MicroVAX and MicroPDP–11

Microsystems Options

Order Number: EK–192AF–MG. F01

July 1993

This manual contains Update Notice 5,
EK–289AE–UD. E01.

October 1988
Updated, December 1988
Updated, September 1989
Updated, November 1991
Updated, May 1992
Updated, July 1993

The Reader's Comments form at the end of this document requests your critical evaluation to assist in preparing future documentation.

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S2324

Preface

This guide provides reference, configuration, and maintenance information for options supported by MicroVAX and MicroPDP-11 systems.

Intended Audience

This document is intended only for DIGITAL Field Service personnel and qualified self-maintenance customers.

Organization

This guide contains an alphabetical listing of all microsystems options, an overview that explains ordering procedures and module configuration, an option section with pertinent information on each supported option, and one appendix.

- The option sections are arranged alphabetically, and each section starts on page 1.

  Each option section begins with a table of ordering information and information on operating system support, diagnostic support, related documentation, and dc power and bus loads. Each option section also contains a description, configuration information, power-up self-tests, and general maintenance information, including field replaceable units (FRUs) and loopback connectors.

- Appendix A provides a list of related documentation.

Warnings, Cautions, and Notes

Warnings, cautions, and notes appear throughout this guide. They have the following meanings:

WARNING	Provides information to prevent personal injury.
CAUTION	Provides information to prevent damage to equipment or software.
NOTE	Provides general information about the current topic.

List of Options

This manual contains descriptions of the following options, which are supported by MicroVAX 3000 and VAX 4000 systems. The options ending with an asterisk are new to this revision:

AAV11–D, –S Digital-to-Analog Converter
ADQ32–A, –S Analog-to-Digital Converter
ADV11–D, –S Analog-to-Digital Converter
AXV11–C, –S Analog I/O Module
CXA16/CXB16 16-Line Asynchronous Multiplexer
CXY08 8-Line Asynchronous Multiplexer
DEFQA FDDIcontroller/Q–bus Adapter *
DELQA Ethernet Interface
DEQNA Ethernet Interface
DEQRA Token Ring Controller Adapter
DESQA Ethernet Adapter
DFA01 Modem
DHV11 8-Line Asynchronous Multiplexer
DIV32 DEC ISNA Controller 100 (synchronous)
DLVJ1 4-Line Asynchronous Interface
DMV11 Synchronous Controller
DPV11 Synchronous Interface
DRQ3B–A, –S High-Speed, Parallel Interface
DRV11–G, DRV1J–S 4-Line, High-Density Parallel Interface
DRV11–WA, DRV1W–S General-Purpose DMA Interface
DSV11 Communications Option
DTC05 DECvoice Multivoice Processor
DZQ11 4-Line Asynchronous Multiplexer
DZV11 4-Line Asynchronous Multiplexer
EF51R Solid State Disk (SSD) *
EF52R Solid State Disk (SSD) *
EF53 Solid State Disk (SSD) *
IBQ01 BITBUS Controller
IEQ11 Communications Controller

TK70 Tape Drive Subsystem
TLZ04 Tape Cassette Drive Subsystem
TLZ06 Tape Cassette Drive Subsystem
TQK70 Controller
TS05 Tape Drive Subsystem
TSZ07 Tape Drive Subsystem
TZ85 Cartridge Tape Drive
TZ857 Magazine Tape Drive
TU81–PLUS Tape Drive
VCB02 Monochrome Video Monitor

Overview

This document describes options supported by MicroVAX and MicroPDP-11 systems. The options are listed alphabetically and contain the following information:

Ordering information
Operating system and diagnostic support available
Related documentation
Brief description
Configuration
Self-test
Loopback connectors
FRUs

Ordering Options

You order option parts based on the system enclosure. Field Service personnel can also order modules by the M number. (For example, M7504 is a DEQNA–M module.)

For the BA23 and BA123 Enclosure, and H9642–J Cabinet

For most options, you must order two item numbers: a *module* and a *cabinet kit*. For example, you order the following two items if you are installing a DEQNA Ethernet interface:

Item	Order Number
Module (M7504)	DEQNA-M
BA23-A cabinet kit, including Type-A filter connector and internal cable	CK-DEQNA-KB

If you are replacing an option, you order only the parts needed. For example, if the base module is faulty, order the module only. If a cable or filter is faulty, order that part separately.

For the BA200-Series Enclosure

Cabinet kits are not necessary for modules designed for BA200-series enclosures because these enclosures do not have separate I/O panels. You order the module only; the filtered I/O connector is part of the module's handle.

You can order a module in either of two ways:

- As a system option (factory installed in BA200-series enclosures)
- In an upgrade kit, to be installed by Field Service.

The module order number ends with $-x$A for a system option, or $-x$F for a field up‸ ade kit. The x indicates a letter that varies from module to module. For example, CXY08-AA is a system option, and CXY08-AF is an upgrade kit. The upgrade kit includes cables, an installation manual, and any other required components.

Only those options that specifically list BA200-series enclosures are supported; check the ordering information at the beginning of each option.

Module Configuration

Each module in a system must use a unique device address and interrupt vector. The device address is also known as the control and status register (CSR) address.

Depending on the device, the CSR address and interrupt vector are either fixed or floating.

A fixed CSR address or vector is an address reserved in memory for that module. Fixed addresses and vectors are positioned at the factory. If you have only one module of a certain type in the system, you do not need to change the factory position. If you have two or more modules of the same type, you must change the address and vector on each additional module.

A floating address or vector is a location assigned within an octal (base 8) range. The exact address or vector depends on what other modules the system contains. The ranges are as follows:

- Floating CSR address: (1776)0010 to (1776)3776
- Floating interrupt vector: (00000)300 to (00000)774

NOTE: *All CSR addresses and interrupt vectors listed in this document are octal values.*

You set most addresses and vectors by positioning switches or jumpers on the module. Here is an example of the 22-bit setting for a CSR address of 17761540:

```
A 21 20 19 18 17 16 15 14 13 12 11 10 09 08 07 06 05 04 03 02 01 00
   1  1  1  1  1  1  1  1  1  0  0  0  1  1  0  1  1  0  0  0  0  0
   | \______/ \______/ \______/ \______/ \______/ \______/ \______/
   1     7        7        6        1        5        4        0
```

In most cases, you can set a CSR address within a typical range by using bits A12 through A03. Bits 21 through 13 are usually all ones (1), and bits

02 through 00 are usually all zeros (0). A typical switch setting shows only the following bits:

```
Address Bits:      A12 A11 A10 A09 A08 A07 A06 A05 A04 A03
Switch Settings:   0   0   0   1   1   0   1   1   0   0
                   |   \_______/   \_______/   \_______/
Address:           6       1           5           4
```

If you set bit A12 to 1, the address would be 17771540.

Similarly, you can set an interrupt vector of 320 by positioning bits V08 through V03. Bits V02 through V00 are usually all zeros (0).

```
Vector Bits:       V08 V07 V06 V05 V04 V03
Switch Settings:   0   1   1   0   1   0
                   \_______/   \_______/
Vector:                3           2
```

NOTE: *The number of switches or jumpers used to control address and vector bits varies among modules.*

Calculating address and vector values is a complex procedure, because some modules use floating addresses and vectors. The value of a floating address depends on what other modules are in the system. For this reason, the MicroVMS and VMS SYSGEN utility has a CONFIG program to determine CSR addresses and interrupt vectors. The next section describes how to use the CONFIG program. If you do not have access to this program, you can determine some common configurations using the information in the section Finding CSR Addresses and Interrupt Vectors Manually. Use this section only when the CONFIG program is not available.

Set CSR addresses and interrupt vectors for a module as follows:

1. Determine the correct values for the module with the CONFIG program.
2. Find the section in this document that describes the module. That section lists the switch and jumper settings for different CSR addresses and interrupt vectors.

Most modules also have switches and jumpers to change their operating characteristics. For some applications, you may have to change the factory settings.

NOTE: *Changing the factory settings may affect the operation of the diagnostics for the device.*

Finding CSR Addresses and Interrupt Vectors with the CONFIG Program

Use the CONFIG program in the MicroVMS and VMS SYSGEN utility to determine the correct CSR address and interrupt vector for a module. Type in a list of the devices in the system, and CONFIG automatically provides CSR address and interrupt vector information. Table 1 lists the devices supported by this utility.

Table 1: Device Abbreviations Used with SYSGEN

Device	Enter at DEVICE> Prompt	Device	Enter at DEVICE> Prompt
CXA16	DHV11	DZV11	DZ11
CXY08	DHV11	IEQ11	IEQ11
DEQNA	QNA	KDA50	UDA
DHV11	DHV11	LPV11	LP11
DLVJ1	DJ11	RC25	UDA
DMV11-M	DMV11	RQDX2	UDA
DMV11-N	DMV11	RQDX3	UDA
DPV11	DPV11	RRD50	VDA
DRV11-WA	DR11W	TQK50	TU81
DZQ11	DZ11	TSV05	TS11

The CONFIG program uses a standard Q22-bus algorithm to determine the correct CSR address and interrupt vector for a module. You must use this program so that the operating system (MicroVMS or VMS) and MDM diagnostics can recognize the CSR addresses and interrupt vectors. You can also use these settings in ULTRIX-32m and VAXELN systems.

To use the SYSGEN utility, type the following at the system command prompt:

```
$ MCR SYSGEN
```

Press [Return]. The utility responds with the prompt

```
SYSGEN>
```

At this prompt, type

```
CONFIGURE
```

Press [Return]. The utility responds with the prompt

```
DEVICE>
```

At this point, enter the abbreviation for each device you are going to use in the system. Table 1 lists the abbreviations.

Enter one abbreviation per line, then press Return. The DEVICE> prompt will prompt for you for another entry. If you are installing more than one unit of a particular device, enter a comma and the number of devices after the abbreviation. For example, DHV11,2 indicates two DHV11 modules.

After you have entered all devices, type Ctrl/Z. The program displays the following information for each device you entered:

CSR address and vector
The name assigned to the device by the operating system
The operating system support status (yes or no)

The program uses an asterisk (*) to indicate a floating address or vector. To exit from the SYSGEN utility, type EXIT at the SYSGEN> prompt and press Return.

Example 1 shows a sample SYSGEN utility display.

Example 1: Sample Output Using the CONFIGURE Command

```
$MCR \SYSGEN
SYSGEN> CONFIGURE
DEVICE> DHV11,2
DEVICE> DMV11
DEVICE> QNA
DEVICE> UDA,2
DEVICE> TU81
DEVICE> CTRL/Z
Device: UDA   Name: PUA CSR: 772150  Vector: 154  Support: yes
Device: TU81  Name: PTA CSR: 774500  Vector: 260  Support: yes
Device: QNA   Name: XQA CSR: 774440  Vector: 120  Support: yes
Device: DMV11 Name: XDA CSR: 760320* Vector: 300* Support: yes
Device: UDA   Name: PUB CSR: 760354* Vector: 310* Support: yes
Device: DHV11 Name: TXA CSR: 760500* Vector: 320* Support: yes
Device: DHV11 Name: TXB CSR: 760520* Vector: 330* Support: yes
```

Finding CSR Addresses and Interrupt Vectors Manually

If the CONFIG program in the SYSGEN utility is not available, you can determine some CSR addresses and interrupt vectors using Table 2. This table lists some common option modules with their standard CSR address and interrupt vector settings. Go to column 4. Put a check mark next to each module in the system. An F in the table indicates a floating CSR address or interrupt vector. The next two sections describe how to determine floating CSR addresses and interrupt vectors. If you use more units of a device than are listed in the table, those units have floating CSR addresses and interrupt vectors unless otherwise specified.

Table 2: CSR Address and Interrupt Vector Worksheet

Option	Module	Unit Number	Check[1]	Vector	CSR Address
AAV11-D	A1009	1	[ ]	F	17776420
ADV11-D	A1008	1	[ ]	F	17776410
DEQNA	M7504	1	[ ]	120	17774440
DHV11	M3104	1	[ ]	F	F
DLVJ1[1]	M8043	1	[ ]	F	17776500
DLVJ1	M8043	2	[ ]	F	17776510
DMV11	M8053	1	[ ]	F	F
DMV11-CP	M8064	1	[ ]	F	F
DPV11	M8020	1	[ ]	F	F
DRV11-JP	M8049	1	[ ]	F	17764120
DRV11-JP	M8049	2	[ ]	F	17764100
DRV11-JP	M8049	3	[ ]	F	17764060
DRV11-WA	M7651	1	[ ]	124	17772410
DRV11-WA	M7651	1	[ ]	F	17772430
DZQ11	M3106	1	[ ]	F	F
DZV11	M7957	1	[ ]	F	F
IEQ11	M8634	1	[ ]	F	17764100
KA630	M7606	-	[ ]	-	-
KDA50	M7164 M7165	1	[ ]	154	17772150
KMV11	M7500	1	[ ]	F	F
KWV11-C	M4002	1	[ ]	F	17770420
LPV11	M8027	1	[ ]	200	17777514
MRV11-D	M8578	-	[ ]	-	-
MS630-A	M760x	-	[ ]	-	-
RC25	M7740	1	[ ]	154	17772150
RLV12	M8061	1	[ ]	160	17774400
RQDX2	M8639	1	[ ]	154	17772150
RQDX3	M7555	1	[ ]	154	17772150
TQK50	M7546	1	[ ]	260	17774500

[1]The DLVJ1 vector can be set only at 300, 340, 400, 440, and so on. If the first available vector is 310 (or 320, 330), you should set the DLVJ1 to 340 and the next device to 400.

Floating Interrupt Vectors

Floating interrupt vectors start at 300_8 and continue in increments of 10_8, with one exception. The device following a DLVJ1 uses an increment of 40_8. You assign floating interrupt vectors in the following order:

DLVJ1 (Increment of 40_8 to next device)
DRV11
DZV11, DZQ11
DPV11
DMV11
Second MSCP (The first is fixed at 154_8.)
Second TQK50 (The first is fixed at 260_8.)
IEQ11
DHV11

Examples: The following examples show the floating interrupt vectors for two sample configurations:

Example 1

DLVJ1	300
DZV11	340
DMV11	350
Second MSCP	360
DHV11	370

Example 2

DZQ11	300
Second MSCP	310
DHV11	320

The CXA16 and CXY08 communications devices for the BA200-series enclosure also have floating interrupt vectors. You should assign the first floating interrupt vector in the BA213 to the CXA16.

Floating CSR Addresses

Table 3 lists floating CSR addresses for many possible system configurations. To find the configuration you want, find a column that includes all the devices in your system that need floating addresses.

Columns 1 through 9 are for systems without a KMV11 module. Columns 10 through 18 are for systems with a KMV11. A KMV11 changes the settings for the DHV11 modules below it in the column.

NOTE: *The CXY08 and CXA16 communications devices for the BA213 enclosure use the same floating CSR addresses as the DHV11.*

Table 3 lists devices in the correct order for assigning floating CSR addresses. If you add or remove a device with a floating CSR address, you often have to recalculate the floating CSR addresses of devices below it in the list.

However, a CSR address with an asterisk (*) in the table does not affect the other addresses in the column. For example, you could use column 1 for a system with one DHV11 module and one or two TK50 tape drives. Adding or removing a second TK50 tape drive from this system does not change the address of the DHV11.

An address without an asterisk *does* affect the addresses below it in the same column. For example, suppose you use column 1 to configure a system with two DHV11s. If you add a second MSCP device to this system later, you must change the CSR addresses of the DHV11s. Column 2 lists the correct CSR addresses for the new configuration.

Examples: The following examples show the correct floating CSR addresses for two sample configurations. You can find these addresses in Table 3.

```
Example 1
1 DZQ11:    17760100
1 DPV11:    17760310
1 DHV11:    17760500

From column 5.
```

```
Example 2
1 DPV11:    17760270
2nd MSCP:   17760354
1 KMV11:    17760460
1 DHV11:    17760520

From column 12.
```

Table 3: Floating CSR Addresses: Sample Configurations

Device	1	2	3	4	5	6	7	8	9
	Substitute the numbers below for the nnn in 17760nnn								
DZV/Q 1				100	100	100	100	100	100
DZV/Q 2				110*	110*	110	110*	110	110*
DZV/Q 3				120*		120		120	
DPV11	270*	270*	270*		310*	330*	310*	330*	310*
DMV11			320*				340	360	340
2nd MSCP		334	354*		354*	374	374	414*	
2nd TQK	404*	444*	444*	444*		504*	504*	504	444*
DHV11 1	440	500	500	500	500	540	540	540	500
DHV11 2	460	520	520	520	520	560	560	560	520
DHV11 3	500	540	540	540	540	620	600	600	540
DHV11 4	520	560	560	560	560	640	620	620	560
DHV11 5	540	600	600	600	600	660	640	640	600

Device	10	11	12	13	14	15	16	17	18
	Substitute the numbers below for the nnn in 17760nnn								
DZV/Q 1				100	100	100	100	100	100
DZV/Q 2				110*	110*	110	110*	110	110*
DZV/Q 3				120*		120		120	
DPV11	270*	270*	270*		310*	330*	310*	330*	310*
DMV11			320*				340	360	340
2nd MSCP		334	354*		354*	374	374	414*	
2nd TQK	404*	444*	444*	444*		504*	504*	504	444*
KMV11	420	460	460	460	460	520	520	520	460
DHV11 1	460	520	520	520	520	560	560	560	560
DHV11 2	500	540	540	540	540	600	600	600	600
DHV11 3	520	560	560	560	560	620	620	620	620
DHV11 4	540	600	600	600	600	640	640	640	640
DHV11 5	560	620	620	620	620	660	660	660	660

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Module Self-Tests

Module self-tests run only when you power up the system. A module self-test can detect hard or repeatable errors, but not intermittent errors.

You can repeat module self-tests by pressing [Restart]. The module's LEDs display pass/fail test results. You can find detailed information in the command status register (CSR) of the module's Q22-bus interface; see the user's guide for the module.

A self-test that passes does not guarantee that the module is good, because the test checks only the controller logic. The test does not check the module's Q22-bus interface, line drivers and receivers, or connector pins—all of which have relatively high failure rates.

A self-test that fails is accurate, because the test does not require any other part of the system to be working.

Using a Loopback Connector

You use a loopback connector with the MicroVAX Diagnostic Monitor (MDM) utilities for troubleshooting communications problems in the system. You can install the loopback connector at different points to isolate a problem to a faulty I/O panel, internal cable, or module (Figure 1).

Start at the system's I/O panel, to see if the problem is in the system enclosure, the external cabling, or the attached device. If the test fails, move the loopback point closer to the CPU until it passes. The faulty FRU is between the point where the test last fails and the point where it passes.

If symptoms change while you are troubleshooting, check all cable connections and start again. You may have introduced a bad connection while performing the procedure.

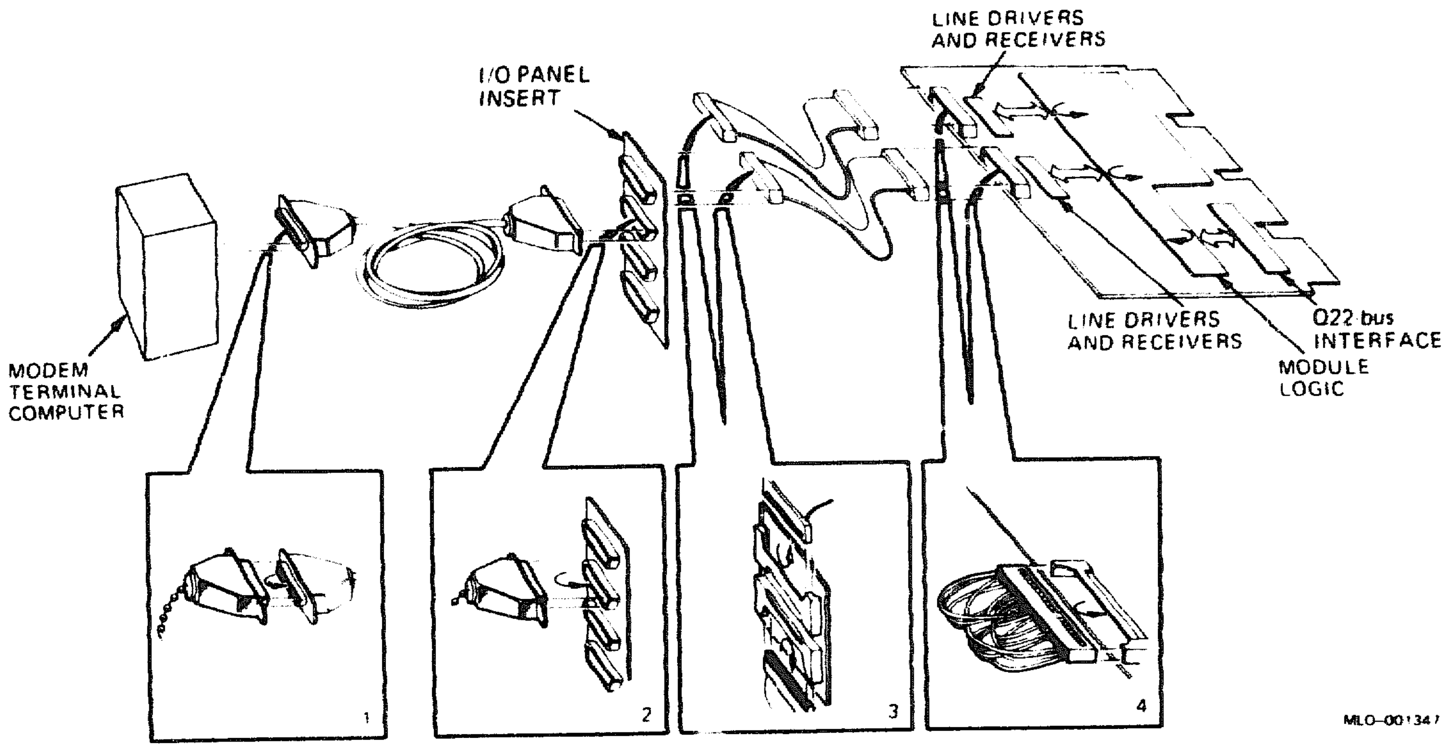


Figure 1: Using a Loopback Connector

AAV11–D, –S Digital-to-Analog Converter

Ordering Information

Module (A1009) for BA23 BA123, and H9642–J	AAV11–D
Module (A1009–PA) for BA200-series	AAV11–SA (factory installed) AAV11–SF (field upgrade)
Cabinet kit (BA23)	CK–AAV1D–KA
Cabinet kit (BA123)	CK–AAV1D–KC
UDIP parts	See Table 2 in this section.

Operating System Support

MicroVMS	Version 4.4 and later, using VAXlab Software Library
RSX–11M	Version 4.3 and later
RSX–11M–PLUS	Version 4.0 and later
VAXELN	Version 3.0 and later
VMS	Version 5.0 and later, using VAXlab Software Library

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 1.08 (release 108) and later
XXDP	Version 2.1 (release 134) and later: VAAAA1.BIC, VADAC0.BIC, XAACB0.OBJ
Power-up self-test LEDs	See module documentation.

Documentation

Q-Bus DMA Analog System User's Guide	EK-AV11D-UG
Universal Data Interface Panel Reference Card	EK-UDIPD-RC

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	Module	+5 V	+12 V	Watts	AC	DC	Insert
AAV11-D	A1009	1.8	0.0	9.0	1.0	1.0	-
AAV11-SA	A1009-SA	1.8	0.0	9.0	2.1	0.5	-

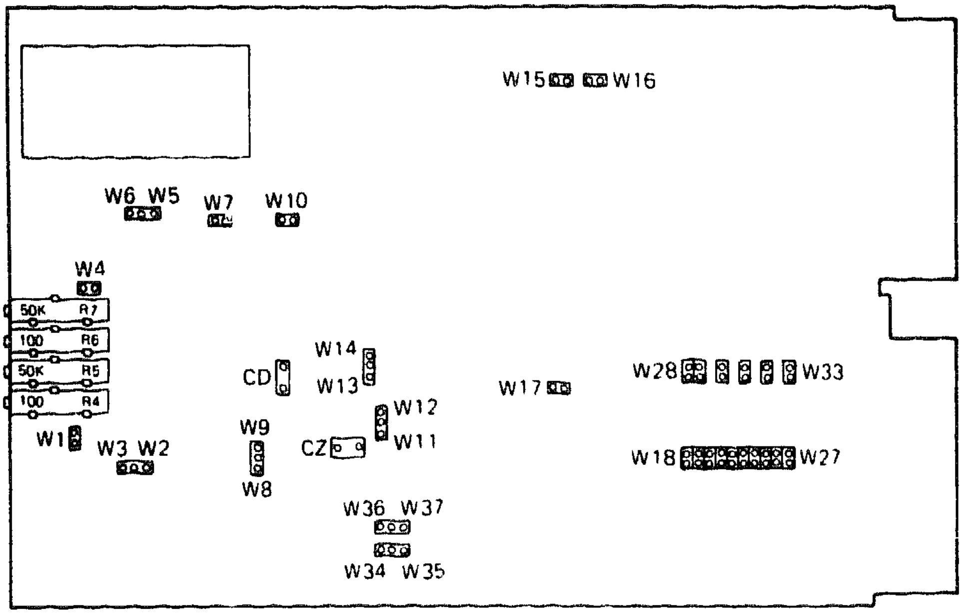
The AAV11-D, -S is a digital-to-analog converter (DAC) with direct memory access (DMA) capability. The AAV11-D is shown in Figure 1.

The AAV11-D is a dual-height module, with full 22-bit addressing and four interrupt levels controlled by jumpers. Outputs include two analog DAC outputs, a digital two-pulse valid data indicator, and four independent digital TTL control lines.

The AAV11 provides two possible throughput levels:

One channel	200 kHz maximum
Two channels	300 kHz

Figure 1: AAV11–D Module Layout (A1009)



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CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

Use jumpers W18 through W33 to set the CSR address and interrupt vector for the AAV11. The CSR address is fixed for the first AAV11. All interrupt vectors float. The following tables list the factory configuration for the CSR address and interrupt vector:

AAV11-D, -S CSR Address: 17776420 (factory position)
Jumpers W18 through W27

Address Bits:	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3
Jumpers:	W18	W19	W20	W21	W22	W23	W24	W25	W26	W27
CSR Address:										
17776420	1	1	1	0	1	0	0	0	1	0

1 = installed, 0 = removed

AAV11-D, -S Interrupt Vector: 330 (factory position)
Jumpers W28 through W33

Vector Bits:	V8	V7	V6	V5	V4	V3
Jumpers:	W28	W29	W30	W31	W32	W33
Vector Address:						
330	0	1	1	0	1	1
300	0	1	1	0	0	0

1 = installed, 0 = removed.

The interrupt priority levels for the AAV11 are as follows:

Priority Level	W15	W16
4	In	In
5	Out	In (factory)
6	In	Out
7	Out	Out

AAV11–D, –S User-Selectable Jumper Features

The AAV11–D, –S has a variety of user-selectable features, which are controlled by jumpers. These features set parameters for specific applications. The customer should select the features.

Table 1 lists the user-selectable features and the factory configuration. To change any of the features, refer to the module documentation.

Table 1: AAV11–D, –S User-Selectable Features

Feature	Factory Configuration	Jumpers
Continuous Mode DMA	Enabled	W10
DMA Wrap Mode	Enabled	W17
Digital/analog ground	Not connected	W7
X–DAC output range	+/–10 Volts	W1, W2, W3
Y–DAC output range	+/–10 Volts	W4, W5, W6
X–DAC data coding	Two's complement	W34, W35
Y–DAC data coding	Two's complement	W36, W37
Z-pulse width	3.5 microseconds	W8, W9
Z-pulse delay	350 nanoseconds	W11, W12
Z-pulse polarity	3.5 microseconds	W13, W14

To facilitate connections to the AAV11–D, –S, you can use a universal data interface panel (UDIP). This panel provides BNC cable connectors and push-tab barrier strips for making cabling connections. The panel, like other universal data interface panels, is installed in a UDIP–BA mounting box. Up to three panels can be installed in a mounting box. The mounting box/panel assembly can then be installed in any standard media mounting slot normally used for TK50, RX50, or RD50-series media devices. The mounting box can also be mounted in a tabletop (UDIP–TA) expansion box for use as an external connection box.

Table 2 lists the UDIP components required for each type of configuration.

Table 2: AAV11 UDIP Components

Module	Enclosure	Front Panel	Mounting Box	Tabletop Box	Other Items
AAV11–S	BA200 series	UDIP–DB	UDIP–BA	UDIP–TA	None
AAV11–D	BA123 media slot	UDIP–DA	UDIP–BA	None	None
AAV11–D	BA123 with tabletop	UDIP–DB	UDIP–BA	UDIP–TA	CK–ADV1D–KC
AAV11–D	BA23 with tabletop	UDIP–DB	UDIP–BA	UDIP–TA	CK–ADV1D–KA

ADQ32–A, –S Analog-to-Digital Converter

Ordering Information

Module (A030) for BA23, BA123, and H9642–J	ADQ32–A
Module (A030-PA) for BA200-series	ADQ32–SA (factory installed) ADQ32–SF (field upgrade)
Cabinet kit (BA23)	CK–ADQ32–KA
Cabinet kit (BA123)	CK–ADQ32–KB
Cabinet kit (BA23 expansion box)	CK–ADQ32–KF
UDIP parts	See Table 2 of this section.

Operating System Support

VMS	Version 5.0 and later, using VAXlab Software Library
MicroVMS	Version 4.5 and later, using VAXlab Software Library

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 2.10 (release 120) and later
XXDP	Version 2.1 (release 134): CZADQA0, CZADRA0, CZADSA0, CXADQA0.
Power-up self-test LEDs	See module documentation.

Documentation

ADQ32 A/D Converter Module User's Guide	EK-153AA-UG
ADQ32 Universal Data Interface Panel Reference Card	EK-UDIPA-RC

DC Power and Bus Loads

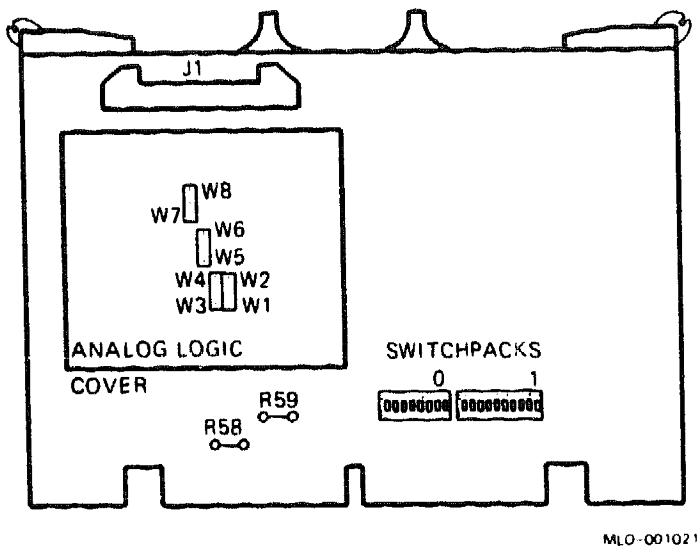
		Current (Amps)		Power	Bus Loads		
Option	Module	+5 V	+12 V	Watts	AC	DC	Insert
ADQ32-A	A030	5.0	0.0	25.0	0.5	2.5	A
ADQ32-S	A030-PA	5.0	0.0	25.0	0.5	2.5	–

The ADQ32 is an analog-to-digital converter with direct memory access (DMA). The ADQ32-A is shown in Figure 1.

The ADQ32 is a quad-height module with full 22-bit addressing, and offers the following features:

- 200 kHz throughput
- DMA data transfer
- Four interrupt levels
- Thirty-two single-ended or 16 differential input channels
- Random channel sampling
- On-board clock with variety of clocking modes
- Selectable clock source (initial or external)

Figure 1: ADQ32–A Module Layout (A030)



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

Use DIP switchpacks 0 and 1 to set the CSR address and interrupt vector for the ADQ32. The CSR address and interrupt vectors float.

On switchpack 1, use switch 08 to set extended block mode. Extended block mode increases DMA data transfer efficiency. It cannot be used in MicroPDP-11 systems. Setting switch 08 to the ON position selects the extended block mode. Use switches 09 and 10, also in switchpack 1, to configure the interrupt priority level. The following tables list the factory configuration for the CSR address and interrupt vector:

ADQ32 CSR Address: 17761140 (factory position)
Switchpack 0

Address Bits:	A12	A11	A10	A9	A8	A7	A6	A5	A4	
Switches:	1	2	3	4	5	6	7	8	9	10*
CSR Address:										
17761140	0	0	0	1	0	0	1	1	0	
17761200	0	0	0	1	0	1	0	0	0	

1 = switch on, 0 = switch off.
* Switch 10 is not used.

ADQ32 Interrupt Vector: 300 (factory position)
Switchpack 1

Vector Bits:	V9	V8	V7	V6	V5	V4	V3
Switches:	1	2	3	4	5	6	7
Vector Address:							
300	0	0	1	1	0	0	0
310	0	0	1	1	0	0	1

0 = switch on, 1 = switch off.

The interrupt priority levels for the ADQ32 are as follows:

	Switch 1	
Priority Level	**9**	**10**
4	1	1
5	1	0
6	0	1
7	0	0

ADQ32 Analog Input Range

The ADQ32 has two selections for analog input ranges. Unipolar signals in the range of 0 to 10 volts can be converted. Bipolar signals in the range of −10 to +10 volts can also be converted. Although the bipolar range setting includes the range covered for unipolar signals, if your signal is unipolar, you will obtain greater resolution using the unipolar setting. Jumpers on the board allow you to select the range.

Two's complement data coding is used for the bipolar input range. When you select the unipolar input range, straight binary coding is used.

Jumpers W1 through W8 on the board control the selection of the analog range. To select the bipolar input range, install jumpers W1, W3, W5, and W7. Install jumpers S2, W4, W6, and W8 to select the unipolar input range. In the bipolar setting, all of the jumpers are installed on the lower portion (closer to the bus fingers) of the jumper fields. These settings are summarized in Table 1.

Table 1: ADQ32 Analog Input Range Jumper Selection

Jumpers	Bipolar	Unipolar
W1, W3, W5, W7	In	Out
W2, W4, W6, W8	Out	In

The factory configuration is for bipolar analog input.

ADQ32 Q/CD Jumpers

Because the ADQ32 is a quad-height board, in some situations the only slots available for installation are Q/CD slots. Q/CD slots, also called Q-over-CD slots, are slots where the upper backplane slots are Q-bus slots but the bottom slots are C/D slots, which are intended for devices that are not Q-bus devices, such as system memory. When the ADQ32 is installed in a Q/CD backplane slot, jumpers R58 and R59 should be removed. Figure 1, earlier in this section, shows the location of jumpers R58 and R59.

When the ADQ32 is factory installed in a system, the factory removes jumpers R58 and R59, if necessary.

To facilitate connections to the ADQ32, you can use a universal data interface panel (UDIP). This panel provides easily removable input strips for making bare lead connections. The panel, like other universal data interface panels, is installed in a UDIP–BA mounting box. The mounting box/panel assembly can then be installed in any standard media mounting slot normally used for TK50, RX50, or RD50-series media devices. The mounting box can also be mounted in a tabletop (UDIP–TA) expansion box for use as an external connection box.

Table 2 lists the UDIP components required for each type of configuration.

Table 2: ADQ32 UDIP Components

Module	Enclosure	Front Panel	Mounting Box	Tabletop Box	Other Items
ADQ32–S	BA200 Series	UDIP–DD	UDIP–BA	UDIP–TA	None
ADQ32–A	BA123 media slot	UDIP–DC	UDIP–BA	None	None
ADQ32–A	BA123 with tabletop	UDIP–DD	UDIP–BA	UDIP–TA	CK–ADQ32–KB
ADQ32–A	BA23 with tabletop	UDIP–DD	UDIP–BA	UDIP–TA	CK–ADQ32–KA

ADV11-D, -S Analog-to-Digital Converter

Ordering Information

Module (A1008) for BA23, BA123, and H9642-J	ADV11-D
Module (A1008-PA) for BA200-series	ADV11-SA (factory installed) ADV11-SF (field upgrade)
Cabinet kit (BA23)	CK-ADV1D-KA
Cabinet kit (BA123)	CK-ADV1D-KC
UDIP parts	See Table 2 of this section.

Operating System Support

MicroVMS	Version 4.2 and later, using VAXlab Software Library
RSX-11M	Version 4.3 and later
RSX-11M-PLUS	Version 4.0 and later
VAXELN	Version 3.0 and later
VMS	Version 5.0 and later, using VAXlab Software Library

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 1.08 (release 108) and later
XXDP	Version 2.1 (release 134) and later: VADAC0.BIC, XADCB0.OBJ.
Power-up self-test LEDs	See module documentation

Documentation

Q-Bus DMA Analog System User's Guide	EK-AV11D-UG
Universal Data Interface Panel Reference Card	EK-UDIPD-RC

DC Power and Bus Loads

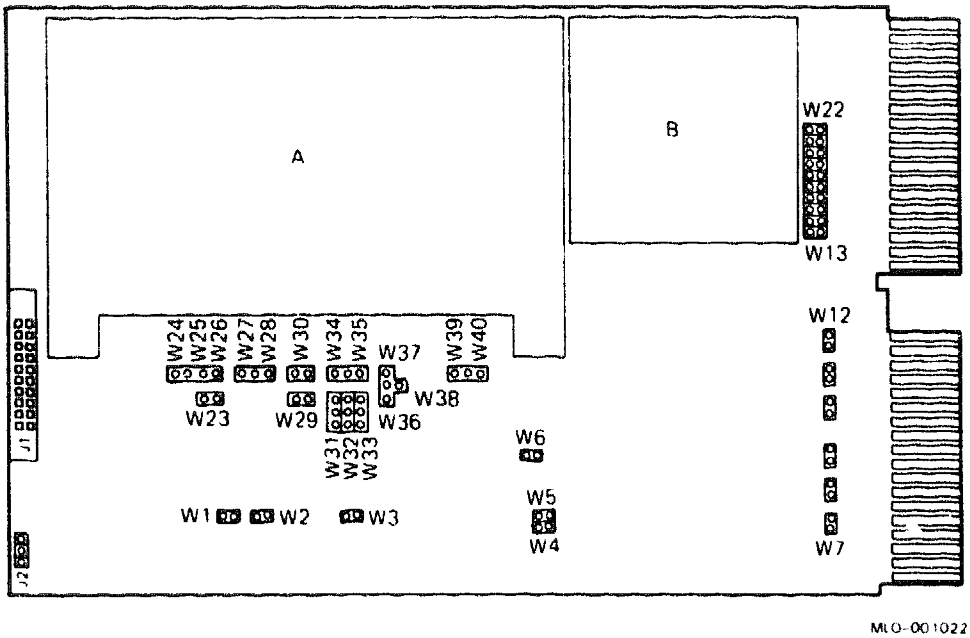
		Current (Amps)		Power	Bus Loads		
Option	Module	+5 V	+12 V	Watts	AC	DC	Insert
ADV11-D	A1008	3.2	0.0	16.0	1.0	1.0	-
ADV11-SA	A1008-PA	3.2	0.0	16.0	2.3	0.5	-

The ADV11-D, -S is an analog-to-digital converter with direct memory access (DMA). The ADV11-D is shown in Figure 1.

The ADV11 is a dual-height module with full 22-bit addressing, and offers the following features:

- Four interrupt levels
- Sixteen single-ended or eight differential input channels
- Selectable clock source (initial or external)
- Programmed I/O or DMA operating modes (with maximum throughput of 50 kHz)

Figure 1: ADV11-D Module Layout (A1008)



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29-26246) when you work with the internal parts of a computer system.*

Use jumpers W7 through W22 to set the CSR address and interrupt vector for the ADV11. The CSR address is fixed for the first ADV11. All interrupt vectors float. The following tables list the factory configuration for the CSR address and interrupt vector:

ADV11-D CSR Address: 17776410 (factory position)
Jumpers W13 through W22

Address Bits:	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3
Jumpers	W13	W14	W15	W16	W17	W18	W19	W20	W21	W22
CSR Address:										
17776410	1	1	1	0	1	0	0	0	0	1

1 = installed, 0 = removed

```
ADV11-D Interrupt Vector:  320 (factory position)
Jumpers W7 through W12
```

Vector Bits:	V8	V7	V6	V5	V4	V3
Jumpers:	W12	W11	W10	W9	W8	W7
Vector Address:						
320	0	1	1	0	1	0
300	0	1	1	0	0	0

1 = installed, 0 = removed

The interrupt priority levels for the ADV11 are as follows:

Priority Level	W15	W16
4	In	In
5	Out	In (factory)
6	In	Out
7	Out	Out

ADV11-D, -S User-Selectable Jumper Features

The ADV11-D, -S has a variety of user-selectable features, which are controlled by jumpers. These features set parameters for specific applications. The customer should select the parameters.

Table 1 lists the user-selectable jumper features and the factory configuration. To change any of these features, refer to the module documentation.

Table 1: ADV11-D, -S User Selectable Features

Feature	Factory Configuration	Jumpers
Continuous Mode DMA	Enabled	W3
DMA Wrap Mode	Enabled	W6
Input range	+/– 10 Volts	W27, W28, W30
Input mode	Single ended	W24, W25, W26, W34
Output coding	Two's complement	W39, W40
Sign Extension	Enabled	W37, W38

To facilitate connections to the ADV11–D, –S, you can use a universal data interface panel (UDIP). This panel provides BNC cable connectors and push-tab barrier strips for making cabling connections. The panel, like other universal data interface panels, is installed in a UDIP–BA mounting box. Up to three panels can be installed in a mounting box. The mounting box/panel assembly can then be installed in any standard media mounting slot normally used for TK50, RX50, or RD50-series media devices. The mounting box can also be mounted in a tabletop (UDIP–TA) expansion box for use as an external connection box.

Table 2 lists the EDIP components required for each type of configuration.

Table 2: ADV11–D, –S UDIP Components

Module	Enclosure	Front Panel	Mounting Box	Tabletop Box	Other Items
ADV11-S	BA200 Series	UDIP-AB	UDIP-BA	UDIP-TA	None
ADV11-D	BA123 media slot	UDIP-AA	UDIP-BA	None	None
ADV11-D	BA123 with tabletop	UDIP-AB	UDIP-BA	UDIP-TA	CK-ADV1D-KC
ADV11-D	BA23 with tabletop	UDIP-AB	UDIP-BA	UDIP-TA	CK-ADV1D-KA

AXV11–C, –S Analog I/O Module

Ordering Information

Module (A0026) for BA23, BA123, and H9642–J	AXV11–D
Module (A0026–PA) for BA200-series	AXV11–SA (factory installed) AXV11–SF (field upgrade)
Cabinet kit (BA23)	CK–AXV1C–KA
Cabinet kit (BA123)	CK–AXV1C–KC
UDIP parts	See Table 2 of this section.

Operating System Support

VMS	Version 5.0 and later, using VAXlab Software Library
MicroVMS	Version 4.4 and later, using VAXlab Software Library
VAXELN	Version 3.0 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 1.10 (release 110) and later
XXDP V2.1	CVAXA, VAXAB0.BIC
Power-up self-test LEDs	See module documentation.

Documentation

AXV11–C/KWV11–C User's Guide	EK–AXVAB–UG
Universal Data Interface Panel Reference Card	EK–UDIPD–RC

DC Power and Bus Loads

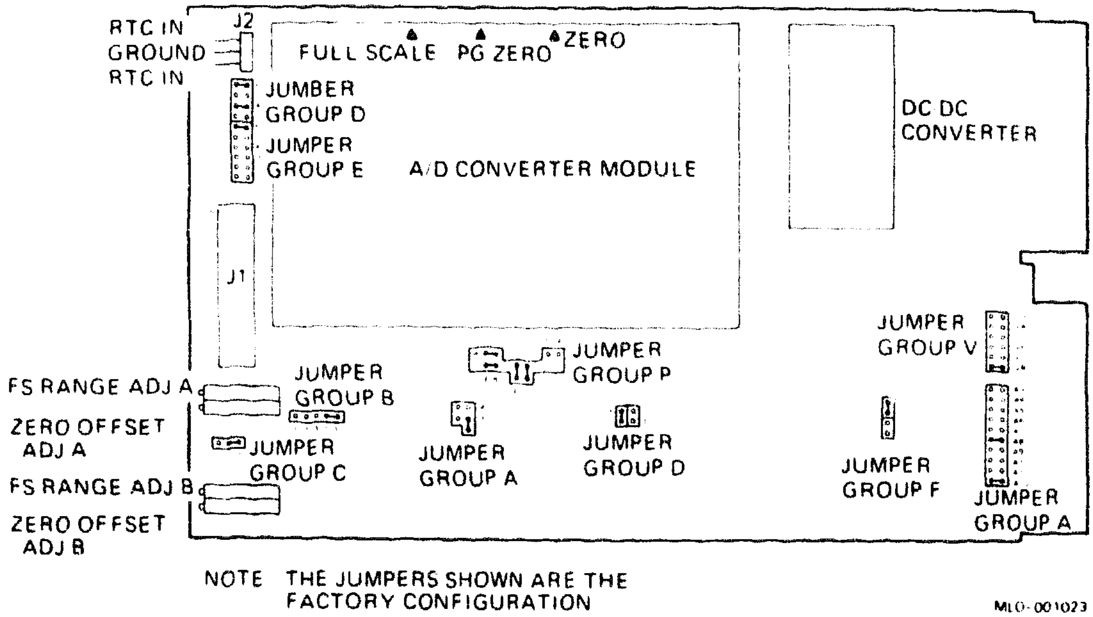
		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
ADX11–D	A0026	2.0	0.0	10.0	0.3	1.2	B
ADX11–S	A0026–PA	2.0	0.0	10.0	0.3	1.2	–

NOTE: *For full use of diagnostic CVAXA, an analog test fixture (30–18692) is required.*

The AXV11 is an analog input/output module. The AXV11–C module layout is shown in Figure 1.

For analog input (A/D conversion), the module contains 16 single-ended or 8 differential input, either unipolar or bipolar. Programmable gain for 1, 2, 4, or 8 can be applied to the input signal. For analog output (D/A conversion), the module provides two 12-bit DACs with unipolar or bipolar output.

Figure 1: AXV11–C Module Layout (A0026)



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

Use jumpers A3 through A12 to set the CSR address and jumpers V3 through V8 to set the interrupt vector for the AXV11. The CSR address is fixed for the first AXV11, and floats for secondary units. The first interrupt vector address is fixed (at 140_8; the factory configuration is for 400_8.) Vectors for all secondary units float. The following tables list the factory configuration for the CSR address and interrupt vector:

AXV11-C, -S CSR Address: 17770400 (factory position)

Address Bits:	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3
Jumpers:	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3
CSR Address:										
17770400	1	0	0	0	1	0	0	0	0	0

1 = installed, 0 = removed

AXV11-C, -S Interrupt Vector: 400 (factory position)

Vector Bits:	V8	V7	V6	V5	V4	V3
Jumpers:	V8	V7	V6	V5	V4	V3
Vector Address:						
140	0	0	1	1	0	0
400	1	0	0	0	0	0
300	0	1	1	0	0	0

1 = installed, 0 = removed

AXV11-C, -S User Selectable Jumper Features

The AXV11-C, -S has a variety of user-selectable features, which are controlled by jumpers. These features set parameters for specific applications. The customer should select the features.

Table 1 lists the user-selectable jumper features and the factory configuration. To change any of these features, refer to the module documentation.

Table 1: AXV11–C, –S User-Selectable Features

Feature	Factory Configuration	Jumpers
DAC A data notation	Offset binary	3A and 5A
DAC B data notation	Offset binary	1B and 5B
DAC A output range	+/– 10 volts	D1, D3
DAC B output range	+/– 10 volts	D1, D3
ADC data notation	Offset binary	1D, 4D, 5D, 6D, 5E, 6E
Analog input mode	Single ended	P1, P2, P8, P9
External trigger source	External trigger	F1, F2

To facilitate connections to the AXV11–C or AXV11–S, you can use a universal data interface panel (UDIP). This panel provides BNC cable connectors and push-tab barrier strips for making cabling connections. The panel, like other universal data interface panels, is installed in a UDIP–BA mounting box. Up to three panels can be installed in a mounting box. The mounting box/pane assembly can then be installed in any standard media mounting slot normally used for TK50, RX50, or RD50-series media devices. The mounting box can also be mounted in a tabletop (UDIP–TA) expansion box for use as an external connection box.

Table 2 lists the UDIP components required for each type of configuration.

Table 2: AXV11–C, –S UDIP Components

Module	Enclosure	Front Panel	Mounting Box	Tabletop Box	Other Items
AXV11–S	BA200 Series	UDIP–AY	UDIP–BA	UDIP–TA	None
AXV11–C	BA123 media slot	UDIP–AX	UDIP–BA	None	None
AXV11–C	BA123 with tabletop	UDIP–AY	UDIP–BA	UDIP–TA	CK–AXV1C–KC
AXV11–C	BA23 with tabletop	UDIP–AY	UDIP–BA	UDIP–TA	CK–AXV1C–KA

CXA16/CXB16 16-Line Asynchronous Multiplexer

The CXA16/CXB16 is an option for BA200-series enclosures only.

Ordering Information

Module (M3118–YA)	CXA16–AA (factory installed) CXA16–AF (field upgrade)
Module (M3118–YB)	CXB16–AA (factory installed) CXB16–AF (field upgrade)
25-pin passive adapter	H8571–A
9-pin passive adapter	H8571–B
Active adapter	H3105
Loopback connectors (external)	12–25146–01 (H3101) 12–25083–01 (H3103)

Operating System Support

Micro/RSX	Version 4.0 and later
RSX–11M	Version 4.3 and later
RSX–11M–PLUS	Version 4.0 and later
ULTRIX–32	Version 2.2
VMS	Version 4.6a and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 2.10 (release 120) and later

CXA16/M3118–YA
CXB16/M3118–YB

Documentation

CXA16/CXB16 Technical Manual	EK–CAB16–TM
CXA16/CXB16 User's Guide	EK–CAB16–UG

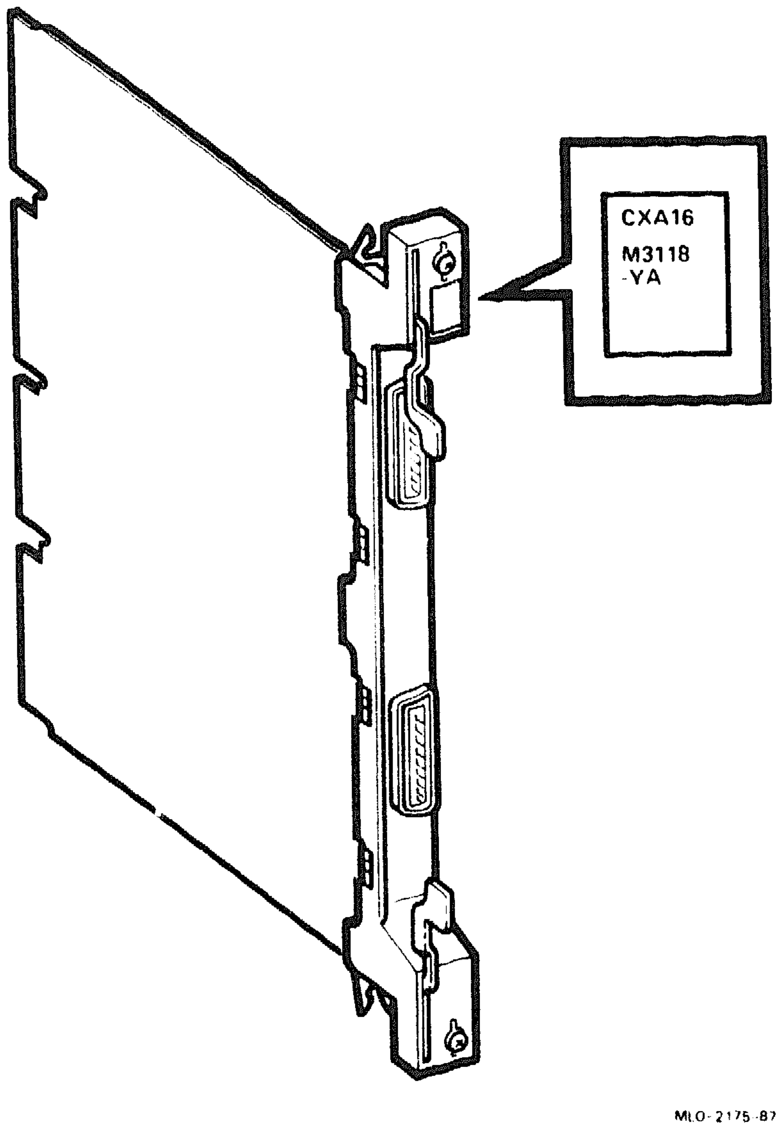
DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
CXA16–M	M3118–YA	1.6	0.2	10.4	3.0	0.5	-
CXB16–M	M3118–YB	2.0	0.0	10.0	3.0	0.5	-

The CXA16/CXB16 asynchronous multiplexer performs data concentration, terminal interfacing, and cluster controlling. The CXA16/CXB16 is shown in Figure 1.

The CXA16/CXB16 is a quad-height module (Figure 1) that provides 16 full-duplex, asynchronous data-only channels. The CXA16/CXB16 is compatible with RS423–A and DEC423 interface standards. In addition, the CXB16 is compatible with the RS422–A interface standard.

Figure 1: CXA16/CXB16 Module (M3118–YA/–YB)



CXA16/M3118-YA
CXB16/M3118-YB

All lines have transient surge suppressors for protection against electrical overstress (EOS) and electrostatic discharge (ESD). You can program each channel separately for split transmit and receive speeds. There are 16 available baud rates:

Available Baud Rates	
50	1800
75	2000
110	2400
134.5	4800
150	7200
300	9600
600	19,200
1200	38.400

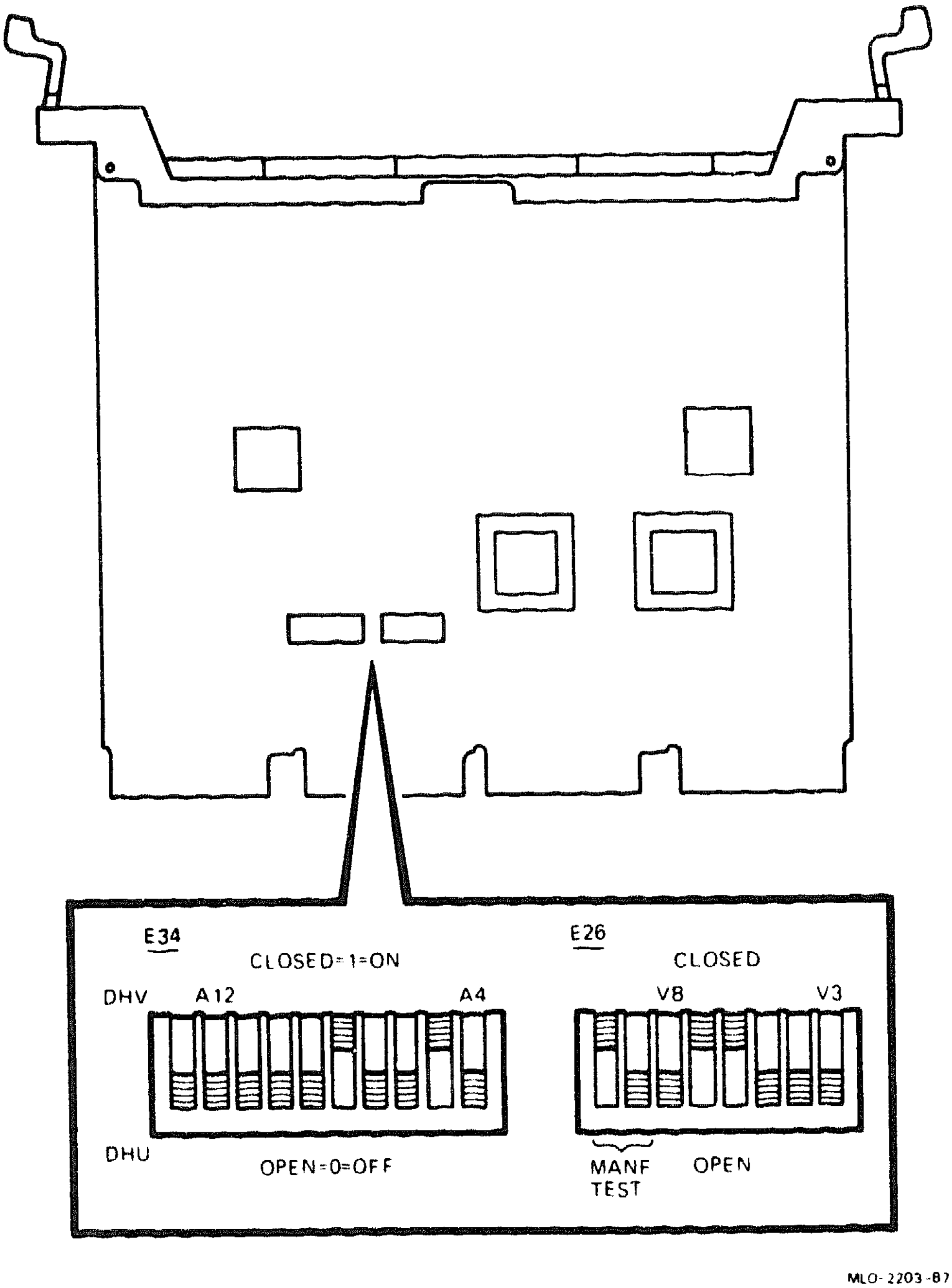
The CXA16/CXB16 provides two throughput rates, based on the character format:

- 122,880 characters per second, at seven bits per character, with one start bit, one parity bit, and one stop bit
- 175,542 characters per second, at five bits per character, with one start bit, no parity bit, and one stop bit

CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

Set the CSR address and interrupt vector for the CXA16/CXB16 by using DIP switches on the module (Figure 2). The CXA16/CXB16 uses a floating CSR address and interrupt vector.

