

Indigo²TM R4400TM 250 MHz CPU Upgrade Installation Guide

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Introduction

This manual explains how to install the R4400™ 250 MHz CPU upgrade in an Indigo²™ workstation.

There are several steps to complete the installation successfully. It's important that you follow the steps in the order they are presented in this manual.

Read through this guide first before starting the upgrade. If you find a term you haven't seen before, see your workstation's Owner's Guide. The glossary contains definitions of many of the terms used in this guide.

Before Installing the Hardware

There are several steps you must complete to install the CPU upgrade successfully. These are:

- Installing the software
- Shutting down the system
- Removing the covers
- Replacing the power supply
- Replacing the CPU module
- Replacing the PROM on the system board
- Replacing the covers

This chapter explains how to shut down the system and how to remove the covers.

Caution: It's a good idea to make a full backup of your system before powering off the system and installing the upgrade. For instructions on backing up your system, see the *Personal System Administration Guide*.

CPU Upgrade Package

Your CPU upgrade package consists of the following items. If anything is missing, contact your sales representative.

- power supply
- CPU module in an antistatic bag
- PROM chip in an antistatic bag
- PROM removal tool

- Phillips screwdriver
- two open-ended wrenches
- antistatic wrist strap
- *Indigo² R4400 250 MHz Upgrade Installation Guide* (this manual)
- compact disc (CD-ROM) (includes software release notes)

Installing the Software

Read the software release notes on the CD for software installation instructions.

Shutting Down the System

Follow these steps to power off the system:

1. Open the front cover of the chassis, as shown in Figure 1-1.
 - Face the front of the Indigo² chassis.
 - Snap the cover away from the top edge of the chassis and tip it down, as shown in Figure 1-1.

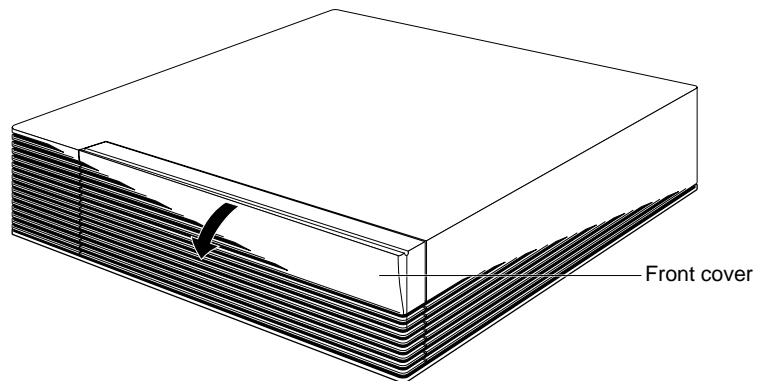


Figure 1-1 Opening the Front Cover of the Indigo² Chassis

2. Press and release the power switch, as shown in Figure 1-2.

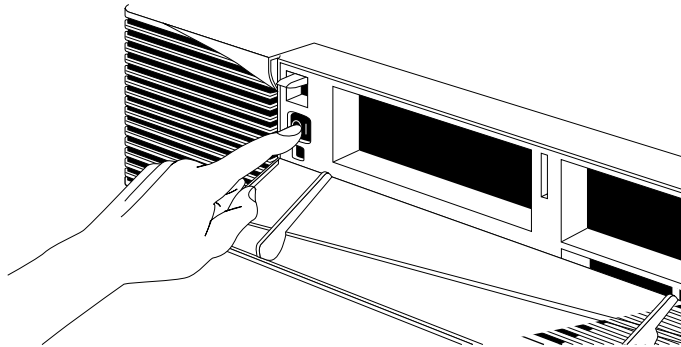


Figure 1-2 Pressing and Releasing the Power Switch

The notifier shown in Figure 1-3 appears on your screen within a few seconds. Then the system powers off automatically within the next minute.

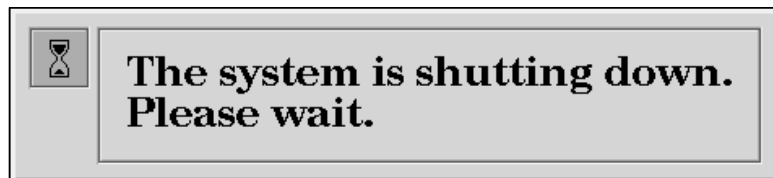


Figure 1-3 System Shutdown Notifier

Removing the Cover

Follow these steps to disconnect the cables and remove the cover:

1. Disconnect the cables from the back of your Indigo² workstation.

Note: Make sure to disconnect the black power cable.

2. Remove the front bezel.
 - Press down on the tabs on each side of the bezel, as shown in Figure 1-4.
 - Pull the bezel away from the chassis.

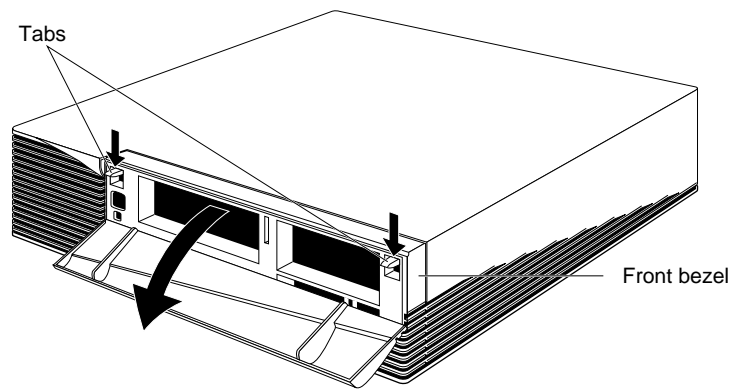


Figure 1-4 Removing the Front Bezel from the Indigo² Chassis

3. Remove the top cover.
 - Press up on the tabs on each side of the drive openings.
 - Pull up on the cover and rotate it back and away from the chassis, as shown in Figure 1-5.

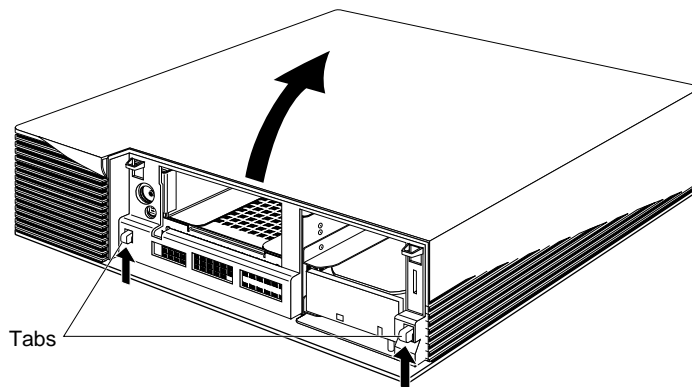


Figure 1-5 Removing the Top Cover of the Indigo² Chassis

You are now ready to begin the hardware installation.

