

HSC Controller

Supplementary Service Information for HSC65 and HSC95 Controllers

Order Number: EK-HS695-SI. B01

This supplement to the *HSC Controller Service Manual* contains updates for the HSC65 and HSC95 controllers. Additional information is also included to update the *HSC Controller Service Manual* for all models of HSC controllers with information developed since last publication.

July 1993

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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. These controllers include the following modules:

- L0142–YC/YD P.ioj2 I/O control processor

This module has the following features:

- 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

- L0121–BA M.cache2 cache memory module

This module contains an increased memory capacity of 64 megabytes. HSC Cache is standard on all HSC65 and HSC95 controllers and is used when upgrading existing HSC40™, HSC70™, HSC60™, and HSC90™ controllers to HSC65 and HSC95 controllers.

- L0123–BA M.std5 memory module

This module is similar to the memory module used in HSC60 and HSC90 controllers.

HSC High Performance Software™ V8.0 is optimized to perform with the HSC65 and HSC95 controllers as well as earlier HSC controller models except the HSC50™ controller.

A new requestor, the L0131–AA K.scsi module (HSC9X–SX), offers Small Computer System Interface (SCSI) drive interface capability to all HSC controller models except the HSC50 controller. SCSI capability is supported by the new KSUTIL utility. Complete instructions for using KSUTIL are included in the *HSC Controller User Guide* for V8.0 software.

Along with the K.scsi module, a new option is available to install up to two BA350–SA modular storage 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.

HSC65 and HSC95 Service Manual Updates

2.1 Introduction

This chapter contains specific update information for the *HSC Controller Service Manual*. All updates are referenced to a specific chapter, table, or figure in the service manual.

2.2 General Information (Chapter 1) Updates

Table 2–1 contains configuration information for the HSC65 and HSC95 controllers. This information supersedes the configuration data in Table 1–1 of the *HSC Controller Service Manual*. Tables 2–1 and 2–2 list the configuration of modules and relevant information for the various HSC controllers. Refer to the *HSC Controller Installation Manual* for site requirements.

Table 2–1 HSC40, HSC70, HSC60, and HSC90 Controller Configurations

Configuration	HSC90	HSC60	HSC70	HSC40
Port processor	L0124-AA	L0124-AA	L0107-YA	L0107-YA
Port link	L0118-YA	L0118-YA	L0118-00	L0118-00
Port buffer	L0125-AA	L0125-AA	L0109	L0109
I/O control processor	L0111-YC	L0111-YD	L0111-00	L0111-YA
Memory standard	L0123-AA	L0123-AA	L0117	L0117
32-Mbyte cache ¹	L0121-AA	L0121-AA	N/A	N/A
Disk data channel	L0108-YA	L0108-YA	L0108-YA	L0108-YA
Tape data channel	L0108-YB	L0108-YB	L0108-YB	L0108-YB
Disk/tape data channel ¹	L0119-YA	L0119-YA	L0119-YA	L0119-YA
8-port disk data channel ²	L0119-YB	L0119-YB	N/A	N/A
SCSI data channel ³	L0131-AA	L0131-AA	L0131-AA	L0131-AA
Maximum disk or tape requestors	8	3	8	3
Available ports	Up to 48	Up to 20	Up to 32	Up to 12
Load devices	RX33™	RX33	RX33	RX33
Power controller ⁴	30-35415-xx	30-35415-xx	30-35415-xx	30-35415-xx
Auxiliary power supply	Yes	⁵	Yes	No

¹The L0121-AA, L0119-YA, L0119-YB, L0131-AA, and L0108-YA/YB are options.

²This module can only be installed in requestors 3, 4, 5, and 6 of an HSC90 controller, and in requestors 3 and 4 of an HSC60 controller.

³This option can only be installed in requestors 2, 3, 4, and 5 for the HSC70 and HSC90 controllers, and in requestors 2, 3, and 4 for the HSC40 and HSC60 controllers.

⁴“xx” designates the model variation for ac line voltage and frequency. HSC40 and HSC70 controllers running on 3-phase line voltage use the 881 power controller, 30-24374-xx.

⁵The HSC60-AA/BA controller does not have an auxiliary power supply unless the HSC Cache option is installed.

Table 2–2 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
64-Mbyte cache	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

¹The L0119-YA, L0119-YB, L0131-AA, and L0108-YA/YB are options.

²This 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.

³This 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 turned on, the HSC controller displays a fault code of 33.

Figures 2–1 and 2–2 show the module utilization labels for the HSC65 and HSC95 controllers to supplement the information shown in Section 1.6 of the *HSC Controller Service Manual*.

Figure 2–1 HSC65 Controller Module Utilization Label

Mod	L0118-YA Rev: CI Port Link	L0125-AA Rev: CI Port Buffer	L0124-00 Rev: CI Port Processor	L0121-BA Rev: Memory Cache	4-Port/K.scsi	4/8-Port/K.scsi	4/8-Port/K.scsi						L0123-BA Rev: Memory 5	L0142-YD Rev: 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

CXO-3555C-T1_R

Figure 2–2 HSC95 Controller Module Utilization Label

Mod	L0118-YA Rev: CI Port Link	L0125-AA Rev: CI Port Buffer	L0124-00 Rev: CI Port Processor	L0121-BA 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-BA Rev: Memory 5	L0142-YC Rev: 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

CXO-3130C_R

The following abbreviations and descriptions are on the module utilization label.

Abbreviation	Description
Mod	Module type
Bkhd	Bulkhead (where SDI™ /STI™ connections to that DCM are made)
Req	“Requestor” (DCM)
Slot	Backplane slot in the card cage that contains the DCM
4-port	4-port DSA DCM
4/8-port	4-port or 8-port DSA DCM
K.scsi	6-device or 7-device SCSI DCM

2.3 Controls and Indicators (Chapter 2) Updates

Table 2–3 contains an updated Table 2–4 of the *HSC Controller Service Manual*.

Table 2–3 Logic Module LEDs

Module	Color	Function
LINK (L0100)	Green	Local CI™ activity
LINK (L0118–00)	Red	Internal maintenance mode
LINK2 (L0118–YA)		
PILA (L0109)	Green	Passed initialization tests
PILA2 (L0125)	Red	Failed initialization tests
	Amber	Always lit (test LED for Engineering)
K.pli (L0107–YA)	Green	Passed initialization tests
K.pli2 (L0124–AA)	Red	Failed initialization tests
K.pli2 only	Amber (upper)	
	Amber	Parity LED 6
	Amber	Parity LED 5
	Amber	Parity LED 4
	Amber	Parity LED 3
	Amber	Parity LED 2
	Amber	Parity LED 1
	Amber	Parity LED 0
K.sdi (L0108–YA)	Green	Passed initialization tests
K.sti (L0108–YB)	Red	Failed initialization tests
K.si 4-port (L0119–YA)		
K.si 8-port (L0119–YB)		

(continued on next page)

Table 2–3 (Cont.) Logic Module LEDs

Module	Color	Function	
K.si only	Amber (upper)	D1—Off for PROM load, on for RAM load.	
	Amber	D2—Parity LED 6	
	Amber	D3—Parity LED 5	
	Amber	D4—Parity LED 4	
	Amber	D5—Parity LED 3	
	Amber	D6—Parity LED 2	
	Amber	D7—Parity LED 1	
	Amber	D8—Parity LED 0	
M.std (L0106–AA)	Green	Memory activity	
M.std2 (L0117–AA)	Amber	Memory activity	
M.std4 (L0123–AA)	Red	Failed initialization tests	
M.std5 (L0123–BA)	Green	Passed initialization tests	
	Amber	M.cache module present (M.std4 and M.std5 only)	
M.std4	Amber (upper)	D1—Single bit error	
M.std5		Amber	D2—Multiple bit error
		Amber	D3—Hi-byte parity error
		Amber	D4—Lo-byte parity error
		Amber	D5—NIB3 error
		Amber	D6—NIB2 error
		Amber	D7—NIB1 error
		Amber	D8—NIB0 error
P.ioc (L0105–00)	Amber (upper)	State indicator	
	Amber	Processor clock	
	Red	Failed initialization tests	
	Green	Passed initialization tests	
P.ioj (L0111–00)	Amber (upper)	D1—J–11 power-up test or micro ODT mode	
P.ioj (L0111–YA)		D2—J–11 power-up test	
P.ioj (L0111–YC)		D3—J–11 power-up test	
P.ioj (L0111–YD)		Amber	D4—J–11 power-up test
		Amber	D5—State indicator
		Amber	D6—Processor clock
		Red	D7—Failed initialization tests
		Green	D8—Passed initialization tests

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Table 2–3 (Cont.) Logic Module LEDs

Module	Color	Function		
P.ioj2 (L0142)	Red	D2—Error mode ¹		
	Amber	D3—Diagnostic mode ¹		
	Green	D4—Runtime mode ¹		
		D5 and D6—The mode is determined by D2 through D4. Decode these indicators as follows:		
	Pack	Diagnostic Mode (Amber) ²	Error Mode (Red)	Runtime Mode (Green)
	D5	LED 7	Any error	DMEM request
	D5	LED 6	Fast HIPAR error	CMEM request
	D5	LED 5	Fast LOPAR error	Boot select
	D5	LED 4	Slow error	DMA request
	D6	LED 3	Fast PERR warning	I/O Page
D6	LED 2	Fast bank select 2	Intr cycle	
D6	LED 1	Fast bank select 1	Slow memory	
D6	LED 0	Fast bank select 0	NVM select	
	Amber	D7—State		
	Amber	D8—Four-pack indicators, decode as follows from top to bottom: Micro ODT J–11 power up tests, SLU J–11 power up tests, Memory J–11 power up tests, Sequence		
	Green	D9—JSS ready		
		D10—Three pack indicators, decode as follows from top to bottom: Passed init tests Failed init tests Instruction fetch		
M.cache (L0121–AA)	Green	Passed initialization tests		
M.cache2 (L0121–BA)	Amber	Initialization tests in progress		
	Red	Failed initialization tests		

¹These LEDs show the mode for D5 and D6.

²See Section 2.9 for more information on these indicators.

