Indigo^2 IMPACT™ Graphics Field Upgrade Instructions for Indigo^{2}™

Document Number 108-0131-002

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FCC Warning

This equipment has been tested and found compliant with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Attention

This product requires the use of external shielded cables in order to maintain compliance pursuant to Part 15 of the FCC Rules.

Indigo^2 IMPACT Graphics Field Upgrade
Instructions for Indigo^2
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About This Guide

This guide is designed as a field upgrade document for Silicon Graphics® trained or approved system support engineers. It covers information about upgrading existing Indigo^{2}™ products to use the higher performance Indigo^{2} IMPACT™ graphics board(s).

This manual does not cover information regarding older Indigo^{2} systems graphics upgrades, nor does it cover graphics installation in a non-Indigo^{2} system. You are encouraged to keep this reference document with other Indigo^{2} IMPACT related manuals so that all of your Indigo^{2} information is in one location.

This document is organized as follows:

Chapter 1 "Introduction to the Indigo^{2} IMPACT Upgrade" gives general device information, including technical considerations and allowable device configurations in the Indigo^{2} desktop product lines.

Chapter 2 "Installing the Upgrade" provides guidelines on how to properly install the upgrade kit parts and accessories into an Indigo^{2} and how to configure them. Information on loading the new operating system and installing external identification components is provided at the end of the chapter.

Chapter 3 "Running Diagnostics and Returning the Old Components" describes Indigo^{2} IMPACT graphics diagnostics and functionality testing, and what parts to return from the upgraded desktop unit.

I.1 Reference Information

The following documents provide an expanded information base that may be useful for filling in details on topics that are not covered in this guide.

I.1.1 Technical Manuals

- *Indigo^{2} Workstation Owner's Guide* (P / N 007-2849-00x)

  Note: If you have the -001 version of this manual (p / n 007-2840-001), make sure that you also have the related flyer (p / n 007-3243-001) that is required with this manual.

- *Indigo^2 Video for Indigo^2 IMPACT Owner's Guide* (P / N 007-2201-00x)
- *Indigo^2 IMPACT Texture Memory Option Board Installation Guide* (P / N 007-3079-00x)
- *Indigo^2 IMPACT Video Programmer's Guide* (P / N 007-2917-00x)

An electronic version of most of the preceding technical documents may be found by remote copying the files as shown from the following location:

comrade.engr:/usr/people/guest/docdist/i2IMPACT

I.1.2 Technical Publications Library Web Site

To access the whole library of Silicon Graphics documentation (including end-user, developer, field service, networking, and system administration manuals) checkout the following site.

http://techpubs.engr.sgi.com

I.1.3 Patch and Release Note Information

For pertinent patch information, see the Global Customer Service (GCS) or the SGI Technical Support (Oasis on the World Wide Web) web pages at the following sites:

- http://bits.csd.sgi.com/digest/patches/
- http://morpheus.corp/oasis.html

Note: This web site also contains release note information.

I.1.4 New Product Information (NPI)

New Product Information (NPI) files contain information about newly released products. such as part numbers, product dependencies, compatibility issues, and related documentation.

An NPI is generated by the Global Customer Service (GCS) group when a new version of a product is released. For a listing of NPIs and any related Indigo^2 IMPACT information, see the following web location:

http://bits.csd.sgi.com/cgi-bin/build_npi_html.sh

I.2 Your Feedback

The service publications group at Silicon Graphics is interested in your comments on this manual. Send any feedback regarding content, technical errors, or needed additions to *techpubs@sgi.com*. Be sure to include the title and part number of the document in your e-mail.

Chapter 1

Introduction to the Indigo^2 IMPACT Graphics Upgrade

This document describes the procedures used to upgrade the graphics board set in an existing Silicon Graphics Indigo^2™ system to an Indigo^2 IMPACT graphics system. The generic term Indigo^2 is used in this document to describe both systems unless there is a specific reason to differentiate them. Note that Indigo^2 IMPACT graphics were known as "Mardigras" during product development.

Caution: The upgrades described in this document should be performed by Silicon Graphics trained or approved field service personnel only.

1.1 Important Notice About POWER Indigo^2 Support

The POWER Indigo^2 does not support the Indigo^2 IMPACT upgrade. Do *not* install this upgrade into a POWER Indigo^2.

1.2 Upgrade Overview

The Indigo^2 IMPACT graphics upgrade offers the customer direct access to next-generation desktop graphics capabilities without the expense of purchasing a new desktop system.

A list of replacement parts used with Indigo^2 IMPACT graphics upgrades is shown in Chapter 2.

1.3 Technical Overview

The Indigo^2 IMPACT graphics board set uses the Geometry Engine® (GE11) Application Specific Integrated Circuit (ASIC) as one of its key performance graphics devices. The Solid IMPACT™ single-board graphics and High IMPACT™ graphics board set use only a single GE11. The Indigo^2 Maximum IMPACT™ graphics board sets two GE11s.

The entry-level MG10 single-board graphics system provides the first level of IMPACT graphics support. The High IMPACT graphics system uses two standard and one optional board, and the Maximum IMPACT system uses three standard and two optional boards. Reference Table 1-1 for a summary of the configurations.

The geometry display (GD) board is the foundation for the MG11, MG14, MG21, and MG 24 graphics board sets. When the GD board is populated with a single GE11 ASIC, it is generally referred to as a GD1. If the board has two GE11s, it is called a GD2.

The GD board acts as the direct interface with the GIO bus (also known as the GIO64), which transfers data from the Indigo^2 CPU board. The GD receives drawing commands and data from the host by way of the GIO backplane bus. The bus is bidirectional and runs at 33 MHz. Data from the GIO bus is fed directly to the GD by way of the HQ3 ASIC that resides on the GD board.

All vertex transformation and many of the image processing operations take place on the graphics display (GD) base board.

The HQ3 acts as a gatekeeper, busing data between the GE11(s), the raster A (RA) interface, and the display control bus (DCB). The DCB carries setup information to the back end components such as the RAMDAC and color map (CMAP) devices. It also communicates with the video option boards (if present). It does not carry graphics signals.

The board's GE11(s) works with a group of other graphics accelerating ASICs to provide a high-performance graphics interface in a compact board set.

The available boards in the Indigo^2 IMPACT set include two raster subsystem boards, raster A (RA) and raster B (RB). These boards perform the rasterizing and double-buffering of triangles before delivery to the display subsystem. An optional 3 MB texture RAM (TRAM) daughter board is available to enhance the performance of the RA and RB boards.

Note: When installing an Indigo^2 Maximum IMPACT graphics subsystem, if the raster A board is upgraded with a TRAM daughter board, then the raster B board must also be upgraded. You may *not* upgrade the TRAM on only one of the raster boards.

1.4 About the Indigo^2 High IMPACT Boards

Initial Indigo^2 High IMPACT configurations ship with a GD board equipped with one 90 MHz GE11 ASIC. This board set is referred to as Indigo^2 High IMPACT.

For additional technical and configuration information on the raster boards, read the information in the following subsections.

See Table 1-1 for a listing of Indigo^2 IMPACT graphics option configurations.

MG10 Solid IMPACT	MG11 Indigo^2 High IMPACT	MG14 Indigo^2 High IMPACT	MG21 Indigo^2 Maximum IMPACT	MG24 Indigo^2 Maximum IMPACT
Single-board graphics with one GE11	Raster A (RA) board with 1 MB of texture RAM	Raster A (RA) board with 1 MB of texture RAM	Raster A (RA) board with 1 MB of texture RAM	Raster A (RA) board with 1 MB of texture RAM

Table 1-1 Indigo^2 IMPACT Graphics Board Configuration Options

MG10 Solid IMPACT	MG11 Indigo^2 High IMPACT	MG14 Indigo^2 High IMPACT	MG21 Indigo^2 Maximum IMPACT	MG24 Indigo^2 Maximum IMPACT
Single-board graphics with one 90 MHz GE11	Geometry Display board (GD) with one 90 MHz GE11	One texture daughter board with 3 MB of TRAM	Raster B (RB) board with 1 MB of texture RAM	Raster B (RB) board with 1 MB of texture RAM
		Geometry Display board (GD) with one 90 MHz GE11	Geometry Display board (GD) with two 80 MHz GE11s	2 optional texture daughter boards with 6 MB of TRAM
				Geometry Display board (GD) with two 80 MHz GE11s

Table 1-1 Indigo^2 IMPACT Graphics Board Configuration Options

1.5 Solid IMPACT (MG10 Overview)

The Solid IMPACT or (MG10) graphics option is a single-board implementation of the IMPACT graphics architecture. A single GE11 is used and the geometry display, raster manager, and HQ circuitry are all on the same board. The 13W3 and StereoView™ connectors are included on the board.

An MG10 IMPACT system cannot use additional raster boards or TRAM daughter boards. Figure 1-1 shows the MG10 single-board IMPACT graphics board. See Figure 1-2 for a basic functional block diagram of the MG10.

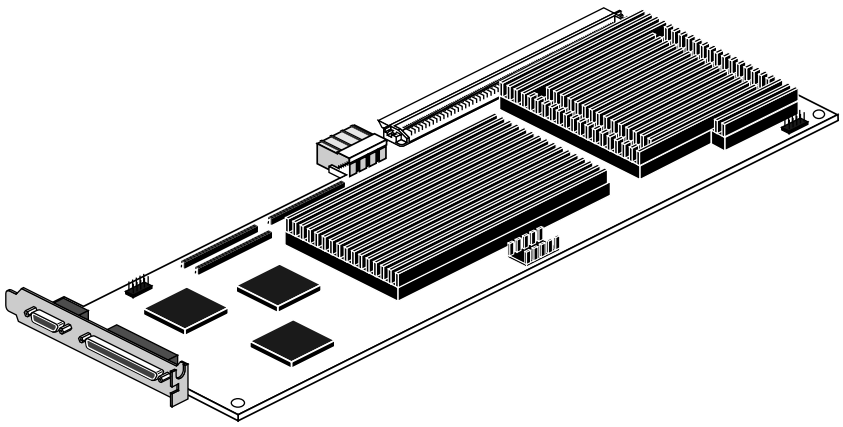
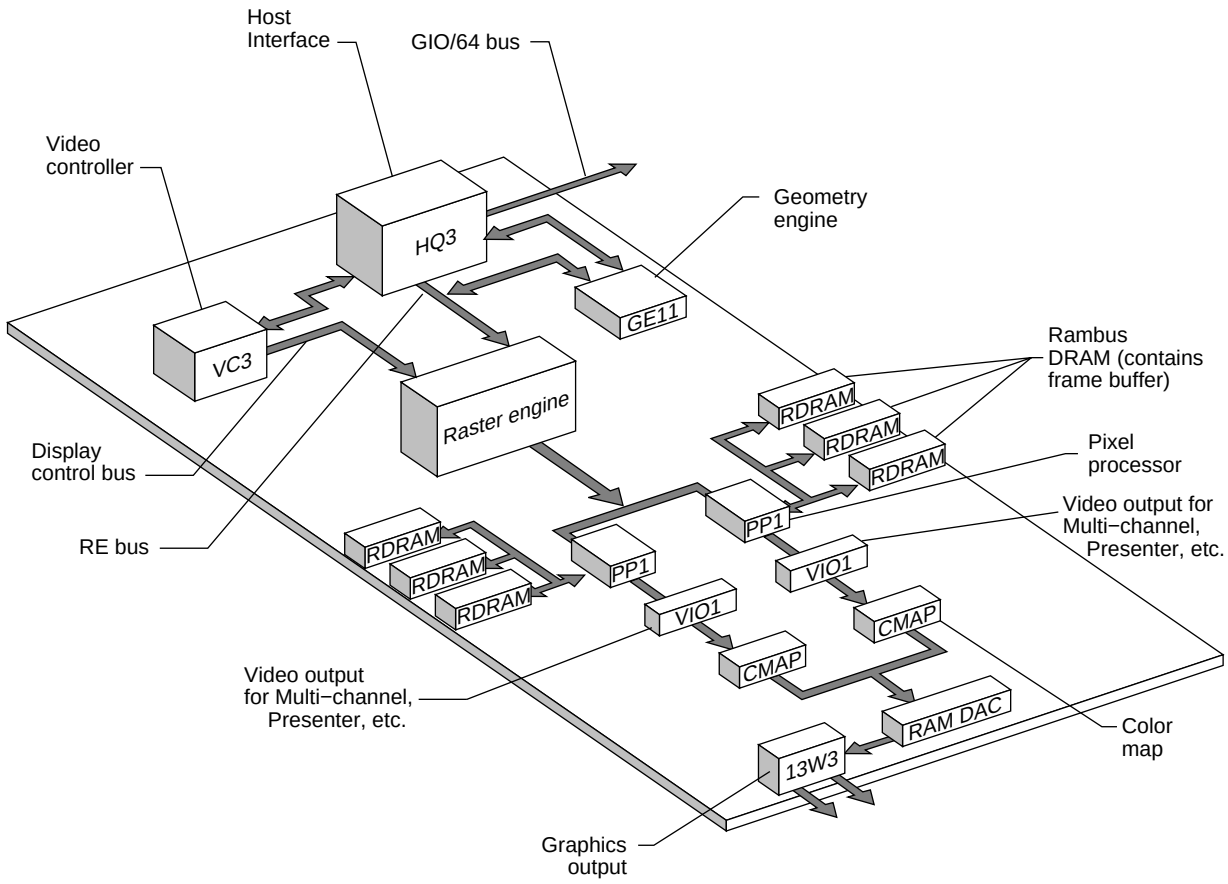


Figure 1-1 Solid IMPACT (MG10) Board

Figure 1-2 Solid IMPACT (MG10) Functional Block Diagram



1.6 Indigo^2 High IMPACT (MG11 and 14) Technical Overview

The GD board combined with the raster A board makes up the basic Indigo^2 High IMPACT graphics set, also known as the MG11. An optional 3 MB texture RAM daughter board installs on the raster A board. It provides enhanced graphics texturing. Adding the optional 3 MB texture RAM daughter board designates the board set as an MG14.

The raster A board houses a single raster subsystem, a display subsystem, a video I/O multiplexer, a texture engine, and 1 MB of texture engine RAM (TRAM). Optionally, it can have a total of 4 MB of TRAM (using a 3 MB TRAM daughter board).

Figure 1-3 shows a two-board graphics set. See Figure 1-4 for an overall functional block diagram of the MG11 or MG14 graphics implementation.

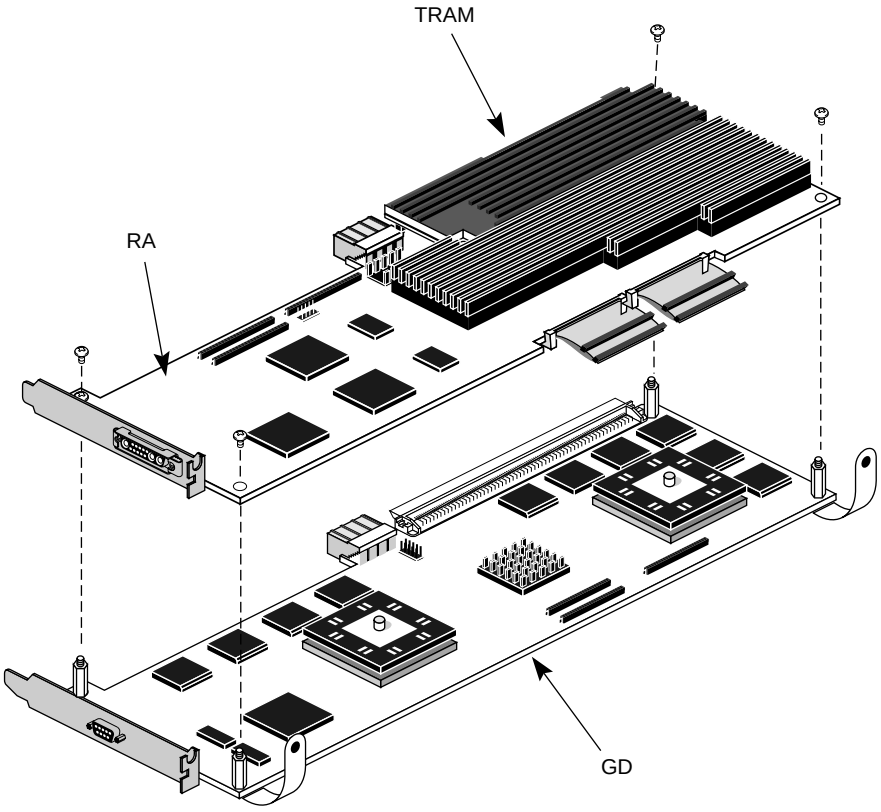


Figure 1-3 Two-Board Graphics With Optional TRAM Daughter Board (MG 14)

Figure 1-4 Indigo^2 High IMPACT (MG11 and MG14) Functional Block Diagram

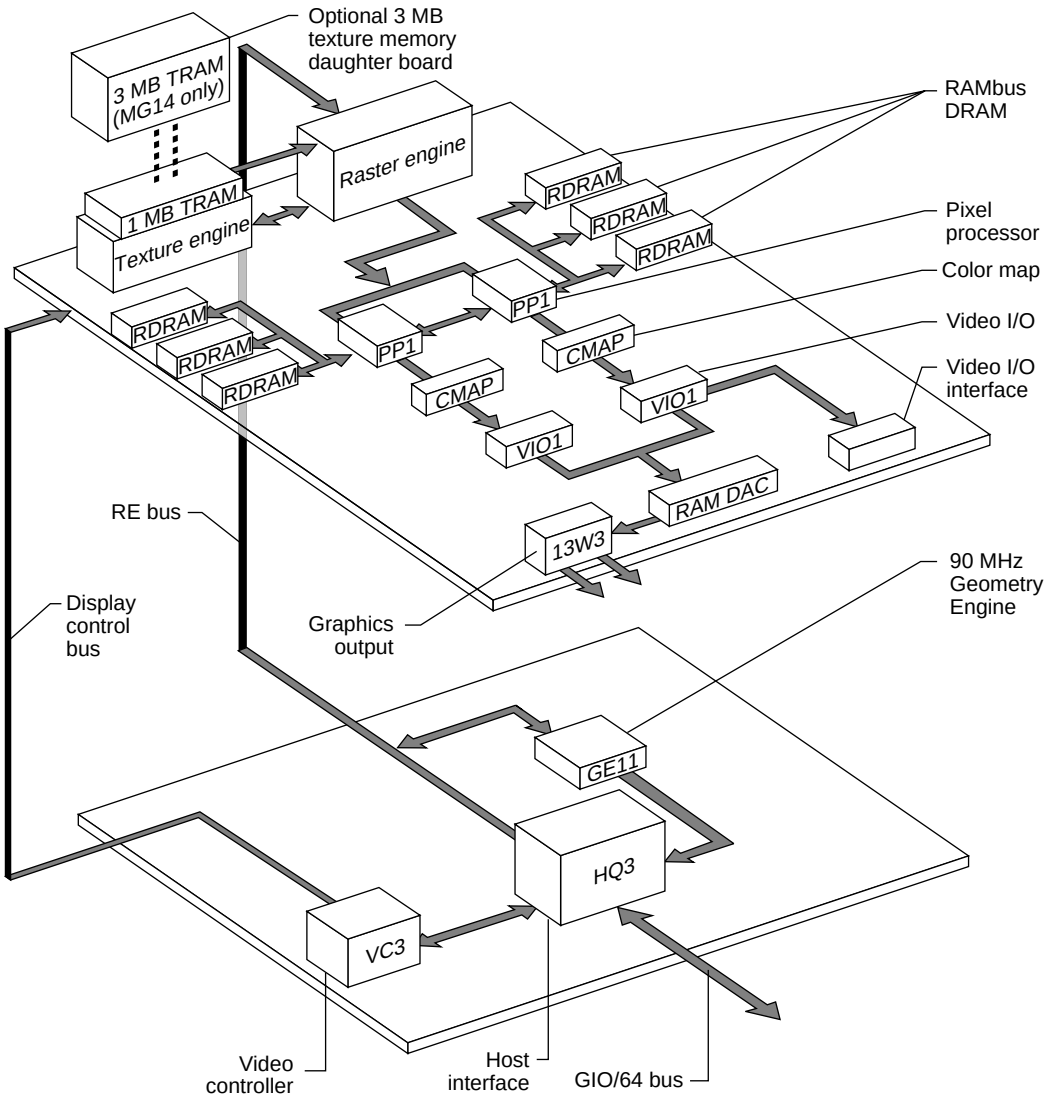
1.7 Indigo^2 Maximum IMPACT (MG21 and 24) Overview

Implementation of an MG21 or 24 graphics board set requires the dual 80 MHz GE11 geometry display (GD) board plus the addition of the raster A board and raster B board.

