

# DIGITAL PowerStorm 1000 Graphics Subsystem

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## Owner's Guide

Part Number: EK-PS5DT-OG. A01

**September 1998**

**Compaq Computer Corporation  
Houston, Texas**

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**September 1998**

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# Preface

## Introduction

This document provides information for installing, troubleshooting, servicing, and upgrading the DIGITAL PowerStorm 1000 graphics subsystem and installing optional texture memory on the Image Rendering Module.

## Audience

This document is for service personnel who are responsible for installing, servicing, and upgrading the PowerStorm 1000 graphics subsystems.

## Organization

**Chapter 1** provides a general description of the PowerStorm 1000 graphics subsystem.

**Chapter 2** provides information on unpacking, installing, and confirming proper installation of the PowerStorm 1000 graphics subsystem. It also provides information on installing optional Texture Memory Modules, optional Image Rendering Modules, and an optional Video Memory Module.

**Chapter 3** provides troubleshooting information such as power on confidence tests and diagnostics.

**Chapter 4** provides information on upgrading an entry PowerStorm 1000 to a full PowerStorm 1000 and a full PowerStorm 1000 to a high resolution PowerStorm 1000.

**Chapter 5** provides removal and replacement procedures for the field replaceable units (FRUs) in the PowerStorm 1000 graphics subsystem.

**Chapter 6** provides a technical description of the graphics subsystem and the individual modules.

**Appendix A** contains the specifications for the PowerStorm 1000 graphics subsystem.

**Appendix B** contains listings of supported monitors and resolutions.

**Appendix C** contains a listing of the field replaceable units and their part numbers.

**Appendix D** contains a complete listing of the Windows NT event log messages along with a description of the messages.

## Conventions

This document uses the following conventions:

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<b>Convention</b>	<b>Meaning</b>
<b>Note</b>	A note calls the reader's attention to any item of information that may be of special importance.
<b>Caution</b>	A caution contains information essential to avoid damage to the equipment.
<b>Warning</b>	A warning contains information essential to the safety of personnel.
<b>❶</b>	Circled numbers provide a link between figures or examples and text.
<i>Italic type</i>	Italic type emphasizes important information, indicates variables, and indicates complete titles of manuals.

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## Related Documents

Other documents related to the DIGITAL PowerStorm 1000 graphics subsystem include the following:

<i>DIGITAL PowerStorm 1000 Texture Memory Installation Procedure</i>	EK-PS5DT-IG
<i>DIGITAL PowerStorm 1000 Upgrade Information</i>	EK-PS5DT-UI

## Reader's Comments

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- Internet electronic mail: *reader-comments@digital.com*
- Mail:

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129 Parker Street

Maynard, MA 01754-2199

For additional information, call 1-800-DIGITAL.



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# Introduction

## 1.1 Product Description

The DIGITAL PowerStorm 1000 graphics subsystem is a configurable, advanced 3D graphics rendering accelerator that is designed to interface with DIGITAL AlphaStation systems running the Windows NT or DIGITAL UNIX operating system.

The DIGITAL PowerStorm 1000 graphics subsystem produces high fidelity interactive visual output that provides near photo-realistic rendering in motion.

The PowerStorm 1000 graphics subsystem's high visual fidelity features include single-pass rendering of:

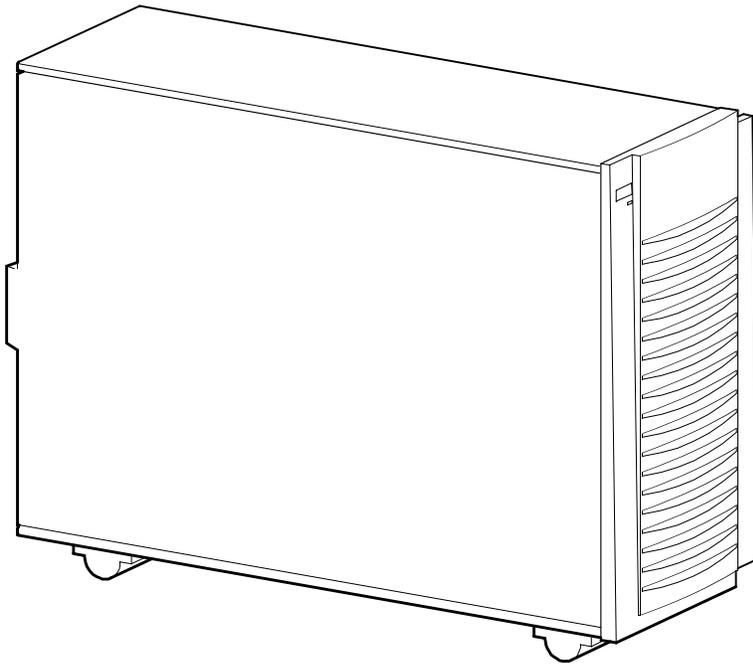
- Anti-aliased primitives (point, line, and triangle)
- Realistically lit shaded and textured surfaces
- Transparent overlapping surfaces
- Fog and haze
- Reflections

The PowerStorm 1000 graphics subsystem's high visual fidelity features include multiple-pass rendering of shadows.

## Introduction

The DIGITAL PowerStorm 1000 graphics subsystem consists of a desktop chassis (see Figure 1-1), a 32-bit PCI Workstation Interface Board and a VGA module (entry and full PowerStorm 1000 subsystem only) for installing in the AlphaStation system, a Host bus (Hbus) cable for connecting the PowerStorm 1000 graphics subsystem to the AlphaStation system, and a VGA cable for connecting the VGA console video output of the VGA module in the AlphaStation to the VGA console input of the Standard Resolution Module in the graphics subsystem (entry and full PowerStorm 1000 subsystem) or to a VGA console monitor (high resolution PowerStorm 1000 subsystem).

**Figure 1-1 PowerStorm 1000 Graphics Subsystem**



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## 1.2 Subsystem Configurations

The PowerStorm 1000 graphics subsystem is available in three configurations. These configurations are listed in Table 1-1 along with their part numbers. A description of the three configurations is contained in the following sections.

**Table 1-1 PowerStorm 1000 Graphics Subsystem Configurations**

<b>Part Number</b>	<b>Configuration</b>
SN-PBXGM-AA	Entry PowerStorm 1000
SN-PBXGM-AB	Full PowerStorm 1000
SN-PBXGM-AC	High Resolution PowerStorm 1000

### 1.2.1 Entry PowerStorm 1000

The entry PowerStorm 1000 is the basic configuration of the graphics subsystem. It consists of a Workstation Interface Board and a VGA module for installing in the AlphaStation, a Host bus (Hbus) cable for connecting the entry PowerStorm 1000 graphics subsystem to the AlphaStation system, a VGA cable for connecting the VGA console video output of the VGA module in the AlphaStation to the VGA console video input of the Standard Resolution Module in the graphics subsystem, and a deskside chassis that contains the following components:

- Motherboard/Backplane
- Graphics Interface Module
- Vertex Module
- Two Image Rendering Modules
- Video Memory Module
- Standard Resolution Module

## Introduction

### 1.2.2 Full PowerStorm 1000

The full PowerStorm 1000 provides increased performance over the entry PowerStorm 1000 graphics subsystem. It consists of a Workstation Interface Board and VGA module for installing in the AlphaStation, a Host bus (Hbus) cable for connecting the full PowerStorm 1000 graphics subsystem to the AlphaStation system, a VGA cable for connecting the VGA console video output of the VGA module in the AlphaStation to the VGA console video input of the Standard Resolution Module in the graphics subsystem, and a deskside chassis that contains the following components:

- Motherboard/Backplane
- Graphics Interface Module
- Vertex Module
- Four Image Rendering Modules
- Two Video Memory Modules
- Standard resolution module

### 1.2.3 High Resolution PowerStorm 1000

The high resolution PowerStorm 1000 is the high resolution configuration of the graphics subsystem that provides 2K x 2K of resolution. It consists of a Workstation Interface Board and VGA module for installing in the AlphaStation, a Host bus (Hbus) cable for connecting the high resolution PowerStorm 1000 graphics subsystem to the AlphaStation system, a VGA cable for connecting the VGA console video output of the VGA module in the AlphaStation to a separate VGA monitor that is required in order to see the boot up and initialization messages, a high resolution video output cable for connecting the output of the High Resolution Module to the Sony DDM-2801C or DDM-2802C (2K x 2K) monitor, and a deskside chassis that contains the following components:

- Motherboard/Backplane
- Graphics Interface Module
- Vertex Module
- Four Image Rendering Modules
- Two Video Memory Modules
- High Resolution Module

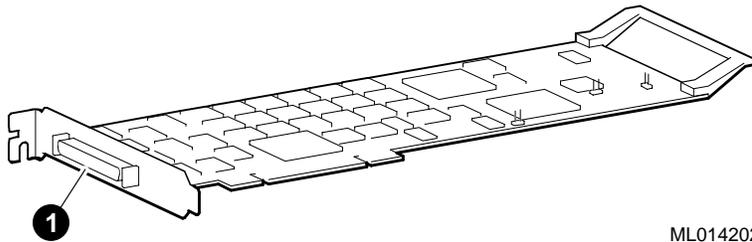
## 1.3 Module Descriptions

The PowerStorm 1000 graphics subsystems are made up of several different types of modules. These modules are described in the following sections.

### 1.3.1 Workstation Interface Board (WIB\_P1)

The Workstation Interface Board is a single-slot PCI board that is keyed for a universal PCI slot and is installed in the AlphaStation system. It provides the interface between the AlphaStation system and the graphics subsystem through an Hbus cable that connects to the Graphics Interface Module in the graphics subsystem deskside chassis. All three PowerStorm 1000 graphics subsystem configurations require a Workstation Interface Board. The Workstation Interface Board bulkhead has one Hbus connector for connecting the Hbus cable. Figure 1-2 shows the Workstation Interface Board.

**Figure 1-2 Workstation Interface Board**



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- ❶ Hbus connector

## Introduction

### 1.3.2 Motherboard/Backplane (RMB)

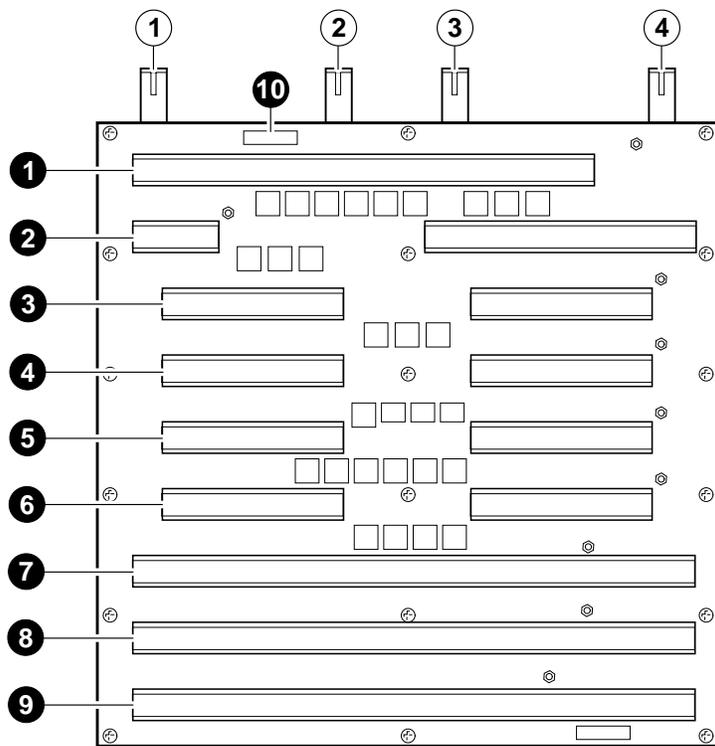
The motherboard is installed in the PowerStorm 1000 graphics subsystem deskside chassis. It provides the interconnect and power distribution between the various modules that are installed in the PowerStorm 1000 graphics subsystem chassis. All three PowerStorm 1000 graphics subsystem configurations require a motherboard. The motherboard contains nine slots to support the following modules:

- One Graphics Interface Module
- One Vertex Module
- Two or four Image Rendering Modules
- One or two Video Memory Modules (one for each pair of Image Rendering Modules)
- One Standard Resolution or High Resolution Module

Figure 1-3 shows the slot layout on the motherboard. The slots and modules are keyed and the slots are labeled.

Slots 5, 6, and 8 are unpopulated in the entry PowerStorm 1000 configuration.

**Figure 1-3 Motherboard**



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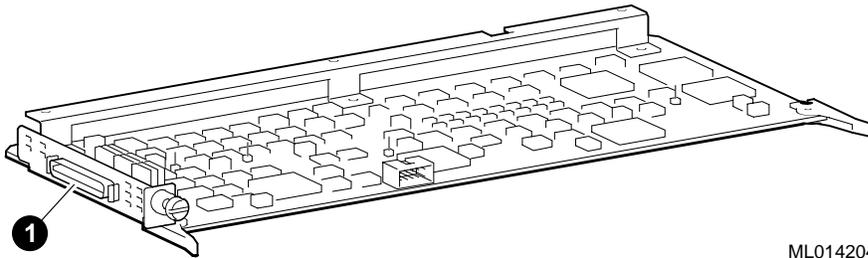
- |   |  |
|---|--|
| ❶ Slot 1 for Graphics Interface Module  | ❸ Slot 8 for 2nd Video Memory Module             |
| ❷ Slot 2 for Vertex Module              | ❹ Slot 9 for Standard / High Resolution Module   |
| ❸ Slot 3 for 1st Image Rendering Module | ❺ Power supply control cable connector           |
| ❹ Slot 4 for 2nd Image Rendering Module | ❻ Ground bus bar for black power cable harnesses |
| ❺ Slot 5 for 3rd Image Rendering Module | ❼ 3.3 V bus bar for orange power cable harnesses |
| ❻ Slot 6 for 4th Image Rendering Module | ❸ 5 V bus bar for red power cable harnesses      |
| ❼ Slot 7 for 1st Video Memory Module    | ❹ Ground bus bar for black power cable harnesses |

## Introduction

### 1.3.3 Graphics Interface Module (GIM\_RW)

The Graphics Interface Module provides the interface between the Hbus cable from the AlphaStation system and the rest of the modules in the deskside chassis. All three PowerStorm 1000 graphics subsystem configurations require a Graphics Interface Module. The Graphics Interface Module bulkhead has one Hbus connector for connecting the Hbus cable. The GIM\_RW also contains the de-compaction engine. Figure 1-4 shows the Graphics Interface Module.

**Figure 1-4 Graphics Interface Module**



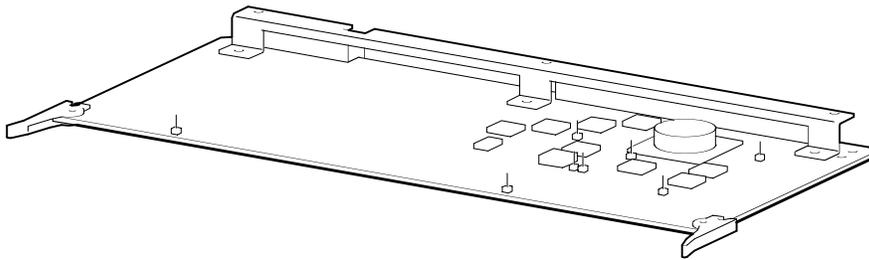
ML014204

- ① Hbus connector
- ② Keyed notch

### 1.3.4 Vertex Module (VXM)

The Vertex Module contains the Vertex Data Manager (VDM) ASIC which receives the stream of Image Rendering Module commands from the AlphaStation system. It assembles the data describing the vertices of points, lines, triangles, and rectangles; computes the additional information needed for their rasterization; and passes the results to the Image Rendering Modules. All three PowerStorm 1000 graphics subsystem configurations require a Vertex Module. Figure 1-5 shows the Vertex Module.

