Stardent

FIELD SERVICE MANUAL

Stardent Computer Inc.

Part Number: 340-0109-01

CONTENTS

13 Quad SCSI Disk Drawer Procedures

14 Configuring Mass Storage Devices

15 Troubleshooting

16 Preventive Maintenance

Appendix A

Appendix B

Appendix C

Appendix D

List of Figures

List of Tables

Field Service Briefs

INTRODUCTION

This document is intended for Stardent field service engineers and shared maintenance customers. It lists the field replaceable units that make up the Stardent 1500/3000 system, describes hardware procedures, gives suggestions for troubleshooting hardware and software problems, and describes preventive maintenance for Stardent 1500/3000. It has an appendix that contains descriptions of the currently available hardware diagnostics and appendices with other supplemental troubleshooting information.

NOTE
The Stardent Customer Support office can be reached 24 hours a day at 1-800-537-1104.

Stardent Computer Corporation has developed a simple maintenance approach that is reflected in the design of its products.

(1) Problems can be diagnosed remotely and reported to remote, electronically connected support centers.

(2) The use of sound system adminstration practices prevents unneccessary loss of data, provides user file security and allows fast recovery after system failures.

(3) Component-level hardware repairs are not performed in the field due to board complexity and multi-layer design.

(4) Field diagnostics are designed to isolate hardware problems to a field replaceable unit (FRU).

(5) Software tools are designed to isolate software problems to small reproducible component sets.

(6) Software patches and workarounds are validated and used for problem resolution prior to upcoming major releases.

Plan to supplement this document with the publications listed here:

- *Installation and Administration Guide*
  This document is the most important supplement for day-

to-day system maintenance. It describes how to install, configure, administer, and upgrade the system. As an appendix it includes the *PROM Manual,* which describes PROM capabilities and commands.

- *Site Preparation Guide*
  This document describes how to prepare a site for Stardent 1500/3000 installation. It includes space, power, and environmental requirements.

- *Commands Reference Manual*
  This manual describes each of the user commands available on Stardent 1500/3000, including system administration commands.

- *Software and Hardware Release Notes*
  These documents, published on a ongoing basis, give up-to-date information on known bugs, bug fixes, and items not included in other published documentation.

In addition to the documents listed above, you may wish to refer to the following documents for help in customizing and maintaining the system and troubleshooting specific problems:

NOTE
Contact your Stardent sales representative for information on ordering manuals.

- *Network File System Manual*
  This manual includes an overview of NFS, description of NFS system administration, and *man page* descriptions of NFS commands, subroutines, and file formats.

- *Doré Reference Manual*
  This document contains *man page* descriptions of each of the Doré subroutines.

- *X Toolkits Reference Manual*
  This document contains *man page* descriptions of window system commands and utilities.

- *Programmer's Reference Manual, Volumes 1-2*
  These documents describe operating system calls, subroutines, libraries, and file formats. Volume 1 contains AT&T UNIX System V-derived entries and Volume 2 contains BSD UNIX 4.3-derived entries.

FIELD REPLACEABLE UNITS

CHAPTER TWO

This chapter lists Stardent 1500/3000 field replaceable units (FRUs) and their part numbers. A summary of the information is given in Table 2-2 at the end of this chapter.

NOTE
You can reach the Stardent Customer Support office at 1-800-537-1104.

You can determine the general FRU category of a part number by examining its 3-digit prefix:

100: Cables
125: Software Tapes
130: Peripheral assemblies direct from vendors and usually without additional Stardent assembly.
154: Sub-assemblies.
155: Full hardware installation kits.
170: Software tapes (with release notes).
350: Documentation (340 if unbound).
345: Release Notes
346: Field Service Briefs
520: Connectors and terminators.

System Module Card Cage, Fan Controller, and Power Supply

CPU Board (P1) — PN 155-0009-01.
Includes the Stardent 1500/3000 integer processing unit (IPU), vector processing unit (VPU), and an RS-232 port for diagnostic communications. Stardent 1500/3000 supports 1-2 identically-configured P1 CPU boards.

CPU Board (P2) — PN 155-0054-01.
Includes the Stardent 1500/3000 integer processing unit (IPU), vector processing unit (VPU), and an RS-232 port for diagnostic communications. Stardent 1500/3000 supports 1-4 identically-configured P2 CPU boards.

CPU Board (P3) — PN 155-0068-01.
Includes the Stardent 1500/3000 integer processing unit (IPU),

vector processing unit (VPU), and an RS-232 port for diagnostic communications. Stardent 1500/3000 supports 1-4 identically-configured P3 CPU boards.

Memory Board/32MB — PN 155-0008-02.
Contains 32 MB of main memory, using 1MB DRAMs. Stardent 1500/3000 supports up to four memory boards of 32 MB each.

I/O Board 1 — PN 155-0007-01.
Contains four RS-232 ports, a parallel printer port, an Ethernet/Cheapernet interface, a keyboard-mouse port, and two SCSI ports, as well as internal interfaces and an internal bus. For use with the Stardent 1500/3000 System Module single I/O back-plane option (part number to be determined).

I/O Board 2 — PN 155-0066-01.
Contains four RS-232 ports, a parallel printer port, an Ethernet/Cheapernet interface, a keyboard-mouse port, and two SCSI ports, as well as internal interfaces and an internal bus. For use with the Stardent 1500/3000 System Module dual I/O back-plane option (part number to be determined).

Graphics Board (G2) — PN 155-0010-01.
Contains frame buffers, Z-buffer, overlay and control planes, and color maps.

Graphics Board (G3) — PN 155-0069-01.
Contains frame buffers, Z-buffer, overlay and control planes, and color maps.

Graphics Expansion Board (optional) — PN 155-0015-01.
Contains additional image planes and pixel and polygon processors, and a video recording interface. Used only with G2 graphics board (# 155-0010-01).

VME Adaptor Board (optional) — PN 155-0016-01.
Contains two bays for Interphase V/4200 Controller board(s) and/or an HVE repeater board.

Blank slot filler — PN 154-0001-01.
Fills card cage slots that do not have boards installed. Slot fillers are required for all empty slots to assure adequate air flow within the System Module card cage.

Fan Controller — PN 130-0014-01.
Consists of one controller for the Stardent 1500/3000 System Module fans.

Power Supply — PN 155-0005-01.
Consists of one Stardent 1500/3000 power supply. No cables are included. When replacing the power supply use the cables from the old power supply unit.

Mass Storage Devices

ThiS section lists internal SCSI device drawers, SCSI disk drives, and the 2-gigabyte tape drive. See *Expansion Cabinet FRU's* below in this chapter for descriptions of other peripheral devices.

1/4-Inch Tape Drawer — PN 155-0004-01.
Consists of an I/O drawer with one 1/4–inch SCSI cartridge tape drive. (See "1/4-Inch Tape Drive," below for tape specs.)

1/4-Inch Tape/Disk Drawer — PN 155-0004-02.
Consists of an I/O drawer with one 1/4–inch SCSI cartridge tape drive and one 380 MB SCSI disk drive. (See "1/4-Inch Tape Drive," below for tape specs.)

1/4-Inch Tape/Disk Drawer — PN 155-0004-03.
Consists of an I/O drawer with one 1/4–inch SCSI cartridge tape drive and one 760 MB SCSI disk drive. (See "1/4-Inch Tape Drive," below for tape specs.)

1/4-Inch Tape Drive — PN 130-0010-01.
Consists of one 1/4–inch SCSI cartridge tape drive. The tape drive can read and write in the QIC-120 high density format. It can read in the QIC-24 low density format.

NOTE
The 1/4-Inch Tape Drive can write only in the QIC-120 *high density* format.

To ensure reliable tape operations, use only tapes that comply with ANSI standard X3B5/85: "Unrecorded Magnetic Mini-Tape Cartridge For Standard Interchange." Here are the most important components of this standard:

Size	.25 inch (6.30 mm)
Flux Transitions	12,500 ftpi (495ftpmm)
Coercivity	550 Oersteds (44,000 Ampere/Meter)

An example of a cartridge tape that meets the ANSI standard is the 3M DC600A, which holds 125 MB of data in the QIC-120 format.

380 MB Disk Drawer — PN 155-0003-01.
Consists of an I/O drawer with one 380 MB Priam Model 738 SCSI disk drive.

380 MB Disk Drawer — PN 155-0003-02.
Consists of an I/O drawer with two 380 MB Priam Model 738 SCSI disk drives.

380 MB Disk Drive — PN 130-0008-01.
Consists of a 380 MB Priam Model 738 SCSI disk drive. The drive holds approximately 320 MB of data when formatted.

760 MB Disk Drawer — PN 155-0003-03.
Consists of an I/O drawer with one 760 MB MAXTOR XT-8760S SCSI disk drive.

760 MB Disk Drawer — PN 155-0003-04.
Consists of an I/O drawer with two 760 MB MAXTOR XT-8760S SCSI disk drives.

760 MB Disk Drive — PN 130-0025-01.
Consists of a 760 MB MAXTOR XT-8760S SCSI disk drive. The drive holds approximately 640 MB of data when formatted.

Two-Gigabyte Tape Drive — PN 130-0031-01.
Consists of an Exabyte EXB-8200 2-Gigabyte tape drive for replacement. Includes integral AC line cord.

Two-Gigabyte Tape Drive Kit — PN 155-0067-01.
Consists of an Exabyte EXB-8200 2-Gigabyte tape drive with 2 tapes, cables, and drive cleaner. For initial installation.

User Interface Module

Monitor — PN 130-0001-01.
Consists of a 19–inch monitor with 1280 pixels by 1024 line resolution. The monitor is a single FRU; subelements are not field-replaceable.

Keyboard — PN 130-0002-01.
Consists of one AT–compatible keyboard with industry-standard scientific layout, and an attached cable that connects to the junction box (see below).

Mouse — PN 130-0003-01.
Includes one optical mouse and a high-resolution 8 inch by 9 inch mouse pad.

Junction Box — PN 155-0012-01.
Consists of a junction box with ports for the monitor, mouse, keyboard, knob box, and tablet.

Stereo Monitor (optional) — PN 130-0017-01.
Consists of a stereo monitor which can be substituted for the standard Stardent 1500/3000 monitor. (See *Cables and Cords* below for a listing of stereo cables.)

Knob Box (optional) — PN 130-0006-01.
Consists of one knob box with eight knobs and an attached cable for connection to the junction box.

Tablet (optional) — PN 130-0005-01.
Consists of one optical graphics tablet and an attached cable for connection to the junction box.

Cables and Cords

User Interface Cables:

The User Interface Cable connects the System Module to the junction box. There are four connectors at the User Interface Module end and six connectors at the System Module end. Choose one of the two cables listed here.

User Interface Cable, 50 ft. — PN 100-0018-01.
50–foot cable.

User Interface Cable, 200 ft. (optional) — PN 100-0017-01.
200–foot cable.

User Interface Cable, Stereo:

The Stereo User Interface Cable is used only with a stereo monitor (PN 130-0017-01). It connects the stereo output on the System Module graphics board to the stereo input on the junction box. Choose one of the cables listed here.

User Interface Cable, Stereo, 50 ft. (optional) — PN 100-0064-02. 50–foot cable.

User Interface Cable, Stereo, 200 ft. (optional) — PN 100-0064-01. 200–foot cable.

System Module and Expansion Cabinet Line Cords:

The System Module line cord connects the System Module to a wall outlet. Choose one of the cords listed here. Cord

specifications are given in Table 2-1 and plug illustrations are given in Figure 2-1. Power consumption for the System Module is 5770 BTUs maximum or 1692 watts.

System Module Line Cord, 110V USA — PN 100-0044-01. Connects the System Module to an 110V AC wall outlet.

System Module Line Cord, 220V USA — PN 100-0045-01. Connects the System Module to a 220V AC wall outlet.

System Module Line Cord, Cont. Europe — PN 100-0046-01. Connects the System Module to a 220V DC wall outlet, consistent with European standards.

System Module Line Cord, Unterminated — PN 100-0047-01. Connects to the System Module and is unterminated at the wall end.

System Module Line Cord, 100/200V Japan — PN 100-0048-01. Connects the System Module to a wall outlet consistent with Japanese standards.

System Module Line Cord, LC British — PN 100-0050-01. Connects the System Module to a wall outlet consistent with British standards.

User Interface Line Cords:

The User Interface line cord connects the junction box to a wall outlet. Cord specifications are given in Table 2-2 and plug illustrations are given in Figure 2-2. Power consumption is 1473 BTUs or 432 watts. Use one of the cords listed here.

User Interface Line Cord, 110V USA — PN 100-0030-01. Connects the User Interface Module junction box to a 110V wall outlet.

User Interface Line Cord, British — PN 100-0059-01. Connects the User Interface Module junction box to a wall outlet consistent with British standards.

User Interface Line Cord, Cont. Europe — PN 100-0061-01. Connects the User Interface Module junction box to a wall outlet consistent with continental European standards.

Other Cables:

Junction Box to Monitor AC Cord — PN 100-0062-01.
Connects the junction box to the monitor. This cord is appropriate for any system configuration, domestic or foreign.

BNC coaxial cable, 36-inch — PN 100-0041-01.
Connects the RGB ports on the junction box to those on the monitor. Three of these cables are required with the standard monitor; an additional cable is required with the stereo monitor.

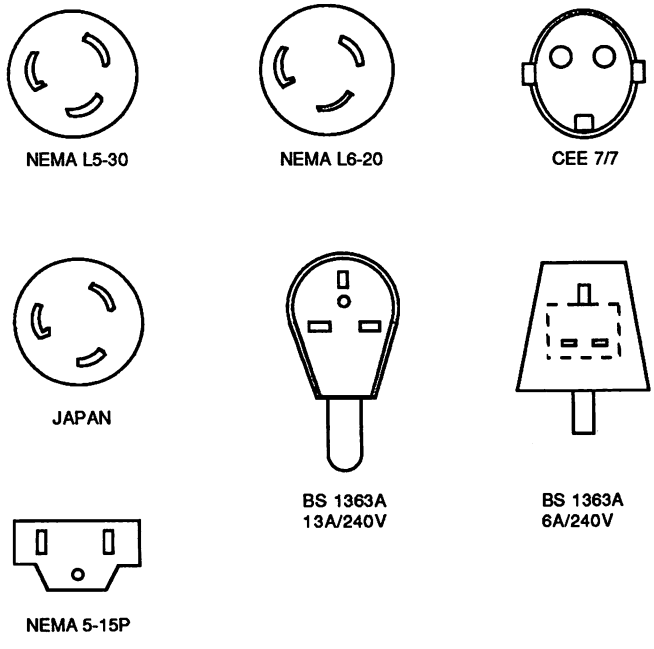


Figure 2-1. Stardent 1500/3000 System Module Line Cords

Table 2-1. Stardent 1500/3000 Line Cord Specifications

Part No.	Title	Plug	Nominal Volt/Curr	Length
100-0044-01	Sys Mod Line Cord USA 110V	NEMA L5-30	115V/30A	10 ft.
100-0045-01	Sys Mod Line Cord USA 220V	NEMA L6-20	230V/20A	10 ft.
100-0046-01	Sys Mod Line Cord Cont. Eur.	CEE 7/7	220V/16A	10 ft.
100-0047-01	Sys Mod Line Cord Unterm.	(NA)	240V/20A	10 ft.
100-0048-01	Sys Mod Line Cord Japan	(See Fig. 2-1)	200V/20A	10 ft.
100-0050-01	Sys Mod Line Cord Brit.	BS 1363A	240V/13A	10 ft.
100-0030-01	User Interface Line Cord USA 110V	NEMA 5-15P	115V/10A	6 ft.
100-0059-01	User Interface Line Cord Brit.	BS1363A	240V/6A	6 ft.
100-0061-01	User Interface Line Cont. Eur.	CEE 7/7	220V/6A	6 ft.

Expansion Cabinet FRU's

Expansion Cabinet — PN 155-0038-01.
Consists of an empty Expansion Cabinet with AC Power Controller and hardware for attaching the Expansion Cabinet to the Stardent 1500/3000 System Module.

Expansion Cabinet with VME Card Cage — PN N/ENC-200).
Consists of an Expansion Cabinet (as above) with VME Card Cage installed. The Card Cage contains empty board fillers in all slots.

VME Card Cage — PN 130-0022-01.
Consists of a VME Card Cage containing empty board fillers in all slots.

AC Power Controller — PN 130-0019-01.
AC Power Controller for replacement in the Expansion Cabinet.

HP 1/2-inch Tape Drive Kit — PN 155-0041-01.
Consists of an HP 88780A 1/2-inch Tape Drive with mounting brackets and hardware for installing in the Expansion Cabinet.

Quad Disk Drawer Kit (with 4-380MB Disks) — PN 155-0061-01. Consists of a Trimm Quad Disk enclosure with 4 Priam model 738 (380 MB) Disk Drives. Also includes power supply and brackets for mounting the enclosure in the Expansion Cabinet.

Quad Disk Drawer Kit (with 4-760MB Disks) — PN 155-0062-01. Consists of a Trimm Quad Disk enclosure with power supply and 4 MAXTOR model XT-8760S (760 MB) Disk Drives. Also

includes brackets for mounting the enclosure in the Expansion Cabinet.

Quad Disk Drawer — PN 154-0022-01.
Consists of an empty Trimm Quad Disk enclosure with power supply and brackets for mounting in the Expansion Cabinet.

380 MB Disk Drive — PN 130-0008-01.
Consists of a 380 MB Priam Model 738 SCSI disk drive. The drive holds approximately 320 MB of data when formatted.

760 MB Disk Drive — PN 130-0025-01.
Consists of a 760 MB MAXTOR XT-8760S SCSI disk drive. The drive holds approximately 640 MB of data when formatted.

Dual SMD Disk Drawer with 1 Disk Drive — PN 155-0040-01. Consists of a Dual SMD Disk Drawer with one Fujitsu K3282M 1-gigabyte disk drive, mounting hardware, and cables; for initial installation.

Dual SMD Disk Drawer with 2 Disk Drives — PN 155-0042-01. Consists of a Dual SMD Disk Drawer with two Fujitsu K3282M 1-gigabyte disk drives, mounting hardware, and cables; for initial installation.

SMD Disk Drive — PN 155-0071-01. Consists of a Fujitsu K3282M 1-gigabyte disk drive with cables for mounting in a Dual SMD Disk Drawer.

SMD Disk Drive Fan — PN 130-0029-01. Consists of one SMD disk drive fan for removal or replacement.

SMD Disk Drawer Power Supply — PN 130-0028-01. Consists of one Dual SMD Disk Drawer power supply for removal or replacement.

Interphase Kit for VME Card Cage — PN 155-0044-01. Consists of an Interphase V/4200 Controller board (size 6U), an assembled VME card cage filler board (size 9U) with modified front panel, and the internal wiring to connect the front panel sockets to the board. For installation in the model N-ENC/200 expansion cabinet with VME card cage.

Interphase Kit for VME Adaptor Board — PN 155-0043-01. Consists of an Interphase V/4200 Controller board (size 6U) with cable panel and cables for installation in the Stardent 1500/3000 System Module VME Adaptor Board (# 155-0016-01).

HVE Repeater Kit — PN 155-0059-01. Consists of a primary and secondary (expansion) HVE repeater boards, with the primary board installed in a VME Adaptor Board (PN 155-0016-01) and the secondary board installed in a VME Card Cage board. Includes cables and connector hardware to complete installation.

Expansion Cabinet Cables and Cords

The Expansion Cabinet uses the same AC power cord as the Stardent 1500/3000 System Module. See *Cables and Cords* above in this chapter for part numbers.

Expansion Cabinet Internal AC Line Cord: VME Card Cage to AC Power Controller — PN 100-0070-01. Consists of an AC line cord to connect the VME Card Cage to the Expansion Cabinet AC Power Controller.

Expansion Cabinet Internal AC Line Cord — PN 100-0071-01. Consists of an AC line cord to connect Expansion Cabinet peripheral drawers to the Expansion Cabinet AC Power Controller.

10' SCSI Cable — PN 100-0068-01. Consists of a 10-foot SCSI cable to connect external SCSI peripherals to the Stardent 1500/3000 System Module I/O board.

13' SCSI Cable — PN 100-0068-02. Consists of a 13-foot SCSI cable to connect external SCSI peripherals to the Stardent 1500/3000 System Module I/O board. This cable should be used for the 1/2-inch tape drive; it can also be used for other SCSI devices.

SCSI Terminator — PN 520-0112-01. Consists of one SCSI terminator for use with SCSI peripheral devices.

Short SMD Data Cable — PN 100-0090-01. Consists of an 8-foot, 26-pin SMD data cable for connecting the Dual SMD Disk Drawer to the VME Card Cage.

Long SMD Data Cable — PN 100-0090-02. Consists of a 14-foot, 26-pin SMD data cable for connecting the Dual SMD Disk Drawer to the Stardent 1500/3000 System Module VME Adaptor Board.

Short SMD Control Cable — PN 100-0086-01. Consists of an 8-foot, 60-pin SMD control cable for connecting the Dual SMD Disk Drawer to the VME Card Cage.

Long SMD Control Cable — PN 100-0086-02. Consists of a 14-foot, 60-pin SMD data cable for connecting the Dual SMD Disk Drawer to the Stardent 1500/3000 System Module VME Adaptor Board.

SMD Drive Power Cables — PN 100-0096-01. Contains cables to connect an SMD Disk Drive to the Power Supply in the Dual SMD Disk Drawer.

Standard Software

Bundled Software (P1/P2), Domestic — PN 170-0001-xx.
Contains the system software tapes; demo tape(s); diagnostics tape; and Operating System, Hardware, Graphics, and Languages Release Notes, for U.S. use. To be used only with Stardent 1500/3000 P1 and P2 processors.

Bundled Software (P3), Domestic — PN 170-0020-xx.
Contains the system software tapes; demo tape(s); diagnostics tape; and Operating System, Hardware, Graphics, and Languages Release Notes, for U.S. use. To be used only with Stardent 1500/3000 P3 processors.

Bundled Software (P1/P2), Export– 170-0002-xx.
Contains the system software tapes; demo tape(s); diagnostics tape; and Operating System, Hardware, Graphics, and Languages Release Notes, for international use. To be used only with Stardent 1500/3000 P1 and P2 processors.

Bundled Software (P3), Export — PN 170-0021-xx.
Contains the system software tapes; demo tape(s); diagnostics tape; and Operating System, Hardware, Graphics, and Languages Release Notes, for international use. To be used only with Stardent 1500/3000 P3 processors.

Optional Software Packages

Ada (P3 only) — PN 170-0025-xx.
Contains the Ada compiler tape and Ada Release Notes. For use only on Stardent 1500/3000 P3 systems.

[1] A terminating *xx* in a part number indicates that the part number changes on a per release basis.

Documenter's Workbench (P1/P2) — PN 170-0003-xx.
Contains the Documenter's Workbench software tape and Documenter's Workbench Release Notes.

Documenter's Workbench (P3) — PN 170-0023-xx.
Contains the Documenter's Workbench software tape and Documenter's Workbench Release Notes.

Doré Source, 1/4-inch QIC tape — PN 170-0006-xx.
Contains portable Doré source code on 1/4-inch QIC tape and Doré Release Notes.

Doré Source, 1/4-inch Sun tape — PN 170-0007-xx.
Contains portable Doré source code on 1/4-inch Sun-compatible tape and Doré Release Notes.

Doré Source, 1/2-inch tape — PN 170-0008-xx.
Contains Doré source code on 1/2-inch tape and Doré Release Notes.

Figaro — PN 170-0019-xx.
Contains the Figaro software tape and Figaro Release Notes. For use only with Stardent 1500/3000 P3 processors.

Fortran (P1/P2) — PN 170-0005-xx.
Contains the Fortran compiler tape and Fortran Release Notes. For use only with Stardent 1500/3000 P1 and P2 processors.

Fortran (P3) — PN 170-0022-xx.
Contains the Fortran compiler tape and Fortran Release Notes. For use only with Stardent 1500/3000 P3 processors.

Library of Contributed Software — PN 170-0010-xx.
Contains the Library of Contributed Software tape and LCS Release Notes.

Mathematica — PN 170-0015-xx.
Contains the Mathematica software tape and Mathematica Release Notes.

Network File System (P1/P2) — PN 170-0004-xx.
Contains the NFS software tape and NFS Release Notes.

Network File System (P3) — PN 170-0024-xx.
Contains the NFS software tape and NFS Release Notes.

Ada Manual — PN 340-0102-00.
From Meridian Software. Describes the Ada compiler on Stardent 1500/3000.

Bisync Manual — PN 340-0124-00.
Describes how to install and troubleshoot the Bysync communications protocol.

C: A Reference Manual — PN 340-0027-xx.
Describes how to program in C.

Commands Reference Manual — PN 340-103-xx.
Describes Stardent 1500/3000 operating system commands.

Documenter's Workbench Manual — PN 340-0034-xx.
Describes device-independent *troff* commands and the *devps* software driver for PostScript™ printers.

Doré Porting and Implementation — PN 340-0057-xx.
Describes how to port Doré to other hardware platforms.

Doré Programmer's Guide — PN 340-0107-xx.
Describes how to program Doré applications.

Doré Reference Manual — PN 340-0108-xx.
Contains Doré reference material and manual pages.

Field Service Manual — PN 340-0109-xx.
Describes Stardent 1500/3000 field maintenance procedures.

Figaro Manual Set — PN 340-0110-xx.
Contains a set of manuals purchased from Template and shipped to Figaro customers.

Fortran Reference Manual — PN 340-0111-xx.
Contains Fortran Manual Pages and a user's guide to Stardent 1500/3000 Fortran.

Hardware Reference Manual — PN 340-0113-xx.
Describes Stardent 1500/3000 hardware in detail.

Installation and Administration Guide — PN 340-0119-xx.
Describes how to install, configure, and administer the Stardent 1500/3000 system.

Mathematica Manual — PN 340-0053-xx.
Contains reference material for the Mathematica package.

Mathematica User's Guide — PN 340-0055-xx.
Describes how to use the Mathematica package.

MATLAB User's Guide — PN 340-0041-xx.
Describes how to use the MATLAB package.

Network File System Manual — PN 340-0126-xx.
Describes the Network File System architecture and protocols and includes man pages.

Principles of Operation Manual — PN 340-0115-xx.
Describes Stardent 1500/3000's hardware/software interface.

Programmer's Guide — PN 340-0116-xx.
Shows how to write, edit, and debug C and Fortran code. Describes the loader and debugger.

Programmer's Reference Manual Vol. 1 — PN 340-0121-xx.
Describes AT&T System V based system calls, subroutines, and file formats.

Programmer's Reference Manual Vol. 2 — PN 340-0122-xx.
Describes BSD 4.3 UNIX based system and library subroutines.

Site Preparation Guide — PN 340-0023-xx.
Shows how to prepare a site for Stardent 1500/3000 installation.

SNA RJE Manual — PN 340-0125-xx.
Gives instructions on installing and troubleshooting the SNA RJE communications protocol. Shipped only to SNA RJE customers.

Start Here: User's Guide — PN 340-0118-xx.
Describes Stardent 1500/3000's user interface to end users.

Window System Manual — PN 340-0114-xx.
Contains X Windows man pages.

Window System Toolkit — PN 340-0112-xx.
Describes how to program X widgets, etc.

Xlib Reference Manual (2 volumes) — PN 340-0022-xx.
Consists of Volumes 1 and 2 of the O'Reilly X Windows Manuals. Describes the Xlib subroutines.

Release Notes

Release Notes part numbers change with each relase, so part numbers are omitted from this section. The part number prefix, 345, does not change, however.

Ada Release Notes.
Contains Ada compiler update information.

Documenter's Workbench Release Notes.
Contains Documenter's Workbench update information.

Doré Release Notes.
Contains Doré update information.

Expansion Cabinet Release Notes.
Contains Expansion Cabinet update information.

Figaro Release Notes.
Contains Figaro update information.

Fortran Release Notes.
Contains Fortran update information.

Graphics Release Notes.
Gives graphics update information.

Hardware Release Notes.
Gives update information on Stardent 1500/3000 hardware.

Language Release Notes.
Gives update information on the Stardent 1500/3000 compilation system.

Library of Contributed Software Release Notes.
Contains LCS update information.

Mathematica Release Notes.
Contains Mathematica update information.

Network File System Release Notes.
Contains Network File System update information.

Operating System Release Notes.
Gives operating system update information.

Field Service Briefs

Field Service Briefs are 1-2 page summaries of field service procedures. They are distributed along with the *Field Service Manual,* but can also be detached and used as separate reference sheets. This section lists the currently-available *Field Service Briefs.*

System Module Door Removal — PN 346-0001-01. Shows how to remove the Stardent 1500/3000 System Module or Expansion Cabinet door.

Circuit Board Removal and Replacement — PN 346-0002-01. Shows how to take circuit boards out of the System Module card cage and replace them.

I/O Drawer Device Removal and Replacement — PN 346-0003-01. Shows how to remove and replace devices in the System Module I/O drawers.

I/O Board Fuse Replacement — PN 346-0004-01. Shows how to change the I/O board SCSI and Ethernet fuses.

I/O Board Configuration — PN 346-0005-01. Shows how to configure I/O board 2 (#155-0066-01) for use with the dual I/O backplane.

Power Supply Removal and Replacement — PN 346-0006-01. Shows how to remove and replace the Stardent 1500/3000 System Module power supply.

System Module Voltage Testing — PN 346-0007-01. Shows how to test Stardent 1500/3000 System Module voltage levels.

Fan Controller Replacement — PN 346-0008-01. Shows how to remove and replace the controller for the Stardent 1500/3000 System Module fans.

Resetting the System — PN 346-0009-01. Shows how do a power-off reset, hard reset, or soft reset.

Wangtek Cartridge Tape Drive Configuration — PN 346-0010-01. Shows how to configure the Wangtek 5125SC (full height) and 5125ES (half-height) 1/4-inch cartridge tape drives.

Priam 738 SCSI Disk Drive Configuration — PN 346-0011-01. Shows how to configure the 380 MB Priam 738 SCSI disk drive.

MAXTOR XT-8760S SCSI Disk Drive Configuration — PN 346-0012-01. Shows how to configure the 760 MB MAXTOR XT-8760S SCSI disk drive.

Fujitsu M2382K SMD Disk Drive Configuration — PN 346-0013-01. Shows how to configure the 1-gigabyte Fujitsu K2382M SMD disk drive.

Exabyte EXB-8200 Tape Drive Configuration — PN 346-0014-01. Shows how to configure the 2-gigabyte Exabyte EXB-8200 SCSI disk drive.

HP88780A Tape Drive Configuration — PN 346-0014-01. Shows how to configure the 1/2-inch HP 88780A reel-to-reel tape drive with SCSI interface.

Table 2-2. Field Replaceable Units and Part Numbers

part number	item
System Module Card Cage:	
155-0009-01	CPU Board–P1
155-0054-01	CPU Board–P2
155-0068-01	CPU Board–P3
155-0008-02	Memory Board, 32 MB
155-0007-01	I/O Board 1
155-0066-01	I/O Board 2
155-0010-01	Graphics Board (G2)
155-0069-01	Graphics Board (G3)
155-0015-01	Graphics Expansion Board
155-0016-01	VME Adaptor Board
130-0014-01	Fan Controller
155-0005-01	Power Supply
154-0001-01	Blank Slot Filler
Internal Mass Storage Devices:	
155-0004-01	Tape Drawer (tape)
155-0004-02	Tape/Disk Drawer (tape and 380 MB disk)
155-0004-03	Tape/Disk Drawer (tape and 760 MB disk)
130-0010-01	Tape Drive
155-0003-01	380 MB SCSI Disk Drawer (one disk)
155-0003-02	380 MB SCSI Disk Drawer (two disks)
130-0008-01	380 MB SCSI Disk Drive
155-0003-03	760 MB SCSI Disk Drawer (one disk)
155-0003-04	760 MB SCSI Disk Drawer (two disks)
130-0025-01	760 MB SCSI Disk Drive
130-0031-01	2-Gigabyte Tape Drive
155-0067-01	2-Gigabyte Tape Drive Kit
User Interface Module:	
130-0001-01	Monitor
130-0002-01	Keyboard
130-0003-01	Mouse and Mouse Pad
155-0012-01	Junction Box
130-0017-01	Stereo Monitor
130-0006-01	Knob Box
130-0005-01	Tablet

Table 2-2. Field Replaceable Units and Part Numbers (continued)

part number	item
Cables and Cords:	
100-0018-01	User Interface Cable (50')
100-0017-01	User Interface Cable (200')
100-0064-02	User Interface Cable, Stereo (50')
100-0064-01	User Interface Cable, Stereo (200')
100-0044-01	System Module Line Cord, USA 110V
100-0045-01	System Module Line Cord, USA 220V
100-0046-01	System Module Line Cord, Cont. Europe
100-0047-01	System Module Line Cord, Unterminated
100-0048-01	System Module Line Cord, Japan
100-0050-01	System Module Line Cord, LC British
100-0030-01	User Interface Module Line Cord, 110V USA
100-0059-01	User Interface Module Line Cord, British
100-0061-01	User Interface Module Line Cord, Cont. Europe
100-0062-01	Junction Box to Monitor AC Cord
100-0041-01	Short Coaxial Cable
Expansion Cabinet:	
155-0038-01	Stardent 1500/3000 Expansion Cabinet
N-ENC/200	Expansion Cabinet with VME Card Cage
130-0022-01	VME Card Cage
130-0019-01	AC Power Controller
155-0041-01	HP Tape Drive Kit
155-0061-01	Quad Drawer Kit with 4x380 MB disks
155-0062-01	Quad Drawer Kit with 4x760 MB disks
154-0022-01	Quad Drawer Kit with no disks
130-0008-01	380 MB SCSI Disk Drive
130-0025-01	760 MB SCSI Disk Drive
155-0040-01	Dual SMD Drawer with 1 Disk
155-0042-01	Dual SMD Drawer with 2 Disks
155-0071-01	Fujitsu 1 GB SMD Disk Drive
130-0029-01	SMD Drive Fan
130-0028-01	Dual SMD Drawer Power Supply
155-0044-01	Interphase Kit for VME Card Cage Installation
155-0043-01	Interphase Kit for VME Adaptor Board Installation
155-0059-01	HVE Repeater Kit

[2] See note 1.

Table 2-2. Field Replaceable Units and Part Numbers (continued)

part number	item
Expansion Cabinet Cables and Cords:	
100-0070-01	VME Card Cage AC Line Cord
100-0071-01	Expansion Cabinet Peripherals AC Line Cord
100-0068-01	Short (10') SCSI cable
100-0068-02	Long (13') SCSI cable
520-0112-01	SCSI terminator
100-0090-01	Short 26-pin SMD Data Cable
100-0090-02	Long 26-pin SMD Data Cable
100-0086-01	Short 60-pin SMD Control Cable
100-0086-02	Long 60-pin SMD Control Cable
100-0096-01	SMD Disk Drive Power Cables
Standard Software:	
170-0001-xx[2]	Bundled Software (P1/P2), domestic
170-0020-xx	Bundled Software (P3), domestic
170-0002-xx	Bundled Software (P1/P2), Export
170-0021-xx	Bundled Software (P3), Export
Optional Software Packages:	
170-0025-xx	Ada Compiler (P3 only)
170-0003-xx	Documenter's Workbench (P1/P2)
170-0023-xx	Documenter's Workbench (P3)
170-0006-xx	Doré Source, 1/4-inch QIC tape
170-0007-xx	Doré Source, 1/4-inch Sun tape
170-0008-xx	Doré Source, 1/2-inch tape
170-0009-xx	Doré Binary, Sun tape
170-0019-xx	Figaro
170-0005-xx	Fortran Compiler (P1/P2) only
170-0022-xx	Fortran Compiler (P3) only
170-0010-xx	Library of Contributed Software
170-0015-xx	Mathematica
170-0004-xx	NFS Package (P1/P2)
170-0024-xx	NFS Package (P3)

Table 2-2. Field Replaceable Units and Part Numbers (continued)

part number	item
Documentation:	
340-0102-xx	Ada Manual
340-0124-xx	Bisync Manual
340-0027-xx	C: A Reference Manual
340-0103-xx	Commands Reference Manual
340-0034-xx	Documenter's Workbench Manual
340-0057-xx	Doré Porting and Implementation
340-0107-xx	Doré Programmer's Guide
340-0108-xx	Doré Reference Manual
340-0109-xx	Field Service Manual
340-0110-xx	Figaro Manual Set
340-0111-xx	Fortran Reference Manual
340-0113-xx	Hardware Reference Manual
340-0119-xx	Installation and Administration Guide
340-0053-xx	Mathematica Manual
340-0055-xx	Mathematica User's Guide
340-0041-xx	MATLAB User's Guide
340-0126-xx	Network File System Manual
340-0115-xx	Principles of Operation Manual
340-0116-xx	Programmer's Guide
340-0121-xx	Programmer's Reference Manual (Vol. 1)
340-0122-xx	Programmer's Reference Manual (Vol. 2)
340-0023-xx	Site Preparation Guide
340-0125-xx	SNA RJE Manual
340-0118-xx	Start Here: User Guide
340-0114-xx	Window System Manual
340-0112-xx	Window System Toolkit
340-0022-xx	Xlib Reference Manual (2 volumes)

Table 2-2. Field Replaceable Units and Part Numbers (continued)

part number	item
Field Service Briefs:	
346-0001-01	System Module Door Removal
346-0002-01	Circuit Board Removal and Replacement
346-0003-01	I/O Drawer Device Removal and Replacement
346-0004-01	I/O Board Fuse Removal and Replacement
346-0005-01	I/O Board Configuration
346-0006-01	Power Supply Removal and Replacement
346-0007-01	System Module Voltage Testing
346-0008-01	Fan Controller Removal and Replacement
346-0009-01	Resetting the System
346-0010-01	Wangtek Cartridge Tape Drive Configuration
346-0011-01	Priam 738 SCSI Disk Drive Configuration
346-0012-01	MAXTOR XT-8760S SCSI Disk Drive Configuration
346-0013-01	Fujitsu K2382M SMD Disk Drive Configuration
346-0014-01	Exabyte EXB-8200 SCSI Tape Drive Configuration
346-0015-01	HP 88780A Tape Drive Configuration

SYSTEM MODULE DOOR REMOVAL

CHAPTER THREE

You can remove the Stardent 1500/3000 System Module rear door for improved access during I/O device or circuit board installation or removal.

Open the rear door as wide as possible. Lift the door vertically until the hinges clear the holes in the chassis hinge brackets (See Figure 3-1). Pull the door clear of the System Module chassis.

To reinstall, align the door hinges with the holes in the hinge brackets and lower the door into place.

NOTE
You can reach the Stardent Customer Support office at 1-800-537-1104.

NOTE
Follow these same steps to remove the System Module front door or the Expansion Cabinet front or rear doors.

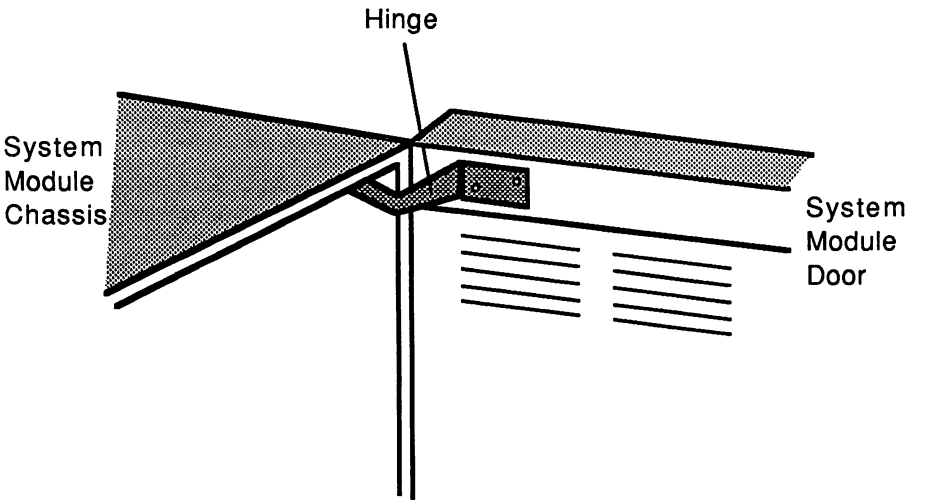


Figure 3-1. System Module Door Removal

CIRCUIT BOARD ADDITION OR REPLACEMENT

CHAPTER FOUR

Follow the procedure given here to replace a Stardent 1500/3000 circuit board or add a new circuit board to the system. Use Figure 4-1 for reference.

Step 1: Preparation. Wear a static wrist guard for the duration of the procedure. Make sure the system is powered down and unplugged at the AC circuit breaker on the back of the Stardent 1500/3000 System Module (see Figure 4-2).

Step 2: Preparation. Open the special, static-protected circuit board box that contains the new or replacement board.

Step 3: Preparation. Open the back door of the Stardent 1500/3000 System Module.

Step 4: Board Removal. Remove any cables blocking the board you wish to remove. The I/O, graphics and VME Expansion boards each have several cables to disconnect. The CPU board may have a cable connected to the DCP port; the graphics expansion board may have cables for external video recording.

Step 5: Board Removal. Simultaneously loosen the knobs on the two extractor rods that secure the board to the card cage. The rods are located at the top and bottom of the board. Loosening the knobs simultaneously prevents misalignment problems. If you wish, you can use extractor/adaptor knobs to help loosen the rods (Stardent Computer Corp. part number 210-0411-01).

Step 6: Board Removal. Gently slide the board out of the card cage (see Figure 4-1).

Step 7: Board Removal. Place the board in the open board box on the static-protective spongy material. Carefully remove the static-protective bubble wrap from the new board and enclose the old board in it. Make sure the board box is packed carefully with

NOTE
You can reach the Stardent Customer Support office at 1-800-537-1104.

WARNING
Failure to wear a static wrist guard can cause an electrostatic discharge (ESD) and seriously damage electronic board components. DO NOT TOUCH BOARD COMPONENTS.

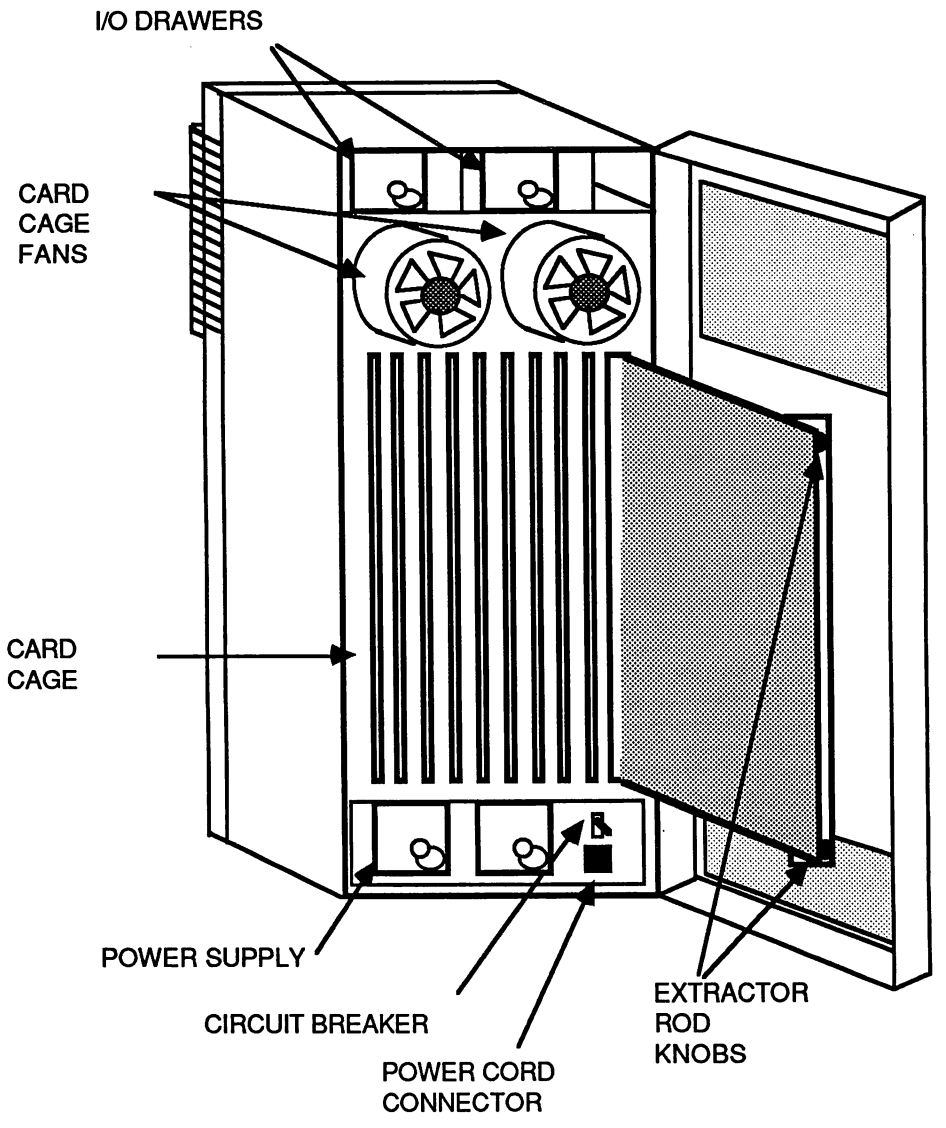


Figure 4-1. Circuit Board Removal

its static-protective material before you send the old board back for service.

Step 8: Board Installation. If you have not already done so, carefully remove the static-protective bubble wrap from the new or replacement board.

Step 9: Board Installation. Make sure that no cables are blocking the slot where the board is to be placed.

Step 10: Board Installation. Carefully slide the board into the appropriate slot in the card cage, making sure the board slides into both the upper and lower tracks. As you slide the board in the component side should be on your right. Continue sliding the board until it touches firmly against the backplane.

Step 11: Board Installation. Secure the board with at the top and bottom, making sure to manipulate both knobs simultaneously. By turning both knobs simultaneously you apply uniform pressure to the backplane and assures proper seating of the connectors. Make the knobs finger-tight. The board's back panel should now be flush with the back panels of all of the other boards in the card cage.

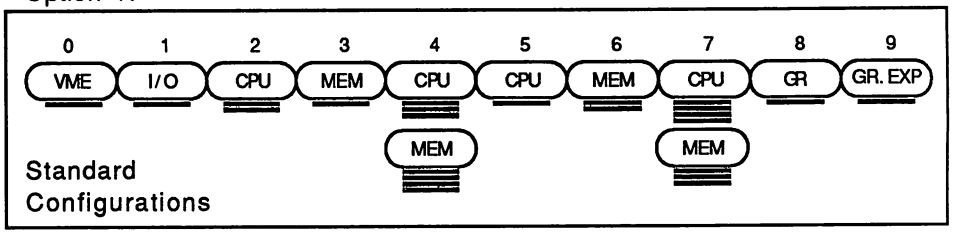
If you are adding a new board, use Figure 4-3 to confirm the correct card cage slot.

Step 12: Board Installation. Connect cables to the new board as needed and screw down any locking screws. If you need instructions on connecting cables, see the *Installation and Administration Guide.*

You can now close the back of the System Module and reboot the system.

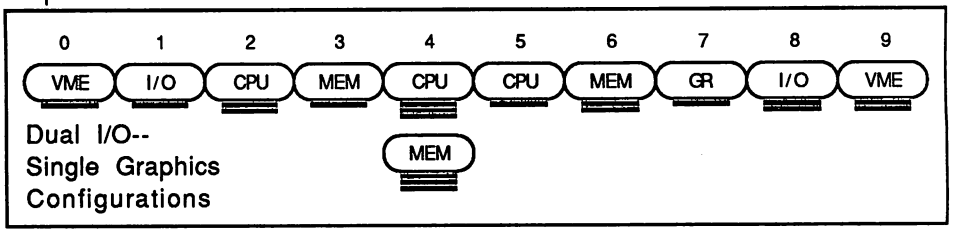
BACKPLANE A

Option 1:

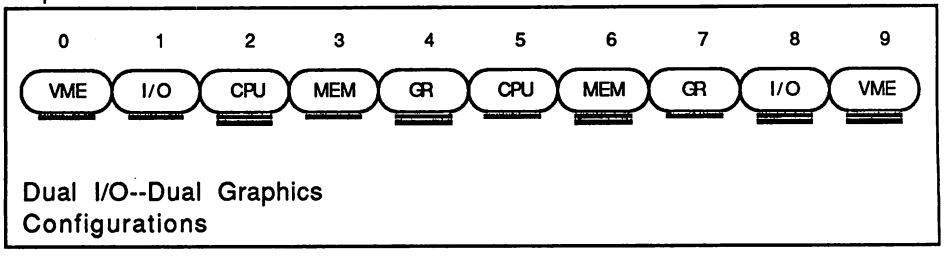


BACKPLANE B

Option 2:



Option 3:



Option 4:

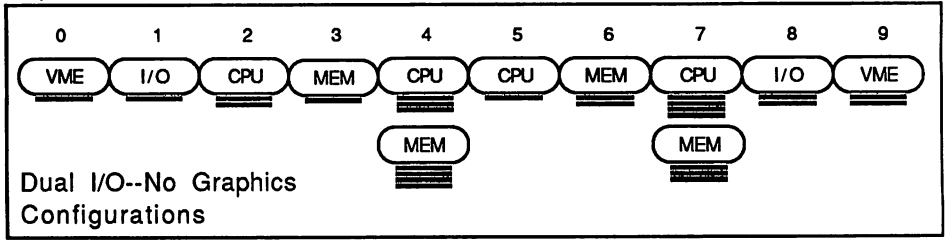


Figure 4-2. Circuit Board Configuration

I/O DRAWER REMOVAL AND REPLACEMENT

CHAPTER FIVE

This chapter describes how to remove the Stardent 1500/3000 System Module I/O drawers and how to remove and install SCSI disk and tape drives in the I/O drawers. Please refer to Chapter 14 for instructions on how to configure SCSI disk and tape drives.

NOTE
You can reach the Stardent Customer Support office at 1-800-537-1104.

Step 1: Preparation. Wear a static wrist guard to protect against electrostatic discharge. Have a Phillips screwdriver available.

Step 2: Preparation. Make sure the system is completely powered down. **If you have just powered the system down, wait at least 20 seconds before beginning to remove the I/O drawer.** This ensures that the drive heads have been locked.

Step 3: I/O Drawer Removal. Unlock and open the hinged door on the front of the Stardent 1500/3000 System Module. Note that the door is secured with a key along its right edge. Refer to Figure 5-1.

CAUTION
For safety reasons the front door should remain locked when not needed for immediate access.

Step 4: I/O Drawer Removal. Disconnect the cable pair from the drawer by loosening the two black screw heads on either side of the drawer and pulling gently to release the cable support.

Step 5: I/O Drawer Removal. Locate the two horizontal snap-locks on either side of the I/O drawer you wish to remove. Slide the fasteners horizontally away from the drawer.

Step 6: I/O Drawer Removal. Slide the drawer out. Note that each drawer weighs 25-30 pounds when full.

Step 7: Disk or Tape Drive Removal. Remove the 14 Phillips screws that the secure the cover of the I/O drawer. There are 4 screws on the front, 4 on the back, and 3 on each side. The four screws on the front have washers.

Step 8: Disk or Tape Drive Removal. Remove the metal cover of the I/O drawer.

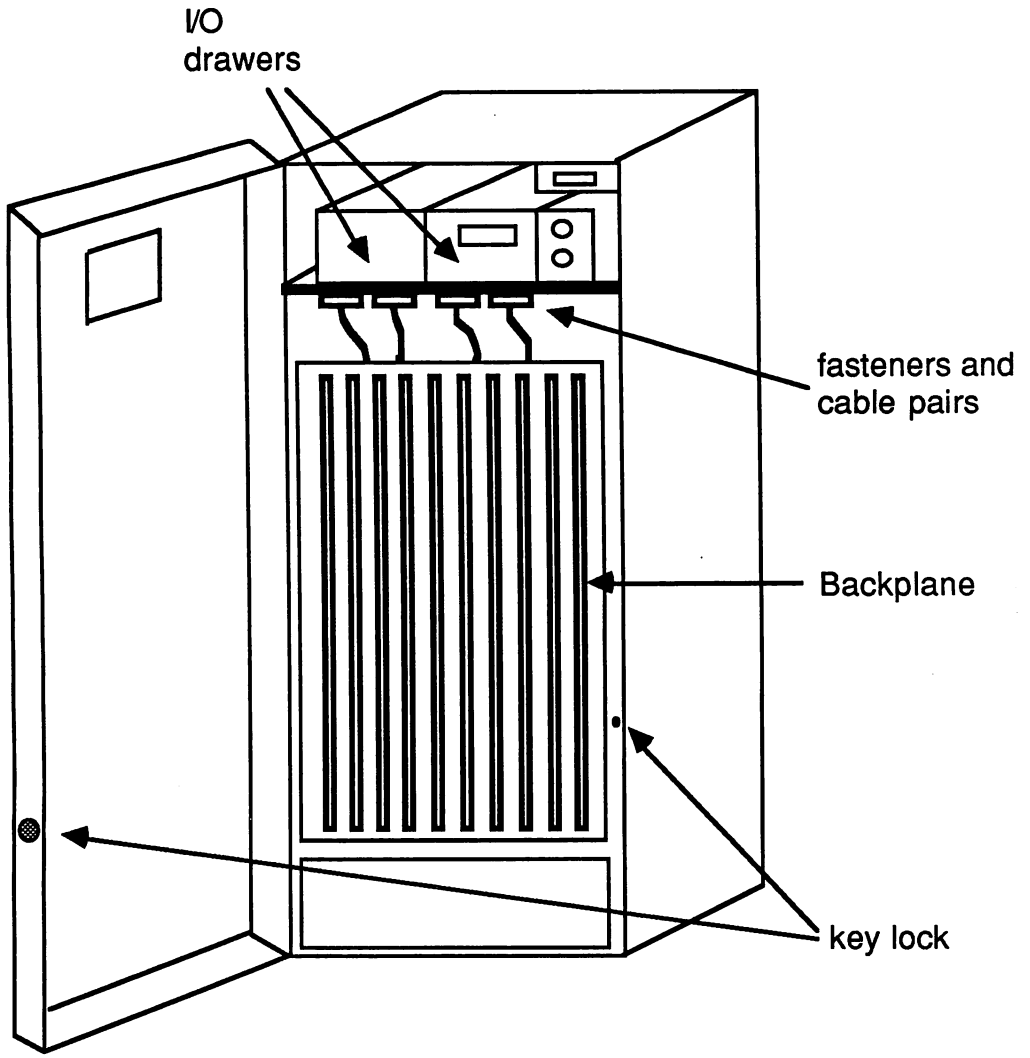


Figure 5-1. Stardent 1500/3000 System Module--Front Door Open

Step 9: Disk or Tape Drive Removal. Unplug the flat ribbon cable attached to the disk or tape drive (marked at location A in Figure 5-2). When you pull, use the white ribbon attached to the ribbon cable to avoid direct strain on the cable itself. Pull horizontally.

