

September 27, 1993



Dear HSC Customer,

This package contains the new HSC High Performance Software V8.3 (QA-NBKAA). This software includes new support for SCSI tape devices and the RZ28 and EZ51 disk devices. It also includes enhanced I/O performance for the K.scsi data channel module and fixes to several minor software inconsistencies.

In HSC High Performance Software V8.3, the only qualified SCSI disks specified and eligible for software service support are the RZ26, RZ28, RZ74, and EZ51. SCSI tape support includes the TZ86 and TZ867, TLZ06 and TLZ6L, TSZ07, TKZ60, and TKZ09. Digital supports only devices specifically stated as qualified by Digital in the HSC Software Product Description (SPD).

Digital Equipment Corporation does not warrant, either express or implied, nonspecified products with respect to functionality, operability, or compatibility at the device, subsystem, system, or cluster level.

Any problems arising from nonspecified and nonqualified configurations are the customer's responsibility. Contact your Digital Sales Representative for updates on specified Digital-supported devices.

HSC High Performance Software V8.3 replaces V8.0, V8.1, and V8.2. HSC software V8.3 supports HSC40, HSC70, HSC60, HSC90, HSC65, and HSC95 controllers. In addition, it replaces HSC software V6.5 (QX926) for HSC40, HSC70, HSC60, and HSC90 controllers, and HSC software V7.0 for HSC65 and HSC95 controllers. A new *HSC Controller User Guide* is supplied with HSC software V8.3, which incorporates all User Guide updates previously issued.

HSC High Performance Software V8.3 and OpenVMS software V5.5-2 are the minimum versions required to use the HSC K.scsi module. For K.scsi module implementations, HSC software V8.3 is supported on OpenVMS V5.5-2 and V6.0 with limitations. The limitations consist of a generic device recognition for SCSI disks and tapes. In the HSC software SHOW DISK display, SCSI disk devices are identified as "HSX00." In the HSC software SHOW TAPE display, SCSI tape devices are identified as "HST00" and SCSI tape loaders are identified as "HST01." In the OpenVMS software SHOW DEVICE/FULL display, SCSI devices are identified as "device type (type not yet identified)." HSC40/70/60/90/65/95 installations which do not use the HSC K.scsi module may use HSC High Performance Software V8.3 with OpenVMS V5.4-2 and higher.

You can use the SCTSAV utility included on the software diskette to retain your custom parameters when upgrading either HSC software V6.5, V7.0, V8.0, V8.1, or V8.2 to HSC software V8.3. Refer to the *HSC High Performance Software V8.3 Release Notes*, included with this package, for instructions on how to use SCTSAV to install the software. The *HSC Controller User Guide* contains detailed information on using the SCTSAV utility.

We encourage you to install HSC High Performance Software V8.3 at your earliest convenience. Its prompt installation will ensure the highest level of HSC controller functionality, performance, and reliability.

Sincerely,

Kathleen A. Cara
HSC Product Manager

Software Product Description

PRODUCT NAME: HSC High Performance Software, Version 8.3

SPD 42.81.04

DESCRIPTION

HSC software is the software component of a special-purpose hardware/software set that makes up a Hierarchical Storage Controller (HSC) and associated options. The HSC is an intelligent mass-storage server, interfacing one or more host computer systems to a set of mass-storage devices. HSC software is the software executed within the I/O Control Processor and certain other peripheral processors of the HSC. The hardware models using HSC High Performance Software Version 8.3 are the HSC40, HSC60, HSC65, HSC70, HSC90, and HSC95. HSC High Performance Software Version 8.3 does NOT operate on the HSC50. HSC High Performance Software Version 8.3 is required to use the HSC9X-SX/SZ, SCSI Data Channel.

The HSC is an intelligent subsystem. Together with the devices it controls, it is seen by the host computers as a single high-level entity. The host computers send high-level I/O requests to the HSC subsystem and relegate to the subsystem the responsibility for all low-level operations required to implement the high-level requests. Internally, the HSC subsystem uses programmed processors to direct and to perform its detailed I/O operations.

Features

The HSC software is arranged by function. Major portions of the software include: the Disk Server, which services all I/O requests for disk units; the Tape Server, which services all I/O requests for tape units; the Cache Server, which performs cache lookup and update functions; and the DUP (Diagnostics/Utilities Protocol) Server, which services the host-to-utility connection.

Multiple Host Connections

The HSC attaches to host computer systems through the Computer Interconnect (CI). The HSC supports connection to the maximum number of CI nodes in any valid VMScluster configuration.

The HSC also supports connections within valid VAX System V or ULTRIX configurations.