**Figure 1-5 Vertex Module**



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- ① Keyed notch

## Introduction

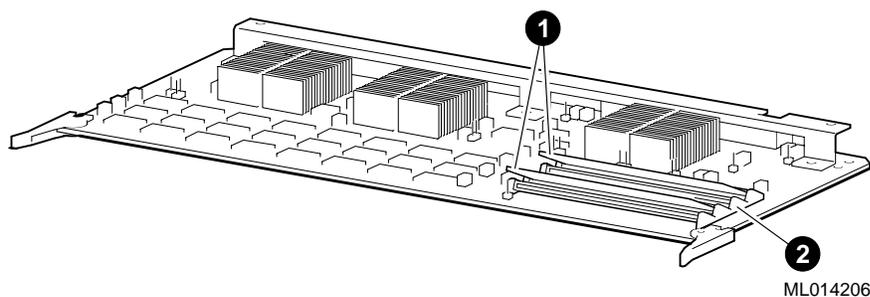
### 1.3.5 Image Rendering Module (IRM)

The Image Rendering Module contains one SSLD and two SAM ASICs that provide rasterization for anti-aliased points, lines, and polygons; depth cueing; multilevel surface transparency; stenciling; texture mapping; hidden surface removal; Z ordering of pixels; and window clip testing for occluded windows. The Image Rendering Modules are supported in pairs. The entry PowerStorm 1000 graphics subsystem contains two Image Rendering Modules, while the full and high resolution PowerStorm 1000 graphics subsystems contain four Image Rendering Modules.

Each Image Rendering Module contains four sockets for the Texture Memory Modules (TMMs). Each Image Rendering Module is shipped with two 16 MB Texture Memory Modules installed for an initial 32 MB of texture memory. Texture Memory Modules must be installed in pairs on each Image Rendering Module and each Image Rendering Module in the graphics subsystem must have the same amount of texture memory installed. An optional additional 32 MB of texture memory is available for the PowerStorm 1000 graphics subsystem. See Section 2.6.1 for the procedures for installing the optional Texture Memory Modules.

Figure 1-6 shows the Image Rendering Module.

**Figure 1-6 Image Rendering Module**

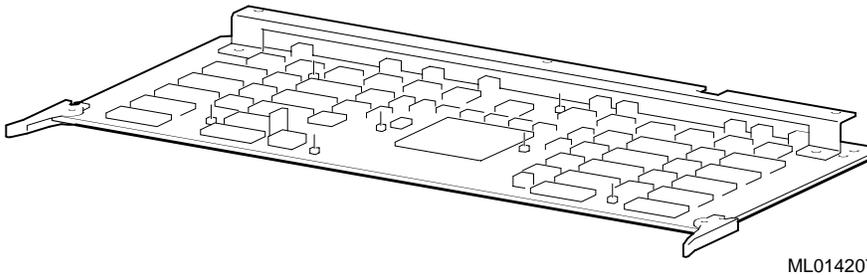


- ❶ Texture Memory Modules
- ❷ Texture memory sockets
- ❸ Keyed notch

### 1.3.6 Video Memory Module (VMM)

The Video Memory Module provides the frame buffer for the graphics subsystem and contains one Raster Controller (RC) ASIC. The entry PowerStorm 1000 graphics subsystem contains one Video Memory Module, while the full and high resolution PowerStorm 1000 graphics subsystems contain two Video Memory Modules. Figure 1-7 shows the Video Memory Module

**Figure 1-7 Video Memory Module**



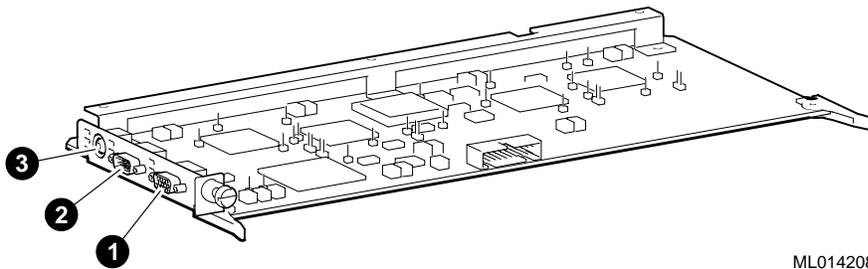
- ① Keyed notch

## Introduction

### 1.3.7 Standard Resolution Module (SRM)

The Standard Resolution Module provides support for displaying either the VGA console or graphics output. It also provides the support for stereoscopic rendering. The Standard Resolution Module supports the VGA console by using a pass-through video cable attached to a standard VGA module. The additional VGA module is required to be installed in the AlphaStation system in order for console output to be displayed. The Standard Resolution Module supports (1920 x 1280) at 76 Hz and resolutions of 640 x 480 up to 1920 x 1280. The entry and full PowerStorm 1000 graphics subsystems contain a Standard Resolution Module. The Standard Resolution Module bulkhead has a DIN style connector for the stereoscopic output, an HD15 female input connector for the VGA console video, and an HD15 female output connector for the graphics video cable. Figure 1-8 shows the Standard Resolution Module.

**Figure 1-8 Standard Resolution Module**



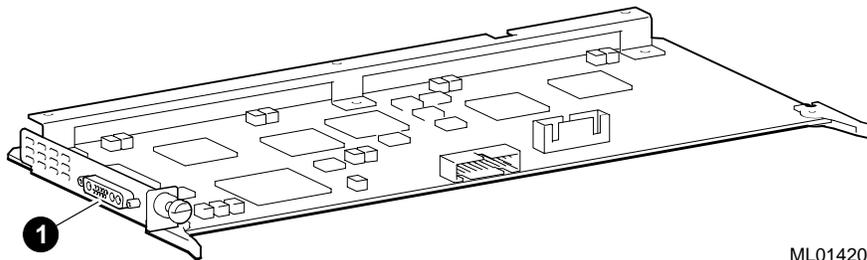
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- |                                     |                                 |
|-------------------------------------|---------------------------------|
| ❶ Graphics video output connector   | ❸ Stereoscopic output connector |
| ❷ VGA console video input connector | ❹ Keyed notch                   |

### 1.3.8 High Resolution Module (HRM)

The High Resolution Module provides the same basic functionality as the Standard Resolution Module, except that it only supports a resolution of 2K x 2K at 60 Hz which is required for the Sony DDM-2801C and DDM-2802C monitors. The High Resolution Module does not support stereoscopic output or switching for console output. The VGA console must be provided by using a separate monitor. The high resolution PowerStorm 1000 graphics subsystem contains a High Resolution Module. The High Resolution Module bulkhead has a D13W3 connector for connecting the HRM video cable. The other end of the HRM video cable has five BNC-connectors that provide video signals for red, green, blue, horizontal sync, and vertical sync to the monitor. Figure 1-9 shows the High Resolution Module.

**Figure 1-9 High Resolution Module**



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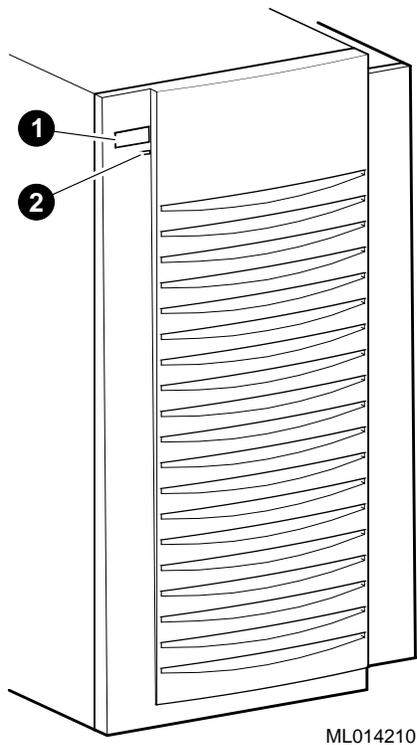
- ❶ Video output connector
- ❷ Keyed notch

## Introduction

### 1.4 Controls and Indicators

The PowerStorm 1000 graphics subsystems have a power ON/OFF switch and a power LED indicator on the front panel of the deskside chassis. Figure 1-10 shows the locations of the power ON/OFF switch and the power LED indicator.

**Figure 1-10 Controls and Indicators**



❶ Power ON/OFF switch

❷ Power LED indicator

## **2.1 Introduction**

This chapter contains the procedure for installing the PowerStorm 1000 graphics subsystem. It also contains the procedure for installing the optional Texture Memory Modules, Image Rendering Modules, and Video Memory Module. The major topics covered in this chapter include:

- Unpacking the Subsystem
- Installing the Workstation Interface Board and VGA Module
- Connecting the Subsystem to the Workstation
- Confirming Proper Installation
- Installing Options

## Installation

### 2.2 Unpacking the Subsystem

The PowerStorm 1000 graphics subsystem shipment may include more than one carton. Check the packing list to ensure that all items listed have been received.

If the equipment is damaged or if any items are missing, notify the delivery agent and contact the DIGITAL sales representative.

Save all shipping cartons in case the equipment needs to be moved to a new location, or needs to be returned for repair.

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#### WARNING

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**The PowerStorm 1000 graphics subsystem desktide chassis can weigh 32 kg (70 lb) or more. Use sufficient personnel or the proper lifting equipment to remove the desktide chassis from the shipping carton.**

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#### ACHTUNG

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**Das Tischgehäuse für das Graphiksubsystem der PowerStorm 1000-Produktreihe kann 32 kg (70 lb) oder mehr wiegen. Achten Sie darauf, daß Ihnen genügend Hilfskräfte oder geeignete Hebegeräte zur Verfügung stehen, wenn Sie das Tischgehäuse aus dem Lieferkarton herausnehmen.**

---

### 2.3 Installing the Workstation Interface Board and VGA Module

All three PowerStorm 1000 graphics subsystems require that a Workstation Interface Board be installed in the AlphaStation system. The entry and full PowerStorm 1000 graphics subsystems also require that a VGA Module be installed in the AlphaStation system and connected to the Standard Resolution Module with a pass-through video cable for console output to be displayed.

Perform the following procedure to install the Workstation Interface Board and the VGA Module in the AlphaStation system:

1. Refer to the AlphaStation system documentation and perform an orderly power down of the system.
2. Refer to the AlphaStation system documentation and remove the PCI card cage cover.

## Installation

3. Remove the filler panel screw and the blank filler panel from the PCI slot selected for installing the Workstation Interface Board. Save the filler panel screw for securing the Workstation Interface Board in place.
4. Put on an antistatic wriststrap.

---

### Caution

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An antistatic wriststrap *must* be worn when handling any board or module to prevent damage to the board or module.

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5. Slide the Workstation Interface Board into the selected PCI slot and apply firm pressure until the Workstation Interface Board is firmly seated. Secure the Workstation Interface Board in place with the filler panel screw that was removed in step 3.
6. If an entry or full PowerStorm 1000 graphics subsystem is being installed, remove the filler panel screw and the blank filler panel from the PCI slot selected for installing the VGA Module. Save the filler panel screw for securing the VGA Module in place.
7. Slide the VGA Module into the selected PCI slot and apply firm pressure until the VGA Module is firmly seated. Secure the VGA Module in place with the filler panel screw that was removed in step 6.
8. Reinstall the PCI card cage cover on the AlphaStation system.
9. Connect one end of the Hbus cable to the connector on the Workstation Interface Board bulkhead.
10. If an entry or full PowerStorm 1000 graphics subsystem is being installed, connect one end of the VGA cable to the VGA console video output connector on the VGA Module.

## Installation

### 2.4 Connecting the Subsystem to the Workstation

To connect the PowerStorm 1000 graphics subsystem to the AlphaStation system, the graphics subsystem deskside chassis must be placed along side or near the AlphaStation system.

Perform the following procedure to connect the PowerStorm 1000 graphics subsystem deskside chassis to the AlphaStation system.

1. Connect the Hbus cable from the Workstation Interface Board in the AlphaStation system to the Hbus connector on the Graphics Interface Module bulkhead located at the top rear of the deskside chassis.
2. For the entry and full PowerStorm 1000 graphic subsystems, connect the VGA cable from the VGA Module in the AlphaStation system to the VGA console video input connector on the Standard Resolution Module bulkhead located at the bottom rear of the deskside chassis.
3. For the entry and full PowerStorm 1000 graphic subsystems, connect the VGA monitor cable from the VGA monitor to the graphics video output connector on the Standard Resolution Module bulkhead located at the bottom rear of the deskside chassis.
4. For the high resolution PowerStorm 1000 graphic subsystem, connect the VGA monitor cable from the VGA monitor to the VGA Module in the AlphaStation system. Connect the HRM video cable from the D3w13 connector on the High Resolution Module bulkhead located at the bottom rear of the deskside chassis to the five BNC-connectors on the Sony DDM-2801C or DDM-2802C 2K x 2K monitor.

## 2.5 Confirming Proper Installation

After connecting the PowerStorm 1000 graphics subsystem to the AlphaStation system, perform the following procedure to confirm proper installation:

---

**Note**

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The PowerStorm 1000 graphics subsystem must always be powered on before booting the AlphaStation system. If this is not done, the AlphaStation system will not boot and appear to not have a video module.

---

1. Power on the PowerStorm 1000 graphics subsystem deskside chassis.
2. Refer to the AlphaStation system documentation to power on and boot the AlphaStation system.
3. If the PowerStorm 1000 graphics drivers are not installed on the AlphaStation system, install them and reboot the AlphaStation system. See Section 2.2 for the software installation information.

For the entry and full PowerStorm 1000 graphic subsystems, console messages will be displayed on the graphics monitor.

For the high resolution PowerStorm 1000 graphic subsystem, a VGA compatible monitor must be connected to the VGA Module in the AlphaStation system in order to see the console messages. Console messages will not be displayed on the graphics monitor.

4. If errors are reported, take the appropriate action or contact DIGITAL Support.
5. Log on the system and open several Windows.
6. Start one or more graphics applications.
7. Refer to Chapter 3 and run diagnostics if desired or if problems are detected.

## Installation

### 2.6 Installing Options

The following sections contain information for installing optional Texture Memory Modules, Image Rendering Modules, and a Video Memory Module.

---

#### **WARNING**

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**Before servicing the PowerStorm 1000 graphics subsystem, ensure that the power On/Off switch on the front of the deskside chassis is in the OFF position and disconnect the deskside chassis power cord from the ac input receptacle.**

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#### **ACHTUNG**

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**Stellen Sie sicher, daß vor der Wartung des Graphiksubsystems der PowerStorm 1000-Produktreihe der Ein/Aus-Schalter an der Vorderseite des Tischgerätes ausgeschaltet ist und das Netzkabel aus der Netzsteckdose gezogen wurde.**

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---

#### **WARNING**

---

**Only a qualified service person should remove and replace components in the PowerStorm 1000 graphics subsystem. A qualified service person should have the technical training and experience necessary to be aware of the hazards to which they are exposed in performing a task and the measures that should be taken to minimize the danger to themselves or other persons.**

---

**ACHTUNG**


---

**Die Komponenten des Graphiksubsystems der PowerStorm 1000-Produktreihe dürfen nur von erfahrenem und dazu qualifiziertem Wartungspersonal entfernt und ersetzt werden. Qualifiziertes Personal sollte entsprechend technisch geschult sein und über die nötige Erfahrung verfügen, um die möglichen Gefahren zu kennen, denen sie bei der Ausführung der notwendigen Wartungsarbeiten ausgesetzt sein könnten, und um die entsprechenden Schritte zur Minimierung dieser Gefahren für das Wartungspersonal und für andere Personen unternehmen zu können.**

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### 2.6.1 Installing Optional Texture Memory Modules

Each Image Rendering Module in the graphics subsystem contains four sockets for the Texture Memory Modules. These sockets are numbered 4 through 1 starting from the outside edge of the module. Each Image Rendering Module is shipped with two 16 MB Texture Memory Modules that are installed in sockets 1 and 3 for an initial 32 MB of texture memory. Texture Memory Modules must be installed in pairs on each Image Rendering Module and each Image Rendering Module in the graphics subsystem must have the same amount of texture memory installed. An optional 32 MB of texture memory is available for the PowerStorm 1000 graphics subsystems.

The two 32 MB texture memory options available for the PowerStorm 1000 graphics subsystems along with a description are listed in Table 2-1.

**Table 2-1 Texture Memory Options**

Option	Description
SN-PBXGM-GA	32 MB of texture memory for the entry PowerStorm 1000 graphics subsystem. Consists of four 16 MB Texture Memory Modules.
SN-PBXGM-GB	32 MB of texture memory for the full and high resolution PowerStorm 1000 graphics subsystems. Consists of eight 16 MB Texture Memory Modules.

Perform the following procedure to install the optional Texture Memory Modules:

1. Perform a normal system power down (see Section 5.2).
2. Remove the left side panel (see Section 5.4).
3. Remove the module hold-down bracket (see Section 5.5).
4. Put on an antistatic wriststrap.