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Table 2–3 (Cont.) Logic Module LEDs

Module	Color	Function
	Amber (upper)	D1—Single bit ECC error
	Amber	D2—Multiple bit ECC error
	Amber	D3—Hi-byte data memory parity error
	Amber	D4—Lo-byte data memory parity error
	Amber	D5—Functional state machine activity
	Amber	D6—Diagnostics state machine activity
	Amber	D7—M.cache waiting to be enabled
	Amber	D8—Pattern compare failure
<hr/>		
K.scsi ³ (L0131–AA)	Green	Passed initialization tests
	Amber	Initialization tests in progress
	Red	Failed initialization tests
	Amber (upper)	D1—Data transfer in progress
	Amber	D2—Non-transfer dialog in progress
	Amber	D3—Poll in progress
	Amber	D4—Heartbeat (module functional)
	Amber	D5—KSUTIL/firmware resident utilities operating
	Amber	D6—Firmware resident utilities write in progress
	Amber	D7—Firmware resident utilities read in progress
	Amber	D8—Unused

³Diode pack D1 through D8 indications are for normal operation only. Refer to Section 2.9 for indications when a module fault is detected.

Table 2–4 contains an updated Table 2–5 of the *HSC Controller Service Manual*.

Table 2–4 Logic Module Switches

Module	Switch	Setting
LINK (L0100)	S1	Node address
	S2	Node address (must be same as S1)
<hr/>		
LINK (L0118–00) LINK2 (L0118–YA)	S1	Node address.
	S2	Node address (must be the same as S1).
	S3	S3-1—On if cluster size >16, otherwise off (see Section 2.4.1).
		S3-2—Normally off. Delta time. S3-3—Normally off. Quiet slot. S3-4—Normally on. Slot count.
<hr/>		
PILA (L0109) PILA2 (L0125–00)	S1	H/W rev. Do not change except by FCO.
	<hr/>	
K.pli (L0107–YA)	S1	H/W rev. Do not change except by FCO.

(continued on next page)

Table 2–4 (Cont.) Logic Module Switches

Module	Switch	Setting		
K.pli2 (L0124-AA)	S1	Not used.		
	S2	Repeats failing internal diagnostics. Mfg only.		
	S3	Detects CI path failure. Mfg only.		
	S4	Local diagnostic. Mfg only.		
K.si 4-port (L0119-YA) K.si 8-port (L0119-YB)	S1	S1-1—Normally off. Loop on error. Mfg only.		
		S1-2—Normally off. Burn in. Mfg only.		
S1-3—Normally off. Ext loop. Mfg or field use.				
S1-4—Normally off. Ext clock. Mfg only.				
P.ioc (L0105-00) P.ioj (L0111-00) P.ioj (L0111-YA) P.ioj (L0111-YC) P.ioj (L0111-YD)	S1	Serial number. Mfg only.		
		P.ioj2 (L0142-YC/YD)	S1-1	Boot ROM write enable
			S1-2	NVM test
			S1-3	XYLINX test
			S1-4	Halt on error (enabled with strap installed on J15)
M.std2 (L0117-00)	S1	RX33 timing. Mfg only.		
M.std4 (L0123-AA) M.std5 (L0123-BA)	S1	RX33 timing. Mfg only.		

2.4 Removal and Replacement Procedures (Chapter 3) Updates

2.4.1 Setting the Port Link Module Switches

S1 and S2 are the node address switches on the port link module. The node address switches on the replacement module must be set identically to the switch settings on the removed port link module. The L0100-E2 and L0118 port link modules also have an additional switch pack (S3). This section contains information on how to locate and set these switches when replacing the LINK and LINK2 modules.

The switch configurations and their significance are as follows:

- S1/S2—Node number
- S3-1—Cluster size (GT15)
- S3-2, S3-3—Delta time/quiet slot
- S3-4—Quiet slot count

Figure 2–3 shows the LINK module (L0100) node address switches.

Figure 2–3 LINK Module Node Address Switches

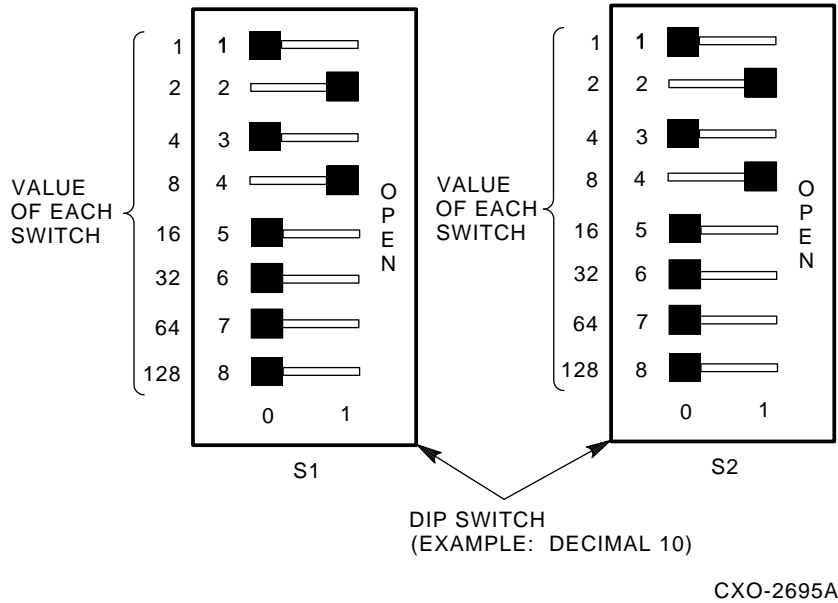


Figure 2–4 shows the LINK module (L0100–E2/L0118) node address switches. Incorrect switch and/or jumper settings on the CI interface modules in both the HSC controllers and the CI host nodes can cause various cluster disturbances, including:

- Disks in mount verification
- Many virtual circuit (VC) closures, resulting in shadow copy initiation on shadowed disks
- Various OpenVMS™ bugchecks, most commonly CLUEXIT

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

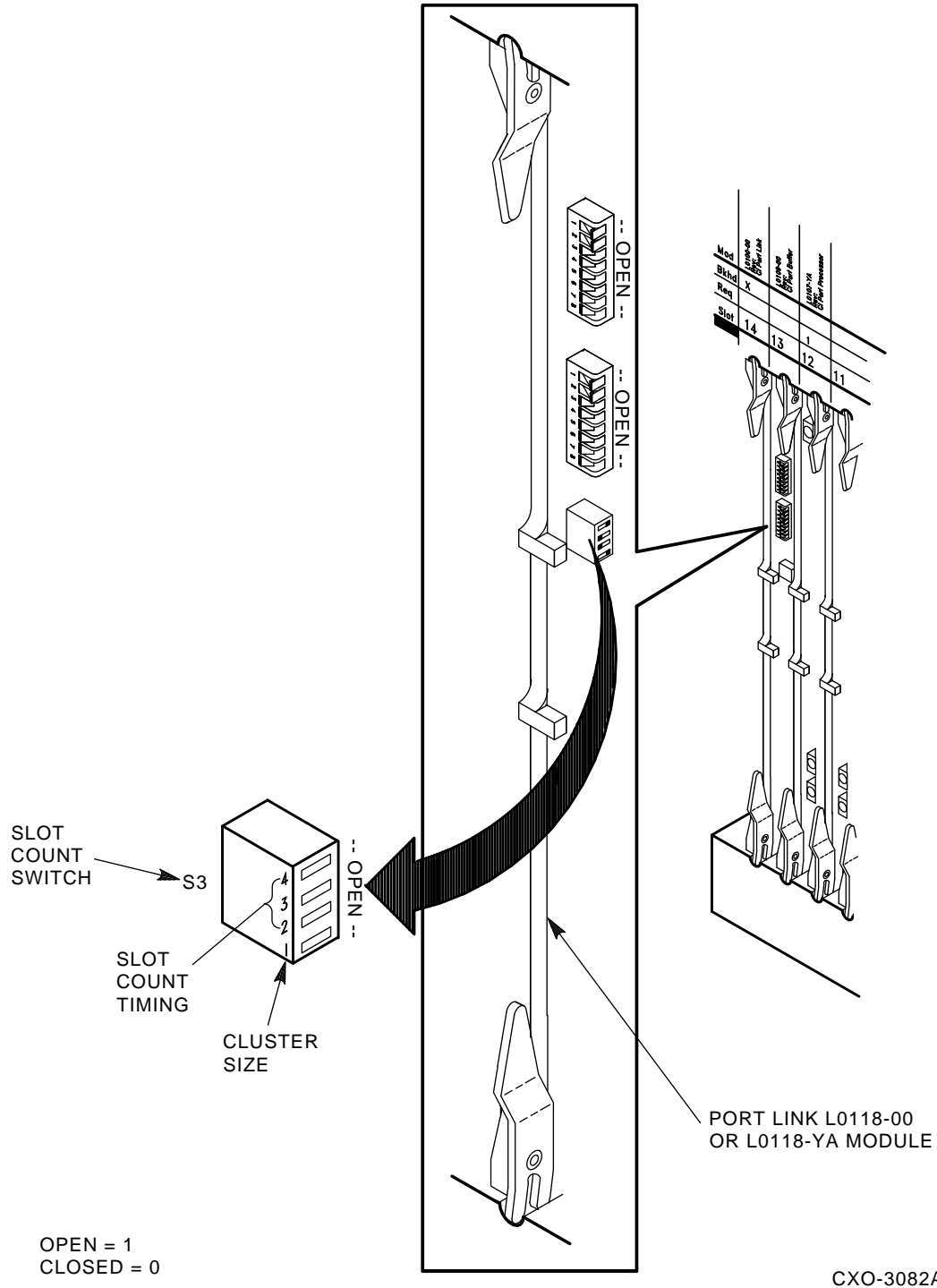
- Slot count timing (also called “quiet time”)
- Cluster size

Settings for these mechanisms are selected by switch positions on the L0100/L0118 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 timing has two possible settings: 7 or 10. At the time of HSC controller installation, all LINK and CI adapter modules in the cluster must be set to a consistent value to avoid cluster disturbances.

Digital™ highly recommends that the slot count timing for all CPU and HSC controller nodes within a cluster be set to a value of 10 (not 7). HSC60 and HSC90 controllers, as well as recently manufactured HSC40 and HSC70 controllers, are shipped with their LINK modules set to a slot count timing of 10.

Figure 2-4 LINK Module (L0100-E2/L0118) Node Address Switches



However, LINK modules for previously installed HSC controllers or CI port adapter modules in host systems may still be set at a slot count timing of 7. If your cluster does not contain a CIXCD adapter and is operating without

problems at a slot count timing of 7, you may set the HSC60 or HSC90 controller LINK module to 7 for installation or replacement of the LINK module and defer resetting the entire cluster to a slot count timing of 10 until a more convenient time.

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

To assist you with setting the slot count timing in your cluster, Table 2–5 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 2–5 also contains a list of LINK and adapter module switch and jumper settings to select the appropriate cluster size.