This combination of raster A and B boards with the GD board is the basic Indigo^2 Maximum IMPACT graphics set, also known as the MG21. Using an optional 3 MB texture RAM daughter board on raster A and raster B offers enhanced graphics texturing (also known as MG24).

Note: When equipping the raster boards with extra TRAM, raster A and raster B must both use the TRAM daughter boards. You may not upgrade only one of the two raster boards with a TRAM daughter board.

The raster A board houses a single raster subsystem, a display subsystem, a video I/O multiplexer, a texture engine, and 1 MB of texture RAM (TRAM). The raster A board provides the 13W3 monitor connector.



The raster B has a single raster subsystem, a texture engine, and 1 MB of texture RAM standard.

Figure 1-5 shows a three-board graphics set with optional TRAM daughter boards. See Figure 1-6 for an overall functional block diagram of the MG21 or MG24 graphics implementation.

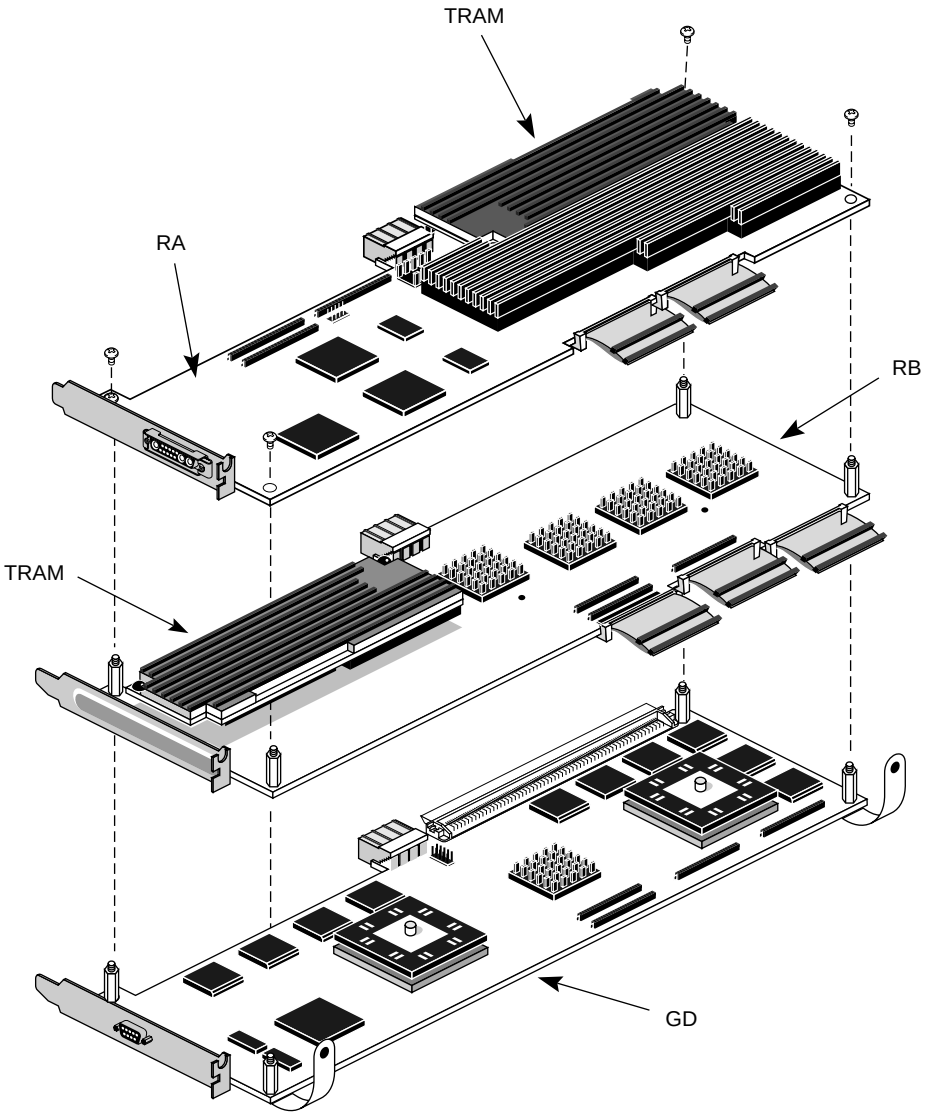
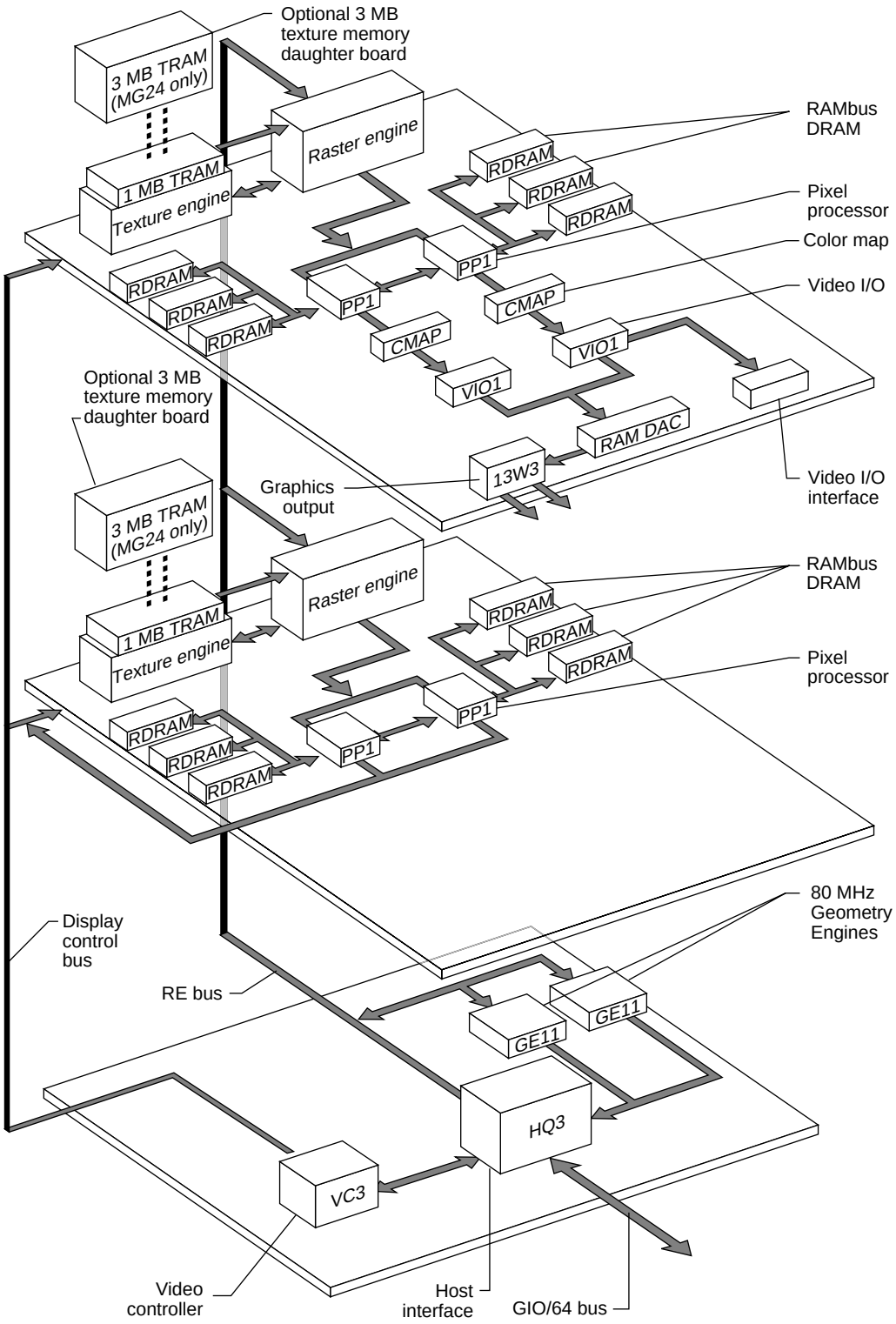


Figure 1-5 Three-Board Graphics (MG21 or MG24)

Figure 1-6 Indigo2 Maximum IMPACT (MG21 and MG24) Functional Block Diagram

1.8 Graphics Circuitry Overview

The following subsections discuss major components that make up the Indigo^2 IMPACT graphics board set. Some of the components are optional, and not every system has all of them. Consult Table 1-1 for information on the hardware included with each version of the graphics board set.


Optional 3 MB
texture memory
daughter board
3 MB TRAM
(MG24 only)
1 MB TRAM
Texture engine
Raster engine
RAMbus
DRAM
RDRAM
RDRAM
RDRAM
Pixel
processor
PP1
Color map
CMAP
Video I/O
VIO1
RAM DAC
13W3
Video I/O
interface
Graphics
output
Optional 3 MB
texture memory
daughter board
3 MB TRAM
(MG24 only)
1 MB TRAM
Texture engine
Raster engine
RAMbus
DRAM
RDRAM
RDRAM
RDRAM
Pixel
processor
PP1
80 MHz
Geometry
Engines
Display
control
bus
RE bus
GE11
GE11
HQ3
VC3
Video
controller
Host
interface
GIO/64 bus

1.8.1 HQ3 Bus Interface ASIC

The HQ3 ASIC has a 50 MHz internal clock and a 100 MHz interface to the GE11(s). The GIO64 interface to the system motherboard runs at 33 MHz. The HQ3 deals with both graphics primitives (lines and triangles) and pixels. It supports transfer of all OpenGL® pixel types. It can reformat pixel line areas for optimal Geometry Engine and raster engine processing.

The HQ3 supports the following types of high-speed transfers:

- Straight through, host-to-raster-engine pixel reads and writes.
- Host-to-Geometry Engine and raster engine operators and format conversions.
- Raster-engine-to-Geometry Engine pixel operations on screen-to-screen copies.
- Raster engine or Geometry Engine to host transfers for pixel read reformatting.

The HQ3 also acts as an interface for the GE11(s). By using an internal RAM-based microcode sequencer, the HQ3 can:

- parse the GE11 instruction stream into primitives for distribution to the GE11(s)
- track GL attributes and update the GE11(s) as needed
- normalize 8- or 12-bit color values
- control REbus ownership and arbitration
- reformat GIO data into raster engine register formats

1.8.2 GE11 ASIC

GE11 ASIC(s) are installed on the geometry display (GD) board in the Indigo^2 IMPACT. The GE11s used have internal first-in-first-out (FIFO) buffers. They each also use static random access memories (SRAMs). Each GE11 ASIC on the GD board uses

- two 64Kx18 data SRAMs
- four 64Kx18 SRAMs for microcode

The GE11 has an internal microcode sequencer, but it executes by way of an external microcode RAM. Direct access to external RAM is also used for storing look-up tables and context information.

Other GE11 internal features include

- three floating point unit and integer cores
- a 2Kx32 main internal RAM
- instruction cache TAG RAM
- a 32-bit wide instruction block
- a branch table cache
- 32x32 bit data registers
- a 16x32 bit address register file

- precision floating point number to integer converter
- 128x32 bit output buffer RAM used for passing information to the raster engine

1.8.3 Raster Engine (RE) ASIC

Each raster engine (RE) ASIC works with two pixel processor (PP1) ASICs, and six RAMbus Dynamic Random Access Memory (RDRAMs).

The GE11 feeds geometry, color, and texture information for triangles, blocks, lines, and points to the RE ASIC. Computation of pixel primitives and their associated parameters are passed on to the rendering subsystem. Increasing the number of raster engines increases the fill rate for all spans. The Indigo^2 IMPACT graphics system is limited to a maximum of two raster engines (one on the raster A board and one on the raster B board).

1.8.4 Texture Engine (TE) ASIC

The texture engine (TE) provides texturing capabilities to the graphics rendering raster engine (RE) discussed in the previous subsection. The TE is an enhancement to the graphics renderer ASIC. Only one TE is used with each RE.

Note: The Solid IMPACT board does not contain a TE ASIC and does not have hardware texturing capabilities.

Each texture engine uses one or (optionally) four texture RAM (TRAM) ICs. To add the three optional texture RAM devices to the raster board requires the installation of an optional TRAM daughter board.

Each raster board can have one optional 3 MB TRAM daughter board installed.

Note that you cannot configure a system that uses one raster board with the optional 3 MB TRAM daughter board and a second that has only 1 MB of TRAM.

1.8.5 High-Resolution Back-End Circuitry (HRBE)

The HRBE consists of

- a VC3 high-resolution timing display generator (on the GD board)
- two VIO1 video interface ASICs (on the raster board)
- two color map ICs (CMAPs) (on the raster board)
- one RAMDAC digital-to-analog converter (on the raster board)
- one 13W3 video connector (on raster A)

1.8.6 VIDEO IC (VIO1) ASIC

The VIO1 has three functional connection lines:

- the outputs received from the color map IC
- an output line to the RAMDAC IC
- a bidirectional (input and output) bus that can connect to an optional Indigo^2 IMPACT video, ICO, or presenter board

1.9 Environmental Considerations

The Indigo^2 IMPACT graphics system consumes more power and dissipates approximately 300 BTUs per hour more heat than previous Indigo^2 XZ, XL, and Extreme graphics systems. However, there are no special additional site requirements for power and no additional site requirements for cooling.

All other environmental site requirements, including humidity, altitude, temperature, and vibration are unchanged.

1.10 New Operating System

Indigo^2 IMPACT upgrades require IRIX 5.3 for Indigo^2 All IMPACT or later.

1.11 Support for EISA Option Boards

Some EISA option boards may not yet be supported. Either you or the customer may wish to verify with Silicon Graphics whether or not a particular option board is supported. Also note that the Indigo^2 IMPACT backplane has one less EISA connector available than previous Indigo^2 backplanes.

1.12 Indigo^2 IMPACT Connectors

The raster A board has a 13W3 monitor connector, and the GD board has a 9-pin StereoView connector. Figure 1-7 shows the connectors and their pinouts.

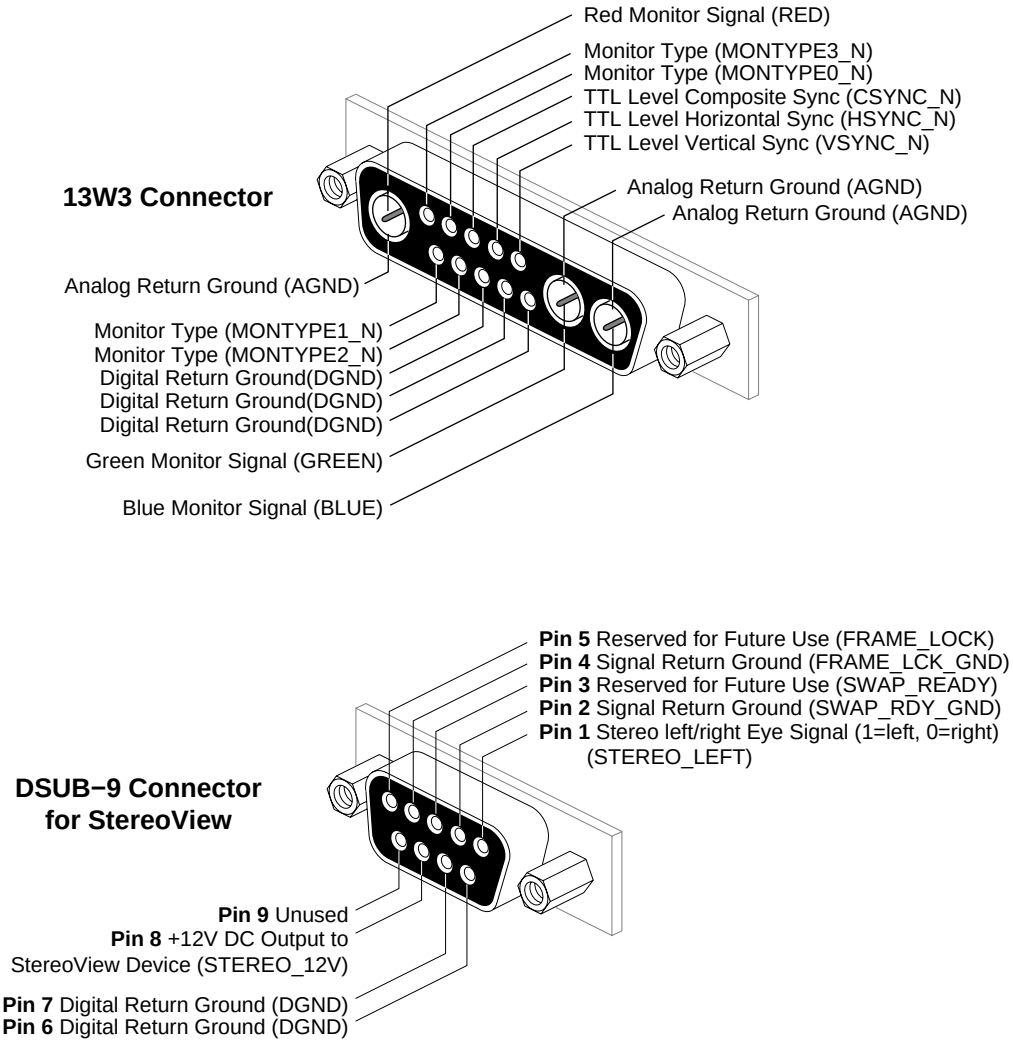


Figure 1-7 Indigo^2 IMPACT Graphics Connectors

1.13 Power Supplies (IMPACT and Dual-Head Support)

There are three different versions of the power supply for the Indigo^2. Each version has different graphics support capabilities (see Table 1-2 and Figure 1-8).

