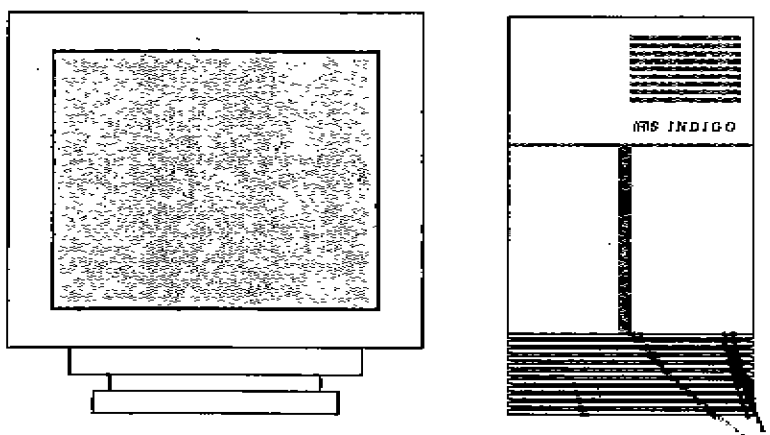
Field Service Handbook

for Silicon Graphics Workstations

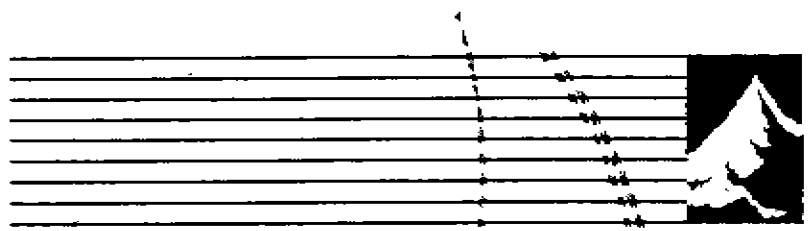
Indigo™



APEX
COMPUTER

Field Service Handbook

Indigo Workstations



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Section 1—Specifications

This section includes the following information about Indigo systems:

- Product description
- Models
- Environmental and physical specifications

Product Description

Introduced in September 1991, the Indigo series is Silicon Graphics' best performing mini-tower graphics workstation. Indigo systems are configured with one of the following microprocessors: the MIPS 33 MHz R3000, the MIPS 100MHz R4000, or the MIPS 150MHz R4400. Indigo systems support six different graphics subsystems. The mini-tower chassis contains three 3.5" drive bays.

Features

Indigo systems feature the following:

Microprocessors .....MIPS 33 MHz R3000
MIPS 100 MHz R4000
MIPS 150 MHz R4400

Memory ..... **R3000-based systems:**
8–96MB memory; 12 SIMM slots
Uses 2, 4, and 8MB SIMMs

R4x00-based systems:
16–384 MB memory; 12 SIMM slots
Uses 4, 8, 16, or 32 MB SIMMs

Graphics subsystems .....Entry-level graphics
XS graphics
XS24 graphics
XS24Z graphics
XZ graphics
Elan graphics

I/O ..... GIO bus with two GIO slots; 2 serial ports

Mass storage .....Three 3.5" drive bays

Network connections .....Ethernet (AUI connector)

Operating system .....IRIX (System V, with BSD 4.3 enhancements)
Minimum revision: IRIX 4.0.5 F
Latest revision: IRIX 5.3

Models

Indigo systems are configured in a number of models, based on the microprocessor, graphics subsystems, amount of installed memory, and system disk drive. The section below list the model numbers of systems based on the MIPS R3000 and R4000 microprocessor.

SGI also offers Indigo server configurations, which do not include a graphics subsystem.

Note: SGI offers upgrades of R3000 and R4000 Indigos to the 150 MHz R4400 microprocessor.

Systems Using the 33 MHz R3000 (standard configurations)

Model Number	Graphics	Memory	Monitor
W-4DRPC-08S	None	8 MB	None
W-4DRPC	Entry Level	16 or 32 MB	16"
W-4DRPCXS	XS	16 or 32 MB	16"
W-4DRPCXS24	XS24	16 or 32 MB	16"
W-4DRPCXS24Z	XS24Z	16 or 32 MB	16"
W-4DRPCEG	Elan	16 or 32 MB	19"

Systems Using the 100 MHz R4000 (standard configurations)

Model Number	Graphics	Memory	Monitor
WB-R50	Entry Level	16 or 32 MB	16"
WB-R50XS	XS	16 or 32 MB	16"
WB-R50XS24	XS24	16 or 32 MB	16"
WB-R50XZ	XZ	16 or 32 MB	19"
WB-R50EG	Elan	16 or 32 MB	19"

Environmental and Physical Specifications

Environment

Operating temperature .....55 to 95°F (13 to 35°C)

Storage temperature.....14 to 150°F (-10 to 65°C)

Size and Weight

Chassis .....Width—9.5" (24 cm)
Height—15" (38 cm)
Depth—10.9" (28cm)
Weight—24lbs (11 kg)

19" monitor .....Width—19" (48 cm)
Height—19" (48 cm)
Depth—20" (51 cm)
Weight—72 lbs (33 kg)

16" Monitor .....Width—15.5" (39 cm)
Height—16" (41 cm)
Depth—17" (43 cm)
Weight—47 lbs (21 kg)

Keyboard .....Width—18.5" (47 cm)
Height—1" (2.5 cm)
Depth—8.5" (22 cm)
Weight—3 lbs (1.4 kg)

Power

Line voltage .....100 VAC
240 VAC

Current .....System—2.3 amps at 120 VAC
Monitor— 2.5 amps at 120VAC

AC frequency range.....47 to 63 Hz

Input plug type.....NEMA 5-15

Heat displacement .....1200 BTUs/hour

Section 2—Configurations

This section contains the following configuration information about Indigo systems.

- Chassis configuration (front and rear views)
- Component locations for CPU boards
  - IP12
  - IP20
- Memory slot configuration
- Backplane component locations
- Graphics subsystems
  - Entry Level
  - XS
  - XS24
  - XS24Z
  - XZ
  - Elan
- Monitors
- Jumper settings for supported peripheral devices

Displaying the System Configuration

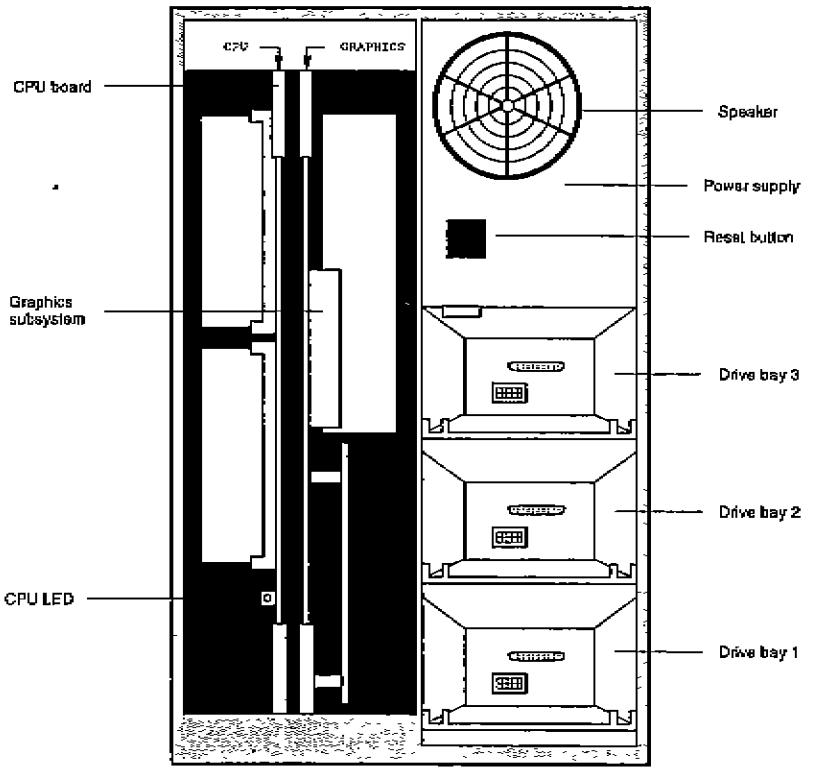
Use the **hinv** (hardware inventory) command to display a list of the hardware configured in the system. Execute the **hinv** command from the Command Monitor (see Section 3, page 3-3) or from the IRIX system prompt.

Chassis Configuration

Indigo systems are configured in a mini-tower deskside chassis.

- Three front loading 3.5" drive bays
- Two-slot backplane (CPU slot and graphics slot)
- On-off switch (rear)
- System reset switch (front)
- System status LED (located on CPU board)
  - Power (green)
  - Fault (yellow)
- Power supply; located above drive bays
- Fan; located in rear of power supply

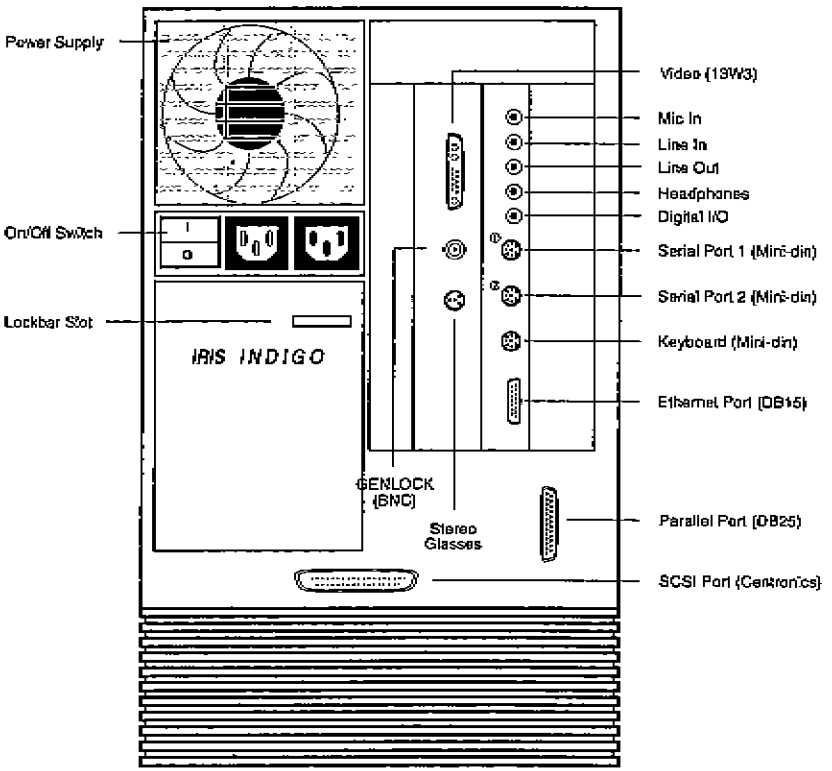
Chassis—Front View (without front cover)



Comments

1. The system disk drive resides in drive bay 1. Configure option drives in drive bays 2 and 3.
2. During the power-on self tests (POSTs), the CPU LED is yellow and blinking. After the system passes its POSTs, LED turns solid green.
3. If system fails POSTs, LED remains yellow (solid or blinking).
4. The 210W power supply was replaced by a 250W power supply.
5. Remove power supply from front of system.
6. Power supply, speaker, and fan configured as an assembly.
7. Install and remove CPU and graphics subsystem from front of system.

Chassis—Rear View



Comments

1. The parallel and SCSI connectors reside on the system backplane.
2. Systems with Entry Level graphics subsystems have 13W3 and 15-pin composite video ports (no GENLOCK or stereo glasses ports) on graphics board.

CPU Boards

Indigo systems support two different CPU boards.

- R3000-based systems use the **IP12** CPU
- R4x00-based system use the **IP20** CPU

IP12 CPU Boards

The IP12 CPU board is configured with a MIPS 33 MHz R3000 microprocessor and an R3010 floating point unit, which are soldered to the CPU board.

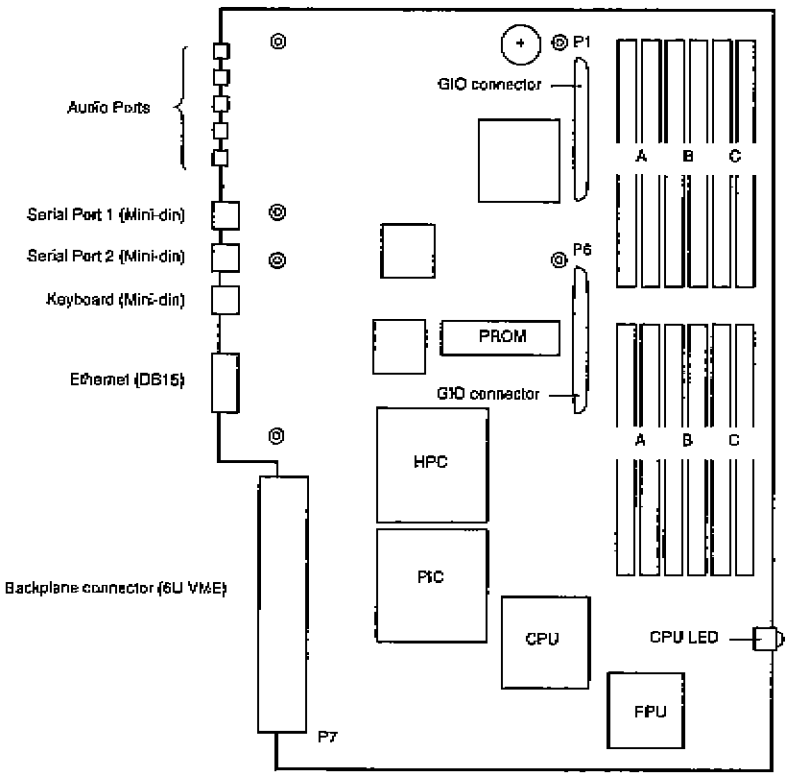
IP20 CPU Boards

On IP20 CPU boards, the MIPS microprocessor is configured on a removable daughter card. IP20 CPUs can be configured with the following MIPS microprocessors:

- 100 MHz R4000
  - 16 K primary cache (8 K data/8 K instruction)
  - 1 MB secondary cache
- 150 MHz R4400
  - 32 K primary cache (16 K data/16 K instruction)
  - 1 MB secondary cache

Note: The field replaceable unit (FRU) for the IP20 CPU includes both the CPU board and the R4x000 daughter card. SGI does not swap these components separately. However, third-party companies may offer separate CPU motherboard and R4x00 daughter card replacements.