Supported Device Types

The HSC connects to mass-storage devices from Digital Equipment Corporation's family of Standard Disk Interface (SDI) drives, and tape devices from Digital's family of Standard Tape Interface (STI) drives. The HSC also supports devices from Digital's family of SCSI RZ disks, EZ solid state disks and SCSI tapes. If the HSC is dedicated to disk support, and the HSC9X-SF 4 shelf SCSI Array is used, the maximum number of ports for SDI/SCSI disk devices are: HSC40, 12 SDI/21 SCSI; HSC60/65, 20 SDI/21 SCSI; HSC70, 32 SDI/52 SCSI; HSC90/95, 48 SDI/52 SCSI; and the Rackmount HSC95 48 SDI/56 SCSI, respectively. Combinations of SDI/STI and SCSI devices can also be configured as described below.

STI and SCSI tapes connected to HSCs have two software restrictions that must be observed: the maximum number of ports allowable for tape per HSC (24), and the maximum number of drives (masters and slaves) supported by the HSC software (24). The maximum number of ports allowed by the HSC hardware/software for STI/SCSI tape devices are: HSC40/60/65 (dedicated to tape support), 12 STI/12 SCSI; HSC70/90/95 24 STI /24 SCSI; and the rackmount HSC95 24 STI/24 SCSI, respectively. The TA81, TA8x7, and SA10x tape formatters can connect only one tape unit per port (formatter), while the TA7x, TA9x, and SCSI formatters can connect up to four units per port (formatter).

HSC High Performance Software Version 8.3 operates SCSI disks in both single-path and dual-path modes; SCSI tapes are operated in single-path mode only.

The HSC allows users to attach different mixes of Digital SDI disks, STI tapes, and SCSI disks and tapes given the limitation of the data channel modules (four ports each for HSC5X-BA/CA/DA, eight ports for the HSC9X-FA and seven targets for the HSC9X-SX/SZ), with up to a maximum of eight data channel modules on an HSC70, HSC90, and HSC95, and up to a maximum of three data channel modules on an HSC40, HSC60, and HSC65. The four lowest requester slots on the standalone HSCs may be used for the SCSI

Data Channel Module HSC9X-SX/SZ. With the HSC9X-SE Standalone HSC Extension I/O Bulkhead, up to eight SCSI Data Channel Modules may be used in the Standalone HSC. The rackmount HSC95 can use up to eight SCSI Data Channel Modules.

In HSC High Performance Software Version 8.3, the only qualified SCSI disks specified and eligible for software service support are the RZ26, RZ28 and RZ74 and EZ51. In addition, the only qualified SCSI tapes specified and eligible for software service support are TZ86, TZ867, TLZ06, TLZ6L, TSZ07, TKZ60, and TKZ09. Digital supports only devices specifically stated as qualified in this Software Product Description (SPD). DIGITAL DOES NOT WARRANT, EITHER EXPRESS OR IMPLIED, NON-SPECIFIED PRODUCTS WITH RESPECT TO FUNCTIONALITY, OPERABILITY OR COMPATIBILITY AT THE DEVICE, SUBSYSTEM, SYSTEM OR CLUSTER LEVEL. Any problems arising from non-specified and non-qualified configurations are the customer's responsibility.

The interaction between the HSC and the drive is entirely parameter-driven, the drive specifying its characteristics to the HSC when connected.

Optimized Device Management

HSC software converts host requests into device-specific requests. It manages the physical activity of the drives, supporting parallel transfers on multiple data channels. The HSC also implements deep buffering (the ability to interpret and prepare for transfer) of host commands.

The HSC disk and tape servers ensure systemwide fairness by managing internal resources. These servers overlap CI activity with device activity. The HSC disk server also provides user control of parameters that may be user-workload specific.

For SDI disk units, the HSC disk server performs overlapped seeks on all drives even when transfers are in progress. It executes ordered seeks for requests on the same drive. Inter-requester rotational position sensing is used to initiate transfers only when a drive is in the correct position. Intra-request rotational position sensing is used to optimize fragments of a complete request to a single drive.

For SCSI disk units, the HSC disk server maintains a pipeline of requests. The SCSI Data Channel Card (HSC9X-SX/SZ) maintains a pipeline on a per-disk basis to ensure data prefetching and overlapped seeks. Attached SCSI disks maintain an ordered work queue, only obtaining the attention of the HSC9X-SX/SZ when they are ready to transfer. The disk server generates work fragments that enable the HSC9X-SX/SZ and drive

to work efficiently. Attached SCSI drives generally re-sequence work requests performing seek optimizations internally.

