EMULEX SD59X™ Series Disk Drive Installation and Maintenance Manual

SM9050501-00, Rev A
September 1991

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Shielded cables must be used between the board and attached peripherals to prevent radio frequency interference from this source.

The above statement applies to products marketed in the U.S.A.

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The above statement applies to products marketed in Canada.

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Printed in U.S.A.

EMULEX STATEMENT OF WARRANTY

Effective: October 15, 1990

BASIC WARRANTY - In the absence of any optional warranty or continuing provisions extended by formal agreement, Emulex warrants its products in accordance with the schedules listed below.

CONTROLLERS - DATA COMMUNICATIONS PRODUCTS - Emulex warrants for a period of five (5) years from the date of shipment, that each product shall be free of defects in material and workmanship. These products include all disk and tape controllers, communication multiplexers, and communication servers.

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CABLE WARRANTY - All Emulex-provided cables are warranted for ninety (90) days from date of shipment.

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In the event product(s) returned under the provisions of this Warranty are subsequently determined by Emulex to be functionally operational and in accordance with its published specifications, i.e. "No Defect Found" (NDF), Purchaser will be charged an NDF fee and the product shall be returned to Purchaser freight collect.

ON-SITE SERVICES ARE NOT INCLUDED AS A PART OF THESE WARRANTIES.

GENERAL TERMS - The above warranties shall not apply to expendable components such as fuses, bulbs, and the like, nor to connectors and other items not a part of the basic product. Nor does the foregoing warranty extend to experimental or developmental products, or to products that have been subject to misuse, neglect, accident, improper media usage or abuse; have been improperly wired, repaired, or altered by anyone other than Emulex; have been used in material violation of Emulex's operating instructions; or have had their serial numbers removed, defaced or altered. Emulex shall have no obligation to make repairs or to provide replacement for normal wear and tear, or necessitated in whole or in part by catastrophe, fault or negligence of the user; or improper or unauthorized use of the product; or use of the product in a manner for which it was not designed; or by causes external to the product, such as, but not limited to, power failure or air conditioning malfunction. Emulex's sole obligation hereunder shall be to repair or replace items covered under the above warranties. Purchaser shall provide for removal of the defective product, shipping charges for return to Emulex, and installation of its replacement. Above warranties are subject to change without notice.

THE EXPRESSED WARRANTIES SET FORTH IN THIS AGREEMENT ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND ALL SUCH OTHER WARRANTIES ARE HEREBY DISCLAIMED AND EXCLUDED BY EMULEX. THE STANDARD EXPRESSED WARRANTIES ARE IN LIEU OF ALL OBLIGATIONS OR LIABILITIES ON THE PART OF EMULEX FOR DAMAGES, INCLUDING BUT NOT LIMITED TO SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THE PRODUCT.

Customer's sole and exclusive remedy for any breach of this warranty, whether in contract, tort, strict liability, or otherwise, shall be Emulex's obligation to repair or replace as set forth above.

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PREFACE

About This Manual

This manual describes the installation and maintenance procedures for the Emulex SD59X series disk drives.

Complete operating instructions are provided in the *SD59X User's Guide*, SM9050905-00 and are not repeated in this document. This manual contains the following sections:

- **Section 1 (Introduction)** describes the SD59X disk drives, lists the subsytem accessories, and gives the specifications of the subsystem.
- **Section 2 (Installation)** details the steps required to install the SD59X, connect all cables, and perform the required steps in software to attach the unit to the controller.
- **Section 3 (Troubleshooting)** describes the built-in diagnostics for identification and correction of most fault conditions.
- **Section 4 (Maintenance)** provides removal and replacement procedures for all field-replaceable components of the SD59X.
- **Appendix A (Switch Settings)** provides a reference for the location and default settings of the DIP switches and jumpers on the SM90–1, SM90-2, and servo boards within the SD59X.
- **Appendix B (Menu Charts)** provides a series of flowcharts which detail the different menus used for fault isolation.
- **Appendix C (Error Codes)** lists and interprets the complete series of error codes that may be displayed on the SD59X control panel.

Audience

This manual is intended for field service and maintenance personnel who are familiar with the procedures for working with electrostatic-sensitive components and sustained high-current power supplies.

Product Support

Emulex products are backed by a broad range of educational and technical support services. These services are available to you so that you can maximize your system performance and make effective use of our products.

For assistance in the continental United States, Alaska, or Hawaii, contact Emulex at:

- Technical Support
  California: (714) 662-5600
  Outside California: (800) 854-7112
  FAX: (714) 966-1299
- Ordering Acessories
  California: (714) 662-5600
  Outside California: (800) 854-7112
  FAX: (714) 241-0792, Attention: Order Administration
  TLX: 183627, Attention: Order Administration

Related Documentation

The following documents provide additional information about the SD59X series and related SDI components:

SD59X User's Guide, P/N SD9050905-00
DA01 Disk Data Channel Card User's Manual, P/N DA0150901-00
SDA900 Drive Tray Installation Instructions, P/N SM9051601-00
SDA900 Series Standard Disk Array Storage Subsystem User's Manual, P/N SM9050902-00

For information on the DEC controllers and their protocols for related diagnostics and utilities, refer to the following DEC publications:

Storage System Diagnostics and Utilities Protocol, P/N AA-L620A-TK

HSC50/70 Storage Controller
Installation Manual, P/N EK-HSC50-IN
Service Manual, P/N EK-HSC50-SV

HSC70 Storage Controller
Installation Manual, P/N EK-HSC70-IN
Service Manual, P/N EK-HSC70-SV

Section 1
INTRODUCTION

1.1 Overview

This section describes the SD59X series of disk drives and lists the specifications of each model. A list of accessories for expanding and maintaining the subsystem is also included.

WARNING!! The SD59X is designed to be installed and serviced only by authorized field service personnel. Opening the chassis may expose untrained personnel to dangerous shock.

CAUTION! All expressed and implied warranties concerning the mechanical and electrical reliability of this subsystem will be considered null and void if non-authorized personnel attempt to install the unit or if it is operated with any of the cover plates or outer shells removed. These covers must be in place to maintain proper air flow required for cooling.

1.2 General Description

The SD59X is a series of high-performance 5.25-inch disk drives that incorporate the DEC Standard Disk Interface (SDI), and implement full functionality of DEC's Digital Storage Architecture (DSA). Installation of the SD59X requires no modifications to your current system. Each drive features a 16-character display for operation menus, status messages, and error codes.

The SD590 is compatible with all DSA controllers, including the HSC40/50/70, UDA50, KDA50, and KDB50.

The SD591 is designed for operation with the 24 MHz KDM70 controller and Emulex DA01 channel card. Both models of the SD59X are fully compatible with HSC software, version 3.7 and above.

Operation and troubleshooting procedures are performed using five dual-function switches and a series of prompts or messages on the control panel display.

Two error reporting modes are available for troubleshooting a fault condition. The standard mode provides error reporting that can be used with programs such as DEC's VAX SIM+. An extended mode provides more definitive error reporting that system personnel may use to rapidly correct hardware faults.

Physically the SD59X consists of the following:

- A 5.25-inch HDA assembly with associated control electronics
- A high-capacity power supply
- An Emulex SM90 interface PCB Assembly
- An intelligent control panel with non-volatile memory for storing set-up parameters.

These components are packaged in a quarter-rack drive pan. The specifications for the SD59X are listed in subsection 1.4.

Table 1-1 lists the models in the SD59X series.

Table 1-1. SD59X Disk Drives

Disk Drive Model	Formatted Capacity (MB)
SD590	859
SD591	950

1.3 Subsystem Accessories

Table 1–2 lists the part numbers for accessories such as subsystem enclosures and additional SDI cables that you may need for installation or spares.

External SDI cables should be obtained from Emulex to be sure that the connector screws do not damage the unit's PCB or its components.

Table 1–2. Subsystem Accessories

Model Number	Description
SDR89	Rack Mounting Tray Kit
SDF89	Filler Plate Kit
SDI-12	External SDI Cable, 12-foot
SDI-25	External SDI Cable, 25-foot
SDI-50	External SDI Cable, 50-foot
SDA9X2	24-inch Pedestal (4 drives)
SDA9X4	42-inch Cabinet (12 drives)
SDA9X6	60-inch Cabinet (18 drives)

For ordering information, contact Emulex Sales Support at the following address and telephone number:

Emulex Corporation
3545 Harbor Boulevard
Costa Mesa, CA 92626

California Telephone: (714) 662–5600
Outside California: (800) 854–7112

FAX: (714) 241–0792 Attention: Order Administration
TLX: 183627 Attention: Order Administration

1.4 Specifications

Tables 1–3 and 1–4 contain the specifications of the SD59X.

Table 1–3. General Specifications of the SD59X

Parameter	Description
Languages Displayed	English, French, German, Spanish, Japanese
Compatibility	
Controllers	KDA50 (SD590) KDB50 (SD590) KDM70 (SD590, 591) UDA50 (SD590) HSC40/50/70 Emulex DA01 (SD590, 591) HSC5X-BA (SD590) HSC5X-DA (SD590)
Software	HSC Version 3.7 or above
Dimensions	
Height	5.0 inches (127 mm)
Width	9.25 inches (235 mm)
Length	25.5 inches (648 mm)
Weight	20 pounds (9.1 kg)
Input Voltage	
100–240 VAC	Autoranging (no voltage switch setting required)
Power Consumption	
115 VAC	60 Hz, 3 A max., 185 W
230 VAC	50 Hz, 2 A max., 200 W
Disk Drive	
Formatted Capacity	
SD590	859 MB
SD591	950 MB
Transfer Rate	
SD590	22 MHz (2.8 MB/s)
SD591	24 MHz (3.0 MB/s)
Average Latency	5.56 milliseconds (disk rotates at 5400 rpm)
Seek Time	
Full	22.5 milliseconds maximum
Average	11.5 milliseconds
Single Track	1.7 milliseconds maximum

Table 1–4. Environmental Specifications of the SD59X

Parameter	Description
Temperature	
Operating	50° to 113°F (10° to 45°C). Maximum temperature is reduced 1°F per 1000 feet (1.8°C per 1000 meters) of altitude.
Rate of Change	27°F (15°C) per hour, max.
Storage (Packaged)	14° to 122°F (-10° to 50°C).
Rate of Change	27°F (15°C) per hour, max.
Transit (Packaged)	-40° to 140°F (-40° to 60°C).
Rate of Change	36°F (20°C) per hour, max.
Humidity	
Operating (no condensation allowed)	20% to 80% maximum wet bulb of 82°F (28°C) and a minimum dewpoint of 36°F (2°C).
Storage (Packaged)	5% to 95%
Transit (Packaged)	5% to 95%
Baraometric Pressure	
Operating	-1,000 to 6,560 feet (-305 to 2,000 meters) 30 inches Hg (104 kPa) to 23 inches Hg (79 kPa)
Storage (Packaged)	-1,000 to 10,000 feet. (-305 to 3,000 meters) 30 inches Hg (104 kPa) to 20 inches Hg. (69 kPa)
Transit (Packaged)	-1,000 to 40,000 feet. (-305 to 12,192 meters). 30 inches Hg (104 kPa) to 6 inches Hg (19 kPa)

Section 2
INSTALLATION

2.1 Overview

This section details the procedures required to install the SD59X in your system. Installation includes setting the spin-up delay, mounting the drive in your system cabinet, connecting cables, and performing an initial power up self-test.

The following checklist summarizes the steps required to install your SD59X and prepare it for operation.

INSTALLATION CHECKLIST

- ☐ 1. Inspect the SD59X for signs of shipping damage.
- ☐ 2. Evaluate the power capacity of the subsystem and the number of drives in the subsystem. If spin-up delays are required, set them on the SM90–1 and Servo boards in the SD59X.
- ☐ 3. Mount the SD59X in the enclosure and assemble the bezel and control panel to the drive.
- ☐ 4. Connect AC power and SDI cables to the rear panel.
- ☐ 5. Apply power and run preliminary diagnostics to verify the SD59X is fully functional.
- ☐ 6. Set the Error Reporting mode from the control panel.
- ☐ 7. Set the Unit ID on each drive.
- ☐ 8. Attach the SD59X to the controller. Use the operating system commands to Initialize and Mount the drive.

2.2 FCC Compliance

The SD59X has been tested and found to comply with the limits for a Class A computing device in a properly shielded system. Connection to the SDI bus is via shielded cable. Emulex offers shielded cables for the SD59X in various lengths for all installation sites.

The SD59X generates and uses radio frequency energy. If it is not installed and used strictly in accordance with the instructions contained in this manual, it may cause Electromagnetic interference (EMI) with radio and television reception. The installer is responsible for proper installation, including maintaining the shield that is built into equipment cabinets. Routing of cables between the SD59X and the system will have a major impact on the amount of EMI that is radiated by the system. Emulex is not responsible for any radio or television interference caused by unauthorized installation or modifications to the SD59X.

If the SD59X causes interference to radio or television reception as determined by turning the SD59X off and on again, use the following to reduce the effects:

- Plug the subsystem into a different power outlet so that the subsystem and receiver are on separate branch circuits.
- Verify that the mounting screws and ground wires on the subsystem cabinet are securely fastened on the cabinet and to the ground plane.
- Reorient the receiver's antenna.
- Relocate the subsystem (containing the SD59X) with respect to the receiver.
- Move the subsystem away from the receiver.

If necessary, consult the dealer or an experienced radio/television technician for additional suggestions. Additional information is contained in the FCC publication *How to Identify and resolve Radio–TV Interference Problems*, Stock No. 004-000-00345-4. This is available form the U.S. Government Printing Office, Washington D.C. 20402.

2.3 Pre-Installation Inspection

Before unpacking the SD59X, inspect the shipping carton for evidence of possible shipping damage. Report any damage to the shipping company as directed on the form included in the carton.

Open the carton and verify that the model or part number, revision level, and serial numbers agree with those on the shipping invoice and purchase order. Visually inspect the unit for bent or broken connector pins, cracks or dents in the cabinet, or other obvious physical damage. Immediately report any such damage to Emulex.

NOTE: If you are installing more than one SD59X, be sure to keep each drive with it's respective control panel. The control panel firmware contains the serial number of the drive, which is required to maintain warranty traceability.

CAUTION! The SD59X contains Electrostatic Sensitive Devices. Use a wrist strap or other appropriate anti-static procedures when handling the SD59X and any of the circuit boards within the unit.

2.3.1 Verify Correct Voltage

The SD59X features automatic voltage selection. However, it is important that the input voltage is within the range of 100–240VAC.

WARNING!! Improper AC voltage may result in personal injury and permanent damage to equipment. The AC voltage must be within the range of 100–240 VAC.

AVERTISSEMENT Une mauvaise sélection de la voltage c.a. peut provoquer des blessures et endommager irrémédiablement l'équipement. La voltage c.a. doit être dans l'etendue 100–240 V c.a.

WARNUNG Falschen Wechselspannung kann zu Verletzungen des Bedienungspersonals und dauerhaften Schäden am Gerät führen. Die spielraum des Wechselspannung müssen sein 100–240 V Wechselstrom.

