

Silicon Graphics Prism™ Visualization System  
User's Guide for Extreme Scalable  
Configurations

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## Record of Revision

<b>Version</b>	<b>Description</b>
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- Installing or Connecting Optional Components . . . . . 14
  - Adding or Removing PCI Cards . . . . . 15
  - Adding or Removing Disk Drives . . . . . 15
  - Connecting a Keyboard and Mouse . . . . . 16
  - Optional USB Extender . . . . . 17
  - Optional DM8 Audio Board . . . . . 19
    - Board Installation . . . . . 19
    - Cables and Connectors . . . . . 20
    - Functional Features . . . . . 20
    - Troubleshooting Tips. . . . . 21
- 2. System Control. . . . . 23**
  - Levels of System Control . . . . . 25
  - System Controller Interaction. . . . . 26
  - L1 Controller . . . . . 28
    - L1 Controller Functions . . . . . 28
    - L1 Front Panel Display . . . . . 30
  - Optional Ethernet Switch . . . . . 32
  - Console Hardware Requirements . . . . . 33
  - Operating the L1 . . . . . 35
    - L1 Mode . . . . . 36
      - Viewing System Configuration (from a Brick's Perspective) . . . . . 36
      - Command Targeting . . . . . 37
      - Viewing Information, Warnings, and Error Messages . . . . . 37
      - Powering On, Powering Off, and Resetting the Brick . . . . . 37
    - Console Mode from L1 . . . . . 39
      - L1 Console Selection . . . . . 39
      - Viewing Information, Warnings, and Error Messages . . . . . 41
  - L2 Emulator Operation . . . . . 42
    - Configuring an Emulated L2's IP Address . . . . . 42
    - Viewing System Configuration . . . . . 44
    - Setting Command Targeting . . . . . 45
    - Viewing Information, Warnings, and Error Messages . . . . . 47
    - Powering On, Powering Off, and Resetting the System From the L2 Emulator . . . . . 47

	Console Mode from the L2 Emulator . . . . .	48
	Console Selection . . . . .	49
	L1 Mode from L2 Emulation . . . . .	51
	Upgrading L1 Firmware . . . . .	52
	Upgrading L1 Firmware . . . . .	52
<b>3.</b>	<b>System Overview . . . . .</b>	<b>55</b>
	System Models . . . . .	57
	System Architecture . . . . .	59
	System Features . . . . .	61
	Modularity and Scalability . . . . .	61
	Distributed Shared Memory (DSM) . . . . .	61
	Distributed Shared I/O . . . . .	62
	ccNUMA Architecture . . . . .	62
	Cache Coherency. . . . .	62
	Non-uniform Memory Access (NUMA) . . . . .	63
	Reliability, Availability, and Serviceability (RAS). . . . .	63
	System Components . . . . .	65
	Bay (Unit) Numbering . . . . .	67
	Rack Numbering . . . . .	67
	Optional System Components . . . . .	68
<b>4.</b>	<b>Rack Information . . . . .</b>	<b>69</b>
	Overview . . . . .	69
	40U Rack . . . . .	70
	Technical Specifications . . . . .	72
<b>5.</b>	<b>XG2N Graphics Module and CPU Expansion Module . . . . .</b>	<b>73</b>
	XG2N Module . . . . .	74
	Front Panel Controls . . . . .	78
	Internal Components . . . . .	80
	CPU Expansion Module . . . . .	81
	Cabling XG2N Modules . . . . .	83
	Optional SGI ImageSync Cabling . . . . .	83
	Connecting a Monitor . . . . .	85

<b>6.</b>	<b>CR-brick</b>	. . . . .	. 87
	Overview	. . . . .	. 88
	External Components	. . . . .	. 91
	Front Panel Components	. . . . .	. 91
	Rear Panel Components	. . . . .	. 93
	Internal Components	. . . . .	. 95
	Processors	. . . . .	. 95
	Memory DIMMs	. . . . .	. 95
	Pinouts	. . . . .	. 95
	Product Options	. . . . .	. 96
	Important Notes	. . . . .	. 96
	Technical Specifications	. . . . .	. 97
<b>7.</b>	<b>IX-brick</b>	. . . . .	. 99
	Product Overview	. . . . .	. 100
	External Components	. . . . .	. 104
	Front Panel Components	. . . . .	. 104
	Rear Panel Components	. . . . .	. 106
	PCI and PCI-X Card Configuration Guidelines	. . . . .	. 108
	Important Installation Considerations	. . . . .	. 109
	Supported PCI Cards	. . . . .	. 110
	PCI Card Carrier	. . . . .	. 110
	Technical Specifications	. . . . .	. 111
<b>8.</b>	<b>PX-brick</b>	. . . . .	. 113
	Product Overview	. . . . .	. 114
	External Components	. . . . .	. 116
	Front Panel Components	. . . . .	. 116
	Rear Panel Components	. . . . .	. 118
	PCI and PCI-X Card Configuration Guidelines	. . . . .	. 120
	Important Installation Considerations	. . . . .	. 121
	Supported PCI and PCI-X Cards	. . . . .	. 122
	PCI Card Carrier	. . . . .	. 122
	Technical Specifications	. . . . .	. 123

<b>9.</b>	<b>R-brick</b>	. . . . .	.125
	Overview	. . . . .	.126
	External Components	. . . . .	.128
	Front Panel Components.	. . . . .	.128
	Rear Panel Components	. . . . .	.128
	Technical Specifications	. . . . .	.130
<b>10.</b>	<b>Power Bay</b>	. . . . .	.131
	Overview	. . . . .	.132
	External Components	. . . . .	.134
	Front Panel Components.	. . . . .	.134
	Rear Panel Components	. . . . .	.135
	Distributed Power Supplies	. . . . .	.136
	Technical Specifications	. . . . .	.138
<b>11.</b>	<b>SGI TP900 Storage Module</b>	. . . . .	.139
	Overview	. . . . .	.140
	External Components	. . . . .	.141
	Front Panel Components.	. . . . .	.141
	Disk Drive Carrier Module	. . . . .	.142
	Dummy Carrier Module	. . . . .	.142
	Rear Panel Components	. . . . .	.143
	Power Supply Module	. . . . .	.144
	Input/Output (I/O) Module	. . . . .	.144
	Loopback module	. . . . .	.144
	Cooling Module	. . . . .	.144
	Blank Module.	. . . . .	.145
	Terminator Plug	. . . . .	.145
	Technical Specifications	. . . . .	.146
	Product Options	. . . . .	.146
<b>12.</b>	<b>D-brick2 Storage Module</b>	. . . . .	.147
	D-brick2 Overview	. . . . .	.148
	Functional Description	. . . . .	.149
	D-brick2 Features	. . . . .	.149

D-brick2 External Components . . . . .	150
Drive Carrier Modules and “Dummy” Modules . . . . .	150
Power Supply/Cooling Modules . . . . .	152
Operator’s Panel . . . . .	153
Loop Resiliency Circuit (LRC) Modules . . . . .	154
Powering the D-brick2 On or Off. . . . .	156
Powering On the D-brick2 . . . . .	156
Powering Off the D-brick2 . . . . .	156
D-brick2 Technical and Environmental Specifications. . . . .	158
<b>13. Maintenance and Upgrade Procedures . . . . .</b>	<b>161</b>
Maintenance Precautions and Procedures . . . . .	162
Preparing the System for Maintenance or Upgrade . . . . .	162
Returning the System to Operation . . . . .	162
Installing or Removing Internal Parts . . . . .	163
IX-bricks and PX-bricks . . . . .	165
Adding or Replacing a PCI or PCI-X Card . . . . .	165
Installing or Replacing a Disk Drive in the IX-brick . . . . .	174
Installing a System Disk Drive . . . . .	175
Removing a System Disk Drive . . . . .	177
XG2N and CPU Expansion Modules. . . . .	179
Opening the XG2N and CPU Expansion Modules. . . . .	179
Opening the Cover . . . . .	179
Removing the Optional Chassis Rail . . . . .	180
Removing the PCI/PCI-X Support Bracket . . . . .	182
Reinstalling the PCI/PCI-X Support Bracket . . . . .	183
Reinstalling the Optional Chassis Rail . . . . .	184
Closing the Cover. . . . .	185
Replacing an XG2N Graphics Card . . . . .	186
Removing and Replacing Power Supplies . . . . .	193
Removing and Replacing Memory DIMMs . . . . .	197
Memory DIMM Group Placement and Guidelines . . . . .	197
Installing a DIMM Group . . . . .	199
Removing a DIMM . . . . .	202

L1 Controller Display . . . . .	.204
TP900 Enclosure . . . . .	.211
Replacing a TP900 Drive Carrier Module . . . . .	.211
D-brick2 Storage Module . . . . .	.215
Installing or Replacing a D-brick2 Drive Carrier Module . . . . .	.215
Installing a Drive Carrier Module . . . . .	.215
Replacing a Drive Carrier Module . . . . .	.219
<b>14. Troubleshooting and Diagnostics . . . . .</b>	<b>.221</b>
Troubleshooting Chart . . . . .	.222
L1 Controller Error Messages . . . . .	.224
Reading XG2N Power Supply Status LEDs. . . . .	.229
XG2N and CPU Expansion Module Power Supply Status LEDs. . . . .	.230
SGI Electronic Support . . . . .	.231
Customizing the XF86Config File . . . . .	.234
Configuring a System for Stereo . . . . .	.234
Example “Device” Section for Stereo . . . . .	.235
Sample Stereo Mode Entries . . . . .	.236
Example “Monitor” Section for Stereo. . . . .	.236
Example “Screen” Section for Stereo . . . . .	.236
Configuring a System for Full Scene Anti-Aliasing . . . . .	.237
Example “Device” Section for Full Scene Anti-Aliasing. . . . .	.238
Configuring a System for Dual-Channel Operation . . . . .	.239
Example “Device” Section for Dual Channel . . . . .	.240
Enabling Overlay Planes. . . . .	.241
Example “Device” Section to Enable Overlay Planes . . . . .	.241
Configuring a System for External Genlock or Framelock . . . . .	.242
Configuring Monitor Positions . . . . .	.244
Example “ServerLayout” Section for Four Monitors in a Line . . . . .	.244
Example “ServerLayout” Section for Four Monitors in a Square . . . . .	.245
Configuring Monitor Types . . . . .	.246
Example “Device” Section for Use With Two Analog Monitors . . . . .	.246
Configuring a System for Multiple Xservers . . . . .	.247
Identifying Event Devices . . . . .	.248

	Creating a Multi-Seat XF86Config File . . . . .	249
	Example “ServerLayout” Sections for Three Xservers . . . . .	253
	Pointing X to the New XF86Config-Nserver File . . . . .	254
	Example /etc/X11/gdm/gdm.conf Servers Section for Three Xservers . . . . .	255
<b>A.</b>	<b>Technical Specifications and Pinouts . . . . .</b>	<b>257</b>
	System-level Specifications . . . . .	258
	Physical Specifications . . . . .	259
	Environmental Specifications . . . . .	260
	Power Specifications . . . . .	261
	I/O Port Specifications. . . . .	262
	Ethernet Port . . . . .	263
	DB-9 Serial Port . . . . .	264
	DVI-I Connector . . . . .	266
	USB Type A Connector . . . . .	268
	USB Type B Connector . . . . .	269
<b>B.</b>	<b>Safety Information and Regulatory Specifications . . . . .</b>	<b>271</b>
	Safety Information . . . . .	271
	Regulatory Specifications . . . . .	273
	CMN Number . . . . .	273
	CE Notice and Manufacturer’s Declaration of Conformity . . . . .	273
	Electromagnetic Emissions . . . . .	274
	FCC Notice (USA Only) . . . . .	274
	Industry Canada Notice (Canada Only) . . . . .	275
	VCCI Notice (Japan Only) . . . . .	275
	Chinese Class A Regulatory Notice. . . . .	275
	Korean Class A Regulatory Notice . . . . .	275
	Shielded Cables . . . . .	276
	Electrostatic Discharge . . . . .	276
	Laser Compliance Statements. . . . .	277
	Lithium Battery Statements . . . . .	278
	<b>Index. . . . .</b>	<b>281</b>

# Figures

<b>Figure 1-1</b>	Power Switch “On” Setting . . . . .	5
<b>Figure 1-2</b>	D-brick2 PSU/cooling Module Power Switch . . . . .	5
<b>Figure 1-3</b>	TP900 Storage Module Power Switch . . . . .	6
<b>Figure 1-4</b>	PDU and PDS Circuit Breaker Switches . . . . .	6
<b>Figure 1-5</b>	L1 Controller Display Location Example . . . . .	12
<b>Figure 1-6</b>	Connecting the USB Keyboard and Mouse to the IX-brick . . . . .	16
<b>Figure 1-7</b>	Keyboard & Mouse Connected to IX-brick via Optional USB Extender . . . . .	18
<b>Figure 1-8</b>	DM8 Interface Panel and Connectors . . . . .	19
<b>Figure 2-1</b>	Silicon Graphics Prism System Control Network (Example) . . . . .	24
<b>Figure 2-2</b>	Console Controller Network Diagram Example . . . . .	27
<b>Figure 2-3</b>	L1 Front Panel . . . . .	30
<b>Figure 2-4</b>	Ethernet Switch System Controller Block Diagram (Example) . . . . .	32
<b>Figure 3-1</b>	Silicon Graphics Prism Extreme System (2-Rack System Shown). . . . .	56
<b>Figure 3-2</b>	Silicon Graphics Prism Extreme System (Example Configuration) . . . . .	58
<b>Figure 3-3</b>	Functional Block Diagram of CR-brick . . . . .	60
<b>Figure 3-4</b>	Prism Extreme System Components Example . . . . .	66
<b>Figure 4-1</b>	Prism Extreme Tall (40U) Rack . . . . .	71
<b>Figure 5-1</b>	Front and Rear Views of XG2N Module . . . . .	75
<b>Figure 5-2</b>	Rear View of XG2N Graphics Module with FireGL X2PRO-256 (Showing First Module Pipe Numbering) . . . . .	76
<b>Figure 5-3</b>	Pipe Numbering of Additional XG2N Graphics Modules with FireGL X2PRO-256 . . . . .	76
<b>Figure 5-4</b>	Rear View of XG2N Graphics Module with FireGL X3-256 (Showing First Module Pipe Numbering) . . . . .	77
<b>Figure 5-5</b>	Pipe Numbering of Additional XG2N Graphics Modules with FireGL	

	X3-256 . . . . .	. 77
<b>Figure 5-6</b>	Silicon Graphics Prism XG2N and Compute Module Front Panel Controls . . . . .	. 78
<b>Figure 5-7</b>	Silicon Graphics Prism XG2N Module Internal View . . . . .	. 80
<b>Figure 5-8</b>	Front and Rear Views of CPU Expansion Module . . . . .	. 82
<b>Figure 5-9</b>	Cabling Example of SGI ImageSync Card to Graphics . . . . .	. 84
<b>Figure 6-1</b>	Front and Side View of CR-brick . . . . .	. 88
<b>Figure 6-2</b>	CR-brick Block Diagram . . . . .	. 90
<b>Figure 6-3</b>	Front View of CR-brick . . . . .	. 92
<b>Figure 6-4</b>	Rear View of CR-brick . . . . .	. 94
<b>Figure 7-1</b>	Front View of the IX-brick . . . . .	. 100
<b>Figure 7-2</b>	IX-brick Block Diagram. . . . .	. 102
<b>Figure 7-3</b>	Front Panel of IX-brick . . . . .	. 105
<b>Figure 7-4</b>	Rear Panel of IX-brick . . . . .	. 107
<b>Figure 7-5</b>	Numbering of IX-brick PCI-X Slots . . . . .	. 108
<b>Figure 8-1</b>	Front View of the PX-brick. . . . .	. 114
<b>Figure 8-2</b>	Block Diagram of PX-brick. . . . .	. 115
<b>Figure 8-3</b>	Front Panel and Display on the PX-brick. . . . .	. 117
<b>Figure 8-4</b>	Rear Panel of the PX-brick . . . . .	. 119
<b>Figure 8-5</b>	Numbering of PCI and PCI-X Card Slots. . . . .	. 120
<b>Figure 9-1</b>	Front View of the R-Brick . . . . .	. 126
<b>Figure 9-2</b>	R-brick Block Diagram . . . . .	. 127
<b>Figure 9-3</b>	Rear View of R-brick . . . . .	. 129
<b>Figure 10-1</b>	Front and Rear Views of Power Bay . . . . .	. 133
<b>Figure 10-2</b>	Front View of Power Bay . . . . .	. 134
<b>Figure 10-3</b>	Rear View of Power Bay . . . . .	. 135
<b>Figure 10-4</b>	Front and Rear Views of the DPS . . . . .	. 136
<b>Figure 11-1</b>	Front View of TP900 Storage Module. . . . .	. 141
<b>Figure 11-2</b>	Drive Carrier LED Indicators . . . . .	. 142
<b>Figure 11-3</b>	Rear View of TP900 Storage Module . . . . .	. 143
<b>Figure 11-4</b>	SCSI Terminator Plug . . . . .	. 145
<b>Figure 12-1</b>	D-brick2 Front and Rear Views . . . . .	. 148
<b>Figure 12-2</b>	D-brick2 Drive Carrier Module and “Dummy” Module . . . . .	. 151

<b>Figure 12-3</b>	Anti-Tamper Locking on the D-brick2 Disk Drive . . . . .	.152
<b>Figure 12-4</b>	D-brick2 Operators Panel and Power Supply/Cooling Modules . . . . .	.153
<b>Figure 12-5</b>	D-brick2 Loop Resiliency Circuit (LRC) Module . . . . .	.155
<b>Figure 13-1</b>	Removing a Card Carrier . . . . .	.166
<b>Figure 13-2</b>	Extracting the Carrier Metal Filler Plate . . . . .	.167
<b>Figure 13-3</b>	Adjusting the Carrier Guide Bar . . . . .	.168
<b>Figure 13-4</b>	Mounting Card in Carrier . . . . .	.169
<b>Figure 13-5</b>	Mounting Half-height PCI Card into Carrier . . . . .	.170
<b>Figure 13-6</b>	Moving Carrier Guide Bar to Secure Half-height PCI Card . . . . .	.170
<b>Figure 13-7</b>	Installing the Bracket to Secure a Half-height PCI Card . . . . .	.171
<b>Figure 13-8</b>	Installing a Card in a Slot . . . . .	.172
<b>Figure 13-9</b>	Seating the Card in the Slot . . . . .	.172
<b>Figure 13-10</b>	Location of SCSI Disk Drive Bays . . . . .	.174
<b>Figure 13-11</b>	Installing a Disk Drive . . . . .	.176
<b>Figure 13-12</b>	Removing a Disk Drive . . . . .	.178
<b>Figure 13-13</b>	Opening the System Cover . . . . .	.180
<b>Figure 13-14</b>	Removing an Optional Chassis Rail . . . . .	.181
<b>Figure 13-15</b>	Removing the Lower PCI/PCI-X Support Bracket . . . . .	.182
<b>Figure 13-16</b>	Replacing the Lower PCI/PCI-X Support Bracket . . . . .	.183
<b>Figure 13-17</b>	Replacing the Chassis Rail. . . . .	.184
<b>Figure 13-18</b>	Closing the System Cover . . . . .	.185
<b>Figure 13-19</b>	Removing the XG2N Graphics Card Bracket . . . . .	.187
<b>Figure 13-20</b>	Remove XG2N Graphics Board Assembly . . . . .	.188
<b>Figure 13-21</b>	Synchronization Cable Connection on Underside of Graphics Board	189
<b>Figure 13-22</b>	Installing the Graphics Card and Retaining Screws . . . . .	.190
<b>Figure 13-23</b>	Replacing the PCI/PCI-X Support Bracket . . . . .	.191
<b>Figure 13-24</b>	Location of Power Supplies . . . . .	.193
<b>Figure 13-25</b>	Removing a Power Supply . . . . .	.195
<b>Figure 13-26</b>	Installing the Power Supply . . . . .	.196
<b>Figure 13-27</b>	Layout of Slots and DIMM Memory Groups . . . . .	.198
<b>Figure 13-28</b>	DIMM Locations (XG2N Module Shown, Others Similar). . . . .	.200
<b>Figure 13-29</b>	Inserting a DIMM . . . . .	.201
<b>Figure 13-30</b>	Removing a DIMM. . . . .	.203

<b>Figure 13-31</b>	L1 Controller Display on Base Compute Module . . . . .	204
<b>Figure 13-32</b>	Removing the L1 Controller Display Panel . . . . .	207
<b>Figure 13-33</b>	Installing an L1 Controller Display Panel . . . . .	209
<b>Figure 13-34</b>	Unlocking the Anti-Tamper Lock . . . . .	212
<b>Figure 13-35</b>	Releasing the Carrier Handle . . . . .	213
<b>Figure 13-36</b>	Carrier Camming Lever . . . . .	214
<b>Figure 13-37</b>	Unlocking the Drive Carrier Module . . . . .	216
<b>Figure 13-38</b>	Opening the Module Handle . . . . .	217
<b>Figure 13-39</b>	Inserting the Disk Drive Module in a D-brick2 . . . . .	217
<b>Figure 13-40</b>	Locking the Drive Carrier Module . . . . .	218
<b>Figure 13-41</b>	Unlocking the Disk Drive Module . . . . .	219
<b>Figure 13-42</b>	Removing the Drive Carrier Module . . . . .	220
<b>Figure 14-1</b>	Full Support Sequence . . . . .	231
<b>Figure 14-2</b>	Four Monitors in a Line . . . . .	244
<b>Figure 14-3</b>	Four Monitors in a Square . . . . .	245
<b>Figure A-1</b>	Ethernet Port. . . . .	263
<b>Figure A-2</b>	Serial Port . . . . .	264
<b>Figure A-3</b>	DVI-I Connector Pinout . . . . .	266
<b>Figure A-4</b>	Pin Number Locations for USB Type A Connector . . . . .	268
<b>Figure A-5</b>	Pin Number Locations for USB Type B Connector . . . . .	269
<b>Figure B-1</b>	VCCI Notice (Japan Only) . . . . .	275
<b>Figure B-2</b>	Chinese Class A Regulatory Notice . . . . .	275
<b>Figure B-3</b>	Korean Class A Regulatory Notice . . . . .	275

## Tables

<b>Table 2-1</b>	L1 Controller Functions . . . . .	28
<b>Table 2-2</b>	Location Guidelines for Connecting USB/Ethernet Adapters . . .	33
<b>Table 4-1</b>	Tall Rack Technical Specifications . . . . .	72
<b>Table 6-1</b>	Configurable Items of CR-brick . . . . .	96
<b>Table 6-2</b>	CR-brick Technical Specifications . . . . .	97
<b>Table 7-1</b>	Physical Specifications of the IX-brick . . . . .	111
<b>Table 7-2</b>	Port Specifications of the IX-brick . . . . .	111
<b>Table 8-1</b>	Physical Specifications of PX-brick . . . . .	123
<b>Table 8-2</b>	Port Specifications of the PX-brick . . . . .	123
<b>Table 9-1</b>	R-brick Technical Specifications . . . . .	130
<b>Table 9-2</b>	R-brick Port Specifications . . . . .	130
<b>Table 10-1</b>	Power Supply LED States . . . . .	137
<b>Table 10-2</b>	Power Bay Technical Specifications . . . . .	138
<b>Table 10-3</b>	Power Supply Technical Specifications . . . . .	138
<b>Table 11-1</b>	Status LEDs . . . . .	142
<b>Table 11-2</b>	TP900 Storage Module Technical Specifications . . . . .	146
<b>Table 11-3</b>	TP900 Storage Module Configurable Items . . . . .	146
<b>Table 12-1</b>	D-brick2 Weight Information . . . . .	158
<b>Table 12-2</b>	D-brick2 Enclosure Power Specifications . . . . .	158
<b>Table 12-3</b>	D-brick2 Ambient Temperature and Humidity Requirements . .	159
<b>Table 12-4</b>	Additional Environmental Requirements for D-brick2 . . . . .	159
<b>Table 13-1</b>	Customer-replaceable Components and Maintenance Procedures	163
<b>Table 14-1</b>	Troubleshooting Chart. . . . .	222
<b>Table 14-2</b>	L1 Controller Messages . . . . .	225
<b>Table 14-3</b>	L1 Controller Hexadecimal Boot Error Codes . . . . .	227

<b>Table 14-4</b>	LED Status and Power Supply Condition . . . . .	229
<b>Table 14-5</b>	XG2N & CPU Expansion Module LED Status and Power Supply Condition. . . . .	230
<b>Table 14-6</b>	Input Video Formats (Framelock). . . . .	243
<b>Table 14-7</b>	Options for Monitor Layout . . . . .	246
<b>Table A-1</b>	Silicon Graphics Prism Extreme Configuration Ranges. . . . .	258
<b>Table A-2</b>	Silicon Graphics Prism Extreme Physical Specifications . . . . .	259
<b>Table A-3</b>	Silicon Graphics Prism Extreme Environmental Specifications . . . . .	260
<b>Table A-4</b>	Power Specifications . . . . .	261
<b>Table A-5</b>	Ethernet Connector Pin Assignments. . . . .	263
<b>Table A-6</b>	Serial Port Pinout . . . . .	265
<b>Table A-7</b>	DVI-I Connector Signals and Pins. . . . .	266
<b>Table A-8</b>	Pin Assignments for USB Type A Connector . . . . .	268
<b>Table A-9</b>	Pin Assignments for USB Type B Connector. . . . .	269

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## About This Guide

This guide provides an overview of the architecture and descriptions of the major components of the Silicon Graphics Prism Visualization System Extreme scalable configurations. It also provides the standard procedures for powering on and powering off the system, basic troubleshooting information, and important safety and regulatory specifications.

### Audience

This guide is written for owners, system administrators, and users of Silicon Graphics Prism Visualization System Extreme scalable configurations. It is written with the assumption that the reader has a general knowledge of computers and computer systems.

### Important Information



---

**Warning:** To avoid problems, you must ask your SGI system support engineer (SSE) to perform all the set up, addition or replacement of parts, cabling, and service of your Silicon Graphics Prism Visualization system, with the exception of the following items that you can perform yourself:

---

- Using your system console and your L1 controller to enter commands and perform system functions such as powering on and powering off, as described in this guide.
- Adding and replacing PCI, PCI-X, and graphics cards, as described in this guide.
- Adding and replacing memory, power supplies, and the L1 controller display in XG2N and CPU expansion modules, as described in this guide.
- Adding and replacing disk drives in the TP900 and D-brick2 storage modules, and in the IX-brick, as described in this guide.

- Using the On/Off switch and other switches (the reset and non-maskable interrupt [NMI] switches on the CR-bricks) on the front panel of your system bricks.
- Using the ESI/ops panel (operating panel) on the D-brick2.

## Chapter Descriptions

The following topics are covered in this guide:

- Chapter 1, “Operation Procedures,” provides instructions for powering on and powering off your system.
- Chapter 2, “System Control,” describes the function of the L1 and L2 controllers and provides instructions for operating the controllers.
- Chapter 3, “System Overview,” provides environmental and technical information needed to properly set up and configure the Silicon Graphics Prism Extreme system.
- Chapter 4, “Rack Information,” describes the rack used for the Silicon Graphics Prism Extreme system.
- Chapter 5, “XG2N Graphics Module and CPU Expansion Module,” describes the connectors and LEDs located on the front and rear of the XG2N module and the CPU expansion module and provides an overview of the modules’ function.
- Chapter 6, “CR-brick,” describes the connectors and LEDs located on the front and rear of the CR-brick and provides an overview of the brick’s function.
- Chapter 7, “IX-brick,” describes the connectors and LEDs located on the front and rear of the IX-brick and provides an overview of the brick’s function.
- Chapter 8, “PX-brick,” describes the connectors and LEDs located on the front and rear of the PX-brick and provides an overview of the brick’s function.
- Chapter 9, “R-brick,” describes the connectors and LEDs located on the front and rear of the R-brick and provides an overview of the brick’s function.
- Chapter 10, “Power Bay,” describes the function and physical components of the power bay.
- Chapter 11, “SGI TP900 Storage Module,” provides a brief overview and functional description of the TP900 storage module.
- Chapter 12, “D-brick2 Storage Module,” provides a brief overview and functional description of the D-brick2, and also provides powering on and powering off instructions.

- Chapter 13, “Maintenance and Upgrade Procedures,” provides instructions for installing or removing the customer-replaceable components of your system.
- Chapter 14, “Troubleshooting and Diagnostics,” provides recommended actions if problems occur on your system as well as graphics configuration information.
- Appendix A, “Technical Specifications and Pinouts,” provides physical, environmental, and power specifications for your system. Also included are the pinouts for the non-proprietary connectors.
- Appendix B, “Safety Information and Regulatory Specifications,” lists all regulatory information related to use of the Silicon Graphics Prism system in the United States and other countries. It also provides a list of safety instructions to follow when installing, operating, or servicing the product.

## Related Publications

The following SGI documents are relevant to the Silicon Graphics Prism system:

- SGI Total Performance 900 Storage System User's Guide  
(P/N 007-4428-xxx)

This fully-illustrated guide explains how to operate and maintain the SGI Total Performance 900 (TP900) SCSI storage system.

- SGI Total Performance 9100 (2Gb TP9100) Storage System User's Guide  
(P/N 007-4522-xxx)

This fully-illustrated guide explains how to operate and maintain the 2Gb SGI Total Performance 9100 Fibre Channel storage system.

- SGI InfiniteStorage TP9400 and SGI InfiniteStorage TP9500 and TP9500S RAID User's Guide (P/N 007-4304-xxx)

This fully-illustrated guide explains how to operate and maintain the 2Gb SGI TP9400 and 2Gb SGI TP9500 Fibre Channel storage systems.

- SGIconsole Hardware Connectivity Guide  
(P/N 007-4340-xxx)

This fully-illustrated guide explains how to connect the SGIconsole to the various SGI server and graphics system configurations. SGIconsole is a multi-server management system that manages and monitors multiple servers throughout a customer's computing environment, whether those servers are on site or remote.

- SGI L1 and L2 Controller Software User's Guide  
(P/N 007-3938-xxx)

This guide describes how to use the L1 and L2 controller commands at your system console to monitor and manage your SGI system.

- Man pages (online)

Man pages locate and print the titled entries from the online reference manuals.

You can obtain SGI documentation, release notes, or man pages in the following ways:

- See the SGI Technical Publications Library at <http://docs.sgi.com>. Various formats are available. This library contains the most recent and most comprehensive set of online books, release notes, man pages, and other information.
- The release notes, which contain the latest information about software and documentation in this release, are in a file named README.SGI in the root directory of the SGI ProPack for Linux Documentation CD.
- You can also view man pages by typing `man <title>` on a command line.

SGI systems include a set of Linux man pages, formatted in the standard UNIX “man page” style. Important system configuration files and commands are documented on man pages. These are found online on the internal system disk (or CD-ROM) and are displayed using the `man` command. For example, to display the man page for the `xscsidisktest` command, type the following on a command line:

```
man xscsidisktest
```

References in the documentation to these pages include the name of the command and the section number in which the command is found.

For additional information about displaying man pages using the `man` command, see `man(1)`.

In addition, the `apropos` command locates man pages based on keywords. For example, to display a list of man pages that describe disks, type the following on a command line:

```
apropos disk
```

For information about setting up and using `apropos`, see `apropos(1)`.

## Conventions

The following conventions are used throughout this document:

<b>Convention</b>	<b>Meaning</b>
Command	This fixed-space font denotes literal items such as commands, files, routines, path names, signals, messages, and programming language structures.
<i>variable</i>	The italic typeface denotes variable entries and words or concepts being defined. Italic typeface is also used for book titles.
<b>user input</b>	This fixed-space font denotes literal items that the user enters in interactive sessions. Output is shown in nonbold, fixed-space font.
[ ]	Brackets enclose optional portions of a command or directive line.
...	Ellipses indicate that a preceding element can be repeated.
man page(x)	Man page section identifiers appear in parentheses after man page names.
<b>GUI element</b>	This font denotes the names of graphical user interface (GUI) elements such as windows, screens, dialog boxes, menus, toolbars, icons, buttons, boxes, fields, and lists.

## Product Support

SGI provides a comprehensive product support and maintenance program for its products, as follows:

- If you are in North America, contact the Technical Assistance Center at +1 800 800 4SGI or contact your authorized service provider.
- If you are outside North America, contact the SGI subsidiary or authorized distributor in your country.

## Reader Comments

If you have comments about the technical accuracy, content, or organization of this document, contact SGI. Be sure to include the title and document number of the manual with your comments. (Online, the document number is located in the front matter of the manual. In printed manuals, the document number is located at the bottom of each page.)

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- Send mail to the following address:

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1500 Crittenden Lane, M/S 535  
Mountain View, California 94043

SGI values your comments and will respond to them promptly.



# Operation Procedures

This chapter contains the following sections that explain how to operate your new system:

- “Precautions” on page 1
- “Connecting a System Console” on page 3
- “Powering the System On and Off” on page 4
- “Using Embedded Support Partner (ESP)” on page 11
- “Monitoring Your Server” on page 12
- “Installing or Connecting Optional Components” on page 14

## Precautions

Before operating your system, familiarize yourself with the safety information in the following sections:

- “ESD Precaution” on page 1
- “Safety Precautions” on page 2

## ESD Precaution

---

**Caution:** Observe all ESD precautions. Failure to do so can result in damage to the equipment.

---

Wear an SGI-approved wrist strap when you handle an ESD-sensitive device to eliminate possible ESD damage to equipment. Connect the wrist strap cord directly to earth ground.

## Safety Precautions



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**Warning:** Before operating or servicing any part of this product, read the “Safety Information” on page 271.

---



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**Warning:** Keep fingers and conductive tools away from high-voltage areas. Failure to follow these precautions will result in serious injury or death. The high-voltage areas of the system are indicated with high-voltage warning labels.

---



---

**Caution:** Power off the system only after the system software has been shut down in an orderly manner. If you power off the system before you halt the operating system, data may be corrupted.

---

---

**Note:** A lithium battery is installed on the system I/O card located in the IX-brick.

---



---

**Warning:** If a lithium battery is a soldered part, only qualified SGI service personnel should replace this lithium battery. For a battery of another type, replace it only with the same type or an equivalent type recommended by the battery manufacturer, or an explosion could occur. Discard used batteries according to the manufacturer’s instructions.

---

## Connecting a System Console

The system console enables you to perform the following activities:

- Monitor your system by reading the system's status and error message information generated and displayed by the SGI system's L1 controller.
- Enter L1 controller commands to monitor or change particular system functions. You can, for example, monitor the speed of fans for a particular brick. See the *SGI L1 and L2 Controller Software User's Guide* for descriptions of these commands.
- Power on or power off individual bricks or all bricks (except for the storage modules) in your system.

If you connect a console that contains SGIconsole software, you can perform the functions listed above and have boundary scan capabilities. Boundary scan capabilities enable an SGI system support engineer (SSE) to test the functionality of your system.

## Powering the System On and Off

This section explains how to power on and power off individual bricks or your entire Silicon Graphics Prism system, as follows:

- “Powering On the System” on page 4
- “Powering Off the System” on page 9

For servers with a system console, you can power on and power off individual bricks or the entire system at the system console.

If you are using an SGI console, you can monitor and manage your server from a remote location. You can also monitor and manage your server with tools such as VACM, Console Manager, and PCP. For details, see the documentation for the particular tool.

The Embedded Support Partner (ESP) program enables you and your SGI system support engineer (SSE) to monitor your server remotely and resolve issues before they become problems. For details on this program, see “Using Embedded Support Partner (ESP)” on page 11.

## Powering On the System

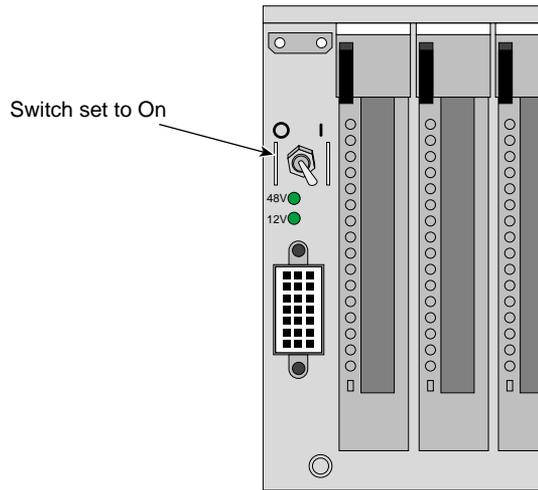
This section describes how to prepare to power on your system, and how to power on your system by using either of the following:

- L1 controller
- System console

### Preparing to Power On

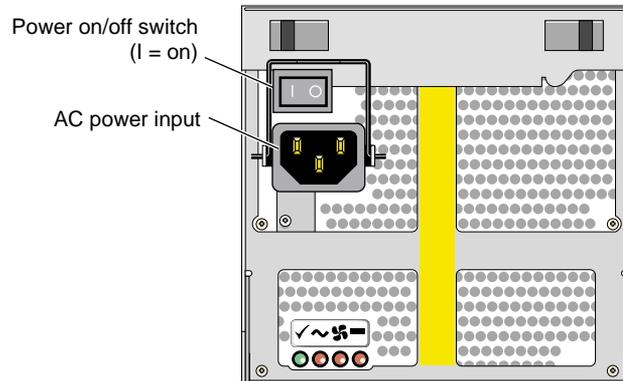
To prepare to power on your system, follow these steps:

1. Check to ensure that the cabling between the power distribution unit (PDU) and the wall power-plug receptacle is secure.
2. For each individual brick that you want to power on, make sure that the **PWR** (power) switch is set to the **1** (on) position, as shown in Figure 1-1 for the IX-brick. This will start the L1 controller(s) for the brick(s) when the brick(s) are powered on. The 12-VDC LED on an individual brick illuminates green when an L1 controller has powered on successfully.



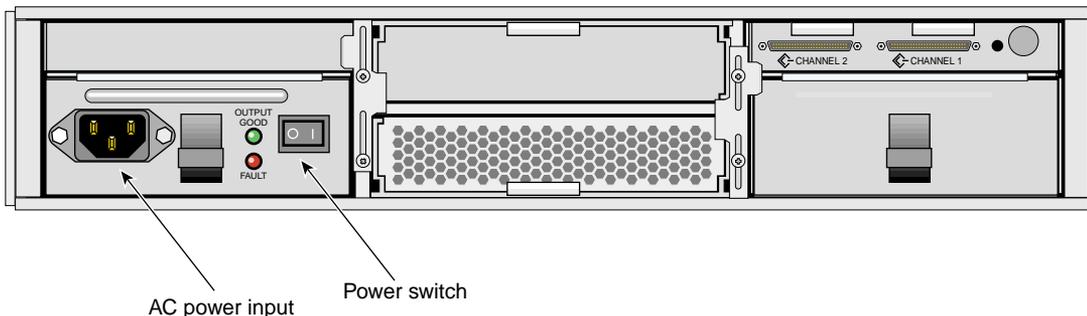
**Figure 1-1** Power Switch “On” Setting

3. If you plan to power on a D-brick2, or an entire server that includes a D-brick2, make sure that the power switch on the rear of each PSU/cooling module (two per D-brick2) is in the 1 (on) position. The location of the power switch on the D-brick2 PSU/cooling module is shown in Figure 1-2.



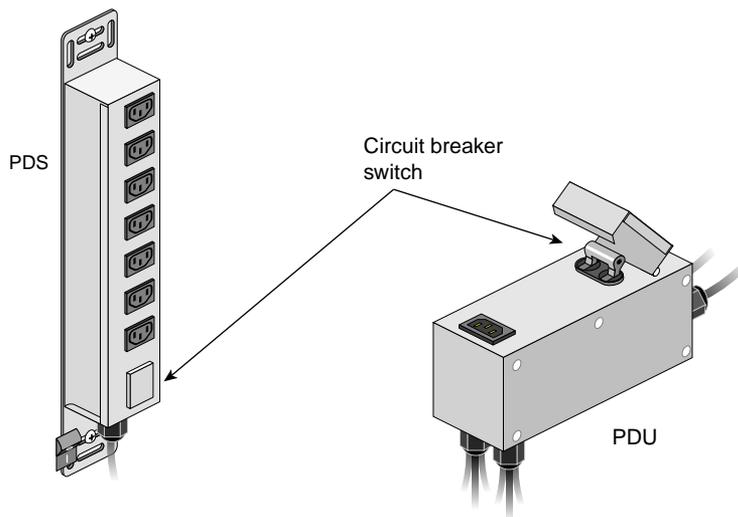
**Figure 1-2** D-brick2 PSU/cooling Module Power Switch

The standard configuration of the TP900 storage module has one power supply, as shown in Figure 1-3. You can add an optional second power supply to the TP900 system to provide n+1 redundant power. The second power supply is identical to the first power supply and would be located in the lower-right section of the TP900 storage module. Both power switches must be in the 1 (on) position to provide redundant power.



**Figure 1-3** TP900 Storage Module Power Switch

4. Make sure that the PDU and PDS circuit breaker switches shown in Figure 1-4 are turned on to give power to the server system when the system is powered on.



**Figure 1-4** PDU and PDS Circuit Breaker Switches

---

**Note:** Verify that the LEDs turn on and light green and that your controllers display that the system is powered on for each segment of the procedure, which indicates that the power-on procedure is proceeding properly. If you have a problem while powering on and an error message appears on the L1 controller, or the system console, see your online log files and the information in “L1 Controller Error Messages” on page 224 to learn what the error message indicates and how to resolve the problem.

---

### Powering On at the System Console

The power-on procedure at a system console varies with your server setup, as follows:

- If you have a system console, you can toggle between L1 and console mode. This enables you to power on your server with L1 commands and view the activity by changing to the console mode.
- If you have a system console connected to a server with an ethernet interface, you can toggle between L1 and console mode, and power on your server with L1 controller commands, and monitor the power-on activity by changing to the console mode.

For detailed instructions on using a system console using the L1 mode, see “Operating the L1” on page 35.

See the section “Console Hardware Requirements” in Chapter 2, and the *SGIconsole Hardware Connectivity Guide*, P/N 007-4340-00x for additional information on the optional SGI console.

### Powering On in the L1 Mode

The following sections describe how to power on your system in L1 mode.

The L1 controller display, located on the front of each brick, should display `L1 running` once the power-on procedure starts.

---

**Note:** If you have a problem while powering on and an error message appears on your console display, see “L1 Controller Error Messages” on page 224 to learn what the error message indicates and how to resolve the problem.

---

To power on your system while in the L1 mode, follow these steps:

1. The prompt on your system shows the rack and slot number of the CR-brick to which you have connected your console. If you want to power on the CR-brick (001c05 in our example) indicated in the prompt, enter the following command. (If you want to power on the bricks connected to the CR-brick, proceed to the next step.)

```
001c05-L1> power up
```

2. If you want to power on the bricks connected to the CR-brick, enter the following command:

```
oo3c01-L1> * power up
```

```
(* indicates all)
```

3. From the L1 prompt, display the brick configuration information by entering the following command:

```
001c05-L1> config
```

In L1 mode, you can obtain only limited information about the system configuration. A CR-brick only has information about its attached I/O brick and, if another CR-brick is attached to the I/O brick, information about that CR-brick and its attached I/O brick. An I/O brick only has information about its attached CR-brick and an R-brick only has information about itself.

The L1 controller display, located on the front of each brick, should display `L1 running` once the power-on procedure starts.

## Powering Off the System

You can power off individual bricks or your entire server system using either the system console interface or the L1 controller of the primary CR-brick.

### Powering Off at the System Console

The power-off procedure at a system console varies with your server setup, as follows:

- If you have a system console connected to a server with an ethernet or other hardware interface, you can toggle between L1 and console mode, power off your server with L1 controller commands, and monitor the power-off activity by changing to the console mode.
- If your system console is running on a server via a serial interface connection, you can also toggle between L1 and console mode. This enables you to power off your server with L1 commands and view the activity by changing to the console mode.

For detailed instructions on using a system console in the L1 mode, see “Operating the L1” on page 35.

The following instructions describe how to power off your system in the L1 mode.

### Powering Off in the L1 Mode

The L1 controller display for each brick should display `L1 running` once the power-off procedure starts.

---

**Note:** If you have a problem while powering off and an error message appears on your console display, see “L1 Controller Error Messages” on page 224 to learn what the error message indicates and how to resolve the problem.

---

To power off your system while in the L1 mode, follow these steps:

1. The prompt on your system shows the rack and slot number of the CR-brick to which you have connected your console. If you want to power off the CR-brick (001c05 in our example) indicated in the prompt, enter the following command. (If you want to power off the bricks connected to the CR-brick, proceed to the next step.)

```
001c05-L1> power down
```

2. If you want to power off the bricks connected to the CR-brick, enter the following command:

```
001c05-L1> * power down
```

```
(* indicates all)
```

3. From the L1 prompt, display the brick configuration information by entering the following command:

```
001c05-L1> config
```

In L1 mode, you can obtain system configuration information within a specific set of inter connectivity limits. A CR-brick only has information about its attached I/O brick and, any other CR-bricks attached to it.

An I/O brick only has information about its attached CR-brick and an R-brick only has information about itself.

## Using Embedded Support Partner (ESP)

Embedded Support Partner (ESP) automatically detects system conditions that indicate potential future problems and then notifies the appropriate personnel. This enables you and SGI system support engineers (SSEs) to proactively support systems and resolve issues before they develop into actual failures.

ESP enables users to monitor one or more systems at a site from a local or remote connection. ESP can perform the following functions:

- Monitor the system configuration, events, performance, and availability.
- Notify SSEs when specific events occur.
- Generate reports.

ESP also supports the following:

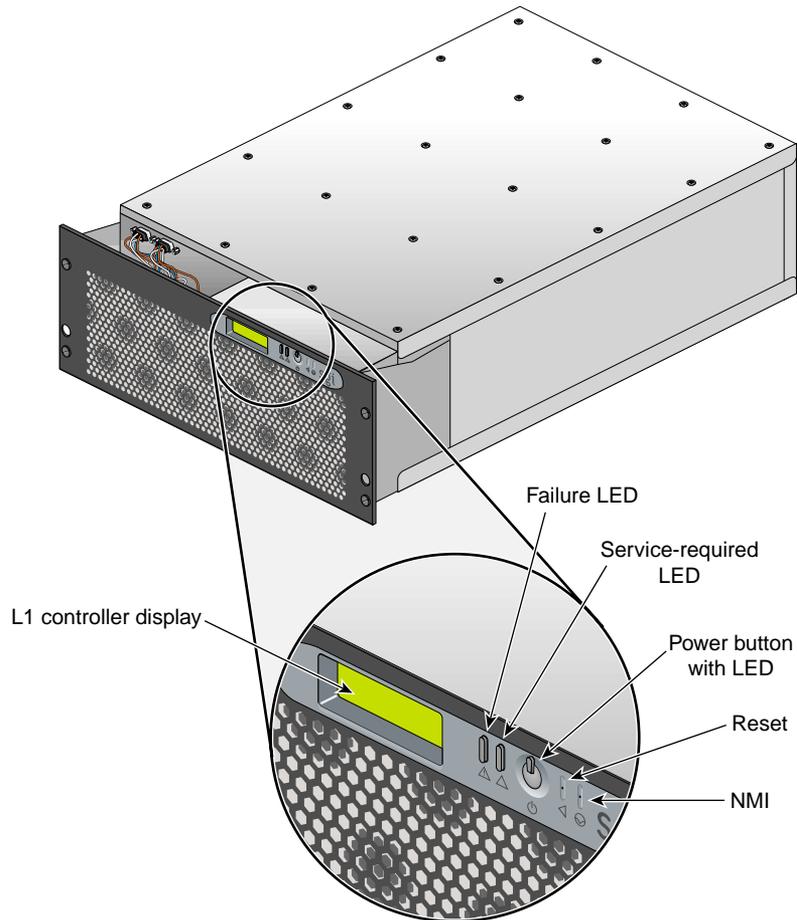
- Remote support and on-site troubleshooting.
- System group management, which enables you to manage an entire group of systems from a single system.

For additional information on this and other available monitoring services, see the section “SGI Electronic Support” on page 231.

## Monitoring Your Server

You can monitor your Silicon Graphics Prism system from the following sources:

- On the L1 controller's display at the front of each brick (except the TP900 and D-brick2), as shown in Figure 1-5, you can monitor brick items. For example, you can see if the fans on a particular brick are operating properly.



**Figure 1-5** L1 Controller Display Location Example

- You can connect an optional SGIconsole via an Ethernet port adapter or simple serial interface. You will need to connect either a local or remote workstation to monitor the servers via Ethernet.

These console connections enable you to view the status and error messages generated by the L1 controllers in your Silicon Graphics Prism rack. You can also use these consoles to input L1 commands to manage and monitor your system.

---

**Note:** The SGIconsole enables you to use various software tools, such as VACM, Console Manager, and PCP, to manage and monitor your system. See the *SGIconsole Start Here* guide for descriptions of these tools and for references to other documents with information about these tools.

---

- You can connect a dumb terminal to the CR-brick console port. If you have multiple CR-bricks, connect the dumb terminal to the bottom-most CR-brick in the rack. This connection enables you to view the status and error messages generated by the L1 controller and to enter L1 commands to manage and monitor your system.

See the section “Console Hardware Requirements” in Chapter 2, and the *SGIconsole Hardware Connectivity Guide*, P/N 007-4340-00x for additional information on the optional SGI console.

## Installing or Connecting Optional Components

Besides adding a system console, you can add or replace the following hardware items on your Silicon Graphics Prism system:

- Peripheral component interface (PCI) cards into your IX-brick or PX-brick.
- Disk drives to your IX-brick, TP900 disk storage module, or D-brick2 storage module.
- Connecting one or more keyboards or mice.
- Using an optional USB extender for keyboards and mice that will be more than 10 feet (3 meters) away from the USB ports on the system.
- Connecting to an optional DM8 audio board.

The sections that follow discuss these activities in more detail.



**Warning:** You can add or replace only the items listed in this section. For your safety and for the protection of your server system, contact your SGI system support engineer (SSE) to install any hardware items not listed in this section.

---



**Warning:** Before installing, operating, or servicing any part of this product, read the “Safety Information” on page 271.

---

## Adding or Removing PCI Cards

The PCI-X based I/O system, an industry standard for connecting peripherals to a processor, is the primary I/O system for the Silicon Graphics Prism system.

The IX-brick and PX-brick subsystems provide PCI and PCI-X support for the Silicon Graphics Prism system. The IX-brick provides 12 PCI slots. One of the 12 slots is reserved for a system PCI card. If additional PCI slots are required beyond the 11 remaining slots in the IX-brick, a PX-brick is configured into the system.

See “Adding or Replacing a PCI or PCI-X Card” on page 165 for detailed instructions on installing or removing PCI cards.

## Adding or Removing Disk Drives

The IX-brick supports the system boot functions and contains one or two low-profile disk drives. See “Installing or Replacing a Disk Drive in the IX-brick” on page 174 for detailed instructions on installing or removing disk drives.

The TP900 is a SCSI-based disk storage module that provides JBOD (just a bunch of disks) mass storage and that has up to 8 disk drives in each storage module. See “Replacing a TP900 Drive Carrier Module” on page 211 for detailed instructions on installing or removing disk drives.

The D-brick2 is a Fibre Channel-based disk storage enclosure that provides JBOD mass storage and that has up to 16 disk drives in each storage enclosure. See “Installing or Replacing a D-brick2 Drive Carrier Module” on page 215 for detailed instructions on installing or removing disk drives.

## Connecting a Keyboard and Mouse

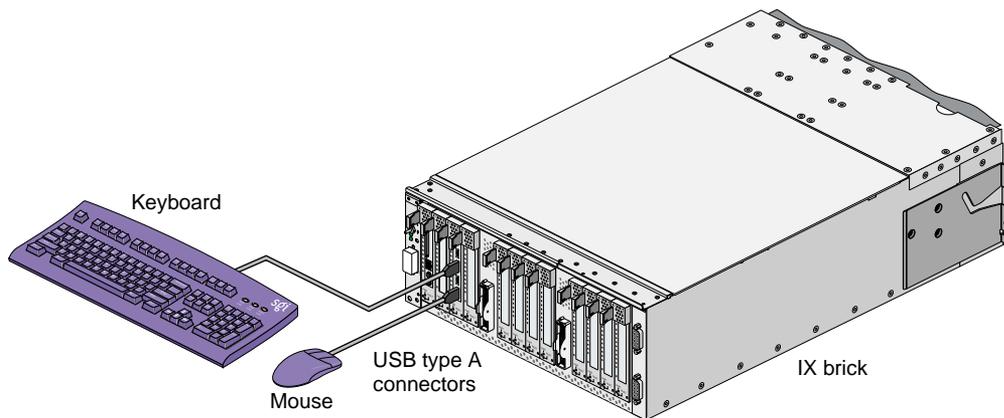
Connect a USB keyboard and a USB mouse to your system, as shown in Figure 1-6. The USB port closest to the top of the chassis is port 1.

Figure 1-6 shows the USB PCI card in bus 2, slot 1 (the third PCI slot from the left) of the IX brick, which is the preferred location for this card. Some configurations may have the USB card in a different PCI slot.

---

**Note:** If your keyboard/mouse pair will be more than 10 feet (3 meters) away from the USB ports on the system, please refer to the section “Optional USB Extender” on page 17 for details about how to connect these devices through a USB extender.

---



**Figure 1-6** Connecting the USB Keyboard and Mouse to the IX-brick

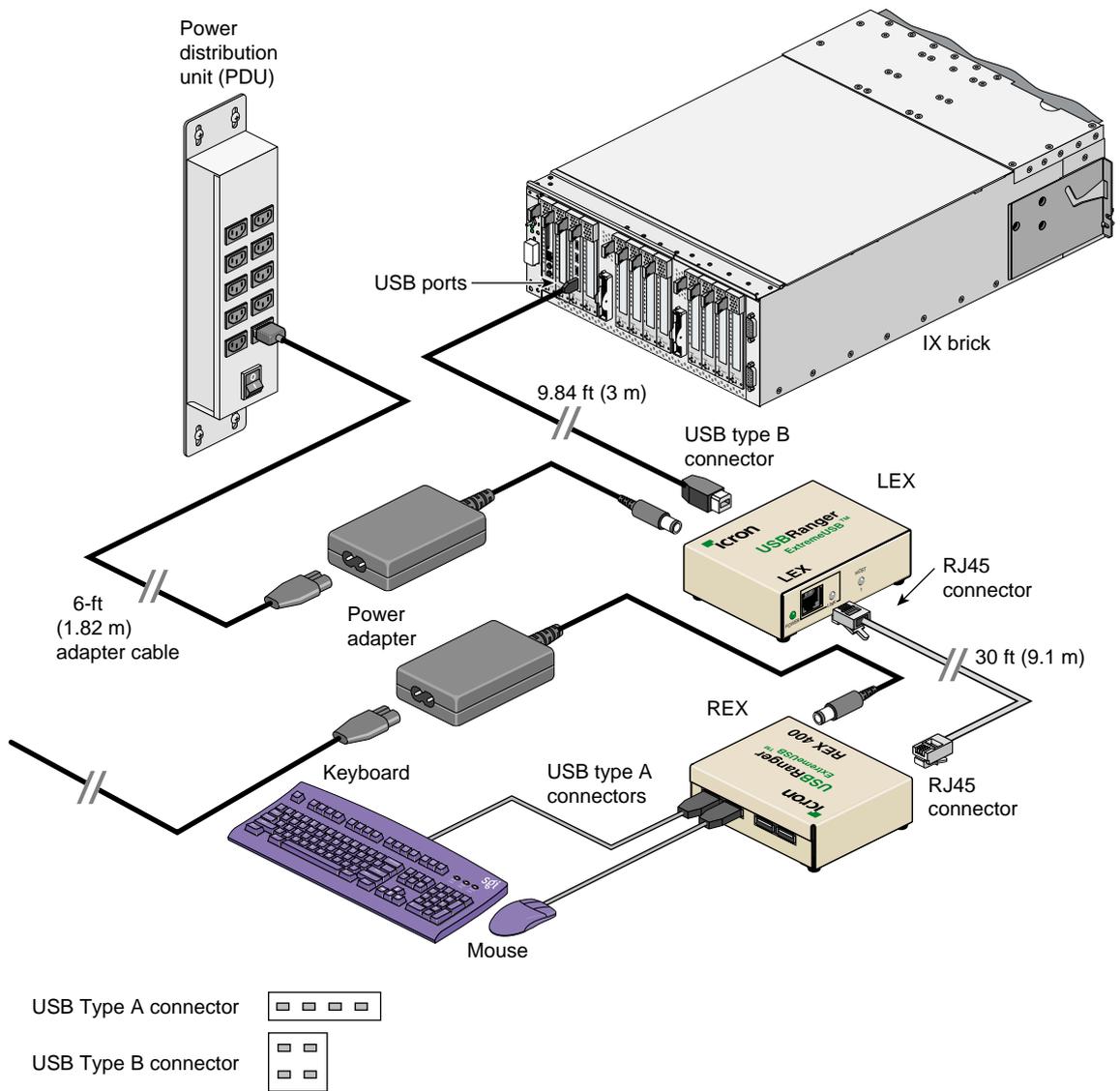
## Optional USB Extender

You can plug the keyboard and mouse directly into a USB card in an IX or PX brick (see “Connecting a Keyboard and Mouse” on page 16), or you can use an optional USB extender that allows you to place the keyboard and mouse up to 328.68 feet (100 m) from the USB card, see Figure 1-7 on page 18.