Figure 2: CXA16/CXB16 Module Layout



CXA16/M3118–YA
CXB16/M3118–YB

The CXA16/CXB16 factory positions are as follows:

CXA16/CXB16 CSR Address: 17760440 (factory position)
Switchpack E34

Address Bits:	A12	A11	A10	A9	A8	A7	A6	A5	A4
E34 Switches:	2	3	4	5	6	7	8	9	10
CSR Address 17760440:	0	0	0	0	1	0	0	1	0

1 = closed, 0 = open

CXA16/CXB16 Interrupt Vector: 300 (factory position)

Vector Bits:	V8	V7	V6	V5	V4	V3
E26 Switches:	3	4	5	6	7	8
Vector Address 300:	0	1	1	0	0	0

1 = closed, 0 = open

Switch E34–1 selects DHV11 or DHU11 programming mode. Select the mode appropriate to the device driver in the system. Generally, DHU11 mode gives better performance because it does not require as much CPU time. To select DHU11 mode, set switch E34–1 to 1 (closed).

For correct operation, make sure switch E27–1 is closed (1) and switch E27–2 is open (0). Closing switch E27–1 selects the onboard 14.7458-MHz oscillator. Closing switch E27–2 selects the external loopback indicator for the self-test, in both DHU and DHV modes.

Both the CXA16–AA and –AF, and CXB16–AA and –AF include a 70–24314–01 cabinet kit with the following parts:

Two 7.6 m (25 ft) BC16D–25 cables
Two H3104 cable concentrators
Cable extender (null modem cable with modified modular jacks)

Both the H8571–A and H8571–B convert a D-connector to a modified modular jack. This conversion is required for connecting terminals and printers to office cables terminated with modified modular plugs. The H3105 converts EIA–232–D signals to DEC423 signals.

CXY08 8-Line Asynchronous Multiplexer

The CXY08 module is an option for BA200-series enclosures only.

Ordering Information

Module (M3119–YA)	CXY08–AA (factory installed) CXY08–AF (field upgrade)
Loopback connectors (external)	H3046 H3197 (12–15336–07)

Operating System Support

Micro/RSX	Version 4.0 and later
RSX-11M	Version 4.3 and later
RSX-11M-PLUS	Version 4.0 and later
ULTRIX-32	Version 2.2
VMS	Version 4.6.a and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 2.10 (release 120) and later

Documentation

CXY08 Technical Manual	EK–CXY08–TM

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
CXY08–M	M3119–YA	1.8	0.3	12.6	3.2	0.5	–

NOTE: *Both the CXY08–AA and –AF include a 70–24314–01 external cable.*

The CXY08 asynchronous multiplexer performs data concentration, real-time processing, and interactive terminal handling. The CXY08 is a quad-height module with a BA200-series handle (Figure 1). The CXY08 option also includes two cable assemblies. The module provides eight full-duplex serial data channels. Each cable assembly has a 4-channel distributor.

All eight channels allow autoanswer dial-up operation over the public-switched telephone network. You can use AT&T 103, 113, and 212 modems, or the equivalent.

CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

Select the CSR address and interrupt vector for the CXY08 by using DIP switches on the module (Figure 2). The CXY08 uses a floating CSR address and interrupt vector.

Figure 1: CXY08 Module (M3119–YA)

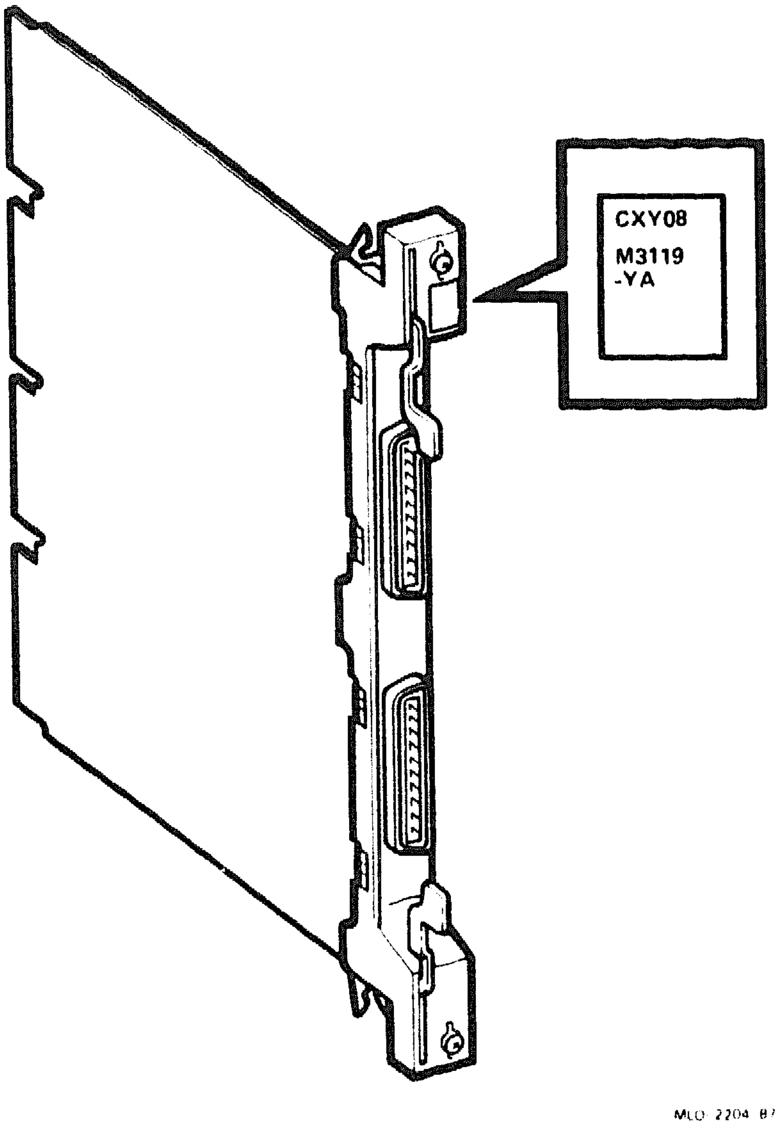
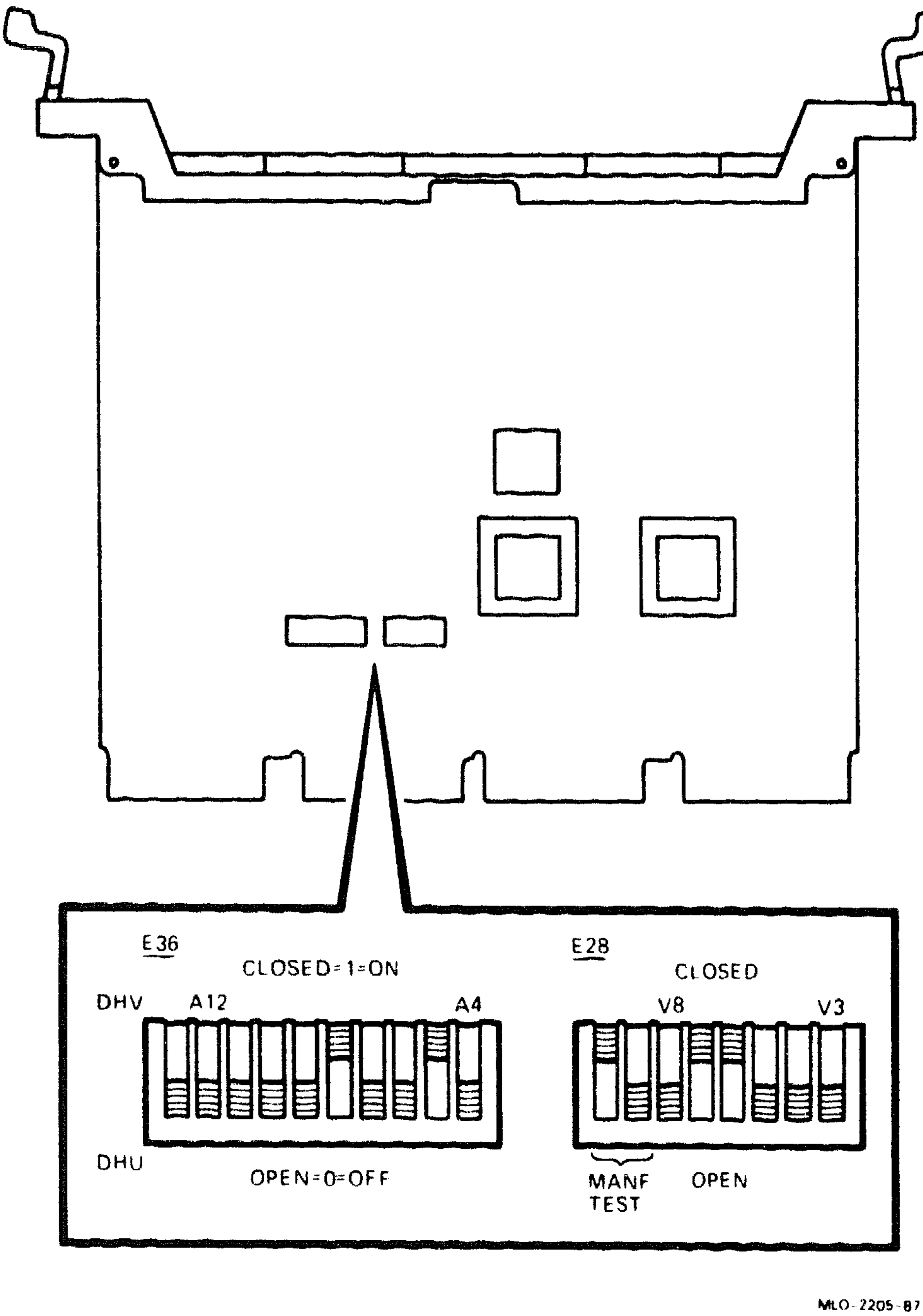


Figure 2: CXY08 Module Layout



The CXY08 factory CSR address switch positions are as follows:

CSR Address Bits

NOTE: *(1 = closed, 0 = open)*

	A12	A11	A10	A9	A8	A7	A6	A5	A4
E36 Switches	2	3	4	5	6	7	8	9	10
CSR Address 17760440:	0	0	0	0	1	0	0	1	0

CYX08 Interrupt Vector: 300 (factory position)

Vector Address Bits

1 = CLOSED, 0 = OPEN:

Vector bits	V8	V7	V6	V5	V4	V3
E28 Switches	3	4	5	6	7	8
Vector Address 300:	0	1	1	0	0	0

Switch E36–1 selects DHV11 or DHU11 programming mode. Select the mode appropriate to the device driver in the system. Generally, DHU11 mode gives better performance because it does not require as much CPU time. To select DHU11 mode, set switch 36–1 to 0 (open). This selects the DHU11 programming mode, while setting switch 36–1 to 1 (closed), selects DHV11 programming mode.

Switch E28–1 should be set to 1 (closed) and switch E28–2 should be set to 0 (open); these switches are used during manufacturing.

DEFQA FDDIcontroller to Q–bus Adapter

The DEFQA is an adapter that allows the transmission of data from Q–bus-based MicroVAX 3300, 3400, 3500, 3600, 3800, 3900 and BA4xx-based VAX 4000 systems to the FDDI network.

The DEFQA is available as either a single attachment station (SAS) or a dual attachment station (DAS) to the network. Figure 1 shows a DAS DEFQA.

Ordering Information	
SAS DEFQA/M7534–AS for BA2xx/4xx-based systems (factory installed)	DEFQA–SA
SAS DEFQA/M7534–AS for BA2xx/4xx-based systems (field installed)	DEFQA–SF
DAS DEFQA/M7534–AD for BA2xx/4xx-based systems (factory installed)	DEFQA–DA
DAS DEFQA/M7534–AD for BA2xx/4xx-based systems (field installed)	DEFQA–DF
Performance	
Maximum throughput (constrained by Q–bus bandwidth)	15 megabits/second
Physical Specifications	
Single quad-height module	8 ½ in × 10 ½ in
Power Requirements	
SAS option	+5 Vdc, 5.12 A (maximum) +12 Vdc, 0.01 A (typical)
DAS option	+5 Vdc, 5.6 A (maximum) +12 Vdc, 0.01 A (typical)

Operating System Support	
OpenVMS	Version 5.5–2 with DEC LAN Device Driver Kit *or* Version 6.1 and later[1]
DEC LAN Device Driver Kit (TK50) for OpenVMS VAX Version 5.5–2	QA–OPAAA–H5
DEC LAN Device Driver Kit (magtape) for OpenVMS VAX Version 5.5–2	QA–OPAAA–HM
Diagnostic Support	
Power-On Self-Test Diagnostic (POST)	See the device documentation.
MicroVAX Diagnostic Monitor (MDM)	Version 138 and later
Related Documentation	
DEC FDDIcontroller/Q–bus Installation	EK–DEFQA–IN

[1]The kit is required *only* with Version 5.5–2 of the OpenVMS operating system.

Jumper and Switches

A pair of jumper pins reside on the DEFQA. Installing a jumper enables the FLASH memory to be updated. Usually, the jumper is removed.

A switchpack on the DEFQA allows you to set the CSR address. Switches 1 through 7 respectively represent Q–bus address bits 6 through 12, the variable part of the address (Example 1). Figure 1 shows the location of the switches.

Example 1 CSR Address

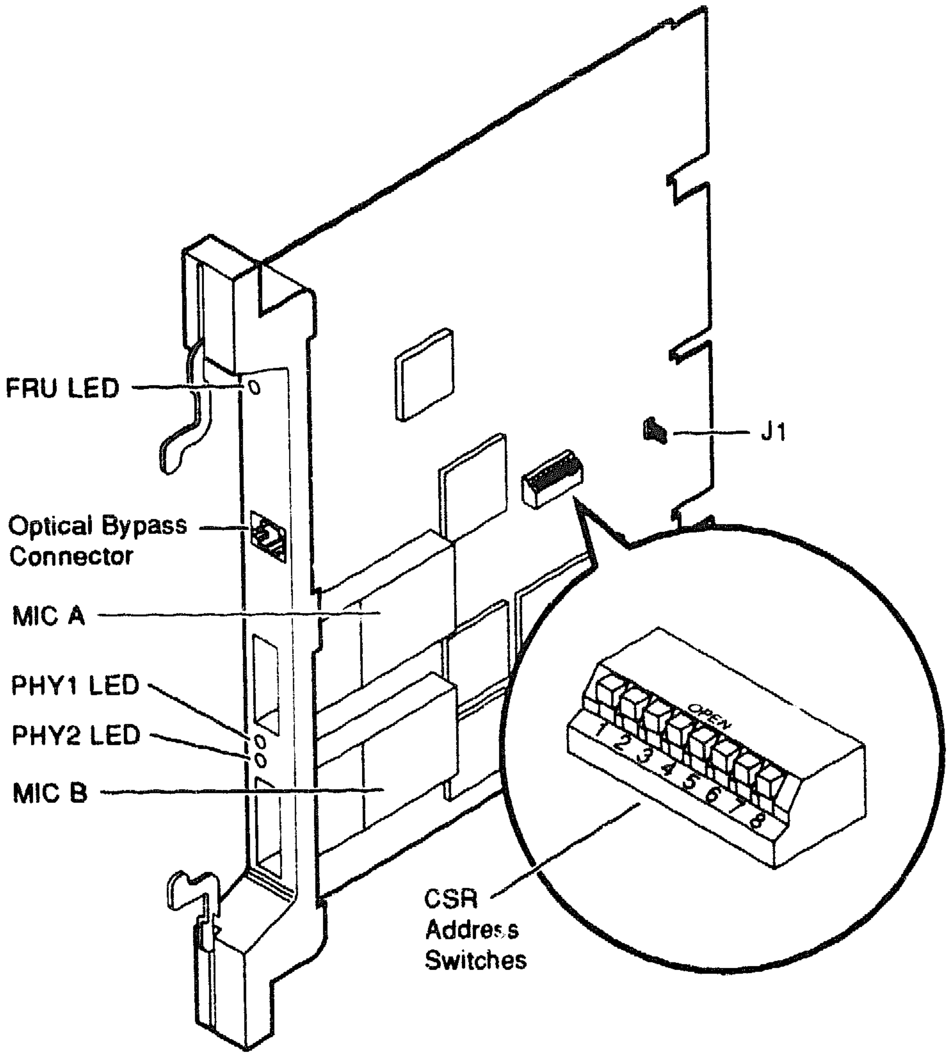
```
Address            1 7 7  6 1 4  0 0
                   _____  _____  ___
                     |      |     |
              Always 177    |   Always 00
                            |
                   Variable value set in switches
```

The following describes the switch settings for CSR address 17761400:

CSR Address	1	7	7	6	1	4	0	0
Binary Equivalent	1	1 1 1	1 1 1	1 1 0	0 0 1	1 0 0	0 0 0	0 0 0
Switch Settings	—	—	—	– 0	0 0 1	1 0 0	—	—
Switches	—	—	—	– 7	6 5 4	3 2 1	—	—

Switch Settings: 1 = On = Down = Open 0 = Off = Up = Closed

Figure 1 DEFQA Module (DAS Option)



NOTE: The optical bypass connector, PHY2 LED, and MIC B reside only on a DAS DEFQA.

MLO-010871

Indicators

Bicolor (red/green) LEDs on the DEFQA indicate its status. The SAS option has a field replaceable unit LED (FRU LED) and a physical layer FDDI connection state LED (PHY LED). The DAS option has an FRU LED and two PHY LEDs. The following table describes the LED indications and Figure 1 shows the LED locations on the DEFQA.

When the FRU LED is . . .	It indicates . . .	and you should . . .
Solid red for < 6 seconds	the DEFQA is in the power-up state	wait for the testing to complete.
Solid red for > 6 seconds	the DEFQA has failed its self-test	see the device documentation.
Blinking red	the DEFQA has detected a failure	see the devicc documentation.
Off	no power	power up the system box or expander.
Solid green	the DEFQA has successfully passed its self-test	operate the DEFQA.
Blinking green	the DEFQA has passed its self-test, and is waiting for the driver to be installed	wait for the driver installation to complete.

When the PHY LED is . . .	It indicates . . .	and you should . . .
Solid red	the DEFQA has detected a failure with the port, or the link confidence test (LCT) failed	verify the operation of the DEFQA by running the self-test diagnostic.
Blinking red	the cables are installed incorrectly	verify the cable connections.
Off	one of the following:	
	– no power	power up the system box or expander.
	– the port is not available	wait for the port.
	– software configuring is incomplete	wait for the completion.
Solid green	the DEFQA is working correctly and is in standby mode	do nothing.
Blinking green	one of the following:	
	– the port is not being used	do nothing.
	– the connection is in progress	wait for the connection.
	– the link is available, but cannot make a connection	verify the cable connections.

DELQA Ethernet Interface

Ordering Information

Module (M7516) for BA23, BA123, and H9642–J	DELQA–M		
Module (M7516–PA)	DELQA–SA (factory installed) DELQA–SF (field upgrade)		
	BA23	BA123	H9642–J
DELQA cabinet kit	CK–DELQA–YB	CK–DELQA–YA	CK–DELQA–YF
30-cm (12-in) cable/filter connector	70–21202–01	–	–
53-cm (21-in) cable/filter connector	–	70–21202–1K	–
90-cm (36-in) cable/filter connector	–	–	70–21202–03
Loopback connectors	70–21489–01 (external) 12–22196–02 (external)		

Operating System Support

ULTRIX–32	Version 2.2 or later
VMS	Version 4.6.a and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 2.10 (release 120) and later
XXDP	Version 2.1 (release 134): XQNAF0.OBJ
Power-up self-test LEDs	Three LEDs

Documentation

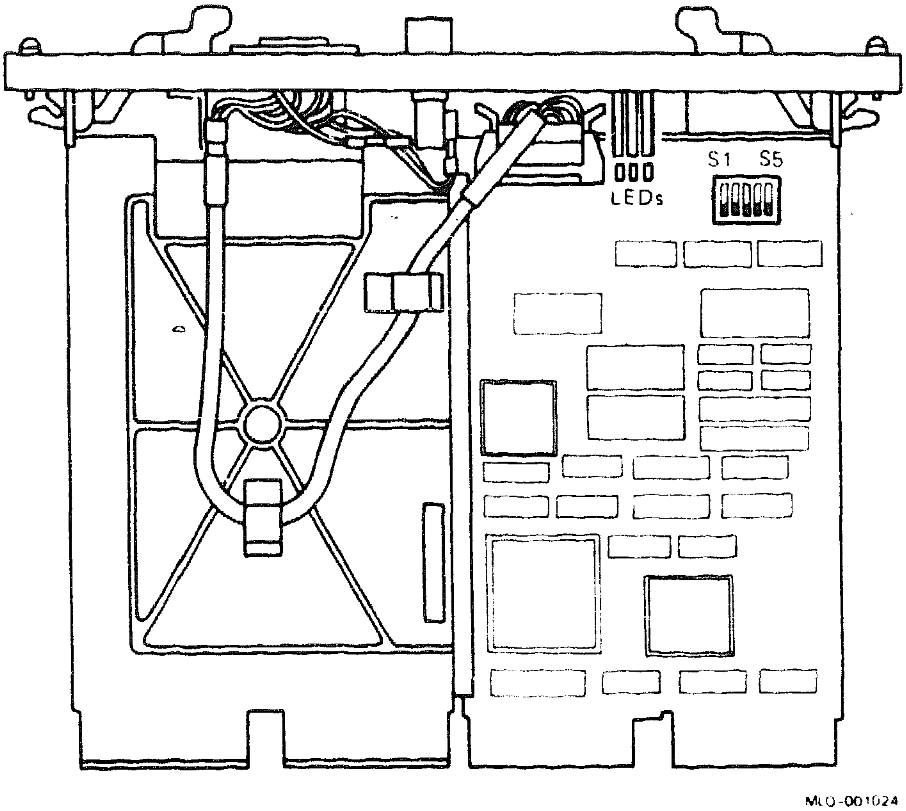
DELQA User's Manual	EK-DELQA-UG
DELQA Installation Guide	EK-DELQA-IN

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	Module	+5 V	+12 V	Watts	AC	DC	Insert
DELQA-M	M7516	2.5	0.5	19.5	2.2	0.5	A
DELQA-S	M7516-PA	2.5	0.5	19.5	2.2	0.5	–

The DELQA ovides a high-speed synchronous connection between a Q-bus system and a local area network (LAN) based on the Ethernet communications system. Ethernet lets computers exchange data within a moderate distance (2.8 km; 1.74 mi). The DELQA has all the functions of the DEQNA, plus maintenance operation protocol (MOP) functions. Figure 1 shows the DELQA-S module (M7516-PA).

Figure 1: DELQA–S Module Layout (M7516–PA)



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

You configure the DELQA by setting five switches, shown in Figure 1. The switches are set in the closed (1) position at the factory. The DELQA supports DEQNA mode and DELQA mode, which you select with S3. Note that S4 is an option switch, whose function depends upon the position of S3.

The sanity timer enabled by S4 monitors the host for hardware or software malfunctions. Enable the sanity timer for specific applications only.

CAUTION: *If you enable the sanity timer in the DEQNA mode and down-line load software or diagnostics, the sanity timer may time out before the load is complete.*

The DELQA interrupt vector of 120 is written into a read/write register by software. If a second DELQA is used, its interrupt vector floats.

Table 1 lists the functions of the DELQA switches. Table 2 lists the differences between DEQNA mode and DELQA mode.

Table 1: DELQA Switches

Switch	Function
S1	Open = CSR address 17774460 (for second DELQA)
S1	Closed = CSR address 17774440 (factory)
S2	Reserved
S3	Open = DEQNA mode selected (lock mode)
S3	Closed = DELQA mode selected (normal mode)
S4	Open, and S3 open = sanity timer ON
S4	Closed, and S3 open = sanity timer OFF
S4	Open, and S3 closed = remote boot ON
S4	Closed, and S3 closed = remote boot OFF (factory)
S5	Reserved

Table 2: DELQA Modes

Support	DEQNA Mode	DELQA Mode
All DEQNA functions	Yes	Yes
MOP functions	No	Yes
Self-test support	Yes	Yes
Boot/diagnostic code support	Yes	Yes
Sanity timer	Yes	No

Power-Up Self-Test

The DELQA power-up self-test runs only when the module is switched to DELQA normal mode. It is initiated at system power-up, hardware reset, network boot, or when you issue the following boot command:

```
>>> B XQAO
```

Three LEDs on the DELQA module display the test results (Table 3). To reset the LEDs, shut down the system, then power it up again.

Table 3: DELQA LED Self-Test Results

LED			
1	**2**	**3**	**Definition**
Off	Off	Off	DELQA citizenship (CQ) test passed.
Off	Off	On	External loopback test failed.
Off	On	On	DELQA internal error.
On	On	On	Cannot upload the BD ROM contents, or the first setup packet prefill failed.

NOTE: *If you replace the DELQA, you must: (1) install the original station address PROM from the old DELQA, or (2) change the network data base at the host system to reflect the new station address.*

DEQNA Ethernet Interface

Ordering Information

Module (M7504) for BA23, BA123, and H9642-J	DEQNA-M		
Module (M7504-PA) for BA200-series	DEQNA-SA (factory installed) DEQNA-SF (field upgrade)		
Fuse, 1.5 A slow blow	90-07213-00		
	BA23	BA123	H9642-J
DEQNA cabinet kit	CK-DEQNA-KB	CK-DEQNA-KA	CK-DEQNA-KF
30-cm (12-in) cable/filter connector	70-21202-01	-	-
53-cm (21-in) cable/filter connector	-	70-21202-1K	-
90-cm (36-in) cable/filter connector	-	-	70-21202-03
Loopback connectors	70-21489-01 (external) 12-22196-02 (external)		

Operating System Support

DSM-11	Version 3.3 and later
MicroVMS	Version 4.1m or later
RT-11	Version 5.4D and later
ULTRIX-32m	Version 2.0 or later
VAXELN	Version 1.1 or later

Diagnostic Support

MicroVAX Diagnostic Monitor	All versions and releases
XXDP	Version 2.1 (release 134): XPNAF0.OBJ
Power-up self-test	Three LEDs

Documentation

DEQNA Ethernet User's Guide	EK-DEQNA-UG

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
DEQNA-M	M7504	3.5	0.5	23.5	2.8	0.5	A
DEQNA-S	M7504-PA	3.5	0.5	23.5	2.2	0.5	-

The DEQNA is a dual-height module that connects a Q22-bus system to a local area network (LAN) based on the Ethernet communications system. Ethernet lets computers exchange data within a moderate distance (2.8 km; 1.74 mi). The DEQNA can transmit data at a rate of 1.2 Mbytes/sec through coaxial cable. For high Ethernet traffic, you can install a second DEQNA.

There are two versions of the DEQNA module:

For the BA23, BA123, and H9642	DEQNA-M (Figure 1)
For BA200-series	DEQNA-SA (Figures 2 and 3)

Figure 1: DEQNA–M Module Layout (M7504)

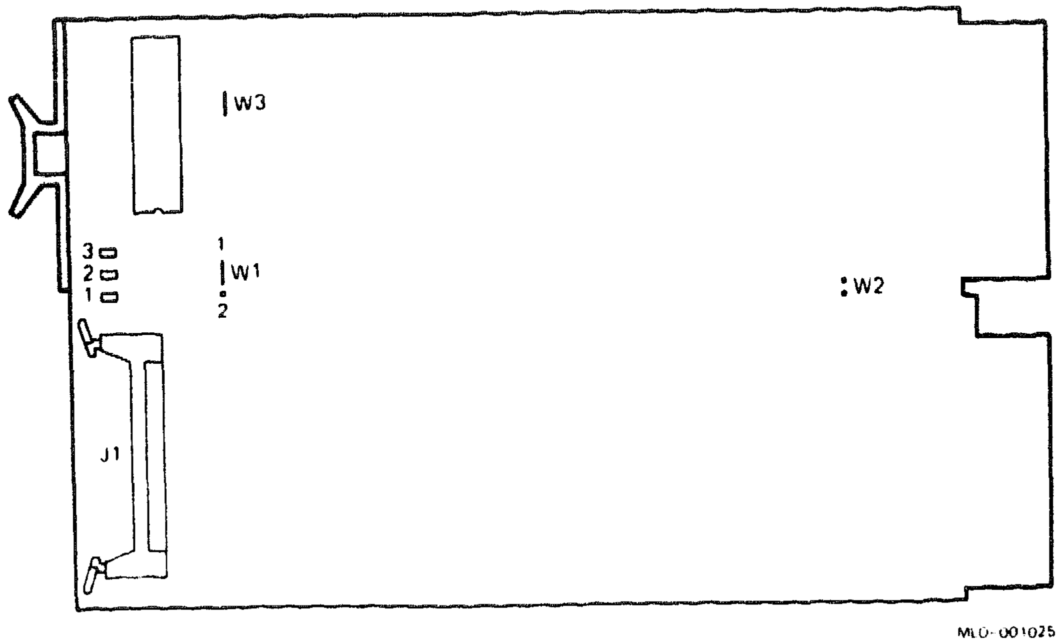


Figure 2: DEQNA–SA Module Layout (M7504–PA)

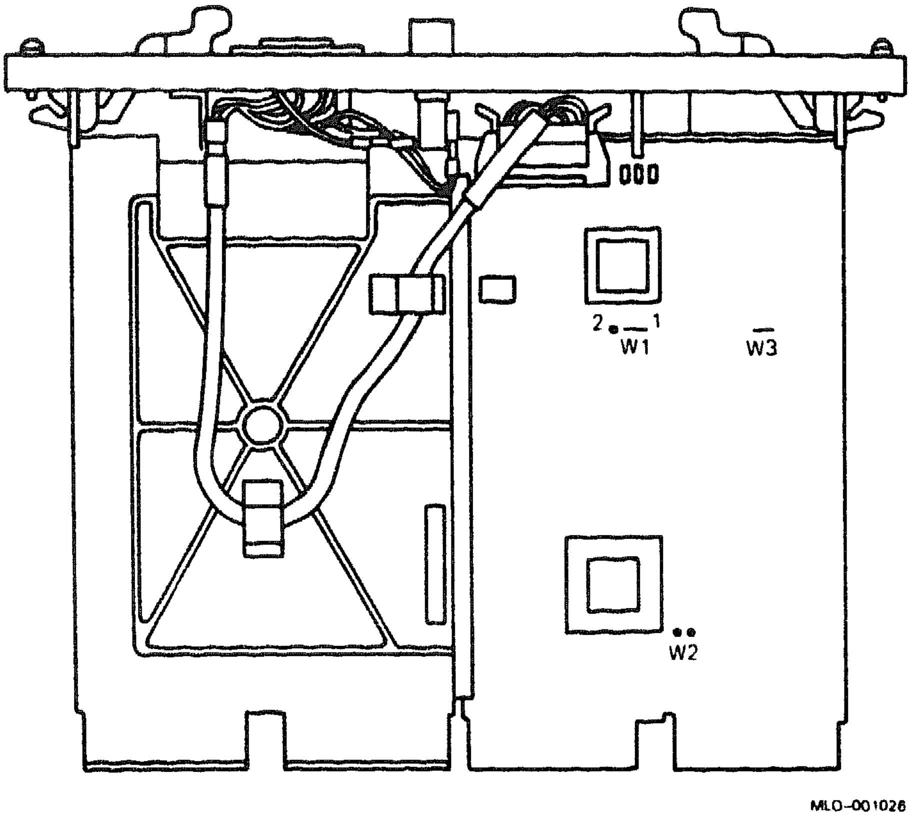
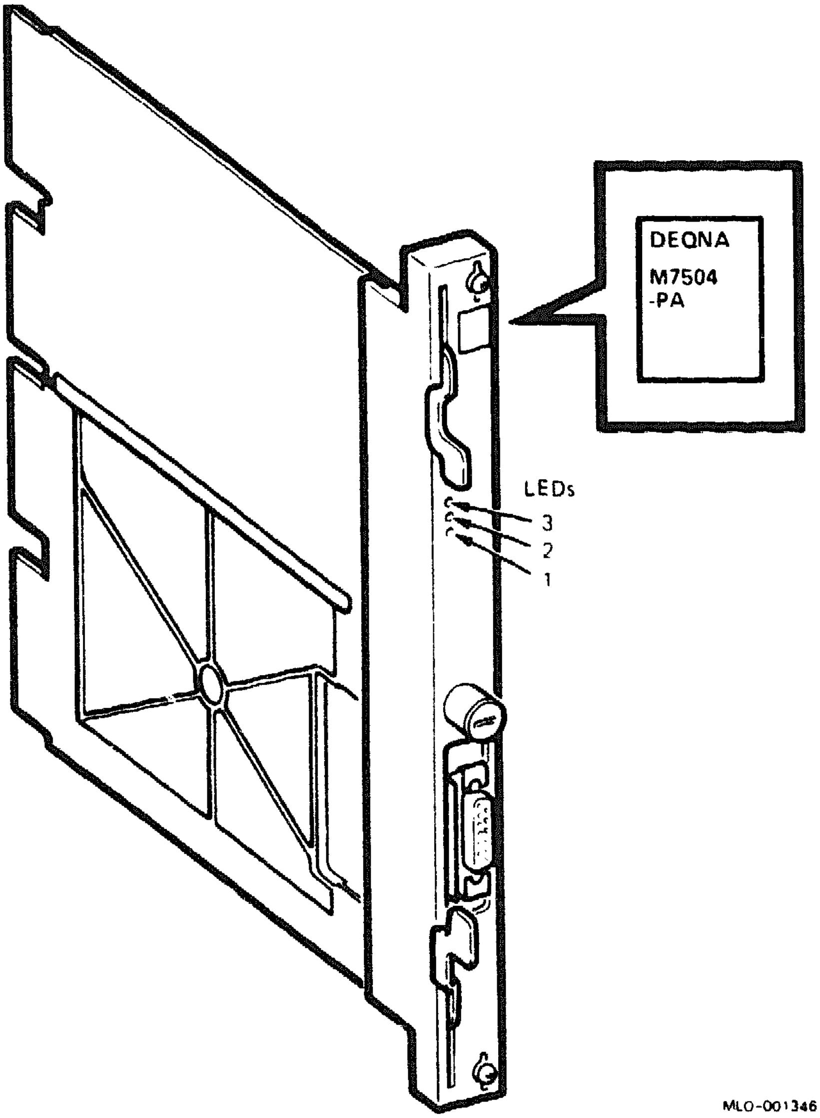


Figure 3: DEQNA–SA Handle



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

DEQNA/M7504

You configure the DEQNA by using three jumpers, W1 through W3. Jumper W1 determines the CSR address. The DEQNA CSR addresses are factory positioned as follows:

DEQNA Module No.	CSR Address
1	17774440
2	17774460

If you install two DEQNAs, move jumper W1 of the second DEQNA to the left (farthest from W3) and center pins (Figure 1 or 2).

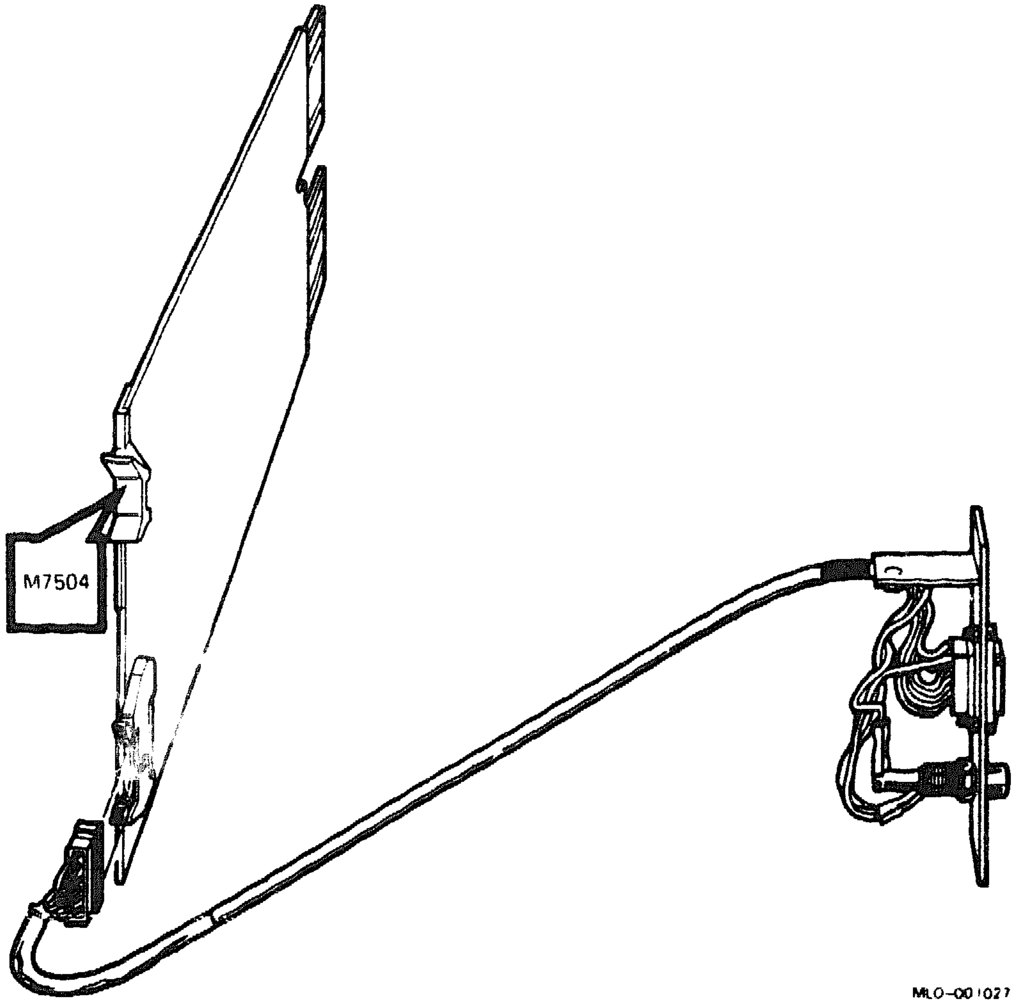
The interrupt vector is written into a read/write register by software. The interrupt vectors are as follows:

DEQNA Module No.	Interrupt Vector
1	120
2	Floating

Jumper W2 is normally removed, in order to provide fair access to all DMA devices using the Q22-bus. When removed, W2 makes the DEQNA wait 5 µsec before requesting the bus again.

Jumper W3 is normally installed, in order to disable a sanity timer at initialization. Figure 4 shows the internal cabling for the DEQNA-M.

Figure 4: DEQNA–M Internal Cabling



DEQNA Power-Up Self-Test

The DEQNA self-test is run by the CPU, not by the DEQNA's onboard microcomputer chip. This feature improves the accuracy of a successful test, because the test checks the Q22-bus interface. However, it reduces the accuracy of an unsuccessful test, because a CPU or Q22-bus problem can also cause the failure. The accuracy of a successful test is also improved because the test performs an external loopback test through the Ethernet transceiver or a loopback connector.

Figure 5 shows the DEQNA LEDs. Table 1 describes the LED error codes for a system that uses the DEQNA as a boot device. If the system does not use the DEQNA as a boot device, all LEDs remain on.

Figure 5: DEQNA Module LEDs

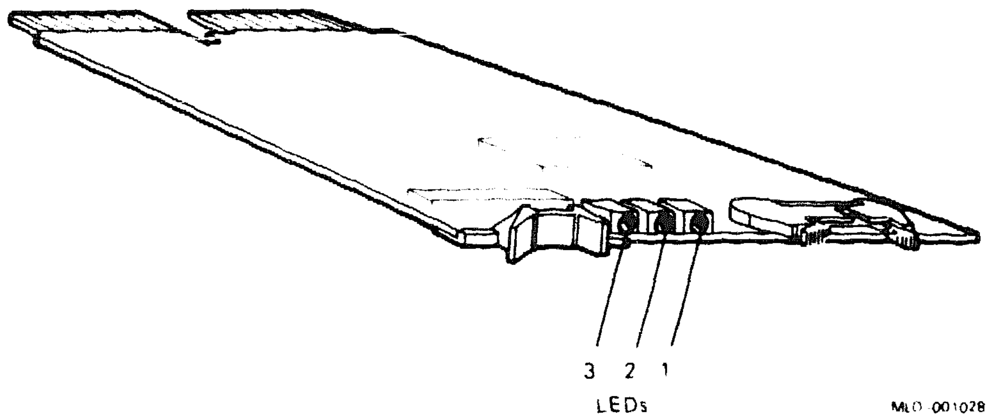


Table 1: DEQNA LED Error Codes

LEDs			
3	**2**	**1**	**Test and Possible FRU Failures**
On	On	On	DEQNA station address PROM test 1. DEQNA module 2. KA630 module 3. Q22-bus device 4. Backplane
On	On	Off	DEQNA internal loopback test 1. DEQNA module
On	Off	Off	DEQNA external loopback test (Requires loopback connector or working transceiver.) 1. DEQNA module 2. Cabling (shorted, opened, or not connected) 3. Fuse in CPU I/O insert
Off	Off	Off	DEQNA passed all power-up tests.

DEQRA Token Ring Controller

The DEQRA Token Ring Controller and its software, TRDRV/VMS, enables Q-bus VAX systems to connect to either a 4- or 16-Mbits/second Token Ring network, and act as full function DECnet Phase IV nodes and PATHWORKS for VMS servers.

Token Ring

The Token Ring Controller (M7533-AB) is a quad height Q-bus module that is used to communicate between the Q-bus and an IBM-compatible Token Ring (IEEE). This controller has a Token Ring port recessed into the module handle.

Some of the features include a 32-bit processor, random-access memory, programmable read-only memory, Token Ring interface circuitry, and host interface circuitry. Self-test diagnostics are provided on the module. A serial EIA–232 console port is provided for connection to a console device. It is used with BA200-series and BA400-series enclosures.

Ordering Information

DEQRA–CA	DEQRA module, documentation, and license letter
BC29E–15 (optional)	External console ribbon cable, 15-feet. Used for microcode DEBUG
BC26P–15 (optional)	Adapter cable used to connect Token Ring.
OL–GVJAP–AA	Software license

Functional Information

Supported protocols	IBM-compatible Token Ring (IEEE 802.5)
Operating system supported	VMS 5.4-3
	DECTRN Driver VMS 1.0

Performance

Data transfer rate	4-Mbits and 16-Mbits

Diagnostic Support

Diagnostic support	Power-up self test MDM (Version 136) Installation Verification Procedure DEQRA specific from host

Configuration Information

M7533–AB	Base module
Form factor	Quad height

Related Documentation

EK–DEQRA–IN	DEC TRNcontroller 100 Hardware Installation and Debugging
EK–DEQRA-TM	DEC TRNcontroller 100 Hardware Description and Operation
AA–PH7NA–TE	DEC Token Ring Network Device Driver for VMS Installation
AA–PH7PA–TE	DEC Token Ring Network Device Driver for VMS Use and Programming

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads (Maximum)	
Option	Module	+5 V	+12 V	Watts	AC	DC
DEQRA	M7533–AB	5.0	0.1	21.2	5.0	2.0

Switches

The following address switches are for the Q-bus.

Push button switch NMI

When pressed, NMI switch puts the MC68020 processor on the module into ODT68 (Debugging Mode). Normally unused.

Push button switch RST

When pressed the RST switch will reset the MC68020 processor and run onboard power-up diagnostics. Not used during normal operation.

NOTE: *The memory address jumper is shipped with jumper in from the factory.*

Shard Memory Base Address

The following table lists the switch numbers for the base address range.

Table 1: Shared Memory Base Address Switch Numbers

	Address Bits Switch Numbers		
Address Range	**S1**	**S2**	**S3**
00000000-01777777	0	0	0
02000000-03777777	0	0	1
04000000-05777777	0	1	0
06000000-07777777	0	1	1
10000000-11777777	1	0	0
12000000-13777777	1	0	1
14000000-15777777	1	1	0
16000000-17777777	1	1	1

Interrupt Level

The interrupt request (IRQ) is level 4 (BR4).

Control Status Register (CSR)

The following table lists the CSR bits and a functional description of each of the bits.

Table 2: Control Status Register (CSR) Bits

Bits	Description
(15–09)	Output Port: Bits are read only by the CPU host and user definable.
08	Unused
07	Host Non-maskable Interrupt (NMI) request: When the host sets this bit to 1, it puts the 68020 processor on the module into ODT68 debugging.
06	Interrupt Enable (IE): When the host sets this bit to 1, the Q-bus IRQ4 interrupt is enabled.
05	Host Reset Request (HRR): When the host sets this to 1, it causes the MC68020 processor on the module to reset and run the onboard power-up diagnostics.
04–00	Input Port: These bits are read/writeable by the host. They are user definable.

Control Status Register (CSR) Switch Settings

The following table lists the CSR switch settings.

Table 3: CSR Switch Settings

		CSR Switches[1] [2]										
Base Address[3]	**Q-bus Address**	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**S8**	**S9**	**S10**	**S11**	**S12**
2000 0000	760000	0	0	0	0	0	0	0	0	0	0	0
2000 0040	760002	0	0	0	0	0	0	0	0	0	0	1
2000 0800	760004	0	0	0	0	0	0	0	0	0	1	0
2000 00C0	760006	0	0	0	0	0	0	0	0	0	1	1
2000 0100	760010	0	0	0	0	0	0	0	0	1	0	0
2000 0140	760012	0	0	0	0	0	0	0	0	1	0	1
2000 0180	760014	0	0	0	0	0	0	0	0	1	1	0
2000 01C0	760016	0	0	0	0	0	0	0	0	1	1	1
2000 0200	760020	0	0	0	0	0	0	0	1	0	0	0
2000 0F40	767772	1	1	1	1	1	1	1	1	1	0	1
2000 0F80	767774	1	1	1	1	1	1	1	1	1	1	0
2000 0FC0	767776	1	1	1	1	1	1	1	1	1	1	1

[1]Switch ON = 1, Switch OFF = 0
[2]Switch 1 is not used
[3]Default address is 761344

Table 4: Module Interface Connector Pins Definitions

Bus Pin	Signal Mnemonic
AA1	No connection
AB1	No connection
AC1	BDAL16 L
AD1	BDAL17 L
AE1	No connection
AF1	No connection
AH1	No connection
AJ1	GND
AK1	No connection
AL1	No connection
AM1	GND
AN1	No connection
AP1	No connection
AR1	BREF L
AS1	No connection
AT1	GND
AU1	No connection
AV1	No connection
BA1	BDCOK H
BB1	No connection
BC1	BDAL18 L
BD1	BDAL19 L
BE1	BDAL20 L

Table 4 (Cont.): Module Interface Connector Pins Definitions

Bus Pin	Signal Mnemonic
BF1	BDAL21 L
BH1	No connection
BJ1	GND
BK1	No connection
BL1	No connection
BM1	GND
BN1	No connection
BP1	No connection
BR1	No connection
BS1	No connection
BT1	GND
BU1	No connection
BV1	+5
AA2	+5
AB2	No connection
AC2	GND
AD2	No connection
AE2	BDOUT L
AF2	BRPLY L
AH2	BDIN L
AJ2	BSYNC L
AK2	BWTBT L
AL2	BIRQ4 L
AM2	BIAKI L

Table 4 (Cont.): Module Interface Connector Pins Definitions

Bus Pin	Signal Mnemonic
AN2	BIAKO L
AP2	BBS7 L
AR2-AS2	JUMPERED
AT2	BINIT L
AU2	BDAL00 L
AV2	BDAL01 L
BA2	+5
BB2	No connection
BC2	GND
BD2	+12
BE2	BDAL02 L
BF2	BDAL03 L
BH2	BDAL04 L
BJ2	BDAL05 L
BK2	BDAL06 L
BL2	BDAL07 L
BM2	BDAL08 L
BN2	BDAL09 L
BP2	BDAL10 L
BR2	BDAL11 L
BS2	BDAL12 L
BT2	BDAL13 L
BU2	BDAL14 L

Table 4 (Cont.): Module Interface Connector Pins Definitions

Bus Pin	Signal Mnemonic
BV2	BDAL15 L
A2	+5
C2	GND
M2-N2	JUMPERED
R2-S2	JUMPERED
T1	GND

DESQA Ethernet Adapter

The DESQA–S is a microprocessor–based device that provides all the logic necessary to connect to the Ethernet. The DESQA provides an interface from the Q-bus to ThinWire, thickwire (standard), or IEEE 802.3 network. It is fully supported by both the PDP–11 and MicroVAX families, which are available in BA200-series enclosures.

Ordering Information

DESQA–S Q-bus to Ethernet adapter module	70–24505–01
Gap filler assembly (gap filler and two flathead screws)	M3127–PA
BNC tee-connector	12–25869–01
BNC 50-ohm terminators (2)	12–26318–02
Cable clamp (ThinWire)	12–29702–01

Operating System Support

VMS
DECnet RSX
RSTS
ULTRIX–32
VAXELN
DSM–11
RT–11

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 3.01 (release 126) and later
Power-up self-test LEDs	Six LEDs

Documentation

DESQA Technical Manual	EK–DESQA–TM
DESQA Field Maintenance Print Set	MP–02435
H4000 Ethernet Transceiver Field Maintenance Print Set	MP–01369
H4000 Ethernet Transceiver Technical Manual	EK–H4000–TM
Ethernet Installation Guide	EK–ETHER–IN
DECconnect System Planning and Installation Guide	EK–DECSY–CG
MDM User's Guide[1]	AA–FM7AE–DN

[1]Included in the MicroVAX Systems Maintenance Kit (ZNABX–GZ, C5).

Documentation

Guide to Networking on VAX/VMS	AA–Y512B–TE
NIE User's Guide	AA–H106A–TE
Introduction to Local Area Networking	EB–22714–18
The Ethernet, A Local Area Network, Data Link Layer, and Physical Layer Specification	AA–K759B–TK

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	Module	+5 V	+12 V	Watts	AC	DC	Insert
DESQA–SA	M3127	2.4	0.22	14.64	3.3	0.5	B

Table 1: DESQA–S (M3127–PA) (Jumper)

Jumper Selection	Function
Middle pin row to ThinWire pin row	ThinWire
Middle pin row to thickwire pin row	Thickwire (standard)

Table 2: DESQA–S (M3127–PA) (Switch)

Switch Selection	Function
IN	Thickwire (standard)
OUT	ThinWire

CAUTION: *The ThinWire/thickwire switch should only be used with the system power turned off.*

Figures 1 and 2 show the module layout with jumpers and switch.

Figure 1: DESQA (M3127–PA) Module Layout/Jumpers

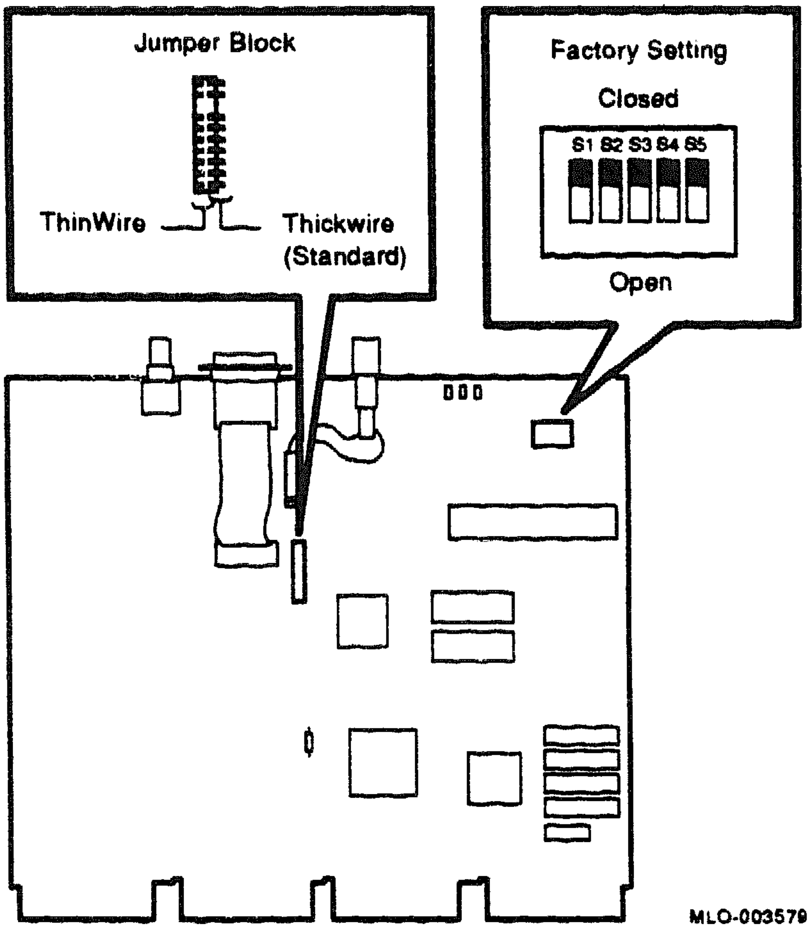


Figure 2: DESQA (M3127–PA) Module Layout/Switch

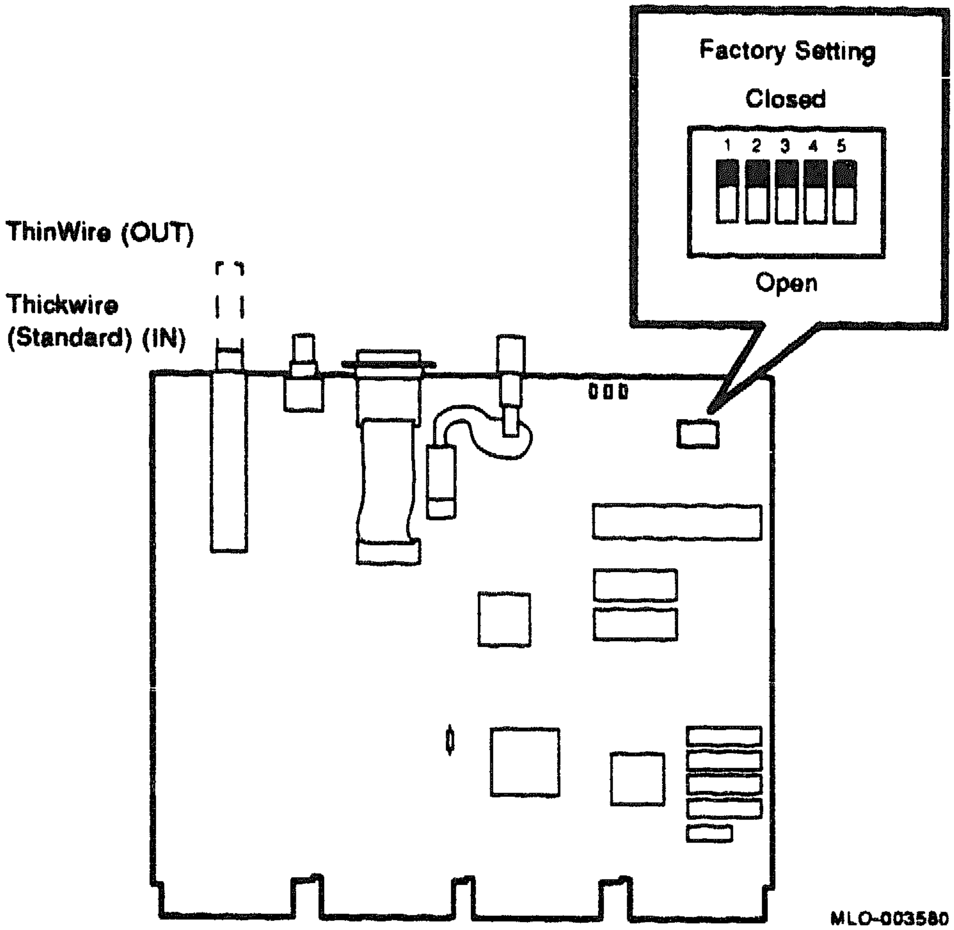


Table 3: CSR Address Selection

Switch	Position	Function
S1	closed	Selects CSR address 17774440 (factory setting)
	open	Selects CST address 17774460 (second DESQA)
S2	—	Reserved
S3	closed	Selects normal mode (factory setting)
	open	Selects DEQNA lock mode
S4 closed	S3 closed	Remote boot disabled (factory setting)
S4 closed	S3 open	Sanity timer disabled at power up
S4 open	S3 closed	Remote boot enabled at power up
S4 open	S3 open	Sanity timer enabled at power up
S5	—	Reserved

DFA01 Modem

The DFA01 is an option for BA200-series enclosures only.

