
Educational Services



**KFQSA Module
Service Guide**

EK-KFQSA-SG-003

Digital Equipment Corporation

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1

General Information

The KFQSA module is an integrated storage adapter used for Q-bus to Digital Storage Systems Interconnect (DSSI) bus protocol conversion. The host processor(s) are connected to the KFQSA module through the Q-bus, which is hardwired across the host(s) enclosure backplane. Figure 1-1, Figure 1-2, and Figure 1-3 display the typical DSSI VAXcluster host(s) configurations and KFQSAs to ISEs relationships.

A single quad-height KFQSA module can connect as many as seven DSSI integrated storage elements (ISEs) to the host through a single DSSI bus. A DSSI VAXcluster configuration with dual hosts and two KFQSA modules can connect up to six ISEs. A three host configuration with three KFQSAs modules can connect five ISEs through the DSSI bus.

NOTE

The KFQSA module supports up to seven DSSI ISEs, but some MicroVAX configurations support less than seven devices. To determine your system's storage capability, review the information about allocation of physical space per cabinet or expansion box options in your system documentation.

Figure 1-1 DSSI Single host Configuration

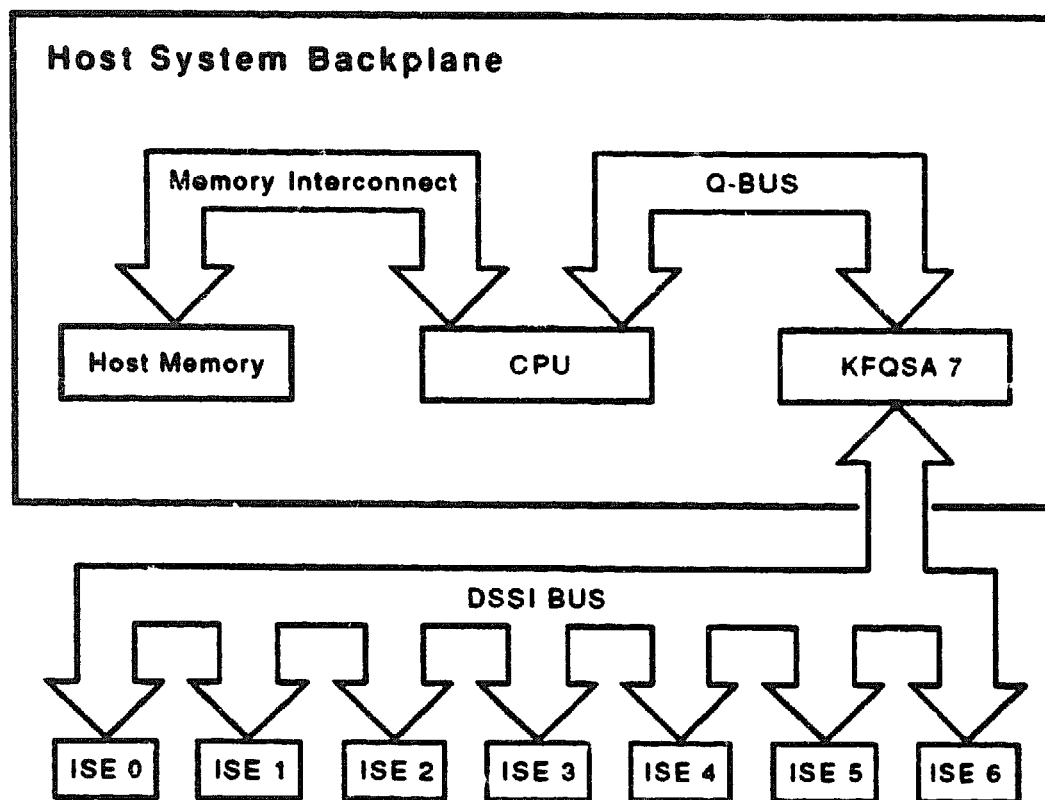


Figure 1-2 DSSI VAXcluster with Dual Hosts

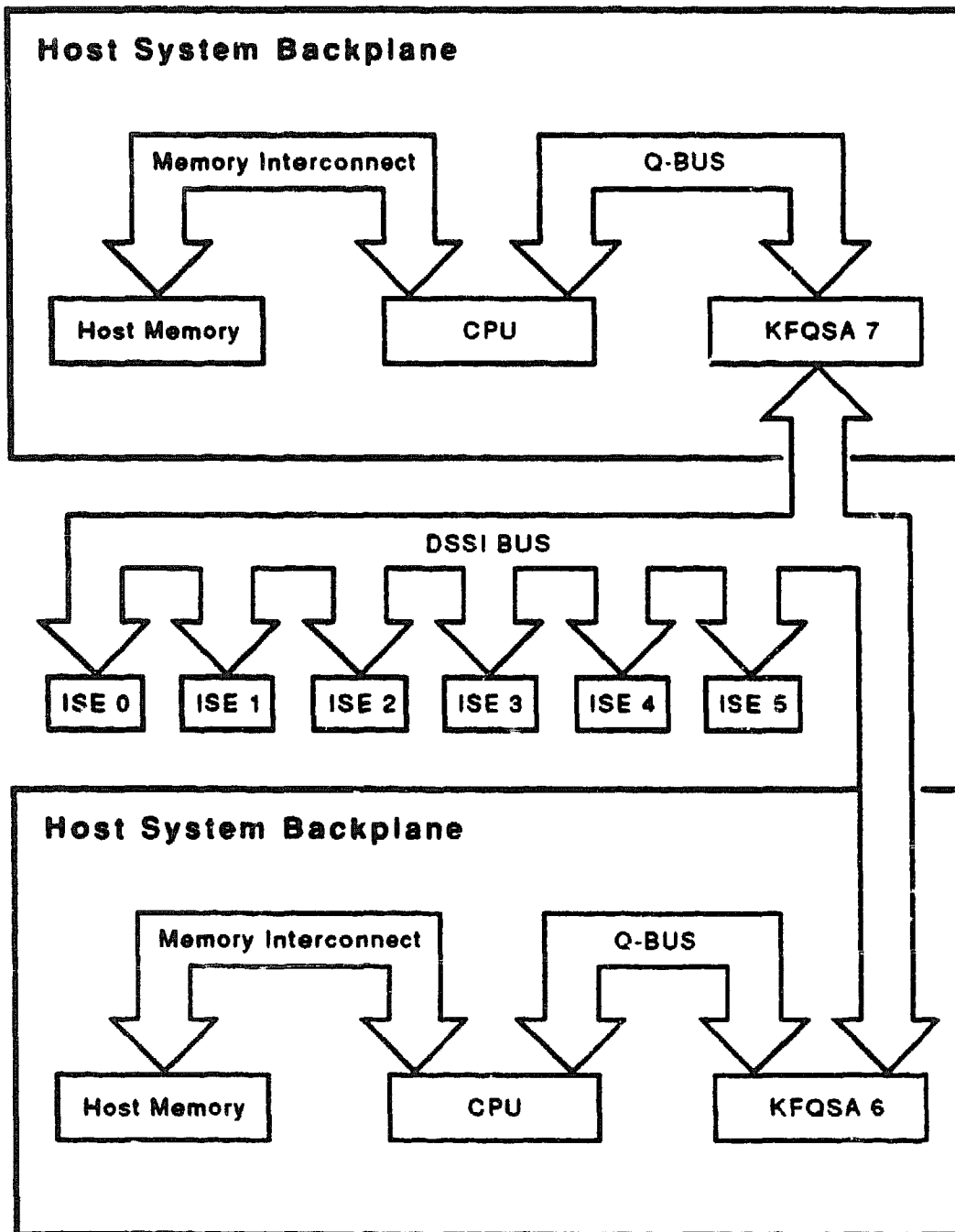
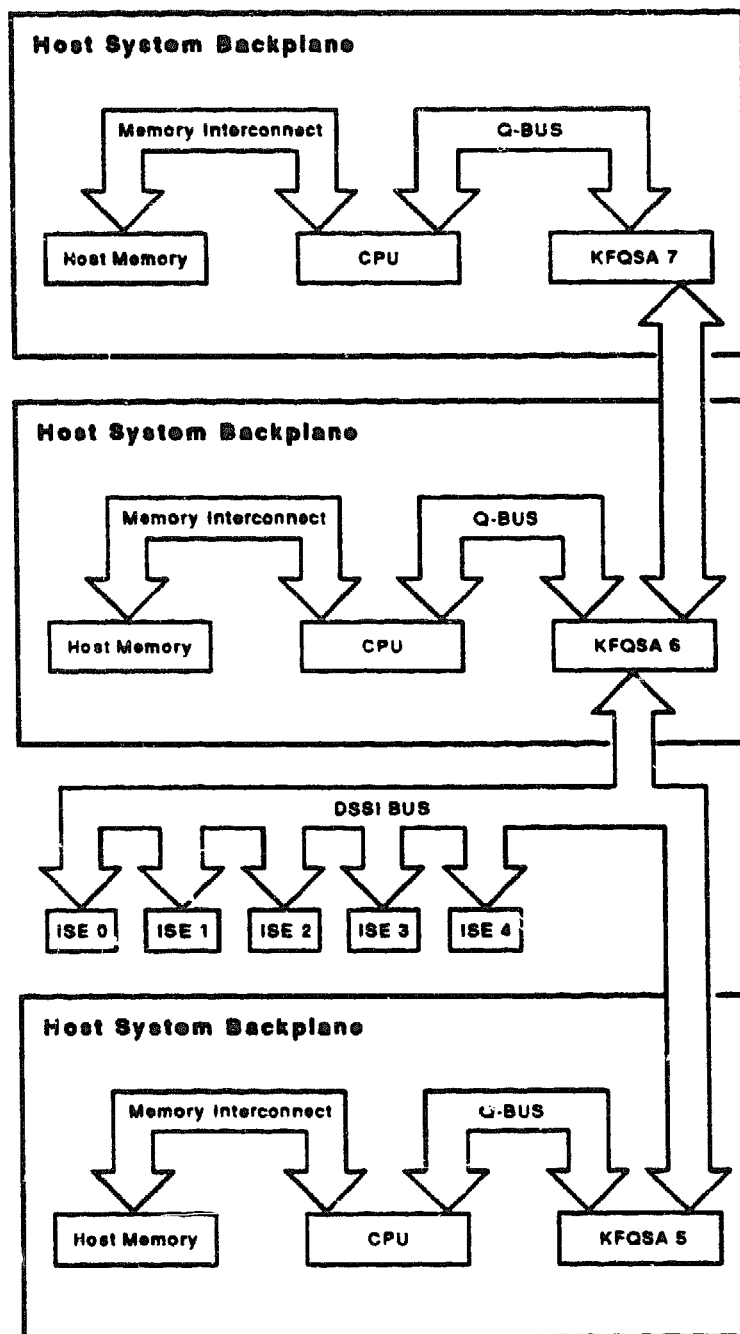


Figure 1-3 DSSI VAXcluster with Three Hosts



1.1 KFQSA Module Overview

The KFQSA module is a protocol converter that supports storage systems protocols (SSPs) to and from a Q-bus host, and DSSI bus protocols to and from the ISEs on the DSSI bus. The module passes requests and responses to and from the host, transfers data to and from the ISEs on the DSSI bus, and buffers data as necessary. The physical path and DSSI protocol between the KFQSA module and the ISEs are transparent to the host processor.

Each DSSI ISE contains an intelligent controller that controls data transfers between the ISE and the host. The KFQSA module has the addressing logic and programmable paths that allow the host to communicate with the DSSI devices.

The host processor sends I/O requests to the ISE through the Q-bus, the KFQSA module, and the DSSI bus. After receiving the I/O request, the ISE manages the transfer of data over the DSSI bus. When the transfer is complete, the controller uses the KFQSA module to notify the host. If the data transfer is unsuccessful, an error message is sent to the host.

The KFQSA module is supported by the following operating systems and diagnostic utilities:

- VMS Version 5.1 or later¹
- ULTRIX-32m Version 3.0 or later
- VAXELN Version 3.0 or later
- MicroVAX Diagnostic Monitor (MDM) Version 3.0 or later

1.2 KFQSA Module in the DSA Environment

The KFQSA module is designed to meet the requirements of a set of standards and specifications called Digital Storage Architecture (DSA).

Communications between the host processor and DSSI devices that are made through the KFQSA module adhere to Digital's Mass Storage Control Protocol (MSCP), Tape Mass Storage Control Protocol (TMSCP), or Diagnostic Utility Protocol (DUP).

In an MSCP or TMSCP environment, the ISE controller is the logical area that contains the intelligence to perform detailed I/O handling tasks. This allows the host to send command messages, such as requests for reads or writes to the controller, and receive response messages back from the controller.

¹ KFQSA DSSI VAXcluster configurations must use VMS Version 5.1-1 or later.

The DUP is used by both the MDM utility and the VMS operating system for device diagnostic communications. You can use the DUP utility to run DSSI device-resident diagnostics and utilities (local programs). Consult your DSSI ISE documentation for information about using DUP and the device-resident programs.

The host uses two levels of software to accomplish its tasks. The first, and higher level, is called a class driver. Its knowledge is limited to a class of devices, such as disks and their capabilities. A class driver builds MSCP or TMSCP command messages from information provided by the application program (for example, through the \$QIO system service under the VMS operating system). It also notifies the application that I/O requests are complete when MSCP or TMSCP response messages are received.

The second level of host software is called the port driver. It passes messages to and from the module (in this case, the KFQSA module), and provides communications services that are required by a specific communications link. The port driver is not aware of the meaning of the messages, nor does it know the type of controller or device being used (for example, a disk or tape device).

The class driver used in a KFQSA DSSI subsystem is the same class driver that is used with all other DSA SSP controllers¹ (for example, the DUDRIVER in VMS). The KFQSA module conforms to the SSP port interface specification, and uses the same port driver that is used by all other SSP controllers (in other words, the PUDRIVER in VMS). Therefore, each ISE connected to the KFQSA module appears as an RQDX3 controller with one disk drive attached to the host software.

In the controller architecture, there are also two levels of software: the class server and the port driver. The class server communicates with the class driver and contains the intelligence necessary to process detailed I/O commands. The port driver in the controller, like the host port driver, handles message passing only.

The KFQSA module provides the link between the host's driver software and the DSSI bus. Each side of the KFQSA module (host/Q-bus and controller/DSSI bus) has a microprocessor subsystem that passes messages and data between the host and the DSSI bus.

¹ SSP controllers also include the RQDX3, KDA50, RRD50, RQC25, TQK50, and TQK70 controllers.

When the KFQSA module receives a request from the host, it takes the request packet from the SSP ring, strips the SSP header, applies a DSSI packet header, and transmits the request to the appropriate DSSI ISE. When the KFQSA module receives the response from the ISE, it performs in one of two ways: it strips the DSSI packet header, applies an SSP header, and inserts the packet into the SSP ring; or it performs a DMA data transfer over the Q-bus to the host followed by a response to the DSSI ISE.

1.3 DSSI VAXcluster Configurations

DSSI ISEs have a capability built into their firmware that allows the ISE to maintain simultaneous connections with more than one host system.

A DSSI VAXcluster system uses DSSI as the interconnect. Q-bus VAX or MicroVAX systems interface to DSSI by means of a DSSI adapter such as a KFQSA Module. Some processor modules have embedded DSSI.

As many as 8 DSSI nodes may use the same interconnect. A DSSI node is any device to which DSSI transports information and for which DSSI therefore needs an address, including ISEs and KFQSA adapters on VAX or MicroVAX systems.

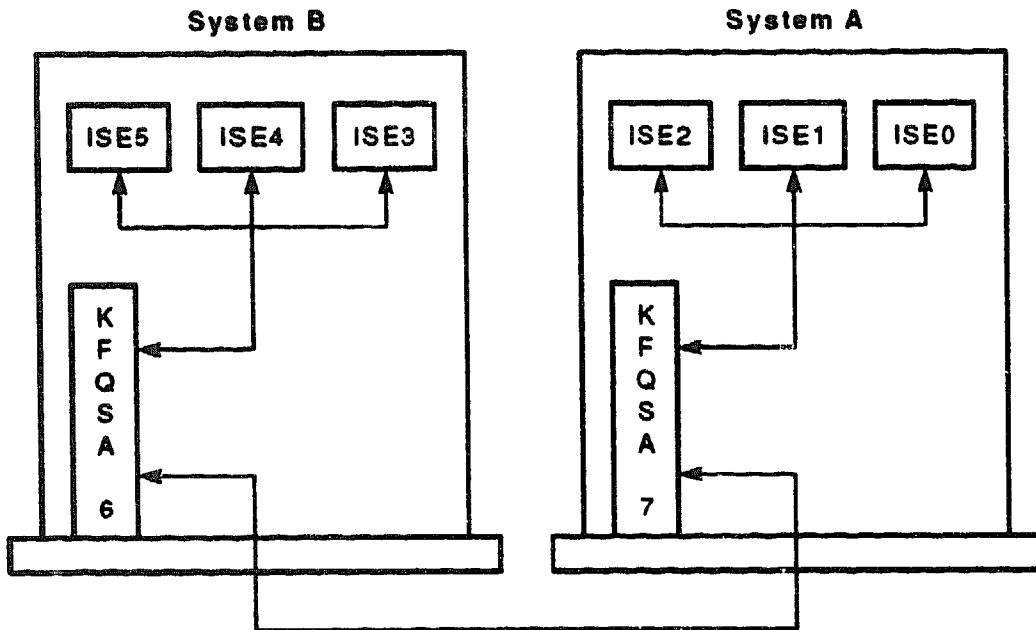
In a DSSI VAXcluster configuration, the host systems (and possibly an expansion cabinet such as the R215F) are connected together through an external DSSI cable. Each system is a boot server in a Local Area VAXcluster. The host systems may share a common system disk ISE or may have independent system disk ISEs. Each system has direct and equal access to the common system disk ISE through its KFQSA module and to any other ISE in either enclosure.

Figure 1-4, Figure 1-5, and Figure 1-6 are examples of DSSI VAXcluster configurations using the KFQSA module.

1.4 KFQSA Module Description

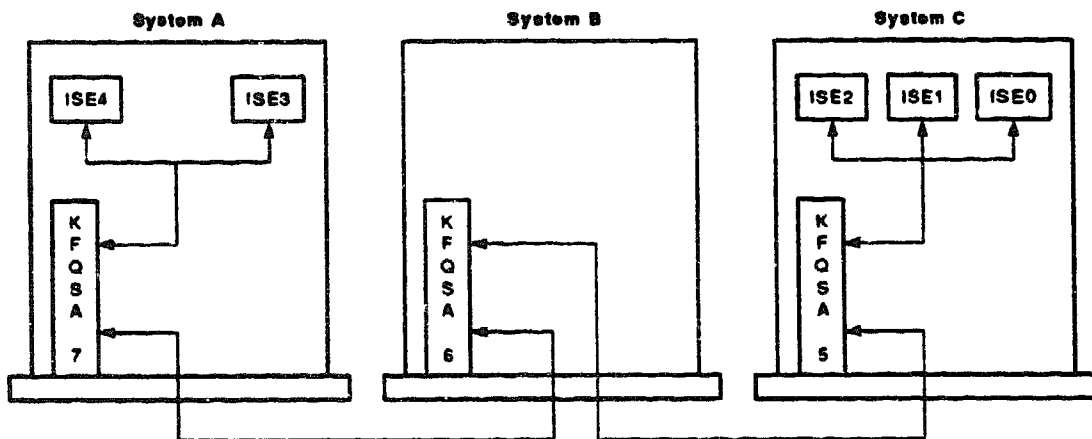
Figure 1-7 shows the locations of the switches, LEDs, DSSI connector, fuse, and manufacturing jumper on the KFQSA module.

