port on the back of the base unit. Additional SCSI option boards (adapters) can be installed to support external SCSI devices as well. Refer to the "Adding Option Boards" section later in this chapter to install new boards.

Cable Length Requirements

The desktop systems are equipped with an Ultra SCSI controller (AIC 7860) for all internal and external SCSI devices. By default, the controller arbitrates with each device (that is, initiates sync negotiation) to determine the data rate the device will use to transfer data (5, 10, or 20 MHz). If the target device complies with the 20 MHz SCSI specification, then the data transfer rate will be 20 MHz. If another device complies with a different specification, then data transfer will be at the lowest data rate without changing any settings for the controller or the target device.

The deskside systems use a Fast SCSI-2 controller (AIC-7850) for all external SCSI devices. Fast SCSI-2 devices comply with the 10 MHz SCSI specification. You should install only Fast SCSI-2 devices to the external SCSI port. If you install an Ultra SCSI device, data transfer rates are limited to the SCSI-2 specification. If you install a SCSI-1 device, data transfer rates are limited to the specification of the device.

CAUTION Connecting a non-compliant SCSI-1 device to the system may cause your system to stop working, or lead to other unpredictable results.

You can add up to five external single-ended SCSI devices to a desktop workstation, and up to seven external single-ended SCSI devices to a deskside workstation. The number of devices and length of the cables used to connect the devices becomes a factor when using Fast SCSI-2 or Ultra SCSI devices. Ultra-SCSI devices impose shorter cable restrictions than Fast SCSI-2 or SCSI-1. The total length of the SCSI cabling must not exceed the following:

<u>Number of Devices</u>	<u>SCSI-1</u>	<u>Fast SCSI-2</u>	<u>Ultra SCSI</u>
1 to 4	19.8 feet (6 meters)	9.9 feet (3 meters)	9.9 feet (3 meters)
5 to 7	9.9 feet (3 meters)	9.9 feet (3 meters)	4.9 feet (1.5 meters)

NOTE The SCSI controller (integrated or on an option board) counts as one device.

NOTE The AIC 7860 in the desktop system can be configured to transfer data at Fast SCSI-2 rates for all devices. This allows Ultra SCSI devices to be installed without being hampered by the Ultra SCSI cable restrictions. Total cable length can then be extended to the Fast SCSI-2 length. See "Disabling SCSI Sync Negotiation" later in this chapter to configure the controller.

When attaching drives to the system's SCSI port on the I/O connector board, the total length of the SCSI cabling is the sum of all of the following:

- ◆ SCSI bus trace length on I/O expansion board - 12.0 inches (30.5 cm)
- ◆ SCSI cable inside the base unit - 41 inches (104 cm)
- ◆ SCSI cable inside each device (average) - 8 inches, (20 cm)
- ◆ SCSI cable between the base unit and the first device
- ◆ SCSI cable between each device

If attaching SCSI drives to an optional SCSI adapter, the total length of the SCSI cabling is the sum of all of the following:

- ◆ SCSI cable inside the system (101.6 mm)
- ◆ SCSI cable inside each external device (203.2 mm)
- ◆ SCSI cable between the base unit and the first device
- ◆ SCSI cable between each device

Connecting the Device

To add an external SCSI device:

1. Connect the SCSI cable to the SCSI port on the base unit and to the device.
2. Set the device's SCSI ID to an unused number (1, 2, 3, 5, or 6). By default, the following devices use pre-defined SCSI IDs:
 - System disk drive uses ID 0.
 - CD-ROM drive uses ID 4.
 - SCSI bus uses ID 7.
3. Disable or enable the device's SCSI termination according to the vendor's instructions. The last external device on the SCSI cable chain must have SCSI termination enabled. All other external devices must have SCSI termination disabled.
4. If necessary, install the device drivers and configure the device according to the vendor's instructions.

Disabling SCSI Sync Negotiation

Use the following instructions if you need to disable the SCSI sync negotiation, which forces the controller to transfer data at a specified rate (slower than its capability) for the target devices.

To disable sync negotiation:

1. Power off the system and reboot into DOS using the SYSUTIL diskette.
2. From the SYSUTIL main menu, select SCSI Select Utility.
3. From the Options box, select Configure/View Host Adapter Settings.
4. Select the SCSI Device Configuration option.
5. Change the Initiate Sync Negotiation values for all the attached SCSI devices (represented by their SCSI ID number) to no.
6. Set the Maximum Sync Transfer Rate values for the devices to the desired settings. If changing these settings to extend cable lengths or add more devices, set Ultra SCSI devices to 10.0 or less.

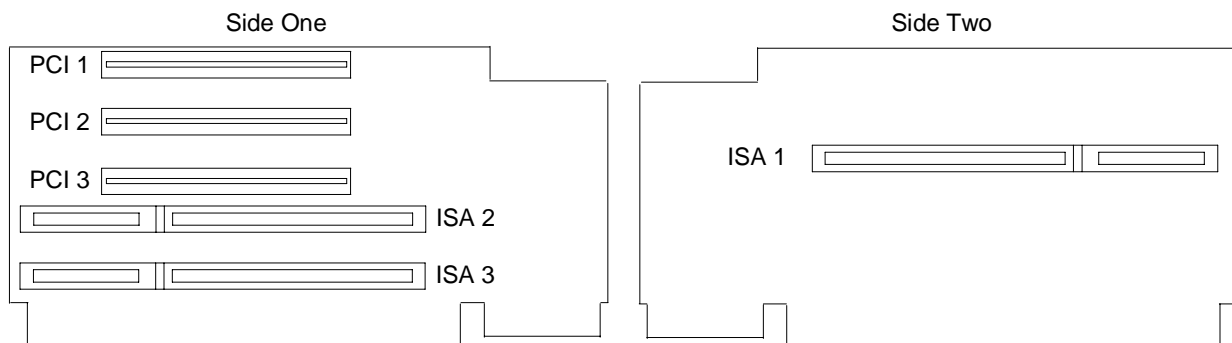
NOTE The Advanced Configuration Option allows you to disable the Ultra SCSI controller. When Ultra SCSI is enabled, the available sync rates are 20, 16, 13.4, 10. When Ultra SCSI is disabled then 10, 8, 6.7, 5 are available.

7. Press ESC until the Exit Utility dialog displays. Select Yes and press ENTER.
8. Press any key to restart the system.

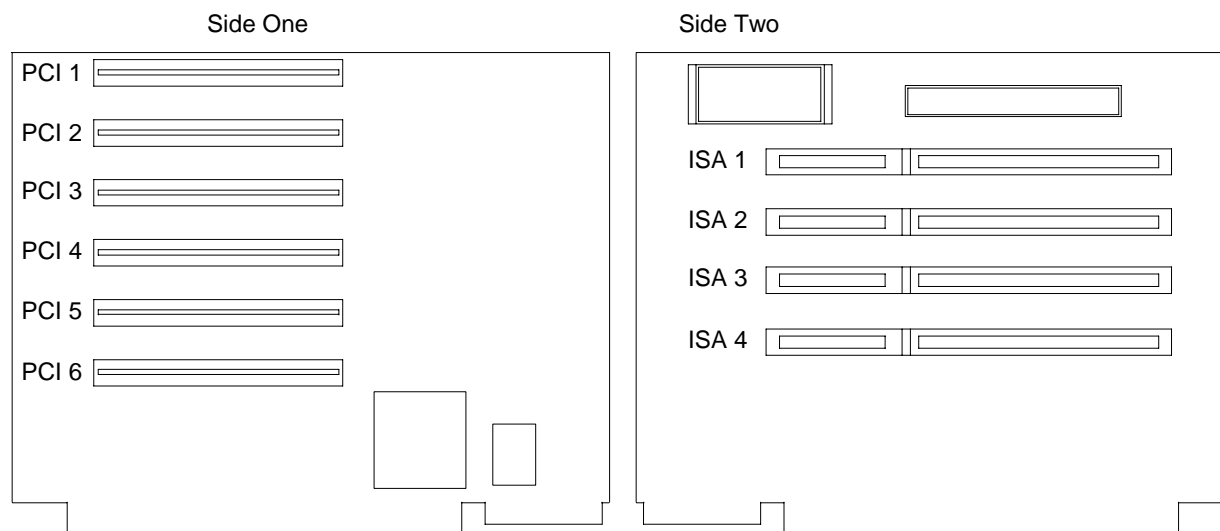
Adding Option Boards

This section briefly describes the differences between Peripheral Component Interconnect (PCI) and Industry Standard Architecture (ISA) option boards. Instructions are also provided for installing option boards on the riser card.

The following figure shows the riser card in a desktop system.



In deskside systems, PCI boards connect to side 1 of the riser card; ISA boards connect to side 2. The following figure shows the slots on the deskside riser card.



Primary PCI Slots

Some PCI option boards (refer to documentation delivered with the board) must be installed in a primary PCI slot. In a desktop system, PCI slots 1, 2, and 3 are primary. In a deskside system, PCI slots 5 and 6 are primary.

PCI Option Boards

PCI option boards do not require manual system configuration when installing the board. The system BIOS detects the board's presence during startup and reads information from the board's configuration registers to assign the necessary system resources. However, if installing a PCI IDE controller, you must set jumpers on the controller before installing it into the system, as follows.

Setting jumpers on PCI IDE controller boards:

1. Set the jumpers on single-channel controllers to coordinate the IDE channel to IRQ 14. Set the jumpers on dual-channel controllers to coordinate the primary IDE channel to IRQ 14, and the secondary IDE channel to IRQ 15. Use the guide below when setting the jumpers.

Desktop Systems

	IRQ14	IRQ15
PCI Slot 1	INT A	INT B
PCI Slot 2	INT D	INT A
PCI Slot 3	INT C	INT D

Deskside Systems

	IRQ14	IRQ15
PCI Slot 5	INT A	INT B
PCI Slot 6	INT D	INT A

2. Install the PCI IDE controller into a primary PCI slot, as follows.

To install PCI option boards:

1. Remove the blanking plate from an available PCI slot.
2. Install the PCI option board. Press firmly to ensure the board seats completely into the riser card connector.
3. Mount the board to the chassis using the screw removed in step 1 above.
4. After closing the base unit, restart the system. The new PCI board is recognized and configured automatically.

ISA Option Boards

ISA boards are not designed with internal registers that define the board's configuration to the system during startup. Therefore, you must run the System Configuration Utility (SCU) to define the board to the system. Run the SCU before installing an ISA board to reserve system resources for the board and to prevent conflicts with option boards already installed. Refer to "Using the System Configuration Utility" later in this chapter.

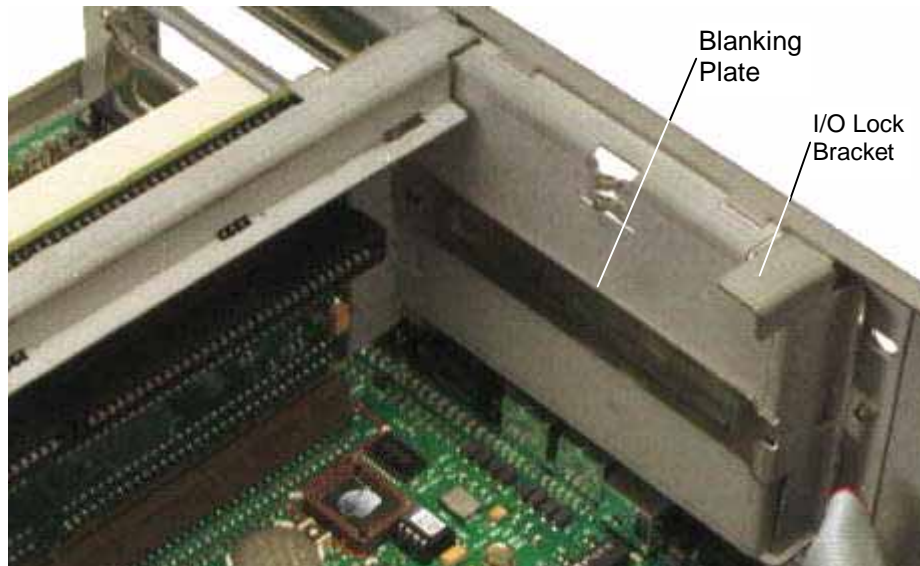
To install an ISA board into a desktop system:

1. Remove the system hard disk drive (or its bracket if the disk drive is not installed).

NOTE

ISA Slot 1 can be used only if the hard disk drive is less than 1.6-inches high.

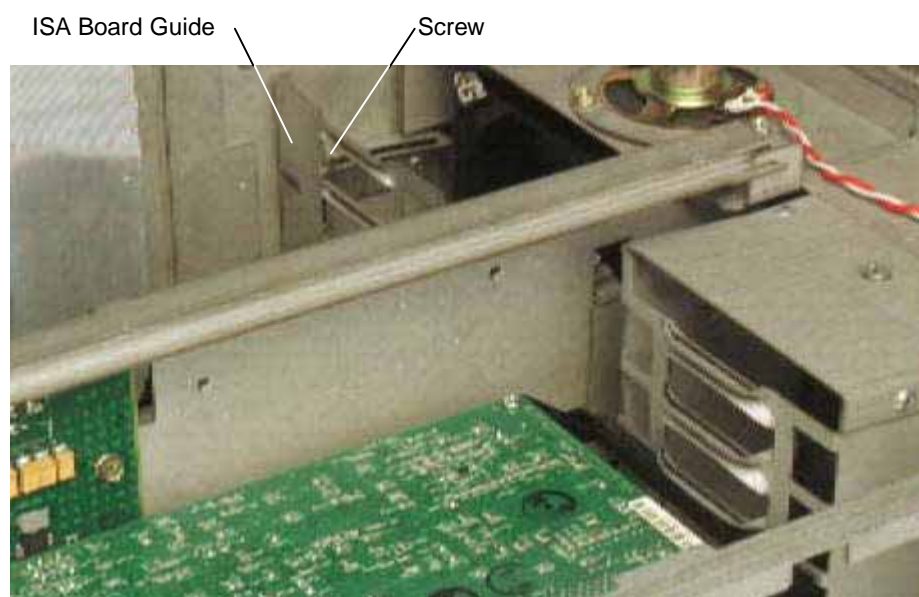
2. If installing the board onto side one of the riser card, remove the blanking plate from the appropriate slot.
3. If installing the board to side two of the riser card, remove the I/O lock bracket and the blanking plate from the destination slot, as shown in the following figure.



