TDZ 2000

System Reference

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INTERGRAPH
COMPUTER SYSTEMS

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Intergraph Computer Systems, Huntsville AL 35894-0001

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Warnings

The service and upgrade instructions should be performed by qualified personnel only. Qualified personel do not have to be Intergraph service personnel. Those who are familiar with servicing computers can follow instructions in a manual to service equipment, and do so without harm to themselves or damage to 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 within the power supply. In the event of failure, the power supply must be replaced by qualified service personnel. Use Intergraph power supplies only.

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.

Notes

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

This device is designed and manufactured to comply with approved safety standards for information processing and business equipment.

Contents

Introduction

This *System Reference* provides information necessary to service and upgrade a TDZ 2000. For reference information on the TowerMate expansion base, see the *TowerMate Expansion Base Installation and Use* guide, included with the TowerMate.

Document Conventions

Bold	Commands, words, or characters that you key in literally.
Italic	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* document is shipped with each system, and provides detailed information about the following:

- Setting up the system hardware.
- Configuring the operating system and associated system software.
- Using the system.
- Using the AMIBIOS Setup program.
- Reinstalling system software.

An online *System Introduction* is delivered with the system, and provides information about the following:

- Intergraph Computer Systems support.
- System hardware features.
- Basic system controls.
- Available hardware options.

1 Accessing the System

This chapter lists hand tools and describes servicing restrictions, methods for avoiding electrostatic discharge, and how to remove and attach cover panels.

This system features a new, extensible chassis architecture designed for ease of upgrades and expansion. The design provides easy access to PCI and ISA card slots, memory, processors, and power supply.

Tools

You will need the following tools to service the system:

- Antistatic wrist strap
- Antistatic mat connected to an earth ground
- Quarter-inch nutdriver
- No. 1 and No. 2 Phillips screwdrivers
- Small or medium flat-blade standard screwdriver

NOTE You do not need any tools to open the TDZ 2000 case.

NOTE "Right side" and "left side" are as seen from the front of the unit.

CAUTION Follow all warnings and cautions in the servicing instructions. If you fail to follow documented, approved procedures, personal injury and damage to equipment can result.

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

Protecting Against Electrostatic Discharge

Electrostatic discharge (ESD) can damage sensitive components inside the unit. Take the following precautions when working with internal components:

- Unplug the unit from AC power before servicing any electronic component inside the chassis. Remember that the TDZ 2000 is always on when connected to AC power.
- Touch the bare metal of the chassis to ensure the chassis and your body are at the same electric potential.
- Attach the antistatic wrist strap to its connector on the antistatic mat. Ensure that the metal conductor bead in the elastic sleeve of the antistatic strap contacts bare skin.
- 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.

Opening and Closing the Case

Opening the system for service or upgrades consists of two simple steps. Remove the top cover first, then remove the left side panel. No tools are needed. You need only remove the

top cover and left side panel for most routine service procedures. See Chapter 2, "Servicing the System," for additional details on removing and replacing case components.

CAUTION Do not use the bottom portion of the face panel or the lip at the top, rear of the unit as a hand hold when moving the system. Equipment damage and personal injury can result.

The left side panel has a tab that closes an interlock switch inside the power supply. When you take off the left side panel, the safety interlock removes AC power to the system.

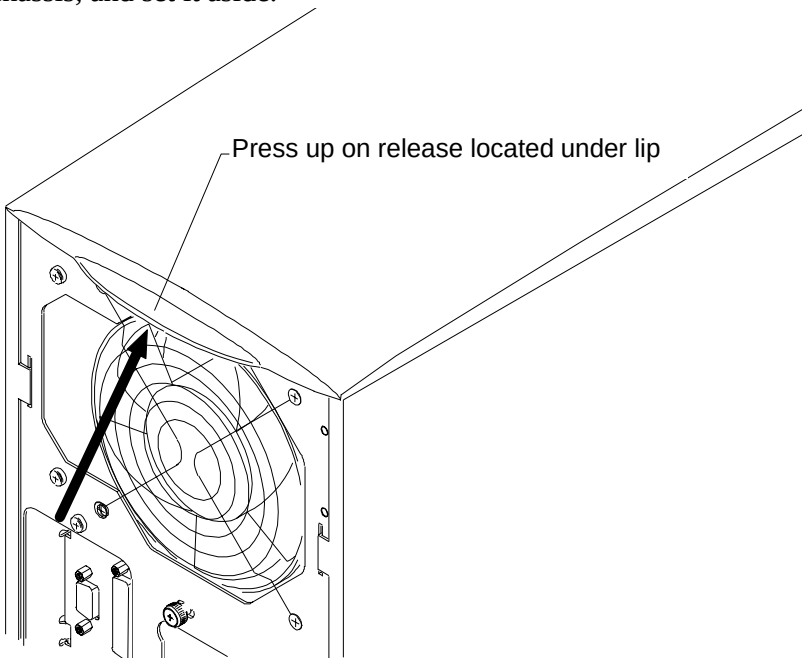
WARNING **Do not attempt to defeat the safety interlock and run the system with the left side panel removed. Personal injury and equipment damage can result.**

CAUTION Before you open the case, shut down the system and turn off power to the system and external devices (including peripheral drives and display). Use caution to avoid injury when lifting the computer or removing covers and other hardware.

NOTE Removing the right side panel is necessary only for servicing internal bay disk drives, the plastic cowling on the right panel, or the face panel.

To open the case:

1. Ensure the system is shut down and that you have disconnected the system and any attached external devices from AC power.
2. Grasp the lip on the top cover at the rear of the system and press up on the release. See the following figure.
3. Keep pressing the release, slide the top cover back until it stops, remove it from the chassis, and set it aside.



4. Grasp the cowling at the bottom of the left side panel and lift.
5. Slide the left side panel back until it stops, remove it from the chassis, and set it aside.
6. Repeat steps 4 and 5 to remove the right side panel, if necessary.

To close the case:

1. Place the side panel on the chassis so that all tabs on the rear of the chassis insert into their slots.

NOTE When installing the left side panel, ensure that the security tab aligns with its corresponding slot on the panel.

2. Push the side panel toward the front of the chassis, then push down to seat the panel.
3. Repeat steps 1 and 2 to install the remaining side panel, if necessary.
4. Place the top cover on the chassis so that all tabs are inserted into their slots.
5. Slide the top cover forward until it locks into place.

CAUTION After servicing or upgrading the system, always replace the covers that were removed. Do not defeat the AC interlock. The covers ensure the system maintains proper air flow, so internal components do not overheat and fail. The covers also ensure that electromagnetic interference (EMI) emissions remain below the standard requirements.

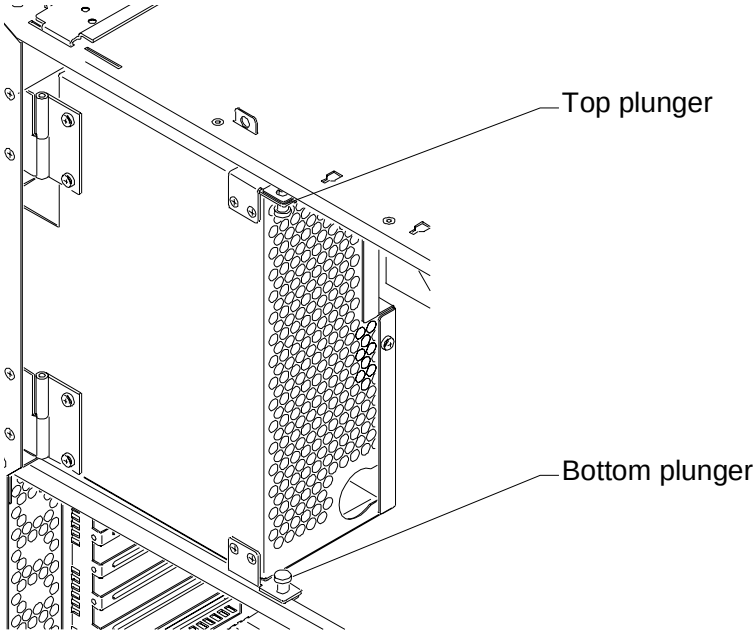
Accessing Components Behind the Power Supply

To access the processors and DIMMs, remove the knurled retaining/grounding screw on the rear of the chassis, disengage the locking plungers, and swing the hinged power supply out of the chassis. Or, you can remove the power supply entirely. However, you need not remove the power supply for most routine service or upgrade tasks. As needed, you may want to disconnect power supply cables to peripheral devices to swing the power supply out fully.

See Chapter 2, “Servicing the System,” for complete details on removing the power supply.

To access components behind the power supply:

1. Unplug the AC power cord from the rear of the unit.
2. Remove the top cover and left side panel. See the previous section for details.
3. Remove the knurled retaining/grounding screw just below the top system fan on the rear of the chassis.
4. Grasp both knurled plungers on the power supply, pull them toward each other, and then swing the power supply toward you.



NOTE Disconnect power cables to internal devices as needed to allow the power supply to swing out fully.

5. Access the exposed components as needed.

To stow the power supply:

1. Reconnect any power cables that you disconnected.
2. Grasp both knurled plungers, pull them toward each other, and then swing the power supply away from you, back into the chassis.

CAUTION Carefully swing the power supply back into the chassis. Avoid pinching cables. Hold the external SCSI cable against the chassis brace or rearrange cables slightly while swinging the power supply into the chassis.

3. Align the plunger holes and release both plungers.
4. Install the retaining/grounding screw on the rear panel.
5. Install the left side panel and top cover.
6. Plug the AC power cord into its connector on the rear of the chassis.

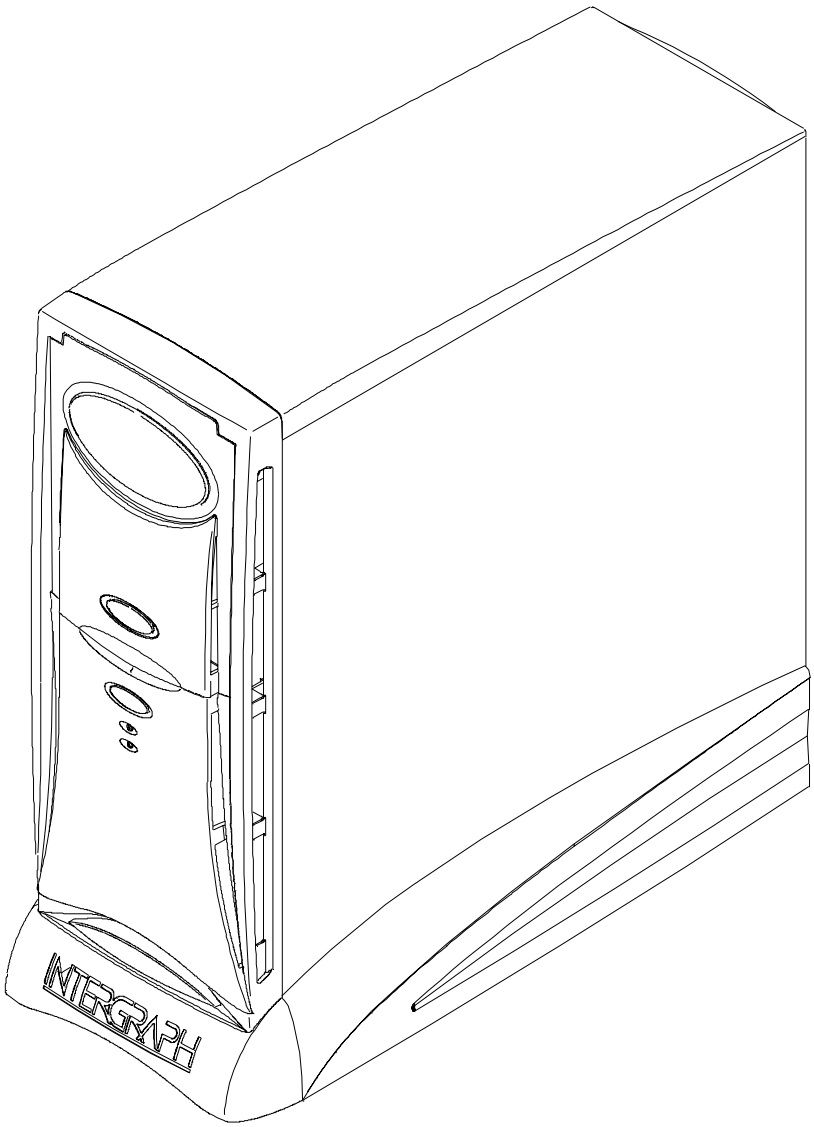
2 Servicing the System

This chapter describes how to replace the standard parts within the system. Obey all warning and caution labels while replacing parts.

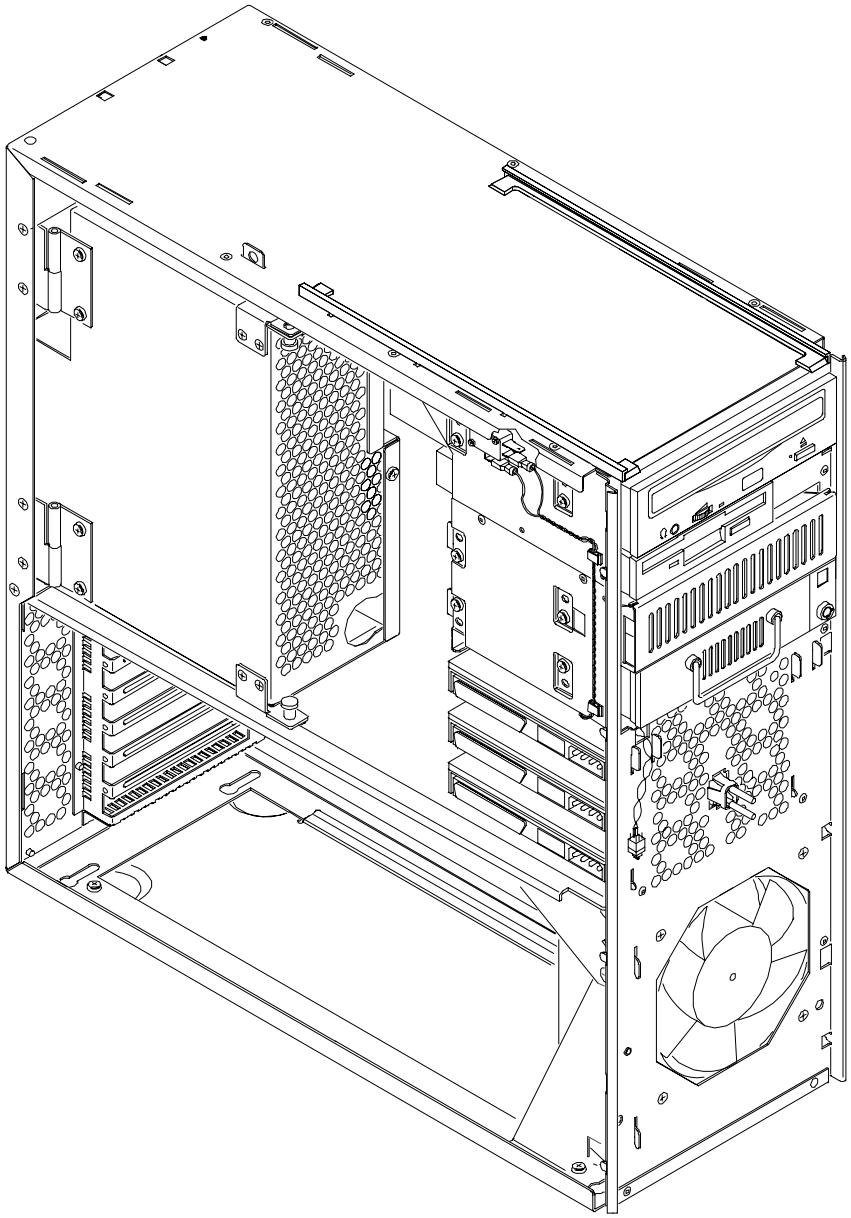
Note that internal parts servicing procedures assume you have removed the left side panel from the system. After you have finished servicing the system, replace panels as described in Chapter 1, "Accessing the System."

System Illustrations

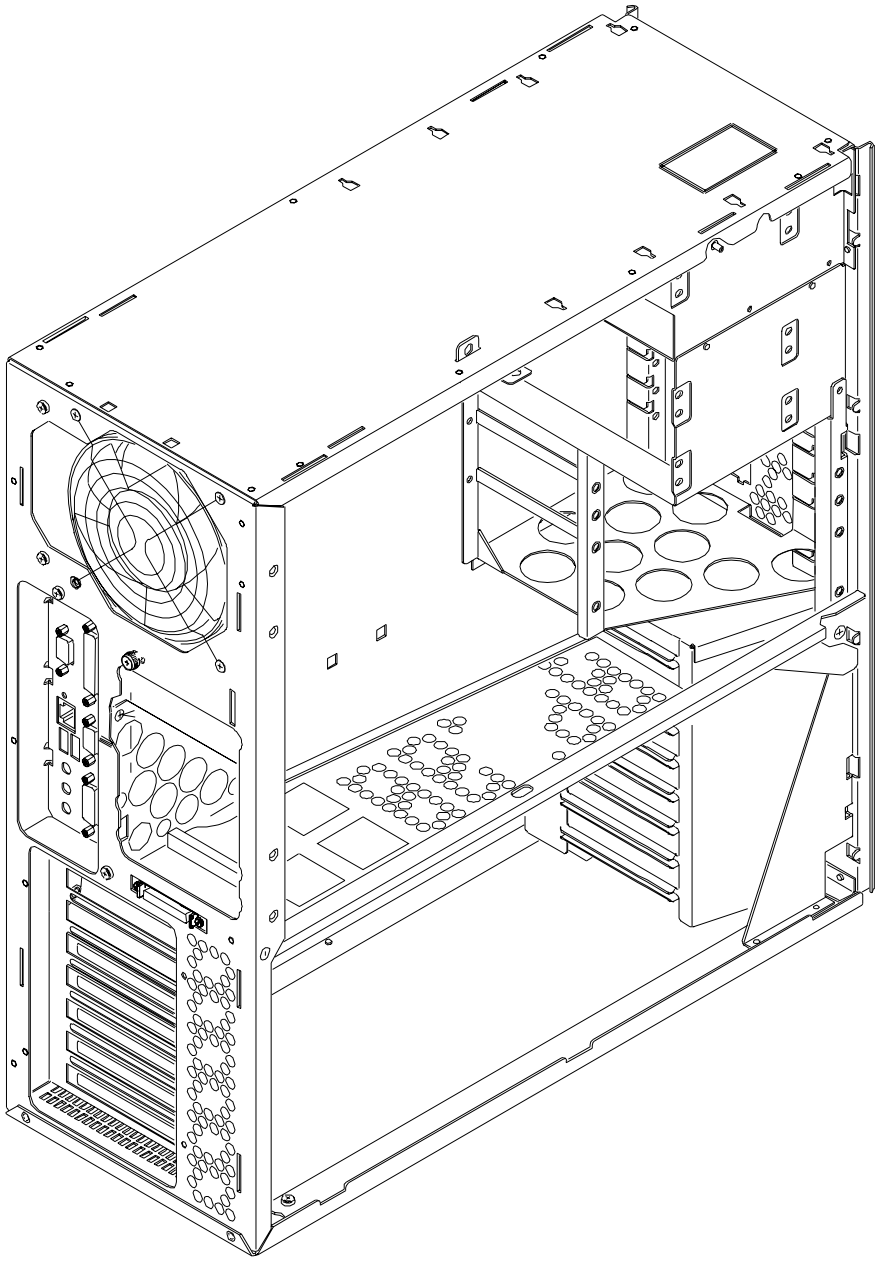
The illustrations show various external and internal views of the system. The front, right view below depicts the system with all covers in place.



The front, left view below depicts the major parts of the system. Covers, cables, system board and expansion cards are not shown.



The back, left view below depicts the chassis with all major components removed.



Case Components

Ordinarily you will not need to replace any of the external case components unless they are broken or cosmetically damaged. All case components are designed for durability, but the item that may require replacement first is the door and hinge assembly.

WARNING **Disconnect the system from AC power before servicing internal components! Failure to remove AC power may result in equipment damage or personal injury.**

NOTE See Chapter 1, "Accessing the System," for instructions on opening the system and protecting against electrostatic discharge.

CAUTION Follow all warnings and cautions in servicing instructions. If you fail to follow documented, approved procedures, personal injury or damage to equipment can result.

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

CAUTION Do not overtighten screws and other fasteners to avoid damaging threads.