Table 2–5 L0118 LINK Module and CI Adapter Module Switch/Jumper Settings

Adapter Type	Host System	LINK Module	Function	Switch/Jumper Setting
CI750 CI780 CIBCI	VAX-11/750™ VAX-11/78x, VAX 86x0 VAX 82x0, VAX 83x0 VAX 87x0, VAX 8800	L0100 Rev E ^{1 2}	Slot=7 Slot=10 Clu_size=16	S3-1=Open S3-1=Closed Fixed
	HSC40, HSC50, HSC70	L0118 Rev B ³	Slot=7 Slot=10 Clu_size=16 Clu_size=32	S3-4=Open S3-4=Closed S3-1=Open S3-1=Closed
	HSC60, HSC90 HSC65, HSC95	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 ^{4 5}	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 ⁵	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

¹L0100 Rev “D” modules are not supported.

²On L0100 Rev “E” modules, S3-2 serves no function.

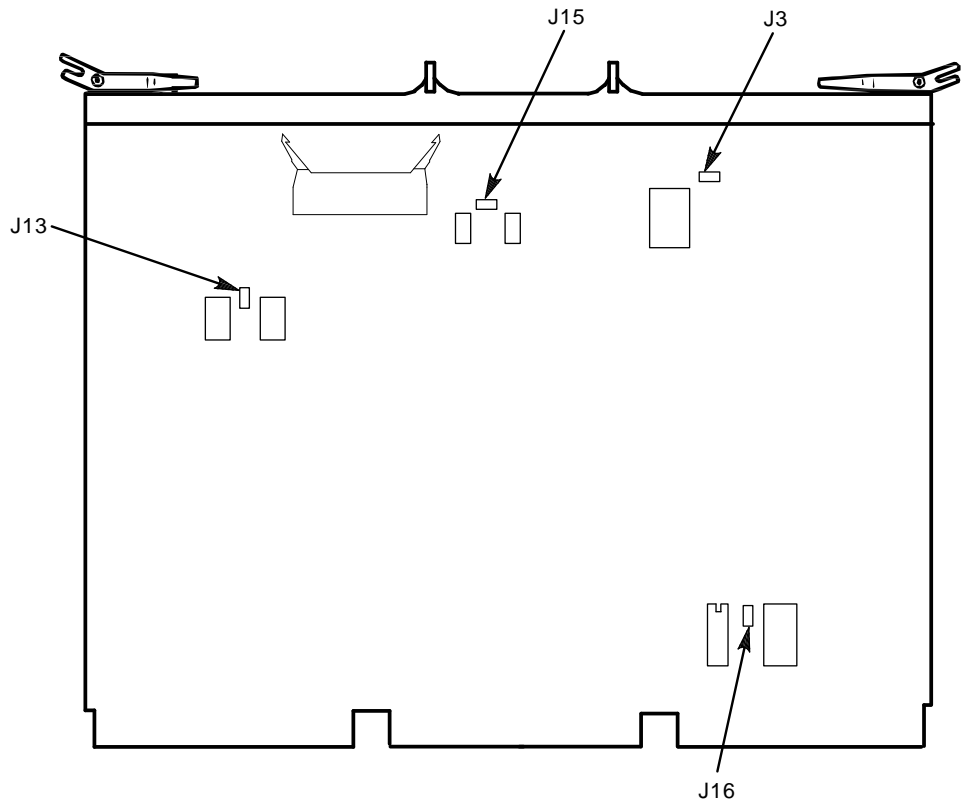
³On L0118 modules, all on-module jumpers must be left in their default positions and S3-2 and S3-3 must remain open.

⁴For 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).

⁵For CIBCA and CIXCD options, install *only* those backplane jumpers listed and those required to specify the node address.

Refer to Section 3.5.4 of the *HSC Controller Service Manual* when removing and replacing the P.ioj2 module. Figure 2–5 shows the location of the jumpers on the P.ioj2 module. Table 2–6 contains a listing of the P.ioj2 module jumpers.

Figure 2–5 P.ioj2 Module Locations



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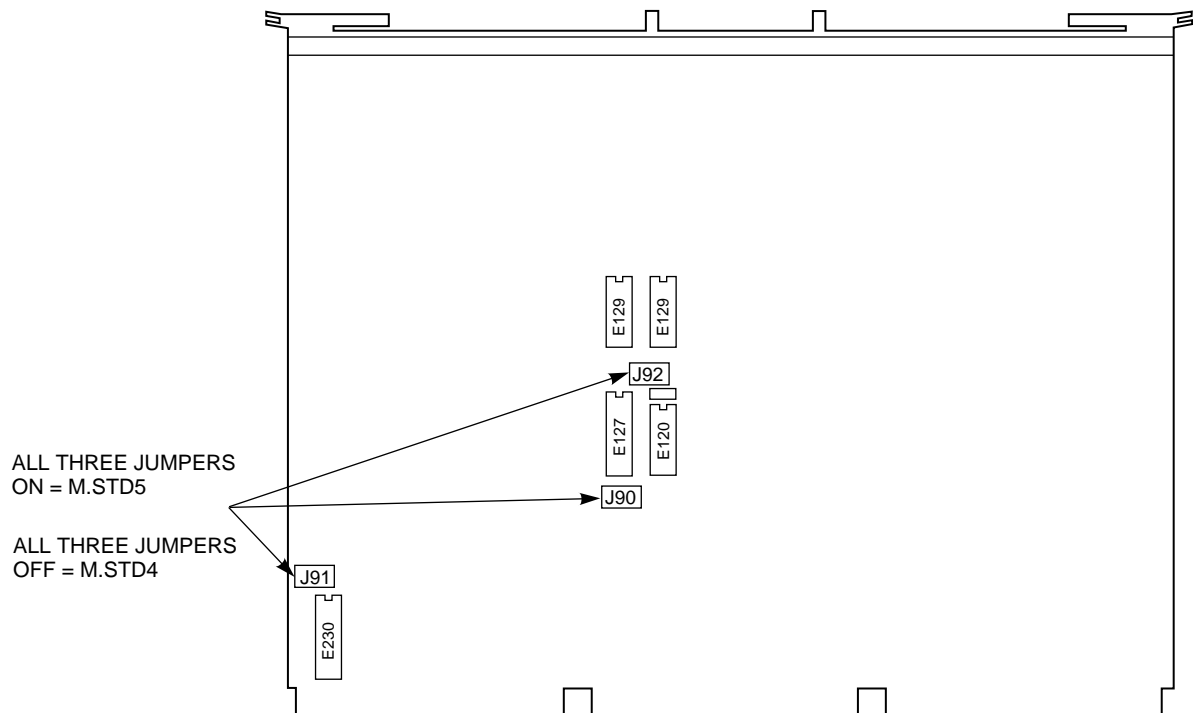
Table 2–6 P.ioj2 Module Jumpers

Jumper	Purpose	Setting
J3	Alternate configuration serial ROM	In: E132 used for boot Out: E131 used for boot (default)
J13	HSC65/HSC95 select	In: HSC95 controller Out: HSC65 controller
J15	Strap for halt on error	Jumper installed w/S1-4 closed enables halt on error
J16	Static bus arbitration	Do not remove

2.4.2 Removing and Replacing the HSC Memory Module (M.std5)

Refer to the procedure given in Section 3.5.9 of the *HSC Controller Service Manual* to remove and replace the M.std5 memory module used in the HSC65 and HSC95 controllers. See Figure 2–6 for the location of the jumpers on this module. These jumpers must be installed for HSC65 and HSC95 controllers and removed for HSC60 and HSC90 controllers.

Figure 2–6 Memory Module M.std5 Jumper Locations



NOTE: ALL THREE JUMPERS (W90, W91, AND W92) MUST BE ON, OR ALL THREE MUST BE OFF. ANY OTHER CONFIGURATION IS NOT VALID, AND MAY CAUSE OPERATIONAL FAILURE.

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2.4.3 Removing and Replacing the SCSI Data Channel Module (K.scsi)

When replacing the K.scsi module, see Tables 2–7 and 2–8 and verify that jumpers and terminators are installed correctly on the K.scsi module board, and that the correct PROMs are installed. Configure and check out the K.scsi module according to the directions in the *Supplementary Installation Information for HSC65 and HSC95 Controllers* included with the replacement module.

Table 2–7 K.scsi Module Jumpers

HSC SCSI Data Channel Module Jumpers				
Jumper Pins				
Jumper	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	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. TERM PWR
	2	3	In	
JP12	1	2	In	Supply SCSI bus TERM PWR

Table 2–8 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

2.4.4 Relative Device Speeds

Table 2–9 contains an updated relative device speeds table for use when configuring the backplane of all HSC controllers. This table supersedes Table 3–5 of the *HSC Controller Service Manual*.

Table 2–9 Disk and Tape Drive Configurations

Device	Relative Speed	Priority
TA™9x, SA™10x/TA8x7 tape drive	Fastest	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	Slowest	Lowest

Refer to Table 2–3 for information to supplement Table 3–7 of the *HSC Controller Service Manual*. The removal and replacement procedures for the M.cache2 and M.std5 modules are identical to the procedures given in Sections 3.5.8 and 3.5.9 of the *HSC Controller Service Manual*.

2.4.5 Jumpers for Rev A5 RX33 Disk Drive

See Figure 2–7 for a diagram of the factory setting for jumpers on the RX33 disk drive. This figure supplements Section 3.6.1.2 of the *HSC Controller Service Manual*. You should verify the location of these jumpers when replacing the disk drive in an HSC controller. Note that the drive position selector jumper, D0 is set for drive 0; if you are replacing drive 1 you should move this jumper to the D1 position.

2.5 Initialization Procedures (Chapter 4) Updates

The HSC65 and HSC95 controllers initialize in the same manner as the other HSC controller models.

