HSC65 and HSC95 Controllers

Installation Manual

Order Number: EK–HSCCN–IN. A01

This manual contains information necessary to install HSC65 and HSC95 controllers and to upgrade existing HSC controller models to the HSC65 and HSC95 controller level. This manual supersedes the *HSC Controller Installation Manual* and the *Supplementary Installation Information for HSC65 and HSC95 Controllers* for HSC65 and HSC95 controller installation.

Digital Equipment Corporation
Maynard, Massachusetts

October 1993

The postpaid READER'S COMMENTS card requests the user's critical evaluation to assist in preparing future documentation.

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Purpose

Use this installation manual for the following activities:

- Planning and preparing for HSC65™ or HSC95™ controller installation

- Performing initial HSC65 or HSC95 controller installation

- Testing the HSC65 or HSC95 controller subsystem operation after installation

- Installing upgrade kits to convert other HSC™ controller models to HSC65 or HSC95 controllers

- Installing HSC65 and HSC95 controller options

Please review this entire installation manual before installing HSC65 or HSC95 controllers, upgrade kits, or options.

Audience

This manual is primarily written for Digital™ Multivendor Services personnel performing HSC controller installation and upgrades. The secondary audience is Digital Equipment Corporation customers performing their own HSC controller installations and upgrades.

Overview

This manual describes installation procedures for HSC65 and HSC95 controllers and includes the following:

- Descriptions of the hardware and a discussion of HSC controller roles in a VAXcluster™

- Preparing the HSC controller site including HSC controller unpacking the controller, cabling, and console terminal configuration references

- Configuring the HSC controller and its storage devices for optimum performance

- Turning on the HSC controller

- Verifying the functionality of the HSC controller and storage devices using device integrity tests

- Enabling the HSC controller to function in a cluster by setting system parameters

- Installing HSC components including upgrade kits, additional tape or disk data channel modules, and the Small Computer System Interface (SCSI) conversion kits and modules

This manual does not specifically address the following items:

- MSCP™ or TMSCP™ protocols

- Information on HSC software utility programs, such as SETSHO (This information is contained in the *HSC Controller User Guide*.)

- Logic or code implementations of HSC controller components

- Error messages (Refer to the *HSC Controller User Guide* or the *HSC Controller Service Manual*.)

- Repair and troubleshooting information (This information is contained in the *HSC Controller Service Manual*.)

Related Documentation

For additional user and service information, refer to the following Digital Equipment Corporation documents:

- *HSC Controller Service Manual* (EK–HSCMA–SV)

- *HSC Controller User Guide* (AA–PFSQB–TK)

- *Supplementary Service Information for the HSC65 and HSC95 Controllers* (EK–HSC695–SI. B01)

- *HSC Controller Pocket Reference Card* (EK-HSCPK-RC-003)

- *Installing and Using the LA75 Printer* (EK–0LA75–UG)

- *Star Coupler User Guide* (EK–SC008–UG)

- *TU58 DECtape II User Guide* (EK–0TU58–UG)

- *VT220 Installation Guide* (EK–VT220–IN)

- *VT220 Owners Manual* (EK–VT220–UG)

- *VT220 Programmer Pocket Guide* (EK–VT220–HR)

- *VT320 Installation Guide* (EK–VT320–IN)

- *VT320 Owner's Manual* (EK–VT320–UG)
- *VT320 Programmer Pocket Guide* (EK–VT320–HR)
- *VT420 Installation Guide* (EK–VT420–IN)
- *VT420 Owner's Manual* (EK–VT420–UG)
- *VAXcluster Systems Quorum* (EC–P0754–xx)

Table 1 contains a list of telephone numbers and addresses for ordering manuals)

Table 1   Telephone and Direct Mail Orders

Your Location	Call	Contact
Continental USA, Alaska, or Hawaii	800-DIGITAL	Digital Equipment Corporation P.O. Box CS2008 Nashua, New Hampshire 03061
Puerto Rico	809-754-7575	Local Digital subsidiary
Canada	800-267-6215	Digital Equipment of Canada Attn: DECdirect Operations KAO2/2 P.O. Box 13000 100 Herzberg Road Kanata, Ontario, Canada K2K 2A6
International	—	Local Digital subsidiary *or* approved distributor
Internal[1]	— U.S. Software Supply Business (SSB) Digital Equipment Corporation 10 Cotton Road, Nashua, New Hampshire 03063-1260	

[1]For internal orders, you must submit an Internal Software Order Form (EN–01740–07).

1

General Information

1.1 Introduction

The HSC65 and HSC95 controllers offer increased performance to the HSC controller family through updated processor electronics, improved cache performance, and optimized software.

This chapter provides the following information for HSC65 and HSC95 controllers:

- A general description of the HSC65 and HSC95 controllers

- A table of HSC65 and HSC95 controller component configurations by model

- A table of HSC65 and HSC95 controller module nomenclatures

- HSC65 and HSC95 controller module descriptions

- A description of a basic VAXcluster™

HSC High Performance Software™ is optimized to perform with the HSC65 and HSC95 controllers as well as earlier HSC controller models, except the HSC50™ controller.

Instructions are included in this manual for installing the optional K.scsi module, as well as upgrade kits to install up to four StorageWorks™ building block (SBB) shelves, with integral SCSI devices, into the HSC controller cabinet. These shelves are installed in the top section of the cabinet and are supported by all models of HSC controller except the HSC50 controller.

Table 1–1 lists the major components contained within the HSC65 and HSC95 controller models.

Table 1–1   HSC65 and HSC95 Controller Configurations

Configuration	HSC95	HSC65	Rack Mount HSC95
Port processor	L0124–AA	L0124–AA	L0124–AA
Port link	L0118–YA	L0118–YA	L0118–YA
Port buffer	L0125–AA	L0125–AA	L0125–AA
I/O control processor	L0142–YC	L0142–YD	L0142–YC
Memory standard	L0123–BA	L0123–BA	L0123–BA
32-Mbyte cache [1]	L0121–BA	L0121–BA	L0121–BA
Disk data channel	L0108–YA	L0108–YA	L0108–YA
Tape data channel	L0108–YB	L0108–YB	L0108–YB
Disk/tape data channel [1]	L0119–YA	L0119–YA	L0119–YA
8-port disk data channel [2]	L0119–YB	L0119–YB	L0119–YB
SCSI data channel[3]	L0131–AA	L0131–AA	L0131–AA
Maximum disk or tape requestors	8	3	8
Available ports	Up to 48	Up to 32	Up to 56
Load devices	RX33	RX33	RX33
Power controller [4]	30–35415–xx	30–35415–xx	n/a
Auxiliary power supply	Yes	Yes	Yes

[1]The L0119–YA, L0119–YB, L0131–AA, and L0108–YA/YB are options.

[2]This module can only be installed in requestors 3, 4, 5, and 6 of an HSC95 controller, and in requestors 3 and 4 of an HSC65 controller.

[3]This module can only be installed in requestors 2, 3, 4, and 5 for the HSC95 controller, requestors 2, 3, and 4 for the HSC65 controller, requestors 2, 3, 4, and 5 for the HSC95–SA/SB controller (50% SCSI), and in requestors 2 through 9 for the HSC95–ZA/ZB controller (100% SCSI).

[4]"xx" designates the model variation for ac line voltage and frequency.

_____ **Note** _____

These module configurations are enforced in the HSC software. If an invalid configuration is powered on, the HSC controller displays a fault code of 33.

_____ **Note** _____

Do not attempt to mix older model modules with newer, higher performance modules. This practice can cause module compatibility problems resulting in performance problems. For example, do not mix older L0100 port LINK modules with new port LINK modules in some clusters.

1.2 HSC65 and HSC95 Controller General Description

The HSC controller is mounted in a modified H9642 40-inch tall cabinet, similar to the extended H9642 cross-products series. The HSC controller cabinet contains the following components:

- A card cage
- Extended hex modules
- A dual load device
- A self-contained power controller
- Main and optional auxiliary power supplies
- An exhaust duct
- A blower

1.3 HSC65 and HSC95 Controller Module Descriptions

Each HSC controller contains modules for communicating on the CI™ (computer interconnect) bus, communicating with disk drives and tape formatters/drives, and controlling HSC functions.

The Digital Equipment Corporation module part number is stamped on each module handle.

The module names, module part numbers, module functions, and card cage slot locations of each module used in the HSC65 and HSC95 controllers are as folows:

- The **I/O control processor module** (L0142–YC/YD, P.ioj2) contains memory management and memory interface logic. These processors set up and direct all internal processes within the HSC subsystem. These modules feature:
  - Support for up to three requestors for the HSC65 controller and up to eight requestors for the HSC95 controller
  - Three megabytes of on-board program memory
  - Increased number of control memory windows
  - Gate array enhancements to improve processor performance

  The P.ioj2 module resides in card cage slot 1.

- The **memory standard 5 module** (L0123–BA, M.std5) contains 3 MB of program memory, 256 KB of control memory, 512 KB of data memory, and the RX33™ disk drive controller logic. The M.std5 module resides in card cage slot 2.

  _____ **CAUTION** _____

  The switchpack on the M.std5 memory module is factory set to calibrate the RX33 disk drive controller. Do not change the setting of this switchpack; the switch settings are unique to each module and cannot be restored outside of the manufacturing environment.

  _____

- The **disk data channel module** (L0108–YA, K.sdi) operation is controlled by an on-board microprocessor with a local programmed read-only memory (PROM). Refer to Table 1–1 for a listing of the HSC65 and HSC95 controller requestor slots for K.sdi modules.

- The **tape data channel module** (L0108–YB, K.sti) supports up to four STI tape formatters (for example: TA78 and TA81). The TA90 tape subsystem is not supported by this module. Refer to Table 1–1 for a listing of the HSC65 and HSC95 controller requestor slots for K.sti modules.

- The **disk/tape data channel module** (4-port K.si) (L0119–YA) is an interface between the HSC controller and the SDI or STI bus, and is a direct replacement for the K.sdi or K.sti data channel modules.

  The 4-port K.si module is configured for disk or tape interface when the HSC controller is initialized and the module functions are the same as the K.sdi or K.sti modules. The 4-port disk/tape data channel module resides in the same card cage slots and requestors as the K.sdi and K.sti disk or tape data channel modules. Refer to Table 1–1 for a listing of the HSC65 and HSC95 controller requestor slots for K.si modules.

- The **8-port disk data channel module** (8-port K.si module) (L0119–YB) can only be configured as a disk controller, and is supported by version 6.0 or later versions of HSC software. Refer to Table 1–1 for a listing of the HSC65 and HSC95 controller requestor slots for 8-port K.si modules.

- The **SCSI data channel module** (L0131–AA, K.scsi module) offers Small Computer System Interface (SCSI) drive interface capability to all HSC controller models except the HSC50 controller. SCSI capability is supported by the KSUTIL utility. Complete instructions for using KSUTIL are included in the *HSC Controller User Guide*. Refer to Table 1–1 for a listing of the HSC65 and HSC95 controller requestor slots for K.scsi modules.

- The **cache memory** module (L0121–BA, M.cache2) contains 64 MB of dynamic error correction code (ECC) memory used as a disk cache for any disks attached to the HSC controller. The M.cache2 module also contains 512 KB of dual-ported data memory. Other features of the M.cache module include:

  - Single-bit error correction and double-bit error detection for cache memory.

  - High-speed state machine logic to move data between cache data memory and cache memory.

  - High-speed self-test of all cache data memory and cache memory upon power-up.

  The M.cache2 module must be used with the M.std5 memory module and occupies card cage slot 11.

- The **port processor module** (L0124–AA, K.pli2) is part of the K.ci host interface module set. The port processor module functions as the interface between the CI transmissions and the HSC controller global memory structures. The port processor module resides in card cage slot 12 and is dedicated as Requestor 1.

- The **port buffer module**, (L0125–AA, PILA2) is part of the K.ci host interface module set. The port buffer module provides a limited number of high-speed buffers to accommodate the difference between the burst data rate of the CI bus and HSC internal memory buses. The port buffer module also interfaces to the port LINK module through the internal link interconnect (ILI) signals and the port processor module through PLI signals. The port buffer module resides in card cage slot 13.

- The **port LINK module** (L0118–YA LINK, also known as the CI LINK), is part of the K.ci host interface module set. The port LINK module interfaces through line drivers/receivers directly to the CI coaxial cables, and to the port buffer module through a set of interconnect link signals. The port LINK module also indirectly interfaces to the port processor module through the port buffer module, using a set of port link interface (PLI) signals. The port LINK module resides in card cage slot 14.

1.4 HSC Controller Module Utilization Labels

The module utilization label is located at the front of the HSC controller, above the card cage. This label shows the location of each HSC module.

Figure 1–1   HSC65 Controller Module Utilization Label

Mod	L0118-00 Rev: CI Port Link	L0109-YA Rev: CI Port Buffer	L0124-00 Rev: CI Port Processor	L0121-AA Rev: Memory Cache	4-Port/K.scsi	4/8-Port/K.scsi	4/8-Port/K.scsi	4-Port	4-Port	4-Port	4-Port	4-Port	L0123-AA Rev: Memory 4	L0111-Y Rev: J-11 I/O Cont. Proc.
Bkhd					A	B/H	C/J	D/K	E/L	F	M	N		
Req			1		2	3	4	5	6	7	8	9		0
Slot	14	13	12	11	10	9	8	7	6	5	4	3	2	1

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Figure 1–2 HSC95 Controller Module Utilization Label

Mod	L0118-00 Rev: CI Port Link	L0109-YA Rev: CI Port Buffer	L0124-00 Rev: CI Port Processor	L0121-AA Rev: Memory Cache	4-Port/K.scsi	4/8-Port/K.scsi	4/8-Port/K.scsi	4/8-Port/K.scsi	4/8-Port	4-Port	4-Port	4-Port	L0123-AA Rev: Memory 4	L0111-Y Rev: J-11 I/O Cont. Proc.
Bkhd					A	B/H	C/J	D/K	E/L	F	M	N		
Req			1		2	3	4	5	6	7	8	9		0
Slot	14	13	12	11	10	9	8	7	6	5	4	3	2	1

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1.5 Basic Cluster Description

Figure 1–3 shows a basic cluster configuration. A cluster is a collection of
processors, storage servers, and associated storage devices connected together
through a star coupler. Processors and storage servers are intelligent entities
called nodes. The central hub (common connection point) for all VAXcluster
nodes connected to the CI bus is a star coupler. The star coupler is a cabinet
that contains cable connectors and transformers through which all the nodes of a
cluster are connected.

Figure 1–3 Basic Cluster
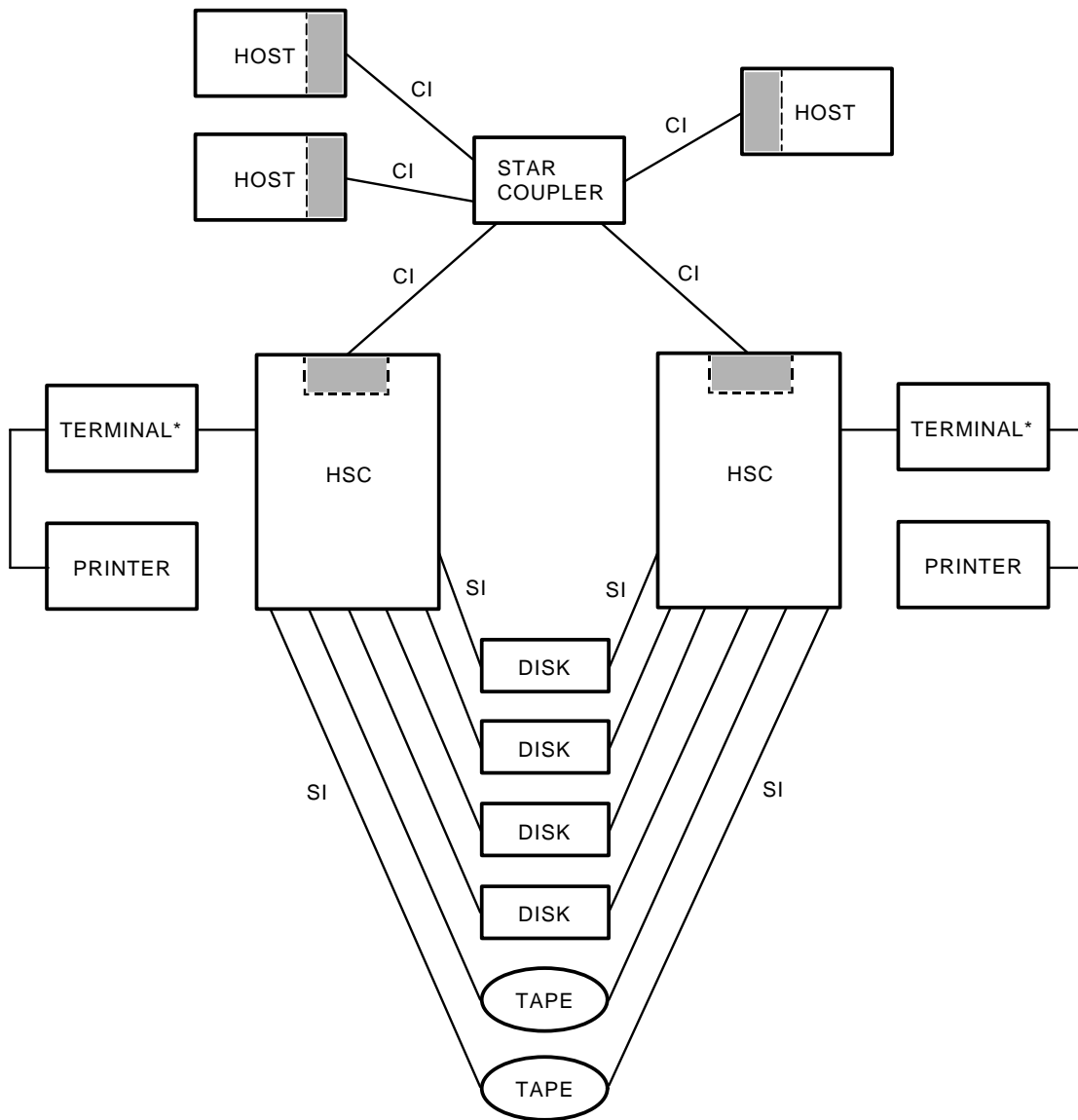
CI INTERFACE

*   VIDEO OR LA12

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For a list of current Digital Equipment Corporation processors that can be configured into a VAXcluster, refer to the operating system *Software Product Description*, shipped with your OpenVMS™ and ULTRIX™ software.

The following list describes hardware elements specific to clusters:

• Star coupler—A passive device used as a common connection point for all nodes on a VAXcluster connected to the CI bus. The star coupler connects all CI bus cables from individual nodes in a radial or star arrangement. Physically, the star coupler is a cabinet containing two internal transformer panels. One transformer connects the "A" path send and receive, the other connects the "B" path send and receive. This redundancy means that there is no single point of failure. Typically, the star coupler connects up to 16 nodes.

More than 16 nodes can be configured in a cluster with the CI star coupler extender (CISCE). The CISCE connects up to 32 nodes (a maximum of 16 CPU nodes and 16 HSC controller nodes).

- CI (computer interconnect) bus—A high-speed bus connecting all nodes in a cluster to the star coupler, and thus to each other.

- CI interface—An intelligent microprocessor controller within each OpenVMS VAX™ computer or DECsystem™ connecting each node to the CI bus. (The HSC controller K.ci is the HSC controller interface to the CI.)

- HSC controller—A high-speed server for management of data between disk/tape drives and the host.

- Disk drive—A storage unit where data is stored on magnetic disks and data is randomly accessed.

- Tape drive—A storage unit where data is stored on magnetic tapes and data is sequentially accessed.

1.6 HSC Controller Operating Software

HSC High Performance Software™ is shipped to the user along with the *HSC Controller User Guide* and the *HSC Software Release Notes*. The HSC software is distributed on one RX33 floppy diskette that contains operating software, device integrity tests, and utilities.

Information for the HSC controller software commands and utilities can be found in the *HSC Controller User Guide*.

1.6.1 Listing of Upgrade Kit Part Numbers

Table 1–2 lists the upgrade kit order numbers for all HSC controllers.

Table 1–2 HSC Controller Upgrade Kits

Order Number	Description
HSC6x–EA	HSC40 controller to HSC65 controller, 60 Hz
HSC6x–EB	HSC40 controller to HSC65 controller, 50 Hz
HSC6x–FA	HSC60 controller to HSC65 controller, 60 Hz
HSC6x–FB	HSC60 controller to HSC65 controller, 50 Hz
HSC6x–GA	HSC60 controller to HSC65 controller[1]
HSC9x–LA	HSC40 controller to HSC95 controller, 120V
HSC9x–LB	HSC40 controller to HSC95 controller, 240V
HSC9x–MA	HSC60 controller to HSC95 controller, 120V
HSC9x–MB	HSC60 controller to HSC95 controller, 240V
HSC9x–NA	HSC60 controller to HSC95 controller, 120V[1]
HSC9x–PA	HSC70 controller to HSC95 controller
HSC9x–QA	HSC90 controller to HSC95 controller
HSC9x–RA	HSC90 controller to HSC95 controller[1]
HSC9x–HA	HSC65 controller to HSC95 controller

[1]For HSC60 or HSC90 controllers that have the L0121–AA HSC Cache option installed. You must return the L0123–AA memory module and the L0123–AA cache module after upgrading. These kits do not include the auxiliary power supply.

2
Installation

This chapter will help you with the unpacking and initial setup of your HSC controller. This chapter contains procedures for the following:

- Preparing the site
- Unpacking and deskidding the HSC controller
- Cabling
- Setting module switches

An overview on video terminal and printer cabling is also included.

2.1 Preparing the Site

Site preparation and planning are necessary before installing an HSC controller. Use Figure 2–1 to plan for HSC controller physical, electrical, and environmental specifications.

_____ WARNING _____

To prevent damage to equipment and and injury to personnel, ensure all power sources meet the specifications required for this equipment.

_____

HSC power controllers intended for single phase, 50 Hz, 240 Vac operation have a power cord that plugs into a socket in the back panel. These power controllers are supplied with one of the various line cords listed in Table 2–1 for each country's service.

Figure 2–1 Specifications for HSC Controllers Using Single-Phase AC Power

DESCRIPTION	OPTION DESIGNATION
HSC MASS STORAGE SERVER WITH HSC POWER CONTROLLER	HSCXX-BA = 60 HZ, 100/120 V
	HSCXX-BB = 50 HZ, 220/240 V

MECHANICAL

MOUNTING CODE	WEIGHT		HEIGHT		WIDTH		DEPTH		CAB TYPE (IF USED)
	LBS	KG	IN	CM	IN	CM	IN	CM	
FS	450	240.0	41.1	105.9	21.3	54.0	35.0	91.4	MODIFIED H9642

POWER (AC)

AC VOLTAGE NOMINAL	AC VOLTAGE TOLERANCE	FREQUENCY AND TOLERANCE	PHASE	STEADY-STATE CURRENT (RMS)	POWER CONSUMPTION (MAX)
100/120	90 - 132	60 HZ $\pm$ 3	1	22.5A	1846 WATTS
220/240	174 - 264	50 HZ $\pm$ 3	1	12.2A	1846 WATTS

POWER (AC)

PLUG TYPE	POWER CORD LENGTH	INTERRUPT TOLERANCE	APPARENT POWER (KVA)
NEMA - L5 - 30P	15 FT (4.5 M)	4 MS (MIN)	1.5 (KVA)
IEC 320 - C20*	15 FT (4.5 M)	4 MS (MIN)	1.7 (KVA)

POWER (AC)

HSC OPTION	INRUSH CURRENT	SURGE DURATION
HSCXX - BA	140 AMPS	16 MS
HSCXX - BB	140 AMPS	20 MS

DEVICE ENVIRONMENT

TEMPERATURE		RELATIVE HUMIDITY		RATE OF CHANGE		HEAT DISSIPATION	
OPERATING**	STORAGE	OPERATING	STORAGE	TEMP	HUMIDITY	60 HZ	50 HZ
59 - 90° F	.40 - 151° F	20 - 80%	5 - 95%	20° F/HR	20%/HR	1568 BTU/HR	1656 KJ/HR
15 - 32° C	.40 - 66° C			11° C/HR			

DEVICE ENVIRONMENT

ALTITUDE (MAX) **		AIR VOLUME (AT INLET)		AIR QUALITY
OPERATING	STORAGE	FT³/MIN	M³/MIN	PARTICLE COUNT (MAX)
8000 FT	30,000 FT	210	5.92	N/A
2.4 KM	9.1 KM			

* HSCXX-BB HAS INLET FOR REMOVABLE LINE CORD OPTIONS.

**ALTITUDE CHANGES: DERATE THE MAXIMUM TEMPERATURE 1.8° C PER THOUSAND METERS
(1.0° F PER THOUSAND FEET).

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Table 2–1 Line Cord Part Numbers For Various Countries

Line Cord Part Number	Service
17-00199-10	Central Europe
17-00198-05	Australia
17-00364-06	Italy
17-00209-05	United Kingdom
17-00209-05	Europe (IEC 309 plug and harmonized cordage)
17-01256-01	220 Vac service in U.S., Canada, and Japan (IEC 309 plug with UL/CSA cord.)

2.1.1 Environmental Considerations

The HSC controller is designed to operate in a business or light industrial environment that complies with FCC Class A computing device standards. The cleanliness of the site is important for the operation of any computer system, and the HSC controller requires these same standards.

2.1.1.1 Electrostatic Discharge

Electrostatic discharge (ESD) is a common problem for any electronic device and may cause lost data, system downtime, or other problems. The most common source of static electricity is the movement of people in contact with carpets and clothing materials. Low humidity allows a large amount of electrostatic charge to build up. Use the following strategies to minimize electrostatic discharge problems:

- Maintain more than 40 percent relative humidity in the computer room.

- Place the system away from heavy traffic paths.

- Do not use carpet, if possible. If carpet is necessary, choose an antistatic carpet. If a carpet is already in place, place antistatic mats around the system to help decrease electrostatic discharge.

- Always use ESD wrist straps when handling modules.

The HSC controller conforms to Digital Standard 102 (Sections 0 through 3, and 7) in regard to electrostatic discharge.

2.1.1.2 Floor Space Requirements

The floor space needed for the HSC controller is shown in Figure 2–2. The minimum service clearance required is 91.44 cm (36 inches) for access to both the front and rear of the HSC controller. No service clearance is required on either side of the HSC controller.

2.1.1.3 Power and Safety Requirements

The HSC controller adds no unusual fire or safety hazards to an existing computer system. The wiring used by Digital conforms to UL, CSA, and IEC standards. The HSC controller conforms to Digital Standard 119–0 Product Safety standards.

Figure 2–2 HSC Controller Floor Space Requirements

105.71 CM
(41.62 IN)

91.44 CM
(36.0 IN)

53.98 CM
(21.25 IN)
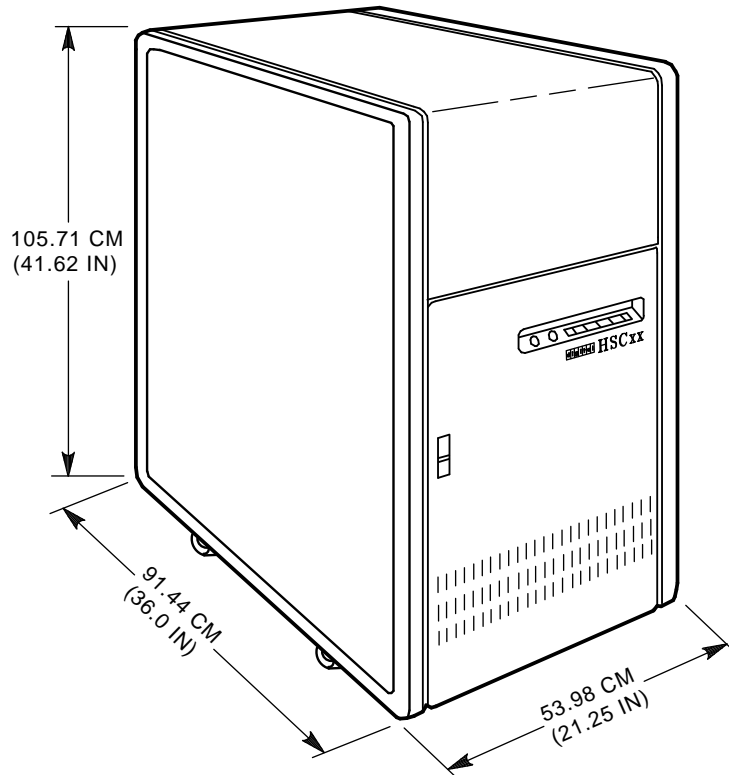
NOTE: A SERVICE CLEARANCE OF 91.44 CM (36.0 IN) IS REQUIRED,
       BOTH IN FRONT AND IN BACK OF THE HSC.

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Each HSC controller is shipped with a grounding connection on its frame. The main circuit breaker on the power controller removes ac power from the HSC logic, fans, blower, and power supplies. Figure 2–3 shows the ac power plug and receptacle diagrams for both 60 Hz and 50 Hz models.
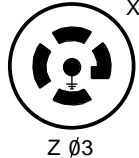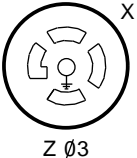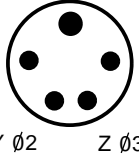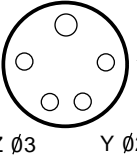
_____ **WARNING** _____

To prevent damage to equipment and injury to personnel, ensure power sources meet the specifications required for this equipment. Use the specifications listed in Figure 2–1 to plan for adequate power, floor space, and weight requirements.
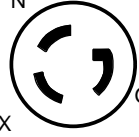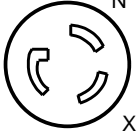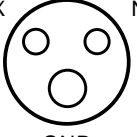
2.2 Unpacking the HSC Controller

When delivered, the HSC controller is packed in a cardboard sleeve attached to a shipping pallet as shown in Figure 2–4. Remove the HSC controller packing material using the unpacking procedure attached to the outside of the cardboard sleeve.

Figure 2–3 HSC Controller Line Voltage Plugs and Receptacles

SOURCE		PLUG	RECEPTACLE
120/208V 30A 3 PHASE Y 60 HZ HSCXX-AA	NEMA	L2130P X Ø1 Y Ø2 N Z Ø3	L2130R X Ø1 N Y Ø2 Z Ø3
240/416V 16A 3 PHASE Y 50 HZ HSCXX-AB	IEC309 EQUALS HUBBELL	516 P6W GND X Ø1 N Y Ø2 Z Ø3	516 R6W GND N X Ø1 Z Ø3 Y Ø2

CONNECTORS FOR 881 POWER CONTROLLER

SOURCE		PLUG	RECEPTACLE
125V 30A 1 PHASE 60HZ HSCXX-AA	NEMA	L5-30P N GND X	L5-30R N GND X
250V 16A 1 PHASE 50HZ HSCXX-AB	IEC309 OR HUBBELL	320P6W N X GND	320R6W X N GND

CONNECTORS FOR 30-35415-XX POWER CONTROLLER

CXO-3134A

2.2.1 Removing Shipping Material

To remove the HSC controller shipping material (refer to Figure 2–4), use the following procedure:

1. First check the cardboard sleeve and pallet for signs of shipping damage. Report any damage to the Digital Multivendor Services or Digital Sales office in your area, and to the local carrier. Keep all packing material and receipts when a damage claim is filed.

2. Save all packing material, shipping brackets, and hardware for future use when moving the equipment to a new site.

3. Remove the shipping straps, top cover, and the cardboard sleeve from the HSC controller.

4. Remove the carton containing the unloading ramps from the top of the HSC controller.

5. Remove the poly bag covering the HSC controller.

Figure 2–4 Unpacking the HSC Controller
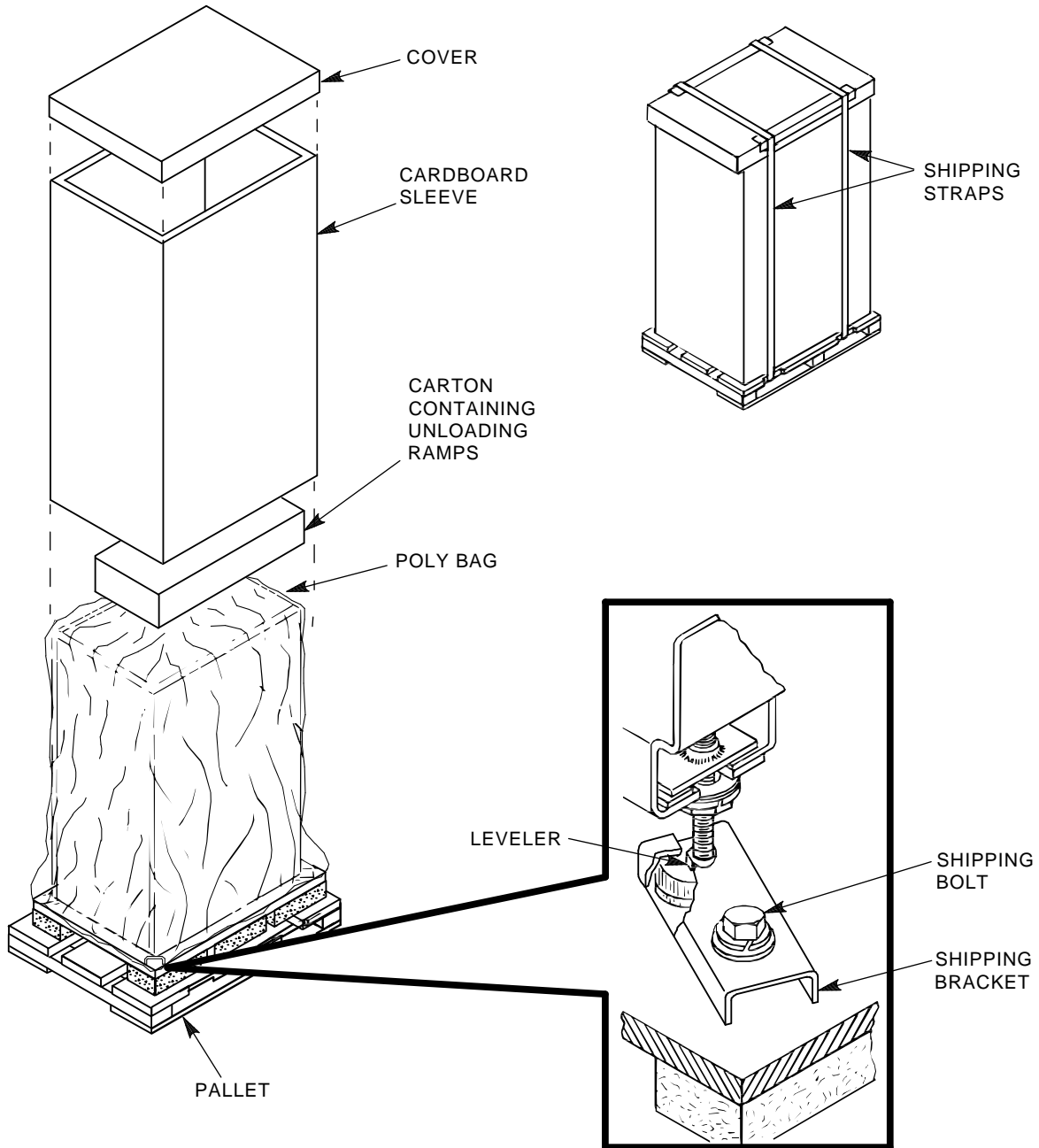
CXO-393D_S

2.2.2 Removing Shipping Hardware and Deskidding the HSC Controller

To ready the HSC controller for module and/or cabling installation, remove the shipping bolts, attach the unloading ramps, adjust the cabinet levelers, and deskid the HSC controller as follows:

1. Remove the shipping bolt from each shipping bracket (at each corner of the cabinet) that secures the HSC controller to the shipping pallet. See the insert in Figure 2–4 for a detailed view of the shipping bracket and bolt.

2. Remove the unloading ramps from their carton. Inspect the ramps, ramp side rails, and metal hardware for the following defects:

    *   Cracks more than 25 percent of the ramp depth, either across or lengthwise on the ramp.

    *   Knots or knotholes going through the thickness of the ramp and greater than 50 percent of the ramp width.

    *   Loose, missing, or broken ramp side rails.

    *   Loose, missing, or bent metal hardware.

        If any of these conditions exist, do no use the ramp. Investigate alternate means of removing the HSC controller or order a new ramp. The part number for the left ramp is 99–07689–01; the part number for the right ramp is 99–07689–02.

3. Extend each ramp to its full length, and insert the steel dowel through the hole in the ramp as shown in Figure 2–5.

4. Attach the unloading ramp to the shipping pallet by fitting the metal tabs of each ramp over the mating hole on the rear of the pallet as shown in Figure 2–5. The rear of the shipping pallet is labeled.

5. Make sure the arrows on the unloading ramps line up with the arrows on the deck of the shipping pallet.

_____ **WARNING** _____

Failure to properly set up the ramps and adjust the cabinet levelers could cause the HSC controller to tip over during removal from its shipping pallet. Injury to personnel and/or damage to the HSC controller may result.

_____

6. Screw the levelers all the way up into the cabinet housing, as shown in Figure 2–6. This allows the HSC controller to roll smoothly down the ramps without ramp-to-leveler interference.

_____ **WARNING** _____

A fully-loaded HSC controller weighs approximately 188.4 kilograms (415.8 pounds). To minimize the risk of personal injury, at least of two people should roll the HSC controller down the ramp.

_____

7. Carefully roll the HSC cabinet down the ramps and into position.

Figure 2–5 Attaching the Unloading Ramps to the Pallet

CXO-394C_S
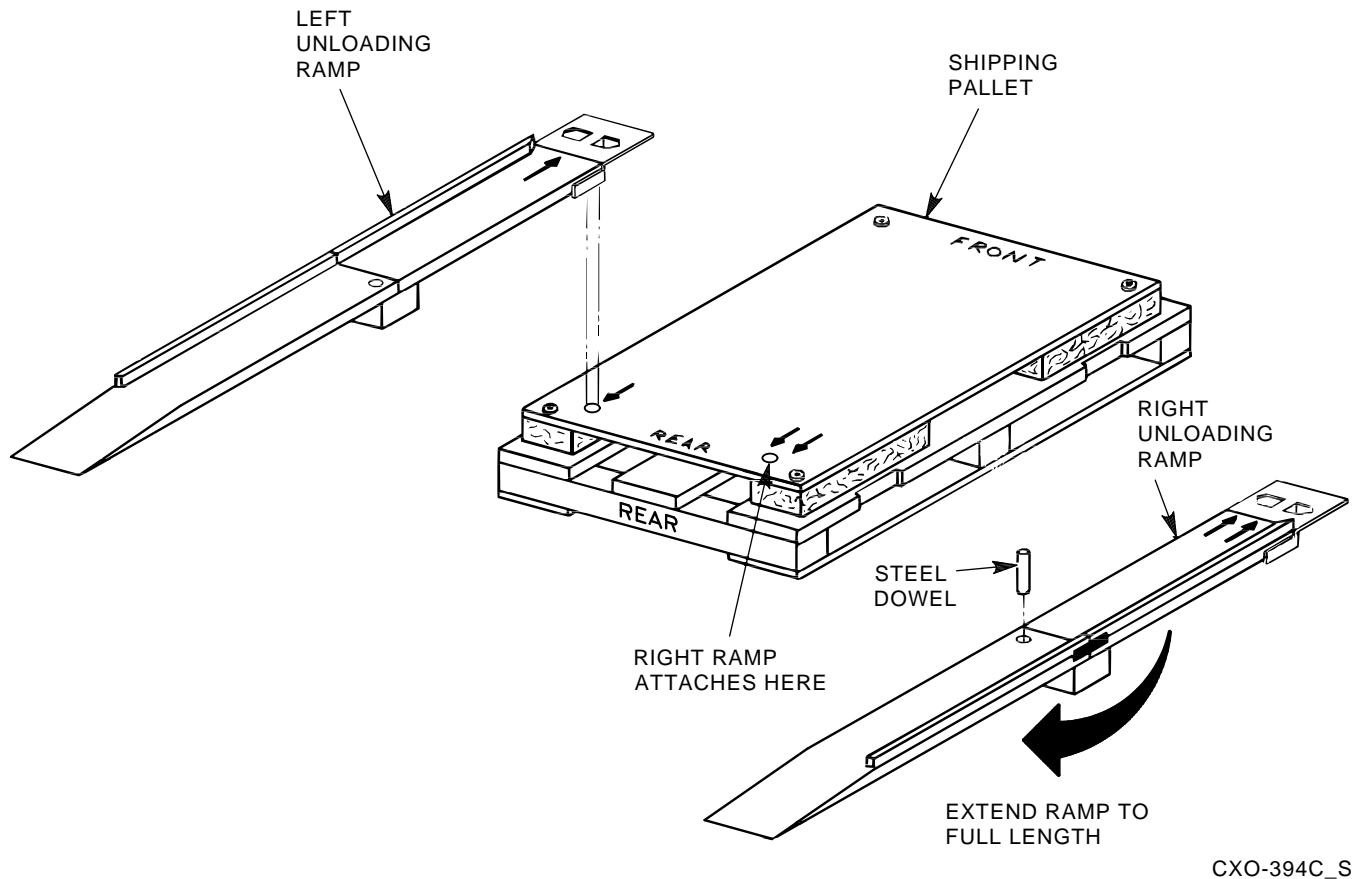
8. Lower the levelers and adjust them until the cabinet is level. Make sure the levelers support the weight of the cabinet and not the cabinet rollers and that the HSC controller is stable.

2.3 Preparing the HSC Controller for Power Up

The following sections list the steps that must be completed prior to applying power to and checking the functionality of the HSC controller. Node addressing, slot count timing, cabling, console video terminal set up, and printer set up are among the tasks to be completed before applying power to the HSC controller.

HSC controllers communicate with host computers by means of the CI (computer interconnect) bus. One CI bus can attach up to 32 nodes (with a maximum of 16 being VMS nodes).

HSC controllers are capable of providing mass storage control for a VAXcluster system. Because of this, it is imperative to establish the HSC controller as a **unique** node in the cluster.

Figure 2–6   Adjusting the HSC Levelers

LOCKNUT

LEVELER
HEX NUT

LEVELER
FOOT
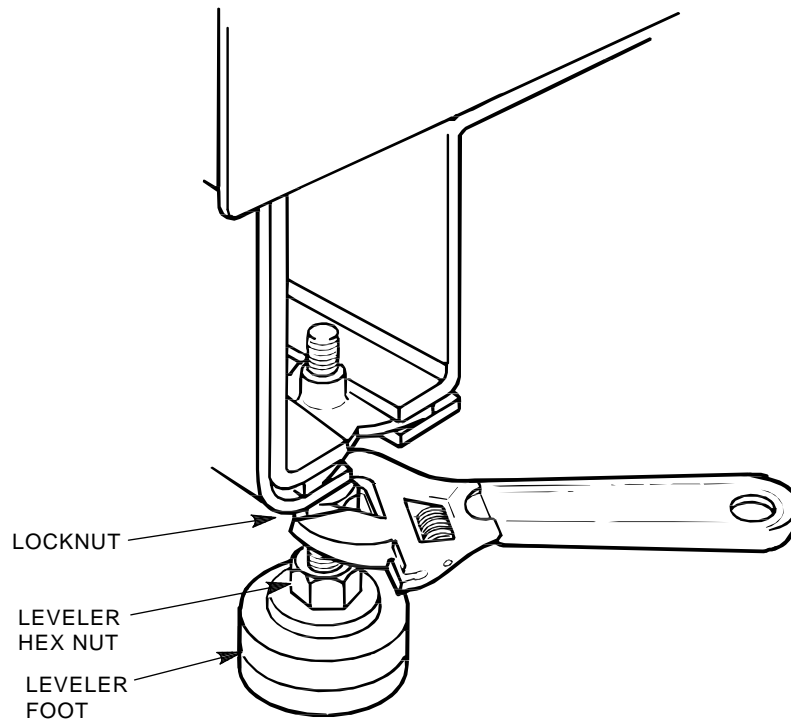
CXO-395C_S

2.4 Installing CI Bus Cables

―――――――――――――― **Note** ――――――――――――――

Before connecting CI bus cables, verify that the LINK module node
address and slot count timing switches have been set as described in
Section 2.8.

――――――――――――――――――――――――――――――――――――

The HSC controller communicates with the host(s) over the CI bus cables.
Between the HSC controller and the host is a coupling device called the star
coupler. The CI bus cables connect the HSC controller to the star coupler. The
star coupler is then connected to the host(s) with another set of CI bus cables.

―――――――――――――― **Note** ――――――――――――――

The star coupler transformer coupling allows nodes to be connected or
disconnected during normal operation without affecting the rest of the
VAXcluster system, without powering down any equipment, or without
impacting the functionality of the CI bus.

――――――――――――――――――――――――――――――――――――

The base CI bus cable part number is BNCIA–xx/NN, with the xx designating the
cable length in meters. CI bus cables come in various lengths including 10-, 20-,
and 45-meter lengths. **The minimum bend radius for any CI bus cable is
four inches.**

Table 2–2 CI Bus Cable Part Numbers

Description	Digital Part Number
CI cable set, 33 ft. (10m)	BNCIA–10/NN
CI cable set, 66 ft. (20m)	BNCIA–20/NN
CI cable set, 148 ft. (45m)	BNCIA–45/NN

Note

The CI bus cable set connects the CI adapter with the star coupler. Each set consists of four CI bus cables (two transmit and two receive). One set is required to connect a CI adapter or HSC controller to a star coupler.

Install the CI bus cables as follows:

1. See Figure 2–7 and locate the four CI bus cable connectors inside the rear of the HSC controller.

2. Mark the cables labeled receive (R) and transmit (T) with an "A" or "B" on each cable tag. The A or B marking must correspond to the path that cable uses. Also mark the previously set node address (from LINK module switches) on each CI bus cable tag.

Note

The CI bus cable connectors are marked corresponding to the receive and transmit paths. Both CI bus paths must be used to connect the HSC controller. The A path contains Transmit A (TA) and Receive A (RA). The B path contains Transmit B (TB) and Receive B (RB). Connector TA on the HSC controller connects to TA on the star coupler; TB on the HSC controller connects to TB on the star coupler. Remember to mark both ends of each CI bus cable before installation to aid in tracking cable destinations for future maintenance and troubleshooting.

---

3. Screw each CI bus cable into the appropriate CI bus cable connector on the CI shelf at the rear of the HSC controller.

4. Screw the star coupler end of each CI bus cable into the star coupler bulkhead panel as described in the installation chapter of the *Star Coupler User Guide*.

2.5 Installing the Power Control Bus Cables and Setting Power Controller Switches

The HSC power controller is a general-purpose, single-phase ac power controller that controls and distributes ac power to various ac input devices in the HSC65 and HSC95 cabinet.

Figure 2–7 Locating the CI Bus Cable Connectors on HSC Controllers
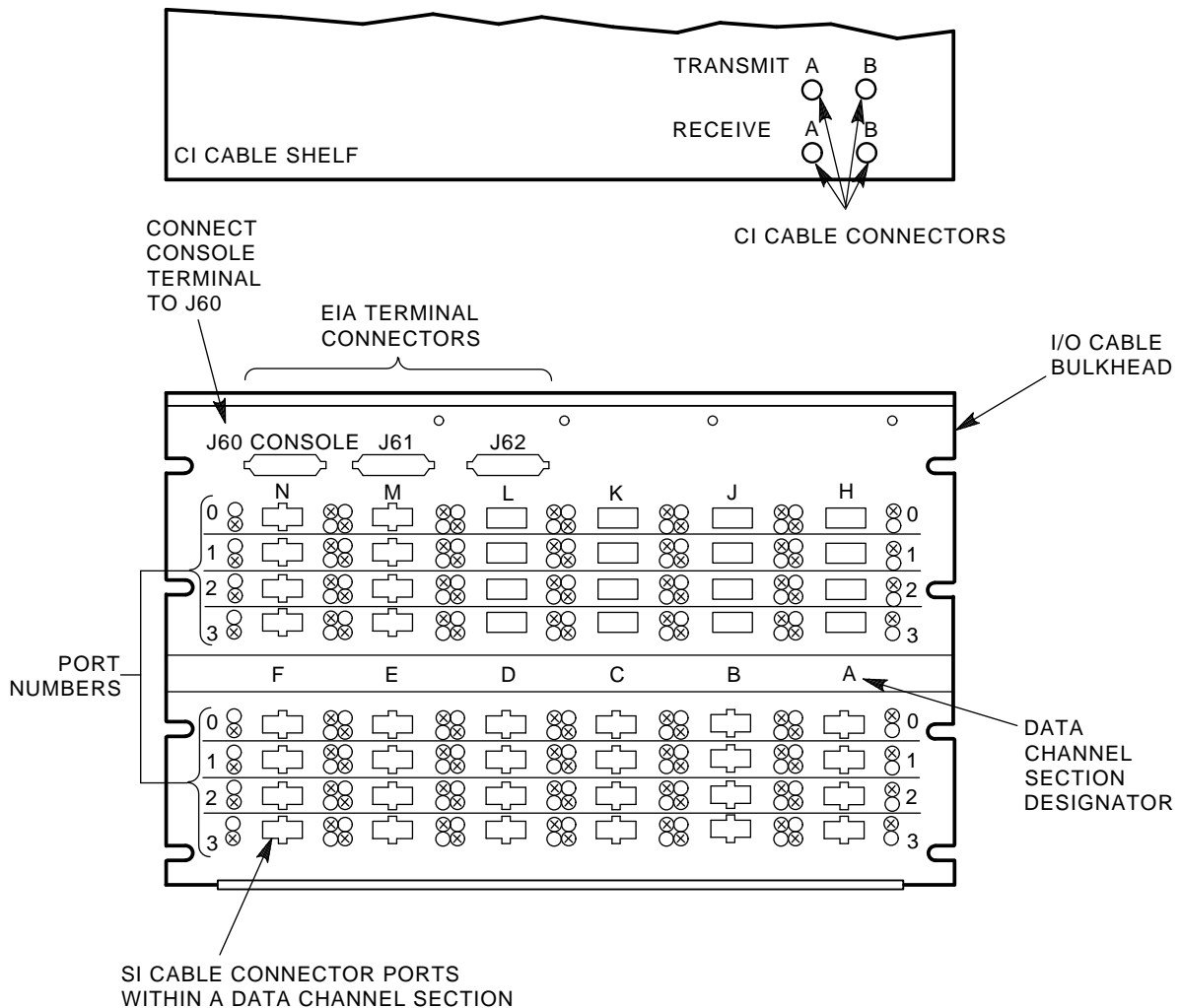
CXO-3079A

To avoid an initial power surge in multidevice computer systems, a power control bus is used. This bus permits a single point of control and allows each device on the computer system to power up sequentially. However, if power sequence (power control bus) cabling is used, the feature for connecting and disconnecting nodes during operation without affecting the rest of the VAXcluster system is lost. You may choose not to use the power sequence cabling feature for this reason. If so, set the Bus/On switch located on the HSC power controller to the ON position and do not install the power control bus cables.

2.5.1 Installing Power Control Bus Cables to the HSC Power Controller

Use the following procedure to attach power control bus cables to the HSC power controller.

1. Open the HSC controller rear door using a 5/32-inch hex wrench.

2. Locate power control bus connectors J10, J11, J12, and J13 on the front panel of the HSC power controller as shown in Figure 2–8. Connectors J10 and J11 are the undelayed connectors (used to connect the HSC controller to the next

device), and J12 and J13 are the delayed connectors (used to connect power control bus cables from the previous device).

3. Connect one end of the power control bus cable to the delayed output connector of the previous computer system device.

4. Connect the other end of that power control bus cable to the undelayed J10 connector on the power controller of the HSC controller being installed.

5. Connect any other device's power control bus cable to the J13 connector on the power controller of the HSC controller being installed.

2.5.2 Setting the HSC Power Controller Bus/On Switch

The BUS/ON switch on the HSC power controller has two positions depicted by international symbols as shown in Figure 2–8. If a power control bus is being used, set this switch to the REMOTE BUS CONTROL position. If a power control bus is not being used, set this switch to the SECONDARY ON position.

Figure 2–8 HSC Power Controller Bus/On Switch
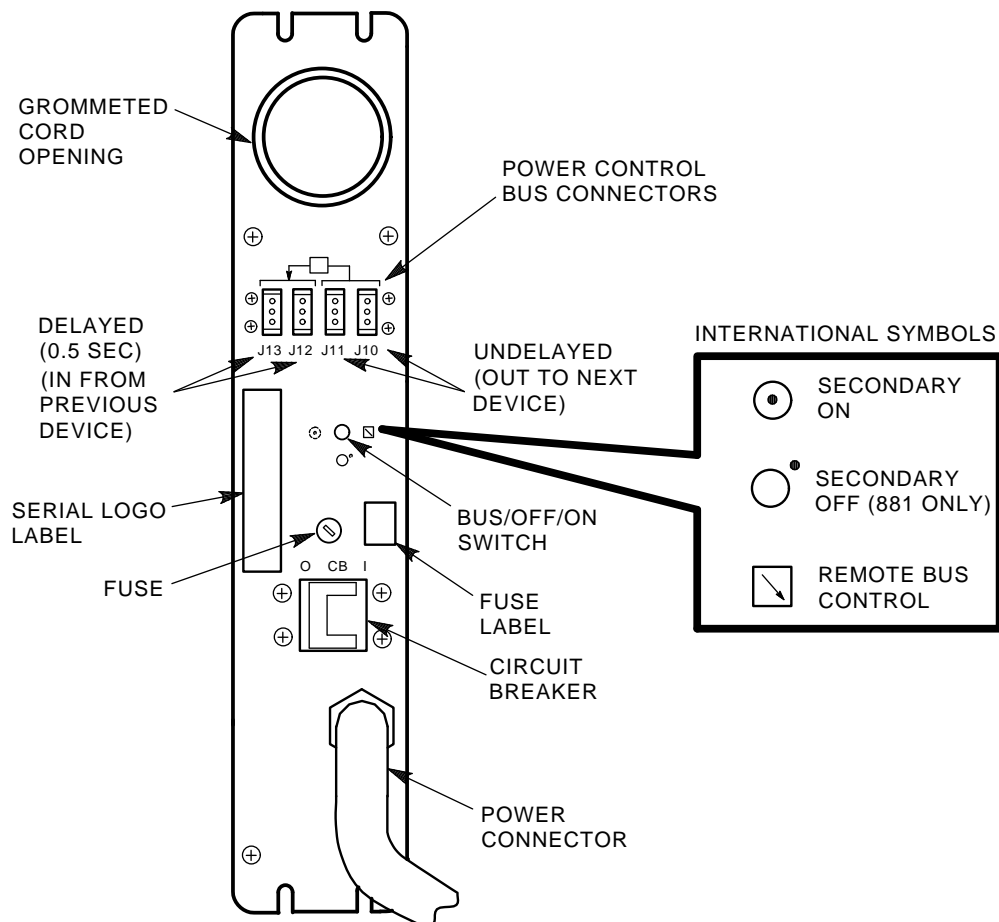
CXO-893B

2.6 Installing SDI/STI Cables

The HSC controller I/O bulkhead is divided into data channel cabling sections.

There are 12 data channel cabling sections on the HSC65 and HSC95 controller I/O bulkhead panels. The sections are labeled A through F on the lower panel, and H, J, K, L, M, N on the upper panel.

Each of the data channel sections (A through F or H through N) contains four cable connector port slots. Each port slot (labeled 0, 1, 2, or 3) has the same performance characteristics.

Figure 2–9 shows the HSC65 and HSC95 controller I/O bulkhead with the data section designators and the SI cable port numbering scheme.

Connect the internal SI cable connector to any one of the four port slots from the same requestor.

Figure 2–9 HSC65 and HSC95 Controller I/O Bulkhead
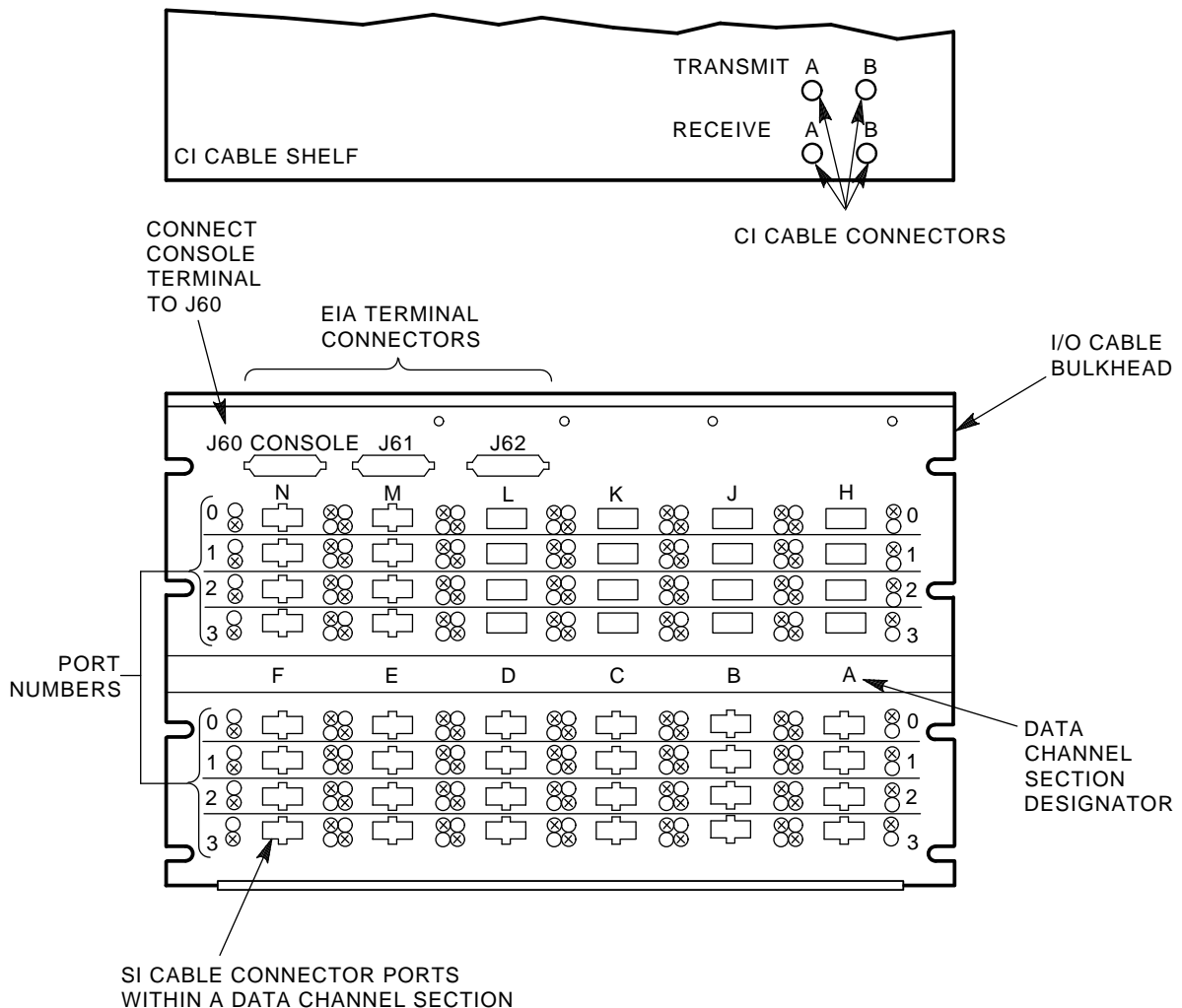
CXO-3079A

2.6.1 Procedure for Connecting SDI/STI Cables

The external SDI™ and STI cables are identical. Use the following procedure to connect SDI/STI cables from the outside of the HSC I/O bulkhead panel to the disk or tape device:

Note

Ensure the disk drives are connected to disk channel modules (L0108–YA) and that tape formatters or tape drives are connected to tape channel modules (L0108–YB). Either disk drives or tape drives can be connected to L0119–YA 4-port disk/tape data channel modules. Only disk drives are supported by the L0119–YB 8-port disk data channel modules.

---

1. Start cabling at either the bottom left or bottom right side of the I/O bulkhead. (This will allow connection to the top row of cables without interference.)

2. Locate the requestor slot of the first data channel module that you installed.

3. Install each SDI/STI cable shield terminator for that requestor slot working from left to right (or right to left). Ensure the SDI/STI cables are grounded to the I/O bulkhead by securing their shield terminators to the I/O bulkhead panel with captive screws.

Note

Do not secure the SDI/STI cables to the I/O bulkhead panel with tie wraps or cable management clips until every port of each requestor has been tested with the ILDISK or ILTAPE device integrity tests and a known good disk or tape drive. This will eliminate having to remove tie wraps or cable clamps should you find a failed cable during your testing.

---

4. Loop the cable management clips within a data channel section around all of the cables in that section.

5. Push the cable management clips into the slots in the sheet metal as shown in Figure 2–10.

6. Install the device end of the SDI/STI cables into each device I/O bulkhead, as described in the appropriate disk drive or tape drive/formatter user guide.

Note

Install the cable cover before turning on the HSC controller.

---

7. Install the cable cover over the bulkhead on the rear door as follows:

    a. If not previously done, open the rear door of the HSC controller cabinet. Remove the cable cover and unwrap it.

    b. Close the rear door.

Figure 2–10   HSC SDI/STI Cable Shield Terminator and Management Clip Installation

CAPTIVE
SCREWS

SDI/STI
CABLE SHIELD
TERMINATORS

CABLE
MANAGEMENT
CLIP

CXO-1893A
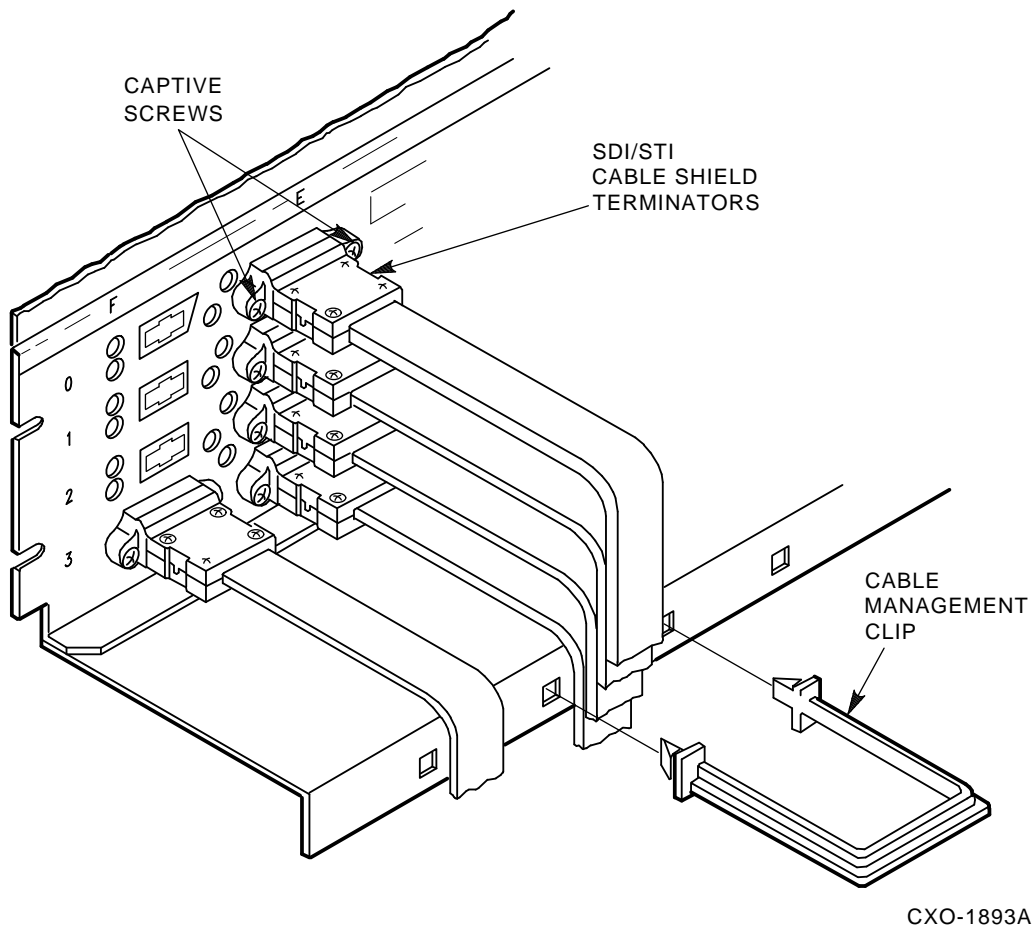
   c. Position the cable cover with its open end down and closed end up. Hook the cover tabs into the matching holes in the rear door and slide the cover down to lock it in place.

2.7 Checking Switch Positions

The K.pli2 and K.si modules have switchpacks that are set during manufacturing. These switches must be in the OFF position for normal operation of the HSC controller. Use the following procedure to verify that the switches on the K.pli2 module and the K.si modules are properly set for normal operation.

1. If you have already not done so, connect the HSC controller to its ac power source. If you have an HSC controller operating from 240 Vac source power, open the rear door of the cabinet and plug the separate power cable to the connector on the rear of the HSC power controller. This cable is packed with the HSC controller cabinet. HSC controllers using 120 Vac source power have the power cable permanently installed on the power controller.

Do not apply power to the HSC controller at this time. The purpose of this step is to properly ground the HSC controller chassis for ESD protection when handling modules.

2. At the front of the HSC controller, locate and remove the K.pli2 module in the card cage.

3. See Figure 2–11 and verify that the switches on the switch pack are all set to the OFF position.

4. Reinstall the K.pli2 module in the card cage.

5. Locate and remove the first K.si module in the card cage.

6. See Figure 2–12 and verify that the switches on the switch pack are all set to the OFF position.

7. Reinstall the K.si module and repeat the verification step for all other K.si modules in the card cage.

2.8 Setting the Switches on the Port LINK Module

The port link module has three switches that must be set for each installation. Two of these switches set the unique node address for the HSC controller; the third switch sets the slot count timing according to the VAXcluster™ configuration.

2.8.1 Guidelines for Setting the Node Address Switches

Unique node addresses are set using the two node address switches on the HSC port LINK module. Use the following guidelines when setting the node address switches on the LINK module:

1. If the HSC controller or a new CPU is added to a cluster, set the address switches to the next available node address for the cluster. The HSC controller should be assigned to lower node addresses.

2. If the HSC controller is presently part of a cluster to which no new nodes have been added, but a LINK module has been replaced, ensure the node address on the new LINK module is set to the same address as the previous module.

2.8.2 Guidelines for Setting the Slot Count Timing Switch

Incorrect switch and/or jumper settings on the CI interface modules in both the HSC controllers and the CI host nodes can cause various cluster disturbances, including:

- Disks in Mount Verification

- Many virtual circuit (VC) closures, resulting in shadow copy initiation on shadowed disks

- Various OpenVMS™ bugchecks, most commonly \CLUEXIT

Figure 2–11 Location of the K.pli2 Module Switchpack

PILA
MODULE

NOTE:
ALL SWITCHES
MUST BE OFF FOR
NORMAL OPERATION.

RED STATUS
LED

GREEN STATUS
LED
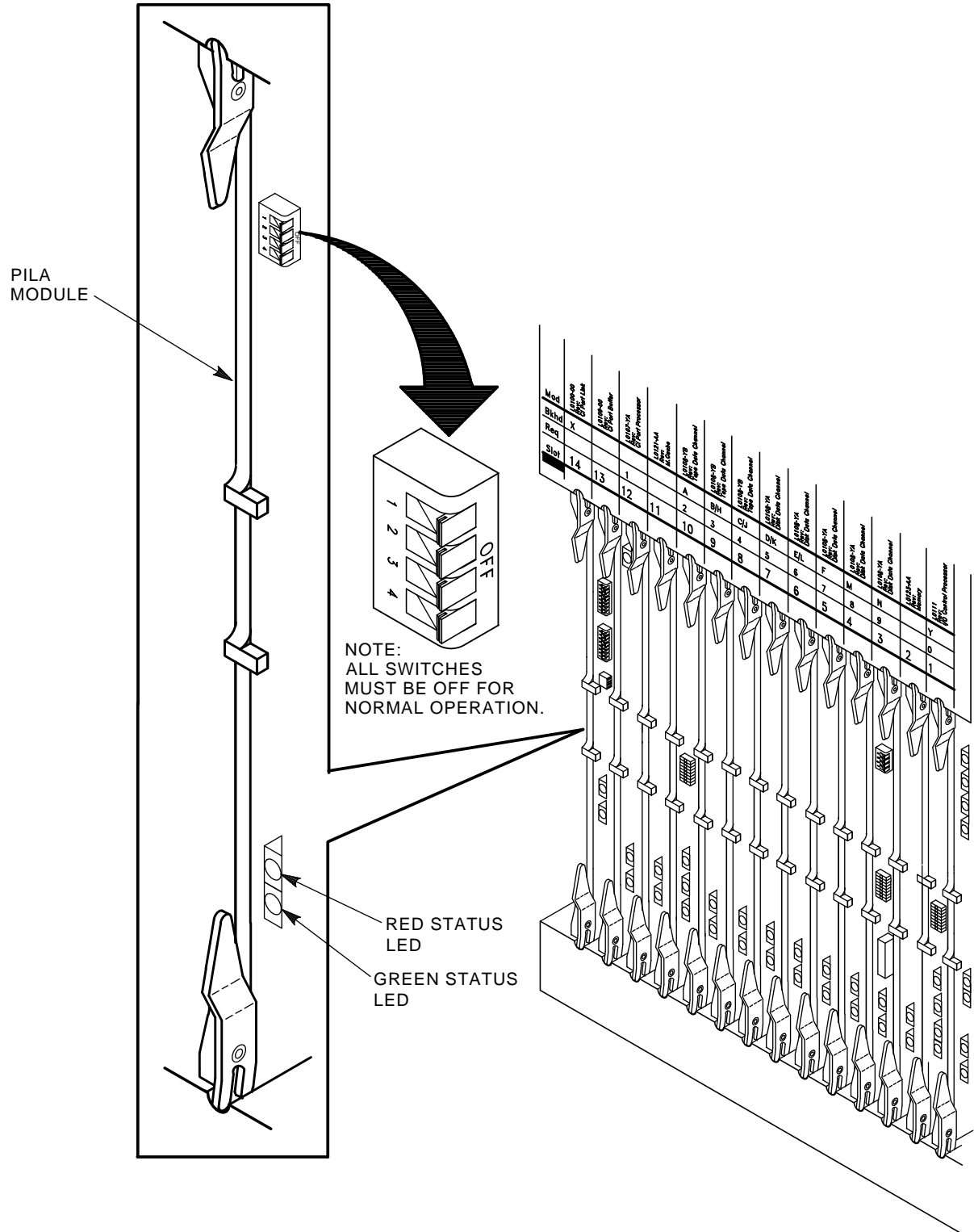
CXO-3960A-TI

Figure 2–12 Location of the K.si Module Switchpack

K.SI DATA CHANNEL
MODULE

NOTE:
ALL SWITCHES
MUST BE OFF FOR
NORMAL OPERATION.

AMBER LEDs,D1-D8
(D1 IS ON TOP)

J1

RED STATUS LED

GREEN STATUS LED
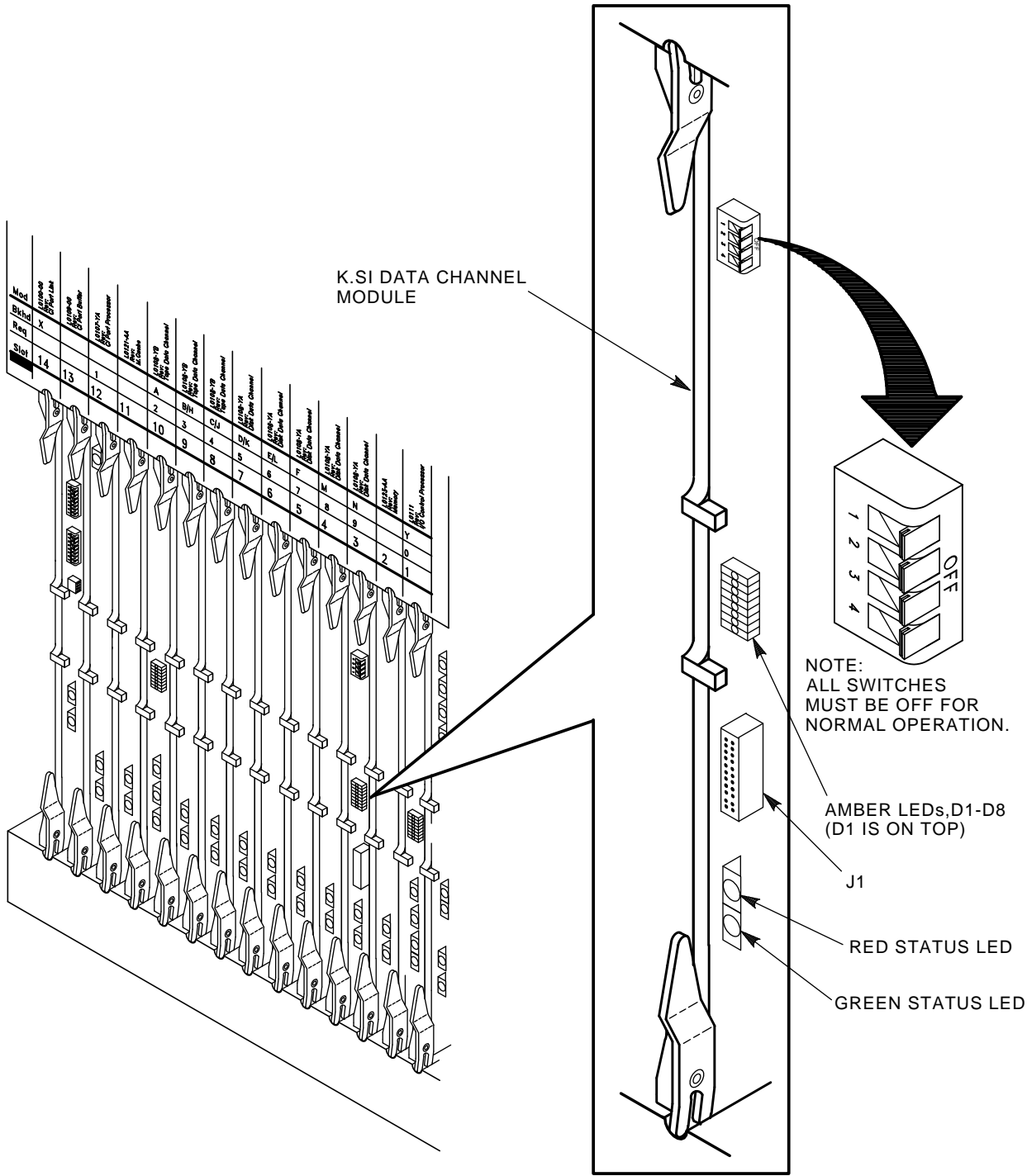
CXO-2495B

The cause of these disturbances are CI collisions caused by mismatched CI communication mechanisms. There are two mechanisms involved:

- Slot count (also called "quiet time")
- Cluster size

Settings for these mechanisms are selected by switch positions on the LINK modules in HSC controllers and older VAX host systems, and by backplane jumpers for CIBCA and CIXCD CI port adapters on newer VAX hosts.