4. Install the option board. Press firmly to ensure the board seats completely in the slot.
5. Replace the system hard disk drive (or its bracket if the disk drive is not installed).

To install an ISA board into a deskside system:

1. Loosen the screw to allow the pivoting ISA board guide to swing toward the system fans, as shown in the following figure.



2. Install the option board. Press firmly to ensure the board seats completely in the slot.
3. Slide the pivoting ISA board guide over the edge of the ISA board; then, tighten the screw.
4. Secure the board to the chassis with the screw, and install the I/O lock bracket.
5. After closing the base unit, restart the system.

You may need to load device drivers to enable the new option board to operate. If so, refer to the documentation provided with the option board.

Using the System Configuration Utility

The System Configuration Utility (SCU) is an MS-DOS utility that will not run in the Windows NT environment. Use the System Utilities (SYSUTIL) diskette delivered with your system to boot the system into MS-DOS. The system must be set to boot from the floppy disk drive (normally drive A) to use the SCU. If necessary, follow the procedure documented in *System Setup* to change the workstation boot sequence.

ISA Boards with a Configuration File

Some ISA boards are shipped with a diskette containing a configuration file. The configuration file can be loaded to the system so that the BIOS reads this file to assign resources during startup. If you install ISA boards that are shipped with a configuration diskette, follow this procedure.

NOTE If a configuration diskette is not delivered with the option board, refer to "ISA Boards without a Configuration File" later in this chapter.

To define ISA boards with a configuration file:

1. Shut down and power off the system.
2. Insert the SYSUTIL diskette into the floppy diskette slot of the combo drive; then restart the system.
3. When the MS-DOS Startup menu displays, select the System Configuration Utility option.
4. Use the arrow keys or the mouse to select Step 2 from the SCU Main Menu. Then press INSERT to add a board that was not detected or has not been installed.

A prompt displays, requesting that you copy the configuration files needed to configure the system. The configuration file is on a diskette provided by the ISA board manufacturer.

5. Press ENTER to accept A:\ as the path to the configuration file.
6. Select the slot where the board will be installed. Only slots 1 through 3 are valid for the desktop system, and slots 1 through 4 are valid for the deskside system.
7. When prompted to insert the source disk, insert the diskette containing the configuration file and press ENTER.

When prompted to insert the destination disk, insert the SYSUTIL diskette and press ENTER. The configuration file from the option board manufacturer will be installed to the system and to the SYSUTIL diskette.

8. Press ESC to return to the SCU Main Menu.
9. Select Step 4 from the SCU Main Menu to save the configuration, and then select Step 6 from the SCU Main Menu to exit the SCU.
10. Remove the diskette from the combo drive; then restart the system.

ISA Boards without a Configuration File

Some ISA board vendors do not include configuration files with their boards. For these boards, you must use the SCU to define the ISA board to the system (that is, manually create a configuration file) by following this procedure.

To define ISA boards without a configuration file:

1. Shut down and power off the system.
2. Insert the SYSUTIL diskette into the floppy diskette slot of the combo drive; then restart the system.
3. When the MS-DOS Startup menu displays, select the System Configuration Utility option.
4. From the SCU Main Menu, select Step 2, then press F6. The ISA Board Definition Menu displays.
5. Enter the data specified in the manufacturer's configuration instructions.

NOTE

Use the TAB and arrow keys to move the cursor from field to field. Once inside the DMA, IRQ, and Ports fields, press ENTER to display the sub-fields for entering the information.

6. Press F10 to save the data to the system.
7. Press ENTER to return to the ISA Board Definition Menu.
8. Press ESC to return to the SCU Main Menu.
9. Select Step 2 from the SCU Main Menu. The Add and Remove Boards Menu displays.
10. Select the required slot number and press INSERT.

11. Select `INSERT` to add the board. The ISA Board Database Menu displays.
12. Select the correct board name and press `ENTER`.
13. When the Slot Selection Menu displays, select the required slot and press `ENTER`.
14. Press `ESC` to return to the SCU Main Menu.
15. Select Step 4 from the SCU Main Menu to save the configuration.
16. Select Step 6 from the SCU Main Menu to exit the SCU.
17. Remove the diskette from the combo drive; then restart the system.

5 System Board

This chapter provides information about the system board (MSMT359), including the following:

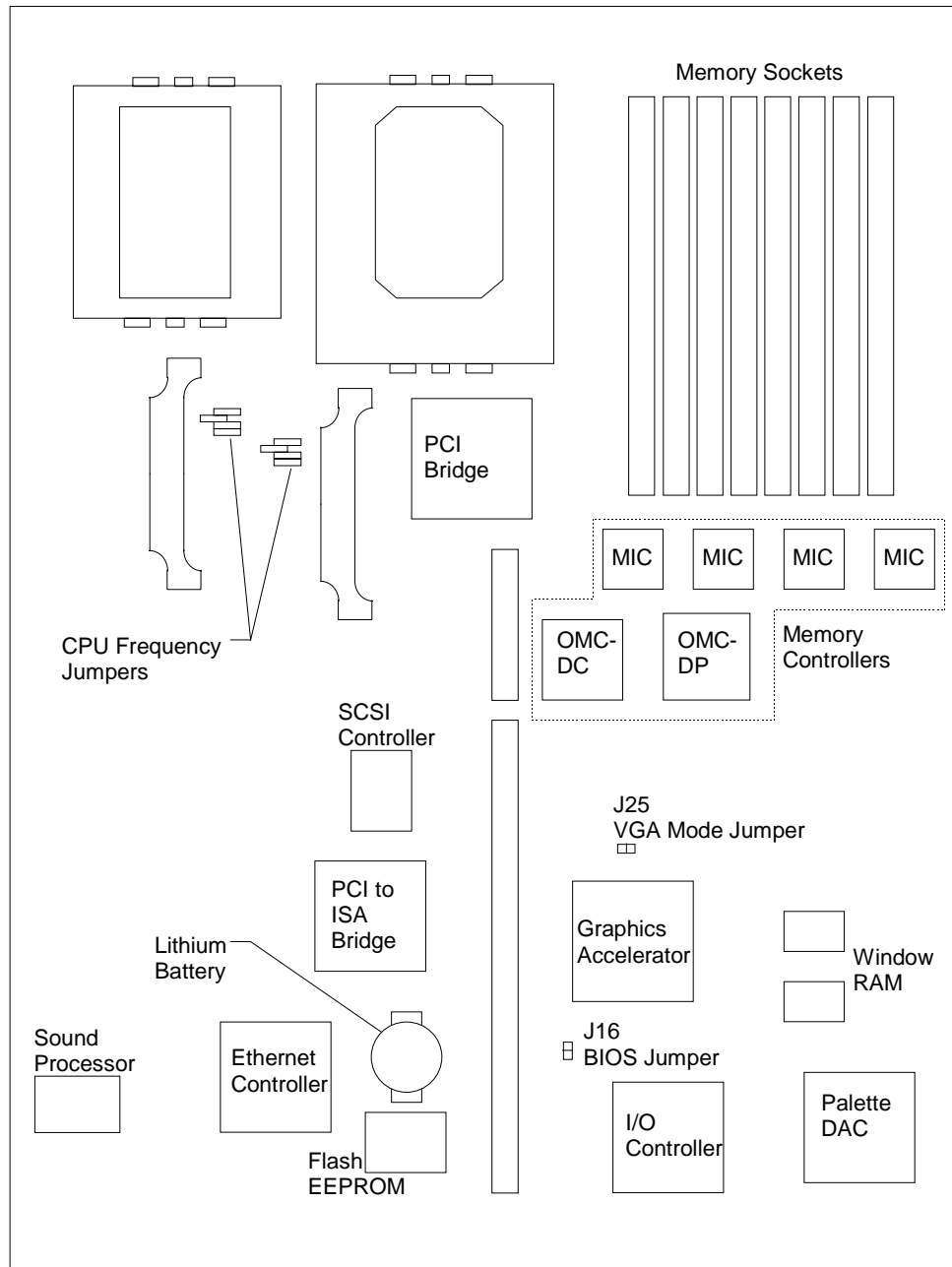
- ◆ Components and chipsets
- ◆ Cable connectors
- ◆ Address configuration
- ◆ External ports

The system board provides the following system functionality:

- ◆ Processors - one to four Intel Pentium Pro 200 MHz, each with 512 KB L2 cache
- ◆ PCI Bridge - Intel Orion PCI bridge provides the interface between the processors and PCI expansion bus
- ◆ PCI to ISA Bridge - Intel 82379AB provides the interface between the ISA expansion bus and the PCI bus
- ◆ Memory - eight memory sockets and Intel memory controllers support up to 1 GB of four-way interleaved memory
- ◆ Networking - Intel 82557 provides Ethernet 10Base-T or 100Base-TX protocol, autodetects network type
- ◆ SCSI - Adaptec 7860 Ultra SCSI controller supports external SCSI drives
- ◆ System I/O - Standard Microsystems Corporation FDC37C932 Super I/O Controller supports mouse, keyboard, floppy disk drive, Real Time Clock, Non-Volatile RAM, serial ports, and parallel port

Components and Chipsets

The following figure shows the locations of the major integrated components and the jumper connectors.



Lithium Battery (CMOS/Clock Battery)

When the system is off, the Lithium battery on the system board provides power to the real time clock and BIOS flash EPROM, which stores the BIOS information. As long as the system is running, the batteries are not used to sustain the information. If the battery fails, the system date and time will be lost and the BIOS will not be installed when the system is rebooted. To replace a failed battery, refer to Chapter 2, "Servicing the Desktop System" or Chapter 3, "Servicing the Deskside System."

Graphics Chipset

G95 Accelerator

The graphics accelerator (Matrox MGA-2064W) interfaces to the system board through the PCI bus. This accelerator supports all of the standard VGA graphics modes in addition to native modes capable of resolutions up to 1600 x 1200. The frame buffer interface is 64 bits wide and is clocked at 100 MHz. Color depths of 4, 8, 16, 24, and 32 bits are supported, allowing a resolution of 1280 x 1024 (24 bit color depth) in only 4 MB of frame buffer memory. Features such as bit block transfer (BitBlt), Line Draws, and Fills provide hardware acceleration for Windows. Video playback is accelerated through scaling and YUV to RGB color space conversion.

Palette DAC

The palette DAC operates up to 175 MHz and converts the digital RGB data in the frame buffer to analog signals for the monitor. The device includes two fully programmable phase-locked loop clock sources for both the memory clock and the pixel clock.

Window RAM

Window RAM (WRAM) is the video memory used by the MGA-2064W. The graphics frame buffer consists of two 256K x 32 WRAM components for 2 MB of video memory. WRAM is a dual-ported video memory specially designed to accommodate common drawing functions, offering higher graphics performance at a lower cost than standard Video RAM.

Starting with 2 MB WRAM, a 2 MB or 6 MB WRAM mezzanine module can be added for improved video performance. 8 MB of WRAM is the maximum amount configurable. Memory above 2 MB increases the number of colors available at each resolution, enabling you to work in true color mode at higher resolutions. Increased WRAM also improves color acceleration by providing extra caching memory for storing off-screen fonts and images.

VGA Mode Jumper

The VGA mode jumper (J25) enables or disables the G95 VGA mode on motherboards equipped with the G95 graphics chipset. By default, the jumper is not installed (OFF), which enables VGA mode. If the jumper is installed (ON), the VGA mode is disabled.

NOTE

You must remove the PCI option boards and the processor module (or P6 bus termination card) to access the VGA mode jumper.

SCSI Controller

The SCSI controller is the Adaptec Ultra SCSI Adapter (AIC-7860), which provides a single-ended bus for SCSI-1, Fast SCSI-2, and Ultra SCSI devices. The SCSI bus is dedicated to the hard disk drives and CD-ROM drive. The SCSI bus actively terminates on the system board and at the end of the internal SCSI cable. The AIC-7860 supports low-speed devices to allow legacy SCSI devices to be used with the system. By default, the controller functions in Fast SCSI-2 mode rather than Ultra mode.

I/O Controller

The Standard Microsystems Corporation (SMC) Super I/O Controller (FDC37C932) integrates mouse, keyboard, serial, parallel (multi-mode), floppy (2.88 MB), and Real-Time Clock (RTC) functions into one chip.

Serial Port

The FDC37C932 supports four serial ports via two external port connectors (COM 1 and COM 2). COM1 can be configured as COM1 or COM3; COM2 can be configured as COM2 or COM4. The serial ports use the system I/O addresses shown below.

Port	Addresses	Interrupts
COM1	3F8-3FF	IRQ4
COM2	2F8-2FF	IRQ3
COM3	3E8-3EF	IRQ4
COM4	2E8-2EF	IRQ3

The addresses for each serial port can be configured in AMIBIOS Setup, as described in the *System Setup*. Do not assign more than one device to the same COM port number. Serial port problems occur because a serial port and another device are assigned to the same COM number. The system and the connected serial device must be set to the same communications parameters (baud rate, parity, number of data bits, and number of stop bits). Refer to the serial device documentation for information about setting these parameters.

