

StorageWorks™ Solutions

HSD05 Array Controller User's Guide

Order Number: EK-HSD05-UG. B01

This manual is part of the StorageWorks family documentation set. It describes the HSD05 Array Controller and contains installation and configuration information. For day-to-day operation, this manual includes a description of the user interface commands and procedures to perform routine tasks.

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Preface

This manual describes the procedures for configuring, installing, operating, and replacing the StorageWorks™ HSD05™ array controller.

Intended Audience

This manual is intended for use by customers and Digital™ employees responsible for systems using the HSD05 array controller.

Structure

This manual is organized as follows:

Chapter 1	Describes the HSD05 array controller and related StorageWorks components.
Chapter 2	Contains procedures to install and configure the HSD05 array controller.
Chapter 3	Contains procedures for using the HSD05 onboard utilities, along with representative tasks that can be performed by the onboard utilities. This chapter also contains information on using the OpenVMS™ error log to troubleshoot the HSD05 array controller, and a remove and replace procedure.
Appendix A	Contains configuration information for the HSD05 and associated SBB shelves, including a listing of cables. This information supplements the SBB shelf information contained in the StorageWorks documents listed in Related Documents.

Related Documents

Table 1 lists the StorageWorks-related user documents. These documents are the primary reference between the HSD05 array controller and the documentation for related components in the StorageWorks building block (SBB) family. The documents listed in Table 1 are provided with every StorageWorks system.

Table 1 StorageWorks Related Documentation

Document Title	Order Number
<i>StorageWorks Solutions Configuration Guide</i>	EK-BA350-CG
<i>StorageWorks Family User's Guide</i> ¹	EK-BA350-UG
<i>StorageWorks Family StorageWorks Building Block User's Guide</i>	EK-SBB35-UG

¹Includes BA350-SA SBB shelf user's guide

Documentation Conventions

The following conventions are used in this manual:

- | | |
|----------------------|--|
| boldface type | Boldface type indicates the first instance of terms being defined in text. In code examples, user input is shown in boldface type. |
| <i>italic type</i> | Italic type indicates emphasis and complete manual titles. |
| OpenVMS VAX | A shortened term indicating the OpenVMS operating system for VAX™ hardware. |

Introduction

The HSD05 array controller is the entry-level product of the StorageWorks HSD family of bus controllers. Installed in a 3½-inch StorageWorks building block (SBB), the HSD05 array controller is used to connect a Digital host DIGITAL storage subsystem interconnect (DSSI) bus to up to seven Small Computer System Interconnect (SCSI) drives.

This chapter presents a basic description of the HSD05 array controller's features, performance, and operating environment. The HSD05 array controller is shown in Figure 1-1; Figure 1-2 presents a typical HSD05 installation, showing the relationship among basic system components.

1.1 HSD05 Array Controller Description

Connecting to a single port on a host DSSI bus, the HSD05 array controller provides connectivity for up to seven SCSI or SCSI-2 disk, tape, and solid-state disk devices. Enclosed in a 3½-inch SBB, it is mounted in a BA350-type shelf containing up to six drives. Two shelves may be connected together to support the maximum seven SCSI devices.

A DSSI bus connects to the HSD05 through a connector on the front panel; SCSI bus connection is made through the shelf backplane connector. The HSD05 is a TMSCP™/MSCP™-compliant device that performs the translations required to support devices conforming to SCSI or SCSI-2 protocols.

The HSD05 array controller is shipped with a DSSI trilink connector and a DSSI terminator that fits on the trilink connector. The trilink connector allows the HSD05 array controller to be connected as either an endpoint or a middle (daisy-chain) node on the DSSI bus. Configured as a bus endpoint, the DSSI terminator is used to properly terminate bus signals.

One or more HSD05 array controllers may be connected on the DSSI bus containing RF™_{xx}/TF™_{xx} drives, host nodes, or other DSSI-compliant nodes (up to eight nodes maximum).

1.1.1 HSD05 Array Controller Features and Capabilities

The HSD05 array controller provides the following features:

- Warm-swapping of attached drives (with a quiesced SCSI bus)
- Support for both OpenVMS VAX and OpenVMS AXP™ systems
- Multihost support for up to three host DSSI nodes in a cluster environment
- User-selectable SCSI and DSSI node IDs

Figure 1–1 HSD05 Array Controller



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- DUP support for modifying operating parameters, such as DSSI nodename and device allocation classes
- Host-based striping
- Host-based volume shadowing (with some restrictions)

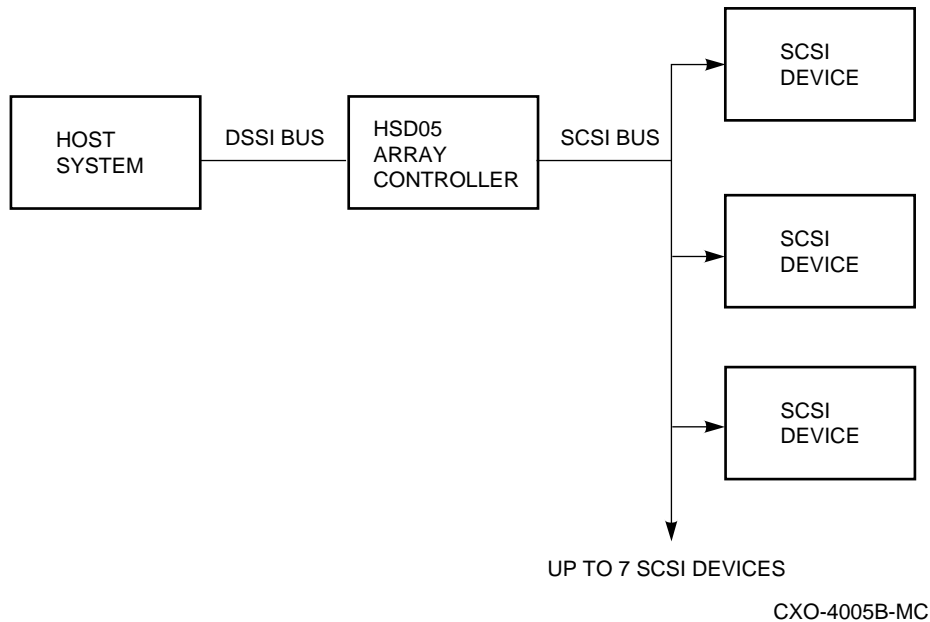
The HSD05 array controller also exhibits the following performance metrics:

- 500+ requests/second (aggregate)
- 1.7 MB/second sustained throughput (aggregate)

Each device served by the HSD05 array controller is independently addressable. Attached disk, tape, and solid-state drives appear to the host as standard DIGITAL storage architecture (DSA™) devices. Disk allocation class is user-definable, with all attached disks sharing the class value. Tape allocation class is independently user-definable in the same manner.

The HSD05 array controller identifies itself on the CI™ bus as a device of type RF72; its software revision is RFX B1. This identification is in device name only, and does not reflect actual device geometries.

Figure 1–2 HSD05 Array Controller Typical Installation



1.1.2 Overview of HSD05 Operating Requirements/Limitations

The HSD05 array controller is designed for installation in shelf slot 0. This preserves the integrity of the backplane SCSI bus, as the HSD05 array controller normally serves as a terminating end of the SCSI bus. Its factory-default SCSI node address, or SCSI ID, is 7.

While attached drives may be removed when the SCSI bus is quiesced (warm-swapped), they should not be removed with the SCSI bus active (hot-swapped) to avoid the possibility of data corruption errors. The HSD05 array controller itself should only be removed when the power is off to all nodes on the DSSI bus that is attached to the HSD05 array controller, and shelf power is disconnected (cold-swap).

Depending upon the complexity of the configuration, total DSSI bus length should be limited to between 30 to 60 feet with an HSD05 array controller attached to guarantee DSSI bus integrity.

Though it comprises the low end of the HSD family of array controllers, the HSD05 array controller does not support DIGITAL Standard Disk Format (DSDF™) protocol. Drives written by the HSD05 array controller can only be read by other StorageWorks array controllers using Transportable mode format; refer to the documentation supplied by other units on the use of this mode.

The HSD05 array controller supports host-based volume shadowing, but does not support controller-based shadowing assists. No HSD05 array controller-based Redundant Array of Independent Disks (RAID) functionality is supported.

The HSD05 array controller identifies attached disk devices as RF72 or RA82 disk drives, and attached tape devices as TU81 tape drives. This does not affect the actual accessible device storage space. However, the following restrictions apply to creating shadow sets:

- Due to device geometry differences, a disk drive served by the HSD05 array controller cannot be part of a shadow set with true RF72 (or any other DSSI device) disk drives.
- Shadow sets using HSD05 array controller-served disk drives must be of the same SCSI device type, for example RZ26, RZ26L, or RZ28 disk drives.

Supported tape drives such as the TLZ06 and TLZ6L offer multiple tape density settings, supported by the HSD05. Tape drives not offering this capability, such as the TZ86, operate in single-density/noncompacted mode only.

The HSD05 array controller does not support dual pathing or failover operation for attached devices.

The HSD05 array controller does not sequence disk drives when spinning up. To minimize surge current to the disk drives, spin up one or two drives at a time.

1.1.3 Connections to DSSI and SCSI Buses

The DSSI bus 68-pin connector (J1) is located on the front panel of the SBB. Connections to the backplane SCSI bus in the SBB shelf are made through a connector (J2) at the rear of the SBB. The module board contains the switches to select the DSSI ID, the SCSI ID, and bus termination. Indicators on the module board are visible through the louvers in the front panel of the unit.

1.1.4 Compatibility with StorageWorks Components

The HSD05 array controller is fully compatible with the power and environmental requirements of StorageWorks family devices. In a typical application, the HSD05 array controller can be installed in an SBB shelf without modification to the shelf, the shelf backplane, or other SBB devices. See Section 1.3 for listings of the physical and environmental specifications for the HSD05 array controller and the SBB shelf unit.

1.2 SBB Shelf Overview

This section provides a brief overview of the SBB shelf and its components.

Refer to the StorageWorks documentation listed in Table 1 for further information on SBB shelves and the StorageWorks family of products.

1.2.1 SBB Shelf Capacity

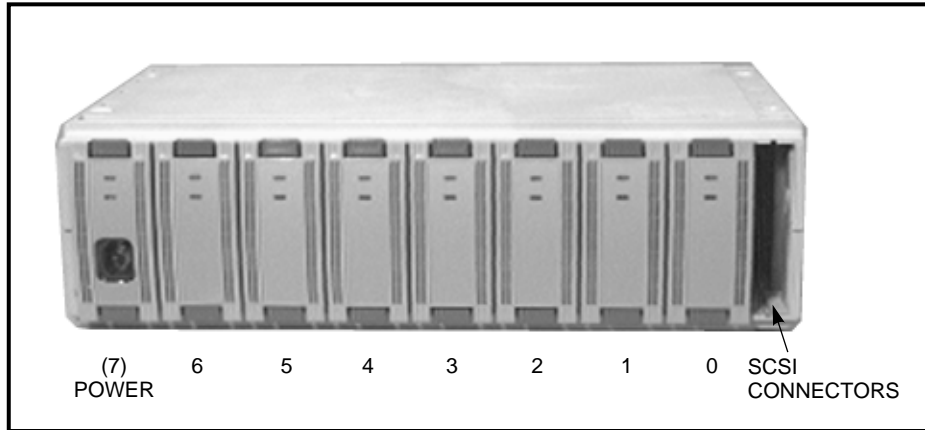
A typical SBB shelf can contain up to eight 3½-inch SBBs, as shown in Figure 1–3. The SBB slots are numbered 0 through 7 from right to left, starting with the slot adjacent to the SCSI connectors. Slot 7 is reserved for the power supply SBB. Slot 6 can be used for either a storage SBB, a redundant power supply, or a battery backup unit (BBU).

Cooling for the SBB shelf is supplied by two redundant blowers mounted on the rear of the shelf.

1.2.2 SBB Shelf SCSI Bus Connections

There are two 50-pin, high-density, female SCSI connectors on the backplane adjacent to slot 0. These connectors are accessible through the front of the SBB shelf. These connectors are not normally used in an HSD05 array controller installation, except when two SBB shelves are used (see Appendix A).

Figure 1–3 Typical SBB Shelf



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1.2.3 SBB Shelf SCSI Bus Addresses

There are seven SCSI bus device addresses (SCSI IDs) that are numbered 0 through 6. These addresses can be assigned to either 3½-inch or 5¼-inch SBBs. The slot numbers and the SCSI device addresses are the same for slots 0 through 6. Slot 7 is reserved for the shelf power supply SBB and does not have a device address.

1.2.4 SBB Shelf Power Supply

The StorageWorks cabinet ac or dc cable distribution unit (CDU) determines the type of power supply to be installed in the shelf.

1.3 HSD05 Array Controller Specifications

This section contains listings of the physical and environmental specifications for the HSD05 array controller and the SBB shelf unit.

Table 1–1 lists the dimensions of the HSD05 array controller and the SBB shelf.

Table 1–1 HSD05 Array Controller and SBB Shelf Dimensions

Description	Height mm (in)	Width mm (in)	Depth mm (in)
HSD05 SBB	121 (4.8)	51 (2.0)	216 (8.5)
BA350 SBB shelf	150 (5.9)	445 (17.5)	350 (13.8)

The HSD05 array controller is fully compatible with the environmental specifications for the StorageWorks family of products. These specifications are given in Table 1–2.