---

**Note:** The local extender (LEX) receives AC power from the system power source or power distribution strip (PDS) in the rack. A 6-ft. (1.82-m) adapter cable connects the extender’s power adapter to the PDU. The REX requires AC power from a source within a 6-ft. (1.82-m) range from the keyboard/mouse connection point.

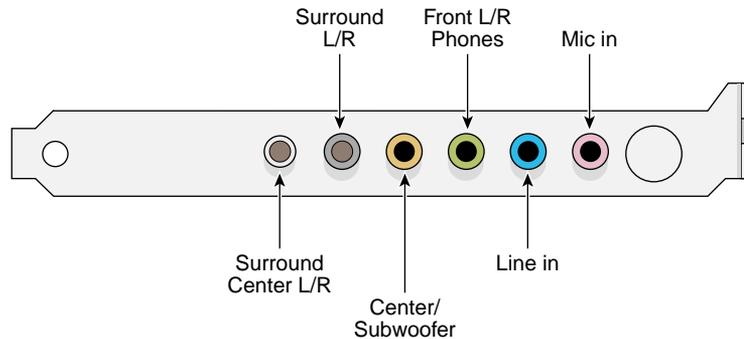
---



**Figure 1-7** Keyboard & Mouse Connected to IX-brick via Optional USB Extender

## Optional DM8 Audio Board

The DM8 is a half-size PCI expansion board that provides audio expansion via the PCI bus. It connects to consumer and professional audio and video equipment via industry-standard interfaces. Note that not all connector functionality is supported under Linux. The DM8 interface panel is shown in Figure 1-8.



**Figure 1-8** DM8 Interface Panel and Connectors

## Board Installation

Your DM8 audio board is tested for operation in specific SGI visualization systems. Select SGI Linux based systems support use of a single DM8 audio board (check with your SGI sales or support representative for functional confirmation). It is recommended that it not be removed and installed in other SGI systems.

SGI Linux based visualization systems support only one DM8 option board. Under most circumstances you should always leave the DM8 installed in the original factory-configured slot. If it does become necessary to either move or replace the board, use the information on removing and replacing PCI cards in your system user's guide for step-by-step instructions. If you don't have the printed user guide handy, it is available on the Internet in the SGI Technical Publications Library at the following location:

<http://docs.sgi.com>

Proceed to the next sections for information on cabling, verifying functionality, and basic operation.

## Cables and Connectors

The DM8 audio board has the following connectors on its rear panel as shown from left to right in Figure 1-8 on page 19:

- Surround Center L/R (silver) a line-level output connector for powered surround Center Left and Right channel speakers (not supported under Linux).
- Surround L/R (black) a line-level output that can connect to powered Surround Left and Right speakers (not supported under Linux).
- Center/Subwoofer (orange) a line-level output that can connect to powered Center and Subwoofer speakers (not supported under Linux).
- Front L/R Phones (green) a jack that connects to powered Left and Right speakers. If you are using a basic two-speaker stereo setup, this is the jack you will use. This is also the jack to use for stereo headphones.
- Line In (blue) a stereo line-level input intended for recording into an audio recording program.
- Mic In (pink) a mic input for connecting a mono microphone for recording, videophone, or voice-recognition applications. This jack is a three-conductor TRS-type jack for condenser (two-conductor) and electret (three-conductor) type microphones.

## Functional Features

The DM8 PCI audio board has the following functional features:

### Line outs:

- Dynamic range of 106 dB (typical, -60 dB input, a-weighted)
- Maximum line output level of 1.26 V<sub>rms</sub> (+2 dBV)
- Frequency response of +0.8/-3.0 dB, 20Hz to 80 kHz

### Line in:

- Dynamic range of 105 dB (a-weighted)

### Mic in:

- Dynamic range of 90 dB (a-weighted)
- Maximum input level of 1.45 V<sub>rms</sub> (3.2 dBV)

**Sampling frequencies (in kHz):**

- Supports sampling frequencies 8, 11.025, 16, 22.05, 32, 44.1, or 48kHz

**Audio playback formats:**

- Output formats supported are:
- 24-bit linear PCM/48kHz playback capability for Linux systems
- 24-bit linear PCM/48kHz recording capability for Linux systems

**Connector features:**

- Analog connector for powered speakers (headphone jack)
- Stereo 1/8-inch mini analog line input
- Mono 1/8-inch mini analog microphone input (with electret mic power)

**Troubleshooting Tips**

Use the following information to help correct any functional problems with the DM8 audio PCI option board:

If the sound is distorted or a channel is not producing sound, try the following:

- Check all cable connections between the audio card and speakers
- Confirm that any powered speakers are powered on

If the audio is not working at all, try these solutions:

- Reboot the system
- Reseat the PCI audio card

If none of these solutions solve the problem, contact your SGI customer support representative or local service provider for additional help.



## System Control

This chapter describes the interaction and functions of system controllers in the following sections:

- “Levels of System Control” on page 25
- “System Controller Interaction” on page 26
- “L1 Controller” on page 28
- “Console Hardware Requirements” on page 33
- “Operating the L1” on page 35
- “L2 Emulator Operation” on page 42
- “Upgrading L1 Firmware” on page 52

The control system for the Silicon Graphics Prism Extreme system manages power control and sequencing, provides environmental control and monitoring, initiates system resets, stores identification and configuration information, and provides console/diagnostic and scan interface.

Figure 2-1 shows an example system control network using an optional SGIconsole and separate (remote) workstation to monitor a single-rack Silicon Graphics Prism system.

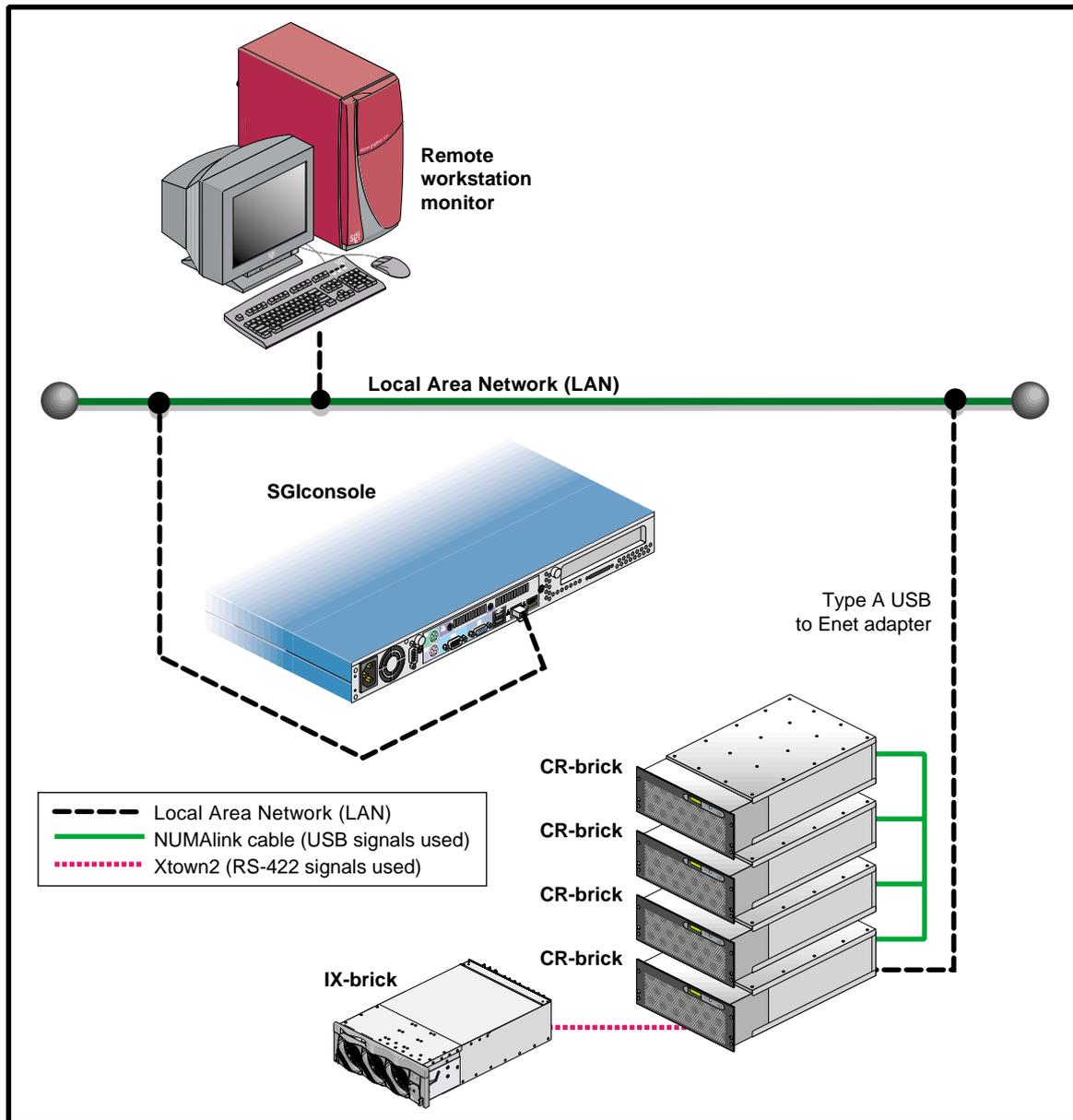


Figure 2-1 Silicon Graphics Prism System Control Network (Example)

## Levels of System Control

The system control network configuration of your server will depend on the size of the system and control options selected. The Silicon Graphics Prism Extreme system has optional levels of control, as follows:

- **L1: brick and system-level control.** The L1 system controller is designed into all CR and NUMA4 R-bricks. There is no interconnected L1 function in the TP900 storage module or the D-brick2. Note that the IX-brick is compatible with the new system control functions, but is interconnected to a CR-brick via an SGI Xtown2 interface using RS-422 signals.
- **Optional SGIconsole.** The L1 controllers in the system report and share status information via the NUMALink-4 cables, thus maintaining controller configuration and topology information between all controllers and the system console. For additional information on the SGIconsole options, see:
  - *SGIconsole Hardware Connectivity Guide*, (P/N 007-4340-00x)
  - *SGIconsole 2.x Start Here*, (P/N 007-4356-00x)
  - *Console Manager for SGIconsole Administrator's Guide*, (P/N 007-4477-00x)

---

**Note:** The D-brick2, which is not monitored by the L1 controller network, has its own ESI/ops panel module with a microcontroller for monitoring and controlling all elements of the D-brick2.

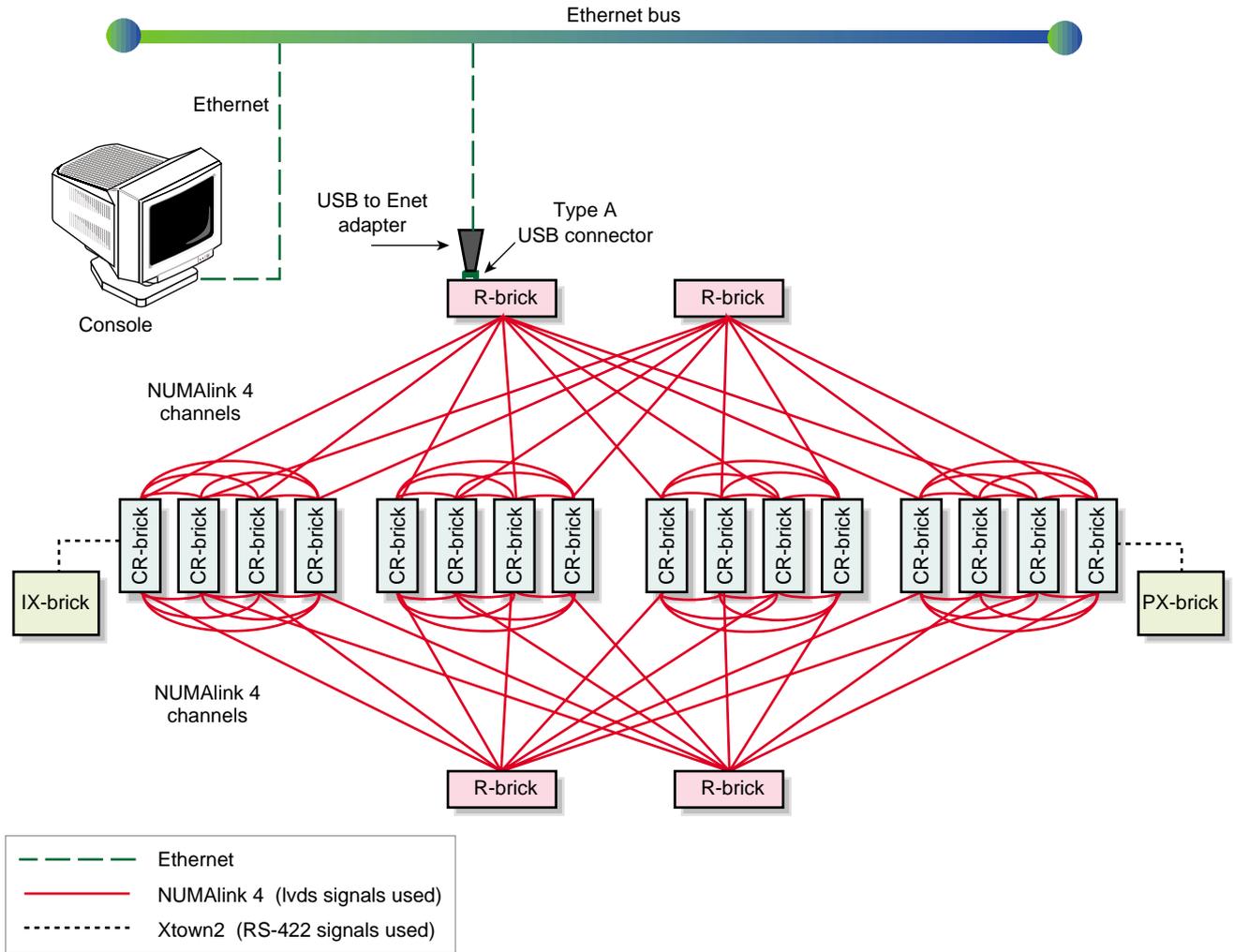
---

## System Controller Interaction

In the Silicon Graphics Prism Extreme system all the L1 controllers communicate with each other in the following ways:

- All CR and NUMALink-4 R-bricks communicate with each other through the NUMALink connections using low voltage differential signaling (LVDS).
- An L1 controller of an I/O brick communicates with an L1 controller of a CR-brick via the Crosstown2 connections using serial (RS-422) signals.
- If a USB-to-Ethernet adapter is connected to either the CR or NUMALink-4 R-brick, the L1 system controller on that brick emulates an L2 controller. Access to the L2 functionality is made by way of an Ethernet connection.

Figure 2-2 diagrams the paths for an example console interaction between the system L1s and a remote Ethernet based console interface.



**Figure 2-2** Console Controller Network Diagram Example

## L1 Controller

All bricks except TP900 storage modules and D-brick2 storage modules have L1 controllers. The following subsections describe the basic features of all L1 controllers:

- “L1 Controller Functions” on page 28
- “L1 Front Panel Display” on page 30

---

**Note:** For additional information on L1 controller commands, see the *SGI L1 and L2 Controller Software User’s Guide (007-3938-xxx)*.

---

## L1 Controller Functions

Table 2-1 summarizes the control and monitoring functions that the L1 controller performs. Many of the L1 controller functions are common across all brick types; however, some functions are applicable to a specific brick type.

**Table 2-1** L1 Controller Functions

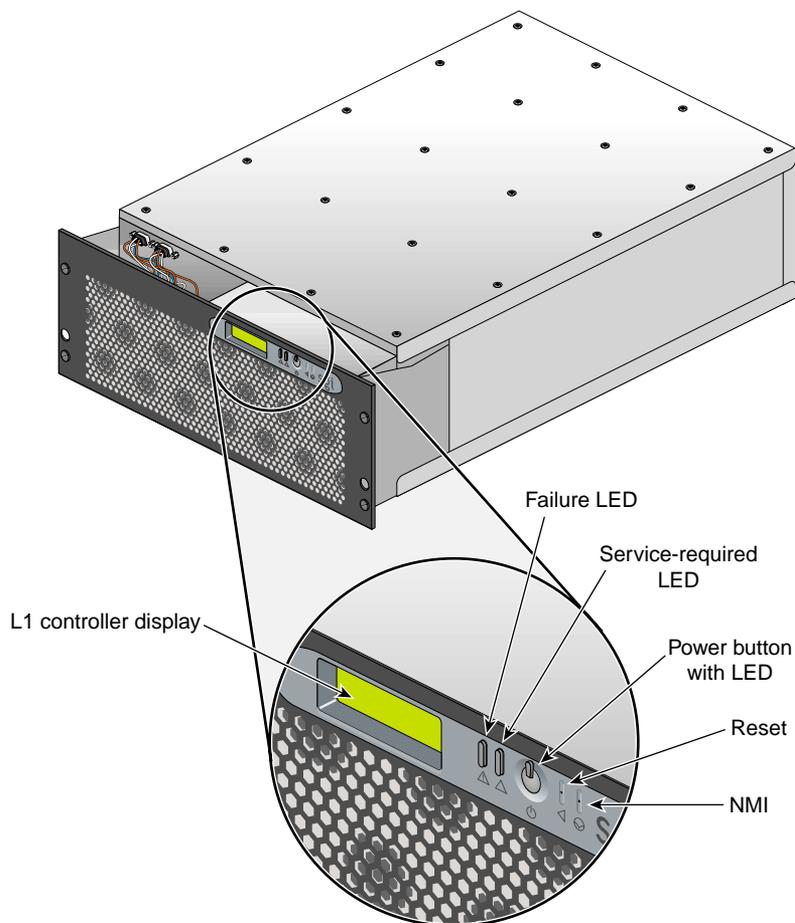
Function	CR-brick	R-brick	IX-brick	PX-brick
Controls voltage regulator modules (VRMs).	X	X	X	X
Controls voltage margining within the brick.	X	X	X	X
Controls and monitors fan speed.	X	X	X	X
Monitors voltage and reports failures.	X	X	X	X
Monitors and reports operating temperature and status of 48-VDC input power.	X	X	X	X
Monitors and controls LEDs.	X	X	X	X
Reads system identification (ID) PROMs.	X	X	X	X
Monitors the On/Off power switch.	X	X	X	X
Monitors the reset switch and the nonmaskable interrupt (NMI) switch.	X			

**Table 2-1** L1 Controller Functions **(continued)**

<b>Function</b>	<b>CR-brick</b>	<b>R-brick</b>	<b>IX-brick</b>	<b>PX-brick</b>
Reports the population of the PCI cards and the power levels of the PCI slots.			X	X
Powers on the PCI slots and their associated LEDs.			X	X

## L1 Front Panel Display

Figure 2-3 shows the L1 controller front panel on the CR-brick.



**Figure 2-3** L1 Front Panel

The front panel display contains the following items:

- 2 x 12 character liquid crystal display (LCD). The display identifies the brick, shows system status, warns of required service, and identifies a failed component.
- Power (On/Off) switch with LED (button with light-emitting diode [LED]).

- Service required LED.
- Failure LED.
- Reset switch and non-maskable interrupt (NMI) switch.

---

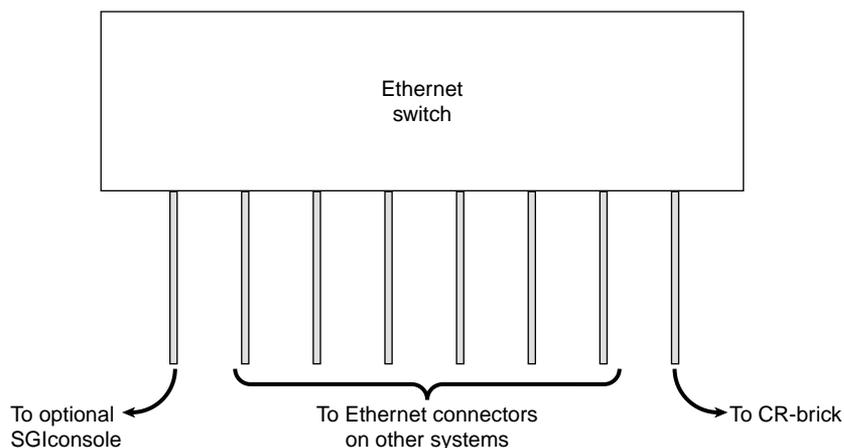
**Note:** The reset and NMI switch functions are available on the CR-brick only.

---

## Optional Ethernet Switch

Use of an Ethernet switch is the preferred method of connecting remote support hardware to multiple systems.

The optional Ethernet switch provides eight Ethernet connectors. Figure 2-4 shows sample connections between the Ethernet switch, an SGIconsole, a CR-brick, and other local SGI systems.



**Figure 2-4** Ethernet Switch System Controller Block Diagram (Example)

## Console Hardware Requirements

The console type and how these console types are connected to the Silicon Graphics Prism Extreme system is determined by what console option is chosen.

If you have a Silicon Graphics Prism Extreme system with a dumb terminal, you can connect the terminal via a serial cable to the (DB-9) console port connector on the rear of the CR-brick.

The terminal must be set to the following functional modes:

- Baud rate of 38,400
- 8 data bits
- One stop bit, no parity
- Hardware flow control (RTS/CTS)

You can also connect a USB-to-Ethernet adapter to the CR-brick or R-brick and place it on a network. This starts an L2-level emulator on the brick's system controller. Use the `telnet` command to connect to the CR-brick or R-brick.

Table 2-2 provides information on connection points for the USB-to-Ethernet adapter depending on the system size.

**Table 2-2** Location Guidelines for Connecting USB/Ethernet Adapters

System Size	Rack Number	Brick Type	Slot Number (U-Location)
64 Processor or smaller	001	CR	Bottom CR-brick in rack
128 Processor	001	R-brick	U-23

By default the L2 emulator uses DHCP to obtain an IP address. To set a static IP, access the L1 via the serial port and use the following commands:

```
001c05-L1> L2 ip <ip address> <netmask> <broadcast>
```

```
001c05-L2> reboot_L1
```

These console connections enable you to view the status and error messages generated by the L1 controllers on your system. You can also use the console to input commands to manage and monitor your system(s). For more information on the L2 emulator, see “L2 Emulator Operation” on page 42.

When the system is connected to a network, an optional SGIconsole can also be used to access the system and manage functional processes. For additional information on the SGIconsole options, see:

- *SGIconsole Hardware Connectivity Guide*, (P/N 007-4340-00x)
- *SGIconsole 2.x Start Here*, (P/N 007-4356-00x)
- *Console Manager for SGIconsole Administrator’s Guide*, (P/N 007-4477-00x)

For more details on connecting a console to a Silicon Graphics Prism Extreme system, see “Connecting a System Console” on page 3. For more information on monitoring your server, see “Monitoring Your Server” on page 12.

## Operating the L1

Each CR-brick and NUMALink-4 R-brick in the Silicon Graphics Prism Extreme system has an updated and enhanced system control implementation. Note that L1 mode operation is for systems without NUMALink-4 routers (R-bricks) and when using a serial console connection to one of the CR-bricks.

An L2 emulator mode is used with the system when NUMALink-4 routers are used and a USB-to-Ethernet adapter is connected. See “L2 Emulator Operation” on page 42 for more information.

Need for a separate optional hardware L2 system controller has been eliminated from the system control network.

The L1 operates in one of these two modes, which are discussed in the sections that follow:

### **L1 Mode**

The L1 prompt is visible and all input is directed to the L1 command processor. The enhanced L1 control system is compatible with the L1 controller in the IX-bricks. The Silicon Graphics Prism L1 system control can perform the following:

- Managing power and sequencing control
- Environmental monitoring and control functions
- Initiation of system resets
- Read/write storage for identification and configuration information
- Provides console/diagnostic and scan interface

The L1 controller in each of the CR or NUMA-4 R-bricks is a complete and fully functional system controller. All the bricks are interconnected by NUMALink-4 connectors and each brick shares its system control information with the others.

### **Console Mode from L1**

Output from the system is visible and all input is directed to the system console.

---

**Note:** The “console mode from L1” mode is supported only if the system console is connected directly to the console port of the CR-brick.

---

## L1 Mode

If you see a prompt of the following form, the L1 is ready to accept commands.

```
001c19-L1>
```

Common operations are discussed in the following sections:

- “Viewing System Configuration (from a Brick’s Perspective)” on page 36
- “Command Targeting” on page 37
- “Viewing Information, Warnings, and Error Messages” on page 37
- “Powering On, Powering Off, and Resetting the Brick” on page 37

### Viewing System Configuration (from a Brick’s Perspective)

An L1 has limited knowledge of the system topology, depending on the system’s configuration. In configurations without an R-brick, each CR-brick has information about other CR-bricks within the system and its attached I/O brick (if any). An I/O brick only has information about its attached CR-brick.

In some configurations with R-bricks (routers) the L1 will only have knowledge of a portion of the bricks in the system. These R-brick configurations require the use of the emulated L2 (via the use of a USB to ethernet adapter), see “L2 Emulator Operation” on page 42 for further details.

You can view a brick’s configuration information with the `config` command as in the following:

```
001c07-L1> config
:0  001c07 LOC
:1  001i11 U-F
:2  001p15 U-G
001c05-L1
```

This example is a system with one CR-brick and two I/O-bricks. The *<number>* that follows the colon (0, 1, and 2, from top to bottom in this example), refers to which local port (NUMAlink or Crosstown) the brick is connected to or accessed through. The local (LOC) brick is the brick that is processing the command.

On all bricks :0 is the local brick, with other values referring to various ports. The specific port description follows the brick’s rack/type/slot field: (i.e. LOC, U-F, U-G, etc.)

## Command Targeting

All commands entered affect only the local brick. You can target a command to all bricks (including the local brick) by prefixing the command with an asterisk (\*).

```
001c05-L1> * version
001c05:
L1 0.7.37 (Image A), Built 11/24/2004 14:59:42 [2MB image]
004i01:
L1 0.7.37 (Image A), Built 11/24/2004 14:59:42 [2MB image]
002c01:
L1 0.7.37 (Image A), Built 11/24/2004 14:59:42 [2MB image]
001x01:
L1 0.7.37 (Image A), Built 11/24/2004 14:59:42 [2MB image]
001c05-L1>
```

## Viewing Information, Warnings, and Error Messages

All information, warnings, and error messages generated by any of the system controllers are in the following form:

```
001c05 ERROR: invalid arguments for 'ver' command, try "help ver"
```

The general format of the message includes a brick identification (this is not present if the command was to the local brick only), type of message, and the message. These messages can be the result of an invalid command (as shown in the example) or from tasks running on the L1, such as the environmental monitor.

Each L1 has a log of local events. Use the L1 command `log` to view the event on any of the L1s.

## Powering On, Powering Off, and Resetting the Brick

Use a serial terminal cable connected to the console port on any one of the CR bricks. From this perspective all functioning bricks with an L1 can be seen in the output of the L1 `config` command.

```
001c07-L1> config
:0 001c07 LOC
:1 001c11 U-F
:2 001c15 U-G
```

```
:3 001c33 U-H
:10 101i35 IIB
```

To power up/down/reset a non-router configuration from the L1, commands must be targeted to all bricks:

```
001c05-L1> * power up
001c05-L1> * power down
001c05-L1> * reset
```

You can power on and power off a specific brick with the `power` command:

```
001c05-L1> power up
001c05-L1>
```

This will power on or power off only the locally attached brick. You can target other specific bricks for the power on or power off commands by preceding the power up/down command with a specific rack, and slot destination, such as:

```
001c05-L1> rack 1 slot 11 power up
001c05-L1>
```

or

```
001c05-L1> r 1 s 11 power up
001c05-L1>
```

This command requires from several seconds to several minutes to complete. Remember that TP900 and D-brick2 options will always have to be manually powered on or off.

## Console Mode from L1

In console mode, output from the system is visible and all input is directed to the system. To enter console mode, press **Ctrl+D** at the L1 prompt:

```
001c05-L1> Ctrl+D
entering console mode 001c05 console, <CTRL-T> to escape to L1
.
<system output appears here>
.
```

To return to L1 mode, press **Ctrl+T**:

```
Ctrl+T
escaping to L1 system controller
001c05-L1>
```

While in L1 mode, you can enter any L1 command. Once the command is executed, the L1 returns to console mode:

```
re-entering console mode 001c05 console, <CTRL-T> to escape to L1
```

To permanently engage the L1 mode, press **Ctrl+T** and then enter the **l1** command:

```
Ctrl+T
escaping to L1 system controller
001c05-L1> l1
L1 command processor engaged, <CTRL-D> for console mode.
001c05-L1>
```

## L1 Console Selection

The brick with which the L1 communicates in console mode is the system console or global master, and you can view and set it with the `select` command. By default, the CR-brick attempts to communicate with its local CPUs when console mode is entered. If the system has been powered on and either one of the bricks received a request to be the system console, then the CR-brick attempts to communicate with that brick. The `select` command by itself shows the current console mode settings:

```
001c05-L1> select
console input: 001c05 console0
console output: not filtered.
```

The following are common subchannels associated with console communications:

- Subchannel 0A specifies Node 0, CPU A.
- Subchannel 0C specifies Node 0 CPU B.
- Subchannel 1A specifies Node 1, CPU A.
- Subchannel 1C specifies Node 1, CPU B.
- Subchannel 2A specifies Node 2, CPU A.
- Subchannel 2C specifies Node 2, CPU B.
- Subchannel 3A specifies Node 3, CPU A.
- Subchannel 3C specifies Node 3, CPU B.
- Node 0 console subchannel.
- Node 1 console subchannel.

The output `console input: 001c05 console0` shows that the system interface console will send input to brick 001c05 and the subchannel to be used is the console0 subchannel.

To change system console status from one brick to the attached CR-brick, use the `select <rack> <slot>` command:

```
001c05-L1> select r 2 s 1
console input: 001c05 console
console output: not filtered.
001c05-L1>
```

To change the subchannel used on the selected brick, use the `select` command followed by the subchannel number or the word `console`:

```
001c05-L1> select sub 0A
console input: 001c05 CPU 0A
console output: not filtered.
001c05-L1>
```

During the boot process on a multi-rack system, there is a window of time in which both CR-bricks are producing output. This output can produce a somewhat jumbled output at the L1. However, you can filter the console output so that the L1 shows output from only the brick chosen to receive console input. You can turn filtering on and off with the `select filter` command.

If you attempt to communicate with a brick that is not responding, a time-out condition results:

```
001c05-L1>
```

```
entering console mode 001c05 console, <CTRL-T> to escape to L1
no response from 001c05 junk bus console UART:UART_TIMEOUT
```

When this time-out condition occurs, either the brick is hung or the subchannel is incorrect. A brick is identified by its rack, type, and slot (001c05). The structure of the brick location is as follows:

rrrbss.p

where:

rrr is the rack number.

b is the brick type.

ss is the slot location of the brick.

p is the partition of the brick (not present if the system is not partitioned).  
R-bricks are not associated with a partition.

In the example shown above, 001c05 is a CR-brick in rack 001 and slot position 05.

## Viewing Information, Warnings, and Error Messages

All information, warnings, and error messages generated by any of the system controllers are in the following form:

```
001c05 ERROR: invalid arguments for 'ver' command, try "help ver"
```

The general format includes a brick identification and the type of message, followed by the message. A message may be the result of an invalid command, as shown in the example, or the result of tasks running on the L1, such as the environmental monitor.

Each L1 has a log of local events. Use the L1 command `log` to view events on any of the L1s.

## L2 Emulator Operation

As mentioned in “System Controller Interaction” on page 26, L1 system controllers in a Silicon Graphics Prism Extreme system can operate in “L2 emulator mode.” This is to say that they essentially perform the same functions as the L2 system controller on the Altix 3000.

A USB Ethernet adapter can be plugged into the type A connector on the CR-brick. Connecting this adapter causes the system controller to start running as an L2 emulator. The adapter can then be connected to a local area network (LAN), giving network access to the system controller through the emulated L2 interface.

### Configuring an Emulated L2’s IP Address

This section refers to setting the IP address on the R-brick, but this is also the procedure to set the IP address on the CR-brick when using a USB/ethernet adapter in non-R-brick configurations.

Setting the IP address of the L2 emulator on the target bricks should be done before connecting the bricks to the network as follows:

Connect a serial cable to the console port on the target NUMAlink-4 R-brick and get the L1 prompt.

At the L1 prompt type:

```
L1> l2
```

To see if the l2 is running (it will be if the USB/Ethernet adapter is plugged in, even if the adapter is not connected to the network).

If the L2 emulator is not running type:

```
L1>! init 4
```

This switches the system controller to run level 4 and forces the L2 emulator to be started whether or not the USB/ethernet adapter is plugged in. There is a space between the “!” and “init”.

Verify the L2 emulator is running again as above.

To set the IP address on the L2 emulator type:

```
L1> l2 ip a.b.c.d 255.255.255.0 a.b.c.255
```

Verifying that the system serial number is set on the L2:

```
L1> l2 serial
```

To set the L2 emulator system serial number:

```
L1> l2 serial set <serial number>
```

Verifying that `msys` is enabled (this allows multiple L2s in a system to exist peacefully with other L2s from another system on the same subnet):

```
L1> l2 msys
```

If `msys` is off, turn it on:

```
L1> l2 msys on
```

Reboot the system controller to make the IP address change take effect:

```
L1> reboot_l1
```

Once this is done for all target R-bricks, connect them to the network (using an optional Ethernet switch if necessary).

The `rackid` on the L2 emulator cannot be set with the L2 "rackid" command, instead it will be inherited from the local L1. As an example: the L2 emulator running on the system controller in 1r14 will have a rack id of 114 (rack \* 100 + slot of the local L1).

Once the L2 emulator is running, you can telnet to the L2 emulator, or use an optional SGIConsole. Functionally it is the same as the separate hardware L2 (box) used with older Altix 3000 systems.

---

**Note:** The L2 touch displays (used with some older Altix 3000 systems) are not used or supported with the L2 emulator.

---

After the connection to the L2 emulation controller is established, the following prompt appears, indicating that the L2 emulator is ready to accept commands:

```
L2>
```

Common operations are discussed in the subsections that follow.

## Viewing System Configuration

You can use the L2 emulator's `config` command to view the current system configuration from a brick level:

```
L2> config
L2 127.0.0.1: - 001 (LOCAL)
L1 127.0.0.1:0:0 - 001c18
L1 127.0.0.1:1:0 - 001r16
L1 127.0.0.1:2:0 - 001r14
L1 127.0.0.1:3:0 - 001c11
L1 127.0.0.1:4:0 - 001c08
L1 127.0.0.1:5:0 - 001c05
L1 127.0.0.1:5:1 - 001i01
L2>
```

As shown above, `config` produces a list of bricks and their locations in the system and the system controller address of each brick. This is similar to the output from using the `config` command on the L1 with the addition of the emulated L2 IP address and USB port number.

The structure of the brick's address is as follows:

a.b.c.d:x:y

where:

a.b.c.d is the IP address of the emulated L2. (In the example above, the IP address is 127.0.0.1.)

x is the USB port number. (In the example above, the port number is 0.)

y is the L1 index, as follows:

0 is the local brick (the brick to which the USB cable is attached).

A number greater than 0 indicates that it is attached directly to or indirectly to the local brick. A brick is identified by its rack, type, and slot (001c05). The structure of the brick location is as follows:

rrrbss.p

where:

rrr is the rack number.

b	is the brick type.
ss	is the slot location of the brick.
p	is the partition of the brick (not present if the system is not partitioned). R-bricks are not associated with a partition.

In the example shown above, 001c05 is a CR-brick in rack 001 and slot position 05.

## Setting Command Targeting

If a command is not understood by the L2 emulator system controller, in general it is passed to the L1 system controllers. The destination determines which L1s receive the command. A destination, specified by the following, is a range of racks and slots:

```
rack <rack list> slot <slot list>
```

The <rack list> specifies a list of racks. This can be a list delimited by commas, such that 2,4,7 specifies racks 2, 4, and 7. You can use a dash to specify a range of racks, such that 2-4 specifies racks 2, 3, and 4. Both nomenclatures can be combined, such that 2-4,7 specifies racks 2, 3, 4, and 7.

You can specify the <slot list> using the same nomenclature. The slot number, sometimes referred to as a bay number, is the unit position number located on the rack, slightly above where the bottom of the brick sits. Each rack unit position number is located toward the top of the two lines that mark the unit position that the number represents. For example, the rack numbering for a brick located in slot 10 would appear on the left front side of the rack.

The slot <slot list> is optional; if not given, then all slots in the specified rack(s) are implied. You should avoid specifying a rack list and a slot list that includes multiple racks and slots, such as rack 2-4,7 slot 1-8,11,13. Generally, you specify a rack and slot together to specify an individual brick.

You can use the aliases *r* and *s* to specify *rack* and *slot*, respectively. You can use the alias *all* or *\** in both the <rack list> and the <slot list>, or by themselves, to specify all racks and all slots.

To send a command to all bricks in a partition, enter the following:

```
partition <partition> <cmd>
```

### Default Destination

When the L2 emulator starts, the default destination is set to all racks and all slots. You can determine the default destination by using the `destination` command:

```
L2> destination
all racks, all slots
L2>
```

The following command sets the destinations to rack 2 and 3, all slots:

```
L2> r 2,3 destination
2 default destination(s) set
L2>
```

The following example shows what bricks are found in the default destination. If you enter a command not understood by the L2 emulator, the command is sent to these bricks.

---

**Note:** In the current implementation, if you add a brick to either rack 2 or 3, it would not be automatically included in the default destination. You would need to reset the default destination.

---

```
L2> destination
002c05 (127.0.0.1:0:2)
003c05 (127.0.0.1:0:0)
L2>
```

The following command resets the default destination to all racks and all slots:

```
L2> destination reset
default destination reset to all racks and slots
L2>
```

### Current Destination

The current destination is a range of racks and slots for a given command. For example, the following command sends the command `<L1 command>` to all bricks in racks 2, 3, 4, and 7:

```
L2> r 2-4,7 <L1 command>
```

This is a one-time destination.

## Command Interpretation

Some L2 commands are the same as the L1 commands. In many cases, this is intentional because the L2 emulator provides sequencing that is necessary for a command to function correctly.

When L1 and L2 commands are similar, you can assure that an L1 command is entered for the bricks in the current destination by preceding the command `<L1 command>` with the `l1` command:

```
L2> r 2-4,7 l1 <L1 command>
```

This is a one-time destination.

## Viewing Information, Warnings, and Error Messages

All information, warnings, and error messages generated by any of the system controllers are in the following form:

```
001c05 ERROR: invalid arguments for 'ver' command, try "help ver"
```

The general format includes a brick identification and the type of message, followed by the message. A message may be the result of an invalid command, as shown in the example, or the result of tasks running on the L1, such as the environmental monitor.

Each L1 has a log of local events. Use the L1 command `log` to view events on any of the L1s.

## Powering On, Powering Off, and Resetting the System From the L2 Emulator

You can power on and power off the system with the `power` command. This command is interpreted by the L2 emulator, because the bricks must be powered on in a specific order.

```
L2> power up  
L2>
```

The `power` command may require several seconds to several minutes to complete. In the example above, all racks and slots in the default destination are affected. Any errors or warnings are reported as described above in “Viewing Information, Warnings, and Error Messages.”

To power on or power off a specific brick, specify a current destination:

```
L2> r 2 s 5 power up
L2>
```

To power on or power off all bricks in a partition, enter the following:

```
L2> partition <partition number> <power up or power down>
```

To reset the system, enter the following:

```
L2> reset
L2>
```

This command restarts the system by resetting all registers to their default settings and rebooting the system controllers. Resetting a running system will cause the operating system to reboot and all memory will be lost.

### Console Mode from the L2 Emulator

In console mode, all output from the system is visible and all input is directed to the system.

To enter console mode from L2, press **Ctrl+D** at the L2 prompt and observe the response:

```
L2> Ctrl+D
entering system console mode (001c05 console0),
<CTRL_T> to escape to L2
.
<system output appears here>
.
```

To return to L2 mode from console mode, press **Ctrl+T**:

```
Ctrl+T
escaping to L2 system controller
L2>
```

At this point, you can enter any L2 or L1 command. When the command completes, the L2 returns to console mode:

```
Re-entering system console mode (002c05 console0),
<CTRL_T> to escape to L2
```

To permanently engage the L2 mode, press `Ctrl+T` and then enter the `l2` command:

```
Ctrl+T
escaping to L2 system controller
L2> l2
L2 command processor engaged, <CTRL_D> for console mode.
L2>
```

## Console Selection

When in console mode, the L2 emulator communicates with the CR-brick set with the `select` command to be the system console or global master. All input from the console is directed to the CR-brick. You can set and view the system console with the `select` command.

The L2 emulator chooses the CR-brick as the default console in the following order of priority:

- The CR-brick in the lowest numbered rack and slot, which has produced console output, and has an attached IX-brick.
- The CR-brick in the lowest numbered rack and slot, which has an attached IX-brick.
- The CR-brick in the lowest numbered rack and slot.

The `select` command by itself shows the current console mode settings:

```
L2> select
known system consoles (non-partitioned)

001c05-L2 detected

current system console

console input: 001c05 CPU 0A
console output: not filtered
```

The following are six common subchannels associated with console communications:

- Subchannel 0A specifies Node 0, CPU A.
- Subchannel 0C specifies Node 0 CPU B.
- Subchannel 1A specifies Node 1, CPU A.
- Subchannel 1C specifies Node 1, CPU B.

- Node 0 console subchannel.
- Node 1 console subchannel.

The output `console input: 002c05 console0` shows that the L2 emulator will send console input to brick 001c05 and the console subchannel will be used.

To change the brick that will be the system console, use the `select <rack>.<slot>` command, where `<rack>` is the rack and `<slot>` is the slot where the brick is located:

```
L2> select 3.1
console input: 003c01 console
console output: no filtered
console detection: L2 detected
```

To change the subchannel used on the selected brick to be the system console, use the `select subchannel <0A|0C|1A|1C>` command. (Use the `select subchannel console` to select the current console as the subchannel of the brick to be the system console.) For example, to select subchannel b as the subchannel of the brick to be the system console, enter the following:

```
L2> select subchannel 1A
console input: 003c01 console CPU1A
console output: no filtered
```

During the boot process on a multibrick system, there is a window of time in which the CR-bricks are all producing output. This can result in a somewhat jumbled output from the L2 emulator. However, you can filter console output so that the L2 emulator will show output from only the brick chosen to receive console input. You can turn on filtering with the `select filter on` command and turn off filtering with the `select filter off` command.

If you attempt to communicate with a brick chosen to receive console input but that is not responding, a time-out condition results:

```
L2> Ctrl+D
entering console mode 001c05 CPU1A, <CTRL_T> to escape to L2

no response from 001c05 Junk bus CPU1A system not responding
no response from 001c05 Junk bus CPU1A system not responding
```

When this time-out condition occurs, either the brick is hung or the subchannel is not correct.

## L1 Mode from L2 Emulation

In L1 mode, the prompt from a single L1 is visible, and all input is directed to that L1 command processor.

To enter L1 mode, enter the rack and a slot followed by `l1`:

```
L2> r 2 s 1 l1
enterling L1 mode 001c05, <CTRL-T> to escape to L2

001c05-L1>
```

To return to L2 emulation mode, press `Ctrl+T`:

```
001c05-L1> Ctrl+T
escaping to L2 system controller, <CTRL-T> to send escape to L1
L2>
```

At this point, you can enter any L2 command. Once the command is executed, the L2 emulator returns to L1 mode:

```
re-entering L1 mode 002c01, <CTRL-T> to escape to L2

001c05-L1>
```

To permanently engage the L2 emulation mode, press `Ctrl+T` and enter the `l2` command:

```
002c01-L1> Ctrl+T
escaping to L2 system controller, <CTRL-T> to send escape to L1
L2> l2
L2 command processor engaged, <CTRL-T> for console mode.

L2>
```

## Upgrading L1 Firmware

The L1 firmware is currently distributed as part of the `snxsc_firmware` package. To determine which version of the package is installed on your system console, enter the following command:

```
$> rpm -q snxsc_firmware
```

If the package is installed, the full package name (including the revision) is returned:

```
snxsc_firmware-1.18.3-1
```

The L1 firmware binary and the utilities used to update it are stored in `/usr/cpu/firmware/sysco`.

## Upgrading L1 Firmware

Note that a USB-to-Ethernet adapter connection or SGIconsole option is required to execute the commands described in this section. See “Console Hardware Requirements” on page 33 and Figure 2-2 on page 27 for descriptions of the hardware connections.

The L1 firmware consists of three parts:

- Boot image
- A image
- B image

At boot time, the boot image validates the A and B image, and if it is not instructed otherwise, it executes the newer of the two images. Because the L1 is running one of the two images, the image not in use is the image that will be overwritten when the firmware is upgraded. You need to re-boot any L1 update either by power-cycling the brick or by using the L1 command `reboot_l1`.

Typically, you will upgrade the firmware through the network connection from the SGIconsole to the L1:

```
$> /usr/cpu/firmware/sysco/flashsc --12 10.1.1.1 -p  
/usr/cpu/firmware/sysco/l1.bin all
```

This updates all the bricks in the system. The `-p` at the end of the first line instructs the firmware to flash the proms in parallel.

You can update individual bricks by replacing *all* with a rack and slot number:

```
$> /usr/cpu/firmware/sysco/flashsc --12 10.1.1.1  
/usr/cpu/firmware/sysco/l1.bin 1.19
```

This updates only the brick in rack 1, slot 19.



## System Overview

This chapter provides an overview of the physical and architectural aspects of your Silicon Graphics Prism Extreme system. The major components of the system are described and illustrated.

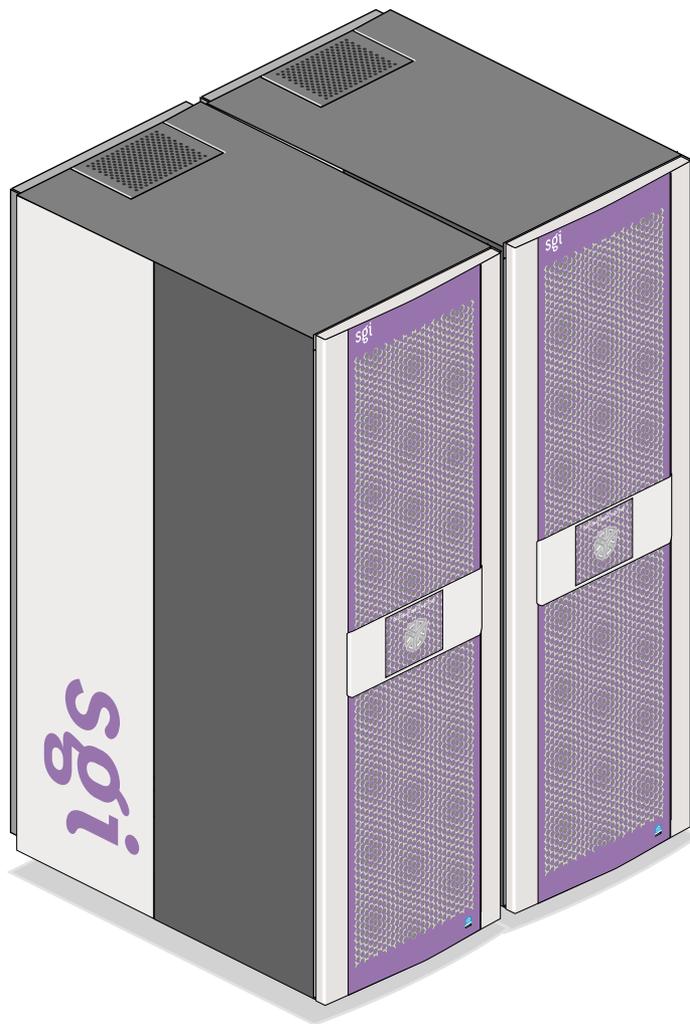
The Silicon Graphics Prism Extreme system is a family of multiprocessor distributed shared memory (DSM) computer systems that scale from 8 to 128 Intel 64-bit processors as a cache-coherent single system image (SSI).

In a DSM system, each processor board contains memory that it shares with the other processors in the system. Because the DSM system is modular, it combines the advantages of low entry-level cost with global scalability in processors, memory, and I/O. You can install and operate the Silicon Graphics Prism Extreme system in a rack in your lab or server room. Each rack holds from 8 to 64 processors in 1 to 8 CR-bricks.

This chapter consists of the following sections:

- “System Models” on page 57
- “System Architecture” on page 59
- “System Features” on page 61
- “System Components” on page 65

Figure 3-1 shows a front view of a multiple-rack Silicon Graphics Prism Extreme system.



**Figure 3-1** Silicon Graphics Prism Extreme System (2-Rack System Shown)

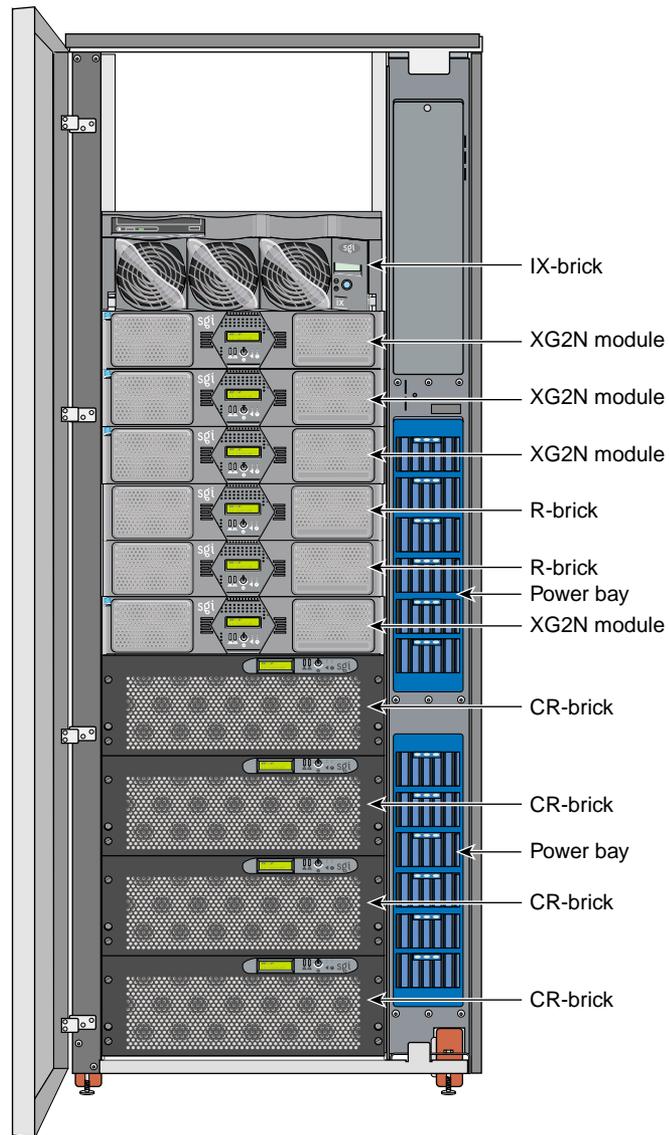
## System Models

The CR-brick contains the processors (8 processors per CR-brick) and two internal high-speed routers (“R-bricks”). The routers connect to other system bricks via NUMALink cables and expand the compute or memory capacity of the Silicon Graphics Prism system. The 40U rack in this server houses all bricks, drives, and other components—up to 40 processor and 8 graphics pipes in a single rack. The Silicon Graphics Prism system can expand up to 128 Intel Itanium 2 processors and 8 graphics pipes.

The system requires a minimum of one 40U rack with at least one power bay and one single-phase PDU per rack. (The single-phase PDU has two openings with three cables that extend from each opening to connect to the power bay. The three-phase PDU has two openings with six cables that extend from each opening to connect to two power bays.)

You can also add additional racks containing CR-bricks, I/O bricks, graphics modules, CPU expansion modules, and disk storage to your server system.

Figure 3-2 shows an example configuration of a 40-processor 8-pipe Silicon Graphics Prism system.



**Figure 3-2** Silicon Graphics Prism Extreme System (Example Configuration)

## System Architecture

The Silicon Graphics Prism system is based on a distributed shared memory (DSM) architecture. Because it is modular, the DSM architecture combines the advantages of low entry cost with the ability to scale processors, memory, and I/O independently.

The system architecture for the Silicon Graphics Prism system is a fourth-generation NUMAflex DSM architecture known as NUMAlink-4. In the NUMAlink-4 architecture, all processors and memory are tied together into a single logical system with special crossbar switches (routers). This combination of processors, memory, and crossbar switches constitute the interconnect fabric called NUMAlink. There are two router switches in each CR-brick.

The basic building block for the NUMAlink interconnect is the CR-brick. A CR-brick contains up to four processor nodes; each processor node consists of a Super-Hub (SHub) ASIC and two 64-bit processors with three levels of on-chip secondary caches. The two Intel 64-bit processors are connected to the SHUB ASIC via a single high-speed front side bus.

The SHub ASIC is the heart of the CR-brick. This specialized ASIC acts as a crossbar between the processors, local SDRAM memory, the network interface, and the I/O interface. The SHub ASIC memory interface enables any processor in the system to access the memory of all processors in the system. Its I/O interface connects processors to system I/O, which allows every processor in a system direct access to every I/O slot in the system.

Another component of the NUMAlink-4 architecture is the router ASIC. The router ASIC is a custom designed 8-port crossbar ASIC in the CR-brick. Using the router ASICs with highly specialized NUMAlink-4 cables provides a high-bandwidth, extremely low-latency interconnect between all CR-bricks in the system. This interconnection can create a single contiguous system memory of up to 1.5 TB (terabytes) for a 128 processor system.

Figure 3-3 on page 60 shows a functional block diagram of the Silicon Graphics Prism Extreme system CR-brick including nodes, routers, and other major components.