Parallel Port

The parallel port functionality of the FDC37C932 includes the following modes:

- ◆ Normal mode (or Compatibility mode) - an industry-standard parallel interface mode. Normal mode provides an asynchronous, byte-wide forward channel (host to peripheral), and is the base mode common to all compliant interfaces.
- ◆ SPP mode (or Byte or Bi-Dir mode) - compatible with IBM PS/2 hosts. SPP is an asynchronous, byte-wide reverse channel (peripheral to host) mode using the eight data lines of the interface for data, and the control/status lines for handshaking. Transfer direction is controlled by the host when the peripheral and the host both support bi-directional use of data lines.
- ◆ EPP mode - provides an asynchronous, byte-wide, bi-directional channel controlled by the host device. This mode also provides separate address and data cycles over the eight data lines of the interface. EPP increases the data transfer performance to 2 MB per second while retaining backward compatibility with existing AT and PS/2 compatible interfaces.
- ◆ ECP mode - similar to EPP, providing an asynchronous, byte-wide, bi-directional channel controlled by the host device. Additionally, ECP implements a control line to distinguish between command and data transfers. A command may optionally be used to indicate single byte data compression or channel address. Other ECP mode features include:

- Supports 2 MB per second data transfer rate
- High performance, half duplex, forward and reverse channel
- Interlocked handshake for fast, reliable data transfer
- Channel addressing for low-cost peripherals
- Link and data layer separation
- Active output drivers and adaptive signal timing
- Peer-to-peer capability

The addresses and interrupts used by the external parallel port can be assigned in AMIBIOS Setup. Refer to the *System Setup* for information to configure the ports. The parallel port addresses and interrupts are shown in the following table.

<u>Port</u>	<u>Address</u>	<u>Interrupt</u>
LPT1	378-37A	IRQ7 or IRQ5
LPT2	278-27A	IRQ7 or IRQ5
LPT3	3BC-3BE	IRQ7 or IRQ5

Processor Components

Processors

The system uses one or two processors installed on the system board. Each processor is 180 MHz or 200 MHz Pentium Pro with 512 MB secondary cache. Quad-processor systems use a processor card (MSMT310) to add two more processors. When only one or two processors are installed, the P6 bus termination card (MSMT311) is installed instead of the processor module. The termination card provides bus termination for the P6 bus.

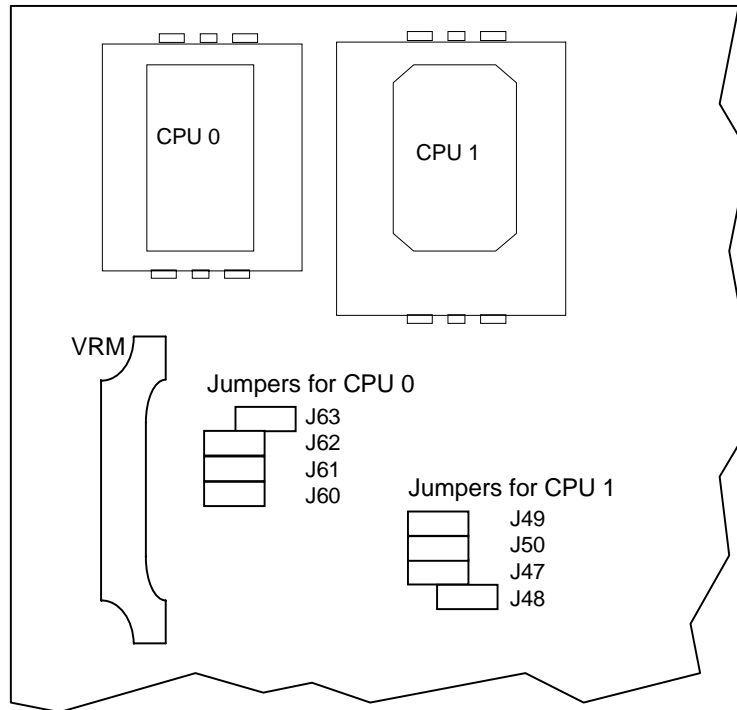
Processor Jumpers

Jumpers are used to set the processor to clock speed ratio for the system. The default, certified configuration is a ratio of 3:1 (3x multiplier). The 180 MHz CPU uses a 60 MHz P6 bus, with jumpers installed to obtain the 3x multiplier. The 200 MHz CPU uses a 66.67 MHz P6 bus, with jumpers installed to obtain the 3x multiplier. The following table shows the jumper settings to obtain the 3x multiplier. IN denotes the jumper is installed on both pins.

<u>CPU 0 Frequency</u>		<u>CPU 1 Frequency</u>	
<u>Jumper</u>	<u>Setting</u>	<u>Jumper</u>	<u>Setting</u>
J63	OUT	J49	IN
J62	IN	J50	IN
J61	IN	J47	IN
J60	IN	J48	OUT

CAUTION Do not change the jumper settings in an attempt to change CPU speed. The CPUs will only operate properly when the jumpers are installed in their default settings.

The following figure shows the detail of the CPU frequency jumper connectors.



NOTE The processor module does not use configurable jumpers.

PCI Bridge

The PCI bridge chip (Intel 82454) provides high-bandwidth PCI compatibility for the system. The bridge chip supports the primary PCI bus and is the path by which processors have access to all PC compatible devices such as the ISA bus, BIOS PROM, and graphics controller. PCI slots 5 and 6 are on the primary PCI bus. PCI slots 1 through 4 (secondary) are supported by an Intergraph programmable part on the riser card.

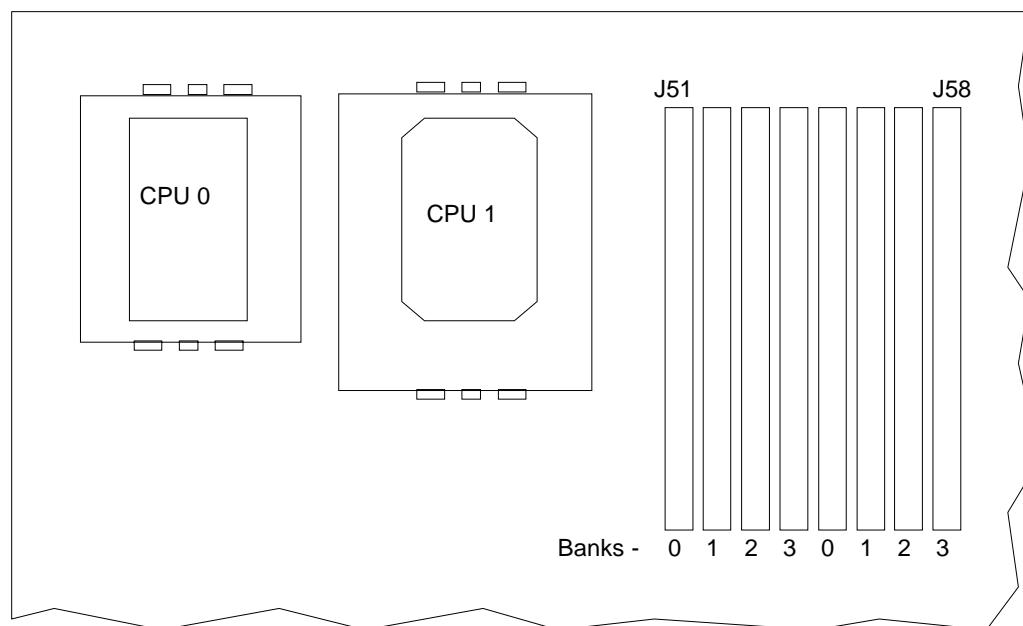
PCI to ISA Bridge

The Intel 82379AB System I/O-APIC (Advanced Programmable Interrupt Controller) bridges the ISA bus off the Primary PCI bus (PCI bus 0). The 82379AB supports all four ISA expansion slots.

Memory Components

Memory Sockets

The system board contains eight memory sockets which accept 72 pin SIMMs from Intergraph. The sockets are divided into four banks. When all sockets are populated, the memory is four-way interleaved which results in maximum memory performance. Refer to Chapter 4 for instructions to upgrade memory. The following figure shows the socket numbers and bank organization.



Memory Controllers

The Orion memory components (OMC) include the OMC-DP (data path) and the OMC-DC (data control). The OMC-DP provides a consolidated memory data path between the P6 bus and the memory interface chips (MICs). The MICs provide the interface between the P6 bus (via the OMC-DP) and the installed memory modules. Each MIC handles 1/4 of the memory data path, and is optimized for interleaved performance using read-around writes and data buffering. The OMC-DC is an addressing and control device for the DRAM array that interfaces to the OMC-DP.

BIOS Components

Flash EPROM

The system board (MSMT329) uses a flash EPROM chip (MYPG782) for the system's Basic Input/Output System (BIOS). The *System Setup Guide* contains information about reprogramming the flash EPROM with a new BIOS when necessary. It also defines the features of the AMIBIOS Setup program, used to modify the BIOS parameters.

BIOS Jumper

The BIOS jumper (J16) allows the BIOS password to be bypassed. By default, the jumper is OFF, which enables the password. When the jumper is ON, the password is disabled.

NOTE

You must remove the PCI option boards and the processor module (or P6 bus termination card) to access the BIOS jumper.

Sound Controller

The sound controller is the Vibra 16C chip from Creative Labs. Integrated onto the system board, the controller is a complete, full-feature MPC 2.0 compliant sound implementation, providing full Sound Blaster Pro functionality and compatibility. The sound controller has the following features and specifications:

Feature	Specification
Sound Controller	Creative Labs Vibra 16C
Audio Resolution	16-bit
Sound Blaster Compatibility	Sound Blaster Pro, with Sound Blaster 16 register compatibility
MIDI/UART Mode/ Compatibility	Roland MPU401
Bus Interface	16-bit ISA
CODEC	16-bit Sigma Delta Stereo
CODEC FIFO	4 Samples
FM Synthesizer	Yamaha OPL3
External Audio Inputs	Microphone (Monoral), Stereo Line-In
Internal Audio Inputs	Stereo FM Synthesis, Stereo Wave Data, Stereo CD, Monoral PC Speaker
Audio Outputs	Stereo Line-Out
MIDI/Joystick	MIDI In, MIDI Out, Up to 4 fire buttons
ADPCM Audio Compression	4:1, 3:1, and 2:1
Sampling Rate Range	5 KHz - 44.1 KHz in 228 selectable steps
Selectable Microphone AGC	Yes
Microphone Support	Low-Impedance (600 Ohms) Dynamic, Electek

The Vibra 16C sound controller is configured entirely through I/O port accesses. When the system is powered up, the hardware forces the Vibra 16C to respond to default I/O port addresses, interrupt request (IRQ) level, and direct memory access (DMA) request and acknowledge. The following table shows the default sound controller configurations and available programmable settings.

Parameter	Default	Other Available
Base I/O Address / MPU-401	220/330	240/300
8-bit DMA Req / Ack Level	1	3
16-bit DMA Req / Ack Level	5	7
Interrupt Request Level	10	5, 7

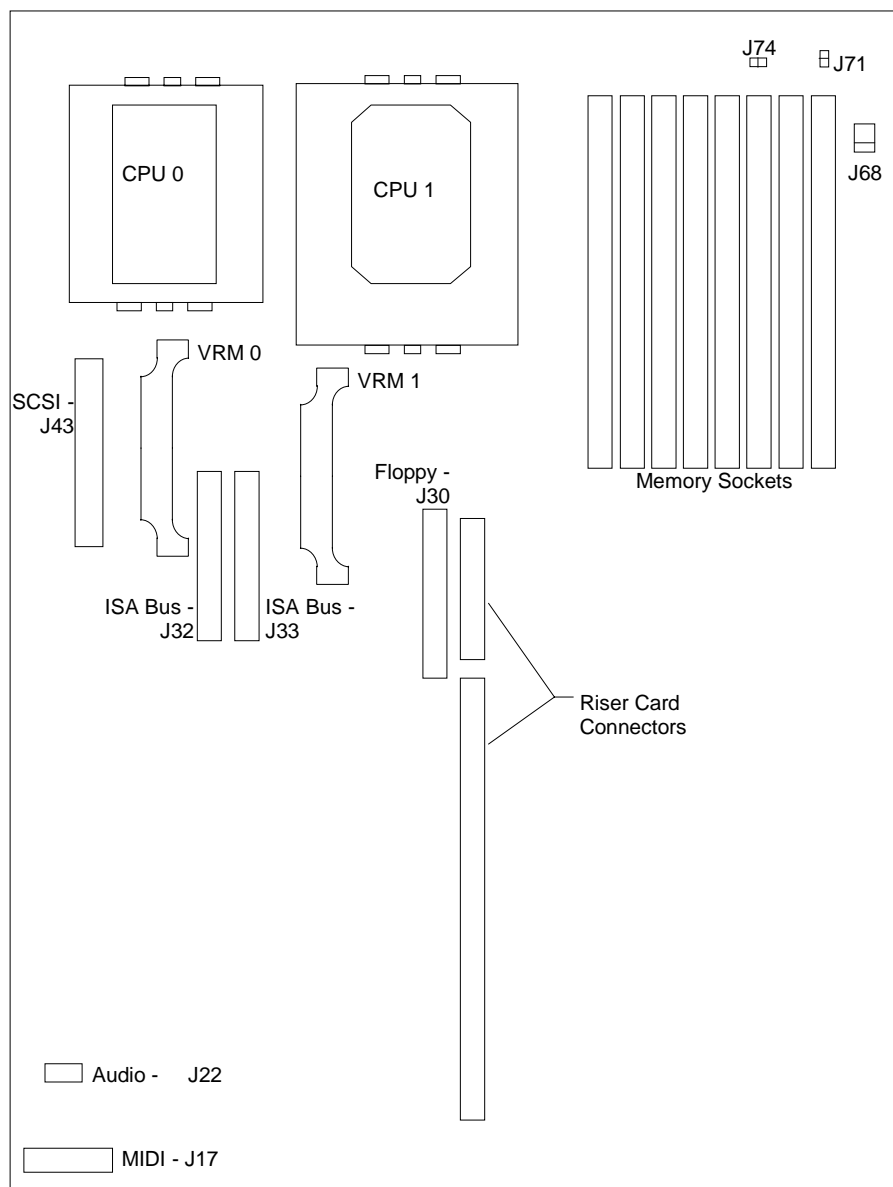
The settings above may be changed in AMIBIOS Setup (see "Chipset Setup" in the Setup and Maintenance Guide, delivered with the system) so the Vibra 16C internal registers respond to custom settings.