ADVERTENCIA La selección inadecuada del voltaje c.a. puede resultar en lesiones personales y daño permanente al equipo. El voltaje c.a. debe estar en el alcance 100–240 V c.a.

チユウイ!! コウリユウデ ンアツヲアヤマツテセツテイ スルト
ジ ンタイニキケンデアリ、キキヲハカイスル
オソ レガアリマス。コウリユウデンアツハ、
100–240 VAC ノハンイニセツテイ
サレテイナケレバナリマセン。

2.4 Configure the Drive

If you are installing one or two SD59X drives in a enclosure, you may skip this section and proceed with subsection 2.5.

If you are installing the SD59X in a system with eight or more other SDI drives, the initial power requirements when all drives are powered up may exceed the capacity of the subsystem controller. For this reason, you may want to set the spin-up delay of each drive at 10-second intervals. To do this, you have to set the Spin-up Delay switches.

To determine the number of drives to be spun-up at each interval, refer to the appropriate documentation for your power distribution system. If the drives are installed in an Emulex SDA900 Series enclosure, refer to the *SDA900 Series Standard Disk Array Storage Subsystem User's Manual.*

2.4.1 Access the Switches

To gain access to the Spin-up Delay switches, you will have to lift the drive out of the SD59X chassis as described below. Before proceeding, be sure that the AC power cord is not connected to the drive or to the AC power source.

1. Remove twelve screws securing the top cover to the drive chassis. Lift the cover from the chassis and place the screws and cover in a secure location. Figure 2–1 shows the SD59X drive with top cover removed.
2. Loosen the four Phillips-head screws securing the drive bracket to the chassis. Do not remove these screws.
3. Grasp the drive bracket by the handle and slide the assembly toward the power supply until the large portion of the screw slots are under the four screw heads (Detail A in Figure 2–1).

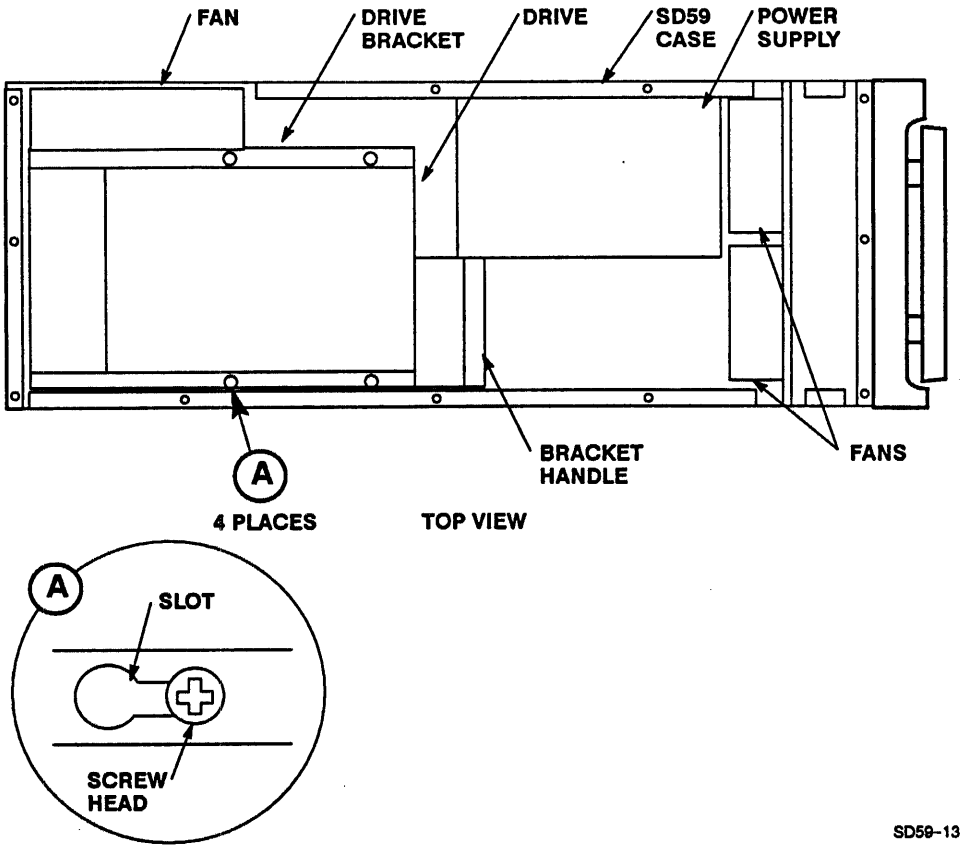


Figure 2–1. SD59X With Top Cover Removed

4. Carefully lift the drive out and place it on top of the chassis so that you have access to the rear and sides of the drive.

5. Loosen four screws shown in Figure 2–2 that secure the rear shield to the sides of the drive. Next, disconnect the cable from the socket and lift the shield with cable attached, up off the drive.

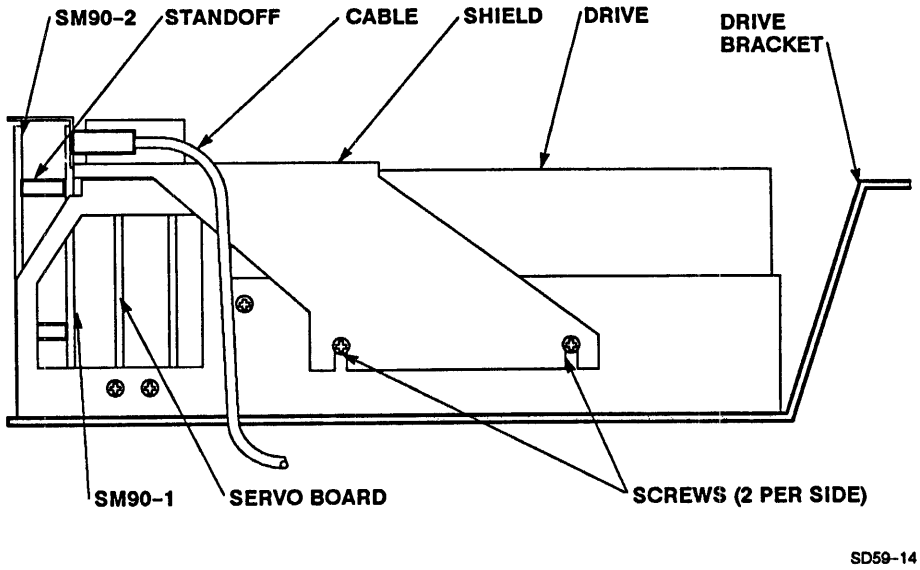


Figure 2–2. SD59X Drive and Shield

6. Remove four screws from the corners of the SM90 board assembly, located at the rear of the drive.

   CAUTION! Electrostatic Sensitive Devices. Use a grounded wrist strap or other appropriate antistatic procedures when removing, handling or inserting boards in the SD59X.

7. Remove the SM90-2 board from the SM90–1 by grasping the board and pulling it toward you, out of the drive.

8. Unscrew the two stand-offs from the upper corners of the SM90–1 board. Remove the board by lifting it up and out of the drive assembly. The Servo board switches are now accessible.

2.4.2 Set Configuration Switches

NOTE: If you wish to change the delay, you must do so on S1 of the Servo board and SW1 of the SM90–1 board.

Refer to Table A–1 (Appendix A) to determine switch settings for the desired delay of each SD59X in the enclosure. Set SW1 on the SM90–1 board and S1 on the Servo board as follows:

1. Figure 2–3 shows the Servo board. Set switches S1–5 through S1–8 as instructed in Appendix A for the desired spin-up delay.

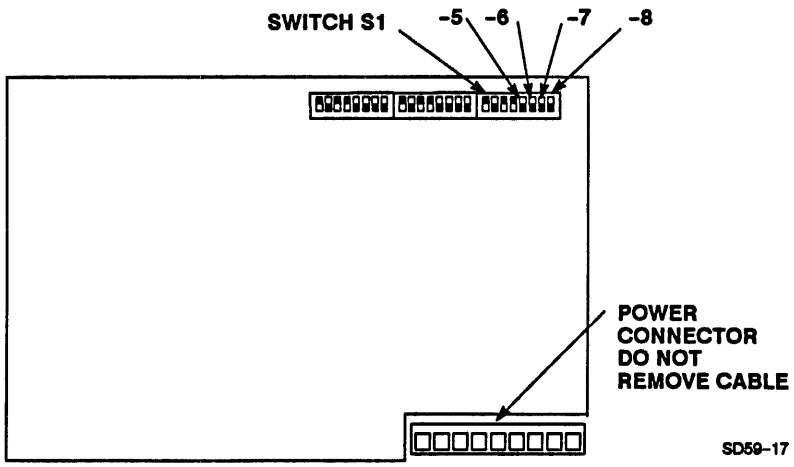


Figure 2–3. Switch S1, Servo Board

2. Figure 2–4 shows the SM90–1 board. Set switches SW1-8 through SW1-10 as instructed in Appendix A for the same delay you set in Step 1.

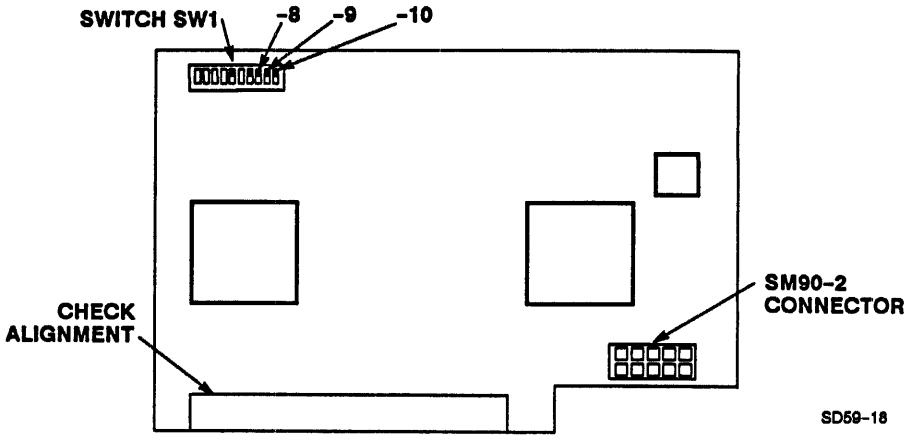


Figure 2–4. Switch SW1, SM90-1 Board

3. Replace the SM90-1 board. Press the board firmly onto the socket in the drive. Be sure the connector on the board is aligned with the pins on the motherboard.
4. Secure the boards with the two stand-offs you removed earlier.
5. Replace the SM90-2 board. Insert the pins on the rear of SM90-2 into the socket on the front (component side) of the SM90-1. Secure the boards with the four screws you removed earlier.

2.4.3 Reassemble the Drive

Replace the disk drive in the chassis and replace the covers as follows:

1. Place the shield over the rear of the disk drive and connect the panel cable to the socket at the rear of the SM90–1 board. Install four screws to secure the shield in place.
2. Carefully lower the drive into the chassis. Be sure the power cable remains connected at the lower right corner of the drive.
3. Push the drive toward the rear of the chassis to engage the mounting screws in their respective slots. Tighten the four screws.
4. Carefully examine the drive and chassis to be sure that all cables are connected and there are no wires or cables crimped between panels or brackets.
5. Place the top cover on the chassis and secure it with the twelve screws you removed earlier.

2.5 Mount the SD59X

To ensure proper air circulation, the SD59X must be mounted in an enclosure. The enclosure may be the Emulex SDA2 pedestal or a 19-inch RETMA rack such as the Emulex 42-inch (SDA4) or 60-inch (SDA6) enclosures. If you will be installing a single SD59X on a drive tray, use the SDF89 filler kit to cover the unused side. Each SD59X is mounted into the enclosure as follows:

1. If required, mount the drive tray in the enclosure using the appropriate hardware.
2. Slide the SD59X into the drive tray until it stops against the rear lip of the tray. Insert a locking bracket into the slot at the front of the tray.
3. Position the drive behind the locking bracket and secure the drive to the bracket with a locking screw as shown in Figure 2–5.

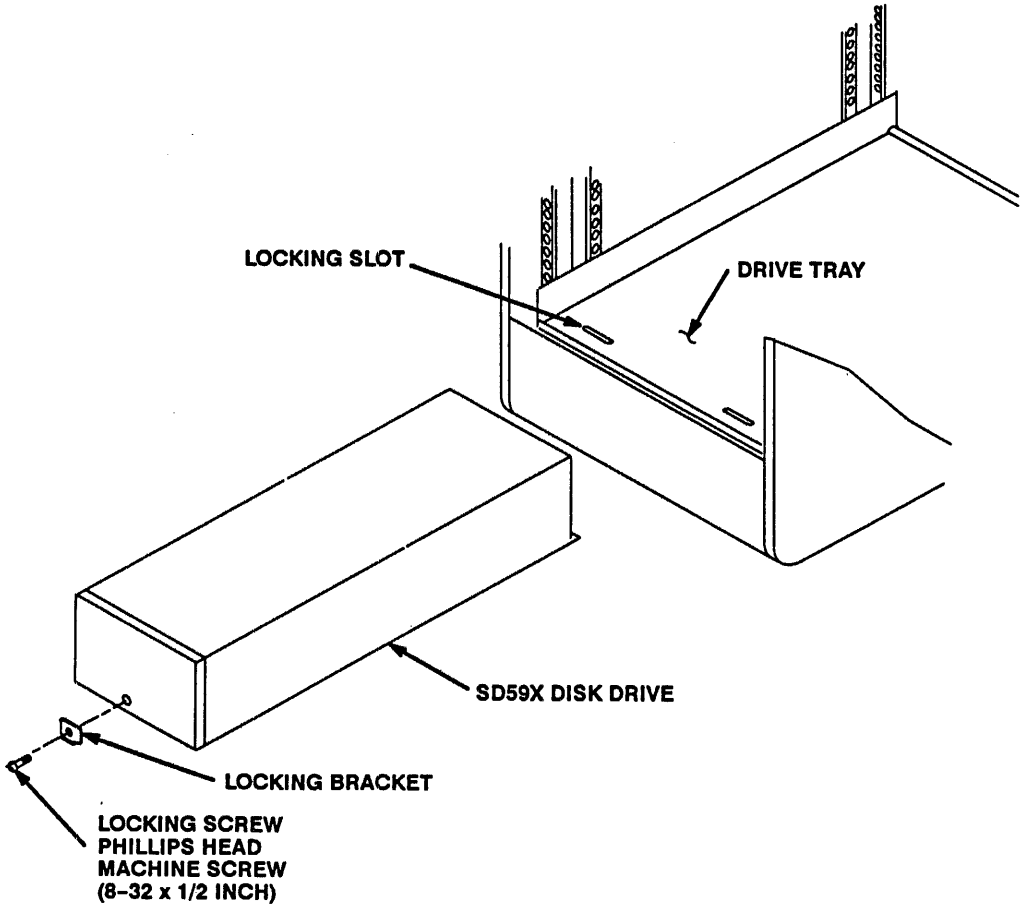


Figure 2–5. Mounting SD59X in Drive Tray

4. Place the bezel on the front of the drive chassis and fasten it losely with two screws in the upper holes (Figure 2–6).
5. Insert the filter neatly behind the bezel. Make sure that the panel I/O cable protrudes from the drive chassis through the cutout in the bottom of the filter and on the bezel.
6. Carefully plug the I/O cable onto the connector at the rear of the control panel.
7. Slip the two copper shield straps from the rear of the control panel between the bezel and the drive chassis. Align the holes in the straps with the holes in the bezel.