Figure 1-4 Two-System DSSI VAXcluster Configuration

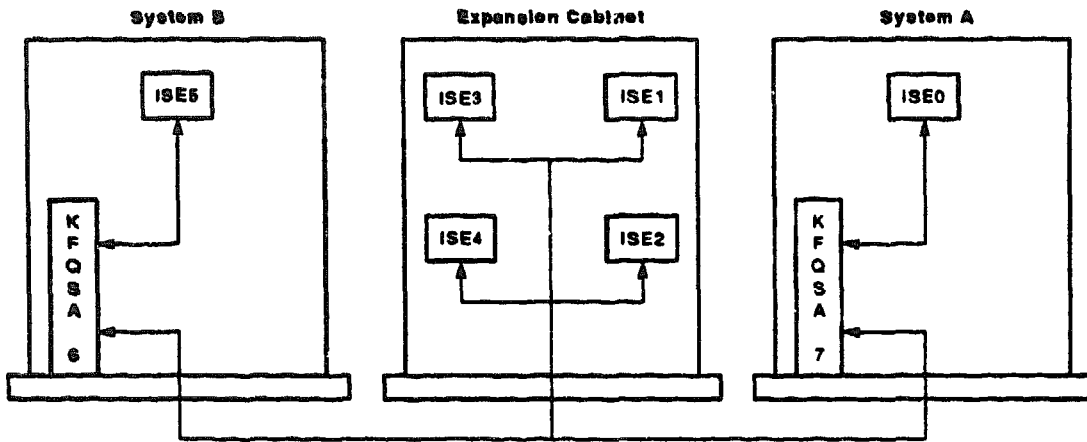


LJ-01734-T10

Figure 1-5 Three-System DSSI VAXcluster Configuration



LJ-01718-T10

Figure 1-6 DSSI VAXcluster with an Expansion Cabinet

LJ-01738-T10

1.4.1 KFQSA Module Switches

The KFQSA module switches are provided for servicing and booting the KFQSA module. Before installing the KFQSA module, you must choose a CSR address that allows the host to access the module. These four switches are used for this purpose. Table 1-1 explains the function of each switch.

During installation, you must use one of the addresses provided by these switches. Both the MDM utility and the MicroVAX command console require a CSR address for the KFQSA module to configure the KFQSA module and attached DSSI devices. Once booted, use either IOADDRESS or MDM to determine CSR addresses for the DSSI devices that you are connecting to the KFQSA module (Chapter 6 and Chapter 7).

Figure 1-7 Switch, LED, Connector, Terminators, Fuse, and Jumper Locations

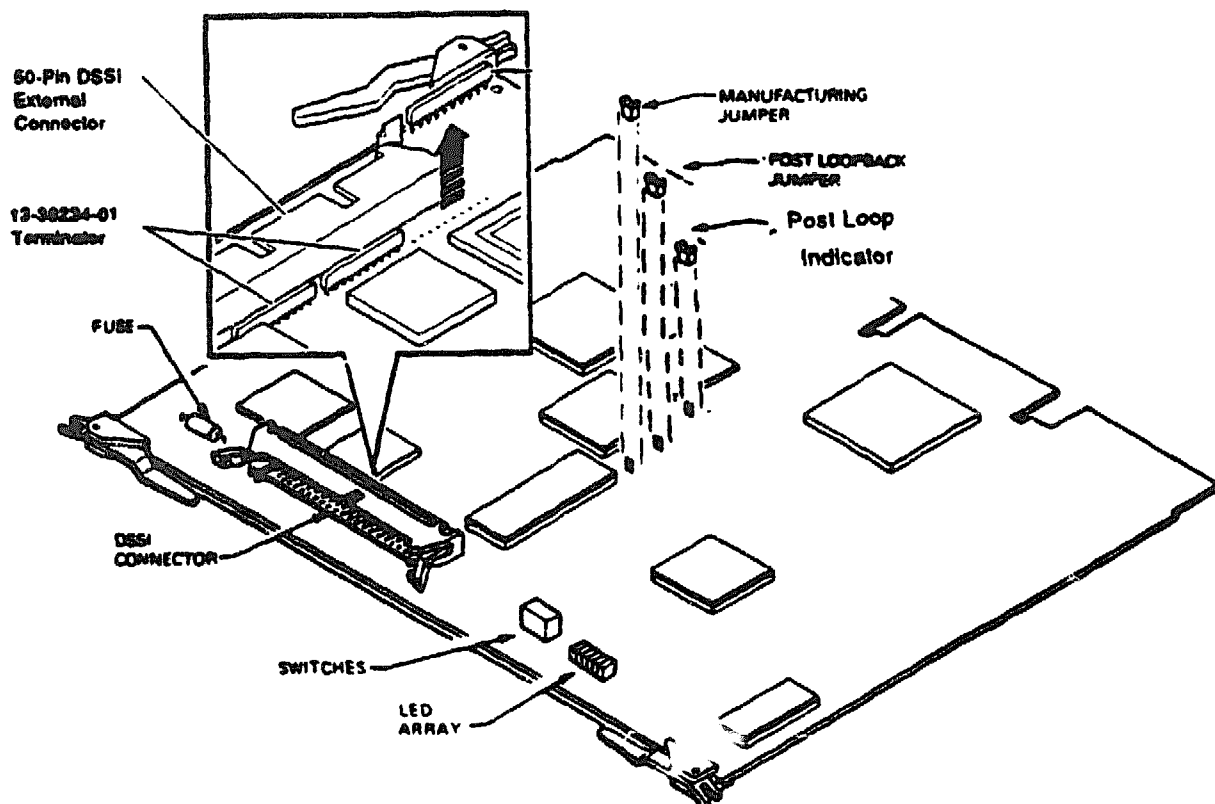


Table 1-1 KFQSA Module Switch Settings

Switch	Position	Function
1	Off	With switch 1 in the OFF position, the other switches are ignored, and CSR addresses are read from the configuration table. After the configuration table has been programmed, the system should be powered down, and this switch should be set to the OFF position, where it should remain unless the configuration table is corrupted and needs to be reprogrammed.
	On	Switch 1 in the ON position enables the selection of a CSR address for programming the configuration table. The switch should be placed in this position for the initial installation. The CSR address selected for programming depends upon the position of the other three switches.
2	Off	Switch 2 in the OFF position enables the selection of one of four CSR addresses that have been dedicated for programming the KFQSA module. Table 1-2 shows how the remaining two switches are used to select one of these addresses. These addresses should <i>only</i> be used to program the EEROM when initially accessing the KFQSA module.
	On	Switch 2 in the ON position enables the selection of one of four addresses normally reserved for MSCP or TMSCP devices. Table 1-3 shows how the remaining two switches are used to select one of these addresses. <i>NOTE: Avoid using these addresses at this time, as they may conflict with other modules in the system. They are provided for future use.</i>
3 & 4		When switches 1 and 2 are in the ON and OFF positions respectively, these switches are used to select one of four dedicated CSR addresses (Table 1-2). When switches 1 and 2 are both in the ON position, they are used to select either a disk (MSCP) address or a tape (TMSCP) address (Table 1-3).

Table 1-2 Selecting a Dedicated KFQSA CSR Address

Switch 1	Switch 2	Switch 3	Switch 4	CSR Address (octal)
On	Off	On	On	0774420 (fixed)
On	Off	On	Off	0774424 (fixed)
On	Off	Off	On	0774430 (fixed)
On	Off	Off	Off	0774434 (fixed)

Table 1-3 Selecting an MSCP or TMSCP CSR Address

Switch 1	Switch 2	Switch 3	Switch 4	CSR Address (octal)
On	On	On	On	0760444 (secondary TMSCP)
On	On	On	Off	0774500 (primary TMSCP)
On	On	Off	On	0760334 (secondary MSCP)
On	On	Off	Off	0772150 (primary MSCP)

1.4.2 Module LEDs

The KFQSA module has a LED array consisting of one green and five red LEDs. At power on, all six LEDs are lit. If the power-on self-test (POST) executes successfully, the red LEDs are extinguished, and the green LED remains lit.

NOTE

POST executes whenever you turn on the host subsystem or when the host issues a Q-bus BUS INIT.

The red LEDs, in combination with the green LED, indicate errors detected during POST. There are two types of errors that can be detected: fatal and nonfatal. A list of error codes generated by POST is provided in Chapter 3.

Fatal errors cause the KFQSA module to abort service and wait for reinitialization. When POST detects a fatal error, the green LED is extinguished and the red LEDs display an error code.

When nonfatal errors occur, the KFQSA module either recovers or continues to operate with impaired efficiency. When POST detects a nonfatal error, the green LED remains lit, and the red LEDs display an error code for ten seconds.

1.4.3 DSSI Cabling and External Bus Termination

The KFQSA module's DSSI connector is a standard 50-pin connector.

CAUTION

Cables that are not DSSI should never be plugged into a DSSI connector. Use of cables other than DSSI cables may blow the KFQSA module fuse and/or cause hardware damage.

Specific DSSI cable routing depends on your system enclosure(s). See Chapter 5 for more information on system enclosures and cabling. The DSSI bus should be terminated at both ends.

NOTE

The KFQSA module (revision K04 or later) have on-board SIP bus terminators that are removable for placement of a KFQSA in the center of the DSSI bus in a three-system VAXcluster configuration.

CAUTION

Never remove the DSSI terminator while power is applied. Doing so may cause both soft and hard (unrecoverable) errors.

The external DSSI terminator has a green LED. This LED should be lit when power is applied to the DSSI bus. If this LED is not lit when power is applied to the DSSI bus, one of the following conditions exists:

- Incorrect or faulty cabling of the DSSI bus
- Bad fuse on the KFQSA module
- DC power problems on the KFQSA module
- DC power problems with a DSSI device-resident controller

1.4.4 KFQSA Terminator Power Fuse

The KFQSA module has a fuse to protect against overcurrent conditions. The fuse (PN 12-10929-06) has a 125 Vdc, 2 A rating. This fuse is socketed for ease of replacement.

1.4.5 Jumpers

There are three jumpers on the KFQSA module. Before installation, make sure all jumpers have been removed.

1.5 KFQSA Module Specifications

The functional and environmental specifications for the KFQSA module are provided in the following tables.

Functional Specifications	
Storage bus interface	Digital Storage Systems Interconnect (DSSI)
Peak transfer rate	4 Mbyte/s
Sustained transfer rate	1.5 Mbyte/s
I/O request throughput	190 I/O requests/s (single-sector reads)
Error detection	DSSI bus parity and check character on all transmissions Adapter byte parity on internal buffer Q-bus parity ¹
MTBF	100,000 hours in typical customer environment (long term steady state)
Power requirements	+5 Vdc $\pm 5\%$ 5.5 A typical
Power dissipation ²	27.5 W typical 35 W maximum

¹As specified in DEC STD 160

²Not including DSSI bus terminator power

Environmental Specifications

Temperature	+5 to +60°C (+41 to +140°F) operating -40 to +66°C (-40 to +151°F) storage
Humidity	10% to 95% noncondensing
Altitude	2438 m (8000 ft) operating 9142 m (30,000 ft) storage

2

Troubleshooting

The troubleshooting goal for the KFQSA module and DSSI ISEs is to isolate and replace a faulty FRU, test the system, and return the functioning system to service. Three tools used to diagnose a KFQSA/DSSI subsystem are:

- POST — the power-on self test (Chapter 3)
- NAKFA — a functional diagnostic (Chapter 3)
- System error logs (Chapter 4)

KFQSA module failures generally fall into one of two categories: either the system fails to boot because of a KFQSA module problem, or the system boots but the KFQSA module fails.

In the case of a boot failure, verify the installation again using the procedures outlined in Chapter 5 and Chapter 6. Most boot problems are caused by incorrectly setting-up the device configuration or addressing.

If the system does not boot, run POST and/or NAKFA. Analyze intermittent errors that still allow booting using the system's device error logs.

Always perform a visual inspection of the KFQSA module and all connected DSSI devices before troubleshooting. Some KFQSA module problems that can be solved by visual inspection are listed in Table 2-1.

Table 2-1 KFQSA Troubleshooting Symptom Analysis

Symptom	Possible Resolution
Green LED on external DSSI terminator is extinguished.	Blown fuse on KFQSA module or dc power problem on DSSI bus. Includes cables and KFQSA and DSSI ISE controller modules.
Continually blowing fuses on the KFQSA module.	Incorrectly plugged or use of cables other than DSSI.
Cannot access configuration table	Improper termination on the KFQSA module. Make sure KFQSA is terminated either through on-board SIP terminators or external DSSI terminators.
Error Code 03 on KFQSA LEDs.	Fatal configuration table error. Use procedures in Chapter 6 or Chapter 7 to reprogram the configuration table.
With switch 1 in the OFF position, MDM displays IP WRITE FAILURE.	A NAKFA image has been corrupted. Reload NAKFA.
Excessive VMS error logs.	Nonexistent or powered-off device on the DSSI bus.
No DSSI devices seen by operating system.	Attempting to boot DSSI devices when switch 1 is set in the ON position. Set switch 1 to the OFF position.
During installation, cannot boot MDM with KFQSA on the bus.	Conflicting boot addresses. Use KFQSA module switches to choose a dedicated address.
Undeterminable soft or hard errors.	Improper bus termination, improper DSSI cable connections, or improper grounding. Make sure the DSSI bus is terminated and the terminator LED is lit to avoid improper bus termination.
Cannot access DSSI devices using SET HOST /DUP.	Wrong version of VMS operating system. VMS Version 5.1 or higher required.
NAKFA or VMS error logs display NO VC.	Improper device connection on the DSSI bus. The KFQSA module must have at least one DSSI device that can be addressed, connected, and available on the bus. The configuration table must accurately reflect the devices present, both CSR and DSSI node ID.

3

Diagnostics

The KFQSA module uses two types of diagnostics to test and troubleshoot the KFQSA DSSI subsystem:

- POST — power-on self-test
- NAKFA — KFQSA module's functional diagnostic

3.1 Power-On Self-Test Diagnostic

The Power-on self-test (POST) performs a comprehensive set of logic tests. It is designed to test about 95 percent of the KFQSA module's logic, and executes in less than ten seconds.

POST executes at system startup or whenever the host executes a Q-bus BUS INIT. It is designed to execute with or without DSSI devices connected to the KFQSA module.

POST execution varies depending on the position of switch 1 on the KFQSA module (Section 1.4).

If switch 1 on the KFQSA module is set in the ON position, POST uses the remaining switches to configure the module (Chapter 1). POST then reads these switches to address the KFQSA module and executes the test.

If switch 1 is set in the OFF position, POST uses the EEROM Configuration Table to set up the KFQSA DSSI subsystem. The EEROM contains two copies of the configuration table as a precaution against corruption of a single copy. The POST sequence for this case is as follows:

1. POST performs a checksum on both copies of the EEROM configuration table.

3-2 Diagnostics

2. If both checksums are valid, the sequence numbers of the two copies of the table are compared. If the sequence numbers are equal, the primary configuration table is used to configure the KFQSA DSSI subsystem. If the sequence numbers are different, POST uses the table with the higher sequence number to configure the subsystem. The other table is updated with information from the table that is used.
3. If only one table has a valid checksum, it is used to configure the subsystem. The invalid table is updated with information from the valid table.
4. If both checksums are invalid, a fatal error is flagged (LED error code 03 and SA error code 8322), and the module is not allowed to function.

POST reports detected errors to two places:

- KFQSA module LEDs through the 8096 microprocessor
- POST error region in the KFQSA module's EEROM

Table 3-1 shows the POST LED nonfatal error codes. Table 3-2 shows all POST LED fatal error codes.

Table 3-1 POST LED Nonfatal Error Codes

Green LED	Red LEDs					Meaning
	4	3	2	1	0	
•	○	○	○	○	•	At least one (but not all) CSR address parity error. ¹
•	○	○	○	•	○	At least one (but not all) discrete port error in the QMI chip. ¹
•	○	○	•	○	○	Successful retry during a RAM test. ¹
•	○	•	○	○	○	Watchdog timer nonfatal error. ¹
•	○	○	○	○	○	POST passed.

○ = LED off. • = LED on

¹The nonfatal error code is displayed for ten seconds (minimum).

Table 3-2 POST LED Fatal Error Codes

Green LED	Red LEDs					Meaning
	4	3	2	1	0	
•	•	•	•	•	•	Never started or 8096 CPU error
•	•	•	•	•	•	8096 set-up error
•	•	•	•	•	•	CSRD chip test error
•	•	•	•	•	•	QMI Chip test error
•	•	•	•	•	•	Fatal configuration table error (set note)
•	•	•	•	•	•	8096 EPROM test error
•	•	•	•	•	•	8096 DPRAM test error (low byte)
•	•	•	•	•	•	8096 DPRAM test error (high byte)
•	•	•	•	•	•	68000 CPU test error
•	•	•	•	•	•	68000 10 usec BERR timer test error
•	•	•	•	•	•	68000 EPROM test error
•	•	•	•	•	•	68000 local RAM test error (low byte)
•	•	•	•	•	•	68000 local RAM test error (high byte)
•	•	•	•	•	•	68000 interrupt vector test error
•	•	•	•	•	•	DSSI timer test error
•	•	•	•	•	•	FIFO chip test error
•	•	•	•	•	•	Buffer RAM parity test error
•	•	•	•	•	•	Buffer RAM test error (first 64K, bits 0...3)
•	•	•	•	•	•	Buffer RAM test error (first 64K, bits 4...7)
•	•	•	•	•	•	Buffer RAM test error (first 64K, bits 8...11)
•	•	•	•	•	•	Buffer RAM test error (first 64K, bits 12...15)
•	•	•	•	•	•	Buffer RAM test error (second 64K, bits 0...3)
•	•	•	•	•	•	Buffer RAM test error (second 64K, bits 4...7)
•	•	•	•	•	•	Buffer RAM test error (second 64K, bits 8...11)
•	•	•	•	•	•	Buffer RAM test error (second 64K, bits 12...15)
•	•	•	•	•	•	SII chip test error

Table 3-2 (Continued) POST LED Fatal Error Codes

Green LED	Red LEDs					Meaning
	4	3	2	1	0	
○	●	●	○	○	●	68000 DPRAM test error (low byte)
○	●	●	○	●	○	68000 DPRAM test error (high byte)
○	●	●	○	●	●	Microprocessor interrupt test error
○	●	●	●	○	○	68000 bus error
○	●	●	●	○	●	Unexpected interrupt (68000 side)
○	●	●	●	●	○	8096 set up complete error
○	●	●	●	●	●	Parity error during BRAM test

○ = LED off, ● = LED on

NOTE

It is possible to solve fatal configuration table errors without replacing the KFQSA module. Set switch 1 in the ON position, boot, and reconfigure the configuration table.