Slot count has two possible settings: 7 or 10. At the time of HSC controller installation, it is necessary that all LINK and CI adapter modules in the cluster be set to a consistent value to avoid the cluster disturbances mentioned above.

Digital recommends that the slot count for all CPU and HSC controller nodes within a cluster be set to a value of 10 (not 7). HSC65 and HSC95 controllers are shipped with their LINK modules set to a slot count of 10.

However, LINK modules for some previously installed HSC controllers in a cluster or CI port adapter modules in host systems may still be set at a slot count of 7. If your cluster does not contain a CIXCD adapter and is operating without problems at a slot count of 7, you may set the HSC65 or HSC95 controller LINK module to 7 for installation and defer resetting the entire cluster to slot count 10 until a more convenient time.

If your cluster does contain a CIXCD adapter, all LINK and CI adapter modules should already be set to 10 because the CIXCD adapter does not support a slot count of 7.

To assist you with setting the slot count in your cluster, Table 2–3 lists LINK and adapter module switch and jumper settings.

In addition, the cluster size parameter must be consistent throughout the cluster at a value of either 16 or 32. If **all** nodes in your cluster are numbered in the range of 0 to 15, you may select a cluster size of either 16 or 32. If your cluster has **any** node numbered in the range of 16 to 31, you must select a cluster size of 32. Table 2–3 also contains a list of LINK and adapter module switch and jumper settings to select the appropriate cluster size.

Table 2–3 L0118 LINK Module and CI Adapter Module Switch/Jumper Settings

Adapter Type	Host System	LINK Module	Function	Switch/Jumper Setting
	HSC95[1]	L0118–YA	Slot=7 Slot=10 Clu_size=16 Clu_size=32	S3–4=Open S3–4=Closed S3–1=Open S3–1=Closed
CIBCA–Ax, CIBCA–Bx[2], [3]	VAX™ 82x0, VAX 83x0 VAX 85x0, VAX 8700 VAX 88x0, VAX 6000™	T1025 T1046	Slot=7 Slot=10 Clu_size=16 Clu_size=32	Jumper E11–41=Out Jumper E11–41=In Jumper D30–60=Out Jumper D30–60=In
CIXCD–xx[3]	VAX 6000, VAX 9000™	T2080	Slot=7 Slot=10 Clu_size=16 Clu_size=32	Not Supported Jumper E15–45=In Jumper D15–45=Out Jumper D15–45=In

[1]On L0118 modules, all on-module jumpers must be left in their default positions and S3–2 and 3 must remain open.

[2]For CIBCA options, all referenced jumpers are located on the backplane slot for the PORT (T1015/T1045) module, *not* the slot allocated to the LINK (T1025/T1046) module. For CIBCA options, all reference jumpers are on the backplane slot for the PORT (T1015 or T1045 module).

[3]For CIBCA and CIXCD options, install *only* those backplane jumpers listed and those required to specify the node address.

2.8.3 LINK Module Switch Setting Procedure

The procedure that follows contains the steps for setting the node address and slot count timing switches.

Set the LINK module switches as follows:

1. If not done previously, connect the HSC controller to its ac power source. If you have an HSC controller operating from 240 Vac source power, open the rear door of the cabinet and plug the separate power cable to the connector on the rear of the HSC power controller. This cable is packed with the HSC controller cabinet. HSC controllers using 120 Vac source power have the power cable permanently installed on the power controller.

    Do not apply power to the HSC controller at this time. The purpose of this step is to properly ground the HSC controller chassis for ESD protection when handling modules.

2. Ask your system manager to identify the unique node address for each device on the CI bus.

3. Unlock and open the HSC controller front door with the key provided.

4. Open the HSC controller card cage cover by turning the card cage cover nylon latches as shown in Figure 2–13.

5. If this is a new HSC controller installation, remove and replace all modules (while wearing your properly grounded ESD wrist strap) to ensure they are properly seated. The modules may have loosened during shipping.

Figure 2–13 HSC Controller Front Inside View

NYLON
LATCHES

CARD
CAGE
COVER

DISKETTE
STORAGE
AREA
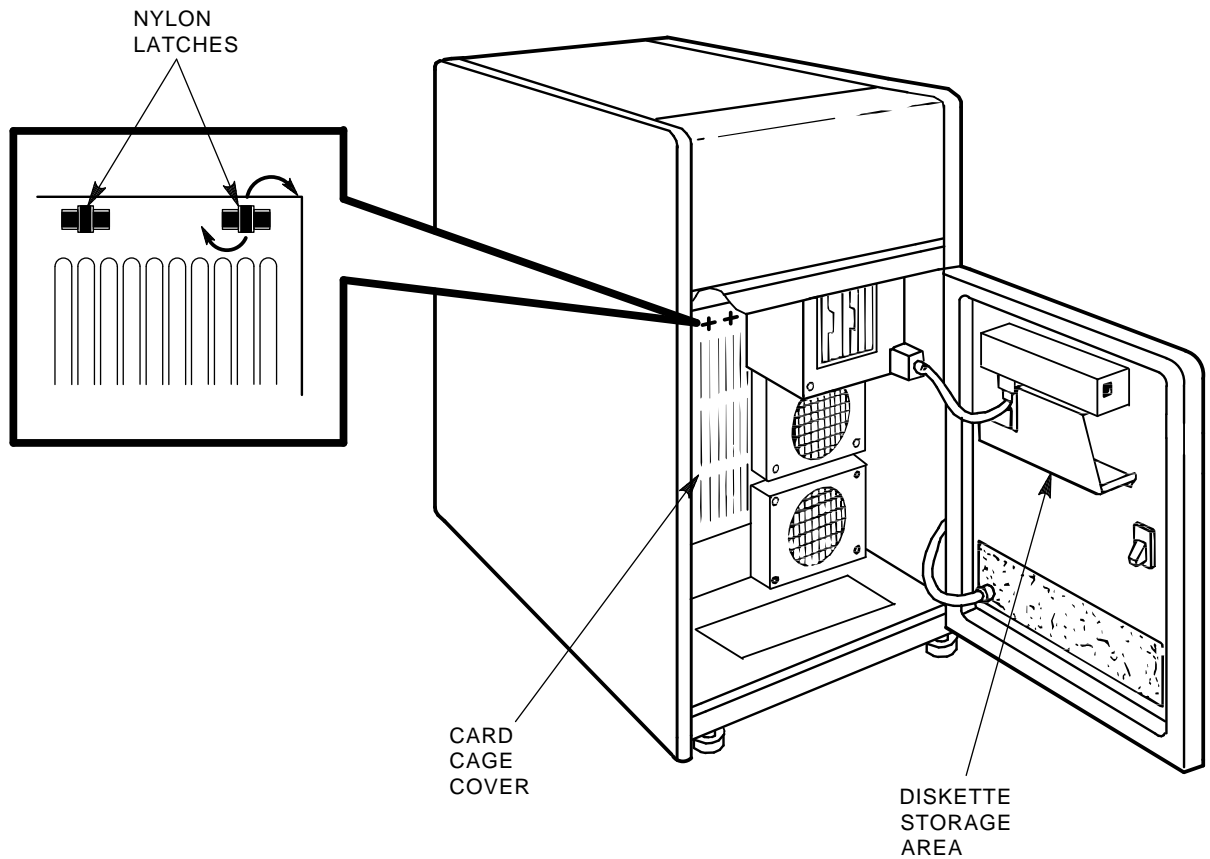
CXO-887B_S

_____ **CAUTION** _____

Remember to plug the HSC controller into a wall receptacle to properly
ground the unit before using the ESD wrist strap.

_____

6. Locate the LINK module in the HSC controller card cage. Refer to
    Figure 2–14 for the location of the node address switches on the LINK
    module.

7. Set the node address switches to a unique node address.

_____ **Note** _____

Remember to set the S1 and S2 node address switches to the same value.

_____

8. Locate the slot count timing switch (S3) on the L0118–YA port LINK module.

Figure 2–14 Location of the Switches on L0118–YA LINK Module

S1

NODE
ADDRESS
SWITCHES

-- OPEN --

S2

-- OPEN --

SLOT
COUNT
SWITCH ——→ S3

SLOT
COUNT
TIMING

CLUSTER
SIZE

-- OPEN --

PORT LINK MODULE
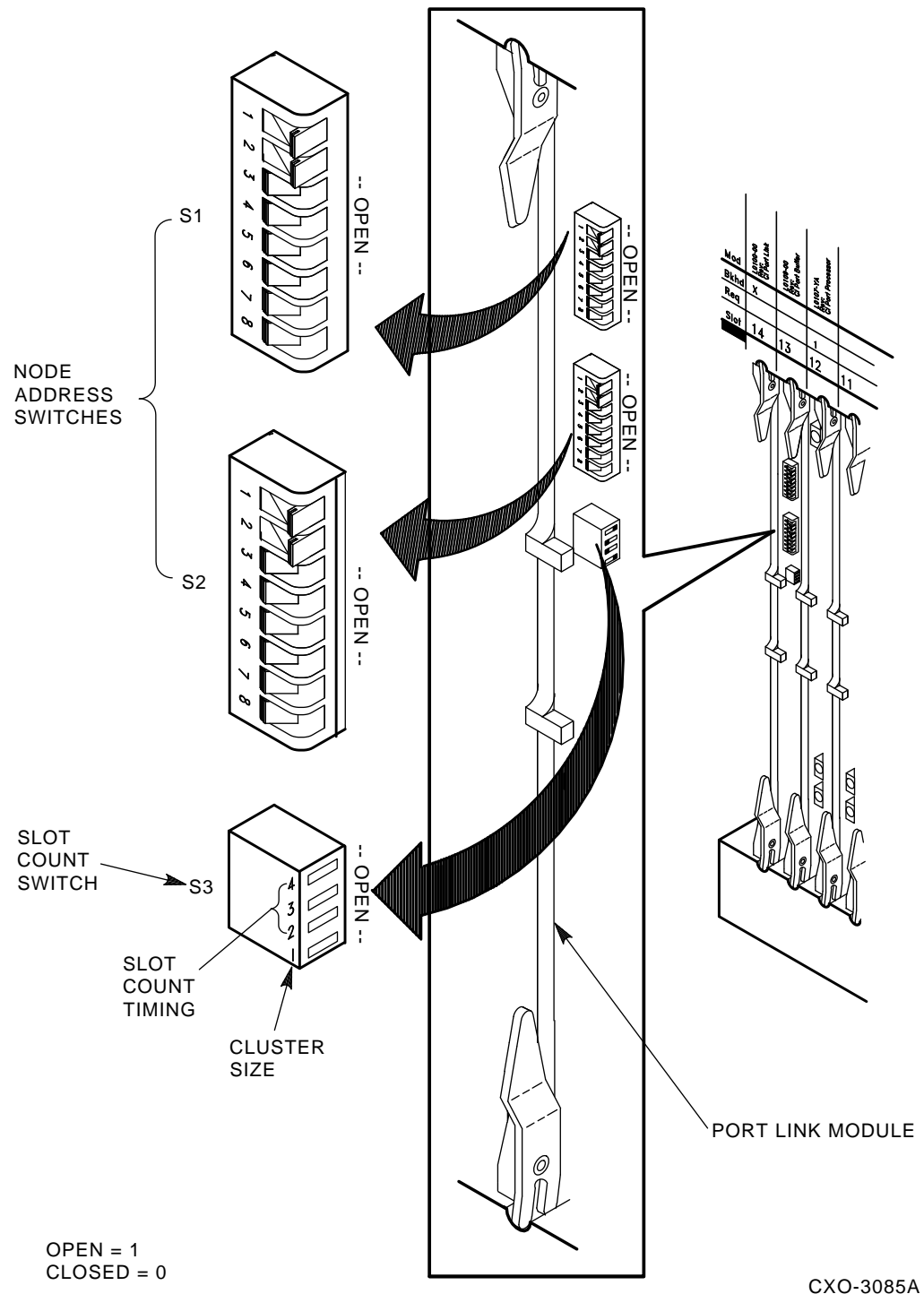
OPEN = 1
CLOSED = 0

CXO-3085A

9. Set the cluster size on S3–1. Switch S3–1 can be set to open (1) or Closed
(0) if all nodes in the cluster have a node number of 15 or less. Set S3–1
to Closed (0) if **any** node in the cluster has a node number of 16 or greater.
Refer to Table 2–3 for a listing of LINK module switch and jumper settings
for various VAXcluster configurations.

10. Set the slot count switch to the proper value for the cluster by using the settings for S3–2, S3–3, and S3–4 (either 7 or 10) given in Table 2–3. Refer to Figure 2–14 for the location of the slot count switch pack.

Table 2–4 lists the settings of the switches as Open or Closed on the LINK module for slot counts of 7 and 10. The table also lists two additional reserved settings for S3. These settings should be used only as directed by Digital Multivendor Services.

Table 2–4   L0118–YA LINK Module S3 Switch Slot Count Timing Settings

Slot Count	S3–2	S3–3	S3–4	Comment
7	Open	Open	Open	
10	Open	Open	Closed	Default
Reserved #1	Open	Closed	Open	Slot count=11
Reserved #2	Open	Closed	Closed	Slot count=14

_____ **Note** _____

When setting the S3 switches, Open= 1 and Closed= 0. Remember that S3–1 is used to set the cluster size and is not related to the slot count timing settings.

_____

11. Insert the LINK module into the backplane slot after the node address (S1 and S2) and slot count (S3) switches have been set.

12. Install other requestors in the HSC controller backplane. Instructions for installing K.si module options are given in Chapter 13. Refer to Chapter 14 when installing K.scsi modules.

13. Replace the card cage cover and close the HSC controller front door.

2.9 HSC Controller Console Video Terminal and Printer Configurations

Various combinations of video terminals and printers have been distributed with HSC controllers. Therefore, rather than listing the setup differences of each video terminal and each printer, this section only lists the parameters that need to be set for each device. Model-specific setup instructions can be found within each video terminal's and printer's owner and/or installation manuals.

The following general procedures explain how to cable and set up the video terminal and line printer:

1. Remove the video terminal and the printer from their shipping cartons.

2. Using the standard EIA cable provided, screw one end to the video terminal EIA port and the other end to the EIA port on the HSC controller I/O bulkhead. The EIA port is designated J60 and is located at the upper left corner of the I/O bulkhead panel.

3. Plug the printer system cable (provided with the printer) into the system port on the back of the printer.

4. Plug the adapter (part number H8571–B) into the back of the video terminal.

5. Plug the other end of the printer system cable into the adapter.

6. Plug the video terminal and printer power cables into a standard grounded wall socket. Apply power to both terminals.

_____ **Note** _____

Do not use the HSC power controller as a power source for the console terminals.

_____

7. Set up the video terminal and printer using use the model-specific video terminal and printer manuals.

2.10 HSC Controller Final Checkout

Refer to Chapter 3 to apply power to the HSC controller. Chapter 4 contains the procedure to set the basic parameters on the HSC controller. After setting parameters, perform any device integrity tests required by the procedures given in Chapter 5.

Once the verification is complete, close the cabinet doors and turn the door lock fasteners one half turn clockwise to lock the doors. The system is ready to be turned over to your system manager.

3
Power

3.1 Applying Power to the HSC Controller Before Online Testing

This section explains the procedures for applying power to HSC65 and HSC95 controllers.

—————————— **Note** ——————————

During the acceptance and checkout procedure, error messages may appear. Refer to the *HSC Controller User Guide* and the *HSC Controller Service Manual* for error message information.

———————————————————————

3.1.1 Powering Up HSC Controllers

Use the following procedure for applying power to HSC65 and HSC95 controllers:

1. Open the HSC controller rear door with a 5/32-inch hex wrench.

2. Verify that the ac circuit breaker on the HSC power controller is in the 0 (OFF) position (refer to Figure 3–1).

3. Open the front door of the HSC controller.

4. Locate the DC Power switch at the front of the HSC controller and ensure that it is in the OFF position. Refer to Figure 3–2.

Figure 3–1 Locating the HSC Power Controller Circuit Breaker

CXO-1896B
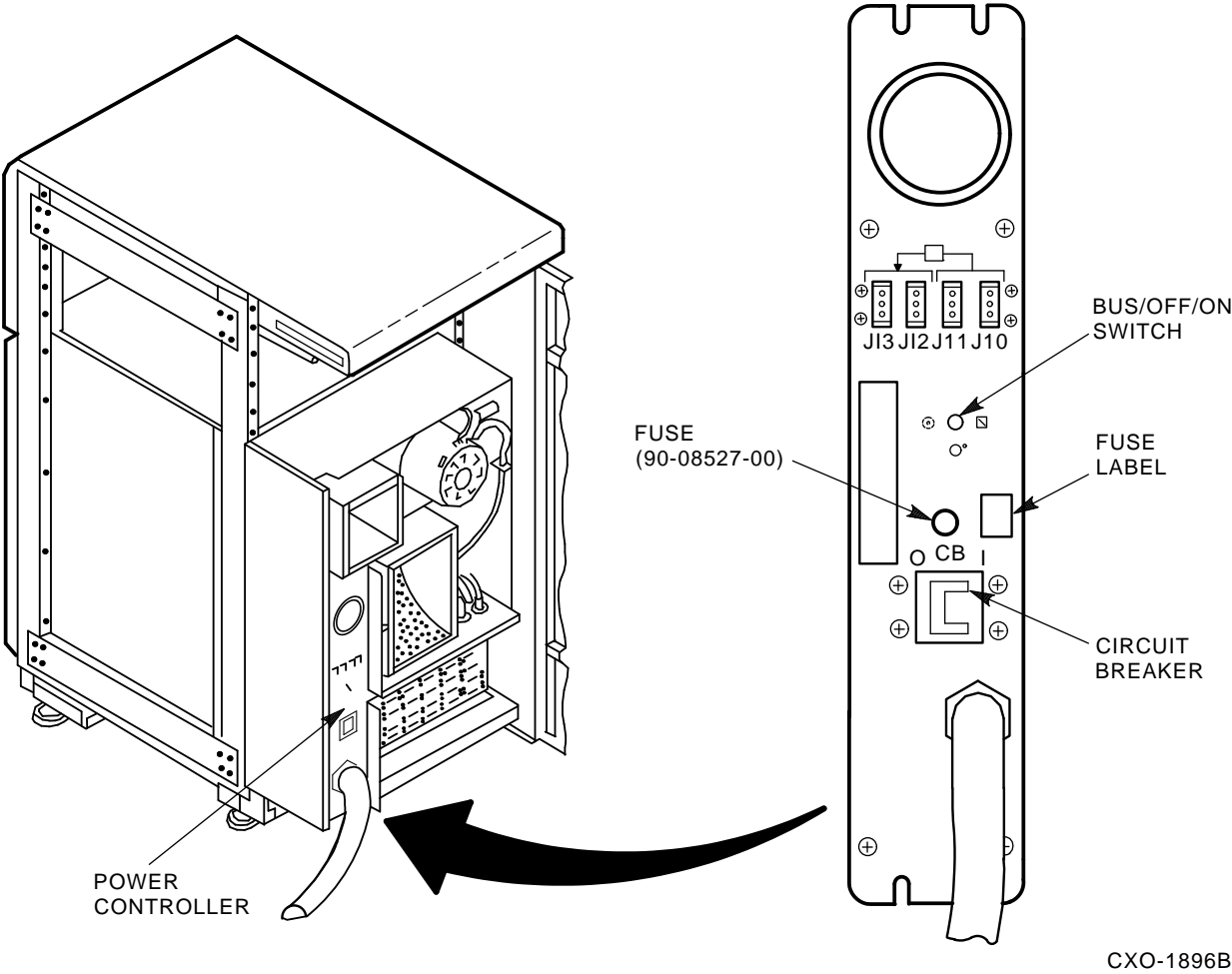
Figure 3–2 Locating the HSC DC Power Switch

DC POWER
SWITCH

OCP SIGNAL/
POWER LINE
CONNECTOR

CXO-946D_S
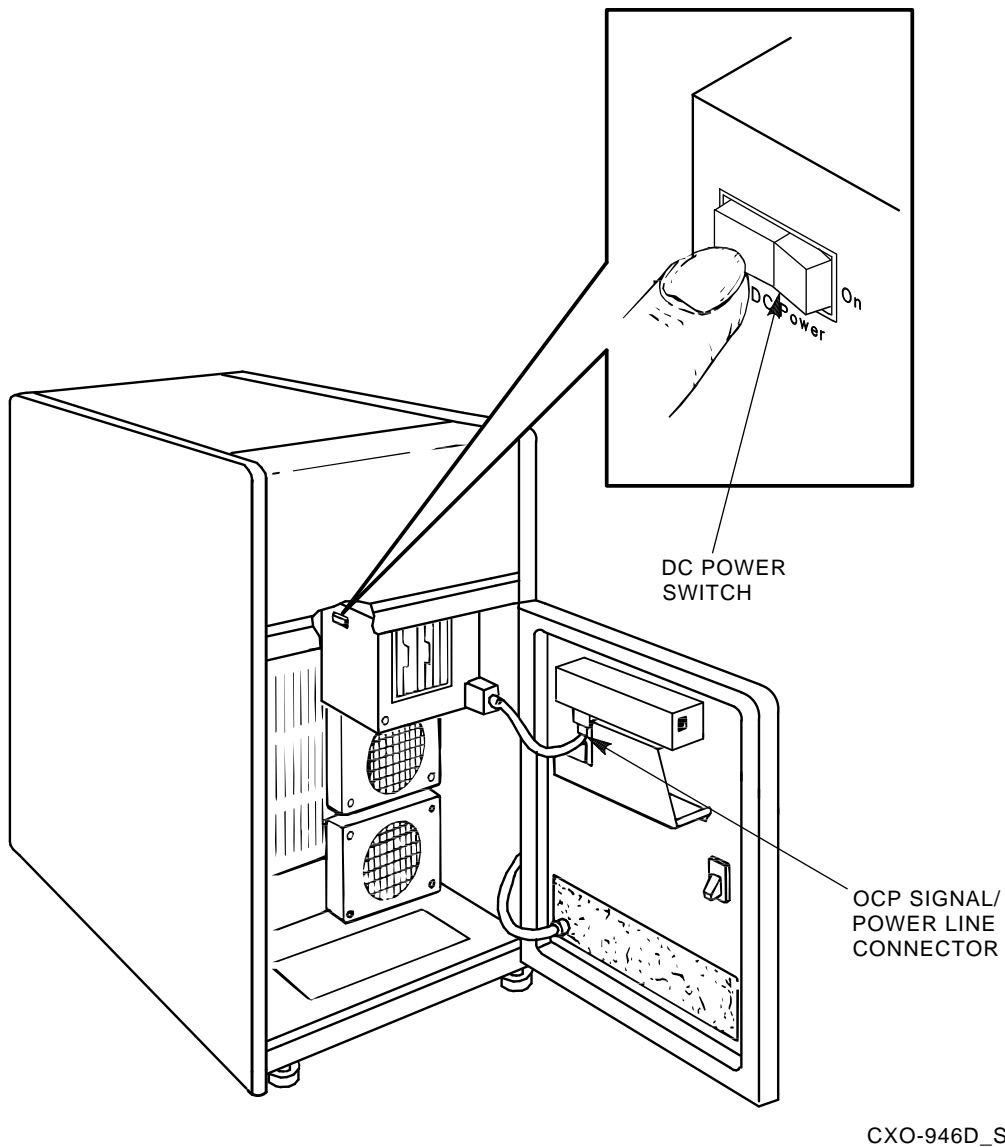
5. Perform this step if not done previously. Verify that the wall receptacle to be used for the HSC controller is wired for proper output. Plug the HSC power controller into the appropriate ac wall receptacle. If the HSC controller is intended for 240 Vac operation, unpack the power cord and connect it to the power controller, and then to the ac source.

6. Set the circuit breaker on the HSC power controller to the 1 (ON) position.

7. Turn the Bus/On switch on the HSC power controller to the proper position. If the HSC controller is connected to the remote bus, set the switch to the symbol depicting REMOTE BUS CONTROL; otherwise, set it to the symbol depicting SECONDARY ON.

8. Ensure that the blower and power supply fans are working by checking the air flow from the exhaust ducts and by checking for fan movement within the power supplies themselves. If airflow or fan movement is absent, turn off the ac power to the HSC controller by setting the circuit breaker on the power controller to the OFF position. Check to make sure the blower cord and power supply cords are plugged into the power controller. Reapply power and check for air flow.

9. Close the HSC controller rear door.

10. Install the system load media to prepare for running the device integrity tests.

11. Turn the DC Power switch to the ON position. The DC Power switch is located on the left side of the RX33 load device, at the front of the HSC controller.

12. Ensure the power indicator on the operator control panel (OCP) is lit.

Note

The Power indicator on the OCP indicates the presence of all three voltages required for HSC controller operation. If the Power indicator lamp is not lit, a required voltage is missing or the power fail line is asserted from the power supplies. Check the output voltages of the power supply/supplies for the missing voltage(s).

3.2 Running the UART Echo Test

To test the serial path between the local console terminal and the UART chip on the HSC I/O control processor (P.ioj2) module, the HSC controller echoes characters typed on the console terminal as if the terminal were in local mode. Prior to booting the HSC controller, perform the UART Echo test to ensure proper operation of the I/O control processor module, console terminal, and the path between. Perform the UART echo test procedure as follows:

Note

The UART Echo test can be performed by one person if the console terminal has been installed on top of the HSC controller. If for some reason the console terminal is located in a remote location away from the HSC controller, two people will be needed to run this test.

---

1. Make sure the Secure/Enable switch on the HSC load device panel is in the ENABLE position. see Figure 3–3 for the location of the Secure/Enable switch.

2. With power on, push in and hold the OCP Init switch.

3. Type any series of characters on the console terminal keyboard while holding in the OCP Init switch.

4. Ensure the string of characters typed are echoed on the console terminal's screen.

Figure 3–3   Locating the Secure/Enable Switch

CXO-1898B
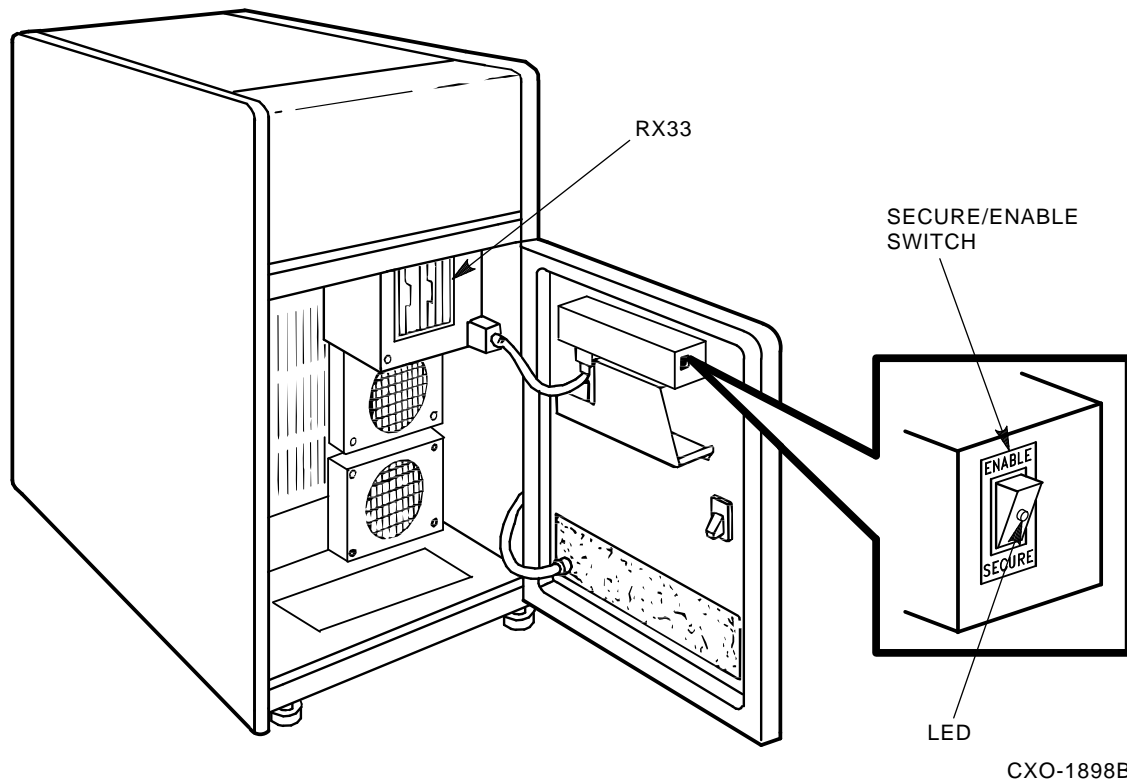
5. Refer to the *HSC Controller Service Manual* or video terminal installation
    manual for information on troubleshooting communication problems between
    the HSC controller and local console terminal.

4

Setting System Parameters

This chapter contains the procedures necessary to complete the online portion of the HSC controller installation.

In performing these procedures, the HSC controller is first rebooted to load the HSC software. After the HSC boot process has loaded the software, an initialization process reads a System Configuration Table (SCT) from the load media. This process uses the SCT to configure the HSC subsystem. The SCT is set at the factory and remains as the default until changes are made and a reboot occurs to write over the factory settings.

The SCT contains such system parameters as system identification number and system name as alterable characteristics. However, any such alterations should be made before the HSC controller is placed on line. If the validity of the SCT is doubtful, use either of the boot procedures given in this chapter to reset the SCT to the default.

---------------------------- **CAUTION** ----------------------------

Do *not* push in the Online switch on the HSC operator control panel (OCP) until all parameters are set. The HSC controller may require a reboot after setting some parameters; refer to the *HSC Controller User Guide* for information on using the SETSHO commands. After setting the parameters, use the SHOW SYSTEM command to view your settings.

4.1 Rebooting the HSC Controller

Use either of the following methods to reboot the HSC controller. Before performing either method, print a hardcopy of all the system parameters and save them for Digital Multivendor Services personnel. This hardcopy will be used for reference in case the HSC controller parameters are lost or corrupted during the process.

Both booting actions return the SCT to factory default settings. After the HSC controller boots, it displays a message indicating that the factory SCT is in use. The system identification, system name, and allocation are changed later in this chapter with the SETSHO utility.

These reboot procedures should be used with care. It is unlikely the default parameters are correct for any particular HSC controller. This action changes the system identification number and system name as set at installation time for a node address unique to the cluster.

Method 1

Perform the following steps to reboot the HSC controller:

1. Verify that the OCP Online switch is in the out position (the HSC controller is off line).

2. Hold the Fault switch in and turn the DC Power switch inside the front door of the HSC controller off and then on. Continue holding the Fault switch in until the "INIPIO-I Booting..." portion of the boot message is displayed:

```
INIPIO-I Booting...

    HSC95 Version V800 30-Jul-1992 10:25:18        System HSC009

Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992,
1993.  Digital Equipment Corporation. All Rights Reserved.
```

The HSC controller model, the software version number, and the system number are site specific. If this message is not displayed, verify that the Online switch is set to the out position. If it is, turn off the HSC controller by setting the circuit breaker on the power controller to 0. Verify that all modules are correctly installed and seated in the backplane, then turn the power back on.

Note

If the system has an illegal configuration of modules installed in the HSC backplane, a message listing the illegal modules is displayed on the console. Additionally, the HSC OCP displays fault code 33. Refer to Table 1–1 for a complete listing of legal modules in the HSC backplane. Figure 4–1 contains a summary of all OCP fault codes. Refer to the *HSC Controller Service Manual* for more information on the fault codes.

Method 2

The second method of rebooting is to enter SETSHO command SET SCT CLEAR. This command is equivalent to holding in the Fault switch during the initial phase of the reboot. Complete instructions for running the SETSHO utility are given in the *HSC Controller User Guide*.

Figure 4–1 Operator Control Panel Fault Codes

DESCRIPTION	HEX	OCT	BINARY	OCP INDICATORS				
				INIT	FAULT	ONLINE		
K.PLI/K.PLI2 ERROR	01	01	00001	OFF	OFF	OFF	OFF	ON
K.SDI/K.SI INCORRECT VERSION OF MICROCODE	02	02	00010	OFF	OFF	OFF	ON	OFF
K.STI/K.SI INCORRECT VERSION OF MICROCODE	03	03	00011	OFF	OFF	OFF	ON	ON
P.IOJ CACHE FAILURE[1]	08	10	01000	OFF	ON	OFF	OFF	OFF
K.CI FAILURE[1]	09	11	01001	OFF	ON	OFF	OFF	ON
DATA CHANNEL MODULE ERROR[1]	0A	12	01010	OFF	ON	OFF	ON	OFF
P.IOJ/C MODULE FAILURE	11	21	10001	ON	OFF	OFF	OFF	ON
M.STD2/M.STD4 MODULE FAILURE[4]	12	22	10010	ON	OFF	OFF	ON	OFF
BOOT DEVICE FAILURE[2]	13	**23**	10011	ON	OFF	OFF	ON	ON
PORT LINK NODE ADDRESS SWITCHES OUT OF RANGE	15	25	10101	ON	OFF	ON	OFF	ON
MISSING FILES REQUIRED[3]	16	26	10110	ON	OFF	ON	ON	OFF
NO WORKING K.CI, K.SDI, K.STI, OR K.SI IN SUBSYSTEM	18	30	11000	ON	ON	OFF	OFF	OFF
INITIALIZATION FAILURE	19	31	11001	ON	ON	OFF	OFF	ON
SOFTWARE INCONSISTENCY	1A	32	11010	ON	ON	OFF	ON	OFF
ILLEGAL CONFIGURATION[5]	1B	33	11011	ON	ON	OFF	ON	ON

1. THESE ARE TERMED SOFT OR NONFATAL ERRORS.
2. POSSIBLE MEMORY MODULE/CONTROLLER (EXCEPT ON THE HSC50 CONTROLLER).
3. THIS FAULT CODE WILL ALSO BE DISPLAYED IF THE P.IOC MODULE IS NOT AT THE MINIMUM REVISION LEVEL.
4. SWAP MEMORY MODULE FIRST. IF PROBLEM PERSISTS, TRY REPLACING THE P.IOJ/C MODULE.
5. REFER TO SECTION 1.1 AND CHECK PROPER MODULE CONFIGURATION.

CXO-3133B_R

4.2 Setting System Parameters

This section contains the procedures to set the system parameters after installation of the HSC software and reboot.

4.2.1 Setting the System Identification Number

Enter the following SETSHO command to set the system identification number:

```
SETSHO> SET ID %xnnnn
```

where *%xnnnn* informs SETSHO that the following string is a 12-digit hexadecimal number ranging from 1 to 7FFFFFFFFFFF.

Press the Return key. A subsequent reboot sets the system identification number.

4.2.2 Setting the HSC Controller System Name

To set the HSC controller system name, enter the following command at the
HSC> prompt:

HSC> **SET NAME** *somename*

where *somename* is the HSC controller system name supplied by the system
manager.

Allowable characters include A through Z, 0 through 9, a dollar sign ($), and the
underscore (_). Not all host architectures allow the full range of system names.
Refer to the *HSC Controller User Guide* for restrictions on character length and
symbols. Make sure the system name is unique. The system name just entered
will be set by a subsequent reboot.

4.2.3 Setting the Storage Allocation Class

To set the storage allocation class, enter the following command at the HSC>
prompt:

HSC> **SET ALLOCATE DISK** *n*

where *n* is a decimal number (0 through 255); the default value for *n* is 0.

You can also use the following command:

HSC> **SET ALLOCATE TAPE** *N*

These commands are used in conjunction with VAXcluster software functionality
to set the disk or tape allocation class. A subsequent reboot sets the storage
allocation class.

4.2.4 Verifying System Parameters Are Set

Do *not* push in the Online switch on the HSC controller OCP until all parameters
are set.

Some SETSHO commands require an HSC controller reboot to exit properly; refer
to the *HSC Controller User Guide* for information on using the SETSHO utility.
After rebooting, enter Ctrl/Y or Ctrl/C to return to the HSC> prompt and enter
the SHOW SYSTEM command to view your settings:

```
 Ctrl/C
HSC> SHOW SYSTEM  Return
 3-Nov-1992 13:08:33.84 Boot:  2-Nov-1992 16:47:17.84   Up: 20:21
Version: V800           System ID: %X00000000FA05        Name: HSC005
Front Panel:  Enabled                                    HSC Type: HSC95
Console Dump:  Enabled
Automatic DITs:  Enabled
Periodic DITs:  Enabled, Interval = 1
Disk Allocation Class:    0             Tape Allocation Class:    0
Disk Drive Controller Timeout: 2 seconds
Disk Drive Caching:  Enabled
Maximum Tape Drives:  24
Maximum Formatters:  24
SETSHO-I Program Exit
```

Press the HSC controller OCP Online switch only after the desired parameters
set with the SET commands have been verified. When the HSC controller finishes
the boot procedure, it is on line to the host and all system parameters are valid.

Another SETSHO utility command that is useful during HSC controller installation is the SHOW ALL command (enter SHOW ALL). This command displays the same information that the SHOW SYSTEM command does, plus more system-specific information, such as which data channel modules are in which slots, which CI circuits are open, and so on. Individual SHOW commands, such as SHOW TAPE and SHOW DISK, also may be used. Refer to the *HSC Controller User Guide* for more information on the SETSHO utility and for detailed instructions on operating an HSC controller.

5

Device Integrity Tests

This chapter presents seven device integrity tests that execute on the HSC controller. These tests only affect the device being tested, though the HSC controller may experience some performance degradation. The device integrity tests reside on the HSC controller system media disk.

The tests described in this chapter are as follows:

- ILRX33—RX33 disk drive integrity test
- ILMEMY—Memory integrity test
- ILCACH—Cache memory integrity test
- ILDISK—Disk drive integrity test
- ILTAPE—Tape device integrity test
- ILTCOM—Tape compatibility test
- ILEXER—Multidrive exerciser

5.1 Generic Prompt Syntax and Error Message Format

Before you run any of these tests, you need to familiarize yourself with the generic prompt syntax and error message format. A description of each is given in the following sections.

5.1.1 Generic Prompt Syntax

All prompts issued by the HSC controller tests use a generic syntax, as follows:

- Prompts requiring user action or input are followed by a question mark.
- Prompts offering a choice of responses show those choices in parentheses.
- A capital D in parentheses indicates that the response should be in decimal format.
- Square brackets ([ ]) enclose the prompt default. If the square brackets are empty, no default exists for that prompt.

5.1.2 Generic Error Message Format

All device integrity tests follow a generic error message format, as follows:

```
    XXXXXX>x>tt:tt T#aaa E#bbb   U-ccc
<TEXT STRING DESCRIBING ERROR>

    FRU1-dddddd FRU2-dddddd
    MA-eeeeee
    EXP-yyyyyy
    ACT-zzzzzz
```

where:

XXXXXX> is the appropriate device integrity test prompt.
x> is the letter indicating the type of integrity test that was initiated:

> D> is the demand integrity test.
> A> is the automatic integrity test.
> P> is the periodic integrity test.

tt:tt is the current time.
aaa is the decimal number denoting the test that failed.
bbb is the decimal number denoting the error detected.
ccc is the unit number of the drive being tested.
FRU1 is the most likely field replaceable unit (FRU).
FRU2 is the next most likely FRU.
dddddd are the names of FRU1 and FRU2.
MA is the media address.
eeeee is the octal number denoting offset within the block.
EXP is the expected contents.
yyyyyy is the octal number denoting data expected.
ACT is the actual contents.
zzzzzz is the octal number denoting data actually found.

The first line of the error message contains general information about the error. The second line describes the nature of the error. Lines 1 and 2 are mandatory and appear in all error messages. Line 3 and any succeeding lines display additional information and are optional.

5.2 ILRX33—RX33 Disk Drive Device Integrity Test

The ILRX33 exerciser tests either of the RX33 disk drives attached to the HSC controller. ILRX33 runs concurrently with other HSC controller processes and uses the services of the HSC control program and the diagnostic execution monitor (DEMON).

ILRX33 performs several writes and reads to verify the RX33 disk drive internal data paths and read/write electronics.

A scratch diskette is not required. ILRX33 does not destroy any data on the HSC software media.

The exerciser tests only the RX33 disk drive, the RX33 disk drive controller on the memory module, and the data path between the P.ioj module and the RX33 disk drive. All other system hardware is assumed to be working properly.

ILRX33 verifies that only a particular RX33 disk drive and controller combination is working or failing. Therefore, the test should not be used as a subsystem troubleshooting aid. This test does not support flags. If the test indicates that a drive or controller is not operating correctly, replace the drive and/or controller.

5.2.1 System Requirements

The hardware and software requirements include the following:

- I/O control processor module with boot ROMs
- Memory/disk controller module
- RX33 disk drive controller with at least one working drive
- HSC controller system media
- Console terminal

5.2.2 Operating Instructions

Enter Ctrl/Y to display the HSCxx> prompt. Then, enter either RUN ILRX33 or RUN DX*n*:ILRX33 to initiate the test.

Note

The term DX*n*: refers to the RX33 disk drives (DX0: or DX1:).

If ILRX33 cannot load from the specified diskette, try loading the test from the other diskette. For example, if RUN ILRX33 fails, try RUN DX*n*:ILRX33.

5.2.3 Test Termination

ILRX33 can be terminated by entering Ctrl/Y. The test automatically terminates after reporting an error; however, if the error displayed is "Retries Required", the test continues.

5.2.4 Parameter Entry

The device name of the RX33 disk drive to be tested is the only parameter sought by this test. When the test is invoked, the following prompt is displayed:

```
Device Name of RX33 to test (DX0:, DX1:, LB:) [] ?
```

Note

The string LB: indicates which RX33 disk drive was last used to boot the control program.

One of the indicated strings must be entered. If one of these strings is not entered, the test displays the message "Illegal Device Name" and the prompt is repeated.

5.2.5 Progress Reports

At the end of the test, the following message is displayed:

```
ILRX33>D>tt:tt Execution Complete
```

where *tt:tt* is the current time.

5.2.6 Test Summary

Test 001, Read/Write Test—Verifies that data can be written to the diskette and read back correctly. All reads and writes access physical block 1 of the RX33 disk drive (the RT–11 operating system volume ID block). This block is not used by the HSC controller operating software.

Initially, the contents of block 1 are read and saved. Three different data patterns are then written to block 1, read back, and verified. The read/write electronics in the drive and the internal data path between the RX33 disk drive controller and the drive are checked. Following the read/write test, the original contents of block 1 are written back to the diskette.

If the data read back from the diskette does not match the data written, a data compare error is generated. The error report lists the media address (MA) in error within the block together with the expected (EXP) and actual (ACT) contents of the word.

5.2.7 Error Message Example

All error messages issued by ILRX33 conform to the HSC generic error message format described in Section 5.1.2. Following is a typical ILRX33 error message:

```
ILRX33>D>00:00 T#001 E#003 U- 50182
ILRX33>D> No Diskette Mounted
ILRX33>D> FRU1-Drive
ILRX33>D>00:00 Execution Complete
```

Additional (optional) lines may be found on some error messages.

5.2.8 Error Messages

This section describes error messages issued by ILRX33. Hints about the possible cause of the error are provided where feasible.

- **Block Number Out of Range**—Indicates that the driver detected a request to read a block number outside the range of legal block numbers (0 through 2399 decimal). Because the ILRX33 reads and writes disk block 1, this error message may indicate a software problem.

- **Data Compare Error**—Indicates data subsequently read back:

```
MA -aaaaaa
EXP-bbbbbb
ACT-cccccc
```

  Where:
  aaaaaa represents the address of the failing word within the block (512 bytes) that was read.
  bbbbbb represents the data written to the word.
  cccccc represents the data read back from the word.

  Because this test only reads and writes block 1 of the diskette, all failures are related to block 1.

- **Hard I/O Error**—Indicates that the program encountered a hard error while attempting to read or write the diskette.

- **Illegal Device Name**—Indicates the user specified an illegal device name when the program prompted for the name of the drive to be tested. Legal device names include DX0:, DX1:, and LB:. After displaying this error, the program again prompts for a device name. Enter one of the legal device names to continue the test.

- **No Diskette Mounted**—Indicates the RX33 disk drive being tested does not contain a diskette. Insert a diskette before repeating the test. If this error is displayed when the drive does contain a diskette, the drive or controller is at fault.

- **Operation Aborted**—Reported if ILRX33 is aborted by entering Ctrl/Y.

- **Retries Required**—Indicates a read or write operation failed when first attempted, but succeeded on one of the retries performed automatically by the driver software. This error normally indicates that the diskette media is degrading and the diskette should be replaced.

- **Unknown Status STATUS=*xxx***—Indicates ILRX33 received a status code it did not recognize. The octal value *xxx* represents the status byte received. RX33 disk drive reads and writes are performed for ILRX33 by the control program's driver software. At the completion of each read or write operation, the driver software returns a status code to the RX33 disk drive test, describing the result of the operation. The test decodes the status byte to produce a description of the error.

  An unknown status error indicates that the status value received from the driver did not match any of the status values known to the test. The status value returned (*xxx*) is displayed to help determine the cause of the problem. Any occurrence of this error should be reported through a Software Performance Report (SPR). See the *HSC Controller Service Manual* for detailed information on SPR submission.

- **Write-Protected**—Indicates the RX33 disk drive being tested contains a write-protected diskette. Try again with a write-enabled diskette. If the diskette is already write-enabled, the RX33 disk drive or controller is faulty.

5.3 ILMEMY—Memory Integrity Test

The memory integrity test (ILMEMY) is designed to test HSC controller data buffers. This test can be initiated automatically or on demand. It is initiated automatically to test data buffers that produce a parity or nonexistent memory (NXM) error when in use by any of the K modules.

ILMEMY tests only data memory buffers. Control program memory errors typically cause a reboot of the HSC controller.

Buffers that fail the memory test are removed from service and sent to the disabled buffer queue.

_____ **Note** _____

The contents of the disabled buffer queue are lost during a reboot of the HSC controller. As a result, all bad memory locations are lost.

_____

Buffers sent twice to the ILMEMY test are also sent to the disabled buffer queue even if they did not fail the test. Buffers that pass the memory test and have not been tested previously are sent to the free buffer queue for further use by the control program.

When the test is initiated on demand, any buffers in the disabled buffer queue are tested and the results of the test are displayed on the terminal from which the test was initiated.

This test runs concurrently with other HSC controller processes and uses the services of the control program and the DEMON.

Note

If an I/O control processor module or a memory module fails during the periodic memory tests, the FACILITY section of the crash code displays PRMEMY, which indicates that the failure occurred during the periodic tests.

5.3.1 System Requirements

Hardware requirements include the following:

- I/O control processor module
- At least one memory module
- RX33 disk drive controller with one working drive
- A console terminal to start ILMEMY on demand

This program only tests data buffers located in the HSC controller data memory. All other system hardware is assumed to be working.

HSC software must be loaded to run this test.

5.3.2 Operating Instructions

Enter Ctrl/Y to display the HSCxx> prompt:

```
Ctrl/Y
HSCxx>
```

Enter RUN dev:ILMEMY to initiate the memory integrity test. This program has no user-supplied parameters or flags.

If the memory integrity test is not contained on the specified device (dev:), an error message is displayed.

5.3.3 Test Termination

You can terminate ILMEMY at any time by entering Ctrl/Y.

5.3.4 Progress Reports

Error messages are displayed as needed. At the end of the test, the following message is displayed (by DEMON):

```
ILMEMY>D>tt:tt Execution Complete
```

where *tt:tt* is the current time.

5.3.5 Test Summary

Test 001 receives a queue of buffers for testing. If the ILMEMY is initiated automatically, the queue consists of buffers from the suspect buffer queue.

When the control program detects a parity or NXM error in a data buffer, the buffer is sent to the suspect buffer queue. While in this queue, the buffer is not used for data transfers. The HSC controller periodic scheduler checks the suspect buffer queue at regular intervals to determine if it contains any buffers. If buffers are found on the queue, they are removed and ILMEMY is automatically initiated to test those buffers.

If the ILMEMY test is initiated on demand, it retests only those buffers already known to be disabled.

If the test is initiated automatically and the buffer passes the test, the program checks to see if this is the second time the buffer was sent to the memory integrity test. If this is the case, the buffer is probably producing intermittent errors. The buffer is retired from service and sent to the disabled buffer queue. If this is the first time the buffer is sent to the memory integrity test, it is returned to the free buffer queue for further use by the control program. In this last case, the address of the buffer is saved in case the buffer again fails and is sent to the memory integrity test a second time.

ILMEMY will terminate when all buffers on the test queue are tested.

5.3.6 Error Message Example

All error messages issued by the ILMEMY conform to the generic error message format described in Section 5.1.2. Following is a typical ILMEMY error message:

```
ILMEMY>A>09:33  T#001 E#000
ILMEMY>A>Tested Twice with no Error (Buffer Retired)
ILMEMY>A>FRU1-M.std2  FRU2-
ILMEMY>A>Buffer Starting Address (physical) = 15743600
ILMEMY>A>Buffer Ending Address   (physical) = 15744776
ILMEMY>D>09:33 Execution Complete
```

5.3.7 Error Messages

This section describes the error messages issued by ILMEMY.

- **Can't Allocate Timer, Test Aborted**—Indicates that the program failed to allocate a timer for SLEEP.

- **Memory Data Error**—Indicates the wrong data was read while testing a buffer. The buffer is retired from service and sent to the disabled buffer queue.

- **Memory Parity Error**—Indicates a parity error occurred while testing a buffer. The buffer is retired from service and sent to the disabled buffer queue.

- **NXM Trap (Buffer Retired)**—Indicates that an unknown address or memory location is being referenced. The buffer is retired from service and its address is sent to the disabled buffer queue.

- **Returned Buffer to Free Buffer Queue**—Indicates a buffer failed during use by the control program but that no error was detected. Because this is the first time the buffer was sent to the memory integrity test, it is returned to the free buffer queue for further use by the control program. The address of the buffer is stored by the memory integrity test in case the buffer fails again when in use by the control program.

- **Tested Twice with No Error**—Indicates the buffer under test passed the memory test. However, this is the second time the buffer was sent to the memory test and passed it. Because the buffer has a history of two failures while in use by the control program, yet does not fail the memory test, intermittent failures on the buffer are assumed. The buffer is retired from service and sent to the disabled buffer queue.

5.4 ILCACH—Cache Memory Integrity Test

The ILCACH test is designed to test the M.cache hardware module. ILCACH can be invoked in three ways:

- ILCACH is always initiated when the HSC controller is turned on if the boot code determines that an M.cache module is available and properly connected to the memory module.

- The cache server software can automatically invoke the ILCACH test if the M.cache module exceeds error thresholds.

- ILCACH may be run on demand at the HSC console.

When ILCACH is initiated at HSC controller power-up, it verifies the results of the M.cache module self-test. The M.cache module self-test checks all of the cache and data memory resident on the module. If there are no memory errors, the ILCACH exerciser runs a series of tests to verify the operation of the portions of the M.cache module that the self-test does not verify.

If the M.cache module self-test reports an error, the ILCACH exerciser performs two tasks:

- It determines if the M.cache module is usable.

- If the module is usable, ILCACH verifies the cache memory to determine what portions of it are usable. The result of this test is a Good Cache List, which is sent to the Cache Server software for further processing.

ILCACH is started automatically by the cache server software when the server determines that the M.cache module has exceeded its error thresholds. ILCACH tests all of the functions on the M.cache module and determines if the error that occurred was fatal or if just portions of the onboard memory were recording errors. If the M.cache module has a fatal error, all caching is disabled. If portions of the memory are found to be usable, a new Good Cache List is generated and reported to the cache server software.

When ILCACH is started on demand by a user, the exerciser runs its set of tests, and a new Good Cache List is generated and reported to the cache server software. ILCACH can only be started on demand if the M.cache module is not being used to cache valid data.

ILCACH runs concurrently with other processes in the HSC controller and uses the services of the HSC software control program and DEMON.

5.4.1 System Requirements

Hardware requirements include the following:

- P.ioj–18/P.ioj2 I/O control processor module

- M.std4/M.std5 memory module

- M.cache module

- RX33 disk drive controller with one working RX33 disk drive

- Console terminal from which to start ILCACH on demand

Software requirements include the following:

- HSC Version 6.0 or higher control program software on an RX33 diskette

---
Note

Earlier software versions are not compatible with the M.cache module.

5.4.2 Operating Instructions

Enter Ctrl/C. The keyboard monitor responds with the prompt:

Ctrl/C
HSC>

Enter RUN ILCACH to initiate the M.cache integrity test. This program has no user-supplied parameters or flags.

5.4.3 Progress Reports

Error messages are displayed as needed. At the end of the test, the following message is displayed (by DEMON):

```
ILCACH>D>hh:mm Execution Complete
```

where *hh:mm* is the current time.

The following is an example run of ILCACH with no error message:

```
HSC>RUN ILCACH

ILCACH>D>hh:mm Execution Starting

ILCACH>D>hh:mm Execution Complete
```

5.4.4 Test Termination

ILCACH cannot be terminated while running.

5.4.5 Test Summaries

Test summaries for ILCACH are as follows:

- **Test 001, Verify M.cache Self-Test**—Verifies that the M.cache module self-test, invoked by INIPIO, returns a successful status.

- **Test 002, DIAGNOSTIC Buffers Test**— Verifies that all of the diagnostic bytes of cache memory can be written and read back. The diagnostic bytes are the 8 bytes at the top of every 32 kilowords. There are a total of 1024 diagnostic buffers. The data written to the diagnostic bytes is generated by the M.cache module pattern generator.

- **Test 003, Cache Data Register Test**—Verifies that the cache data register can be written and read back. Triplets generated by the M.cache module pattern generator are written to the register and then read back.

- **Test 004, CBUS Address Test**—Verifies that the CBUS address register can be correctly read and that it contains the correct value.

- **Test 005, Refresh Rate Test**—Verifies that the cache memory does a refresh cycle every 25 bus cycles. The test writes a sector to M.cache memory, waits 2 seconds, then reads back the sector and checks for errors. The test also verifies that only one sector of data was transferred to check for underwriting or overwriting.

5.4.6 Error Message Example

All error messages issued by ILCACH conform to the generic error message format described in Section 5.1.2. Following is a typical ILCACH error message:

```
ILCACH>A>09:33 T#001 E#000
ILCACH>A>Error detected with REFRESH CYCLE
ILCACH>A>FRU1-MCACHE

ILCACH>D>09:33 Execution Complete
```

5.4.7 Error Messages

This section describes the error messages issued by ILCACH.

- **Cannot Allocate A Timer, Test Aborted**—ILCACH cannot allocate a timer to properly run its tests.

- **ILCACH cannot be aborted via CTRL/Y or CTRL/C**—ILCACH cannot be terminated while running.

- **MCACHE hardware module not present, or not installed correctly**—ILCACH was invoked by the user but there was no M.cache module installed in the HSC controller, or the M.cache module was incorrectly installed.

- **MCACHE Memory Address Error**—This error is displayed in the following form:

  ```
  MCACHE Memory Address Error.
  Expected Address = xxxxxxxx
  Actual Address   = yyyyyyyy
  ```

  This error occurs when Test 004, CBUS Address Test, finds that the cache memory address did not match the expected value.

- **MCACHE Module is unusable. Caching will be disabled**—The M.cache module is unusable due to errors found in the ILCACH test

- **MCACHE must be disabled. Use SET SERVER DISK/NOCACHE to disable cache**—The user has attempted to run ILCACH on an M.cache module that is still on line to the cache server.

- **More than 50% of CACHE is bad.**—More than 50% of the memory on the M.cache module has single-bit ECC errors. No caching will be done on this module.

- **Status Word Not Expected Value**—The M.cache module status word did not contain the expected value. ILCACH reports the returned status word and the associated error as shown in the following example:

  ```
  ILCACH>A>09:33 T#001 E#001
  ILCACH>A>MCACHE Detected Error
  ILCACH>A>FRU1-MCACHE
  ILCACH>A>MCACHE Status Word = 006377
  ILCACH>A>Summary Error Bit
  ILCACH>A>Multi-bit ECC Error

  ILCACH>D>09:33 Execution Complete
  ```

- **Timed out reading the MCACHE Status Register**—The M.cache module state machine is not processing any cache commands.

- **Unable to transfer one sector from CACHE to DATA memory**—The M.cache module is either overwriting or underwriting one sector's worth of information to data memory.

- **Unsupported invocation of ILCACH**—ILCACH was invoked incorrectly.

- **MCACHE Memory Address Error**—ILCACH Test 04 found an M.cache module address that did not match the expected value. This error is reported in the following form:

    ```
    Expected Address = xxxxxxxxx
    Actual Address   = yyyyyyyyy
    ```

- **Between 25% and 50% of CACHE is bad**—One 8-megabyte bank of memory on the M.cache module is bad. The M.cache module is still usable but is not operating with its full memory.

5.5 ILDISK—Disk Drive Integrity Test

The ILDISK test isolates disk drive-related problems to a disk drive (including the Enhanced Mode ESE20 storage element) an SDI cable, or a disk data channel module.

ILDISK runs in parallel with disk I/O from a host CPU. However, the drive being diagnosed cannot be on line to any host.

ILDISK can be initiated upon demand through the console terminal or automatically by the control program when an unrecoverable disk drive failure occurs.

ILDISK is automatically invoked by default whenever a drive is declared inoperative, except when a drive is declared inoperative while in use by an integrity test or utility.

Automatic initiation of ILDISK can be inhibited by entering the SETSHO command SET AUTOMATIC DIAGNOSTICS DISABLE. If the SET AUTOMATIC DIAGNOSTICS command is entered and DISABLE is specified, ILMEMY (a test for suspect buffers) is also disabled. For this reason, leaving ILDISK automatically enabled is preferable.

The tests that are performed vary, depending on whether the disk drive is known to the HSC controller disk server.

If the disk drive is unknown to the disk server, it was either unable to communicate with the HSC controller or was declared inoperative when it failed while communicating with the HSC controller.

Because the drive cannot be identified by unit number, the user must supply the requestor number and port number of the drive. Once the user has supplied these identification numbers, then the SDI verification tests can execute. The SDI verification tests check the path between the K.sdi/K.si module and the disk drive and command the drive to run its integrity tests. If the SDI verification tests fail, the most probable FRU is identified in the error report. If the SDI verification tests pass you can assume that the drive is the FRU.

If the drive is known to the disk server, that is, identifiable by unit number, the Read/Write/Format tests are performed in addition to the SDI verification tests. If an error is detected, the most probable FRU is identified in the error report. If no errors are detected you can assume that the FRU is the drive.

To find the drives known to the disk and tape servers, enter the SETSHO command SHOW DISKS or SHOW TAPES.

5.5.1 System Requirements

Hardware requirements include the following:

- Disk drive

- Disk data channel, connected by an SDI cable

The software requirements for this test reside on the system media and include the following:

- HSC software

- ILDISK.DIA program

- DEMON

- K.sdi/K.si microcode (installed with the K.sdi/K.si module)

The ILDISK test assumes that the I/O control processor module and the memory module are working.

Refer to the disk drive documentation to interpret errors that occur in the drive's integrity tests.

5.5.2 Operating Instructions

Use the following procedure to initiate ILDISK.

---------------------------------- **Note** ----------------------------------

To prevent access from another HSC controller, deselect the alternate port switch on the drive to be tested. The alternate port switch is the drive port switch allowing alternate HSC controller access to the drive.

----

1. Enter Ctrl/Y to display the HSCxx> prompt. The keyboard monitor responds with the following prompt:

   ```
   HSCxx>
   ```

2. Enter RUN dev:ILDISK to initiate the disk drive integrity tests. Wait until ILDISK is read from the system software load media into the program memory.

   If the software media containing ILDISK is not loaded when the RUN dev:ILDISK command is entered, an error message is displayed. Insert the software media containing ILDISK and repeat steps 1 and 2.

3. Enter the parameters after ILDISK is started. Refer to Section 5.5.4 for the parameter entries.

5.5.3 Test Termination

You can terminate the ILDISK test by entering Ctrl/Y or Ctrl/C. Test termination may not take effect immediately because certain parts of the program cannot be interrupted. An example would be during SDI commands. If an SDI DRIVE DIAGNOSE command is in progress, interfering with the disk drive at this time can cause the program to wait 2 minutes before aborting.

When ILDISK is aborted, it display the following message:

```
Execution Aborted
```

5.5.4 Parameter Entry

When run on demand, ILDISK first prompts with the following:

```
DRIVE UNIT NUMBER (U) [] ?
```

Enter the unit number of the disk drive being tested. Unit numbers are in the form D*nnnn*, where *nnnn* is a decimal number between 0 and 4094, corresponding to the number printed on the drive unit plug. Terminate the unit number response by pressing Return.

ILDISK attempts to acquire the specified unit through the diagnostic interface. If the unit is acquired successfully, ILDISK next prompts for the drive integrity test to be executed.

If the acquire fails, one of the following conditions is encountered:

- The specified drive is unavailable. This indicates that the drive is connected to the HSC controller but is currently on line to a host CPU or an HSC controller utility. Online drives cannot be diagnosed. ILDISK repeats the prompt for the unit number.

- The specified drive is unknown to the disk functional software. Drives are unknown for one of the following reasons:

  - The drive and/or disk data channel port is broken and cannot communicate with the disk functional software.

  - The drive was previously communicating with the HSC controller but a serious error occurred; consequently the HSC controller has ceased communicating with the drive (marked the drive as inoperative).

  In either case, ILDISK prompts for a requestor number and port number. See Section 5.5.5.

After receiving the unit number (or requestor and port), ILDISK prompts you with the following:

```
RUN A SINGLE DRIVE DIAGNOSTIC (Y/N) [N] ?
```

Entering "N" causes the drive to execute its entire integrity test set. Entering "Y" executes a single drive integrity test. If a single drive integrity test is selected, the test prompts you with the following:

```
DRIVE TEST NUMBER (H) [] ?
```

Enter a number (in hex) specifying the drive integrity test to be executed. Consult the appropriate disk maintenance or service manual to determine the number of the test to perform. Entering a test number not supported by the drive results in an error generated in Test 05.

The test prompts you for the number of passes to perform:

```
# OF PASSES TO PERFORM (1 to 32767) (D) [1] ?
```

Enter a decimal number between 1 and 32767, specifying the number of test repetitions. Pressing Return without entering a number runs the test once.

5.5.5 Specifying Requestor and Port

To test drives unknown to the disk functional software, you must specify the requestor number and port number. The requestor number is any number 2 through 9 specifying the disk data channel connected to the drive under test.

The port number is 0 through 7; it specifies which of eight disk data channel ports is connected to the drive under test. The requestor number and port number can be determined in one of two ways:

- By tracing the SDI cable from the desired disk drive to the bulkhead connector, then tracing the bulkhead connector to a specific port on one of the disk data channels.

- By using the SHOW DISKS command to display the requestor and port numbers of all known drives. To use this method, exit ILDISK by entering Ctrl/Y. Enter SHOW DISKS at the HSCxx> prompt.

  The SHOW DISKS command displays a list of all known drives including the requestor number and port number for each drive. Each disk data channel has four or eight possible ports to which a drive can be connected. By inference, the port number of the unknown unit must be one not listed in the SHOW DISKS display (assuming the unknown drive is not connected to a defective disk data channel). A defective disk data channel illuminates the red LED on the lower front edge of the module. Refer to the *HSC Controller User Guide* for detailed information on submitting an SPR.

After you have supplied a requestor number and port number to ILDISK, the program checks to ensure the specified requestor and port do not match any drive known to the HSC controller software. If the requestor and port do not match a known drive, ILDISK prompts for the number of passes to perform, as described in Section 5.5.4. If the requestor and port do match a known drive, ILDISK reports an error.

5.5.6 Progress Reports

ILDISK produces an end-of-pass report at the completion of each pass of the integrity test. One pass of the program can take several minutes, depending upon the type of drive being diagnosed.

5.5.7 Test Summaries

The test summaries for ILDISK are as follow:

- **Test 00, Parameter Fetching**—Fetches the user-selected parameters. The user is prompted to supply a unit number and/or a requestor and port number. This part of ILDISK also prompts for the number of passes to perform.

- **Test 01, Run K.si/K.sdi Microdiagnostics**—Commands the disk data channel to execute two of its resident microdiagnostics. The revision level of the disk data channel microcode must be up to date to execute the microdiagnostics. The microdiagnostics executed are the partial SDI test (K.sdi test 7) and the SERDES/RSGEN test (K.sdi/K.si test 10).

- **Test 02, Check for Clocks and Drive Available**—Issues a command to interrogate the real-time drive state of the drive. This command does not require an SDI exchange but the real-time status of the drive is returned to ILDISK. The real-time status should indicate that the drive is supplying clocks and that the drive should be in the available state.

- **Test 03, Drive Initialize Test**—Issues a DRIVE INITIALIZE command to the drive under test. This checks both the drive and the controller real-time state line of the SDI cable. The drive should respond by momentarily stopping its clock, then restarting it.

- **Test 04, SDI Echo Test**—First ensures that the disk data channel microcode supports the ECHO command. If not, a warning message is displayed and the rest of Test 04 is skipped. Otherwise, the test directs the disk data channel to conduct an ECHO exchange with the drive. An ECHO exchange consists of the disk data channel sending a frame to the drive and the drive returning it. An ECHO exchange verifies the integrity of the write/command data and the read/response data lines of the SDI cable.

- **Test 05, Run Drive Integrity Tests**—Directs the drive to run its internal integrity test. The drive is commanded to run a single integrity test or its entire set of integrity tests, depending upon user response to the following prompt:

  ```
  Run a Single Drive Diagnostic?
  ```

  Before commanding the drive to run its integrity tests, the drive is brought on line to prevent the drive from giving spurious available indications to its other SDI port. The drive integrity tests are started when the disk data channel sends a DIAGNOSE command to the drive. The drive does not return a response frame for the diagnose until it is finished performing the integrity tests. This can require two or more minutes. While the disk data channel is waiting for the response frame, ILDISK cannot be interrupted by entering Ctrl/Y.

- **Test 06, Disconnect From Drive**—Sends a DISCONNECT command to the drive and then issues a GET LINE STATUS internal command to the K.sdi/K.si to ensure that the drive is in the available state. The test also expects that Receiver Ready and Attention are set in drive status and that Read/Write Ready is not set.

- **Test 07, Check Drive Status**—Issues a GET STATUS command to the drive to check that none of the drive's error bits are set. If any error bits are set, they are reported and the test issues a DRIVE CLEAR command to clear the error bits. If the error bits fail to clear, an error is reported.

- **Test 08, Drive Initialize**—Issues a command to interrogate the real-time drive state of the drive. The test then issues a DRIVE INITIALIZE command to ensure that the previous DIAGNOSE command did not leave the drive in an undefined state.

- **Test 09, Bring Drive On Line**—Issues an ONLINE command to the drive under test. Then a GET LINE STATUS command is issued to ensure that the drive's real-time state is proper for the online state. Read/Write Ready is expected to be true; Available and Attention are expected to be false.

- **Test 10, Recalibrate and Seek**—Issues a RECALIBRATE command to the drive. This ensures that the disk heads start from a known point on the media. Then a SEEK command is issued to the drive, and the drive's real-time status is checked to ensure that the SEEK did not result in an Attention condition. Then another RECALIBRATE command is issued, returning the heads to a known position.

- **Test 11, Disconnect From Drive**—Issues a DISCONNECT command to return the drive to the available state. Then the test checks the drive's real-time status to ensure that Available, Attention, and Receiver Ready are true, and that Read/Write Ready is false.

- **Test 12, Bring Drive On Line**—Attempts to bring the disk drive to the online state. Test 12 is executed only for drives known to the disk functional software. Test 12 consists of the following steps:

  1. GET STATUS—ILDISK issues an SDI GET STATUS command to the disk drive.

  2. ONLINE—ILDISK directs the diagnostic interface to bring the drive on line.

  If the GET STATUS and the ONLINE commands succeed, ILDISK proceeds to Test 13. If the GET STATUS and the ONLINE commands fail, ILDISK goes directly to Test 17 (termination). Note the online operation is performed through the diagnostic interface, invoking the same software operations a host invokes to bring a drive on line. An online operation at this level constitutes more than just sending an SDI ONLINE command. The factory control block and replacement control block of the drive are also read and certain software structures are modified to indicate the new state of the drive. If the drive is unable to read data from the disk media, the online operation fails. If Test 12 fails, ILDISK skips the remaining tests and goes to Test 17.

- **Test 13, Read Only I/O Operations Test**—Verifies that all read/write heads in the drive can seek and properly locate a sector on each track in the drive read-only diagnostic block number (DBN) space. DBN space is an area on all disk media devoted to diagnostic or integrity test use.

  Test 13 attempts to read at least one sector on every track in the read-only area of the drive's DBN space. The test checks the sector to ensure that the sector contains the proper data pattern. Bad sectors are allowed but there must be at least one good sector on each track in the read-only area. After each successful DBN read, ILDISK reads one logical block number (LBN) to further enhance seek testing. This ensures that the drive can successfully seek to and from the DBN area from the LBN area of the disk media. ILDISK performs Test 14 when Test 13 completes.

- **Test 14, I/O Operations Test (Read/Write 512 byte format)**—Checks to see if the drive can successfully write a pattern and read it back from at least one sector on every track in the drive read/write DBN area. The read/write DBN space is an area on every disk drive devoted to diagnostic or integrity test read/write testing.

  Bad sectors are allowed but at least one sector on every track in the read/write area must pass the test. After Test 14 completes, ILDISK goes to Test 16.

- **Test 16, Format Test**—This test will only be executed if ILDISK did not encounter any errors during the previous tests. If previous errors were detected, ILDISK goes directly to Test 17. In Test 16, ILDISK formats blocks 0 and 1 in the drive's read/write DBN space. After formatting blocks 0 and 1, ILDISK checks that at least one of these blocks can be read without error. After Test 16 completes, ILDISK goes to Test 17.

- **Test 17, Terminate ILDISK**—The ILDISK termination routine performs the following steps:

  1. If the drive is unknown to the disk functional software, or if the SDI verification test failed, the test goes to step 5.

  2. An SDI CHANGE MODE command is issued to the drive. The CHANGE MODE command directs the drive to disallow access to the DBN area.

  3. The drive is released from exclusive integrity test use. This returns the drive to the available state.

  4. The drive is reacquired for exclusive integrity test use. This is to allow looping if more than one pass is selected.

  5. If more passes are left to perform, the test is reinitiated.

  6. If no more passes are left to perform, ILDISK releases the drive, returns all acquired structures, and terminates.

5.5.8 Error Message Example

All error messages issued by ILDISK conform to the generic error message format described in Section 5.1.2. The following is a typical ILDISK error message:

```
ILDISK>D>09:35 T#005 E#035 U-D00082
ILDISK>D>Drive Diagnostic Detected Fatal Error
ILDISK>D>FRU1-Drive   FRU2-
ILDISK>D>Requestor Number 04
ILDISK>D>Port Number 03
ILDISK>D>Test  0025 Error  007F
ILDISK>D>End Of Pass  00001
```

5.5.9 Error Messages

This section describes the error messages issued by ILDISK.

- **512-Byte Format Failed**—The program attempted to perform a 512-byte format to the first two sectors of the first track in the read/write DBN area. No errors were detected during the actual formatting operation but subsequent attempts to read either of the reformatted blocks failed. The specific error detected is identified in the error report.

- **Attention Not Set in Available Drive**—The SDI verification routine executed a command to interrogate the real-time drive state line of the drive and found Attention was not asserted even though the drive is Available.

- **Attention Set After SEEK**—The SDI verification routine issued a SEEK command to the drive which resulted in an unexpected Attention condition. The drive status is displayed with the error report. Refer to the service manual for that drive.

- **Attention Set in On-Line Drive**—The SDI verification routine issued an ONLINE command to the drive. The drive entered the online state but an unexpected Attention condition was encountered.

- **Available Not Set In Available Drive**—The SDI verification routine executed a command to interrogate the real-time drive state line of the drive. ILDISK found Available was not set in a drive that should be Available.

- **Available Set in On-Line Drive**—The SDI verification routine issued an ONLINE command to the disk drive. Then a command was issued to interrogate the real-time drive state line of the drive. The line status indicates that the drive is still asserting Available.

- **Can't Acquire Drive State Area**—ILDISK cannot perform the low-level SDI tests because it cannot acquire the drive state area for the drive. The drive state area is a section of the K Control Area used to communicate with the drive through the SDI interface. To perform the SDI tests, ILDISK must take exclusive control of the drive state area; otherwise, the operational software may interfere with the tests. The drive state area must be in an inactive state (no interrupts in progress) before it can be acquired by ILDISK. If the drive is rapidly changing its SDI state and generating interrupts, ILDISK may be unable to find the drive in an inactive state.

- **Can't Acquire Specified Unit**—ILDISK was initiated automatically to test a disk drive that was declared inoperative. When initiated by the disk functional software, ILDISK was given the requestor number, port number, and unit number of the drive to test. ILDISK successfully acquired the drive by unit number but the requestor and port number of the acquired drive did not match the requestor and port number given when ILDISK was initiated. This indicates that the HSC controller is connected to two separate drives with the same unit number plugs. To prevent inadvertent interaction with the other disk drive, ILDISK performs only the low-level SDI tests on the unit specified by the disk functional software. Read/write tests are skipped because the drive must be acquired by unit number to perform read/write transfers.

- **Can't Read Any Sector on Track**—As part of Test 13, ILDISK attempts to read a pattern from at least one sector of each track in the read-only area of the drive DBN space. (The DBN space is an area on every disk drive reserved for diagnostic or integrity test use.) All drives have the same pattern written to each sector in the read only DBN space.

  During the read process, ILDISK detected a track that does not contain any sector with the expected pattern. Either ILDISK detected errors while reading, or the read succeeded but the sectors did not contain the correct pattern. The error information for the last sector accessed is supplied in the error report. The most likely cause of this error is a disk media error. If Test 14 also fails, the problem may be in the disk read/write electronics, or the DBN area of the disk may not be formatted correctly. To interpret the MSCP™ status code, refer to the *HSC Controller Service Manual*.

- **Can't Write Any Sector on Track**—As part of Test 13, ILDISK attempts to write a pattern to at least one sector of each track in the read/write area of the drive DBN space. (The DBN space is an area on every disk drive reserved for diagnostic use only.)

  During the write process, ILDISK detected a track with no sector that passed the read/write test. That is, ILDISK could not write a pattern and read it back successfully on any sector on the track. The error information for the last sector accessed is identified in the error report. The most probable cause of this error is a disk media error.

  If Test 13 also failed, the problem could be in the disk read/write electronics, or the DBN area of the disk may not be formatted correctly. To interpret the MSCP status code, see Section 5.5.10.