## Installation

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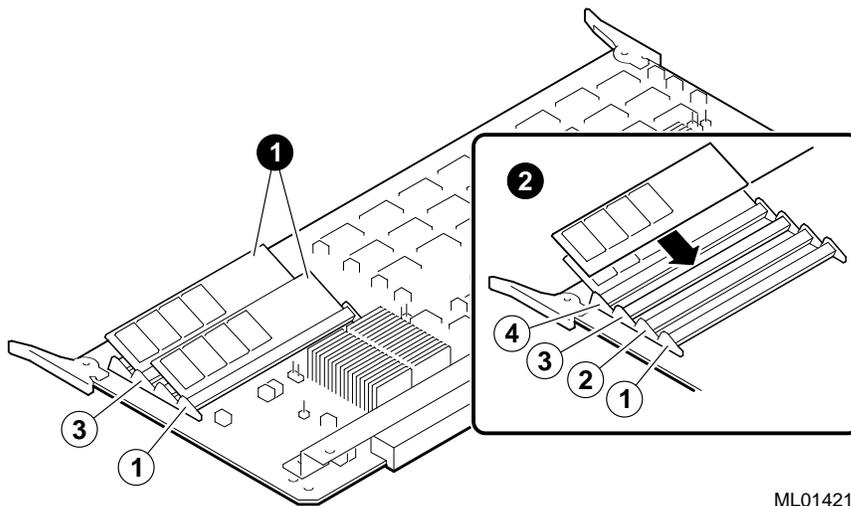
### Caution

---

An antistatic wriststrap *must* be worn when handling any board or module to prevent damage to the board or module.

---

5. Remove all of the Image Rendering Modules from the graphics subsystem deskside chassis (see Section 5.11). The entry PowerStorm 1000 graphics subsystem contains two Image Rendering Modules and the full and high resolution PowerStorm 1000 graphics subsystems contains four Image Rendering Modules.
6. Remove the existing 16 MB Texture Memory Modules ❶ from sockets 1 and 3 (❶ and ❸) and reinstall them in sockets 4 and 3 (❷ and ❸) on each Image Rendering Module (see Figure 2-1 ❷).
7. Remove the new 16 MB Texture Memory Modules from their antistatic protective bag.
8. Align a 16 MB Texture Memory Module ❶ with texture memory socket 2 ❷ on the Image Rendering Module (see Figure 2-1).
9. Push firmly on the Texture Memory Module until it is seated in the socket.
10. Repeat steps 8 and 9 to install a 16 MB Texture Memory Module in texture memory socket 1 ❶ on the same Image Rendering Module.
11. Repeat steps 8 through 10 for each Image Rendering Module in the graphics subsystem.
12. Reinstall all of the Image Rendering Modules into the graphics subsystem deskside chassis (see Section 5.11).
13. Reinstall the module hold-down bracket (see Section 5.5).
14. Reinstall the left side panel (see Section 5.4).

**Figure 2-1 Installing Optional Texture Memory Modules**

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## 2.6.2 Installing Optional Image Rendering Modules

The entry PowerStorm 1000 graphics subsystem can be upgraded to a full PowerStorm 1000 graphics subsystem by installing two optional Image Rendering Modules. Image Rendering Modules must be installed in pairs and if two more Image Rendering Modules are installed, a second Video Memory Module must also be installed (see Section 2.6.3). If the graphics subsystem that the Image Rendering Modules are being installed in has 64 MB of texture memory already installed on the existing Image Rendering Modules, the SN-PBXGM-GA texture memory option must be ordered and installed on the two new Image Rendering Modules.

Perform the following procedure to install the two optional Image Rendering Modules:

1. Perform a normal system power down (see Section 5.2).
2. Remove the left side panel (see Section 5.4).
3. Remove the module hold-down bracket (see Section 5.5).
4. Put on an antistatic wriststrap.

---

### Caution

---

An antistatic wriststrap *must* be worn when handling any board or module to prevent damage to the board or module.

---

## Installation

5. Remove the 1st Image Rendering Module from the antistatic protective bag.
6. Align the 1st Image Rendering Module with slot 5 and slide it into the deskside chassis.
7. Push firmly on the Image Rendering Module until it is seated in the connector and the locking levers are locked.
8. Remove the 2nd Image Rendering Module from the antistatic protective bag.
9. Align the 2nd Image Rendering Module with slot 6 and slide it into the chassis.
10. Push firmly on the Image Rendering Module until it is seated in the connector and the locking levers are locked.
11. Reinstall the module hold-down bracket (see Section 5.5).
12. Reinstall the left side panel (see Section 5.4).

### 2.6.3 Installing Optional Video Memory Module

In the PowerStorm 1000 graphics subsystems, a Video Memory Module is required for each pair of Image Rendering Modules. If two optional Image Rendering Modules are installed in the subsystem, an optional Video Memory Module must also be installed.

Perform the following procedure to install the optional Video Memory Module:

1. Perform a normal system power down (see Section 5.2).
2. Remove the left side panel (see Section 5.4).
3. Remove the module hold-down bracket (see Section 5.5).
4. Put on an antistatic wriststrap.

---

#### Caution

---

An antistatic wriststrap *must* be worn when handling any board or module to prevent damage to the board or module.

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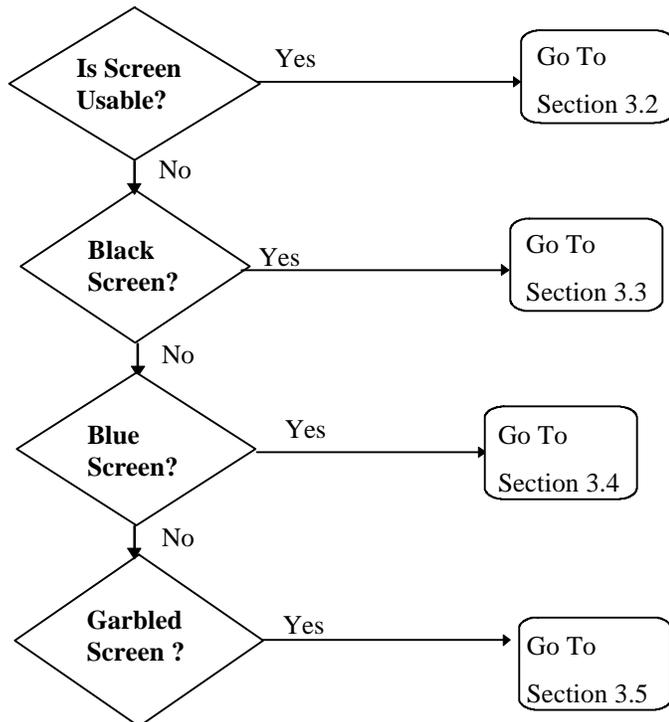
5. Remove the Video Memory Module from the antistatic protective bag.
6. Align the Video Memory Module with slot 8 and slide it into the deskside chassis.
7. Push firmly on the Video Memory Module until it is seated in the connector and the locking levers are locked.
8. Reinstall the module hold-down bracket (see Section 5.5).
9. Reinstall the left side panel (see Section 5.4).

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# Troubleshooting

## 3.1 Troubleshooting Windows NT

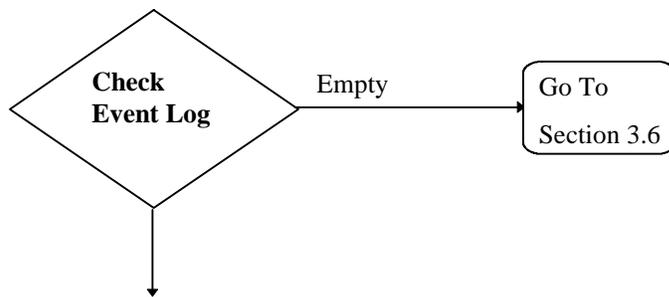
In the event of difficulty with the PowerStorm 1000 graphics subsystem, use the following flowchart and sections to find and correct the problem.



## Troubleshooting

### 3.2 Screen is Usable

If the screen is usable use the following flowchart:



#### Check The Event Log:

1. Using the mouse, enter the Event Viewer through the Start, Programs, Administrative Tools, and Event Viewer Menus.
2. Look for events generated by “rw”.
3. If there are any events listed, they may indicate configuration problems that would prevent the PowerStorm 1000 device drivers from loading. Some events to look for include:
  - Hbus cable not detected
  - Graphics Interface Module not detected
  - Vertex Module not detected
  - Invalid Image Rendering Module configuration detected
  - No supported Standard or High Resolution Module detected

Refer to Appendix D for a complete listing of event log messages and their causes.

If any of these messages appear in the event log, the PowerStorm device hardware is either misconfigured or malfunctioning and customer service should be notified.

### 3.3 Black Screen

If the screen is black, check the power and verify the AlphaStation as described below.

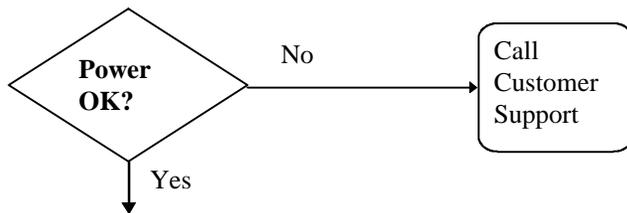
**Check Power:**

Verify that power is applied to the PowerStorm 1000 subsystem, the AlphaStation, and the monitor and that they are “ON” and that no fuses or circuit breakers are open.

On the PowerStorm 1000 subsystem, depress the power ON/OFF switch on the front panel of the deskside chassis. Verify that the power LED is illuminated.

Remove the left side panel and verify that all power control harness are plugged in to their proper location. Refer to Chapter 5 if a problem is suspected.

With the left side panel off, use a pen to depress the interlock switch. Verify that the motherboard power LEDs are lit. ( These are located under the 1st Image Rendering Module on the right side of the motherboard.) There are LEDs for +5, +3.3, and +12 volts. Also verify that the system fan is operating.



**Verify AlphaStation:**

On the entry and full PowerStorm 1000, connect the VGA cable from the AlphaStation directly to the monitor. Disconnect the Hbus cable from the AlphaStation.

On the high resolution PowerStorm 1000, disconnect the Hbus cable from the AlphaStation.

Re-boot the AlphaStation and check for normal operation.

If it does not re-boot properly, remove the Workstation Interface Board from the AlphaStation and try again. If it re-boots, then call customer support to report a defective Workstation Interface Board. Otherwise, go to the AlphaStation troubleshooting procedure.

## Troubleshooting

### 3.4 Blue Screen

If the screen is blue, re-boot the AlphaStation system. If the blue screen persists, verify the AlphaStation as described below.

**Verify AlphaStation:**

On the entry and full PowerStorm 1000, connect the VGA cable from the AlphaStation directly to the monitor. Disconnect the Hbus cable from the AlphaStation.

On the high resolution PowerStorm 1000, disconnect the Hbus cable from the AlphaStation.

Re-boot the AlphaStation and check for normal operation.

If it does not re-boot properly, remove the Workstation Interface Board from the AlphaStation and try again. If it re-boots, then call customer support to report a defective Workstation Interface Board. Otherwise, go to the host AlphaStation troubleshooting procedure.

### 3.5 Garbled Screen

If the screen is garbled, re-boot the AlphaStation system. If the garbled screen persists, verify the AlphaStation as described below.

**Verify AlphaStation:**

On the entry and full PowerStorm 1000, connect the VGA cable from the AlphaStation directly to the monitor. Disconnect the Hbus cable from the AlphaStation.

On the high resolution PowerStorm 1000, disconnect the Hbus cable from the AlphaStation.

Re-boot the AlphaStation and check for normal operation.

If it does not re-boot properly, remove the Workstation Interface Board from the AlphaStation and try again. If it re-boots, then call customer support to report a defective Workstation Interface Board. Otherwise, go to the AlphaStation troubleshooting procedure.

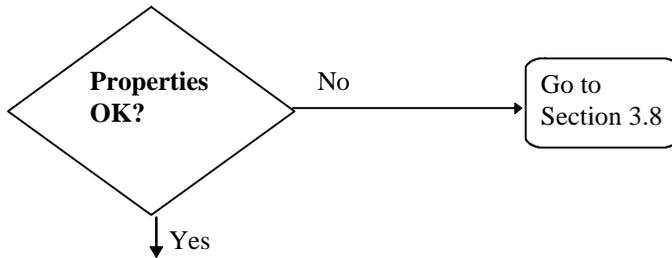
### 3.6 Verify Display Properties

Verify the display properties and that the device drivers are registered as described below.

Verify that the PowerStorm 1000 subsystem has started.

Enter the Display Applet by right clicking on the Desktop and then going through the Properties, Settings, and Display Type Menus.

- Adapter Type should be: Entry, Full, or High Resolution
- Manufacturer should be: DIGITAL
- Current Files should be: rw.sys,rw.dll

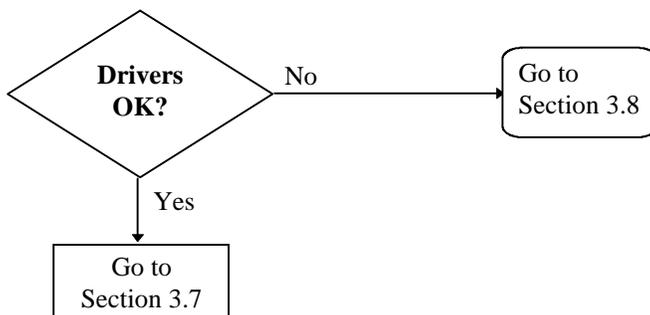


#### Verify that the PowerStorm 1000 device drivers are registered:

Enter the Devices Applet by going through the Start, Settings, Control Panel, and Devices Menus.

Once in the Devices menu, scroll down until you find “rw” – this is the PowerStorm 1000 miniport device driver.

- Status should indicate “:Started”
- Startup should indicate “System”



## Troubleshooting

### **3.7 Run Diagnostics**

Run the short version diagnostics. If these pass, then run the long version diagnostics.

Refer to Section 3.9 for information on running the diagnostics and corrective actions.

### **3.8 Re-Install Software**

Re-install the software following the instructions ????? elsewhere in this manual?????.

Ensure that the installer has the correct privileges and that there is adequate disk space.

### **3.9 Diagnostics**

### **3.10 Troubleshooting DIGITAL UNIX**

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## Upgrading the Subsystem

### 4.1 Introduction

There are two upgrade options available for the PowerStorm 1000 graphics subsystems. An entry PowerStorm 1000 graphics subsystem can be upgraded to a full PowerStorm 1000 and a full PowerStorm 1000 graphics subsystem can be upgraded to a high resolution PowerStorm 1000.

Table 4-1 lists the upgrade options available for the PowerStorm 1000 graphics subsystems along with a description.

**Table 4-1 Upgrade Options**

Option	Description
SN-PBXGM-UA	For upgrading an entry PowerStorm 1000 to a full PowerStorm 1000
SN-PBXGM-UB	For upgrading a full PowerStorm 1000 to a high resolution PowerStorm 1000

An entry PowerStorm 1000 graphics subsystem can also be upgraded to a high resolution PowerStorm 1000 by ordering and installing both of the options listed in Table 4-1.

---

#### WARNING

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**Before servicing the PowerStorm 1000 graphics subsystem, ensure that the power On/Off switch on the front of the deskside chassis is in the OFF position and disconnect the deskside chassis power cord from the ac input receptacle.**

---

## Upgrading the Subsystem

---

### **ACHTUNG**

---

**Stellen Sie sicher, daß vor der Wartung des Graphiksubsystems der PowerStorm 1000-Produktreihe der Ein/Aus-Schalter an der Vorderseite des Tischgerätes ausgeschaltet ist und das Netzkabel aus der Netzsteckdose gezogen wurde.**

---

---

### **WARNING**

---

**Only a qualified service person should remove and replace components in the PowerStorm 1000 graphics subsystem. A qualified service person should have the technical training and experience necessary to be aware of the hazards to which they are exposed in performing a task and the measures that should be taken to minimize the danger to themselves or other persons.**

---

---

### **ACHTUNG**

---

**Die Komponenten des Graphiksubsystems der PowerStorm 1000-Produktreihe dürfen nur von erfahrenem und dazu qualifiziertem Wartungspersonal entfernt und ersetzt werden. Qualifiziertes Personal sollte entsprechend technisch geschult sein und über die nötige Erfahrung verfügen, um die möglichen Gefahren zu kennen, denen sie bei der Ausführung der notwendigen Wartungsarbeiten ausgesetzt sein könnten, und um die entsprechenden Schritte zur Minimierung dieser Gefahren für das Wartungspersonal und für andere Personen unternehmen zu können.**

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## 4.2 Upgrading Entry PowerStorm 1000 to Full PowerStorm 1000

The entry PowerStorm 1000 graphics subsystem is upgraded to a full PowerStorm 1000 by installing the SN-PBXGM-UA upgrade option. This option consists of two Image Rendering Modules, a Video Memory Module, and four 16 MB Texture Memory Modules.

