Software Product Description

PRODUCT NAME: HSD30 Array Controller Operating Firmware (HSOF), Version 2.5 **SPD 53.53.03**

DESCRIPTION

The HSD30 Array Controller Operating Firmware (HSOF) is the software component of the HSD30 array controller. This array controller is an intelligent mass storage server that interfaces between host computer systems and SCSI-attached mass storage devices using Digital Equipment Corporation's DSSI bus. HSOF executes in the HSD30 array controller; it processes MSCP I/O requests from hosts, performing the lower-level operations required to execute these requests.

HSOF FUNCTIONS

HSOF performs the following functions:

- Testing and diagnosis of the HSD30 array controller
- Host interconnect and protocol services
- SCSI device control
- Subsystem management services
- Local program support

The following sections describe these functions.

Testing and Diagnosis of the HSD30 Array Controller

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

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

Host Interconnect and Protocol Services

The HSD30 array controller attaches to host computer systems using the DSSI bus. It may be installed in VMScluster configurations. Each DSSI bus supports up to eight nodes. Digital allows up to four HSD30 array controllers per DSSI bus.

SCSI Device Control

HSOF converts host I/O requests expressed in the MSCP protocol into device-specific SCSI commands. It supports concurrent commands and data transfers on multiple SCSI device buses to the maximum extent possible for each supported device type.

HSOF device control functions include the following:

Error Detection and Recovery

HSOF recovers from device errors including bad block replacement for supported disk drives that do not perform this function for themselves.

For errors on the DSSI interface, HSD30 array controller hardware and HSOF 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 HSD30 controllers installed within the same controller shelf.

Device Integrity Testing

HSOF executes Device Integrity Test programs on system manager command. These tests will perform the following:

- Verify correct operation of individual devices
- Place the HSD30 array controller under load to verify correct subsystem operation

Disk Striping

HSOF treats sets of disk drives as stripesets (2 to 14 members) for improved I/O performance through load balancing. A stripeset appears to the OpenVMS operating system as a single disk drive.

RAID (RAIDsets)

HSOF treats sets of disk drives as RAIDsets (3 to 14 members) when the separately licensed RAID option is installed. Each RAIDset is presented to the hosts as a single large virtual disk. Refer to the *HS Family of Array Controllers Optional Operating Firmware Software Product Description* (SPD 54.38.01) for further information.

Mirroring

HSOF treats sets of disk drives as mirrorsets (2 to 6 members) when the separately licensed Mirroring option is installed. Each mirrorset is presented to the hosts as a single large virtual disk. Refer to SPD 54.38.01 for further information.

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.

Write-Back Cache

When the separately licensed Write-Back Cache option is installed, HSOF can provide improved I/O performance by supporting write-back caching for user selected disks, stripesets, RAIDsets, and mirrorsets. For further information concerning the Write-Back Cache option, refer to SPD 54.38.01.

Error Logging

HSOF uses DSSI protocol messages to report faulty or failing devices and controller faults to all connected hosts that have error logging enabled.

Subsystem Management Services

HSOF provides the following subsystem management service:

Alteration of Subsystem Parameters

HSOF includes a Command Line Interpreter (CLI) utility that allows a system manager to display and manipulate controller parameters and device configuration information.

Dynamic Status Display

The HSOF VTDPY utility allows a system manager to view the HSD30-based subsystem's state dynamically. This utility can use VT200-, VT300-, and VT400-series video terminals.

Local Program Support

HSOF supports the following local programs:

- DILX disk inline exerciser
- TILX tape inline exerciser
- VTDPY user display for current controller state and performance data
- C_SWAP for controller and/or cache module warm swap (for dual-redundant configurations)
- FLS for enabling and disabling optional licensed features
- CFMENU for configuring controller-attached storage devices
- Code Patch (CLCP) for firmware changes
- FMU for displaying controller last failure and memory system failure information and control of spontaneous event logging and last failure logging displays
- CONFIG for automatically adding new devices to your configuration
- CLONE utility for obtaining snapshot copies of data (requires mirroring)

HARDWARE REQUIREMENTS

HSOF requires an HSD30 array controller on which to execute.

The HSD30 array controller includes three SCSI device buses for connecting storage devices. The specific devices supported by HSOF are listed in the *OTHER HARDWARE* section of this document.