- **Change Mode Failed**—ILDISK issued an SDI CHANGE MODE command to the drive and the command failed. The drive is presumed to be the failing unit because the SDI interface was previously verified.

- **Command Failure**—The SDI verification test detected a failure while attempting to send an SDI command to the drive. One of the following errors occurred:

  - Did Not Complete—The drive did not respond to the command within the allowable time. Further SDI operations to the drive are disabled.

  - K.sdi Detected Error—The K.sdi/K.si detected an error condition while sending the command or while receiving the response.

  - Unexpected Response—The SDI command resulted in an unexpected response from the drive. This error can be caused by a DIAGNOSE command if a single drive integrity test was selected and if the drive does not support the specified test number.

- **DCB Not Returned, K Failed for Unknown Reason**—The SDI verification test directed the disk data channel to execute one of its microdiagnostics. The microdiagnostic completed without reporting any error but the disk data channel did not return the dialog control block (DCB). All drives connected to the disk data channel may now be unusable. The disk data channel is the probable FRU and the HSC controller probably will have to be rebooted.

- **DDUSUB Initialization Failure**—The diagnostic interface did not initialize. This error is not recoverable and is caused by the following:

  - Insufficient memory to allocate buffers and control structures required by the diagnostic interface.

  - The disk functional software is not loaded.

- **Drive Acquired But Can't find Control Area**—The disk drive was acquired, and ILDISK obtained the requestor number and port number of the drive from the diagnostic interface. However, the specified requestor does not have a control area. This indicates that a software problem and should be reported through a Software Performance Report (SPR). See the *HSC Controller Service Manual* for detailed information on SPR submission.

- **Drive Can't Be Brought On Line**—A failure occurred when ILDISK attempted to bring the specified drive on line. One of the following conditions occurred:

  - Unit Is Offline—The specified unit went to the offline state and now cannot communicate with the HSC controller.

  - Unit Is In Use—The specified unit is now marked as in use by another process.

  - Unit Is a Duplicate—Two disk drives are connected to the HSC controller, both with the same unit number.

  - Unknown Status from DDUSUB—The diagnostic interface returned an unknown status code when ILDISK attempted to bring the drive on line.

- **Drive Clear Did Not Clear Errors**—When ILDISK issued a GET STATUS command, error bits were set in the drive response. Issuing a DRIVE CLEAR failed to clear the error bits. The drive is the probable FRU.

- **Drive Diagnostic Detected Error**—The SDI verification test directed the disk drive to run an internal integrity test. The drive indicated the integrity test failed but the error is not serious enough to warrant removing the drive from service. The test number and error number for the drive are displayed

(in hex) in the error report. For the exact meaning of each error, refer to the service manual for that drive.

- **Drive Diagnostic Detected Fatal Error**—The SDI verification test directed the disk drive to run an internal integrity test. The drive indicated the integrity test failed and the error is serious enough to warrant removing the drive from service. The test and error number are displayed (in hex) in the error report. For the exact meaning of each error, refer to the service manual for that drive.

- **Drive Disabled Bit Set**—The SDI verification test issued an SDI GET STATUS command to the drive under test. The drive disabled bit was set in the status returned by the drive, indicating the drive detected a serious error and is now disabled.

- **Drive online in enhanced ESE mode.**—An ESE20 storage element, capable of running in enhanced mode, has been brought on line in enhanced mode for ILDISK tests.

- **Drive online in normal mode.**—An ESE20 storage element, capable of running in enhanced mode, has been brought on line in normal mode for ILDISK tests.

- **Drive online in normal mode. HSC variants not currently enabled.**—ILDISK attempted to bring an ESE20 storage element on line in enhanced mode. However, the HSC controller has not been enabled to support the enhanced (variant) mode of operation. Refer to the *HSC Controller User Guide* for information on using the SETSHO command SET SERVER DISK/VARIANT_PROTOCOL to enable enhanced mode operations on the HSC controller.

- **Drive online in normal mode. Requested variant is not supported.**—ILDISK tried to bring an ESE20 storage element on line in enhanced mode. However, some component of the HSC controller does not support the enhanced mode of operation. Verify that the ESE20 is attached to a K.si data channel module that is configured with disk microcode by using the SETSHO commands SHOW DISK and SHOW REQUESTORS. Refer to the *HSC Controller User Guide* for information on using these SETSHO commands.

  The ESE20 storage element cannot be run in enhanced mode on a K.sdi disk data channel module. If the ESE is attached to a properly configured K.si module and this message is still being sent, there may be a software problem. Submit an SPR with the HSC console log and any other information pertinent to the HSC controller configuration.

- **Drive online in normal mode. Retry operation later.**—ILDISK attempted to bring an ESE20 storage element on line in enhanced mode. However, the drive indicated that the enhanced mode of operation cannot currently be enabled.

  The ESE20 does not allow enhanced mode operations to be enabled while it is restoring data from its data retention system (this restoration takes approximately 10 minutes on an ESE20). If, during the restoration period, the ESE20 storage element receives a request from the HSC controller to bring the drive on line in enhanced mode, the ESE responds by issuing this message. Retry the operation after the data restore operation is completed.

- **Drive Spindle Not Up to Speed**—ILDISK cannot continue testing the drive because the disk spindle is not up to speed. If the drive is spun down, it must be spun up before ILDISK can completely test the unit. If the drive appears to be spinning, it may be spinning too slowly or the drive may be returning incorrect status information to the HSC controller.

- **Drive Transfer Queue Not Empty Before Format**—ILDISK found a transfer already queued to the K.sdi/K.si when the format test began. ILDISK should have exclusive access to the drive at this time, and all previous transfers should have been completed before the drive was acquired. To avoid potentially damaging interaction with another disk process, ILDISK aborts testing when this condition is detected.

- **Drive Unavailable**—The selected disk drive is not available for ILDISK.

- **Drive Unknown to Disk Functional Code**—The disk drive selected is not known to the disk functional software. The drive may not be communicating with the HSC controller, or the disk functional software may have disabled the drive due to an error condition. ILDISK prompts the user for the drive's requestor and port. Refer to Section 5.5.5 for information on specifying requestor and port.

- **Drive Went Off Line**—The drive previously acquired by the integrity test is now unknown to the disk functional code. This indicates that the drive spontaneously went off line or stopped sending clocks and is now unknown. Restart the test using the requestor and port numbers instead of the drive unit number.

- **Duplicate Unit Detected**—At times during the testing sequence, ILDISK must release, then reacquire the drive under test. After releasing the drive and reacquiring it, ILDISK noted that the requestor and port numbers of the drive it was originally testing do not match the requestor and port numbers of the drive just acquired. This indicates that the HSC controller is connected to two separate drives with the same unit number. If this error is detected, ILDISK discontinues testing to prevent inadvertent interaction with the other disk drive.

- **Echo Data Error**—The SDI verification test issued an SDI ECHO command to the drive. The command completed but the wrong response was returned by the drive. The SDI set and the disk drive are the probable FRUs.

- **Echo Framing Error**—The framing code (upper byte) of an SDI ECHO command response is incorrect. The expected and actual ECHO frames are displayed with the error message. The K.sdi/K.si module cable and the drive are the probable FRUs.

- **Error Bit Set in Drive Status Error Byte**—The SDI verification test executed an SDI GET STATUS command to the drive under test. The error byte in the returned status was nonzero, indicating one of the following conditions:

  – Drive error

  – Transmission error

  – Protocol error

  – Initialization integrity test failure

  – Write lock error

For the exact meaning of each error, refer to the service manual for that drive.

- **Error Reading LBN**—This test alternately reads DBNs and LBNs to test the drive's ability to seek properly. The error indicates that an LBN read failed. The drive is the probable FRU.

- **Error Releasing Drive**—ILDISK attempted to release the drive under test. The release operation failed. One of the following conditions occurred:

  - Could Not Disconnect—An SDI DISCONNECT command to the drive failed. Check the drive port lamp to see if the drive has been allocated to an alternate HSC controller.

  - Unknown Status from DDUSUB—The diagnostic interface returned an unknown status code. This indicates a software error and should be reported through a Software Performance Report (SPR). See the *HSC Controller Service Manual* for detailed information on SPR submission.

- **Error Starting I/O Operation**—ILDISK detected an error when initiating a disk read or write operation. One of the following conditions occurred:

  - Invalid Header Code—ILDISK did not supply a valid header code to the diagnostic interface. This indicates a software error and should be reported through a Software Performance Report (SPR). See the *HSC Controller Service Manual* for detailed information on SPR submission.

  - Could Not Acquire Control Structures—The diagnostic interface could not acquire sufficient control structures to perform the operation. Retry ILDISK during a period of lower HSC controller activity if this condition persists.

  - Could Not Acquire Buffer—The diagnostic interface could not acquire a buffer needed for the operation. Retry ILDISK during a period of lower HSC controller activity if this condition persists.

  - Unknown Status from DDUSUB—The diagnostic interface returned an unknown status code. This indicates a software error and should be reported through a Software Performance Report (SPR). See the *HSC Controller Service Manual* for detailed information on SPR submission.

- **Error in DCB on Completion**—The SDI verification test directed the disk data channel to execute one of its microdiagnostics. The microdiagnostic completed without reporting any error but the disk data channel returned the dialog control block (DCB) with an error indicated. The disk data channel is the probable FRU.

- **Failed To Reacquire Unit**—In order for ILDISK to allow looping, the drive under test must be released then reacquired. (This method is required to release the drive from the online state.) The release operation succeeded but the attempt to reacquire the drive failed. One of the following conditions occurred:

  - Drive Unknown to Disk Functional Code—A fatal error caused the disk functional software to declare the drive inoperative, so the drive unit number is not recognized. You must now test the drive by specifying requestor and port number.

  - Drive Unavailable—The specified drive is not available for integrity test use. The drive may be allocated to an alternate HSC controller. Check the drive port lamp to see if this caused the error.

– Unknown Status from DDUSUB—This indicates a software error and should be reported through a Software Performance Report (SPR). See the *HSC Controller Service Manual* for detailed information on SPR submission.

- **Failure While Updating Drive STATUS**—When in the process of returning the drive to the same mode as ILDISK originally found it in, an error occurred while performing an SDI GET STATUS command. In order to ensure that the disk functional software is aware of this mode change, ILDISK calls the diagnostic interface routines to perform a GET STATUS on the drive. These routines also update the disk functional software information on the drive to reflect the new mode.

  This error indicates that the drive status update failed. The diagnostic interface returns one of three different status codes with this error:

  – Drive Error—The GET STATUS command could not be completed due to an error during the command. If informational error messages are enabled (through a SET ERROR INFO command), an error message describing the failure is displayed on the console terminal.

  – Bad Unit Number—The diagnostic interface could not find the unit number specified. The drive may have spontaneously transitioned to the offline state (no clocks) since the last ILDISK operation. For this reason, the unit number is unknown when the diagnostic interface tries to do a GET STATUS command.

  – Unknown Status From DDUSUB—Refer to the listing for this error.

- **Format DRAT Was Not Returned to Completion Queue**—The K.sdi/K.si module failed to complete a format operation. A format operation consists of a read followed by a format. The read completed successfully, and the fragment request block (FRB) for the format was returned by the K.sdi/K.si module with no error indicated. However, the disk rotational access table (DRAT) for the format operation was never returned, indicating a probable K.sdi/K.si module failure. After reporting this error, the format test aborts.

- **Format Operation Timed Out**—The K.sdi/K.si module failed to complete a format operation. A format operation consists of a read followed by a format. The read completed successfully but after waiting a 16-second interval, the format was not complete. A change in drive state may prevent formatting, the drive may no longer be sending sector/index information to the K.sdi/K.si module, or the K.sdi/K.si module may be unable to sample the drive state. The format test aborts on this error to prevent damage to the existing disk format.

- **Format Tests Skipped Due to Previous Error**—To prevent possible damage to the existing disk format, ILDISK does not attempt to format if any errors were detected in the tests preceding the format tests. This error message informs the user that formatting tests will not be performed.

- **I/O Operation Lost**—While ILDISK was waiting for a disk read or write operation to complete, the diagnostic interface notified ILDISK that no I/O operation was in progress. This error may have been induced by a hardware failure but it actually indicates a software problem, and the error should be reported by a Software Performance Report (SPR). See the *HSC Controller Service Manual* for detailed information on SPR submission.

- **Init Did Not Stop State Line Clock**—The SDI verification test sent an SDI INITIALIZE command to the drive. When the drive receives this command, it should momentarily stop sending state line clock to the disk data channel. The disk data channel did not see the state line clock stop after sending the initialize. The drive is the most probable FRU.

- **Insufficient Memory, Test Not Executed**—The SDI verification test could not acquire sufficient memory for control structures. The SDI verification test could not be executed. Use the SETSHO command SHOW MEMORY to display available memory. If any disabled memory appears in the display, consider further testing of the memory module. If no disabled memory is displayed and no other integrity test or utility is active on this HSC controller, submit a Software Performance Report (SPR). See the *HSC Controller Service Manual* for detailed information on SPR submission.

- **Insufficient Resources to Perform Test**—This error indicates that further testing cannot be completed due to a lack of required memory structures. To perform certain drive tests, ILDISK needs to acquire timers, a dialog control block (DCB), free control blocks (FCBs), data buffers, and enough control memory to construct two disk rotational access tables (DRATs). If any of these resources are unavailable, testing cannot be completed. Under normal conditions, these resources should always be available.

- **Invalid Requestor or Port Number Specified**—The requestor number given was not in the range 2 through 9, or the port number given was not in the range 0 through 7. Specify requestor and port numbers within the allowable ranges.

- **K Microdiagnostic Did Not Complete**—The SDI verification test directed the disk data channel to execute one of its microdiagnostics. The microdiagnostic did not complete within the allowable time. All drives connected to the disk data channel may now be unusable (if the microdiagnostic never completes) and the HSC controller will probably have to be rebooted. The disk data channel module is the probable failing FRU.

- **K Microdiagnostic Reported Error**—The SDI verification test directed the disk data channel to execute one of its microdiagnostics. The microdiagnostic completed and reported an error. The disk data channel is the probable FRU.

- **K.sdi Detected Error During Format**—The K.sdi/K.si module detected an error during a format operation. Each error bit set in the fragment request block (FRB) is translated into a text message that accompanies the error report.

- **K.sdi Detected Error in Read Preceding Format**—To guarantee that the disk is on the correct cylinder and track while formatting, ILDISK queues a read operation immediately preceding the FORMAT command. The read operation failed, so ILDISK aborted the format test. Each error bit set in the fragment request block (FRB) is translated into a text message that accompanies the error report.

- **K.sdi Does Not Support ECHO**—The disk data channel connected to the drive under test does not support the SDI ECHO command because the disk data channel microcode is not the latest revision level. This is not a fatal error but the disk data channel microcode should be updated to allow for improved isolation of drive-related errors.

- **K.sdi Does Not Support Microdiagnostics**—The K.sdi/K.si module connected to the drive under test does not support microdiagnostics. This indicates that the K.sdi/K.si microcode is not at the latest revision level. This is not a fatal error but the K.sdi/K.si module should probably be updated with the latest microcode to improve error detection capabilities.

- **Not Enough Good DBNs for Format**—In order to guarantee that the disk is on the proper cylinder and track, all formatting operations are immediately preceded by a read operation on the same track where the format is planned. This requires the first track in the drive's read/write DBN area to contain at least one good block that can be read without error. This error message indicates that a good block was not found on the first track of the read/write DBN area, so the formatting tests are skipped.

- **Read DRAT Not Returned to Completion Queue**—To guarantee the disk is on the correct cylinder and track while formatting, ILDISK queues a read operation immediately preceding the format command. The read operation apparently completed successfully because the fragment request block (FRB) for the read was returned with no error bits set. However, the disk rotational access table (DRAT) for the read operation was not returned indicating a problem with the K.sdi/K.si module.

- **Read Operation Timed Out**—To guarantee that the disk is on the correct cylinder and track while formatting, ILDISK queues a read operation immediately preceding the FORMAT command. The read operation did not complete within 16 seconds indicating the K.sdi/K.si module is unable to sense sector/index pulses from the disk, or the disk is not in the proper state to perform a transfer. ILDISK aborts the format test following this error report.

- **Read/Write Ready Not Set in On-line Drive**—The SDI verification test executed a command to interrogate the real-time drive state line of the drive. The drive should be in the online state but the Read/Write Ready bit was not set in the status register.

  This could be caused by a failing disk drive, bad Read/Write logic, or bad media.

- **Read/Write Ready Set in Available Drive**—The SDI verification routine executed a command to interrogate the real-time drive state line of the drive and found the Available bit asserted. However, Read/Write Ready also was asserted. Read/Write Ready should never be asserted when a drive is in the available state.

- **Receiver Ready Not Set**—The SDI verification routine executed a command to interrogate the Real-Time Drive State Line of the drive. The routine expected to find Receiver Ready asserted but it was not.

- **Req/Port Number Information Unavailable**—ILDISK was unable to obtain the requestor number and port number from the HSC disk software tables. The drive may have changed state and disappeared while ILDISK was running. If this error persists, submit a Software Performance Report (SPR). See the *HSC Controller Service Manual* for detailed information on SPR submission.

- **Requestor Does Not Have Control Area**—ILDISK cannot find a control area for the requestor supplied by the user. One of the following conditions exists:

  – The HSC controller does not contain a disk data channel (or other type of requestor) in the specified requestor position.

  – The disk data channel (or other type of requestor) in the specified requestor position failed its initialization integrity tests and is not in use by the HSC controller.

  Open the HSC controller and remove the cover from the card cage. Locate the module slot in the card cage that corresponds to the requestor. Refer to the module utilization label above the card cage to help locate the proper requestor.

  If a blank module (air baffle) is in the module slot, the HSC controller does not contain a requestor in the specified position. If a requestor is in the module slot, check that the red LED on the lower front edge of the module is lit. If so, the requestor failed and was disabled by the HSC controller. If the red LED is not lit, a software problem exists that should be reported with a Software Performance Report (SPR). See the *HSC Controller Service Manual* for detailed information on SPR submission.

- **Requestor Selected Is Not a K.sdi**—The requestor specified was not a disk data channel (K.sdi/K.si). Specify a requestor that contains a disk data channel.

- **RUN DRIVE RESIDENT DIAGNOSTICS**—This message accompanies an error message, indicating some type of failure while ILDISK was communicating with a disk drive.

- **SDI Enable Variant command failed**—The HSC controller attempted to issue an SDI command to an ESE20 storage element to enable variant operations, but the SDI command failed. Verify that the ESE is available and that all SDI cable connections are secure. Check for other HSC error messages that may indicate why the SDI command failed.

- **Specified port contains a Known Drive**—The requestor and port specified contain a drive known to the disk functional software. The unit number of the drive is supplied in the report. ILDISK does not allow testing a known drive through requestor number and port number.

- **State Line Clock Did Not Start Up After Init**—The SDI verification test sent an SDI INITIALIZE command to the drive. When the drive receives this command, it should momentarily stop sending state clock to the disk data channel. The disk data channel saw the state clock stop, but the clock never restarted. The drive is the most probable FRU.

- **State Line Clock Not Running**—The SDI verification test executed a command to interrogate the real-time drive state of the drive. The returned status indicates that the drive is not sending state line clock to the disk data channel. Either the port, SDI cable, or drive is defective, or the port is not connected to a drive.

- **Testing Aborted Ping-Pong Testing Detected**—ILDISK was automatically initiated to test a disk drive declared inoperative by the disk functional code. The disk drive had previously been automatically tested at least twice and somehow was returned to service. Because the tests performed by ILDISK may be causing the inoperative drive to be returned to service,

ILDISK does not attempt to test an inoperative drive more than twice. On all succeeding invocations of ILDISK, this message prints and ILDISK exits without performing any tests on the drive.

- **Unexpected Item on Drive Service Queue**—The SDI verification test directed the disk data channel to execute one of its microdiagnostics. The microdiagnostic completed without error, and the disk data channel returned the dialog control block (DCB) with no errors indicated. However, the disk data channel sent the drive state area to its service queue, indicating an unexpected condition in the disk data channel or drive.

- **Unit Selected Is Not a Disk**—The response to the unit number prompt was not of the form D*nnnn*. Refer to Section 5.5.4 for the correct prompt format.

- **Unknown Status from DDUSUB**—A call to the diagnostic interface resulted in the return of an unknown status code. This indicates a software error and should be reported through a Software Performance Report (SPR). See the *HSC Controller Service Manual* for detailed information on SPR submission.

- **Wrong Structure on Completion Queue**—While formatting, ILDISK checks each structure returned by the K.sdi/K.si module to ensure that the structure was sent to the proper completion queue. This error indicates that one of these structures was sent to the wrong completion queue. This type of error indicates a problem with the K.sdi/K.si microsequencer or a control memory failure.

5.5.10 MSCP Status Codes—ILDISK Error Reports

Following is a list of some of the MSCP status codes that may appear in ILDISK error reports. All status codes are listed in the octal radix. Further information on MSCP status codes is provided in the *HSC Controller Service Manual*.

007—Compare Error
010—Forced Error
052—SERDES Overrun
053—SDI Command Timeout
103—Drive Inoperative
110—Header Compare or Header Sync Timeout
112—EDC Error
113—Controller Detected Transmission Error
150—Data Sync Not Found
152—Internal Consistency Error
153—Position or Unintelligible Header Error
213—Lost Read/Write Ready
253—Drive Clock Dropout
313—Lost Receiver Ready
350—Uncorrectable ECC Error
353—Drive Detected Error
410—One Symbol ECC Error
412—Data Bus Overrun
413—State or Response Line Pulse or Parity Error
450—Two Symbol ECC Error
452—Data Memory NXM or Parity Error
453—Drive Requested Error Log
510—Three Symbol ECC Error
513—Response Length or Opcode Error
550—Four Symbol ECC Error

553—Clock Did Not Restart After Init
610—Five Symbol ECC Error
613—Clock Did Not Stop After Init
650—Six Symbol ECC Error
653—Receiver Ready Collision
710—Seven Symbol ECC Error
713—Response Overflow
750—Eight Symbol ECC Error

5.6 ILTAPE—TAPE Device Integrity Tests

The following tests can be initiated through ILTAPE:

- **Tape formatter-resident integrity tests.**

- **Functional test of the tape transport.** The three types of tape transport tests are listed below. See Section 5.6.6 for a summary of each.

  – Fixed canned sequence

  – User sequence supplied at the terminal

  – Fixed streamer sequence

- **Full test of the K.sti/K.si interface.** When a full test is selected, the K.sti/K.si microdiagnostics are executed, line state is verified, an ECHO test is performed, and a default set of formatter tests is executed. See the DRIVE UNIT NUMBER prompt in Section 5.6.3 for information on initiating a full test. Detected failures result in fault isolation to the FRU level.

Hardware required to run ILTAPE includes the following:

- HSC controller with K.sti/K.si

- STI-compatible tape formatter

- TA™78, TA81, or other DIGITAL Storage Architecture (DSA) tape drive (for transfer commands only)

- Console terminal

- RX33 disk drive

In addition, the I/O control processor, program memory, and control memory must be working.

Software required to run ILTAPE includes the following:

- HSC software

- DEMON

- K.sti/K.si microcode (installed with the K.sti/K.si module)

5.6.1 Operating Instructions

The following steps outline the procedure for running ILTAPE. The test assumes that an HSC controller is configured with a terminal and an STI interface. If the HSC controller is not booted, start with step 1. If the HSC controller is already booted, proceed to step 2.

1. Boot the HSC controller.

Press the Init button on the OCP. The following message appears:

```
INIPIO-I Booting...
```

The boot process takes about 2 minutes. When booting has completed, the following message is displayed:

```
HSC Version xxxx Date Time  System n
```

2. Enter Ctrl/Y to display the HSCxx> prompt. The keyboard monitor responds with the following prompt:

```
HSCxx>
```

3. Enter RUN DXn:ILTAPE to initiate the tape device integrity test program. The following message will appear:

```
ILTAPE>D>hh:mm Execution Starting
```

5.6.2 Test Termination

ILTAPE can be terminated by entering Ctrl/C. When you terminate ILTAPE in this fashion, it runs until the current test sequence finishes. This can take several minutes. Certain errors that occur during execution will cause ILTAPE to terminate automatically.

5.6.3 User Dialog

The following paragraphs describe ILTAPE/user dialog during execution of ILTAPE. Note that the default values for the input parameters appear within the brackets of the prompt. The absence of a value within the brackets indicates that the input parameter does not have a default value.

ILTAPE executes two times for each pass when executing on cache-capable drives. Write Back Caching is disabled for the first pass and enabled for the second pass. When cache is enabled, ILTAPE issues all SDI Level Two caching commands in addition to the normal commands issued for the first pass. You are informed of the enabled/disabled status of cache with appropriate messages.

```
DRIVE UNIT NUMBER (U) []?
```

To run formatter tests or transport tests, enter T*nnn*, where *nnn* is the MSCP unit number (such as T316).

For a full interface test, enter X*m*, where *m* is any number. Typing X instead of T requires a requestor number and slot number. The following two prompts solicit requestor/slot numbers:

```
ENTER REQUESTOR NUMBER (2-9) []?
```

Enter the requestor number. The range includes numbers 2 through 9, with no default value.

```
ENTER PORT NUMBER (0-3) []?
```

Enter the port number. The port number must be 0, 1, 2, or 3 with no default value. After this prompt is answered, ILTAPE executes the K.sti/K.si interface test. At completion of this test, ILTAPE exits and issues an Execution Complete message. You must restart ILTAPE to run additional tests.

If you entered T*nnn* at the Drive Unit Number prompt, ILTAPE issues the following prompt:

```
EXECUTE FORMATTER DEVICE INTEGRITY TEST (Y/N) [Y]?
```

Enter "Y" or press the Return key to execute the formatter device integrity tests. Entering "N" will not test the formatter device.

```
MEMORY REGION NUMBER (H) [0]?
```

This prompt appears if the response to the previous prompt was a Return or "Y". A formatter test is named according to the formatter memory region where it executes. Enter the memory region (in hex) in which the formatter test is to execute. ILTAPE continues at the prompt for iterations. Refer to the appropriate tape drive service manual for more information on formatter tests.

If you specify a memory region in the range 8000 through FFFF hexadecimal, you will be further prompted for diagnostic parameters as follows:

```
ENTER FORMATTER DIAGNOSTIC PARAMETERS (Y/N) [N]? Y
PARAMETER 00: 33
PARAMETER 01: 33
.
.
.
PARAMETER 14: 77
PARAMETER 15: 77
IS SCRATCH MEDIA MOUNTED (Y/N) []?
```

Enter up to 15 parameters as shown. If you enter less than 15 parameters, terminate your last entry by pressing Return. This causes the test to skip to the IS SCRATCH MEDIA MOUNTED prompt.

If you do not elect to run the formatter device integrity test, the following prompt is displayed:

```
EXECUTE TEST OF TAPE TRANSPORT (Y/N) [N]?
```

To test the tape transport, enter "Y". If you enter "N" or press the Return key to select the default, ILTAPE exits.

The following prompts appear when you select the tape transport test:

```
IS SCRATCH MEDIA MOUNTED (Y/N) []?
```

This test writes to the tape transport, requiring a mounted scratch tape. Enter "Y" if a scratch tape is already mounted.

```
Functional Test Sequence Number (0 thru 5) [1]?
```

Select one of five transport tests. The default is 1 (the canned sequence). If you select the canned sequence, the test then skips to the ENTER CANNED SEQUENCE RUN TIME IN MINUTES prompt.

Enter 0 if a new user sequence will be input from the terminal. You are then prompted for the user sequence beginning with the following prompt:

```
INPUT STEP 00:
```

See Section 5.6.4 for a description of user sequences.

You can also enter 2, 3, or 4 to select a user sequence previously input and stored on the HSC device. Enter 5 to select the streaming sequence.

```
ENTER CANNED SEQUENCE RUN TIME IN MINUTES (D) [1]?
```

Answering this prompt determines the time limit for the canned sequence. It appears only if the canned sequence is selected. Enter the total run time limit in minutes. The default is 1 minute.

Still continuing with the canned sequence, if the device under test is not a TA90 tape drive, you are next prompted for density:

```
SELECT DENSITY (0=ALL, 1=1600, 2=6250) [0]?
```

If you select a density that is not supported by the tape drive or is not on the list of options, you will receive an error message and be re-prompted for density. The default selection, ALL, tests the drive at 1600 and 6250 bpi in separate passes.

The test now goes on to the speed selection prompt if the drive supports variable speeds. If the drive does not support variable speeds, the test skips to the DATA PATTERN NUMBER prompt.

If you have selected the canned sequence and the device under test is a TA90 tape drive *without* the optional data compaction board, ILTAPE sets the speed and density prompts automatically and skips to the DATA PATTERN NUMBER prompt.

If the device under test is a TA90 tape drive with the optional data compaction board installed, ILTAPE issues the following density prompt:

```
SELECT DENSITY (0=ALL, 1=Normal, 3=Normal Compacted) [1]?
```

If you select a density that is not supported by the tape drive, or is not on the list of options, you will receive an error message and be re-prompted for density. Selecting ALL tests the drive at normal and compacted densities in separate passes. Because the TA90 tape drive operates at fixed speeds, the test now goes on to the DATA PATTERN NUMBER prompt.

The next series of prompts concerns speed selection. The particular prompts depend upon the type of speeds supported (fixed or variable). ILTAPE determines the speed types supported and will prompt you accordingly.

------------------------------ **Note** ------------------------------

If only a single speed is supported, ILTAPE does not prompt for speed. It runs at the single speed supported.

If fixed speeds are supported, ILTAPE displays a menu of supported speeds, as follows:

```
SPEEDS AVAILABLE:
                (1) ssss ips
                (2) ssss ips
                (3) ssss ips
                (4) ssss ips
SELECT SPEED? (D) [0=AUTOMATIC]?
```

where *ssss* is the supported speed in inches per second.

To select a fixed speed, enter a number 1 through 4 that corresponds to one of the displayed speeds. The default is the lowest supported speed. ILTAPE continues at the data pattern prompt.

If variable speeds are supported, ILTAPE displays the lower and upper bounds of the supported speeds as follows:

```
VARIABLE SPEEDS AVAILABLE:

    LOWER BOUND = lll ips

    UPPER BOUND = uuu ips
```

To select a variable speed, enter a number within the bounds, inclusively, of the displayed supported variable speeds. The default is the lower bound. The prompt for a variable speed is as follows:

```
SELECT VARIABLE SPEED (D) [0 = LOWEST]?
```

The next prompt asks for the data pattern.

```
DATA PATTERN NUMBER (0,1,2,3,4) [3]?
```

Choose one of five data patterns. The data patterns are defined as follows:

0—User supplied
1—All zeros
2—All ones
3—Ripple zeros (default)
4—Ripple ones

If you enter 1, 2, 3, or 4, the test skips to the SELECT RECORD SIZE prompt. If your response is 0, the following prompt appears:

```
HOW MANY DATA ENTRIES (1-16) []?
```

Enter the number of unique words in the data pattern. Up to 16 words are permitted. Next, enter the data pattern in hexadecimal in response to the following prompt:

```
DATA ENTRY (H) []?
```

This prompt repeats until the data words specified in the previous prompt are exhausted.

```
SELECT RECORD SIZE (GREATER THAN 0) (D) [8192]?
```

---------------------------- **Note** ----------------------------

The Record Size prompt does not appear if you selected the streaming sequence (choice 5 at the Functional Test Sequence Number prompt).

Enter the desired record size in decimal bytes. The default is 8192 bytes. The maximum record size that can be specified is 12288.

```
ITERATIONS (D) [1]?
```

Enter the number of times the selected tests are to run. After the number of iterations is entered, the selected tests begin execution. Messages are displayed for any errors encountered during execution.

5.6.4 User Sequences

To test/exercise a tape transport, write a sequence of commands at the terminal. This sequence may be saved on the HSC controller load device and recalled for execution at a later time. Up to three user sequences can be saved.

Following is a list of supported user sequence commands:

WRT—Write one record
RDF—Read one record forward
RDFC—Read one record forward with compare
RDB—Read one record backward
RDBC—Read one record backward with compare
FSR—Forward space one record

FSF—Forward space one file
BSR—Backspace one record
BSF—Backspace one file
REW—Rewind
RWE—Rewind with erase
UNL—Unload (after rewind)
WTM—Write tape mark
ERG—Erase gap
C*nnn*—Counter set to *nnn* (0 = 1000)
D*nnn*—Delay *nnn* ticks (0 = 1000)
BR*nn*—Branch unconditionally to step *nn*
DB*nn*—Decrement counter and branch if nonzero to step *nn*
TM*nn*—Branch on Tape Mark to step *nn*
NT*nn*—Branch on NO Tape Mark to step *nn*
ET*nn*—Branch on EOT to step *nn*
NE*nn*—Branch on NOT EOT to step *nn*
QUIT—Terminate input of sequence steps

To initiate the user sequence dialog, enter 0 in response to the following prompt:

```
Functional Test Sequence Number (0 thru 5) [1]?
```

The paragraphs that follow describe the ILTAPE user dialog during a new user sequence.

```
INPUT STEP   nn
```

Enter one of the user sequence commands listed previously in response to this prompt. ILTAPE keeps track of the step numbers and automatically increments them. Up to 50 steps may be entered. Entering QUIT in response to the INPUT STEP prompt terminates the user sequence. At that time, the following prompt appears:

```
Store Sequence as Sequence Number (0,2,3,4) [0]?
```

The sequence entered at the terminal may be stored on the HSC controller load device in one of three files. To select one of these files, enter 2, 3, or 4. Once stored, the sequence may be recalled for execution at a later time by referring to the appropriate file (entering 2, 3, or 4 in response to the sequence number prompt).

Entering the default sequence number 0 indicates that the user sequence just entered should not be stored. In this case, the sequence cannot be run at a later time. Sequence number 1 is the canned sequence described in Section 5.6.6.4

An example of a user sequence follows:

```
INPUT STEP  00  REW   ;Rewind the tape

INPUT STEP  01  C950  ;Set counter to 950

INPUT STEP  02  WRT   ;Write one record

INPUT STEP  03  ET07  ;If EOT branch to step 7

INPUT STEP  04  RDB   ;Read backward one record

INPUT STEP  05  FSR   ;Forward space one record

INPUT STEP  06  DB02  ;Decrement counter, branch

                      ;to step 2 if nonzero

INPUT STEP  07  REW   ;Rewind the tape
```

```
INPUT STEP  08  QUIT  ;Terminate sequence input
STORE SEQUENCE AS SEQUENCE NUMBER (0,2,3,4) [0]? 3
```

This sequence writes a record, reads it backwards, and skips forward over it.
If an EOT is encountered prior to writing 950 records, the tape is rewound
and the sequence terminates. In this example, the sequence is saved on the
HSC controller load device as sequence number 3 and can be recalled at a later
execution of ILTAPE.

The following density prompts are issued if a user-defined sequence is selected.
The differences between these density prompts and the canned sequence prompts
is that the choice ALL cannot be selected. Only one pass with one density can be
run for the user sequences.

If the device under test is not a TA90 tape drive, you are prompted for density as
follows:

```
SELECT DENSITY (1=800, 2=1600, 3=6250) [3]?
```

If the device under test is a TA90 tape drive with the optional data compaction
board installed, you are prompted for density as follows:

```
SELECT DENSITY (1=Normal, 3=Normal Compacted) [1]?
```

If you select a density that is not supported by the tape drive or not on the list of
options, ILTAPE issues an error message and you are re-prompted for density.

For TA90 tape drives without the data compaction board installed, the density
prompt is skipped, since there is only one density to choose from.

5.6.5 Progress Reports

When transport testing is finished, a summary of soft errors appears on the
terminal upon completion of the test. The format of this summary is as follows:

```
Soft Error Summary:

Unit  Media  Double  Double  Single  Single  Other  Other  Other
N     Error  Trkerr  Trkrev  Trkerr  Trkrev  Err A  Err B  Err C
T020  000001 00000   00000   00000   00000   000000 00002  00000
```

Successful completion of a formatter test is indicated by the following message on
the terminal:

```
TEST nnnn DONE
```

where *nnnn* is the formatter test number.

When an error is encountered, an error message is printed on the terminal.

5.6.6 Test Summaries

The following sections summarize the tests run by ILTAPE.

5.6.6.1 Interface Test Summary

This portion of ILTAPE tests the STI of a specific tape data channel and port. It
also performs low-level testing of the formatter by interfacing to the K.sti/K.si
drive service area (port) and executing various Level 2 STI commands. The
testing is limited to dialog operations; no data transfer is done. The commands
issued are DIAGNOSE, READ MEMORY, GET DRIVE STATUS, and READ
LINE STATUS.

K.sti/K.si microdiagnostics are executed to verify the tape data channel. A default set of formatter tests (out of memory region 0) is executed to test the formatter, and an echo test is performed to test the connection between the port and the formatter.

Failures detected are isolated to the extent possible and limited to tape data channels, the STI set, or the formatter. The STI set includes a small portion of the K.sti/K.si module and the entire STI (all connectors, cables, and a small portion of the drive). The failure possibilities of the STI set are as follows:

- STI cables or connectors (most probable)

- Formatter

- K.sti/K.si module (least probable)

When the STI set is identified as the FRU, replacement should be in the order listed.

5.6.6.2 Formatter Test Summary

Formatter tests are executed out of a formatter memory region selected by the user. Refer to the tape drive service manual for a description of the formatter tests. Failures detected identify the formatter as the FRU.

5.6.6.3 User Sequence Test Summary

User sequences are used to exercise the tape transport. The particular sequence is totally user-defined. Refer to Section 5.6.4.

5.6.6.4 Canned Sequence Test Summary

The canned sequence is a fixed routine for exercising the tape transport. The canned sequence first performs a quick verify of the ability to read and write the tape at all supported densities. Using a user-selected record size, the canned sequence then writes, reads, and compares the data written over a 200-foot length of tape. Positioning over this length of tape is also performed. Finally, random record sizes are used to write, read, compare, and position over a 50-foot length of tape. Errors encountered during the canned sequence are reported at the terminal.

5.6.6.5 Streaming Sequence Test Summary

The streaming sequence is a fixed sequence that attempts to write and read the tape at speed (without hesitation). The entire tape is written, rewound, and read back. This test may be terminated at any time by entering Ctrl/Y.

5.6.7 Error Message Example

All error messages issued by ILTAPE conform to the generic error message format described in Section 5.1.2. The optional text is dependent upon the type of error. An example of an ILTAPE error message follows:

```
ILTAPE>D>09:31 T # 011 E # 011 U-T00101
ILTAPE>D>COMMAND FAILURE
ILTAPE>D>MSCP WRITE MULTIPLE COMMAND
ILTAPE>D>MSCP STATUS:   000000
ILTAPE>D>POSITION    001792
```

The test number reflects the state level where ILTAPE was executing when an error occurred. This number does not indicate a separate test that can be called. Table 5–1 defines the ILTAPE state levels.

Table 5–1 ILTAPE Test Levels

Test Number/ State Level	ILTAPE State
0	Initialize tape software interface
1	Device (port, formatter, unit) acquisition
2	STI interface test
3	Formatter tests executing in response to Diagnostic Request (DR) bit
4	Tape transport functional test
5	User-selected formatter test
6	Termination and cleanup

5.6.8 Error Messages

This section describes the error messages issued by ILTAPE.

- **AVAILABLE Set in Online Drive**—After successful completion of an ONLINE command to the formatter, the AVAILABLE bit is set.

- **Chosen Density Is Not Supported**—You have selected a density that is not supported by the drive under test.

- **Command Failure**—A command failed during execution of ILTAPE. The command in error may be one of several types, such as an MSCP or Level 2 STI command. The failing command is identified in the optional text of the error message. For example:

    ```
    ILTAPE>D>MSCP READ COMMAND
    ILTAPE>D>MSCP STATUS:  nnnnnn
    ```

- **DCB Not Returned, K Failed for Unknown Reason**—During the STI interface test, the requestor failed for an undetermined reason and the dialog control block (DCB) was not returned to the completion queue.

- **Data Compare Error**—During execution of the user or canned sequence, ILTAPE encountered a software compare mismatch on the data written and read back from the tape. The software compare is actually carried out by a subroutine in the diagnostic interface, TDUSUB. The results of the compare are passed to ILTAPE. The text of the error message identifies the data in error.

- **EDC Error**—During execution of the user or canned sequence, ILTAPE encountered an EDC error on the data written and read back from the tape. This error is actually detected by the diagnostic interface, TDUSUB, and reported to ILTAPE. The text of the error message identifies the data in error.

- **Echo Data Error**—Data echoed across the STI interface was incorrectly returned.

- **Error in DCB on Completion**—During the STI interface test, an error condition was returned in the DCB.

- **Formatter Device Integrity Test Detected Error**—A test running in the formatter has detected an error. Any error text from the formatter is displayed.

- **Formatter Device Integrity Test Detected Fatal Error**—A test running in the formatter has detected a fatal error. Any error text from the formatter is displayed.

- **Formatter State Not Preserved Across Init**—The state of the formatter prior to a formatter initialize was not preserved across the initialization sequence.

- **Init Did Not Stop State Line Clock**—During the STI interface test, after execution of a formatter INITIALIZE command, the state line clock did not drop for the time specified in the STI specification.

- **Initialization Failure**—Tape path software interface cannot be established due to insufficient resources (buffers, queues, timers, and so forth).

- **Insufficient Resources to Acquire Specified Device**—During execution, ILTAPE was unable to acquire the specified device due to a lack of necessary resources. This condition is identified to ILTAPE by the tape functional code through the diagnostic interface, TDUSUB. ILTAPE has no knowledge of the specific unavailable resource.

- **Insufficient Resources To Acquire Timer**—ILTAPE was unable to acquire a timer from the system; insufficient buffers are available in the system to allocate timer queues.

- **Invalid Multiunit Code from GUS Command**—After a unit number is input to ILTAPE and prior to acquiring the unit, ILTAPE attempts to obtain the unit's multiunit code through the GET UNIT STATUS command. This error indicates a multiunit code of zero was returned to ILTAPE from the tape functional code. Because a multiunit code of zero is invalid, this error is equivalent to a device unknown to the tape subsystem.

- **Invalid Requestor/Port Number**—Selected requestor or port number is out of range or the requestor selected is not known to the system.

- **K Microdiagnostic Did Not Complete**—During the STI interface test, the requestor microdiagnostic timed out.

- **K Microdiagnostic Reported Error**—During the STI interface test, an error condition was reported by the K microdiagnostics.

- **K.STI DOES NOT SUPPORT MICRODIAGNOSTICS**—While doing the inter-tape verification routine, the system determined that the revision level of the tape data channel module microcode was too low.

- **Load Device Error—File Not Found**—During the user-sequence dialog, ILTAPE was unable to locate the sequence file associated with the specified user-sequence number. Ensure that the load device media is properly installed. The program re-prompts for a user-sequence number. To break the loop of re-prompts, enter Ctrl/Y.

- **Load Device Read Error**—While attempting to read a user sequence from the load device, a read error was encountered. Ensure that a sequence has been stored on the load device as identified by the user sequence number. The program re-prompts for a user sequence number. To break the loop of re-prompts, enter Ctrl/Y.

- **Load Device Write Error—CHECK IF WRITE LOCKED**—An error occurred while attempting to write a user-sequence to the HSC controller load device. Check to see if the load device is write protected. The prompt calls for a user-sequence number. To break the loop of re-prompts, enter Ctrl/Y.

- **PATTERN WORD ERROR**—During the execution of a user or canned sequence, the pattern word compared to the data on tape did not match. The software compare is actually carried out by a subroutine in the diagnostic interface, TDUSUB. The results of the compare are passed to ILTAPE. The text of the error message identifies the data in error.

- **Read Memory Byte Count Error**—The requested byte count used in the read (formatter) memory command is different from the actual byte count received.

  EXPECTED COUNT: *xxxx*   ACTUAL COUNT: *yyyy*

- **Receiver Ready Not Set**—After issuing an ONLINE command to the formatter, the Receiver Ready signal was not asserted.

- **Requested Device Is Busy**—The selected device is on line to another controller or host.

- **Requested Device Unknown**—The device that was requested is not known to the tape subsystem.

- **Requestor Not A K.sti**—The selected requestor is not known to the system as a tape data channel.

- **Selected Unit Not a Tape**—The selected drive is not known to the HSC controller as a tape.

- **State Line Clock Did Not Start Up After Init**—During the STI interface test and after execution of a formatter INITIALIZE command, the state line clock did not start up within the time specified in the STI specification.

- **State Line Clock Not Running**—During the STI interface test, execution of an internal command to interrogate the real-time formatter state line of the drive indicated that the state line clock is not running.

- **Tape write protected—Test Terminating**—You have mounted a scratch tape that is write protected.

- **Timeout Acquiring Drive Service Area**—While attempting to acquire the drive service area (port) in order to run the STI interface test, a timeout occurred. If this happens, the tape functional code is corrupted. ILTAPE invokes a system crash.

- **Unable to Release Device**—Upon termination of ILTAPE or upon an error condition, the device(s) could not be returned to the system.

- **Unexpected Item on Drive Service Queue**—During the STI interface test, an unexpected entry was found on the drive service queue.

- **Unit Unknown or On Line to Another Controller**—The device identified by the selected unit number is either unknown to the system or on line to another controller. Verify that the selected unit number is correct and run ILTAPE again.

- **UNIT WENT OFFLINE OR AVAILABLE**—During the execution of a user sequence, the drive state is checked and found to be available or off line. Check the drive and make sure that it remains on line for the duration of the test.

- **Unknown Status from TDUSUB**—An unknown status was returned from the tape diagnostic interface.

5.7 ILTCOM—Tape Compatibility Test

ILTCOM tests the tape compatibility of different tape drives. The tapes tested may have been written on different systems with different STI-compatible tape drives connected to an HSC controller through the STI bus.

A compatibility tape consists of file groups (called bunches) of specific data pattern records. ILTCOM may generate, modify, read, or list a compatibility tape. Data read from the compatibility tape is compared to the expected pattern.

Each bunch contains a header record and several data records of different sizes and is terminated by a tape mark. The last bunch on a tape is followed by an additional tape mark (thus forming logical EOT).

There is a total of 199 records in each bunch: one header record followed by 198 data records. The header record contains 48 (decimal) bytes of 6-bit encoded descriptive information, as follows:

Table 5–2 ILTCOM Header Record

Field	Description	Length	Example
1	Drive type	6 bytes	TA78
2	Drive serial number	6 bytes	123456
3	Processor type	6 bytes	HSC
4	Processor serial number	6 bytes	123456
5	Date	6 bytes	093083
6	Comment [1]	18 bytes	Comment

[1]ILTCOM can read but cannot generate, a comment field.

The data records are arranged as follows:

- 66 records, 24 (decimal) bytes in length. These records sequence through 33 different data patterns. The 1st and 34th records contain pattern 1, the 2nd and 35th records contain pattern 2, and so forth, through the 33rd and 66th records that contain pattern 33.

- 66 records, 528 (decimal) bytes in length. These records sequence through the 33 data patterns as described above.

- 66 records, 12,024 (decimal) bytes in length. These records sequence through the 33 data patterns in the same manner as the preceding data records.

The data patterns used by ILTCOM are shown in Table 5–3.

Table 5–3 ILTCOM Data Patterns

Pattern Number	Pattern (Octal)	Description
1	377	Ones
2	000	Zeros
3	274, 377, 103, 000	Peak shift
4	000, 377, 377, 000	Peak shift
5	210, 104, 042, 021	Floating one

(continued on next page)

Table 5–3 (Cont.)   ILTCOM Data Patterns

Pattern Number	Pattern (Octal)	Description
6	273, 167, 356, 333	Floating zero
7	126, 251	Alternate bits
8	065, 312	Square pattern
9	000, 377	Alternate frames
10	001	Track 0 on
11	002	Track 1 on
12	004	Track 2 on
13	010	Track 3 on
14	020	Track 4 on
15	040	Track 5 on
16	100	Track 6 on
17	200	Track 7 on
18	376	Track 0 off
19	375	Track 1 off
20	373	Track 2 off
21	367	Track 3 off
22	357	Track 4 off
23	337	Track 5 off
24	277	Track 6 off
25	177	Track 7 off
26	207, 377, 370, 377	Bit peak shift
27	170, 377, 217, 377	
28	113, 377, 264, 377	
29	035, 377, 342, 377	
30	370, 377, 207, 377	
31	217, 377, 170, 377	
32	264, 377, 113, 377	
33	342, 377, 035, 377	

5.7.1 System Requirements

The hardware requirements necessary to run ILTCOM include the following:

- HSC controller with K.sti/K.si module

- STI-compatible tape formatter

- Tape drive

Because ILTCOM is not diagnostic in nature, all of the necessary hardware is assumed to be working. Errors are detected and reported but fault isolation is not a goal of ILTCOM.

ILTCOM software requirements include the following:

- HSC software

- DEMON

- K.sti/K.si microcode

- TFUNCT (on HSC software diskette)

5.7.2 Operating Instructions

The following steps outline the procedure for running ILTCOM. ILTCOM assumes that the HSC controller is configured with a terminal, an STI interface, and a TA78 tape drive (or STI-compatible equivalent). If the HSC controller is already booted, go to step 2. If the HSC controller needs to be booted, start with step 1.

1. Boot the HSC controller.

   Press the Init button on the OCP. The following message appears:

   ```
   INIPIO-I Booting...
   ```

   The boot process can take several minutes, then the following message appears:

   ```
   HSC Version xxxx Date Time System n
   ```

2. Enter Ctrl/Y to display the HSCxx> prompt. The keyboard monitor responds with the following prompt:

   ```
   HSCxx>
   ```

3. Enter RUN DXn:ILTCOM to initiate the tape compatibility device integrity test program. The following message will be displayed:

   ```
   ILTCOM>D>hh:mm Execution Starting
   ```

5.7.3 Test Termination

ILTCOM is terminated normally by selecting the exit function (EXIT) or by entering Ctrl/Y or Ctrl/C. Certain errors that occur during execution cause ILTCOM to terminate automatically.

5.7.4 Parameter Entry

ILTCOM allows the writing, reading, listing, or the modification of compatibility tapes. The following describes the user dialog during the execution of ILTCOM:

```
DRIVE UNIT NUMBER (U) []?
```

Enter the tape drive MSCP unit number (such as T21). If the device under test is a TA90 tape drive, with or without the optional data compaction board installed, ILTCOM displays the following prompt for density:

```
Density (1=Normal, 3=Normal Compacted) [1]?
```

The default density is Normal. If you select Normal Compacted density and the drive under test does not support this mode, you will receive an error message.

If the device under test is not a TA90 tape drive, ILTCOM displays the following prompt for density:

```
SELECT DENSITY FOR WRITES (1600,6250) (d) []?
```

There is no default, you must enter a density.

ILTCOM automatically sets speed for all types of drives, including the TA90 tape drive.

```
SELECT FUNCTION (WR=WRITE,REA=READ,ER=ERASE,LI=LIST,REW=REWIND,EX=EXIT) []?
```

Enter the function by using the characters that uniquely identify the desired function (for instance, REA for read).

The subsequent dialog is dependent upon the function selected.

- **Write**—The write function writes new bunches on the compatibility tape. Bunches are either written one at a time or over the entire tape. Bunches are written from the current tape position. If the write function is selected, the following prompt occurs:

  ```
  PROCEED WITH INITIAL WRITE (Y/N) [N]?
  ```

  Enter Y to proceed with the initial write. The default is no, in which case program control is continued at the function selection prompt. If the response is yes, the following prompt occurs:

  ```
  WRITE ENTIRE TAPE (Y/N) [N]?
  ```

  Enter Y if the entire tape is to be written. Writing of bunches begins at the current tape position and continues to physical EOT. Enter the default N if the entire tape is not to be written. In this case, only one bunch is written from the current tape position. This prompt only appears on the initial write selection. After the bunch has been written, control continues at the function selection prompt.

- **Read**—The read function reads and compares the data in the bunches with an expected (predefined) data pattern. As the reads occur, the bunch header information is displayed at the terminal. The format of the display is shown in the following example:

  ```
  BUNCH    01 WRITTEN BY TA78  SERIAL NUMBER 002965
  ON A HSC SERIAL NUMBER 005993 ON 09-18-84
  ```

  The number of bunches to be read is user selectable. All reads are from the beginning of tape (BOT). If the read function is selected, the following prompt is displayed:

  ```
  READ HOW MANY BUNCHES (D) [0=ALL]?
  ```

  Enter the number of bunches to be read. The default (0) causes all bunches to be read. After the requested number of bunches has been read and compared, control continues at the function selection prompt.

- **List**— The list function reads and displays the header of each bunch on the compatibility tape from BOT. The display is the same as the one described under the read function. The data contents of the bunches are *not* read and compared. After listing the tape bunch headers, control continues at the function selection prompt.

- **Erase**—The erase function erases a user-specified number of bunches from the current tape position toward BOT. ILTCOM backs up the specified number of tape marks and writes a second tape mark (logical EOT). This effectively erases the specified number of bunches from the tape. Thus, for example, if the current tape position is at bunch 5 and the user wishes to erase two bunches, three bunches are left on the tape after the ERASE command completes.

  ILTCOM does not allow the user to erase all bunches. At least one bunch must remain. For example, with five bunches on the tape, only four bunches can be erased.

  If the erase function is selected, the following prompt is displayed:

  ```
  ERASE HOW MANY BUNCHES FROM CURRENT POSITION (D) [0]?
  ```

Enter the number of bunches to be erased. The default of 0 results in no change in tape contents or position. Control continues at the function selection prompt.

- **Rewind—**The rewind function rewinds the tape to BOT.

- **Exit—**The exit function rewinds the tape and exits the tape compatibility program ILTCOM.

5.7.5 Test Summaries

ILTCOM writes, reads, and compares compatibility tapes upon user selection. The testing that takes place looks for compatibility of tapes written on different drives (and systems).

Incompatibilities due to data compare errors or unexpected formats are reported as they are found. ILTCOM makes no attempt to isolate any faults found during execution; it only reports incompatibilities and other errors as they occur.

5.7.6 Error Message Example

All error messages issued by ILTCOM conform to the generic error message format described in Section 5.1.2. An example of an ILTCOM error message follows:

```
ILTCOM>D>09:29 T 000 E 003 U-T00100
ILTCOM>D>COMMAND FAILURE
ILTCOM>D>OPTIONAL TEXT
```

The optional text is dependent upon the type of error. Some error messages contain the term *object count* in the optional text. Object count refers to the tape position (in objects) from BOT.

5.7.7 Error Messages

This section describes the error messages issued by ILTAPE.

- **Can't Find End of Bunch—**The compatibility tape being read or listed has a bad format.

- **Chosen density is not supported—**You have selected a density that is not supported by the drive under test.

- **Command Failure—**A command failed during execution of ILTCOM. The command in error may be one of several types (MSCP level, STI Level 2, and so forth). The failing command is identified in the optional text of the error message. For example:

```
ILTCOM>D>tt:tt T 000 E 003 U-T00030
ILTCOM>D>COMMAND FAILURE
ILTCOM>D>MSCP READ COMMAND
ILTCOM>D>MSCP STATUS: nnnnnn
```

- **Data Compare Error—**A data compare error has been detected. The actual and expected data are displayed in the optional text of the error message. For example:

```
ILTCOM>D>tt:tt T 000 E 011 U-T00030
ILTCOM>D>DATA COMPARE ERROR
ILTCOM>D>EXPECTED DATA: XXXXXX  ACTUAL DATA: YYYYYY
ILTCOM>D>NUMBER OF FIRST WORD IN ERROR:  nnnnn
ILTCOM>D>NUMBER OF WORDS IN ERROR:  mmmmm
ILTCOM>D>OBJECT COUNT = cccccc
```

- **Data EDC Error**—An EDC error was detected. Actual and expected values are displayed in the optional text of the error message.

- **Device is Unknown**—The user selected a drive not known to the system as a tape.

- **Error Releasing Drive**—After completion of execution or after an error condition, the tape drive could not successfully be returned to the system.

- **Insufficient Resources to Acquire Drive**—ILTCOM was unable to acquire the specified device due to lack of system resources. Try again later.

- **Invalid User Selection**—The selected unit is unknown to the HSC controller.

- **Specified Unit Cannot Be Brought On Line**—The selected unit is off line, on line to another controller, or not available.

- **TDUSUB Initialization Failure**—The tape path cannot be established due to insufficient resources.

- **Unknown Status from TDUSUB**—An unknown error condition returned from the software interface TDUSUB.

5.8 ILEXER—Multidrive Exerciser

ILEXER exercises the various disk drives and tape drives attached to the HSC controller. The exerciser is initiated upon demand. Drives to be tested are selected by the operator. The exerciser issues random READ, WRITE, and COMPARE commands to exercise the drives. The results of the exerciser are displayed on the terminal from which it was initiated.

The reports given by ILEXER do not provide any analysis of the errors reported, nor explicitly call out a specific FRU. This is strictly an exerciser.

ILEXER automatically enables write-back caching when executing on a cache-capable disk drive. This action is transparent to you.

ILEXER runs with other processes on the HSC controller. It is loaded from the RX33 disk drive and uses the services of the DEMON and the control software.

5.8.1 System Requirements

For the ILEXER program to run, the following hardware and software items must be available.

Hardware requirements include the following:

- Console terminal

- I/O control processor module with boot ROMs

- K.sdi, K.sti, and/or K.si data channel module

- Memory module

- RX33 disk drive

- SDI-compatible disk drive and/or STI compatible tape drive

Software requirements include the following:

- Control program (system diskette or tape)

- DEMON

- K.si, K.sdi, and/or K.sti microcode
- Disk and/or tape functional code
- Error handler
- Diagnostic Interface to disk and/or tape functional code

Tests cannot be performed on drives if their respective interfaces are not available (K.sdi, K.sti, or K.si).

5.8.2 Operating Instructions

Enter Ctrl/Y to display the HSCxx> prompt. The keyboard monitor responds with the prompt:

```
Ctrl/Y
HSCxx>
```

Enter RUN DXn:ILEXER to initiate the multidrive exerciser. The system loads the program from the specified local load media. When the program is successfully loaded, the following message is displayed:

```
ILEXER>D>hh:mm Execution Starting
```

where *hh:mm* is the current time.

ILEXER then prompts for parameters. After all prompts are answered, the execution of the test continues. Error reports and performance summaries are returned from ILEXER.

When ILEXER has run for the specified time interval, reported any errors found, and generated a final performance summary, the exerciser concludes with the following message:

```
ILEXER>D>hh:mm Execution Complete
```

5.8.3 Test Termination

ILEXER terminates normally when it completes the exercise on each selected drive, reports any errors found, and displays the final performance summary. All resources, including the drive being tested, are released. The operator may terminate ILEXER before normal completion by entering Ctrl/Y. The following output is displayed, plus a final performance summary:

```
ILEXER>D>hh:mm DIAGNOSTIC ABORTED
ILEXER>D>PLEASE WAIT -- CLEARING OUTSTANDING I/O
```

Certain parts of ILEXER cannot be interrupted, so entering Ctrl/Y may have no effect for a brief moment and may need to be repeated. Whenever ILEXER is terminated, whether normally or by operator abort, ILEXER always completes any outstanding I/O requests and prints a final performance summary.

5.8.4 Parameter Entry

The parameters in ILEXER follow the format:

```
PROMPT DESCRIPTION (DATATYPE) [DEFAULT]?
```

The PROMPT DESCRIPTION explains the type of information ILEXER needs from the operator. DATATYPE is the form ILEXER expects and can be one of the following:

Y/N—Yes/no response
D—Decimal number

U—Unit number (see form below)

H—Number (in hex)

DEFAULT is the value used if a Return is pressed for that particular value. If a default value is not allowed, it appears as [ ].

Note

Entering Ctrl/Z at any time during parameter input selects the default values for the remaining parameters.

The first prompt after starting ILEXER is as follows:

```
Drive Unit Number (U) [] ?
```

Enter the unit number of the drive to be tested. This prompt has no default. Unit numbers are either in the form D*nnnn* or T*nnnn*, where *nnnn* is a decimal number between 0 and 4094 that corresponds to the number printed on the drive's unit plug. The D or T indicates either a disk drive or tape drive, respectively. Terminate the unit number by pressing the Return key. ILEXER attempts to acquire the specified unit through the HSC controller Diagnostic Interface. If the unit is acquired successfully, ILEXER continues with the next prompt. If the acquire fails with an error, one of the following conditions was encountered:

- The specified drive is unavailable. This indicates the drive is connected to the HSC controller but is currently on line to a host CPU or an HSC controller utility. Online drives cannot be exercised. ILEXER repeats the prompt for the unit number.

- The specified drive is unknown to the disk functional software. Drives are unknown for one of the following reasons:

  - The drive and/or K.sdi/K.si port is broken and cannot communicate with the disk functional software.

  - The drive was communicating with the HSC controller when a serious error occurred and the HSC controller ceased communicating with the drive.

  In either case, ILEXER asks the operator if another drive will be selected. If so, it asks for the unit number. If not, ILEXER begins to exercise the drives selected. If no drives are selected, ILEXER terminates.

When a disk drive is specified, one set of prompts is presented. When a tape drive is selected, an entirely different set of prompts is presented.

If a nondefaultable parameter is encountered, the following message appears:

```
ILEXER>D>hh:mm Nondefaultable Parameter
```

Select up to 12 drives to be exercised. These can be either all disk drives, all tape drives, or a combination of the two.

5.8.5 Disk Drive Prompts

The following prompt is presented if the drive selected for test is a disk drive:

```
Access User Data Area (YN) [N]?
```

If this prompt is answered with an "N" or by pressing the Return key, testing is confined to the disk area reserved for diagnostics or integrity tests (DBN area). The multidrive exerciser continues by displaying the following prompt:

```
Terminate Test on Drive Following Initial Write (YN) [N]?
```

Answering "Y" to this and the next prompt directs ILEXER to perform testing in the user data area.

CAUTION

It is the operator's responsibility to see that the data contained in the user data area is either backed up or of no value.

```
Are You Sure (YN) [N]?
```

Answering "N" or pressing the Return key causes the DBN area to be exercised. Answering "Y" allows the exercise to take place in the user data area of the disk.

```
Do You Want BBR (YN) [Y]?
```

Answer "N" if you suspect the drive is bad. If you are positive the drive is good, answer "Y" or press the Return key to enable BBR.

```
Start Block Number (D) [0]?
```

This value specifies the starting block of the area ILEXER exercises when the user data area is selected. If block 0 is specified, ILEXER begins with the first LBN on the disk.

```
End Block Number (D) [0=MAX]?
```

This parameter specifies the ending block of the area ILEXER exercises when the user data area is selected. If block 0 is specified as the ending block, ILEXER exercises up to the last LBN on the disk.

```
Initial Write Test Area (YN) [N]?
```

Answering "Y" to this prompt causes ILEXER to write the entire test area before beginning random testing. If the prompt is answered with an "N"or by pressing the Return key, the prompt immediately following is omitted.

```
Terminate Test on Drive Following Initial Write  (YN) [N]?
```

This question allows an initial write on the drive and terminates the test at that point. The default answer (N) permits this initial write. After completing the initial write, the test continues to exercise the drive.

Note

The following prompts specify the test sequence for the part of the test that follows the initial write portion. Even if you request read-only mode, the drive will not be write protected until after any initial write has been completed.

```
Sequential Access (YN) [N]?
```

You have the option of requesting all disk data access be performed in a sequential manner.

```
Read Only (YN) [N]?
```

If answered with "N" or by pressing the Return key, you are prompted for both a pattern number and the possibility of write-only mode. If the answer is "Y", ILEXER does not prompt for write-only mode but only asks for a data pattern number if an initial write was requested.

```
Data Pattern Number (0-15) (D) [15]?
```

You have the option of selecting one of 16 disk data patterns. The default data pattern (15) is the factory format data pattern. Selecting data pattern 0 allows you to specify a pattern with a maximum of 16 words and presents the following two prompts:

```
Define Pattern 0 - How Many Words (16 MAX) (D) [16]?
Data in Hex (H) [0]?
```

Enter the number of hexadecimal words in your pattern and the data pattern in response to these prompts.

```
Write Only (YN) [N]?
```

This option permits only write operations on a disk. This prompt is not displayed if read-only mode is selected.

```
Data Compare (YN) [N]?
```

If this prompt is answered with an "N" or by pressing the Return key, data read from the disk is not checked; for example, disk data is not compared to the expected pattern. If you enter a "Y", the following prompt is displayed. The media must have been previously written with a data pattern in order to do a data compare.

```
Data Compare Always (YN) [N]?
```

Answering with "Y" causes ILEXER to check the data returned by every disk read operation. Answering with an "N" or pressing the Return key causes data compares on 15 percent of the disk reads.

---------------------------- **Note** ----------------------------

Selection of data compares significantly reduces the number of disk sectors transferred in a given time interval. This can degrade performance on other drives not being tested; do not perform data compares unless absolutely necessary.

```
Another Drive (YN) []?
```

Entering "Y" permits selection of another drive for exercising. This prompt has no default. Entering "N" causes ILEXER to display the following:

```
Minimum Disk Transfer Length in Sectors (1 TO 400) [10]?
Maximum Disk Transfer Length in Sectors (1 TO 400) [10]?
```

These prompts request the range of size in sectors of each data transfer issued to the disk drives. The default disk transfer length is 10 sectors. If data compares are selected, the maximum transfer length is 35 sectors:

```
Minimum Disk Transfer Length in Sectors (1 TO 35) [10]?
Maximum Disk Transfer Length in Sectors (1 TO 35) [10]?
```

Once the preceding parameters are entered, ILEXER continues with the global user prompts listed in Section 5.8.7.

5.8.6 Tape Drive Prompts

ILEXER displays the following prompts if the drive selected is a tape drive:

```
Do you wish to enable enhanced performance (YN) [Y]?
```

This prompt is issued if you have selected a tape drive that supports enhanced protocol. If you answer with "Y" or press the Return key, your test is run in the default enhanced protocol. Answering with "N" runs the test in normal protocol.

```
Is a Scratch Tape Mounted (YN) []?
```

Entering "N" results in a re-prompt for the drive unit number. Entering "Y" displays the next prompt.

```
Are You Sure (YN) [N]?
```

If the answer is "N", you are prompted again for the drive unit number. If you enter a "Y", the following prompt is displayed.

```
Data Pattern Number (16-22) (D) [21]?
```

Seven data patterns are available for tape. The default pattern (pattern 21) is defined in Section 5.8.8.

If the device under test is a TA90 tape drive, with or without the optional data compaction board installed, ILEXER prompts the user for density as follows:

```
Density (1=Normal, 3=Normal Compacted) [1]?
```

The default density is Normal. If you select Normal Compacted density and the drive under test does not support this mode, you will receive an error message.

ILEXER automatically sets speed for all types of drives, including the TA90 tape drive. If a device supports multiple speeds, the following three prompts are issued; otherwise, the next prompt is the "Record Length in Bytes" prompt.

```
Select Automatic Speed Management (YN) [N]?
```

Either Automatic Speed Management (if the feature is supported) or a tape drive speed is selected at this point. If the choice is Automatic Speed Management, the available speeds are not displayed.

```
ILEXER>D>{Fixed|Variable} Speeds Available:
```

This is an informational message identifying the speeds available for the tape drive. If the speeds are fixed, the value is presented. If the speed is variable within a range, the range is listed, and the next prompt asks you to select a speed. See the tape drive user documentation for available speeds.

```
Select {Fixed|Variable} Speed (D)  [1|0=Lowest]?
```

This prompt allows selection of fixed or variable speed for the tape drive selected. See the tape drive user documentation for available speeds.

```
Record Length in Bytes (2 to 12288) (D) [8192]?
```

Response to this prompt specifies the size in bytes of a tape record. Maximum size is 12 Kbytes. The default value is 8192 and the standard record-length size for 32-bit systems. Constraints on the diagnostic interface prohibit selection of the maximum allowable record length of 64 Kbytes.

```
Data Compare (YN) [N]?
```

Entering "N" results in no data compares performed during a read from tape. Entering "Y" displays the following:

```
Data Compare Always (YN) [N]?
```

Entering "Y" selects data compares to be performed on every tape read operation. Entering "N" or pressing the Return key causes data compares to be performed on 15 percent of the tape reads.

```
Another Drive (YN) []?
```

If answered with a "Y", the prompts beginning with the prompt for DRIVE UNIT NUMBER are repeated. If answered with an "N", the global prompts in Section 5.8.7 are presented. This prompt has no default, allowing you to default all other prompts and set up another drive for this pass of ILEXER.

5.8.7 Global Prompts

The following prompts are presented to you when no more drives or drive-specific parameters are to be entered into the testing sequence. These prompts are global in the sense that they pertain to all the drives.

```
Run Time in Minutes (1 TO 32767) [10]?
```

The minimum run time is 1 minute and the default is 10 minutes. After the exerciser has executed for that period of time, all testing terminates and a final performance summary is displayed.

```
Hard Error Limit (D) [20]?
```

You can specify the number of hard errors allowed for the drives being exercised. The limit can be set from 0 to 20. When a drive reaches this limit, it is removed from any further exercising on this pass of ILEXER. Hard errors include the following types:

- Tape drive BOT encountered unexpectedly
- Invalid MSCP response received from functional code
- UNKNOWN MSCP status code returned from functional code
- Write attempted on write-protected drive
- Tape formatter returned error
- Read compare error
- Read data EDC error
- Unrecoverable read or write error
- Drive reported error
- Tape mark error (ILEXER does not write tape marks)

- Tape drive truncated data read error

- Tape drive position lost

- Tape drive short transfer occurred on read operation

- Retry limit exceeded for a tape read, write, or read reverse operation

- Drive went OFFLINE or AVAILABLE unexpectedly

The next prompt calls for the report format:

```
Narrow Reprot (YN) [N]?
```

Entering "Y" presents a narrow report which displays the performance summaries in 32 columns. The default display, selected by entering "N" or pressing the Return key, is 80 columns. The format of this display is described in further detail in Section 5.8.12. This report format is intended for small hand-held terminals.

```
Enable Soft Error Reports (YN) [N]?
```

Entering "Y" enables soft error reports. By default, you do not see any soft error reports specific to the number of retires required on a tape I/O operation.

Entering "N" or pressing the Return key results in no soft error report. Soft errors are classified as those that eventually complete successfully after explicit controller-managed retry operations. They include read, write, and read reverse requested retries.

5.8.8 Data Patterns

The data patterns available for use with ILEXER are listed in the following sections. Note that pattern 0 is a user-defined data pattern. Space is available for a repeating pattern of up to 16 words.

The following are data patterns for disks:

```
Pattern 0       Pattern 1       Pattern 2       Pattern 3
User Defined    105613          031463          030221


Pattern 4       Pattern 5       Pattern 6       Pattern 7
Shifting 1s     Shifting 0s     Alter 1s,0s     B1011011011011001
000001          177776          000000          133331
000003          177774          000000
000007          177770          000000
000017          177760          177777
000037          177740          177777
000077          177700          177777
000177          177600          000000
000377          177400          000000
000777          177000          177777
001777          176000          177777
003777          174000          000000
007777          170000          177777
017777          160000          000000
037777          140000          177777
077777          100000          000000
177777          000000          177777
```

```
Pattern 8        Pattern 9    Pattern 10      Pattern 11
B0101../B1010.. B110...      26455/151322
052525          155554       026455          066666
052525                       026455
052525                       026455
125252                       151322
125252                       151322
125252                       151322
052525                       026455
052525                       026455
125252                       151322
125252                       151322
052525                       026455
125252                       151322
052525                       026455
125252                       151322
052525                       026455
125252                       151322


Pattern 12      Pattern 13   Pattern 14      Pattern 15
Ripple 1        Ripple 0     Manufacture --  Patterns
000001          177776       155555          155555
000002          177775       133333          133333
000004          177773       155555          066666
000010          177767       155555          155555
000020          177757       133333          133333
000040          177737       155555          066666
000100          177677       155555          155555
000200          177577       133333          133333
000400          177377       155555          066666
001000          176777       155555          155555
002000          175777       133333          133333
004000          173777       155555          066666
010000          167777       155555          155555
020000          157777       133333          133333
040000          137777       155555          066666
100000          077777       155555          155555
```

The following are data patterns for tapes:

```
Pattern 16         Pattern 17   Pattern 18     Pattern 19
Alternating        All ones     Alternating    Alternating bytes
one and zero bits               bytes of all   of all ones and
                                ones           all zeros

Pattern 20         Pattern 21   Pattern 22     Pattern 23
Alternating        Alternating  Alternating    Alternating bytes
two  bytes of      four  bytes  three bytes of of ones and zeros
ones and two       of ones and  ones and one   with high byte in
bytes  of zeros    four bytes   byte zeros     pattern number also
                                               zero. Pattern 23 is
                                               used with odd record
                                               sizes.
```

5.8.9 Setting/Clearing Flags

The ENABLE SOFT ERROR REPORT display prompt in Section 5.8.7 allows the display of soft error reports. No other error reports can be inhibited.

5.8.10 Progress Reports

ILEXER has three basic forms of progress reports, as follow:

- The **data transfer error** report is printed each time an error is encountered in one of the drives being tested.

- The **performance summary** is printed when the operator terminates the pass with Ctrl/Y. The performance summary is also printed on a periodic basis during the execution of ILEXER.

- The **communication error** report is sent to the console terminal any time ILEXER is unable to establish and maintain communications with the drive selected for exercising.

These reports are discussed in more detail in the following sections.

5.8.11 Data Transfer Error Report

The ILEXER data transfer error report is printed on the terminal each time a data transfer error is found during execution of ILEXER. The report describes the nature of the error and all data pertinent to the error found. The data transfer error report is a standard HSC error log message. It contains all data necessary to identify the error. The only exception to this is when the error encountered by ILEXER is a data compare error. In this case, ILEXER has performed a check and found an error during the compare, resulting in an ILEXER error report.

5.8.12 Performance Summary

The performance summary is printed on the terminal when a testing session is manually terminated or after the specified number of minutes for the periodic performance summary. This report provides statistical data that is tabulated by ILEXER during the execution of this test.

The performance summary presents the statistics which are maintained on each drive. This summary contains the following:

- The drive unit number

- The drive serial number

- The number of position commands performed

- The number of kilobytes read and written

- The number of hard errors

- The number of soft errors

- The number of software correctable transfers

For tape drives being exercised by ILEXER, an additional report breaks down the software correctable errors into eight different categories.

To set the frequency of the report display, enter Ctrl/G while ILEXER is executing. The following prompt is displayed:

```
Interval time for performance summary in seconds (D) [30]?
```

Answer this prompt with a time interval between 1 and 3599 seconds.

Note

Entering a value of 1 causes the performance summary to be immediately
printed using the previous time interval.

The format of the performance summary follows:

```
                      PERFORMANCE SUMMARY (DEFAULT)

Unit R   Serial    Position   Kbyte     Kbyte   Hard Soft Corr.
 No  -   Number   Operations  Read     Written  Error Error Error
Dddd    HHHHHHHH  dddddddddd dddddddd dddddddddd ddddd ddddd ddddd
Tddd    HHHHHHHH  dddddddddd dddddddd dddddddddd ddddd ddddd ddddd
```

A performance summary is displayed for each disk drive and tape drive active on
the HSC controller. The following list explains the performance summary:

- **Unit Number**—The unit number of the drive. D is for disk and T is for tape.
  The number is reported in decimal format.