Step 10: Disk or Tape Drive Removal. Disconnect the white-tipped power cable(s) (marked as B in Figure 5-2). The cartridge tape drive has two power cables; the SCSI disk drive has one.

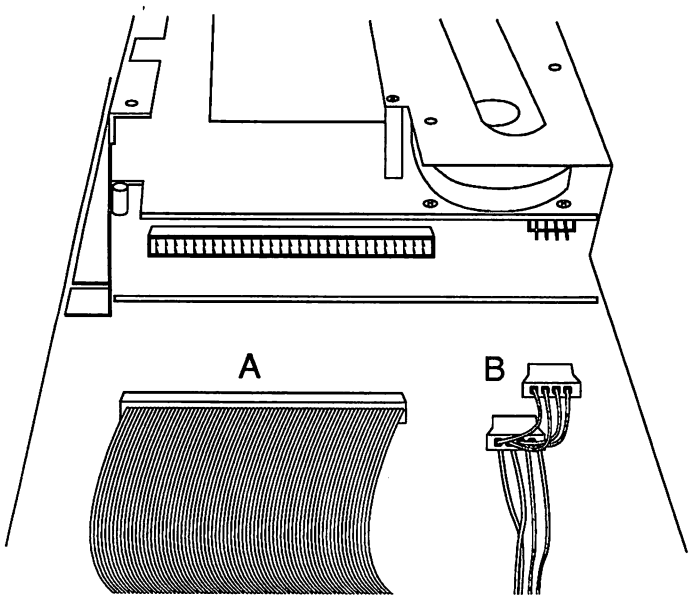


Figure 5-2. Drive Cables

Step 11: Disk or Tape Drive Removal. Remove the 4 Phillips screws that connect the disk or tape drive to the I/O drawer. There are two screws with washers on each side. Refer to Figure 5-3.

Step 12: Disk or Tape Drive Removal. The cartridge tape drive may have some strips of metallic tape attached to the drive and I/O drawer. If so, loosen the metallic tape before removing the cartridge tape drive.

Step 13: Disk or Tape Drive Removal. Remove the cartridge tape or disk drive. The disk drive can be lifted up and out. The tape drive must slide out the front of the I/O drawer.

Step 14: Disk or Tape Drive Installation. Unpack the new SCSI disk or cartridge tape drive and record its serial number.

Step 15: Disk Drive Installation. You must configure the new SCSI disk or tape drive prior to installation. Chapter 14 gives instructions for configuring each disk and tape device supported by Stardent 1500/3000.

Step 16: Disk or Tape Drive Installation. Place the disk or tape drive in the drawer and secure it with 4 Phillips screws (with washers). The tape drive should slide in through the hole in the

front. Secure any metallic tape. Figure 5-4 shows I/O drawer device IDs and locations.

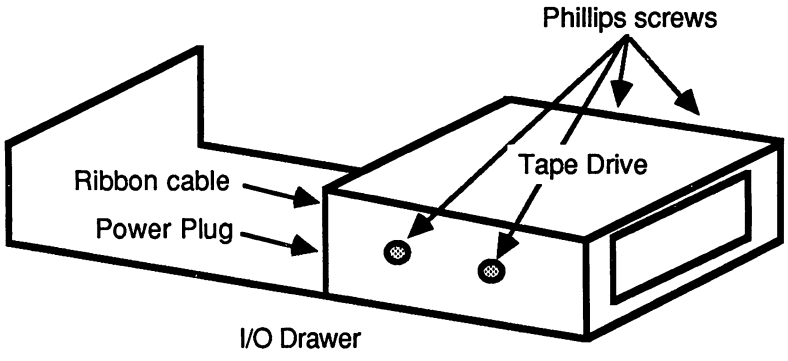


Figure 5-3. I/O Drawer Screw Locations

Step 17. Disk or Tape Drive Installation. Connect the ribbon cable and the white-tipped power cable(s) to the disk or tape drive (disk drives have one power plug; the tape drive has one or two plugs, depending upon the vintage). Make sure the cables are firmly seated.

Step 18. Disk or Tape Drive Installation. Before replacing the I/O drawer cover we recommend that you place the uncovered drawer in the Stardent 1500/3000 System Module, power up the machine in diagnostic mode, and run the diagnostic *periph.diag*. If *periph.diag* fails it is a signal to check that all cable connections are secure and that the drive is otherwise installed correctly. Follow the remaining steps in this procedure with the I/O drawer cover off, then repeat the steps once you have replaced the cover. When you replace the cover make sure that the label end is in the front and that the fourteen Phillips screws are secure but not overly tight.

19. Disk or Tape Drive Installation. Slide the I/O drawer into its slot in the front of the Stardent 1500/3000 System Module. Fasten the black screw heads on either side of the drawer and reconnect the cable pair.

20. Disk or Tape Drive Installation. Close the front door of the System Module, lock the door and remove the key, turn the lower front panel key switch to the "diagnostic" position, and power on the machine.

21. Disk or Tape Drive Installation. Boot the peripheral diagnostics program by typing

```
prom 1> b stand/periph.diag
```

The program checks the device configuration and runs some diagnostic tests. (Appendix C describes the specific tests and error messages.) If no problems are found you may to replace the I/O cover, if necessary, and boot the UNIX system.

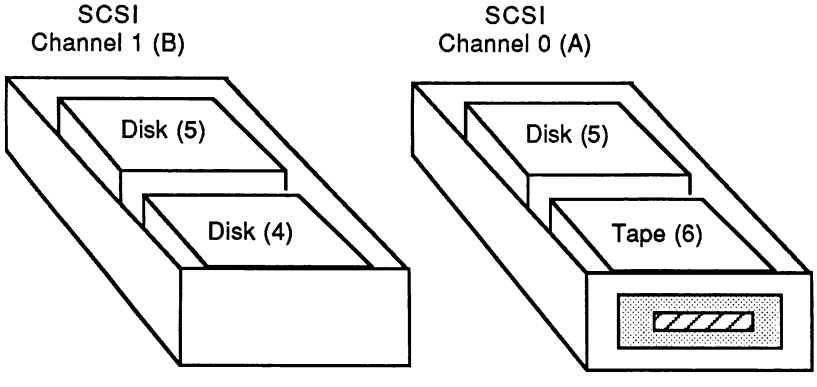


Figure 5-4. I/O Drawer Device Numbers

I/O BOARD PROCEDURES

CHAPTER SIX

This chapter explains the following two procedures:

- Configuring the I/O board for placement in card cage slot 1 or slot 8.
- Replacing the SCSI or Ethernet fuses on the I/O board.

NOTE
You can reach the Stardent Customer Support office at 1-800-537-1104.

Configuring the I/O Board

Two versions of the Stardent 1500/3000 System Module I/O board are currently available. The first, Stardent #155-0007-01, is used with the single I/O board backplane. The second, Stardent #155-0066-01, is used with the dual I/O board backplane. **This procedure applies only to I/O board 2, which is used with the dual I/O backplane.**

Step 1: Stardent 1500/3000 Power Off. The Stardent 1500/3000 **must** be powered off whenever removing the I/O board. See the *Installation and Administration Guide* for details on how to power down the Stardent 1500/3000 safely.

Step 2: I/O Board Removal. Carefully unpack the I/O board and place it on its static-protective packaging material. (If you need to reconfigure a currently-installed I/O board, remove the board from the card cage according to the instructions in Chapter 4, *Circuit Board Removal and Replacment.*

Step 3: SCSI Terminators. There are 2 sets of 5 internal SCSI terminators on the I/O board, U010B5-U010G2 and U036E9-U040E9. Exactly one set must be terminated; which one depends on the location of the I/O board (slot 1 or slot 8). The terminators are 10-pin SIPs and the sets are interchangeable. See Table 6-1 for the SCSI terminator configurations, and see Figure 6-1 for the locations of the two terminator sets.

Step 4: Jumpers. Table 6-1 shows how to configure jumper U103J4 and header U135M2. Figure 6-2 shows their locations on the I/O board.

Table 6-1. I/O Board Configuration

SLOT No.	HEADER U135M2	JUMPER U103J4	TERMINATORS U101B5-U010G2	TERMINATORS U036E9-U040E9
1	connect 2-3	out	empty	terminated
8	connect 1-2	in	terminated	empty

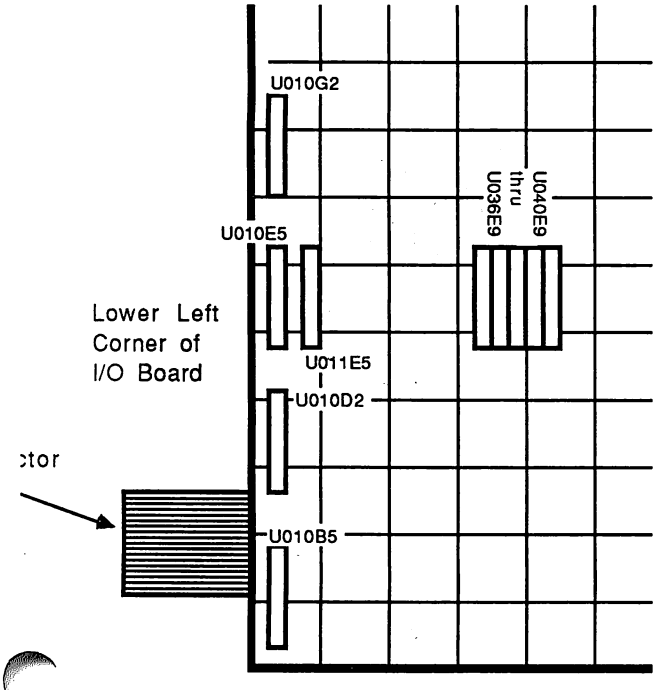


Figure 6-1. I/O Board Internal SCSI Terminator Locations

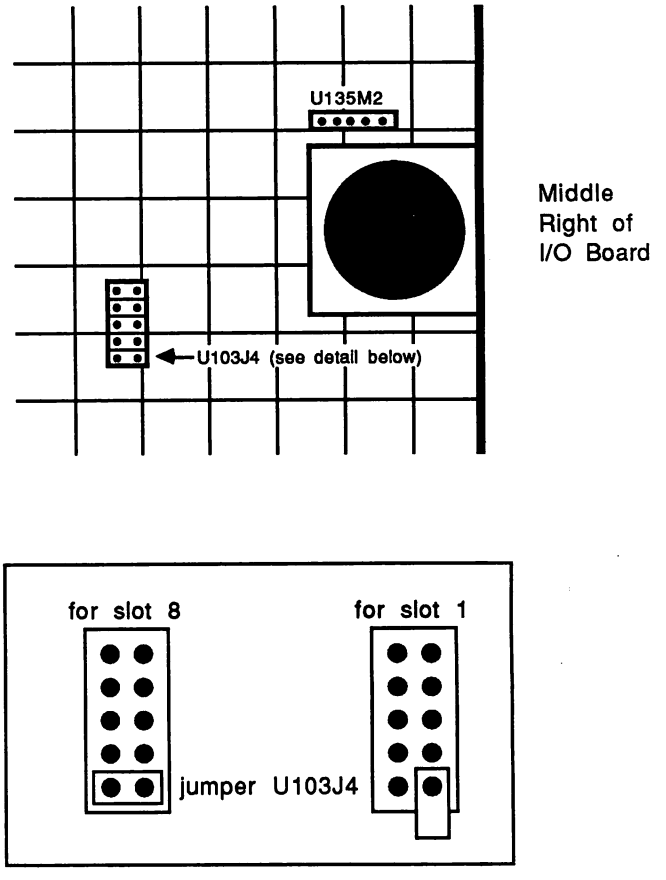


Figure 6-2. I/O Board Jumper Locations

I/O Board Fuse Removal

Follow the procedure given here to replace the SCSI or Ethernet fuses on the Stardent 1500/3000 System Module I/O board.

Step 1: Preparation. You need a Micro 2A-273 2 amp, 125 volt fuse for this procedure. We recommend that you have an Ohmeter available.

Step 2: Stardent 1500/3000 Power Off. The Stardent 1500/3000 **must** be powered off when removing the I/O board. See the *Installation and Administration Guide* for details on how to power down the Stardent 1500/3000 safely.

Step 3. Follow the instructions in Chapter 4 to remove the I/O board from the card cage.

Step 4. Figure 6-3 shows the location of the two fuses. Their orientation is parallel to the board and in the direction shown. We recommend that you use an Ohmeter to check if the existing and new fuses are good. (It is difficult to check visually.) A short indicates a good fuse; an open indicates a bad fuse.

Step 5. Unplug and replace the bad fuse. The fuse has the orientation shown in the figure.

Step 6. Replace the I/O board according to the instructions in Chapter 4.

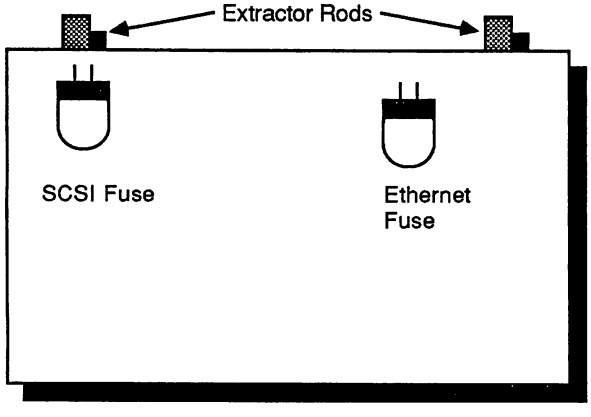


Figure 6-3. I/O Board Fuse Locations

POWER SUPPLY REPLACEMENT

CHAPTER SEVEN

Follow the procedure given here to replace the Stardent 1500/3000 System Module power supply.

NOTE
You can reach the Stardent Customer Support office at 1-800-537-1104.

Step 1: Preparation. You need a Phillips screwdriver and an adjustable wrench for this procedure. Make sure that the system is completely powered down and unplugged. Open the hinged door on the front of the Stardent 1500/3000 System Module. Note that the door is secured with a key along its right edge.

Step 2. Unlock and open the back door of the System Module (the same key is used to lock the front and back doors). If you wish you may remove the back door for easier access. (See Chapter 3 for door removal instructions.)

Step 3. Remove the metal power supply restraint from the power supply chassis (there is one Phillips screw to remove). Then remove the power cable from the back of the System Module. You may need to remove the metal cable and cord guard before removing the power cord itself.

Step 4. Return to the front of the System Module. Remove the 5 Phillips screws (3 top, 2 bottom) that hold the plastic guard to the power supply unit. Remove the plastic guard.

Step 5. Remove the cable connections to the power supply unit. **Do not remove any cable connections to the back plane!** There are five Phillips connections, two nut connections, and one J1 connection. Connector locations and voltages are printed on the power supply unit and shown in Figure 7-1. Replace the screws and nuts as the cables are removed. Note that the J1 cable is not screwed in. It can just be pulled.

Step 6. Move cables out of the way to free the power supply unit. Note that the nut-connected cables are quite stiff. They must be moved carefully to free the power supply unit.

Step 7. Return to the back of the System Module. Remove the 4 Phillips screws (2 on each side) that connect the power supply unit to the System Module chassis.

Step 7. Slide the power supply unit out the back of the System Module. **The unit weighs about 57 pounds, so be careful.**

Step 8. To install a new power supply unit, reverse the above procedure. Consult Figure 7-1 before connecting the cables to the power supply unit. Make sure all connections are tight.

Once you have finished replacing the power supply, relock the front door of the System Module prior to powering the system on. (You may also relock the back door, but that isn't necessary.)

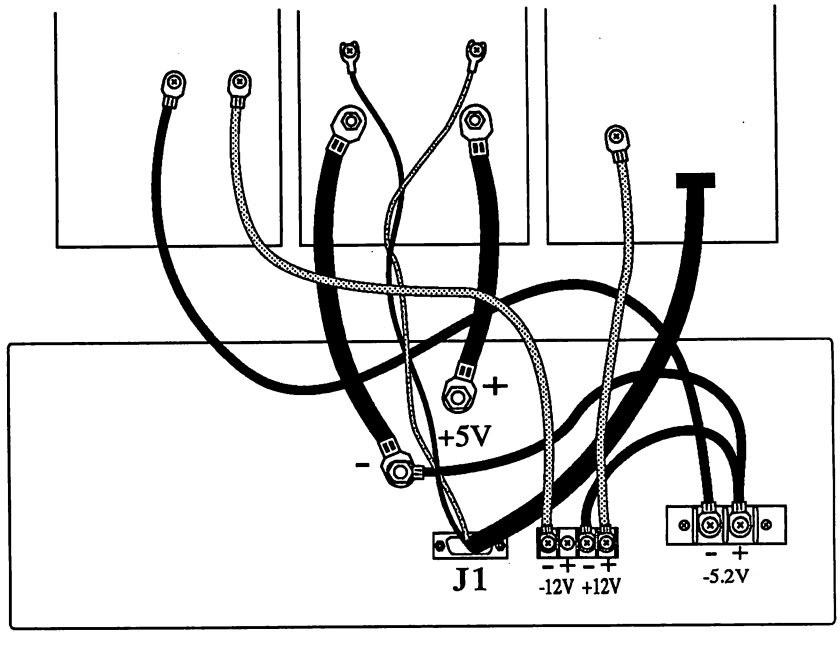


Figure 7-1. Stardent 1500/3000 System Module Power Supply Connections

SYSTEM MODULE VOLTAGE TESTING

CHAPTER EIGHT

Follow the procedure given here to check Stardent 1500/3000 System Module voltages.

Step 1: Preparation. A Phillips screwdriver and a voltmeter are required for this procedure.

Step 2: Preparation. Remove any jewelry or metal that could come in contact with the backplane.

Step 3:. Unlock and open the front door of the Stardent 1500/3000 System Module.

Step 4:. The backplane is covered by a protective plastic shield. The shield connected to the backplane by 4 Phillips screws. Remove the lower 2 screws and loosen the upper 2 screws so that the plastic shield swings open slightly at the bottom and permits voltmeter access to the cable connections shown in Figure 8-1.

Step 5:. Jiggle the thick power cables labeled "GND" and "+5V" in Figure 8-1. If they are loose, tighten them before checking voltages.

Step 6:. Use the voltmeter to check the voltages on the backplane. The correct voltages are printed on the backplane itself. You may find them difficult to read, however, so refer to Figure 8-1 to be sure of the correct testing location and value. The voltages should be accurate to within 2 percent.

Step 7:. Once you have checked the voltages, carefully reattach the plastic protective shield and tighten the 4 screws. Close and lock the front door of the System Module.

NOTE
You can reach the Stardent Customer Support office at 1-800-537-1104.

WARNING
The System Module backplane carries potentially dangerous high current levels. Remove all jewelry and metal before beginning this procedure.

CAUTION
For safety reasons the front door should remain locked when not needed for immediate access.

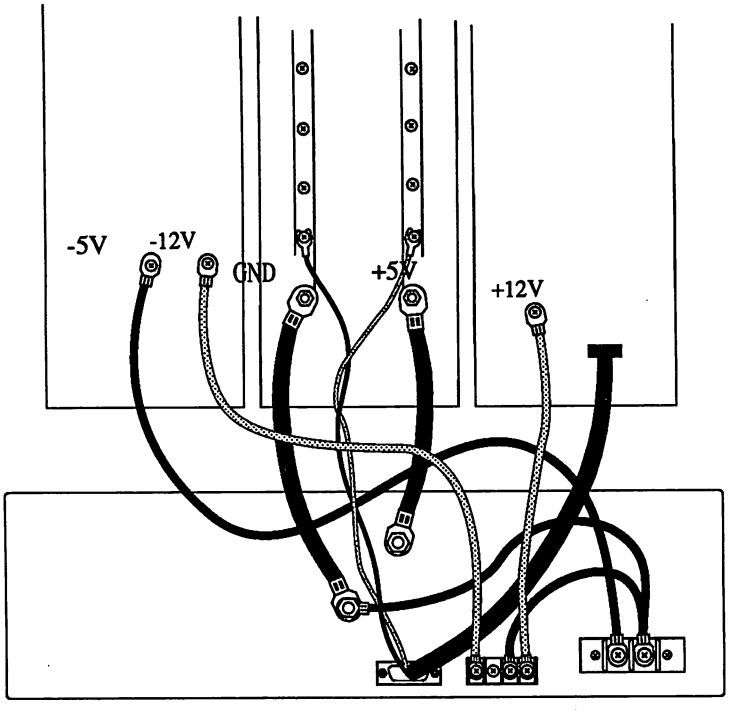


Figure 8-1. Power Supply Connections and Voltage Values

FAN CONTROLLER REPLACEMENT

CHAPTER NINE

The Stardent 1500/3000 System Module fan controller board is located at the back of the System Module, behind the fan on the right side. Follow this procedure to remove the controller board for replacement.

NOTE
You can reach the Stardent Customer Support office at 1-800-537-1104.

Step 1: Stardent 1500/3000 Power Off. Stardent 1500/3000 **must** be powered off to remove the fan controller board. See the *Installation and Administration Guide* for details on how to power down the Stardent 1500/3000 safely.

Step 2: Fan Removal. Remove the 2 screws that connect the right fan and fan shield to the back of the Stardent 1500/3000 System Module (see Figure 9-1). Remove the fan shield. Remove the 2 sets of wires that connect the fan to the controller board. **Note their attachment positions for later replacement** (see Figure 9-2).

Step 3: Wire Removal. Remove the 3 sets of wires that connect the temperature sensors to the controller board. **Note their attachment positions for later replacement** (see Figure 9-2). Remove the 2 sets of controller power wires from the controller board.

NOTE
Special care must be taken when removing the fan controller board. The plastic pins on which the board is mounted are not flexible, and the board can easily be broken.

Step 4: Board Removal. **Carefully** pull the board straight off the 4 plastic pins to remove.

Step 5: Replacement. Reverse the steps above to replace the fan controller. Carefully unpack the new controller, push it against the plastic pins (Figure 9-2), reattach the controller wires, place the new controller in the proper location at the back of the System Module, and reattach the fan shield and connecting screws.

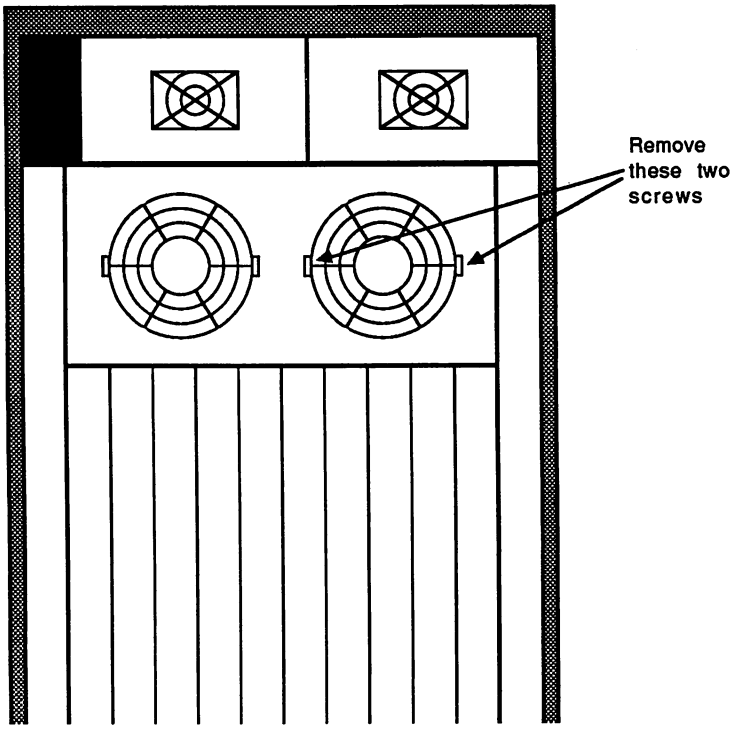


Figure 9-1. Stardent 1500/3000 System Module Rear

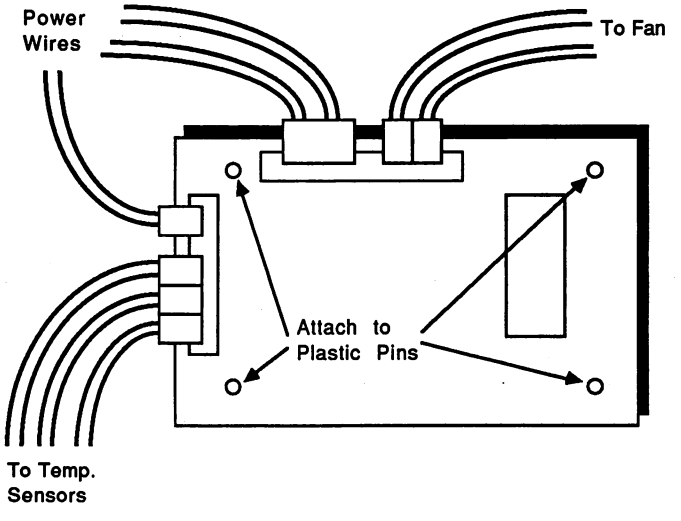


Figure 9-2. Fan Controller Board--Wiring Detail

MONITOR ADJUSTMENTS

CHAPTER TEN

Field adjustments for the Sony GDM 1950 graphic display monitor and the are described in the Sony Monitor *Service Manual.* This chapter contains notes to help you perform the adjustments described in the Sony manual. Have the manual in hand as you read this chapter.

Note 1: Preparation. Two tools are required for monitor adjustments: a Phillips screwdriver and a special adjustment tool. The special adjustment tool is stored within the monitor casement.

Note 2. Follow the illustrations in Chapter 2 of the Sony manual to remove the outer cover of the monitor and the EMI shield. Field adjustments are performed in three locations:

- The "L1" board, a partially detachable block of adjustment knobs used for convergence adjustments. See Figure 2-4 in the Sony manual.
- The "D" board, Figure 2-5 in the Sony manual.
- Behind the "D" board, where focus, screen, and horizontal stat. adjustment knobs are located. See Figure 2-6 in the Sony manual.

Note 3. Chapter 4 in the Sony manual describes the adjustments themselves. To perform the adjustments you must generate test patterns. Scripts to generate test patterns are available. Check with the Stardent Customer Support head office.

Note 4. The acronym *VR* used throughout the manual means *variable resistor* (potentiometer).

Note 5. The picture projection test (1. in the Sony manual) requires a white cross-hatch test pattern. SCREEN VR refers to the screen potentiometer in Figure 2-6 of the manual.

Note 6. The following adjustments should not be done in the field:

- White balance coarse adjustment (2-1)
- Beam landing coarse adjustment (2-2)
- Convergence coarse adjustment (2-3)
- Beam landing adjustment (2-4)

Note 7. Use a green cross-hatch test pattern for the following adjustments:

- Top and bottom pincushion distortion (2-6)
- Vertical and horizontal position and size (2-7)
- Horizontal pincushion distortion (2-8)
- Vertical linearity (2-9)

Note 8. Use a white cross-hatch signal for the focus adjustment (2-10).

Note 9. Omit the static convergence adjustment (2-11).

Note 10. Use a white cross-hatch test pattern for the dynamic convergence adjustment (2-12).

Note 11. Omit the white balance adjustment (2-13) and the safety related adjustments (3.).

VME CARD CAGE PROCEDURES

CHAPTER ELEVEN

Use this chapter when performing any of the following procedures:

- Adding an Interphase Controller board to the VME Card Cage
- Removing and replacing Interphase Controller boards in the VME Card Cage
- Removing and replacing an HVE Repeater board in the Stardent 1500/3000 System Module VME Adaptor board
- Removing and replacing the HVE Repeater Cables
- Removing and replacing an HVE Repeater board in the Expansion Cabinet VME Card Cage
- Removing and replacing the entire VME Card Cage from the Expansion Cabinet

NOTE
To have the VME Card Cage power supply replaced, call the Stardent Customer Support Office at 1-800-537-1104.

Do not perform any of the procedures in this chapter without replacement parts on hand; the Stardent 1500/3000 System Module must be down until all parts are replaced.

Adding an Interphase Controller to the Card Cage

Adding a new board to the VME card cage differs from replacing a board in that backplane jumpers must be removed from any slots that are being configured with new boards. Follow the procedure in this section to add new controller boards and follow the procedure in the next section to remove and replace controller boards.

The Interphase Controller kit for the VME Card Cage (# 155-0044-01) comes assembled with a filler board with modified front panel, an Interphase Controller board, and the internal wiring to

connect the front panel sockets to the board. Adding an Interphase Controller is simply a matter of replacing the empty filler board with an Interphase board assembly.

Step 1: Stardent 1500/3000 Power Off. The Stardent 1500/3000 **must** be powered off whenever removing or adding peripheral devices. See the *Installation and Administration Guide* for details on how to power down the Stardent 1500/3000 safely.

Step 2: Preparation. Turn off the Expansion Cabinet AC Power Controller. Remove the AC Power cord that connects the Power Controller to the VME Card Cage.

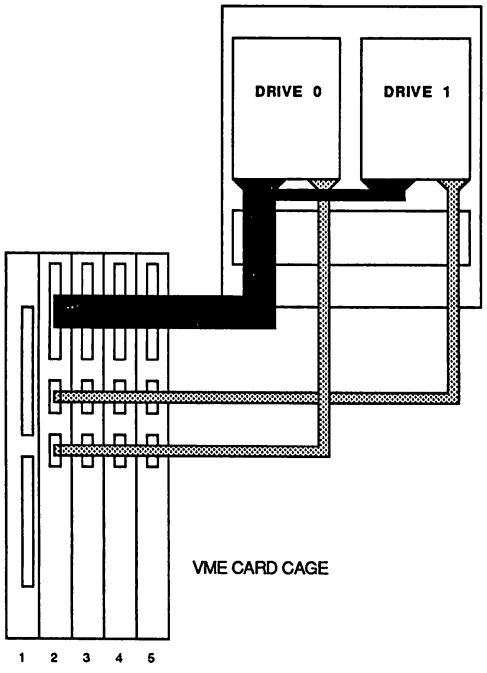


Figure 11-1. Wiring a New Interphase Controller to the SMD Drawer

Step 3: Removing the Filler Board. New controller boards should be placed consecutively in the card cage, beginning with slot 2. Unscrew the two screws at the top and bottom of the board in the slot where the new controller is to be installed. Grab hold of the two black levers and push them away from each other (see Figure Figure 11-2). Slide the board out of the Card Cage.

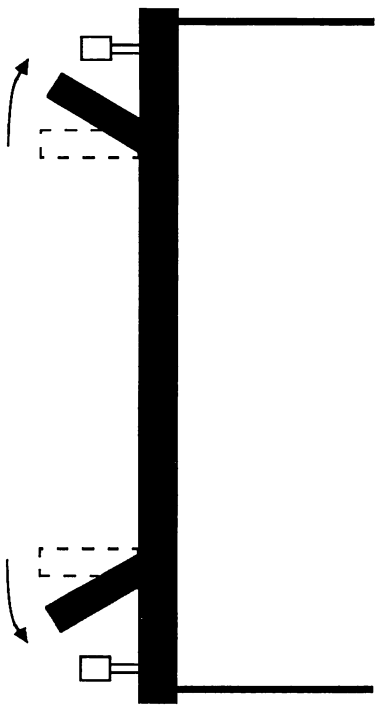


Figure 11-2. Removing VME Card Cage Board Fillers

Step 4: Setting the Board Address. Controller board addresses are ordered sequentially as shown in Figure 11-3. Set the DIP switch bank according to the figure, depending on which slot the new controller board occupies (the DIP switch bank is at location J4 on the controller board). Contact Stardent Customer Support (1-800-537-1104) if you wish to place more than four SMD controllers in a card cage. Also, before you assign device numbers, check Table 11-5 in the chapter entitled *System Overview*.

Step 5: Inserting the Board Assembly. Insert the new board assembly into the vacant slot. Tighten the two screws at the top and bottom of the board.

Step 6: Attach Drive Cables. Attach the 60-pin control cable and 26-pin data cable(s) that connect the Interphase Controller board assembly to the Dual SMD Drive Drawer. The data cable from drive 0 goes to the lower 26-pin slot on the board assembly, and the data cable from drive 1 (if present) goes to the upper 26 back-pin slot (see Figure 11-1).

NOTE
Some VME Card Cage models have backplanes without a jumper window. In this case, the entire back panel must be removed to access the jumpers (12 screws).

Boards should be placed consecutively in the card cage, beginning with slot 2. To help troubleshoot problems, however, you may want to test boards in non-consecutive positions. We believe (though have not yet confirmed) that this is possible. Remove the jumpers from the slots in which you are testing boards and replace jumpers for all unused slots. Always store unused jumpers as shown in Figure 11-4.

Step 7: Remove Backplane Jumpers. Remove the 3 screws on the card cage jumper window (see Figure 11-4). Remove the 5 jumpers labeled PX00-PX04 on the slot with the new controller board (see Figure 11-5). Replace the jumper window.

The controller is now installed. You can now complete other procedures as needed and then power up the system.

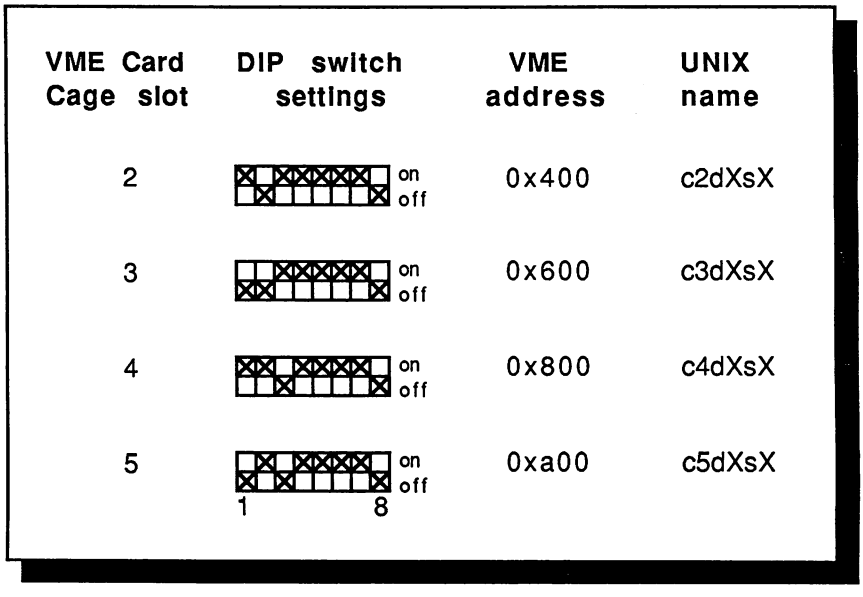


Figure 11-3. Interphase Controller Board DIP Switch Settings

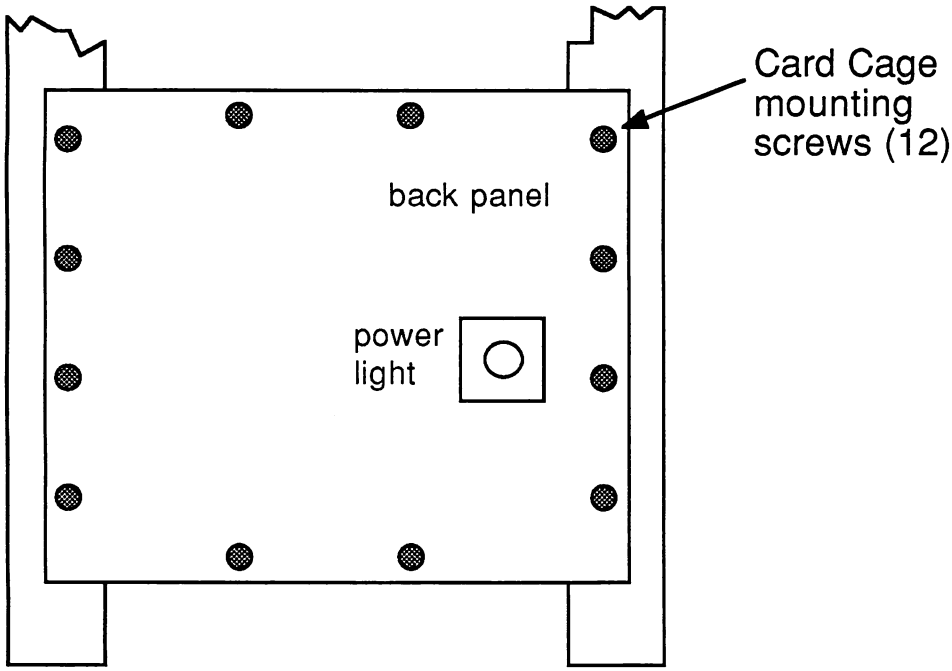


Figure 11-4. VME Card Cage Back Panel--Jumper Access

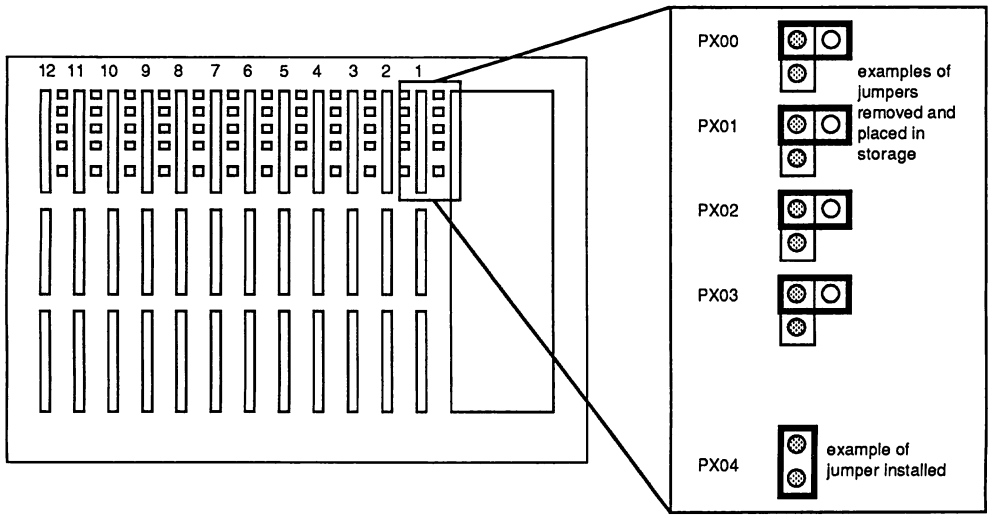


Figure 11-5. VME Card Cage Board Slot Jumpers

Replacing Controller Boards

The Interphase Controller kit for the VME Card Cage (# 155-0044-01) comes assembled with a filler board with modified front panel, an Interphase Controller board, and the internal wiring to connect the front panel sockets to the board. Replacing an Interphase Controller is simply a matter of replacing the entire board assembly.

Step 1: Stardent 1500/3000 Power Off. The Stardent 1500/3000 **must** be powered off whenever removing or adding peripheral devices. See the *Installation and Administration Guide* for details on how to power down the Stardent 1500/3000 safely.

Step 2: Preparation. Turn off the Expansion Cabinet AC Power Controller. Remove the AC Power cord between the Power Controller and the VME Card Cage.

Step 3: Remove Drive Cables. Remove the 60-pin control cable and 26-pin data cable(s) that connect the Interphase Controller board assembly to the Dual SMD Drive Drawer.

Step 4: Removing the Board Assembly. Unscrew the two screws at the top and bottom of the board in the slot where the new controller is to be installed. Grab hold of the two black levers and push them away from each other (see Figure 11-2). Slide the board out of the Card Cage.

Step 5: Verify Board Address. Check to see that the DIP switches at location J4 on the controller board are set correctly according to Figure 11-3. DIP switch settings vary depending on which slot the controller board occupies.

Step 6: Replacing the Board Assembly. Insert the new board assembly into the correct slot. Tighten the two screws at the top and bottom of the board.

Step 7: Attach Drive Cables. Attach the 60-pin control cable and 26-pin data cable(s) that connect the Interphase Controller board assembly to the Dual SMD Drive Drawer. The data cable from drive 0 goes to the lower 26-pin slot on the board assembly, and the data cable from drive 1 (if present) goes to the upper 26-pin slot (see Figure 11-1).

Replacing an HVE Repeater Board in the System Module

Use this procedure to remove and replace an HVE Repeater board located in the Stardent 1500/3000 System Module VME Adaptor board. Note that the Primary HVE Repeater board is located in the System Module VME Adaptor Board, while the Secondary (Expansion) Repeater board resides in the VME Card Cage.

Step 1: Stardent 1500/3000 Power Off. The Stardent 1500/3000 **must** be powered off whenever removing or adding peripheral devices. See the *Installation and Administration Guide* for details on how to power down Stardent 1500/3000 safely.

Step 2: Preparation. Turn off the Expansion Cabinet AC Power Controller. Remove the AC Power cord that connects the Power Controller to the VME Card Cage.

Step 3: Removing the VME Adaptor Board. Loosen the two knobs at the top and bottom of the VME Adaptor board and slide the board out. For details on board removal, see Chapter 4, *Circuit Board Addition or Replacement.*

Step 4: Removing the HVE Repeater. Place the VME Adaptor board on a flat surface with the component side up. Remove the two shielded ribbon cables from the repeater board. Check to see that the two black levers closest to the VME board front panel are in their horizontal position. Simultaneously push the two black levers near the rear of the repeater board towards each other (see Figure 11-6). Lift the repeater board from the lower bay. Return the two rear black levers to their original position.

Step 5: Replacing the HVE Repeater. Place the new HVE Repeater in the lower bay. Simultaneously push the two black levers closest to the VME board front panel towards each other until the repeater is firmly in place. Return the levers to their original position. Replace the two shielded ribbon cables.

Step 6: Replacing the VME Adaptor Board. Replace the VME Adaptor board in the Stardent 1500/3000 System Module. See Chapter 4, *Circuit Board Addition or Replacement,* for details.

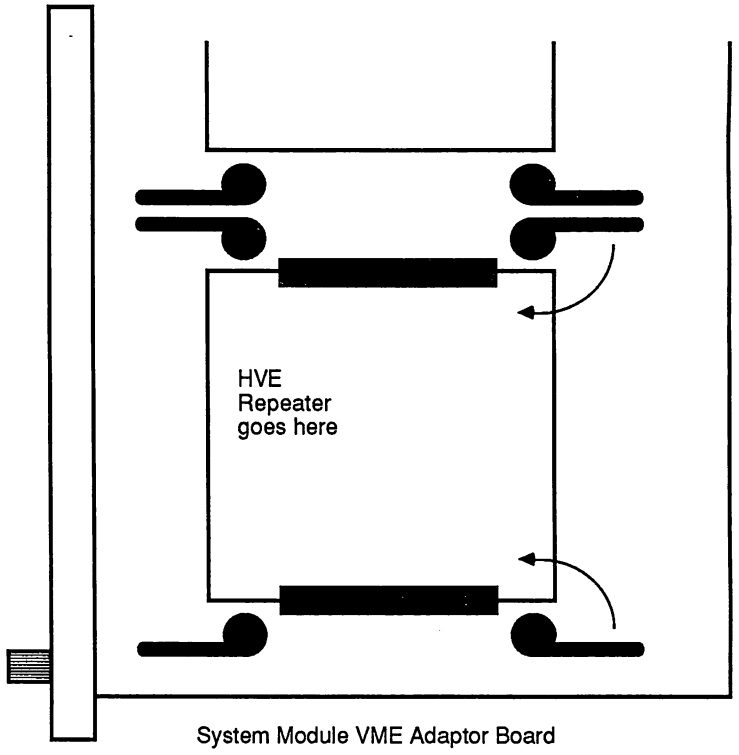


Figure 11-6. Removing a Repeater Board from the VME Adaptor Board

Replacing the HVE Repeater Cables

Use this procedure to replace the two shielded ribbon cables that connect the Stardent 1500/3000 System Module VME Adaptor board to the Expansion Cabinet VME Card Cage. Note: the two cables are different; one is a 50-position cable, the other is 60-position. When replacing, be sure to connect the cables to their correct socket.

Step 1: Stardent 1500/3000 Power Off. The Stardent 1500/3000 **must** be powered off whenever removing or adding peripheral devices. See the *Installation and Administration Guide* for details on how to power down the Stardent 1500/3000 safely.

Step 2: Preparation. Turn off the Expansion Cabinet AC Power Controller. Remove the AC Power cord between the Power Controller and the VME Card Cage.

Step 3: Removing the VME Adaptor Board. Loosen the two knobs at the top and bottom of the VME Adaptor board and slide the board out. For details on board removal, see Chapter 4, *Cir-*

cuit Board Addition or Replacement.

Step 4: Replacing the Repeater Cables at the Stardent 1500/3000. Remove the two shielded ribbon cables from the primary HVE Repeater board. Unscrew the 3 screws that connect the cable clamp to the front window bracket at the face of the VME Adapter board (see Figure Figure 11-7). Slide the two ribbon cables out and replace. Replace the cable clamp (3 screws).

NOTE
The Repeater cables are **not** keyed. Pin 1 is marked on the Repeater board itself, and the wire corresponding to pin 1 on the cable is colored blue (or red). Take special care to insure that the cables are attached correctly.

Step 5: Replacing the VME Adaptor Board. Replace the VME Adaptor board in the Stardent 1500/3000 System Module. See Chapter 4, *Circuit Board Addition or Replacement,* for details.

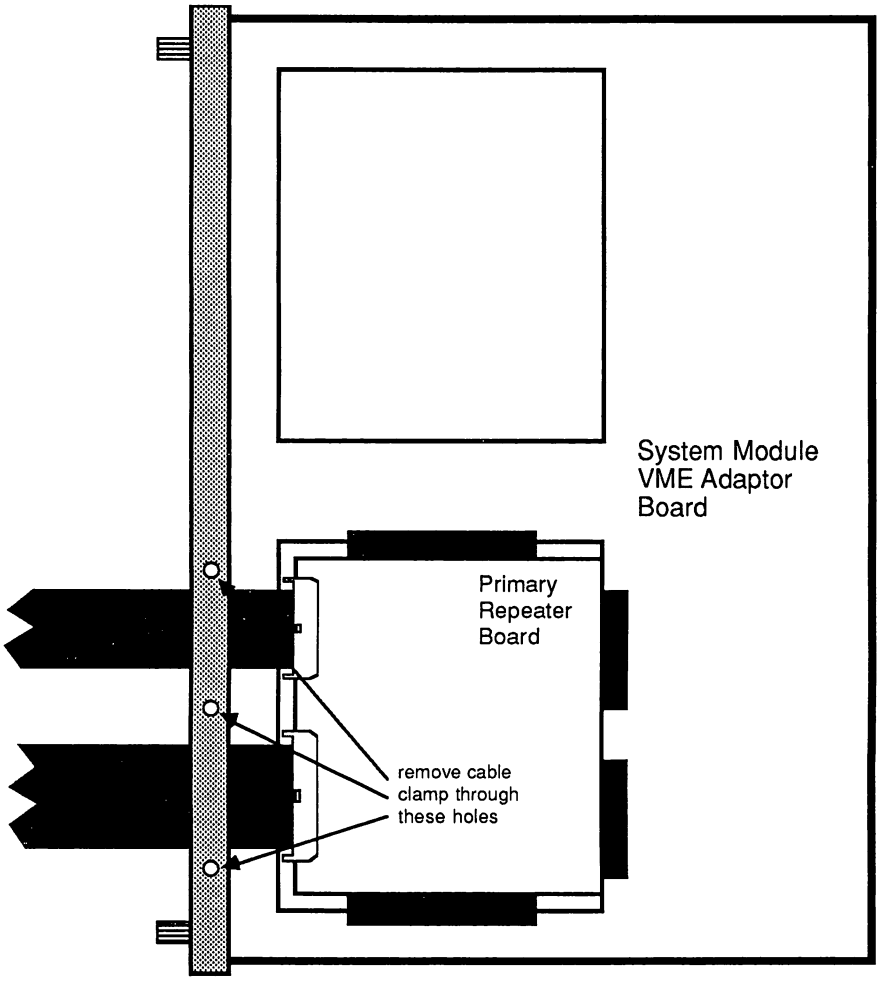


Figure 11-7. Removing the Repeater cables from the VME Adaptor Board

Step 6: Removing the HVE Repeater Assembly. Unscrew the two crews at the top and bottom of the board in slot 1 of the VME

Card Cage. Grab hold of the two black levers and push away from each other (see Figure 11-2). Slide the board out of the Card Cage.

Step 7: Replacing the Repeater Cables at the Card Cage. Remove the two shielded ribbon cables from the secondary (expansion) HVE Repeater board. Remove the two cable clamps at the front edge of the filler board (2 screws each) (see Figure 11-8). Put the two new ribbon cables in place and replace the cable clamps.

Step 8: Replacing the HVE Repeater Assembly. Insert the HVE Repeater assembly back into slot 1 of the VME Card Cage. Tighten the two screws at the top and bottom of the board.

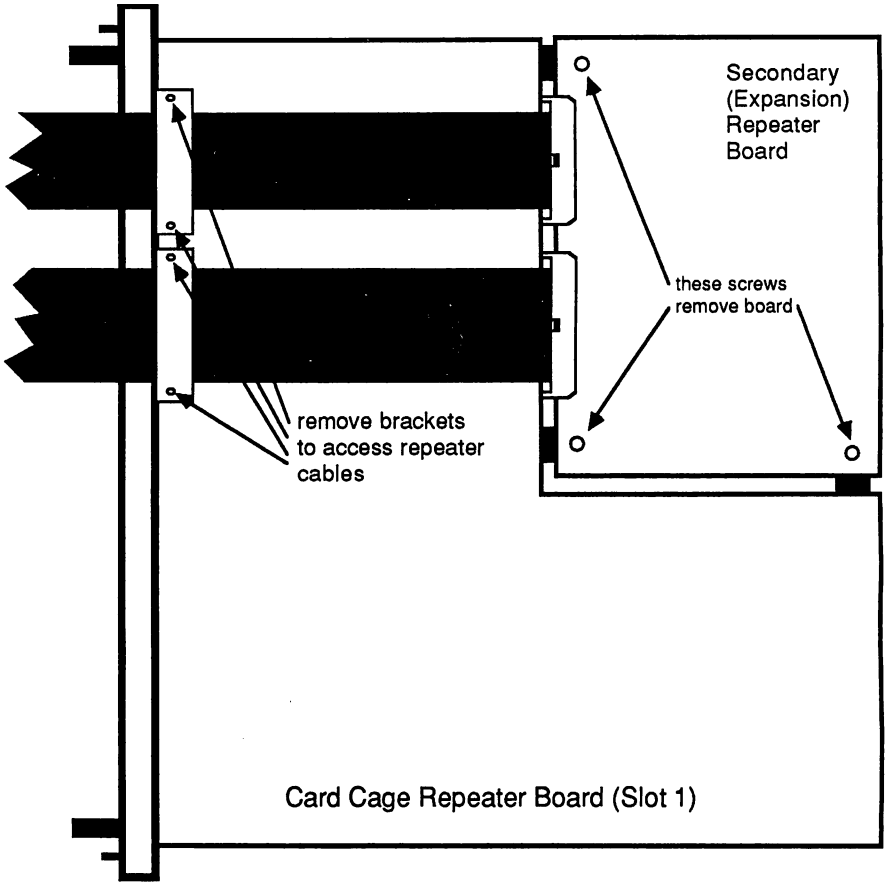


Figure 11-8. Removing the Repeater cables from the VME Card Cage

Replacing a Repeater Board in the VME Card Cage

Step 1: Stardent 1500/3000 Power Off. The Stardent 1500/3000 **must** be powered off whenever removing or adding peripheral devices. See the *Installation and Administration Guide* for details on how to power down the Stardent 1500/3000 safely.

Step 2: Preparation. Turn off the Expansion Cabinet AC Power Controller. Remove the AC Power cord between the Power Controller and the VME Card Cage.

Step 3: Removing the Filler Board. Loosen the two screws at the top and bottom of the board in slot 1 of the VME Card Cage. Grab hold of the two black levers and push away from each other. Slide the board out of the Card Cage.