The HSD30 array controller is ordered as follows:

HSD30–AA	StorageWorks array controller for 18 (dual-redundant) or 21 (nonredundant) SCSI-2 disk/tape/optical devices; no Read Cache
HSD30–AD	StorageWorks array controller for 18 (dual-redundant) or 21 (nonredundant) SCSI-2 disk /tape/optical devices; 16 MB Read Cache
HSD30–AF	StorageWorks array controller for 18 (dual-redundant) or 21 (nonredundant) SCSI-2 disk /tape/optical devices; 32 MB Read Cache

Controller Configuration Restrictions

The following configuration restrictions apply:

- A maximum of six devices may be attached to a single SCSI device bus on dual-redundant HSD30 array controller configurations.
- A maximum of seven devices may be attached to a single SCSI device bus on nonredundant HSD30 array controller configurations.

- Up to four HSD30 array controllers per DSSI host bus are currently allowed.
- Separate buses are supported for dual-redundant configurations when using Open VMS Alpha Version 6.1 and higher operating system software.
- CD–ROM devices are supported with limitations. Refer to the *HSD30 Array Controller Operating Firmware Release Notes* for specific information.
- A maximum total of 20 mirrorsets and RAIDsets are supported by HSOF Version 2.5.
- A maximum combined total of 30 storagesets (mirrorsets, RAIDsets, and stripesets) are supported by HSOF Version 2.5.

The RAID and mirroring options require a Write-Back Cache module.

The Write-Back Cache option requires the HSD30–YX Write-Back Cache option kit along with the appropriate cache module option.

Note: Configuration guidelines for the HSD30 array controller are provided in the *HS Family of Array Controllers User's Guide*.

Host Node Hardware and Software Required

A valid OpenVMS VAX, OpenVMS Alpha, or VMScluster configuration with a supported DSSI interface (see SOFTWARE REQUIREMENTS section) is required to run HSOF software.

OTHER HARDWARE

HSOF supports the following DSSI adapters:

- SHAC-based embedded/native (for various VAX and DEC systems)
- Embedded/native adapter for DEC 4000 systems
- KFMSA (for XMI-based systems)
- KFESA (for AlphaServer 1000, AlphaServer 2000, AlphaServer 2100)

HSOF supports the following optional hardware:

- HSD30–XD (Upgrades the HSD30–AA option to include a 16 MB Read Cache option)
- HSD30–XE (32 MB read cache module)
- HSD30–YC (Write-back cache batteries and bracket)
- HSD30–XF (Upgrades the HSD30–AA option to include a 32 MB Read Cache option)
- HSD30–YX (HSD30 Write-Back Cache option kit, includes two batteries, a battery bracket, and a Write-Back Cache option license)

HSOF supports the SCSI-attached devices listed in Table 1:

Table 1
HSD30 Family Array Controller Supported Devices

Device Model #	Device Type	Capacity Gbytes	Minimum Microcode Version	Min. H/W Rev.†
RZ26–VA	dd	1.05	T392	D02
RZ26L–VA	dd	1.05	440C	A01
RZ28–VA	dd	2.1	435E	B01
RZ28B–VA	dd	2.1	0003	A01
RZ29B–VA	dd	4.3	0007	B01
RZ74–VA	dd	3.57	T427B	B07
TKZ60–EC [2]	td	0.440	111	B01
TL820 (A01) [2,3]	tlib	4,000‡	1d3M	L1
TLZ06–VA	td	4 ‡	0491	A04
TLZ6L–VA	tl	16 ‡	0491	A01
TLZ07–VA	td	8.0‡	04AQ	AX01
TSZ07–AA [2]	td	0.140	0309	A01
TZ86–VA	td	6	430B	A02
TZ87–VA	td	20 ‡	930A	A01
TZ87N–VA [4]	td	20‡	930A	A01
TZ87–TC [2,3]	td	20‡	9514	B02
TZ867–AE/AF [2]	td	42	430B	A01
TZ875–NT [2,4]	td	100‡	930A	A01
TZ875–TA [2]	td	100‡	930A	A01
TZ877–AE/AF[2]	td	140 ‡	930A	A01
RRD42–VB/VU	CD	0.6	1.1a	A01
RRD43–AA	CD	0.6	0064	A02
RRD44–AA	CD	0.6	3493	A02
RWZ52–VA[1,5]	mod	600MB /side	3404	A01

[1] Must be set to transportable mode.

[2] Requires 0.2 meter SCSI–1-to-SCSI–2 transition cable, Digital internal part number 17–03831–01.