- **R**—The status of the drive. If an asterisk (*) appears in this field, the drive
  was removed from the test and the operator was previously informed. If the
  field is blank, the drive is being exercised.

- **Serial Number**—The serial number (in hex) for each drive.

- **Position**—The number of seeks.

- **Kbyte Read**—The number of Kbytes read by ILEXER on each drive.

- **Kbyte Written**—The number of Kbytes written by ILEXER.

- **Hard Error**—The number of hard errors reported by ILEXER for a particular
  drive.

- **Soft Error**—The number of soft tape errors reported by the exerciser if
  enabled by the operator.

- **Correctable Errors**—The number of correctable ECC errors encountered by
  ILEXER. Only ECC errors above the specific drive ECC error threshold are
  reported through normal functional code error reporting mechanisms. ECC
  errors below this threshold are not reported through an error log report but
  are included in this count maintained by ILEXER.

If any tape drives are exercised, the following summary is displayed within each
performance summary:

```
Unit Media Double Double Single Single Other Other Other
 No   Error Trkerr Trkrev Trkerr Trkrev Err A Err B Err C

Tddd ddddd ddddd   ddddd  ddddd  ddddd ddddd ddddd ddddd
```

An explanation of the information in each column follows:

- **Unit No**—The unit number of the tape drive being exercised.

- **Media Error**—The number of bad spots detected on the recording media.

- **Double TRKERR**—The number of double-track errors encountered during a
  read or write forward.

- **Double TRKREV**—The number of double-track errors encountered during a
  read reverse or write reverse.

- **Single TRKERR**—The number of single-track errors detected during a read or write in the forward direction.

- **Single TRKREV**—The number of single-track errors encountered during a read reverse or write reverse.

- **Other Err A-C**—Reserved for future use.

```
                    PERFORMANCE SUMMARY (NARROW)

ILEXER>D>PER SUM
D[T]ddd
SN HHHHHHHHHHH
P ddddd
R ddddddddd
W ddddddddd
HE ddddd
SE ddddd
SC ddddd
```

This summary is repeated for each drive tested.

If tape drives are being tested, the following report is issued for each tape drive following the disk drive performance summaries:

```
ILEXER>D>ERR SUM
ILEXER>D>Tddd
ILEXER>D>ME ddddd
ILEXER>D>DF ddddd
ILEXER>D>DR ddddd
ILEXER>D>SF ddddd
ILEXER>D>SR ddddd
ILEXER>D>OA ddddd
ILEXER>D>OB ddddd
ILEXER>D>OC ddddd
```

5.8.13 Communications Error Report

Whenever an error is encountered that prevents it from communicating with one of the drives to be exercised, ILEXER issues a standard error report. This report gives details that enable you to identify the problem. For further isolation of the problem, you should run another test, such as ILDISK or ILTAPE, specifically designed to isolate the failure.

5.8.14 Test Summaries

The test numbers in ILEXER correspond to the module being executed within ILEXER itself. The following tests are included in ILEXER:

- **Test number 1, Main Program: MDE**—The MDE is the main program within ILEXER. It is responsible for calling all other portions of ILEXER. It obtains the buffers and control structures for the exerciser. It verifies that disk or tape functionalities are available before allowing ILEXER to continue.

- **Test number 2, INITT**—INITT is called to initialize drive statistic tables. It obtains the parameters and verifies the values of each one entered. This routine calls INICOD to obtain drive-specific parameters.

- **Test number 3, INICOD**—INICOD is the initialization code for ILEXER. It obtains the various parameters for the drives from the operator and fills in the drive statistic tables with initial data for each drive. It also verifies the validity of the input for the parameters. INICOD, in turn, calls ACQUIRE to acquire the disk and/or tape drive.

- **Test number 4, ACQUIRE**—ACQUIRE is responsible for acquiring the drives as specified by the operator. It brings all selected drives on line to the controller and spins up the disk drives. Errors reported in this routine cause the removal of the drive from the exercise.

- **Test number 5, INITD**—INITD initializes the disk drives for the exercise. This routine clears all disk access control blocks and invokes the initial write.

- **Test number 6, TPINIT**—TPINIT initializes the tape drives for the exercise. It rewinds all acquired tape drives and verifies that the drives are at the BOT. If an error occurs, the drive is removed from the exerciser. TPINIT is also responsible for obtaining buffers for each acquired tape drive.

- **Test number 7, Exerciser**—EXER is the main code of the exerciser. It dispatches to the disk exerciser (QDISK and CDISK) and the tape exerciser (TEXER). It continuously queues I/O commands to disk and tape and checks for I/O completion. The subroutines EXER calls are responsible for sending commands and checking for I/O completion.

- **Test number 8, QDISK**—QDISK is part of the disk exerciser that selects commands to send to the disk drives. If the initial write is still in progress, it returns to EXER. QDISK calls a routine to select the command to exercise the disk drive. The following scenario is the algorithm used to select the command:

  – If the drive is read only and data compare is not requested, a read operation is queued to the drive.

  – If read only and data compare (occasional) are requested, a read operation is queued along with a random choice of compare/no-compare.

  – If read only and data compare (always) are requested by the operator, a READ-COMPARE command is queued to the drive.

  – If write only is requested and data compare is not, then a write request is queued to the disk drive.

  – If write only and data compare (occasional) are requested, a write operation is queued along with a random choice of compare/no-compare.

  – If write only and data compare (always) are requested, a WRITE-COMPARE command is queued to the drive.

  – If only data compare (occasional) is requested, then a random selection of read/write and compare/no-compare is done.

  – If only data compare (always) is requested, a COMPARE command is paired with a random selection of read/write.

  QDISK randomly selects the number of blocks for the selected operation.

- **Test number 9, RANSEL**—RANSEL is the part of the tape exerciser that is responsible for sending commands to the tape drives. This routine is called by TEXER, the tape exerciser routine. RANSEL selects a command for a tape drive using a random number generator. Following are some constraints for the selection process:

  – No reads when no records exist before or after the current position.

  – No writes when records exist after the current position.

  – No position of record when no records exist before or after the current position.

- Reverse commands are permitted on the drive when 16 reverse commands previously have been selected. That is, 1 out of every 16 reverse commands are sent to the drive. Immediately following a reverse command, a position to the end-of-written-tape is performed. The reason for forward biasing the tape is to prevent thrashing.

The following commands are executed in exercising the tape drives:

- READ FORWARD

- WRITE FORWARD

- POSITION FORWARD

- READ REVERSE

- REWIND

- POSITION REVERSE

RANSEL randomly selects the number of records to read, write, or skip.

- **Test number 10, CDISK**—CDISK checks for the completion of disk I/O specified by QDISK. CDISK checks the return status of a completed I/O operation and if any errors occur, they are reported.

- **Test number 11, TEXER**—TEXER is the main tape exerciser which selects random writes, reads, and position commands. TEXER processes the I/O once it is completed and reports any errors encountered.

- **Test number 12, EXCEPT**—EXCEPT is the ILEXER exception routine. This is the last routine called by MDE. EXCEPT is called when a fatal error occurs, when ILEXER is stopped with Ctrl/Y, or when the program expires its allotted time. It cleans up any outstanding I/O, as necessary, returns resources, and returns control to DEMON.

5.8.15 Error Message Format

ILEXER outputs four types of error formats, as follow:

- Prompt errors

- Data compare errors

- Pattern word errors

- Communication errors

The format of these errors conform to the generic error message format described in Section 5.1.2.

5.8.15.1 Prompt Error Format

Prompt errors occur when the operator enters the wrong type of data or the data is not within the specified range for a parameter. The format is as follows:

```
ILEXER>D>error message
```

The error message is an ASCII string describing the error.

5.8.15.2 Data Compare Error Format

A data compare error occurs when an error is detected during the exercise of a particular drive. The two formats for the data compare error are data word compare error and pattern word error. A data word compare error occurs when the data read does not match the expected pattern. The error message format is as follows:

```
ILEXER>D>hh:mm T#ddd E#dddd U-dddd
ILEXER>D>Error Description
ILEXER>D>MA --  HHHHHHHHHH
ILEXER>D>EXP -- HHHH
ILEXER>D>ACT -- HHHH
ILEXER>D>MSCP STATUS CODE = HHHH
ILEXER>D>FIRST WORD IN ERROR = ddddd
ILEXER>D>NUMBER OF WORDS IN ERROR = ddddd
```

where:
hh:mm is the current system time.
T is the test number in the exerciser.
E corresponds to the error number.
U is the unit number for which the error is being reported.
MA is the media address (block number) where the error occurred.
EXP is the expected data.
ACT is the data (or code) actually received.
MSCP STATUS CODE is the code received from the operation.
FIRST WORD IN ERROR describes the number of the first word found in error.
NUMBER OF WORDS IN ERROR—Once an error is found, the routine continues to check the remainder of the data returned and counts the number of words found in error.

5.8.15.3 Pattern Word Error Format

The format for the pattern word error is slightly different from the data word compare error. A pattern word error occurs when the first data word in a block is not a valid pattern number. The error message format is as follows:

```
ILEXER>D>hh:mm T#ddd E#ddd U-dddd
ILEXER>D>Error Description
ILEXER>D>MA -- HHHHHHHHHH
ILEXER>D>EXP -- HHHH
ILEXER>D>ACT -- HHHH
```

The MSCP status code, first word in error, and number of words in error are not relevant for this type of error. The other fields are as described for the data compare error.

5.8.15.4 Communications Error Format

Communications errors occur when ILEXER cannot establish/maintain communications with a selected drive. The error message appears in the following format:

```
ILEXER>D>hh:mm T#ddd E#ddd U-uddd
ILEXER>D>Error Description
ILEXER>D>Optional Data lines follow here
```

where:
hh:mm is the time stamp.
T is the test number in the exerciser.
E corresponds to the error number.
U is the unit number for which the error is being reported.
Error Description is an ASCII string describing the error encountered.

Optional Data lines—A maximum of eight optional lines per report.

5.8.16 Error Messages

This section lists the informational and error messages and explains the cause of each error. A typical error message is as follows:

```
ILEXER>D>09:32 T#006 E#204 U-T00100
ILEXER>D>Comm Error: TBUSUB call failed
```

Use the E#*xxx* code to interpret the type of ILEXER error. ILEXER generic errors have error numbers of 99 or less. ILEXER disk errors have error numbers between 100 and 199. ILEXER tape errors have error numbers between 200 and 299.

5.8.16.1 Informational Messages

Informational messages are not fatal to the exerciser and are only intended to perform the following functions:

- Alert the user to incorrect input to parameters

- Indicate missing interfaces

- Provide user information

The informational messages listed by ILEXER are as follows:

- **Disk Interface Not Available**—Indicates the disk functionality is not available to exercise disk drives. This means that the HSC controller's disk functional code is not loaded.

- **Drive online in enhanced ESE mode**—An ESE20 storage element, capable of running in enhanced mode, has been brought on line in enhanced mode for ILEXER tests, as requested by the user.

- **Drive online in normal mode**—An ESE20 storage element, capable of running in enhanced mode, has been brought on line in normal mode for ILEXER tests, as requested by the user.

- **Drive online in normal mode. HSC variants not currently enabled**—The user requested that an ESE20 storage element be brought on line in enhanced mode. However, the HSC controller has not been enabled to support the enhanced (variant) mode of operation. Refer to the *HSC Controller User Guide* for information on using the SETSHO command SET SERVER DISK/VARIANT_PROTOCOL to enable enhanced mode operations on the HSC controller.

- **Drive online in normal mode. Requested variant is not supported.**—ILEXER tried to bring an ESE20 storage element on line in enhanced mode on request from the user. However, some component of the HSC controller does not support the enhanced mode of operation. Verify that the ESE20 is attached to a K.si data channel module that is configured with disk microcode by using the SETSHO commands SHOW DISK and SHOW REQUESTOR. Refer to the *HSC Controller User Guide* for information on using these SETSHO commands.

  The ESE20 storage element cannot be run in enhanced mode on a K.sdi disk data channel module. If the ESE20 is attached to a properly configured K.si module, and this message is still being sent, there may be a software problem. Submit an SPR with the HSC console log and any other information pertinent to the HSC controller configuration.

- **Drive online in normal mode. Retry operation later.**—ILEXER attempted to bring an ESE20 storage element on line in enhanced mode on request of the user. However, the drive indicated that the enhanced mode of operation cannot be enabled. The ESE20 does not allow enhanced mode operations to be enabled while it is restoring data from its data retention system (this restoration takes approximately 10 minutes on an ESE20). If, during the restoration period, the ESE20 receives a request from the HSC controller to bring the drive on line in enhanced mode the ESE20 responds by issuing this message. Retry the operation after the restore operation is completed.

- **Number Must Be Between 0 and 15**—Reported when the user enters an erroneous value for the data pattern on a disk.

- **Pattern Number Must Be Within Specified Bounds**—Reported when the operator tries to specify a disk pattern number for a tape.

- **Please Mount a Scratch Tape**—Appears after an N response to the prompt asking if the scratch tape is mounted on the tape drive to be tested.

- **Please Wait—Clearing Outstanding I/O**—Displayed when the operator enters Ctrl/Y to stop ILEXER. All outstanding I/O commands are aborted at this time.

- **SDI Enable Variant command failed**—The HSC controller attempted to issue an SDI command to an ESE20 storage element to enable variant operations, but the SDI command failed. Verify that the ESE20 is available and that all SDI cable connections are secure. Check for other HSC error messages indicating why the SDI command failed.

- **Starting LBN is Either Larger Than Ending LBN or Larger Than Total LBN on Disk**—Re-prompts for the correct values. The operator selected a starting block number for the test that is greater than the ending block number selected, or the starting block number is greater than the largest block number for the disk.

- **Tape Interface Not Available**—Indicates the tape functionality is not available to exercise tape drives. This means that the HSC controller's tape functional code is not loaded.

- **You May Enter at Most 16 Words in a Data Pattern**—Reported if the operator specifies more than 16 words for a user-defined pattern. The operator is then re-prompted for the value.

5.8.16.2 Generic Errors

The following list indicates the error text and cause of errors displayed by ILEXER. ILEXER generic errors have numbers of 99 or less.

- **Could Not Get Buffers for Transfers**—The buffers required for a tape transfer could not be acquired.

- **Could Not Get Control Block for Timer—Stopping ILEXER**—ILEXER could not obtain a transmission queue for a timer. This should occur only on a heavily loaded system and is fatal to ILEXER.

- **Could Not Get Timer—Stopping ILEXER**—The exerciser could not obtain a timer. Two timers are required for ILEXER. This should only occur on a heavily loaded system and is fatal to ILEXER.

- **Could Not Return Drive to Available State**—The release of the drive from ILEXER was unsuccessful. This is the result of a drive being taken from the test due to reaching an error threshold or going off line during the exercise.

- **Couldn't Get Drive Status—Choose Another Drive**—ILEXER was unable to obtain the status of a drive for one of the following reasons:

  – The drive is not communicating with the HSC controller. Either the formatter or the disk is not on line.

  – The cables to the K.sdi, K.sti, or K.si modules are loose.

- **Disk Functionality Unavailable—Choose Another Drive**—The disk interface is not available. A previous message is printed at the start of ILEXER if any of the interfaces are missing. This error prints when the operator still chooses a disk drive for the exercise.

- **Drive Cannot Be Brought On Line**—ILEXER was unable to bring the selected drive on line. One of the following conditions occurred:

  – The unit went into an Offline state and cannot communicate with the HSC controller.

  – The unit specified is now being used by another process.

  – There are two drives of the same type with duplicate unit numbers on the HSC controller.

  – An unknown status was returned from the diagnostic interface when ILEXER attempted to bring the drive on line.

- **Drive Is Unavailable—Choose Another Drive**—This could result from any of the following conditions:

  – The drive port button is disabled for that port.

  – The drive is on line to another controller.

  – The drive is not able to communicate with the controller on the port selected.

- **Drive Is Unknown—Choose Another Drive**—The drive chosen for the exerciser is not known to the functional software for that particular drive type. Either the drive is not communicating with the HSC controller, or the drive has been disabled due to an error condition.

- **Invalid Time Entered...Must Be from 1 to 3599**—The user entered an erroneous value to the performance summary time interval prompt.

- **No Disk or Tape Functionality...Exerciser Terminated**—Neither disk nor tape functional software is available to run the exercise. This error condition terminates ILEXER.

- **No Tape Mounted on Unit...Mount and Continue**—The operator specified that a scratch tape was mounted on the tape drive selected when it was not mounted. Mount a tape and continue.

- **Record Length Larger than 12K or 0**—The record length requested for the transfer to tape was either greater than 12K or was 0.

- **Tape Functionality Unavailable—Choose Another Drive**—The tape interface is not available. A previous message is printed at the start of ILEXER if any of the interfaces are missing. This error prints when the operator still chooses a tape drive for the exercise.

- **Tape Rewind Commands Were Lost—Cannot Continue**—The drive was unloaded during ILEXER execution.

- **This Unit Already Acquired**—A unit number was specified for testing but the associated drive has already been acquired.

- **User Requested Write on Write-Protected Unit**—The operator should check the parameters entered and the write protection on the drive to make sure they are consistent.

5.8.16.3 Disk Errors

The following list includes the error text and cause of ILEXER disk errors. ILEXER disk errors have error numbers between 100 and 199.

- **Command Failed—Invalid Header Code**—ILEXER did not pass a valid header code to the diagnostic interface for the HSC controller.

- **Command Failed—No Buffer Available**—The diagnostic interface was unable to obtain buffers to run the exercise. The HSC controller could be overloaded. Try ILEXER when the HSC controller has less I/O activity. If the error still occurs, test the HSC controller memory.

- **Command Failed—No Control Structures Available**—The diagnostic interface could not obtain disk access control blocks to run the exercise. The HSC controller could be overloaded. Try ILEXER when the HSC controller has less I/O activity. If the error still occurs, test the HSC controller memory.

- **Couldn't Put Drive in DBN Space—Removed from Test**—An error or communication problem occurred during the delivery of an SDI command to put the drive in DBN space.

- **Data Compare Error**—Bad data was detected during a read operation.

- **Disk Unit Numbers Must Be Between 0 and 4094 decimal**—The operator specified a disk unit number outside the allowed range of values.

- **Drive No Longer Exercised**—A disk drive reached the hard error limit or the drive went off line to the HSC controller during the exercise.

- **Drive No Longer On Line**—A drive that was being exercised went into an available state. This could be caused by the operator releasing the port button on the drive. A fatal drive error could also cause the drive to go into this state. This error message identifies the function attempted by ILEXER that caused an error to occur. Error logs do not indicate the operation attempted.

- **Drive Spindle Not Up to Speed—Spin Up Drive and Restart**—The disk drive is not spun up.

- **EDC Error**—Error detection code error. Invalid data was detected during a read operation.

Note

The following "hard failure" error messages identify the function attempted by ILEXER that caused an error to occur. Error logs do not indicate the operation attempted.

- **Hard Failure on Compare Operation**—A hard failure occurred during a compare of data on the disk drive.

- **Hard Failure on Disk**—A hard error occurred on the disk drive being exercised.

- **Hard Failure on Initial Write Operation**—A hard failure occurred during an initial write to the disk drive.

- **Hard Failure on Read Operation**—A hard failure occurred during a read operation on the disk drive being exercised.

- **Hard Failure on Write Operation**—A hard fault occurred during a write operation on the specified disk drive.

- **No DACB Available—Notify Customer Services, Submit SPR**—This is reported if no DACBs can be acquired. If this happens, contact Digital Services as soon as possible and submit an SPR.

- **Pattern Number Error**—The first two bytes of each sector, which contain the pattern number, did not contain a valid pattern number.

- **Some Disk I/O Failed to Complete**—An I/O transfer did not complete during an allotted time period.

- **Unknown Unit Number Not Allowed in ILEXER**—The operator attempted to enter a unit number of the form X*nnnn*, which is not accepted by ILEXER.

- **Write Requested on Write-Protected Drive**—The operator requested an initial write operation on a drive that was already write protected. The operator should write enable the drive reporting the error or have ILEXER do a read-only operation on the drive.

5.8.16.4 Tape Errors

The following list includes the error text and cause of ILEXER tape errors. ILEXER tape errors have error numbers between 200 and 299.

- **Comm Error: TDUSUB Call Failed**—ILEXER cannot communicate with the drive through interface structures because they have been removed. Either the drive went from online to available, the drive is offline, or there is a fault.

- **Controller Error...Hard Error..Rewinding to Restart**—A communications problem exists between the controller and the formatter.

- **Could Not Set Unit Char...Removing from Test**—The drive is off line and not communicating.

- **Couldn't Get Formatter Characteristics**—A communication problem with the drive is indicated. It could be caused by the unit not being on line.

- **Couldn't Get Unit Characteristics**—The drive is not communicating with ILEXER. The unit could be off line.

- **Data Pattern Word Error Defect**—The first two bytes of a record containing the data pattern did not contain a valid pattern number.

- **Data Read EDC Error**—Error detection code error; incorrect data was detected.

- **Drive Error...Hard Error**—The drive unexpectedly transitioned from the on line to the available state while being exercised.

- **Drive Went Available...Removing from Test**—During the exercise the drive unexpectedly transitioned from the on line to the available state.

- **Drive Went Offline...Removing from Test**—The drive went off line during the exercise. This is caused by the operator taking the drive off line or a hard failure forcing the drive off line.

- **Formatter Error...Hard Error**—A communications problem exists between the formatter and the controller and/or drive.

- **Hard Error Limit Exceeded...Removing Drive from Test**—The drive exceeded the threshold of hard errors determined by a global user parameter (Section 5.8.7). The drive is then removed from the exercise.

- **Read Data Error**—A read operation failed during a data transfer, and no data was transferred.

- **Retry Required on Tape Drive**—A failed read/write operation required a retry before succeeding.

- **Short Transfer Error...Rewinding to Restart**—Less data was received than transferred.

- **Some Tape I/O Failed to Complete**—The drive or formatter stopped functioning properly during a data transfer.

- **Tape Mark Error...Rewinding to Restart**—ILEXER does not write tape marks. This error indicates a drive failure.

- **Tape Position Discrepancy**—The tape position was lost, indicating a hard failure.

- **Tape Position Lost...Rewinding to Restart**—An error occurred during a data transfer or a retry of one.

- **Truncated Record Data Error...Rewinding to Restart**—More data was received than expected, indicating a drive problem.

- **Unexpected BOT Encountered...Will Try to Restart**—The drive is experiencing a positioning problem.

- **Unexpected Error Condition...Removing Drive from Test**—This is caused by TMSCP™ error conditions, which are not allowed (invalid commands, unused codes, write-protected drive write, and so forth).

- **Unrecoverable Read Error...Rewinding to Restart**—A hard error occurred during a read operation and a data transfer did not take place.

- **Unrecoverable Write Error...Rewinding to Restart**—A hard error occurred during a write operation. The write did not take place.

6

Upgrading Your HSC40 Controller to an HSC65 Controller

This chapter contains a new procedure to upgrade an existing HSC40 controller to an HSC65 controller. After installing your upgrade kit, the upgraded HSC controller will be the higher level model in all respects.

6.1 Preparing for the Upgrade

Perform the following steps to prepare for the upgrade:

1. Use the packing slip to verify that all the components of the upgrade kit are included and are not damaged. If there is a discrepancy between Table 6–1 and the packing slip, the packing slip takes precedence.

Table 6–1   HSC6X–EA/EB Upgrade Kit Contents

Digital Part Number	Component Description	Quantity
L0124–AA	K.pli2 port processor module	1
L0118–YA	LINK2 link module	1
L0125–AA	PILA2 port buffer module	1
L0142–YD	P.ioj2 I/O control processor module	1
L0123–BA	M.std5 memory standard module	1
L0121–BA	M.cache2 cache memory module	1
HSC5x–EA/EB	60 Hz or 50 Hz auxiliary power supply	1
17–00958–01	SI cables	4
70–23125–02	Rear door assembly	1
74–38607–08	HSC65 medallion	1
36–15946–01	Product conversion label	1
36–21684–06	HSC65 module placement label	1
74–46084–01	Cable cover	1
EK–HSCCN–IN. A01	*HSC65 and HSC95 Controller Installation Manual*	1

2. At the HSC> prompt on your console terminal screen display, enter a SHOW
    ALL command to extract the system parameters. The SHOW ALL command
    displays information and parameters of the following SHOW commands:

SHOW CI	SHOW MEMORY
SHOW CONNECTIONS	SHOW ODT
SHOW CREDIT_MANAGER	SHOW POLLER
SHOW DISKS	SHOW REQUESTORS
SHOW ERROR	SHOW SERVER CACHE
SHOW EXCEPTION	SHOW SERVER DISK
SHOW HOST	SHOW SYSTEM
SHOW LINES	SHOW TAPES
SHOW LOAD	SHOW VIRTUAL_CIRCUITS

3. Print a hard copy of these system parameters if your system does not
    automatically produce a copy. You will use this copy to reset the HSC
    software parameters after installing your upgrade components.

4. If your cluster does not have failover capabilities, shut down the cluster and
    go to step 7.

5. If your system has failover capabilities, fail over all disk and tape drives to
    the alternate HSC controller.

6. Enter the SHOW TAPES and SHOW DISKS commands (shown in bold type
    in the example) to verify that no disk or tape drives are on line to the HSC
    controller being upgraded.

HSC>**SHOW DISKS** `Return`

SETSHO-I No Disk units found

The Disk NOHOST_ACCESS Table is empty.

The CACHE Table is empty.
SETSHO-I Program Exit

`Ctrl/Y`

HSC> **SHOW TAPES** `Return`

SETSHO-I No Tape units found

The Tape NOHOST_ACCESS Table is empty.
SETSHO-I Program Exit

———————————————— **Note** ————————————————
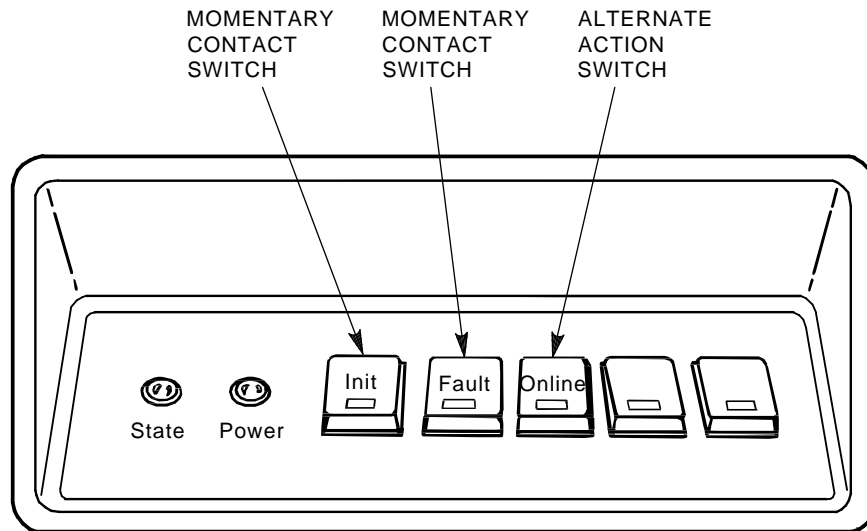
Some disk or tape drives may appear in the above examples if they are
in the AVAILABLE state but not ONLINE. This is acceptable and you
should continue with the upgrade.

———

6.2 Installing Upgrade Kit Modules

Install the new modules from the upgrade kit using the following procedure:

1. Set the Online switch on the HSC controller operator control panel (OCP) to the out position. Figure 6–1 shows the location of the Online switch.

2. Open the front door of the HSC controller cabinet.

Figure 6–1 Locating the OCP Online Switch
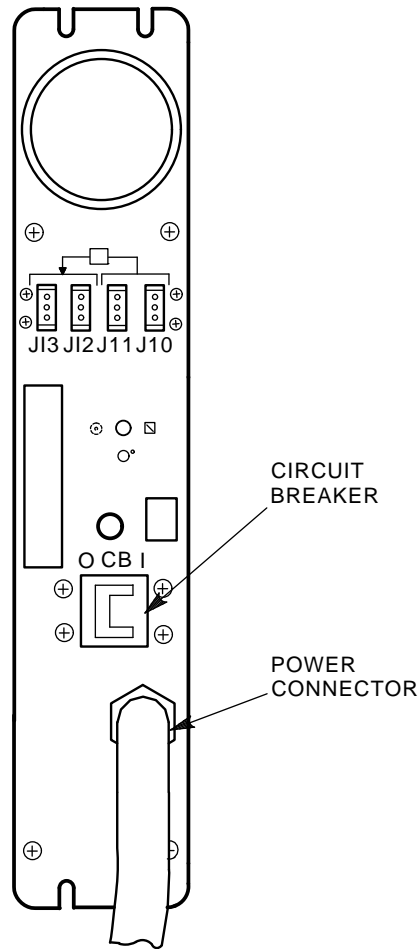
CXO-008B_S

3. Turn dc power off by setting the DC Power switch to the 0 position. The DC Power switch is located on the left side of the RX33 disk drive housing at the front of the HSC controller.

4. Open the rear door of the HSC controller cabinet.

5. Turn off ac power by setting the HSC power controller circuit breaker (CB) to the 0 position, as shown in Figure 6–2. Verify that power is off by checking that the LEDs are not lit on the installed modules.

CAUTION

If the power control bus is connected to another device, use caution when removing the power control bus cable. This bus could be daisy chained to other equipment that is not related to the HSC controller.

---

6. At the front of your HSC controller, turn the nylon latches on the card cage cover plate one-quarter turn clockwise or counterclockwise. Pull the card cage cover up and out and set it aside.

Figure 6–2 HSC Power Controller Front Panel

JI3 JI2 J11 J10

CIRCUIT
BREAKER

O CB I

POWER
CONNECTOR

CXO-1117B

_____ **CAUTION** _____

Do not attempt to handle HSC controller modules unless you have taken
proper precautions against electrostatic discharge (ESD). When handling
modules, wear the ESD grounding wrist strap provided inside the front
door of the HSC controller cabinet. Do not put modules on anything other
than a properly grounded antistatic work surface.

7. Remove selected HSC40 modules and replace them with the upgrade modules
   listed in Table 6–2.

Table 6–2   Upgrade Modules for HSC40 to HSC65 Controller Upgrade

Card Cage Slot Number	Module Part Numbers
Slot 1:	
Remove module	L0111–YA
Replace with module	L0142–YD
Slot 2:	
Remove module	L0117–AA
Replace with module	L0123–BA
Slot 11:	
Remove module	N/A
Replace with module	L0121–BA
Slot 12:	
Remove module	L0107–YA
Replace with module	L0124–AA
Slot 13:	
Remove module	L0109
Replace with module	L0125–AA
Slot 14:	
Remove module	L0100 E2/L0118–00
Replace with module	L0118–YA

8. Attach the labels accompanying the new modules to the appropriate slot position on the module placement label. The placement label is located directly above the module card cage.

6.3 Installing the HSC Cabinet Rear Door

Use the following procedure to remove the rear door of the HSC cabinet and replace it with the door supplied in the upgrade kit:

1. Open the rear door of the HSC controller cabinet.

2. Release the top hinge pin by pulling down on the release lever.

3. Carefully slide the top hinge out of place and lift up on the door to release the bottom hinge pin. Use care to avoid bending the bottom hinge pin.

4. Drop the lower pin of the new door from the upgrade kit into place on the lower hinge of the cabinet. Pull down on the lever attached to the upper hinge pin and slide the top hinge into place. Release the hinge pin lever.

5. Close the rear door.

6. Position the cable cover with its open end down and closed end up. Hook the cover tabs into the matching holes in the rear door and slide the cover down to lock it into place.

6.4 Installing 8-Port K.si Module SDI Cables

Use the following procedure to install the necessary SDI cables for 8-port K.si disk data channel modules:

1. See Figure 6–3 and disconnect the airflow sensor power connector (J70) from the side of the exhaust duct.

2. Remove the exhaust duct from the bottom of the blower duct by lifting up the quick release latch on the right side of the exhaust duct and turning the two quarter-turn latches on the inside left side of the exhaust duct clockwise or counterclockwise. This hardware is shown in Figure 6–3.

Figure 6–3 Removing the Exhaust Duct and Airflow Sensor
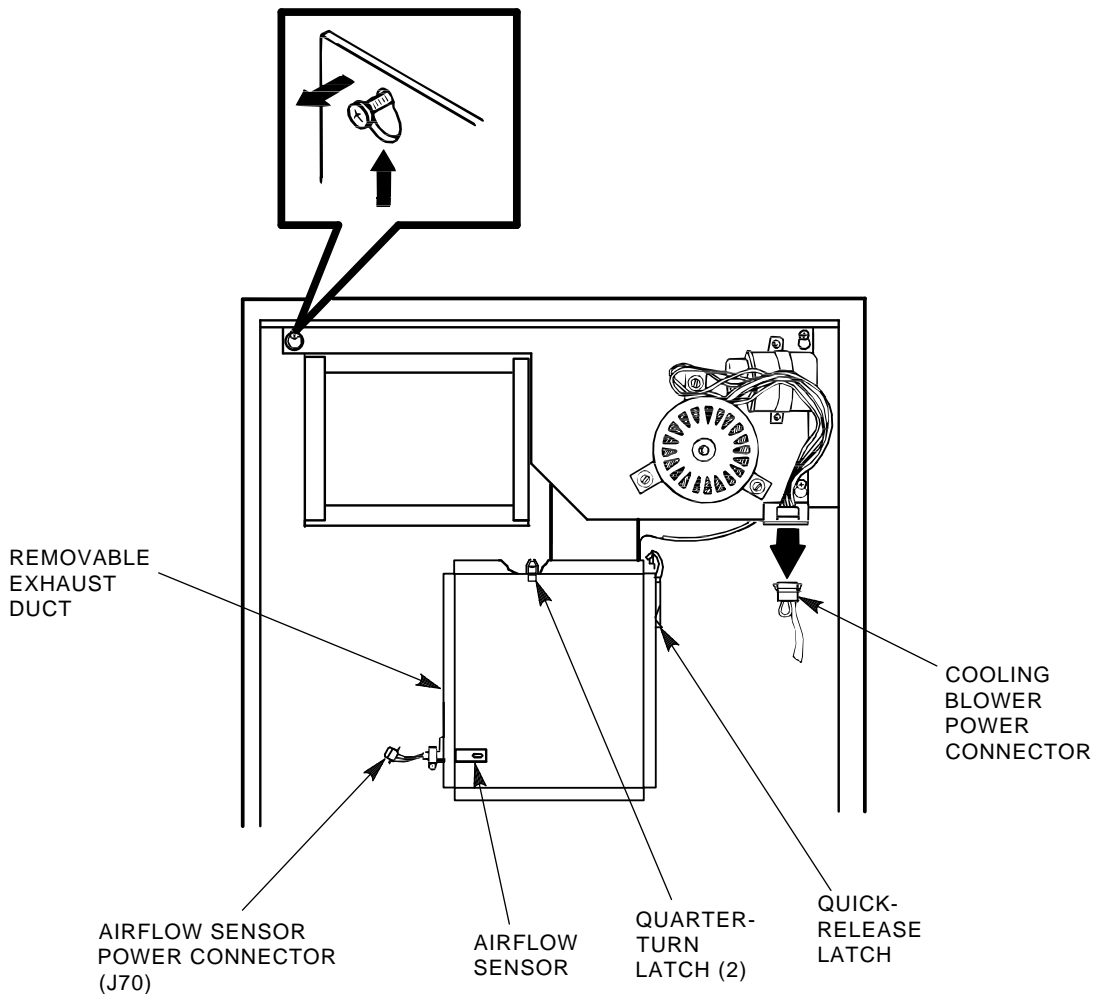
CXO-939C_S

3. See Figure 6–4 and install SDI cables to the HSC controller backplane at sections H/J/K/L. The SDI cable connectors are keyed to be installed only one way. Do not use excessive force; if a connector does not seat easily, be sure you have correctly aligned the connector key with the backplane connector key.

4. Connect the I/O bulkhead end of each SDI cable using Figure 6–4 and Table 6–3 as your guide. These cable connectors are also keyed to be installed only one way. Do not use excessive force; if a connector does not seat easily, be sure you have correctly aligned the key.

Table 6–3 Locations for SDI Cable Connectors

Backplane Requestor	Backplane Section	Port Connector	Position In I/O Bulkhead
3	H	0	H0
3	H	1	H1
3	H	2	H2
3	H	3	H3
4	J	0	J0
4	J	1	J1
4	J	2	J2
4	J	3	J3
5	K	0	K0
5	K	1	K1
5	K	2	K2
5	K	3	K3
6	L	0	L0
6	L	1	L1
6	L	2	L2
6	L	3	L3

5. Install the right-hand screws to all connectors on the I/O bulkhead. Then install the left-hand screws. Recheck the screws for tightness, being careful to not disturb the other I/O bulkhead connectors.

6. Verify that all connectors on the backplane and I/O bulkhead are seated. Verify that you have not disturbed any of the connectors on the CI shelf during installation.

7. Replace the exhaust duct and the airflow sensor power connector.

Figure 6–4 Installing SDI Interconnect Cables to the I/O Bulkhead Panel

TO I/O BULKHEAD PORT L0 - L3

TO I/O BULKHEAD PORT K0 - K3

TO I/O BULKHEAD PORT J0 - J3

TO I/O BULKHEAD PORT H0 - H3

BACKPLANE

KEYS

FROM BACKPLANE REQUESTOR 6, BULKHEAD L

FROM BACKPLANE REQUESTOR 5, BULKHEAD K

FROM BACKPLANE REQUESTOR 4, BULKHEAD J

FROM BACKPLANE REQUESTOR 3, BULKHEAD H

REQ 9   REQ 8

ALL PORT 0 CONNECTORS

ALL PORT 1 CONNECTORS

ALL PORT 2 CONNECTORS

ALL PORT 3 CONNECTORS

I/O BULKHEAD

CXO-3046A

6.5 Installing an Auxiliary Power Supply (HSC5x–EA/EB)

Use the following procedure to install an auxiliary power supply:

_____ CAUTION _____

Use care when removing the cabinet doors so you do not damage the OCP cable at the front door and the I/O cables at the rear door of the HSC controller cabinet.

_____

1. At the front door of the HSC controller cabinet, verify that there is enough slack in P40 on the OCP and the green grounding wire near the bottom of the door to allow you to remove the door and set it aside. If there is not enough slack, disconnect P40 at the OCP and the grounding wire at the door.
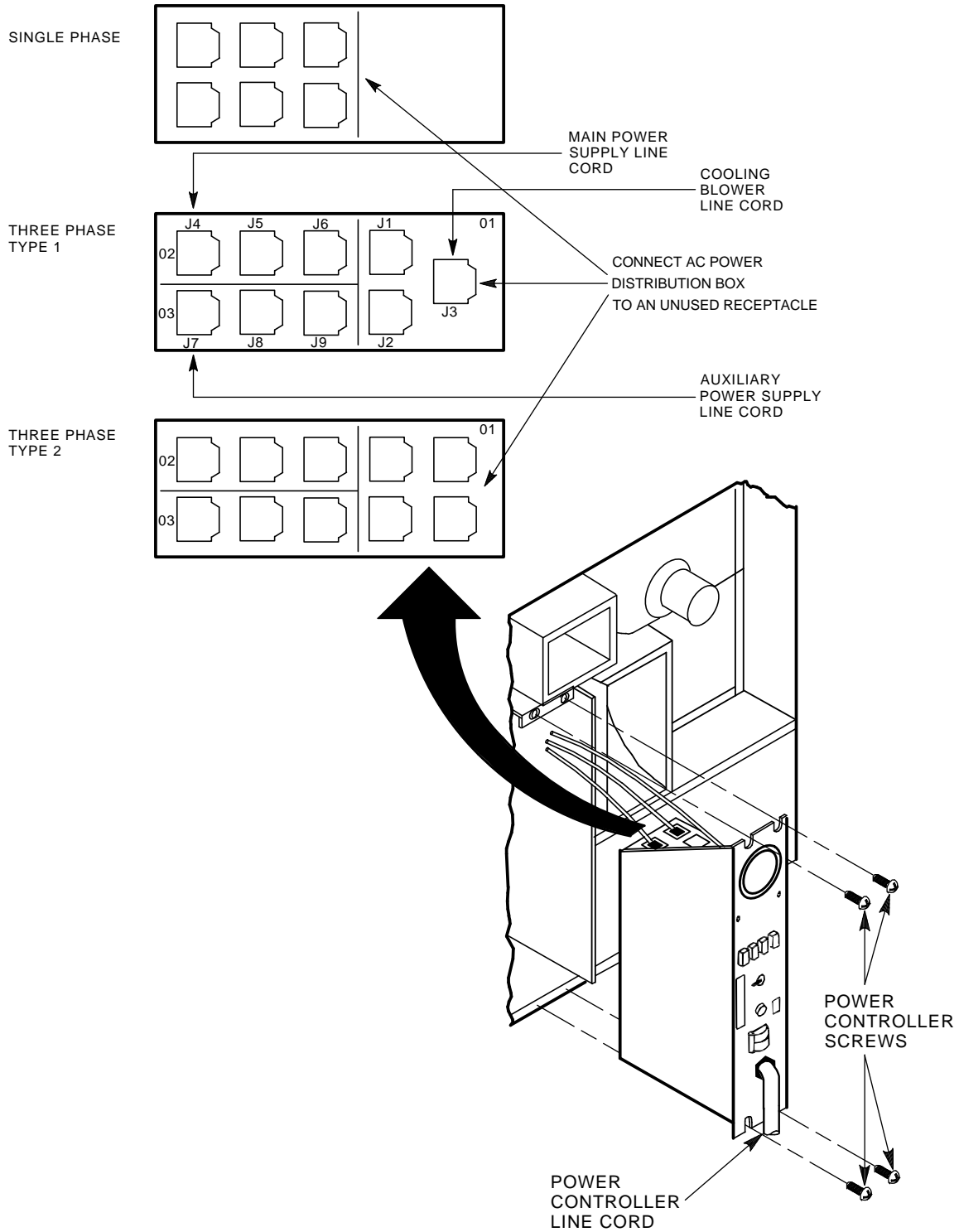
2. Remove both doors of the cabinet by pulling down on the spring-loaded rod on the top hinge inside the door. Lift the doors off their bottom pins and set aside.

3. Remove the rear door latch by loosening its screws to provide the needed clearance to remove the HSC power controller. It is necessary to remove the HSC power controller to provide access to the rear of the auxiliary power supply and its cables.

4. Remove the two top screws and then the two bottom screws that secure the HSC power controller to the cabinet as shown in Figure 6–5. While removing the two bottom screws, push up on the HSC power controller to take the weight off the screws.

5. Pull the HSC power controller out only enough to allow removal of the power control bus cables, if attached. Remove the power control bus cables from connectors J10, J11, J12, and J13 on the front panel of the HSC power controller, as shown in Figure 6–5. Label these cables as you remove them to refer to later when reinstalling the power controller.

6. Pull the HSC power controller completely out of the cabinet and set it on the floor next to the HSC controller. **Be careful not to stress the cables that remain attached to the top panel of the power controller.**

7. At the front of the HSC cabinet, remove the cover plate over the auxiliary power space by loosening the four captive screws in each corner of the plate. These could be Phillips head screws on some models of HSC controller.

8. Remove the L-shaped air baffle plate inside the auxiliary power supply space. Figure 6–6 shows the auxiliary power supply housing that will replace the cover plate.

9. On the auxiliary power supply, remove the two kep nuts and washers from the studs on the rear of the power supply. These nuts may be packaged separately in a plastic bag.

10. Slide the auxiliary power supply into its housing in the cabinet. Make sure that the power cord or other cables are not pinched between the auxiliary power supply and the cabinet while performing this step. Verify that the two studs on TB1 of the auxiliary power supply are through the holes in the flexbus from the HSC backplane.

Figure 6–5   Removing the HSC Power Controller

SINGLE PHASE

MAIN POWER
SUPPLY LINE
CORD

COOLING
BLOWER
LINE CORD

THREE PHASE
TYPE 1

J4   J5   J6   J1   01

02

03

J7   J8   J9   J2

J3

CONNECT AC POWER
DISTRIBUTION BOX
TO AN UNUSED RECEPTACLE

AUXILIARY
POWER SUPPLY
LINE CORD

THREE PHASE
TYPE 2

01

02

03

POWER
CONTROLLER
SCREWS

POWER
CONTROLLER
LINE CORD

CXO-3669A_TI

11. Secure the four captive mounting screws on the front of the auxiliary power supply to the power supply cabinet bracket. These screws are shown in Figure 6–6.

12. Connect the following cables to the rear of the auxiliary power supply, as shown in Figure 6–7. The terminals on auxiliary power supply terminal board TB1 are numbered from left to right.

   a. Connect J50 to the 3-pin connector, P50.

   b. Connect J51 to the 2-pin connector, P51.

   c. Install the two kep nuts and washers on the studs at the lower right-hand edge of TB1.

   d. Route the power cord of the auxiliary power supply through the auxiliary power supply space and into the HSC power controller space.

Figure 6–6 Installing the Auxiliary Power Supply
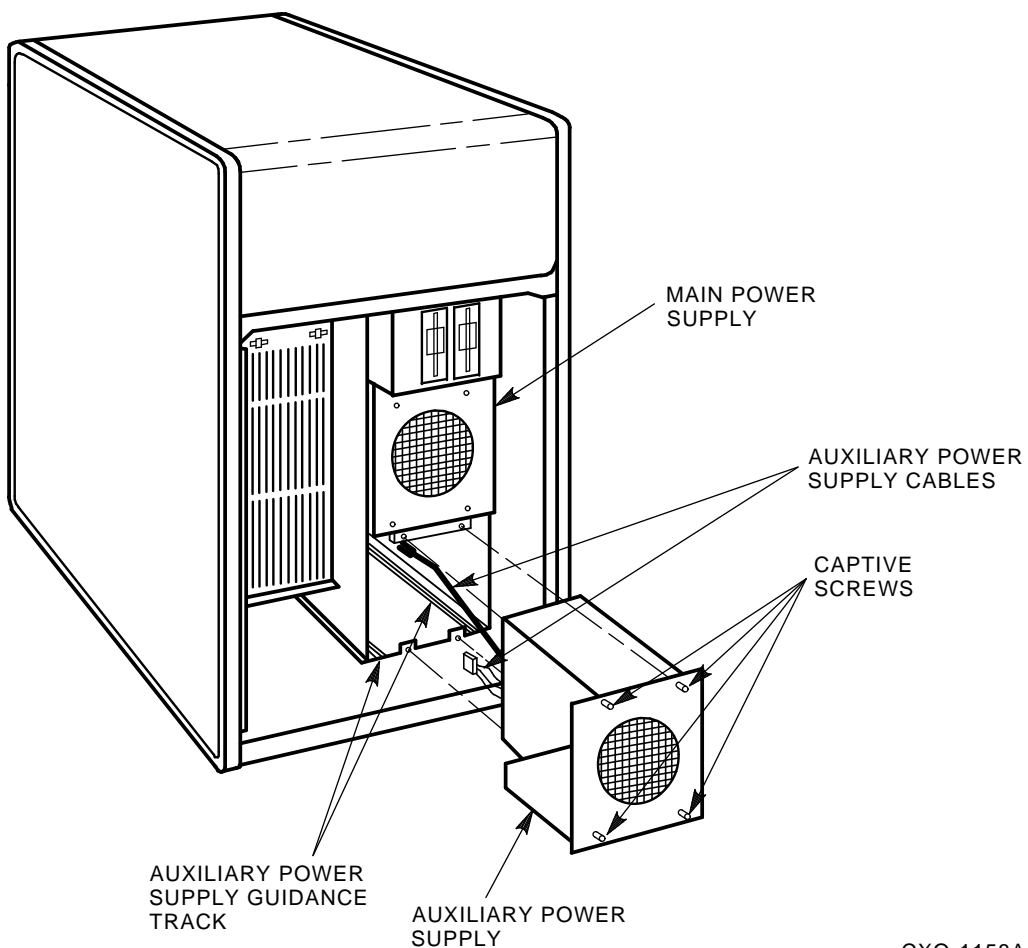
CXO-1158A

Figure 6–7 Auxiliary Power Supply TB1 Connections

WIRE LIST		
COLOR	POSITION	SIGNAL
BLACK	TBI-2	GROUND (5 V SENSE)
RED	TBI-1	5 V SENSE
BROWN	TBI-4	POWER FAIL
BLUE	TBI-7	ACC
BROWN	TBI-6	AC
GRN/YEL	TBI-5	CHASSIS GROUND
BLUE	TBI-3	ON/OFF
BLACK	TBI-2	GROUND (5 V SENSE)

AUXILIARY POWER SUPPLY - REAR VIEW

POWER FAIL

POWER SUPPLY
TERMINAL STRIP

TB1

1 2 3 4 5 6 7

J51
TO BACKPLANE

J50
TO MAIN
POWER SUPPLY

TO
BACKPLANE

GROUND

+V1
+5 VDC

-V1
GROUND

FLEXBUS

LINE CORD
TO POWER
CONTROLLER
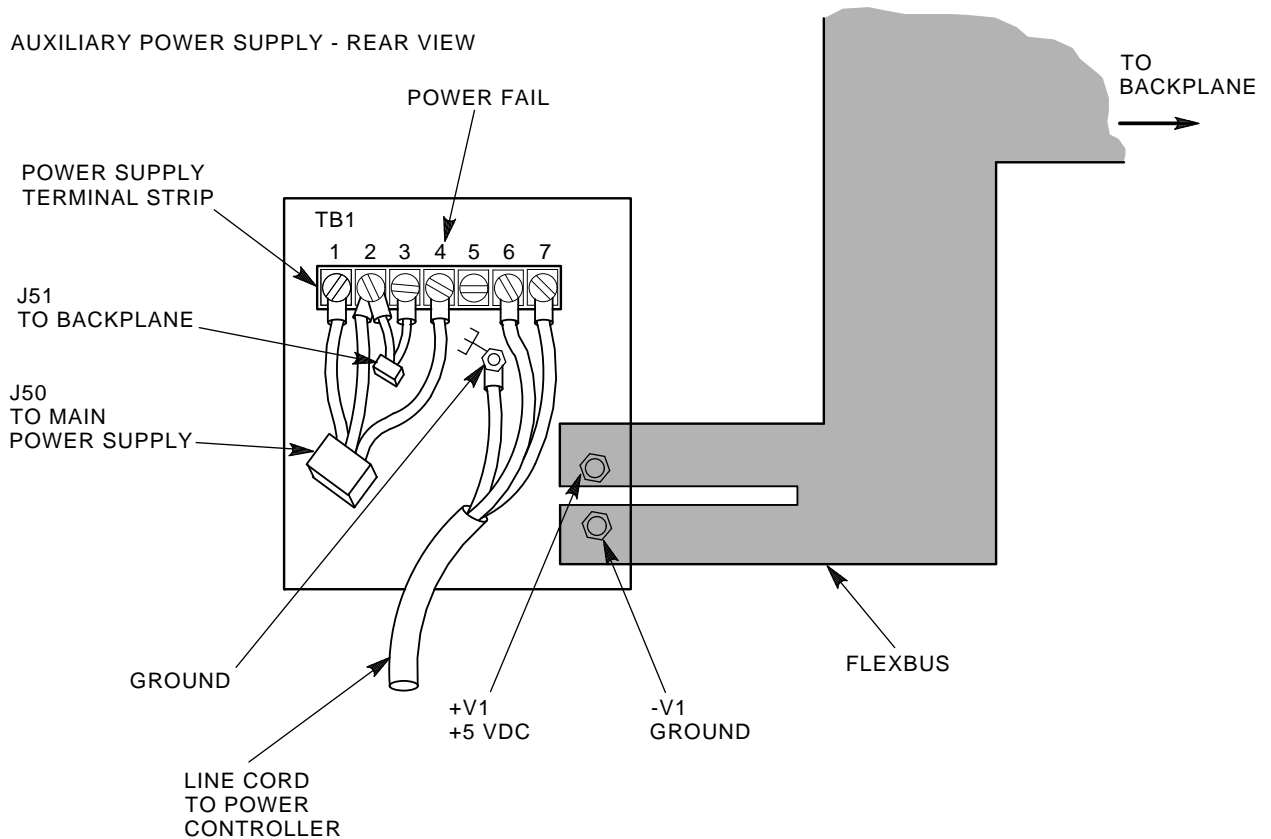
CXO-943B

13. Connect the auxiliary power supply line cord to J7 on the power controller. To ensure proper phase distribution of the source voltage, verify that the main power supply (J4) and cooling blower (J3) line cords (shown in Figure 6–5) are still attached to the top panel of the HSC power controller.

14. Reinstall the power controller in the reverse order that it was removed.

15. Reinstall the front and rear doors of the HSC cabinet. Reconnect P40 on the OCP and the green grounding wire at the bottom of the front door.

16. Reconnect the power cord to the power source and set the HSC power controller circuit breaker to the 1 (ON) position. Set the DC Power switch to the 1 position.

17. Check the voltages for the auxiliary power supply at the following points.

Voltage	Test Point	Check
+5.0 Vdc	Connector P40 on the OCP	Voltage between the red wire, pin 15, and the black wire, pin 14, should read between +4.95 and +5.15 Vdc. If this voltage is not within tolerance, remove power from the HSC controller immediately.
-5.2 Vdc	Connector P70 on the airflow sensor	Voltage between the orange wire, pin 3, and ground should read between –4.96 and –5.46 Vdc.
+12 Vdc	Connector P70 on the airflow sensor	Voltage between the purple wire, pin 1, and ground should read between 11.4 and 12.6 Vdc.

If the +5.0 Vdc output is not at least +4.95 Vdc, verify that the auxiliary power supply fan is running. If the fan is **not** running, verify that the power cord is correctly installed. If the fan **is** running, recheck all connections.

18. Set the DC Power switch to the 0 (OFF) position. Set the power controller circuit breaker to the 0 position and disconnect the HSC controller power cord from the power source.

6.6 Post-Upgrade Tests

Use the following procedure to test the upgrade:

1. Add new requestors (disk or tape data channel modules) to the HSC controller as required. If you are installing new K.si 4-port or 8-port data channel modules, refer to the *HSC Controller Installation Manual* included with your K.si module option kit.

   The K.si modules are by default disk data channels after initial installation or on first boot of the HSC software. If the attached devices are tape drives, perform initialization and reconfiguration procedures, as described in the *HSC Controller Installation Manual*.

2. Replace the card cage cover after all new modules have been installed.

3. Reconnect the HSC controller power cord to the power source.

4. Turn on the HSC controller by setting the circuit breaker (CB) on the HSC power controller to 1 (ON).

5. Ensure the Secure/Enable switch is in the ENABLE position.

6. Verify that the Online switch is in the out position.

7. Ensure that the System and Utilities diskette is installed and the RX33 drive release handle is closed.

8. At the front of the HSC controller, set the DC Power switch to ON.

9. Ensure that the Power indicator on the OCP is on.

_____ **Note** _____

If the OCP Power indicator is not on, reset the circuit breaker to 0 (OFF), remove the requestors from the backplane, and reset the circuit breaker to 1 (ON). This check determines if any of the new requestors are causing a problem.

_____

10. All HSC controller module green status LEDs should be on.

11. The HSC automatic reboot begins. Verify that the HSC controller console terminal displays the following boot message:

```
INIPIO-I Booting...

    HSC95 Version V800 30-Jul-1992 10:25:18      System HSC009

Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992,
1993.  Digital Equipment Corporation. All Rights Reserved.
```

The HSC controller model, the software version number, and the system number are site specific. If this message is not displayed, verify that the Online switch is set to the out position. If it is, turn off the HSC controller by setting the circuit breaker on the power controller to 0. Verify that all modules are correctly installed and seated in the backplane, then turn the power back on.

6.7 Completing the Upgrade

Perform the following steps to complete the upgrade procedure:

1. Replace the HSC40 controller serial number label on the rear door of the HSC controller with the new HSC65 controller serial number label included with your upgrade kit.

2. Change the medallion on the front door of your HSC40 controller to reflect the new HSC65 controller model number. Figure 6–8 shows the location of the HSC40 medallion.

Figure 6–8 Locating the HSC40 Controller Model Number Medallion

CXO-3087A

3. Attach the new HSC65 medallion as follows:

   a. On the inside of the HSC controller front door, remove the old medallion by snipping off the pins behind their securing clips.

   b. Push the new HSC65 medallion through the holes in the front door and secure by twisting the new wing clips onto the medallion's pins.

4. Close and latch the front and rear doors of the HSC controller.

5. Hold the Fault switch in and turn the DC Power switch inside the front door of the HSC controller off and then on. Continue holding the Fault switch in until the "INIPIO-I Booting..." portion of the boot message is displayed:

```
INIPIO-I Booting...

    HSC95 Version V800 30-Jul-1992 10:25:18        System HSC009

Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992,
1993.  Digital Equipment Corporation. All Rights Reserved.
```
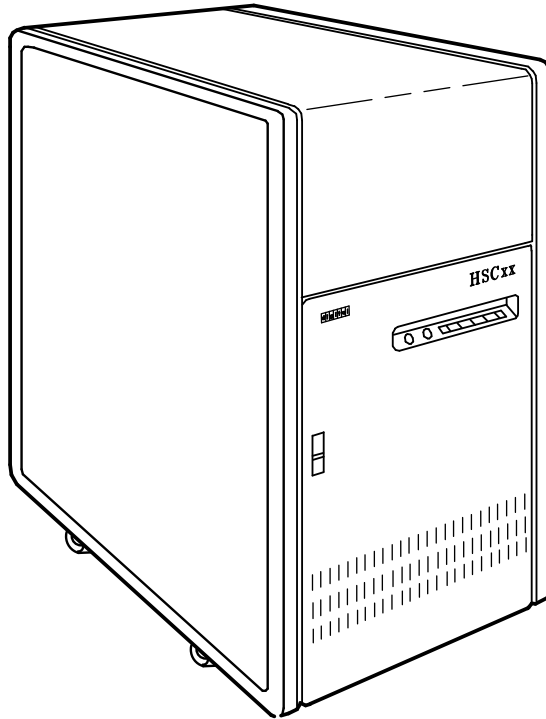
   The HSC controller model, the software version number, and the system number are site specific. If this message is not displayed, verify that the Online switch is set to the out position. If it is, turn off the HSC controller by setting the circuit breaker on the power controller to 0. Verify that all modules are correctly installed and seated in the backplane, then turn the power back on.

6. Enter the SHOW ALL command at the HSC> prompt and compare the display to the hard copy you made in step 2 of Section 6.1.

7. Set the system name, ID, disk allocation, and tape allocation using the appropriate SET commands. Reset other parameters as required by the site.

_____ **Note** _____

Only reset the SET REQUESTOR parameters if the software has been upgraded, if 4-port K.si modules are added and configured with tape drives, or if tape-to-disk drive/disk drive-to-tape data channel module changes are made.

_____

Enter a SHOW REQUESTORS command to identify the requestors.

Ctrl/Y

SETSHO>**SHOW REQUESTORS** Return

```
Req     Status  Type           Version                Microcode Loaded
0       Enabled P.ioj
1       Enabled K.ci           MC- 73 DS- 3 Pila-64 K.pli-15   CI
2/A     Enabled K.si           MC- 17 DS- 3            tape
3/B     Enabled K.sti          MC- 27 DS- 2            n/a
4/CJ    Enabled K.si/8         MC- 12 DS- 4            disk
5/DK    Enabled K.si/8         MC- 12 DS- 4            disk
6/EL    Enabled K.si/8         MC- 12 DS- 4            disk
7/F     Enabled K.sdi          MC- 42 DS- 3            n/a
8/M     Enabled K.si           MC- 12 DS- 4            disk
9/N     Enabled K.si           MC- 12 DS- 4            disk
```

In this example, requestor 2 is a 4-port K.si module that is configured as a tape data channel. Requestors 4, 5, and 6 are 8-port K.si modules that are configured as disk data channels. Requestors 8 and 9 are 4-port K.si modules that are configured as disk data channels. Note that this SHOW REQUESTORS display may not represent an advisable HSC controller configuration. It is intended to illustrate the various combinations of displays only.

For each requestor, the following information is displayed:

- Requestor number and bulkhead

- Status (enabled or disabled)

- Type of requestor (P.ioj/c, K.ci, K.si, K.sdi, K.sti, or Empty)

- Microcode version—If the requestor is a K.si module, the type of microcode loaded is also displayed. In the example, Requestor 2 is a 4-port K.si module that is configured as a disk data channel. By default, disk microcode is loaded into a K.si module.

8. Enter the reconfiguring commands (shown in bold type in the example) as
   follows, then reboot the HSC controller:

   `Ctrl/Y`

   HSC>**RUN SETSHO** `Return`

   SETSHO>**SET REQUESTOR 2/TYPE=TAPE** `Return`

   SETSHO-I Your settings require an IMMEDIATE reboot on exit.

   SETSHO>**EXIT** `Return`

   SETSHO-Q Rebooting HSC. Press RETURN to continue, CTRL/Y to abort: `Return`

   INIPIO-I Booting...

       HSC95 Version V700 30-Jul-1992 10:25:18   System HSC009

   Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992

   Digital Equipment Corporation. All Rights Reserved.

9. Check to see if any red status indicators are lit on any modules in the card
   cage. Follow standard troubleshooting procedures and replace any failed
   modules. (If a module is replaced, you may have to reset all of your system
   parameters.)

10. Set the Online switch to the in position. Check that the Online indicator
    on the OCP lights within 15 seconds. Enter Ctrl/Y, then reconcile any error
    messages.

11. Ensure that OpenVMS software can access the disks for that HSC controller
    by mounting and performing failover on the disks, if applicable. Verify that
    at least one disk or tape per requestor is functional on the upgraded HSC
    controller.

12. Connect any additional cables and install any disks as required to complete
    the subsystem installation.

To ensure that the upgrade modules are fully functional, run the ILEXER
and ILMEMY device integrity tests. Refer to Chapter 4 of the *HSC Controller
Installation Manual* for instructions when running these tests.

6.8 Returning the Removed Modules

Digital Multivendor Services personnel and customers who install their own
upgrades should use the following instructions for repackaging and returning the
removed HSC modules. Use the following procedure in the U.S. area only:

1. Package the HSC modules in the same container(s) in which the HSC
   controller upgrade kit was shipped. Be sure the return address label has been
   removed from inside the box prior to packing.

CAUTION

When handling modules, wear the ESD grounding wrist strap provided
inside the front door of the HSC controller cabinet. Do not put modules
on anything other than a properly grounded antistatic work surface.

---

2. Seal the container securely with packing tape.

3. Affix the return address label shipped with the upgrade kit to the outside of the package. Be sure to cover up all previous shipping information with the address label or with packing tape. If the label is lost or missing from the kit, create a label similar to the example shown in Figure 6–9.

Figure 6–9 Sample Return Mailing Label

RETURN TO
Returns Sort Center
D001

DEC # _____   RA # _____

Ship to:

Digital Equipment Corp.
Rt 127 Dock Area D001
Contoocook, NH 03229-9210
ATTN: Returns Sort Center

CXO-3341A

4. Contact your district CAS representative for a Return Authorization Number (RA #). CAS will also need the Digital sales order number (DEC #) and the customer name. CAS will arrange for pickup of this material.

_____ **Note** _____

If you do not know the appropriate CAS representative, contact the district sales office for instructions.

_____

5. Write the DEC # and the RA # on the return address label. Please be sure this number is legible.

6. Digital Multivendor Services engineers should advise the customer that they will be billed for these modules if they are not returned to Digital Equipment Corporation. If there are any questions, the customer should contact a Digital sales representative.

7. Ensure that the package is sent to the customer shipping area for pickup.

8. Digital Multivendor Services engineers should fill out the LARS form, ensuring that the fields listed in Table 6–4 are filled out as indicated.

Table 6–4 LARS Form Fields

Field	Required Entry
System Processor Type:	HSC
Activity:	N
Call Type:	I
Module/Fail Area:	HSCxx–xx/xx RA #_ _ _ The HSC controller upgrade kit order number (HSCxx–xx) is as listed in the shipping paperwork. Ensure that the RA number (RA #) is also as listed.

7

Upgrading Your HSC40 Controller to an HSC95 Controller

This chapter contains a new procedure to upgrade an existing HSC40 controller to an HSC95 controller. After installing your upgrade kit, the upgraded HSC controller will be the higher level model in all respects.

7.1 Preparing for the Upgrade

Perform the following steps to prepare for the upgrade:

1. Use the packing slip to verify that all the components of the upgrade kit are included and are not damaged. If there is a discrepancy between Table 7–1 and the packing slip, the packing slip takes precedence.

Table 7–1   HSC9X–LA/LB Upgrade Kit Contents

Digital Part Number	Component Description	Quantity
L0124–AA	K.pli2 port processor module	1
L0118–YA	LINK2 link module	1
L0125–AA	PILA2 port buffer module	1
L0142–YC	P.ioj2 I/O control processor module	1
L0123–BA	M.std5 memory standard module	1
L0121–BA	M.cache2 cache memory module	1
HSC5x–EA/EB	60 Hz or 50 Hz auxiliary power supply	1
17–00958–01	SI cables	4
70–23125–02	Rear door assembly	1
74–38607–09	HSC95 medallion	1
36–15946–01	Product conversion label	1
36–21684–07	HSC95 module placement label	1
74–46084–01	Cable cover	1
EK–HSCCN–IN. A01	*HSC65 and HSC95 Controller Installation Manual*	1

2. At the HSC> prompt on your console terminal screen display, enter a SHOW ALL command to extract the system parameters. The SHOW ALL command displays information and parameters of the following SHOW commands:

SHOW CI	SHOW MEMORY
SHOW CONNECTIONS	SHOW ODT
SHOW CREDIT_MANAGER	SHOW POLLER
SHOW DISKS	SHOW REQUESTORS
SHOW ERROR	SHOW SERVER CACHE
SHOW EXCEPTION	SHOW SERVER DISK
SHOW HOST	SHOW SYSTEM
SHOW LINES	SHOW TAPES
SHOW LOAD	SHOW VIRTUAL_CIRCUITS

3. Print a hard copy of these system parameters if your system does not automatically produce a copy. You will use this copy to reset the HSC software parameters after installing your upgrade components.

4. If your cluster does not have failover capabilities, shut down the cluster and go to step 7.

5. If your cluster has failover capabilities, fail over all disk and tape drives to the alternate HSC controller.

6. Enter the SHOW TAPES and SHOW DISKS commands to verify that no tape or disk drives are on line to the HSC controller being upgraded (shown in bold type in the example).

```
HSC>SHOW DISKS Return

SETSHO-I No Disk units found

The Disk NOHOST_ACCESS Table is empty.

The CACHE Table is empty.
SETSHO-I Program Exit
  Ctrl/Y
HSC> SHOW TAPES Return

SETSHO-I No Tape units found

The Tape NOHOST_ACCESS Table is empty.
SETSHO-I Program Exit
```

─────────────────────── **Note** ───────────────────────

Some disk or tape drives may appear in the above examples if they are in the AVAILABLE state but not ONLINE. This is acceptable and you should continue with the upgrade.

──

7.2 Installing Upgrade Kit Modules

Install the new modules from the upgrade kit using the following procedure:

1. Set the Online switch on the HSC controller operator control panel (OCP) to the out position. Figure 7–1 shows the location of the Online switch.

2. Open the front door of the HSC controller cabinet.

Figure 7–1   Locating the OCP Online Switch
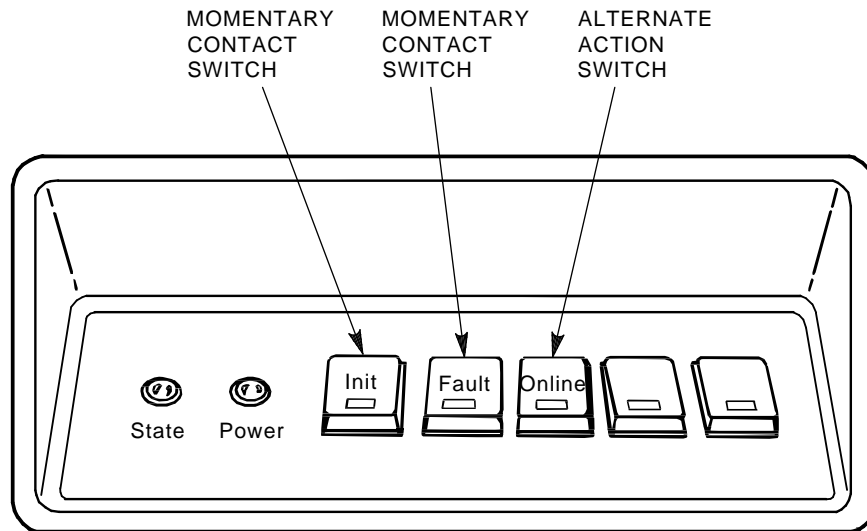
CXO-008B_S

3. Turn dc power off by setting the DC Power switch to the 0 position. The DC Power switch is located on the left side of the RX33 disk drive housing at the front of the HSC controller.

4. Open the rear door of the HSC controller cabinet.

5. Turn off ac power by setting the HSC power controller circuit breaker (CB) to the 0 position, as shown in Figure 7–2. Verify that power is off by checking that no LEDs are lit on the installed modules.

_____ **CAUTION** _____

If the power control bus is connected to another device, use caution when removing the power control bus cable. This bus could be daisy chained to other equipment that is not related to the HSC controller.

_____

6. At the front of your HSC controller, turn the nylon latches on the card cage cover plate one-quarter turn clockwise or counterclockwise. Pull the card cage cover up and out and set it aside.

Figure 7–2 HSC Power Controller Front Panel
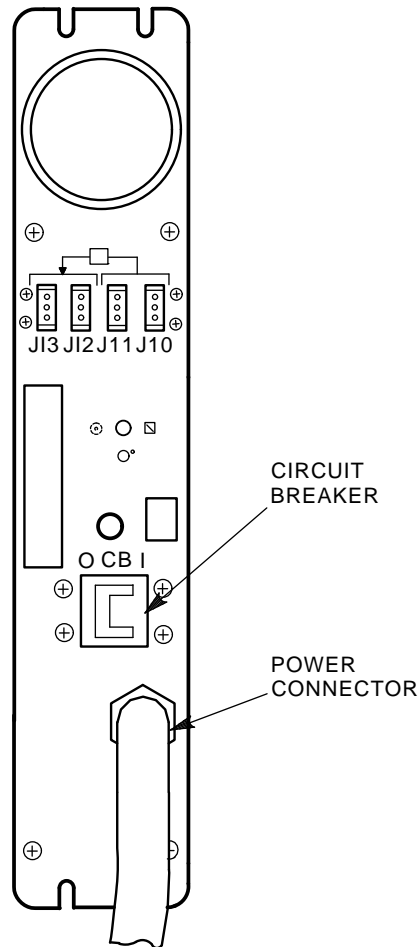
CXO-1117B

_____ **CAUTION** _____

Do not attempt to handle HSC controller modules unless you have taken
proper precautions against electrostatic discharge (ESD). When handling
modules, wear the ESD grounding wrist strap provided inside the front
door of the HSC controller cabinet. Do not put modules on anything other
than a properly grounded antistatic work surface.

_____

7. Remove selected HSC40 modules and replace them with the upgrade modules
   listed in Table 7–2.

Table 7–2   Upgrade Modules for HSC40 to HSC95 Controller Upgrade

Card Cage Slot Number	Module Part Numbers
Slot 1:	
Remove module	L0111–YA
Replace with module	L0142–YC
Slot 2:	
Remove module	L0117–AA
Replace with module	L0123–BA
Slot 11:	
Remove module	n/a
Replace with module	L0121–BA
Slot 12:	
Remove module	L0107–YA
Replace with module	L0124–AA
Slot 13:	
Remove module	L0109
Replace with module	L0125–AA
Slot 14:	
Remove module	L0100 E2/L0118–00
Replace with module	L0118–YA

8. Attach the labels accompanying the new modules to the appropriate slot
   position on the module placement label. The placement label is located
   directly above the module card cage.

7.3 Installing the HSC Cabinet Rear Door

Use the following procedure to remove the rear door of the HSC cabinet and
replace it with the door supplied in the upgrade kit:

1. Open the rear door of the HSC controller cabinet.

2. Release the top hinge pin by pulling down on the release lever.

3. Carefully slide the top hinge out of place and lift up on the door to release the
   bottom hinge pin. Use care to avoid bending the bottom hinge pin.

4. Drop the lower pin of the new door from the upgrade kit into place on the
   lower hinge of the cabinet. Pull down on the lever attached to the upper
   hinge pin and slide the top hinge into place. Release the hinge pin lever.

5. Close the rear door.

6. Position the cable cover with its open end down and closed end up. Hook the cover tabs into the matching holes in the rear door and slide the cover down to lock it into place.

7.4 Installing 8-Port K.si Module SDI Cables

Use the following procedure to install the necessary SDI cables for 8-port K.si disk data channel modules:

1. See Figure 7–3 and disconnect the airflow sensor power connector (J70) from the side of the exhaust duct.

2. Remove the exhaust duct from the bottom of the blower duct by lifting up the quick release latch on the right side of the exhaust duct and turning the two quarter-turn latches on the inside left side of the exhaust duct clockwise or counterclockwise. This hardware is shown in Figure 7–3.