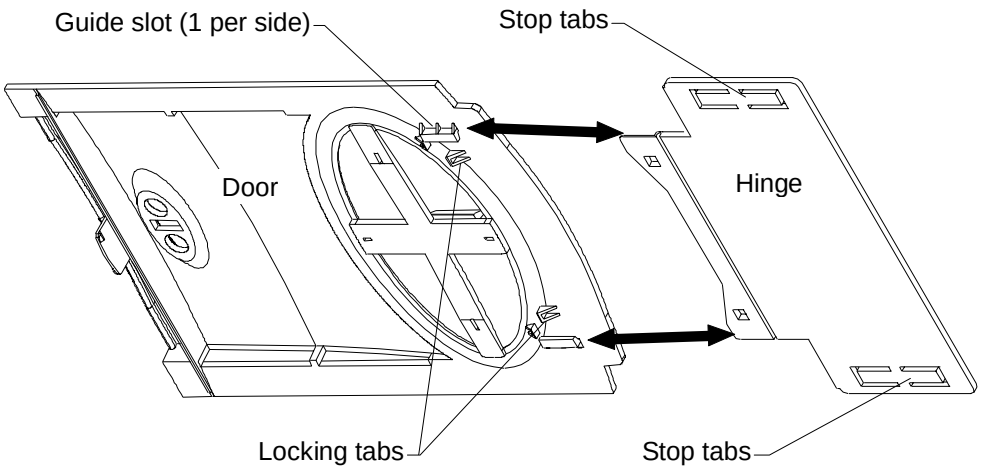
To replace the hinge or door, you must first remove the top cover. To replace the face panel, you must remove the top cover and the door.

To replace the top cover:

1. Remove the top cover. See Chapter 1, "Accessing the System," for details.
2. Install the new cover.

To replace the door assembly:

1. Remove the top cover. See Chapter 1, "Accessing the System," for details.
2. Lift the door and hold it at a 90-degree angle from the face panel.
3. Insert a small flat-blade screwdriver between the door and hinge, near one of the square holes on the underside of the door.

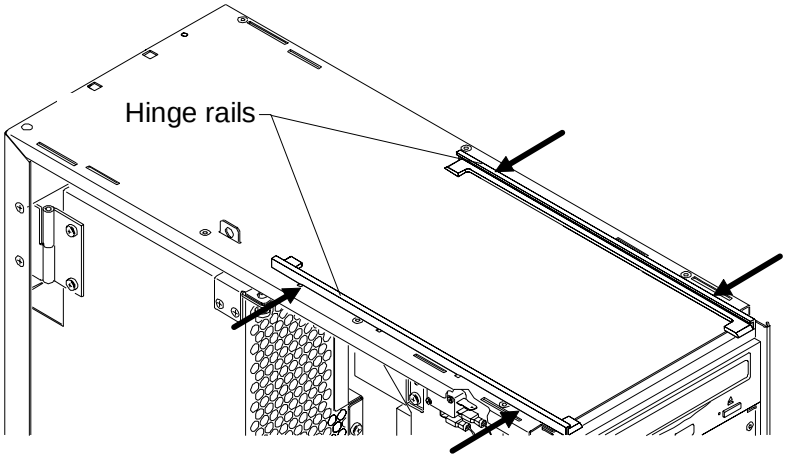


4. Pull the door toward you and pry the hinge and door apart until one side of the door releases from its locking tab.
5. Repeat steps 3 and 4 for the other side of the door hinge.
6. Remove the door.
7. Do both of the following on the underside of the door:
   - Spread the release tabs on the large emblem and remove it
   - Squeeze the release tabs on the small emblem and remove it
8. Slide the hinge toward the front of the chassis until it stops.
9. Use a flat-blade screwdriver and pry each of the stop tabs on the hinge until the hinge releases from the rails.
10. Orient the new hinge so that the locking tabs face down and insert the new hinge into the track and push it forward until it stops.
11. Hold the hinge, align the beveled edges of the hinge with the guide slots on the door, and push the door firmly onto the hinge until it snaps into place.
12. Press the two emblems onto the door until they snap into place.
13. Operate the door to test its movement.
14. Install the top cover. See Chapter 1, “Accessing the System,” for details.

To replace the hinge rails:

1. Remove the door. See the procedure above for details.
2. Slide the hinge toward the front of the chassis until it stops.

3. Use a flat-blade screwdriver and pry each of the stop tabs on the hinge until the hinge releases from the rails.

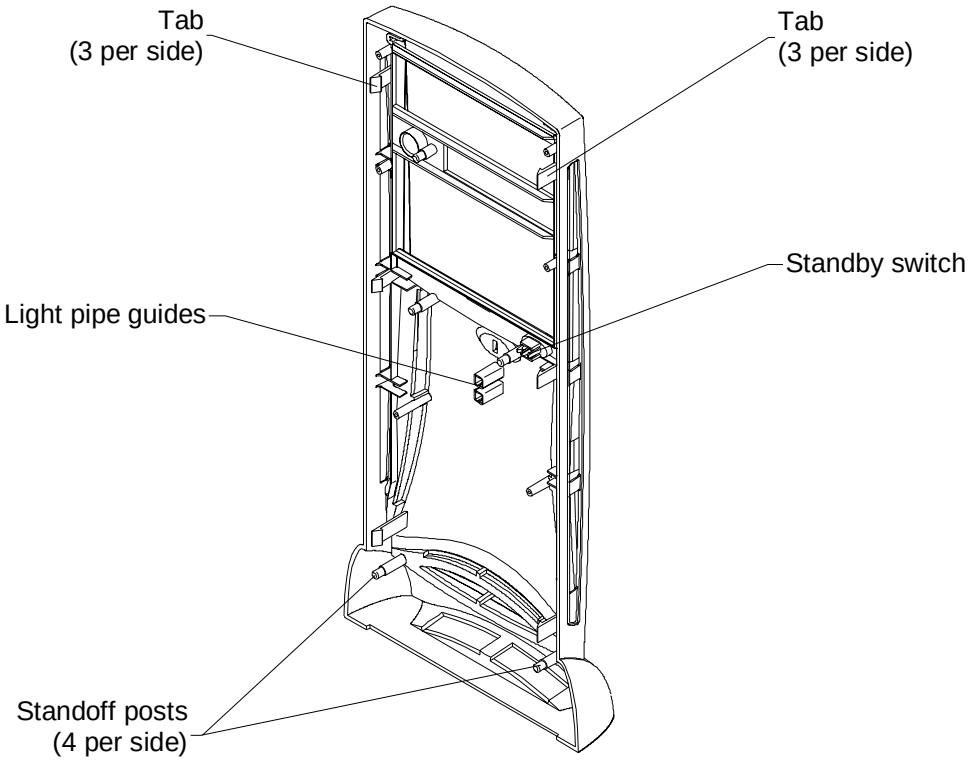


4. Remove the hinge from the rail.
5. Press a hinge rail toward the middle of the chassis until all four tabs release.
6. Lift the hinge rail off the chassis.
7. Orient the new hinge rail the same way as the one you removed, place the tabs in the slots, and press outward until the rail snaps into place.
8. From the front of the chassis, slide the hinge into the rails.

To replace the face panel:

1. Remove the top cover and both side panels. See Chapter 1, "Accessing the System," for details.
2. Remove the door. See the "To replace the door assembly" procedure above for details.
3. Push the hinge back, away from the front of the chassis.
4. Use a flat-blade screwdriver to gently pry and release each of the plastic tabs on both sides of the chassis. The tabs on the right side of the chassis are recessed. First release the bottom tabs, release the middle tabs, and then release the top tabs.

CAUTION Release the tabs with care. Do not apply more pressure than necessary.



5. Pull the face panel away from the chassis slightly to ensure all tabs are released.
6. Grasp the left side of the face panel and pivot it left to expose the standby switch and cable.
7. Spread the switch mount locking tabs, grasp the switch, and pull the switch out of its mount.
8. Turn the face panel downward until the standby switch button drops out.
9. Place the left side of the new face panel near the left, front of the chassis and orient the switch so that the black and green wires are at the bottom.
10. Push the standby switch into the mount until it snaps into place.
11. Place the standby switch button into its hole and push firmly until it seats.
12. Align the new face panel with the tab notches and light pipe guides, and carefully push the panel onto the chassis until all tabs engage.
13. Install the door, left and right side panels, and top cover.

To replace the left or right side plastic cowling:

1. Remove the top cover, then remove the side panel that has the plastic you want to replace. See Chapter 1, “Accessing the System,” for details.
2. Place the side panel, with the cowling side down, on a flat, padded surface.

3. Remove the screw that secures the plastic to the side panel.
4. Grasp one side of the panel, press the release tabs, and lift the panel off the plastic.
5. Turn the side panel over and press the new plastic onto the panel until the release tabs engage.
6. Turn the side panel over and install the screw.
7. Install the side panel onto the chassis.
8. Install the top cover. See Chapter 1, “Accessing the System,” for details.

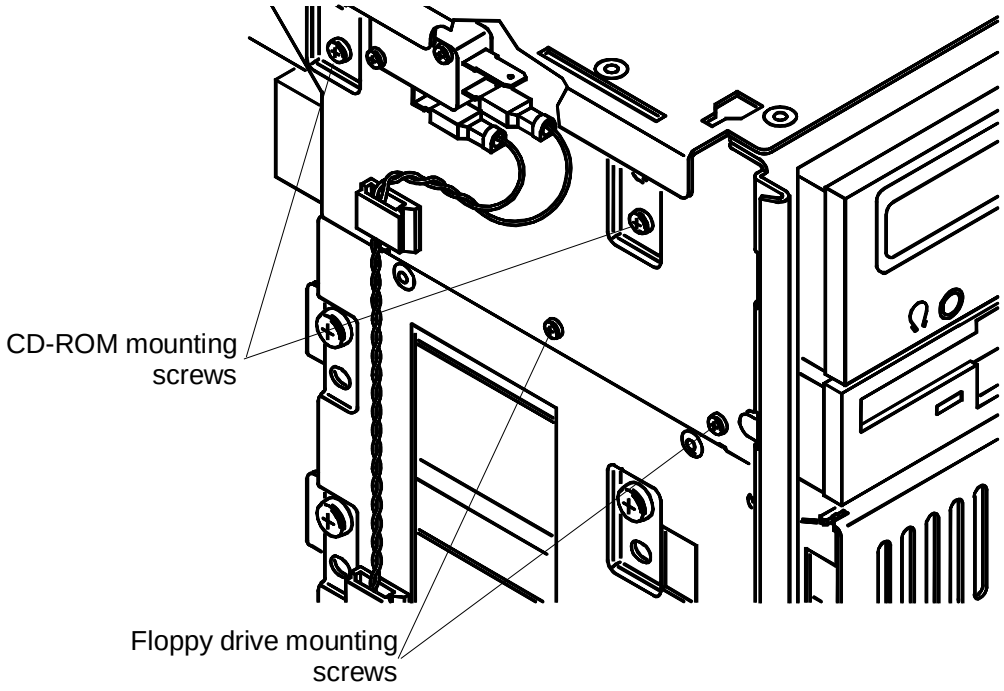
Peripheral Drives

This section explains how to replace the floppy, CD-ROM, and internal and external bay disk drives. See Chapter 6, “Peripherals,” for details on drive configuration and cables.

Floppy Disk Drive

To replace the floppy disk drive:

1. Disconnect the power cable and data cable from the drive. Note the position of the red stripe on the data cable.
2. Remove the two screws that secure the floppy drive to the chassis. See the following figure.



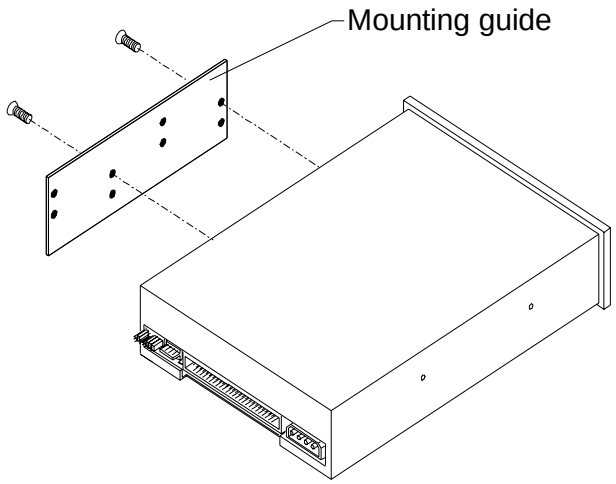
3. From inside the chassis, push the back of the floppy drive until the bezel clears the chassis, and slide the device out.
4. Slide the new floppy drive into the chassis and align the mounting holes.
5. Install the two mounting screws.
6. Connect the data cable and the power cable.

CD-ROM Drive

The procedure for replacing a SCSI or an EIDE CD-ROM drive is the same, except for data cables and jumper settings.

To replace the CD-ROM drive:

1. Disconnect the power cable, data cable, and audio cable from the CD-ROM drive.
2. Remove the screws that secure the CD-ROM drive to the chassis. See the previous figure.
3. From inside the chassis, push the back of the CD-ROM until the bezel clears the chassis, then slide the device out.
4. Remove the mounting guide from the right side of the CD-ROM. See the following figure.



5. Note the jumper settings on the rear of the CD-ROM.
6. Do one of the following on the new CD-ROM:
   - Set the EIDE master/slave jumper to the same position (Master) as the old drive if you are installing an EIDE drive

- Set the SCSI ID jumper to the same address as the old drive if you are installing a SCSI drive

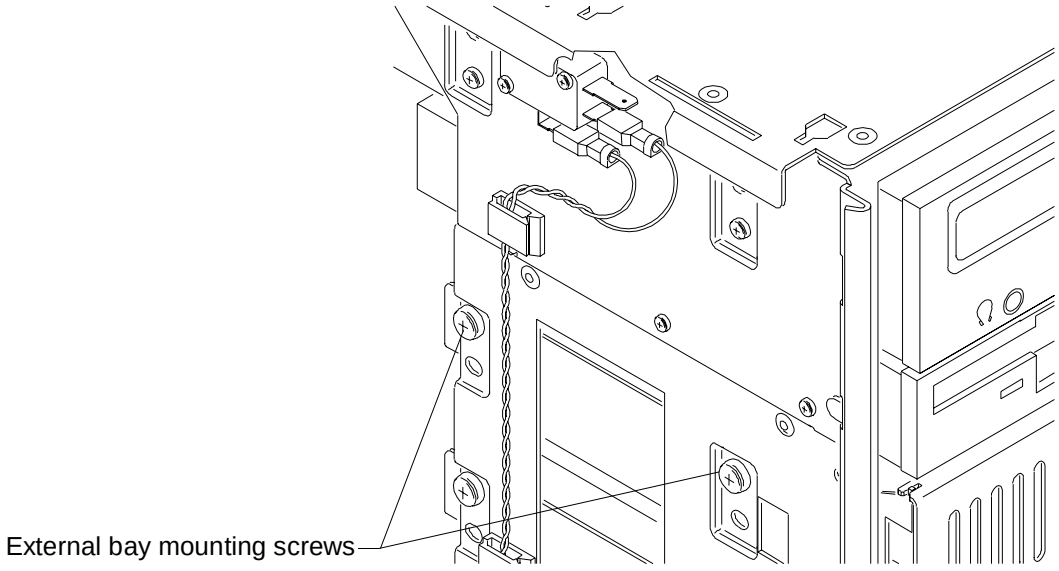
7. Install the mounting guide on the right side of the new CD-ROM.
8. Slide the new CD-ROM drive into the chassis and align the mounting holes.
9. Install the screws that secure the CD-ROM to the chassis.
10. Connect the audio cable, data cable, and power cable.

External Bay Disk Drives

If a Kingston or other brand of removable disk module is installed in the external bay, see the vendor documentation for disk drive and module replacement instructions.

To replace an external bay disk drive:

1. Disconnect the SCSI cable and power cable from the disk drive.
2. Remove the two screws that secure the external bay disk drive tray to the chassis. See the following figure.

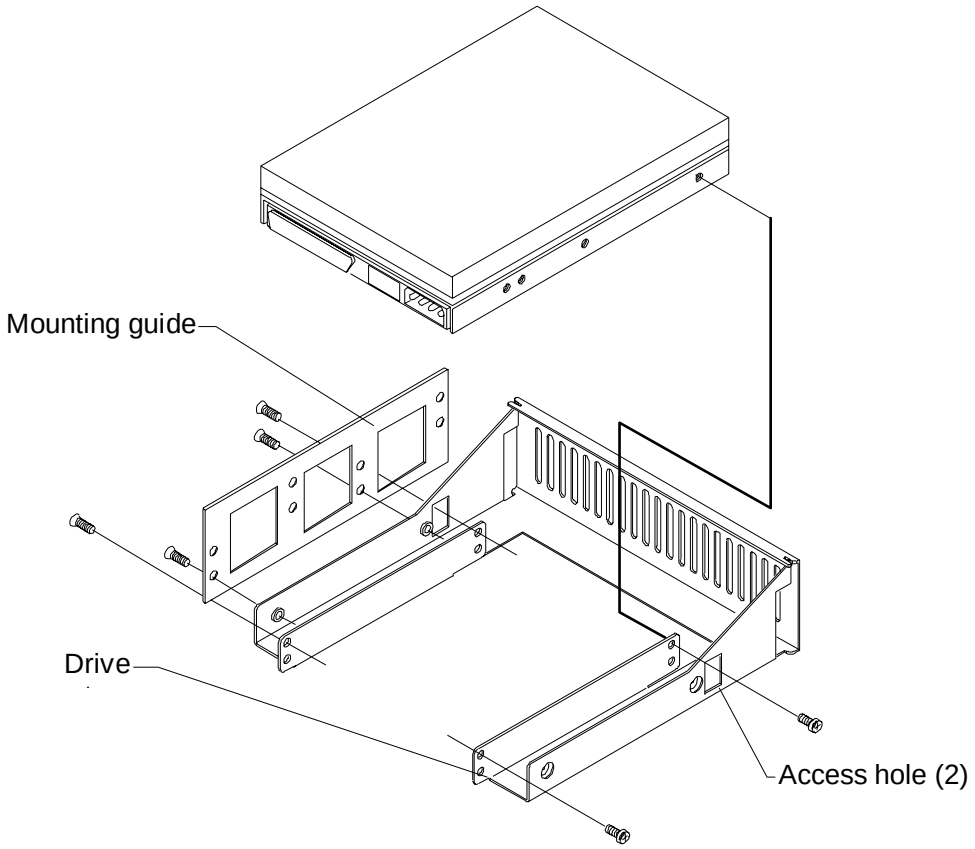


3. From inside the chassis, push the tray out of the external bay, grasp the front of the tray, and then slide it out of the bay.
4. Remove the screws that secure the disk drive to the tray and remove the drive.
5. Do all of the following:
   - Note the SCSI ID jumper settings on the old drive
   - Set the SCSI ID on the new drive to the same ID as the old drive

- Disable termination on the new drive

See Chapter 6, “Peripherals,” for details on these tasks.

6. Place the disk drive in the tray, align the mounting holes, and install the mounting screws that secure the disk drive to the tray. See the following figure.



7. Slide the tray assembly into the chassis and align the mounting holes.
8. Install the screws that secure the tray to the chassis.
9. Connect the SCSI cable and the power cable to the disk drive.

Internal Bay Disk Drives

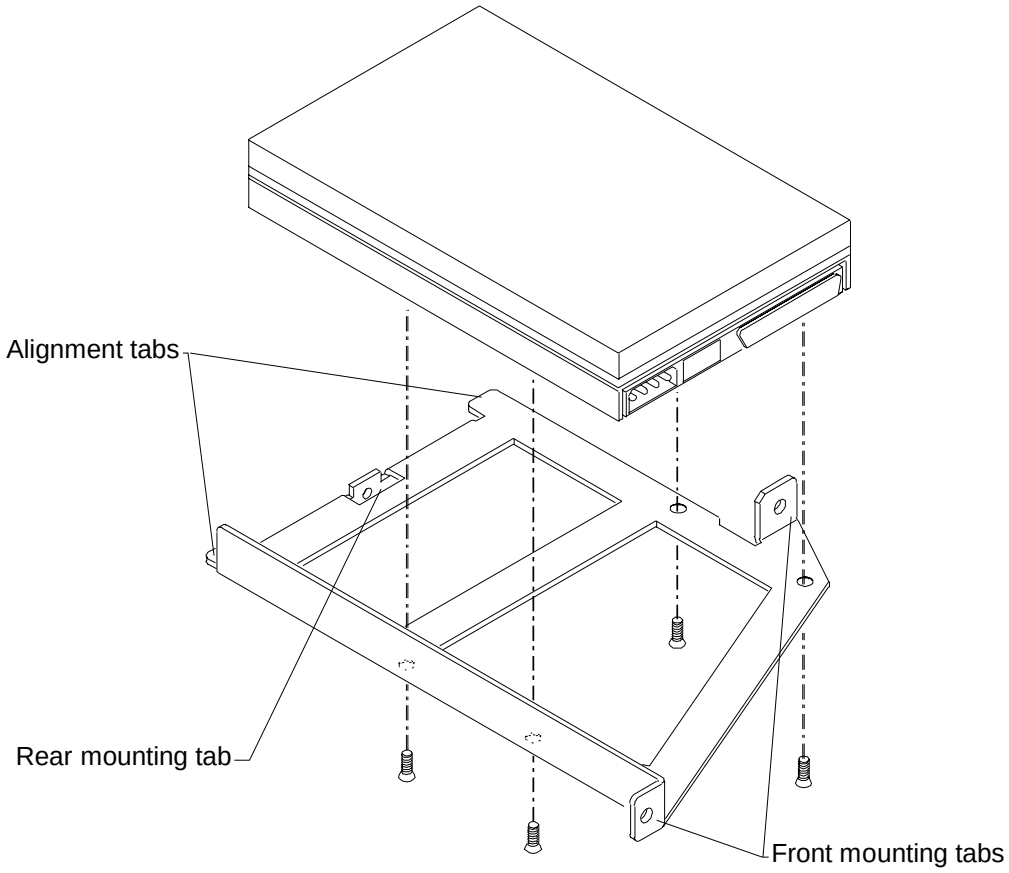
To replace an internal bay disk drive:

1. Remove the right and left covers. See Chapter 1, “Accessing the System,” for details.
2. Disconnect the SCSI cable and power cable from the disk drive.
3. Remove the two screws that secure the drive bracket assembly to the left side of the chassis.