Step 4: Removing the Repeater Board. Remove the two shielded ribbon cables from the repeater board. Remove the 3 screws that connect the repeater board to the board filler. **Save these screws for subsequent replacement.**

Step 5: Replacing the Repeater Board. Place the new repeater board in the filler board and fasten with three screws. Attach the two shielded ribbon cables to the board. Insert the board assembly into the vacant slot. Tighten the two screws at the top and bottom of the board.

Replacing the VME Card Cage

Use this procedure to remove and replace the entire VME Card Cage.

Step 1: Stardent 1500/3000 Power Off. The Stardent 1500/3000 **must** be powered off whenever removing or adding peripheral devices. See the *Installation and Administration Guide* for details on how to power down the Stardent 1500/3000 safely.

Step 2: Preparation. Turn off the Expansion Cabinet AC Power Controller. Remove the AC Power cord between the Power Controller and the VME Card Cage.

NOTE
Removing the Expansion Cabinet front door may be helpful when removing the Card Cage. See Chapter 3, *System Module Door Removal.*

Step 3: Removing the Repeater Board. Unscrew the two screws at the top and bottom of the VME board located in slot 1 of the card cage (see Figure 11-1). Grab hold of the two black levers and push away from each other. Slide the board completely out and place on top of the System Module.

Step 4: Removing Controller Boards. Unscrew the two screws at the top and bottom of any VME boards located in slots 2-5 of the card cage. Grab hold of the two black levers on each board and push away from each other. Slide the board(s) completely out of the card cage and place on top of the Expansion Cabinet. Leave any remaining slot fillers in the card cage.

Step 5: Removing the Card Cage. Remove the 12 screws that connect the Card Cage to the Expansion Cabinet. (See Figure 11-4). Slide the Card Cage out from the front of the Cabinet.

NOTE
Removing the VME Card Cage is a two-person job. It is extremely heavy, and should be slid onto a suitable pallet or cart immediately after removal.

Step 6: Replace Card Cage. Slide the replacement Card Cage into the Expansion Cabinet from the front until the flanges rest against the cabinet mounting rack. Fasten with 8 screws (see Figure 11-8).

Step 7: Replace Boards. Remove as many empty board fillers as necessary to allow room for all old boards. Slide the repeater board into slot 1; slide any controller boards into their old positions in slots 2-5. Fasten all boards by tightening the screws at the top and bottom of the board front panel.

DUAL SMD DISK DRAWER PROCEDURES

CHAPTER TWELVE

This chapter describes how to perform the following Expansion Cabinet Dual SMD Disk Drawer procedures:

- Removing an SMD Disk Drive for repair or replacement
- Adding an SMD Disk Drive to an existing drawer (a replacement drive or a second drive to a drawer with only one drive)
- Removing and replacing the Interphase Controller Board in the Stardent 1500/3000 System Module VME Adaptor Board
- Removing and replacing a faulty SMD Drawer power supply
- Installing the mounting rails for a Dual SMD Drive Drawer

WARNING
To ensure that your disk drives function properly when subject to temperature variations, the SMD Disk Drawers must be installed with sufficient vertical spacing between them. When you install SMD drawers, make sure that you start rails from the top of the cabinet, that you evenly space all the drawers in the cabinet, and that at least three mounting holes are left vacant between adjacent drawers.

Removing an SMD Drive

The following steps describe how to remove an SMD Disk Drive from a drawer for repair or replacement.

Step 1: Stardent 1500/3000 Power Off. The Stardent 1500/3000 **must** be powered off whenever removing or adding peripheral devices. See the *Installation and Administration Guide* for details on how to power down the Stardent 1500/3000 safely.

Step 2: Preparation. Turn off the drawer power supply and the cabinet AC Power Controller.

WARNING
Be sure the Expansion Cabinet anti-tip bar is in place whenever the drawer is extended.

Never pull out more than one peripheral drawer at a time.

Step 3: Preparation. Open the front door of the Expansion Cabinet and remove the cover panel from the front of the drawer (4 screws). Remove the screw that connects each side of the drawer to the cabinet mounting rack (see Figure 12-1).

Step 4: Preparation. Make sure the Expansion Cabinet anti-tip bar is in place and pull the drawer out until it is fully extended.

Step 5: External Hardware Removal. If 2 drives are present, remove the ESD clips connecting them (2 screws each clip). Remove the ESD bar (2 screws) from the drive to be removed (see Figure 12-2).

Step 6: Drive Cover Removal. Remove the remaining 4 screws (6 if only one drive is present) from the drive cover. Pry the cover up from the front of the drive (away from the fan assembly) and pull out.

Step 7: External Hardware Removal. Remove the cable cover (2 screws) and cable clamp (3 screws) from the rear of the drive (see Figure 12-2).

Step 8: Cable Removal. Remove the control and data cables that connect the drive to the VME Card Cage or the Stardent 1500/3000 System Module. Remove the power cord that connects the drive to the drawer power supply (see Figure 12-3).

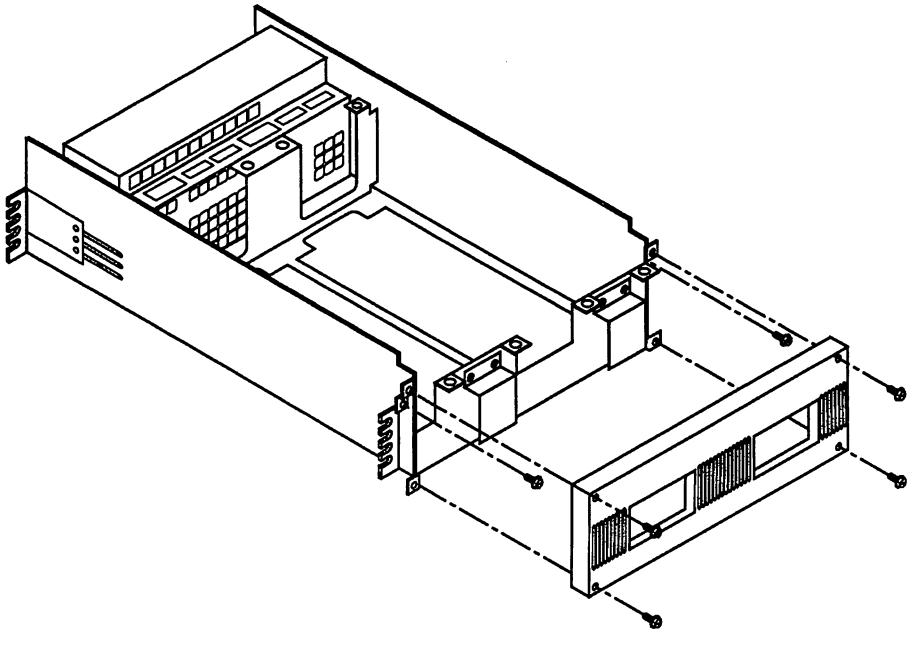


Figure 12-1. SMD Drawer Front Panel Detail

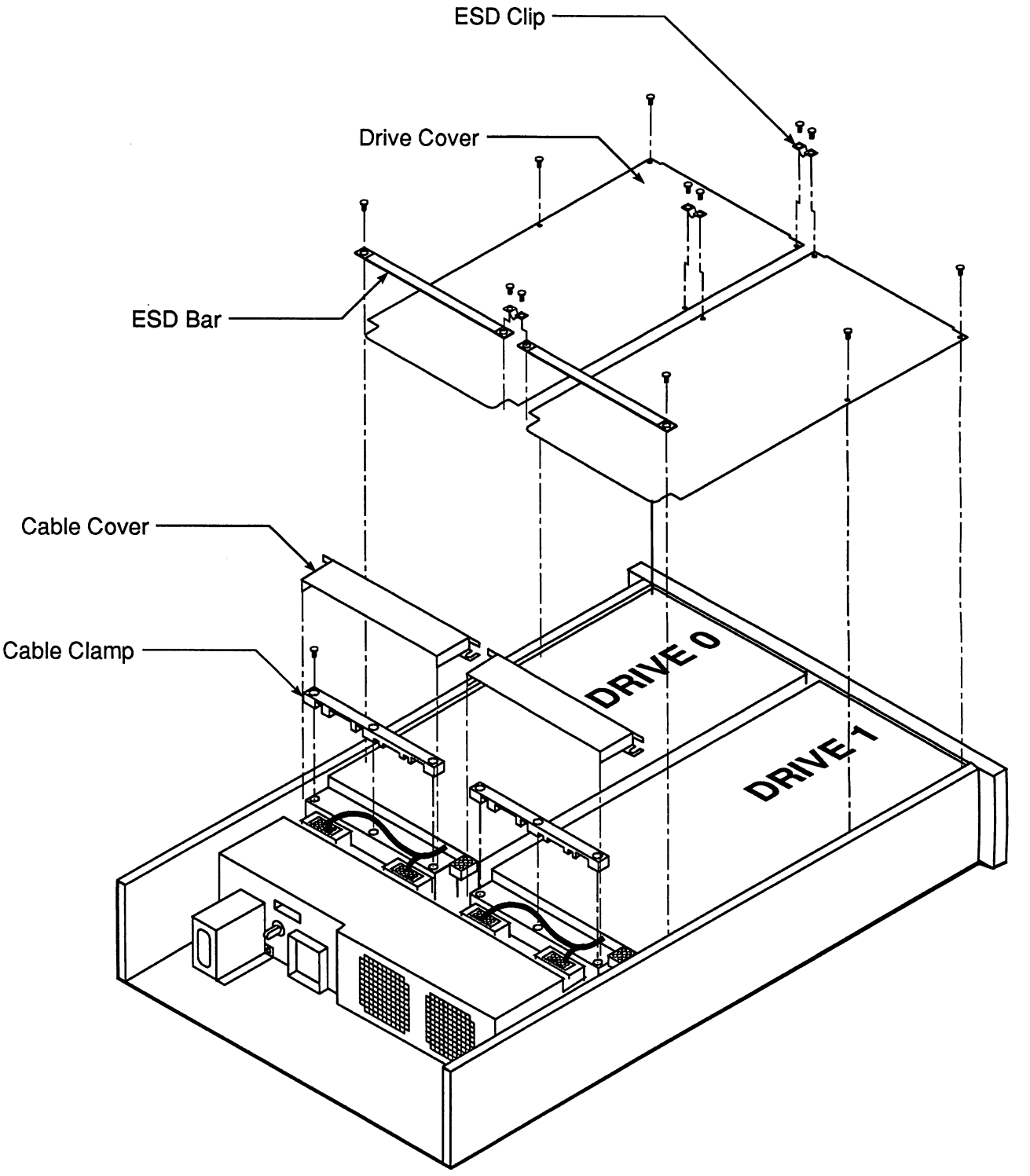


Figure 12-2. SMD Drawer External Hardware

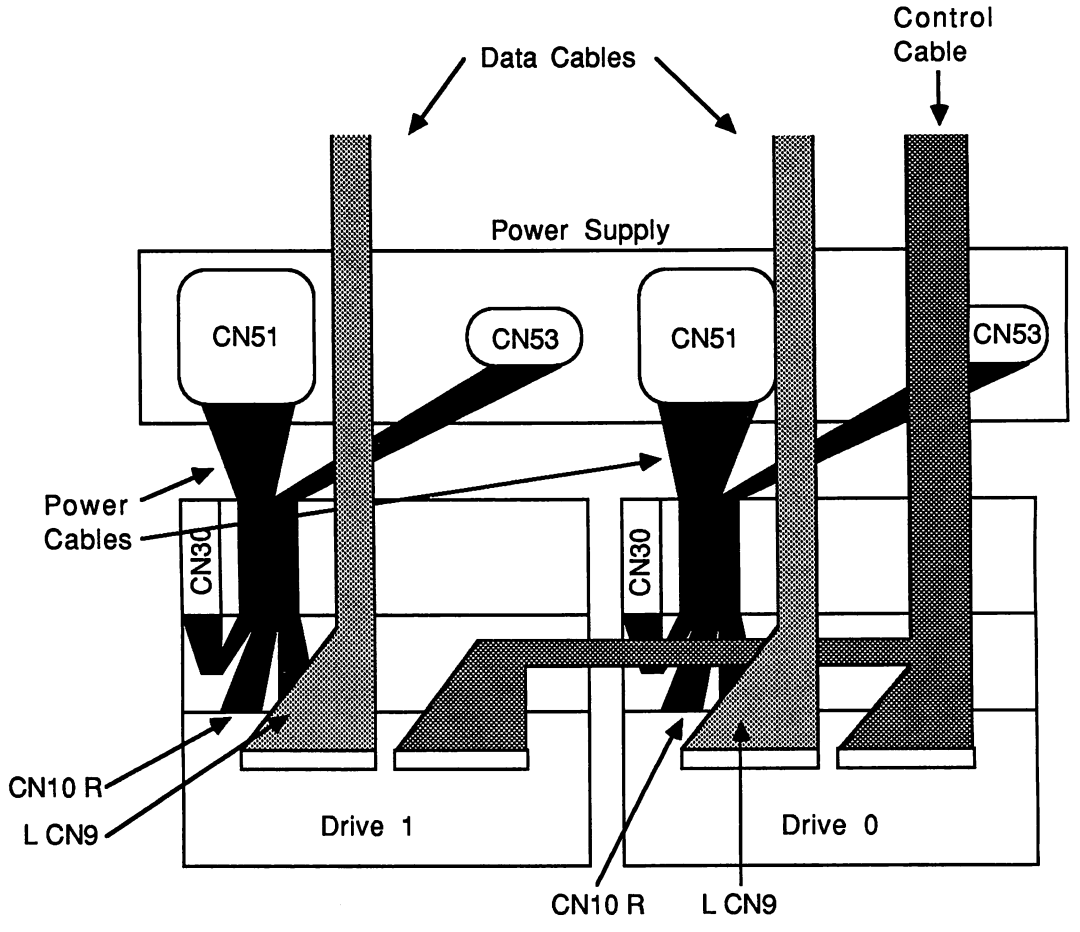


Figure 12-3. SMD Drive Cables

Step 9: Bracket Removal. Remove the 4 screws that connect the drive to the drawer (see Figure 12-4). Lift the drive out of the drawer. Remove the bracket assembly (2 flathead screws each side). The bracket is part of the drawer assembly and must be used to install a replacement drive.

Step 10: Hardware Replacement. Replace the cable clamp and cable cover on the drive (see Figure 12-2).

Step 11: Drive Cover Replacement. The drive cover must be replaced before shipping. From an angle, slide the rear of the drive cover beneath the tabs located near the rear of the drive (see Figure 12-5). Let the cover down and *inside* the front edge on the drive itself (see Figure 12-6). Lay the ESD bar across the rear of the drive. Insert all 8 screws loosely and then tighten.

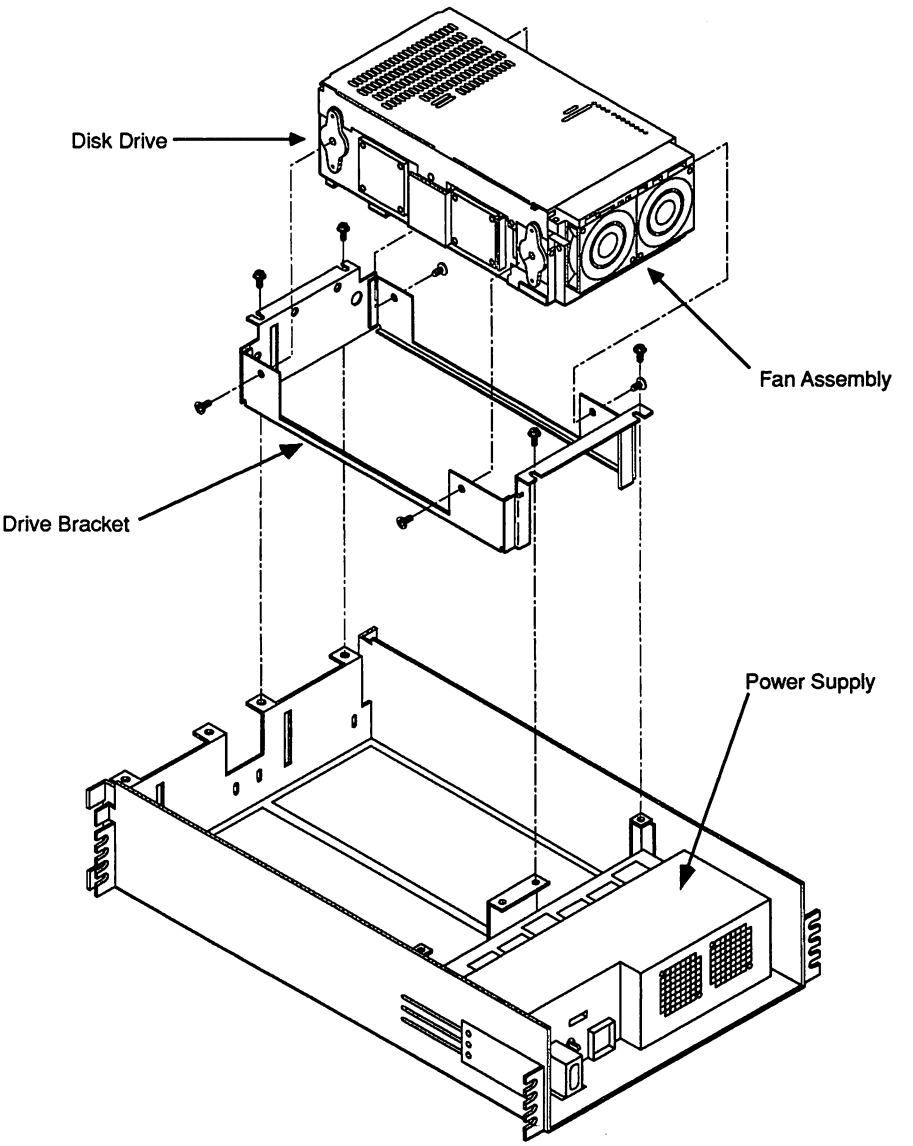


Figure 12-4. SMD Drive Bracket

Push the drawer back into place and secure it to the cabinet with the 2 screws on the drawer rail (see Figure 12-1). Replace the drawer cover panel (4 screws).

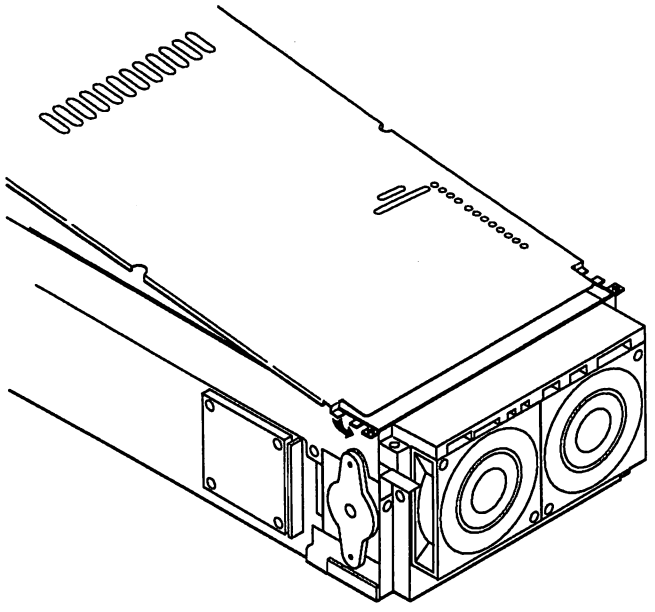


Figure 12-5. SMD Drive Cover--Rear View

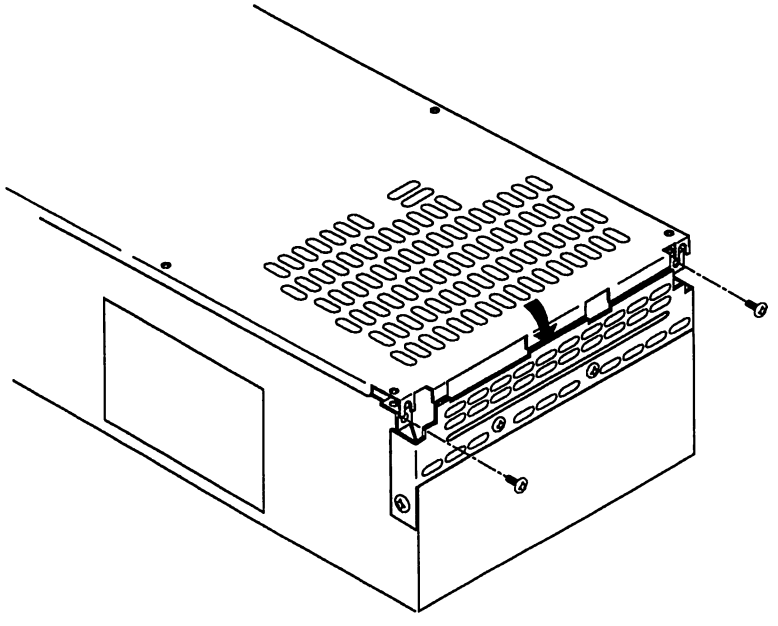


Figure 12-6. SMD Drive Cover--Front View

Adding an SMD Drive

Follow this procedure to add a second drive to a drawer with only one drive or to replace a faulty drive with a new or repaired one.

Step 1: Stardent 1500/3000 Power Off. Stardent 1500/3000 **must** be powered off whenever removing or adding peripheral devices. See the *Installation and Administration Guide* for details on how to power down the Stardent 1500/3000 safely.

Step 2: Preparation. Turn off the drawer power supply and the cabinet AC Power Controller.

Step 3: Drive Cover Removal. Remove the ESD bar (2 screws) from the drive to be removed (see Figure 12-2). Remove the remaining 6 screws from the drive cover. Pry the cover up from the front of the drive (away from the fan assembly) and pull out.

Step 4: Hardware Removal. Remove the cable cover (2 screws) and the cable clamp (3 screws) from the drive (see Figure 12-2).

Step 5: Fan Installation. Attach the fan assembly (if not done already) to the rear of the drive unit (2 screws).

Step 6: Drawer Extension. Open the front door of the Expansion Cabinet and remove the cover panel from the front of the drawer (4 screws). See Figure 12-1. Remove the screws that connect each side of the drawer to the cabinet mounting rack (see Figure 12-1). Make sure the Expansion Cabinet anti-tip bar is in place and pull the drawer out until it is fully extended.

Step 7: Bracket Assembly. Remove the drive bracket from the drawer (4 screws). Attach the drive to the bracket assembly (2 flathead screws each side). Mount the drive assembly in the drawer (4 screws) (see Figure 12-4).

Step 8: Power Cable Installation. Install the power cable at locations CN51 and CN53 on the drawer power supply, location CN30 on the drive fan assembly, and locations CN10R and LCN9 on the drive (see Figure 12-3).

Step 9: Drive Cable Installation. Attach the inner connector of the control cable to the 60-pin coupler on top of drive 0. If 2 drives are present, attach the end connector of the control cable to the 60-pin coupler on top of drive 1 (see Figure 12-3). If only one drive is present, no connection is required for the end connector.

Step 10: Drive Cable Installation (With Stardent 1500/3000 System Module). Connect the control cable to the 60-pin slot in the System Module VME Adaptor Board. Connect the data cable from drive 0 to the lower 26-pin slot on the VME Adaptor Board. If there are 2 drives, connect the data cable from drive 1 to the upper 26-pin slot (see Figure 12-7).

NOTE
Facing the front of the cabinet, the right-hand drive is called "drive 0" and the left-hand drive, "drive 1."

Step 11: Drive Cable Installation (with VME Card Cage). Connect the control cable to the 60-pin slot in the Controller board mounted in any of slots 2-5 of the VME Card Cage. Connect the data cable from Drive 0 to the lower 26-pin slot of the board. If there are 2 drives, connect the data cable from drive 1 to the upper 26-pin slot (see Figure 12-8).

Step 12: Terminators. When adding a second SMD Disk drive, remove the terminators on drive 0. Pry all 8 terminators from their sockets (see Figure 12-9). Note: the last drive on the cable **must** be terminated in order to perform correctly.

Step 13: Hardware Replacement. Replace the cable clamp (3 screws) and cable cover (2 screws) on the drive (see Figure 12-2).

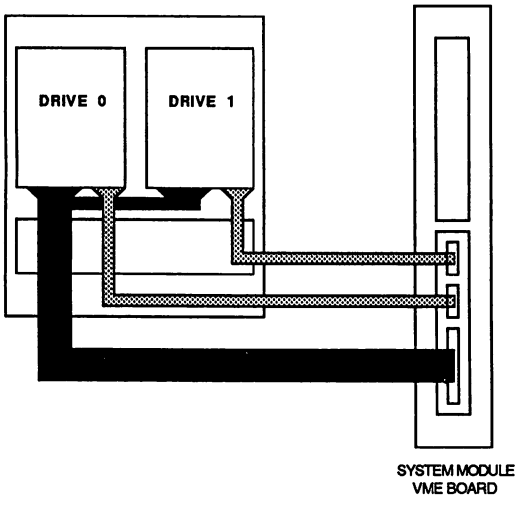


Figure 12-7. Wiring the SMD Drawer to the Stardent 1500/3000 System Module

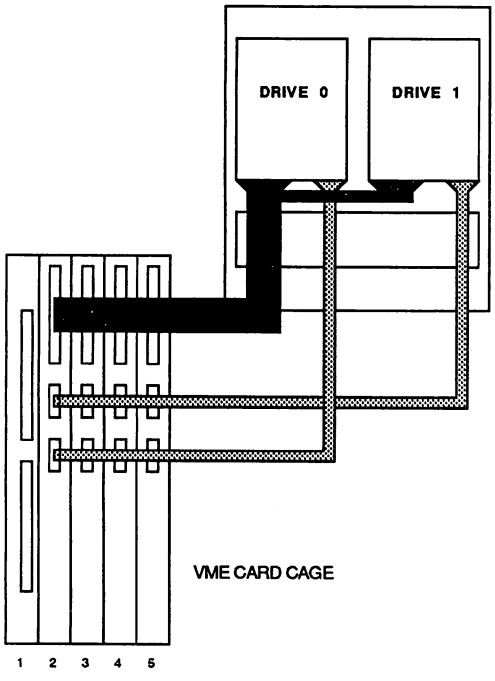


Figure 12-8. Wiring the SMD Drawer to the VME Card Cage

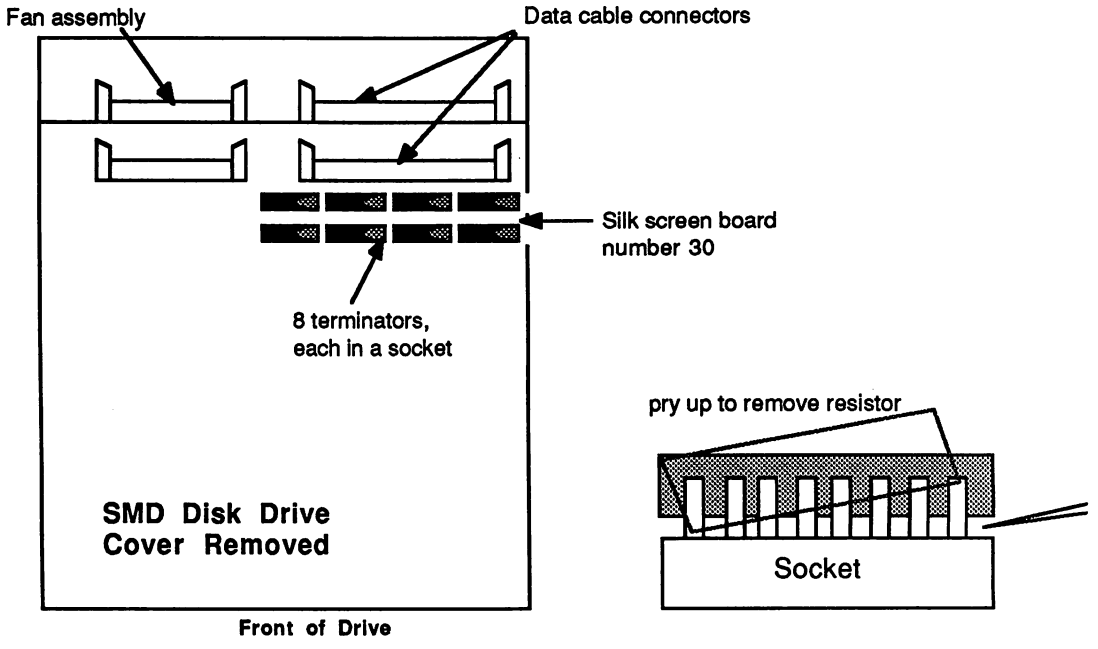


Figure 12-9. Removing SMD Drive Terminators

Step 14: Drive Cover Replacement. From an angle, slide the rear of the drive cover beneath the tabs located near the rear of the drive (see Figure 12-5). Let the cover down and tuck the tabs on the front of the cover *inside* the front edge of the drive itself (see Figure 12-6). If 2 drives are present, connect the 3 ESD clips to the previously existing drive. Lay the ESD bar across the rear of the drive. Insert all 8 screws and tighten.

Step 15: Dip Switches. It is not necessary to remove the drive cover to set the drive DIP switches. The DIP switches are accessible through holes in the drive cover. Set the switches for drive 0 (and drive 1, if present) as shown in Figure 12-11.

Step 16: Cover Panel Replacement. Push the drawer back into place and drawer to the cabinet with the 2 screws on the drawer rail (see Figure 12-1). Replace the drawer cover panel (4 screws).

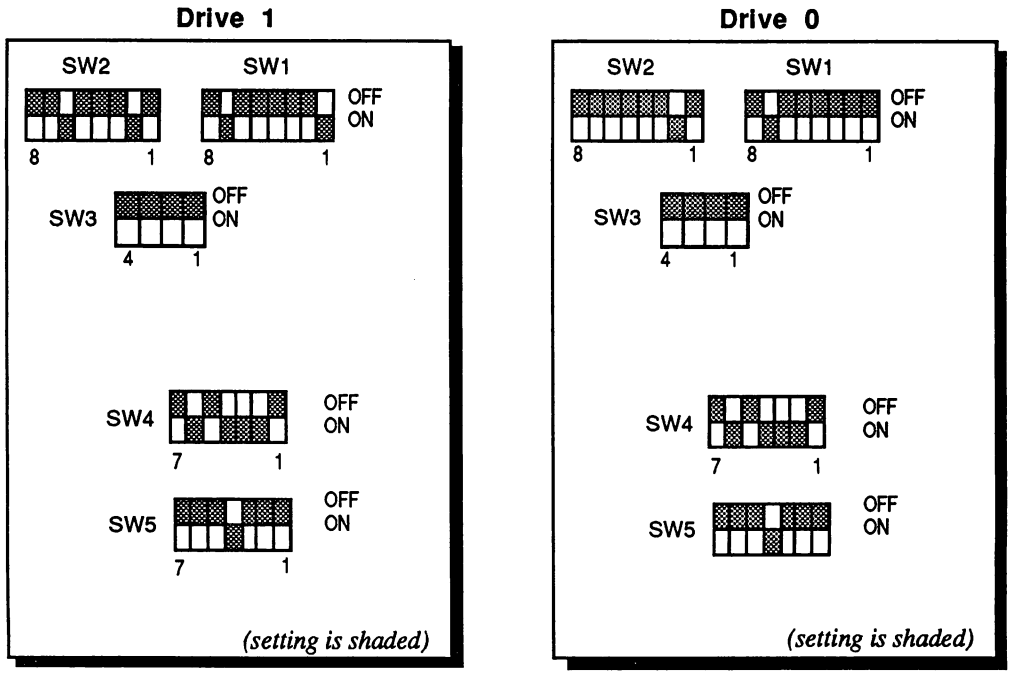


Figure 12-10. SMD Drive DIP Switch Settings

Replacing the VME Controller Board

Use this procedure to remove and replace an Interphase Controller Board from the Stardent 1500/3000 System Module VME Adaptor Board. The VME Adaptor Board can accommodate have one or two Interphase Controllers. Perform the procedure only when a replacement controller is available.

Step 1: Stardent 1500/3000 Power Off. The Stardent 1500/3000 **must** be powered off whenever removing or adding peripheral devices. See the *Installation and Administration Guide* for details on how to power down the Stardent 1500/3000 safely.

Step 2: Removing the VME Adaptor Board. Loosen the two knobs at the top and bottom of the VME Adaptor Board and slide the board out. For details on board removal, see Chapter 4, *Circuit Board Addition or Replacement.*

Step 3: Removing the Interphase Controller. Lay the VME Adaptor Board on a flat surface with the component side up. Remove the 3 internal ribbon cables from the controller board.

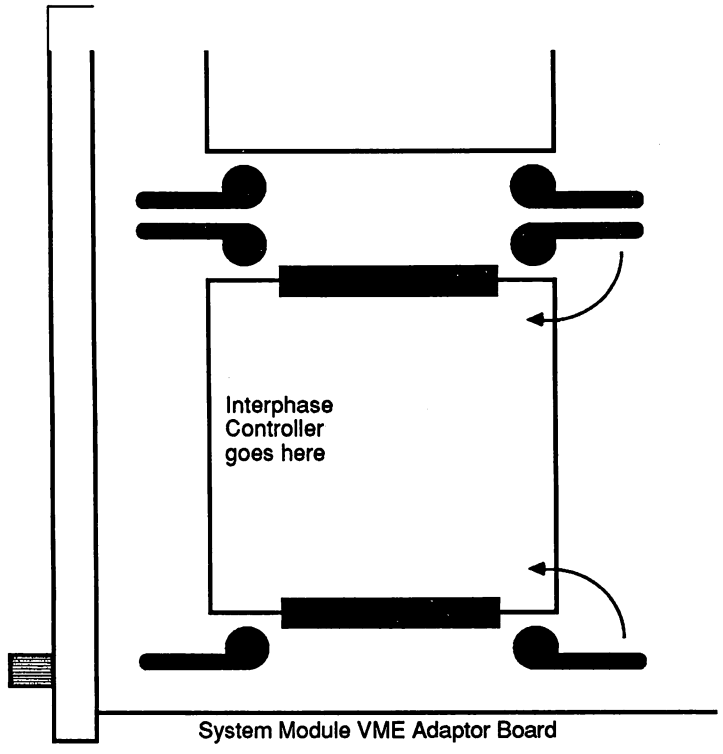


Figure 12-11. Removing the Interphase Controller Board

Check to see that the two black levers closest to the VME Board front panel are in their horizontal position. Simultaneously push the two black levers near the rear of the controller board towards each other (see Figure 12-11). Lift the controller board from the bay. Return the two rear black levers to their original position.

Step 4: Replacing the Interphase Controller. Lay the new Interphase Controller in the now vacant bay. Simultaneously push the two black levers closest to the VME Board front panel towards each other until the controller is firmly in place. Return the levers to their original position. Attach the 3 internal ribbon cables that connect the controller board to the VME Board front panel.

Step 5: Replacing the VME Adaptor Board. Replace the VME Adaptor Board in the Stardent 1500/3000 System Module. See Chapter 4, *Circuit Board Addition or Replacement,* for details.

Replacing the Drawer Power Supply

Use this procedure when a drawer power supply is found to be faulty and a replacement has been ordered and received.

Step 1: Stardent 1500/3000 Power Off. The Stardent 1500/3000 **must** be powered off whenever removing or adding peripheral devices. See the *Installation and Administration Guide* for details on how to power down the Stardent 1500/3000 safely.

Step 2: Preparation. Turn off the drawer power supply and the cabinet AC Power Controller.

Step 3: Cable Removal. Remove the power cord that connects the power supply to the AC Power Controller. Remove the power cables that connect each drive to the power supply at locations CN51 and CN53 (see Figure 12-3).

Step 4: Removal. From the rear of the cabinet, remove the 4 screws that connect the rear of the power supply to the drawer (see Figure 12-12).

Step 5: Drawer Extension. From the front of the cabinet, remove the cover panel from the front of the drawer (4 screws). Remove the screw that connects each side of the drawer to the cabinet mounting rack (see Figure 12-1). Make sure the anti-tip bar is in place and extend the drawer fully.

Step 6: Removal. Remove the 3 screws that connect the front of the power supply to the drawer (see Figure 12-12). Push the drawer back into the cabinet, and slide the drawer power supply out from the rear of the cabinet.

Step 7: Mount Power Supply (Rear). Slide the replacement power supply into the drawer from the rear of the cabinet. The bottom edge of the power supply closest to the drive(s) slides into a slot towards the middle of the drawer assembly. Insert the 4 screws that attach the rear of the power supply to the drawer (see Figure 12-12) and tighten. Depending on what is mounted above the drawer, it may be necessary to insert all screws from the front of the cabinet, with the drawer fully extended.

Step 8: Mount Power Supply (Front). Insert the 3 screws that attach the front of the power supply (see Figure 12-12) and tighten.

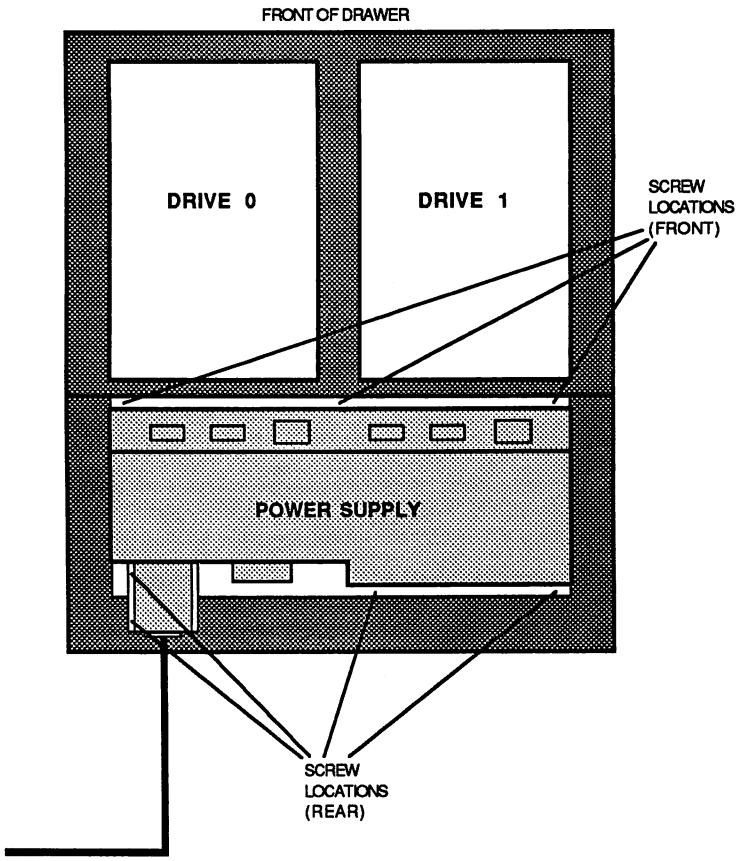


Figure 12-12. SMD Drawer Powersupply Screw Locations

Step 9: Cable Installation. Attach the power cable(s) from the drive(s) to locations CN51 and CN53 on the power supply (see Figure 12-3). Connect the power cord from the power supply to the AC Power Controller.

Step 10: Voltage Selection. Before powering the drawer, check the voltage selector on the rear of the power supply (underneath the plastic shield) to be sure the jumper is in the correct slot (110V or 220V).

Step 11: Cover Panel Replacement. Push the drawer back into place and secure to the cabinet with the 2 screws on the drawer rail (see Figure 12-1). Replace the drawer cover panel (4 screws).

Installing Mounting Rails for the Dual SMD Disk Drawer

Follow these steps when adding a Dual SMD Disk Drawer to an existing Expansion Cabinet. The drawer is shipped with an SMD Drive (or Drives) already mounted. Choose a location for the drawer (see the *Installation and Administration Guide* for rules and guidelines). The drawer occupies 3 EIA units (approximately 5 1/4 inches).

To ensure that your disk drives function properly when subject to temperature variations, the SMD Disk Drawers must be installed with sufficient vertical spacing between them. Start installation from the top of the expansion cabinet, evenly space all the peripheral drawers throughout the cabinet, and make sure that at least three mounting holes are left free between adjacent drawers. Mount the rails for the drawer as outlined below, and slide the drawer onto the rails.

Step 1: Preparation. Nine vertical holes on the Expansion Cabinet mounting rack are required for the Dual SMD Disk Drawer Identify holes 5, 6, 7, and 8 (hole 1 being the uppermost hole) by marking the paint on the mounting rack. Repeat from the rear of the Cabinet.

Step 2: Preparation. Remove the 2 side rails from the drawer (2 screws). On the rails, remove the adjustable bracket and refasten on the inner slots, if not done already (see Figure 12-13). Do not tighten the screws on the adjustable bracket at this time.

Step 3: Mount Rail (Front). Position each of the rails (one at a time) so that the 4 screw holes occupy the marked positions in front of the mounting rack (see Figure 12-14) at the front of the Cabinet. Mount the nut plate behind the rack, insert screws and tighten.

Step 4: Mount Rail (Rear). From the rear of the Cabinet, move the adjustable bracket so that it fits tightly against the *outside* of the mounting rack. Insert the screws through the adjustable bracket, through the rack, into a nut plate, and tighten. Tighten the 3 screws on the inside of the adjustable bracket.

Step 5: Insert Drawer. Slide the drawer onto the mounting rails. Push the drawer all the way to the rear of the cabinet (make sure the spring clips engage at the rear of the drawer). Check the back of the expansion cabinet to see if it has a drawer interlock cable to prevent multiple drawers from being removed at one. If so, attach the cable to the drawer.

NOTE
The space between rails must be *exactly* 17.56 inches for correct installation of the Drawer. Use the spacer shipped with the drawer to check the clearance between the mounting rails.

Inserting the SMD Drawer onto the mounting rails is a two-person job. The drives are extremely heavy, and may be severely damaged if handled improperly.

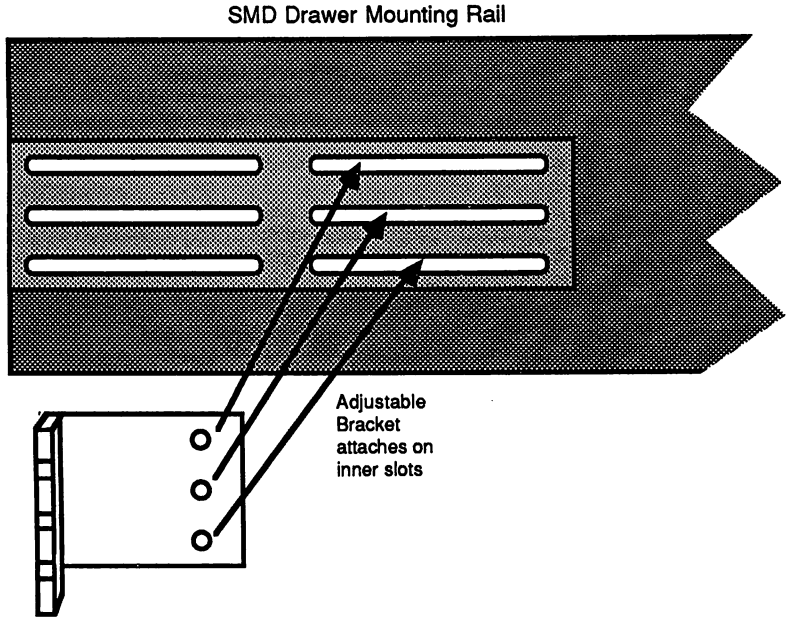


Figure 12-13. SMD Drawer Mounting Rail Adjustable Bracket Location

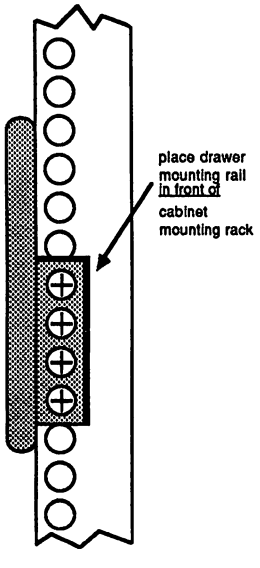


Figure 12-14. SMD Drawer Mounting Rail

QUAD SCSI DISK DRAWER PROCEDURES

CHAPTER THIRTEEN

The Expansion Cabinet Quad Disk Drawer contains space for 4 daisy-chained SCSI disk drives. A SCSI cable is used to connect the Quad Drawer directly to the Stardent 1500/3000 System Module I/O board.

Stardent Computer Corp. currently supports two disk drives for use with the Quad Disk Drawer: the MAXTOR XT-8760S (760 MB) and the Priam 738 (380 MB). New or replacement Quad Disk Drawers are shipped with 4 drives of the same type (see Chapter 2, *Field Replaceable Units* for part numbers); however, for removal and replacement purposes you may freely mix drives in the same drawer.

Use this chapter when performing any of the following Quad SCSI Disk Drawer procedures:

- Removing a Disk Drive for repair or replacement
- Adding or replacing a Disk Drive
- Replacing the fuse for the Drawer power supply
- Removing the entire Quad Disk Drawer
- Installing mounting rails for the Quad SCSI Disk Drawer.

Removing a Disk Drive

Use this procedure to remove a single disk drive for repair or replacement.

Step 1: Stardent 1500/3000 Power Off. Stardent 1500/3000 **must** be powered off whenever removing or adding peripheral devices. See the *Installation and Administration Guide* for details on how to power down the Stardent 1500/3000 safely.

Step 2: Expansion Cabinet Power Off. Turn off the Expansion Cabinet AC Power Controller and the Quad Disk Drawer. Remove the power cord from the Disk Drawer and the AC Power Controller.

Step 3. Open the Expansion Cabinet. Extend the anti-tip bar (see *Installing the Expansion Cabinet* in the *Installation and Administration Guide* for instructions). Remove the drawer front panel by holding each side and pulling straight off.

Step 4. Hold the Disk Drawer by the top cross bar (see Figure 13-1) and slide the Disk Drawer out until it locks into place. **DO NOT** pull the drawer by either of the two front drives.

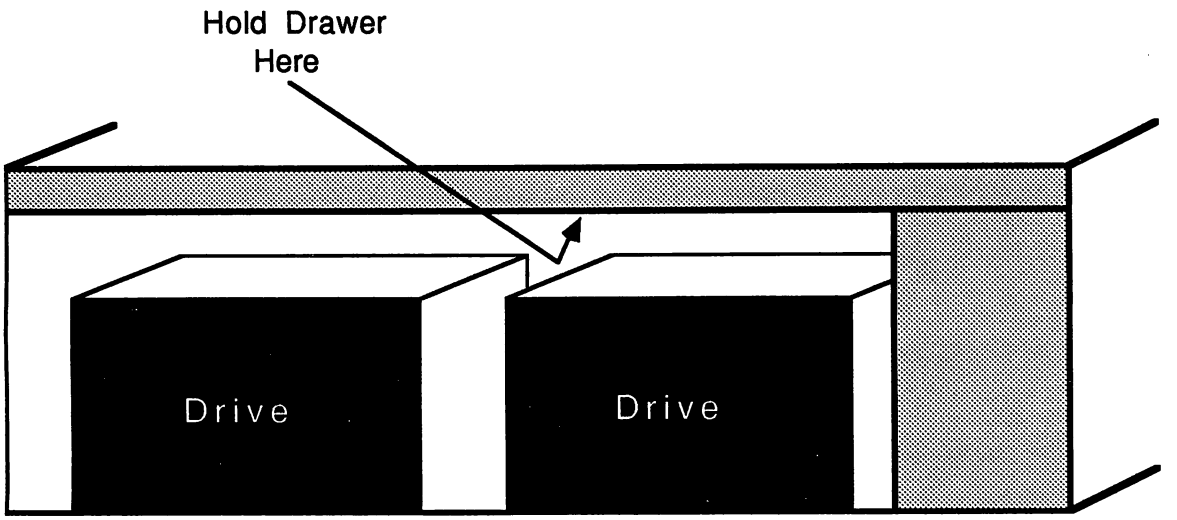


Figure 13-1. Front View of Quad Drawer--Front Panel Removed

NOTE
If one of the rear drives is to be removed, the drive directly in front of it must be removed first. Follow Steps 5-8 for each drive that must be removed.

Step 5: Remove Drawer Cover. Remove the 12 screws that connect the drawer cover to the drawer. Pull up on the front of the cover and slide towards the rear.

Step 6: Remove Drive. Push the drive slightly towards the rear of the drawer. Pull down on the clip on the bottom of the drive and hold. Slide the drive out a short distance with your other hand. **DO NOT** slide the drive completely out at this time.

Step 7: Remove Cables. Remove the power cable and SCSI ribbon cable from the rear of the drive. The power cable is on the left (looking from above), and the SCSI connector is on the right.

Step 8: Remove Drive. Slide the drive completely out of the drawer.

Step 9: Remove Drive Mount. Unscrew the drive mount from the bottom of the disk drive (4 screws). **Save these screws for later replacement.** Slide the drive mount back into the slot in the drawer until it locks in place.

Step 10. The drive is now ready for shipping. Replace the drawer cover (12 screws) and slide the drawer into the Expansion Cabinet. Replace the drawer front panel.

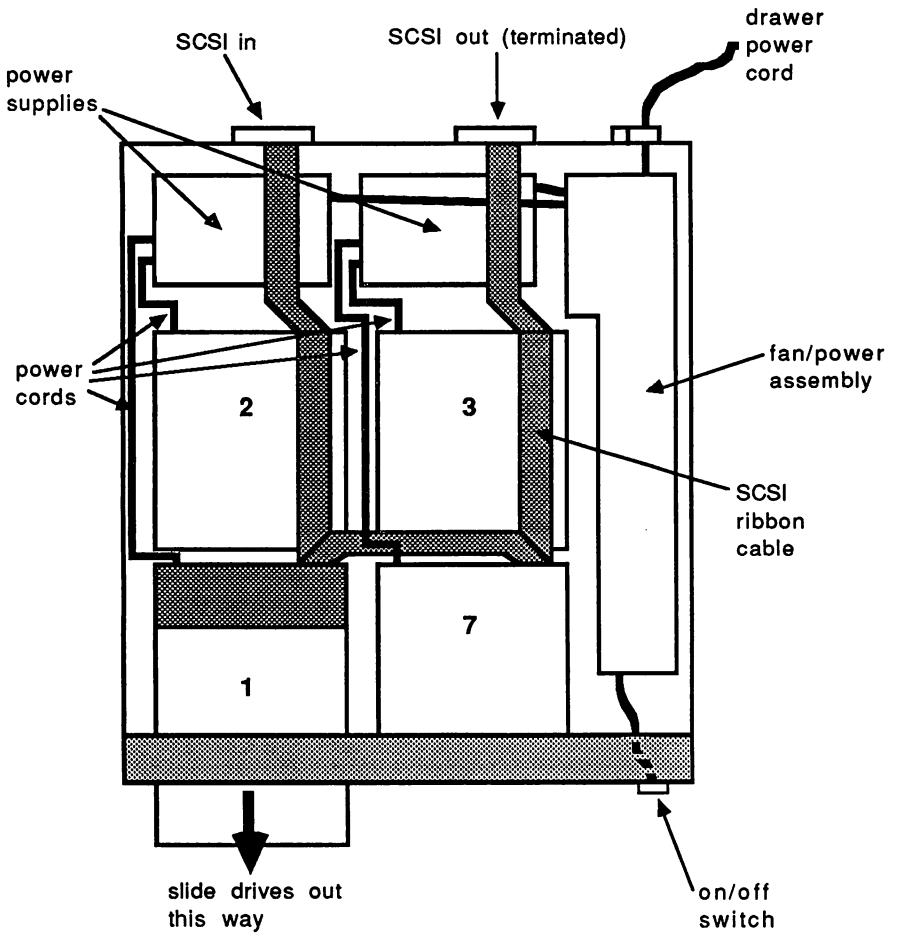


Figure 13-2. Above View of Quad Disk Drawer

Adding a Disk Drive

Use this procedure to add a disk drive to a Quad Drawer as a replacement for a previously removed disk drive.

Step 1: Stardent 1500/3000 Power Off. The Stardent 1500/3000 **must** be powered off whenever removing or adding peripheral devices. See the *Installation and Administration Guide* for details on how to power down the Stardent 1500/3000 safely.

Step 2. Turn off the Expansion Cabinet AC Power Controller. Turn off the Quad Disk Drawer. Remove the power cord from the Disk Drawer and the AC Power Controller.

Step 3. Open the Expansion Cabinet and extend the anti-tip bar (see *Installing the Expansion Cabinet* in the *Installation and Administration Guide* for instructions). Remove the Disk Drawer front panel by holding from each side and pulling straight off.

Step 4. Hole the Disk Drawer by the top crossbar and slide the drawer out until it locks into place. **DO NOT** pull the drawer by either of the two front drives (see Figure 13-1).

Step 5: Remove Drawer Cover. Remove the 12 screws that connect the drawer cover to the drawer. Pull up on the front of the cover and slide towards the rear.

Step 6: Set Device ID. Follow the instructions in the chapter entitled *Configuring Mass Storage Devices* in this guide.

Step 7: Attach Drive Mount. Remove the empty drive mount from the drawer by pushing the mount towards the rear of the drawer, pulling down on the clip on the underside of the mount, and pulling the mount out. Attach the drive mount to the bottom of the drive (4 screws), being careful not to damage any of the drive components.

Step 8: Insert Drive. Slide the drive assembly in far enough so that you can attach the power cable and the SCSI ribbon cable to the rear of the drive. Once you have attached the cables, slide the drive in until it locks into place.