Figure 7–3 Removing the Exhaust Duct and Airflow Sensor
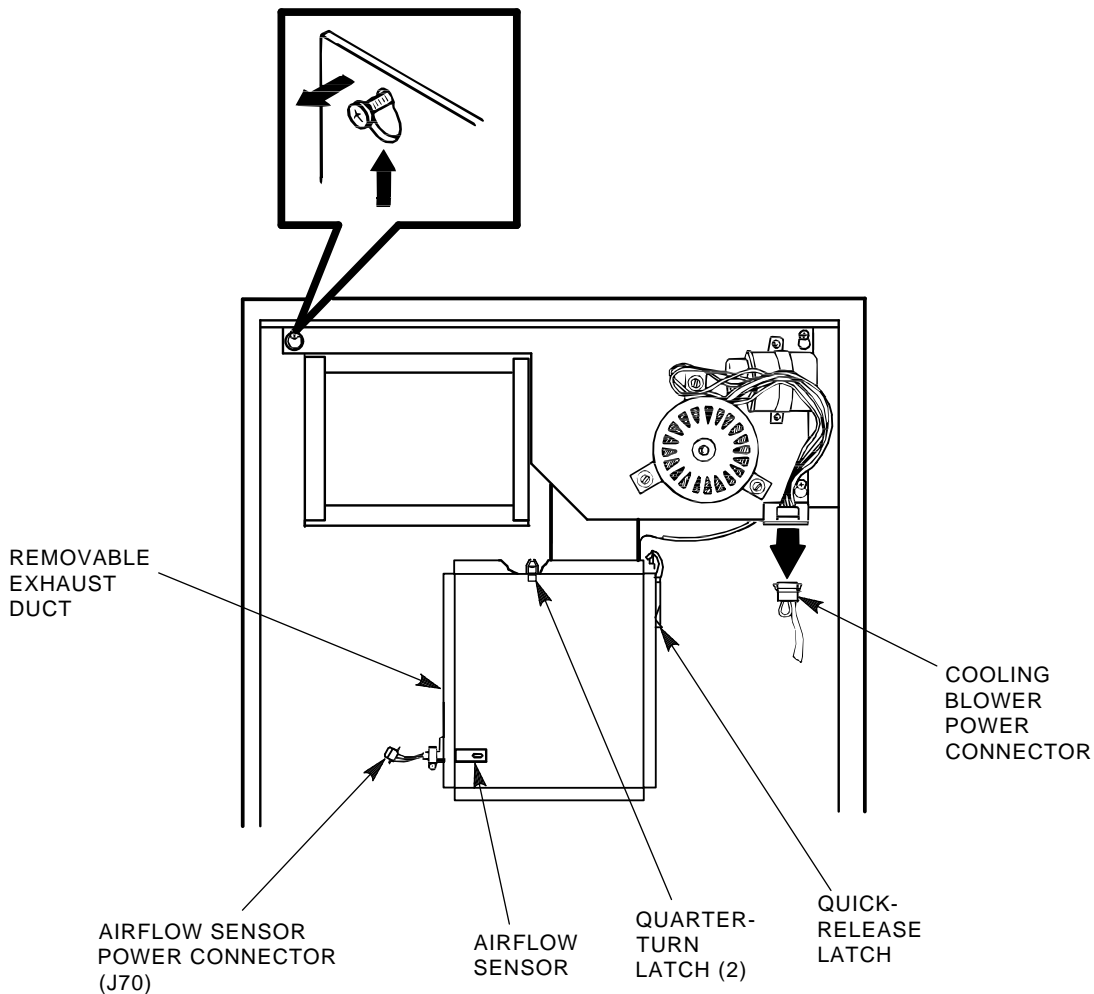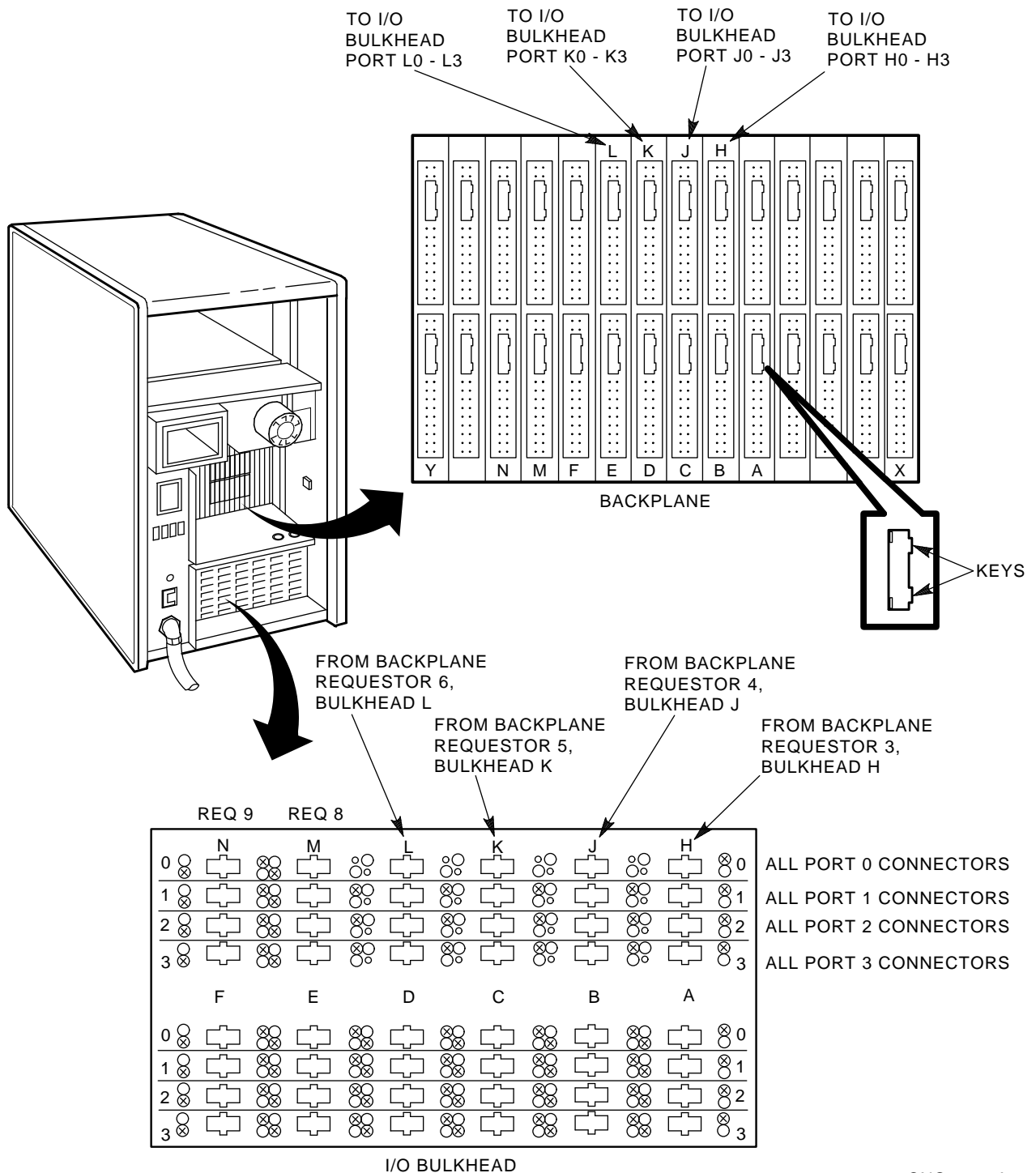

CXO-939C_S

3. See Figure 7–4 and install SDI cables to the HSC controller backplane at sections H/J/K/L. The SDI cable connectors are keyed to be installed only one way. Do not use excessive force; if a connector does not seat easily, be sure you have correctly aligned the connector key with the backplane connector key.

4. Connect the I/O bulkhead end of each SDI cable using Figure 7–4 and Table 7–3 as your guide. These cable connectors are also keyed to be installed only one way. Do not use excessive force; if a connector does not seat easily, be sure you have correctly aligned the key.

Table 7–3   Locations for SDI Cable Connectors

Backplane Requestor	Backplane Section	Port Connector	Position In I/O Bulkhead
3	H	0	H0
3	H	1	H1
3	H	2	H2
3	H	3	H3
4	J	0	J0
4	J	1	J1
4	J	2	J2
4	J	3	J3
5	K	0	K0
5	K	1	K1
5	K	2	K2
5	K	3	K3
6	L	0	L0
6	L	1	L1
6	L	2	L2
6	L	3	L3

5. Install the right-hand screws to all connectors on the I/O bulkhead. Then install the left-hand screws. Recheck the screws for tightness, being careful to not disturb the other I/O bulkhead connectors.

6. Verify that all connectors on the backplane and I/O bulkhead are seated. Verify that you have not disturbed any of the connectors on the CI shelf during installation.

7. Replace the exhaust duct and the airflow sensor power connector.

Figure 7–4 Installing SDI Interconnect Cables to the I/O Bulkhead Panel

TO I/O
BULKHEAD
PORT L0 - L3

TO I/O
BULKHEAD
PORT K0 - K3

TO I/O
BULKHEAD
PORT J0 - J3

TO I/O
BULKHEAD
PORT H0 - H3

L K J H

Y N M F E D C B A X

BACKPLANE

KEYS

FROM BACKPLANE
REQUESTOR 6,
BULKHEAD L

FROM BACKPLANE
REQUESTOR 5,
BULKHEAD K

FROM BACKPLANE
REQUESTOR 4,
BULKHEAD J

FROM BACKPLANE
REQUESTOR 3,
BULKHEAD H

REQ 9   REQ 8

N   M   L   K   J   H

0   0   ALL PORT 0 CONNECTORS
1   1   ALL PORT 1 CONNECTORS
2   2   ALL PORT 2 CONNECTORS
3   3   ALL PORT 3 CONNECTORS

F   E   D   C   B   A

0   0
1   1
2   2
3   3

I/O BULKHEAD

CXO-3046A

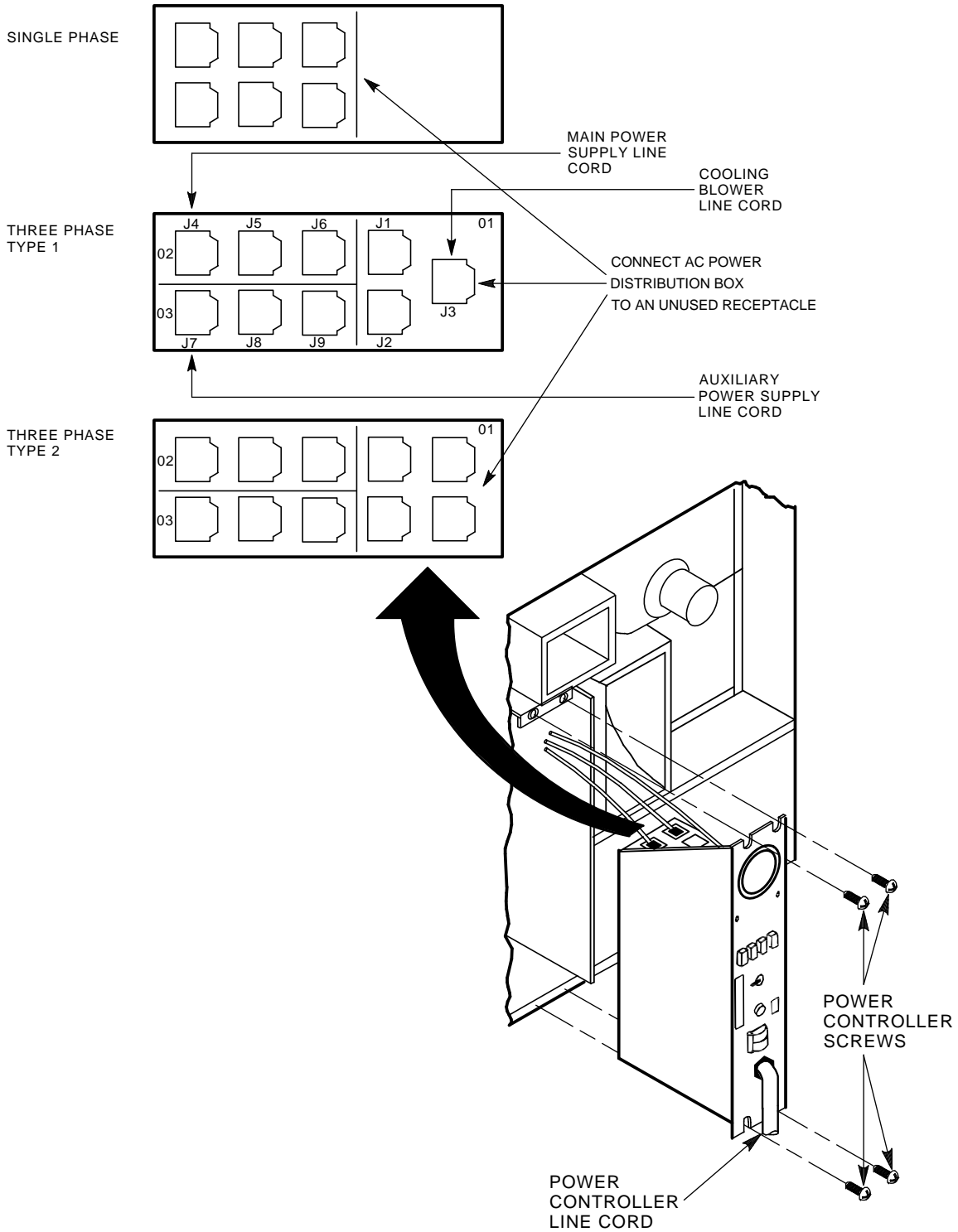## 7.5 Installing an Auxiliary Power Supply (HSC5x–EA/EB)

Use the following procedure to install an auxiliary power supply:

_____ CAUTION _____

Use care when removing the cabinet doors so you do not damage the OCP cable at the front door and the I/O cables at the rear door of the HSC controller cabinet.

_____

1. At the front door of the HSC controller cabinet, verify that there is enough slack in P40 on the OCP and the green grounding wire near the bottom of the door to allow you to remove the door and set it aside. If there is not enough slack, disconnect P40 at the OCP and the grounding wire at the door.

2. Remove both doors of the cabinet by pulling down on the spring-loaded rod on the top hinge inside the door. Lift the doors off their bottom pins and set aside.

3. Remove the rear door latch by loosening its screws to provide the needed clearance to remove the HSC power controller. It is necessary to remove the HSC power controller to provide access to the rear of the auxiliary power supply and its cables.

4. Remove the two top screws and then the two bottom screws that secure the HSC power controller to the cabinet as shown in Figure 7–5. While removing the two bottom screws, push up on the HSC power controller to take the weight off the screws.

5. Pull the HSC power controller out only enough to allow removal of the power control bus cables, if attached. Remove the power control bus cables from connectors J10, J11, J12, and J13 on the front panel of the HSC power controller, as shown in Figure 7–5. Label these cables as you remove them to refer to later when reinstalling the power controller.

6. Pull the HSC power controller completely out of the cabinet and set it on the floor next to the HSC controller. **Be careful not to stress the cables that remain attached to the top panel of the power controller.**

7. At the front of the HSC cabinet, remove the cover plate over the auxiliary power space by loosening the four captive screws in each corner of the plate. These could be Phillips head screws on some models of HSC controller.

8. Remove the L-shaped air baffle plate inside the auxiliary power supply space. Figure 7–6 shows the auxiliary power supply housing that will replace the cover plate.

9. On the auxiliary power supply, remove the two kep nuts and washers from the studs on the rear of the power supply. These nuts may be packaged separately in a plastic bag.

10. Slide the auxiliary power supply into its housing in the cabinet. Make sure that the power cord or other cables are not pinched between the auxiliary power supply and the cabinet while performing this step. Verify that the two studs on TB1 of the auxiliary power supply are through the holes in the flexbus from the HSC backplane.

Figure 7–5   Removing the HSC Power Controller

SINGLE PHASE

MAIN POWER
SUPPLY LINE
CORD

COOLING
BLOWER
LINE CORD

THREE PHASE
TYPE 1

J4   J5   J6   J1   01

02

03

J7   J8   J9   J2

J3

CONNECT AC POWER

DISTRIBUTION BOX

TO AN UNUSED RECEPTACLE

AUXILIARY
POWER SUPPLY
LINE CORD

THREE PHASE
TYPE 2

01

02

03

POWER
CONTROLLER
SCREWS

POWER
CONTROLLER
LINE CORD

CXO-3669A_TI

11. Secure the four captive mounting screws on the front of the auxiliary power supply to the power supply cabinet bracket. These screws are shown in Figure 7–6.

12. Connect the following cables to the rear of the auxiliary power supply, as shown in Figure 7–7. The terminals on auxiliary power supply terminal board TB1 are numbered from left to right.

    a. Connect J50 to the 3-pin connector, P50.

    b. Connect J51 to the 2-pin connector, P51.

    c. Install the two kep nuts and washers on the studs at the lower right-hand edge of TB1.

    d. Route the power cord of the auxiliary power supply through the auxiliary power supply space and into the HSC power controller space.

Figure 7–6 Installing the Auxiliary Power Supply

MAIN POWER SUPPLY

AUXILIARY POWER SUPPLY CABLES

CAPTIVE SCREWS

AUXILIARY POWER SUPPLY GUIDANCE TRACK

AUXILIARY POWER SUPPLY
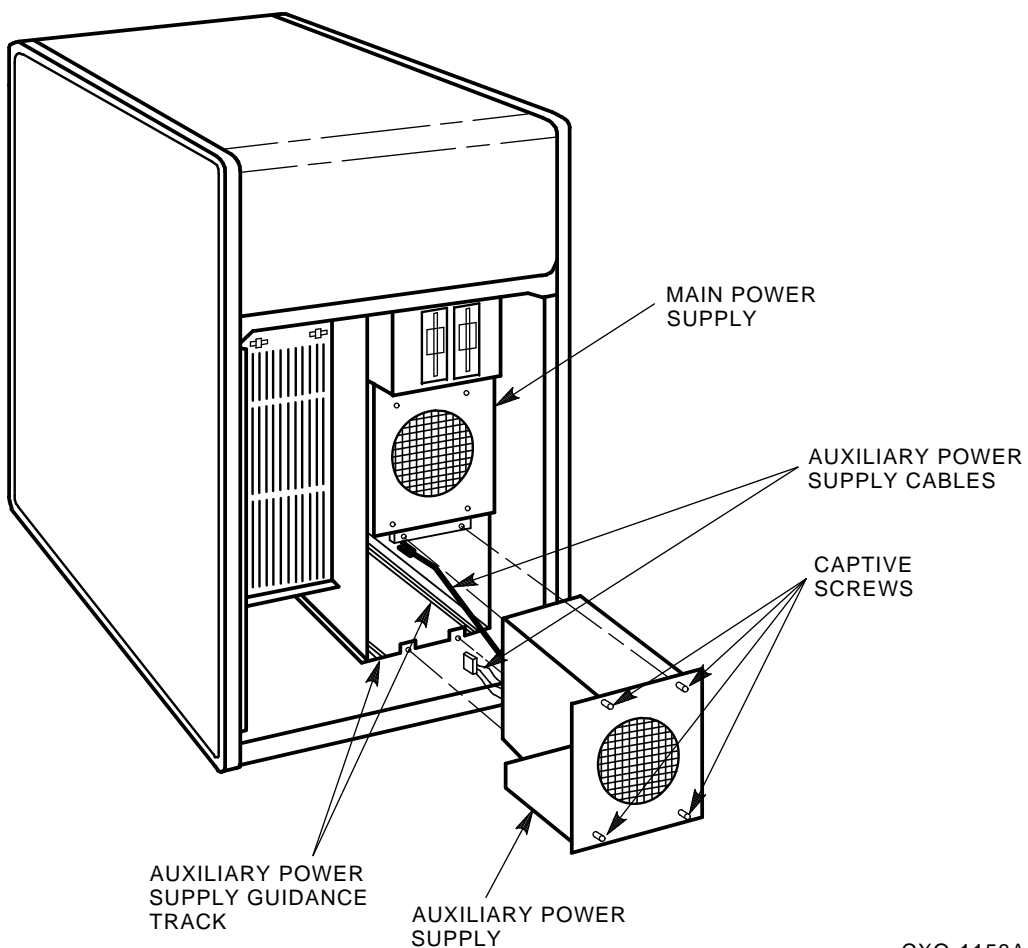
CXO-1158A

Figure 7–7 Auxiliary Power Supply TB1 Connections

WIRE LIST		
COLOR	POSITION	SIGNAL
BLACK	TBI-2	GROUND (5 V SENSE)
RED	TBI-1	5 V SENSE
BROWN	TBI-4	POWER FAIL
BLUE	TBI-7	ACC
BROWN	TBI-6	AC
GRN/YEL	TBI-5	CHASSIS GROUND
BLUE	TBI-3	ON/OFF
BLACK	TBI-2	GROUND (5 V SENSE)
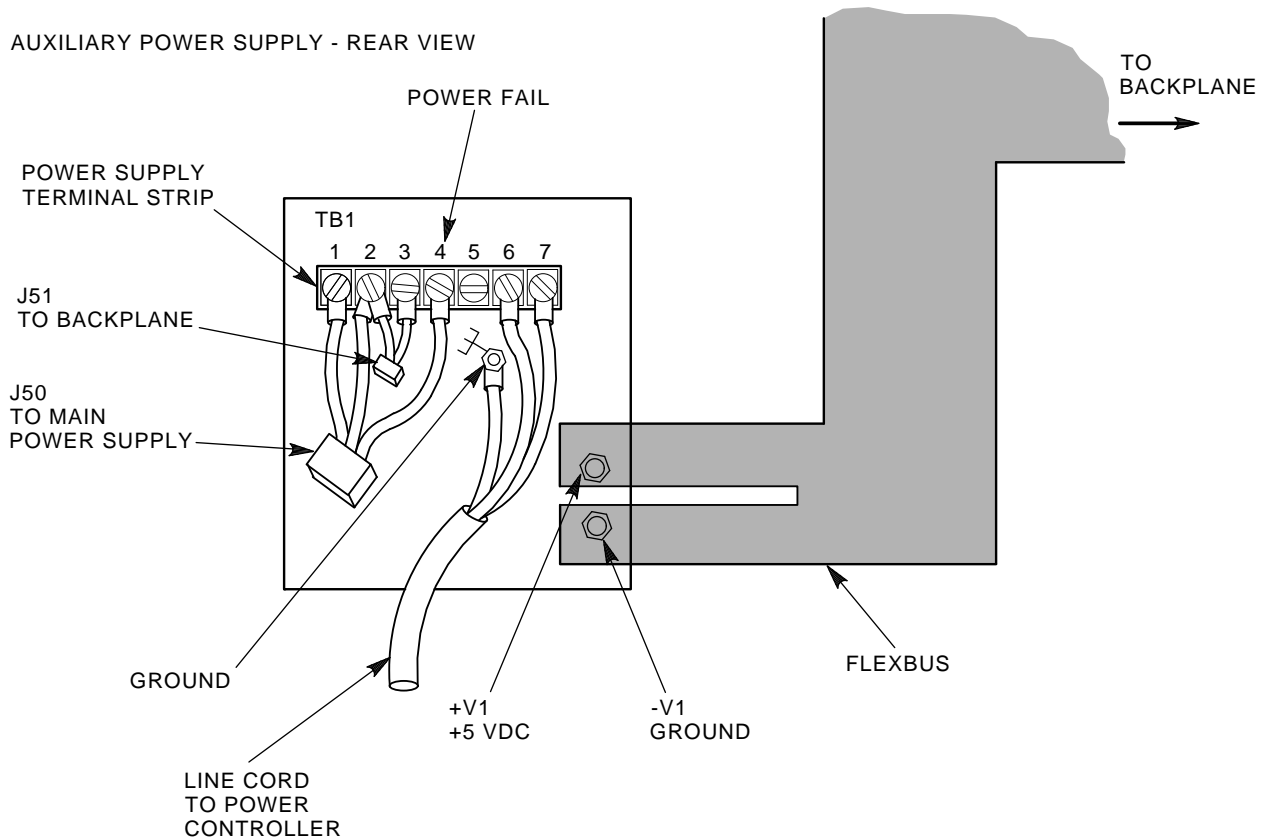
CXO-943B

13. Connect the auxiliary power supply line cord to J7 on the power controller. To ensure proper phase distribution of the source voltage, verify that the main power supply (J4) and cooling blower (J3) line cords (shown in Figure 7–5) are still attached to the top panel of the HSC power controller.

14. Reinstall the power controller in the reverse order that it was removed.

15. Reinstall the front and rear doors of the HSC cabinet. Reconnect P40 on the OCP and the green grounding wire at the bottom of the front door.

16. Reconnect the power cord to the power source and set the HSC power controller circuit breaker to the 1 (ON) position. Set the DC Power switch to the 1 position.

17. Check the voltages for the auxiliary power supply at the following points.

Voltage	Test Point	Check
+5.0 Vdc	Connector P40 on the OCP	Voltage between the red wire, pin 15, and the black wire, pin 14, should read between +4.95 and +5.15 Vdc. If this voltage is not within tolerance, remove power from the HSC controller immediately.
-5.2 Vdc	Connector P70 on the airflow sensor	Voltage between the orange wire, pin 3, and ground should read between –4.96 and –5.46 Vdc.
+12 Vdc	Connector P70 on the airflow sensor	Voltage between the purple wire, pin 1, and ground should read between 11.4 and 12.6 Vdc.

If the +5.0 Vdc output is not at least +4.95 Vdc, verify that the auxiliary power supply fan is running. If the fan is **not** running, verify that the power cord is correctly installed. If the fan **is** running, recheck all connections.

18. Set the DC Power switch to the 0 (OFF) position. Set the power controller circuit breaker to the 0 position and disconnect the HSC controller power cord from the power source.

7.6 Post-Upgrade Tests

Use the following procedure to test the upgrade:

1. Add new requestors (disk or tape data channel modules) to the HSC controller as required. If you are installing new K.si 4-port or 8-port data channel modules, refer to the *HSC Controller Installation Manual* included with your K.si module option kit.

   The K.si modules are by default disk data channels after initial installation or on first boot of the HSC software. If the attached devices are tape drives, perform initialization and reconfiguration procedures, as described in the *HSC Controller Installation Manual*.

2. Replace the card cage cover after all new modules have been installed.

3. Reconnect the HSC controller power cord to the power source.

4. Turn on the HSC controller by setting the circuit breaker (CB) on the HSC power controller to 1 (ON).

5. Ensure the Secure/Enable switch is in the ENABLE position.

6. Verify that the Online switch is in the out position.

7. Ensure that the System and Utilities diskette is installed and the RX33 drive release handle is closed.

8. At the front of the HSC controller, set the DC Power switch to ON.

9. Ensure that the Power indicator on the OCP is on.

Note

If the OCP Power indicator is not on, reset the circuit breaker to 0 (OFF), remove the requestors from the backplane, and reset the circuit breaker to 1 (ON). This check determines if any of the new requestors are causing a problem.

---

10. All HSC controller module green status LEDs should be on.

11. The HSC automatic reboot begins. Verify that the HSC controller console terminal displays the following boot message:

```
INIPIO-I Booting...

    HSC95 Version V800 30-Jul-1992 10:25:18        System HSC009

Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992,
1993.  Digital Equipment Corporation. All Rights Reserved.
```

The HSC controller model, the software version number, and the system number are site specific. If this message is not displayed, verify that the Online switch is set to the out position. If it is, turn off the HSC controller by setting the circuit breaker on the power controller to 0. Verify that all modules are correctly installed and seated in the backplane, then turn the power back on.

7.7 Completing the Upgrade

Perform the following steps to complete the upgrade procedure.

1. Replace the HSC40 controller serial number label on the rear door of the HSC controller with the new HSC95 controller serial number label included with your upgrade kit.

2. Change the medallion on the front door of your HSC40 controller to reflect the new HSC95 controller model number. Figure 7–8 shows the location of the HSC40 medallion.

Figure 7–8 Locating the HSC40 Controller Model Number Medallion

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3. Attach the new HSC95 medallion as follows:

    a. On the inside of the HSC controller front door, remove the old medallion by snipping off the pins behind their securing clips.

    b. Push the new HSC95 medallion through the holes in the front door and secure by twisting the new wing clips onto the medallion's pins.

4. Close and latch the front and rear doors of the HSC controller.

5. Hold the Fault switch in and turn the DC Power switch inside the front door of the HSC controller off and then on. Continue holding the Fault switch in until the "INIPIO-I Booting..." portion of the boot message is displayed:

```
INIPIO-I Booting...

    HSC95 Version V800 30-Jul-1992 10:25:18       System HSC009

Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992,
1993.  Digital Equipment Corporation. All Rights Reserved.
```

The HSC controller model, the software version number, and the system number are site specific. If this message is not displayed, verify that the Online switch is set to the out position. If it is, turn off the HSC controller by setting the circuit breaker on the power controller to 0. Verify that all modules are correctly installed and seated in the backplane, then turn the power back on.

6. Enter the SHOW ALL command at the HSC> prompt and compare the display to the hard copy you made in step 2 of Section 7.1.

7. Set the system name, ID, disk allocation, and tape allocation using the appropriate SET commands. Reset other parameters as required by the site.

_____ **Note** _____

Only reset the SET REQUESTOR parameters if the software has been upgraded, if 4-port K.si modules are added and configured with tape drives, or if tape-to-disk drive/disk drive-to-tape data channel module changes are made.

_____

Enter a SHOW REQUESTORS command to identify the requestors.

[Ctrl/Y]

SETSHO>**SHOW REQUESTORS** [Return]

```
Req     Status  Type            Version             Microcode Loaded
0       Enabled P.ioj
1       Enabled K.ci            MC- 73 DS- 3 Pila-64 K.pli-15   CI
2/A     Enabled K.si            MC- 17 DS- 3              tape
3/B     Enabled K.sti           MC- 27 DS- 2              n/a
4/CJ    Enabled K.si/8          MC- 12 DS- 4              disk
5/DK    Enabled K.si/8          MC- 12 DS- 4              disk
6/EL    Enabled K.si/8          MC- 12 DS- 4              disk
7/F     Enabled K.sdi           MC- 42 DS- 3              n/a
8/M     Enabled K.si            MC- 12 DS- 4              disk
9/N     Enabled K.si            MC- 12 DS- 4              disk
```

In this example, requestor 2 is a 4-port K.si module that is configured as a tape data channel. Requestors 4, 5, and 6 are 8-port K.si modules that are configured as disk data channels. Requestors 8 and 9 are 4-port K.si modules that are configured as disk data channels. Note that this SHOW REQUESTORS display may not represent an advisable HSC controller configuration. It is intended to illustrate the various combinations of displays only.

For each requestor, the following information is displayed:

- Requestor number and bulkhead

- Status (enabled or disabled)

- Type of requestor (P.ioj/c, K.ci, K.si, K.sdi, K.sti, or Empty)

- Microcode version—If the requestor is a K.si module, the type of microcode loaded is also displayed. In the example, Requestor 2 is a 4-port K.si module that is configured as a disk data channel. By default, disk microcode is loaded into a K.si module.

8. Enter the reconfiguring commands (shown in bold type in the example) as follows, then reboot the HSC controller:

Ctrl/Y

HSC>**RUN SETSHO** Return

SETSHO>**SET REQUESTOR 2/TYPE=TAPE** Return

SETSHO-I Your settings require an IMMEDIATE reboot on exit.

SETSHO>**EXIT** Return

SETSHO-Q Rebooting HSC. Press RETURN to continue, CTRL/Y to abort: Return

INIPIO-I Booting...

    HSC95 Version V700 30-Jul-1992 10:25:18   System HSC009

Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992

Digital Equipment Corporation. All Rights Reserved.

9. Check to see if any red status indicators are lit on any modules in the card cage. Follow standard troubleshooting procedures and replace any failed modules. (If a module is replaced, you may have to reset all of your system parameters.)

10. Set the Online switch to the in position. Check that the Online indicator on the OCP lights within 15 seconds. Enter Ctrl/Y, then reconcile any error messages.

11. Ensure that OpenVMS software can access the disks for that HSC controller by mounting and performing failover on the disks, if applicable. Verify that at least one disk or tape per requestor is functional on the upgraded HSC controller.

12. Connect any additional cables and install any disks as required to complete the subsystem installation.

To ensure that the upgrade modules are fully functional, run the ILEXER and ILMEMY device integrity tests. Refer to Chapter 4 of the *HSC Controller Installation Manual* for instructions when running these tests.

7.8 Returning the Removed Modules

Digital Multivendor Services personnel and customers who install their own upgrades should use the following instructions for repackaging and returning the removed HSC modules. Use the following procedure in the U.S. area only:

1. Package the HSC modules in the same container(s) in which the HSC controller upgrade kit was shipped. Be sure the return address label has been removed from inside the box prior to packing.

_____ **CAUTION** _____

When handling modules, wear the ESD grounding wrist strap provided inside the front door of the HSC controller cabinet. Do not put modules on anything other than a properly grounded antistatic work surface.

_____

2. Seal the container securely with packing tape.

3. Affix the return address label shipped with the upgrade kit to the outside of the package. Be sure to cover up all previous shipping information with the address label or with packing tape. If the label is lost or missing from the kit, create a label similar to the example shown in Figure 7–9.

Figure 7–9 Sample Return Mailing Label

```
┌─────────────────────────────────────────────────────┐
│                    RETURN TO                          │
│                Returns Sort Center                    │
│                      D001                             │
│                                                       │
│                                                       │
│   DEC # _____        RA # _____   │
│                                                       │
│                                                       │
│         Ship to:                                      │
│                                                       │
│               Digital Equipment Corp.                 │
│               Rt 127 Dock Area D001                   │
│               Contoocook, NH 03229-9210               │
│               ATTN: Returns Sort Center               │
│                                                       │
└─────────────────────────────────────────────────────┘
```

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4. Contact your district CAS representative for a Return Authorization Number (RA #). CAS will also need the Digital sales order number (DEC #) and the customer name. CAS will arrange for pickup of this material.

_____ **Note** _____

If you do not know the appropriate CAS representative, contact the district sales office for instructions.

_____

5. Write the DEC # and the RA # on the return address label. Please be sure this number is legible.

6. Digital Multivendor Services engineers should advise the customer that they will be billed for these modules if they are not returned to Digital Equipment Corporation. If there are any questions, the customer should contact a Digital sales representative.

7. Ensure that the package is sent to the customer shipping area for pickup.

8. Digital Multivendor Services engineers should fill out the LARS form, ensuring that the fields listed in Table 7–4 are filled out as indicated.

Table 7–4 LARS Form Fields

Field	Required Entry
System Processor Type:	HSC
Activity:	N
Call Type:	I
Module/Fail Area:	HSCxx–xx/xx RA #_ _ _ The HSC controller upgrade kit order number (HSCxx–xx) is as listed in the shipping paperwork. Ensure that the RA number (RA #) is also as listed.

8

Upgrading Your HSC70 Controller to an HSC95 Controller

This chapter contains a new procedure to upgrade an existing HSC70 controller to an HSC95 controller. After installing your upgrade kit, the upgraded HSC controller will be the higher level model in all respects.

8.1 Preparing for the Upgrade

Perform the following steps to prepare for the upgrade:

1. Use the packing slip to verify that all the components of the upgrade kit are included and are not damaged. If there is a discrepancy between Table 8–1 and the packing slip, the packing slip takes precedence.

Table 8–1   HSC9X–PA Upgrade Kit Contents

Digital Part Number	Component Description	Quantity
L0124–AA	K.pli2 port processor module	1
L0118–YA	LINK2 link module	1
L0125–AA	PILA2 port buffer module	1
L0142–YC	P.ioj2 I/O control processor module	1
L0123–BA	M.std5 memory standard module	1
L0121–BA	M.cache2 cache memory module	1
17–00958–01	SI cables	4
70–23125–02	Rear door assembly	1
74–38607–09	HSC95 medallion	1
36–15946–01	Product conversion label	1
36–21684–07	HSC95 module placement label	1
74–46084–01	Cable cover	1
EK–HSCCN–IN. A01	*HSC65 and HSC95 Controller Installation Manual*	1

2. At the HSC> prompt on your console terminal screen display, enter a SHOW ALL command to extract the system parameters. The SHOW ALL command displays information and parameters of the following SHOW commands:

SHOW CI	SHOW MEMORY
SHOW CONNECTIONS	SHOW ODT
SHOW CREDIT_MANAGER	SHOW POLLER
SHOW DISKS	SHOW REQUESTORS
SHOW ERROR	SHOW SERVER CACHE
SHOW EXCEPTION	SHOW SERVER DISK
SHOW HOST	SHOW SYSTEM
SHOW LINES	SHOW TAPES
SHOW LOAD	SHOW VIRTUAL_CIRCUITS

3. Print a hard copy of these system parameters if your system does not automatically produce a copy. You will use this copy to reset the HSC software parameters after installing your upgrade components.

4. If your cluster does not have failover capabilities, shut down the cluster and go to step 7.

5. If your cluster has failover capabilities, fail over all disk and tape drives to the alternate HSC controller.

6. Enter the SHOW TAPES and SHOW DISKS commands to verify that no tape or disk drives are on line to the HSC controller being upgraded (shown in bold type in the example).

```
HSC>SHOW DISKS Return

SETSHO-I No Disk units found

The Disk NOHOST_ACCESS Table is empty.

The CACHE Table is empty.
SETSHO-I Program Exit
 Ctrl/Y 
HSC> SHOW TAPES Return

SETSHO-I No Tape units found

The Tape NOHOST_ACCESS Table is empty.
SETSHO-I Program Exit
```

_____ **Note** _____

Some disk or tape drives may appear in the above examples if they are in the AVAILABLE state but not ONLINE. This is acceptable and you should continue with the upgrade.

_____

8.2 Installing Upgrade Kit Modules

Install the new modules from the upgrade kit using the following procedure:

1. Set the Online switch on the HSC controller operator control panel (OCP) to the out position. Figure 8–1 shows the location of the Online switch.

2. Open the front door of the HSC controller cabinet.

Figure 8–1   Locating the OCP Online Switch

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3. Turn dc power off by setting the DC Power switch to the 0 position. The DC Power switch is located on the left side of the RX33 disk drive housing at the front of the HSC controller.

4. Open the rear door of the HSC controller cabinet.

5. Turn off ac power by setting the HSC power controller circuit breaker (CB) to the 0 position, as shown in Figure 8–2. Verify that power is off by checking that no LEDs are lit on the installed modules.

_____ **CAUTION** _____

If the power control bus is connected to another device, use caution when removing the power control bus cable. This bus could be daisy chained to other equipment that is not related to the HSC controller.

_____

6. At the front of your HSC controller, turn the nylon latches on the card cage cover plate one-quarter turn clockwise or counterclockwise. Pull the card cage cover up and out and set it aside.

Figure 8–2 HSC Power Controller Front Panel

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_____ **CAUTION** _____

Do not attempt to handle HSC controller modules unless you have taken
proper precautions against electrostatic discharge (ESD). When handling
modules, wear the ESD grounding wrist strap provided inside the front
door of the HSC controller cabinet. Do not put modules on anything other
than a properly grounded antistatic work surface.

_____

7. Remove selected HSC70 modules and replace them with the upgrade modules
   listed in Table 8–2.

Table 8–2   Upgrade Modules for HSC70 to HSC95 Controller Upgrade

Card Cage Slot Number	Module Part Numbers
Slot 1:	
Remove module	L0111–00
Replace with module	L0142–YC
Slot 2:	
Remove module	L0117–AA
Replace with module	L0123–BA
Slot 11:	
Remove module	n/a
Replace with module	L0121–BA
Slot 12:	
Remove module	L0107–YA
Replace with module	L0124–AA
Slot 13:	
Remove module	L0109
Replace with module	L0125–AA
Slot 14:	
Remove module	L0100 E2/L0118–00
Replace with module	L0118–YA

8. Attach the labels accompanying the new modules to the appropriate slot position on the module placement label. The placement label is located directly above the module card cage.

8.3 Installing the HSC Cabinet Rear Door

Use the following procedure to remove the rear door of the HSC cabinet and replace it with the door supplied in the upgrade kit:

1. Open the rear door of the HSC controller cabinet.

2. Release the top hinge pin by pulling down on the release lever.

3. Carefully slide the top hinge out of place and lift up on the door to release the bottom hinge pin. Use care to avoid bending the bottom hinge pin.

4. Drop the lower pin of the new door from the upgrade kit into place on the lower hinge of the cabinet. Pull down on the lever attached to the upper hinge pin and slide the top hinge into place. Release the hinge pin lever.

5. Close the rear door.

6. Position the cable cover with its open end down and closed end up. Hook the cover tabs into the matching holes in the rear door and slide the cover down to lock it into place.

8.4 Installing 8-Port K.si Module SDI Cables

Use the following procedure to install the necessary SDI cables for 8-port K.si disk data channel modules:

1. See Figure 8–3 and disconnect the airflow sensor power connector (J70) from the side of the exhaust duct.

2. Remove the exhaust duct from the bottom of the blower duct by lifting up the quick release latch on the right side of the exhaust duct and turning the two quarter-turn latches on the inside left side of the exhaust duct clockwise or counterclockwise. This hardware is shown in Figure 8–3.

Figure 8–3 Removing the Exhaust Duct and Airflow Sensor

CXO-939C_S
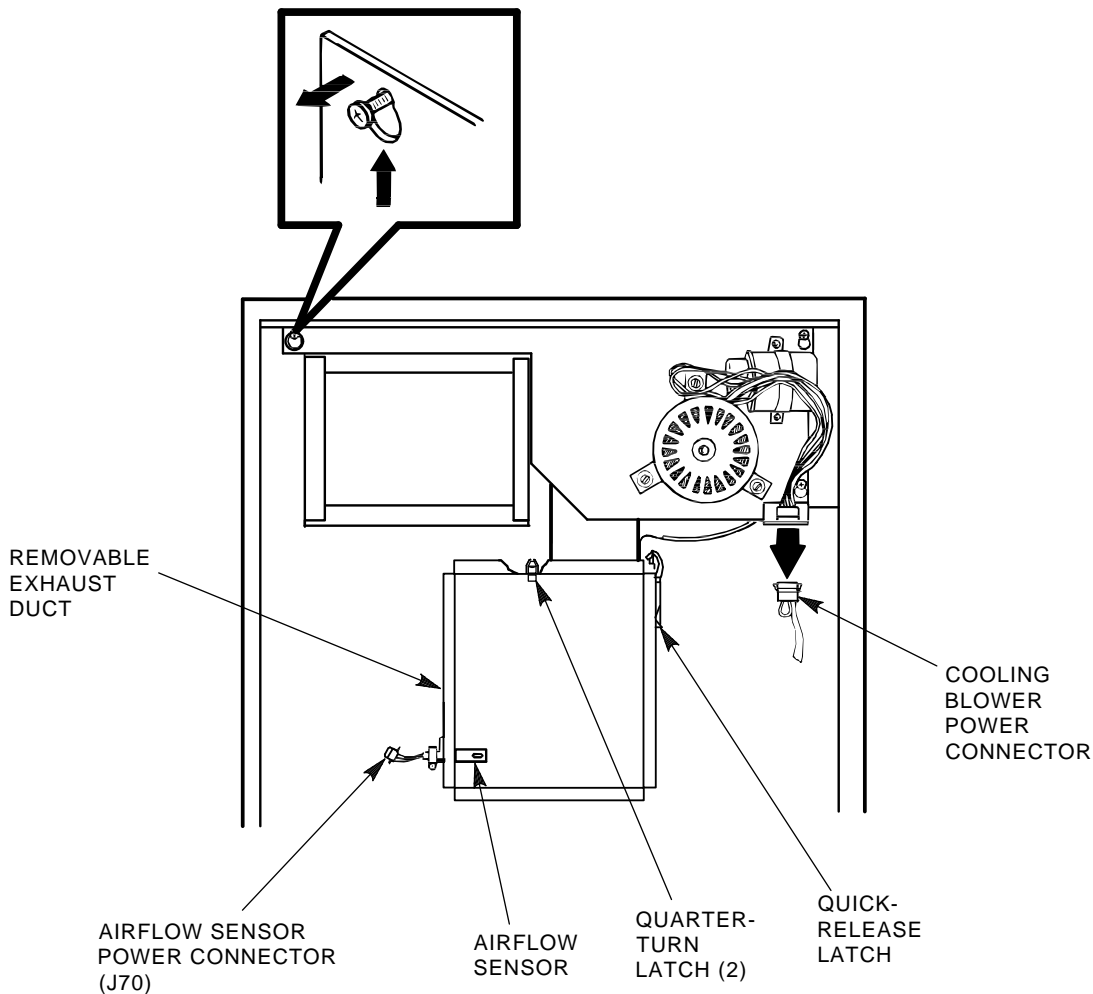
3. See Figure 8–4 and install SDI cables to the HSC controller backplane at sections H/J/K/L. The SDI cable connectors are keyed to be installed only one way. Do not use excessive force; if a connector does not seat easily, be sure you have correctly aligned the connector key with the backplane connector key.

4. Connect the I/O bulkhead end of each SDI cable using Figure 8–4 and Table 8–3 as your guide. These cable connectors are also keyed to be installed only one way. Do not use excessive force; if a connector does not seat easily, be sure you have correctly aligned the key.

Table 8–3 Locations for SDI Cable Connectors

Backplane Requestor	Backplane Section	Port Connector	Position In I/O Bulkhead
3	H	0	H0
3	H	1	H1
3	H	2	H2
3	H	3	H3
4	J	0	J0
4	J	1	J1
4	J	2	J2
4	J	3	J3
5	K	0	K0
5	K	1	K1
5	K	2	K2
5	K	3	K3
6	L	0	L0
6	L	1	L1
6	L	2	L2
6	L	3	L3

5. Install the right-hand screws to all connectors on the I/O bulkhead. Then install the left-hand screws. Recheck the screws for tightness, being careful to not disturb the other I/O bulkhead connectors.

6. Verify that all connectors on the backplane and I/O bulkhead are seated. Verify that you have not disturbed any of the connectors on the CI shelf during installation.

7. Replace the exhaust duct and the airflow sensor power connector.

Figure 8–4 Installing SDI Interconnect Cables to the I/O Bulkhead Panel
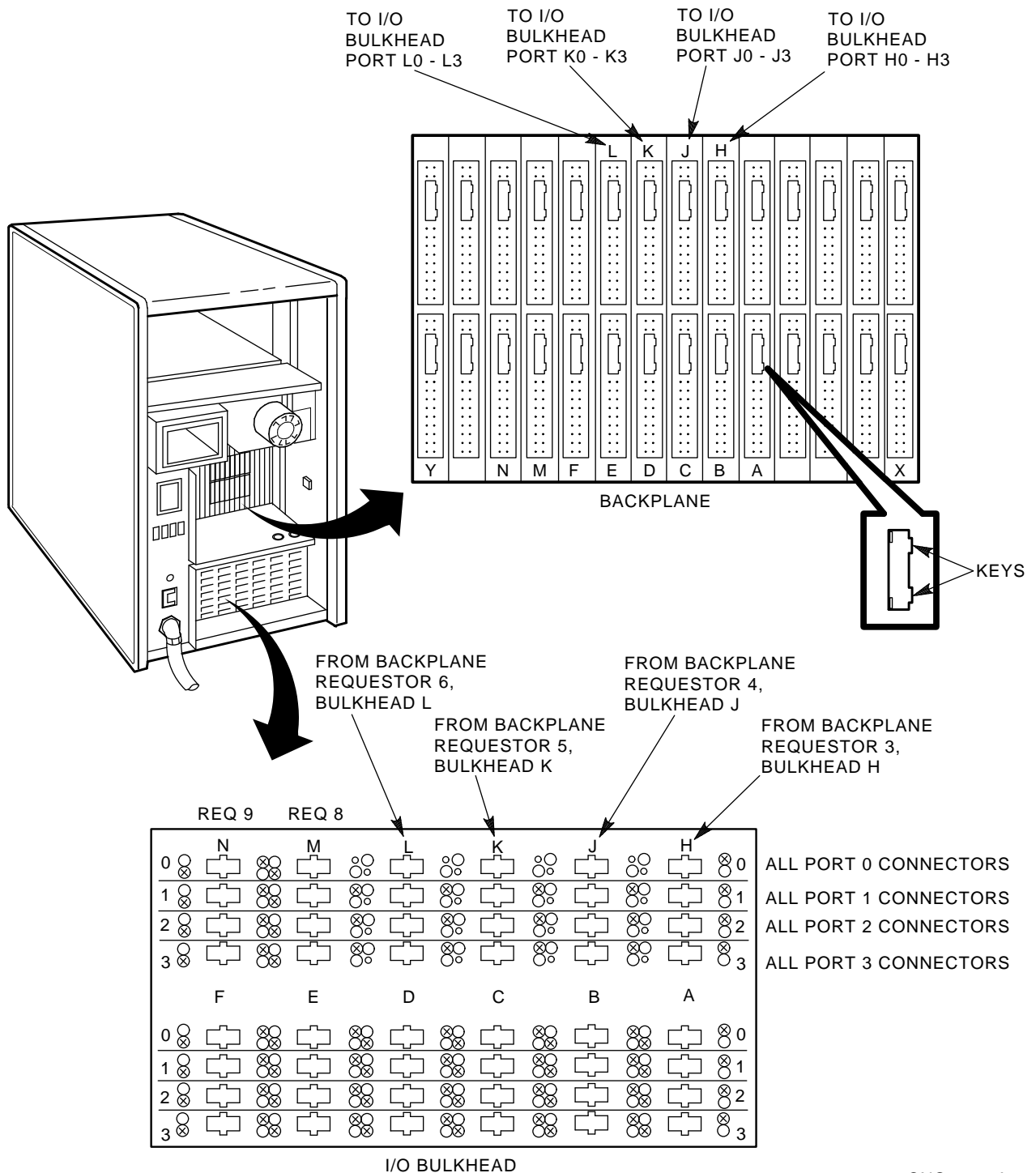
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8.5 Post-Upgrade Tests

Use the following procedure to test the upgrade:

1. Add new requestors (disk or tape data channel modules) to the HSC controller as required. If you are installing new K.si 4-port or 8-port data

channel modules, refer to the *HSC Controller Installation Manual* included with your K.si module option kit.

The K.si modules are by default disk data channels after initial installation or on first boot of the HSC software. If the attached devices are tape drives, perform initialization and reconfiguration procedures, as described in the *HSC Controller Installation Manual*.

2. Replace the card cage cover after all new modules have been installed.

3. Reconnect the HSC controller power cord to the power source.

4. Turn on the HSC controller by setting the circuit breaker (CB) on the HSC power controller to 1 (ON).

5. Ensure the Secure/Enable switch is in the ENABLE position.

6. Verify that the Online switch is in the out position.

7. Ensure that the System and Utilities diskette is installed and the RX33 drive release handle is closed.

8. At the front of the HSC controller, set the DC Power switch to ON.

9. Ensure that the Power indicator on the OCP is on.

--------------------------- **Note** ---------------------------

If the OCP Power indicator is not on, reset the circuit breaker to 0 (OFF), remove the requestors from the backplane, and reset the circuit breaker to 1 (ON). This check determines if any of the new requestors are causing a problem.

----

10. All HSC controller module green status LEDs should be on.

11. The HSC automatic reboot begins. Verify that the HSC controller console terminal displays the following boot message:

```
INIPIO-I Booting...

    HSC95 Version V800 30-Jul-1992 10:25:18      System HSC009

Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992,
1993.  Digital Equipment Corporation. All Rights Reserved.
```

The HSC controller model, the software version number, and the system number are site specific. If this message is not displayed, verify that the Online switch is set to the out position. If it is, turn off the HSC controller by setting the circuit breaker on the power controller to 0. Verify that all modules are correctly installed and seated in the backplane, then turn the power back on.

8.6 Completing the Upgrade

Perform the following steps to complete the upgrade procedure.

1. Replace the HSC70 controller serial number label on the rear door of the HSC controller with the new HSC95 controller serial number label included with your upgrade kit.

2. Change the medallion on the front door of your HSC70 controller to reflect the new HSC95 controller model number. Figure 8–5 shows the location of the HSC70 medallion.

Figure 8–5 Locating the HSC70 Controller Model Number Medallion

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3. Attach the new HSC95 medallion as follows:

   a. On the inside of the HSC controller front door, remove the old medallion by snipping off the pins behind their securing clips.

   b. Push the new HSC95 medallion through the holes in the front door and secure by twisting the new wing clips onto the medallion's pins.

4. Close and latch the front and rear doors of the HSC controller.

5. Hold the Fault switch in and turn the DC Power switch inside the front door of the HSC controller off and then on. Continue holding the Fault switch in until the "INIPIO-I Booting..." portion of the boot message is displayed:

```
INIPIO-I Booting...

    HSC95 Version V800 30-Jul-1992 10:25:18        System HSC009

Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992,
1993.  Digital Equipment Corporation. All Rights Reserved.
```

The HSC controller model, the software version number, and the system number are site specific. If this message is not displayed, verify that the Online switch is set to the out position. If it is, turn off the HSC controller by setting the circuit breaker on the power controller to 0. Verify that all modules are correctly installed and seated in the backplane, then turn the power back on.

6. Enter the SHOW ALL command at the HSC> prompt and compare the display to the hard copy you made in step 2 of Section 8.1.

7. Set the system name, ID, disk allocation, and tape allocation using the appropriate SET commands. Reset other parameters as required by the site.

Note

Only reset the SET REQUESTOR parameters if the software has been upgraded, if 4-port K.si modules are added and configured with tape drives, or if tape-to-disk drive/disk drive-to-tape data channel module changes are made.

Enter a SHOW REQUESTORS command to identify the requestors.

Ctrl/Y

SETSHO>**SHOW REQUESTORS** Return

```
Req     Status  Type            Version             Microcode Loaded
0       Enabled P.ioj
1       Enabled K.ci            MC- 73 DS- 3 Pila-64 K.pli-15   CI
2/A     Enabled K.si            MC- 17 DS- 3            tape
3/B     Enabled K.sti           MC- 27 DS- 2            n/a
4/CJ    Enabled K.si/8          MC- 12 DS- 4            disk
5/DK    Enabled K.si/8          MC- 12 DS- 4            disk
6/EL    Enabled K.si/8          MC- 12 DS- 4            disk
7/F     Enabled K.sdi           MC- 42 DS- 3            n/a
8/M     Enabled K.si            MC- 12 DS- 4            disk
9/N     Enabled K.si            MC- 12 DS- 4            disk
```

In this example, requestor 2 is a 4-port K.si module that is configured as a tape data channel. Requestors 4, 5, and 6 are 8-port K.si modules that are configured as disk data channels. Requestors 8 and 9 are 4-port K.si modules that are configured as disk data channels. Note that this SHOW REQUESTORS display may not represent an advisable HSC controller configuration. It is intended to illustrate the various combinations of displays only.

For each requestor, the following information is displayed:

- Requestor number and bulkhead

- Status (enabled or disabled)

- Type of requestor (P.ioj/c, K.ci, K.si, K.sdi, K.sti, or Empty)

- Microcode version—If the requestor is a K.si module, the type of microcode loaded is also displayed. In the example, Requestor 2 is a 4-port K.si module that is configured as a disk data channel. By default, disk microcode is loaded into a K.si module.

8. Enter the reconfiguring commands (shown in bold type in the example) as follows, then reboot the HSC controller:

`Ctrl/Y`

HSC>**RUN SETSHO** `Return`

SETSHO>**SET REQUESTOR 2/TYPE=TAPE** `Return`

SETSHO-I Your settings require an IMMEDIATE reboot on exit.

SETSHO>**EXIT** `Return`

SETSHO-Q Rebooting HSC. Press RETURN to continue, CTRL/Y to abort: `Return`

INIPIO-I Booting...

    HSC95 Version V700 30-Jul-1992 10:25:18   System HSC009

Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992

Digital Equipment Corporation. All Rights Reserved.

9. Check to see if any red status indicators are lit on any modules in the card cage. Follow standard troubleshooting procedures and replace any failed modules. (If a module is replaced, you may have to reset all of your system parameters.)

10. Set the Online switch to the in position. Check that the Online indicator on the OCP lights within 15 seconds. Enter Ctrl/Y, then reconcile any error messages.

11. Ensure that OpenVMS software can access the disks for that HSC controller by mounting and performing failover on the disks, if applicable. Verify that at least one disk or tape per requestor is functional on the upgraded HSC controller.

12. Connect any additional cables and install any disks as required to complete the subsystem installation.

To ensure that the upgrade modules are fully functional, run the ILEXER and ILMEMY device integrity tests. Refer to Chapter 4 of the *HSC Controller Installation Manual* for instructions when running these tests.

8.7 Returning the Removed Modules

Digital Multivendor Services personnel and customers who install their own upgrades should use the following instructions for repackaging and returning the removed HSC modules. Use the following procedure in the U.S. area only:

1. Package the HSC modules in the same container(s) in which the HSC controller upgrade kit was shipped. Be sure the return address label has been removed from inside the box prior to packing.

―――――――――――――― **CAUTION** ――――――――――――――

When handling modules, wear the ESD grounding wrist strap provided inside the front door of the HSC controller cabinet. Do not put modules on anything other than a properly grounded antistatic work surface.

―――――――――――――――――――――――――――――――――――――――

2. Seal the container securely with packing tape.

3. Affix the return address label shipped with the upgrade kit to the outside of the package. Be sure to cover up all previous shipping information with the address label or with packing tape. If the label is lost or missing from the kit, create a label similar to the example shown in Figure 8–6.

Figure 8–6 Sample Return Mailing Label

```
┌─────────────────────────────────────────────────────────────┐
│                         RETURN TO                            │
│                     Returns Sort Center                      │
│                           D001                               │
│                                                              │
│                                                              │
│    DEC # _____          RA # _____       │
│                                                              │
│                                                              │
│         Ship to:                                             │
│                  Digital Equipment Corp.                     │
│                  Rt 127 Dock Area D001                       │
│                  Contoocook, NH 03229-9210                   │
│                  ATTN: Returns Sort Center                   │
│                                                              │
└─────────────────────────────────────────────────────────────┘
```

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4. Contact your district CAS representative for a Return Authorization Number (RA #). CAS will also need the Digital sales order number (DEC #) and the customer name. CAS will arrange for pickup of this material.

_____ **Note** _____

If you do not know the appropriate CAS representative, contact the district sales office for instructions.

_____

5. Write the DEC # and the RA # on the return address label. Please be sure this number is legible.

6. Digital Multivendor Services engineers should advise the customer that they will be billed for these modules if they are not returned to Digital Equipment Corporation. If there are any questions, the customer should contact a Digital sales representative.

7. Ensure that the package is sent to the customer shipping area for pickup.

8. Digital Multivendor Services engineers should fill out the LARS form, ensuring that the fields listed in Table 8–4 are filled out as indicated.

Table 8–4 LARS Form Fields

Field	Required Entry
System Processor Type:	HSC
Activity:	N
Call Type:	I
Module/Fail Area:	HSCxx–xx/xx RA #_ _ _ The HSC controller upgrade kit order number (HSCxx–xx) is as listed in the shipping paperwork. Ensure that the RA number (RA #) is also as listed.

9

Upgrading Your HSC60 Controller to an HSC65 Controller

This chapter contains a new procedure to upgrade an existing HSC60 controller to an HSC65 controller. After installing your upgrade kit, the upgraded HSC controller will be the higher level model in all respects.

9.1 Preparing for the Upgrade

Perform the following steps to prepare for the upgrade:

1. Use the packing slip to verify that all the components of the upgrade kit are included and are not damaged. If there is a discrepancy between Table 9–1 and the packing slip, the packing slip takes precedence.

Table 9–1   HSC6X–FA/FB/GA Upgrade Kit Contents

Digital Part Number	Component Description	Quantity
L0142–YD	P.ioj2 I/O control processor module	1
L0123–BA	M.std5 memory standard module	1
L0121–BA	M.cache2 cache memory module	1
HSC5x–EA/EB	60 Hz or 50 Hz auxiliary power supply[1]	1
70–23125–02	Rear door assembly	1
74–38607–08	HSC65 medallion	1
36–15946–01	Product conversion label	1
36–21684–06	HSC65 module placement label	1
74–46084–01	Cable cover	1
EK–HSCCN–IN. A01	*HSC65 and HSC95 Controller Installation Manual*	1

[1]Included in HSC6X–FA/FB only.

2. At the HSC> prompt on your console terminal screen display, enter a SHOW ALL command to extract the system parameters. The SHOW ALL command displays information and parameters of the following SHOW commands:

SHOW CI	SHOW MEMORY
SHOW CONNECTIONS	SHOW ODT
SHOW CREDIT_MANAGER	SHOW POLLER
SHOW DISKS	SHOW REQUESTORS
SHOW ERROR	SHOW SERVER CACHE
SHOW EXCEPTION	SHOW SERVER DISK
SHOW HOST	SHOW SYSTEM
SHOW LINES	SHOW TAPES
SHOW LOAD	SHOW VIRTUAL_CIRCUITS

3. Print a hard copy of these system parameters if your system does not automatically produce a copy. You will use this copy to reset the HSC software parameters after installing your upgrade components.

4. If your cluster does not have failover capabilities, shut down the cluster and go to step 7.

5. If your cluster has failover capabilities, fail over all disk and tape drives to the alternate HSC controller.

6. Enter the SHOW TAPES and SHOW DISKS commands to verify that no tape or disk drives are on line to the HSC controller being upgraded (shown in bold type in the example).

HSC>**SHOW DISKS** Return

SETSHO-I No Disk units found

The Disk NOHOST_ACCESS Table is empty.

The CACHE Table is empty.
SETSHO-I Program Exit

Ctrl/Y

HSC> **SHOW TAPES** Return

SETSHO-I No Tape units found

The Tape NOHOST_ACCESS Table is empty.
SETSHO-I Program Exit

_____ **Note** _____

Some disk or tape drives may appear in the above examples if they are in the AVAILABLE state but not ONLINE. This is acceptable and you should continue with the upgrade.

_____

9.2 Installing Upgrade Kit Modules

Install the new modules from the upgrade kit using the following procedure:

1. Set the Online switch on the HSC controller operator control panel (OCP) to the out position. Figure 9–1 shows the location of the Online switch.

2. Open the front door of the HSC controller cabinet.

Figure 9–1 Locating the OCP Online Switch
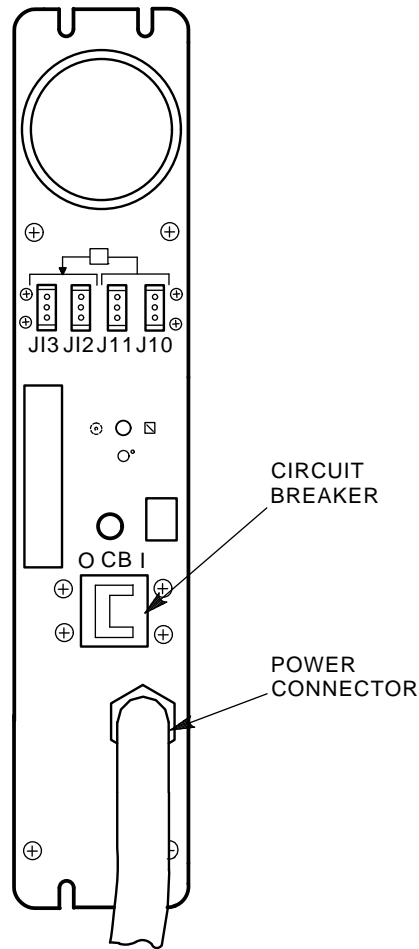
CXO-008B_S

3. Turn dc power off by setting the DC Power switch to the 0 position. The DC Power switch is located on the left side of the RX33 disk drive housing at the front of the HSC controller.

4. Open the rear door of the HSC controller cabinet.

5. Turn off ac power by setting the HSC power controller circuit breaker (CB) to the 0 position, as shown in Figure 9–2. Verify that power is off by checking that no LEDs are lit on the installed modules.

CAUTION

If the power control bus is connected to another device, use caution when removing the power control bus cable. This bus could be daisy chained to other equipment that is not related to the HSC controller.

---

6. At the front of your HSC controller, turn the nylon latches on the card cage cover plate one-quarter turn clockwise or counterclockwise. Pull the card cage cover up and out and set it aside.

Figure 9–2 HSC Power Controller Front Panel

JI3 JI2 J11 J10

CIRCUIT
BREAKER

O CB I

POWER
CONNECTOR

CXO-1117B

_____ **CAUTION** _____

Do not attempt to handle HSC controller modules unless you have taken
proper precautions against electrostatic discharge (ESD). When handling
modules, wear the ESD grounding wrist strap provided inside the front
door of the HSC controller cabinet. Do not put modules on anything other
than a properly grounded antistatic work surface.

_____

7. Remove selected HSC60 modules and replace them with the upgrade modules
    listed in Table 9–2.

Table 9–2 Upgrade Modules for HSC60 to HSC65 Controller Upgrade

Card Cage Slot Number	Module Part Numbers
Slot 1:	
Remove module	L0111–YD
Replace with module	L0142–YD
Slot 2:	
Remove module	L0123–AA
Replace with module	L0123–BA
Slot 11:	
Remove module[1]	L0121–AA
Replace with module	L0121–BA

[1]If installed. Installing the HSC6X–GA upgrade kit requires that you must return the L0121–AA module.

8. Attach the labels accompanying the new modules to the appropriate slot position on the module placement label. The placement label is located directly above the module card cage.

9.3 Installing the HSC Cabinet Rear Door

Use the following procedure to remove the rear door of the HSC cabinet and replace it with the door supplied in the upgrade kit:

1. Open the rear door of the HSC controller cabinet.

2. Release the top hinge pin by pulling down on the release lever.

3. Carefully slide the top hinge out of place and lift up on the door to release the bottom hinge pin. Use care to avoid bending the bottom hinge pin.

4. Drop the lower pin of the new door from the upgrade kit into place on the lower hinge of the cabinet. Pull down on the lever attached to the upper hinge pin and slide the top hinge into place. Release the hinge pin lever.

5. Close the rear door.

6. Position the cable cover with its open end down and closed end up. Hook the cover tabs into the matching holes in the rear door and slide the cover down to lock it into place.

9.4 Installing an Auxiliary Power Supply (HSC5x–EA/EB)

Use the following procedure to install an auxiliary power supply:

_____ **CAUTION** _____

Use care when removing the cabinet doors so you do not damage the OCP cable at the front door and the I/O cables at the rear door of the HSC controller cabinet.

_____

1. At the front door of the HSC controller cabinet, verify that there is enough slack in P40 on the OCP and the green grounding wire near the bottom of the door to allow you to remove the door and set it aside. If there is not enough slack, disconnect P40 at the OCP and the grounding wire at the door.

2. Remove both doors of the cabinet by pulling down on the spring-loaded rod on the top hinge inside the door. Lift the doors off their bottom pins and set aside.

3. Remove the rear door latch by loosening its screws to provide the needed clearance to remove the HSC power controller. It is necessary to remove the HSC power controller to provide access to the rear of the auxiliary power supply and its cables.

4. Remove the two top screws and then the two bottom screws that secure the HSC power controller to the cabinet as shown in Figure 9–3. While removing the two bottom screws, push up on the HSC power controller to take the weight off the screws.

5. Pull the HSC power controller out only enough to allow removal of the power control bus cables, if attached. Remove the power control bus cables from connectors J10, J11, J12, and J13 on the front panel of the HSC power controller, as shown in Figure 9–3. Label these cables as you remove them to refer to later when reinstalling the power controller.

6. Pull the HSC power controller completely out of the cabinet and set it on the floor next to the HSC controller. **Be careful not to stress the cables that remain attached to the top panel of the power controller.**

7. At the front of the HSC cabinet, remove the cover plate over the auxiliary power space by loosening the four captive screws in each corner of the plate. These could be Phillips head screws on some models of HSC controller.

8. Remove the L-shaped air baffle plate inside the auxiliary power supply space. Figure 9–4 shows the auxiliary power supply housing that will replace the cover plate.

9. On the auxiliary power supply, remove the two kep nuts and washers from the studs on the rear of the power supply. These nuts may be packaged separately in a plastic bag.

10. Slide the auxiliary power supply into its housing in the cabinet. Make sure that the power cord or other cables are not pinched between the auxiliary power supply and the cabinet while performing this step. Verify that the two studs on TB1 of the auxiliary power supply are through the holes in the flexbus from the HSC backplane.

11. Secure the four captive mounting screws on the front of the auxiliary power supply to the power supply cabinet bracket. These screws are shown in Figure 9–4.

12. Connect the following cables to the rear of the auxiliary power supply, as shown in Figure 9–5. The terminals on auxiliary power supply terminal board TB1 are numbered from left to right.

    a. Connect J50 to the 3-pin connector, P50.

    b. Connect J51 to the 2-pin connector, P51.
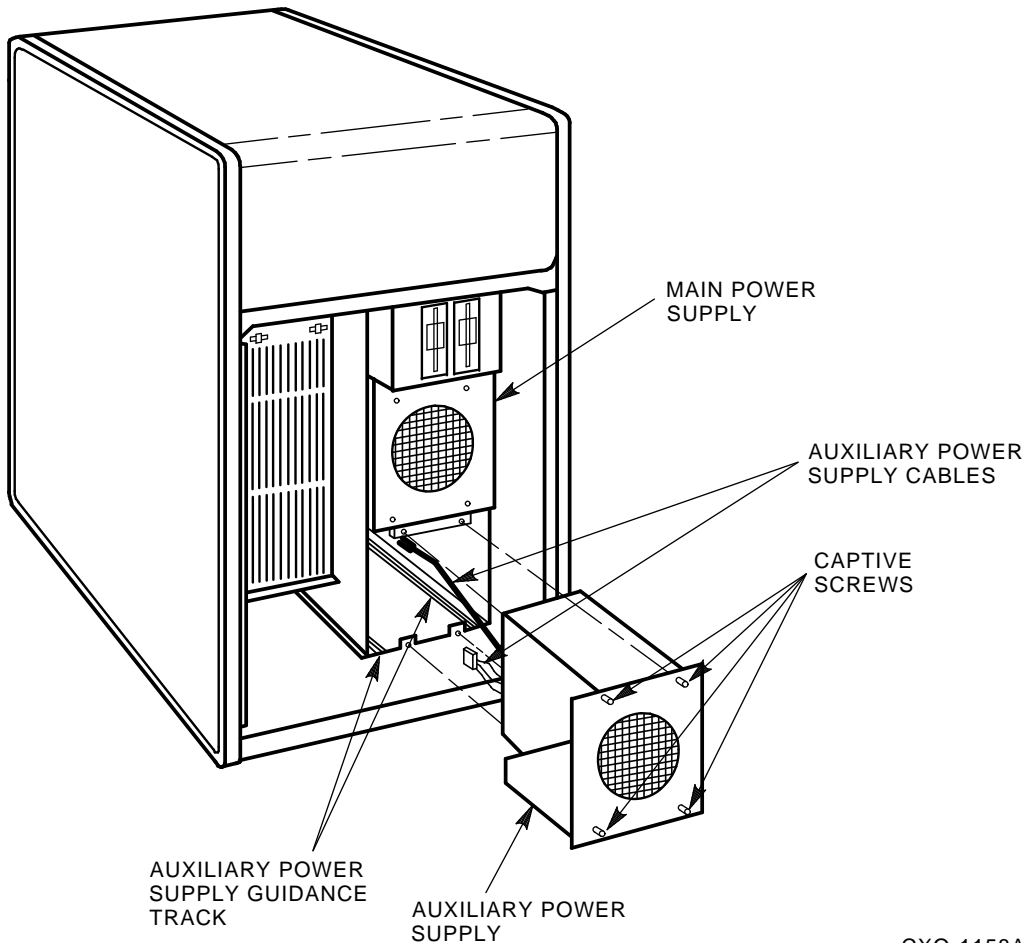
Figure 9–3 Removing the HSC Power Controller

SINGLE PHASE

MAIN POWER
SUPPLY LINE
CORD

COOLING
BLOWER
LINE CORD

THREE PHASE
TYPE 1

J4   J5   J6   J1   01

02

03

J7   J8   J9   J2

J3

CONNECT AC POWER

DISTRIBUTION BOX

TO AN UNUSED RECEPTACLE

AUXILIARY
POWER SUPPLY
LINE CORD

THREE PHASE
TYPE 2

01

02

03

POWER
CONTROLLER
SCREWS

POWER
CONTROLLER
LINE CORD

CXO-3669A_TI

c. Install the two kep nuts and washers on the studs at the lower right-hand edge of TB1.

d. Route the power cord of the auxiliary power supply through the auxiliary power supply space and into the HSC power controller space.

Figure 9–4 Installing the Auxiliary Power Supply
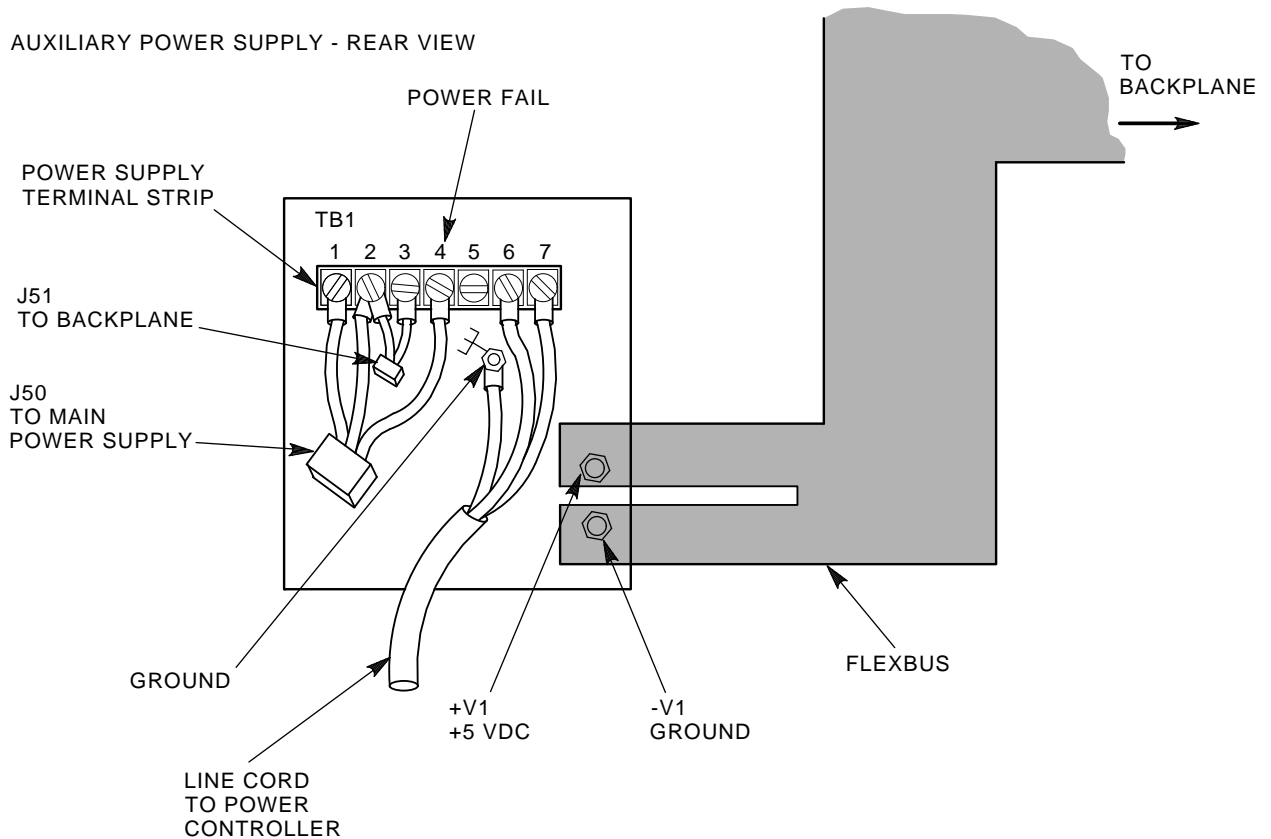
MAIN POWER SUPPLY

AUXILIARY POWER SUPPLY CABLES

CAPTIVE SCREWS

AUXILIARY POWER SUPPLY GUIDANCE TRACK

AUXILIARY POWER SUPPLY

CXO-1158A

13. Connect the auxiliary power supply line cord to J7 on the power controller. To ensure proper phase distribution of the source voltage, verify that the main power supply (J4) and cooling blower (J3) line cords (shown in Figure 9–3) are still attached to the top panel of the HSC power controller.