---

### Note

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If the entry PowerStorm 1000 graphics subsystem that is being upgraded has 64 MB of texture memory installed on each of the existing Image Rendering Modules, the SN-PBXGM-GA texture memory option must be installed on the two Image Rendering Modules included with this upgrade before they are installed in the desktside chassis.

---

Perform the following procedure to install the SN-PBXGM-UA upgrade option:

1. Perform a normal system power down (see Section 5.2).
2. Remove the left side panel (see Section 5.4).
3. Remove the module hold-down bracket (see Section 5.5).
4. Put on an antistatic wriststrap.

---

### Caution

---

An antistatic wriststrap *must* be worn when handling any board or module to prevent damage to the board or module.

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5. Remove the 1st Image Rendering Module from the antistatic protective bag.
6. Align the 1st Image Rendering Module with slot 5 and slide it into the chassis.
7. Push firmly on the Image Rendering Module until it is seated in the connector and the locking levers are locked.
8. Remove the 2nd Image Rendering Module from the antistatic protective bag.
9. Align the 2nd Image Rendering Module with slot 6 and slide it into the desktside chassis.
10. Push firmly on the Image Rendering Module until it is seated in the connector and the locking levers are locked.
11. Remove the Video Memory Module from the antistatic protective bag.

## Upgrading the Subsystem

12. Align the Video Memory Module with slot 8 and slide it into the deskside chassis.
13. Push firmly on the Video Memory Module until it is seated in the connector and the locking levers are locked.
14. Reinstall the module hold-down bracket (see Section 5.5).
15. Reinstall the left side panel (see Section 5.4).

### 4.3 Upgrading Full PowerStorm 1000 to High Resolution PowerStorm 1000

The full PowerStorm 1000 graphics subsystem is upgraded to a high resolution PowerStorm 1000 by installing the SN-PBXGM-UB upgrade option. This option consists of a High Resolution Module and a HRM monitor cable.

Perform the following procedure to install the SN-PBXGM-UB upgrade option:

1. Perform a normal system power down (see Section 5.2).
2. Disconnect the VGA cable and the monitor cable from the Standard Resolution Module.
3. Remove the left side panel (see Section 5.4).
4. Remove the module hold-down bracket (see Section 5.5).
5. Put on an antistatic wriststrap.

---

#### Caution

---

An antistatic wriststrap *must* be worn when handling any board or module to prevent damage to the board or module.

---

6. Remove the Standard Resolution Module (see Section 5.13).
7. Remove the High Resolution Module from the antistatic protective bag.
8. Align the High Resolution Module with slot 9 and slide it into the deskside chassis.
9. Push firmly on the High Resolution Module until it is seated in the connector and the locking levers are locked.
10. Tighten the captive thumb-screw on the left end of the High Resolution Module.
11. Reinstall the module hold-down bracket (see Section 5.5).
12. Reinstall the left side panel (see Section 5.4).
13. Connect the HRM monitor cables to the connector on the High Resolution Module.

---

# Removal and Replacement

## 5.1 Introduction

This chapter contains the procedures for removing and replacing the following components in the desktide chassis of the PowerStorm 1000 graphics subsystem:

- Front Bezel
- Left Side Panel
- Module Hold-Down Bracket
- Power Supply Fans
- Power Supply
- Enclosure Fan
- Graphics Interface Module
- Vertex Module
- Image Rendering Module
- Video Memory Module
- Standard or High Resolution Module
- Motherboard
- Power Control Module

## Removal and Replacement

### Tools Required

The following tools are required for servicing the PowerStorm 1000 graphics subsystem deskside chassis:

- Phillips-head and flat-head screwdrivers
- 7/16-inch nutdriver

## 5.2 Normal System Power Down

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### WARNING

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**Before servicing the PowerStorm 1000 graphics subsystem, ensure that the power On/Off switch on the front of the deskside chassis is in the OFF position and disconnect the deskside chassis power cord from the ac input receptacle.**

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### ACHTUNG

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**Stellen Sie sicher, daß vor der Wartung des Graphiksubsystems der PowerStorm 1000-Produktreihe der Ein/Aus-Schalter an der Vorderseite des Tischgerätes ausgeschaltet ist und das Netzkabel aus der Netzsteckdose gezogen wurde.**

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### WARNING

---

**Only a qualified service person should remove and replace components in the PowerStorm 1000 graphics subsystem. A qualified service person should have the technical training and experience necessary to be aware of the hazards to which they are exposed in performing a task and the measures that should be taken to minimize the danger to themselves or other persons.**

---

## Removal and Replacement

---

### **ACHTUNG**

---

**Die Komponenten des Graphiksubsystems der PowerStorm 1000-Produktreihe dürfen nur von erfahrenem und dazu qualifiziertem Wartungspersonal entfernt und ersetzt werden. Qualifiziertes Personal sollte entsprechend technisch geschult sein und über die nötige Erfahrung verfügen, um die möglichen Gefahren zu kennen, denen sie bei der Ausführung der notwendigen Wartungsarbeiten ausgesetzt sein könnten, und um die entsprechenden Schritte zur Minimierung dieser Gefahren für das Wartungspersonal und für andere Personen unternehmen zu können.**

---

Perform the following procedure to power down the AlphaStation system and the PowerStorm 1000 graphics subsystem before performing any removal and replacement procedures:

1. Refer to the AlphaStation system documentation and perform an orderly shutdown of the operating system.
2. Refer to the AlphaStation system documentation and perform an orderly power down of the system.
3. Disconnect the AlphaStation system power cord from the ac input receptacle.
4. Place the On/Off switch on the front of the PowerStorm 1000 graphics subsystem deskside chassis in the OFF position.
5. Disconnect the PowerStorm 1000 graphics subsystem deskside chassis power cord from the ac input receptacle.

## Removal and Replacement

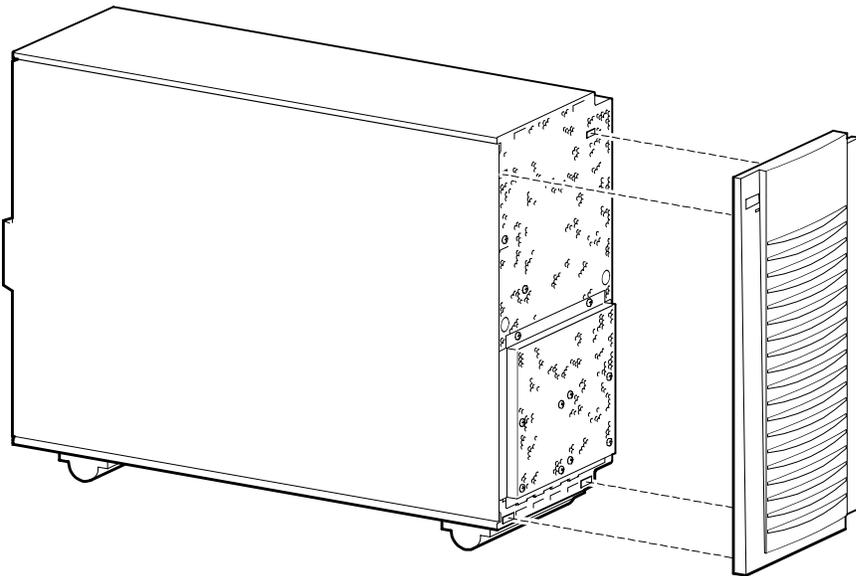
### 5.3 Front Bezel

Perform the following procedure to remove the front bezel from the PowerStorm 1000 graphics subsystem desktop chassis:

1. Grasp the top of the front bezel on each side and pull out until the top of the bezel unsnaps from the catches.
2. Tilt the top of the front bezel out and lift up to remove the front bezel from the chassis (see Figure 5-1).

To replace the front bezel, align the tabs at the bottom of the front bezel with the slots at the bottom front of the chassis, then swing the top of the bezel up and push it onto the front of the chassis until it snaps into place.

**Figure 5-1 Removing the Front Bezel**



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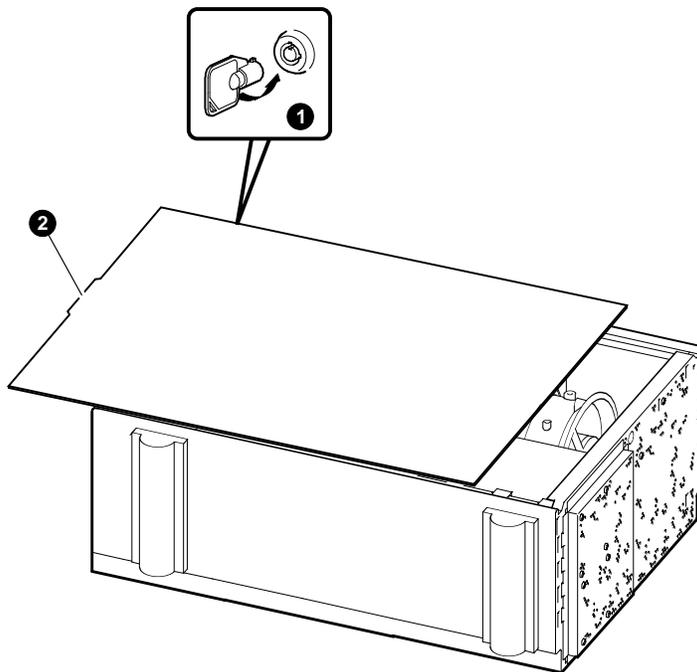
## 5.4 Left Side Panel

Perform the following procedure to remove the left side panel from the PowerStorm 1000 graphics subsystem desktop chassis:

1. Perform a normal system power down (see Section 5.2).
2. Lay the desktop chassis over on its right side (see Figure 5-2).
3. Unlock the left side panel by turning the key ❶, located on the rear of the chassis, counterclockwise (see Figure 5-2).
4. Insert two fingers into the finger grip ❷ on the rear edge of the left side panel.
5. Slide the left side panel toward the rear of the chassis and remove the panel (see Figure 5-2).

To replace the left side panel, reverse steps 1 through 5 of the removal procedure.

**Figure 5-2 Removing the Left Side Panel**



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## Removal and Replacement

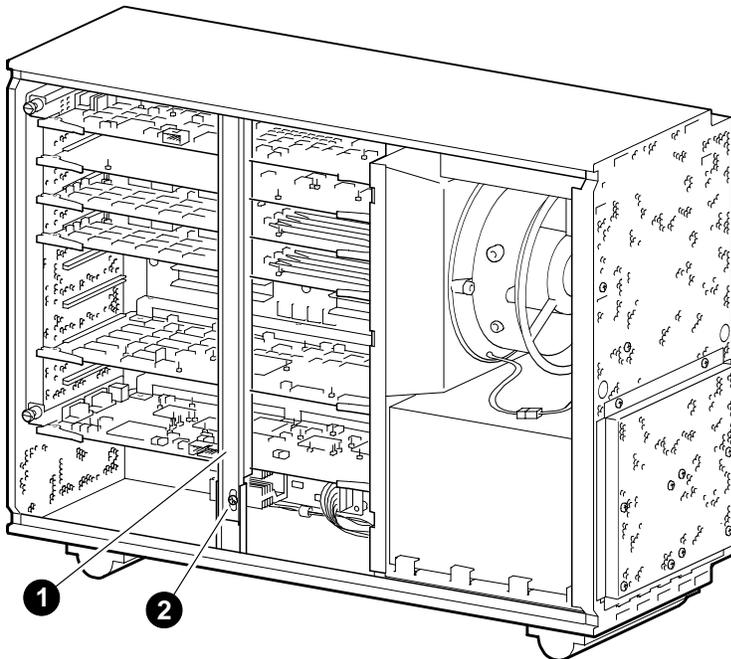
### 5.5 Module Hold-Down Bracket

Perform the following procedure to remove the module hold-down bracket from the PowerStorm 1000 graphics subsystem desktside chassis:

1. Perform a normal system power down (see Section 5.2).
2. Remove the left side panel (see Section 5.4).
3. Grasp the module hold-down bracket ❶ and loosen the screw ❷ that secures the two parts of the module hold-down bracket together (see Figure 5-3).
4. Collapse the module hold-down bracket by sliding the top part of the bracket down until it clears the top of the chassis.
5. Lift the module hold-down bracket out of the chassis.

To replace the module hold-down bracket, reverse steps 1 through 5 of the removal procedure.

**Figure 5-3 Removing the Module Hold-Down Bracket**



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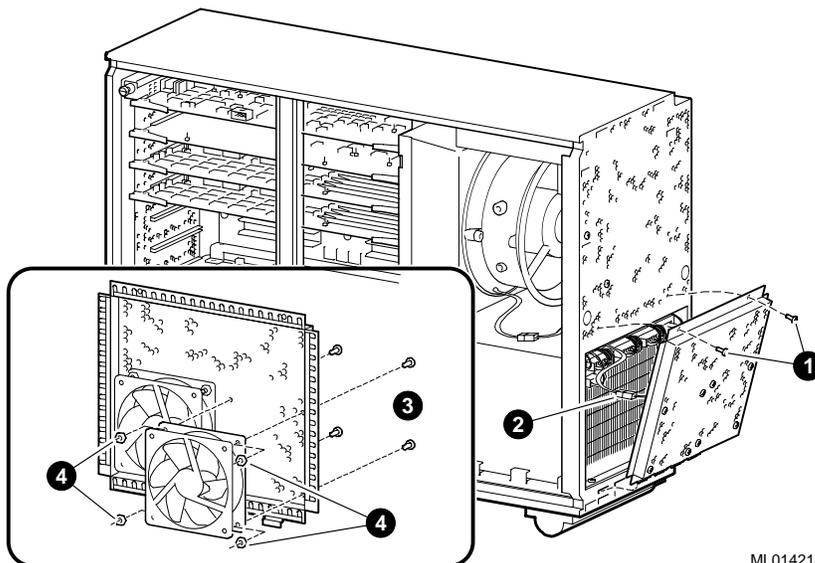
## 5.6 Power Supply Fans

Perform the following procedure to remove the power supply fans from the PowerStorm 1000 graphics subsystem desktside chassis:

1. Perform a normal system power down (see Section 5.2).
2. Remove the front bezel (see Section 5.3).
3. Remove the two screws ❶ that secure the top of the power supply access panel in which the power supply fans are mounted and tilt the top of the access panel away from the chassis (see Figure 5-4).
4. Disconnect the two fan power connectors ❷ (see Figure 5-4).
5. Lift the power supply access panel until the tabs at the bottom of the access panel come out of the slots at the bottom front of the chassis and remove the access panel.
6. Remove the four screws ❸ and nuts ❹ that secure the failing fan to the inside of the power supply access panel (see Figure 5-4).

To replace the power supply fans, reverse steps 1 through 6 of the removal procedure.