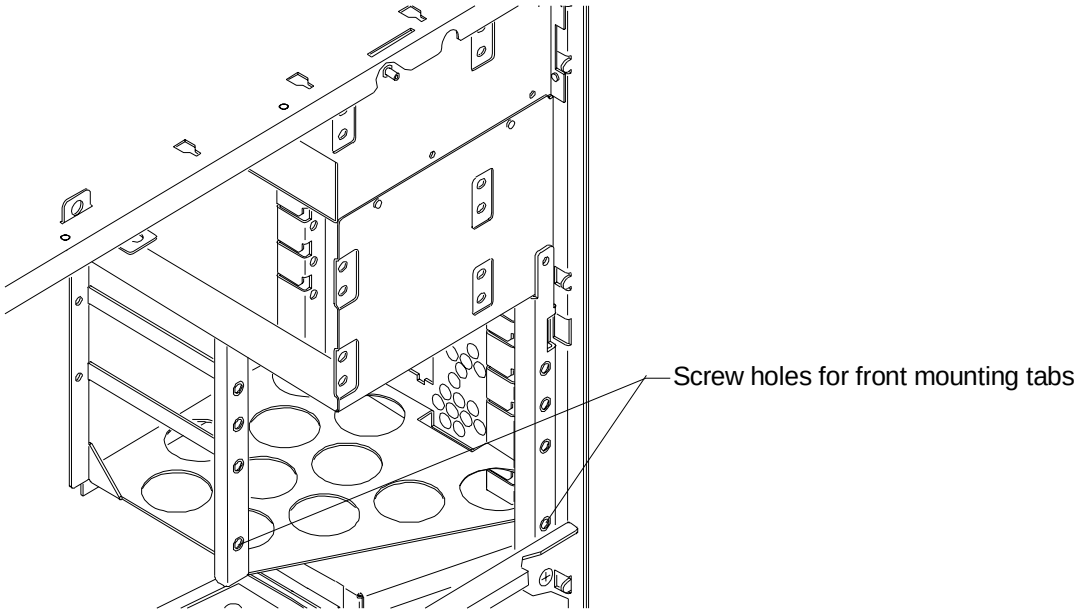
4. Grasp the drive bracket assembly and remove the screw that secures the bracket to the right side of the chassis.
5. Pull the drive bracket assembly out of the chassis.
6. Remove the four screws that secure the old drive to the bracket.
7. Do all of the following:
   - Note the SCSI ID jumper settings on the old drive
   - Set the SCSI ID on the new drive to the same ID as the old drive
   - Disable termination on the new drive

See Chapter 6, “Peripherals,” for details on these tasks.

8. Install the new drive on the bracket.



9. Insert the alignment tabs into the appropriate slots in the chassis.



10. Install the two screws that secure the drive bracket assembly front mounting tabs to the chassis.
11. Install the screw that secures the drive bracket assembly to the right side of the chassis.
12. Install the right side panel.
13. Connect the SCSI cable and the power cable to the new drive.

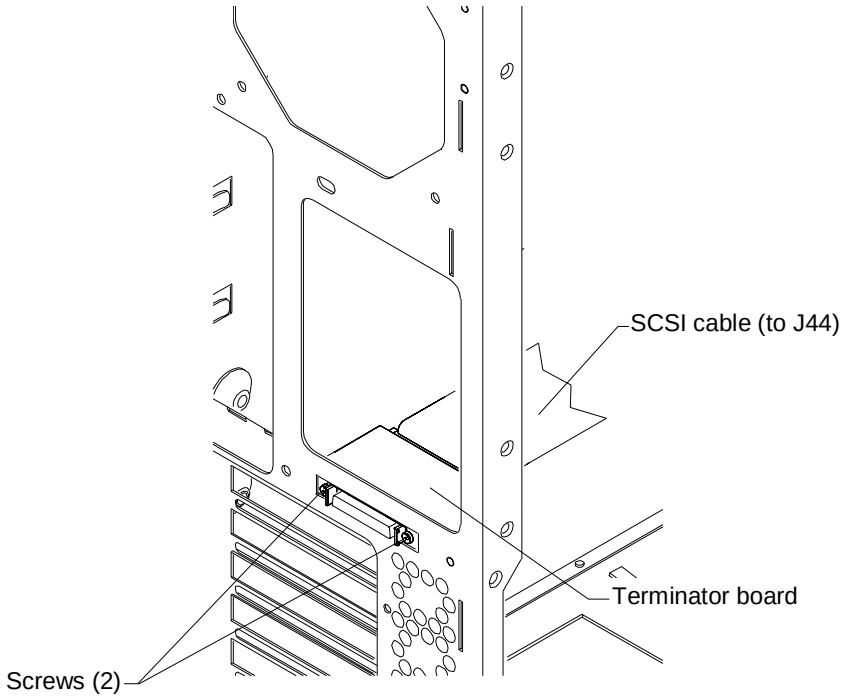
External SCSI Terminator

The connector for the external SCSI terminator board, MSMT283, is mounted on the rear of the chassis just below the power supply. MSMT283 provides active termination for the system end of the external Ultra SCSI bus. Cable MCBL253A connects the terminator to J44 on the system board. See the system board diagram in Chapter 5, “System Board,” for connector and socket locations.

To replace the external Ultra SCSI terminator board:

1. Swing the power supply out of the chassis. See Chapter 1, “Accessing the System,” for details.
2. Unfasten the reusable wire tie that secures the power supply cable bundle.
3. Lift the power supply off its hinge pins and place it aside carefully.

4. Disconnect the SCSI cable (MCBL253A) from the terminator board. See the following figure.



5. Remove the two small screws that secure the connector to the rear of the chassis.
6. Note the orientation of the terminator board and remove it from inside the chassis.
7. Orient the new terminator board component side down, align the mounting holes of the new terminator with the chassis mounting holes, and install the two screws.
8. Connect the SCSI cable to the terminator.
9. Place the power supply on its hinge pins and fasten the wire tie on the cable bundle.
10. Swing the power supply back into the chassis and secure it with the plungers.

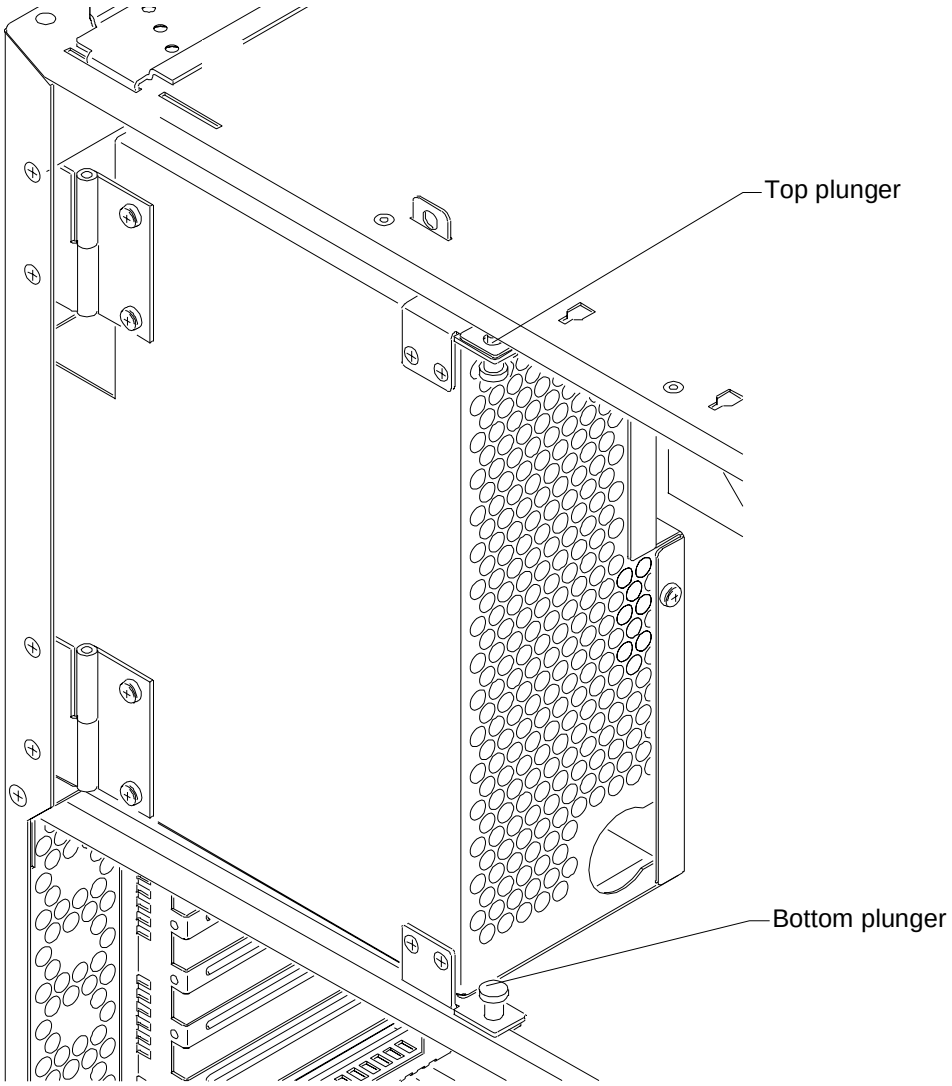
Power Supply

See Chapter 7, “Power Supply, Fans, and Hardware Monitoring Devices,” for details on the power supply.

To replace the power supply:

1. Unplug the AC power cord from the rear of the unit.
2. Note the location of all power cable connectors on the system board and peripheral devices.

3. Disconnect all power cables from all internal devices and the system board.
4. Place the power supply cable bundle outside the chassis.
5. Remove the knurled retaining/grounding screw on the back of the system. This fastener is located between the top fan and the power supply fan.
6. Grasp and pull the power supply plungers toward each other, and then swing the power supply out from the chassis.



7. Swing the power supply out sufficiently to avoid interference from the chassis or the top system fan.
8. Lift the power supply off its hinges and set it aside.
9. If the new power supply does not have hinges and plungers, remove them from the old supply and install them on the new power supply.

10. Place the new power supply on the hinge pins.
11. Connect the power cables to the system board and internal devices. See Chapter 7, "Power Supply, Fans, and Hardware Monitoring Devices," for connection details.
12. Grasp and pull the plungers toward each other, swing the power supply back into the chassis, and secure it with the plungers.

CAUTION Carefully swing the power supply back into the chassis. Avoid pinching cables. Hold the external SCSI cable against the chassis brace or rearrange cables slightly while swinging the power supply into the chassis.

13. Install the retaining/grounding screw on the back of the chassis.
14. Plug the AC power cord into its connector on the back of the chassis.

Bus Termination Card

The bus termination card, MSMT379, is used only in systems with one processor. The card provides termination for the processor bus. Single-processor systems will not operate without the card installed. See the system board diagram in Chapter 5, "System Board," for connector and socket locations.

To replace the bus termination card:

1. Swing the power supply out of the chassis. See Chapter 1, "Accessing the System," for details.
2. Locate the bus termination card at J8, just below the primary CPU.
3. Note the orientation of the card.
4. Grasp the top edge of the card at each end, and pull it straight out.
5. Remove the new card from its antistatic package, orient the card component side up, and insert the card in the slot.
6. Press down firmly until the card is seated.
7. Swing the power supply back into the chassis and secure it with the plungers.

Processor Module

The replacement Pentium II 300 MHz processor, CICM452, is housed in a plastic module with heat sinks. The bottom right heat sink fin is removed to provide clearance for the fan connector on the Revision A system board. The processor module mounts in the dual processor retention module (DPRM). See the system board diagram in Chapter 5, "System Board," for connector and socket locations.

CAUTION To avoid damaging the system board, ensure that your replacement processor has the bottom, right heat sink fin removed.

To replace the processor module:

1. Swing the power supply out of the chassis to expose the processor. See Chapter 1, "Accessing the System," for details.
2. Press the locking tabs on the top corners of the processor module inward, towards each other, until they click into the release position.
3. Slide the processor module out of the DPRM.
4. Remove the new processor from its antistatic package, and align the processor module over the DPRM. The processor module is keyed and fits only one way.
5. Press the processor module down until it seats.
6. Press the processor module locking tabs outward until they click into the locked position.
7. Swing the power supply back into the chassis and secure it with the plungers.

Voltage Regulator Module (VRM)

The voltage regulator module (VRM), CPWS165, is used only in dual-processor systems. The VRM is located at J10, just below the secondary processor. See the system board diagram in Chapter 5, "System Board," for connector and socket locations.

You may want to remove the secondary processor to provide better access before replacing the VRM.

To replace the VRM:

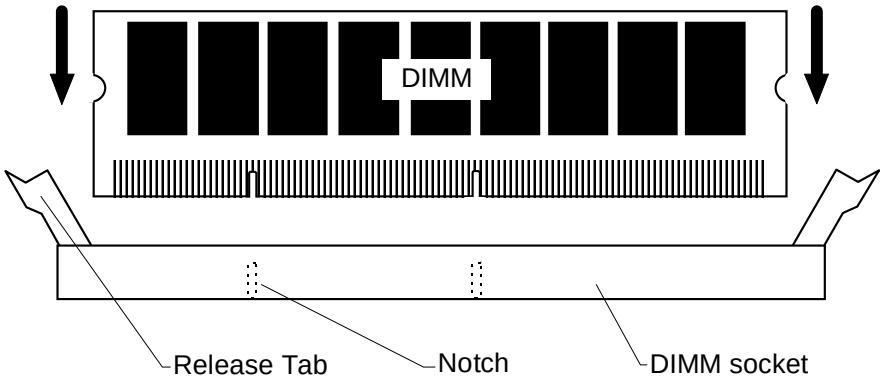
1. Swing the power supply out of the chassis to expose the VRM. See Chapter 1, "Accessing the System," for details.
2. Grasp the top of the VRM with one hand, and use your forefinger and middle finger of the other hand to push the release tabs up, toward the processor.
3. Keep pushing the release tabs and pull the VRM out of its socket.
4. Remove the new VRM from its antistatic package, and align it over the slot.
5. Press the VRM into the slot until the release tabs click.
6. Swing the power supply back into the chassis and secure it with the plungers.

DIMMs

See the section, “Adding Memory,” in Chapter 3, “Upgrading the System,” for important details on handling DIMMs. The DIMM sockets are located just above the power connectors P1 and P2 on the system board. See the system board diagram in Chapter 5, “System Board,” for connector and socket locations.

To replace a DIMM:

1. Swing the power supply out to expose the DIMM sockets. See Chapter 1, “Accessing the System,” for details.
2. Press the release tabs outward, away from each other.
3. Grasp the top edge of the DIMM and pull it out of the socket.
4. Remove the new DIMM from the antistatic package.
5. Orient the DIMM so that the notches match the keys in the socket.

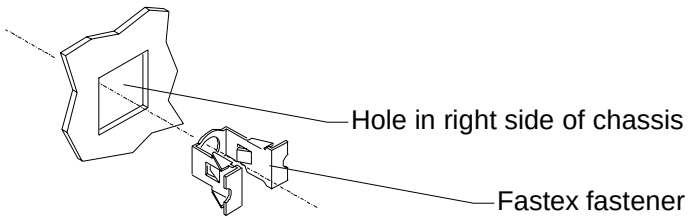


6. Insert the DIMM at a 90-degree angle into the socket.
7. Push gently straight down until the release tabs snap into place.
8. Swing the power supply back into the unit and secure it with the plungers.

System Board

You must swap the DIMMs, bus termination card (if installed), VRM (if installed), and processor module(s) from the old system board to the new one. See the system board diagram in Chapter 5, “System Board,” for connector and socket locations.

Note that a number of Fastex fasteners are mounted in the right side of the chassis to secure the system board and dual processor retention module (DPRM) supports. Do not overtighten the screws to these fasteners. If overtightened, the fasteners may distort.



To remove the system board:

1. Remove the top cover and both side panels. See Chapter 1, "Accessing the System," for details.
2. Remove the power supply. See the "Power Supply" section above for details.
3. Lay the chassis down on its right side.
4. Note the locations where all cables are connected to the system board.
5. Disconnect all cables from the system board.
6. Note the locations of the expansion cards, remove them, and place the cards on an antistatic surface.
7. Remove DIMMs, the bus termination card (if installed), VRM (if installed), and processor module(s) and place them on an antistatic surface. See the respective procedures above for details on removing these components.
8. Remove the chassis brace.
9. Remove the jackscrews on all external port connectors.

WARNING **Use care when removing or installing the screws to avoid damaging components on the system board.**

10. Remove the four screws and the four plastic rivets on the dual processor retention module (DPRM), and remove the DPRM from the chassis.
11. Remove the 21 screws from the system board.
12. Lift the system board out of the chassis and place it on an antistatic surface.

To install a new system board:

1. Place the new system board into the chassis, align all mounting holes, and install the jackscrews on the external port connectors.
2. Loosely install the remaining screws on the system board, except those for the DPRM. **Do not tighten** the screws yet.
3. Mount the DPRM to the system board with the plastic rivets. The DPRM is keyed to the processor slots to ensure correct orientation.

4. Tighten all fasteners that secure the system board and DPRM to the chassis. You may need to adjust the Fastex fasteners slightly on the right side of the chassis.
5. Install the chassis brace.
6. Install the DIMMs, processor(s), VRM (if used), and bus termination card (if used) on the system board.
7. Install the expansion cards back into their original slots.
8. Connect the internal cables to the system board. If you need help identifying cable connections, see Chapter 5, "System Board."
9. Place the power supply on its hinge pins, swing it back into the chassis, and secure it with the plungers.
10. Install the power supply retaining/grounding screw on the rear of the chassis.
11. Install the right and left side panels, and then install the top cover.

Expansion Cards

See the system board diagram in Chapter 5, "System Board," for connector and socket locations.

To replace an expansion card:

1. Disconnect the external device attached to the expansion card connector on the rear of the system.
2. Disconnect any internal cable that connects the card to another device (if installed), such as a geometry board.
3. Remove the screw that secures the card to the left card guide.
4. Pull the expansion card straight out, and place it on an antistatic surface.
5. Slide the new card into the same slot from which you removed the old card.
6. Install the screw that secures the card to the left card guide.
7. Connect any cables from other internal devices, if installed.
8. Connect the external device to the expansion card connector on the rear of the system.

Fans

See Chapter 7, "Power Supply, Fans, and Hardware Monitoring Devices," for details on fans.

NOTE Arrows on the fan indicate airflow direction and rotation. Ensure system fans are installed with the airflow direction arrow pointing in the correct direction.

To replace the top system fan:

1. Remove the power supply. See the "Power Supply" section above for details.
2. Remove the primary processor and the secondary processor (if installed). See the "To replace the processor module" procedure above for details.
3. Disconnect the fan power cable from J5, which is located near the top left of the secondary processor slot on the system board.
4. Remove the four screws securing the grille and fan to the chassis.
5. Gently pull the fan right until the motor housing contacts the DPRM.
6. Gently pull the fan downward until the fan housing clears the chassis and remove the fan.
7. Note the airflow direction of the fan and the position of the fan cable.
8. Ensure the airflow direction arrow on the new fan is pointing in the correct direction, then place the new fan at an angle inside the chassis.
9. Grasp the fan with one hand and use the other to slightly pull the left side of the DPRM toward the right so that the fan slips into place.
10. Place the grille on the outside, align the mounting holes, and install the four screws. Do not overtighten.
11. Connect the fan power cable to J5.
12. Install the processor module(s).
13. Install the power supply, swing it back into the chassis, and secure it with the plungers.

To replace the bottom system fan:

1. Remove the face panel. See the "Case Components" section above for details.
2. Remove the expansion cards. See the "Expansion Cards" section above for details.
3. Remove the two screws that secure the right card guide to the chassis.
4. Lift the card guide up to disengage the mounting tabs, and remove it from the chassis.
5. Disconnect the fan power cable from J54, which is located near the battery on the front edge of the system board.
6. Note the airflow direction of the fan.
7. Remove the four screws securing the fan to the front of the chassis and remove the fan.