14. Reinstall the power controller in the reverse order that it was removed.

15. Reinstall the front and rear doors of the HSC cabinet. Reconnect P40 on the OCP and the green grounding wire at the bottom of the front door.

Figure 9–5 Auxiliary Power Supply TB1 Connections

WIRE LIST		
COLOR	POSITION	SIGNAL
BLACK	TBI-2	GROUND (5 V SENSE)
RED	TBI-1	5 V SENSE
BROWN	TBI-4	POWER FAIL
BLUE	TBI-7	ACC
BROWN	TBI-6	AC
GRN/YEL	TBI-5	CHASSIS GROUND
BLUE	TBI-3	ON/OFF
BLACK	TBI-2	GROUND (5 V SENSE)

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16. Reconnect the power cord to the power source and set the HSC power controller circuit breaker to the 1 (ON) position. Set the DC Power switch to the 1 position.

17. Check the voltages for the auxiliary power supply at the following points.

Voltage	Test Point	Check
+5.0 Vdc	Connector P40 on the OCP	Voltage between the red wire, pin 15, and the black wire, pin 14, should read between +4.95 and +5.15 Vdc. If this voltage is not within tolerance, remove power from the HSC controller immediately.
-5.2 Vdc	Connector P70 on the airflow sensor	Voltage between the orange wire, pin 3, and ground should read between –4.96 and –5.46 Vdc.
+12 Vdc	Connector P70 on the airflow sensor	Voltage between the purple wire, pin 1, and ground should read between 11.4 and 12.6 Vdc.

If the +5.0 Vdc output is not at least +4.95 Vdc, verify that the auxiliary power supply fan is running. If the fan is **not** running, verify that the power cord is correctly installed. If the fan **is** running, recheck all connections.

18. Set the DC Power switch to the 0 (OFF) position. Set the power controller circuit breaker to the 0 position and disconnect the HSC controller power cord from the power source.

9.5 Post-Upgrade Tests

Use the following procedure to test the upgrade:

1. Add new requestors (disk or tape data channel modules) to the HSC controller as required. If you are installing new K.si 4-port or 8-port data channel modules, refer to the *HSC Controller Installation Manual* included with your K.si module option kit.

   The K.si modules are by default disk data channels after initial installation or on first boot of the HSC software. If the attached devices are tape drives, perform initialization and reconfiguration procedures, as described in the *HSC Controller Installation Manual*.

2. Replace the card cage cover after all new modules have been installed.

3. Reconnect the HSC controller power cord to the power source.

4. Turn on the HSC controller by setting the circuit breaker (CB) on the HSC power controller to 1 (ON).

5. Ensure the Secure/Enable switch is in the ENABLE position.

6. Verify that the Online switch is in the out position.

7. Ensure that the System and Utilities diskette is installed and the RX33 drive release handle is closed.

8. At the front of the HSC controller, set the DC Power switch to ON.

9. Ensure that the Power indicator on the OCP is on.

_____ **Note** _____

If the OCP Power indicator is not on, reset the circuit breaker to 0 (OFF), remove the requestors from the backplane, and reset the circuit breaker

to 1 (ON). This check determines if any of the new requestors are causing a problem.

10. All HSC controller module green status LEDs should be on.

11. The HSC automatic reboot begins. Verify that the HSC controller console terminal displays the following boot message:

```
INIPIO-I Booting...

    HSC95 Version V800 30-Jul-1992 10:25:18      System HSC009
```

Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992, 1993. Digital Equipment Corporation. All Rights Reserved.

The HSC controller model, the software version number, and the system number are site specific. If this message is not displayed, verify that the Online switch is set to the out position. If it is, turn off the HSC controller by setting the circuit breaker on the power controller to 0. Verify that all modules are correctly installed and seated in the backplane, then turn the power back on.

9.6 Completing the Upgrade

Perform the following steps to complete the upgrade procedure:

1. Replace the HSC60 controller serial number label on the rear door of the HSC controller with the new HSC65 controller serial number label included with your upgrade kit.

2. Change the medallion on the front door of your HSC60 controller to reflect the new HSC65 controller model number. Figure 9–6 shows the location of the HSC60 medallion.

Figure 9–6 Locating the HSC60 Controller Model Number Medallion

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3. Attach the new HSC65 medallion as follows:

   a. On the inside of the HSC controller front door, remove the old medallion by snipping off the pins behind their securing clips.

   b. Push the new HSC65 medallion through the holes in the front door and secure by twisting the new wing clips onto the medallion's pins.

4. Close and latch the front and rear doors of the HSC controller.

5. Hold the Fault switch in and turn the DC Power switch inside the front door of the HSC controller off and then on. Continue holding the Fault switch in until the "INIPIO-I Booting..." portion of the boot message is displayed:

```
INIPIO-I Booting...

    HSC95 Version V800 30-Jul-1992 10:25:18        System HSC009

Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992,
1993.  Digital Equipment Corporation. All Rights Reserved.
```

The HSC controller model, the software version number, and the system number are site specific. If this message is not displayed, verify that the Online switch is set to the out position. If it is, turn off the HSC controller by setting the circuit breaker on the power controller to 0. Verify that all modules are correctly installed and seated in the backplane, then turn the power back on.

6. Enter the SHOW ALL command at the HSC> prompt and compare the display to the hard copy you made in step 2 of Section 9.1.

7. Set the system name, ID, disk allocation, and tape allocation using the appropriate SET commands. Reset other parameters as required by the site.

_____ **Note** _____

Only reset the SET REQUESTOR parameters if the software has been upgraded, if 4-port K.si modules are added and configured with tape drives, or if tape-to-disk drive/disk drive-to-tape data channel module changes are made.

_____

Enter a SHOW REQUESTORS command to identify the requestors.

Ctrl/Y

SETSHO>**SHOW REQUESTORS** Return

```
Req     Status  Type            Version                 Microcode Loaded
0       Enabled P.ioj
1       Enabled K.ci            MC- 73 DS- 3 Pila-64 K.pli-15   CI
2/A     Enabled K.si            MC- 17 DS- 3            tape
3/B     Enabled K.sti           MC- 27 DS- 2            n/a
4/CJ    Enabled K.si/8          MC- 12 DS- 4            disk
5/DK    Enabled K.si/8          MC- 12 DS- 4            disk
6/EL    Enabled K.si/8          MC- 12 DS- 4            disk
7/F     Enabled K.sdi           MC- 42 DS- 3            n/a
8/M     Enabled K.si            MC- 12 DS- 4            disk
9/N     Enabled K.si            MC- 12 DS- 4            disk
```

In this example, requestor 2 is a 4-port K.si module that is configured as a tape data channel. Requestors 4, 5, and 6 are 8-port K.si modules that are configured as disk data channels. Requestors 8 and 9 are 4-port K.si modules that are configured as disk data channels. Note that this SHOW REQUESTORS display may not represent an advisable HSC controller configuration. It is intended to illustrate the various combinations of displays only.

For each requestor, the following information is displayed:

- Requestor number and bulkhead

- Status (enabled or disabled)

- Type of requestor (P.ioj/c, K.ci, K.si, K.sdi, K.sti, or Empty)

- Microcode version—If the requestor is a K.si module, the type of microcode loaded is also displayed. In the example, Requestor 2 is a 4-port K.si module that is configured as a disk data channel. By default, disk microcode is loaded into a K.si module.

8. Enter the reconfiguring commands (shown in bold type in the example) as follows, then reboot the HSC controller:

Ctrl/Y

HSC>**RUN SETSHO** Return

SETSHO>**SET REQUESTOR 2/TYPE=TAPE** Return

SETSHO-I Your settings require an IMMEDIATE reboot on exit.

SETSHO>**EXIT** Return

SETSHO-Q Rebooting HSC. Press RETURN to continue, CTRL/Y to abort: Return

INIPIO-I Booting...

    HSC95 Version V700 30-Jul-1992 10:25:18   System HSC009

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Digital Equipment Corporation. All Rights Reserved.

9. Check to see if any red status indicators are lit on any modules in the card cage. Follow standard troubleshooting procedures and replace any failed modules. (If a module is replaced, you may have to reset all of your system parameters.)

10. Set the Online switch to the in position. Check that the Online indicator on the OCP lights within 15 seconds. Enter Ctrl/Y, then reconcile any error messages.

11. Ensure that OpenVMS software can access the disks for that HSC controller by mounting and performing failover on the disks, if applicable. Verify that at least one disk or tape per requestor is functional on the upgraded HSC controller.

12. Connect any additional cables and install any disks as required to complete the subsystem installation.

To ensure that the upgrade modules are fully functional, run the ILEXER and ILMEMY device integrity tests. Refer to Chapter 4 of the *HSC Controller Installation Manual* for instructions when running these tests.

9.7 Returning the Removed Modules

Digital Multivendor Services personnel and customers who install their own upgrades should use the following instructions for repackaging and returning the removed HSC modules. Use the following procedure in the U.S. area only:

1. Package the HSC modules in the same container(s) in which the HSC controller upgrade kit was shipped. Be sure the return address label has been removed from inside the box prior to packing.

_____ **CAUTION** _____

When handling modules, wear the ESD grounding wrist strap provided inside the front door of the HSC controller cabinet. Do not put modules on anything other than a properly grounded antistatic work surface.

_____

2. Seal the container securely with packing tape.

3. Affix the return address label shipped with the upgrade kit to the outside of the package. Be sure to cover up all previous shipping information with the address label or with packing tape. If the label is lost or missing from the kit, create a label similar to the example shown in Figure 9–7.

Figure 9–7 Sample Return Mailing Label

RETURN TO
Returns Sort Center
D001

DEC # _____   RA # _____

Ship to:

Digital Equipment Corp.
Rt 127 Dock Area D001
Contoocook, NH 03229-9210
ATTN: Returns Sort Center

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4. Contact your district CAS representative for a Return Authorization Number (RA #). CAS will also need the Digital sales order number (DEC #) and the customer name. CAS will arrange for pickup of this material.

_____ **Note** _____

If you do not know the appropriate CAS representative, contact the district sales office for instructions.

_____

5. Write the DEC # and the RA # on the return address label. Please be sure this number is legible.

6. Digital Multivendor Services engineers should advise the customer that they will be billed for these modules if they are not returned to Digital Equipment Corporation. If there are any questions, the customer should contact a Digital sales representative.

7. Ensure that the package is sent to the customer shipping area for pickup.

8. Digital Multivendor Services engineers should fill out the LARS form, ensuring that the fields listed in Table 9–3 are filled out as indicated.

Table 9–3 LARS Form Fields

Field	Required Entry
System Processor Type:	HSC
Activity:	N
Call Type:	I
Module/Fail Area:	HSCxx–xx/xx RA #_ _ _ The HSC controller upgrade kit order number (HSCxx–xx) is as listed in the shipping paperwork. Ensure that the RA number (RA #) is also as listed.

10

Upgrading Your HSC60 Controller to an HSC95 Controller

This chapter contains a new procedure to upgrade an existing HSC60 controller to an HSC95 controller. After installing your upgrade kit, the upgraded HSC controller will be the higher level model in all respects.

10.1 Preparing for the Upgrade

Perform the following steps to prepare for the upgrade:

1. Use the packing slip to verify that all the components of the upgrade kit are included and are not damaged. If there is a discrepancy between Table 10–1 and the packing slip, the packing slip takes precedence.

Table 10–1   HSC9X–MA/MB/NA Upgrade Kit Contents

Digital Part Number	Component Description	Quantity
L0142–YC	P.ioj2 I/O control processor module	1
L0123–BA	M.std5 memory standard module	1
L0121–BA	M.cache2 cache memory module	1
HSC5x–EA/EB	60 Hz or 50 Hz auxiliary power supply[1]	1
70–23125–02	Rear door assembly	1
74–38607–09	HSC95 medallion	1
36–15946–01	Product conversion label	1
36–21684–07	HSC95 module placement label	1
74–46084–01	Cable cover	1
EK–HSCCN–IN. A01	*HSC65 and HSC95 Controller Installation Manual*	1

[1]Included in HSC9X–MA/MB only.

2. At the HSC> prompt on your console terminal screen display, enter a SHOW
   ALL command to extract the system parameters. The SHOW ALL command
   displays information and parameters of the following SHOW commands:

SHOW CI	SHOW MEMORY
SHOW CONNECTIONS	SHOW ODT
SHOW CREDIT_MANAGER	SHOW POLLER
SHOW DISKS	SHOW REQUESTORS
SHOW ERROR	SHOW SERVER CACHE
SHOW EXCEPTION	SHOW SERVER DISK
SHOW HOST	SHOW SYSTEM
SHOW LINES	SHOW TAPES
SHOW LOAD	SHOW VIRTUAL_CIRCUITS

3. Print a hard copy of these system parameters if your system does not
   automatically produce a copy. You will use this copy to reset the HSC
   software parameters after installing your upgrade components.

4. If your cluster does not have failover capabilities, shut down the cluster and
   go to step 7.

5. If your cluster has failover capabilities, fail over all disk and tape drives to
   the alternate HSC controller.

6. Enter the SHOW TAPES and SHOW DISKS commands to verify that no tape
   or disk drives are on line to the HSC controller being upgraded (shown in
   bold type in the example).

```
HSC>SHOW DISKS Return

SETSHO-I No Disk units found

The Disk NOHOST_ACCESS Table is empty.

The CACHE Table is empty.
SETSHO-I Program Exit
```
Ctrl/Y
```
HSC> SHOW TAPES Return

SETSHO-I No Tape units found

The Tape NOHOST_ACCESS Table is empty.
SETSHO-I Program Exit
```

_____ **Note** _____

Some disk or tape drives may appear in the above examples if they are
in the AVAILABLE state but not ONLINE. This is acceptable and you
should continue with the upgrade.

_____

10.2 Installing Upgrade Kit Modules

Install the new modules from the upgrade kit using the following procedure:

1. Set the Online switch on the HSC controller operator control panel (OCP) to the out position. Figure 10–1 shows the location of the Online switch.

2. Open the front door of the HSC controller cabinet.

Figure 10–1 Locating the OCP Online Switch

CXO-008B_S

3. Turn dc power off by setting the DC Power switch to the 0 position. The DC Power switch is located on the left side of the RX33 disk drive housing at the front of the HSC controller.

4. Open the rear door of the HSC controller cabinet.

5. Turn off ac power by setting the HSC power controller circuit breaker (CB) to the 0 position, as shown in Figure 10–2. Verify that power is off by checking that no LEDs are lit on the installed modules.

_____ **CAUTION** _____

If the power control bus is connected to another device, use caution when removing the power control bus cable. This bus could be daisy chained to other equipment that is not related to the HSC controller.

_____

6. At the front of your HSC controller, turn the nylon latches on the card cage cover plate one-quarter turn clockwise or counterclockwise. Pull the card cage cover up and out and set it aside.

Figure 10–2 HSC Power Controller Front Panel

CXO-1117B

_____ **CAUTION** _____

Do not attempt to handle HSC controller modules unless you have taken
proper precautions against electrostatic discharge (ESD). When handling
modules, wear the ESD grounding wrist strap provided inside the front
door of the HSC controller cabinet. Do not put modules on anything other
than a properly grounded antistatic work surface.

_____

7. Remove selected HSC60 modules and replace them with the upgrade modules
   listed in Table 10–2.

Table 10–2 Upgrade Modules for HSC60 to HSC95 Controller Upgrade

Card Cage Slot Number	Module Part Numbers
Slot 1:	
Remove module	L0111–YD
Replace with module	L0142–YC
Slot 2:	
Remove module	L0123–AA
Replace with module	L0123–BA
Slot 11:	
Remove module[1]	L0121–AA
Replace with module	L0121–BA

[1]If installed. Installing the HSC9X–NA upgrade kit requires that you must return the L0121–AA module.

8. Attach the labels accompanying the new modules to the appropriate slot position on the module placement label. The placement label is located directly above the module card cage.

10.3 Installing the HSC Cabinet Rear Door

Use the following procedure to remove the rear door of the HSC cabinet and replace it with the door supplied in the upgrade kit:

1. Open the rear door of the HSC controller cabinet.

2. Release the top hinge pin by pulling down on the release lever.

3. Carefully slide the top hinge out of place and lift up on the door to release the bottom hinge pin. Use care to avoid bending the bottom hinge pin.

4. Drop the lower pin of the new door from the upgrade kit into place on the lower hinge of the cabinet. Pull down on the lever attached to the upper hinge pin and slide the top hinge into place. Release the hinge pin lever.

5. Close the rear door.

6. Position the cable cover with its open end down and closed end up. Hook the cover tabs into the matching holes in the rear door and slide the cover down to lock it into place.

10.4 Installing an Auxiliary Power Supply (HSC5x–EA/EB)

Use the following procedure to install an auxiliary power supply:

_____ **CAUTION** _____

Use care when removing the cabinet doors so you do not damage the OCP cable at the front door and the I/O cables at the rear door of the HSC controller cabinet.

_____

1. At the front door of the HSC controller cabinet, verify that there is enough slack in P40 on the OCP and the green grounding wire near the bottom of the door to allow you to remove the door and set it aside. If there is not enough slack, disconnect P40 at the OCP and the grounding wire at the door.

2. Remove both doors of the cabinet by pulling down on the spring-loaded rod on the top hinge inside the door. Lift the doors off their bottom pins and set aside.

3. Remove the rear door latch by loosening its screws to provide the needed clearance to remove the HSC power controller. It is necessary to remove the HSC power controller to provide access to the rear of the auxiliary power supply and its cables.

4. Remove the two top screws and then the two bottom screws that secure the HSC power controller to the cabinet as shown in Figure 10–3. While removing the two bottom screws, push up on the HSC power controller to take the weight off the screws.

5. Pull the HSC power controller out only enough to allow removal of the power control bus cables, if attached. Remove the power control bus cables from connectors J10, J11, J12, and J13 on the front panel of the HSC power controller, as shown in Figure 10–3. Label these cables as you remove them to refer to later when reinstalling the power controller.

6. Pull the HSC power controller completely out of the cabinet and set it on the floor next to the HSC controller. **Be careful not to stress the cables that remain attached to the top panel of the power controller.**

7. At the front of the HSC cabinet, remove the cover plate over the auxiliary power space by loosening the four captive screws in each corner of the plate. These could be Phillips head screws on some models of HSC controller.

8. Remove the L-shaped air baffle plate inside the auxiliary power supply space. Figure 10–4 shows the auxiliary power supply housing that will replace the cover plate.

9. On the auxiliary power supply, remove the two kep nuts and washers from the studs on the rear of the power supply. These nuts may be packaged separately in a plastic bag.

10. Slide the auxiliary power supply into its housing in the cabinet. Make sure that the power cord or other cables are not pinched between the auxiliary power supply and the cabinet while performing this step. Verify that the two studs on TB1 of the auxiliary power supply are through the holes in the flexbus from the HSC backplane.

11. Secure the four captive mounting screws on the front of the auxiliary power supply to the power supply cabinet bracket. These screws are shown in Figure 10–4.

12. Connect the following cables to the rear of the auxiliary power supply, as shown in Figure 10–5. The terminals on auxiliary power supply terminal board TB1 are numbered from left to right.

    a. Connect J50 to the 3-pin connector, P50.

    b. Connect J51 to the 2-pin connector, P51.

Figure 10–3 Removing the HSC Power Controller

SINGLE PHASE

THREE PHASE
TYPE 1

J4   J5   J6   J1   01

02

03

J7   J8   J9   J2

J3

THREE PHASE
TYPE 2

01

02

03

MAIN POWER
SUPPLY LINE
CORD

COOLING
BLOWER
LINE CORD

CONNECT AC POWER
DISTRIBUTION BOX
TO AN UNUSED RECEPTACLE

AUXILIARY
POWER SUPPLY
LINE CORD

POWER
CONTROLLER
SCREWS

POWER
CONTROLLER
LINE CORD

CXO-3669A_TI

c.   Install the two kep nuts and washers on the studs at the lower right-hand edge of TB1.

d.   Route the power cord of the auxiliary power supply through the auxiliary power supply space and into the HSC power controller space.

Figure 10–4 Installing the Auxiliary Power Supply

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13. Connect the auxiliary power supply line cord to J7 on the power controller. To ensure proper phase distribution of the source voltage, verify that the main power supply (J4) and cooling are still attached to the top panel of the HSC power controller.

14. Reinstall the power controller in the reverse order that it was removed.

15. Reinstall the front and rear doors of the HSC cabinet. Reconnect P40 on the OCP and the green grounding wire at the bottom of the front door.

Figure 10–5 Auxiliary Power Supply TB1 Connections

WIRE LIST		
COLOR	POSITION	SIGNAL
BLACK	TBI-2	GROUND (5 V SENSE)
RED	TBI-1	5 V SENSE
BROWN	TBI-4	POWER FAIL
BLUE	TBI-7	ACC
BROWN	TBI-6	AC
GRN/YEL	TBI-5	CHASSIS GROUND
BLUE	TBI-3	ON/OFF
BLACK	TBI-2	GROUND (5 V SENSE)

AUXILIARY POWER SUPPLY - REAR VIEW

POWER FAIL

POWER SUPPLY
TERMINAL STRIP

TB1

1 2 3 4 5 6 7

J51
TO BACKPLANE

J50
TO MAIN
POWER SUPPLY

TO
BACKPLANE

GROUND

+V1
+5 VDC

-V1
GROUND

FLEXBUS

LINE CORD
TO POWER
CONTROLLER

CXO-943B

16. Reconnect the power cord to the power source and set the HSC power controller circuit breaker to the 1 (ON) position. Set the DC Power switch to the 1 position.

17. Check the voltages for the auxiliary power supply at the following points.

Voltage	Test Point	Check
+5.0 Vdc	Connector P40 on the OCP	Voltage between the red wire, pin 15, and the black wire, pin 14, should read between +4.95 and +5.15 Vdc. If this voltage is not within tolerance, remove power from the HSC controller immediately.
-5.2 Vdc	Connector P70 on the airflow sensor	Voltage between the orange wire, pin 3, and ground should read between –4.96 and –5.46 Vdc.
+12 Vdc	Connector P70 on the airflow sensor	Voltage between the purple wire, pin 1, and ground should read between 11.4 and 12.6 Vdc.

If the +5.0 Vdc output is not at least +4.95 Vdc, verify that the auxiliary power supply fan is running. If the fan is **not** running, verify that the power cord is correctly installed. If the fan **is** running, recheck all connections.

18. Set the DC Power switch to the 0 (OFF) position. Set the power controller circuit breaker to the 0 position and disconnect the HSC controller power cord from the power source.

10.5 Post-Upgrade Tests

Use the following procedure to test the upgrade:

1. Add new requestors (disk or tape data channel modules) to the HSC controller as required. If you are installing new K.si 4-port or 8-port data channel modules, refer to the *HSC Controller Installation Manual* included with your K.si module option kit.

   The K.si modules are by default disk data channels after initial installation or on first boot of the HSC software. If the attached devices are tape drives, perform initialization and reconfiguration procedures, as described in the *HSC Controller Installation Manual*.

2. Replace the card cage cover after all new modules have been installed.

3. Reconnect the HSC controller power cord to the power source.

4. Turn on the HSC controller by setting the circuit breaker (CB) on the HSC power controller to 1 (ON).

5. Ensure the Secure/Enable switch is in the ENABLE position.

6. Verify that the Online switch is in the out position.

7. Ensure that the System and Utilities diskette is installed and the RX33 drive release handle is closed.

8. At the front of the HSC controller, set the DC Power switch to ON.

9. Ensure that the Power indicator on the OCP is on.

_____ **Note** _____

If the OCP Power indicator is not on, reset the circuit breaker to 0 (OFF), remove the requestors from the backplane, and reset the circuit breaker

to 1 (ON). This check determines if any of the new requestors are causing a problem.

10. All HSC controller module green status LEDs should be on.

11. The HSC automatic reboot begins. Verify that the HSC controller console terminal displays the following boot message:

```
INIPIO-I Booting...
    HSC95 Version V800 30-Jul-1992 10:25:18      System HSC009
Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992,
1993.  Digital Equipment Corporation. All Rights Reserved.
```

The HSC controller model, the software version number, and the system number are site specific. If this message is not displayed, verify that the Online switch is set to the out position. If it is, turn off the HSC controller by setting the circuit breaker on the power controller to 0. Verify that all modules are correctly installed and seated in the backplane, then turn the power back on.

10.6 Completing the Upgrade

Perform the following steps to complete the upgrade procedure.

1. Replace the HSC60 controller serial number label on the rear door of the HSC controller with the new HSC95 controller serial number label included with your upgrade kit.

2. Change the medallion on the front door of your HSC60 controller to reflect the new HSC95 controller model number. Figure 10–6 shows the location of the HSC60 medallion.

Figure 10–6 Locating the HSC60 Controller Model Number Medallion

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3. Attach the new HSC95 medallion as follows:

   a. On the inside of the HSC controller front door, remove the old medallion by snipping off the pins behind their securing clips.

   b. Push the new HSC95 medallion through the holes in the front door and secure by twisting the new wing clips onto the medallion's pins.

4. Close and latch the front and rear doors of the HSC controller.

5. Hold the Fault switch in and turn the DC Power switch inside the front door of the HSC controller off and then on. Continue holding the Fault switch in until the "INIPIO-I Booting..." portion of the boot message is displayed:

```
INIPIO-I Booting...

    HSC95 Version V800 30-Jul-1992 10:25:18      System HSC009

Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992,
1993.  Digital Equipment Corporation. All Rights Reserved.
```

   The HSC controller model, the software version number, and the system number are site specific. If this message is not displayed, verify that the Online switch is set to the out position. If it is, turn off the HSC controller by setting the circuit breaker on the power controller to 0. Verify that all modules are correctly installed and seated in the backplane, then turn the power back on.

6. Enter the SHOW ALL command at the HSC> prompt and compare the display to the hard copy you made in step 2 of Section 10.1.

7. Set the system name, ID, disk allocation, and tape allocation using the
   appropriate SET commands. Reset other parameters as required by the site.

Note

Only reset the SET REQUESTOR parameters if the software has been
upgraded, if 4-port K.si modules are added and configured with tape
drives, or if tape-to-disk drive/disk drive-to-tape data channel module
changes are made.

Enter a SHOW REQUESTORS command to identify the requestors.

Ctrl/Y

SETSHO>**SHOW REQUESTORS** Return

```
Req     Status  Type            Version                 Microcode Loaded
0       Enabled P.ioj
1       Enabled K.ci            MC- 73 DS- 3 Pila-64 K.pli-15   CI
2/A     Enabled K.si            MC- 17 DS- 3            tape
3/B     Enabled K.sti           MC- 27 DS- 2            n/a
4/CJ    Enabled K.si/8          MC- 12 DS- 4            disk
5/DK    Enabled K.si/8          MC- 12 DS- 4            disk
6/EL    Enabled K.si/8          MC- 12 DS- 4            disk
7/F     Enabled K.sdi           MC- 42 DS- 3            n/a
8/M     Enabled K.si            MC- 12 DS- 4            disk
9/N     Enabled K.si            MC- 12 DS- 4            disk
```

In this example, requestor 2 is a 4-port K.si module that is configured as
a tape data channel. Requestors 4, 5, and 6 are 8-port K.si modules that
are configured as disk data channels. Requestors 8 and 9 are 4-port K.si
modules that are configured as disk data channels. Note that this SHOW
REQUESTORS display may not represent an advisable HSC controller
configuration. It is intended to illustrate the various combinations of displays
only.

For each requestor, the following information is displayed:

- Requestor number and bulkhead
- Status (enabled or disabled)
- Type of requestor (P.ioj/c, K.ci, K.si, K.sdi, K.sti, or Empty)
- Microcode version—If the requestor is a K.si module, the type of
  microcode loaded is also displayed. In the example, Requestor 2 is a
  4-port K.si module that is configured as a disk data channel. By default,
  disk microcode is loaded into a K.si module.

8. Enter the reconfiguring commands (shown in bold type in the example) as follows, then reboot the HSC controller:

<kbd>Ctrl/Y</kbd>

HSC>**RUN SETSHO** <kbd>Return</kbd>

SETSHO>**SET REQUESTOR 2/TYPE=TAPE** <kbd>Return</kbd>

SETSHO-I Your settings require an IMMEDIATE reboot on exit.

SETSHO>**EXIT** <kbd>Return</kbd>

SETSHO-Q Rebooting HSC. Press RETURN to continue, CTRL/Y to abort: <kbd>Return</kbd>

INIPIO-I Booting...

    HSC95 Version V700 30-Jul-1992 10:25:18   System HSC009

Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992

Digital Equipment Corporation. All Rights Reserved.

9. Check to see if any red status indicators are lit on any modules in the card cage. Follow standard troubleshooting procedures and replace any failed modules. (If a module is replaced, you may have to reset all of your system parameters.)

10. Set the Online switch to the in position. Check that the Online indicator on the OCP lights within 15 seconds. Enter Ctrl/Y, then reconcile any error messages.

11. Ensure that OpenVMS software can access the disks for that HSC controller by mounting and performing failover on the disks, if applicable. Verify that at least one disk or tape per requestor is functional on the upgraded HSC controller.

12. Connect any additional cables and install any disks as required to complete the subsystem installation.

To ensure that the upgrade modules are fully functional, run the ILEXER and ILMEMY device integrity tests. Refer to Chapter 4 of the *HSC Controller Installation Manual* for instructions when running these tests.

10.7 Returning the Removed Modules

Digital Multivendor Services personnel and customers who install their own upgrades should use the following instructions for repackaging and returning the removed HSC modules. Use the following procedure in the U.S. area only:

1. Package the HSC modules in the same container(s) in which the HSC controller upgrade kit was shipped. Be sure the return address label has been removed from inside the box prior to packing.

_____ **CAUTION** _____

When handling modules, wear the ESD grounding wrist strap provided inside the front door of the HSC controller cabinet. Do not put modules on anything other than a properly grounded antistatic work surface.

_____

2. Seal the container securely with packing tape.

3. Affix the return address label shipped with the upgrade kit to the outside of the package. Be sure to cover up all previous shipping information with the address label or with packing tape. If the label is lost or missing from the kit, create a label similar to the example shown in Figure 10–7.

Figure 10–7 Sample Return Mailing Label

```
┌─────────────────────────────────────────────────────────────┐
│                         RETURN TO                            │
│                     Returns Sort Center                      │
│                           D001                               │
│                                                              │
│                                                              │
│     DEC # _____          RA # _____      │
│                                                              │
│                                                              │
│           Ship to:                                           │
│                                                              │
│                   Digital Equipment Corp.                    │
│                   Rt 127 Dock Area D001                      │
│                   Contoocook, NH 03229-9210                  │
│                   ATTN: Returns Sort Center                  │
│                                                              │
└─────────────────────────────────────────────────────────────┘
```

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4. Contact your district CAS representative for a Return Authorization Number (RA #). CAS will also need the Digital sales order number (DEC #) and the customer name. CAS will arrange for pickup of this material.

─────────────────────────────── **Note** ───────────────────────────────

If you do not know the appropriate CAS representative, contact the district sales office for instructions.

──

5. Write the DEC # and the RA # on the return address label. Please be sure this number is legible.

6. Digital Multivendor Services engineers should advise the customer that they will be billed for these modules if they are not returned to Digital Equipment Corporation. If there are any questions, the customer should contact a Digital sales representative.

7. Ensure that the package is sent to the customer shipping area for pickup.

8. Digital Multivendor Services engineers should fill out the LARS form, ensuring that the fields listed in Table 10–3 are filled out as indicated.

Table 10–3 LARS Form Fields

Field	Required Entry
System Processor Type:	HSC
Activity:	N
Call Type:	I
Module/Fail Area:	HSCxx–xx/xx RA #_ _ _ The HSC controller upgrade kit order number (HSCxx–xx) is as listed in the shipping paperwork. Ensure that the RA number (RA #) is also as listed.

11

Upgrading Your HSC90 Controller to an HSC95 Controller

This chapter contains a new procedure to upgrade an existing HSC90 controller to an HSC95 controller. After installing your upgrade kit, the upgraded HSC controller will be the higher level model in all respects.

11.1 Preparing for the Upgrade

Perform the following steps to prepare for the upgrade:

1. Use the packing list to verify that all the components of the upgrade kit are included and are not damaged. Table 11–1 lists the components found in your upgrade kit. If there is a discrepancy between this table and the packing slip, the packing slip takes precedence.

Table 11–1   HSC9X–QA Upgrade Kit Contents

Digital Part Number	Component Description	Quantity
L0142–YC	P.ioj2 I/O control processor module	1
L0123–BA	M.std5 memory standard module	1
L0121–BA	M.cache2 cache memory module	1
70–23125–02	Rear door assembly	1
74–38607–09	HSC95 Medallion	1
36–15946–01	Product conversion label	1
36–21684–06	HSC95 module placement label	1
74–46084–01	Cable cover	1
EK–HSCCN–IN. A01	*HSC65 and HSC95 Controller Installation Manual*	1

2. At the HSC> prompt on your console terminal screen display, enter a SHOW ALL command to extract the system parameters. The SHOW ALL command displays information and parameters of the following SHOW commands:

SHOW CI	SHOW MEMORY
SHOW CONNECTIONS	SHOW ODT
SHOW CREDIT_MANAGER	SHOW POLLER
SHOW DISKS	SHOW REQUESTORS
SHOW ERROR	SHOW SERVER CACHE
SHOW EXCEPTION	SHOW SERVER DISK
SHOW HOST	SHOW SYSTEM
SHOW LINES	SHOW TAPES
SHOW LOAD	SHOW VIRTUAL_CIRCUITS

3. Print a hard copy of these system parameters if your system does not automatically produce a copy. You will use this copy to reset the HSC software parameters after installing your upgrade components.

4. If your cluster does not have failover capabilities, shut down the cluster and go to step 7.

5. If your cluster has failover capabilities, fail over all disk and tape drives to the alternate HSC controller.

6. Enter the SHOW TAPES and SHOW DISKS commands to verify that no tape or disk drives are on line to the HSC controller being upgraded (shown in bold type in the example).

```
HSC>SHOW DISKS Return

SETSHO-I No Disk units found

The Disk NOHOST_ACCESS Table is empty.

The CACHE Table is empty.
SETSHO-I Program Exit
 Ctrl/Y
HSC> SHOW TAPES Return

SETSHO-I No Tape units found

The Tape NOHOST_ACCESS Table is empty.
SETSHO-I Program Exit
```

_____ **Note** _____

Some disk or tape drives may appear in the above examples if they are in the AVAILABLE state but not ONLINE. This is acceptable and you should continue with the upgrade.

_____

11.2 Installing Upgrade Kit Modules

Install the new modules from the upgrade kit using the following procedure:

1. Set the Online switch on the HSC controller operator control panel (OCP) to the out position. Figure 11–1 shows the location of the Online switch.

Figure 11–1   Locating the OCP Online Switch
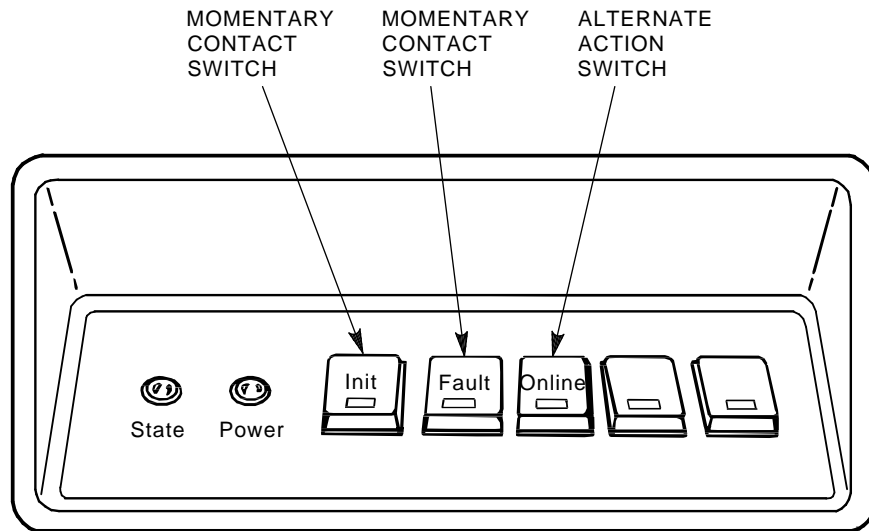
CXO-008B_S

2. Open the front and rear doors of the HSC controller cabinet.

3. Turn dc power off by setting the DC Power switch to the 0 position. The DC Power switch is located on the left side of the RX33 disk drive housing at the front of the HSC controller.

4. Turn off ac power by setting the HSC power controller circuit breaker (CB) to the 0 position, as shown in Figure 11–2. Verify that power is off by checking that no LEDs are lit on the installed modules.

CAUTION

If the power control bus is connected to another device, use caution when removing the power control bus cable. This bus could be daisy chained to other equipment that is not related to the HSC controller.

---

5. Remove the HSC power cord from the power source.

CAUTION

Do not attempt to handle HSC controller modules unless you have taken proper precautions against electrostatic discharge (ESD). When handling modules, wear the ESD grounding wrist strap provided inside the front

---

Figure 11–2 HSC Power Controller Front Panel

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door of the HSC controller cabinet. Do not put modules on anything other than a properly grounded antistatic work surface.

6. At the front of your HSC controller, turn the nylon latches on the card cage cover plate one-quarter turn. One latch turns clockwise, the other counterclockwise. Pull the card cage cover up and out and set it aside.

7. Remove selected HSC90 modules and replace them with the upgrade modules as listed in Table 11–2.

Table 11–2 Upgrade Modules for HSC90 to HSC95 Controller Upgrade

Card Cage Slot Number	HSC90 to HSC95 Module Changes
Slot 1:	
Remove module	L0111–YC
Replace with module	L0142–YC
Slot 2:	
Remove module	L0123–AA
Replace with module	L0123–BA
Slot 11:	
Remove module[1]	L0121–AA
Replace with module	L0121–BA

[1]If installed. Installing the HSC HSC9X–RA upgrade kit requires that you must return the L0121–AA module.

8. Attach the labels accompanying the new modules to the appropriate slot position on the module placement label. The placement label is located directly above the module card cage.

11.3 Installing the HSC Cabinet Rear Door

Use the following procedure to remove the rear door of the HSC cabinet and replace it with the door supplied in the upgrade kit:

1. Open the rear door of the HSC controller cabinet.

2. Release the top hinge pin by pulling down on the release lever.

3. Carefully slide the top hinge out of place and lift up on the door to release the bottom hinge pin. Use care to avoid bending the bottom hinge pin.

4. Drop the lower pin of the new door from the upgrade kit into place on the lower hinge of the cabinet. Pull down on the lever attached to the upper hinge pin and slide the top hinge into place. Release the hinge pin lever.

5. Close the rear door.

6. Position the cable cover with its open end down and closed end up. Hook the cover tabs into the matching holes in the rear door and slide the cover down to lock it into place.

11.4 Post-Upgrade Tests

Use the following procedure to test the upgrade:

1. Add new requestors (disk or tape data channel modules) to the HSC controller as required. If you are installing new K.si 4-port or 8-port data channel modules, refer to the *HSC Controller Installation Manual* included with your K.si module option kit.

The K.si modules are by default disk data channels after initial installation or on first boot of the HSC software. If the attached devices are tape drives, perform initialization and reconfiguration procedures, as described in the *HSC Controller Installation Manual*.

2. Replace the card cage cover after all new modules have been installed.

3. Reconnect the HSC controller power cord to the power source.

4. Turn on the HSC controller by setting the circuit breaker (CB) on the HSC power controller to 1 (ON).

5. Ensure the Secure/Enable switch is in the ENABLE position.

6. Verify that the Online switch is in the out position.

7. Ensure that the System and Utilities diskette is installed and the RX33 drive release handle is closed.

8. At the front of the HSC controller, set the DC Power switch to ON.

9. Ensure that the Power indicator on the OCP is on.

_____ **Note** _____

If the OCP Power indicator is not on, reset the circuit breaker to 0 (OFF), remove the requestors from the backplane, and reset the circuit breaker to 1 (ON). This check determines if any of the new requestors are causing a problem.

_____

10. All HSC controller module green status LEDs should be on.

11. The HSC automatic reboot begins. Verify that the HSC controller console terminal displays the following boot message:

```
INIPIO-I Booting...

    HSC95 Version V800 30-Jul-1992 10:25:18       System HSC009
```

Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992, 1993. Digital Equipment Corporation. All Rights Reserved.

The HSC controller model, the software version number, and the system number are site specific. If this message is not displayed, verify that the Online switch is set to the out position. If it is, turn off the HSC controller by setting the circuit breaker on the power controller to 0. Verify that all modules are correctly installed and seated in the backplane, then turn the power back on.

11.5 Completing the Upgrade

Perform the following steps to complete the upgrade procedure.

1. Replace the HSC90 controller serial number label on the rear door of the HSC controller with the new HSC95 controller serial number label included with your upgrade kit.

2. Change the medallion on the front door of your HSC90 controller to reflect the new HSC95 controller model number. Figure 11–3 shows the location of the HSC90 medallion.

Figure 11–3 Locating the HSC90 Controller Model Number Medallion

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3. Attach the new HSC95 medallion as follows:

    a. On the inside of the HSC controller front door, remove the old medallion by snipping off the pins behind their securing clips.

    b. Push the new Digital HSC95 medallion through the holes in the front door and secure by twisting the new wing clips onto the medallion's pins.

4. Close and latch the front and rear doors of the HSC controller.

5. Hold the Fault switch in and turn the DC Power switch inside the front door of the HSC controller off and then on. Continue holding the Fault switch in until the "INIPIO-I Booting..." portion of the boot message is displayed:

```
INIPIO-I Booting...

    HSC95 Version V800 30-Jul-1992 10:25:18        System HSC009

Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992,
1993.  Digital Equipment Corporation. All Rights Reserved.
```

The HSC controller model, the software version number, and the system number are site specific. If this message is not displayed, verify that the Online switch is set to the out position. If it is, turn off the HSC controller by setting the circuit breaker on the power controller to 0. Verify that all modules are correctly installed and seated in the backplane, then turn the power back on.

6. Enter the SHOW ALL command at the HSC> prompt and compare the display to the hard copy you made in step 2 of Section 11.1.

7. Set the system name, ID, disk allocation, and tape allocation using the appropriate SET commands. Reset other parameters as required by the site.

Note

Only reset the SET REQUESTOR parameters if the software has been upgraded, if 4-port K.si modules are added and configured with tape drives, or if tape-to-disk drive/disk drive-to-tape data channel module changes are made.

Enter a SHOW REQUESTORS command to identify the requestors.

Ctrl/Y

SETSHO>**SHOW REQUESTORS** Return

```
Req     Status  Type            Version             Microcode Loaded
0       Enabled P.ioj
1       Enabled K.ci            MC- 73 DS- 3 Pila-64 K.pli-15   CI
2/A     Enabled K.si            MC- 17 DS- 3            tape
3/B     Enabled K.sti           MC- 27 DS- 2            n/a
4/CJ    Enabled K.si/8          MC- 12 DS- 4            disk
5/DK    Enabled K.si/8          MC- 12 DS- 4            disk
6/EL    Enabled K.si/8          MC- 12 DS- 4            disk
7/F     Enabled K.sdi           MC- 42 DS- 3            n/a
8/M     Enabled K.si            MC- 12 DS- 4            disk
9/N     Enabled K.si            MC- 12 DS- 4            disk
```

In this example, requestor 2 is a 4-port K.si module that is configured as a tape data channel. Requestors 4, 5, and 6 are 8-port K.si modules that are configured as disk data channels. Requestors 8 and 9 are 4-port K.si modules that are configured as disk data channels. Note that this SHOW REQUESTORS display may not represent an advisable HSC controller configuration. It is intended to illustrate the various combinations of displays only.

For each requestor, the following information is displayed:

- Requestor number and bulkhead

- Status (enabled or disabled)

- Type of requestor (P.ioj/c, K.ci, K.si, K.sdi, K.sti, or Empty)

- Microcode version—If the requestor is a K.si module, the type of microcode loaded is also displayed. In the example, Requestor 2 is a 4-port K.si module that is configured as a disk data channel. By default, disk microcode is loaded into a K.si module.

8. Enter the reconfiguring commands (shown in bold type in the example) as follows, then reboot the HSC controller:

`Ctrl/Y`

HSC>**RUN SETSHO** `Return`

SETSHO>**SET REQUESTOR 2/TYPE=TAPE** `Return`

SETSHO-I Your settings require an IMMEDIATE reboot on exit.

SETSHO>**EXIT** `Return`

SETSHO-Q Rebooting HSC. Press RETURN to continue, CTRL/Y to abort: `Return`

INIPIO-I Booting...

    HSC95 Version V700 30-Jul-1992 10:25:18   System HSC009

Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992

Digital Equipment Corporation. All Rights Reserved.

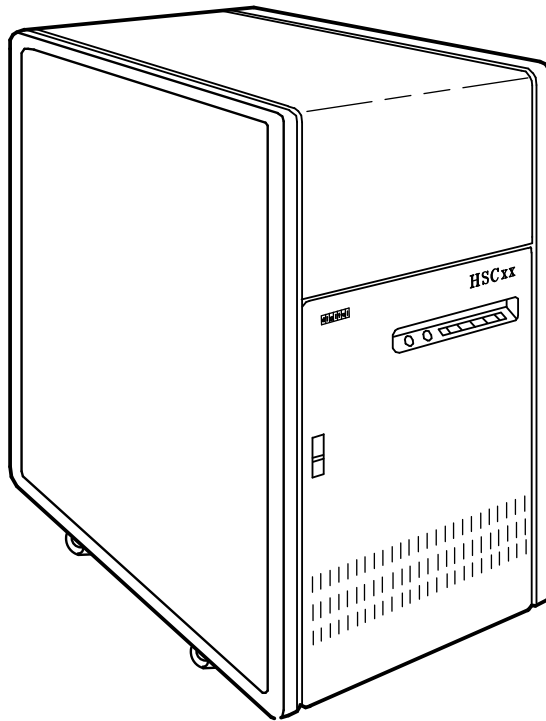9. Check to see if any red status indicators are lit on any modules in the card cage. Follow standard troubleshooting procedures and replace any failed modules. If a module is replaced, you may have to reset all of your system parameters.

10. Set the Online switch to the in position. Check that the Online indicator on the OCP lights within 15 seconds. If not, enter a Ctrl/Y, and the command SET ERROR INFO, and reconcile any error messages.

11. Ensure that OpenVMS software can access the disks for that HSC controller by mounting and performing failover on the disks, if applicable. Verify that at least one disk or tape per requestor is functional on the upgraded HSC controller.

12. Connect any additional cables and install any disk or tape drives as required to complete the subsystem installation.

To ensure that the upgrade modules are fully functional, run the ILEXER and ILMEMY device integrity tests. Refer to Chapter 4 of the *HSC Controller Installation Manual* for instructions when running these tests.

11.6 Returning the Removed Modules

Digital Multivendor Services personnel and customers who install their own upgrades should use the following instructions for repackaging and returning the removed HSC modules. Use the following procedure in the U.S. area only:

1. Package the HSC modules in the same container(s) in which the HSC controller upgrade kit was shipped. Be sure the return address label has been removed from inside the box prior to packing.

_____ **CAUTION** _____

When handling modules, wear the ESD grounding wrist strap provided inside the front door of the HSC controller cabinet. Do not put modules on anything other than a properly grounded antistatic work surface.

_____

2. Seal the container securely with packing tape.

3. Affix the return address label shipped with the upgrade kit to the outside of the package. Be sure to cover up all previous shipping information with the address label or with packing tape. If the label is lost or missing from the kit, create a label similar to the example shown in Figure 11–4.

Figure 11–4 Sample Return Mailing Label

```
┌─────────────────────────────────────────────────────────┐
│                      RETURN TO                            │
│                  Returns Sort Center                      │
│                        D001                               │
│                                                           │
│                                                           │
│   DEC # _____          RA # _____    │
│                                                           │
│                                                           │
│         Ship to:                                          │
│                 Digital Equipment Corp.                   │
│                 Rt 127 Dock Area D001                     │
│                 Contoocook, NH 03229-9210                 │
│                 ATTN: Returns Sort Center                 │
│                                                           │
└─────────────────────────────────────────────────────────┘
```

CXO-3341A

4. Contact your district CAS representative for a Return Authorization Number (RA #). CAS will also need the Digital sales order number (DEC #) and the customer name. CAS will arrange for pickup of this material.

_____ **Note** _____

If you do not know the appropriate CAS representative, contact the district sales office for instructions.

_____

5. Write the DEC # and the RA # on the return address label. Please be sure this number is legible.

6. Digital Multivendor Services engineers should advise the customer that they will be billed for these modules if they are not returned to Digital Equipment Corporation. If there are any questions, the customer should contact a Digital sales representative.

7. Ensure that the package is sent to the customer shipping area for pickup.

8. Digital Multivendor Services engineers should fill out the LARS form, ensuring that the fields listed in Table 11–3 are filled out as indicated.

Table 11–3 LARS Form Fields

Field	Required Entry
System Processor Type:	HSC
Activity:	N
Call Type:	I
Module/Fail Area:	HSCxx–xx/xx RA #_ _ _ The HSC controller upgrade kit order number (HSCxx–xx) is as listed in the shipping paperwork. Ensure that the RA number (RA #) is also as listed.

12

Upgrading Your HSC65 Controller to an HSC95 Controller

This chapter contains a new procedure to upgrade an existing HSC65 controller to an HSC95 controller. After installing your upgrade kit, the upgraded HSC controller will be the higher level model in all respects.

12.1 Preparing for the Upgrade

Perform the following steps to prepare for the upgrade:

1. Use the packing slip to verify that all the components of the upgrade kit are included and are not damaged. Table 12–1 lists the components found in your upgrade kit. If there is a discrepancy between this table and the packing slip, the packing slip takes precedence.

Table 12–1   HSC9X–XX or HSC9X–XX Upgrade Kit Contents

Digital Part Number	Component Description	Quantity
L0142–YC	P.ioj2 I/O control processor module	1
74–38607–09	HSC95 medallion	1
36–15946–01	Product conversion label	1
36–21684–07	HSC95 module placement label	1
EK–HSCCN–IN. A01	*HSC65 and HSC95 Controller Installation Manual*	1

2. At the HSC> prompt on your console terminal screen display, enter a SHOW ALL command to extract the system parameters. The SHOW ALL command displays information and parameters of the following SHOW commands:

SHOW CI	SHOW MEMORY
SHOW CONNECTIONS	SHOW ODT
SHOW CREDIT_MANAGER	SHOW POLLER
SHOW DISKS	SHOW REQUESTORS
SHOW ERROR	SHOW SERVER CACHE
SHOW EXCEPTION	SHOW SERVER DISK
SHOW HOST	SHOW SYSTEM
SHOW LINES	SHOW TAPES
SHOW LOAD	SHOW VIRTUAL_CIRCUITS

3. Print a hard copy of these system parameters if your system does not automatically produce a copy. You will use this copy to reset the HSC software parameters after installing your upgrade components.

4. If your cluster does not have failover capabilities, shut down the cluster and go to step 7.

5. Fail over all disk and tape drives to the alternate HSC controller.

6. Enter the SHOW TAPES and SHOW DISKS commands to verify that no tape or disk drives are on line to the HSC controller being upgraded (shown in bold type in the example).

```
HSC>SHOW DISKS Return

SETSHO-I No Disk units found

The Disk NOHOST_ACCESS Table is empty.

The CACHE Table is empty.
SETSHO-I Program Exit
```

Ctrl/Y

```
HSC> SHOW TAPES Return

SETSHO-I No Tape units found

The Tape NOHOST_ACCESS Table is empty.
SETSHO-I Program Exit
```

──────────────── **Note** ────────────────

Some disk or tape drives may appear in the above examples if they are in the AVAILABLE state but not ONLINE. This is acceptable and you should continue with the upgrade.

──

12.2 Installing Upgrade Kit Modules

Install the new module(s) from the upgrade kit using the following procedure:

1. Set the Online switch on your HSC65 controller operator control panel (OCP) to the out position. Figure 12–1 shows the location of the Online switch.

2. Open the front and rear doors of the HSC controller cabinet.

Figure 12–1 Locating the OCP Online Switch
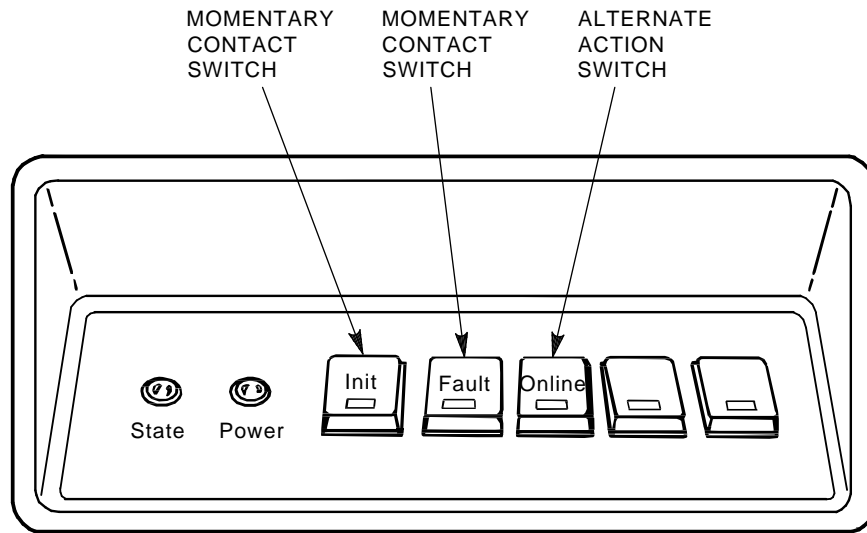
CXO-008B_S

3. Turn dc power off by setting the DC Power switch to the 0 position. The DC Power switch is located on the left side of the RX33 disk controller housing at the front of the HSC controller.

4. Turn off ac power by setting the HSC power controller circuit breaker (CB) to the 0 position, as shown in Figure 12–2. Verify that power is off by checking that no LEDs are lit on any of the installed modules.

CAUTION

If the power control bus is connected to another device, use caution when removing the power control bus cable. This bus could be daisy-chained to other equipment that is not related to this HSC controller.

---

5. Disconnect the HSC power cord from the power source.

CAUTION

Do not attempt to handle HSC controller modules unless you have taken proper precautions against electrostatic discharge (ESD). When handling modules, wear the ESD grounding wrist strap provided inside the front

---

Figure 12–2 Locating the HSC Power Controller Circuit Breaker
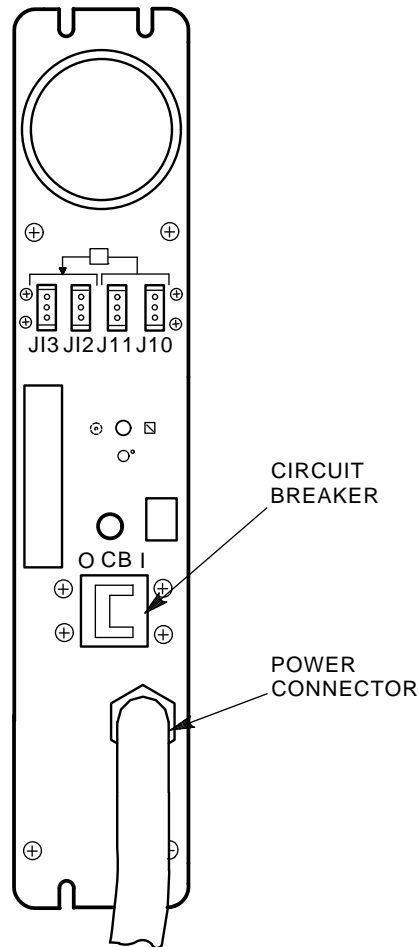
CXO-1117B

door of the HSC controller cabinet. Do not put modules on anything other than a properly grounded antistatic work surface.

6. At the front of your HSC controller, turn the nylon latches on the card cage cover plate one-quarter turn clockwise or counterclockwise. Pull the card cage cover up and out and set it aside.

7. Remove selected HSC65 modules and replace them with the upgrade modules as listed in Table 12–2.

Table 12–2 Upgrade Modules for HSC65 to HSC95 Controller Upgrade

Card Cage Slot Number	HSC65 to HSC95 Module Changes
Slot 1:	
Remove module	L0142–YD
Replace with module	L0142–YC

8. Attach the module labels accompanying the new modules to the appropriate slot position on the module placement label. The placement label is located directly above the module card cage.

12.3 Post-Upgrade Tests

Use the following procedure to test the upgrade:

1. Add new requestors (disk or tape data channel modules) to the HSC controller as required. If you are installing new K.si 4-port or 8-port data channel modules, refer to the *HSC Controller Installation Manual* included with your K.si module option kit.

   The K.si modules are by default disk data channels after initial installation or on first boot of the HSC software. If the attached devices are tape drives, perform initialization and reconfiguration procedures, as described in the *HSC Controller Installation Manual*.

2. Replace the card cage cover after all new modules have been installed.

3. Reconnect the HSC controller power cord to the power source.

4. Turn on the HSC controller by setting the circuit breaker (CB) on the HSC power controller to 1 (ON).

5. Ensure the Secure/Enable switch is in the ENABLE position.

6. Verify that the Online switch is in the out position.

7. Ensure that the System and Utilities diskette is installed and the RX33 drive release handle is closed.

8. At the front of the HSC controller, set the DC Power switch to ON.

9. Ensure that the Power indicator on the OCP is on.

_____ **Note** _____

If the OCP Power indicator is not on, reset the circuit breaker to 0 (OFF), remove the requestors from the backplane, and reset the circuit breaker to 1 (ON). This check determines if any of the new requestors are causing a problem.

_____

10. All HSC controller module green status LEDs should be on.

11. The HSC automatic reboot begins. Verify that the HSC controller console terminal displays the following boot message:

```
INIPIO-I Booting...

    HSC95 Version V800 30-Jul-1992 10:25:18        System HSC009
```

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1993. Digital Equipment Corporation. All Rights Reserved.

The HSC controller model, the software version number, and the system number are site specific. If this message is not displayed, verify that the Online switch is set to the out position. If it is, turn off the HSC controller by setting the circuit breaker on the power controller to 0. Verify that all modules are correctly installed and seated in the backplane, then turn the power back on.

12.4 Completing the Upgrade

Perform the following steps to complete the upgrade procedure:

1. Replace the HSC65 controller serial number label on the rear door of the HSC controller with the new HSC95 controller serial number label included with your upgrade kit.

2. Change the medallion on the front door of your HSC65 controller to reflect the new HSC95 controller model number. Figure 12–3 shows the location of the HSC65 medallion.

Figure 12–3 Locating the HSC65 Controller Model Number Medallion

CXO-3087A

3. Attach the new HSC95 medallion as follows:

   a. On the inside of the HSC controller front door, remove the old medallion by snipping off the pins behind their securing clips.

   b. Push the new Digital HSC95 medallion through the holes in the front door and secure by twisting the new wing clips onto the medallion's pins.

4. Close and latch the front and rear doors of the HSC controller.

5. Hold the Fault switch in and turn the DC Power switch inside the front door of the HSC controller off and then on. Continue holding the Fault switch in until the "INIPIO-I Booting..." portion of the boot message is displayed:

```
INIPIO-I Booting...

     HSC95 Version V800 30-Jul-1992 10:25:18      System HSC009

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1993.  Digital Equipment Corporation. All Rights Reserved.
```

   The HSC controller model, the software version number, and the system number are site specific. If this message is not displayed, verify that the Online switch is set to the out position. If it is, turn off the HSC controller by setting the circuit breaker on the power controller to 0. Verify that all modules are correctly installed and seated in the backplane, then turn the power back on.

6. Enter the SHOW ALL command at the HSC> prompt and compare the display to the hard copy you made in step 2 of Section 12.1.

7. Set the system name, ID, disk allocation, and tape allocation using the appropriate SET commands. Reset other parameters as required by the site.

_____ **Note** _____

Only reset the SET REQUESTOR parameters if the software has been upgraded, if 4-port K.si modules are added and configured with tape drives, or if tape-to-disk drive/disk drive-to-tape data channel module changes are made.

_____

Enter a SHOW REQUESTORS command to identify the requestors.

Ctrl/Y

SETSHO>**SHOW REQUESTORS** Return

```
Req     Status   Type             Version                Microcode Loaded
0       Enabled  P.ioj
1       Enabled  K.ci             MC- 73 DS- 3 Pila-64 K.pli-15    CI
2/A     Enabled  K.si             MC- 17 DS- 3            tape
3/B     Enabled  K.sti            MC- 27 DS- 2            n/a
4/CJ    Enabled  K.si/8           MC- 12 DS- 4            disk
5/DK    Enabled  K.si/8           MC- 12 DS- 4            disk
6/EL    Enabled  K.si/8           MC- 12 DS- 4            disk
7/F     Enabled  K.sdi            MC- 42 DS- 3            n/a
8/M     Enabled  K.si             MC- 12 DS- 4            disk
9/N     Enabled  K.si             MC- 12 DS- 4            disk
```

In this example, requestor 2 is a 4-port K.si module that is configured as a tape data channel. Requestors 4, 5, and 6 are 8-port K.si modules that are configured as disk data channels. Requestors 8 and 9 are 4-port K.si modules that are configured as disk data channels. Note that this SHOW REQUESTORS display may not represent an advisable HSC controller configuration. It is intended to illustrate the various combinations of displays only.

For each requestor, the following information is displayed:

- Requestor number and bulkhead

- Status (enabled or disabled)

- Type of requestor (P.ioj/c, K.ci, K.si, K.sdi, K.sti, or Empty)

- Microcode version—If the requestor is a K.si module, the type of microcode loaded is also displayed. In the example, Requestor 2 is a 4-port K.si module that is configured as a disk data channel. By default, disk microcode is loaded into a K.si module.

8. Enter the reconfiguring commands (shown in bold type in the example) as follows, then reboot the HSC controller:

[Ctrl/Y]

HSC>**RUN SETSHO** [Return]

SETSHO>**SET REQUESTOR 2/TYPE=TAPE** [Return]

SETSHO-I Your settings require an IMMEDIATE reboot on exit.

SETSHO>**EXIT** [Return]

SETSHO-Q Rebooting HSC. Press RETURN to continue, CTRL/Y to abort: [Return]

INIPIO-I Booting...

    HSC95 Version V700 30-Jul-1992 10:25:18   System HSC009

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Digital Equipment Corporation. All Rights Reserved.

9. Check to see if any red status indicators are lit on any modules in the card cage. Follow standard troubleshooting procedures and replace any failed modules. (If a module is replaced, you may have to reset all of your system parameters.)

10. Set the Online switch to the in position. Check that the Online indicator on the OCP lights within 15 seconds. If not, enter a Ctrl/Y, enter the command SET ERROR INFO, and reconcile any error messages.

11. Ensure that OpenVMS software can access the disks for that HSC controller by mounting and performing failover on the disks, if applicable. Verify that at least one disk or tape per requestor is functional on the upgraded HSC controller.

12. Connect any cables and install any disks or tapes as required to complete the subsystem installation.

To ensure that the upgrade modules are fully functional, run the ILEXER and ILMEMY device integrity tests. Refer to Chapter 4 of the *HSC Controller Installation Manual* for instructions when running these tests.

12.5 Returning the Removed Modules

Digital Multivendor Services personnel and customers who install their own upgrades should use the following instructions for repackaging and returning the removed HSC modules. Use the following procedure in the U.S. area only:

1. Package the HSC modules in the same container(s) in which the HSC controller upgrade kit was shipped. Be sure the return address label has been removed from inside the box prior to packing.

CAUTION

When handling modules, wear the ESD grounding wrist strap provided inside the front door of the HSC controller cabinet. Do not put modules on anything other than a properly grounded antistatic work surface.

---

2. Seal the container securely with packing tape.

3. Affix the return address label shipped with the upgrade kit to the outside of the package. Be sure to cover up all previous shipping information with the address label or with packing tape. If the label is lost or missing from the kit, create a label similar to the example shown in Figure 12–4.

Figure 12–4 Sample Return Mailing Label

```
RETURN TO
Returns Sort Center
D001



DEC # _____              RA # _____



         Ship to:

               Digital Equipment Corp.
               Rt 127 Dock Area D001
               Contoocook, NH 03229-9210
               ATTN: Returns Sort Center
```

                                                    CXO-3341A

4. Contact your district CAS representative for a Return Authorization Number (RA #). CAS will also need the Digital sales order number (DEC #) and the customer name. CAS will arrange for pickup of this material.

_____ **Note** _____

If you do not know the appropriate CAS representative, contact the district sales office for instructions.

_____

5. Write the DEC # and the RA # on the return address label. Please be sure this number is legible.

6. Digital Multivendor Services engineers should advise the customer that they will be billed for these modules if they are not returned to Digital Equipment Corporation. If there are any questions, the customer should contact a Digital sales representative.

7. Ensure that the package is sent to the customer shipping area for pickup.

8. Digital Multivendor Services engineers should fill out the LARS form, ensuring that the fields listed in Table 12–3 are filled out as indicated.

Table 12–3 LARS Form Fields

Field	Required Entry
System Processor Type:	HSC
Activity:	N
Call Type:	I
Module/Fail Area:	HSCxx–xx/xx RA #_ _ _ The HSC controller upgrade kit order number (HSCxx–xx) is as listed in the shipping paperwork. Ensure that the RA number (RA #) is also as listed.

13

Installing K.si Module Options

13.1 Introduction

This chapter contains information on how to install, configure, and test 4-port (HSC5X–DA) and 8-port (HSC9X–FA) K.si modules.

The HSC controller may contain a mix of the following data channel module options:

- HSC5X–DA option, 4-port K.si (L0119–YA) data channel module (can be configured for disk or tape devices)

- HSC9X–FA option, 8-port K.si (L0119–YB) data channel module (does not support tape drives)

- HSC5X–BA option, K.sdi (L0108–YA) disk data channel module

- HSC5X–CA option, K.sti (L0108–YB) tape data channel module

- HSC9X–SX option, K.scsi (L0131–AA) SCSI data channel module

Refer to the *HSC Controller Service Manual* for information on how to install the K.sdi (HSC5X–BA) disk data channel module and the K.sti (HSC5X–CA) tape data channel module. An installation procedure for SCSI data channels is contained in Chapter 14.

13.2 K.si Module Restrictions

Certain restrictions apply to the various data channel module types, such as minimum software versions. Some data channel modules are only usable in specific HSC controller models. For information concerning possible restrictions, refer to the software- and hardware-specific sections of this chapter.

13.2.1 4-Port K.si Module Restrictions

The HSC5X–DA 4-port K.si module (L0119–YA) is the enhanced disk data channel substitute module for the HSC5X–BA (K.sdi module, L0108–YA) or the tape data channel HSC5X–CA (K.sti, L0108–YB) modules. The 4-port K.si module can be used for all HSC controller models.

13.2.2 8-Port K.si Module Restrictions

The HSC9X–FA 8-port K.si module (L0119–YB) is used in HSC60, HSC90, HSC65, and HSC95 controllers only. This module is for disk drives only, and cannot be configured for tape drives.

13.2.3 K.si Module Software Version Restrictions

The 4-port K.si data channel module initializes only with HSC V3.90 or higher software. HSC V6.0 and higher software must be used with the 8-port K.si module.

The following sections explain how to install, configure, and test both 4-port and 8-port K.si modules, and how to configure disk and tape requestors in the HSC backplane for optimum performance.

13.3 HSC Controller Configurations and Guidelines for Enhanced Performance

To obtain maximum performance from the HSC controller, configure the tape and disk requestors in the backplane according to the following guidelines:

Each K.si, K.sdi, or K.sti module in the backplane has a requestor priority number according to its backplane slot. You can enhance the performance of the HSC controller by arranging the attached devices according to their transfer speeds by performing the following:

- Attaching the slower devices to the lower priority requestors
- Attaching the faster devices to the higher priority requestors

Assign requestor priorities to the requestors while the HSC controller is powered down for K.si module installation.

With faster devices, such as the TA90 tape drive and RA90 disk drive, backplane configuration is especially important. Failure to configure the devices properly could result in a significant loss of performance.

See Table 13–1 for a list of the device relative transfer speeds for different Digital storage devices.

Table 13–1 Disk and Tape Drive Configurations

Device	Transfer Rate	DCM Priority
TA9x, SA10x/TA8x7 tape drive	Highest	Highest
RA™90 or RA92 disk drive	.	.
RA73 disk drive	.	.
ESE or EP–ESE storage element	.	.
RA82 disk drive	.	.
RA81 disk drive	.	.
RA71 or RA72 disk drive	.	.
RA60 disk drive	.	.
RA70 disk drive	.	.
RA80 disk drive	.	.
Other DSA tape drives	.	.
SCSI tape drives	.	.
SCSI disk drives	Lowest	Lowest

Requestor priority ascends from Requestor 2, with the lowest priority, through the highest requestor number on the HSC controller. Note that requestor priority levels are all relative; that is, the individual requestor numbers have no intrinsic

speed characteristic. If you have only one drive in your system, you will not get better performance by placing it on a high priority requestor instead of on a low priority requestor.

If it is necessary to mix TA90/TA91 tape drives with slower tape drives on a requestor, this should be done on the highest priority requestor.

When configuring, it is recommended that you leave blank slots where possible to allow for add-on drives without having to move existing cables.

13.4 Installing 4-Port or 8-Port K.si Modules

This section describes installation of the 4-port or 8-port K.si module.

13.4.1 Installing K.si Modules in HSC Controllers

See Table 13–2 for requestor positions when installing the 4-port K.si module (L0119–YA). Empty requestor positions must contain module baffles for proper operation of the HSC controller.

See Table 13–2 for requestor positions when installing the 8-port K.si module (L0119–YB). Empty requestor positions must contain module baffles for proper operation of the HSC controller. HSC40 or HSC70 controllers must be upgraded to an HSC60, HSC90, HSC65 or HSC95 controllers to use the 8-port K.si module.

Table 13–2 Backplane Requestor Configuration for HSC Models

| HSC Controller Model | 4-Port K.si | | 8-Port K.si | |
	Requestors	I/O Bulkhead	Requestors	I/O Bulkhead
HSC40	2, 3, or 4	A, B, or C	None	None
HSC70	2 through 9	A through N	None	None
HSC60	2, 3, or 4	A, B, or C	3 or 4	B or C and H or J
HSC90	2 through 9	A through N	3, 4, 5, or 6	B through E and H through L
HSC65	2 through 9	A through N	3 or 4	B or C and H or J
HSC95	2 through 9	A through N	3, 4, 5, or 6	B through E and H through L

Use the following procedure to install a 4-port or 8-port K.si module in an HSC controller:

1. Open the front door of the HSC cabinet by turning the key clockwise and pressing the button just above the key to expose the door handle.

2. Grasp the handle and pull it towards you to open the door.

_____ WARNING _____

To prevent personal injury or module component damage, remove dc power from the card cage before installing or replacing modules. Remember to use an ESD grounding wrist strap when handling modules.

_____

3. Turn off the dc power by setting the DC Power switch to OFF. The DC Power switch is located on the left side of the RX33 diskette controller housing.

4. Turn the two nylon latches on the card cage cover plate one-quarter turn clockwise or counterclockwise.

5. Pull the card cage cover up and out.

6. Refer to Section 13.3 and verify that the requestors are arranged according to the transfer speeds of their attached devices.

7. Replace the existing K.sdi or K.sti module with a new K.si module as appropriate. If you are installing a new requestor, install the K.si module in the card cage. Table 13–2 summarizes the HSC backplane requestor configuration for various HSC controller models.

_____ **Note** _____

The 4- and 8-port enhanced K.sdi and K.sti modules are used only for requestor upgrades. If you are replacing a failed requestor, you may put in another K.sdi or K.sti module.

_____

8. Attach the label accompanying the new K.si module option to the appropriate location on the module utilization label. The module utilization label is located above the card cage.

9. See Figure 13–1 and install the SI cables to the I/O bulkhead port slots of the requestor slot for the K.si module you just installed.

Figure 13–1 K.si Module I/O Bulkhead Cable Connections
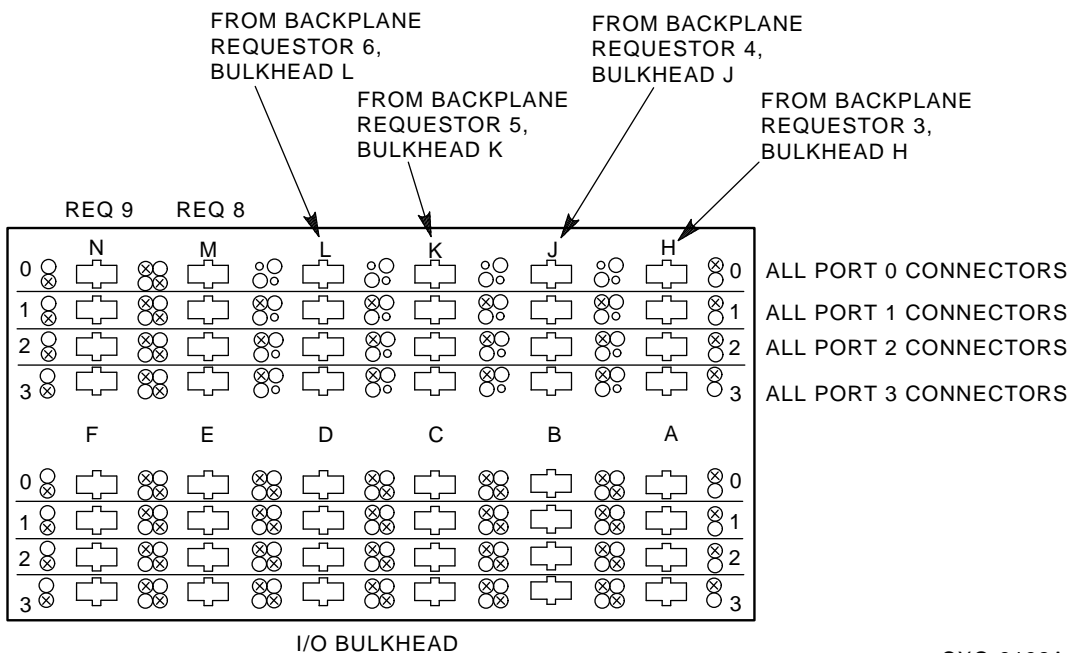
10. Verify that all switches on the K.si module switchpack are set to OFF.

11. Go to Section 13.4.2 for the K.si module initialization procedure.

13.4.2 Initializing K.si Modules

The K.si module is configured by default as a disk data channel when it is first booted after initial installation, or on the first boot of the HSC software. This default can result in a mismatch between the K.si module configuration and the devices attached to the K.si module. The mismatch causes device errors to be displayed on the HSC controller console terminal screen, and the HSC controller declares the device(s) to be inoperative.

This mismatch can happen under the following conditions:

- After initial installation of the K.si module, when it comes up as a default disk data path channel and the attached devices are tape drives.

- After replacing the type of device (disk or tape) with the opposite type, such as after physically configuring the HSC requestors as described in Section 13.3.