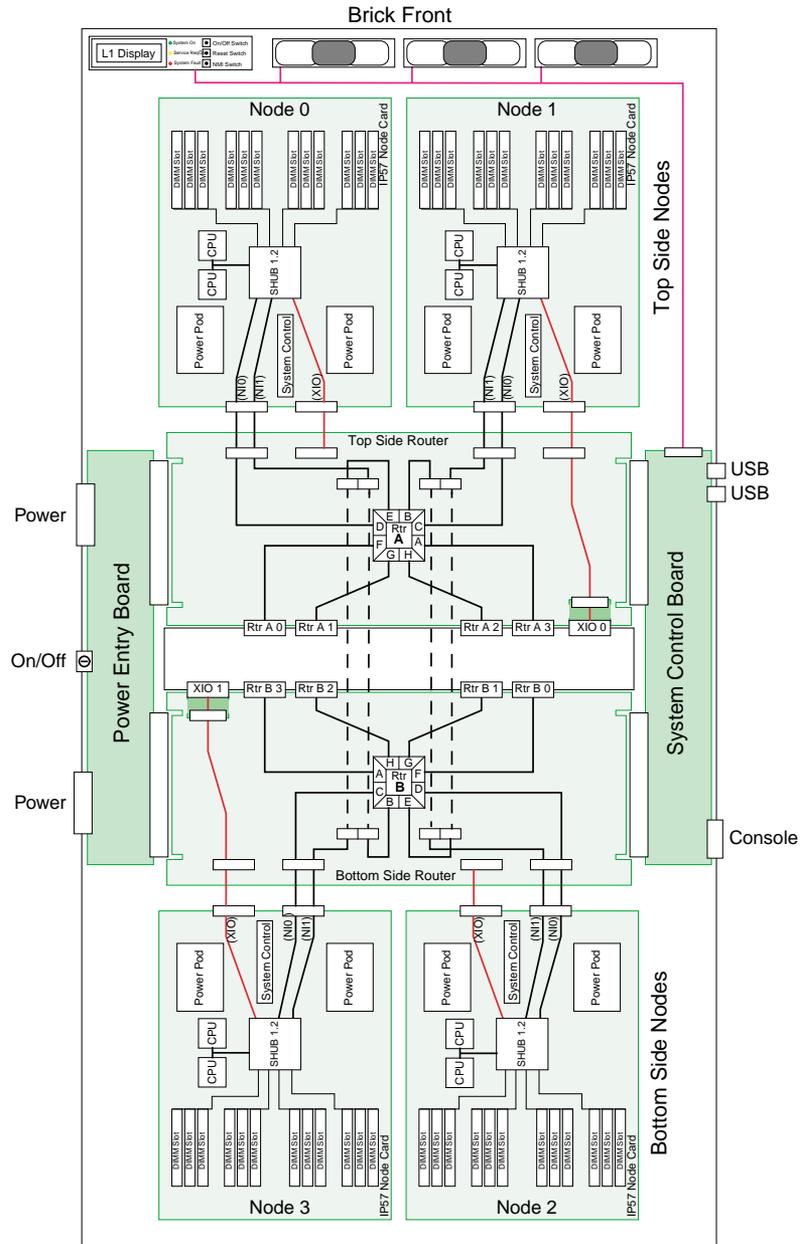


Figure 3-3 Functional Block Diagram of CR-brick

## System Features

The main features of the Silicon Graphics Prism systems are introduced in the following sections:

- “Modularity and Scalability” on page 61
- “Distributed Shared Memory (DSM)” on page 61
- “Distributed Shared I/O” on page 62
- “Reliability, Availability, and Serviceability (RAS)” on page 63

### Modularity and Scalability

The Silicon Graphics Prism systems are modular systems. The components are housed in building blocks referred to as bricks. You can add different brick types to a system to achieve the desired system configuration. You can easily configure systems around processing capability, I/O capability, memory size, or storage capacity. You place individual bricks that create the basic functionality (compute/memory, I/O, and power) into custom 19-inch racks. The air-cooled system has redundant, hot-swap fans at the brick level and redundant, hot-swap power supplies at the rack level.

### Distributed Shared Memory (DSM)

In the Silicon Graphics Prism system memory is physically distributed among the CR-bricks (compute/router nodes) and the XG2N and Compute modules; however, it is accessible to and shared by all processors within the system, even those in different bricks/modules. A CR-brick with configured memory but zero processors is generally referred to as a “memory node” or M-brick.

Note the following types of memory:

- If a processor accesses memory that is connected to the same SHUB ASIC on a compute node, the memory is referred to as the node’s *local memory*.
- If processors access memory located in other nodes, the memory is referred to as *remote memory*.
- The total memory within the system is referred to as *global memory*.

Memory latency is the amount of time required for a processor to retrieve data from memory. Memory latency is lowest when a processor accesses local memory.

## Distributed Shared I/O

Like DSM, I/O devices are distributed among the compute nodes (each compute node has two I/O ports) and are accessible by all compute nodes through the NUMalink interconnect fabric.

## ccNUMA Architecture

As the name implies, the cache-coherent non-uniform memory access (ccNUMA) architecture has two parts, *cache coherency* and *nonuniform memory access*, which are discussed in the sections that follow.

### Cache Coherency

The Silicon Graphics Prism systems use caches to reduce memory latency. Although data exists in local or remote memory, copies of the data can exist in various processor caches throughout the system. Cache coherency keeps the cached copies consistent.

To keep the copies consistent, the ccNUMA architecture uses directory-based coherence protocol. In directory-based coherence protocol, each block of memory (128 bytes) has an entry in a table that is referred to as a directory. Like the blocks of memory that they represent, the directories are distributed among the compute nodes. A block of memory is also referred to as a cache line.

Each directory entry indicates the state of the memory block that it represents. For example, when the block is not cached, it is in an unowned state. When only one processor has a copy of the memory block, it is in an exclusive state. And when more than one processor has a copy of the block, it is in a shared state; a bit vector indicates which caches contain a copy.

When a processor modifies a block of data, the processors that have the same block of data in their caches must be notified of the modification. The Silicon Graphics Prism system uses an invalidation method to maintain cache coherence. The invalidation method purges all unmodified copies of the block of data, and the processor that wants to modify the block receives exclusive ownership of the block.

## Non-uniform Memory Access (NUMA)

In DSM systems, memory is physically located at various distances from the processors. As a result, memory access times (latencies) are different or “non-uniform.” For example, it takes less time for a processor to reference its local memory than to reference remote memory.

## Reliability, Availability, and Serviceability (RAS)

The Silicon Graphics Prism system components have the following features to increase the reliability, availability, and serviceability (RAS) of the systems.

- **Power and cooling:**
  - Power supplies are redundant and can be hot-swapped.
  - Bricks have overcurrent protection.
  - Fans are redundant and can be hot-swapped.
  - Fans run at multiple speeds in all bricks except the optional R-brick. Speed increases automatically when temperature increases or when a single fan fails.
- **System monitoring:**
  - System controllers monitor the internal power and temperature of the bricks, and automatically shut down bricks to prevent overheating.
  - Memory, L2 cache, L3 cache, and all external bus transfers are protected by single-bit error correction and double-bit error detection (SECCDED).
  - The NUMALink interconnect network is protected by cyclic redundancy check (CRC).
  - The L1 primary cache is protected by parity.
  - Each brick has failure LEDs that indicate the failed part; LEDs are readable via the system controllers.
  - Systems support the optional Embedded Support Partner (ESP), a tool that monitors the system; when a condition occurs that may cause a failure, ESP notifies the appropriate SGI personnel.
  - Systems support remote console and maintenance activities.
- **Power-on and boot:**

- Automatic testing occurs after you power on the system. (These power-on self-tests or POSTs are also referred to as power-on diagnostics or PODs).
- Processors and memory are automatically de-allocated when a self-test failure occurs.
- Boot times are minimized.
- **Further RAS features:**
  - Systems support partitioning.
  - Systems have a local field-replaceable unit (FRU) analyzer.
  - All system faults are logged in files.
  - Memory can be scrubbed when a single-bit error occurs.

## System Components

The Silicon Graphics Prism system features the following major components:

- **40U rack.** This is a custom rack used for both the compute and I/O rack in the Silicon Graphics Prism system.
- **CR-brick.** This contains the compute power, standard routers and DIMM memory for the Silicon Graphics Prism system. The CR-brick is 4U high and contains four Super-Hub (SHUB) ASICs, eight Intel Itanium 2 processors, eight NUMALink-4 router ports, and up to 48 memory DIMMs.
- **IX-brick.** This 4U-high brick provides the boot I/O functions and 12 PCI-X slots.
- **PX-brick.** This 4U-high brick provides 12 PCI-X slots on 6 buses for PCI expansion.
- **R-brick.** This is a 2U-high, 8-port router brick.
- **XG2N module.** This is a 2U-high module containing processors, memory, and 2 graphics pipes.
- **CPU Expansion module.** This is a 2U-high module containing processors and memory (it is very much like the XG2N module, but does not contain graphics pipes).
- **Power bay.** The 3U-high power bay holds a maximum of six power supplies that convert 200-240 VAC to 48 VDC. The power bay has eight 48-VDC outputs.
- **D-brick2.** This is a 3U-high disk storage enclosure that holds a maximum of 16 low-profile Fibre Channel disk drives.
- **TP900 disk storage module.** This is a 2U-high disk storage enclosure that holds a maximum of eight low-profile Ultra320 SCSI disk drives.
- **SGIconsole.** This is an optional combination of hardware and software that allows you to manage multiple SGI servers.

Figure 3-4 on page 66 shows the Silicon Graphics Prism system components.

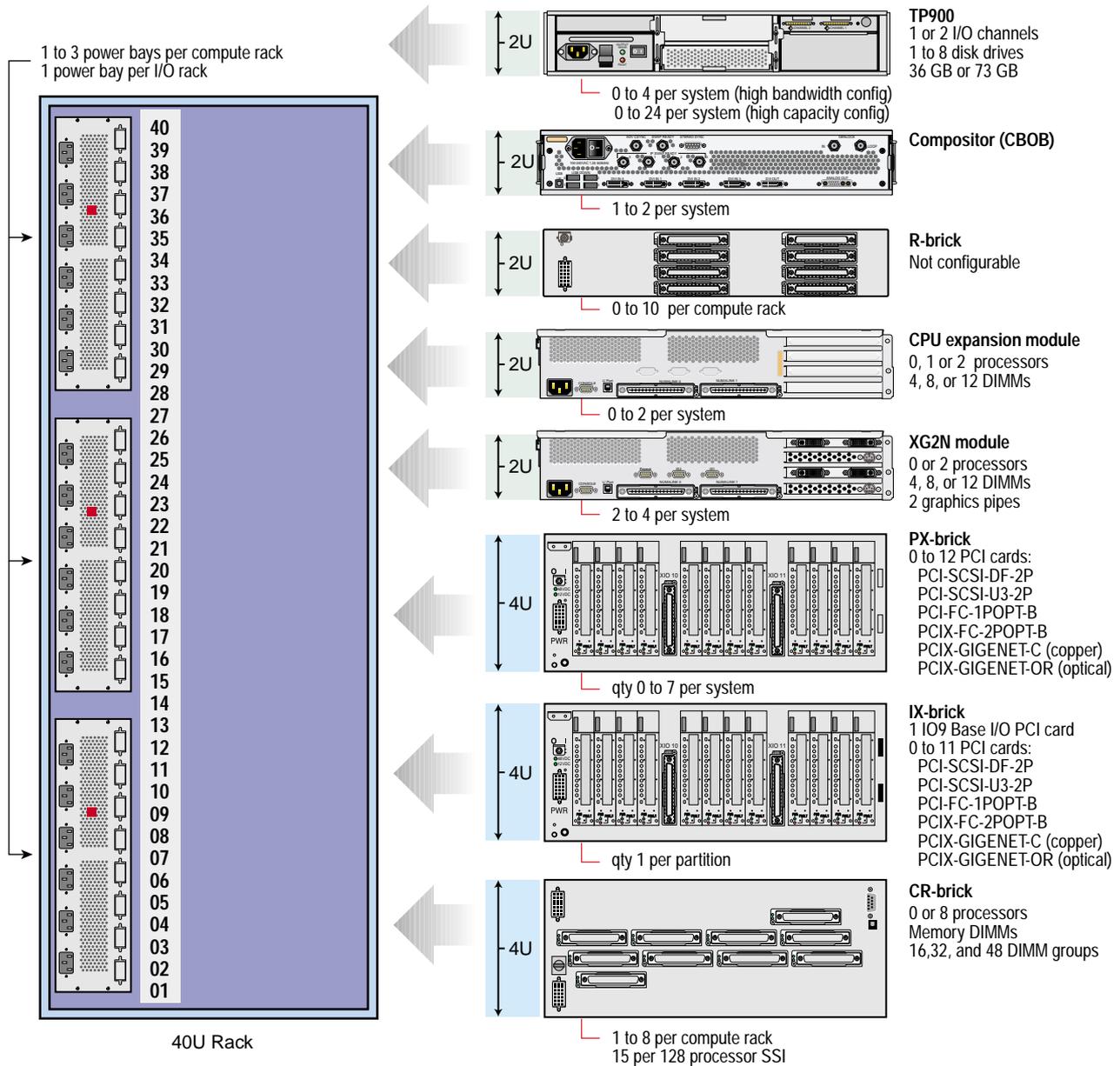


Figure 3-4 Prism Extreme System Components Example

## Bay (Unit) Numbering

Bays in the racks are numbered using standard units. A standard unit (SU) or unit (U) is equal to 1.75 inches (4.445 cm). Because bricks occupy multiple standard units, brick locations within a rack are identified by the bottom unit (U) in which the brick resides. For example, in the 40U rack, a CR-brick positioned in U05, U06, and U07 is identified as being in U05.

## Rack Numbering

A rack is numbered with a three-digit number. Compute racks are numbered sequentially beginning with 001. A compute rack is a rack that contains CR-bricks. I/O racks are numbered sequentially and by the physical quadrant in which the I/O rack resides. In a single compute rack system, the rack number is always 001.

## Optional System Components

The Silicon Graphics Prism system has the following external storage options:

- **Host bus adapter interfaces (HBA)**
  - 2Gbit Fibre Channel, 200MB/s peak bandwidth
  - Ultra320 SCSI, 320 MB/s peak bandwidth
  - Gigabit Ethernet copper and optical
  - 10-Gigabit Ethernet PCI-X
- **JBOD (just a bunch of disks)**
  - SGI TP900 Ultra320 SCSI
- **RAID**
  - SGI TP9300, TP9300S, TP9500 or TP9500S, 2 Gbit Fibre Channel
  - D-brick2, 2 Gbit Fibre Channel
- **Data servers**
  - SGI InfiniteStorage NAS 2000 Fileserver
  - SGI SAN Server 2000/San Gateway
- **Tape libraries**
  - STK L20, L40, L80, L180, and L700
  - ADIC Scalar 100, Scalar 1000, Scalar 10000, and ADIC Scalar i2000
- **Tape drives**
  - STK 9840B, 9940B, LTO, SDLT, and DLT

Availability of optional components for the Silicon Graphics Prism systems may vary based on new product introductions or end-of-life components. Check with your SGI sales or support representative for the most current information on available product options.

## Rack Information

This chapter describes the physical characteristics of the tall (40 U) racks in the following sections:

- “Overview” on page 69
- “40U Rack” on page 70
- “Technical Specifications” on page 72

### Overview

At the time this document was published only the tall (40U) rack shown in Figure 4-1 was approved for use with the Silicon Graphics Prism Extreme system.

## 40U Rack

The rack (shown in Figure 4-1 on page 71) has the following features and components:

- **Cable entry/exit area** located in the rear floor of the rack. All cables are attached to the rear of the bricks. The rack is mounted on four casters; the two rear casters swivel. The base of the rack has leveling pads, a ground strap, and seismic tie-downs.

The rack also has cable entry/exit areas at the top, bottom, and sides of the rack. I/O and power cables pass through the bottom of the rack. NUMALink cables pass through the top and sides of the rack. Cable management occurs in the rear of the rack.

- **One, two, or three power bays**, depending on your computing needs. Each power bay in a compute rack will typically have three to six power supplies. Each power bay in an I/O rack will typically have one to three power supplies.
- **One, two, or three power distribution units (PDUs)** per rack, depending on the number of power bays. A PDU can be a single-phase power or three-phase power distribution unit.



**Figure 4-1** Prism Extreme Tall (40U) Rack

## Technical Specifications

Table 4-1 lists the technical specifications of the tall rack.

**Table 4-1** Tall Rack Technical Specifications

<b>Characteristic</b>	<b>Specification</b>
Height	74.25 in. (1886 mm)
Width	30.88 in. (784 mm)
Depth	53 in. (1346 mm)
Weight (empty)	425 lb (192.78 kg)
Weight (maximum)	1400 lb (635 kg)

## **XG2N Graphics Module and CPU Expansion Module**

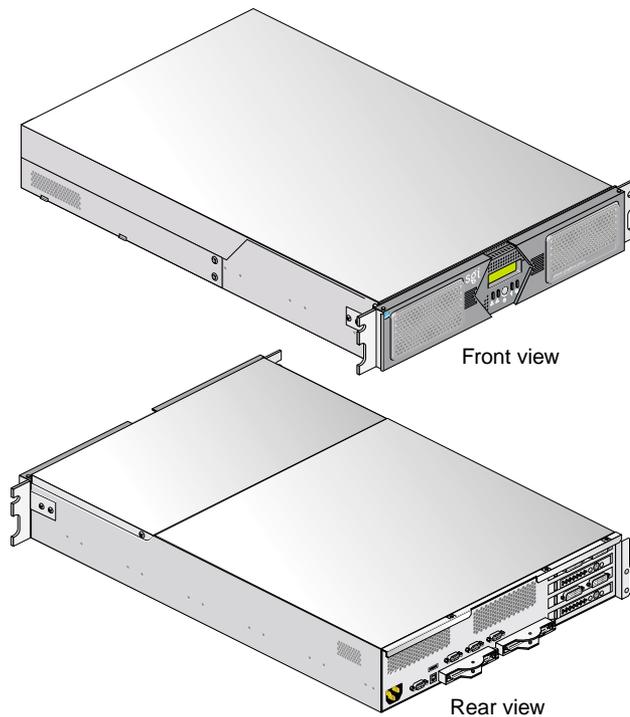
Each XG2N graphics module provides two graphics pipes to the Silicon Graphics Prism Visualization System, as well as providing up to two additional CPUs and additional memory.

The CPU expansion module has the same 2U form-factor as the XG2N module, but adds CPUs and memory without graphics pipes.

## XG2N Module

The XG2N graphics module (see Figure 5-1) is a 2U AC-powered device that consists of the following:

- Two graphics pipes
- Zero or two Intel Itanium 2 processors (each with integrated L1, L2, and L3 caches)
- Between 0 GB and 24 GB of local DIMM memory (4, 8, or 12 DIMMs)
- One L1 controller that provides the following services:
  - Controls and sequences power
  - Controls and monitors the environment
  - Initiates a reset
  - Stores identification and configuration information



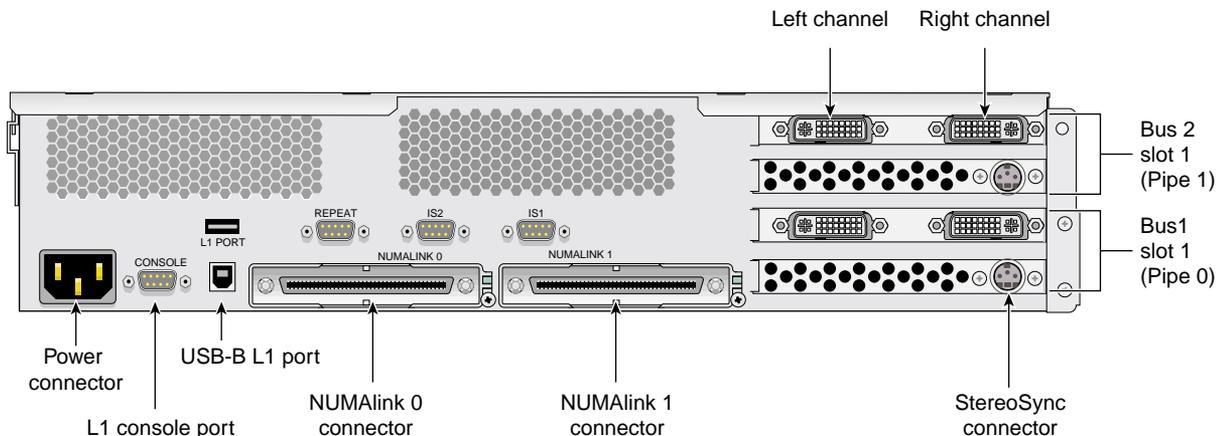
**Figure 5-1** Front and Rear Views of XG2N Module

The XG2N module is a 2U rack-mountable enclosure which, in addition to the two high-performance graphics pipes, adds to the host system a node board with two CPUs and four, eight, or twelve memory DIMMs. This module connects as an integral part of the system's compute/memory fabric. Though it contains CPUs and memory, the XG2N module does not have boot I/O functionality, and therefore may not be used as a standalone system.

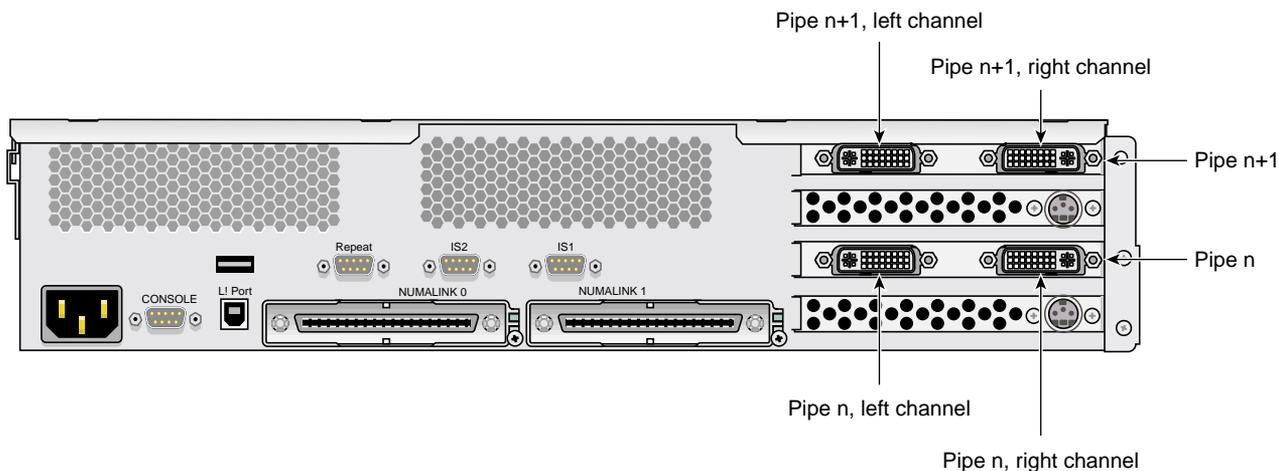
The rear panel of the XG2N module with FireGL X2PRO-256 is shown in Figure 5-2 on page 76. The rear panel of the XG2N module with FireGL X3-256 is shown in Figure 5-4 on page 77.

The XG2N module is a node-connected module, and therefore connects to the host system using NUMALink. This way the XG2N module becomes an integral part of the system, and can contain both CPUs and memory, in addition to graphics output capabilities.

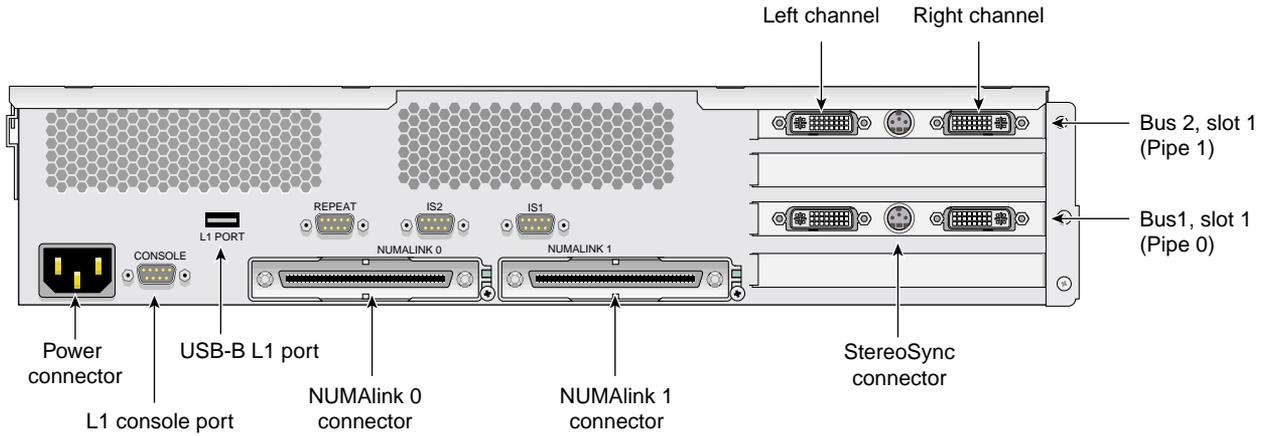
Each XG2N module contains two graphics pipes, each capable of supporting two display devices. In systems with only two pipes, the pipe and channel designations are defined as in Figure 5-2 and Figure 5-4. In systems with more than one XG2N graphics module the pipes are numbered as shown in Figure 5-3 and Figure 5-5.



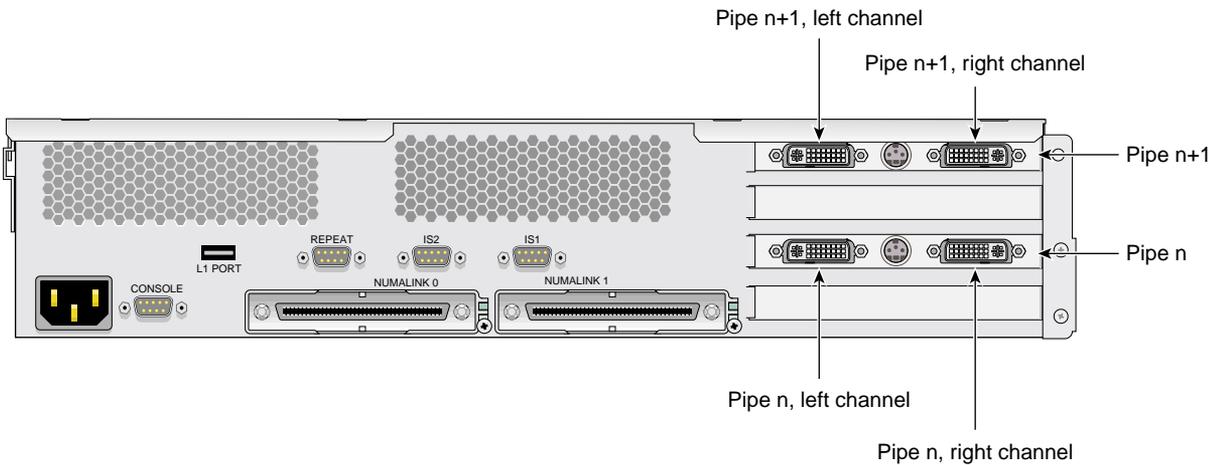
**Figure 5-2** Rear View of XG2N Graphics Module with FireGL X2PRO-256 (Showing First Module Pipe Numbering)



**Figure 5-3** Pipe Numbering of Additional XG2N Graphics Modules with FireGL X2PRO-256



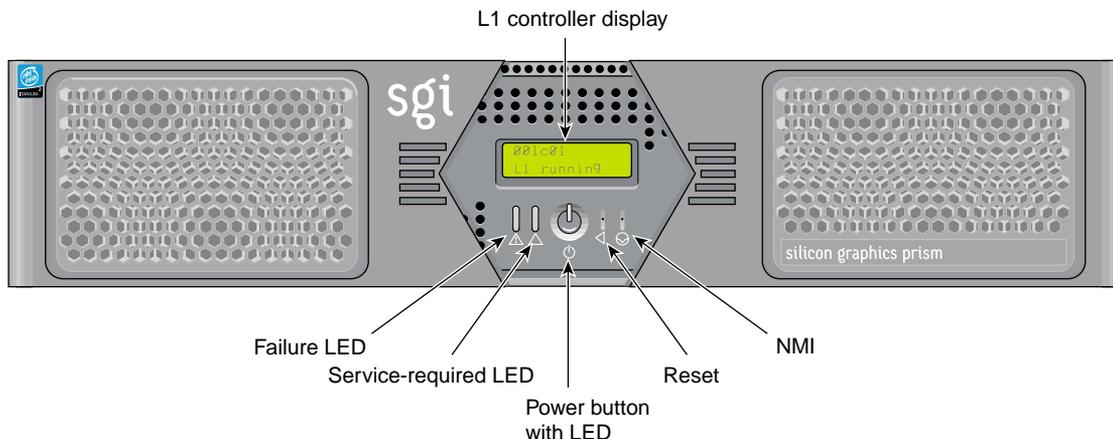
**Figure 5-4** Rear View of XG2N Graphics Module with FireGL X3-256 (Showing First Module Pipe Numbering)



**Figure 5-5** Pipe Numbering of Additional XG2N Graphics Modules with FireGL X3-256

## Front Panel Controls

This section describes the front panel controls and indicators of the XG2N module as shown in Figure 5-6.



**Figure 5-6** Silicon Graphics Prism XG2N and Compute Module Front Panel Controls

The front panels of the modules have the following controls:

- **L1 controller display.** A liquid crystal display (LCD) that shows status and error messages generated by the L1 controller.

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**Note:** Refer to the *SGI L1 and L2 Controller Software User's Guide (007-3938-00x)* for more information on the L1 controller.

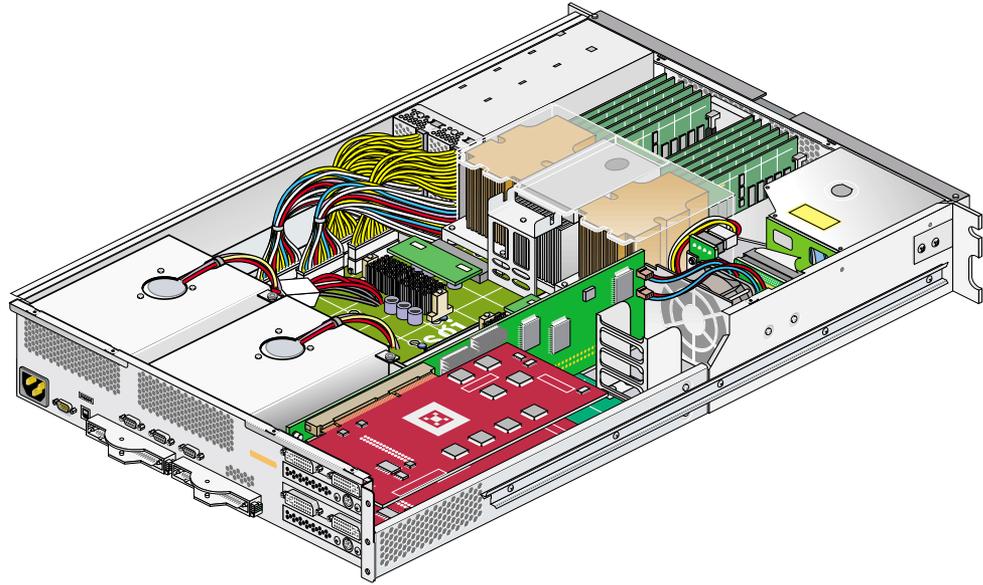
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- **Status LEDs.** The front panel has the following LEDs:
  - **Power-button LED.** This green LED illuminates when the internal components are on.
  - **Service-required LED.** This amber LED illuminates to indicate that an item is not functioning properly (for example, a fan is off), but the system is still operating.
  - **Failure LED.** This red LED illuminates to indicate that a failure has occurred and the system or module has shut down.

- **Power button.** Press this button to power on the individual module. Alternatively, you can power on all the system modules at once from an optional system console.
- **Reset button.** Press this button to reset the internal processors and ASICs. The reset will cause a memory loss.
- **NMI button.** Pressing this button issues a non-maskable interrupt command to a module. When the system hangs, you can send the affected module an NMI interrupt. The interrupt goes to PROM and causes the CPU state to be captured for that module. This information is saved in flash PROM and in the system log, and can assist SGI technicians in debugging system hangs and customer problems.

## Internal Components

Figure 5-7 shows an internal view of the XG2N module.



**Figure 5-7** Silicon Graphics Prism XG2N Module Internal View

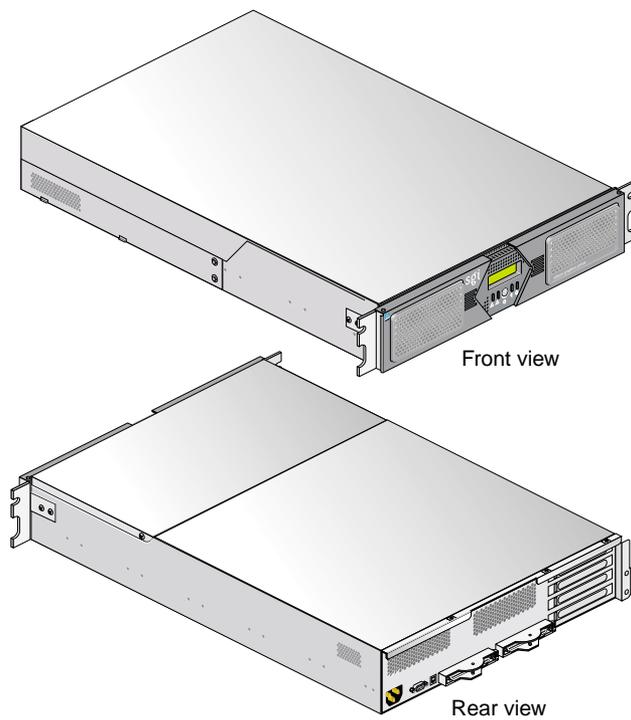
## CPU Expansion Module

The CPU expansion module is a 2U AC-powered device that consists of the following:

- Zero, one, or two Intel Itanium 2 processors (each with integrated L1, L2, and L3 caches)
- Between 2 GB and 24 GB of local DIMM memory (4, 8, or 12 DIMMs)
- One L1 controller that provides the following services:
  - Controls and sequences power
  - Controls and monitors the environment
  - Initiates a reset
  - Stores identification and configuration information

Figure 5-8 shows the front and rear views of a CPU expansion module.

The front panel controls of the CPU expansion module are the same as those shown for the XG2N graphics module, shown in Figure 5-6.



**Figure 5-8** Front and Rear Views of CPU Expansion Module

## Cabling XG2N Modules

Two types of cabling are unique to the XG2N graphics module and are described in this section. These are:

- “Optional SGI ImageSync Cabling” on page 83
- “Connecting a Monitor” on page 85

### Optional SGI ImageSync Cabling

If your system was shipped from SGI with the SGI ImageSync (IS) cables pre-installed, you should proceed to the next section, “Connecting a Monitor” on page 85, and continue with the setup.

---

**Note:** When using an ImageSync card a monitor must be connected to the left channel of the first pipe to which the ImageSync card is cabled.

---

If your system did not come with SGI ImageSync cables pre-installed, use the following steps to install them:

1. Connect the DB9 connector on the IS card in your base compute module to the SGI ImageSync DB9 connector (labeled **IS1**) located above the **NUMAlink 1** connector on the back of the XG2N using an SGI ImageSync DB9-to-DB9 cable.
2. Daisy-chain the SGI ImageSync cable from this first XG2N to any additional graphics modules in your system by connecting an ImageSync DB9-to-DB9 cable from the **Repeat** connector (located above the **NUMAlink 0** connector) and routing it to the ImageSync connector (labeled **IS1**) on the back of the next XG2N graphics module, as shown in Figure 5-9.

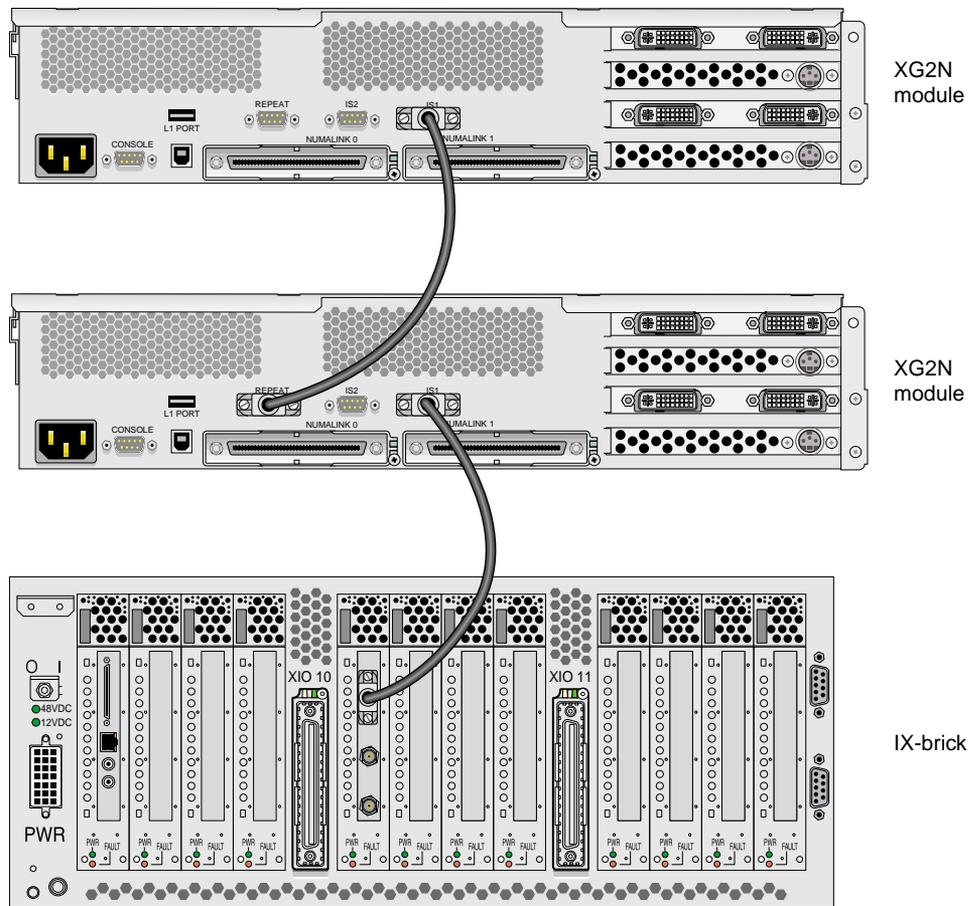


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**Caution:** Although the image sync subsystem uses DB-9 connectors, these connectors, whether on the ImageSync card or on the XG2N modules, are not serial ports. Connecting a serial device to these connectors may cause damage to both the ImageSync devices and the serial devices.

---

**Note:** Figure 5-9 is intended only to show an example of how the ImageSync cables connect. Your system may be configured differently.



**Figure 5-9** Cabling Example of SGI ImageSync Card to Graphics

## Connecting a Monitor

Select the monitor on which you want the Linux OS console to appear, and connect this monitor to the left channel of pipe 0 on your graphics module. The connector for the left channel of pipe 0 is located in the lower left section of the PCI graphics area on the back of your primary system graphics module. See Figure 5-2 for reference.

If you have a single XG2N graphics module, pipe 0 will be located in that module.

If you have multiple XG2N graphics modules, pipe 0 will typically be in the XG2N module located closest to the bottom of the first rack. The Silicon Graphics Prism platform comes with a choice of optional monitor types and sizes.



---

**Caution:** Ensure that the electrical rating on the monitor label matches the outlet voltage range (100–120 VAC or 220–240 VAC) before you plug in the monitor.

---

If you use a monitor in locations that do not have the appropriate outlets, contact your SGI system support engineer (SSE) before plugging in the monitor power cable.

Plug in and turn on your monitor or display as described in the documentation that accompanies your monitor.



## CR-brick

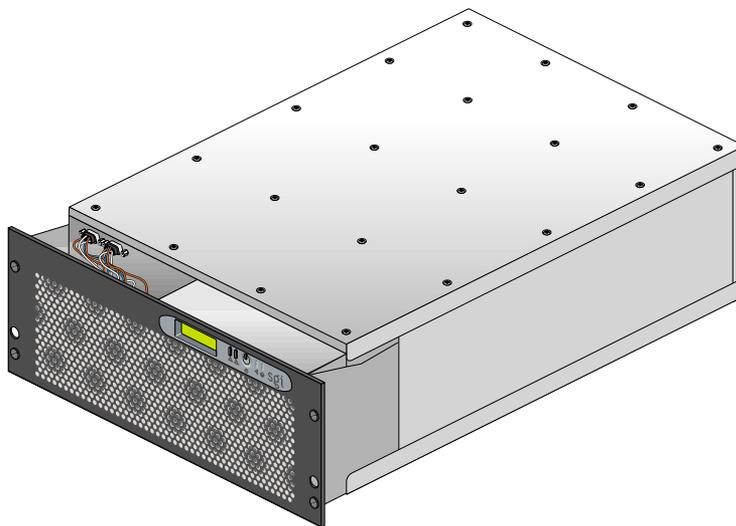
This chapter describes the function and physical components of the CR-brick in the following sections:

- “Overview” on page 88
- “External Components” on page 91
- “Internal Components” on page 95
- “Pinouts” on page 95
- “Product Options” on page 96
- “Important Notes” on page 96
- “Technical Specifications” on page 97

## Overview

The CR-brick is a 4U-high enclosure that contains the compute and memory functionality for the Silicon Graphics Prism system. Figure 6-1 on page 88 shows a front and side view of the CR-brick.

The CR-brick is divided into separate nodes that are connected internally by high-speed NUMALink channels. Each node has two 64-bit processors and 12 memory DIMM slots connected to a custom-designed application-specific integrated circuit (ASIC). This ASIC is the heart of the CR-brick, and it provides an intelligent interface between the processors, memory, network fabric, and peripheral I/O.



**Figure 6-1** Front and Side View of CR-brick

The CR-brick has the following features:

- Up to eight 64-bit RISC processors (two processors per node)
- Large secondary caches (on each processor)
- Up to 48 memory DIMM slots (12 slots per node)
- Up to eight internal NUMAlink channels (two per node)
- Up to eight external NUMAlink channels (two per node)
- Two 1.2-GB/s (each direction) Xtown2 I/O channels
- One USB port for system controller support
- One serial console port
- One L1 controller and LCD display
- Three hot-pluggable fans

Figure 6-2 shows a block diagram of the CR-brick.

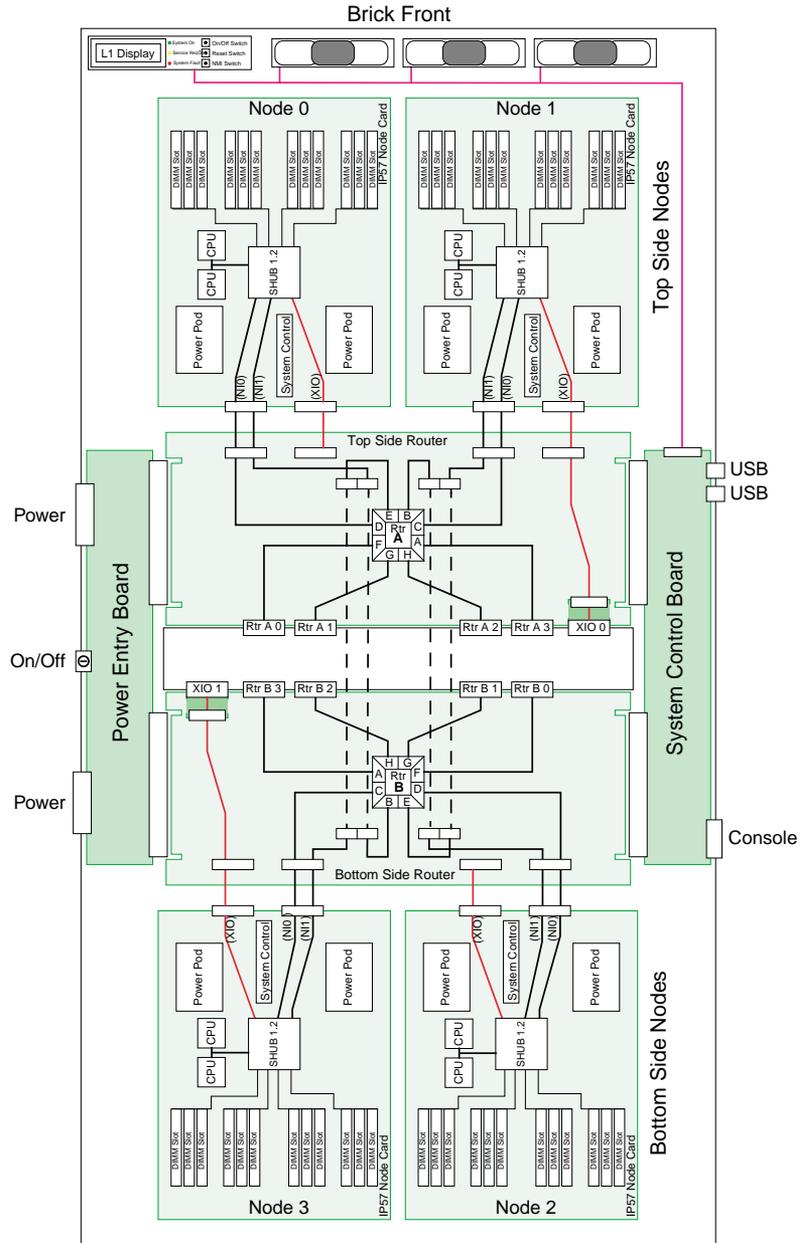


Figure 6-2 CR-brick Block Diagram

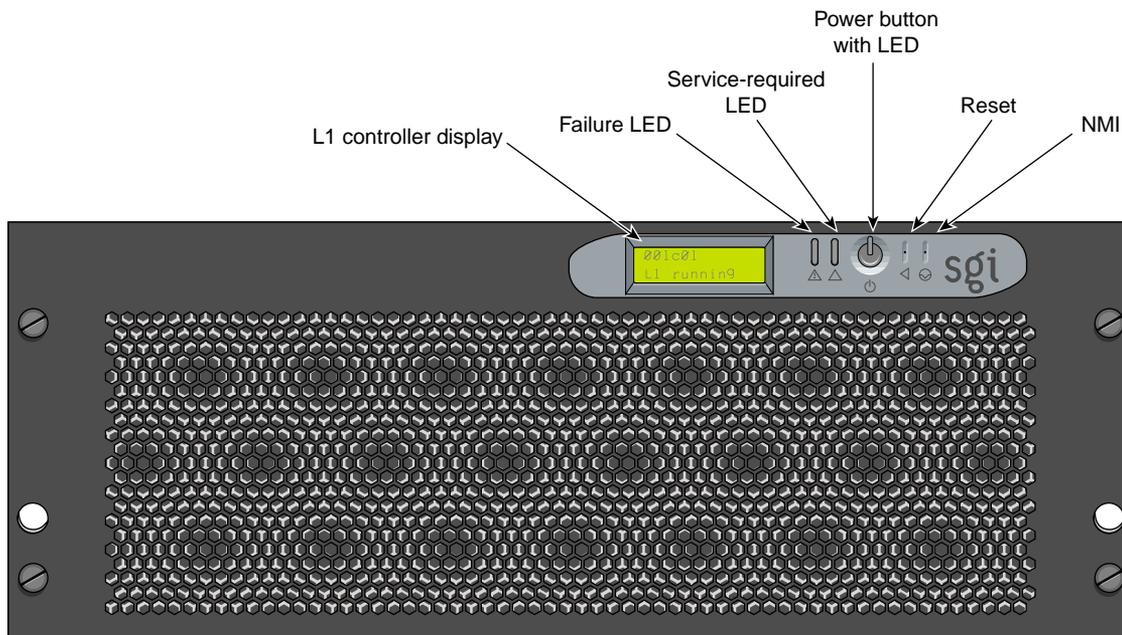
## External Components

This section describes the external components located on the front and rear panels of the CR-brick.

### Front Panel Components

The CR-brick contains the following front panel items (see Figure 6-3 on page 92):

- Three hot-pluggable fans.
- L1 controller display. The display is a 55.7 mm X 32mm backlit liquid crystal display (LCD) that displays system messages. It will display two lines with a maximum of 12 characters on each line.
- On/Off switch with LED. Press this switch to turn on the CR-brick internal components. You can also turn these on at a system console.
- L1 controller switches and LEDs:
  - **On/Off LED.** This LED illuminates green when the CR-brick internal components are on and turns off when they are off.
  - **Service required LED.** This LED illuminates orange to indicate that an item is broken or not operating properly (for example, a fan is off), but the CR-brick is still operating.
  - **Failure LED.** This LED illuminates red to indicate that a system failure has occurred and the CR-brick system is down.
  - **Reset switch.** Press this switch to reset the internal processors of the CR-brick. All register values will be reset to their default states and the operating system will be rebooted. (See the non-maskable interrupt [NMI] to perform a reset without losing the register data.)
  - **Non-maskable interrupt [NMI] switch.** Press this switch to force the CR-brick into power-on diagnostics (POD) mode. The PROM saves the register state for each CPU. On the next reboot, the operating system retrieves the information from PROM and logs it in the system log. SGI service personnel can also perform an error dump or other maintenance action before rebooting the partition. The NMI command is necessary to troubleshoot a system.



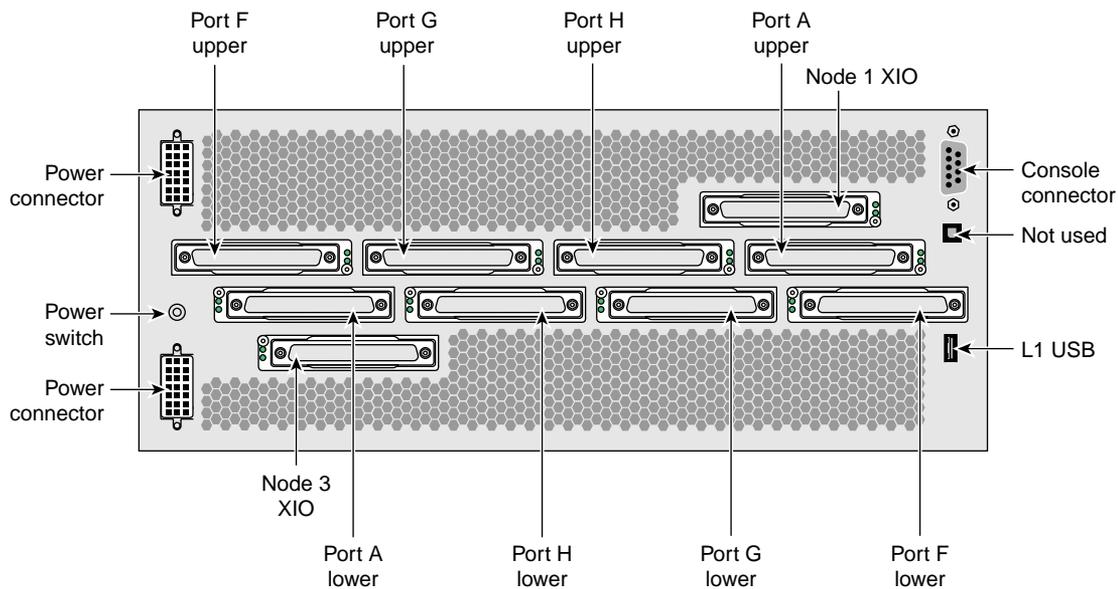
**Figure 6-3** Front View of CR-brick

## Rear Panel Components

The CR-brick has the following rear panel items (see Figure 6-4):

- **Power switch.** Move the power switch to the **1** position to power on the L1 controller within the CR-brick, and to the **0** position to power off the L1 controller. Powering on the L1 controller illuminates the 12-VDC LED green.
- **Two PWR (power) connectors.** These connect the CR-brick to the power bay, to provide 12-VDC and 48-VDC power to the CR-brick.
- **48-VDC and 12-VDC LEDs.** The power switch must be in the ON (**1**) position for these LEDs to be on. The 12-VDC LED illuminates green when the L1 controller is powered on and operating, and the 48-VDC LED illuminates green when the rest of the CR-brick internal components are powered on and operating. You can power on the internal components by pressing the On/Off switch (brick reset button) on the L1 controller panel.
- **NUMAlink connectors A, F, G, H (or Network Interface (NI) connectors).** These upper and lower connectors attach the CR-brick to an R-brick or to other CR-bricks. These are connected with a NUMAlink cable at 3.2 GB/s in each direction.
- **Heartbeat LEDs.** The four heartbeat LEDs turn on and off at a preset rate when the Linux operating system is running. The heartbeat LEDs indicate that the processor is functioning and can process an interrupt from the operating system. The LEDs for each node are arranged in pairs. The lower LED represents the processor 0 heartbeat, and the upper LED represents the processor 1 heartbeat.
- **Node 1 and Node 3 XIO (II - I/O Interface) connectors.** These Xtown2 connectors connect a CR-brick to an IX-brick or PX-brick. These are connected with a NUMAlink cable at 1.2 GB/s in each direction.
- **Console connector.** This is an RS-232 serial port (console and diagnostic port) that connects the L1 controller within a CR-brick to a system console. The CR-brick L1 controller communicates with a system console through the console connector, which provides a serial bus that uses the standard RS-232 protocol.
- **L1 host port connector.** This universal serial bus (USB) connector connects to the L1 controller.
- **Processor status LEDs.** The 32 processor status LEDs (8 for each processor) are used by SGI service engineers for diagnostic purposes.
- **Link and XIO connector LEDs.** Each connector has an LED that illuminates yellow and an LED that illuminates green. One LED illuminates yellow to indicate that both the CR-brick and the brick to which it is connected are powered on. The other

LED illuminates green when the link between the CR-brick and the other brick is established.



**Figure 6-4** Rear View of CR-brick

## Internal Components

The node electronics are connected internally to two NL4 router ASICs. Each of the two router ASICs connects to four Dnet connectors on the rear panel of the CR-brick (8 total Dnet connectors). Two XIO ports from the node boards (node 1 and node 3 are brought out to the rear of the brick. Each node board contains two processors and 4, 8, or 12 memory DIMMs. The processors, memory, I/O, and network connections on each node board are interconnected via a SHub ASIC. This ASIC acts as a crossbar between the processor interface, local memory interface, network interface, and I/O interfaces.

---

**Note:** The internal components of the CR-brick can be serviced only by trained SGI technicians.

---

### Processors

Eight 64-bit Intel Itanium 2 processors with secondary cache are mounted on half panel printed circuit boards (referred to as node boards). To reduce memory latency, each processor can access three levels of on-chip cache memory. L3 cache sizes and types vary with processor speed.

### Memory DIMMs

The Silicon Graphics Prism system uses commodity off-the-shelf memory DIMMs. The DIMM card is a JEDEC standard 184-pin card.

### Pinouts

See “I/O Port Specifications” on page 262 for pinout specifications for the non-proprietary connectors on the CR-brick.

## Product Options

See Table 6-1 for configurable items in the CR-brick.

**Table 6-1** Configurable Items of CR-brick

Configurable Item	Options
Memory size	4, 8, or 12 DIMMs per node
Processors	0 or 8 per CR-brick

---

**Note:** A CR-brick with 0 processors on the internal node boards is generally referred to as a “memory only” brick or M-brick.

---

## Important Notes

The CR-brick has the following restrictions:

- All processors within the CR-brick must be the same frequency; however, CR-bricks within a partition or system can have different processor speeds.
- All processor revisions must be the same within a processor node.
- The processor revisions of CPUs between processor nodes can be no greater than  $n+1$ .
- All memory DIMMs within a memory bank (group) must be the same speed, capacity, and use the same chip technology.
- Different logical banks within a CR-brick can have different DIMM capacities and chip technologies.
- Memory DIMMs must be added in groups of four DIMMs per node board.