Table 1–2 Environmental Specifications

Condition	Specification
Optimum Operating Environment	
Temperature	+18° to +24°C (+65° to +75°F)
<i>Rate of change</i>	3°C (5.4°F)
<i>Step change</i>	3°C (5.4°F)
Relative humidity	40% to 60% (noncondensing) with a step change of 10% or less (noncondensing)
Altitude	From sea level to 2400 meters (8000 feet)
Air quality	Maximum particle count .5 micron or larger, not to exceed 500,000 particles per cubic feet of air
Inlet air volume	.026 cubic meters per second (50 cubic feet per minute)
Maximum Operating Environment (Range)	
Temperature	+10° to +40°C (+50° to +104°F) Derate 1.8°C for each 1000 meters (1.0°F for each 1000 feet) of altitude Maximum temperature gradient 11°C/hr (20°F/hr) ±2°C/hr (4°F/hr)
Relative humidity	10% to 90% (noncondensing) Maximum wet bulb temperature: 28°C (82°F) Minimum dew point: 2°C (36°F)
Maximum Nonoperating or Storage Environment (Range)	
Temperature	
<i>Nonoperating</i>	+18° to +29°C (+65° to +85°F)
<i>Storage</i>	–40° to +66°C (–40° to +151°F)
Relative humidity	
<i>Nonoperating</i>	10% to 90% (noncondensing)
<i>Storage</i>	8% to 95% in original shipping container (noncondensing); otherwise, 50% (noncondensing)
Altitude	From –300 meters (–1000 feet) to +3600 meters (+12,000 feet) MSL

Preparing to Use the HSD05 Array Controller

This chapter contains information and procedures for unpacking, configuring, and installing the HSD05 array controller.

2.1 Site Preparation

The HSD05 array controller is fully compatible with all physical, electrical, and environmental specifications for SBB shelves and components. Refer to Section 1.3 for a listing of applicable factors to be considered when installing or storing the HSD05 array controller.

Environmental Stabilization

To ensure proper operation of Digital storage devices, the SBB shelf temperature must be within 18–29°C (65–85°F). Table 2–1 specifies the time required to thermally stabilize the HSD05 array controller and other SBBs based on the ambient shipping temperature.

CAUTION

Be sure to thermally stabilize the HSD05 array controller in the operating environment prior to installation or operation. Otherwise, the associated electronics may be damaged when power is applied to the unit.

If condensation is visible on the outside of the HSD05 array controller:

Stabilize the HSD05 array controller in the operating environment for 6 hours or until the condensation is no longer visible, whichever is longer. Do not insert the HSD05 array controller into the shelf until it is fully stabilized.

If condensation is not visible on the outside of the HSD05 array controller:

Thermally stabilize the HSD05 array controller for the amount of time specified in Table 2–1.

Table 2–1 Thermal Stabilization Specifications

Ambient Temperature Range ° C	Ambient Temperature Range ° F	Minimum Stabilization Time
60 to 66	140 to 151	3 hours
50 to 59	122 to 139	2 hours
40 to 49	104 to 121	1 hour
30 to 39	86 to 103	30 minutes
18 to 29	65 to 85	None
10 to 17	50 to 64	30 minutes
0 to 9	32 to 49	1 hour
-10 to -1	14 to 31	2 hours
-20 to -11	-4 to 13	3 hours
-30 to -21	-22 to -5	4 hours
-40 to -31	-40 to -21	5 hours

2.2 Unpacking the HSD05 Array Controller

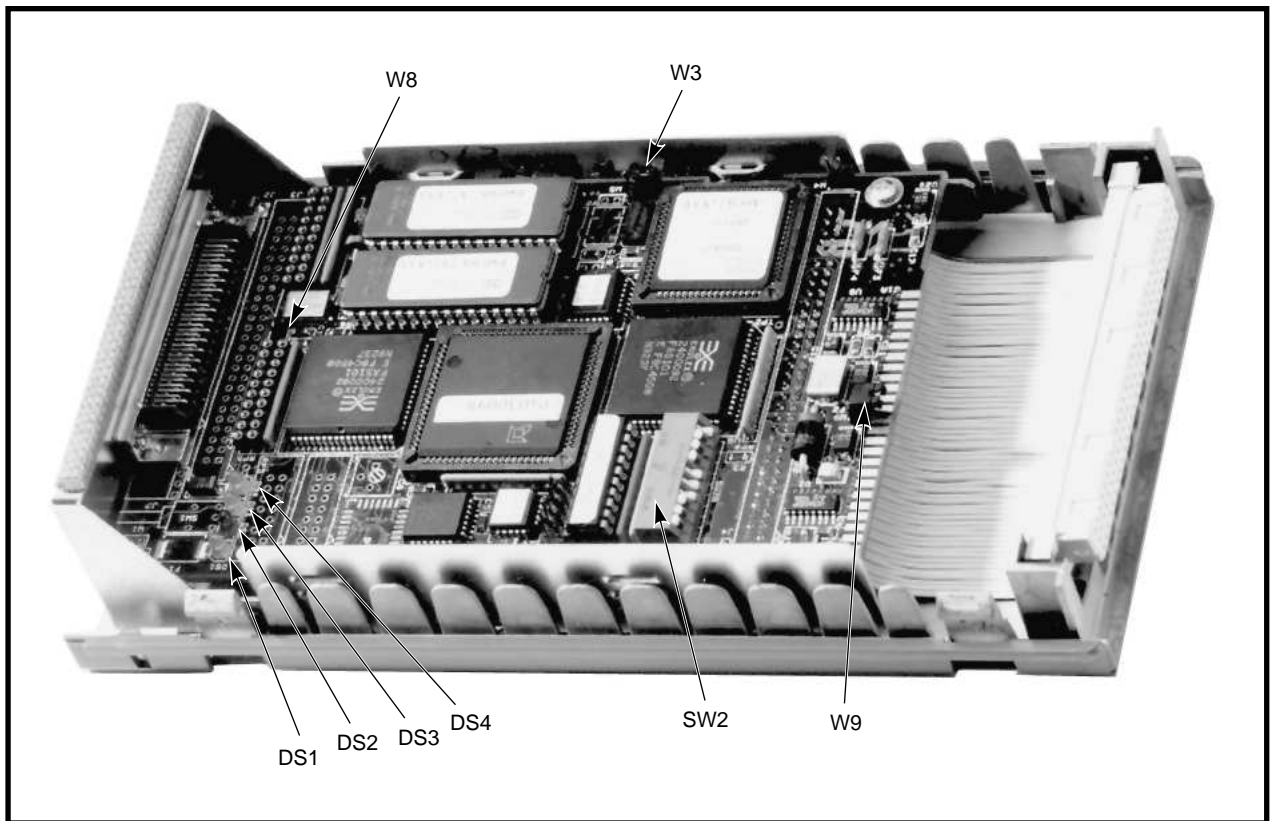
Use the following procedure to remove the HSD05 array controller from its shipping carton :

1. Before unpacking the HSD05 array controller, inspect the shipping carton for signs of external damage. Report any damage to the local carrier, and to Digital Multivendor Services or your local Digital sales office.
2. Be sure to thermally stabilize the HSD05 array controller as given in Environmental Stabilization and Table 2–1.
3. After removing the HSD05 array controller from its shipping container, inspect the array controller for signs of external damage. Report any damage to the local carrier, and to Digital Multivendor Services or your local Digital sales office.
4. To prevent damage from electrostatic discharge (ESD), do not touch the HSD05 DSSI or SCSI connectors.

2.3 HSD05 Array Controller Switches and Jumpers

The HSD05 array controller module board contains switches and jumpers, as shown in Figure 2–1. All jumpers are installed at the factory and do not need to be set during normal installation of the HSD05 array controller. The switch sections on the device configuration switchpack need to be set to configure the DSSI ID and the SCSI ID.

Figure 2-1 HSD05 Array Controller Module Board Layout



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The functions of the switches and jumpers on the module board are given in the following tables:

- **Table 2-2** lists the jumper settings for the HSD05 array controller. These settings need not be changed during a normal installation.
- **Table 2-3** lists the switch sections in the device configuration switchpack (SW2). You will need to set these switches according to the procedures given in Section 2.4.

Table 2–2 HSD05 Array Controller Module Board Jumpers

Jumper	Definition
W1	Reserved
W2	Reserved
W3	EPROM size
W4	Wait state
W5	Reserved
W6	Reserved
W7	Reserved
W8	DSSI terminator power supplied by module
W9	SCSI terminator power supplied by module

Table 2–3 Device Configuration Switchpack (SW2) Sections

Section	Definition	Default
SW2–1	MSB of DSSI ID	Open (DSSI ID = 0)
SW2–2	NSB of DSSI ID	Open
SW2–3	LSB of DSSI ID	Open
SW2–4	MSB of SCSI ID	Closed (SCSI ID = 7)
SW2–5	NSB of SCSI ID	Closed
SW2–6	LSB of SCSI ID	Closed
SW2–7	Spare	Open
SW2–8	Spare	Open
SW2–9	Spare	Open
SW2–10	Active SCSI termination	Closed (terminators installed)

2.4 Setting the Device Configuration on the HSD05 Array Controller

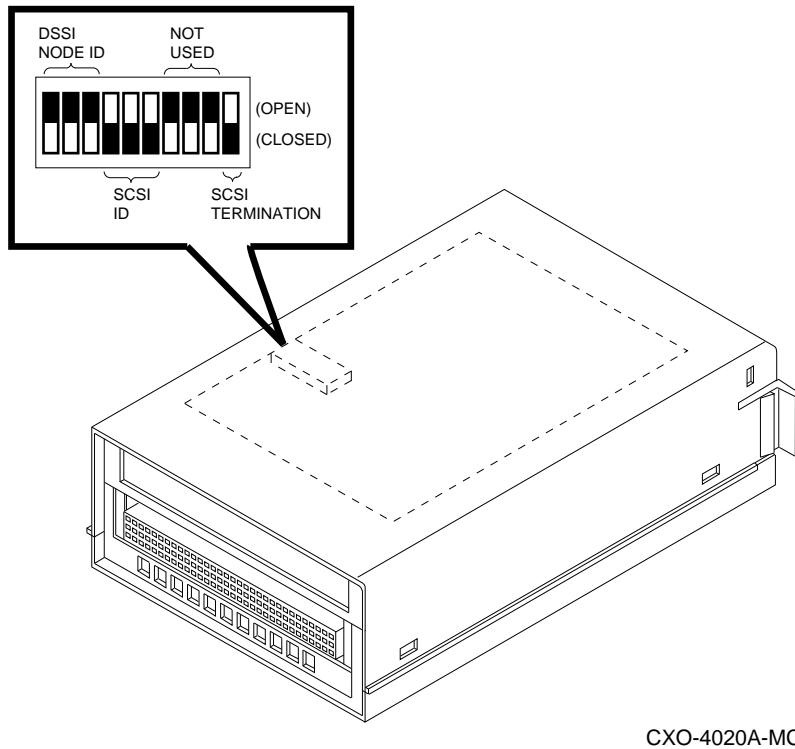
This section contains the procedure to set the switches on the HSD05 array controller module board prior to installation in the SBB shelf. To access the switches, look through the slot in the back cover of the HSD05 array controller and locate the configuration switchpack, as shown in Figure 2–2.

The device configuration switchpack contains 10 switch elements, divided into DSSI ID and SCSI ID sections as shown in Figure 2–2. Refer to The NAME_ALGRM Parameter for detailed information on the makeup of the MSCP/TMSCP unit numbers.

2.4.1 DSSI ID

The DSSI port (J1) on the front panel connects the HSD05 array controller to a standard DSSI bus device, such as a VAX 4000™ host computer.

Figure 2–2 Device Configuration Switchpack



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Selecting the DSSI ID

Each device on the DSSI bus requires a unique device address in the range of 0 through 7. DSSI ID 7 has the highest priority on the bus and DSSI ID 0 has the lowest priority. The DSSI ID is factory set to 0; you may need to change this ID to one that is currently not being used on your system.

Setting the DSSI ID

Table 2–4 lists the sections of SW2 and the corresponding settings for each DSSI ID. On the switchpack, the closed position is with the switch in the down position, and the open position is with the switch in the up position.

Table 2–4 DSSI ID Switch Settings

DSSI ID	SW2–1	SW2–2	SW2–3
0	Open	Open	Open
1	Open	Open	Closed
2	Open	Closed	Open
3	Open	Closed	Closed
4	Closed	Open	Open
5	Closed	Open	Closed
6	Closed	Closed	Open
7	Closed	Closed	Closed

Use the following procedure to set the DSSI ID:

1. At the system console prompt, enter the console command `SHOW DEVICE` on OpenVMS VAX systems, or `SHOW CONFIG` on OpenVMS AXP systems, to determine the DSSI ID numbers currently active on the DSSI bus.
2. Select an unused DSSI ID number for the HSD05 array controller.
3. Refer to Figure 2–2 and Table 2–3 to locate the DSSI ID switches on the device configuration switchpack.
4. Using a small blade screwdriver or similar tool, reach through the slot in the rear panel of the HSD05 array controller, and set the switchpack to the DSSI ID number selected in Step 2.

2.4.2 SCSI ID

The SCSI port (J2) plugs into the SBB shelf backplane when the HSD05 array controller is installed in the shelf. This port must have a unique SCSI ID for that SBB shelf.

Selecting the SCSI ID

The HSD05 array controller is factory set to SCSI ID = 7 to give it the highest priority on the SCSI bus. The other devices in the configuration must have SCSI ID numbers between 0 and 6. For normal operation, you should not need to reset the SCSI ID.

Setting the SCSI ID

Table 2–5 lists the sections of SW2 and the corresponding sections used to set the SCSI ID. On the switchpack, the closed position is with the switch in the down position, and the open position is with the switch in the up position.

Table 2–5 SCSI ID Switch Settings

SCSI ID	SW2–4	SW2–5	SW2–6
0	Open	Open	Open
1	Open	Open	Closed
2	Open	Closed	Open
3	Open	Closed	Closed
4	Closed	Open	Open
5	Closed	Open	Closed
6	Closed	Closed	Open
7	Closed	Closed	Closed

Use the following procedure to set the SCSI ID, if required:

1. Select an unused SCSI ID for the HSD05 array controller.
2. Refer to Figure 2–2 and Table 2–3 to locate the SCSI ID switches on the node configuration switchpack.
3. Using a small blade screwdriver or similar tool, reach through the slot in the rear panel of the HSD05 array controller and set the switchpack to the SCSI ID number selected in Step 2.

2.4.3 Selecting Bus Termination

DSSI and SCSI bus rules require that these buses be terminated at both physical ends.