Power Supply P/N	Comments
9430814 (older-style, early Indigo2 power supply)	Supports Extreme, XZ, and XL graphics, but *does not* support Indigo^2 IMPACT graphics. This power supply must be replaced by 060-8001-00x or 060-0021-00x for the IMPACT upgrade.

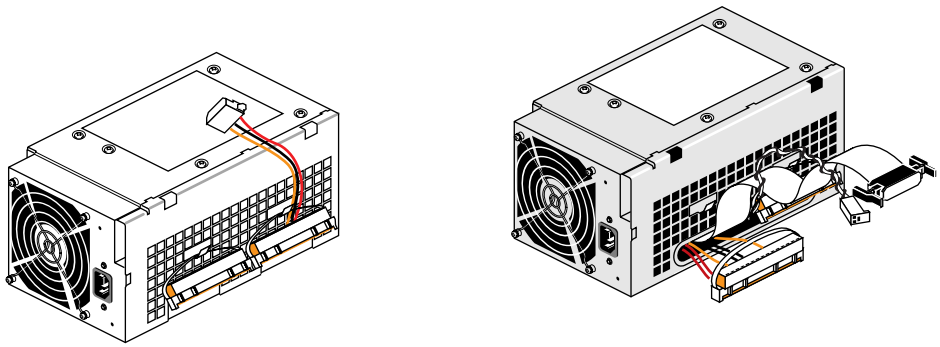
Table 1-2 Indigo^2 Power Supply Versions

Power Supply P/N	Comments
060-8001-00x (385-watt *first* replacement power supply)	Supports Indigo^2 IMPACT graphics and also supports all dual-head configurations, except for the Solid and Maximum IMPACT combination in an R4400 Indigo^2 (see Table 1-3).
060-0021-00x (390-watt *second* replacement power supply)	Supports Indigo2 IMPACT graphics and *all* dual-head configurations (see Table 1-3).

Table 1-2 Indigo^2 Power Supply Versions

The new power supply is mechanically similar to previous revisions. However, it provides higher current ratings and also has a direct power connection to the new Indigo^2 IMPACT graphics backplane. The increase is required for the Indigo^2 IMPACT and other graphics upgrades.

Note: The IMPACT graphics boards use mainly 3.5 V technology rather than 5 V.



Old−style power supply (p/n 9430814)

New−style 385 watt (p/n 060−8001−00x) and 390 watt (p/n 060−8021−00x) power supplies for Indigo^2 IMPACT

Figure 1-8 Indigo^2 Power Supplies

Note: The 385-watt (first replacement) power supply (p/n 060-8001-00x) and the 390-watt (second replacement) power supply (060-0021-00x) look nearly identical. See Table 1-3 for a list of support differences between the two power supplies.

Dual-Head IMPACT configuration	Supported by first replacement power supply (p/n 060-8001-00x)?	Supported by second replacement power supply (p/n 060-0021-00x)?
Two Solid heads	Yes	Yes
One Solid and one High head	Yes	Yes
Two High heads	Yes	Yes

Table 1-3 Power Supplies and Dual-Head IMPACT Support

Dual-Head IMPACT configuration	Supported by first replacement power supply (p/n 060-8001-00x)?	Supported by second replacement power supply (p/n 060-0021-00x)?
One Solid and one Maximum head	No	Yes

Table 1-3 Power Supplies and Dual-Head IMPACT Support

Note: Only one MG21 or MG24 (Maximum) three-board set can be installed into an Indigo^2 at a time, so you can never have a dual-head Indigo^2 system with two Maximum IMPACT board sets. The Indigo^2 IMPACT has only four available graphics board slots.

1.14 System Motherboard and PROM Replacement

The PROM on the IP22 motherboard can be accessed only after removing existing graphics, EISA, and video boards. See Section 2.2.4, “Removing the Old Components” in Chapter 2.

Chapter 2

Installing the Upgrade

This chapter describes the procedures for upgrading an existing Indigo^2 with an Indigo^2 IMPACT graphics board or board set. There are two types of upgrades:

- Upgrading and retrofitting the non-IMPACT-ready Indigo^2 system.

  This is a more involved and time-consuming upgrade. It requires that you replace the power supply, midplane, motherboard PROM, as well as the old graphics board(s).

- Upgrading the IMPACT-ready Indigo^2 system

  This upgrade consists of replacing the old graphics board and connecting power cables.

2.1 Safety

Be sure to read the safety guidelines outlined in this section before proceeding with the installation procedures.

Warning: **This equipment is extremely sensitive and is susceptible to damage caused by electrostatic discharge (ESD). ESD is an electrical discharge (spark) caused by the buildup of electrical potential on clothing and other materials.**

Follow these ESD-preventive measures:

- Connect a ground strap to your wrist when installing and removing boards. Use an approved wrist strap with an in-line resistor to prevent electric shock.
- Be sure that you and all of the electrical equipment that you handle during this installation remain at a ground potential of zero to avoid damage from ESD.
- Remove a component from its antistatic bag only when you are properly grounded with a ground strap, and only when you are working on the board or installing it.
- Do not use an ohmmeter on the graphics boards.

Warning: **Use extreme care when handling the IMPACT graphics boards and attached flex cables. Do not set the boards down roughly onto a hard surface (such as a desktop or filing cabinet) and be careful not to scrape the underside of the boards against parts of the system chassis. Do not press on the flexible (flex) interconnect between the graphics boards.**

2.2 Upgrading A Non-IMPACT-Ready Indigo^2 Chassis

This section describes how to upgrade non-IMPACT-ready systems to accept the IMPACT graphics board(s). If you are not sure whether your Indigo^2 is a non-IMPACT-ready or an IMPACT-ready system, look for the following major differences (see also Section 2.3).

- The IMPACT-ready system has a gold-colored midplane; the older-style, non-IMPACT-ready Indigo^2 systems do not.
- The non-IMPACT-ready Indigo^2 systems contain the older power supply (p / n 9430814). See Section 1.13 in Chapter 1.

2.2.1 Procedure Overview

The basic steps to upgrade the system are:

- Review the safety, ESD, and cover removal procedures. See Section 2.2.3.
- Verify that the customer's system has been backed up.
- Verify that you have all of the required components before proceeding with the installation. See Section 2.2.2, "Checking the Kit Content and Tools."
- Power off the system and remove its power supply, graphics board(s), any optional EISA or video card, the PROM, and backplane.
- Install the upgrade components (power supply, backplane, PROM, graphics boards, and any optional TRAM board). See Section 2.2.5, "Installing the New Components."
- Power on the system, enter the Command Monitor, and verify the new configuration using the *hinv* command. See Section 2.4.
- Boot the new IRIX miniroot from CD-ROM and install IRIX. See Section 2.4, "Software Installation."
- Attach the Indigo^2 "IMPACT" upgrade emblem to the front of the system and the upgrade identification label to the back of the system. See Section 2.6, "Completing the Installation."
- Run diagnostics if applicable, and pack and return the old parts (see Chapter 3).

2.2.2 Checking the Kit Content and Tools

The upgrade kit (see Figure 2-1) includes but is not limited to the following:

- Graphics board set (one of the following)
  - Indigo^2 Solid IMPACT graphics board (P / N 030-0786-00x) (MG10)
  - Indigo^2 High IMPACT graphics board set (P / N 013-1150-00x) (MG11)
  - Indigo^2 Maximum IMPACT graphics board set (P / N 013-1149-00x) (MG21)
- 385-watt power supply (P / N 060-8001-00x) or 390-watt power supply (P / N 060-8021-00x)
- Graphics system backplane (P / N 013-1147-00x)

- Backplane bracket and screw (P / N 040-1038-00x)
- Indigo^2 IMPACT PROM (P / N 070-1367-007 or 070-1371-007) or later revision
- PROM-removal tool (P / N 9448008)
- IRIX operating system CD-ROM(s) (P / N is variable)
- Graphics board set retention pin (P / N 040-1238-00x)
- Wrench for removing board standoffs (P / N 040-8341-00x)
- Indigo^2 IMPACT badge (P / N 050-0204-00x)
- Upgrade label (to attach to the back of the system) (P / N 024-8080-00x)
- Disposable wrist strap (P / N 8050103)
- RMA documents for old components

Note: The optional TRAM daughter board (P / N 030-0676-00x) is shipped in a separate upgrade kit. Detailed installation instructions are included in the *Indigo^2 IMPACT Texture Memory Option Board Installation Guide* (P / N 007-3079-001)

You need the following tools:

- phillips type screwdriver
- wrist strap
- PROM extraction tool

You should also make sure that a CD-ROM drive is available, preferably one that is attached directly to the system (either internally or externally).

If you are not familiar with booting the IRIX miniroot and using the software installation tool *inst*, refer to *the Software Installation Administrator's Guide.*

2.2.3 Removing the System Covers

Begin the upgrade by properly shutting down the system and powering it off. Then move to the front of the unit and remove the covers. Use the following steps:

1. Snap the front cover away from the top and press the power switch.
2. Remove the security bar (if present) and disconnect any EISA, graphics, or video cables that are connected to the system.
3. Press down on the tabs and remove the front bezel (see Figure 2-2).
4. Press up on the tabs at either side of the drive openings.
5. Pull up on the cover and lift it back and away from the chassis.

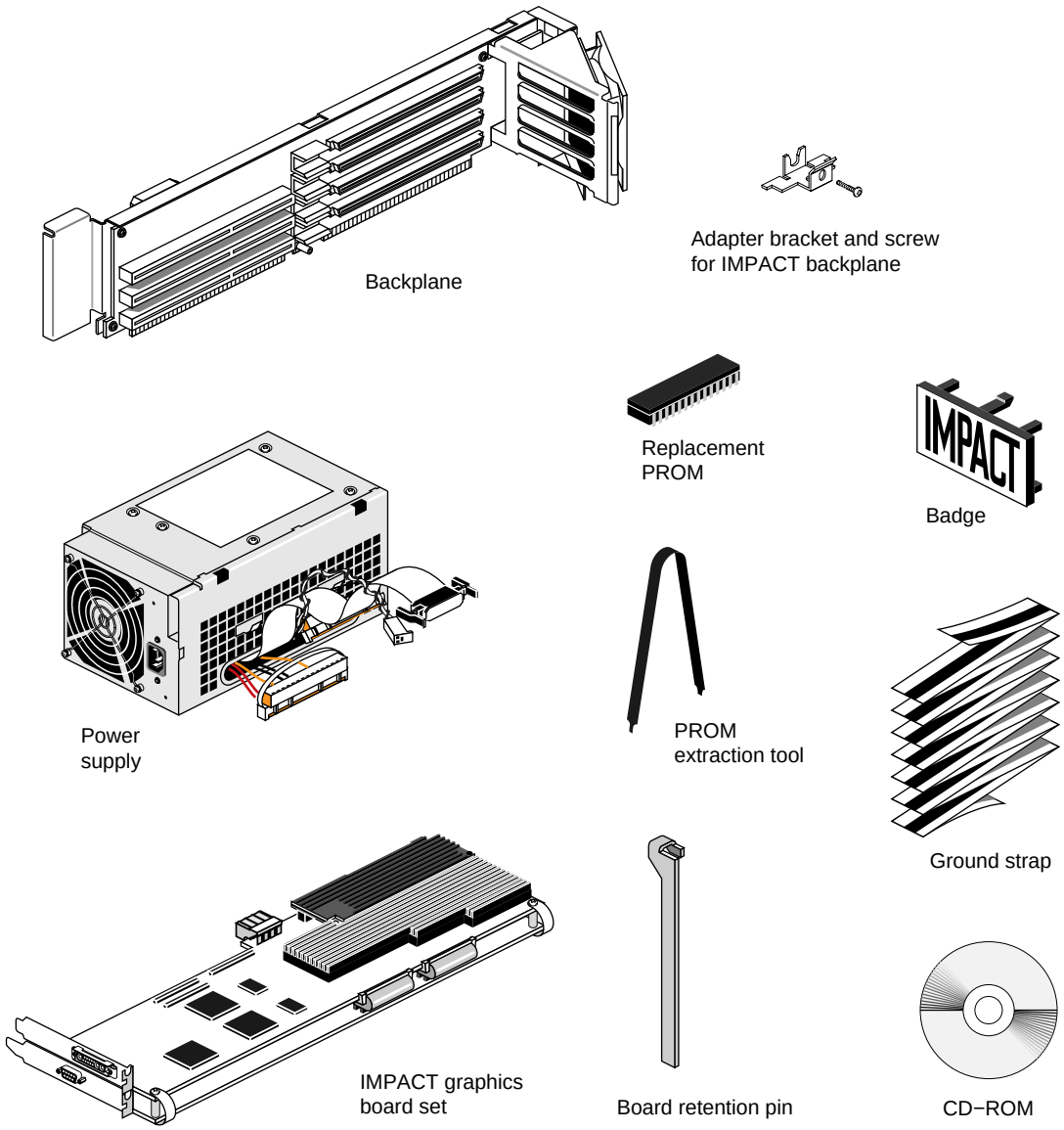


Figure 2-1 Indigo^2 IMPACT Upgrade Kit Contents

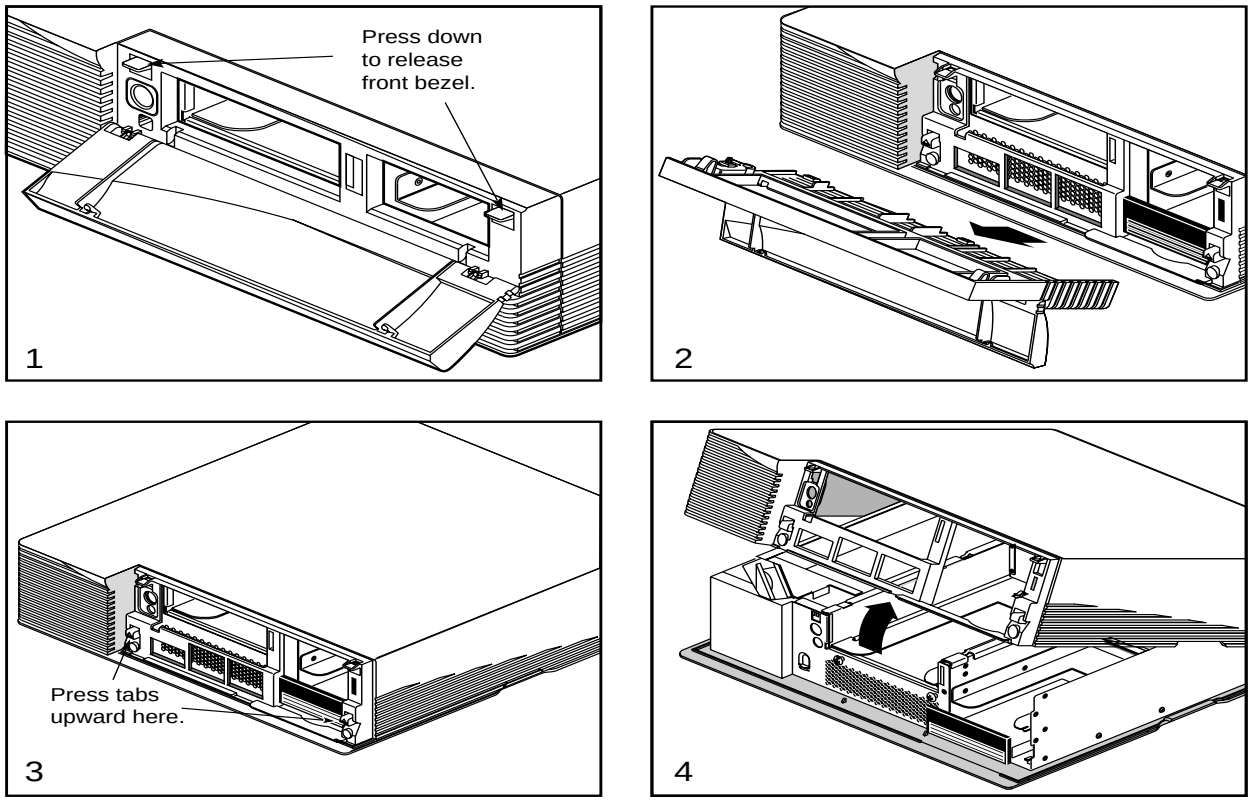


Figure 2-2 Removing the Covers

2.2.4 Removing the Old Components

Remove the old components from the customer's Indigo^2 as follows:

1. Lower the metal door that covers the GIO and EISA expansion slots, then unfasten the screws on the I/O plates that hold the graphics, EISA, or video boards to the chassis. Figure 2-3 shows a board removal example. Graphics boards, EISA, or video boards are all removed in a similar manner.

   Note: You may find a standoff wrench, shown in Figure 2-4 useful when removing boards.

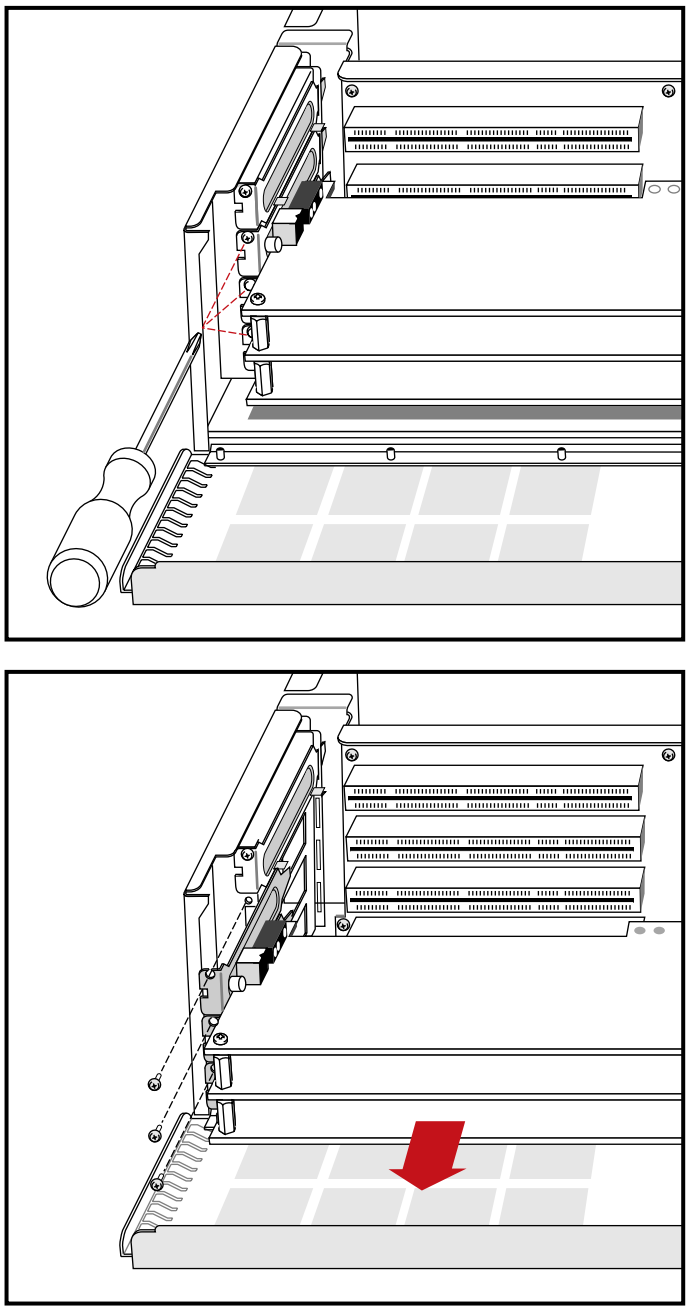


Figure 2-3 Board Removal Example

2. Unlatch the retaining clips and disconnect the flat flex SCSI cable from the rear of the 5-1/4 inch drive tray.
3. Undo the captive screws located in the lower front of the tray (see Figure 2-5). Note that if a drive is installed in the tray, you may remove it or leave it in place.
4. Slide the tray back to unlatch it, then lift it up and out of the system.