**Figure 5-4 Removing the Power Supply Fans**



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## Removal and Replacement

### 5.7 Power Supply

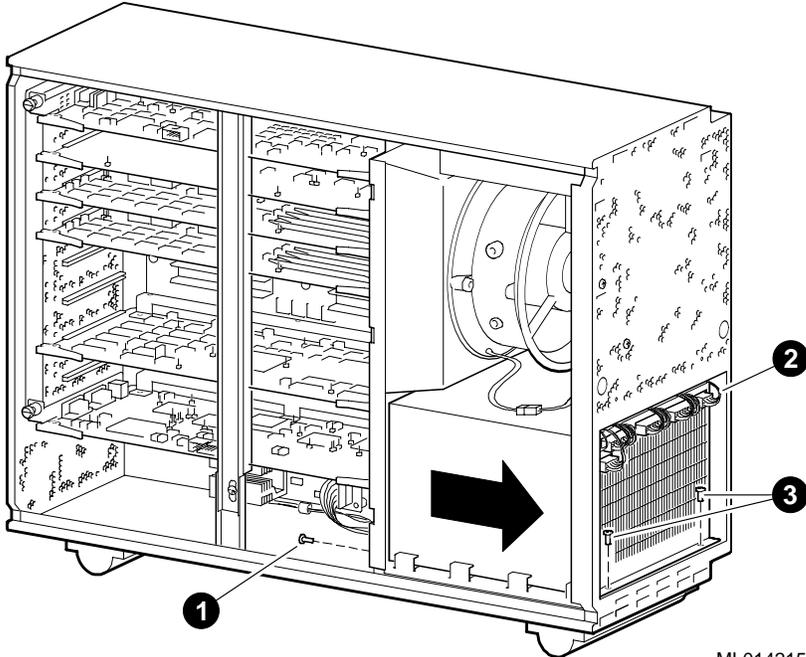
Perform the following procedure to remove the power supply from the PowerStorm 1000 graphics subsystem desktside chassis:

1. Perform a normal system power down (see Section 5.2).
2. Remove the left side panel (see Section 5.4).
3. Remove the front bezel (see Section 5.3).
4. Remove the two screws that secure the top of the power supply access panel and tilt the top of the access panel away from the chassis (see Figure 5-4).
5. Disconnect the two fan power connectors (see Figure 5-4).
6. Lift the power supply access panel until the tabs at the bottom of the access panel come out of the slots at the bottom front of the chassis and remove the access panel.
7. Remove the screw ❶ that secures the rear of the power supply to the center brace of the chassis (see Figure 5-5).
8. Disconnect the five connectors ❷ on the front of the power supply (see Figure 5-5).
9. Remove the two screws ❸ that secure the bottom front edge of the power supply to the chassis (see Figure 5-5).
10. Slide the power supply forward and out of the chassis.

To replace the power supply, reverse steps 1 through 10 of the removal procedure.

Removal and Replacement

Figure 5-5 Removing the Power Supply



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## Removal and Replacement

### 5.8 Enclosure Fan

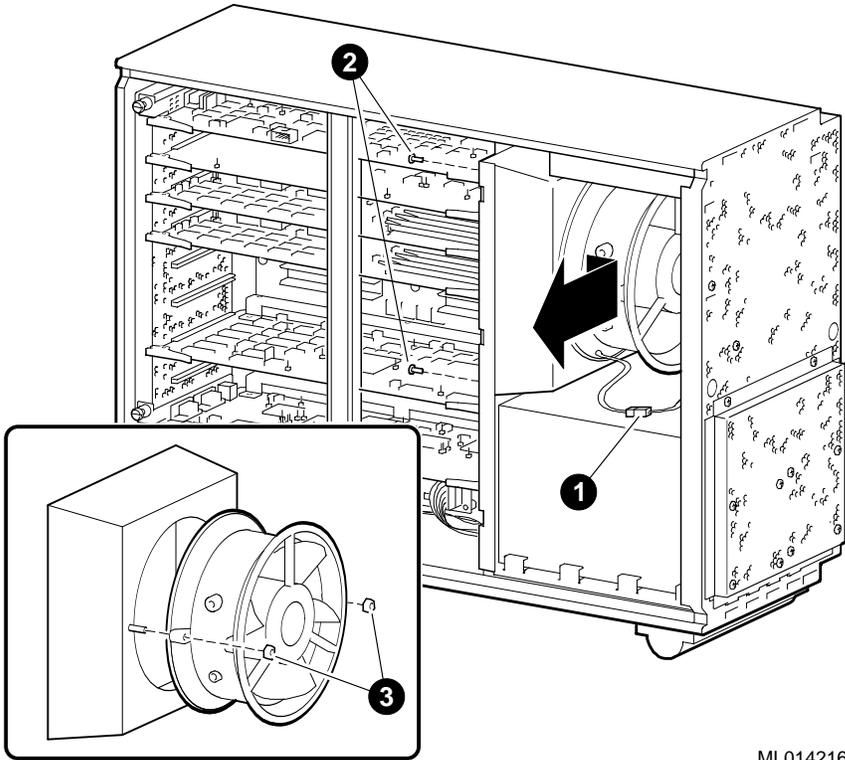
Perform the following procedure to remove the enclosure fan from the PowerStorm 1000 graphics subsystem desktide chassis:

1. Perform a normal system power down (see Section 5.2).
2. Remove the left side panel (see Section 5.4).
3. Disconnect the enclosure fan connector ❶ (see Figure 5-6).
4. Remove the two screws ❷ that secure the air plenum and enclosure fan to the center brace of the chassis (see Figure 5-6).
5. Slide the air plenum and enclosure fan forward and out through the side of the chassis.
6. Remove the two nuts ❸ that secure the enclosure fan to the air plenum (see Figure 5-6).

To replace the enclosure fan, reverse steps 1 through 6 of the removal procedure.

Removal and Replacement

Figure 5-6 Removing the Enclosure Fan



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## Removal and Replacement

### 5.9 Graphics Interface Module

Perform the following procedure to remove the Graphics Interface Module from the PowerStorm 1000 graphics subsystem deskside chassis:

1. Perform a normal system power down (see Section 5.2).
2. Disconnect the Hbus cable from the connector on the rear of the Graphics Interface Module.
3. Remove the left side panel (see Section 5.4).
4. Remove the module hold-down bracket (see Section 5.5).
5. Put on an antistatic wriststrap.

---

#### Caution

---

An antistatic wriststrap *must* be worn when handling any board or module to prevent damage to the board or module.

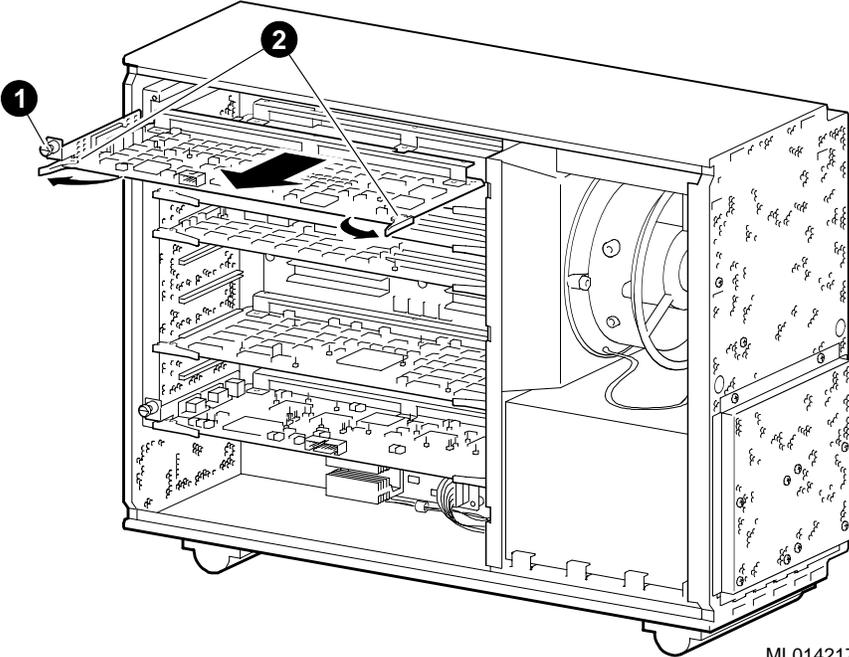
---

6. Loosen the captive thumb-screw ❶ on the left end of the Graphics Interface Module (see Figure 5-7).
7. Pull out on the levers ❷ at each end of the Graphics Interface Module (see Figure 5-7).
8. Slide the Graphics Interface Module out of the card cage.

To replace the Graphics Interface Module in slot 1 (top slot), reverse steps 1 through 8 of the removal procedure.

Removal and Replacement

Figure 5-7 Removing the Graphics Interface Module



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## Removal and Replacement

### 5.10 Vertex Module

Perform the following procedure to remove the Vertex Module from the PowerStorm 1000 graphics subsystem desktside chassis:

1. Perform a normal system power down (see Section 5.2).
2. Remove the left side panel (see Section 5.4).
3. Remove the module hold-down bracket (see Section 5.5).
4. Put on an antistatic wriststrap.

---

#### Caution

---

An antistatic wriststrap *must* be worn when handling any board or module to prevent damage to the board or module.

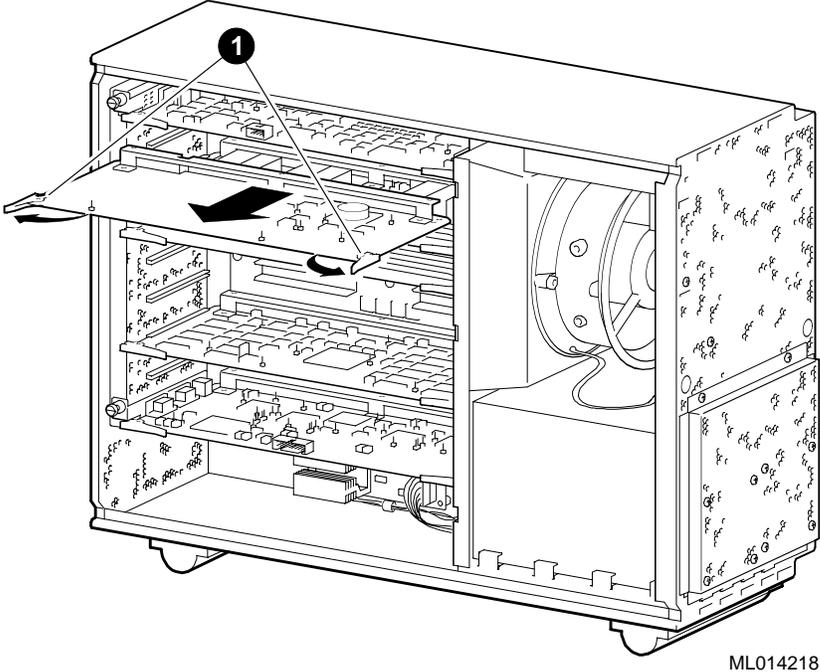
---

5. Pull out on the levers ❶ at each end of the Vertex Module (see Figure 5-8).
6. Slide the Vertex Module out of the card cage.

To replace the Vertex Module in slot 2 (2nd slot from the top), reverse steps 1 through 6 of the removal procedure.

Removal and Replacement

Figure 5-8 Removing the Vertex Module



## Removal and Replacement

### 5.11 Image Rendering Module

The entry PowerStorm 1000 graphics subsystem deskside chassis contains two Image Rendering Modules; one in slot 3 and one in slot 4. The full and high resolution PowerStorm 1000 graphics subsystem deskside chassis contains four Image Rendering Modules; one in slot 3, one in slot 4, one in slot 5, and one in slot 6.

Perform the following procedure to remove an Image Rendering Module from the PowerStorm 1000 graphics subsystem deskside chassis:

1. Perform a normal system power down (see Section 5.2).
2. Remove the left side panel (see Section 5.4).
3. Remove the module hold-down bracket (see Section 5.5).
4. Put on an antistatic wriststrap.

---

#### Caution

---

An antistatic wriststrap *must* be worn when handling any board or module to prevent damage to the board or module.

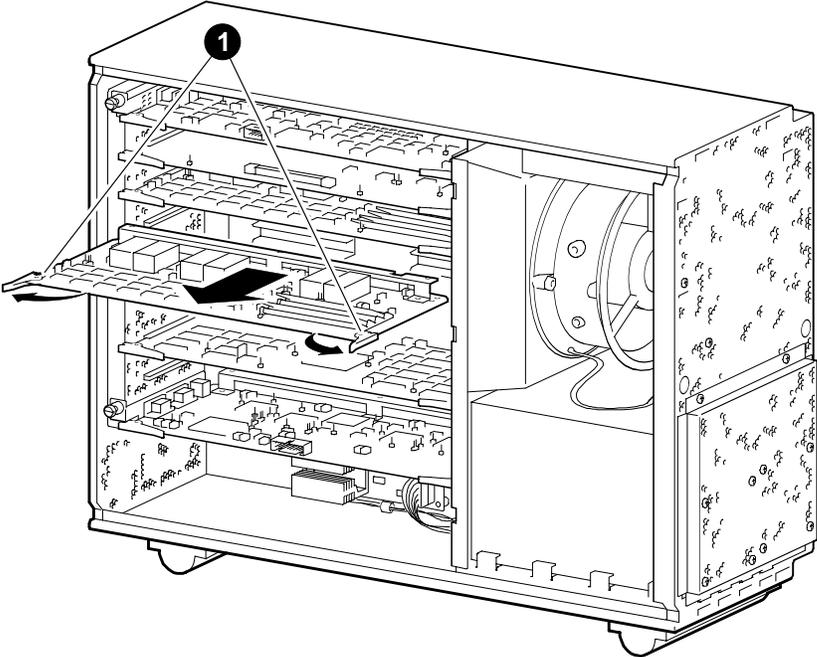
---

5. Pull out on the levers ❶ at each end of the Image Rendering Module being removed (see Figure 5-9).
6. Slide the Image Rendering Module out of the card cage.

To replace the Image Rendering Module, reverse steps 1 through 6 of the removal procedure.

Removal and Replacement

Figure 5-9 Removing an Image Rendering Module



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## Removal and Replacement

### 5.12 Video Memory Module

The entry PowerStorm 1000 graphics subsystem deskside chassis contains one Video Memory Module in slot 7. The full and high resolution PowerStorm 1000 graphics subsystem deskside chassis contains two Video Memory Modules; one in slot 7, and one in slot 8.

Perform the following procedure to remove a Video Memory Module from the PowerStorm 1000 graphics subsystem deskside chassis:

1. Perform a normal system power down (see Section 5.2).
2. Remove the left side panel (see Section 5.4).
3. Remove the module hold-down bracket (see Section 5.5).
4. Put on an antistatic wriststrap.

---

#### Caution

---

An antistatic wriststrap *must* be worn when handling any board or module to prevent damage to the board or module.

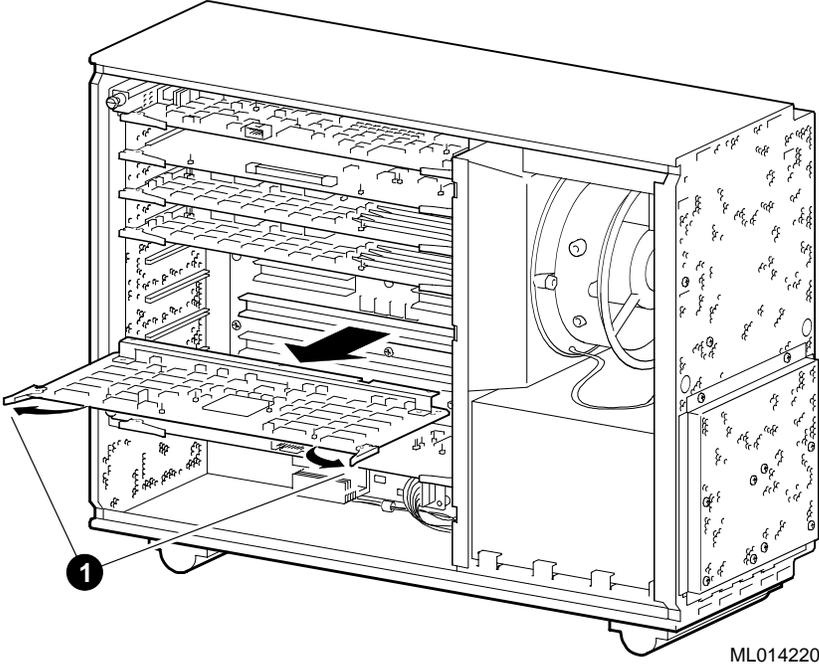
---

5. Pull out on the levers ❶ at each end of the Video Memory Module being removed (see Figure 5-10).
6. Slide the Video Memory Module out of the card cage.

To replace the Video Memory Module, reverse steps 1 through 6 of the removal procedure.

Removal and Replacement

Figure 5-10 Removing a Video Memory Module



## Removal and Replacement

### 5.13 Standard or High Resolution Module

Perform the following procedure to remove the Standard or High Resolution Module from the PowerStorm 1000 graphics subsystem deskside chassis:

1. Perform a normal system power down (see Section 5.2).
2. For the entry or full PowerStorm 1000 graphics subsystem, disconnect the VGA cable and the monitor cable from the input and output connectors on the rear of the Standard Resolution Module.

For the high resolution PowerStorm 1000 graphics subsystem, disconnect the high resolution monitor cable from the connector on the rear of the High Resolution Module.

3. Remove the left side panel (see Section 5.4).
4. Remove the module hold-down bracket (see Section 5.5).
5. Put on an antistatic wriststrap.