Cable Connectors

The following figure shows the internal connector locations. Verify Pin 1 location for each connector on the system board.

NOTE For the power connectors, refer to “Power Supply Information” in this chapter.

The following figure shows the location of the cable and jumper connectors. The CPU, VRM, memory sockets, and riser card connectors are provided for reference.



Floppy Pinout

All odd pins are connected to ground.

<u>Signal</u>	<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>	<u>Pin</u>
RPM	2	DRV0-	14	TRK0-	26
No connect	4	MTR1-	16	WRPRT-	28
DRATE0	6	DIR	18	RDATA-	30
INDEX-	8	STEP-	20	HDSEL	32
MTR0-	10	WDATA-	22	DSKCHG	34
DRV1-	12	WGATE-	24		

Audio Pinout

<u>Signal</u>	<u>Pin</u>
Right Sound Channel	1
Ground	2
Left Sound Channel	3
Ground	4

ISA Bus J32 Pinout

<u>Signal</u>	<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>	<u>Pin</u>
IRQ15	1	SD+(0)	15	Ground	28
IRQ14	2	SD+(1)	16	RSTDRV	29
IRQ10	3	SD+(4)	17	Ground	30
IRQ3	4	SD+(5)	18	SA+(6)	31
IRQ7	5	MEMW-	19	SA+(7)	32
IRQ9	6	MEMR-	20	SA+(10)	33
IOCS16-	7	SA+(17)	21	SA+(11)	34
Ground	8	SA+(18)	22	SA+(14)	35
IOCHRDY+	9	SA+(21)	23	SA+(15)	36
Ground	10	SA+(22)	24	BALE	37
SD+(14)	11	SA+(1)	25	IOR-	38
SD+(15)	12	Ground	26	D7BUFDIR	39
SD+(11)	13	SA+(3)	27	PWR_DWN	40
SD+(10)	14				

ISA Bus J33 Pinout

<u>Signal</u>	<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>	<u>Pin</u>
Spare	1	SD+(2)	15	Ground	28
IRQ11	2	SD+(3)	16	SA+(4)	29
IRQ4	3	SD+(6)	17	SA+(5)	30
IRQ5	4	SD+(7)	18	SA+(8)	31
0WS-	5	SA+(19)	19	SA+(9)	32
Ground	6	SA+(20)	20	SA+(12)	33
MEMCS16-	7	SA+(23)	21	SA+(13)	34
Ground	8	SBHE-	22	SA+(16)	35
SPKR-	9	SA+(0)	23	AEN	36
Ground	10	Ground	24	IOW-	37
SD+(13)	11	SA+(2)	25	Ground	38
SD+(12)	12	Ground	26	LOBUFDIR	39
SD+(9)	13	ISA BCLK	27	HIBUFDIR	40
SD+(8)	14				

Address Configuration

DMA Channels

The system board uses Direct Memory Address (DMA) channels to exchange data without accessing the CPU. Some channels are assigned for specific use by the system, as defined below. Each DMA channel appropriates full 32-bit processing. For an ISA bus, channels 0 through 3 are 8-bit and channels 4 through 7 are 16-bit channels.

<u>DMA</u>	<u>Assignment</u>	<u>DMA</u>	<u>Assignment</u>
0	Spare	4	Cascade input for 0-3
1	Vibra 16C Controller	5	Vibra 16C Controller
2	I/O Controller	6	Spare
3	Parallel Port	7	Spare

Input/Output Addresses

The following table lists a small subset of the reserved I/O addresses.

<u>Address</u>	<u>Device</u>
0278 - 027F	Parallel Port LPT2
02E8 - 02EF	Serial Port COM4
02F8 - 02FF	Serial Port COM2
0378 - 037F	Parallel Port LPT1
03B0 - 03BF	Monochrome Display/Printer Adapter
03C0 - 03CF	Enhanced Graphics Adapter (EGA/VGA)
03D0 - 03DF	Color/Graphics Monitor Adapter (CGA/MCGA)

<u>Address</u>	<u>Device</u>
03E8 - 03EF	Serial Port COM3
03F0 - 03F7	I/O Controller
03F8 - 03FF	Serial Port COM1

Memory Address Map

The following table lists the memory address map assignments.

<u>Memory Address</u>	<u>Size</u>	<u>Assignment</u>
00000000 - 0009FFFF	640K	System board memory
000A0000 - 000BFFFF	128K	Video memory
000C0000 - 000C7FFF	32K	Video ROM
000C8000 - 000DFFFF	96K	Available I/O Adapter ROM
000E0000 - 000EFFFF	64K	BIOS ROM and PCMCIA
000F0000 - 000FFFFF	64K	BIOS ROM
00100000 - 0FFFFFFF	256M	Expansion memory
10000000 - 3FFFFFFF	----	Reserved

PCI to ISA Bus Interrupt Mapping

The ISA bridge (Intel 82379AB) provides the sixteen conventional ISA interrupts, plus four interrupt request pins for PCI peripheral interrupts (PIRQ0 through PIRQ3). For PC-AT architecture compatibility reasons, the PCI interrupts are routed to the ISA interrupts within the ISA bridge. The assertion of a PCI interrupt concludes in an ISA interrupt being asserted.

The 8-bit PIRQ Route Control Registers in the ISA bridge determine to which ISA interrupt a PIRQ is routed. Four PIRQ Route Control Registers are used for the PCI interrupts, located at the ISA bridge address offsets defined below.

<u>PCI Interrupt Request</u>	<u>Address Offset (Hex)</u>
PIRQ0	60
PIRQ1	61
PIRQ2	62
PIRQ3	63

Bit 7 of each PIRQ registers enable (Low) or disable (High) the routing of the PIRQ to an ISA interrupt. The lowest four bits (3:0) of each PIRQ register determines to which ISA interrupt the PIRQ will be routed, as defined below.

<u>Bits (3:0) of PIRQ</u>	<u>ISA Interrupt</u>	<u>Bits (3:0) of PIRQ</u>	<u>ISA Interrupt</u>
0000	Reserved	1000	Reserved
0001	Reserved	1001	IRQ9
0010	Reserved	1010	IRQ10
0011	IRQ3	1011	IRQ11
0100	IRQ4	1100	IRQ12
0101	IRQ5	1101	Reserved

<u>Bits (3:0) of PIRQ</u>	<u>ISA Interrupt</u>	<u>Bits (3:0) of PIRQ</u>	<u>ISA Interrupt</u>
0110	IRQ6	1110	IRQ14
0111	IRQ7	1111	IRQ15

PCI Bus Configuration Space

The table below lists the configuration space used for the primary PCI bus. The PCI bus uses type 1 configuration access, which specifies two 32-bit I/O ports used as the index register (0CF8h) and the data register (0CFCh).

<u>Device</u>	<u>Device Number</u>	<u>0CF8h Value</u>
Host-to-PCI Bridge (PCMC)	0	800000XX
PCI-to-ISA Bridge	2	800010XX
Graphics Accelerator	5	800028XX
Ethernet Controller	6	800030XX
SCSI Controller	7	800038XX
PCI Slot 1	D	800068XX
PCI Slot 2	E	800070XX
PCI Slot 3	F	800078XX

Each PCI slot on the riser card has four available interrupt lines: INTA, INTB, INTC, and INTD. These are connected to the PCI interrupts PIRQ0 through PIRQ3, as shown below:

<u>Interrupt Line</u>	<u>Slot 1</u>	<u>Slot 2</u>	<u>Slot 3</u>	<u>Slot 4</u>	<u>Slot 5</u>	<u>Slot 6</u>
INTA	PIRQ0	PIRQ1	PIRQ2	PIRQ3	PIRQ0	PIRQ1
INTB	PIRQ1	PIRQ2	PIRQ3	PIRQ0	PIRQ1	PIRQ2
INTC	PIRQ2	PIRQ3	PIRQ0	PIRQ1	PIRQ2	PIRQ3
INTD	PIRQ3	PIRQ0	PIRQ1	PIRQ2	PIRQ3	PIRQ0

ISA Bus IRQ Assignments

The ISA slots on the riser card accommodate ISA based option boards and a 16-bit wide expansion bus. The ISA bus interrupt (IRQ) assignments are defined below.

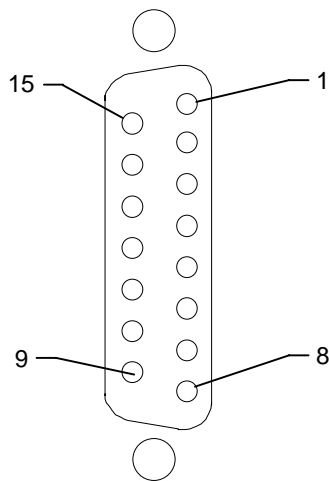
<u>IRQ</u>	<u>Name</u>	<u>IRQ</u>	<u>Name</u>
0	System Timer 0	8	Real Time Clock
1	Keyboard Full	9	Spare
2	Cascade input for IRQ8 - IRQ15	10	Vibra 16C Controller
3	COM2, COM4	11	Spare
4	COM1, COM3	12	Mouse
5	Spare	13	Not Available
6	I/O Controller	14	Spare
7	Parallel Port	15	Spare

The spare interrupts listed above may be assigned to PCI and ISA devices. When you add a PCI device to the system, the interrupt will be automatically assigned by the system BIOS. However, at least one interrupt must be available for the PCI bus. For increased performance, one interrupt should be left available for each PCI based controller used in the system. When you add a ISA board, you must assign the interrupt using the System Configuration Utility and jumpers on the option board.

External Ports

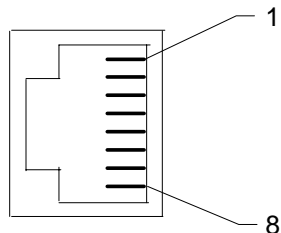
The following figures show the external ports in their proper orientation, when the base unit is in the upright position.

MIDI Pinout



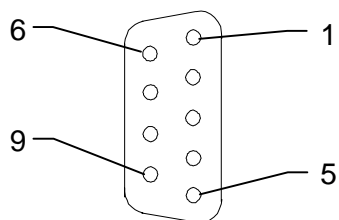
Pin	Signal	Pin	Signal
1	+5V	9	+5V
2	Fire button 0	10	Fire button 2
3	X-axis, joystick 1	11	X-axis, joystick 2
4	Ground	12	MIDI out
5	Ground	13	Y-axis, joystick 2
6	Y-axis, joystick 1	14	Fire button 3
7	Fire button 1	15	MIDI in
8	+5V		

Ethernet Pinout



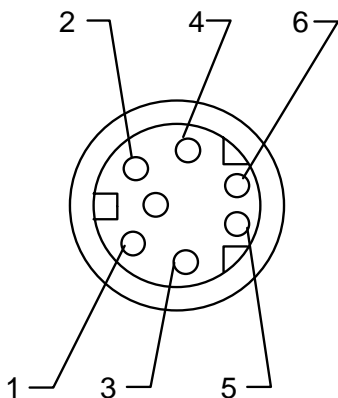
Pin	Signal	Pin	Signal
1	TD+ - Transmit	5	Reserved
2	TD- - Transmit	6	RD- - Receive
3	RD+ - Receive	7	Reserved
4	Reserved	8	Reserved

Serial (COM) Pinout



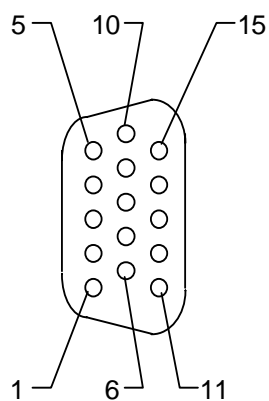
Pin	Signal
1	DCD - Data Carrier Detect
2	RD - Receive Data
3	TD - Transmit Data
4	DTR - Data Terminal Ready
5	Ground
6	DSR - Data Set Ready
7	RTS - Request to Send
8	CTS - Clear to Send
9	RI - Ring Indicator

Mouse and Keyboard Pinout



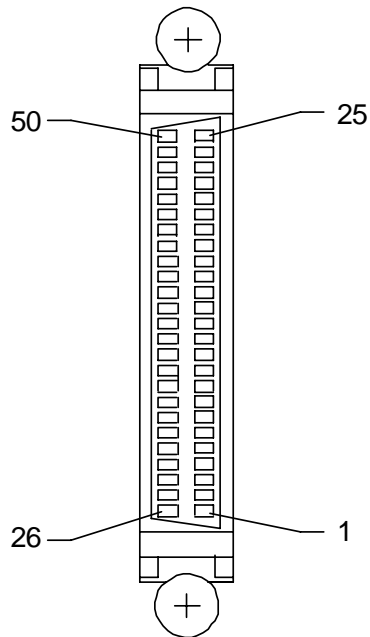
Mouse		Keyboard	
Pin	Signal	Pin	Signal
1	MDATA	1	KDATA
2	Reserved	2	Reserved
3	Ground	3	Ground
4	Fused VCC - +5V	4	Fused VCC - +5V
5	MCLK	5	KCLK
6	Reserved	6	Reserved

Video Pinout



Pin	Signal
1	R - Red
2	G - Green
3	B - Blue
4	MID2 - Monitor ID2
5, 6, 7, 8, 10	Ground
9	No Connect
11	MID0 - Monitor ID0
12	MID1 - Monitor ID1
13	HSYNC - Horizontal Sync
14	VSYSN - Vertical Sync
15	MID3 - Monitor ID3

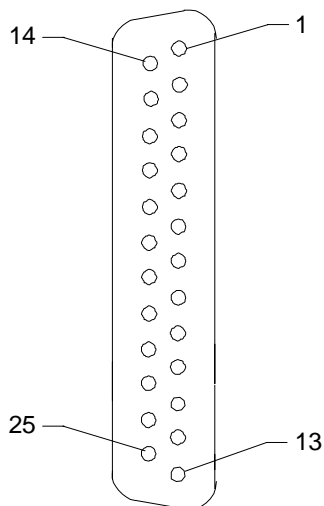
SCSI Pinout



Pin	Signal
26	Command Data-0
27	Command Data-1
28	Command Data-2
29	Command Data-3
30	Command Data-4
31	Command Data-5
32	Command Data-6
33	Command Data-7
34	Command Data Parity
38	Terminator Power
41	Attention
43	Busy
44	Acknowledge
45	Reset
46	Message
47	Select
48	Command
49	Request
50	Input/Output

Note Pins 12, 13, 14, 37, and 39 are not connected; all other pins not listed are connected to ground.