Ordering Information

Module (M3121–PA)	DFA01–AA (factory installed) DFA01–AF (field upgrade)

Operating System Support

Micro/RSX	Version 4.0 and later
MicroVMS	Version 4.6.a and later
ULTRIX–32	2.2

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 2.0 (release 115) and later

Documentation

DFA01 Modem User's Guide	EK–CAB16–TM
DFA01 Modem Option Installation Guide	EK–DFA01–IN

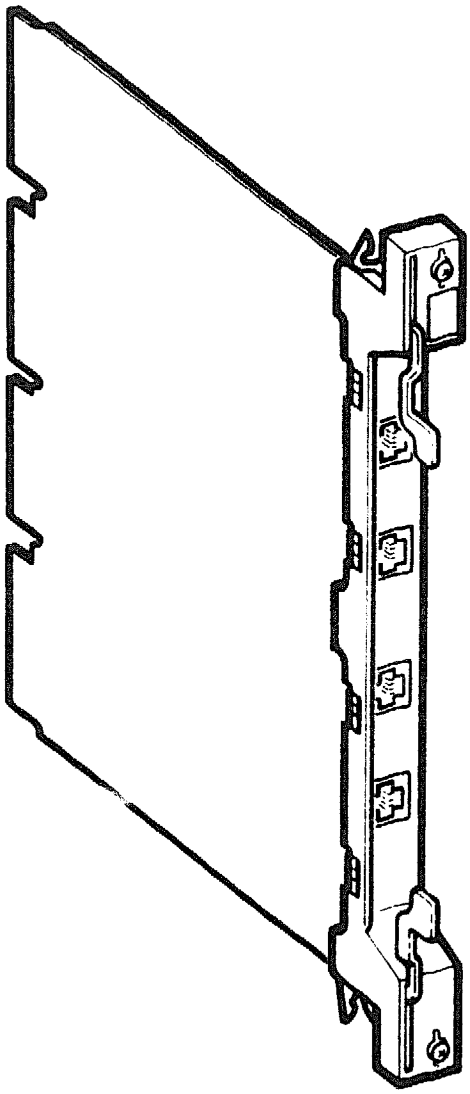
DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
DFA01–A	M3121–PA	1.97	0.4	14.7	3.0	1.0	–

The DFA01 quad-height modem, shown in Figures 1 and 2, consists of a pair of 300/1200/2400 bits/s direct connect modems and a DZQ11 interface. This modem is designed as a Q22-bus device for BA200-series enclosures only. The DFA01 modem uses standard dial-up telephone service to transmit and receive serial binary data.

The DFA01 is a full-duplex device based on the CCITT V.22 *bis* technology. You can install up to eight DFA01 modules in a BA200-series enclosure for a 2- to 16-line capability in the United States and Canada.

Figure 1: DFA01 Module with Handle

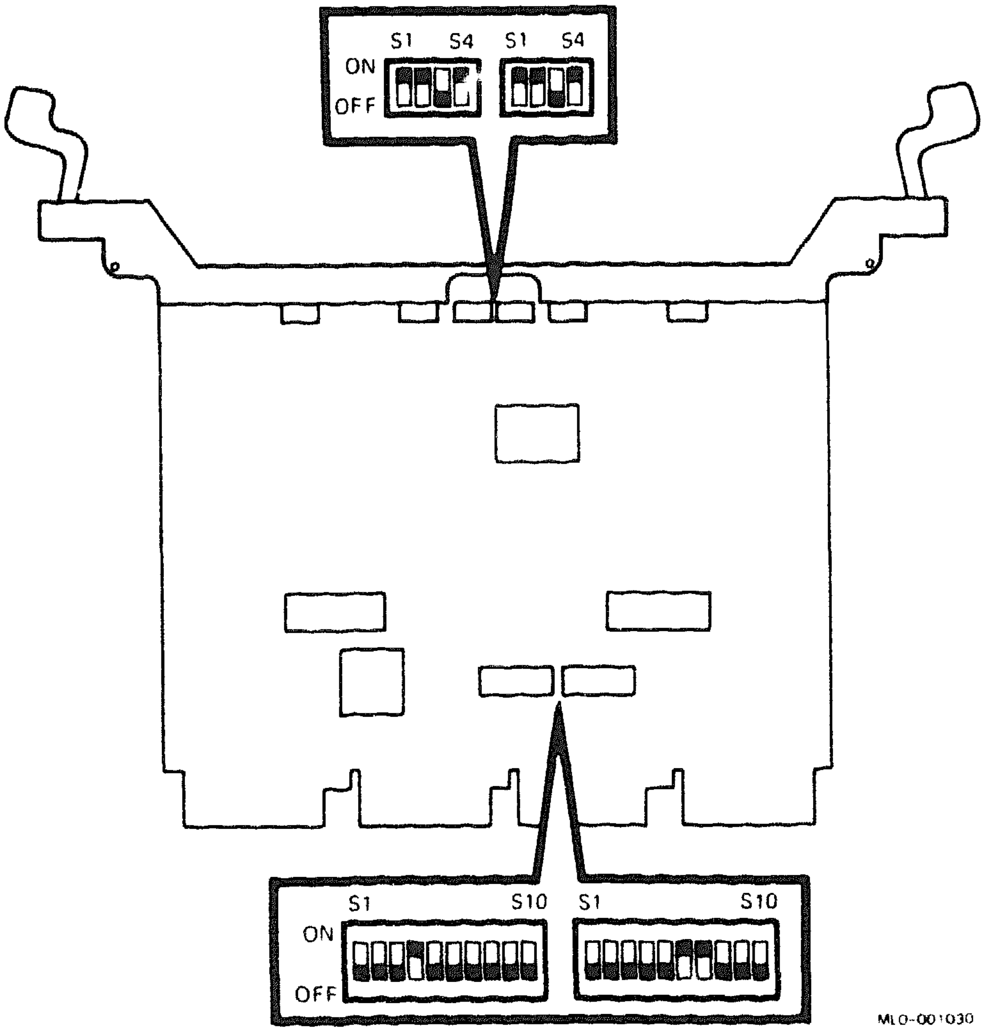


MLO–001029

CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

The DFA01 contains four switchpacks with 28 switch settings. The location of the switchpacks and their factory configurations are shown in Figure 2. The DFA01 module is configured at the factory for connection to single and multiline telephone service.

Figure 2: DFA01 Module Layout (M3121–PA)



Use switchpack S2, switches 1 through 10, to set the CSR address of the DFA01. Use switchpack S1, switches 3 through 8, to set the interrupt vector. The following tables list the factory configurations for the CSR address and interrupt vector:

DFA01 CSR Address: 17760100 (factory position)
Switchpack S2

Address Bits:	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3
S2 Switches:	10	9	8	7	6	5	4	3	2	1
CSR Address 17760100:	0	0	0	0	1	0	0	0	0	0

1 = closed, 0 = open

DFA01 Interrupt Vector: 300 (factory position)
Switchpack S1

Vector Bits:	V8	V7	V6	V5	V4	V3
S1 Switches:	8	7	6	5	4	3
Vector Address 300:	0	1	1	0	0	0

1 = closed, 0 = open

The remaining switches on switchpack S1 have the following functions:

S1 Switch	Function	Result
1	ON = line three DCOK.	Causes a pulse on the DCOK line.
2	ON = line three Boot/Halt.	Causes a halt condition on the CPU.
9	ON = MTST0 asserted.	All serial inputs are looped to their corresponding outputs.
10	ON = MTST1 asserted.	All outputs are floated to a high impedance state, and the state of MST0 is invalid.

Switchpacks S3 and S4 contain switches for PR/PC (programmed operation) and MI/MIC (mode interconnect sense). Switchpack S3 controls these settings for modem A, and switchpack S4 controls these settings for modem B.

PR/PC is used for programmable connections such as FJ41S or RJ45S when the wall jack has a resistor (installed by the local phone company) to program the output level of each modem's transmitter. PR/PC is enabled and disabled using switch S1 in each switchpack. The factory configuration is PR/PC disabled; S2 is enabled, allowing permissive operation.

Note that S1 and S2 cannot both be enabled at the same time. To enable PR/PC (S1), you must disable MI/MIC (S2).

Use MI/MIC for keyed telephone operation from the handset. You enable MI/MIC using switches S3 and S4 in each switchpack. When MI/MIC is enabled, the modem can sense these lines. The factory configuration is MI/MIC disabled. Table 1 lists the factory positions.

Table 1: DFA01 S3 and S4 Factory Positions

S3 and S4 Switches	State
1	Open (PR/PC disabled)
2	Closed (permissive operation enabled)
3	Open (MI/MIC disabled)
4	Open (MI/MIC disabled)

DHV11 8-Line Asynchronous Multiplexer

Ordering Information

Module (M3104)	DHV11–M		
	BA23	BA123	H9642–J
DHV11 cabinet kits	CK–DHV11–AB	CK–DHV11–AA	CK–DHV11–AF
30-cm (12-in) cable	BC05L–01	–	–
50-cm (21-in) cable	–	BC05L–1K	–
90-cm (36-in) cable	–	–	BC05L–03
Type-B filtered connector	H3173–A	H3173–A	H3173–A
Loopback connectors	H3277 (internal) 12–15336–07 (external) H329 (internal) H325 (external)		

Operating System Support

Micro/RSTS	Version 2.2 and later
Micro/RSX	Version 4.0 and later
MicroVMS	Version 4.1m and later
RSTS/E	Version 9.5 and later
RSX–11M	Version 4.3 and later
RSX–11M–PLUS	Version 4.0 and later
ULTRIX–11	Version 3.1 and later
ULTRIX–32m	Version 1.1 and later
VAXELN	Version 2.0 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	All versions and releases
XXDP	Version 2.1 (release 134): VDHAE0.BIC, VDHBE1.BIC, XDHVI0.OBJ.
Power-up self-test LEDs	One LED (On indicates correct operation.)

Documentation

DHV11 Technical Manual	EK-DHV11-TM

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
DHV11-M	M3104	4.5	0.55	29.1	2.9	0.5	B (2)

NOTE: *Each cabinet kit includes two type-B filtered connectors and the appropriate pair of cables.*

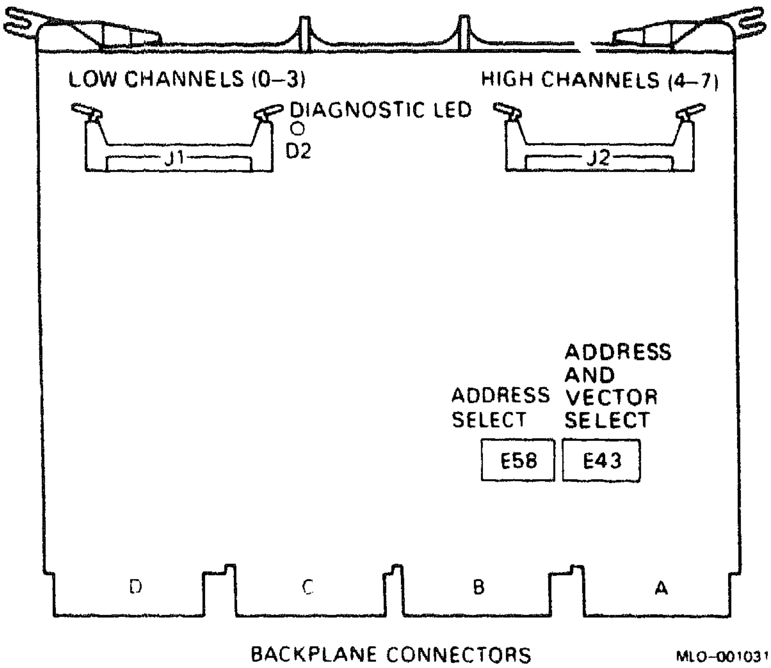
The DHV11 asynchronous multiplexer, shown in Figure 1, provides support for up to eight serial lines for data communications. The DHV11 is a quad-height module with the following features:

- Full modem control
- Direct memory access (DMA) or silo output
- Silo input buffering
- Split speed

The DHV11 is compatible with the following modems:

DIGITAL—DF01, DF02, DF03, DF112
AT&T—103, 113, 203c, 202d, 212

Figure 1: DHV11 Module Layout (M3104)



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

Use switchpacks E58 and E43 (Figure 1) to set the CSR address and interrupt vector. The CSR address and interrupt vector are floating, and depend on the other modules in the system. The following tables list the factory configurations for the CSR address and interrupt vector:

DHV11 CSR Address: 17760460 (factory position)
Switchpacks E58 and E43

Address Bits:	A12	A11	A10	A9	A8	A7	A6	A5	A4
E43 and E58 Switches:	1	2	3	4	5	6	7	8	1
CSR Addresses:									
17760440	0	0	0	0	1	0	0	1	0
17760460	0	0	0	0	1	0	0	1	1
17760500	0	0	0	0	1	0	1	0	0
17760520	0	0	0	0	1	0	1	0	1

1 = on, 0 = off

DHV11 Interrupt Vector: 300 (factory position)
Switchpack E43

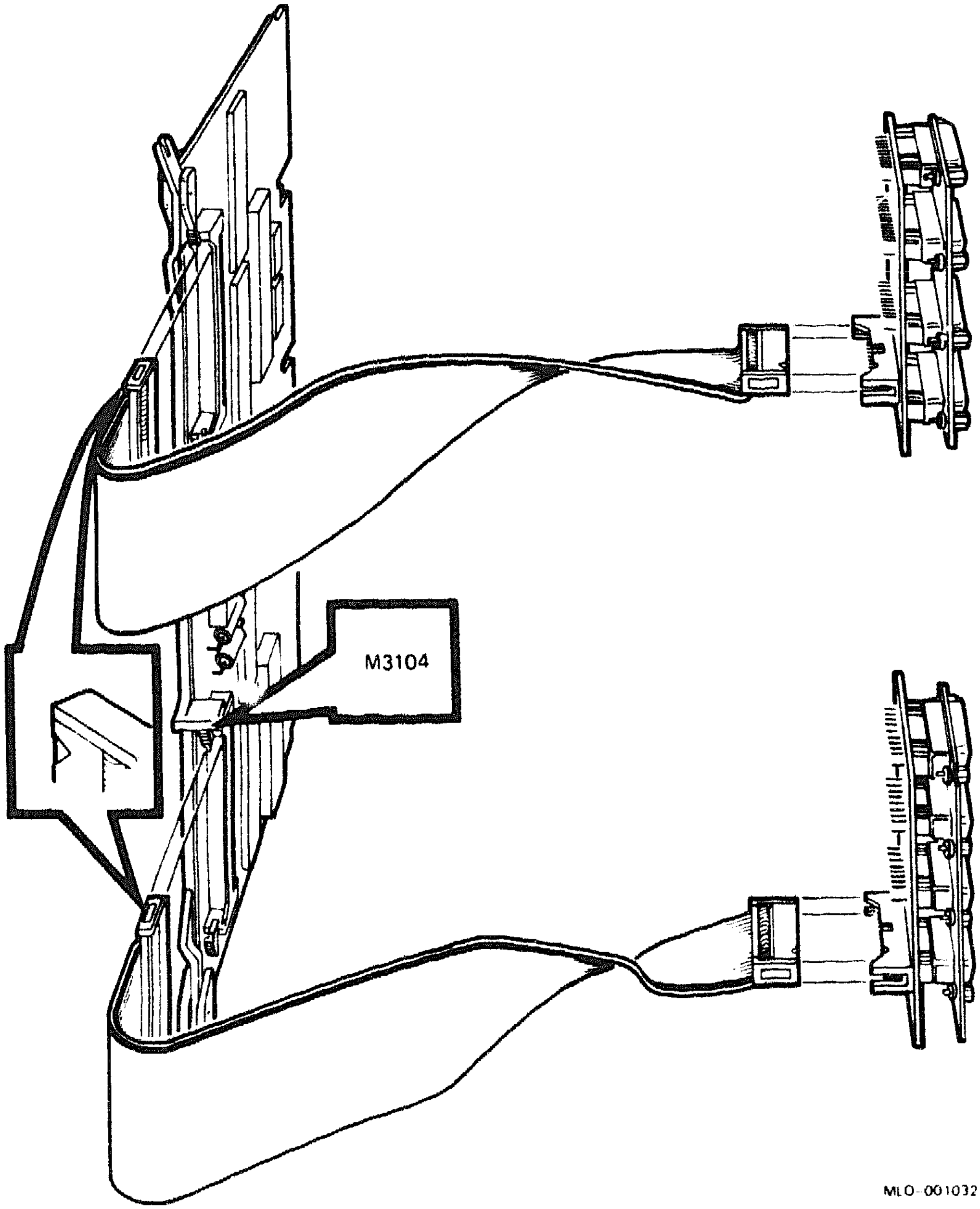
Vector Bits:*	V8	V7	V6	V5	V4	V3
E43 Switches:	3	4	5	6	7	8
Addresses:						
300	0	1	1	0	0	0
310	0	1	1	0	0	1

1 = closed, 0 = open

* E43 switch 2 is not used.

Figure 2 shows the internal cabling for the DHV11. When installing internal cables, make sure you connect the red stripe side to pin A (pin 1) of the DHV11 connectors. Then install the other end of the cables by aligning the red stripe with the small arrow (pin 1) on the filtered connector.

Figure 2: DHV11 Internal Cabling



DHV11 Remote Distribution Cabinet Kit

Ordering Information

	BA23	BA123	H9642–J
Cabinet kit	CK–DHV11–VB	CK–DHV11–VA	CK–DHV11–VF
Type-B filtered connector	H3176	H3176	H3176
Remote distribution panel	H3175	H3175	H3175
3-m (10-ft) external cable	BC22H–10	BC22H–10	BC22H–10
30-cm (12-in) internal cable	BC05L–01	–	–
53-cm (21-in) internal cable	–	BC05L–1K	–
90-cm (36-in) internal cable	–	–	BC05L–03

Operating System Support

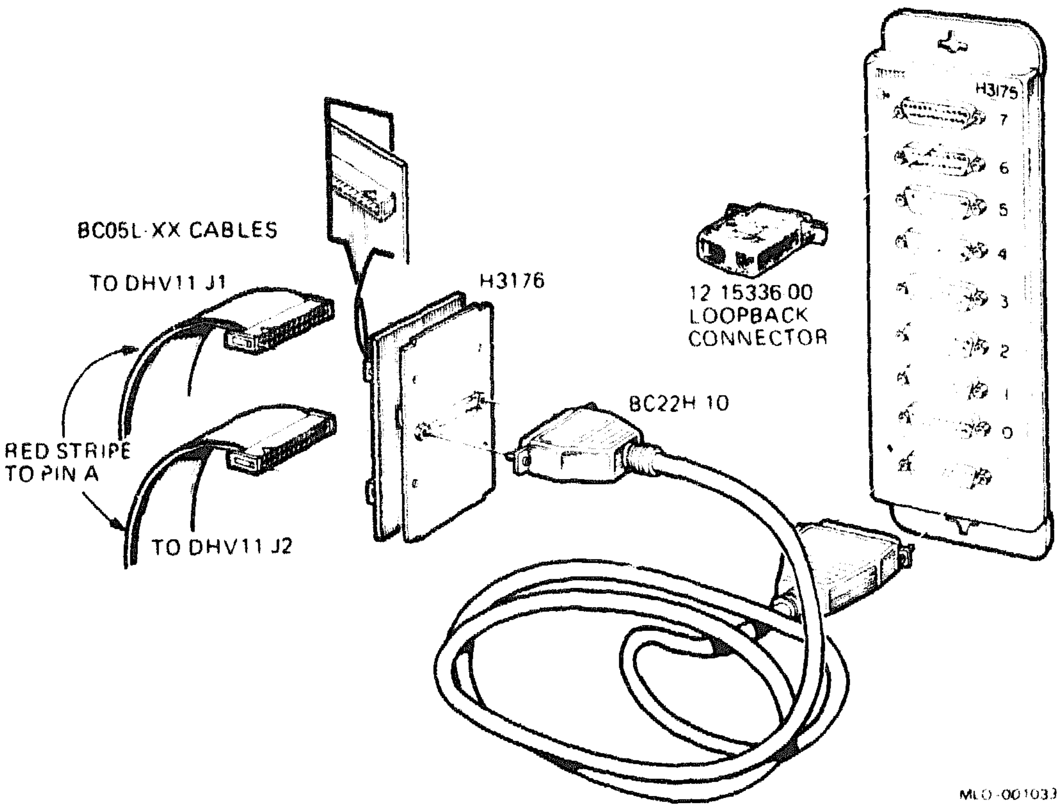
Micro/RSX	Version 4.0 and later
Micro/RSTS	Version 2.2 and later
MicroVMS	Version 4.1m and later
RSTS/E	Version 9.5 and later
RSX–11M	Version 4.3 and later
RSX–11M–PLUS	Version 4.0 and later
ULTRIX–11	Version 3.1 and later
ULTRIX–32m	Version 1.1 and later
VAXELN	Version 2.0 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	All versions and releases
Power-up self-test LEDs	None

The DHV11 remote distribution cabinet kit, shown in Figure 3, lets you distribute eight data-only serial lines from one type-B filtered connector, by using a remote distribution panel. This option increases the number of DHV11 serial lines you can connect to an enclosure without using additional distribution inserts. Each cabinet kit includes two cables.

Figure 3: DHV11 Remote Distribution Cabinet Kit



The kit includes the following parts:

Part No.	Description
H3176	Bulkhead panel that fits into one type-B I/O panel cutout
H3175	Remote distribution panel with eight 25-pin, D-subminiature connectors
H315–B	Loopback connector
BC22H–10	3-m (10-ft) cable that connects H3175 panel and H3176 panel
BC05L–xx[1]	Two cables that connect the DHV11 to the H3176 panel

[1]xx designates length of cable.

The H3176 bulkhead panel is a type-B panel with two 40-pin headers and a fully filtered female 25-pin, D-subminiature connector. The H3176 connects to a DHV11 via two BC05L–xx cables, which supply eight pairs of data signals (transmit/receive) plus the signal ground for each pair.

The H3175 remote distribution panel distributes the eight pairs of data signals and their signal grounds to eight male 25-pin, D-subminiature connectors. The H3175 connects to the H3176 panel via the BC22H–10 cable. The H3175 has teardrop cutouts on both ends. You can mount the H3175 either vertically or horizontally on a wall or floor. The H3175 measures 279 mm x 86 mm x 17.7 mm (11 in x 3.4 in x 0.7 in).

DIV32 Synchronous Communications Controller

The Digital ISDN controller 100 (DIV32) is a single-board synchronous communications controller that provides Intergrated Services Digital Network (ISDN) interface to the VAX 4000 and Q-bus MicroVAX 3000 series systems. The DIV32 connects directly to the BA200 and BA400 series enclosures.

The DIV32 Synchronous Communications Controller has the following features:

- High performance, 64-Kbit/second, circuit-switched access to ISDN services via Q-bus VAX systems.
- Allows two protocols to run simultaneously, one on each channel, and to one or two different destinations.
- Reduces communication line cost with traffic-sensitive time-cutting mode.
- VAX ISDN software manages ISDN call control and customer-application development on host.
- Software allows any VMS based Ethernet node to manage the ISDN connection.

Ordering Information

DIV32–SA	The VAX 4000 and Q-bus MicroVAX 3000 series systems, factory installed
DIV32–SF	Field installed
BC23T	3 meters (10 feet) ISDN BRA cable; ISO 8877
BC23T	7.6 meters (25 feet) ISDN BRA cable; ISO 8877

NOTE: *Cables must be ordered separately.*

Related Documentation

EK-DIV32-UG	DIV32 User Guide

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads	
Option	Module	+5 V	+12 V	Watts	AC	DC
DIV32–SA	—	5.5	0.0	27.50	3.5	1.0

DLVJ1 4-Line Asynchronous Interface

Ordering Information

Module (M8043)	DLVJ1-M		
	BA23	BA123	H9642
DLVJ1 cabinet kit	CK-DLVJ1-LB	CK-DLVJ1-LA	CK-DLVJ1-LF
Type-B filter connector	70-19964-00	70-19964-00	70-19964-00
30-cm (12-in) internal cable	70-16436-1C	-	-
53-cm (21-in) internal cable	-	70-16436-1K	-
90-cm (36-in) internal cable	-	-	70-16436-03

Operating System Support

RSX-11M	Version 4.3 and later
RSX-11M-PLUS	Version 4.0 and later
RT-11	Version 5.4D and later
ULTRIX-11	Version 3.1 and later
VAXELN	Version 2.0 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	All versions and releases
XXDP	Version 2.1 (release 134): VDLAB1.BIC
Power-up self-test LEDs	None

Documentation

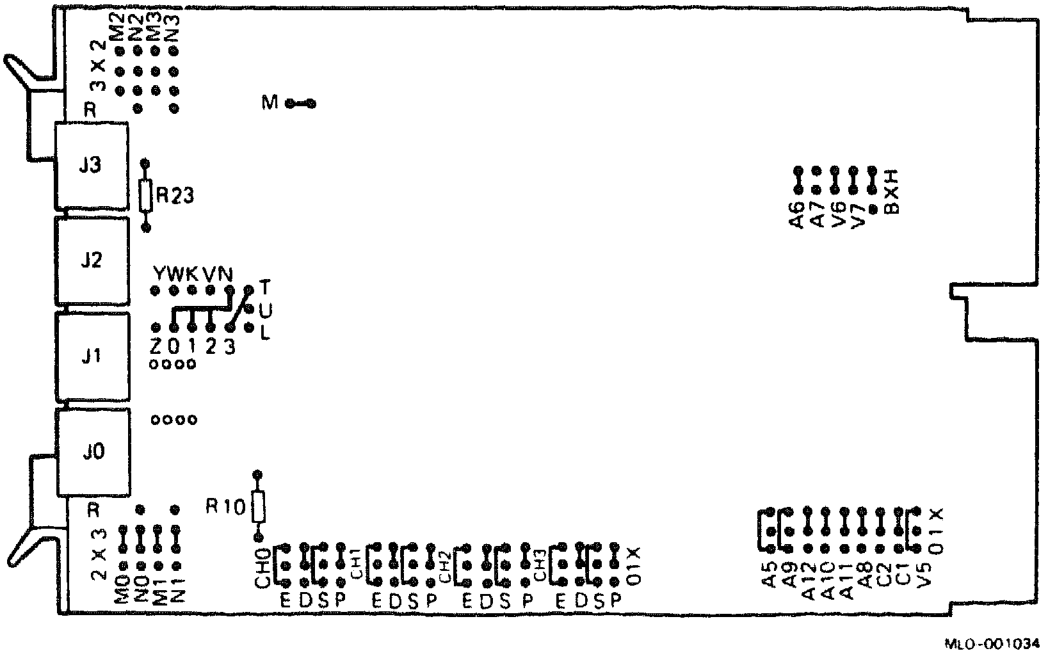
DLV11-J User's Guide	EK-DLV1J-UG

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
DLVJ1-M	M8043	1.0	0.25	8.0	1.0	1.0	B

The DLVJ1 (formerly DLV11-J), shown in Figure 1, is a dual-height module that connects a Q-bus to up to four asynchronous serial lines (channels 0 through 3) for data communications. The serial lines must conform to EIA and CCITT standards. The DLVJ1 acts as four separate devices. The factory configuration of the module sets CH-3 as the console serial line unit (SLU).

Figure 1: DLVJ1 Module Layout (M8043)



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29-26246) when you work with the internal parts of a computer system.*

Use wire-wrap pins, as shown in Figure 1, to set the CSR address and interrupt vector for the DLVJ1. The CSR addresses for two DLVJ1 modules are fixed.

The following table lists the factory configuration for the CSR address of the first channel (CH–0).

DLVJ1 CSR Address: 17776500 (factory position)*

Module	CH-0 CSR Address	A12	A11	A10	A9	A8	A7	A6	A5
1	17776500	1-x	1-x	1-x	0-x	1-x	R	x-h	0-x
2	17776540	1-x	1-x	1-x	0-x	1-x	R	x-h	1-x

0-x = 0, 1-x = 1
R = 0, no wire-wrap
x-h = 1, wire-wrap on pins x and h

* C1 and C2 are wire-wrapped on pins 1 and x. This sets the CH-3 CSR address to 17777650. To use CH-3 as a non-console device, wire-wrap C1 and C2 on pins 0 and x.

The CSR address of the other channels is 10_8 greater for each additional channel. For example, if CH–0 is 17776500, the CH–1 CSR address is 17776510. The CSR address for CH–2 is 17776520, and so on. There is one exception: when CH–3 is used as the console device, its address is fixed at 17777560, regardless of the setting of the other channels.

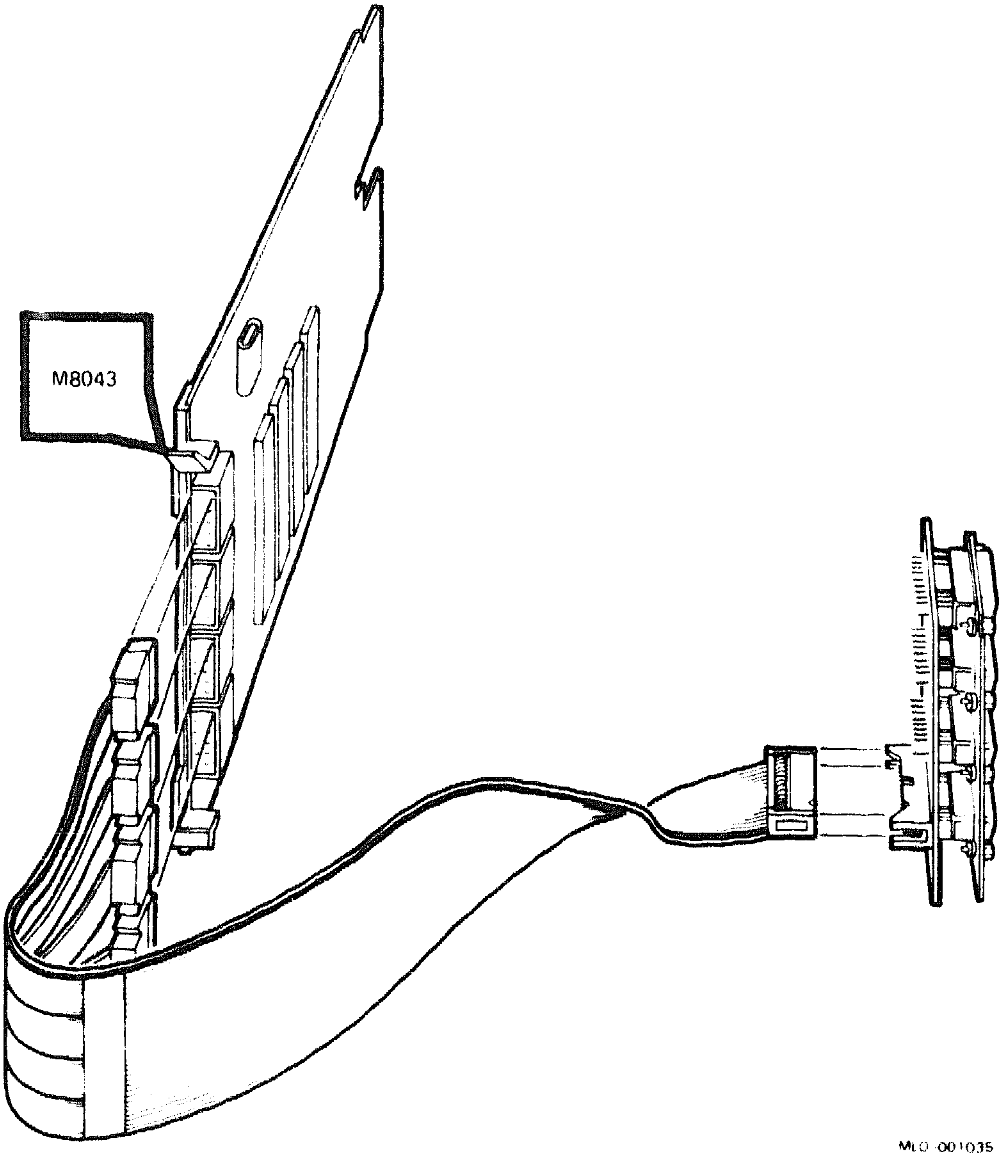
The DLVJ1 interrupt vector floats. The actual interrupt vector depends on the other modules in the system. Set the interrupt vector of channel 0 only at X00 or X40. The interrupt vector of the remaining channels is 10 (octal) greater for each channel. For example, if the module is set at 300, then the interrupt vector of CH–1 is 310. The interrupt vector for CH–2 is 320, and so on. There is one exception: when CH–3 is used as the console device, its interrupt vector is fixed at 60, regardless of the setting of the other channels. Figure 2 shows the internal cabling for the DLVJ1. The following table lists the factory configuration for the interrupt vector:

DLVJ1 Interrupt Vector: 300 (factory position)*

Vector Bits:	V8	V7	V6	V5	V4	V3
Vector Address:						
300	--	x-h	x-h	0-x	--	--
340	--	x-h	x-h	1-x	--	--

x-h = 1, jumper inserted between pins x and h.
0-x = 0, jumper inserted between 0 and x.
1-x = 1, jumper inserted between 1 and x.
* CH-3 interrupt vector is 60 (receive) and 64 (transmit).

Figure 2: DLVJ1 Internal Cabling



DMV11 Synchronous Controller

Four versions of the DMV11 option are available for different types of system interfaces:

EIA RS232-C/CCITT V.28
CCITT V.35/DDS
Integral modem
RS423-A/CCITT V.24

Make sure you order the version that meets the interface requirements of your system.

Ordering Information

Loopback connectors	H3251 (external) H3255 (internal) H3254 (internal)		

EIA RS232-C/CCITT V.28			
Module (M8053)	DMV11-M		
External cable	BC22E or BC22F		
	BA23	BA123	H9642-J
Cabinet kit	CK-DMV11-AB	CK-DMV11-AA	CK-DMV11-AF
Distribution panel	70-20863-01	70-20863-01	70-20863-01
30-cm (12-in) internal cable	BC08S-01	-	-
53-cm (21-in) internal cable	-	BC08S-1K	-
90-cm (36-in) internal cable	-	-	BC08S-03

CCITT V.35/DDS			
Module (M8053)	DMV11-M		
	BA23	BA123	H9642-J
Cabinet kit	CK-DMV11-BB	CK-DMV11-BA	CK-DMV11-BF
63-cm (25-in) external modem cable	BC17E-25	BC17E-25	BC17E-25
30-cm (12-in) internal cable	70-20861-01	-	-
53-cm (21-in) internal cable	-	70-20861-1K	-
90-cm (36-in) internal cable	-	-	70-20861-03

Ordering Information

Integral Modem

Module (M8064)	DMV11-N		
	BA23	BA123	H9642-J
Cabinet kit	CK-DMV11-CB	CK-DMV11-CA	CK-DMV11-CF
Distribution panel	70-20862-00	70-20862-00	70-20862-00
30-cm (12-in) internal cable	70-18250-01	-	-
53-cm (21-in) internal cable	-	70-18250-1K	-
90-cm (36-in) internal cable	-	-	70-20861-03

RS423-A/CCITT V.24

Module (M8053)	DMV11-M		
External cable	BC55D		
	BA23	BA123	H9642-J
Cabinet kit	CK-DMV11-FB	CK-DMV11-FA	CK-DMV11-FF
Distribution panel	70-20864-01	70-20864-01	70-20864-01
38-cm (15-in) internal cable	BC08S-1C	-	-
53-cm (21-in) internal cable	-	BC08S-1K	-
90-cm (36-in) internal cable	-	-	BC08S-03

Operating System Support

MicroVMS	Version 4.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	All versions and releases
XXDP	Version 2.1 (release 134): VDMAC1.BIC, BCMBC0.BIN, VDMCC1.BIN, VDMDC0.BIN, VDMEC0.BIN
Power-up self-test LEDs	None

Documentation

DMV11 Synchronous Controller Technical Manual	EK-DMV11-TM
DMV11 Synchronous Controller User's Guide	EK-DMV11-UG

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	Module	+5 V	+12 V	Watts	AC	DC	Insert
DMV11-M	M8053	3.4	0.4	21.8	2.0	1.0	A
DMV11-N	M8064	3.4	0.26	20.12	2.0	1.0	A

The DMV11 is a single-line, synchronous interface that provides local or remote interconnection between Q-bus systems and other computer systems with EIA RS–232–C/CCITT V.28, CCITT V.35, or EIA RS–423/RS–449 interfaces.

The quad-height DMV11 modules, shown in Figures 1 and 2, support the following functions:

Full-duplex or half-duplex operations
Direct memory access (DMA)
Point-to-point communications
Multipoint communications

Figure 1: DMV11–M Module Layout (M8053)

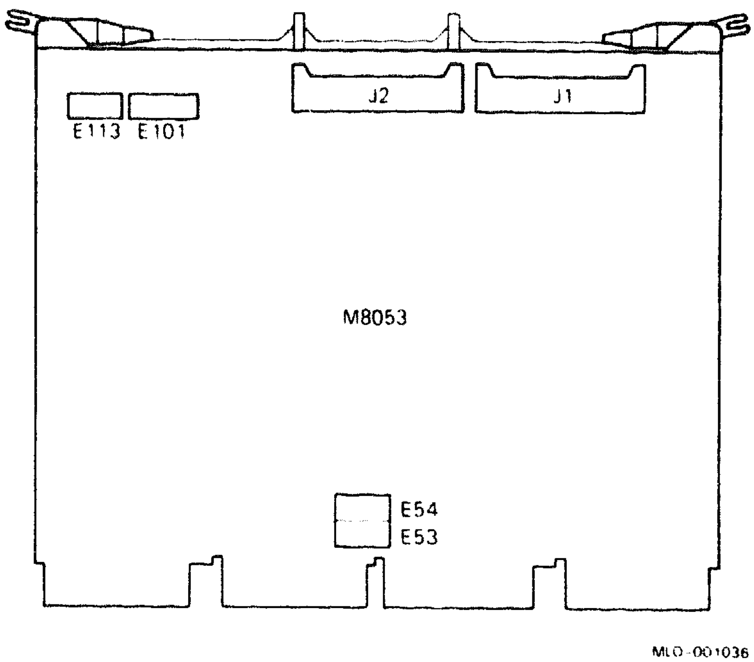
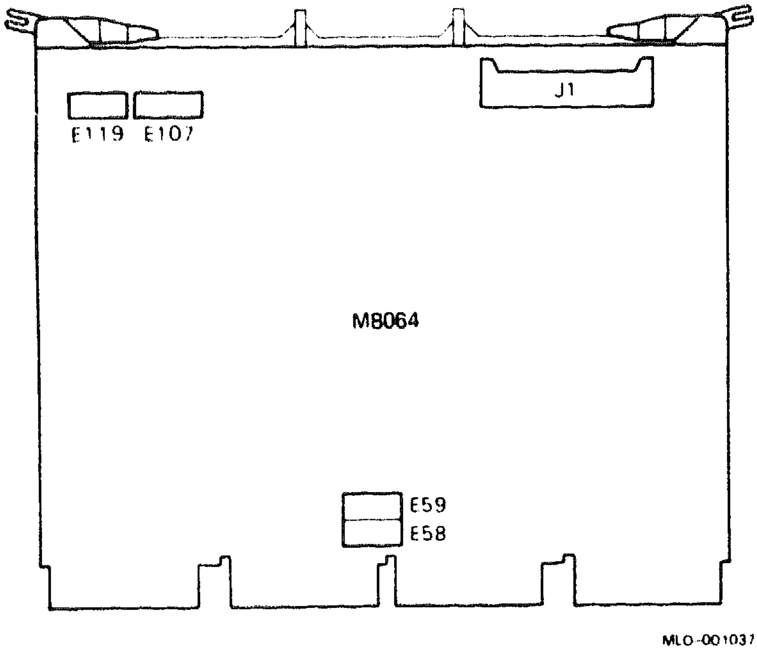


Figure 2: DMV11–N Module Layout (M8064)



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

For the DMV11–M, use switchpacks E53 and E54 (Figure 1) to set the CSR address and interrupt vector. For the DMV11–N, use switchpacks E58 and 59 (Figure 2) to set the CSR address and interrupt vector. The CSR address and interrupt vector both float. The actual settings depend on the other modules in the system.

The following tables list the factory configurations and typical switch positions for the CSR address and interrupt vector:

DMV11 CSR Address: 177760340 (factory position)
Switchpacks E53, E54, E58, and E59

Address Bits:	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3
Switchpacks:	E53 (M8053) E58 (M8064)							E54 (M8053) E59 (M8064)		
Switches:	8	7	6	5	4	3	2	1	2	1
CSR Address:										
177760340	0	0	0	0	0	1	1	1	0	0
177760360	0	0	0	0	0	1	1	1	1	0

1 = on = closed, 0 = off = open

DMV11 Interrupt Vector: 300 (factory position)
Switchpacks E54 and E59

Vector Bits:	V8	V7	V6	V5	V4	V3
E54 and E59 Switches:	8	7	6	5	4	3
Vector Address:						
300	0	1	1	0	0	0
310	0	1	1	0	0	1

1 = on = closed, 0 = off = open

You can select several DMV11 features with a DIP switch: switch E101 on M8053, and switch E107 on M8064 (Figures 1 and 2). Table 1 lists typical switch settings and functions. Table 2 lists the different operating mode selections.

Table 1: DMV11 Switch Positions

E101/E107 Switch[1]	Typical Setting	Function
E101–S10[2]	Off	Off for EIA interface, on for V.35.
S9	Off	Must be off for integral modem (M8064) or when running above 19.2 Kbaud.
S8, S7, S6	On	Select operating mode when S1 is off. See Table 2.

[1]E101 is on M8053. E107 is on M8064.
[2]Not used on M8064.

Table 1 (Cont.): DMV11 Switch Positions

E101/E107 Switch[1]	Typical Setting	Function
S5	On	When off, enables remote load detect.
S4	On	When off, enables power-on boot.
S3	On	When off, enables auto answer.
S2	On	Selects unit number for booting. On = first DMV11. Off = second DMV11.
S1	On	Determines method for selecting the operating mode. Off = S6, S7, and S8 select the operating mode. See Table 2, below. On = software selects the operating mode.

[1]E101 is on M8053. E107 is on M8064.

Table 2: DMV11 Operating Modes

E101/E107 Switch			
S8	**S7**	**S6**	**Operating Mode[1]**
On	On	On	HDX point-to-point, DMC compatible
On	On	Off	FDX point-to-point, DMC compatible
On	Off	On	HDX point-to-point
On	Off	Off	FDX point-to-point
Off	On	On	HDX control station
Off	On	Off	FDX control station
Off	Off	On	HDX tributary station
Off	Off	Off	FDX tributary station

[1]HDX = half-duplex, FDX = full-duplex

Another DIP switch determines the DIGITAL data communications message protocol (DDCMP) address register tributary/password: switch E113 on M8053 and switch E119 on M8064. You must set this switch to a unique site address. For more information, see the *DMV11 Synchronous Controller User's Guide*.

Figures 3 and 4 show the internal cabling for the four DMV11 interfaces.

Figure 3: DMV11–M Internal Cabling (M8053)

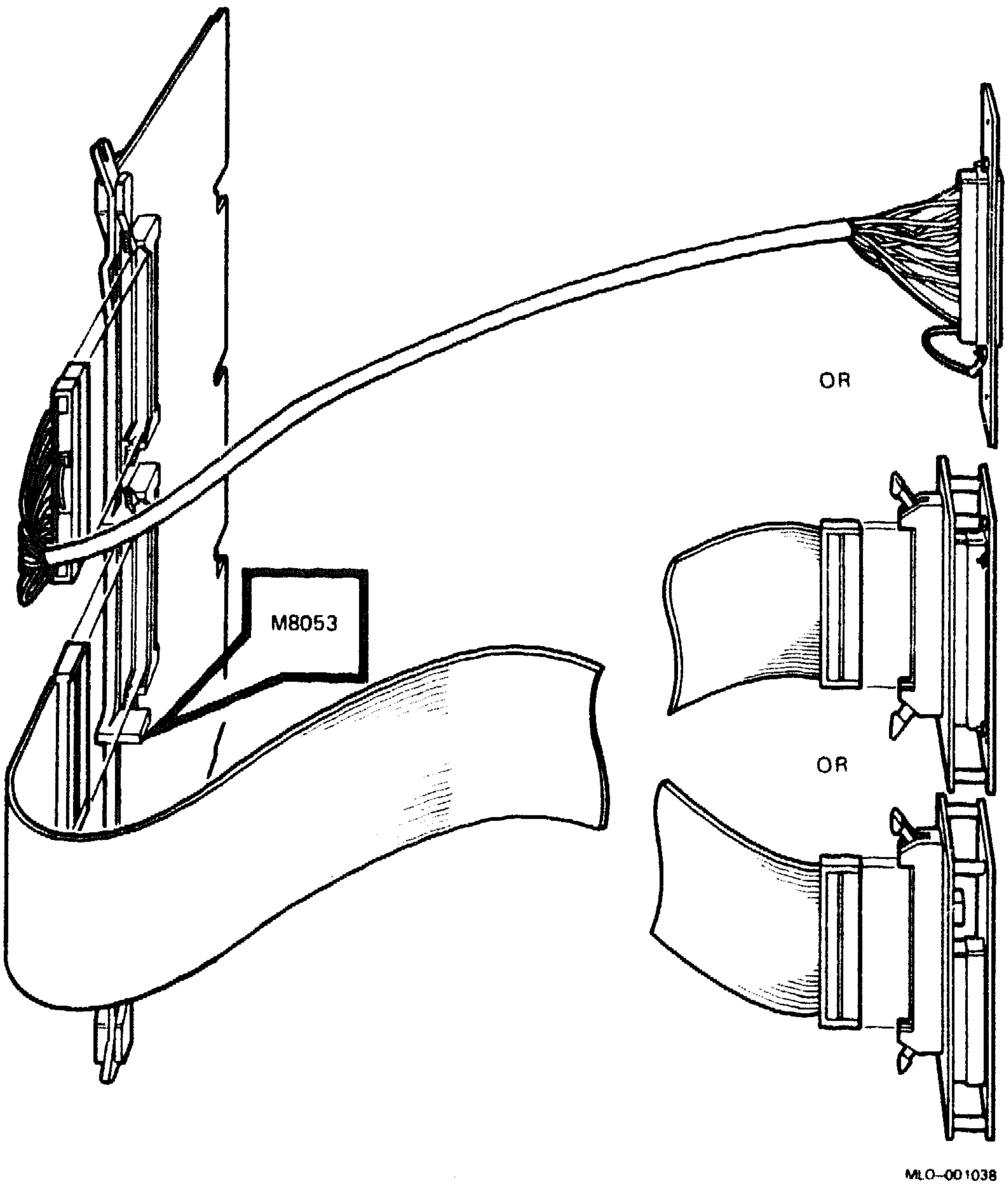
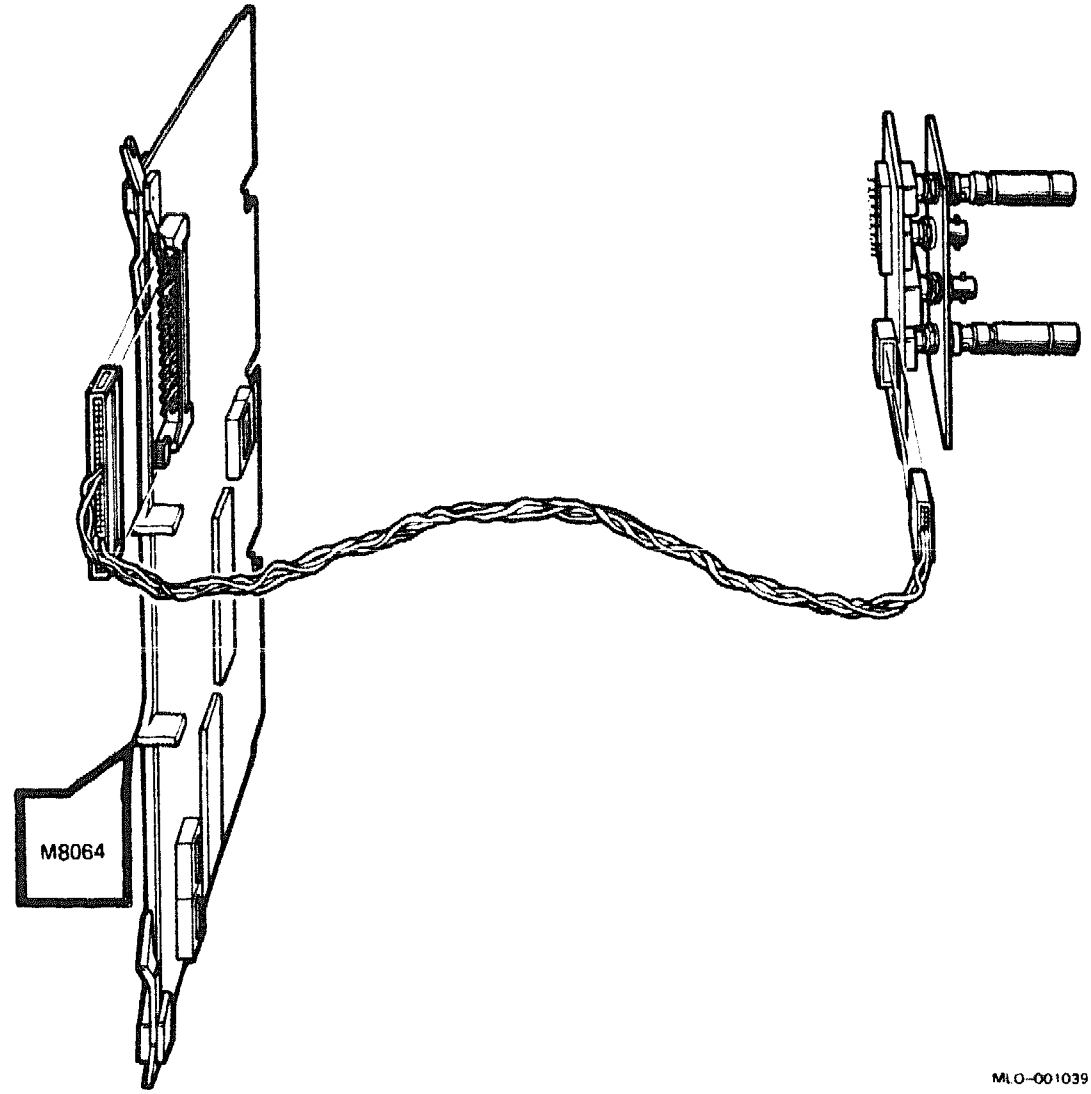


Figure 4: DMV11–N Internal Cabling (M8064)



DPV11 Synchronous Interface

Ordering Information

Module (M8020) for BA23, BA123, and H9642–J	DPV11–M		
Module (M8020–PA) for BA200-series	DPV11–AA (factory installed) DPV11–AF (field upgrade)		
	BA23	BA123	H9642–J
DPV11 cabinet kit	CK–DPV11–AB	CK–DPV11–AA	CK–DPV11–AF
30-cm (12-in) internal cable	BC26L–01	–	–
Type-A filtered connector	70–17261–01	70–17261–01	70–17261–01
53-cm (21-in) internal cable	–	BC26L–1K	–
90-cm (36-in) internal cable	–	–	BC26L–03
Loopback connectors	H3259 (external) H3260 (internal)		

Operating System Support

DSM–11	Version 3.3 and later
MicroVMS	DPV11–M: Version 4.2 and later DPV11–AA/–AF: Version 4.6A and later
RSX–11M	Version 4.3 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	All versions and releases
XXDP	Version 2.1 (release 134) VDPVC1.BIN, XDPVC0.OBJ
Power-up self-test LEDs	None

Documentation

DPV11 Synchronous Interface User's Manual	EK-DPV11-UG
DPV11 Technical Manual	EK-DPV11-TM

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
DPV11-M	M8020	1.2	0.3	9.6	1.0	1.0	A
DPV11-A	M8020-PA	1.2	0.30	9.6	1.0	1.0	-

The DPV11-M is a dual-height module. It connects the Q22-bus to a modem, using a synchronous serial line. The serial line conforms to EIA standards RS232-C, RS422-A, and RS423-A. The quad-height DPV11-A consists of one DPV11-M module and a panel support with an attached bulkhead handle.

The DPV11 provides EIA compatibility for local communications only (timing and data leads). The DPV11 is intended for two types of protocols:

- Character-oriented protocols, such as DIGITAL data communications message protocol (DDCMP)
- Bit-oriented communications protocols, such as synchronous data link control (SDLC)

The M8020 module layout is shown in Figure 1. The M8020-PA module layout is shown in Figure 2.

Figure 1: DPV11–M Module Layout (M8020)

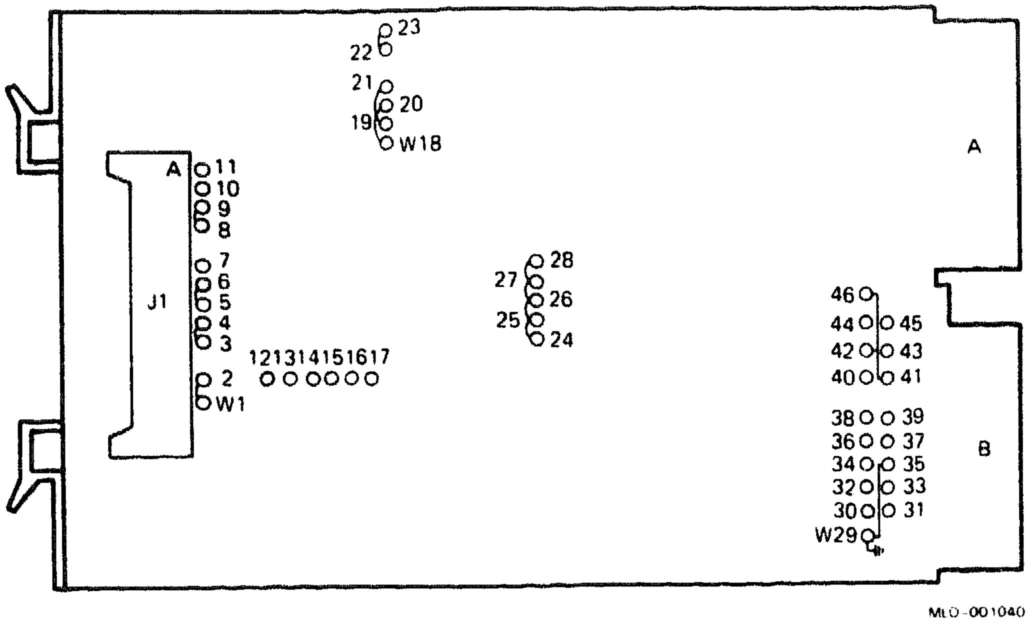
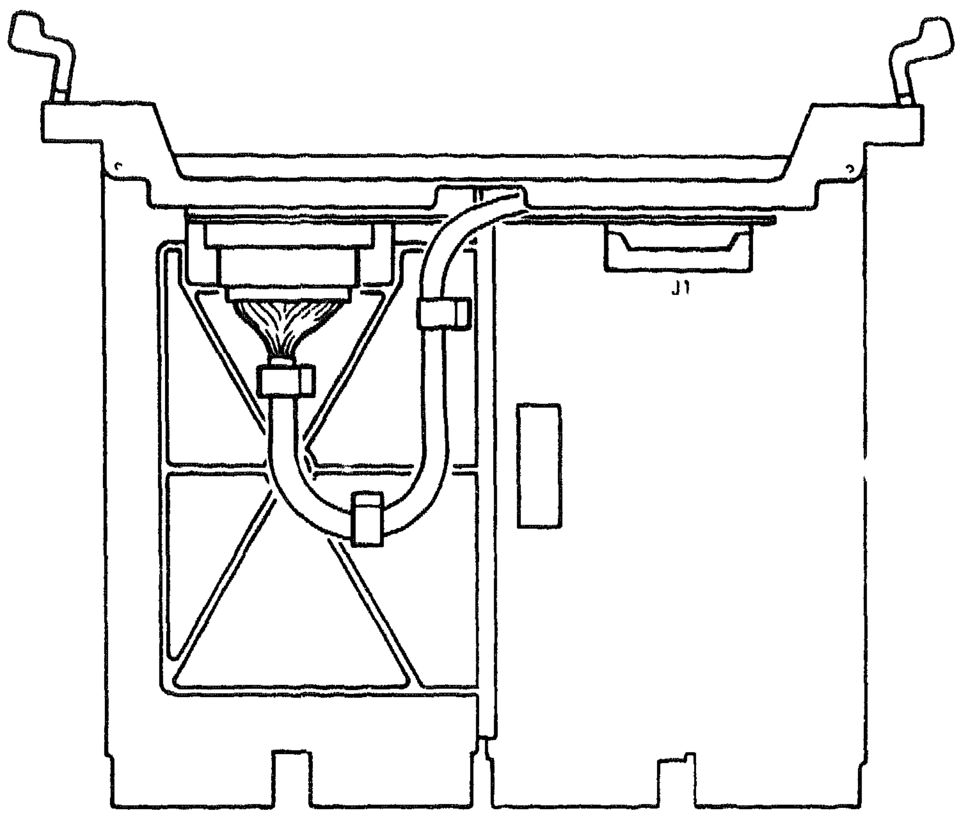


Figure 2: DPV11-A Module Layout (M8020-PA)



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29-26246) when you work with the internal parts of a computer system.*

Use jumpers, shown in Figure 1, to set the CSR address and interrupt vector of the DPV11. The CSR address and interrupt vector are both floating. The actual DPV settings depend on the other modules in the system.