---

#### Caution

---

An antistatic wriststrap *must* be worn when handling any board or module to prevent damage to the board or module.

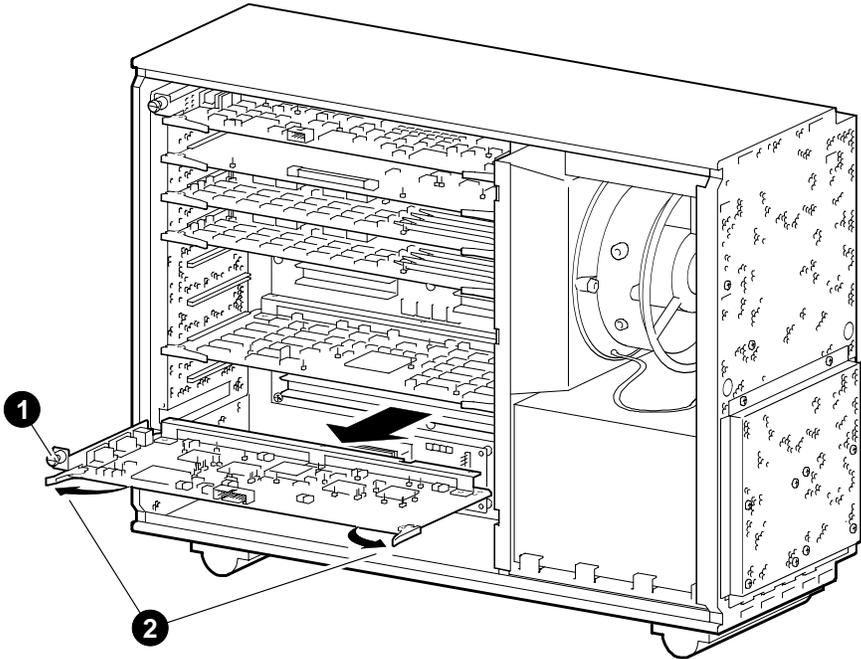
---

6. Loosen the captive thumb-screw ❶ on the left end of the Standard or High Resolution Module (see Figure 5-11).
7. Pull out on the levers ❷ at each end of the Standard or High Resolution Module (see Figure 5-11).
8. Slide the Standard or High Resolution Module out of the card cage.

To replace the Standard or High Resolution Module in slot 9 (bottom slot), reverse steps 1 through 8 of the removal procedure.

Removal and Replacement

Figure 5-11 Removing the Standard or High Resolution Module



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## Removal and Replacement

### 5.14 Motherboard

Perform the following procedure to remove the motherboard from the PowerStorm 1000 graphics subsystem desktide chassis:

1. Perform a normal system power down (see Section 5.2).
2. For the entry or full PowerStorm 1000 graphics subsystem, disconnect the VGA cable and the monitor cable from the input and output connectors on the rear of the Standard Resolution Module.

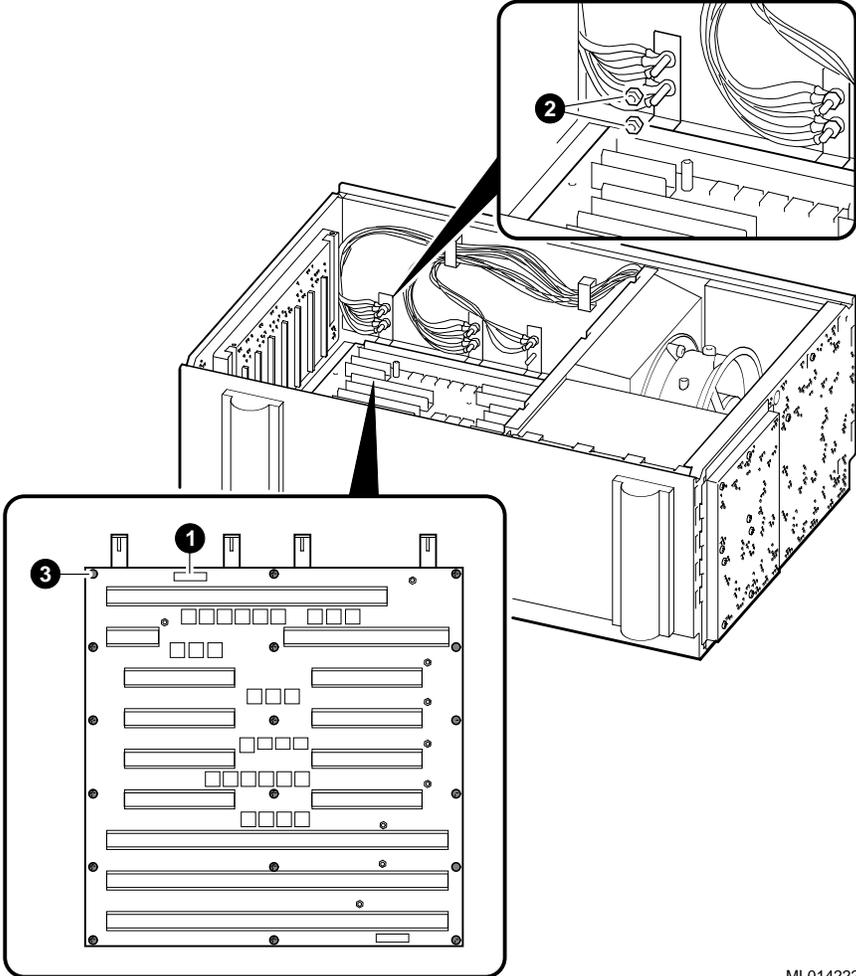
For the high resolution PowerStorm 1000 graphics subsystem, disconnect the high resolution monitor cable from the connector on the rear of the High Resolution Module.

3. Disconnect the Hbus cable from the connector on the rear of the Graphics Interface Module.
4. Remove the left side panel (see Section 5.4).
5. Remove the module hold-down bracket (see Section 5.5).
6. Remove the Graphics Interface Module (see Section 5.9).
7. Remove the Vertex Module (see Section 5.10).
8. Remove the Image Rendering Modules (see Section 5.11).
9. Remove the Video Memory Module(s) (see Section 5.12).
10. Remove the Standard or High Resolution Module (see Section 5.13).
11. Disconnect the power supply control cable (J3) connector ❶ from the top of the motherboard (see Figure 5-12).
12. Using a 7/16-inch nutdriver, remove the two kepnuts ❷ that secure the power cable harnesses to the left bus bar at the top of the motherboard (see Figure 5-12).
13. Remove the power cable harnesses from the two studs on the bus bar.
14. Repeat steps 12 and 13 for the remaining three bus bars at the top of the motherboard.
15. Remove the 18 screws ❸ that secure the motherboard to the chassis and remove the motherboard (see Figure 5-12).

To replace the motherboard, reverse steps 1 through 15 of the removal procedure.

Removal and Replacement

Figure 5-12 Removing the Motherboard



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- ❶ Power supply control cable connector
- ❷ Kegnuts
- ❸ 18 screws

## Removal and Replacement

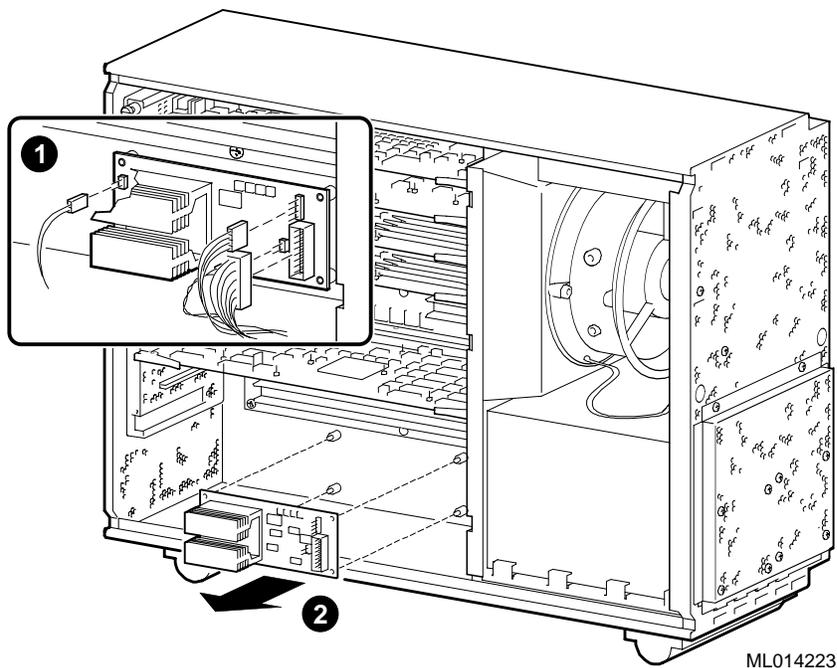
### 5.15 Power Control Module

Perform the following procedure to remove the Power Control Module from the PowerStorm 1000 graphics subsystem desktside chassis:

1. Perform a normal system power down (see Section 5.2).
2. Remove the left side panel (see Section 5.4).
3. Remove the module hold-down bracket (see Section 5.5).
4. Disconnect the four connectors ❶ from the Power Control Module (see Figure 5-13).
5. Carefully pull the Power Control Module off of the four standoff retaining posts ❷ that secure the Power Control Module to the chassis and remove the Power Control Module (see Figure 5-13).

To replace the Power Control Module, reverse steps 1 through 5 of the removal procedure.

**Figure 5-13 Removing the Power Control Module**



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## Technical Description

### 6.1 Introduction

This chapter provides a technical description of the DIGITAL PowerStorm 1000 graphics subsystem and the individual boards and modules that make up the subsystem.

### 6.2 Subsystem Description

The DIGITAL PowerStorm 1000 graphics subsystem motherboard system bus is called the DBus. The DBus supports 64 bits of data and 28 bits of address clocked at 66.67 MHz. A clock skew of +/- 1 ns is maintained throughout the system. Appropriate clock distribution along with PLL circuitry is critical to the design of the graphics subsystem. The DBus utilizes bus repeaters spaced at approximately six inch intervals to minimize the effects of trace length and loading.

The host connection is made through the Workstation Interface Board in the AlphaStation system via a 32-bit interconnect cable (Hbus) to the Graphics Interface Module in the graphics subsystem desktide chassis. The Graphics Interface Module uses discrete off-the-shelf components and interfaces to the graphics subsystem motherboard. The Hbus supports up to 130 million bytes per second throughput between the host and DBus.

The DBus interfaces directly to the Graphics Interface Module and the Video Memory Modules via the Raster Controller (RC) ASICs, and the Standard or High Resolution Module. The Graphics Interface Module is capable of Hbus slaveship as well as DBus slave/mastership. As a master, it has the capability to send pixels to/from the Video Memory Modules via the RC ASICs or interface to various peripherals and memory pools within the system.

## Technical Description

The Vertex Data Manager (VDM) ASIC on the Vertex Module provides the interface between the Graphics Interface Module FIFOs and the Image Rendering Modules. This VDM ASIC has responsibility for assembling and formatting information for the rendering pipeline on the Image Rendering Modules. The VDM ASIC also performs Vertex Bus control.

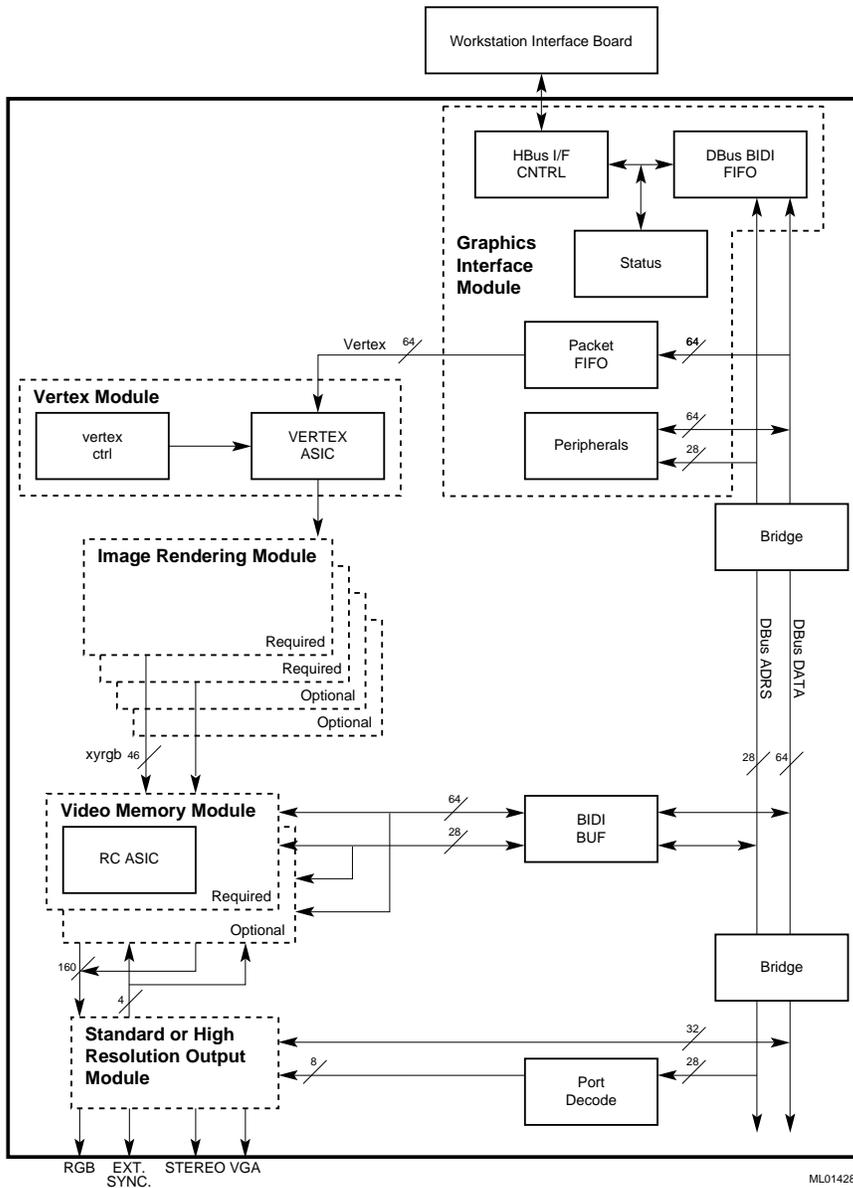
The Image Rendering Module contains the Super Slicer Dicer (SSLD) ASIC and two Sub-pixel Area Manager (SAM) ASICs to provide rasterization for anti-aliasing points, lines, and triangles whose data is stored in Pix Link Memory (PLM) buffers. The final red/green/blue (RGB) data is transmitted to the RC ASICs.

The RC ASICs are mounted on the Video Memory Modules, one RC per Video Memory Module. Their main function is to arbitrate incoming pixels generated by the Image Rendering Modules and/or arriving from the DBus as they funnel into the frame buffer. The RC ASICs will also configure the frame buffer resolutions, generate the appropriate video RAM timing, and support pixel operations such as BLT, window erase, and logical rasterops.

A block diagram of the DIGITAL PowerStorm 1000 graphics subsystem is shown in Figure 6-1.

# Technical Description

**Figure 6-1 PowerStorm 1000 Graphics Subsystem Block Diagram**



## Technical Description

### 6.3 Module Descriptions

The following sections contain technical descriptions of the boards and modules that make up the DIGITAL PowerStorm 1000 graphics subsystem.

#### 6.3.1 Workstation Interface Board (WIB\_P1)

The Workstation Interface Board is implemented in the form factor of the host computer bus. It provides a high-speed memory-mapped connection to the graphics subsystem via the Hbus. It is through the Workstation Interface Board that the host computer may access any device in the system that interfaces to the Dbus.

The Workstation Interface Board is a single slot PCI bus board that provides the interface between the AlphaStation system and the PowerStorm 1000 graphics subsystem.

The Workstation Interface Board interfaces to a common "HBus" cable between the AlphaStation system and the graphics subsystem. In addition, the Workstation Interface Board provides DMA capabilities from the host memory to the graphics subsystem. This is a critical feature for off-loading the host from transfer operations due to the high bandwidth requirements needed to maintain the rendering performance goals of the graphics subsystem.

The Workstation Interface Board does not provide console support. Instead, the AlphaStation system will have VGA support provided by a separate VGA Module. A VGA cable connects the VGA Module in the AlphaStation system to the graphics subsystem's (entry and full PowerStorm 1000) Standard Resolution Module. An "enable/disable" switch is provided to switch between the VGA video source and the graphics subsystem's video source. The Workstation Interface Board contains a PROM for future support.