Installing the Hardware

This chapter explains how to install the hardware for the CPU upgrade. Installing the hardware consists of:

- Replacing the power supply
- Replacing the CPU module
- Replacing the PROM chip

Attaching the Wrist Strap

Wear the wrist strap to prevent the flow of static electricity, which can damage the board.

Caution: The components inside the Indigo² are extremely sensitive to static electricity. Handle all boards carefully, and wear the wrist strap shipped with the upgrade board while replacing parts inside the workstation.

To attach the wrist strap, follow these steps:

1. Put the wrist strap over your wrist, making sure it is tight against your arm.
2. Attach the alligator clip to a metal part of the Indigo² chassis.

Replacing the Power Supply

To replace the power supply, follow these steps:

1. If you have not already shut down the system, removed the cover, and attached the wrist strap, go to “Shutting Down the System” on page 2 for instructions.
2. Remove the power supply screws.
 - Face the back of the workstation, as shown in Figure 2-1. The power supply is located on the left.
 - Remove the two screws from the back and the two screws from the side of the chassis.

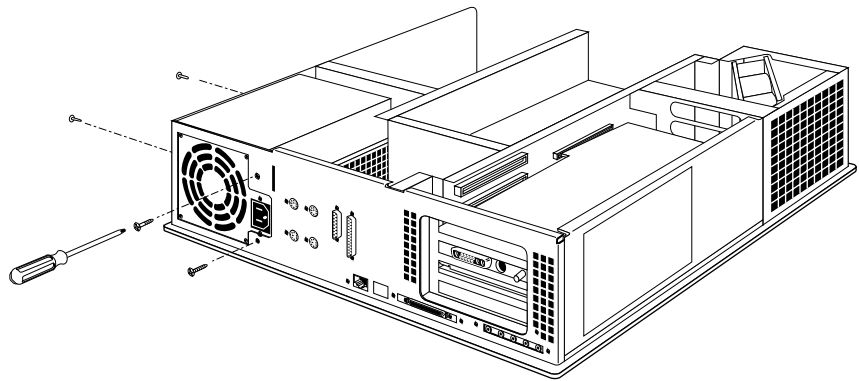


Figure 2-1 Removing the Power Supply Screws

3. Move the workstation, or position yourself so that you are facing the front of the workstation, as shown in Figure 2-2.
4. Remove the 5-1/4" drive tray and drive. Removing the drive tray makes it easier to remove the power supply and install the new one. If a drive is installed in the tray, you do not need to remove the drive from the tray. (Figure 2-2 shows only the drive tray.)
 - Disconnect the SCSI cable from the connector on the back of the 5-1/4" drive tray.
 - Remove the two screws that hold the 5-1/4" drive tray to the chassis.

The screws are located below the drive tray in the center front of the workstation.

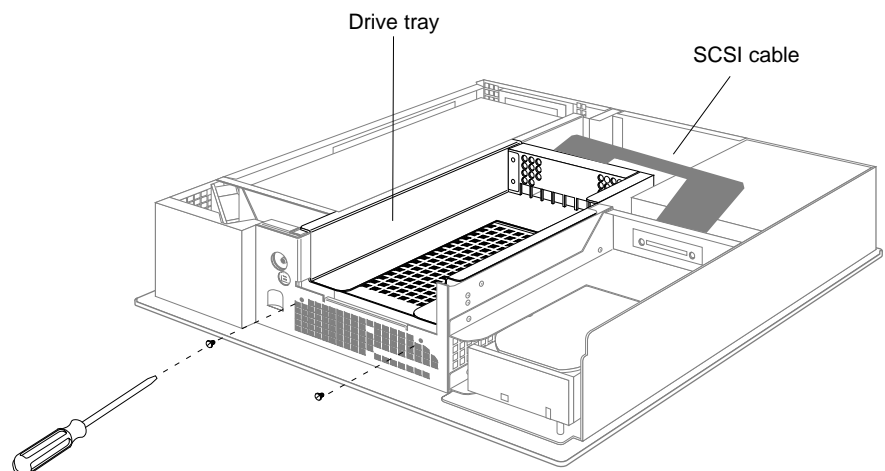


Figure 2-2 Removing the Screws on the 5-1/4" Drive Tray

5. Push the drive tray toward the back of the workstation about 1/2", and pull up to remove the tray, as shown in Figure 2-3.

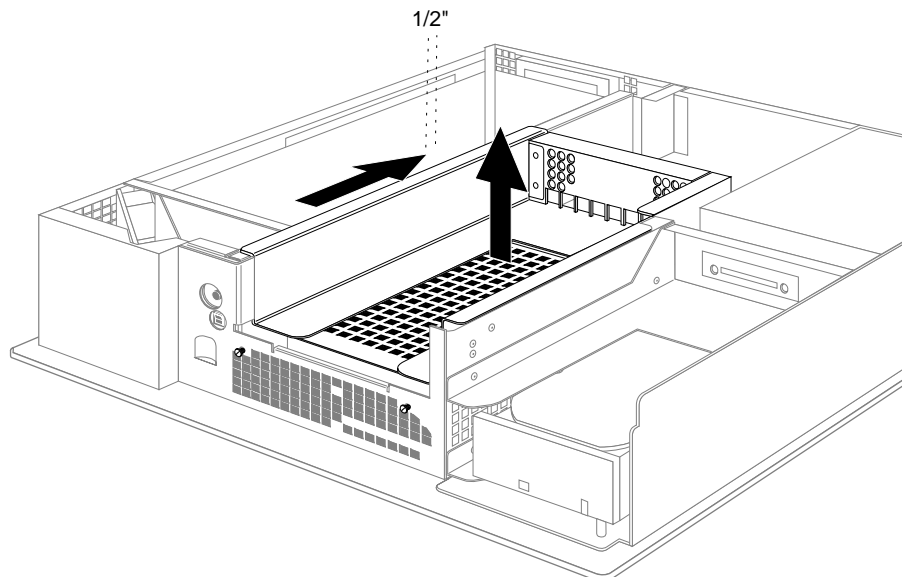


Figure 2-3 Removing the 5-1/4" Drive Tray From the Chassis

6. Move the workstation, or position yourself so that you are facing the back of the workstation, as shown in Figure 2-4.
7. Disconnect the three power cable connectors, as shown in Figure 2-4.
 - Disconnect the two connectors located on the side of the power supply near the memory modules by grasping each connector and pulling it straight up.
 - Disconnect the connector located near the disk drives by grasping it and pulling it straight back.