The DSSI bus can be terminated externally by using a terminator on the DSSI tralink connector (shown in Figure 2–3), supplied with the HSD05 array controller. Because the HSD05 array controller typically occupies one end of the DSSI bus, this terminator is normally installed. Make sure that the other end of the DSSI bus is properly terminated.

Note

The DSSI bus uses two types of connectors: either a microribbon connector or a tab-and-socket connector. If you are connecting to a KFMSA/KFMSB host adapter, the cable will have microribbon connectors at both ends. All other host adapters use a tab-and-socket connector. The tralink has two microribbon connectors.

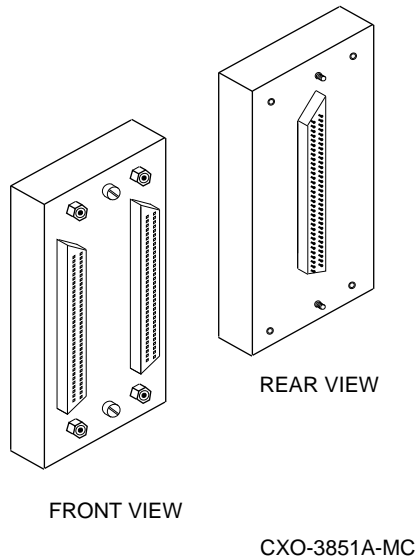
Selecting a terminator on the SCSI bus is dependent on the exact configuration of the SBB shelf in the chain of SCSI devices. The HSD05 array controller is shipped with active SCSI bus termination enabled. When installed in SBB shelf slot 0, it provides termination at the HSD05 array controller end of the SCSI bus. Make sure that the other end of the SCSI bus is also terminated properly.

Refer to the StorageWorks documentation for the rules used to select terminations on the SCSI bus. Appendix A contains diagrams of some typical installations of the HSD05 array controller.

2.5 Installing the HSD05 Array Controller in an SBB Shelf

Before starting this procedure, verify that the SBB shelf receiving the HSD05 array controller is the correct one, and that it is permissible to change any SCSI cables connected to JA1 and JB1 of the shelf to suit the planned configuration.

Figure 2–3 DSSI Trilink Connector



The HSD05 array controller should be installed in shelf slot 0. SCSI bus integrity can be compromised if the HSD05 array controller is installed in any other slot of a standard SBB shelf. Refer to the StorageWorks documentation for further information on selecting an SBB slot and on cable configuration rules for the SBB shelf.

Installation Procedure

Use the following procedure to install the HSD05 array controller in the SBB shelf:

1. Remove power from the shelf by removing the input power cable(s) to the power supply SBB(s) in the shelf. If there is only one power supply SBB in the shelf, it will be in slot 7.
2. Remove all SCSI devices from the SBB shelf.
3. For single-shelf HSD05 array controller configurations, disconnect any cables at JA1 and JB1 of the shelf.
4. For dual-shelf HSD05 array controller configurations, see Figure A–2 for a diagram showing interconnected shelves.
5. Insert the HSD05 array controller into shelf slot 0.
6. Take all DSSI nodes off line to remove power from the DSSI bus that will be connected to the HSD05 array controller.

CAUTION

Make sure that the trilink connector pins are not bent or damaged before installing it on the HSD05 array controller.

7. Install a DSSI trilink connector (part number 12-39921-02), shown in Figure 2-3, at J1 on the front panel of the HSD05 array controller.
8. Connect the DSSI cables to the trilink connector as directed in either of the the following:
 - If the HSD05 array controller occupies one end of the DSSI bus, connect the DSSI cable to one of the connectors on the trilink. Install a DSSI bus terminator (part number 12-31281-01) on the other trilink connector.
 - If the HSD05 array controller occupies a mid-point of the DSSI bus, connect the DSSI bus cables from adjacent nodes to the trilink connectors. The DSSI bus terminator is not used on the trilink in this configuration.

Appendix A shows several typical HSD05 array controller cable configurations.

9. Restore power to the DSSI bus nodes, but do not boot the host systems at this time.

2.6 Applying Power

Apply power to the SBB shelf and the HSD05 array controller as follows:

1. Connect the input power cable(s) to the power supply SBB(s) in the shelf.
2. Verify that the Shelf Status indicator on the power supply SBB is lit. If this indicator is not lit, refer to the StorageWorks documentation to troubleshoot the cause of the fault.
3. Verify that the following HSD05 array controller indicators (shown in Figure 2-1), visible from top to bottom through the front panel louvers, are as follows:

Indicator	Color	Status
DS4	Green	On to show that termination power, supplied by either the HSD05 array controller or the SBB shelf, is applied to the SCSI bus
DS3	Green	On to show that termination power, supplied by either the HSD05 array controller or the host bus, is applied to the DSSI bus.
DS2	Red	Blinks for 15 seconds during module boot. If this indicator blinks for longer than 15 seconds, there is a device fault.
DS1	Green	Blinks during normal operation while the subsystem is booted.

CAUTION

Device unit numbers as seen by the hosts must be unique through the system or cluster containing the HSD05 array controller. If a unit number is added that overlaps the unit number of another device on another controller of a system or cluster, all the devices on the other

controller can disappear. In this event, the unit number conflict should be resolved, and controller power should then be cycled off/on to make the devices available to the host system or cluster.

4. At the system console prompt, enter the console command `SHOW DEVICE` on OpenVMS VAX systems, or `SHOW CONFIG` on OpenVMS AXP systems, to verify that the HSD05 DSSI node address is on line to the host systems.

2.7 Setting Parameters for the HSD05 Array Controller

The OpenVMS diagnostic and utility protocol (DUP) utility provides a gateway to modifying HSD05 array controller parameters. You can run this utility from either the system console or from the OpenVMS system prompt.

Once a DUP connection to the HSD05 array controller is established, the onboard PARAMS configuration utility is used to set and show HSD05 parameters. Chapter 3 contains procedures for using the HSD05 onboard device and diagnostic utility (UTILIT) during normal operation of the subsystem.

In the following sections, user input is shown in **boldface** type in the examples.

2.7.1 Starting PARAMS from the Console Prompt on OpenVMS VAX Systems

Use the following procedure to start PARAMS from the console prompt on OpenVMS VAX systems:

1. At the console prompt, enter the `SHOW DEVICE` command as shown in the following example:

```
>>> SHOW DEVICE
DSSI Node ID 0 (DSSI nodename) ❶
DSSI NODE ID 5 (*)
UQSSP Disk Controller 0 (772150)
-DUA0 (RA82)
Ethernet Adapter
-ESA0 (08-00-2B-13-80-85)
```

- ❶ This is the HSD05 array controller. The *DSSI nodename* is initially a six-digit number. Do not confuse this number with the DSSI ID value.
2. Depending upon your installation, enter one of the following two command lines to use the DUP utility to establish a connection to the HSD05 array controller:

```
>>> SET HOST/DUP/DSSI a
Starting DUP server...
Copyright (C) 1994 Digital
HSD05 Serial No: 8
Firmware Rev. B1 (X36 )
DIRECT V1.0 D Dec 21 1993 16:59:31
PARAMS V1.0 D Dec 21 1993 16:59:31
UTILIT V1.0 D Dec 21 1993 16:59:31
End of directory
Task Name?
```

where *a* is the DSSI ID of the HSD05 array controller.

You may have to explicitly specify the DSSI bus (0 or 1) to properly establish a connection to the HSD05 array controller. In such cases use the following command line:

```
>>> SET HOST/DUP/DSSI/BUS:n a
Starting DUP server...

Copyright (C) 1994 Digital
      HSD05   Serial No: 8
      Firmware Rev. B1   (X36 )

DIRECT V1.0 D Dec 21 1993 16:59:31
PARAMS V1.0 D Dec 21 1993 16:59:31
UTILIT V1.0 D Dec 21 1993 16:59:31

End of directory

Task Name?
```

where:

n is the DSSI bus ID number (0 or 1).

a is the DSSI ID for the HSD05 array controller.

3. At the “Task Name?” prompt, enter PARAMS. If you do not see the “Task Name?” prompt, DUP has not established a connection to the HSD05 array controller. In this event, see your system manager.
4. At the PARAMS prompt, see Section 2.7.3 to configure HSD05 parameters.

2.7.2 Starting PARAMS from the Console Prompt on OpenVMS AXP Systems

Use the following procedure to start PARAMS from the console prompt on OpenVMS AXP systems:

1. At the console prompt, enter the SHOW CONFIG command as shown in the following example:

```
>>>SHOW CONFIGURATION

Console V2.8-9900                               VMS PALcode X5.37F, OSF PALcode X1.28F
CPU 0      P      B2001-BA DECchip (tm) 21064-3
CPU1      -
Memory 0   -
Memory 1   -
Memory 2   -
Memory 3   P      B2002-DA 128 MB
Ethernet 0 P      08-00-2B-32-E6-AB
Ethernet 1 P      08-00-2B-32-E6-AA

          ID 0   ID 1   ID2   ID 3   ID 4   ID 5   ID 6   ID 7
A   SCSI   P      RZ73                                     Host
B   SCSI   P      RZ73                                     Host
C   DSSI   P           RF73                             RF72❶ Host
D   DSSI   P           RF73                             RF73 Host
E   SCSI   P      TZ85   RRD42                                     Host
Futurebus+ P           FBD0                                     Host

System Status Pass          Type b to boot ducl.1.0.2.0
```

- ❶ This display is a map of the attached devices and their SCSI/DSSI bus addresses. The HSD05 array controller is displayed as device RF72. In this example, the ID 4 column shows that the DSSI ID = 4, and row C shows that the DSSI bus designation where the HSD05 resides is C.

2. Enter the following command to use the DUP utility to establish a connection to the HSD05 array controller:

```
>>> SET HOST -DUP d
```

where *d* is the appropriate port address identifier for the HSD05 array controller.

The following command line shows an example of this entry:

```
>>> SET HOST -DUP PUC0.4.0.2.0
Starting DUP server...

Copyright (C) 1994 Digital
      HSD05      Serial No: 8
      Firmware Rev. B1   (X36 )

DIRECT V1.0 D Dec 21 1993 16:59:31
PARAMS V1.0 D Dec 21 1993 16:59:31
UTILIT V1.0 D Dec 21 1993 16:59:31

End of directory

Task?
```

3. At the “Task?” prompt, enter PARAMS. If you do not see the “Task?” prompt, DUP has not established a connection to the HSD05 array controller. In this event, see your system manager.
4. At the PARAMS prompt, see Section 2.7.3 to configure HSD05 parameters.

2.7.3 PARAMS Configuration Utility

The PARAMS configuration utility display shows the settings for HSD05 array controller parameters. At the PARAMS prompt, enter SHOW /ALL to display the current HSD05 parameters. When entering this command, a space is required between the SHOW and /ALL qualifier. The meaning of each parameter is given in Table 2–6.

HSD05 array controller operating parameters are initialized by manufacturing. Depending upon the specific configuration of your system or cluster, suggested parameters that may need to be set include:

- NODENAME
- DISK_ALCS
- TAPE_ALCS
- UNIT_OFFSET

Table 2–6 PARAMS Configuration Utility HSD05 Array Controller Parameters

Parameter Name	Definition
NODENAME	HSD05 node name. This value must be unique among all systems in the VAXcluster™ system. The string cannot include the dollar sign (\$), or underscore (_) characters and should be no longer than eight characters. The factory default for the node name is a unique six-digit number.

(continued on next page)

Table 2–6 (Cont.) PARAMS Configuration Utility HSD05 Array Controller Parameters

Parameter Name	Definition
SYSTEMID	Specifies the lower order 32 bits of the 48-bit system identification number. The factory default for this identifier is the same as specified by the NODENAME parameter.
DISK_ALCS	Determines the device allocation class for all disk devices connected to HSD05 array controller. If disks are to be served to other nodes within the VAXcluster, this parameter must be non-zero and match the ALLOCLASS SYSGEN parameter on connected systems. The factory default for this parameter is zero.
TAPE_ALCS	Determines the device allocation class for all tape devices connected to the HSD05 array controller. If tapes are to be served to other nodes within the VAXcluster, this parameter must be non-zero and match the ALLOCLASS SYSGEN parameter on connected systems. The factory default for this parameter is zero.
INTERVAL	Controls the rate at which SCSI device scanning is done. This value is only used if SCANNING is enabled. The factory default for this parameter is 60 seconds.
NUMPOLL	Controls the number of SCSI devices to look for during each INTERVAL. This parameter is currently not implemented but may be activated in a future revision of the firmware. The factory default for this parameter is 7, which scans for all available units at each interval.
UNIT_OFFSET	Helps to differentiate devices when a system has two DSSI buses. Unit offset is specified as the value to be used in the thousands position of the MSCP unit ID, such as x for DIAx210. This offset is automatically created by the system. The unit offset values must be unique for each DSSI bus on the system. The factory default for this parameter is 0.
SYNC_RATE	The rate in MHz that data is transferred during the data transmission phase between target and host. The factory default for this parameter is 7 MHz.
MAX_HOSTS	Determines the maximum number of hosts with which the HSD05 array controller will communicate. This parameter is primarily used for disk and tape credit allotment. For best performance, set this parameter to the maximum number of hosts to be used. Digital supports up to three hosts (the factory default) in a multihost HSD05 array controller configuration.
FASTSCAN	Reduces the SCSI SELECT timeout to a much smaller value, with the default timeout set at 250 milliseconds. This parameter is currently not implemented. The factory default for this parameter is 0 (disabled).
SCANNING	Enables/disables the HSD05 array controller's ability to scan for newly connected devices. If scanning is disabled, the HSD05 array controller only does one scan for devices at power up, and will not look for new devices every INTERVAL seconds. The factory default for this parameter is 1.
DISCONNECT	Enables/disables the ability to disconnect all SCSI devices connected to the HSD05 array controller. When only one device is connected to the HSD05 array controller, this parameter should be disabled for better performance. The factory default for this parameter is 1.