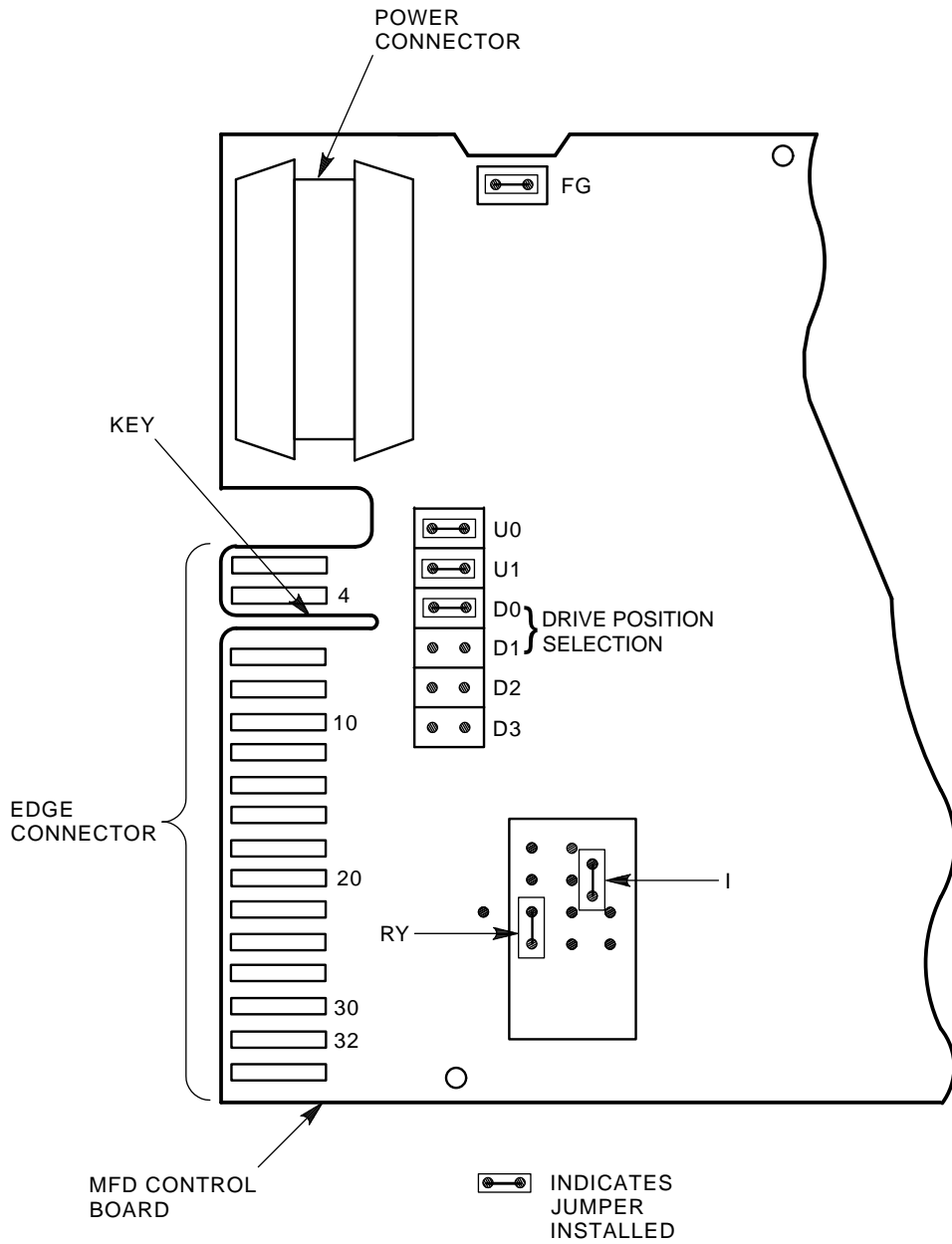
2.6 Device Integrity Tests (Chapter 5) Updates

The HSC65 and HSC95 controllers introduce no new device integrity tests (DITs).

2.6.1 ILTAPE

The instructions for ILTAPE state that if you specify a memory region in the range of 8000 through FFFF hexadecimal as a response to the MEMORY REGION NUMBER prompt, you will be further prompted for diagnostic parameters. **This is incorrect.** For all drive types, specifying a memory region in the range of 8000 through FFFF hexadecimal causes a subsequent prompt for scratch media. There is an intervening prompt for diagnostic parameters only if the unit being tested is a TA9x tape drive.

Figure 2-7 Revision A5 Jumper Configurations



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2.7 Offline Diagnostics (Chapter 6) Updates

The following sections describe two new offline diagnostics and updates several existing diagnostics.

2.7.1 CONFIG—Offline Configuration Diagnostic

The offline diagnostic CONFIG is intended to help the user determine if the current tested configuration is a valid HSC configuration. It also displays all other relevant system information such as memory type and requestor configuration.

The main difference between this new CONFIG diagnostic and older diagnostics like SIZER is that CONFIG determines the processor speed by using timing loops. For this reason, CONFIG does not rely on external jumper settings to determine if the processor is a 15Mhz or 18Mhz processor. CONFIG also flags any possible errors at the end of the listing.

2.7.1.1 System Requirements

The CONFIG diagnostic runs with any bootable configuration of the HSC controller from the offline mode.

2.7.1.2 Operating Instructions

At the ODL> prompt, enter the CONFIG command. The CONFIG diagnostic test indicates that it has been loaded by displaying the following:

```
ODL> HSC OFL System Configuration Version Vnnn
```

where: Version *Vnnn* is the version number.

Enter the HELP command if you wish more information regarding the CONFIG command.

2.7.1.3 Typical CONFIG Diagnostic Test Run

The following example shows the output of a typical CONFIG diagnostic test run on a fully equipped HSC90 controller:

```
ODL>CONFIG
HSC OFL System Configuration Version V601
Configuration for HSC
SLT  REQ      DESCRIPTION          HSC TSTD   HSC 40  HSC 60  HSC 70  HSC 90
-----
1      L0111-YA, P.IOJ,15MHZ,3R          X
1      L0111-00, P.IOJ,15MHZ,8R          X
1      L0111-YD, P.IOJ,18MHZ,3R          X
1      L0111-YC, P.IOJ,18MHZ,8R          X
2      L0117, M.STD2                     X
2      L0117, M.STD4                     X
11     L0121, M.CACHE                     X (OPT) (OPT)
3-10  2-9    L0119-YA,K.SI,4 PORT,REQ= 2 78    234     234    2345678 2345678
3-10  2-9    L0119-YB,K.SI,8 PORT,REQ= 3456    234     234    2345678 3456
3-10  2-9    L0108-YA,K.SDI, REQ=           234     234    2345678 2345678
3-10  2-9    L0108-YB,K.STI, REQ=           234     234    2345678 2345678
12-14 L0107,L0109,L0118,K.CI           X
12-14 L0124,L0125,L0118,K.CI2         X

```


2.7.1.4 CONFIG Diagnostic Test Termination

The test is self terminating. Upon exiting, the CONFIG diagnostic display shows if you have a valid configuration for your HSC controller or lists errors to show an invalid configuration.

2.7.1.5 Error Information

The error messages displayed by the CONFIG diagnostic describe the specific modules installed that are not valid for the tested HSC controller. These messages are self explanatory; refer to Table 2–1 for a detailed listing of all valid HSC controller configurations.

2.7.2 ROM—Offline ROM Update Diagnostic

The offline ROM update diagnostic (ROM) is an enhancement utility that allows the boot ROM software in the P.ioj2 module to be updated. The diagnostic can also display the version number of the currently installed ROM software for you to compare with the version number of the boot ROM software residing on the current HSC software distribution diskette. If you desire, you can select the correct options and update the ROM.

The ROM software file names as distributed on the HSC software diskette are ROMPG0.SAV and ROMPG1.SAV. This software resides on all HSC software (V7.0 and above) distribution diskettes as well as on the offline diskettes associated with that software.

Never load a lower version of software into the boot ROM than is already installed.

2.7.2.1 System Requirements

The ROM update diagnostic only runs on HSC controllers equipped with the L0142 P.ioj2 module; no other modules have the capability of updating the boot ROM.

2.7.2.2 Operating Instructions

At the ODL> prompt, enter the ROM command. The ROM update diagnostic test indicates that it has been loaded by displaying the following information:

```
ODL> HSC OFL ROM LOADER UPDATE UTILITY Version Vnnn
```

where: Version *Vnnn* is the version number.

Enter the HELP command if you wish more information regarding the ROM command.

The test then asks you to specify the RX33 drive containing the new boot ROM software:

```
Which drive do you want to load ROM files from [0] ?
```

Enter the drive number and press Return. You can update the boot ROM from either of the HSC controller's floppy disk drives. In the event that the functional software distribution diskette has a later version of the boot ROM software than is on the offline distribution diskette, run ROM from drive 0 and leave the functional software in drive 1. Then, at the previous prompt, enter 1 to perform the update from drive 1.

If you only wish to get information about the current boot ROM software, enter the number of the drive containing the offline distribution diskette with the ROM diagnostic. Subsequent prompts allow you to exit the diagnostic without updating the boot ROM.

The ROM diagnostic then displays the following information about the current boot ROM software (example display data shown):

```
Current ROM VERSION Number is 000703
Current number of times your ROM has been written is 00002
New ROM Version Number to be loaded is 0000704
To enable ROM Update, set switch 1 to the OFF (down) position, Type <CR> ?
```

If you only want to read the version number of the current boot ROM software, leave the switch in the ON position and press Return, or enter N at the next prompt.

If you want to update the boot ROM, set switch 1 on the P.ioj2 module as directed. The diagnostic then asks for confirmation before performing the update:

```
Are you sure you want to update (Y/N) ? [N]
```

If you enter N or press the Return key, the diagnostic is aborted; if you enter Y to initiate an update, ROM displays the following status (example display data shown):

```
Page 0 ROM successfully updated with new ROM image from Floppy
Loading page 1 of ROM from RX33 to Program Memory
Page 1 ROM successfully updated with new ROM image from Floppy
WARNING: Remember to reset switch 1 back to the 0 (ON) position
```

The test terminates at normal completion of the update. If you fail to set the switch as indicated, ROM returns an appropriate error message and aborts with no update performed.

Note

As indicated by the warning message, do not forget to reset switch SW1 back to the 0 (ON) position. Running with the switch enabled can cause unrecoverable errors to the boot ROM software.

2.7.2.3 Error Information

Error messages produced by this test conform to the HSC generic diagnostic error message format as contained in the *HSC Controller Service Manual*. The following list describes each error:

- **Failed to update ROM with new Write count**—After each update performed by the ROM software, the total number of writes is incremented by 1. If for any reason this value could not be updated, this error is displayed. Getting this error does not affect the actual ROM update operation; that is, the new version of boot ROM software has been successfully written when this error is displayed. If you get this error, first retry the ROM update procedure. If the retry does not resolve the error, replace the P.ioj2 module.
- **Calculated EDC does not match expected EDC of *nnnnnn***—After the boot ROM has been updated, an EDC (error detection code) calculation is performed on the newly written page. This error is displayed if the value obtained is not the same as the expected EDC as listed in the update version of boot ROM software. This error renders the boot ROM inoperable because

any subsequent boot will cause the check diagnostic to also fail. The expected EDC is given in address 17776776 (octal). If you get this error, first retry the ROM update procedure. If the retry does not resolve the error, replace the P.ioj2 module.