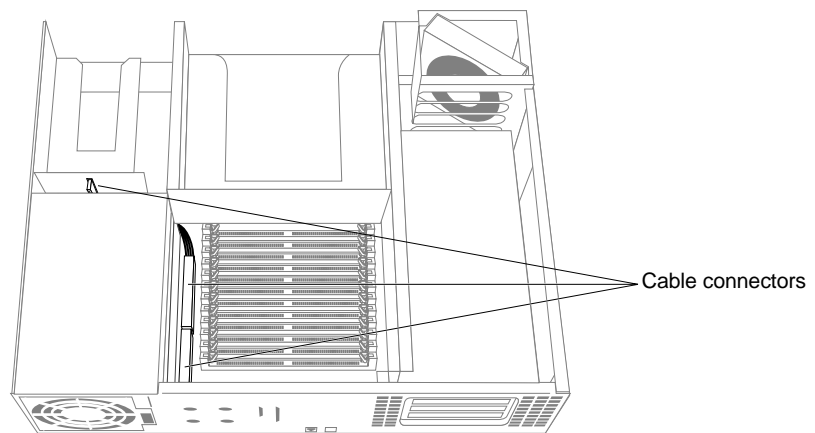


Figure 2-4 Locating the Three Power Supply Cable Connectors

8. Remove the power supply.
 - Move the power supply toward the front of the workstation about 1/4", as shown in Figure 2-5, by pushing on the flat surfaces around the fan.

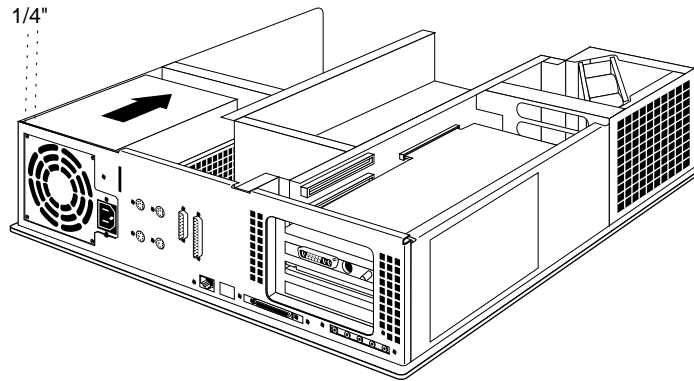


Figure 2-5 Moving the Power Supply Toward the Front of the Chassis

- Lift the power supply up and out of the chassis, as shown in Figure 2-6.

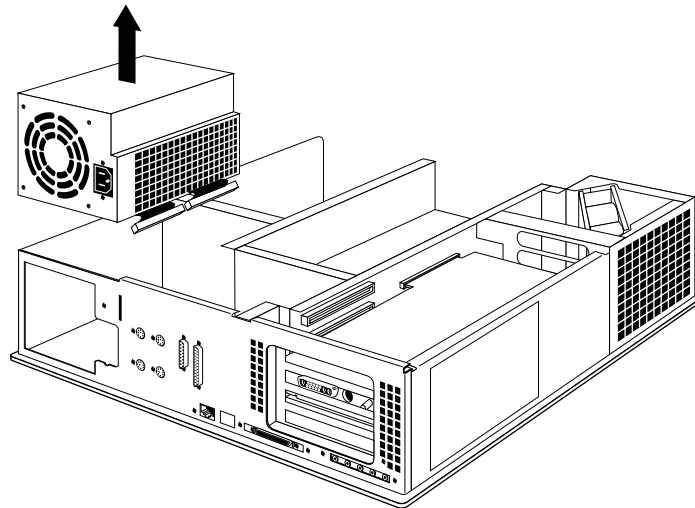


Figure 2-6 Removing the Power Supply From the Chassis

9. Before installing the new power supply, connect the power cable located close to the disk drives.
 - Hold the power supply with one hand, and with your other hand connect the free end of the power cable shown in Figure 2-7 to the connector located close to the disk drives.

The connector is keyed so that you can connect it only one way if you don't force it.

- Press the connector firmly until seated. Check that it is seated all the way in the socket.

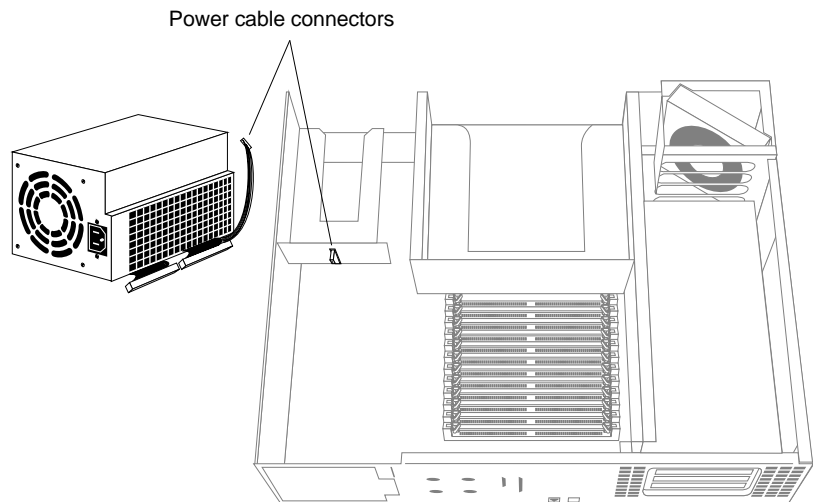


Figure 2-7 Connecting the Power Cable Located Close to the Disk Drives

10. Install the new power supply, as shown in Figure 2-8.

- Hold the power supply so that the fan faces the back of the chassis and the power cables are at the bottom.
- Lower the power supply into the Indigo² chassis as close to the disk drives as possible. Make sure the power supply is flat against the bottom of the chassis.
- Shove the power supply toward the back of the chassis, as far as it will go, making sure the metal tabs on the floor of the chassis engage in the slot underneath the power supply.

If the tabs do not engage in the slot, raise the power supply and lower it again, making sure it is flat against the bottom of the chassis.

Tip: A good test is to lift up the power supply. If the chassis comes up with it, the metal tabs are engaged.

- Replace the four screws that hold the power supply, in the locations shown in Figure 2-8.

If the screw holes do not line up, verify that the power supply is seated all the way, and is pushed all the way against the back of the chassis.

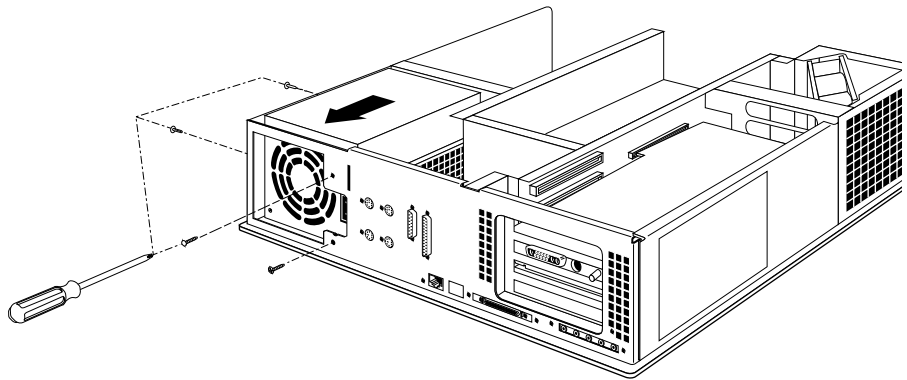


Figure 2-8 Installing the Power Supply

11. Connect the remaining two power cables.
 - Connect the two power cables located close to the memory modules, as shown in Figure 2-9. These connectors are not keyed, so make sure you align them correctly before pressing firmly to seat them.
 - Check that the two connectors are seated all the way in the sockets.