## Technical Specifications

Table 6-2 lists the technical specifications of the CR-brick.

**Table 6-2** CR-brick Technical Specifications

<b>Characteristic</b>	<b>Specification</b>
Height	6.67 in. (16.9 cm)
Width	19 in. (49.26 cm)
Depth	29 in. (73.66 cm)
Weight	68 lb (30.9 kg) maximum
Input power	48 VDC (~1300 W)



## IX-brick

The IX-brick is an I/O expansion subsystem that connects I/O devices to your system by using either the PCI or PCI-X protocol. The PCI-X protocol enables I/O devices to operate at clock speeds of up to 133 MHz, or 1 Gbit/s. This protocol also enables I/O devices to operate more efficiently, thereby providing a higher sustained bandwidth at any clock frequency. By supporting this protocol, the IX-brick addresses the need for increased bandwidth of PCI devices.

The IX-brick also has the components (disk drives and DVD-ROM) that are required to run your operating system or install other software applications or upgrades.

This chapter describes the function and physical components of the IX-brick, and it describes how to install and replace PCI cards and disk drives. Specifically, it includes the following information:

- “Product Overview” on page 100
- “External Components” on page 104
- “PCI and PCI-X Card Configuration Guidelines” on page 108
- “Technical Specifications” on page 111

---

**Note:** Throughout this chapter, the term “PCI card” refers to cards with PCI or PCI-X capabilities. When necessary, distinctions between the cards are noted.

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**Note:** For information about installing or replacing a PCI card, see “Adding or Replacing a PCI or PCI-X Card” on page 165.

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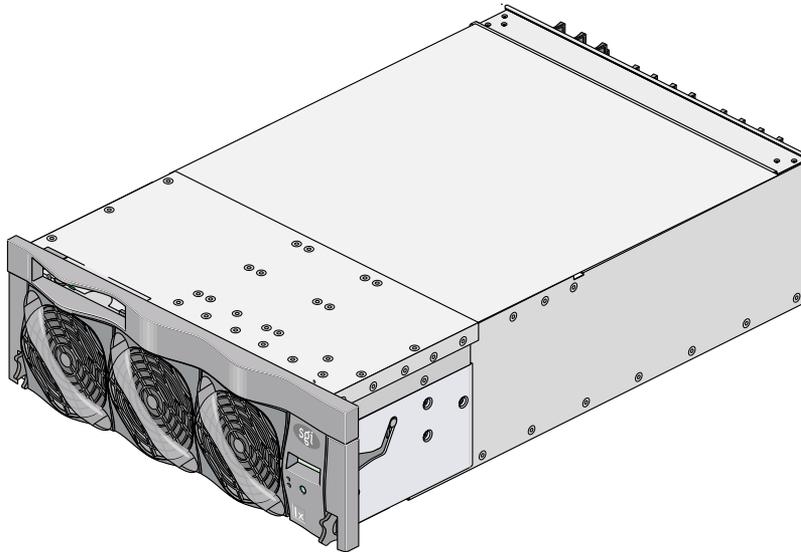
## Product Overview

The 4U-high IX-brick, shown in Figure 7-1, provides 12 PCI-X slots that support up to 12 PCI or PCI-X cards. The 12 slots are configured as six 2-slot buses.

---

**Note:** You can install PCI cards in 11 of the 12 PCI slots. One PCI-X slot (the left-most slot) is reserved for a base I/O PCI card. This card is required for the base I/O functions, including system disk(s) and DVD-ROM, Ethernet interface, and serial connections.

---



**Figure 7-1** Front View of the IX-brick

The IX-brick offers the following features:

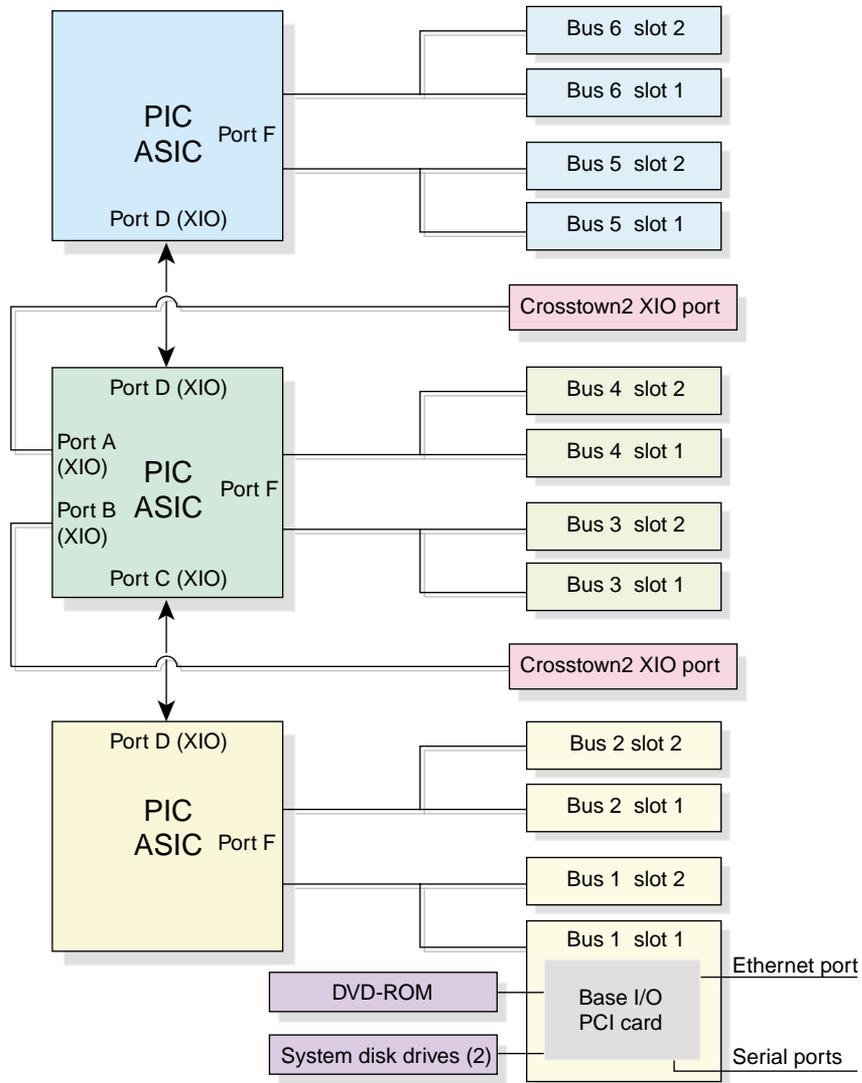
- The IX-brick supports both PCI and PCI-X cards.
- The IX-brick can have up to four serial ports supported by the base I/O card. Additional optional serial ports reside on a daughtercard that you can purchase as an optional component.

---

**Note:** The serial-port daughtercard requires the space of one PCI-X slot, but it does not connect to the PCI-X bus.

---

Three PIC (PCI interface chip) ASICs are key components of the IX-brick architecture. These ASICs support two 1200- or 800-MB/s Xtown2 XIO ports and six PCI-X buses (see Figure 7-2). Each bus has two card slots in which you can install PCI cards. (Slot 1 of bus 1, however, seats the base I/O card only.) For best base I/O performance, leave the PCI slot (bus 1 slot 2) next to the base I/O card empty, or install only a 66 MHz PCI card.



**Figure 7-2** IX-brick Block Diagram

Also important to the IX-brick architecture is the base I/O PCI card (“IO9 card”). This card contains logic that controls the DVD-ROM and internal system disk drives, and it provides the following connectors (see Figure 7-4):

- **Internal system disk connector** that connects to up to two internal disk drives.
- **Ethernet port** (10/100/1000 Mbps). This autonegotiating 10BaseT/100BaseT/1000BaseT twisted-pair Ethernet port connects the system to an Ethernet network.
- **External SCSI connector.** This 68-pin VHDCI external SCSI port enables you to connect your system to an external SCSI device.

For an updated list of supported SCSI devices, see the SGI Supportfolio at <http://support.sgi.com>.

- **Real-time interrupt input and output.** The RT interrupt input and RT interrupt output functionality of the IO9 PCI card is not supported under SGI Linux + ProPack. These connectors are not usable with this system.

## External Components

This section describes the external components that are located on the front and rear panels of the IX-brick.

### Front Panel Components

The IX-brick has the following front panel components (see Figure 7-3):

- **Two system disk drives.** These customer-removable, sled-mounted disk drives are used to house your operating system and other application software. (See “Installing or Replacing a Disk Drive in the IX-brick” on page 174) for instructions for installing or removing the SCSI disk drives.)
- **DVD-ROM device.** This device loads software onto your IX-brick. (It is used for text reading only in CD-ROM mode.)
- **L1 controller display.** This liquid crystal display (LCD) displays status and error messages that the L1 controller generates.

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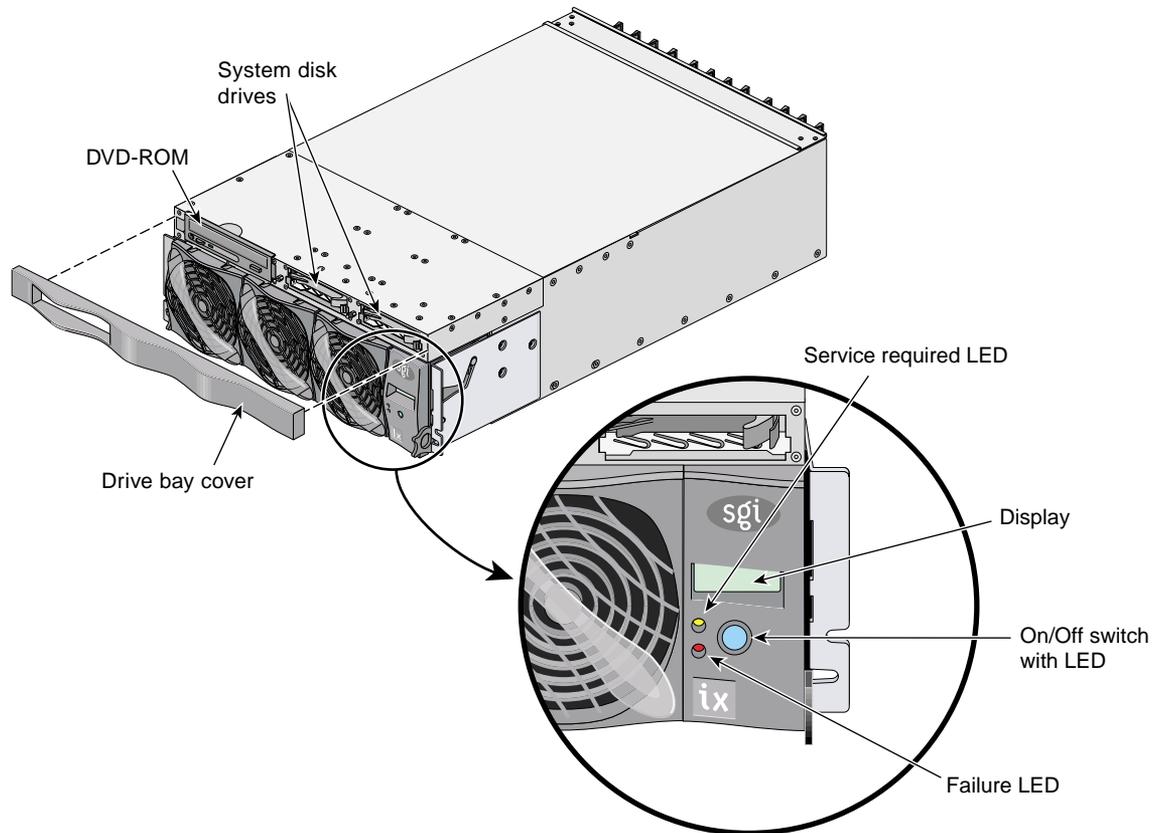
**Note:** For more information about the L1 controller, see the *SGI L1 and L2 Controller Software User's Guide*.

---

- **On/Off switch with LED.** Press this button to turn on the internal components of the IX-brick. Alternatively, you can turn on the internal components at a system console. When the internal components are on, the LED illuminates green.
- **LEDs:**
  - **On/Off switch LED.** This green LED illuminates when the internal components of the IX-brick are on and turns off when they are off.
  - **Service required LED.** This LED illuminates yellow to indicate that a component is broken or is not operating properly (for example, if a fan is off), but the IX-brick is still operating.
  - **Failure LED.** This LED illuminates red to indicate that a system failure has occurred and the IX-brick is not operating.
- **Fans.** Three hot-swappable fans provide the required cooling for your IX-brick.



**Warning:** To prevent personal injury, or damage to the IX-brick, the hot-swappable fans can be installed only by a trained SGI system support engineer (SSE).



**Figure 7-3** Front Panel of IX-brick

## Rear Panel Components

The IX-brick has the following rear panel components (see Figure 7-4):

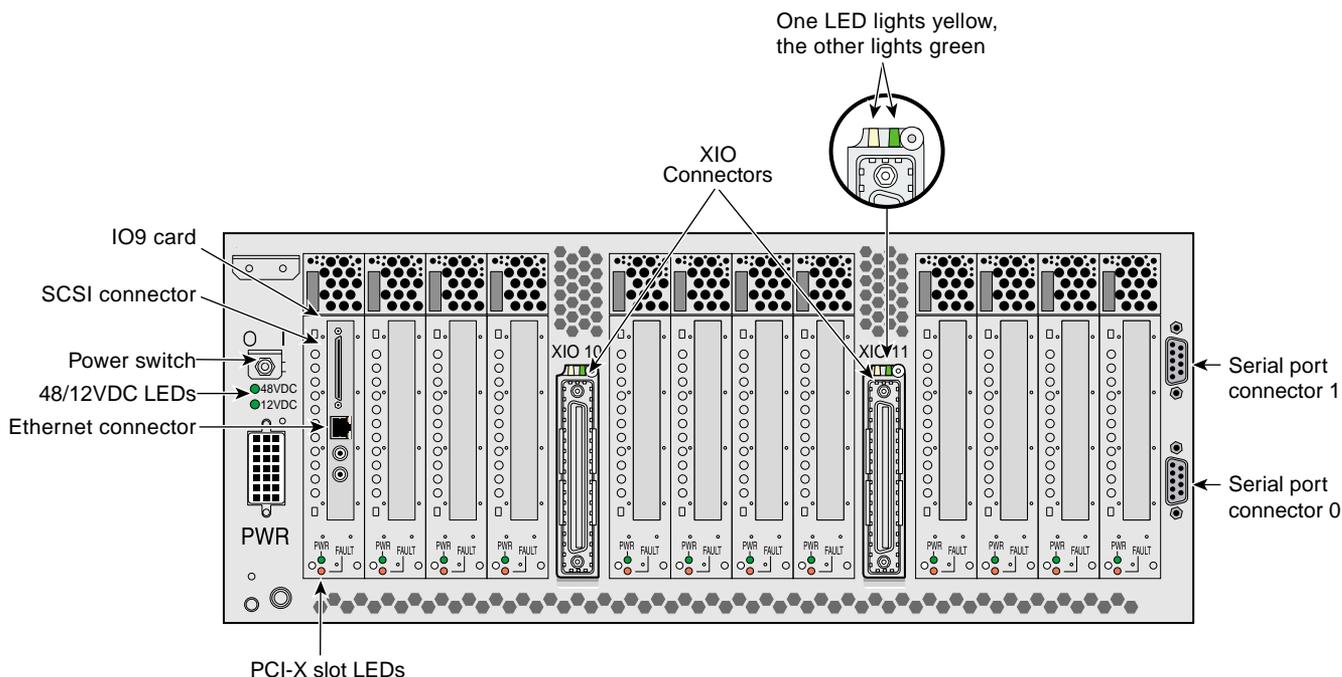
- **Power switch.** Moving the power switch to the **1** position powers on the L1 controller of the IX-brick, and moving it to the **0** position powers off the L1 controller. The 12-VDC LED illuminates green when the L1 controller is powered on.
- **12-VDC LED.** The 12-VDC LED illuminates green when the L1 controller is powered on and operating. The L1 controller is powered on by turning on the power switch.
- **48-VDC LED.** The power switch must be in the ON (1) position for this LED to light. The 48-VDC LED illuminates green when the rest of the IX-brick internal components are powered on and operating. The rest of the internal components are powered on by pressing the On/Off switch on the front panel of the brick, or via the L2 controller display or system console.
- **PWR (power) connector.** This connector connects to a power bay, which provides power to the IX-brick.
- **PCI-X slots.** These slots seat the PCI cards. See “Adding or Replacing a PCI or PCI-X Card” on page 165. The card slots are numbered bus 1 through bus 6. Each bus has two slots, labeled 1 and 2, as shown in Figure 7-4.
- **PCI-X slot LEDs.** Each PCI-X slot has the following LEDs:
  - **PWR (power) LED.** This LED illuminates green when the PCI card is installed securely and is getting power.
  - **Fault LED.** This LED illuminates yellow when a fault occurs with the PCI card.
- **XIO 10 and XIO 11 connectors.** Each connector can connect the IX-brick to one C-brick. As an option, the second connector can be connected to another C-brick to create a dual-ported IX-brick, which would provide greater bandwidth.
- **XIO 10 and XIO 11 connector LEDs.** Each XIO connector has two LEDs, as follows:
  - The yellow LED illuminates to indicate that both the IX-brick and the brick to which it is connected are powered on.
  - The green LED illuminates when a link has been established between the IX-brick and the brick to which it connects.
- **Two DB-9 RS-232 serial port connectors.** These ports can be used as COM ports to connect to serial devices. They require the presence of the base I/O card.

The leftmost PCI-X slot (bus 1, slot 1) seats a base I/O card that has the following connectors:

- **External SCSI connector.** This 68-pin VHDCI external SCSI port enables you to connect your system to an external SCSI device.

For an updated list of supported SCSI devices, see the SGI Supportfolio at <http://support.sgi.com>.

- **Ethernet RJ45 connector.** This autonegotiating 10/100/1000BaseT Ethernet port connects the system to an Ethernet network.
- **RTO and RTI stereo jack connectors (Not used).** The RTO (output) and RTI (input) connectors are not supported under the current SGI Linux ProPack release.



**Figure 7-4** Rear Panel of IX-brick

## PCI and PCI-X Card Configuration Guidelines

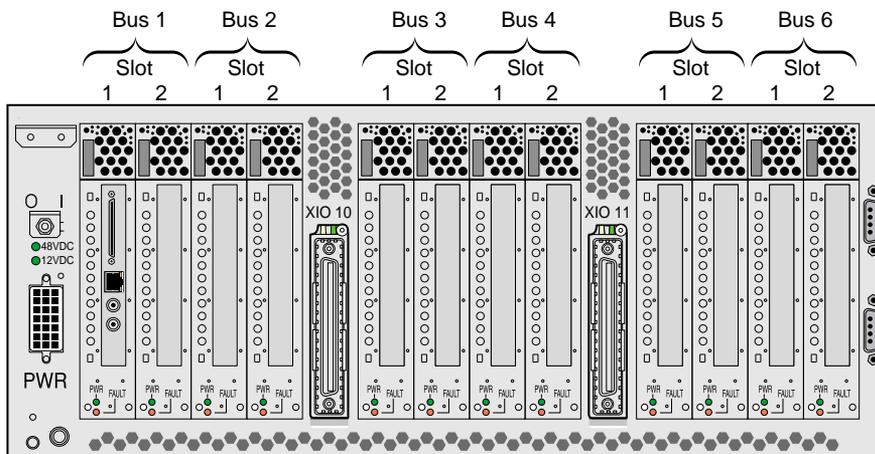
The PCI-X slots are numbered bus 1 through bus 6. Each bus has two slots, labeled 1 and 2, as shown in Figure 7-5. Separate buses enable the IX-brick to run cards of different frequencies at the same time. For example, bus 1 can have one 133-MHz card, bus 2 can have two 66-MHz cards, bus 3 can have two 33-MHz cards, and so on.

The PCI-X bus supports 32-bit and 64-bit PCI or PCI-X cards at the same time.

For maximum bandwidth, PCI cards are distributed across all six buses when they are integrated at the factory.

This section contains the following information:

- “Important Installation Considerations” on page 109
- “Supported PCI Cards” on page 110
- “PCI Card Carrier” on page 110



**Figure 7-5** Numbering of IX-brick PCI-X Slots

## Important Installation Considerations

To maximize the operating efficiency of the PCI cards, consider the following configuration guidelines before you install the cards.

- You can place one or two PCI cards on one bus, or one or two PCI-X cards on one bus.
- You should avoid mixing cards that operate at different frequencies or in different modes. If you have two cards of different speeds on the same bus, both cards operate at the lower speed. If a PCI card and PCI-X card are on the same bus, both cards operate in PCI mode. Note the following examples:
  - When one 133-MHz PCI-X card resides on a bus, the card operates at 133 MHz in PCI-X mode.
  - When two 133-MHz PCI-X cards reside on a bus, the cards operate at 100 MHz in PCI-X mode.
  - When two 66-MHz PCI-X cards reside on a bus, the cards operate at 66 MHz in PCI-X mode.
  - When two 66-MHz PCI cards reside on a bus, the cards operate at 66 MHz in PCI mode.
  - When one 66-MHz PCI card and one 66 MHz PCI-X card reside on a bus, the cards operate at 66 MHz in PCI mode.
  - When two 33-MHz PCI cards reside on a bus, the cards operate at 33 MHz in PCI mode.
  - When one 66-MHz PCI card and one 33-MHz PCI card reside on the same bus, the cards operate at 33 MHz in PCI mode.

---

**Note:** When installing a PCI card, you need to shut down the operating system and power off the IX-brick before installing the card.

---

## Supported PCI Cards

SGI supports various PCI cards. These cards can be purchased from SGI or another manufacturer. Ask your SGI sales representative for a current list of PCI cards that SGI supports.

## PCI Card Carrier

Each PCI card is mounted on a carrier so that you can slide the cards into and out of the brick. This carrier supports most PCI cards; it can be adjusted to accommodate cards of different sizes. (To learn how to adjust a carrier, see “Adding or Replacing a PCI or PCI-X Card” on page 165.)

When the IX-brick is shipped, any card that was ordered is installed with a carrier, and any unoccupied slot is populated with an empty carrier. A carrier must be present in an unpopulated slot to maintain an even airflow through the brick and to protect against electromagnetic interference (EMI).

## Technical Specifications

Table 7-1 lists the physical specifications of the IX-brick.

**Table 7-1** Physical Specifications of the IX-brick

Characteristics	Specifications
Height	6.64 in. (168.65 mm)
Width	17.5 in. (444.5 mm)
Depth	27.74 in. (704.59 mm)
Weight	65 lb (29.5 kg)
Input Power	+48 VDC (250 watts)

Table 7-2 shows the port specifications of the IX-brick.

**Table 7-2** Port Specifications of the IX-brick

Port	Quantity	Connector Type
Power entry	One	21-pin Foxcon
XIO	Two	Proprietary 100-pin dual row

**The following external connectors are located on the base I/O card:**

SCSI connector	One external	68-pin VHDCI external
Ethernet	One	RJ-45
RT interrupt input and output	One input and one output - (not used)	Stereo jack (not supported under SGI ProPack for Linux)



## PX-brick

The PX-brick is an optional PCI-X based I/O expansion subsystem that connects I/O devices to your system. The PX-brick supports both PCI and PCI-X protocol. PCI-X protocol enables I/O devices to operate at clock speeds of up to 133 MHz, or 1 Gbit/s. This new protocol also enables I/O devices to operate more efficiently, thereby providing a higher sustained bandwidth at any clock frequency.

This chapter describes the function and physical components of the PX-brick, and it provides guidelines for configuring PCI cards in the brick. Specifically, it includes the following information:

- “Product Overview” on page 114
- “External Components” on page 116
- “PCI and PCI-X Card Configuration Guidelines” on page 120
- “Technical Specifications” on page 123

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**Note:** Throughout this chapter, the term “PCI card” refers to cards with either PCI or PCI-X capabilities. When necessary, distinctions between the cards are noted.

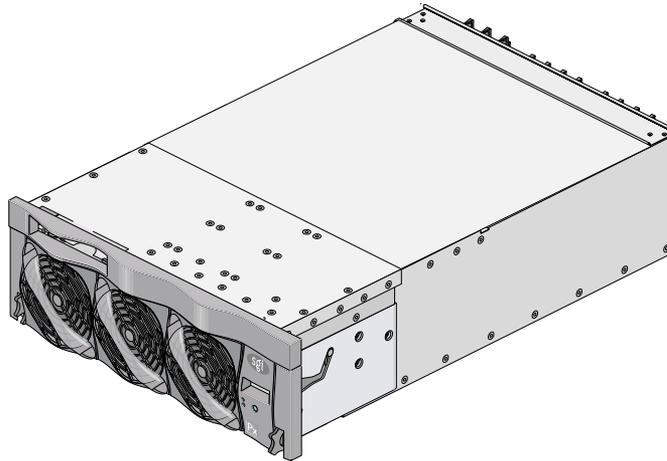
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For information about installing or replacing a PCI card, see “Adding or Replacing a PCI or PCI-X Card” on page 165.

## Product Overview

The 4U-high PX-brick shown in Figure 8-1 provides 12 card slots to support up to 12 PCI or PCI-X cards. The 12 slots are configured as six 2-slot buses.

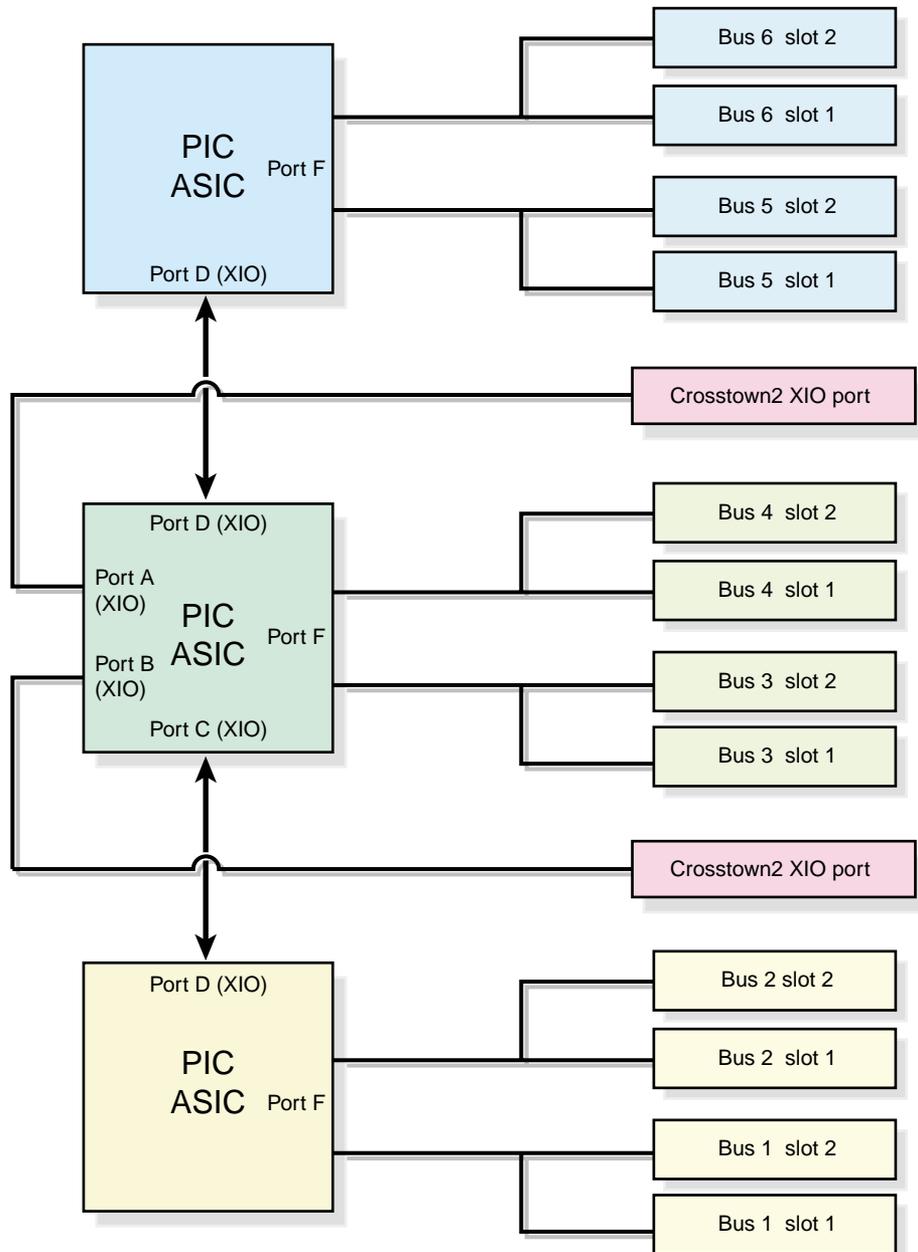
Figure 8-1 provides a front view of the PX-brick.



**Figure 8-1** Front View of the PX-brick

Three PIC (PCI interface chip) ASICs are key components of the PX-brick architecture. The PIC ASICs support the following (see Figure 8-2):

- Two 1200- or 800-MB/s Xtown2 XIO ports. (You can select the MB/s setting with the L1 controller command `XIO`. For more information, see the *SGI L1 and L2 Controller Software User's Guide*.)
- Six PCI/PCI-X buses. Each bus has two card slots in which you can install PCI or PCI-X cards.



**Figure 8-2** Block Diagram of PX-brick

## External Components

This section describes the external components located on the front and rear panels of the PX-brick.

### Front Panel Components

The following are the front panel components of the PX-brick (see Figure 8-3):

- **L1 controller and display.** The L1 controller generates PX-brick status and error messages that appear on the liquid crystal display (LCD).

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**Note:** For more information about the L1 controller, see the *SGI L1 and L2 Controller Software User's Guide*.

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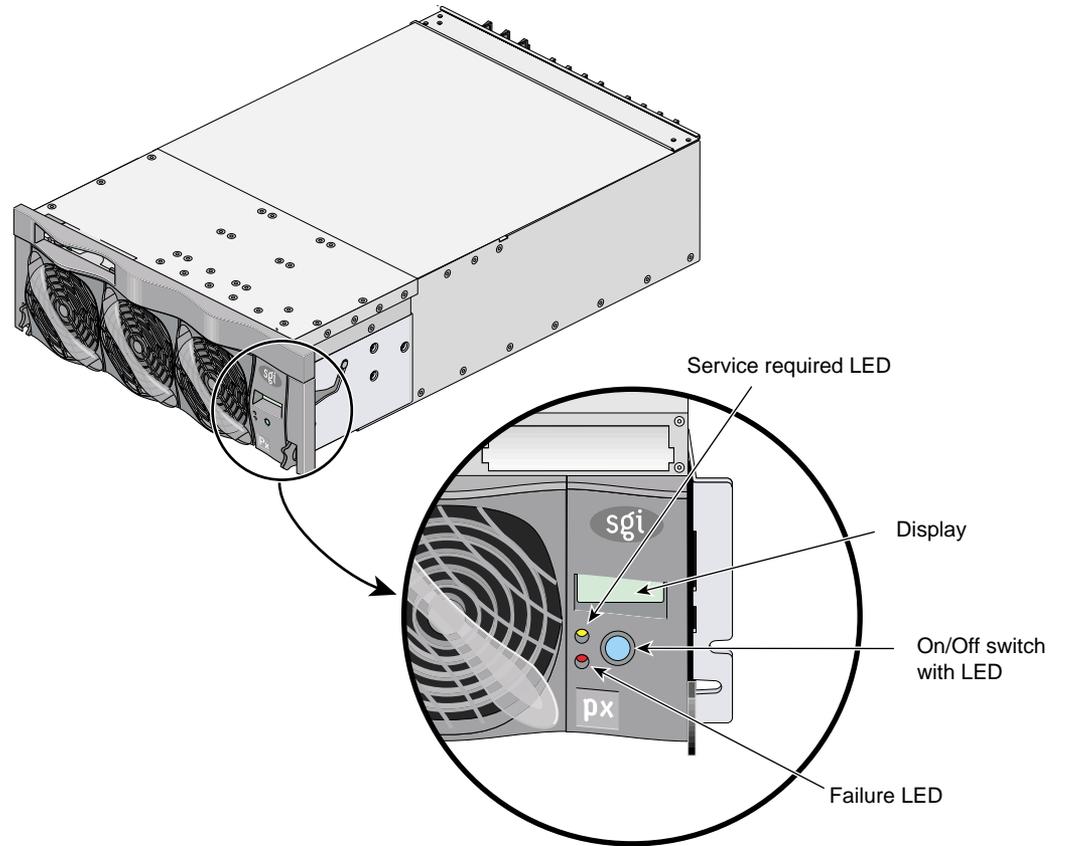
- **On/Off switch with LED.** Press this button to turn on the internal components of the PX-brick. Alternatively, you can turn on the internal components at an L2 controller display or at a system console. When the internal components are on, the LED illuminates green.
- **LEDs:**
  - **On/Off switch LED.** This green LED illuminates when the internal components of the PX-brick are on and turns off when they are off.
  - **Service required LED.** This LED illuminates yellow to indicate that a component is broken or is not operating properly (for example, if a fan is off), but the PX-brick is still operating.
  - **Failure LED.** This LED illuminates red to indicate that a system failure has occurred and the PX-brick is not operating.
- **Fans.** Three hot-swappable fans provide the required cooling for your PX-brick.



---

**Warning:** To prevent personal injury, or damage to the PX-brick, the hot-swappable fans can be installed only by a trained SGI system support engineer (SSE).

---



**Figure 8-3** Front Panel and Display on the PX-brick

## Rear Panel Components

The PX-brick has the following rear panel components (see Figure 8-4):

- **Power switch.** Moving the power switch to the **1** position powers on the L1 controller of the PX-brick, and moving it to the **0** position powers off the L1 controller. The 12-VDC LED illuminates green when the L1 controller is powered on.
- **12-VDC LED.** The 12-VDC LED illuminates green when the L1 controller is powered on and operating. The L1 controller is powered on by turning on the power switch.
- **48-VDC LED.** The power switch must be in the ON (1) position for this LED to illuminate. The 48-VDC LED illuminates green when the rest of the PX-brick internal components are powered on and operating. The rest of the internal components are powered on by pressing the On/Off switch on the front panel of the brick, or via the L2 controller display or system console.
- **PWR (power) connector.** This connector connects to a power bay, which provides power to the PX-brick.
- **PCI/PCI-X slots.** These slots support PCI or PCI-X cards. See “Adding or Replacing a PCI or PCI-X Card” on page 165. The card slots are numbered bus 1 through bus 6. Each bus has two slots, labeled 1 and 2, as shown in Figure 5-4.
- **PCI-X Slot LEDs.** Each slot has the following LEDs:
  - **PWR (power) LED.** This LED illuminates green when the PCI card carrier is installed securely and is getting power.
  - **Fault LED.** This LED illuminates yellow when a fault occurs with the PCI card.
- **XIO 10 and XIO 11 connectors.** Each connector can connect the PX-brick to one compute brick (CR-brick). As an option, the second connector can be connected to another compute brick to create a dual-ported PX-brick, which would provide greater bandwidth.
- **XIO 10 and XIO 11 connector LEDs.** Each connector has two LEDs, as follows:
  - The yellow LED illuminates to indicate that both the PX-brick and the compute brick to which it is connected are powered on.
  - The green LED illuminates when a link has been established between the PX-brick and the brick to which it connects.

Figure 8-4 shows the location of the rear panel components of the PX-brick.

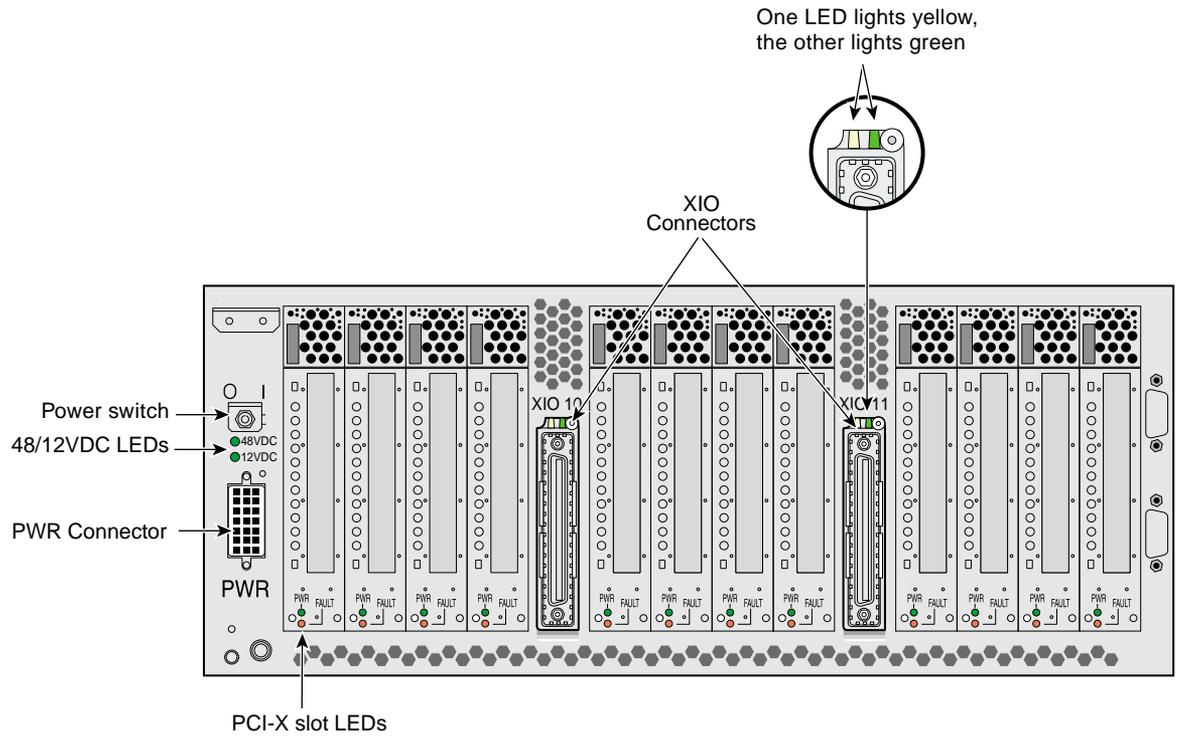


Figure 8-4 Rear Panel of the PX-brick

## PCI and PCI-X Card Configuration Guidelines

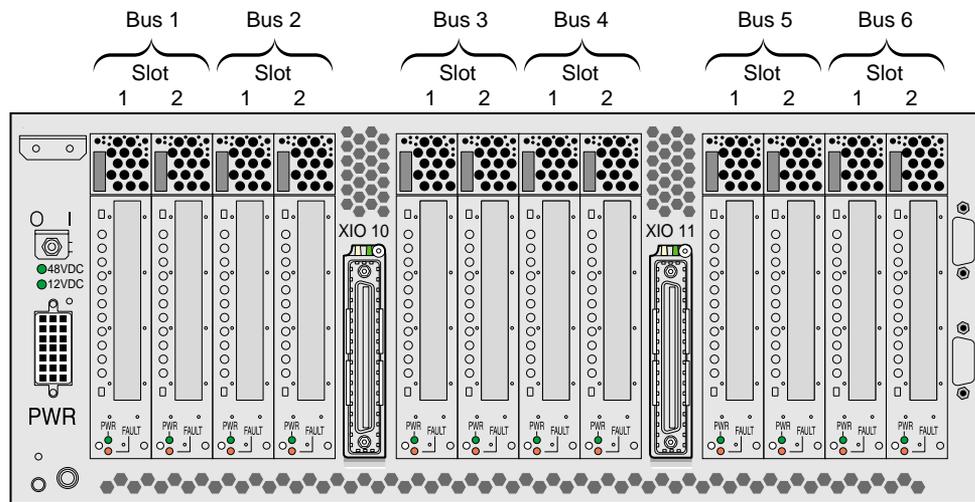
The PCI and PCI-X card slots on the motherboard are numbered bus 1 through bus 6. Each bus has two slots, labeled 1 and 2, as shown in Figure 8-5. Separate buses enable the PX-brick to run cards of different frequencies at the same time. As a result, the same PX-brick can run 133-MHz, 100-MHz, 66-MHz, and 33-MHz cards at the same time.

The PCI/PCI-X bus supports 32-bit and 64-bit PCI or PCI-X cards at the same time.

For maximum bandwidth, PCI/PCI-X cards are distributed across all six buses when they are integrated at the factory.

This section contains the following information:

- “Important Installation Considerations” on page 121
- “Supported PCI and PCI-X Cards” on page 122
- “PCI Card Carrier” on page 122



**Figure 8-5** Numbering of PCI and PCI-X Card Slots

## Important Installation Considerations

To maximize the operating efficiency of the PCI cards, consider the following configuration guidelines before you install the cards.

- You can place one or two PCI cards on one bus, or one or two PCI-X cards on one bus.
- You should avoid mixing cards that operate at different frequencies or in different modes. If you have two cards of different speeds on the same bus, both cards operate at the lower speed. If a PCI card and a PCI-X card are on the same bus, both cards operate in PCI mode. Note the following examples:
  - When one 133-MHz PCI-X card resides on a bus, the card operates at 133 MHz in PCI-X mode.
  - When two 133-MHz PCI-X cards reside on a bus, the cards operate at 100 MHz in PCI-X mode.
  - When two 66-MHz PCI-X cards reside on a bus, the cards operate at 66 MHz in PCI-X mode.
  - When two 66-MHz PCI cards reside on a bus, the cards operate at 66 MHz in PCI mode.
  - When one 66-MHz PCI card and one 66 MHz PCI-X card reside on a bus; the cards operate at 66 MHz in PCI mode.
  - When two 33-MHz PCI cards reside on a bus, the cards operate at 33 MHz in PCI mode.
  - When one 66-MHz PCI card and one 33-MHz PCI card reside on the same bus, the cards operate at 33 MHz in PCI mode.

---

**Note:** When installing a PCI card, you need to shut down the operating system and power off the PX-brick before installing the card.

---

## Supported PCI and PCI-X Cards

SGI supports various PCI and PCI-X cards. These cards can be purchased from SGI or another manufacturer. Ask your SGI sales representative for a current listing of PCI and PCI-X cards supported by SGI.

## PCI Card Carrier

Each PCI card is mounted on a carrier so that you can slide the cards into and out of the brick. This carrier supports most PCI cards; it can be adjusted to accommodate cards of different sizes. (To learn how to adjust a carrier, see “Adding or Replacing a PCI or PCI-X Card” on page 165.)

When the PX-brick is shipped, any card that was ordered is installed with a carrier, and any unoccupied slot is populated with an empty carrier. A carrier must be present in an unpopulated slot to maintain an even airflow through the brick and to protect against electromagnetic interference (EMI).

## Technical Specifications

Table 8-1 lists the physical specifications of the PX-brick.

**Table 8-1** Physical Specifications of PX-brick

Characteristic	Specification
Height	6.64 in. (168.65 mm)
Width	17.5 in. (444.5 mm)
Depth	27.74 in. (704.59 mm)
Weight	60 lb (27.2 kg)
Input power	+48 VDC (225 watts)

Table 8-2 shows the port specifications of the PX-brick.

**Table 8-2** Port Specifications of the PX-brick

Port	Quantity	Connector Type
Power entry	One	21-pin Foxcon
XIO	Two	Proprietary 100-pin dual row



## **R-brick**

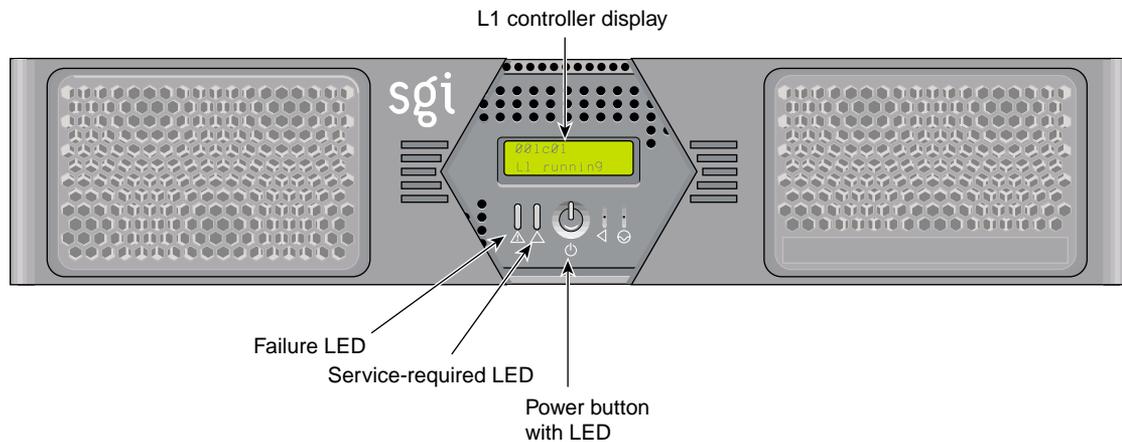
This chapter describes the function and physical components of the optional R-brick in the following sections:

- “Overview” on page 126
- “External Components” on page 128
- “Technical Specifications” on page 130

## Overview

The R-brick (router brick) is an eight-port optional router that functions as a high-speed switch to route network packets from one CR-brick to another through the NUMAlink interconnect fabric. Figure 9-1 shows a front view of the R-brick.

The key component within the R-brick is the router chip, an SGI custom-designed ASIC. The router chip is an eight-port crossbar that connects any input-link channel to any of the seven possible output-link channels.

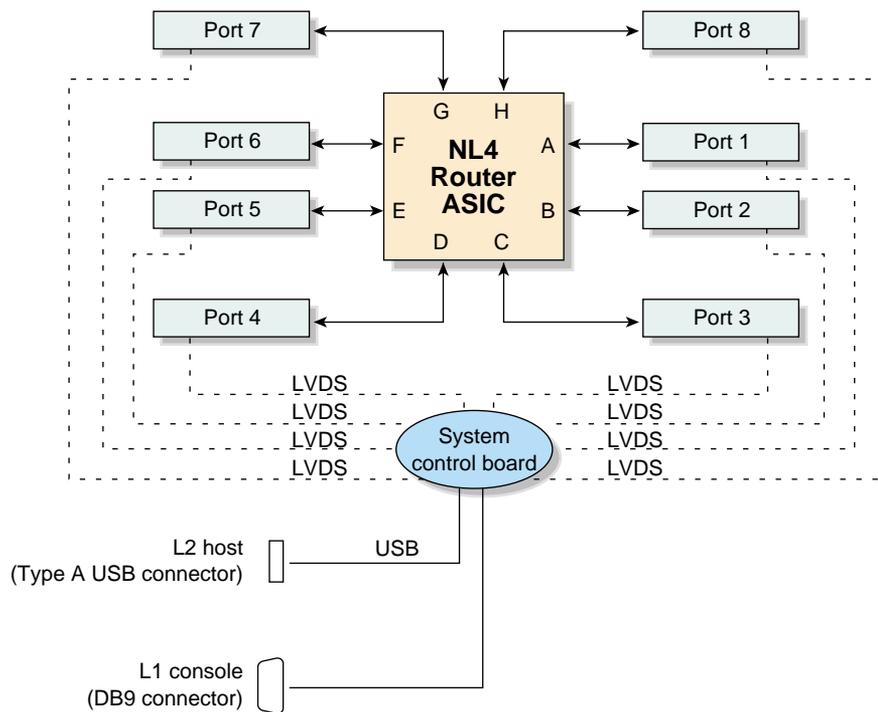


**Figure 9-1** Front View of the R-Brick

The R-brick has the following features:

- Eight NUMAlink channels
- One USB port for system controller support
- One L1 controller and LCD display
- Two hot-pluggable cooling fans

Figure 9-2 shows a block diagram of the R-brick.



**Figure 9-2** R-brick Block Diagram

## External Components

This section describes the external components that are located on the front and rear panels of the R-brick.

### Front Panel Components

The R-brick contains the following front panel items (as shown in Figure 9-1 on page 126):

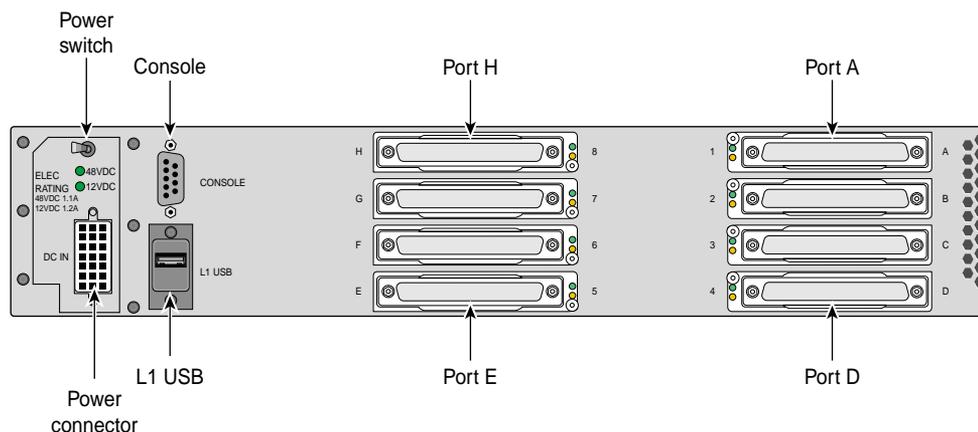
- **L1 display.** The L1 display is a 55.7 mm X 32 mm backlit liquid crystal display (LCD) that displays system messages. It displays two lines with a maximum of 12 characters on each line.
- **On/Off switch with LED.** Press this button to turn on the R-brick internal components. You can also turn on the R-brick internal components at a system console.
- **Three LEDs:**
  - **On/Off switch LED.** This LED illuminates green when the R-brick internal components are on and turns off when they are off.
  - **Service required LED.** This LED illuminates orange to indicate that an item is broken or not operating properly (for example, a fan is off), but the R-brick is still operating.
  - **Failure LED.** This LED illuminates red to indicate that a system failure has occurred and the R-brick is down.
- **Fans.** Two hot-pluggable fans provide N+1 redundant cooling.

### Rear Panel Components

The R-brick has the following rear panel items (see Figure 9-3):

- **Power switch.** Move the power switch to the I position to power on the L1 controller within the R-brick, and to the 0 position to power off the L1 controller. Powering on the L1 controller illuminates the 12-VDC LED green.
- **PWR (power) connector.** This connects the R-brick to the power bay, to provide 12-VDC and 48-VDC power to the R-brick.

- **48-VDC and 12-VDC LEDs.** The power switch must be in the ON (I) position for these LEDs to be on. The 12-VDC LED illuminates green when the L1 controller is powered on and operating, and the 48-VDC LED illuminates green when the rest of the R-brick internal components are powered on and operating. You power on the internal components by pressing the On/Off switch on the L1 controller panel.
- **Links R TO R connectors** (1, 6, 7, and 8, or A, F, G, and H). These link connectors connect the R-brick to other R-bricks in the network fabric.
- **Links R to R and CR to R connectors** (2, 3, 4, and 5 or B, C, D, and E). These link connectors normally connect the R-brick to CR-bricks; however, in larger systems they are also used to connect R-bricks to R-bricks.
- **L1 port connector.** This connects the internal USB hub of the R-brick to an optional console/controller. The internal USB hub can receive the USB signals from the controller via this port and distribute these signals to the L1 of the R-brick.
- **Link connector LEDs.** Each NUMALink connector has two LEDs, as follows:
  - The yellow LED illuminates to indicate that both the R-brick and the brick to which it is connected are powered on.
  - The green LED illuminates when a link has been established between the R-brick and the brick to which it is connected.



**Figure 9-3** Rear View of R-brick

## Technical Specifications

Table 9-1 lists the technical specifications of the R-brick.

**Table 9-1** R-brick Technical Specifications

<b>Characteristic</b>	<b>Specification</b>
Height	3.3 in. (83.82 mm)
Width	17.38 in. (441.45 mm)
Depth	27.5 in. (698.50 mm)
Weight	20 lb (9.1 kg)
Input power	48 VDC (~ 60 W)

Table 9-2 lists the specifications of the R-brick ports.

**Table 9-2** R-brick Port Specifications

<b>Port</b>	<b>Quantity</b>	<b>Peak Transfer Rate</b>
link	8	3.2 GB/s each direction
L1	1	12 Mbits/s

## Power Bay

This chapter describes the function and physical components of the power bay in the following sections:

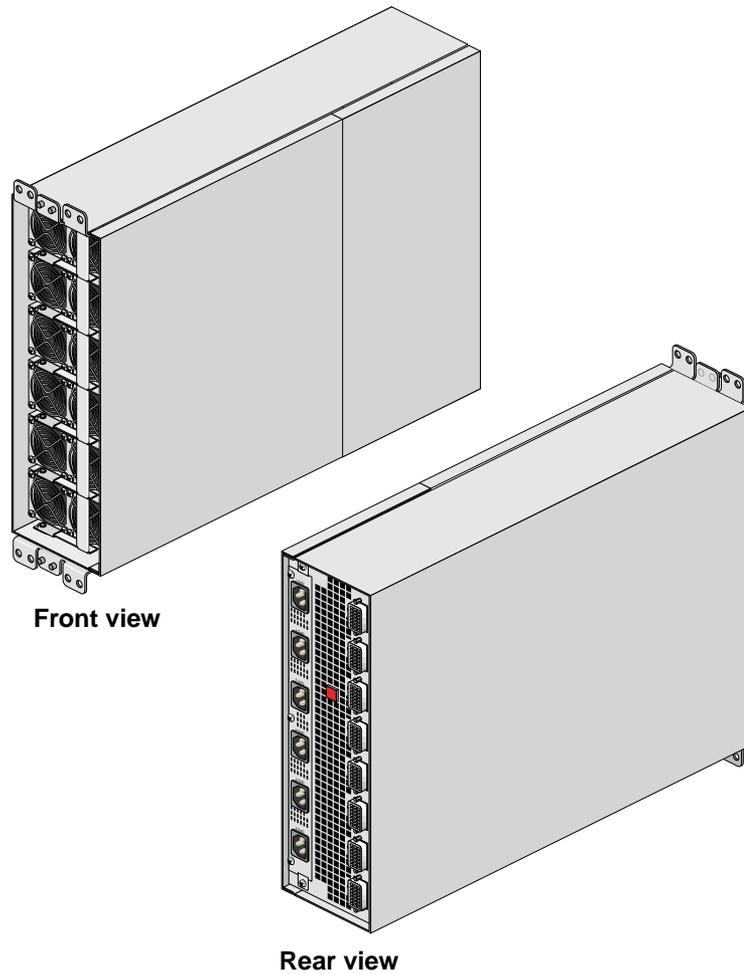
- “Overview” on page 132
- “External Components” on page 134
- “Distributed Power Supplies” on page 136
- “Technical Specifications” on page 138

## Overview

The power bay is a 3U-high enclosure that holds a maximum of six hot-swappable distributed power supply modules (DPSs). The power bay monitors, controls, and supplies AC power to the DPSs. Although the power bay can hold a maximum of six DPSs, in this system the power bay contains three or five DPSs. The compute racks require power bays with five DPSs and the I/O racks require power bays with three DPSs.

Each DPS inputs single-phase AC voltage and outputs 950 W at 48 VDC and 42 W at 12 VDC. The outputs of the DPSs are bused together. For example, when the power bay contains three DPSs, the DPSs are bused together to provide approximately 2,760 W of 48 VDC power and 135 W of 12 VDC power.

Figure 10-1 shows front and rear views of the power bay.