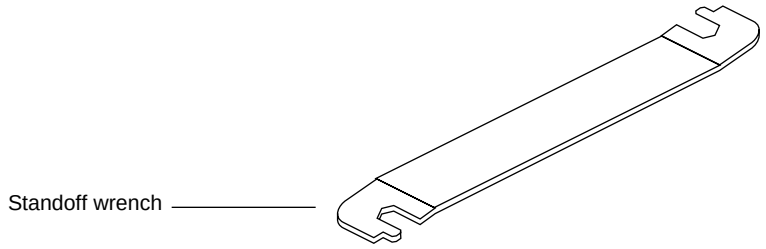


Figure 2-4 Standoff Wrench

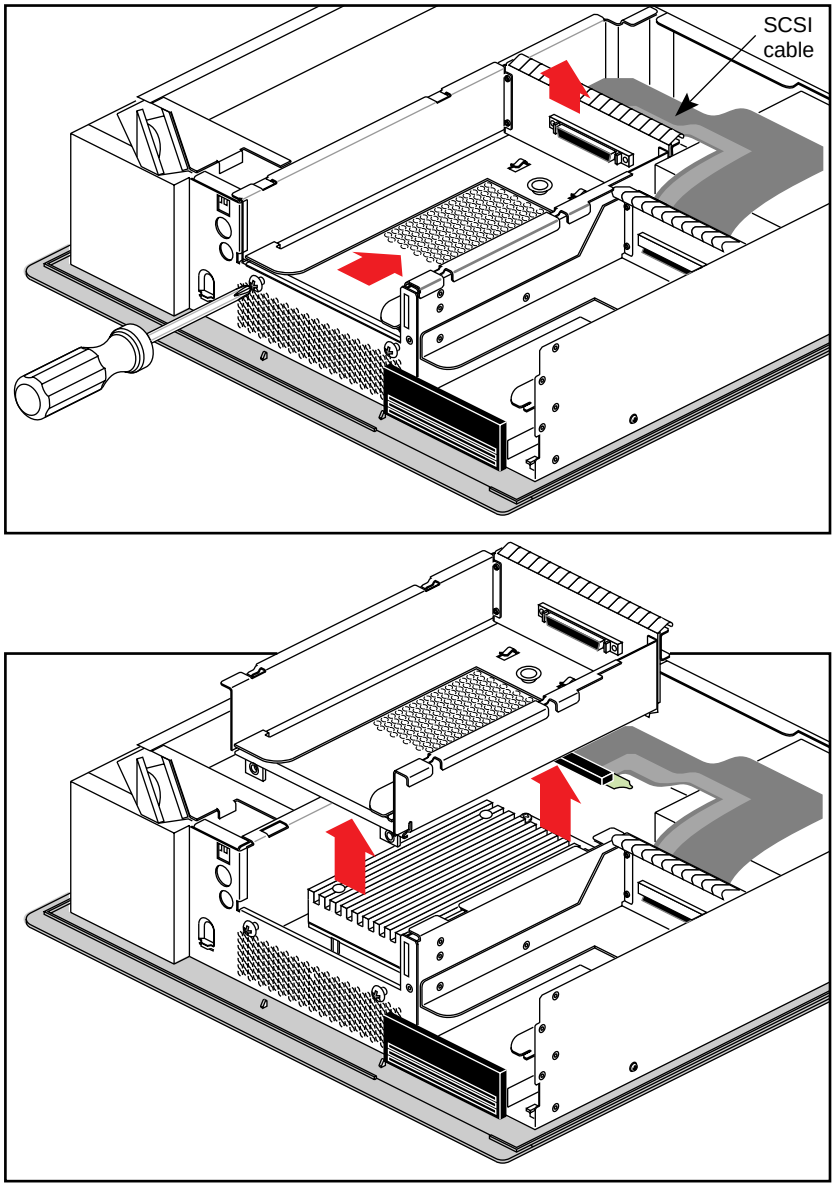


Figure 2-5 Removing the 5-1/4 Inch Drive Tray

5. Disconnect the motherboard and system drive power supply cables as shown in Figure 2-6.

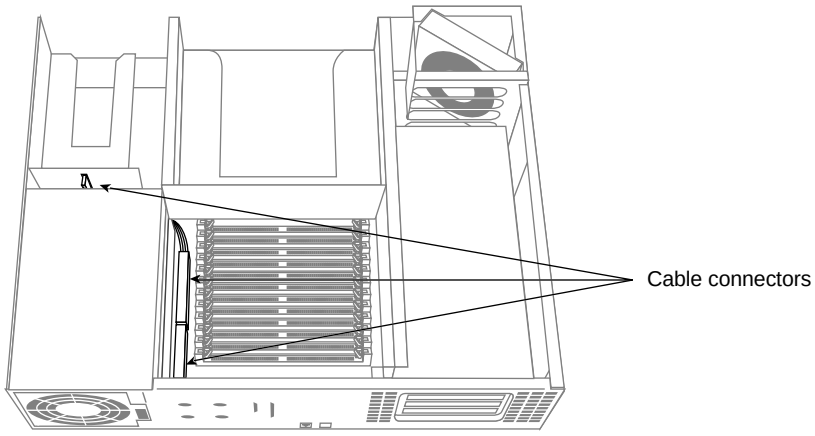


Figure 2-6 Disconnecting the Power Supply Cables

6. Unfasten the four screws that hold the power supply in place. Two are located on the back of the system and the other two are located on the side of the system, as shown in Figure 2-7.

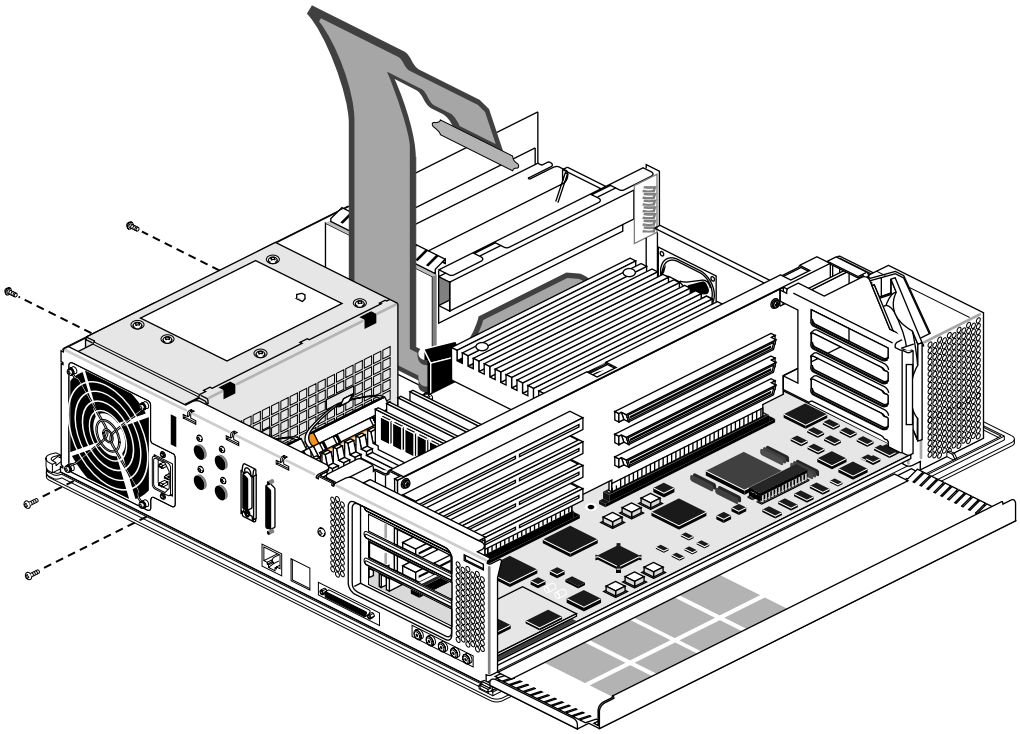


Figure 2-7 Removing the Power Supply Screws

7. Slide the power supply toward the front of the system about 1/4 inch (approximately 6 mm), then lift it out of the chassis, as shown in Figure 2-8.

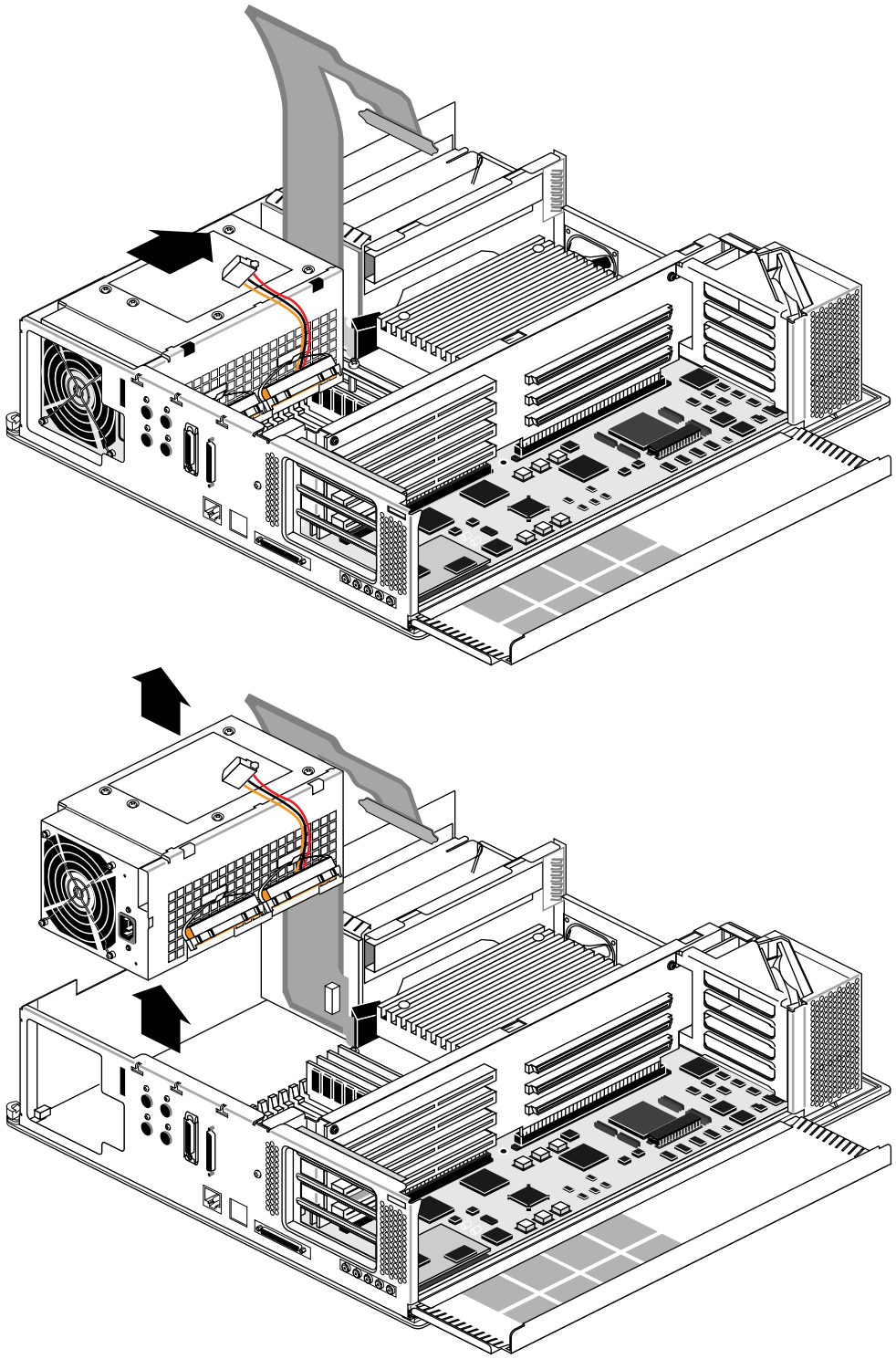


Figure 2-8 Unlatching and Removing the Power Supply

8. Locate the PROM on the system motherboard. See Figure 2-9.
9. Remove the old PROM using the tool provided in the upgrade kit.

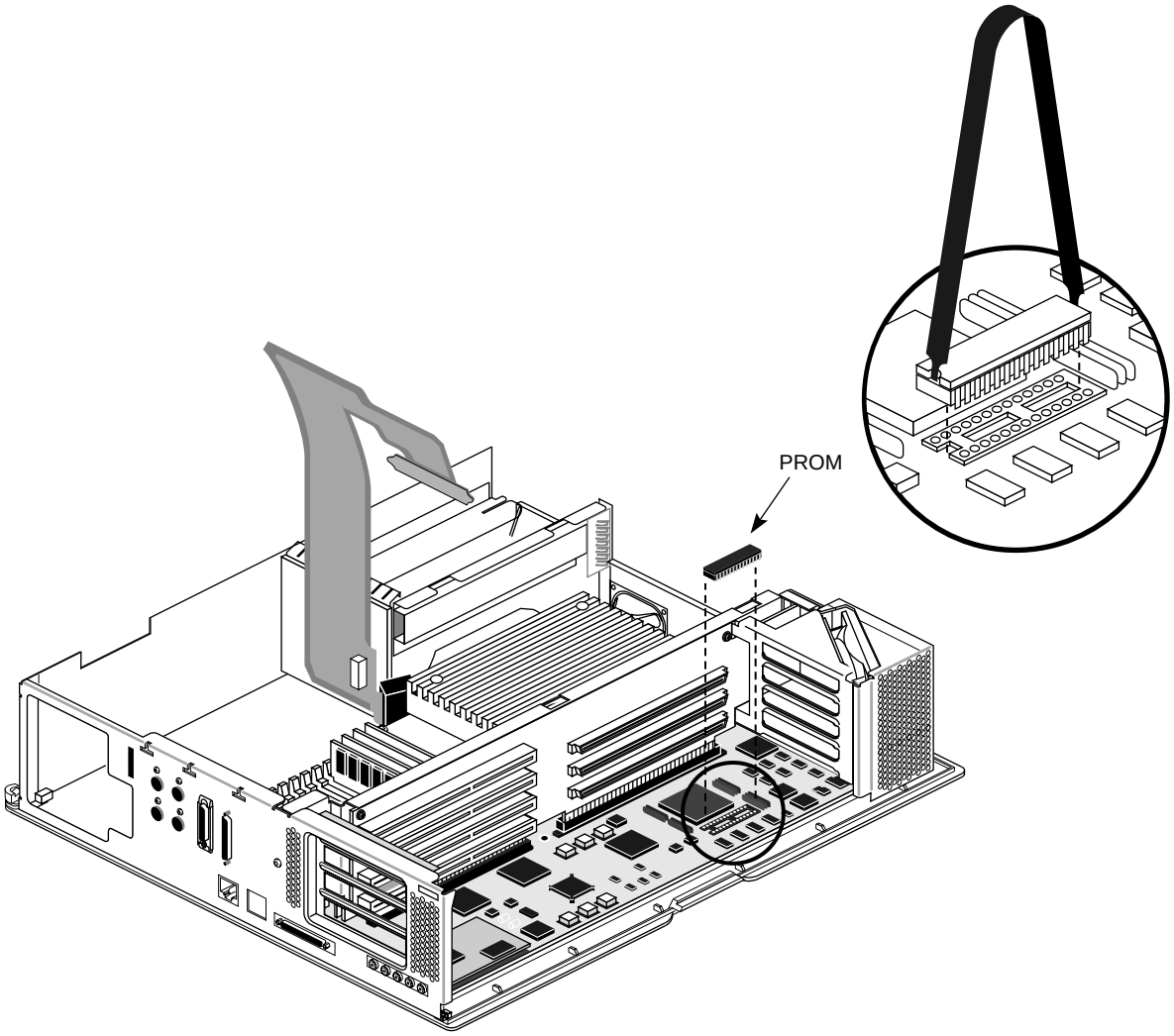


Figure 2-9 Locating and Extracting the Old PROM From the Motherboard

10. Remove the two screws that fasten the EISA / GIObus backplane to the chassis, as shown in Figure 2-10. The first screw connects the backplane to the rear sheet-metal frame of the Indigo^2; the second secures the backplane to the motherboard.
11. Lift out the backplane and fan assembly by pulling up on the metal tabs located at either end of the backplane.

    Note: Some older chassis may not have screws fastening the backplane to the chassis.

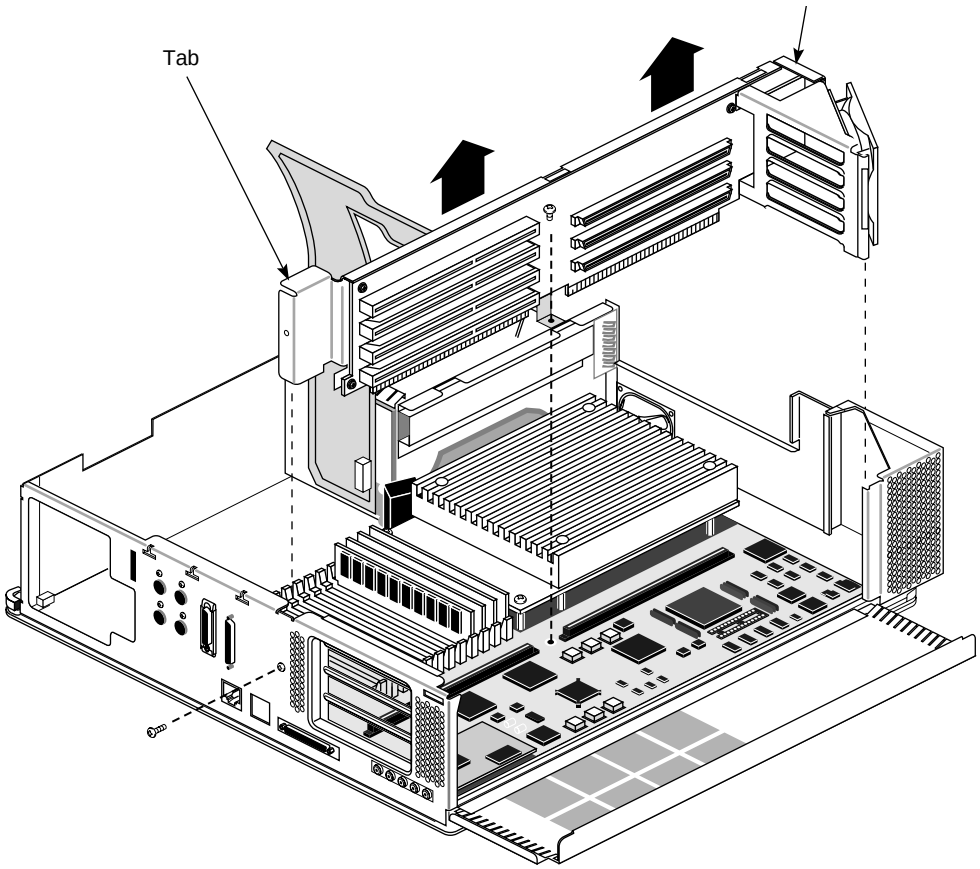


Figure 2-10 Removing the Old Backplane and Fan Assembly

12. You are finished removing the old components of the system. Proceed with Section 2.2.5, “Installing the New Components.”