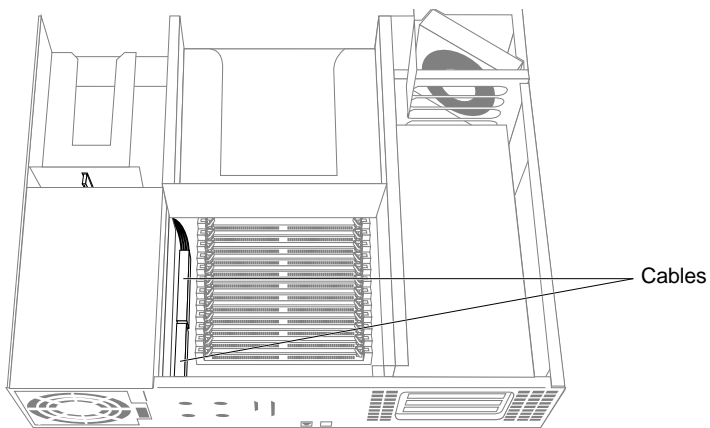


Figure 2-9 Connecting the Power Cables

You have finished replacing the power supply and are ready to replace the CPU module.

Replacing the CPU Module

Replacing the CPU module consists of:

- Removing the CPU module
- Installing the new CPU module
- Re-installing the drive tray

Follow these steps to replace the CPU module:

1. If you have not already shut down the system, removed the cover, attached the wrist strap, and replaced the power supply, go to “Shutting Down the System” on page 2 for instructions.
2. Locate the CPU module.

The CPU module is the large elevated module on the system board that is protected by a textured heat sink. It contains the CPU chip, cache, and CPU clock crystal.

Note: Figure 2-10 shows an R4400 150 MHz CPU module as viewed from the rear of the workstation. If your workstation has the R4000[®] CPU module, it looks a little different, but is located in the same place.

3. Remove the CPU module.
 - Loosen the four captive screws on the corners of the module that attach it to the system board, as shown in Figure 2-10. (For the R4000 module, loosen and remove the four Phillips screws.)
 - Disconnect the module connector from the socket on the system board by lifting up on the edges of the module and gently rocking it back and forth.
 - Lift the module up and away from the board.

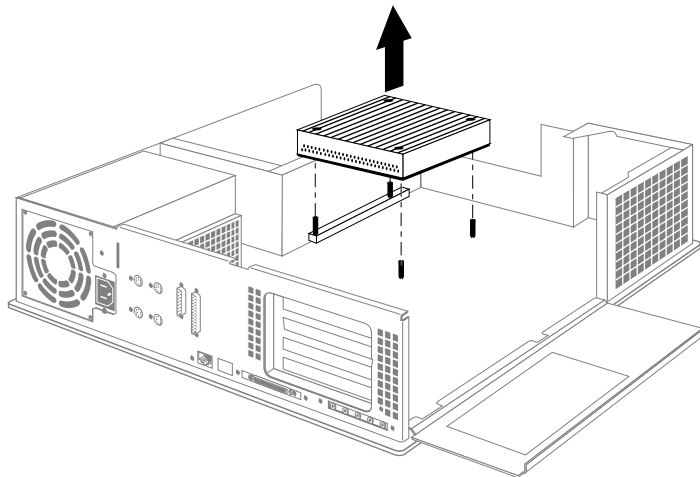


Figure 2-10 Removing the CPU Module

4. Install the new CPU module.
 - Position the new module so that the connector on the bottom of the module aligns with the socket on the system board, as shown in Figure 2-11.
 - Press down on top of the module connector until it is securely attached to the socket on the board.
5. Secure the module to the system board, as shown in Figure 2-11.
 - Tighten the four screws on the top of the heat sink.
 - Remove two Phillips screws from the small plastic bag that comes with this upgrade.
 - Insert and tighten the two Phillips screws in the location shown in Figure 2-11.

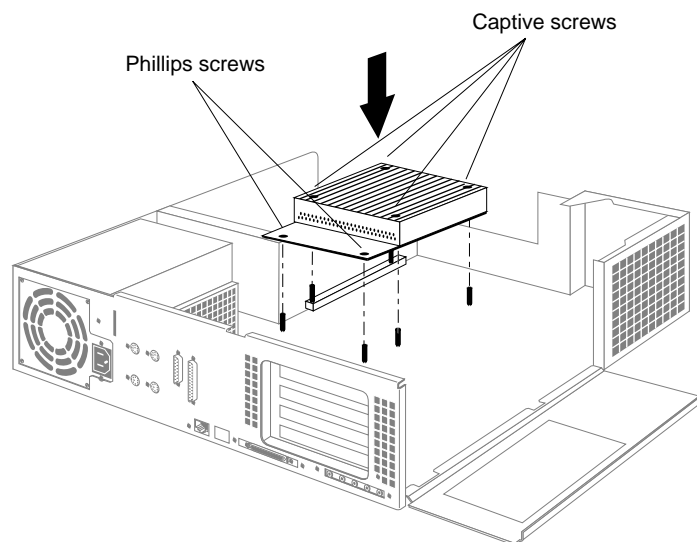


Figure 2-11 Installing the CPU Module

6. Replace the 5-1/4" drive and tray.
 - Position the drive and tray so that the tabs on the sides of the tray fit inside the slot openings in the chassis and the open side of the tray faces the front of the workstation, as shown in Figure 2-12.

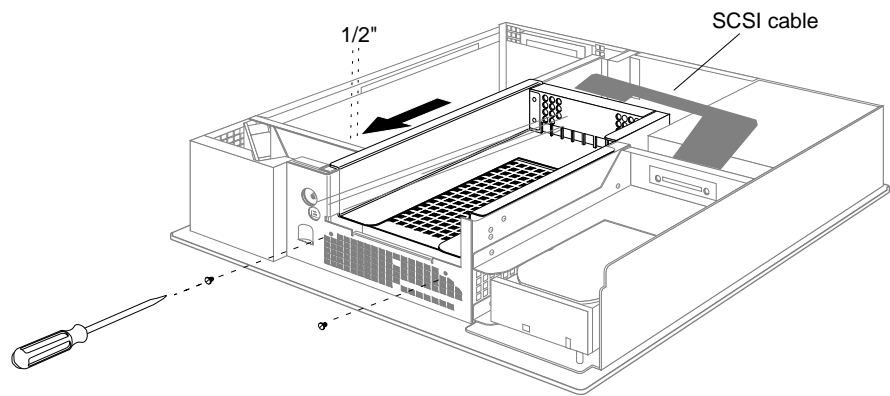


Figure 2-12 Installing the 5-1/4" Drive Tray

- Push the tray forward about a 1/2" to lock it in place.
- Tighten the two captive screws.
- Reattach the SCSI cable to the connector on the back of the drive tray.