3.2 Four Step Initialization Process

The Four Step Initialization (Four Step Init) process is common to hosts initializing SSP devices. It is transparent to the user, but it is helpful to use for diagnosing certain errors.

The Four Step Init process occurs after the KFQSA module executes POST. It is possible for the KFQSA module to successfully complete POST, which needs no other devices on the DSSI bus, and fail the Four Step Init process that requires devices to be ready, available, and on-line.

If this situation occurs, VMS error logs and NAKFA respond with a NO VC error message. If this error occurs and the KFQSA module has passed POST, examine the DSSI ISEs to make sure they are on line. Check the DSSI bus to ensure that it is properly terminated.

The following is a description of the Four Step Init process:

1. The KFRQSA module lets the host know it supports 22-bit addressing. The host writes the interrupt vector address and interrupt enable bit to the KFRQSA SA register.
2. The KFRQSA module acknowledges completion of step 1. The host writes a main memory ring base address to the SA register. This memory is used for communications between the host and the KFRQSA subsystem.
3. The KFRQSA module echoes the interrupt address and enables the bit from step 1. The host writes the SA with more communications information.
4. The KFRQSA module writes the SA register with DSSI device types and the KFRQSA microcode version number. The host writes the SA register with the GO flag.

During this step, virtual circuits are established with the DSSI devices connected to the KFRQSA module. To establish a virtual circuit, the DSSI device must be available and on line.

3.3 Using NAKFA

NAKFA is a KFRQSA functional diagnostic that is executed using the MicroVAX Diagnostic Monitor (MDM) utility. The MDM utility scans for individual devices on the bus and loads one image of NAKFA for each DSSI device connected to the KFRQSA module. Like all MDM diagnostics, NAKFA is menu driven.

NOTE

This section is written for users with a working knowledge of the MDM utility.

3.3.1 Loading NAKFA

There are several ways to load and execute MDM diagnostics. This section describes one way in which only the device being tested is selected. This allows more time for KFQSA module or DSSI device troubleshooting.

1. Load MDM.

(For example: >>>B DUA1.)

The system displays the following:

MicroVAX Diagnostic Monitor initializing.....Please wait

MicroVAX Diagnostic Monitor - Version 3.0

CONFIDENTIAL DIAGNOSTIC SOFTWARE
PROPERTY OF
DIGITAL EQUIPMENT CORPORATION

Use Authorized Only Pursuant to a Valid Right-to-use License

Copyright (c) 1986, 1988
Digital Equipment Corporation

The current date and time is: 12-JAN-1989 13:30

Press the RETURN key to continue,
or enter the new date and time; then press the RETURN key.

[DD-MM-YYYY HH:MM]:

The current date and time is: 12-JAN-1989 13:30

2. Enter the correct date and time, then press **RETURN**.

The following text is displayed on the screen:

Do you want to use menu mode or command line mode?

- 1 - menu mode
- 2 - command line mode

Type the number; then press the RETURN key.

3. Select command line mode.

4. At the prompt, type the following:

```
MDM>>SHOW BUS
```

This shows you information about devices that can be tested. For example:

Autoconfigure set ON

Filename	CSR	VECTOR	BR_LEVEL	STATUS
NAKAA	160000	000	0	CONNECTED
NAMSA	160002	000	0	CONNECTED
.				
.				
.				
NAKFA	160334	300	4	CONNECTED

The bus display defaults are *Autoconfigure set ON* and *STATUS CONNECTED*. These defaults mean that the diagnostics are loaded automatically when the system is configured.

5. At the prompt, type the following:

```
MDM>>SET AUTOCONFIGURATION OFF
```

This command reverses the status of diagnostics to **IGNORED**. This means that the diagnostics are not loaded when the system is configured.

6. At the prompt, type the following:

```
MDM>>connect 160334 file_name NAKFA vector 300 br_level 4
```

7. At the prompt, type the following:

```
MDM>>SHOW BUS
```

The system displays new configuration and status. For example:

```
Autoconfigure set OFF
```

Filename	CSR	VECTOR	BR_LEVEL	STATUS
NAKAA	160000	000	0	IGNORED
NAMSA	160002	000	0	IGNORED
.				
.				
.				
NAKFA	160334	300	4	CONNECTED

8. At the prompt, type the following:

```
MDM>>CONFIGURE
```

9. At the prompt, type the following:

```
MDM>>SHOW CONFIGURATION BRIEF
```

The following list of enabled diagnostics is displayed:

```
1 NO Ld KAA Disabled
2 NO Ld MSA Disabled
.
.
.
5 KFQSAA - KFQSA subsystem
```

```
MDM>>
```

3.3.2 Testing the KFQSA Subsystem Using NAKFA in Menu Mode

This section explains how to use the MDM utility to access the MDM device menu, NAKFA's KFQSA subsystem menu, and NAKFA's KFQSA utility tests and program menu.

Use the following procedure to access the KFQSA device menu:

1. **Boot MDM.** Select menu mode in response to menu mode or command line mode query.

The following text is displayed on the screen:

MAIN MENU

- 1 - Test the system
- 2 - Display System Configuration and Devices
- 3 - Display the System Utilities Menu
- 4 - Display the Service Menu
- 5 - Display the Connect/Ignore Menu
- 6 - Select single device tests

Type the number; then press the RETURN key.

2. **Select the service menu.**

The following text is displayed on the screen:

Service Menu

CAUTION: This menu is intended for use by qualified service personnel only. Misuse of the commands could destroy data.

- 1 - Set test and message parameters
- 2 - Exercise system continuously
- 3 - Display the device menu
- 4 - Enter command line mode

Type the number; then press the RETURN key,
or type 0 and press the RETURN key to return to the Main Menu.

3. Select the device menu. In this example, other device diagnostics are loaded. The following text is displayed on the screen:

```
MAIN
SERVICE
DEVICE
```

This menu lets you select a device for testing.

```
1 CPUA - MicroVAX/rtVAX CPU
2 MEMA - MicroVAX memory system
3 RQDXA - Winchester diskette controller
4 TKXXA - TK50/TK70 controller
5 KFQSA - KFQSA subsystem
```

4. Select the device-specific (KFQSA subsystem) menu.

The following text is displayed on the screen:

```
DEVICE MENU
KFQSA - KFQSA subsystem menu
```

Testing is Enabled

```
1 - Enable/Disable testing for device
2 - Perform all functional tests
3 - Perform the exerciser test
4 - Display the device utilities menu
```

The functional and exerciser tests are described later in this chapter. To modify functional and exerciser tests, proceed to the next step, make modifications, and return to the device menu.

5. Select the device utilities menu.

The KFQSA device utility menu displays the following utilities and special subsystem tests:

MAIN MENU
SERVICE MENU
DEVICE MENU
KFQSAA - KFQSA SUBSYSTEM MENU
UTILITY PROGRAM AND TESTS MENU

Utility selections are:

- 1 - KFQSA Configuration Utility
- 2 - DSSI Device Data Erase Utility
- 3 - Select Device Resident Programs
- 4 - KFQSA Information Gathering Service
- 5 - Customize Diagnostic Functionality Utility

The KFQSA configuration utility is used to configure the DSSI devices in a KFQSAA DSSI subsystem.

You can use this utility to install DSSI add-on devices if at least one DSSI device is attached and has a valid address in the configuration table, and the KFQSA module is in its normal operating mode (that is, switch 1 on the KFQSA module is set in the OFF position). However, if the configuration table is corrupted, you must set switch 1 to the ON position, reboot the KFQSA module, and reconfigure EEROM using this utility.

The device data erase utility is used to intentionally erase customer data.

CAUTION

Only use this utility after consultation with the system manager and execution of BACKUP. Use only when replacing a failing HDA.

This utility provides the customer with the assurance that the data is not leaving the site when a failing HDA is replaced.

The device data erase utility works only when switch 1 on the KFQSA module is set in the OFF position.

3-12 Diagnostics

The select device resident programs utility is used to select the following device-resident programs:

- EXIT
- HISTRY
- DIRECT
- DRVEXR
- ERASE
- DRVTST
- PARAMS
- VERIFY
- DKUTIL

NOTE

The select device resident programs utility works only when switch 1 on the KFQSA module is set in the OFF position.

The following is an example of a device-resident program utility output to a terminal:

Example of Device Resident Program - HISTRY

Please choose a local program or press **RETURN** to continue.

histry

Copyright (c) 1988 Digital Equipment Corporation

Product name: RF30

Drive serial number: EN00601

Node name: R3RBM2

Allocation class: 0

Firmware revision level: RFX V100

Hardware revision level: RF30 PCB-5/EC

Power-on hours: 353

Power cycles: 23

Completed

Press <RETURN> to continue

Support-level personnel and component-level testers use the KFQSA information gathering service to read and write to specific locations on the KFQSA module.

The customize diagnostic functionality utility is used to modify the following programs:

- Service Exerciser — writes over user data (enable or disable)
- Functional Test 18 — writes over user data (enable or disable)

3.4 NAKFA Test Descriptions

Table 3-3 is a summary of NAKFA tests. This information is available on line using the MDM utility. After NAKFA is loaded, type SHO DEVICE TEST at the MDM prompt.

Table 3-3 NAKFA Diagnostic Test Listing

Tests	Name	Description
1. 10	Existence Verification Test	This test checks for the existence of the address of the IP and SA registers for the device under test (DUT).
2. 11	Power-Up Diagnostics Testing	This test performs a bus initialization that invokes the power-up diagnostics on the module. A check is made in the SA register for any errors.
3. 12	Wrap Mode Test	This tests the ability of the module to read in the SA register contents from the host, and then turn around and write the same value back to the host.
4. 13	Small Ring Buffer Test	During this test, the four-step init process occurs without interrupts, using the minimum communications area of one response descriptor and one command descriptor. This minimizes the host memory area with which the controller must communicate.
5. 14	Vector, BR and Interrupt Level Test	The initialization sequence is started with the interrupt enable bit set to verify the device's vector and BR level. The priority level of the interrupt request is also verified.

Table 3-3 (Continued) NAKFA Diagnostic Test Listing

Tests	Name	Description
6, 15	Large Ring Buffer Test	During this test, the four-step init process occurs without interrupts, using the maximum communications area of 128 response descriptors and 128 command descriptors. This maximizes the host memory area with which the controller must communicate.
7, 16	Allocating Memory Beyond The 64K Boundary Test	The transition beyond the 64K boundary may cause addressing problems. This test addresses that issue by allocating a buffer that straddles the 64K memory page boundary.
8, 17	Get DUST Status Test	The Get DUST Status Test requests and tests the DUST status of each unit under test.
9, 18	Peripheral Specific Functional Test — ROM Resident In Peripheral	In conjunction with RF-series ISEs, this test executes DUP Local Program (DRVST) with an expected completion time of 5 minutes. Using KFQSA subsystem utilities, test 18 can be modified to perform write operations. Write operations should only be performed with extreme caution. Tests 9 and 18 do not perform functional testing of the KFQSA module.
	Verify Mode Exerciser	In MDM Customer Mode, the exerciser can simulate simultaneous MSCP READ operations on all of the drives selected for test. Data integrity is verified by the drive resident controller.
	Service Mode Exerciser	In MDM Configuration Mode, the exerciser can simulate simultaneous MSCP READ and WRITE operations on all of the ISEs selected for test. Data integrity is verified by the ISE's controller. The exerciser provides a detailed report of bytes transferred and errors encountered. To perform WRITE operations, you must modify the exerciser using KFQSA subsystem utilities previously described.

3.5 Example of a KFQSA Error Under NAKFA

An example of a NAKFA detected fatal error follows. In this example, the decimal number is generated by the program. The decimal number is interpreted as follows: the 100 in the number indicates a NAKFA diagnostic error; the 42 is the service mode exerciser, the 07 is the test /utility exerciser, and the 52 is the decimal representation for *command time out*.

KFQAC - Error Number 100420752 12-Jan-1988 09:38:50.00
Command Time Out.
The KFQSA is the FRU.

If NAKFA fails, but only displays a hex code, a problem exists between the diagnostic and the MDM utility. Reload the diagnostic.

3.6 Halting Test Execution

To halt NAKFA, type **CTRL/C**. NAKFA stops running, and the MDM utility reports any errors that were detected during testing.

4

KFQSA Error Logs

The KFQSA module generates specific error log entries. Because system error logs can be examined under the VMS operating system, you do not have to bring the customer's system down. Therefore, when KFQSA subsystem problems occur, examine the system error logs first.

The host operating system stores Mass Storage Control Protocol (MSCP) and Storage Systems Protocol (SSP) port error log messages in its error log file. You can display this information on a terminal. Error log messages provide a useful service tool because they do the following:

- Show error/status information that was generated at the time the error occurred.
- Show information about intermittent on-line errors.
- Run on-line (it may not be necessary to interrupt customer operations).

There are three types of error log entries:

- Port initialization
- Port fail
- Last fail packet

Port initialization and port fail entries produce error codes in the SA register (Section 4.2). The most useful information for troubleshooting a failing KFQSA module is located in the SA codes for these types of error log entries. Note, however, that a successful port initialization also produces an SA error code. The last fail packet contains information that may help explain a port initialization or port fail entry.

4.1 Error Log Interpretation

The KFQSA module generates three specific kinds of error logs:

- KFQSA generic error logs
- KFQSA 8096 error logs
- KFQSA 68000 error logs

Error analysis for systems running the VMS operating system is performed by the Error Report Format (ERF) utility. In other operating systems, this operation is done by utilities similar to the ERF utility. Sample formats of the binary error logs used by the ERF utility to produce VMS error reports appear in Appendix A through Appendix C. These formats are also applicable to other operating systems. Refer to your operating system documentation for details on running the error reporting facility for your system.

The ERF utility decodes the binary error log and displays an easy to read error report. The message displayed for each error is analogous to what is listed in the Label column of the error log tables in the appendixes. Section 4.2 shows a sample ERF report for a KFQSA error.

To access the ERF utility, you must use the VMS system account or an account with system privileges.

After entering the system's field service account, access the error log utility under the VMS operating system as follows:

```
$Analyze/error
```

To create a file in your directory of the error information displayed, use the following option with the analyze/error command:

```
/output=<filename.ext>
```

4.2 Sample Error Logs for KFQSA Errors

The following is an example of a port initialization error and fatal error of a system-generated error log. The error log is for a KFQSA module with a FIFO TEST ERROR (832D) in the SA register.

```
***** ENTRY          9. *****
ERROR SEQUENCE 609.    LOGGED ON:      SID 0A000002
DATE/TIME 18-JAN-1989 14:14:47.75      SYS_TYPE 01120101

DEVICE ATTENTION  KA650 CPU REV# 2.  FW REV# 18.
                      SCS NODE: VEVMSB

"DSA" PORT SUB-SYSTEM, UNIT_VEVMSB$PUDO: INIT SEQUENCE FAILURE

SA                      832D                      FIFO CHIP TEST ERROR
                                                ERROR

INIT SEQUENCE

UCB$W_PORTSTEP1        0AA0                      PORT ALLOWS HOST ODD ADDRESSES
                                                22-BIT HOST ADDRESSING SUPPORTED
                                                STEP 1

UCB$W_HOSTSTEP1         A'B2                      INTERRUPT VECTOR 310 (OCTAL)
                                                INTERRUPT ENABLE
                                                16. RING RESPONSE SLOTS
                                                16. COMMAND RING SLOTS

UCB$W_PORTSTEP2         0000
UCB$W_HOSTSTEP2         6088
UCB$W_PORTSTEP3         0000
UCB$W_HOSTSTEP3         0003                      MAPPING REGISTER #432 SELECTED

UCB$W_PORTSTEP4         0000
UCB$W_HOSTSTEP4         0003

GO
HOST REQUESTS "LAST FAIL"
"BURST", 2. 16-BIT TRANSFER(S)
```

4-4 KFQSA Error Logs

MAPPING ALLOCATION INFORMATION

VEC\$L_MAPREG	000C81B0	"MPR" #432. STARTING MAP REGISTER "MPR"(S) PERMANENTLY ALLOCATED 12. MAP REGISTER(S) ALLOCATED DIRECT DATAPATH
ORB\$L_OWNER	00000000	OWNER UIC [000,000]
UCB\$L_CHAR	0C450000	SHARABLE AVAILABLE ERROR LOGGING CAPABLE OF INPUT CAPABLE OF OUTPUT
UCB\$W_STS	0040	TIMED OUT
UCB\$L_OPCNT	00000000	0. QIO'S THIS UNIT
UCB\$W_ERRCNT	0004	4. ERRORS THIS UNIT
UCB\$W_NUMBINITS	0002	2. INIT SEQUENCE(S)

POST is executed, since this error is most likely preceded by a KFQSA bugcheck. This results in the KFQSA LEDs (refer to the LED error codes in Section 1.4.1) displaying a FIFO error code.

This is a fatal error. Replace the KFQSA module.

4-6 KFQSA Error Logs

MAPPING ALLOCATION INFORMATION

VEC\$\$_MAPREG 000C81C8

"MPR" #456. STARTING MAP REGISTER
"MPR"(S) PERMANENTLY ALLOCATED
12. MAP REGISTER(S) ALLOCATED
DIRECT DATAPATH

ORB\$_OWNER 00000000

OWNER UIC [000,000]

UCB\$_CHAR 0C450000

SHARABLE
AVAILABLE
ERROR LOGGING
CAPABLE OF INPUT
CAPABLE OF OUTPUT

UCB\$_STS 0010

ONLINE

UCB\$_OPCNT 00000000

0. QIO'S THIS UNIT

UCB\$_ERRCNT 0007

7. ERRORS THIS UNIT

UCB\$_NUMBINITS 1522

5410. INIT SEQUENCE(S)

The following is an example of a last fail packet:

```
***** ENTRY      885. *****
ERROR SEQUENCE 1147.      LOGGED ON:      SID 08000000
DATE/TIME 18-JAN-1989 14:14:47.75      SYS_TYPE 01010000

DEVICE ATTENTION  KA630

"DSA" PORT SUB-SYSTEM, UNIT_PUB0:

MESSAGE TYPE      0004      UDA PORT MESSAGE

MSLG$SL_CMD_REF  00000000
MSLG$W_SEQ_NUM   0000      SEQUENCE #0

MSLG$B_FORMAT    00      CONTROLLER ERROR

MSLG$B_FLAGS     01      SEQUENCE NUMBER RESET

MSLG$W_EVENT     00CA      CONTROLLER ERROR
                        INTERNAL DATA-STRUCTURE ERROR

MSLG$Q_CNT_ID    30363238
                  02153530      UNIQUE IDENTIFIER, 353030363238 (X)
                        DISK CLASS DEVICE (166)
                        DSSI

MSLG$B_CNT_SVR   10      CONTROLLER SOFTWARE VERSION #16

MSLG$B_CNT_HVR   00      CONTROLLER HARDWARE REVISION #0

"LASTFAIL" CODE  8344      "LASTFAIL" CODE
                        ERROR CODE #836.
```

5

Removal and Replacement Procedures

This chapter explains how to remove and replace a KFAQSA module from a host enclosure(s).

