



Excellerator[™]

Model e100

Installation and Support Manual

Excellerator Installation and Support Manual ver. 90017a

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Table of Contents

Notation and Syntax Conventions	i
Chapter 1 Introduction	1
1.1 Overview	1
1.1.1 Excellerator Block Diagram	2
1.1.2 Power Consumption	2
1.1.3 Backup Power	2
1.1.4 Internal Backup Hard Drive	2
1.2 Product Specifications	3
Chapter 2 Installation	5
2.1 Installation Procedure	5
2.1.1 SCSI Cable Connections and Termination	6
2.1.2 Setting SCSI ID	6
2.1.3 Applying Line Power	6
2.1.4 Battery Charging	7
2.1.5 Power On	7
2.1.6 Initial Format	7
2.2 Host Computer installation/Drive Geometry	7
2.2.1 HP UNIX (HPUX) Installation	7
2.2.2 SUN (Solaris) Installation	9
Chapter 3 Operation	11
3.1 Master DC POWER Switch	11
3.2 SHUTDOWN Procedure	12
3.3 STARTUP Procedure	12
3.4 Internal Hard Drive Diagnostics (SERVICE Lamp)	13
Chapter 4 Troubleshooting	15
4.1 General Troubleshooting	15
4.1.1 Power	15
4.1.2 SCSI Problems	15
4.2 Backup and Restore Errors	16
4.3 Error Correction and Reporting	16
4.4 Spare Parts List	16
Appendix A External SCSI Cables and Accessories	17
Appendix B Warranty and Service Policies	21
Index	23

Notation and Syntax Conventions

This manual uses the following notation and syntax conventions:

<i>italics</i>	Indicates arguments in a command line that you must replace with a valid value. In text, it is used to indicate document titles.
<code>courier</code>	Indicates computer output and program listings.
<code>courier bold</code>	Indicates user input to the computer and nonprinting keys

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Chapter 1

Introduction

1.1 Overview

Solid Data's Excellerators, are ultra-high-performance devices that appear exactly like a magnetic disk drive to a host computer system. While the Solid Data Excellerator is a semiconductor memory device, it provides all the characteristics of a rotating disk to the SCSI interface. However, because of the speeds of the semiconductor storage array, data can be accessed at speeds far greater than those of any magnetic disk.

The Model e100 Excellerator holds one memory array per chassis. The array is available in capacities of 536 megabytes, and 1.072 and 2.144 gigabytes of formatted data. The Solid Data Excellerator is designed to be a plug-and-play performance accelerator. In general, it is only necessary to select a SCSI ID number, connect the SCSI cable(s) and terminators, then apply power. The Excellerator will then appear to the SCSI host disk controller as a SCSI disk.



Figure 1-1. Model e100 Excellerator



Figure 1-2. Indicator Lights Model e100 Excellerator

NOTE: Various microcode (EEPROM) versions are available for optimizing the Excellerator when used with operating systems requiring other than the default of 512 blocks per sector storage. Please contact the Solid Data Systems Technical Support Group for details.