You are finished replacing the CPU module and are ready to replace the PROM chip.

Replacing the PROM Chip

Installing the PROM chip consists of:

- Removing the graphics board or board set (so you can reach the PROM chip)
- Removing the PROM chip
- Installing the new PROM chip
- Replacing the graphics board set

Removing the Graphics Board Set

- If your workstation has an XL graphics board, follow the instructions in “Removing the XL Board” below.
- If your workstation has an XZ or Extreme graphics board set, follow the instructions in “Removing the XZ or Extreme Graphics Board Set” on page 23.

Removing the XL Board

To remove the XL graphics board, follow these steps:

1. Make sure the wrist strap is attached to a metal part of the workstation.

2. Move the workstation or position yourself so that you are facing the expansion slots.
3. Open the metal panel in front of the expansion slots by pulling up on the panel and lowering it, as shown in Figure 2-13.

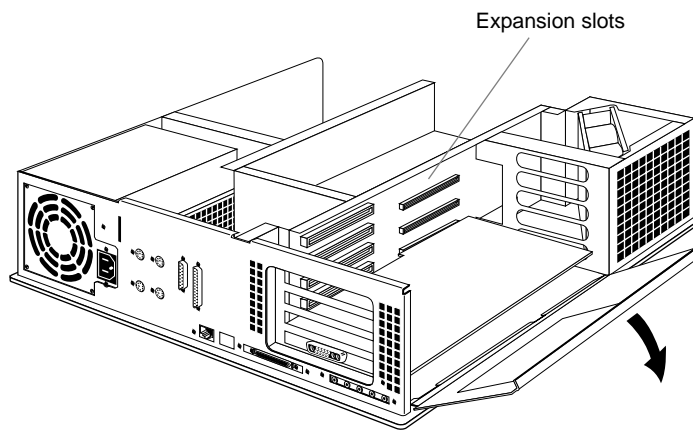


Figure 2-13 Opening the Metal Panel in Front of the Expansion Slots

4. Remove the screw attaching the graphics board to the slot as shown in Figure 2-14.

The screw is located on the metal extension on the left side of the board.

- Loosen the screw first with the Phillips screwdriver.
- Then unscrew it all the way with your hand, and remove it.

Note: The screw is very small. If you drop it into the chassis, remove it to prevent the possibility of shorting the system.

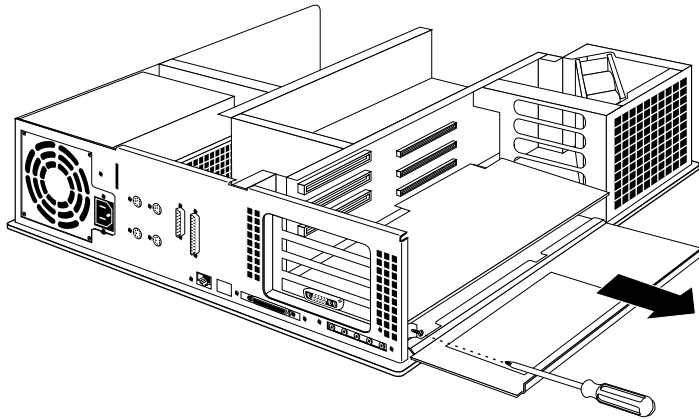


Figure 2-14 Removing the Screw From the Metal Extension

5. Remove the board from the chassis, using the two open-ended wrenches provided with the upgrade package. Note that if your XL board has handles attached, use them to extract the board instead of the wrenches.
 - Grasp the wrenches as shown in Figure 2-15. The orientation of the wrenches is important.

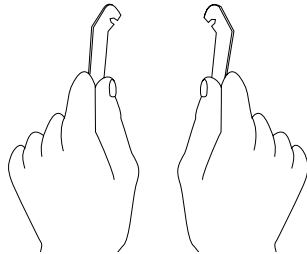


Figure 2-15 Orientation of the Wrenches

- Hook the ends of the wrenches in the small holes on each side of the front of the board, as shown in Figure 2-16.
- Brace your index fingers against the chassis and pry the wrenches outward. The board comes out.

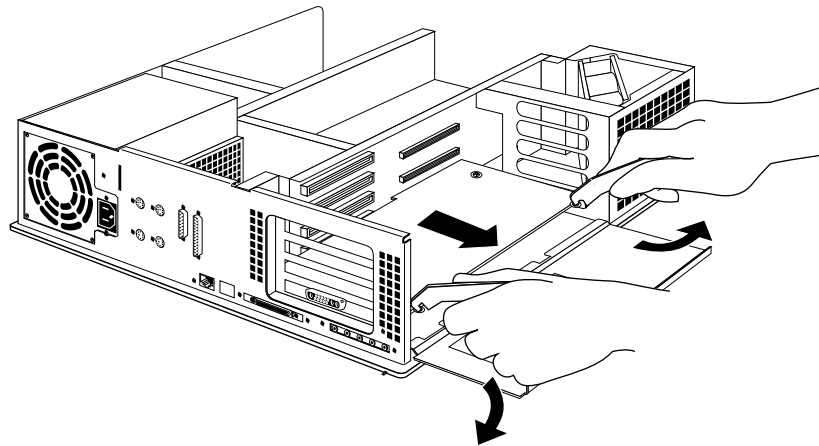


Figure 2-16 Removing the XL Board From the Chassis

- Place the board on a flat, antistatic surface so the side with the chips faces up. An empty antistatic bag or a clean, dry desktop works well.

You are finished removing the XL graphics board. Go to “Removing and Replacing the PROM Chip” on page 26.

Removing the XZ or Extreme Graphics Board Set

To remove the XZ or Extreme graphics board set, follow these steps:

1. Make sure the wrist strap is attached to a metal part of the chassis.
2. Move the workstation or position yourself so that you are facing the expansion slots, as shown in Figure 2-17.
3. Open the metal panel in front of the expansion slots by pulling up on the panel and lowering it. Figure 2-17 shows an XZ graphics board set.