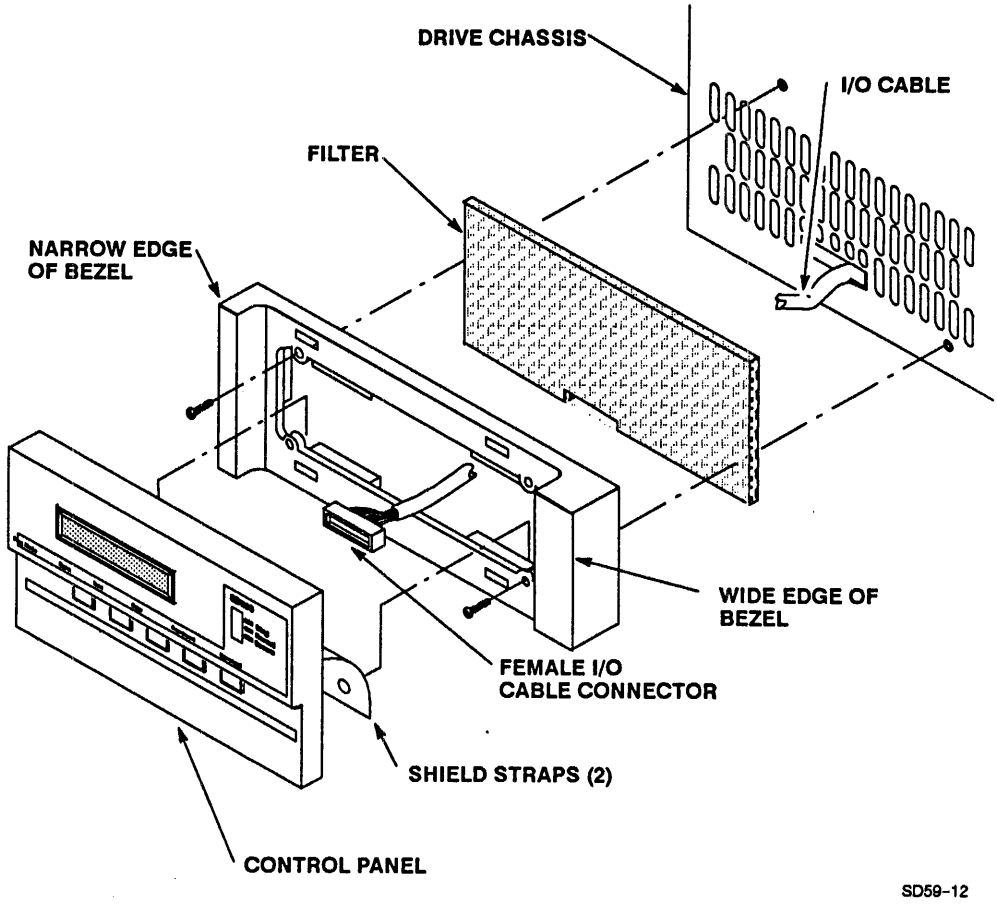


Figure 2–6. Mounting the Filter, Bezel, and Control Panel

8. Install two screws in the lower holes to secure the straps. Tighten the four screws to secure the bezel to the chassis.
9. Press the control panel into the front bezel. Be sure all four tabs on the panel are locked into the corresponding slots on the bezel.

2.6 Connect SDI Cables

The SD59X permits connection to two separate controllers for convenient, rapid switching in case of a system crash. For this reason, the rear panel is equipped with two interface connections, labeled Port A and Port B.

To use this feature, be sure the ports are connected to two similar but separate controllers on a cluster or system featuring automatic failover (e.g., one HSC50 and one HSC70).

CAUTION! Emulex cables are designed specifically for the SD59X series drives. If you use SDI cables that were not provided by Emulex, be sure that the cable-mounting screws do not protrude from the connector housing by more than 0.25 inches.

If you are connecting the SD59X using External SDI cables, the cables may be attached directly to the port connectors and secured using the two captive screws on the connector. Refer to Table 1–2 for a list of cables available from Emulex.

If you are using Internal SDI cables, they should be attached using the cable-support assembly shown in Figure 2–7. To connect the internal cables:

1. Attach the bracket assembly to the rear of the drive using two 4-40 x 3/8-inch screws.
2. Place the two SDI cables (Port A and Port B) on the cable bracket. Be sure the connectors are oriented correctly, with the large notch facing down.
3. Insert the Port A and Port B cables into the respective sockets at the rear of the unit. Ensure the SDI cable is fully seated in each connector.
4. Place the cable clamp across the two cables and secure it to the bracket with two 4-40 x 3/8-inch screws.

This method is required to ensure proper grounding connections for the internal cables when installing the drive in an SDA9XX Series subsystem. It also provides a support for the cables, reducing the possibility of damage to the connector from the cable weight.

Refer to the appropriate DEC documentation for details on connecting the SDI cables to the controllers.

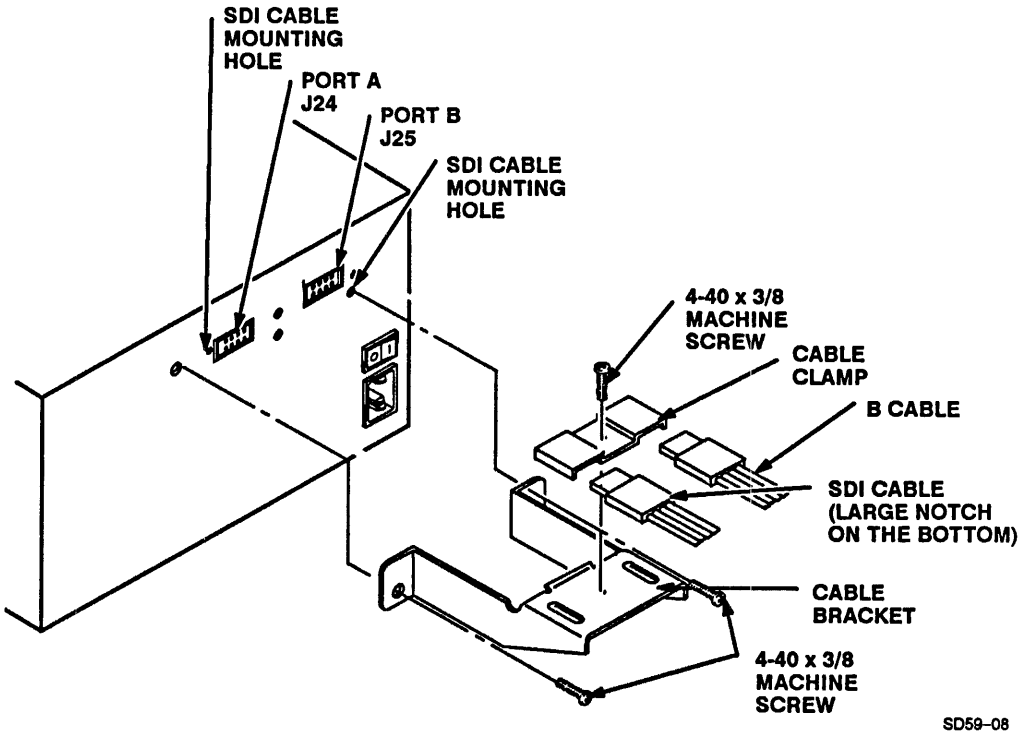


Figure 2–7. SD59X Cable Connections

2.7 Initial Power-Up and Testing

Be sure the input voltage is between 100 and 240 VAC before proceeding. Connect a power cord between the socket on the SD59X (Figure 2–8) and the AC power outlet.

Press the power switch on the rear panel to the ON (|) position. This will apply power and initiate a series of self tests to verify proper operation.

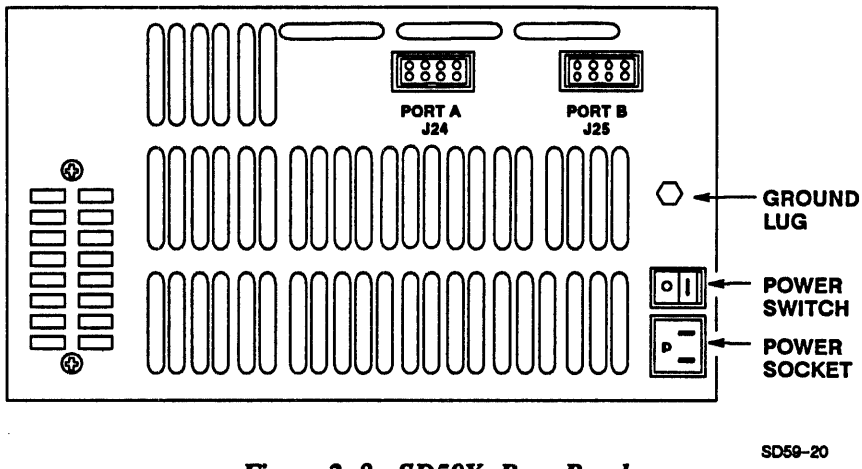


Figure 2–8. SD59X Rear Panel

2.7.1 Run Preliminary Diagnostics

When all self-tests are complete, the display reads `0 STOPPED` where `0` is the MSCP address (Unit ID) of the drive. Run the following diagnostic routine to exercise the drive before placing it in service.

1. Press and release the <Run> switch to spin up the drive. Wait until the LED on the <Run> switch is on (not flashing) and the display reads `0 READY`.
2. Be sure the Port A and Port B switches are off (LEDs are not illuminated). Slide the Mode Select switch to the Diagnostic position.
3. Press the <Menu> switch, if required, to change the display to read `1a Run Tests`.
4. Press the <Enter> switch to select the test mode. Press <Enter> again to select `2a Default Sequence`, and again to select `3a Start Test(s)`.
5. Begin the test sequence by pressing <Enter>. The display indicates each test number while it is being run.
6. During this procedure, the display will indicate `Test #0E Err #xx` and the <Fault> switch LED will go on. This is normal for this test, because the loop-back plugs were not installed.
7. Press the <Fault> switch to clear the error and continue the tests.
8. If all of the other tests are successful, the display will indicate `Tests Passed`, followed by `3a Start Test(s)`.
9. Place the Mode Select switch in the Normal position and continue with the installation in the next subsection.
10. If any of the tests indicate a failure, refer to Section 3 to troubleshoot the unit before placing it in service.

2.8 Set the Error Reporting Mode

The SD59X drives may be set for Standard or Emulex Extended mode error reporting. In Standard mode, the device reports errors using only the DEC-implemented codes which can be read and implemented into utilities such as VAX SIM+.

If the Emulex Extended mode is selected, a more definitive set of error codes is used. Even though the extended codes are not recognized by DEC's utilities, they may be used by Emulex Technical Support and Service personnel to quickly identify and correct most faults that may occur with the SD59X.

Use the following procedure to set the error reporting mode:

1. Be sure that both Port A and Port B are OFF. Set the mode Select switch to the Diagnostic mode.
2. Press <Next> to change the display from `1a Run Test(s)`, to `1b Show/Set`.
3. Press <Enter> to change the display to `4a Unit Number`.
4. Press and release the <Next> switch several times until the display reads `4f Err Reporting`.
5. Press <Enter> to display `6a Std Report`.
6. Use the <Next> switch to toggle between `6a Std Report` and `6b Extd Report`. Press <Enter> to select the desired method. The default is Standard Reporting.
7. Press <Menu> to return to the beginning of the menus. Slide the Mode Select switch to Normal.

2.9 Prepare the SD59X for Operation

The following procedures prepare the SD59X for operation with the host system. This requires assigning the unit ID, attaching it via software to the controller, and setting some basic parameters from the control panel.

NOTE: The SD59X drives are formatted at the factory and should not be reformatted. To properly reformat the drive, you must use the Media Defect List attached to the inside chassis.

Because the various operating systems use different command syntax, it is beyond the scope of this manual to provide the exact commands for all systems. This section provides examples of command strings for systems running under VMS. If your system uses a different operating system, please consult your DEC system documentation for the commands appropriate to your system.

2.9.1 Determine Unit ID

Use the following procedure to determine the correct unit ID for the new drive. This number will be used to set the ID in subsection 2.9.2:

NOTE: HSC40/50/70 Cluster Controllers require HSC Software version 3.70 or later. Prior to version 3.70, the Replacement Block Number (RBN) was limited to a maximum of 15 bits. The larger size SD59X drives (1.2 GB) require an RBN of more than 15 bits.

1. For systems with the HSC40/50/70 controllers:
   a. At the HSC terminal, type `SHO DISKS` at the `HSC>` prompt to display the current SDI drive unit numbers.
   b. Select an unassigned number for each new drive you are installing. Be sure that each drive has its own unique number.
2. For systems with the KDA50, KDB50, or UDA50 controllers:
   a. In VMS, display the controller mnemonic by typing `MCR SYSGEN SHO/CON`.
   b. At the VMS prompt ($) type `SHO DEV D <CR>` to display the list of current SDI drive unit numbers.
   c. Select an unassigned number for each new drive you are installing. Be sure that each drive has its own unique number.

2.9.2 Set Unit ID on the SD59X

For each unit being installed, set the unit ID as follows:

1. Set the Mode Select switch to the Diagnostic position.
2. Use the <Menu> or <Next> switch to toggle the display to read `1b Show/Set`. Press <Enter> to display `4a Unit Number`.
3. Press <Enter> to display `Set Unit # Ω`.
4. Use the <Increment> or <Decrement> switch to set the first digit of the unit ID.
5. If the unit ID consists of more than one digit (e.g., unit #205), press <Next> to advance to the second digit. The display will read `Set Unit # ΩX`, where X is the number you set in Step 4.
6. Repeat step 5 for the third and fourth digits if required, to complete entering the unit ID.

   NOTE: Unit IDs may be in the range of 0 to 4094. If a value outside this range is entered, you will see the message `Invalid Unit No`. If this occurs, check your numbers and repeat steps 2 through 6 to enter the correct number.
7. If you enter an incorrect ID, press <Menu> to abandon the current setting and return to the display `4a Unit Number`. Repeat steps 3 through 6.
8. Save the unit ID in NOVRAM by pressing <Enter>. After saving the ID, the display returns to `4a Unit Number`.
9. Return the unit to the Normal mode with the Mode Select switch.

2.10 Attach SD59X to the Controller

The following software procedures are required to attach the SD59X to your controller. These procedures are for systems running under VMS. If your system uses a different operating system, refer to the appropriate system documentation for your system.