**Figure 10-1** Front and Rear Views of Power Bay

The power bay has the following features:

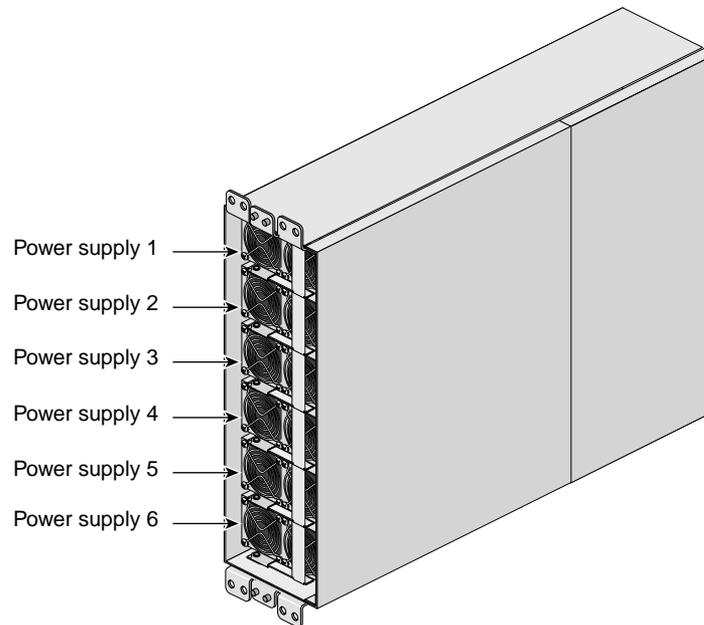
- 3U-high enclosure
- Six AC input connectors
- Eight DC output connectors
- Fault reset button

## External Components

This section describes the external components located on the front and rear panels of the power bay.

### Front Panel Components

The front of the power bay seats the distributed power supplies (see Figure 10-2). When the power bay contains three power supplies, the supplies reside in locations 4, 5, and 6.



**Figure 10-2** Front View of Power Bay

## Rear Panel Components

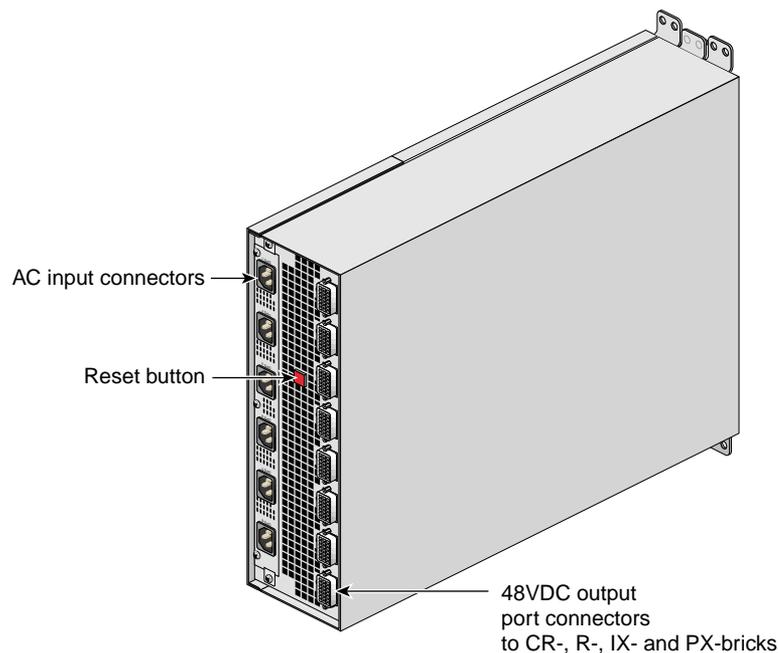
The power bay module has eight DC output connectors (see Figure 10-3). A power cord connects one output connector to a C-brick, R-brick, IX-brick, or PX-brick. This connection provides 12-VDC standby power, 48-VDC power, and monitoring signals.

---

**Note:** The L1 controller of a connecting module can monitor the status and enable the output ports of the power bay.

---

The power bay module also has six AC input connectors, one for each power supply location. For example, when the power bay contains three power supplies, connectors 4, 5, and 6 connect to the power distribution strip (PDS). When the power bay contains six power supplies, connectors 1, 2 and 3 also connect to the PDS. The reset button is used to reset the power bay when a fault condition occurs.



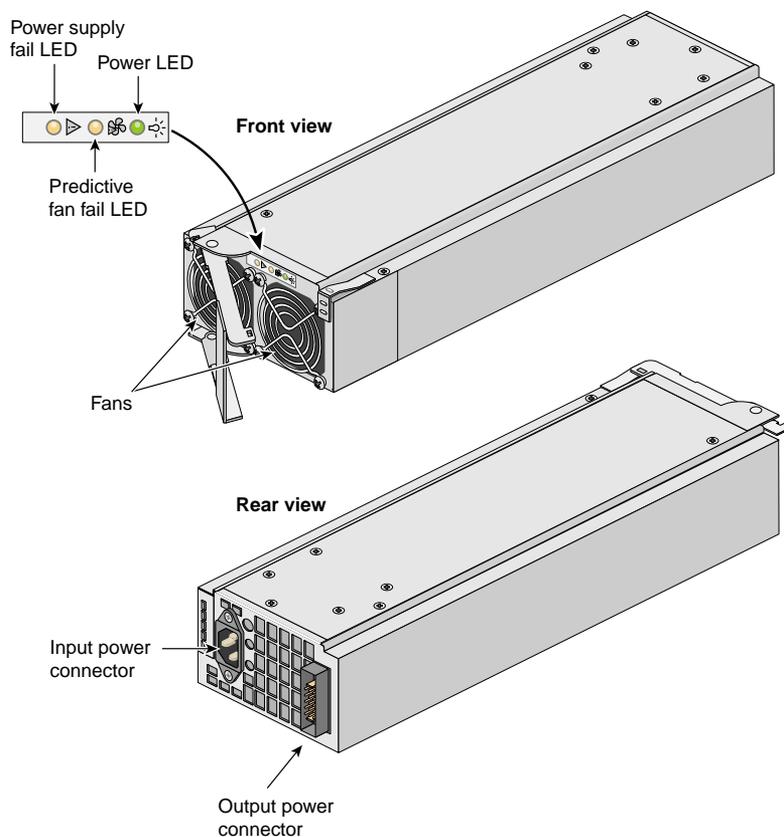
**Figure 10-3** Rear View of Power Bay

## Distributed Power Supplies

The distributed power supplies (DPSs) are air-cooled devices; each DPS has two fans that move air from the front of the rack to the rear of the rack. Figure 10-4 shows front and rear views of a DPS.

Each DPS has the following LEDs:

- Power
- Predictive fan fail (PFAIL)
- Power supply fail (FAIL)



**Figure 10-4** Front and Rear Views of the DPS

The input and output power connectors shown in the rear view picture of the power supply interconnect with the power bay through a motherboard located inside the power bay.

Table 10-1 lists conditions of the power supplies and the corresponding states of the LEDs.

**Table 10-1** Power Supply LED States

Power Supply Condition	LED States		
	Power (Green)	PFAIL (Amber)	FAIL (Amber)
AC voltage not applied to all power supplies	Off	Off	Off
AC voltage not applied to this power supply	Off	Off	On
AC voltage present; standby voltage on	Blinking	Off	Off
Power supply DC outputs on	On	Off	Off
Power supply failure	Off	Off	On
Current limit reached on 48-VDC output	On	Off	Blinking
Predictive failure	On	Blinking	Off

Each power supply also contains a serial ID EEPROM that identifies the model and serial number of the supply. The L1 controller of a connecting module reads this information.

## Technical Specifications

Table 10-2 lists the technical specifications of the power bay.

**Table 10-2** Power Bay Technical Specifications

<b>Characteristic</b>	<b>Specification</b>
Height	5.12 in. (130.04 mm)
Width	17.5 in. (444.5 mm)
Depth	23.87 in. (606.3 mm)
Weight (with five power supplies)	64.5 lb (29.26 kg)
Input voltage	220 VAC
Output voltage	12 VDC and 48 VDC

Table 10-3 lists the technical specifications of the distributed power supplies.

**Table 10-3** Power Supply Technical Specifications

<b>Characteristic</b>	<b>Specification</b>
Height	5 in. (127 mm)
Width	2.8 in. (71.12 mm)
Depth	13 in. (330.2 mm)
Weight	7.5 lb (3.40 kg)
Input voltage	220 VAC
Output voltage	12 VDC and 48 VDC

## **SGI TP900 Storage Module**

This chapter describes the function and physical components of the optional SGI TP900 storage module in the following sections:

- “Overview” on page 140
- “External Components” on page 141
- “Technical Specifications” on page 146
- “Product Options” on page 146

## Overview

The SGI TP900 storage module is a rackmountable, 2U-high, 8-drive storage system that provides JBOD (“just a bunch of disks”) storage. The drive backplane of the TP900 connects the 8 drives on one SCSI bus. As an option, the storage system can also be configured on two SCSI buses (2 strings of 4 drives).

---

**Note:** For more information about the TP900 storage module, see the *SGI Total Performance 900 Storage System User's Guide*.

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The TP900 storage module has the following features:

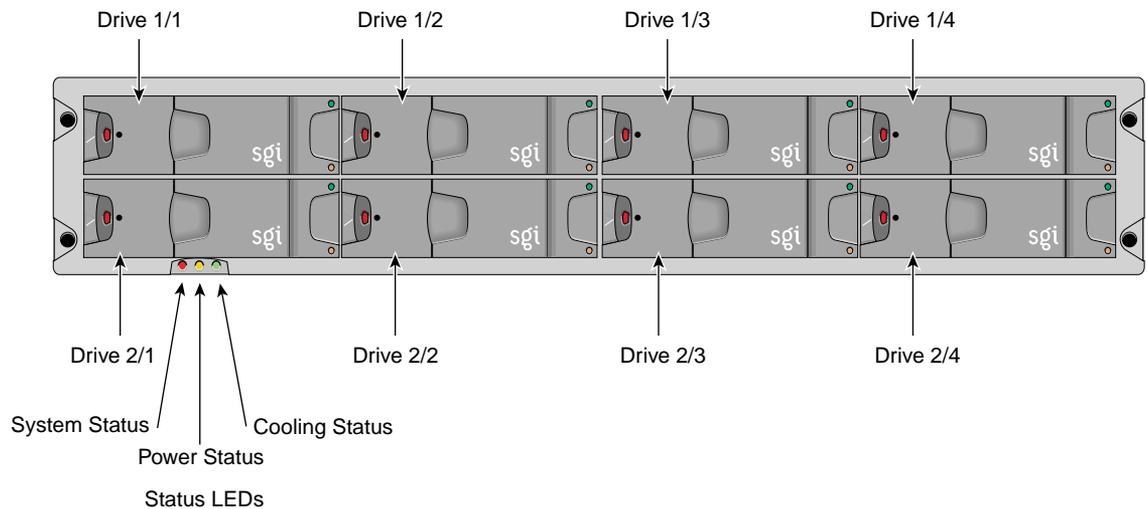
- Supports 8 1.0-inch high, 3.5-in. disk drives.
- Anti-tamper locks on each disk drive to prevent accidental removal.
- Sled-mounted drives for easy removal and insertion.
- Redundant power and cooling.
- Single- or dual-channel operation.

## External Components

This section describes the external components located on the front and rear panels of the TP900 storage module.

### Front Panel Components

The front of the SGI TP900 chassis consists of 8 drive bays that contain either disk drive carrier modules or dummy carrier modules, which are discussed in the subsections that follow. The front of the TP900 is 4 drive bays wide by 2 drive bays high. The bays are numbered 1 and 2 from top to bottom, and 1 to 4 from left to right. See Figure 11-1.



**Figure 11-1** Front View of TP900 Storage Module

The TP900 houses the following front panel components, which are discussed in the subsections that follow:

- Drive carrier module
- Dummy carrier module

The front of the chassis also contains three status LEDs that are described in Table 11-1.

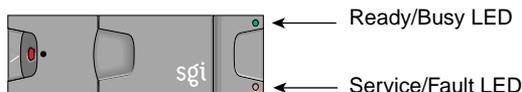
**Table 11-1** Status LEDs

LED	Status
System status	Green signifies that power is applied to the enclosure. Amber signifies that the ESI processor has failed.
Power status	Green signifies that the power supplies are functioning normally. Amber signifies a power supply failure.
Cooling status	Green signifies that all fans are functioning normally. Amber signifies a fan failure.

### Disk Drive Carrier Module

The disk drive carrier module is a die-cast aluminum carrier that houses a single 1.0-in. high, 3.5-in. disk drive.

Each drive carrier has two LEDs: an upper green LED and a lower amber LED. In normal operation, the green illuminates and flickers as the drive operates. The amber LED illuminates when a fault occurs. See Figure 11-2 for the locations of LEDs.



**Figure 11-2** Drive Carrier LED Indicators

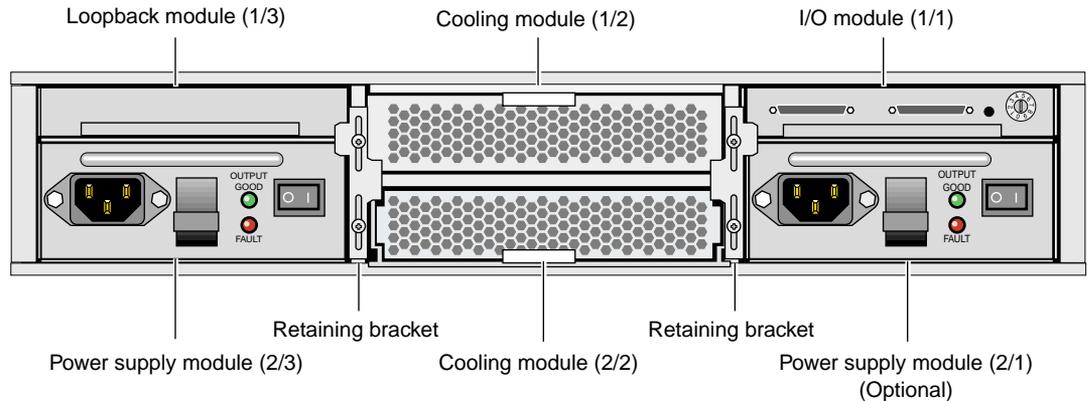
This carrier has a handle that enables you to insert and remove the carrier from the drive bay. The handle also has an anti-tamper lock that locks the handle in place; therefore, the carrier cannot be removed from the drive bay. When the handle is locked, a red indicator is visible in the handle. When carrier is unlocked, a white indicator is visible.

### Dummy Carrier Module

Dummy carrier modules are provided for installation in all unused drive bays. They are designed as integral drive module front caps with handles. They must be installed in unused drive bays to maintain a balanced airflow.

## Rear Panel Components

The rear of the TP900 storage module contains 6 bays that house power supply, cooling, and SCSI I/O modules. See Figure 11-3. The rear of the TP900 storage module is 3 bays wide by 2 bays high. The bays are numbered 1 and 2 from top to bottom, and 1 to 3 from right to left.



**Figure 11-3** Rear View of TP900 Storage Module

The TP900 rear bays house the following components, which are discussed in the subsections that follow:

- Power supply module
- Input/output (I/O) module
- Loopback module
- Cooling module
- Blank module
- Terminator plug

### Power Supply Module

The SGI TP900 storage system requires one 350-W power supply module, which is mounted in the rear of the system (location 2/3). Power supply voltage operating ranges are nominally 115 V or 230 V and are selected automatically.

Optionally, a second power supply module (location 2/1) can be added to the TP900 system to provide n+1 redundant power. In this n+1 redundant configuration, the power supply modules operate together; if one power supply module fails, the other module supplies power until the faulty unit is replaced.

The power supply module contains two LEDs that are located on the front panel of the power supply. The green LED indicates power output. The amber LED indicates a power supply failure.

### Input/Output (I/O) Module

The I/O module contains two VHDCI connectors and a switch to set the SCSI ID range. The SGI TP900 storage module supports one I/O module for a 1 x 8 configuration and 2 I/O modules for a 2 x 4 configuration. The 1 x 8 configuration creates a SCSI bus structure with 1 string of 8 drives. The 2 x 4 configuration creates a SCSI bus structure with 2 strings of 4 drives.

---

**Note:** When only one I/O module is present in the system, the other I/O module location contains a loopback module that has no external connectors.

---

### Loopback module

The backplane of the TP900 consists of two 4-drive channels. A loopback module is used to connect the two internal drive channels together when the TP900 is configured as one channel with 8 drives.

### Cooling Module

The cooling module consists of fans that pull warm air from a plenum behind the drive backplane and exhaust the warm air at the rear of the enclosure. The cooling modules connect to the backplane for power and status signal connections.

The TP900 system requires one cooling module, which is mounted in the rear of the system. Optionally, a second cooling module can be added to the system to provide redundant cooling. In this redundant configuration, the cooling modules operate together; if one module fails, the other module adequately cools the system until the faulty unit is replaced.

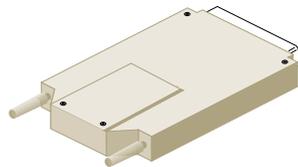
The front panel of the cooling module has two LEDs. The green LED indicates that the cooling module is functioning properly. The amber LED indicates a fan failure.

### Blank Module

Blank modules are placed in all vacant power supply and cooling module bays to maintain proper airflow through the system.

### Terminator Plug

Each I/O module has two 68-pin VHDCI connectors. A host bus adapter is connected to one of the VHDCI connectors and a terminator plug is placed in the remaining connector. Figure 11-4 shows the terminator plug.



**Figure 11-4** SCSI Terminator Plug

## Technical Specifications

Table 11-2 lists the technical specifications of the TP900 storage module.

**Table 11-2** TP900 Storage Module Technical Specifications

Characteristic	Specification
Height	3.37 in. (85.7 mm)
Width	17.6 in. (447 mm)
Depth	21.46 in. (545 mm)
Weight:	
Maximum configuration	48.5 lb (22 kg)
Empty enclosure	14.3 lb (6.5 kg)
Input power	100-254 VAC (~175 W)

## Product Options

Table 11-3 lists the available configurable items for the TP900 storage module.

**Table 11-3** TP900 Storage Module Configurable Items

Configurable Item	Options
Disk drives	1 minimum, 8 maximum
I/O module	1 minimum, 2 maximum
Cooling module	1 minimum, 2 maximum
Power supply module	1 minimum, 2 maximum

## D-brick2 Storage Module

This chapter describes the functional and physical components of the D-brick2 non-RAID mass storage option brick. It also explains how to power the D-brick2 on and off, and how to replace disk drive modules in the D-brick2. For troubleshooting and additional detailed information on the D-brick2, see *SGI Total Performance 9100 (2Gb TP9100) Storage System User's Guide (P/N 007-4522-00x)*, which is available online at <http://docs.sgi.com>.

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**Note:** If you require RAID storage, ask your SGI sales representative about SGI RAID storage products, such as the SGI TP9400 and SGI TP9500 or TP9500S.

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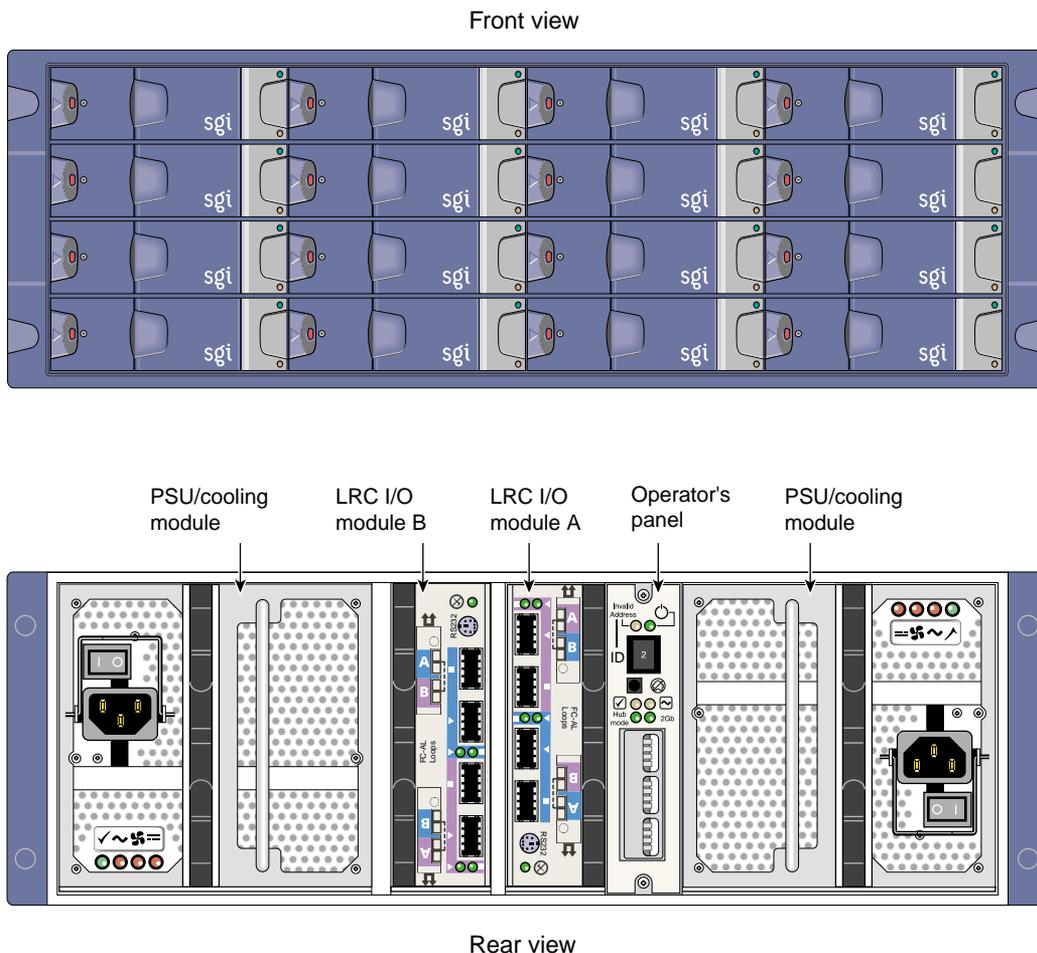
This chapter is divided into the following five major sections:

- “D-brick2 Overview” on page 148
- “D-brick2 External Components” on page 150
- “Powering the D-brick2 On or Off” on page 156
- “D-brick2 Technical and Environmental Specifications” on page 158

For instructions on removing or replacing the drive carrier modules, see “Installing or Replacing a D-brick2 Drive Carrier Module” on page 215.

## D-brick2 Overview

The optional D-brick2 module is a high performance, large-scale non-RAID storage system for your SGI rackmounted system. Each enclosure contains a minimum of 2 and maximum of 16 disk drives, and the component modules that handle I/O, power and cooling, and operations. Optional RAID storage systems are available for your system through your SGI sales representative. Figure 12-1 shows front and rear views of the D-brick2.



**Figure 12-1** D-brick2 Front and Rear Views

## Functional Description

The modular design of the D-brick2 expands easily to meet your mass storage needs. This storage system provides compact, high-capacity JBOD (“just a bunch of disks”) storage for supported SGI systems. Each D-brick2 is connected to one or more Fibre Channel boards (host bus adapters, or HBAs) in the SGI host system, either separately or in a combination (loop).

## D-brick2 Features

The optional D-brick2 storage system has the following features:

- Maximum configuration of up to 96 drives (six D-brick2 units)
- 1x16 (more storage) and 2x8 (more bandwidth) disk topologies in each brick
- Dual power feeds with dual power supplies
- Redundant cooling
- Non-disruptive component replacement
- Enclosure services interface (ESI) for SCSI enclosure services (SES)

## D-brick2 External Components

This section discusses the external D-brick2 components that you can access, add, replace, or upgrade. These include the following:

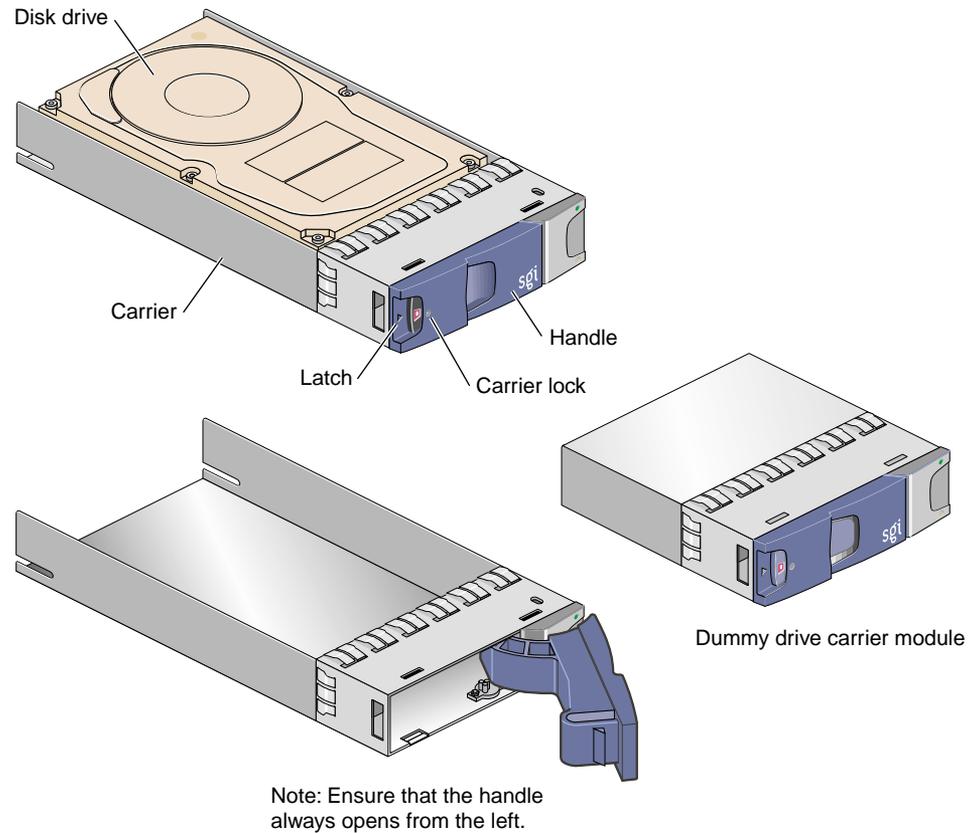
- Drive carrier modules
- “Dummy” drive modules
- Power supply and cooling modules
- Operator’s panel
- Loop resiliency circuit (LRC) I/O modules

The first two items are accessed at the front of the module; the last three items are located in the rear of the D-brick2 unit.

### Drive Carrier Modules and “Dummy” Modules

The disk drive carrier module consists of a hard disk drive mounted in a die-cast aluminum carrier (see Figure 12-2). The carrier protects the disk drive from radio frequency interference, electromagnetic induction, and physical damage. It also provides a means for thermal conduction.

Dummy drive carrier modules must be installed in all unused drive bays. They are designed as integral drive module front caps with handles and must be fitted to all unused drive bays to maintain a balanced airflow. Figure 12-2 shows examples.



**Figure 12-2** D-brick2 Drive Carrier Module and “Dummy” Module

A key (Torx screwdriver) to lock or unlock the disk drives is provided with each D-brick2. A red indicator is visible in the center rectangular aperture in the handle if the anti-tamper lock is locked, and a black indicator is visible when the lock is unlocked (see Figure 12-3).

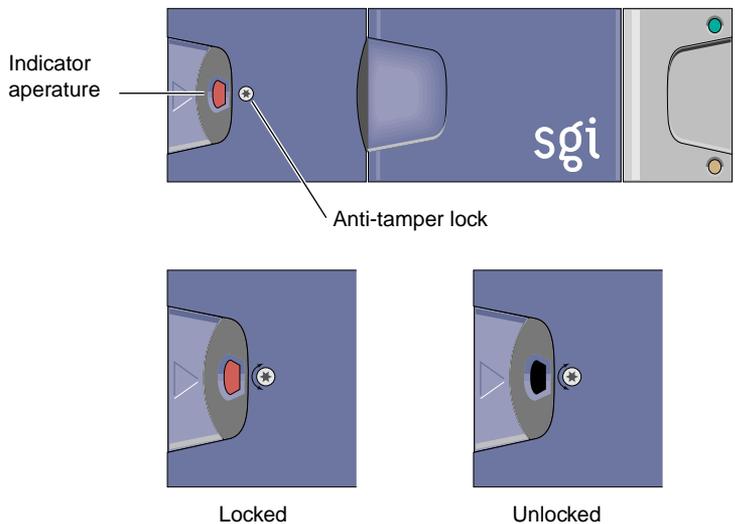


Figure 12-3 Anti-Tamper Locking on the D-brick2 Disk Drive

## Power Supply/Cooling Modules

Two power supply/cooling modules (PSUs) are mounted in the rear of the D-brick2. These modules supply redundant cooling and power to the enclosure and are auto-ranging. The supplies should be plugged into your SGI rack's power distribution strip (PDS). Four LEDs mounted on the rear panel of the D-brick2's PSU/cooling module indicate the status of the power supply and the fans (see Figure 12-4 on page 153).

---

**Note:** If a power supply fails, do not remove it from the enclosure until you have a replacement power supply. The cooling fans in the supply will continue to operate.

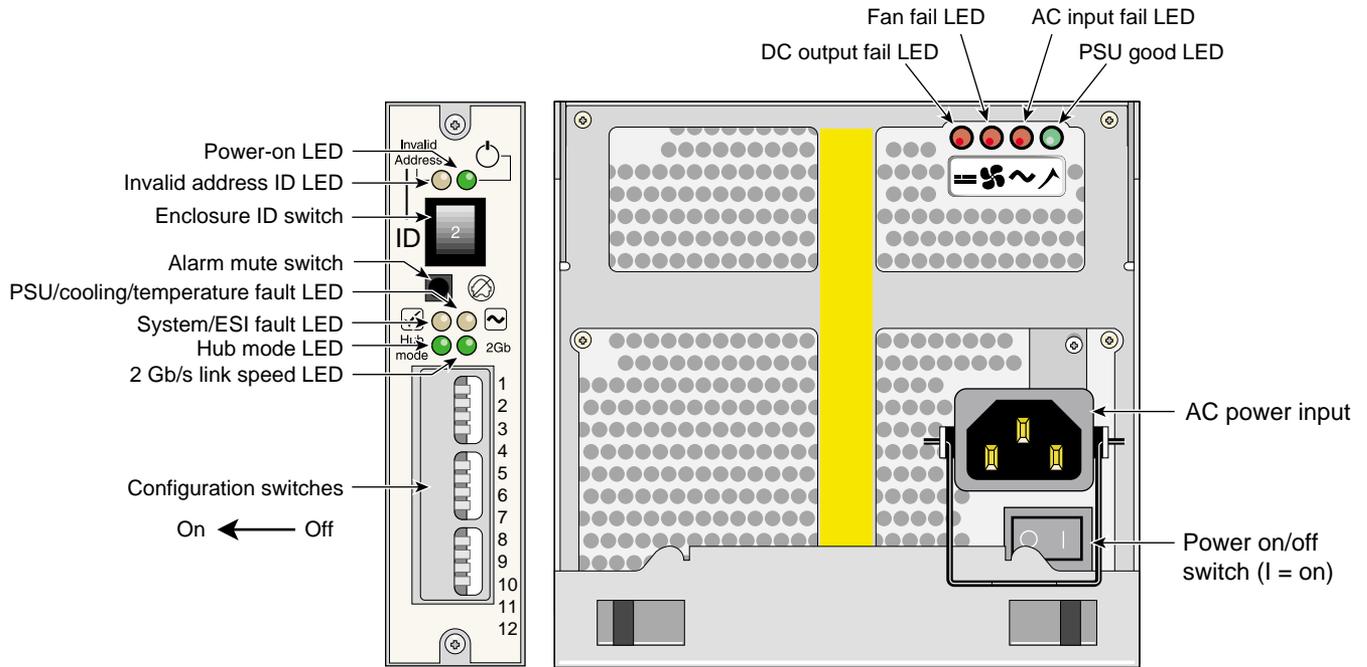
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**Caution:** You must finish replacing a PSU/cooling module within 10 minutes after removing one. Otherwise, thermal overload of the D-brick2 can result.

---



**Figure 12-4** D-brick2 Operators Panel and Power Supply/Cooling Modules

## Operator's Panel

The operator's panel ("ops panel") contains an enclosure services processor that monitors and controls D-brick2 functions. The ops panel contains LEDs 9 show the status of all modules, an audible alarm that indicates a fault state is present, a push-button alarm mute switch, and a thumbwheel enclosure ID address range selector switch. When the D-brick2 is powered on, the audible alarm sounds for one second, and the power-on LED illuminates.

Figure 12-4 identifies all controls and indicators on the ops panel. Note that the operator's panel configuration switches slide left for "on" and right for "off." For detailed descriptions of the LEDs and configuration switch information, see Chapter 5 in the *SGI Total Performance 9100 (2Gb TP9100) Storage System User's Guide (P/N 007-4522-00x)*.

## Loop Resiliency Circuit (LRC) Modules

The D-brick2 uses a Fibre Channel arbitrated loop (FC-AL) to interface with the host computer system. The FC-AL backplane incorporates two independent loops formed by port bypass circuits within the LRC I/O modules. Figure 12-5 shows an LRC module.

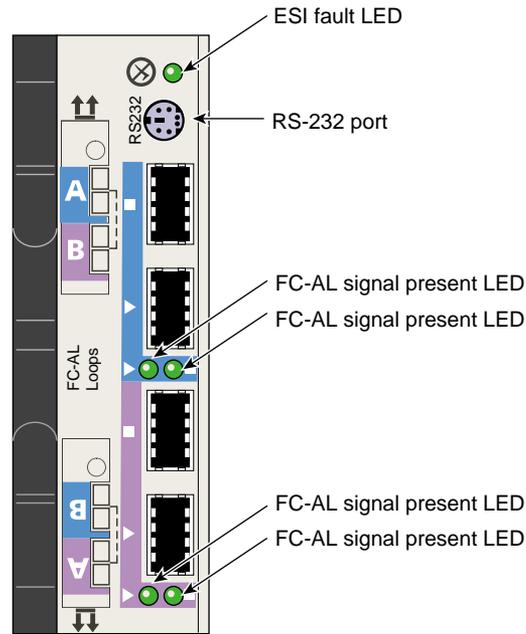
Processors housed on the LRC modules provide enclosure management and interface to devices on the backplane, a PSU/cooling module, and an ops panel to monitor internal functions. These processors operate in a master/slave configuration to allow failover. See the *SGI Total Performance 9100 (2Gb TP9100) Storage System User's Guide (P/N 007-4522-00x)* for details.

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**Note:** The JBOD LRC I/O module can address up to 96 disk drives; a maximum of six enclosures can be cabled together.

---

The enclosure may be configured with either one or two LRC I/O modules. If only one module is installed, an I/O blank module must be installed in the unused bay.



**Figure 12-5** D-brick2 Loop Resiliency Circuit (LRC) Module

## Powering the D-brick2 On or Off

This section explains how to power the D-brick2 on and off.

### Powering On the D-brick2

Before powering on the D-brick2, confirm that the following is true:

- Drives are seated in the correct bays and blank plates are fitted in any empty bays.
- Ambient temperature is within the specified range of 10 °C to 40 °C (50 °F to 104 °F).
- The system power distribution unit (PDU) and power distribution strip (PDS) are on.

To power on the D-brick2, follow these steps:

1. Connect an AC power cord to each PSU/cooling module.
2. Connect the AC power cords to the system PDS.
3. Turn the power switch on each PSU/cooling module to the “on” position (I = on, O = off). See Figure 12-4 on page 153 for switch locations.

The green “PSU good” LED illuminates. Also, the “power on” LED on the ESI/ops panel (see Figure 12-4 on page 153) of each module turns green when AC power is present.

If the “power on” LED on the ESI/ops panel does not illuminate, or if the amber “system/ESI fault” LED illuminates, verify that you followed all steps. For troubleshooting tips, see the *SGI Total Performance 9100 (2Gb TP9100) Storage System User’s Guide* or contact your service provider.

### Powering Off the D-brick2

Before powering off the D-brick2, confirm that the following has occurred:

- All system users have been notified and are logged off.
- Disk data has been backed up as appropriate.

To power off a D-brick2 enclosure, follow these steps:

1. Move the power switch on the rear of each PSU/cooling module to the “off” position (position **I** = on, **O** = off). See Figure 12-4 on page 153 for switch locations.
2. Unplug the power cable from the PSU/cooling module(s) as appropriate. For example, you would follow this step if you are replacing an individual module.
3. If you are shutting down multiple bricks in the system, you may want to switch the PDS or PDU breaker switch to the “off” position.

The LEDs on the back of the unit should turn dark a few seconds after you power off the PSU/cooling module.

## D-brick2 Technical and Environmental Specifications

The rackmounted D-brick2 disk enclosure is 13.4 cm (5.3 in.) high, 50 cm (19.7 in.) deep, and 44.6 cm (17.5 in.) wide. Component weights, power requirements, and environmental information for the D-brick2 are provided in the following tables.

---

**Note:** You should always follow system-level technical, operational, and environmental specifications, regardless of the tolerances of individual system bricks.

---

Table 12-1 shows the weights of the brick and the various D-brick2 components.

**Table 12-1** D-brick2 Weight Information

Component	Weight
D-brick2 enclosure, fully populated	32.3 kg (71 lb)
D-brick2 enclosure, empty	17.9 kg (39.4 lb)
Power supply/cooling module	3.6 kg (7.9 lb)
Disk carrier module with drive	0.88 kg (1.9 lb)
LRC I/O module	1.2 kg (2.6 lb)

Table 12-2 shows the power requirements and specifications of the D-brick2.

**Table 12-2** D-brick2 Enclosure Power Specifications

Specification	Value
Voltage range for rack	200-240 VAC
Voltage range selection	Automatic
Frequency	50-60 Hz
Power factor	>0.98
Maximum power consumption	700 VA
Typical power consumption	400 VA or less

**Table 12-2** D-brick2 Enclosure Power Specifications

Specification	Value
Inrush current (25 °C [77 °F] cold-start 1 PSU)	100 A maximum peak for 4 ms, 25 A thereafter at maximum voltage
Harmonics	Meets EN61000-3-2
Power cord: Cord type	SV or SVT, 18 WG minimum, 3 conductor
Plug	250 V, 10 A
Socket	IEC 320 C-14, 250 V, 15 A

Table 12-3 provides temperature and humidity requirements for D-brick2 modules.

**Table 12-3** D-brick2 Ambient Temperature and Humidity Requirements

Factor	Temperature	Relative Humidity	Maximum Wet Bulb
Operating temperature	5 °C to 40 °C (41 °F to 104 °F)	20% to 80% noncondensing	23 °C (73 °F)
Non-operating temperature	0 °C to 50 °C (32 °F to 122 °F)	8% to 80% noncondensing	27 °C (80 °F)
Storage temperature	1 °C to 60 °C (34 °F to 140 °F)	8% to 80% noncondensing	29 °C (84 °F)
Shipping temperature	-40 °C to +60 °C (-40 °F to 140 °F)	5% to 100% nonprecipitating	29 °C (84 °F)

Table 12-4 provides additional environmental specifications for D-brick2 units.

**Table 12-4** Additional Environmental Requirements for D-brick2

Environmental Factor	Requirement
Altitude, operating	0 to 3047 m (0 to 10,000 ft)
Altitude, non-operating	-305 to 12,192 m (-1000 to 40,000 ft)
Shock, operating	Vertical axis 5 g peak 1/2 sine, 10 ms
Shock, non-operating	30 g 10 ms 1/2 sine

**Table 12-4** Additional Environmental Requirements for D-brick2

<b>Environmental Factor</b>	<b>Requirement</b>
Vibration, operating	0.21 grms 5-500 Hz random
Vibration, non-operating	1.04 grms 2-200 Hz random
Acoustics	Less than 6.0 B LwA operating at 20 °C
Safety and approvals	CE, UL, cUL
EMC	EN55022 (CISPR22-A), EN55024 (CISPR24), FCC-A

## Maintenance and Upgrade Procedures

This chapter provides information about installing or removing components from your SGI system, as follows:

- “Maintenance Precautions and Procedures” on page 162
- “IX-bricks and PX-bricks” on page 165
- “XG2N and CPU Expansion Modules” on page 179
- “TP900 Enclosure” on page 211
- “D-brick2 Storage Module” on page 215

## Maintenance Precautions and Procedures

This section describes how to open the system for maintenance and upgrade, protect the components from static damage, and return the system to operation. The following topics are covered:

- “Preparing the System for Maintenance or Upgrade” on page 162
- “Returning the System to Operation” on page 162
- “Installing or Removing Internal Parts” on page 163



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**Warning:** Before performing any maintenance operations on your system, carefully read “Safety Information” on page 271.

---

### Preparing the System for Maintenance or Upgrade

To prepare the system for maintenance, follow these steps:

1. If you are logged on to the system, log out.

At your system console, switch to the L1 mode by entering the following command:

```
$> Ctrl+T
```

From the L1 prompt (L1>), power off the system with the following command:

```
L1> power down
```

2. Locate the PDU(s) in the rear of the rack and turn off the circuit breaker switches on each PDU.

### Returning the System to Operation

When you finish installing or removing components, return the system to operation as follows:

1. Turn each of the circuit breaker switches to the “on” position.
2. At your system console, enter the following command:

```
L1> power up
```

3. Verify that the LEDs turn on and illuminate green and that your controllers display that the system is powered on for each segment of the procedure, which indicates that the power-on procedure is proceeding properly.

If your system does not boot correctly, see “Troubleshooting Chart” on page 222, for troubleshooting procedures.

## Installing or Removing Internal Parts



**Caution:** The components inside the system are extremely sensitive to static electricity. Always wear a grounding wrist strap when you work with parts inside your system.

To use the grounding wrist strap, follow these steps:

1. Unroll the first two folds of the band.
2. Wrap the exposed adhesive side firmly around your wrist, unroll the rest of the band, and then peel the liner from the copper foil at the opposite end.
3. Attach the copper foil to an exposed electrical ground, such as a metal part of the chassis.



**Caution:** Do not attempt to install or remove components that are not listed in Table 13-1. Components not listed must be installed or removed by a qualified SGI field engineer.

Table 12-1 lists the customer-replaceable components and the page on which you can find the instructions for installing or removing the component.

**Table 13-1** Customer-replaceable Components and Maintenance Procedures

Component	Procedure
PCI and PCI-X cards	“Adding or Replacing a PCI or PCI-X Card” on page 165
IX-brick disk drives	“Installing or Replacing a Disk Drive in the IX-brick” on page 174
XG2N graphics cards	“Replacing an XG2N Graphics Card” on page 186
XG2N or CPU Expansion Power Supply	“Removing and Replacing Power Supplies” on page 193

**Table 13-1** Customer-replaceable Components and Maintenance Procedures

<b>Component</b>	<b>Procedure</b>
XG2N or CPU Expansion DIMMs	“Removing and Replacing Memory DIMMs” on page 197
XG2N or CPU Expansion L1 Controller Display	“L1 Controller Display” on page 204
TP900 drive carrier modules	“Replacing a TP900 Drive Carrier Module” on page 211
D-brick2 drive carrier modules	“Installing or Replacing a D-brick2 Drive Carrier Module” on page 215

## IX-bricks and PX-bricks

This section describes maintenance operations on IX-bricks and PX-bricks.

### Adding or Replacing a PCI or PCI-X Card



---

**Warning:** Before installing, operating, or servicing any part of this product, read the “Safety Information” on page 271.

---

This section provides instructions for adding or replacing a PCI or PCI-X card in the IX-brick or PX-brick. To maximize the operating efficiency of your cards, be sure to read all the introductory matter in the “PCI and PCI-X Card Configuration Guidelines” on page 120 before beginning the installation.



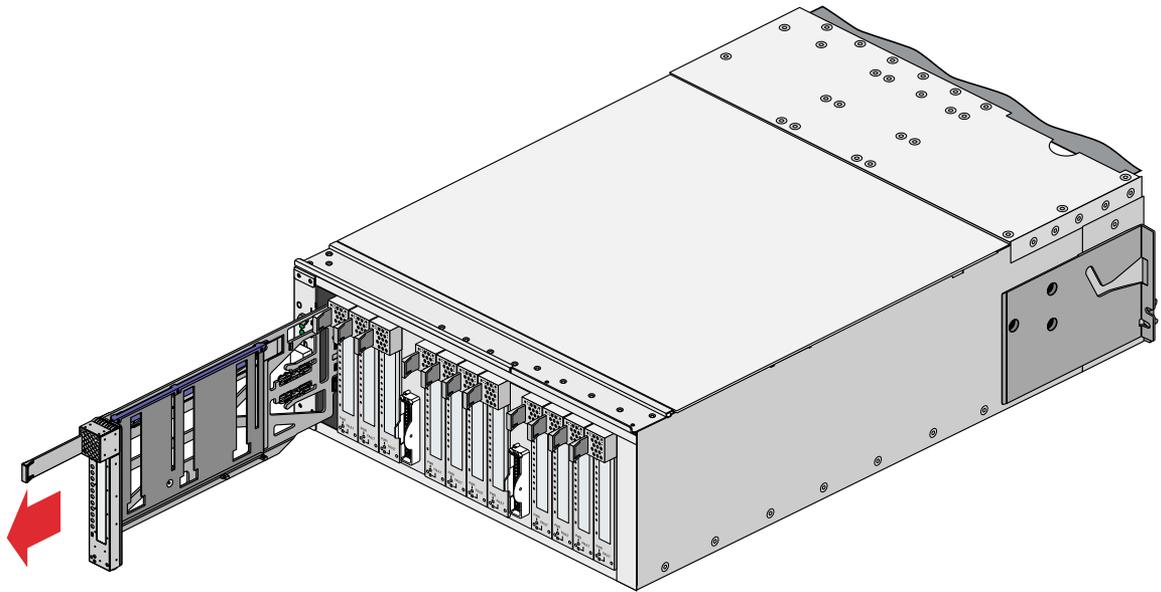
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**Caution:** To protect the PCI cards from ESD damage, SGI recommends that you use a grounding wrist strap while installing a PCI card.

---

To add or replace a PCI card, follow these steps:

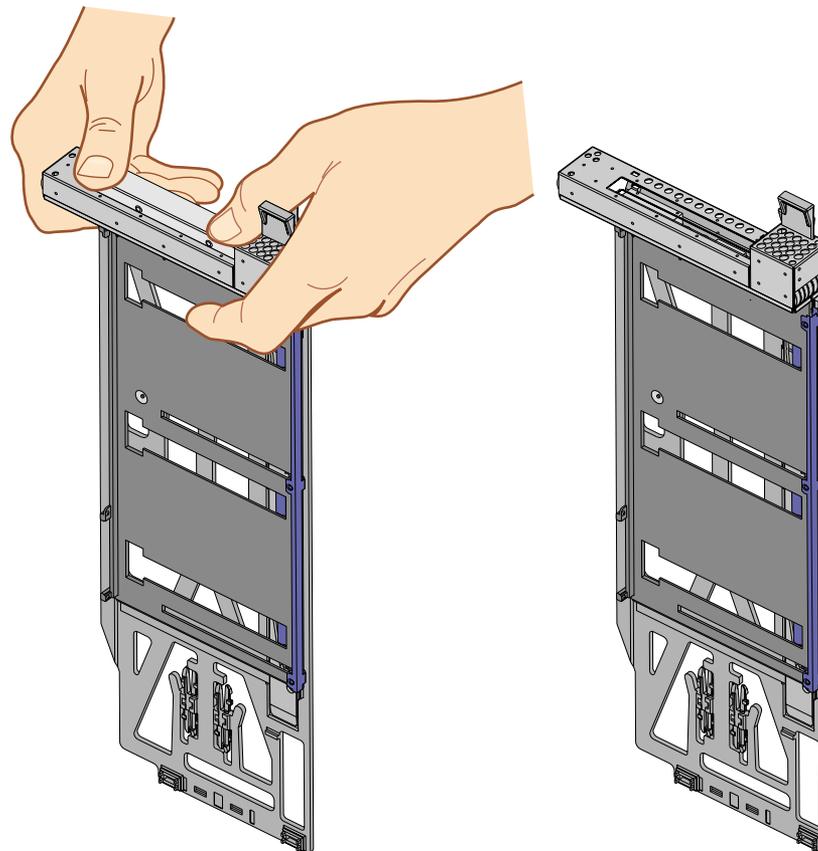
1. Shut down the operating system. (See your software guide if you need instructions to do this.)
2. Power off the I/O brick by following the power-off instructions in the “Powering Off the System” on page 9.
3. To extract it from the slot, pull the handle on the selected card carrier straight out, as shown in Figure 13-1.



**Figure 13-1** Removing a Card Carrier

4. If you are replacing a card, gently remove the existing card from the carrier.

If you are adding a card, extract the carrier metal filler plate by pushing down on it, as shown in Figure 13-2. This filler plate covers the area where your card connectors will protrude out to the rear panel of the I/O brick.



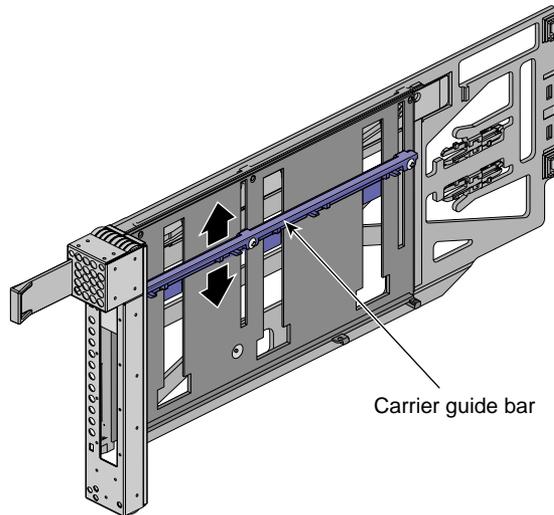
**Figure 13-2** Extracting the Carrier Metal Filler Plate

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**Note:** If you are adding or replacing a half-height PCI card, skip step 5 and proceed to step 6.

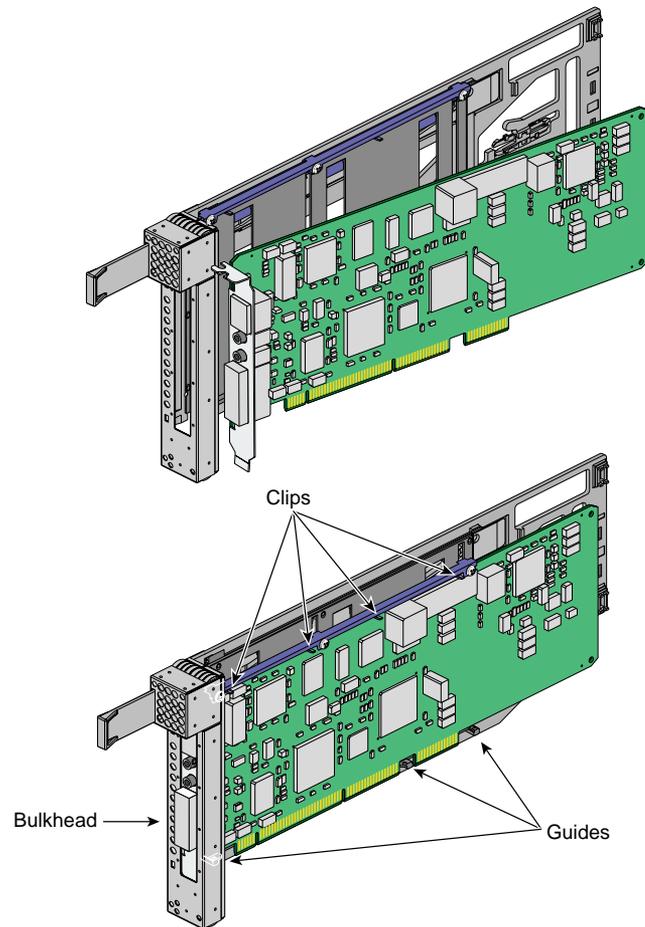
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5. If the full-height card that you want to install does not fit in the carrier, follow these steps:
  - a. Loosen the three screws on the guide bar with a Phillips screwdriver (if your carrier uses T8 Torx screws, you will need a Torx screw driver).
  - b. Adjust the carrier guide bar (also known as the alignment rail) up or down as necessary (see Figure 13-3).



**Figure 13-3** Adjusting the Carrier Guide Bar

- c. Mount the card in the carrier, as shown in Figure 13-4, so that the following occurs:
  - The card connectors protrude through the bulkhead where the metal filler plate was located.
  - The edge connectors fit between the bottom guides of the carrier.
  - The top of the card fits under the clips on the guide bar.
- d. Tighten the three screws on the guide bar. Then skip step 6 and proceed to step 7.



**Figure 13-4** Mounting Card in Carrier

6. To install a half-height PCI card in a carrier, follow these steps:
  - a. Remove the two screws from the carrier guide bar, as shown in Figure 13-5.

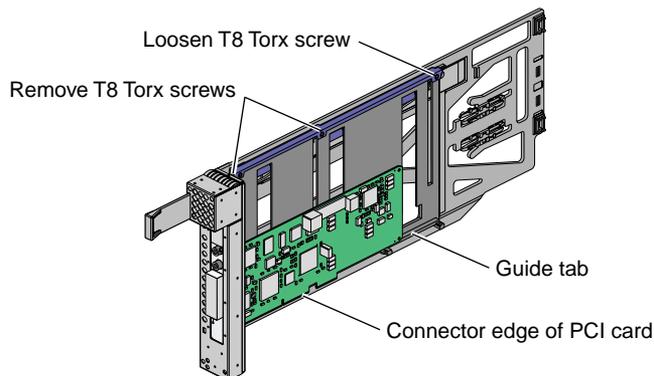
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**Note:** Take care not to lose the threaded inserts in the carrier guide bar.

---

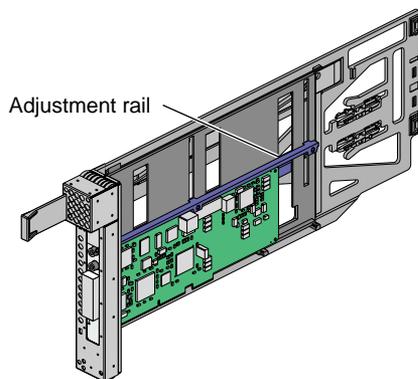
- b. Loosen the third screw of the carrier guide bar.

- c. Place the half-height PCI card in the carrier so that the connector edge of the card rests against the lower guide tab of the carrier (see Figure 13-5).