    Note: The video boards designed to work with XZ, XL, or Extreme graphics do not work with Indigo^2 IMPACT graphics. Do not attempt to reinstall them with the new graphics boards.

2.2.5 Installing the New Components

Install the new components as follows:

1. Install the new PROM on the system motherboard. See Figure 2-11.

   Be sure the PROM is firmly seated.

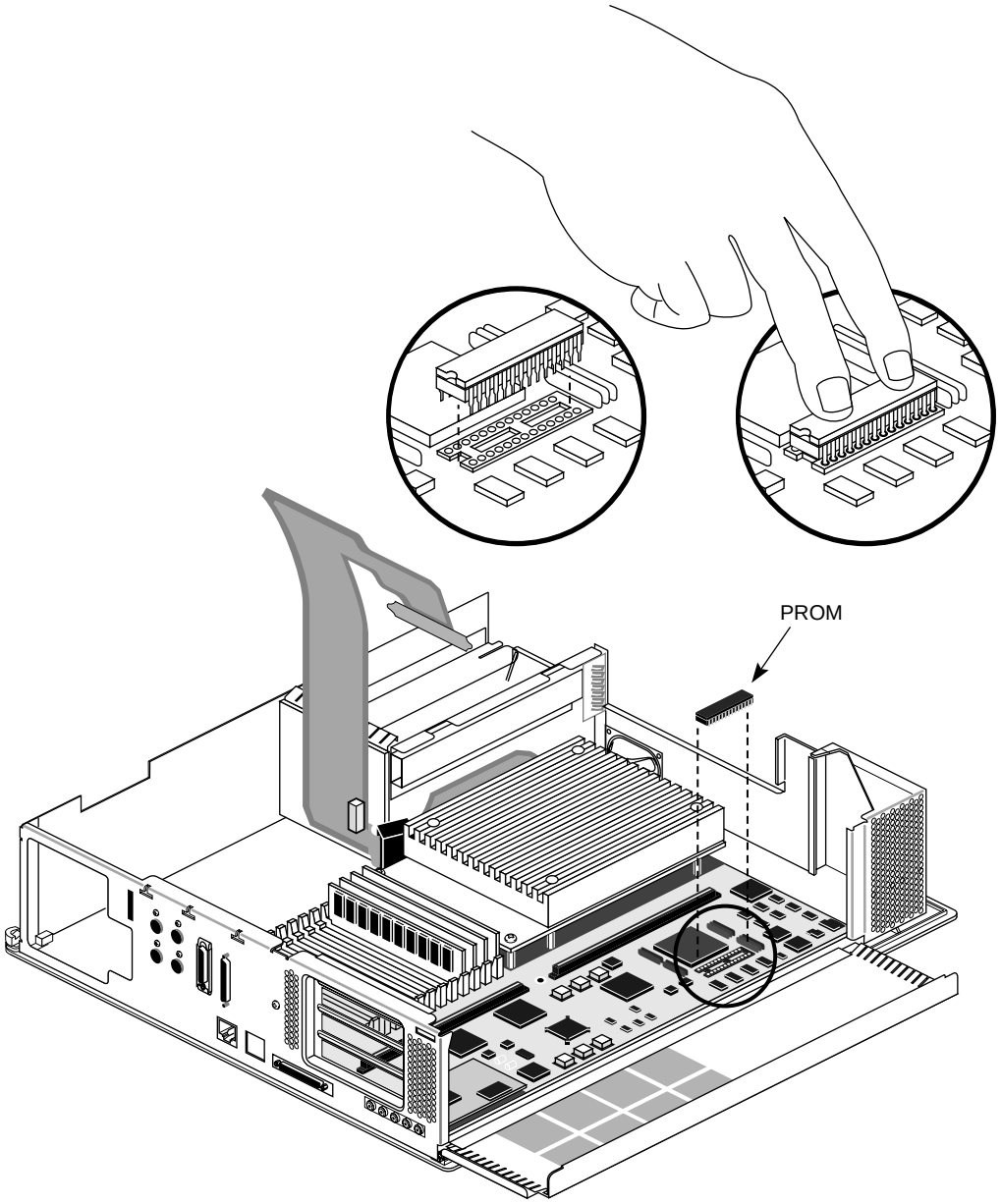


Figure 2-11 Aligning and Installing the New PROM on the System Motherboard

2. Holding the power supply in one hand, connect the power cable that attaches to the back of the system drive bay first.
3. Lower the power supply into the chassis as close to the disk drives as possible. Make sure that the power supply is flat against the bottom of the chassis.
4. Push the supply toward the back of the chassis, making sure that the metal tabs on the chassis floor engage the slots on the bottom of the power supply.

   Note: If you can't lift up on the supply without lifting up the chassis, the tabs are properly engaged.

5. Align the screw holes on the power supply with the appropriate holes on the chassis, then install and tighten the screws. See Figure 2-12.

6. Connect the two power cables located near the SIMM modules into the motherboard. These cables are not keyed and should be carefully aligned before pressing firmly to seat them. The side-connected power cables are not attached until the new backplane and fan assembly is installed.

   Note: With some older models of the Indigo^2 system, you may have difficulty sliding the power supply into position. If this happens, remove the power supply and examine the bottom of the unit. Locate the two tabs on the bottom of the power supply that attach the unit to the **U**-shaped slots on the bottom of the system chassis. Using a flat-bladed screwdriver, bend the two tabs outward slightly (approximately two to three millimeters) so that they protrude farther from the bottom of the power supply. This allows the tabs to slide into the **U**-shaped slots.

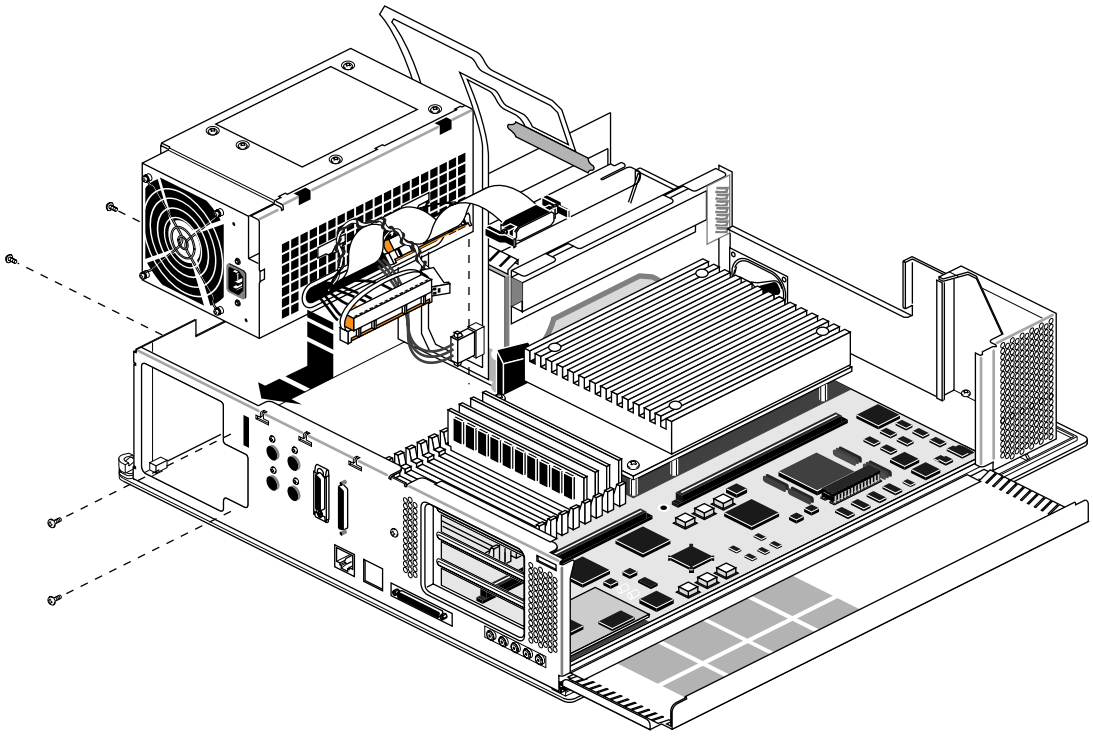


Figure 2-12 Installing the New Power Supply

7. Install the new backplane adapter bracket onto the motherboard using the screw from the old backplane. Note that the “tongue” of the bracket is closest to the graphics boards, while the “forked” piece is closer to the CPU and drives. See Figure 2-13.

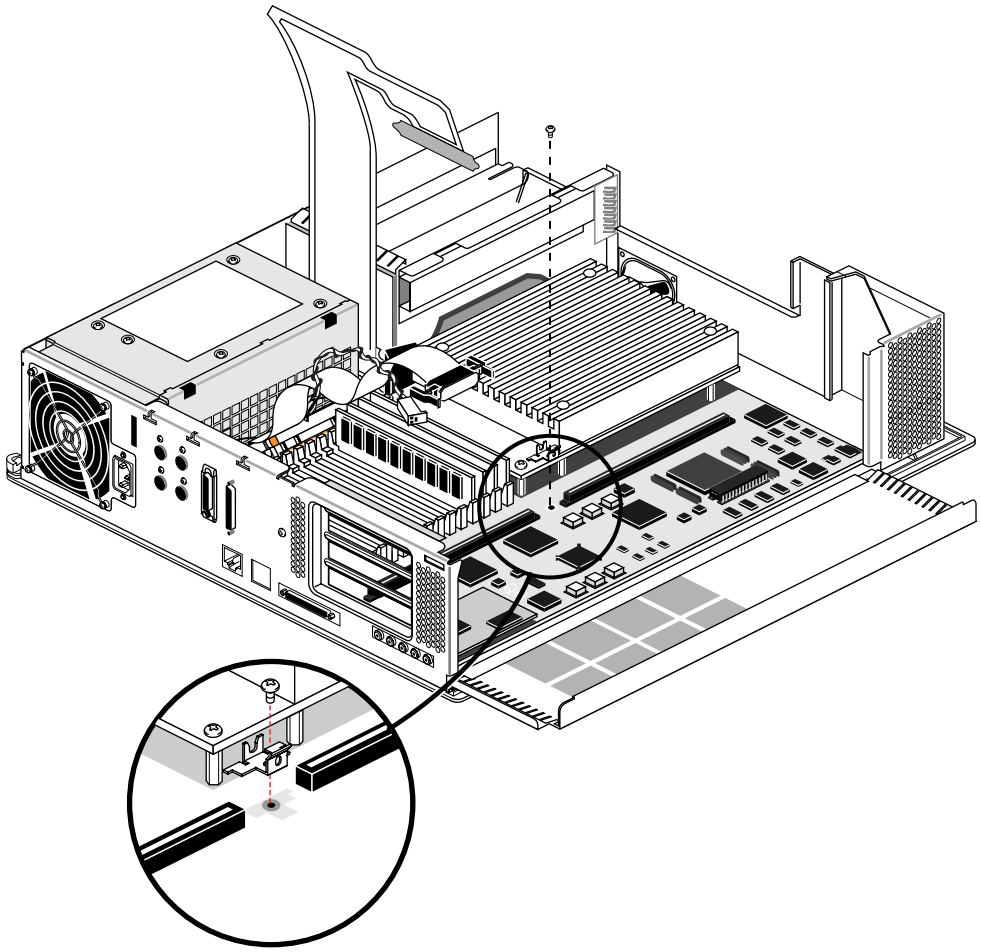


Figure 2-13 Indigo^2 IMPACT Backplane to Motherboard Adapter Bracket

8. Install the new backplane by lowering it into position and pressing firmly to seat the backplane connectors in the slots on the system motherboard. See Figure 2-14.
9. Install the screw (from the upgrade kit) that connects the motherboard adapter bracket to the cylinder protruding from the bottom of the backplane sheetmetal. Install and tighten the screw that holds the backplane to the rear chassis sheet metal.
10. Unroll the two power cables from the new power supply and connect them to the new backplane.

    Note: You may need to cut the cable tie that helps to secure the two power cables in place during shipping to allow you to plug in the cables.

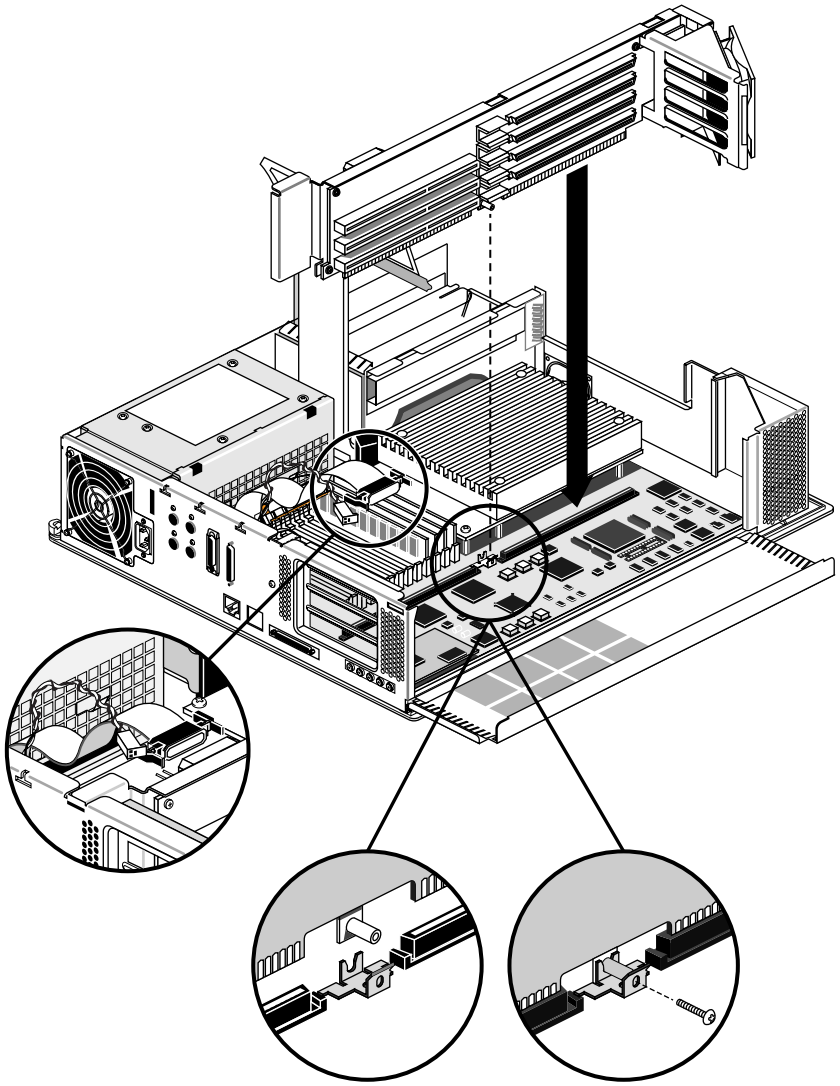


Figure 2-14 Installing the New Backplane

11. Prepare for installation of the new boards by attaching any TRAM daughter boards to their respective connectors. See Figure 2-15 for an example. See the *Indigo^2 IMPACT Texture Memory Option Board Installation Guide* (P / N 007-3079-001) if you need detailed information.

    Note: With some configurations (Indigo^2 Maximum IMPACT), it may be impossible to reinstall EISA boards in the upgraded system. Only new Indigo^2 IMPACT video boards work with the new graphics. Older (XL, XZ, or Extreme™) boards are not supported.

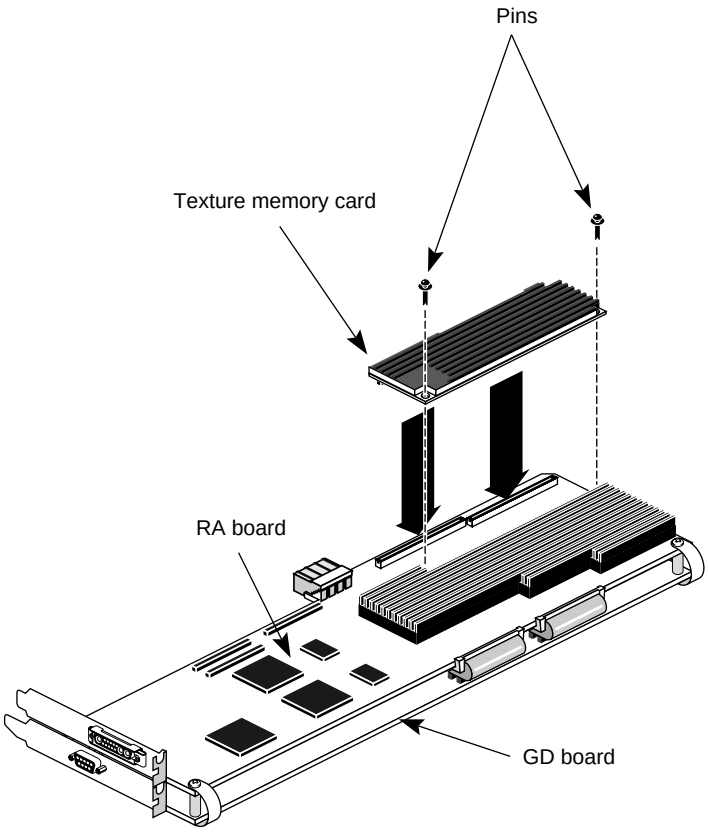


Figure 2-15 TRAM Daughter Board Installation

12. Install the graphics boards, any Indigo^2 IMPACT supported video board, and any EISA boards that you removed from the system. See Figure 2-16.

    Note: Always install the board set with the geometry display (GD) board in the bottom slot of the backplane. With the single-board Solid IMPACT upgrade, it is preferable to install the board into the second slot from the bottom. However, this board can fit into any available slot.

    Consult the *Indigo^2 Video for Indigo^2 IMPACT Owner's Guide* (P / N 007-2201-003) for specific information on installing Indigo^2 IMPACT-compatible video boards.

    Caution: When inserting and seating the graphics boards in the new backplane, never press on the flex connectors or cables. Always seat the boards by pushing on them near the standoffs. Be careful when holding or touching the boards not to bend any of the fine-pitch pins used on the boards.