Step 9. Replace the drawer cover (12 screws) and slide the drawer into the Expansion Cabinet. Replace the drawer front panel.

Replacing the Quad Drawer Fuse

A spare fuse for the power supply is located in the fuse assembly on the Quad Drawer rear panel (see Figure 13-2). To remove, pry the clip on the fuse assembly to the right and pull out.

To change the Quad Drawer voltage setting, pull the black fuse holder out and reinsert the holder upside down so that the correct setting appears on the outside of the fuse assembly.

WARNING
Before removing the fuse assembly, be sure that power to the drawer is off and the power cord is removed.

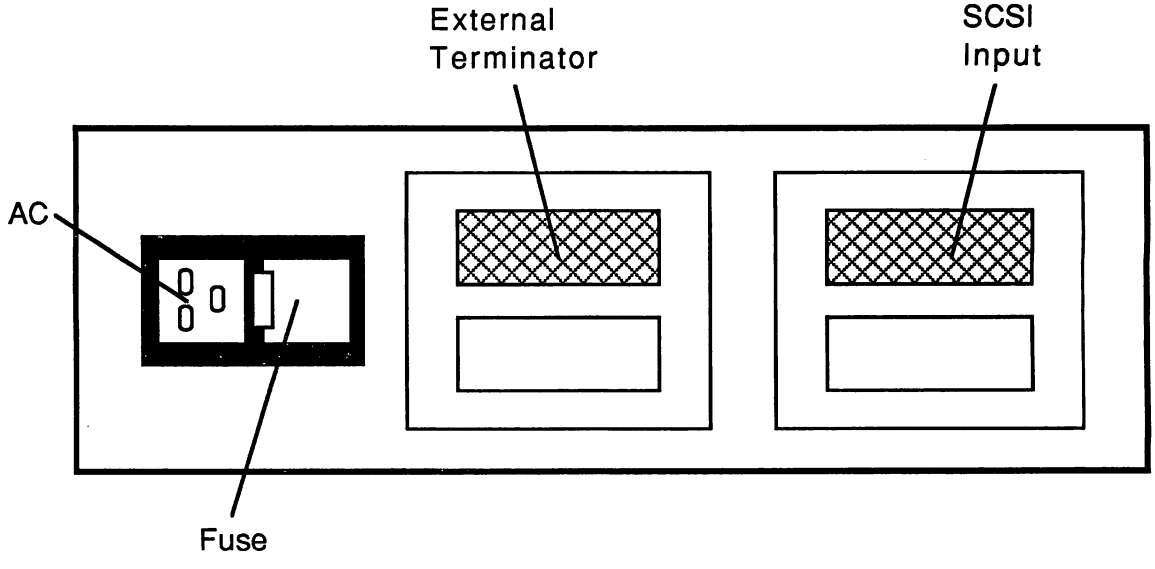


Figure 13-3. Rear View of Quad Drawer

Removing the Quad Disk Drawer

The Quad Drawer, drawer power supplies, and drawer cables constitute a single FRU. Follow the procedure in this section to replace the Quad Drawer.

Step 1. Turn off the Expansion Cabinet AC Power Controller. Turn off the Quad Disk Drawer. Remove the power cord from the Disk Drawer and the AC Power Controller.

Removing the Quad Disk Drawer (continued)

Step 2. Open the Expansion Cabinet and extend the anti-tip bar. Remove the Disk Drawer front panel by holding from each side and pulling straight off.

NOTE
Removing the Quad Disk Drawer is a two-person job. The drawer, when full, weighs about 50 pounds.

Step 3. Hold the Disk Drawer by the top crossbar and slide the Disk Drawer out until it locks into place. **DO NOT** pull the drawer by either of the two front drives (see Figure 13-1).

Step 4. Press the tabs located on the underside of each mounting rail (towards the rear of the drawer). Slide the drawer out of the cabinet. **The drawer weighs approximately 50 lbs. when fully configured.** Place the drawer onto a suitable cart or pallet immediately upon removal.

Installing Mounting Rails for the Quad Disk Drawer

Follow these steps when to add a new Quad Disk Drawer to an existing Expansion Cabinet. The drawer is shipped with 4 SCSI Drives already installed.

Step 1: Preparation. Choose a location for the Quad Disk Drawer (see *Installing the Expansion Cabinet* in the *Installation and Administration Guide* for guidelines). The drawer occupies 3 EIA units (approximately 5 1/4 inches) and requires 9 vertical holes on the Expansion Cabinet mounting rack. Locate the top hole that is to be used for mounting the drawer, then count down and identify holes 7 and 8. Place a nut clip on each of holes 7 and 8. Repeat from the rear of the Cabinet.

Step 2: Mount Rails. Position each of the rails (one at a time) so that the 2 screw holes line up with the nut clips. The tabs at the front end of the rail must be facing towards the bottom of the cabinet. Be sure the rail mounting holes are on the **outside** of the cabinet mounting rack (see Figure 13-4). (If necessary, loosen the 4 screws on the adjustable bracket at the rear of the drive and slide so the bracket fits flush against the **outside** of the mounting rack). Insert screws and tighten.

NOTE
Inserting the Quad Drawer onto the mounting rails is a two-person job. The drawer weighs about 50 pounds when full.

Step 4: Insert Drawer. Slide the drawer onto the mounting rails. Push the drawer towards the rear of the cabinet. When the spring clips engage, press the tabs on the underside of the rails and push the drawer all the way into the cabinet.

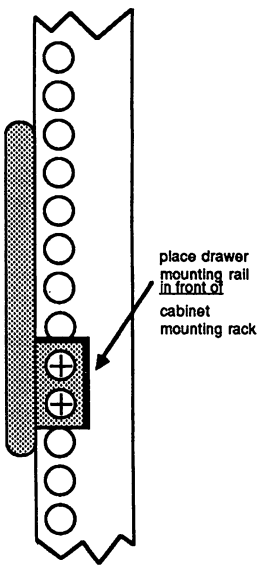


Figure 13-4. Quad Drawer Rail Mount Detail

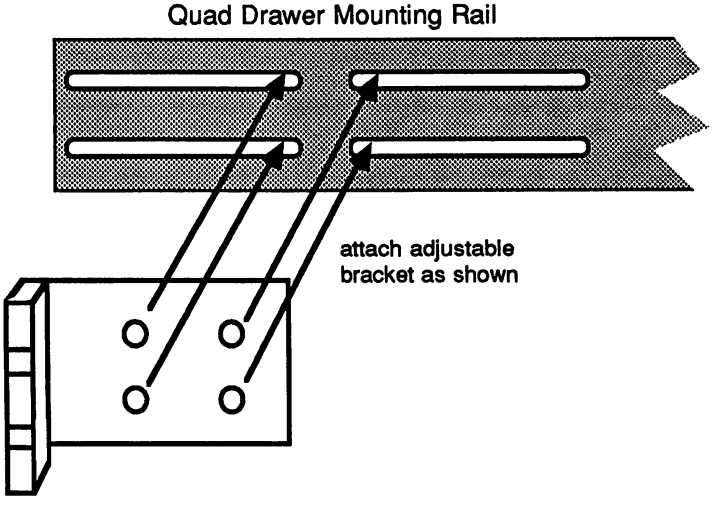


Figure 13-5. Quad Drawer Rail Adjustable Bracket Location

CONFIGURING MASS STORAGE DEVICES

CHAPTER FOURTEEN

This chapter describes how to configure the disk and tape drives that are used with the Stardent 1500/3000 Graphics Supercomputer and Stardent 1500/3000 Server. The following drives are currently supported:

- Priam 738: 5 1/4-inch disk drive with SCSI interface (380 MB unformatted)
- MAXTOR XT-8760S: 5 1/4-inch disk drive with SCSI interface (760 MB unformatted)
- Wangtek 5125ES (half-height): 1/4-inch tape drive with SCSI interface (120 MB unformatted)
- Wangtek 5125SC (full-height): 1/4-inch tape drive with SCSI interface (120 MB unformatted)
- HP 88780A: 1/2-inch reel-to-reel tape drive with SCSI interface (140 MB formatted)
- Exabyte EXB-8200: 1/4-inch tape drive with SCSI interface (2 GB unformatted)
- Fujitsu M2382K: 8-inch SMD disk drive (1 GB unformatted)

To install SCSI disk or tape drives within the Stardent 1500/3000 System Module, refer to the instructions in Chapter 9 of this manual. To install disk drives in the Stardent 1500/3000 Expansion Cabinet Dual SMD Disk Drawer see Chapter 12 of this manual. To install disk drives in the Expansion Cabinet Quad Disk Drawer, see Chapter 13 of this manual.

Priam 738 Disk Drive

To configure the Priam 738 disk drive you must remove a terminator from the drive board and set the drive device number.

Priam 738 Terminator Removal. The location of the terminator on the drive board is shown in Figure 14-1. Remove the terminator by prying it loose with a small flat-head screwdriver.

Priam 738 Device Number Assignment. Assign the disk drive device number by placing pin jumpers on pins at the back of the disk drive (see Figure 14-2). With the back of the drive facing you, locate the block of pins to the left. Counting from the left, use pins 1 to 3 to code the device number in binary. For instance, to code device number 4, as shown in Figure 14-2, place a jumper over the third pair of pins from the left. Also verify that pins 4 and 5 are covered with jumpers.

Store extra jumpers by placing them over one of the pins in a pair.

Figure 14-10 shows device number assignments for Stardent 1500/3000 I/O drawer and Quad drawer devices.

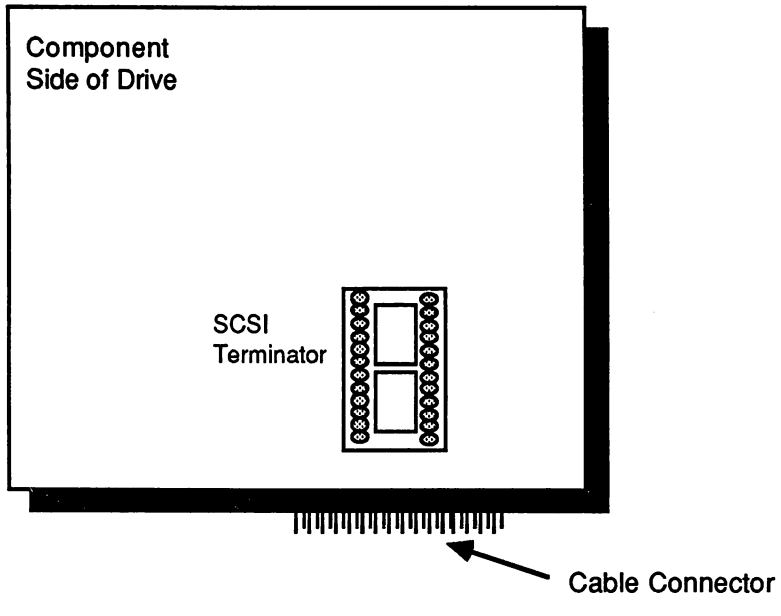


Figure 14-1. Priam 738 Disk Drive Terminator Location

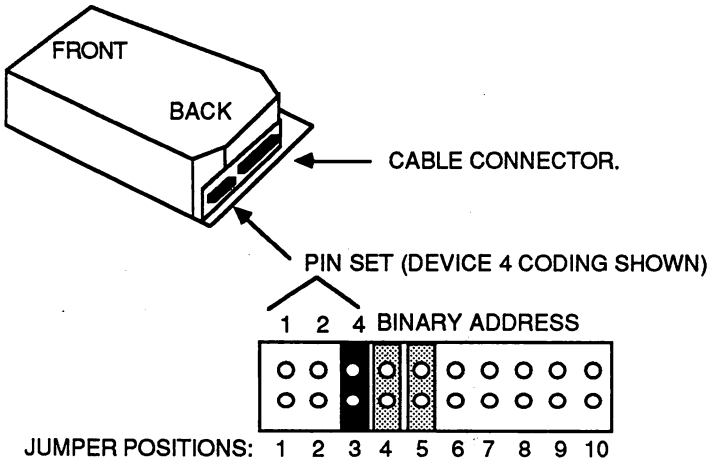


Figure 14-2. Setting the Priam 738 Disk Drive Device Number

MAXTOR XT-8760S Disk Drive

Follow these steps to configure the MAXTOR XT-8760S disk drive.

Step 1. The drive board terminator locations are shown in Figure 14-3. The terminators are 8-pin SIP resistors and are located adjacent to the cable connector as shown in the figure. Remove the three terminators (a pair of needle-nosed pliers may help).

Step 2. Locate pin pair JP41 just to the right of the cable connector (as you face the board from the cable connector edge). Remove the jumper covering pin pair JP41. Refer to Figure 14-3.

Step 3. Code the disk drive device number by placing pin jumpers on the correct pins in the pin set JP37-JP36-JP35, as shown in Figure 14-3.

Pin pairs JP37-JP36-JP35 code the disk drive device number in binary. Pair JP37 is the 1's place, JP36 is the 2's place, and JP35 is the 4's place. The figure shows how to code device number 4. To code device number 5, jump pairs JP37 and JP35.

Figure 14-10 shows device number assignments for Stardent 1500/3000 I/O drawer and Quad drawer devices.

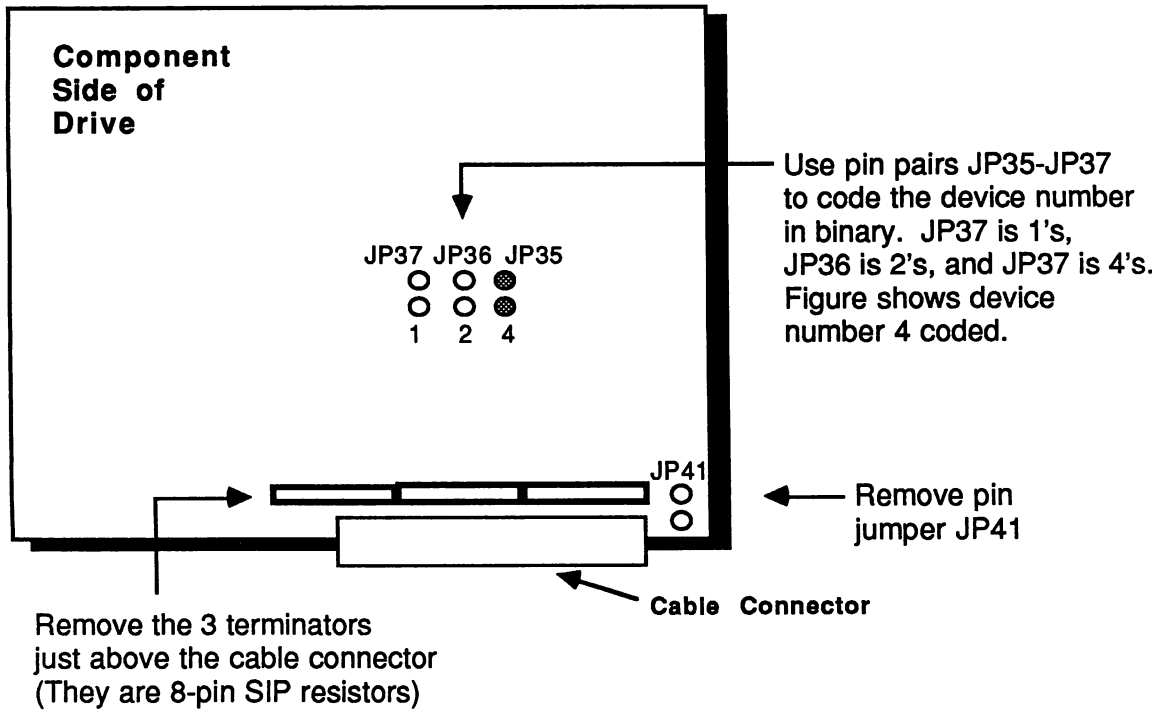


Figure 14-3. Setting the MAXTOR Disk Drive Device Number

Wangtek Tape Drives

NOTE
The component board of the Wangtek 5125ES "half-height" tape drive is not completely exposed. You can gain access within the couple of inches that seperate the drive from its mountings.

To configure the Wangtek 5125 ES and 5125 SC tape drives you must remove the terminators and code the tape drive device number. Refer to Figure 14-4 and Figure 14-5.

Wangtek Drive Terminator Removal. Figures 14-4 and 14-5 show the locations of the Wangtek 5125ES and 5125SC drive terminators, respectively. Use a pair of needle-nosed pliers to remove the terminators.

Wangtek. Code the tape drive device number by placing pin jumpers on the correct pins in the pin set shown according to Figure 14-4 or 14-5.

- The Wangtek 5125ES has a triple row of pins (labeled HDR3) with the pin 1 triplet to the right as you face the board at the cable connector edge. Triplets 1-3 code the device number in binary. Code device number 6 by jumping the *lower* two pins in pairs 2 and 3 (counting from the right).

- The Wangtek 5125SC has a double row of pins (labeled JP5) with pair 1 closest to the cable connector edge of the board. Use pairs 1-3 t code the device number in binary. Code device number 6 by jumping pin pairs 2 and 3 (counting from the cable connector edge of the board). Note that the single block of pins to the right of the double row contains spare jumpers. They can be used as needed.

The cartridge tape drive, which resides in the right Stardent 1500/3000 System Module I/O drawer, should always be assigned device number 6.

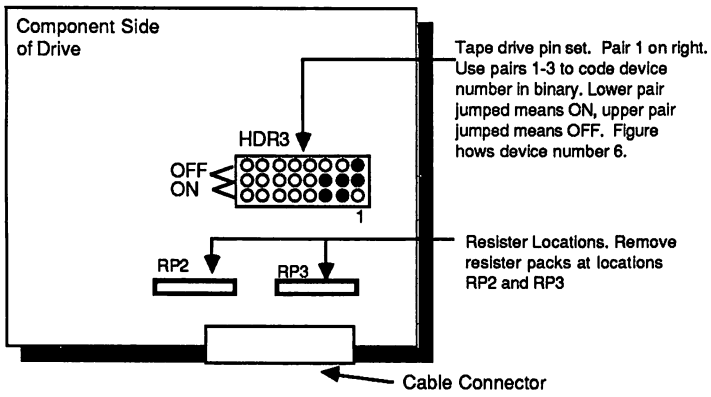


Figure 14-4. Wangtek Half-Height Component Board

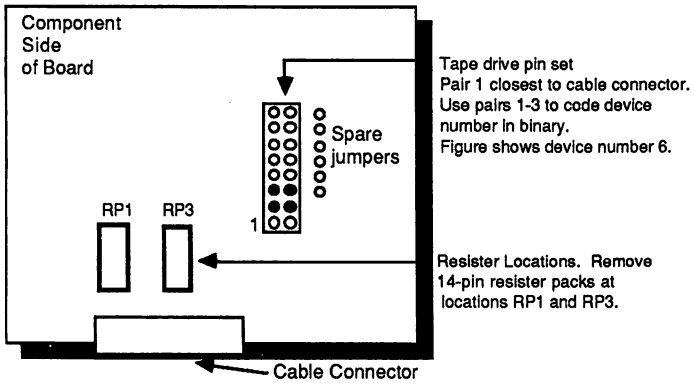


Figure 14-5. Wangtek Full-Height Component Board

HP 88780A Tape Drive

Follow these steps to assign a device number for the HP 88780A reel-to reel tape drive.

Step 1. Make sure the tape drive is powered-up but off-line.

Step 2. Locate the control buttons on the front panel of the drive, as shown in Figure 14-6.

Step 3. Set the tape drive device number as follows:

Press OPTION to enter the option mode

Press NEXT until ID appears

Press ENTER

Press NEXT or PREV until you reach the desired device number (e.g. 7 for device number seven).

Press ENTER. The number you selected appears for a moment. The display then reverts to ID.

Press OPTION or RESET to leave the option mode.

The tape drive is now configured for use. Follow the instructions in the HP 88780A User's Guide to use the tape drive with your system.

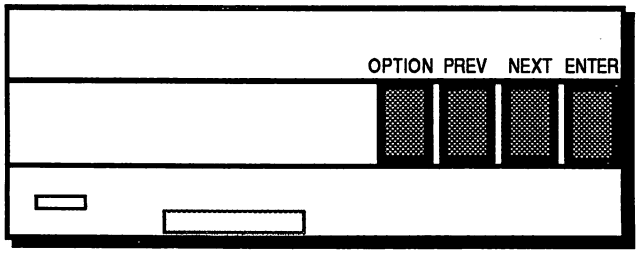


Figure 14-6. Front View of HP 88780A ½-inch Tape Drive

Exabyte EXB-8200 Tape Drive

Exabyte Device Number. To assign the Exabyte EXB-8200 tape drive device number, remove the cover of the drive. Use the DIP switches on the back of the drive to code the device number in binary. (Refer to Figure 14-7). As you face the back of the drive the left-most switch is the 1's place, the middle switch is the 2's place, and the right-most switch is th 4's place. Figure 14-7 shows device number 6 coded.

Exabyte Terminators. The Exabyte tape drive is shipped **without** internal SCSI terminators. An external SCSI terminator is included with the drive and is necessary if the Exabyte is the last device in a SCSI daisy chain.

NOTE
To access the Exabyte device number DIP switches, the drive cover must be removed. This requires a special Torque screwdriver. There are three screw locations: on the top of the rear panel, and along the bottom of each side panel, towards the rear of the drive.

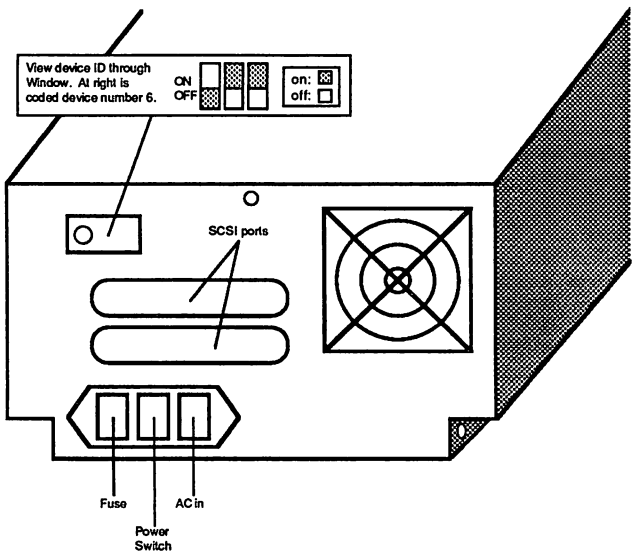


Figure 14-7. Rear View of Exabyte Tape Drive (Cover Removed)

Fujitsu M2382K SMD Disk Drive

The following must be observed when configuring the Fujitsu SMD drive:

SMD Drive DIP Switch Settings. The DIP switch settings for the 8" SMD drive must be set as shown in Figure 14-8. Note that the DIP switches should be set **with the drive cover in place** Use a small screwdriver or other thin object to set the switches through the openings in the drive cover.

SMD Drive Terminators. The location of the SMD drive terminators is shown in Figure 14-9. The second drive in an SMD daisy chain **must** be terminated (if only one drive is present in an SMD drawer, it must be terminated). The terminators are 16-pin resistor packs and are located near number 30 on the edge of the board.

The drive cover must be removed to access the terminators. See Chapter 12, *Dual SMD Disk Drawer Procedures,* for details on drive cover removal.

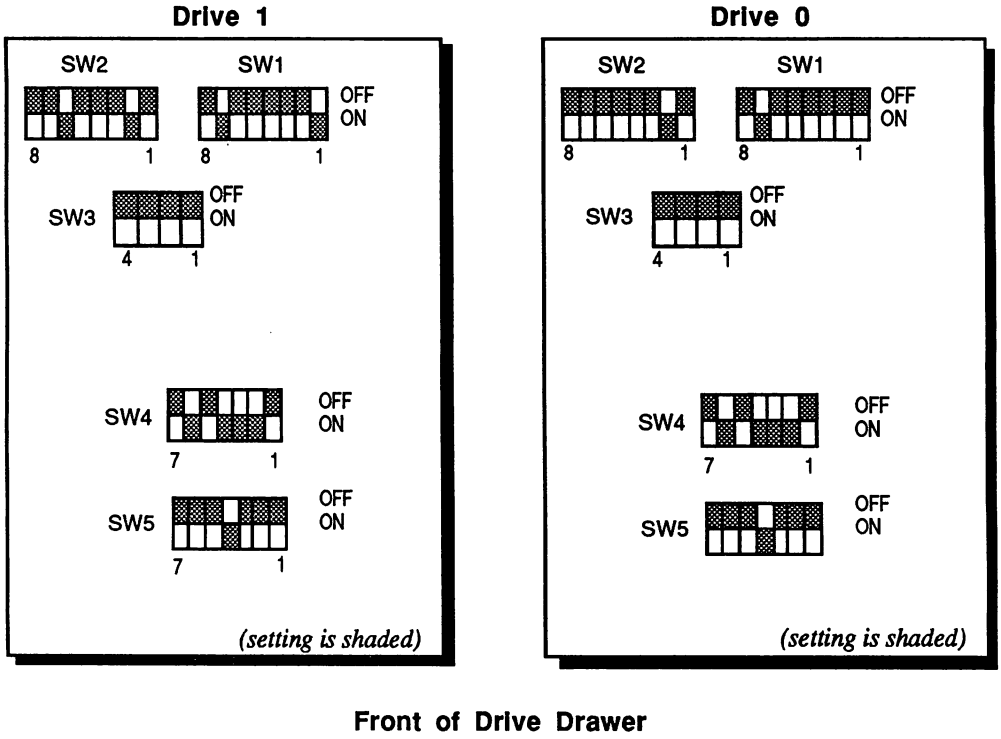


Figure 14-8. SMD Drive DIP Switch Settings

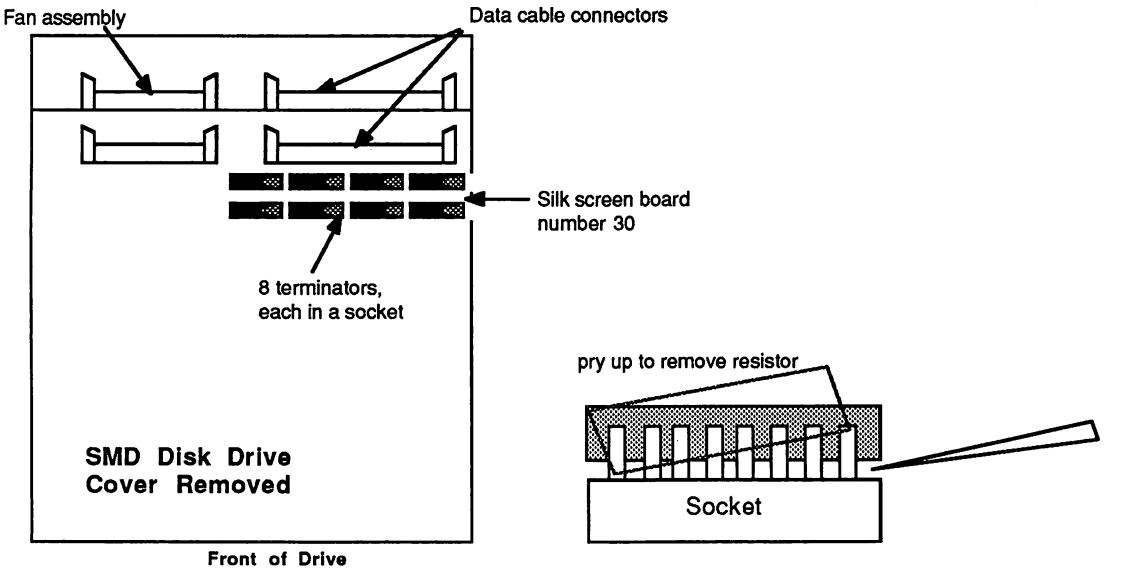


Figure 14-9. SMD Drive Terminator Locations

Recommended Device Numbers

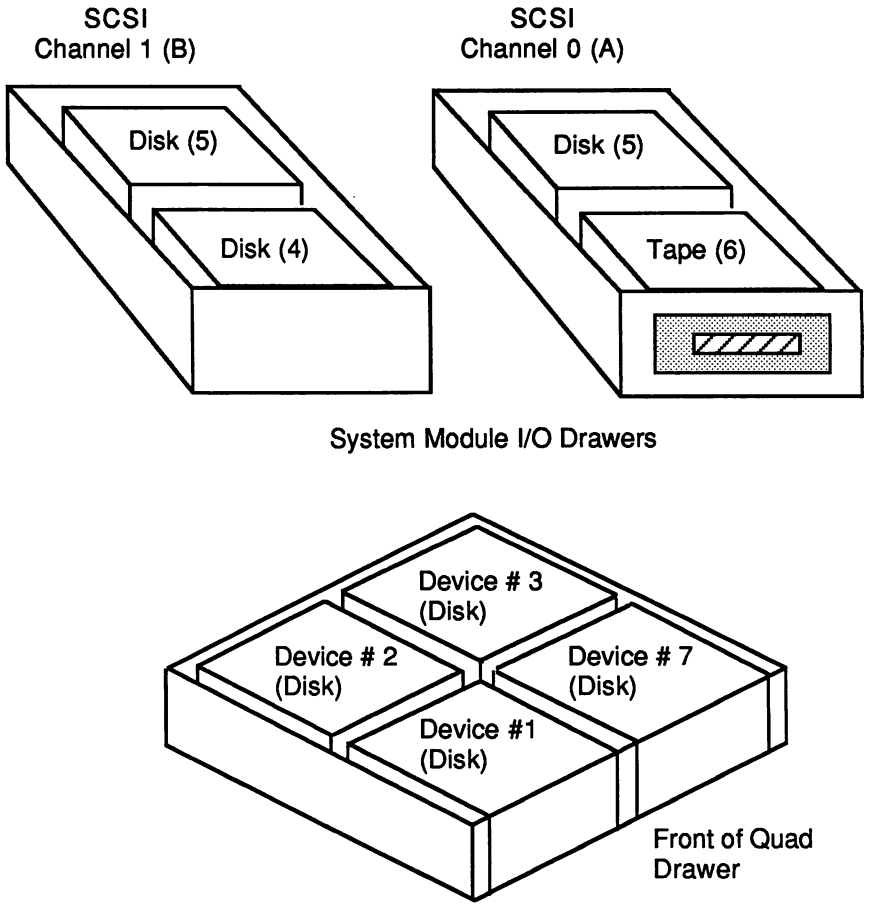


Figure 14-10. Recommended Stardent 1500/3000 Mass Storage Device Numbers

TROUBLESHOOTING

CHAPTER FIFTEEN

The objective of Stardent 1500/3000 troubleshooting is to make the system functional by solving a problem or working around it, and when that is not possible, to isolate the problem to the field replaceable unit (FRU) or specific software component. A secondary objective is to help isolate problems that preclude use of specific features or applications. In general, the better a problem is isolated, the faster an FRU or bug fix can be dispatched. Note that component-level hardware repair is not done in the field.

NOTE
You can reach the Stardent Customer Support office at 1-800-537-1104.

The chapter has four main sections:

- System module LEDs.
- Hardware problems, or when to suspect hardware problems and how to diagnose them.
- Booting Problems, or problems with getting the system up and running.
- Operational problems, or problems with the normal functioning of the system or applications. (To be supplied.)

System Module LEDs

Diagnostic LEDs are located on the Stardent 1500/3000 system module front panel and near the top of each ciruit board. See Appendix B for a description of the LEDs on each board.

Front Panel LEDs. Behind the Stardent logo on the front panel is a green power light (LED). It monitors the state of the Stardent 1500/3000 power supply and is always on when Stardent 1500/3000 is powered. The amber LED on the front panel monitors the boot process. Its activity and that of the GREEN LED are summarized in Table 15-1.

Table 15-1. Front Panel LED Activity

Green LED: Stardent 1500/3000 powered	 LED is on.
Amber LED: Preboot, PROM Booting UNIX Running normally Problem	 LED flashes. LED flashes while UNIX is loaded. LED is off. LED is on steadily. Examine the console for error messages and the CPU board LEDs for failure information.

Circuit Board Pass/Fail LEDs. Each circuit board has a small set of LEDs near the top for more detailed diagnostic information. The first (GREEN) is a global pass indicator; the second (RED) is a global fail indicator. They work as follows:

(1) When the system power is turned on the GREEN pass light and the RED fail light are both lit.

(2) As the system goes through an inital self-test (described below in this chapter under "Booting Problems") the GREEN light is turned off and the RED light is turned on.

(3) Once the self-test passes the RED light is turned off and the GREEN light is turned on. (The entire self-test process takes a few seconds.)

Given this sequence of events, you can determine the following facts by looking at the top two circuit board LEDs.

- If the GREEN pass light is on and the RED fail light is off, the board has passed the inital self-test. This does not guarantee that the board is good, however. The board could have a problem not caught by the self-test.

- If the RED light is on and the GREEN light is off, the board has failed the self-test.

- If both the GREEN and RED lights are on the self-test was not completed or not yet attempted. It is necessary to use other information such as the messages printed over the diagnostic communications port (DCP) on the boot CPU board to see if the board has failed.

Other Circuit Board LEDs. On each circuit board the remaining LEDs (all RED) give other information. For instance, the fifth LED from the top of the I/O board is a mouse activity light. If you press the left mouse button, the LED lights to show that the I/O board is communicating with the mouse. Appendix B gives the meanings of all the circuit board LEDs. meanings.

CPU Board LEDs. The LEDs on the boot CPU board give specific information about the steps taken during the initial power-on self-tests of all the boards. As the system goes through initial self-tests the bottom six LEDs on the boot CPU board plus the GREEN pass light are lit in patterns to indicate progress. The LED patterns are hex codes for steps in the self-test. For instance, the code listed as b1 in Appendix B is the step "finding I/O boards." If the self-test halts and the LED code is b1, you know that the boot CPU was unable to locate the I/O board. That information is needed for further problem diagnosis and should be reported to Stardent Customer Support. Appendix B includes all the CPU board LED codes.

See "Booting Problems" below in this chapter for more on the power-up self-test sequence.

Normal CPU Board LED Operation. During normal system operations the LEDs on the boot CPU pulse up and down as the CPU continually checks communications with system devices. The LEDs on any secondary CPUs flash continually. Absence of these patterns is a definitive problem indicator, though the problem is not necessarily with the CPU board.

Hardware Problems

Two types of information are available to to help you isolate hardware problems to an individual FRU.

(1) The system may give you an explicit indication of a hardware problem via a system message or via the LEDs on the system boards. For instance, if the red failure LED on any of the system boards is lit without the green pass light being lit, the board has failed the self-test.

(2) A suite of diagnostics is available to help isolate hardware problems to the individual FRU. Detailed instructions on how to run the diagnostics and descriptions of the diagnostics themselves are contained in Appendix C.

When should you suspect a hardware problem?

- When a front panel or board LED indicates failure.
- When a problem occurs right after you power on the machine and before the PROM prompt appears.
- When an error message suggests a hardware failure.
- When the system behaves in an erratic fashion.
- When the system crashes intermittently.
- When you have unsuccessfully attempted to isolate a problem as a software problem and still have not isolated the trouble.

Hardware Diagnostics

Hardware diagnostics are located on the primary boot disk, */dev/dsk/c1d5s0*, in the directory */stand*. Appendix C gives instructions for booting and running the diagnostics. [1]

Table 15-2 lists the currently available hardware diagnostics. They come in five categories: CPU, memory, I/O, graphics, and VME. The diagnostics enable you to isolate most hardware problems to an individual board within the diagnostic category. Nine of the diagnostics,

cpu.diag
hare.diag
mem.diag
memrbus.diag
ioregs.diag
iobuscv.diag
grfield.diag
scsi.diag
periph.diag [2]

form the basic set; the rest of the diagnostics provide more detailed analysis.

Follow the suggestions given below when you suspect hardware problems. The suggestions given here supplement those given under *Booting Problems* below in this chapter. Figure 15-1 and

[1] The diagnostics are also located on the diagnostics tape shipped with Stardent 1500/3000.

[2] for diagnosing network problems, add *lance.diag* to this set.

Figure 15-2 at the end of this chapter contain a flow-chart version of the suggestions given here.

Table 15-2. Hardware Diagnostics

CPU/FPU	MEM	I/O	GRAPHICS	GR.EXPAN.	VME
cpu.diag	mem.diag	desktop.diag	gr.diag*	gr.diag*	vme.diag
cpmex1.diag* [3]	cpmex1.diag*	mapper.diag	grex1.diag*	grfield.diag	
cpmex2.diag*	cpmex2.diag*	serial.diag	grex2.diag*		
fpmex.diag	hare.diag	ioexbts.diag*	grex3.diag*		
fpuex.diag	memcbit.diag	ioexdpe.diaga*			
fpuregs.diag	memrbus.diag	ioexnxl.diag*			
fpuops.diag		iobuscv.diag			
hare.diag		ioregs.diag			
lvags.diag		iotimer.diag			
lvagsb.diag		lance.diag			
svags.diag		periph.diag			
vagsw.diag		scsi.diag			
vrf.diag		serial.diag			
arb.diag					
arithex.dev					

(1) If you suspect a hardware problem, first check the voltages to the System Module backplane according to the procedure given in Chapter 5 of this manual.

(2) If you cannot bring up the PROM, make sure you have a terminal connected (at 2400 baud) to the DCP on the boot CPU board. Power-down and power-up the machine and examine the messages printed at the DCP terminal. For details and follow-up see "Booting Problems" below in this chapter.

(3) Once you are in the PROM you can run hardware diagnostics. First run *cpu.diag* to check the boot CPU (with an emphasis on the integer processor portion of the board). To run the diagnostic, boot it from its location on disk:

```
prom 1> b stand/cpu.diag
```

(All the other diagnostics can be booted in the same way.)

(4) If *cpu.diag* passes, continue to the next step. If it fails, the error message you get should indicate whether or not the problem involves memory access. If it does, it could be a

[3] Diagnostics marked with an asterisk (*) in the table are loaded into the instruction cache on the CPU board. They must be run from a terminal connected to the DCP on the CPU board.

memory board problem. Run *mem.diag* to check the status of all the active memory boards in the system. If *mem.diag* passes, the problem is probably with the CPU board. Plan to report the bad CPU board to Stardent Customer Support along with error message codes.

(5) If *cpu.diag* passes, run *hare.diag* (halt-restart) to do halt and restart exercises on the CPU board and to check the vector processing unit (sometimes called floating point unit) and Read bus access.

(6) If *hare.diag* passes, continue to the next step. If it fails, the error message you get should indicate whether or not the problem involves memory or R-bus access. If it does, the problem could be a memory board or bus problem. Run *memrbus.diag* to check interactions between memory and the bus. If *memrbus.diag* passes, the problem is probably with the CPU board. Plan to report the bad CPU board to Stardent Customer Support along with error message codes.

(7) If you have multiple memory or CPU boards in the system, you should disable the bad memory or CPU board and attempt to reboot before reporting the bad board. Disabling the bad board gives you a functioning system or lets you diagnose other board failures.

NOTE
Before powering down the machine it is a good idea to take a crash dump according to the instructions in *Crash Dump Procedure* in the *Installation and Administration Guide*. The crash dump records the state of memory prior to power-down. It may be quite useful if the problem turns out to involve software.

To disable a board you must power-down the machine. To disable the CPU board use the disable/enable switch on the back of the board, below the LEDs. To disable a memory board slide it out of the card cage so that in no longer connects to the backplace. (1/4 to 1/2–inch should be sufficient.) Do not remove the board from the card cage unless you have a blank slot filler (Stardent Part Number 154-0001-01) to take its place. Report the one or more bad boards to Stardent Customer Support along with error message codes.

(8) Once you have checked the CPU board, run *mem.diag* (if you have not already done so) to check the memory boards. If the diagnostic passes, continue to the next step. If it fails and you have a multiple memory board system, disable the board and try to reboot. Disabling the bad board gives you a functioning system or lets you diagnose other board failures. Report the bad board to Stardent Customer Support along with error message codes.

(9) Once you have checked the memory boards, run *ioregs.diag, iobuscv.diag* and *scsi.diag* to check the I/O board. If the diagnostics pass, continue to the next step. Report the bad I/O board to Stardent Customer Support along with error message codes.

(10) If you suspect a network-related hardware problem, first check the Ethernet/Cheapernet switch on the back of the I/O board to be sure that the switch setting corresponds to the type of network being used. If you still suspect a network problem, run *lance.diag* after you have run the I/O board diagnostics. If the messages indicate an Ethernet transceiver problem, the problem could be with the version of transceiver being used or with the Ethernet fuse on the I/O board . Stardent 1500/3000 requires the level 2 Ethernet transceiver. If a bad fuse is indicated, power down the machine and change the Ethernet fuse according to the instructions given in Chapter 7 of this manual. Try to reboot. If you are successful, the problem is solved. If *lance.diag* fails in another way, report the failure to Stardent Customer Support along with error message codes.

(11) Once you have checked the I/O board, run *grfield.diag* to check the graphics and graphics expansion boards. If the diagnostic passes, continue to the next step. If it fails, the error messages should indicate whether the graphics or the graphics expansion board is bad. Report the bad board to Stardent Customer Support along with error message codes.

(12) If you suspect that the problem may involve SCSI devices (disk or tape), run *periph.diag*. If the diagnostic passes, continue to the next step. if it fails, report the failure to Stardent Customer Support along with error message codes.

(13) If you still have not isolated the problem, run other diagnostics listed in Table 15-1 in categories according to your suspicions about what might be wrong. Based on the diagnostic run and the error messages received, report the bad board or device to Stardent Customer Support along with error message codes.

(14) If you still cannnot find the problem after running all the diagnostics, it could be a software problem in disguise. If you have not powered the system down, take a crash dump, following the instructions given in *Crash Dump Procedure* in the *Installation and Administration Guide*; then

contact Stardent Customer Support for follow-up instructions or dial-in assistance.

Booting Problems

When you boot Stardent 1500/3000 from a power-off condition with the lower key switch in the "normal" position, the following sequence of events normally occurs. [4]

(1) The system clears and initializes registers, locates the master CPU, performs self-tests on the boot CPU board, memory boards, I/O board and graphics boards, initializes the PROM environment, and boots the PROM. If the NVRAM variable *bootmode* is set to *a* (for autoboot), the system proceeds to boot SASH and the UNIX system (see (2) below) without outputting a PROM prompt. If *bootmode* is set to *m* (for manual), the system outputs a prompt of the form

```
prom x>
```

where x is the CPU ID of the master CPU.

(2) If *bootmode* is set to *a*, the system then automatically boots SASH (the standalone shell). SASH permits the addressing of individual files on a disk as well as devices.

(3) If *bootmode* is set to *a*, the UNIX system is then booted. It is booted to single user mode or multi-user mode, depending upon the value of the *initdefault* entry in the file */etc/inittab*. If the system boots to single user mode, you see a pound sign prompt (#); if the system boots to mult-user mode, you see a *login:* prompt.

Let us now examine what can happen at each step.

Power-on, booting the PROM

As the system performs board diagnostics it sends progress messages and errors, if any, to the diagnostics communication port

[4] See Appendix D, *Resetting the System* for more on Stardent 1500/3000 key switch operations.

(DCP) on the master CPU. [5] The messages look something like this:

```
DCP internal loopback test...Done.
Checksum the bootprom...Done.
Test and init cache...Done.
Test and init etlbs...Done.
Config and init memory...Done.
Test and init I/O board...Done.
Test and init GR board...Done.

Selftest Complete
```

The printing of each message is a signal that a self-test is about to be done. The system prints the message, such as

```
Config and init memory
```

it then prints three dots (...), and it then proceeds to do the self-test. Once the self-test is complete, the word done is printed. Thus, when you see

```
Test and init I/O board...Done.
```

on the screen, you know that the I/O board has passed its self-test.

If a self-test fails "Done" is not printed and you may see an error message. For instance, if you see the following output

```
DCP internal loopback test...Done.
Checksum the bootprom...Done.
Test and init cache...Done.
Test and init etlbs...
```

and the terminating "Done" does not print, the test of ETLBs (external translation lookaside buffers) on the boot CPU board has failed. When this happens, make sure that you record the status of the LEDs on the CPU board as discussed above under "System Module LEDs" in this chapter. The cache and etlb tests test the CPU board; the other test names should be self-explanatory.

The system does an internal check of all CPU boards; the DCP connected to the boot CPU board only prints progress and error messges associated with the boot CPU, however. If you want to see the results of self-tests on secondary CPU boards you must hook terminals to their DCPs. To do complete tests (including

[5] To receive these messages, the DCP terminal must operate at 2400 baud.

communications with other boards and the bus) on secondary CPU boards you must power-down the machine and disable the boot CPU. To disable the board use the enable/disable switch located just below the board LEDs.

Once the self-test is complete, the Stardent 1500/3000 monitor is activated, and output is now sent to both the DCP and the monitor. A board inventory is printed, followed by a PROM prompt. The output is similar to this:

```
Titan Monitor, Version 6.3, Thu May 26, 10:28:31 PDT 1988
Board Inventory:
slot     status          revid           board type
  1      0x012c001a      24              I/O
  2                      3               CPU, cpuid: 1
  3      0x01ff0020      0               Memory, 32 Mbyte
  5                      3               CPU, cpuid: 2
  6      0x01ff0020      0               Memory, 32 Mbyte
  8      0x012c9000      0               Graphics
  9                      0               Graphics Expansion
prom 1>
```

If the PROM boots successfully and you see the PROM prompt, the DCP is not needed to receive special messages. If the PROM fails to boot, however, it is important that you attach a terminal to the DCP, reboot the system from a power-off condition, and observe the messages that appear. (For details on using the DCP, see the *Installation and Administration Guide.)*

The PROM lets you determine easily the physical location of the boot CPU. The board inventory shows the card cage slot and the CPU ID of each CPU board. In the inventory given above on this page slot 2 holds the board with CPU ID 1 and slot 5 holds the board with CPU ID 2. Now notice the PROM prompt. The number following the work `prom` indicates the CPU ID of the boot CPU. In this case the boot CPU is the one in slot 2 (CPU ID 1). [6]

[6] To determine the mapping between CPU ID and card cage slot, take the octal representation of the card cage slot, drop the 4's digit, and reverse the remaining two digits. The resulting number is the CPU ID. Thus, for instance, the CPU board in slot 5 has octal representation:

101

Dropping the 4's digit leaves

01

and reversing the remaining digits leaves

10

which is the binary representation of the number 2. Thus, the CPU ID of the CPU board in slot 5 is 2.

Once the PROM is booted successfully you may want to check the board inventory displayed on the screen. The inventory should correspond to the actual configuration of the machine and the "status" entries for the memory, graphics, and I/O boards should be as follows:

```
memory board     0x01ff0020
graphics board   0x01zz9000
I/O board        0x01zz00zz
```

(The *zz* means that the value may vary.) If there is any discrepancy in the board inventory, it indicates a problem. Power off and reboot. If that doesn't work, follow the suggestions given in "Hardware Problems," above in this chapter to isolate the problem.

If booting aborts before the PROM prompt appears, follow the suggestions given below. The suggestions appear in the flow-chart in Figure 15-1.

(1) Check the messages that appear on the DCP terminal. They indicate at which board the self-test stopped and may describe the problem.

(2) If a board failure is indicated, check to see if the board has been incorrectly installed. Fortunately, any installation mistakes should be obvious by a look at the card cage. Is the board in the correct slot? Is it sticking out or clearly mis-aligned? If not, the board has failed. Report the failure to Stardent Customer Support, together with the specific LED pattern on the board.

(3) You may get a specific error message such as

```
!ERROR – I/O has bad fuse !
```

In the case of a bad I/O fuse, power down the machine and replace the I/O board SCSI fuse according to the instructions in Chapter 7 of this manual. Reboot.

(4) If the problem involves the graphics board, disconnect the keyboard and bring up the PROM prompt from the DCP. (When the keyboard is disconnected the system knows that the monitor is unavailable.) Once you have access to the PROM you can run the graphics board diagnostics as described above under "Hardware Diagnostics" and report the results to Stardent Customer Support.

(5) Disable any bad CPU or memory boards, if you have a multiple board installation. The board LEDs and error messages may indicate which board is bad, or they may not. If you are not sure which CPU or memory board is bad, try disabling the boot CPU or the memory board in the highest card cage slot.

To disable a CPU board, locate the enable/disable switch just below the LED panel on the side of the board assembly. Move the switch to the "disable" position. To disable a memory board, slide it out of card cage so that it no longer connects to the backplane. (1/4 to 1/2–inch should be sufficient). Do not remove the board from the card cage unless you have a blank slot filler (PN 154-0001-01) to take its place. Once you have disabled any bad CPU or memory boards try to reboot. Doing so gives you a functioning system or lets you diagnose other failures. Report the bad board to Stardent Customer Support.

Booting SASH

In automatic boot mode the SASH (NVRAM variable *secondary*) is booted prior to booting the UNIX system. If the boot of SASH is successful, a message such as the following appears on the monitor screen.

```
Titan Standalone Shell, Version 6.3 Tue July 26 19:06:47 PDT 1988
```

If SASH does not boot successfully, the rest of the boot process is aborted. The action you take depends upon the messages that appear on the monitor screen when the system attempts to boot SASH. Figure 15-3 at the end of this chapter summarizes recommended actions in a flow-chart. Here are a couple of examples:

(1) Disk access problems. Suppose you get this error message when the system attempts to boot SASH:

```
sense condition key=0x2
SCSI B: UNIT (1,5,0) not ready error code=5
could not load secondary boot file $secondary=scsi(1,5,8)sash
couldn't load UNIX
prom x>
```

In this example the system attempted to access the primary boot disk and was unsuccessful. This could happen if the disk is not up to speed when accessed. To deal with the problem, wait a few seconds, then do a hard reset.

If the problem recurs, run the diagnostic *periph.diag*. If the inventory printed as part of the diagnostic output does not match the actual configuration, or if you get an error message, the disk drive may not be installed correctly. Power down the machine and inspect the disk drive cable connections (see the instructions for adding disk drives in Chapter 9). Reboot. If you get a another error message suggesting SCSI problems when the system attempts to boot SASH, run the diagnostic *scsi.diag* and report the results to Stardent Customer Support.

(2) SASH access problems. Suppose you see this message when the system attempts to boot SASH:

```
secondary not found
prom x>
```

In this case check the value of the NVRAM variable *secondary*, and then reboot. *secondary* should be equal to scsi(1,5,8)sash.

If you have assigned the correct value of *secondary* and the system still cannot find SASH, try booting SASH directly from the system tape. Load the system tape in the cartridge tape drive (for instructions see *Overview* in the *Installation and Administration Guide*) and issue these commands:

```
prom x> b scsi(0,6,3)
```

You should see the SASH prompt appear. You can now boot UNIX:

```
sash x> b
```

If you have trouble booting SASH from the system software tape, you likely have a corrupted tape. Report the problem to Stardent Customer Support.

You may encounter other problems booting SASH. If you can't find the source of the problem, always try booting SASH directly from tape, then trying to boot again. If that doesn't work, report the problem to Stardent Customer Support, together with information about what you tried and what error messages you received. If you need to boot SASH from tape, remember to install SASH in the disk volume header once the UNIX system is up and running. To install SASH in the disk volume header use *dvhtool* as described in *Software Installation* in the *Installation and Administration Guide*.

Booting UNIX

In automatic boot mode the SASH boot is followed by an attempt to boot the UNIX system. If successful, you see various messages appear on the screen, followed by a pound sign prompt if the boot is to single user mode and a *login:* prompt if the boot is to multi-user mode.

The boot may fail for any of a variety of reasons. Here are some generic symptoms:

(1) You get the message

```
can't load unix - unix not found
```

(2) You get an exception message once the system has tried to carry through the boot process.

(3) As desired, you enter multi-user mode (init level 2), but encounter problems before the *login:* prompt appears.

The first two cases are covered in this section; the last case is discussed in the next section. Suggestions are summarized in the flow-chart in Figure 15-4 at the end of this chapter.

In the first case, check the values of the NVRAM variables *path* and *bootfile*. They should have the values

```
path=scsi(1,5,0)
bootfile=unix
rootdev=scsi(1,5,0)
```

Reboot.

To deal with the second symptom or to troubleshoot the problem if you follow step 1 and cannot reboot successfully, you must boot the mini-root, a small (12 MB) version of the root file system with enough UNIX for troubleshooting. Your only copy of the mini-root is on the system software tape (section 4). Load the system tape, then use these commands to copy the mini-root from tape to the primary boot disk's swap partition (partition 1) and to boot the mini-root:

```
sash x> copy scsi(0,6,4) scsi(1,5,1)
sash x> b scsi(1,5,1)unix rootdev=scsi(1,5,1)
```

Once the mini-root is booted, first check the root file system:

```
# fsck -y /dev/dsk/c1d5s0
```

(If you can't boot the mini-root, something is seriously wrong with the system tape or the disk. Run *periph.diag* (and *scsi.diag* if *periph.diag* is successful), then report the problem to Stardent Customer Support.)

During the file system check, observe any Phase 2 ("Checking path names") error messages. If any error messages refer to files with "mode" other than 20000, you may need to reload the operating system from tape and reboot. Before doing so, contact Stardent Customer Support for any additional instructions or dial-in assistance.

Once you have checked the root file system, mount it on an available mount point, move to the appropriate directory, and look for the UNIX kernel:

```
# mount /dev/dsk/c1d5s0 /mnt
mount warning: <> mounted as </mnt>
# cd /mnt
# ls -l unix
```

If you get a message such as this,

```
unix: no such file or directory
```

it means that the UNIX kernel has been lost. Fortunately it is easy to reconfigure the kernel. If you have NFS on the system, type

```
# cd /mnt/config
# /mnt/bin/make NFSDEF="" ADDITIONS=libnfs.a
```

If you don't have NFS, type

```
# cd /mnt/config
# /mnt/bin/make
```

Once the *make* is complete, move the new kernel to the root file system, unmount the file system and reset the system:

```
# mv unix /mnt/unix
# cd /
# umount /mnt
# sync
# halt
```

That should fix the problem and let you boot successfully from the PROM.