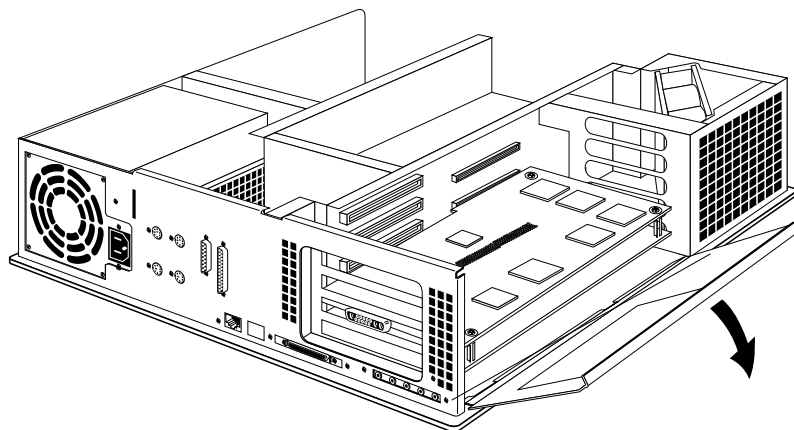


Figure 2-17 Lowering the Metal Panel in Front of the Expansion Slots

4. Remove the screws attaching the board to the slots as shown in Figure 2-18.

The screws are located on the metal extension on the left side of each board.

Note: Figure 2-18 shows an XZ graphics board set. If your workstation has the Extreme graphics board set, there will be three screws to remove.

- Loosen each screw first with the Phillips screwdriver.
- Then unscrew it all the way with your hand, and remove it.

The screws are very small. If you drop a screw into the chassis, remove it to prevent the possibility of shorting the system.

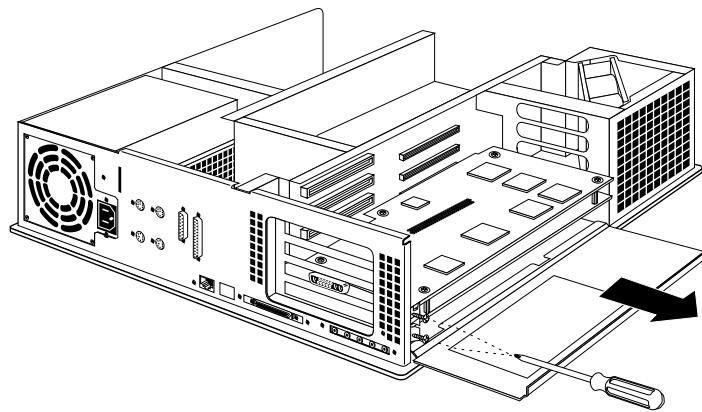


Figure 2-18 Removing the Screws From the Metal Extension

5. Pull the board set out of the workstation, as shown in Figure 2-19.
 - Turn both hands inward so that your thumbs point to the floor,
 - Place your index fingers behind the small metal posts on each side of the board.
 - Brace your thumbs against the chassis, and pull the board out of the slot. You may need to use some force.
 - Place the board set down on a flat, antistatic surface so the side with the chips faces up. An empty antistatic bag or a clean, dry desktop works well.

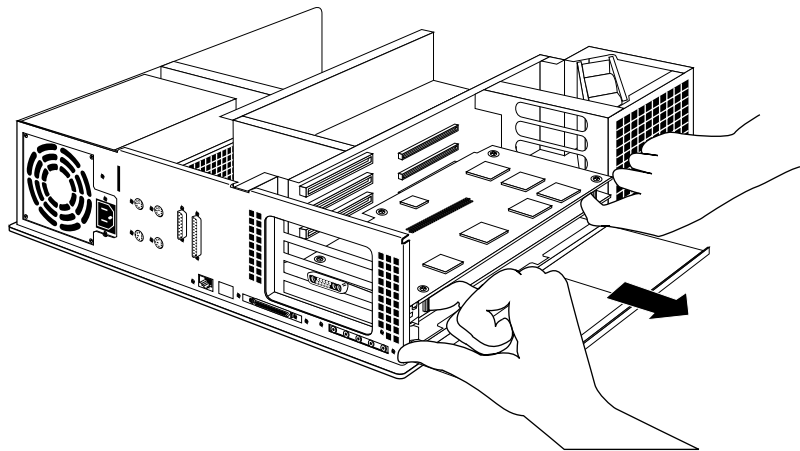


Figure 2-19 Pulling the Board Set out of the Chassis

You are finished removing the graphics board set. Go to “Removing and Replacing the PROM Chip” on page 26.

Removing and Replacing the PROM Chip

Follow these steps to remove and replace the PROM chip:

1. Locate the PROM chip. The PROM chip is located in a socket on the system board below the slot from which you removed the graphics board, as shown in Figure 2-20.

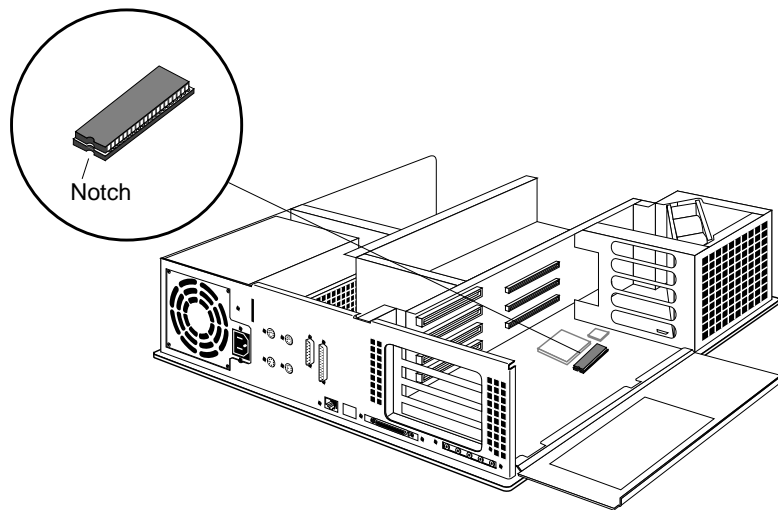


Figure 2-20 Locating the PROM Chip on the System Board

2. Before removing the PROM chip, familiarize yourself with it. Note that it has either a semi-circular notch or a small, indented circle at one end, as shown in Figure 2-20. You'll use this notch or circle to orient the PROM when you install it.

3. Remove the PROM chip from the system board.

The PROM chip is seated in a socket that is permanently attached to the system board. You remove the PROM chip with a chip removal tool, included in this package. The tool looks like a pair of huge tweezers. When you use the tool, be sure to insert it under the PROM chip itself, and not under the socket.

- Insert the chip removal tool between the PROM chip and the socket on the board, as shown in Figure 2-21. Work the chip away from the socket in a rocking motion, pulling up on one side of the chip and then on the other side. It may be difficult to loosen.
- Continue the rocking motion until the PROM chip is all the way out of the socket.

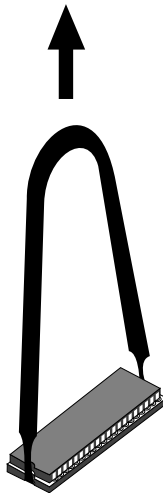


Figure 2-21 Removing the PROM Chip

4. Install the new PROM chip.
 - Grasp the new PROM chip. Orient it above the socket on the system board so the end with the semi-circular notch or small, indented circle on the PROM chip lines up with the notch in the socket. (See Figure 2-22.)
 - Line up all of the pins on the PROM with the corresponding holes in the socket.