13. Secure each board with a screw at the upper left corner (see Figure 2-16).

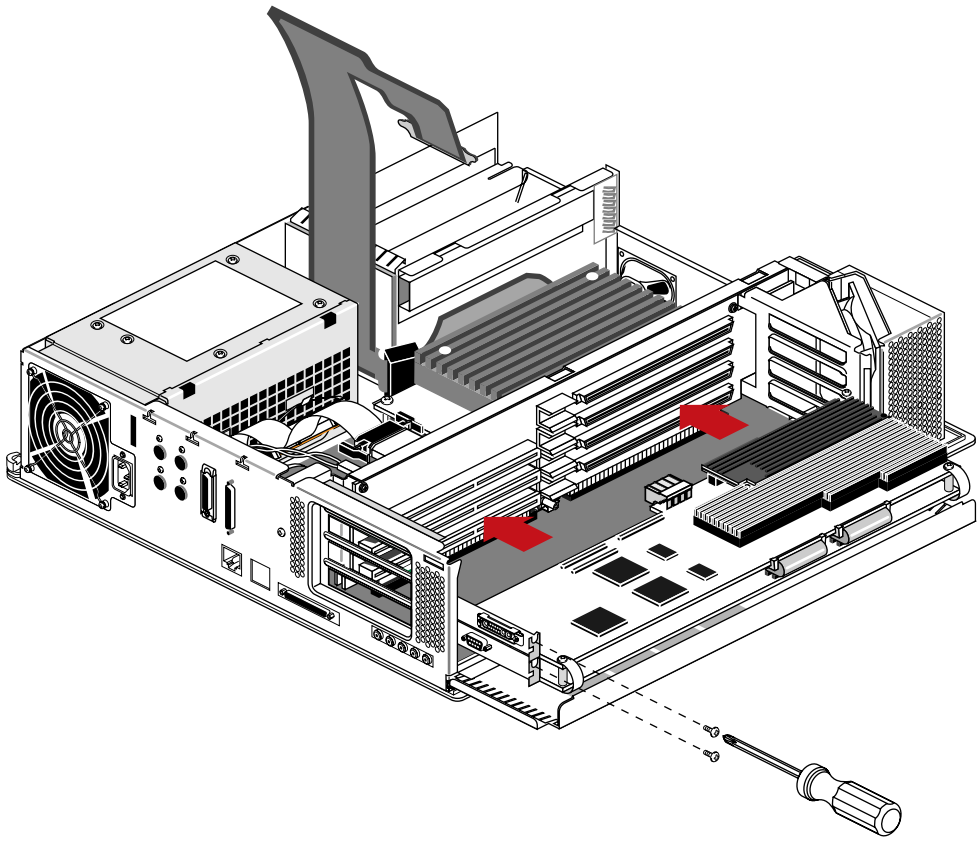


Figure 2-16 Installing the Indigo^2 IMPACT Graphics Boards

14. Position the board retention pin on the sheet-metal chassis next to the fan housing as shown in Figure 2-17.
15. Swing the metal door of the chassis upright and make sure it snaps in place.

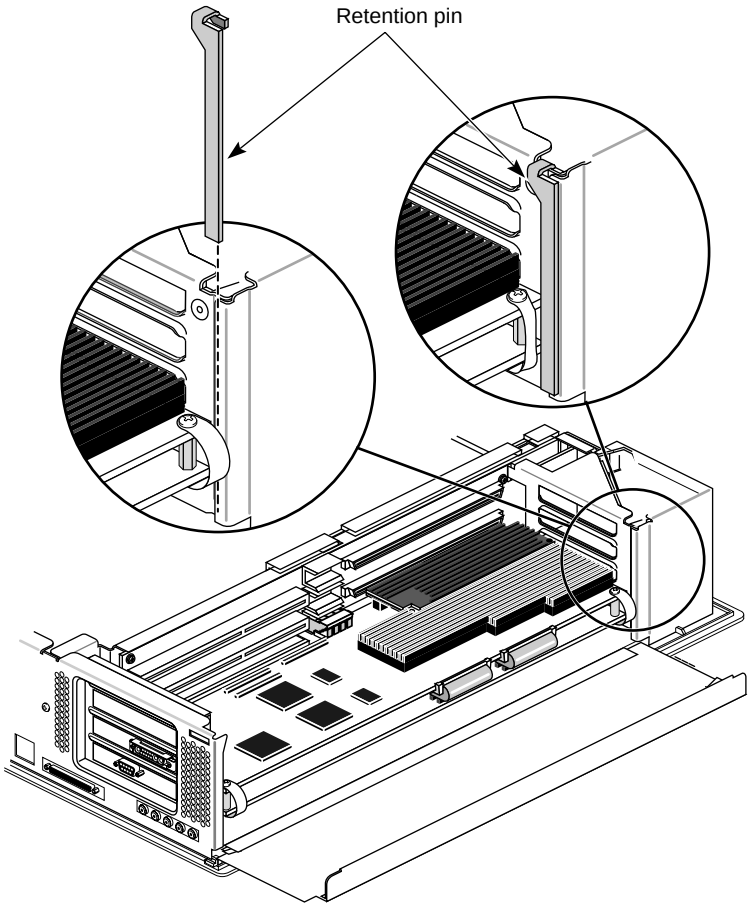


Figure 2-17 Installing the Board Set Retention Pin

16. Reinstall the 5-1/4 inch drive tray and reattach the flat SCSI cable and retention clips. When lowering the tray, keep it level, as shown in Figure 2-18, to avoid hitting the CPU module with a corner of the drive tray.

    Caution: Be very careful not to damage the CPU module when reinstalling the 5-1/4 inch drive tray. The back side of the CPU module is very close to the underside of the drive tray. Before sliding the drive tray forward and locking it in place, visually inspect the clearance between the drive tray and the CPU module. (Look through the perforated metal at the bottom of the drive tray).

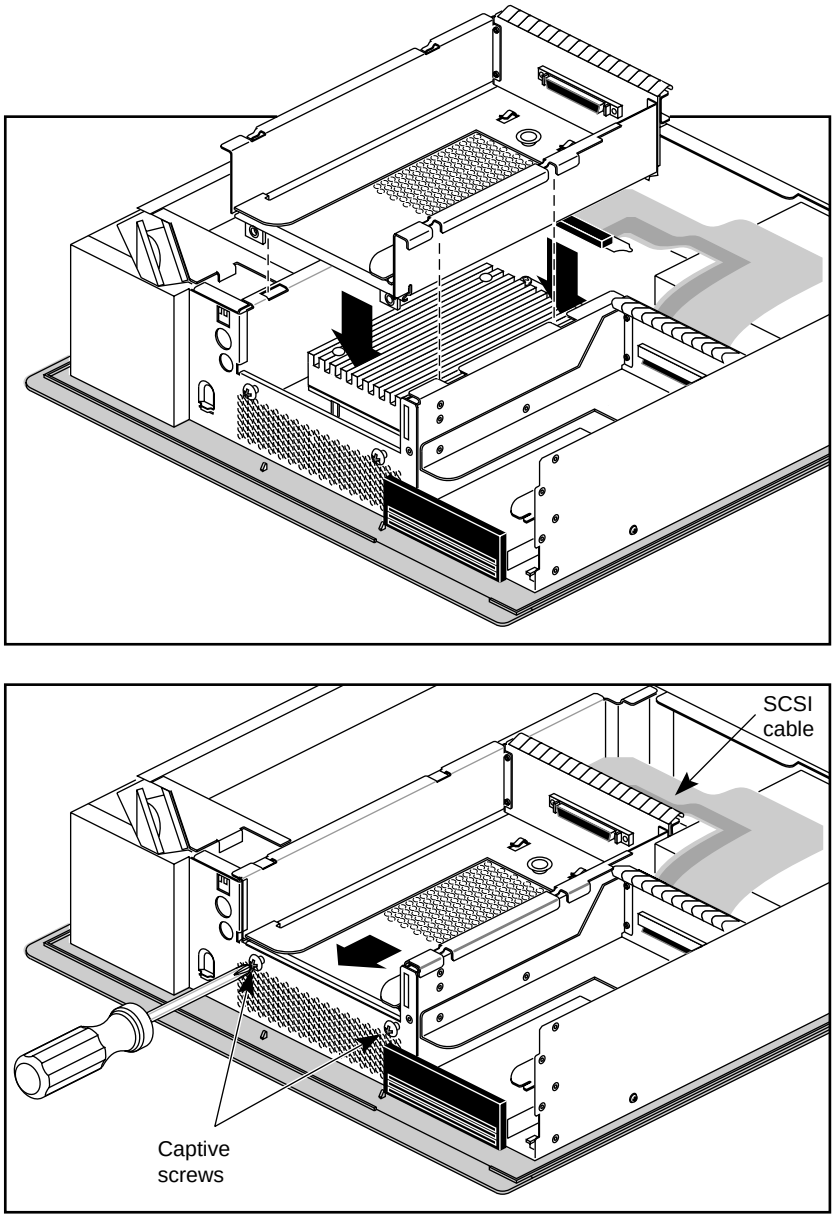


Figure 2-18 Reinstalling the 5-1/4 Inch Drive Tray

17. Replace the top cover, as shown in Figure 2-19. Be sure to properly align the plastic tabs in the top rear of the cover when sliding it on.
    - Place the tabs on the underside of the cover into the holes under the top ridge at the back of the chassis.
    - Slide the cover forward as the tabs slide into the holes.
    - Lower the cover onto the chassis until it snaps into place.

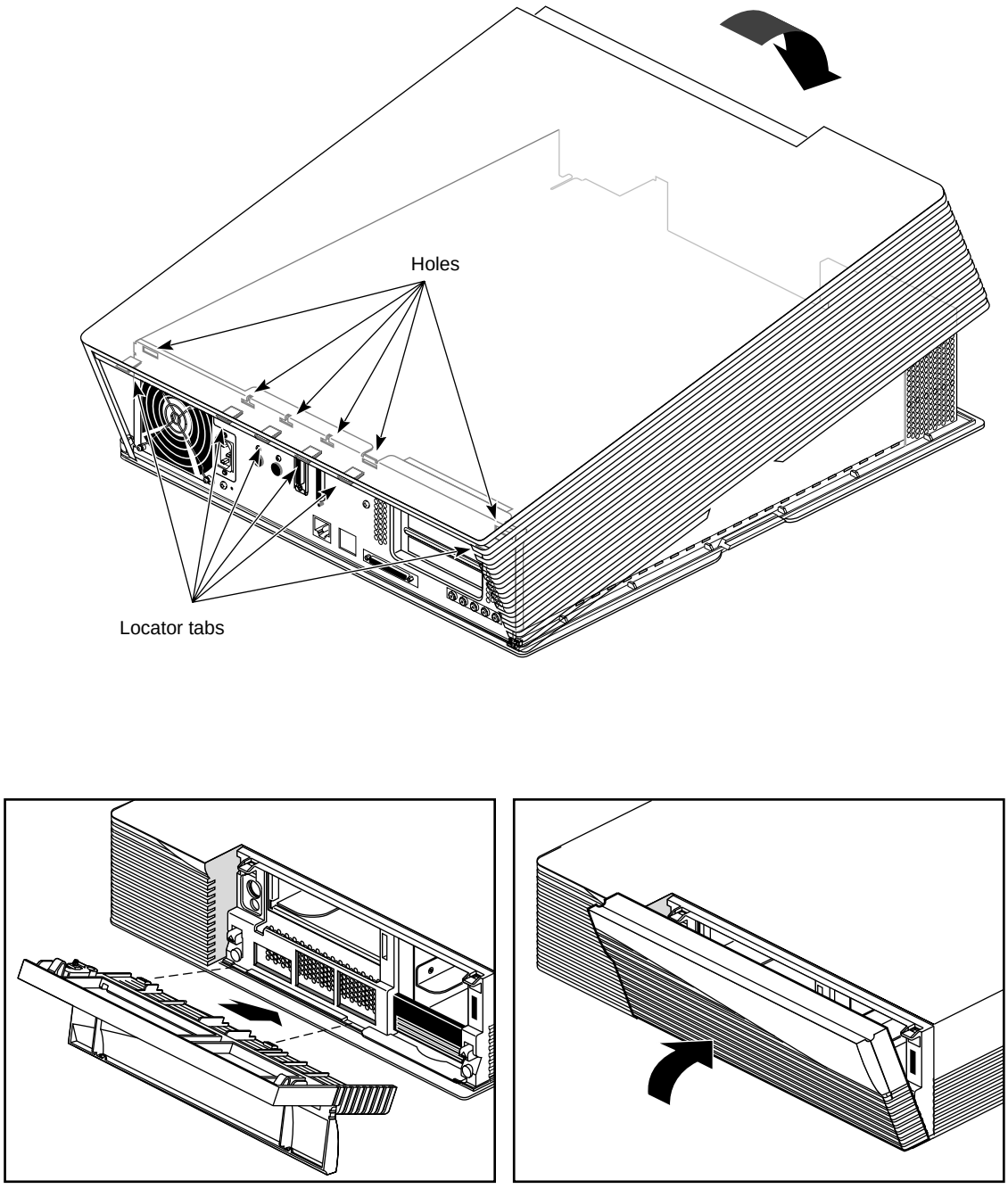


Figure 2-19 Replacing the Top Cover

18. Reinstall any peripherals and attach any applicable graphics, video, or EISA cables to the system.

Note that the Indigo^2 IMPACT graphics board set uses a DB-9 connector for StereoView connections rather than the previous round MINIDIN-8 for the XL, XZ, and Extreme graphics boards sets.

Note: Always confirm that the new backplane assembly fan is working as soon as you power on the system after the upgrade. There should be noticeable air outflow at the front left corner.

2.3 Upgrading from an Indigo^2 IMPACT Ready System to an Indigo^2 IMPACT

Upgrading your Indigo^2 IMPACT Ready system to an Indigo^2 IMPACT requires replacing the board set and connecting power cables.

1. Shut down the system, remove the cover, and attach the wrist strap.
2. Move the workstation or position yourself so that you are facing the expansion slots, as shown in Figure 2-20.

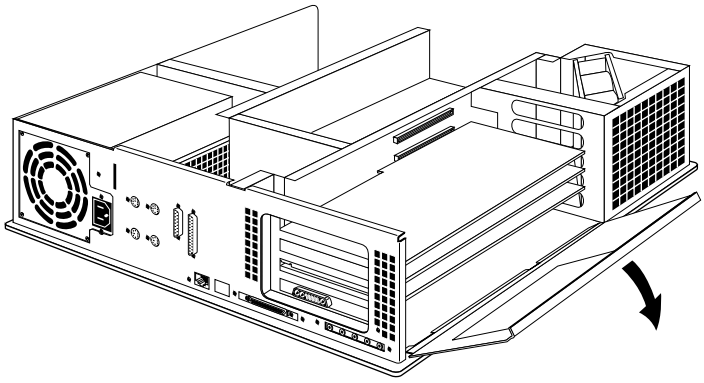


Figure 2-20 Opening the Metal Panel

3. Open the metal panel in front of the expansion slots by pulling up on the panel and lowering it.

   Note: If an option board is installed above your Indigo^2 Extreme graphics board set, you must remove it before proceeding. Follow the procedure for removing the option board as outlined in its installation manual.

4. Remove the screws attaching the board set to the workstation slots as shown in Figure 2-21.

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

   - Loosen each screw with the Phillips screwdriver.
   - Unscrew and remove the screws with your hand.

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

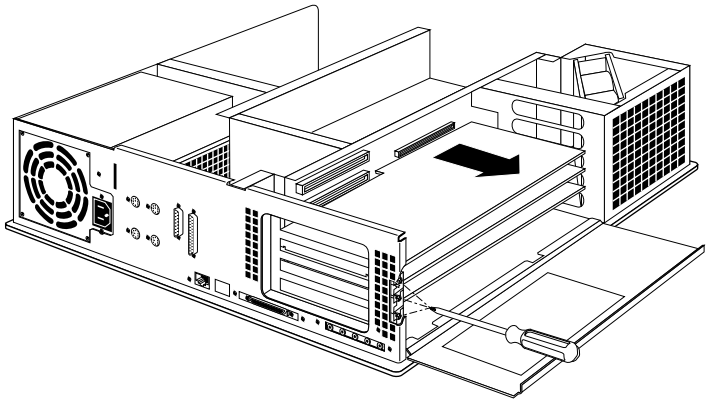


Figure 2-21 Removing the Screws Holding the Board Set

5. Remove the retention pin from the workstation.
   - Check how the retention pin rests against the front of the board set.
   - Grasp the retention pin on the right-front end of the board set and pull it up and off. See Figure Figure 2-22.

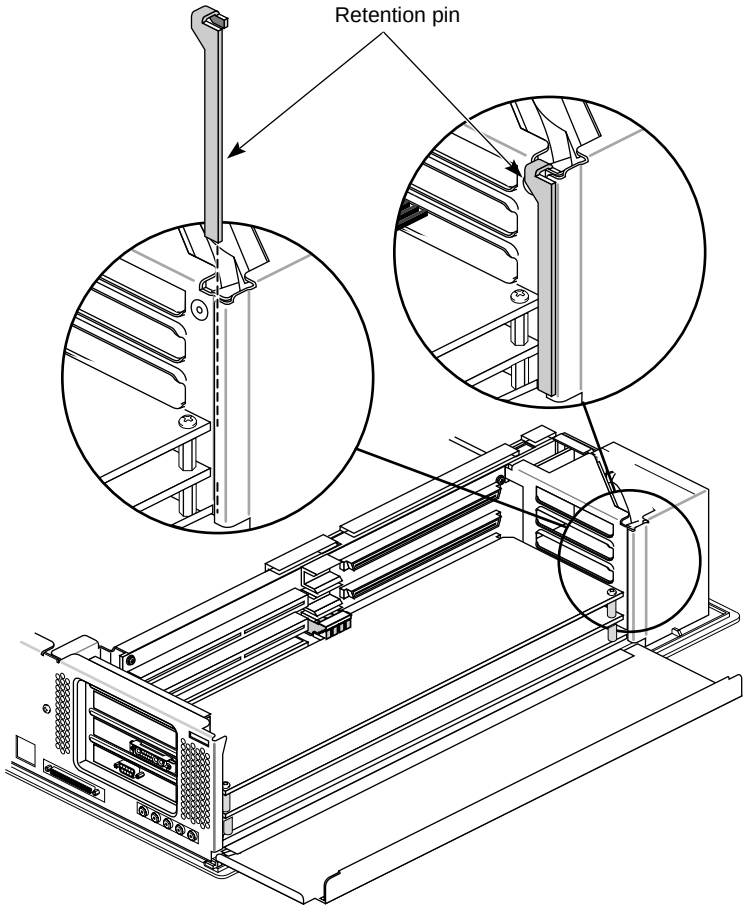


Figure 2-22 Removing the Retention Pin

6. Pull the board set out of the workstation, as shown in Figure 2-23.
   - 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.