The mini-root lets you experiment to solve other problems as well. For instance, suppose you are attempting to boot to single user mode. The UNIX system is loaded, then you see this output:

```
INIT: SINGLE USER MODE
su: unknown ID root
```

The system is unable to locate root or execute the *su* shell. As described above, boot the mini-root, mount the root file system on */mnt*, then compare the mini-root and root file system versions of */bin/su*:

```
# cmp /bin/su /mnt/bin/su
```

If they are different, */bin/su* has been corrupted. You may need to reinstall the operating system from tape. Call Stardent Customer Support for confirmation. (If you wish you can try copying the mini-root's version of *su* to the root file system's version,

```
# cp /bin/su /mnt/bin/su
```

but be forewarned that that may not be sufficient to solve the problem. If *su* has been corrupted, chances are good that something else has been corrupted as well.)

If root is simply not found, check the file */mnt/etc/passwd* (the */etc/passwd* file in the root file system.) If root is missing or if the entry has been corrupted, copy the correct root entry from the mini-root version of the file, */etc/passwd*. If */mnt/etc/passwd* has been completely lost, restore it by copying */etc/passwd* to */mnt/etc/passwd*. Note that when you copy */etc/passwd* to */mnt/etc/passwd*, all user information is lost, so don't do the copy unless you are sure that the full */etc/passwd* file has been lost.

Once you have repaired the damage to the *passwd* file, unmount the root file system and reboot:

```
# cd /
# umount /mnt
# sync
# halt
```

In general, for problems during the initial load of UNIX:

- Boot the mini-root and use it to examine the root file system.
- If you encounter problems that can't be solved by reconfiguring the kernel or making minor changes to a few files, you may need to reload the UNIX system from tape. Before doing so check with Stardent Customer Support.

Reloading the system from tape is a drastic step, and the support office may have alternative suggestions.

If problems persist, hardware may be the culprit. Run hardware diagnostics and report results to Stardent Customer Support, together with a detailed description of what transpired.

Booting UNIX to Multi-user Run Level

When you boot UNIX to the multi-user run level, you see the following message:

```
INIT: new run level: 2
```

The system then executes the shell script */etc/rc2* which in turn mounts and checks file systems and initializes system capabilities that have been configured: network, NFS, lp spooler, and so on. Here is sample output:

```
INIT: SINGLE USER MODE
# init 2

INIT: New run level: 2

Checking root file system (/dev/dsk/c1d5s0).

  /dev/dsk/c1d5s0       type S54K
  ** Phase 1 - Check Blocks and Sizes
  ** Phase 2 - Check Pathnames
  ** Phase 3 - Check Connectivity
  ** Phase 4 - Check Reference Counts
  ** Phase 5 - Check Free List
  2326 files 66800 blocks 14952 free
The system is coming up.  Please wait.

***** Normally all file systems are fscked.
***** To fsck only dirty ones, type 'yes' within 5 seconds: yes
***** Only dirty file systems will be fscked.
mountall: fscking /dev/dsk/c1d5s2 (/user).

  /dev/dsk/c1d5s2       type S54K
  /dev/dsk/c1d5s2       ** Phase 1 - Check Blocks and Sizes
  /dev/dsk/c1d5s2       ** Phase 2 - Check Pathnames
  /dev/dsk/c1d5s2       ** Phase 3 - Check Connectivity
  /dev/dsk/c1d5s2       ** Phase 4 - Check Reference Counts
  /dev/dsk/c1d5s2       ** Phase 5 - Check Free List
  /dev/dsk/c1d5s2       1109 files 101692 blocks 12496 free
mount: warning: <> mounted as </user>
network configured.
Internet daemons: inetd.
BSD daemons:  syslogd sendmail comsat.
```

```
started
finished
NFS daemons:starting portmap
starting mountd
starting nfsd 6
mounting network file systems...
starting cron.
lp spooler
The system is ready.

login:
```

At each stage in the process, the */etc/rc2* script calls one of the files in the directory */etc/rc2.d*. The */etc/rc2.d* directory contains symbolic links to the actual shell scripts that are executed. (The script files themselves are in */etc/init.d*.) Table 15-3 shows the connection between the */etc/rc2.d* files (symbolic links), and the message that is printed when the file is invoked.

Table 15-3. rc2 Files and Messages

/etc/rc2.d file	screen messages
S01MOUNTFSYS	Checking root file system (/dev/dsk/c1d5s0).
S20ssysetup	no messages
S21perf	no messages
S30tcp	network configured
S35bsd	Internet daemons: syslogd sendmail comsat. started finished
S40nfs	NFS daemons:starting portmap starting mountd starting nfsd 6 mounting network file systems...
S50RMTMPFILES	no messages
S70uucp	no messages
S75cron	starting cron.
S85lp	lp spooler

Once the rc2 files have been called, the system scans the */etc/inittab* file and spawns any *getty* processes indicated for run level 2. You see these messages:

```
The system is ready.

login:
```

The information in the above table can help you start the system in case of trouble. Suppose the multi-user run level initialization fails while initializing NFS, so instead of the message in the table, you see an error message. To get the system started without NFS, simply remove the rc2.d file:

```
# rm /etc/rc2.d/S40nfs
```

The file is only a symbolic link, so you do not need to worry about destroying information. Do remember to record the name of the file you have removed, so you can recreate it once the problem has been fixed.

```
# ln -s /etc/init.d/nfs S40nfs
```

Once the *rc2.d* file is removed, NFS is no longer configured upon entry to run level 2. You can enter multi-user mode and have a functional system while you further troubleshoot the problem.

Problems that occur as the system enters run level 2 can often be traced to system configuration problems. To troubleshoot configuration problems, follow the procedures and suggestions in *Configuring the System* in the *Installation and Administration Guide.* If you cannot solve the problem, report the problem to Stardent Customer Support together with a full description of what transpired.

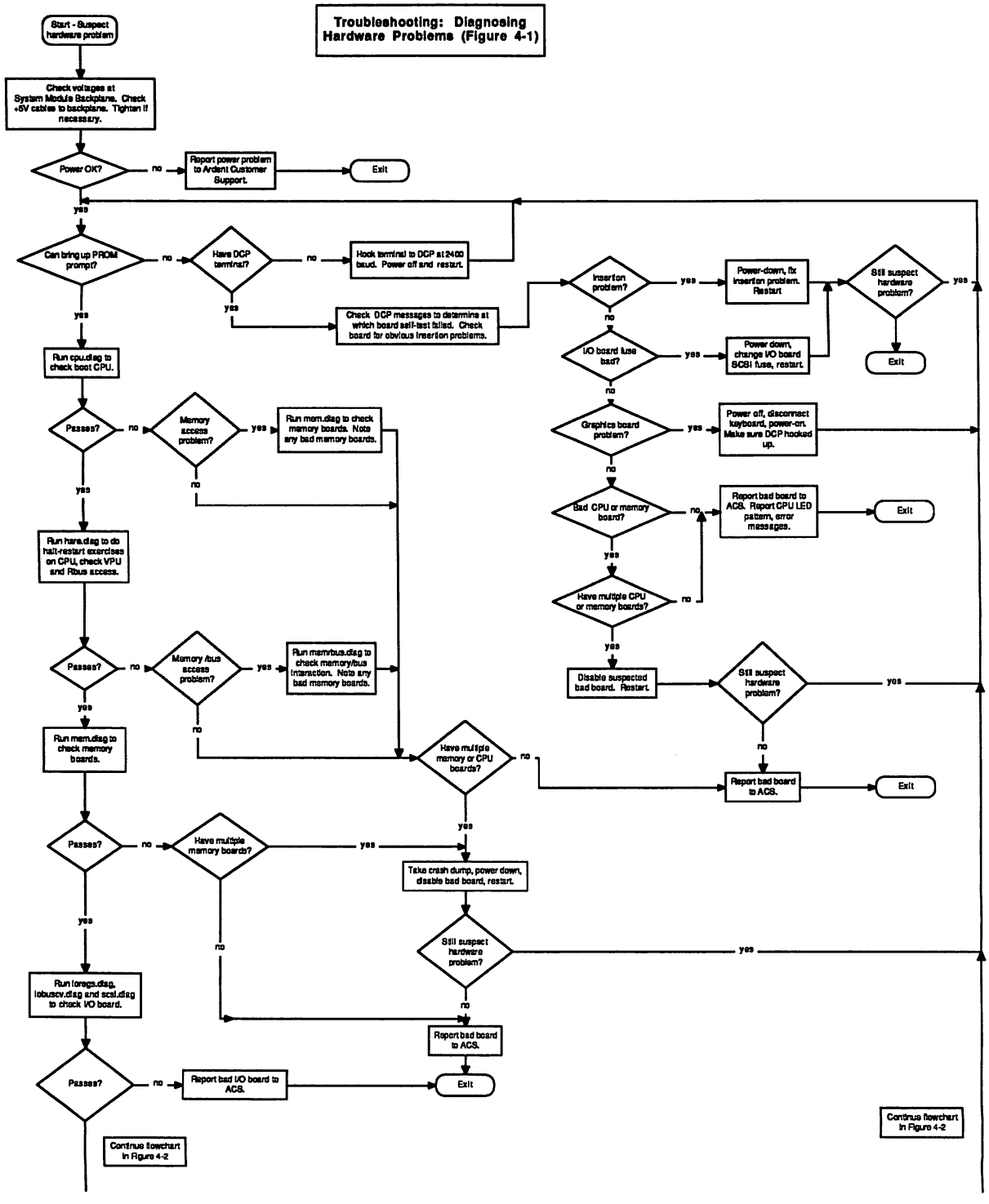


Figure 15-1. Diagnosing Hardware Problems

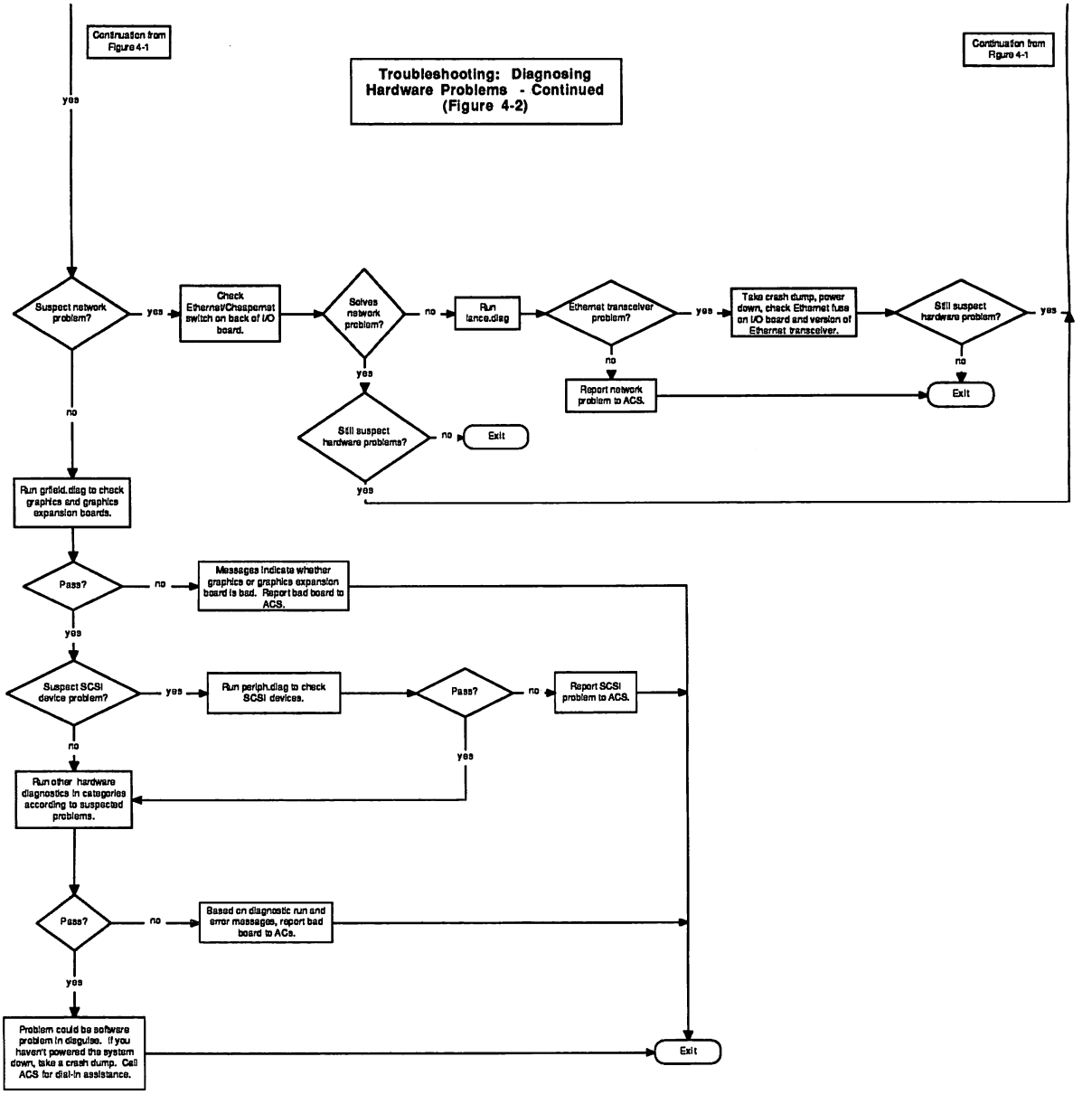


Figure 15-2. Diagnosing Hardware Problems (continued)

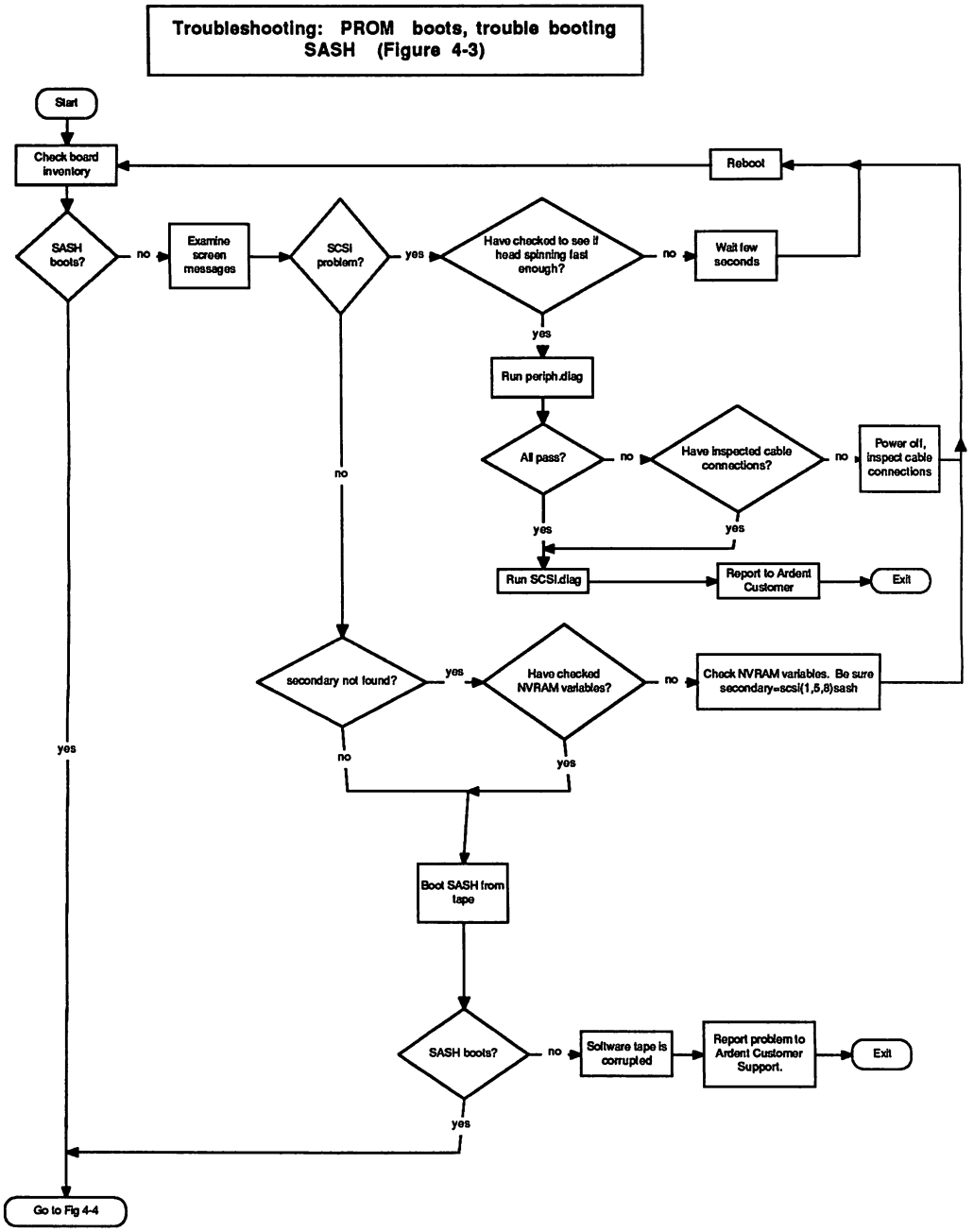


Figure 15-3. PROM Boots, Trouble Booting SASH

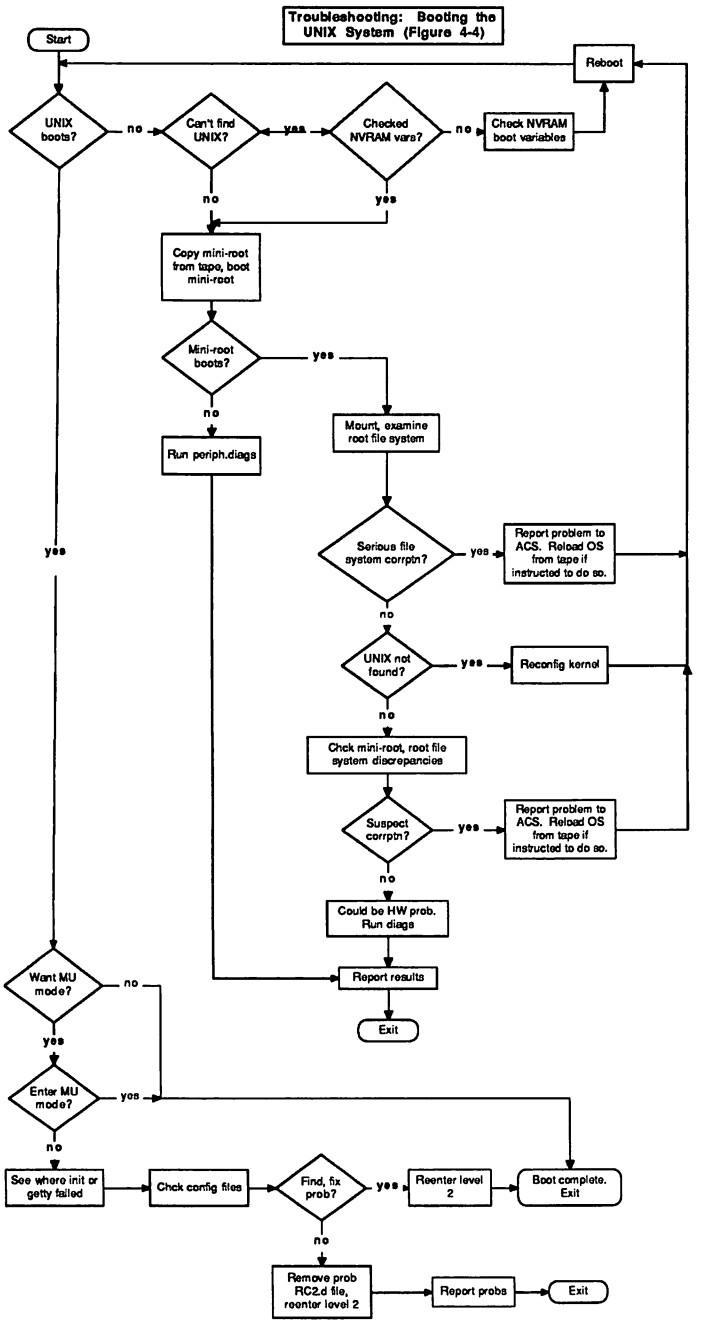


Figure 15-4. Trouble Booting the UNIX System

PREVENTIVE MAINTENANCE

CHAPTER SIXTEEN

Preventive maintenance for the Stardent 1500/3000 graphics supercomputer consists of cartridge tape retensioning, cartridge tape head cleaning, air filter cleaning, extractor rod lubrication, and system fan inspection. Cartridge tape retensioning and head cleaning and air filter cleaning can be done by the Stardent 1500/3000 system administrator. Procedures are given under *Preventive Maintenance* in Chapter 1 of the *System Administrator's Guide.*

NOTE
You can reach the Stardent Customer Support office at 1-800-537-1104.

This chapter describes extractor rod lubrication and system fan inspection.

Extractor Rod Lubrication

Extractor rods (Part No. 210-0325-01) should be lubricated after approximately 10 circuit board removals or replacements. Use a general, light viscosity, petroleum-based, Teflon-impregnated lubricant ("Tri-Flow" or equivalent). Follow these steps to lubricate the rods.

Step 1: Remove the circuit board assembly from the card cage. Follow the instructions given in "Circuit Board Removal and Replacement" at the beginning of this chapter. If you wish you can use extractor/adaptors (Stardent Part Number 210-0411-01).

Step 2 Clean the extractor rod threads. Rotate the threads through a tissue to remove residue.

Step 3: Apply lubricant. Apply lubricant to the two surfaces where the brass thrust washers contact the plastic PCB stiffener and to the threaded end of the extractor rod. Use a capillary tube that is supplied with lubricant. Use approximately three drops on each thrust washer surface and three drops on the threaded region of the extractor rod (lubricate all threads equally with the three drops of lubricant.

Step 4: Replace the circuit board assembly. Replace the circuit board according to the instructions given in "Circuit Board Removal and Replacement" at the beginning of this chapter.

System Fan Inspection

Figure 16-1 shows air flow through the Stardent 1500/3000 System Module. The System Module has six fans: Two for the card cage, two for the power supply, and one for each of the I/O drawers. Inspect the fans periodically or if you notice a problem (noise or heat).

To inspect the fans open the back of the System Module and check to see that each fan is spinning quietly. Report any problems to Stardent Customer Support.

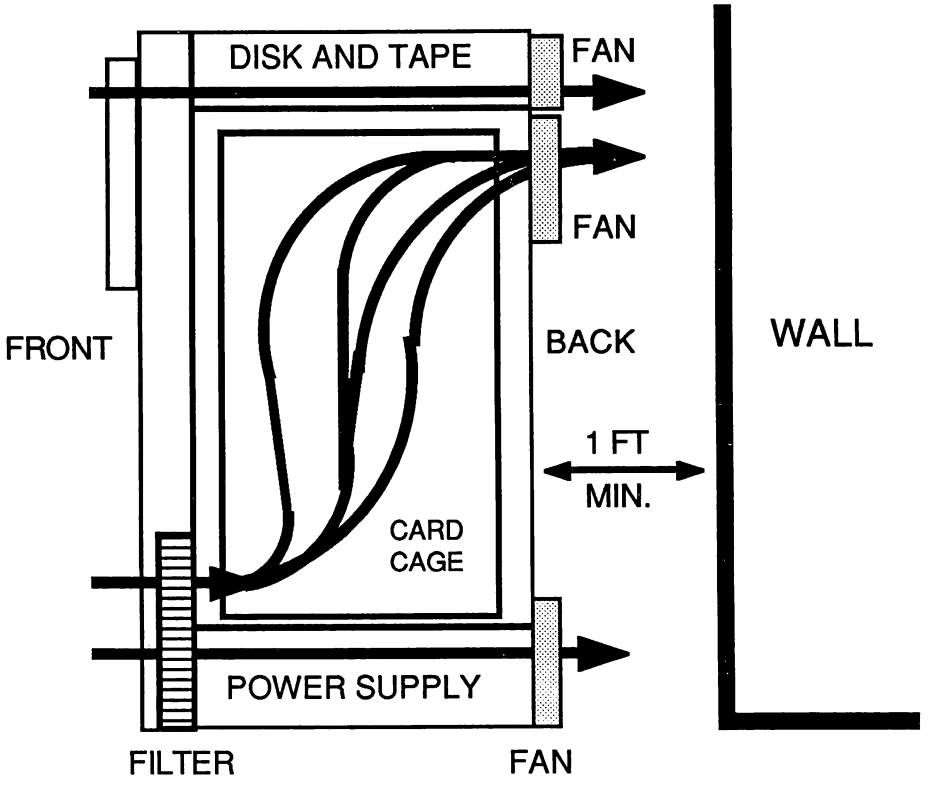


Figure 16-1. Stardent 1500/3000 System Module Air Flow

RS-232 PORT TROUBLESHOOTING

APPENDIX A

Follow these steps to troubleshoot RS-232 port problems.

1. Confirm the types of devices (DTE or DCE) that are being connected. This determines the configuration of the cable.

2. Consult device manuals for exact RS-232 pin requirements (DTR<CD<CTS,RTS,DSR) and transmission specifics (char size, start/stop bits, parity, baud).

3. Check for correct cable configuration by testing continuity between pins on each end of the cable.

4. Use the RS-232 break-out box to monitor activity. Check that the status/control signals are in the proper states.

5. For problems that have to do with losing characters, check that the device being connected knows about and has enabled software flow control (^S,^Q). some devices such as Apple Computers do not know about software flow control. In these cases the baud rate can be adjusted down to where the machine should be able to handle the character stream.

6. For problems involving garbage characters, the likely problem is noise on the line. One major contributing factor to noise is over-extended RS-232 cables. The RS-232 spec indicates a maximum of 50 feet. In reality, the limit can be stretched without serious problem. Serious problems arise, however, when you use a long RS-232 cable with an unterminated end. This is typical when an RS-232 switch box is used at the terminal end. In one position the cable floats and acts like an antenna. The typical symptom of this problem is that the port of the machine looks as if it is getting a continuous stream of characters.

NOTE
You can reach the Stardent Customer Support office at 1-800-537-1104.

7. For more non-deterministic problems you need to use an RS-232 protocol analyzer. The analyzer gives a complete picture of activity over the line. It also allows you to simulate a user-specified sequence of events, useful for reproducing problems.

CIRCUIT BOARD LEDs

APPENDIX B

This appendix lists status indications that the CPU diagnostic PROM outputs during its power-up self-test sequence. It also gives the meanings of the LEDs on each of the System Module circuit boards.

CPU Board LED Indicators

Figure B-1 shows the physical layout of the LEDs on the CPU board.

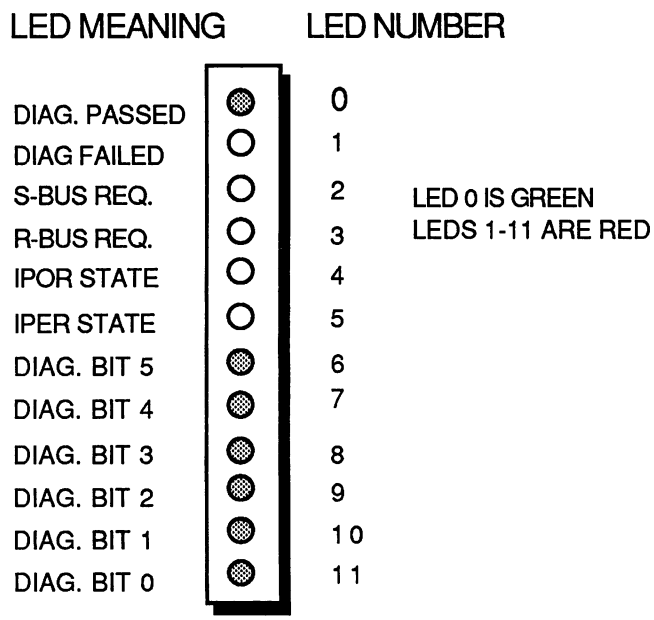


Figure B-1. CPU Board LED Layout

The top two LEDs are the same on the I/O, memory, graphics, graphics expansion, and VME expansion boards. When the green LED is lit, it means the board passed the diagnostic self-tests; when the red LED is lit, the board failed. The bottom six LEDs are a hex code for steps in the system's initial self-test process.

Reading the LED Self-test Status/Error Indicators

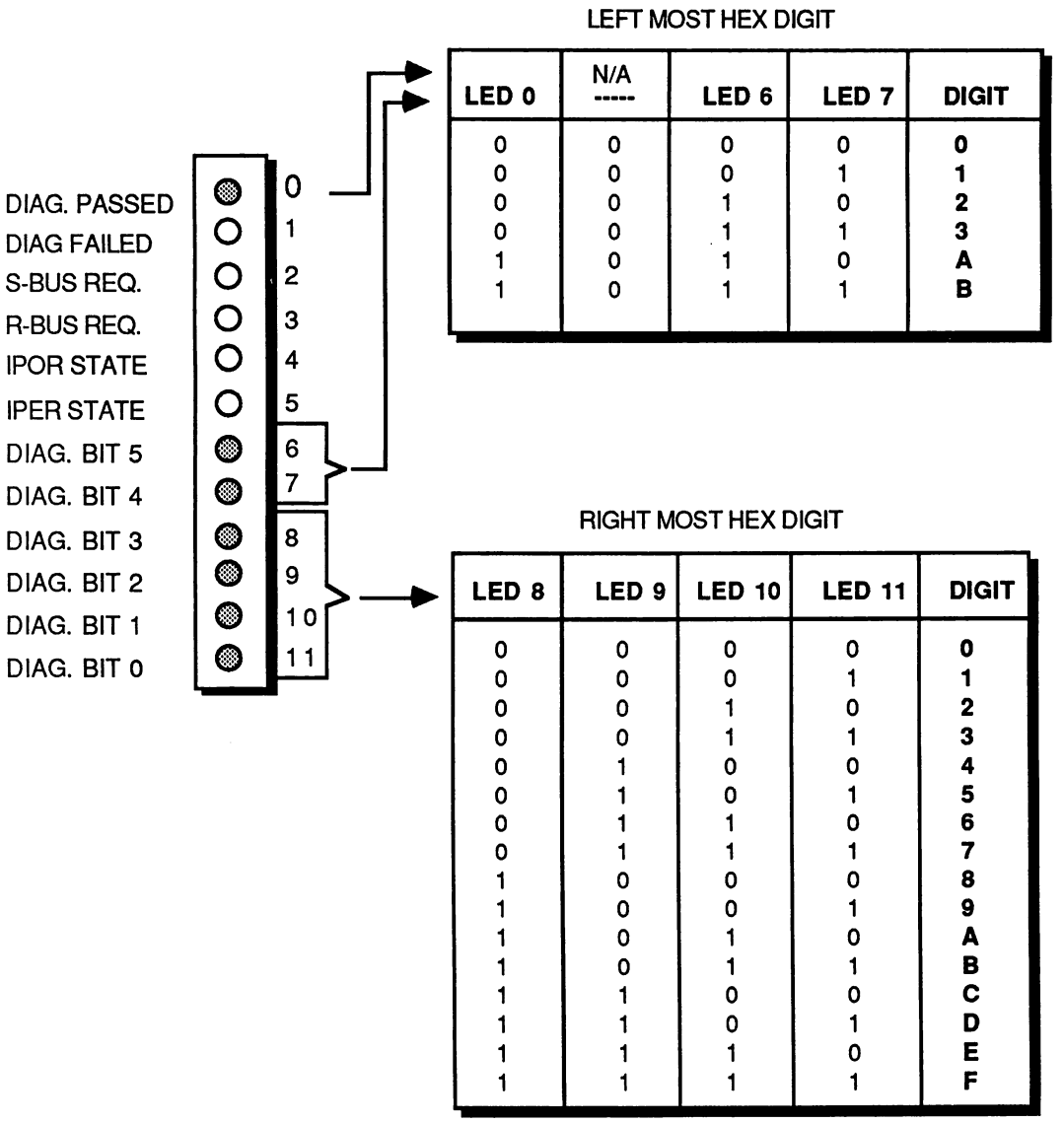
This section lists PROM boot self-test steps and their associated LED codes. The codes are in hex and can be interpreted as shown in Figure B-2. The CPU board's four lower LEDs (listed as LEDs 8 through 11 in Figure B-2) represent the lower (rightmost) hex digit. The higher (leftmost) hex digit is represented by LEDs 6, 7 and 0 in Figure B-2. The green pass light (LED 0) is the 8's bit in the binary representation of the higher hex digit.[1]) For instance, if LEDs 6, 9 and 10 are lit the corresponding hex number is 26 and the self-test step is

```
CPU_LED_IC_TINV 26 Test I cache for invalidation
```

If LEDs 0, 6 and 11 are lit, the corresponding hex number is a1 and the self-test step is

```
CPU_LED_IOSTO   a1 Test IO board's SCSI stackerout
```

[1] Note that there is no ambiguity in the use of the green pass light (LED 0) as a pass light and as code for a self-test step. The first set of self-test steps listed in the table tests the CPU board itself. While the tests are running the green pass light is off, consistent with the fact that all the self-test codes in this section have zero in the leftmost digit's 8's position. Once the CPU tests have passed the CPU's green pass light is turned on, and consistent with that all the remaining steps in the self-test have a 1 coded in the 8's position of the left-most digit.



LED 0	N/A -----	LED 6	LED 7	DIGIT
0	0	0	0	**0**
0	0	0	1	**1**
0	0	1	0	**2**
0	0	1	1	**3**
1	0	1	0	**A**
1	0	1	1	**B**

LED 8	LED 9	LED 10	LED 11	DIGIT
0	0	0	0	**0**
0	0	0	1	**1**
0	0	1	0	**2**
0	0	1	1	**3**
0	1	0	0	**4**
0	1	0	1	**5**
0	1	1	0	**6**
0	1	1	1	**7**
1	0	0	0	**8**
1	0	0	1	**9**
1	0	1	0	**A**
1	0	1	1	**B**
1	1	0	0	**C**
1	1	0	1	**D**
1	1	1	0	**E**
1	1	1	1	**F**

Figure B-2. Reading CPU Board LED Codes

Here is the list of CPU board LED codes. The LED codes are lit as that step in the CPU boot sequence is performed. If an error occurs during the boot sequence, the LED register will freeze showing the value appropriate to the test that has just begun to run.

CPU_LED_CAUSE	01 zeroing coprocessor cause register
CPU_LED_IC_AD	02 test I cache as mem with addrs as data
CPU_LED_IC_PAT	03 test I cache as mem with mult. pats
CPU_LED_DC_AD	04 test D cache as mem with addrs as data
CPU_LED_DC_PAT	05 test D cache as mem with mult. pats
CPU_LED_C_FILL	06 Fill both caches (I & D)
CPU_LED_FLUSH1	07 flushing i cache
CPU_LED_FLUSH2	08 flushing d cache
CPU_LED_ENABLE	09 enabling bus and bus watcher
CPU_LED_DBCLR	0A clearing doorbell answer register
CPU_LED_CPUID	0B determining cpu id
CPU_LED_BOOT	0C spinning to determine boot processor
CPU_LED_DIAG	0D executing cpu diagnostic
CPU_LED_RING	0E ringing slave processor's doorbells
CPU_LED_BOOTCPU	0F we're the boot processor
CPU_LED_IC_TAGS	10 Test I cache tag bits
CPU_LED_DC_TAGS	11 Test D cache tag bits
CPU_LED_IC_TOFF	12 Test I cache tag offset of 16k
CPU_LED_DC_TOFF	13 Test D cache tag offset of 16k
CPU_LED_IT_CHK	14 Check IC tag offset for misses, par.
CPU_LED_DT_CHK	15 Check DC tag offset for misses, par.
CPU_LED_PXSUM	16 Indicates bootprom checksum section
CPU_LED_a8	17 <unassigned>
CPU_LED_a7	18 <unassigned>
CPU_LED_a6	19 <unassigned>
CPU_LED_a5	1A <unassigned>
CPU_LED_a4	1B <unassigned>
CPU_LED_a3	1C <unassigned>
CPU_LED_a2	1D <unassigned>
CPU_LED_a1	1E <unassigned>
CPU_LED_a0	1F <unassigned>
CPU_LED_TETLB	20 Test the etlbs with address as data
CPU_LED_TETLB1	20 Test the etlbs with multiple patterns
CPU_LED_IC_NAD	22 Test I cache with not addrs as data
CPU_LED_DC_NAD	23 Test D cache with not addrs as data

CPU_LED_IC_INV	24 Invalidate I cache
CPU_LED_DC_INV	25 Invalidate D cache
CPU_LED_IC_TINV	26 Test I cache for invalidation
CPU_LED_DC_TINV	27 Test D cache for invalidation
CPU_LED_IC_PZ	28 Test I cache parity bits on data bits
CPU_LED_DC_PZ	29 Test D cache parity bits on data bits
CPU_LED_IC_TPZ	2A Test I cache parity on tag bits
CPU_LED_DC_TPZ	2B Test D cache parity on tag bits
CPU_LED_I_NFLSH	2C Test I cache not purged doing Dcache
CPU_LED_D_NFLSH	2D Test D cache not purged doing Icache
CPU_LED_IC_CHK	2E Test I cache for misses, parity, etc
CPU_LED_DC_CHK	2F Test D cache for misses, parity, etc
CPU_LED_PORTA_F	30 Serial port A in the SCC8530 failed
CPU_LED_PORTB_F	31 Serial port B in the SCC8530 failed
CPU_LED_ILPAB	32 Internal loopback test on ports A&B
CPU_LED_PORTAB	33 Init ports A&B to 9600 baud
CPU_LED_ETLB_SZ	34 Size the ETLBs small = 2k, big = 8k
CPU_LED_BANKERR	35 wrong memory bank (0=8, 1=16, 3=32)
CPU_LED_EVERR	36 fnd more than 2 mem brds in odd slots
CPU_LED_ODDERR	37 fnd more than 2 mem brds in even slots
CPU_LED_MEMMULT	38 found more than 4 memory cards
CPU_LED_GRPMULT	39 multiple graphics boards in backplane
CPU_LED_GRPNXA	3a expected an NXA looking for graphics
CPU_LED_IOMULT	3b found multiple I/O cards in backplane
CPU_LED_IONXA	3c expected an NXA looking for I/O
CPU_LED_NOMEM	3d didn't find any memory cards
CPU_LED_MEMNXA	3e expected an NXA looking for memory
CPU_LED_SLAVE	3f waiting for boot processor

At this point, the Green LED has been turned on (boot tests "passed", but the testing continues)

CPU_LED_MEMCONF	b0 finding memory boards
CPU_LED_IOCONF	b1 finding I/O board(s)
CPU_LED_GRPCONF	b2 finding graphics board(s)
CPU_LED_MEMDIAG	b3 starting memory config/diagnostic
CPU_LED_MEMC1	b4 reading banks and chip size
CPU_LED_MEMPWR	b5 power fail reset config to mem card
CPU_LED_MEMITLV	b6 configuring interleaves
CPU_LED_MEMEN	b7 enabling ECC
CPU_LED_MEMZ	b8 writing zeroes to all banks
CPU_LED_MEMR	b9 sys reset memory config

CPU_LED_16WAY	ba set memory boards to 16way interleave
CPU_LED_ADMEM	bb test memory with address data
CPU_LED_PATMEM	bc test memory with multiple patterns
CPU_LED_42	bd <unassigned>
CPU_LED_41	be <unassigned>
CPU_LED_40	bf <unassigned>
CPU_LED_IOAMAP	a0 Test IO board's mapper - addrs as data
CPU_LED_IOSTO	a1 Test IO board's SCSI stackerout
CPU_LED_IOSTI	a2 Test IO board's SCSI stackerin
CPU_LED_IODMAC	a3 Test IO board's DMA counter
CPU_LED_IODMAR	a4 Test IO baord's DMA cntrl register
CPU_LED_IOSAD	a5 Test IO board's DAM enable
CPU_LED_IOSCSI	a6 Test IO board's SCSI reset
CPU_LED_IOKB	a7 Do the IO board's keyboard selftest
CPU_LED_57	a8 <unassigned>
CPU_LED_56	a9 <unassigned>
CPU_LED_GRREG	aa Test the GR board's registers (static)
CPU_LED_GRMEM	ab Test the GR board's srams
CPU_LED_GRBT	ac Test the Gr board's brooktrees
CPU_LED_GRINIT	ad Test the GR board's init sequence
CPU_LED_GRR_RW	ae GR board's register r/w test
CPU_LED_50	af <unassigned>

If the any of the above tests fail, the "FAULT" LED is turned on, and the binary value indicated in the table is shown as the error condition.

Circuit Board LED Definitions

The tables below give LED definitions for each circuit board in the Stardent 1500/3000 System Module card cage.

Table B-1. CPU Board LEDs

LED	Color	Description
0	Green	Diagnostic passed
1	Red	Diagnostic failed
2	Red	S-Bus Request
3	Red	R-Bus Request
4	Red	IPOR state
5	Red	IPER state
6	Red	diagnostic bit 5
7	Red	diagnostic bit 4
8	Red	diagnostic bit 3
9	Red	diagnostic bit 2
10	Red	diagnostic bit 1
11	Red	diagnostic bit 0

Table B-2. Memory Board LEDs

LED	Color	Description
0	Green	Diagnostic passed
1	Red	Diagnostic failed
2	Red	S-Bus Request
3	Red	R-Bus Request
4	Red	16 way interleave
5	Red	Fatal error
6	Red	ECC
7	Red	Board enabled

Table B-3. I/O Board LEDs

LED	Color	Description
0	Green	Diagnostic passed
1	Red	Diagnostic failed
2	Red	S-Bus Request
3	Red	I/O busy
4	Red	Memory request
5	Red	Mouse activity
6	Red	LAN activity
7	Red	LAN heart beat
8	Red	SCSI A busy
9	Red	SCSI B busy
10	Red	Interrupt
11	Red	Error lagged

Table B-4. Graphics Board LEDs

LED	Color	Description
0	Green	Diagnostic passed
1	Red	Diagnostic failed
2	Red	S-Bus Request
3	Red	GR busy
4	Red	Bus error
5	Red	DMA busy
6	Red	RDMA busy
7	Red	WDMA busy

Table B-5. Graphics Expansion Board LEDs

LED	Color	Description
0	Green	Diagnostic passed
1	Red	Diagnostic failed

Table B-6. VME Expansion Board LEDs

LED	Color	Description
0	Green	Diagnostic passed
1	Red	Diagnostic failed
2	Red	Busy
3	Red	Strobe
4	Red	Master request
5	Red	Master
6	Red	Slave
7	Red	Interrupt

RUNNING DIAGNOSTICS

APPENDIX C

This appendix contains a general description of how to locate and load the Stardent 1500/3000 diagnostics, the sequence in which the diagnostics should be run, and finally contains the *man–pages* that describe each of the diagnostics that are currently available for the Stardent 1500/3000. Each diagnostic test runs independently, but loads a menu from which you can choose to run part or all of the tests that the particular diagnostic provides.

There are two diagnostics tapes for the Stardent 1500/3000, depending on the CPU board used (P2 or P3). The diagnostics have the same names, but **cannot** be interchanged. **P3 diagnostics will not run with a P2 processor board, and vice-versa.** The diagnostic tape also contains diagnostics for a second I/O board and second VME board, if applicable.

Locating and Loading Stardent 1500/3000 Diagnostics

The Diagnostics tape shipped with your system includes the diagnostic tests named in Table C-1, in bootable form.

NOTE
Allow 20 seconds after system reset before attempting to load a diagnostic from tape.

Diagnostics notes:

1 Diagnostics that are marked with a † are used to test the second I/O board of a dual I/O board configuration.

2 Diagnostics that are marked with a †† are used to test the second VME Adaptor board of a dual I/O board configuration.

3. Diagnostics that are marked with a * are loaded into the instruction cache on the CPU card. These particular diagnostics must be run from a terminal connected to the DCP, as the Stardent 1500/3000 main terminal will hang with the message "EXEC scsi(0,6,n)".

   Note that following each asterisk'ed test, you must do a hard

(key-switch) reset before running anything else, because these tests usually leave the machine registers in an undefined state. In fact, it is good idea to perform a keyboard-based reset (by entering the 'reset' command at the 'prom X>' prompt) following **each** diagnostic that you run, as a just-in-case measure.

When you perform the hard reset, allow about 20 seconds before attempting to load the next diagnostic to allow the tape reset sequence to complete. If insufficient time is allowed, in response to a boot-diagnostic command, you'll get a message stating that SCSI A is not ready.

4. To run desktop.diag or desktop2.diag†, a set of hardware loopback elements are required, connecting serial port A to B and C to D. This allows the system to test the integrity of the cable assembly as well as the ability of each port to send and receive data.
5. The diagnostic *gr.diag* requires a DCP console. Disconnect the keyboard, reset the Stardent 1500/3000 system, then boot the test from the DCP terminal. This is necessary because there is a conflict between an attempt to test the graphics elements and using the system display as an output device for the diagnostics results. The diagnostic *grfield.diag* does not require a DCP console.

To use the diagnostics, proceed as follows:

1. Halt the system, using the following procedure: First, login as 'root' or use the 'su' command to become root. In this case, note that the hash mark (#) is shown as the system prompt.

```
# sync
# sync
# shutdown
```

This procedure takes the system down to single user mode. Then, still as 'root', perform the following command sequence:

```
# sync
# sync
# halt
```

Table C-1. Stardent 1500/3000 Diagnostics

CPU/FPU	MEM	I/O	GRAPHICS	VME
cpu.diag	mem.diag	desktop.diag	gr.diag*	vmehp.diag
cpmex1.diag*	cpmex1.diag*	mapper.diag	grfield.diag	vmeip.diag
cpmex2.diag*	cpmex2.diag*	serial.diag	grex1.diag*	----------
etlbs.diag	hare.diag	ioexbts.diag*	grex2.diag*	vmehp2.diag††
fpuex.diag*	memcbit.diag	ioexdpe.diag*	grex3.diag*	vmeip2.diag††
fpmex.diag*	memrbus.diag	ioexnxl.diag*		
fpuregs.diag		iobuscv.diag		
fpuops.diag		ioregs.diag		
hare.diag		iotimer.diag		
lvags.diag		lance.diag		
lvagsb.diag		periph.diag		
svags.diag		scsi.diag		
vagsw.diag		----------		
vrf.diag		desktop2.diag†		
arb.diag		mapper2.diag†		
arithex.diag		serial2.diag†		
		ioexbts2.diag*†		
		ioexdpe2.diag*†		
		ioexnxl2.diag*†		
		iobuscv2.diag†		
		ioregs2.diag†		
		iotimer2.diag†		
		lance2.diag†		
		scsi2.diag†		

2. Boot the appropriate diagnostic from tape by giving a command of the form:

```
prom #> b scsi(0,6,n)
```

where n is the tapefile (section) number as shown in Table C-2 of the diagnostic to be run.

For example, to boot the mem.diag:

```
prom #> b scsi(0,6,3)
```

The diagnostics are menu-driven, and will prompt you for appropriate input. For more information on running the diagnostics, see the individual *man-page*.

NOTE
If you attempt to boot a file that is beyond the end of the tape, you'll be presented with a message that says: "Invalid a.out file (bad magic number).

Table C-2. Diagnostic Tape File Numbers

Diagnostic Name	Position	Diagnostic Name	Position
cpu.diag	2	memcbit.diag	28
mem.diag	3	memrbus.diag	29
periph.diag	4	scsi.diag	30
grfield.diag	5	serial.diag	31
mapper.diag	6	svags.diag	32
ioregs.diag	7	vagsw.diag	33
lance.diag	8	vmeip.diag	34
hare.diag	9	fpmex.diag*	35
vrf.diag	10	grex1.diag*	36
fpuex.diag*	11	grex2.diag*	37
arb.diag	12	grex3.diag*	38
arithex.diag*	13	desktop2.diag†	39
cpmex1.diag*	14	mapper2.diag†	40
cpmex2.diag*	15	serial2.diag†	41
desktop.diag	16	ioexbts2.diag*†	42
etlbs.diag	17	ioexdpe2.diag*†	43
fpuops.diag	18	ioexnxl2.diag*†	44
fpuregs.diag	19	iobuscv2.diag*†	45
gr.diag	20	ioregs2.diag†	46
iobuscv.diag*	21	iotimer2.diag†	47
ioexbts.diag*	22	lance2.diag†	48
ioexdpe.diag*	23	scsi2.diag†	49
ioexnxl.diag*	24	vmeip2.diag††	50
iotimer.diag	25	vmehp.diag	51
lvags.diag	26	vmehp2.diag††	52
lvagsb.diag	27		

Common Elements To The Diagnostic Menus

Each diagnostic test includes a set of menu elements that are common to all diagostics. These common elements are:

- A banner line, that announces the test name.
- A list of default values for the various options that the diagnostic test can accept. If you wish to change any of these default values, the change may be made by specifying the appropriate value on the command line, or by using a menu item to input the new value. These parameters are accepted on the command line to allow an automated diagnostic system to be attached in place of the DCP terminal, to set its own parameters and to run the tests, logging the results without human intervention.

- A menu from which various tests or test options may be selected.

The following arguments are accepted by the primary menu, either on the command line that you use to call the diagnostic function, or as a response to the menu presented to you:

Help Type H (or h or ?) for help. The diagnostic presents a brief introduction to the use of the test.

Here is an illustration that shows the elements that are common to most menus. The individual items shown here are described in separate paragraphs, immediately following the top level menu illustration shown in Figure C-1.

0.	q	Quit.
1.	l=*n*	Loop *n* times.
2.	v=*n*	Verbosity level (*n*=0-2).
3.	er=*n*	Report *n* errors max.
4.	hoe=*n*	Halt on an error (n=0 or 1).

Figure C-1. Sample Top Portion of Diagnostic Menus

q The first menu item is *q*, the *quit* selection. This selection allows you to terminate the diagnostic from the main menu.

l=n The second menu item is l=*n*, which determines how many times a test will loop (reporting its result each time) before the test terminates and returns to the main menu. If you wish to change the loop count without using the menu system, then put l=*n* or L=*n* (where *n* is an integer value) as one of the parameters. If you specify L=0, this means run the test an unspecified number of times, that is, forever. Here is an example that establishes the loop count as 25:

```
prom 0> b scsi(0,0,n) L=25
```

Note that most tests respond to a CTRL-C (^C) typed from the DCP keyboard or the main console keyboard to terminate the test before the entire loop count has been reached.

v=n This third menu item establishes the *verbosity* level of the test. Type v=*n* where *n* is an integer in the range of 0 to 2 that defines the verbosity level, that is how verbose

(wordy) test run messages should be. A verbosity level of 2 is the default. A verbosity level of zero results in a very terse message output. Here is an example that establishes a high verbosity level:

```
prom 0> b scsi(0,6,n) V=2
```

er=n The fourth standard menu selection is er=*n*, which represents the maximum number of errors that may occur before the test aborts and either returns to display the main menu again or goes to the next test if you had selected a group of tests, such as "all". The default for most tests is a value of zero. Just as a loop count of zero means an indefinite number of loops, so too er=0 (or ER=0) means that an unlimited number of errors can be reported without aborting the test. Here is an example of a command line input that assures that the test aborts after hitting the first error:

```
prom 0> b scsi(0,6,n) ER=1
```

hoe=n The fifth standard menu selection is hoe=*n*, which represents *halt-on-error*. This allows you to view the error message before the test continues, even when ER=0 (an infinite number of error reports before the test aborts). The parameters that are accepted by this command are 0 or 1, where 0 means false, and 1 means true. Press ENTER to go on to the next phase of the test.

top If the test you booted has sub-menus, every submenu has this selection. It allows you to go back to the highest menu of the test.

up Allows you to move up one level from the current submenu

Selecting An Item From The Menu

Note that each menu item is not only associated with an abbreviation of the command item that allows you to select the test, but each item is also explicitly associated with a menu item number. Any menu item may be selected by using the abbreviation or by specifying the menu item number in response to the prompt

```
Choose one:
```

If the test requires additional parameters, the test itself will ask you for those parameters.

Other Menu Items

Each test has menu items that are explicitly associated with that test. The common menu items are all described above, so space on the *man-pages* describes only those menu items that are unique to each test.

Verilog Check Function

This section documents the error codes that can be generated for any tests that are verilog-script based. When an error is reported by such a test, a line number is also reported. This is the line number in the verilog source code at which the error was sensed.

The most common error that is reported here is that the data that was read was not the expected value. One or more lines above the point at which the error was sensed, there is a verilog command that wrote or read a particular memory location. The error report, then, is a result of this read or write, wherein the operation did not produce the expected results. The error reporting is slightly ambiguous in this case because to read from or write to specific memory locations in the floating point unit, it is necessary to read the data from a location known as 'dataLo' or 'dataHi'.

A verilog read command takes data from a named register location and places it into one of these two externally accessible registers for the system to read. This happens because the design of the FPU prevents directly reading the contents of these registers. Thus, the read command, and the subsequent interpretation of the data, are separated in time. A separate function, called check, interprets the data as to actual and expected values, but only the script source can (as of this writing) provide the information about which operation was being performed when the error occured or which register location was being examined.