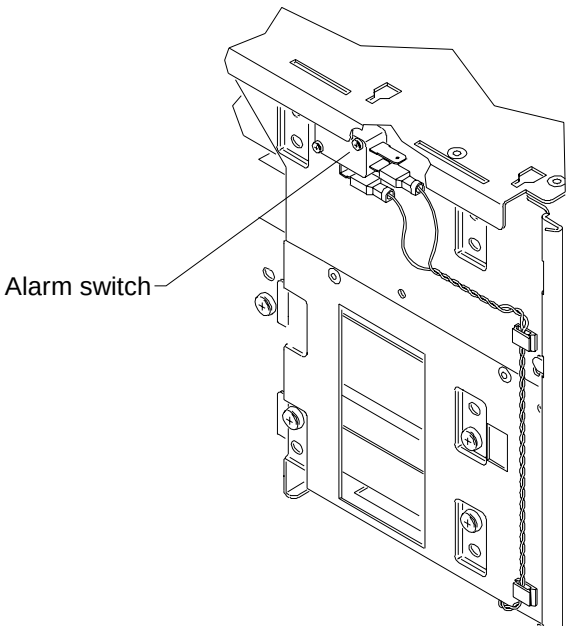
8. Ensure that the airflow direction arrow on the new fan is pointing in the correct direction and place the fan inside the chassis.
9. Align the mounting holes, and install the four screws. Do not overtighten.
10. Connect the fan power cable to J54.
11. Insert the card guide tabs into the slots and push the card guide down until the tabs engage.
12. Install the two screws that secure the card guide to the chassis.
13. Install the expansion cards.
14. Install the face panel.

Chassis Intrusion Alarm Switch

The chassis intrusion alarm switch (CWSX30800) has three connectors. Only the bottom two connectors are used. See the system board diagram in Chapter 5, "System Board," for connector and socket locations.

To replace the chassis intrusion alarm switch:

1. Note where the red and black wires connect to the switch.
2. Disconnect the wires from the switch.



3. Remove the two screws that secure the switch to the chassis and remove the switch.

4. Align the new switch with the chassis mounting holes and install the screws.
5. Connect the black wire to the middle connector and connect the red wire to the bottom connector.

Lithium (CMOS/Clock) Battery

The battery is located near the bottom front of the system board. See the system board diagram in Chapter 5, "System Board," for details.

After you remove the battery, the system will lose its operating parameters stored in CMOS. As a result, the system BIOS parameters are lost. Parameters include date, time, hardware configuration, and other data.

After you install the new battery, you must reset the date and time and reconfigure the BIOS. See the *TDZ 2000 System Setup* for details on updating and configuring the BIOS.

WARNING **There is a danger of explosion if the battery is incorrectly replaced.**

WARNING **Replace the battery with the same or equivalent type only, as recommended by the battery manufacturer. Dispose of used batteries according to the battery manufacturer's instructions.**

To replace the battery:

1. Remove any expansion cards that restrict access to the battery. See the "Expansion Cards" above for details.
2. Note the positive orientation of the battery. Carefully remove the discharged battery by grasping it firmly and pulling it out of the socket.
3. Install the new battery in the same orientation as the old battery.
4. Dispose of the battery according to the manufacturer's instructions.
5. Install the expansion cards that you removed.

LEDs, Light Pipe, and Standby Switch

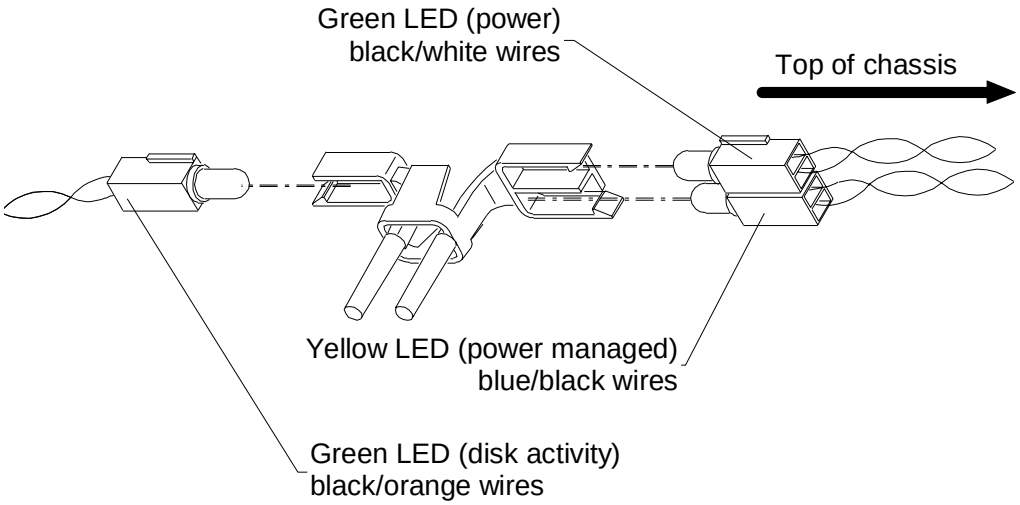
See the system board diagram in Chapter 5, "System Board," for connector and socket locations. See also the "Cable Routing and Pinouts" section in Chapter 5, "System Board," for LED and standby switch cable and connector details.

To replace an LED:

1. Remove the internal bay disk drives. See the "Internal Bay Disk Drives" section for details.
2. Note the locations of each of the three LEDs on the light pipe.
3. Remove the LED from its mount on the light pipe, then disconnect the LED cable from its connector on the system board.
4. Remove the LED cable from the chassis.
5. Route the new LED cable through the chassis and connect it to the appropriate connector on the system board.
6. Press the LED into its mount on the light pipe.

To replace the light pipe:

1. Remove the face panel. See the "Case Components" section above for details.
2. Remove the internal bay disk drives. See the "Internal Bay Disk Drives" section above for details.
3. Disconnect the LEDs from the light pipe.



4. Squeeze the mounting tabs on the light pipe inward and push the light pipe through its mounting hole.
5. From inside the chassis, remove the light pipe.
6. Orient the new light pipe so that its twin LED mounts face up, and press the light pipe through its mounting hole until it snaps into place.
7. Push each of the LEDs into its respective mount on the new light pipe.
8. Install the internal bay disk drives.

9. Install the face panel.

To replace the standby switch:

1. Remove the face panel. See the “Case Components” section above for details.
2. Disconnect the standby switch cable connector from the system board.
3. Remove the switch cable from the chassis.
4. Insert the connector end of the switch cable through the cable access hole on the front of the chassis and route the new switch cable through the chassis.
5. Connect the switch cable to the connector on the system board.
6. Press the switch into its mount on the face panel.
7. Install the face panel and the switch button.

3 Upgrading the System

This chapter describes upgrading memory and processors, as well as installing expansion cards, internal SCSI drives, and external SCSI drives.

Adding Memory

You can upgrade memory on the MSMT401 system board in 64 MB or 128 MB increments. The minimum total memory is 64 MB and the maximum total memory is 512 MB.

You can install DIMMs one at a time. Each bank has only one slot.

Memory upgrade kits from Intergraph Computer Systems contain one DIMM and a disposable antistatic wrist strap.

WARNING **Disconnect the system from AC power before servicing internal components! Failure to remove AC power may result in equipment damage or personal injury.**

NOTE See Chapter 1, "Accessing the System," for instructions on opening the system and protecting against electrostatic discharge.

CAUTION Follow all warnings and cautions in servicing instructions. If you fail to follow documented, approved procedures, personal injury and damage to equipment can result.

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

CAUTION Do not overtighten screws and other fasteners to avoid damaging threads.

CAUTION System memory modules from Intergraph Computer Systems are 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 not function properly or reliably in your Intergraph computer.

To avoid damaging DIMMs and voiding the warranty, take the following precautions:

- Do not touch the gold-plated finger contacts.
- Do not install DIMMs that have tin-plated finger contacts.
- Do not bend, twist, drop, or otherwise handle DIMMs carelessly.
- Do not expose DIMMs to moisture or extreme temperatures.
- Do not remove DIMMs from the antistatic bag until installation.

Before you install memory, do the following:

- Inspect DIMM keying. The finger contacts on the DIMM must match the socket configuration. This ensures that you have the correct voltage and type of DIMM.
- Inspect DIMM contacts. The DIMM must have gold-plated fingers that match the gold-plated socket contacts.

Follow these population rules to correctly install the DIMMs:

- Remember that you can install DIMMs one at a time.
- Install DIMMs one bank at a time; begin with bank 0 or the first open bank; end with bank 3.
- Press the DIMM straight down into the socket. Do not rock the DIMM; apply even pressure along the top edge of the DIMM.
- Restart the computer after adding or replacing DIMMs. The computer detects the new memory automatically.

The following table shows possible memory configurations. Each bank contains one socket. NP designates the socket is not populated.

Memory	Bank 0	Bank 1	Bank 2	Bank 3
64 MB	64 MB	NP	NP	NP
128 MB	64 MB	64 MB	NP	NP
	128 MB	NP	NP	NP
256 MB	64 MB	64 MB	64 MB	64 MB
	64 MB	64 MB	128 MB	NP
	128 MB	128 MB	NP	NP
512 MB	128 MB	128 MB	128 MB	128 MB

Typical memory configurations include the following: 64 MB (one 8Mx72 DIMM); 128 MB (one 16Mx72 DIMM); 256 MB (two 16Mx72 DIMMs); and 512 MB (four 16Mx72 DIMMs).

See the system board diagram in Chapter 5, “System Board,” for socket locations.

To install the memory upgrade:

1. Swing the power supply out to expose the DIMM sockets. See Chapter 1, “Accessing the System,” for details.
2. Locate the available DIMM socket and ensure the release tabs are open.
3. Grasp the DIMM so that the notch positions match the keys in the socket. See the figure in the section, “DIMMs,” in Chapter 2, “Servicing the System.”.
4. Insert the DIMM at a 90-degree angle into the socket.
5. Push gently straight down until the release tabs snap into place.
6. Swing the power supply back into the chassis and secure it with the plungers.

Adding a Processor

You can upgrade a single processor system to a dual processor system. You can upgrade a processor to a faster processor. You can install a processor module with heat sinks (CICM452, Intergraph standard part) or a boxed processor module with integral fan (non-Intergraph part). The lower right heat sink fin on the Intergraph processor module is removed to provide clearance for the fan connector at J5 on the MSMT401 Revision A system board.

Processors are mounted in a dual processor retention module (DPRM), which surrounds the processor slots. See the system board diagram in Chapter 5, "System Board," for the location of processor slots and related connectors.

Single-to-Dual Upgrade

You can upgrade to dual processors in the following ways:

- You can purchase a TDZ 2000 single-to-dual processor upgrade kit (PUPG11906) from Intergraph Computer Systems. The kit contains all the hardware, software, and documentation required to perform the upgrade.
- If you purchase a second processor from another vendor, you can purchase a Voltage Regulator Module (VRM) from Intergraph Computer Systems.

After completing the hardware upgrade, you must also upgrade to a multi-processor version of Windows NT. You can upgrade the operating system in the following ways:

- You can purchase the Intergraph upgrade kit mentioned previously. The kit contains all the hardware, software, and documentation required to perform the upgrade.
- If you have or purchase a *Windows NT 4.0 Workstation Resource Kit* (ISBN 1-57231-343-9), you can use software on the kit's CD-ROM to upgrade Windows NT 4.0. The files required for the upgrade are UPTOMP.EXE , UPTOMP.INF, and UPTOMP.TXT.
- While not recommended by Intergraph Computer Systems, you can back up all critical system data, install the second processor and VRM, and reinstall Windows NT 4.0 to load the required multi-processor Hardware Abstraction Layer (HAL).

NOTE You do not have to change any jumper settings when installing a second processor.

To install a single-to-dual processor upgrade:

1. Swing the power supply out to expose the processor slots. See Chapter 1, "Accessing the System," for details.
2. Remove the MSMT379 bus termination card from J8, the secondary processor slot. Place the card in an antistatic package.

3. Orient the processor module so that the heat sink fins point to the top of the chassis and insert the module into the open socket on the dual processor retention module (DPRM).
4. Press straight down and apply even pressure at both ends of the CPU module until it seats. The DPRM is keyed to ensure proper insertion.
5. Press the processor module locking tabs outward until they click into the locked position.
6. Find J10, the secondary voltage regulator module (VRM) socket.
7. Remove the new VRM from its antistatic package and slide the VRM into its mount.
8. Press straight down and apply even pressure at both ends of the VRM until it snaps into place. The socket is keyed to ensure proper insertion.
9. If you installed a boxed processor with integral fan into the secondary processor slot, connect the fan cable to J1, located near the top, right corner of the system board. The fan cable for a boxed processor installed in the primary processor slot connects to J4, located near the top left of the system board.
10. Swing the power supply back into the chassis and secure it with the plungers.

Adding Expansion Cards

You can install Peripheral Component Interconnect (PCI), non-compliant PCI, Industry Standard Architecture (ISA), and Plug-n-Play (PnP) expansion cards in the system. See below for a general description of the types of cards.

- PCI cards contain configuration registers that define resource information to the system during startup. PCI cards do not require manual system configuration when installing the card. 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.

NOTE All PCI expansion cards sold by Intergraph fully comply with the *Peripheral Component Interconnect Specification, 2.1.*

- Non-compliant PCI cards mechanically comply with the *Peripheral Component Interconnect Specification 2.1* , but do not contain configuration registers that allow the system to automatically assign the necessary resources. These cards install in PCI slots, but you must configure the BIOS to assign system resources before installing the card. In this regard, they are like ISA cards, as described below.
- ISA cards do not contain registers that define the resource information to the system during startup. Therefore, you must configure the BIOS to define the card to the system before installing the ISA card. This reserves system resources for the card.

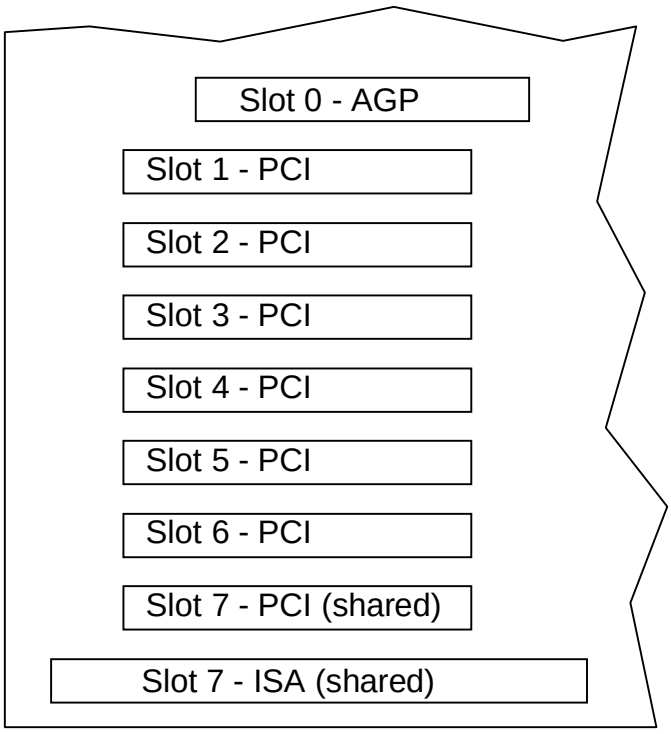
- PnP cards are ISA cards that contain configuration registers like PCI cards. During startup, the system BIOS automatically detects the installed card and assigns the necessary system resources. Since a PnP card is ISA-based, you install it in the ISA slot.

NOTE Assign system resources for an ISA card and any non-compliant PCI cards before installation. See the "Assigning System Resources" section below.

Each installed PCI card must draw less than 25 watts of power. The total allowable maximum wattage for PCI cards is 175 watts. The PCI slots are limited to 25 watts power dissipation per the *Peripheral Component Interconnect Specification 2.1* .

Slot Locations

The expansion slots are located at the bottom, left section of the system board, as shown in the following figure. Slots 1 through 4 are primary slots and slots 5 through 7 are secondary. Slot 7 is a shared PCI/ISA slot. You can install a card in the number 7 PCI slot or the ISA slot, but not both.



NOTE Since the TowerMate expansion base uses the ISA slot to connect to the Ultra-tower, you cannot install a card into either of the shared slots if you install the TowerMate option. However, the TowerMate features a shared PCI/ISA slot, which replaces the occupied shared slot in the Ultra-tower. For more information, see the TowerMate documentation.

Upgrading Graphics Cards

If you are upgrading or replacing an Intergraph graphics, geometry, or VGA/power supply card, see the following tables for part numbers and recommended PCI slot designations.

Intergraph Graphics Card Part Numbers

The table below lists the part numbers of Intergraph graphics cards specified in the PCI Slot Designation table in the following section.

Part Number	Graphics Card
MSMT408	RealiZm II 1.3MP Graphics Card
MSMT415	RealiZm II 2.5MP Graphics Card
MSMT411	RealiZm II 2.5MP+ Graphics Card
MSMT416	VGA/Power Supply Card for RealiZm II
MSMT382	RealiZm II Geometry Accelerator

PCI Slot Designations for Intergraph RealiZm II Graphics Cards

DS and TS indicate dual-screen and triple-screen configurations, respectively.

Card	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
ZX13			MSMT408	MSMT416			
ZX13 DS			MSMT408	MSMT416	MSMT408	MSMT416	
ZX13 TS		MSMT408	MSMT416	MSMT408	MSMT416	MSMT408	MSMT416
ZX13-G		MSMT382	MSMT408	MSMT416			
ZX13-G DS		MSMT382	MSMT408	MSMT416	MSMT408	MSMT416	
ZX13-G TS	MSMT382	MSMT408	MSMT416	MSMT408	MSMT416	MSMT408	MSMT416
ZX25			MSMT415	MSMT416			
ZX25 DS			MSMT415	MSMT416	MSMT415	MSMT416	
ZX25 TS		MSMT415	MSMT416	MSMT415	MSMT416	MSMT415	MSMT416
ZX25-G		MSMT382	MSMT415	MSMT416			
ZX25-G DS		MSMT382	MSMT415	MSMT416	MSMT415	MSMT416	
ZX25-G TS	MSMT382	MSMT415	MSMT416	MSMT415	MSMT416	MSMT415	MSMT416
VX25			MSMT411	MSMT416			
VX25 DS			MSMT411	MSMT416	MSMT411	MSMT416	
VX25 TS		MSMT411	MSMT416	MSMT411	MSMT416	MSMT411	MSMT416
VX25-G		MSMT382	MSMT411	MSMT416			
VX25-G DS		MSMT382	MSMT411	MSMT416	MSMT411	MSMT416	
VX25-G TS	MSMT382	MSMT411	MSMT416	MSMT411	MSMT416	MSMT411	MSMT416

Installing Expansion Cards

If you are installing double card sets, such as a graphics card and a geometry accelerator, repeat the following procedure for the second card. See the documentation that came with the card for details on connecting the two cards.

For other cards, such as internal modems or SCSI adapters, see the documentation that came with the card for details on installation, configuration, cable connections, and operation.

To install an expansion card:

1. Locate an open slot. If you are installing any of the Intergraph RealiZm II products, see the table above for required slot assignments.
2. Remove the blanking plate for the slot. Keep the retaining screw.
3. Remove the expansion card from its antistatic packaging.
4. Slide the expansion card carefully into the card guides. Ensure that the gold-fingered connectors on the board's edge are aligned properly with the slot connector.
5. Push the card into the slot firmly and evenly until it is fully seated in the slot connector.
6. Inspect the connection. If it does not appear to be correct, remove and reinstall the card.
7. Install the retaining screw.
8. Attach any required cables to the internal or external connectors.
9. Install covers and restart the system.

Assigning System Resources

Some expansion cards include a configuration diskette that you can use to reserve the system resources required for the card. Other expansion cards do not include a diskette, but require that you manually program the BIOS with the configuration information.

See the "Configuring the BIOS" chapter in the *TDZ 2000 System Setup* for details on assigning system resources and configuring the BIOS for expansion cards.

See also the "Using System Resources" chapter in the *TDZ 2000 System Setup,* for a list of available system address resources (DMA, I/O, memory) and related details.

NOTE Treat non-compliant PCI cards and PCMCIA cards as ISA cards for assigning system resources.

Adding Internal SCSI Drives

The system provides dual-channel Wide Ultra SCSI-3 support for internal and external mass storage devices.

The TDZ 2000 features the following peripheral bays:

- One 3.5-inch x 1-inch external bay for floppy or combo drive.
- One 5.25-inch x 1.6-inch external bay for CD-ROM.
- Two 5.25-inch x 1.6-inch external bays for disk drives or other devices.
- Three 3.5-inch x 1-inch or two 3.5-inch x 1.6-inch internal bays for system or optional disks.

NOTE When installing 5.25-inch peripheral devices, use the screws provided in the package found in the Accessory Box.

See the following chapters for related information and important details:

- Chapter 5, “System Board,” for details on SCSI connector locations and pinouts.
- Chapter 6, “Peripherals,” for details on drive locations, jumpers, and cables.
- Chapter 7, “Power Supply, Fans, and Hardware Monitoring Devices,” for details on power supply cable connectors and pinouts.

Remember the following when installing devices in the system’s drive bays:

- If you are installing a SCSI drive, have the vendor’s documentation available to follow instructions for setting the SCSI ID, enabling or disabling termination, installing device drivers when required, and configuring other drive attributes.
- If you are installing a drive that connects to an adapter card (such as an EIDE drive), see the vendor’s documentation for installing the adapter card and required cables. See the “Adding Expansion Cards” section above for details.
- If you are installing a Kingston or other brand of removable disk drive module, see the vendor’s documentation for installing the module, removing terminators, and setting the SCSI ID.