1.1.1 Excellerator Block Diagram

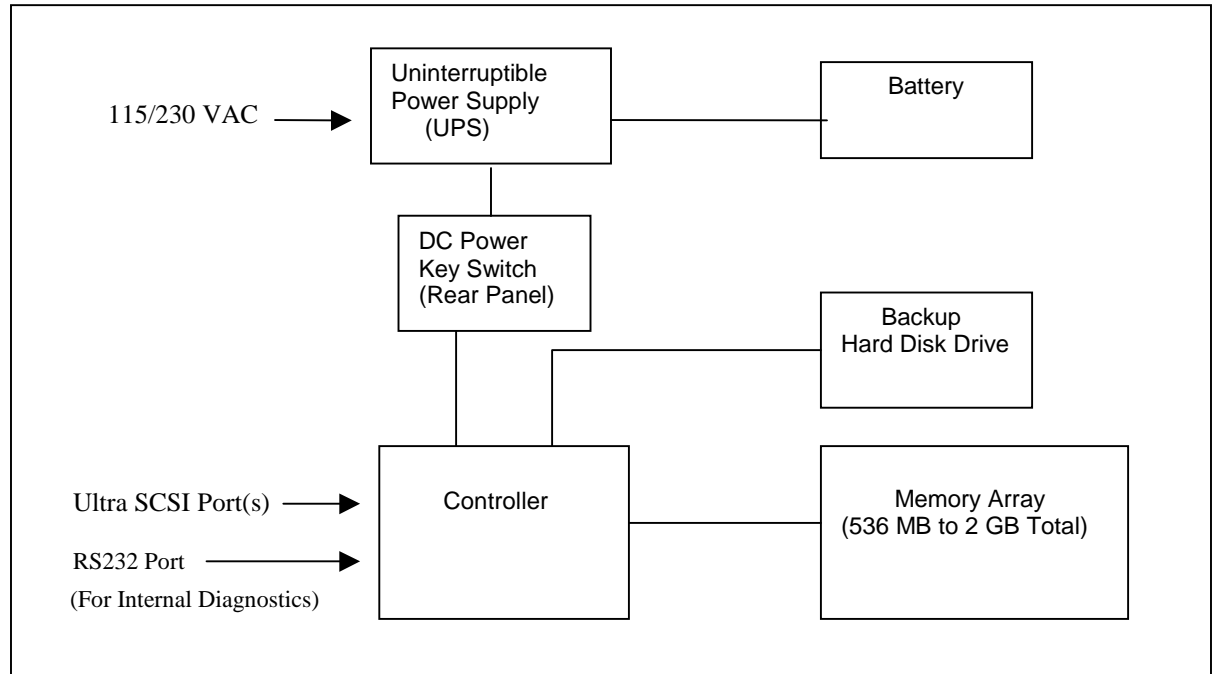


Figure 1.1. Excellerator Block Diagram

1.1.2 Power Consumption

The maximum power consumption for a model e100 Excellerator is 100 watts.

1.1.3 Backup Power

The Solid Data Excellerator uses an on-line uninterruptible power supply (UPS) which supplies all internal power for the memory array controller card, memory array, backup devices, and cooling fans. In the event of a line failure, fully charged internal batteries will supply all required power for a period of up to 1 hour.

1.1.4 Internal Backup Hard Drive

The backup disk has enough capacity to backup/restore the full memory array content. The backup process is automatic if line power is absent for a period of time greater than 1 minute. The Solid Data Excellerator is off-line to the host during the backup/shutdown process. When backup/shutdown is initiated due to power failure, power will automatically be removed from the internal semiconductor memory array after all data has been recorded on the backup device. When power is restored, the Solid Data Excellerator will restore the memory array contents from the backup disk and return to an on-line condition.

1.2 Product Specifications

Table 1-1. Excellerator Specifications

GENERAL SPECIFICATIONS	
Form Factor	Rackmount
Capacity Range	536MB, 1GB or 2GB
Battery Backup	Internal
Battery Operation	Approx. 1 hour
Battery Charging	12 hours from total discharge
Backup/Shutdown Time (approximate)	750MB/min
Restore Time (approximate)	750MB/min
RELIABILITY	
Calculated MTBF	250,000 hours
Demonstrated MTBF	>2,000,000 hours
Error Rate (per bits transferred)	
Recoverable	<10 errors in 10^{15}
Unrecoverable	<10 errors in 10^{17}

POWER	
Power Connector (fully loaded)	NEMA 5-15
Voltage	105-128 or 208-250 VAC, 50/60Hz; Single Phase
Maximum Power Consumption	100 watts
OPERATING ENVIRONMENT	
Ambient Temperature	5°–40°C (41°–104°F)
Relative Humidity	0-90% (non-condensing)
Altitude	Up to 15,000' above sea level
DIMENSIONS	
Height	1.75 in.
Width	19 in.
Depth	27.5 in.
Weight	36 lbs.