CAUTION

Only qualified service personnel should attempt to replace the KFAQSA module. Before you attempt the procedure, make sure that the system manager has backed up all files. Have the system manager perform a system shutdown of the operating system before turning off power. Make sure that the customer has taken these steps before removing any panels from the enclosure.

CAUTION

Static electricity can damage integrated circuits. Always wear a grounded wrist strap attached to a grounded work surface when installing modules. All necessary parts are available in the Antistatic Kit (PN 29-26246).

5.1 BA440 Installation Procedure

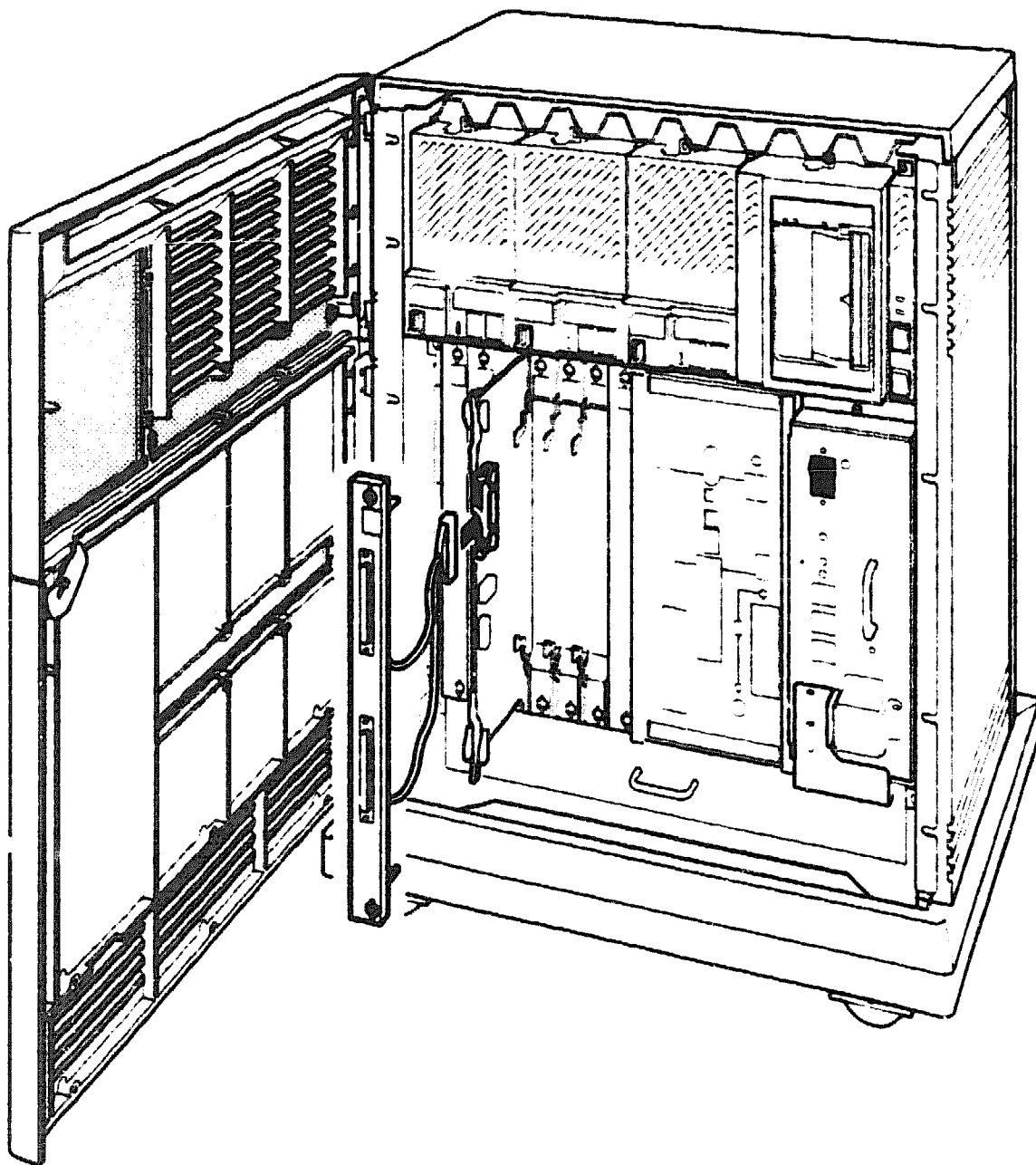
To gain access to the BA440 enclosure, there is a three-position lock that determines which controls you can access. The level of access is as follows:

1. Top position opens the upper door only.
2. Middle position locks both doors.
3. Bottom position opens both doors together.

To install the KFQSA Q-bus Adapter Module do the following:

1. Insert the key into the lock on the front door. Turn the key to the bottom position.
2. Slide the window down.
3. Turn the power switch  off (to the O position).
4. Pull the release latch on the front door out and use it as a hand grip to remove the door from the system.
5. Remove the bulkhead cover from in front of the KFQSA module by releasing the one-quarter-turn captive screws holding it to the card cage.
6. Disconnect the DSSI cable from the KFQSA module, and slide the module out of the card cage.
7. Make sure the replacement module has its switches set in the correct position (Section 1.4).
8. Slide the replacement KFQSA module into the card cage slot and push in the levers to lock the module into place.
9. Attach the DSSI connector to the KFQSA module (Figure 5-1).
 - a. If using bulkhead handle (PN 70-26020-02) ensure the on-board SIP terminators (PN 13-38234-01) are removed (Figure 1-7), and connect an external DSSI terminator (PN 12-29258-01) to one of the connectors on the bulkhead covers. SIP terminator removal is supported on KFQSA revision K04 and later.
 - b. If using bulkhead handle (PN 70-26020-01) ensure the on-board SIP terminators are on the KFQSA module.
10. Connect external the DSSI cable(s) to the bulkhead cover.

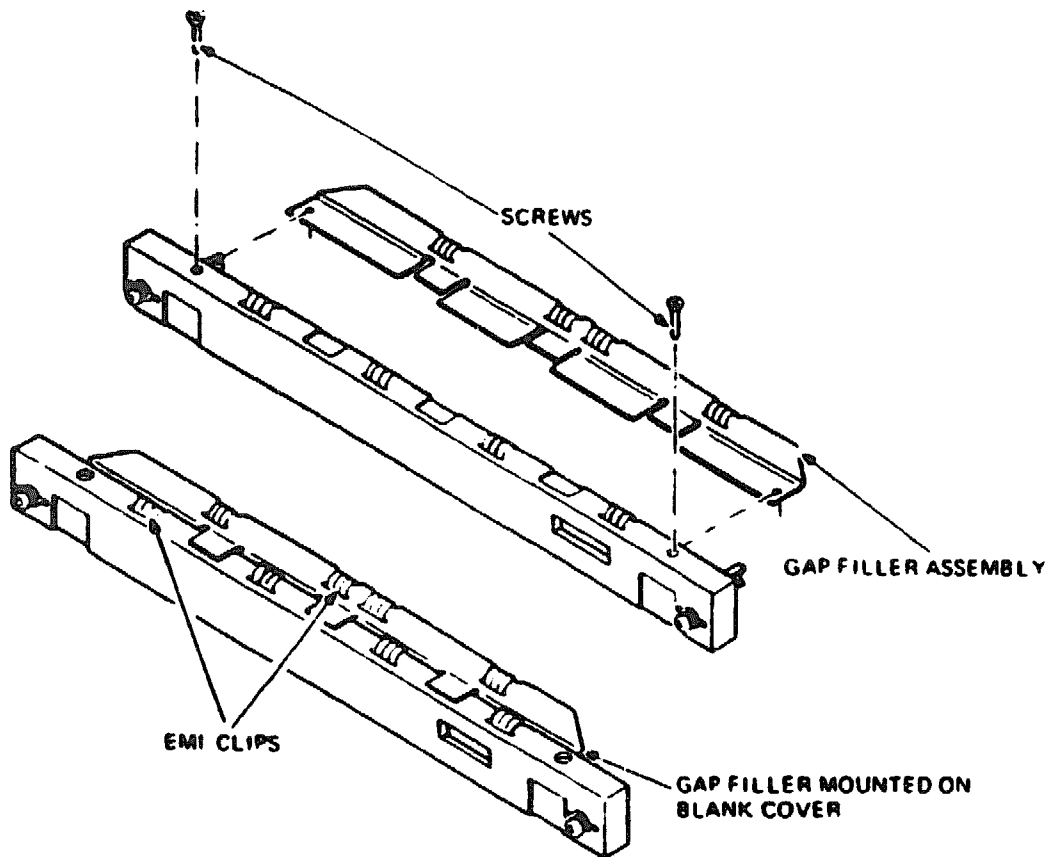
Figure 5-1 BA440 Cabling for a KFQSA In a VAX 4000 System



5-4 Removal and Replacement Procedures

- 11. Before attaching the bulkhead cover over the KFQSA module, run the power-on self-test (POST) diagnostics. Make sure that the red LEDs all go out indicating that the POST diagnostics have completed successfully.**
- 12. Configure the DSSI subsystem following the procedures outlined in the next two chapters. Make sure that switch 1 on the KFQSA is returned to the OFF position once the configuration procedure is completed.**
- 13. Place the bulkhead cover over the module and attach it to the card cage enclosure. If the KFQSA is installed in a slot next to a module with a recessed handle, install the gap filler assembly as follows.**
 - a. Using two screws and one gap filler (PN 70-24071-01), attach the gap filler to the top and bottom of the side of the KFQSA bulkhead cover (Figure 5-2). Make sure the gap filler fits into the tab indentations on the KFQSA bulkhead cover.**
 - b. Place the bulkhead cover with the gap filler over the card cage slot.**
 - c. Make sure there is correct ground (no open spaces) between the KFQSA and the neighboring module.**
 - d. When removing a KFQSA from a BA440 enclosure use the steps mentioned above in the reverse order.**

Figure 5-2 Installing the Gap Filler Assembly



MA 0000A 01
ENR 0000 00

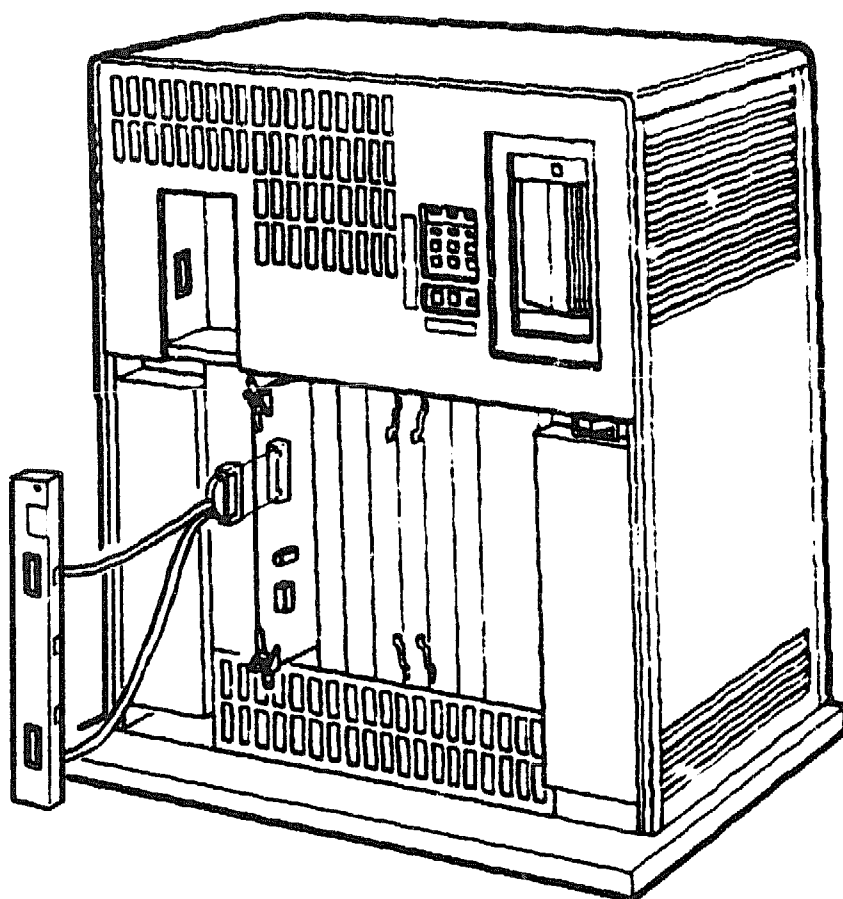
5.2 BA213 Installation Procedure

The front door of the BA213 enclosure has a 3-position lock that limits access to the system controls. The controls are located behind a smoked plastic window at the upper right corner of the cover.

The BA213 installation procedure is as follows:

1. Insert the key into the lock on the front door. Turn the key to the bottom position.
2. Slide the window down.
3. Turn the power switch  off (to the O position).
4. Remove the front door by pulling the release latch outward and using it as a hand grip to remove the door from the system.
5. Remove the bulkhead cover from in front of the KFQSA module by releasing the one-quarter-turn captive screws holding it to the card cage.
6. Disconnect the DSSI cable from the KFQSA module and slide the module out of the card cage.
7. Make sure the replacement module has its switches set in the correct position (Section 1.4).
8. Slide the replacement KFQSA module into the card cage slot and push in the levers to lock the module into place.
9. Attach the DSSI connector to the KFQSA module.
 - a. If using bulkhead handle (PN 70-26020-02) ensure the on-board SIP terminators (PN 13-38234-01) are removed (Figure 1-7), and connect an external DSSI terminator (PN 12-29258-01) to one of the connectors on the bulkhead cover. SIP terminator removal is supported on KFQSA revision K04 and later.
 - b. If using bulkhead handle (PN 70-26020-01) ensure the on-board SIP terminators are on the KFQSA module.
10. Connect the DSSI cable(s) to the bulkhead cover.
11. Before attaching the bulkhead cover to the KFQSA module, run the power-on self-test (POST) diagnostics. Make sure that the red LEDs all go out, indicating that the POST diagnostics have completed successfully

Figure 5-3 Cabling for a KFQSA In a Host System using a BA213 Enclosure



LJ-01716-SCAN

12. Place the bulkhead cover over the opening in front of the KFQSA module and tighten the captive screws by turning them one-quarter turn clockwise. If the KFQSA module is installed in a slot next to a module with a recessed handle, install the gap filler assembly as follows:
 - a. Using two screws and one gap filler (PN 70-24505-01), attach the gap filler to the top and bottom of the side of the KFQSA bulkhead cover (Figure 5-2). Make sure the gap filler fits into the tab indentations on the KFQSA bulkhead cover.
 - b. Place the bulkhead cover with the gap filler over the card cage slot.

5-8 Removal and Replacement Procedures

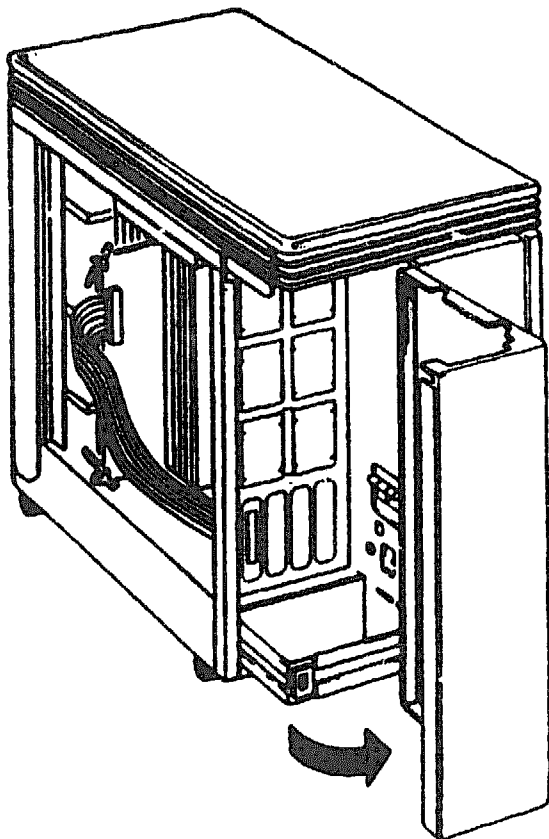
- c. Ensure that there is correct ground (no open spaces) between the KFQSA module and its neighboring module.
13. Configure the DSSI subsystem following the procedures outlined in the next two chapters. Make sure that switch 1 on the KFQSA module is returned to the OFF position when the configuration procedure is complete.
14. Reassemble the BA213 enclosure by reversing steps 1 through 4.

5.3 BA123 Installation Procedure

Refer to Figure 5-4 while performing the following procedure:

1. Remove the ac power cord from the wall outlet.
2. Open the rear door of the enclosure.
3. Loosen the captive screw that connects the right side panel to the rear of the enclosure (Figure 5-5).
4. The panel is attached to the bottom of the enclosure frame by two snap fasteners. Pull the bottom of the panel out until the panel detaches from the bottom of the enclosure.
5. Lift the panel slightly to release it from the lip at the top of the frame and remove the panel.