#### 6.3.2 Motherboard/Backplane (RMB)

The motherboard provides the interconnect and power distribution between the various modules that make up the PowerStorm 1000 graphics subsystem. In addition to the numerous connectors that are required to implement this interconnect, the motherboard contains active components to distribute clocks, provide Dbus bridges that are required to maintain acceptable skew within the system, Dbus control logic, and a serial I.D. PROM for identification.

The motherboard contains nine slots to support the following modules:

- One Graphics Interface Module
- One Vertex Module
- Up to four Image Rendering Modules
- One Video Memory Module per Image Rendering Module pair
- One Standard Resolution Module or High Resolution Module

### 6.3.3 Graphics Interface Module (GIM)

The Graphics Interface Module contains the circuitry to interface between the workstation cable and the Dbus, and thereby the rest of the PowerStorm 1000 graphics subsystem. The Graphics Interface Module is capable of operating as a master on the Dbus. In addition to its host interface function, the Graphics Interface Module contains various ancillary peripherals and control logic necessary for the rest of the system. The design allows access from the HBus at a peak bandwidth of 130 MB/second.

Creating the Graphics Interface Module as a separate module facilitates field upgrades to new interfacing technologies (such as a Fiber channel) and removes many active components from the motherboard for enhanced manufacturability and maintainability.

The Graphics Interface Module provides the following "Standard I/O" devices for the PowerStorm 1000 graphics subsystem:

- Interface to the Workstation Interface Board via the Hbus cable
- Flash ROM
- Timer
- Status Registers
- Control Registers
- LEDs
- Dip Switch
- Interrupt Controller
- Serial Interface for in circuit programmable devices
- PROM support circuitry
- JTAG Controller
- LED Display Driver

All I/O devices are accessible to the workstation processor as well as any processor in the PowerStorm 1000 graphics subsystem.

## Technical Description

### 6.3.4 Vertex Module (VXM)

The Vertex Module contains the Vertex Data Manager (VDM) ASIC, which is the first state of the rendering pipeline. It has been implemented as its own module to remove a high pin count BGA package from the motherboard; thereby enhancing manufacturability and maintainability while providing the capability to replace the entire rendering pipeline with a future design if required.

The VDM ASIC receives the stream of Image Rendering Module commands from the AlphaStation system, assembles the data describing the vertices of points, lines, triangles, and rectangles, computes the additional information needed for their rasterization, and passes the results to the Image Rendering Module. Commands destined for ASICs further along the pipeline also pass through the VDM in sequence and with other work, thus reducing the need for time consuming flush operations.

In addition to its rendering functions, the VDM provides Vertex Bus control.

### 6.3.5 Image Rendering Module (IRM)

The Image Rendering Module provides rasterization for anti-aliased points, lines and polygons, depth cueing, multilevel transparency, stenciling, texture mapping, hidden surface removal, Z ordering of pixels, window clip testing for occluded windows, and multiple API support. The PowerStorm 1000 graphics subsystem supports configurations of either two or four Image Rendering Modules.

The module control section provides setup and configuration services while the module functionality section provides image generation services. The module is implemented using three ASICs (one Super Slicer Dicer (SSLD) ASIC and two Sub-pixel Area Manager (SAM) ASICs).

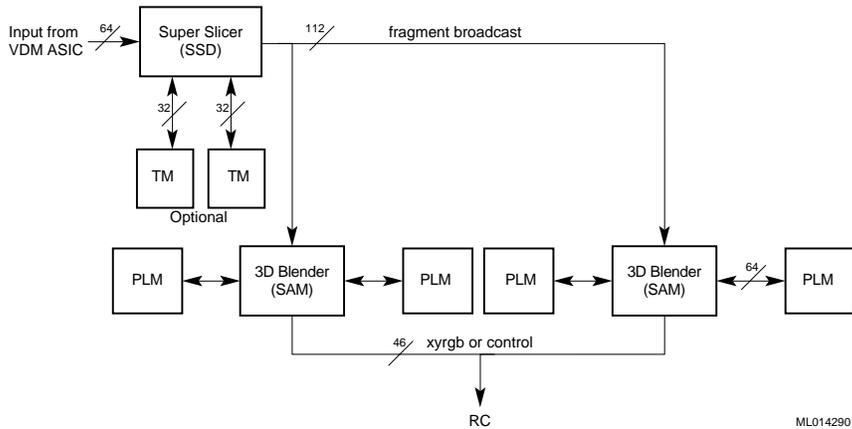
- The SSLD ASIC computes pixel addresses, calculates RGB values and coverage information for the resulting pixels, applies texture map and depth cue algorithms as appropriate, and finally passes the pixel fragments into one of two SAM ASICs. The SSLD also performs Alpha Test and Alpha Modulate functions (required by OpenGL).
- The SAM ASICs contain the necessary facilities for building complex images within memory buffers called Pixel Link Memory (PLM) buffers.
- Within each Image Rendering Module, four independent banks of PLM buffers serve interleaved screen pixel locations. They also contain window specific allocation tables to speed garbage collection for pixel links no longer needed after a swap-buffers operation. Each SAM manages two banks of PLM buffers in which it allocates and maintains pixel link lists based on incoming fragments, and computes composite RGB results to pass on to the Video Memory Module section. The SAM ASICs are responsible for Stencil/Z tests and operations and fragment blending.

## Technical Description

Each pixel link contains RGB, alpha, stencil, and Z values plus a pointer to the next link. Links are stored in receding Z order. These lists are the heart of the HiFIVE anti-aliasing system, eliminating the need for presorting primitives and multi-pass algorithms by retaining enough information at multiple Z depths. Figure 6-2 illustrates an Image Rendering Module block diagram.

While the fragment modification calculations for texture mapping are part of the SSLD ASIC, the actual mipmap storage is in separate memory on the Texture Memory Modules. All Image Rendering Modules in a PowerStorm 1000 graphics subsystem must have the same amount of texture memory, either 32 MB or 64 MB.

**Figure 6-2 Image Rendering Module Block Diagram**



## Technical Description

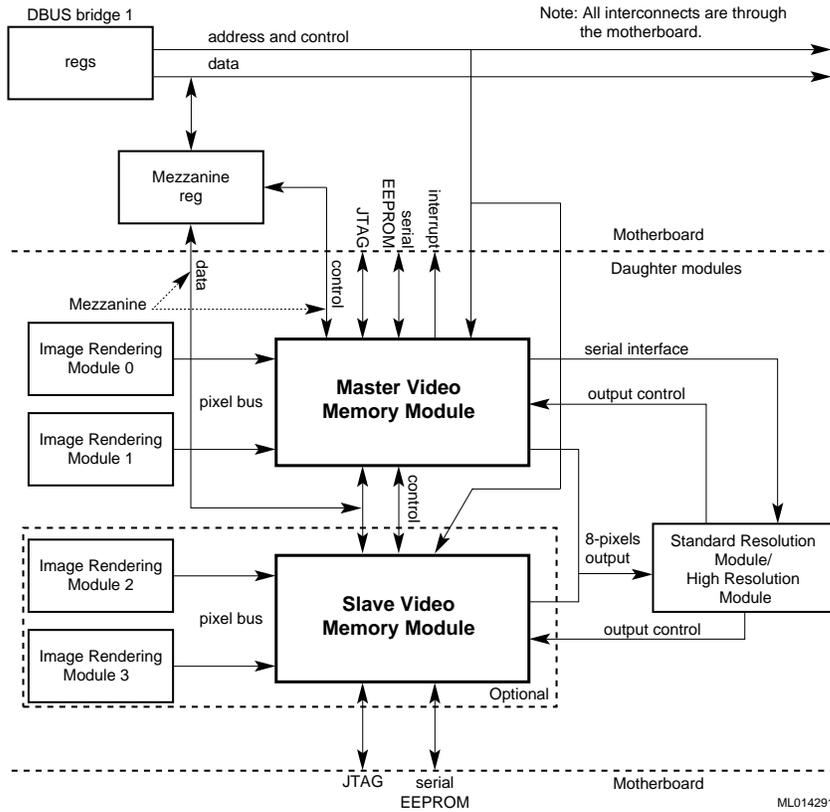
### 6.3.6 Video Memory Module (VMM)

One Video Memory Module is required if two Image Rendering Modules are in the PowerStorm 1000 graphics subsystem, two if there are four Image Rendering Modules. Each Video Memory Module contains a Raster Controller (RC) ASIC and VRAM screen buffer memory for resolutions of up to 2048 x 1024 containing:

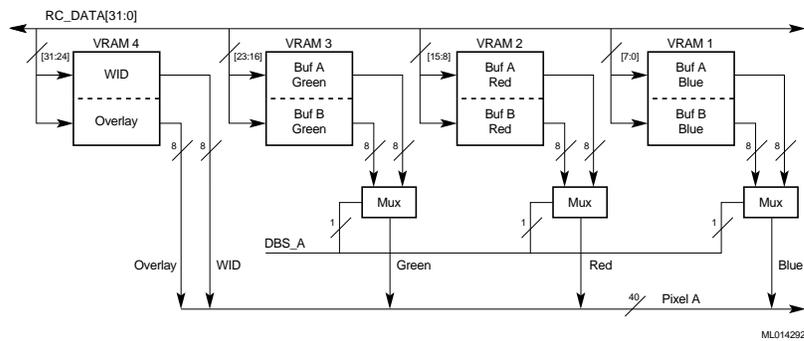
- Eight bits double-buffered red data
- Eight bits double-buffered green data
- Eight bits double-buffered blue data
- Eight bits window identification information
- Eight bits double-buffered overlay information

The RC ASIC manages the random access port of the VRAM, storing pixels assembled by the SAM ASICs in the Image Rendering Module. The serial port is forwarded to the Standard Resolution Module or the High Resolution Module with the Window ID (WID) clocked out several cycles ahead to allow time for the buffer selection information to propagate back from the Window Attribute Mixer (WAM) ASIC. A block diagram of the interface to the Video Memory Module is shown in Figure 6-3. A block diagram of a single pixel is shown in Figure 6-4.

**Figure 6-3 Video Memory Module Interface Diagram**



**Figure 6-4 Pixel Block Diagram**



## Technical Description

### 6.3.6.1 Raster Control (RC) ASIC

One RC ASIC is mounted on each Video Memory Module in the subsystem. The RC ASIC supports a full DBus slave interface for direct access of the frame buffer on the Video Memory Module or for any of the master units on the DBus. The RC also supports up to two Image Rendering Module input interfaces. Each Image Rendering Module interface requires 11 bits of X, 11 bits of Y, and 24 bits of RGB. The RC to video memory interface is a bi-directional 32-bit data, 10-bit address and 19 bits of VRAM control. The main functions of the RC ASIC are video DRAM control, screen resolution mapping, raster operations, and BLT.

All software registers in the RC ASIC are loadable via the DBus interface or the Image Rendering Module interface for pipeline synchronization.

### 6.3.6.2 Frame Buffer

The PowerStorm 1000 graphics subsystem frame buffer is configurable. The frame buffer consists of one or two Video Memory Modules. When configured with the Standard Resolution Module, the frame buffers transfer four pixels out of the frame buffer during each video RAM shift register read cycle. When configured with the High Resolution Module, the frame buffers transfer eight pixels out of the frame buffer during each video RAM shift register read cycle. Table 6-1 identifies the relationship between the number of Video Memory Modules in the frame buffer and the maximum screen resolutions supported.

The Frame Buffer Memory is implemented using 4 MByte video RAMs.

**Table 6-1 Frame Buffer Configurations**

Number of Video Memory Modules	Supported Resolutions
1	1980 x 1280 or lower
2	2048 x 2048 or lower

### 6.3.6.3 Eight-Bit Overlay Planes

Eight-bit double buffered overlay planes are a standard feature of the PowerStorm 1000 graphics subsystem.

### 6.3.6.4 Control Planes

The PowerStorm 1000 graphics subsystem has several types of control planes:

- Eight window ID planes
- One Z buffer erase plane
- One window clip plane
- Eight stencil planes
- Double-buffered 8-bit overlay/blink planes

A control plane is a frame buffer plane that allocates one bit per pixel to perform a function on a per-pixel basis that controls how a pixel value is written into or read from the frame buffer.

The Window ID planes allow the application to control various attributes on a window by window basis. Attributes under control of the window ID planes include:

- Double buffer control
- Pixel type (indexed or true color)
- Several blink/overlay options

The Z buffer Erase Plane allows the frame buffer hardware to mark DRAM locations used for Z buffering as erased, even if they have not been. This allows the corresponding VRAM locations to be erased at full speed without waiting for the DRAM to be erased.

The Window Clip Plane allows windows to be updated by the server without requiring all updates to be compared against a list of clip rectangles for all the areas that overlapping windows intersect. This allows high performance rendering in a window environment.

The Stencil Planes are used for particular cases where round-off or truncation error can cause Z-fighting for objects intended to have the same Z-value.

The overlay/blink planes provide a mechanism to display 8-bit visuals without affecting the existing image in the true color planes. These are double-buffered. They can also produce a minimal true color approximation in 3/3/2 (R/G/B) configuration.

## Technical Description

### 6.3.7 Video Generation

The following sections describe video generation.

#### 6.3.7.1 Window Attribute Mixer (WAM) ASIC

The WAM ASIC is responsible for video timing generation, window attribute processing, and the controlling of the frame buffer data to the RAMDAC. The WAM ASIC processes RGB data two pixels at a time, generates control for the double buffer select, decodes the window identification, and modifies the RGB data destined for the RAMDAC based on this information. Because each WAM processes RGB, the overlay information can be folded into the RGB pixel stream, relieving the RAMDAC of this responsibility and providing more flexibility in the processing of the overlay information.

#### 6.3.7.2 Video Output Modules

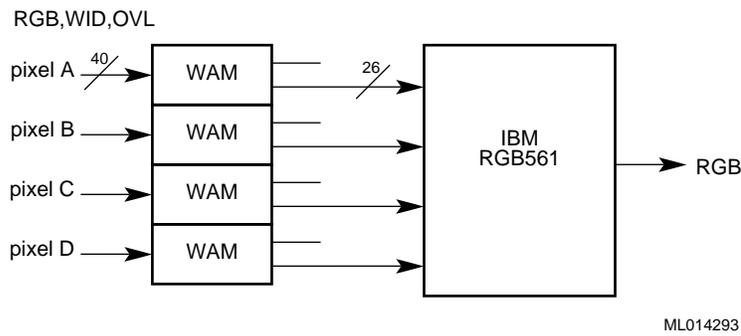
Two different types of video output modules are designed to support the PowerStorm 1000 graphics subsystem. One (and only one) of the two is configured in each the PowerStorm 1000 graphics subsystem. Each of the configurations relies on four WAM ASICs as an integral component. This module provides the video signal generation, synchronization to a variety of resolutions, aspect ratios, and refresh rates. It generates the video out by merging the contents of the frame buffer memory on the video memory modules. It provides hardware support for crosshair and cursor RAM and double buffer select control logic. The double buffer selection process is performed on the video memory module.

### 6.3.8 Standard Resolution Module (SRM)

One of the video output modules is the Standard Resolution Module. The Standard Resolution Module supports (1920 x 1280) at 76hz and resolutions of 640 x 480 up to 1920 x 1280. The Standard Resolution Module is the module used when stereographic images are required. The Standard Resolution Module can be operated with one or two Video Memory Modules. The block diagram for the Standard Resolution Module is shown in Figure 6-5.

The Standard Resolution Module provides a video switching capability between an external VGA video output and the video output from the IBM RGB561 Palette DAC. Based on the state of a software programmable configuration bit, video will be either from the IBM RGB561 source or an external VGA source. The default video source setting for power-up/reset is the external VGA source.