[3] Requires DWZZA–AA 8-bit-to-16-bit SCSI adapter.

[4] Cannot read TK50, TK70, TZ30 format tapes.

[5] This device cannot be warm swapped.

dd = disk drive
dl = disk library
td = tape drive
tlib = tape library
CD = CD-ROM reader
ssd = solid state disk
mod = magneto optical disk

†Hardware revision.

‡Values represent compressed data (compression factor is device and data dependent based on individual device and data pattern algorithms).

Table 1 (Cont.)
HSD30 Family Array Controller Supported Devices

Device Model #	Device Type	Capacity Gbytes	Minimum Microcode Version	Min. H/W Rev.†
EZ51R–VA[5]	ssd	0.1069	V096	D01
EZ54R–VA[5]	ssd	0.4277	V096	A01
EZ58R–VA[5]	ssd	0.8553	V109	C01

[5]This device cannot be warm swapped.

dd = disk drive
dl = disk library
td = tape drive
tlib = tape library
CD = CD-ROM reader
ssd = solid state disk
mod = magneto optical disk

†Hardware revision.

Note: Refer to the *StorageWorks Array Controllers HSD30 Array Controller Operating Firmware Release Notes*, order number EK–HSD30–RN, for the most current information on device support and device restrictions.

This list represents the **only** devices that are supported. Digital Equipment Corporation neither supports nor recommends any device not listed for use with the HSD30 array controller and HSOF, regardless of supplier or stated conformance to ANSI SCSI specifications. Digital will not assure correct operation of any unqualified device, nor assure that such devices will not have impact on other supported devices, on the HSD30 array controller itself, or on a Digital system configuration.

SOFTWARE REQUIREMENTS

HSOF requires one of the following versions of the OpenVMS operating system:

- OpenVMS Alpha Version 6.1
- OpenVMS Alpha Version 1.5
- OpenVMS VAX Version 6.1
- OpenVMS VAX Version 6.0
- OpenVMS VAX Version 5.5–2

All of these are supported with limitations identified in Chapter 8 of the *HS Family of Array Controllers User's Guide*.

DEVICE CONFIGURATION RESTRICTIONS

- Disks attached to an HSD30 array controller may not currently be used as initialization devices for VAX 7000 and VAX 10000 processors.
- Disk attached to an HSD30 array controller may not currently be used as initialization devices for DEC 7000 and DEC 10000 processors.

DISTRIBUTION MEDIA

HSOF is shipped on PCMCIA program card media only.

ORDERING INFORMATION

HSOF is shipped preinstalled with every hardware configuration that includes an HSD30 array controller.

For self-maintenance customers, or others who require separate ordering of software, HSOF for the HSD30 array controllers may be ordered separately as follows:

Software Licenses: QL–2YHA9–**
Software Media and Docs: QA–2YHAB–HS
Software Documentation: QA–2YHAB–GZ
Software Product Services: QT–2YH9A*–**

* Denotes variant fields. For additional information on available licenses, services, and media, refer to the appropriate price book.

Refer to SPD 54.38.01 for RAID, Write-Back Cache, and Mirroring software license ordering information.

SOFTWARE LICENSING

An HSOF license is shipped with every hardware configuration that includes an HSD30 array controller.

This software is furnished only under a license. For more information about Digital's licensing terms and policies, contact your local Digital office.

The RAID, Write-Back Cache, and Mirroring options require separate licenses and require that a license key be installed for correct operation. When the RAID, Write-Back Cache, and Mirroring options are ordered with the controller, the license keys are factory installed. Refer to SPD 54.38.01 for more information. The following are the license order numbers for the Write-Back cache, RAID, and disk mirroring options:

- QL–3HVA9–AA CACHE FW HSD30 TRAD LIC
- QL–3HVA9–RA CACHE FW HSD30 TRAD UPD LIC
- QL–3HYA9–AA RAID FW HSD30 TRAD LIC
- QL–3HYA9–RA RAID FW HSD30 TRAD UPC LIC
- QL–4DRA9–AA MIRRORING FW HSD30 TRAD LIC

- QL–4DRA9–RA MIRRORING FW HSD30 TRAD UPD LIC

SOFTWARE PRODUCT SERVICES

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

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

SOFTWARE WARRANTY

Warranty for this software product is provided by Digital as defined in the Software Warranty Addendum of this SPD.

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