NOTE Internal SCSI drives are not terminated. The internal SCSI cable provides termination. You must disable termination on any drive that you install in the system.

Device Locations

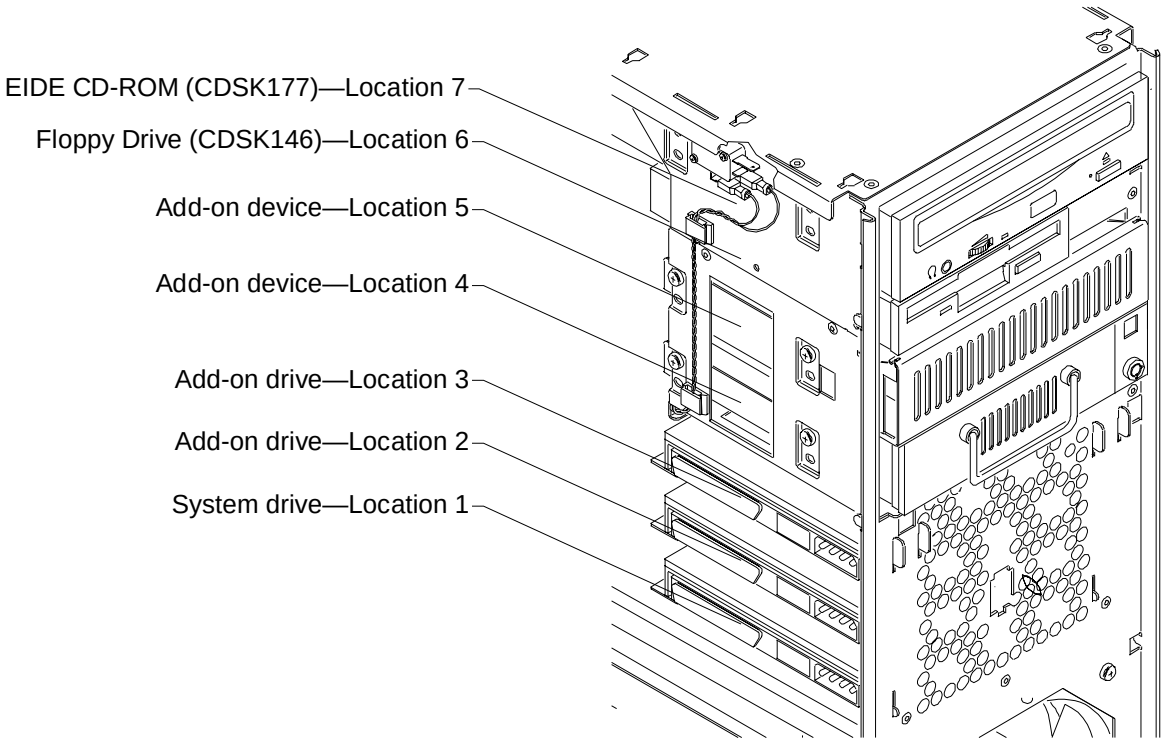
You can add optional mass storage devices to the internal and external drive bays. The following table provides the drive locations and related information. See the figure below.

Location	Drive	Peripheral Bay	Max Bay Capacity	SCSI ID
1	System disk drive	Internal	3.5-inch x 1.0 or 1.6-inch	0
2	Add-on disk drive	Internal	3.5-inch x 1.0 or 1.6-inch	1
3	Add-on disk drive	Internal	3.5-inch x 1.0-inch	2
4	Add-on device	External	5.25-inch x 1.6-inch	3
5	Add-on device	External	5.25-inch x 1.6-inch	4
6	Floppy drive	External	3.55-inch x 1.0-inch	—
7	EIDE CD-ROM	External	5.25-inch x 1.6-inch	—

NOTE You can install a total of three 3.5-inch x 1.0-inch drives or a total of two 3.5-inch x 1.6-inch drives in the internal drive bay.

The following figure shows drive locations. Devices are installed in all locations for figure. The EIDE CD-ROM, floppy drive, and system drive are standard. Other devices are available as options.

NOTE If you are installing an additional EIDE device on the primary EIDE bus, you must mount the device in Location 5 due to cabling restrictions.

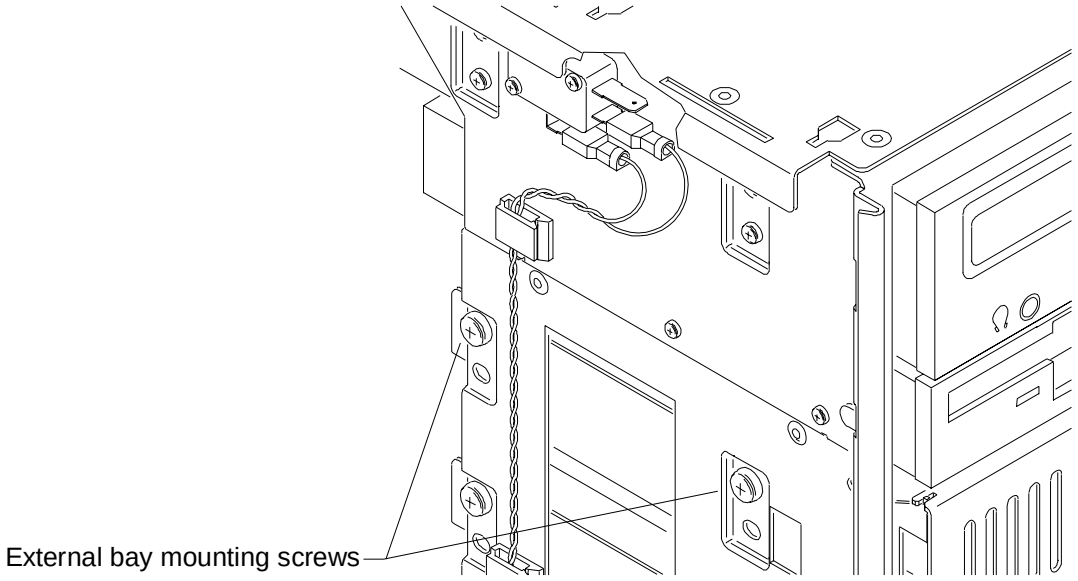


Installing Devices in the Drive Bays

NOTE Two internal bay drive brackets are installed in the chassis for mounting drive mechanisms.

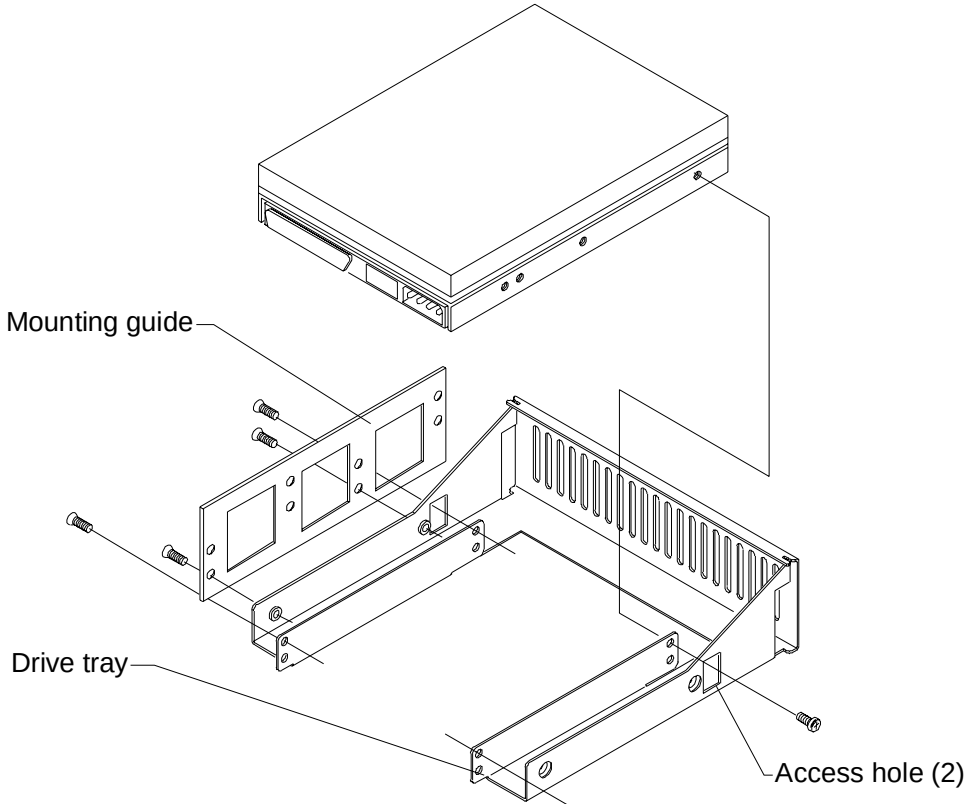
To install a drive in the external drive bay:

1. Remove the two screws that secure the external bay disk drive tray to the chassis. See the following figure.



2. From inside the chassis, push the tray out of the external bay. Then grasp the front of the tray and slide it out of the bay.
3. Do all of the following:
   - Set the SCSI ID on the new drive to an unused ID number
   - Disable termination on the new drive

   See Chapter 6, “Peripherals,” for details on these tasks.
4. Do one of the following:
   - If installing a standard disk drive, place the disk drive in the tray, align the mounting holes, and install the four mounting screws
   - If installing a 1.6-inch device, such as a tape drive or a CD writer, remove the mounting guide from the drive tray and attach the guide to the right side of the device
   - If installing a Kingston removable disk drive module, do not use the mounting guide



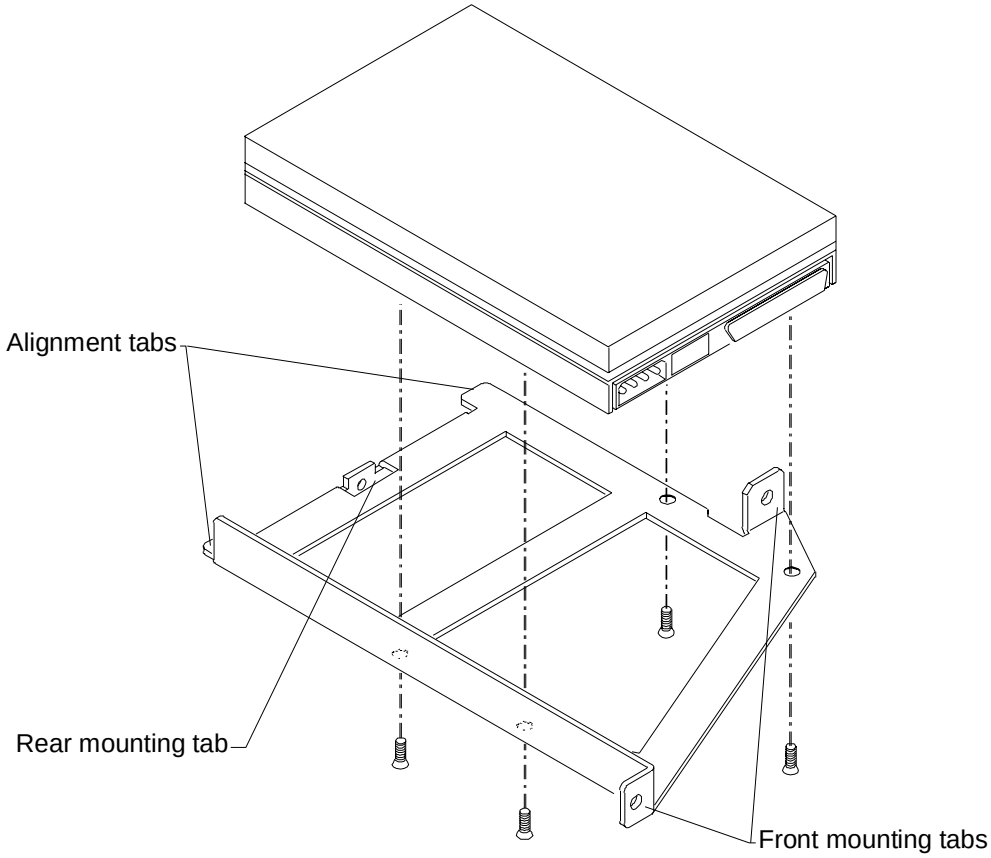
5. Do one of the following:
   - Slide the tray assembly into the chassis, align the mounting holes, and install the screws
   - Slide the 1.6-inch device into the chassis, align the mounting holes, and install the screws provided in the package found in the Accessory Box
   - Slide the removable disk drive module into the chassis, align the mounting holes, and install the mounting screws on the left and right sides of the chassis
6. Connect the SCSI cable and the power cable to the disk drive.

To install a drive in the internal bay:

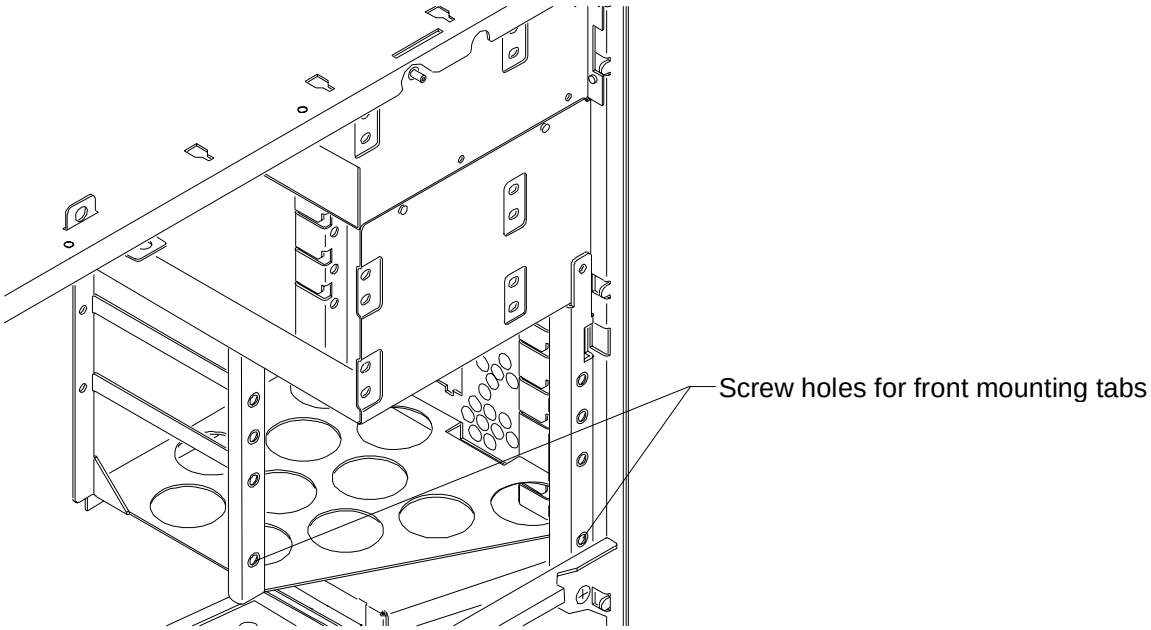
1. Remove the right and left covers. See Chapter 1, “Accessing the System,” for details.
2. Remove the two screws that secure the spare drive bracket assembly to the left side of the chassis.
3. Grasp the drive bracket assembly and remove the screw that secures the bracket to the right side of the chassis.
4. Pull the drive bracket assembly out of the chassis.

5. Do all of the following:
   - Set the SCSI ID on the new drive to an unused ID number
   - Disable termination on the new drive

   See Chapter 6, “Peripherals,” for details on these tasks.
6. Install the bracket on the new drive.



7. Insert the alignment tabs into the appropriate slots in the chassis.



8. Install the two screws that secure the drive bracket assembly front mounting tabs to the chassis.
9. Install the screw that secures the drive bracket assembly to the right side of the chassis.
10. Install the right cover.
11. Connect the SCSI cable and the power cable to the new drive.

Adding External SCSI Drives

You can add single-ended external SCSI drives to the system by connecting them to a SCSI port on the back of the system. The TDZ 2000 features a standard Ultra SCSI external port. A Wide Ultra SCSI external port is optional. See “External Ports” in Chapter 5, “System Board,” for a figure of port locations.

You can also install additional SCSI expansion cards (adapters) to support external SCSI drives. See the “Adding Expansion Cards” above for details.

NOTE Most SCSI adapters do not recognize a hard disk drive that was formatted using a different brand of adapter. For example, a hard disk drive formatted with an Adaptec SCSI adapter will not work with a Symbios SCSI adapter. You must use only Symbios-formatted hard disk drives with a Symbios SCSI adapter.

SCSI Cable Length Guidelines

The number of drives and length of the cables used to connect the drives is a factor when using SCSI-1, Fast SCSI (SCSI-2), Ultra SCSI, and Wide Ultra SCSI drives. Fast SCSI, Ultra SCSI, and Wide Ultra SCSI impose shorter cable restrictions than SCSI-1. The total length of the SCSI cabling must not exceed the following:

Drives	SCSI-1	Fast SCSI-2	Ultra SCSI	Wide Ultra SCSI
1 to 4	19.8 ft (6 meters)	9.9 ft (3 meters)	9.9 ft (3 meters)	9.9 ft (3 meters)
5 to 7	9.9 ft (3 meters)	9.9 ft (3 meters)	4.5 ft (1.5 meters)	4.5 ft (1.5 meters)

NOTE The SCSI controller (on the system board or an adapter card) counts as one device.

The total length of the SCSI cabling is the sum of the following:

- Wide Ultra SCSI cable inside the system—52 inches (132 cm)
- Ultra SCSI cable inside the system—14 inches (35.5 cm)
- SCSI cable inside each device—average 8 inches (20 cm)
- SCSI cable between the system and the first device
- SCSI cable between each device

SCSI Cable Quality Guidelines

To ensure data integrity and optimum performance, do the following:

- Use only Intergraph SCSI cables. Cables from other vendors may not provide adequate shielding.
- Use the shortest cables possible to connect SCSI devices to the system and to each other.

SCSI ID Guidelines

By default, specific devices use the following SCSI IDs:

- System disk drive (standard) uses ID 0
- SCSI bus always uses ID 7
- Read/write CD-ROM (optional) drive uses ID 4
- 4 mm DAT drive (optional) uses ID 6
- Iomega Jaz drive (optional) uses ID 6

NOTE To easily determine the ID of each SCSI device on the system, restart the system. When the BIOS screen displays, look for the list of SCSI devices and write down the ID for each device.

Some SCSI devices feature push switches to set the ID, while others have DIP switches or jumpers. See the vendor documentation for details on setting the ID.

SCSI Termination Guidelines for External Devices

Follow the guidelines below for terminating SCSI devices:

- **Enable** termination on the last external drive on the SCSI cable chain.
- **Disable** termination on all other external drives on the SCSI cable chain.
- Use only an active terminator on externally-terminated devices.

Connecting the Device

To add an external SCSI device:

1. Connect one end of the external SCSI cable to one of the following external ports:
   - The standard Ultra SCSI port, located just under the AC line out connector
   - The optional Wide Ultra SCSI port, located on the right side of the I/O panel
2. Connect the other end of the cable to the SCSI device.
3. Set the SCSI ID of the device to an unused number.
4. If the SCSI device is:
   - the *last* or *only* device on the SCSI chain, *enable* SCSI termination
   - NOT the *last* or *only* device on the SCSI chain, *disable* SCSI termination
5. Ensure that the power switch on the device is in the off position, and then connect the power cord to the device and then to an AC receptacle.
6. Turn on the power to the device and any other devices on the SCSI chain.
7. Start the system. If necessary, install the software drivers and configure the drive according to the vendor's instructions.

Changing SCSI Host Adapter or Device Settings

Depending on your system configuration or the capabilities of SCSI devices connected to your system, you may need to use the SCSI Configuration Utility to change host adapter or device settings. See Chapter 3, "Configuring the System," in the *TDZ 2000 System Setup* for details.

4 System Hardware Overview and Specifications

This chapter contains general, technical information about the hardware in a TDZ 2000.

System Configuration Summary

The following table summarizes the main features of the system.