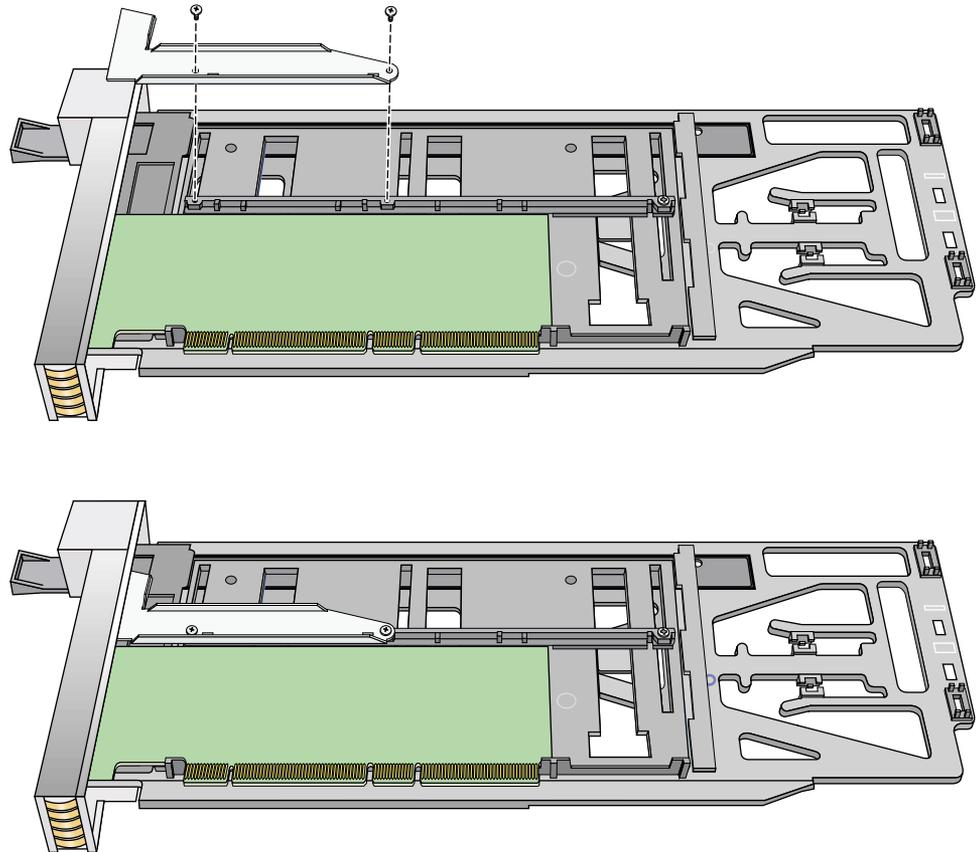
**Figure 13-5** Mounting Half-height PCI Card into Carrier

- d. Move the carrier guide bar (adjustment rail) so that it holds the card firmly in place (see Figure 13-6).



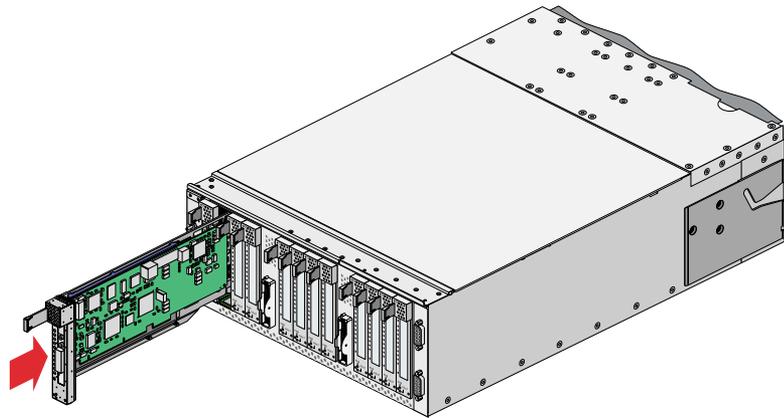
**Figure 13-6** Moving Carrier Guide Bar to Secure Half-height PCI Card

- e. Place the PCI card bracket so that the screw holes of the bracket align with the empty screw holes of the carrier guide bar, as shown in Figure 13-7.
- f. Secure the bracket to the carrier guide bar with two T8 Torx screws.
- g. Tighten the screw that you loosened in step 6b.



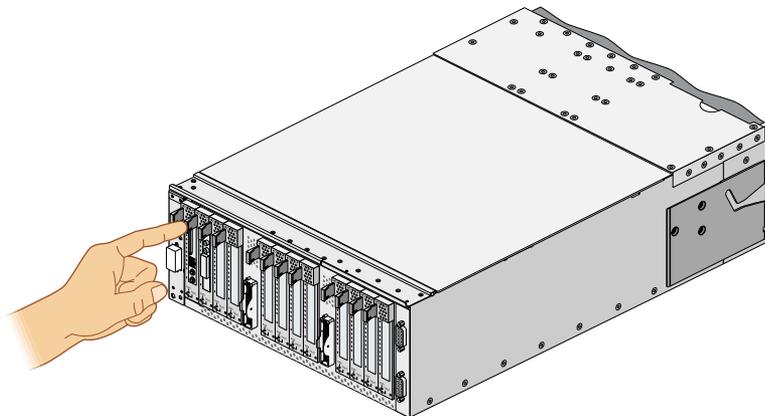
**Figure 13-7** Installing the Bracket to Secure a Half-height PCI Card

7. Insert the carrier-mounted PCI card into the vacant slot, using the slot guide, as shown in Figure 13-8.



**Figure 13-8** Installing a Card in a Slot

8. Push horizontally on the carrier seating bar, as shown in Figure 13-9, to seat the card securely in the slot.



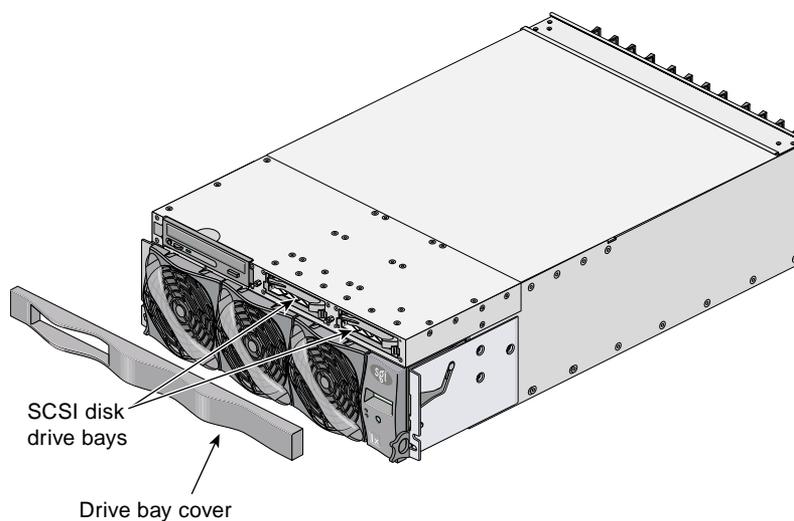
**Figure 13-9** Seating the Card in the Slot

9. Power on the I/O brick by following the power-on instructions in the “Powering On the System” on page 4.
10. Boot your operating system software. (See your software operation guide if you need instructions to boot your operating system.)

11. Run the `hinv` hardware inventory command to verify the installation. This command lists hardware that the operating system discovered during the boot operation.

## Installing or Replacing a Disk Drive in the IX-brick

The IX-brick has two system disk drive bays as shown in Figure 13-10. This section describes how to install or remove the drives.



**Figure 13-10** Location of SCSI Disk Drive Bays

## Installing a System Disk Drive

Before you install a disk drive, you must power off the IX-brick according to the instructions in the “Powering Off the System” on page 9.



---

**Caution:** To protect the system from ESD damage, SGI recommends that you use a grounding wrist strap while installing the disk drive.

---

To install a disk drive, see Figure 13-11 and follow these steps:

1. Remove the drive bay cover to access the two disk drive bays (see panel 1 in Figure 13-11).

---

**Note:** If you are installing only one disk drive, install it in the right-most bay.

---

2. Position the drive assembly so that it engages the bay guide rails, and then gently push the drive into the bay. Do not use the locking handle to push the drive into the bay.
3. Swing the locking handle towards the chassis until the locking handle engages the latch.
4. Snap on the drive bay cover.

After you finish installing the disk drive, power on the IX-brick according to the instructions in the “Powering On the System” on page 4.

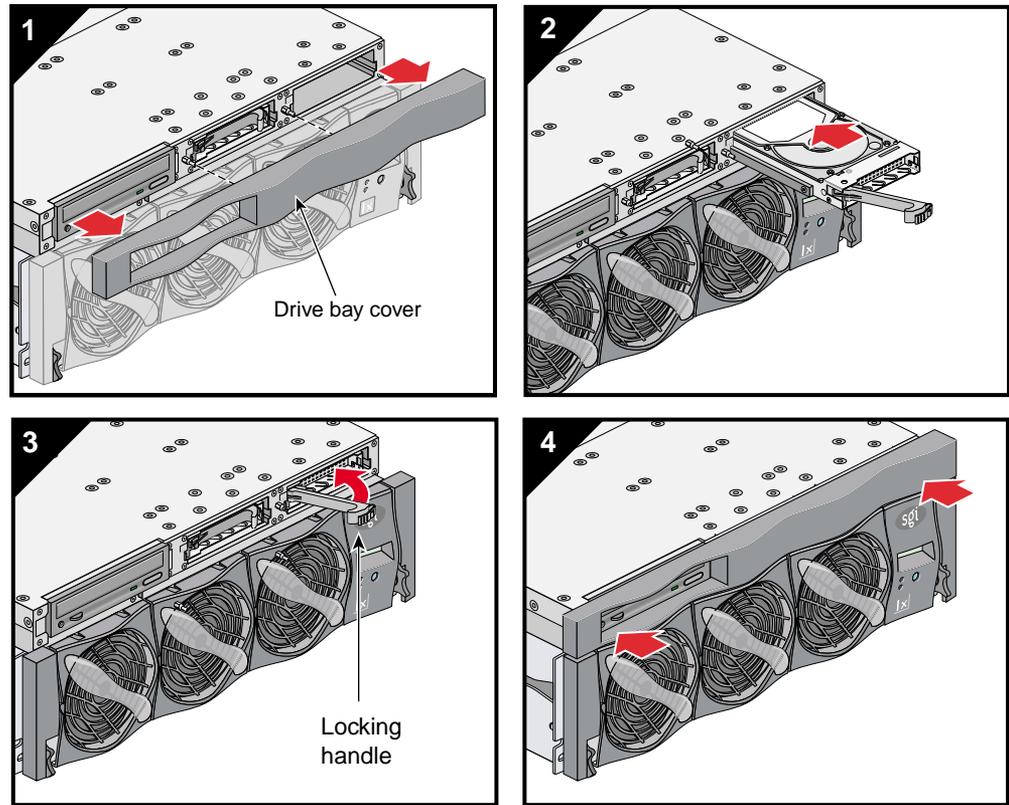


Figure 13-11 Installing a Disk Drive

## Removing a System Disk Drive

Before you remove a disk drive, you must power off the IX-brick according to the instructions in the “Powering Off the System” on page 9.

To remove a disk drive, follow these steps (see Figure 13-12):

1. Remove the drive bay cover to access the two disk drive bays, as shown in panel 1 of Figure 13-12.
2. Remove the disk drive by depressing its handle lock with your thumb and pulling the handle away from the chassis until the handle disengages the disk drive connector from the backplane connector.
3. Carefully slide the disk drive out of the bay and place it on an ESD-safe surface. Do not use the handle to pull the disk drive out of the bay.

---

**Note:** When the IX-brick has only one disk drive installed, it should reside in the right-most bay.

---

4. Install the drive bay cover.

After you remove the disk drive, power on the IX-brick according to the instructions in the “Powering On the System” on page 4.

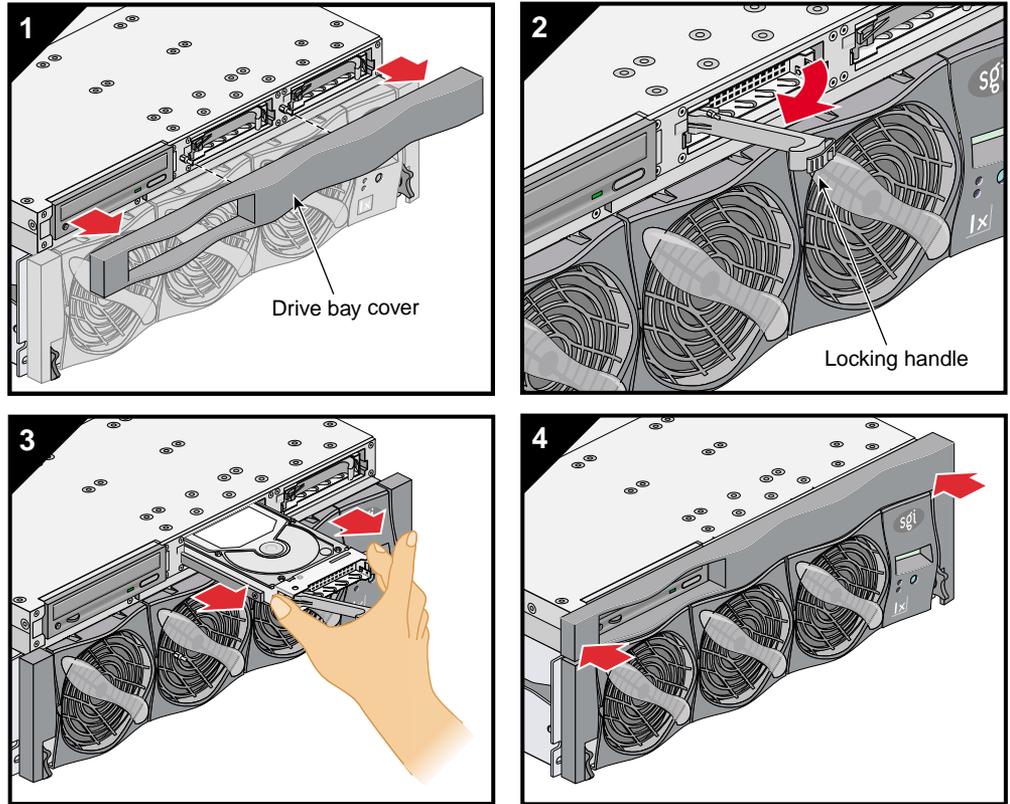


Figure 13-12 Removing a Disk Drive

## XG2N and CPU Expansion Modules

This section describes maintenance operations on the XG2N module and the CPU expansion module.

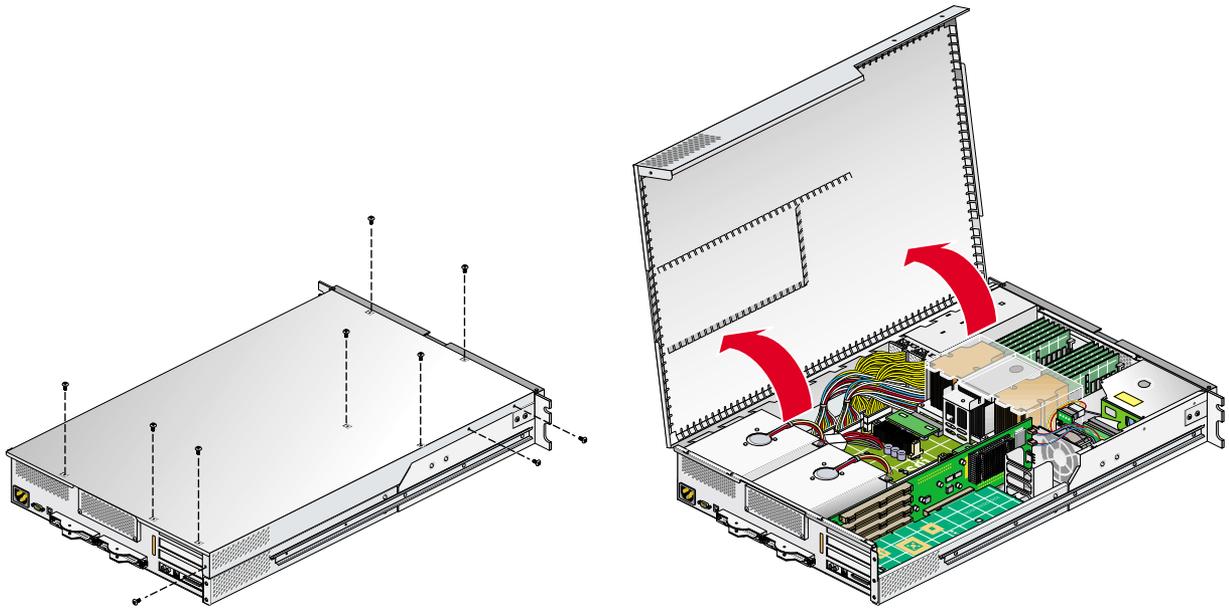
### Opening the XG2N and CPU Expansion Modules

Many of the procedures in this section require the removal of the top cover, a frame rail, or a support bracket in order to access the internal components you are removing or replacing. This section describes how to remove and replace these items.

#### Opening the Cover

Use the following steps to open the cover:

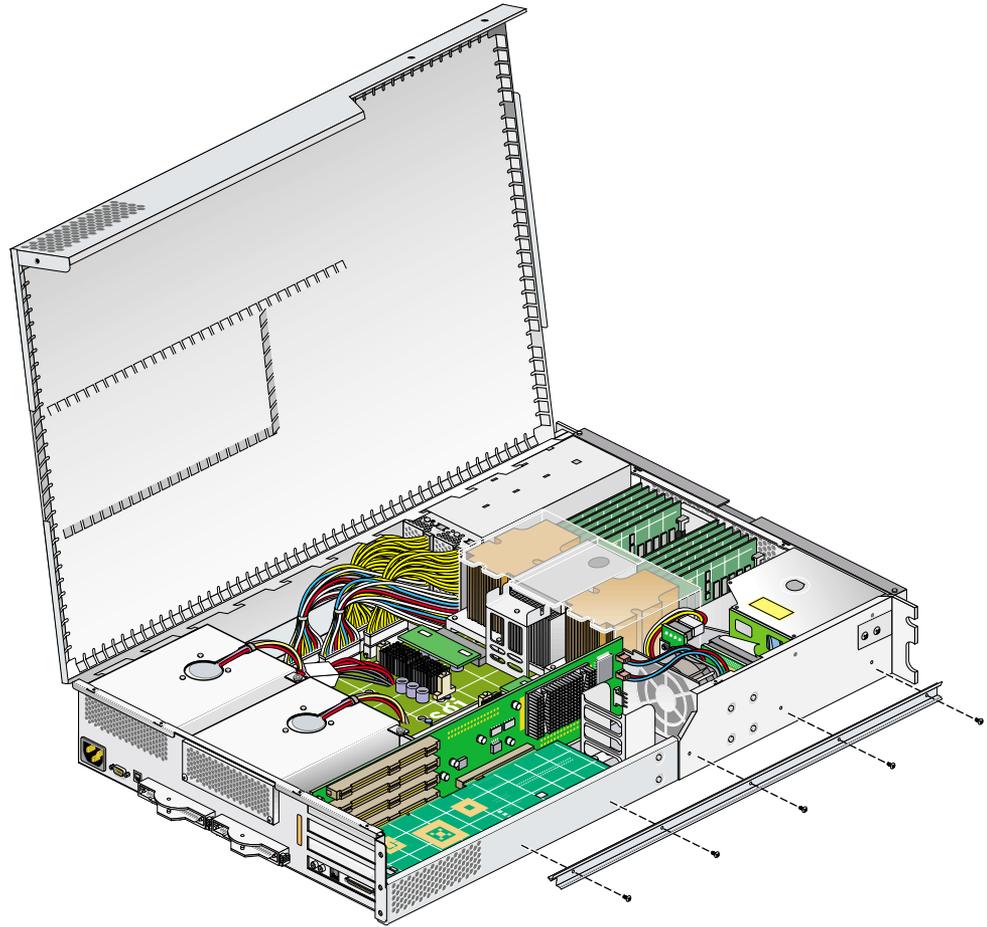
1. To remove the module's top cover and access the internal system components, remove the ten Phillips screws as shown in Figure 13-13.
2. Lift the hinged cover into the fully open position.



**Figure 13-13** Opening the System Cover

### Removing the Optional Chassis Rail

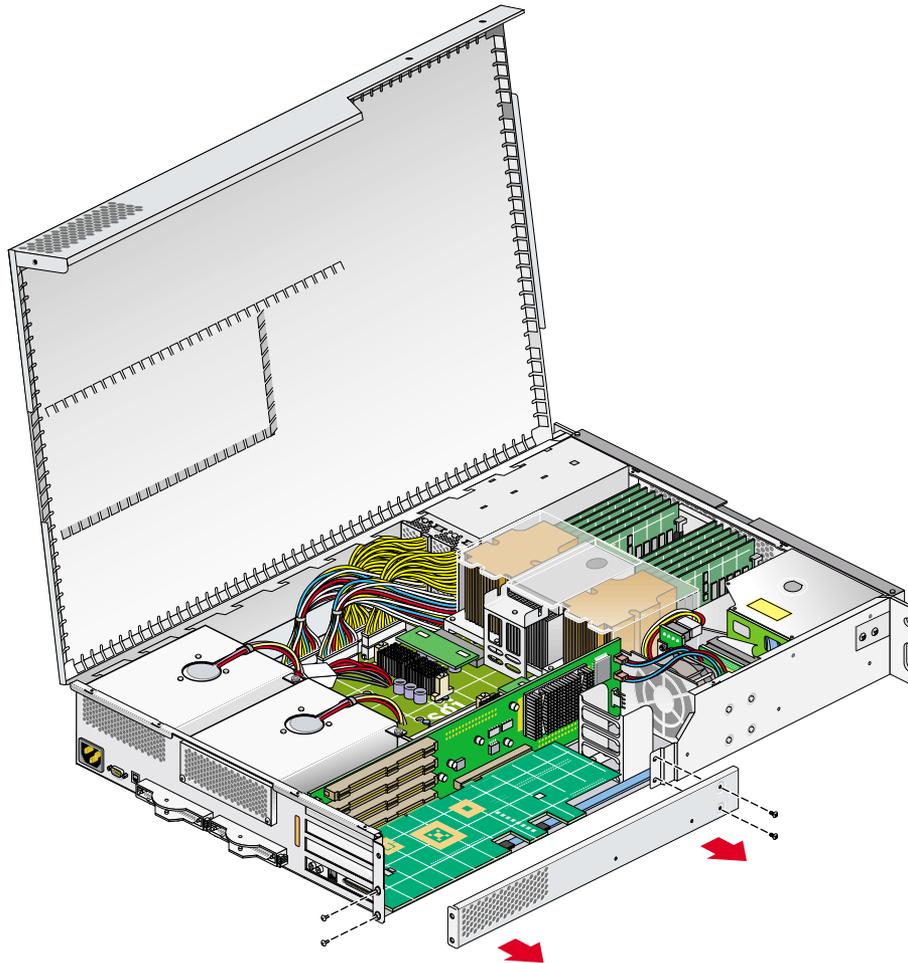
If you are installing a card in the bottom slot of an XG2N module you will need to remove the optional chassis rail. To do this, unscrew the five Phillips screws, as shown in Figure 13-14. (If you are not installing a card into the bottom slot, or your module is not slide-rail mounted, you will not need to perform this step.)



**Figure 13-14** Removing an Optional Chassis Rail

### Removing the PCI/PCI-X Support Bracket

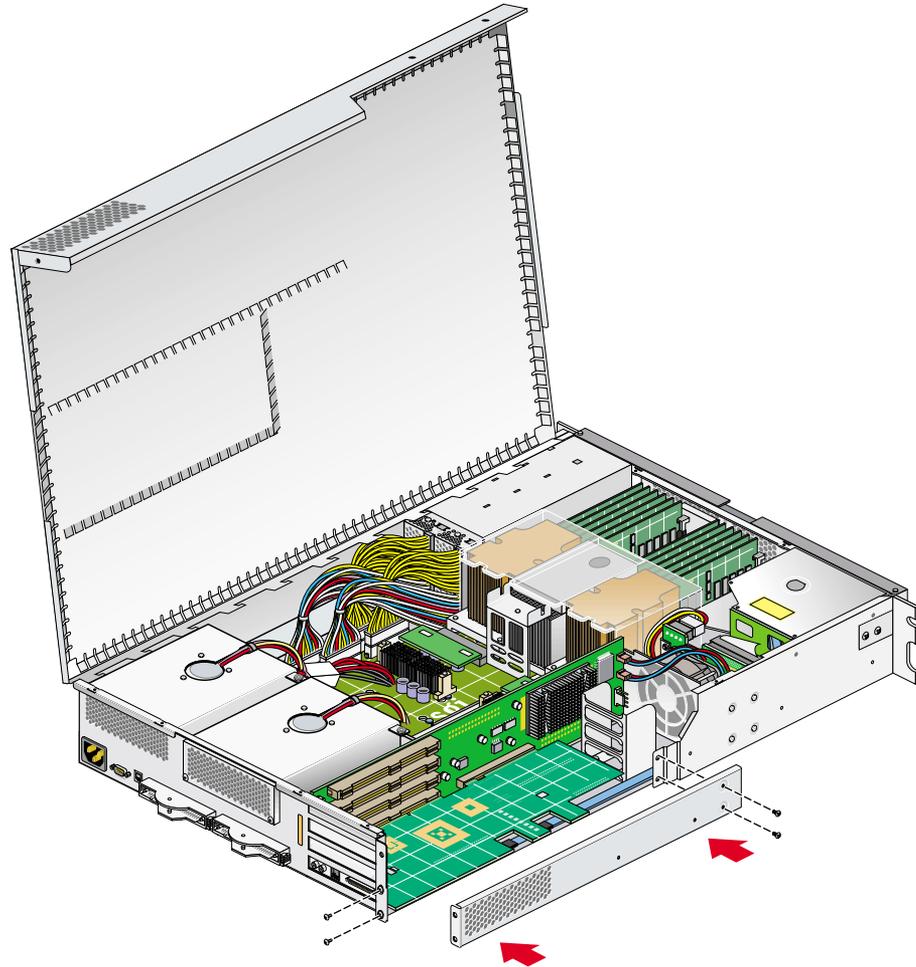
If you are accessing the bottom card in an XG2N module you must remove the lower PCI/PCI-X support bracket that covers this slot. To do this remove the four Phillips screws, as shown in Figure 13-15. (If you are not installing a card into one the bottom slot you will not need to perform this step.)



**Figure 13-15** Removing the Lower PCI/PCI-X Support Bracket

## Reinstalling the PCI/PCI-X Support Bracket

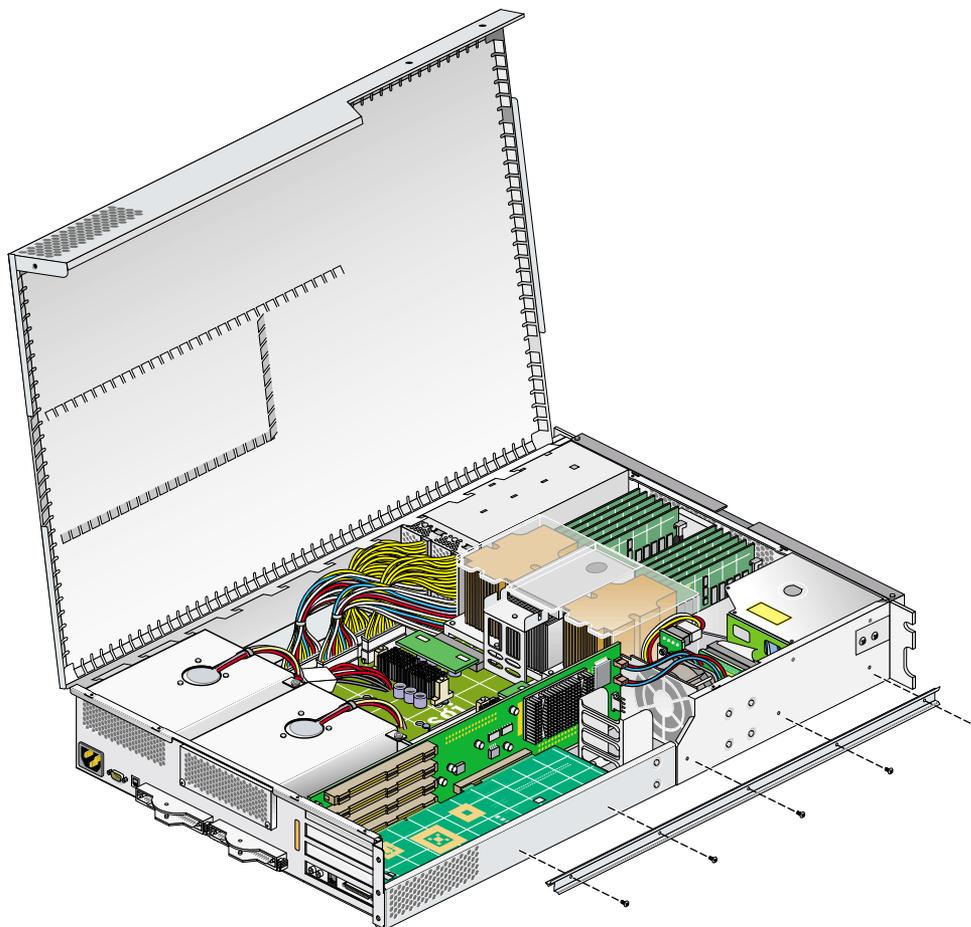
If you removed the PCI/PCI-X support bracket, replace it and screw in the four Phillips screws, as shown in Figure 13-16.



**Figure 13-16** Replacing the Lower PCI/PCI-X Support Bracket

### Reinstalling the Optional Chassis Rail

If you removed the optional chassis rail, replace it and screw in the five Phillips screws, as shown in Figure 13-17.

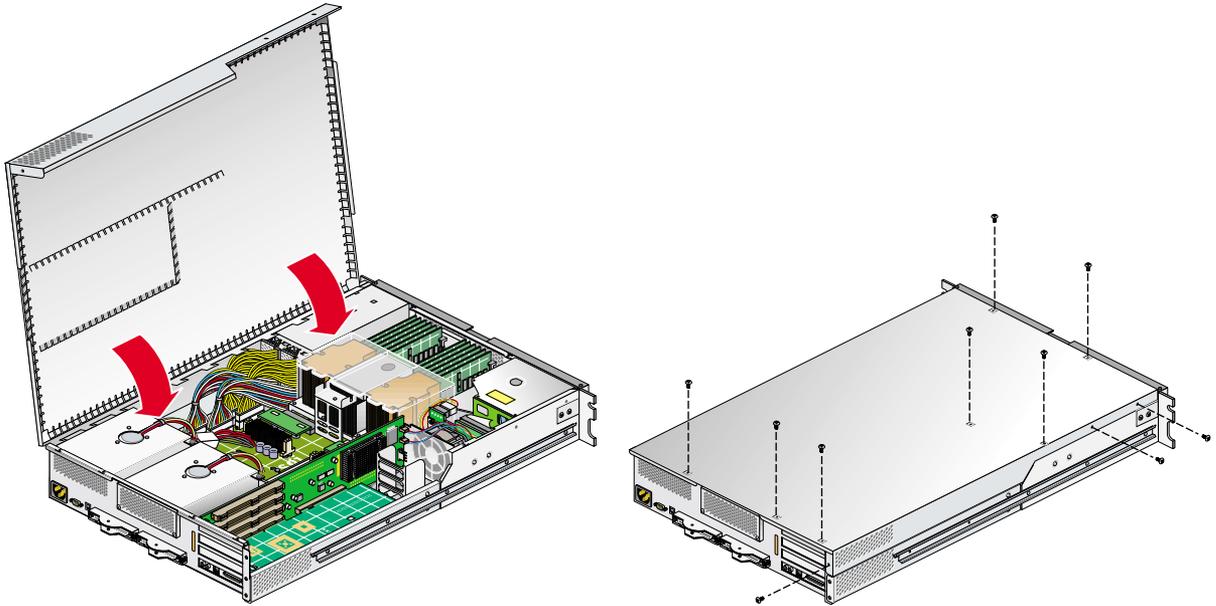


**Figure 13-17** Replacing the Chassis Rail

## Closing the Cover

Use the following steps to close the cover:

1. Close the hinged cover on the system and screw in the ten Phillips screws to secure the cover, as shown in Figure 13-18.



**Figure 13-18** Closing the System Cover

## Replacing an XG2N Graphics Card

To replace a graphics card in an XG2N module, follow these steps:

1. Power off the Silicon Graphics Prism platform. For power off instructions, see “Powering Off the System” on page 9.
2. Disconnect all of the cables at the rear of the module.



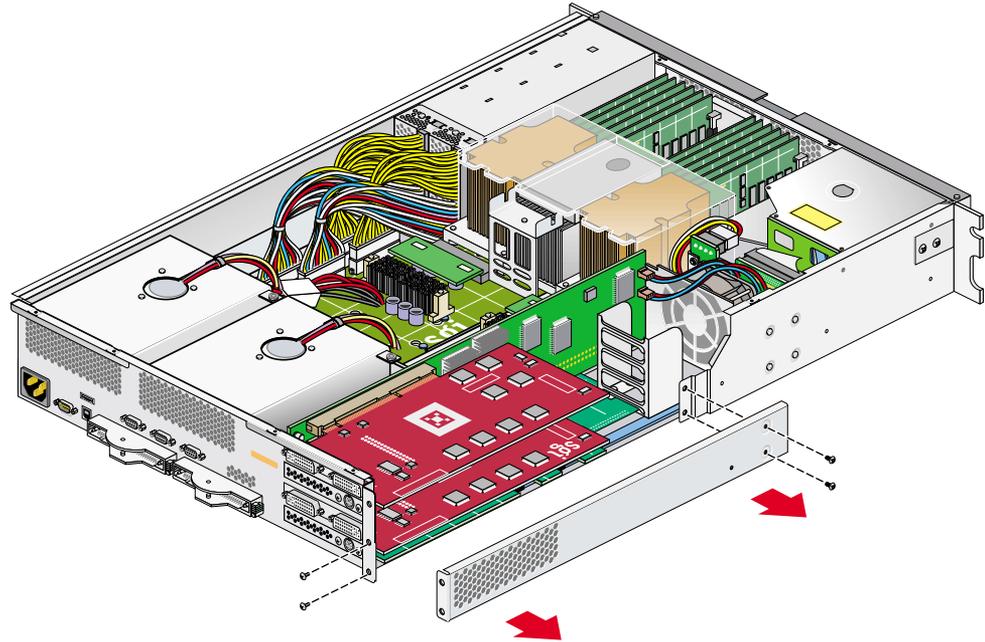
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**Warning:** Components may be hot. To avoid injury, allow the components to cool for approximately five minutes before you proceed with these instructions.

---

3. If your module is rackmounted, remove the two screws that secure the module to the front rails of the rack. If the module is mounted with shelf rails, remove the screws at the rear also. If your module is not rackmounted, proceed to step 6.
4. If the module is mounted with the optional slide rail kit, pull the module from the rack until it is stopped by the safety latches. Otherwise, two people should lift the unit from the rack and place it on a stable work surface.
5. Remove the module (using two people) from the optional slide rails by depressing the safety latches and sliding the module outward. Place it on a stable work surface.
6. Open the top cover as described in “Opening the Cover” on page 179.
7. When removing and replacing a graphics card, you may need to remove an optional chassis rail by unscrewing the five Phillips screws (as described in “Removing the Optional Chassis Rail” on page 180).

8. Remove the lower PCI/PCI-X support bracket by unscrewing the four Phillips screws, as shown in Figure 13-19.



**Figure 13-19** Removing the XG2N Graphics Card Bracket

9. Undo and remove the two screws that hold the card to the back panel, as shown in Figure 13-20.



**Caution:** Each graphics card has a 7-pin synchronization cable connected from the PCI riser board to the underside of the graphics card. Be careful not to pull the graphics card away from the board too far as you remove it.

10. Pull the card gently out of the main connector on the riser board until it is clear of the back panel and main connector.
11. Carefully rotate the board over and disconnect the 7-pin keyed synchronization cable from the bottom of the graphics board (it attaches the graphics card assembly to the PCI riser board). See Figure 13-21 on page 189.
12. Place the graphics card on an ESD-safe surface or in a protective bag.

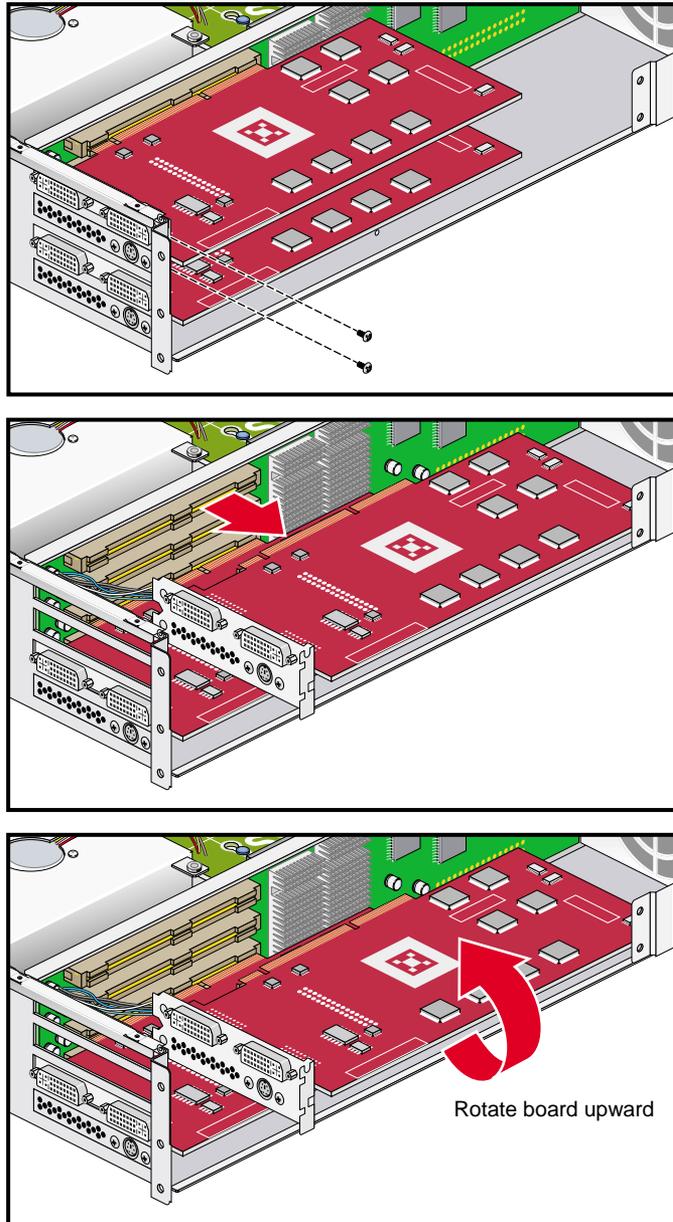
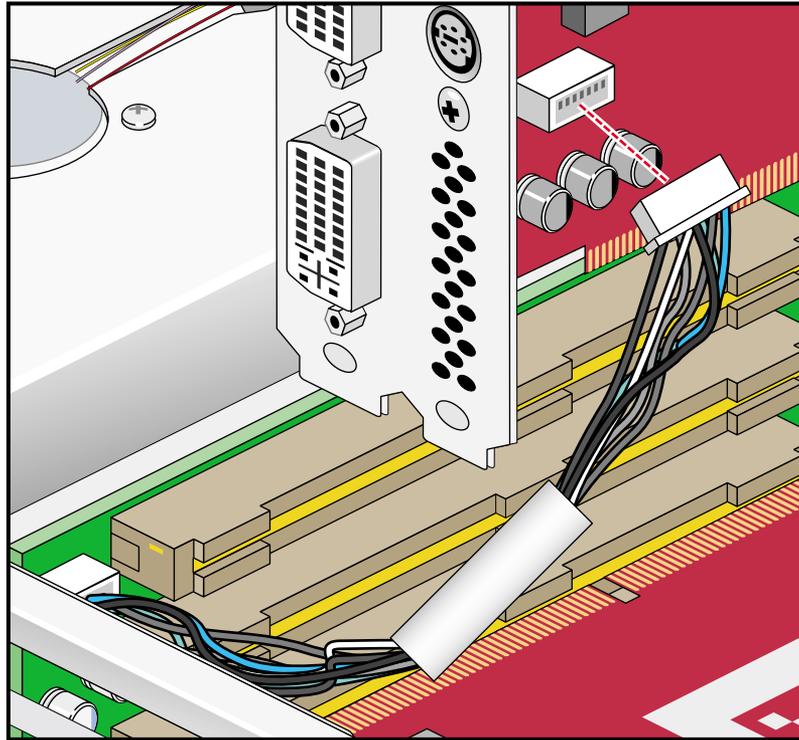


Figure 13-20 Remove XG2N Graphics Board Assembly



**Figure 13-21** Synchronization Cable Connection on Underside of Graphics Board

To install a new XG2N graphics card, use the following steps:

1. Place the board close to the graphics connector on the riser board and tilt it up until you can see the connector location for the 7-pin synchronization cable.
2. Gently insert the 7-pin synchronization cable into the connector on the bottom of the replacement graphics card (see Figure 13-21). The connector is keyed and will only insert in the proper orientation. You should hear or feel a slight snap as the connector is seated.
3. Insert the card into the slot the old graphics card was removed from by pushing the card into the connector until it is properly seated and installing the back panel retaining screws, as shown in Figure 13-22.

Be careful not to snag the 7-pin synchronization cable between the graphics card and the riser board connector when you install the new card.

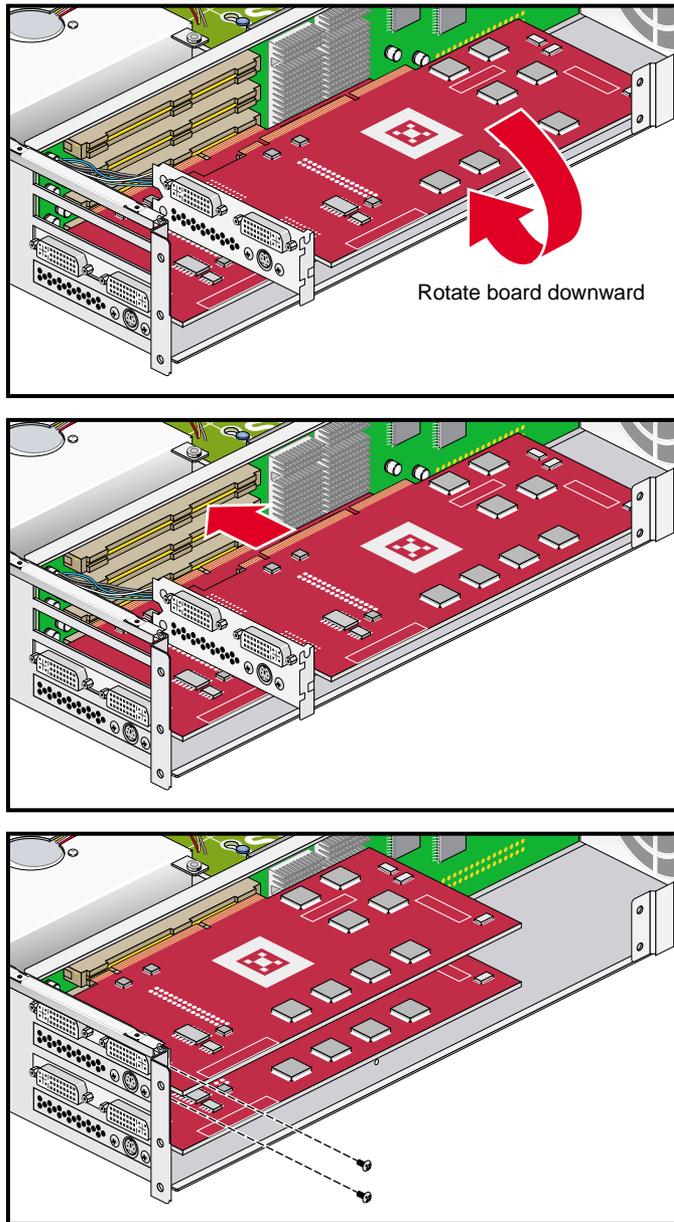
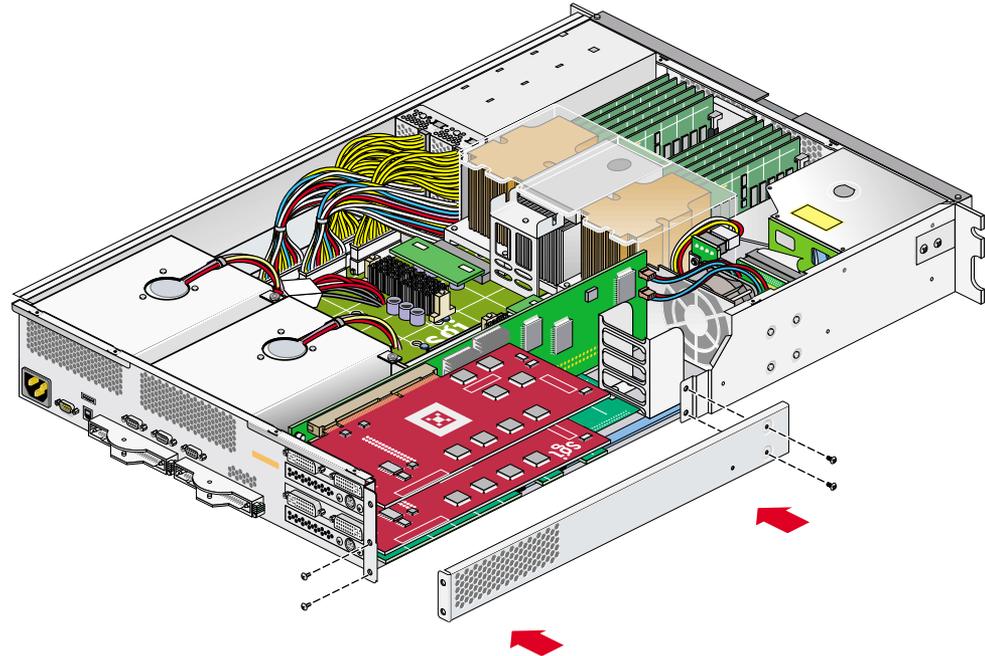


Figure 13-22 Installing the Graphics Card and Retaining Screws

4. Replace the lower PCI/PCI-X support bracket and screw in the four Phillips screws, as shown in Figure 13-23.



**Figure 13-23** Replacing the PCI/PCI-X Support Bracket

5. Replace the optional chassis rail (if applicable) as described in “Reinstalling the Optional Chassis Rail” on page 184.
6. Close the top cover as described in “Closing the Cover” on page 185.
7. If your system uses optional slide rails, follow substeps a-d; otherwise go to step 8.
  - a. Fully extend the left and right slide rails from the rack until they lock into place.
  - b. This step requires two people. With one person holding each side of the module, align the chassis rails of the module with the slide rails of the rack.
  - c. Slide the chassis rails into the slide rails until the chassis rails are stopped by the safety latches.
  - d. Press the safety latches on both sides of the module, and slide the module into the rack.

8. For modules mounted on shelf rails, use two people to slide the unit into the rack.
9. Install the two screws that secure the module to the front rails of the rack. For shelf mounted units, secure the two screws at the back.
10. Install all of the cables at the rear of the module.
11. Power on the Silicon Graphics Prism platform. For powering on instructions, see “Powering On the System” on page 4.

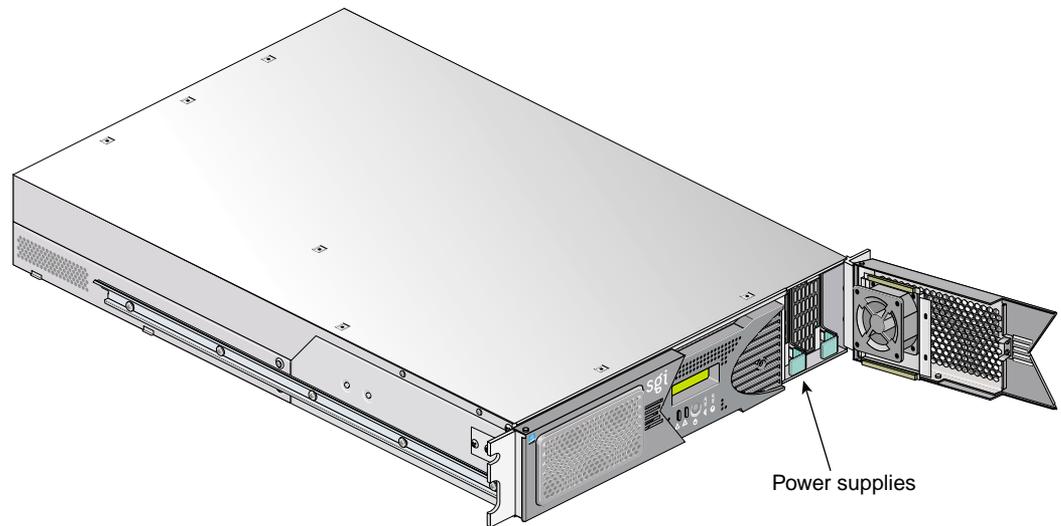
## Removing and Replacing Power Supplies

The XG2N and CPU expansion modules in a Silicon Graphics Prism system can contain one or two sled-mounted power supplies (see Figure 13-24). For information on determining the operational status of a power supply, see “XG2N and CPU Expansion Module Power Supply Status LEDs” on page 230.

---

**Note:** The XG2N graphics module always requires two power supplies; no redundant power is available. The system must be shut down prior to power supply replacement.

---



**Figure 13-24** Location of Power Supplies

To replace a power supply, follow these steps:

1. If you are replacing a power supply in an XG2N module, power off the Silicon Graphics Prism platform as described in the section “Powering Off the System” on page 9. The XG2N module always uses two supplies. There is no redundant power supply option available.
2. Remove the power supply to be replaced, as follows:

- a. Swing open the bezel door located on the right side of the module front panel. With a Phillips screw driver, unscrew the two screws on the screen cover as shown in Figure 13-25A.
- b. Swing open the screen cover as shown in Figure 13-25B.
- c. Disengage the power supply from the power supply bay by pushing the interior release button to the right and pulling up and out on the green handle lock as shown in Figure 13-25C.
- d. Gently pull out the power supply from the chassis until it clears the power supply bay as shown in Figure 13-25D. Place the power supply on an ESD-safe surface.

---

**Caution:** When pulling out the power supply from the chassis, make sure not to disturb the power supply fan's ribbon cable.

---

3. Install the replacement power supply, as follows:
  - a. Position the power supply in the slot and with the power supply handle pulled up (fully opened), gently push the power supply into the bay as shown in Figure 13-26A.

---

**Caution:** When installing the power supply, make sure that the power supply does not clip or pinch the power supply fan's ribbon cable.

---

- b. Push in and down on the green handle and snap the power supply into place as shown in Figure 13-26B.
- c. After you have installed the power supply, swing the screen cover until it closes as shown in Figure 13-26C.

---

**Caution:** When closing the screen cover, make sure that the cover does not clip or pinch the power supply fan's ribbon cable.

---

- d. Screw in the two Phillips screws that you had removed as shown in Figure 13-26D, and close the bezel door.
4. Power on the Silicon Graphics Prism platform, as described in "Powering On the System" on page 4.

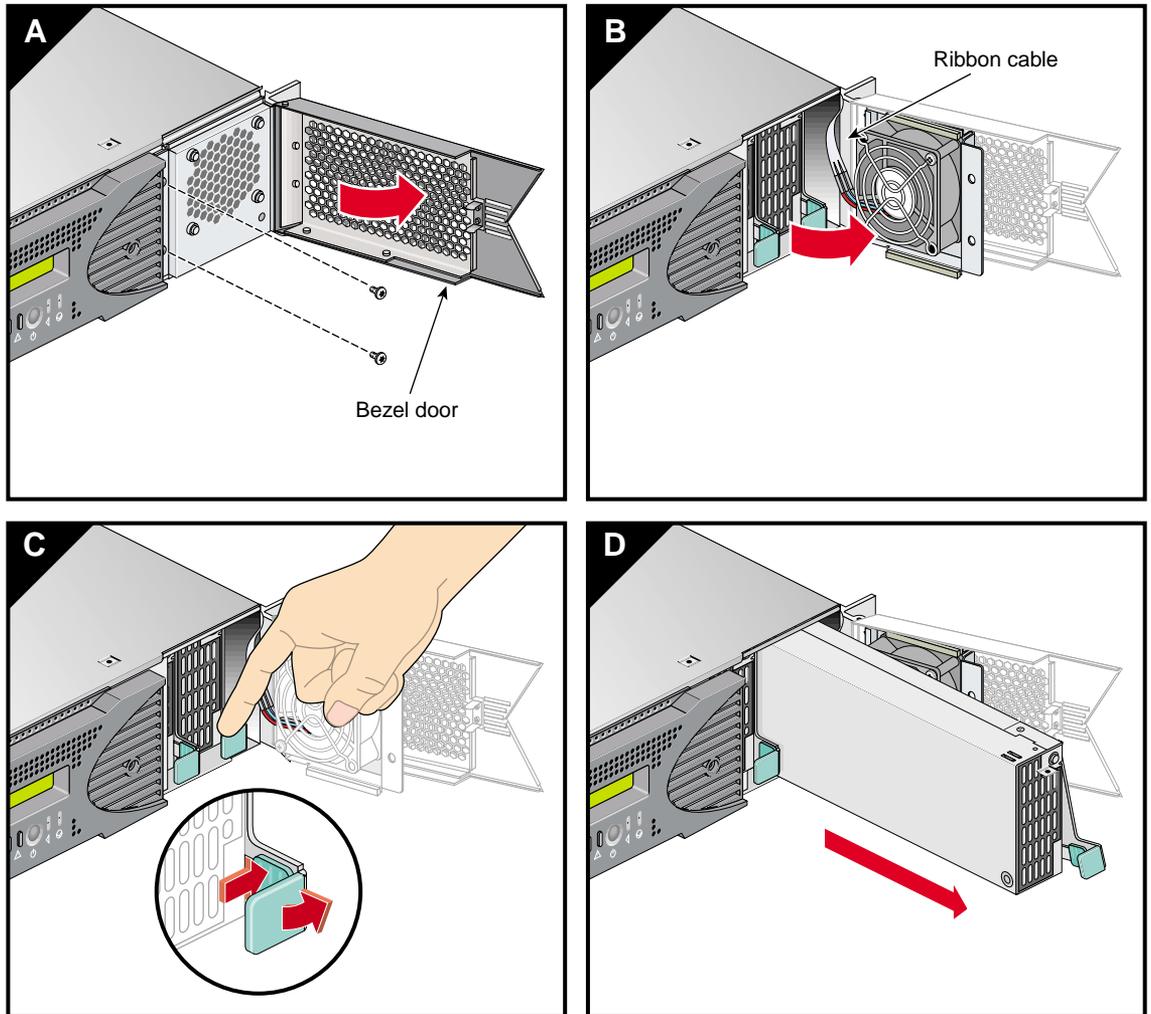


Figure 13-25 Removing a Power Supply

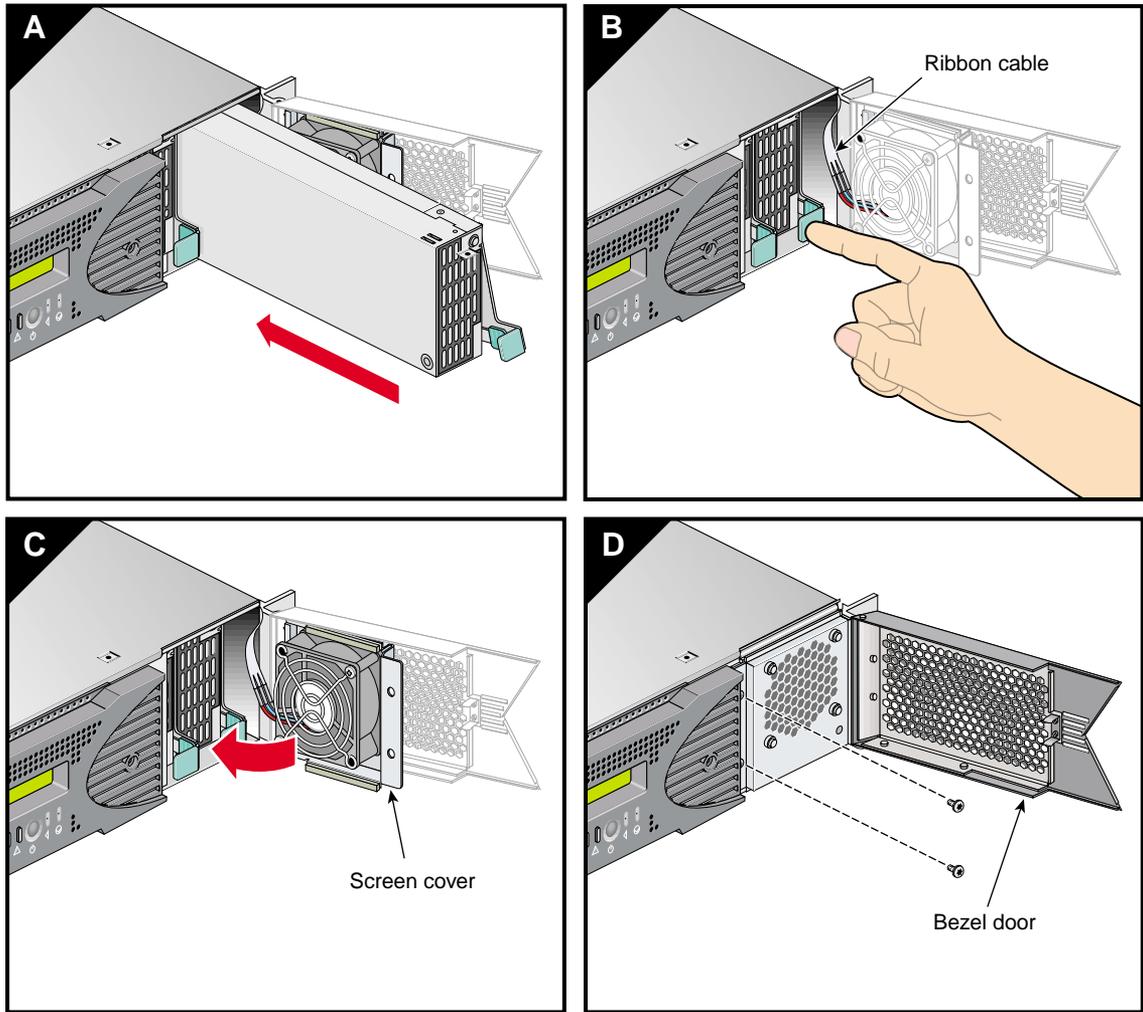


Figure 13-26 Installing the Power Supply

## Removing and Replacing Memory DIMMs

This section provides guidelines for DIMM selection and installation, followed by instructions to install and remove DIMMs.