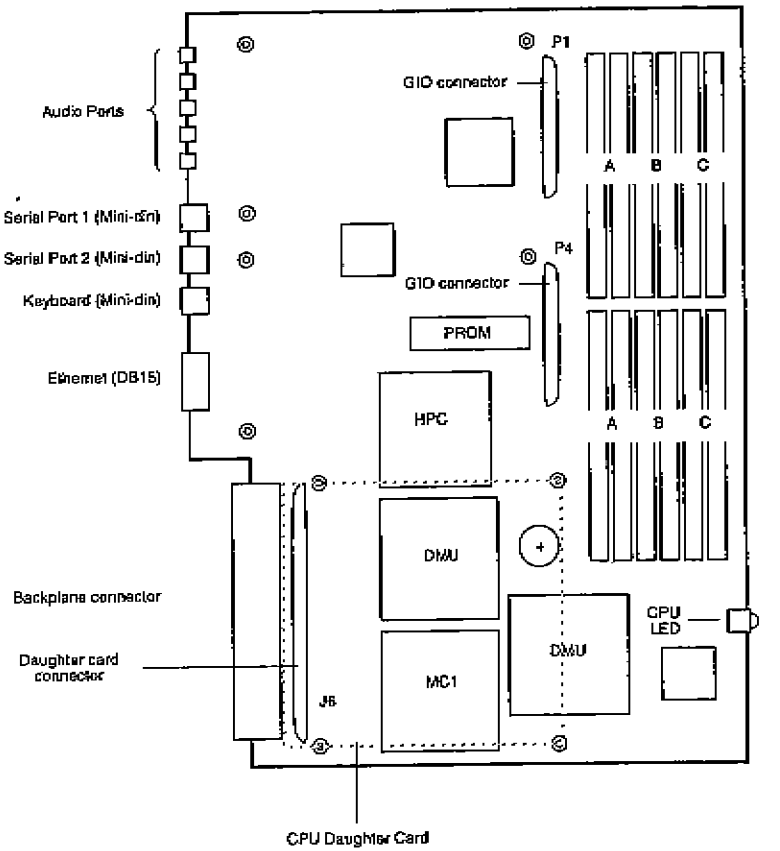
CPU—IP12 Component Locations



Comments

1. Systems with Entry Level graphics subsystems require Rev. Boot PROM.
2. Battery is soldered to CPU board.

CPU—IP20 Component Locations



Comments

1. CPU daughter card connects to CPU motherboard at location J6.
2. Systems configured with R4000-based CPU daughter card use a 50 MHz crystal oscillator on the daughter card; systems configured with R4400-based CPU daughter card use a 75 MHz crystal oscillator on the daughter card.
3. Battery is soldered to CPU board.

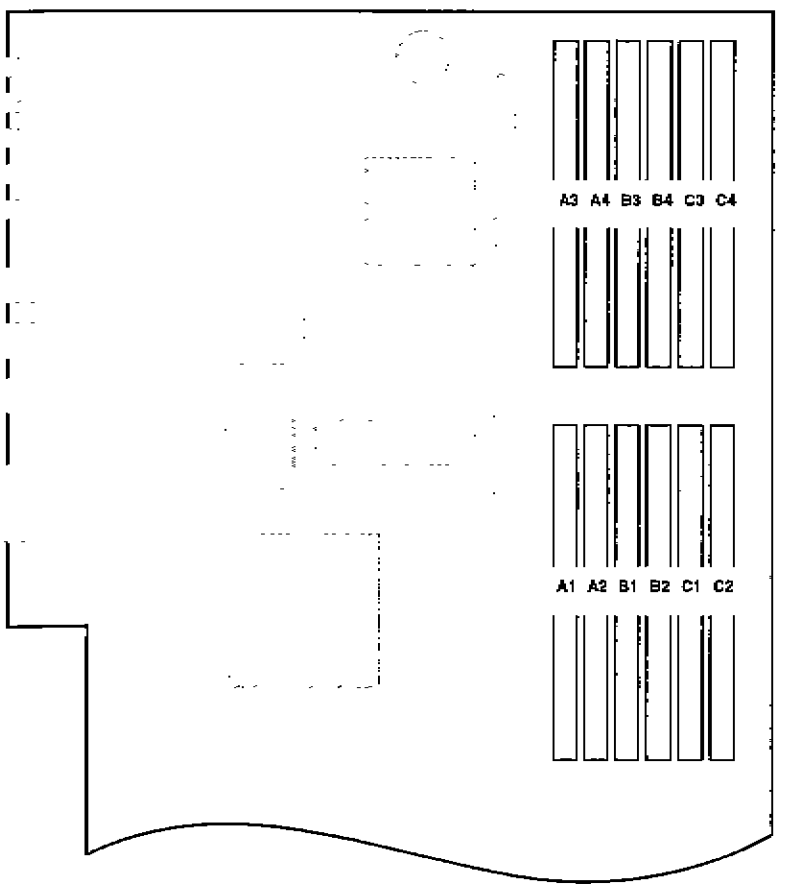
Memory

Indigo systems use single in-line memory modules (SIMMs). The CPU board contains 12 SIMM slots, organized in three banks of four slots.

Note: The SIMMs used in the IP12 and IP20 CPUs are not interchangeable.

Memory—IP12 CPU

- Memory capacity is 8–96 MB
- Systems support 2 MB, 4 MB*, and 8 MB SIMMs
- Each bank of SIMM slots (A, B, and C) is comprised of four slots (1–4).



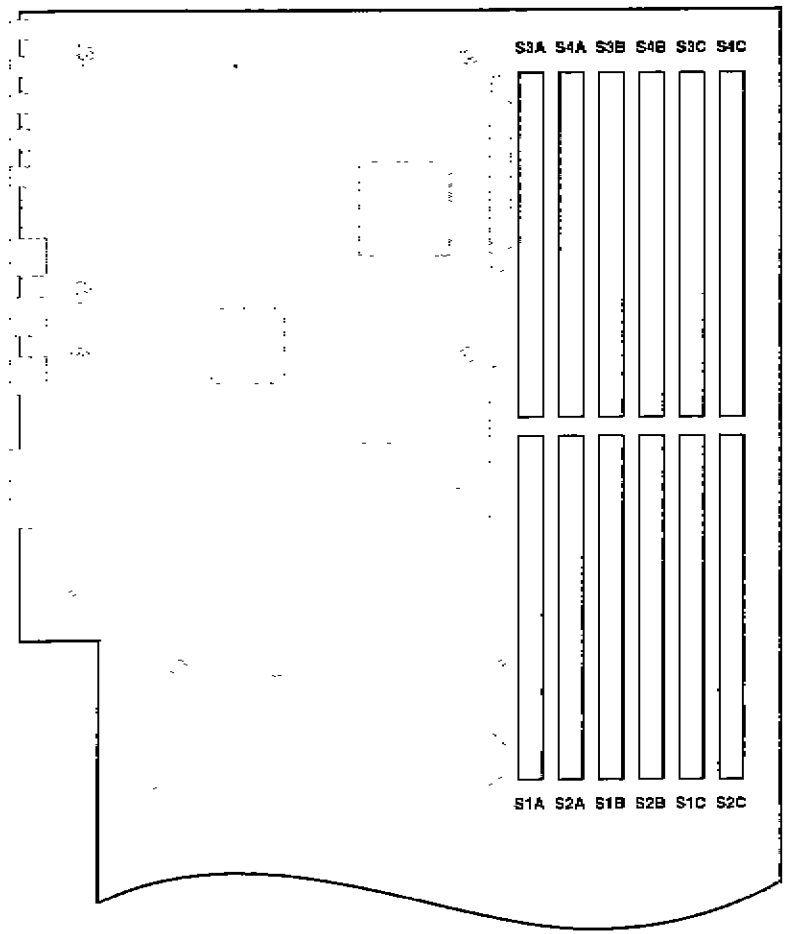
*Note: See rule #5 on next page.

Memory—Rules for Populating Memory Slots on IP12 CPU

1. Install memory in multiples of four SIMMs (four per bank).
2. Each bank must contain similar capacity SIMMs.
3. Banks can be populated in any order.
4. To mix 2 MB, 4 MB, and 8 MB SIMMs, follow rule #2.
5. IP12 CPUs only support four 4 MB SIMMs (only one bank can be populated with 4 MB SIMMs).

Memory—IP20 CPU

- Memory capacity is 32–384 MB
- Systems support 4 MB, 8 MB, 16 MB, and 32 MB SIMMs
- Each bank of SIMM slots (SA, SB, and SC) is comprised of four slots (1–4)



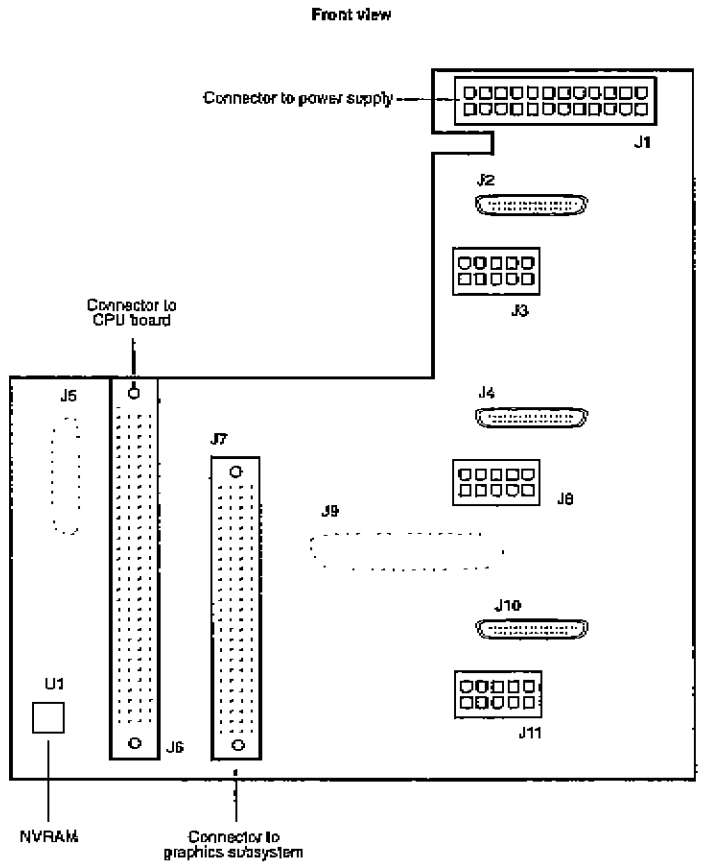
Memory—Rules for Populating Memory Slots on IP20 CPU

1. Install memory in multiples of four SIMMs (four per bank).
2. Each bank must contain similar capacity SIMM.
3. Banks can be populated in any order.
4. To mix 4 MB,8 MB, 16 MB, and 32 MB SIMMs, follow rule #2.

Backplane

The Indigo system backplane contains connectors for the CPU board and graphics subsystem, as well as the SCSI and SCSI power connectors for each of the three drive bays. CPU board, graphics subsystem, and SCSI devices plug into the backplane from the front of the chassis.

The external SCSI connector (location J9) and the parallel port (location J5) are mounted on the back of the backplane and are accessed from the rear of the chassis.



Comments

1. System NVRAM (location U1) is a removable ASIC, which contains PROM Monitor information such as the system's Ethernet address and the PROM Monitor password.

Graphics Subsystems

Indigo systems can be configured with six different graphics subsystems.

- Entry Level
- XS
- XS24
- XS24Z
- XZ
- Elan

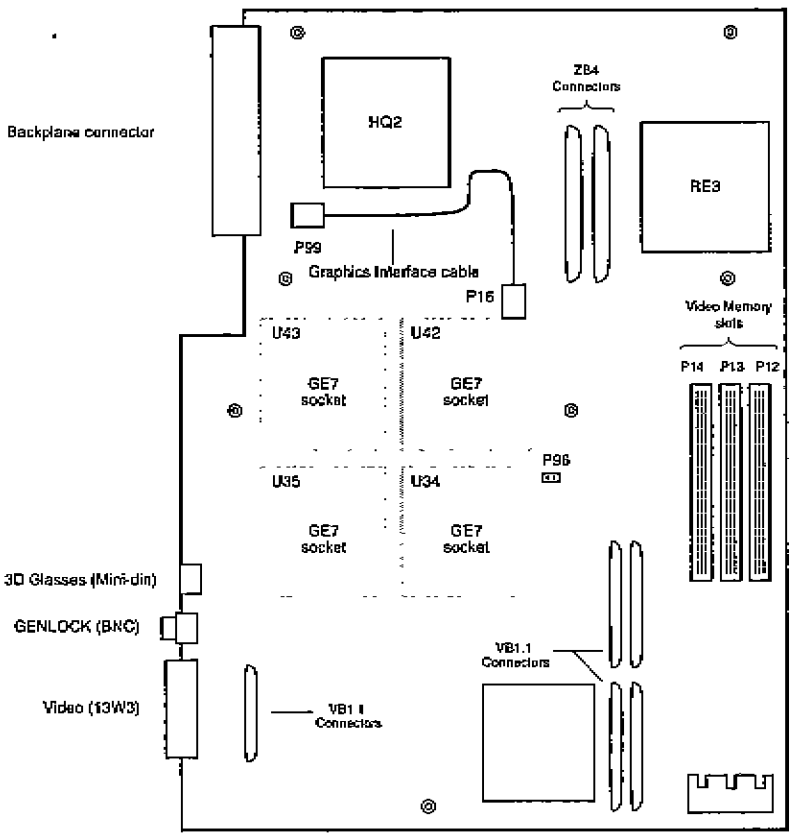
Each subsystem (except the single-board Entry Level) is comprised of one graphics motherboard and graphics daughter cards.

Entry Level Graphics

The 8-bit Entry Level graphics subsystem is a single-board graphics subsystem comprised of an LG2 graphics board. The LG2 board contains a 13W3 video connector and a 15-pin composite video connector.

Graphics—GR2 Motherboard

All Indigo graphics subsystems (except Entry Level) are configured with a GR2 graphics motherboard. The GR2 can be configured with one, two, or four GE7 geometry engines and one or three VM2 video memory modules. Different graphics subsystems will be configured with different quantities of GE7s and VM2s.



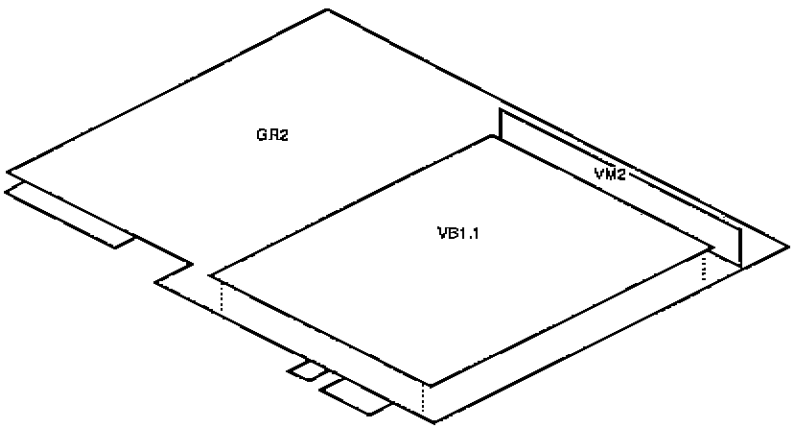
Comments

1. GE7 geometry engines are removable ASICs; however, GE7 ASICs are not field replaceable.
2. VM2 video memory modules reside in locations P14, P13, and P12.
3. In graphic subsystems configured with one VM2 memory module, the VM2 must reside in location P14.
4. For normal operation, jumper at location P96 must be installed (jumper is used for manufacturing testing).

