



# Software Product Description

**PRODUCT NAME:** HSD10 Array Controller Operating  
Software Version 1.0

**SPD 61.26.00**

## DESCRIPTION

HSD10 Array Controller Operating Software is the software component of the HSD10 Array Controller. The Operating Software resides as firmware in a flash electronically erasable programmable read-only memory (EEPROM) component of the HSD10. The EEPROM firmware can be upgraded from a PC floppy disk via an RS232 port (See the HSD10 User's Guide for procedures). The software executes in the HSD10 Array Controller; it processes MSCP I/O requests from the host computer, performing the lower level operations required to execute these requests. HSD10 Operating Software Version 1.0 correlates to HSD10 Firmware Version B475.

The HSD10 Array Controller may be configured as either an end point or a middle node on the DSSI bus, using the DSSI terminator or tralink connector that are included with the hardware.

## HSD10 Operating Software Functions

The HSD10 Operating Software performs the following functions:

- Test and diagnosis of the HSD10 Array Controller
- Control of SCSI devices
- Command Line Interpreter support

The following sections describe these functions.

### Test and Diagnosis of the HSD10 Array Controller

Internal diagnostics execute automatically when the power is turned on or when the array controller is reset.

LEDs on the module's front bezel provide diagnostic information upon array controller failure.

Error log entries are also sent to the host.

### Control of SCSI Devices

HSD10 operating software converts host requests expressed in the MSCP protocol into device-specific SCSI commands. It supports commands and data transfers on a single SCSI device bus for each supported device type.

HSD10 operating software device control functions include the following:

#### *Error Detection and Recovery*

HSD10 operating software recovers from device errors including bad block replacement for supported disk drives that do not perform this function internally.

For I/O errors on the internal system bus, HSD10 device channel processor hardware and HSD10 operating software cooperate to provide the following:

- Automatic retransmission of data detected as being in error
- Automatic detection of internal data path errors
- Automatic failover of attached devices between identically configured HSD10 Array Controllers installed within the same device shelf in redundant HSD10 configurations.

#### *Exercising Disk and Tape Devices*

HSD10 operating software executes programs to exercise supported disk drives and tape devices on system manager command. These tests will perform the following:

- Verify correct operation of individual devices
- Place the HSD10 Array Controller under load to verify correct subsystem operation.

#### *RAID 0, Disk Striping*

HSD10 operating software can treat user defined sets of from 2 to 7 disk drives as RAID Level 0 arrays (called stripesets) for improved I/O performance through load balancing. A RAID Level 0 array appears to the OpenVMS Operating System as a single disk drive. Up to 3 stripesets are supported per single HSD10 Array Controller.

**CAUTION:** OpenVMS Operating System versions prior to Version 6.0 do not support real or virtual disk devices larger than about 8.5 GB as file-structured devices. Using disk devices larger than 8.5 GB with earlier versions of the operating system causes data corruption. Stripesets and RAIDsets can potentially appear to the OpenVMS Operating System as large devices.

#### *RAID 1, Disk Mirroring (HSD10-Bx models only)*

HSD10 Disk Mirroring capability provides the following functions:

- Real-time maintenance of up to four identical copies of data on mirrorsets of separate disks attached to a single HSD10
- Protection of data against disk failure by replicating all data on each member of the mirrorset
- Ability to increase or decrease the number of members in a mirrorset as requirements change

HSD10-based mirroring is more flexible than host-based shadowing in that members of an HSD10-based mirrorset need not be of the same device type; however, effective mirrorset size will always be of the smallest number.

HSD10-based mirrorsets can have up to four members on the HSD10's SCSI bus; up to three different two-member mirrorsets can exist on a given single-shelf HSD10 simultaneously. In addition, a mirrorset can be partitioned into up to eight equally-sized partitions using the SET MIRRORSET command. However, creation of mirrorsets out of partitions is not supported.