- **Exceeded maximum number of writes for current ROM device**—After all information is read from the boot ROM device, the write count is incremented. If this value exceeds 10000, the maximum number of updates allowed by the ROM manufacturer, this error is displayed. If you get this error, first retry the ROM update procedure. If the retry does not resolve the error, replace the P.ioj2 module.
- **ERROR: Incorrect program memory or ROM memory address detected**—This error is displayed if, after the ROM page is updated, the ending or last address is not 17777000 (octal). If you get this error, first retry the ROM update procedure. If the retry does not resolve the error, replace the P.ioj2 module.
- **ERROR: Could not access page 1 of ROM memory**—This error is displayed if, after updating page 0 ROM, the diagnostic cannot select page 1 ROM. If you get this error, first retry the ROM update procedure. If the retry does not resolve the error, replace the P.ioj2 module.
- **ERROR: Could not re-access page 0 of ROM memory**—After updating page 1 of ROM, the software reselects page 0. If page 0 cannot be accessed, this error is displayed. If you get this error, first retry the ROM update procedure. If the retry does not resolve the error, replace the P.ioj2 module.

2.7.3 Updates to OMEM—Offline Memory Test

The following changes only apply when running OMEM with a L0142 P.ioj2 module. All other documentation remains the same as given in the *HSC Controller Service Manual*.

The following new prompt has been added to test the program memory on the P.ioj2 module:

```
Enter 0 for P.IOJ Program Memory, 1 for M.STD Program Memory (D) [D] ?
```

Under certain conditions, you may wish to select the M.std module program memory. After this prompt is displayed, and if the slow memory on the M.std5 module is selected, the following message is displayed:

```
WARNING: To ensure fast memory re-enabling after a CNTRL-Y,  
clear bit 15 in the window index register (17770020)
```

This message is displayed because, if test memory is left abruptly while accessing M.std5 module slow memory, the slow memory may still have access enabled and cause fatal errors. If this occurs, perform either a hard or soft reboot of the HSC controller to clear the problem.

2.7.4 Updates to OFLRXE—Offline RX33 Exerciser

The following changes have been made to the OFLRXE diagnostic. These changes only apply when running OFLRXE with a L0142 P.ioj2 module. All other documentation remains the same as given in the *HSC Controller Service Manual*.

To allow direct memory access (DMA) between the disk drive and either the slow memory on the M.std5 module or the fast memory on the P.ioj2 module, the following new prompt has been added:

```
Perform DMA transfers to FAST(0) or SLOW(1) memory [0] ?
```

Enter 0 or press Return to select fast memory. Enter 1 to select slow memory.

To allow DMA transfers between the disk drive and either program, data, or control memory, a new feature on the P.ioj2 module, the following new prompt has been added:

```
Perform ALL RX transfers to PROGRAM(0), DATA(1), or CONTROL(2) memories [0] ?
```

Enter the appropriate response to select a memory, or press Return to select the program memory for transfer.

2.8 Utilities (Chapter 7) Updates

The HSC65 and HSC95 controllers require no new utilities, and there are no changes to existing utilities.

2.9 Troubleshooting Techniques (Chapter 8) Updates

This section contains additional servicing information for the HSC65 and HSC95 controllers.

2.9.1 Updates to the OCP Fault Code Displays

Refer to the *HSC Controller Service Manual*, and find the paragraph on page 8–12 that references Table 8–4, Required Configuration Checks for HSC Controllers. In this paragraph, it is stated that fault code 33 checks for an illegal configuration of modules in the HSC backplane. This is true. However, for HSC Software™ V7.0, you may get fault code 33 on the OCP with no message on the console if you have the illegal configuration of a P.ioj2 module with no accompanying M.std5 module.

The P.ioj2 module features a writeable boot ROM that is write enabled with module switch S1-1. Because having write enable mistakenly set can destroy the contents of the boot ROM, this condition is flagged by the system during the configuration checks and the boot is aborted. The offline diagnostics, however, will boot the HSC controller under this condition.

Table 2–10 is an update for Table 8–4 in the *HSC Controller Service Manual*.

Table 2–10 Required Configuration Checks for HSC Controllers

HSC Model	Configuration Check
HSC40	15 MHz IO processor module (L0111–YA) installed K.pli2 Port processor module (L0124–AA) not installed No 8-port K.si modules (L0119–YB) installed in any requestors No modules installed in requestors 5 through 9 No 32-Mbyte M.cache (L0121–AA) module installed No 64-Mbyte M.cache (L0121–BA) module installed
HSC70	15 MHz IO processor module (L0111–00) installed K.pli2 Port processor module (L0124–AA) not installed No 8-port K.si modules (L0119–YB) installed in any requestors No 32-Mbyte M.cache (L0121–AA) module installed No 64-Mbyte M.cache (L0121–BA) module installed
HSC60	18 MHz IO processor module (L0111–YD) installed M.std4 memory module (L0123–AA) installed K.pli Port processor module (L0107–YA) not installed No 8-port K.si module (L0119–YB) installed in requestor 2 No modules installed in requestors 5 through 9 No 64-Mbyte M.cache (L0121–BA) module installed
HSC90	18 MHz IO processor module (L0111–YC) installed M.std4 memory module (L0123–AA) installed K.pli Port processor module (L0107–YA) not installed No 8-port K.si modules (L0119–YB) installed in requestors 2, 7, 8, or 9 No 64-Mbyte M.cache (L0121–BA) module installed
HSC65	18 MHz IO processor module (L0142–YD) installed M.std5 memory module (L0123–BA) installed K.pli Port processor module (L0107–YA) not installed No 8-port K.si module (L0119–YB) installed in requestor 2 No modules installed in requestors 5 through 9 No 32-Mbyte M.cache (L0121–AA) module installed Boot ROM write is not enabled
HSC95	18 MHz IO processor module (L0142–YC) installed M.std5 memory module (L0123–BA) installed K.pli Port processor module (L0107–YA) not installed No 8-port K.si modules (L0119–YB) installed in requestors 2, 7, 8, or 9 No 32-Mbyte M.cache (L0121–AA) module installed Boot ROM write is not enabled

2.9.2 Module LEDs

Refer to the *HSC Controller Service Manual*, section 8.3.2, Module LEDs. Note from Table 2–3 that the P.ioj2 module contains many new indicators.

The yellow diagnostic mode indicators in LED packs D5 and D6 of the P.ioj2 module are used during offline boot only. These indicators show the current test number in octal format. For example, if the binary code 00 001 000 was displayed on D7–D0, it would indicate test number 10 (octal) is running. These indicators are not used in functional mode on the HSC65 controller.

2.9.3 K.scsi Module Diagnostic Codes

Table 2–11 lists the K.scsi module power on self-tests in the sequence of execution. The diagnostic code and the most probable cause of a failure are also listed.

Table 2–11 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

¹Diagnostic status

²Most *probable* cause of failure

³Test not fully run unless requested

Failure of any part of the power on self-test generates the following display:

- 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.
- The top four yellow LEDs (LEDs 1 through 4) display the code of the *first* test failed.

2.9.4 Alphabetical List of HSC Software V8.0 Out-of-Band Messages

The following messages are in addition to those in Section 8.5 of the *HSC Controller Service Manual*.

Duplicate Tape Unit *xx*

Error Type: Tape functional out-of-band (001145)

Severity: Informational

Description: Tape unit numbers are duplicated within the system.

Action: Locate the duplicate tape units and change the unit number on one of them.

Possible FRUs: This message could be caused by a failed drive module. The unit number sensing on the drive may be at fault. (Refer to the drive service manual.)

Insufficient memory for cache initialization. Cache disabled.

Error Type: SINI out-of-band (000046)

Severity: Error

Description: The cache server failed to allocate enough memory for its internal data structures. Without this memory, the cache server cannot function.

Action: Use the HSC software offline diagnostics to verify memory on the M.std memory module and on the M.cache cache module.

Possible FRUs:

- Memory module
- M.cache module

M.cache Disabled Due to Time Out of Command.

Error Type: DEMON out-of-band (001642)

Severity: Error

Description: The M.cache module did not respond to a command issued by the ILCACH diagnostic within the command timeout period.

Action: Cycle dc power on the HSC controller. If the problem persists, replace the M.cache module.

Possible FRUs: M.cache module

Non-zero P.io serial number = *nnnnnn*

Error Type: CI-detected out-of-band (001341)

Severity: Information

Description: The CI manager has detected a nonzero value in the P.io module serial number register. The serial number *nnnnnn* is an octal number of up to six digits. In normal operation, the serial number register should contain all zeros.

Action: There may be an incorrect jumper set on the P.ioj module. This condition is not a problem, but you should investigate the cause of this message.

VC closed with node *nn* due to credit request timeout

Error Type: CI-detected out-of-band (001301)

Severity: Warning

Description: The VC was closed after a request for credits was not serviced within the timeout period.

Action: An occasional occurrence is of no consequence. However, if this condition occurs frequently, it may be caused by high load on the HSC controller or CI bus.

Possible FRUs: K.ci module set

2.10 Appendices A through D

The following software exception codes are in addition to those listed in Appendix B of the *HSC Controller Service Manual*.

DISK

002020

SCSI disk unit protocol inconsistency

Facility: DEMON, ILDISK

Explanation: ILDISK detected an inconsistency when trying to bring a SCSI drive on line.

Action: Submit an SPR with the crash dump. Include the user's responses to ILDISK questions.

004134

Unknown variant protocol

Facility: DISK, SDI

Explanation: The disk server received a variant protocol request from a disk drive, but the protocol specified was unknown.

Action: Submit an SPR with the crash dump.

TAPE

006061

While retiring TRBs, a block was encountered that is not a TRB

Facility: TAPE, TFSERVER

Explanation: While retiring tape request blocks (TRB), the tape server performs consistency checks on the blocks being retired. A block was encountered that was of the wrong type.

Action: Submit an SPR with the crash dump.

006062

Outstanding TRB count has been decremented below zero

Facility: TAPE, TFSERVER

Explanation: The tape server maintains a count of outstanding tape request blocks (TRB). While doing TRB completion processing, the TRB count dropped below zero.

Action: Submit an SPR with the crash dump.

006137

DCB attempting to advance sequence numbers is not the one that backed them up

Facility: TAPE, TFSTI

Explanation: During DCB error processing, the port DCB sequence number is backed up to prevent new work from starting. When the error DCB completes, the number is re-advanced.

Action: Submit an SPR with the crash dump.

006142

Interrupt from K.sti with no known TFCB

Facility: TAPE, TFATNAVL

Explanation: An interrupt has occurred from a K.sti tape data channel module for which a tape formatter control block (TFCB) does not exist.

Action: Submit an SPR with the crash dump.

2.10.1 Normal Operation Status Codes

Table 2–12 contains an update to Table D-1 in Appendix D of the *HSC Controller Service Manual*, listing the normal operation status codes for K-requestors.