(continued on next page)

Table 2–6 (Cont.) PARAMS Configuration Utility HSD05 Array Controller Parameters

Parameter Name	Definition
POWERONRST	Enables/disables issuing a SCSI BUS RESET command when the system is turned on. The factory default for this parameter is 1 (enabled).
TRYSYNC	Enables/disables synchronous negotiation when a SCSI device is initialized. For very short cables, synchronous negotiation can be disabled for better performance in ASYNC mode rather than SYNC mode. The factory default for this parameter is 1 (enabled).
SPIN_DOWN	Enables/disables the ability of the HSD05 array controller to spin down drives or eject media when the operating system issues a spin down command, such as the OpenVMS command DISMOUNT/UNLOAD. The factory default for this parameter is 1 (enabled).
TAGGED_CMD	Enables/disables simple tag queuing. The factory default for this parameter is 1 (enabled).
TRUNCATE	This parameter truncates the number of blocks to be divisible by 126. The factory default for this parameter is 1. This default supports faster OpenVMS volume shadowing catch-up time. A value of 0 selects no truncation for compatibility with other third-party units.
DEVICE_TYPE	This parameter applies to disk drives only. When disabled (set to 0), the device type reported by the HSD05 array controller to the OpenVMS operating system is an RA82™ disk drive. When enabled, the HSD05 array controller reports the RF72™ device type. The device type reported to the host does not affect the accessible disk space. The factory default for this parameter is 1 (enabled).
IMMEDIATE	When enabled, this parameter causes the IMMEDIATE bit in the SCSI START and STOP commands to be set. Note that when IMMEDIATE is set to 0, the OpenVMS prompt does not return until the drive's media is ejected or the drive has spun down. The factory default for this parameter is 1 (enabled).
CMD_P3	Determines the type of transmission used on the DSSI bus for single host configurations only: 0 for standard and 1 for fast mode. This is a hidden parameter that is not displayed by the PARAMS SHOW /ALL, SHOW /SCSI, or SHOW /SCS commands. To display this parameter value, use the SHOW CMD_P3 command in the PARAMS utility. The factory default for this parameter is 1 (fast mode).
TMARKSEARCH	Enables fast tape mark searching. Because some tape drives perform slowly while looking for tape marks during operations on large space records, a skip tapemark is done instead. Because the device does not report the number of records skipped between tapemarks, the position (object) count is not correct when this parameter is enabled. The factory default for this parameter is 0 (disabled).
SHORT_TMARK	Enables/disables writing short filemarks on Exabyte® devices. When disabled, all filemarks are written as large filemarks. The factory default for this parameter is 1 (enabled).

(continued on next page)

Table 2–6 (Cont.) PARAMS Configuration Utility HSD05 Array Controller Parameters

Parameter Name	Definition
WT_PROTECTED	Enables/disables write protection for each SCSI ID. When disabled (set to 0), it allows read-write access to a SCSI ID, and when enabled, it restricts access to read only. This parameter is in the form of a boolean matrix, with the leftmost position representing a SCSI ID of 7, and the rightmost position representing a SCSI ID of 0. For example, a WT_PROTECTED setting of 00000001 allows read-write access to SCSI IDs 1 through 7 and read only access to SCSI ID 0. The factory default for this parameter is 00000000 (no devices write protected).
ONLINE	Controls whether devices are on line or off line to the host. This parameter is in the form of a boolean matrix, with the leftmost position representing SCSI ID=7, and the rightmost position representing SCSI ID=0. For example, a WT_PROTECTED setting of 10000000 sets SCSI IDs 0 through 6 off line and SCSI ID 7 on line. The factory default for this parameter is 11111111 (all devices on line).
NAME_ALGRM	This parameter is fully described in The NAME_ALGRM Parameter.
SCSI_ID_X	Used in conjunction with the NAME_ALGRM parameter to set alternative device names for each SCSI ID.

The NAME_ALGRM Parameter

The NAME_ALGRM parameter toggles between the HSD05 array controller's standard device naming convention and an alternative convention based upon the TMSCP/MSCP unit number. When NAME_ALGRM is set to the default of 0, the HSD05 array controller uses its standard naming algorithm, which assigns a unit number composed of the DSSI ID of the HSD05 array controller according to the following parameters:

- **Unit offset**—A unique number (0 - 9) for each host DSSI bus. This parameter can be used to modify bus numbering conflicts in multiple DSSI bus configurations.
- **DSSI ID**—The DSSI device address for the HSD05 array controller.
- **SCSI ID**—The SCSI device address for the storage device. This is set by either the device's shelf slot position or by ID switches on the device.
- **SCSI logical unit number**—The device address of a subdevice attached to a SCSI device identified by SCSI ID *x*.

Setting NAME_ALGRM to 1 activates the alternative naming algorithm, which assigns a unit number in conjunction with the SCSI_ID_X parameter. These two conventions are summarized as follows:

NAME_ALGRM Setting	Formula for MSCP/TMSCP Unit Number ¹	Example																											
0	<i>wxyz</i>	1234 where: <i>w</i> = 1, <i>x</i> = 2, <i>y</i> = 3, <i>z</i> = 4																											
1	<i>scsi_id_x + ((w + 1) * z)</i>	Assuming <i>w</i> = 1, <i>z</i> = 1, and the <i>scsi_id_x</i> parameter values are as follows:																											
		<table border="1"> <thead> <tr> <th>SCSI ID</th> <th>SCSI_ID_X</th> <th>MSCP/TMSCP Unit Number</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>2</td></tr> <tr><td>1</td><td>10</td><td>12</td></tr> <tr><td>2</td><td>20</td><td>22</td></tr> <tr><td>3</td><td>30</td><td>32</td></tr> <tr><td>4</td><td>40</td><td>42</td></tr> <tr><td>5</td><td>50</td><td>52</td></tr> <tr><td>6</td><td>60</td><td>62</td></tr> <tr><td>7</td><td>70</td><td>72</td></tr> </tbody> </table>	SCSI ID	SCSI_ID_X	MSCP/TMSCP Unit Number	0	0	2	1	10	12	2	20	22	3	30	32	4	40	42	5	50	52	6	60	62	7	70	72
SCSI ID	SCSI_ID_X	MSCP/TMSCP Unit Number																											
0	0	2																											
1	10	12																											
2	20	22																											
3	30	32																											
4	40	42																											
5	50	52																											
6	60	62																											
7	70	72																											

¹where:
w = UNIT_OFFSET parameter
x = DSSI ID
y = SCSI ID
z = SCSI logical unit number

2.7.4 Display Device Parameters Using the PARAMS Config Utility

To display the device parameters, enter SHOW /ALL at the PARAMS prompt; a space is required between the SHOW and /ALL qualifier. The default settings are as follows:

```
PARAMS> SHOW /ALL
```

Parameter Name	Active	Min.	Max.	Units
NODENAME	"xxxxxx"	1	8	Ascii
SYSTEMID	xxxxxx	1	268435456	DecimalNum
DISK_ALCS	0	0	255	DecimalNum
TAPE_ALCS	0	0	255	DecimalNum
INTERVAL	60	0	32768	Seconds
NUMPOLL	7	0	7	DecimalNum
UNIT_OFFSET	0	0	9	DecimalNum
SYNC_RATE	7	1	10	DecimalNum
MAX_HOSTS	4	1	7	DecimalNum
FASTSCAN	0	0	1	Boolean
SCANNING	1	0	1	Boolean
POWERONRST	1	0	1	Boolean
TRYSYNC	1	0	1	Boolean
SPIN_DOWN	1	0	1	Boolean
TAGGED_CMD	1	0	1	Boolean
TRUNCATE	1	0	1	Boolean
DEVICE_TYPE	1	0	1	Boolean
IMMEDIATE	1	0	1	Boolean
TMARKSEARCH	0	0	1	Boolean
SHORT_TMARK	1	0	1	Boolean
WT_PROTECTED	0000000	0	1	BooleanM

ONLINE	11111111	0	1	BooleanM
NAME_ALGRM	0	0	255	DecimalNum
SCSI_ID_0	0	0	9999	DecimalNum
SCSI_ID_1	10	0	9999	DecimalNum
SCSI_ID_2	20	0	9999	DecimalNum
SCSI_ID_3	30	0	9999	DecimalNum
SCSI_ID_4	40	0	9999	DecimalNum
SCSI_ID_5	50	0	9999	DecimalNum
SCSI_ID_6	60	0	9999	DecimalNum
SCSI_ID_7	70	0	9999	DecimalNum

2.7.5 Set Device Parameters Using the PARAMS Configuration Utility

Use the following procedure to set new device parameters:

1. At the PARAMS prompt, enter the parameters you wish to change, as shown in the following example:

```
PARAMS> SET NODENAME HSD1
PARAMS> SET DISK_ALCS 10
```

In this example, the NODENAME has been changed to HSD1 and the DISK_ALCS parameter set to 10.

2. Enter the SHOW /ALL command to display your changed parameters:

```
PARAMS> SHOW /ALL

Parameter Name      Active      Min.      Max.      Units
-----
NODENAME            "HSD1"     "         "         1         8         Ascii
SYSTEMID            131072
DISK_ALCS           10         0         255       DecimalNum
TAPE_ALCS           0         0         255       DecimalNum
INTERVAL            60         0         32768     Seconds
.
.
.
SCSI_ID_4           40         0         9999     DecimalNum
SCSI_ID_5           50         0         9999     DecimalNum
SCSI_ID_6           60         0         9999     DecimalNum
SCSI_ID_7           70         0         9999     DecimalNum
```

3. Save the changes to nonvolatile memory with the following command:

```
PARAMS> WRITE
```

4. Reboot the HSD05 array controller to use the new parameters:

```
PARAMS> RESTART
```

5. Install the SCSI devices in the SBB shelf, making sure that the SCSI IDs are unique for each HSD05, and that they do not overlap each other or the SCSI address of the HSD05 array controller (default = 7). You do not need to remove power from the SBB shelf for this step.
6. Check that the Device Fault indicators on the front panels of the storage unit SBBs are not lit. If any indicator is lit, refer to the StorageWorks documentation to troubleshoot the cause of the fault.

7. At the system console prompt, enter the console command `SHOW DEVICE` on OpenVMS VAX systems or OpenVMS AXP systems to verify that the SCSI devices are available to the host systems.

CAUTION

The HSD05 array controller returns a limited set of device type identification names to the host. All attached tape drives are identified as TU81 (MUAxxx). All attached disk drives are normally identified as RF72 (DIAxxx); this can be changed to identification as RA82 (DUAXxx) by setting the HSD05 parameter `DEVICE_TYPE` to 0. These device types as reported to the host do not affect actual accessible device storage space.

Due to device geometry differences, a disk drive served by the HSD05 array controller cannot be part of a shadow set with true RF72, or any other DSSI disk drives. Shadow sets using HSD05 array controller-served disk drives must be of the same SCSI device type; for example, RZ26, RZ26L, or RZ28 disk drives.

8. Reboot the host systems to update the host device tables to the new settings for the HSD05 array controller and attached devices. Verify that any parameter changes are shown at both the console and within the OpenVMS operating system.

Operating the HSD05 Array Controller

This chapter contains procedures used in the everyday operation of the HSD05 array controller, including how to run the onboard utilities, troubleshooting procedures, and a remove and replace procedure for the HSD05 array controller.

CAUTION

Whenever a host on a DSSI bus containing an HSD05 array controller is rebooted, Digital recommends that the HSD05 array controller is also reset to ensure consistent reporting of HSD05-served devices to the host. This can be accomplished by issuing a “restart” command in the PARAMS configuration utility, or simply by removing and restoring power to the HSD05-served shelf.

3.1 HSD05 Device Utilities

The HSD05 onboard utilities (UTILIT) allow you to monitor, format, qualify, and exercise SCSI devices from the OpenVMS operating system. The onboard utilities are accessed through the diagnostic and utility protocol (DUP) server, either through the system console or from the OpenVMS prompt.

In this chapter, user input is shown in **boldface** type in the examples.

CAUTION

The HSD05 array controller returns a limited set of device type identification names to the host. All attached tape drives are identified as TU81 (MUAxxx). All attached disk drives are normally identified as RF72 (DIAxxx); this can be changed to identification as RA82 (DUAxxx) by setting the HSD05 parameter DEVICE_TYPE to 0. These device types as reported to the host do not affect actual accessible device storage space.

Due to device geometry differences, a disk drive served by the HSD05 array controller cannot be part of a shadow set with true RF72, or any other DSSI disk drives. Shadow sets using HSD05 array controller-served disk drives must be of the same SCSI device type; for example, RZ26, RZ26L, or RZ28 disk drives.

3.1.1 Starting UTILIT from the Console Prompt on OpenVMS VAX Systems

Use the following procedure to start UTILIT from the console prompt on OpenVMS VAX systems:

1. At the console prompt, enter the SHOW DEVICE command as shown in the following example:

```
>>> SHOW DEVICE
DSSI Node ID 0 (DSSI nodename) ❶
-DIA200 (RF72)
-DIA210 (RF72)
-DIA250 (RF72)

DSSI NODE ID 5 (*)

UQSSP Disk Controller 0 (772150)
-DUA0 (RA82)

Ethernet Adapter
-ESA0 (08-00-2B-13-80-85)
```

- ❶ This is the HSD05 array controller. The *DSSI nodename* is initially a six-digit number. Do not confuse this number with the DSSI ID value.
2. Depending upon your installation, enter one of the following two command lines to use the DUP utility to establish a connection to the HSD05 array controller:

```
>>> SET HOST/DUP/DSSI a
Starting DUP server...

Copyright (C) 1994 Digital
HSD05 Serial No: 8
Firmware Rev. B1 (X36 )

DIRECT V1.0 D Dec 21 1993 16:59:31
PARAMS V1.0 D Dec 21 1993 16:59:31
UTILIT V1.0 D Dec 21 1993 16:59:31

End of directory

Task Name?
```

where *a* is the DSSI ID of the HSD05 array controller.