Table 1-2. HVD or LVD SCSI Controller Specifications

Average Access Time	.014 milliseconds
Maximum Access Time	.020 milliseconds
Seek Time	0
Latency	0
Data Rate	Synchronous 40.0MB/sec.
	Asynchronous 28.0MB/sec.
Maximum Number of Device-Level I/Os Per Sec.	23,060 (1 block I/O, includes access time, data transfer time, and status phase)
Mechanical Connections	Micro D, 68 Pin, Female
Termination	Removable (external)
Supported Hosts	All SCSI: Data General, DEC, Hewlett-Packard, IBM, Silicon Graphics, Sun Microsystems, Altos, Stratus, Concurrent

Table 1-3. Summary of HVD/LVD Characteristics

Characteristics	High Voltage Differential Wide Ultra SCSI	Low Voltage Differential Wide Ultra2 SCSI
Data Rate	40 MB/sec.	40 MB/sec.
Data Bus Width	16 bits	16 bits
# Connector Pins	68	68
Max. Cable Length	25 meters	12 meters

Chapter 2

Installation

2.1 Installation Procedure

To install a Solid Data Excellerator, complete the following steps:

1. On receipt of the Solid Data Excellerator and before applying power, remove the front panel and examine the controller card and memory array. The front panel is mounted with two capture screws. Verify that both cards are fully seated in their sockets and that no mechanical damage has been sustained during transportation. If there are indications that damage has occurred, remove the top cover and visually examine the batteries and other assemblies before applying line power.
2. Solid Data e100 Excellerators are shipped from the factory with slides that can be mounted on the sides of the unit for use in standard ANSI/EIA racks. They should be mounted so that the vent holes in the sides of the Excellerator line up with the cutouts in the slides, as pictured in Figure 2-1.



Figure 2-1. e100 with Side Rails

3. Connect the appropriate SCSI cables from the host system to the Excellerator. See section 2.1.1 for details. See Appendix A for descriptions of the SCSI cables.
4. Insure that the SCSI bus is properly terminated. Excellerators require external termination. Refer to section 2.1.1 for details.
5. Set the SCSI ID for the Excellerator. It is set by rotary switches on the front edge of the controller card. See section 2.1.2 for details.
6. Insert the power cable into the receptacle in the rear of the Excellerator, and move the DC POWER switch on the rear panel to ON.
7. The STARTUP IN PROGRESS and ACTIVITY lamps will light. At this point, the Excellerator is restoring the contents of the backup drive to the memory array(s). While the Excellerator is in a restore mode, it is off-line to the host system. Wait until the STARTUP IN PROGRESS and ACTIVITY lamps extinguish and the SYSTEM READY lamp lights before accessing the drive.

NOTE: It is important to allow the restore operation to complete prior to accessing the device from the host system.

9. Perform the host operating system software configuration.

10. If attaching to a UNIX based host, run IOTest™ to ensure the Excellerator is operating properly and at full speeds. IOTest™ is available on CD, and via anonymous FTP from <ftp:soliddata.com/IOTest> or via the Web at www.soliddata.com/products. Please download and read the README file prior to running IOTest™.

The following sections explain the above steps in greater detail.

2.1.1 SCSI Cable Connections and Termination

Model e100 Excellerators are dual port and have four connectors on the rear panel. Each port has two connectors that can be used for SCSI cables or terminators. Refer to Figure 2-2 for the rear panel configuration. **It is important that both ports are terminated with the proper terminator, whether or not they are being used.** Dual-port drives have two separate and distinct SCSI buses with separate SCSI ID's. These SCSI ID's do not have to be identical. The connectors associated with each port are grouped together, with one above the other. Figure 2-2 shows the terminators attached to the bottom connector of each port.

Excellerators are available in HVD or LVD configurations. The terminator type must reflect the configuration of the host adapter and the controller. The terminators for the SCSI controller cards are externally mounted on the rear panel of the unit. The Excellerator can be daisy-chained as long as the last unit is terminated, the maximum SCSI bus length has not been exceeded, and each Excellerator has a distinct SCSI ID number.



Figure 2-2. e100 Excellerator Rear Panel

2.1.2 Setting SCSI ID

The SCSI ID is set with one of two rotary switches on the front edge of the controller card. These switches are accessible by removing the front panel of the Excellerator. Set the SCSI ID with switch S2. Dual port models utilize both switch S2 and S3 and may be set to two different SCSI ID's. Switch S2 will set the ID for port B, S3 for port A. See Figure 2-3 for the location of these switches.



Figure 2-3. Controller SCSI switch locations

2.1.3 Applying Line Power

Connect the unit to a standard 115VAC or 230VAC 50/60 Hz outlet.