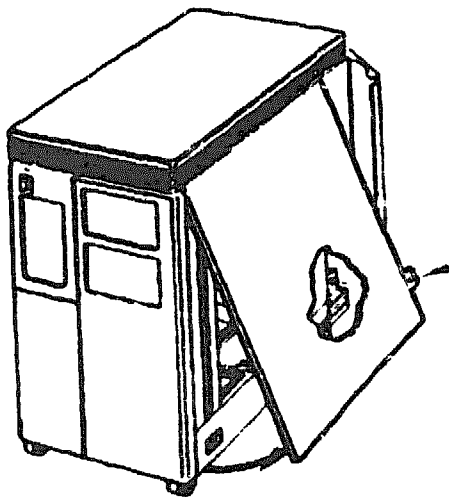
Figure 5-4 KFQSA Installation in a BA123 Enclosure



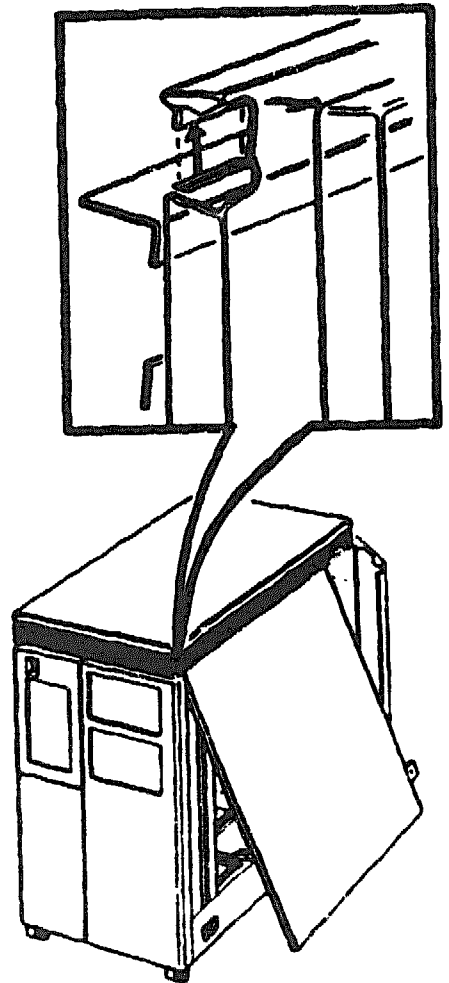
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5-10 Removal and Replacement Procedures

Figure 5-5 Removing the Right Side Panel



6/14 14045

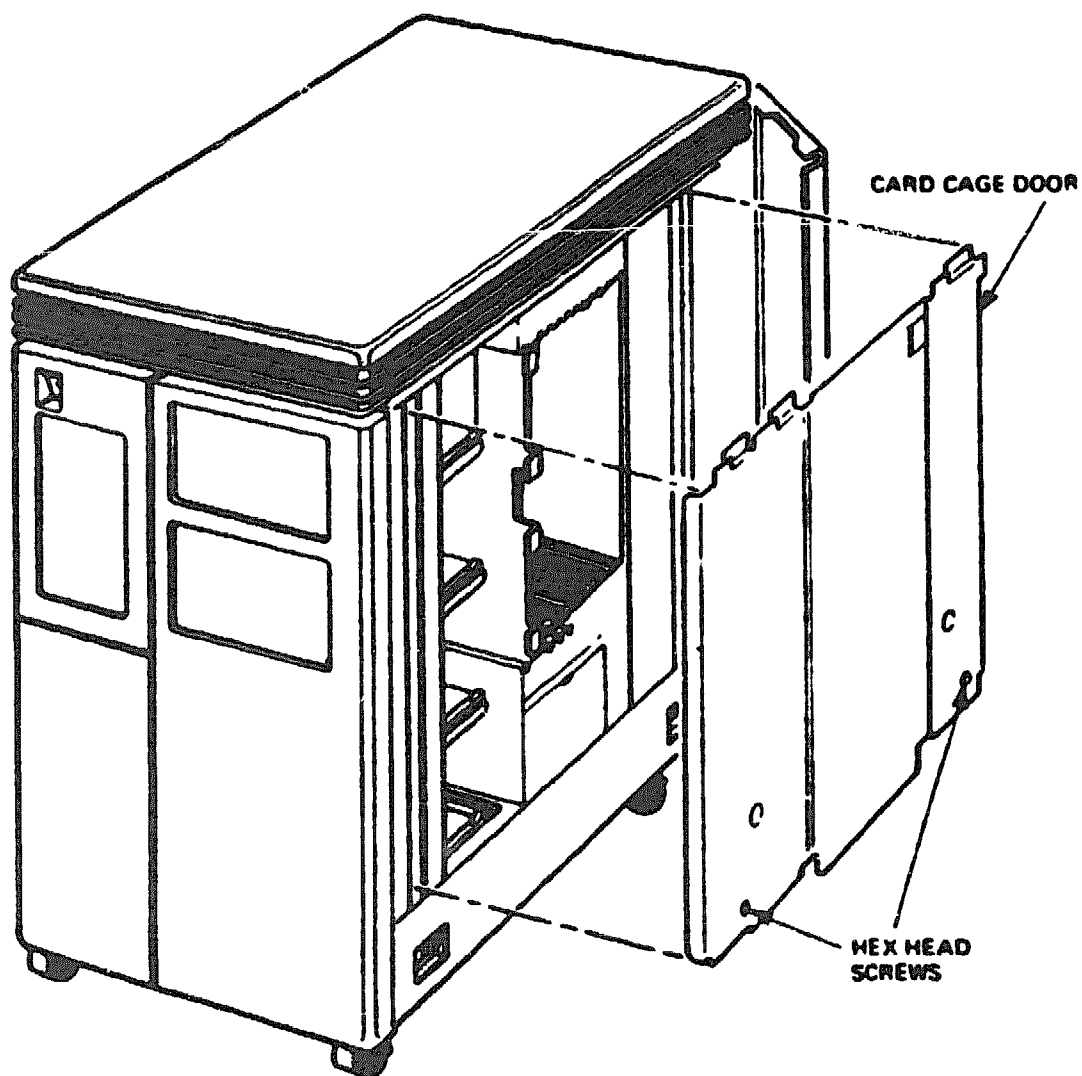


6/14 14045

6. Remove the card cage door by releasing the two clasps at the front end of the door and swinging the door open (Figure 5-6).
7. Remove the DSSI cable from the KFQSA module and slide it out of the card cage.
8. Check to ensure that the switches on the replacement KFQSA module are in the correct position (Section 1.4).
9. Slide the KFQSA module into the appropriate card cage slot and push in the levers to lock the module in place.
10. Connect the DSSI cable to the KFQSA module.
11. Install the mounting plate onto the I/O panel and attach the external DSSI connector to it.
12. Connect the DSSI cable (Figure 5-4).
13. Connect the external terminator and run the POST diagnostics. Make sure that all red LEDs go out indicating that POST executed successfully.
14. Configure the DSSI subsystem following the procedures outlined in the next two chapters. Make sure that switch 1 on the KFQSA module is returned to the OFF position when the configuration procedure is completed.
15. Reassemble the enclosure by reversing steps 1 through 6.
16. Remove the external terminator and connect the DSSI cable from the R215F expansion cabinet to the connector.

5-12 Removal and Replacement Procedures

Figure 5-6 Removing the Card Cage Door



MA-8311-87A

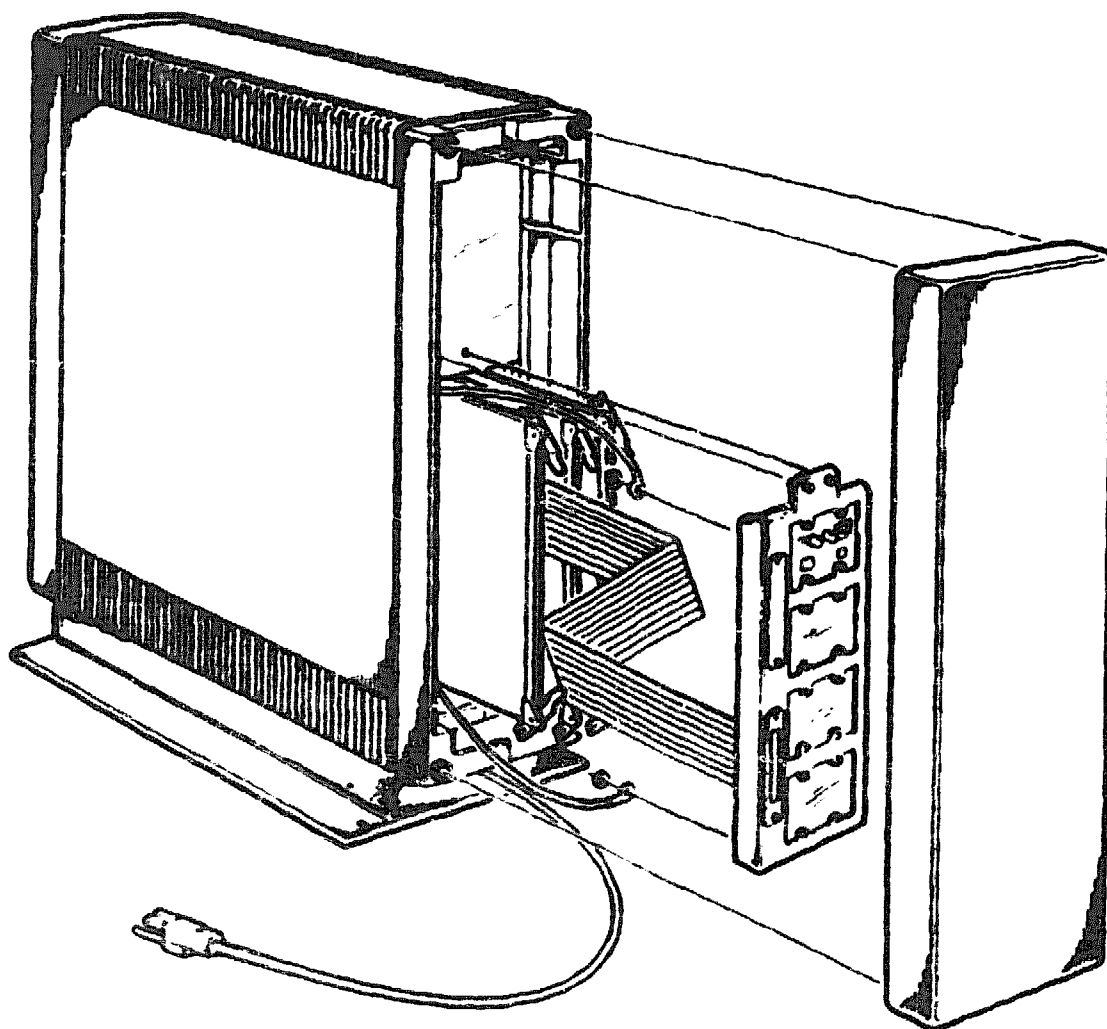
5.4 BA23 Installation Procedure

Refer to Figure 5-7 while performing the following procedure:

1. Remove the ac power cable from the wall outlet.
2. Remove the rear cover and all cables. Label all cables for reinstallation later.
3. Loosen the two screws retaining the rear I/O panel assembly. Swing the assembly open, and remove the ground strap screws.
4. Disconnect any cables attached to the back of the I/O panel assembly. Note their specific location and the orientation of the red strip on each cable.
5. Remove the DSSI cable from the KFQSA module, and slide it out of the card cage.
6. Check to ensure that the switches on the replacement KFQSA module are in the correct position (Section 1.4).
7. Slide the KFQSA module into the appropriate card cage slot and push the levers in to lock the module in place.
8. Connect the DSSI cable to the KFQSA module.
9. Install the mounting plate onto the I/O panel and attach the external DSSI connector to it.
10. Connect the external terminator and run the POST diagnostics. Make sure that all red LEDs go out indicating that the POST diagnostics executed successfully.
11. Replace the I/O panel.
12. Configure the DSSI subsystem following the procedures outlined in the next two chapters.
13. Remove the I/O panel and return switch 1 on the KFQSA module to the OFF position when the configuration procedure is completed.
14. Replace the I/O panel and rear cover of the BA23 enclosure.
15. Remove the external terminator and attach the DSSI cable from the R215F expansion cabinet to the connector.

5-14 Removal and Replacement Procedures

Figure 5-7 KFQSA Installation in a BA23 Enclosure



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5.5 Installing DSSI VAXcluster Configurations

A DSSI VAXcluster is a highly integrated organization of VAX computers. As members of a DSSI VAXcluster, computers can share processing resources, disks and queues under a single VMS security and management software and can boot and fail independently. DSSI VAXcluster configurations provide a high level of processing and data access.

5.5.1 Types of DSSI Bus Configurations

DSSI Single Host Configurations use a DSSI bus as the interconnect. Q-bus or MicroVAX systems interface to DSSI bus by means of a DSSI adapter (KFQSA). As many as 8 DSSI nodes may use the same interconnect. A DSSI node is any device to which DSSI transports information and for which DSSI therefore needs an address. In a DSSI Single Host Configuration the node number for the KFQSA is usually 7.

Two-System DSSI VAXcluster Configurations use two host systems to share RF-series ISEs. The maximum number of ISEs that can be accessed by the hosts is 6. The ISEs can be located within each host, within an expander enclosure, or both. A two-host system provides high disk availability for critical applications. In a two-system DSSI VAXcluster configuration the node numbers for the KFQSAs are 7 and 6.

Three-System DSSI VAXcluster Configurations allow the common DSSI bus to share all the resources among the three hosts. In a three host configuration, the middle node (KFQSA6) has all the on-board terminators removed from the board (Figure 1-7). The unterminated KFQSA adapter has both an IN and OUT bulkhead connectors which allows DSSI bus signals to travel through the adapter to the other hosts. Maximum number of ISEs to be accessed in this configuration is 5.

5.6 Rules When Installing DSSI VAXcluster Systems

There are some restrictions that apply to DSSI VAXcluster systems using the KFQSA module:

- Adapter modules connected to the same DSSI bus when running VMS Version 5.3-1 and before must be of the same type.
- The host systems must be in close proximity to each other due to DSSI bus cable length limitations (measured from end terminator to end terminator). Maximum distance in a three-system configuration is 82 feet in a computer room environment and 65 feet in an office environment.
- All enclosures in a DSSI VAXcluster configuration must be powered from the same ac feed. That is, they must either be powered from the same ac circuit, or if they are powered from different ac circuits then those circuits must not power any other equipment, must share a single ground point, and must have a dedicated ground wire between the outlet and the single point ground.
- Terminators must reside at the ends of the DSSI bus when configured for multiple hosts.
- All systems must be using VMS Version 5.1-1 or later.
- The maximum of 5 enclosures can be configured on a DSSI VAXcluster; for example, two VAX or MicroVAX systems and three expansion enclosures or three VAX systems and two expansion enclosures.
- Each ISE on a DSSI VAXcluster must appear with the same device name and address on all host nodes.
- A maximum of 3 Q-bus VAX or MicroVAX systems can be present on a DSSI VAXcluster. The middle KFQSA adapter board is unterminated.
- Each node on a single DSSI interconnect must have a unique DSSI ID number that allows the software to communicate with the storage devices. Numbers must be between 0 and 7. These numbers are permanently associated with the hardware. Node numbers may be repeated on different DSSI interconnects that are connected to the same host systems.

- The length of any single cable between the connectors on a DSSI VAXcluster bus is 25 feet.

NOTE

Due to limitations in the MicroVAX II boot ROMs, two MicroVAX II systems in a DSSI VAXcluster configuration cannot automatically boot from a common system disk ISE. If a common system disk is used, each node in the DSSI VAXcluster configuration must boot from a different root (SYS0, SYS1). The MicroVAX II can only boot automatically from SYS0. It is recommended that each MicroVAX II have its own locally connected system disk (such as an RD54 or RA82). When a common system disk ISE is a requirement, one MicroVAX II may automatically boot from SYS0, but the other must be booted manually from SYS1.

When a MicroVAX II is in a DSSI VAXcluster with a MicroVAX 3000 or higher series system, the MicroVAX II should boot from SYS0 and the MicroVAX 3000 or higher series system, the MicroVAX II should boot from SYS0 and the MicroVAX 3000 or higher series system should boot from an alternate root.

If you are installing more than one system into a DSSI VAXcluster configuration, install each system individually and test it to make sure it is in proper working order. When you complete the installation and testing of each system, then reconfigure each system using the procedures in either Chapter 7 (for MicroVAX 3000 or higher series systems using console commands) or Chapter 6 (for systems that must use MDM).

This includes:

- Determining correct CSR addresses for all modules in each system
- Reprogramming the KFQSA configuration table for the new configuration
- Reconfiguring any modules whose CSR addresses changed as a result of the new configuration
- Changing the allocation class of the ISEs so that they are all the same as both hosts

After reconfiguring, remove the terminators and connect the DSSI extension cables between the hosts or expansion cabinets.

5.7 Warm Swapping KFQSA Q-bus Modules

Warm swapping of KFQSA Q-bus modules only applies to the repair and replacement of failing KFQSA Q-bus modules within a multisystem DSSI VAXcluster environment. KFQSAs (M7769, revision K04 and later) are the only modules that support warm swapping procedures for BA200-series and BA400-series enclosures.

Due to a lack of provisions to maintain external DSSI bus continuity, coupled with nonremovable embedded DSSI terminators, KFQSA (M7769, revisions before K04) Q-bus modules *do not* support warm swapping maintenance techniques. The attempted warm swapping of any of the earlier revisions of the KFQSAs will leave the DSSI bus unterminated and susceptible to bus errors which could cause data corruption on ISEs.

WARNING

Warm Swapping of the KFQSA Q-bus Module requires additional information given in *Digital Storage Systems Interconnect Warm Swapping Guide for BA400-Series Enclosures and KFQSA Adapters* (EK-457AA-SG). This manual should be obtained before performing warm swapping procedures on any KFQSA Q-bus adapter modules.

6

Programming the Configuration Table Using Console Commands

The KFQSA configuration table may be programmed in two ways, either by the use of console commands or by using the MicroVAX Diagnostic Monitor (MDM). Using the console commands is the recommended choice if your system has this capability.

To find out if you can use console commands for programming the configuration table, reinitialize the system and read the microcode version that is displayed on the console. If the microcode version is 4.1 or greater, the console commands may be used for programming the KFQSA configuration table.

If your system does not have this capability, refer to Chapter 7 for the MDM procedure. If your system does have console commands, perform the procedure described in this chapter.

To find the console commands available, type **HELP** at the console prompt (**>>>**). To program the KFQSA configuration table, use these commands.

6.1 Determining CSR Addresses

Each module in a Q-bus system must use a set of unique Q-bus addresses and interrupt vectors. One of these addresses, generally the lowest of the set, is known as the Control and Status Register (CSR) address. The KFQSA module emulates an SSP controller¹ for each ISE connected, and presents a separate CSR address for each emulated controller. Therefore, you must program the KFQSA module with a correctly chosen CSR address for each ISE on the DSSI bus. Interrupt vectors for the KFQSA

¹ SSP controllers also include the RQDX3, KDA50, RRD50, RQC25, TQK50, and TQK70 controllers. All ports are identical and are operated by the same PUDRIVER.

6-2 Programming the Configuration Table Using Console Commands

and SSP controllers are programmed automatically by the operating system.

Unlike most other Q-bus controllers, KFQSA CSR addresses are not set with switches or jumpers. They are contained in the form of a configuration table in nonvolatile memory on the KFQSA module.

NOTE

To access the configuration table, you must first establish a boot path to the KFQSA module. To do this, set the KFQSA module switches to select one of the dedicated addresses shown in Table 1-2. You must also ensure the KFQSA is terminated either through on-board SLP terminators or through external DSSI terminators.

Before programming the configuration table, first determine what the CSR addresses are for all devices on the system. Calculating CSR addresses is a complex procedure because some devices are assigned *floating* addresses. Floating addresses vary, depending on which modules are installed on the system.