For further implementation details, consult the *HSD10 Array Controller User's Guide* (EK-HSD10-UG).

#### *Read Cache*

The read cache functionality stores data temporarily in the Array Controller's read cache and satisfies subsequent host requests for that data from cache so that the host need not wait for data to be read from disk media.

#### *Error Logging*

HSD10 operating software reports faulty or failing devices and module faults to all connected hosts that have error logging enabled.

#### **Command Line Interpreter**

The HSD10 operating software provides Command Line Interpreter support for the Command Utility.

#### *HSD10 Command Utility*

The HSD10 Command Utility is comprised of commands to set HSD10 and device operating characteristics, define device mapping to hosts, and display current environment information. See the *HSD10 Array Controller User's Guide* (EK-HSD10-UG) for detailed descriptions of the command set, parameters, and default parameters.

#### **HARDWARE REQUIREMENTS**

HSD10 operating software requires an HSD10 Array Controller on which to execute.

The HSD10 Array Controller includes one SCSI device bus for connecting storage devices. The specific devices supported by HSD10 operating software are listed in the HARDWARE SUPPORT section of this document. See the Systems and Options Catalog for additional information.

#### *General Configuration Rules*

The following general rules apply to all configurations:

- On a given SCSI or DSSI bus, each node must have a unique ID Number (0 to 7), to a maximum of eight nodes total
- The SCSI bus must be properly terminated at both ends
- Each DSSI bus must be properly terminated at both ends
- Except for the dual-shelf configuration, no SCSI cables should connect to shelf connectors JA1 and JB1
- Maximum DSSI cable length between DSSI nodes is 9.2 meters (30 feet)
- Overall (end-to-end) maximum DSSI cable length is 18.3 meters (60 feet)

#### *Allowable Device Configurations*

The following disk/tape/solid state disk/optical device configurations are supported on an HSD10 Array Controller's SCSI bus:

- Up to seven disk or optical storage devices
- Up to two tape and two disk/optical or one tape and five disk/optical devices (and no other devices)
- Up to two solid-state devices (and no other devices)
- CD-ROM devices are supported on and HSD10 Array Controller's.

Use of the HSD10 with the DWZZA Differential SCSI Adapter is not supported.

**Note:** Configuration instructions for the HSD10 Array Controller are provided in the *HSD10 Array Controller User's Guide* (EK-HSD10-UG).

### OPTIONAL HARDWARE

The HSD10 Array Controller can be ordered in six models.

- HSD10-AA StorageWorks Array Controller
- HSD10-AD StorageWorks Array Controller with 16-Mbyte read cache
- HSD10-AF StorageWorks Array Controller with 32-Mbyte read cache
- HSD10-BA StorageWorks Array Controller with RAID 1
- HSD10-BD StorageWorks Array Controller with RAID 1 & 16-Mbyte read cache
- HSD10-BF StorageWorks Array Controller with RAID 1 & 32-Mbyte read cache

### HARDWARE SUPPORT

This list represents the **only** devices that are supported. Digital Equipment Corporation neither supports nor recommends any device not listed for use with the HSD10 Array Controller and HSD10 operating software, regardless of supplier or stated conformance to ANSI SCSI specifications. Digital will not assure correct operation of any unqualified device or configuration, nor assure that such devices will not have impact on other supported devices, on the HSD10 Array Controller itself, or on a Digital system configuration.

HSD10 operating software supports the SCSI-attached devices, with the specified minimum hardware revisions, identified below in Table 1 ("HSD10- Supported Devices and Operating Firmware").

Use of the HSD10 with the DWZZA Differential SCSI Adapter is not supported.