2.1.4 Battery Charging

Batteries must be sufficiently charged to support full backup operation during a power outage. Operation without fully charged batteries will not damage the unit or extend charging time. In the event of power line failure, however, full backup of stored data cannot be guaranteed. In order to guarantee fully charged batteries, insert the line cord into the appropriate outlet for 24 hours with the Excellerator DC POWER switch in the on position. Battery charging is fully automatic and occurs whenever the unit is powered on.

2.1.5 Power On

The Excellerator is powered up by turning on the master DC POWER switch on the rear panel. Refer to Figure 2-2 for the location of the master DC POWER switch. The POWER LED on the front panel will light, followed by the STARTUP IN PROGRESS and ACTIVITY indicators. Refer to table 1-1 for backup/restore operation times. While the SSD is restoring to the memory array from the internal backup device, it is off-line to the operating system.

CAUTION: To power the Excellerator off, make sure the Excellerator is backed up to the host operating system. See Chapter 3 for instructions on powering the Excellerator off.

2.1.6 Initial Format

The Solid Data Excellerator does not require a low-level format. Proper parity is written into the memory array(s) as the Excellerator restores from its backup drive.

Each host system has its own set of firmware or operating system utilities to configure, initialize, and high-level format the Excellerator. Refer to the manufacturer's documentation more information.

2.2 Host Computer Installation

2.2.1 HP UNIX (HPUX) Installation

Hardware Installation:

1. Set the SCSI ID # on the HVD or LVD controller card using rotary switches S2 next to the "B" port connector, and S3 next to the "A" port connector on the controller card. Each device must have its own distinct ID. SCSI ID "7" is generally reserved for the controller. This may be different for your specific controller.
2. Connect a 68-pin cable between the controller and the back of the Excellerator. The second back panel connector of each port, must be terminated with the appropriate HVD or LVD terminator.

Software Installation (HPUX Versions 10.X/11.X):**Boot HPUX**

Boot HPUX and use `/etc/ioscan` to make sure the system sees the drive. Device special files should be created automatically.

```
ISL>HPUX
      :disc3(52.6.0;0)/hp-ux
      .....
      .....

:/>/etc/ioscan -fn
```

If necessary, create the device special files as follows:

```
:/>insf -e
:/>
```

Read Drive Description

Use `/etc/diskinfo` to read back basic drive description:

```
:/>/etc/diskinfo /dev/rdisk/c22t0d0
```

Initialize the Drive

Initialize the drive using `/etc/mediainit`:

```
:/>mediainit -v /dev/rdisk/c22t0d0
```

NOTE: `/etc/mediainit` should take about 2 seconds to complete.

Create Physical Volume

Initialize the Solid State Disk for LVM

```
:/>pvcreate /dev/rdisk/c22t0d0
```

Create File System

Create the file system using `/etc/newfs`:

```
:/>/etc/newfs -v /dev/rdisk/c22t0d0
```

Create Mount Point and Mount Excellerator

```
:/>mkdir /RAMDSK
:/>mount /dev/dsk/c22t0d0 /RAMDSK
```

Check Mounted File Systems

```
:/>bdf
Filesystem      Kbytes  used  avail  capacity  mounted on
/dev/dsk/c4t0d0  506344    9  455200    0%      /RAMDSK

:/>df
/RAMDSK(/dev/dsk/c4t0d0) :    911400 Blocks    131068 i-nodes
```

2.2.2 SUN Solaris Installation

This appendix explains how to install an Excellerator on a Solaris host computer system.

Hardware Installation:

Connect the SCSI cable between the controller on the SUN host and the back of the Excellerator. Ensure that both ports on the back of the Excellerator are terminated properly. Apply AC power to the Excellerator, and turn on the MASTER DC POWER Switch on the rear panel.

Software Installation:

Boot Solaris

Boot Solaris by typing "boot -r" at the "ok" prompt. This will cause Solaris to re-configure the device special files for the new configuration.

Configuration Information

Configuration information is placed in /var/adm/messages as the system boots.