The following tables list the factory configurations and other common positions for the CSR address and interrupt vector:

DPV11 CSR Address: 17760010 (factory position)

Address Bits:	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3
Pins:	W31	W30	W36	W33	W32	W39	W38	W37	W34	W35
CSR Address:										
17760010	0	0	0	0	0	0	0	0	0	1
17760270	0	0	0	0	0	1	0	1	1	1
17760310	0	0	0	0	0	1	1	0	0	1

1 = jumper inserted between pin Wxx and pin 29 (ground).
0 = jumper removed.

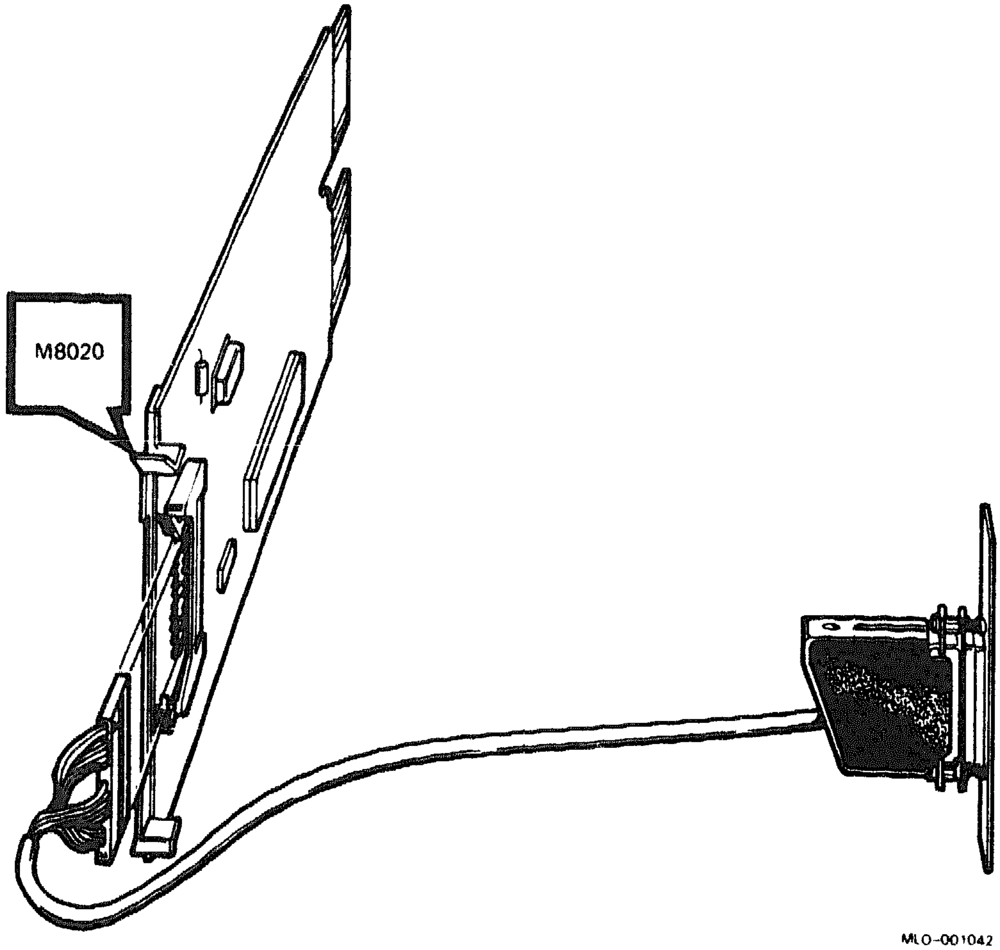
DPV11 Interrupt Vector: 300 (factory position)

Vector Bits:	V8	V7	V6	V5	V4	V3
Pins:	W43	W42	W41	W40	W44	W45
Vector Address:						
300	0	1	1	0	0	0
310	0	1	1	0	0	1

1 = jumper inserted between pin Wxx and pin 46 (ground).
0 = jumper removed.

Figure 3 shows the internal cabling of the DPV11.

Figure 3: DPV11 Internal Cabling



DRQ3B–A, –S High-Speed, Parallel Interface

Ordering Information

Module (M7658) for BA23, BA123, and H9642–J	DRQ3B–A
Module (M7658–PA) for BA200-series	DRQ3B–SA (factory installed) DRQ3B–SF (field upgrade)
Loopback connectors	17–00861–01 (internal) 17–01481–01 (external)

Operating System Support

MicroVMS	Version 4.6.a and later, using VAXlab Software Library, or standalone driver
VAXELN	Version 3.0 and later
VMS	Version 5.0 and later, using VAXlab Software Library
ULTRIX–32	Version 2.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 2.0 (release 115) and later

Documentation

DRQ3B Parallel DMA I/O Module User's Guide	EK–O47AA–UG

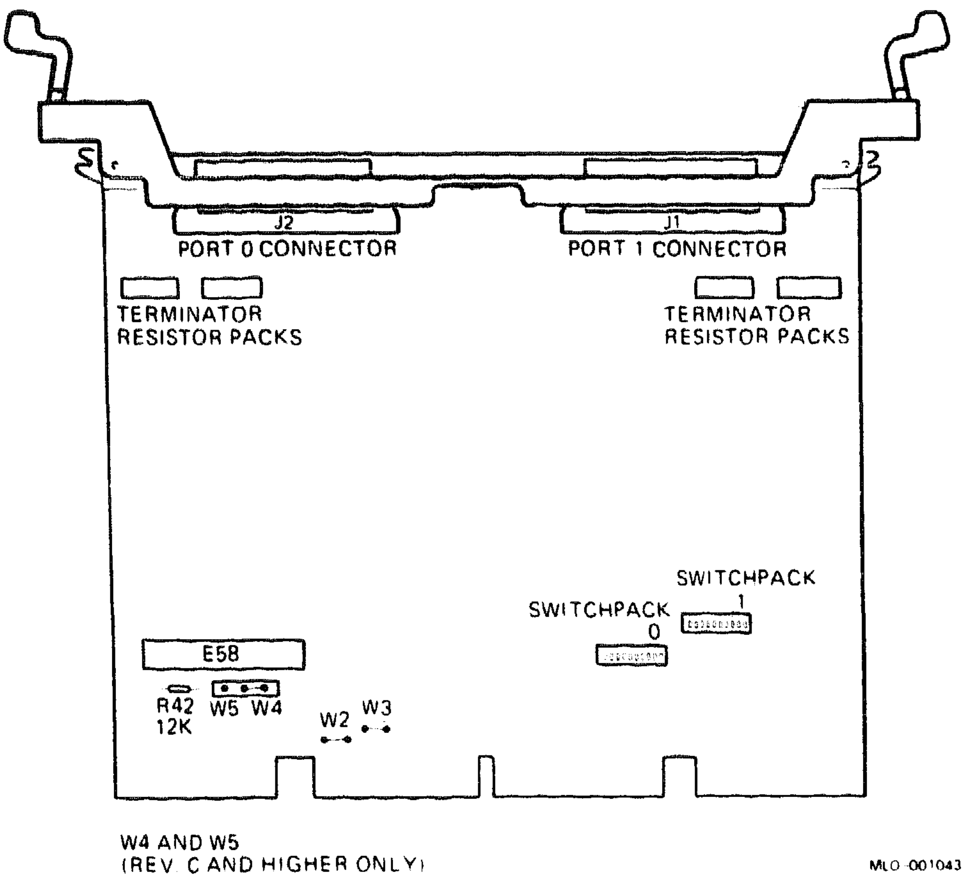
DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
DRQ3B–A	M7658	4.5	0.0	22.5	2.0	1.0	A (2)
DRQ3B–S	M7658–PA	4.5	0.0	22.5	2.0	1.0	–

The DRQ3B–A, –S parallel direct memory access (DMA) I/O module allows input and output of parallel digital data at transfer rates of up to 1.3 MHz of 16-bit words. It is designed to provide maximum data transfer rates with a minimum of system bus interaction.

The DRQ3B–S is shown in Figure 1.

Figure 1: DRQ3B–S Module Layout (M7658–PA)



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

Use DIP switchpacks 0 and 1 (Figure 1) to set the CSR address and interrupt vector on the DRQ3B. The CSR and interrupt vectors float.

Use Switch 08 of switchpack 1 to set the extended block mode. The extended block mode increases data transfer rates by approximately 20 percent to 1.3 MHz (words). It cannot be used in MicroPDP–11 systems. Setting switch 08 to ON selects the extended block mode.

The following tables list the factory configuration and positions for a second DRQ3B:

DRQ3B CSR Address: 17760740 (factory position)
Switchpack 9

Address Bits:	A12	A11	A10	A9	A8	A7	A6	A5	A4	
Switches:	1	2	3	4	5	6	7	8	9	10*
CSR Address:										
17760740	0	0	0	0	1	1	1	1	0	
17760760	0	0	0	0	1	1	1	1	1	

1 = switch on, 0 = switch off
* Switch 10 is not used.

DRQ3B Interrupt Vector: 300 (factory position)
Switchpack 1

Vector Bits:	V9	V8	V7	V6	V5	V4	V3
Switches:	1	2	3	4	5	6	7
Vector Address:							
300	0	0	1	1	0	0	0
310	0	0	1	1	0	0	1

0 = switch on, 1 = switch off

Use switches 9 and 10 of switchpack 1 to configure the interrupt priority level, as follows:

	Switchpack 1	
Priority Level	**9**	**10**
4	1	1
5	1	0
6	9	1
7	0	0

DRQ3B Holdoff Time Selection

Whenever the DRQ3B releases the bus, it waits a short period of time (called the holdoff time) before it again requests control of the bus. The DRQ3B holdoff time can be set to 1 or 2.7 μsec.

The holdoff time of 2.7 μsec ensures that other modules installed in a system have an opportunity to acquire the bus. However, the maximum throughput rate of the DRQ3B cannot be achieved using this setting.

The maximum throughput rate is achieved using the 1 µsec holdoff time and extended block mode. However, when the holdoff time is set for 1 µsec, modules in the backplane farther from the CPU than the DRQ3B may have difficulty acquiring the bus.

Selecting the holdoff time depends on the module revision level, as follows:

	Holdoff Time	
Module Revision	**1.0 µsec**	**2.7 µsec**
Level C and higher	Jumper W4 In	Jumper W5 In (factory)
Level B	Resistor R42 (12K ohms) installed (factory)	Resistor R42 (12K ohms) removed (factory)

NOTE: *R42 can be resoldered to the module by Field Service if the 1 µsec holdoff time is needed again.*

DRQ3B Q/CD Jumpers

Jumpers W2 and W3 must be removed when the DRQ3B is installed in a BA200-series enclosure.

DRQ3B Terminator Resistor Packs

The DRQ3B has replaceable terminator resistor packs. Some signals from external devices may not be strong enough to assert a high or low signal clearly, due to cabling length or to the nature of the device driver. In this case, Field Service can replace the factory resistor packs with optional packs, to allow weaker signals to be interpreted correctly.

The optional packs must be installed by Field Service. Table 1 lists the available resistor packs.

Table 1: Terminator Resistor Packs

Order Number	Resistance (ohms)	Current Needed (milliamps)	Notes
13-19367-01	220/330	22	Standard
13-11003-02	330/680	15	Optional
13-11003-01	180/390	28	Optional

DRV11–J, DRV1J–S 4-Line, High-Density Parallel Interface

Ordering Information

Module (M8049) for BA23, BA123, and H9642–J	DRV11–J		
Module (M8049–PA) for BA200-series	DRV1J–SA (factory installed) DRV1J–SF (field upgrade)		
	BA23	BA123	H9642
DRV11–J cabinet kit	CK-DRV1J-KA	CK-DRV1J-KB	CK-DRV1J-KF
38-cm (15-in) internal cable	BC06L–1C	-	-
Type-A filter connector	12–14614–02	12–14614–02	12–14614–02
53-cm (21-in) internal cable	-	BC06L–1K	-
90-cm (36-in) internal cable	-	-	BC06L–03
Loopback connectors	BC05WA (M8049) BC06R (M8049–PA)		

Operating System Support

DSM-11	Version 3.3 and later
MicroVMS	Version 4.6 and later, using VAXlab Software Library
RSX-11M	Version 4.3 and later
RSX-11M-PLUS	Version 4.0 and later
VAXELN	Version 2.0 and later
VMS	Version 5.0 and later, using VAXlab Software Library

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 1.10 (release 110) and later
XXDP	Version 2.1 (release 134): VDRCC0.BIC, VDRDB0.BIC, XDRJC0.OBJ.
Power-up self-test LEDs	One LED (On indicates correct operation)

DRV11–J/M8049
DRV1J–S/M8049–PA

Documentation

DRV11–J Interface User's Manual	EK–DRV1J–UG

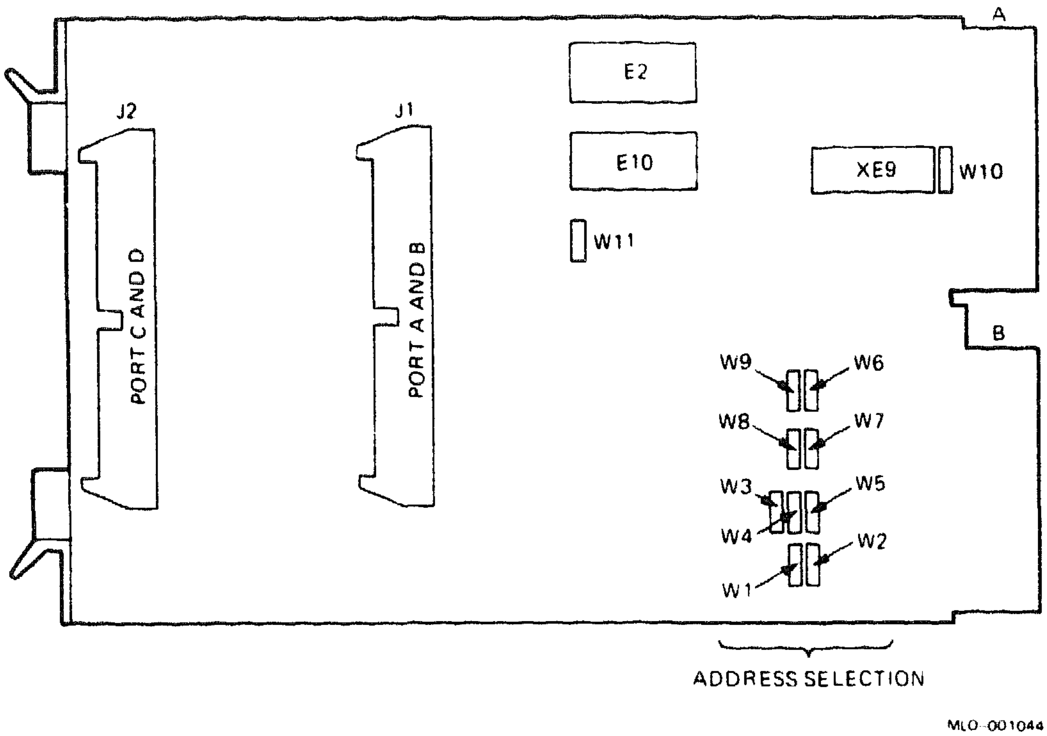
DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
DRV11–J	M8049	1.8	0.0	9.0	2.0	1.0	A (2)
DRV1J–S	M8049–PA	1.8	0.0	9.0	2.0	1.0	–

NOTE: *Each cabinet kit includes two type-A filter connectors and two internal cables.*

The DRV11 is a dual-height module that connects a Q-bus to 64 I/O lines. These lines are organized as four 16-bit ports, A through D. Data line direction is selectable under program control for each 16-bit port. The DRV11–J is shown in Figure 1.

Figure 1: DRV11–J Module Layout (M8049)



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

The CSR address is fixed, using jumpers W1 through W9. The DRV11–J interrupt vector is set under program control. The following table lists the factory configurations and the positions for a second DRV11 module.

DRV11-J CSR Address: 17764160 (factory position)

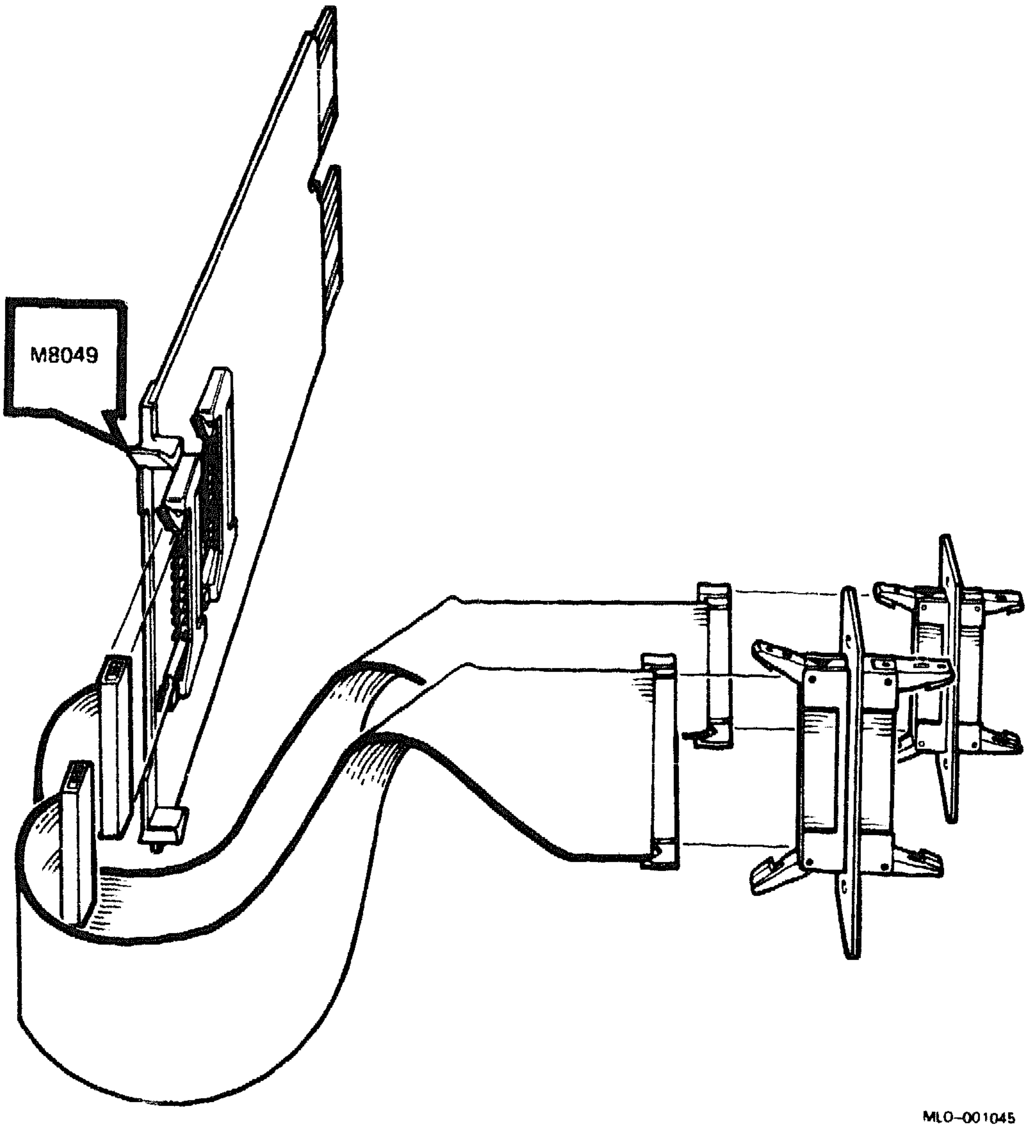
Module	Address Bits: Jumpers:	A12 W1	A11 W2	A10 W3	A9 W4	A8 W5	A7 W6	A6 W7	A5 W8	A4 W9
1	17764160	0	1	0	0	0	0	1	1	1
2	17764140	0	1	0	0	0	0	1	1	0

1 = installed, 0 = removed

DRV11–J/M8049
DRV1J–S/M8049–PA

Figure 2 shows the internal cabling for the DRV11–J.

Figure 2: DRV11–J Internal Cabling



DRV11-WA, DRV1W-S General-Purpose DMA Interface

Ordering Information

Module (M7651) for BA23, BA123, and H9642-J	DRV11-WA		
Module (M7651-PA) for BA200-series	DRV1W-SA (factory installed) DRV1W-SF (field upgrade)		
	BA23	BA123	H9642
DRV11-WA cabinet kit	CK-DRV1B-KA	CK-DRV1B-KF	CK-DRV1B-KF
30-cm (12-in) internal cable	BC06K-1C	-	-
Type-A filter connector	12-14614-01	12-14614-01	12-14614-01
53-cm (21-in) internal cable	-	BC06K-1K	-
90-cm (36-in) internal cable	-	-	BC06K-03

Operating System Support

DSM-11	Version 3.3 and later
MicroVMS	Version 4.4 and later, using VAXlab Software Library
RSX-11M	Version 4.3 and later
RSX-11M-PLUS	Version 4.0 and later
VAXELN	Version 3.0 and later
VMS	Version 4.0 and later, using VAXlab Software Library

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 1.06 (release 106) and later
Power-up self-test LEDs	None

DRV11-W/M7651
DRV1W-S/M7651-PA

Documentation

DRV11-WA General Purpose DMA User's Guide	EK-DRVWA-UG

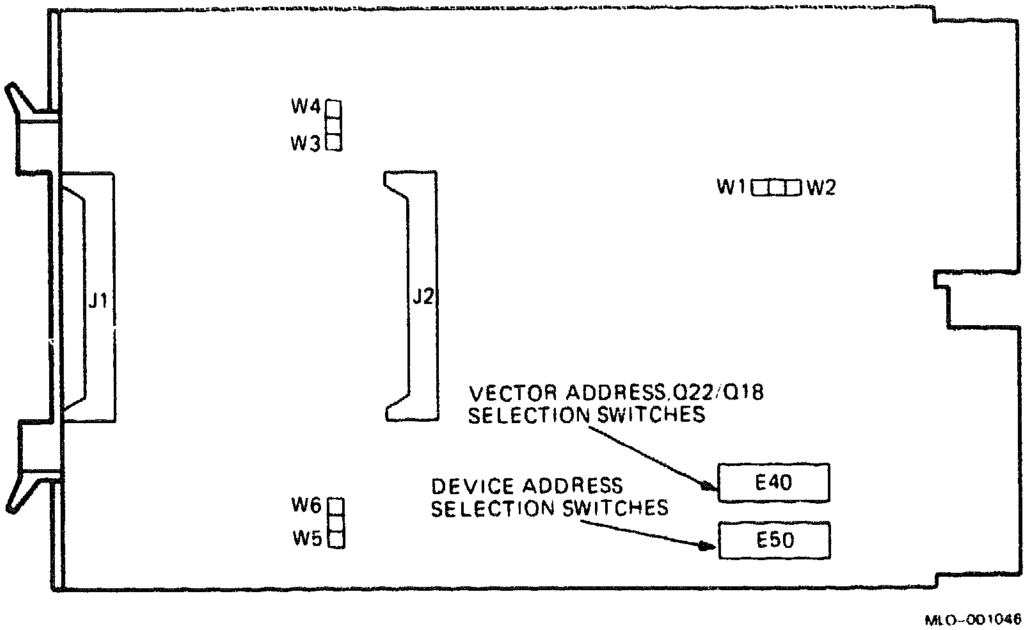
DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
DRV11-W	M7651	1.8	0.0	9.0	2.0	1.0	A (2)
DRV1W-S	M7651-PA	1.8	0.0	9.0	2.0	1.0	-

NOTE: *Each cabinet kit includes two internal cables and two type-A filter connectors.*

The DRV11 is a general-purpose DMA interface for transferring 16-bit data words directly between MicroVAX II systems and a user's I/O device. The DMV11-WA is shown in Figure 1.

Figure 1: DRV11-WA Module Layout



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29-26246) when you work with the internal parts of a computer system.*

The factory position for the DMA interface base address is 17772410. In this case, the base address is the address of the word count register WCR, not the CSR register. The following tables list the factory positions for the device address switch and the interrupt vector. The base address and interrupt vectors float, so the factory setting must be changed.

DRV11-WA Base Address: 17772410 (factory position)
Switchpack E50

Address Bits:	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3
Switches:	1	2	3	4	5	6	7	8	9	10
Base Address:										
17772410	1	0	1	0	1	0	0	0	0	1
17760240*	0	0	0	0	0	1	0	1	0	0
17760260	0	0	0	0	0	1	0	1	1	0

1 = on, 0 = off
* First possible floating value

DRV11-WA Interrupt Vector
Switchpack E40

Vector Bits:	V9	V8	V7	V6	V5	V4	V3	V2
Switches:	1	2	3	4	5	6	7	8
Vector Address:								
124	0	0	0	1	0	1	0	1
300*	0	0	1	1	0	0	0	0

1 = on, 0 = off
* First possible floating value

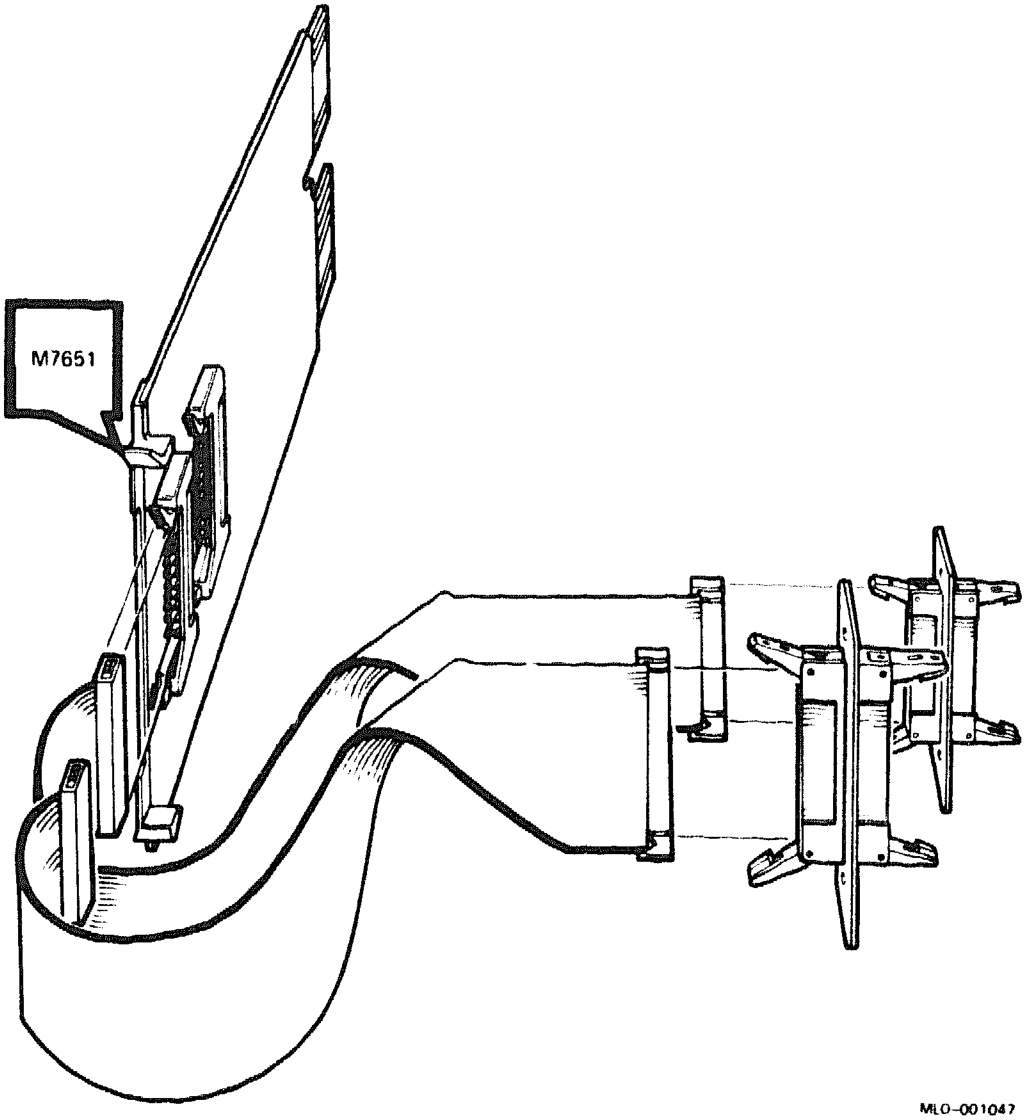
Switch E40–9 is not used. Switch E40–10 must be on to enable 22-bit addressing.

Table 1 lists three other features selected by jumpers. Figure 2 shows the DRV11–WA internal cabling.

Table 1: DRV11 Jumper-Selected Features

Feature	Jumper Installed	Setting
Burst mode	W1	Unlimited burst
	W4	4-cycle burst (factory)
Link mode	W3	Normal mode (factory)
	W4	Link mode
Interrupt mode	W5	Independent interrupt (factory)
	W6	Ready interrupt

Figure 2: DRV11-WA Internal Cabling



DSV11 Communications Option

Ordering Information

Module (M3108) for BA23, BA123, and H9642–J	DSV11-AA (first DSV11 option) DSV11-AB (extra DSV11 option)
Module (M3108–PA) for BA200-series	DSV11-SA (factory installed, first DSV11 option) DSV11-SB (factory installed, extra DSV11 option) DSV11-SF (field upgrade, first DSV11 option) DSV11-SG (field upgrade, extra DSV11 option)
BA23 cabinet kit	CK-DSV11-UA
BA123 cabinet kit	CK-DSV11-UB
H9642–J cabinet kit	CK-DSV11-UF
Loopback connectors (external)	H3199 (50-pin) H3198 (34-pin) H3248 (25-pin) H3250 (34-pin)

Operating System Support

VMS	Version 4.7 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 2.3 (release 124) or later

Documentation

DSV11 Communications Option Technical Description	EK-DSV11-TD
DSV11-M Communications Option Installation Guide	EK-DSV1M-IN
DSV11-M Communications Option User Guide	EK-DSV1M-UG
DSV11-SF Communications Option Installation Guide	EK-DSV11-IN
DSV11-S Communications Option User Guide	EK-DSV11-UG

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	Module	+5 V	+12 V	Watts	AC	DC	Insert
DSV11-M	M3108	5.43	0.69	38.0	3.9	1.0	B
DSV11-S	M3108-PA	5.43	0.69	38.0	3.9	1.0	-

The DSV11 is a two-channel, high-speed, synchronous communications option for use on Q-bus backplanes. The DSV11-S is shown in Figure 1.

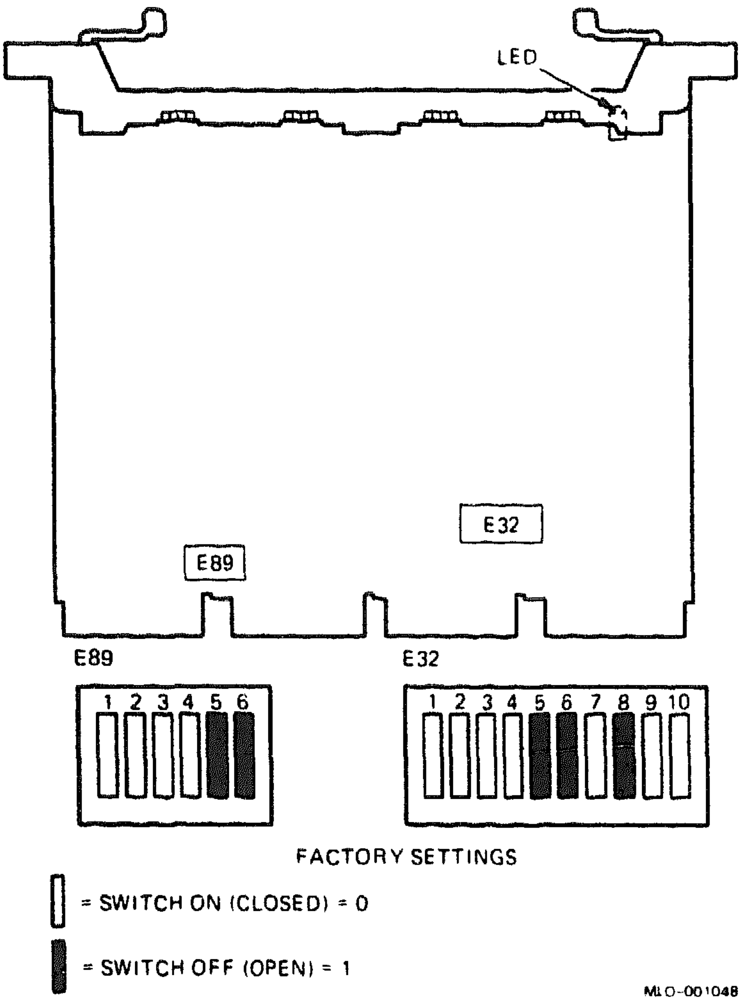
The DSV11 supports the following synchronous communications protocols:

DDCMP
HDLC/SDLC
BISYNC

The DSV11 allows any of the following synchronous interfaces:

RS-423
RS-422
RS-232/V.24
V.35

Figure 1: DSV11–S Module Layout (M3108–PA)



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

Use switchpack E32 (Figure 1) to set the CSR address. The CSR address floats. The actual DSV11 settings depend on the other modules in the system.

The interrupt vector also floats. It is set by the software and cannot be changed by switches.

Use switchpack E89 (Figure 1) to select the DSV11 bus grant and DMA continuity.

The following tables list the configurations for the CSR address and for the bus grant and DMA continuity:

DSV11 CSR Address: 17760640 (factory position)
Switchpack E32

Address Bits:	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3
E32 Switches:	1	2	3	4	5	6	7	8	9	10
CSR Address:										
17760640	0	0	0	0	1	1	0	1	0	0
17760740	0	0	0	0	1	1	1	1	0	0

1 = open, 0 = closed

DSV11 Bus Grant and DMA Continuity
Switchpack E89

E89 Switches	1	2	3	4	5	6	
DSV11-M, Q/Q Slots	0	0	0	0	0	0	(factory position)
DSV11-M, Q/CD Slots	0	0	0	0	1	1	
DSV11-SF	0	0	0	0	1	1	(factory position)

1 = open, 0 = closed

DECvoice Multiline Voice Processing Subsystem

DECvoice, the DTC05 option is a quad-width Q–bus module that provides voice generation and recognition capability. DECvoice software allows the DTC05 option to operate in either Multiline mode (8 lines) to support digitized speech or in the full function mode (single) to support digitized speech and enhanced functionality such as recognition and synthesis. Multiline DECvoice provides users with the tools necessary to customize the isolated word recognition capabilities for application-specific vocabularies.

Ordering Information	
DTCN5–UG	T1 DECvoice upgrade kit processing module
DTC05–SA	Factory installed DECvoice processing module
CL–42RSI–VA	8-Line VAXserver system (VAXserver 4000 Model 200)
CL–42RTI–VA	8-Line VAX timesharing system (VAXserver 4000 Model 200)
CL–42HSI–VA	16-Line VAXserver system (VAXserver 4000 Model 200)
CL–42HTI–VA	16-Line timesharing system (VAXserver 4000 Model 300)
CL–43JSI–CA	24-Line VAXserver system (VAXserver 4000 Model 300)
CL–43JSI–DA	72-Line VAXserver system (VAXserver 4000 Model 300)
CL–43JS2–AA	48-Line dual-host VAXserver system (VAXserver 4000 Model 300)
CL–43JT1–AA	24-Line VAX timesharing system (VAXserver 4000 Model 300 dual-host timesharing system)
CL–43JT2–AA	48-Line dual-host VAXserver system (VAXserver 4000 Model 300 dual host timesharing system)

Functional Information	
Maximum lines per cabinet	48
Lines per system option	Up to 8

Related Documentation

Multiline DECvoice Hardware Installation Manual	EK-DVMLS-IN
DECvoice Software Reference Manual	AA-LE86C-TE
DECvoice Software Installation Manual	AA-PB3HA-TE
DECvoice Software Documentation	QA-VFUAA-GZ

Configuration Information

Form factor	Quad height
VAX 4000-300	11 DTC05 (9 modules) support 72 Multiline, plus two modules support single-line full function mode.
VAX 4000-200 (BA430)	Six DTC05 modules support 48 lines in Multiline mode or 6 lines in single-line full function mode.
VAX 4000-200 (BA215)	Two DTC05s support 16 lines in Multiline mode or two lines in single- line full function mode.
MicroVAX 3800/3900	Nine DTC05 (six modules) support 48 lines in Multiline mode and three telephone lines to support single-line full function mode.
MicroVAX 3500/3600	Six DTC05 (three modules) support 24 telephone lines in Multi-line mode and three lines to support single-line full function mode.

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads	
Option	Module	+5 V	+12 V	Watts	AC	DC
DTC05-SA	DECvoice	4.0	0.0	15.8	3.6	.75
DTCN5-UG	Upgrade kit	7.17	0.0	35.8	7.0	1.5

DZQ11 4-Line Asynchronous Multiplexer

Ordering Information

Module (M3106) for BA23, BA123, and H9642–J	DZQ11–M		
Module (M3106–PA) for BA200-series	DZQ11–SA (factory installed) DZQ11–SF (field upgrade)		
	BA23	BA123	H9642
DZQ11 cabinet kit	CK–DZQ11–DB	CK–DZQ11–DA	CK–DZQ11–DF
Type-B filter connector	70–19964–00	70–19964–00	70–19964–00
30-cm (12-in) internal cable	BC05L–01	–	–
53-cm (21-in) internal cable	–	BC05L–1K	–
90-cm (36-in) internal cable	–	–	BC05L–03
Loopback connectors	H3277 (internal) 12–15336–07 (external) H329 (internal) H325 (external)		

Operating System Support

MicroVMS	Version 4.1m and later
ULTRIX-32m	Version 1.1 and later
VAXELN	Version 2.0 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	All revisions
Power-up self-test LEDs	None

Documentation

DZQ11 Asynchronous Multiplexer User's Guide	EK-DZQ11-UG
DZQ11 Asynchronous Multiplexer Technical Manual	EK-DZQ11-TM

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
DZQ11-M	M3106	1.0	0.36	9.32	1.5	1.0	B
DZQ11-S	M3106-PA	1.0	0.36	9.3	1.4	0.5	-

The DZQ11 is a dual-height module that connects the Q22-bus to as many as four asynchronous serial lines. The DZQ11 conforms to the RS232-C and RS423-A interface standards. The DZQ11 permits dial-up (autoanswer) operation with modems using full-duplex operations, such as AT&T models 103, 113, 212, or the equivalent.

The DZQ11-M module layout is shown in Figure 1. The DZQ11-S module layout is shown in Figure 2, and the module handle is shown in Figure 3.

Figure 1: DZQ11–M Module Layout (M3106)

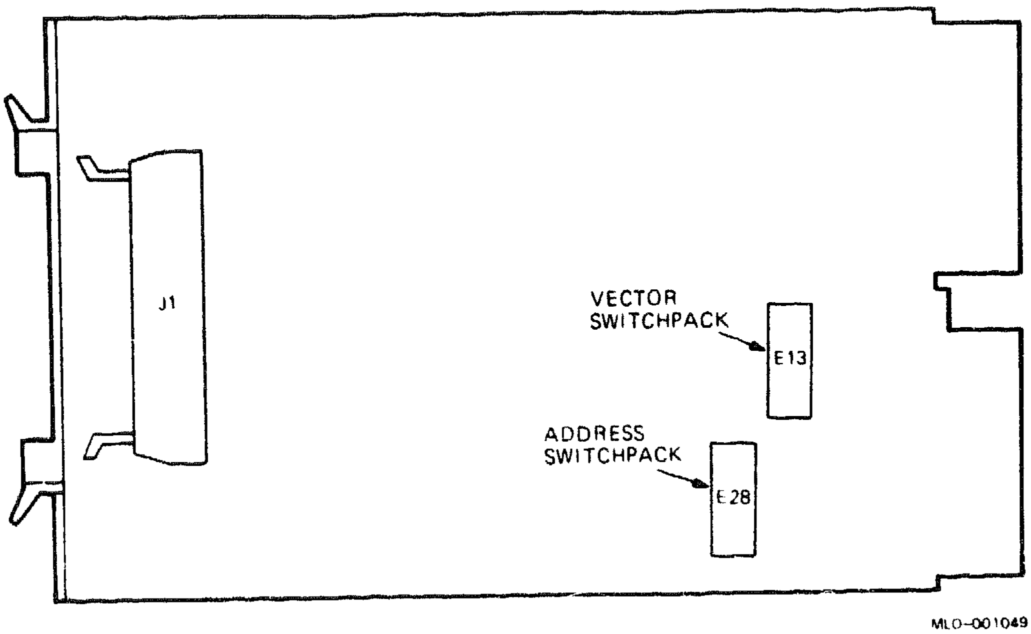


Figure 2: DZQ11–S Module Layout (M3160–PA)

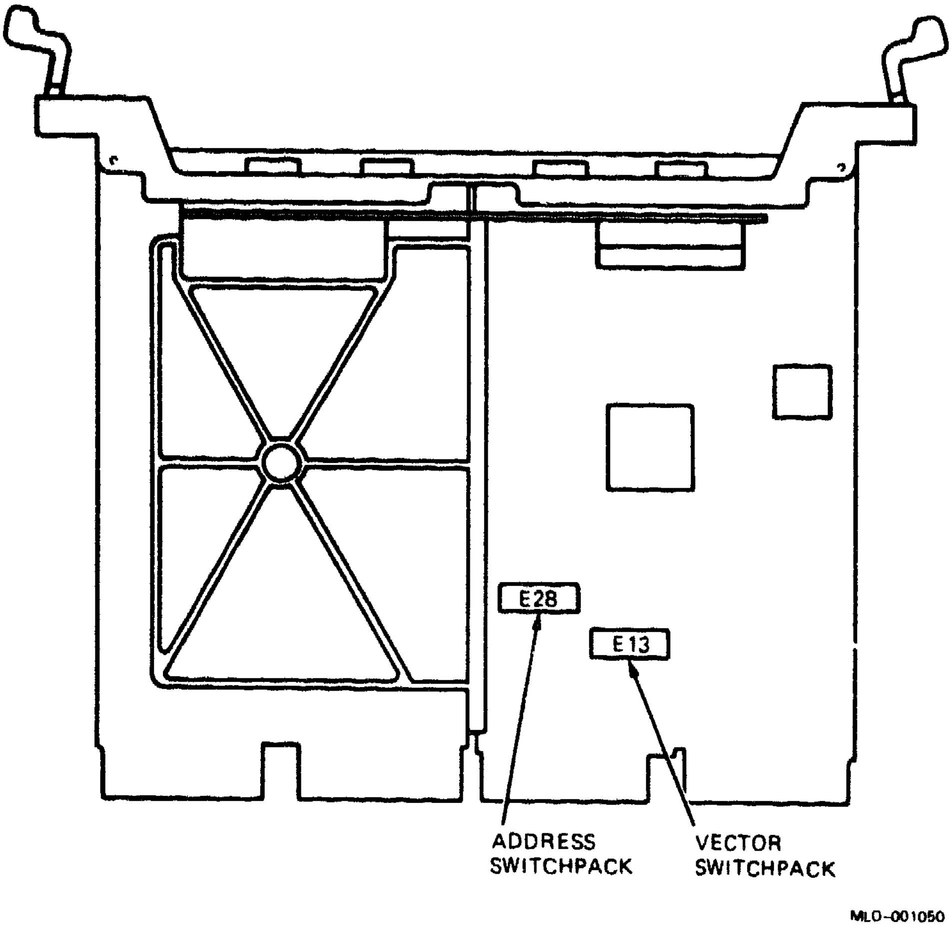
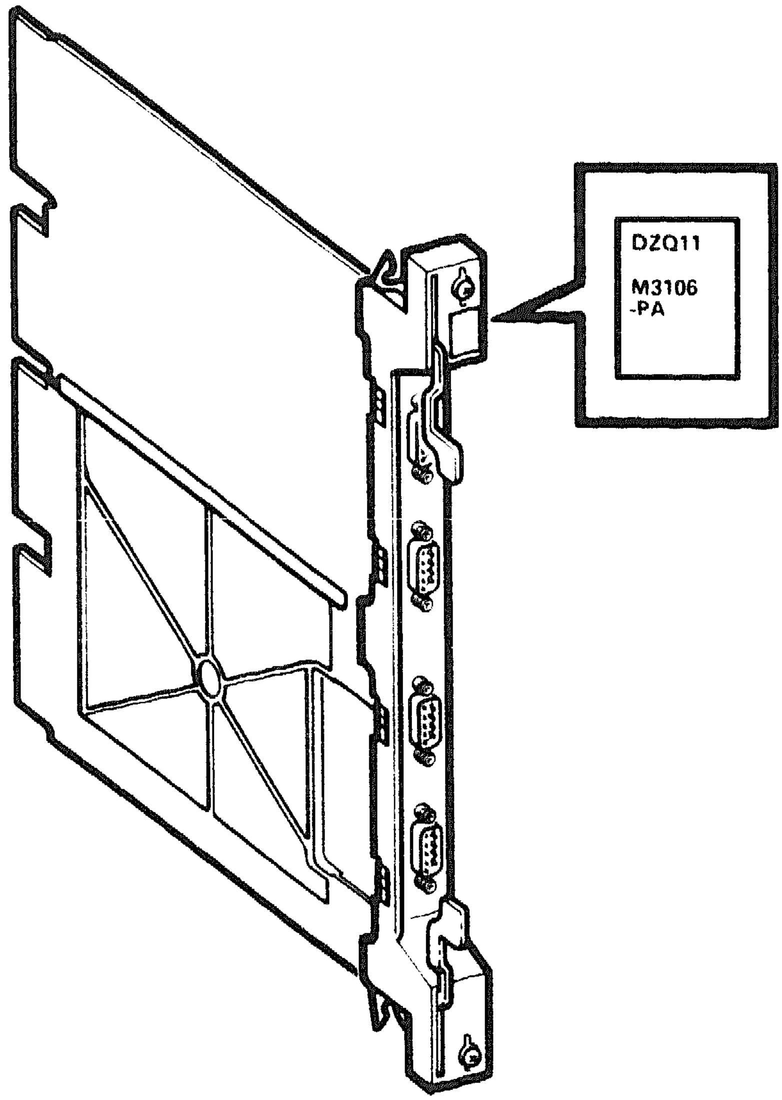


Figure 3: DZQ11–S Handle (BA200-Series)



MLO-2207-87

CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

Use switchpacks E28 and E13 (Figure 1 or 2) to set the module's CSR address and interrupt vector. The CSR address and interrupt vector float. The actual positions depend on the other modules in the system. The following tables list the factory configurations and other common positions for the CSR address and interrupt vector:

DZQ11 CSR Address: 17760010 (factory position)
Switchpack E28

Address Bits:	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3
E28 Switches:	1	2	3	4	5	6	7	8	9	10
CSR Address:										
17760010	0	0	0	0	0	0	0	0	0	1
17760100	0	0	0	0	0	0	1	0	0	0
17760110	0	0	0	0	0	0	1	0	0	1
17760120	0	0	0	0	0	0	1	0	1	0

1 = closed, 0 = open

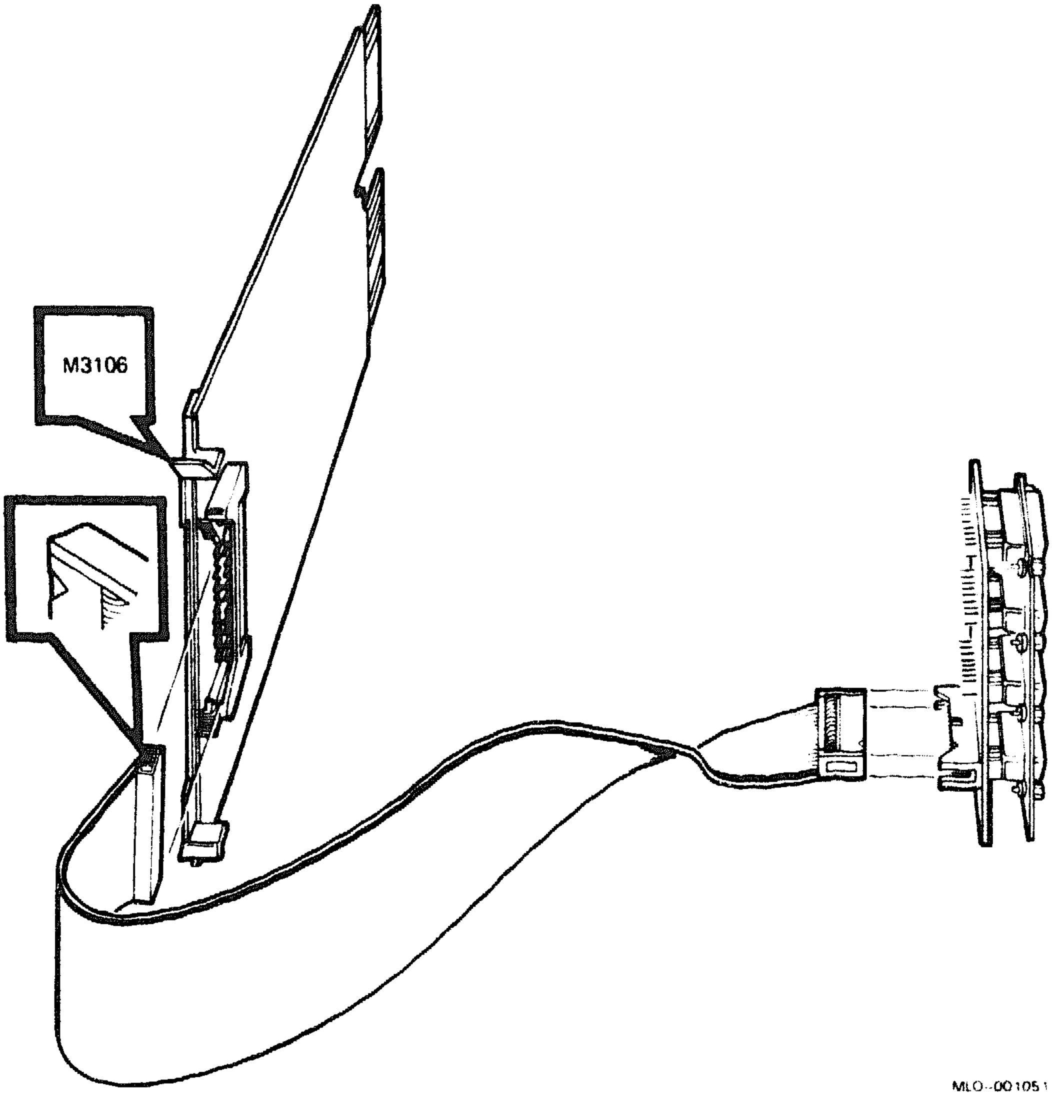
DZQ11 Interrupt Vector: 300 (factory position)
Switchpack E13

Vector Bits:	V8	V7	V6	V5	V4	V3
E13 Switches:	1	2	3	4	5	6
Vector Address:						
300	0	1	1	0	0	0
310	0	1	1	0	0	1

1 = closed, 0 = open

Figure 4 shows the internal cabling for the DZQ11–M.

Figure 4: DZQ11–M Internal Cabling



DZV11 4-Line Asynchronous Multiplexer

Ordering Information

Module (M7957)	DZV11-M		
	BA23	BA123	H9642-J
DZV11 cabinet kit	CK-DZV11-DB	CK-DZV11-DA	CK-DZV11-DF
Type-B filter connector	70-19964-00	70-19964-00	70-19964-00
30-cm (12-in) internal cable	BC05L-01	-	-
53-cm (21-in) internal cable	-	BC05L-1K	-
90-cm (36-in) internal cable	-	-	BC05L-03

Operating System Support

Micro/RSTS	Version 2.2 and later
Micro/RSX	Version 4.0 and later
MicroVMS	Version 4.1m and later
RSX-11M	Version 4.3 and later
RSX-11M-PLUS	Version 4.0 and later
RT-11	Version 5.4D and later
ULTRIX-11	Version 3.1 and later
ULTRIX-32m	Version 1.1 and later
VAXELN	Version 2.0 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 1.06 (release 106) and later
XXDP	Version 2.1 (release 134): VDZAD3.BIC, VDZBD0.BIC, VDZCB1.BIN, VDZDA0.BIN
Power-up self-test LEDs	None

Documentation

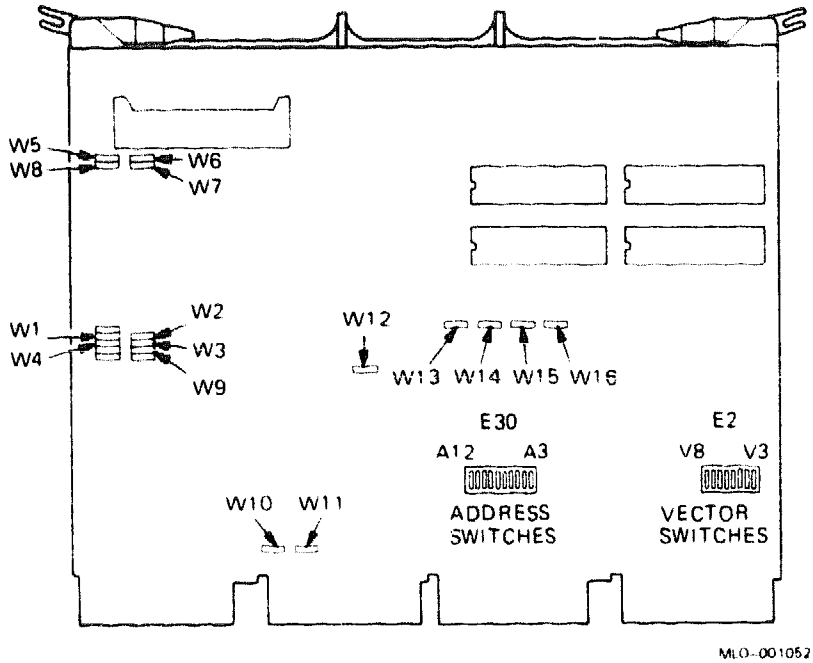
DZV11 Asynchronous Multiplexer Technical Manual	EK-DZV11-TM
DZV11 Asynchronous Multiplexer User's Guide	EK-DZV11-UG

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
DZV11-M	M7957	1.2	0.39	10.7	3.9	1.0	B

The DZV11, shown in Figure 1, is a quad-height module that connects a Q22-bus to as many as four asynchronous serial lines. The DZV11 conforms to the RS232 interface standard. The DZV11 permits dial-up (autoanswer) operation with modems using full-duplex operations, such as AT&T models 103, 113, 212, or the equivalent.