**Table 1  
HSD10-Supported Devices and Operating Firmware**

Device	Type <sup>5</sup>	Capacity GB	Minimum Microcode Version	Min H/W Rev
RZ26-VA	DD	1.05	T392	D02
RZ26L-VA/VW <sup>4</sup>	DD	1.05	440C	A01
RZ26N-VA/VW <sup>4</sup>	DD	1.05	446	A01
RZ28-VA/VW <sup>4</sup>	DD	2.1	435E	B01
RZ28B-VA	DD	2.1	0003	A01
RZ28D-VA/VW <sup>4</sup>	DD	2.1	0008	A01
RZ28M-VA/VW <sup>4</sup>	DD	2.1	466	A01
RZ29B-VA/VW <sup>4</sup>	DD	4.3	0007	B01
RZ73-VA	DD	2.0	T384	A01
RZ74-VA	DD	3.57	T427B	B07
TLZ06-VA	TD	4 <sup>2</sup>	4BQD	A04
TLZ6L-VA	TL	16 <sup>2</sup>	4BQD	A01
TLZ07-VA	TD	8 <sup>2</sup>	4BQD	AX01
TLZ7L-VA	TL	16 <sup>2</sup>	4BQD	AX01
TZ86-VA	TD	6	430B	A02
TZ87-VA	TD	20 <sup>2</sup>	V40	A01
TZ88-VA	TL	20 <sup>2</sup>	V40	A01
RRD43-VA	CD	0.6	0064	A02
RRD44-VA	CD	0.6	3493	A02
RRD45-VA	CD	0.6	1645	A01
RWZ52-VA <sup>13</sup>	MO	0.6 per side	3404	A01
EZ51R-VA <sup>3</sup>	SSD	0.1069	V096	D01
EZ54R-VA <sup>3</sup>	SSD	0.4277	V096	A01
EZ64-VA <sup>3</sup>	SSD	0.1069	V063	A01
EZ69-VA <sup>3</sup>	SSD	0.4277	V063	A01

<sup>1</sup>This device must be SET TRANSPORTABLE.

<sup>2</sup>Values represent compressed data.

<sup>3</sup>Do not warm swap this device. Use a cold swap method for device replacement.

<sup>4</sup>VW models require BA356 wide device shelves and 8-bit I/O modules.

<sup>5</sup>Device codes: CD = CD-ROM reader; DD = Disk drive; MO = Magneto-Optical disk; SSD = Solid state disk; TD = Tape drive; TL = Tape loader.

### SOFTWARE REQUIREMENTS

On OpenVMS VAX systems, the HSD10 Array Controller requires OpenVMS VAX Version 5.5-2 software or higher. On OpenVMS Alpha systems, the HSD10

Array Controller requires OpenVMS Alpha Version 6.1 software or higher.

### **DISTRIBUTION MEDIA**

HSD10 operating software is shipped on the embedded EEPROM. Upgrades are shipped on PC-compatible 3.5" diskettes.

### **ORDERING INFORMATION**

HSD10 operating software is shipped pre-installed with every hardware configuration that includes an HSD10 Array Controller.

For self-maintenance customers, or others who require redundant copies of the software on a 3.5" PC diskette, HSD10 operating software for the HSD10 Array Controller may be ordered as follows:

- QA-55ZAA-HC HSD10 Array Controller RAID Software KIT
- QL-55ZA9-AA HSD10 Array Controller RAID TRAD License
- QL-55ZA9-RA HSD10 Array Controller RAID TRAD UPD License

### **SOFTWARE LICENSING**

An HSD10 operating software license is shipped with every HSD10. This software is furnished only under a license. For more information about Digital's licensing terms and policies, contact your Digital representative.

### **SOFTWARE PRODUCT SERVICES**

A variety of service options are available from Digital. For more information, contact your Digital representative.

Software service for HSD10 operating software is covered under the terms and conditions of the Integrated Hardware and Software Customer Service contracts.

### **SOFTWARE WARRANTY**

Digital's StorageWorks HSD10 Array Controller provides a 90-day software warranty and one year software update service warranty on this product. The warranty card is enclosed in the hardware package and **one** must be returned per controller to ensure the appropriate number of updates.

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