Format Drive

Format, partition and label the Excellerator using the format command. See the format man page for more information about specific options

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Chapter 3 Operation

This chapter describes the controls for and explains how to operate Excellerators. The major topics covered are:

- Master DC POWER switch (rear panel)
- SHUTDOWN procedure
- STARTUP procedure
- Internal Hard Drive Diagnostics (SERVICE lamp)

3.1 Master DC POWER Switch

The Master DC POWER switch is located on the rear panel of the Solid Data Excellerator. This switch controls the power to the entire e100. Moving the Master DC POWER switch to the ON position will cause the cooling fan to spin, the backup batteries to begin charging, and the backup SCSI device to spin up. In addition, the front panel POWER lamp will illuminate followed shortly by the STARTUP IN PROGRESS and ACTIVITY indicator lights. The internal backup device will then load the memory arrays with the data stored on the backup device during which time the Excellerator is off-line to the host. When complete, the STARTUP IN PROGRESS and ACTIVITY indicators will go out, indicating that the Solid Data Excellerator has performed initial diagnostics and is ready for use. The Solid Data Excellerator does not require a low-level format. Proper parity is written into the memory array(s) as the unit restores from its backup drive.

Figure 3-1. e100 Excellerator Rear Panel

The shutdown process moves the data on a block-by-block basis to locations in the



backup device. All of the data is saved exactly as it existed in memory when the shutdown sequence was initiated. Saving the contents of the memory array to the backup device does not affect the contents of the memory array. During the shutdown process, the Excellerator is off-line to the host.

3.2 SHUTDOWN Procedure

The following steps should be performed when it is necessary to shutdown the Excellerator (actual order to be determined by individual operating system/backup utility being used):

- Backup all data on the Excellerator to the operating system. This may take the form of database dumps or UNIX backup utilities such as dump or tar.
- Stop all database servers or other jobs using the Excellerator.
- Dismount the Excellerator from the operating system, if it is mounted. This is done to force the buffer cache to flush.
- Turn off the DC POWER switch on the rear panel of the Excellerator. The SYSTEM READY lamp will extinguish, the SHUT DOWN IN PROGRESS and ACTIVITY lamps will illuminate, and the Excellerator will start a backup of the memory array(s) to the internal hard disk. This process is automatic when the DC POWER switch is turned off. Refer to Table 1-1 for backup/restore operation times.

CAUTION: While the Excellerator is backing up to the internal disk, it is off-line to the operating system.

3.3 STARTUP Procedure

The following steps should be performed when bringing the Excellerator up from a power-off state:

- Connect the Excellerator to an AC power source.
- Turn the DC POWER switch on the rear panel to the “ON” position. The front panel POWER lamp will illuminate, followed shortly by the STARTUP IN PROGRESS and ACTIVITY lamps. The Excellerator will restore the contents of the internal backup device to the memory array(s). Refer to Table 1-1 for backup/restore operation times.

CAUTION: While the Excellerator is restoring data from the internal disk, it is off-line to the operating system.

- When the startup operation has completed, the STARTUP IN PROGRESS and ACTIVITY lamps will go out. At this point the Excellerator goes on-line.
- Boot the host system, and start the database servers or applications which are utilizing the Excellerator.

3.4 Internal Hard Drive Diagnostics (Service Lamp)

The Backup Drive (included in Solid Data Systems SSD products) sees only occasional use. When the SSD is powered up, the content of the backup drive is copied to the SSD memory (DRAM) array, and the backup drive is then powered down. Normal read and write activity is then supported by the memory array. However, if a sustained power-failure condition is detected – i.e., if AC power fails for a period of time exceeding one minute -- the contents of the memory array are copied to the backup drive, after which the SSD is powered down.

Automatic Diagnostic Tests

Under normal SSD operation the Backup Drive remains powered off most of the time. One minute after the SSD is turned on and in the ready state, and at approximately a 5-day interval, a diagnostic daemon wakes up. This daemon spins up the backup drive, performs a diagnostic routine on the drive and then spins the drive down.

If the drive fails to spin up, or fails the diagnostic test, then the front panel service light is illuminated.

When the Backup Drive is in this failed condition, the Backup SCSI port periodically resets the SCSI bus and probes for a new Backup Drive.