To correct this problem, connect the data channel to the proper drive or refer to Section 13.4.3 and reconfigure the K.si module. Section 13.6 describes the conditions that require you to reboot the HSC controller.

Use the following procedure to initialize a K.si module:

1. Turn on dc power by setting the DC Power switch to the 1 (on) position.

2. Press and release the Init switch on the OCP. The HSC controller displays the following boot message on the HSC console:

```
INIPIO-I Booting...

    HSC95 Version V800 30-Jul-1992 10:25:18        System HSC009

Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992,
1993.  Digital Equipment Corporation. All Rights Reserved.
```

   The HSC controller model, the software version number, and the system number are site specific. If this message is not displayed, verify that the Online switch is set to the out position. If it is, turn off the HSC controller by setting the circuit breaker on the power controller to 0. Verify that all modules are correctly installed and seated in the backplane, then turn the power back on.

   This message must show a minimum HSC software version of V3.90 for the 4-port K.si module, and V6.0 for the 8-port K.si module. The HSC model and the system number are site specific.

3. Enter a Ctrl/Y to return to the HSC> prompt.

4. Enter a SHOW REQUESTORS command to identify the requestors.

```
Ctrl/Y

SETSHO>SHOW REQUESTORS  Return

Req     Status  Type            Version               Microcode Loaded
0       Enabled P.ioj
1       Enabled K.ci           MC- 73 DS- 3 Pila-64 K.pli-15   CI
2/A     Enabled K.si           MC- 17 DS- 3            tape
3/B     Enabled K.sti          MC- 27 DS- 2            n/a
4/CJ    Enabled K.si/8         MC- 12 DS- 4            disk
5/DK    Enabled K.si/8         MC- 12 DS- 4            disk
6/EL    Enabled K.si/8         MC- 12 DS- 4            disk
7/F     Enabled K.sdi          MC- 42 DS- 3            n/a
8/M     Enabled K.si           MC- 12 DS- 4            disk
9/N     Enabled K.si           MC- 12 DS- 4            disk
```

In this example, requestor 2 is a 4-port K.si module that is configured as a tape data channel. Requestors 4, 5, and 6 are 8-port K.si modules that are configured as disk data channels. Requestors 8 and 9 are 4-port K.si modules that are configured as disk data channels. Note that this SHOW REQUESTORS display may not represent an advisable HSC controller configuration. It is intended to illustrate the various combinations of displays only.

For each requestor, the following information is displayed:

- Requestor number and bulkhead
- Status (enabled or disabled)
- Type of requestor (P.ioj/c, K.ci, K.si, K.sdi, K.sti, or Empty)
- Microcode version—If the requestor is a K.si module, the type of microcode loaded is also displayed. In the example, Requestor 2 is a 4-port K.si module that is configured as a disk data channel. By default, disk microcode is loaded into a K.si module.

13.4.3 Changing the K.si Module Configuration

When the K.si module is installed and the HSC controller is initialized, the default parameters configure both the 4-port and 8-port K.si module as a disk data channel. The K.si module configuration must be changed for all 4-port K.si modules that have tape devices attached. The 8-port K.si module can only be configured as a disk data channel.

The following example shows how to change the configuration of the 4-port K.si module in Requestor 2 (slot 10) from a default disk data channel to a tape data channel:

Ctrl/Y

HSC>**RUN SETSHO** Return

SETSHO>**SET REQUESTOR 2/TYPE=TAPE** Return

SETSHO-I Your settings require an IMMEDIATE reboot on exit.

SETSHO>**EXIT** Return

SETSHO-Q Rebooting HSC, type Y to continue, CTRL/Y to abort:**Y** Return

INIPIO-I Booting...

    HSC95 Version V800 30-Jul-1992 10:25:18   System HSC009

Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992,
1993. Digital Equipment Corporation. All Rights Reserved.

The HSC controller model, the software version number, and the system number are site specific. If this message is not displayed, verify that the Online switch is set to the out position. If it is, turn off the HSC controller by setting the circuit breaker on the power controller to 0. Verify that all modules are correctly installed and seated in the backplane, then turn the power back on.

This configuration is retained on the boot media to ensure that the K.si module initializes in the proper data channel configuration. If a K.si module is configured as a tape data channel and disk drives are attached, reconfigure the K.si module by using the same procedure and specifying TYPE=DISK. Enter a SHOW REQUESTORS command to identify the requestors.

`Ctrl/Y`

SETSHO>**SHOW REQUESTORS** `Return`

```
Req     Status  Type            Version                 Microcode Loaded
0       Enabled P.ioj
1       Enabled K.ci            MC- 73 DS- 3 Pila-64 K.pli-15    CI
2/A     Enabled K.si            MC- 17 DS- 3            tape
3/B     Enabled K.sti           MC- 27 DS- 2            n/a
4/CJ    Enabled K.si/8          MC- 12 DS- 4            disk
5/DK    Enabled K.si/8          MC- 12 DS- 4            disk
6/EL    Enabled K.si/8          MC- 12 DS- 4            disk
7/F     Enabled K.sdi           MC- 42 DS- 3            n/a
8/M     Enabled K.si            MC- 12 DS- 4            disk
9/N     Enabled K.si            MC- 12 DS- 4            disk
```

In this example, requestor 2 is a 4-port K.si module that is configured as a tape data channel. Requestors 4, 5, and 6 are 8-port K.si modules that are configured as disk data channels. Requestors 8 and 9 are 4-port K.si modules that are configured as disk data channels. Note that this SHOW REQUESTORS display may not represent an advisable HSC controller configuration. It is intended to illustrate the various combinations of displays only.

For each requestor, the following information is displayed:

- Requestor number and bulkhead

- Status (enabled or disabled)

- Type of requestor (P.ioj/c, K.ci, K.si, K.sdi, K.sti, or Empty)

- Microcode version—If the requestor is a K.si module, the type of microcode loaded is also displayed. In the example, Requestor 2 is a 4-port K.si module that is configured as a disk data channel. By default, disk microcode is loaded into a K.si module.

13.4.4 Completing the K.si Module Installation

Perform the following procedure to complete installation of the K.si module:

1. Close and secure the rear door of the HSC controller.

2. Replace the module card cage cover at the front of the HSC controller.

3. Ensure the system media is placed in the load device.

4. Hold the Fault switch in and turn the DC Power switch inside the front door of the HSC controller off and then on. Continue holding the Fault switch in until the "INIPIO-I Booting..." portion of the boot message is displayed:

```
INIPIO-I Booting...

    HSC95 Version V800 30-Jul-1992 10:25:18      System HSC009
```

Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992,
1993. Digital Equipment Corporation. All Rights Reserved.

The HSC controller model, the software version number, and the system number are site specific. If this message is not displayed, verify that the Online switch is set to the out position. If it is, turn off the HSC controller by setting the circuit breaker on the power controller to 0. Verify that all modules are correctly installed and seated in the backplane, then turn the power back on.

5. Before completing the installation tests, run ILDISK, ILTAPE (as required), ILEXER, and ILMEMY device integrity tests. Refer to Chapter 5 for information on running these tests.

6. Close and lock the HSC front door.

13.5 K.si Module LED Functions and Switchpack Settings

The K.si module has the normal red and green status LEDs and an LED pack containing eight amber LEDs. The K.si module also has a switchpack containing four switches. Figure 13–2 shows the location of the K.si module switchpack and LEDs.

Figure 13–2 Locating the K.si Module Switchpack and LEDs

K.SI DATA CHANNEL MODULE

NOTE:
ALL SWITCHES MUST BE OFF FOR NORMAL OPERATION.

AMBER LEDs,D1-D8 (D1 IS ON TOP)

J1

RED STATUS LED

GREEN STATUS LED

CXO-2495B

13.5.1 K.si Module LED Functions

Table 13–3 describes the functions of the LEDs on the K.si module.

Table 13–3   K.si Module LED Functions

Color	Function	Description
Amber	D1	Top LED of 8-LED pack. Indicates type of load: off for microcode RAM disabled; on for microcode RAM enabled.
Amber	D2–D8	Remaining LEDs of 8-LED pack. Module clocks are inhibited when a microinstruction parity error is detected. The bit content of the upper error register 2 is displayed on the LEDs.
Red	Board status	Indicates an inoperable module, except during initialization when it comes on during module testing.
Green	Board status	Indicates the operating software is running and the self-test microdiagnostics have successfully completed.

13.5.2 K.si Module Switchpack Setting Options

Table 13–4 describes the names and functions of the four switches on the K.si module switchpack. SW1 is at the top of the switchpack.

Note

All four switches of the K.si module switchpack must be in the OFF position to prevent errors during initialization and normal operation. The switchpack is reserved for manufacturing only.

Table 13–4   K.si Module Switchpack Setting Options

Switch Number	Switch Name	Description	Normal Position
SW1	MFG	Provides loop on error and single port external loop.	OFF
SW2	Burn in	Continuous loop. Assumes external loop and clock.	OFF
SW3	Ext loop	Loops on all ports; for system or field use only.	OFF
SW4	Ext clock	Substitutes external clock.	OFF

13.6 K.si Module New Boot Microcode

When changing to a new boot media, reboot the HSC by holding in the INIT and FAULT switch at the same time. This clears the old microcode from the K.si module. Then use the procedure in Section 13.4.3 to configure the K.si module. Repeat the SET REQUESTOR command for each improperly configured K.si module in the HSC controller to set the configuration on the new boot media.

Table 13–5 describes the conditions that determine when new microcode is loaded into a K.si module.

Table 13–5 K.si Module New Microcode Load Conditions

Action	New Microcode Load
Using the SET REQUESTOR n/TYPE=*type* command and allowing the HSC to automatically reboot when exiting SETSHO.	Yes
Using the SET REQUESTOR n/TYPE=*type* command and not rebooting by entering Ctrl/C to exit SETSHO.	No
Booting the system after a total power fail or after turning off the HSC controller.	Yes
Changing requestor modules. This action requires power down of the HSC controller.	Yes
Changing to new boot media of same version HSC software.	Yes— The new microcode is loaded when the new media is first booted.
Changing to new boot media of different version HSC software.	Yes
Using the SET SCT CLEAR command.	Yes—With media that has been previously booted, hold the Fault switch until the *INIPIO-I Booting...* message appears.
Pushing in the Init switch while holding the Fault switch in until the "INIPIO-I Booting..." message appears. This action clears the System Configuration Table (SCT).	No

14

HSC SCSI Data Channel Module Upgrade

This chapter describes the procedures for upgrading HSC controllers for use with SCSI devices, and includes the following information:

- Determining the kits required for upgrading a specific HSC controller model
- Defining the sequence for completing the upgrade
- Describing the upgrade procedures to include cabling and power on self-test

_____ **Note** _____

HSC50 controllers cannot be upgraded to use the HSC SCSI data channel module.

_____

14.1 HSC Controller SCSI Upgrade Kits

Table 14–1 defines the kits required to upgrade HSC controllers, their contents, and uses.

Table 14–1   HSC SCSI Data Channel Module Upgrade Kits

Upgrade Kit	Kit Contents and Usage Information
HSC9X–SA HSC SCSI Ready Adapter Kit	Rear door assembly with single-ended SCSI connectors, differential SCSI connectors, rear door to transition cable board (TCB) SCSI cables, and cable cover. **Use:** Allows up to four K.scsi modules to be installed in an HSC controller. Required for all HSC controller SCSI upgrades _except_ HSC65 and HSC95 controllers.
HSC9X–SE HSC SCSI Bulkhead Kit	SCSI bulkhead and blank filler plate. **Use:** Allows up to eight K.scsi modules to be installed in an HSC controller.
HSC9X–SF HSC Extended Top Cover Kit	Contains all of HSC9X–SS and a new top cover assembly. **Use:** Allows up to four StorageWorks building block (SBB) shelves to be installed in an HSC controller.

(continued on next page)

Table 14–1 (Cont.) HSC SCSI Data Channel Module Upgrade Kits

Upgrade Kit	Kit Contents and Usage Information
HSC9X–SS HSC SCSI Array Starter Kit	Upper front door assembly, ac power strip box assembly, and ac power cord for installing an SBB shelf in an HSC cabinet. **Use:** Allows up to two SBB shelves to be mounted in an HSC cabinet.
HSC9X–SX HSC SCSI Data Channel Module Kit	HSC SCSI data channel module and transition cable board (TCB). **Use:** Required for *dual path* HSC controller SCSI upgrades. This kit is a component of HSC9X–SZ HSC SCSI Mounting and Interface Kit.
HSC9X–SZ HSC SCSI Mounting and Interface Kit	BA350–SA modular storage shelf, ac shelf power supply, RETMA and metric mounting brackets, shelf power cord, and the HSC9X–SX HSC SCSI data channel module kit. **Use:** Required for all HSC controller to SCSI device connections. This kit includes HSC9X–SX HSC SCSI Data Channel Module Kit.

Table 14–2 HSC SCSI Upgrade Kit Applicability

Kit No.	HSC Controller Model Number						Comments
	40	70	60	90	65	95	
HSC9X–SA	Yes	Yes	Yes	Yes	No	No	HSC65 and HSC95 controllers have a SCSI ready door.
HSC9X–SE	Yes	Yes	Yes	Yes	Yes	Yes	For adding from five to eight K.scsi modules to HSC controller.
HSC9X–SF	Yes	Yes	Yes	Yes	Yes	Yes	For up to four SBB shelves installed in an HSC controller.
HSC9X–SS	Yes	Yes	Yes	Yes	Yes	Yes	For up to two SBB shelves installed in an HSC controller.
HSC9X–SX	Yes	Yes	Yes	Yes	Yes	Yes	This kit is part of the HSC9X–SZ kit and is used separately for dual pathing.
HSC9X–SZ	Yes	Yes	Yes	Yes	Yes	Yes	Required when SCSI devices are mounted in SBB shelves and connected to HSC controllers in an HSC cabinet.This kit includes the HSC9X–SX kit.

14.2 Preliminary Procedure (All Kits)

Complete the following procedure before installing any of the HSC SCSI data channel upgrade kits:

1. Notify the customer that the HSC controller will not be available during the installation and to transfer operations to other controllers.

2. Fail over all disk and tape drives to the alternate HSC controller. If the cluster does not have failover capabilities, shut down the cluster.

3. Verify that none of the HSC controller tape drives or disk drives are on line by entering the SHOW TAPES and SHOW DISKS commands.

Figure 14–1 HSC OCP Switch Locations
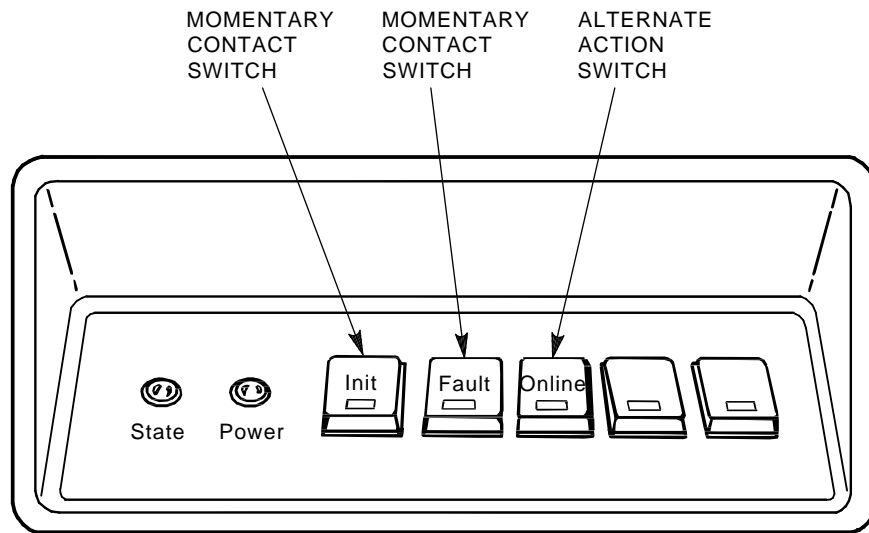
CXO-008B_S

4. Set the Online switch on the HSC controller operator control panel (OCP), shown in Figure 14–1, to the OUT position.

5. Open the front door of the HSC cabinet and turn dc power off by setting the DC Power switch, located on the left side of the RX33 disk drive housing, to the 0 (off) position.

6. At the front of the cabinet, turn the two nylon latches on the card cage cover plate (shown in Figure 14–2) one-quarter turn clockwise or counterclockwise. Pull the card cage cover up and out.

7. Open the rear door of the HSC cabinet.

8. Turn ac power off by setting CB1, the HSC power controller circuit breaker shown in Figure 14–3, to the 0 (off) position. Observe the data channel module LEDs on the front of the HSC controller and verify that all LEDs are off, indicating that power is off.

Figure 14–2 Card Cage Cover Plate

NYLON
LATCHES

CARD
CAGE
COVER

DISKETTE
STORAGE
AREA

CXO-887B_S
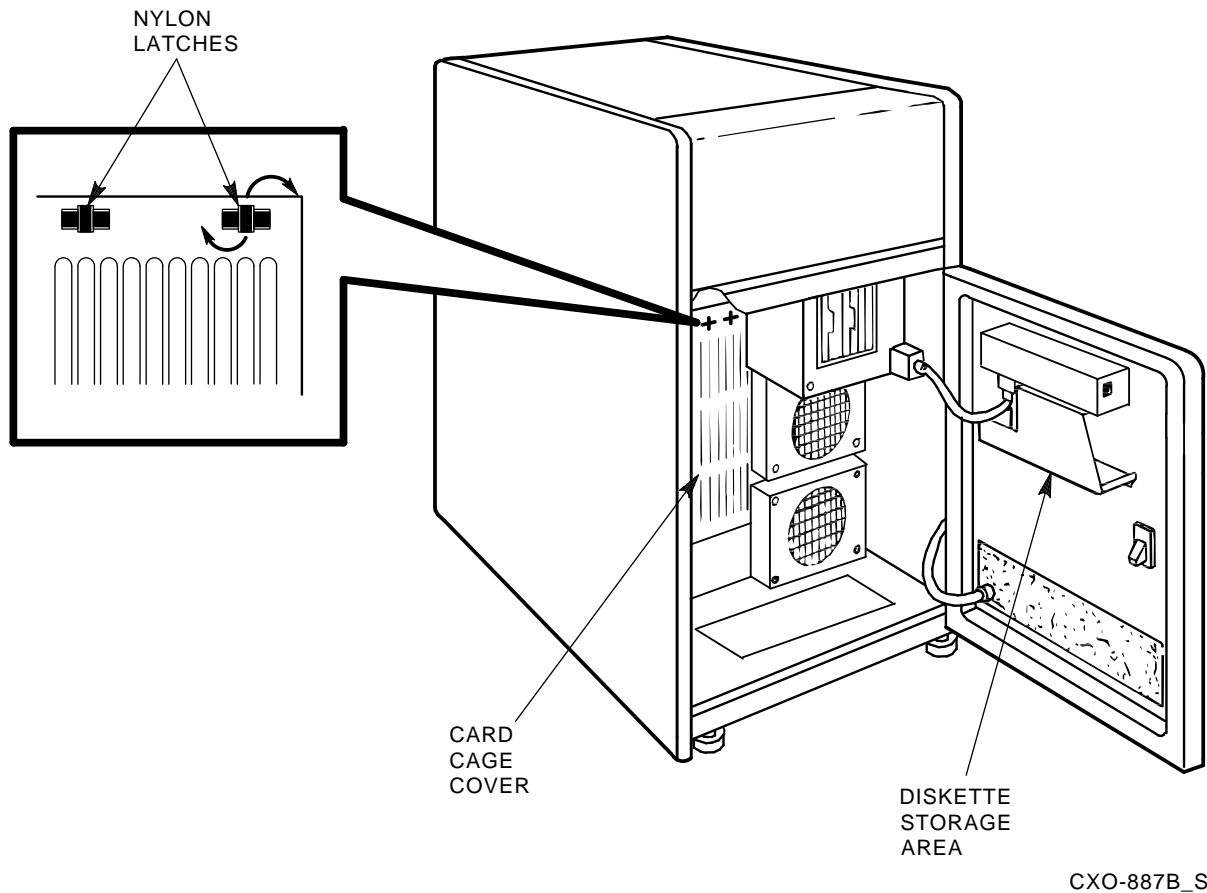
9. Disconnect the HSC controller power cord from its source power.

10. Remove the rear door by pulling down on the top hinge pin lever until the hinge pin clears the mounting hole in the top cover. Lift up on the door to release the bottom hinge pin and remove the door from the cabinet.

_____ **CAUTION** _____

Do not attempt to handle HSC controller modules unless you have taken proper precautions against electrostatic discharge (ESD). When handling modules, wear the ESD grounding wrist strap provided inside the front door of the HSC controller cabinet. Do not put modules on anything other than a properly grounded antistatic work surface.

_____

11. Relocate or remove the data channel module installed in requestor 2. Apply power and run the off-line diagnostics to verify that the relocated data channel module is functioning properly. For multiple HSC SCSI data channel module installations, repeat this step for other requestors receiving the K.scsi module.

Figure 14–3 HSC Power Controller Front Panel

CIRCUIT
BREAKER

POWER
CONNECTOR
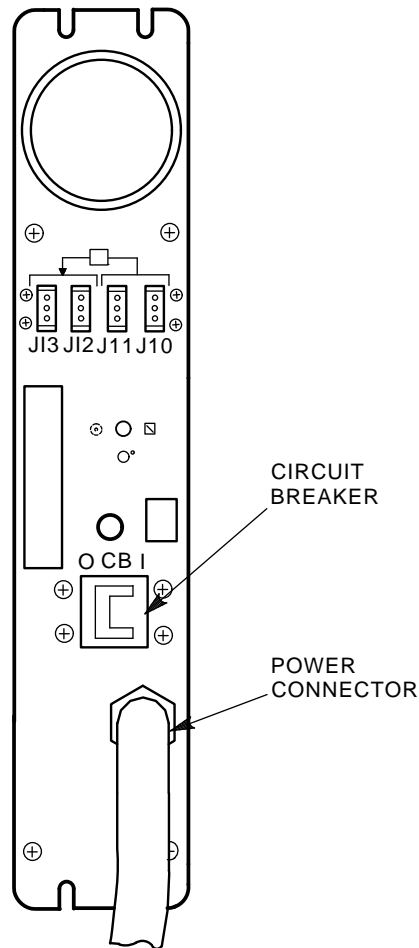
CXO-1117B

Based on the HSC controller configuration, you are now ready to initiate one of
the procedures described in the following sections. These procedures are to be
completed in the recommended sequence. You may skip any procedure that does
not apply to your system.

14.3 Installing Kit HSC9X–SS (Two SBB Shelves)

Kit HSC9X–SS allows you to install up to two SBB shelves in an HSC controller
cabinet. Refer to Section 14.4 to install kit HSC9X–SF with up to four SBB
shelves in an HSC controller cabinet. A complete list of parts in kit HSC9X–SS is
given in Table 14–3.

_____ **Note** _____

Kit BA35X–RB is included in kit HSC9X–SZ and does not have to be
ordered separately.

_____

Table 14–3 Kit HSC9X–SS Parts List

Part No.	Description	Qty	Upgrade Kit
12–21368–02	Screw, SEMS, 10-32 pan, 0.625 XRCS	12 3	BA35X–RB HSC9X–SS
12–21368–03	Screw, SEMS, 10-32 pan, 0.343 XRCS	2	HSC9X–SS
17–03020–05	Power cord, shelf redundant, 1.54 m (5 ft)	1	BN21Q–05
17–00442–15	Power cord, term, 0.91 m (3 ft), 15 A	1	HSC9X–SS
17–00442–50	Power cord, shelf, 1.31 m (4 ft), 10 A	1	HSC9X–SZ
70–29775–01	Power strip box assembly	1	HSC9X–SS
70–29776–01	Upper front door assembly	1	HSC9X–SS
74–43804–01	Standoff, male-female	2	HSC9X–SS
74–46085–01	Bracket, test	1	HSC9X–SS
74–46410–01	Bracket, box, power	1	HSC9X–SS
74–46412–01	Bracket, hinge, front door, upper	1	HSC9X–SS
74–46417–01	Rail, single shelf, RETMA	2	BA35X–RB
74–46418–01	Bar, nut, shelf bracket, RETMA	4	BA35X–RB
74–46419–01	Bracket, retainer, 0.25 inch recess	2	BA35X–RB
74–46419–02	Bracket, retainer, 1.50 inch recess	4	BA35X–RB
90–06560–00	Nut, kep, 6-32, 0.312 AF	4	HSC9X–SS
90–06565–00	Nut, kep, 10-32, 0.375 AF	6	HSC9X–SS
90–07032–00	Tie, cable	1 2	HSC9X–SS HSC9X–SZ
90–08264–00	Mount, cable tie, adhesive backed	1	HSC9X–SS
90–09718–06	Grommet, strip, extruded, 5/8 in	2	HSC9X–SS
90–09941–02	Stud, ball, male, threaded, 0.447	2	HSC9X–SS

WARNING

To prevent possible injury, do not begin these procedures until you have removed power from the HSC controller as described in Section 14.2.

Installing kit HSC9X–SS in an HSC controller involves the following steps:

- Perform the preliminary procedure (Section 14.2).
- Position the HSC cabinet for easy access (Section 14.3.1).
- Label and disconnect the internal and external cables (Section 14.3.1).
- Remove the end panels, the top cover, and the rear door (Section 14.3.1).
- Straighten the cabinet vertical uprights (Section 14.3.2).
- Install the shelf rails (Section 14.3.3)
- Install the SBB shelves (Section 14.3.4).
- Install the front door hinge bracket and ball studs (Section 14.3.5).
- Install the power strip box assembly (Section 14.3.6).
- Replace the top cover (Section 14.3.7).

- Connect the SCSI cables (Section 14.5.1).

- Install the power and storage system building blocks (SBBs) (Section 14.5.2).

- Connect the ac power (Section 14.5.3).

- Install the upper front door (Section 14.5.4).

- Replace the end panels (Section 14.5.5).

- Reposition the HSC cabinet and connect external cables (Section 14.5.6).

- Install the transition cable boards and K.scsi modules in kit HSC9X–SX (Section 14.7).

If you are installing a single SBB shelf, you have the option of installing it either in the front or the rear of the cabinet. Adding a second shelf later requires the following parts:

- BA350–SA SBB shelf

- BA35X–RB RETMA shelf rail kit

- BA35X–HA universal ac input power supply

- Up to seven storage SBBs

When you install the first shelf in the rear, your must complete the procedure in Section 14.2 to install a second shelf in the front, including the steps described in Section 14.3.5 to install the door mounting hardware.

14.3.1 Preparing the HSC Controller for Upgrade

Use the following procedure to remove the side panels, top cover, and miscellaneous hardware from the HSC cabinet.

1. Gain access to all four sides of the HSC cabinet.

   a. Label all external cables.

   b. Disconnect the external cables.

   c. Move the cabinet so you have access to all four sides.

2. Open the front door of the HSC controller cabinet.

3. At the front of the HSC cabinet, loosen, but do not remove, the four end panel mounting bracket screws at the base of the cabinet and slide the brackets towards the center of the cabinet.

4. Remove the end panels by sliding the panels up and away from the cabinet. If the end panels fit too tightly, you may have to use a wooden lever to lift up on the end panels from the bottom.

5. Remove the two 8-32 screws and kep nuts on each side of the top cover that secure the top cover to the lateral support bracket. Loosen the two 10-32 kep nuts at the rear of the top cover. Slide the top cover to the rear and lift off.

_____ WARNING _____

Be careful not to drop the kep nuts, nut bars, screws, or any other hardware into the cabinet.

_____

6. Remove the four kep nuts or screws on the blank bezel and remove the panel. After installation, the blank bezel will be replaced by the upper front door assembly. Discard this part after the upgrade.

14.3.2 Straightening HSC Cabinet Vertical Uprights

In some HSC controllers, the cabinet vertical uprights are not parallel to the lateral side rails. This causes the shelf mounting rails to be too close together at the rear for properly installing the shelf. You can detect this condition by observing the relationship of the vertical upright to the lateral side rail. If the uprights are not parallel, use a six-inch or larger crescent wrench to straighten the uprights as follows:

1. Firmly attach the crescent wrench to the top of the vertical upright.

2. Bend the rail outward.

3. Reposition the wrench a few inches lower on the vertical upright and bend the rail outward.

4. Repeat steps 2 and 3 until the vertical upright is approximately parallel to the lateral side rail.

5. Repeat this procedure on the other vertical upright, if needed.

14.3.3 Installing the Shelf Rails

Table 14–4 lists the parts in kit BA35X–RB (part of HSC9X–SZ) that are used to install the shelf rails:

Table 14–4   Kit BA35X–RB Shelf Rail Parts List

Part No.	Description	Qty
12–21368–02	Screw, SEMS, 10-32 pan, 0.625 Phillips	12
74–46417–01	Rail, single shelf, RETMA	2
74–46418–01	Bar, nut, shelf bracket, RETMA	4
74–46419–01	Bracket, retainer, shelf 0.25 inch recess	2
74–46419–02	Bracket, retainer, shelf 1.50 inch recess	4

The parts kit includes generic parts for installing SBB shelves in either the front or rear positions in the HSC controller cabinet. If you are installing a shelf in the front position, you will have the 0.25 inch recess shelf-retainer brackets left over after installation. If you are installing a shelf in the rear position, you will have two of the 1.50 inch shelf retainer brackets left over after installation. Figures 14–4 and 14–5 show the part names and exploded views of the shelf rails for front and back mounted shelves.

_____ **Note** _____

Unless otherwise stated, mounting hole locations are counted from the top of the cabinet uprights, the shelf rails, and the nut bars. In this

Figure 14–4 Front Shelf Rail Assembly

OUTER
NUT BAR

RETAINER
BRACKET
POSITION #1

MARKED
END

INNER
FLANGE

RETAINER
BRACKET
POSITION #2

INNER
NUT BAR

INNER
RETAINER
BRACKET
(1.5 INCH)

MARKED
END

SHELF
RAIL

OUTER
RETAINER
BRACKET
(1.5 INCH)

SCREW, SEMS
10-32 PAN,
.625 XRCS
(6 PLACES)

OUTER
FLANGE

FRONT VERTICAL
CABINET RAIL
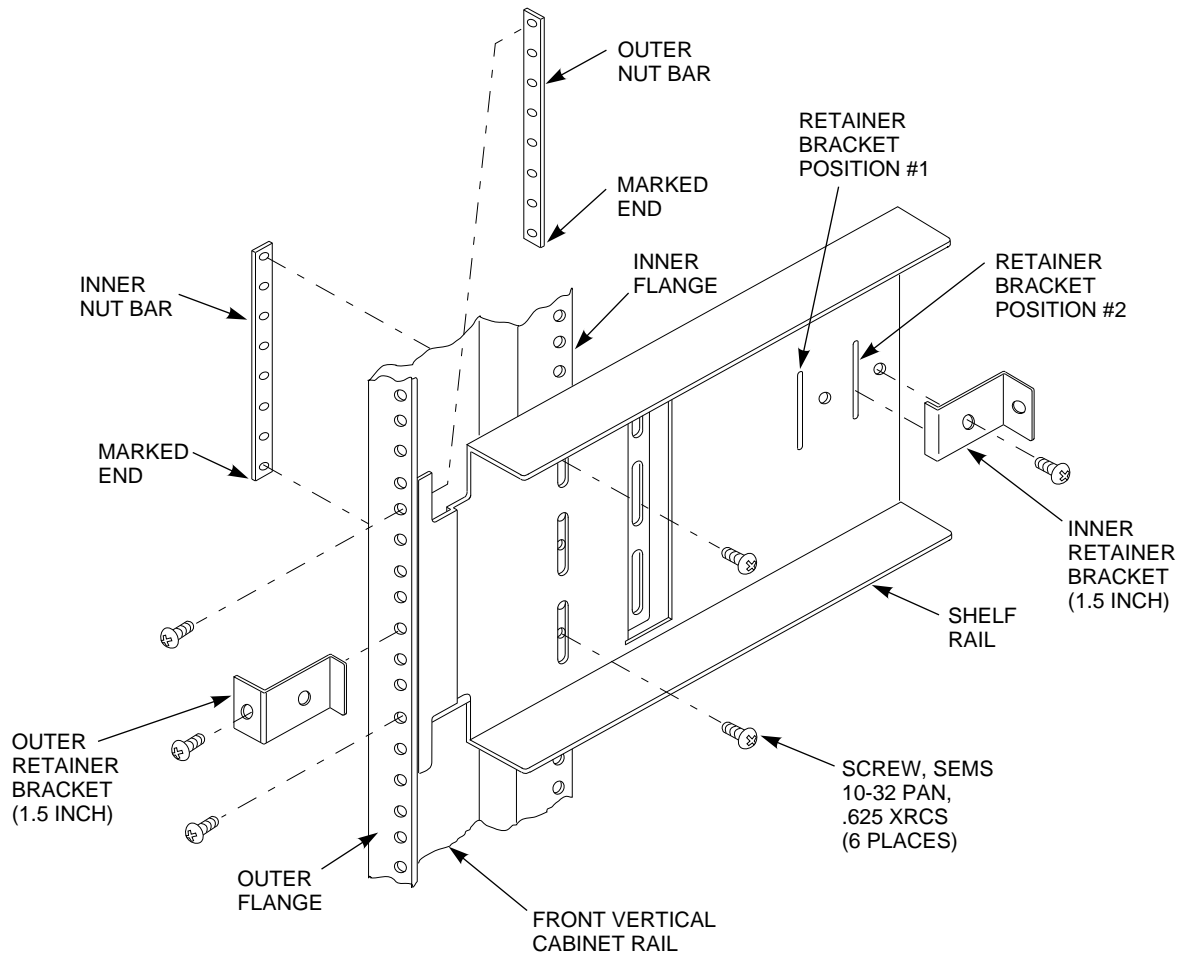
CXO-3834A-MC

procedure, left and right is based on viewing the cabinet from the front
for a front mounted shelf, and from the rear for a rear mounted shelf.

The following notes apply to all installations of the SBB shelf in the HSC
controller:

- The shelf rails can be installed in either the front or the rear of a cabinet.

- For orientation purposes, the bottom of the nut bar has a pattern of three
  small V-shaped marks. Unless otherwise specified, the nut bar is always
  oriented with this pattern at the bottom.

- All screws used in this procedure are SEMS 10-32 pan head Phillips, 0.625
  inch long.

- Shelf rail mounting screws are not fully tightened until after it has been
  verified that the shelf can be properly slipped into place.

- Forcing an SBB shelf into the rails can damage the shelf. If you are unable
  to easily insert the shelf, the shelf rails are not properly aligned, either
  vertically or horizontally. Remove the shelf and check the shelf rail position
  and alignment. The procedure for aligning the vertical uprights is described
  in Section 14.3.2.

Figure 14–5 Rear Shelf Rail Assembly

OUTER
NUT BAR

RETAINER
BRACKET
POSITION #1

MARKED
END

RETAINER
BRACKET
POSITION #2

INNER
FLANGE

INNER
NUT BAR

INNER
RETAINER
BRACKET
(1.5 INCH)

MARKED
END

SHELF
RAIL

OUTER
RETAINER
BRACKET
(.25 INCH)

SCREW, SEMS
10-32 PAN,
.625 XRCS
(6 PLACES)

REAR VERTICAL
CABINET RAIL

OUTER
FLANGE
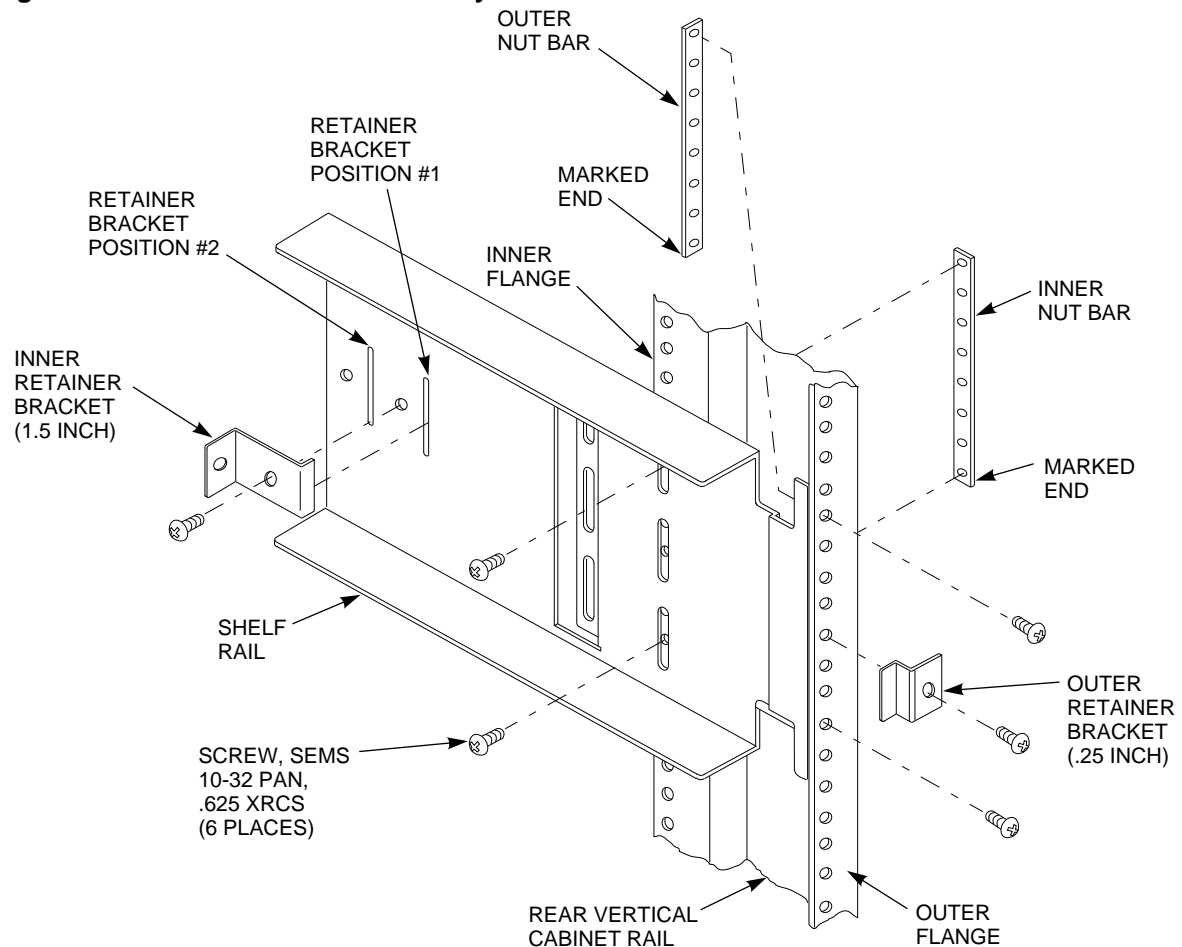
CXO-3835A-MC

Some steps in the rail installation procedure are specific to either a front or rear mounted shelf. The specific steps for a front mounted shelf are identified with the phrase "**For a front mounted shelf**;" rear mounted shelf text is preceded with the phrase "**For a rear mounted shelf**."

1. **For a front mounted shelf**, install a 1.5 inch shelf retainer bracket in the *rear* vertical slot on a shelf rail. Secure it with a screw through the bracket and into the side rail insert. Install a shelf retainer bracket on the other shelf rail. Go to Step 3.

   For a rear mounted shelf, install a 1.5 inch shelf retainer bracket in the *front* vertical slot on a shelf rail. Secure it with a screw through the bracket and into the side rail insert. Install a shelf retainer bracket on the other shelf rail. Go to Step 2.

2. **For a rear mounted shelf**, position a shelf rail on the vertical upright with shelf rail flange *behind* the vertical upright. The shelf rail must be flush against the vertical upright and rest on the on the top cover shield.

3. Place a nut bar *behind* the shelf rail flange. Align the bottom nut bar hole (the end with the pattern of three V-shaped marks) with hole 16 counting from the top of the vertical rail. Insert a screw through the vertical upright, the shelf rail flange, and into the nut bar. Do not fully tighten the screw.

4. Counting from the top of the vertical upright, insert a screw through hole 9 of the upright, the bottom shelf rail flange slot, and into the nut bar bottom screw hole. Do not fully tighten the screw.

5. On the side of the vertical upright, align the bottom nut bar mounting hole (hole 16) with the bottom side rail slot, and the mounting hole in the vertical upright. Insert a screw through the side rail slot, the vertical upright and into the nut bar. Do not fully tighten the screw.

6. Insert a screw through the top side slot of the rail, vertical upright hole 9, and into the nut bar top mounting hole. Do not fully tighten the screw.

7. Repeat Steps 2 through 6 to install the other side rail.

8. Orient the SBB shelf with the SCSI connectors on the right end. Carefully insert the shelf into the shelf rails and push it in until it is firmly seated against the rear shelf retaining brackets. Tighten the mounting screws on the front of the vertical upright. **For a rear mounted shelf**, check that the SBB devices will clear the sheet metal of the cabinet during removal and replacement.

9. Remove the shelf and tighten the mounting screws in the side of the vertical upright.

14.3.4 Installing An SBB Shelf

Before installing the SBB shelf, refer to the configuration guidelines and procedures given in the StorageWorks documentation and in Appendix A.

CAUTION

Forcing the shelf into the rails can damage the shelf. If you are unable to insert the shelf easily, the shelf rails are not properly aligned. This could be caused by a bent upright. See Section 14.3.2 for corrective action.

For a front mounted shelf, insert the shelf into the rails and verify that it is fully seated against the 1.5 inch shelf retaining brackets. Mount a 1.5 inch shelf retaining bracket over the front of the vertical upright. Insert a screw through hole 12 of the vertical upright, the middle slot of shelf rail flange, and into the nut bar. Tighten the screw. Repeat this step for the other shelf rail.

Note

It is normal for the right front retainer bracket to have a slight amount of play even when the screw is fully seated.

For a rear mounted shelf, insert the shelf into the rails and verify that it is fully seated against the 1.5 inch shelf retaining brackets. Mount a 0.25 inch shelf retaining bracket over the front of the vertical upright. Insert a screw through hole 12 of the vertical upright, the middle slot of shelf rail flange, and into the nut bar. Tighten the screw. Repeat this step on the other shelf rail.

14.3.5 Installing the Upper Front Door Hardware

After the shelf is configured and permanently installed with the retainer brackets, you must install the hardware that carries the front door over the SBB shelf space. There are two procedures to do this, depending upon if there is a shelf installed in the front of the HSC controller cabinet, or if the only shelf is in the rear position.

- If there is a shelf installed in the front of the HSC cabinet:

    1. Remove the screw in hole 9 of the vertical upright.

    2. Position the front door hinge bracket on the upright and align the bottom mounting hole of the bracket with hole 15 of the vertical upright. The flange of the bracket that carries the part number marking is oriented at the bottom.

    3. Insert a 10-32 screw through the bottom mounting hole of the bracket, hole 15 of the vertical upright, and into the nut bar. Do not tighten.

    4. Insert a 10-32 screw in the top mounting hole of the hinge bracket, hole 4 of the upright, and into the nut bar. Do not tighten.

    5. Reinstall the 10-32 screw in hole 9 of the vertical upright. Center holes in the hinge bracket with the holes in the upright and tighten all screws.

    6. Install the ball studs in the male-female standoffs.

    7. Insert one ball stud assembly through hole 3 of the left upright and secure with a 10-32 kep nut.

    8. Insert one ball stud assembly through hole 15 of the left upright and into the nut bar. Final alignment of the hinge bracket is part of a later procedure.

- If the front of the HSC cabinet does not have a shelf installed:

    1. Position the front door hinge bracket on the upright and align the bottom mounting hole of the bracket with hole 15 of the vertical upright.

    2. Insert a 10-32 screw through the bottom mounting hole of the bracket, hole 15 of the vertical upright, and secure with a kep nut. Do not tighten.

    3. Insert a 10-32 screw in the top mounting hole of the hinge bracket, hole 4 of the upright, and secure with a kep nut. Do not tighten.

    4. Center holes in the hinge bracket with the holes in the upright and tighten both screws.

    5. Install the ball studs in the male-female standoffs.

    6. Insert one ball stud assembly through hole 3 of the left upright and secure with a 10-32 kep nut.

    7. Insert one ball stud assembly through hole 15 of the left upright and secure with a kep nut. Final alignment of the hinge bracket is part of a later procedure.

14.3.6 Installing the Power Strip Box Assembly

The power strip box assembly is located in the left rear corner of the HSC cabinet. The parts required for this installation procedure are listed in the following table:

Part No.	Description	Qty
74–46410–01	Bracket, box, power	1
90–09718–06	Grommet, strip, extruded, 5/8 in	2
90–08264–00	Mount, cable tie, adhesive backed	1
90–06560–00	Nut, kep, 6-32, 0.312 AF	4
90–06565–00	Nut, kep, 10-32, 0.375 AF	2
70–29775–01	Power strip box assembly	1
12–21368–03	Screw, SEMS, 10-32 pan, 0.343 XRCS	2
12–21368–02	Screw, SEMS, 10-32 pan, 0.625 XRCS	1
36–41063–01	Label, revised current rating	1

Note

Unless otherwise stated, mounting hole locations are measured from the top of the cabinet uprights, the shelf rails, and the nut bars. In the following procedure, left and right is based on viewing the cabinet from the rear.

Use the following procedure to mount the power strip box:

1. Remove the door stop and kep nut. Discard the kep nut.

2. Position the power box mounting bracket so that the upper mounting insert is aligned with hole 4 of the left rear upright.

3. Install the door stop through hole 4 in the rear upright into the upper mounting insert in the power box mounting bracket.

4. Install a 10-32, 0.625 inch SEMS screw through hole 5 in the rear upright into the lower mounting insert.

5. Align the upper side mounting hole with hole 4 in the side upright. Insert a 10-32, 0.343 inch SEMS screw through the power box mounting bracket into the side upright. Insert a 10-32 kep nut between the lateral support and the side upright and tighten the screw.

6. Align the lower side mounting hole with hole 5 in the side upright. Insert a 10-32, 0.343 inch SEMS screw through the power box mounting bracket into the side upright. Insert a 10-32 kep nut between the lateral support and the side upright and tighten the screw.

7. Place the power strip box assembly with the ac input receptacle towards the interior of the cabinet over the four mounting studs on the power box mounting bracket.

8. Place a 6-32 kep nut on each of the four studs and tighten.

9. Install the two grommets in the cutout on the left rear corner of the cabinet extender panel. Position the the grommets so they do not extend beyond the edge of the shelf or interfere with the spring fingers.

14.3.7 Replacing the Top Cover

Use the following procedure to replace the top cover when installing the two-shelf SCSI upgrade kit (HSC9X–SS):

1. Slide the top cover under the flanges on the rear vent support bracket.

2. Align the rear mounting studs and slide the cover towards the front until the cover extends beyond the front uprights by approximately one quarter of an inch.

3. Ensure that the top cover hinge pin mounting hole and the rear vent support hinge pin mounting hole are aligned.

4. Tighten the nuts on the mounting studs.

5. On each side, install the two 8-32 screws and kep nuts that attach the top cover to the lateral support bracket.

6. Attach the Revised Current Rating label to the back edge of the HSC controller top cover (above the rear door), to the right of the last label in the row.

14.4 Installing Kit HSC9X–SF (Four SBB Shelves)

Kit HSC9X–SF allows you to install up to four SBB shelves in an HSC controller cabinet. Refer to Section 14.3 to install kit HSC9X–SS with up to two SBB shelves in an HSC controller cabinet. A complete list of parts in kit HSC9X–SF is given in Table 14–5. Refer to Figure 14–6 for an illustration of the complete kit HSC9X–SF assembly.

Figure 14–6   Kit HSC9X–SF Assembly

HSC SERIAL
NUMBER
LABEL

HSC
PATENT
LABEL

HSC REVISED
POWER
RATING
LABEL

TOP COVER
ASSEMBLY

UPPER FRONT
DOOR ASSEMBLY

BALL
STUD

STANDOFF

POWER
STRIP
BOX
ASSEMBLY

RIGHT HAND
SUPPORT
BRACKET

FRONT DOOR
HINGE BRACKET

LEFT HAND
SUPPORT
BRACKET
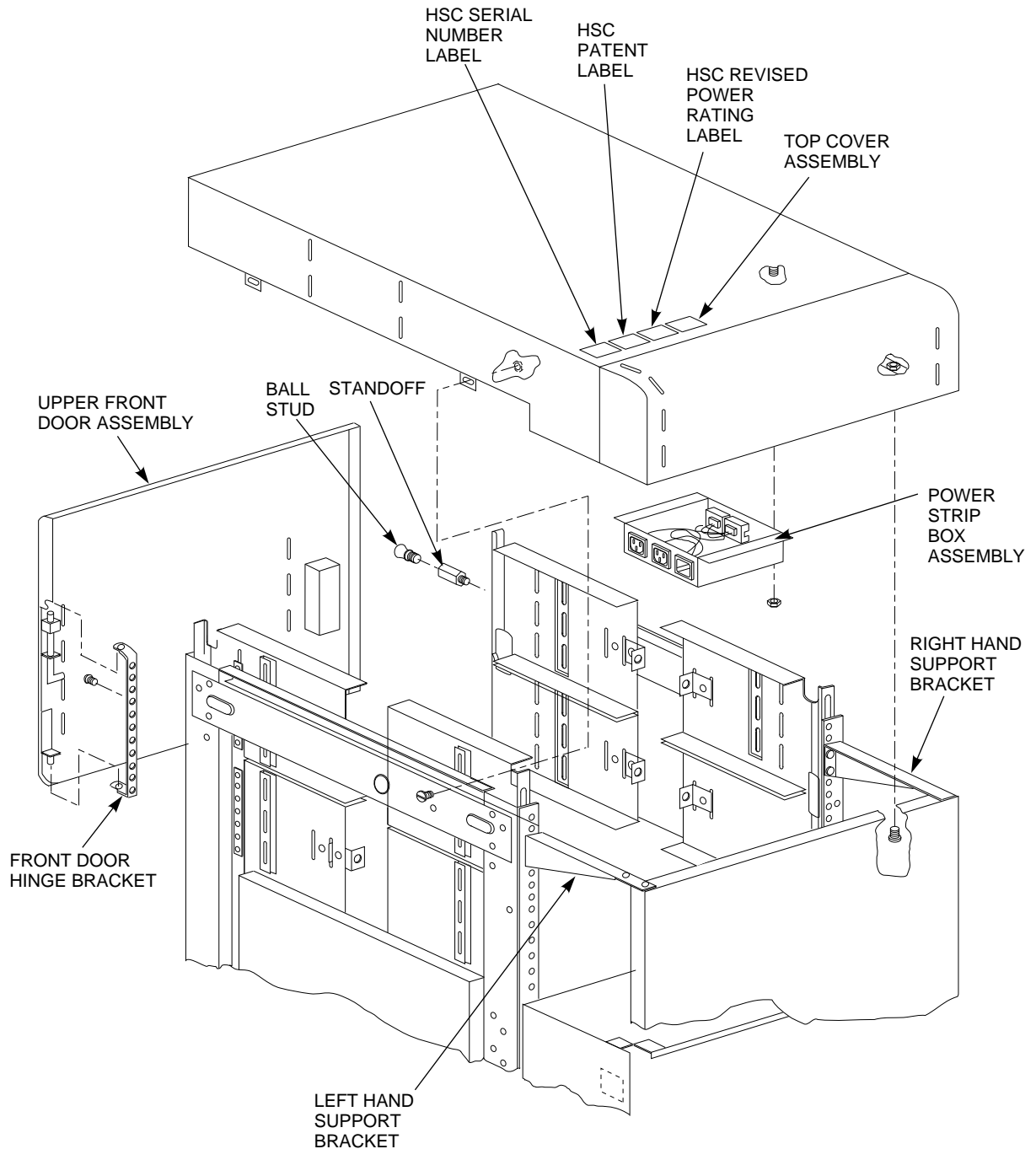
CXO-3917A-MC

_____ **Note** _____

Kit BA35X–RB is included in kit HSC9X–SZ and does not have to be
ordered separately.

Table 14–5   Kit HSC9X–SF Parts List

Part No.	Description	Qty	Upgrade Kit
12–21368–02	Screw, SEMS 10-32 pan .625 XRCS	6	HSC9X–SF
12–21368–02	Screw, SEMS, 10-32 pan, 0.625 Phillips	12	BA35X–RB
17–00442–15	Power cord, term, 0.91 m (3 ft), 15 A	1	HSC9X–SF
36–17880–03	Label, FCC class A, peripheral	1	HSC9X–SF
36–21129–35	Label, FTZ, HSC	1	HSC9X–SF
36–32173–01	Label, HSC patent	1	HSC9X–SF
36–41063–01	Label, Revised power rating, SCSI UP	1	HSC9X–SF
37–01476–01	Package assembly	1	HSC9X–SF
70–29775–01	Power strip box assembly	1	HSC9X–SF
70–30128–01	Upper front door assy.	1	HSC9X–SF
70–30129–01	Top cover assembly	1	HSC9X–SF
74–43804–01	Standoff, male-female	2	HSC9X–SF
74–46085–01	Bracket, test	1	HSC9X–SF
74–46412–01	Bracket, hinge, front door, upper	1	HSC9X–SF
74–46417–01	Rail, single shelf, RETMA	2	BA35X–RB
74–46418–01	Bar, nut, shelf bracket, RETMA	4	BA35X–RB
74–46419–01	Bracket, retainer, shelf 0.25 inch recess	2	BA35X–RB
74–46419–02	Bracket, retainer, shelf 1.50 inch recess	4	BA35X–RB
74–47039–01	Bracket, support, RH	1	HSC9X–SF
74–47039–02	Bracket, support, LH	1	HSC9X–SF
90–06022–01	Screw, machine 6-32 pan, .375 XRCS	1	HSC9X–SF
90–06037–01	Screw, mach 8-32 pan, .375 XRCS	6	HSC9X–SF
90–06560–00	Nut, kep, 6-32, 0.312 AF	4	HSC9X–SF
90–06563–00	Nut, kep, 8-32, 0.344 AF	4	HSC9X–SF
90–06565–00	Nut, kep, 10-32, 0.375 AF	8	HSC9X–SF
90–07031–01	Tie, cable	8	HSC9X–SF
90–08264–00	Mount, cable tie, adhesive backed	1	HSC9X–SF
90–09718–06	Grommet, strip, extruded, 5/8 in	2	HSC9X–SF
90–09941–02	Stud, ball, male, threaded, 0.447	2	HSC9X–SF
90–09168–00	Bumper, screw	1	HSC9X–SF

Installing kit HSC9X–SF in an HSC controller involves the following steps:

- Perform the preliminary procedure (Section 14.2).

- Position the HSC cabinet for easy access (Section 14.4.1).

- Label and disconnect the internal and external cables (Section 14.4.1).

- Remove the end panels, the top cover, front blank bezel, rear vent support bracket, doorstop, and the rear door (Section 14.4.1).

- Straighten the cabinet vertical uprights (Section 14.4.2).

- Install the new top cover (Section 14.4.3

- Install the shelf rails (Section 14.4.4)

- Route power and signal cables Section 14.4.5

- Install the SBB shelves (Section 14.4.6).

- Install the front door hinge bracket and ball studs (Section 14.4.7).

- Connect the SCSI cables (Section 14.5.1).

- Install the power and storage system building blocks (SBBs) (Section 14.5.2).

- Connect the ac power (Section 14.5.3).

- Install the upper front door (Section 14.5.4).

- Replace the end panels (Section 14.5.5).

- Reposition the HSC cabinet and connect external cables (Section 14.5.6).

- Install the transition cable boards and K.scsi modules in kit HSC9X–SX (Section 14.7).

After completing the installation of the SBB shelves, install the transition cable boards (TCB) in the HSC backplane and the K.scsi modules in the card cage. The final checkout procedure is given as part of the K.scsi module installation procedure.

14.4.1 Preparing the HSC Controller for Upgrade

Use the following procedure to remove the side panels, top cover, and miscellaneous hardware from the HSC cabinet.

1. Gain access to all four sides of the HSC cabinet.

   a. Label all external cables.

   b. Disconnect the external cables.

   c. Move the cabinet so you have access to all four sides.

2. Open the front door of the HSC controller cabinet.

3. Loosen, but do not remove, the four end panel mounting bracket screws at the base of the cabinet and slide the brackets towards the center of the cabinet.

4. Remove the end panels by sliding the panels up and away from the cabinet. If the end panels fit too tightly, you may have to use a wooden lever to lift up on the end panels from the bottom. Keep the end panels for reassembly.

   _____ WARNING _____

   Be careful not to drop the kep nuts, nut bars, screws, or any other hardware into the cabinet.

   _____

5. Remove the two 8-32 screws and kep nuts on each side of the top cover that secure the top cover to the lateral support bracket. Loosen the two 10-32 kep nuts at the rear of the top cover. Slide the top cover to the rear and lift off. Discard this part after the upgrade.

6. Remove the serial number label from the front of the top cover. This label will be reapplied to the new top cover.

7. Remove the four kep nuts or screws on the blank bezel and remove the panel. After installation, the blank bezel will be replaced by the upper front door assembly. Discard this part after the upgrade.

8. At the rear of the HSC cabinet, remove the two screws that hold the rear vent support bracket to the cabinet. Remove the bracket and discard this part after the upgrade.

9. At the rear of the HSC cabinet, remove the door stop kep nut. Remove the door stop and retain for reassembly.

14.4.2 Straightening HSC Cabinet Vertical Uprights

In some HSC controllers, the cabinet vertical uprights are not parallel to the lateral side rails. This causes the shelf mounting rails to be too close together at the rear for properly installing the shelf. You can detect this condition by observing the relationship of the vertical upright to the lateral side rail. If the uprights are not parallel, use a six-inch or larger crescent wrench to straighten the uprights as follows:

1. Firmly attach the crescent wrench to the top of the vertical upright.

2. Bend the rail outward.

3. Reposition the wrench a few inches lower on the vertical upright and bend the rail outward.

4. Repeat steps 2 and 3 until the vertical upright is approximately parallel to the lateral side rail.

5. Repeat this procedure on the other vertical upright, if needed.

14.4.3 Install New Top Cover

Install the new top cover on the HSC controller cabinet with the following procedure:

1. Install the power strip box assembly at the studs on the top cover. Orient the box so the male connector (power input) is toward the hinge at the rear of the top cover, as shown in Figure 14–6.

2. Set the top cover in place on the HSC cabinet. Align the four tabs on the top cover with the four holes in the cabinet frame rail and adjust the space from the front edge of the top cover to the cabinet front vertical rail to 7.62 millimeters (.300 inches). Install four 8-32 screws through the holes in the top cover and the inside of the frame rail and secure with 8-32 kep nuts.

3. Reapply the serial number label to the new top cover. Refer to Figure 14–6 and install the labels supplied in the kit as shown.

14.4.4 Installing the Shelf Rails

Table 14–6 lists the parts in kit BA35X–RB (part of HSC9X–SZ) that are used to install the shelf rails:

Table 14–6   Kit BA35X–RB Shelf Rail Parts List

Part No.	Description	Qty
12–21368–02	Screw, SEMS, 10-32 pan, 0.625 Phillips	12
74–46417–01	Rail, single shelf, RETMA	2
74–46418–01	Bar, nut, shelf bracket, RETMA	4

(continued on next page)

Table 14–6 (Cont.)   Kit BA35X–RB Shelf Rail Parts List

Part No.	Description	Qty
74–46419–01	Bracket, retainer, shelf 0.25 inch recess	2
74–46419–02	Bracket, retainer, shelf 1.50 inch recess	4

The parts kit includes generic parts for installing SBB shelves in either the front
or rear positions in the HSC controller cabinet. If you are installing a shelf in the
front position, you will have the 0.25 inch recess shelf-retainer brackets left over
after installation. If you are installing a shelf in the rear position, you will have
two of the 1.50 inch shelf retainer brackets left over after installation. Figures
14–7 and 14–8 show the part names and exploded views of the shelf rails for front
and back mounted shelves.

Figure 14–7 Front Shelf Rail Assembly
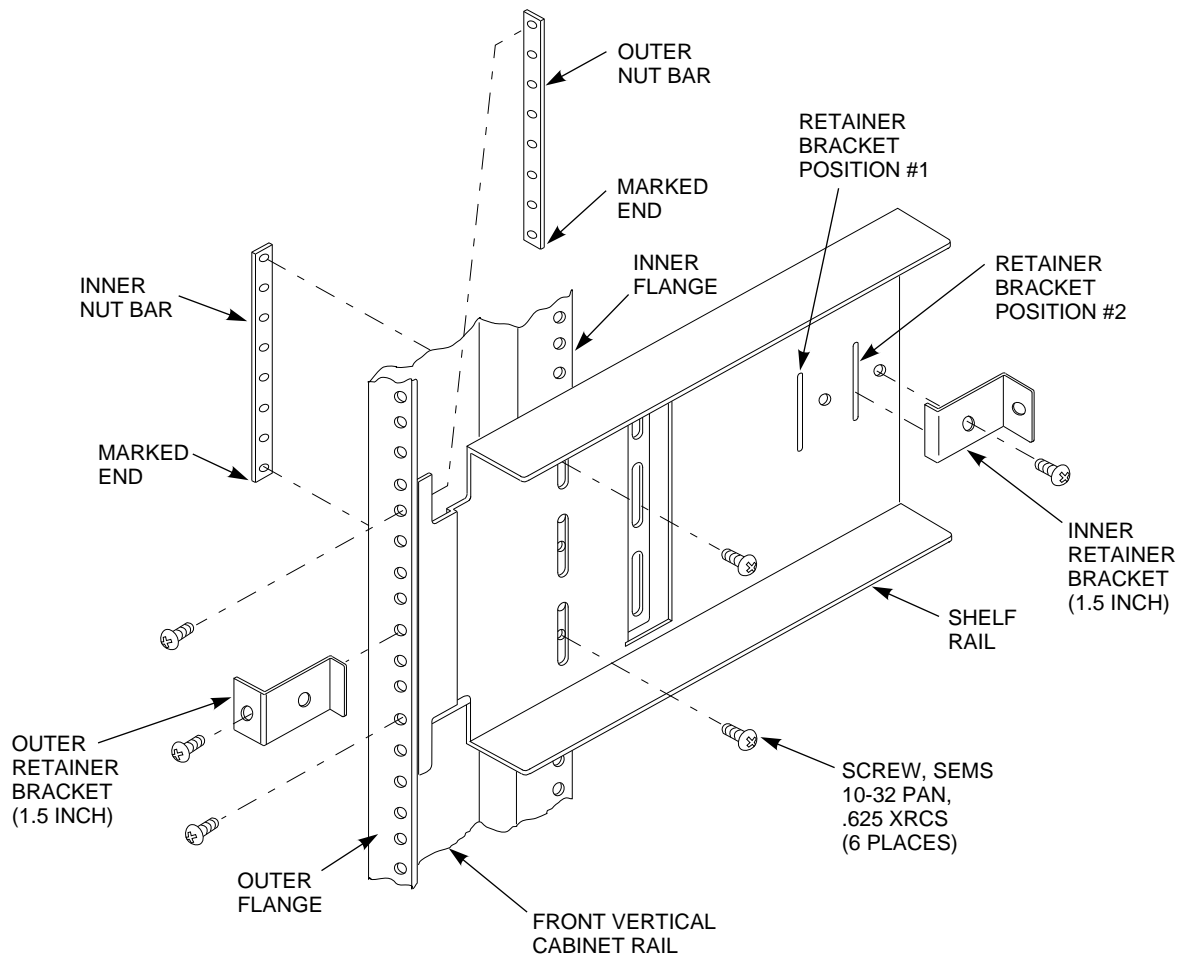
CXO-3834A-MC

Figure 14–8 Rear Shelf Rail Assembly

OUTER
NUT BAR

RETAINER
BRACKET
POSITION #1

RETAINER
BRACKET
POSITION #2

MARKED
END

INNER
FLANGE

INNER
NUT BAR

INNER
RETAINER
BRACKET
(1.5 INCH)

MARKED
END

SHELF
RAIL

OUTER
RETAINER
BRACKET
(.25 INCH)

SCREW, SEMS
10-32 PAN,
.625 XRCS
(6 PLACES)

REAR VERTICAL
CABINET RAIL

OUTER
FLANGE
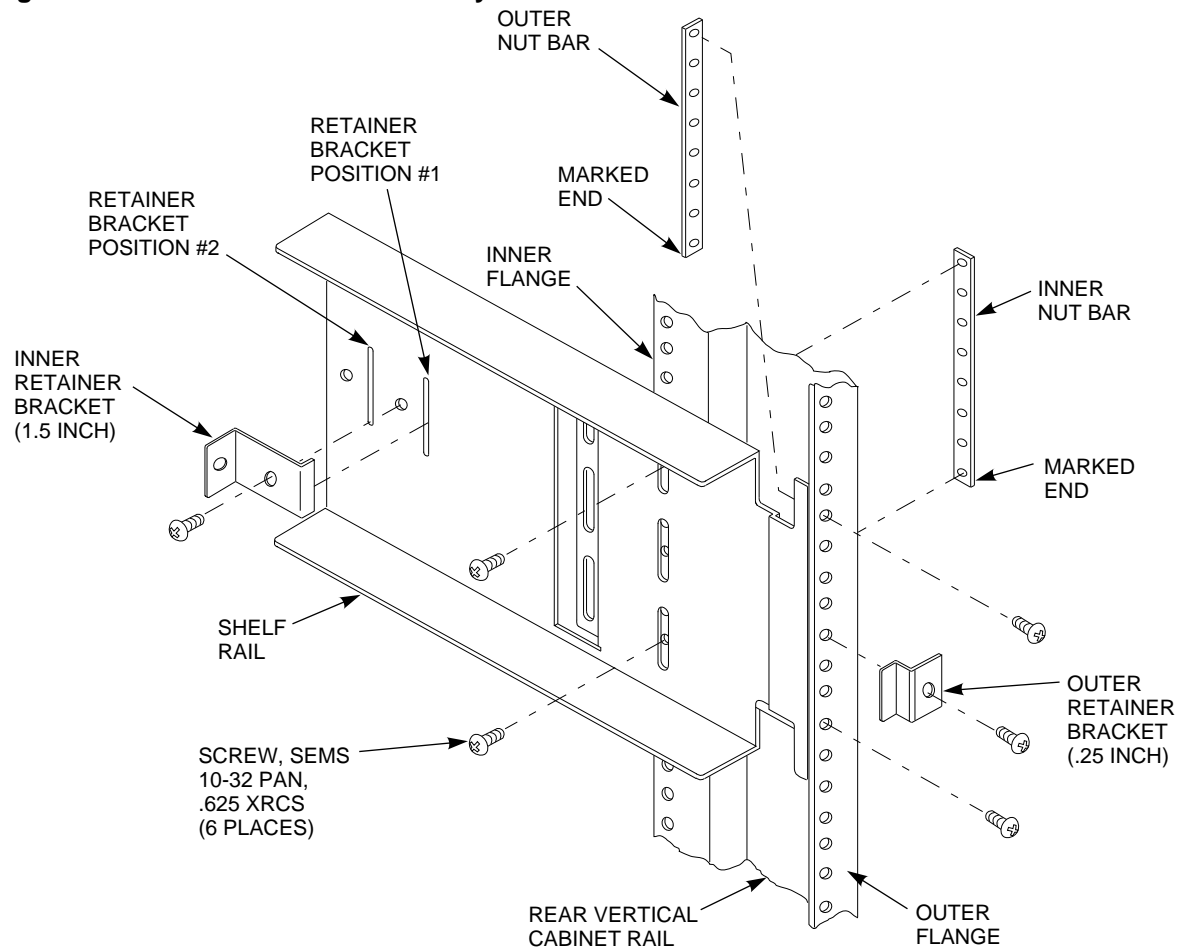
CXO-3835A-MC

_____ **Note** _____

Unless otherwise stated, mounting hole locations are counted from the
top of the cabinet uprights, the shelf rails, and the nut bars. In this
procedure, left and right is based on viewing the cabinet from the front
for a front mounted shelf, and from the rear for a rear mounted shelf.

_____

The following notes apply installing an SBB shelf in the HSC controller:

- The shelf rails can be installed in either the front or the rear of a cabinet.

- For orientation purposes, the bottom of the nut bar has a pattern of three
  small V-shaped marks. Unless otherwise specified, the nut bar is always
  oriented with this pattern at the bottom.

- All screws used in this procedure are SEMS 10-32 pan head Phillips, 0.625
  inch long.

- Shelf rail mounting screws are not fully tightened until after it has been
  verified that the shelf can be properly slipped into place.

- Forcing an SBB shelf into the rails can damage the shelf. If you are unable to easily insert the shelf, the shelf rails are not properly aligned, either vertically or horizontally. Remove the shelf and check the shelf rail position and alignment. The procedure for aligning the vertical uprights is described in Section 14.4.2.

Some steps in the rail installation procedure are specific to either a front or rear mounted shelf. The specific steps for a front mounted shelf are identified with the phrase "**For a front mounted shelf**;" rear mounted shelf text is preceded with the phrase "**For a rear mounted shelf**."

1. **For a front mounted shelf**, install a 1.5 inch shelf retainer bracket in the *rear* vertical slot on a shelf rail. Secure it with a screw through the bracket and into the side rail insert. Install a shelf retainer bracket on the other shelf rail. Go to Step 3.

   For a rear mounted shelf, install a 1.5 inch shelf retainer bracket in the *front* vertical slot on a shelf rail. Secure it with a screw through the bracket and into the side rail insert. Install a shelf retainer bracket on the other shelf rail. Go to Step 2.

   _____ **Note** _____

   The tops of the shelf rails for the upper two SBB shelves will stand out above the vertical rails.

   _____

2. **For a rear mounted shelf**, position a shelf rail on the vertical upright with shelf rail flange *behind* the vertical upright. The shelf rail must be flush against the vertical upright and a bottom shelf must rest on the the top cover shield.

3. Place a nut bar *behind* the shelf rail flange. Align the bottom nut bar hole (the end with the pattern of three V-shaped marks) with hole 5 for an upper shelf, or hole 16 for a lower shelf, counting from the top of the vertical rail. Insert a screw through the vertical upright, the shelf rail flange, and into the nut bar. Do not tighten the screw.

4. Counting from the top of the vertical rail, insert a screw through hole 2 for an upper shelf, or hole 9 for a lower shelf, of the vertical rail, the shelf rail flange slot, and into the nut bar screw hole. Do not tighten the screw.

5. Align the bottom nut bar screw hole with hole 7 for an upper shelf, or hole 16 for a lower shelf, of the side vertical rail. Insert a screw in the bottom rail slot, and through hole 6 for an upper shelf, or hole 15 for a lower shelf, of the side vertical rail and into the nut bar. Do not tighten the screw.

6. Insert a screw through the top side slot of the shelf rail, side vertical upright hole 2 for an upper shelf, or hole 9 for a lower shelf, and into the nut bar top mounting hole. Do not tighten the screw.

7. Repeat Steps 2 through 6 to install the other side rail.

8. Orient the SBB shelf with the SCSI connectors on the right end. Carefully insert the shelf into the shelf rails and push it in until it is firmly seated against the rear shelf retaining brackets. Tighten the mounting screws on the front of the vertical upright. **For a rear mounted shelf**, check that the SBB devices will clear the sheet metal of the cabinet during removal and replacement.

9. Remove the shelf and tighten the mounting screws in the side of the vertical upright.

14.4.5 Routing Power Cords and Signal Cables

Use the following procedure to route the SBB power cords and signal cables inside the HSC cabinet.

1. At the left front side of the HSC cabinet, install a cable tie through the tie mount in the top cover. Route the power cords for the front SBB shelves through this cable tie, leaving a 17 inch service loop for the bottom shelf, and a 10 inch service loop for the top shelf, measured from the end of the power cable to the cable tie. Tighten the cable tie.

2. Route the power cords through a cable tie installed through the tie mount in the right rear of the top cover (facing from the rear) and tighten the cable tie.

3. Facing from the rear of the HSC cabinet, plug the power cords for the front shelves into the two outlets on the right side of the power strip box assembly.

4. Facing from the rear of the HSC cabinet, plug the power cords for the rear SBB shelves into the two outlets on the left side of the power strip box assembly.

5. At the right front side of the HSC cabinet, install a cable tie through the tie mount in the top cover. Route the signal cables for the front SBB shelves through this cable tie, leaving a 19 inch service loop for the bottom shelf and a 14½-inch service loop for the top shelf, measured from the end of the signal cable to the cable tie. Tighten the cable tie.

6. Route the front shelf signal cables through a cable tie installed through the tie mount in the left rear of the top cover (facing from the rear) and tighten the cable tie. Coil excess signal cable in front of the rear shelf.

14.4.6 Installing An SBB Shelf

Before installing the SBB shelf, refer to the configuration guidelines and procedures given in the StorageWorks documentation and in Appendix A.

_____ **CAUTION** _____

Forcing the shelf into the rails can damage the shelf. If you are unable to insert the shelf easily, the shelf rails are not properly aligned. This could be caused by a bent upright. See Section 14.4.2 for corrective action.

_____

For a front mounted shelf, use the following procedure:

1. Insert the shelf into the rails and verify that it is fully seated against the 1.5 inch shelf retaining brackets on the rear of the rails.

2. For an upper shelf, remove the screw in hole 5 of the vertical rail, place a 1.5 inch shelf retaining bracket over the hole and replace and tighten the screw.

3. For a lower shelf, insert a screw through hole 12 of the vertical upright, the middle slot of shelf rail flange, and into the nut bar. Tighten the screw.

4. Repeat this procedure for the other shelf rail.

---------------------------------- **Note** ----------------------------------

It is normal for the right front retainer bracket to have a slight amount of play even when the screw is fully seated.

For a rear mounted shelf, use the following procedure:

1. Insert the shelf into the rails and verify that it is fully seated against the 1.5 inch shelf retaining brackets.

2. For an upper shelf, remove the screw in hole 5 of the vertical rail, place a RH (right hand) or LH (left hand) mounting bracket over the hole, and replace the screw. Install a screw in hole 3 of the vertical rail.

---------------------------------- **Note** ----------------------------------

If there is no upper shelf installed, install the RH or LH mounting bracket with screws in holes 3 and 5 of the vertical rail and secure with kep nuts

----

3. Secure the LH and RH mounting brackets to the top cover using 8-32 screws.

4. Place a 0.25 inch shelf retaining bracket over hole 12 of the rear vertical upright. Insert a screw through the shelf retaining bracket, the vertical upright, the middle slot of shelf rail flange, and into the nut bar. Tighten the screw.

5. Repeat this procedure for the other shelf rail.

6. Remove the screw in hole 9 of the rear vertical upright and install the rear door stop. If there is no shelf installed in that position, secure the door stop with a kep nut.

14.4.7 Installing the Upper Front Door Hardware

After the shelf is configured and permanently installed with the retainer brackets, you must install the hardware that carries the front door over the SBB shelf space. There are two procedures to do this, depending upon if there is a shelf installed in the front of the HSC controller cabinet, or if the only shelf is in the rear position.