For tape units, the HSC supports overlapped positioning and other non-transfer commands on multiple drives, even when transfers are in progress.

To provide reserve processing power for peaks and bursts in the I/O workload and consistently high performance, the HSC controller should be routinely operated at no more than 80% busy as shown in the "%Idle" metric of the VTDPY display. If an HSC controller's reserve is significantly less than 20 percent, improved performance may be seen by moving some of the busier drives to another HSC controller.

Error Detection and Recovery

The HSC and the devices connected to it (hosts as well as disk and tape units) perform autonomous error recovery actions whenever a device error is detected.

Included for host interface detection are:

- Automatic retransmission of data detected as being in error
- Automatic retransmission on an alternate host path if the primary path fails
- Automatic detection of subsystem internal data path errors
- Thresholding of subsystem internal memory errors

For disk transfers, the HSC automatically:

- Corrects up to 8 errors (of up to 10 bits each) or one 80-bit error in each sector on SDI disks
- Retries erroneous reads
- Replaces bad blocks and redirects subsequent reads and writes to their replacements
- Detects and recovers some mechanical failures (such as mis-seeks)

For tape transfers, the HSC participates in formatter-directed recovery, permitting use of specific retry algorithms that are device dependent.

Device Integrity Test Ability

The HSC executes Device Integrity Test programs while continuing to service host requests. This capability is employed in three ways:

- Automatic Device Integrity Tests that are automatically executed when the HSC detects that one of its components (disk, tape, or HSC-internal devices) may be malfunctioning
- Demand Device Integrity Tests that are executed upon the direction of the operator

- Periodic Device Integrity Tests that automatically check certain functions of HSC components at regular intervals

Error Logging

Unrelated to a specific self-test, the HSC provides information describing faulty or failing disk or tape devices. The information is reported via messages to the HSC console device and messages reported over the CI to all hosts that have the device on-line or to the host that issued the failing command depending on the type of error. In addition, the HSC uses the same mechanism to report errors of faulty or failing modules within the HSC.

Errors relating to transfers (host read or write requests) and non-transfer related errors are based on severity. Depending on the error, the severity is either based on a predetermined setting or set during run time. The messages displayed on the HSC console can be limited to specific levels of severity if desired.

Volume Backup and Duplication

The HSC can perform a disk-to-tape volume backup and a tape-to-disk volume restore. This can be completely relegated to the HSC, and need not occupy or consume host CPU and memory resources.

The HSC can also perform disk duplication between disks connected to the same HSC, copying an SDI/SCSI disk device to a like device.

Shadowing

At host request, the HSC can maintain identical data on a set of disk drives (of like model and mode and with identical geometry) during ongoing host I/O operations. For shadowing specifications, refer to the operating system's Software Product Description (SPD).

HSC Software Version 8.3 supports Volume Shadowing Phase II on both SDI and SCSI disks. Volume Shadowing Phase I is supported on SDI disks only.

Alteration of Subsystem Parameters

As part of HSC Software, the SETSHO utility allows the user to alter and display parameters that control internal operation, as well as to display configuration-related information. The SCTSAV utility allows HSC parameters to be saved and used with new software versions.

Dynamic Status Display

The utility VTDPY allows the user to view the status of critical system operation and parameters dynamically. This program can run on VT200, VT300, and VT400 Series video terminals.

HARDWARE REQUIREMENTS

HSC Software is required for models HSC40, HSC60, HSC65, HSC70, HSC90, or HSC95.

To perform I/O operations to a disk or tape unit, an HSC5X-BA Disk Data Channel, HSC5X-CA Tape Data Channel, HSC5X-DA Disk/Tape Data Channel, HSC9X-FA Disk Data Channel, or HSC9X-SX/SZ SCSI Data Channel is also required.

To perform HSC data caching, the HSC6X-BA/BB (cache option for the HSC60) and HSC9X-BA (cache option for the HSC90) or the HSC65 or HSC95 with integrated cache are required.

Three SCSI I/O bulkheads are available to change or increase the maximum number of SCSI Data Channel cards in an HSC.

- HSC9X-SC Rackmount HSC 100% SCSI I/O Bulkhead
- HSC9X-SD Rackmount HSC 50% SCSI I/O Bulkhead
- HSC9X-SE Standalone HSC 100% SCSI I/O Bulkhead

Two SCSI Array Starter Kits are available for the Standalone HSC controller to allow the installation of StorageWorks BA350-SA shelves in the top of the Standalone HSCs.