Here are the errors that can be sensed during verilog-based testing, and a suggestion for each as to how to examine the source code to determine which address has the problem, allowing further diagnostic efforts on that area.

Error 100

DataLo does not contain the expected value. This error

message reports the actual value, the expected value, and a mask value. In this case, the mask value indicates, by a 1-bit in each position, which bits were being checked. In other words, any bit position in the mask that contains a zero is a don't-care bit for comparison purposes. Examine the source code above the error to determine which register was read into dataLo.

Error 102
: DataHi does not contain the expected value. Same interpretation as for Error 100. That is, an actual, expected and a mask value are reported. Examine the source code above the error to determine which register was read into dataHi.

Error 104
: An expected interrupt did not occur. Examine the source code above the reported line number to determine which interrupt was expected.

Error 106, 108
: When this error occurs, the test has just checked the contents of a vector register in the vector register file (vrf). The contents is not as expected. This could have resulted from an error in vrf memory (bad chip), or from a bad result of an arithmetic operation in the ALU. Check the source code to determine what operation preceded this error.

Error 110, 112, 114
: The memory does not contain the expected data after some operation. If error 110 occurs, then the dataLo word of a 64-bit data transaction has been found to be in error. If error 112 occurs, both words were in error. If error 114 occurs, then the dataHi part of previous operation was not as expected.

Error 116
: The contents of the CPU status register was not as expected. The bit number with an unexpected value is reported. Examine the source code to determine what operation was performed just prior to the checking of the CPU status register.

Test Sequencing

This section specifies the order in which the Stardent 1500/3000 diagnostics should be performed. It is necessary to use this sequence because some of the Stardent 1500/3000 diagnostics

assume that certain areas have already been tested and verified as functional and concentrate on isolating the functions of other areas.

These tests should be run first in the following order:

```
cpu.diag
mem.diag
ioregs.diag
periph.diag
```

The cpu.diag assures that all portions of the boot CPU board are functional. The mem.diag checks that the memory board (or boards) are working correctly. The ioregs.diag checks the I/O circuitry and the periph.diag checks that reading and writing to the disks operates correctly.

After these diagnostics have run without errors, the remaining diagnostics may be run in any sequence desired. The first four tests, however, **must be run in the order specified above** of the system may not be able to run **any other** diagnostics.

This page intentionally left blank.

NAME

cpmex1.diag*, cpmex2.diag* – Tests CPU response to exception conditions.

DESCRIPTION

Tests the error detecting and error generating logic on the CPU board, the error detecting and error generating logic on the *first* memory board, and the bus interface logic on the CPU and the memory board that has the lowest logical memory ID number.

The tests cpmex1.diag and cpmex2.diag are separate parts of a single test suite. Both CPU and Memory exception tests are performed. These tests are designed to deliberately force error conditions to occur (1) when the CPU is sending data to the memory to test that the memory detects the errors, and (2) to force errors to occur when the Memory sends data back to the CPU so that the CPU detects the error.

DETAILS

Because the tests cause errors that convince the CPU that the data coming across the bus is bad, the actual program code cannot be loaded into the normal system memory space. Therefore the tests are loaded into the instruction cache on the CPU board. This allows the program code to be run without accessing the system memory bus. Because of the limited memory space available in the cache, the tests were split into two parts. Thus the names cpmex1.diag and cpmex2.diag, each of which runs a separate part of the exception tests.

When errors occur, they appear in four possible places:

- The S Bus Status Register on the CPU board
- The S Bus Status Register on the Memory board
- The Integer processor's Status register
- The Integer processor's Cause register

The general test method is as follows:

- Use the CPU board *Test Register* to force data transfer errors on data sent from the CPU.
- Use the Memory board *PECTL* register to force data transfer errors on data sent from the Memory to the CPU.
- Check the values in each of the error status registers specified above for expected values versus the actual value that is received, masking off the bits that have no bearing on the test. These unused bits are called *don't care* bits.

BOARDS THAT MUST BE INSTALLED

One CPU board, one memory board, and a known good I/O board for downloading the test. If more than one memory board is installed, these diagnostics test only that memory board that has the lowest ID number.

SPECIAL COMMAND LINE PARAMETERS

Do not specify *all* on the command line. If the *all* menu item is chosen from the menu and a test fails, the tests must be run individually to determine which of the tests in that menu is actually failing. There is *no* progress message generated indicating which of the menu–selectable tests is being conducted.

MENU ITEMS SPECIFIC TO THIS TEST

Test menu for cpmex1.diag.

sr – This test reads the Scrub Register. The test performs a read on a write–only register to test the exception condition *illegal operation.*

sa – This test forces an alignment error during a memory scrub operation.

wa – This test forces an alignment error during a write to memory.

rdp – This test forces a data parity error on a read from memory.

rap – This test forces an address parity error on a read from memory.

wdp – This test forces a data parity error on a write to memory.

wap – This test forces an address parity error on a write to memory.

ra – This test forces an alignment error on a read from memory.

wl – This test forces an alignment error on a write to memory.

Test menu for cpmex2.diag.

la – This test forces an alignment error on a load and sync operation.

le – This test forces an ECC error during a load and sync operation.

se – This test forces an ECC error during a Scrub ECC operation.

cr – This test creates a *reserved Cycle Type* exception on a read.

cw – This test creates a *reserved Cycle Type* exception on a write.

re – This test forces an ECC error during a read operation.

bt – This test creates a bus timeout.

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

100 Memory error, reports physical address for the error, the actual data and the data that was expected.

121 The test that is being performed failed to get an expected interrupt. This is the error code that is reported when the Integer Processor cause register does not get the expected value.

122 CPU Board S Bus Status register did not contain the expected value. This error report contains the actual value, the expected value, and the don't care bits so that the bit causing the error can be determined.

142 IPU Cause register did not contain the expected value. Reports actual, expected and don't care bits for the register.

152 Memory S Bus Status register did not contain the expected value. Reports actual, expected and don't care bits for the register.

162 Memory is operating at 16-way interleave. This test cannot be run when 16-way interleave is active. Power down the machine and remove all except one of the memory boards, power up and try again.

EXAMPLES

This section contains the actual bit patterns for the S Bus Status registers and the CPU Cause register, along with an explicit sample that shows how the bits are interpreted.

Processor Status Register (contains CPU S Bus Status)										
31	30	29	28	27	26	25	24	13-16	15-8	7-0
NXA	BTO	DPE	APE	ITT	AAE	RPE	BRD	zero	ProcStatus	ProcControl

Memory Board Status Register (Contains Memory S Bus Status)										
31	30	29	28	27	26	25	24	13-16	15-8	7-0
0	0	DPE	APE	ITT	AAE	RPE	BRD	ReqID	IntlvErr	BoardControl

Cause Register (inside the Integer Processor Chip)		
31-6	5-2	1-0
Not tested	ExceptionCode	Not Tested

NAME

cpu.diag – Tests the circuitry on the CPU board.

DESCRIPTION

This test checks various registers and interrupt sources. It does not, however, test the CPU's response to exception conditions. The pair of tests, cpmex1.diag and cpmex2.diag handle this exception testing. The following items are tested here:

- Boot PROM
- LED Register
- CPUID PROM
- ID Register
- S Bus Status Register
- Doorbell Register
- Semaphore Address Register
- External Translation Lookaside Buffer (ETLB)
- Processor ID Register

DETAILS

The following lists the kinds of tests that are performed for each of the above entities on the CPU board.

- Boot PROM
  A checksum is performed.
- LED Register
  The individual bits are tested to assure that all LEDs can be lit or extinguished.
- CPUID PROM
  The types of entries in the PROM are checked and the ethernet address in the PROM is output.
- ID Register
  This test reports the ID value of the CPU that is running the test and the slot number in which it is installed.
- S Bus Status Register
  By either directly writing bits into the S Bus Status register or by using the Test Register to set various bits, several error types that are supposed to be sensed by the S Bus Status Register are tested. This test also checks that the appropriate interrupt is generated when error types are simulated.
- Doorbell Register
  This test checks the ability of the CPU to respond correctly to ringing of the CPU's doorbell. Ringing the doorbell causes an interrupt to occur and directs the CPU to begin execution of a function at a specific address in response to the interrupt. If there is more than one CPU installed (and active) in the system, the other CPU's doorbells are rung also, checking that they respond as expected. Note that this is the only test, within the cpu.diag sequence, during which multiple processors are tested. If you wish to run cpu.diag on each processor in a multi-processor system, you will have to run the test with each processor individually as the boot processor. This requires either turning off the power and physically moving the CPU board to the boot processor slot (whichever slot has the lowest slot ID, usually slot 4), or disabling the current boot CPU card and rebooting the system.

- Semaphore Address Register
  Testing this register assures that the CPU will be able to use it to access memory locations that are specified for semaphore operation.
- External Translation Lookaside Buffer (ETLB)
  The tests on the ETLB include testing of the ETLB memory and all registers associated with address translation for the vector processing unit.
- Processor ID Register
  This test checks that the process ID register can contain all possible values that can be assigned to process ID.

BOARDS THAT MUST BE INSTALLED

Requires one CPU board, one memory board, and a known good I/O Board for downloading the test.

SPECIAL COMMAND LINE PARAMETERS

None

MENU ITEMS SPECIFIC TO THIS TEST

idp Tests the CPU ID PROM

idr Tests the CPU ID Register

bsr Tests the S Bus Register

sbi Tests the S Bus Interrupts

db Runs the doorbell test

sem Performs the semaphore register test

et Performs the ETLB tests

led Performs the LED test

pid Tests the PID register

chk Performs a boot PROM Checksum

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

100 SBStatus bit test FAILED

102 Interrupt exception error. Reports error code.

104 Semaphore Address test failed. Reports the bits in error.

106,108
CPUID Register test failed. Reports the bits in error.

110 Card type is supposed to be "CPU", (card type value = 1), but a different card type was found in the CPU ID Register.

112 ACT = %08x, EXP = %08x, Not Tested: %08x0, HE, value,ETLBCONT_MBZ,ETLBCONT_DT);

114 ACT = %08x, EXP = %08x, Not Tested: %08x0, HE, value,ETLBCONT_MBZ,ETLBCONT_DT);

116 ACT = %08x, EXP = %08x, Not Tested: %08x0,

118 ACT = %08x, EXP = %08x, Not Tested: %08x0,

120-126
The ETLB has been tested for accuracy of its address translation capability. Any failures report the failing address, along with the actual and expected

values.

128-134
The ETLB has been tested as memory, through the ExtEntryHi register. Any failures report the failing address, along with the actual and expected values.

138-142
The ETLB has been tested as memory, through the ExtEntryLo register. Any failures report the failing address, along with the actual and expected values.

144 An exception did not occur when an attempt was made to write to a read-only page.

146,150,154
Incorrect value found in testing the ETLB Condition register.

148,152
Incorrect value found in testing the CPU Status register.

156 During a test of the ETLB condition register, the test should have generated a non existent address status, but the NXA bit did not get set.

158 The entries in the ETLB were declared as invalid, but when access to an invalid address was attempted, an exception (invalid entry) did not occur.

160,162
During invalid entry testing of the ETLB, the ETLB condition register or the CPU Status register had an incorrect value. The incorrect bits are reported.

164 Incorrect value found while testing the S Bus ETLB condition register.

166 Expected an NXA during testing that invalid PID causes an interrupt and that global matches allow any PID match to succeed. NXA did not occur when expected.

168 Exception should have occured when generating a Semaphore PID miss.

170 Incorrect value (no exception occured) when attempting to match an invalid PID in non-global mode.

172 CPU status register contains an incorrect value when attempting to match an invalid PID in non-global mode.

174,176,178
Exception not caused when trying to match an invalid PID in non-global mode.

180 Incorrect response to ringing one's own doorbell register.

182 Incorrect response to ringing another processor's doorbell. The failing processor number is reported.

184-196
An unexpected type of exception occurred. The contents of the various exception and status registers are printed for examination. The registers dumped are the frame, cause_code, status, cause, and the CPU status register.

200 Incorrect PROM Checksum was found. Actual and expected value are reported.

210 No ID PROM was found.

212 Bad checksum in the CPU ID PROM.

215-275
These error codes report lack of expected exceptions that should have occured as a result of S Bus Status register (in conjunction with Test Register) error forcing.

300,305,310
Expected exception did not occur while performing Semaphore access.

NAME

arithex.diag* – check that the system correctly recovers from exceptions generated by the arithmetic logic.

DESCRIPTION

This test deliberately generates arithmetic exceptions, checks that the exception condition is registered, then checks that the proper corrective action is taken.

DETAILS

none

BOARDS THAT MUST BE INSTALLED

This test requires a CPU card, and at least one memory card to be present in the system, and a known good I/O board for downloading the test.

SPECIAL COMMAND LINE PARAMETERS

None

MENU ITEMS SPECIFIC TO THIS TEST

arith1,

arith2,

arith3,

arith4

Separate parts of the overall arithmetic exception recovery test.

all Run all of the above

INTERPRETING THE ERROR CODES

The only error type reported here is that the actual value did not equal the expected value. The error reporting includes the source line in the verilog test script, the actual value read, and the expected value. The script must be examined to determine what type of testing is being performed. This error could indicate an error either in the load pipe circuitry, the memory, the ETLB circuitry, the vector register memory, the arithmetic logic units, or anywhere in between.

NAME

arb.diag – Tests the arbitration circuitry.

DESCRIPTION

This test assures that bus arbitration works correctly by using two (or more) CPU boards to access an area of shared memory. Only shared read-access to memory is tested. This test also assures that the processor that requested a particular data word actually receives it.

DETAILS

The test is conducted by having five individual memory spaces, called the A space, a shared space, and three B spaces. The main processor initializes the shared space such that each memory location contains a value that is equivalent to its offset from the beginning of that memory space. Then it starts each slave processor. Each slave processor reads the shared space, one memory location at a time, and writes into its own (B) space, a value that is the complement of the data read from the shared space.

The boot processor does the same, writing a copy of the shared space data into its A space. Then each processor checks that the data in its own space matches the data in the shared space. Finally, each processor checks the other processor's memory space to make sure that each other processor has been successful. In this manner, if one processor is not functioning correctly, another processor can report the failure.

BOARDS THAT MUST BE INSTALLED

Requires at least 2 CPU boards and one memory board, and a known good I/O board for downloading the test.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

arb – Run the arbitration test.

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

100 Incorrect board ID sensed (Only the Boot CPU can run this test)

101 Count of non-boot processors does not match the number of responses received (Two CPUs responding to the same ID?)

102 Incorrect value found in first address of the shared memory buffer (Memory addressing or arbiter problem)

104 Slave processor timeout occured, no acknowledge signal received when master tried to start slave processor (Slave processor not responding)

105 No response from any slave processor, so no test was run (This test needs more than one CPU)

106 Boot CPU found a miscompare in another processor's memory space (Slave CPU not working?)

108 CPU other than the boot CPU did not begin its test run within a specific period (Slave CPU is not working?)

110 Slave processor found a miscompare in its own address space (Memory or arbiter error)

112 Slave processor found a miscompare in boot processor's memory space (Memory or arbiter error)

114 Unknown error detected by one (identified) processor (This error should not occur. It means an error was sensed but that the type of error was not identified.)

116 Data miscompare error (Can be generated by master or slave, should be followed by error 106, 110, or 112, if not followed by those errors, it is the boot processor that found the problem)

NAME

desktop.diag, desktop2.diag† – Tests the I/O boards in slots 1 and 8, repectively.

DESCRIPTION

Tests the user interface module and printer.

DETAILS

None.

BOARDS THAT MUST BE INSTALLED

This test requires one CPU board, one memory board, one I/O board, and the user interface module.

SPECIAL COMMAND LINE PARAMETERS

None

MENU ITEMS SPECIFIC TO THIS TEST

kb Keyboard internal test. Asks the keyboard to test itself and reports the results.

kbm Keyboard manual test. (User intervention required.) The user types on the keyboard and verifies that the output is what is expected for each key.

pm Printer mouse test. Requires a fixture connecting the printer port to the mouse port.

md Mouse dump. Shows the raw output of the mouse.

ss Sound DMA test - saita. (User intervention required.) Plays a simple tune on the I/O expansion box speaker.

sh Sound DMA test - horse. (User intervention required.) Plays a simple tune on the I/O expansion box speaker.

pt Piano (keyboard sound) test. (User intervention required.) Certain keys generater tones on the expansion box speaker.

sf Sound frequency test. (User intervention required.) Generates test tones on the expansion box speaker.

pp Printer polling output. Requires that a printer be attached. Checks that output to the printer in "polling printer ready" mode works as expected.

pi Printer Interrupt output. Requires that a printer be attached. Checks that output to the printer, where printer yields a ready interrupt, works as expected.

pd Printer DMA output. Requires that a printer be attached. Check that operating printer in DMA mode works as expected.

all All non manual tests.

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

101 A DMA channel error has occurred. The channel in error is reported.

105 Keyboard self test has failed.

107 Keyboard interface test has failed.

109 An undefined error code has been transmitted from the keyboard; the error code is printed.

111 A keyboard reset has been issued but the keyboard has not responded.

113 An unexpected response has been received as a reply to keyboard reset.

115 As a result of keyboard reset, two responses are expected. The second response did not arrive.

117 An unexpected response has been received as the second reply to keyboard reset.

119 Command byte read from keyboard not as expected.

121 Error while reading a test byte in the loopback test on the keyboard.

123-133
Keyboard status register contents not as expected.

163 8255 status register contents not as expected.

165 Button register value not as expected

167,169
Printer register value not as expected

171 Error in initializing printer

173 Cannot write to 8255 port C

175,177
After putting a character to the printer, the return status was not as expected.

185,187
During printer output via DMA, the return status was not as expected.

191 Sound DMA buffer overflowed.

NAME

etlbs.diag – Tests the ETLB on the CPU board as memory.

DESCRIPTION

This test checks the RAM used as ETLB's on the CPU board as though it was ordinary random access memory chips.

DETAILS

None.

BOARDS THAT MUST BE INSTALLED

One CPU board, one memory board and a known good I/O board for downloading the test.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

adt Use the ETLB addresses as the data which each is to store. This assures uniqueness of addressability for each location.

pat Run a pattern test on the ETLB memory.

INTERPRETING THE ERROR CODES

This section documents the error codes that can be generated for any tests that are verilog-script based. When an error is reported by such a test, a line number is also reported. This is the line number in the verilog source code at which the error was sensed.

100 DataLo does not contain the expected value. This error message reports the actual value, the expected value, and a mask value. In this case, the mask value indicates, by a 1-bit in each position, which bits were being checked. In other words, any bit position in the mask that contains a zero is a don't-care bit for comparison purposes. Examine the source code above the error to determine which register was read into dataLo.

102 DataHi does not contain the expected value. Same interpretation as for Error 100. That is, an actual, expected and a mask value are reported. Examine the source code above the error to determine which register was read into dataHi.

104 An expected interrupt did not occur. Examine the source code above the line number reported to determine which interrupt was expected.

106,108
When this error occurs, the test has just checked the contents of a vector register in the vector register file (vrf). The contents were not as expected. This could have resulted from an error in vrf memory (bad chip), or from a bad result of an arithmetic operation in the ALU. Check the source code to determine what operation preceded this error.

110,112,114
The memory does not contain the expected data after some operation. If error 110 occurs, then the dataLo word of a 64-bit data transaction has been found to be in error. If error 112 occurs, both words were in error. If error 114 occurs, then the dataHi part of previous operation was not as expected.

116 The contents of the CPU status register was not as expected. The bit number with an unexpected value is reported. Examine the source code to determine what operation was performed just prior to the checking of the cpu status register.

NAME

fpmex.diag* – check correct response to fpu or memory generated exceptions.

DESCRIPTION

This test forces exception conditions and checks that the FPU and the memory board respond correctly. Note that this is one of the tests that loads into the instruction cache on the CPU board and requires a machine reset following the test.

DETAILS

None.

BOARDS THAT MUST BE INSTALLED

This test requires one CPU board, at least one memory board, and a known good I/O board for downloading the test. If multiple CPU boards are installed, only the boot master is tested. The test will not function if the memory is running in 16-way interleave (terminates with an error 162 reported). Easy solution: install only one memory board.

SPECIAL COMMAND LINE PARAMETERS

None

MENU ITEMS SPECIFIC TO THIS TEST

cpu Runs the CPU R Bus Status Register tests.

mem Runs the Memory Board R Bus Status Register tests

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

150 After forcing an FPU exception, the status registers do not contain the expected value. The register in error is noted, along with the actual and expected value.

155 A normal operation on the R Bus caused an unexpected exception.

160 An expected exception did not occur during a register write operation.

162 Memory is running in 16-way interleave and this test cannot be run in this configuration. See "Boards that must be installed" above.

165 An expected exception did not occur during a register read operation.

NAME

fpuex.diag* – check correct response to fpu generated exceptions.

DESCRIPTION

This test forces exception conditions and checks that the FPU responds correctly. Note that this is one of the tests that loads into the instruction cache on the CPU board and requires a machine reset following the test.

DETAILS

None.

BOARDS THAT MUST BE INSTALLED

This test requires one CPU board, at least one memory board, and a known good I/O board for downloading the test. If multiple CPU boards are installed, only the boot master is tested. The test will not function if the memory is running in 16-way interleave (terminates with an error 162 reported). Easy solution: install only one memory board.

SPECIAL COMMAND LINE PARAMETERS

None

MENU ITEMS SPECIFIC TO THIS TEST

ex1 Performs a basic exception test

acex Checks for ACEX exception

daex Checks for DAEX exception

roex Checks for ROEX exception

nxop Checks for NXOP exception

vhex Checks for VHEX exception

vlex Checks for VLEX exception

INTERPRETING THE ERROR CODES

When this test reports an error, a customer can only determine that there is a problem with the CPU board and that is must be replaced. For the factory test technician, the error reporting includes a line number of the source code for the verilog testing. The source code must be examined to determine what particular cicuit was under test at the time the error was reported.

NAME

fpuops.diag – Checks correct results for scalar and vector floating point operations.

DESCRIPTION

This test verifies that the floating point unit can perform all known scalar and vector arithmetic operations.

DETAILS

None.

BOARDS THAT MUST BE INSTALLED

This test requires one CPU board, at least one memory board, and a known good I/O board for downloading the test. If there is more than one CPU board installed, only that which is designated the boot master is tested.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

s Performs scalar tests

v Performs vector tests

all Performs both scalar and vector tests

INTERPRETING THE ERROR CODES

When this test reports an error, a customer can only determine that there is a problem with the CPU board and that is must be replaced. For the factory test technician, the error reporting includes a line number of the source code for the verilog testing. The source code must be examined to determine what particular cicuit was under test at the time the error was reported.

NAME

fpuregs.diag – Tests the FPU registers for correct operation.

DESCRIPTION

This test checks various FPU registers to determine that they are functioning as designed.

DETAILS

None.

BOARDS THAT MUST BE INSTALLED

This test requires one CPU board, at least one memory board, and a known good I/O board for downloading the test.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

ma Tests the mask address register

md Tests the mask data register

mia Tests the miscellaneous address register

mid Tests the miscellaneous data register

v1a Tests the vcu1 address register

v1d Tests the vcu1 data register

v2a Tests the vcu2 address register

v2d Tests the vcu2 data register

op Tests the opdq register

all Runs all fpu register tests

INTERPRETING THE ERROR CODES

When this test reports an error, a customer can only determine that there is a problem with the CPU board and that is must be replaced. For the factory test technician, the error reporting includes a line number of the source code for the verilog testing. The source code must be examined to determine what particular cicuit was under test at the time the error was reported.

NAME

gr.diag – Tests the graphics main and graphics expansion boards.

DESCRIPTION

This diagnostic tests for the proper functioning of the graphics and the graphics expansion board (if present).

DETAILS

Details of each test are specified with each menu and submenu selection.

BOARDS THAT MUST BE INSTALLED

This test requires at least one CPU board, one memory board, a graphics main board, a graphics expansion board and a known good I/O board for downloading the test. Note that to run this test, *the system keyboard must be disconnected and a DCP console must be installed.*

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

The following menu items, specific to the test, are provided. Note that the main menu has many many submenu items. The descriptions of the tests are indented appropriately to denote submenus. The illustration here shows how the main menu is presented. Note that the '***' following a main menu selection indicates that there is a submenu that is presented when this menu item is selected.

MAIN MENU

0.	q	Quit.		9.	zo	Z_Op Tests	***
1.	l=*n*	Loop *n* times.		10.	bl	Block Tests	***
2.	v=*n*	Verbosity level (*n*=0-2).		11.	in	Interrupt Tests	***
3.	er=*n*	Report *n* errors max.		12.	vm	VMUX Tests	***
4.	hoe=*n*	Halt on *n*th error.		13.	cs	Exerciser/Checksum	
5.	rs	Regs/SRAMs/Brooktree	***	14.	vb	Visual Base Bd	
6.	rr	Rasterizer Reg Tests	***	15.	vx	Visual Exp Bd	
7.	vr	VRAM Tests	***	16.	pp	Peek & Poke	
8.	po	Pixel_Op Tests	***	17.	all	All Tests.	

'***' means there is a submenu attached to this item

The paragraphs that follow are indented to indicate their presence on the:

- Main Menu (Item is listed as a primary heading)
- First Submenu (Item is listed as a subheading to the main menu item)
- Second Level Submenu (Indent of approximately 5 spaces from the left hand margin)

rs (Submenu)

Registers/SRAMs/Brooktree – this selection brings up the following submenu.

reg This selection brings up the register test submenu

r1	Test the LED register
r2	Test the Board ID Register
r3	Test the Video Control Register
r4	Test the Wr DMA Word Count Register
r5	Test the Wr DMA Start Address Register
r6	Test the Rd DMA Word Count Register
r7	Test the Rd DMA Start Address Register
r8	Test the Interrupt Enable Register
r9	Test the first address of the video timing memory
ra	Test the first address of address translation memory
rb	Test the first address of the color map
rc	Test any address
rd	Write data into A register
all	Perform all register tests in this submenu

sr This selection brings up the SRAM test submenu

m1	Test the Video Timing Memory
m2	Test the Address Translation Memory
m3	Test the Color Table Memory
m4	Test arbitrary locations within the SRAM
all	Perform all SRAM tests in this submenu

rd This selection brings up the RAMDAC test submenu

rd	Test the RED register
gr	Test the Green register
bl	Test the Blue register
ps	Test the Pseudo Color register
rgb	Test the ability to do RGB colors in parallel
all	Perform all RAMDAC tests in this submenu

rr (Submenu)

This selection brings up the Rasterizer submenu.

reg Tests the rasterizer registers
ras Tests the rasterizer selection modes
all Runs the ras and reg tests above.

vr (Submenu)

This selection brings up the following VRAM test submenu.

p8s The Pixel_8 selection brings up the following submenu

rr	Test Red/Red (Red rasterizer, red plane)
rg	Test Red/Green (Red rasterizer, green plane)
rb	Test Red/Blue (Red rasterizer, blue plane)
oc	Test Overlay/Control plane
zb	Test the Z-buffer plane
gf	Test the Green front plane
gb	Test the Green back plane
bf	Test the Blue front plane
bb	Test the Blue back plane

pss Pixel_S Write/Read Subtest brings up the following menu

rr	Test Red/Red (Red rasterizer, red plane)
rg	Test Red/Green (Red rasterizer, green plane)
rb	Test Red/Blue (Red rasterizer, blue plane)
fr	Test the front plane
bk	Test the rear plane

pts Point Write/Read Subtest brings up the following menu

rr	Test Red/Red (Red rasterizer, red plane)
rg	Test Red/Green (Red rasterizer, green plane)
rb	Test Red/Blue (Red rasterizer, blue plane)
oc	Test Overlay/Control plane
zb	Test the Z-buffer plane
gf	Test the Green front plane
gb	Test the Green back plane
bf	Test the Blue front plane
bb	Test the Blue back plane

p8 Test all of VRAM with Pixel8 Write/Read test
ps Test all of VRAM with Pixel_S Write/Read test
pt Test all of VRAM with Point Write/Read test
all Perform all of the above VRAM tests

po (Submenu)

This selection brings up the Pixel_Op menu as follows

rec	Foreground Register test. Check that the foreground registers can hold all possible values.
pat	Area Pattern test. Check that the area pattern registers can hold all possible values.
fun	Pixel function test. Verify that each of the possible pixel functions can be executed.
clp	Clip test.
img	Image Write mask. Verify the correct operation of the image write mask.
clr	Clear Mode. Verify the correct operation of clear mode for the rasterizers.
vec	Vector (H/V). Verify correct operation of vector generation hardware.
org	Origin (X&Y). Verify that writing to the origin registers resets the onscreen position of the upper lefthand corner of the screen display.
all	All Pixel_Ops. This test selection performs all pixel ops shown in this menu.

zo (Submenu)

This selection brings up the following Z_Op test submenu.

mm	Z-deep test. Test the Z-buffer functions.
pl	Plane test.
bit	Bit test.
all	All. Runs all Z_Op tests in this menu.

bo (Submenu)

This selection brings up the Block test submenu as follows.

rd	Move a block of pixels around the sides of the screen.
ct	Move a block of pixels to the center of the screen.
pan	Move a block of pixels across the diagonal of the screen.
rds	Same as *rd* except is a scope loop
cts	Same as *ct* except is a scope loop
pas	Same as *pan* except is a scope loop
all	Runs *rd*, *ct* and *pan*.

in (Submenu)

This selection brings up an interrupt test submenu as shown below. The purpose of this set of tests is to verify that various operations do indeed cause an interrupt to the central processor.

i1	DMA Error
i2	Multiple RAS Error (occurs when a read to multiple Rastersizers is requested - only one is allowed to write to the bus at a time.)
i3	Rasterizer Sync Error
i4	Color Table Load Complete
i5	Color Table Error
i6	VBLANK Interrupt
i7	Video SRAM Error
i8	DMA All Done Interrupt
i9	DMA Read Interrupt
ia	DMA Write Interrupt
all	Runs all interrupt tests

cs (Submenu)

bas	Base Board Triangle - uses the triangle drawing hardware to render a triangle to the rasterizer memory, then checks that the appropriate bits have been set in the rasterizer memory.
exp	Base Board and Expansion Board triangle - uses the triangle drawing hardware on both the base and expansion boards to render a colored triangle to the rasterizer memory and then checks that the appropriate bits have been set in the rasterizer memory.
all	Runs both the *bas* and the *exp* tests.

vb (Submenu)

This selection brings up a submenu that provides visual feedback regarding the proper operation of the graphics base board.

ba	Base board tests. Includes a sequence of visual tests.
ha	Halt tests. Verifies that it is possible to halt a graphics board DMA operation in progress (at a command boundary), then resume with the rest of the queued DMA commands with expected results.
nt	NTSC Tests. Checks that the system will correctly output to an NTSC monitor.
pt	PAL Tests. Checks that the system will correctly output to a PAL monitor.
st	Stereo Tests. Checks that the system will correctly output for and synchronize to a set of stereo glasses.
all	Runs all of the above expansion board visual tests.

vm (Submenu)

This selection brings up the following VMUX (Video multiplexor) test submenu.

all	Runs the VMUX tests

vx (Submenu)

This selection brings up a submenu that provides visual feedback regarding the proper operation of the graphics expansion board.

ex	Expansion board tests. Includes a sequence of visual tests.
ha	Halt tests. Verifies that it is possible to halt a graphics board DMA operation in progress (at a command boundary), then resume with the rest of the queued DMA commands with expected results.
nt	NTSC Tests. Checks that the system will correctly output to an NTSC monitor.
pt	PAL Tests. Checks that the system will correctly output to a PAL monitor.
all	Runs all of the above expansion board visual tests.

pp (Submenu)

This selection brings up the Peek and Poke submenu as follows. This allows the technician to manually operate the graphics hardware.

in	Initialize SRAMs. This is usually the first test performed when this submenu is selected.
dp	Dump. Dumps the contents of various memory and registers on the graphics board according to the following menu.

sp	Select pseudo RAMDAC
sr	Select red RAMDAC
sg	Select green RAMDAC
sb	Select blue RAMDAC
d1	Dump RAMDAC Color Table
d2	Dump RAMDAC Overlay Table
d3	Dump Video Timing SRAM
d4	Dump Address Translation RAM
d5	Dump Full Color SRAM
d6	Dump Pseudo Color SRAM
d7	Dump Write DMA Buffer
d8	Dump Read DMA Buffer
d9	Dump VRAM (Point Read)

rwr	Rasterizer Register Write/Read.
rr	Rasterizer Register Read.
rl	Rasterizer Register Scope Loop.
pw	Point Write/Read.
pr	Point Read.
ps	Point Scope Loop.
rec	Draw Rectangle.
p8l	Pixel8/16 Scope Loop.

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

100 This error message is printed when an error occurs during block move tests on the rasterizers. The failing rasterizer is identified by name. Additional messages that accompany this one identify the move direction for the block, the source and destination values, and the failing address for the block move, showing actual and expected values.

102 This error message is printed when an error occurs during a block move in a diagonal direction (panning a block diagonally). The same kind of supplemental information is printed as for error 101.

104,106
A graphics interrupt has been generated, and the CPU has been directed to wait for a given period of time before it should respond to the interrupt. At the end of this interval, the CPU checked that the interrupt actually occured and it did not.

108 A graphics interrupt occured and the CPU tried to clear the graphics board Status register by clearing the appropriate bit in the Interrupt Enable register. The Status Register did not clear as expected.

110 A graphics interrupt occured and the CPU tried to clear the graphics board Status register by clearing the appropriate bit in the Interrupt Clear register. The Status Register did not clear as expected.

112 Following the generation of a graphics interrupt, the graphic Status register did not contain the expected value. Both the actual and expected value are reported.

114 Data for a specific operating mode (normal, NTSC, PAL etc) has been copied into the video SRAM, intended to switch the video into this particular mode. This error indicates that the data read was not the same as the data written and therefore the video SRAM will not necessarily display what is expected. This indicates there is something wrong with the Video SRAM memory or its selection logic.

116,118
This error occurs when there has been a timeout while waiting for the Write DMA or Read DMA to complete. The Write and Read DMA control register contents, as well as the DMA address contents for write or read DMA are also reported.

120 RAMDAC CMD register contents not as expected following initialization for a specific operating mode (normal, NTSC, PAL, etc.). This message also reports the failing register and the actual and expected data.

122 RAMDAC MASK register contents not as expected following initialization for a specific operating mode.

124 RAMDAC BLINK register contents not as expected following initialization for a specific operating mode.

126 RAMDAC CNTRL register contents not as expected following initialization for a specific operating mode.

128 When the diagnostic tried to set the value of one of the color registers in the SRAM, the color value read was not the same as that written. This is a memory error associated with the SRAM.

130 The diagnostic was comparing the data in the SRAM to the data that was written into the RAMDAC internal color table memory and found a miscompare. This could indicate a problem in the RAMDAC memory, or in the DMA circuitry that transfers data from the SRAM to the RAMDAC.

132 Following a Pixel_8 or point write, the contents of the video RAM are compared to that which was expected to be written to the various bit planes. Any discrepancies are reported as actual and expected values, along with the failing address. This could indicate a failure in the VRAM chips or their access circuitry.

134

This function handles error report for VRAM tests in the following cases:

dx=10,dy=1024, (xadrs,yadrs) starting every 4 pixel/byte, or
dx=1280,dy=8, (xadrs,yadrs) starting every 4 pixel/byte, or
dx=10,dy=1024, (xadrs,yadrs) starting every 2 pixel/halfword,or
dx=1280,dy=8, (xadrs,yadrs) starting every 2 pixel/halfword.

(1) x location of pixel that failed.
(2) y location of pixel that failed.
(3) Actual versus expected data in byte.
(4) Use Xor to indicate failing bit(s) in 8, 16, 32, 64 bit addresses.
(5) Read retry to see failure on read or write.
(6) Find out which chip(s) failed.

136 Error during the interactive point write test. The user has already entered the X and Y addresses and the data to be written. The system reports the data that it read following a write. The data read did not match the data the user tried to write.

138 Error during the interactive point read test. The user has already entered the X and Y addresses and the data that the user believes is at that location. The system reports the data that it read does not match what the user though was located at that position.

140 When doing either an Area pattern Inhibit/Enable Test or an Area pattern Background/Foreground test, the actual value read back after a write did not match the value that was written. The failing rasterizer number, along with the X and Y address, the actual and expected values are reported.

142 Various rasterizer modes were set, and either a horizontal or a vertical vector is drawn. The test that generates this error checks the vector to see if it is drawn correctly. The error reported is "vector is neither H or V".

144 Rasterizer error. Test reports X and Y addresses, expected and actual data, and Xor results to show bits in error.

146,148,150,152

Brooktree RAMDAC registers are being tested. The data read back from a register in a specified RAMDAC is not as written. The failing RAMDAC and the failing address, along with the actual and expected value are reported.

156 The Graphics card ID register contents was checked and found that it does not contain the expected value. Actual and expected value are reported.

158,160,162,164
The ability of each rasterizer to correctly write its corresponding bit planes is verified. If the Red Rasterizer has an error, error 158 is reported. Errors 160, 162 and 164 are for the Z, Green, and Blue rasterizers respectively.

166,168,170,172
The graphics board is capable of queuing up several sets of graphics DMA commands, each of which has an explicit starting point consisting of a header word and count, along with the data that describes the command. A halt test is being performed which consists of telling the graphics board to come to a stop at the next command boundary (following the current graphics DMA operation). The address of the next command in sequence is saved so that another operation may be done to the graphics, then is restored to allow the queued operations to be finished. These errors indicate that the graphics halt test did not work as expected in that the expected data did not compare to the actual data read from the video memory. Error 166 is associated with the Red Rasterizer; errors 168, 170, and 172 are associated with the Z, Green and Blue rasterizers respectively.

174,176,178,180,182
The tests that are running here check the integrity of the data path from the video ram, through the video multiplexors and the color tables within the RAMDACs. Basically, known values are placed into the frame buffer and the color tables, and the video RAMs are placed into static mode (not run at normal video speeds) so that the color that is stored into the frame buffer can be passed through the color table and the "translated" value for that color can be checked. Several different patterns and operating modes are checked, with and without overlays used, and in both full color and pseudocolor mode, assuring that all color tables and all data paths are checked.
The type of test that was being performed at the time of the error is indicated with this error message.

194 The Z-buffer was being tested and the image data was not as expected. Reports the actual and expected values, along with the failing address.

196 The Z-buffer was being tested, and the Z-buffer memory did not contain the value that was written at a particular position. Both the actual and the expected values are reported, as well as the failing address.

197 During several of the diagnostics, the system occasionally checks to see that various registers contain the expected value. This error is reported when the actual and expected values don't match. The error is normally preceded by a report of which test was being performed and may provide more clues as to exactly which circuitry is not functioning correctly. Actual and expected value, along with the failing register address is reported.

198 The graphics attribute portion of the SRAM was being loaded and the value written did not match the value that was read after this SRAM was initialized.

200 This diagnostic forces deliberate errors to be registered into the graphics board S Bus Status Register and checks that the system responds correctly to these errors happening. The deliberate errors are NXA (non existent address), DPE (data parity error), RPE (requestor parity error) and BTO (bus time out). If any of these error responses is incorrect, the type of test, the actual and expected contents of the status register is reported. This error is generated when the graphics board is acting as an initiator.

201 A known pattern is written to the video SRAM through the normal rectangle area fill functions. The checksum of the patterned area is calculated and errors are individually reported for each of the bit planes involved in generating the pattern. This tests the rectangle fill function, the area pattern register, and the video SRAM on the base board.

202 This error value reports a failure of the graphics board to force a "boot error" operation when writing into the appropriate bit of the graphics board S Bus Status Register.

203 This is the same as error 201 except that it reports problems on the graphics expansion board instead of the base board.

204 This error is reported if a forced error does not occur while the graphics board is acting as a responder.

206 Graphics test was unable to locate a memory board that it could use during other tests. (No memory board responded when queried).

208 The graphics diagnostic deliberately generated an interrupt but the interrupt did not occur.

210,212
An attempt was made to generate an exception condition using the graphics S Bus Status register but the exception did not get registered by the CPU.

214 An unexpected graphics board status value or an unexpected graphics interrupt has occurred. The contents of various registers is dumped For examination. These include CPU SBUS status register, the Graphics board S Bus Status register, the MIPS (Integer Processor) Cause register, the MIPS EPC register, the MIPS SR register, and the MIPS BADVADDR register.

NAME

grex1.diag* – Tests exceptions for graphics boards (Part 1 of 3).

DESCRIPTION

This test exercises various bits in the graphics board S Bus Status register to assure that setting various bits in the graphics board S Bus register will cause the proper interrupt to be generated to the CPU board.

DETAILS

In the system, all boards are supposed to be capable of detecting certain kinds of exception conditions and when they detect them, they should cause the processor to be interrupted. This test checks that the graphics board exception response circuitry is operational, but does not deliberately generate any of the exception conditions -- instead it simply sets the appropriate error bits directly and checks to see that the appropriate interrupt will occur.

BOARDS THAT MUST BE INSTALLED

This test needs a CPU board, at least one memory board, a graphics board, and a known good I/O board for downloading the test.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

rt Responder test - this test also writes to the graphics board S Bus Status register to cause an interrupt. The difference from the initiator test is that during this test, the graphics board is identified as the "culprit", in other words, the CPU is told that the graphics board sensed (and perhaps in some way caused) the problem. The test then checks to assure that the CPU has properly identified that it is indeed the graphics board who flagged the problem.

it Initiator test - performs a memory bit test on various bits in the graphics board S Bus Status register (checks that the bit that we set or clear is the bit -- and the ONLY bit -- that is affected and that it is set to the proper state). Then the test checks to see that setting this bit causes the expected kind of interrupt (and no other).

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

200 This error is generated if the test finds that it cannot set (or clear) a specified bit in the graphics board S Bus Status register. The expected and actual values are reported, as well as the explicit bit that was being checked.

202 Writing the S Bus status register during the initiator test should have caused a boot error interrupt. But this did not occur. (Boot error happens when a particular board in the system identifies an error by setting one of its error bits, but no board steps up to say that it was the one that caused the problem.)

204 An interrupt did not occur when a specific bit in the graphics S Bus Status register was set during the responder test.

NAME

grex2.diag* – Tests exceptions for graphics boards (Part 2 of 3).

DESCRIPTION

In the system, all boards are supposed to be capable of detecting certain kinds of exception conditions, no matter which board in the system actually caused the problem. This test checks that the graphics board is able to detect all of this class of errors.

DETAILS

The test initiates a bus transaction between the CPU board and the memory board and, as in cpmex1.diag (and cpmex2.diag), deliberate errors are forced using the test register on the CPU board. Following receipt of the interrupt that is expected, the test checks that the graphics board also registered the same error.

BOARDS THAT MUST BE INSTALLED

This test needs a CPU board, at least one memory board, a graphics board, and a known good I/O board for downloading the test.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

rt Responder test - this is the only test in the menu. The graphics board is simply acting as a bus watcher in this case. The error of some kind has been deliberately set, and though the graphics board is not a participant, it is expected to notice that this kind of error occured and latch it into its own S Bus Status register.

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

206 The test was not able to find a memory board that it could use for this test.

210 The graphics board S Bus Status register failed to register the error that was generated.

NAME

grex3.diag* – Tests exceptions for graphics boards (Part 3 of 3).

DESCRIPTION

In grex2.diag, the graphics board was simply a responder, watching the bus for transactions possibly intended for it, but also recording errors that it saw regardless of which board the transaction was intended for. In this test, the graphics board is the initiator, ordered to transfer data to or from memory, and we test that a bus transaction initiated by the graphics board is capable of generating the various bus error types for the S Bus Status register.

DETAILS

The test initiates a bus transaction between the grapics board and the memory board and, as in cpmex1.diag (and cpmex2.diag), deliberate errors are forced using the PECTL register on the memory board. Following receipt of the interrupt that is expected, the test checks that the graphics board also registered the same error.

BOARDS THAT MUST BE INSTALLED

This test needs a CPU board, at least one memory board, a graphics board, and a known good I/O board for downloading the test.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

it Initiator test - this is the only test in the menu. See *Details* for more information.

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

206 The test was not able to find a memory board that it could use for this test.

208 An interrupt condition was deliberately forced, but the interrupt did not occur. The contents of both the graphics board S Bus Status register and the CPU board status register are presented with this error report.

210 The graphics board S Bus Status register failed to register the error that was generated.

NAME

grfield.diag – Field test for the graphics main and graphics expansion boards.

DESCRIPTION

This diagnostic tests for the proper functioning of the graphics and the graphics expansion board (if present).

DETAILS

Details of each test are specified with each menu and submenu selection.

BOARDS THAT MUST BE INSTALLED

This test requires at least one CPU board, one memory board, a graphics main board, a graphics expansion board and a known good I/O board for downloading the test.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

The following menu items, specific to the test, are provided. Note that the main menu has many many submenu items. The descriptions of the tests are indented appropriately to denote submenus. The illustration here shows how the main menu is presented. Note that the '***' following a main menu selection indicates that there is a submenu that is presented when this menu item is selected.

MAIN MENU

0.	q	Quit.		9.	zo	Z_Op Tests	***
1.	l=*n*	Loop *n* times.		10.	bl	Block Tests	***
2.	v=*n*	Verbosity level (*n*=0-2).		11.	in	Interrupt Tests	***
3.	er=*n*	Report *n* errors max.		12.	vm	VMUX Tests	***
4.	hoe=*n*	Halt on *n*th error.		13.	cs	Exerciser/Checksum	
5.	rs	Regs/SRAMs/Brooktree	***	14.	vb	Visual Base Bd	
6.	rr	Rasterizer Reg Tests	***	15.	vx	Visual Exp Bd	
7.	vr	VRAM Tests	***	16.	all	All Tests.	
8.	po	Pixel_Op Tests					

'***' means there is a submenu attached to this item

The paragraphs that follow are indented to indicate their presence on the:

- Main Menu (Item is listed as a primary heading)
- First Submenu (Item is listed as a subheading to the main menu item)
- Second Level Submenu (Indent of approximately 5 spaces from the left hand margin)

rs (Submenu)

Registers/SRAMs/Brooktree – this selection brings up the following submenu.

reg		This selection brings up the register test submenu
	all	Perform all register, SRAM and RAMDAC tests

rr (Submenu)

This selection brings up the following submenu.

all	This selection runs the rasterizer register and selection mode tests

vr (Submenu)

This selection brings up the following VRAM test submenu.

p8	Test all of VRAM with Pixel8 Write/Read test
ps	Test all of VRAM with Pixel_S Write/Read test
pt	Test all of VRAM with Point Write/Read test
all	Perform all of the above VRAM tests

po (Submenu)

Run the Pixel_Op Subtests, shows the following submenu.

all	All Pixel_Ops. This test selection performs all pixel ops shown in this menu.

zo (Submenu)

This selection brings up the following Z_Op test submenu.

all	All. Runs all Z_Op tests

bo (Submenu)

This selection brings up the Block test submenu as follows.

all	moves a block of pixels around the screen, then moves the block to the center of the screen, finally moves it diagonally across the screen.

in (Submenu)

This selection brings up an interrupt test submenu as shown below. The purpose of this set of tests is to verify that various operations do indeed cause an interrupt to the central processor.

all	Runs all interrupt tests

cs (Submenu)

all	Runs both the *base board* and the *expansion board* tests.

vb (Submenu)

This selection brings up a submenu that provides visual feedback regarding the proper operation of the graphics base board.

ba	Base board tests. Includes the following:
ha	Halt tests. Verifies that it is possible to halt a graphics board DMA operation in progress (at a command boundary), then resume with the rest of the queued DMA commands with expected results.
all	Runs all of the above expansion board visual tests.

vm (Submenu)

This selection brings up the following VMUX (Video multiplexor) test submenu.

all	Runs the VMUX tests

vx (Submenu)

This selection brings up a submenu that provides visual feedback regarding the proper operation of the graphics expansion board.

ex	Expansion board tests. Includes the following: ???
ha	Halt tests. Includes the following kinds of tests: ???
all	Runs all of the above expansion board visual tests.

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

100 This error message is printed when an error occurs during block move tests on the rasterizers. The failing rasterizer is identified by name. Additional messages that accompany this one identify the move direction for the block, the source and destination values, and the failing address for the block move, showing actual and expected values.

102 This error message is printed when an error occurs during a block move in a diagonal direction (panning a block diagonally). The same kind of supplemental information is printed as for error 101.

104,106
A graphics interrupt has been generated, and the CPU has been directed to wait for a given period of time before it should respond to the interrupt. At the end of this interval, the CPU checked that the interrupt actually occured and it did not.

108 A graphics interrupt occured and the CPU tried to clear the graphics board Status register by clearing the appropriate bit in the Interrupt Enable register. The Status Register did not clear as expected.

110 A graphics interrupt occured and the CPU tried to clear the graphics board Status register by clearing the appropriate bit in the Interrupt Clear register. The Status Register did not clear as expected.

112 Following the generation of a graphics interrupt, the graphic Status register did not contain the expected value. Both the actual and expected value are reported.

114 Data for a specific operating mode (normal, NTSC, PAL etc) has been copied into the video SRAM, intended to switch the video into this particular mode. This error indicates that the data read was not the same as the data written and therefore the video SRAM will not necessarily display what is expected. This indicates there is something wrong with the Video SRAM memory or its selection logic.

116,118
This error occurs when there has been a timeout while waiting for the Write DMA or Read DMA to complete. The Write and Read DMA control register contents, as well as the DMA address contents for write or read DMA are also reported.

120 RAMDAC CMD register contents not as expected following initialization for a specific operating mode (normal, NTSC, PAL, etc.). This message also reports the failing register and the actual and expected data.

122 RAMDAC MASK register contents not as expected following initialization for a specific operating mode.

124 RAMDAC BLINK register contents not as expected following initialization for a specific operating mode.

126 RAMDAC CNTRL register contents not as expected following initialization for a specific operating mode.

128 When the diagnostic tried to set the value of one of the color registers in the SRAM, the color value read was not the same as that written. This is a memory error associated with the SRAM.

130 The diagnostic was comparing the data in the SRAM to the data that was written into the RAMDAC internal color table memory and found a miscompare. This could indicate a problem in the RAMDAC memory, or in the DMA circuitry that transfers data from the SRAM to the RAMDAC.

132 Following a Pixel_8 or point write, the contents of the video RAM are compared to that which was expected to be written to the various bit planes. Any discrepancies are reported as actual and expected values, along with the failing address. This could indicate a failure in the VRAM chips or their access circuitry.

134

This function handles error report for VRAM tests in the following cases:

dx=10,dy=1024, (xadrs,yadrs) starting every 4 pixel/byte, or
dx=1280,dy=8, (xadrs,yadrs) starting every 4 pixel/byte, or
dx=10,dy=1024, (xadrs,yadrs) starting every 2 pixel/halfword,or
dx=1280,dy=8, (xadrs,yadrs) starting every 2 pixel/halfword.

(1) x location of pixel that failed.
(2) y location of pixel that failed.
(3) Actual versus expected data in byte.
(4) Use Xor to indicate failing bit(s) in 8, 16, 32, 64 bit addresses.
(5) Read retry to see failure on read or write.
(6) Find out which chip(s) failed.

136 Error during the interactive point write test. The user has already entered the X and Y addresses and the data to be written. The system reports the data that it read following a write. The data read did not match the data the user tried to write.

138 Error during the interactive point read test. The user has already entered the X and Y addresses and the data that the user believes is at that location. The system reports the data that it read does not match what the user though was located at that position.

140 When doing either an Area pattern Inhibit/Enable Test or an Area pattern Background/Foreground test, the actual value read back after a write did not match the value that was written. The failing rasterizer number, along with the X and Y address, the actual and expected values are reported.

142 Various rasterizer modes were set, and either a horizontal or a vertical vector is drawn. The test that generates this error checks the vector to see if it is drawn correctly. The error reported is "vector is neither H or V".

144 Rasterizer error. Test reports X and Y addresses, expected and actual data, and Xor results to show bits in error.

146,148,150,152
Brooktree RAMDAC registers are being tested. The data read back from a register in a specified RAMDAC is not as written. The failing RAMDAC and the failing address, along with the actual and expected value are reported.

156 The Graphics card ID register contents was checked and found that it does not contain the expected value. Actual and expected value are reported.

158,160,162,164
The ability of each rasterizer to correctly write its corresponding bit planes is verified. If the Red Rasterizer has an error, error 158 is reported. Errors 160, 162 and 164 are for the Z, Green, and Blue rasterizers respectively.

166,168,170,172
The graphics board is capable of queuing up several sets of graphics DMA commands, each of which has an explicit starting point consisting of a header word and count, along with the data that describes the command. A halt test is being performed which consists of telling the graphics board to come to a stop at the next command boundary (following the current graphics DMA operation). The address of the next command in sequence is saved so that another operation may be done to the graphics, then is restored to allow the queued operations to be finished. These errors indicate that the graphics halt test did not work as expected in that the expected data did not compare to the actual data read from the video memory. Error 166 is associated with the Red Rasterizer; errors 168, 170, and 172 are associated with the Z, Green and Blue rasterizers respectively.

174,176,178,180,182
The tests that are running here check the integrity of the data path from the video ram, through the video multiplexors and the color tables within the RAMDACs. Basically, known values are placed into

the frame buffer and the color tables, and the video RAMs are placed into static mode (not run at normal video speeds) so that the color that is stored into the frame buffer can be passed through the color table and the "translated" value for that color can be checked. Several different patterns and operating modes are checked, with and without overlays used, and in both full color and pseudocolor mode, assuring that all color tables and all data paths are checked.
The type of test that was being performed at the time of the error is indicated with this error message.