You may have to explicitly specify the DSSI bus (0 or 1) to properly establish a connection to the HSD05 array controller. In such cases, use the following command line:

```
>>> SET HOST/DUP/DSSI/BUS:n a
Starting DUP server...

Copyright (C) 1994 Digital
HSD05 Serial No: 8
Firmware Rev. B1 (X36 )

DIRECT V1.0 D Dec 21 1993 16:59:31
PARAMS V1.0 D Dec 21 1993 16:59:31
UTILIT V1.0 D Dec 21 1993 16:59:31

End of directory

Task Name?
```

where:

n is the DSSI bus ID number (0 or 1).

a is the DSSI ID for the HSD05 array controller.

3. At the “Task Name?” prompt, enter UTILIT. If you do not see the “Task Name?” prompt, DUP has not established a connection to the HSD05 array controller. In this event, see your system manager.
4. At the UTILIT prompt, refer to Section 3.1.4 to configure HSD05 parameters.

3.1.2 Starting UTILIT from the Console Prompt on OpenVMS AXP Systems

Use the following procedure to start UTILIT from the console prompt on OpenVMS AXP systems:

1. At the console prompt, enter the SHOW CONFIG command as shown in the following example:

```
>>>SHOW CONFIGURATION
      Console V2.8-9900                      VMS PALcode X5.37F, OSF PALcode X1.28F
      CPU 0          P      B2001-BA DECchip (tm) 21064-3
      CPU1          -
      Memory 0       -
      Memory 1       -
      Memory 2       -
      Memory 3       P      B2002-DA 128 MB
      Ethernet 0     P      08-00-2B-32-E6-AB
      Ethernet 1     P      08-00-2B-32-E6-AA

      ID 0  ID 1  ID2  ID 3  ID 4  ID 5  ID 6  ID 7
      A  SCSI  P    RZ73                               Host
      B  SCSI  P    RZ73                               Host
      C  DSSI  P          RF73                        RF72❶      Host
      D  DSSI  P          RF73                        RF73      Host
      E  SCSI  P    TZ85  RRD42                               Host
      Futurebus+    P          FBD0                               Host

      System Status Pass          Type b to boot ducl.1.1.0.2.0
```

- ❶ This display is a map of the attached devices and their SCSI/DSSI bus addresses. The HSD05 array controller is displayed as device RF72. In this example, the ID 4 column shows that the DSSI ID = 4, and row C shows that the DSSI bus designation is C.

2. Enter the following command to use the DUP utility to establish a connection to the HSD05 array controller.

```
>>> SET HOST -DUP d
```

where *d* is the appropriate port address identifier for the HSD05 array controller.

The following command line shows an example of this entry:

```
>>> SET HOST -DUP PUC0.4.0.2.0
Starting DUP server...

Copyright (C) 1994 Digital
      HSD05      Serial No: 8
      Firmware Rev. B1 (X36 )

DIRECT V1.0 D Dec 21 1993 16:59:31
PARAMS V1.0 D Dec 21 1993 16:59:31
UTILIT V1.0 D Dec 21 1993 16:59:31

End of directory
Task?
```

3. At the “Task?” prompt, enter UTILIT. If you do not see the “Task?” prompt, DUP has not established a connection to the HSD05 array controller. In this event, see your system manager.
4. At the UTILIT prompt, refer to Section 3.1.4 to configure HSD05 parameters.

3.1.3 Starting the UTILIT Configuration Utility from the OpenVMS Prompt

You can start the UTILIT configuration utility from the OpenVMS prompt if both of the following are true:

- You have the appropriate system manager privileges on the host system.
- The DUP utility on your system has been started.

Activate the DUP server and use the following procedure to start the UTILIT utility:

1. On OpenVMS VAX systems, connect to the DUP server as follows:

```
$ MC SYSGEN CONNECT DUP_server/NOADAPTER
```

where *DUP_server* is the system DUP server and is typically “FYA0:”.

On OpenVMS AXP systems, connect to the DUP server as follows:

```
$ MC SYSMAN IO CONNECT DUP_server/NOADAPTER/DRIVER=SYS$FDRIVER
```

where *DUP_server* is the system DUP server and is typically “FYA0:”.

2. Enter the following to start the UTILIT configuration utility:

```
$ SET HOST/DUP/TASK=UTILIT/SERVER=MSCP$DUP n
```

```
Copyright (C) 1994 Digital
HSD05 Serial No: 8
Firmware Rev. B1 (X36 )

DIRECT V1.0 D Dec 21 1993 16:59:31
PARAMS V1.0 D Dec 21 1993 16:59:31
UTILIT V1.0 D Dec 21 1993 16:59:31

End of directory

UTILIT>
```

where *n* is the DSSI nodename. See your system manager if you have difficulty after entering this command line.

3. At the UTILIT prompt, refer to Section 3.1.4 to configure the HSD05 parameters.

3.1.4 UTILIT Device Utility Commands

This section lists the UTILIT device commands and describes the action performed by each command.

3.1.4.1 The HELP Command

The HELP command lists the onboard utilities command and the proper syntax for each command, as shown in Example 3–1.

Example 3–1 HELP Commands and Syntax

```
UTILIT> HELP
HELP
SHOW [device_name] | [/ALL]
SELECT device_name
DESELECT device_name
ABORT device_name

- Disk Commands -
FORMAT device_name
QUALIFY device_name [/WRITE]
DISKTEST device_name [/WRITE]

- Tape Commands -
TAPETEST device_name

UTILIT>
```

The symbol *device_name* refers to a valid MSCP/TMSCP™ device label for either a direct access or sequential access device. Direct access devices, such as disk drives, are specified with the “DIA” or “DUA” prefix to the device label, for example, “DIA100”. Sequential access devices, such as tape drives, are specified with the “MUA” prefix, for example, “MUA120”.

3.1.4.2 The SHOW Command

The SHOW command displays device information for either the device specified by the *device_name* or for all devices by specifying the /ALL qualifier, as shown in Example 3–2

Example 3–2 SHOW Command Display

```
UTILIT> SHOW DIA220
Device①SID②Vendor③ Model④ Rev⑤ Dev Stat⑥ Maint Oper⑦Maint Status⑧
-----
DIA220 2-0 DEC RZ28 435E MAINT DISKTEST IN PROGRESS
UTILIT> SHOW /ALL
Device SID Vendor Model Rev Dev Stat Maint Oper Maint Status
-----
MUA210 1-0 DEC TLZ06 0491 MAINT IDLE READY
DIA220 2-0 DEC RZ28 435E MAINT IDLE READY
MUA240 4-0 DEC TLZ6 0491 AVAILABLE
DIA260 6-0 DEC RZ26 329A AVAILABLE
UTILIT>
```

- ① Device is the MSCP or TMSCP device name.
- ② SID is the SCSI ID in the form target-logical unit number (LUN).
- ③ Vendor is the first seven characters of the manufacturer’s name.
- ④ Model is the first seven characters of the manufacturer’s model name.
- ⑤ Rev is the manufacturer’s firmware revision code.
- ⑥ Dev Stat is the current device status.
- ⑦ Maint Oper is the UTILIT maintenance operation.
- ⑧ Maint Status is the UTILIT maintenance operation status.

3.1.4.3 The SELECT Command

The SELECT command is used to specify a device for maintenance before you perform a format, qualify, or exercise operation.

Use the SHOW command to determine if the device is AVAILABLE to the HSD05 array controller. Devices that are listed as being OFFLINE or ONLINE to the HSD05 array controller cannot be selected.

When a device is selected, its operational status becomes MAINT and the device is not available to the OpenVMS operating system.

Command Syntax

The following is the syntax of the SELECT command:

```
SELECT device_name
```

The symbol *device_name* refers to a valid MSCP/TMSCP device label for either a direct access or sequential access device. Direct access devices, such as disk drives, are specified with the “DIA” or “DUA” prefix to the device label, for example, “DIA100”. Sequential access devices, such as tape drives, are specified with the “MUA” prefix, for example, “MUA120”.

Example 3–3 is an example of the SELECT operation display.

Example 3–3 SELECT Operation Display

```
UTILIT> SELECT DIA100
Device①SID②Vendor③ Model④ Rev⑤ Dev Stat⑥ Maint Oper⑦Maint Status⑧
-----
DIA220 2-0 DEC RZ28 435E MAINT IDLE READY
UTILIT>
```

- ① Device is the MSCP device name.
- ② SID is the SCSI ID (target/lun).
- ③ Vendor is the first seven characters of the manufacturer’s name.
- ④ Model is the first seven characters of the manufacturer’s model name.
- ⑤ Rev is the manufacturer’s firmware revision code.
- ⑥ Dev Stat is the current device status.
- ⑦ Maint Oper is the UTILIT maintenance operation.
- ⑧ Maint Status is the UTILIT maintenance operation status.

3.1.4.4 The DESELECT Command

The DESELECT command deselects the devices that were selected for maintenance by the UTILIT command SELECT. The deselected devices are then returned to the AVAILABLE state.

Command Syntax

The following is the syntax of the DESELECT command:

```
DESELECT device_name
```

The symbol *device_name* refers to a valid MSCP/TMSCP device label for either a direct access or sequential access device. Direct access devices, such as disk drives, are specified with the “DIA” prefix to the device label, for example, “DIA100”. Sequential access devices, such as tape drives, are specified with the “MUA” prefix, for example, “MUA120”.

Example 3–4 is an example of the DESELECT command.

Example 3–4 DESELECT Command

```
UTILIT> DESELECT DIA100  
UTILIT>
```

3.1.4.5 The ABORT Command

Use the ABORT command to terminate the QUALIFY, DISKTEST, and TAPETEST operations. These operations normally run until stopped with the ABORT command or by powering off the HSD05 array controller.

Command Syntax

The following is the syntax of the ABORT command:

```
ABORT device_name
```

The symbol *device_name* refers to a valid MSCP/TMSCP device label for either a direct access or sequential access device. Direct access devices, such as disk drives, are specified with the “DIA” prefix to the device label, for example, “DIA100”. Sequential access devices, such as tape drives, are specified with the “MUA” prefix, for example, “MUA120”.

Example 3–5 is an example of the ABORT command.

Example 3–5 ABORT Command

```
UTILIT> ABORT DIA100  
UTILIT>
```

3.1.4.6 FORMAT

After a device is selected with the SELECT command, you can use the FORMAT command to perform a format operation.

Command Syntax

The following is the syntax of the FORMAT command:

```
FORMAT device_name
```

The symbol *device_name* refers to a valid MSCP device label for a direct access device. Direct access devices, such as disk drives, are specified with the “DIA” prefix to the device label, for example, “DIA100”.

Command Description

You are prompted to confirm the format operation on the selected drive. Answering “N” or “NO” aborts the operation with no change to the data on the device. Answering “Y” or “YES” to this prompt starts the format operation on the device.

The FORMAT command does not display a completion message. You can monitor the format operation by periodically entering the SHOW command or by observing the device’s activity indicator. After formatting the device, you should run one or more qualification passes with the QUALIFY command.

Once started, you cannot abort the FORMAT operation. Example 3–6 shows of a FORMAT operation display:

Example 3–6 FORMAT Operation Display

```
UTILIT> FORMAT DIA100
Device①SID②Vendor③ Model④ Rev⑤ Dev Stat⑥ Maint Oper⑦Maint Status⑧
-----
DIA220 2-0 DEC RZ28 435E MAINT IDLE READY
FORMAT will destroy all data on this device. Are you sure (Y/N)? YES
UTILIT>
```

- ① Device is the MSCP device name.
- ② SID is the SCSI ID (target/lun).
- ③ Vendor is the first seven characters of the manufacturer’s name.
- ④ Model is the first seven characters of the manufacturer’s model name.
- ⑤ Rev is the manufacturer’s firmware revision code.
- ⑥ Dev Stat is the current device status.
- ⑦ Maint Oper is the UTILIT maintenance operation.
- ⑧ Maint Status is the UTILIT maintenance operation status.

3.1.4.7 The QUALIFY Command

You should run one or more qualification passes with the QUALIFY command after a drive is formatted. The device to be qualified must first be selected with the SELECT command.

Command Syntax

The following is the syntax of the QUALIFY command:

```
QUALIFY device_name [/write]
```

The symbol *device_name* refers to a valid MSCP device label for a direct access device. Direct access devices, such as disk drives, are specified with the “DIA” prefix to the device label, for example, “DIA100”. The /WRITE qualifier selects a write-read qualify operation.

Command Description

The QUALIFY command can run either read-only or write-read (using the /WRITE qualifier). The write-read qualification operation consists of writing sequential 32-kilobyte chunks of data to the device and then reading it back. This sequence repeats until all logical blocks on the device have been written and read. Bad blocks are replaced and retested in a write-read qualify operation. You should use the write-read qualifier for newly formatted drives.

Running QUALIFY in the read-only mode verifies media readability and consistency, but does not alter any drive data.

You are prompted to confirm the qualify operation on the selected device. Answering “N” or “NO” aborts the operation with no change to the data on the device. Answering “Y” or “YES” to this prompt starts the qualify operation on the device.

Terminating the Test

QUALIFY runs until it is terminated with the ABORT command or until the HSD05 array controller is powered off. The number of passes made is displayed on a pass counter.

Example 3–7 shows a write-read qualification run using the QUALIFY command.

Example 3–7 Write-Read Qualification Run Using the QUALIFY Command

```
UTILIT> QUALIFY DIA100 /WRITE
Device①SID②Vendor③ Model④ Rev⑤ Dev Stat⑥ Maint Oper⑦Maint Status⑧
-----
DIA220 2-0 DEC RZ28 435E MAINT IDLE READY
QUALIFY will destroy all data on this device. Are you sure (Y/N)? YES
UTILIT>
```

- ① Device is the MSCP device name.
- ② SID is the SCSI ID (target/lun).
- ③ Vendor is the first seven characters of the manufacturer’s name.
- ④ Model is the first seven characters of the manufacturer’s model name.
- ⑤ Rev is the manufacturer’s firmware revision code.
- ⑥ Dev Stat is the current device status.
- ⑦ Maint Oper is the UTILIT maintenance operation.

- ⑧ Maint Status is the UTILIT maintenance operation status.