Should the Excellerator be turned off by the DC POWER switch before the initial backup drive diagnostic test is done, it will write the contents of the memory array to the drive, but not power down. Rather, it will return to the System Ready state. Turn the DC POWER switch back to the on position. After the diagnostic tests are run, the Excellerator can then be powered off by the DC POWER switch, and will again go through its normal shutdown procedure.

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Chapter 4

Troubleshooting

This chapter gives detailed information on troubleshooting a system and running the Excellerator's firmware-resident maintenance diagnostic. The major topics covered are:

- General troubleshooting procedures
- Running the firmware-resident diagnostics
- Error correction and reporting

4.1 General Troubleshooting

4.1.1 Power

Connect the AC POWER cord to the AC POWER receptacle on the rear panel of the Excellerator and turn the rear panel master DC POWER switch to the ON position.

The internal cooling fans will begin to operate. This indicates that the internal batteries are being charged and that the internal UPS is operating. If the internal fans do not operate, check the fuse on the rear panel.

When the master DC POWER switch on the rear panel is turned on, the Excellerator will go into a "Startup in Progress" cycle. During this period of time, the Excellerator will be "off-line" to the operating system. The operating system and controller microcode programs may not recognize the Excellerator when it is in a restore mode.

4.1.2 SCSI Problems

In the event the host system does not see the Excellerator on the SCSI bus, check the following:

- Ensure that the host bus adapter type (ie. "High Voltage Differential" or "Low Voltage Differential") matches the Excellerator.
- Ensure that the Excellerator has completed its restore/startup cycle before the host adapter polls the SCSI bus. Some adapters/host systems will not recognize the Excellerator when it is in restore/startup mode.
- Ensure that the Excellerator has a unique SCSI address on the SCSI bus. Host adapters are typically assigned to SCSI ID 7.
- The SCSI bus must be terminated with the proper type of termination. The overall length of the bus must be less than 25 meters for HVD, and 12 meters for LVD.

4.2 Backup and Restore Errors/ Internal Hard Drive Diagnostics

Internal hard drive diagnostics are included in the Excellerators. Approximately one minute after Startup and every five days thereafter, the Excellerators will automatically run an internal hard drive diagnostics test. This will not affect system operation, however the ACTIVITY lamp will illuminate for approximately one to two minutes during these tests.

4.3 Error Correction and Reporting

Solid Data Excellerators employ full syndrome error correction/detection to the memory array. This technique allows full correction of all single-bit errors with zero degradation in user performance. Syndrome is applied to every 8 bytes of data stored in the array. The memory array is structured to make multiple-bit error highly improbable from a statistical point of view. Multiple-bit errors are detected but not corrected.

Errors are reported through the SCSI bus according to the ANSI SCSI specification. "Check condition" is issued for any command ending in error. "Sense key 01 sense code 18H" indicates a correctable error, while "Sense key 03 sense code 11H" indicates a non-correctable error.

Errors reported to host computers via the SCSI bus are logged or reported to the console depending on the operating system. These errors will be in the same format as if they had been reported by a mechanical disk drive.

4.4 Spare Parts List

Table 4-1. Spare Parts List

<u>Solid Data Part</u>	<u>Description</u>
44001	Fuse, pico, 5 amp
44003-25	Fuse, 3AG, SLO, 32V, 25 amp
44005	Fuse, pico, 10 amp
44011	Fuse, 5X20MM, 5A, SLO
70108	Controller Card, LVD
70107	1 GB Memory Array
70111	2 GB Memory Array
70117	536 MB Memory Array
70103	Controller Card, HVD
75025-9100	Drive, HD, SCSI, 9.1GB
75012	Terminator, wide, HVD
75036	Terminator, wide, dual mode, SE/LVD
73044-xx	Cable, SCSI, 68 Micro"D" (M) to 68 Micro "D" (M), xx=length (")
73050-xx	Cable, SCSI, 68 Micro"D" (M) to 50 Micro "D" (M), xx=length (")
73058-xx	Cable, SCSI, 68 Micro"D" (M) to Centronics 50 (M), xx=length (")
73059-xx	Cable, SCSI, 68 Micro"D" (M) to 68 mini Centronics (M), (for IBM), xx=length
73102-xx	HVD VHDCI to 68 pin Micro "D" cable assembly
73103-xx	LVD VHDCI to 68 pin Micro "D" cable assembly
90006	Manual, Installation & Support
94001	CD, IOTest

Appendix A

External SCSI Cables and Accessories



Figure A-1. 73044 68 pin Micro "D" (M) to 68 pin Micro "D" (M) cable assy.