### Memory DIMM Group Placement and Guidelines

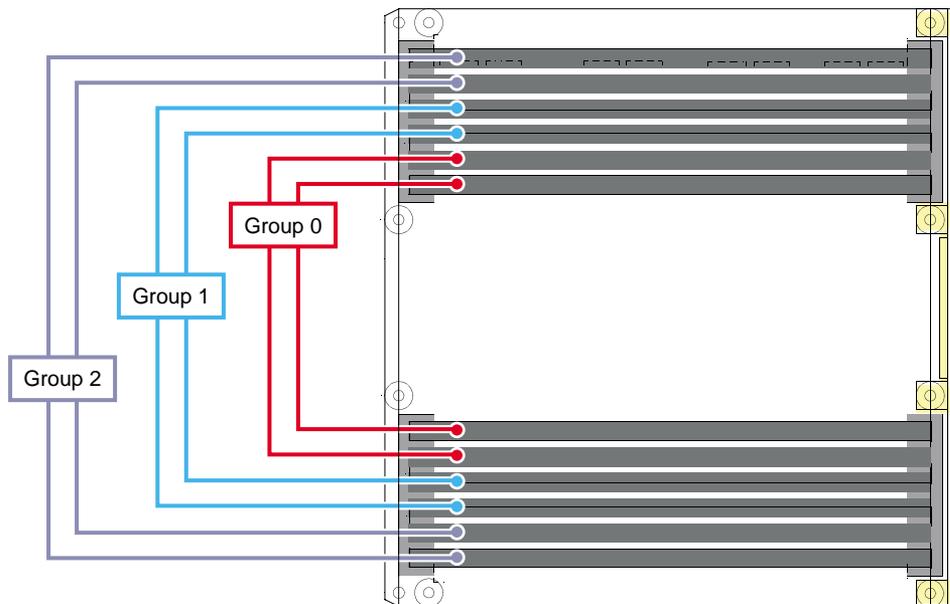
Memory is contained on cards that are referred to as DIMMs (dual inline memory modules). Each XG2N and CPU expansion module can contain four, eight, or twelve DIMMs installed in DIMM slots located on the module's node board.

These twelve DIMM slots are organized into three groups of four DIMMs each, as shown in Figure 13-27 on page 198.

DIMMs are installed one per DIMM slot, and must be installed in groups of four.

Follow these guidelines when installing DIMM groups:

- Memory is increased or decreased in four-DIMM group increments only.
- Each of the four DIMMs that make up a DIMM group must be the same memory size and speed; however, different groups of DIMMs can differ in memory size.
- The first four DIMMs (group 0) must be in place for the base compute module to operate properly.
- Mixing DIMM groups with different access speeds will cause the memory bus to default to the speed used for the slowest group.
- The maximum bus speed for a completely full set of DIMM memory slots (three installed groups), defaults to 100 MHz or 133 MHz, depending on the type of DIMMs installed.
- The DIMMs used in the Silicon Graphics Prism platform modules are **not** compatible with DIMMs used in the Origin 200, Origin 350 series, SGI 3000 series, SGI 2000 series, Onyx systems, Fuel, Octane or Tezro systems.



**Figure 13-27** Layout of Slots and DIMM Memory Groups



**Caution:** Electronic equipment can be irreparably damaged by electrostatic discharge (ESD). Always follow these preventive measures when you handle a system component:

- Remove a component from its antistatic bag only when you are ready to install it.
  - If you handle a component before installation, do not place it on surfaces that produce ESD (carpeting, for example) or near devices that create static electricity.
  - Attach a static wrist strap to a grounded connection on your system when you install or remove a component.
-

## Installing a DIMM Group

To install a DIMM group, follow these steps:

1. Power off the Silicon Graphics Prism platform. For powering off instructions, see “Powering Off the System” on page 9.
2. Disconnect all of the cables at the rear of the module.

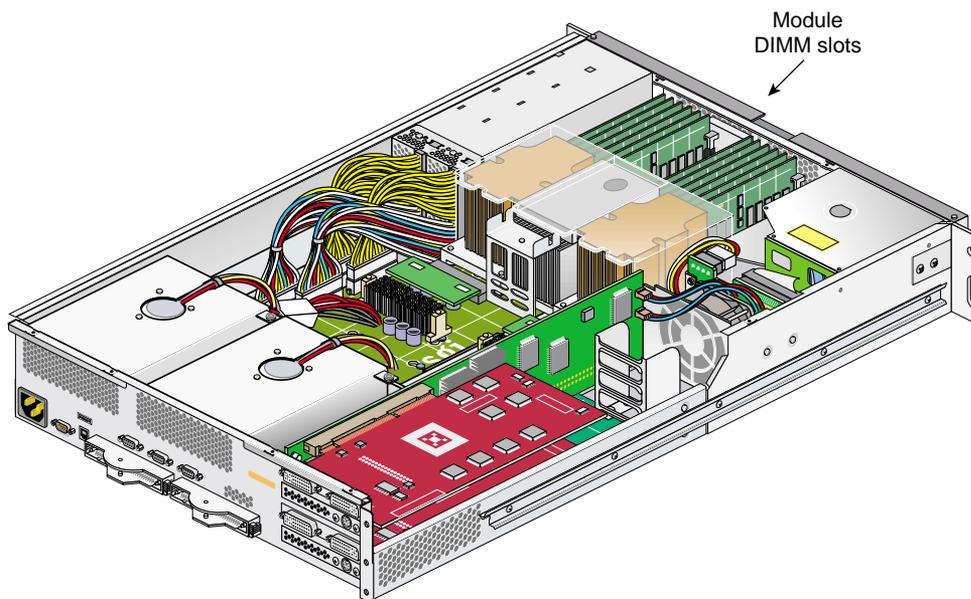


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**Warning:** Components may be hot. To avoid injury, allow the components to cool for approximately five minutes before you proceed with these instructions.

---

3. Remove the two screws that secure the module to the front rails of the rack. For shelf-mounted modules, remove the two screws at the rear of the unit.
4. With shelf-mounted rails, use two people to slide the module out and move it to a stable work surface. With optional slide rails, pull the module from the rack until it is stopped by the safety latches.
5. Open the top cover as described in “Opening the Cover” on page 179.



**Figure 13-28** DIMM Locations (XG2N Module Shown, Others Similar)

6. Install the DIMMs, as follows (see Figure 13-28 and Figure 13-29):

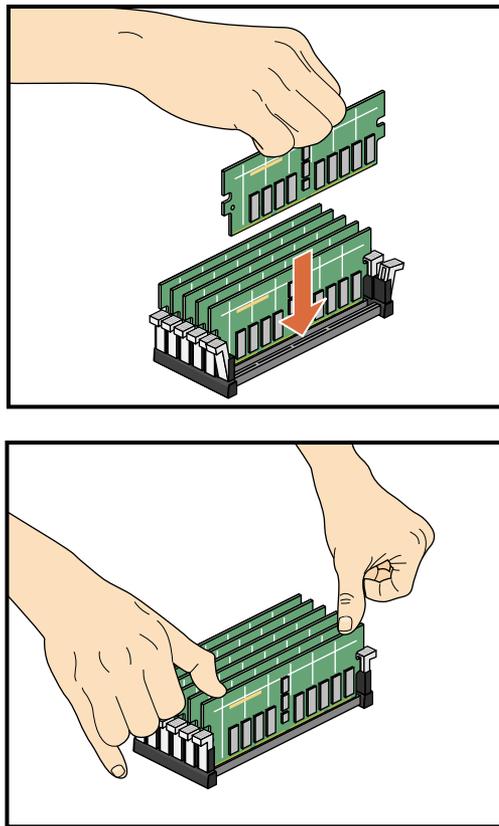
---

**Note:** If you need to find the correct locations in which to install the DIMMs, make sure to read the introductory material in “Removing and Replacing Memory DIMMs” on page 197.

---

- a. Ensure the ejector latches are in the open position (leaning away from the slot).
  - b. Hold the DIMM only by its edges and remove it from its antistatic package.
  - c. Align the bottom edge of the DIMM with the keyed socket.
  - d. Insert the bottom edge of the DIMM into the socket, and then press down evenly on the DIMM until it seats correctly. Use extreme care when you install a DIMM. If you apply too much pressure, you can damage the socket.
  - e. When the DIMM is fully seated in the connector, the ejector latches snap into place flush with each end of the DIMM, see Figure 13-29.
7. Close the top cover as described in “Closing the Cover” on page 185.

8. If using optional slide rails, press the safety latches on both sides of the module and slide the module into the rack. For shelf-mounted units, use two people to slide the module back into the rack.
9. Install the two screws that secure the module to the front rails of the rack. If shelf rails are used, install the two rear screws.
10. Install all of the cables at the rear of the module.
11. Power on the Silicon Graphics Prism platform as described in “Powering On the System” on page 4.



**Figure 13-29** Inserting a DIMM

## Removing a DIMM

To remove a DIMM, follow these steps:

1. Power off the Silicon Graphics Prism platform. For powering off instructions, see “Powering Off the System” on page 9.
2. Disconnect all of the cables at the rear of the module.



---

**Warning:** Components may be hot. To avoid injury, allow the components to cool for approximately five minutes before you proceed with these instructions.

---

3. Remove the two screws that secure the module to the front rails of the rack. For shelf-mounted modules, remove the two screws at the rear of the unit.
4. With shelf-mounted rails, use two people to slide the module out and move it to a stable work surface. With optional slide rails, pull the module from the rack until it is stopped by the safety latches.
5. Open the top cover as described in “Opening the Cover” on page 179.
6. Remove the DIMM, as follows (see Figure 13-28 and Figure 13-30):

---

**Note:** For guidelines on removing or replacing the DIMMs, make sure to read the introductory material in “Removing and Replacing Memory DIMMs” on page 197 and see Figure 13-27 on page 198.

---

- a. Push out and down on the two ejector latches (located at each end of the DIMM socket) to disengage the DIMM from its connector.
- b. Carefully grasp the DIMM and pull it up and out of the guide rails.

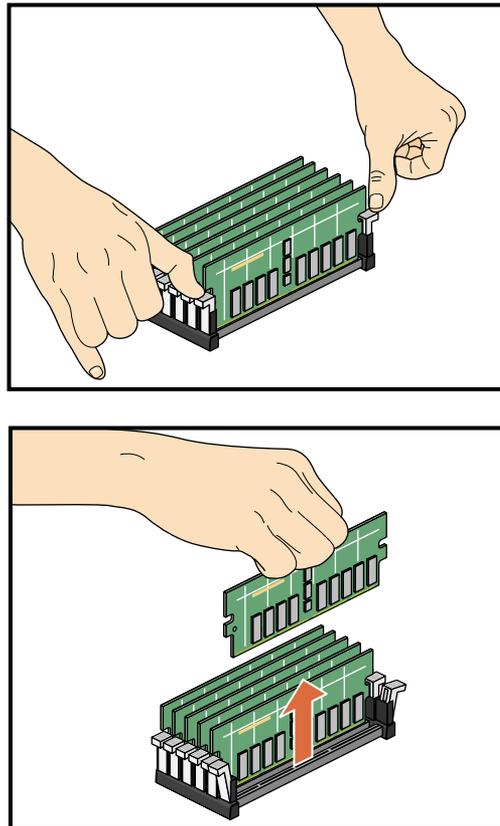
---

**Note:** Hold the DIMM only by its edges. Be careful not to touch its components or gold edge connectors.

---

- c. Place the DIMM on an ESD-safe surface.
7. If you are installing a new DIMM, proceed to “Installing a DIMM Group” on page 199. If you are not installing a new DIMM, proceed to the next step.
  8. Close the top cover as described in “Closing the Cover” on page 185.

9. If using optional slide rails, press the safety latches on both sides of the module and slide the module into the rack. For shelf-mounted units, use two people to slide the module back into the rack.
10. Install the two screws that secure the module to the front rails of the rack. If shelf rails are used, install the two rear screws.
11. Install all of the cables at the rear of the module.
12. Power on the Silicon Graphics Prism platform as described in “Powering On the System” on page 4.



**Figure 13-30** Removing a DIMM

## L1 Controller Display

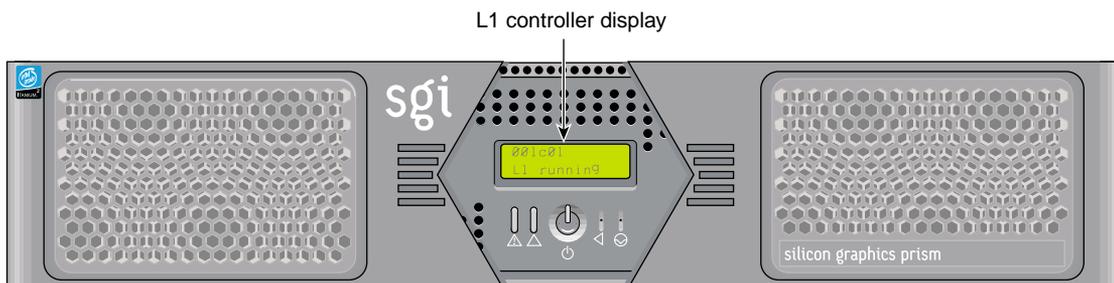
The L1 controller, which is used to monitor and manage the XG2N and CPU expansion modules of the Silicon Graphics Prism platform, has a display located on the front panel as shown in Figure 13-31. Each of these modules is factory- shipped with an L1 controller display.

This section describes how to replace an L1 controller display panel in an XG2N or CPU expansion module.

---

**Note:** The L1 display on other modules, such as the CR-brick, IX-brick, PX-brick, etc., are not user-replaceable.

---



**Figure 13-31** L1 Controller Display on Base Compute Module

To replace an L1 controller display, follow these steps:

1. Power off the system as described in “Powering Off the System” on page 9.
2. Disconnect all of the cables at the rear of the module.



---

**Warning:** Components may be hot. To avoid injury, allow the components to cool for approximately five minutes before you proceed with these instructions.

---

3. Remove the two screws that secure the module to the front rails of the rack. For shelf-mounted modules, remove the two screws at the rear of the unit.

4. With shelf-mounted rails, use two people to slide the module out and move it to a stable work surface. With optional slide rails, pull the module from the rack until it is stopped by the safety latches.

5. Open the top cover as described in “Opening the Cover” on page 179.
6. On the front panel of your system, remove the front bezel by unscrewing the two Phillips screws holding the bezel to the chassis, as shown in Figure 13-32A.
7. Holding the L1 display cover with one hand, unscrew the single Phillips screw holding the L1 display cover to the chassis, as shown in Figure 13-32B. Gently unhook and pull away the L1 display cover from the chassis.
8. Unscrew the two Phillips screws holding the L1 controller display panel to the L1 display protective cover, as shown in Figure 13-32C.
9. Gently disconnect the L1 controller cable from the connector on the L1 controller display, as shown in Figure 13-32D.

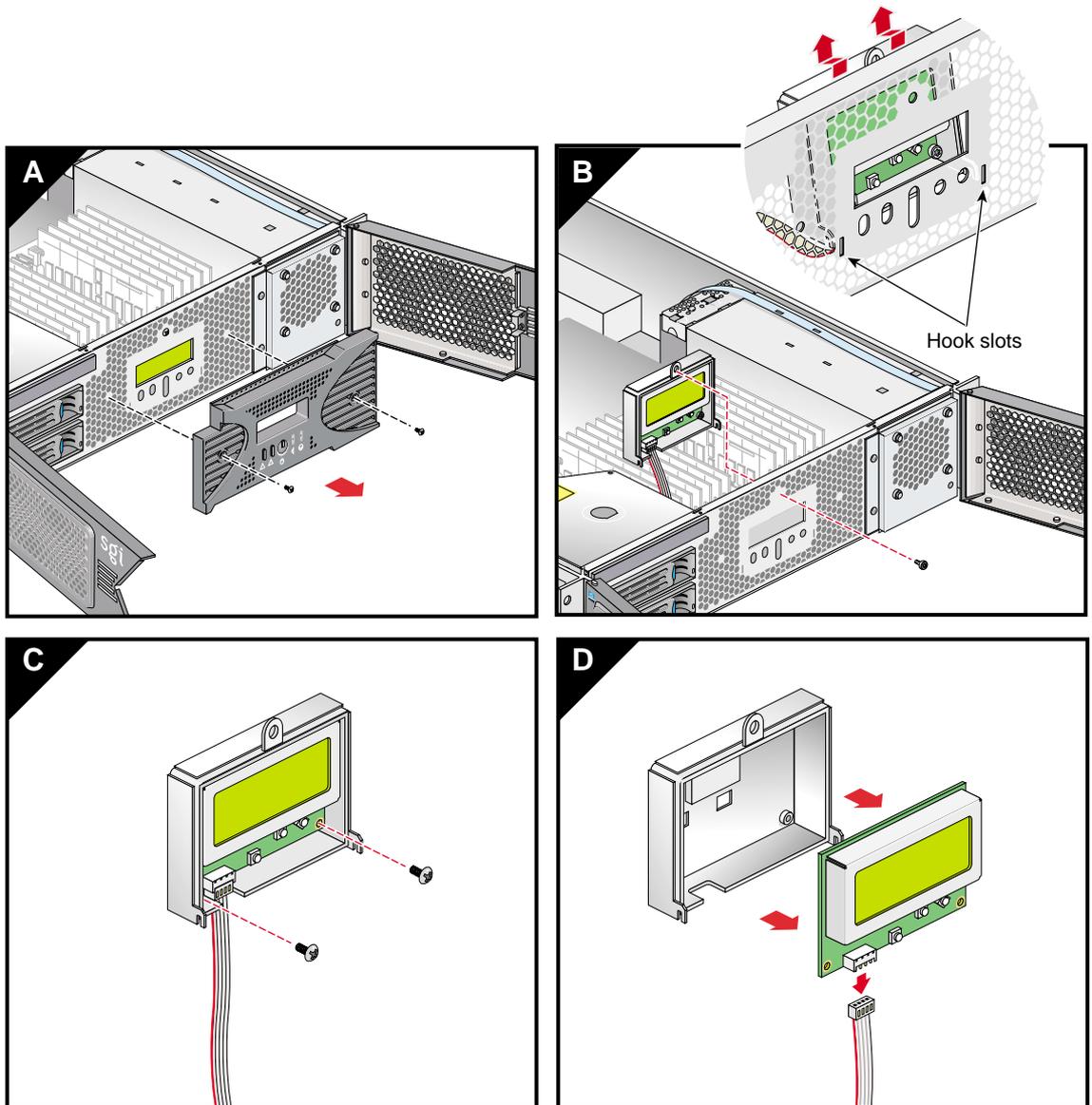
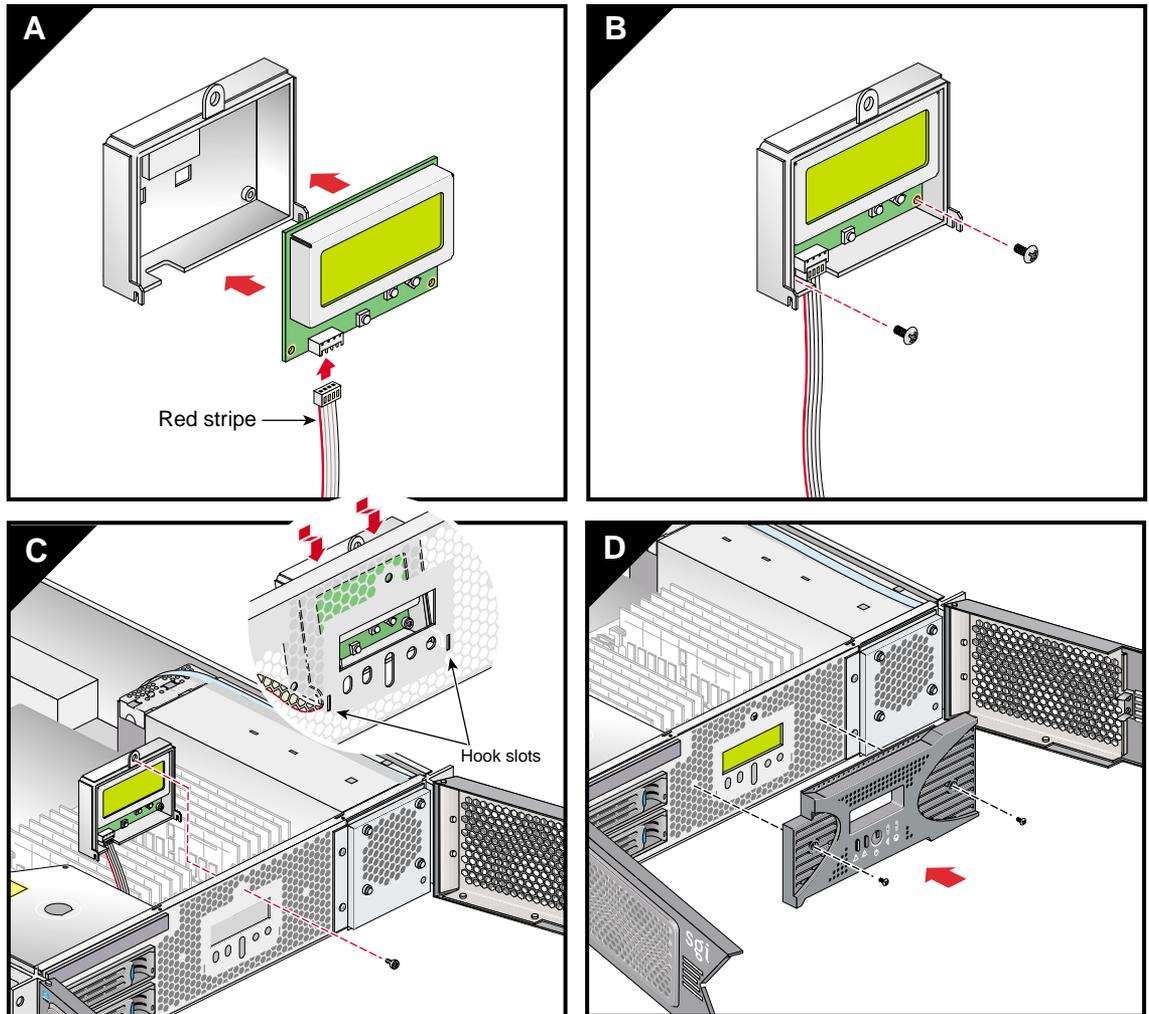


Figure 13-32 Removing the L1 Controller Display Panel

10. Connect the L1 controller cable to the connector on the new L1 controller display, making sure that the red stripe is to your left, as shown in Figure 13-33A.
11. Align the two screw holes on the L1 controller display with the holes on the L1 display protective cover, and screw in the two Phillips screws, as shown in Figure 13-33B.
12. Hook in the L1 display protective cover onto the slots on the front chassis and, holding the L1 display cover up against the front chassis, screw in the Phillips screw, as shown in Figure 13-33C.
13. Replace the front bezel onto the front chassis of the system by screwing in the two Phillips screws holding the bezel to the chassis, as shown in Figure 13-33D.



**Figure 13-33** Installing an L1 Controller Display Panel

14. Close the top cover as described in “Closing the Cover” on page 185.
15. If using optional slide rails, press the safety latches on both sides of the module and slide the module into the rack. For shelf-mounted units, use two people to slide the module back into the rack.

16. Install the two screws that secure the module to the front rails of the rack. If shelf rails are used, install the two rear screws.
17. Install all of the cables at the rear of the module.
18. Power on the Silicon Graphics Prism platform as described in “Powering On the System” on page 4.

## TP900 Enclosure

This section describes operations on the TP900 enclosure.

### Replacing a TP900 Drive Carrier Module



---

**Caution:** Follow electrostatic discharge (ESD) precautions while replacing the drive carriers. Avoid contact with the backplane components and module connectors.

---

To remove and replace a drive carrier module from the SGI TP900 enclosure, follow these steps:



---

**Caution:** Do not remove a drive carrier unless a replacement or a dummy carrier can be immediately added. The system must not be run without all modules in place. Any unused drive bays must be fitted with a dummy carrier module.

---

1. Spin down the drive prior to removal, using the operating system.



---

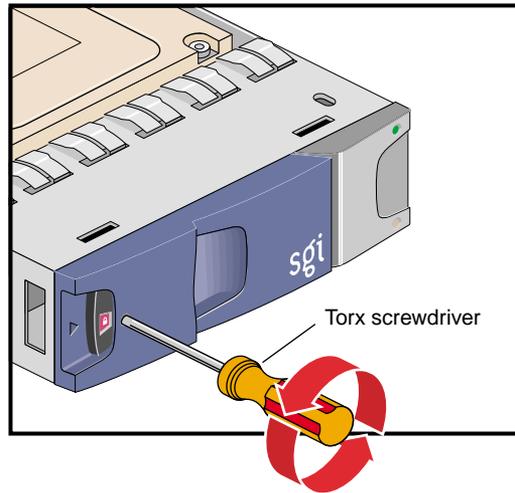
**Caution:** Damage can occur to a drive if it is removed while still spinning. If you cannot use the operating system to spin down the drives prior to removal, perform all steps of the following procedure to ensure that the drive has stopped prior to removal.

---

---

**Note:** The anti-tamper lock must be off. If the drive module is locked, insert the Torx screwdriver (included with the disk drive) into the socket in the lower part of the handle trim. Then turn it 90 degrees counterclockwise until the indicator visible in the center aperture of the handle shows black. See Figure 13-34.

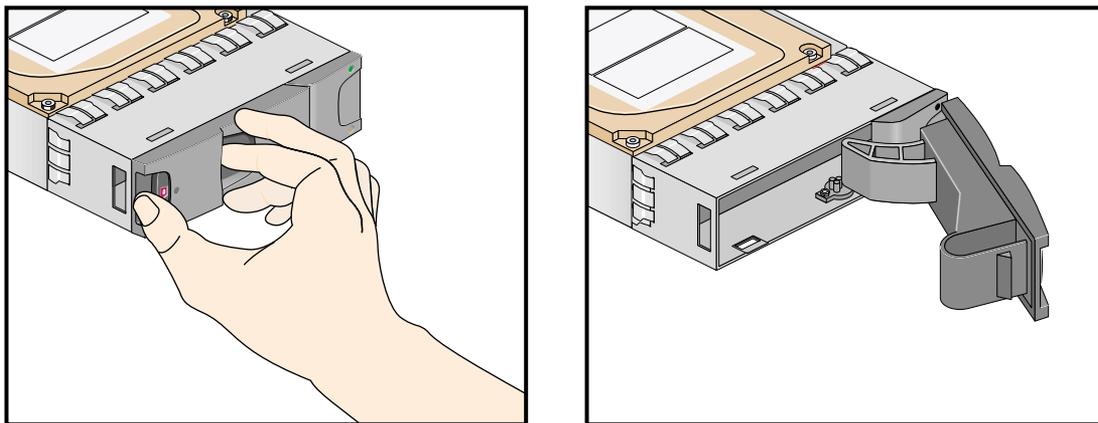
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**Figure 13-34** Unlocking the Anti-Tamper Lock

2. Release the carrier handle by pressing the latch in the handle towards the right.
3. Gently withdraw the drive carrier module approximately 1 inch (25 mm), and then wait 30 seconds for the drive to spin down.
4. After 30 seconds, withdraw the module from the drive bay.

5. Release the handle of the replacement carrier by pressing the latch in the handle towards the right, as shown in Figure 13-35. Insert the carrier into the enclosure.



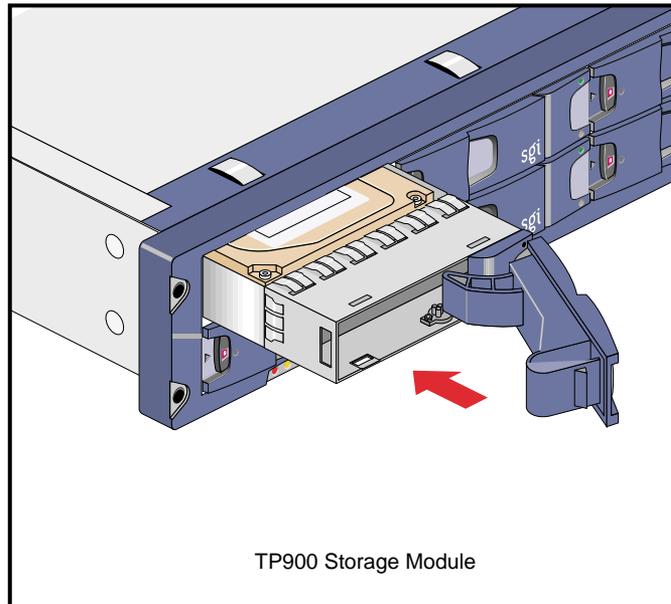
**Figure 13-35** Releasing the Carrier Handle

---

**Important:** Ensure that the carrier is oriented so that the drive is uppermost and the handle opens from the left.

---

6. Gently slide the carrier all the way into the enclosure until it is stopped by the camming lever on the right of the carrier, as shown in Figure 13-36.



**Figure 13-36** Carrier Camming Lever

7. Push the carrier handle into place—the camming foot on the base of the carrier will engage in a slot in the enclosure. Continue to push firmly until the handle fully engages. You should hear a click as the latch engages and holds the handle closed.

## D-brick2 Storage Module

This section describes operations on the D-brick2 storage module.

### Installing or Replacing a D-brick2 Drive Carrier Module

This section explains how to install or replace a drive carrier in the D-brick2 storage module, as follows:

- “Installing a Drive Carrier Module” on page 215
- “Replacing a Drive Carrier Module” on page 219



---

**Caution:** Observe all ESD precautions when handling modules and components. Avoid contact with backplane components and module connectors. Failure to observe ESD precautions could damage the equipment.

---



---

**Caution:** Do not remove a drive carrier unless a replacement or dummy carrier can be immediately added. The system must not be run without all modules in place. Any unused drive bays must be fitted with a dummy carrier module.

---

### Installing a Drive Carrier Module

Note the following:

- All disk drive bays must be filled with either a drive carrier module or a dummy drive module; no bay should be left completely empty.
- The drives in bays 1/1 and 4/4 of the D-brick2 storage module are required for enclosure management; these bays must always be occupied.

To install a new disk drive module in the storage system, follow these steps:

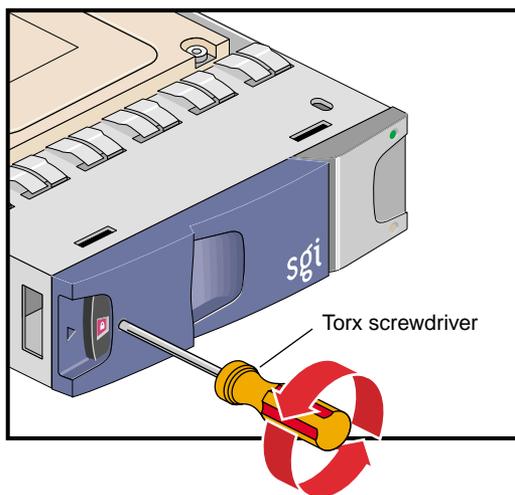
1. Ensure that you have enough drive carrier modules and dummy modules to occupy all bays.
2. Carefully open the bag containing the drive carrier module.



**Warning:** The disk drive handle might have become unlatched in shipment and might spring open when you open the bag. As you open the bag, keep it a safe distance from your face.

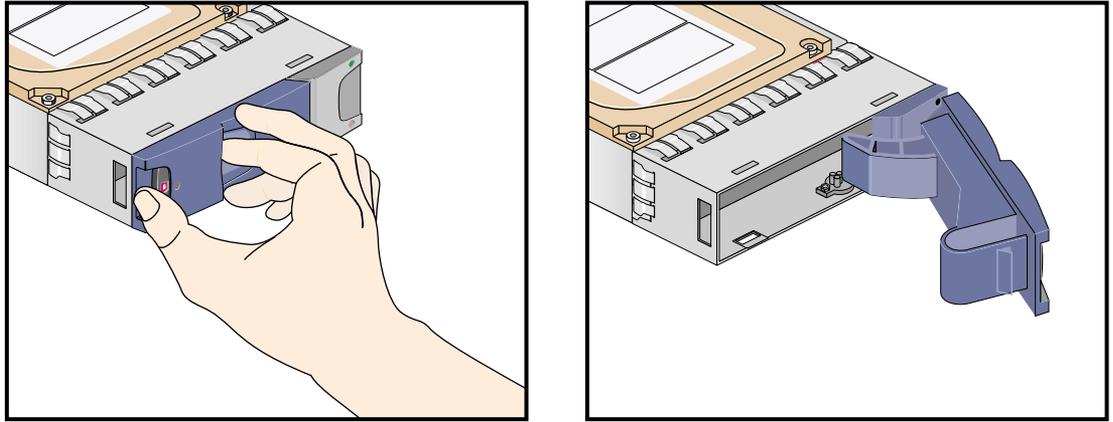
3. Place the drive carrier module on an antistatic work surface and ensure that the anti-tamper lock is disengaged (unlocked). The indicator window is red when the drive is locked. A disk drive module cannot be installed if its anti-tamper lock is activated (locked) outside the enclosure.

Drives are shipped with their locks set in the unlocked position. However, if a drive is locked, insert the Torx screwdriver (included with the disk drive) into the socket in the lower part of the handle trim and turn it 90 degrees counterclockwise until the indicator visible in the center aperture of the handle shows black. See Figure 13-37.



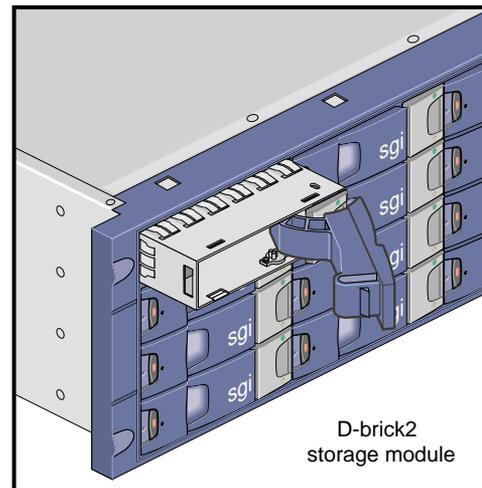
**Figure 13-37** Unlocking the Drive Carrier Module

4. Open the handle of the replacement carrier by pressing the latch handle towards the right (see Figure 13-38).



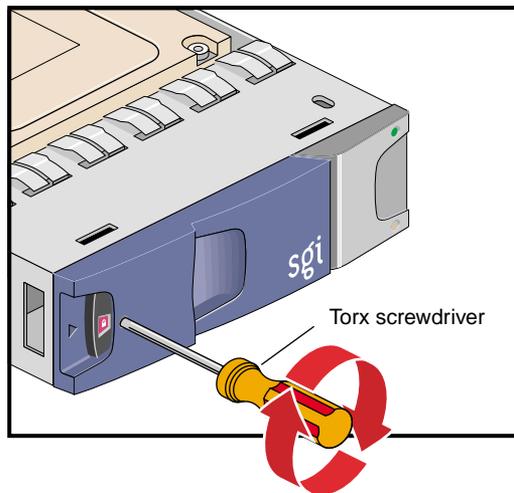
**Figure 13-38** Opening the Module Handle

5. Remove the dummy drive carrier module from the target drive bay.
6. Orient the new drive carrier module so that the hinge of the handle is on the right. Then slide the drive carrier module into the chassis until it is stopped by the camming lever on the right of the module (see Figure 13-39).



**Figure 13-39** Inserting the Disk Drive Module in a D-brick2

7. Swing the drive handle shut and press it to seat the drive carrier module. The camming lever on the right of the module will engage with a slot in the chassis. Continue to push firmly until the handle fully engages with the module cap. You should hear a click as the latch engages and holds the handle closed.
8. Repeat steps 2 through 7 for all drive modules to be installed.
9. When you finish installing the drive carrier module(s), lock the drive carrier module(s) in the chassis by inserting the Torx screwdriver in the drive module and turning it 90 degrees clockwise. The indicator in the drive carrier module turns red when the drive is locked. See Figure 13-40.



**Figure 13-40** Locking the Drive Carrier Module

10. Install dummy drive carrier modules in all empty drive bays. The drive handle and camming mechanisms operate the same as those in a standard drive carrier module.

## Replacing a Drive Carrier Module

This section explains how to replace a defective drive carrier module.

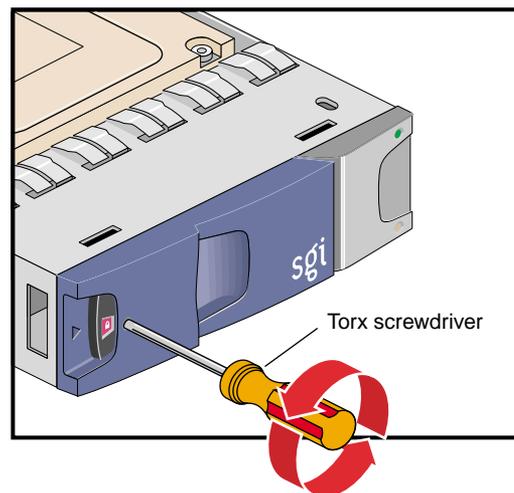


**Caution:** Follow electrostatic discharge (ESD) precautions while replacing the drive carriers. Avoid contact with the backplane components and module connectors.

**Note:** Replace disk drive modules one at a time.

To remove a drive carrier module from the D-brick2 enclosure, follow these steps:

1. Make sure that enough disk drives and dummy drives are available to occupy all bays.
2. Ensure that users are logged off of the affected systems; back up data if necessary.
3. If the drive module is locked, insert the Torx screwdriver into the anti-tamper lock and turn it 90 degrees counterclockwise. The indicator in the drive carrier module turns black when the drive is unlocked. See Figure 13-41.



**Figure 13-41** Unlocking the Disk Drive Module

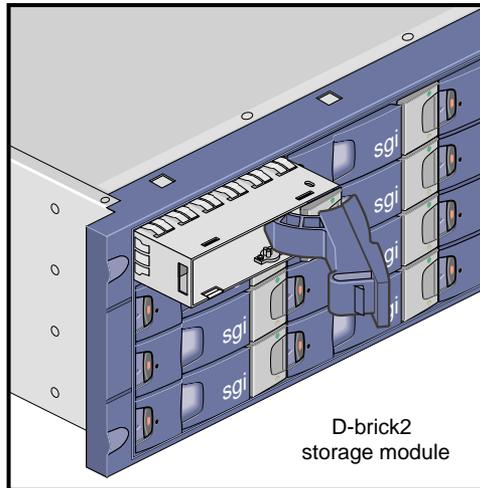
4. Open the handle by pressing the latch on the module handle towards the right. Then gently slide the module out of the enclosure approximately 1 inch (25 mm), and wait 30 seconds for the drive to stop spinning. See Figure 13-42.



---

**Caution:** Damage can occur to a drive if it is removed while still spinning.

---



**Figure 13-42** Removing the Drive Carrier Module

5. After 30 seconds, withdraw the module from the drive bay. Replace it immediately; follow the instructions in “Installing a Drive Carrier Module” on page 215.

## Troubleshooting and Diagnostics

This chapter provides the following sections to help you troubleshoot your system:

- “Troubleshooting Chart” on page 222
- “L1 Controller Error Messages” on page 224
- “SGI Electronic Support” on page 231
- “Customizing the XF86Config File” on page 234

## Troubleshooting Chart

Table 14-1 lists recommended actions for problems that can occur. To solve problems that are not listed in this table, use the SGI Electronic Support system or contact your SGI system support engineer (SSE). For more information about the SGI Electronic Support system, see the “SGI Electronic Support” on page 231.

**Table 14-1** Troubleshooting Chart

Problem Description	Recommended Action
The system will not power on.	<p>Ensure that the power cord of the PDU is seated properly in the power receptacle.</p> <p>Ensure that the PDU circuit breaker is on.</p> <p>If the power cord is plugged in and the circuit breaker in on, contact your SSE.</p>
An individual brick will not power on.	<p>Ensure that the power switch (if applicable) at the rear of the brick is on (1 position).</p> <p>View the L1 display; see Table 14-2 if an error message is present.</p> <p>If the L1 controller is not running, contact your SSE.</p> <p>Check the connection between the brick and its power source.</p>
The system will not boot the operating system.	Contact your SSE.
The Service Required LED illuminates on a CR-brick, an R-brick, an IX-brick, or a PX-brick.	View the L1 display of the failing brick; see Table 14-2 for a description of the error message.
The Failure LED illuminates on a CR-brick, an R-brick, an IX-brick, or a PX-brick.	View the L1 display of the failing brick; see Table 14-2 for a description of the error message.
The green or yellow LED of a NUMAlink port (rear of R-brick) is not illuminated.	Ensure that the NUMAlink cable is seated properly on the R-brick and the destination brick.
The PWR LED of a populated PCI slot is not illuminated.	Reseat the PCI card.
The Fault LED of a populated PCI slot is illuminated (on).	Reseat the PCI card. If the fault LED remains on, replace the PCI card.

**Table 14-1** Troubleshooting Chart (continued)

Problem Description	Recommended Action
The System Status LED of the TP900 is amber.	Contact your SSE.
The Power Status LED of the TP900 is amber.	Contact your SSE to replace the power supply module. The power supply module also has an amber LED that indicates a fault.
The Cooling Status LED of the TP900 is amber.	Contact your SSE to replace the cooling module. The cooling module also has an amber LED that indicates a fault.
The amber LED of a disk drive is on.	Replace the disk drive.

## L1 Controller Error Messages

Table 14-2 lists error messages that the L1 controller generates and displays on the L1 display. This display is located on the front of the XG2N modules, CPU expansion modules, CR-bricks, R-bricks, IX-brick, and PX-bricks. For serial-number related errors, check with your service provider for documentation on prevention and solutions.

The serial number error messages listed at the end of Table 14-2 are messages that will come across the L1 console (at the L1 or optional L2 prompt). The log being referenced is the L1 log. Users can get the contents by using the `log` command from an L1 prompt, or `l1 log` command from an optional L2 prompt.

Actions that could cause serial number error messages include:

- Moving a module or brick from one system to another.
- Replacing the interface board of a system module.
- L1 NVRAM memory failure.
- Incorrect serial number setting on an optional L2 system controller.

---

**Note:** In Table 14-2, a voltage warning occurs when a supplied level of voltage is below or above the nominal (normal) voltage by 10 percent. A voltage fault occurs when a supplied level is below or above the nominal voltage by 20 percent.

---

**Table 14-2** L1 Controller Messages

<b>L1 System Controller Message</b>	<b>Message Meaning and Action Needed</b>
<b>Internal voltage messages:</b>	
ATTN: x.xV high fault limit reached @ x.xxV	30-second power-off sequence for the module.
ATTN: x.xV low fault limit reached @ x.xxV	30-second power-off sequence for the module.
ATTN: x.xV high warning limit reached @ x.xxV	A higher than nominal voltage condition is detected.
ATTN: x.xV low warning limit reached @ x.xxV	A lower than nominal voltage condition is detected.
ATTN: x.xV level stabilized @ x.xV	A monitored voltage level has returned to within acceptable limits.
<b>Fan messages:</b>	
ATTN: FAN # x fault limit reached @ xx RPM	A fan has reached its maximum RPM level. The ambient temperature may be too high. Check to see if a fan has failed.
ATTN: FAN # x warning limit reached @ xx RPM	A fan has increased its RPM level. Check the ambient temperature. Check to see if the fan stabilizes.
ATTN: FAN # x stabilized @ xx RPM	An increased fan RPM level has returned to normal.
<b>Temperature messages: low alt.</b>	
ATTN: TEMP # advisory temperature reached @ xxC xxF	The ambient temperature at the module's air inlet has exceeded 30 °C.
ATTN: TEMP # critical temperature reached @ xxC xxF	The ambient temperature at the module's air inlet has exceeded 35 °C.
ATTN: TEMP # fault temperature reached @ xxC xxF	The ambient temperature at the module's air inlet has exceeded 40 °C.
<b>Temperature messages: high alt.</b>	
ATTN: TEMP # advisory temperature reached @ xxC xxF	The ambient temperature at the module's air inlet has exceeded 27 °C.

**Table 14-2** L1 Controller Messages (**continued**)

L1 System Controller Message	Message Meaning and Action Needed
ATTN: TEMP # critical temperature reached @ xxC xxF	The ambient temperature at the module's air inlet has exceeded 31 °C.
ATTN: TEMP # fault temperature reached @ xxC xxF	The ambient temperature at the module's air inlet has exceeded 35 °C.
<b>Temperature stable message:</b>	
ATTN: TEMP # stabilized @ xxC/xxF	The ambient temperature at the module's air inlet has returned to an acceptable level.
<b>Power off messages:</b>	
Auto power down in xx seconds	The L1 controller has registered a fault and is shutting down. The message displays every five seconds until shutdown.
Base module appears to have been powered down	The L1 controller has registered a fault and has shut down.
<b>Serial number messages:</b>	
Brick Serial Number mismatch	See L1 log for details.
System Serial Number mismatch	See L1 log for details.
Invalid System Serial Number format	See L1 log for details.
No assigned System Serial Number	See L1 log for details.

Under certain circumstances a system software or hardware error can occur prior to the graphics console's ability to display information. In this case you can see the error only on the L1 controller panel or from an optional system console connected to the Console serial port on the back of the system. In these cases an error message is displayed on the L1 display of the form <geoid> ERR <error code> or <geoid> POD <error code>. Most of the time, these errors indicate a serious problem and customer service should be called (please provide the error code to the service representative). See Table 14-3 for a partial list of the L1 Hexadecimal boot error codes.

**Table 14-3** L1 Controller Hexadecimal Boot Error Codes

Error code	Message Meaning or Action Needed
0x80	The unit has no DIMM memory — insure that DIMM group 0 is fully populated. See the information in “Removing and Replacing Memory DIMMs” on page 197.
0x81	Write to system controller timed out.
0x82	Request for system reset failed.
0x83	Local master arbitration failed.
0x84	No memory available to allocate hardware configuration structure.
0x85	Can't initialize klconfig.
0x87	Disabled by environment variable.
0x88	Call to unimplemented chip specific function.
0x89	System controller communication initialization failed.
0x8b	Nasid assignment failed.
0x8c	Route calculation failed.
0x8d	Critical system controller transaction failed.
0xb0	PAL early self test failed.
0xb1	SAL entered with invalid function code.
0xb2	SAL invoked for firmware recovery.
0xb3	SAL_RESET called with bad parameters.
0xb4	main () returned
0xb5	PAL_CACHE_INFO failed looking for cache to reload.

**Table 14-3** L1 Controller Hexadecimal Boot Error Codes (**continued**)

---

<b>Error code</b>	<b>Message Meaning or Action Needed</b>
0xb6	Cache preloading PAL call failed.
0xb7	Scratch area overflowed the CPU's caches.
0xb8	PAL_MEM_FOR_TEST failed.
0xb9	Bad address calculated for PAL_TEST_PROC
0xba	PAL_COPY_INFO failed.
0xbb	Bad PAL shadow address calculated
0xbc	PAL_COPY_PAL failed.
0xbd	SDA transfer area overflowed.
0xbe	No PROM segment (eg. EFI) found.
0xbf	PROM segment (eg. EFI) exited.
0xc0	Out of SAL->EFI handoff memory.
0xc1	Cache tests failed.
0xc2	Error flashing PROM.
0xc3	Could not write new value to cr.lid
0xd8	This unit has illegal DIMM population. Check and replace memory, see "Removing and Replacing Memory DIMMs" on page 197.
0xf0	Waiting for primary lock.

---

## Reading XG2N Power Supply Status LEDs

Use the LED located on the front (towards the top) of the XG2N power supply to read the condition of the power supply. Table 14-5 shows the LED status and the power supply condition that LED status indicates. See “Removing and Replacing Power Supplies” on page 193 for information on removing and replacing a power supply.

**Table 14-4** LED Status and Power Supply Condition

LED Status	Power Supply Condition Indicated
Off	If your system has one power supply, it indicates that the power supply is not receiving AC power. If your system has two power supplies, the LED on both power supplies would be Off, and it would indicate that both power supplies are not receiving AC power. Power supplies will not be receiving AC power because either the module is not plugged into power, or an electrical fuse has blown.
Amber	Indicates a fault condition for one of the following reasons: <ul style="list-style-type: none"> <li>- In a system where you have two power supplies, one of the power supplies is not receiving AC power.</li> <li>- The voltage limit has been exceeded.</li> <li>- The temperature limit has been exceeded.</li> <li>- The current limit has been exceeded.</li> </ul>
Blinking Green	The power supply is receiving AC power, but the main primary DC power has not yet activated.
Green	The power supply is operating properly.

## XG2N and CPU Expansion Module Power Supply Status LEDs

Use the LED located on the front (towards the top) of the XG2N and CPU Expansion module power supplies to read the condition of the power supplies. Table 14-5 shows the LED status and the power supply condition that LED status indicates. See “Removing and Replacing Power Supplies” on page 193 for information on removing and replacing a power supply.

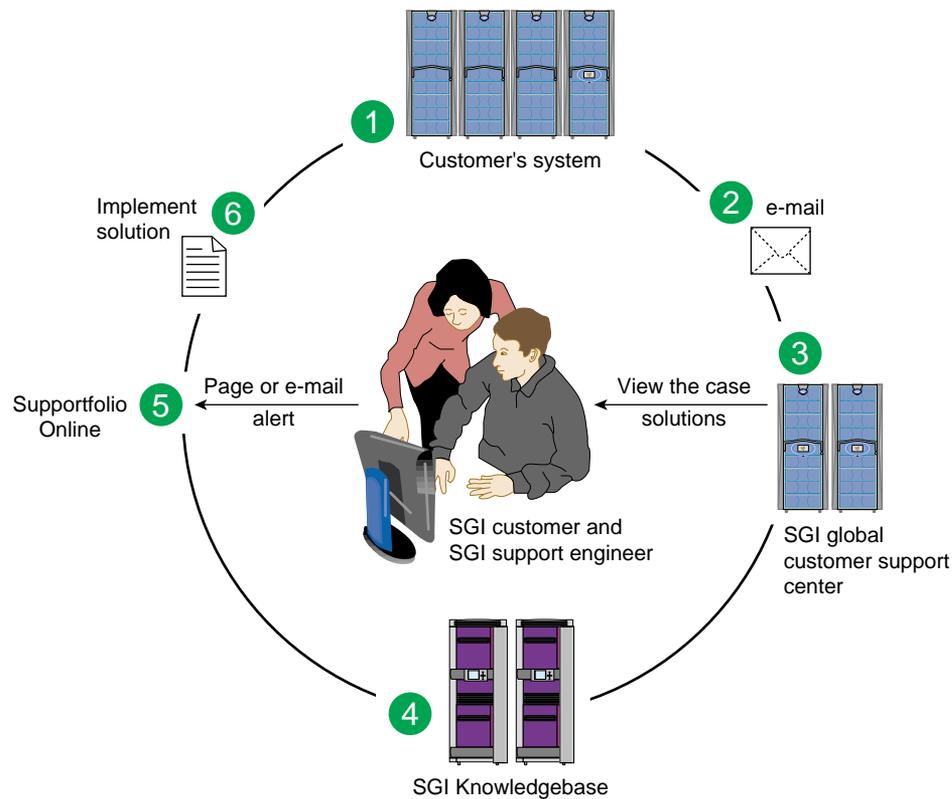
**Table 14-5** XG2N & CPU Expansion Module LED Status and Power Supply Condition

LED Status	Power Supply Condition Indicated
Off	If your system has one power supply, it indicates that the power supply is not receiving AC power. If your system has two power supplies, the LED on both power supplies would be Off, and it would indicate that both power supplies are not receiving AC power. Power supplies will not be receiving AC power because either the module is not plugged into power, or an electrical fuse has blown.
Amber	Indicates a fault condition for one of the following reasons: <ul style="list-style-type: none"> <li>- In a system where you have two power supplies, one of the power supplies is not receiving AC power.</li> <li>- The voltage limit has been exceeded.</li> <li>- The temperature limit has been exceeded.</li> <li>- The current limit has been exceeded.</li> </ul>
Blinking Green	The power supply is receiving AC power, but the main primary DC power has not yet activated.
Green	The power supply is operating properly.

## SGI Electronic Support

SGI Electronic Support provides system support and problem-solving services that function automatically, which helps resolve problems before they can affect system availability or develop into actual failures. SGI Electronic Support integrates several services so they work together to monitor your system, notify you if a problem exists, and search for solutions to problems.

Figure 14-1 shows the sequence of events that occurs if you use all of the SGI Electronic Support capabilities.



**Figure 14-1** Full Support Sequence

The sequence of events can be described as follows:

1. Embedded Support Partner (ESP) monitors your system 24 hours a day.
2. When a specified system event is detected, ESP notifies SGI via e-mail (plain text or encrypted).
3. Applications that are running at SGI analyze the information, determine whether a support case should be opened, and open a case if necessary. You and SGI support engineers are contacted (via pager or e-mail) with the case ID and problem description.
4. SGI Knowledgebase searches thousands of tested solutions for possible fixes to the problem. Solutions that are located in SGI Knowledgebase are attached to the service case.
5. You and the SGI support engineers can view and manage the case by using Supportfolio Online as well as search for additional solutions or schedule maintenance.
6. Implement the solution.

Most of these actions occur automatically, and you may receive solutions to problems before they affect system availability. You also may be able to return your system to service sooner if it is out of service.

In addition to the event monitoring and problem reporting, SGI Electronic Support monitors both system configuration (to help with asset management) and system availability and performance (to help with capacity planning).

The following three components compose the integrated SGI Electronic Support system:

**SGI Embedded Support Partner (ESP)** is a set of tools and utilities that are embedded in the SGI Linux ProPack release. ESP can monitor a single system or group of systems for system events, software and hardware failures, availability, performance, and configuration changes, and then perform actions based on those events. ESP can detect system conditions that indicate potential problems, and then alert appropriate personnel by pager, console messages, or e-mail (plain text or encrypted). You also can configure ESP to notify an SGI call center about problems; ESP then sends e-mail to SGI with information about the event.