3.1.4.8 The DISKTEST Command

The DISKTEST command performs an exercise on the selected disk device. You should run DISKTEST on all newly formatted and qualified devices. The device to be exercised must first be selected with the SELECT command.

Command Syntax

The following is the syntax of the DISKTEST command:

```
DISKTEST device_name [/write]
```

The symbol *device_name* refers to a valid MSCP device label for a direct access device. Disk drives are specified with the “DIA” prefix to the device label. The /WRITE qualifier selects a write-read disktest operation.

Command Description

The DISKTEST command can run either read-only or write-read (using the /WRITE qualifier) tests. The write-read DISKTEST operation consists of writing to randomly selected logical blocks and verifying the data. This sequence repeats until all logical blocks on the device have been written and read, then the test begins again until the ABORT command is entered to terminate the DISKTEST. You must perform a write-read disktest to write data to the disk before you perform the read-only disktest.

You are prompted to confirm the DISKTEST operation on the selected drive. Answering “N” or “NO” aborts the operation with no change to the data on the device. Answering “Y” or “YES” to this prompt starts the DISKTEST on the device.

Running the DISKTEST operation with the /WRITE qualifier replaces media errors when encountered. If other types of errors occur, the test is stopped and the error condition is displayed in the Maint Status field of the display.

Terminating the Test

The DISKTEST test operation runs until it is terminated with the ABORT command or until the HSD05 array controller is powered off.

Example 3–8 shows a write-read qualification run.

Example 3–8 Write-Read Qualification Run Using the DISKTEST Command

```
UTILIT> DISKTEST /WRITE DIA220
Device①SID②Vendor③ Model④ Rev⑤ Dev Stat⑥ Maint Oper⑦Maint Status⑧
-----
DIA220 2-0 DEC RZ28 435E MAINT IDLE READY
DISKTEST will overwrite some or all data on this device. Are you sure (Y/N)? YES
Initiating Disk Test
UTILIT>
```

- ① Device is the MSCP device name.
- ② SID is the SCSI ID (target/lun).
- ③ Vendor is the first seven characters of the manufacturer’s name.

- ④ Model is the first seven characters of the manufacturer’s model name.
- ⑤ Rev is the manufacturer’s firmware revision code.
- ⑥ Dev Stat is the current device status.
- ⑦ Maint Oper is the UTILIT maintenance operation.
- ⑧ Maint Status is the UTILIT maintenance operation status.

3.1.4.9 The TAPETEST Command

This command performs a tape exercise on the selected tape device. This test requires enough tape to accommodate 10 megabytes of 1-kilobyte blocks. The device to be exercised must first be selected with the SELECT command.

Command Syntax

The following is the syntax of the TAPETEST command:

```
TAPETEST device_name
```

The symbol *device_name* refers to a valid TMSCP device label for a direct access or sequential access device. Tape drives are specified with the “MUA” prefix to the device label.

Command Description

The TAPETEST exercise consists of writing, rewinding, and reading each section of tape, up to but not including a filemark. Block sizes start at 32 kilobytes and are halved on each successive write/rewind/read pass. The test is restarted when the block size reaches 1 kilobyte.

You are prompted to confirm the TAPETEST operation on the selected drive. Answering “N” or “NO” aborts the operation with no change to the data on the device. Answering “Y” or “YES” to this prompt starts the TAPETEST operation on the device.

The TAPETEST operation replaces media errors when encountered. If other types of errors occur, the test is stopped and the error condition is displayed in the Maint Status field of the display.

Terminating the Test

TAPETEST runs until it is terminated with the ABORT command or until the HSD05 array controller is powered off.

Example 3–9 shows a TAPETEST run.

Example 3–9 TAPETEST Run Display

```
UTILIT> TAPETEST DIA220
Device①SID②Vendor③ Model④ Rev⑤ Dev Stat⑥ Maint Oper⑦Maint Status⑧
-----
DIA220 2-0 DEC      RZ28      435E MAINT      IDLE      READY
TAPETEST will overwrite some or all data on this device. Are you sure (Y/N)? YES
Initiating Tape Test
UTILIT>
```

- ① Device is the TMSCP device name.

- ② SID is the SCSI ID (target/lun).
- ③ Vendor is the first seven characters of the manufacturer's name.
- ④ Model is the first seven characters of the manufacturer's model name.
- ⑤ Rev is the manufacturer's firmware revision code.
- ⑥ Dev Stat is the current device status.
- ⑦ Maint Oper is the UTILIT maintenance operation.
- ⑧ Maint Status is the UTILIT maintenance operation status.

3.2 Device Utility Procedures

This section contains procedures and examples for some representative tasks that are frequently performed using the onboard utilities of the HSD05 array controller.

3.2.1 Formatting and Qualifying a SCSI Drive

You can format a specified device that is **AVAILABLE** to the HSD05 array controller using the **FORMAT** command. After the format operation is completed, you should use the **QUALIFY** command to verify that the device is ready for use. You should also run the **DISKTEST** procedure given in Section 3.2.2 to further test the drive before it is returned to service.

Format and Qualify Task Procedure

Use the following procedure to format and qualify a specified device:

1. At the UTILIT prompt, enter the **SHOW** command with the *device_name* qualifier to determine device status.
2. If the device status is not **AVAILABLE**, enter the appropriate operating system commands to make the device available to the HSD05 array controller.
3. At the UTILIT prompt, enter the **SELECT** command and specify a device name.
4. Verify that the device status has changed to **MAINT** in the **SELECT** display.
5. Enter the **FORMAT** command and specify the *device_name* of the device to be formatted.
6. At the verification prompt, check that the device name given under the Device header of the **FORMAT** display is the device that you need to format. Answer "Y" or "YES" to begin the format operation.
7. Monitor the Maint Oper status of the format operation using the **SHOW** command. When the status changes back to **IDLE**, the format operation is complete.
8. Enter the **QUALIFY** command to begin the qualify operation.
9. At the verification prompt, check that the device name given under the Device header of the **QUALIFY** display is the device that you need to format. Answer "Y" or "YES" to begin the qualify operation.
10. Monitor the pass counter of the **SHOW** command display until one or more passes have been completed by the utility.
11. Enter the **ABORT** command to terminate the qualify operation.

12. Enter the DESELECT command to bring the device back to the AVAILABLE status.
 13. Enter the appropriate operating system commands to bring the device on line.
- Example 3–10 shows the complete format/qualify task procedure.

Example 3–10 Format/Qualify Task Procedure

```

UTILIT>SHOW DIA220
Device  SID  Vendor  Model  Rev  Dev Stat  Maint Oper  Maint Status
-----
DIA220  2-0  DEC     RZ28   435E  AVAILABLE  IDLE        READY

UTILIT>SELECT DIA220
Device  SID  Vendor  Model  Rev  Dev Stat  Maint Oper  Maint Status
-----
DIA220  2-0  DEC     RZ28   435E  MAINT     IDLE        READY

UTILIT>FORMAT DIA220
Device  SID  Vendor  Model  Rev  Dev Stat  Maint Oper  Maint Status
-----
DIA220  2-0  DEC     RZ28   435E  AVAILABLE  IDLE        READY
FORMAT will destroy all data on this device.  Are you sure (Y/N)? YES

UTILIT>SHOW DIA220
Device  SID  Vendor  Model  Rev  Dev Stat  Maint Oper  Maint Status
-----
DIA220  2-0  DEC     RZ28   435E  AVAILABLE  FORMAT     READY

UTILIT>SHOW DIA220
Device  SID  Vendor  Model  Rev  Dev Stat  Maint Oper  Maint Status
-----
DIA220  2-0  DEC     RZ28   435E  AVAILABLE  IDLE        READY

UTILIT>QUALIFY DIA220
Device  SID  Vendor  Model  Rev  Dev Stat  Maint Oper  Maint Status
-----
DIA220  2-0  DEC     RZ28   435E  AVAILABLE  IDLE        READY
QUALIFY will destroy all data on this device.  Are you sure (Y/N)? YES

UTILIT>SHOW DIA220
Device  SID  Vendor  Model  Rev  Dev Stat  Maint Oper  Maint Status
-----
DIA220  2-0  DEC     RZ28   435E  MAINT     QUALIFY    PASS #0

UTILIT>ABORT
UTILIT>DESELECT DIA220
UTILIT>

```

3.2.2 Exercising a Disk Device

You can exercise a disk device using the DISKTEST command of the onboard utilities. This exercise can be done as part of a FORMAT/QUALIFY operation, or to verify the performance of the device while troubleshooting the system.

DISKTEST Task Procedure

Use the following task procedure to exercise a specified disk device:

1. At the UTILIT prompt, enter the SHOW command with the *device_name* qualifier to determine device status.
2. If the device status is not AVAILABLE, enter the appropriate operating system commands to make the device available to the HSD05 array controller.
3. At the UTILIT prompt, enter the SELECT command and specify a device name.
4. Verify that the device status has changed to MAINT in the SELECT display.
5. Enter the DISKTEST command and specify the *device_name* of the device to be exercised.
6. At the verification prompt, check that the device name given under the Device header of the DISKTEST display is the device that you need to exercise. Answer “Y” or “YES” to begin the device exercise.
7. Monitor the pass counter of the SHOW command display until one or more passes have been completed by the utility.
8. Enter the ABORT command to terminate the DISKTEST operation.
9. Enter the DESELECT command to bring the device back to the AVAILABLE status.
10. Enter the appropriate operating system commands to bring the device on line.

Example 3–11 shows the complete DISKTEST task procedure.

Example 3–11 DISKTEST Task Procedure

```
UTILIT>SHOW DIA220
Device  SID  Vendor  Model   Rev   Dev Stat  Maint Oper  Maint Status
-----
DIA220  2-0  DEC     RZ28    435E  AVAILABLE IDLE        READY
UTILIT>SELECT DIA220
Device  SID  Vendor  Model   Rev   Dev Stat  Maint Oper  Maint Status
-----
DIA220  2-0  DEC     RZ28    435E  MAINT     IDLE        READY
UTILIT>DISKTEST /WRITE DIA220
Device  SID  Vendor  Model   Rev   Dev Stat  Maint Oper  Maint Status
-----
DIA220  2-0  DEC     RZ28    435E  AVAILABLE DISKTEST  READY
DISKTEST will overwrite some or all data on this device.  Are you sure (Y/N)? Y
UTILIT>SHOW DIA220
Device  SID  Vendor  Model   Rev   Dev Stat  Maint Oper  Maint Status
-----
DIA220  2-0  DEC     RZ28    435E  MAINT     DISKTEST  PASS #0
UTILIT>ABORT DIA220
UTILIT>DESELECT DIA220
UTILIT>
```

3.2.3 Exercising a TAPE Device

You can exercise a tape device using the TAPETEST command of the onboard utilities. This exercise can be done as part of a FORMAT/QUALIFY operation, or to verify the performance of the device while troubleshooting the system.

TAPETEST Task Procedure

Use the following procedure to exercise a specified tape device:

1. At the UTILIT prompt, enter the SHOW command with the *device_name* qualifier to determine device status.
2. If the device status is not AVAILABLE, enter the appropriate operating system commands to make the device available to the HSD05 array controller.
3. At the UTILIT prompt, enter the SELECT command and specify a device name.
4. Verify that the device status has changed to MAINT in the SELECT display.
5. Verify that the tape device to be exercised contains a scratch tape that can be overwritten by TAPETEST.
6. Enter the TAPETEST command and specify the *device_name* of the device to be exercised.
7. At the verification prompt, check that the device name given under the Device header of the TAPETEST display is the device that you need to exercise. Answer “Y” or “YES” to begin the device exercise.
8. Enter the ABORT command to terminate the TAPETEST operation.
9. Enter the Deselect command to bring the device back to the AVAILABLE status.

10. Enter the appropriate operating system commands to bring the device on line. Example 3–12 shows the complete TAPETEST procedure.

Example 3–12 TAPETEST Task Procedure

```
UTILIT>SHOW MUA210
Device  SID  Vendor  Model   Rev   Dev Stat  Maint Oper  Maint Status
-----
MUA210  1-0  DEC     TLZ06   0491  AVAILABLE
UTILIT>SELECT MUA210
Device  SID  Vendor  Model   Rev   Dev Stat  Maint Oper  Maint Status
-----
MUA210  1-0  DEC     TLZ06   0491  MAINT     IDLE      READY
UTILIT>TAPETEST MUA210
Device  SID  Vendor  Model   Rev   Dev Stat  Maint Oper  Maint Status
-----
MUA210  1-0  DEC     TLZ06   0491  MAINT     IDLE      READY
TAPETEST will overwrite some or all data on this device.  Are you sure (Y/N)? Y
Initiating Tape Test.
UTILIT>SHOW MUA210
Device  SID  Vendor  Model   Rev   Dev Stat  Maint Oper  Maint Status
-----
MUA210  1-0  DEC     TLZ06   0491  MAINT     TAPETEST  PASS #0
UTILIT>ABORT MUA210
UTILIT>DESELECT MUA210
UTILIT>
```