2.10.1 HSC40/50/70 Cluster Controllers

Use the following procedure for systems with the DEC HSC40/50/70 controllers:

1. From the HSC terminal, type `R SETSHO` to display the `SETSHO>` prompt. Next, type `SHO REQ` to display the list of hardware.

   Verify that you have a DEC channel card with REV 34 or higher. This will appear on the terminal as `Enabled K.sdi MC- xx`, where xx is the REV number. For systems with channel cards below REV 37, SERDES overrun errors can be reported when ILEXER is running in the user area of the HSC.

2. At the `SETSHO>` prompt, type `SHO DISKS` to verify that the new unit ID numbers are included.

3. Log into VMS and perform an INITIALIZE (INIT) on the drive.

4. Perform a MOUNT (MOU) and BACKUP/VERIFY (BAC/VER) on the drive.

5. Repeat steps 3 and 4 for each drive you installed.

6. Check the dual port failover by deselecting the Port switch that is illuminated. The deselected port controller should display an error and the other port should go on-line.

7. Press the Port switch to enable the desired port if it was turned off during this procedure. If the <Run> switch LED is not illuminated, press the switch to spin up the drive. The SD59X is now ready for routine operation.

2.10.2 KDA50, KDB50, and UDA50 Controllers

The following procedure is for attaching the SD59X to systems using the Emulex DA01 channel card as well as those systems using DEC's KDA50, KDB50, KDM70, or UDA50 channel cards.

1. Be sure the external SDI cable from the controller is connected to either Port A or Port B on the rear of the SD59X.
2. Turn the corresponding Port switch (A or B) ON by pressing the switch and illuminating the LED.
3. Log into VMS and use the command `SHO DEV D` to obtain a list of connected SDI drives. Be sure the new drives are included.
4. Perform an INITIALIZE (INIT) on the drive.
5. Perform a MOUNT (MOU) and BACKUP/VERIFY (BAC/VER) on the drive.
6. Repeat steps 4 and 5 for each drive that you installed.
7. Press the Port switch to enable the desired port if it was turned off during this procedure. If the <Run> switch LED is not illuminated, press the switch to spin up the drive. The SD59X is now ready for routine operation.

Section 3
TROUBLESHOOTING

3.1 Overview

This section describes the procedures for running diagnostic routines resident in the SD59X, interpreting the error codes and messages, and troubleshooting most problems that can occur with the SD59X.

WARNING!! Some of the procedures in this section require opening the SD59X chassis. This should be done only by authorized field service personnel. Opening the chassis may expose untrained personnel to dangerous shock. The chassis covers must be replaced immediately after performing any troubleshooting to ensure proper air flow throughout the drive chassis.

3.2 Preliminary Troubleshooting

If a problem occurs during the installation, examine obvious sources of error before running a series of extensive diagnostic programs. After reviewing the procedures in Section 2, carefully examine the SD59X and host controller for the following:

- If the SD59X exhibits symptoms of power failure, refer to subsection 3.2.1.
- Be sure that the SDI cables are correctly connected between the controller and either Port A or Port B of the SD59X.
- Check the cable connectors to be sure there are no bent or broken pins.
- Be sure the drive is spun up and the correct Port switch is enabled.
- Check the controller to be sure that it passed its self-test.
- Check the switch on the control panel to be sure it is set to the Normal mode and that the <Run> LED is illuminated.

If you are experiencing a problem and all of the above items are normal, run the diagnostic routines as described in subsection 3.3.

3.2.1 Troubleshooting Power Problems

If the SD59X fails to power-up as evidenced by a blank display and the LEDs do not illuminate, check the following items.

1. Verify that the power cord is connected to an outlet supplying between 110 VAC and 240 VAC. Be sure the power cord is connected to the outlet and the rear panel of the SD59X.
2. Be sure the Power switch on the rear panel is set to the ON position. This is marked on the switch with a bar (—).
3. If correct power is being supplied, the internal temperature sensor may have failed.
   a. Remove the power cord from the rear of the SD59X and from the power source.
   b. Remove the top cover of the SD59X by removing twelve screws and lifting the cover from the unit.
   c. Use an ohmmeter to measure the resistance of the temperature sensor, shown in Figure 3-1 . If the resistance is greater than 10Ω, the sensor is defective and must be replaced.

NOTE: The temperature sensor is designed to open (infinite resistance) at an ambient temperature of 122°F (50°C).

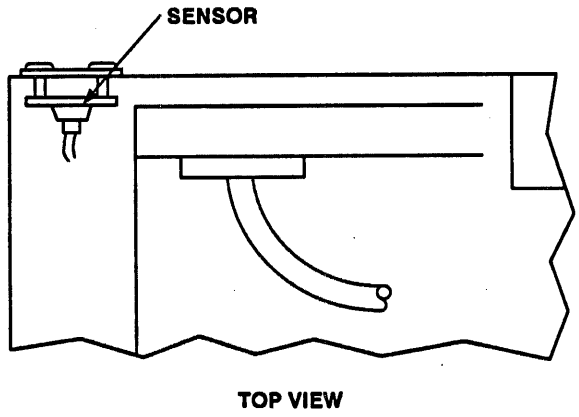


Figure 3-1. Location of Temperature Sensor

3.3 Using Internal Diagnostics

The internal diagnostics allow you to run a series of tests on the entire SD59X or on a single function individually. Before proceeding with the diagnostics be sure that the Host system will not try to access the drive during these tests.

3.3.1 Prepare SD59X for Diagnostics

The following procedure prepares the SD59X to run the diagnostic routines:

1. If the unit is in the Normal mode, be sure the drive is not being accessed by the host computer.
2. Press the <Run> switch to initiate a spin-down. Wait for the READY message on the display, and be sure the Run LED is OFF. If either Port switch LED is illuminated, press the switch to turn it OFF.
3. At the rear panel of the SD59X, remove the SDI cables from Port A and Port B. Install the special loop-back plugs in the Port connectors as shown in Figure 3–2.

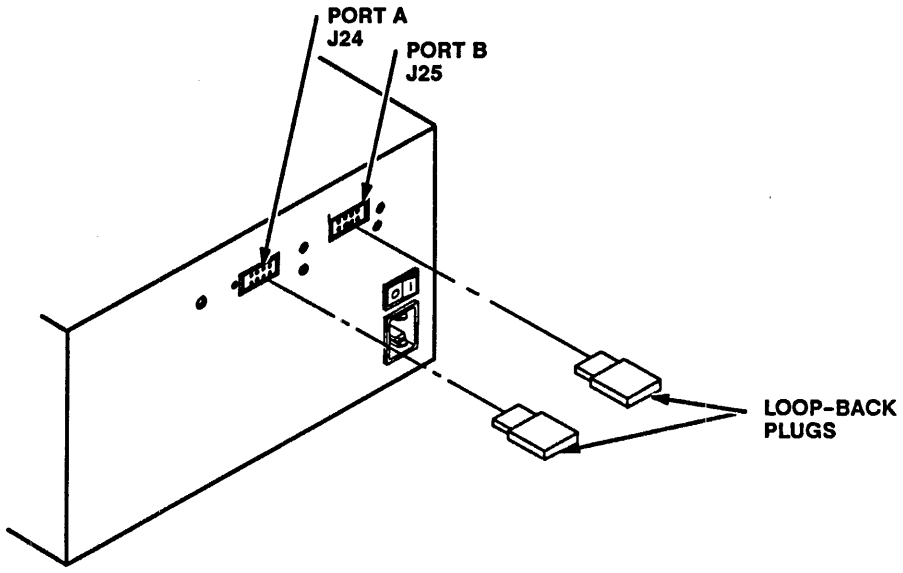


Figure 3–2. Install Loop-Back Plugs

4. Press the <Run> switch to spin-up the drive. The display reads SPIN-UP and the Run LED flashes. Wait a few seconds for the LED to stop flashing. The display either reads READY or shows a cylinder number, indicating the drive is spun up.

5. Set the Mode Select switch to the Diagnostic position. This illuminates the yellow LED and displays a series of messages, ending with `1a Run Tests` (see Figure C-1).

6. Press <Next> to display the message `1b Show/Set` then press <Enter> to display `4a Unit Number`.

7. Press and release <Next> several times until the display reads `4f Err Reporting`. Press <Enter> to select this option. The display now indicates the current reporting mode, either `6a Std Report` or `6b Extd Report`.

8. Use the <Next> switch to toggle the display to your desired reporting mode, and press <Enter> to set the option.

9. Press <Menu> twice to exit this menu and return the display to `1a Run Test(s)`.

10. If an error log is present on the unit's memory, the action described in step 9 results in a display of `1b Show/Set`. In this case, press <Next> to display `1a Run Test(s)`.

3.3.2 Run the Diagnostics

Figure 3–3 illustrates the structure of the diagnostic menus. These are divided into two groups – Functional Tests and Control Parameters.

The Functional Test menus are used to select the specific tests to be run, set the number of passes, and start the test sequence. When the Diagnostic mode is first entered, the unit defaults to the Functional Test menu indicated by the display message `1a Run Tests`.

The Control Parameter menus are used for setting the display language and error reporting mode, as well as for reading the status registers and serial number of the drive.

Appendix C contains a series of menu flowcharts that illustrate the operation and inter-relationship of each menu.

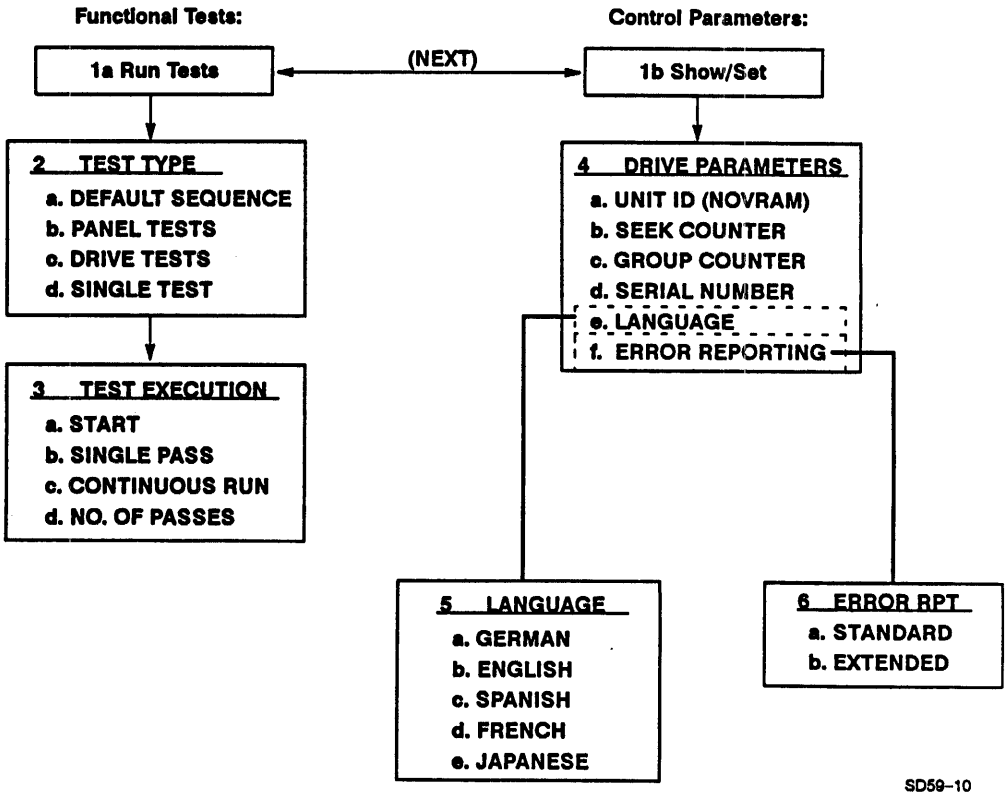


Figure 3–3. Diagnostic Menu Organization

Table 3–1 lists the tests that may be run in selected groups (Default, Drive, or Panel), or individually as a Single test.

Table 3–1. SD59X Function Test

Test Number	Test Description
1	PROM Verification
2	Control Panel LED Test
3	Sector Count Port
4	Read/Write Controls
5	Clock Controls
6	Maximum Sector Number Output Port
7	HDA Interface Ports
8	Control Panel Switches
9	Timer 5.5
A	Timer 6.5
B	Interrupt 7.5 Status A and B
C	SDI Output Port
D	SDI Command/Response - Data I/O
E	SDI Cable Loop-back - Both Ports
F	Diagnostic Data I/O Ports
10	Disk Data Read/Write Verification
11	Seek Error and Fault Error Recovery
12	Interlock Status
13	Interrupt Control Port

To run any or all of the tests do the following:

1. From the Diagnostic mode, switch the display to read `1a Run Test(s)` if it is not already at that point.
2. Press <Enter> to obtain the message `2a Default Seq`. Next select the type of testing you wish to perform.
   a. `2a Default Sequence` will perform each of the tests in Table 3-1. Press <Enter> to run these or <Next> to display `2b Panel Test`.
   b. `2b Panel Test` exercises the switches and LEDs on the control panel. Press <Enter> to select or <Next> to display `2c Drive Tests`.

c. `2c Drive Tests` check Read/Write operations, head seek functions, and sector counts. Press <Enter> to run these tests or <Next> to display `2d Single Test`.

d. To run a single, selected test, press <Enter>. When the display reads `Enter Test: # XX`, use the <Increment> and <Decrement> switches to enter the test number selected from Table 3-1.

3. Press <Enter> to set the test cycle or repetition count, `3a Start Test(s)`. As illustrated in Figure C-3, press <Next> to select one of the three options listed below. Press <Enter> to begin the cycle. The <Menu> switch exits back to Step 2.

   a. Selecting `3b Single Pass` runs the desired test(s) a single time and returns to the `Start Test(s)` display.

   b. Selecting `3c Continuous` runs the desired test sequence until it is stopped by pressing <Menu> to exit the cycle.

   c. Use `3d Set Passes` to run the test cycle for a specified number of times. Use <Enter> to display `Passes (1-255) XXX`. Use the <Increment> and <Decrement> switches to set the repetition count.

4. Press <Enter> to begin the selected test cycle. The system performs each test. Upon completion, if no errors are encountered, the display reads `Tests Passed`, followed by `3a Start Test(s)`.

5. During the Panel Test (Menu item 2b), the message `Test 08 Set NM` will appear. When this occurs, proceed as follows:

   a. Set the mode Select switch to Normal and press each switch starting with <Run/Menu> and ending with <Port B/Increment>.

   b. When the display reads `Test 08 Set DM`, set the Mode Select switch back to Diagnostics to continue the test.

6. If any test detects an error condition, the display shows the test number error code, and the Fault LED turns ON. The test cycle will halt until you press the <Fault> switch to clear the error register.

7. Refer to Appendix D for a list of the error codes and their definitions. If the error indicates a hardware failure, refer to subsection 3.4 for information on obtaining service.

3.3.3 Return Unit to Operation

When all tests are complete and the fault is corrected, return the drive to normal operation.