Type CONFIGURE at the console prompt (>>>).

The CONFIGURE console command is similar to the VMS SYSGEN CONFIGURE utility. It permits the user to enter Q-bus device names, and then generates a table of recommended Q-bus CSR addresses.

Upon entering the command, the system prompts you for a device and a number. Type HELP to find the valid responses. The following information is displayed:

```
>>>configure
Enter device configuration, HELP, or EXIT
Device, Number? help
Devices:
LPV11      KXJ11      DLV11J     DZQ11      DZV11      DFA01
RLV12      TSV05      RXV21      DRV11W     DRV11B     DPV11
DMV11      DELQA      DEQNA      RQDX3      KDA50      RRD50
RQC25      KFQSA-DISK TQK50      TQK70      TU81E      RV20
KFQSA-TAPE KMV11      IEQ11      DHQ11      DHV11      CXA16
CXB16      CXY08      VCB01      QVSS       LNV11      LNV21
QPSS       DSV11      ADV11C     AAV11C     AXV11C     KWV11C
ADV11D     AAV11D     VCB02      QDSS       DRV11J     DRQ3B
VSV21      IBQ01      IDV11A     IDV11B     IDV11C     IDV11D
IAV11A     IAV11B     MIRA       ADQ32      DTC04      DESNA
IGQ11
Numbers:
1 to 255, default is 1
Device, Number?
```

Enter the name and number of devices for each type of device in the system. After all devices are entered, type EXIT. For example, if your system has a TK70 tape drive, three RF30 ISEs, and a DEQNA module, respond as follows:

```
Device,Number? tk70
Device,Number? kfqsa-disk,3
Device,Number? deqna
Device,Number? exit
```

When you exit, the command responds with CSR address/vector assignments for all entered devices. For the previous example, the response is as follows:

```
Address/Vector Assignments
-774440/120 DEQN?
-772150/154 KFQSA-DISK
-760334/300 KFQSA-DISK
-760340/304 KFQSA-DISK
-774500/260 TK70
>>>
```

6.2 Programming the KFQSA Configuration Table

To program the CSR addresses assigned to the DSSI devices in the previous section, type the following command at the console prompt:

```
>>> set host/uqssp/maintenance/service n
```

NOTE

The */service n* parameter specifies the controller number of a KFQSA module in service mode, where *n* is a number from 0 to 3 (Table 1-2):

- 0 is for CSR address 774420
- 1 is for CSR address 774424
- 2 is for CSR address 774430
- 3 is for CSR address 774434

When you type this command, the current contents of the configuration table are displayed. For example, if the first address is selected and the configuration table is currently blank, the contents of the table are as follows:

6-4 Programming the Configuration Table Using Console Commands

```
>>> set host/uqssp/maintenance/service 0
UQSSP Controller (774420)
```

Enter SET, CLEAR, SHOW, HELP, EXIT, or QUIT

```
Node      CSR Address      Model
  7        ----- KFQSA -----
?
```

NOTE

If you can not access the configuration table, check for correct KFQSA termination.

Type HELP for a quick reference of the available commands. The following information is displayed:

```
? help
```

Commands:

SET <node> \KFQSA	set KFQSA DSSI node number
SET <node> <CSR_address><model>	enable a DSSI device
CLEAR <node>	disable a DSSI device
SHOW	show current configuration
HELP	print this text
EXIT	program the KFQSA
QUIT	don't program the KFQSA

Parameters:

<node>	0 to 7
<CSR_address>	760010 to 777774
<model>	21 (disk) or 22 (tape)

```
?
```

To add the three RF30 ISEs from the previous example, type the following:

```
? set 0 772150 21
? set 1 760334 21
? set 2 760340 21
?
```

NOTE

Make sure you enter the addresses in the same order that they were given when you used the CONFIGURE command.

Type SHOW to display the information you just entered. The following information is displayed:

? show

Node	CSR Address	Model
0	772150	21
1	760334	21
2	760340	21
7	----- KFQSA -----	

?

To delete an entry from the table, use the CLEAR command. For example, to delete the entry for node 2, type CLEAR 2 at the question mark (?) prompt.

Type EXIT when you finish programming to write the entries to the configuration table.

? exit

Programming the KFQSA ...

>>>

Power down the system, remove the KFQSA module, and set switch 1 to the OFF position, enabling the addresses programmed into the configuration table to be read. Then power the system back up.

To view devices on the Q-bus, type either SHOW QBUS or SHOW UQSSP at the console prompt.

The SHOW QBUS command displays all Q-bus I/O addresses that respond to a word aligned read. The console displays the address in VAX I/O space (in hex) and as it would appear in the Q-bus I/O space (in octal). The console also displays word data that was read (in hex) for each address.

The following is an example of the SHOW QBUS command:

>>> show qbus

Scan of Qbus I/O Space

```
-200000DC (760334) = 0000 (300) RQDX3/KDA50/RRD50/RQC25/KFQSA-DISK
-200000DE (760336) = 0AA0
-200000E0 (760340) = 0000 (304) RQDX3/KDA50/RRD50/RQC25/KFQSA-DISK
-200000E2 (760342) = 0AA0
-20001468 (772150) = 0000 (154) RQDX3/KDA50/RRD50/RQC25/KFQSA-DISK
-2000146A (772152) = 0AA0
-20001910 (774420) = 0000 (000) KFQSA
-20001912 (774422) = 0AA0
-20001920 (774440) = FF08 (120) DELQA/DEQNA
-20001922 (774442) = FF00
-20001940 (774500) = 0000 (260) TQK50/TQK70/TU81E/RV20/KFQSA-TAPE
-20001942 (774502) = 0BC0
```

Scan of Qbus Memory Space

>>>

6-6 Programming the Configuration Table Using Console Commands

The **SHOW UQSSP** command displays the status of all disk and tape devices on the Q-bus that support the SSP protocol. The controller number, CSR address, boot name, and type of device is displayed for each device.

The following is an example of the **SHOW UQSSP** command:

```
>>> show uqssp
UQSSP Disk Controller 0 (772150)
-DUA0 (RF30)

UQSSP Disk Controller 1 (760334)
-DUB1 (RF30)

UQSSP Disk Controller 2 (760340)
-DUC2 (RF30)

UQSSP Tape Controller 0 (774500)
-MUA0 (TK70)
>>>
```

6.3 Programming the KFQSA for DSSI VAXcluster Configuration

This section describes how to program the KFQSA module in the event you are setting up a DSSI VAXcluster systems. Due to cabling limitations, this will always involve two or more adapters and up to six ISEs.

This procedure has three objectives.

1. To configure both KFQSA modules so that they can access all of the ISEs connected to the DSSI bus
2. To give each KFQSA a unique DSSI node ID
3. To configure the KFQSAs and ISEs so that each ISE has a device name that is unique and universal throughout the cluster

NOTE

All systems should be powered up and displaying the console prompt (>>>). The DSSI cables between the host systems should not be connected at this time.

Figure 6-1 and Figure 6-2 are typical block diagrams of DSSI VAXcluster configurations. Using these examples, Perform the following procedure on system A.

Figure 6-1 KFQSA Modules in a DSSI VAXcluster Two-System Configuration

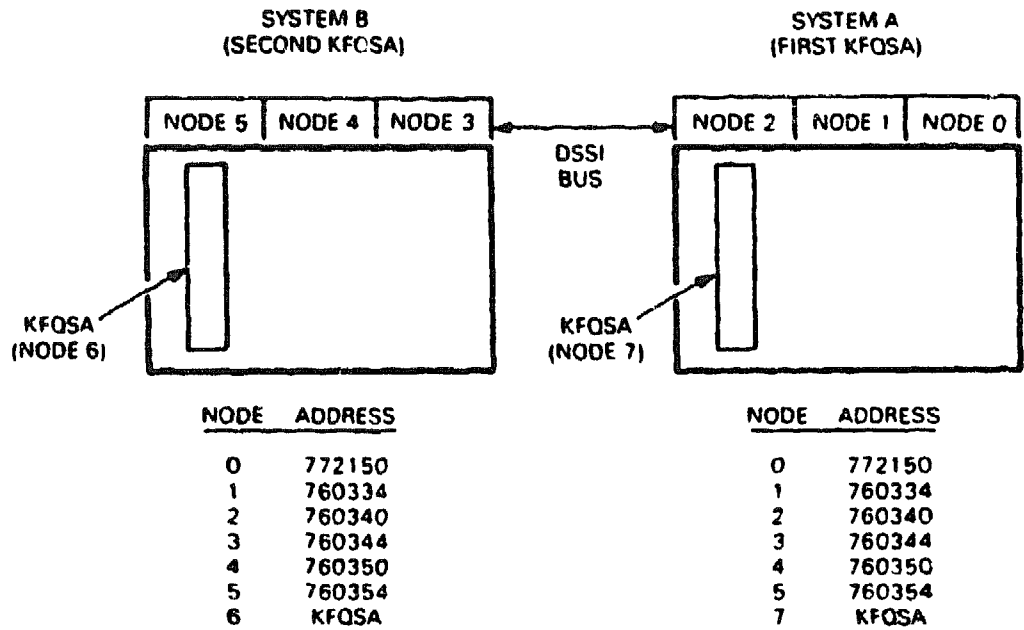
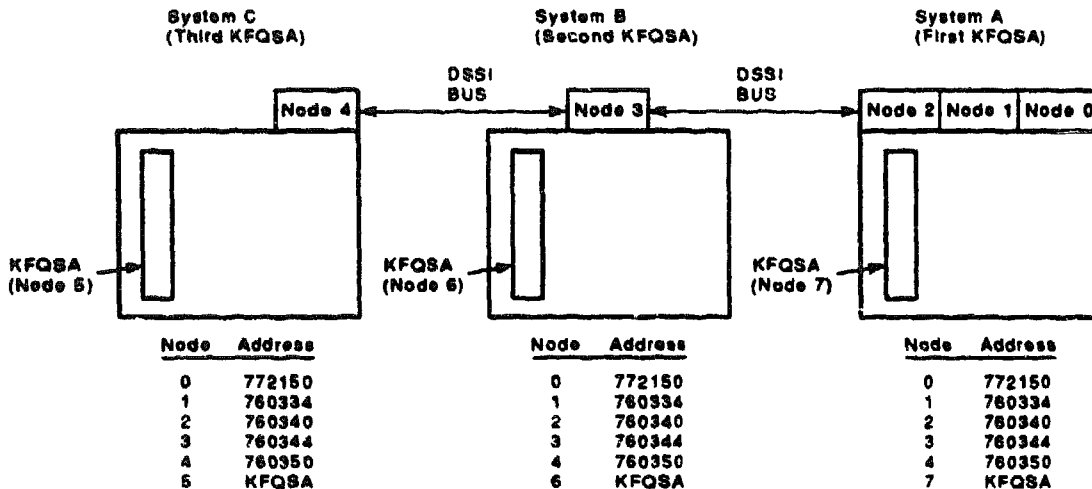


Figure 6-2 KFQSA Modules in a DSSI VAXcluster Three-System Configuration

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For purposes of this discussion, the host with the lower number ISEs (0, 1, 2) will be referred to as system A, and the host with the higher number ISEs (3, 4, 5) will be referred to as system B.

Perform the following procedure on system A.

1. Display the current addresses and devices as follows:

NOTE

Make hardcopy printouts of the displays, or write down the information obtained in this step. It will be needed later.

- a. Type **SHOW UQSSP** for a display of all SSP controllers currently on the system. This display lists the Q-bus address (octal) and port name of each SSP device on the system. An example of this display is shown in Section 6.2.
- b. Type **SHOW QBUS** for a display of the eight-digit VAX address (hex) for each device. An example of this display is shown in Section 6.2.

- c. Find the eight-digit VAX address (hex) that corresponds to the Q-bus address for each ISE in the system. Record this information, as it will be needed in a later step.

NOTE

In the examples given in Section 6.2 for the **SHOW UQSSP** and **SHOW QBUS** commands, the Q-bus address (772150) for ISE 0 has a corresponding VAX address (hex) of 20001468.

2. Run the Configure utility to determine the correct address for each device and module in the dual-host system by performing the following steps. The Configure utility is explained in more detail in Section 6.1.
 - a. At the console prompt, type **CONFIGURE**.
 - b. Then type **HELP** at the *Device, Number?* prompt for a list of devices that can be configured.

NOTE

Some devices listed in the **HELP** display are not supported by the KA655-AA CPU.

- c. For each device in the system, type the device name at the *Device, Number?* prompt. If there is more than one of the same device type, enter the device name, a comma, and the total number of devices of that type.

Be sure you list *all* devices in the first system and the ISEs in *both* systems.

- d. Type **EXIT**. The Configure utility displays address/vector assignments for all devices entered.
3. Compare the addresses displayed from running the Configure utility with those displayed from the **SHOW QBUS** display.

Adding the ISEs from the second system may bump the address of another Q-bus device. Make sure that all device addresses, other than those of the ISEs, have not changed. If the device address differs between the two displays, you must reconfigure your system.

4. Program the KFQSA configuration table in the first system by following the procedures outlined in Section 6.2. Make sure to include all ISEs connected to the DSSI bus in the configuration table. Assign a DSSI node ID of 7 to this KFQSA.
5. Repeat steps 1 through 4 for the second system.

6. Program the KFQSA in the second system by following the procedures outlined in Section 6.2. Make sure to include all ISEs in both systems in the configuration table. Assign a DSSI node ID of 6 to this KFQSA.
7. Power down both systems.
8. Remove the KFQSA modules and set switch 1 on both modules to the OFF position.
9. Connect the DSSI cable between the two systems.
10. Replace any necessary DSSI unit ID plugs in the Operator Control Panels of each system to make them match the DSSI node IDs assigned to the ISEs for the DSSI VAXcluster configuration.

NOTE

Make sure all DSSI ID sockets in both Operator Control Panels have plugs in them. Use blank plugs in any sockets that do not have corresponding ISEs connected.

11. Power up both systems.
12. For each system:
 - a. Type SHOW QBUS to verify that all addresses are present and correct.
 - b. Type SHOW UQSSP to verify that all ISEs are displayed correctly.

NOTE

Make sure that the ISEs have been assigned the same DSSI node IDs in both KFQSA configuration tables.

13. Boot one node and note the device names reported by VMS.
14. Shut down the node and boot the other one. Note the device names to ascertain that both systems see the same set of ISE device names.

CAUTION

Make sure that the device name of each ISE is identical on both nodes. Failure to do so can result in a partitioned cluster, and consequently data corruption.

6.4 Setting the ISE Allocation Class

This section describes how to change the ISE allocation class. In DSSI VAXcluster configurations, you must assign the same nonzero allocation class to both host systems and all connected ISEs. The ISEs ship with the allocation class set to zero.

Change the allocation class by using the following procedure.

1. Determine the correct allocation class according to the rules on clustering.

NOTE

In a DSSI VAXcluster configuration, the same allocation class must be assigned to both systems and to all connected ISEs. This allocation class must be different from that of other systems or of hierarchical storage controllers (HSC) in a cluster.

2. At the console prompt (>>>), type **SET HOST/DUP/UQSSP/DISK # PARAMS**.

Where # is the DSSI node ID of the ISE to which the allocation class is to be set.

3. At the **PARAMS>** prompt, type **SHOW ALLCLASS** to check the current allocation class.

The system responds with the following display.

Parameter	Current	Default	Type	Radix
ALLCLASS	1	0	Byte	Dec B

PARAMS>

4. Type **SET ALLCLASS #**, where # is the allocation class to which you want the ISE set.

EXAMPLE: SET ALLCLASS 2 sets the allocation class to 2.

5. Type **SHOW ALLCLASS** to check the new allocation class.

The system responds with the following display

Parameter	Current	Default	Type	Radix
ALLCLASS	2	0	Byte	Dec B

PARAMS>

6. Type **WRITE**. The system responds with:

Changes require controller initialization, ok? [Y/ (N)]

7. Type **Y** to save the new allocation class value.
8. Repeat steps 3 through 8 for each ISE on the DSSI bus.
9. Power cycle both systems and repeat step 3 to verify the new allocation class.

Programming the Configuration Table Using the MDM Utility

7.1 Determining CSR Addresses

Each module in a Q-bus system must use a set of unique Q-bus addresses and interrupt vectors. One of these addresses, generally the lowest of the set, is known as the Control and Status Register (CSR) address.

7.1.1 Overview

The KFQSA module emulates an SSP controller¹ for each ISE connected, and presents a separate CSR address for each emulated controller. Therefore, you must program the KFQSA module with a correctly chosen CSR address for each ISE on the DSSI bus. Interrupt vectors for the KFQSA and SSP controllers are programmed automatically by the operating system.

Unlike most other Q-bus controllers, KFQSA CSR addresses are not set with switches or jumpers. They are contained in the form of a configuration table in nonvolatile memory on the KFQSA module. The configuration table is programmed using an MDM program (Section 7.2).

NOTE

To access the configuration table, you must first establish a boot path to the KFQSA module. To do this, set the KFQSA module switches to select one of the dedicated addresses shown in

¹ SSP controllers also include the RQDX3, KDA50, RRD50, RQC25, TQK50, and TQK70 controllers. All ports are identical and are operated by the same PUDRIVER.

Table 1-2. If you cannot access the configuration table check for correct DSSI termination.

Before you program the configuration table, you must first determine what the CSR addresses are for all devices on the system. Calculating CSR addresses is a complex procedure because some devices are assigned *floating* addresses. Floating addresses vary, depending on which modules are installed on the system.

Use an MDM utility called IOADDRES to determine what the CSR addresses and interrupt vectors are for all devices on the system. This utility is supported in MDM Version 3.0, level 125 and higher. The next section describes how to use IOADDRES. It is written for users with a working knowledge of the MDM utility. Refer to the *MDM User's Guide* (PN AA-FM7A-DM) for more information about using the MDM utility.

7.1.2 Using the MDM Utility IOADDRES to Determine CSR Addresses

Follow the steps listed in this section to use the MDM utility IOADDRES to determine CSR addresses:

1. Boot MDM and enter the date and time.
2. Select the command line mode (option 2). The system issues a caution and instructs you to either enter 1 for the menu mode or 2 to proceed with the command line mode.
3. Enter 2 and press **RETURN**. The system displays the MDM>> prompt.
4. Type the command RUN IOADDRES. The system responds with the following message:

Configuring utility for IOADDRES

The display prompts you to enter a number for each class of devices that it supports. Table 7-1 lists the abbreviations for supported devices.