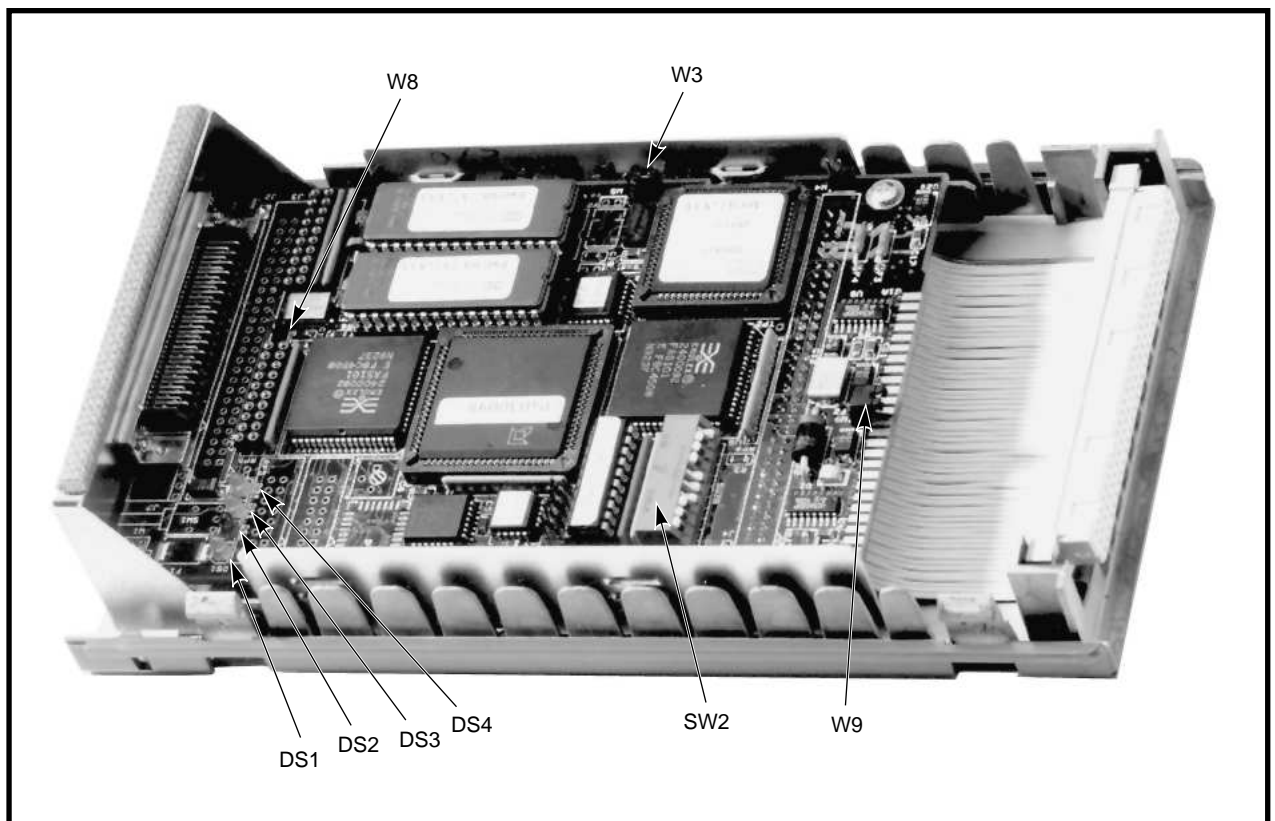
3.3 Troubleshooting

This section contains troubleshooting information for the HSD05 array controller. The HSD05 array controller uses a system of onboard LED indicator codes to indicate the source of an internal fault. You can also use the OpenVMS Analyze/Error utility to read an HSD05 error log for information about devices connected to the HSD05 array controller.

LED Indicators

The location of the LED indicators (DS1 through DS4) is shown in Figure 3–1. During normal operation, these indicators are visible through the louvers on the front panel of the HSD05 array controller.

Figure 3–1 HSD05 Array Controller Module Board Layout



CXO-4053A-PH

When the HSD05 array controller boots, red indicator DS1 blinks for 15 seconds before it shuts off. If this indicator blinks for more than 15 seconds, it indicates that the onboard diagnostics have found a fault.

The fault code is read out as a two-digit error code on the indicators; each digit of the code is indicated by the number of times the indicator blinks. The first digit of the code is separated from the second digit by a one-second pause. A two-second pause separates the error code from its next repetition. This code is repeated until reset by a power-off of the HSD05 array controller.

Table 3–1 lists the serviceable error codes and the associated problem. For all other error codes, recheck the integrity of all bus terminator and cable connections and verify that all shelf SBBs are seated properly. If these actions do not resolve the problem, replace the HSD05 array controller.

Table 3–1 HSD05 LED Indicator Codes

Code	Problem	Resolution
11	DSSI port problem	Ensure that DSSI termination power is supplied by either the host bus or the HSD05 array controller. Check all DSSI bus connections and terminations.
12	SCSI port problem	Ensure that SCSI termination power is supplied by either the host bus or the HSD05 array controller. Check all SCSI bus connections and terminations.

3.4 HSD05 Error Logs

The HSD05 array controller logs error conditions in the OpenVMS error log file ERRLOG.SYS. To retrieve this information, use the OpenVMS command ANALYZE/ERROR_LOG. Refer to the applicable OpenVMS documentation to read this error log when troubleshooting the HSD05 array controller.

The HSD05 array controller reports the following two types of error logs:

- **Type 1** error logs are SCSI port related.
- **Type 2** error logs are SCSI command related.

For each of the types of error logs, there are also separate formats for disk and tape devices.

The following two tables contain information to be used in interpreting HSD05 array controller errors during OpenVMS error log analysis:

- **Table 3–2** lists the codes in the error logs generated by the HSD05 array controller.
- **Table 3–3** lists the SCSI bus phases reported by the HSD05 array controller.

Table 3–2 Port Error Codes

Code (Hexadecimal)	Port Status
2000	Internal sync problem.
4002	Internal inconsistency error; tried to send an unsupported SPORT opcode.
4007	Internal inconsistency error; tried to send an unsupported message.
8000	Reserved.
8001	Reserved.
8003	Double Check condition encountered. Check condition status returned on a Request Sense due to previous check condition status.
8004	Unsupported SCSI status returned by target.
8005	Unsupported message received.
8006	Target rejected a non-rejectable message.
8008	Phase transition timeout.
8009	Gross error bit was set in SCSI chip.
800A	Parity error bit was set in SCSI chip.

(continued on next page)

Table 3–2 (Cont.) Port Error Codes

Code (Hexadecimal)	Port Status
800B	Illegal command bit was set in SCSI chip
800C	250 millisecond SCSI timeout because device does not exist.
800D	Illegal disconnect because target disconnected during data-out, data-in, or message-out phase.
800E	Hung bus timeout because target was connected to the bus for more than 30 seconds.
800F	Device did not go bus-free after device reset, abort tag, or clear queue condition.
8010	SCSI bus reset detected.
8011	Disconnected device timeout.

Table 3–3 SCSI Bus Phases

Code	Phase
00	Data out
01	Data in
02	Command
03	Status
04	Reserved
05	Reserved
06	Message out
07	Message in

3.4.1 Type 1 Error Logs for a Disk Drive

The following example shows a type 1 error log for a disk drive with a SCSI port problem:

```

LONGWORD1.    00002801
LONGWORD2.    0102800E
LONGWORD3.    000000FF
LONGWORD4.    00000000
LONGWORD5.    00000000

```

To decipher the error log, break up each longword into its constituent bytes, as shown in the following example:

```

                Byte:  3      2      1      0
LONGWORD1.    00      00      28      01

                Byte:  7      6      5      4
LONGWORD2.    01      02      80      0E

                Byte: 11      10      9      8
LONGWORD3.    00      00      00      FF

                Byte: 15      14      13      12
LONGWORD4.    00      00      00      00

                Byte: 19      18      17      16
LONGWORD5.    00      00      00      00

```

The meaning of these bytes is summarized in Table 3–4.

Table 3–4 Type 1 Disk Drive Error Log Bytes

Byte	Description
0	Indicates the type of error log: <ul style="list-style-type: none"> • 01 is a type 1 error log • 02 is a type 2 error log
1	The hexadecimal number of SCSI command that was being executed when the error occurred. Refer to the SCSI documentation for a listing of SCSI commands. In the example, the number 28 indicates that the SCSI command being executed was a READ EXTENDED.
4 and 5	A hexadecimal number to indicate the type of port error encountered. Refer to Table 3–2 for a listing of port error codes. In the example, the error code 800E indicates that the error was a hung bus timeout.
6 through 12	The phase history leading up to the error. The bytes preceding the end marker “FF” represent the phases that the SCSI bus went through before encountering the error. Refer to Table 3–3 for a listing of SCSI bus phases. In the example, the “01” in byte 7 indicates that the error occurred in the Data In phase.

3.4.2 Type 1 Error Logs for a Tape Drive

A type 1 error log for a tape drive reports information on a SCSI port problem in a format similar to the following:

```

MSLG$B_FMTR_SVR 01  FORMATTER SOFTWARE VERSION #1
MSLG$B_FMTR_HVR 01  FORMATTER HARDWARE REVISION #1
TU81 DRIVE EXTENDED SENSE INFORMATION
BYTE1           0C  DATA CHECK
BYTE2           80  ILLEGAL CHANNEL COMMAND
BYTE3           02  VELOCITY CHECK
BYTE4           FF  BOT
                  UNRECOVERABLE
                  ID FAULT
                  READ DATA CHECK
                  PE CRC CHECK
                  AGC FAULT
BYTE5           00  FRMTR CMD CODE = 00(X)
BYTE6           00
BYTE7           00
BYTE8           00
BYTE9           00
BYTE10          00
BYTE11          00
BYTE12          00
BYTE13          00
BYTE14          00
BYTE15          00  DEV COMMAND CODE
BYTE16          00  DEV MARGINAL CONDITION CODE

```

The first byte in the stack identifies the type of error log that follows. In the example, the first byte is “01”, indicating a type 1 error log.

The second byte is the code for the SCSI command that was being executed when the error occurred. Refer to the SCSI documentation for a listing of command numbers. In the example, the code “01” indicates a SCSI REZERO UNIT command.

Bytes 1 and 2 of the extended sense information form a hexadecimal number indicating the type of port error encountered. A listing of port errors is given in Table 3-2. In the example, the code “800C” indicates that the device does not exist.

Bytes 3 through 16 of the extended sense information give the phase history leading up to the error. The bytes preceding the end marker “FF” represent the phases that the SCSI bus went through before encountering the error. Refer to Table 3-3 for a listing of SCSI bus phases. In the example, the code “02” in byte 3 indicates that the SCSI bus was in the Command phase when the problem occurred.

3.4.3 Type 2 Error Logs for a Disk Drive

The following example shows a type 2 error log for a disk drive with a SCSI command problem:

```
LONGWORD1.    00007002
LONGWORD2.    00000006
LONGWORD3.    00002900
LONGWORD4.    00280000
LONGWORD5.    98D01D00
```

To decipher the error log, break up each longword into its constituent bytes, as shown in the following example:

```

                Byte:  3      2      1      0
LONGWORD1.    00      00      70      02

                Byte:  7      6      5      4
LONGWORD2.    00      00      00      06

                Byte: 11      10      9      8
LONGWORD3.    00      00      29      00

                Byte: 15      14      13     12
LONGWORD4.    00      28      00      00

                Byte: 19      18      17     16
LONGWORD5.    98      D0      1D      00
```

The meaning of these bytes is summarized in Table 3-5.

Table 3-5 Type 2 Disk Drive Error Log Bytes

Byte	Description
0	Indicates the type of error log: <ul style="list-style-type: none"> • 01 is a type 1 error log • 02 is a type 2 error log
4	The sense key of the extended sense data, describing the general category of the error. Refer to the SCSI documentation for a listing of sense key definitions. In the example, the sense key value of “06” indicates that a UNIT ATTENTION condition has occurred.

(continued on next page)

Table 3–5 (Cont.) Type 2 Disk Drive Error Log Bytes

Byte	Description
9, 10	Indicates the additional sense code of the extended sense data to give a more detailed description of the error. Refer to the SCSI documentation for a listing of sense key definitions. In the example, the additional sense code value is “29”, indicating that the error was caused by a power on, a reset, or a bus reset condition.
14 through 19	The hexadecimal representation of the SCSI command that was being executed when the error occurred. Refer to the SCSI documentation for a listing of SCSI command numbers. In the example, the number “28” indicates that a READ EXTENDED command was executing when the error occurred.

3.4.4 Type 2 Error Logs for a Tape Drive

A type 2 error log for a tape drive reports information on a SCSI command problem in the following format:

Byte	Description
1	First byte of the Request Sense information.
4	Sense key; this is byte 2 of the sense data.
5 through 8	Bytes 3 through 6 of the Request Sense data.
9 and 10	ASC and ASC1: bytes 12 and 13 of the Request Sense data.
11 through 13	Bytes 15 through 17 of the Request Sense data.
14 through 19	First six bytes of the SCSI command.

The following is an example of a type 2 error log for a tape drive:

```

MSLG$B_FMTR_SVR      02  (TYPE 2 ERROR LOG)
MSLG$B_FMTR_HVR      01  (SENSE BYTE 0)
TU81 DRIVE EXTENDED SENSE INFORMATION
BYTE1 (SENSE KEY)    06  UNIT CHECK
BYTE2 (BYTE 3)       00
BYTE3 (BYTE 4)       00
BYTE4 (BYTE 5)       00
BYTE5 (BYTE 6)       00  FRMTR CMD CODE = 00(X)
BYTE6 (BYTE 12)      29  VARIABLE GAP MODE (SHORT)
                        DIAGNOSTIC MODE
                        AUTO SPEED MODE

BYTE7 (BYTE 13)      00
BYTE8 (BYTE 14)      00
BYTE9 (BYTE 15)      00
BYTE10 (BYTE 16)     00
BYTE11 (SCSI CDB 0)  01  TRACK IN ERROR = 2
BYTE12 (SCSI CDB 1)  00
BYTE13 (SCSI CDB 2)  00
BYTE14 (SCSI CDB 3)  00
BYTE15 (SCSI CDB 4)  00  DEV COMMAND CODE
BYTE16 (SCSI CDB 5)  00  DEV MARGINAL CONDITION CODE

```

The first byte in the stack identifies the type of error log that follows. In the example, the first byte is “02”, indicating a type 2 error log.

Byte 1 of the extended sense information give the sense key to indicate the general category of the error. Refer to the SCSI documentation for a listing of SCSI sense code values. In the example, the sense key value of “06” indicates that a UNIT ATTENTION condition has occurred.

Byte 6 of the extended sense information indicates the additional sense code in the extended sense data to give a more detailed description of the error. Refer to the SCSI documentation for a listing of SCSI sense code definitions. In the example, an additional sense code of “29” indicates that a power on, a reset, or a bus device reset occurred.

Byte 7 of the extended sense information indicates the additional sense code qualifier. When used in conjunction with the additional sense code in byte 6, the qualifier may provide additional information about the error. Refer to the SCSI documentation for additional sense code qualifier definitions. In the example, the qualifier of “00” with an additional sense code of “29” provide no additional information.