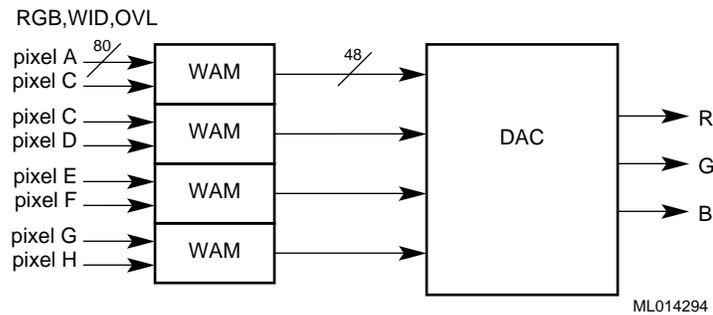
**Figure 6-5 Standard Resolution Module Block Diagram**



### 6.3.9 High Resolution Module (HRM)

The second video output module is the High Resolution Module. The High Resolution Module only supports the 2K x 2K resolution. The High Resolution Module requires two Video Memory Modules. The High Resolution Module does not provide console support. A second console is required in the high resolution PowerStorm 1000 subsystem. The block diagram for the High Resolution Module is shown in Figure 6-6.

**Figure 6-6 High Resolution Module Block Diagram**





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# A

## Specifications

This appendix contains the electrical, environmental, and physical specifications for the PowerStorm 1000 graphics subsystem desktside chassis.

Table A-1 contains the electrical specifications for the PowerStorm 1000 graphics subsystem desktside chassis.

**Table A-1 Electrical Specifications**

<b>Electrical Requirements</b>	
Nominal voltage	100-120 Vac/220-240 Vac with automatic voltage sensing
Operational voltage range	90-128 Vac/190-256 Vac
Input current (maximum)	6.5 A at 100-120 Vac 3.6 A at 220-240 Vac
Phasing	Single-phase
Nominal frequency	50/60 Hz
Frequency range	47-53 Hz/57-63 Hz
Input power	780 W input maximum, power factor .98 minimum

## Specifications

Table A-2 contains the environmental specifications for the PowerStorm 1000 graphics subsystem deskside chassis.

**Table A-2 Environmental Specifications**

<b>Environmental Requirements</b>	
Operating temperature range	10°C to 40°C (50°F to 104°F)
Operating humidity range	20% to 80% (non-condensing)
Operating altitude	2,438 m (8,000 ft.) maximum
Non-operating temperature range	-20°C to 65°C (-4°F to 149°F)
Non-operating humidity range	10% to 90% (non-condensing)
Non-operating altitude	4,876 m (16,000 ft.) maximum
Air intake location	Front
Air exhaust location	Rear
Shipping vibration	IAW Federal Std. 101, Method 5019
Non-operating shock	306, 25 ms halfsine

Table A-3 contains the physical specifications for the PowerStorm 1000 graphics subsystem deskside chassis.

**Table A-3 Physical Specifications**

<b>Physical Characteristics</b>	
Chassis	
Weight	32 kg (70 lb.)
Depth	64.52 cm (25.4 in.)
Width	23.88 cm (9.4 in.)
Height	44.2 cm (17.4 in.)

## B

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# Supported Monitors and Resolutions

The PowerStorm 1000 graphics subsystem supports the DIGITAL auto-scanning color monitors listed in Table B-1.

**Table B-1 Supported Monitors**

<b>Monitor</b>	<b>Model</b>
19 inch	Mitsubishi Diamondtron, PCXAV-CZ/CY
21 inch	Mitsubishi Diamondtron CRT, PCXAV-WZ/WY
24 inch	Sony Trinitron CRT, PCXAV-AZ

The Sony GDM-1934 monitor, as well as other monitors that meet the specifications listed in Table B-2, are supported.

The Sony Trinitron DDM-2801C and DDM-2802C monitors support the 2K x 2K resolution required by the High Resolution Module.

## Supported Monitors and Resolutions

Table B-2 lists the resolutions and refresh rates for the monitors supported by the Standard Resolution Module.

**Table B-2 Monitor Resolutions and Refresh Rates**

Resolution	DIGITAL 19" Monitor	DIGITAL 21" Monitor	DIGITAL 24" Monitor
	Refresh Rate (Hz)		
640 x 480	100 hor/150 vert	100 hor/150 vert	100 hor/150 vert
800 x 600 (SVGA)	60, 85	75, 85	
1024 x 768 (XGA)	60, 75, 85	70, 85	85
1152 x 864		75	
1280 x 1024	60, 75	75, 85	85
1600 x 1200	65, 75	65, 75	75
1600 x 1280			70
1920 x 1080 (U.S. HDTV)			75
1920 x 1200			65, 75

The High Resolution Module supports a Sony Trinitron DDM-2802C or DDM-2801C monitor with a resolution of 2K x 2K and a refresh rate of 60 Hz.

When the user starts a stereo application, the software automatically changes the refresh rate to support stereo without flickering. Table B-3 lists the stereo mode resolutions and refresh rates for the monitors supported by the Standard Resolution Module.

**Table B-3 Stereo Mode Monitor Resolutions and Refresh Rates**

Resolution	DIGITAL 19" Monitor	DIGITAL 21" Monitor	DIGITAL 24" Monitor
	Refresh Rate (Hz)		
640 x 480	100 hor/150 vert	100 hor/150 vert	100 hor/150 vert
800 x 600 (SVGA)	143	143	
1024 x 768 (XGA)	114	114	116
1152 x 864		102	
1280 x 1024	87	87	89

# C

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## Field Replaceable Units (FRUs)

The major field replaceable units (FRUs) and their part numbers for the PowerStorm 1000 graphics subsystem are listed in Table C-1.

**Table C-1 PowerStorm 1000 Graphics Subsystem FRUs**

<b>Part Description</b>	<b>Part Number</b>
Workstation Interface Board	30-48917-01
VGA Module	PCXGA-AC
Motherboard	30-48918-01
Graphics Interface Module	30-49346-01
Vertex Module	30-48916-01
Image Rendering Module	30-48913-01
Video Memory Module	30-48914-01
Standard Resolution Module	30-48915-01
High Resolution Module	30-48921-01
Power Supply Fan (two per system)	70-33551-01
Power Supply	H7291-AB
Enclosure Fan	12-36202-02
Power Control Module	30-48920-01
Hbus Cable	17-04565-01
VGA Cable	17-04354-01
High Resolution Video Cable	17-04690-01
Power Switch/LED Assembly Cable	17-04566-01



## D

# Event Log Messages

Table D-1 lists the PowerStorm 1000 graphics subsystem event log messages that may appear during Windows NT operation. Table D-1 also lists the parameters and descriptions of the event log messages.

**Table D-1 Windows NT Event Log Messages**

Message	Parameters	Description
HBus cable not detected.	None	The Hbus cable is not connected to both the AlphaStation and Graphics Interface Module or the Graphics Interface Module is not being detected by the Workstation Interface Module.
Graphics Interface Module not detected.	None	The Graphics Interface Module is not present in the system or is not being detected by the Workstation Interface Board.
Vertex Module not detected.	None	A Vertex Module is not present in the system or is not being detected by the Graphics Interface Module.
Invalid Image Rendering Module configuration detected.	IRM Mask	The Image Rendering Module configuration detected was not valid. The IRM Mask value displayed is a bit mask indicating which Image Rendering Modules are present. The lowest order bit corresponds to IRM0, bit 1 to IRM1, ... .
Invalid Video Memory Module configuration detected	VMM Mask	No Video Memory Module is installed, one Video Memory Module is installed but in the wrong slot in the backplane, or the Graphics Interface Module is not correctly detecting the Video Memory Module configuration. VMM Mask is the setting of the Video Memory Module configuration bits read from the Graphics Interface Module Status register.

## Event Log Messages

**Table D-1 (cont.) Windows NT Event Log Messages**

Message	Parameters	Description
No supported VOM detected.	VOM Type Code	The VOM type code read from the Graphics Interface Module Status registers was not x indicating that a Standard Resolution Module was present or y indicating that a High Resolution Module was present. The Type Code displayed is the value of the type code bits that were contained in the Graphics Interface Module Status register.
Only one Image Rendering Module detected - System Performance Degraded.	IRM Mask	Only one Image Rendering Module was detected. IRM Mask will be 1 – the value of the Image Rendering Module configuration bits read from the Graphics Interface Module Status register.
Invalid texture memory configuration detected	IRM0 TM Size IRM1 TM Size IRM2 TM Size IRM3 TM Size	Either no texture memory is installed on any Image Rendering Module or the Image Rendering Modules installed have different amounts of texture memory. The parameter values indicate the amount of texture memory installed on each Image Rendering Module specified in MB, the size will be zero for an Image Rendering Module that is not installed.
Invalid PixLink memory configuration detected.	IRM0 PLM Size IRM1 PLM Size IRM2 PLM Size IRM3 PLM Size	The Image Rendering Modules installed have different amounts of PixLink memory. The parameter values indicate the amount of PixLink memory installed on each Image Rendering Module specified in MB, the size will be zero for an Image Rendering Module that is not installed.
Event data has been lost.	Number of lost events	Events are being generated faster than they can be logged and some event messages have been discarded. The parameter value indicates the number of events that have been discarded.
A Local Bus parity error has been detected.	Workstation Interface Board Status Register	The Workstation Interface Board has detected a parity error on it's local bus. The parameter value is the contents of the Workstation Interface Board Status register.
An Hbus time-out error has been detected.	Workstation Interface Board Status Register	The Workstation Interface Board has detected a Hbus time-out. The parameter value is the contents of the Workstation Interface Board Status register.

## Event Log Messages

**Table D-1 (cont.) Windows NT Event Log Messages**

Message	Parameters	Description
A Hbus parity error has been detected.	Workstation Interface Board Status Register	The Workstation Interface Board has detected an Hbus parity error. The parameter value is the contents of the Workstation Interface Board Status register.
A Write Size error has been detected.	Workstation Interface Board Status Register	The Workstation Interface Board has padded a sized PIO write operation.
An Illegal Access error has been detected.	Workstation Interface Board Status Register	Software has attempted to perform an sequential address space access in random address space. The parameter value is the contents of the Workstation Interface Board Status register.
An Hbus Power On/Off Error has been detected.	Workstation Interface Board Status Register	The Workstation Interface Board has detected that power has been toggled on the PowerStorm 1000 chassis. The parameter value is the contents of the Workstation Interface Board Status register.
Bogus Graphics Interface Module status register value read.	GIM Status Register 0 GIM Status Register 1	Software has determined that the values read from Graphics Interface Module Status registers 0 and/or 1 are invalid. The parameter values are the contents of these registers.
A Hbus parity error has been detected.	GIM Status Register 0 GIM Status Register 1	The Graphics Interface Module has detected an Hbus parity error. The parameter values are the contents of the Graphics Interface Module Status registers.
A Dbus time-out error has been detected.	GIM Status Register 0 GIM Status Register 1 Master Address	The Graphics Interface Module has detected a Dbus time-out. The parameter values are the contents of the Graphics Interface Module Status registers, the ID of the module that was Dbus master when the time-out was detected, and the address being referenced.
The Graphics Interface Module has detected an address/data order error.	GIM Status Register 0 GIM Status Register 1	The Graphics Interface Module has detected that the order of the addresses and data coming from the Hbus is incorrect. Parameter values are the contents of the Graphics Interface Module Status registers.
Shadow DMA hung.	First GIM Status Register 0 Final GIM Status Register 0 First GIM Status Register 1 Final GIM Status Register 1	A RC Pick or Pipe Sync interrupt has been received indicating that rendering is complete, but there is a shadow DMA in progress and it has not finished for more than 50 microseconds.

## Event Log Messages

**Table D-1 (cont.) Windows NT Event Log Messages**

Message	Parameters	Description
Mezzanine Bus hung.	Dbus Status Register 0 Dbus Status Register 1 RC Status Register	A RC Pick or Pipe Sync interrupt has been received indicating that rendering is complete, but the RC mezzanine bus is busy.
Bogus Dbus Status.	Dbus Status Register 0 Dbus Status Register 1	Software has determined that the values read from Dbus status registers 0 and/or 1 are invalid. The parameter values are the contents of these registers.
The RC ASIC has detected an error: Master.	Dbus Status Register 0 Dbus Status Register 1 Last RC Command (high) Last RC Command (low)	The Master RC ASIC has received a bad command. Parameter values are the contents of Dbus status registers 0 and 1, and the upper and lower halves of the bad command.
The RC ASIC has detected an error: Slave	Dbus Status Register 0 Dbus Status Register 1 Last RC Command (high) Last RC Command (low)	The Slave RC ASIC has received a bad command. Parameter values are the contents of Dbus status registers 0 and 1, and the upper and lower halves of the bad command.
An unexpected RC interrupt has been detected.	Dbus Status Register 0 Dbus Status Register 1 RC Status Register	An unexpected interrupt has been received from an RC ASIC. Parameter values are the contents of Dbus status registers 0 and 1, and the contents of the RC status register.
A Packet Controller error has been detected.	Dbus Status Register 0 Dbus Status Register 1	The Graphics Interface Module has detected a Packet Controller error. Since the PowerStorm 1000 system does not have a packet controller this event should never be seen. Parameter values are the contents of Dbus status registers 0 and 1.
The VDM ASIC has detected an error.	Dbus Status Register 0 Dbus Status Register 1	The VDM ASIC has detected a bad VDM command. Parameter values are the contents of Dbus status registers 0 and 1.

## Event Log Messages

**Table D-1 (cont.) Windows NT Event Log Messages**

Message	Parameters	Description
SAM ASIC has detected an error or PixLink Memory is exhausted.	Dbus Status Register 0 Dbus Status Register 1	The SAM ASIC has detected a bad SAM command or PixLink memory is used up. Parameter values are the contents of Dbus status registers 0 and 1
SSLD ASIC has detected an error.	Dbus Status Register 0 Dbus Status Register 1	The SAM ASIC has detected a bad SAM command. Parameter values are the contents of Dbus status registers 0 and 1
An SRM error has been detected.	Dbus Status Register 0 Dbus Status Register 1	The SRM has detected a burst I/O request (which is not supported). Parameter values are the contents of Dbus status registers 0 and 1
Unexpected DMA Channel 0 interrupt.	PCI INTCSR	Software has received a DMA channel 0 interrupt that it had not requested. The parameter value is the contents of the Workstation Interface Board's PCI interrupt control and status register.
Unexpected DMA Channel 1 interrupt.	PCI INTCSR	Software has received an DMA Channel 0 Interrupt (and does not use DMA channel 0). The parameter value is the contents of the Workstation Interface Board's PCI interrupt control and status register.
A PCI Target Abort error has been detected.	PCI INTCSR	The Workstation Interface Board's PCI controller has generated or received a time-out interrupt. The parameter value is the contents of the Workstation Interface Board's PCI interrupt control and status register.
Watchdog Time-out.	Outcome	A Pipe-Sync command that was sent though the rendering pipe as a consistency check did not cause an interrupt to be generated within the time-out time (roughly 4 seconds). This check is performed only during times of low DMA activity. The parameter value indicates whether software will perform a soft or hard reset to recover.
DMA Time-out.	Outcome	A previously started DMA has not completed within the time-out period allowed (2 seconds). The parameter value indicates whether software will perform a soft or hard reset to recover.

## Event Log Messages

**Table D-1 (cont.) Windows NT Event Log Messages**

Message	Parameters	Description
Pipe Sync Time-out.	Outcome	A Pipe-Sync command has been sent through the rendering pipe but the Pipe-Sync interrupt was not received within the time-out period. The parameter value indicates whether software will perform a soft or hard reset to recover.
ASIC reset required.	Outcome	An error has occurred that requires the PowerStorm 1000 ASIC be reset in order to recover. The error that resulted in this action was logged by the event preceding this event in the event log. Possible causes include. The parameter value indicates whether software will perform a soft or hard reset to recover.
Fatal Interrupt, graphics system reset required.	Outcome	An error has occurred that requires a full reset of the PowerStorm 5DT system. The error that resulted in this action was logged by the event preceding this event in the event log. Possible causes include; Invalid Dbus status register values, a Shadow DMA hang, a Standard Resolution Module or High Resolution Module error, Invalid Graphics Interface Module status register values, Graphics Interface Module Address/Data error, Hbus Time-out, Hbus cable removed, or loss of power. The parameter value indicates whether software will perform a soft or hard reset to recover.
Fatal Interrupt, graphics system reboot required.	Outcome	An error has occurred that requires a full reset of the PowerStorm 1000 system. The error that resulted in this action was logged by the event preceding this event in the event log. Possible causes include; Invalid Dbus status register values, a Shadow DMA hang, a Standard Resolution Module or High Resolution Module error, Invalid Graphics Interface Module status register values, Graphics Interface Module Address/Data error, Hbus Time-out, Hbus cable removed, or loss of power. The parameter value indicates whether software will perform a soft or hard reset to recover.