1. After all tests have been run, press the <Menu> switch to return the display to level 1 (1a Run Tests or 1b Show/Set).
2. Remove the loop-back plugs from the rear panel and re-connect the Port A and Port B SDI cables.
3. Return the Mode Select switch to the Normal position. The display reads `Returning to NM`, followed by `READY`.
4. If the message `Remove Loop-Back` is displayed, be sure the plugs were removed as directed in Step 2. If you already removed them, press the <Enter> switch. This should clear the message and display `READY`.
5. Place the drive back on-line by pressing the appropriate Port switch(es).

3.4 Service

If you are experiencing problems with your SD59X drive, you can get help by calling Emulex Technical Support at the telephone numbers listed below. If an error code indicates a defective drive, return the drive to an authorized Emulex repair center for service.

Do not return the drive to Emulex without prior authorization. Before returning a product to Emulex, whether or not it is under warranty, you must first obtain a Return Material Authorization (RMA) and shipping instructions. Any item received by the factory without an authorization will be returned to the owner at the owner's expense.

In the continental United States, Alaska, and Hawaii, contact:

Emulex Technical Support
3545 Harbor Boulevard
Costa Mesa, CA 92626

Telephone: (714) 662-5600
(1-800-854-7112 outside of California)
FAX: (714) 966-1299

Outside of the United States, contact the distributor from whom the SD59X was initially purchased.

After you have received an RMA, package the unit, preferably using the original packing material, and send it *postage paid and insured*, to the address given in the shipping instructions.

Section 4
MAINTENANCE

4.1 Overview

Maintenance of the SD59X in the field, is limited to verifying that the configuration switches are set correctly, replacement of defective modules in the SD59X, and cleaning the air filter. The field-replaceable modules in the SD59X are:

- Cooling fans
- Power supply
- SM90 interface board(s)
- Control Panel
- Disk drive subassembly

The Control Panel is easily removed without disassembling the SD59X. To gain access to the other modules, you will first have to disassemble the SD59X as described in subsection 4.3.

After replacing the defective module, subsection 4.7 details the steps required to return the SD59X to normal operation. Subsection 4.8 details the procedure for cleaning or replacing the air filter.

4.2 Replace the Control Panel

If the diagnostics described in Section 3 indicate a faulty Control Panel, the entire panel must be replaced as follows:

1. Take the SD59X off line and power down the unit.
2. Press down on the top of the panel and tilt it toward you. Disconnect the cable at the rear of the panel. Remove two screws that fasten the shield straps and bezel to the chassis. Slide the straps from behind the bezel and remove the panel from the SD59X.
3. Insert the bottom tabs of the new panel in the corresponding slots of the bezel (refer to Figure 2–6). Slip the shield straps between the bezel and the chassis and secure them with the two screws removed in step 2.
4. Connect the cable protruding through the filter to the connector on the rear of the panel.
5. Tilt the panel upward and press the upper tabs into the slots in the bezel.

4.2.1 Enter the SD59X Serial Number into NOVRAM

To provide warranty traceability, the Control Panel NOVRAM stores the serial number of the SD59X to which it is attached. Use the following procedure to enter the serial number into the NOVRAM of the new Control Panel. The serial number of each SD59X is printed on a tag attached to the rear of the unit.

NOTE: Once the Serial Number is entered, it cannot be changed! Check each character carefully before entering it during the following procedure.

1. Attach the power cord to the rear of the SD59X and to the power source.
2. Press the AC power switch (rear panel) to the ON (|) position.
3. Wait until the unit completes its self-tests, indicated by the display reading `READY`.
4. Set the Mode Select switch to the Diagnostic position. The display will read `1a Run Tests`.
5. Press the <Next> switch, to display `1b Show/Set`.
6. Press <Enter> to advance to `4a Unit Number`.
7. Press <Next> until `4d Serial Number` is displayed.
8. Press <Enter> to display `Ser #Q00000000000`.
9. A cursor appears under the leftmost digit of the serial number. You may change this digit by pressing <Increment> or <Decrement>.
10. Advance to the next digit by pressing the <Next>. At any time you may press <Menu> to return to `4d Serial Number` without altering the previous digit.
11. When you have completed entering the serial number, save it by pressing <Enter>. This records the new number in the NOVRAM and returns you to `4d Serial Number`.
12. Return to Normal Mode by setting the Mode Select switch to Normal.

4.3 Prepare the SD59X for Disassembly

To replace any of the SD59X subsystems, the unit must be disassembled according the procedures given in the following subsections.

- Disk drive or SM90 boards – subsection 4.4.
- Power supply – subsection 4.5
- Cooling fans – subsection 4.6

If the SD59X is installed in a system enclosure, it must first be removed from the enclosure as follows:

WARNING!! Before removing covers from the SD59X, be sure that the unit is taken off-line and the AC power cord disconnected. Failure to follow this precaution could expose you to hazardous voltages that will cause personal injury from electric shock.

1. Take the drive off-line by turning both <Port A> and <Port B> OFF. Next, spin the drive down by pressing the <Run> switch. Wait for the display to read STOPPED.
2. Press the AC Power switch to the OFF (0) position. Remove the AC power cord from the socket on the rear of the SD59X and from the AC power outlet. Remove any SDI cables that may be connected to the rear panel.
3. Remove the SD59X from the enclosure:
   a. Remove the Control Panel by pressing down on the top of the panel and pulling the top of the panel toward you. Lift the panel from the unit and disconnect the cable at the back of the panel.
   b. Remove four screws securing the front bezel to the drive chassis. Remove the front bezel.
   c. Use a flat-blade screwdriver to remove the locking screw securing the drive to the locking bracket.
   d. Lift the front of the SD59X to clear the retaining bracket, and slide the drive toward you and out of the drive tray. Place the drive on a clear work surface.
4. Remove twelve screws securing the top cover to the SD59X chassis. Lift the cover from the chassis and place the screws and cover in a secure location. Figure 4–1 shows the SD59X with top cover removed.

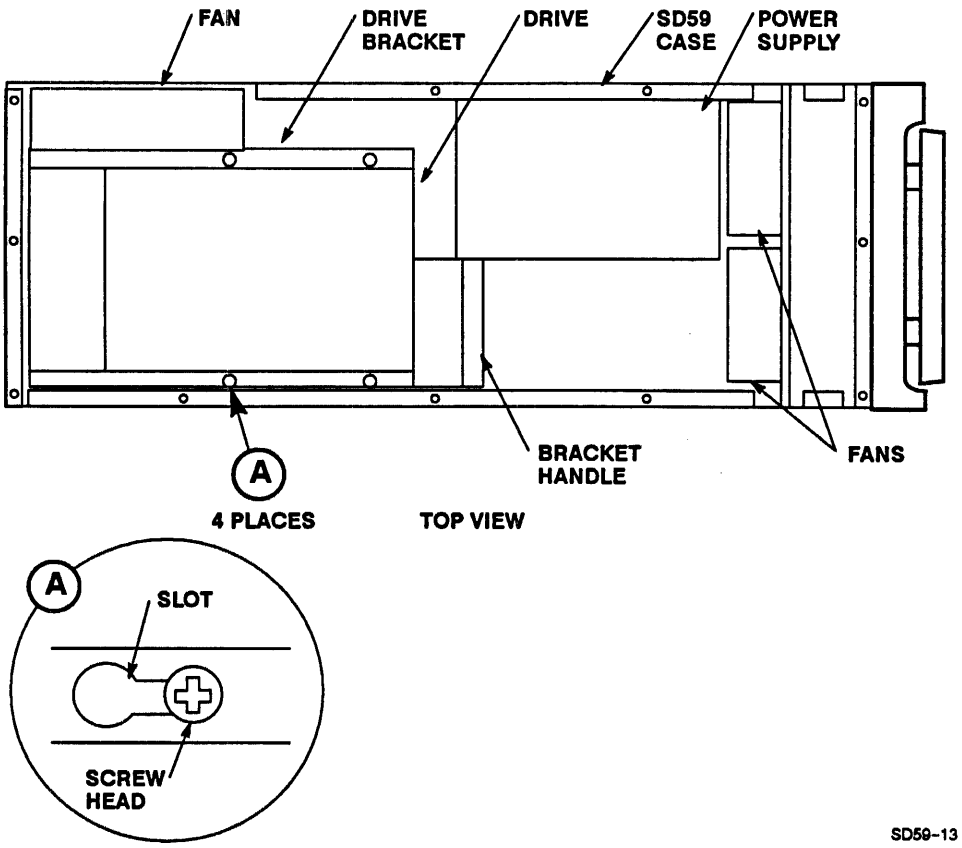


Figure 4–1. SD59X With Top Cover Removed

5. Proceed to the subsection listed on the previous pages for the appropriate replacement procedure.

4.4 Replace Disk Drive Subassemblies

Use the following procedures to replace the entire disk drive assembly or either of the Emulex SM90 assembly boards. Before proceeding, be sure that the AC power cord is not connected to the drive or to the AC power source.

1. Loosen the four Phillips-head screws securing the drive bracket to the chassis. Do not remove these screws.
2. Grasp the drive bracket by the handle and slide the assembly toward the power supply until the large portion of the screw slots are under the four screw heads (Detail A in Figure 4–1).
3. Carefully lift the drive out and place it on top of the chassis so that you have access to the circuit boards and the sides of the drive.
4. Loosen four screws shown in Figure 4–2 that secure the rear shield to the sides of the drive. Next, disconnect the cable from the socket and lift the shield with cable attached, up off the drive.

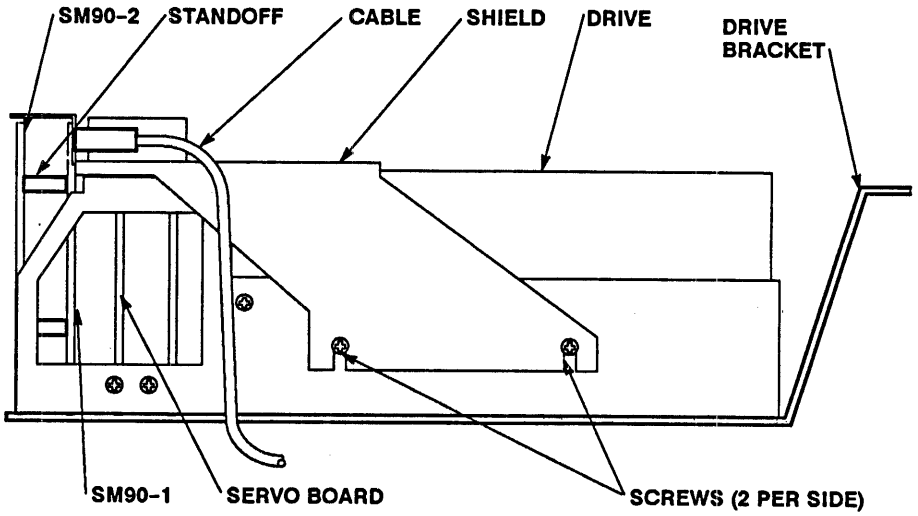


Figure 4–2. SD59X Disk Drive Assembly

5. Remove four screws from the corners of the SM90-2 board at the rear of the drive. Remove the SM90-2 board by pulling it toward you.

   CAUTION! Electrostatic Sensitive Devices. Use a grounded wrist strap or other appropriate antistatic procedures when removing, handling or inserting boards in the SD59X drives.

6. Unscrew the two upper stand-offs that secure the SM90-1 to the chassis. Remove the SM90-1 board by grasping the assembly and pulling it up, out of the drive. The Servo board is now exposed.

4.4.1 Replace the Disk Drive Assembly

Use the following procedure to replace the entire disk drive assembly. Refer to Appendix A to ensure the replacement drive is configured correctly before it is installed.

1. Disconnect the cable (labeled P1) from the power connector at the lower right corner of the drive assembly as shown in Figure 4–3.
2. Separate the drive from the drive bracket by removing six flat-head screws from the bottom of the bracket.
3. Attach the replacement drive to the bracket with the six screws you removed in step 2.
4. Connect the power cable (P1) to the socket on the lower right rear of the new drive.

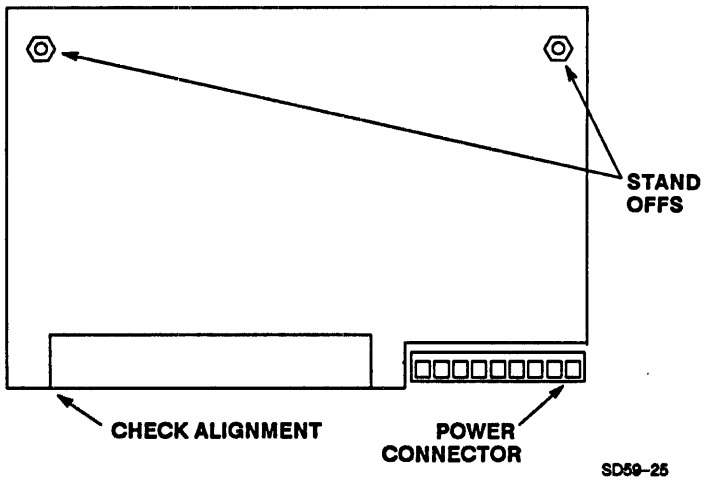


Figure 4–3. SD59X Disk Drive Connections

5. Replace the SM90-1 board assembly into the drive chassis. Press the assembly firmly on to the socket in the drive as shown in Figure 4–3. Be sure the connector on the board is aligned with the pins on the motherboard.
6. Install the two stand-offs to secure the board to the chassis.
7. Press the SM90–2 onto the SM90–1 board. Secure the SM90 assembly with the four screws you removed in subsection 4.4

4.4.2 Reassemble the SD59X

Replace the drive in the chassis, replace the covers, and install the drive in the enclosure as follows:

1. Place the shield over the rear of the drive and connect the cable to the socket at the rear of the SM90–1 board. Install four screws to secure the shield in place.
2. Carefully lower the drive into the chassis. Be sure the power cable remains connected at the lower right corner of the drive.
3. Push the drive toward the rear of the chassis to engage the mounting screws in their respective slots. Tighten the four screws.
4. Carefully examine the drive and chassis to be sure that all cables are connected and there are no wires or cables crimped between panels or brackets.
5. Place the top cover on the chassis and secure it with the twelve screws you removed in subsection 4.3.

4.5 Replace the SD59X Power Supply

If the SD59X fails because of a faulty power supply, the supply must be replaced as follows:

1. Locate the power supply in Figure 4–1. Remove the four screws securing the supply to the SD59X chassis.
2. Disconnect the 3-pin, AC Input connector (Figure 4–4) by pulling the connector up and off of the supply. Do not grab the connector by the individual wires as you may separate the wires from the connector.
3. Disconnect the 7-pin Drive Power connector from the supply as in step 2.
4. Disconnect the small 2-pin connector from the bottom socket of the interconnect board, located between the two cooling fans (Figure 4–5).