If there is an upper or lower SBB shelf installed in the front of the HSC cabinet:

1. If there is a lower SBB shelf installed, remove the screw in hole 9 of the right vertical upright (facing the front of the HSC cabinet); for an upper shelf, remove the screw in hole 5 of the vertical upright. These screws carry the shelf retainer bracket.

2. Position the front door hinge bracket on the upright and align the bottom mounting hole of the bracket with hole 15 of the right vertical upright. The flange of the bracket that carries the revision number marking is oriented at the bottom.

3. Insert a 10-32 screw through the bottom mounting hole of the bracket, hole 15 of the vertical upright, and into the nut bar. Do not tighten. If a lower SBB shelf is not installed, use a kep nut.

4. If only a lower shelf is installed, insert a 10-32 screw in the top mounting hole of the hinge bracket, hole 4 of the upright, and into a kep nut. If an upper shelf is installed, place the screw in hole 5 of the vertical rail, along with the shelf retainer bracket. Do not tighten.

5. Reinstall the 10-32 screw in hole 9 of the vertical upright. This screw also carries the lower shelf retainer bracket, if the shelf is installed. Center holes in the hinge bracket with the holes in the upright and tighten all screws.

6. Install the ball studs in the male-female standoffs.

7. Insert one ball stud assembly through hole 3 of the left upright and secure with a 10-32 kep nut. If an upper shelf is installed, the screw will go into the nut bar instead of the kep nut.

8. Insert one ball stud assembly through hole 15 of the left upright and into the nut bar. If a lower shelf is not installed, use a kep nut. Final alignment of the hinge bracket is part of a later procedure.

If the front of the HSC cabinet does not have a shelf installed:

1. Position the front door hinge bracket on the upright and align the bottom mounting hole of the bracket with hole 15 of the vertical upright.

2. Insert a 10-32 screw through the bottom mounting hole of the bracket, hole 15 of the vertical upright, and secure with a kep nut. Do not tighten.

3. Insert a 10-32 screw in the top mounting hole of the hinge bracket, hole 4 of the upright, and secure with a kep nut. Do not tighten.

4. Center holes in the hinge bracket with the holes in the upright and tighten both screws.

5. Install the ball studs in the male-female standoffs.

6. Insert one ball stud assembly through hole 3 of the left upright and secure with a 10-32 kep nut.

7. Insert one ball stud assembly through hole 15 of the left upright and secure with a kep nut. Final alignment of the hinge bracket is part of a later procedure.

14.5 Completing SBB Shelf Installation

Use the procedures in this section to complete the installation of SBB shelves performed in Sections 14.3 or 14.4

14.5.1 Installing the Shelf SCSI Cables

The procedures in this section do not apply to shelves with a SCSI adapter, such as the DWZZA–VA. The procedures for connecting SCSI differential cables are included in Section 14.5.2.

_____ **Note** _____

SCSI cables are not part of the HSC cabinet upgrade kits. Compatible single-ended and differential SCSI cables listed in Table 14–13 and are ordered separately.

_____

The SCSI shelf connectors (receptacles) are located at the right-end of the shelf and can only accommodate 50-pin, high-density, straight connectors (plugs), as shown in Figure 14–9. The upper receptacle in the shelf is for the SCSI bus input. The lower receptacle is used to extend the SCSI bus to another shelf. Normally, all seven storage SBBs are located in a single shelf and the lower receptacle is not used.

Figure 14–9   SCSI "A" Cable Connector

PIN #1

BOTTOM
VIEW

SIDE
VIEW
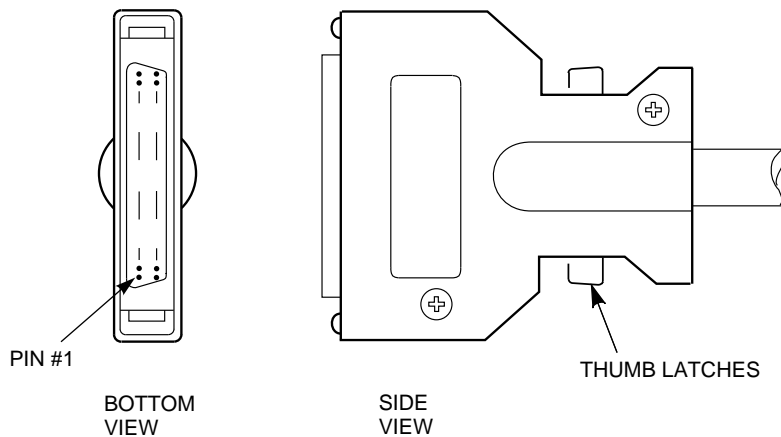
THUMB LATCHES

CXO-3651B-MC

To connect a SCSI 50-pin "A" cable to the shelf receptacle:

_____ **Note** _____

If four SBB shelves are installed in an HSC cabinet, the longer cable goes to the lower SBB shelf.

_____

1. Press and hold both thumb latches on the connector (plug) shell.

2. Carefully align the plug with receptacle.

3. Gently insert the plug into the receptacle until it is fully seated.

_____ **CAUTION** _____

Ensure that you do not deform the shell or bend any pins while inserting the plug into the receptacle.

_____

4. Release the thumb latches.

5. Verify the cable is firmly attached by gently pulling on the shell without pressing the thumb latches.

6. Do not route the other end of the cable yet.

14.5.2 Installing the SBBs

Refer to the StorageWorks documentation for a listing of the nomenclature and part numbers for the Storage Building Blocks in your installation. Use the following procedure to install the SBBs:

1. As shown in Figure 14–10, install the primary ac power supply SBB into slot 7, located at the left end of the shelf.

Figure 14–10   SBB Shelf

CXO-3617A-PH

2. Install the redundant power SBB or the battery backup (BBU) SBB in slot 6, next to the primary power supply.

_____ **Note** _____

Complete step 3 when the HSC SCSI data channel module is located in another HSC controller cabinet. Then go to step 5, which is applicable to all shelves.

_____

3. For SBB shelves that are remotely located from the HSC controller, install the SCSI adapter in slot 0 of the remote SBB shelf, and connect a differential SCSI cable. Route the cable to the rear door of the HSC controller cabinet containing the HSC SCSI data channel module assembly and connect the cable to the assigned requestor differential SCSI connector. You may have to remove one or more SBBs from the shelf to provide room to complete this step.

4. Connect right-angle 68-pin SCSI "P" cable connector shown in Figure 14–11 to the receptacle on the SCSI adapter.

Figure 14–11 SCSI "P" Cable Connector

BOTTOM
VIEW

68
34
35
1

PIN #1

SIDE
VIEW

digital

SCREW
FASTENERS

CXO-3627C-MC
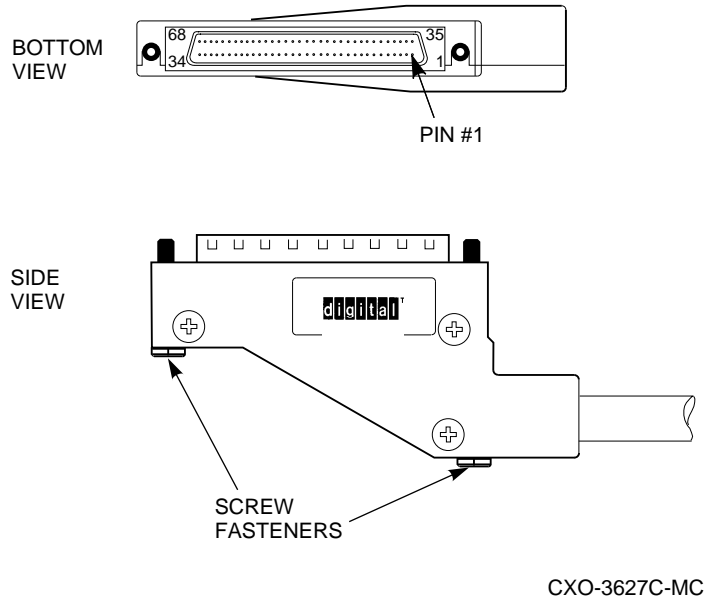
5. Install the storage SBBs starting with the first empty slot at the right end of the shelf (slot 0 or slot 1).

6. Ensure that all SBBs are firmly seated and can only be removed when the the SBB mounting tabs are pressed.

14.5.3 Connecting the AC Power

The parts required for this installation procedure are listed in the following table:

Part No.	Description	Quantity/Shelf
17–00442–50	Power cord, shelf, 1.31 m (4 ft), 10 A	1
17–03020–05	Power cord, shelf redundant, 1.54 m (5 ft)	1
17–00442–15	Power cord, terminal, 0.91 m (3 ft), 15 A	1
90–07032–00	Tie, cable	3

Perform the following steps to connect the ac power cord to the power distribution box (HSC9X–SS) or power strip box assembly (HSC9X–SF):

1. Remove the rear door latch.

2. Remove the four power controller screws (Figure 14–12).

3. Pull the HSC power controller completely out of the cabinet and set it on the floor next to the HSC controller.

_____ **CAUTION** _____

Be sure that you do not stress any cables connected to the power controller.

_____

Figure 14–12 Removing the HSC Power Controller

SINGLE PHASE

THREE PHASE
TYPE 1

02
03
J4 J5 J6 J1 01
J7 J8 J9 J2
J3

THREE PHASE
TYPE 2

02
03
01

MAIN POWER
SUPPLY LINE
CORD

COOLING
BLOWER
LINE CORD

CONNECT AC POWER
DISTRIBUTION BOX
TO AN UNUSED RECEPTACLE

AUXILIARY
POWER SUPPLY
LINE CORD

POWER
CONTROLLER
SCREWS

POWER
CONTROLLER
LINE CORD
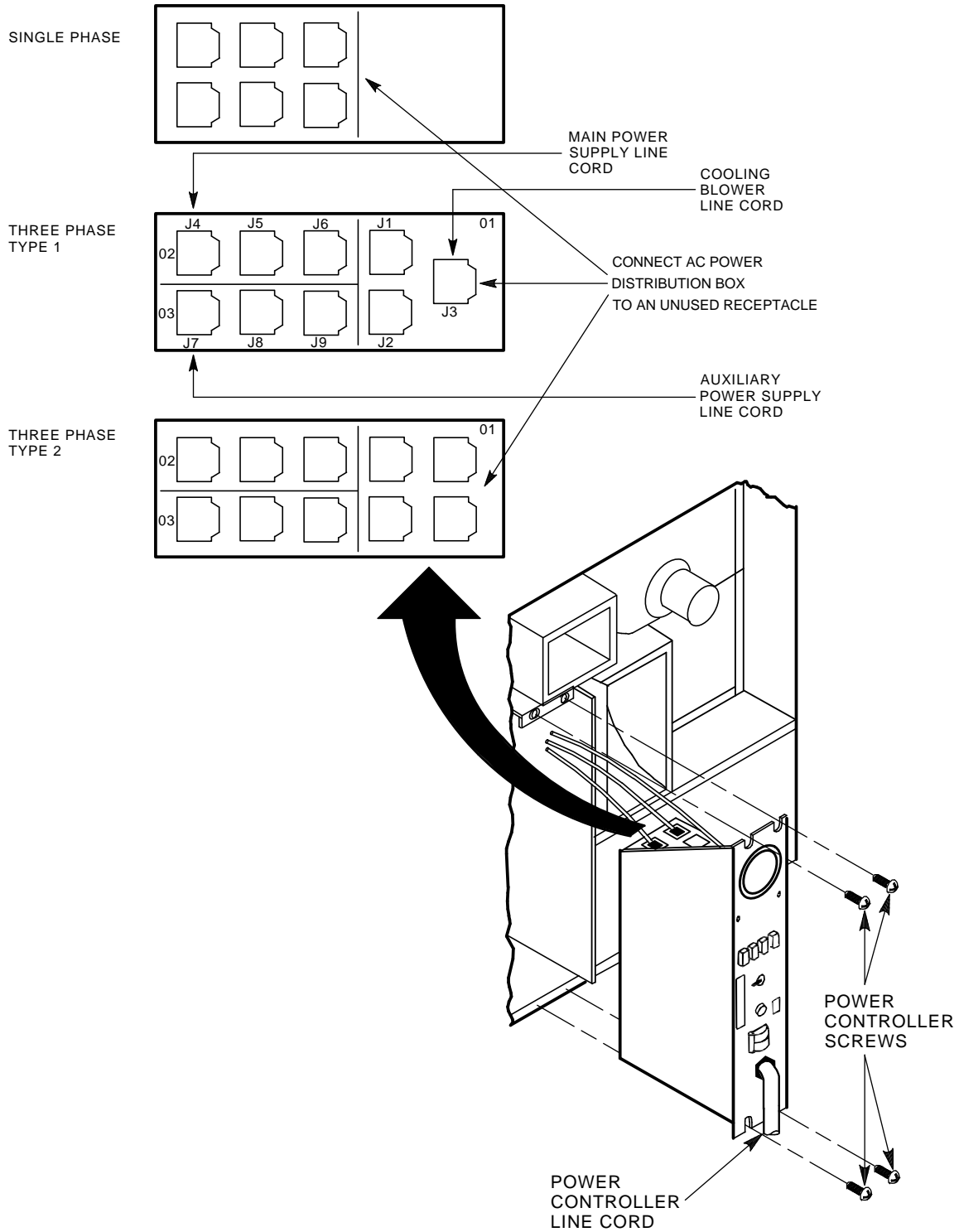
CXO-3669A_TI

4. Install the cable tie mounting block at the left side of the extender frame. The correct position is just below the top of the extender frame plate, at the cutout.

5. For a three-phase power controller, connect the power strip box assembly ac power cord to an unused phase 1 receptacle on the power controller top panel, as shown in Figure 14–12 For a single-phase power controller, connect the cord to any unused receptacle.

6. Route the ac power cord through the power controller front access hole and the cutout in the extender plate. Use a cable tie to secure the cord to cable tie mounting block.

7. Install the power controller and insert the four mounting screws.

8. Replace the rear door latch.

9. Connect the power cord to the ac input receptacle on the power strip box assembly.

10. For a two-shelf HSC cabinet installation (kit HSC9X–SS), connect the shelf power cords to the power strip box assembly and the shelf power SBBs. Coil up excess power cord and lay on top of the rear shelf.

11. For a four-shelf HSC cabinet installation (kit HSC9X–SF), the cables have been previously connected. Lay the power cables for the front shelves on the top of the rear shelf to the right of the power strip box assembly; the cords for the rear shelves are coiled and laid to the left of the power strip box assembly.

12. If there are redundant shelf power supplies in the HSC controller, use the redundant shelf power cord and repeat this procedure to connect the other Y-cable end to the redundant supply. Coil up the excess cord and secure it with two cable ties.

14.5.4 Installing the Upper Front Door

Use the following procedure to install the upper front door:

1. Insert the lower hinge pin in mounting bracket hinge pin hole.

2. Pull down on the upper hinge pin release lever and align the upper hinge pin with the upper hinge pin hole; release the lever.

3. Loosen and adjust the hinge bracket if you cannot fully close the door.

4. Close the door and ensure that both ball studs engage and release properly.

14.5.5 Replacing the End Panels

Use the following procedure to replace the end panels:

1. Carefully align the end panel with the key buttons. Slide the panel into place, ensuring that the four key slot studs are are fully seated.

2. Repeat the process for the other end panel.

3. At the front of the cabinet, slide the end panel mounting brackets out until they fully engage the end panels. Tighten the four end panel mounting bracket screws.

14.5.6 Positioning the HSC Cabinet

Reconnect all cables and reposition the HSC cabinet. Perform the procedures in Section 14.7 to complete the SBB shelf installation procedure.

14.6 Installing Kit HSC9X–SE (SCSI Bulkhead Kit)

Kit HSC9X–SE allows installation of from five to eight K.scsi modules in an HSC controller backplane. A complete list of parts in kit HSC9X–SE is given in Table 14–7.

Table 14–7   Kit HSC9X–SE Parts List

Part No.	Description	Qty
37–01476–01	Package assembly	1
70–30136–01	Bottom I/O bulkhead, SCSI	1
74–47050–01	Plate, filler	1
90–07032–00	Tie, cable	8

14.6.1 Removing the Exhaust Duct and Cables

Remove the exhaust duct in the drawing (refer to Figure 14–14) and the SDI/STI cable from the backplane as follows:

_____ **CAUTION** _____

When removing and replacing the exhaust duct, be careful of the sharp edges under the foam padding on the exhaust duct flange.

_____

1. Support the exhaust duct with one hand and turn the two quarter turn latches either clockwise or counter-clockwise.

_____ **Note** _____

Some HSC70 controllers have two quick release latches to secure the exhaust duct.

_____

2. Lift up on the quick release latch on the right side.

3. Remove the exhaust duct from the bottom of the blower duct.

4. Disconnect the airflow power sensor connector (J70) on the left side of the duct.

_____ **CAUTION** _____

Wear an ESD grounding wrist strap while working near the backplane.

_____

5. On the backplane, carefully remove the SDI/STI cable from the SCSI requestor slot to the I/O bulkhead.

CAUTION

To prevent accidentally disconnecting the two REQ slot backplane
connector shrouds, use a nonmetallic, insulated tool to hold the shrouds
in place when removing cables or TCBs.
___

Figure 14–13 Exhaust Duct
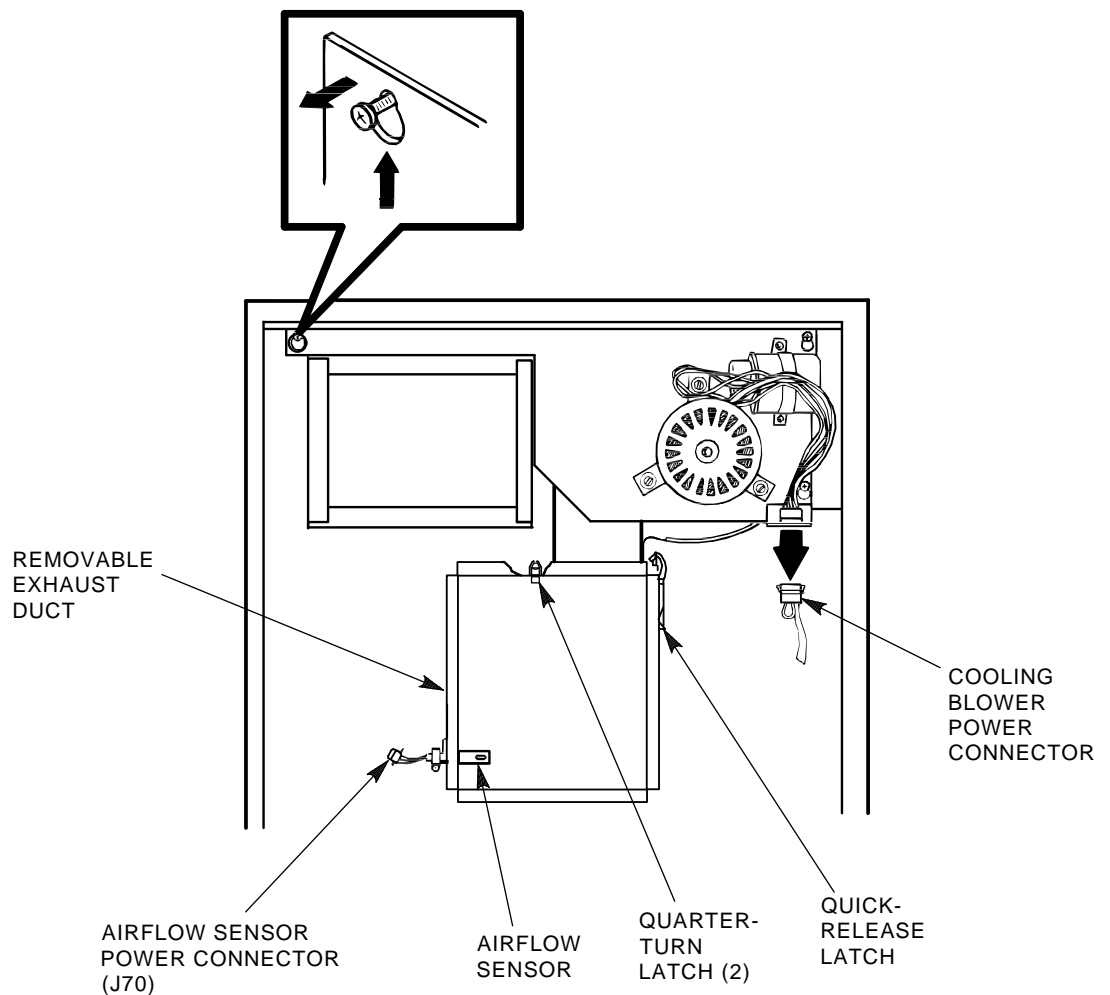
CXO-939C_S

14.6.2 Installing the SCSI Bulkhead

Perform the following steps to install the SCSI bulkhead:

1. Loosen or remove the screws that secure the CI cable bulkhead to the top I/O
   bulkhead. Remove the CI bulkhead and set aside. Do not pull the CI cables
   from their backplane connections or stress the cables during this procedure.

2. Unplug the SDI/STI cables for the top I/O bulkhead from the backplane.

3. Remove the screws that secure the top I/O bulkhead to the extender frame of the HSC controller cabinet and to the bottom I/O bulkhead. Remove the bulkhead and set aside for replacement later in this procedure using the same screws.

4. Remove the screws that secure the bottom I/O bulkhead to the extender frame. Save the screws for reassembly.

5. Unplug the SDI/STI cables for the bottom I/O bulkhead from the backplane. Remove the bottom I/O bulkhead and discard.

6. Install the SCSI bulkhead in place of the bottom I/O bulkhead using the screws saved in Step 4.

7. Determine the number of K.scsi modules to be installed in the HSC backplane.

8. Remove the unused SDI/STI cables from the top I/O bulkhead. Refer to Table 14–8 to determine which cables will be unused. For example, if you are installing 6 K.scsi modules, Requestors 8 and 9 will have the SDI/STI cables attached and Requestors 2 through 7 will have the SDI/STI cables removed.

9. Refer to Table 14–8 and install the transition cable boards (TCBs) in the HSC backplane.

10. Install the SCSI cables to the TCBs at the positions listed in Table 14–8.

11. Install the SDI/STI cables in the pin field shroud at the positions listed in Table 14–8.

Table 14–8   Installing TCBs and SDI/STI Cables

Number of K.scsi Modules	Requestor Number[1]							
	9	8	7	6	5	4	3	2
4	N[2]	M	L	K/J	TCB	TCB	TCB	TCB
5	N	M	L	TCB	TCB	TCB	TCB	TCB
6	N	M	TCB	TCB	TCB	TCB	TCB	TCB
7	N	TCB	TCB	TCB	TCB	TCB	TCB	TCB
8	TCB	TCB	TCB	TCB	TCB	TCB	TCB	TCB

[1]In this table, the designation "TCB" refers to a locations that a TCB is installed into, and the designations N through K/J refer to locations that receive an SDI/STI cable.

[2]N, M, L, and K are located in the lower row of the top backplane pin field shroud. J is located in the upper row of the pin field shroud.

12. Reinstall the top I/O bulkhead and the CI bulkhead.

14.6.3 Replacing the Exhaust Duct

Use the following procedure to replace the exhaust duct:

1. Connect the airflow power sensor connector (J70) on the left side of the duct.

2. Install the exhaust duct on the bottom of the blower duct.

3. Support the exhaust duct with one hand and align the two quarter turn latches. Rotate the latches either clockwise or counter-clockwise to lock the duct in place.

4. Press down on the quick release latch on the right-side to firmly secure the duct.

_____ **Note** _____

Some HSC70 controllers have two quick release latches to secure the exhaust duct.

_____

14.6.4 Completing SCSI Bulkhead Installation

To complete installation of the SCSI bulkhead, refer to Sections 14.7.2 through 14.10 to install and configure the K.scsi modules.

14.7 Installing Kit HSC9X–SX (SCSI Data Channel Upgrade)

Complete this procedure to install the Transition Cable Board (TCB) and K.scsi data channel module.

14.7.1 Transition Cable Board Installation

The parts required for completing this procedure are listed in the following table:

Part No.	Description	Qty
54–22877–01	HSC SCSI transition cable board (TCB)	1
90–08264–00	Mount, cable tie, adhesive backed	1
90–07032–00	Tie, cable	1

14.7.1.1 Removing the Exhaust Duct and Cables

Remove the exhaust duct in the drawing (refer to Figure 14–14) and the SDI/STI cable from the backplane as follows:

_____ **CAUTION** _____

When removing and replacing the exhaust duct, be careful of the sharp edges under the foam padding on the exhaust duct flange.

_____

1. Support the exhaust duct with one hand and turn the two quarter turn latches either clockwise or counter-clockwise.

_____ **Note** _____

Some HSC70 controllers have two quick release latches to secure the exhaust duct.

_____

2. Lift up on the quick release latch on the right side.

3. Remove the exhaust duct from the bottom of the blower duct.

4. Disconnect the airflow power sensor connector (J70) on the left side of the duct.

_____ **CAUTION** _____

Wear an ESD grounding wrist strap while working near the backplane.
_____

5. On the backplane, carefully remove the SDI/STI cable from the SCSI
   requestor slot to the I/O bulkhead.

_____ **CAUTION** _____

To prevent accidentally disconnecting the two REQ slot backplane
connector shrouds, use a nonmetallic, insulated tool to hold the shrouds
in place when removing cables or TCBs.
_____

Figure 14–14 Exhaust Duct
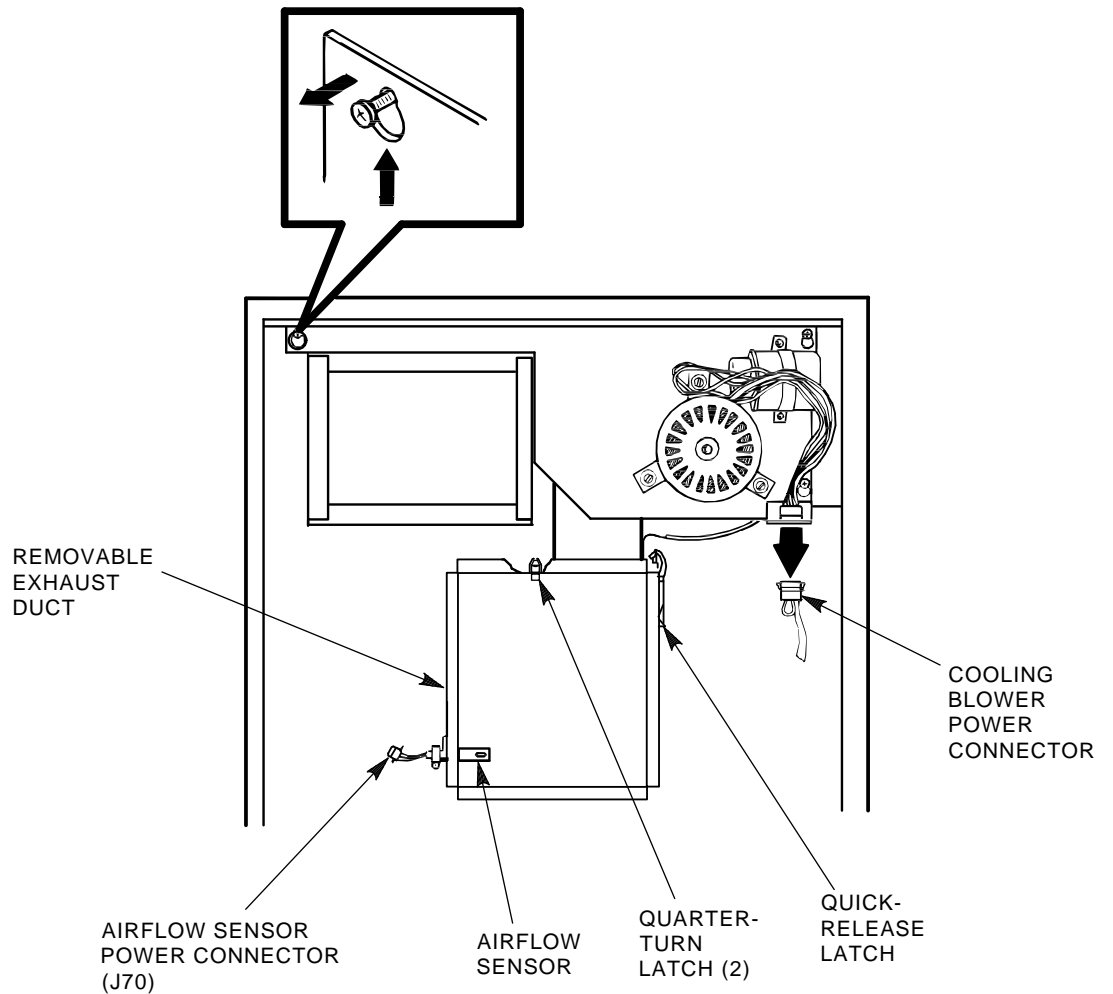
CXO-939C_S

14.7.1.2 Installing the TCB

Use the following procedure to install the TCB:

_____ **CAUTION** _____

Do not attempt to handle HSC controller modules unless you have taken proper precautions against electrostatic discharge (ESD). When handling modules, wear the ESD grounding wrist strap provided inside the front door of the HSC controller cabinet. Do not put modules on anything other than a properly grounded antistatic work surface.

_____

1. The factory-installed jumper on the TCB determines whether the TCB actively terminates the single-ended SCSI bus. The jumper does not affect the active termination of the differential SCSI bus.

2. Starting with requestor 2, connect the rear door 50-pin single-ended SCSI cable to the upper TCB connector. Make sure that the keying rib on the cable connector matches the notch in the TCB connector.

3. Starting with requestor 2, connect the rear door 68-pin differential SCSI cable to the lower TCB connector. Make sure that the keying rib on the cable connector matches the notch in the TCB connector.

4. Carefully insert the TCB into the backplane requestor connector shroud ensuring that you do not bend or distort any backplane pins.

5. Install the cable tie mount on right side of the extender frame at the bottom rear.

6. Secure the SCSI cable to this mount with a cable tie. Be sure to allow enough slack in the cable so that the door can open fully.

14.7.1.3 Replacing the Exhaust Duct

Use the following procedure to replace the exhaust duct:

1. Connect the airflow power sensor connector (J70) on the left side of the duct.

2. Install the exhaust duct on the bottom of the blower duct.

3. Support the exhaust duct with one hand and align the two quarter turn latches. Rotate the latches either clockwise or counter-clockwise to lock the duct in place.

4. Press down on the quick release latch on the right-side to firmly secure the duct.

_____ **Note** _____

Some HSC70 controllers have two quick release latches to secure the exhaust duct.

_____

14.7.2 Installing the HSC SCSI Data Channel Module

This section describes how to install the HSC SCSI data channel module and test it for proper operation.

CAUTION

Because this procedure assumes that the HSC controller is shut down and has all external connections disconnected, do not use this procedure when removing and replacing a defective K.scsi module. Refer to Appendix B for the correct remove and replace procedure.

The parts required for this procedure are listed in the following table:

Part No.	Description	Qty
L0131–AA	HSC SCSI data channel module (7 devices)	1
36–21758–03	Label, module placement (K.scsi module)	1

HSC controllers can accommodate a maximum of four HSC SCSI data channel modules. The first is installed in requestor 2, slot 10; the second in requestor 3, slot 9, and so forth. Therefore, you must relocate any data channel controllers installed a requestor slot selected for a HSC SCSI data channel module installation before you begin these procedures.

The installation procedure is based on installing the first HSC SCSI data channel module in requestor 2, slot 10. The procedures for installing modules in slots 9, 8, and 7 are identical.

CAUTION

Do not attempt to handle HSC controller modules unless you have taken proper precautions against electrostatic discharge (ESD). When handling modules, wear the ESD grounding wrist strap provided inside the front door of the HSC controller cabinet. Do not put modules on anything other than a properly grounded antistatic work surface.

Use the following procedure to install the HSC SCSI data channel module:

1. Place the ESD grounding strap from inside the front door on your wrist and adjust it for proper fit.

2. Carefully unwrap the HSC SCSI data channel module and place it on an antistatic work surface.

3. Refer to Tables 14–9 and 14–10 and verify that jumpers and terminators are installed correctly on the module board.

Table 14–9   K.scsi Module Jumpers

HSC SCSI Data Channel Module Jumpers

Jumper	Jumper Pins From	To	State	Function and Comments
JP1	1	2	In	32 MHz clock
JP2	1	2	In	48 MHz clock
JP3	N/A	N/A	Out	Not used—No jumper installed
JP4	N/A	N/A	Out	Not used—No jumper installed
JP5	N/A	N/A	Out	Not used—No jumper installed
JP6	1 2	2 3	In Out	Reset control
JP7	N/A	N/A	Out	Not used—No jumper installed
JP8	1	2	In	MFP clock H
JP9	1	2	In	MFP clock L
JP11	1 2	2 3	Out In	No internal termination power source required. TERM PWR
JP12	1	2	In	Supply SCSI bus TERM PWR

Table 14–10   K.scsi Module Terminators

Device	Action	Function
U163	Remove	Differential SCSI bus terminator
U164	Remove	Differential SCSI bus terminator
U165	Remove	Differential SCSI bus terminator
U166	Remove	Single-ended SCSI bus terminator
U167	Remove	Single-ended SCSI bus terminator

4. Align the module with requestor 2 guide slides and slide it in until it is fully seated. Press down on the card latches to secure the module.

5. Remove the label marked L0131–AA from the label sheet and apply it to the card cage label in the space for that requestor.

6. Apply power to the HSC cabinet as follows:

   a. Reconnect the HSC controller power cord to the power source.

   b. Turn on the HSC controller by setting the circuit breaker (CB) on the HSC power controller to 1 (on).

   c. Ensure the Secure/Enable switch is in the ENABLE position.

   d. Verify that the Online switch is in the out position.

   e. Ensure that the System and Utilities diskette is installed and the RX33 drive release handle is closed.

   f. At the front of the HSC controller, set the DC Power switch to the 1 position (on).

   g. Ensure that the Power indicator on the OCP is on.

h. All HSC controller module green status LEDs should be on. Refer to Table 14–11 to interpret the status LEDs on the K.scsi module.

i. Verify that the HSC controller console terminal displays the following boot message:

```
INIPIO-I Booting...

    HSC95 Version V800 30-Jul-1992 10:25:18      System HSC009
```

Copyright 1982,1983,1984,1985,1986,1987,1988,1989,1990,1991,1992, 1993. Digital Equipment Corporation. All Rights Reserved.

The HSC controller model, the software version number, and the system number are site specific. If this message is not displayed, verify that the Online switch is set to the out position. If it is, turn off the HSC controller by setting the circuit breaker on the power controller to 0. Verify that all modules are correctly installed and seated in the backplane, then turn the power back on.

Table 14–11   K.scsi Module LED Status Codes

Color	LED Number	Test or Failure Status[1]	Downloading Firmware	Operating Mode
Yellow	1[2]	Primary error bit 0	Off	Off (On = data transferring)
Yellow	2	Primary error bit 1	Off	Off (On = dialog in progress)
Yellow	3	Primary error bit 2	Off	Off (On = bus polling activity)
Yellow	4	Primary error bit 3	Off	Flashing = module heartbeat
Yellow	7	Secondary error bit 3	Off	On = KSUTIL running
Yellow	8	Secondary error bit 2	Off	Off (On = KSUTIL write operation)
Yellow	9	Secondary error bit 1	Off	Off (On = KSUTIL read operation)
Yellow	10[3]	Secondary error bit 0	Off	Flashing = dual-path heartbeat
Green	5	Off	On	On
Red	6	On	Off	Off

[1]State of yellow LEDs changes to indicate test status or failure code. See Table 14–12.

[2]Least Significant Digit (LSD), upper LED.

[3]Most Significant Digit (MSD), lower LED.

7. Failure of any part of the K.scsi module power on self-test generates the following display:

   • The top four yellow LEDs (LEDs 1 through 4) display the code of the *first* test failed.

   • The green LED (LED 5) is off.

   • The red LED (LED 6) is on.

   • LEDs 7 through 10, the lower LED block, are not part of the error code display.

   • Table 14–12 lists the power on self-tests in the sequence of execution. The diagnostic code and the most probable cause of a failure are also listed.

Table 14–12   Diagnostic Codes

Self Test Sequential Listing	Primary LED Value (Hex)	Secondary LED Value (Hex)	Status Code[1]	Cause of Failure[2]
68000 register test	2	3 through 7	013	SCSI data channel module
68901 MFP test	2	8 through F	013	SCSI data channel module
68681 DUART test	3	1 through 8	013	SCSI data channel module
MAC BC test	3	9 through C	301	SCSI data channel module
D-memory interface[3]	4	0 through F	302	SCSI data channel module I/O control processor Memory module
C-memory interface[3]	6	0 through 5	103	SCSI data channel module I/O control processor Memory module
RAM	C, D	9 through B	106	SCSI data channel module
Flash ROM	D	1 through 4	106	SCSI data channel module
Single ended ESP test	E	1 through 9	307	SCSI data channel module Cabling TCB Termination
Differential SCSI test	F	1 through 9	307	SCSI data channel module Cabling TCB Termination

[1]Diagnostic Status.

[2]Most *probable* cause of failure.

[3]Test not fully run unless requested.

8. Run the Test Bus off-line diagnostics to ensure that the HSC SCSI data channel module is functioning properly and interfaces properly with the other requestors.

14.8 Configuring the HSC SCSI Data Channel

Refer to the *HSC Controller User's Guide* and run the KSUTIL utility to configure the SCSI data channel module. Refer to Appendix A for information on configuring and cabling the SCSI data channel.

14.8.1 Configuring Single-Path HSC SCSI Data Channels

If the HSC controller is single-pathed, configure the K.scsi module for the following parameters:

- Single-pathing
- MSCP unit numbers
- SCSI ID=7

14.8.2 Configuring Dual-Path HSC SCSI Data Channels

Dual-path HSC controller configurations containing one or more K.scsi modules require that you shut down one of the HSC controllers in the pair while you set up the K.scsi module parameters on the other. This is to prevent a duplicate SCSI ID error due to the default SCSI ID that comes up when a K.scsi module is powered on. Use the following procedure to configure the K.scsi modules when installing a dual-path HSC controller configuration:

_____ CAUTION _____

Because this procedure requires you to shut down both HSC controllers in the dual-path pair, do not use this procedure when removing and replacing a defective K.scsi module. Refer to Appendix B for the correct remove and replace procedure.

_____

1. Shut down one HSC controller of the pair by setting the front panel DC power switch to the off (0) position.

2. Use the KSUTIL utility to configure the following parameters in the K.scsi module on the powered-up HSC controller:

   - Dual-pathing
   - MSCP unit numbers
   - SCSI ID=0

   Instructions for running KSUTIL are contained in the *HSC Controller User Guide*.

3. Shut down this HSC controller by setting the DC power switch to the off (0) position.

4. Set the DC power switch on the first HSC controller to the on (1) position.

5. After this HSC controller completes its boot, run KSUTIL and configure the following parameters on the K.scsi module in this HSC controller:

   - Dual-pathing
   - MSCP unit numbers
   - SCSI ID=7

   When you have finished setting these parameters, boot this HSC controller.

6. Set the DC power switch on the other HSC controller to the on (1) condition.

7. With both HSC controllers booted, check that the K.scsi module configurations are as previously set.

14.9 Connecting the External SCSI Cables

Connect the external SCSI cables only after configuring the K.scsi modules using the procedure in Section 14.8

The following part is required for this procedure:

Part No.	Description	Qty	Upgrade Kit
74–46084–01	Cover, decorative, cable	1	HSC9X–SA

Table 14–13 lists the HSC controller compatible single-ended and differential SCSI cables for connecting SBB shelves and external SCSI devices to the HSC cabinet SCSI compatible rear door. These SCSI cables are not part of the HSC cabinet upgrade kits, and must be ordered separately.

Refer to Appendix A for maximum bus length calculations and configuration guidelines to be used when connecting external cables to the HSC controller.

Table 14–13 Cables

	Length	
Order No.	Meters	Feet
Single-Ended SCSI "A" Cables		
Description:		
SCSI–2, 50-conductor cable with two high-density male straight connectors.		
BN21H–0C	0.3	0.98
BN21H–0E	0.5	1.6
BN21H–01	1.0	3.3
BN21H–1E	1.5	4.8
BN21H–02	2.0	6.5
BN21H–03	3.0	9.8
BN21H–05	5.0	16.4
Differential SCSI "P" Cables		
Description:		
SCSI–3, 68-conductor cable with one male standard straight connector and one male standard right-angle connector.		
BN21K–02	2.0	6.5
BN21K–03	3.0	9.8
BN21K–05	5.0	16.4
BN21K–10	10.0	32.8
BN21K–15	15.0	49.2
BN21K–20	20.0	65.6

Complete the following procedure to connect the external SCSI cables:

1. For SCSI cables connected to an SBB shelf in the HSC cabinet:

   a. Select the shelf SCSI cable assigned to requestor 2.

b. Route the cable to rear of the cabinet and through the aperture at the top of the rear door.

c. Connect the requestor 2 SCSI cable to the single-ended (50-pin) requestor 2 SCSI receptacle on the rear door.

2. For SCSI cables connected to SCSI devices in another cabinet:

a. Select the shelf SCSI cable assigned to requestor 2. This is a differential cable if a DWZZA is installed in shelf slot 0.

b. Route the cable selected in Step 1 from the other cabinet to the HSC cabinet rear door or the I/O bulkhead, if installed.

c. Connect the requestor 2 SCSI cable to the differential (68-pin) requestor 2 SCSI receptacle on the rear door or the I/O bulkhead, if installed.

3. Connect the requestor 3, requestor 4, and requestor 5 cables in the same manner.

4. With the open end of cover pointing down, align the cover mounting tabs with the rear door mounting holes.

5. Insert the cover tabs into the rear door holes.

6. Carefully pull down on the cover ensuring that it does not damage the SCSI cables and fully seat the tabs.

7. Verify that the door swings freely and does not bind.

14.10 Recording Configuration Data

Correcting an HSC SCSI data channel module problem can require replacing the module and configuring the new module. A printed copy of the current configuration is required to ensure the replacement module is properly configured. Use the following procedure to print the HSC SCSI data channel module configuration:

1. Enable the printer.

2. Run SET SHO.

3. Run SHO DISK to print the configuration.

4. Place the configuration printout where it is readily accessible for troubleshooting.

A

SBB Shelf Configuration Guidelines

Use the guidelines in this section for configuring the K.scsi module in an HSC controller. Table A–1 lists the internal bus lengths to be used when calculating the total bus length.

Table A–1 Bus Length Calculations

	Length	
Item	**Meters**	**Feet**
The SBB shelf contributes	0.8	2.62
The HSCxx internal cable contributes	0.8	2.62
The Rack Mount HSC internal cable contributes	1.0	3.28
These additions to total SCSI bus length must be considered when calculating the bus length.		

A.1 SBB Shelf with Single SCSI–2 Bus

When the SBB shelf has only one bus for a maximum of seven SBBs, the configuration rules are:

- The terminator board (BA35X–MB) must be installed in the backplane connector adjacent to slot 1.

- The jumper board (BA35X–MC) must be installed in the backplane connector adjacent to slot 5.

- The SCSI–2 single-ended bus is a slow bus (5 megabytes per second transfer rate). The total bus length must not exceed six meters (19.7 feet).

- For differential SCSI bus operations, the HSC controller must be in the end bus position. It cannot be placed in the mid-bus position.

- The maximum cable length for differential bus operations is 20 meters (65.6 feet).

- SCSI signal converters, such as the DWZZA–VA, must be installed in slot 0.

- When a SCSI–2 single-ended cable is connected to JA–1, you must disable single-ended terminator on the DWZZA–VA SCSI signal converter in slot 0.

- Using a tri-link connector block (H885–AA) with a DWZZA–VA SCSI signal adapter, requires disabling the DWZZA–VA differential terminators.

A.2 SBB Shelf with Dual SCSI–2 Buses

When the SBB shelf has two SCSI–2 buses (one for three SBBs and one for four SBBs), the configuration rules are as follow:

- The terminator board (BA35X–MB) must be installed in the backplane connector adjacent to slot 5.

- The jumper board (BA35X–MC) is not required for dual-bus operation. However, it is recommended that it be installed in the backplane connector adjacent to slot 1, to ensure it easily located. When the jumper is installed in this location it has no effect on SCSI bus operations.

- The SCSI–2 single-ended bus is a slow bus (5 megabytes per second transfer rate). The total bus length must not exceed six meters (19.7 feet).

- For differential SCSI bus operations, the HSC controller must be in the end bus position. It cannot be placed in the mid-bus position.

- The maximum cable length for differential bus operations is 20 meters (65.6 feet).

- SCSI signal converters, such as the DWZZA–VA, can be installed in slot 0 (which is connected to JA–1) or slot 1 (which is connected to JB–1).

- When a SCSI–2 single-ended cable is connected to JA–1, you must disable the single-ended terminator on the DWZZA–VA SCSI signal converter in slot 0.

- When a SCSI–2 single-ended cable is connected to JB–1, you must disable the single-ended terminator on the DWZZA–VA SCSI signal converter in slot 1.

- The SHELF_OK signal is connected to slot 0. Therefore, only the HSC controller connected to JA–1 can monitor this signal.

- Using a tri-link connector block (H885–AA) with a DWZZA–VA SCSI signal adapter, requires disabling the DWZZA–VA differential terminators.

A.3 Multiple SBB Shelves

Multiple SBB shelves can be used with an HSC controller. When multiple SBB shelves are used, they can be configured as either a single or dual bus shelf—a hybrid configuration—using the following the configuration rules:

- The single bus or dual bus connection rules apply to each single or dual bus shelf.

- The first shelf in a single-ended hybrid configuration must be a single bus shelf with the HSC controller connected to JA–1. The jumper board BA35X–MC is installed in the backplane connector adjacent to slot 5. JB–1 is the bus output connector.

    _____ **Note** _____

    Single-ended SCSI-2 buses can only be terminated at the end of the bus. Therefore, do not install a terminator board in the first shelf.

    _____

- The second shelf in a single-ended hybrid configuration can be configured as either a single bus shelf or as a dual bus shelf.

- When there are more than four devices to be added to the bus, configure the shelf as a single shelf with the terminator board behind slot 1, and the jumper board behind slot 5. The input connector is JA–1.

- When there are *three or fewer SBBs*, connect JB–1 of the first shelf to JA–1 of the second shelf. Install the terminator board behind slot 5. No jumper board is required, but it can be installed behind slot 1 for safekeeping.

- When there are *four* SBBs, connect JB–1 of the first shelf to JB–1 of the second shelf. Install the terminator board behind in slot 5. No jumper board is required, but it can be installed behind slot 1 for safekeeping.

A.4 Examples of HSC Controller/SBB Configurations

This section contains some examples of typical configurations using the HSC controller and StorageWorks building blocks. The configurations are as follows:

- **Single-ended dual-path:** This configuration is used with the rackmount HSC95 controller only and incorporates a Y-cable between the TCB and the I/O bulkhead (Figure A–1).

- **Dual-path HSC controllers with internal SBBs:** This configuration is for HSC controllers that have either the HSC SCSI Array Starter Kit (HSC9X–SS) or the HSC Extended Top Cover Kit (HSC9X–SF) installed (Figure A–3).

- **Six 5¼-inch SCSI devices on one HSC controller:** This configuration uses a DWZZA in Slot 0 of the first SBB shelf (Figure A–4).

- **Six 5¼-inch SCSI devices in dual-path configuration with tri-link:** This configuration uses a DWZZA and Tri-Link in slot 0 of the first SBB shelf (Figure A–5).

- **Six 5¼-inch SCSI devices in dual-path configuration with two DWZZAs:** This configuration uses two DWZZAs and no tri-link. (Figure A–6).

Figure A–1 Single-Ended Dual-Path (Rackmount HSC95 Controller Only)
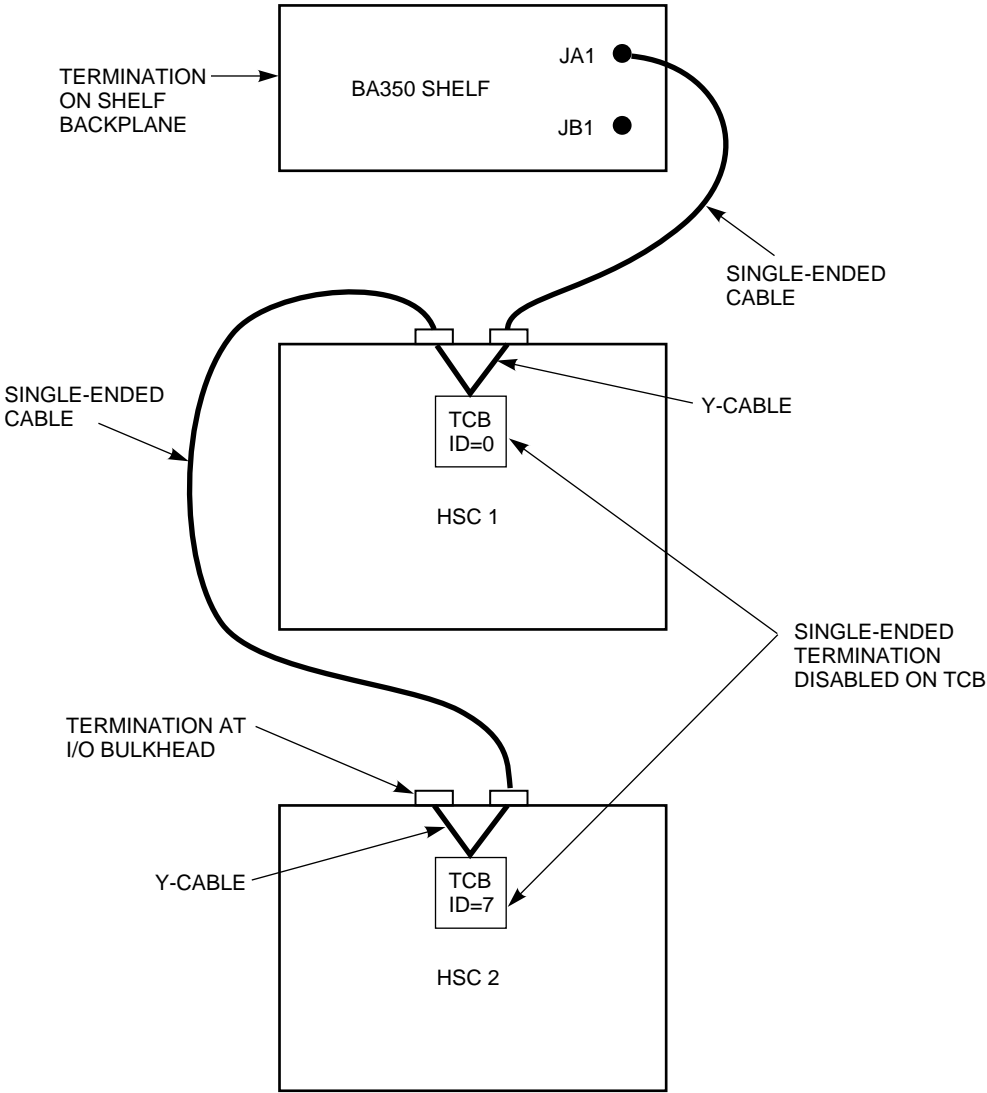
CXO-3943A-MC

Figure A–2 Dual-Path HSC Controllers with Single Internal SBB
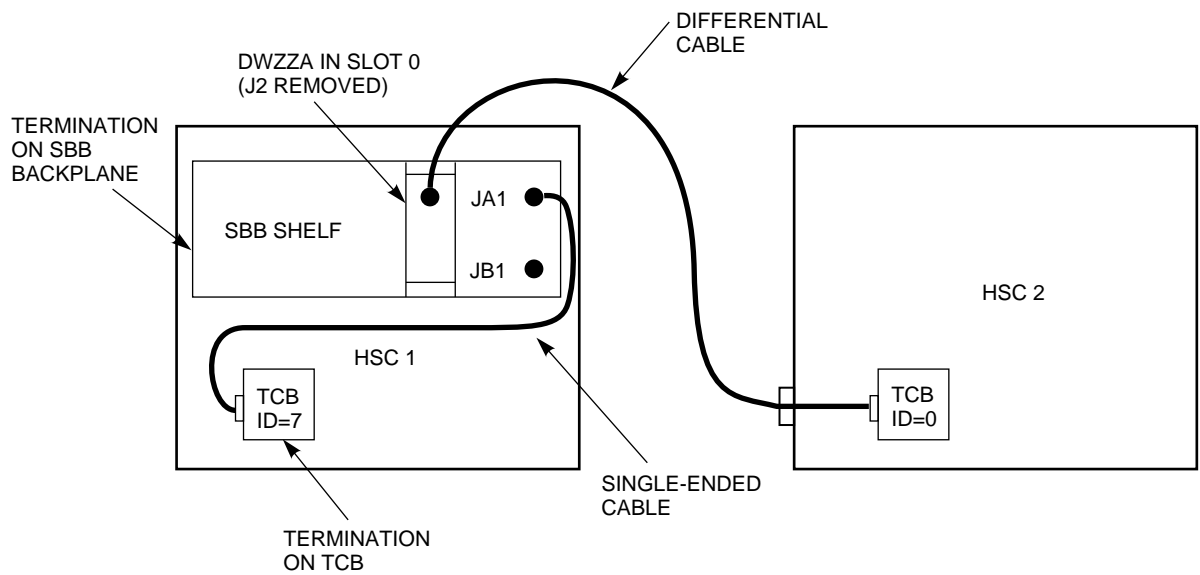
CXO-3990A-MC

Figure A–3 Dual-Path HSC Controllers with Internal SBBs
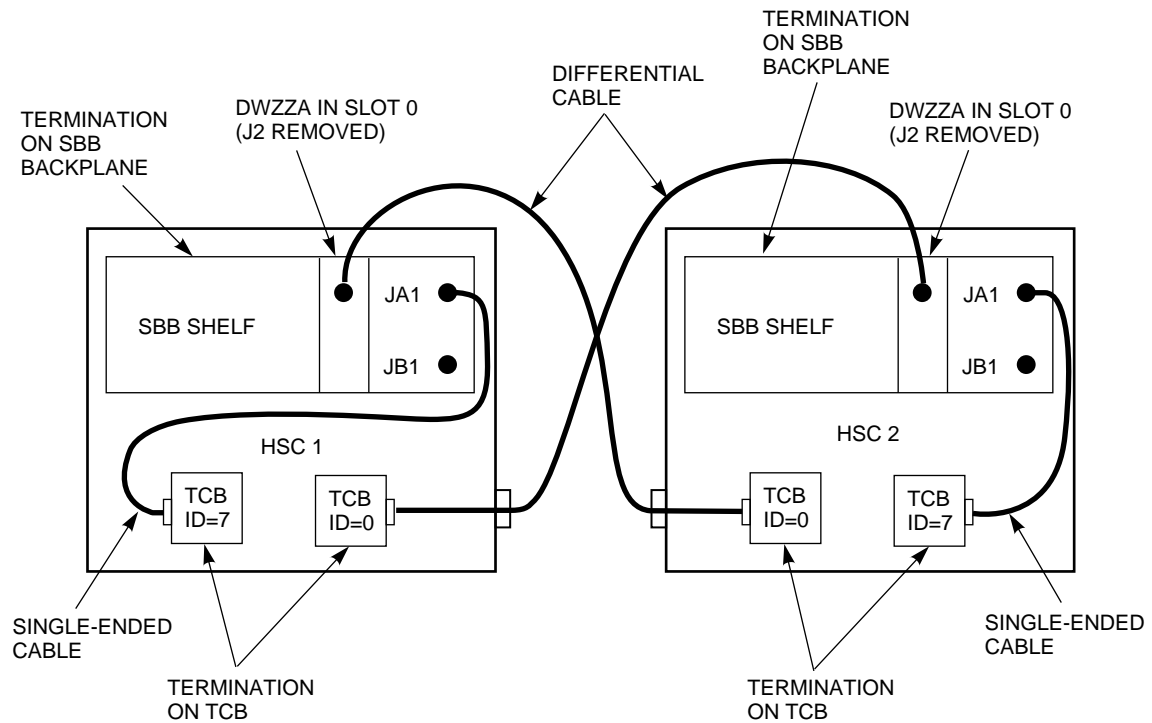
CXO-3944A-MC

Figure A–4 Six 5¼-Inch SCSI Devices On One HSC Controller

DWZZA IN SLOT 0
(J2 , AND DIFFERENTIAL
TERMINATION INSTALLED)

DIFFERENTIAL
CABLE

SBB SHELF

JA1

JB1

HSC

TCB
ID=7

BACKPLANE
TERMINATION
REMOVED

SBB SHELF

JA1

JB1

SINGLE-ENDED
CABLE

SBB SHELF

JA1

JB1

BACKPLANE
TERMINATION
INSTALLED
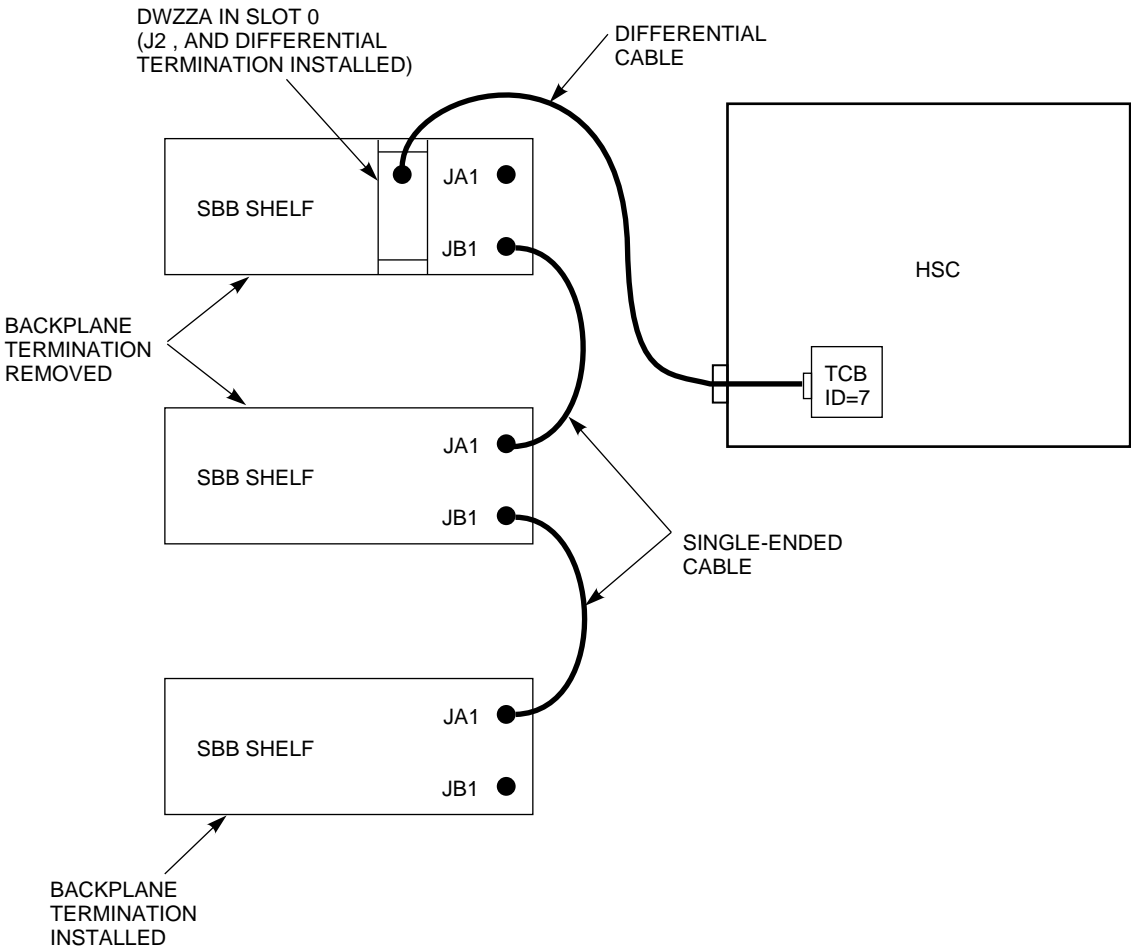
CXO-3951A-MC

Figure A–5 Six 5¼-Inch SCSI Devices in Dual-Path Configuration with Tri-Link

DWZZA IN SLOT 0
(TRI-LINK [H885-AA]
AND J2 INSTALLED;
DIFFERENTIAL TERMINATION
REMOVED)

DIFFERENTIAL
CABLE

SBB SHELF

JA1

JB1

HSC 1

TCB
ID=0

BACKPLANE
TERMINATION
REMOVED

SINGLE-ENDED
CABLE

SBB SHELF

JA1

JB1

DIFFERENTIAL
CABLE

SINGLE-ENDED
CABLE

SBB SHELF

JA1

JB1

HSC 2

TCB
ID=7

BACKPLANE
TERMINATION
INSTALLED

CXO-3945A-MC
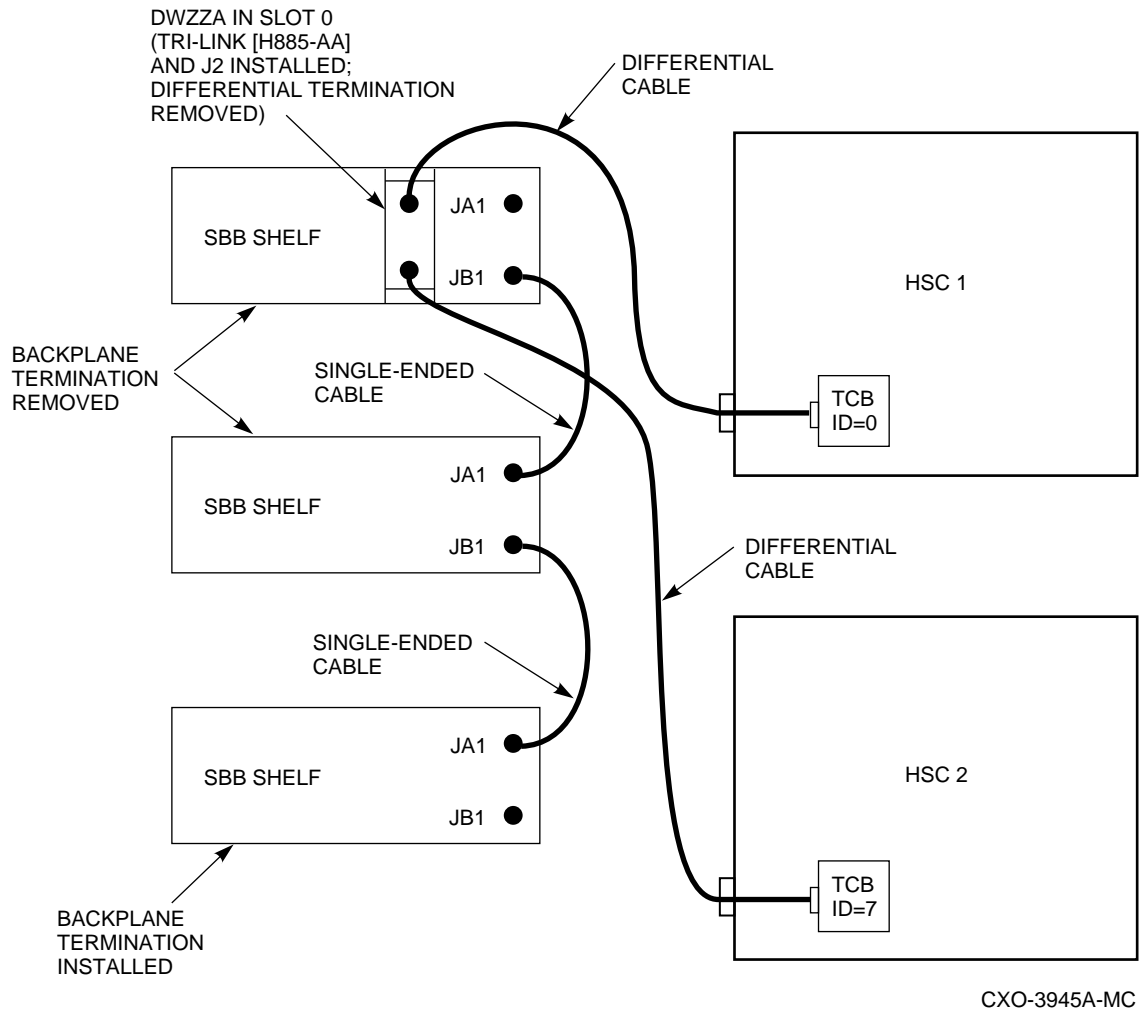
Figure A–6 Six 5¼-Inch SCSI Devices in Dual-Path Configuration with Two DWZZAs

DWZZA IN SLOT 0
(J2 AND DIFFERENTIAL
TERMINATION INSTALLED)

DIFFERENTIAL
CABLE

SBB SHELF

JA1

JB1

HSC 1

TCB
ID=0

BACKPLANE
TERMINATION
REMOVED

SBB SHELF

JA1

JB1

SINGLE-ENDED
CABLE

SBB SHELF

JA1

JB1

HSC 2

TCB
ID=7

BACKPLANE
TERMINATION
INSTALLED

DWZZA IN SLOT 0
(J2 REMOVED,
DIFFERENTIAL
TERMINATION
INSTALLED)

DIFFERENTIAL
CABLE

CXO-3946A-MC

B
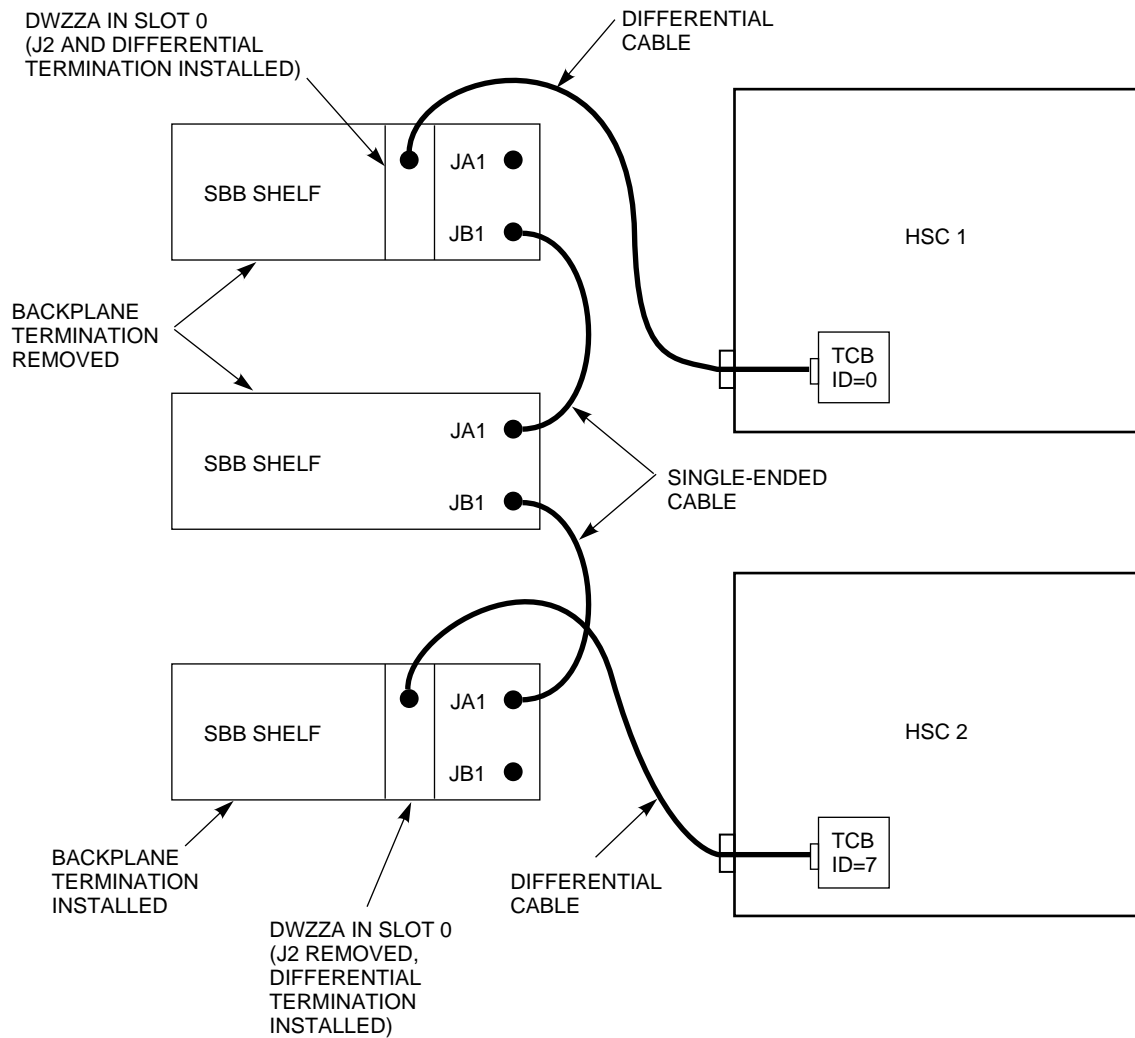
Removing and Replacing a K.scsi Module

This appendix describes how to remove and replace the K.scsi data channel module and test it for proper operation.

Use the following procedure to remove and replace the K.scsi data channel module:

CAUTION

Do not attempt to handle HSC controller modules unless you have taken proper precautions against electrostatic discharge (ESD). When handling modules, wear the ESD grounding wrist strap provided inside the front door of the HSC controller cabinet. Do not put modules on anything other than a properly grounded antistatic work surface.

---

1. Notify users that the HSC controller is being taken off line and the drives attached to it will not be available.

2. Dismount or fail over any drives connected to the HSC controller.

3. Remove power from the HSC controller by setting the front panel DC Power switch to the 0 (off) position.

4. Place the ESD grounding strap from inside the front door on your wrist and adjust it for proper fit.

5. Open the front door of the HSC cabinet.

6. Turn the two nylon latches on the card cage cover plate one-quarter turn and pull the cover up and out.

7. Check the module utilization label above the card cage for the location of the problem K.scsi module. Remove the K.scsi module.

8. Carefully unwrap the replacement K.scsi module and place it on an antistatic work surface.

9. See Tables B–1 and B–2 and verify that jumpers are installed correctly on the module board and the terminators are removed.

Table B–1 K.scsi Module Jumpers

HSC SCSI Data Channel Module Jumpers

Jumper	Jumper Pins		State	Function and Comments
	From	To		
JP1	1	2	In	32 MHz clock
JP2	1	2	In	48 MHz clock
JP3	N/A	N/A	Out	Not used—No jumper installed
JP4	N/A	N/A	Out	Not used—No jumper installed
JP5	N/A	N/A	Out	Not used—No jumper installed
JP6	1	2	In	Reset control
	2	3	Out	
JP7	N/A	N/A	Out	Not used—No jumper installed
JP8	1	2	In	MFP clock H
JP9	1	2	In	MFP clock L
JP11	1	2	Out	No internal termination power source required.
	2	3	In	TERM PWR
JP12	1	2	In	Supply SCSI bus TERM PWR

Table B–2 K.scsi Module Terminators

Device	Action	Function
U163	Remove	Differential SCSI bus terminator
U164	Remove	Differential SCSI bus terminator
U165	Remove	Differential SCSI bus terminator
U166	Remove	Single-ended SCSI bus terminator
U167	Remove	Single-ended SCSI bus terminator

10. Align the module with the requestor slot guide slides of the card cage and slide it in until it is fully seated. Press down on the card latches to secure the module.

11. If the HSC controller is SCSI ID=0 of a dual-path pair, unplug the differential cable at the DWZZA from the ID=7 HSC controller.

12. Apply power to the HSC controller by setting the DC Power switch to the 1 (on) position.

13. Refer to Table B–3 to interpret the status LEDs on the K.scsi module.

Table B–3 K.scsi Module LED Status Codes

Color	LED Number	Test or Failure Status[1]	Downloading Firmware	Operating Mode
Yellow	1[2]	Primary error bit 0	Off	Off (On = data transferring)
Yellow	2	Primary error bit 1	Off	Off
Yellow	3	Primary error bit 2	Off	Off
Yellow	4	Secondary error bit 4	Off	Flashing = normal
Yellow	7	Secondary error bit 3	Off	On = KSUTIL running
Yellow	8	Secondary error bit 2	Off	Off
Yellow	9	Secondary error bit 1	Off	Off
Yellow	10[3]	Secondary error bit 0	Off	Flashing = dual-path
Green	5	Off	On	On
Red	6	On	Off	Off

[1]State of yellow LEDs changes to indicate test status or failure code. See Table B–4.

[2]Least Significant Digit (LSD), upper LED.

[3]Most Significant Digit (MSD), lower LED.

14. Failure of any part of the power on self-test generates the following display:

   - The top four yellow LEDs (LEDs 1 through 4) display the code of the *first* test failed.

   - The green LED (LED 5) is off.

   - The red LED (LED 6) is on.

   - LEDs 7 through 10, the lower LED block, are not part of the error code display.

15. Table B–4 lists the power on self-tests in the sequence of execution. The diagnostic code and the most probable cause of a failure are also listed.

Table B–4 Diagnostic Codes

Self Test Sequential Listing	Primary LED Value (Hex)	Secondary LED Value (Hex)	Status Code[1]	Cause of Failure[2]
68000 register test	2	3 through 7	013	SCSI data channel module
68901 MFP test	2	8 through F	013	SCSI data channel module
68681 DUART test	3	1 through 8	013	SCSI data channel module
MAC BC test	3	9 through C	301	SCSI data channel module
D-memory interface[3]	4	0 through F	302	SCSI data channel module or M.std memory module
C-memory interface[3]	6	0 through 5	103	SCSI data channel module
RAM	C, D	9 through B	106	SCSI data channel module
Flash ROM	D	1 through 4	106	SCSI data channel module
Single ended ESP test	E	1 through 9	307	SCSI data channel module, cabling, TCB, or termination
Differential SCSI test	F	1 through 9	307	SCSI data channel module

[1]Diagnostic status.

[2]Most *probable* cause of failure.

[3]Test not fully run unless requested.

16. If the HSC controller is single-pathed, or is SCSI ID=7 of a dual-pathed pair, configure the K.scsi module for the following parameters:

    - Single or dual-pathing
    - MSCP unit numbers
    - SCSI ID=7

17. If the HSC controller is SCSI ID=0 of a dual-path pair, configure the K.scsi module as follows:

    a. Use the KSUTIL utility to configure the K.scsi module for the following parameters:

        - Dual-pathing
        - MSCP unit numbers
        - SCSI ID=0

    b. Remove power from the HSC controller by setting the DC Power switch to the 0 (off) position.

    c. Replace the differential cable disconnected in Step 11.

    d. Apply power to the HSC controller by setting the DC Power switch to the 1 (on) position.

    e. With both HSC controllers booted, check that the K.scsi module configurations are as previously set.

18. Run the Test Bus offline diagnostics to ensure that the HSC SCSI data channel module is functioning properly and interfaces properly with the other requestors.

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