Feature	Description
Processors	One or two 300 MHz Intel Pentium II with external 512 KB cache
Memory	Four banks, one DIMM per bank, non-interleaved
Memory Width	72 bits, ECC protected
Memory Style	Industry-standard 168-pin, unbuffered DIMM
Memory Type	SDRAM (Synchronous Dynamic Random Access Memory)
Memory Speed	66 MHz
Memory Density	Single or double density
Minimum/Maximum memory	64 MB (1-8Mx72 minimum); 512 MB (4-16Mx72 maximum)
Memory Expansion	64 or 128 MB increments
Networking	10/100BaseT/TX Ethernet
SCSI	One dual channel, 16-bit, Fast-20 Wide SCSI-3 controller for internal and external SCSI devices
EIDE	Primary EIDE port for CD-ROM (standard)
Mouse	Primax
Keyboard	PS/2 style, NMB multimedia with speakers
Graphics	Intergraph RealiZm II (ZX13, ZX25, & VX25)
System Disk Drive	4.3 GB or 9.1 GB 10,000 RPM (Wide Ultra, SMART)
CD-ROM	24X EIDE CD-ROM (standard) or 4X/2X SCSI CD Writer
I/O Slots	Six full-length PCI, one full-length PCI/ISA, one full-length Accelerated Graphics Port (AGP)
Peripheral Bays	Three 3.5-inch x 1-inch or two 3.5-inch x 1.6-inch internal bays for system disk and optional disks
	One 3.5-inch x 1.0-inch external bay for floppy drive
	One 5.25-inch x 1.6-inch external bay for CD-ROM
	Two 5.25-inch x 1.6-inch external bays for optional devices
I/O Ports	One PS/2 Mouse Port and one PS/2 Keyboard Port
	One Parallel Port, EPP- and ECP-compatible
	Two Serial (COM) Ports
	MIDI/Game Port
	Two Universal Serial Bus (USB) Ports

Feature	Description
	One Fast-SCSI 3 (Ultra) Port (standard)
	One Fast Wide SCSI 3 (Wide Ultra) Port (optional)
	Ethernet Port (RJ45 connector)
	Audio Ports: Microphone, Line In, Line Out
Power Supply	500 Watts, auto-ranging

System Board

The following table lists the main chip components on the MSMT401 system board.

Component	Description
System BIOS	American Megatrends BIOS 841xx
Processor(s)	Intel Pentium II; 300 MHz, SEC (Single Edge Connector)
Host-to-PCI Bridge	Intel 82443LX
Sound Controller	Crystal CS4237B
Ethernet Controller	Intel 82558 10/100BaseTX PCI
SCSI Controller	Symbios SYM53C876
Combo Controller	Standard Microsystems FDC37C682
PCI-to-ISA Bridge	Intel PIIX4
EIDE Controller	Intel 82371AB PCI/IDE Xccelerator
Universal Serial Bus Ports	Intel 82371AB PCI/IDE Xccelerator

Hardware Monitoring and Power Management

The TDZ 2000 features advanced hardware monitoring and power management capabilities. These capabilities help you save energy, prolong system life, and provide for future functionality, such as remote system wakeup.

The InterSite Hardware Monitor software reports the following key voltages and system states:

- All major voltages, including processor bus voltage; +5 V; +3.3 V; +12 V; -12 V
- Processor voltage ID
- Temperature at two locations (near primary processor and near expansion slots)
- Fan speed
- Low battery voltage alert
- Chassis intrusion security alert

See Chapter 2 in the *System Setup* for details on InterSite Hardware Monitor.

The top LED on the front panel indicates the following power states of the system:

LED	Power State	Description	Explanation
Green	Working	On	System is fully usable; power conservation is on a per-device basis.
Off	Mechanical Off	Off	No power consumption. The system is electromechanically off, disconnected from AC line power, or is indicating that one of the supply voltages is not correct. The system requires reconnection of power or correction of voltage problem and returns to the Working state only after a full shutdown and restart.

If the power cord is plugged in, but the LED is off, then the system has a power voltage problem. Call the Customer Response Center for assistance.

Refer to the *System Setup* for information about using the Automatic Shutdown Utility.

Intrusion Alert Switch

The intrusion alert switch (CSWX30800) is mounted at the top left side of the system near the front. This microswitch is the only replaceable component in the hardware monitoring system. If you detach the side panel when the system is off, the event is registered in the InterSite Hardware Monitor software. See Chapter 2, “Servicing the System,” for details on replacing the switch. See also InterSite Hardware Monitor Help for details.

Temperature Sensors

Resistive temperature sensors are located on the system board at U1 and U143, near the primary processor and the expansion slots, respectively. These devices provide signals for reporting temperature readout data to the InterSite Hardware Monitor software. The sensor at U143 provides the signal for controlling fan speed. The temperature sensors are part of the system board and are not field replaceable. See the system board diagram in Chapter 5, "System Board," for sensor location.

System Model Number

The model number on the unit identifies the system hardware and software configuration. The following table defines the individual digits.

Digit	Meaning	
1: Series	K:	TDZ 2000
2: Processor Type	2:	Single Intel Pentium II, 300 MHz, 512 KB cache
	3:	Dual Intel Pentium II, 300 MHz, 512 KB cache
3. Graphics	0:	No graphics
	7:	G97 Matrox Millennium II
	8:	RealiZm II ZX13
	A:	RealiZm II ZX25
	B:	RealiZm II VX25
4: Chassis	0:	Workstation
	V:	With Kingston Removable Drive Module
5: Memory	0:	No memory
	6:	64 MB
	7:	128 MB
6: CD-ROM	0:	No CD-ROM
	3:	EIDE CD-ROM
	5	SCSI CD-ROM
7: Disk Drives	R:	4.3 GB 10,000 RPM
	S:	9.1 GB 10,000 RPM
8: Operating System	2:	Windows NT Workstation
9: Revision	Variable	

Specifications

The following specifications apply to the TDZ 2000.

Item	Specifications
Dimensions	25.8 x 7.9 x 20.2 inches (65.4 x 20.0 x 50.8 cm)
Weight	55 LB. (25 kg) fully configured
Maintenance clearance	36 inches (91.4 cm) front and back
AC line voltage (US)	90 - 132 VAC, 47 - 63 Hz, 1 phase, 15A/125 V receptacle
AC line voltage (International)	180 - 264 VAC, 47 - 63 Hz, 1 phase, 15A/250 V receptacle
Power consumption	780 W (based on 6.5 A, 120 VAC, 60 Hz)
Recommended room temperature	50° to 80° F (10° to 26° C)
Recommended room humidity	20% to 80% (non-condensing)
Heat dissipation	2,662.14 BTU/hr

Optional Hardware

If your system includes any of the following hardware, see the documentation delivered with that hardware for additional information:

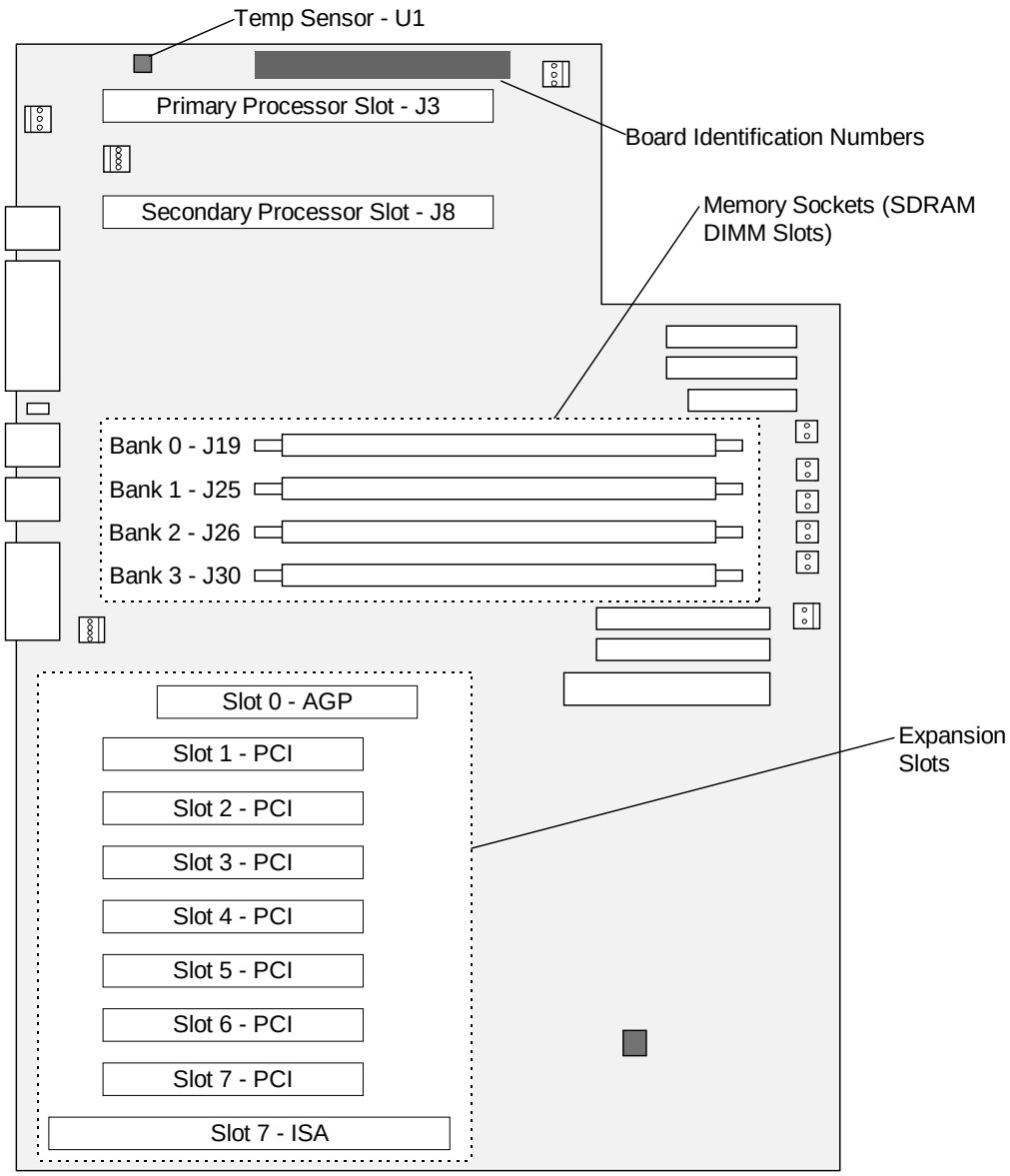
- Display (single, double, triple)
- External SCSI CD-ROM, SCSI CD-ROM reader/writer, SCSI optical drive, or SCSI disk drive
- Removable SCSI disk drive

5 System Board

This chapter provides cable and jumper connector information, major component descriptions, memory subsystem details and addresses, and external port pinouts for the MSMT401 (Revision A) system board.

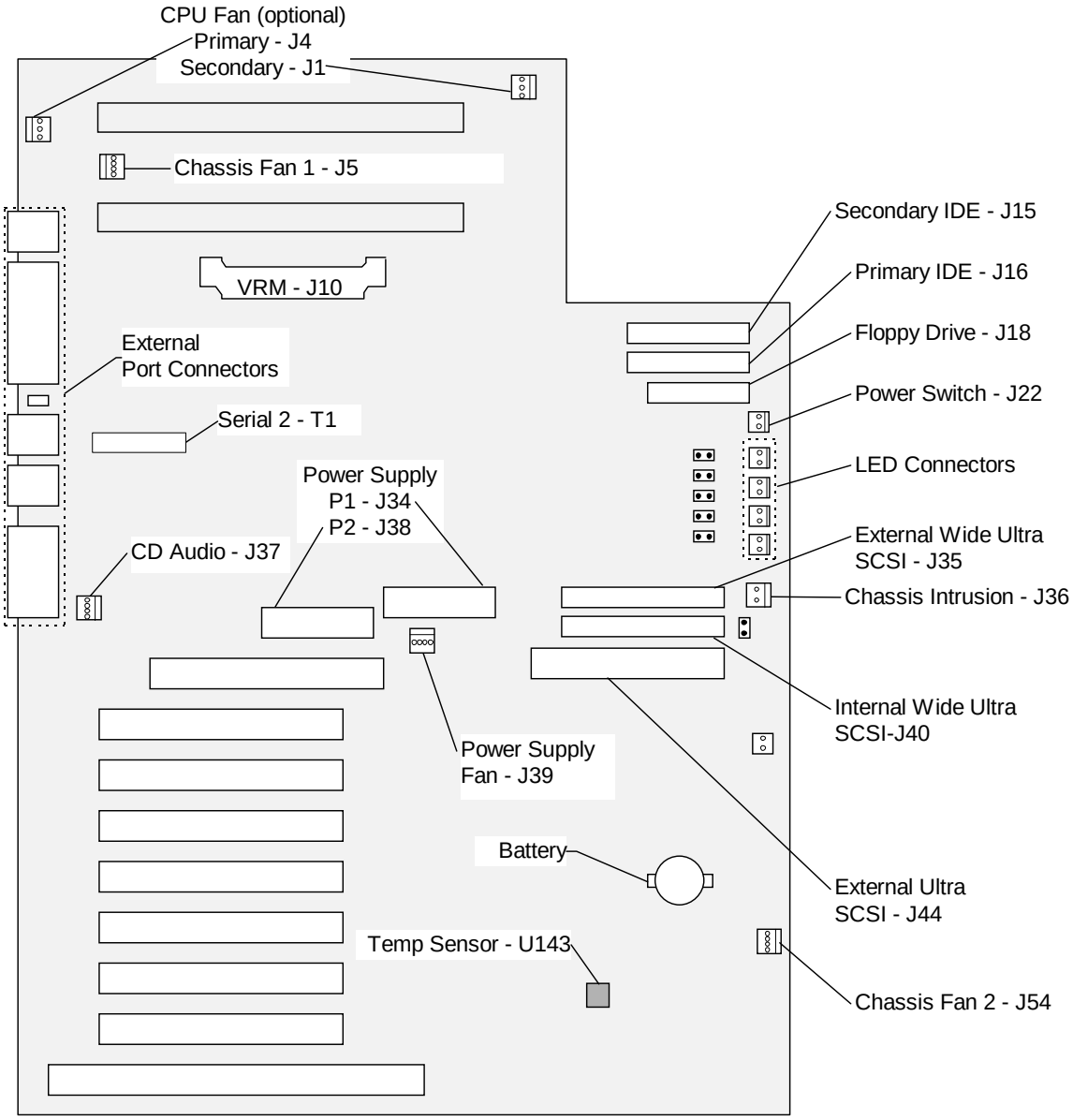
Slots and Sockets

The following diagram shows the location of slots and sockets on the system board.



Cable Routing and Pinouts

The following figure shows the cable connectors and other components on the system board.



The following tables lists jumper, connector, cable, and device connection details.

NOTE See Chapter 7, “Power Supply, Fans, and Hardware Monitoring Devices,” for power connectors J34 and J38. See also Chapter 6, “Peripherals,” for details on data cables.

From	Board Connector	Cable	To
J4	Boxed processor fan (primary)	—	Optional CPU fan
J1	Boxed processor fan (secondary)	—	Optional CPU fan
J37	CD-ROM Audio	MCBL122A	EIDE CD-ROM CDSK177
J5	Chassis Fan 1	CFAN12009	Fan, top rear
J54	Chassis Fan 2	CFAN12009	Fan, bottom front
J33	Disk Activity LED	MCBL247A	Front panel disk activity LED (green)
J18	Floppy	MCBL067A	Floppy drive CDSK146
J36	Intrusion Alarm	MCBL251A	Intrusion alarm switch CSWX30800
J29	LED Power	MCBL248A	Front panel power LED (green)
J23	LED Power	MCBL249A	Front panel power LED (yellow)
J22	Main Power	MCBL250A	Front panel power button
J39	Power supply fan	P10	Fan, power supply, 2- or 4-wire
J16	Primary EIDE	MCBL252A	EIDE CD-ROM CDSK177
J44	SCSI, External Ultra	MCBL253A3	MSMT283 terminator/adapter with 50-pin high-density external connector
J35	SCSI, External Wide Ultra	MCBL255A	Rear panel 68-pin connector, optional
J40	SCSI, Internal Wide Ultra	MCBL254A	System disk at SCSI ID 0
T1	Serial Port 2	MCBLW680A	Rear panel external serial port 2 (COM2)

J1, J4 - Boxed Processor Fan (optional)

Pin	Signal	Pin	Signal
1	Ground	3	Tach
2	+12V		

J37 - CD-ROM Audio, MCBL122A, EIDE CD-ROM CDSK177

Pin	Signal	Pin	Signal
1	Right Sound Channel	3	Left Sound Channel
2	Ground	4	Ground

J5 - Chassis Fan 1, CFAN12009 (top rear)

Pin	Signal	Color	Pin	Signal	Color
1	Fan control input	Brown	3	Voltage +	Red
2	Fan Tach	White	4	Return -	Black

J54 - Chassis Fan 2, CFAN12009 (bottom front)

Same as J5.

J33 - Disk Activity LED (green), MCBL247A

Pin	Signal	Color
1	DiskActive	Orange
2	Ground	Black

J18 - Floppy Disk Drive, MCBL067A, CDSK146

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

J36 - Intrusion Alarm, MCBL251A, Switch CSWX30800

Pin	Signal	Color
1	Alarm	Red
2	Ground	Black

J29 - Power On LED (green), MCBL248A

Pin	Signal	Color
1	PwrGood	White
2	Ground	Black

J23 - Power Managed LED (yellow), MCBL249A

Pin	Signal	Color
1	PwrGood	Blue
2	Ground	Black

J22 - Main Power, MCBL250A, Front Panel Standby Switch

Pin	Signal	Color
1	+ 5 V trickle	White
2	PWRBTN	Green

J39 - Power Supply Fan, P10, Power Supply, 2-Wire

Pin	Signal	Color
1	Voltage +	Red
2	Return -	Black

J39 - Power Supply Fan, P10, Power Supply, 4-Wire

Pin	Signal	Color	Pin	Signal	Color
1	Fan control input	Brown	3	Voltage +	Red
2	Fan Tach 1	White	4	Return -	Black

J16 - Primary EIDE, MCBL252A, EIDE CD-ROM CDSK177

Pin	Signal	Pin	Signal	Pin	Signal
1	BRSTDRV-	15	D01+(1)	28	VCC
2	Ground	16	D01+(14)	29	DOAK0-
3	D01+(7)	17	D01+(0)	30	Ground
4	D01+(8)	18	D01+(15)	31	IRQ14
5	D01+(6)	19	Ground	32	IOCS16-
6	D01+(9)	20	—	33	DA1

Pin	Signal	Pin	Signal	Pin	Signal
7	D01+(5)	21	D0RQ0-	34	—
8	D01+(10)	22	Ground	35	DA0
9	D01+(4)	23	DOIOW-	36	DA2
10	D01+(11)	24	Ground	37	CS1P-
11	D01+(3)	25	D0IOR-	38	CS3P-
12	D01+(12)	26	Ground	39	IDEACTVP-
13	D01+(2)	27	IORDY	40	Ground
14	D01+(13)				

J35 - SCSI, External Wide Ultra, MCBL255A, 68-Pin Connector (optional)

Pin	Signal	Pin	Signal	Pin	Signal
17	TERMPWR	45	SD-(5)	57	SBSY-
18	TERMPWR	46	SD-(6)	58	SACK-
35	SD-(12)	47	SD-(7)	59	SRSI-
36	SD-(13)	48	SDP0-	60	SMSG-
37	SD-(14)	49	Ground	61	SSEL-
38	SD-(15)	50	Ground	62	SCD-
39	SDP1-	51	TERMPWR	63	SREQ-
40	SD-(0)	52	TERMPWR	64	SIO-
41	SD-(1)	53	No connection	65	SD-(8)
42	SD-(2)	54	Ground	66	SD-(9)
43	SD-(3)	55	SATII-	67	SD-(10)
44	SD-(4)	56	Ground	68	SD-(11)

Remaining pins connected to ground.

J40 - SCSI, Internal Wide Ultra, MCBL254A, System Disk/Other SCSI Devices

See “J35” above.

J44 - SCSI, External Ultra, MCBL253A, MSMT383 Terminator

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
2	SD-(0)	16	SD-(7)	30	Ground	44	SSEL-
4	SD-(1)	18	SDP0-	32	SATII-	46	SCD-
6	SD-(2)	20	Ground	34	Ground	48	SREQ-
8	SD-(3)	22	Ground	36	SBSY-	50	SIO-
10	SD-(4)	24	Reserved	38	SACK-		
12	SD-(5)	26	TPWR	40	SRST-		
14	SD-(6)	28	Reserved	42	SMSG-		

Remaining pins connected to ground.

T1 - Serial Port 2, MCBLW680A, External Serial Port 2

See pinouts for “Serial” below.

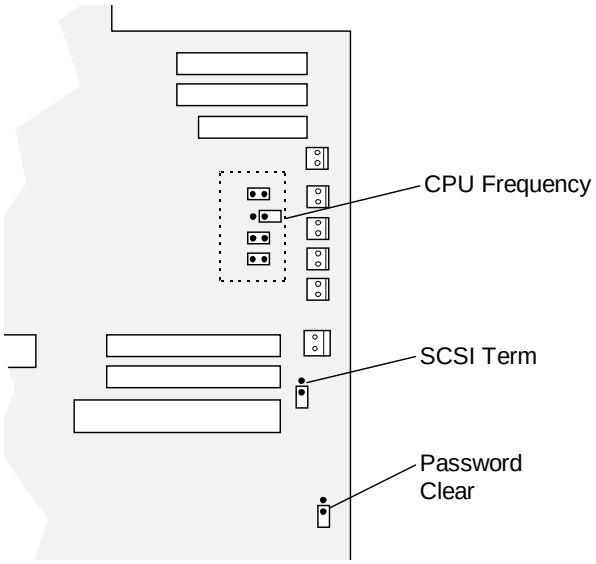
Jumper Connectors

The following table shows the jumper settings for CPU frequency. IN denotes the jumper is installed on both pins. The jumpers are located to the right of the DIMM slots. See the system board diagram above for details.