Table 7-1 Device Abbreviations Used with IOADDRESS

Device	Device Class	Device	Device Class
AAV11-DA	AAA	IDV11-A	IDA
AAV11-C	AAC	IDV11-B	IDB
ADQ32	AQA	IDV11-C	IDC
ADV11-C	ADC	IDV11-D	IDD
ADV11-DA	ADA	IEQ11	IEA
AXV11-C	AXA	KDA50	ZZZ
CXA16	DHA	KFQSA	ZZZ
CXF32	DHF	KMV1A	ZZY
DEQNA	XQA	KMV1B	ZZY
DESNA	CQA	KWV11-C	KWA
DFA01	ZZQ	KXJ11	KXA
DHF11	DHF	LNV11	LAA
DHV11	DHA	LNV21	LNA
DLV11	DLA	LPV11	LPA
DMV11	DMA	MIRA	MIA
DPV11	DPA	QCA	QCA
DRQ3B	QBA	RC25	ZZZ
DRQ11-C	DQA	RQDXn	ZZZ
DRV11-J	DRB	RRD50	ZZZ
DRV11-W (DR11W mode)	ZZW	TQK50	ZZT
DRV11-W (DR11B mode)	ZZB	TSV05	TSA
DSV11	DSA	VCB01	VCA
DTC04	DTA	VCB02	VCB
DZQ11	ZZQ	VSV21	VVA
DZV11	ZZQ	Token Bus Adapter	ZQA
IAV11-A	IAA		
IAV11-B	IAB		
IBQ01	IBA		

5. At each query, enter the number of devices in the class shown that are installed in the system. If there are no devices of that class in the system, press **RETURN** in response to that query. The default value of zero is entered.

After you respond to all queries, the system displays a summary of the class and number of devices in each class you selected. It then displays a table containing the following information:

- The device class and number of devices selected for that class
 - The CSR address and interrupt vector
 - The first available floating CSR address and vector
6. Print out the information provided for all DSSI devices (or make a note of it) for programming the configuration table.

7. Type EXIT and press RETURN.

Once the CSR values are determined for all modules in the system, the addresses for the DSSI devices must be programmed into the KFQSA Configuration Table using the procedure detailed in the next section. If any other modules in the system require reconfiguration, refer to the installation manual for each module or to your system maintenance documentation for configuration instructions.

7.2 Programming the KFQSA Configuration Table

NOTE

This procedure should only be performed when the board is initially installed or when a new storage element is added to the bus.

7.2.1 Programming a Blank or Unknown Configuration Table

Follow this procedure when the KFQSA module is initially installed or if there is no access to a previously programmed configuration table.

1. Make sure that switch 1 is in the ON position (Section 1.4.1).
2. Load MDM.

For example: >>>B DUA1.

The system displays the following:

MicroVAX Diagnostic Monitor initializing.....Please wait

MicroVAX Diagnostic Monitor - Version 3.0

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Use Authorized Only Pursuant to a Valid Right-to-use License

Copyright (c) 1986, 1988
Digital Equipment Corporation

The current date and time is: 12-JAN-1988 13:30

Press the RETURN key to continue,
or enter the new date and time; then press the RETURN key.

[DD-MMM-YYYY HH:MM]:

The current date and time is: 12-JAN-1989 13:30

3. Enter the correct date and time, then press **RETURN**.

The following is displayed on the screen:

Do you want to use menu mode or command line mode?

- 1 - menu mode
- 2 - command line mode

Type the number; then press the RETURN key.

7-6 Programming the Configuration Table Using the MDM Utility

4. Select Command Line Mode.
5. At the prompt, type the following command:

```
MDM>>SHO BUS
```

This shows you information about devices that can be tested. For example:

Autoconfigure set ON

Filename	CSR	VECTOR	BR_LEVEL	STATUS
NAKAA	160000	000	0	CONNECTED
NAMSA	160002	000	0	CONNECTED
.				
.				
.				
NAKFA	160334	300	4	CONNECTED

The bus display defaults are *Autoconfigure set ON* and *STATUS CONNECTED*. These defaults mean that the diagnostics are loaded automatically when the system is configured.

6. At the prompt, type the following command:

```
MDM>>SET AUTOCONFIGURATION OFF
```

This reverses the status of diagnostics to **IGNORED**. This means that the diagnostics are not loaded at configuration.

7. At the prompt, type the following command:

```
MDM>> connect 160334 file_name NAKFA vector 300 br_level 4
```

8. At the prompt, type the following command:

```
>>SHOW BUS
```

The system displays the new configuration and status. For example:

Autoconfigure set OFF

FILENAME	CSR	VECTOR	BR_LEVEL	STATUS
NAKAA	160000	000	0	IGNORED
NAMSA	160002	000	0	IGNORED
.				
.				
.				
NAKFA	160334	300	4	CONNECTED

9. At the prompt, type the following command:

MDM>>RESTART

The system displays the following:

Loaded diagnostic program for KFQSAA

Configuring diagnostic for KFQSAA

The system is ready for testing.

Press the RETURN key to continue. >

10. Press **RETURN** to enter menu mode.
11. Select option 4 — Display the service menu.
12. Select option 3 — Display the device menu.
13. Select the KFQSAA — KFQSA subsystem (the option number depends upon your system configuration).
14. Select option 4 — Display the device utilities menu.
15. Select option 1 — KFQSA configuration utility.

7-8 Programming the Configuration Table Using the MDM Utility

The system displays the following KFQSA configuration table:

KFQSA DSSI Node ID			
Entry #0	0		
	CSR Address	DSSI Node ID	Model Number
Entry #1	000000	0	0
Entry #2	000000	0	0
Entry #3	000000	0	0
Entry #4	000000	0	0
Entry #5	000000	0	0
Entry #6	000000	0	0
Entry #7	000000	0	0

Change KFQSA Configuration Table?

Valid response - [(yes) or no] :

NOTE

The configuration table may have been previously programmed for manufacturing testing or other purposes. In this case, it contains information other than zeros for one or more entries. If this occurs, clear any unused entries to zero while performing this procedure. Follow the procedure outlined in Section 7.2.3.

16. Type YES and press **RETURN**.

The system responds as follows:

Enter the number of the entry to change (0-7):

17. Type 0 and press **RETURN** to change the KFQSA DSSI Node ID.

The system responds by displaying the entry #0 portion of the table.

	KFQSA DSSI Node ID
Entry #0	0

Change the KFQSA DSSI Node ID?
Valid response - [(yes) or no] :

18. Type YES and press **RETURN**.

The system responds with the following prompt:

Enter a decimal value (0-7) for the KFQSA DSSI Node ID:

19. The KFQSA module is normally set at DSSI Node ID 7. Type 7 and press **RETURN**.

The system displays the configuration table again with the newly entered information in it. It then displays the following prompt:

Change another entry?
Valid response - [(yes) or no] :

20. Type YES and press **RETURN**.

The system displays the following:

Enter the number of the entry to change (0-7):

21. Select an entry number for one of the storage devices on your system's DSSI bus. For example, to select entry #1, type 1 and press **RETURN**.

The system displays the following:

	CSR Address	DSSI Node ID	Model Number
Entry #1	000000	0	0

Change CSR address or clear this entry ?
Valid response - [(yes) or no] :

22. Type YES and press **RETURN**.

The system displays the following:

Valid CSR addresses: Floating space: 760100 - 763776
Disk fixed address: 772150
Tape fixed address: 774500
Enter a 0 to clear this entry or a 18 bit octal number:

23. Type the address assigned to this device by the IOADDRESS utility and press **RETURN**.

7-10 Programming the Configuration Table Using the MDM Utility

The system responds with the following prompt:

Change DSSI Node ID ?
Valid response - [(yes) or no] :

24. Type YES and press **RETURN**.

The system responds with the following prompt:

Enter a decimal number (0-7) for the DSSI Node ID:

25. Type in the DSSI Node ID number you want to assign to that particular device and press **RETURN**. Each entry must have a unique DSSI Node ID assigned to it.

NOTE

Entries that have all zeros are ignored by the system. Therefore, it is acceptable to assign the DSSI Node ID of 0 to an entry with a valid CSR address, as long as it is only assigned to one device on the DSSI bus.

The system automatically adds the model number and displays the configuration table again: with the updated information in it. It then displays the following prompt:

Change another entry?
Valid response - [(yes) or no] :

26. Repeat steps 20 through 25 until all devices on the DSSI bus have been assigned a CSR address, DSSI node ID, and model number. Any unused entries that have values assigned to them should be cleared to zero using the procedure outlined in Section 7.2.3.
27. After you have entered all information into the configuration table, type NO and press **RETURN** when you see the following prompt:

Change another entry ?
Valid response - [(yes) or no] :

The system displays one of the following messages:

This KFQSA is in CONFIGURE ONLY mode. Power down and place the board in NORMAL mode via KFQSA switches.

OR

The manufacturing jumper is in.

28. Press **RETURN**. The system responds with the following prompt:

KFQSA passed.

Press the RETURN key to return to the previous menu.

29. Press **RETURN**. This puts you at the Utility Programs and Tests menu.
30. To exit the MDM utility, press **BREAK**.
31. Power down the system and remove the KFQSA module from its backplane slot.
32. Put switch 1 in the OFF position.
- If the message in step 27 indicates that the manufacturing jumper is in, remove it before replacing the board (Section 1.4.5).
33. Replace the KFQSA board in its backplane slot.
34. Power up the system.
35. Reboot the MDM utility and repeat steps 1 through 15. Read the CSR table to ensure that everything you entered is correct.
36. If everything is as it should be, type NO and press **RETURN** at the following prompt:
- Change KFQSA Configuration Table?
Valid response - [(yes) or no] :
- If further modifications are required, repeat steps 16 through 26 as needed to make the desired modifications.
37. Repeat steps 27 through 31.

7.2.2 Adding a Device to the Configuration Table

1. Leave switch 1 on the KFQSA module in the OFF position.
2. Perform steps 2 through 16 listed in Section 7.2.1. In this case, the configuration table already contains information that was previously entered. For example, if a KFQSA module with two ISEs is already on the system, and you are adding another ISE, the configuration table is displayed as follows with information already in entries 0, 1, and 2:

KFQSA DSSI Node ID			
Entry #0	7		
	CSR Address	DSSI Node ID	Model Number
Entry #1	772150	0	21
Entry #2	760334	1	21
Entry #3	000000	0	0
Entry #4	000000	0	0
Entry #5	000000	0	0
Entry #6	000000	0	0
Ent: #7	000000	0	0

Change KFQSA Configuration Table ?

Valid Response - [(yes) or no] :

3. Type YES and press **RETURN**. The system displays the following:

Enter the number of the entry to change (0-7):

4. Select the next available entry. For example, to select entry #3, type 3 and press **RETURN**. The system displays the following:

	CSR Address	DSSI Node ID	Model Number
Entry #3	000000	0	0

Change CSR address or clear this entry ?

Valid response - [(yes) or no] :

5. Type YES and press **RETURN**.

The system displays the following:

Valid CSR addresses: Floating space: 760100 - 763776

Disk fixed address: 772150

Tape fixed address: 774500

Enter a 0 to clear this entry or a 18 bit octal number:

6. Type the address assigned to this device by the IOADDRES utility and press **RETURN**. For this example, the CSR address is 760340.

The system responds with the following prompt:

Change DSSI Node ID ?

Valid response - [(yes) or no] :

7. Type YES and press **RETURN**.

The system responds with the following prompt:

Enter a decimal number (0-7) for the DSSI Node ID:

8. Type in the DSSI Node ID number you want to assign to that particular device and press **RETURN**. Each entry must have a unique DSSI Node ID assigned to it. For this example, assign DSSI Node ID 2.

The system automatically enters the model number and displays the configuration table again with the updated information in it, as follows:

7-14 Programming the Configuration Table Using the MDM Utility

KFQSA DSSI Node ID			
Entry #0	7		
	CSR Address	DSSI Node ID	Model Number
Entry #1	772150	0	21
Entry #2	760334	1	21
Entry #3	760340	2	21
Entry #4	000000	0	0
Entry #5	000000	0	0
Entry #6	000000	0	0
Entry #7	000000	0	0

Change another entry ?

Valid response - [(yes) or no] :

9. If you are adding more devices, repeat steps 3 through 8 for each device you are adding. Make sure to clear any unused entries by following the procedure outlined in Section 7.2.3.

After you fill in the table for each device on the DSSI bus, type NO and press **RETURN**.

The system responds with the following:

KFQSAA passed.

Press the RETURN key to return to the previous menu.

10. Press **RETURN**. This puts you at the Utility Programs and Tests menu.
11. Exit the MDM utility and press **BREAK**.
12. Power down the system, then power up the system again so the changes you make are written to the configuration table.

7.2.3 Removing a Device from the Configuration Table

NOTE

Removing a device from the KFQSA configuration table may change the CSR address of other devices in the Q-bus floating address space.

When taking a DSSI device off the bus, clear the information in the configuration table for that device. For example, remove the ISE added in Section 7.2.2.

1. Leave switch 1 on the KFQSA module in the OFF position.
2. Perform steps 2 through 16 in Section 7.2.1.

The system displays the following:

KFQSA DSSI Node ID			
Entry #0	7		
	CSR Address	DSSI Node ID	Model Number
Entry #1	772150	0	21
Entry #2	760334	1	21
Entry #3	760340	2	21
Entry #4	000000	0	0
Entry #5	000000	0	0
Entry #6	000000	0	0
Entry #7	000000	0	0

Change KFQSA Configuration Table ?

Valid response - [(yes) or no] :

3. Type YES and press **RETURN**.

The system displays the following prompt:

Enter the number of the entry to change (0-7) :

7-16 Programming the Configuration Table Using the MDM Utility

4. Select the entry number for the device you are removing. For example, to select entry #3, type 3 and press **RETURN**. The system displays the following:

	CSR Address	DSSI Node ID	Model Number
Entry #3	760340	2	21

Change CSR address or clear this entry ?

Valid response - [(yes) or no] :

5. Type YES and press **RETURN**.

The system displays the following:

Valid CSR addresses: Floating space 760100 - 763776

Disk fixed address: 772150

Tape fixed address: 774500

Enter a 0 to clear this entry or a 18 bit octal number:

6. Type 0 and press **RETURN**.

The system responds with the following message:

The DSSI Node ID and Model Number are automatically zeroed.
Press (RETURN) to continue

When you press **RETURN**, the configuration table is displayed again, with the CSR address, DSSI Node ID, and model number reset to zeros for the selected entry #, as follows:

KFQSA DSSI Node ID			
Entry #0	7		
	CSR Address	DSSI Node ID	Model Number
Entry #1	772150	0	21
Entry #2	760334	1	21
Entry #3	000000	0	0
Entry #4	000000	0	0
Entry #5	000000	0	0
Entry #6	000000	0	0
Entry #7	000000	0	0

Change another entry ?

Valid Response - [(yes) or no] :

- Repeat the procedure for each device you wish to delete from the table. When you finish editing the table, type NO and press **RETURN**.

The system displays the following:

KFQSAA passed.

Press the RETURN key to return to the previous menu.

- Press **RETURN**. This puts you at the Utility Programs and Tests menu.
- Exit the MDM utility and press **BREAK**.
- Power down the system, then power up the system again so the changes you make are written to the configuration table.

7.3 Programming the KFQSA for DSSI VAXcluster Configuration

This section describes how to program the KFQSA module in each system of a DSSI VAXcluster configuration.

NOTE

The DSSI cable should be connected between the two systems, and power to both systems should be turned on.

Perform the following procedure on one host system.

1. Determine the correct CSR address for each device and module in the system by performing the steps outlined in Section 7.1.2. Make sure to include all devices residing in the system, and all ISEs connected to the DSSI bus.
2. Program the KFQSA configuration table to add the CSR addresses, DSSI node ID, and model number for the ISEs, as detailed in Section 7.2.

NOTE

Make sure all DSSI node IDs programmed into the configuration table are sequential, and in increasing order. Do not skip any numbers.

3. Reprogram any modules whose CSR addresses were bumped as a result of including the ISEs.
4. Assign a DSSI node ID of 7 to the KFQSA in this system.
5. Repeat the procedure in steps 1 through 3 for the other system. Assign a DSSI node ID of 6 to the KFQSA in this system.

NOTE

Make sure that the ISEs have been assigned the same DSSI node IDs in both KFQSA configuration tables.

CAUTION

Make sure that the device name of each ISE is identical on both nodes. Failure to do so can result in a partitioned cluster and consequently data corruption.

6. Replace any necessary DSSI unit ID plugs in the Operator Control Panel for each ISE to make them match the DSSI node IDs assigned to the ISEs for the DSSI VAXcluster configuration.

7. Boot one node and note the device names reported by VMS.
8. Shut down the node and boot the other one. Note the device names to ascertain that both systems see the same set of device names.

7.4 Setting the ISE Allocation Class

This section describes how to change the ISE allocation class. In a DSSI VAXcluster configuration you must assign the same nonzero allocation class to both host systems and to all ISEs on the DSSI bus.

NOTE

DSSI ISEs are shipped with the allocation class set to zero.

Change the allocation class by using the following procedure. This procedure only needs to be performed from one of the host systems.

1. Determine the correct allocation class for the ISEs according to the rules on clustering.

NOTE

In a DSSI VAXcluster configuration, the same allocation class must be assigned to both systems and to all connected ISEs. This allocation class must be different from that of other systems or of hierarchical storage controllers (HSC) in a cluster.

2. Set switch 1 on the KFQSA to OFF.
3. Enter MDM and select the menu mode. The screen displays:

MAIN MENU

- 1 - Test the system
- 2 - Display System Configuration and Devices
- 3 - Display the System Utilities Menu
- 4 - Display the Service Menu
- 5 - Display the Connect/Ignore Menu
- 6 - Select single device tests

Type the number; then press the RETURN key.

4. Select the Service Menu. The screen displays:

Service Menu

CAUTION: This menu is intended for use by qualified service personnel only. Misuse of the commands could destroy data.

- 1 - Set test and message parameters
- 2 - Exercise system continuously
- 3 - Display the device menu
- 4 - Enter command line mode

Type the number; then press the RETURN key,
or type 0 and press the RETURN key to return to the Main Menu.

5. Select the device menu. In this example, there are other device diagnostics loaded. The screen displays:

```
MAIN
SERVICE
DEVICE
```

This menu lets you select a device for testing.

- 1 CPUA - MicroVAX/rtVAX CPU
- 2 MEMA - MicroVAX memory system
- 3 RQDXA - Winchester diskette controller
- 4 TKXXA - TK50/TK70 controller
- 5 KFQSA - KFQSA subsystem

6. Select the device-specific (KFQSA subsystem) menu. The screen displays:

```
DEVICE MENU
KFQSA - KFQSA subsystem menu
```

Testing is Enabled

- 1 - Enable/Disable testing for device
- 2 - Perform all functional tests
- 3 - Perform the exerciser test
- 4 - Display the device utilities menu

7. Select the device utilities menu.

The KFQSA DEVICE UTILITY MENU displays utilities and special subsystem tests:

```
MAIN MENU
SERVICE MENU
DEVICE MENU
KFQSA - KFQSA SUBSYSTEM MENU
UTILITY PROGRAM AND TESTS MENU
```

Utility selections are:

- 1 - KFQSA Configuration Utility
- 2 - DSSI Device Data Erase Utility
- 3 - Select Device Resident Programs
- 4 - KFQSA Information Gathering Service
- 5 - Customize Diagnostic Functionality Utility

8. Select the Device Resident Programs menu. The system displays:

RUNNING A UTILITY SERVICE TEST

To halt the test at any time and return to the previous menu, type CTRL-C by holding down the CTRL key and pressing the C key.