Parallel Pinout

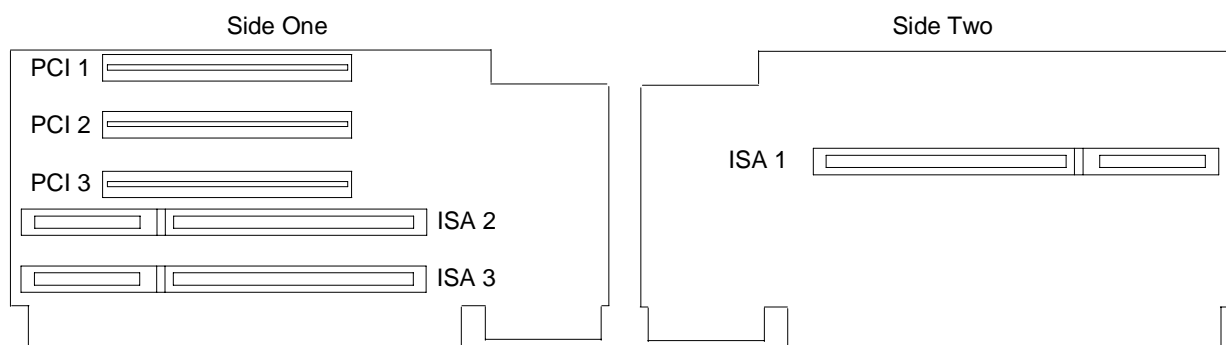


Pin	Signal	Pin	Signal
1	-Strobe	10	-ACK - Acknowledge
2	Data 0	11	Busy
3	Data 1	12	PE - Paper Empty
4	Data 2	13	+Select
5	Data 3	14	-Auto FDXT - Auto Feed
6	Data 4	15	-Error
7	Data 5	16	-Init - Start
8	Data 6	17	-SLCTIN - Select
9	Data 7	18-25	Ground

6 Riser Cards

This chapter describes the riser cards for the desktop and desktide systems.

Desktop Riser Card (MSMT345)



Expansion Slots

The riser card has three PCI slots and three ISA slots. All PCI slots are on the primary PCI bus, supported by the PCI bridge on the system board.

Graphics Card Slot Assignments

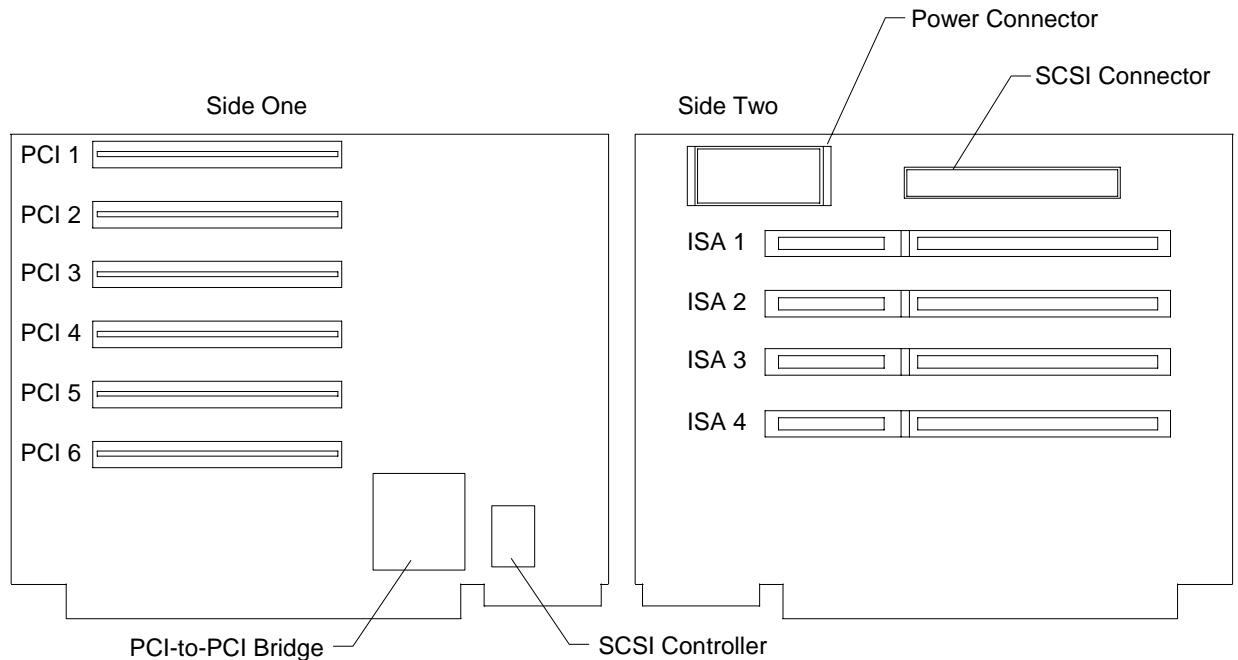
Graphics card are installed in specific PCI slots on the riser card. The following chart specifies the slots where graphics boards are located.

NOTE Systems with on-board graphics use G95 accelerator on the system board, rather than an installed PCI card.

	<u>Millennium II Dual Screen (DS)</u>	<u>Millennium II A la Carte</u>	<u>Millennium II A la Carte, DS</u>	
Slot 2			Millennium II card (first screen)	
Slot 3	Millennium II card (second screen)	Millennium II card	Millennium II card (second screen)	
	<u>Intense 3D (I3D)</u>	<u>I3D, DS</u>	<u>I3D with Geometry (G)</u>	<u>I3D-G, DS</u>
Slot 1			Geometry accelerator	Geometry accelerator
Slot 2	I3D card	I3D card	I3D card	I3D card
Slot 3		I3D card		I3D card
	<u>Z10</u>	<u>Z10, DS</u>	<u>Z10 with Texture</u>	
Slot 1		Z10 card		
Slot 2	Z10 card	Z10 card	Z10 card	
Slot 3			Texture card	

	<u>Z13</u>	<u>Z13 with Geometry</u>	<u>Z25</u>	<u>Z25 with Geometry</u>
Slot 1		Geometry accelerator		Geometry accelerator
Slot 2	Z13 card	Z13 card	Z13 card	Z13 card
Slot 3	VGA board	VGA board	VGA board	VGA board

Deskside Riser Card (MSMT280, MSMT463)



Expansion Slots

The riser card has six PCI slots and four ISA slot. PCI slots 5 and 6 are on the primary PCI bus, supported by the PCI bridge on the system board. PCI slots 1 through 4 (secondary) are supported by a PCI-to-PCI bridge (an Intergraph programmable part for MSMT463, or the DEC 21050 chip for MSMT280). Some PCI option boards must be installed in a primary PCI slot, as stated in the documentation delivered with the option board.

NOTE Full-length PCI cards cannot be installed in PCI slot 6 if the processor module is installed on system board MSMT353. The processor module is used in quad-processor systems only.

SCSI Controller and Connector

If the riser card is MSMT280, the system's internal SCSI devices use the SCSI controller on the system board (AIC-7860). The SCSI cable for external devices connects to the SCSI connector on the riser card.

If the riser card is MSMT463, the system's internal SCSI devices use the SCSI controller on the riser card (AIC-7880). The SCSI cable for internal devices connects to the SCSI connector on the riser card. External devices use the SCSI controller on the system board.

Graphics Card Slot Assignments

Graphics card are installed in specific PCI slots on the riser card. The following chart specifies the slots where graphics boards are located.

NOTE Systems with onboard graphics use the G95 accelerator on the system board, rather than an installed PCI card.

	Millennium II Dual Screen (DS)	Millennium II A la Carte	Millennium II A la Carte, DS	
Slot 3			Millennium II card (first screen)	
Slot 4	Millennium II card (second screen)	Millennium II card	Millennium II card (second screen)	
	Intense 3D (I3D)	I3D, DS	I3D with Geometry (G)	I3D-G, DS
Slot 3		I3D card		I3D card
Slot 4	I3D card	I3D card	I3D card	I3D card
Slot 5			Geometry accelerator	Geometry accelerator
	Z10	Z10, DS	Z10 with Texture (T)	Z10-T, DS
Slot 2	Z10 card	Z10 card	Z10 card	Z10 card
Slot 3		Z10 card	Texture card	Texture card
Slot 4				Z10 card
Slot 5				Texture card
	Z13	Z13, DS	Z13-G	Z13-G, DS
Slot 1		Z13 card		Z13 card
Slot 2		VGA card		VGA card
Slot 3	Z13 card	Z13 card	Z13 card	Z13 card
Slot 4	VGA card	VGA card	VGA card	VGA card
Slot 5			Geometry accelerator	Geometry accelerator
	Z25	Z25, DS	Z25-G	Z25-G, DS
Slot 1		Graphics board		Graphics board
Slot 2		VGA board		VGA board
Slot 3	Graphics board	Graphics board	Graphics board	Graphics board
Slot 4	VGA board	VGA board	VGA board	VGA board
Slot 5			Geometry board	Geometry board

NOTE In a TDZ-610, the RAID controller board is installed in PCI Slot 2 if the system also contains the Z25-G board set.

7 Power Supplies, Power Distribution Board, and Fans

This chapter provides information for the desktide and desktop power supplies and fans. The power distribution board information is also included here for systems using the internal RAID section.

Desktide Power Supply (MPWS131)

The TDZ-410, TDZ-610, InterServe 605, and InterServe 605UW systems use the MPWS131 power supply, which has a maximum output of 539 watts.

NOTE If the system has internal RAID section, a power distribution board is also installed. Refer to “Power Distribution Board (MPCBD13)” later in this section for more information.

The power supply is switchable (autoranging) between 90-132 VAC or 180-264 VAC, depending on the location. The input frequency is 47-63 Hz, single phase. At full load, nominal AC line, nominal power factor of 0.6, and temperature of 25°C, the power supply has a minimum efficiency of 65 percent.

DC Output Specifications

The following table details the power supply DC output specifications.

	Outputs					Unit
	#1	#2	#3	#4	#5	
Nominal Output Voltages ^{1,5}	+3.3	+5.1	+12.0	-12.0	-5.0	V _{DC}
Continuous Load (Maximum) ¹	48 ^{3,4}	76 ^{3,4}	12 ⁴	0.5	0.5	A _{DC}
Continuous Load (Minimum) ¹	0	6	0	0	0	A _{DC}
Noise and Ripple (PARD) (DC to 30 MHz) ²	50	50	100	250	100	mV _{pp}
Initial Setting Tolerance (Maximum) ^{2,5}	±3%	±3%	±5%	±10%	±10%	
Regulation Line/Load (Maximum) ^{2,5}	±3%	±3%	±5%	±10%	±10%	
Overshoot - Turn on/off (Maximum)	5%	5%	10%	10%	10%	

Notes:

1. The 539 W power supply meets or exceeds the specifications in the above table. For the noted specifications, the Maximum values describe the smallest acceptable maximum load, and the Minimum values describe the largest acceptable minimum load.
2. These outputs are measured at the connector of a loaded cable.
3. The +3.3 V and +5.1 V outputs do not draw more than 400 watts combined.

4. Any combination of +3.3 V, +5.1 V, and +12 V do not exceed their maximum or 539 watts of total power.
5. The sum of Initial Setting Tolerance and Line/Load Regulation does not exceed 3% for the +3.3 V output, 3% for the +5.1 V output, 5% for the +12.0 V output, and 10% for the negative output voltages.

Cable Connectors

The following table shows the cable connectors from the power supply that connect to the riser card and to the devices in the system.

The following table shows the cable connectors from the power supply that connect to the riser card and to the devices in the system.