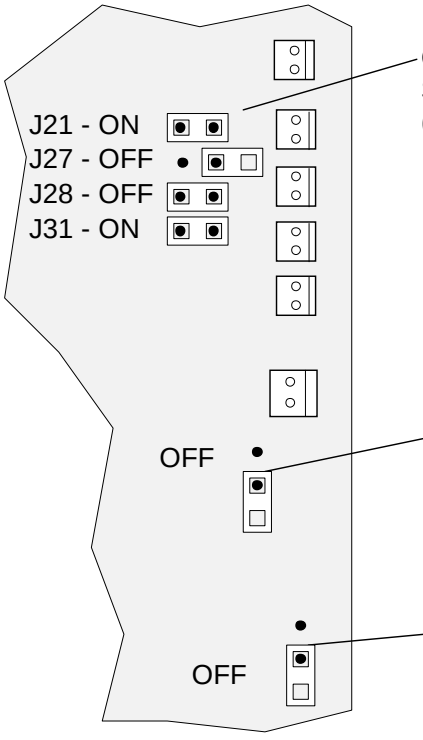
NOTE BIOS version 8410F or higher must be installed to use a 333 MHz Pentium II processor. Earlier BIOS versions do not support frequencies higher than 300 MHz.

Jumper	266 MHz	300 MHz	333 MHz
J21	ON	ON	OFF
J27	OFF	OFF	OFF
J28	ON	OFF	ON
J31	ON	ON	ON

The following figure shows the jumper locations on the system board.



The following figure details the jumper settings.



CPU Frequency. Settings for 266 MHz (Default)

Do not change CPU Frequency jumper settings.

SCSI Term - J41

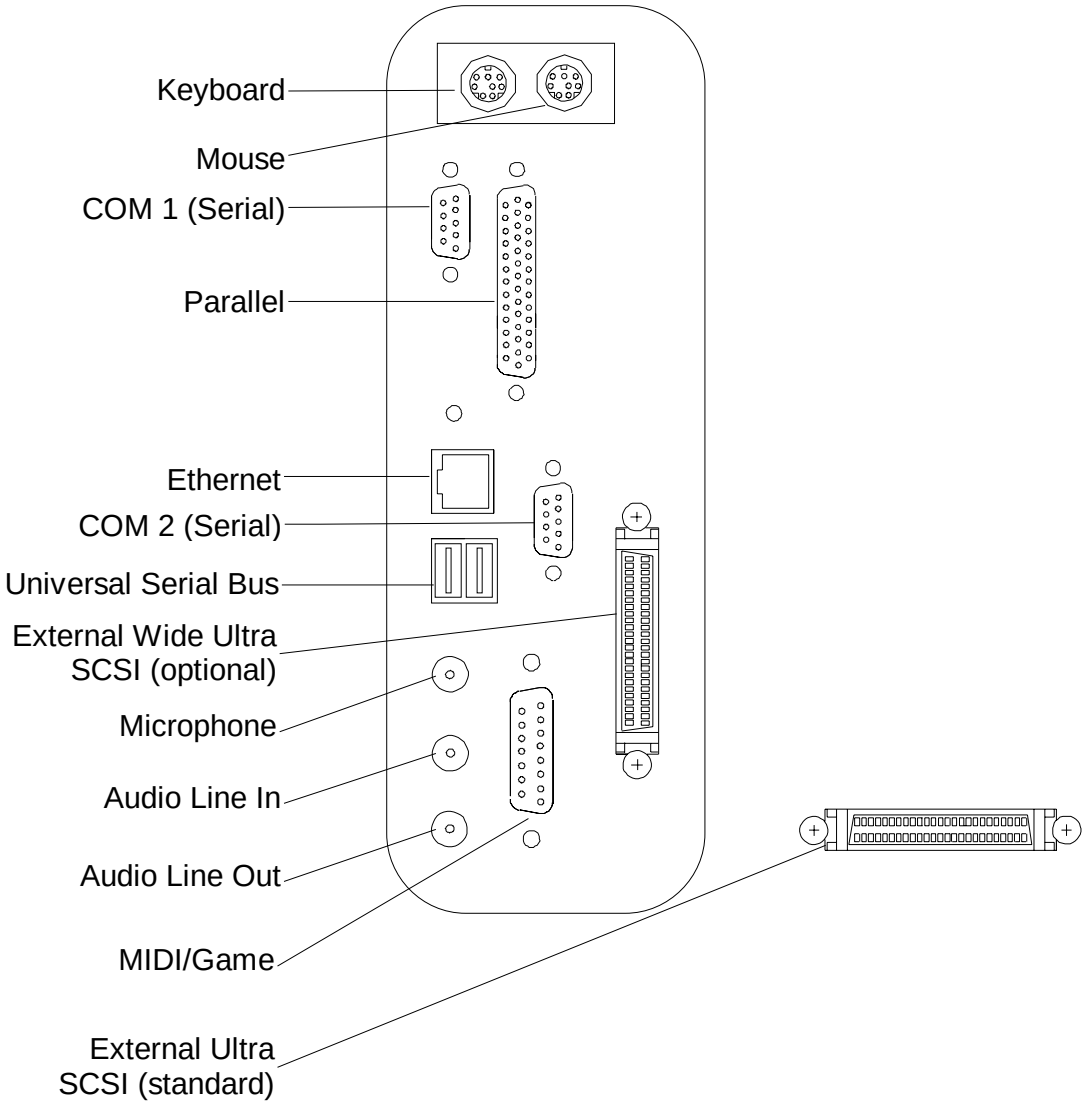
OFF (default) means termination is enabled. Add a jumper to disable termination.

Password Clear - J47

OFF means BIOS checks for password during boot. ON means BIOS will not check for password.

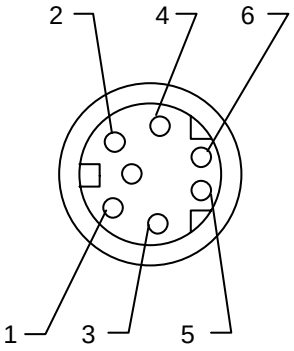
External Ports

The following figure shows the external ports on the back of the unit.



Keyboard, Mouse

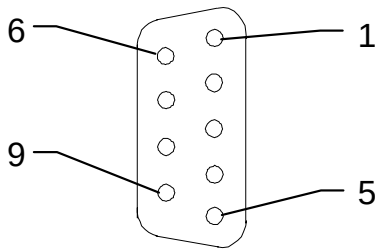
The keyboard and mouse ports are PS/2 style, 6-pin ports. They are not interchangeable.



Pin	Signal
1	KDATA (keyboard) MDATA (mouse)
2	Spare
3	Ground
4	VCC
5	KCLK
6	Spare

Serial

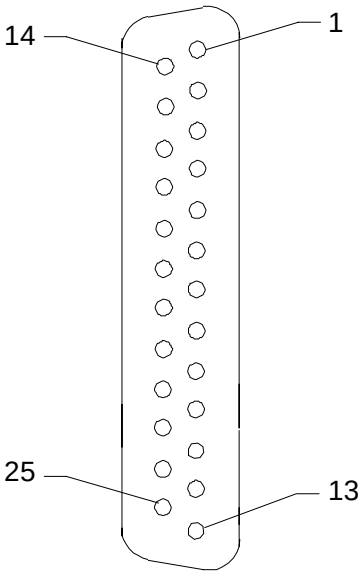
1 2 The serial ports (also referred to as RS-232 asynchronous communications ports, or COM ports) connect modems, printers, peripherals, and other computers to the system. The serial ports (labeled 1 and 2) are 9-pin, male DB9 connectors. If connecting a serial device with a 25-pin DB25 connector, use a 25-pin to 9-pin adapter cable to mate with the serial port on the system. Use only shielded cables with the serial ports.



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

Parallel

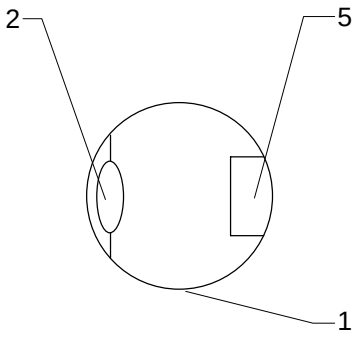
The parallel port is used almost exclusively for printers, but is compatible with any peripheral device designed to interface with a standard Centronics-type parallel port. Use only shielded cables with the parallel port (DB-25).



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

Audio Line Out

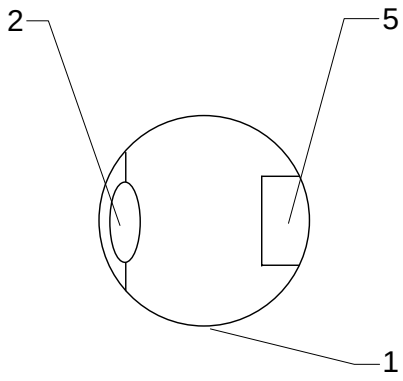
The Audio Line Out port connects the speaker jack of the NMB multimedia keyboard to the computer. You can also use the port to connect other audio output devices, such as stereo speakers or headphones, a tape deck or an external amplifier, to the computer.



Pin	Signal
1	Ground
2	Left Channel Out
5	Right Channel Out

Audio Line In

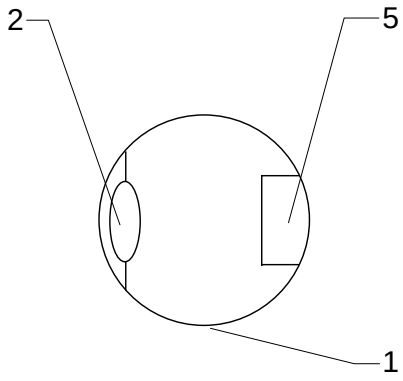
The Audio Line In port connects audio input devices, such as a tape deck or a CD player, to the computer.



Pin	Signal
1	Ground
2	Left Channel In
5	Right Channel In

Microphone

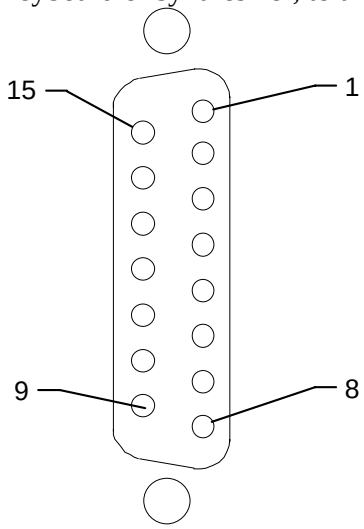
The Microphone port connects the microphone jack of the NMB multimedia keyboard to the computer. You can also use the port to connect a headset microphone to the computer.



Pin	Signal
1	Ground
2	MIC 2
5	MIC 1

Game/MIDI

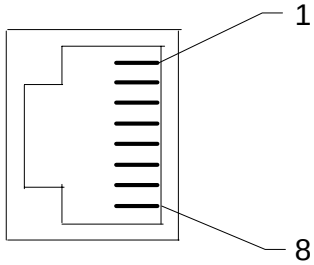
The Game/MIDI port connects a game joystick or a MIDI device, such as a musical keyboard or synthesizer, to the system.



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

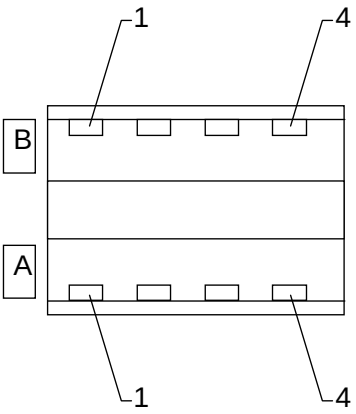
The Ethernet port connects a network cable (with an RJ45 connector) to the computer.



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

Universal Serial Bus

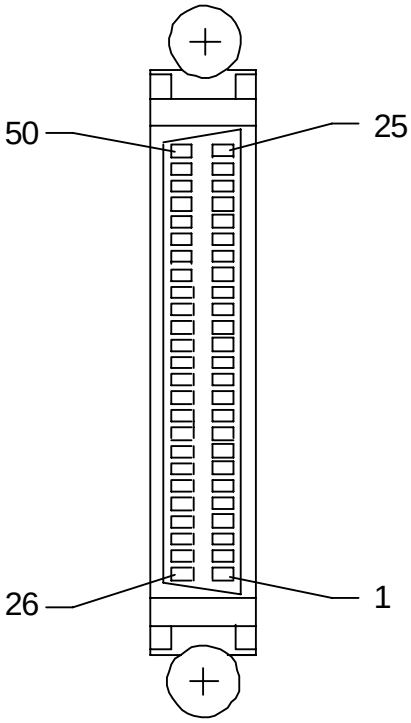
The Universal Serial Bus (USB) port connects USB devices to the computer. These devices can include printers, keyboards and other peripherals that have historically used serial, parallel, mouse, and keyboard I/O buses. USB devices, designed to be fully Plug-and-Play (PnP), feature hot attach/detach and daisy-chain capabilities. The USB port can transfer data at a maximum theoretical rate of 12 megabits per second.



Pin	Signal	Pin	Signal
A1	PWR	B1	PWR
A2	-	B2	-
A3	+	B3	+
A4	GROUND	B4	GROUND

External Ultra SCSI

The external Ultra SCSI port (standard) connects external SCSI devices, such as tape drives or hard disks, to the computer. The maximum sustainable data transfer rate is 20 MB per second.

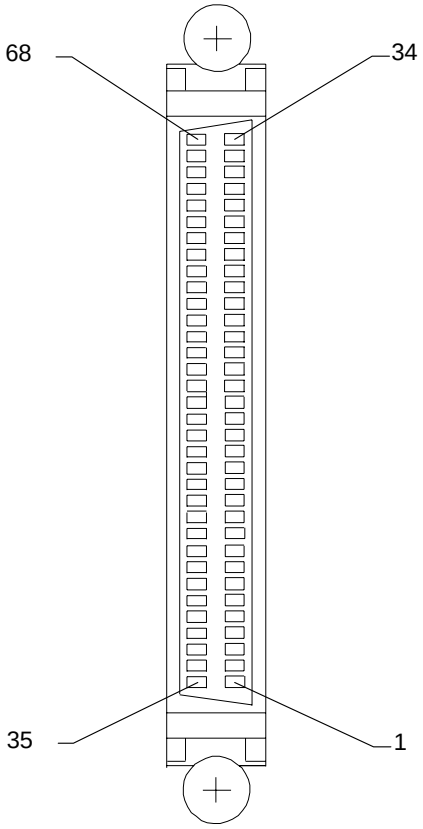


Pin	Signal
26	Command Data-0
27	Command Data-1
28	Command Data-2
29	Command Data-3
30	Command Data-4
31	Command Data-5
32	Command Data-6
33	Command Data-7
34	Command Data Parity
38	Terminator Power
41	Attention
43	Busy
44	Acknowledge
45	Reset
46	Message
47	Select
48	Command
49	Request
50	Input/Output

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

External Wide Ultra SCSI

The external Wide Ultra SCSI port (optional) connects Wide Ultra SCSI devices, such as tape drives or hard disks, to the computer. This port has a maximum theoretical sustainable data transfer rate of 40 MB per second.



Pin	Signal	Pin	Signal
17	TERMPWR	50	Ground
18	TERMPWR	52	TERMPWR
35	SD-(12)	53	No connection
36	SD-(13)	54	Ground
37	SD-(14)	55	SATII-
38	SD-(15)	56	Ground
39	SDP1-	57	SBSY-
40	SD-(0)	58	SACK-
41	SD-(1)	59	SRSI-
42	SD-(2)	60	SMSG-
43	SD-(3)	61	SSEL-
44	SD-(4)	62	SCD-
45	SD-(5)	63	SREQ-
46	SD-(6)	64	SIO-
47	SD-(7)	65	SD-(8)
48	SDP0-	66	SD-(9)
49	Ground	67	SD-(10)
51	TERMPWR	68	SD-(11)

NOTE Pins not listed are connected to ground.

Sound Controller

The sound controller is the Crystal CS4237B. Integrated onto the system board, the controller is a complete, fully-featured PC 97 compliant sound implementation. It has the following specifications:

Feature	Specification
Audio Resolution	16-bit
MIDI/UART Mode Compatibility	Roland MPU401
Bus Interface	16-bit ISA
CODEC	Delta Sigma-based Windows Sound System
CODEC FIFO	16 Samples
FM Synthesizer	Crystal internal FM synthesis
External Audio Inputs	Microphone (Monaural), Stereo Line-In
Internal Audio Inputs	Stereo FM Synthesis, Stereo Wave Data, Stereo CD, Monaural 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

The Crystal CS4237B sound controller is configured entirely through I/O port accesses. When the system is powered up, the hardware forces the Crystal CS4237B 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
Base I/O Address / MPU-401	220/330
8-bit Playback DMA	1
8-bit Capture DMA	3
Base IRQ / MPU IRQ	5/15

Configuration Data

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.

DMA	Assignment	DMA	Assignment
0	LPT	4	Cascade input for 0-3
1	Crystal CS4237B Controller	5	Spare
2	Floppy Controller	6	Spare
3	Crystal CS4237B Controller	7	Spare

Input/Output Addresses

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

Address	Device
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)
03F0 - 03F7	Floppy Controller
03F8 - 03FF	Serial Port COM1

Memory Address Map

The following table lists the memory address map assignments.

Memory Address	Size	Assignment
00000000 - 0009FFFF	640K	System board memory
000A0000 - 000BFFFF	128K	Video memory
000C0000 - 000C7FFF	32K	Video ROM

Memory Address	Size	Assignment
00000000 - 0009FFFF	640K	System board memory
000C8000 - 000DFFFF	96K	Available I/O Adapter ROM
000E0000 - 000EFFFF	64K	BIOS ROM and PCMCIA
000F0000 - 000FFFFF	64K	BIOS ROM
00100000 - 1FFFFFFF	511M	Expansion memory
20000000 - 3FFFFFFF	—	Reserved

PCI to ISA Bus Interrupt Mapping

The ISA bridge 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.

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 is routed. You can map the PIRQs to the following ISA interrupts:

IRQ 5, 10, 11, 15

You can also map to IRQ 3, 4, 7, 12, and 14, but other devices are disabled if you do so.

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

Interrupt Line	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
INTA	PIRQ0	PIRQ1	PIRQ2	PIRQ3	PIRQ0	PIRQ1	PIRQ2
INTB	PIRQ1	PIRQ2	PIRQ3	PIRQ0	PIRQ1	PIRQ2	PIRQ3
INTC	PIRQ2	PIRQ3	PIRQ0	PIRQ1	PIRQ2	PIRQ3	PIRQ0
INTD	PIRQ3	PIRQ0	PIRQ1	PIRQ2	PIRQ3	PIRQ0	PIRQ1

Interrupt Requests (IRQs)

System interrupt request (IRQ) assignments are defined below.

IRQ	Name	IRQ	Name
0	System Timer	8	Real Time Clock
1	Keyboard	9	SMBUS/ACPI
2	Cascade input for IRQ8 - IRQ15	10	Crystal CS4237B Sound Controller
3	COM2, COM4	11	Spare
4	COM1, COM3	12	Mouse
5	MIDI port	13	Floating Point Unit
6	Floppy Controller	14	EIDE CD-ROM
7	Parallel Port	15	Hardware Monitor

You can assign the spare interrupt listed above to an ISA device. When you add a PCI device to the system, the system BIOS automatically assigns the interrupt. However, at least one interrupt must be available for the PCI bus.

When you add an ISA board, you must reserve the interrupt using the AMIBIOS Setup utility and jumpers on the expansion board. See the *TDZ 2000 System Setup* for details on using AMIBIOS Setup. See also the vendor documentation for the expansion board for jumper and related information.

6 Peripherals

This chapter provides information on the cabling and configuration of common peripherals within the system.

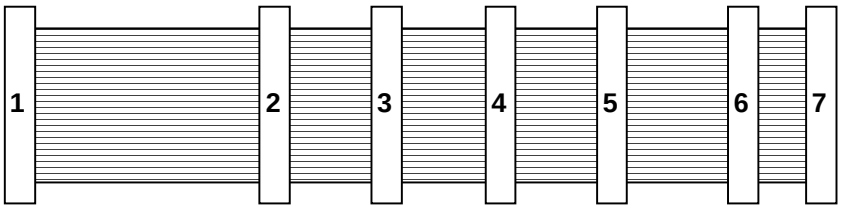
Peripheral Cables

This section provides information on peripheral cables and associated connections. See the section, “Cable Routing and Pinouts,” in Chapter 5, “System Board,” for additional details. Cable illustrations are not to scale. You can identify the cables and connectors using their spacing as reference. Connectors for SCSI devices are spaced approximately 8 in (20 cm) apart.

CAUTION You must disable termination on any SCSI device you install internally. If you do not disable termination, the system may fail to start or may behave erratically.

Internal Wide Ultra SCSI Cable (MCBL254A) Connection Locations

The following illustration and table show the cable connectors and the locations to which they attach. This cable is approximately 52 in (132 cm) long.