Figure 1: DZV11 Module Layout (M7957)



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29-26246) when you work with the internal parts of a computer system.*

Use switchpack E30 to set the CSR address, and switchpack E2 to set the vector address (Figure 1). Both the CSR address and interrupt vector float; their settings depend on the other modules in the system. The following tables list the factory configuration for the CSR address and interrupt vector:

DZV11 CSR Address: 17760010 (factory position)
Switchpack E30

Address Bits:	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3
E30 Switches:	1	2	3	4	5	6	7	8	9	10
CSR Address:										
17760010	0	0	0	0	0	0	0	0	0	1
17760100	0	0	0	0	0	0	1	0	0	0

1 = closed, 0 = open

```
DZV11 Interrupt Vector:   300 (factory position)
Switchpack E2

Vector Bits:     V8  V7  V6   V5  V4  V3
E2 Switches:     1   2   3    4   5   6

Vector Address:
   300           0   1   1    0   0   0
   310           0   1   1    0   0   1

1 = closed, 0 = open
```

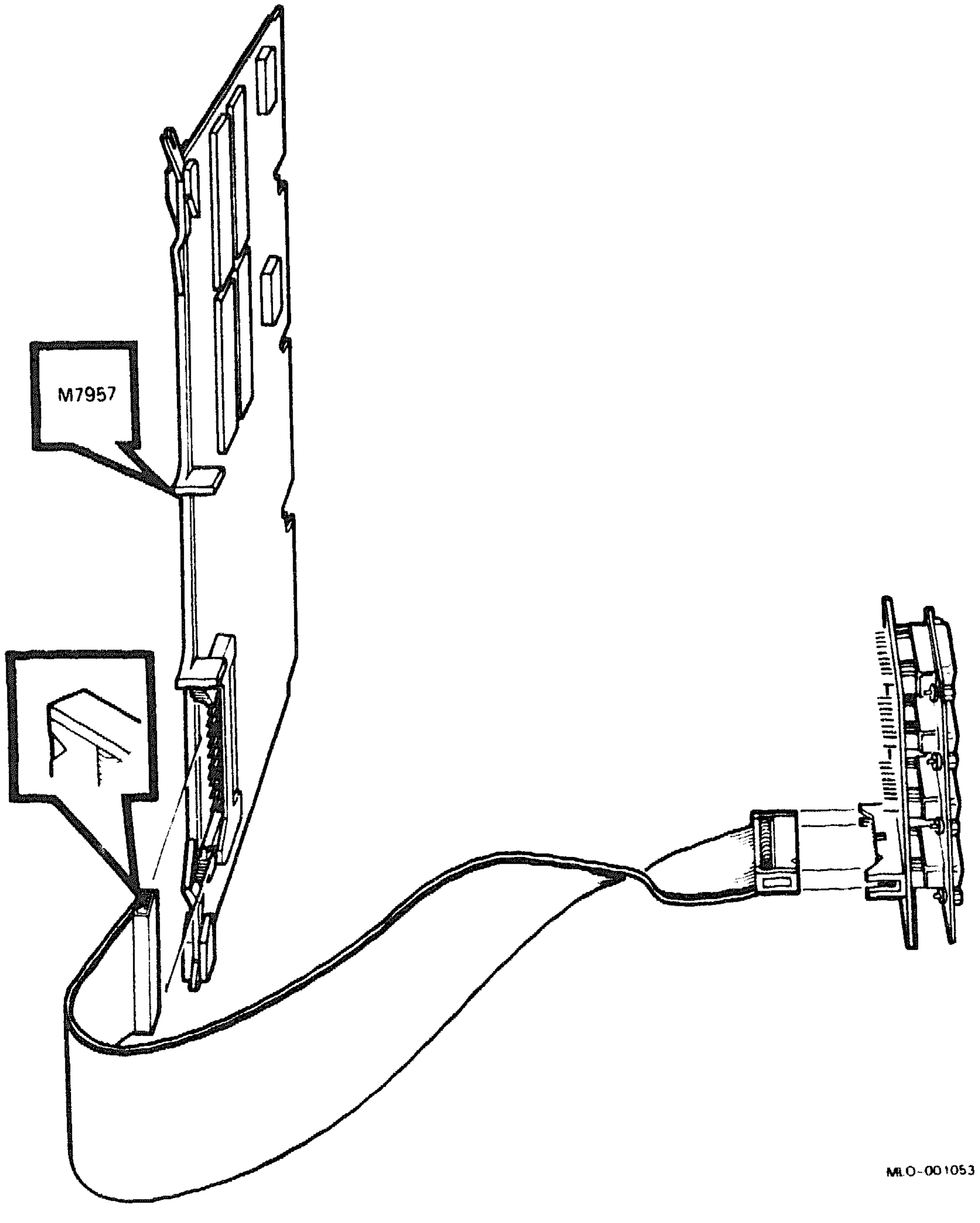
Table 1 lists the DZV11 jumpers (Figure 1) and their configurations. Jumpers W1 through W8 are used to control modems. Jumpers W1 through W4 connect data terminal ready (DTR) to request to send (RTS); these jumpers must be installed to enable you to run external test diagnostic programs. Jumpers W5 through W8 connect the forced busy (FB) leads to the RTS leads; with these jumpers installed, the assertion of an RTS lead places an on or busy signal on the corresponding forced busy lead.

Table 1: DZV11 Jumper Configurations

Jumper	Position	Description
W1	In	DTR to RTS, line 03.
W2	In	DTR to RTS, line 02.
W3	In	DTR to RTS, line 01.
W4	In	DTR to RTS, line 00.
W5	In	RTS to FB, line 03.
W6	In	RTS to FB, line 02.
W7	In	RTS to FB, line 01.
W8	In	RTS to FB, line 00.
W9, W12, W13, W14, W15, W16	In	Do not remove; used only for manufacturing tests.
W10, W11	In	Remove only when the module is used where the CD rows are connected to an adjacent module.

Figure 2 shows the DZV11 internal cabling.

Figure 2: DZV11 Internal Cabling



EF51R Solid State Disk

The EF51R is a 5.25-inch, DSSI-based solid state disk (SSD). It features an integrated data retention system that combines battery backup protection with a hard disk to preserve data in the event of a power failure. It provides 107 megabytes of storage space for BA4xx-based systems and expander cabinets.

Ordering Information[1]	
EF51R SSD for BA4xx-based systems and expanders (factory installed)	EF51R–AA
EF51R SSD for BA4xx-based systems and expanders (field installed)	EF51R–AF
Storage Capacity	
Data storage capacity	107 megabytes, formatted
Performance	
Average access time	0.25 milliseconds
Peak transfer rate	800 I/O transfers/second
Physical Specifications	
Height	8.26 cm (3.25 in)
Width	14.6 cm (5.75 in)
Depth	20.32 cm (8.0 in)
Weight	2.55 kg (5 lb 10 oz)
Configuration Information	
Form factor	5.25-inch
Power Requirements	
	+5 Vdc, 0.0 A
	+12 Vdc, 1.5 A (typical)
	+12 Vdc, 2.3 A (peak)
Power consumption	18.0 W (typical)

[1]No cables are required.

Operating System Support	
OpenVMS	Version 5.4–3 and later
Diagnostic Support	
Power-On Self-test diagnostic (POST)	See the device documentation.
Diagnostic Utilities Protocol (DUP)	See the device documentation.
MicroVAX Diagnostic Monitor (MDM)	Release 137A and later
Related Documentation	
EF5xx-Series Solid State Disk Service Guide	EK–EF5XX–SG
EF5xx-Series Solid State Disk User Guide	EK–EF5XX–UG
BA400 Storage Devices Installation Procedure	EK–BA44A–IN

EF52R Solid State Disk

The EF52R is a 5.25-inch, DSSI-based solid state disk (SSD). It features an integrated data retention system that combines battery backup protection with a hard disk to preserve data in the event of a power failure. It provides 205 megabytes of storage space for BA4xx-based systems and expander cabinets.

The EF52R is *not* available in Europe.

Ordering Information[1]	
EF52R SSD for BA4xx-based systems and expanders (factory installed)	EF52R–AA
EF52R SSD for BA4xx-based systems and expanders (field installed)	EF52R–AF
Storage Capacity	
Data storage capacity	205 megabytes, formatted
Performance	
Average access time	0.25 milliseconds
Peak transfer rate	800 I/O transfers/second
Physical Specifications	
Height	8.26 cm (3.25 in)
Width	14.6 cm (5.75 in)
Depth	20.32 cm (8.0 in)
Weight	2.55 kg (5 lb 10 oz)
Configuration Information	
Form factor	5.25-inch

[1]No cables are required.

Power Requirements	
	+5 Vdc, 0.0 A +12 Vdc, 1.4 A (typical) +12 Vdc, 2.2 A (peak)
Power consumption	16.6 W (typical)
Operating System Support	
OpenVMS	Version 5.4–3 and later
Diagnostic Support	
Power-On Self-Test diagnostic (POST)	See the device documentation.
Diagnostic Utilities Protocol (DUP)	See the device documentation.
MicroVAX Diagnostic Monitor (MDM)	Release 137A and later
Related Documentation	
EF5xx-Series Solid State Disk Service Guide	EK–EF5XX–SG
EFxx-Series Solid State Disk User Guide	EK–EF5XX–UG
BA400 Storage Devices Installation Procedure	EK–BA44A–IN

EF53 Solid State Disk

The EF53 is a 5.25-inch, DSSI-based solid state disk (SSD). It provides 267 megabytes of storage space for BA4xx-based systems and expander cabinets.

The EF53 is available *only* in Europe.

Ordering Information[1]	
EF53 SSD for BA4xx-based systems and expanders (factory installed)	EF53–AA
EF53 SSD for BA4xx-based systems and expanders (field installed)	EF53–AF
Storage Capacity	
Data storage capacity	267 megabytes, formatted
Performance	
Average access time	0.25 milliseconds
Peak transfer rate	800 I/O transfers/second
Physical Specifications	
Height	8.26 cm (3.25 in)
Width	14.6 cm (5.75 in)
Depth	20.32 cm (8.0 in)
Weight	2.55 kg (5 lb 10 oz)
Configuration Information	
Form factor	5.25-inch
Power Requirements	
	+5 Vdc, 2.2 A (typical) +5 Vdc, 3.7 A (peak) +12 Vdc, 0.0 A (typical) +12 Vdc, 0.1 A (peak)

[1]No cables are required.

Power Requirements	
Power consumption	11.2 W (typical)
Operating System Support	
OpenVMS	Version 5.4–3 and later
Diagnostic Support	
Power-On Self-Test diagnostic (POST)	See the device documentation.
Diagnostic Utilities Protocol (DUP)	See the device documentation.
MicroVAX Diagnostic Monitor (MDM)	Release 137A and later
Related Documentation	
EF5xx-Series Solid State Disk Service Guide	EK–EF5XX–SG
EF5xx-Series Solid State Disk User Guide	EK–EF5XX–UG
BA400 Storage Devices Installation Procedure	EK–BA44A–IN

IBQ01 BITBUS Controller

The IBQ01 BITBUS control system uses hardware, software, and firmware to provide an interface between intelligent devices using BITBUS and application software running on a MicroVAX II.

Ordering Information

EIA RS485 BITBUS controller interface for system installation	IBQ01–AA
Cable kit for use with MicroVAX II in BA123 enclosure (21-inch cable)	CK–IBQ01–AA
Cable kit for use with MicroVAX II in BA23 enclosure (12-inch cable)	CU–IBQ01–AB
Cable kit for use with MicroVAX II in H9642 enclosure (36-inch cable)	CU–IBQ01–AF
EIA RS485 BITBUS controller interface for factory installation into BA213, BA215, and BA220 enclosures	(M3125–PA) IBQ01–SA
EIA RS485 BITBUS controller interface for field installation into BA213, BA215, and BA220 enclosures	IBQ01–SF
Gap filler assembly (gap filler and two flathead screws)	70–24505–01

Operating System Support

Ethernet Server Kit (BA214 enclosure)	ZNA07–CM, CP, or C5
Loopback Connector (used in Service Mode)	IBQ01–TA
MicroVAX II MDM	MDM diagnostics

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 1.01
Power-up self-test	
MicroVAX System Maintenance Kit	ZNABX–GZ, C5

Documentation

IBQ01 BITBUS Controller User's Guide	EK–IBQ01–UG
MDM User's Guide	AA–FM7A–DN
IBQ01 BITBUS Installation Guide	EK–IBQ01–IN
IBQSF Option Installation Guide	EK–IBQSF–IN
IBQ01 BITBUS Controller Technical Manual	EK–IBQ01–TM

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	Module	+5 V	+12 V	Watts	AC	DC	Insert
IBQ01–AA		5.0	0.0	25.0	4.6	1.0	B
IBQ01–SA/SF		5.0	0.0	25.0	4.6	1.0	–

Module Order

Use the following recommended module list to help you correctly install the IBQ01 module in a BA200-series enclosure.

KA630/KA620/KA640/KA650/KA655
MS630–B/C
MRV11–D
DEQNA
DPV11
DFA01
DZQ11
CXA16
CXB16
CXY08
IEQ11 (no restrictions on position)
IBQ01 (no restrictions on position)
DRQ3B
DRV1W
TQK50 (not applicable in BA214 enclosure)
RQDX3 (not applicable in BA214 enclosure)

The IBQ01 has an interrupt priority of 4.

Configuring the IBQ01

Set the IBQ01 BITBUS controller address using switch pack E75. Factory setting is 760770. If more than one IBQ01 is used, use word size = 4. See Figure 1.

CSR Address

Address	Rank	Size	Modulus (Octal)
CSR	50	02	10

Vector Address

Address	Rank	Size	Modulus (Octal)
Vector	78	2	4

Speed

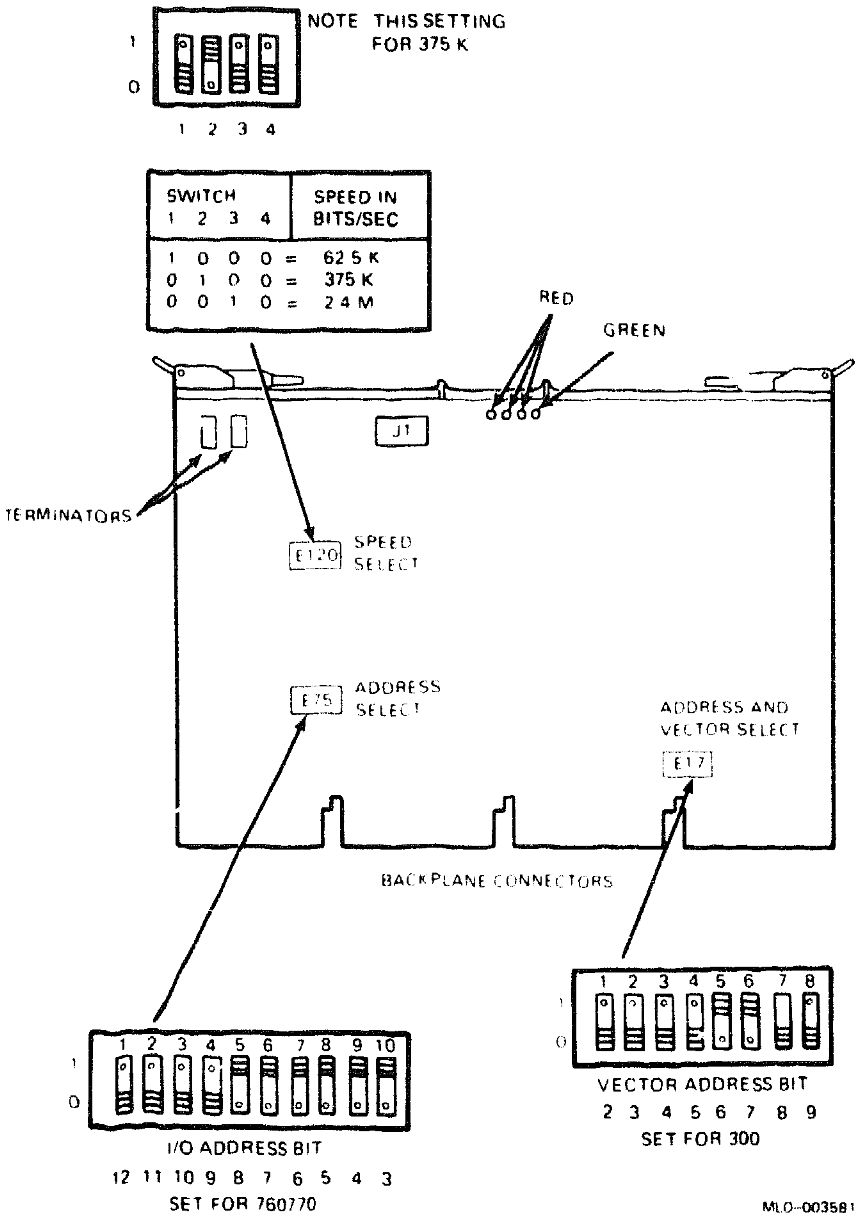
Synchronous Mode

Speed	2.4 Mbits/s
Maximum segment distance	30 meters (99 ft)
Number of nodes per segment	28
Number of segments	1
Total allowable distance	30 meters (99 ft)
Total number of addresses	28
Speed–low	62.5 Kbits/s
Maximum segment distance	1200 meters (3937 ft)
Number of nodes per segment	26
Number of segments	11
Total allowable distance	13,200 meters (43,310 ft)
Total number of addresses	250

Speed
Self-Clocked Mode

Speed–high	375 Kbits/s
Maximum segment distance	300 meters (984 ft)
Number of nodes per segment	28
Number of segments	3
Total allowable distance	900 meters (2953 ft)
Total number of addresses	84

Figure 1: IBQ01 Module Layout (M3125)



SWITCH 1 2 3 4	SPEED IN BITS/SEC
1 0 0 0 =	62 5 K
0 1 0 0 =	375 K
0 0 1 0 =	2 4 M

IEQ11 Communications Controller

Ordering Information

Module (M8634-PA) for BA200-series	IEQ11-SA (factory installed)	
	IEQ11-SF (field upgrade)	
Loopback connector	BN01A-02	

	IEEE	IEC
IEQ11 system for BA23, BA123, and H9642-J	IEQ11-AC	IEQ11-AD
Module (M8634)	IEQ11	IEQ11
Internal cable	BN11J-0C	BN11K-0C
Type-B filtered connector	-	-
Optional cable for 2nd controller	BN11M-0C	BN11L-0C

Operating System Support

MicroVMS	Version 4.2 and later
ULTRIX-32m	Version 2.0 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 1.08 (release 108) and later

Documentation

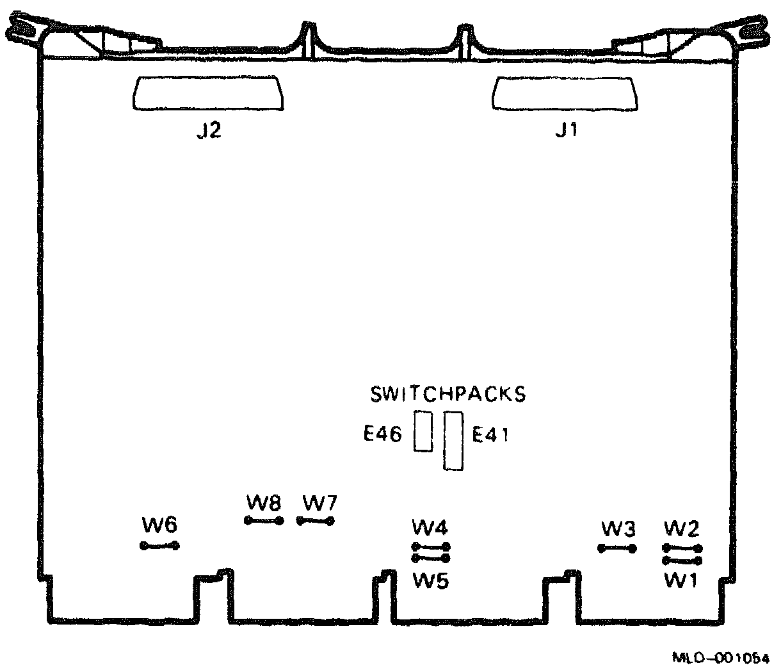
IEU11-A/IEQ11-A User's Guide	EK-IEUQ1-UG

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	Module	+5 V	+12 V	Watts	AC	DC	Insert
IEQ11	M8634	3.0	0.0	15.0	2.0	1.0	B
IEQ11-S	M8634-PA	3.5	0.0	17.5	2.0	1.0	-

The IEQ11 provides interface functions with the IEC/IEEE bus, a standard instrumentation bus. Figure 1 shows the M8634 module; the M8634-PA module layout is the same, and contains an attached BA200-series bulkhead handle to connect to external devices.

Figure 1: IEQ11 Module Layout (M8634)



The following IEEE 488-1978 interface functions are available from the IEQ11 system:

Automatic source handshake	Remote local
Automatic acceptor handshake	Parallel poll
Talker and extended talker, includes serial poll capability	Device clear
Listener and extended listener	Device trigger
Service request	Controller

When you order an IEQ11-AC or –AD system, you receive the M8634 module, one module-to-bulkhead cable, and an I/O bulkhead panel. You can order an optional second cable to connect the second controller on the IEQ11 module to the same bulkhead panel.

When you order an IEQ11–SF, you receive the M8634–PA module and a loopback connector (BN01A–02).

CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

Two DIP switchpacks and eight jumpers determine the IEQ11 module configuration (Figure 1). Use switchpack E41 to set the CSR address, and switchpack E46 to set the interrupt vector. Remove jumpers W1, W4, W5, W6, W7, and W8. Install jumpers W2 and W3.

The following tables list the factory configurations for the IEQ11 CSR address and interrupt vector:

IEQ11 CSR Address: 17764100 (factory position)
Switchpack E41

Address Bits:	A12	A11	A10	A9	A8	A7	A6
E41 Switches:	S1	S2	S3	S4	S5	S6	S7
CSR Address:							
17764100	0	1	0	0	0	0	1

1 = on, 0 = off

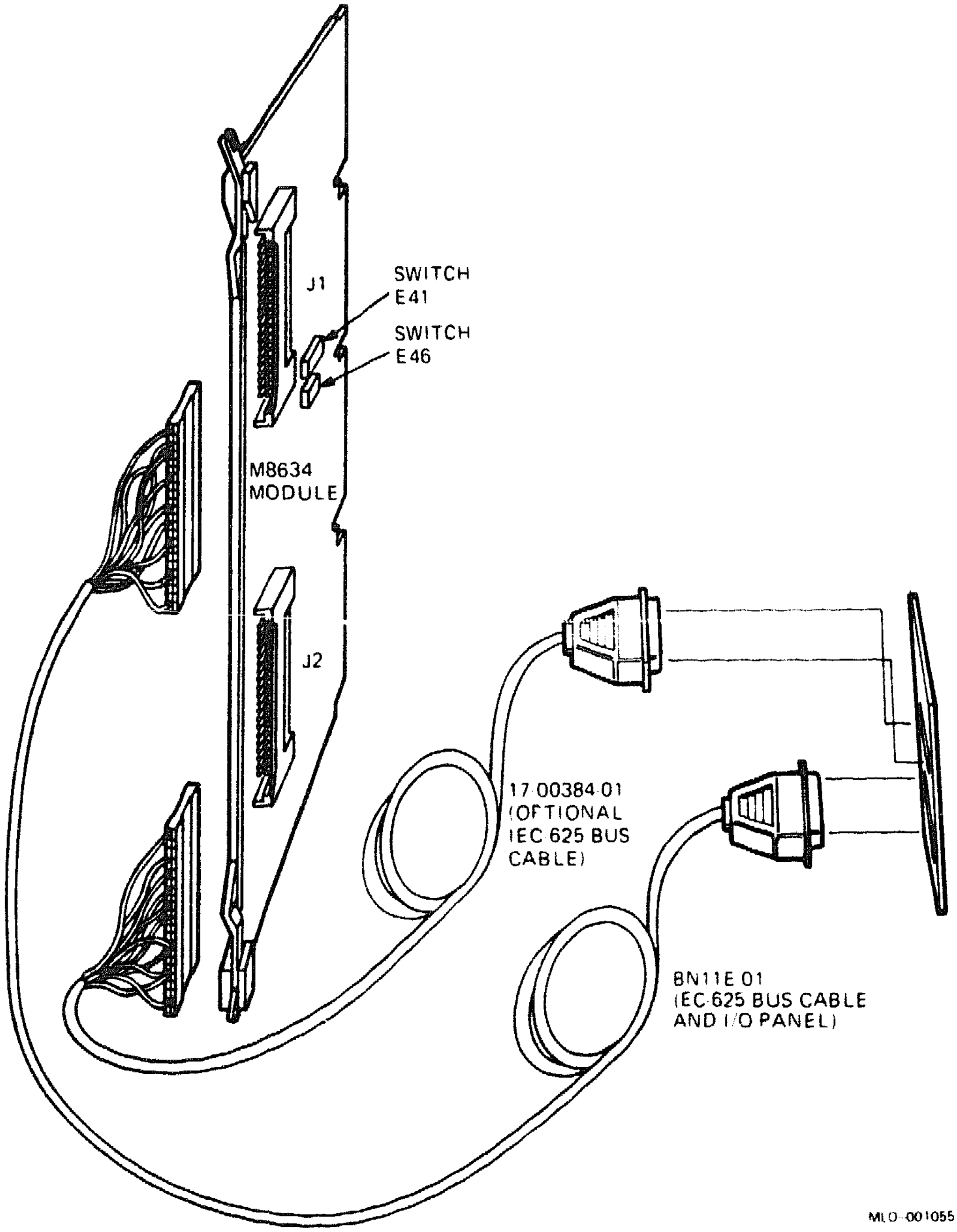
IEQ11 Interrupt Vector: 270 (factory position)
Switchpack E46

Vector Bits:	V8	V7	V6	V5	V4	V3
E46 Switches:	S1	S2	S3	S4	S5	S6
Vector Address:						
300	0	1	1	0	1	1

1 = on, 0 = off

Figure 2 shows the internal cabling for the M8634 module (IEEE version). The cable that connects to J1 on the module is included with the option. The second cable is optional. IEC cabling (not shown) also uses a type-B filtered connector and two cables.

Figure 2: IEQ11 (M8634) Internal Cabling (IEEE Version)



KDA50–Q Disk Controller

This option is available for the H9642–J and H9644 cabinets only.

Ordering Information

KDA50 controller kit	KDA50–QA
KDA50–Q controller processor module	M7164–00
KDA50–Q controller SDI module	M7165–00
50-conductor module interconnect cable	70–18448–00
40-conductor module interconnect cable	70–18447–00
Internal SDI cable	17–00951–03
Type-B filter connector (2)	70–21937–01

Operating System Support

DSM–11	Version 3.3 and later
Micro/RSTS	Version 2.2 and later
Micro/RSX	Version 4.0 and later
MicroVMS	Version 4.2 and later
RSX–11M	Version 4.3 and later
RSX–11M–PLUS	Version 4.0 and later
ULTRIX–32m	Version 1.2 and later
VAXELN	Version 2.1 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 1.06 (release 106) and later
Power-up self-test LEDs	Four LEDs (M7164) Four LEDs (M7165)

Documentation

KDA50–Q User's Guide	EK-KDA5Q-UG

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
KDA50–Q	M7164	6.93	0.0	34.65	3.0	0.5	–
KDA50–Q	M7165	6.57	0.03	33.21	–	–	–

The KDA50–Q controller connects up to four 16-bit RA series drives to the Q22-bus. The KDA50–Q consists of two quad-height modules: the processor module and the standard disk interface (SDI) module. The KDA50–Q is an intelligent controller with on-board microprocessors. Host system programs communicate with the controller and drives by using the mass storage control protocol (MSCP).

Figures 1 and 2 show the jumper, switch, and LED locations on the KDA50–Q controller module set.

Figure 1: KDA50–Q Processor Module Layout (M7164)

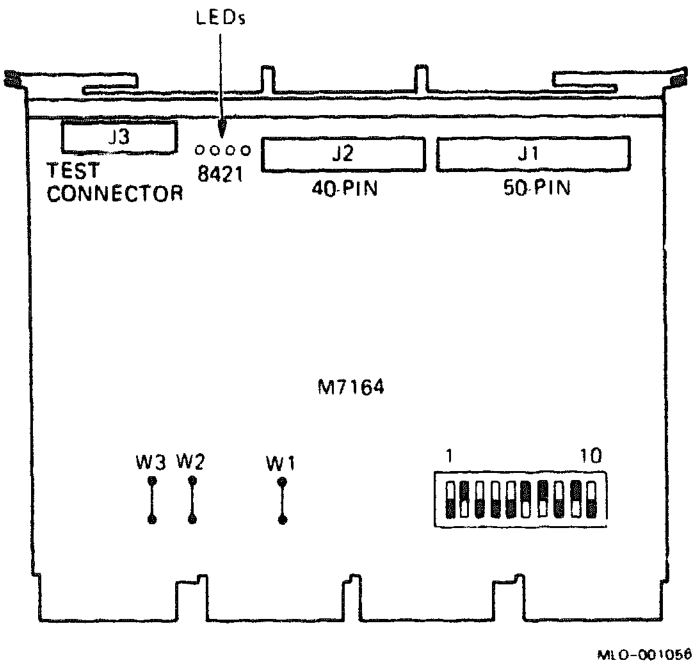
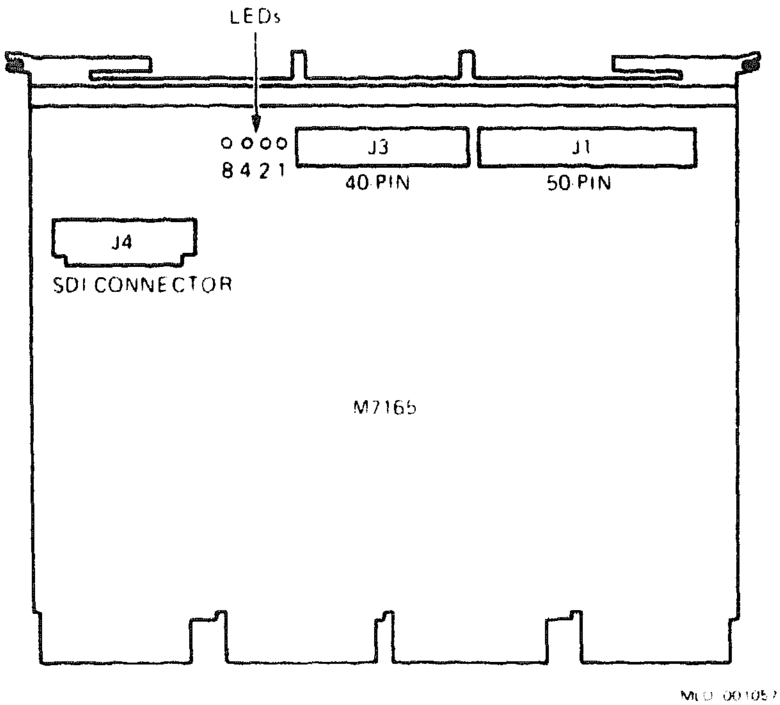


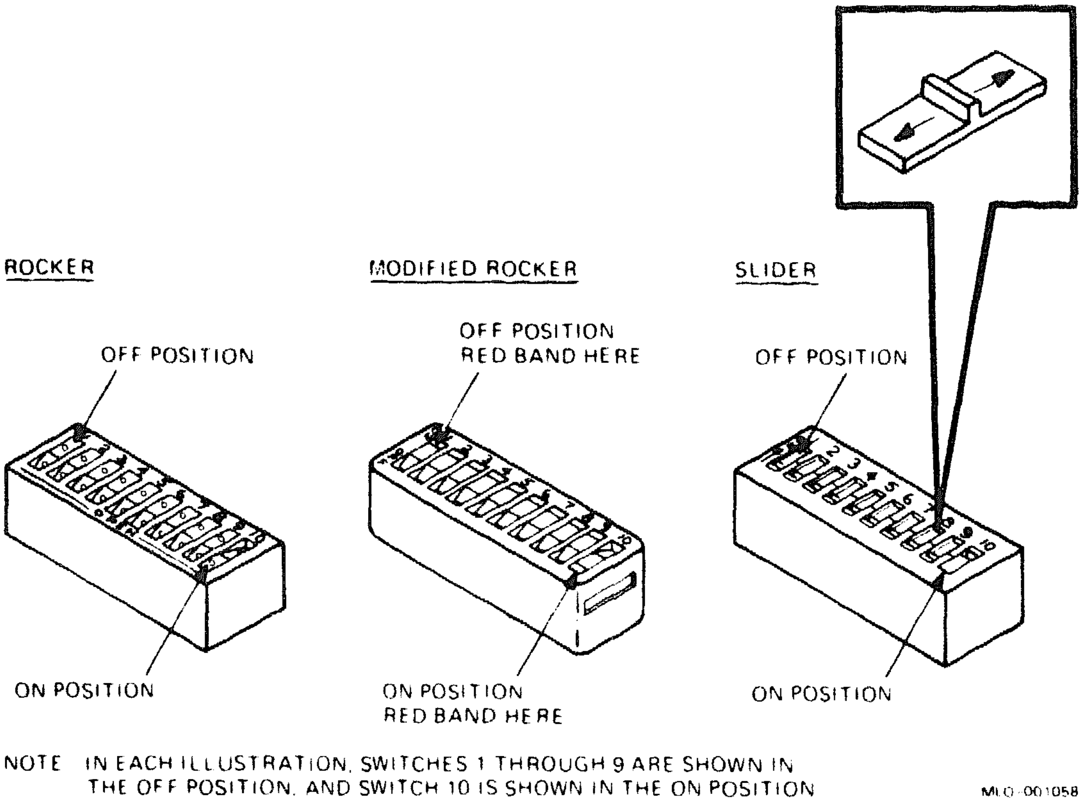
Figure 2: KDA50–Q SDI Module Layout (M7165)



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

The KDA50–Q is an MSCP device. The CSR address for the first MSCP device in a system is 17772150. Use the switchpack on the M7164 processor module (Figure 1) to set the CSR address. If you install more than one MSCP device, you must set the CSR address of the second device within the floating range. Figure 3 shows how to operate the address selector switch.

Figure 3: KDA50–Q Address Selector Switch



The factory configuration for the CSR address is shown below.

MSCP CSR Address: 17772150 (factory position)

Address Bits:	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2
M7164 Switches:	W1	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
CSR Address:											
17772150	1	0	1	0	0	0	1	1	0	1	0
Possible settings for a second MSCP device:											
17760334	0	0	0	0	0	1	1	0	1	1	1
17760354	0	0	0	0	0	1	1	1	0	1	1
17760374	0	0	0	0	0	1	1	1	1	1	1

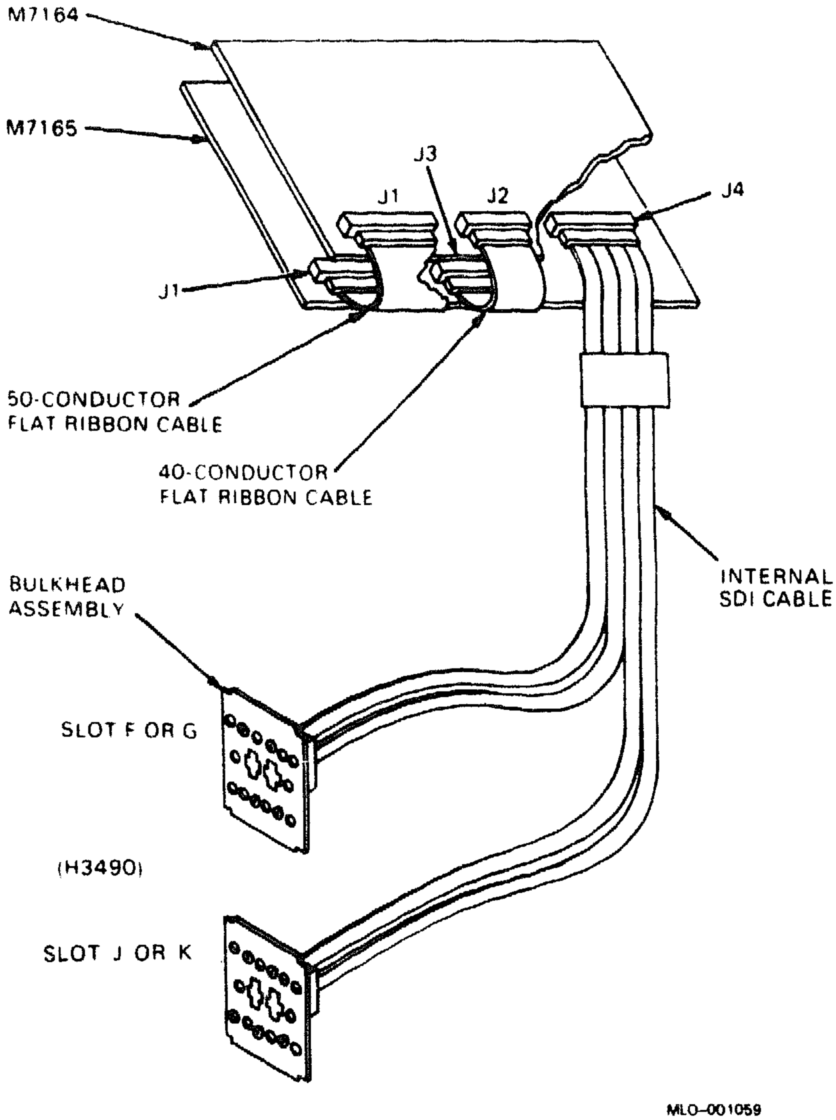
1 = switch on or M7164 jumper W1 in.
0 = switch off or M7164 jumper W1 cut.

The interrupt vector for the KDA50–Q is set under program control. The first MSCP device is assigned a fixed interrupt vector of 154. If you install a second MSCP device (KDA50–Q), its interrupt vector floats.

NOTE: *If you use an RQDX disk controller, always make the RQDX the first MSCP device in the backplane and give the KDA50 a floating CSR address.*

Figure 4 shows the internal cabling for the module set intended for the H9642–J cabinet.

Figure 4: KDA50–Q Internal Cabling



Power-Up Tests

Figure 5 shows the KDA50–Q LEDs for both the M7164 and M7165 modules. Table 1 lists the LED error codes. When the table lists two codes for the same error, both codes indicate the same failure. The order of the KDA50–Q LEDs is reversed (1 2 4 8) when you view the module with the handles placed horizontally (chips upward).

Figure 5: KDA50–Q Module LEDs

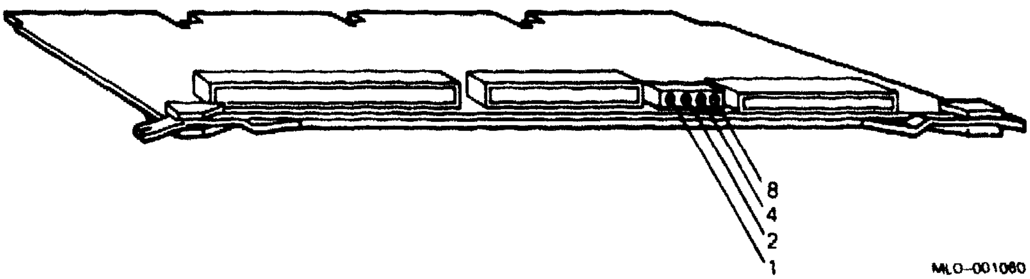


Table 1: KDA50 LED Error Codes

M7164 8421[1]	M7165 8421[1]	Hex Value	Most Likely Error Symptom	Failure
0001	XXXX	1	Undefined	Not used
0010	0000	2	Microcode stuck in init step 2	M7164 or software
0011	0000	3	Microcode stuck in init step 3	See Note 1.
0100	0000	4	Microcode stuck in init step 4 or Q-bus timeout error	M7164 or host inactive
010F	0000	4/5	Test successful. Normal operating display.	–
0110 XXXX	XXXX 0110	6	Undefined	Not used
0111 XXXX	XXXX 0111	7	Undefined	Not used
1000	0000	8	Wrap bit 14 set in SA register.	M7164 or software

[1] 1 = on, 0 = off, X = either on or off, F = flashing

Table 1 (Cont.): KDA50 LED Error Codes

M7164 8421[1]	M7165 8421[1]	Hex Value	Most Likely Error Symptom	Failure
1001 0000	0000 1001	9	Board one error.	M7164
1010 1010	0000 1010	A	Board two error.	M7165
1011 XXXX	XXXX 1011	B	Undefined	Not used
XXXX 1100	1100 XXXX	C	Timeout error, check error code in SA register	Many causes. See Table 2-2 in *KDA50-Q User's Guide*.
1101 XXXX	XXXX 1101	D	RAM parity error	M7165
1110 XXXX	XXXX 1110	E	ROM parity error	M7164
1111	1111	F	Sequencer error	M7164
Cycling		-	None	See KDA50 LED Error Codes below.

[1] 1 = on, 0 = off, X = either on or off, F = flashing

KDA50 LED Error Codes

- Error code 3 (0011) usually occurs during installation. The error indicates that the KDA50-Q tried to access memory via the Q22-bus. The module detected a problem during a direct memory access (DMA). Here are four typical causes for this error, with suggested solutions.

  1. Q22-bus routing in the backplane.

     You may need to install grant continuity cards in unused module slots (either dual or quad), to ensure that DMA devices that are installed on the Q22-bus later will work correctly. Routing problems seldom occur when another DMA device is installed immediately after the KDA50-Q in a correctly working Q22-bus sequence.

  2. DMA access to memory.

     The KDA50-Q may be unable to access memory because of a problem with the memory or CPU modules. This problem seldom occurs if another DMA device is installed on the same Q22-bus.

3. Grant-passing devices.

   Check the applicable CPU maintenance documentation to find what installed devices come before the KDA50–Q in the Q22-bus grant continuity sequence. One or more devices may not properly pass grants to the following devices in the sequence. You must place the KDA50–Q before any such device(s) in the backplane. Grant-passing problems seldom occur if another DMA device follows the KDA50–Q in the Q22-bus sequence.

4. M7164 module.

   If none of the problems above is the cause of this error, the M7164 module may be at fault.

- During a cycling pattern, the M7164 LEDs flash first, then the M7165 LEDs. The LEDs flash one at a time, from the least significant bit (LSB) to the most significant bit (MSB). The LEDs turn on and off for about 0.25 second, then repeat at about a 4-second rate. The pattern happens so rapidly that it appears the LEDs are flashing at the same time.

  The LEDs normally cycle while the KDA50–Q is waiting for the host to start the initialization process. At this time, the KDA50–Q responds to the initialization and the cycling pattern stops. This action normally occurs in about 4 seconds if the system software is ready to establish a connection with the KDA50–Q.

  If the cycling pattern continues beyond the start of the initialization process, the KDA50–Q is not responding to the host CPU.

KFQSA Storage Adapter

Ordering Information

Module (M7769) for BA23	KFQSA–AA
Module (M7769) for BA123	KFQSA–BA
Module (M7769) for BA200-series	KFQSA–SA (factory installed) KFQSA–SF (field upgrade with cables for internal and external ISEs) KFQSA–SG (field upgrade with cables for external ISEs)

Operating System Support

ULTRIX–32m	Version 3.0 and later
VAXELN	Version 3.2 and later
VMS	Version 5.0–2A and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 3.01 (release 126) and later
Power-up self-test LEDs	Six LEDs

Documentation

KFQSA Installation Manual	EK–KFQSA–IN

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	Module	+5 V	+12 V	Watts	AC	DC	Insert
KFQSA–A/B	M7769	5.5	0.0	27.0	3.8	0.5	B
KFQSA–S	M7769	5.5	0.0	27.0	3.8	0.5	–

NOTE: *Each option kit includes a KFQSA module, preconfigured cabling, a terminator, mounting hardware, and documentation. See the KFQSA Installation Manual for a complete list of KFQSA option kit parts and part numbers.*

The KFQSA module is a storage adapter that allows Q-bus host systems that support the KFQSA to communicate with storage peripherals based on the DIGITAL Storage Architecture (DSA), using the DIGITAL Storage System Interconnect (DSSI). One KFQSA module can connect up to seven integrated storage elements (ISEs) to the host system using a single DSSI bus cable.

The KFQSA module is a protocol converter that supports Q-bus protocols to and from the host and DSSI bus protocols to and from the DSSI storage elements. The KFQSA contains the addressing logic required to make a connection between the host and a requested ISE on the DSSI bus. Each ISE has its own controller, which contains the intelligence and logic necessary to control data transfers over the DSSI bus.

CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

Check the KFQSA module for the presence of a jumper intended for manufacturing use only. The location of this jumper is shown in Figure 1. Remove the jumper, if present.

Table 1 describes the functions of the switches on the KFQSA DIP switchpack.

Figure 1: KFQSA Module Layout (M7769)

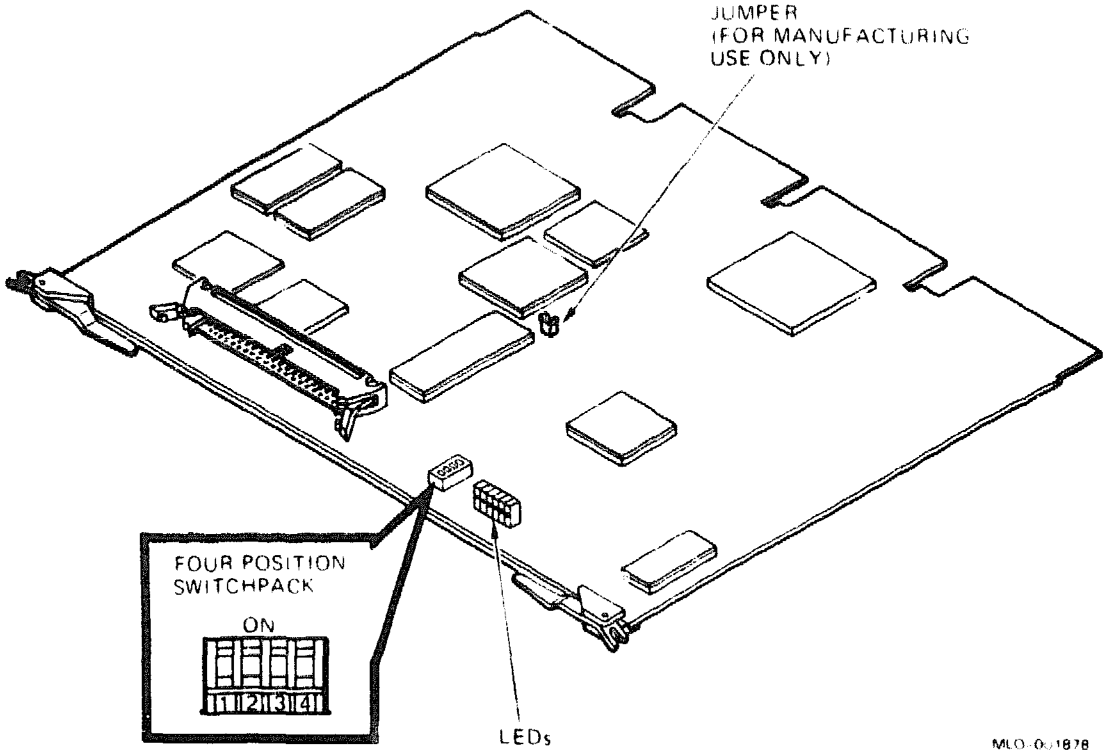


Table 1: KFQSA Switch Settings

Switch	Function
1	**Off position**. Switches 2, 3, and 4 are ignored and CSR addresses are read from the EEROM. **On position**. Enables the CSR setting of switches 2, 3, and 4.
2	**Off position**. Enables CSR addresses dedicated to the KFQSA. Use only for initially accessing the KFQSA in order to program the EEROM. Do not use when running diagnostics. **On position**. Enables CSR addresses for mass storage control protocol (MSCP) or tape mass storage control protocol (TMSCP) devices.
3 and 4	When switches 1 and 2 are On and Off, respectively, use these switches to select one of four dedicated KFQSA CSR addresses.

At installation, use the four-position DIP switchpack on the KFQSA (Figure 1) as follows to set a temporary CSR address that enables you to boot the system and access the EEROM:

1. Set switch 1 to the On position.
2. Set switches 2, 3, and 4 to reflect a CSR address from one of the tables below.

Dedicated KFQSA CSR Addresses (Fixed)
KFQSA Four-Position Switchpack

	Mode	Fx/Fl	MSB	LSB
Switches:	1	2	3	4
CSR Address:				
17774420	0	1	0	0
17774424	0	1	0	1
17774430	0	1	1	0
17774434	0	1	1	1

Fx/Fl = fixed/floating
1 = off, 0 = on

MSCP or TMSCP CSR Addresses (Floating)
KFQSA Four-Position Switchpack

	Service	Fx/Fl	Dk/Tp	Pri/Sec	
Switches:	1	2	3	4	
CSR Address:					
17760444	0	0	0	0	(tape secondary)
17774500	0	0	0	1	(tape primary)
17760334	0	0	1	0	(disk secondary)
17772150	0	0	1	1	(disk primary)

Fx/Fl = fixed/floating
Dk/Tp = disk/tape
Pri/Sec = primary/secondary
1 = off, 0 ⇒ on

The EEROM on the KFQSA contains a configuration table that you program with the CSR addresses of all the devices in the system. See the *KFQSA Installation Guide* for procedures on determining CSR addresses and programming the configuration table using the MicroVAX Diagnostic Monitor (MDM). After you have programmed the configuration table, disable the four-position switchpack by setting switch 1 to the On position.

The KFQSA module has six LEDs, shown in Figure 1: one green and five red. When you power up the system, all six LEDs light. After the diagnostic routines complete successfully, only the green LED remains lit. The KFQSA module reacts to fatal and nonfatal errors, as follows:

- Fatal errors: the green LED goes out and a sequence of red LEDs remain lit.
- Nonfatal errors: the red LEDs display an error code for about 10 seconds.

The KFQSA LED error codes are listed in Table 2. To provide an error history, all errors are written into the KFQSA volatile memory.

Table 2: KFQSA LED Error Codes

LEDs 1 2 3 4 5 6[1]	Error Code Description
x x x x x x	Drive never powered up, or 8096 CPU error
0 0 0 0 0 0	8096 in hang state
0 0 0 0 0 x	CSRD chip test error
0 0 0 0 x 0	QMI chip test error
0 0 0 0 x x	Fatal configuration table error
0 0 0 x 0 0	8096 EPROM test error
0 0 0 x 0 x	8096 DPRAM test error (low byte)
0 0 0 x x 0	8096 DPRAM test error (high byte)
0 0 0 x x x	68000 CPU test error
0 0 x 0 0 0	68000 10- sec BERR timer test error
0 0 x 0 0 x	68000 EPROM test error
0 0 x 0 x 0	68000 local RAM test error (low byte)
0 0 x 0 x x	68000 local RAM test error (high byte)
0 0 x x 0 0	68000 interrupt controller test error
0 0 x x 0 x	8254 timer test error
0 0 x x x 0	FIFO chip test error
0 0 x x x x	Buffer RAM parity interrupt test error
0 x 0 0 0 0	Buffer RAM test error (first 64K, bits 0 through 3)
0 x 0 0 0 x	Buffer RAM test error (first 64K, bits 4 through 7)
0 x 0 0 x 0	Buffer RAM test error (first 64K, bits 8 through 11)
0 x 0 0 x x	Buffer RAM test error (first 64K, bits 12 through 15)
0 x 0 x 0 0	Buffer RAM test error (second 64K, bits 0 through 3)
0 x 0 x 0 x	Buffer RAM test error (second 64K, bits 4 through 7)

[1]LED 1 is green; LEDs 2 through 5 are red.
0 = Off; x = On.

Table 2 (Cont.): KFQSA LED Error Codes

LEDs 1 2 3 4 5 6[1]	Error Code Description
0 x 0 x x 0	Buffer RAM test error (second 64K, bits 8 through 11)
0 x 0 x x x	Buffer RAM test error (second 64K, bits 12 through 15)
0 x x 0 0 0	SII chip test error
0 x x 0 0 x	68000 DPRAM test error (low byte)
0 x x 0 x 0	68000 DPRAM test error (high byte)
0 x x 0 x x	Microprocessor interrupt test error
0 x x x 0 0	Unexpected 68000 BERR
0 x x x 0 x	Unexpected interrupt (68000 side)
0 x x x x 0	8096 setup complete error
0 x x x x x	Parity error during BRAM test
x 0 0 0 0 0	POST passed
x 0 0 0 0 x	Nonfatal CSRD error[2]
x 0 0 0 x 0	Nonfatal QMI error[2]
x 0 0 x 0 0	Successful retry during a RAM test[2]
x 0 x 0 0 0	Nonfatal QMI DMA timeout

[1]LED 1 is green; LEDs 2 through 5 are red.
0 = Off; x = On.

[2]Nonfatal error code displayed for minimum of 10 seconds.

Programming the DSSI Subsystem 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 has console commands, perform the procedure described in this chapter. If not, see the *KFQSA Installation Guide* for procedures on programming the KFQSA configuration table using MDM.

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

Determining CSR Addresses

Each module in a Q-bus-based system must use a set of unique Q-bus addresses and interrupt vectors. One of these, generally the lowest of the set, is known as the CSR address. The KFQSA emulates an SSP controller[1] for each ISE connected, and thus presents a separate CSR address for each emulated controller. You must program the KFQSA with a correctly chosen CSR address for every ISE on the DSSI bus. Interrupt vectors for the KFQSA (and other 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 nonvolatile memory on the KFQSA module, in the form of a configuration table. To access the configuration table, you must set the switches on the KFQSA to select one of the dedicated addresses.

Before programming the configuration table, first determine what the CSR addresses should be for all devices on the system. Calculating CSR addresses is a complex procedure because some devices are assigned floating addresses. Floating addresses vary with each module installed on the system.

At the console prompt (>>>) type **CONFIGURE**.

---

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

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.

Enter the command. The system prompts you for a device and a number. To find what the valid responses are, type **HELP**. The system displays:

```
>>>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?
```

Respond by entering the device name and number of each device. After all the devices have been entered, type **EXIT**. For example, if your system has a TK70, three RF30s, and a DEQNA, you would respond as follows:

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

The system responds with CSR address/vector assignments for all entered devices. For the above example, the response is:

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

Record the address/vector assignments for use in the next procedure.

Programming the KFQSA Configuration Table

In order 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 in SERVICE mode, where n is from 0 to 3*

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

Typing this command displays the current contents of the configuration table. For example, suppose the first address is selected and the configuration table is currently blank.

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

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

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

Type **HELP** for a quick reference of the available commands.

```
? help
Commands:
   SET <node> \KFQSA                set KFQSA DSSI node ID
   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 example in the previous section, type:

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

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

Type **SHOW** to display what you just entered.

```
? 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 the ISE with a DSSI node ID of 2, type **CLEAR 2** at the ? prompt.

Type **EXIT** when you are done 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. For each address the console displays the address in VAX I/O space (in hex), the address as it would appear in the Q-bus I/O space (in octal), and the word data that was read (in hex).

An example of the SHOW QBUS command is as follows:

```
>>> show qbus
Scan of Qbus I/O Space
-200000DC (760334) = 0000 (300) RQDX3/KDA50/RRD50/RQC25/KFQSA-DISK
-200000DE (760336) = 0AAC
-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
>>>
```

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

An example of the SHOW UQSSP command is:

```
>>> 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)
>>>
```

Programming the KFQSA for Multi-Host Systems

This section describes how to program the KFQSA module in the event you are setting up a multi-host system. Due to cabling limitations, in practice this will always involve two 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.

Figure 2 is a diagram of a typical multi-host application, which will be used as an example during this procedure.

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

NOTE: *Both systems should be powered up and displaying the console (>>>) prompt. The DSSI cable between the two systems should not be connected at this time.*

Perform the following procedure on the first system.

1. Display the current addresses and devices as follows:

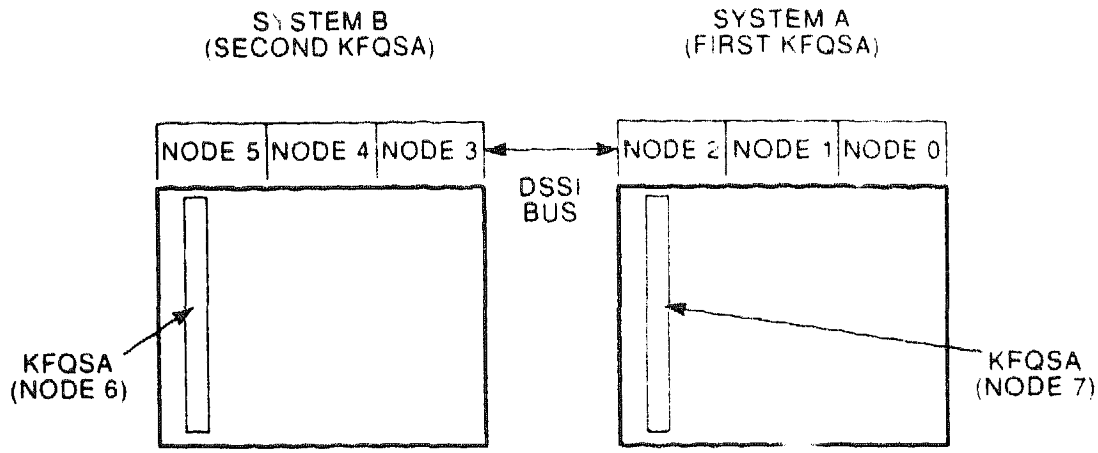
   NOTE: *Make hardcopy printouts of the displays, or write down the information obtained in this step. It will be needed later on.*

   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 the previous section, Programming the KFQSA Configuration Table.

   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 the previous section, Programming the KFQSA Configuration Table.

   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.

Figure 2: Example of KFQSA Dual-Host Configuration



NODE	ADDRESS
0	772150
1	760334
2	760340
3	760344
4	760350
5	760354
6	KFQSA

NODE	ADDRESS
0	772150
1	760334
2	760340
3	760344
4	760350
5	760354
7	KFQSA

MLO 002414

> **NOTE:** *In the examples given 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 the *KFQSA Installation Guide*.

   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 the previous section, Programming the KFQSA Configuration Table. 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 the previous section, Programming the KFQSA Configuration Table. 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 multi-host 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.*

Setting the ISE Allocation Class

This section describes how to change the ISE allocation class. In multi-host 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 multi-host 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 (HSCs) 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 you want to set the ISE to.

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.

KZQSA Storage Adapter

The KZQSA (M5976) storage adapter controls the TLZ04, TSZ07, and RRD-series devices on the Q22-bus.