<u>Connector</u>	<u>Device</u>	<u>Connector</u>	<u>Device</u>
P1	Riser Card	P6	Auxiliary Drive (or RAID section)
P2	CD-ROM Drive	P7	Auxiliary Drive
P3	Auxiliary Drive	P8	Auxiliary Drive
P4	Auxiliary Drive (or RAID section)	P9	Combo Drive
P5	Auxiliary Drive		

P1 Pinout

<u>Pin</u>	<u>Signal</u>	<u>Wire Color</u>	<u>Pin</u>	<u>Signal</u>	<u>Wire Color</u>
1	+3.3V	Orange	13	+5V	Red
2	+3.3V	Orange	14	Ground	Black
3	+3.3V	Orange	15	Ground	Black
4	Ground	Black	16	+5V	Red
5	Ground	Black	17	Ground	Black
6	Ground	Black	18	-12V	Blue
7	+3.3V	Orange	19	+5V	Red
8	+3.3V	Orange	20	-5V	Red
9	+5V	Red	21	Ground	Black
10	Ground	Black	22	+12V	Yellow
11	+5V	Red	23	Ground	Black
12	Ground	Black	24	Power Good	Green

P2 - P8 Pinout

<u>Pin</u>	<u>Signal</u>	<u>Wire Color</u>
1	+12V	Yellow
2	Return	Black
3	Return	Black
4	+5V	Red

P9 Pinout

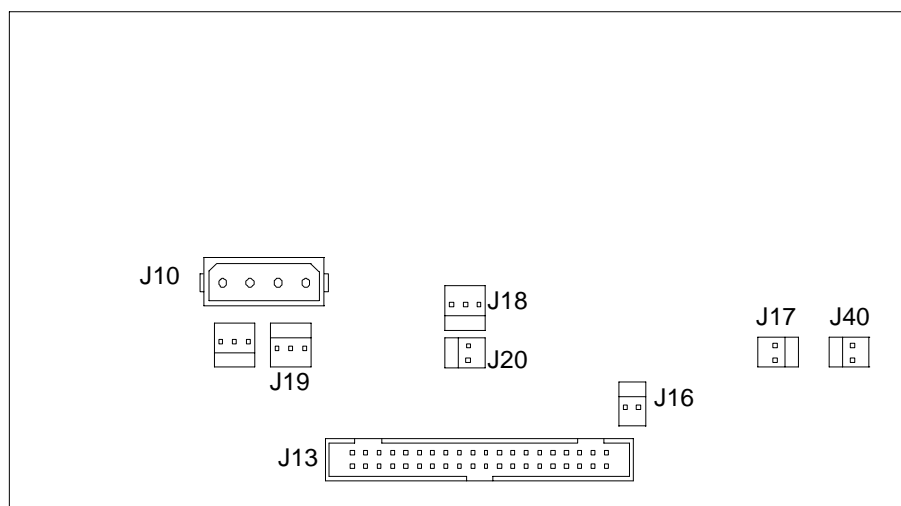
Pin	Signal	Wire Color
1	+5V	Red
2	Return	Black
3	Return	Black
4	+12V	Yellow

Power Distribution Board (MPCBD13)

The power distribution board is only used in systems with the internal RAID section. These systems include the internal RAID section, and require special power signal routing.

Cable Connectors

The following figure shows the MPCBD13 cable connectors.



J10, Power

Pin	Signal	Wire Color
1	+12V	Yellow
2	Return	Black
3	Return	Black
4	+5V	Red

J13, RAID Sensor

Pin	Signal	Pin	Signal	Pin	Signal
1,2,3,4	+5.1V	22	Not used	34	Drive 3 Status
6	Dskbad	24	Not used	36	Drive 4 Status
8	Dskgood	26	Alarm Reset	38	Drive 5 Status
10	Alarm	30	Drive 1 Status	40	Drive 6 Status

<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>
12,14,28	No Connect	32	Drive 2 Status	Remaining	Ground
16	Pwrbad				

J16, Power On LED

<u>Pin</u>	<u>Signal</u>	<u>Wire Color</u>
1	Pwrgood	Black
2	Ground	Black

J17, Alarm Silence Button

<u>Pin</u>	<u>Signal</u>	<u>Wire Color</u>
1	Alarm reset	Red
2	Ground	Black

J18, Drive Installed

<u>Pin</u>	<u>Signal</u>	<u>Wire Color</u>
J18 - 1	Drive 1	Brown
J18 - 2	Drive 2	Black
J18 - 3	Drive 3	Red

J19, Drive Installed

<u>Pin</u>	<u>Signal</u>	<u>Wire Color</u>
J19 - 1	Drive 4	Brown
J19 - 2	Drive 5	Black
J19 - 3	Drive 6	Red

J20, Auxiliary LED

<u>Pin</u>	<u>Signal</u>	<u>Wire Color</u>
1	Remote On/Off In	Black
2	Remote On/Off Out	Black
3	LED Ground	Orange

J40, Channel Mode LED

<u>Pin</u>	<u>Signal</u>	<u>Wire Color</u>
1	Disk bad	Black
2	Ground	Black
3	Disk good	Orange

Deskside Fans

Option Board Fans (MCBLZ520 and MCBLY690)

The option board are cooled by one 119 mm (MCBLZ520) and two 80 mm (MCBLY690) fans. All deskside systems use these fans.

RAID Fan (CFAN111)

Only the systems with internal RAID uses the 92 mm RAID fan (CFAN1110), located between the power supply and the RAID disk drives.

System Disk Fan (MCBL172A)

Only non-RAID deskside systems use the 80 mm fan (MCBL172A) mounted to the power supply access panel.

Desktop Power Supplies

The desktop systems use a 300 Watt or 200 Watt power supply, as follows:

- ◆ 300 Watt power supply (MPWS141 or MPWS148) - TDZ-410
- ◆ 200 Watt power supply (MPWS140) - TD-310 and InterServe 305

The power supply is switchable (manual) between 90-132 VAC or 180-264 VAC, depending on the location. The input frequency is 47-63 Hz, single phase. At full load, nominal AC line, nominal power factor of 0.6, and temperature of 25°C, the power supply has a minimum efficiency of 65 percent.

300 W DC Output Specifications

	Outputs					Unit
	#1	#2	#3	#4	#5	
Nominal Output Voltages ^{1,5}	+3.3	+5.0	+12.0	-12.0	-5.0	V _{DC}
Continuous Load (Maximum) ¹	20 ^{3,4}	45 ^{3,4}	5 ^{4,5}	0.5	0.5	A _{DC}
Continuous Load (Minimum) ¹	0	2	0	0	0	A _{DC}
Noise and Ripple (PARD) (DC to 30 MHz) ²	50	50	100	250	100	mV _{pp}
Initial Setting Tolerance (Maximum) ⁶	±3%	±3%	±5%	±10%	±10%	
Regulation Line/Load (Maximum) ^{2,6}	±3%	±3%	±5%	±10%	±10%	
Overshoot, Turn on/off (Maximum)	5%	5%	10%	10%	10%	

Notes:

1. The 300 W power supply meets or exceeds the specifications in the above table. For the noted specifications, the Maximum values describe the smallest acceptable maximum load, and the Minimum values describe the largest acceptable minimum load.
2. These outputs are measured at the connector of a loaded cable.
3. The +3.3 V and +5.0 V outputs do not draw more than 240 watts combined.
4. Any combination of +3.3 V, +5.0 V, and +12 V do not exceed their maximum or 300 watts of total power.
5. The +12 V output is able to supply a peak current of 7 amps for 30 seconds.
6. The sum of Initial Setting Tolerance and Line/Load Regulation does not exceed 3% for the +3.3 V output, 3% for the +5.0 V output, 5% for the +12.0 V output, and 10% for the negative output voltages.
7. Current always flows from the +12 V (or -12 V) output to the fans.
8. No output exceeds 240 VA under any condition.

200 W DC Output Specifications

	Outputs					Unit
	#1	#2	#3	#4	#5	
Nominal Output Voltages ^{1,5}	+3.3	+5.0	+12.0	-12.0	-5.0	VDC
Continuous Load (Maximum) ¹	19 ^{3,4}	34 ^{3,4}	5 ^{4,5}	0.5	0.5	ADC
Continuous Load (Minimum) ¹	0	2	1	0	0	ADC
Noise and Ripple (PARD) (DC to 30 MHz) ²	50	50	100	250	100	mV _{pp} Max
Initial Setting Tolerance ⁶	±3%	±5%	±5%	±10%	±10%	Max
Regulation Line/Load ^{2,6}	±3%	±5%	±5%	±10%	±10%	Max
Overshoot (Turn on/off)	5%	5%	10%	10%	10%	Max

Notes:

1. The 200 W power supply power supply should meet or exceed these specifications. For the noted specifications, the Maximum values describe the smallest acceptable maximum load and the Minimum values describe the largest acceptable minimum load.
2. These outputs are measured at the connector of a loaded cable
3. The +3.3 V and +5.0 V outputs will never draw over 170 watts together.
4. Any combination of +3.3 V, +5.0 V, and +12 V cannot exceed their maximum or 200 watts of total power.
5. The +12 V output must be able to supply a peak current of 6 amps for 30 seconds.
6. The sum of Initial Setting Tolerance and Line/Load Regulation will not exceed 3% for the +3.3 V output, 5% for the +5.0 V output, 5% for the +12.0 V output, and 10% for the negative output voltages.
7. For +5 V output loads less than 4 amps, the +12 V maximum load shall be limited to 3.5 amps.
8. When the + 12 V output is at minimum load, the +5 V load will not exceed 50% of full load.

9. Current will always be flowing from the +12 V output to the fans.
10. No output may exceed 240 VA under any condition.

Cable Connectors

The following table shows the cable connectors from the power supply the system board and to other devices in the system. The connectors and pinouts are the same for the 200 Watt and 300 Watt power supplies.

<u>Connector</u>	<u>Device</u>	<u>Connector</u>	<u>Device</u>
P1	System Board	P6	Hard Disk Drive
P2	System Board	P7	CD-ROM Drive
P3	System Board	P8	Hard Disk Drive
P4	System Board	P9	Floppy Drive or Combo Drive
P5	System Board		

P1 Pinout

<u>Pin</u>	<u>Signal</u>	<u>Wire Color</u>
1	Power Good	Green
2	+5V	Red
3	+12V	Yellow
4	-12V (Key)	Blue
5	Ground	Black
6	Ground	Black

P2 Pinout

<u>Pin</u>	<u>Signal</u>	<u>Wire Color</u>
1	Return (Key)	Black
2	Return	Black
3	-5V	White
4	+5V	Red
5	+5V	Red
6	+5V	Red

P3 Pinout

<u>Pin</u>	<u>Signal</u>	<u>Color</u>
1	+5V	Red
2	+5V (Key)	Red
3	+5V	Red
4	Return	Black
5	Return	Black
6	Return	Black

P4 Pinout

<u>Pin</u>	<u>Signal</u>	<u>Color</u>
1	Return	Black
2	Return	Black
3	Return	Black
4	+5V	Red
5	+5V	Red
6	+5V (Key)	Red

P5 Pinout

<u>Pin</u>	<u>Signal</u>	<u>Color</u>
1	+3.3V	Orange
2	+3.3V	Orange
3	+3.3V	Orange
4	+3.3V	Orange
5	Return (Key)	Black
6	Return	Black

P6, P7, P8 Pinout

<u>Pin</u>	<u>Signal</u>	<u>Color</u>
1	+12V	Yellow
2	Return	Black
3	Return	Black
4	+5V	Red

P9 Pinout

<u>Pin</u>	<u>Signal</u>	<u>Color</u>
1	+5V	Red
2	Return	Black
3	Return	Black
4	+12V	Yellow

Desktop Fans

The desktop systems use a fan mounted onto the power supply to provide internal cooling. No other fans are used.

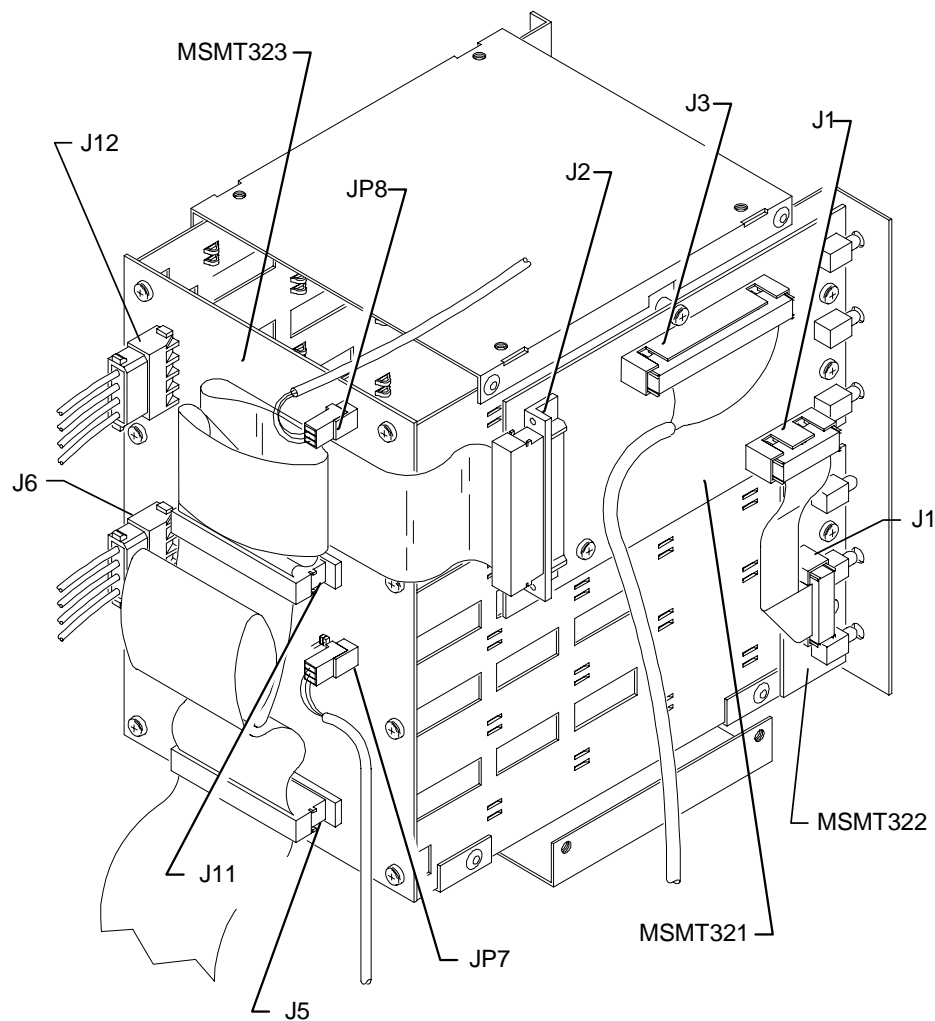
8 Peripherals

This chapter describes the peripherals used in the desktop and desktside systems, including:

- ◆ RAID section
- ◆ CD-ROM drive
- ◆ Disk drives (1 GB, 2 GB, 4 GB)
- ◆ Floppy disk drive
- ◆ Combo drive

RAID Section

The following figure shows the RAID Section (MESAN15) assembly, used in TDZ-610 and some InterServe 605 systems.