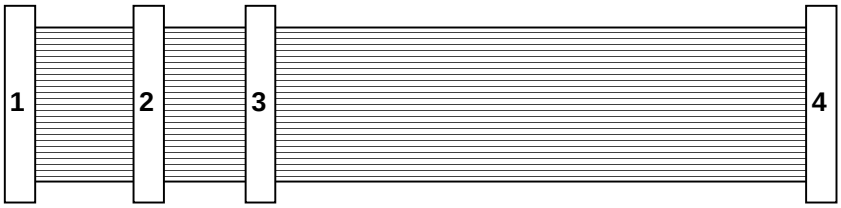


Connector	Connects To
1	J40, system board
2	System Disk at Location 1 (internal bay)
3	Disk at Location 2 (internal bay)
4	Disk at Location 3 (internal bay)
5	Device at Location 4 (external bay)
6	Device at Location 5 (external bay)
7	Active terminator

See “Device Locations” in Chapter 3, “Upgrading the System,” for details on standard peripheral locations.

Internal Ultra SCSI Cable (MCBL253A) Connection Locations

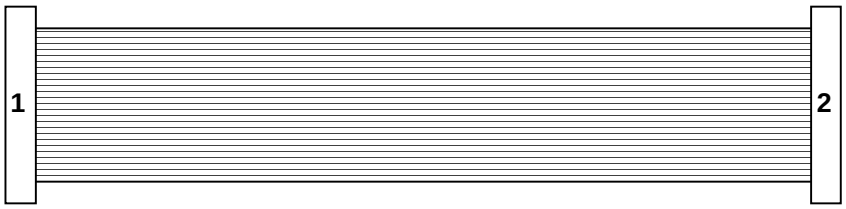
The following illustration and table show the cable connectors and the locations to which they attach. This cable is approximately 36 in (91 cm) long.



Connector	Connects To
1	J44, system board
2	Device at Location 4 (external bay)
3	Device at Location 5 (external bay)
4	External SCSI Terminator board MSMT283

External Wide Ultra SCSI Cable (MCBL255A) Connection Locations

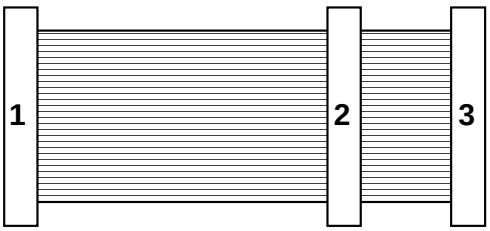
The following illustration and table show the cable connectors and the locations to which they attach. This optional cable is approximately 14 in (35.5 cm) long.



Connector	Connects To
1	J35, system board
2	External SCSI 68-pin connector on rear panel

EIDE Cable (MCBL252A) Connection Locations

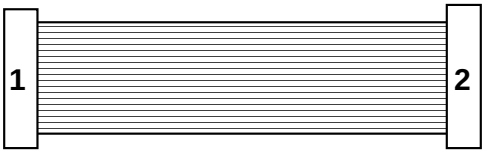
The following illustration and table show the cable connectors and the locations to which they attach. This cable is approximately 10.5 in (26.7 cm) long.



Connector	Connects To
1	J16, system board
2	Device at Location 5 (external bay)
3	EIDE CD-ROM CDSK177 at Location 7

Floppy Cable (MCBL067A) Connection Locations

The following illustration and table show the cable connectors and the locations to which they attach. This cable is standard and is approximately 17 in (43.1 cm) long.



Connector	Connects To
1	J18, system board
2	Floppy disk drive

Peripheral Configuration

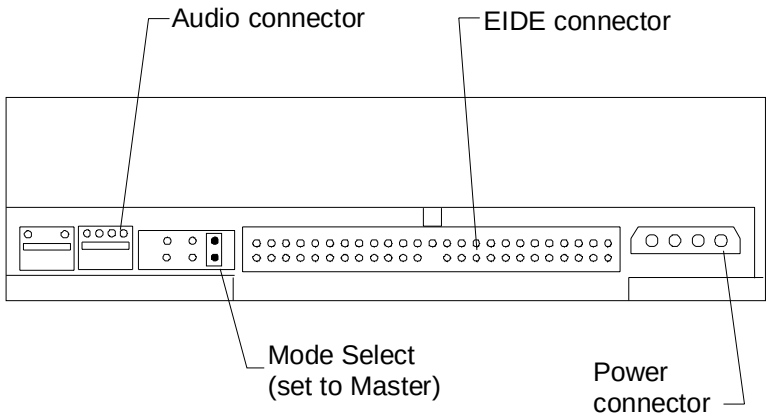
This section provides illustrations and information on configuring common peripherals for the system.

See the following for related information:

- Chapter 5, “System Board,” for cable connector locations and pinouts.
- Chapter 7, “Power Supply, Fans, and Hardware Monitoring Devices,” for power cable information and pinouts.
- Vendor documentation provided with the peripheral device.

EIDE CD-ROM Drive (CDSK177)

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

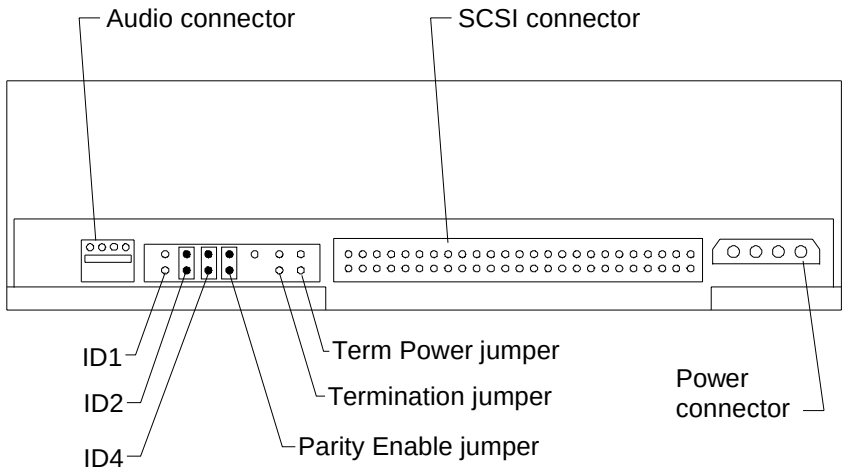


Device Connector	Cable	Connects to
Audio (analog)	MCBL122A	J37, system board
EIDE	MCBL252A	J16, primary EIDE, system board
Power	P4	Power supply

The Mode Select header is jumpered “Master” as shown.

SCSI CD Recorder (CDSK133)

The following figure shows the back of the CD recorder.



Device Connector	Cable	Connects to
Audio (analog)	MCBL122A	J37, system board
Power	P3; P5-P9	Power supply
SCSI	MCBL254A	J40, system board

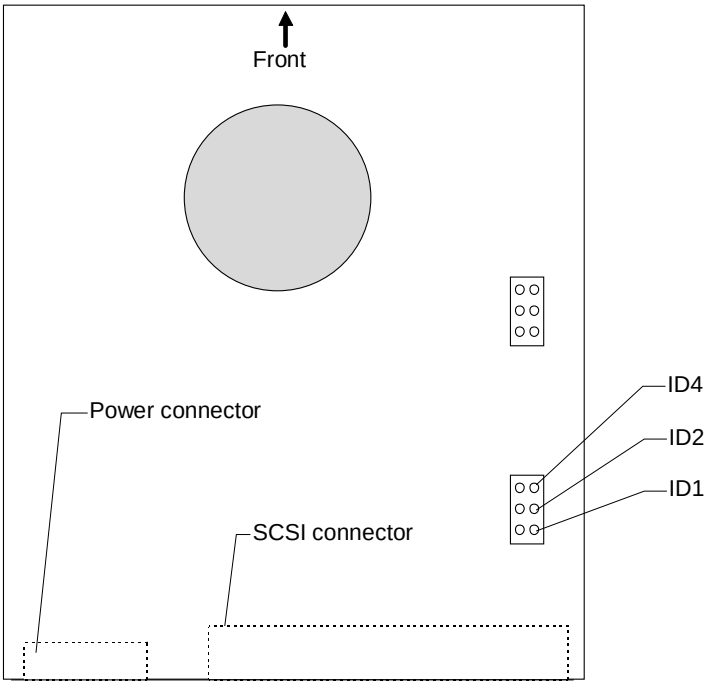
To disable SCSI termination, remove the Termination jumper and the Term Power jumper.

Use jumpers as defined in the following table to set the SCSI ID.

SCSI ID	ID1	ID2	ID4
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

Iomega Jaz 1 GB SCSI Internal Drive (CDSK168)

The following figure shows the jumpers on the bottom of the drive.



Device Connector	Cable	Connects to
Power	P3; P5-P9	Power supply
SCSI	MCBL254A	J40, system board

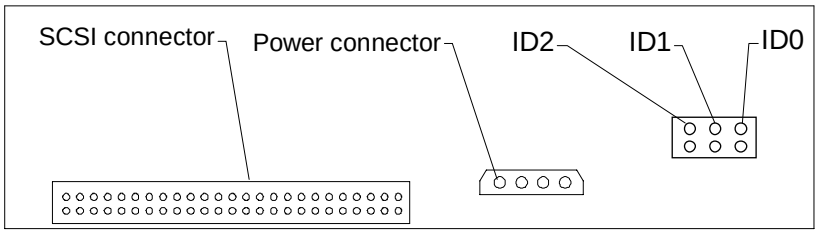
The drive is not terminated and requires external termination only if installed as the last device on the SCSI chain.

Use jumpers as defined in the following table to set the SCSI ID. The factory default address is SCSI ID 5.

SCSI ID	ID1	ID2	ID4
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

40 GB 8MM Tape Drive (CMTP169)

The following figure shows the back of the tape drive.



Device Connector	Cable	Connects to
Power	P3; P5-P9	Power supply
SCSI	MCBL254A	J40, system board

SCSI termination is permanently disabled.

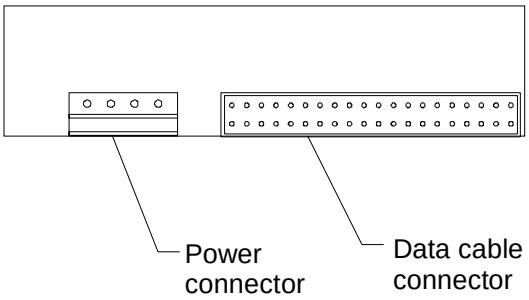
Use jumpers as defined in the following table to set the SCSI ID.

SCSI ID	ID0	ID1	ID2
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

Floppy Disk Drive (CDSK146)

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



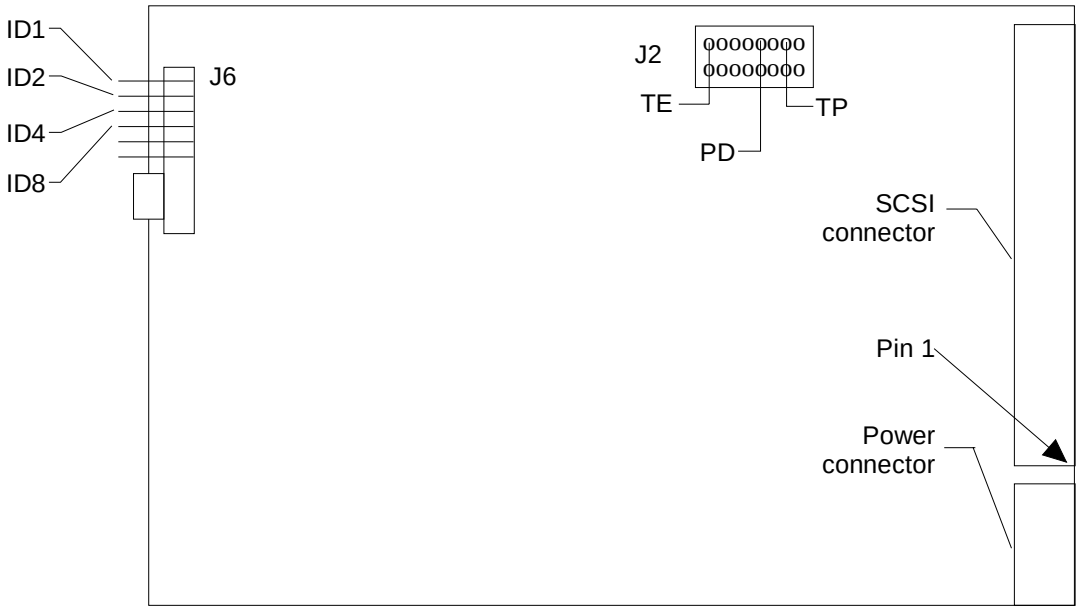
Device Connector	Cable	Connects to
Power	P3	Power supply
Data	MCBL194A	J18, system board

4.3 GB and 9.1 GB Disk Drives (CDSK166, CDSK167)

You can use either of the following Wide Ultra SCSI disk drives in the system:

Part Number	Vendor Number	RPM	Capacity
CDSK166	Seagate ST19101W	10,000	9.1 GB
CDSK167	Seagate ST34501W	10,000	4.3 GB

The following figure shows the jumper connectors J6 and J2 on the Seagate 4.3 GB and 9.1 GB disk drives. Remove the drive from its bracket to access J2.



Device Connector	Cable	Connects to
Power	P3; P5-P9	Power supply
SCSI	MCBL254A	J40, system board

To disable SCSI termination, remove the TE jumper from connector J2. To enable parity, remove the PD jumper from connector J2. For optimum performance, remove all jumpers from J2.

Use jumpers as defined in the following table to set the SCSI ID.

SCSI ID	ID1	ID2	ID4	ID8
0	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF

7 Power Supply and Cooling Fans

This chapter describes the 500-watt power supply, power-related pinouts, cooling fans, and hardware monitoring devices.

Power Supply

CPWS15200 is a 500-watt autoranging supply. It switches between 90-132 VAC or 180-264 VAC, depending on the location. The input frequency is 47-63 Hz, single phase. At full load, the power supply has a minimum efficiency of 65 percent.

When you connect AC power to the system, the computer is powered in its lowest "trickle" power state, even though the fans do not run and the LEDs do not glow. In this respect, the TDZ 2000 is always powered on.

An interlock switch turns off input voltage to the power supply when the side panel is removed. A tab on the left end of the left side panel closes the switch when the panel is correctly installed on the system.

The power supply contains no user- or field-serviceable parts. You must install a new power supply if an internal component, such as the fan or interlock switch, is defective.

The following table details the DC output specifications for the power supply.

	Output #1	**Output #2**	**Output #3**	**Output #4**	**Output #5**	**Output #6**	**Unit**
Nominal Output Voltages [1, 5]	+3.3 [4]	+5.0 [4]	+12.0 [4]	–12.0	–5.0	5 V AO [6]	VDC
Continuous Load (Maximum.) [1]	35 [3, 4]	70 [3, 4]	12 [4]	0.5	0.5	1	ADC
Continuous Load (Minimum.) [1]	2	2	0	0	0	0	ADC
Noise and Ripple (PARD) (DC to 30 MHz)	50	50	100	250	100	50	mVp-p Max
Regulation Line/Load [2, 5]	±3%	±3%	±5%	±10%	±10%	±3%	Max
Overshoot (Turn on/off)	5%	5%	10%	10%	10%	5%	Max

The following notes apply:

1. Power supply should meet or exceed these specifications. For the noted specifications, the "Max" values describe the smallest acceptable maximum load and the "Min" values describe the largest acceptable minimum load.

2. The maximum combined continuous load of all outputs shall not exceed 500 Watts.
3. The maximum combined continuous load of the +5.0V and +3.3V outputs shall not exceed 385 Watts.
4. The +12 V output must be able to supply a peak current of 17 amps for 30 seconds.
5. Current will always be flowing from the +12V (or –12V) output to the fans.
6. The 5V AO (Always On) output shall remain ON with the AC input power connected, whether the power supply DC outputs are disabled (OFF) or enabled (ON) by the power-up circuitry.

Cable Connectors

The following table lists the cable connectors from the power supply that connect to the system board and other devices.

Connector	Device	Notes
P1	J34 on system board	
P2	J38 on system board	
P3	Disk Drive	
P4	Floppy disk or combo drive	Daisy chained from P3
P5	Disk Drive	
P6	Disk Drive	Daisy chained from P5
P7	Disk Drive	
P8	Disk Drive	
P9	Disk Drive	Daisy chained from P8
P10	Power Supply Fan	Connects to J39

P1 Pinout

P1 connects to J34, a 20-pin connector on the system board.

Pin	Signal	Wire Color	Pin	Signal	Wire Color
1	+3.3V	Orange	11	+3.3V/+3.3V sense	Orange/Brown
2	+3.3V	Orange	12	-12V	Blue
3	Ground	Black	13	Ground/3.3V sense	Black/Black
4	+5V	Red	14	Remote On	Green
5	Ground	Black	15	Ground	Black
6	+5V	Red	16	Ground	Black

7	Ground	Black	17	Ground	Black
8	Powergood	Gray	18	-5V	White
9	No connection	—	19	5V	Red
10	+12V	Yellow	20	5V	Red

P2 Pinout

P2 connects to J38, a 22-pin connector on the system board.

Pin	Signal	Wire Color	Pin	Signal	Wire Color
1	+3.3V	Orange	12	+3.3V	Orange
2	+3.3V	Orange	13	Ground	Black
3	Ground	Black	14	Ground	Black
4	Ground	Black	15	Ground	Black
5	+5V	Red	16	+5V	Red
6	+5V	Red	17	Ground	Black
7	Ground	Black	18	+5V	Red
8	+5V	Red	19	Ground	Black
9	Ground	Black	20	Ground	Black
10	5V Standby	Purple	21	Ground	Black
11	+5V	Red	22	+5V	Red

P3 and P5 - P9 Pinout

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

P4 Pinout

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

Cooling Fans

The TDZ 2000 has three cooling fans. One is inside the power supply; the others are mounted in the chassis. All fans are 12 VDC. The fans pressurize the chassis and force warm air out from the vents. Hardware controls the dynamic speed of each four-wire fan.

See Chapter 5, "System Board," for connector locations and fan cable pinouts. See also Chapter 2, "Servicing the System," for details on replacing the chassis fans.

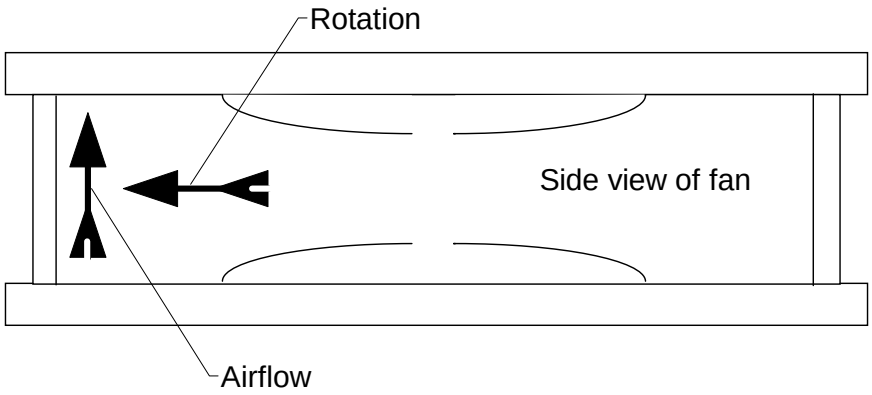
The table below summarizes fan information.

Fan	Location	Size	Airflow	Devices Cooled	Connector
Chassis fan 1	Top rear	120 mm	Back-to-front	Processors, drives	J5, system board
Chassis fan 2	Bottom front	120 mm	Front-to-back	Option cards	J54, system board
Power supply	Power supply	92 mm	Back-to-front	Power supply	J39, system board

The two chassis fans (CFAN12009) are field replaceable.

The power supply fan is not field replaceable. If the fan requires replacement, you must replace the power supply.

Arrows on each fan indicate airflow direction and rotation, as in the following illustration.



Ensure that you install each chassis fan with the airflow direction arrow pointing toward the *inside* of the chassis.

Dynamic Fan Speed Control

Hardware controls dynamic fan speed, based on temperature measured by a sensor and whether the temperature is rising or falling. See “Temperature Sensors” below for additional details.

The following table indicates the composite fan speed for four temperature setpoints. As the temperature inside the chassis varies with the heat load, the fans change speed accordingly. For example, if the temperature exceeds setpoint T1, composite fan speed increases to medium low.

Temperature Setpoint	Fan Speed (Composite) Temperature Rising	Fan Speed (Composite) Temperature Falling
	High	High
T3—109.4° F (43° C)	↑	↓
	Medium High	High
T2—104° F (40° C)	↑	↓
	Medium Low	Medium High
T1—98.6° F (37° C)	↑	↓
	Low	Medium Low
T0—93.7° F (34° C)	↑	↓
	Low	Low

The following table defines composite fan speeds used in the previous table.

Composite Fan Speed	Chassis Fan 1	Chassis Fan 2	Power Supply Fan
High	High	High	High
Medium High	High	High	Low
Medium Low	High	Low	Low
Low	Low	Low	Low

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