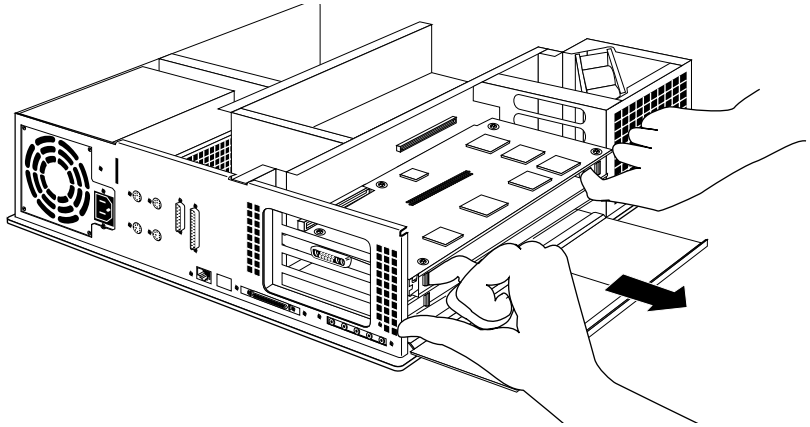


Figure 2-23 Removing the Board Set

2.3.1 Installing the Board(s)

1. Replace the Indigo^2 IMPACT board(s) in the chassis.

   Note: Insert the board carefully so that the board edge does not catch on the EMI lining along the inner left cutout area. Make sure the EMI lining is not damaged and remains between the chassis and the graphics board's metal extension.

   - Grasp the chassis with your fingers and push the board set into place with your thumbs. See Figure 2-24.
   - Push the board set into the slot until the connector on the back of the board is securely inserted to the connector on the midplane.

     Note: Place pressure on the recommended board edge or standoff near the top of any board stack when reinserting the board stack into the workstation. You will need to use some force to properly seat the board stack.

   Caution: As you replace the board set, do not press on the flexible cables that connect your Indigo^2 IMPACT board(s).

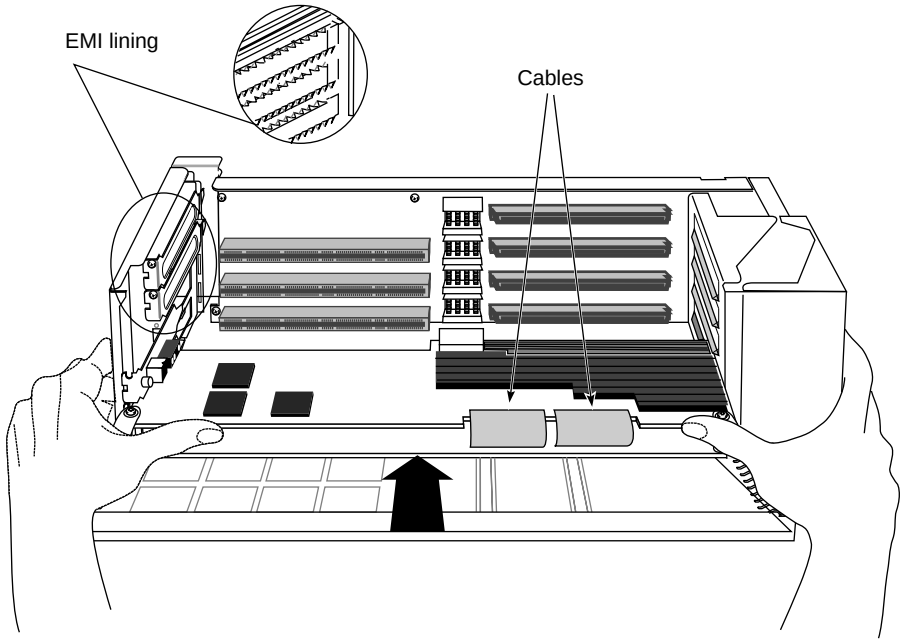


Figure 2-24 Connecting the Indigo^2 IMPACT Graphics Board(s) to the Midplane (High IMPACT Version Shown)

2. Visually check that the boards are completely seated in their connectors when viewed from above (see Figure 2-25).

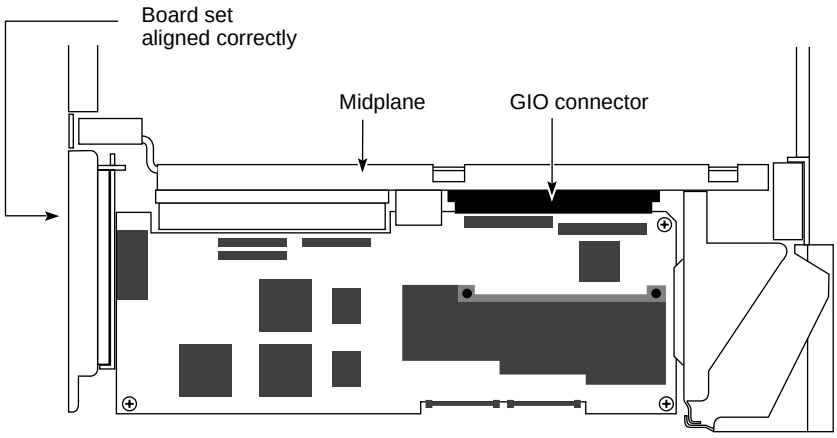


Figure 2-25 Board Set Correctly Aligned

3. 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.

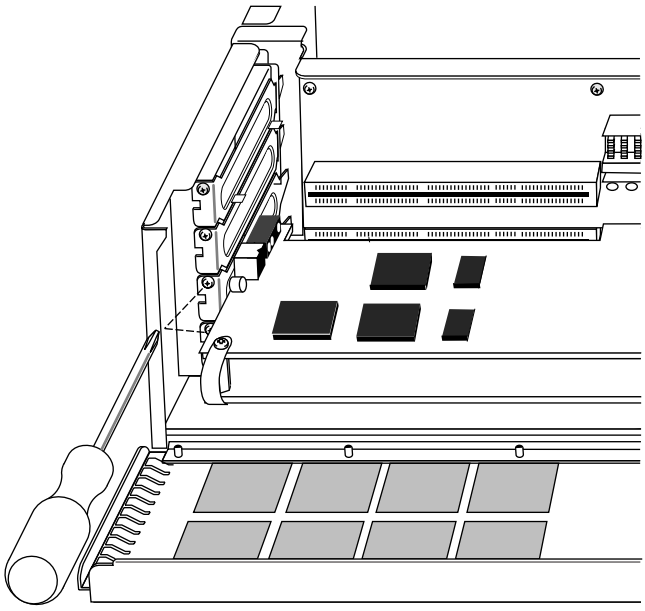


Figure 2-26 Inserting the Screws for the High IMPACT Board Set

Note: You will insert one screw into your Maximum IMPACT board set.

4. Hang the retention pin so that it sits in front of the board set, between the board set and the metal panel. The retention pin prevents the board set from moving away from the connectors (see Figure 2-27).

   Note: Use the retention pin as a plumb line to determine if the board set is properly seated. If the retention pin hangs at a 90^{o} angle to the top of the workstation, the board set is properly installed. If the pin is tilted, push in on the board set until it is properly connected.

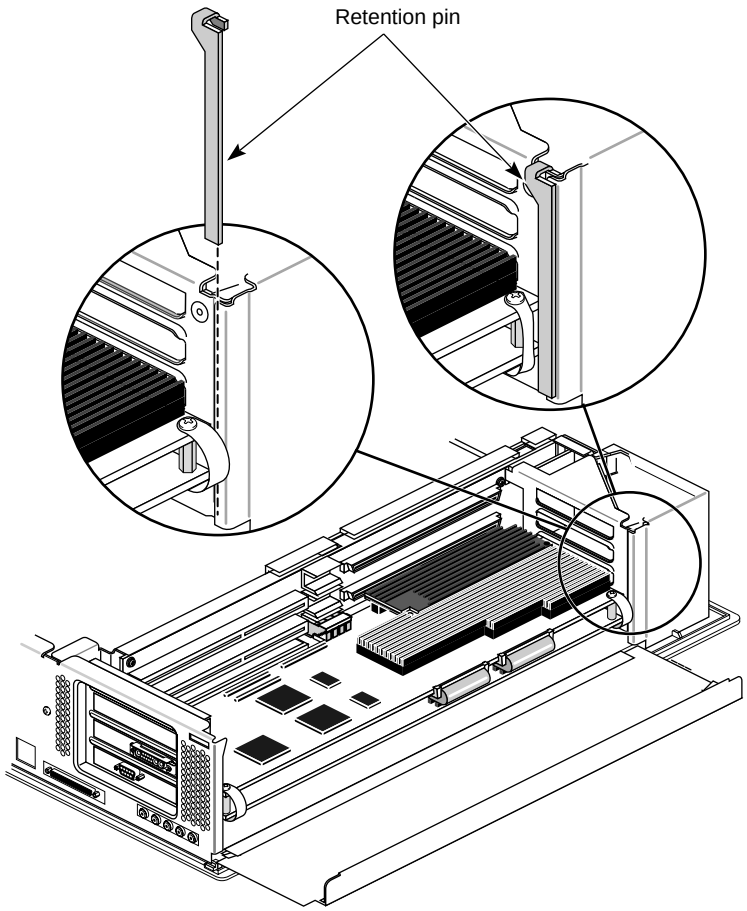


Figure 2-27 Hanging the Retention Pin

5. Tip the metal panel up in front of the boards until it snaps into place (see Figure 2-28). This completes installation of the Indigo^2 IMPACT graphics board(s). You can now connect the internal power cables to the midplane as shown in the new few steps.

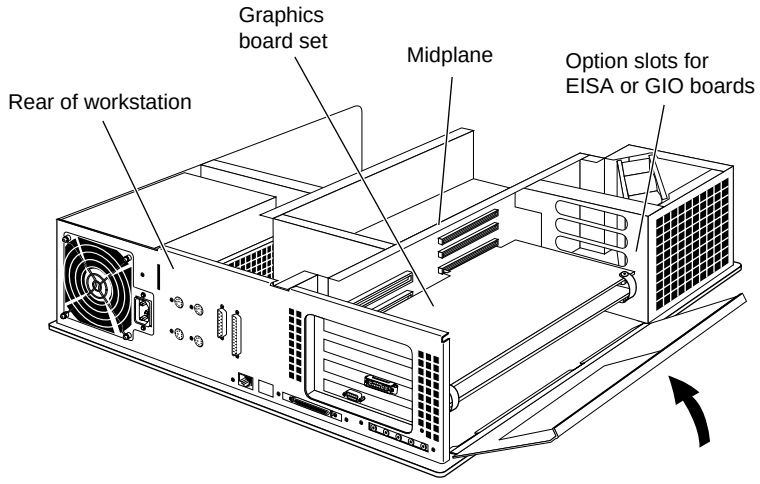


Figure 2-28 Closing the Metal Panel

6. Disconnect the power supply cables from their storage site on the power supply. See Figure 2-29.
   - Pinch together the corrugated edges on the power cable connector, and pull to disconnect it.
   - Pull gently on the twisted-pair connector to disconnect it.

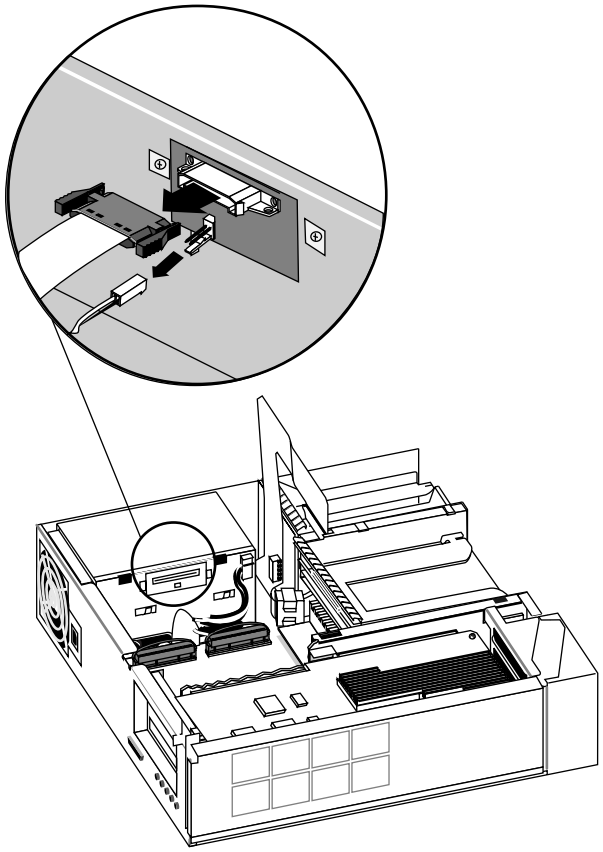


Figure 2-29 Disconnecting the Power Cables from Storage Site

7. Connect the power cable and twisted-pair cable to the gold-colored midplane.
   - Pinch together the corrugated edges on the power cable connector, and connect it to the midplane. See Figure 2-30.
   - Push gently on the twisted-pair connector to connect it to the midplane.

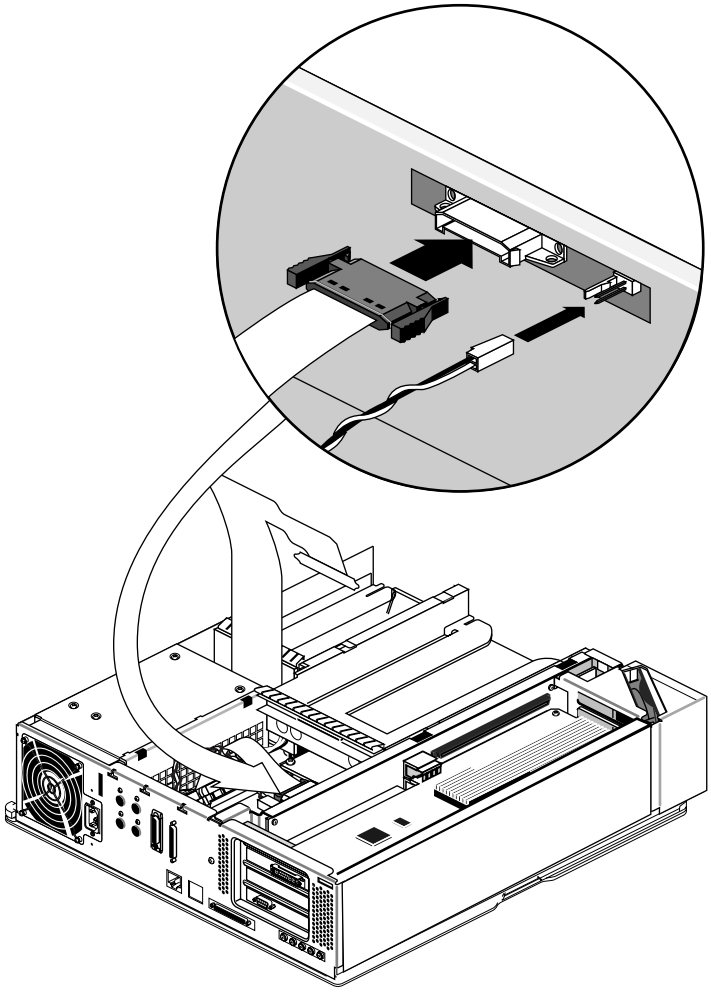


Figure 2-30 Connecting the Power and Twisted Pair Cables to the Midplane

8. Remove the antistatic wrist strap.
9. To replace the cover, and power on the system, go to the next section.

2.3.2 Replacing the Cover

To replace the top cover, follow these steps:

1. Align and close the top cover (see Figure 2-31).
2. Face the front of the workstation.

- Look through the holes as you lower the cover to move the tabs into place.

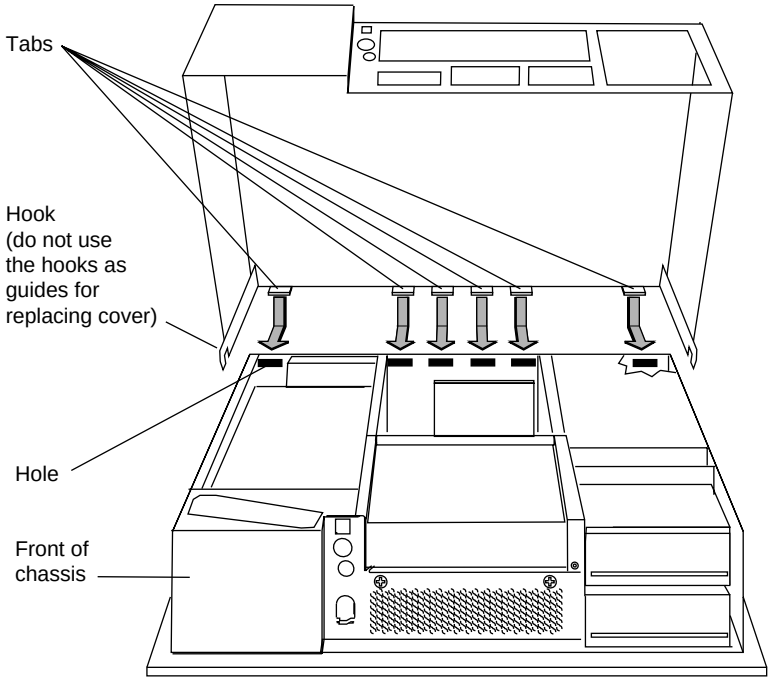


Figure 2-31 Looking Through Holes to Place Tabs

- Slide the tabs into the holes and pull the cover down until it snaps into place. The cover fits tightly over the workstation.

3. Replace the bezel.
    - Place the tabs on the bottom of the bezel into the grooves in the front of the chassis, as shown in Figure 2-32.
4. Tilt the bezel up until it snaps into place.
5. Reinstall the lockbar if you had one installed.
    - Slide it through the bezel and out the back of the workstation.
    - Reattach the lock.
    - Close the front panel of the bezel.

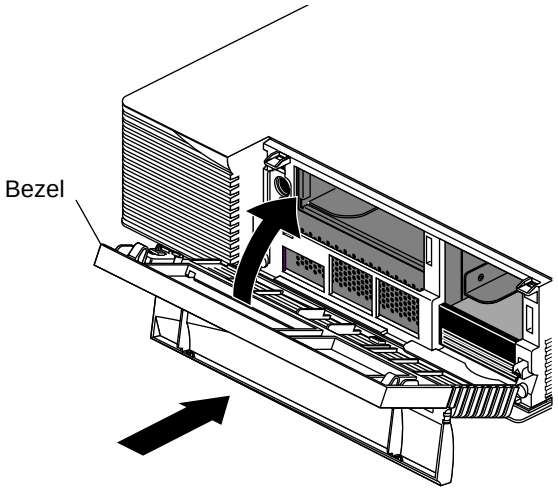


Figure 2-32 Replacing the Bezel

6. Reconnect the cables to their connectors on the back of the Indigo^2 IMPACT workstation.
7. You are ready to power on the system.

2.4 Software Installation

The next step in the upgrade procedure is to install IRIX 5.3 for Indigo^2 All IMPACT (p/n 812-0119-0x0). You must perform this installation from the miniroot.