J5 and J11, MCBL054A, RAID SCSI

<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>
1-16	Ground	43	SCSI Data Bit 3	56	Fault Data
17	Term Power	44	SCSI Data Bit 4	57	Busy
18	Term Power	45	SCSI Data Bit 5	58	Acknowledge
19	No Connect	46	SCSI Data Bit 6	59	Reset
20-34	Ground	47	SCSI Data Bit 7	60	Message
35	SCSI Data Bit 12	48	SCSI Data Parity 0	61	Select
36	SCSI Data Bit 13	49	SWAP (Ground)	62	Carrier Detect
37	SCSI Data Bit 14	50	Shell OK (Ground)	63	Request
38	SCSI Data Bit 15	51	Term Power	64	I/O
39	SCSI Data Parity 1	52	Term Power	65	SCSI Data Bit 8
40	SCSI Data Bit 0	53	No Connect	66	SCSI Data Bit 9
41	SCSI Data Bit 1	54	Fault Clock (Ground)	67	SCSI Data Bit 10
42	SCSI Data Bit 2	55	Attention	68	SCSI Data Bit 11

J1, MCBL061A, LED Signals

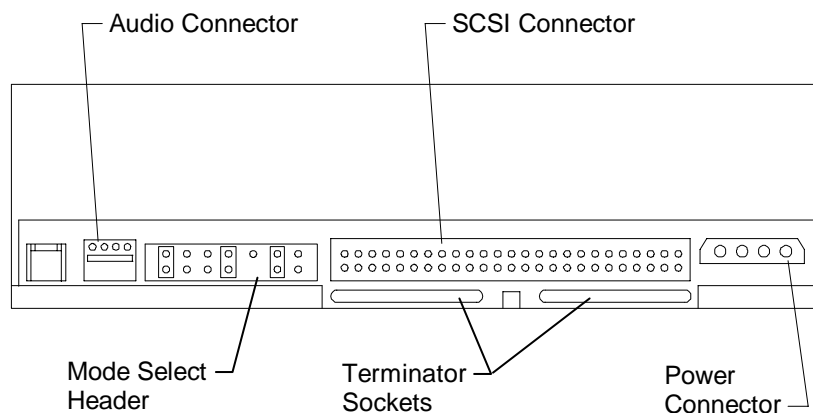
<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>
1	Ground	6	Slot 2 Amber	11	Ground
2	Slot 3 Amber	7	Ground	12	Slot 1 Green
3	Ground	8	Slot 2 Green	13	VCC
4	Slot 3 Green	9	Ground	14	VCC
5	Ground	10	Slot 1 Amber		

J3, MCBL055A, RAID Sensor

<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>
1,2,3,4	+5.1V	22	Not used	34	Drive 3 Status
6	Dskbad	24	Not used	36	Drive 4 Status
8	Dskgood	26	Alarm Reset	38	Drive 5 Status
10	Alarm	30	Drive 1 Status	40	Drive 6 Status
12,14,28	No Connect	32	Drive 2 Status	Remaining	Ground
16	Pwrbad				

CD-ROM Drive

The following figure shows the back of the CD-ROM drive.



Settings for mode select header, which sets SCSI ID, parity, and other drive functionality are printed on the CD-ROM drive.

Terminator resistors are installed in the terminator sockets only when active termination is required. By default, these sockets are empty since termination is provided by the SCSI cable.

Disk Drives

The following disk drives are used in non RAID systems. For information about the RAID drives used in systems with the internal RAID section, refer to the InterRAID documentation.

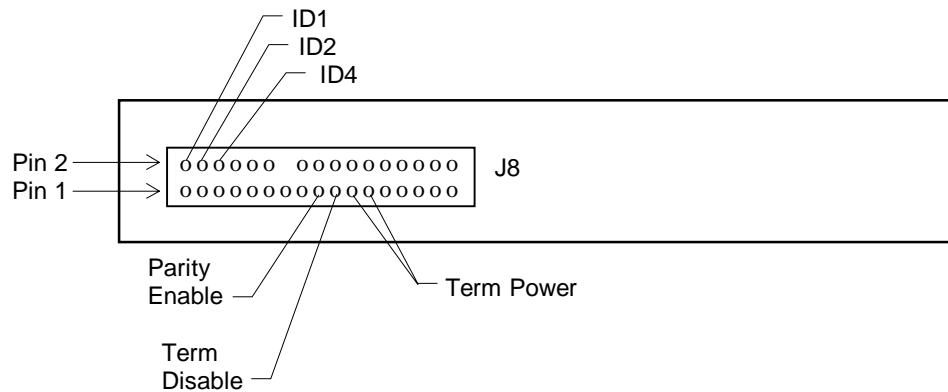
Part Number	Vendor Number	Capacity
CDSK111	Seagate ST51080N	1 GB
CDSK094	Seagate ST32155N	2 GB
CDSK098	Conner CFP4207S	4 GB
CDSK123	Seagate ST34371N	4 GB

SCSI ID selection is defined in the following table. Each disk drive has a connector which uses jumpers to set the SCSI ID. Where Seagate uses ID1, ID2, and ID4 to identify how to set the SCSI ID, Conner uses 0E1, 0E2, and 0E3.

SCSI ID	ID1/0E1	ID2/0E2	ID4/0E3
0	Off	Off	Off
1	On	Off	Off
2	Off	On	Off
3	On	On	Off
4	Off	Off	On
5	On	Off	On
6	Off	On	On

CDSK111 1 GB

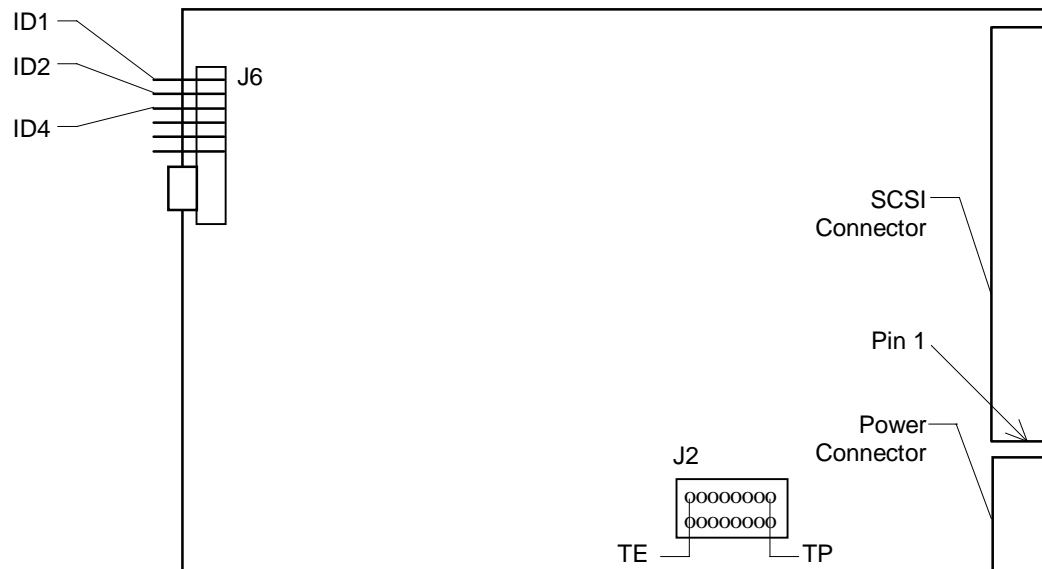
The following figure shows the jumper connector J8 on the back of the disk drive.



SCSI ID selection uses the ID1, ID2, and ID4 jumpers on connector J8. To disable SCSI termination, install the Term Disable jumper and remove both Term Power jumpers from connector J8. To enable SCSI termination, remove the Term Disable jumper and install both Term Power jumpers onto J8.

CDSK094 2 GB

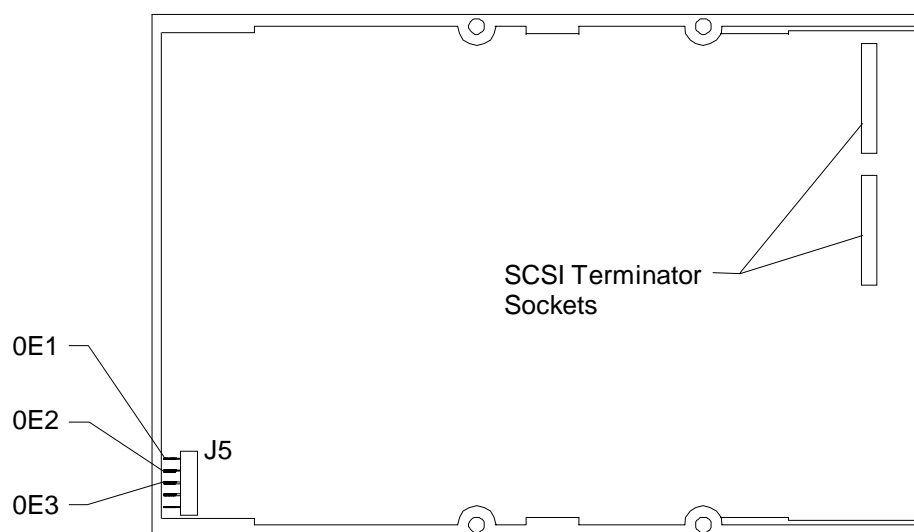
The following figure shows the jumper connectors J6 and J2 on the disk drive.



SCSI ID selection uses the ID1, ID2, and ID4 jumpers on connector J6. To disable SCSI termination, remove the TE jumper from connector J2.

CDSK098 4 GB

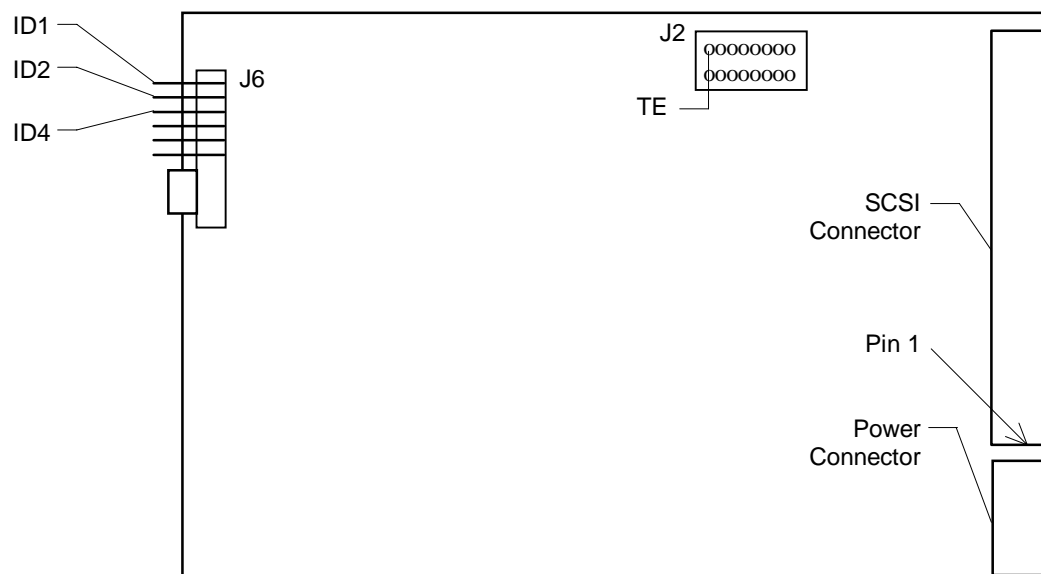
The following figure shows the jumper connector J5 and SCSI terminator sockets on the disk drive.



Connectors 0E1 through 0E3 are also available on a jumper block near the SCSI terminator sockets; do not install jumpers on these connectors. To enable SCSI termination, install the proper resistors into both terminator sockets. To disable SCSI termination, remove both resistors from the sockets.

CDSK123 4 GB

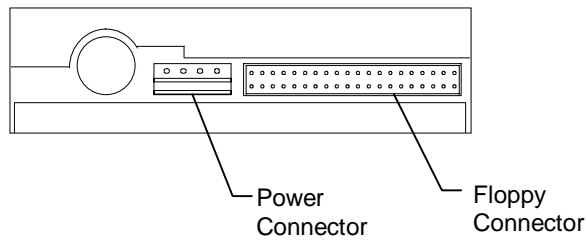
The following figure shows the jumper connectors J6 and J2 on the disk drive.