Caution: Make sure you line up the notch or the small circle on the PROM chip with the notch in the socket and that all the pins are aligned with corresponding holes. If you install the PROM chip backwards, or if the pins are not aligned, you will damage the PROM chip, and the system will not power on.

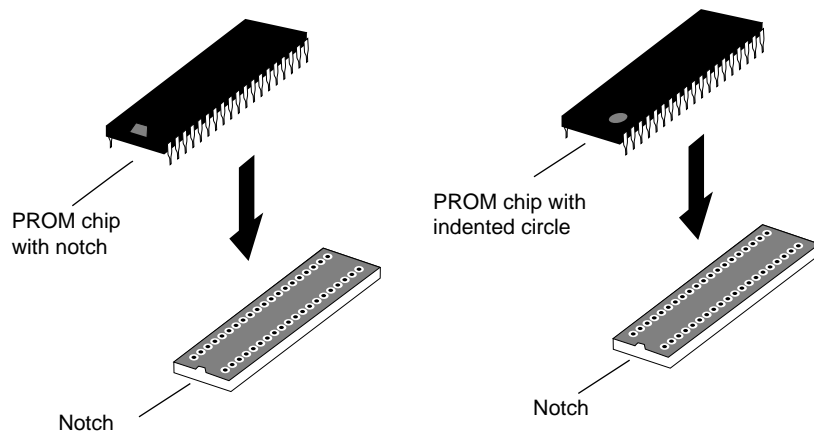


Figure 2-22 Lining Up the PROM Chip

5. Once the pins are lined up, press down firmly on the top of the PROM chip until it is completely and evenly seated in the socket, as shown in Figure 2-23.

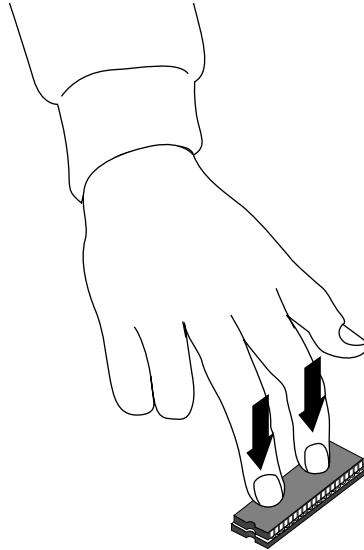


Figure 2-23 Pressing the PROM Chip Into the Socket

6. Visually check to make sure all the pins on the PROM are inserted correctly in the holes on the socket, and the PROM is seated all the way.

You are now ready to replace the graphics board or board set.

Replacing the Graphics Board Set

- If you are replacing an XL graphics board, go to “Replacing the XL Graphics Board” below.
- If you are replacing an XZ or Extreme graphics board set, go to “Replacing the XZ or Extreme Graphics Board Set” on page 31.

Replacing the XL Graphics Board

Follow the steps below to re-install the XL graphics board:

1. Install the board.
 - Grasp the board with the metal extension on the left and the side with the chips facing up.
 - Align the metal extension on the left of the board with the slot on the chassis. At the same time align the right edge of the board with the metal grooves on the right of the chassis, as shown in Figure 2-24.

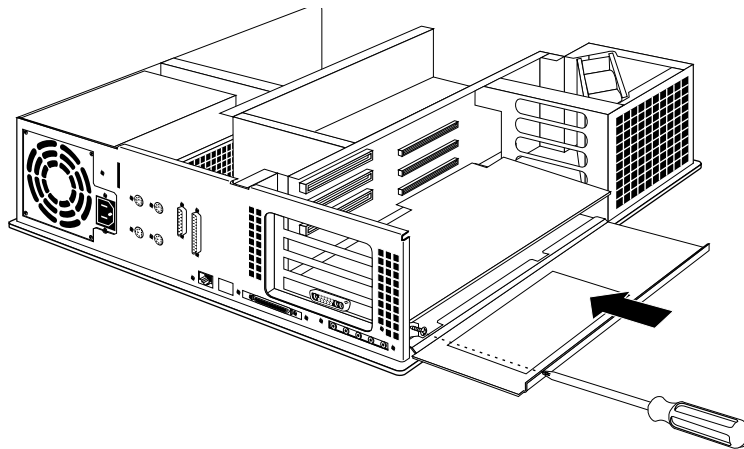


Figure 2-24 Replacing the XL Graphics Board in the Chassis

- Push the board into the slot until the connector on the back of the board is securely connected to the connector on the EISA backplane. Make sure that the EMI lining is not damaged and remains between the chassis and the XL graphics board's metal extension.
2. Insert and tighten the screw that holds the board to the chassis. The screw opening is located on the metal extension on the left side of the board. (See Figure 2-24).
 3. Tip the metal panel up in front of the board you just installed until it snaps into place.

You are finished replacing the graphics board and are ready to complete the installation.

Replacing the XZ or Extreme Graphics Board Set

Follow the steps below to install either the XZ or the Extreme graphics board set:

1. Install the board set.
 - Grasp the board set with metal extensions on the left and the sides with the chips facing up.
 - Align the metal extensions on the left of the board set with the slots on the chassis. At the same time align the right edge of the board set with the metal grooves on the right of the chassis, as shown in Figure 2-25.
 - Push the board set into the slot until the connector on the back of the board is securely connected to the connector on the EISA backplane.

2. Insert and tighten the screws that hold the board set to the chassis. The screw openings are located on the metal extension on the left side of each board. Make sure that the EMI lining is not damaged and remains between the chassis and the XZ graphics board's metal extension.

Note: Figure 2-25 shows an XZ graphics board set. If you have an Extreme graphics board set, there will be three screws to insert and tighten.

3. Tip the metal panel up in front of the boards you just installed until it snaps into place.

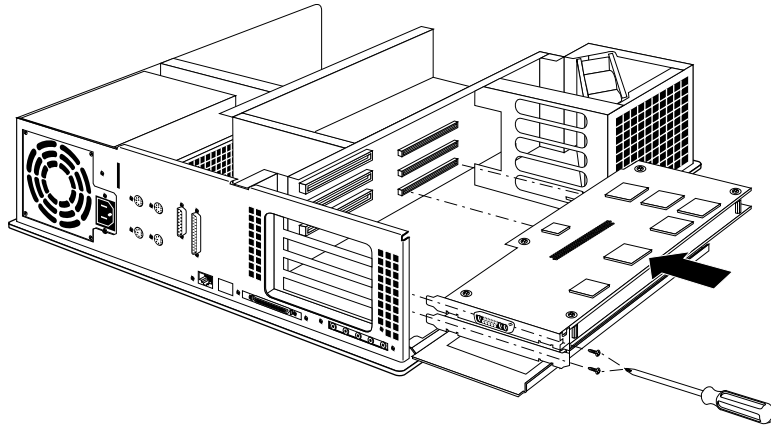


Figure 2-25 Replacing the Graphics Board Set

You are finished replacing the graphics board set and are ready to complete the installation.