Ordering Information

KZQSA–SA	Factory installed
KZQSA–SF	Field installed

Functional Information

Adapter protocol	TMSCP
Supported drive	TLZ04; two external cables or two drives
Controllers per system	2

Performance Information

Peak transfer rate	4 Mbytes synchronous
Error Detection	Q-bus parity

Configuration Information

Form factor	Quad height

Related Documentation

KZQSA Storage Adapter Installation and User	EK–KZQSA–IN Manual

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	Module	+5 V	+12 V	Watts	AC	DC	
KZQSA	M5976–SA	5.5	0.0	27.5	4.4	1.0	–

KMV1A–M, –S Programmable Communications Controller

Ordering Information

Module (M7500–PA) for BA200-series enclosures RS232–C/CCITT V.23 interface	KMV1A–SF (field upgrade)
Module (M7500–PB) for BA200-series enclosures RS422–A/CCITT V.11 interface	KMV1A–SG (field upgrade)
Module (M7500–PC) for BA200-series enclosures RS423–A/CCITT V.10 interface	KMV1A–SH (field upgrade)
Module (M7500) for BA23, BA123, and H9642–J	KMV1A–M

	BA23	BA123	H9642–J
Cabinet kits			
RS232–C/CCITT V.23 interface	CK–KMV1A–AB	CK–KMV1A–AA	CK–KMV1A–AF
RS422–A/CCITT V.11 interface	CK–KMV1A–EB	CK–KMV1A–EA	CK–KMV1A–EF
RS423–A/CCITT V.10 interface	CK–KMV1A–FB	CK–KMV1A–FA	CK–KMV1A–FF

Operating System Support

MicroVMS	Version 4.2 and later
ULTRIX–32m	Version 2.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 1.08 and later
Power-up self-test LEDs	Three LEDs

KMV1A–M/M7500
KMV1A–S/M7500–P

Documentation

KMV11 Programmable Communications Controller Technical Manual	EK–KMV11–TM
KMV11 Programmable Communications Controller User's Guide	EK–KMV11–UG

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
KMV1A–M	M7500	2.6	0.2	15.4	3.0	1.0	A
KMV1A–S	M7500–P	2.6	0.2	15.4	3.0	1.0	–

The KMV1A is a programmable data communications interface for systems that use the Q22-bus. The quad-height KMV1A provides the following features:

- Direct memory access (DMA) across the Q22-bus, for medium-speed transmission and reception with minimum programming overhead
- DCT11 microprocessor executing the PDP–11 base-level instruction set
- Multiprotocol serial controller chip
- 4K words of EPROM with root firmware and power-up self-test diagnostics
- Application mode operation, for customer-developed firmware using the PDP–11 instruction set
- 32 Kbytes of RAM space, for implementation of data-link protocols
- Synchronous (bit-oriented or byte-oriented) and asynchronous capabilities for application firmware
- Extensive modem signal support
- Onboard, programmable null modem clock

Figure 1 shows the module layout for the KMV1A–M and KMV1A–S. Figure 2 shows the KMV1A–S module with handle.

Figure 1: KMV1A Module Layout (Example)

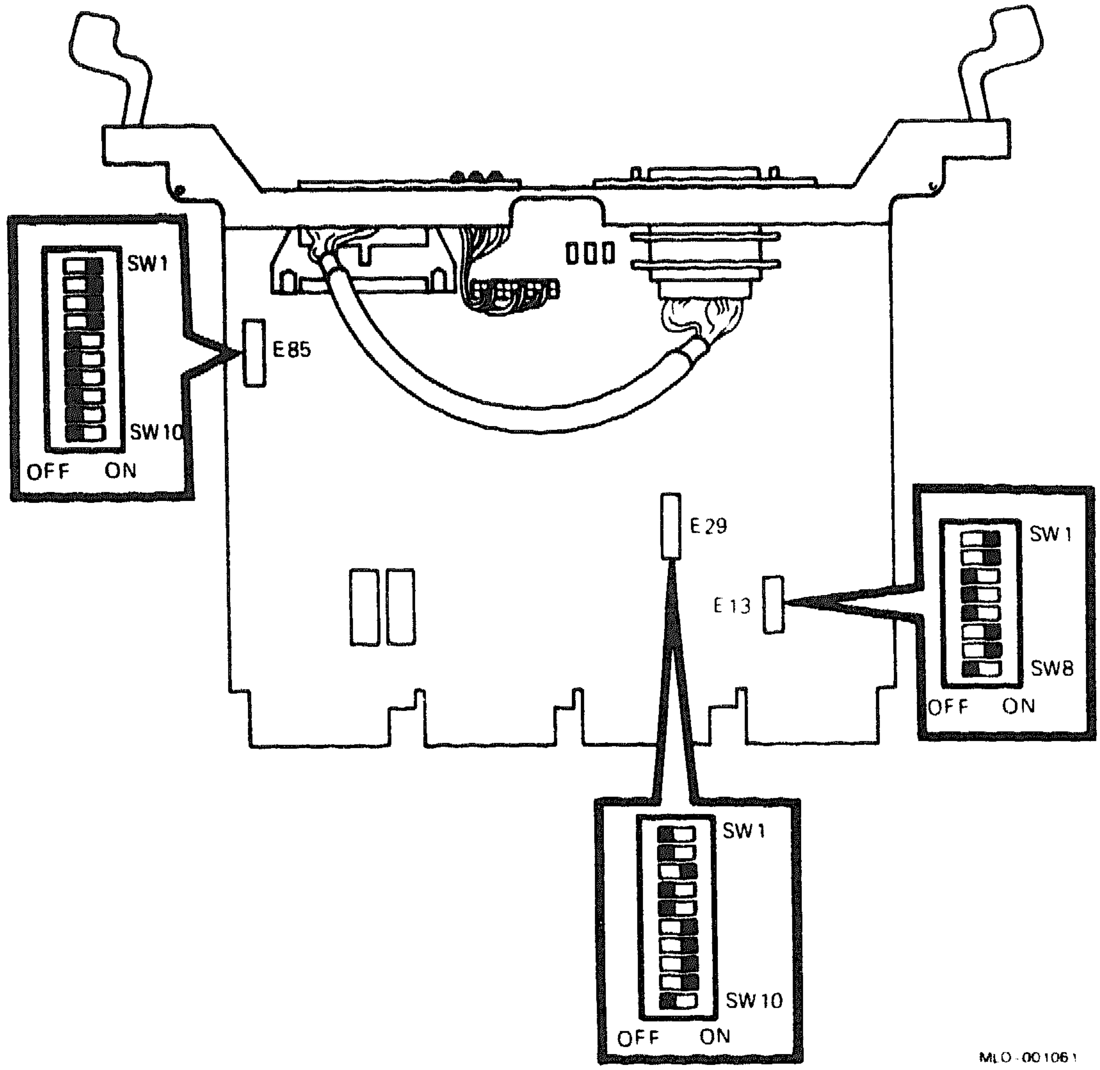
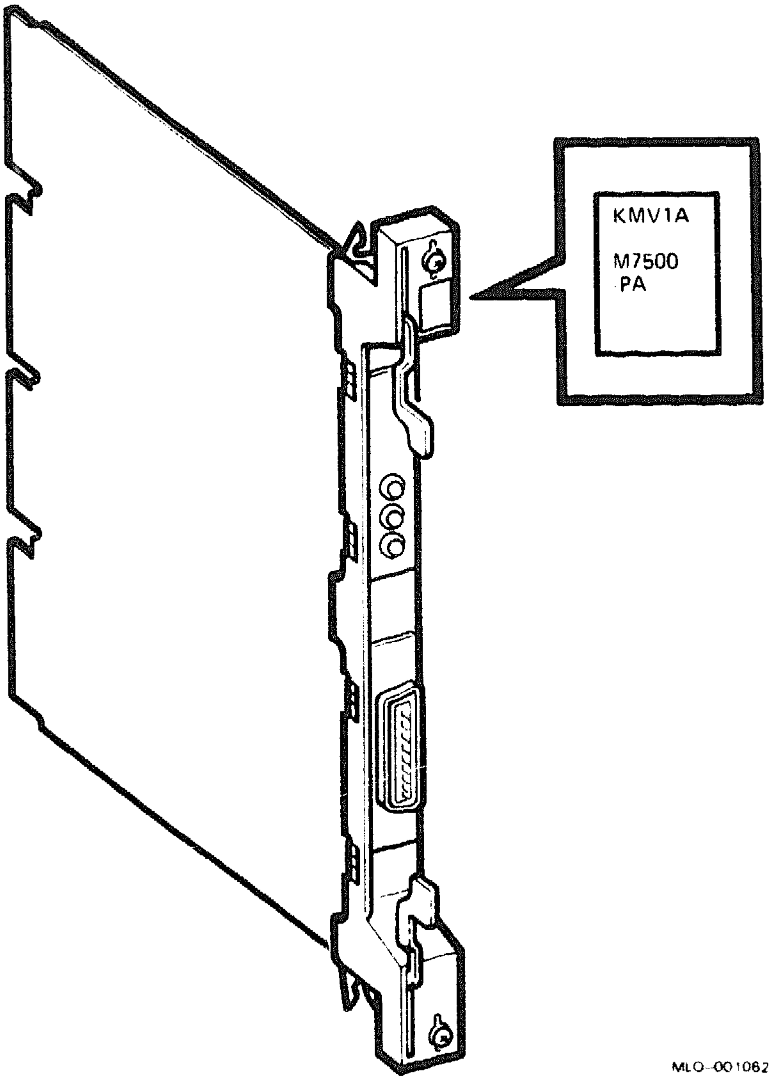


Figure 2: KMV1A–S Module with Handle (BA200-Series)



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

The CSR address and interrupt vector are set using two switchpacks, E29 and E13 (Figure 1). For the CSR address, use switches 1 through 9 on switchpack E29. For the interrupt vector, use switches 1 through 7 on switchpack E13.

The CSR address for the KMV1A floats; its factory position is 17760020. The interrupt vector floats; its factory position is 320. The following tables list the factory configurations for the CSR and vector addresses:

```
KMV1A CSR Address:  17760020 (factory position)
Switchpack E29

Address Bits:  A12   A11 A10 A9   A8  A7  A6   A5  A4
E29 Switches:  S9    S8  S7  S6   S5  S4  S3   S2  S1
-----------------------------------------------------------------
CSR Address:
17760020     0      0   0   0    0   0   0    0    1   factory
```

```
KMV1A Interrupt Vector:  320 (factory position)
Switchpack E13

Vector Bits:         V8  V7  V6    V5  V4  V3

E13 Switches:  S7    S6  S5  S4    S3  S2  S1

Vector Address:
320            0     0   1   1     0   1   0
```

Table 1 lists the positions for switches 1 through 8 on switchpack E85 (Figure 1), which determine the interfaces: RS–423–A, RS–232–C, or RS–422–A. Be sure that switches 9 and 10 on switchpack E85 remain in the On position, to enable CCITT 107 and CCITT 112.

Table 1: KMV1A Switchpack E85 Positions

E58 Switch	RS–423–A/RS–232–C Switch Position	RS–422–A Switch Position
1	Off	On
2	Off	On
3	Off	On
4	Off	On
5	On	Off
6	On	Off
7	On	Off
8	On	Off

KMV1A-M/M7500
KMV1A-S/M7500-P

The KMV1A has three self-test LEDs. Switches S8 on switchpack E13, and S10 on switchpack E29 effect self-test operation, as listed in Table 2. The KMV1A LED codes are described in Table 3.

Table 2: KMV1A Self-Test Switches

E13 S8	E29 S10	Self-Test Operation
On	On	Disabled
On	Off	Enabled (factory position, start via CSR command or at power-up, for one pass)
Off	Off	Self-test manual start for continuous loop
Off	On	Extended self-test start for continuous loop

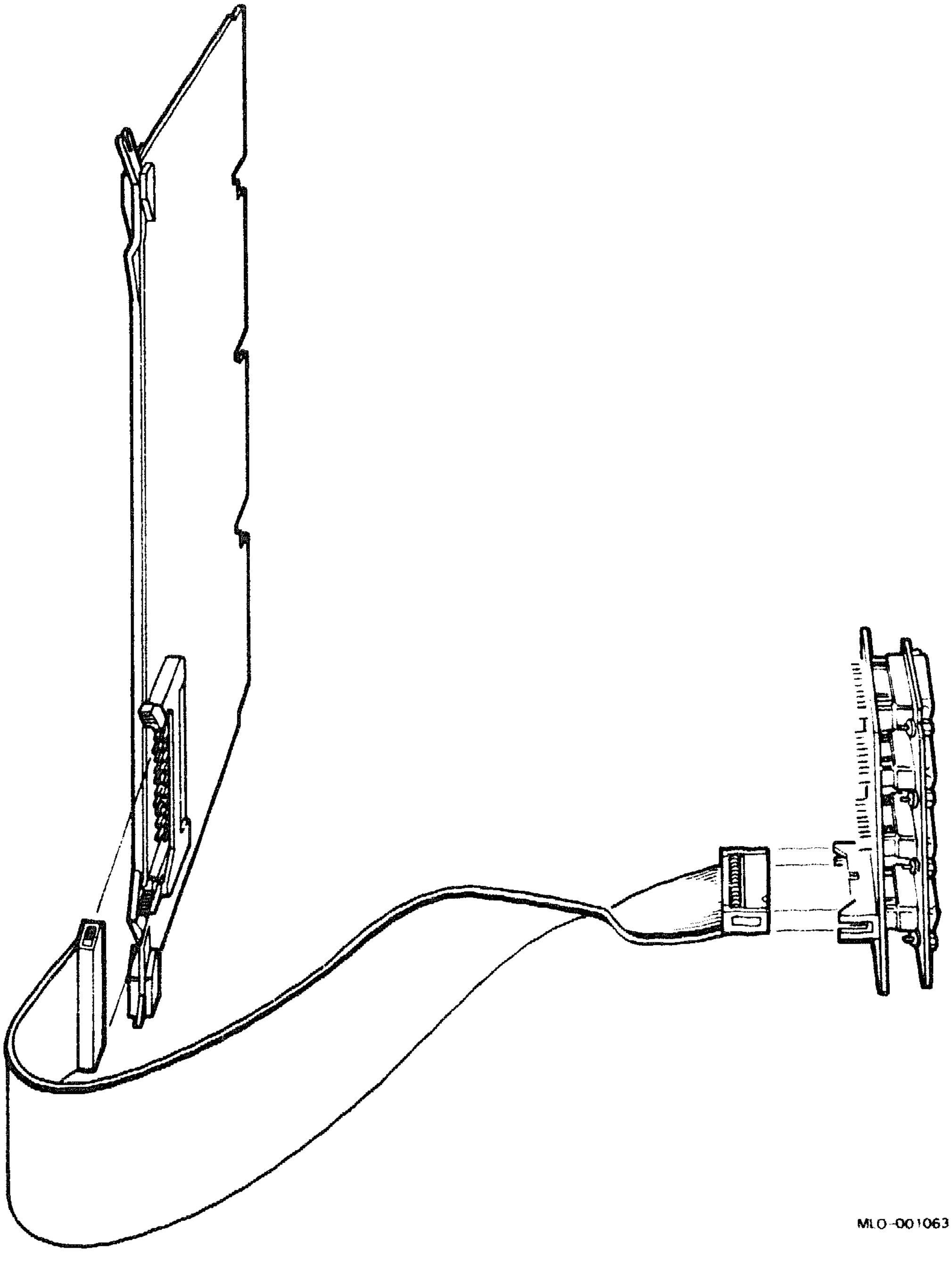
Table 3: KMV1A LED Codes

Red	Yellow	Green[1]	Description
Off	On	Off	Self-test started. (Should remain in this state for 10 seconds if test is enabled, and indefinitely if test is disabled.)
Off	On	On	Self-test in process.
Off	Off	On	Successful self-test.
On	Off	Off	Unsuccessful self-test.

[1]When you set the module self-test switch for continuous loop, the green LED cycles on and off (10 seconds for a normal self-test and 0.05 second for an extended self-test).

Figure 3 shows the internal cabling for the KMV1A-M.

Figure 3: KMV1A–M Internal Cabling



KWV11-C, -S Programmable Real-Time Clock

Ordering Information

Module (M4002) for BA23, BA123, and H9642-J	KWV11-C
Module (M4002-PA) for BA200-series	KWV11-SA (factory installed) KWV11-SF
Cabinet kit (BA23)	CK-KWV1C-KA
Cabinet kit (BA123)	CK-KWV1C-KC
UDIP parts	See Table 2 of this section.

Operating System Support

DSM-11	Version 3.3 and later
MicroVMS	Version 4.4 and later, using VAXlab Software Library
RSX-11M	Version 4.3 and later
RSX-11M-PLUS	Version 4.0 and later
VAXELN	Version 2.0 and later
VMS	Version 5.0 and later, using VAXlab Software Library

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 1.08 (release 108) and later
Power-up self-test LEDs	See module documentation.

KWV11-C/M4002
KWV11-S/M4002-PA

Documentation

AXV11-C/KWV11-C User's Guide	EK-AXVAB-UG
Universal Data Interface Panel Reference Card	EK-UDIPD-RC

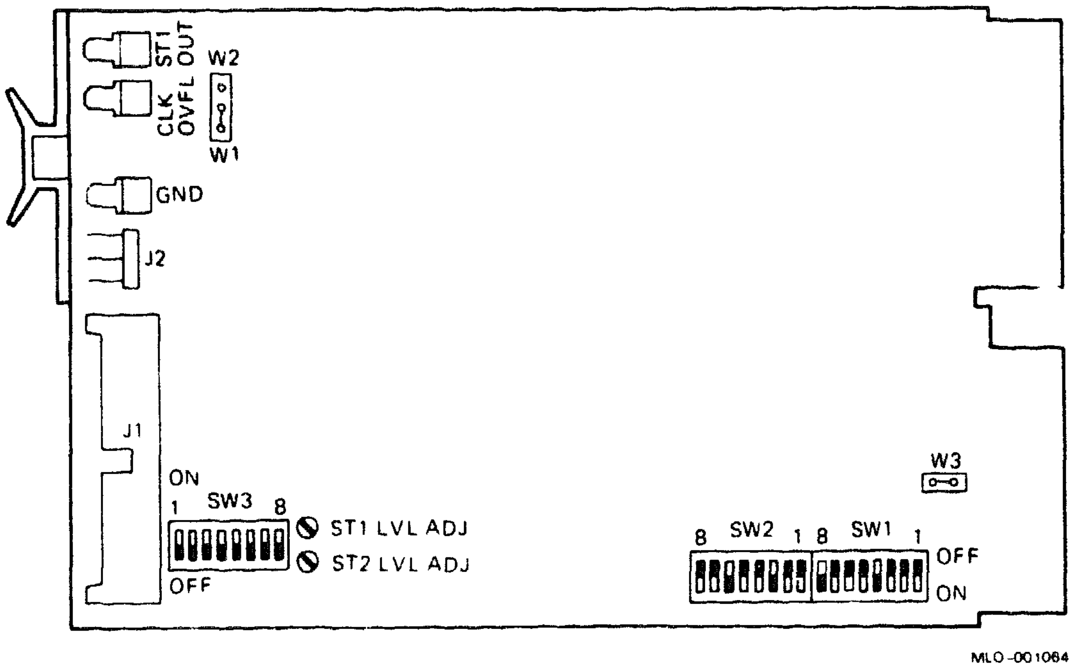
DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
KWV11-C	M4002	2.2	0.13	11.2	1.0	1.0	-
KWV11-S	M4002-PA	2.2	0.13	11.2	1.0	0.3	-

The KWV11 is a programmable real-time clock. You can program the KWV11 to count from one to five crystal-controlled frequencies. The frequencies can come either from an external frequency or event or from a 50 or 60 Hz line frequency on the Q-bus.

The KWV11 can either generate interrupts or it can synchronize the processor to external events. The KWV11-C module (M4002) is shown in Figure 1; module M4002-PA has the same module layout as the M4002, and contains an attached BA200-series bulkhead handle to connect to external devices.

Figure 1: KWV11-C Module Layout (M4002)



The KWV11 has two Schmitt triggers that have three possible functions:

- Start the clock
- Serve as an external trigger for other modules (such as the ADV11-D or AAV11-D)
- Generate interrupts

A clock overflow can also serve as an external trigger to other modules.

CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29-26246) when you work with the internal parts of a computer system.*

KWV11-C/M4002
KWV11-S/M4002-PA

Use switchpacks SW1 and SW2 on the KWV11 (Figure 1) to set the CSR address and interrupt vector. The CSR is fixed for the first KWV11, and floats for secondary units. All vectors float. The following tables list the factory configurations for the CSR address and interrupt vector:

KWV11 CSR Address: 17770420 (factory position)
Switchpacks SW1 and SW2

Address Bits:	11	10	9	8	7	6	5	4	3	2
Switchpack:	SW1	-----	-----	-----	-----	-----	-----	-->	SW2	
Switches:	1	2	3	4	5	6	7	8	1	2
CSR Address:										
17770420	0	0	0	1	0	0	0	1	0	0

1 = on, 0 = off

KWV11 Interrupt Vector: 440 (factory position)
Switchpack SW2

Interrupt	V8	V7	V6	V5	V4	V3
SW2 Switches:	3	4	5	6	7	8
Vector Address:						
440	1	0	0	1	0	0
300	0	1	1	0	0	0

1 = on, 0 = off

The two Schmitt triggers condition the input waveforms to a form the user needs. You can adjust both to trigger at any level in the ±12 V range (or at TTL fixed levels) and on either the positive or negative slope of the input signal. Switchpack SW3 consists of three switches and a potentiometer for each Schmitt trigger (Figure 1). The use of these switches and potentiometers is shown in Figure 2.

Figure 2: KWV11–C/–S Slope and Reference-Level Switches

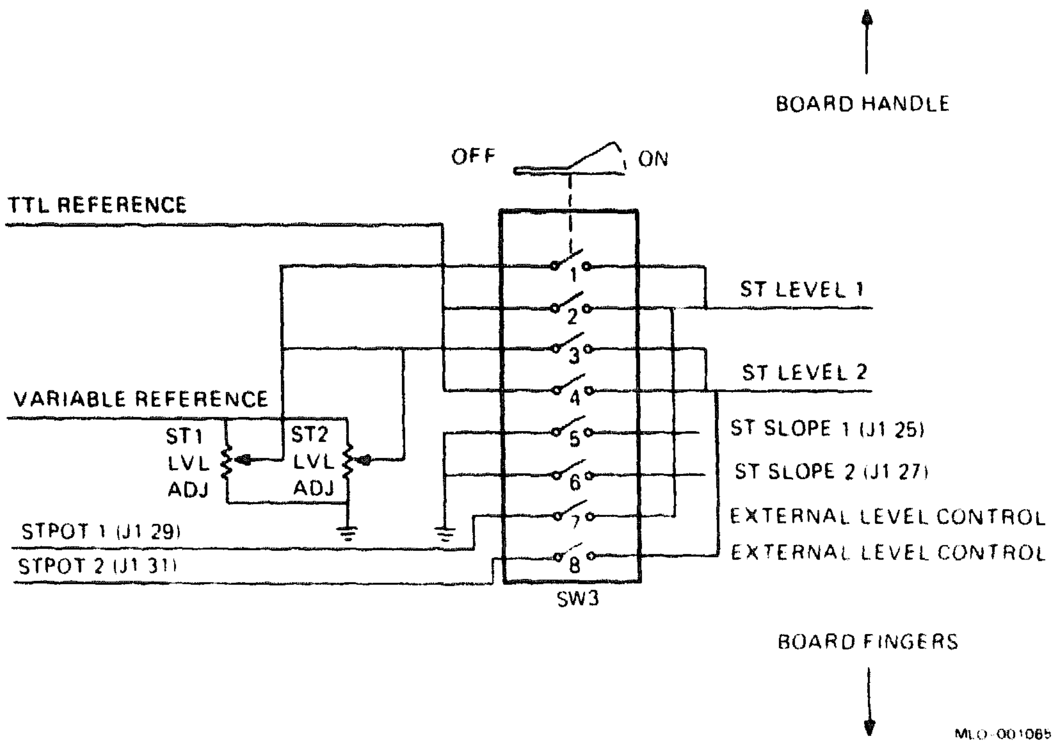


Table 1 describes the Schmitt trigger settings.

Table 1: KWV11-C/-S Schmitt Trigger Settings

SW3 Switch Number	Description
1	With this switch on and switch 2 off, ST1 fires at a level determined by the ST1 LVL ADJ potentiometer with a range of ±12 V. Switches 1 and 2 cannot be on together.
2	With this switch on and switch 1 off, ST1 fires at a fixed reference level for TTL logic. The potentiometer has no effect. Switches 1 and 2 cannot be on together.
3	With this switch on and switch 4 off, ST2 fires at a level determined by the ST2 LVL ADJ potentiometer within a range of ±12 V. Switches 3 and 4 cannot be on together.
4	With this switch on and switch 3 off, ST2 fires at a fixed reference level for TTL logic. The potentiometer has no effect. Switches 3 and 4 cannot be on together.
5	When this switch is off, ST1 fires on the negative slope (high to low transition) of the input signal. When on, ST1 fires on the positive slope (low to high transition).
6	When this switch is off, ST2 fires on the negative slope of the input signal. When on, ST2 fires on the positive slope.
7, 8	Not used.

To facilitate connections to the KWV11-C or KWV11-S, you can use a universal data interface panel (UDIP). This panel provides BNC cable connectors and push-tab barrier strips for making cabling connections. The panel, like other universal data interface panels, is installed in a UDIP-BA mounting box. Up to three panels can be installed in a mounting box. The mounting box/panel assembly can then be installed in any standard media mounting slot normally used for TK50, RX50, or RD50-series media devices. The mounting box can also be mounted in a tabletop (UDIP-TA) expansion box for use as an external connection box.

The KWV11 UDIP Components are listed in Table 2.

Table 2: KWV11 UDIP Components

Module	Enclosure	Front Panel	Mounting Box	Tabletop Box	Other Items
KWV11–S	BA200-series	UDIP–KB	UDIP–BA	UDIP–TA	None
KWV11–C	BA123 media slot	UDIP–KA	UDIP–BA	None	None
KWV11–C	BA123 with tabletop	UDIP–KB	UDIP–BA	UDIP–TA	CK–KWV1C–KC
KWV11–C	BA23 with tabletop	UDIP–KB	UDIP–BA	UDIP–TA	CK–KWV1C–KA

LPV11/LP25 and LPV11/LP26 Printer Subsystems (LP25 and LP26 Printers)

Ordering Information

Module (M8027-PA) for BA200-series	LPV11-SA (factory installed) LPV11-SF (field installed)		
Module (M8027) for BA23, BA123, and H9642-J	LPV11/LP25	LPV11/LP26	
Printer system	LPV11-B	LPV11-F	
Printer	LP25-BA	LP26-EB	
10-m (30-ft) cable	BC27A-30	BC27A-30	
LPV11 controller	LPV11-00	LPV11-00	
	BA23	BA123	H9642-J
Cabinet kit	CK-LPV1A-KA	CK-LPV1A-KB	CK-LPV1A-KF
38-cm (15-in) cable	BC05L-1C	–	–
Type-A filter connector	70-20398-00	70-20398-00	70-20398-00
53-cm (21-in) cable	–	BC05L-1K	–
90-cm (36-in) cable	–	–	BC05L-03

Operating System Support

DSM-11	Version 3.3 and later
Micro/RSTS	Version 2.2 and later
Micro/RSX	Version 4.0 and later
MicroVMS	Version 4.2 and later
RSTS/E	Version 9.5 and later
RT-11	Version 5.4D and later
ULTRIX-32m	Version 2.0 and later
VAXELN	Version 2.0 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 1.06 (release 106) and later
Power-up self-test LEDs	None

Documentation

LP11/LA11 Line Printer Manual	EK-OLP11-TM
LPV11 User's Guide	EK-LPV11-OP

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
LPV11	M8027	0.8	0.0	4.0	1.4	1.0	A
LPV11-S	M8027-PA	1.6	0.0	8.0	1.8	0.5	-

NOTE: *Use cabinet kits CK-LPV1A-KA and -KB with a part revision of B1 or higher only. Use cabinet kit CK-LPV1A-KF with a part revision of A1 or higher only. The packing slip included with the cabinet kit contains the revision number. (Make sure the 70-20398 connectors are at part revision D1 or later. A label on the bottom of the module contains the part number for the connector.)*

The LPV11 module controls the flow of data between the Q22-bus and a line printer. Figure 1 shows the M8027 module. Figure 2 shows the M8027–PA module, which consists of two LPV11 modules and an attached bulkhead handle.

Figure 1: LPV11 Module Layout (M8027)

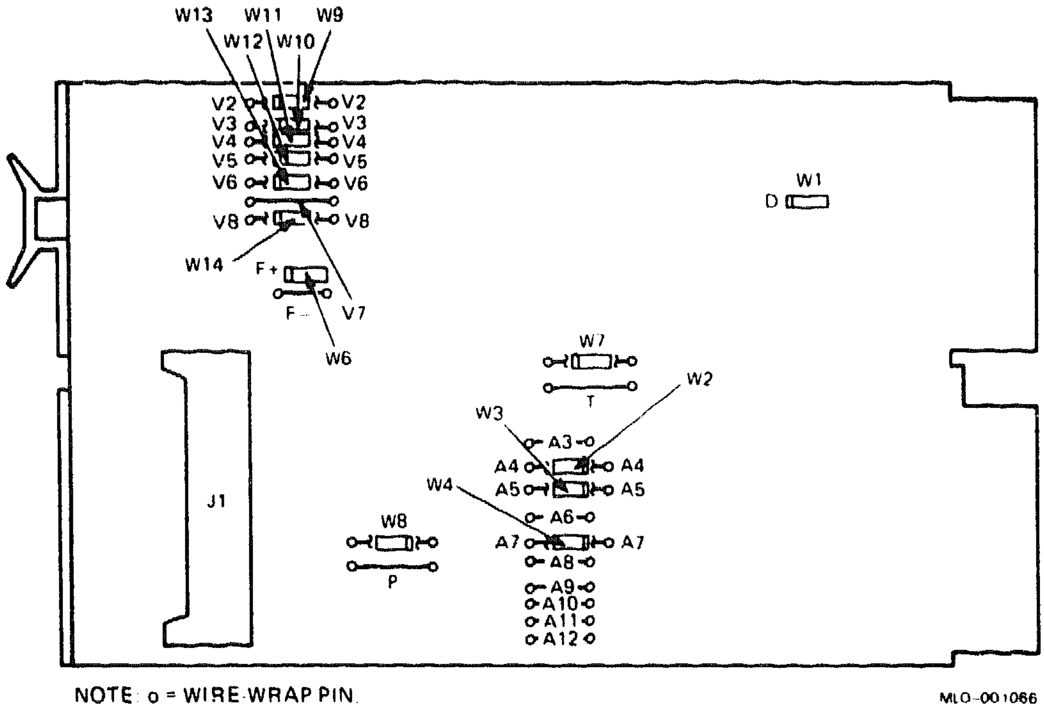
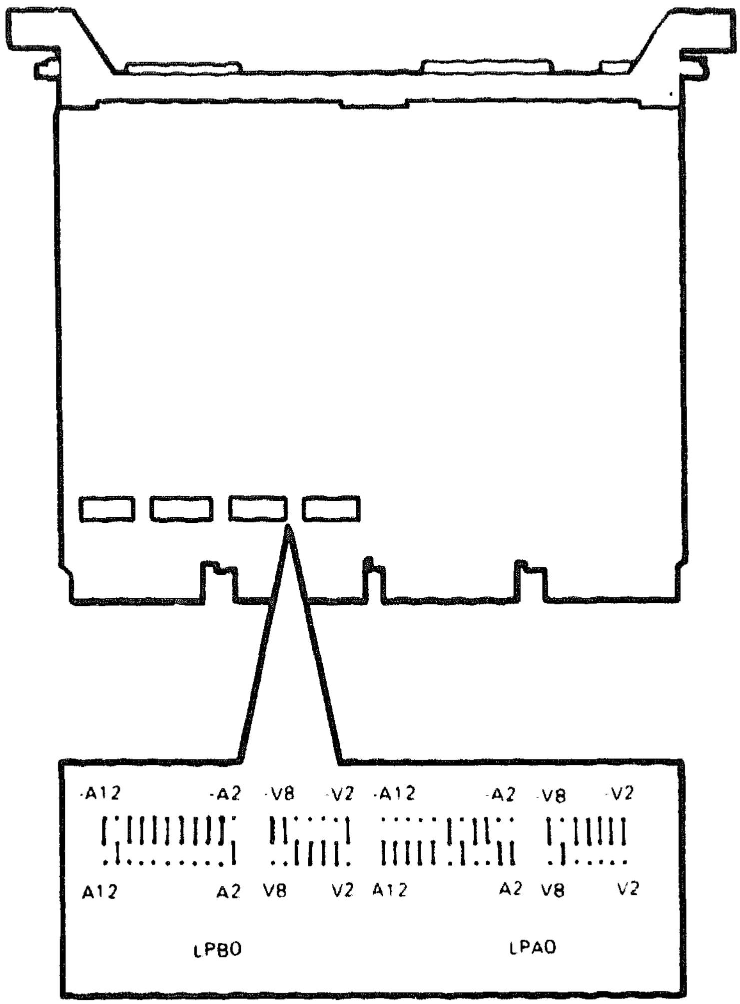


Figure 2: LPV11–SA Module Layout (M8027–PA)



MLO-001067

CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

You set the CSR address and interrupt vector of the LPV11 by using jumpers.

- On the M8027 module, use jumpers W2, W3, and W4 to set the CSR address, and use jumpers W9 through W14 and jumper V7 to set the interrupt vector (Figure 1).
- On the M8027-PA module, use the LPA0 jumpers to set the CSR address and interrupt vector for the first LPV11; use the LPB0 jumpers to set the CSR address and interrupt vector for the second LPV11 (Figure 2).

The CSR addresses and interrupt vectors are fixed. The following tables list the factory configurations for a first and second LPV11.

LPV11 CSR Address: 17777514 (factory position)

Address Bits:	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3
Jumpers:						W4		W3		W2
CSR Address:										
17777514	1	1	1	1	1	0	1	0	0	1
17764004	0	1	0	0	0	0	0	0	0	0

M8027 module: 0 = installed, 1 = removed
M8027-PA module: 0 = bottom and center post
1 = top and center post

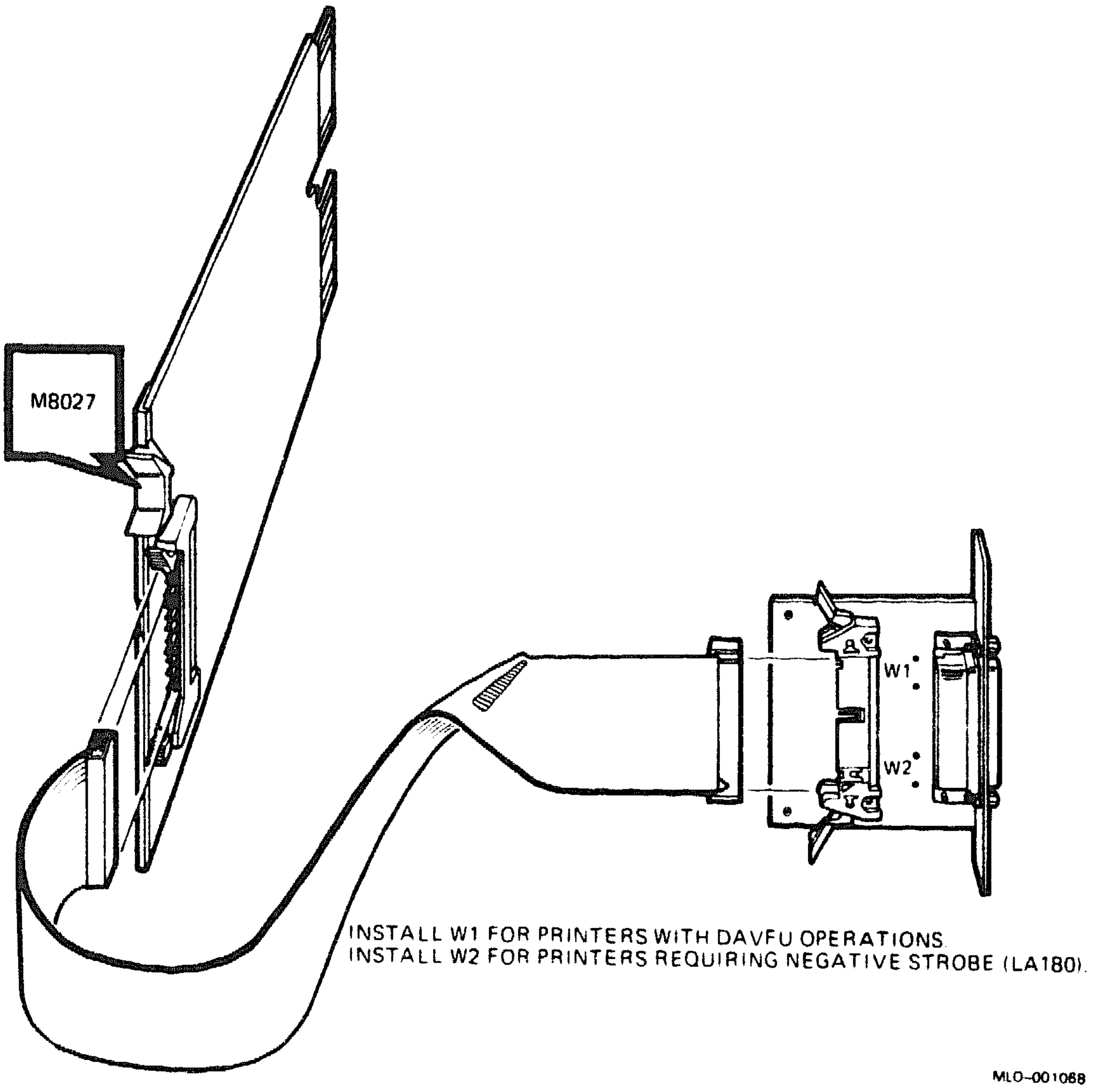
LPV11 Interrupt Vector: 200 (factory position)

Vector Bits:	V8	V7	V6	V5	V4	V3	V2
Jumpers:	W14	V7	W13	W12	W11	W10	W9
Vector Address:							
200	0	1	0	0	0	0	0
170	0	0	1	1	1	1	0

M8027 module: 0 = installed, 1 = removed
M8027-PA module: 0 = bottom and center post
1 = top and center post

Figure 3 shows the LPV11 internal cabling.

Figure 3: LPV11 Internal Cabling



MRV11–D PROM Memory Module

The MRV11–D is a fusible, high-density, dual-size PROM memory module. The module contains 41 jumper posts, 2 switch packs, and 16 28-pin memory-chip sockets. The module can use a variety of user ROM chips: masked ROMs, fusible link ROMs, and ultraviolet erasable PROMs (UV EPROMs) are acceptable to use. The MRV11–D accepts several memory-chip densities, up to and including 32K by 8, with 16 32K devices. The modules total memory capacity can be 512K bytes.

Ordering Information

MRV11–D Universal PROM Module	M8578
Ethernet Server Kit	ZNA07–CM, CP, or C5

Operating System Support

Built-in diagnostics	Yes
IBQ01 MicroVAX Diagnostic Monitor (MDM)	3 error-free passes

Diagnostic Support

none

Documentation

MRV11–D Universal PROM Module	EK–MRV1D–UG
Field Maintenance Print Set	MP–00566
MDM Users Guide	AA–FM7AB–DN

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	Module	+5 V	+12 V	Watts	AC	DC	Insert
MRV11–D	M8578	1.6	0.0	8.0	3.0	0.5	—

Standard Addresses

Recommended page mode:
Window 0 is addressed between 17773000 and 17773776
Window 1 is addressed between 17765000 and 17765776
PCR address is fixed at location 1777520

Page mode PCR is configured between 17777000 and 1777036.

Terminal address used by console ODT addresses:
16-bit addressing = 177560 - 177566
18-bit addressing = 777560 - 777566
22-bit addressing = 1777560 - 1777566

Detailed technical information is beyond the scope of this manual. For more complete information, refer to the specific options manuals. For the locations of jumpers and switches see Figure 1.

PROM Sizes and Pinouts

The MRV11–D contains 16 24-pin sockets to house the various PROMs and static RAM devices that can be used in the module. The sockets can house 2K by 8, 4K by 8, 8K by 8, and 32K by 8 PROMs. In addition, the bottom half of the socket array (chip sets 0 through 3) can accommodate static RAM. The 2K by 8 and 4K by 8 PROMs contain 24 pins while the others contain 28 pins.

Figure 1: MRV11-D (M8578) Jumper and Switch Locations

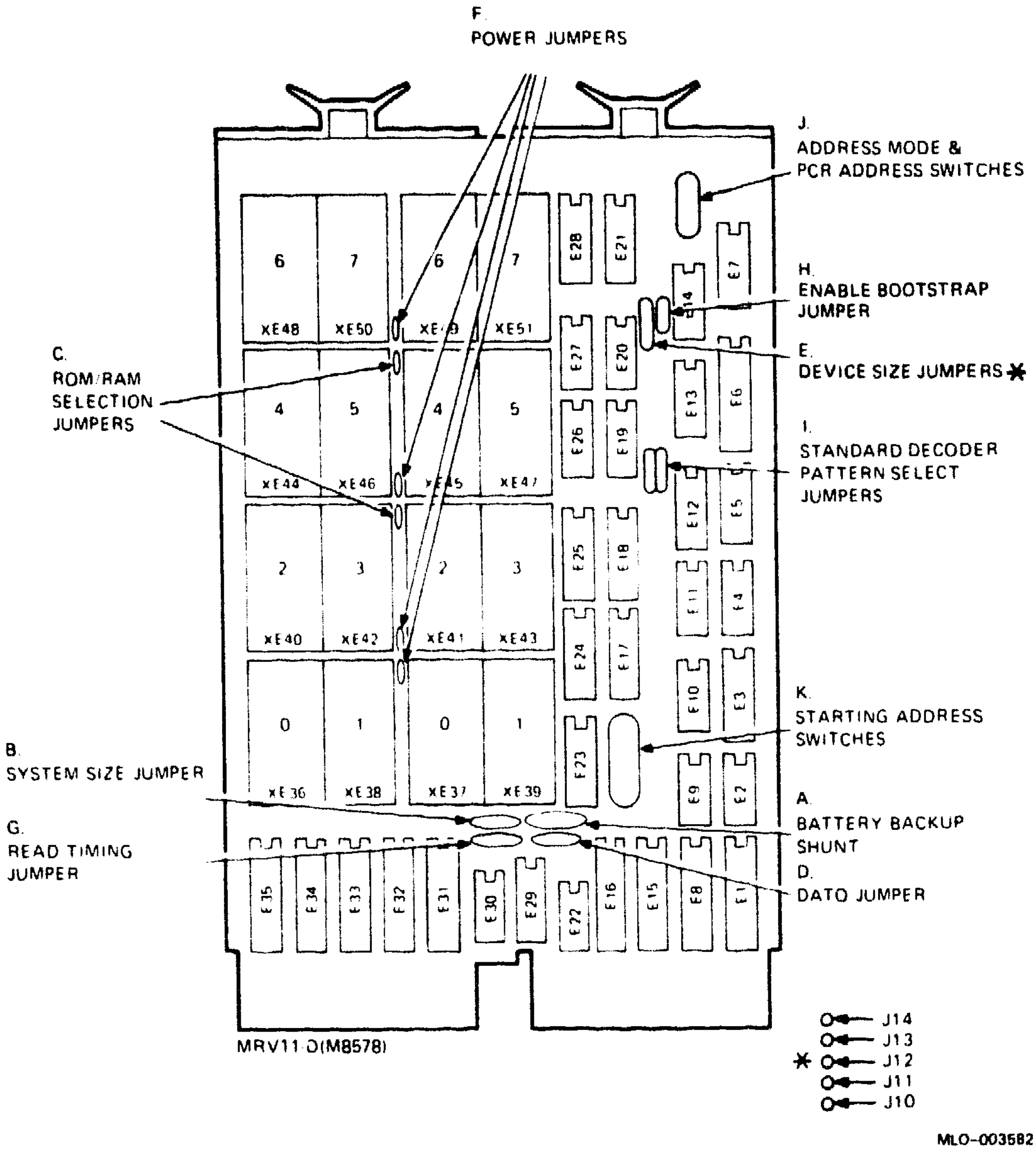


Table 1: Storage Capacity per ROM Chip Size and Number of Chips

Number of Chips Installed	Capacity (Kbytes) 2K by 8	4K by 8	8K by 8	16K by 8	32K by 8
2	4	8	16	32	64
4	8	16	32	64	128
6	12	24	48	96	192
8	16	32	64	128	256
10	20	40	80	160	320
12	24	48	96	192	384
14	28	56	112	224	448
16	32	64	128	256	512

Table 2: Typical EPROMs

UV PROMs	Chip Array Size	Maximum Memory Array Size
Intel 2716	2K by 8	32 Kbytes
Intel 2732	4K by 8	64 Kbytes
Intel 2764	8K by 8	128 Kbytes
Intel 27128	16K by 8	256 Kbytes

Table 2 (Cont.): Typical EPROMs

UV PROMs	Chip Array Size	Maximum Memory Array Size
Masked PROMs		
Mostek MK3700	8K by 8	128 Kbytes
NCR 23128	16K by 8	256 Kbytes
NEC 23256	32K by 8	512 Kbytes
National 52364	8K by 8	128 Kbytes
Signetics 23128	16K by 8	256 Kbytes
Synertek 2365	8K by 8	128 Kbytes
Synertek 2365A	8K by 8	128 Kbytes
Synertek 2316B	2K by 8	32 Kbytes
Synertek 2333	4K by 8	64 Kbytes

RA60 Disk Drive

The RA60 disk drive is supported in the H9642–J cabinet only. Order both the RA60 disk drive and cables and the interconnect cable when installing the RA60 option.

Ordering Information

RA60 disk drive and cables (120 V, 240 V)	RA60–AF
Interconnect cable with connector block	BC26–V6

Operating System Support

DSM–11	Version 3.3 and later
Micro/RSTS	Version 2.2 and later
Micro/RSX	Version 4.0 and later
MicroVMS	Version 4.2 and later
RSX–11M	Version 4.3 and later
RSX–11M–PLUS	Version 4.0 and later
ULTRIX–11	Version 3.1 and later
ULTRIX–32m	Version 1.2 and later
VAXELN	Version 2.1 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Revision 1.06 and later
Power-up self-test LEDs	None

Documentation

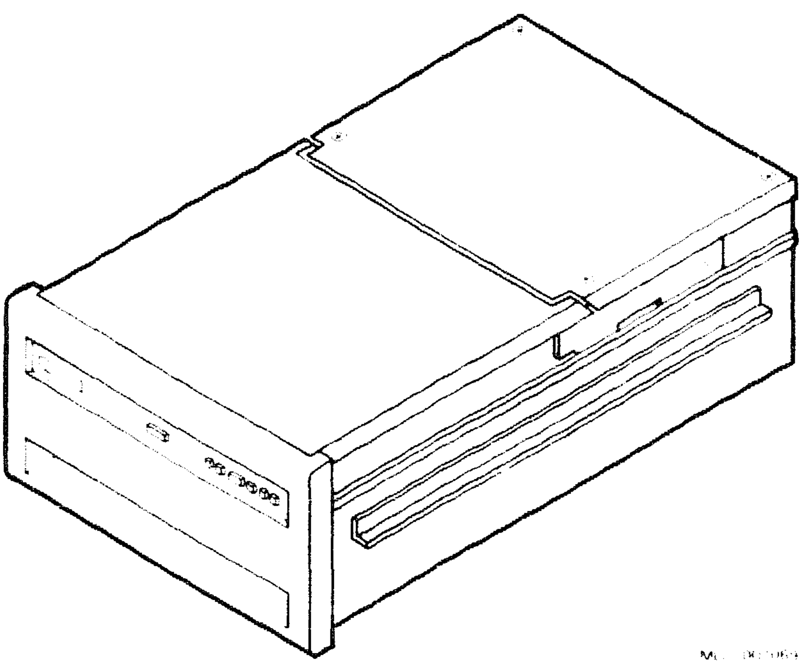
RA60 Disk Drive Service Manual	EK-ORA60-SV
RA60 Disk Drive User Guide	EK-ORA60-UG

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	Module	+5 V	+12 V	Watts	AC	DC	Insert
KDA50-Q	M7164, M7165	13.5	.03	67.9	3.0	0.5	(2) B

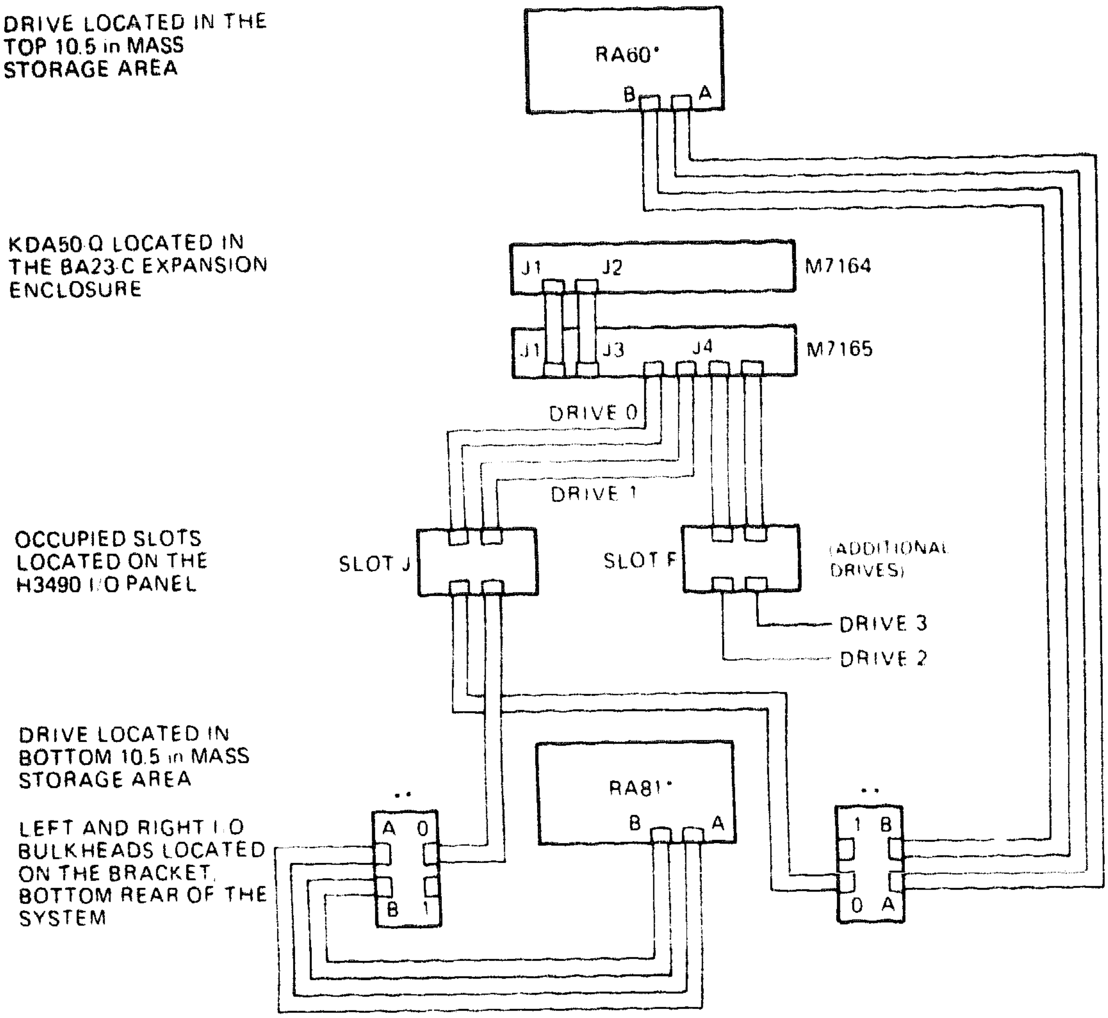
The RA60 is a high-capacity, removable disk drive with 205 Mbytes of formatted storage space (Figure 1). The RA60 uses microprocessor-controlled diagnostics and a 170-bit error correction code (ECC) to ensure data reliability. The RA60 operates with the KDA50 controller set.

Figure 1: RA60 Disk Drive



The RA60/RA81 cabling is shown in Figure 2. The BC26V–6 cable includes a connector block for connecting RA60 cables. The connector block is mounted on the bracket at the lower rear of the cabinet (Figure 2).

Figure 2: RA60/RA81 Cabling, H9642–J Cabinet



* FACTORY CONFIGURATION: PORT 0. IN THIS CONFIGURATION THE PORT A SWITCHES ON BOTH DRIVES MUST BE DEPRESSED.

** PORT 0 CORRESPONDS TO PORT A FOR THE PRIMARY CPU
PORT 1 CORRESPONDS TO PORT B FOR AN EXTERNAL CPU

MLO-00-070

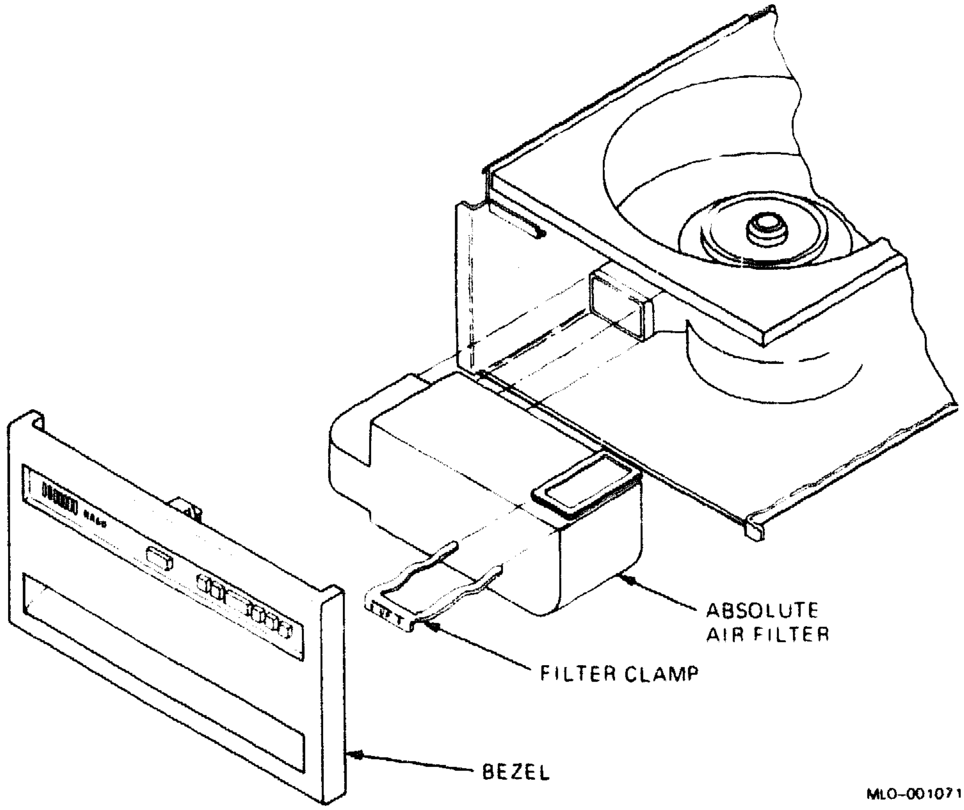
RA60 Fan Filter

The fan filter is an RA60 field replaceable unit (FRU). Remove the RA60 fan filter as follows:

CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

1. Remove the RA60 from the cabinet according to the procedures in the FRU section of *H9642–J Cabinet Maintenance*.
2. Remove the six screws that hold the RA60 bezel in place. The bezel is shown in Figure 3.
3. Disconnect P401 from the RA60 front panel module.
4. Pivot the bezel so the cover catch retainer clears the cross brace. Remove the bezel.
5. Remove the fan filter assembly by sliding it forward (Figure 3).

Figure 3: Removing the RA60 Fan Filter



RA70 Disk Drive

Ordering Information

RA70 drive kit	RA70–AF

Operating System Support

ULTRIX–32m	Version 2.2 and later
VMS	Version 4.6a and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 2.11 (release 121) and later
Power-up self-test LEDs	Two LEDs

Documentation

RA70 Disk Drive Service Manual	EK–ORA70–SV

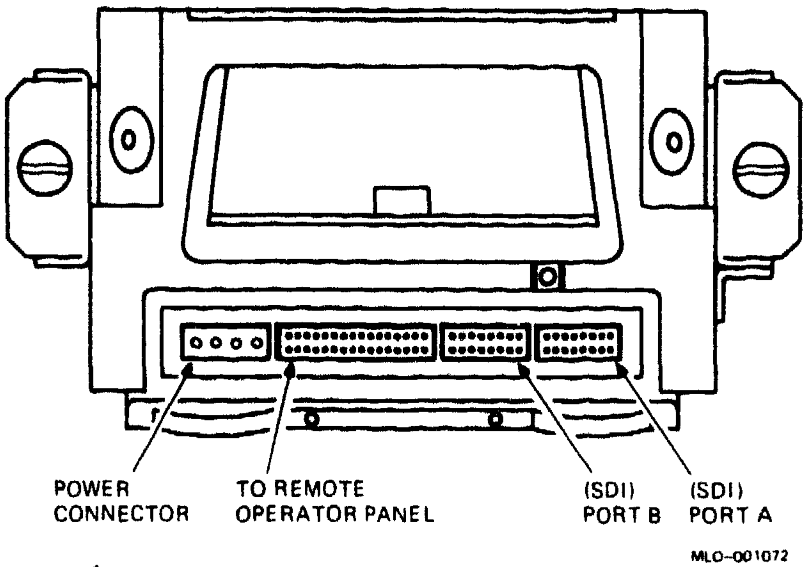
DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
KDA50–Q	M7164	6.93	0	34.6	3.0	0.5	(2) B
KDA50–Q	M7165	6.57	0.03	33.21	–	–	–

RA70

The RA70 is a full-height, 13.1-cm (5.25-in) fixed-disk drive, with a storage capacity of 280 Mbytes. The RA70 drive has four connectors, shown in Figure 1.