Graphics—XS

The 8-bit XS graphics subsystem is a two-board graphics subsystem comprised of the following:

- GR2 graphics motherboard, configured with one GE7 geometry engine
- OneVM2 8-bit video memory module
- VB1.1 Video Buffer daughter card



Comments

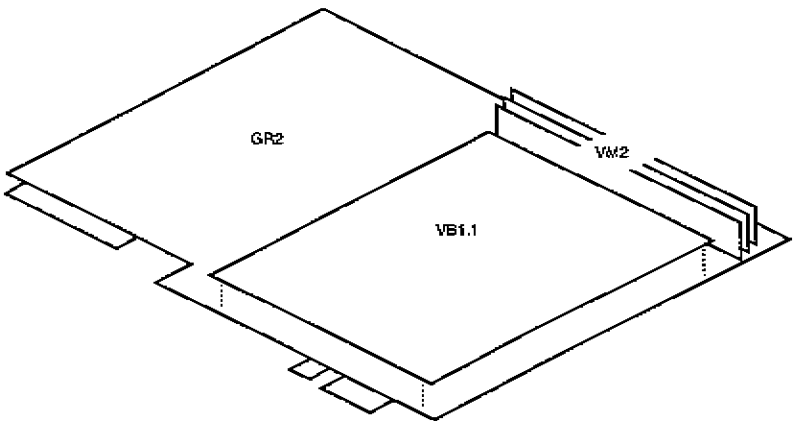
1. The GE7 geometry engine resides in location U43. The other three GE7 sockets are jumpered with an interconnect.
2. The VM2 memory module resides in location P14.

Graphics—XS24

The 24-bit XS24 graphics subsystem is a two-board graphics subsystem comprised of the following:

- GR2 graphics motherboard, configured with one GE7 geometry engine
- Three VM2 8-bit video memory modules
- VB1.1 Video Buffer daughter card

Note: The XS24 graphics subsystem is the same configuration as the XS with the addition of two VM2 memory modules.



Comments

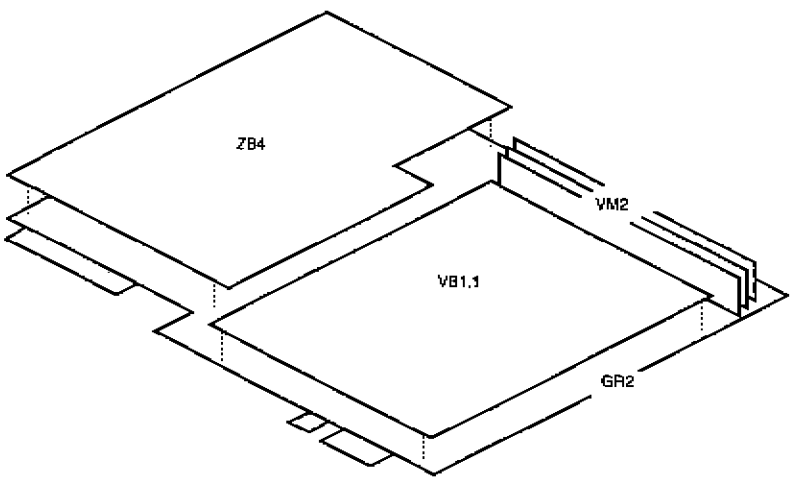
1. The GE7 geometry engine resides in location U43. The other three GE7 sockets are jumpered with an interconnect.
2. The system will operate with one VM2 memory module (with downgraded performance); single VM2 must reside in location P14.

Graphics—XS24Z

The 24-bit XS24Z graphics subsystem is a three-board graphics subsystem comprised of the following:

- GR2 graphics motherboard, configured with one GE7 geometry engine
- Three VM2 8-bit video memory modules
- VB1.1 Video Buffer daughter card
- ZB4 Z Buffer daughter card

Note: The XS24Z graphics subsystem is the same configuration as the XS24 with the addition of the ZB4 Z Buffer daughter card.



Comments

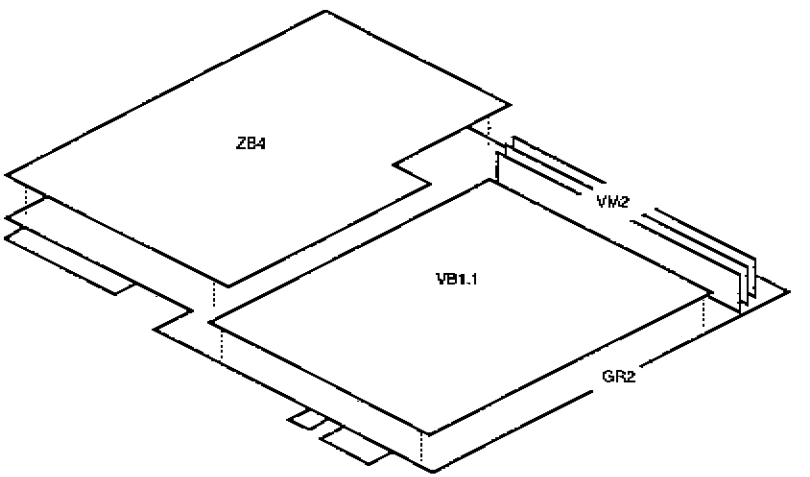
1. The GE7 geometry engine resides in location U43. The other three GE7 sockets are jumpered with an interconnect.
2. System will operate without ZB4 daughter card (with downgraded performance).
3. System will operate with one VM2 memory module (with downgraded performance); single VM2 must reside in location P14.

Graphics—XZ

The 24-bit XZ graphics subsystem is a three-board graphics subsystem comprised of the following:

- GR2 graphics motherboard, configured with two GE7 geometry engines
- Three VM2 8-bit video memory modules
- VB1.1 Video Buffer daughter card
- ZB4 Z Buffer daughter card

Note: The XZ graphics subsystem is the same configuration as the XS24Z with the addition of a GE7 geometry engine on the GR2 graphics motherboard.



Comments

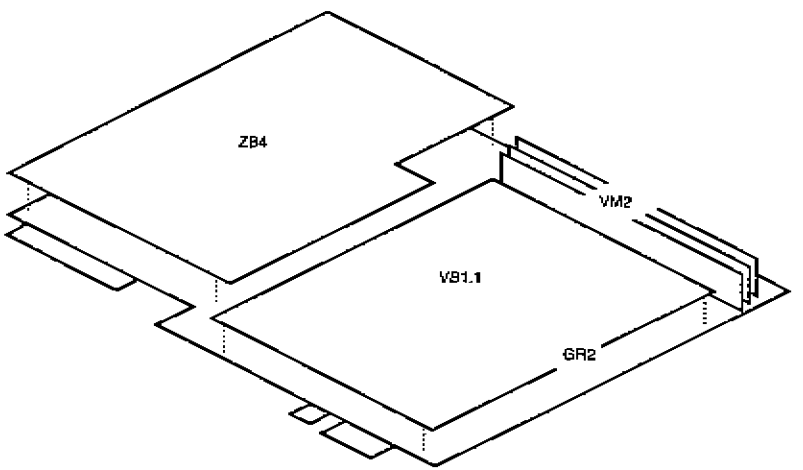
1. The two GE7 geometry engines reside in locations U43 and U35. The other two GE7 sockets are jumpered with an interconnect.
2. System will operate without ZB4 daughter card (with downgraded performance).
3. System will operate with one VM2 memory module (with downgraded performance); single VM2 must reside in location P14.

Graphics—Elan

The 24-bit Elan graphics subsystem is a three-board graphics subsystem comprised of the following:

- GR2 graphics motherboard, configured with four GE7 geometry engines
- Three VM2 8-bit video memory modules
- VB1.1 Video buffer daughter card
- ZB4 Z buffer daughter card.

Note: The Elan graphics subsystem is the same configuration as the XZ with the addition of two GE7 geometry engines on the GR2 graphics motherboard.



Comments

1. All four GE7 sockets are populated.
2. System will operate without ZB4 daughter card (with downgraded performance).
3. System will operate with one VM2 memory module (with downgraded performance); single VM2 must reside in location P14.

Monitors

See the following table for compatibility information about monitors supported by Indigo systems:

Size	Manufacturer	Manufacturer Model #	SGI FRU #	Input Connector
16"	Sony	GDM-1630SG	9330040	BNC
16"	Sony	GDM-1630SG	9330809	13W3
16"	Mitsubishi	TFS6705KW-CD	9330813	13W3
16"	Mitsubishi	TFS6705KW-SG	9330814	13W3
19"	Sony	GDM-1930SG	9330041	13W3
19"	Sony	GDM-1930SG	9330810	13W3
19"	Mitsubishi	HL7965KW-CD	9330811	13W3
19"	Mitsubishi	HL7965KW-SG	9330818	13W3

Note: Monitors with the manufacturer model number ending with "SG" have an SGI logo on the front bezel. Monitors with "CD" in the model number do not have an SGI logo.

Peripheral Devices

This section includes drive ID and jumpering information for the following 3.5" peripheral devices supported by Indigo systems.

Disk Drives

Capacity	Manufacturer/Model #	SGI FRU Number
400 MB	Seagate ST1480N	013-8454-001
535MB	Seagate ST3610N	013-8759-001
1GB	Seagate ST11200N	013-8714-001
1GB	IBM 0663E15	013-9042-001 (9410824)

Tape Drives

Capacity/Format	Manufacturer/Model #	SGI FRU Number
1GB 1/4" QIC	Wangtek 51000	9420813
1.3GB DAT	Archive E4320NT	013-8451-001

Media Devices

Device	Manufacturer/Model #	SGI FRU Number
644MB CD-ROM*	Toshiba TXM-3301E1	9410819
644MB CD-ROM*	Toshiba TXM-3401E1	9410829
1.44MB Floppy	TEAC FD-235HS	013-8450-001

*Note: Model TXM-3301E1 has a data transfer rate of 75 blocks/second; Model TXM3401E has a data transfer rate of 163.5 blocks/second (dual-speed).

SCSI Addressing

The following table shows the typical drive IDs used for addressing SCSI devices on SGI systems. Use this table as a guide when addressing SCSI devices or selecting drive ID for installed devices.

Drive ID	Device	Comments
1	Disk	The system disk drive (root drive) is always drive ID 1
2	Disk or tape	Alternative drive ID for tape drives which typically use drive ID 7
3	Disk	Option disk drive
4	Disk	Option disk drive
5	Disk	Option disk drive
6	CD-ROM	CD-ROM typically uses drive ID 6; other drive IDs can be used
7	Tape	Tape drives typically use drive ID 7; drive ID 2 is alternative address

Jumper Settings for Disk Drives

For Indigo systems, set jumpers so that

- Parity is enabled.
- Spindle motor starts on command.
- SCSI bus is terminated on last drive.

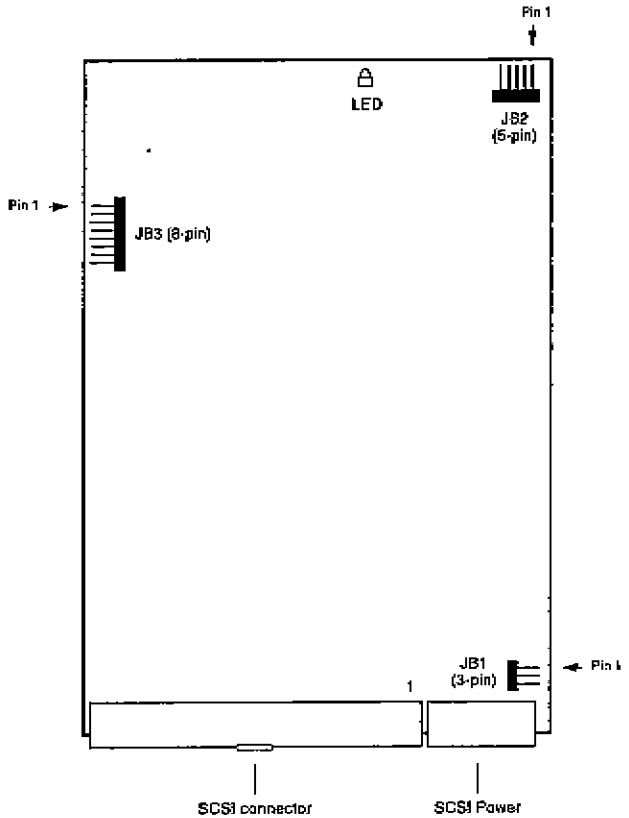
See information on individual drive for locations of appropriate jumpers.

Identifying Disk Drives

Use the fx utility to identify the manufacturer and manufacturer's model of disk drives installed in the system. For information about using fx to identify disk drives, see Section 3, page 3-19.

Disk Drives—400MB 3.5" SCSI

Seagate ST1480N



JB2 Jumper Settings

Jumper	Description	Setting In	Out
1	N/A	–	–
2	N/A	–	–
3	N/A	–	–
4	Spindle sync	Enabled	Disabled
5	Ext. LED Power	Enabled	Disabled

SCSI Drive ID (JB1 jumpers)

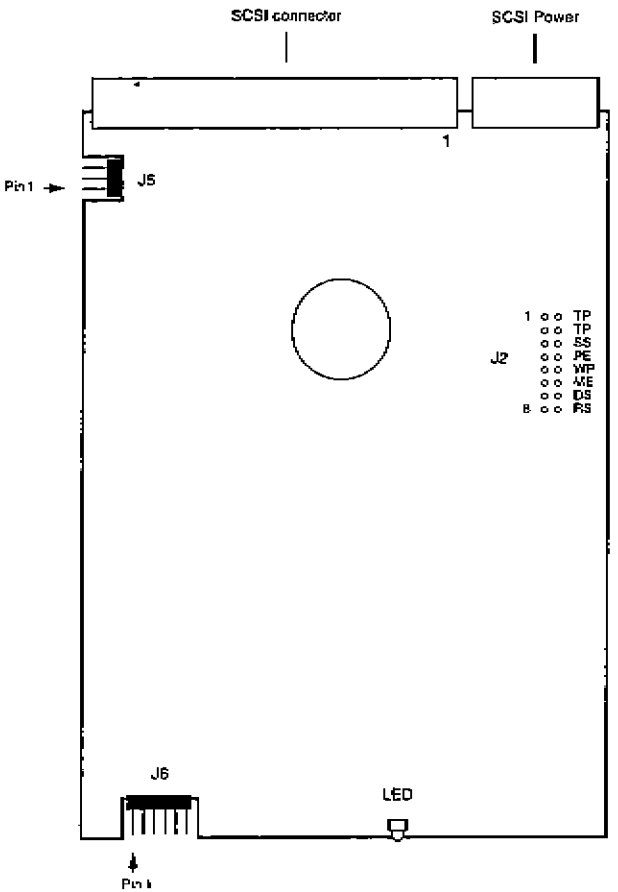
Drive ID	Jumper 3	Jumper 2	Jumper 1
1	Out	Out	In
2	Out	In	Out
3	Out	In	In
4	In	Out	Out
5	In	Out	In
6	In	In	Out
7	In	In	In