KFQSAB started.

KFQSAB pass 1 test number 3 started.

Copyright 1988 Digital Equipment Corporation

Completed.

EXIT	DRVEXR	DRVTST
HISTORY	ERASE	PARAMS
DIRECT		

Please choose a local program or press <RETURN> to continue.

NOTE

The Select Device Resident Programs Utility works only when switch 1 on the KFQSA module is set to OFF.

9. Type **PARAMS** and press **RETURN**.
10. At the **PARAMS>** prompt, type **SHOW ALLCLASS** to check the current allocation class.

The system responds with the following display.

Parameter	Current	Default	Type	Radix
-----	-----	-----	-----	-----
ALLCLASS	1	0	Byte	Dec B

PARAMS>

11. Type **SET ALLCLASS #**, where # is the allocation class you want to set the ISE to.

Example: **SET ALLCLASS 2** sets the allocation class to 2.

12. Type **SHOW ALLCLASS** to check the new allocation class.

The system responds with the following display.

Parameter	Current	Default	Type	Radix
-----	-----	-----	-----	-----
ALLCLASS	2	0	Byte	Dec B

PARAMS>

13. Type **WRITE**. The system responds with:

Changes require controller initialization, ok? [Y/ (N)]

14. Type **Y** to save the new allocation class value.

15. Repeat the preceding procedure for each ISE on the DSSI bus.

16. Power cycle both systems and repeat step 10 to check the new allocation class.

A

Generic KFQSA Error Log Format

The format of a generic KFQSA error log message is as follows:

15	0	Byte Offset
LSW		0
command reference number		
MSW		2
unit number		4
sequence number		6
flags	format	8
event code		10
LSW		12
controller identifier		14
		16
		18
MSW		
HW vrsn	SW vrsn	20
SA Error Code		22
Controller Format Code		24

NOTE

The generic KFQSA error packet is always preceded by a port fail packet. They also share the same sequence number.

Table A-1 lists the definitions for the KFQSA generic error log.

Table A-1 KFQSA Generic Error Log Definitions

Byte Field	Data	Definition
0-3	Always 0	Command Reference Number: the CRN is 0 if the error message is not related to an MSCP command, or if the operating system does not use this feature.
4	0-7	Number of attached DSSI devices relative to DSSI node ID.
6	>0	Sequence number, firmware controlled.
7	1	MSCP Flag: "sequence number reset.
8	0	Format: indicates controller error format.
"	1	"; indicates host memory access error format.
10	0A (hex)	"; controller command timeout.
"	6A (hex)	"; inconsistent data structure.
"	69 (hex)	"; non-existent memory.
"	89 (hex)	"; memory parity error.
12-18	>0	Controller identifier, MSCP controller ID.
20	>0	Adapter firmware revision number.
21	>0	Adapter hardware version number.
22		SA Error Code: firmware detected. See Table A-2.
22		SA Error Code: POST detected. See Table A-3.
24	1-12	Controller format code. See Table A-4.

Table A-2 KFQSA Specific Operational Firmware SA Errors

Error Code	Definition
8340	DSSI port protocol error
8341	DSSI port frame retransmission failure
8342	DSSI port detected remote node failure
8343	DSSI port detected virtual circuit reset
8344	KFQSA fatal bugcheck
8345	SCS connection error
8346	SCS protocol error
8347	Maximum device connections per path exceeded
8348	Host DMA write failure
8349	Host DMA read failure
834A	DMA compare error
834B	No VC during 4-step Init

Table A-3 KFQSA Specific POST SA Error Codes

Error Code	Definition
8320	CSRD chip test error
8321	QMI chip test error
8322	Fatal configuration table error
8323	8096 EPROM test error
8324	8096 DPRAM test error (low byte)
8325	8096 DPRAM test error (high byte)
8326	68000 CPU test error
8327	68000 10 usec BERR timer test error
8328	68000 EPROM test error
8329	68000 local RAM test error (low byte)
832A	68000 local RAM test error (high byte)
832B	68000 interrupt vector register test error
832C	8254 timer test error
832D	FIFO chip test error
832E	Buffer RAM parity test error
832F	Buffer RAM test error (1st 64K, bits 0...3)
8330	Buffer RAM test error (1st 64K, bits 4...7)
8331	Buffer RAM test error (1st 64K, bits 8...11)
8332	Buffer RAM test error (1st 64K, bits 12...15)
8333	Buffer RAM test error (2nd 64K, bits 0...3)
8334	Buffer RAM test error (2nd 64K, bits 4...7)
8335	Buffer RAM test error (2nd 64K, bits 8...11)
8336	Buffer RAM test error (2nd 64K, bits 12...15)
8337	SII chip test error
8338	68000 DPRAM test error (low byte)
8339	68000 DPRAM test error (high byte)
833A	Microprocessor interrupt test error
833B	68000 bus error
833C	Unexpected interrupt (68K side)
833D	8096 set up complete error
833E	Parity error during BRAM test
833F	Unexpected 8096 interrupt

Table A-4 KFQSA Error Log Format Codes

Format Code	Error Log Packet Types
1	8096 bugcheck packet
2	8096 DMA error packet
3	DSSI port detected remote node failure DSSI port detected virtual circuit failure
4	DSSI port invalid frame opcode DSSI port invalid frame length received DSSI port credit violation
5	DSSI port frame retransmission error
6	DSSI port sequence number violation
7	Not used
8	SCS connection error
9	SCS protocol violation
10	68000 bug check packet
11	Maximum device connections exceeded
12	Invalid maintenance region

B

KFQSA 8096 Error Log Packets

There are two KFQSA 8096 error log formats:

- 8096 DMA error log (Format 1)
- 8096 bugcheck error log (Format 2)

The 8096 error log packets are last fail packets. This means the data in these packets is from 8096 detected fatal errors.

B-2 KFQSA 8096 Error Log Packets

B.1 8096 DMA Error Log Format

15	0	Byte Offset
LSW		0
command reference number		2
MSW		4
unit number		6
sequence number		8
flags	format	10
event code		12
LSW		14
controller identifier		16
MSW		18
HW vran	SW vran	20
SA Error Code		22
Controller Format Code		24
DSSI Node		26
Reason Code		28
LSW		30
Host Address		32
MSW		34
LSW		36
Buffer Address		38
MSW		40
Requested Byte Count		42
Undelivered Byte Count		44
CSRD Register 0		46
CSRD Register 1		48
CSRD Register 2		50
CSRD Register 3		
CAM Status Register		

Table B-1 lists the definitions for the KFQSA DMA error log. Fields 0 through 22 are the same as the KFQSA generic error log fields previously described.

Table B-1 KFQSA DMA Error Log Definitions

Field	Data	Definition
26	0-7	DSSI node ID
28		Reason code (see below)
	B020	Ring error in DMA communications write operation
	B021	Ring error in DMA communications read operation
	B022	Ring error in DMA communications compare operation
	B023	Ring error in DMA command queue write operation
	B024	Ring error in DMA command queue read operation
	B025	Ring error in DMA command port read operation
	B026	Ring error in DMA response queue write operation
	B027	Ring error in DMA response queue read operation
	B028	Ring error in DMA response port read operation
	B029	Ring error in DMA response port write operation
	B040	Message error in DMA command packet read operation
	B041	Message error in DMA command packet write operation
	B060	Data error in DMA data read operation
	B061	Data error in DMA data write operation

NOTE

The CSRD Ring Register fields in the error log packet are valid only in a Ring DMA packet error.

B-4 KFQSA 8096 Error Log Packets

B.2 3096 Bugcheck Error Log Format

15	0	Byte Offset		Byte Offset
LSW		0	Index	52
command reference number		2	PDacHi	54
MSW		4	PDacLo	56
unit number		6	DecHi	58
sequence number		8	DecLo	60
flags	format	10	DReg	62
event code		12	LRegHi	64
LSW		14	LRegLo	66
controller identifier		16	ISRRReg0	68
MSW		18	ISRRReg1	70
HW vran	SW vran	20	Path	72
SA Error Code		22	ActivePath	74
Controller Format Code		24	DT7W_SemaPath	76
DSSI Node		26	DT7W_SemaCmd	78
(Bugcheck) Reason Code		28	DT7W_SemaTimer	80
PC		30	Stack length in longword	82
SP		32	Stack	84
PSW		34	.	.
REG.		36	.	.
REG1		38	.	.
REG2		40	.	.
REG3		42	.	.
REG4		44	.	.
REG5		46	.	.
REG6		48	.	.
REG7		50	.	.
			.	178

DSSI Node: 0-7

Reason Code: See Table B-2 for reason code values.

NOTE

If the response buffer is not large enough to hold all the listed data, the packet is truncated.

Table B-2 8096 Error Log Reason Codes

DMA Ring Error	
B020	DMA communications area write error
B021	DMA communications area read error
B022	DMA communications area compare error
B023	DMA command queue write error
B024	DMA command queue read error
B025	DMA command port read error
B026	DMA response queue write error
B027	DMA response queue read error
B028	DMA response port read error
B029	DMA response port write error
DMA Message Error	
B040	DMA command packet read error
B041	DMA response packet write error
DMA Data Error	
B060	DMA data read error
B061	DMA data write error

C

68000 Error Logs

C.1 68000 Error Log Format 3, DMA Read/Write, PPD Port Restart/VC Restart

15	0	Byte Offset
LSW		0
command reference number		2
MSW		4
unit number		6
sequence number		8
flags	format	10
event code		12
LSW		14
controller identifier		16
MSW		18
HW vrsn	SW vrsn	20
SA Error Code		22
Controller Format Code		24

C.2 68000 Error Log Format 4, Credit Error

15	0	Byte Offset
LSW		0
command reference number		2
MSW		4
unit number		6
sequence number		8
flags	format	10
event code		12
LSW		14
controller identifier		16
MSW		18
HW vrsn	SW vrsn	20
SA Error Code		22
Controller Format Code		24
SA Error Sub Code		26

SA Error Sub Code: See Table C-1, 68000 SA Error Sub Codes.

C.3 68000 Error Log Format 5, Max. Retries Exceeded

15	0	Byte Offset
LSW		0
command reference number		2
MSW		4
unit number		6
sequence number		8
flags	format	10
event code		12
LSW		14
controller identifier		16
MSW		18
HW vrsn	SW vrsn	20
SA Error Code		22
Controller Format Code		24
Transmission Error		26

C.4 68000 Error Log Format 6, Port Error: Sequence # Mismatch

15	0	Byte Offset
LSW		0
command reference number		2
MSW		4
unit number		6
sequence number		8
flags	format	10
event code		12
LSW		14
controller identifier		16
MSW		18
HW vrsn	SW vrsn	20
SA Error Code		22
Controller Format Code		24
SA Error Sub Code		26
Rcvd Seq #	Expected Seq #	28

SA Error Sub Code: See Table C-1, 68000 SA Error Sub Codes.

C.5 68000 Error Log Format 7, SCS Level Error

15	0	Byte Offset
LSW		0
command reference number		2
MSW		4
unit number		6
sequence number		8
flags	format	10
event code		12
LSW		14
controller identifier		16
MSW		18
HW vrsn	SW vrsn	20
SA Error Code		22
Controller Format Code		24
SA Error Sub Code		26
Path	Conn Id	28

SA Error Sub Code: See Table C-1, 68000 SA Error Sub Codes.

Path: The DSSI Bus ID of the device to which the module was attempting to connect.

Conn ID: The SSP Connection ID of the failed connection. See Table C-2.

C.6 68000 Error Log Format 8, SCS Connect Error

15	0	Byte Offset
LSW		0
command reference number		2
MSW		4
unit number		6
sequence number		8
flags	format	10
event code		12
LSW		14
controller identifier		16
MSW		18
HW vrsn	SW vrsn	20
SA Error Code		22
Controller Format Code		24
SA Error Sub Code		26
Path	Conn Id	28
Reason		30

SA Error Sub Code: See Table C-1, 68000 SA Error Sub Codes.

Path: The DSSI Bus ID of the device to which the module was attempting to connect.

Conn ID: The SSP Connection ID of the failed connection. See Table C-2.

C.7 68000 Error Log Format 9, SCS Protocol Error

15	0	Byte Offset
LSW		0
command reference number		
MSW		2
unit number		4
sequence number		6
flags	format	8
event code		10
LSW		12
controller identifier		14
MSW		16
HW vrsn	SW vrsn	18
SA Error Code		20
Controller Format Code		22
SA Error Sub Code		24
Path	Conn Id	26
Received Message Length		28
Received Message Type		30
Connection State		32
		34

SA Error Sub Code: See Table C-1, 68000 SA Error Sub Codes.

Path: The DSSI Bus ID of the device to which the module was attempting to connect.

Conn ID: The SSP Connection ID of the failed connection. See Table C-2. If the message length is less than four, this field is undefined. If the SA subcode is 'Message Rx'd with bad Rec ID', this field is undefined.

Received Message Length: The length of the SCS error message in bytes.

Connection State: The state of the SCS connection when the error occurred. See Table C-4. Table C-3 contains the standard SCS connection state values, Table C-4 contains the KFQSA implementation specific states. If the SA Subcode is 'Message Rx'd with bad Rec ID', this field is undefined.

C.8 68000 Error Log Format 10, Bugcheck

15	0	Byte Offset		Byte Offset
LSW		0	LSW	32
command reference number		2	A2	MSW
MSW		4		54
unit number		6	A1	LSW
sequence number		8		56
flags	format	10	A0	MSW
event code		12		58
LSW		14	D7	LSW
controller identifier		16		60
MSW		18	D6	MSW
HW wren	SW wren	20		62
SA Error Code		22	D5	LSW
Controller Format Code		24		64
Bugcheck Reason Code		26	D4	MSW
PC	LSW	28		66
MSW		30	D3	LSW
SP	LSW	32		68
MSW		34	D2	MSW
A6	LSW	36		70
MSW		38	D1	LSW
A5	LSW	40		72
MSW		42	D0	MSW
A4	LSW	44		74
MSW		46	PSW	76
A3	LSW	48	Stack length in longword	78
MSW		50	Stack	80
			.	82
			.	84
			.	86
			.	88
			.	90
			.	92
			.	94
			.	96
			.	98
			.	100
			.	175

NOTE

If response buffer is not large enough to hold all the listed data, the packet is truncated.

C.9 68000 Error Log Format 11, CMM Level Error

15	0	Byte Offset
LSW		0
command reference number		
MSW		2
unit number		4
sequence number		6
flags	format	8
event code		10
LSW		12
		14
controller identifier		16
		18
MSW		18
HW vrsn	SW vrsn	20
SA Error Code		22
Controller Format Code		24
SA Error Sub Code		26
Path	Invalid Conn Id	28

Path: The DSSI Bus ID of the device to which the module was attempting to send.

Invalid Connection ID: Only one device connection per path is allowed in the KFQSA module. An attempt was made to establish more than one device connection on a path. This is the ID of the second device connection. See Table C-2, SSP Connection ID.

C.10 68000 Error Log Format 12, Maintenance Error

15	0	Byte Offset
LSW		0
command reference number		
MSW		2
unit number		4
sequence number		6
flags	format	8
event code		10
LSW		12
controller identifier		14
MSW		16
HW vrsn	SW vrsn	18
SA Error Code		20
Controller Format Code		22
Invalid Region Identifier		24
		26

Invalid Region Identifier: The value in region ID field of maintenance command packet is undefined. Defined values are in Table C-5, Maintenance Regions.

Table C-1 68000 SA Error Subcodes

Port Level Protocol Error	
8001	DSSI port packet length violation
8002	DSSI port level credit violation
8003	DSSI port sequence number violation
8004	DSSI port invalid frame violation
SCS Connect Error	
8005	SCS connect response NAK'd by remote
8006	SCS accept response NAK'd by remote
8007	SCS connection rejected by remote
SCS Level Protocol Error	
8008	SCS invalid process names in accept request
8009	SCS packet length violation
800A	SCS invalid message type
800B	SCS invalid message receive ID
800C	SCS invalid connection state
800D	SCS control message credit violation
800E	SCS invalid credit response acknowledgement
800F	SCS credit violation

Table C-2 Connection ID Values

ID Number	Purpose
0	Disk
1	Tape
2	DUP
3-253	Invalid for KFQSA module
254	Verification testing
255	Maintenance protocol

Table C-3 SCS Connection State Table, Region States

SCS State	Value (Decimal)
CLOSED	0
LISTEN	1
OPEN	2
DISC_ACK	3
DISC_REC	4
DISC_SENT	5
DISC_MTCH	6
CON_SENT	7
CON_ACK	8
CON_REC	9
ACCP_SENT	10

**Table C-4 SCS Level Protocol Error Log State Values
(KFQSA Implementation Specific)**

SCS State	Value (Decimal)
CLOSED	0
LISTEN	1
OPEN	2
DISC_ACK	3
DISC_REC	4
DISC_SENT	5
DISC_MTCH	6
CON_SENT	7
CON_ACK	8
CON_REC	9
ACCP_SENT	10
ACPT_REC	11
REJ_REC	12
CON_PEND	13
ACPT_PEND	14
DISC_PEND	15
REJ_SENT	16

Table C-5 Maintenance Regions

Region ID	Region Name	Maximum Offset	Region Size	Access	Restriction
1	68000 Test Region	MBZ	02	R/W	Local node
2	68000 Local RAM	3FFE	4000	R/O	
3	68000 ROM	1FFFE	20000	R/O	
4	Dual Port RAM	3FFE	4000	R/O	
5	68000 Buffer RAM	3FFFE	40000	R/O	
6	68000 Bugcheck	MBZ	B2	R/W	
7	8096 Bugcheck	MBZ	B2	R/W	
8	Manufacturing Test	0FFE	1000	R/W	
9	Data Link Counters	MBZ	28	R/W	
10	Soft Reset	MBZ	MBZ	W/O	Time stamp
16	Port Layer Counters	MBZ	20	R/W	
17	SCS Conn. State	MBZ	0C	R/O	
18	68000 Error Log	MBZ	B2	R/W	
19	8096 Error Log	MBZ	B2	R/W	
20	68K Virtual Circuit	MBZ	82	R/O	
64	8096 Local RAM	0FE	100	R/O	
65	8096 ROM	3FFE	4000	R/O	
66	8096 Configuration	MBZ	22	R/W	
67	8096 EEROM	1FE	200	R/O	Config. len
68	8096 System Params.	MBZ	10	R/O	
69	8096 Test	MBZ	02	R/W	
70	8096 Config. Reset	MBZ	MBZ	W/O	Local node
71	8096 Usable CSR Word	MBZ	02	R/O	
72	8096 I/O Port	MBZ	02	R/O	

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