194 The Z-buffer was being tested and the image data was not as expected. Reports the actual and expected values, along with the failing address.

196 The Z-buffer was being tested, and the Z-buffer memory did not contain the value that was written at a particular position. Both the actual and the expected values are reported, as well as the failing address.

197 During several of the diagnostics, the system occasionally checks to see that various registers contain the expected value. This error is reported when the actual and expected values don't match. The error is normally preceded by a report of which test was being performed and may provide more clues as to exactly which circuitry is not functioning correctly. Actual and expected value, along with the failing register address is reported.

198 The graphics attribute portion of the SRAM was being loaded and the value written did not match the value that was read after this SRAM was initialized.

200 This diagnostic forces deliberate errors to be registered into the graphics board S Bus Status Register and checks that the system responds correctly to these errors happening. The deliberate errors are NXA (non existent address), DPE (data parity error), RPE (requestor parity error) and BTO (bus time out). If any of these error responses is incorrect, the type of test, the actual and expected contents of the status register is reported.
This error is generated when the graphics board is acting as an initiator.

201 A known pattern is written to the video SRAM through the normal rectangle area fill functions. The checksum of the patterned area is calculated and errors are individually reported for each of the bit planes involved in generating the pattern. This tests the rectangle fill function, the area pattern register, and the video SRAM on the base board.

202 This error value reports a failure of the graphics board to force a "boot error" operation when writing into the appropriate bit of the graphics board S Bus Status Register.

203 This is the same as error 201 except that it reports problems on the graphics expansion board instead of the base board.

204 This error is reported if a forced error does not occur while the graphics board is acting as a responder.

206 Graphics test was unable to locate a memory board that it could use during other tests. (No memory board responded when queried).

208 The graphics diagnostic deliberately generated an interrupt but the interrupt did not occur.

210,212
An attempt was made to generate an exception condition using the graphics S Bus Status register but the exception did not get registered by the CPU.

214 An unexpected graphics board status value or an unexpected graphics interrupt has occurred. The contents of various registers is dumped For examination. These include CPU SBUS status register, the Graphics board S Bus Status register, the MIPS (Integer Processor) Cause register, the MIPS EPC register, the MIPS SR register, and the MIPS BADVADDR register.

NAME

hare.diag – Halt and retry exercisor.

DESCRIPTION

This test checks the ability of the floating point unit to be interrupted for a context switch, then to resume its operation coming up with the correct answers to arithmetic operations.

NOTE: This test runs forever; it must be stopped after any user selected time interval by pressing CTRL-C. The test will halt after a cycle stops (roughly 15 seconds or less).

DETAILS

In standalone mode, only one processor board (the boot processor) is tested. In unix mode (using hare.unix instead of hare.diag), multiple processes may be started and thereby multiple processors may be simultaneously running hare.unix. Under systest, for example, 26 hare.unix processes are started simultaneously. The test checks most of the available arithmetic operations of the floating point unit.

BOARDS THAT MUST BE INSTALLED

At least one CPU card, at least one memory board, and a known good I/O board for downloading the test.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

None; when this test is loaded, it begins executing immediately.

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

106,108,110,112
: Expected value in some register was not equal to the actual value.

NAME

iobuscv.diag, iobuscv2.diag† – Tests the bus converters on the I/O boards in slots 1 and 8, respectively.

DESCRIPTION

There are several sources for DMA data transfer to an internal ("micro bus") bus on the I/O board. This test checks that each possible source of DMA is functional, that the bus arbitration on this internal bus is functional, and that the conversion from Stardent 1500/3000 Bus to the internal bus (and vice versa) works correctly.

DETAILS

None.

BOARDS THAT MUST BE INSTALLED

This test requires a CPU board, a memory board and the I/O board.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

ad Address path test. Checks that writing addresses to the DMA controller results in the correct addressed location being accessed.

da Data path test. Checks that the data registers in the DMA controller are functional.

dm Dma test. Data is written from I/O to memory and the memory copy of the data is checked for accuracy.

ov Overlapped buffer test. Two channels are set up to do overlapped DMA and the correct operation is verified.

ca DMA cache test.

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

101 While testing a specified register location, an unexpected value was found.

103 The program wrote to register dc_marhi (address 10fffd00c), and the value read from that same location yielded different data than was written.

105 The program wrote to a register at location 10fffd00d, and it unexpectedly changed the value stored at 10fffd00c.

107 The data written to 10fffd00d was read back and found to be different than expected.

109 A walking-ones test was performed on the data registers. The data read back did not match the data written. The actual and expected values are reported.

123 The DMA controller is reset, and the system expects to find the DMA interrupt cleared. However, an interrupt bit (DMA03) was found to be set.

125 During an overlapped DMA test, the data read back was not the same as that written. The differences are reported.

127 After an appropriate waiting time, it was found that a DMA operation did not complete.

129 The DMA finished, but an error was reported. The error is specified with this error message.

131 This is a continuation of error 129 in that the contents of all of the DMA registers is reported.

133 A DMA was performed and the data read back was not the same as the data that was written. The location of the bad data, along with the actual and expected values, is reported.

139 The DMA controller was reset, but not all of the interrupt bits were cleared.

141 Following the dma cache test, the register contents were not as expected. The actual and expected values are reported.

NAME

ioexbts.diag*, ioexbts2.diag*† – Tests that the SCSI I/O channels can generate various exceptions on the I/O boards in slots 1 and 8 respectively.

DESCRIPTION

Various parity errors and bus errors are caused during a DMA transfer between the memory and each of the two SCSI channels A and B.

DETAILS

Because a Data Parity Error (in this case instituted by using the Memory board's PECTL register) causes problems on the bus, this test is loaded resident to the instruction cache. Since running from the instruction cache prevents any bus accesses for the instructions, data parity errors can be forced without making it impossible for the CPU to correctly interpret its next instruction sequence.

BOARDS THAT MUST BE INSTALLED

This test requires a CPU board, at least one memory board, an I/O board, and a SCSI adaptor board to be installed in the I/O board.

COMMAND LINE PARAMETERS

None

MENU ITEMS SPECIFIC TO THIS TEST

se Performs various kinds of I/O exceptions using the SCSI channels.

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

(un-numbered)
This error message reports that a forced data parity error for a specified numbered byte did not occur. The possible reports show errors as: "DPE(Byte_4) on" through "DPE(Byte_7) on".

101 This message indicates that an attempt to force a Boot Error failed.

103 The test tried to generate an RPE error (requester parity) but the error did not occur.

105 The test tried to force a DPE error (data parity) but the error did not occur.

107 An unexpected exception occured. The type of exception is reported.

501 A DMA, once started, has completed too quickly.

503 A DMA timeout has happened.

505 I/O initiator test has tried to find a memory board to use for data transfer and no memory board has responded.

NAME

ioexdpe.diag*, ioexdpe2.diag*† – Tests the I/O DMA channels on the I/O boards in slots 1 and 8, respectively.

DESCRIPTION

Tests that I/O DMA channels can generate various exceptions. Various parity errors and bus errors are caused during a DMA transfer between the memory and the I/O board.

DETAILS

Because a Data Parity Error (in this case instituted by using the Memory board's PECTL register) causes problems on the bus, this test is loaded resident to the instruction cache. Since running from in the instruction cache prevents any bus accesses for the instructions, data parity errors can be forced without making it impossible for the CPU to correctly interpret its next instruction sequence.

BOARDS THAT MUST BE INSTALLED

This test requires a CPU board, at least one memory board, and an I/O board.

COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

de Performs various kinds of I/O exceptions using the DMA I/O channels.

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

(un-numbered)
This error message reports that a forced data parity error for a specified numbered byte did not occur. The possible reports show errors as: "DPE(Byte_4) on" through "DPE(Byte_7) on".

101 This message indicates that an attempt to force a Boot Error failed.

103 The test tried to generate an RPE error (requester parity) but the error did not occur.

105 The test tried to force a DPE error (data parity) but the error did not occur.

107 An unexpected exception occured. The type of exception is reported.

501 A DMA, once started, has completed too quickly.

503 A DMA timeout has happened.

505 I/O initiator test has tried to find a memory board to use for data transfer and no memory board has responded.

NAME

ioexnxl.diag*, ioexnxl2.diag*† – Test Lance data transfers on the I/O boards in slots 1 and 8, respectively.

DESCRIPTION

Test that Lance data transfers can generate various exceptions. Various parity errors and bus errors are caused during a DMA transfer between the memory and the lance circuit.

DETAILS

Because a Data Parity Error (in this case instituted by using the Memory board's PECTL register) causes problems on the bus, this test is loaded resident to the instruction cache. Since running from the instruction cache prevents any bus accesses for the instructions, data parity errors can be forced without making it impossible for the CPU to correctly interpret its next instruction sequence.

BOARDS THAT MUST BE INSTALLED

This test requires a CPU board, at least one memory board, an I/O board, and a SCSI adaptor board to be installed in the I/O board.

COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

nx Tests for errors caused by accessing non-executable memory locations.

le Tests for errors generates by the network controller chip.

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

(un-numbered)
This error message reports that a forced data parity error for a specified numbered byte did not occur. The possible reports show errors as: "DPE(Byte_4) on" through "DPE(Byte_7) on".

101 This message indicates that an attempt to force a Boot Error failed.

111 The diagnostic was unable to initialize lance hardware for testing.

113 The lance hardware generated a data parity error, indicating a bus problem.

115 The lance hardware failed to generate an expected level 1 exception.

117 The lance hardware failed to generate an expected interrupt.

119 There was an interrupt, but it wasn't from lance.

121 The diagnostic read an internal lance status register and got the wrong pattern.

123 The diagnostic did not get the expected interrupt.

NAME

ioregs.diag, ioregs2.diag† – Test the registers on the I/O boards in slots 1 and 8, respectively.

DESCRIPTION

This test performs what might be called generic testing of the various registers on the I/O board.

DETAILS

I/O registers are tested to determine that all of their bits can be set and reset. The NVRAM is checked for its ability to store data. The I/O mapper is tested like normal memory and its ability to act as a mapper is checked. The S Bus Status Register is frozen (as is supposed to happen when an error condition is sensed) and an additional error is generated. This new error condition should not affect the current contents of a frozen Status register.

BOARDS THAT MUST BE INSTALLED

This test requires a CPU card, a memory card and an I/O card with a SCSI adaptor installed.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

led Tests the LED register

st Freezes the Status register and verify that it stays frozen.

mp Tests the I/O mapper as memory and as a mapper.

sc Tests the SCSI stacker in both input and output modes.

nv Tests the NVRAM as though it is memory.

vme Performs tests on the VME registers, verifying that all bits can be set and reset.

all Performs all of the above tests.

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

101 The LED register has been tested to determine whether it is possible to turn on or turn off the current to each LED. A failure in this test indicates a failure in a logic circuit that switches power to the LED and does not indicate a failure of the LED itself. LED failures can only be determined by visual inspection or by a voltage probe.

103 During a register test, a particular exception condition was forced, but no exception was registered. The type of exception is reported.

105 Same as 103

145 The card ID register was tested and an unexpected value was returned.

147 The CPU looked for an I/O board in the appropriate slot but the I/O board either is not present or is not responding to a board inventory query.

149 The system was unable to read the interrupt register on the I/O board.

151 An interrupt condition was deliberately stimulated, but the appropriate interrupt bit did not get set.

153 Unexpected interrupt.

155 SCSI channel A is unreadable.

157 SCSI channel B is unreadable.

159 SCSI Status returned a nonzero value. The status value is reported.

NAME

iotimer.diag, iotimer2.diag† – Tests the timer on the I/O boards in slots 1 and 8, respectively.

DESCRIPTION

See above.

DETAILS

None.

BOARDS THAT MUST BE INSTALLED

This test requires a CPU board, a memory board and an I/O board.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

cl Clock test - checks that the time of day clock is functioning

ti Timer test - checks that the countdown timer is functioning

cw Clock Write Test - checks that it is possible to set the clock and that the setting is correctly reflected in the current clock time.

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

101 The system has looped 100 times, reading the timer each time. Because the clock chip updates many times slower than the system clock, this test expects that it should be able to read the same time value several passes in succession. If this error occurs, it means that the clock chip is putting out random values and the system is "unable to read the same time twice".

103 If this error occurs, it indicates that the time of day clock is not running. The error report says "TODC appears to be stuck".

105 This test writes the year value to the clock chip. If this error occurs, when the test read the year value, the value was not as expected.

107 This test writes the seconds, tens of seconds, minutes, hours and month values to the clock chip, then checks that the correct values have been stored. If this error happens, the clock chip had an incorrect value. All values are reported so that the value in error may be determined.

111 This test checks that the timer high latch and timer low latch can be written and that the value read back is the same as the value written. This test primarily checks that the data can get to the timer.

115 This test checks accessibility of 6 data registers in the timer chip. If this error occurs, the actual and expected values and the address that yielded incorrect results are reported.

117 This test checks that the countdown timer number 1 is functioning. If this error happens, timer number 1 in the clock/timer chip may be bad.

119 This test checks that countdown timer number 3 is counting in catenated mode. If this error happens, timer number 3 in the clock/timer chip may be bad.

121 This test checks that countdown timer number 2 is counting in catenated mode. If this error happens, timer number 2 in the clock/timer chip may be bad.

123 If this error occurs, it means that the timer has counted down, but the timer interrupt bit in the clock/timer interrupt register was not set.

NAME

lance.diag, lance2.diag† – Tests the Ethernet interface on the I/O boards in slots 1 and 8, respectively.

DESCRIPTION

This diagnostic tests the Ethernet and Cheapernet interface. For one of the tests, either a transceiver cable with a tap for the Ethernet interface or a terminator for the Cheapernet interface must be provided (external loopback test). Note that the address mapper test (mapper.diag) should be performed first to verify correct operation of the I/O Mapper since this circuitry is used during the test.

DETAILS

This Ethernet/LANCE Testing/Bring-up Program can be called as either a cache test or a PROM test/diagnostic. The tests proceed as follows:

1) Read to/Write from LANCE registers and verify.
2) Try to load the init block through each entry in the I/O mapping table. For a memory-less test, we expect these to always fail. For memory, these must always succeed.

   NOTE: A memory-less test (run from cache) will go no farther.
3) Internal Loopback

   • Checks the CRC generated by the chip when transmitting
4) External Loopback is tested two different ways,

   • Checks the CRC generated by the chip when transmitting

   • Checks the CRC checking when receiving
5) If all the above tests have succeeded, the system will attempt to PING to a user-specified site until the user interrupts.

BOARDS THAT MUST BE INSTALLED

This diagnostic needs the CPU board, at least one memory board, and the I/O board.

SPECIAL COMMAND LINE PARAMETERS

all If you specify *all* on the command line, the lance.diag executes all tests on the menu except the signal test. If this test is loaded from the DCP, the argument *all* is ignored.

MENU ITEMS SPECIFIC TO THIS TEST

lr Read/write lance registers" Performs Read/Write pattern tests on the Lance register.

in This test initializes the lance through the I/O address mapper. It loads the initialization block through each entry in the address mapper. The purpose of the test is to check the DMA path, and to examine basic function of the Lance chip.

il This test is called the internal loop back test. The LANCE chip is programmed for the internal loop back mode that allows the chip to receive its own transmitted packet. Some test patterns are transmitted and received within the chip and verified. This test dose not need an external transceiver cable or a tap.

el This test is called the external loopback test" The LANCE chip is programmed for the external loop back mode that allows the chip to transmit a packet through a transceiver cable out to the Ethernet coaxial cable and then to

received its packet through the transceiver cable. This test examines the operationability of all Ethernet interface and connections through the coaxial cable. Also, CRC generation logic and CRC check logic are tested individually. The external test may fail with a heavy traffic cable, and cause warning message such as "#WARNING retrying ...". According to the data sheet of the LANCE chip, it is not an error, but it must not happen with an isolated cable. In the current implementation, the program allows consecutive 10 retries with warning messages, and judges 11th retries as an error.

all Executes all tests on the menu except the signal test.

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

101 During the lance register test, the program was unable to clear an interrupt that was pending to the lance present when the test was started. Prior to this error report, the user will be told that an unexpected lance interrupt was pending and that this test would clear that interrupt before attempting to proceed.

103 During lance register testing, reading back the CSR0 register yielded a value different than that written.

105 During lance register testing, reading back the CSR3 register yielded a value different than that written.

107 During lance register testing, reading back the CSR1 register yielded a value different than that written.

109 During lance register testing, reading back the CSR2 register yielded a value different than that written.

111 Note: Error codes 111–129 are for the internal loopback test. During attempt to initialize lance through the I/O mapper, the correct operating mode bits did not become set. Attempted to set both MODE_DRX and MODE_DTX, but no other mode bits. Internal loopback mode initialization.

112 An interrupt was expected during the lance initialization routine, but it did not happen.

113,114
An incorrect return value was received from the lance following initialization. The addressed location and the expected value are reported.

115 Attempted to force a lance interrupt and it did not occur.

117 Attempted to force a lance interrupt and got a different interrupt instead.

119 Attempted to force a particular lance interrupt and got a different lance interrupt. The failing pattern and lance status are reported.

121 Expecting a lance transmit buffer empty interrupt but it was not received. The lance status is reported.

123 Checking the lance transmit descriptor during loopback testing to see if the message header says that the message belongs to lance. Message descriptor value is incorrect.

125 The destination address in the message header was not correct. Prints the actual and expected value.

127 The lance had a data error, the data pattern received was not the same as the pattern that was sent.

129 The CRC value (error checking code) of the message was incorrect.

131 Lance initialization failed during setup for external loopback test.

133 Expected lance interrupt did not happen.

135 Attempted to force a lance interrupt and got a different interrupt instead.

137 Attempted to force a particular lance interrupt and got a different lance interrupt. The failing pattern and lance status are reported.

139,143
Performing the external loopback test with a loaded cable. The number of retries has exceeded the count of 10 so it is assumed that either the cable is extremely busy or there is some other error, possibly with the cable or transceiver. Retries occured following a BABL or MISS, or with a retryable transmit error. Status values in various lance registers are reported along with this error.

141 Same as 121, but with the external loopback test.

145 Same as 125, but with the external loopback test.

147 Same as 127, but with the external loopback test.

149 Same as 129, but with the external loopback test.

NAME

lvags.diag – Test the A load pipe on the Boot CPU.

DESCRIPTION

This test generates random patterns in memory and directs the A load pipe to load from various memory areas, checking that the results of the load are as expected. In other words, did the vector registers actually receive the contents that they were told to load.

DETAILS

None.

BOARDS THAT MUST BE INSTALLED

This test requires a CPU board, and at least one memory board to be present in the system. If more than one CPU board is to be tested, the individual boards must be tested separately by making each, in turn, the boot processor.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

lv1 One set of tests of loading random sets of vector registers from random memory locations.

lv2–lv6
Identical to *lv1* except that the random number generator is started with a different random seed value.

INTERPRETING THE ERROR CODES

The only error type reported here is that the actual value did not equal the expected value. The error reporting includes the source line in the verilog test script the actual value read and the expected value. The script must be examined to determine what type of testing is being performed. This error could indicate an error either in the load pipe circuitry, the memory, the ETLB circuitry, the vector register memory or anywhere in between.

NAME

lvagsb.diag – Test the B load pipe on the Boot CPU.

DESCRIPTION

This test generates random patterns in memory and directs the B load pipe to load from various memory areas, checking that the results of the load are as expected. In other words, did the vector registers actually receive the contents that they were told to load.

DETAILS

None.

BOARDS THAT MUST BE INSTALLED

This test requires a CPU board, and at least one memory board to be present in the system. If more than one CPU board is to be tested, the individual boards must be tested separately by making each, in turn, the boot processor.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

lv1 One set of tests of loading random sets of vector registers from random memory locations.

lv2–lv6
Identical to *lv1* except that the random number generator is started with a different random seed value.

INTERPRETING THE ERROR CODES

The only error type reported here is that the actual value did not equal the expected value. The error reporting includes the source line in the verilog test script the actual value read and the expected value. The script must be examined to determine what type of testing is being performed. This error could indicate an error either in the load pipe circuitry, the memory, the ETLB circuitry, the vector register memory or anywhere in between.

NAME

mapper.diag, mapper2.diag† – Tests the Address Mapper on the I/O boards in slots 1 and 8, respectively.

DESCRIPTION

This diagnostic checks the functionality of the I/O board address mapper, and the onboard DMA controller, channels 0-7 (internal request mode). It also uses the NVRAM.

DETAILS

The *mapper.diag* performs a DMA walking one pattern between NVRAM and system memory in both directions. It uses any address mapper entry and DMA channel combination.

BOARDS THAT MUST BE INSTALLED

This test needs a CPU board, a memory board, and an I/O board.

SPECIAL COMMAND LINE PARAMETERS

These are command line parameters that may be specified, and the actions that they perform.

all_poll
executes *"r/w test"* first, then executes *"all_poll"* test.

all_int
executes *"r/w test"* first, then executes *"all_int"* test.

MENU ITEMS SPECIFIC TO THIS TEST

sp Set Parameters - Prompts the user to select the address mapper entry and DMA channel for the test.

rw R/W Test – Writes several patterns to all of the address mapper entries and reads back to verify.

dp DMA Poll (with set parms) – executes DMA between NVRAM and system memory through the selected address mapper entry and DMA channel. The program detects the completion of the DMA by polling the DMA status register.

di DMA Int (with set parms) – executes DMA between NVRAM and system memory through the selected address mapper entry and DMA channel. The program detects the completion of the DMA by the interrupt from the DMA controller.

ap All DMA Poll (all parms) – executes DMA with all combinations of address mapper entry and DMA channel. The program detects completion of the DMA by polling the DMA status register.

ai All DMA Int (all parms) – executes DMA with all combinations of address mapper entry and DMA channel. The program detects completion of the DMA by the interrupt from the DMA controller.

as All Short (short test) – executes a shortened form of the *ap* and the *ai* tests.

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

101 This diagnostic installs its own exception handler because many times it deliberately causes certain exception conditions. This message says program execution was still in the handler when something generated another exception.

103 An unexpected exception condition has occured. The actual and the expected exception condition are reported.

105 An exception has been signalled, but the exception register contains all zero bits and the type of exception cannot be identified.

107 CPU Error status not responding as expected. Type of exception cannot be determined.

109 Unexpected interrupt. Reports the kind of interrupt that was supposed to be generated and the type of interrupt that actually was sensed.

111 Unexpected I/O status error. Reports the kind of status value that actually was received, along with the expected value.

121,127,129
The data that was read from the NVRAM did not compare to the data in the mapper. This test also reports whether the test was running with or without interrupts enabled. The memory location under test, as well as the location within NVRAM are reported, along with the values of the data in each. This could indicate a bad memory chip in the mapper or something wrong with the mapper addressing circuitry.

123 An incorrect value has been found in the CSR register of the 68450 when DMA has completed on a specific channel.

131 Parity error was sensed while reading the mapper data. If a data error has not thusfar been reported for a particular memory location, then only the parity bit memory may be in error.

133,135
This test checks the ability of the mapper to actually map memory locations for the I/O operations using a walking zero and walking one test.

NAME

mem.diag – Tests all memory boards in the system.

DESCRIPTION

This diagnostic performs a number of different tests on all memory boards found in the system. There are tests with various patterns written into memory to verify uniqueness of addressability, as well as tests that establish the ability of all memory locations to store all possible values. Some testing is done to verify the ability of the ECC bits to respond correctly and that the refresh circuitry is doing its job. For extended testing of the ECC memory and the refresh circuitry, see the description of memcbits.diag.

DETAILS

None.

BOARDS THAT MUST BE INSTALLED

This test needs a CPU board, and at least one memory board.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

cn Select a specific memory board number to be tested.

ec Veryify memory function with refresh active.

- *wz* Walking ones and zeros pattern testing
- *mi* Marching patterns, incrementing addresses
- *md* Marching patterns, decrementing addresses
- *ad* Address as data
- *na* Not-address as data
- *mp* Multiple pattern tests
- *rd* Random data testing
- *ra* Random address testing

nec Disable refresh, wait, then check that at least one memory location in each bank develops an error due to refresh being disabled. Provides the same submenu selections as shown for *ec* above except deletes the *sub* (Sub Word Test) item.

cb Perform a test on the ECC check bits, testing them as though they were ordinary memory. Provides the same submenus as shown for *ec* above except deletes the *sub* (Sub Word Test) item.

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ; however, the type of error is as summarized here.)

101 Attempted to generate a non-existent address (NXA) but the NXA bit did not get set as expected.

103 NXA bit was set but was not expected to be set.

105 Memory test code is loaded into memory board ID number 0; it is not possible to test the check bits on a board that contains the object code for the check bit test (otherwise it would convince the system that this memory board is faulty).

110 A check bit test cannot be conducted if 16-way interleave is active.

115 A board inventory has been taken and no memory boards were found other than the one board into which the object code for this test has been loaded.

127 The 32 Meg board has not been selected correctly. In other words, the user has specified that a 32 meg RAM board is in a particular slot and is to be tested as a 32 Meg RAM, but the board identifier says this slot does not contain 32 Megabytes.

150 You have specified that a memory board in a certain physical slot should be tested but when the system looked in that slot, it did not find a memory board.

160 Running with ECC on (The system attempted to turn off error correction, but it would not disable on the memory board being tested).

200 Incorrect entry, try again.

250,255
These error codes reports memory errors, giving the failing address, the actual value and the expected value.

260 Attempting to tell the system to check memory board 0 during check bit testing, but board 0 holds the object code and cannot run this test.

NAME

memcbit.diag – Tests check bits and refresh capability of a memory board.

DESCRIPTION

This test treats the ECC check bits in memory as though they were ordinary memory. Various memory tests are performed to assure that all of the check bits are functional. ECC operations are disabled for the memory board that is being tested. Because this test modifies the contents of the ECC bits, it is necessary that at least two memory boards be installed. The first board (usually memory board ID 0) holds the program code. A memory board other than board 0 is tested. Note that 16-way interleave cannot be active as this makes the two (or four) memory boards operate as a contiguous memory space and would prevent disabling the ECC on just one board. To prevent 16-way interleave from becoming active:

- If there are two memory boards in the system, and if both are exactly the same size, install one memory board in memory ID slot 0 (physical slot 3) and the other in memory ID slot 2 (physical slot 6).
- If there are two or four memory boards in the system and at least one is of a different capacity than the others, 16-way interleave will not be selected.
- If there are three memory boards in the system, 16-way interleave will not be selected.

DETAILS

None.

BOARDS THAT MUST BE INSTALLED

This test needs a CPU board, and at least two memory boards. The memory boards must not be operating in 16-way interleave. The test reports problems, such as only one memory board found or if 16-way interleave is on with more than one board installed.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

cb Select the Check Bit test menu.

- *wr* For 2 MegaWords, write memory with zeros and read back the value.
- *sd* Perform a walking one, then a walking zero test on the check bits.
- *ma* Perform memory testing by writing and then reading a pattern, then its complement, on the ECC bits.

rt Select the Refresh Test menu

- *vr* Veryify memory function with refresh active.
- *dr* Disable refresh, wait, then check that at least one memory location in each bank develops an error due to refresh being disabled.
- *db* Set double refresh, exercise the memory, and verify that double refresh is functioning.

dm Display Memory board data

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ; however, the type of error is as summarized here.)

101 Memory does not appear to be fully populated to four banks of memory on a specific board. When "gang mode" is selected, there must be four banks of memory on each board.

191 Unable to turn off refresh on a particular memory board's interleave control.

Unable to write the R Bus Status Register with the memory board configuration for a particular memory board.

Other Errors

This test will refuse to run if there is only one memory board or if 16-way interleaving is active. Each condition is associated with a reason-I-did-not-run message.

NAME

memrbus.diag – Tests R bus functionality.

DESCRIPTION

This diagnostic verifies that the data path to the memory from the R-Bus is functional by writing a pattern to the memory and reading it back to verify that the correct values are written. There is no direct path from the IPU to the R-Bus. Thus the floating point unit's VRF (vector register file) is used to pass data to and from the memory using the R-Bus.

This test assumes that the memory itself has been thoroughly tested using mem.diag and only verifies the ability of the R-Bus to access the memory for reading.

DETAILS

None.

BOARDS THAT MUST BE INSTALLED

This test needs a known good CPU board, a known good I/O board for downloading the diagnostic, and at least one memory board. All memory boards found in the system are tested.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

pt Run RBus memory pattern testing.

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ; however, the type of error is as summarized here.)

ERROR No memory boards were found (no error number reported for this message).

160 The data read back was not the same as the data that was written. The failing addresses, the actual data read and the expected data are reported.

170 When a read error occurs, this test retries the read. If it happens that the read passes on the second try, this error is reported in addition to ERROR 160.

NAME

periph.diag – Tests the peripherals.

DESCRIPTION

This document describes the Stardent 1500/3000 peripheral diagnostics and describes their use.

BOARDS THAT MUST BE INSTALLED

This test requires a CPU board, at least one memory board, an I/O board and an Adaptek Controller card installed in the I/O board.

DETAILS

These devices are supported:

1. SCSI Priam disk drive
2. SCSI MAXTOR disk drive
3. SCSI Wangtek 1/4" tape (half-height or full-height) drive
4. SCSI HP 1/2" tape drive
5. SCSI Exabyte 1/4" tape drive
6. SMD Fujitsu disk drive

The following notes apply to these tests

- The peripheral diagnostic tests run stand-alone similar to the existing diagnostics.
- The tests use the standard diagnostic monitor for user interface.
- The tests are single-threaded, i.e. each device is tested separately without concurrency. Only one test, backup simulation, provides some concurrency; it copies data from one device to another using read and write commands.
- The peripheral diagnostics are intended for use by Field Engineering and Manufacturing Process, probably at the initial test, burn in, and final acceptance test stations.
- SCSI disconnect is enabled on all commands.

RUNNING THE TESTS

WARNING: there is no hardware for executing SCSI bus reset from the Ardent machine. This means that if the bus is hung, the user must reset the machine from the PROM by entering "reset" before booting the test.

WARNING: The format test contained here only tests the ability of the system to format a disk. IT DESTROYS THE CURRENT DISK DATA AND PARTITIONING INFORMATION. If you use the format command, you will have to re-format the disk using the standard system format command.

There are two ways to interface with the program; using command line arguments, and using menu selections. To run the diagnostic from the PROM prompt, enter:

```
PROMx> b periph.diag
```

A menu will be displayed. The user may run tests or change fail limits from the menu interface. The first menu displayed is called the top menu. From the top menu, the user can select second level submenus, such as the disk and tape submenus.

It is also possible to run tests directly without going through the menu. This is done by entering:

```
PROMx> b periph.diag all
```

SPECIAL COMMAND LINE PARAMETERS

In addition to the command line arguments supported by the diagnostic monitor, the following are offered:

all This causes the program to find the devices present in the system, then run all the tests on them. All disks and tapes found will be tested.

alld This causes the program to find the devices present in the system, then run all the disk tests on the first disk found.

allt This causes the program to find the devices present in the system, then run all the tape tests on the first tape found.

dm This causes the program to skip the top menu and display the disk menu directly. Normally, the disk menu is a submenu selected from the top menu.

tm This causes the program to skip the top menu and display the tape menu directly. Normally, the tape menu is a submenu selected from the top menu.

dco This allows the user to specify the disk controller number to be used when selecting disk tests. An equal sign, '=', then an unsigned integer value must follow the argument (no spaces). The default value of this argument is -1 indicating that the program will determine the disk controller number when it finds the devices present in the system. If the user specifies a value, e.g. dco=1, then the specified controller number will be used.

dtar This allows the user to specify the disk target number to be used when selecting disk tests. An equal sign, '=', then an unsigned integer value must follow the argument (no spaces). The default value of this argument is -1 indicating that the program will determine the disk target number when it finds the devices present in the system. If the user specifies a value, e.g. dtar=1, then the specified target number will be used.

tco This allows the user to specify the tape controller number to be used when selecting tape tests. An equal sign, '=', then an unsigned integer value must follow the argument (no spaces). The default value of this argument is -1 indicating that the program will determine the tape controller number when it finds the devices present in the system. If the user specifies a value, e.g. tco=1, then the specified controller number will be used.

ttar This allows the user to specify the tape target number to be used when selecting tape tests. An equal sign, '=', then an unsigned integer value must follow the argument (no spaces). The default value of this argument is -1 indicating that the program will determine the tape target number when it finds the devices present in the system. If the user specifies a value, e.g. ttar=1, then the specified target number will be used.

rcon This commands the program to prompt the user for confirmation before reassigning a defective disk block detected during defect scanning. When prompted, the user may select 'y' to reassign the defective block or 'n' to bypass it.

ss This causes the program to run in single step mode. The program prompts the user before executing any SCSI command. When prompted, the user may press ENTER to execute the command, enter "s" to skip it, or "g" to execute the command and disable single step mode. On-line help is also available by entering "h".

DISK DIAGNOSTICS DESCRIPTION

This describes the SCSI disk diagnostic test.

Disk Parameters

The SCSI READ CAPACITY command will be used to determine disk parameters, such as the block size and number of blocks. Fail limits and test parameters are changeable by the user through the disk parameter submenu.

Disk Write Levels

Three levels of disk write testing are available:

1. Non-destructive (no writing). All parts of the test that write to the disk are skipped. The test can be run on a user disk without causing any damage to its data. This is the default level.
2. Writing is only allowed on the diagnostic partition only. The test can run on a user disk without causing damage to its data, unless there is a disk seek or servo problem, in which case user data can get destroyed. The diagnostic partition is a small area of the disk allocated by the format program. Old versions of the format program did not support the diagnostic partition. The diagnostic test will detect the absence of the diagnostic partition and will not write to the disk.
3. Writing is allowed on the entire disk (destructive). The test will overwrite whatever data is on the disk, therefore, the user must backup the disk before running this level if the disk data needs to be preserved.

Disk Tests

Before any disk test is executed, some initial checks are done. First the I/O board fuse and bus state are checked. The SCSI INQUIRY command is executed and the device type is verified. The SCSI REQUEST SENSE command is executed to clear any pending SCSI UNIT ATTENTION condition. Then the SCSI READ CAPACITY is executed to determine the size and block length. If any of these checks fails, the test ends.

- SCSI check. The objective is to verify that the I/O board can communicate with the target and that the target can execute basic SCSI commands used by the operating system. This excludes the FORMAT and REASSIGN BLOCK commands. The WRITE command may or may not get executed depending on the write test level. The SCSI disconnect/reconnect feature is also verified during the read and write operation.
- Performance check. The objective is to make transfer rate benchmark measurements. Four benchmarks are performed; sequential (sustained) read transfer rate, sequential (sustained) write transfer rate, random access read transfer rate, and close random access read transfer rate.

  Sustained read transfer rate is done by reading 1.28 MB, 64 KB at a time starting from block 0.

  Sustained write transfer rate is skipped if the write level is 1, or done by writing 1.28 MB, 64 KB at a time starting from block 0 (write level 3) or within the diagnostic partition (write level 2).

  Random transfer rate is done by reading 100 KB, 1 block at a time from random block addresses.

  Close random transfer rate is done by reading 100 KB, 1 block at a time from random block addresses within the first 2000 blocks.

- Self-test. This is done by executing the SCSI SEND DIAGNOSTIC command to the drive, causing it to execute self-diagnostics and return results.
- Volume header check. This is done by calling the SCSI driver to open the disk volume header partition, reading the volume header, checking the magic number and checksum, then verifying the diagnostic partition.
- Sequential defect scan. The objective is to scan blocks sequentially, looking for defects. This is done by writing, reading, and checking for medium or recovered errors detected by the disk.
- Random defect scan. The objective is to scan blocks randomly, looking for defects. This is done by writing the disk with a sequential pattern, then reading the disk using random addresses and checking for defects.

DEFECT SCAN STRATEGY

- The drive's defect detection and error reporting are used.
- Blocks with RECOVERED ERRORS as well as MEDIUM ERRORS are reassigned (mapped out) and logged as soon as detected. The reassigned block is rewritten with the pattern.
- At the end of the test, counts of the RECOVERED and MEDIUM errors are reported and the drive is passed or failed.
- The STOP AFTER X ERRORS capability of the diagnostic monitor cannot be used for this since defects are not necessarily errors.

TAPE DIAGNOSTICS DESCRIPTION

The tape diagnostic requires a scratch tape to be mounted on the drive. The test writes test patterns to the tape and, therefore, destroys any previous data on the tape.

Tape Tests

Before any tape test is executed, some initial checks are done. First the I/O board fuse and bus state are checked. The SCSI INQUIRY command is executed and the device type is verified. The tape is checked for Write Protect errors. The drive is put in BUFFERED mode using the SCSI MODE SELECT command. Finally, the SCSI REWIND command is issued in case the tape needs to be rewound. If any of these checks fails, the test ends.

- SCSI check. The objective is to verify that all the SCSI commands used by the operating system can be executed, except the ERASE command.
- Self-test. This is done by executing the SCSI SEND DIAGNOSTIC command to the drive, causing it to execute self-diagnostics and return results.
- Erase test. The SCSI ERASE command is executed. This takes about 10 minutes.
- Sequential write/read. The objective is to write all blocks sequentially, then reading them back.

ASSUMPTIONS

- The I/O board SCSI channels, DMA hardware, memory, SCSI cables, and other system hardware are tested using other diagnostics.
- The drive is already configured and formated as the customer will see it using the MODE SELECT and FORMAT commands. This is done at the receiving inspection station and is not part of the diagnostic.

MENU ITEMS SPECIFIC TO THIS TEST

The top menu allows the user to run all tests, all disk tests, all tape tests, and select submenus. The disk submenu allows the user to run one or all disk tests, and select the disk parameter submenu. The tape submenu allows the user to run one or all

tape tests, and select the tape parameter submenu. The disk parameter submenu allows the user to change disk test parameters and fail limits. The tape parameter submenu allows the user to change tape test parameters and fail limits.

TOP MENU

In addition to the menu selections supported by the diagnostic monitor, the following are available:

dm Select the disk submenu.

tm Select the tape submenu.

nd= Change the expected minimum number of disks in the system. The expected minimum number of disks is used in the "all" option only. If the number of disks present in the system is less than the expected minimum number of disks, an error message is reported and the test is considered to have failed.

nt= Change the expected minimum number of tapes in the system. The expected minimum number of tapes is used in the "all" option only. If the number of tapes present in the system is less than the expected minimum number of tapes, an error message is reported and the test is considered to have failed.

find Find bus devices present in the system. The bus devices present in the system is found automatically at the beginning of the program. This option allows the user to find the present devices again. Finding present devices is done by issuing SCSI INQUIRY command to all possible target ID's on all SCSI bus channels, starting from bus A target 0, and ending with bus B target 7.

alld Run all disk tests on one disk. The disk to test is the first disk found, starting from SCSI bus A, target ID 0. The bus and target ID of the disk may be changed using command line arguments or menu selections.

allt Run all tape tests on one tape. The tape to test is the first tape found, starting from SCSI bus A, target ID 0. The bus and target ID of the tape may be changed using command line arguments or menu selections.

bak Run the backup simulation test. The test is run only if there is a disk and a tape on the system. The disk and tape ID to use are those of the first disk and tape found on the system. The disk and tape addresses can be changed using command line arguments or menu selections. The test copies 640 blocks from the disk to the tape, 32 blocks at a time, using disk read and tape write commands. This test is run on one disk and tape as part of the "all" option also.

all Run all peripheral tests on all present devices.

DISK SUBMENU

In addition to the menu selections supported by the diagnostic monitor, the following are available:

pm Select the disk parameter submenu.

chk Run the disk SCSI check test.

bm Run the disk benchmark test.

self Run the disk self test.

vh Run the disk volume header test.

seq Run the disk sequential defect scan.

rnd Run the disk random defect scan.

fmt Format the disk. Note that this is not a test and is not executed as part of the "alld" or "all" options. This utility must be used very carefully, since it issues the SCSI FORMAT command, erasing the entire disk. This option can only be executed if the write level is 3. (See Disk Write Levels).

alld Run all disk tests on one disk, i.e. options:

chk bm self vh seq rnd

DISK PARAMETER SUBMENU

In addition to the menu selections supported by the diagnostic monitor, the following are available:

co= Change controller number of disk to test.

tar= Change target ID of disk to test.

df= Change maximum number of defects on the disk to be used in the SCSI check and defect scan tests. The disk is failed if the number of defects exceeds this.

md= Change maximum number of medium defects (unrecoverable medium errors) detected during the defect scan tests. The disk is failed if the number of unrecoverable defects exceeds this.

rd= Change maximum number of recovered defects (recoverable medium errors) detected during the defect scan tests. The disk is failed if the number of recoverable defects exceeds this.

sr= Change minimum sustained transfer rate in bytes/second in the disk benchmark test. The disk is failed if the transfer rate is below this.

rr= Change minimum random transfer rate in bytes/second in the disk benchmark test. The disk is failed if the transfer rate is below this.

cr= Change minimum close random transfer rate in bytes/second in the disk benchmark test. The disk is failed if the transfer rate is below this.

lb= Change low block address to start defect scan from.

hb= Change high block address to end defect scan at.

rt= Change random defect scan number of loops.

pat Change disk write pattern by prompting the user to enter the pattern.

wr Change write level by prompting the user to enter the write level. Supported write levels are:

1 No disk writing allowed.

2 Can write to diagnostic partition (user prompted for confirmation).

3 Can write to entire disk (user prompted for confirmation twice).

ft Change disk SCSI format type by prompting the user to enter the format type. Supported format types are:

1 Format with no defects.
2 Format with factory defects only.
3 Format with all defects (factory and grown).

In addition to the states supported by the diagnostic monitor, the following are available:

wr	Write level.
df	Maximum number of defects.
md	Maximum number of medium defects.
rd	Maximum number of recovered defects.
sr	Minimum sustained transfer rate.
rr	Minimum random transfer rate.
cr	Minimum close random rate.
lb	Defect scan low block address.
hb	Defect scan high block address.
rt	Random defect scan number of loops.
ft	Format type.

TAPE SUBMENU

In addition to the menu selections supported by the diagnostic monitor, the following are available:

pm Select tape parameter menu.

chk Run the tape SCSI check test.

self Run the tape self test.

ers Run the tape erase test.

wrrd Run the tape write/read test.

retn Tape retension. Note that this is not a test and is not executed as part of the "allt" or "all" options.

allt Run all the tape tests, i.e. options:

chk self ers wrrd

TAPE PARAMETER SUBMENU

In addition to the menu selections supported by the diagnostic monitor, the following are available:

co= Change controller number of tape to test.

tar= Change target ID of tape to test.

wrb= Change number of blocks in the write/read test.

wrl= Change number of loops in the write/read test.

pat Change tape write pattern by prompting the user to enter the pattern.

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

1 Number of disk drives present is fewer than expected.

2 Number of tape drives present is fewer than expected.

3 SCSI Controller fuse blown (reports which controller).

4 SCSI Controller hung (reports which controller).
5 Illegal space mode (did not detect tape write filemark).
20 Number of disk defects exceeds maximum number allowable.
21 SCSI command error (reports SCSI sense error).
22 Device type does not match specified device type.
23 Error during SCSI read operation.
24 Error during SCSI write operation.
25 No disconnect during SCSI read operation.
26 SCSI sense error (reports which one).
27 Failed to detect illegal block address error.
40 No good blocks on disk to read from.
41 Sustained transfer rate for read operation too low.
42 Sustained transfer rate for write operation too low.
43 Data transfer rate too low.
50 Unable to open volume header (reports file name).
51 Unable to read volume header.
52 Bad magic number in the volume header.
53 Checksum error in volume header.
54 No diagnostic partition on disk (old format).
60 Missing filemark (reports block number).
61 Tape is write protected.

NAME

scsi.diag, scsi2.diag† – Tests the scsi interface on the I/O boards in slots 1 and 8, respectively.

DESCRIPTION

The *scsi.diag* tests internal SCSI circuitry and external disk.

DETAILS

None.

BOARDS THAT MUST BE INSTALLED

This test requires a CPU board, at least one memory board and an I/O board. If an external SCSI disk is installed, it too will be tested. *Note:* the address mapper is used during this test. Run *mapper.diag* first to assure that the mapper is functioning properly before attempting this test.

SPECIAL COMMAND LINE PARAMETERS

c[ontroller]	controller number, 0 for SCSI A and 1 for SCSI B, default value is -1 which means no controller present.
t[arget]	Specifies SCSI target number, default is -1 (an illegal value)
lu[n] or *log[ical]* 20	Specifies the logical unit number (lun), default is 0.
p[artition]	Specifies the partition number (Prtn), default value is 0.
f[rom]	Specifies the starting block number of area to be tested, default is 0.
to	Specifies the ending end block number of area to be tested, default is 1.
all	The test is executed in non-interactive mode. The tested area is defined by parameters described above.

MENU ITEMS SPECIFIC TO THIS TEST

register function test

This test makes internal function test for SCSI interface. It does

- read write pattern test for the stacker, DMA registers and SCSI controller WD33C93 on-chip registers,
- issue reset command to the SCSI controller and examine whether proper interrupt and status are got,
- enable DMA and examine proper interrupt.

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ, however the type of error is as summarized here.)

121 Error while pattern tests being run on SCSI_LODATA registers. Failing register, actual and expected value are reported.

123 Error while pattern tests being run on SCSI_HIDATA registers. Failing register, actual and expected value are reported.

125 Error while pattern testing the SCSI Stacker. The failing stacker register, along with the actual and expected pattern are reported.

127 Error while pattern testing the SCSI DMA registers. The failing stacker register, along with the actual and expected pattern are reported.

129,131
Error while testing the SCSI DMA control register. Reports the actual and expected values.

133,135
Data error while using SCSI DMA to transfer data to or from memory. Failing location, actual and expected value are reported.

137,139
After a reset, all of the registers in the SCSI chip should contain a value of zero except the WD93_DATA register). These error codes happen if the chip did not reset as expected. Could indicate a faulty SCSI chip.

140 Following a SCSI reset, the SCSI interrupt bit should be set, and it was not set.

141 One channel (at least one, that is) of the SCSI failed to reset.

142 An incorrect ID value was found in the ID register of the SCSI chip.

145,147
Attempting to enable DMA on channel A or B but found the DMA already enabled. Actual and expected values in the WD93_CONTROL register are reported.

149 Cannot enable DMA on SCSI channel A.

151 Received undexpected NXA (non existent address) exception during a test of SCSI output.

153 If error 151 was generated, a bus time out (BTO) should also have happened. The BTO did not happen.

155 The error that SHOULD follow error 151.

157 Cannot enable DMA.

158 Incorrect value found in dmalo register; actual and expected values are reported.

159 Incorrect value found in dmahi register; actual and expected values are reported.

NAME

serial.diag, serial2.diag† – Tests the serial ports on the I/O boards in slots 1 and 8, respectively.

DESCRIPTION

This test is interactive in that it requires setup by a test technician. The serial ports may be tested either via an internal loopback, or by external loopback means. Testing using external loopbacks assumes that all pins are appropriately connected and that the I/O driver and receiver circuits in the serial lines are functioning properly.

DETAILS

The Stardent 1500/3000 serial ports are labeled A, B, C, and D. This diagnostic calls them 0, 1, 2, and 3. It displays a chart showing which port number is associated with which letter.

BOARDS THAT MUST BE INSTALLED

A cpu board, a memory board and the I/O board under test.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

from User is asked to specify which is the source (sender) port for the test. The default is port 1.

to User is asked to specify which is the destination (receiver) port for the test. The default is port 3.

b User is asked to specify the baud rate to be used during these tests. The default baud rate is 9600.

sc Runs a read/write test to verify that the sender and receiver ports are functional.

at Runs an async loop test.

dm Runs an async loop test under DMA in half duplex mode.

fd Runs the async loop test under DMA but in full duplex mode.

do Runs an async DMA out test.

all Runs all loopback tests on the ports the user specified in the from and to parameters.

all4 This test assumes that you have loopback cables attached from ports 1 to 3 and from ports 0 to 2. This item asks that all tests described above should be run on both sets of input/output ports.

az Analyser tests. Brings up a separate menu and the message: "Serial Tests that require a protocol analyser".

SUBMENU For az MENU Item

Connect the protocol analyser to the appropriate port and then select one of the following tests.

ar Asynchronous Receive Test

sr Synchronous Receive Test Synchronous Transmit Test

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ; however, the type of error is as summarized here.)

101,103
During an async loop test on DMA channels 0, 2, 4 or 5, an unexpected interrupt occured. This test is run in half duplex mode.

105 During an async loop test on DMA channels 0, 2, 4 or 5, the data that was trensmitted did not equal the data that was received.

107 If this error happens, you have selected the wrong port to be the sender. Ports 0 and 2 can be the "from" ports, and ports 4 and 5 can be the "to" ports for this loopback test.

109,111
Same as 101.

113 An incorrect port pair has been specified for the full duplex testing. the from port must be specified as port 0 and the to port as port 1.

115,117
This error occurs during a full-duplex mode test of the serial ports in loopback mode. The error numbers 115 and 117 have the same meaning as 101.

119 An error has occured in the serial data transfer. The error value is reported and to interpret it you'll need the data sheet for the serial port chips.

121 Same as 101.

123 A data error has not been signalled by the serial circuitry, however the data that was read did not match the data that was transmitted. The actual and expected values are reported.

131 A read-write walking one's test was being conducted, and the data received did not match the data that was transmitted. The actual and expected values are reported.

133,135
A read-write addressing test was being conducted, and the data read did not match the data written. The actual and expected values are reported, along with the failing address.

137 Status bits are deliberately reset; if this error occurs, it reports that a serial port is active when it should have been inactive. The failing bit(s) and port are reported.

139 Status bits are deliberately set; if this error occurs, it reports that a serial port is inactive when it should have been active. The failing bit(s) and port are reported.

141 During a synchronous mode serial receive test, the sender brings the DSR line low. However the register in the serial receiver still sees DSR as high. This could be a fault in the sender chip (never actually lowers DSR) or in the receiver chip (never sees DSR move). Can be checked by an oscilloscope or a logic tester.

143 The receiving port timed out waiting for DSR.

145 This error occurs when DSR fails to reset.

147 Same as 101.

149 During a synchronous mode serial send test, the sender brings the CTS line low. However the register in the serial receiver still sees CTS as high. This could be a fault in the sender chip (never actually lowers DSR) or in the receiver chip (never sees CTS move). Can be checked by an oscilloscope or a logic tester.

151 A time limit is set during which a character must be output. This time limit was exceeded.

153 CTS never got reset.

155 During an async receive test, DSR would not reset.

157,159
Timeout waiting for DSR to be reset.

161 During an async receive, the data that was received did not match that which was transmitted.

201,203
Baud rate mismatch between sender and receiver. The baud rate of both is reported.

311 System error (function inaccessible to user): wrong unit number.

313 Time out, serial chip did not come ready while trying to read a character.

315 Time out, serial chip did not come ready while trying to write a character.

317 Same as 311

319 Programmer error: invalid serial port

NAME

svagsb.diag – Tests the D store pipe on the Boot CPU.

DESCRIPTION

This test generates random patterns in the vector registers, and directs the "D" load pipe to store to various memory areas, checking that the results of the store are as expected. In other words, did the vector address generators actually direct the contents of the vector registers to the correct locations in memory.

DETAILS

None.

BOARDS THAT MUST BE INSTALLED

This test requires a CPU board, and at least one memory board to be present in the system. If more than one CPU board is to be tested, the individual boards must be tested separately by making each, in turn, the boot processor.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

lv1 One set of tests of loading random sets of vector registers from random memory locations.

lv2–lv6
Identical to *lv1* except that the random number generator is started with a different random seed value.

INTERPRETING THE ERROR CODES

The only error type reported here is that the actual value did not equal the expected value. The error reporting includes the source line in the verilog test script the actual value read and the expected value. The script must be examined to determine what type of testing is being performed. (Test script not provided to customers — a failure only indicates that the CPU board has a problem and should be replaced). This error could indicate an error either in the load pipe circuitry, the memory, the ETLB circuitry, the vector register memory or anywhere in between.

NAME

vagsw.diag – Tests the vector address generator switch.

DESCRIPTION

This test checks the vector address generator switch logic.

DETAILS

None.

BOARDS THAT MUST BE INSTALLED

This test requires one CPU board, and at least one memory board.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

v1 Runs the first vagswitch test.

v2 Runs the second vagswitch test.

all Runs both vagswitch tests.

INTERPRETING THE ERROR CODES

When this test reports an error, a customer can only determine that there is a problem with the CPU board and that is must be replaced. For the factory test technician, the error reporting includes a line number of the source code for the verilog testing. The source code must be examined to determine which particular cicuit was under test at the time the error was reported.

NAME

vmehp.diag, vmehp2.diag†† – Tests the VME boards in slots 0 and 9, respectively.

DESCRIPTION

This test checks the VME board control registers and verifies the ability of the VME board to perform DMA.

DETAILS

None.

BOARDS THAT MUST BE INSTALLED

This test requires one CPU board, at least one memory board, the I/O board, a VME board, and an HP controller board (not usually available in the field).

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

pat Allows the user to enter data patterns for the read/write tests.

vr Runs the VME control register test

ir Runs the iopb register test

dc Allows the direct entry of a VME diagnostic command.

dw Runs the DMA word test

ds Runs the DMA short test

all Runs all of the above tests

ww Runs the DMA Write (word) test, no readback of data written

sw Runs the DMA Write (short) test, no readback of data written

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ; however, the type of error is as summarized here.)