JB3 Jumper Settings

Jumper	Description	Setting In	Out
1	N/A	–	–
2	Motor start	Wait for command	No delay
3	Motor start delay	Delay (16 sec. x drive ID#)	No delay
4	Write protect	Enabled	Disabled
5	Parity check	Enabled	Disabled
6	N/A	–	–
7	Termination	Term. power to SCSI bus	Disabled
8	Termination	Term. power to disk	Disabled

Disk Drives—535MB 3.5" SCSI

Seagate ST3610N



J2 Jumper Settings

		Setting	
Jumper	Description	In	Out
TP (1)	Termination power	Term. power to SCSI bus	Not term.
TP (2)	Termination power	Term. power to drive	Not term.
SS (3)	Reserved	–	Yes
PE (4)	Parity	Enabled	Disabled
WP (5)	Write protect	Enabled	Disabled
ME (6)	Motor start	Wait for start command	No delay
DS (7)	Motor start delay	Delay (16 sec. x drive ID)	No delay
RS (8)	Reserved	–	–

SCSI Drive ID (JB5 jumpers)

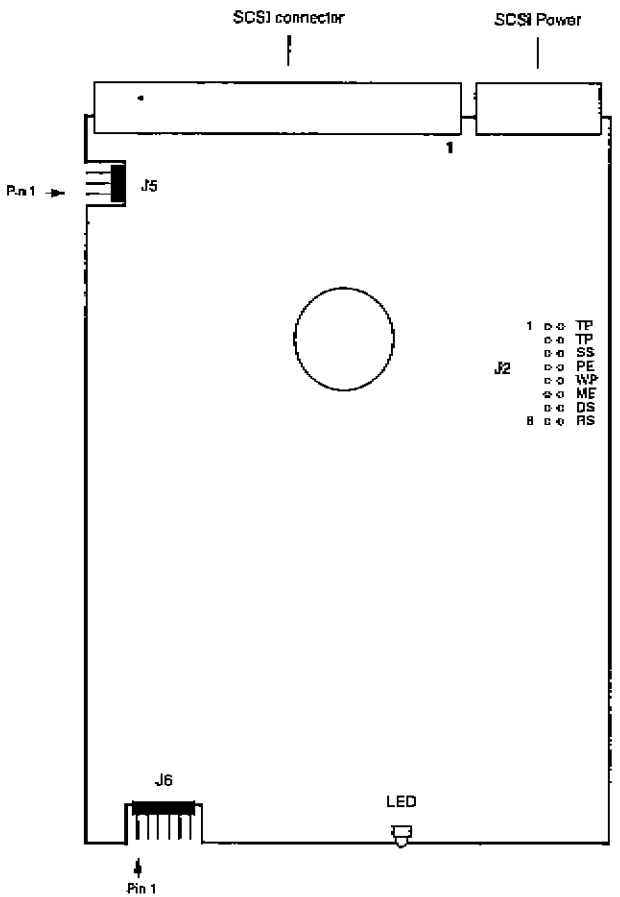
Drive ID	Jumper 1	Jumper 2	Jumper 3
1	In	Out	Out
2	Out	In	Out
3	In	In	Out
4	Out	Out	In
5	In	Out	In
6	Out	In	In
7	In	In	In

J6 Jumper Settings

Leave all pins on the J6 jumper block unjumpered.

Disk Drives—1GB 3.5" SCSI-2

Seagate ST11200N



J2 Jumper Settings

Jumper	Description	Setting In	Setting Out
TP (1)	Termination power	Term. power to SCSI bus	Not term.
TP (2)	Termination power	Term. power to drive	Not term.
SS (3)	Reserved	–	Yes
PE (4)	Parity	Enabled	Disabled
WP (5)	Write protect	Enabled	Disabled
ME (6)	Motor start	Wait for start command	No delay
DS (7)	Motor start delay	Delay (16 sec. x drive ID)	No delay
RS (8)	Reserved	–	–

SCSI Drive ID (JB5 jumpers)

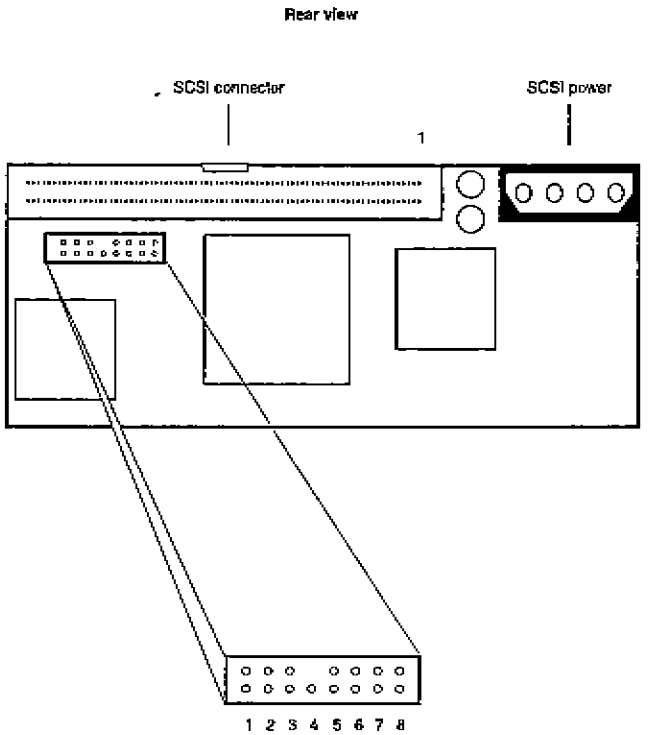
Drive ID	Jumper 1	Jumper 2	Jumper 3
1	In	Out	Out
2	Out	In	Out
3	In	In	Out
4	Out	Out	In
5	In	Out	In
6	Out	In	In
7	In	In	In

J6 Jumper Settings

Leave all pins on the J6 jumper block unjumpered.

Disk Drives—1GB 3.5" SCSI-2

IBM 0663E15



Jumper Settings

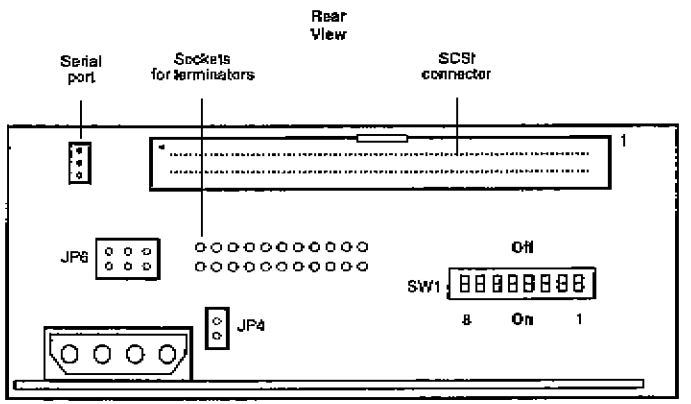
		Setting	
Jumper	Description	In	Out
1	SCSI ID	(see below)	(see below)
2	SCSI ID	(see below)	(see below)
3	SCSI ID	(see below)	(see below)
4	N/A	–	–
5	Motor start delay	Delay (10 sec. x drive ID#)	Wait to start
6	N/A	–	–
7	N/A	–	–
8	LED Power	Enabled	Disabled

SCSI Drive ID

Drive ID	Jumper 1	Jumper 2	Jumper 3
1	Out	Out	Out
2	In	Out	Out
3	Out	In	Out
4	In	In	Out
5	Out	Out	In
6	In	Out	In
7	Out	In	In

Tape Drives—1.3GB 4mm DAT SCSI

Archive E4320NT



SW1 DIP Switches

Set the DIP switches for the following:

- SCSI addressing
- Appropriate SCSI mode (SCSI or SCSI-2)
- Parity enabled
- Self test disabled

Switch	Description	Setting Off	On
1	SCSI addressing	(see below)	
2	SCSI addressing	(see below)	
3	SCSI addressing	(see below)	
4	SCSI mode	SCSI	SCSI-2
5	Parity	Disable	Enable
6	N/A	set to Off	
7	N/A	set to Off	
8	Self testing	Disable	Enable

SCSI Drive ID (SW1 DIP switches)

To use external SCSI addressing, set switches to drive ID 0.

Drive ID	Switch 3	Switch 2	Switch 1
0	Off	Off	Off
1	On	Off	Off
2	Off	On	Off
3	On	On	Off
4	Off	Off	On
5	On	Off	On
6	Off	On	On
7	On	On	On

Note: On SGI systems, tape drives are typically set to drive ID 2 or 7.

JP6 Jumpers

The JP6 jumper block also specifies SCSI addressing. Leave these jumpers open and use SW1 DIP switches to set the drive ID.

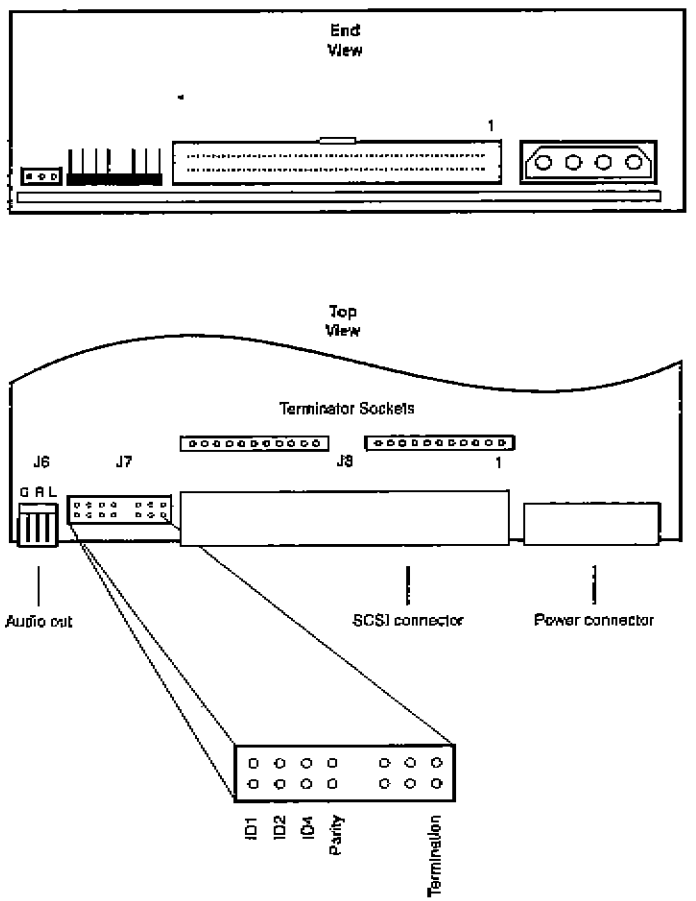
For external SCSI addressing, attach the SCSI addressing cable on the drive sled to JP6 jumper bank. The drive ID will be determined the drive bay in which the drive is installed.

JP4 Termination Jumper

Jumper	Description	Setting On	Off
JP4	Terminator Power	Terminated	Unterminated

CD-ROM Drive—644MB

Toshiba TXM-3301E1 and TXM3401E*



*Note: Model TXM-3301E1 has a data transfer rate of 75 blocks/second; the TXM3401E is a dual-speed CD-ROM drive and has a data transfer rate of 163.5 blocks/second.

J7 Jumper Settings

		Setting	
Jumper	Description	In	Out
ID1	SCSI addressing	(see below)	(see below)
ID2	SCSI addressing	(see below)	(see below)
ID4	SCSI addressing	(see below)	(see below)
Parity	Parity Checking	Enabled	Disabled
Termination	Terminator Power	Terminated	Unterminated

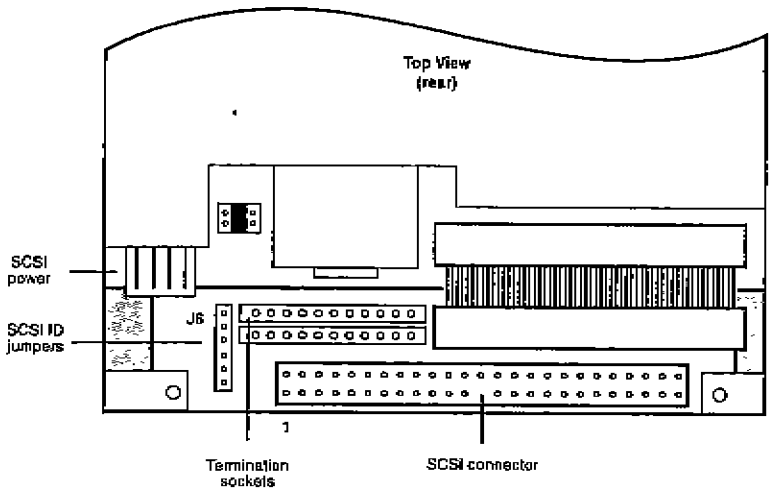
SCSI Drive ID

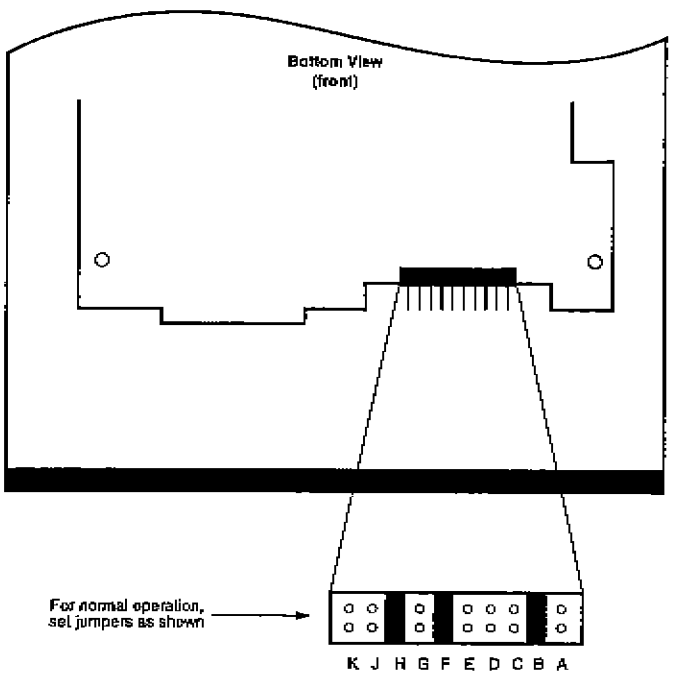
Drive ID	Jumper ID1	Jumper ID2	Jumper ID4
1	In	Out	Out
2	Out	In	Out
3	In	In	Out
4	Out	Out	In
5	In	Out	In
6	Out	In	In
7	In	In	In

Note: On SGI systems, the CD-ROM drive is typically set to drive ID 6.