Figure 1: RA70 Connectors



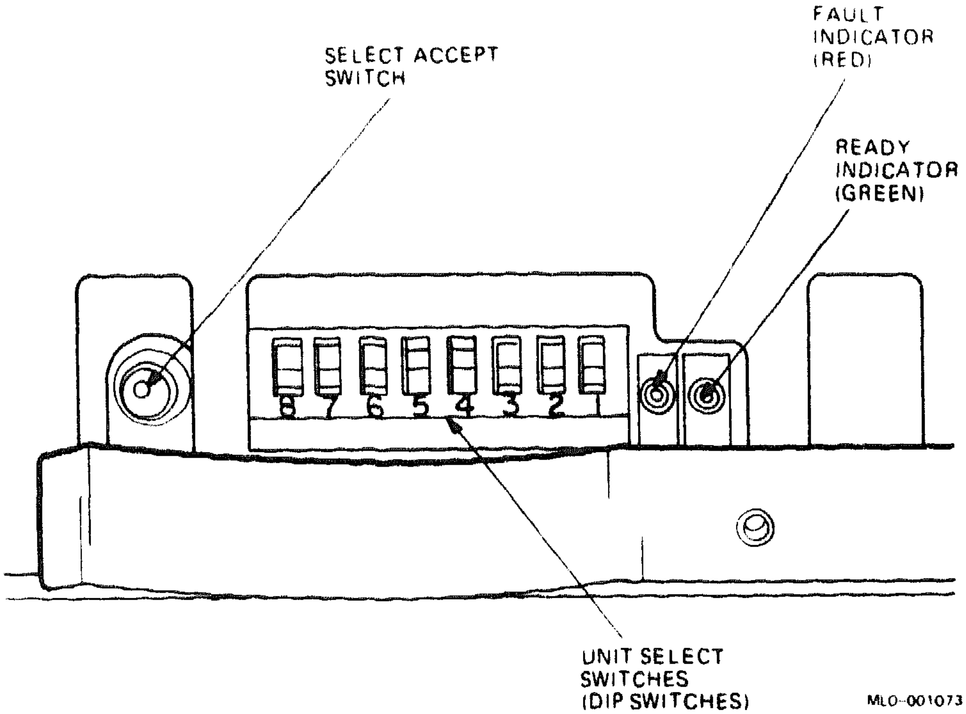
The RA70 drive also has Ready and Fault indicators on the drive itself (Figure 2), but they are not visible because the RA70 is mounted with the front facing the inside of the mass storage area. The indicators on the operator console panel duplicate the indicators on the drive.

All RA70 indicators normally light on the operator control panel (OCP) when power is applied to the drive, while the drive is performing internal start-up diagnostics. This indicator should go out within 15 seconds. If any indicator remains on, or lights at any time other than during the first 15 seconds after start-up, the drive has detected a drive fault.

If the drive has detected a fault, you can press the fault indicator button to get a flashing error code from all six of the indicators on the operator console panel.

If no fault is found, you can use the fault indicator button as a lamp tester.

Figure 2: RA70 Switches



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29-26246) when you work with the internal parts of a computer system.*

The RA70 contains a Unit Select/Accept switch and a Unit Select DIP switch, both shown in Figure 2. Neither of these switches is accessible once the RA70 is installed, so you must set the Unit Select DIP switch to the correct setting before installing the drive. The Unit Select DIP switch sets the unit number by which the drive is known to the host system. It is an 8-bit binary switch, with switch 1 as the least significant bit (LSB).

WARNING: *The RA70 is heavy (4.72 kg; 10.4 lb). Be prepared for the weight when handling the drive.*

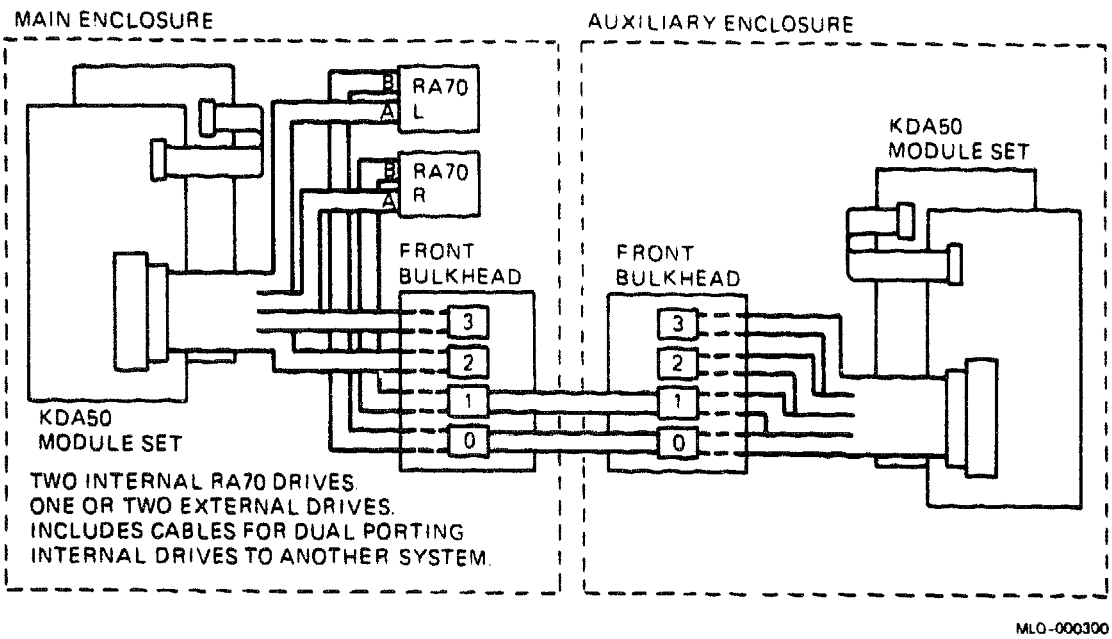
Set the unit number using the following DIP switches:

Drive Number	DIP Switch Setting (1 = switch on) 8 7 6 5 4 3 2 1
0	0 0 0 0 0 0 0 0
1	0 0 0 0 0 0 0 1
2	0 0 0 0 0 0 1 0
3	0 0 0 0 0 0 1 1

The Unit Select/Accept switch is used to notify a drive that the unit number has been changed, while the system is operating. Because the RA70 drive is mounted facing the rear of the system, this switch is inaccessible during system operation and is not used.

Figure 3 shows the cabling for RA70s in a dual-cabinet configuration where two processors share RA70s.

Figure 3: RA70 Dual-Cabinet Cabling

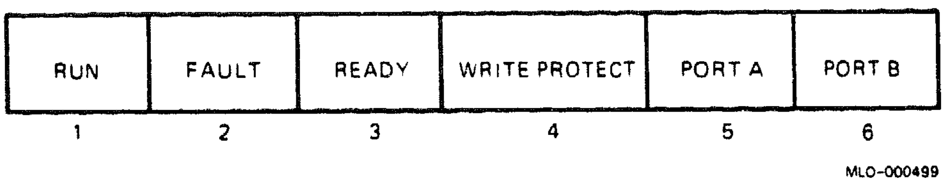


RA70 Diagnostics

If an RA70 drive detects a fault at power-up, the Fault indicator lights. and the drive remains off line. At that point, you can press the Fault indicator, and the six indicator lights on the operator console panel flash a hexadecimal error code, in a range from 00 to 3F. The *RA70 Service Guide* describes each code. Figure 4 shows the indicators that form the hex display listed in the table. The lights indicate the following FRUs:

Hex Code	Indicator	Most Probable FRU
00	000000	None
1F	011111	Head disk assembly (HDA)
3F	111111	System power supply
All others	–	Electronic control module (ECM)

Figure 4: Operator Console Panel Indicators



RA70 Error Logs

When a fault occurs, error codes are generated and stored in the host error log (if it is enabled), and the RA70 internal drive error log. The host error log captures four generic status bytes (including an error byte) and eight extended status bytes (including a drive state and error code byte). These bytes are described in detail in the *RA70 Disk Drive Service Manual.*

The RA70 internal drive error log also captures the error log byte. RA-series internal drive error logs are invoked through the Field Service version of the MicroVAX Diagnostic Monitor (MDM), as follows:

1. From the MDM Main Menu, select 4: Display the Service Menu.
2. Select 3: Display the Device Menu.
3. Select the KDA50: Q-bus SDI disk controller.

4. Display the Device Utilities Menu.
5. Select 3: Drive Internal Error Log Utility.

The format of the Internal Drive Error Log is shown in Example 1.

Example 1: RA70 Internal Drive Error Log Format

```
Entry Entry Err Err      Seek     Mfg     Drive Specific Hex Data      Drive Err
Loctn Count Typ Code     Count    Code    Byte 0-9, right to left      Message
 (D)   (D)  (A)  (H)      (D)      (H)              (H)                    (A)
----  ----- --- ---   --------- ---  ----------------------------- -----------
  7     3    DE  39    453122    32   00 00 09 0A 00 00 00 04 32 58 wrg&off.trk.
  6     3    DE  E7    452446    33   00 00 09 04 FF FB 0B 05 42 75 inc.lhd.sek.
  5     3    DE  E9    452446    34   00 00 09 03 FF FB 0B 05 12 9D exp.sek.tmr.
  4     3        00    451699    00   00 00 09 02 02 F6 05 04 79 A0 drv.sys.ini.
  3     3        00    451699    00   00 00 09 01 02 F6 05 04 7A BB exp.onl.atn.
  2     3        00    451616    00   00 00 09 00 00 00 00 02 42 A0 drv.sys.ini.
  1     3        00    451616    00   00 00 09 00 00 00 00 00 40 C0 drv.pwr.rst.
191     2        00         0    00   00 00 00 00 00 00 00 00 00 00 passed.test.

                             Byte  9  8  7  6  5  4  3  2  1  0
                                  -----+------ --+-- -+ -+ -+ -+
                                       !         !    !  !  !  !
                                       1         2    3  4  5  6
```

The ten bytes of drive-specific hex data printed by the internal error log are divided by the RA70 into the following six data fields:

- Logic processor number of minutes
- Servo processor destination cylinder
- Servo processor destination logical head number
- Servo processor physical state number
- Logic processor logical state bit flags
- Logic processor fault number

Two possible occurrences are displayed in the Error Type and Error Code columns: events and errors.

An error has an Error Type such as DE and an Error Code consisting of a nonzero value, as shown in the first three lines in the sample log above.

An event has a blank Error Type and an Error Code of 00, as shown in the last five lines in the sample log above.

The error codes in the Error Code column of the internal error log are described in the *RA70 Disk Drive Service Manual*. The most probable causes of errors to the field replaceable units (FRUs) are listed in Table 1.

NOTE: *The RA70 is not an FRU. The FRUs are the Electronic Control Module (ECM) and the Head Disk Assembly (HDA).*

Table 1: RA70 Error Codes

Error	Most Probable Cause			
Code	**ECM**	**HDA**	**Ctrl.**	**Cable**
03	1	2		3
06	1			
07	1	2		3
08	1		2	3
09	1		2	3
0B	1		2	3
0C	1		2	3
0E	1		2	3
13	1	2		
14	1	2		
15	1	2		
16	1	2		
17	1		3	2
18	1		3	2
1D	1	2		
1E	1	2		
1F	1			
20	1		3	2
25	1	2		
26	1	2		
27	1	2		
31	1			
32	1			
33	1			
34	1			
35	1			
39	1			
3C	1			
41	1		3	2
43	1		3	2
44	1		3	2

Table 1 (Cont.): RA70 Error Codes

Error Code	Most Probable Cause ECM	HDA	Ctrl.	Cable
4B	1	2		
4D	1	2		
4E	1			
4F	1		3	2
50	1			
51	1			
60	1	2		
62	1	2		
67	1	2		
85	1			
86	1			
87	1			
88	1			
89	1			
8A	1			
8B	1			
8C	1			
8D	1			
94	1			
95	1			
96	1			
C6		1		
C9	1			
CD	1			
DB	1	2		
E0–EF	1			
F2	1	2		
FD	1			

Table 2 lists part numbers for RA70 drive hardware for BA200-series enclosures.

Table 2: RA70 Part Numbers

Description	Part No.
Cable, RA70 to signal distribution board	17-00847-06
RA70 ECM	70-22494-01
RA70 HDA	70-21946-01
RA70 operator control panel (OCP)	54-17232-01
RA70 shoe plate	70-22474-01
RA70 shock mount top (attach to drive)	74-24559-02
RA70 shock mount bottom (attach to drive)	74-24559-01
RA70 shock mount top (attach to enclosure)	70-23997-05
RA70 shock mount bottom (attach to enclosure)	70-23997-06
Screws for RA70 drive slides (4)	90-10155-00

Electronic Control Module (ECM)

The electronic control module is an RA70 field replaceable unit (FRU). Remove the ECM from the RA70 drive as follows.

WARNING: *The RA70 is much heavier (4.72 kg; 10.4 lb) than other 13.1-cm (5.25-in) drives. Be prepared for the extra weight when handling the drive.*

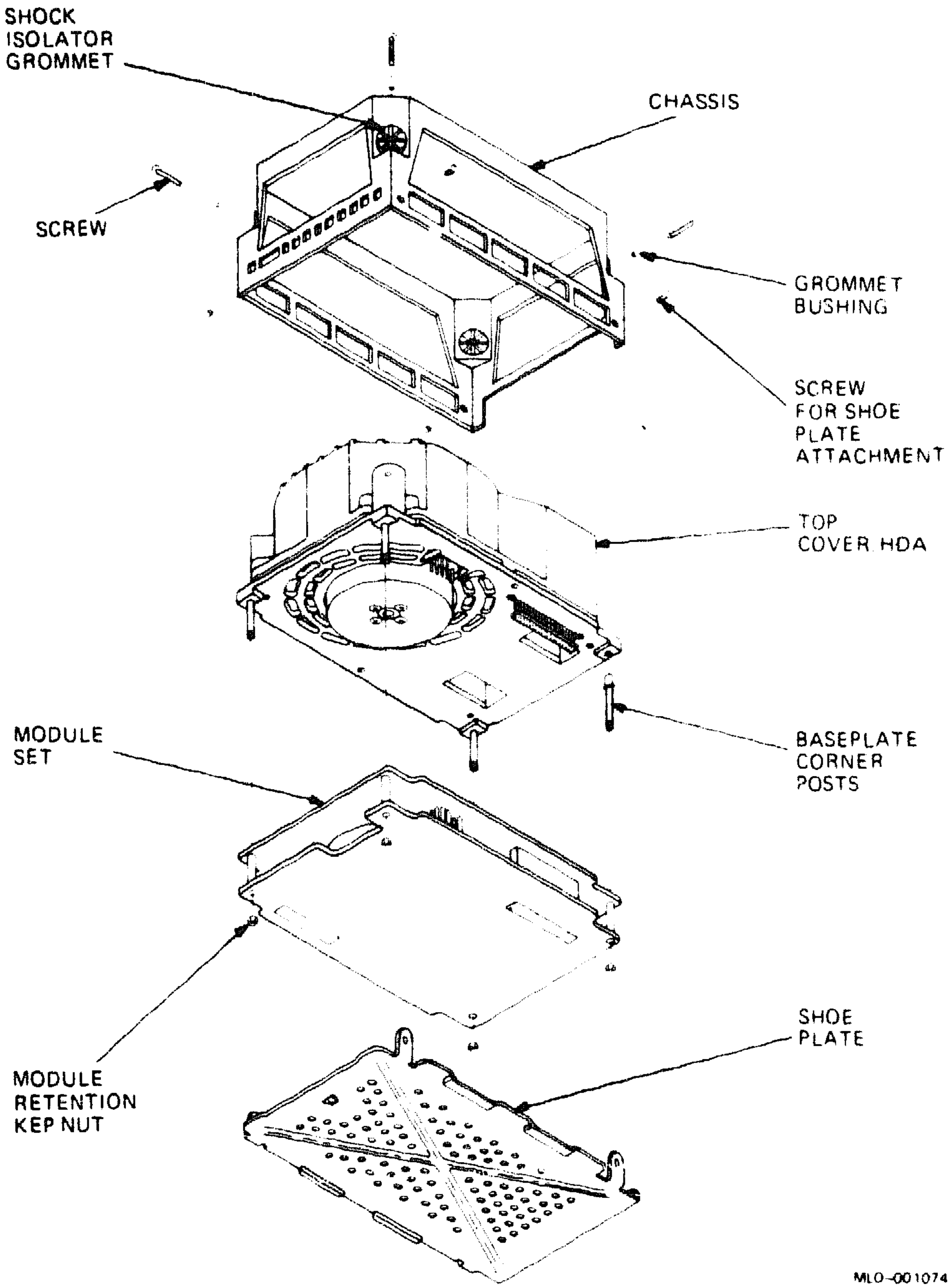
CAUTION: *Disk drives are susceptible to electrostatic damage. Do not handle the RA70 disk drive unless you are wearing an antistatic wrist strap that is properly grounded to the enclosure frame. Use the Antistatic Kit (29-26246). When you have removed the drive, place it on the antistatic mat.*

Refer to Figure 5 as you use the following procedure:

1. Remove the RA70 drive from the BA200-series enclosure, using the procedure in the FRU section of the appropriate enclosure maintenance documentation.
2. Remove the RA70 side slides.
3. Using a medium-sized Phillips screwdriver, carefully remove the four screws that secure the shoe plate to the mounting assembly. Removing the shoe plate exposes the ECM and the four quarter-inch nuts that secure the ECM.
4. Use a quarter-inch nut driver to remove the nut at each corner of the ECM assembly.
5. Remove the ECM by carefully pulling it away from the HDA. Because of the length of the connector pins, you may need to rock the ECM slightly to free the ECM assembly from the connectors on the HDA.

CAUTION: *The ECM is a two-module set. Do not take the module assembly itself apart.*

Figure 5: RA70 Components

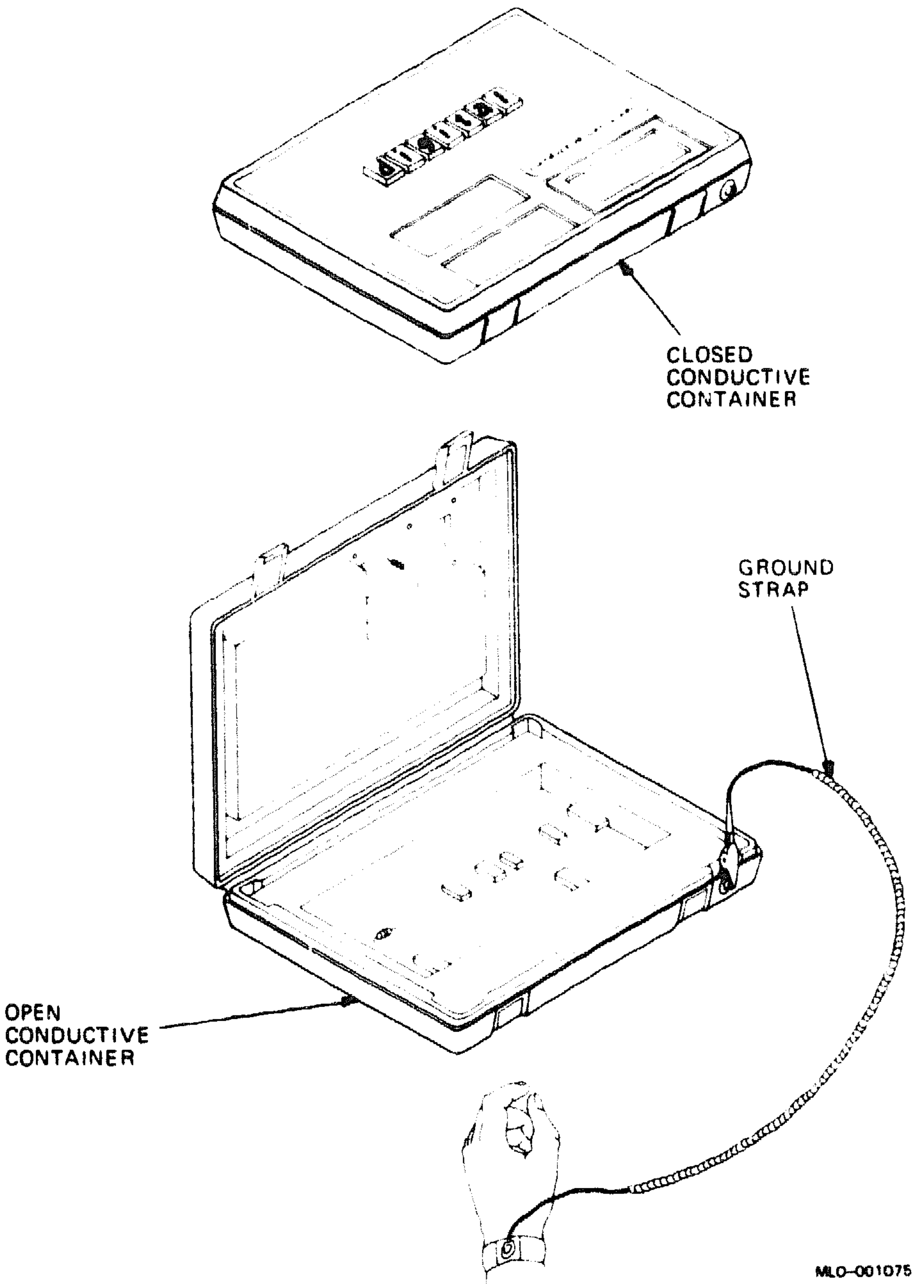


Preparing the ECM for Return

You must use a special conductive container to ship a defective module assembly to a repair depot. Attach the wrist strap from the Antistatic Kit (29-26246) to the conductive container before placing the faulty FRU inside the container (Figure 6). The container itself is conductive and is therefore grounded to the surface on which it is placed.

After placing the ECM in the container, secure the snaps on the front of the container. The FRU is now ready for shipment.

Figure 6: RA70 Conductive Container



Replacing the ECM

NOTE: *Use the Antistatic Kit (29-26246) when handling the ECM.*

Replace the four quarter-inch nuts and finger tighten. Using the quarter-inch nut driver, tighten each nut one-quarter or one-half turn, as needed.

Head Disk Assembly (HDA)

The head disk assembly (HDA) is an RA70 FRU. Remove the ECM from the HDA and the RA70 chassis. See the procedure under Electronic Control Module (ECM).

NOTE: *It is not necessary to disconnect the HDA from the chassis. The chassis is part of the head disk assembly FRU.*

Before installing the new HDA, remove the shunt terminator attached to the bottom of the new HDA and install it on the old HDA.

Preparing the HDA for Return

You must use a special corrugated box with a foam rubber cushion for shipment. The normal procedure is to unpack the new HDA and to return the defective HDA in the same container.

It is not necessary to wear an antistatic wrist strap when packing an HDA for return shipment. If the HDA is defective, however, you must first place the defective unit in a plastic bag sealed with desiccant foam from the replacement HDA. You must then place the plastic bag in the contoured cutout of the foam rubber cushion, inside the corrugated box. You can then seal the box for return shipment.

RA81 Disk Drive

The RA81 disk drive is supported in an H9642–J cabinet only. When installing a new RA81 option, order both the drive and the interconnect cable.

Ordering Information

RA81 disk drive (120 V)	RA81-HA
RA81 disk drive (240 V)	RA81-HD
Interconnect cable with connector block	BC26V-6

Operating System Support

DSM-11	Version 3.3 and later
Micro/RSTS	Version 2.2 and later
Micro/RSX	Version 4.0 and later
MicroVMS	Version 4.2 and later
RSX-11M	Version 4.3 and later
RSX-11M-PLUS	Version 4.0 and later
RT-11	Version 5.4D and later
ULTRIX-11	Version 3.1 and later
ULTRIX-32m	Version 1.2 and later
VAXELN	Version 1.1 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 1.06 (release 106) and later
Power-up self-test LEDs	None

Documentation

RA81 Disk Drive Service Guide	EK-ORA81-SV
RA81 Disk Drive User Guide	EK-ORA81-UG

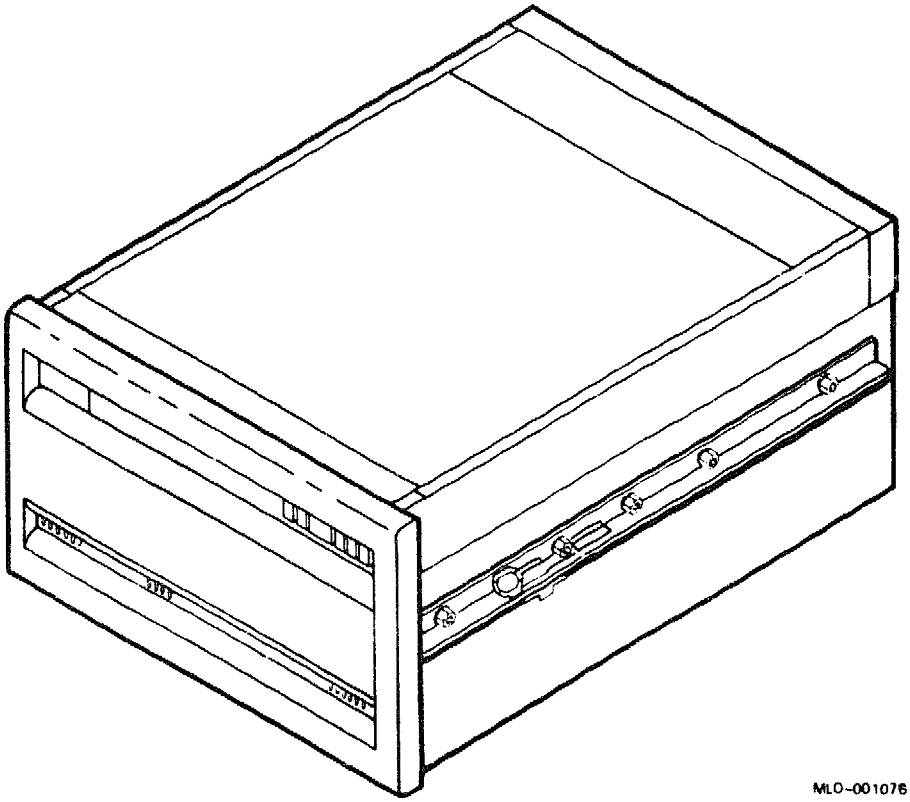
DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
KDA50-Q	M7164	6.93	0	34.6	3.0	0.5	(2) B
KDA50-Q	M7165	6.57	0.03	33.21	-	-	-

The RA81 (Figure 1) is a high-capacity, fixed-disk drive with 456 Mbytes of formatted storage space. The RA81 uses microprocessor-controlled diagnostics and a 170-bit error correction code (ECC) to ensure data reliability. The RA81 operates with the KDA50-Q controller set.

The BC26V-6 cable includes a connector block for connecting RA81 cables. The connector block is mounted on the bracket at the lower rear of the cabinet. (See the RA60/RA81 cabling figure in the RA60 section.)

Figure 1: RA81 Disk Drive



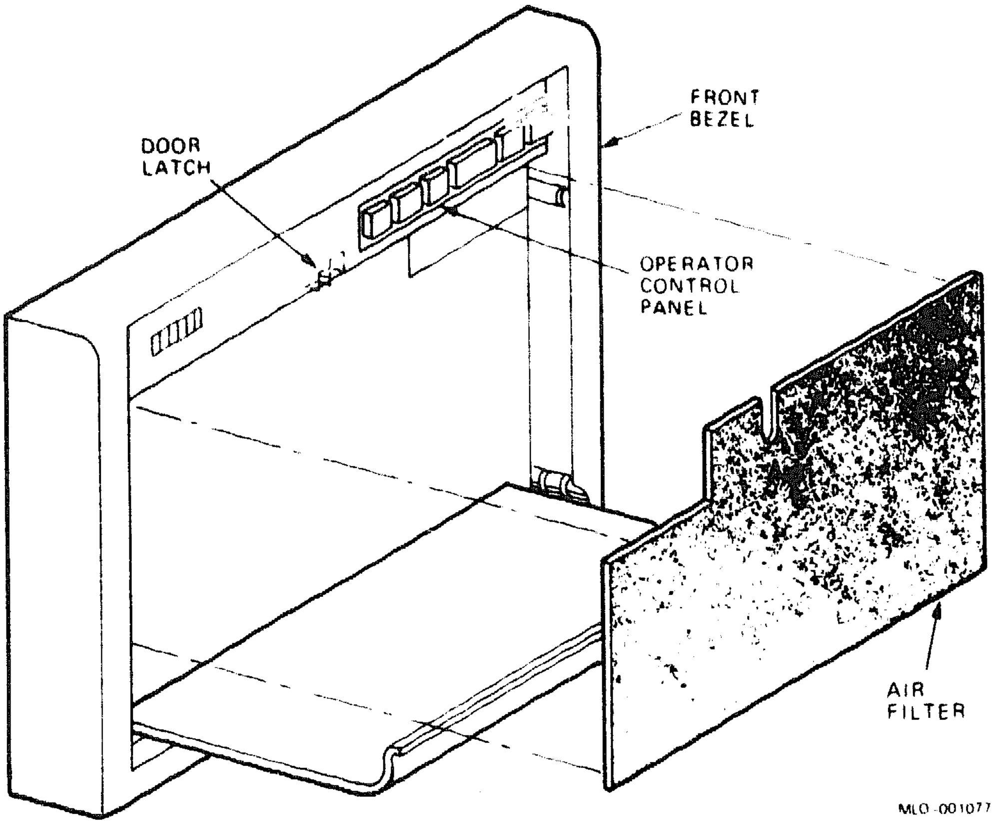
RA81 Fan Filter

The fan filter is an RA81 field replaceable unit (FRU). Remove the RA81 fan filter as described below.

CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

1. Remove the RA81 drive according to the FRU procedures in the *H9642-J Cabinet Maintenance*.
2. Push down on the RA81 door latch (Figure 2) and lower the door to a horizontal position.
3. Pull down on the top half of the fan filter, then lift it out of the RA81 drive.

Figure 2: Removing the RA81 Fan Filter



RA82 Disk Drive

When installing a new RA82 option, order both the drive and the interconnect cable.

Ordering Information

RA82 disk drive (120 V)	RA82-HA
RA82 disk drive (240 V)	RA82-HD
Interconnect cable with connector block	BC26V-6

Operating System Support

Micro/RSX	Version 4.0 and later
RSX-11M	Version 4.3 and later
RSX-11M-PLUS	Version 4.0 and later
ULTRIX-32m	Version 2.2 and later
VMS	Version 4.6a and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 2.10 (release 120) and later
Power-up self-test LEDs	None

Documentation

RA82 Disk Drive Service Guide	EK-ORA82-SV
RA82 Disk Drive User Guide	EK-ORA82-UG

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
KDA50-Q	M7164	6.93	0	34.6	3.0	0.5	(2) B
KDA50-Q	M7165	6.57	0.03	33.21	–	–	–

RA82

The RA82 is a high-capacity, 35-cm (14-in) fixed disk drive with 622 Mbytes of formatted storage space. The RA82 uses the KDA50–Q controller set.

The BC26V–6 cable is attached to a connector block for connecting RA82 cables. The connector block is mounted on the bracket at the lower rear of the cabinet.

RA90 Disk Drive

The RA90 disk drive is supported in the H9644 cabinet only.

Ordering Information

RA90 drive kit	RA90–MA (factory installed) RA90–NA (field upgrade)

Operating System Support

ULTRIX–32m	Version 2.2 and later
VMS	Version 4.6a and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 3.01 (release 126) and later
Power-up self-test LEDs	One test LED

Documentation

RA90 Disk Drive Service Manual	EK–ORA90–SV
RA90 Disk Drive User Guide	EK–ORA90–UG

DC Power and Bus Loads

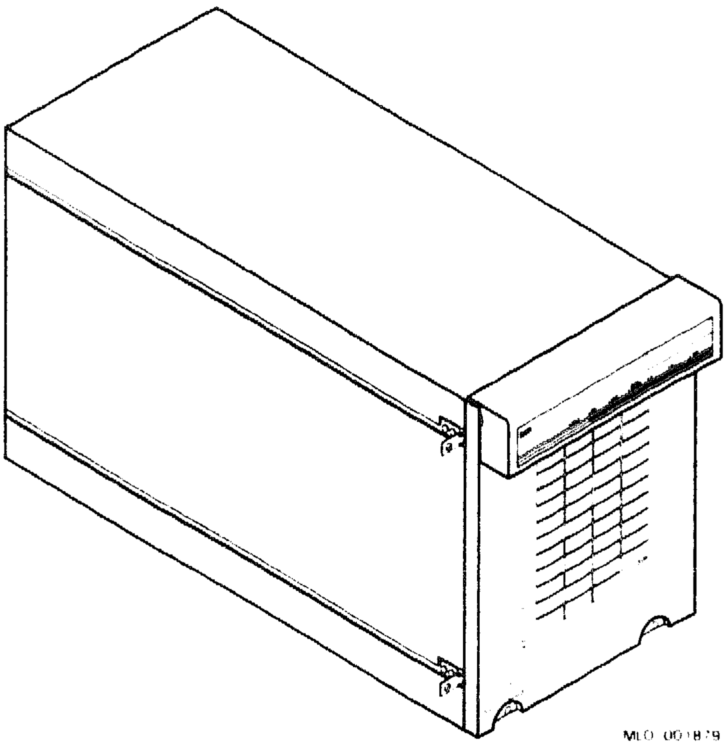
		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
KDA50–Q	M7164	6.93	0	34.6	3.0	0.5	–
KDA50–Q	M7165	6.57	0.03	33.21	–	–	–

RA90

The RA90 is a high-density, fixed-media disk drive that uses thin-film media and thin-film heads. The RA90 heads, disks, rotary actuator, and filtering system are encased in the head disk assembly (HDA). The unformatted capacity of the RA90 is 1.6 gigabytes, and the formatted capacity is 1.2 gigabytes distributed over 7 platters with 14 surfaces. The average seek time of the RA90 is 17.5 msec, or 19.0 msec with subsystem overhead.

The RA90, shown in Figure 1, operates in the H9644 cabinet through the KDA50–Q controller set, which is installed in the BA213 chassis. Both external and internal standard disk interface (SDI) cables connect to the I/O bulkhead located at the base of the rear of the H9644.

Figure 1: RA90 Disk Drive



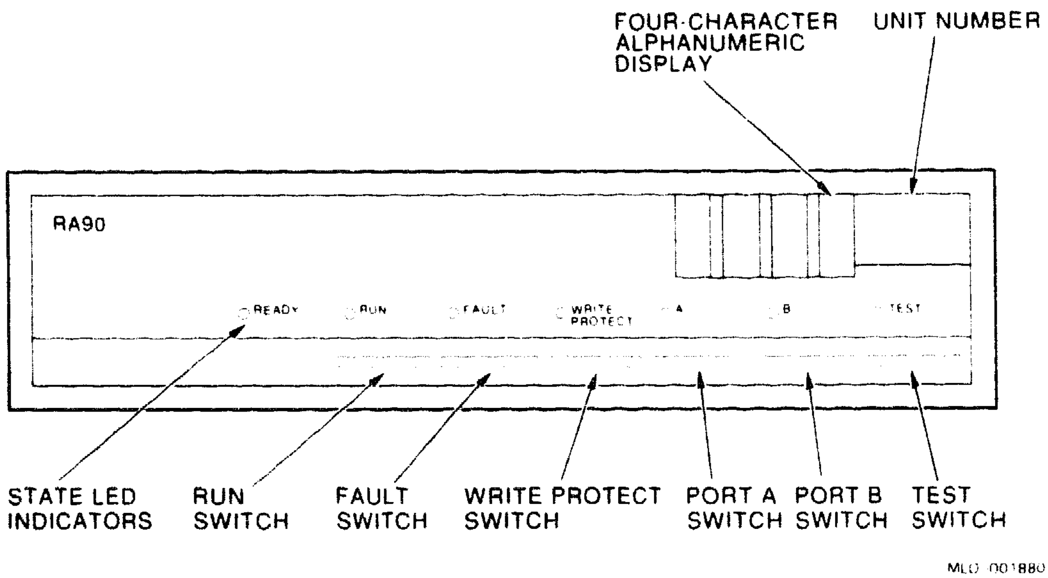
Operator Control Panel

The RA90 disk drive operator control panel (OCP), shown in Figure 2, supports the following operator functions:

- Selects and displays the unit address number
- Selects Run, Write Protect, Port A, and Port B
- Displays faults and error codes
- Selects tests in the test mode
- Controls the microcode update process
- Communicates with the RA90 master processor

The OCP contains six input switches, seven LED indicators, a four-character alphanumeric display, and a microcode update port. The logical state of the switches changes each time you select an OCP switch. The switch state appears in the alphanumeric display. For example, if you select the Run switch, an R appears in the OCP display.

Figure 2: RA90 Operator Control Panel (OCP)



Drive-Resident Diagnostics

The drive-resident diagnostics run at power-up or reset of the master processor and test the following:

- Hardware (CPU, ROM, RAM, SCI, and TIMER)
- Logic (processor board, servo board, and PCM board)
- Functions (guardband detect, seek/timing, and read/write)

The drive-resident diagnostics are invoked under four conditions:

- Power-up or master processor reset
- External init (SDI initialization command)
- OCP test mode selection
- Functional firmware sequences (idle loop)

Successful completion of the hardware tests is indicated by a series of OCP displays, as follows:

- Blank (1 second).
- WAIT (16 seconds).
- 0000 (If programmed, the drive unit number is displayed. Otherwise, zeros are displayed.)

If the Fault LED on the OCP lights, or if no OCP activity occurs during the power-up resident diagnostics, enter the fault display mode by selecting the Fault switch. The OCP then displays a three-character fault code in the format E 00, where 00 is a two-digit fault code. Table 1 lists the error codes and actions to take. See the *RA90 Disk Drive Service Manual* for additional information on drive troubleshooting.

Table 1: RA90 OCP Error Codes

Error Code	Description	Action
0F or 6F	Drive write-protected	Disable write protection by setting the OCP write-protect switch, or turn off software write protection.
22 or 2D	Drive or power supply over-temperature condition	Spin down and remove power from the drive. Make sure the front filter is clean and the room temperature is within 18 C to 24 C (64.4 F to 75.2 F).

Acceptance Testing

After the power-up tests complete successfully, you must run the following acceptance tests from the OCP in this order:

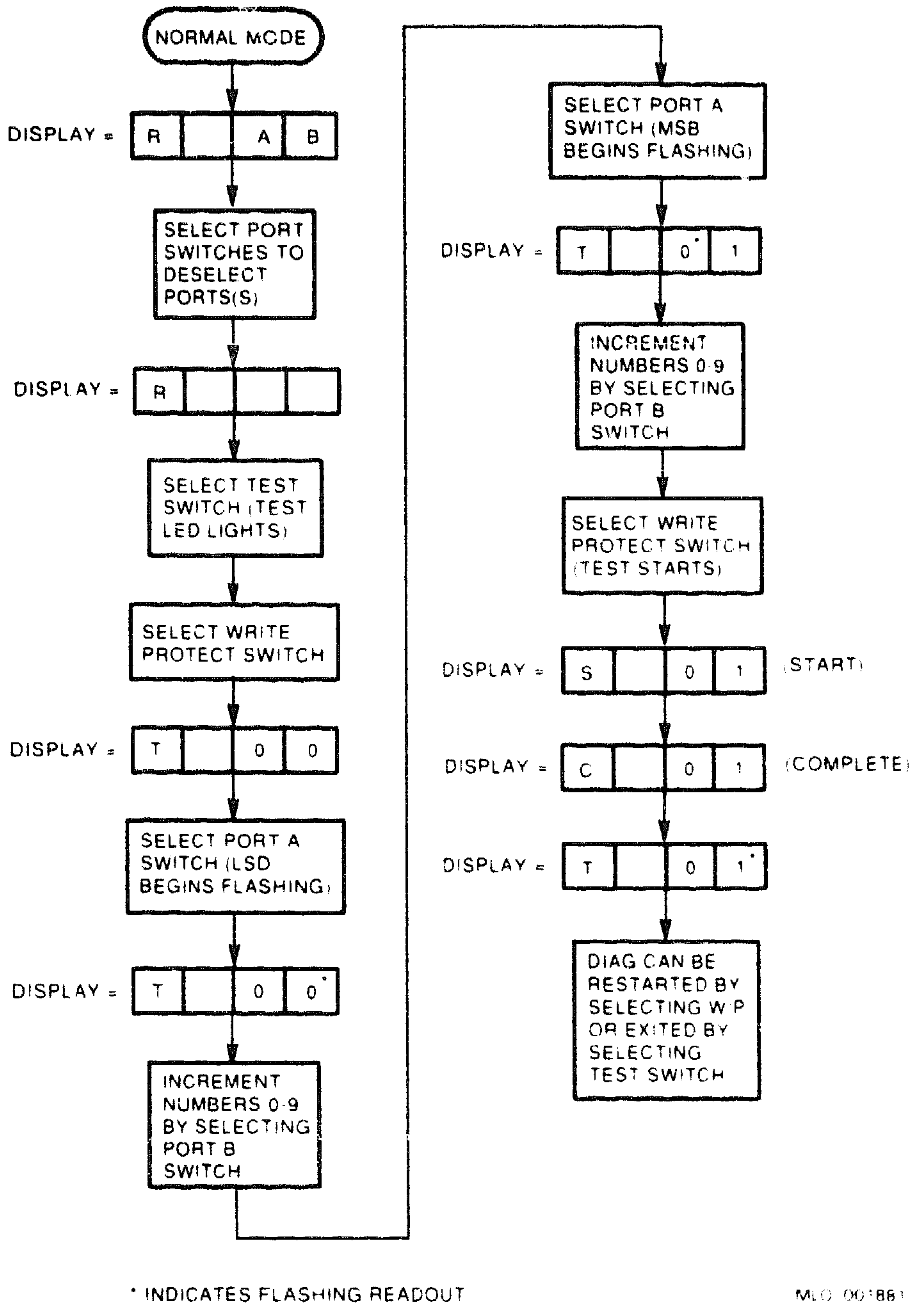
1. Test T 00: Drive spun down.
2. Test T 00: Drive spun up.

Run the acceptance tests from the OCP as follows. (Refer to Figure 3.)

1. Power up the drive.
2. Select the Test switch.
3. Select the Write Protect switch to initiate the diagnostic mode.
4. Select the diagnostic to run by using Port A and Port B switches (Figure 3).
5. Start the test by selecting the Write Protect switch.
6. Stop the test by selecting the Port A switch.
7. Reinitiate the tests by selecting the Write Protect switch again. Select the Test switch to exit and test mode.

After the acceptance tests complete successfully, the OCP displays an R and lights the Ready and Run indicators.

Figure 3: RA90 Resident Diagnostic Test Selection



RA92 ISE

The RA92 disk drive provides 1.5 Gbytes of formatted storage space. The VAX 4000 Model 300 supports the RA92 only in separate storage expansion enclosures.

Storage Capacity

User capacity	1.5 Gbytes
User capacity (blocks)	2,940,952 Gbytes

Ordering Information

RA92–CA/CD	RA92 disk drive (120 V @ 60 Hz; 240 V @ 50 Hz)
BC26J–XX/25/50/80	12-, 25-, 50-, or 80-foot interconnect cable
BC27V–XX/25/50/80	12-, 15-, 25-, 35-, 50-, or 80-foot interconnect cable

Performance

Average seek time	16.5 milliseconds
Single track seek	3.0 milliseconds
Peak transfer rate	22.2 Mbits/second

Physical Specifications

Height	26.47 cm (10.42 in)
Width	23.0 cm (8.75 in)
Depth	60.96 cm (24.0 in)
Weight	31.8 kg (70 lb)

Configuration Information

Form factor	10.5-in high

Related Documentation

EK-ORA90-UG	RA90/RA92 User Guide
EK-ORA90-SV	RA90/RA92 Service Manual
EK-ORA90-PS	RA90/RA92 Pocket Service Guide
EK-ORA90-TD	RA90/RA92 Technical Description
EK-ORA90-IP	RA90 Illustrated Parts Breakdown

RC25 Disk Subsystem

Ordering Information

	120 V	240 V
RC25 disk drive subsystem	RQC25-AA	RQC25-AB
RC25 disk drive	–	–
Removable cartridge	RC25K-DC	RC25K-DC
KLESI module	M7740	M7740
Internal cable	70-18652-00	70-18652-00
Type-A filtered connector	–	–
External cable	17-00445-03	17-00445-03
RC25 tabletop unit	RC25-AA	RC25-AB

Operating System Support

DSM-11	Version 3.3 and later
Micro/RSTS	Version 2.2 and later
Micro/RSX	Version 4.0 and later
MicroVMS	Version 4.1m and later
RSX-11M	Version 4.3 and later
RSX-11M-PLUS	Version 4.0 and later
RT-11	Version 5.4D and later
ULTRIX-11	Version 3.1 and later
ULTRIX-32m	Version 1.1 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 1.08 (release 108) and later
XXDP	Version 2.1 (release 134): XRCFC0.OBJ, ZRCDB0.BIN
Power-up self-test LEDs	None

Documentation

RC25 Disk Subsystem Pocket Service Guide	EK-ORC25-PS
RC25 Disk Subsystem User Guide	EK-ORC25-UG

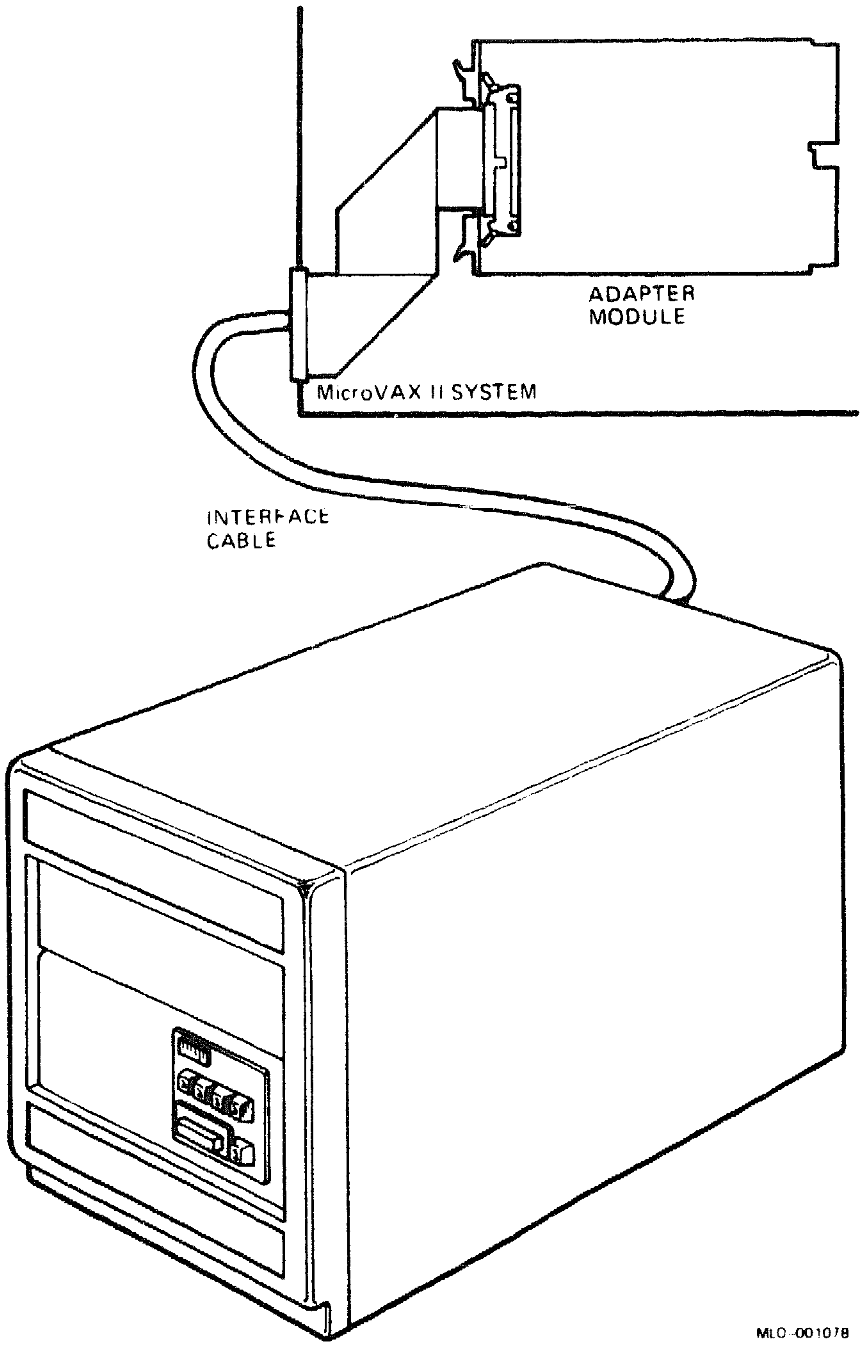
DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
KLESI	M7740	3.0	0.0	15.0	2.3	1.0	A
RC25	-	1.0	2.5	35.0	-	-	-

The RC25 is a mass storage disk subsystem with a storage capacity of 52 Mbytes. Figure 1 shows the RC25 as a standalone subsystem. You can also install the RC25 in an H9642–J enclosure. The RC25 has two 20-cm (8-in), double-sided disks, each with a capacity of 26 Mbytes. One disk is fixed and one is removable. Both disks are mounted on and driven by the same spindle.

CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

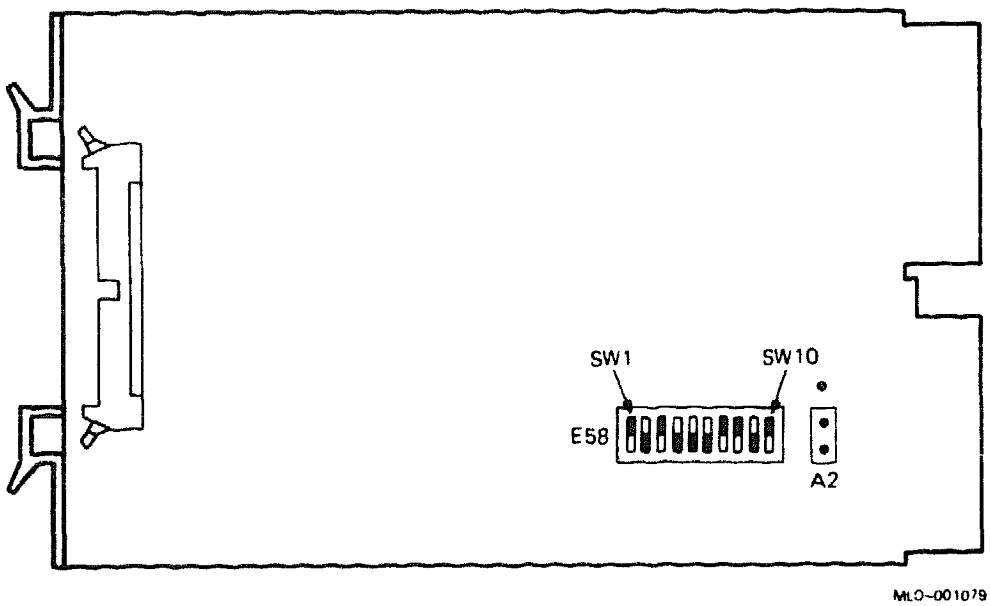
Figure 1: RC25 Disk Subsystem



The RC25 uses a KLESI (M7740) adapter module. Use DIP switchpack E58 on the KLESI to set the CSR address (Figure 2). The CSR address factory configuration, and an address for a second KLESI module, follow Figure 2. The interrupt vector is set under program control.

NOTE: *The KLESI and RQDX controller are both MSCP devices. The first MSCP device in a system is assigned a CSR address of 17772150. If you install more than one MSCP device in the same system, you must set the CSR address of the second device within the floating range.*

Figure 2: KLESI Module Layout (M7740)



KLESI (M7740) CSR Address
Switchpack E58

Address Bits:	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2
	<----------				E58 Switches			------------>			Jumper
	1	2	3	4	5	6	7	8	9	10	W
CSR Address:											
17772150	1	0	1	0	0	0	1	1	0	1	0*
Possible addresses for a second MSCP device:											
17760334	0	0	0	0	0	1	1	0	1	1	1
17760354	0	0	0	0	0	1	1	1	0	1	1

1 = switch on; 0 = switch off

* 0 = jumper on left and center pin (module edge facing you)
  1 = jumper on right and center pin

RD31 and RD32 Diskette Drives

Ordering Information

RD31 disk drive kit	RD31-AA
RD32 disk drive kit	RD32-AA
RD31 or RD32 disk drive	RD31-EA or RD32-EA
Extension power cable	17-01389-01
20-pin cable (30 cm; 12 in)	17-00282-01
34-pin signal cable	17-00286-00
Stacking bracket	74-33598-01

Operating System Support

Micro/RSX	Version 4.0 and later
Micro/RSTS	Version 2.2 and later
RSX-11M	Version 4.3 and later
RSX-11M-PLUS	Version 4.0 and later
RT-11	Version 5.4D and later
ULTRIX-11	Version 3.1 and later

Diagnostic Support

Power-up self-test LEDs	None

Documentation

RD31-A Disk Drive Technical Description	EK-RD31A-TD
RD32 Fixed Disk Drive Technical Description	EK-ORD32-TD
RD31/32 Fixed Disk Drive Option Installation Guide	EK-RD3XA-IN

DC Power and Bus Loads

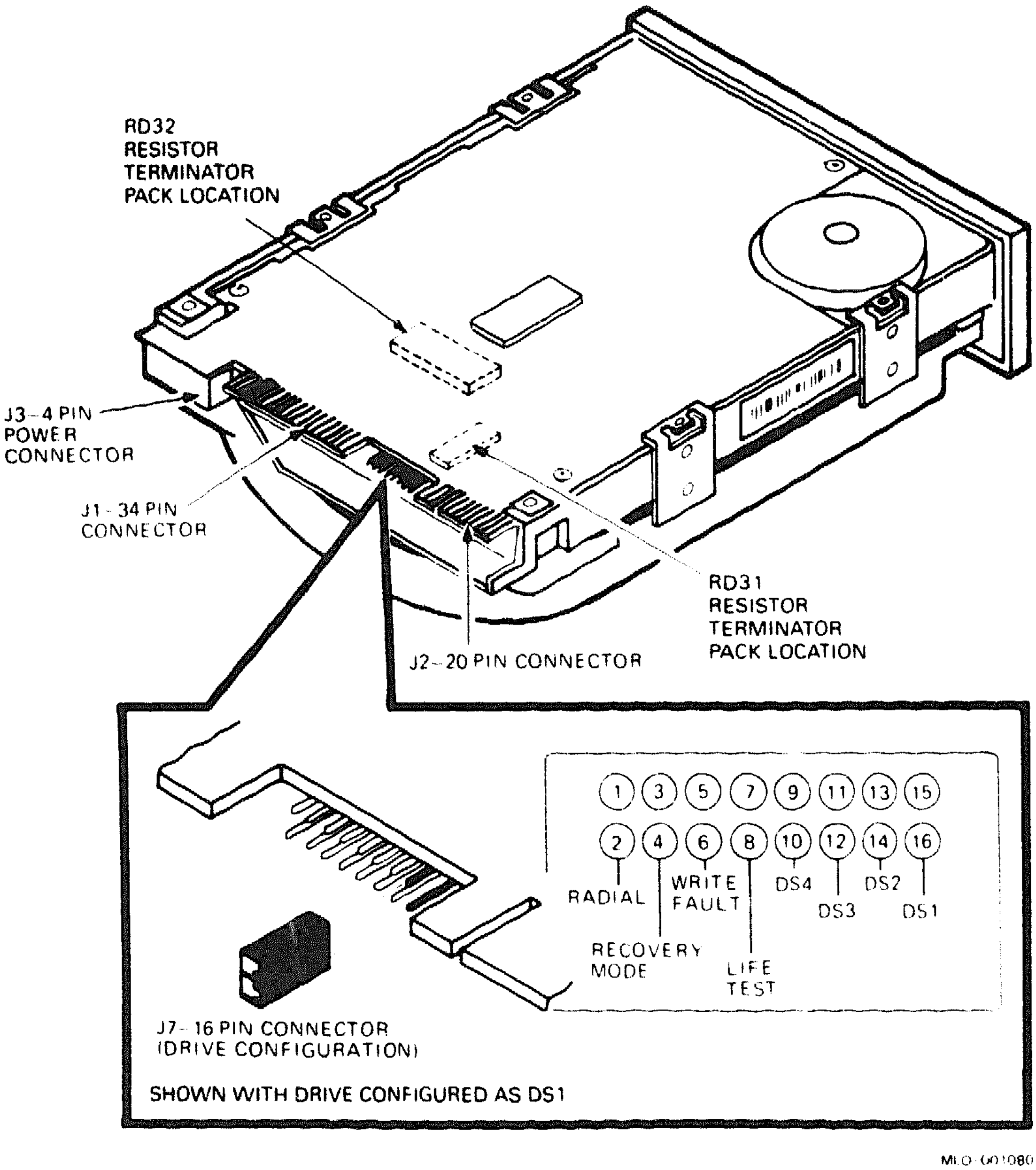
Option	Module	Current (Amps) +5 V	+12 V	Power Watts	Bus Loads AC	DC	Insert
RD31	-	0.9	0.9	38.8	-	-	-
RD32	-	0.9	0.6	33.0	-	-	-

The RD31/32, shown in Figure 1, is a 13.3-cm (5.25-in), half-height, fixed-disk drive with the following formatted storage capacities:

RD31: 20 Mbytes
RD32: 42 Mbytes

The RD31/32 is a random access drive that uses nonremovable hard disks. The drive is mounted in mass storage port 0 of the BA23 enclosure and interfaces with the Q22-bus through the RQDX3 controller module. You can install a second RD31/32 on top of the first drive. See the *RD31/32 Fixed Disk Drive Option Installation Guide* for procedures to install two drives in mass storage port 0.