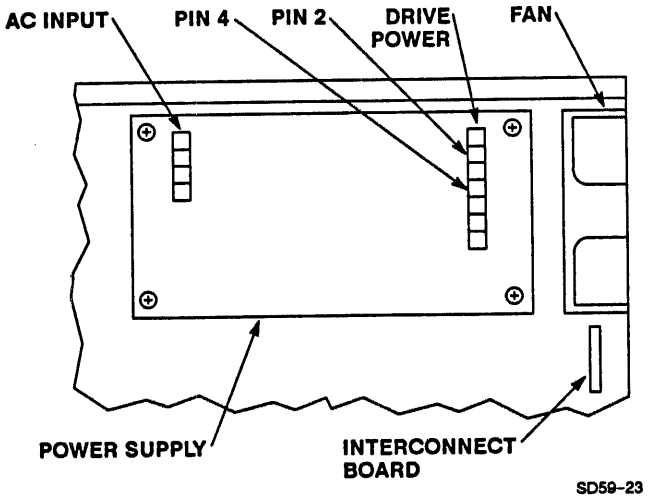


Figure 4–4. SD59X Power Supply

5. Lift the power supply out of the chassis and remove the two-wire fan power cable from pins 2 and 4 of the output connector.
6. Connect the 2-wire fan cable to the new power supply. Be sure to tighten the screws to ensure proper electrical contact.
   Connect: Red wire to pin 4
   Black wire to pin 2
7. Insert the new supply into the SD59X chassis with the 3-pin connector toward the disk drive. Fasten the supply to the chassis with the four screws.
8. Attach the 2-pin fan power cable to the connector at the bottom of the Interconnect board.
9. Attach the AC Input and Drive power cables to the respective connectors on the supply.
10. Reassemble the SD59X in the subsystem as described in subsection 4.7.

4.6 Replace Cooling Fans

If any of the cooling fans become inoperative, the SD59X may overheat. If a fan fails, it therefore should be replaced as soon as possible. Figure 4–5 shows the power connections for all three fans.

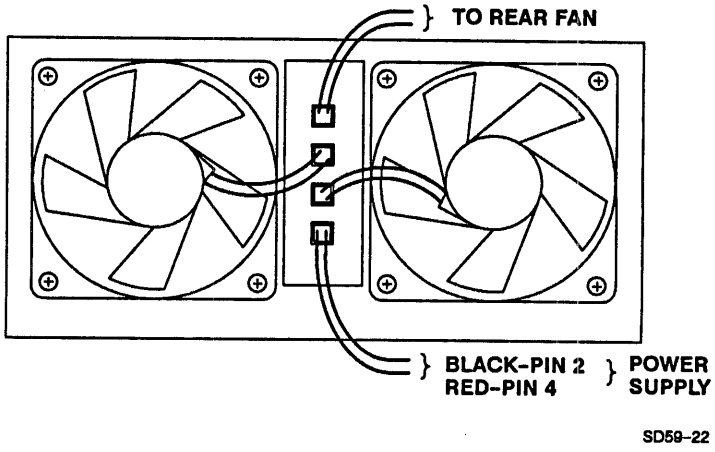


Figure 4–5. Cooling Fan Power Connections

To replace the fans:

1. Disconnect the appropriate connector from the interconnect board, located between the two fans at the front of the chassis.
2. To replace one of the fans at the front, remove the four screws from the face of the fan and lift the fan out of the chassis.
3. To replace the rear fan, remove the two screws from the side of the SD59X chassis and two screws at the rear. Remove the fan from the chassis.
4. Install the new fan and secure it with the screws you removed in steps 2 or 3. Be sure the fans are oriented so that the air flow is toward the rear of the unit.
5. Connect the power cable from the new fan(s) to the appropriate socket on the interconnect board.
6. Proceed to subsection 4.7 to restore the SD59X to operation.

4.7 Return the Subsystem to Operation

1. Carefully examine the drive and chassis to be sure that all cables are connected and there are no wires or cables crimped between panels or brackets.
2. Place the top cover on the chassis and secure it with the twelve screws you removed in subsection 4.3.
3. Install the drive in the drive tray as described in Section 2.
4. Connect the AC power to the drive and turn the AC power switch ON at the rear of the drive shown in Figure 4–6.

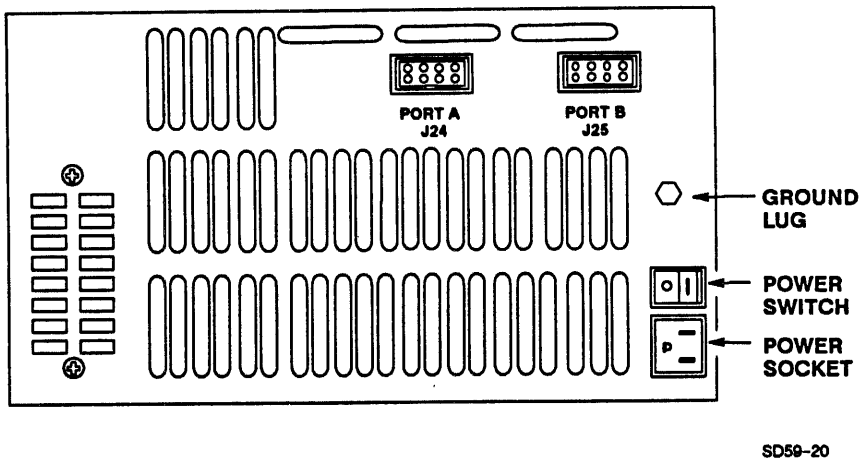


Figure 4–6. SD59X Rear Panel

4.8 Cleaning or Replacing the Air Filter

The SD59X is equipped with an air filter to prevent dirt particles from entering the components of the unit, thus preventing possible damage. This filter should be cleaned on a regular basis as follows:

- Every six months in a Class A computer environment
- Every four to five months in a Class B computer environment
- Every three months in an unregulated environment

To clean the filter:

1. Press down on the top of the control panel and tilt the panel toward you. This will expose the filter.
2. Grasp the filter by the edge and gently pull it out of the unit.
3. Wash the filter in warm, soapy water. Rinse thoroughly and allow to dry. If the filter becomes damaged or can no longer be cleaned for any reason it must be replaced.

CAUTION! The filter must be completely dry before replacing it in the SD59X.

4. Position the cleaned filter in the front bezel and press the edges in so that they are seated between the bezel and the SD59X chassis.
5. Tilt the control panel upwards and press on the top front of the panel until it locks in place.

Appendix A
CONFIGURATION SWITCHES

A.1 Overview

This Appendix lists the configuration switch and jumper settings on the SD59X and shows the correct settings required to set various spin-up delays. Except for spin-up delay, these switches and jumpers should remain at their factory-default positions. Spin-up delay settings may be required to accommodate more than eight drives mounted in the same enclosure.

A.2 Setting the Sequential Spin-up Delay

All SD59X drives are configured at the factory for a Spin-up Delay of 0. To enable sequential spin-up of multiple drives, set each drive as shown in Table A–1 below. Be sure to set both SW1 on the SM90-1 board and S1 on the Servo board for each drive. Figures A-1 and A-2 show the location and settings of these switches for the SD590 and SD591, respectively.

Table A–1. Spin-up Delay Settings

Spin-up Sequence Number	SM90-1 Board Logical Address SW1–			Servo Board Logical Address S1–				Spin-up Delay (sec)
	8	9	10	5	6	7	8	
0	**ON**	**ON**	**ON**	**OFF**	**OFF**	**OFF**	**OFF**	**0**
1	ON	OFF	ON	ON	OFF	OFF	OFF	10
2	ON	ON	OFF	OFF	ON	OFF	OFF	20
3	ON	OFF	OFF	ON	ON	OFF	OFF	30
4	OFF	ON	ON	OFF	OFF	ON	OFF	40
5	OFF	OFF	ON	ON	OFF	ON	OFF	50
6	OFF	ON	OFF	OFF	ON	ON	OFF	60
7	OFF	OFF	OFF	ON	ON	ON	OFF	70

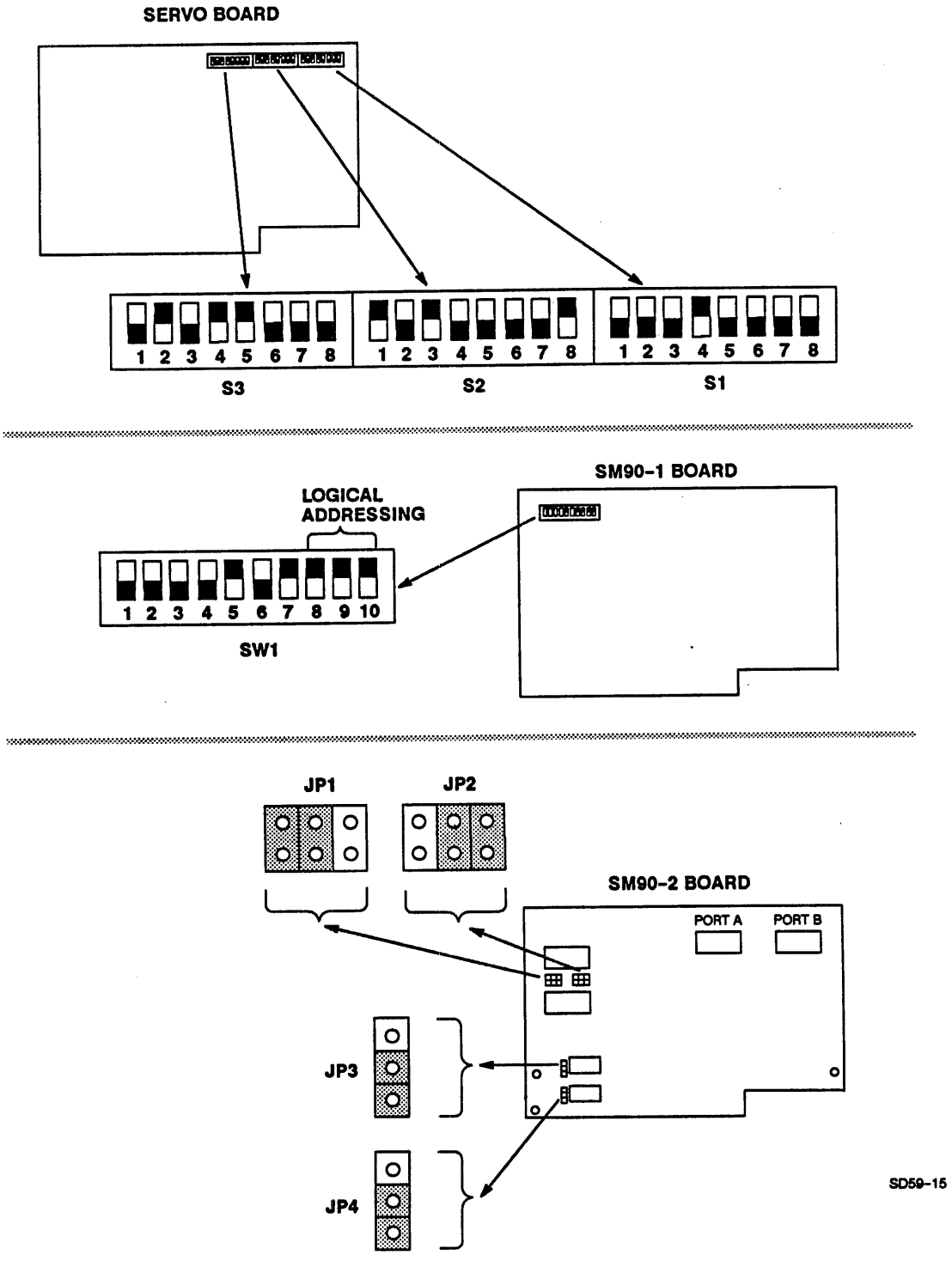


Figure A–1. Switch and Jumper Settings for SD590

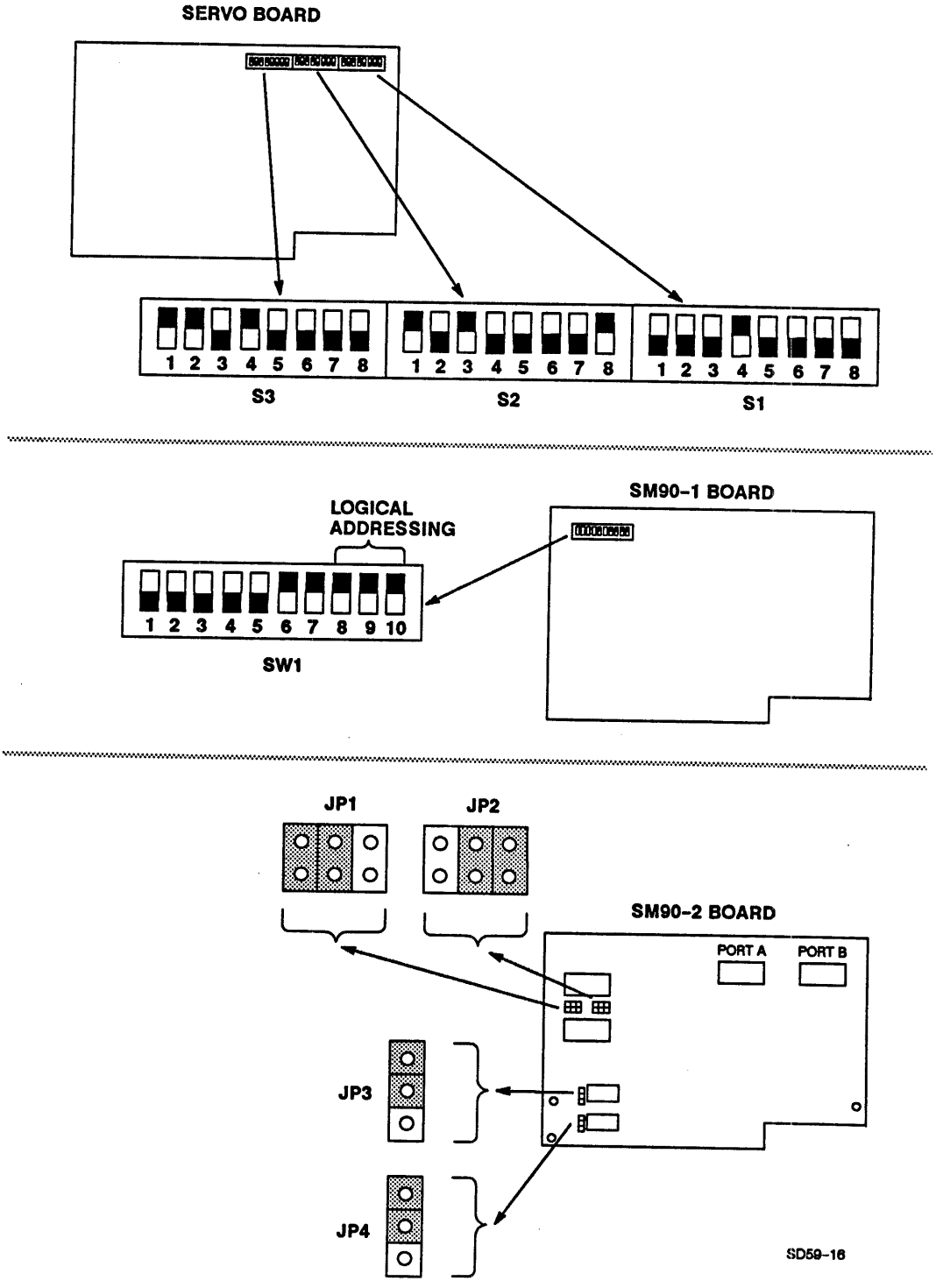


Figure A–2. Switch and Jumper Settings for SD591

Appendix B
MENU CHARTS

B.1 Overview

Figures B–1 through B–6 show the menus that appear on the display. Refer to them as you read about the Control Panel in Section 2.