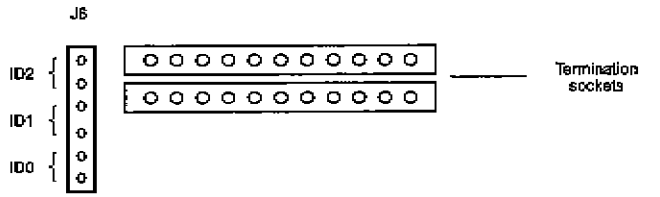
Floppy Drive—1.44MB 3.5" SCSI

TEAC FD-235HS





SCSI Drive ID (J6 jumpers)



Drive ID	Jumper ID2	Jumper ID1	Jumper ID0
1	In	In	In
2	In	Out	In
3	In	Out	Out
4	Out	In	In
5	Out	In	Out
6	Out	Out	In
7	Out	Out	Out

Section 3—Operation

This section is a quick reference to system level software used in maintaining and troubleshooting Indigo systems and includes the following:

- PROM Monitor
  - Command Monitor commands
  - PROM Monitor Environmentals
- Forcing console output to the Diagnostic Port
- Booting the system
- Standalone shell (sash)
  - Booting sash
  - sash Commands
- fx (disk drive format and exercise utility)
  - Booting fx
  - fx commands
  - Running fx
  - Formatting and labeling the disk drive
  - Adding bad blocks to the bad block list
  - Identifying disk drives
- Using Integrated Diagnostics Environment (IDE)
- Rebuilding the kernel
- Testing power supply voltages

PROM Monitor

The PROM Monitor is firmware that resides in PROMs located on the CPU board. Use the PROM Monitor to:

- Access diagnostic console on an ASCII terminal (connected to serial port A).
- Access and change the PROM Monitor environmentals
- Load the standalone shell (sash)
- Run basic system diagnostics
- Install the operating system

The PROM Monitor also performs basic power-on self tests (POSTs). After the system passes its POSTs, it displays the System Maintenance Menu:

```
System Maintenance Menu

1] Start System

2] Install System Software

3] Run Diagnostics

4] Recover System

5] Enter Command Monitor

Option?
```

Note: On Indigo systems, the System Maintenance Menu has icons to the left of each menu item. To start one of the menu items, with the cursor on the icon, click the left mouse button. You can also select the menu item by pressing the number key corresponding to the menu item.

Command Monitor

To enter the Command monitor, from the System Maintenance Menu, type **5** or click on the Command monitor icon. The system displays the >> prompt.

To display the Command Monitor commands:

- At the >> prompt, type **help** and press **<Return>**.

  The system displays the following commands:

auto	Performs an automatic boot.
boot	Boot a specified boot device and file.
exit	Exits Command Monitor; returns system to PROM Monitor.
help	Displays Command Monitor menu; also displays information on specific command (**help** *command*).
init	Writes current environmentals to non-volatile memory (NVRAM). Use **init** after changing an environmental. **Note:** After using **init**, the **resetenv** command will not reset environmentals to previous values.
hinv	Displays list of installed hardware; does not list non-SCSI devices.
ls	Lists contents of installed disk devices; using **ls** without an argument lists the contents of the volume directory of the system disk drive.
passwd	Use to password protect the Command Monitor.
printenv	Displays current settings for PROM Monitor environmentals. (See the next page for descriptions.)
resetenv	Resets the PROM Monitor environmental to previous values; does not work after running **init**.
resetpw	Resets the password for entry into the Command Monitor.
setenv	Used to change PROM Monitor environmental (**setenv** *environmental value*).
single	Puts system into single-user mode.
unsetenv	Reverts PROM Monitor environmental to previous value (**unsetenv** *environmental*); does not work if you used **init** command after changing environmental.
version	Displays the PROM Monitor revision and the system's CPU type.

PROM Monitor Environmentals

Use the **printenv** command to display the following PROM Monitor environmentals and their current values. Use the **setenv** command with the following syntax to change these variables.

setenv *environmental value*

AutoLoad Automatically boots system after power-on or reset:

- **Yes** PROM Monitor boots IRIX after system passes power-on diagnostics
- **No** Allows you to select boot device and boot program from PROM Monitor

eaddr Displays the hardware Ethernet address.

console Specifies device selected as system console:

- **d** Selects serial port1 as console; used for displaying diagnostics on ASCII terminal connected to port1
- **g** Selects display monitor and system keyboard as system console

diskless Indicates whether or not system has a disk drive:

1 = no disk drive

0 = installed disk

dbaud Displays the baud rate for the diagnostics terminal, which you attach to serial port 1.

volume Specifies speaker volume during POST; ranges from 0 to 256.

sgilogo Display SGI logo; set to **Yes** or **No.**

netaddr Specifies the system's Internet address; value used for booting across network.

ConsoleOut Automatically sets output device during start-up, where value is determined from **console** variable; (**multi(0)serial(0)** if console value is **d**; **video()** if console is set to **g**).

ConsoleIn Automatically sets output device during start-up; value determined by console variable (**multi(0)serial(0)** if **console** environmental value is **d** or **video()** if value is **g**).

cpufreq Displays the CPU frequency (in MHz).

SystemPartition Specifies the location of sash; default is **dksc(0,1,8)**, which is volume header of system disk drive.

OSLoadPartition Specifies disk partition where the root file system resides.

OSLoader Identifies operating system loader program; default is sash.

OSLoadFilename Identifies the bootable Unix kernel; default is */unix*

Forcing the Console to the Diagnostic Port

If you do not have control of the graphics console (monitor may be unreadable or blank and system will not accept commands from keyboard), it may be necessary to force the console to the diagnostic port.

To force console output to the diagnostics port:

1. Install an ASCII terminal to serial port1 of the system.
2. Configure the terminal for 9600 baud, 8 bit, 1 stop bit, no parity.
3. Power off system and disconnect the keyboard.
4. Power on system.
5. To enter the Command Monitor, from the System Maintenance Menu, type **5**. The system displays the >> prompt.
6. To set console environmental to diagnostics, at the Command Monitor prompt, enter **setenv console d**.
7. At the Command Monitor prompt, enter **init**.
8. Power off the system and reconnect the keyboard.
9. Power on system.

   The ACSII terminal connected to serial port 1 is now the system console.

Booting the System

Manual booting from the PROM Monitor allows you to select the boot device and the boot program. This enables you to boot the system using devices and programs different from the system disk and standard boot program.

To boot the system manually, use the **boot** command in the Command Monitor and the following syntax:

boot [**-f**n] *device*[*x*,*y*,*z*)*filename* [*argument*]

-f Prevents PROM Monitor from using boot program specified in bootfile environmental (since default setting for bootfile points to sash, **-f** option prevents system from loading sash)

-n Allows system to access disk drive, locate boot program and loads it into system memory, but does not execute boot program.

device Indicates the type of boot device. Possible boot devices include:

- **dksc** SCSI disk drive (includes CD-ROM drive)
- **tpsc** SCSI tape drive
- **bootp** Network
- **tpqic** VME tape drive (QIC)

(x,y,z) Specifies controller, device address, and partition

- *x* Selects the controller
- *y* Selects the device address. Note SCSI disks start at 1
- *z* Selects partition where boot program is located

filename Name of boot file being loaded by the PROM Monitor. Files include:

- **sash** Standalone shell
- **fx** Disk drive format and exercise utility
- **ide** Integrated Diagnostics environment

See table on next page for a list of bootable files and their locations on the boot device for Indigo systems.

argument Supplies additional instructions concerning the boot process. Two useful arguments include:

- **initstate** Specifies the system init state (also called run level). Use format **initstate=***x*, where *x* is the specified run level. See table on page 3-8 for descriptions of possible run levels).
- **showconfig** Displays the system configuration while system is booting up. Use the format **showconfig=istrue**

Bootable Files

Filename	Systems	Device/Location	Boot Command
sash	All	System disk: **dksc(0,1,8)**	**boot -f dksc(0,1,8)sash**
ide	All	System disk: **dksc(0,1,8)**	**boot -f dksc(0,1,8)ide**
fx	All	System disk: **dksc(0,1,8)**	**boot -f dksc(0,1,8)fx**
sashIP12	R3000-based (IP12 CPU)	CD-ROM: **dksc(0,6,8)**	**boot -f dksc(0,6,8)sashIP12**
sash.IP12	R3000-based (IP12 CPU)	Tape (drive ID 2): **dksc(0,2,0)** Tape (drive ID 7): **dksc(0,7,0)**	**boot -f dksc(0,2,0)sash.IP12** **boot -f dksc(0,7,0)sash.IP12**
ide.IP12	R3000-based (IP12 CPU)	CD-ROM: **dksc(0,6,8)**	**boot -f dksc(0,6,8)ide.IP12**
fx.IP12	R3000-based (IP12 CPU)	Tape (drive ID 2): **dksc(0,2,0)** Tape (drive ID 7): **dksc(0,7,0)** CD-ROM: **dksc(0,6,7)/stand**	**boot -f dksc(0,2,0)fx.IP12** **boot -f dksc(0,7,0)fx.IP12** **boot -f dksc(0,6,8)/stand/fx.IP12**
sashARCS	R4x00-based (IP20 CPU)	Tape (drive ID 2): **dksc(0,2,0)** Tape (drive ID 7): **dksc(0,7,0)** CD-ROM: **dksc(0,6,8)**	**boot -f dksc(0,2,0)sashARCS** **boot -f dksc(0,7,0)sashARCS** **boot -f dksc(0,6,8)sashARCS**
ide.IP20	R4x00-based (IP20 CPU)	Tape (drive ID 2): **dksc(0,2,0)** Tape (drive ID 7): **dksc(0,7,0)** CD-ROM: **dksc(0,6,8)**	**boot -f dksc(0,2,0)ide.IP20** **boot -f dksc(0,7,0)ide.IP20** **boot -f dksc(0,6,8)ide.IP20**
fx.ARCS	R4x00-based (IP20 CPU)	Tape (drive ID 2): **dksc(0,2,0)** Tape (drive ID 7): **dksc(0,7,0)** CD-ROM: **dksc(0,6,7)/stand**	**boot -f dksc(0,2,0)fx.ARCS** **boot -f dksc(0,7,0)fx.ARCS** **boot -f dksc(0,6,7)/stand/fx.ARCS**

Run Levels

Run Level	Description
s	Single user mode
0	System is shut down or in PROM Monitor mode
1	Single user mode, this is called by the s level
2	This is the normal run level for multi user mode
3	Multi-user mode (with network disabled)
4	Alternate run level for multi-user
5	Special run level for system admin uses
6	System reboot

Standalone Shell (sash)

The standalone shell (sash) contains commands used to perform system maintenance.

To boot sash:

- At the >> prompt, use the following format:

  `boot -f device(x,y,z)filename`

  Use the bootable file table on page 3-7 for the applicable device, file location, and filename.

- If the **bootfile** environmental points to sash—typically located at dksc(0,1,8)—at the >> prompt, enter **boot**.

After you boot sash, the system displays the sash: prompt.

sash Commands

Use the help command to display the following sash commands:

boot	Boots specified program on specified device; similar to the boot command in the Command Monitor.
	Example: `boot -f dksc(0,1,8)ide fe`
cat	Reads a file and displays it on standard output device.
	Example: `cat dksc(0,1,0)/etc/passwd`
copy	Use to copy files or file systems; copies block by block.
	Example: `cp dksc(0,1,1) dksc(0,2,1)`
go	Executes the listed booted program into memory.
help	Displays the sash commands and their syntax
install	Loads the installation tools
ls	List files and directories in the UNIX file system.
	Example: **ls dksc(0,1,0)/**
printenv	Displays the PROM Monitor environmental variable.
setenv	Use to set an environmental variable.
unsetenv	Use to revert a PROM Monitor environmental variable to its previous value.
version	Displays version of the PROM Monitor installed in system and the system's CPU type.

fx

fx is a formatting and exercise utility used for basic maintenance on disk drives.

Booting fx

A variety of ways exist to boot fx.

To boot fx from the system disk:

1. From the Command Monitor prompt (>>), enter

   ```
   boot -f dksc(0,1,8)fx
   ```

2. From the sash: prompt, enter fx

To boot fx from CD-ROM:

1. From the Command Monitor prompt (>>), enter

   ```
   boot -f dksc(0,6,8)filename
   ```

2. To boot fx, from the sash: prompt, enter

   ```
   dksc(0,6,7)/stand/filename
   ```

   Use the table on page 3-7 for the applicable fx file name.

To boot fx from tape:

- From the >> prompt, enter

  ```
  boot -f tpsc(x,y,z)filename
  ```

  Use the table on page 3-7 for the applicable fx file location and file name.

To boot fx from the network:

- Configure a boot server (with attached CD-ROM or tape drive) to provide bootable files to a client system on the network and the configure the client so that it can boot fx over the network.

  Note: Before configuring the boot server, make sure there is enough disk space in the */usr* file system for the */dist/sa* file.

  - In IRIX 4.0.5F, */dist/sa* is 20 MB.
  - In IRIX 5.2, */dist/sa* is 28 MB.

On the boot server

1. Edit the */usr/etc/inetd.conf* file. At the IRIX system prompt, enter

   ```
   vi /usr/etc/inetd.conf
   ```

2. Locate the following line:

   ```
   tftp dgram udp wait guest /usr/etc/tftpd tftpd -s bootpath
   ```

3. Edit the above line to so that *bootpath* is */usr/local/boot*:

   ```
   tftp dgram udp wait guest /usr/etc/tftpd tftpd -s /usr/local/boot
   ```

4. Save and quit the */usr/etc/inetd.conf* file.

5. Create a directory called */usr/local*. At the system prompt, enter

   ```
   mkdir /usr/local
   ```

6. In the */usr/local* directory, create a subdirectory called *boot* (by default, network bootable files must reside in */usr/local/boot* on the boot server). At the prompt, enter

   ```
   mkdir /usr/local/boot
   ```

7. Make a directory called */usr/local/boot/dist*. At the system prompt, enter

   ```
   mkdir /usr/local/boot/dist
   ```

8. From a IRIX distribution CD-ROM or tape, copy the */dist/sa* file (which contains all bootable files) into the */usr/local/boot/dist* directory. Depending on the media, do one of the following:

   CD-ROM

   a. Mount the boot server's CD-ROM on */CDROM*.

   b. Copy the bootable files to */usr/local/boot/dist*. At the system prompt, enter

      ```
      cp -r /CDROM/dist/sa /usr/local/boot/dist
      ```

   Tape

   - Copy the bootable files to */usr/local/boot/dist*. At the system prompt, enter

     ```
     distcp -vwr /dev/nrtape /usr/local/boot/dist "sa"
     ```

   Boot server is now configured so that client systems can boot fx over the network. In addition to fx, clients can also boot the standalone shell (sash) and the Integrated Diagnostics Environment (IDE).

On the client system

1. To set the **netaddr** environmental (in the PROM Monitor) using the client's Internet address, at the >> prompt, enter

   ```
   setenv netaddr ipaddress
   ```

2. To set system to ignore installed media device (even if the client has no media device), at the >> prompt, enter

   ```
   setenv tapeless 1
   ```

3. To create a variable that points to the bootable files in the */usr/local/boot/dist* directory on the boot server, at the >> prompt, enter

   ```
   setenv tapedevice bootp()serverhostname:/usr/local/boot/dist/sa
   ```

4. To boot fx over the network, at the >> prompt, enter

   ```
   boot -f $tapedevice(filename)
   ```

   Use the table on page 3-7 for the applicable fx filename.