Figure A-2. 73059 68 Micro "D" to 68 mini Centronics (M) cable assy (IBM).



Figure A-3 73102 HVD, & 73103 LVD VHDCI to 68 pin Micro "D" cable assy.



Figure A-4. 43008 (Standard) Power Cord



Figure A-5. 43014 3' Power Cord or 43021 6' Power Cord



Figure A-6 75012 Terminator for HVD Applications



Figure A-7 75036 Terminator for LVD Applications

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Appendix B

Warranty and Service Policies

A.1 Warranties and Limitations

Solid Data warrants that the products to be delivered thereunder are free from defects in material and workmanship and meet Solid Data's performance specifications; provided, however, that (a) Solid Data's liability under this warranty is limited to repairing or replacing or issuing credit for (in the discretion of Solid Data) any product delivered hereunder not conforming to this warranty; (b) this warranty is limited to a one-year period commencing with the date of shipment of any such product; (c) minor deviations from specifications, which do not affect performance of the products covered hereby, are excluded from this warranty; (d) Solid Data will not be liable under this warranty unless (i) Solid Data is properly notified in writing by Buyer upon discovery of the failure of any product to conform to this warranty, (ii) such product is returned (with Solid Data's written approval) to Solid Data, transportation charges prepaid by Buyer, (iii) such product is received by Solid Data not more than 10 days after the last day of the one-year warranty period, and (iv) Solid Data's examination of such product discloses to Solid Data's reasonable satisfaction that such defects or failures have not been caused by misuse, neglect, improper installation, repair, alteration, or accident; (e) THE FOREGOING CONSTITUTES Solid Data's ENTIRE LIABILITY IMPLIED AND/OR STATUTORY (EXCEPT AS TO TITLE), AND STATES THE FULL EXTENT OF Solid Data's LIABILITY TO BUYER OR TO ANY OTHER PARTY FOR ANY BREACH OF SUCH WARRANTY AND FOR DAMAGES, WHETHER DIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL, RESULTING FROM ANY SUCH BREACH; and (f) OTHER THAN AS EXPRESSLY PROVIDED IN THIS DOCUMENT, NO WARRANTY IS MADE AS TO THE MERCHANTABILITY OF THE GOODS TO BE DELIVERED, NOR IS ANY WARRANTY MADE AS TO THE FITNESS OF SUCH GOODS FOR ANY PARTICULAR PURPOSE.

A.2 Service Policies

Before reporting a service problem, run all of the troubleshooting tests to determine that there is an actual problem and to isolate the problem. If, after running the troubleshooting tests, you determine that there is a service problem, please contact us at:

Solid Data Systems

ATTN: Customer Support
 2945 Oakmead Village Court
 Santa Clara, CA 95051
 TEL: 408/727-5497
 FAX: 408/727-5496

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Index

A

Applying Line Power 6

B

Backup and Restore Errors 16

Backup Power 2

Battery Charging 7

Block Diagram, Excellerator 2

C

Cables, SCSI 17

E

Error Correction and Reporting 16

F

Front Panel of an Excellerator 1

G

General Troubleshooting 15

H

Host Computer Installation 7

I

Initial Format 7

Installation 5

Internal Backup Hard Drive 2

Internal Hard Drive Diagnostics 13

Introduction 1

O

Operation 11

Overview 1

P

Power On 7

Power Consumption 2

Product Specifications 3

R

Rear Panel of an Excellerator 6

S

SCSI Cables 17

SCSI Cable Connections 6

SCSI Controller Specifications 3

SCSI Problems 15

SCSI Terminators 18, 19

Service Lamp 13

Service Policies 21

Setting SCSI ID 6

Shutdown Procedure 12

Spare Parts List 16

Startup Procedure 12

Summary of SCSI Characteristics 4

T

Termination 6

Troubleshooting 15

W

Warranty and Service 21