Menu items begin with a prefix that identifies both the menu and the item within the menu. For example, the items on Menu Chart 1 are prefixed *1a* and *1b*, items on Menu Chart 2 are prefixed *2a*, *2b*, and so forth.

This appendix employs the following typographical conventions.

1. X's represent digits of a value. The display may suppress leading zeros, even if they are shown here with the full field of X's.
2. A double frame indicates [menu items], shown as they appear in the display.
3. A single frame indicates [remarks], or instructions for moving between menu items or altering selection items.
4. Angle brackets indicate function switches, for example, <*Enter*>, <*Next*>, or <*Menu*>.

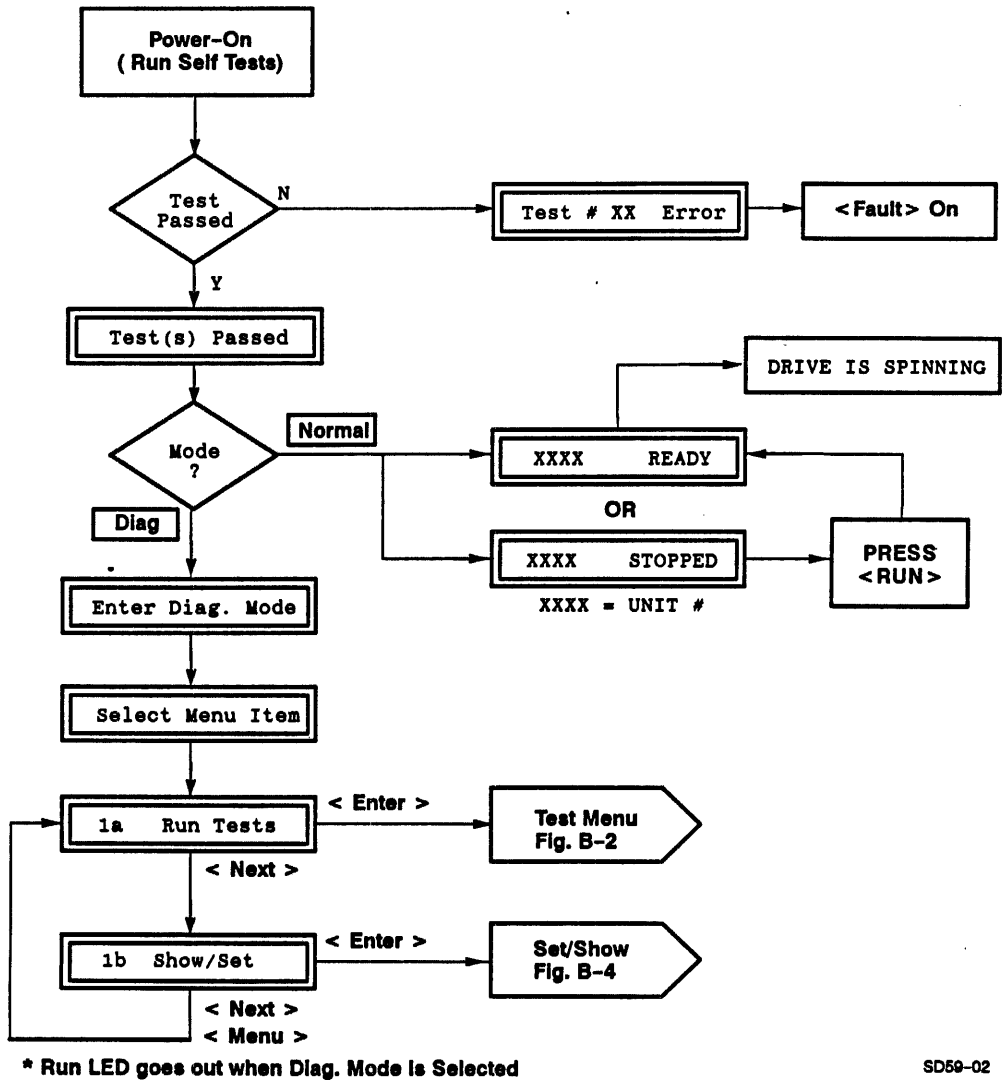
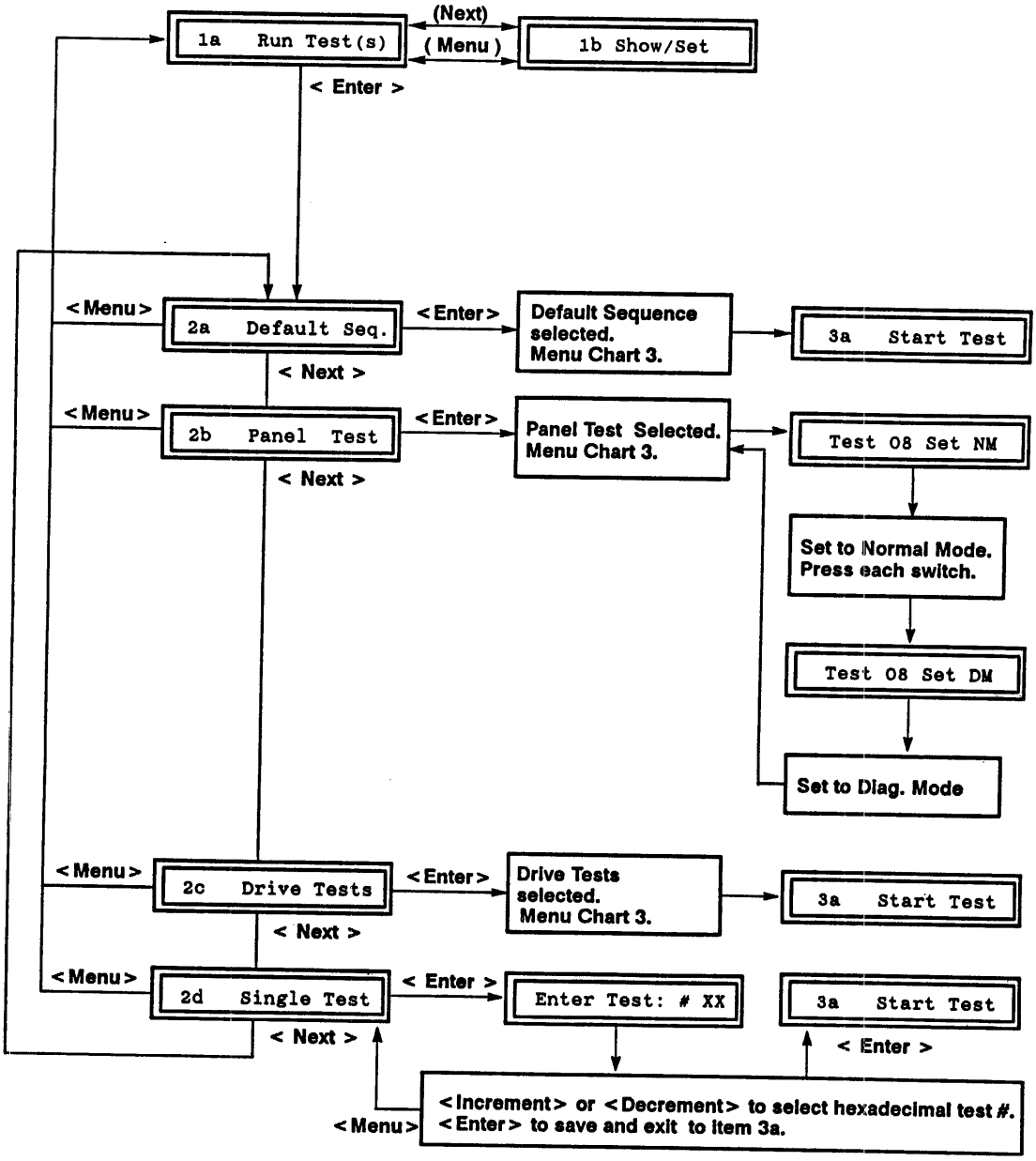


Figure B–1. Start Up Sequence and Main Menu

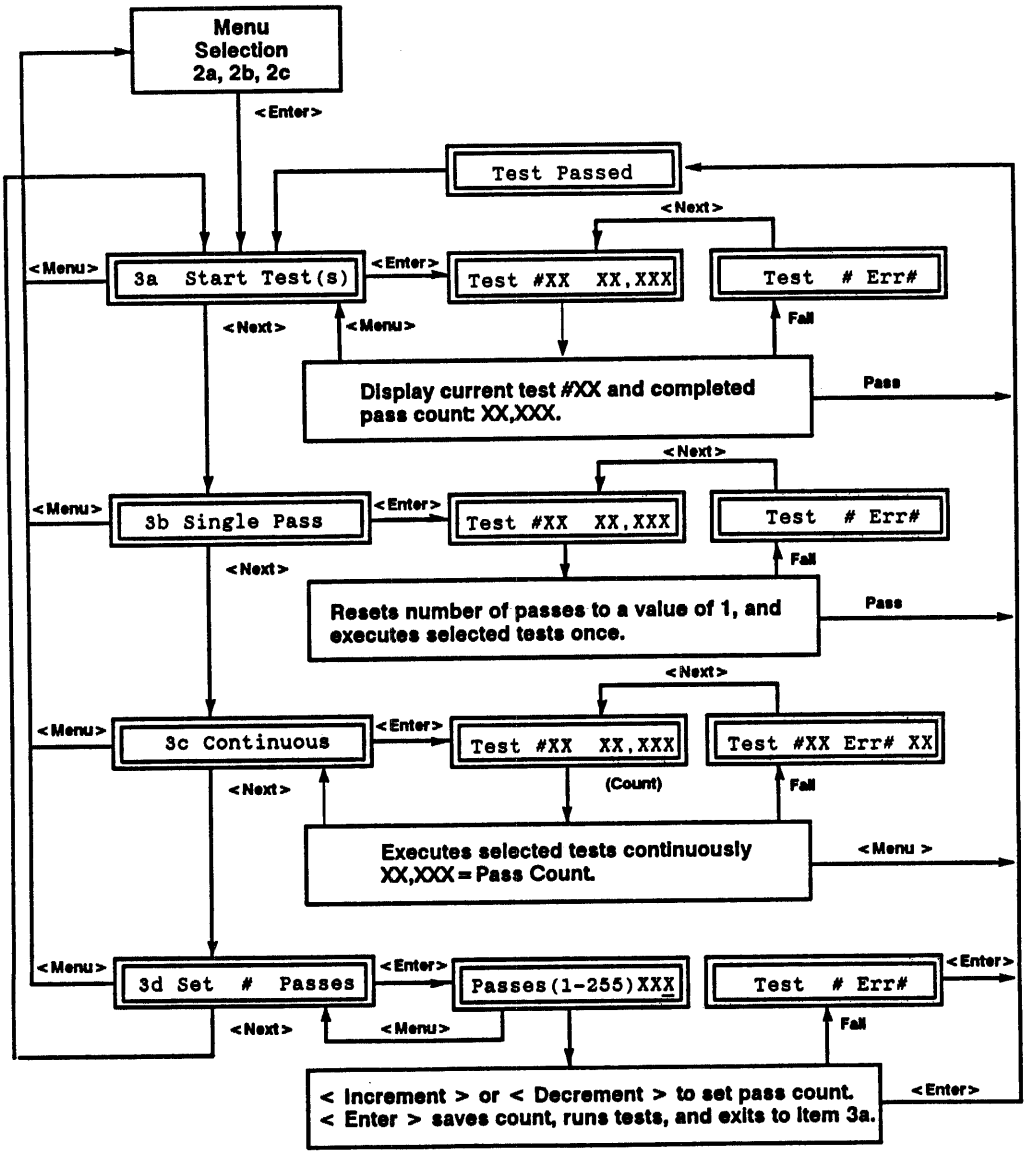


NOTE: If a test selection has been made since powering the drive up, on entry to Menu 2 from Item 1a Run Tests, the previous selection is automatically redisplayed, i.e., Item 2a, 2b, or 2c or " Enter Test: # XX".

Port A and B must be off and loop back connectors installed.

SD59-03

Figure B–2. Test Selection Menu



NOTE: If a test reports an error, < Fault > clears the error and allows the execution of the next test or next pass, if any, or return to Item 3a. If an error is being displayed, < Menu > or exit from diagnostic to Normal Mode is effective only after the error is cleared by pressing < Fault >.