Running fx

After using one of the above methods to boot fx, the system displays the following message:

```
Currently in safe read-only mode

Do you require extended mode with all options available with all options
available? (no)
```

1. Enter **y**
2. At the `fx: "device-name" = (dksc)` prompt, enter the device name you want to format or press **<Return>** to use device in parenthesis.
3. At the `fx: ctlr# = (0)` prompt, enter the number of the device's controller or press **<Return>** to use the controller number in parenthesis.
4. At the `fx: drive# = (1)`, enter the number of the device or press **<Return>** to use the number in parenthesis.

   The system displays the fx menu and fx> prompt:

```
----- please choose one (? for help, .. to quit this menu)-----
[exi]t            [d]ebug/          [l]abel/          [a]uto
[b]adblock/       [exe]rcise/       [r]epartition/    [f]ormat
fx>
```

Running fx in IRIX

fx is also available when the IRIX operating system is running. Use the following command to start fx in a read-only mode.

Note: To use fx in IRIX, you must be logged in as root.

To start fx in IRIX:

1. At the IRIX root prompt, enter **/usr/bin/fx**.

   The system prompts you to select the device name, the controller number, and the drive ID number.

2. Select the device name, the controller number, and the drive ID number.

   After displaying a warning message and the manufacturer and manufacturer's model number of the selected drive, the system displays the fx> prompt.

fx Commands

fx offers the following commands:

exit Exits fx. During an fx session, a copy of all disk label information is maintained in memory. When you exit, you have the option to write this information to disk if you have made any changes to the buffer. When you exit, fx will ask if you want to re-create the drive label.

debug Provides capability to read, write, and dump blocks of data. Debug is used-primarily for engineering and manufacturing (not needed for field service).

label Enables you to do various tasks to a disk drive label. You can use **label** to read the disk's existing label or create a new label using default values.

Note: Labeling the drive destroys existing data and files in the volume directory.

The label command contains four sub-commands:

show Shows existing contents of disk label. The show command contains a number of sub-commands.

sync Writes label in memory buffer to disk.

set Contains sub-commands that allow you to change various drive information such as boot information, drive parameters, and partition.

create Contains sub-commands that allow you to create a default SGI label, which includes parameters for boot information, drive parameters, and default partitions.

auto Creates the SGI disk label and formats the disk. Auto is a good choice for formatting a virgin disk drive.

badblock Allows you to access or manipulate the bad block list contained in the disk label on ESDI disk drives. For SCSI drives, you can only display the bad block list.

For SCSI disk drives, only the following bad block commands are available:

adbb Add new bad blocks to badblock list in buffer

showbb Display badblock list from buffer

exercise Offers a variety of disk exercises. After formatting the disk, use the exercise function to find bad blocks. If a bad spot is detected during an exercise, the head and cylinder location of the bad spot is entered into a memory buffer. When you exit fx, you have the option to re-create the disk label, which will assign an alternative track to a bad spot.

The **exercise** commands perform the following functions:

butterfly Performs butterfly exercise

errlog Print error log

random Performs random seek exercise

sequential Performs sequential test

stoponerror Set to stop exercise when error occurs

settestpat Sets test pattern for exercise

showtestpat Prints data test pattern

complete Performs complete read/write test

repartition Use to repartition a disk drive. The following sub-commands are available:

rootdrive Use to repartition a drive that will be used as the root drive.

optiondrive Use to repartition a disk drive that will not be used as the root drive.

resize Use to repartition a partition on a disk drive. When you use **resize**, other disk partitions are adjusted to accommodate the changes.

expert Use to manually set partition sizes and types.

Note: Repartitioning the drive can destroy data.

format Formats the disk drive. Use to format the entire drive or sections of the drive. Formatting the disk drive destroys any existing data that resides in the volume header of the disk label (such as sash, fx, and IDE).

Formatting and Labeling a System SCSI Disk Drive

To format the disk drive:

1. Boot fx (see page 3-10 for procedures for booting fx).
2. At the extended mode prompt, enter **y**.
3. At the device name, controller #, and drive# prompts, select the appropriate values.
4. To select the **format** command from the fx main menu, enter **f**.

   The system will prompt you for which drive parameters to use.

Note: When formatting an unformatted drive, use the default drive parameters.

5. To select the current (default) parameters, press **<Return>**.

   The system displays the prompt, "about to destroy data...ok?"

6. To format the disk drive, at the "...ok" prompt, enter **yes**.

   The system formats the disk drive; when format is complete, system returns to fx main menu.

To label the disk drive:

1. From the fx main menu, at the fx> prompt, enter **l**.
2. To create a label, at the fx/label prompt, enter **c**.
3. To create a complete label, at the fx/label/create prompt, enter **a**.

   The system creates the new label.

4. To go back up to the label menu, at the fx/label/create prompt, type **..** and press **<Return>**.
5. To write (sync) the new label to the volume header of the disk drive, at the fx/label> prompt, enter **sy**.

   The system writes the label to the disk drive and displays the message, "writing label info to dksc(0,1,)"

6. To exit fx, at the fx/label> prompt, enter **../exit**.

   System returns to the System Maintenance Menu.

Formatting, Labeling, and Repartitioning a Second SCSI Disk Drive

To format the disk drive:

1. Boot fx (see page 3-10 for procedures for booting fx).
2. At the extended mode prompt, enter **y**.
3. At each of the device name and controller# prompts, select the appropriate value.
4. At the drive# prompt, enter the appropriate drive ID. (Drive ID 1 is reserved for system disk drive).
5. To select the **format** command from the fx main menu, at the fx> prompt, enter f.

   The system will prompt you for which drive parameters to use.

Note: When formatting an unformatted drive, use the default drive parameters.

6. To select the current (default) parameters, press **<Return>**.

   The system displays the prompt, "about to destroy data...ok?"

7. To format the disk drive, at the "...ok" prompt, enter yes.

   The system formats the disk drive. When format is complete, system returns to fx main menu.

To label and repartition the disk drive:

1. From the fx main menu, at the fx> prompt, enter **l**.
2. To create a label, at the fx/label prompt, enter **c**.
3. To create a complete label, at the fx/label/create prompt, enter **a**.

   The system creates the new label.

4. To go back up to the main menu, at the fx/label/create prompt, type **../..** and press **<Return>**.
5. To repartition the drive, at the fx> prompt, enter **r**.

   The system displays the current partition table and the repartition menu.

6. To repartition the drive as an option drive (non-system drive), at the fx/repartition prompt, enter **o**.

   System displays message warning that existing data will be lost when drive is repartitioned.

7. To repartition the disk (and lose existing data), at the Continue? prompt, enter **y**.

   System repartitions disk label, writes the label to the volume header, and displays the new partition table.

8. To exit fx, at the fx/label> prompt, enter **../exit**.

   System returns to the System Maintenance Menu.

Exercising a Disk Drive

1. Boot fx (see page 3-10 for procedures for booting fx).
2. At the extended mode prompt, enter **y**.
3. At the device name, controller #, and drive#, select the appropriate value.
4. To select the exercise command, from the fx> prompt, enter **exe**.

   The system displays the exercise subcommands.

```
fx> exe
----- please choose one (? for help, .. to quit this menu)-----
 [b]utterfly     [r]andom          [st]op_on_error  [sh]owtestpat
 [e]rrorlog      [seq]uential      [s]ettestpat     [c]omplete
fx/exercise>
```

5. To run a test, at the fx/exercise prompt, enter the command for the test you want to run (See page 3-14 for a description of the exercise tests).

   When the test is selected, the system will prompt you for a modifier (default modifier is read only). The available modifiers are

   - **[rd]**-only: Read only; a read-data command will check for read-complete.
   - [ro]-cmp: Read and compare; system compares two disk read commands.
   - [s]eek: Seek; performs a seek and read command to every disk block. (This test takes a long time to complete.)
   - (wr-o)nly: Write only; write command looks for a write complete.
   - (wr-c)mp: Write compare; write command followed by a read and compare.

6. To select a modifier, at the prompt, enter the command for the modifier.

   The system runs the test. Note that the system ignores the badblock list.

7. To display the error log after the test is complete, at the fx/exercise> prompt, enter **e**.
8. To exit fx, at the fx/exercise> prompt, enter **../exit**.

   The system returns to the System Maintenance Menu.

Adding to the Bad Block List

If fx discovers a bad block on a disk drive during an exercise, you can use fx to add the block to the disk's bad block list.

To add a bad block to the bad block list

1. Boot fx. See page 3-10 for the procedures for booting fx.
2. At the extended mode prompt, enter **y**.
3. At the device name, controller #, and drive#, select the appropriate values.
4. Select the **bad block** command. At the fx> prompt, enter **b**.
5. Select the **addbb** (add new badblock to badblock list) command. At the fx/badblock> prompt, enter **a**.

   The system prompts you for a bad block number:

```
please enter a bn from 0 to xxxxxx
fx/badblock/addbb: add badblock:
```

6. At the prompt, enter the bad block number.

   After you enter the bad block number, fx attempts to save the data. The system then redisplays the add badblock: prompt.

7. Repeat step 6 to add additional bad blocks.
8. When finished adding bad blocks, exit the **addbb** utility. At the add badblock: prompt, type **..** and press **<Return>**.

   The system displays the fx/badblock prompt.

9. Exit fx. At the fx/badblock> prompt, enter **../exit**.

   The system returns to the System Maintenance Menu.

Identifying Disk Drives

Use the fx utility (from the PROM Monitor or from IRIX) to identify the manufacturer and manufacturer's model number of the disk drive(s) installed in the system.

To identify a disk drive

1. Boot fx. See page 3-10 for the procedures for booting fx.
2. At the extended mode prompt, enter **y**.
3. At the device name, controller #, and drive #, select the appropriate values.
4. At the fx> prompt, enter **label/show/all**.

   The system displays detailed information about the disk drive.
5. To exit fx, at the fx> prompt, enter **exit**.

Integrated Diagnostics Environment (IDE)

The Integrated Diagnostics Environment (IDE) for Indigo systems is comprised of a set of manufacturing tests that field service personnel can use to troubleshoot hardware problems to the FRU level.

IDE can be run from the graphics console or the diagnostic console.

Running IDE

The IDE tests can be run in two ways:

- **Customer or Silent mode**

  To run the IDE diagnostics in this mode:

  - From the System Maintenance Menu, select **3**.

    The system runs all appropriate tests and then displays a pass ("no failures") or fail ("electronics module failure") message.

To interrupt these tests, type **<Ctrl-c>** and then **<Return>**.

- **FE or Verbose mode**

  To run the IDE diagnostics in this mode,

  - To boot IDE from bootable media, from the Command Monitor prompt, enter

    `boot -f device(x,y,z)filename`

    Use the bootable file table on page 3-7 for the applicable device, file location, and filename.

    When IDE is booted, the system displays the ide>> prompt.
  - To boot IDE from the disk drive, at the Command Monitor prompt, enter

    `ide fe`

    The system displays the ide>> prompt.

When IDE is executed in either mode, it automatically runs the processor and the graphic subsystem tests.

To interrupt these tests, type **<Ctrl-c>** and then **<Return>**.

IDE Error Messages

You may see the following error messages:

```
ERROR: Failure detected in the Electronics Module (CPU).
ERROR: Failure detected in Electronics Module (bitplane expansion).
ERROR: Failure detected in the Electronics Module (Z-buffer).
ERROR: Failure detected in the Electronics Module (FPU).
ERROR: Failure detected in SCSI (0,6).
```

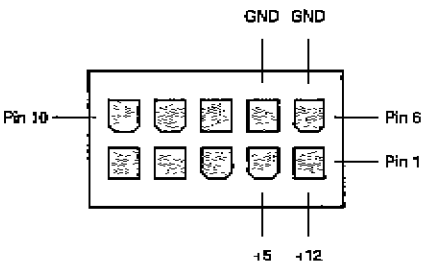
IDE Commands

To display a list of IDE commands, at the ide>> prompt, enter **help**.

exit	Exits IDE.
hinv	Displays list of hardware configured in system.
printenv	Displays current settings for PROM environmental.
version	Displays version of the IRIX operating system installed and the system's CPU type.
audio	Tests the audio hardware.
fpu	Tests the floating point unit.
help_mem	Displays a map of the memory slots.
memtest	Tests main memory.
scsi	Tests all connected SCSI devices.
xscsi	Exercises all connected SCSI disk drives.
repeat	Loops a test continuously or *n* times.
report	Changes the report level.
ip12	Tests the IP12 CPU (R3000-based systems), memory SIMMs, and SCSI devices.
ip20	Tests the IP20 CPU (R4x00-based systems), memory SIMMs, and SCSI devices.
gr2	Tests the GR2 graphics board, VM2 video memory, VB1.1 video buffer, and the ZB4 Z buffer card.
lg1	Tests the LG2 Entry Level graphics board.
ldram	Tests parity on address and data bits on the first four megabytes of system memory.
dram	Tests parity on address and data bits on system memory above first four megabytes.

Testing Power Supply Voltages

Use a digital voltage meter (DVM) and the SCSI power connectors (see diagram below for pin-out) in the drive bays, to test power supply voltages for Indigo systems. Replace power supply if voltages are not within tolerances.



Voltage	Pin-Out	Tolerance	Reference
+12	1	+/- .6V	GND
+5	2	+/- .15V	GND
GND	6,7	N/A	N/A

To test +5 and +12V power supply voltages:

1. Shut down the operating system.
2. Turn off power to the system.
3. Remove any devices from the top and middle drive bays.
4. Remove the shelf between the top and middle drive bays by pressing in on the retaining tabs on each side of the bay and lifting the shelf out.
5. Power-on the system.
6. Attach the ground lead of the DVM to pin 6 or 7 of the SCSI power connector in the middle drive bay.
7. To test the +12V, attach the hot lead of the DVM to pin 1 of connector in top drive bay.
8. To test +5V, attach the hot lead of the DVM to pin 2 of connector in top drive bay.
9. When finished testing voltages, power-off the system.
10. If necessary, replace the power supply.
11. Reassemble drive bays and reinstall devices.

Rebuilding the Kernel

If the system does not boot or the boot process hangs, the problem may be caused by a corrupted kernel. Use the following procedure as a quick way to rebuild the kernel.

To rebuild the kernel:

1. Enter the Installation utility. At the System Maintenance Menu, click on the Install System Software icon or type **2**.

   System prompts you to select a media device and to install media.

2. Start the Administrative Command utility. At the **Inst>** prompt, **enter admin**.
3. Start a UNIX shell. At the admin> prompt, enter **sh**.
4. Change to the */root* directory. At the #> prompt, enter **cd root**.

   Note: When in the UNIX shell in the Administrative command utility, the */root* directory is the **/** directory when the system has booted and is running IRIX.