Completing the Installation

This chapter contains instructions for:

- Replacing the top cover
- Turning on the workstation and verifying the installation
- Troubleshooting the installation
- Returning the old CPU module to Silicon Graphics

Replacing the Top Cover

To replace the top cover, follow these steps:

1. Place the prongs on the underside of the cover into the slots under the top ridge of the backplane of the chassis, as shown in Figure 3-1.
2. Lower the cover onto the chassis until it snaps into place.

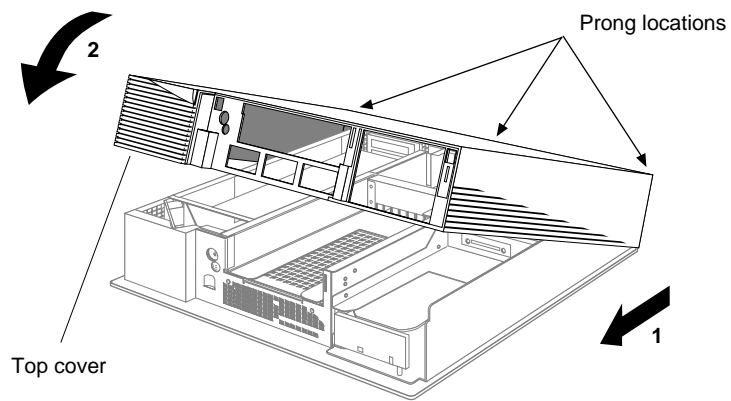


Figure 3-1 Replacing the Top Cover on the Indigo² Chassis

3. Replace the front bezel.
 - Place the tabs on the bottom of the bezel in the grooves in the front of the chassis, as shown in Figure 3-2.
 - Tilt the bezel up until it snaps into place.

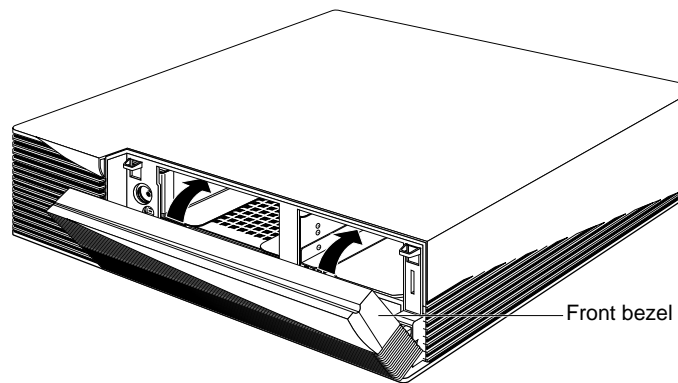


Figure 3-2 Replacing the Front Bezel on the Indigo² Chassis

4. Reconnect the cables to the back of the system.

You are finished upgrading the CPU and ready to start the system.

Turning On the Indigo² Workstation

Power on and log in to your workstation by following these steps:

1. Turn on the system power.
 - Open the front cover by snapping it away from the top edge of the chassis and tipping it down.
 - Press the power switch to turn on the system, as shown in Figure 3-3.

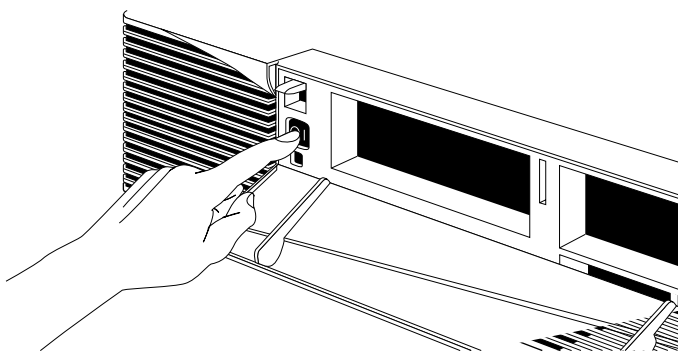


Figure 3-3 Turning On the Indigo² Workstation

Verifying the Installation

When you power on your system, you hear the boot “tune” and see the LED on the front of the machine turn on.

Note: If you do not hear the boot tune or the LED does not turn green, there may be a problem. Go to “Troubleshooting” on page 38.

After the power-on diagnostics run, you see this message:

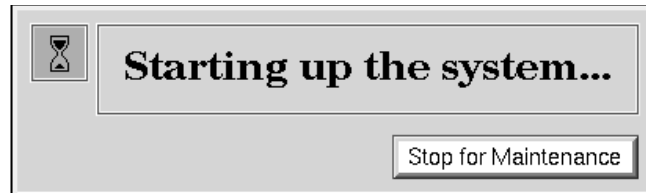


Figure 3-4 The Startup System Notifier

1. Click on *Stop for Maintenance*. The System Maintenance menu appears.
2. Click on "Enter Command Monitor" or press **5** at the System Maintenance menu.
3. Use the hardware inventory command to see a list of the hardware on your system.
 - At the `>>` prompt, type:
`hinv`
Then press `<Enter>`.
 - Look for this line in the listing:
`CPU: MIPS R4400`
4. Exit the Command Monitor. At the `>>` prompt, type:
`exit`
5. Click on "Start System" or press **1** at the System Maintenance menu.

You are now ready to log in.

Troubleshooting

If any of the following occurs, there may be a problem with the installation.

- When you turn on the Indigo², you do not hear the boot tune and the LED does not turn on.
- The system starts to boot and then stalls or behaves erratically.
- When you type `hinv`, you do not see `CPU: MIPS R4400` in the listing.

Disconnect the external cables, remove the covers, and check each of the components you've installed. Read the instructions for each part of the installation to make sure you haven't missed an important step.

Here are some examples of likely problems.

Power Supply Installation

1. Check that the metal tabs on the floor of the chassis are engaged in the slot underneath the power supply and that the power supply is flat against the floor of the chassis.
2. Make sure you've connected all three power cables in the right locations.

CPU Module Installation

1. Check that the module is seated all the way in the socket on the system board.
2. Make sure you've secured the module to the system board with four captive screws and two Phillips screws.
3. Check that you've reconnected the SCSI cable to the connector on the back of the drive tray.

PROM Chip Installation

1. Make sure that you've installed the PROM chip with the right orientation, that is, the notch on the chip should match the notch in the socket on the system board.
2. Look carefully to see if any of the pins are bent or are not aligned with the holes in the socket.
3. Press firmly on the PROM chip to ensure that it is seated all the way.

If you have checked each of the installation procedures, and there is still a problem, contact your service provider.

Returning the Old CPU Module

Use the box that contained the upgrade to return *only* the old CPU module to Silicon Graphics.

Note: Do not return the old power supply or the old PROM chip.

1. Place the old CPU module in the antistatic bag that shipped with the upgrade, and pack it in the box.
2. Use the Return Materials Authorization form to return the old CPU module to Silicon Graphics.

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- Quality of the printing and binding

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