SD59-04

Figure B–3. Test Cycle/Repetition Count

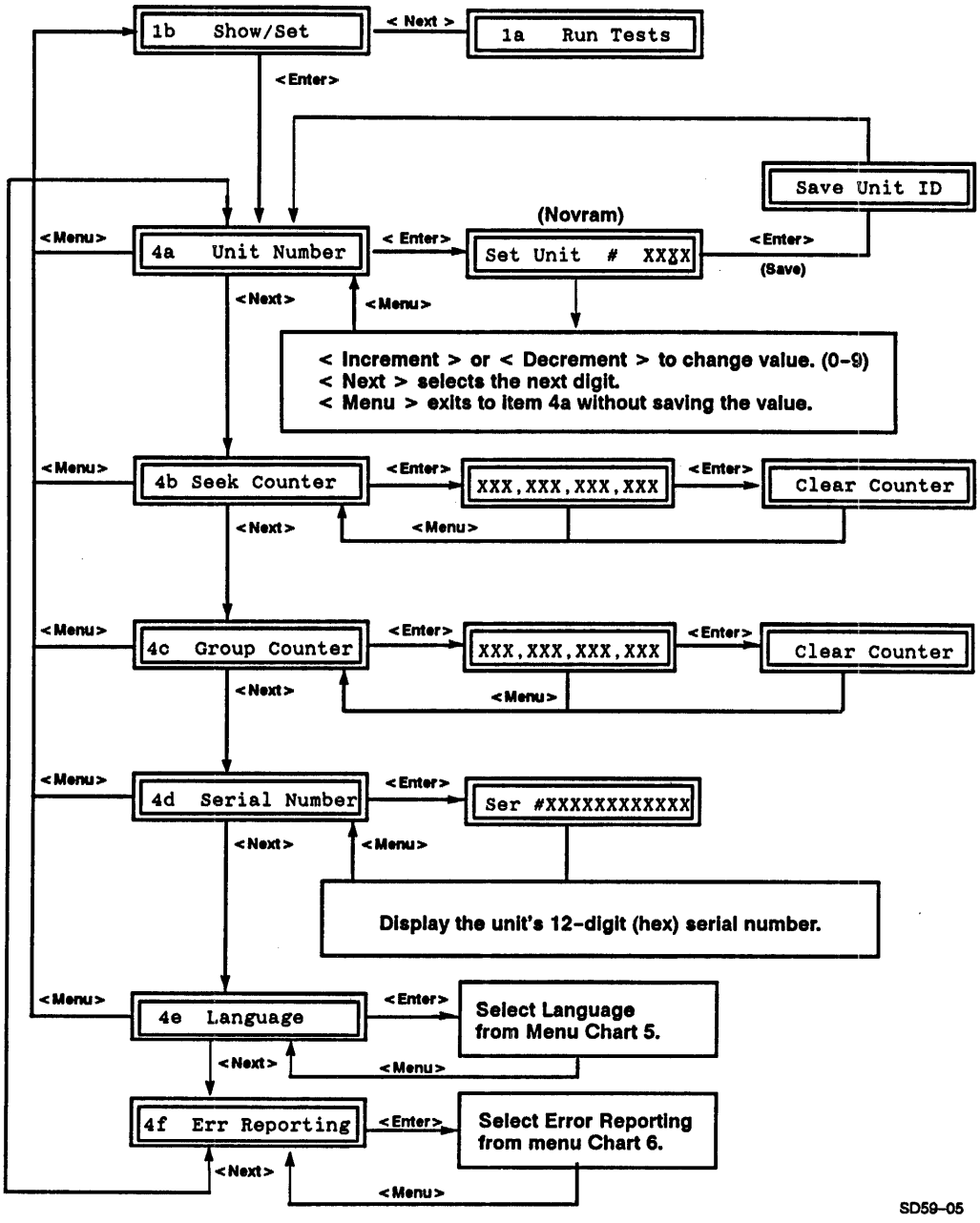


Figure B–4. Set/Show Menu

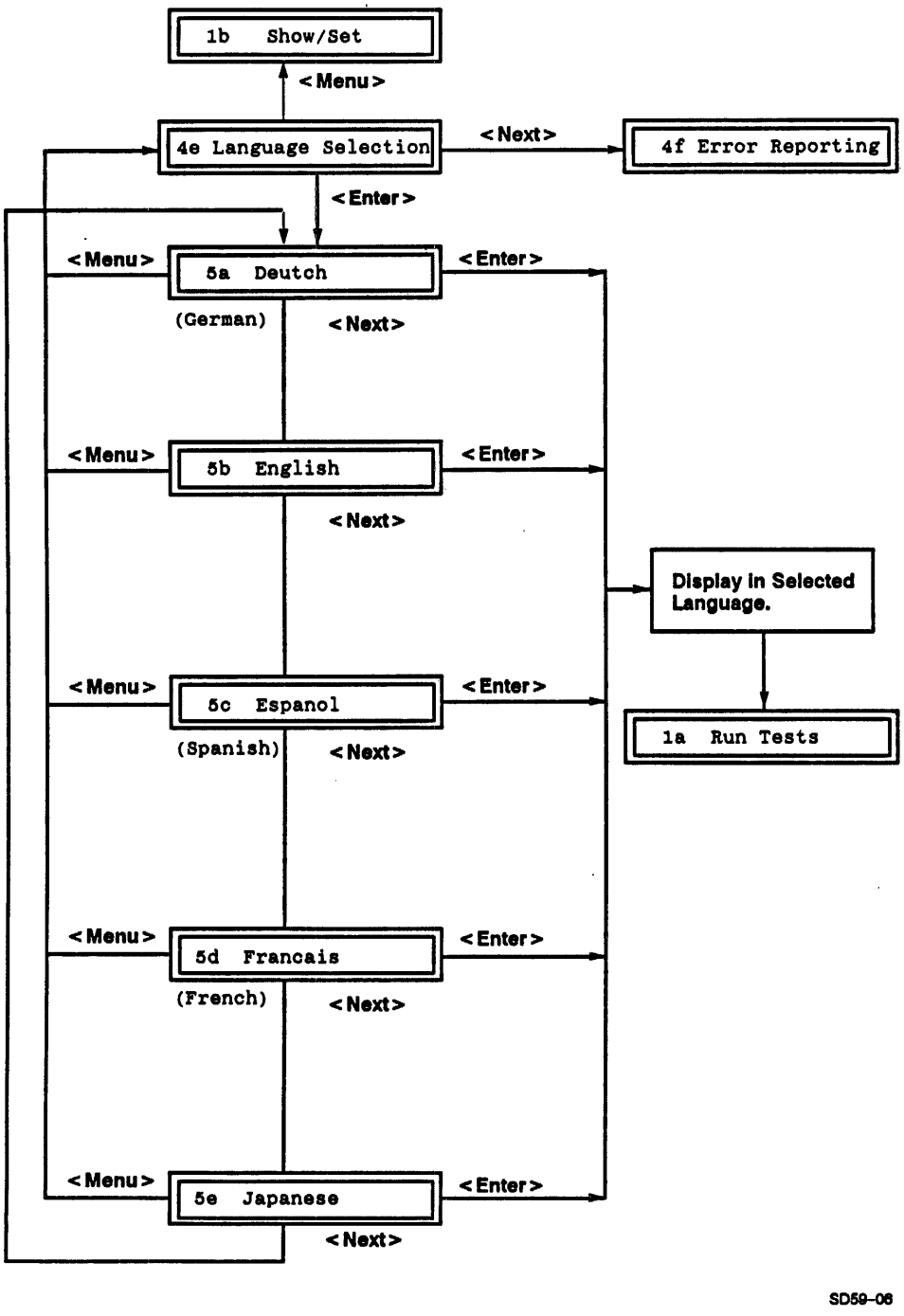


Figure B–5. Language Selection Menu

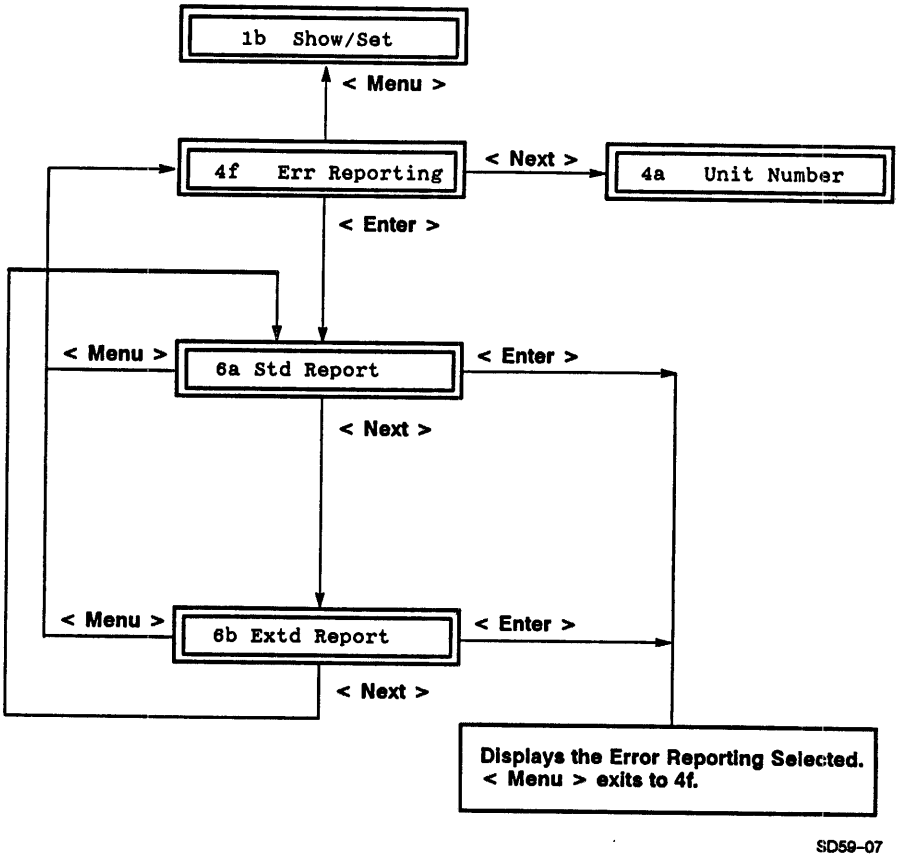


Figure B–6. Error Reporting Selection

Appendix C
ERROR CODE LIST

C.1 Overview

Table C–1 lists the error codes that may appear when the drive detects a fault, and illuminates the Fault LED. Procedures for troubleshooting using the diagnostics are detailed in Section 3. Complete menu charts are provided in Appendix B. Most errors in the table are indicative of hardware problems that are not user serviceable. If you require assistance, call Emulex Technical Support as described in subsection 3.3.

Table C–1. Error Codes

Error Code (Hex)	Probable Problem Area
30	Loss of Servo Clock.
31	Loss of Read Clock.
32	Read Gate or Write Gate .and. Drive Not Ready.
33	Read Gate or Write Gate .and. Drive Not On-Cylinder.
34	Multiple Write Gate Transitions.
35	Write Gate .and. Write Protected.
36	Sector Counter Error.
37	Read Gate .and. Write Gate.
38	Drive Fault.
39	Read Gate or Write Gate .and. Fault.
3A	Late Write Gate.
3D	Drive Write Protect Input True.
3E	Drive Unit Select Input False. *Spin-up delay switches not set correctly.*
3F	7.5 Interrupt with No Error Status Present.
40	-5 VDC Status Bad.
41	Operator Panel Interlock Status Bad.
42	Drive Disabled. *The host has detected a hardware error.*
44	Fatal Error Trap.
46	Drive Already Spun Up. *Either a user or the host software tried to spin up the drive when it was already spun up.*
47	Drive Command Timeout Occurred. *Usually a drive microprocessor failure.*
49	Read/Write Command Overrun.

(Continued on next page)

Table C–1. Error Codes (Continued)

Error Code (Hex)	Probable Problem Area
4D	Drive Spin-Up Failed. *Drive hardware error. Check cabling.*
4E	Drive Spin-Down Failed. *Drive hardware error.*
4F	Drive Seek or Recalibrate Error. *Drive hardware error.*
50	SDI Command Already in Progress.
51	SDI Framing Protocol Error. *Hardware failure or bad SDI cable.*
52	SDI Checksum Error.
53	SDI Parity Error.
54	Invalid Real-time Command.
55	Invalid Microprocessor Command.
56	Command Input Buffer Overrun or Underrun.
57	Drive Error Set .and. 'No Error Allowed' Flag Set.
58	Invalid Head Address.
59	Invalid Cylinder Address.
5A	Changing from 512 to 576 Byte Mode.
5B	Control-in Parity Error.
5C	Control-in Pulse Error.
5F	Command/Write Data Pulse Error.
60	Write Protected Drive. *A write operation was attempted with a drive that is write-protected on the SD59X Control panel.*
61	Unexpected Spin-down. *Be sure the <Run> switch was not accidently turned off.*
62	Illegal Diagnostic Number. *In Single Test, check the Test # and re–enter it.*
64	Run Switch On .and. Drive Disabled.
65	Run Switch Off. *The Run switch on the SD59X Control panel is off. Press it on.*
66	Memory Region Not Found.
67	Drive Unexpectedly Not on Cylinder. *Jumper-selected options on the drive might be set incorrectly.*
68	Attempted to Write Past Memory Region.
69	SDI Transmission Timeout.
6A	Drive Not Online. *Press <Port A> or <Port B> to put them on line.*
6B	Read/Write Ready Status Not Set.
6C	Topology Mode Mismatch.
6D	Available Status Not Set.
6E	Invalid Error Recovery Level (>0).
6F	Invalid Subunit Flag or No Subunit #0 Flag.
70	5.5 Timer Error.

(Continued on next page)

Table C–1. Error Codes (Continued)

Error Code (Hex)	Probable Problem Area
71	6.5 Timer Error.
72	SDI Out/Echo Error.
75	Sector Count Not Found.
76	Diagnostic Read Error Latch Failure.
77	Drive Not Spun Up. *Press <Run> to spin up drive.*
7A	Command Available Time Out.
7B	Drive Init. Found.
7C	Unexpected SDI Status 'B' Error Found.
7D	Unused.
7E	Invalid Command Not Detected.
7F	Loss of Control Clock Not Detected.
80	Loss of Command/Write Clock Not Detected.
81	Expected SDI Status 'B' Port A Error Not Found.
82	Cannot Clear Loss of Command/Write Clock Status Bit.
83	Cannot Clear Loss of Control Clock Status Bit.
84	Expected SDI Status 'B' Port B Error Not Found.
86	Invalid Response Frame.
87	Invalid SDI Data Received.
88	Response Not Detected.
89	Cannot Clear Command Available Status Bit.
8A	Invalid Command Improperly Detected.
8B	Drive Init Not Detected or Not Cleared.
8C	RAM Error.
8E	Mode Switch Error.
8F	Panel Switch Register Error.
90	Loss of Command/Write Clock Improperly Detected.
91	Loss of Control Clock Improperly Detected.
92	Command Available Not Detected.
93	Wrong Command Code Detected.
94	Wrong SDI Data Detected.
95	Sync Detect Failure.
96	Incorrect Number of Sectors.
97	Sector Counter Port Error.
98	Interrupt Control Port Error.
99	Drive Status Ports A or B Error.

(Continued on next page)

Table C–1. Error Codes (Continued)

Error Code (Hex)	Probable Problem Area
9A	Drive Output/Input Ports Error.
9B	Max Sector # Output Port Error.
9C	Interlock Status Port Error.
9D	Read/Write Control Port Error.
9E	Clock Control Port Error.
9F	Disk Data Read/Compare Ports Error.
A0	Interrupt 7.5 Status 'A' Bit 0 Error.
A1	Interrupt 7.5 Status 'A' Bit 1 Error.
A2	Interrupt 7.5 Status 'A' Bit 2 Error.
A3	Interrupt 7.5 Status 'A' Bit 3 Error.
A4	Interrupt 7.5 Status 'A' Bit 4 Error.
A5	Interrupt 7.5 Status 'A' Bit 5 Error.
B0	Interrupt 7.5 Status 'B' Bit 0 Error.
B1	Interrupt 7.5 Status 'B' Bit 1 Error.
B2	Interrupt 7.5 Status 'B' Bit 2 Error.
B3	Interrupt 7.5 Status 'B' Bit 3 Error.
B5	Interrupt 7.5 Status 'B' Bit 5 Error.
C0	Program PROM Checksum Error.
C1	Program PROM Verification Flag Error.
C2	Unexpected SDI Status 'A' Error Found.
C3	Cannot Clear Interrupt Status A or B Error Bit.
C4	Configuration PROM Checksum Error.
C5	Seek Error Not Detected.
C6	Drive Fault Not Detected.
CA	Number of Bad Tracks = 1 to 3.
CB	Number of Bad Tracks > 3.
CC	Drive Not Spun Up. *Press <Run> to spin up drive.*
CD	Sync Detect Failure.
CE	Incorrect Number of Sectors.
DD	Inconsistent Drive Clock Controls.

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EMULEX SD59X™ Series
Disk Drive
Installation and Maintenance Manual
SM9050501-00, Rev A

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