Table 2–12 Normal Operation Status Codes for K-Requestors

Status Code (Octal)	Description
001	K.ci host interface with proper parity
002	K.sdi/K.si disk data channel module with proper parity
004	K.si data channel module with proper parity and no microcode loaded
007	8-port K.si data channel module with microcode loaded.
010	K.ci2 host interface with no microcode loaded
015	K.scsi data channel module
076	Secondary P.io module with proper parity
203	K.sti/K.si tape data channel module with proper parity
205	4-port K.si data channel module with disk microcode loaded
206	4-port K.si data channel module with tape microcode loaded
211	K.ci2 host interface with microcode loaded
212	8-port K.si data channel module with no microcode loaded
277	P.ioc module with proper parity
377	No requestor present

Status codes other than those listed in Table 2–12 indicate that the K-requestor has detected an error. Error status is indicated if bit 6 of the K status bits is set.

2.10.2 K.scsi Module Internal Self Test

The K.scsi module conducts an internal self-test when the system is turned on. This test is composed of 80 individual tests and is organized into three levels: Primary tests, Secondary tests, and Low-Level tests.

There are five primary tests, as listed in the following table:

Test Number	Test Description
1	Fundamental (68000, Stack, PROM, Bus Error, 68901, 68681, MAC)
2	Data Memory Interface tests
3	Control Memory Interface tests
6	Memory (Program RAM, Flash ROM, Buffer RAM) tests
7	ESP chips

Each primary test is further divided into logical secondary and low-level tests. These tests are listed in Table 2–13.

Table 2–13 K.scsi Diagnostic Codes

Test Description	K_status (Octal) (K_status Register)	LED Value (HEX)		Console Output (Decimal)
		Upper	Lower	
1.00 Microprocessor test				
1.10 68000 microprocessor internal test	301	2	3	
1.10 68000 microprocessor RAM test	301	2	4	
1.20 Stack test	301	2	5	
1.30 Bus error test	301	2	6	
1.40 PROM checksum test	301	2	7	
1.00 68901 multifunction peripheral (MFP) device test				
1.51 Reset conditions test	301	2	8	
1.52 Registers readability test	301	2	9	
1.53 Basic register read/write test	301	2	A	
1.54 Timer/counter readability test	301	2	B	
1.55 Timer B test	301	2	C	
1.56 Serial port loopback test	301	2	D	
1.57 Serial port interrupt test	301	2	E	
1.58 Timer A interrupt test	301	2	F	158
1.59 Timer B interrupt test	301	3	0	159
1.00 68681 DUART test				
1.61 Reset conditions test	301	3	1	161
1.62 Register readability test	301	3	1	162
1.63 Mode register read/write test	301	3	3	163
1.64 Channel A loopback test	301	3	4	164
1.65 Channel A FIFO overrun test	301	3	5	165
1.66 Channel B loopback test	301	3	6	166
1.67 Channel B FIFO overrun test	301	3	7	167

(continued on next page)

Table 2–13 (Cont.) K.scsi Diagnostic Codes

Test Description	K_status (Octal) (K_status Register)	LED Value (HEX)		Console Output (Decimal)
		Upper	Lower	
1.68 Interrupt test	301	3	8	168
1.00 MAC–200 chip tests				
1.71 Reset buffer controller test	301	3	9	171
1.72 Control and configuration registers RST	301	3	A	172
1.73 Init buffer controller test	301	3	B	173
1.74 Control, address, limit and reload	301	3	C	174
2.00 Data memory interface test				
2.10 Configuration register and data test	302	4	0	210
2.20 Control register address and data test	302	4	1	220
2.30 Sequencer diagnostic mode and control register count test	302	4	2	230
2.40 Sequencer normal mode and read/write transfer length	302	4	3	240
2.50 Address register test	302	4	4	–
2.51 Part 1 (write preset register)	302	4	4	251
2.52 Part 2 (write load address 0:2)	302	4	5	252
2.53 Part 3 (write load address 3:6)	302	4	6	253
2.54 Part 4 (write fixed addresses 0:3)	302	4	7	254
2.55 Part 5 (write fixed addresses 4:5)	302	4	8	255
2.56 Part 6 (counter test)	302	4	9	256
2.60 EDC test	302			
2.61 EDC seed value test	302	4	A	261
2.62 EDC data test	302	4	B	262
2.70 Interrupt test	302	4	C	270
3.00 Memory interface test				
3.10 Error register power-up test	103	6	0	300
3.20 Configuration register CCY MUX test	103	6	1	320
3.30 Address register test	103	6	2	330
3.40 Data register test	103	6	3	340
3.50 Parity test	103	6	4	350
3.60 Interrupt test	103	6	5	360

(continued on next page)

Table 2–13 (Cont.) K.scsi Diagnostic Codes

Test Description	K_status (Octal) (K_status Register)	LED Value (HEX)		Console Output (Decimal)
		Upper	Lower	
6.00 RAM tests	106			
6.11 Program RAM steering test	106	C	9	611
6.12 Program RAM longword data†	106	C	A	612
6.13 Program RAM word data†	106	C	B	613
6.21 Flash identifier test	106	D	1	621
6.22 Flash write/read test†	106	D	2	622
6.23 Flash erase/clear test†	106	D	3	623
6.24 Flash param block checksum	106	D	4	624
6.31 Buffer RAM longword data	106	D	9	631
6.32 Buffer RAM word data†	106	D	A	632
7.00 ESP 236 device tests, single ended chip tests	307	E	1	–
7.01 Register reset conditions tests	307	E	1	701
7.02 FIFO reset conditions test	307	E	2	702
7.03 FIFO data test	307	E	3	703
7.04 FIFO flush test	307	E	4	704
7.05 FIFO flags test	307	E	5	705
7.06 FIFO overflow test	307	E	6	706
7.07 Transfer count/counter test	307	E	7	707
7.08 Invalid command test	307	E	8	708
7.09 Interrupt test/differential chip tests	307	E	9	709
7.11 Register reset conditions test	307	F	1	711
7.12 FIFO reset conditions test	307	F	2	712
7.13 FIFO data test	307	F	3	713
7.14 FIFO flush test	307	F	4	714
7.15 FIFO flags test	307	F	5	715
7.16 FIFO overflow test	307	F	6	716
7.17 Transfer count/counter test	307	F	7	717
7.18 Invalid command test	307	F	8	718
7.19 Interrupt test	307	F	9	719

†Implies comprehensive (manufacturing) mode only (JP7:1–2 IN)

The test numbering scheme is set up into a 3-digit unique numbering scheme. The first digit is the primary test number, the second is the secondary test number, and the third digit is the low-level test number.

The test number is displayed in three areas:

- In the HSC controller's K-status register
- Through the external serial terminal port connected to the K.scsi module

- On the K.scsi module LED indicators

The HSC controller's K-status register contains the primary test number only. That is, for each primary test, the K-status register is loaded once. The only significant bits in the K-status register are bits 0 through 5. The two most significant bits are used for parity only, so they may be discarded when looking at the error value.

The external serial terminal port can be connected to K.scsi module connector JP6. Whenever the self-tests are run the actual test number is displayed to the terminal prior to the invocation of the test. Note that the tests displayed to the terminal start at test 158. A test complete message ("pass") is displayed at the completion of the self-tests. The following is an example of the terminal output:

```

Return
158,159,161,162,163,164,165,166,167,168,171,172,173,174
200,210,220,230,240,251,252,253,254,255,256,261,262,270
300,310,320,330,340,350,360
611,612,621,624,631
701,702,703,704,705,706,707,708,709,711,712,713,714,715,716,717,718,719
PASS

```

The output shown in this example is with no jumpers installed. The jumpers enable manufacturing mode and should only be installed when directed by Digital Services.

The LEDs are set up into two packs of four LEDs each, as follow:

LED	Test Number
1 (upper LED)	Bit 0 of the primary test number
2	Bit 1 of the primary test number
3	Bit 2 of the primary test number
4	Bit 4 of the secondary test number
5	Bit 3 of the secondary test number
6	Bit 2 of the secondary test number
7	Bit 1 of the secondary test number
8 (lower LED)	Bit 0 of the secondary test number

For example, the LED display for an error of 701, which is primary test 7 with secondary test 1 would be displayed as follows:

```

LED 1 is ON (Bit 0 of the primary test number)
LED 2 is ON (Bit 1 of the primary test number)
LED 3 is ON (Bit 2 of the primary test number)
LED 4 is OFF (Bit 4 of the secondary test number)
LED 5 is OFF (Bit 3 of the secondary test number)
LED 6 is OFF (Bit 2 of the secondary test number)
LED 7 is OFF (Bit 1 of the secondary test number)
LED 8 is ON (Bit 0 of the secondary test number)

```

In this example, you would read the primary test number on LEDs 1 through 3 as 7 and the secondary test number on LEDs 4 through 8 as 1. Note that LED 1 shows the least significant bit of the primary test number, while LED 8 shows the least significant bit of the secondary test number.

2.11 SCSI Error Log Interpretation

This section describes the SCSI error log as shown in Example 2-1.