5. Rename the kernel. At the #> prompt, enter **mv unix unix.copy**.
6. Exit the shell. At the #> prompt, enter **exit**.
7. Exit the Administrative Command utility. At the admin> prompt, enter **exit**.

   The system executes the exit commands and displays various messages.

8. Restart the system. At the "Ready to restart the system. Restart?" prompt, enter **y**.

   Restarting the system causes a new kernel to be built. The system uses the new kernel to boot.

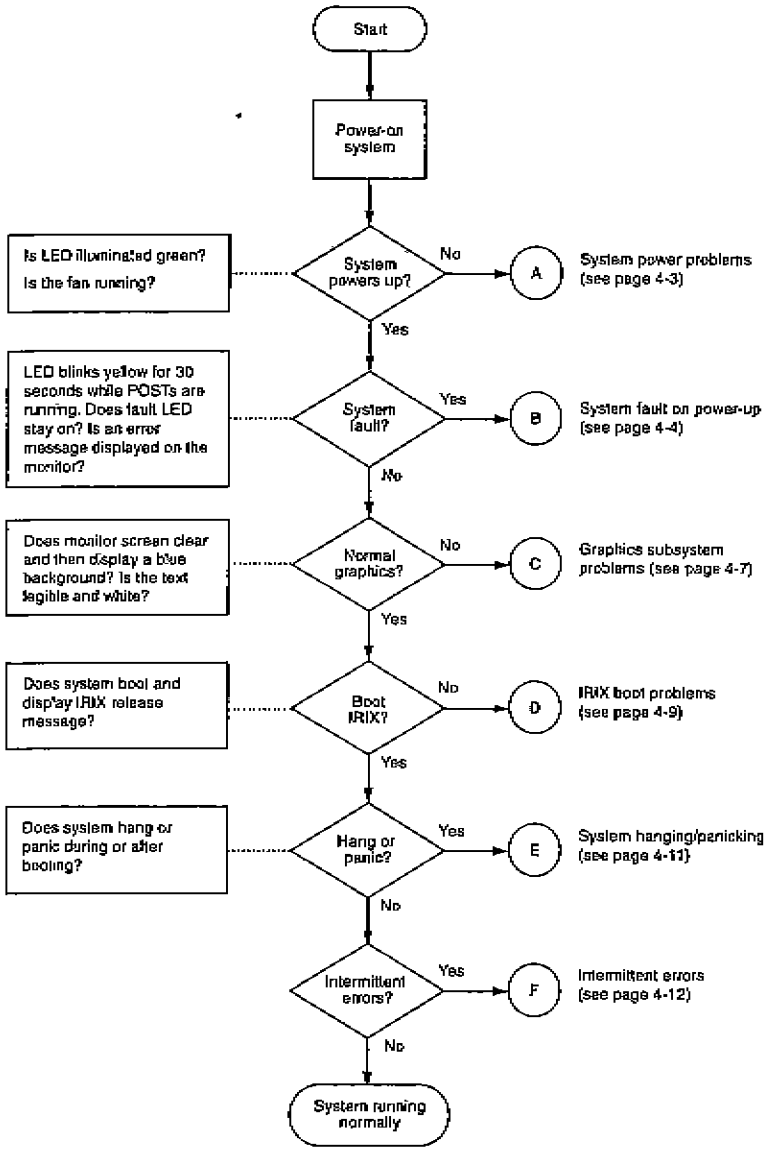
Section 4—Troubleshooting

This section contains flow charts for isolating failing field replaceable units (FRUs) on Indigo systems.

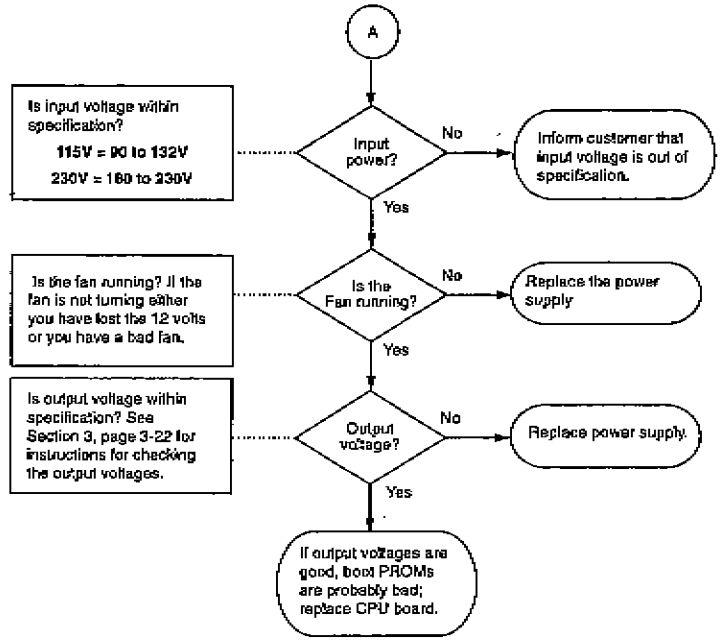
- System power problems
- System fault during power-on
- Graphics problems
- IRIX boot problems
- Hang or panic errors
- Intermittent errors

Master Troubleshooting Flow Chart

Depending on the specific type of error, the master flow chart will point to the appropriate flow chart and page number.



Flow Chart A—System Power Problems



Flow Chart B—System Fault on Power-Up

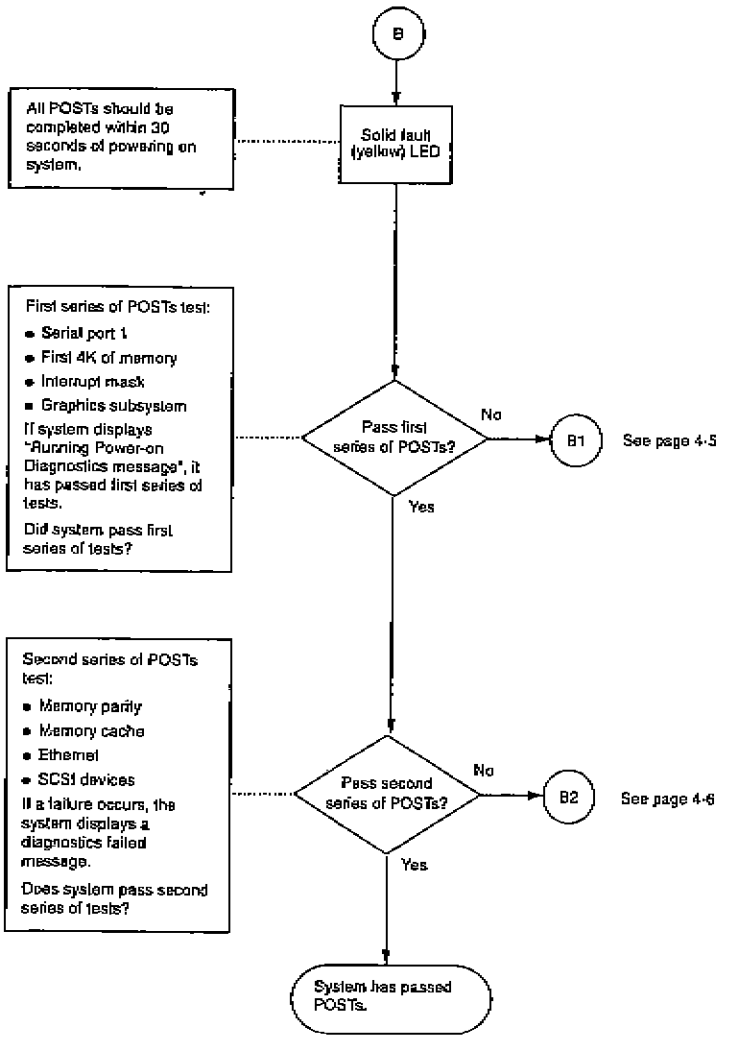


Table B1—System Fails First Series of POSTs

When a failure occurs in the first series of POSTs, the system displays error information on an ASCII terminal connected to the diagnostics port (serial port 1); system displays error message indicating the test that failed.

See table below for decoding the diagnostic messages and CPU LED status.

Diagnostic Message	Failing FRU
DUART test failed	CPU Board
Walking bit memory test failed	Memory SIMM
Memory address uniqueness test failed	Memory SIMM
Graphics test failed	See page 4-7 to isolate failing graphics FRU.
Interrupt mask test failed	CPU
No messages displayed on terminal, but CPU LED blinks for more than 30 seconds	Memory SIMM
No messages displayed on terminal, but CPU LED remains lit for more than 30 seconds	CPU

Table B2—System Fails Second Series of POSTs

When the system fails a test in the second series of POSTs, a message is displayed on the graphics console. See the table below for error messages and the corresponding failing FRU.

Console Error Message	Failing FRU
Hardware failure detected in parity mechanism test	CPU board
Hardware failure detected in data cache or instruction cache test	CPU board
Hardware failure detected in ethernet controller loopback test	CPU board
Device # failed self-diagnostics test	SCSI device or CPU board (See note)
Device # failed DMS test	SCSI device or CPU board (See note)
gfx: no keyboard	Keyboard or keyboard cable

Note: When a SCSI device fails, always check jumpers and termination before replacing device.

Flow Chart C—Graphics Subsystem Problems

Boxes on right side of chart state possible problem areas and then list a set of test numbers. See Table C1 on next page for troubleshooting procedures corresponding to test numbers.

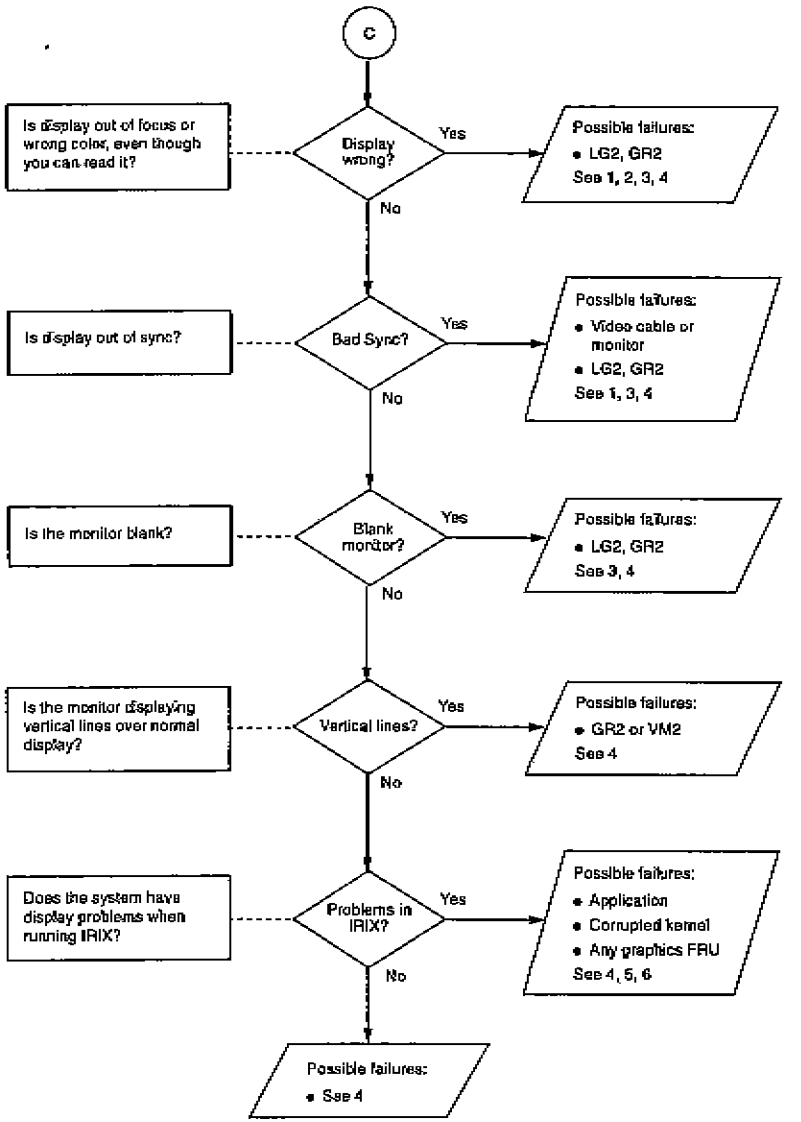


Table C1—Troubleshooting Graphics Subsystems Problems

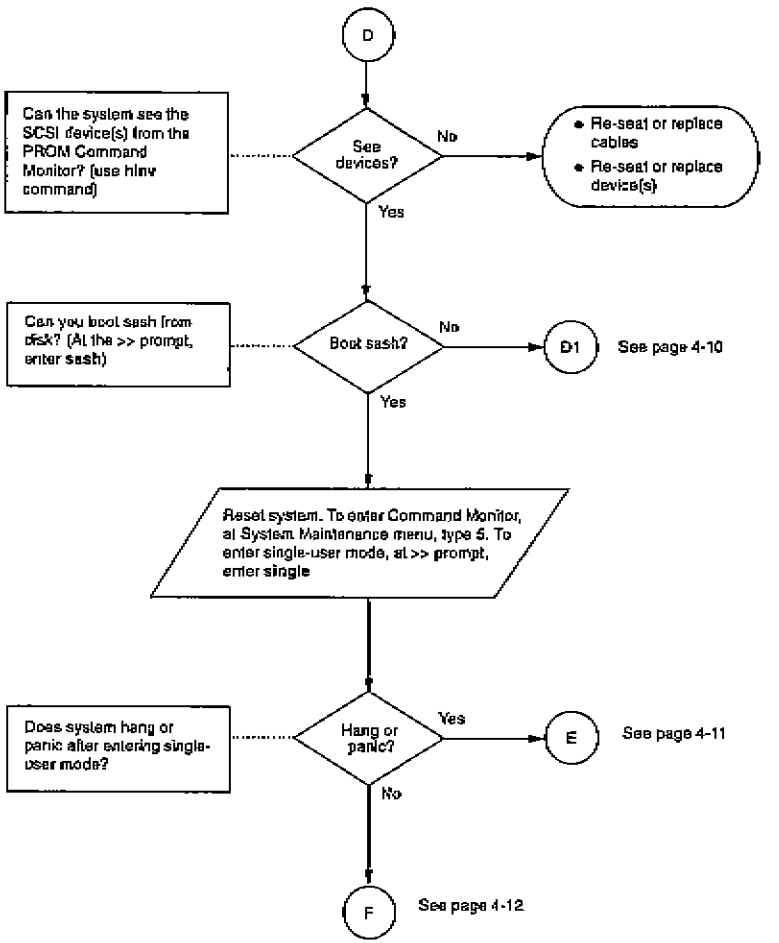
Test	Procedure	Possible Failing FRU
1	• Check monitor cables • Rotate the RGB cables • Replace cables.	Cables
2	• Check monitor termination, last device in video string must be terminated.	Operator error; bad termination
3	• Check monitor • Attach known-good monitor to system	Monitor
4	1. If graphics console is not functioning, force the console to the diagnostics port (See Section 3, page 3-5). 2. Run IDE in FE mode to test the graphics subsystem (See Section 3, page 3-20)	Any graphics board in subsystem
5	• Run the graphics demos or customer's application	Graphics or CPU board
6	• Reinstall IRIX	Bad file system