Follow these steps to boot the miniroot and install the newest version of IRIX:

1. Make sure a CD-ROM drive is attached to the system (or is available on the network). This procedure assumes you have a CD-ROM drive attached either directly to the system or across the network. See the *Software Installation Administrator's Guide* if you need more detailed information on booting the miniroot from a remote CD-ROM.
2. Power on the system.
3. As the system comes up, you see this notifier (see Figure 2-33):

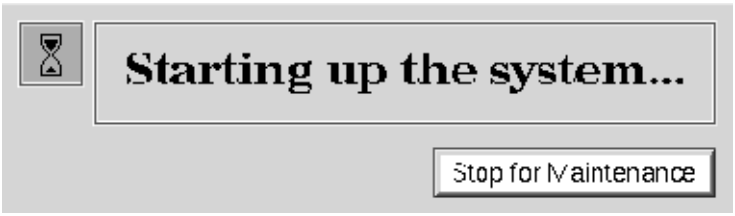


Figure 2-33 System Startup Notifier

4. Click the *Stop for Maintenance* button or press the **<Esc>** key. The System Maintenance menu appears.
5. Select "Enter Command Monitor" or press **5**.
6. At the command monitor prompt (>>), type **hinv <Enter>.**
7. Check for confirmation that the upgrade is recognized; you should see information similar to the following**:**

   ```
   Graphics board: High Impact/TRAM option card
   ```

8. Type **exit** after confirming the upgrade.
9. Select "Install System Software" from the System Maintenance menu or press **2**.
10. Load the applicable IRIX CD into the CD-ROM drive.
11. You should see a series of icons representing installation choices. Select the icon for the installation you are performing, for example Local CD-ROM. The miniroot begins to load.
12. If you wish to perform the installation from a remote CD-ROM:
    - Insert the CD if you have not already done so.
    - Select the Remote Directory icon.
    - Type in the name of the remote host, then click *Accept* or press **<Enter>**.
    - Type in the remote directory name if it is a distribution directory, then click on Accept or press **<Enter>**.
    - Click the *Install* button or press **<Enter>** and the miniroot installs.

13. After a while, you see the *inst* prompt. A default set of subsystems is selected for installation. You may wish to add or delete subsystems as required.
14. After you have selected the appropriate subsystems, enter **go** at the *inst* prompt.
15. Once all the subsystems are installed, enter **quit** to exit from Inst.
16. Type **yes** when asked if you want to reboot the system to multiuser mode.
17. Log in and enter the following command to verify that the installation worked and that the operating system is at the proper IRIX release level:

    ```
    uname -a
    ```

    If *uname* reports that the system is running the applicable level of IRIX software, the installation is successful.

If you do not encounter any problems, see Section 2.5, “Running Demos.”

2.4.1 If You Have Problems With Software Installation

The new operating system eliminates a number of patches that were required for the earlier software release (IRIX 5.3 for Indigo^2 IMPACT). For example, bug fixing patches 817 and 883, as well as video fixing patch 887 have been incorporated into IRIX 5.3 for All Indigo^2 IMPACT. If you attempt to reinstall older patches, installation conflicts occur and cause the Inst program to mistakenly ask you to install “earlier versions” of the patch.

To determine which patches are required or no longer required, consult the product release notes, or check the Global Customer Service (GCS) patch server or the patch Web page at http://bits.csd.sgi.com/digest/patches/ or http://morpheus.corp/oasis.html. Also read the New Product Information at http://bits.csd.sgi.com/cgi-bin/bulletin_viewer.cgi

Note: Patch 1099 (for Solid IMPACT) has been incorporated into the IRIX 5.3 for Indigo^2 IMPACT release. However, patch 1157 and possibly other patches may also be required for the system. Check the web sites listed above for further information.

2.4.1.1 NTSC and PAL Support

To use the NTSC and PAL video formats on the Indigo^2 IMPACT system, you also need to install the Indigo^2 Video for IMPACT option *or* the Indigo^2 IMPACT Video option. Do not confuse the two packages, as they have different capabilities and functions. Here is a brief description of these packages.

- Indigo^2 Video for IMPACT option (marketing code D9-I2V-I) is a video collaboration bundle (see Figure 2-34). This option enables you to conduct video conferences (using the Indy Cam™), output graphics to videotape, display video in a graphics window, save (capture) video to the hard disk, and also provides direct analog input/output for NTSC and PAL support.
- Indigo^2 IMPACT Video option (marketing code D9-I2I-VIDEO) enables real-time digital video for IMPACT (see Figure 2-35). IMPACT video provides high-quality digital video input, output and effects to help create professional video productions.

  Note: This package requires an optional digital-to-analog converter for NTSC and PAL support.

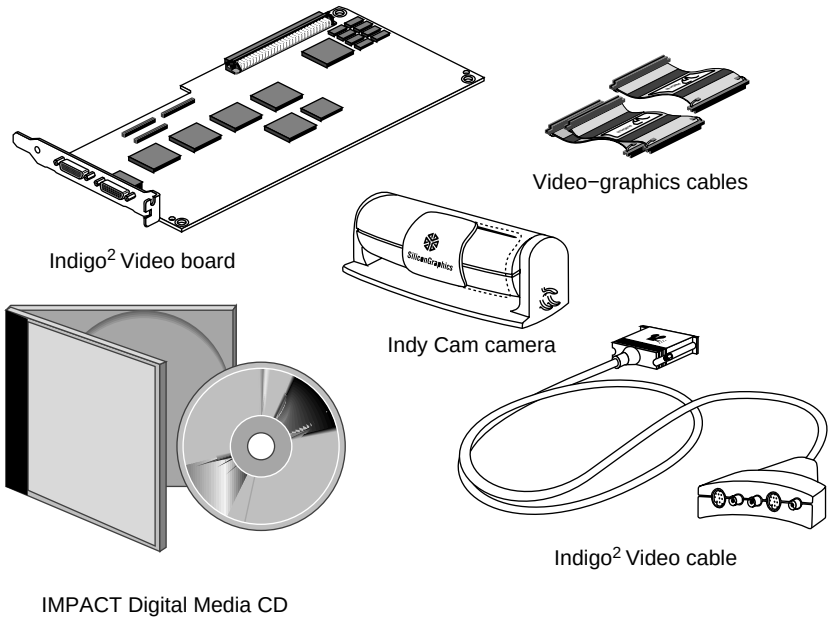


Figure 2-34 Indigo2 Video for IMPACT Package Major Components

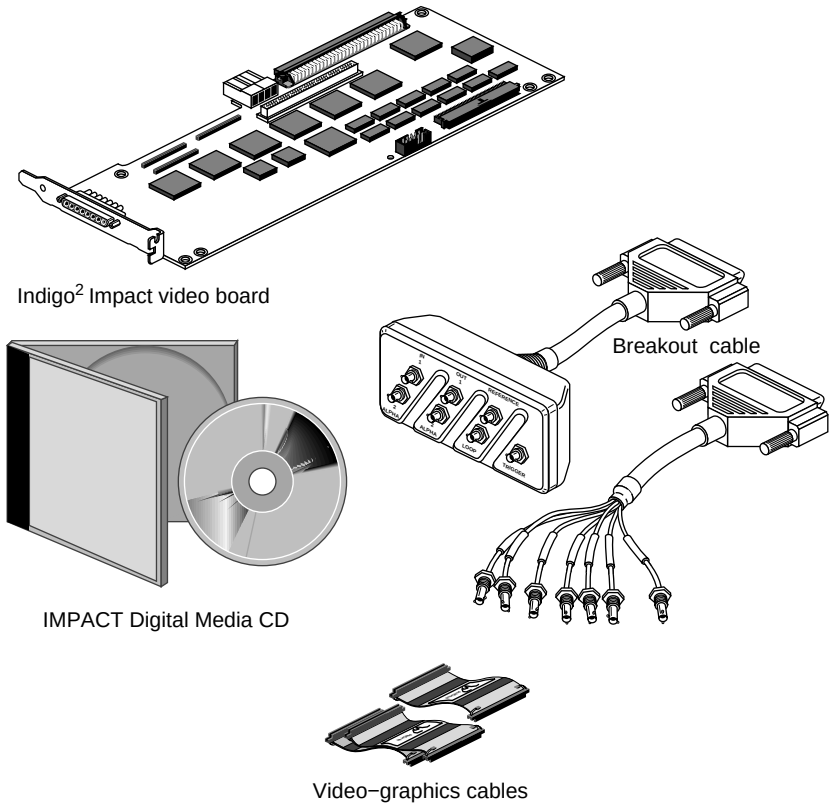


Figure 2-35 Indigo2 IMPACT Video Board Package Major Components

2.4.1.2 Another Possible Related Software Problem

The CD IMPACT Digital Media 1.1 contains software directories to support both the Indigo^2 Video for IMPACT and the Indigo^2 IMPACT Video boards. The Indigo^2 Video for IMPACT directory filename is *impactI2V*. The Indigo^2 IMPACT Video directory filename is *impactvid*.

If you load the wrong directory, it can cause problems. For example, you may not be able to bring up the *vpanel* application if you load *impactvid* instead of *impactI2V*. In addition, if the wrong software image is loaded, some of the Digital Media Tools may cease to function properly and hinv will not list the video board.

To correct this problem, use the *versions remove* command to get rid of the wrong files (including any related patches). Afterwards, reload the operating system software and then install the correct directory.

2.5 Running Demos

Before turning the system over to the customer, it is highly recommended that you run the graphic demo programs to show off the enhanced video capabilities. Load the software demo CD (p/n 813-0447-00x) that ships with the upgrade and read the demo CD instructions to run the demos, as required.

2.6 Completing the Installation

Here are the final steps to complete the upgrade:

1. Attach the Indigo^2 IMPACT badge to the front of the system. It snaps into the front grill in the lower right-hand corner.
2. Install the upgrade label that indicates the new Silicon Graphics model number of the system. Affix the label at the rear of the system, covering part of the old label (see Figure 2-36).
3. If you received a new regulatory label with the upgrade, place the label as follows.
   - For a “full-size” label, place it over the full-size regulatory label on the rear of the workstation (see Figure 2-36).
   - For a “half-size” label, place it below the logos and over the lower portion of the regulatory label on the rear of your workstation (see Figure 2-36).
4. Determine your CMN model number. This number is required by various regulatory groups to help identify your Declaration of Conformity. You can determine your CMN number by cross-referencing the regulatory label designation (see Figure 2-36) against information contained at the following web address: http://www.sgi.com/Products/compliance/index.html.

   Locate and print or save your Declaration of Conformity. Make a note of your CMN number and the date on the Declaration of Conformity here for future reference.

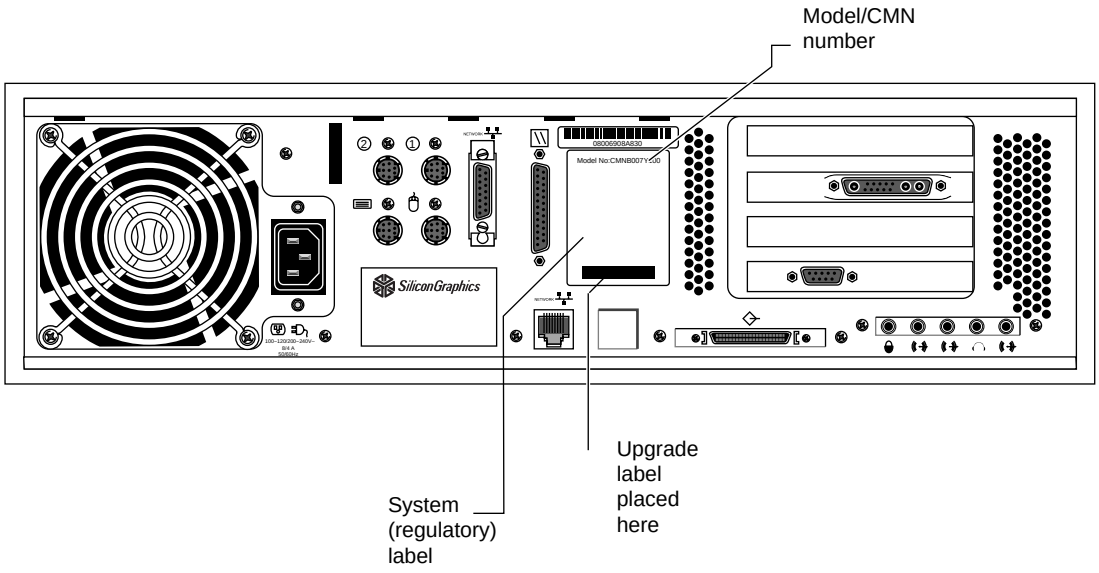


Figure 2-36 Placements for Model Number and System Regulatory Labels

To run the Indigo^2 IMPACT system diagnostics, continue to the beginning of Chapter 3.

Note: Pack the old components for return shipment to Silicon Graphics. Turn to the end of Chapter 3 for details.

Chapter 3

Running Diagnostics and Returning the Old Components

This chapter covers the interactive diagnostic environment (IDE) tests for the Indigo^2 IMPACT upgrade. It also covers the repacking and return of the old graphics boards displaced by the Indigo^2 IMPACT upgrade. The IDE tests are called diagnostics in this document.

3.1 Running the Diagnostics

The diagnostics take approximately 15 to 30 minutes (or longer) to complete (see Note below). There are a number of reasons to run them:

- Run the diagnostics if you power-on the new Indigo^2 IMPACT system and it fails to boot the graphics interface.
- Confirm the system's full functionality by running the diagnostics.
- Trace an unusual screen appearance by running the diagnostics.

Note: Testing time may vary according to the amount of main memory, disk drive capacity, video options, and peripherals present on the system.

Follow this procedure to verify that the graphics upgrade works correctly and that the components are functioning properly:

1. Power off the system or press the reset key if the system is hung.
2. Power on the system. When you see the notifier, click on the *Stop for Maintenance* button, or press **<Esc>**.
3. Select the Run Diagnostics icon or press **3** to run the diagnostics.

A message should appear describing the version of diagnostics being run and confirming the type of CPU board installed. This is followed by the spinning combination of slashes and dashes (often called a "packet pump").

This document presumes that you have upgraded a properly working system with Indigo^2 IMPACT graphics boards. Therefore, only the diagnostic error codes related directly to the graphics are listed in the following section.

3.2 Diagnostic Error Messages

Table 3-1 lists the error codes for the Indigo2 IMPACT diagnostics and associates those codes with the failing component.

Component Demonstrating Errors	Diagnostic Error Codes			
Color map ASIC (raster A or B)	CMP000	CMP001	CMP002	CMP003
	CMP004	CMP100	CMP101	CMP102
	CMP103	CMP104	CMP999	
VC3 ASIC (GD)	VCT000	VCT001	VCT002	VCT003
	VCT004	VCT005	VCT006	
Digital-to-analog convertors (DACs) (raster A)	DAC001	DAC002	DAC003	DAC004
	DAC005	DAC006		
(PP) XMAP (raster A or B)	XMP001	XMP101	XMP999	
Raster A on-board TRAM and TRAM daughter board (if installed)	TRA000	TRA001	TRA100	TRA101
	TRA200	TRA201	TRA300	TRA301
Raster B on-board TRAM and TRAM daughter board (if installed)	TRB000	TRB001	TRB100	TRB101
	TRB200	TRB201	TRB300	TRB301
Texture engine errors (raster A)	TEX000	TEX001	TEX002	TEX003
	TEX004	TEX005	TEX006	TEX007
	TEX008	TEX009	TEX010	
Texture engine errors (raster B)	TEX100	TEX101	TEX102	TEX103
	TEX104	TEX105	TEX106	TEX107
	TEX108	TEX109	TEX110	
Raster A Subsystem RDRAM	RAA000	RAA001	RAA002	RAA003
	RAA004	RAA005	RAA100	RAA101
	RAA102	RAA103	RAA104	RAA105
	RAA200	RAA201	RAA202	RAA203
	RAA204	RAA205	RAB000	RAB001
	RAB002	RAB003	RAB004	RAB005
	RAB100	RAB101	RAB102	RAB103
	RAB104	RAB105	RAB200	RAB201

Table 3-1 Indigo^2 IMPACT Graphics Diagnostic Error Codes

Component Demonstrating Errors	Diagnostic Error Codes			
	RAB202	RAB203	RAB204	RAB205
Raster B subsystem RDRAM	RBA000	RBA001	RBA002	RBA003
	RBA004	RBA005	RBA100	RBA101
	RBA102	RBA103	RBA104	RBA105
	RBA200	RBA201	RBA202	RBA203
	RBA204	RBA205	RBB000	RBB001
	RBB002	RBB003	RBB004	RBB005
	RBB100	RBB101	RBB102	RBB103
	RBB104	RBB105	RBB200	RBB201
	RBB202	RBB203	RBB204	RBB205
Raster A pixel processor errors	PPA000	PPA001	PPA002	PPA003
	PPA004	PPA005	PPA006	PPA100
	PPA101	PPA102	PPA103	PPA104
	PPA105	PPA106		
Raster A pixel processor errors	PPB000	PPB001	PPB002	PPB003
	PPB004	PPB005	PPB006	PPB100
	PPB101	PPB102	PPB103	PPB104
	PPB105	PPB106		
Raster engine (raster A)	RRE000	RRE001	RRE002	RRE003
	RRE004	RRE005	RRE006	RRE007
	RRE008	RRE009	RRE010	RRE011
	RRE012	RRE013	RRE014	RRE015
	RRE016	RRE017	RRE018	RRE019
	RRE020			
Raster engine (raster B)	RRE100	RRE101	RRE102	RRE103
	RRE104	RRE105	RRE106	RRE107
	RRE108	RRE109	RRE110	RRE111
	RRE112	RRE113	RRE114	RRE115
	RRE116	RRE117	RRE118	RRE119
	RRE120			

Table 3-1 (continued) Indigo^2 IMPACT Graphics Diagnostic Error Codes

Component Demonstrating Errors	Diagnostic Error Codes			
HQ3 ASIC (GD board)	HQT000	HQT001	HQT002	HQT003
	HQT004	HQT005	HQT006	HQT007
	HQT008	HQT009	HQT010	HQT011
	HQT012	HQT013	HQT014	HQT015
	HQT016	HQT017	HQT018	HQT019
	HQT020	HQT021		
GE11 ASIC (GD board)	GEE000	GEE001	GEE002	GEE003
DMA errors	DMA000	DMA001	DMA002	DMA003
	DMA004	DMA005	DMA006	DMA007
	DMA008	DMA009	DMA010	DMA011
	DMA012	DMA013	DMA014	

Table 3-1 (continued) Indigo^2 IMPACT Graphics Diagnostic Error Codes

3.3 Returning the Old Components

All components that have been replaced must be returned. This procedure is not optional. Shipping boxes are included in the upgrade kit.

3.4 Packing the Components

Pack the old components in the boxes and antistatic bags provided. Ensure that the returning graphics or other boards are packed to withstand the rigors of surface and air freight transportation.

Caution: Boards must be shipped in antistatic bags.

3.5 Shipping Instructions

Shipping instructions are provided with the RMA kit.