Example 2-1 SCSI Error Log

```

DATE/TIME 24-OCT-1992 02:36:19:.62          SYS_TYPE 00000000
SYSTEM UPTIME: 24 DAYS 06:36:55          VAX/VMS V5.5-2
ERL$LOGMESSAGE ENTRY KA865  HW REV# 3.  SERIAL# 1493 MFG PLANT 15.

I/O SUB-SYSTEM, UNIT _HSC008$DUA66:

MESSAGE TYPE          0001          DISK MSCP MESSAGE
MSLG$L_CMD_REF      00000000
MSLG$W_UNIT        0042          UNIT #66.
MSLG$W_SEQ_NUM     0001          SEQUENCE #1.
MSLG$B_FORMAT      03          SDI ERROR
MSLG$B_FLAGS       41          SEQUENCE NUMBER RESET
                                OPERATION CONTINUING
MSLG$W_EVENT       00EB          DRIVE ERROR
                                DRIVE DETECTED ERROR
MSLG$Q_CNT_ID      0000F708
                                01200000
                                UNIQUE IDENTIFIER, 00000000F708(X)
                                MASS STORAGE CONTROLLER
                                HSC70
MSLG$B_CNT_SVR     3C          CONTROLLER SOFTWARE VERSION #60.
MSLG$B_CNT_HVR     00          CONTROLLER HARDWARE REVISION $0.
MSLG$W_MULT_UNT    0021
MSLG$Q_UNIT_ID     00000000
                                02FF0000
                                UNIQUE IDENTIFIER, 000000000000(X)
                                DISK CLASS DEVICE (166)
                                MODEL = 255❶
MSLG$B_UNIT_SVR    00          UNIT SOFTWARE VERSION #0.
MSLG$B_UNIT_HVR    00          UNIT HARDWARE REVISION #0.
MSLG$L_VOL_SER     00000000
                                VOLUME SERIAL #0.
MSLG$L_HDR_CODE    00000000
                                LOGICAL BLOCK #0.
                                GOOD LOGICAL SECTOR
MSLG$Z_SDI
REQUEST            1F          RUN/STOP SWITCH IN
                                PORT SWITCH IN
                                LOG INFORMATION IN EXTENDED AREA
                                SPINDLE READY
                                PORT B RECEIVERS ENABLED
MODE               00          512-BYTE SECTOR FORMAT
ERROR              00

```

(continued on next page)

Example 2–1 (Cont.) SCSI Error Log

```
CONTROLLER          00
                                NORMAL DRIVE OPERATION

RETRY               70  <<< SENSE DATA FORMAT BYTE 0②
                                112. RETRIES

DEVICE DEPENDENT INFORMATION
LONGWORD 1.        00002906  <<< SENSE DATA FORMAT BYTES 2,12,13,3③
                                /.)../
LONGWORD 2.        02000000  <<< SENSE DATA FORMAT BYTES 4,5,6 REQUESTOR #④
                                /.../
LONGWORD 3.        00000001  <<< DRIVE PORT #⑤
                                /.../
LONGWORD 4.        00000000
```

- ① This is a generic model number for all SCSI devices.
- ② This is byte 0 of the sense data format error code. If this field is equal to 0, refer to Section 2.11.1.
- ③ This longword is read from right to left; the first two bits (06) are byte 2 of the sense data format error code; refer to Table 2–14¹ to read this byte.
The next two (29) are byte 12, the next two (00) are byte 13. These bytes are read together, as described in Table 2–15¹.
The leftmost bits (00) are byte 3 and are read in conjunction with bytes 4, 5, and 6 as described in item 4.

- ④ This longword is read from right to left; the first two bits (00) are byte 4 of the sense data format error code, the next two (00) are byte 5, the next two (00) are byte 6, and the leftmost bits (02) designate the requestor number of the K.scsi module reporting the error.

The contents of the information field represented by bytes 3 through 6 is device type or command specific and is defined within the appropriate section of the SCSI documentation related to that device or command. Target devices must implement this information field. Unless otherwise specified, this field contains the following information¹:

- a. The unsigned logical block address associated with the sense key, for direct-access devices (device type 0), write-once devices (device type 4), CD-ROM devices (device type 5), and optical memory devices (device type 7).
- b. The difference (residue) of the requested length minus the actual length in either bytes or blocks, as determined by the command for sequential access devices (device type 1), printer devices (device type 2), processor devices (device type 3), and some direct access device commands, except as defined in item c. Negative values are indicated by two's complement notation.
- c. The difference (residue) of the requested number of blocks minus the actual number of blocks copied or compared for the current segment descriptor of a Copy, Compare, or Copy and Verify command.

(continued on next page)

¹ This information is taken from the Draft Proposed American Standard for Information Systems Small Computer System Interface-2 (SCSI-II), prepared by the X3T9–Interface Accredited Standards Committee, March 1990.

Example 2–1 (Cont.) SCSI Error Log

- d. For sequential access devices operating in buffered modes 01 or 02 hexadecimal that detect an unrecoverable write error when unwritten data blocks, file marks, or set marks remain in the buffer, the value of the information field for all commands is:
- The total number of data blocks, file marks, and set marks in the buffer if the device is in fixed block mode (block length field of the Mode Sense block descriptor is non-zero and the fixed bit of the Write command is one).
 - The number of bytes in the buffer, including file marks and set marks, if the device is in variable mode (the fixed bit of the Write command is zero).
- ⑤ This is the port number of the K.scsi module reporting the error.

Table 2–14 Sense Key Byte 02

Sense Key (hexadecimal)	Description
0	No Sense There is no specific sense key information to be reported for the designated logical unit. This would be the case for a successful command or a command that received Check Condition or Command Terminated status because one of the filemarks, EOM, or ILI bits is set to one.
1	Recovered Error The last command completed successfully with some recovery action reported by the target unit. Details of this status may be determined by examining additional sense bytes and the information field. When multiple recovered errors occur during one command, the choice of which error to report (such as first, last, most severe) is device specific.
2	Not Ready The logical unit addressed cannot be accessed. Operator intervention may be required to correct this condition.
3	Medium Error The command terminated with a non-recovered error condition that was probably caused by a flaw in the medium or an error in the recorded data. This sense key may also be returned if the target is unable to distinguish between a flaw in the media and a specific hardware failure (sense key 4)
4	Hardware Error The target device detected a non-recoverable hardware failure, such as a controller failure, device failure, or parity error, while performing the command or during a self test.
5	Illegal Request There was an illegal parameter in the command descriptor block or in the additional parameters supplied as data for some commands. If the target detects an invalid parameter in the additional parameters to the command, the target terminates the command without altering the medium. If the target detects an invalid parameter in the additional parameters supplied as data, it may have already altered the medium. This sense key may also indicate that an invalid Identify message was received.
6	Unit Attention The removable medium may have been changed, or the target has been reset.
7	Data Protect A command that reads or writes the medium was attempted on a block that is read or write protected. The read or write operation was not performed.

(continued on next page)

Table 2–14 (Cont.) Sense Key Byte 02

Sense Key (hexadecimal)	Description
8	Blank Check A write-once device or a sequential-access device encountered a blank medium or format-defined end-of-data indication while reading, or a write-once device encountered a non-blank medium while writing.
9	Vendor Specific This sense key is available for reporting vendor-specific conditions.
A	Copy Aborted A Copy, Compare, or Copy And Verify command was aborted due to an error condition on the source device, the destination device, or both.
B	Aborted Command The target aborted the command. The initiating device may be able to recover this condition by trying the command again.
C	Equal A Search Data command has satisfied an equal comparison.
D	Volume Overflow A buffered peripheral device has reached the end-of-partition and data that has not been written to the buffer may remain in the buffer. A Recover Buffered Data command or commands may be issued to read the unwritten data from the buffer.
E	Miscompare The source data did not match the data read from the medium.
F	Reserved

Table 2–15 ASC and ASCQ Assignments

Byte 12 13	DTLPWRSOMC†	Description‡
00 00	DTLPWRSOMC	No additional sense information
00 01	T	File mark detected
00 02	S	End-of-partition or medium detected
00 03	T	Set mark detected
00 04	T S	Beginning-of-partition or medium detected
00 05	T S	End-of-data detected
00 06	DTLPWRSOMC	I/O process terminated
00 11	R	Audio play operation in progress
00 12	R	Audio play operation paused
00 13	R	Audio play operation successfully completed
00 14	R	Audio play operation stopped due to error
00 15	R	No current audio status to return
01 00	D W O	No index or sector signal

†Read this code as follows:

- D** Direct access drive
- T** Sequential access drive
- L** Printer device
- P** Processor device
- W** Write once read multiple device
- R** Read only (CD ROM) device
- S** Scanner Device
- O** Optical memory device
- M** Media changer device
- C** Communication device

‡Codes not shown or blank are reserved.

(continued on next page)

Table 2–15 (Cont.) ASC and ASCQ Assignments

Byte				Description‡
12	13	DTLPWRSOMC†		
02	00	D	WR OM	No seek complete
03	00	DTL	W SO	Peripheral device write fault
03	01		T	No write current
03	02		T	Excessive write errors
04	00	DTLPWRSOMC		Logical unit not ready, cause not reportable
04	01	DTLPWRSOMC		Logical unit is in process of becoming ready
04	02	DTLPWRSOMC		Logical unit not ready, initializing command required
04	03	DTLPWRSOMC		Logical unit not ready, manual intervention required
04	04	DTL	O	Logical unit not ready, format in progress
05	00	DTL	WRSOMC	Logical unit does not respond to selection
06	00	D	WR OM	No reference position found
07	00	DTL	WRSOM	Multiple peripheral devices selected
08	00	DTL	WRSOMC	Logical unit communication failure
08	01	DTL	WRSOMC	Logical unit communication timeout
08	02	DTL	WRSOMC	Logical unit communication parity error
09	00	DT	WR O	Track following error
09	01		WR O	Tracking servo failure
09	02		WR O	Focus servo failure
09	03		WR O	Spindle servo failure
0A	00	DTLPWRSOMC		Error log overflow
0B	00			
0C	00	T	S	Write error
0C	01	D	W O	Write error recovered with auto reallocation
0C	02	D	W O	Write error, auto reallocation failed
0D	00			
0E	00			
0F	00			
10	00	D	W O	ID CRC or ECC error
11	00	DT	WRSO	Unrecovered read error
11	01	DT	W SO	Read retries exhausted

†Read this code as follows:

- D** Direct access drive
- T** Sequential access drive
- L** Printer device
- P** Processor device
- W** Write once read multiple device
- R** Read only (CD ROM) device
- S** Scanner Device
- O** Optical memory device
- M** Media changer device
- C** Communication device

‡Codes not shown or blank are reserved.

(continued on next page)

Table 2–15 (Cont.) ASC and ASCQ Assignments

Byte 12 13	DTLPWRSOMC†			Description‡
11 02	DT	W	SO	Error too long to correct
11 03	DT	W	SO	Multiple read errors
11 04	D	W	O	Unrecovered read error, auto reallocate failed
11 05		WR	O	L–EC uncorrectable error
11 06		WR	O	CIRC unrecovered error
11 07		W	O	Data resynchronization error
11 08	T			Incomplete block read
11 09	T			No gap found
11 0A	DT		O	Miscorrected error
11 0B	D	W	O	Unrecovered read error, recommend reassignment
11 0C	D	W	O	Unrecovered read error, recommend rewrite the data
12 00	D	W	O	Address mark not found for ID field
13 00	D	W	O	Address mark not found for data field
14 00	DTL	WRSO		Recorded entity not found
14 01	DT	WR	O	Record not found
14 02	T			Filemark or setmark not found
14 03	T			End-of-data not found
14 04	T			Block sequence error
15 00	DTL	WRSOM		Random positioning error
15 01	DTL	WRSOM		Mechanical positioning error
15 02	DT	WR	O	Positioning error detected by read of medium
16 00	D	W	O	Data synchronization mark error
17 00	DT	WRSO		Recovered data with no error correction applied
17 01	DT	WRSO		Recovered data with retries
17 02	DT	WR	O	Recovered data with positive head offset
17 03	DT	WR	O	Recovered data with negative head offset
17 04		WR	O	Recovered data with retries and/or CIRC applied
17 05	D	WR	O	Recovered data using previous sector ID
17 06	D	W	O	Recovered data without ECC, data auto reallocated
17 07	D	W	O	Recovered data without ECC, recommend reassignment

†Read this code as follows:

D Direct access drive
T Sequential access drive
L Printer device
P Processor device
W Write once read multiple device
R Read only (CD ROM) device
S Scanner Device
O Optical memory device
M Media changer device
C Communication device

‡Codes not shown or blank are reserved.