(no Error addressing test of RAM on HP test board (reports address).

99 No VME Adaptor board present.

103 Error during walking ones test (reports bad byte).

105 Error during walking zeros test (reports bad byte).

111 Test board 16-bit word would not clear.

113 Error during walking ones slave test (16-bit word).

115 Error during walking zeros slave test (16-bit word).

121 Test board 32-bit word would not clear.

123 Error during walking ones slave test (32-bit word).

125 Error during walking zeros slave test (32-bit word).

349 Pattern read from board did not match pattern written to board.

351 Expected interrupt did not occur.

353 Actual interrupt did not match expected interrupt (reports both interrupt vectors).

151 Addressing test of RAM on HP board failed at given location.

153 Pattern test of RAM on HP board failed at given location.

155 Pattern test of RAM on HP board failed at given location.

157 Walking 1 test of RAM on HP board failed at given location.

159 Walking 0 test of RAM on HP board failed at given location.

301 Data miscompare after HP board, as VME bus master, moved data fron/to Stardent 1500/3000 memory.

303 Short-words at a time (16 bits).

305 Integers at a time (32 bits).

311 Byte pattern miscompared after DMA transfers.

313 Short-word pattern miscompared after DMA transfers.

315 Integer pattern miscompared after DMA transfers.

321 Address unique data miscompare after HP board.

323 Address bytes data miscompare after HP board.

327 With 2 HP boards installed (bd=2), one HP board as a VME master move bytes while the other once moved integers. The byte mover miscompared.

329 The integer moving board's data miscompared.

354 Stardent 1500/3000 got an exception not caused by HP board.

355 Stardent 1500/3000 got an unexpected interrupt type.

NAME

vmeip.diag, vmeip2.diag†† – Tests the VME boards in slots 0 and 9, respectively.

DESCRIPTION

This test checks the VME board control registers and verifies the ability of the VME board to perform DMA.

DETAILS

None.

BOARDS THAT MUST BE INSTALLED

This test requires one CPU board, at least one memory board, the I/O board, a VME board, and an Interphase controller board.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

pat Allows the user to enter data patterns for the read/write tests.

vr Runs the VME control register test

ir Runs the iopb register test

dc Allows the direct entry of a VME diagnostic command.

dw Runs the DMA word test

ds Runs the DMA short test

all Runs all of the above tests

ww Runs the DMA Write (word) test, no readback of data written

sw Runs the DMA Write (short) test, no readback of data written

INTERPRETING THE ERROR CODES

The following errors may be generated by this test. (The actual error wording may differ; however, the type of error is as summarized here.)

101 The test failed to set the "board OK" bit.

103 An interrupt was generated, but an interrupt vector timeout occured.

105 An "error complete" interrupt vector was unexpectedly received.

107 The interrupt vector value generated by the VME board could not be identified.

109 Attempted to clear the interrupt but it would not clear.

NAME

vrf.diag – Tests the vector register file.

DESCRIPTION

This test checks the vector register file as memory and tests its ability to interact correctly with the vector unit. For example, the test checks that the a load or store from memory is retrieved or stored to the correct memory location, that all vector registers are uniquely addressible and so on.

DETAILS

None.

BOARDS THAT MUST BE INSTALLED

This test requires one CPU board, and at least one memory board.

SPECIAL COMMAND LINE PARAMETERS

None.

MENU ITEMS SPECIFIC TO THIS TEST

vrf1 Runs the first vrf test.

vrf2 Runs the second vrf test.

all Runs both vrf tests.

INTERPRETING THE ERROR CODES

When this test reports an error, a customer can only determine that there is a problem with the CPU board and that is must be replaced. For the factory test technician, the error reporting includes a line number of the source code for the verilog testing. The source code must be examined to determine what particular cicuit was under test at the time the error was reported.

RESETTING THE SYSTEM

APPENDIX D

This appendix describes methods of resetting the Stardent 1500/3000 graphics supercomputer. Figure D-1 summarizes the information given here.

Power-off Reset

Moving the upper front panel key switch to the "off" position turns the system's power off. Before turning the power off, make sure the system has been shut down properly. (See *Shutting the System Down* in the *System Administrator's Guide* for shutdown instructions.) As an extra safety precaution make sure that the AC power switch on the lower back of the system module is turned off before removing boards from the card cage. Make sure that the system is unplugged before removing the power supply.

To restart the system after power-off, place the lower key switch in the desired position as described below. Turn the upper key switch to the "on" position.

Hard Reset

When you order a hard reset of the system, the system is immediately halted and the current state of the machine is lost. A hard reset may corrupt the file system or cause you to lose recently created files, so be sure that the system has been properly shut down (or that you have no alternative) before doing a hard reset. Once control is returned to the PROM, the UNIX system is may or may not be booted, depending upon the value of the NVRAM variable *bootmode* and movements of the lower front panel keyswitch.

To do a hard reset, place the lower front panel key switch in the "normal" position and turn the upper key switch to the spring-loaded "reset" position.

The NVRAM variable *bootmode* determines whether a manual boot (to the PROM) or an automatic boot (to the UNIX system) is to be done upon power up or hard reset. The choices are *a* for automatic and *m* for manual.

The actions dictated by the values of *bootmode* can be interrupted by the position of the lower front panel key switch. Specifically, if *bootmode* is set to *a* and you do a hard reset maintaining the lower key switch in the "normal" position, the system attempts to do an automatic boot of the UNIX system. To interrupt the autoboot, you must turn the lower key switch back to the "diagnostic" position within two seconds of doing the reset.

Soft Reset

A soft reset is generally used for debugging purposes. When you order a soft reset of the system, the system interrupts the program that is running and returns control to the PROM. To return to the program after a soft reset you type the PROM command **g** or **go**.

Issuing a soft reset does not cause damage to the system or the program running, providing the **go** command is used to restart after debugging is complete.

To do a soft reset, place the lower front panel key switch in the "diagnostic" position and and turn the upper key switch to the "reset" position. Alternatively, hold down the <CTRL> and <ALT> keys on the key board and type <DEL>.

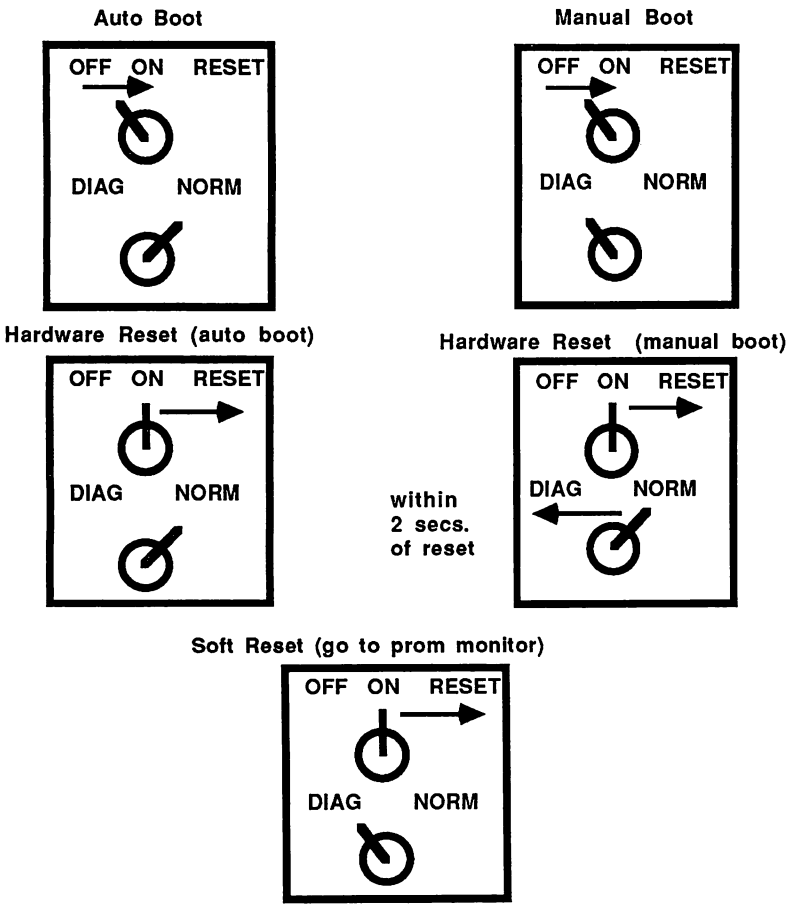


Figure D-1. Resetting the System: Keyswitch Operations

Stardent

Stardent 1500/3000
Field Service Brief

SYSTEM MODULE DOOR REMOVAL

Removal

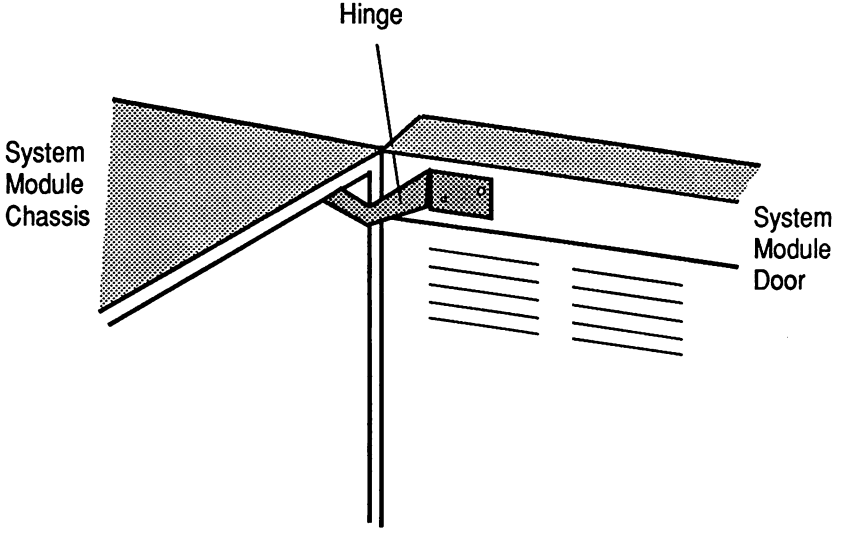
OPEN the System Module rear door as wide as possible.

LIFT the door vertically until the hinges clear the holes in the chassis hinge brackets.

PULL the door away from the System Module chassis.

TO REINSTALL, align door hinges with holes in hinge brackets and lower the door into place.

FOLLOW the same steps to remove the System Module front door or Expansion Cabinet front or rear doors.



Stardent

Stardent 1500/3000
Field Service Brief

CIRCUIT BOARD REMOVAL AND REPLACEMENT

Removal

WEAR a static wrist guard.

POWER down and unplug the system.

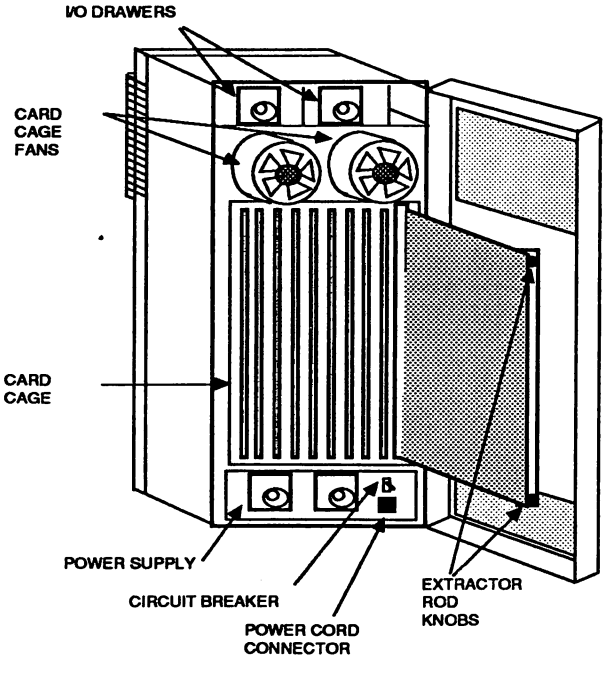
OPEN the static-protective box containing the new or replacement board.

OPEN the back door of the System Module and remove cables from the board you plan to remove.

LOOSEN the board's 2 extractor rod knobs (loosen simultaneously for smooth removal of the board).

SLIDE the board out of the card cage. **Do not touch board components.**

PUT the board in the static-protected box.



Replacement

UNPACK the new or replacement board carefully.

MAKE sure no cables are blocking the slot where the board will be placed.

SEE the figure on the reverse side for correct slot assignment. Note the backplane option (1 or 2 I/O boards) and the number of graphics board sets. One horizontal bar means 1st board of its type; two horizontal bars means 2nd board of its type; and so on.

SLIDE the board into the card cage (component side on the right). Apply equal pressure to top and bottom.

SECURE the board with extractor rod knobs.

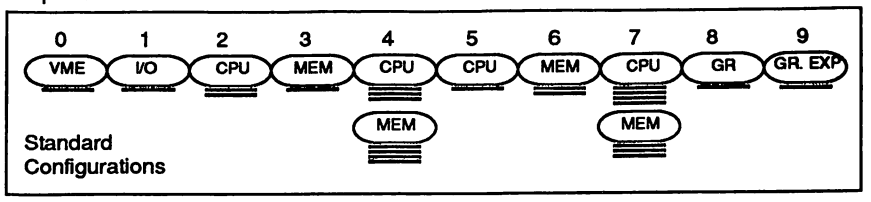
CONNECT cables.

CLOSE the back door of the System Module and power-up the system.

SEE the *Field Service Manual* for more information.

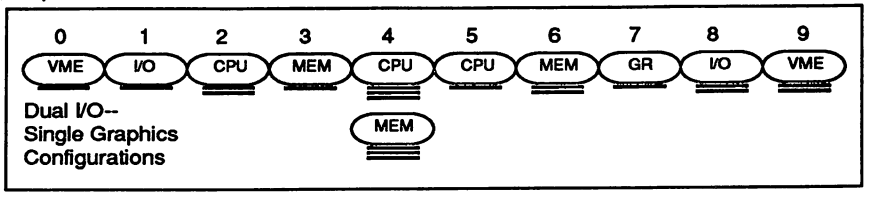
Backplane A

Option 1:

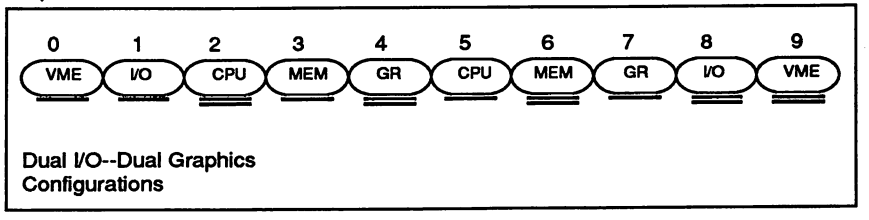


Backplane B

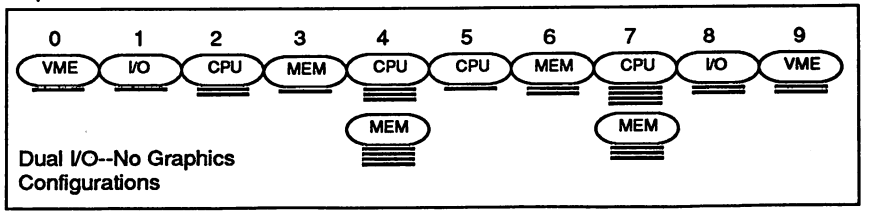
Option 2:



Option 3:



Option 4:



Card Cage Slot Assignments

Stardent

Stardent 1500/3000
Field Service Brief

I/O DRAWER DEVICE REMOVAL AND REPLACEMENT

Removal

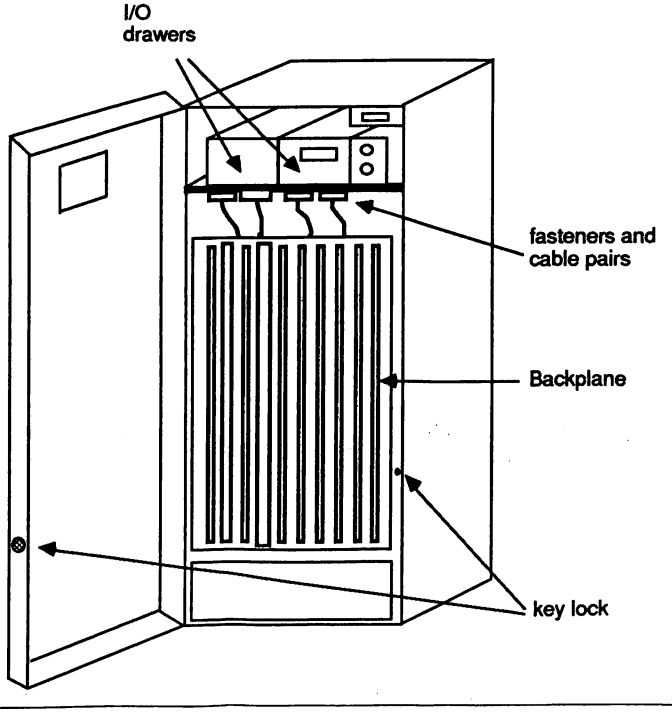
WEAR a static wrist guard.

POWER down the system; wait >= 20 seconds to make sure drive heads have locked.

UNLOCK and open the System Module front door.

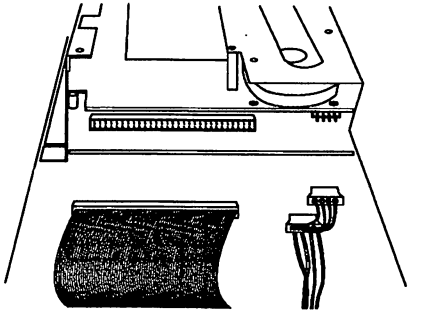
DISCONNECT cable pairs and fasteners from the I/O drawer.

SLIDE I/O drawer out (weight about 30 pounds when full).



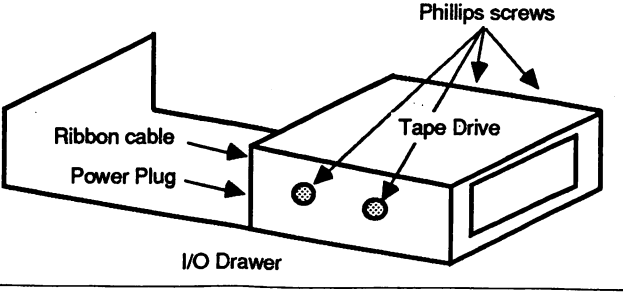
REMOVE the I/O drawer cover (14 Phillips screws).

DISCONNECT the drive's ribbon cable and power cable(s).



REMOVE 4 Phillips screws that attach the drive to the I/O drawer.

REMOVE the drive (lift up to remove disk drive, slide tape drive out front.



Replacement

UNPACK the new or replacement drive. Record the serial number.

CONFIGURE the drive (see *Field Service Brief* 346-0010-01, 346-0011-01, or 346-0012-01 or the *Field Service Manual*). The figure on this page shows device number assignments.

PLACE the drive in the drawer and attach the 4 Phillips screws.

CONNECT the ribbon and power cables.

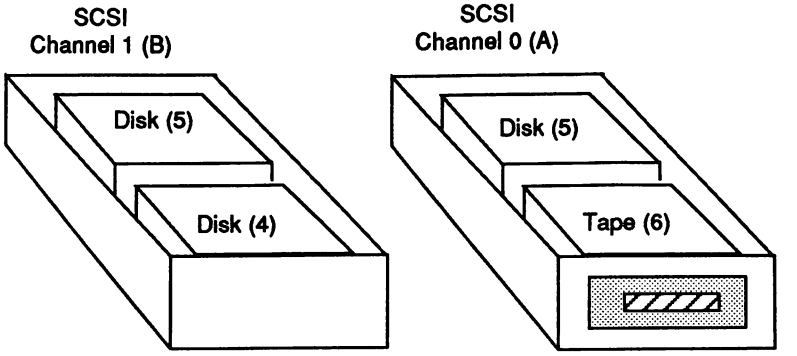
REPLACE the I/O drawer cover (14 Phillips screws).

SLIDE the I/O drawer into the System Module and attach the fasteners and cable pair.

CLOSE and lock the front door and power the system on.

USE periph.diag diagnostic to check the device configuration.

SEE the *Field Service Manual* for more information.



Stardent

Stardent 1500/3000
Field Service Brief

I/O BOARD FUSE REPLACEMENT

Replacement

USE Micro 2A-273 2 amp, 125 volt fuses.

POWER down the system, remove the I/O board.

UNPLUG and remove fuses from locations shown in the figure.

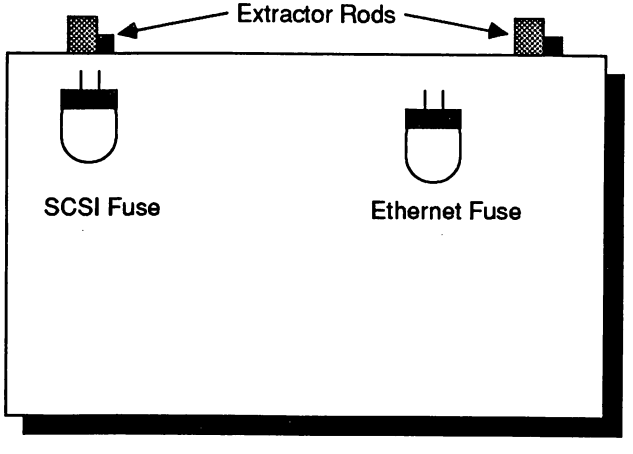
CHECK old and new fuses with Ohmeter (short=good; open=bad).

REPLACE the bad fuse(s). The plugs are oriented as shown in the figure.

REINSTALL the I/O board in the card cage.

POWER up the system.

SEE the *Field Service Manual* for more information.



Stardent

Stardent 1500/3000
Field Service Brief

I/O BOARD CONFIGURATION

Configuration

CONFIGURE only the dual backplane I/O board (#155-0066-01) before use. The single backplane I/O board (#155-0007-01) needs no field configuration.

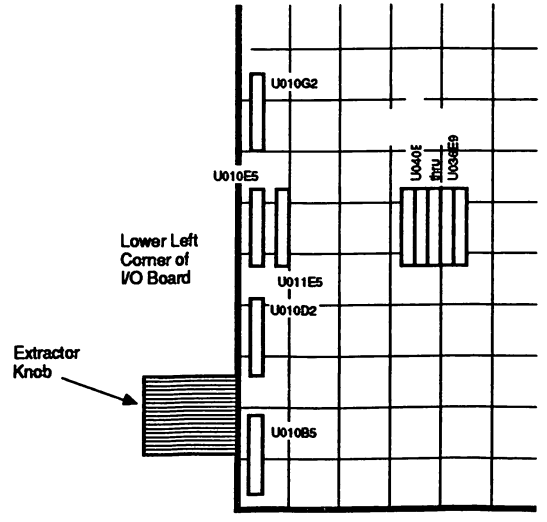
POWER the system off.

REMOVE the I/O board from the card cage.

SET jumpers and assign terminators based on the destination of the board (slot 1 or slot 8). Consult the table and figures.

INSTALL the I/O board in slot 1 or 8 as appropriate.

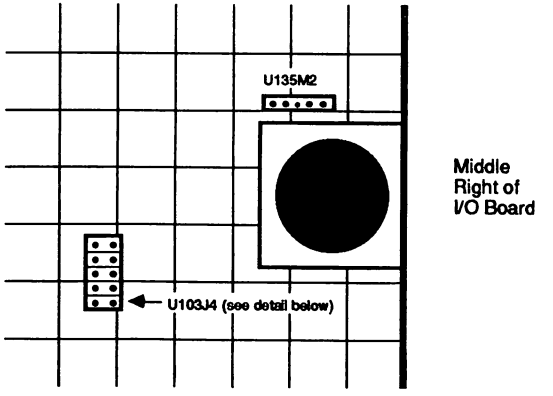
SEE the *Field Service Manual* for more information.

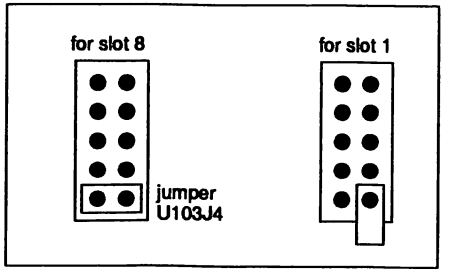


I/O Board Terminators

I/O Board Configuration

Slot No.	Header U135M2	Jumper U103J4	Terminators U101B5-U010G2	Terminators U036E9-U040E9
1	connect 2-3	out	empty	terminated
8	connect 1-2	in	terminated	empty





I/O Board Jumpers

Stardent

Stardent 1500/3000
Field Service Brief

POWER SUPPLY REMOVAL AND REPLACEMENT

Removal

POWER down and unplug the system.

REMOVE the metal power cord restraint from the power supply chassis (back door access), then remove the power cord.

REMOVE the power supply's protective plastic cover (front door access). There are 5 Phillips screws.

REMOVE cable connections to the power supply. **Do not remove any connections to the backplane!** There are 5 Phillips connections, two nut connections and a J1 connection.

REPLACE the screws and nuts as the cables are removed.

MOVE cables out of the way to free the power supply.

OPEN the back door of the System Module and remove the 4 screws that secure the power supply unit.

SLIDE the power supply out the back of the System Module. **Weight is about 57 pounds.**

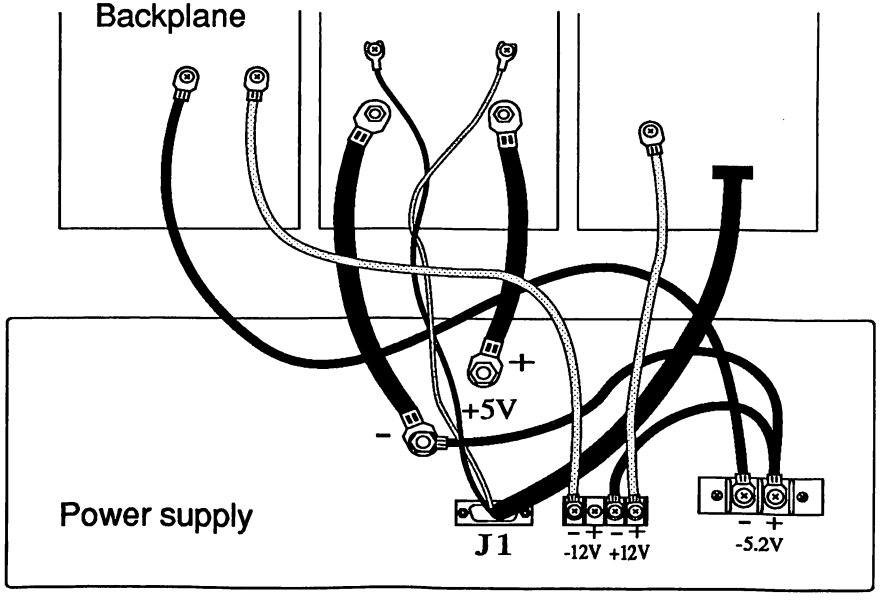
Replacement

REVERSE the previous steps.

CONSULT the figure for correct cable connection locations.

MAKE sure all connections are tight.

RELOCK the front door before powering the system up.



Stardent

Stardent 1500/3000
Field Service Brief

SYSTEM MODULE VOLTAGE TESTING

Testing

REMOVE jewelry or other metal that could come in contact with the backplane.

UNLOCK and open the System Module front door.

REMOVE the 2 lower screws that hold the plastic shield to the backplane.

LOOSEN the 2 upper screws so the plastic shield swings slightly open at the bottom and permits voltmeter access to the cable connections shown in the figure.

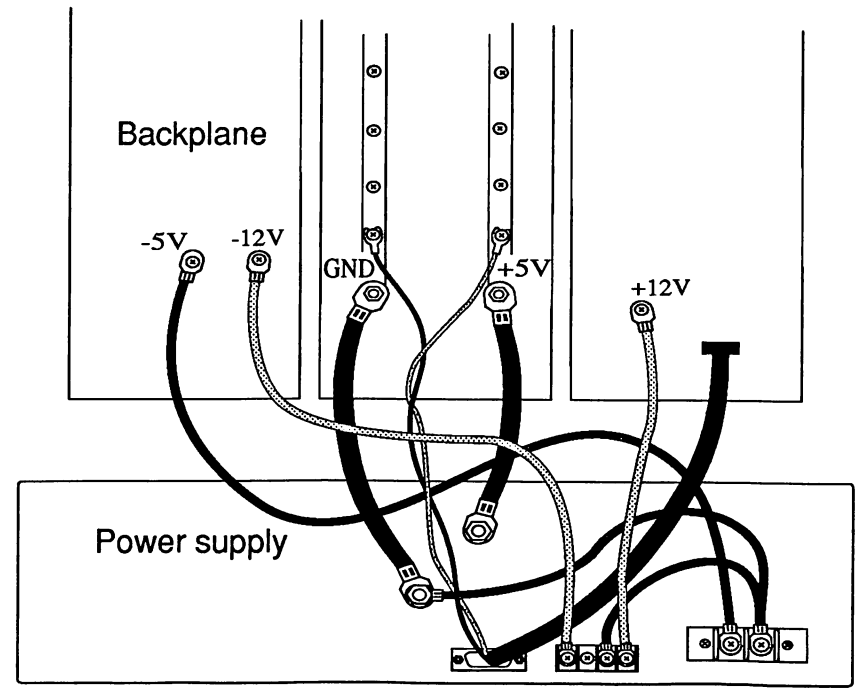
JIGGLE the thick power cables labeled "GND" and "+5V." If loose, tighten them before checking voltages.

CHECK voltages with a voltmeter. Correct voltages are printed on the backplane and shown in the figure. Voltages should be correct to within 2 percent.

REATTACH the plastic shield and tighten the 4 screws.

CLOSE and lock the System Module front door.

SEE the *Field Service Manual* for more information.



Stardent

Stardent 1500/3000
Field Service Brief

FAN CONTROLLER REMOVAL AND REPLACEMENT

Removal and Replacement

POWER the system off.

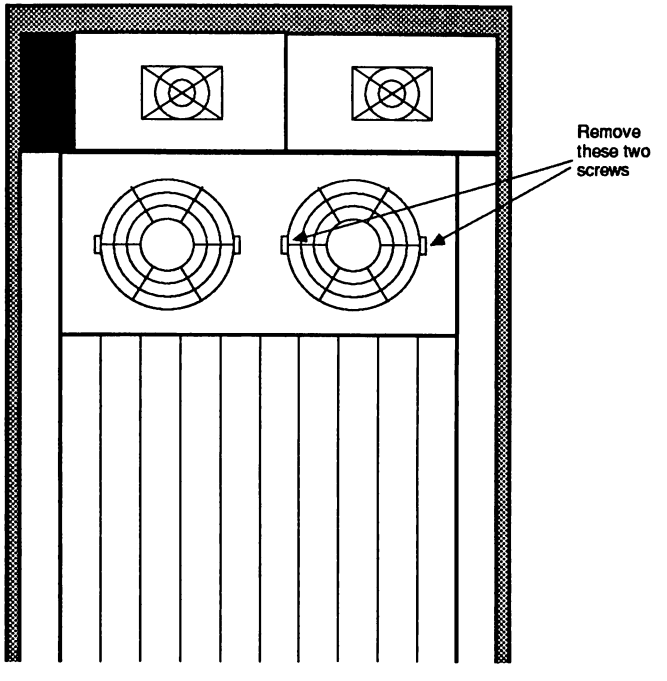
REMOVE 2 screws that connect the right fan and fan shield to the System Module. Remove the fan shield and the 2 sets of wires that connect the fan to the controller board.

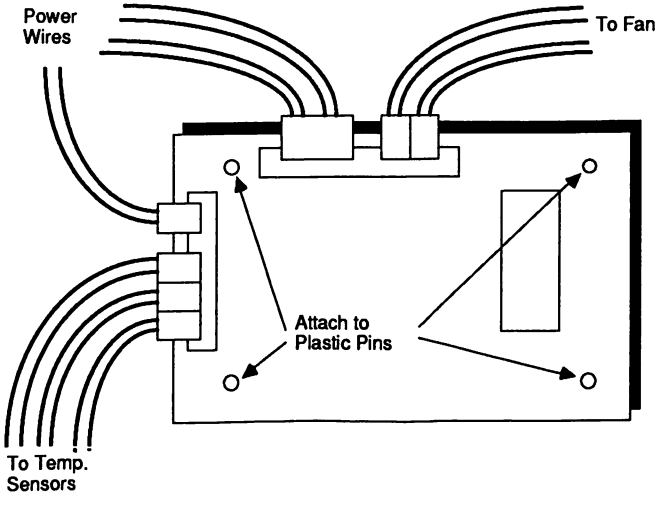
REMOVE 3 sets of wires that connect the temperature sensors to the controller board. Remove the 2 sets of wires from the controller board.

PULL the board away from the plastic pins carefully. **The plastic pins are not flexible and the board can be broken if not careful.**

REVERSE the steps above to replace the controller in the System Module.

SEE the *Field Service Manual* for more information.





Stardent

Stardent 1500/3000
Field Service Brief

RESETTING THE SYSTEM

Resetting

FRONT PANEL KEYSWITCHES

THE UPPER front panel keyswitch is used to power or reset the system. The lower keyswitch determines whether the system is booted just to the PROM (manual boot) or if the UNIX™ system is booted (automatic boot). DIAGNOSTIC position means boot to the PROM; NORMAL means boot the UNIX™ system.

POWER OFF RESET

MOVE upper front panel keyswitch to OFF position. (Before removing boards also turn off the AC power switch on the lower back of the system module.)

RESTART system by placing the lower key switch in desired position (DIAGNOSTIC or NORMAL) and turning the upper keyswitch to ON.

HARD RESET

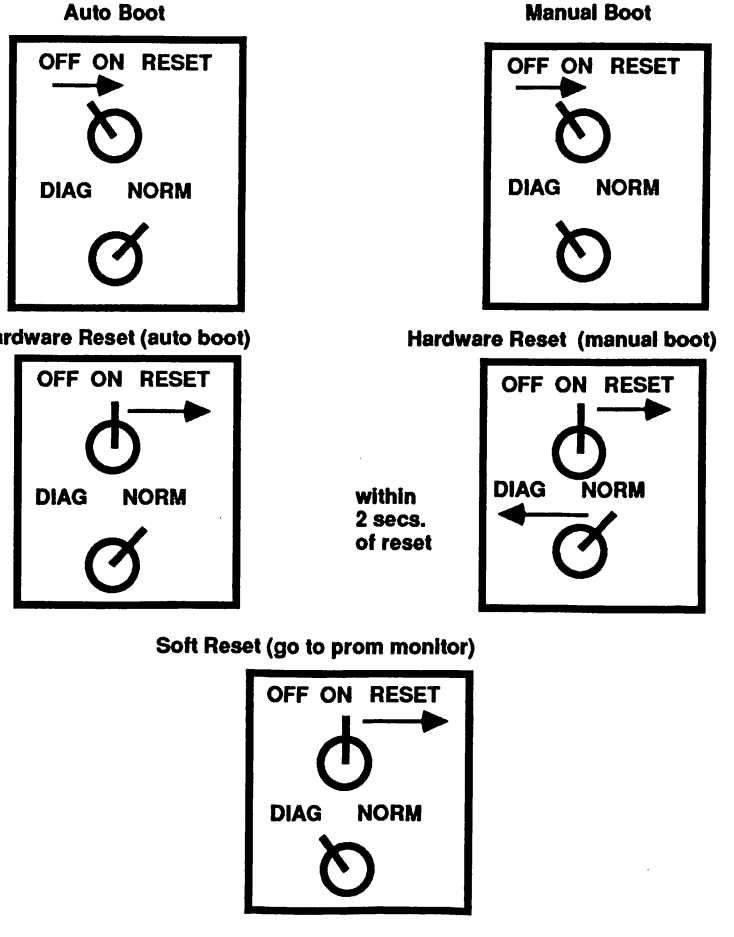
PLACE lower keyswitch in NORMAL position and move upper keyswitch to RESET.

TO RESET to PROM, move lower keyswitch back to DIAGNOSTIC position within 2 seconds of resetting.

SOFT RESET

PLACE lower keyswitch in DIAGNOSTIC position and turn upper keyswitch to RESET. (Alternatively hold down <ctrl> and <alt> keys and type <del>.)

SEE the *Field Service Manual* for more information.



Stardent

Stardent 1500/3000
Field Service Brief

WANGTEK CARTRIDGE TAPE DRIVE CONFIGURATION

Configuration

LOCATE the component side of the tape drive controller. (Note that the board of the Wangtek 5125ES ("half-height") is not completely exposed. Gain access within the couple of inches that separate the drive from its mountings.)

REMOVE drive terminators as shown in the figures. Needle-nosed pliers help removal.

CODE the tape drive device number by placing pin jumpers on the correct pins, as shown in the figures. For the internal cartridge tape drive, use device number 6.

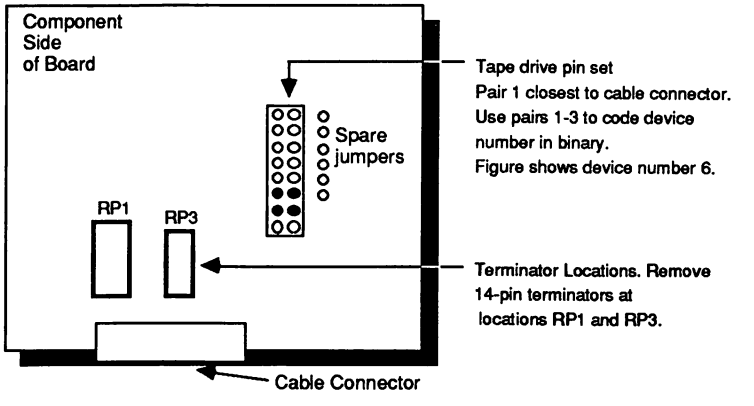
THE TABLE shows UNIX™ special device file names for the internal Wangtek cartridge tape drive.

SEE the *Field Service Manual* for more information. See *Field Service Brief* #346-0001-01 for removal and replacement instructions.

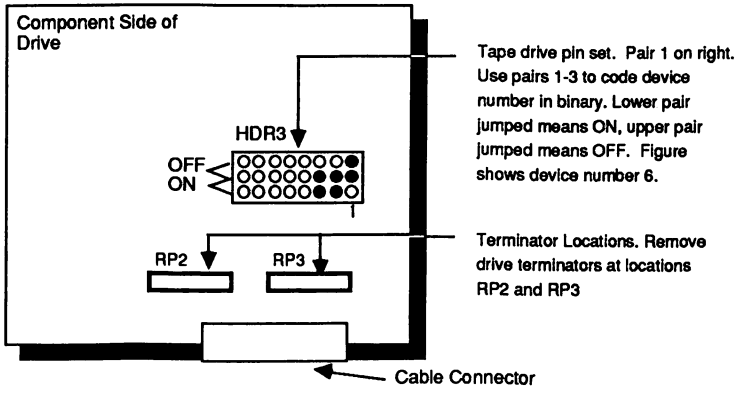
Internal Cartridge Tape Drive Special Device Files

File Name	Equivalent	Description
/dev/rmt/c0d6l	/dev/rmt0	Low density
/dev/rmt/c0d6m	/dev/rmt8	Medium density
/dev/rmt/c0d6h	/dev/rmt16	High density
/dev/rmt/c0d6ln	/dev/rmt4	Low density, no rewind on close
/dev/rmt/c0d6mn	/dev/rmt12	Medium density, no rewind on close
/dev/rmt/c0d6hn	/dev/rmt20	High density, no rewind on close

Wangtek 5125SC Full Height Tape Drive Drive Controller



Wangtek 5125ES Half Height Tape Drive Drive Controller



Stardent

Stardent 1500/3000
Field Service Brief

PRIAM 738 SCSI DISK DRIVE CONFIGURATION

Configuration

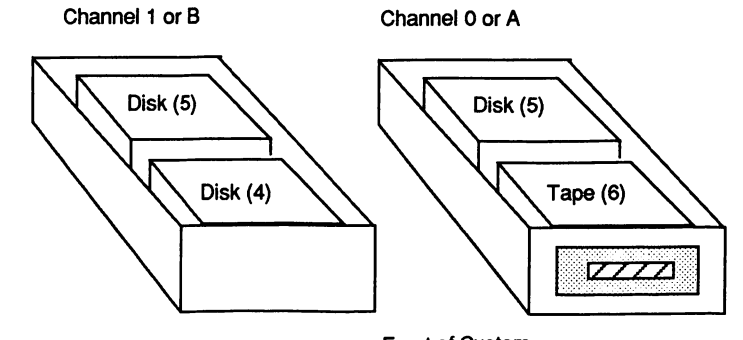
LOCATE the component side of the disk drive controller.

REMOVE the terminator from the location shown in the figure by prying with a flat-head screwdriver.

CODE the disk device number by placing pin jumpers on pins at the back of the disk drive. Counting from the left as shown in the figure, use pins 1 to 3 to code the device number in binary. For instance, to code device number 4, place a jumper over the 3rd pair of pins from the left.

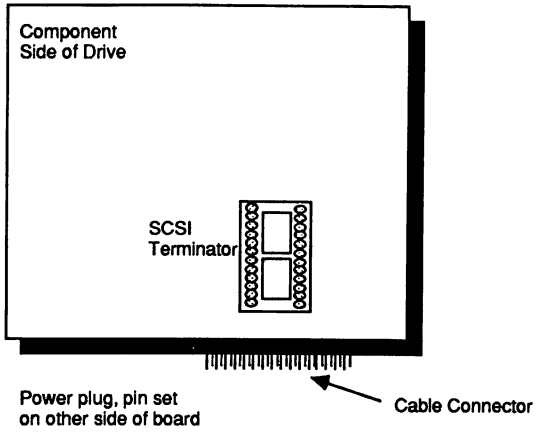
STORE extra jumpers by placing them over one of the pins in a pair.

SEE the figure below for correct I/O drawer device number assignments. See the *Field Service Manual* and *Field Service Brief* #346-0001-01 for more information.

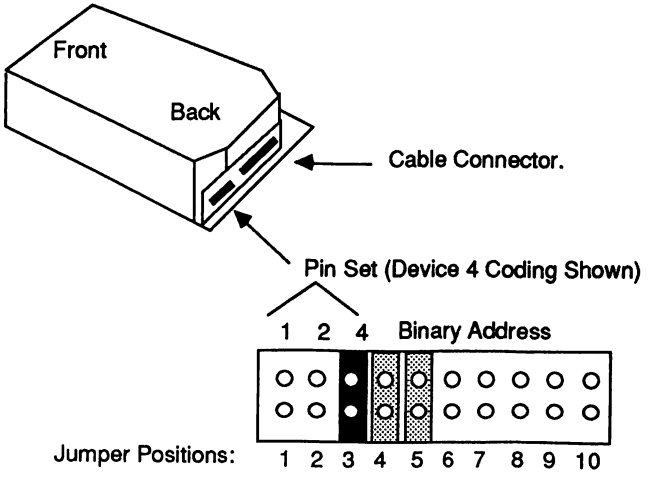


Internal I/O Drawer Device Number Assignments

Disk Drive Controller



Disk Drive Device Number Coding



Stardent

Stardent 1500/3000
Field Service Brief

MAXTOR XT-8760S SCSI DISK DRIVE CONFIGURATION

Configuration

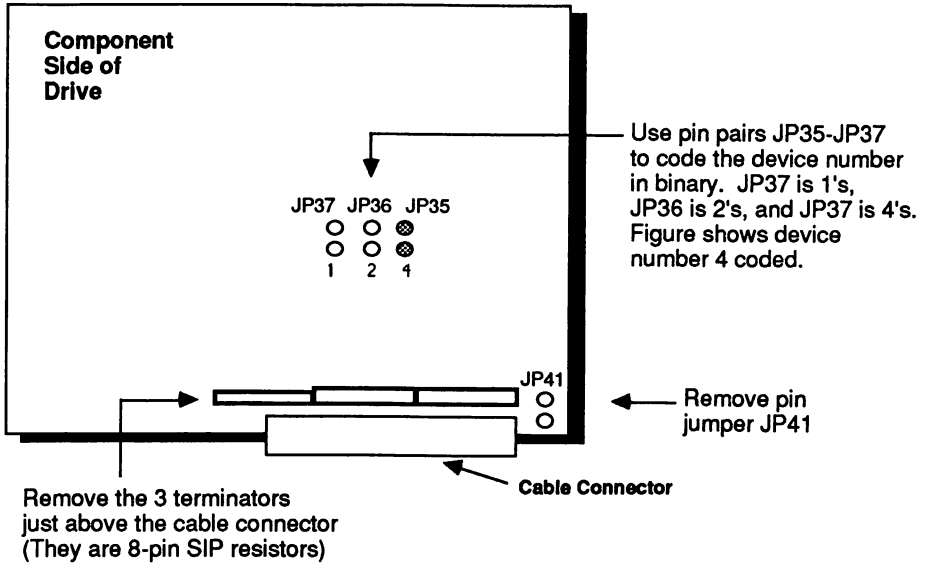
LOCATE the component side of the disk drive board.

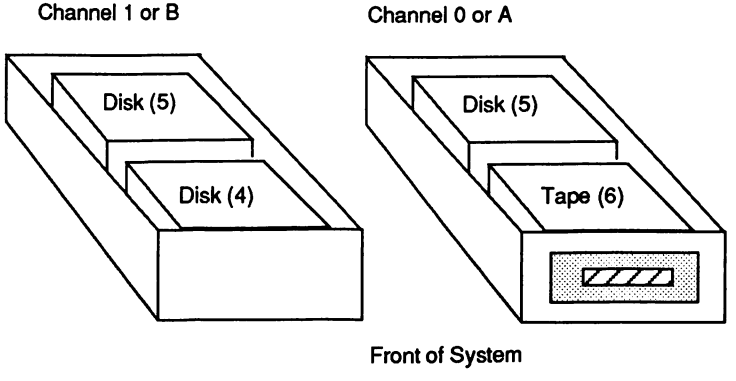
REMOVE the 3 terminators from the locations shown in the figure.

REMOVE the jumper covering pin pair JP4, as shown in the figure.

CODE the disk device number by placing pin jumpers on the correct pins in the pin set JP37-JP36-JP35. Pair JP37 is 1's, JP36 is 2's, JP35 is 4's. The figure shows how to code device number 4.

SEE the figure below for correct I/O drawer device number assignments.





Stardent

Stardent 1500/3000
Field Service Brief

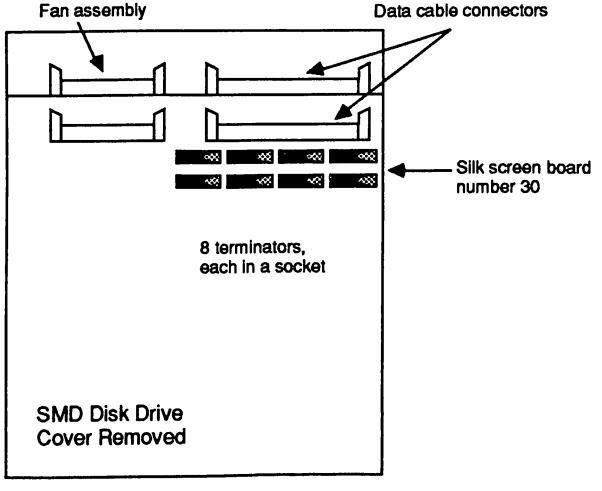
FUJITSU M2382K SMD DISK DRIVE CONFIGURATION

Configuration

FUJITSU M2382K drive configuration consists of checking drive terminators and setting DIP switches.

TERMINATORS

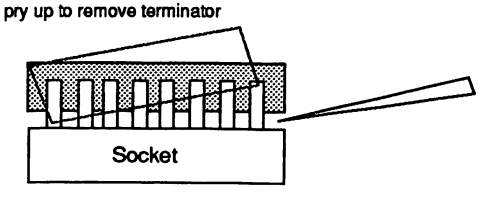
Up to two drives can be connected to a single VME controller. When only one drive is connected the terminators must **NOT** be removed. When two drives are connected terminators must be removed from the drive **NOT** at the end of the data cable.

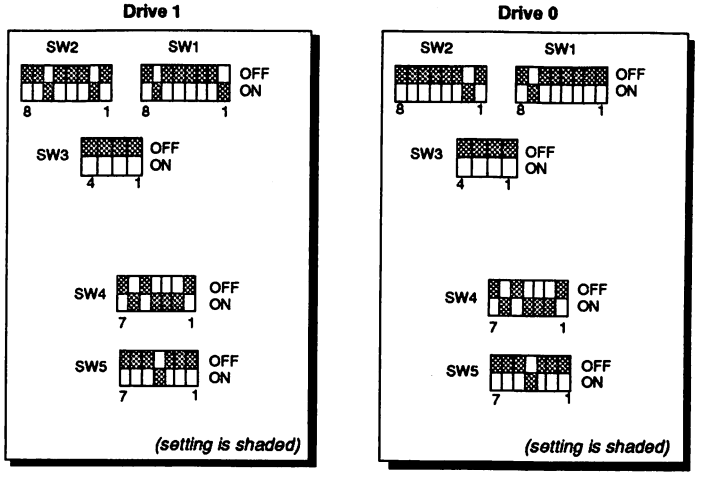


Front of Drive

To check terminators remove the cover of the disk drive. The drive's 8 terminators are located next to data cable connectors on the disk drive controller (silk screened board number 30). The terminators are mounted in socket, unlike other resistor packs on the controller board.

To remove the terminators insert a flat-head screwdriver or similar implement and gently pry the terminator away from its socket.





Front of Drive Drawer

DIP SWITCHES

Once the cover of the disk drive is replaced you can configure the drive's DIP switches according to the figure above.

For more information consult the *Field Service Manual.*

Stardent

Stardent 1500/3000
Field Service Brief

EXABYTE EXB-8200 TAPE DRIVE CONFIGURATION

Configuration

REMOVE the cover of the drive.

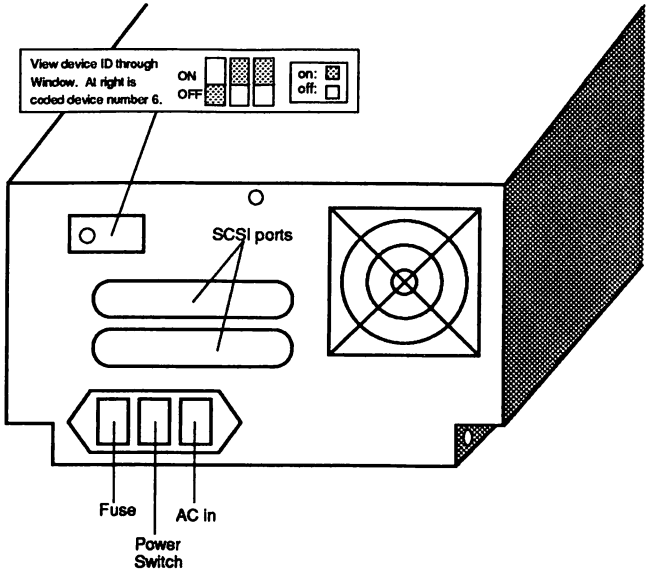
USE the DIP switches on the back of the drive to code the device number in binary (see figure). As you face the back of the drive the left-most switch is the 1's place, the middle switch is the 2's place and the rightmost switch is the 4's place. The figure shows device number 6 coded. We recommend that you connect the tape to SCSI controller 1 on the I/O board in slot 1 of the card cage and assign device number 6. In that case the UNIX special device file is

/dev/rmt/c1d6h (high-density, rewind on close) or

/dev/rmt/c1d6hn (high-density, no rewind on close).

THE Exabyte tape drive is shipped without internal SCSI terminators. An external SCSI terminator is shipped with the drive kit (#155-0067-01) and is necessary unless the Exabyte drive is configured in the middel of a SCSI daisy chain.

FOR more information, consult the *Field Service Manual.*



Exabyte Tape Drive Rear Panel

Stardent

Stardent 1500/3000
Field Service Brief

HP 88780A TAPE DRIVE CONFIGURATION

Configuration

MAKE sure the tape drive is powered-up, but off line.

LOCATE the control buttons on the front panel of the drive, as shown in the figure.

SET the tape drive device number as follows. Choose device number 7.

Press OPTION to enter the option mode.

Press NEXT until ID appears.

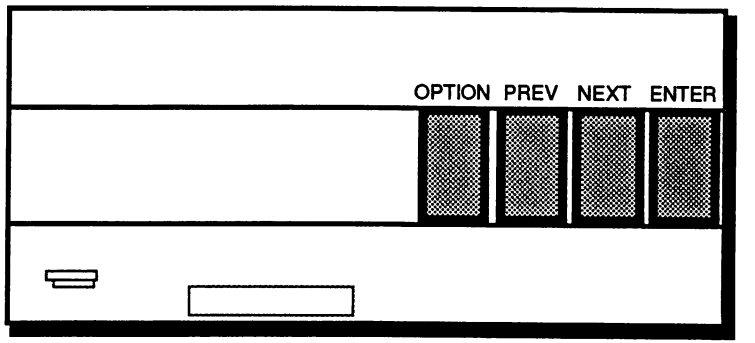
Press ENTER

Press NEXT or PREV until you reach the 7, the desired device number.

Press ENTER. The number 7 appears for a moment, then the display reverts to ID.

Press OPTION or RESET to leave the option mode.

THE tape drive is now configured for use. For more information, consult the *Field Service Manual*.



HP Tape Drive Front Panel