SCSI ID selection uses the ID1, ID2, and ID4 jumpers on connector J6. To disable SCSI termination, remove the TE jumper from connector J2.

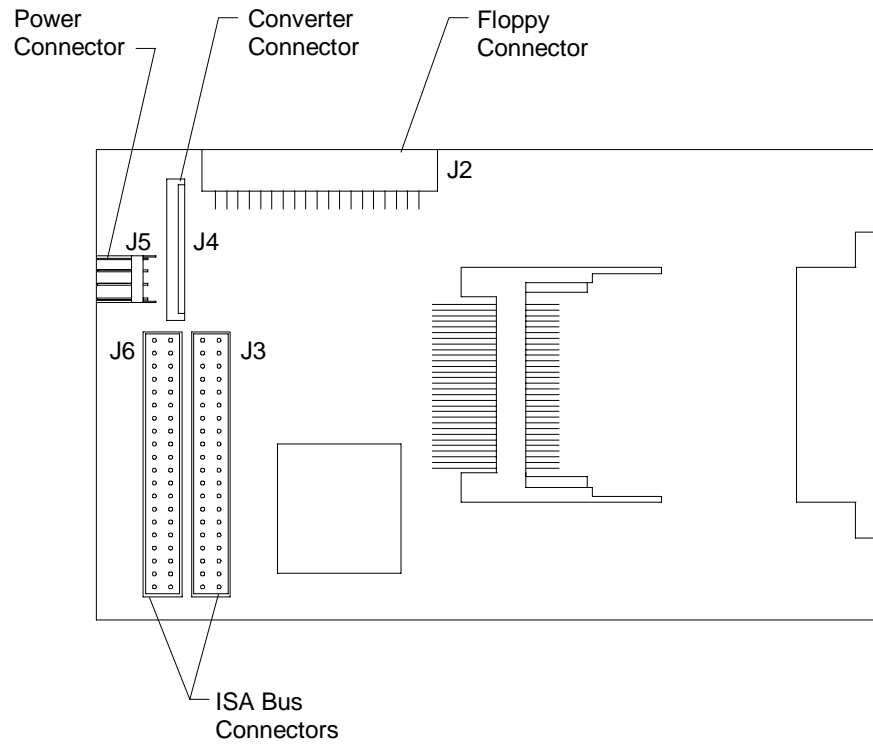
Floppy Disk Drive

The following figure shows the cable connectors on the back of the floppy disk drive.



Combo Drive

The following figure shows the cable connectors on the combo drive.



Note the following items on the combo drive.

- ◆ The ISA bus connector J3 uses cable MCBL084A and connects to J32 on the system board.
- ◆ The ISA bus connector J6 uses cable MCBL084A and connects to J33 on the system board.
- ◆ The converter connector J4 uses cable MCBLZ230 to J2 on the combo drive. The following table shows the pinout of MCBLZ230.

<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>
1	VCC	10	MTR1-	19	Ground
2	INDEX-	11	No connect	20	TRK0-
3	VCC	12	DIR	21	Ground
4	DRV1-	13	No connect	22	WRPRT-
5	VCC	14	STEP-	23	Ground
6	DSKCHG	15	Ground	24	RDATA-
7	No connect	16	WDATA-	25	Ground
8	No connect	17	Ground	26	HDSEL
9	RPM	18	WGATE-		

A Additional System Information

This appendix provides information for cleaning the system, specifications, and model numbers.

Cleaning the System

Follow these guidelines for cleaning the system. Power off the system before cleaning the system. Do not clean parts inside the CD-ROM drive.

- ◆ Exterior Surfaces -- Use a mild cleaning detergent and a clean cloth to clean the monitor screen and the exterior surfaces of the base unit.
- ◆ Mouse -- On the bottom of the mouse, a retaining ring holds the tracking ball in place. To clean the mouse, remove the retaining ring and turn the mouse over; the tracking ball will fall out. Blow gently into the opening. Clean the tracking ball and rollers with a cotton swab and alcohol. Replace the tracking ball and the retaining ring.
- ◆ Keyboard -- Dust the keyboard with a dry cloth. Aerosol cleaners are commercially available to remove the dust between the keys. Keep the keyboard and the surface beneath the keys dry.

Specifications

System BIOS	Quad processor system: AMI BIOS core 782 Single- and dual-processor systems: AMI BIOS core 752
Processor(s)	Intel Pentium Pro
Host Bridge	Intel P6 Bus-to-PCI Bridge chip (OPB) and memory controller (OMC). PCI bus compliant to PCI Bus Specification revision 2.0
Graphics Accelerator	G95, Z10, Z13, Z25, Intense 3D, Matrox Millennium II
Sound Controller	Creative Labs Vibra 16C, MPC 2.0 compliant
Ethernet Controller	Intel 82557 10/100BaseTX PCI LAN
SCSI Controller	Desktop: Adaptec AIC-7850 (internal and external) Deskside (except InterServe 605UW): AIC-7860 internal, AIC-7850 external Interserve 605UW: AIC-7880 internal, AIC-7860 external)
Peripheral Controller	Standard Microsystems FDC37C932
PCI-to-ISA Bridge	Intel 82379AB
Mouse	Three button, 400 DPI
Keyboard	104 key, multimedia
Base Unit Dimensions (W x D x H)	Desktop: 18.75 in. x 18.25 in. x 5 in. (476 mm x 463 mm x 127 mm) Deskside: 7.87 in. x 25.78 in. x 19.88 in (200 mm x 655 mm x 505 mm)
Expansion Slots	Desktop: Two full-length PCI, one full-length PCI/ISA, one full-length ISA, one half-length ISA Deskside: Six full-length PCI (five with quad processors), four full-length ISA

Index

8

82379AB (PCI to ISA bridge), 52

A

Addresses

- parallel port, 50
- serial port, 50

AIC-7860 (SCSI controller), 50

Audio

- pinout, 56

B

Base unit dimensions, 83

Bi-Dir mode

- parallel port, 50

BIOS components, 53

BIOS jumper, 53

Byte mode

- parallel port, 50

C

Cable length requirements

- SCSI devices, 38

CD-ROM drive

- description, 77
- replacing, 19
- replacing, 10

Cleaning

- exterior surfaces, 83
- keyboard, 83
- mouse, 83

Closing the base unit

- deskside, 8
- desktop, 3

CMOS/Clock battery, 49

- replacing, 16, 31

Combo drive

- description, 80
- replacing, 9, 21

Combo drive (MESAM86)

- converter cable (MCBLZ230)
pinout, 81

Compatibility mode

- parallel port, 50

Configuring

- ISA boards, 43

Connecting the device

- SCSI devices, 39

Connector pinouts, 55

CPU frequency

- jumper connectors, 51

D

Desktop system

- servicing, 9

Disabling SCSI sync negotiation

- SCSI devices, 40

Disk drives

- descriptions, 77
- replacing, 19

DMA channels, 57

Document conventions, ix

Document organization, ix

Documentation, xi

E

ECP mode

- parallel port, 50

Electrostatic discharge

- avoiding, 2, 7

EPP mode

- parallel port, 50

Ergonomics, x

Ethernet controller, 83

Ethernet port, 60

Expansion slots, 83

Exterior surfaces

- cleaning, 83

External ports, 60

External SCSI devices

- adding, 38

F

Fans

- deskside, 71
- desktop, 74
- option board
replacing, 30
- system hard disk drive
replacing, 29

FDC37C932 (I/O controller), 50

Flash EEPROM

- description, 53

Floppy
 pinout, 56
 Floppy controller
 (function of FDC37C932), 50
 Floppy disk drive
 description, 80
 replacing, 9, 21

G

G95 accelerator, 49
 Graphics accelerator, 83
 Graphics accelerator (MGA 2064W),
 49
 Graphics card slot assignments, 63, 65
 Graphics chipset, 49

H

Host bridge, 83

I

I/O controller (FDC37C932), 50
 Information
 operating system, x
 system hardware, x
 Input/Output addresses, 57
 Intergraph
 BBS, xii
 FAXLink, xii
 on the Internet, xi
 Internal SCSI devices
 adding, 37
 Internal SCSI drives
 replacing, 19
 Interrupt lines, 59
 Interrupt mapping, 58
 Interrupts
 parallel port, 50
 serial port, 50
 ISA boards
 with a configuration file, 43
 without a configuration file, 44
 ISA bus, 59
 ISA bus IRQ assignments, 59
 ISA bus J32
 pinout, 56
 ISA bus J33
 pinout, 57
 ISA option boards, 42

K

Keyboard, 83
 cleaning, 83

Keyboard controller
 (function of FDC37C932), 50
 Keyboard port, 61

L

Lithium battery, 49

M

Memory
 adding, 35
 Memory address map, 58
 Memory components, 52
 Memory controllers, 53
 Memory sockets, 52
 MGA 2064W (graphics accelerator), 49
 MIDI port, 60
 Model number, 84
 Mouse, 83
 cleaning, 83
 Mouse controller
 (function of FDC37C932), 50
 Mouse port, 61

N

Normal mode
 parallel port, 50

O

Opening the base unit
 deskside, 4
 desktop, 1
 Option board fans
 replacing, 30
 Option board fans (MCBLZ520 and
 MCBL Y690), 71
 Option boards
 adding, 40

P

P6 bus termination card
 replacing, 26
 Palette DAC, 49
 Parallel port, 62
 function of FDC37C932, 50
 PCI
 access panel, 6
 bus
 configuration space, 59
 PCI option boards, 41
 PCI to ISA bridge (82379AB), 52
 PCI to ISA bus interrupt mapping, 58
 PCI-to-ISA bridge, 83

- Peripheral Component Interconnect (PCI)
 - bridge, 52
 - Peripheral controller, 83
 - Peripherals, 75
 - Pinouts
 - audio, 56
 - deskside power supply, 68
 - desktop power supply, 73
 - Ethernet, 60
 - floppy, 56
 - ISA bus J32, 56
 - ISA bus J33, 57
 - keyboard, 61
 - MIDI, 60
 - mouse, 61
 - parallel, 62
 - power distribution board, 69
 - SCSI, 62
 - serial (COM), 61
 - video, 61
 - PIRQ, 58
 - Power distribution board
 - replacing, 33
 - Power Distribution Board (MPCBD13), 69
 - cable connectors, 69
 - Power supply, 84
 - replacing, 17, 32
 - Power supply (MPWS131)
 - cable connectors, 68
 - DC output, 67
 - P1 pinout, 68
 - P2-P8 pinout, 68
 - P9 pinout, 69
 - Power supply (MPWS131), 67
 - Power supply (MPWS140), 71
 - cable connectors, 73
 - DC output, 72
 - P1 pinout, 73
 - P2 pinout, 73
 - P3 pinout, 73
 - P4 pinout, 74
 - P5 pinout, 74
 - P6, P7, P8 pinout, 74
 - P9 pinout, 74
 - Power supply (MPWS141/MPWS148), 71
 - cable connectors, 73
 - DC output, 71
 - P1 pinout, 73
 - P2 pinout, 73
 - P3 pinout, 73
 - P4 pinout, 74
 - P5 pinout, 74
 - P6, P7, P8 pinout, 74
 - P9 pinout, 74
 - Primary PCI slots
 - option boards, 41
 - Processor components, 51
 - Processor jumpers, 51
 - Processor module
 - replacing, 26
 - Processor(s), 51, 83
- R**
- RAID fan (CFAN1110), 71
 - RAID section
 - replacing, 22
 - RAID section (MESAN15), 75
 - Real-Time Clock (RTC)
 - (function of FDC37C932), 50
 - Riser card, 40
 - replacing, 13, 24
 - Riser card (MSMT345)
 - expansion slots, 63
 - Riser card (MSMT345), 63
 - Riser card (MSMT463), 64
 - expansion slots, 64
 - graphics card slot assignments, 65
 - SCSI controller, 64
- S**
- SCSI
 - cable lengths, 39
 - CD-ROM drive termination, 77
 - controller (AIC-7860), 50
 - disabling sync negotiation, 40
 - disk drive termination, 78, 79
 - ultra, 37
 - SCSI controller, 83
 - SCSI port, 62
 - SCSI termination card
 - replacing, 12
 - SCSI-1, 38
 - Serial (COM) port, 61
 - Serial port
 - (function of FDC37C932), 50
 - SIMMs
 - 128 MB, 35
 - installation rules, 35
 - precautions, 35
 - Slots
 - primary PCI, 41, 64
 - Small Computer System Interface (SCSI)
 - adding internal devices, 37
 - Sound controller, 83
 - features, 54

- Specifications, 83
 - SPP mode
 - parallel port, 50
 - System
 - accessing, 1
 - BIOS, 83
 - ergonomics, x
 - maintenance
 - tools required, 1
 - model number, 84
 - upgrades, 35
 - System board, 47
 - address configuration, 57
 - cable connectors, 55
 - components and chipsets, 48
 - external ports, 60
 - replacing, 14, 27
 - System Configuration Utility (SCU), 42
 - using, 43
 - System disk fan (MCBL172A), 71
 - System hard disk drive
 - replacing, 11, 23
 - System hard disk drive fan
 - replacing, 29
- T**
- Tape drive
 - replacing, 19
 - Telephone support, xi
 - Training, xi
- U**
- Ultra SCSI, 37
- V**
- VGA mode jumper, 49
 - Video
 - memory (WRAM), 49
 - Video port, 61
- W**
- Window RAM, 49