- HSC9X-SS Standalone HSC SCSI Array Starter Kit (2 Shelf connections)
- HSC9X-SF Standalone HSC SCSI 4 Shelf Array Starter Kit

The HSC Software supports Disk, Tape, or SCSI Data Channels in any valid module combination (based upon maximum configuration restriction) up to a maximum of three (for HSC40/60/65) or eight modules (for HSC70/90/95) as described in the following table.

Table 1
Maximum Module Configurations for Disks

HSC Type	Max. No. SDI Ports	Max. No. SDI/SCSI	4-Port Modules	8-Port Modules	7-Target SCSI Modules
HSC40	12	21	3	0	3
HSC60	20	21	1	2	3
HSC65	20	21	1	2	3
HSC70	32	52	8	0	8
HSC90	48	52	4	4	8
HSC95	48	52	4	4	8
RM HSC95	48	56	4	4	8

Note: Configuration guidelines for the HSC are provided in the *HSC User's Guide*, Chapter 5.

Host Node Hardware and Software Required

A valid VAX VMS, OpenVMS VAX, OpenVMS AXP, ULTRIX, or VAX System V configuration with CI hardware connection is required. A Digital Customer Service representative can advise which software version and hardware revisions are currently supported for HSC.

HSC Software Version 8.3 does not support HSC50. Support for the HSC50 is provided by a separate software release. (Refer to the Software Product Description for HSC50 Software Version 4.1, SPD 32.96.xx.) In addition, HSC software Version 8.3 does not support 36-bit systems. (Refer to the Software Product Description for HSC Software TOPS-10/20, Version 3.60, SPD 38.05.xx.)

OPTIONAL HARDWARE

Optional hardware for the HSC40/70 consists of the data channel cards HSC5X-BA/CA/DA and HSC9X-SX/SZ.

Optional hardware for the HSC60/65/90/95 consists of HSC5X-BA/CA/DA, HSC9X-FA, and HSC9X-SX/SZ data channel cards, the HSC6X-BA/BB cache option for the HSC60, and the HSC9X-BA cache option for the HSC90.

Optional SCSI Hardware for the HSC40/60/65/70/90/95 consist of three SCSI I/O bulkheads to change or increase the of SCSI Data Channel cards supported in an HSC and two SCSI Array Starter Kits for the standalone HSC to allow the installation of up to four StorageWorks BA350-SA shelves in the top of the standalone HSCs.

- HSC9X-SC Rackmount HSC 100% SCSI I/O Bulk-head

- HSC9X-SD Rackmount HSC 50% SCSI I/O Bulk-head
- HSC9X-SE Standalone HSC 100% SCSI I/O Bulk-head
- HSC9X-SS Standalone HSC SCSI Array Starter Kit (2 Shelf connections)
- HSC9X-SF Standalone HSC SCSI 4 Shelf Array Starter Kit

SOFTWARE REQUIREMENTS

HSC Software Version 8.3 requires the OpenVMS VAX Version 5.5-2 Operating System or higher for HSC9X-SX/SZ implementation. HSC Software Version 8.3 may be operated with OpenVMS Version 5.4-2 if SCSI data channel cards are not being used.

Device	HSC Software	Minimum OpenVMS VAX	OpenVMS Alpha	ULTRIX
HSC9X-SX/SZ	V8.3	V5.5-2	1.5	-
HSC40/60/65/70/90/95	V8.3	V5.4-2	1.5	-

OPTIONAL SOFTWARE

HSC Cache Need Analysis and HSC Cache Performance Analysis Tools are included on this release media and are covered by the standard HSC High Performance Software License.

StorageWorks HSC SPMFMT, Selectable Pattern Multipass Format Utility, may be purchased and used in conjunction with Version 8.3. SPMFMT allows the reformatting of SDI disks to meet Defense Investigative Services requirements for declassifying media. The part number for the SPMFMT Media and Documentation Kit is QA-0WDAA-H7 (SPD 48.23.xx).

GROWTH CONSIDERATIONS

The minimum hardware/software requirements for any future version of this product may be different from the requirements for the current version.

DISTRIBUTION MEDIA

This software is distributed on RX33 diskettes.

ORDERING INFORMATION

The purchase of the HSC40, HSC60, HSC65, HSC70, HSC90, or HSC95 includes the license and media for HSC High Performance Software Version 8.3.

HSC High Performance Software may be ordered with the following part numbers:

Software Media and Documentation Kit:

QA-NBKAA-H7

Software Licenses: QL-NBKA9-AA

Software Product Services: QT-NBKA*-**

For additional information on available licenses, services, and media, refer to the appropriate price book or file.

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