**SGI Knowledgebase** is a database of solutions to problems and answers to questions that can be searched by sophisticated knowledge management tools. You can log on to SGI Knowledgebase at any time to describe a problem or ask a question. Knowledgebase

searches thousands of possible causes, problem descriptions, fixes, and how-to instructions for the solutions that best match your description or question.

**Supportfolio Online** is a customer support resource that includes the latest information about patch sets, bug reports, and software releases.

The complete SGI Electronic Support services are available to customers who have a valid SGI Warranty, FullCare, FullExpress, or Mission-Critical support contract. To purchase a support contract that allows you to use the complete SGI Electronic Support services, contact your SGI sales representative. For more information about the various support contracts, see the following Web page:

<http://www.sgi.com/support/customerservice.html>

For more information about SGI Electronic Support, see the following Web page:

<http://www.sgi.com/support/es>

## Customizing the XF86Config File

The following sections provide information about customizing the XF86Config file for various special configurations.

### Configuring a System for Stereo

This section describes how to configure a system to display stereo images.

Stereo sync is supported only on systems using ImageSync boards.

---

**Note:** Simultaneously running stereo and full scene anti-aliasing can require more graphics-card memory than is available, and thus may not always work correctly.

---

---

**Note:** Stereo may be enabled on either channel of a pipe, but may not be enabled on both channels simultaneously.

---

1. Create a copy of the XF86Config file to be customized for stereo:  

```
# cp /etc/X11/XF86Config /etc/X11/XF86Config.Stereo
```
2. Edit the XF86Config.Stereo file to include the following line at the end of each “Device” section:  

```
Option "Stereo" "1"  
Option "StereoSyncEnable" "1"
```

(see the “Example “Device” Section for Stereo” on page 235).
3. Edit the new XF86Config.Stereo file to include the appropriate stereo modes in the “Monitor” section:
  - a. Create an appropriate mode (see “Sample Stereo Mode Entries” on page 236).
  - b. Add that mode to the “Monitor” section of your XF86Config.Stereo file (see the “Example “Monitor” Section for Stereo” on page 236).

---

**Note:** “Mode” and “Modeline” are two alternative formats used to present the same information.

---

4. Ensure that the monitor supports the high horizontal sync rate setting. Refer to the documentation for the monitor to determine the horizontal sync rate. Modify the HorizSync setting in the “Monitor” section of the XF86Config.Stereo file. For example:

```
HorizSync 22-105
```

5. Modify the “Screen” section so that you use the appropriate mode setting. For example:

```
Modes "1280x1024@96"
```

(see the “Example “Screen” Section for Stereo” on page 236).

6. Make a backup copy of the default /etc/X11/gdm/gdm.conf file:

```
# cp /etc/X11/gdm/gdm.conf /etc/X11/gdm/gdm.conf-old
```

7. Edit the /etc/X11/gdm/gdm.conf file to use the new XF86Config.Stereo file you created:

Replace the line:

```
command=/usr/X11R6/bin/X
```

with:

```
command=/usr/X11R6/bin/X -xf86config /etc/X11/XF86Config.Stereo
```

8. Save the gdm.conf file and reboot the system to restart graphics in stereo mode.

Note that a stereo sync signal will not be present until you run a stereo application. One such application is `ivview`. If your system has `ivview` installed, you can use it to test the stereo configuration by running:

```
ivview /usr/share/data/models/X29.iv
```

and right click to activate the stereo setting on the preferences panel.

### Example “Device” Section for Stereo

```
Section "Device"
    Identifier "SGI SG-0"
    Driver      "fglrx"
    BusId       "PCI:23:0:0"
# === QBS Management ===
    Option "Stereo"          "1"
    Option "StereoSyncEnable" "1"
EndSection
```

### Sample Stereo Mode Entries

```
Modeline "1024x768@96" 103.5 1024 1050 1154 1336 768 771 774 807
Modeline "1280x1024@96" 163.28 1280 1300 1460 1600 1024 1027 1033 1063
Modeline "1024x768@100" 113.309 1024 1096 1208 1392 768 769 772 814
Modeline "1024x768@120" 139.054 1024 1104 1216 1408 768 769 772 823 +hsync +vsync
Modeline "1280x1024@100" 190.960 1280 1376 1520 1760 1024 1025 1028 1085 +hsync +vsync
Mode "1280x1024_96s_mirage"
    DotClock 152.928
    HTimings 1280 1330 1390 1500
    VTimings 1024 1026 1030 1062
EndMode
```

### Example “Monitor” Section for Stereo

```
Section "Monitor"
    Identifier "Stereo Monitor"
    HorizSync 30-96 # multisync
    VertRefresh 50-160 # multisync
    Modeline "1024x768@96" 103.5 1024 1050 1154 1336 768 771 774 807
EndSection
```

### Example “Screen” Section for Stereo

```
Section "Screen"
    Identifier "Screen SG-0"
    Device "SGI SG-0"
    Monitor "Stereo Monitor"
    DefaultDepth 24
    SubSection "Display"
        Depth 24
        Modes "1280x1024@96"
    EndSubSection
EndSection
```

## Configuring a System for Full Scene Anti-Aliasing

This section describes how to configure a system for global or per-window full scene anti-aliasing.

---

**Note:** Simultaneously running stereo and full scene anti-aliasing can require more graphics-card memory than is available, and thus may not work correctly.

---

1. Create a copy of the XF86Config file to be customized for full scene anti-aliasing:

```
# cp /etc/X11/XF86Config /etc/X11/XF86Config.AntiAlias
```

---

**Note:** Automatically-generated XF86Config files should contain the customized multi-sample positions shown in on page 238. If these values are not already present, adding them will significantly improve the quality of your output.

---

2. Edit the new XF86Config.AntiAlias file to include the following line at the end of each “Device” section:

```
Option "FSAAScale" "X"
```

where X is 1, 2, 4, or 6 (see the example “Device” section on page 238).

---

**Note:** Per-window full scene anti-aliasing is accomplished by setting “FSAAScale” to 1. The anti-aliasing level may then be set by the appropriate selection of visuals. Global anti-aliasing is accomplished by setting “FSAAScale” to 2, 4, or 6. In this case, the setting will apply to all OpenGL windows, regardless of the visual being displayed.

---

3. Make a backup copy of the default /etc/X11/gdm/gdm.conf file:

```
# cp /etc/X11/gdm/gdm.conf /etc/X11/gdm/gdm.conf-old
```

4. Edit the /etc/X11/gdm/gdm.conf file to use the new XF86Config.AntiAlias file you created:

Replace the line:

```
command=/usr/X11R6/bin/X
```

with:

```
command=/usr/X11R6/bin/X -xf86config /etc/X11/XF86Config.AntiAlias
```

5. Save the `gdm.conf` file:
6. Restart graphics:  
# <CTRL> <ALT> <BKSPC>

### Example “Device” Section for Full Scene Anti-Aliasing

```
Section "Device"
    Identifier "SGI SG-0"
    Driver      "fglrx"
    BusId       "PCI:23:0:0"
# === FSAA Management ===
    Option "FSAAScale"                "1"
    Option "FSAADisableGamma"         "no"
    Option "FSAACustomizeMSPos"       "yes"
    Option "FSAAMSPosX0"               "0.250000"
    Option "FSAAMSPosY0"               "0.416666"
    Option "FSAAMSPosX1"               "0.083333"
    Option "FSAAMSPosY1"               "0.083333"
    Option "FSAAMSPosX2"               "0.416666"
    Option "FSAAMSPosY2"               "0.750000"
    Option "FSAAMSPosX3"               "0.750000"
    Option "FSAAMSPosY3"               "0.916666"
    Option "FSAAMSPosX4"               "0.583333"
    Option "FSAAMSPosY4"               "0.250000"
    Option "FSAAMSPosX5"               "0.916666"
    Option "FSAAMSPosY5"               "0.583333"
EndSection
```

## Configuring a System for Dual-Channel Operation

To configure a system for dual-channel operation, follow the steps in this section.

---

**Note:** If any pipes managed by an X server have their second channel enabled, then every pipe managed by that X server must have its second channel enabled.

---



---

**Note:** Both channels on a pipe must have the same display resolution.

---

1. Create a copy of the XF86Config file to be customized for dual-channel operation:

```
# cp /etc/X11/XF86Config /etc/X11/XF86Config.DualChannel
```

2. Edit the new XF86Config.DualChannel file to include the following line at the end of each “Device” section:

```
Option "DesktopSetup" mode
```

where *mode* is one of the following:

```
"0x00000100" [this mode clones the managed area]
"0x00000200" [this mode scales the managed area by 2 horizontally]
"0x00000300" [this mode scales the managed area by 2 vertically]
```

(see the example “Device” section on page 240).

---

**Note:** All pipes managed by the same X server must be set to the same mode.

---

3. When using monitors or monitor cables which do not conform to the VESA Display Data Channel (DDC) standard, append the following entry in the “Device” section to enable proper display configuration:

```
Option "NoDDC" "on"
```

4. Make a backup copy of the default /etc/X11/gdm/gdm.conf file:

```
# cp /etc/X11/gdm/gdm.conf /etc/X11/gdm/gdm.conf-old
```

5. Edit the /etc/X11/gdm/gdm.conf file to use the new XF86Config.DualChannel file you created:

Replace the line:

```
command=/usr/X11R6/bin/X
```

with:

```
command=/usr/X11R6/bin/X -xf86config /etc/X11/XF86Config.DualChannel
```

6. Save the `gdm.conf` file:

7. Restart graphics:

```
# <CTRL> <ALT> <BKSPC>
```

### Example “Device” Section for Dual Channel

```
Section "Device"
    Identifier   "SGI SG-0"
    Driver      "fglrx"
    BusId       "PCI:23:0:0"
    Option      "DesktopSetup" "0x00000200"
EndSection
```

## Enabling Overlay Planes

To enable overlay planes, follow these steps:

---

**Note:** The option to enable overlay planes only applies to the first channel on the pipe.

---

1. Edit the `/etc/X11/XF86Config` file to include the following line in each “Device” section for which you want overlay planes enabled:

```
Option "OpenGLOverlay" "On"
```

2. Log out from the desktop, then log back in.

### Example “Device” Section to Enable Overlay Planes

```
Section "Device"  
    Identifier "SGI SG-0"  
    Driver      "fglrx"  
    BusId      "PCI:23:0:0"  
    Option     "OpenGLOverlay" "On"  
EndSection
```

## Configuring a System for External Genlock or Framelock

External genlock and framelock may be used on systems with at least one optional ImageSync board.

To configure your system to receive an external genlock or framelock signal you must run the `setmon` command with the appropriate options.

Before running `setmon`, use `printenv DISPLAY` to ensure that the `DISPLAY` environment variable is set to the local system (for example, `:0.0`). If it is not, use `setenv DISPLAY :0.0` to change it (substituting other numbers for `:0.0` if appropriate).

To set the system for genlock, execute the following command:

```
# setmon -ppipenumber -g graphicsformat
```

where *pipenumber* is the pipe to which this setting should be applied, and *graphicsformat* is one of the timings (modes) listed in the “Monitor” section of the `/etc/X11/XF86Config` file.

To set the system for framelock, execute the following command:

```
# setmon -ppipenumber -Lvideoformat graphicsformat
```

where *pipenumber* is the pipe to which this setting should be applied, *videoformat* is the input video format to be used as a framelock source, and *graphicsformat* is one of the framelock-certified timings (modes) listed in the “Monitor” section of the `/etc/X11/XF86Config` file that is compatible with the chosen input video format (Table 14-6 on page 243 provides a list of compatible formats).

---

**Note:** The default behavior of `setmon` is to load the new format for the current session only and to prompt for input to determine if the format should be saved as the default. To save the new format as the default you must be logged in as root.

---

For more information about the `setmon` command, see the `setmon` man page (`man setmon`).

---

**Note:** Framelock-certified timings will include an “f” appended to their name (i.e., “1280x1024\_5994f” is certified for NTSC (525 line) video timing).

---

**Table 14-6** Input Video Formats (Framelock)

<b>Input Video Format (Framelock Source)</b>	<b>Format Name</b>	<b>Compatible Graphics Formats</b>
525 line at 59.94Hz (NTSC)	525 (or use the alias NTSC)	1280x1024_5994f 1920x1154_5994f
625 line at 50Hz (PAL)	625 (or use the alias PAL)	1280x1024_50f 1920x1154_50f
720-line progressive-scan at 59.94Hz	720p_5994	1920x1154_5994f
720-line progressive-scan at 60Hz	720p_60	1280x1024_60f 1920x1154_60f 1920x1200_60f
1080-line progressive-scan at 25Hz	1080p_25	1280x1024_50f 1920x1154_50f
1080-line interlaced at 25Hz	1080i_25	1280x1024_50f 1920x1154_50f
1080-line progressive-scan at 29.97Hz	1080p_2997	1920x1154_5994f
1080-line interlaced at 29.97Hz	1080i_2997	1920x1154_5994f
1080-line progressive-scan at 30Hz	1080p_30	1280x1024_60f 1920x1154_60f 1920x1200_60f
1080-line interlaced at 30Hz	1080i_30	1280x1024_60f 1920x1154_60f 1920x1200_60f

## Configuring Monitor Positions

When an X-Server is managing multiple monitors, it needs to know their relative positions in order to properly handle cursor cross-over locations.

The monitor positions are specified in the “ServerLayout” section of the `/etc/X11/XF86Config` file as follows:

Each screen is listed, followed by a list of the screens above, below, to the left, and to the right of it (in that order). Figure 14-2 and the following subsection show an example of four monitors arranged in a line.

Programs started by clicking on an icon appear on the screen from which you invoked them. Note that once a program has been launched, it is not possible to move it from one screen to another.

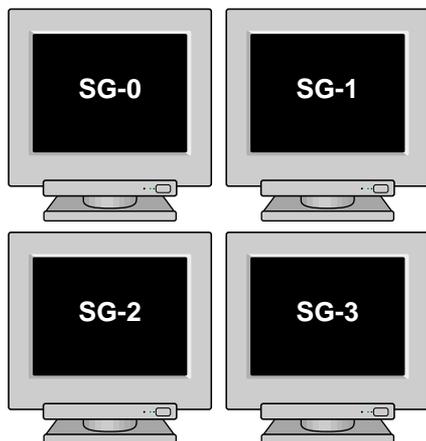


**Figure 14-2** Four Monitors in a Line

### Example “ServerLayout” Section for Four Monitors in a Line

```
Section "ServerLayout"
    Identifier "Four-in-a-Line"
    Screen "Screen SG-0"      ""      ""      ""      "Screen SG-1"
    Screen "Screen SG-1"      ""      ""      "Screen SG-0"  "Screen SG-2"
    Screen "Screen SG-2"      ""      ""      "Screen SG-1"  "Screen SG-3"
    Screen "Screen SG-3"      ""      ""      "Screen SG-2"  ""
    InputDevice "Mousel" "CorePointer"
    InputDevice "Keyboard1" "CoreKeyboard"
EndSection
```

Figure 14-3 and the subsection following it show an example of four monitors arranged in a square.



**Figure 14-3** Four Monitors in a Square

#### Example “ServerLayout” Section for Four Monitors in a Square

```
Section "ServerLayout"
    Identifier "Four-in-a-Square"
    Screen "Screen SG-0"      ""          "Screen SG-2"      ""          "Screen SG-1"
    Screen "Screen SG-1"      ""          "Screen SG-3"      "Screen SG-0"  ""
    Screen "Screen SG-2"      "Screen SG-0"  ""          ""          "Screen SG-3"
    Screen "Screen SG-3"      "Screen SG-1"  ""          "Screen SG-2"  ""
    InputDevice "Mouse1" "CorePointer"
    InputDevice "Keyboard1" "CoreKeyboard"
EndSection
```

## Configuring Monitor Types

The system graphics cards support both analog and digital monitors. The type of monitor connected to each graphics card is specified in the “Device” sections of the `/etc/X11/XF86Config` file.

Table 14-7 lists the allowable options for the `MonitorLayout` line. If the line is not present, both channels default to `AUTO`.

**Table 14-7** Options for Monitor Layout

Monitor Type	Meaning
AUTO	Automatically select monitor type (default)
TMDS	Digital monitor
CRT	Analog monitor
NONE	No monitor

The format is:

```
Option      "MonitorLayout" "channel1type, channel2type"
```

where *channel1type* is the type (AUTO, TMDS, CRT or NONE) of monitor attached to channel 1 (the left DVI-I connector) for this pipe, and *channel2type* is the type (AUTO, TMDS, CRT or NONE) of monitor attached to channel 2 (the right DVI-I connector) for this pipe.

### Example “Device” Section for Use With Two Analog Monitors

```
Section "Device"
    Identifier "SGI SG-0"
    Driver     "fglrx"
    BusId      "PCI:23:0:0"
    Option     "MonitorLayout" "CRT, CRT"
EndSection
```

## Configuring a System for Multiple Xservers

Multiple Xservers allows specific subsets of the keyboards, pointing devices, and monitors attached to a Silicon Graphics Prism system to each be managed by a different Xserver.

---

**Note:** The use of multiple Xservers requires ProPack™ 3, Service Pack 4 or a later release of the software.

---

This section describes a relatively simple configuration. Much more complex configurations are possible, however, and may be accomplished by extending the instructions provided here.

---

**Note:** When configuring multiple seats, the best method is to first attach all devices (keyboards, pointing devices, and monitors) and configure the system with a single Xserver. Once this is done, the configuration may be modified to assign individual subsets of these devices to be managed by separate Xservers.

---

Configuring a system for multi-seat operation involves the following steps, each described in a separate subsection below:

1. Identify the correct event devices (that is, keyboards and pointing devices) for each seat.
2. Create and edit an XF86Config-Nserver file for the desired configuration.
3. Point X to the newly-created XF86Config-Nserver file.

## Identifying Event Devices

An “event device” is a keyboard or pointing device. All event devices connected to the system are listed at boot time on lines beginning with the string “input.” These boot messages may be displayed at a Linux command prompt using the `dmesg` command. The output from the `dmesg` command can be quite long, and therefore is usually filtered with a `grep` command. For example:

```
# dmesg | grep ^input
input0: USB HID v1.10 Keyboard [NOVATEK Generic USB Keyboard] on usb1:4.0
input1: USB HID v1.00 Mouse [Logitech N43] on usb1:5.0
input2: USB HID v1.00 Mouse [Logitech N43] on usb1:6.0
input3: USB HID v1.10 Keyboard [NOVATEK Generic USB Keyboard] on usb1:7.0
input4: USB HID v1.00 Keyboard [SILITEK USB Keyboard and Mouse] on usb1:9.0
input5: USB HID v1.00 Mouse [SILITEK USB Keyboard and Mouse] on usb1:9.1
input6: USB HID v1.00 Mouse [Logitech N43] on usb1:10.0
```

All input devices detected during boot-up will have device nodes created for them in the `/dev/input` directory as follows:

- Each keyboard will have an associated event\* device node.
- Each pointing device will have both an associated event\* device node and an associated mouse\* device node.

The mapping of devices to nodes is by number (that is, `input0` maps to `event0`, `input1` maps to `event1`, and so on). The first input that is a pointing device gets mapped to `mouse0`, the next input that is a pointing device gets mapped to `mouse1`, and so on.

The `dmesg` output shown above would therefore create the following mapping:

```
input0: event0
input1: event1, mouse0
input2: event2, mouse1
input3: event3
input4: event4
input5: event5, mouse2
input6: event6, mouse3
```

This mapping can then be used to edit the `XF86Config-Nserver` file, as described in the next subsection, “Creating a Multi-Seat `XF86Config` File” on page 249.

## Creating a Multi-Seat XF86Config File

A multiple-Xserver configuration requires a customized XF86Config file containing a separate ServerLayout section for each Xserver you will be running.

---

**Note:** The original ServerLayout section (always identified as “Main Layout”) is typically left unchanged, allowing the system to easily be reconfigured as a single-Xserver system.

---

## Creating a New XF86Config File

Start out by creating a new XF86Config file. The easiest way to do this is to simply make a copy of the system’s regular XF86Config file, as follows:

```
# cp /etc/X11/XF86Config /etc/X11/XF86Config-Nservers
```

(where *N* is the number of servers you will be configuring).

## Configuring the Input Devices

Next, configure the input devices as follows:

1. Copy the section beginning:

```
Section "InputDevice"
    Identifier "Keyboard1"
```

and insert a duplicate copy (or copies) below the existing section, until there is one copy for each keyboard (including the original copy in this count).

2. Edit all the keyboard InputDevice sections, in each one changing the driver from “keyboard” to “evdev” and adding an Option line identifying the appropriate event device (in this example, “/dev/input/event0”). The resulting InputDevice sections will look something like the following:

```
Section "InputDevice"
    Identifier "Keyboard1"
    Driver "evdev"
    Option "Device" "/dev/input/event0"
    # ...
EndSection
```

---

**Note:** See “Identifying Event Devices” on page 248 for instructions on how to determine the appropriate event device for each section.

---

---

**Note:** You may assign any number of keyboards to a single Xserver, but no keyboard may be assigned to more than one Xserver.

---

3. Copy the section beginning:

```
Section "InputDevice"
    Identifier "Mouse1"
```

and insert a duplicate copy (or copies) below the existing section, until there is one copy for each pointing device (including the original copy in this count).

4. Edit all the mouse InputDevice sections, changing the Option “Device” line from the default “/dev/input/mice” to one identifying the appropriate event device (in this example, “/dev/input/mouse0”). The resulting InputDevice sections will look something like the following:

```
Section "InputDevice"
    Identifier "Mouse1"
```

```
Driver "mouse"  
Option "Device" "/dev/input/mouse0"  
# ...  
EndSection
```

---

**Note:** See “Identifying Event Devices” on page 248 for instructions on how to determine the appropriate event device.

---

---

**Note:** You may assign any number of pointing devices to a single Xserver, but no pointing device may be assigned to more than one Xserver.

---

### Configuring the New ServerLayout Sections

In this new `XF86Config-Nservers` file, perform the following steps:

1. Copy the section beginning:

```
Section "ServerLayout"
    Identifier "Main Layout"
```

and insert a duplicate copy (or copies) below the existing section, until there is one copy for each Xserver you will have (do NOT include the original "Main Layout" copy in this count).

2. While leaving the original ServerLayout section identified as "MainLayout," give each new ServerLayout section a new name. For example, the first server might be named "Layout0":

```
Identifier "Layout0"
```

the next "Layout1," and so on.

3. Within each new Server Layout section, disable (delete or comment out) every screen that will not be used in that layout:

```
Screen "Screen SG-0"      ""      ""      ""      "Screen SG-1"
# Screen "Screen SG-1"    ""      ""      "Screen SG-0"  ""
```

---

**Note:** You may assign any number of screens to a single Xserver, but no screen may be assigned to more than one Xserver.

---

4. Edit each Server Layout section to make sure than no remaining uncommented screen lists as adjacent another screen that will be managed by a different Xserver:

```
Screen "Screen SG-0"      ""      ""      ""      ""
# Screen "Screen SG-1"    ""      ""      "Screen SG-0"  ""
```

5. Within each Server Layout section, change the input devices to the correct ones for that Xserver. For example, the first Xserver might use:

```
InputDevice "Mouse1"  "CorePointer"
InputDevice "Keyboard1" "CoreKeyboard"
```

6. Save the `XF86Config-Nservers` file.

For an example ServerLayout section from an `XF86Config-3server` file, see "Example "ServerLayout" Sections for Three Xservers" on page 253. In this example, the first two Xservers manage one screen each, while the third Xserver manages two screens.

**Example “ServerLayout” Sections for Three Xservers**

```

# *****
# ServerLayout sections.
# *****

Section "ServerLayout"
    Identifier "Main Layout"
    Screen "Screen SG-0"      ""      ""      ""      "Screen SG-1"
    Screen "Screen SG-1"      ""      ""      "Screen SG-0"  "Screen SG-2"
    Screen "Screen SG-2"      ""      ""      "Screen SG-1"  "Screen SG-3"
    Screen "Screen SG-3"      ""      ""      "Screen SG-2"  ""
    InputDevice "Mouse1" "CorePointer"
    InputDevice "Keyboard1" "CoreKeyboard"
EndSection

Section "ServerLayout"
    Identifier "Layout0"
    Screen "Screen SG-0"      ""      ""      ""      ""
    InputDevice "Mouse1" "CorePointer"
    InputDevice "Keyboard1" "CoreKeyboard"
EndSection

Section "ServerLayout"
    Identifier "Layout1"
    Screen "Screen SG-1"      ""      ""      ""      ""
    InputDevice "Mouse2" "CorePointer"
    InputDevice "Keyboard2" "CoreKeyboard"
EndSection

Section "ServerLayout"
    Identifier "Layout2"
    Screen "Screen SG-2"      ""      ""      ""      "Screen SG-3"
    Screen "Screen SG-3"      ""      ""      "Screen SG-2"  ""
    InputDevice "Mouse3" "CorePointer"
    InputDevice "Keyboard3" "CoreKeyboard"
EndSection

```

### Pointing X to the New XF86Config-Nserver File

Once you have created the new XF86Config-Nserver file, the last step is to tell X to use the new layouts it contains, rather than the default server layout. To do so, perform the following steps:

1. Make a backup copy of the default single-server /etc/X11/gdm/gdm.conf file:  

```
# cp /etc/X11/gdm/gdm.conf /etc/X11/gdm/gdm.conf-old
```
2. Edit the /etc/X11/gdm/gdm.conf file to use the new server layouts you defined in the XF86Config file:

In the [servers] section, comment out the standard server, then add the new server layouts you will be using:

```
#0=Standard  
0=Layout0  
1=Layout1  
2=Layout2
```

3. Define each new server layout. For example:

```
[server-Layout0]  
name=Layout0 server  
command=/usr/X11R6/bin/X :0 -xf86config /etc/X11/XF86Config.3server -layout Layout0  
flexible=true
```

For an example of a multi-Xserver [servers] section, see “Example /etc/X11/gdm/gdm.conf Servers Section for Three Xservers” on page 255.

4. Save the gdm.conf file and reboot the system.

**Example /etc/X11/gdm/gdm.conf Servers Section for Three Xservers**

```
[servers]

#0=Standard
0=Layout0
1=Layout1
2=Layout2

[server-Standard]
name=Standard server
command=/usr/X11R6/bin/X
flexible=true

[server-Layout0]
name=Layout0 server
command=/usr/X11R6/bin/X :0 -xf86config /etc/X11/XF86Config.3server -layout Layout0
flexible=true

[server-Layout1]
name=Layout1 server
command=/usr/X11R6/bin/X :1 -xf86config /etc/X11/XF86Config.3server -layout Layout1
flexible=true

[server-Layout2]
name=Layout2 server
command=/usr/X11R6/bin/X :2 -xf86config /etc/X11/XF86Config.3server -layout Layout2
flexible=true
```



## **Technical Specifications and Pinouts**

This appendix contains technical specification information about your system, as follows:

- “System-level Specifications” on page 258
- “Physical Specifications” on page 259
- “Environmental Specifications” on page 260
- “Power Specifications” on page 261
- “I/O Port Specifications” on page 262

## System-level Specifications

Table A-1 summarizes the Silicon Graphics Prism system Extreme configuration ranges.

**Table A-1** Silicon Graphics Prism Extreme Configuration Ranges

<b>Category</b>	<b>Minimum</b>	<b>Maximum</b>
Processors	8	128
Graphics pipes	2	8
CR-brick DIMM capacity	16	48
System main memory capacity	8 GB (4-node bricks)	6 TB (64-node bricks)
Available XIO I/O channels	2	128
Number of I/O bricks	One IX-brick	One IX-brick and seven PX-bricks

## Physical Specifications

Table A-2 shows the physical specifications of each of the racks used in the Silicon Graphics Prism system.

**Table A-2** Silicon Graphics Prism Extreme Physical Specifications

Feature	Specification
Dimensions for a single tall rack, including doors and side panels (less system display)	Height: 74.25 in. (1886 mm) Width: 30.88 in. (784 mm) Depth: 53 in. (1346 mm)
Shipping dimensions	Height: 80 in. (2032 mm) Width: 41.5 in. (1054 mm) Depth: 62.75 in. (1594 mm)
Weight:	
Empty	425 lb (192.78 kg)
Full rack (maximum)	1400 lb (635 kg)
Shipping weight	
Full rack (maximum)	1785 lb (810 kg)
Access requirements	
Front	48 in. (1219 mm)
Rear	48 in. (1219 mm)
Side	None

## Environmental Specifications

Table A-3 lists the environmental specifications of the Silicon Graphics Prism Extreme system.

**Table A-3** Silicon Graphics Prism Extreme Environmental Specifications

<b>Feature</b>	<b>Specification</b>
Temperature tolerance (operating)	+5 °C (41 °F) to +35 °C (95 °F) (up to 1500 m / 5000 ft.) +5 °C (41 °F) to +30 °C (86 °F) (1500 m to 3000 m / 5000 ft. to 10,000 ft.)
Temperature tolerance (non-operating)	-40 °C (-40 °F) to +60 °C (140 °F)
Relative humidity	10% to 80% operating (no condensation) 10% to 95% non-operating (no condensation)
Heat dissipation to air Prism Extreme (per rack)	38.93 Kbtu/hr maximum (based on 11.41 kW)
Cooling requirement	Ambient air
Air flow: intake (front), exhaust (rear)	Less than 3200 CFM
Maximum altitude	10,000 ft. (3,049 m) operating 40,000 ft. (12,195 m) non-operating
Acoustical noise level	Less than 65 dBa maximum

## Power Specifications

Table A-4 shows the power specifications for the system.

**Table A-4** Power Specifications

<b>Feature</b>	<b>Specification</b>
Single-phase <sup>a</sup> power requirements	
Voltage	200-240V (180-254 VAC min/max)
Frequency	50-60 Hz (47-63 Hz min/max)
Power (maximum)	11.86 kVA (11.41 kW) per rack
Hold-up time	16 ms

a. Three-phase optional

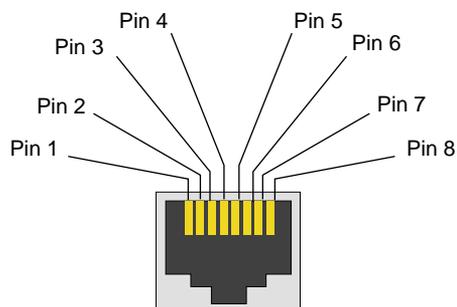
## I/O Port Specifications

This section contains specifications and port pinout information for the base I/O ports of your system, as follows:

- “Ethernet Port” on page 263
- “DB-9 Serial Port” on page 264
- “DVI-I Connector” on page 266
- “USB Type A Connector” on page 268
- “USB Type B Connector” on page 269

## Ethernet Port

The system auto-selects the Ethernet port speed and type (duplex vs. half-duplex) when the system is booted, based on the device to which it is connected. Figure A-1 shows the Ethernet port.



**Figure A-1** Ethernet Port

Table A-5 shows the cable pinout assignments for the Ethernet port operating in both 10/100-Base-T mode and 1000Base-T mode.

**Table A-5** Ethernet Connector Pin Assignments

Pin	Assignment (10/100BaseT)	Pin	Assignment (1000BaseT)
1	Transmit +	1	Transmit/Receive 0+
2	Transmit -	2	Transmit/Receive 0-
3	Receive +	3	Transmit/Receive 1+
4	Not used	4	Transmit/Receive 2+
5	Not used	5	Transmit/Receive 2-
6	Receive -	6	Transmit/Receive 1-
7	Not used	7	Transmit/Receive 3+
8	Not used	8	Transmit/Receive 3-

## DB-9 Serial Port

Figure A-2 shows and Table A-6 lists the pin assignments for the standard DB-9 serial connector. These ports are found on the IX-brick (via the base I/O PCI card), the router brick, the XG2N and CPU expansion modules, and the console and modem ports of the optional L2 controller. These ports are capable of transferring data at rates as high as 230 kbps. Other features of the ports include the following:

- Programmable data, parity, and stop bits
- Programmable baud rate and modem control



**Caution:** Although the image sync subsystem also uses DB-9 connectors, these connectors, whether on the ImageSync card or on the XG2N bricks, are not serial ports. Connecting a serial device to these connectors may cause damage to both the ImageSync devices and the serial devices.

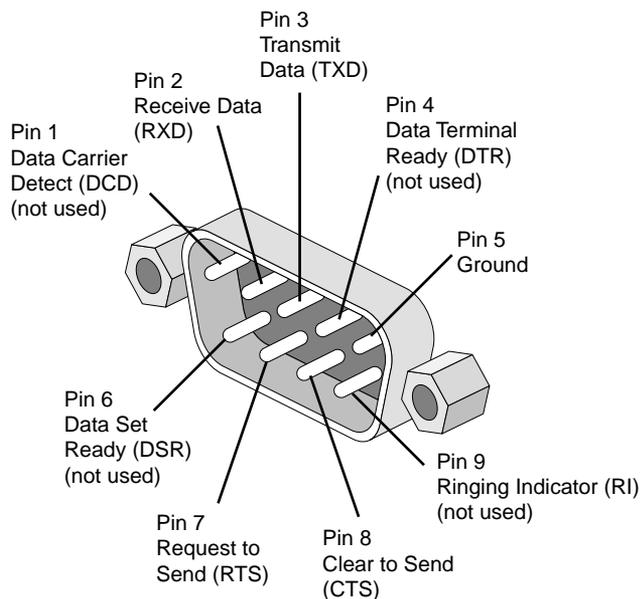


Figure A-2 Serial Port

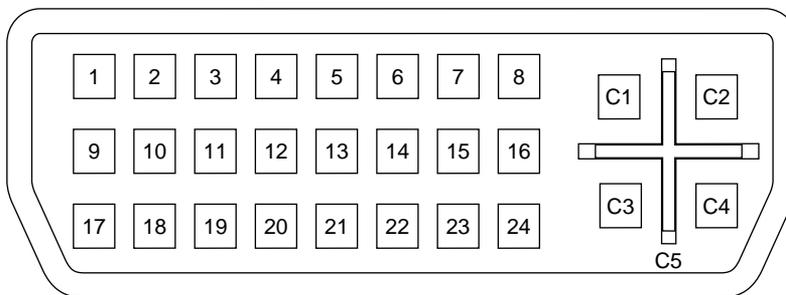
Table A-6 shows pinout assignments for the 9-pin male DB-9 connector.

**Table A-6** Serial Port Pinout

<b>Pin</b>	<b>Name</b>	<b>Function</b>
1	DCD	Data carrier detect (not used)
2	RXD or RD	Receive data
3	TXD or TD	Transmit data
4	DTR	Data Terminal Ready (not used)
5	GND	Ground
6	DSR	Data set ready (not used)
7	RTS	Request to send
8	CTS	Clear to send
9	RI	Ring indicator (not used)

## DVI-I Connector

The XG2N module contains two graphics pipes, each capable of supporting two display devices. The graphics connector and pinouts are shown in Figure A-3 and Table A-7.



**Figure A-3** DVI-I Connector Pinout

The console and L1 connectors on the XG2N module are the same as the compute module.

**Table A-7** DVI-I Connector Signals and Pins

Pin	Function	Pin	Function
1	T.M.D.S. <sup>a</sup> Data 2-	16	Hot Plug Detect
2	T.M.D.S. Data 2+	17	T.M.D.S. Data 0-
3	T.M.D.S. Data 2/4 Shield	18	T.M.D.S. Data 0+
4	T.M.D.S. Data 4-	19	T.M.D.S. Data 0/5 Shield
5	T.M.D.S. Data 4+	20	T.M.D.S. Data 5-
6	DDC Clock	21	T.M.D.S. Data 5+
7	DDC Data	22	T.M.D.S. Clock Shield
8	Analog Vertical Sync	23	T.M.D.S. Clock+
9	T.M.D.S. Data 1-	24	T.M.D.S. Clock-
10	T.M.D.S. Data 1+		
11	T.M.D.S. Data 1/3 Shield	C1	Analog Red Video Out

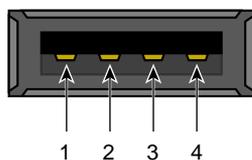
**Table A-7** DVI-I Connector Signals and Pins **(continued)**

<b>Pin</b>	<b>Function</b>	<b>Pin</b>	<b>Function</b>
12	T.M.D.S. Data 3-	C2	Analog Green Video Out
13	T.M.D.S. Data 3+	C3	Analog Blue Video Out
14	+5V Power	C4	Analog Horizontal Sync
15	Ground (for +5V)	C5	Analog Common Ground

a. Transition Minimized Differential Signaling

## USB Type A Connector

Figure A-4 shows the USB type A connector that is used for USB ports 1 through 4 of the optional L2 controller that connects to XG2N and CPU Expansion modules.



**Figure A-4** Pin Number Locations for USB Type A Connector

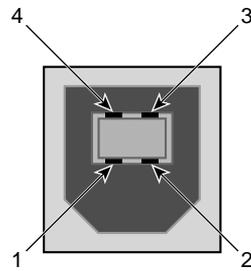
Table A-8 lists the pin assignments.

**Table A-8** Pin Assignments for USB Type A Connector

Signal	Color	Pin Number
VCC	Red	1
-Data	White	2
+Data	Green	3
Ground	Black	4

## USB Type B Connector

Figure A-5 shows the USB type B connector that is used for the USB L1 port of the XG2N and CPU Expansion modules. Table A-9 lists the pin assignments.



**Figure A-5** Pin Number Locations for USB Type B Connector

**Table A-9** Pin Assignments for USB Type B Connector

Signal	Color	Pin Number
VCC	Red	1
-Data	White	2
+Data	Green	3
Ground	Black	4



## Safety Information and Regulatory Specifications

This appendix provides safety information and regulatory specifications for your system in the following sections:

- “Safety Information” on page 271
- “Regulatory Specifications” on page 273

### Safety Information

Read and follow these instructions carefully:

1. Follow all warnings and instructions marked on the product and noted in the documentation included with this product.
2. Unplug this product before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
3. Do not use this product near water.
4. Do not place this product or components of this product on an unstable cart, stand, or table. The product may fall, causing serious damage to the product.
5. Slots and openings in the system are provided for ventilation. To ensure reliable operation of the product and to protect it from overheating, these openings must not be blocked or covered. This product should never be placed near or over a radiator or heat register, or in a built-in installation, unless proper ventilation is provided.
6. This product should be operated from the type of power indicated on the marking label. If you are not sure of the type of power available, consult your dealer or local power company.
7. Do not allow anything to rest on the power cord. Do not locate this product where people will walk on the cord.

8. Never push objects of any kind into this product through cabinet slots as they may touch dangerous voltage points or short out parts that could result in a fire or electric shock. Never spill liquid of any kind on the product.
9. Do not attempt to service this product yourself except as noted in this guide. Opening or removing covers of node and switch internal components may expose you to dangerous voltage points or other risks. Refer all servicing to qualified service personnel.
10. Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
  - When the power cord or plug is damaged or frayed.
  - If liquid has been spilled into the product.
  - If the product has been exposed to rain or water.
  - If the product does not operate normally when the operating instructions are followed. Adjust only those controls that are covered by the operating instructions since improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to normal condition.
  - If the product has been dropped or the cabinet has been damaged.
  - If the product exhibits a distinct change in performance, indicating a need for service.
11. If a lithium battery is a soldered part, only qualified SGI service personnel should replace this lithium battery. For other types, replace it only with the same type or an equivalent type recommended by the battery manufacturer, or the battery could explode. Discard used batteries according to the manufacturer's instructions.
12. Use only the proper type of power supply cord set (provided with the system) for this unit.
13. Do not attempt to move the system alone. Moving a rack requires at least two people.
14. Keep all system cables neatly organized in the cable management system. Loose cables are a tripping hazard that cause injury or damage the system.

## Regulatory Specifications

The following topics are covered in this section:

- “CMN Number” on page 273
- “CE Notice and Manufacturer’s Declaration of Conformity” on page 273
- “Electromagnetic Emissions” on page 274
- “Shielded Cables” on page 276
- “Electrostatic Discharge” on page 276
- “Laser Compliance Statements” on page 277
- “Lithium Battery Statements” on page 278

This SGI system conforms to several national and international specifications and European Directives listed on the “Manufacturer’s Declaration of Conformity.” The CE mark insignia displayed on each device is an indication of conformity to the European requirements.



**Caution:** This product has several governmental and third-party approvals, licenses, and permits. Do not modify this product in any way that is not expressly approved by SGI. If you do, you may lose these approvals and your governmental agency authority to operate this device.

### CMN Number

The model number, or CMN number, for the system is on the system label, which is mounted inside the rear door on the base of the rack.

### CE Notice and Manufacturer’s Declaration of Conformity

The “CE” symbol indicates compliance of the device to directives of the European Community. A “Declaration of Conformity” in accordance with the standards has been made and is available from SGI upon request.

## Electromagnetic Emissions

This section provides the contents of electromagnetic emissions notices from various countries.

### FCC Notice (USA Only)

This equipment complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

---

**Note:** This equipment has been tested and found to comply 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 you will be required to correct the interference at your own expense.

---

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, you are encouraged to try to correct the interference by using one or more of the following methods:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.



---

**Caution:** Changes or modifications to the equipment not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

---

**Industry Canada Notice (Canada Only)**

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique n'émet pas de perturbations radioélectriques dépassant les normes applicables aux appareils numériques de Classe A prescrites dans le Règlement sur les interférences radioélectriques établi par le Ministère des Communications du Canada.

**VCCI Notice (Japan Only)**

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

**Figure B-1** VCCI Notice (Japan Only)

**Chinese Class A Regulatory Notice**

警告使用者：

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

**Figure B-2** Chinese Class A Regulatory Notice

**Korean Class A Regulatory Notice**

이 기기는 업무용으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며 만약 잘못 판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

**Figure B-3** Korean Class A Regulatory Notice

## Shielded Cables

This SGI system is FCC-compliant under test conditions that include the use of shielded cables between the system and its peripherals. Your system and any peripherals you purchase from SGI have shielded cables. Shielded cables reduce the possibility of interference with radio, television, and other devices. If you use any cables that are not from SGI, ensure that they are shielded. Telephone cables do not need to be shielded.

Optional monitor cables supplied with your system use additional filtering molded into the cable jacket to reduce radio frequency interference. Always use the cable supplied with your system. If your monitor cable becomes damaged, obtain a replacement cable from SGI.

## Electrostatic Discharge

SGI designs and tests its products to be immune to the effects of electrostatic discharge (ESD). ESD is a source of electromagnetic interference and can cause problems ranging from data errors and lockups to permanent component damage.

It is important that you keep all the covers and doors, including the plastics, in place while you are operating the system. The shielded cables that came with the unit and its peripherals should be installed correctly, with all thumbscrews fastened securely.

An ESD wrist strap may be included with some products, such as memory or PCI upgrades. The wrist strap is used during the installation of these upgrades to prevent the flow of static electricity, and it should protect your system from ESD damage.

## Laser Compliance Statements

The DVD-ROM drive in this computer is a Class 1 laser product. The DVD-ROM drive's classification label is located on the drive.



**Warning:** Avoid exposure to the invisible laser radiation beam when the device is open.



**Warning:** Attention: Radiation du faisceau laser invisible en cas d'ouverture. Eviter toute exposition aux rayons.



**Warning:** Vorsicht: Unsichtbare Laserstrahlung, Wenn Abdeckung geöffnet, nicht dem Strahl aussetzen.



**Warning:** Advertencia: Radiación láser invisible al ser abierto. Evite exponerse a los rayos.



**Warning:** Advarsel: Laserstråling ved åbning se ikke ind i strålen



**Warning:** Varo! Lavattaessa Olet Alttina Lasersäteilylle



**Warning:** Varning: Laserstrålning när denna del är öppnad ålä tuijota säteeseenstirra ej in i strålen.



**Warning:** Varning: Laserstrålning när denna del är öppnadstirra ej in i strålen.



---

**Warning:** Advarsel: Laserstråling nar deksel åpnesstirr ikke inn i strålen.

---

## Lithium Battery Statements



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**Warning:** If a lithium battery is a soldered part, only qualified SGI service personnel should replace this lithium battery. For other types, replace the battery only with the same type or an equivalent type recommended by the battery manufacturer, or the battery could explode. Discard used batteries according to the manufacturer's instructions.

---



---

**Warning:** Advarsel!: Lithiumbatteri - Eksplosjonsfare ved feilagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Léver det brugte batteri tilbage til leverandøren.

---



---

**Warning:** Advarsel: Eksplosjonsfare ved feilaktig skifte av batteri. Benytt samme batteritype eller en tilsvarende type anbefalt av apparatfabrikanten. Brukte batterier kasseres i henhold til fabrikantens instruksjoner.

---



---

**Warning:** Varning: Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

---



---

**Warning:** Varoitus: Päristö voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suositteluun tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

---



---

**Warning: Vorsicht!: Explosionsgefahr bei unsachgemäßen Austausch der Batterie. Ersatz nur durch denselben oder einen vom Hersteller empfohlenem ähnlichen Typ. Entsorgung gebrauchter Batterien nach Angaben des Herstellers.**

---



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# Index

## A

- adding or replacing memory, 197
- analog monitors, 246
- apropos command, xxiii
- audible alarm, 153

## B

- Base IO card
  - location, 100
- battery statements, 279
- block diagram
  - system, 60
- brick
  - monitored at L1 controller, 12
  - powering off, 9
  - powering on, 4
- brick slot numbering, 67

## C

- cabling
  - ImageSync, 83
  - monitor, 85
- cache coherency, 62
- carrier module
  - replacement procedure, 215
- Chinese Class A regulatory notice, 275

- CMN number, 273
- command targeting
  - L1 mode, 37
  - L2 mode, 45
- connector pin assignment
  - USB type A, 268
  - USB type B, 269
- console
  - L1 mode power off, 9
  - L1 mode power on, 7
  - powering off bricks, 9
  - powering on bricks, 7
- console communications, 49
  - subchannels, 49
- console mode
  - from L1 mode, 39
  - from L2 emulator mode, 48
- console selection, 49
- controller
  - L1, 25
- cooling module LED
  - TP900 storage module, 145
- CPU expansion module, 73, 81
  - Failure LED, 78
  - front panel controls & indicators, 78
  - L1 controller display, 78
  - NMI button, 79
  - Power button, 79
  - Power-button LED, 78
  - Reset button, 79
  - Service-required LED, 78

- CR-brick
  - block diagram, 90
  - front panel components, 91
  - important notes, 96
  - overview, 88
  - rear panel components, 93
  - technical specifications, 97
- customer service, xxiv
  
- D**
- D-brick2, 158
  - components, 150
  - cooling module, 152
  - drive carrier modules, 150
  - dummy modules, 150
  - features, 149
  - front view, 148
  - LRC module, 154
  - overview, 148
  - power supply module, 152
  - powering off, 156
  - powering on, 156
  - rear view, 148
  - technical specifications, 158-159
- D-brick2 components
  - weight, 158
- D-brick2 operator's panel, 153
- digital monitors, 246
- DIMMs
  - adding or replacing, 197
  - installation, 199-201
  - removal, 202-203
- disk drive carrier module
  - replacement procedure, 215
- disk drive installation, 175
- disk drive LED
  - TP900 storage module, 142
- disk drive module
  - adding, 215-218
  - antitamper lock
    - disengaging, 216
    - replacing, 219-220
- distributed power supplies, 136
  - front view, 136
  - LEDs, 136
  - rear view, 136
  - technical specifications, 138
- DM8 audio board, 19
- documentation
  - available via the World Wide Web, xxiii
  - conventions, xxiv
  - man pages, xxiii
- drive carrier module
  - antitamper lock
    - disengaging, 219
- dual-channel
  - configuring, 239
  
- E**
- embedded support partner (ESP), 232
  - system support, 11
- environmental specifications, 260
- error messages, 224
- ESI/ops panel module, 25
- ESP (embedded support partner)
  - system support, 11
- Ethernet connector, 103
- external SCSI connector, 103, 107
  
- F**
- Failure LED
  - CPU expansion module, 78

- XG2N module, 78
  - framelock
    - configuring, 242
  - front and rear panels of the CR-brick, 91
  - front panel controls & indicators
    - CPU expansion module, 78
    - XG2N module, 78
  - front panel display
    - L1 controller, 30
  - front panel LEDs, 78
  - full scene anti-aliasing
    - configuring, 237
- G**
- Genlock
    - configuring, 242
  - graphics module
    - XG2N, 73
  - graphics pipes, 74
- H**
- hot swap disk drive replacement, 215
- I**
- ImageSync cabling, 83
  - Industry Canada Notice (Canada only), 275
  - information, warning, and error message
    - viewing in L1 mode, 37
  - information, warning, and error messages
    - viewing in L2 mode, 41, 47
  - install
    - disk drive, 175
    - memory, 199-201
  - internal view
    - XG2N, 80
  - IX-brick
    - Base IO card, 102
    - block diagram, 102
    - front panel components, 104
    - overview, 100
    - PCI and PCI-X card slots, 108
    - PCI and PCI-X slot rules, 109
    - PCI and PCI-X slots, 106
    - PCI card configuration guidelines, 108
    - rear panel, 107
    - rear panel components, 106
    - RT0 and RT1, 107
    - technical specifications, 110
    - XIO 11 and XIO 10 connectors, 106
- K**
- keyboard extender, 17
  - Knowledgebase, 232
  - Korean Class A regulatory notice, 275
- L**
- L1 console selection, 39
  - L1 controller, 78
    - description, 28
    - error messages, 224
    - front panel display, 30
    - front panel display items, 30
    - functions, 28
    - to monitor bricks, 12
  - L1 controller display
    - CPU expansion module, 78
    - XG2N module, 78
  - L1 firmware upgrade, 52
  - L1 mode

- command targeting, 37
- from L1 software, 36
- from L2 emulation mode, 51
- powering off, 37
- powering off at console, 9
- powering on, 37
- powering on at console, 7
- resetting the brick, 37
- to console mode, 39
- viewing information, warning, and error messages, 37, 41
- viewing system configuration, 36

L1 software

- modes of operation, 35
- to L1 mode, 36

L2 emulation mode

- to L1 mode, 51
- viewing system configuration, 44

L2 emulator mode

- powering off, 47
- powering on, 47
- resetting system, 47
- setting command targeting, 45
- to console mode, 48
- viewing information, warning, and error messages, 47

laser compliance statements, 277

LED

- cooling module
  - TP900 storage module, 145
- disk drive
  - TP900 storage module, 142
- power supply
  - TP900 storage module, 144
- status
  - TP900 storage module, 142

LEDs, front panel, 78

lithium battery warning statements, 2, 278

## M

memory

- adding or replacing, 197
- installation, 199-201
- removal, 202-203

modes of operation

- L1 software, 35

module

- CPU expansion, 73, 81
- XG2N, 73

monitor

- cabling, 85

monitor positions, 244

monitor types (digital and analog), 246

monitoring

- bricks with L1 controller, 12
- embedded support partner, 11
- system, 12

MonitorLayout, 246

## N

NMI button

- CPU expansion module, 79
- XG2N module, 79

non-uniform memory access (NUMA), 63

numbering

- bricks in a rack, 67
- racks, 67

## O

overlay planes

- configuring, 241

**P**

## PCI and PCI-X cards

- installation procedure, 165
- IX-brick PCI and PCI-X slots, 106
- IX-brick slot rules, 109
- PX-brick PCI and PCI-X slots, 118
- PX-brick slot rules, 121
- slots in IX-brick, 108
- slots in PX-brick, 120

## PCI and PCI-X slots

- IX-brick, 106
- PX-brick, 118

## PCI card configuration guidelines

- IX-brick, 108

## PCI cards

- cards supported, 110, 122
- carrier, 110, 122

## PCI carrier

- for PCI cards, 110, 122

## PCI-X cards

- cards supported, 110, 122
- carrier, 110, 122

## PCI-X carrier

- for PCI-X cards, 110, 122

## physical specifications

- Altix 3700 Bx2 Physical Specifications, 259

## pinouts

- Ethernet connector, 263
- serial connector, 264

## pipes

- numbering, 76

## power

- connector
  - TP900 storage module, 144

## power bay

- features, 133
- front panel components, 134
- front view, 133, 134

## overview, 132

- rear panel components, 135
- rear view, 133, 135
- technical specifications, 138

## Power button

- CPU expansion module, 79
- XG2N module, 79

## power specifications, 261

## power supply LED

- TP900 storage module, 144

## Power-button LED

- CPU expansion module, 78
- XG2N module, 78

## powering off

- at system console, 9
- in L1 mode, 9
- L1 mode, 37
- L2 mode, 47
- system, 9

## powering on

- at system console, 7
- in L1 mode, 7
- L1 mode, 37
- L2 emulator mode, 47
- preparation, 4
- system, 4

## product support, xxiv

## PX-brick

- block diagram, 115
- front panel components, 116
- overview, 114
- PCI and PCI-X card installation, 165
- PCI and PCI-X card slots, 120
- PCI and PCI-X slot rules, 121
- PCI and PCI-X slots, 118
- rear panel, 119
- rear panel components, 118
- technical specifications, 123
- XIO 11 and XIO 10 connectors, 118

**R**

RAS features, 63

R-brick

block diagram, 127

features, 126

front panel components, 128

overview, 126

port specifications, 130

rear panel components, 128

rear view, 129

technical specifications, 130

rear panel of the XG2N, 75

regulatory specifications

Chinese Class A regulatory notice, 275

Industry Canada notice (Canada only), 275

Korean Class A regulatory notice, 275

VCCI notice (Japan only), 275

remove

memory, 202-203

Reset button

CPU expansion module, 79

XG2N module, 79

resetting system

L1 mode, 37

L2 mode, 47

RT0 and RT1

IX-brick, 107

RTO and RTI connectors, 103

**S**

SCSI connector, external, 103, 107

Service-required LED

CPU expansion module, 78

XG2N module, 78

setmon command, 242

SGI Knowledgebase. See Knowledgebase

Silicon Graphics Prism system

illustration, 58

status LED

TP900 storage module, 142

Status LEDs, 78

stereo images

configuring, 234

subchannels

associated with console communications, 49

support

embedded support partner (ESP), 11

Supportfolio Online, 233

system

architecture, 59

block diagram, 60

controller, 23

features, 61

monitoring locations, 12

overview, 55

powering off, 9

powering on, 4

system components

list of, 65

optional, 68

Prism Extreme system, 66

**T**

tall rack

features, 70

technical specifications

CR-brick, 97

distributed power supplies, 138

IX-brick, 110

power bay, 138

PX-brick, 123

R-brick, 130

system level, 258

technical support, xxiv

TP900 storage module  
power connector, 144

troubleshooting

L1 controller error messages, 224  
problems and recommended actions, 222

## U

upgrading L1 firmware, 52

USB type A  
connector pin assignments, 268

USB type B  
connector pin assignments, 269

## V

VCCI notice (Japan only), 275

viewing system configuration  
L1 mode, 36

## W

warning and error messages  
viewing in L1 mode, 37

warning messages  
viewing in L2 mode, 41, 47

## X

XF86Config file  
configuring for dual-channel, 239  
configuring for external framelock, 242  
configuring for external Genlock, 242  
configuring for full scene anti-aliasing, 237  
configuring for overlay planes, 241

configuring for stereo, 234  
configuring monitor types, 246

XG2N  
internal view, 80

XG2N graphics module, 73, 74

XG2N module  
Failure LED, 78  
front panel controls & indicators, 78  
L1 controller display, 78  
NMI button, 79  
Power button, 79  
Power-button LED, 78  
Reset button, 79  
Service-required LED, 78

XIO 11 and XIO 10  
IX-brick, 106  
PX-brick, 118