(continued on next page)

Table 2–15 (Cont.) ASC and ASCQ Assignments

Byte					
12	13	DTLPWRSOMC†			Description‡
18	00	DT	WR	O	Recovered data with error correction applied
18	01	D	WR	O	Recovered data with error correction and retries applied
18	02	D	WR	O	Recovered data, data auto reallocated
18	03		R		Recovered data with CIRC
18	04		R		Recovered data with LEC
18	05	D	WR	O	Recovered data, recommend reassignment
19	00	D		O	Defect list error
19	01	D		O	Defect list not available
19	02	D		O	Defect list error in primary list
19	03	D		O	Defect list error in grown list
1A	00	DTLPWRSOMC			Parameter list length error
1B	00	DTLPWRSOMC			Synchronous data transfer error
1C	00	D		O	Defect list not found
1C	01	D		O	Primary defect list not found
1C	02	D		O	Grown defect list not found
1D	00	D	W	O	Miscompare during verify operation
1E	00	D	W	O	Recovered ID with ECC correction
1F	00				
20	00	DTLPWRSOMC			Invalid command operation code
21	00	DT	WR	OM	Logical block address out of range
22	00	D			Illegal function (should use 20 00, 24 00, or 26 00)
23	00				
24	00	DTLPWRSOMC			Invalid field in CDB
25	00	DTLPWRSOMC			Logical unit not supported
26	00	DTLPWRSOMC			Invalid field in parameter list
26	01	DTLPWRSOMC			Parameter not supported
26	02	DTLPWRSOMC			Parameter value invalid
26	03	DTLPWRSOMC			Threshold parameters not supported
27	00	DT	W	O	Write protected
28	00	DTLPWRSOMC			Not ready to ready transition (medium may have changed)

†Read this code as follows:

D Direct access drive
T Sequential access drive
L Printer device
P Processor device
W Write once read multiple device
R Read only (CD ROM) device
S Scanner Device
O Optical memory device
M Media changer device
C Communication device

‡Codes not shown or blank are reserved.

(continued on next page)

Table 2–15 (Cont.) ASC and ASCQ Assignments

Byte 12 13	DTLPWRSOMC†	Description‡
28 01	M	Import or export element accessed
29 00	DTLPWRSOMC	Power on, reset, or bus device reset occurred
2A 00	DTL WRSOMC	Parameters changed
2A 01	DTL WRSOMC	Mode parameters changed
2A 02	DTL WRSOMC	Log parameters changed
2B 00	DTLPWRSO C	Copy cannot execute since host cannot disconnect
2C 00	DTLPWRSOMC	Command sequence error
2C 01	S	Too many parameters specified
2C 02	S	Invalid combination of windows specified
2D 00	T	Overwrite error on update in place
2E 00		
2F 00	DTLPWRSOMC	Commands cleared by another initiator
30 00	DT WR OM	Incompatible medium installed
30 01	DT WR O	Cannot read medium, unknown format
30 02	DT WR O	Cannot read medium, incompatible format
30 03	DT	Cleaning cartridge installed
31 00	DT W O	Medium format corrupted
31 01	D L O	Format command failed
32 00	D W O	No defect spare location available
32 01	D W O	Defect list update failure
33 00	T	Tape length error
34 00		
35 00		
36 00	L	Ribbon, ink, or toner failure
37 00	DTL WRSOMC	Saving parameters not supported
3A 00	DTL WRSOM	Medium not present
3B 00	TL	Sequential positioning error
3B 01	T	Tape position error at beginning of medium
3B 02	T	Tape position error at end of medium
3B 03	L	Tape or electronic vertical forms unit not ready

†Read this code as follows:

D Direct access drive
T Sequential access drive
L Printer device
P Processor device
W Write once read multiple device
R Read only (CD ROM) device
S Scanner Device
O Optical memory device
M Media changer device
C Communication device

‡Codes not shown or blank are reserved.

(continued on next page)

Table 2–15 (Cont.) ASC and ASCQ Assignments

Byte 12 13	DTLPWRSOMC†	Description‡
3B 04	L	Slew failure
3B 05	L	Paper jam
3B 06	L	Failed to sense top of form
3B 07	L	Failed to sense bottom of form
3B 08	T	Reposition error
3B 09	S	Read past end of medium
3B 0A	S	Read past beginning of medium
3B 0B	S	Position past end of medium
3B 0C	S	Position past beginning of medium
3B 0D	M	Medium destination element full
3B0E	M	Medium source element empty
3C 00		
3D 00	DTLPWRSOMC	Invalid bits in identify message
3E 00	DTLPWRSOMC	Logical unit has not self-configured yet
3F 00	DTLPWRSOMC	Target operating conditions have changed
3F 01	DTLPWRSOMC	Microcode has been changed
3F 02	DTLPWRSOMC	Changed operating definition
3F 03	DTLPWRSOMC	Inquiry data has changed
40 00	D	RAM failure (should use code 40 <i>nn</i>)
40 <i>nn</i>	DTLPWRSOMC	Diagnostic failure on component (where <i>nn</i> is hexadecimal value 80 through FF)
41 00	D	Data path failure (should use code 40 <i>nn</i>)
42 00	D	Power-on or self-test failure (should use code 40 <i>nn</i>)
43 00	DTLPWRSOMC	Message error
44 00	DTLPWRSOMC	Internal target failure
45 00	DTLPWRSOMC	Select or reselect failure
46 00	DTLPWRSOMC	Unsuccessful soft reset
47 00	DTLPWRSOMC	SCSI parity error
48 00	DTLPWRSOMC	Initiator detected error message received
49 00	DTLPWRSOMC	Invalid message error

†Read this code as follows:

D Direct access drive
T Sequential access drive
L Printer device
P Processor device
W Write once read multiple device
R Read only (CD ROM) device
S Scanner Device
O Optical memory device
M Media changer device
C Communication device

‡Codes not shown or blank are reserved.

(continued on next page)

Table 2–15 (Cont.) ASC and ASCQ Assignments

Byte 12 13	DTLPWRSOMC†	Description‡
4A 00	DTLPWRSOMC	Command phase error
4B 00	DTLPWRSOMC	Data phase error
4C 00	DTLPWRSOMC	Logical unit failed self configuration
4D 00		
4E 00	DTLPWRSOMC	Overlapped commands attempted
4F 00		
50 00	T	Write append error
50 01	T	Write append position error
50 02	T	Position error related to timing
51 00	T O	Erase failure
52 00	T	Cartridge fault
53 00	DTL WRSOM	Media load or eject failed
53 01	T	Unload tape failure
53 02	DT WR OM	Medium removal prevented
54 00	P	SCSI to host system interface failure
55 00	P	System resource failure
56 00		
57 00	R	Unable to recover table of contents
58 00	O	Generation does not exist
59 00	O	Updated block read
5A 00	DTLPWRSOMC	Operator request or state change input (unspecified)
5A 01	DT WR OM	Operator medium removal request
5A 02	DT W O	Operator selected write protect
5A 03	DT W O	Operator selected write permit
5B 00	DTLPWRSOM	Log exception
5B 01	DTLPWRSOM	Threshold condition met
5B 02	DTLPWRSOM	Log counter at maximum
5B 03	DTLPWRSOM	Log list codes exhausted
5C 00	D O	RPL status change
5C 01	D O	Spindles synchronized

†Read this code as follows:

D Direct access drive
T Sequential access drive
L Printer device
P Processor device
W Write once read multiple device
R Read only (CD ROM) device
S Scanner Device
O Optical memory device
M Media changer device
C Communication device

‡Codes not shown or blank are reserved.

(continued on next page)

Table 2–15 (Cont.) ASC and ASCQ Assignments

Byte 12 13	DTLPWRSOMC†	Description‡
5C 02	D O	Spindles not synchronized
5D 00		
5E 00		
5F 00		
60 00	S	Lamp failure
61 00	S	Video acquisition error
61 01	S	Unable to acquire video
61 02	S	Out of focus
62 00	S	Scan head positioning error
63 00	R	End of user area encountered on this track
64 00	R	Illegal mode for this track
65 00		
66 00		
67 00		
68 00		
69 00		
6A 00		
6B 00		
6C 00		
6D 00		
6F 00		
70 00		
71 00		
72 00		
73 00		
74 00		
75 00		
76 00		
77 00		
78 00		

†Read this code as follows:

- D** Direct access drive
- T** Sequential access drive
- L** Printer device
- P** Processor device
- W** Write once read multiple device
- R** Read only (CD ROM) device
- S** Scanner Device
- O** Optical memory device
- M** Media changer device
- C** Communication device

‡Codes not shown or blank are reserved.

(continued on next page)

Table 2–15 (Cont.) ASC and ASCQ Assignments

Byte 12 13	DTLPWRSOMC†	Description‡
79 00		
7A 00		
7B 00		
7C 00		
7D 00		
7E 00		
7F 00		
80 XX through FF XX		Vendor specific
XX 80 through XX FF		Vendor specific qualification standard ASC

†Read this code as follows:

- D** Direct access drive
- T** Sequential access drive
- L** Printer device
- P** Processor device
- W** Write once read multiple device
- R** Read only (CD ROM) device
- S** Scanner Device
- O** Optical memory device
- M** Media changer device
- C** Communication device

‡Codes not shown or blank are reserved.

2.11.1 Reading Retry Field=0

If the retry field is equal to zero, the first byte is decoded as follows:

Bit	Value	Description
1,2	EE	Internal error
	09	message_opcode frame error
	0F	Write lock error
	2B	Invalid command read/write diagnostic
3,4	40	Invalid memory region
	FC	FCT error; subcode in bits 5,6

Bit	Value	Description
5,6	01	FET not locked
	02	Error reading identifier
	03	Identifier EDC failure
	04	Mode not 512
	05	RCT1 pointer mismatch
	06	FET Dir1_2 inconsistent
	07	Bad port
	08	Too many DIR blocks
	09	Error on write
	0A	Error reading first map
	0B	Characters invalid
	0C	Invalid FCT Block_1
	0D	Bitmap buffer empty
	0E	Error reading bitmap
0F	Error writing bitmap	
10	Sense select failed	
5,6	00	n/a