Byte 11 is the first byte, given in hexadecimal, of the command that was being executed when the error occurred. Refer to the SCSI documentation for a listing of the hexadecimal representations of each command. In the example, a value of “01” in byte 11 indicates that the error occurred during a REZERO UNIT command.

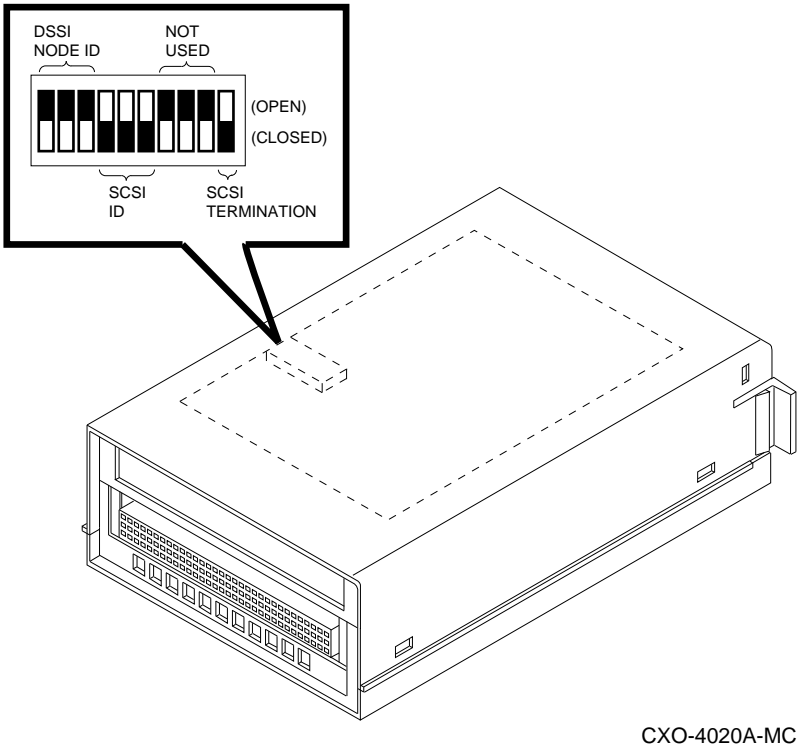
3.5 Removing and Replacing the HSD05 Array Controller

The HSD05 array controller can only be replaced using a cold swap procedure. This procedure requires that shelf and DSSI bus termination power be removed prior to replacement. Failure to remove power can result in blowing one or more fuses in the devices on the DSSI bus.

Use the following procedure to remove and replace the HSD05 array controller:

1. Take all DSSI nodes off line to remove power from the DSSI bus.
2. Remove power to the shelf by disconnecting the power cables at the shelf power supply SBB(s).
3. Disconnect the DSSI trilink connector from the front panel connector of the HSD05 array controller. It is not necessary to disconnect the cables and terminators from the trilink connector.
4. Press the two mounting tabs on the front together to release the HSD05 array controller.
5. Use both hands to pull the HSD05 array controller out of the shelf.
6. See Figure 3–2 and set the DSSI ID, SCSI ID, and bus termination switches on the replacement HSD05 array controller to the settings on the removed HSD05 array controller. A complete description of the switchpack and the switch setting procedure is given in Section 2.3.
7. Insert the replacement HSD05 array controller into the guide slots of the shelf and push it in until it is fully seated and the mounting tabs engage the shelf.
8. Reconnect the DSSI trilink connector to the front panel connector of the HSD05 array controller.
9. Restore power to the shelf by connecting the power cables at the shelf power supply SBB(s).
10. Restore power to the DSSI bus and bring the DSSI host on line.

Figure 3–2 Device Configuration Switchpack



- 11. Perform the procedures in Sections 2.6 and 2.7 to configure and verify proper operation of the HSD05 array controller.

HSD05 Configuration Information

This appendix contains configuration information for the HSD05 and associated SBB shelves. The information in this appendix supplements the SBB shelf information contained in the StorageWorks documents listed in Related Documents.

A.1 DSSI Cables

The HSD05 array controller SBB is connected to the host with one of the DSSI cables listed in Table A-1. The SBB 96-pin connector connects the array controller to the 8-bit wide, single-ended SBB shelf SCSI bus.

Table A-1 Host System to StorageWorks DSSI Cables

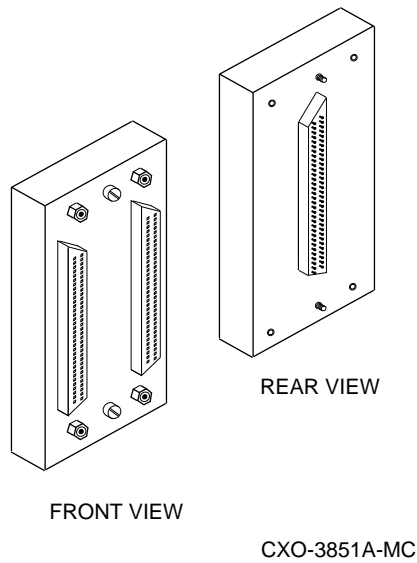
Cable Description	Length		Order No.
	Feet	Meters	
Use one of the following cables to connect an HSD05 array controller to:			
<ul style="list-style-type: none"> • DEC 4000 AXP Model 600 Distributed/Departmental Servers • VAX 4000 Systems and Servers 			
A micro-ribbon cable with:	6	1.8	BC29R-06
<ul style="list-style-type: none"> • One 50-pin right-angle micro-ribbon connector 	9	2.7	BC29R-09
<ul style="list-style-type: none"> • One 50-pin right-angle tab connector 	16	4.9	BC29R-16
	30	9.8	BC29R-30
	45	14.8	BC29R-45
	60	19.7	BC29R-60
Use one of the following cables to connect an HSD05 array controller to:			
<ul style="list-style-type: none"> • DEC 7000™ AXP Model 600 Data Center Servers <i>with a KFMSA/B</i> adapter. • DEC 10000™ AXP Model 600 Mainframe Class Servers <i>with a KFMSA/B</i> adapter. • VAX 6000 Systems and Servers 			
A micro-ribbon cable with:	6	1.8	BC29S-06
<ul style="list-style-type: none"> • One right-angle 50-pin micro-ribbon connector 	9	2.7	BC29S-09
<ul style="list-style-type: none"> • One straight 50-pin micro-ribbon connector 	16	4.9	BC29S-16
	30	9.8	BC29S-30
	45	14.8	BC29S-45
	60	19.7	BC29S-60

Table A–2 lists the DSSI cables approved for interconnecting ("daisy chaining") HSD05 array controller, including the connectors, length, and order number. Each HSD05 array controller includes a tralink connector (see Figure A–1) and a terminator block specifically for these interconnections.

Table A–2 HSD05 Interconnecting DSSI Cables

Cable Description	Length		Order No.
	Feet	Meters	
Use the following cable to connect the HSD05 tralink connectors when:			
<ul style="list-style-type: none"> One shelf is mounted in the <i>front</i> of the cabinet. One shelf is mounted in the <i>rear</i> of the cabinet. One shelf is mounted in the horizontal position. One shelf is mounted in the vertical position. 			
A micro-ribbon cable with:	3	0.98	BC29T–03
<ul style="list-style-type: none"> Two right-angle connectors 	9	3.0	BC29T–09
Use the following cable to connect the HSD05 tralink connectors when:			
<ul style="list-style-type: none"> <i>Both</i> shelves are mounted in the rear of the cabinet. One shelf is mounted in the horizontal position. One shelf is mounted in the vertical position. 			
A micro-ribbon cable with:			
<ul style="list-style-type: none"> Two right-angle connectors 	3	0.98	BC29T–03
Use the following cable to connect the HSD05 tralink connectors when:			
<ul style="list-style-type: none"> <i>Both</i> shelves are mounted in the front cabinet. <i>Both</i> shelves are mounted in the rear cabinet. <i>Both</i> shelves are mounted horizontally <i>adjacent</i> to each other. 			
A micro-ribbon cable with:	2	.66	BC29U–02
<ul style="list-style-type: none"> Two right-angle 50-pin micro-ribbon connectors mounted facing opposite directions. 			

Figure A-1 HSD05 DSSI Trilink Connector



A.2 HSD05 Cabling Diagrams

This section contains cabling diagrams for intershelf connection of the HSD05 and related SBB devices. The diagrams are as follows:

- Figure A-2 is a diagram of two, interconnected SBB shelves.
- Figure A-3 shows the DSSI bus terminated at the HSD05 array controller with a trilink connector.
- Figure A-4 shows the HSD05 array controller occupying a mid-point of the DSSI bus.

Figure A-2 Interconnected SBB Shelves

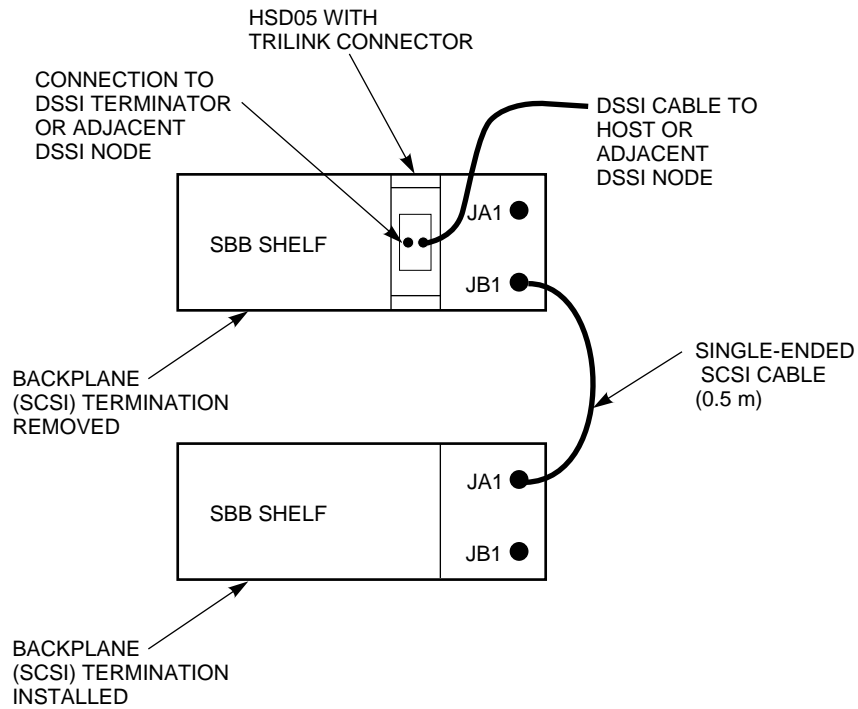


Figure A-3 DSSI Bus Terminated At The HSD05 Array Controller

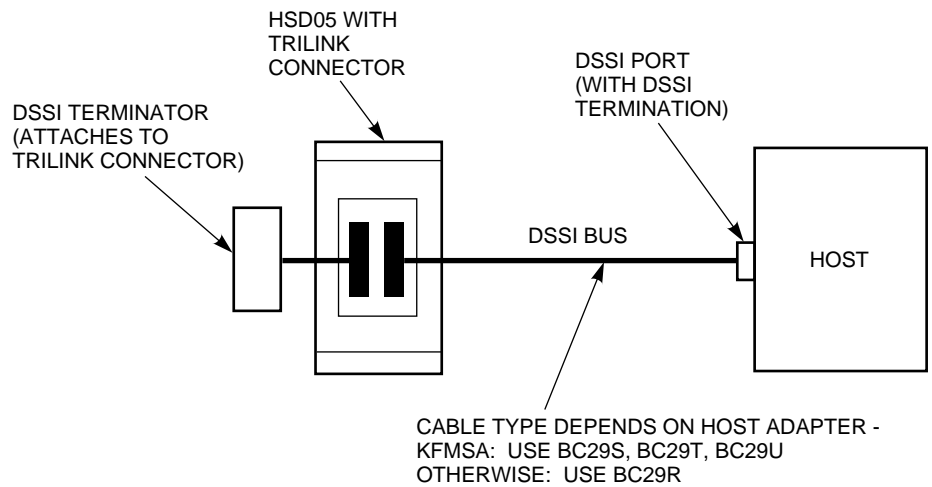
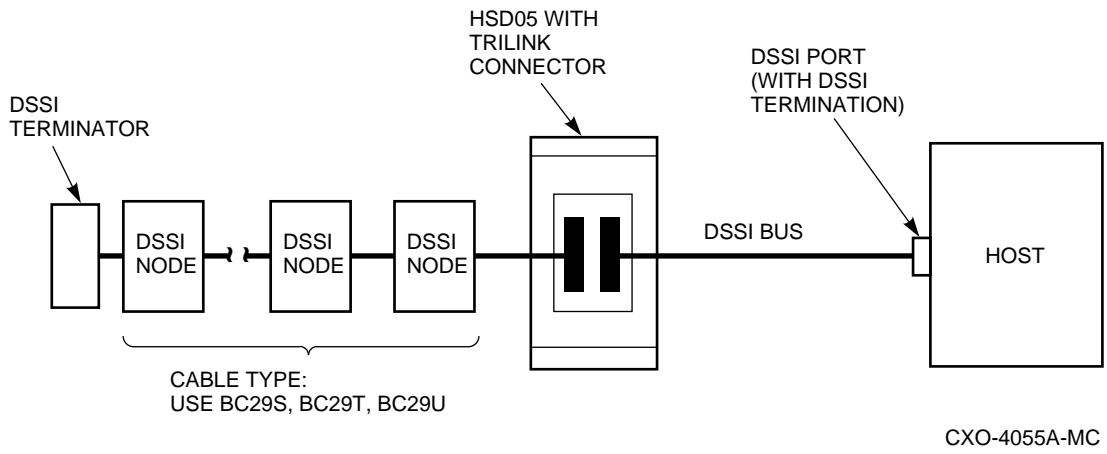


Figure A-4 HSD05 At Mid-Point of DSSI Bus



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