Flow Chart D—IRIX Boot Problems

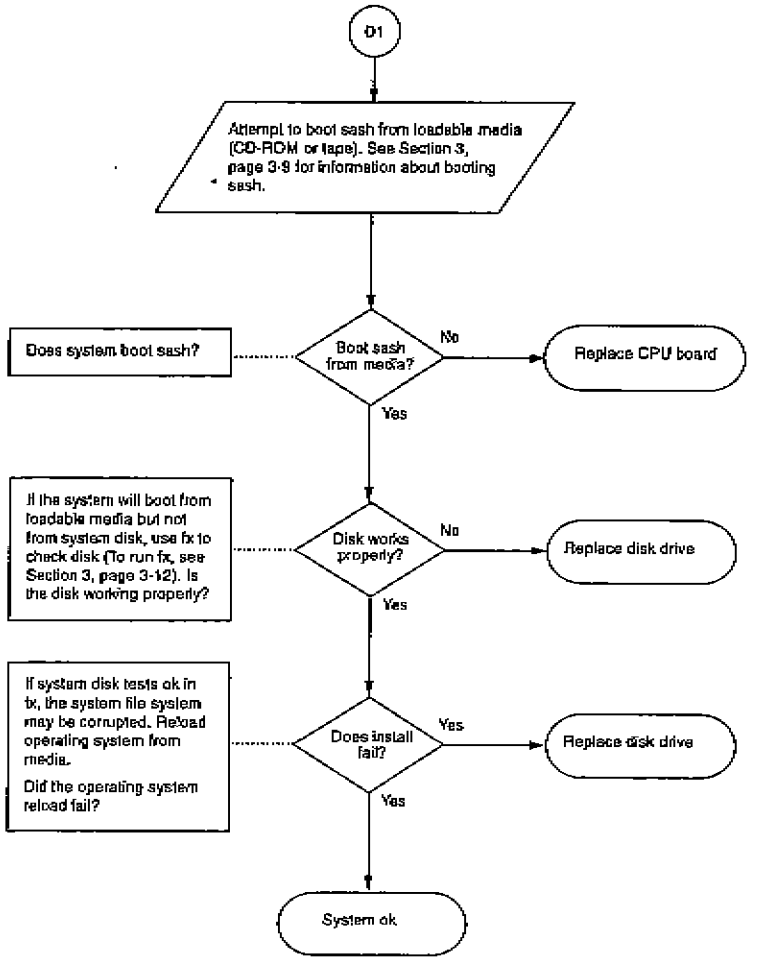
Problems with the following can result in the system not booting:

- CPU
- Memory
- System disk drive
- Standalone shell (sash)
- Corrupted file system

Note: Before proceeding with the flow chart below, re-seat all cables, boards, and devices.

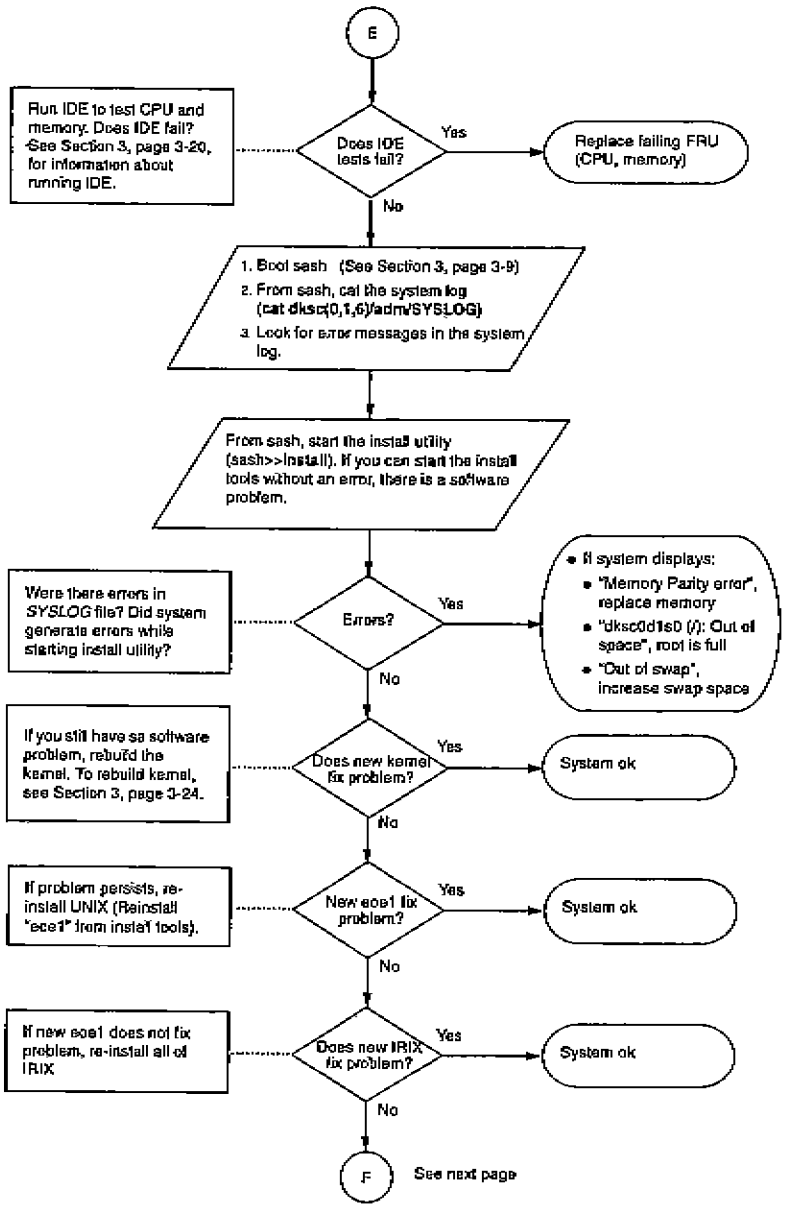


Flow Chart D1—System Cannot Boot sash From System Disk

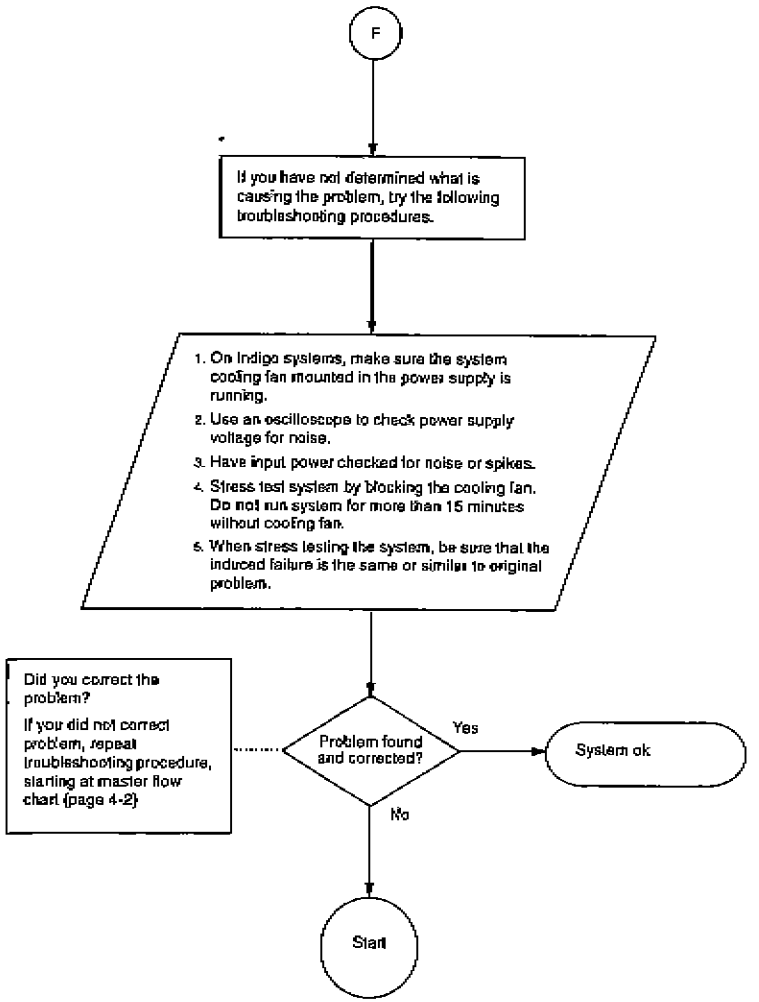


Flow Chart E—System Hangs or Panics

Use chart to troubleshooting system that will not boot single or multi-use IRIX.



Flow Chart F—Intermittent Problems



Section 5—Field Replaceable Units

This section contains a list of field replaceable units (FRU)s for Indigo systems. Also included is a description of SGI's part numbering nomenclature.

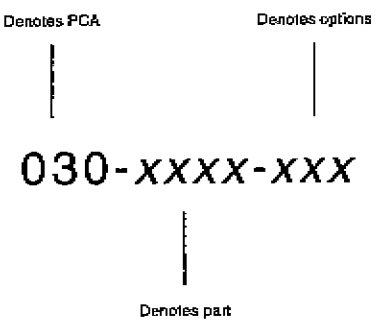
Part Number Nomenclature

SGI's part numbers identify four types of basic system components.

- Printed circuit assemblies (PCAs)
- Peripheral devices (often third-party)
- Assemblies
- Cable Assemblies

Printed Circuit Assemblies

Part numbers for printed circuit assemblies (PCAs) such as CPU boards (without daughter cards), daughter cards, I/O boards, memory boards, graphic subsystem components, and SIMM modules or other basic circuit board take the following format:



For basic PCAs, the first three digits are "030." The second four digits are unique to the particular part and rarely change. The last three digits usually denote options and will change during the part's life cycle.

Peripheral Devices

Devices such as raw disk drives, tape drives, CD-ROM drives, power supplies, and monitors purchased by SGI and then configured into systems are identified by a seven-digit number beginning with "9".

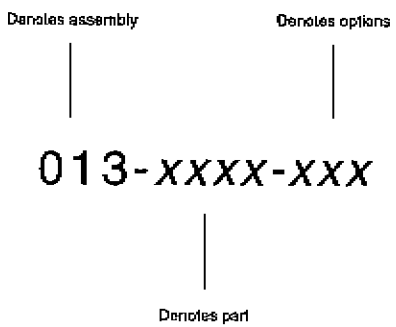
9*XXXXXX*

This seven-digit number is different from the manufacturer's part number.

Assemblies

PCAs or peripheral devices configured together or configured with additional parts such as mounting brackets or cables are called assemblies ("ASSY" in part descriptions). Assemblies are identified a part number that is completely different from the individual PCAs or peripheral devices that comprise an assembly.

Part numbers for assemblies take the following format:



An assembly part number is similar to a PCA part number except that the first three digits are "013". Assemblies include CPU boards with daughter cards, entire graphics subsystems, and disk and tape drives with sleds and cables.

Cable Assemblies

Part numbers for cable assemblies such as power harnesses, video cables, and SCSI cables begin with "018".

FRU List—Indigo Systems

CPU/Memory (R3000-based systems)

FRU Number	Description
030-8044-00x	PCA HP1 33MHz IP12 CPU
030-8118-001	PCA HP1 33MHz IP12 CPU
030-8042-00x	SIMM 2MB
030-8072-001	SIMM 4MB
030-8054-00x	SIMM 8MB

CPU/Memory (R4x00-based systems)

FRU Number	Description
013-8639-00x	PCA ASSY HP2/PM1 50/100MHZ IP20 CPU
013-9117-00x	PCA ASSY HP2/PM2 75/150MHz IP20 CPU
030-8096-00x	PCA HP2 CPU MOTHERBOARD
030-8097-00x	PCA PM1 50/100MHZ CPU DAUGHTER CARD
030-8116-00x	PCA PM2 75/150MHZ CPU DAUGHTER CARD
9016823	SIMM 16MB
9016824	SIMM 32MB
9016821	SIMM 4MB
9016820	SIMM 8MB

Graphics

FRU Number	Description
030-8117-001	PCA GR2 w/ 1GE7s GRAPHICS MOTHERBOARD
030-8122-001	PCA GR2 w/ 2GE7s GRAPHICS MOTHERBOARD
030-8058-006	PCA GR2 w/ 4GE7s GRAPHICS MOTHERBOARD
030-8112-00x	PCA IEV1 GALILEO VIDEO
030-8077-00x	PCA LG2 BASIC LEVEL GRAPHICS BOARD
030-8094-00x	PCA LG2X2 DUAL-HEAD BASIC LEVEL
030-8095-00x	PCA SRV1 INDIGO VIDEO
030-8093-00x	PCA VB1.1 VIDEO BOARD
030-8113-001	PCA VB1.2 VIDEO BOARD
030-8059-00x	PCA VM2 VIDEO MEMORY MODULE
030-8060-00x	PCA ZB4 Z-BUFFER CARD

Drives

FRU Number	Description
9420813	DRIVE 1GB SCSI QIC TAPE DRIVE
013-8451-001	DRIVE ASSY 1.3GB 3.5" DAT TAPE DRIVE
013-8450-001	DRIVE ASSY 1.44MB 3.5" FLOPPY DRIVE
013-8741-001	DRIVE ASSY 1GB 3.5" DISK DRIVE
013-9042-001	DRIVE ASSY 1GB 3.5" DISK DRIVE
013-8449-001	DRIVE ASSY 236MB 3.5" DISK DRIVE
013-8454-001	DRIVE ASSY 400MB 3.5" DISK DRIVE
013-8759-001	DRIVE ASSY 500MB 3.5" DISK DRIVE
9410819	DRIVE CDROM 600MB SCSI
9410829	DRIVE CDROM 600MB SCSI DUAL SPEED

Monitors

FRU Number	Description
9330809	MONITOR 16"
9330840	MONITOR 16"
9330830	MONITOR 16" HIGH RES MULTI SCAN
9330813	MONITOR 16" MULTI SCAN
9330814	MONITOR 16" MULTI SCAN
9330841	MONITOR 19"
9330811	MONITOR 19" AUTO SCAN
9330812	MONITOR 19" AUTO SCAN
9330818	MONITOR 19" AUTO SCAN
9330810	MONITOR 19" DUAL

Cables

FRU Number	Description
018-8095-001	CBL ASSY KEYBOARD (MINI-DIN)
018-8098-001	CBL ASSY SCSI (INTERNAL)
018-8124-001	CBL ASSY SCSI-1 TO SCSI-2 2M
018-8105-001	CBL ASSY VIDEO 13W3 TO BNC
018-8094-001	CBL ASSY VIDEO RGB 13W3

Other

FRU Number	Description
030-8050-00x	HBP1 BACKPLANE
9150801	KEYBOARD ALPS
9150800	MOUSE ALPS (MECHANICAL)
9430810	POWER SUPPLY 210W
9430812	POWER SUPPLY 250W
9660813	TERMINATOR 50-PIN CENTRONICS