Figure 1: RD31/32 Fixed-Disk Drive



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

Configure the drive by installing jumpers on the drive electronics board, shown in Figure 1. Install a jumper on one of the drive selects: DS1, DS2, DS3, or DS4 (Table 1).

Table 1: RD31/32 Drive Select Jumper Connections

Drive	Drive Select 1 2 3 4[1]	Connector
1	1 0 0 0	15 to 16
2	0 1 0 0	13 to 14
3	0 0 1 0	11 to 12
4	0 0 0 1	9 to 10

[1] 1 = jumper in; 0 = jumper out

Table 2 lists the functions of pins 1 through 8; for the Normal mode, do not install jumpers on these pins.

Table 2: RD31/RD32 Device Electronics Board, Pins 1–8

Configuration	Jumper Location	Jumper In
Life test	7 to 8	Factory use only
Write fault	5 to 6	Latched
Recovery mode	3 to 4	Factory use only
Radical	1 to 2	Radical mode

The RD31/32 drives used in most systems have the resistor terminator pack installed, as shown in Figure 1. For specific exceptions, refer to the system installation procedure.

RD50-Series Disk Drives

Ordering Information

	BA23 or H9642–J	BA123	BA200-Series
RD51 kit	RD51A-AA	RD51A-BA	–
RD52 kit	RD52A-AA	RD52A-BA	–
RD53 kit	RD53A-AA	RD53A-BA	RD53E-SF
RD54 kit	RD54A-AA	RD54A-BA	RD54E-SF
Disk kit cables:			
20-pin	17-00282-00	17-00282-01	17-00282-03
34-pin	17-00286-00	17-00286-01	17-00286-03

Operating System Support

DSM-11	Version 3.3 and later
Micro/RSTS	Version 2.2 and later
Micro/RSX	Version 4.0 and later
MicroVMS	Version 4.1m and later. (RD51 may be used as a data device only.)
RSX-11M	Version 4.3 and later
RSX-11M-PLUS	Version 4.0 and later
RT-11	Version 5.4D and later
ULTRIX-11	Version 3.1 and later
ULTRIX-32m	Version 1.1 and later. (RD51 may be used as a data device only.)
VAXELN	Version 2.0 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 1.02 (release 102) and later (RD54: Version 1.14 (release 114) and later)
Power-up self-test LEDs	None

Documentation

RD51-D, -R Fixed Disk Drive Subsystem Owner's Manual	EK-LEP02-OM
RD52-D, -R Fixed Disk Drive Subsystem Owner's Manual	EK-LEP04-OM
RD53-D, -R Fixed Disk Drive Subsystem Owner's Manual	EK-LEP06-OM
11C23-UC/11C23-UE RD52 Upgrade Installation Guide	EK-RD52U-IN

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
RD32	–	0.9	0.6	13.0	–	–	–
RD51	–	1.0	1.6	24.2	–	–	–
RD52	–	1.0	2.5	35.0	–	–	–
RD53	–	0.9	2.5	34.5	–	–	–
RD54	–	1.3	1.34	23.7	–	–	–
RD54A-EA	–	1.4	1.34	22.6	–	–	–

The RD50-series are fixed disk drives with the following storage capacities:

RD51—11 Mbytes	RD53—71 Mbytes
RD52—31 Mbytes	RD54—150 Mbytes

RD50-series drives have jumpers or switches that determine which drive-select lines the drive responds to. The following sections describe the jumpers and switches on each model, along with the removal and replacement procedures for the field replaceable units (FRUs).

If you use an RD50-series drive as a single fixed-disk drive in a BA23 or BA200-series enclosure, you should have the drive respond to drive-select line 3 (DS3). This setting makes the drive number for that unit RD0.

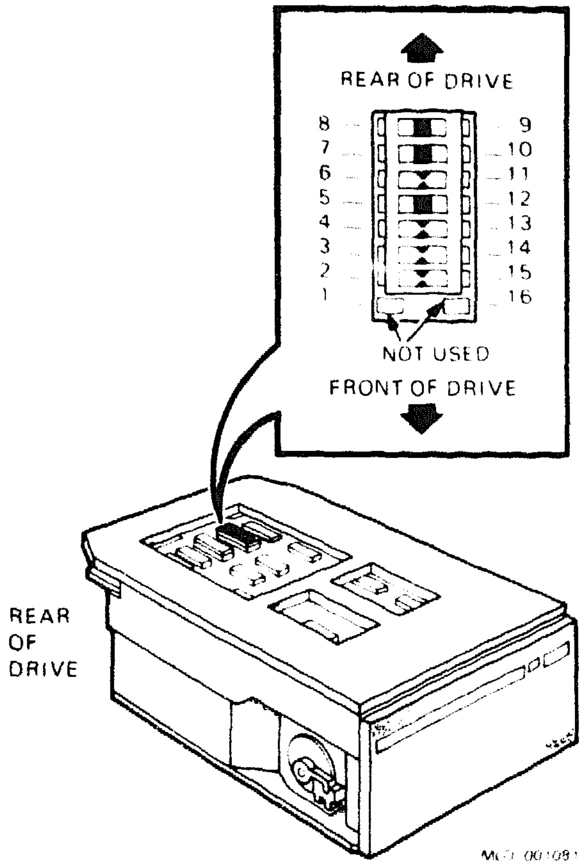
If you use RD50-series drives in a BA123 enclosure, you must install one of the drive-select jumpers or press one of the drive-select switches down. If you use the factory configuration for the M9058 module, you can use any one of the drive-select jumpers or switches since the M9058 determines the drive number.

You must format an RD50 drive when you add it to the system. The formatting utility is available in the MicroVAX Diagnostic Monitor (MDM) and the XXDP V2 Diagnostic Monitor.

RD51 Read/Write Board

The RD51 read/write board has a DIP shunt jumper to select the drive number. The jumper has seven breakable metal strips. Figure 1 shows the jumper setting to select drive number RD0 (drive-select line DS3).

Figure 1: RD51 Disk Drive and Shunt Jumper



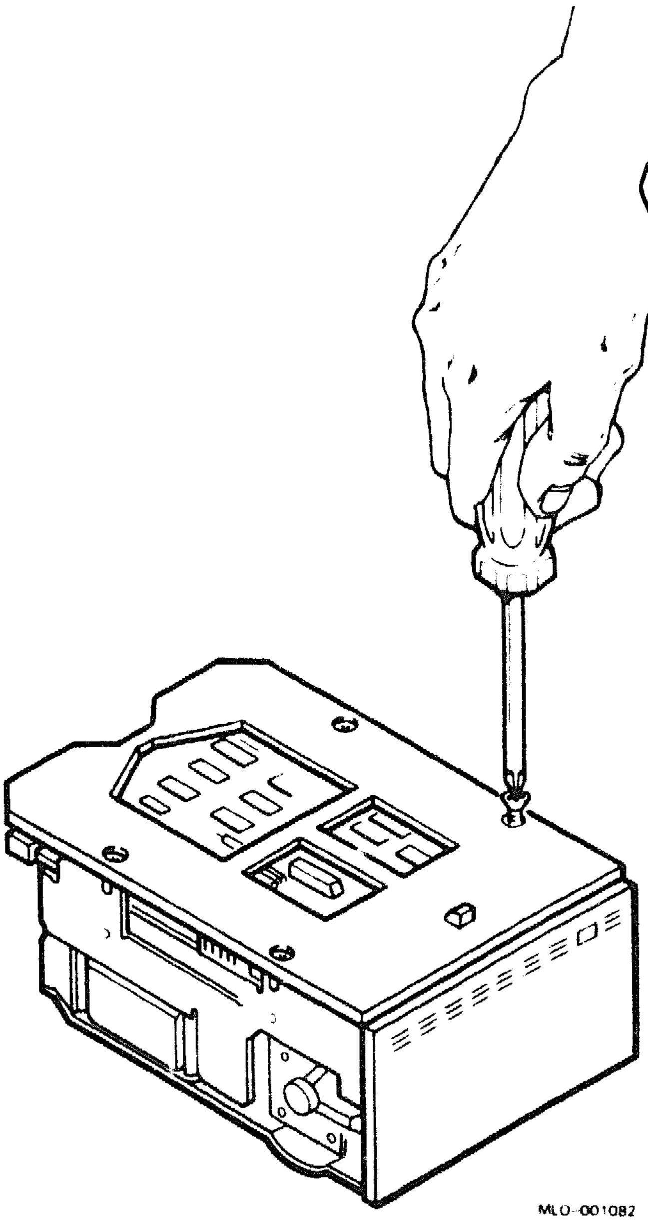
The read/write board is the only part of an RD51 drive that you can replace. Replace the RD51 read/write board as follows:

CAUTION: *Disk drives are susceptible to electrostatic damage. Do not handle the RD51 disk drive unless you are wearing an antistatic wrist strap that is properly grounded to the enclosure frame. Use the Antistatic Kit (29-26246). When you have removed the drive, place it on the antistatic mat.*

1. Remove the RD51 disk drive from the enclosure, using the procedure in the FRU section of the appropriate enclosure maintenance documentation.
2. Remove the four Phillips screws on the skid plate (Figure 2). Set the skid plate aside.

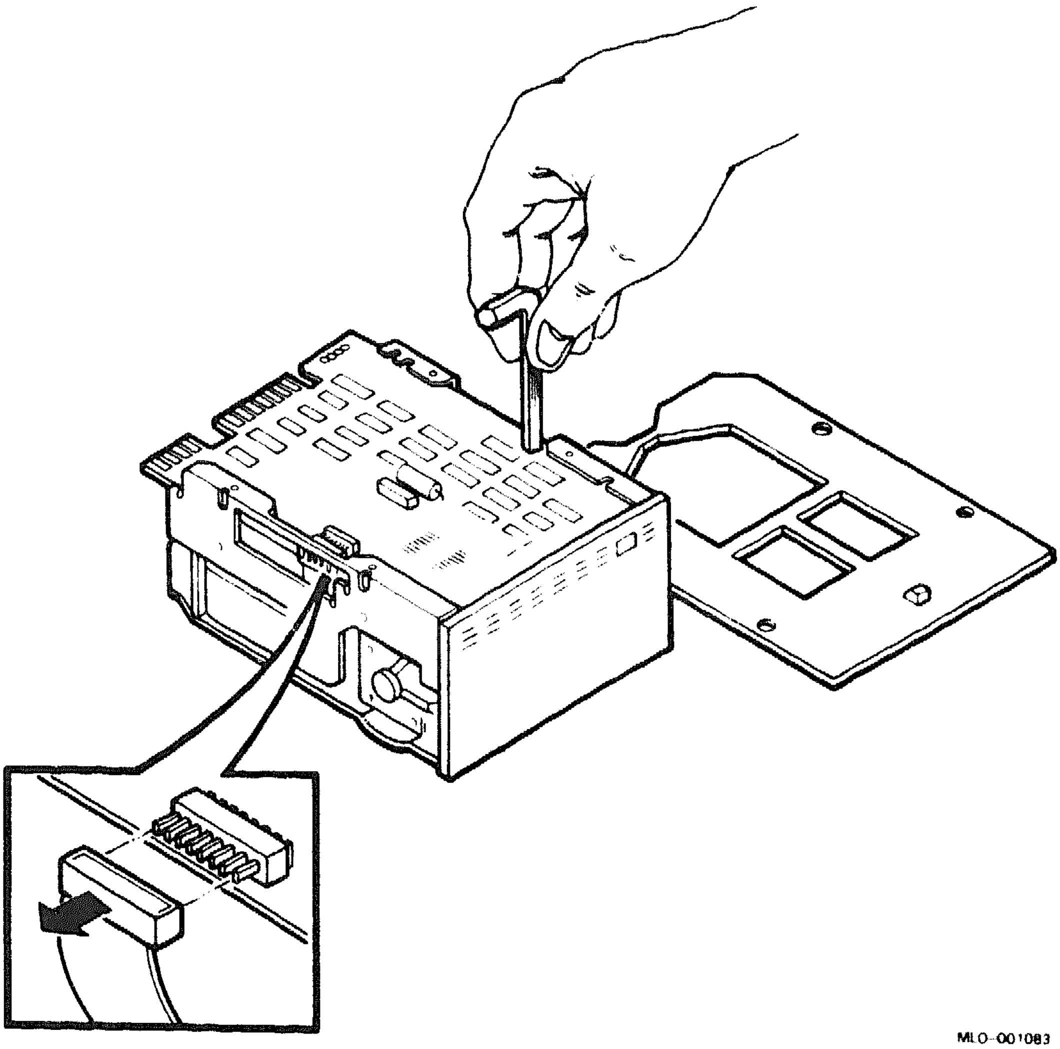
   CAUTION: *Do not touch the RD51 exposed head positioner flag on the front right side. Doing so can cause the head positioner flag to rotate, resulting in damage to the drive.*

Figure 2: Removing the RD51 Skid Plate



3. Using a 3/32-inch Allen wrench, remove the four screws that hold the read/write board to the RD51 drive (Figure 3).

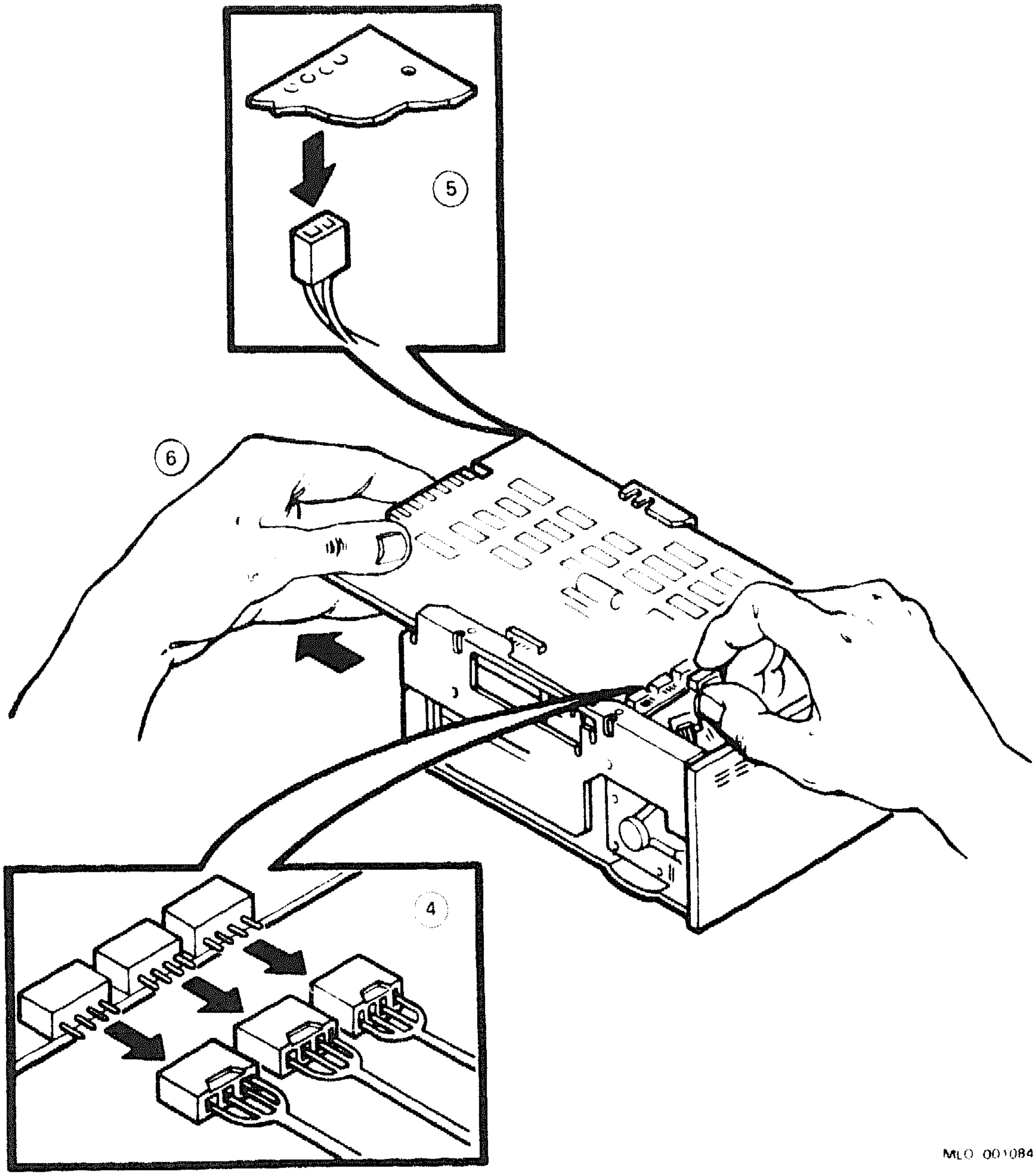
Figure 3: Removing the RD51 Read/Write Board Screws



Refer to Figure 4 for steps 4 through 6.

4. Disconnect connectors P6, P7, and P8 from the front of the read/write board.
5. Disconnect the P4 2-wire connector on the rear of the read/write board, next to the dc power connector.
6. Remove the read/write board.

Figure 4: Removing the RD51 Read/Write Board



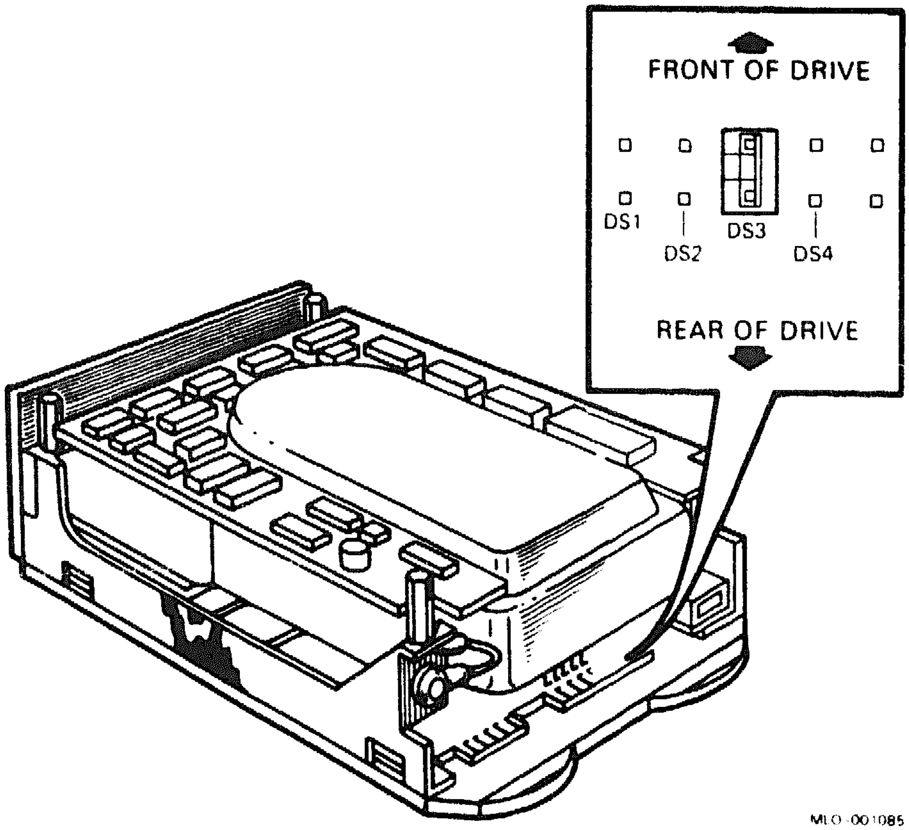
7. Make sure the jumper configuration of the 14-pin DIP shunt pack matches Figure 1.

NOTE: *You do not need to format an RD51 drive when you replace only the read/write board.*

RD52 Main Printed Circuit Board

The RD52 main printed circuit board has five pairs of pins (Figure 5) used to select the drive number. To select drive number RD0, place a jumper on pins DS3. To select drive number RD1, place a jumper on pins DS4.

Figure 5: RD52 Disk Drive and Shunt Jumper



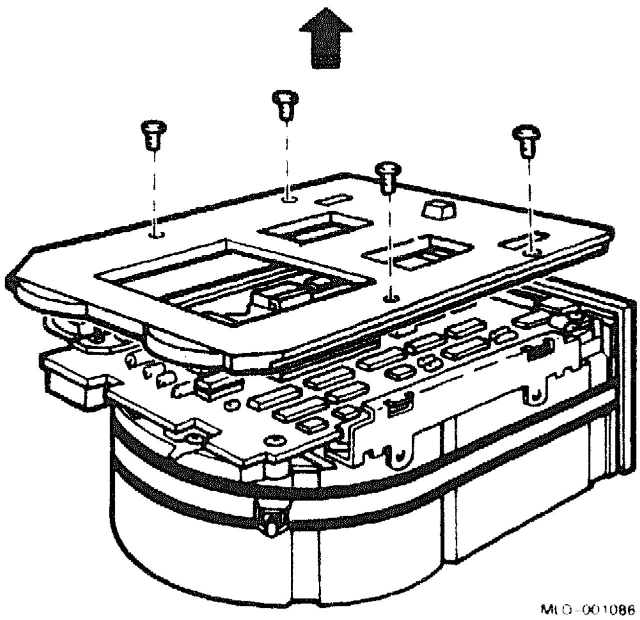
You can replace the main printed circuit board (MPCB) only on RD52 disk drives that have the part number 30–21721–02.

Remove the RD52 disk drive MPCB as follows:

CAUTION: *Disk drives are susceptible to electrostatic damage. Do not handle the RD52 disk drive unless you are wearing an antistatic wrist strap that is properly grounded to the enclosure frame. Use the Antistatic Kit (29-26246). When you have removed the drive, place it on the antistatic mat.*

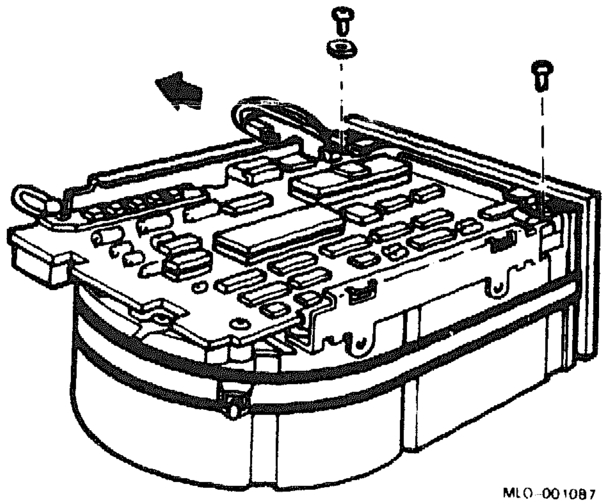
1. Remove the RD52 disk drive from the enclosure, using the procedure in the appropriate enclosure maintenance documentation.
2. Remove the four Phillips screws that hold the slide plate and ground clip to the drive (Figure 6). Set the slide plate aside.

Figure 6: Removing the RD52 Slide Plate Screws



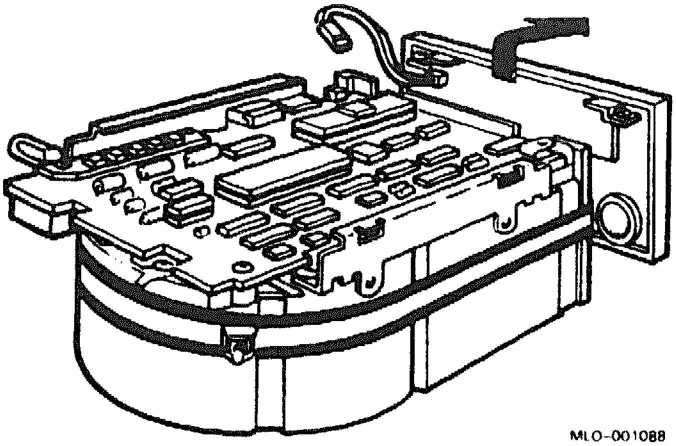
3. Unplug the 2-pin connector (Figure 7).
4. Remove the two Phillips screws that hold the front cover to the drive (Figure 7).

Figure 7: Removing the RD52 Front Cover Screws



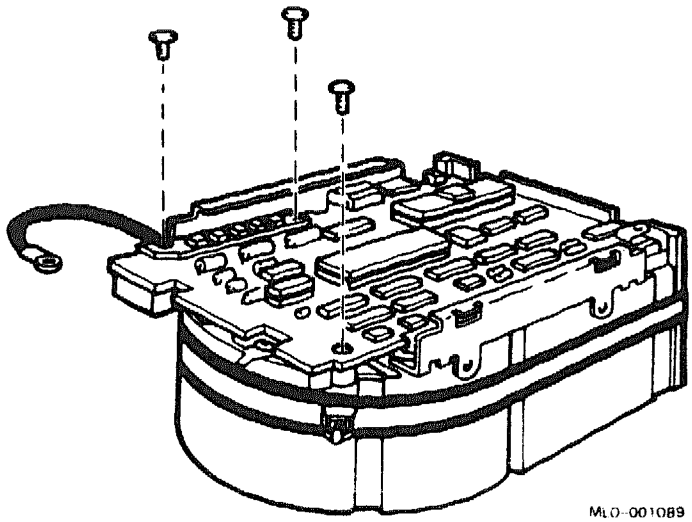
5. The front cover has pop fasteners. Remove the front cover by pulling it away from the drive (Figure 8).

Figure 8: Removing the RD52 Front Cover



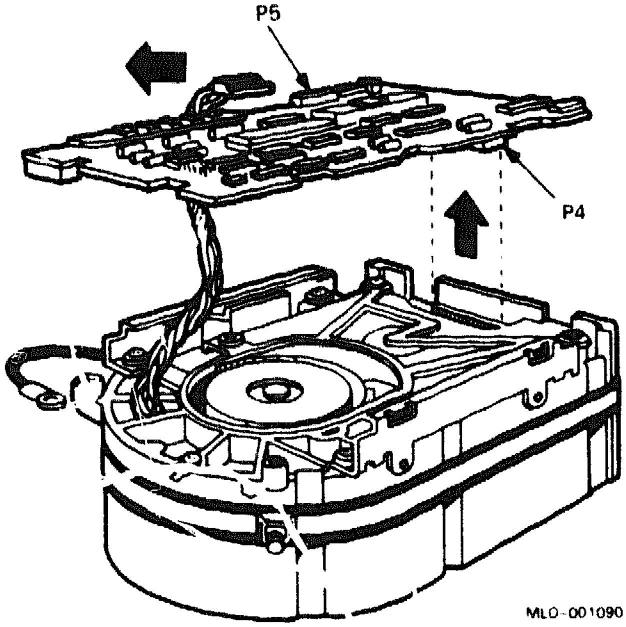
6. Remove the three Phillips screws from the heatsink, grounding strip, and the corner opposite the heatsink (Figure 9).

Figure 9: Removing the RD52 MPBD Screws



7. Lift the MPCB straight up until it clears the RD52 frame; this step disconnects P4, a 12-pin plug (Figure 10).
8. Disconnect P5, a 10-pin connector (Figure 10).

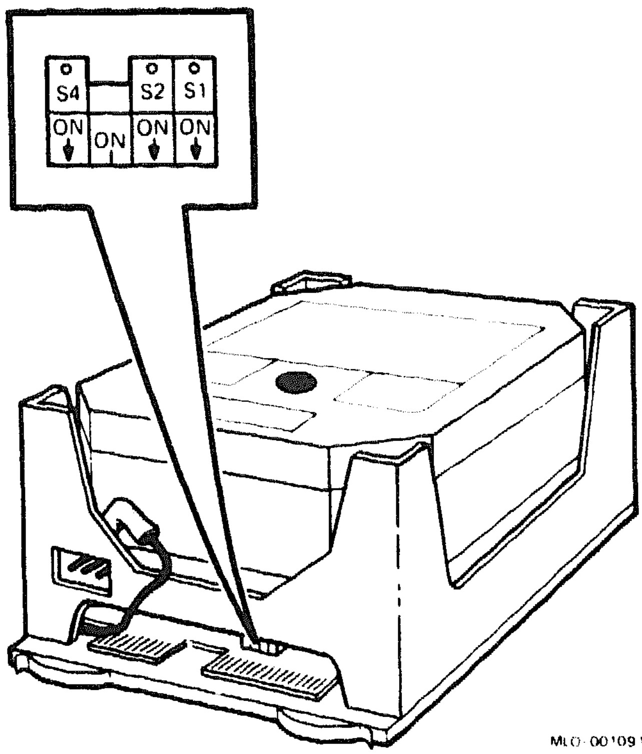
Figure 10: Removing the RD52 MPCB



RD53 Device Electronics Board

The RD53 device electronics board has four switches on the rear edge to select the drive number. To select drive number RD0, press switch S3 (Figure 11). To select drive number RD1, press switch S4.

Figure 11: RD53 Drive Select Switches



The device electronics board is the only part of an RD53 drive that you can replace. Remove the RD53 device electronics board as follows:

CAUTION: *Disk drives are susceptible to electrostatic damage. Do not handle the RD53 disk drive unless you are wearing an antistatic wrist strap that is properly grounded to the enclosure frame. Use the Antistatic Kit (29-26246). When you have removed the drive, place it on the antistatic mat.*

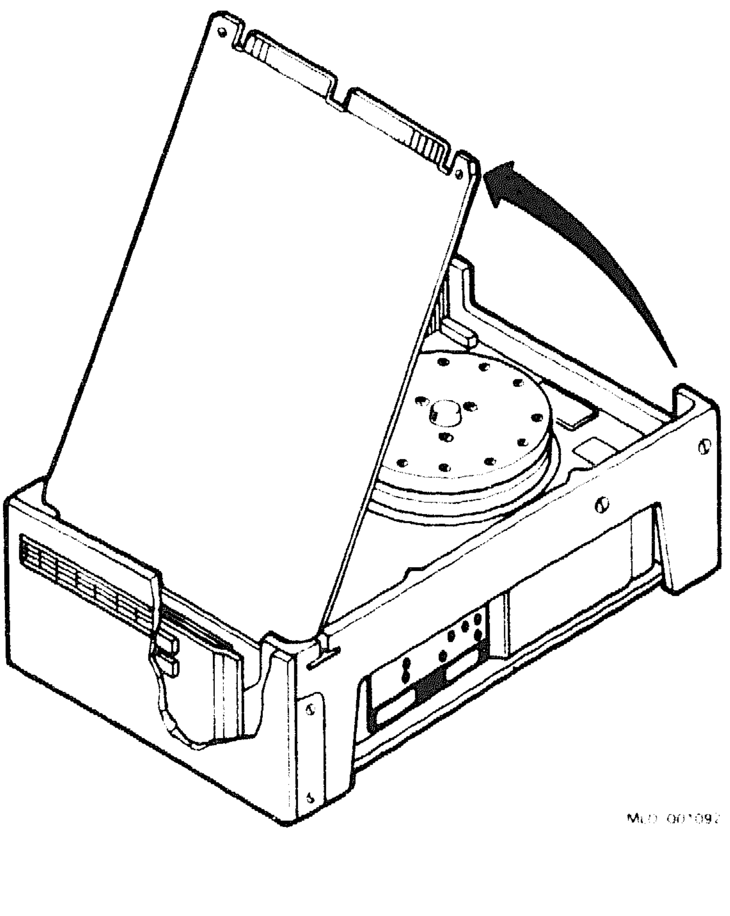
CAUTION: *Handle any fixed-disk drive with care; dropping or bumping the drive can damage the disk surface.*

1. Remove the RD53 drive from the enclosure, using the procedure in the appropriate enclosure maintenance documentation.

2. Remove the four Phillips screws that hold the slide plate and ground clip to the RD53 drive. Set the plate aside.
3. Loosen the two captive screws that hold the device electronics board in place.
4. The board pivots in hinge slots at the front of the drive. Without straining any of the connectors or cables, carefully lift the device electronics board (Figure 12). Tilt the board back until it rests against the outer frame.

   CAUTION: *Flexible circuit material is fragile. Handle the device electronics board carefully to avoid damage.*

Figure 12: Lifting the RD53 Device Electronics Board



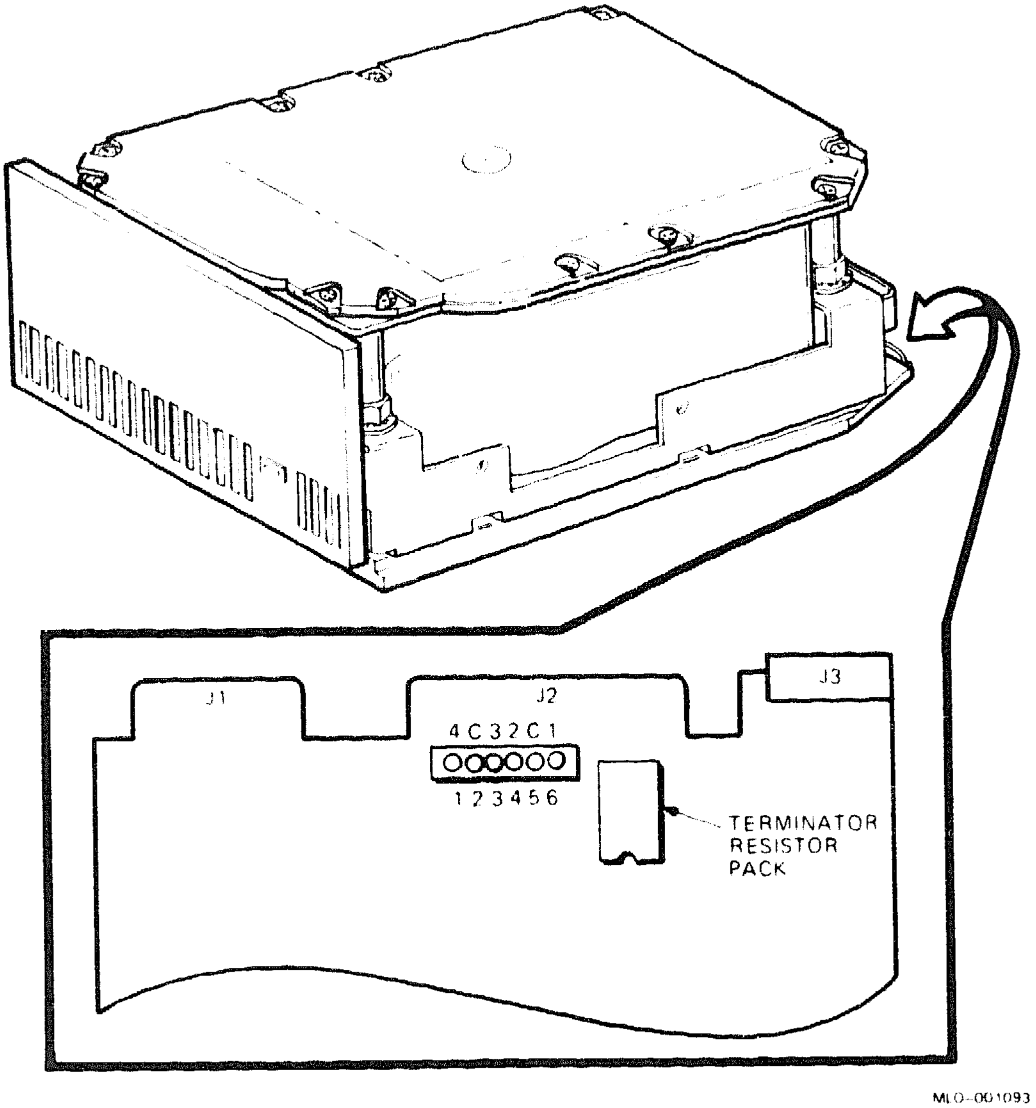
5. On the read/write board, disconnect connector J8 (to the motor control board) and connector J9 (to the preamplifier board). Both connectors and cables are fragile; handle them with care.
6. Lift the device electronics board out of the hinge slots.

RD54 Device Electronics Board

The RD54 device electronics board has six pins to select the drive number (Figure 13). The pins are labeled 1 through 6 or 4 C 3 2 C 1. Both versions are electronically equivalent. To select drive number DUA0, install a jumper connecting pins 2 and 3 or pins C and 2.

CAUTION: *On the RQDX3 controller, the two W23 jumpers should connect pins 1 and 2 and pins 3 and 4. Otherwise, loss of format will occur.*

Figure 13: **RD54 Drive Select Jumpers**



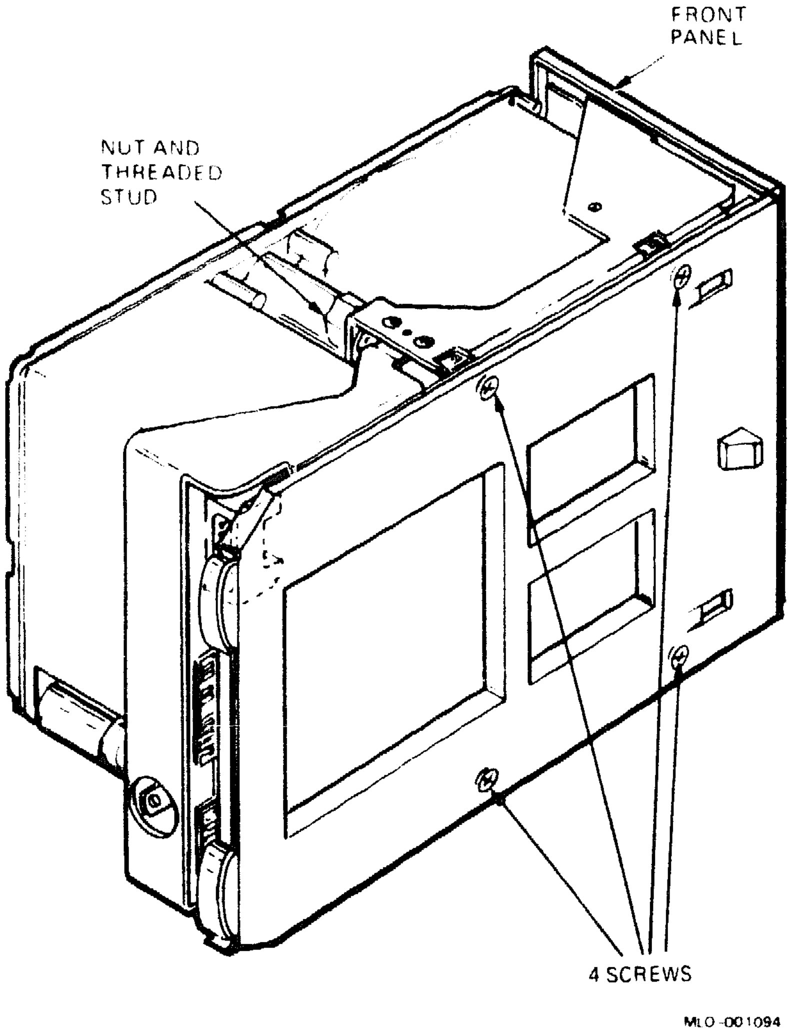
The printed circuit board assembly (PCBA) is the only part of an RD54 drive that you can replace. Remove the RD54 PCBA as follows:

CAUTION: *Disk drives are susceptible to electrostatic damage. Do not handle the RD54 disk drive unless you are wearing an antistatic wrist strap that is properly grounded to the enclosure frame. Use the Antistatic Kit (29–26246). When you have removed the drive, place it on the antistatic mat.*

CAUTION: *Handle any fixed disk drive with care; dropping or bumping the drive can damage the disk surface.*

1. Remove the four Phillips screws that hold the skid plate to the drive (Figure 14). Set the skid plate aside.

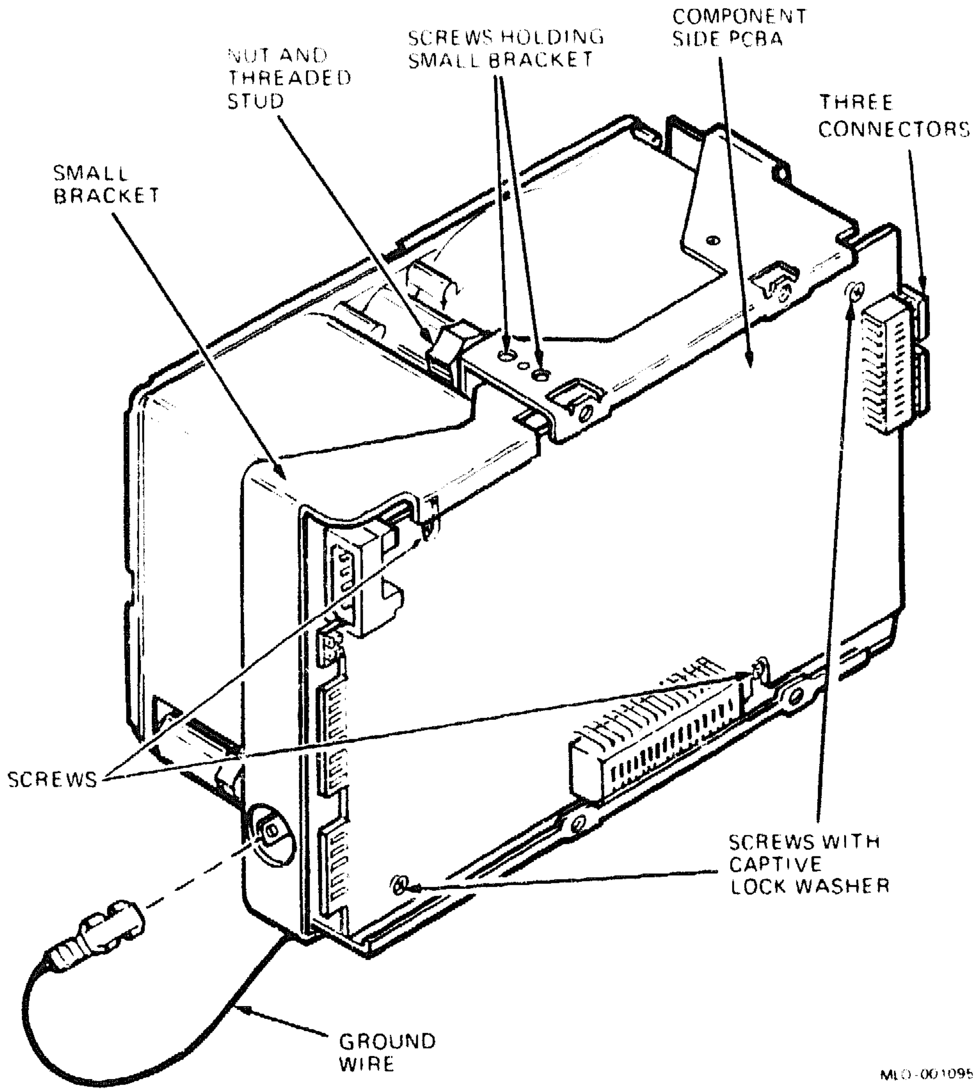
Figure 14: Removing the RD54 Skid Plate



Refer to Figure 15 for steps 2 through 6.

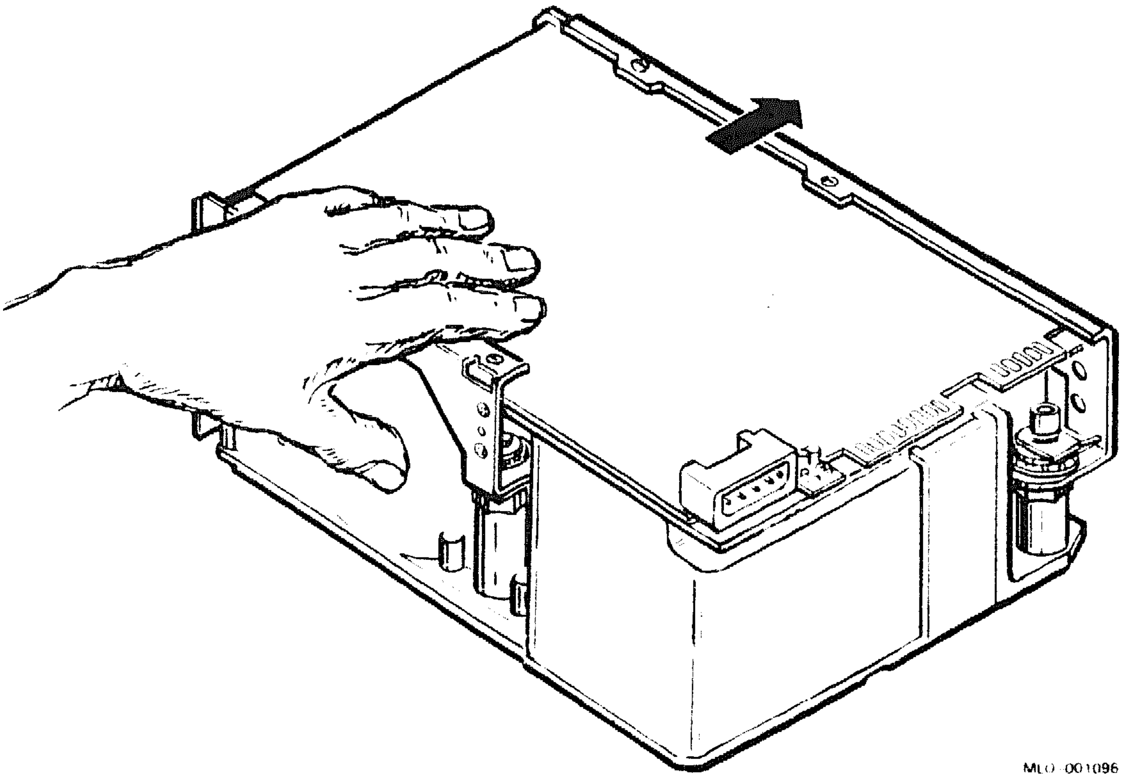
2. Disconnect the green ground wire from the J4 connector.
3. Remove the four Phillips screws that hold the small bracket to the drive. There are two screws on each side of the bracket. Set the bracket aside.
4. Using a 3/8-inch open-end wrench, turn the nut on the threaded stud until the stud is free of the casting.
5. Remove the four Phillips screws that hold the PCBA to the drive. Two of these screws have captive lock washers; note their location.
6. Carefully remove the three connectors at the front of the drive.

Figure 15: RD54 PCBA, View of Component Side



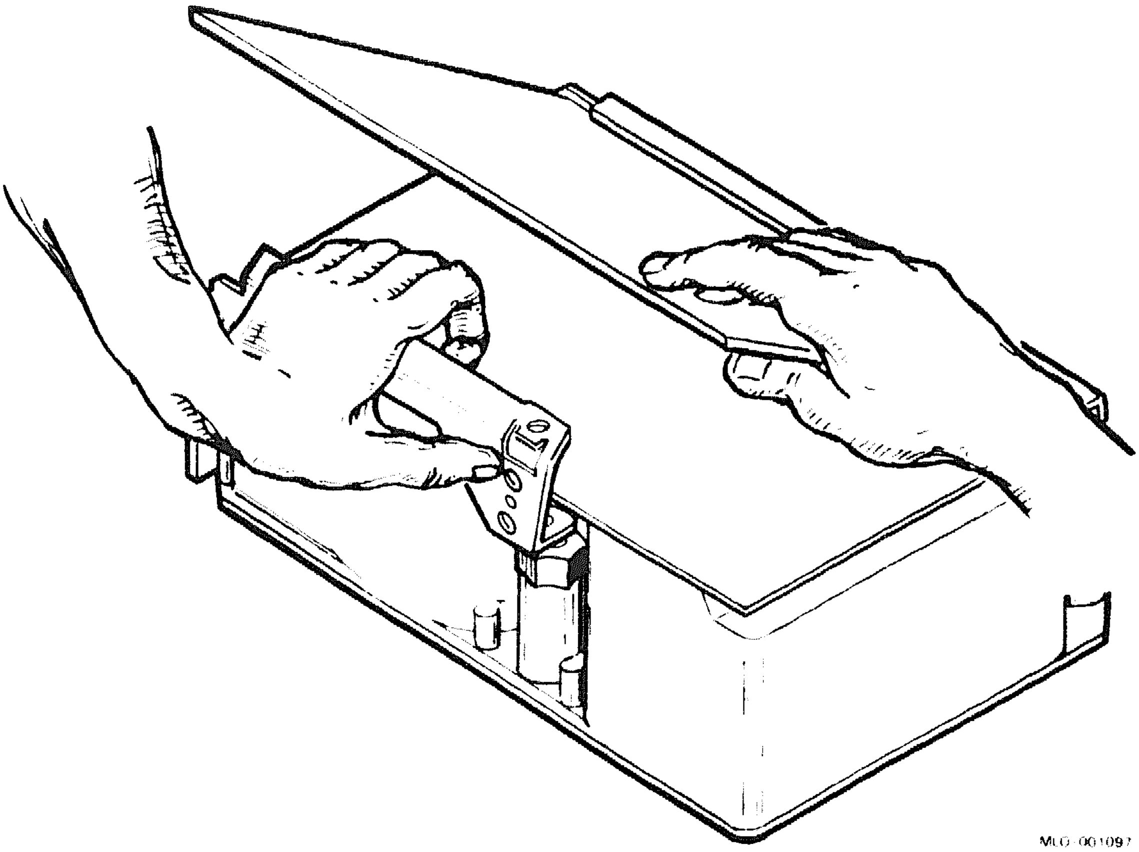
7. Gently slide the PCBA as far as it will go in the direction shown in Figure 16.

Figure 16: Sliding the RD54 PCBA



8. Swing the board up as shown in Figure 17. You may have to pull the bracket back slightly; do not pull the bracket back more than is necessary to remove the board. Do not flex the PCBA when removing it.

Figure 17: Removing the RD54 PCBA



9. Remove the remaining connector on the side of the PCBA. Place the PCBA aside.
10. Do not remove the paper insulator.

Installation

Install the PCBA as follows:

1. Make sure the paper insulator is in place.
2. Reconnect the last connector you removed on the side of the PCBA during the removal procedure.
3. Place the edge of the PCBA against the bracket, as shown in Figure 17. Lay the PCBA flat against the paper insulator.
4. Reconnect the other three connectors to the PCBA.
5. Replace the four screws that hold the PCBA to the drive. Make sure the two screws with captive washers are in the correct location.
6. Place the threaded stud over the hole in the casting.
7. Using a 3/8-inch open-end wrench, turn the nut on the threaded stud counterclockwise at least one-half turn. This step aligns the threads and prevents them from being stripped.
8. Tighten the threaded stud by turning the nut clockwise.
9. Replace the small bracket.
10. Reconnect the green ground wire.
11. Replace the skid plate.

RF30 Integrated Storage Element (ISE)

The RF30 integrated storage element (ISE) is supported in BA200-series enclosures only. An ISE is an intelligent storage device that handles device operations internally rather than through a disk controller.

Ordering Information

RF30 ISE	RF30–SA (factory installed) RF30–SF (field upgrade)

Operating System Support

ULTRIX–32m	Version 3.0 and later
VAXELN	Version 3.2 and later
VMS	Version 5.0–2A and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 2.3 (release 124) and later

Documentation

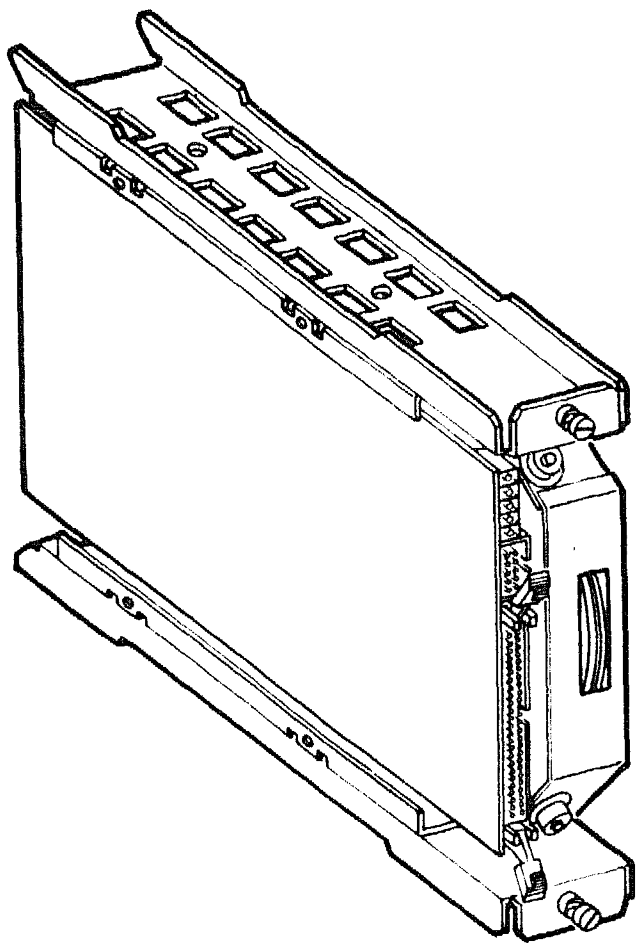
RF30 Integrated Storage Element User's Guide	EK–RF30D–UG
RF30 Integrated Storage Element Installation Manual	EK–RF30D–IM

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads	
Option	Module	+5 V	+12 V	Watts	AC	DC
RF30–S	–	1.25	1.0	17.7	–	–

The RF30 is a half-height, 13.3-cm (5.25-in), fixed-disk integrated storage element (ISE), with a storage capacity of 150 Mbytes and a maximum data transfer rate of about 1.5 Mbits per second. Figure 1 shows the RF30 ISE in its installation position for BA200-series enclosures, with slides attached.

Figure 1: RF30 ISE with Attached Slides



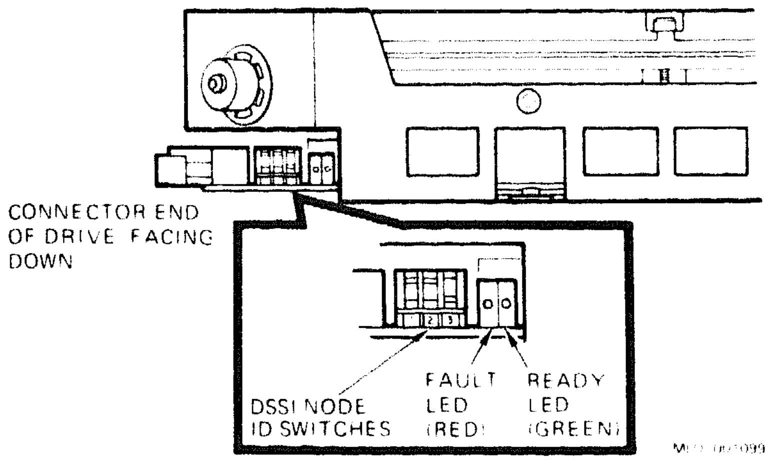
The RF30 ISE is based on the DIGITAL Storage System Interconnect (DSSI) architecture. DSSI supports up to seven storage devices, daisy-chained to the host system through either the KA640 CPU or a host adapter board such as the KFQSA module. You can install the RF30 with other DSSI drives.

The device controller is built into the RF30; it is not a separate module. This feature enables many drive functions to be handled without requiring adapters or intervention by the host system, resulting in improved I/O performance and throughput rates.

CAUTION: *Handle the RF30 ISE with care. Dropping or bumping the RF30 can damage the disk surface.*

DSSI node ID switches are located on the electronics controller module, at the connector end of the RF30 (Figure 2). Set these switches to assign a unique node ID number to each drive on the DSSI bus.

Figure 2: RF30 ID Switches and LEDs



RF30 ISEs are factory configured to the same unit ID. When installing an additional or replacement RF30, make sure the unit ID plug on the operator control panel (OCP) and the unit ID DIP switch on the RF30 are set to the same value. Although the OCP unit ID plugs override the RF30 unit ID DIP switch, it is good practice to set them to the same value. Doing so eliminates the possibility of creating a duplicate unit ID if you disconnect the OCP from the drives and fail to set the DIP switches to the correct value.

Table 1 shows the RF30 switch settings for up to seven DSSI nodes.

Table 1: RF30 Switch Settings

DSSI Node ID	Switch[1] 1 (MSB)	2	3 (LSB)
0	Down	Down	Down
1	Down	Down	Up
2	Down	Up	Down
3	Down	Up	Up
4	Up	Down	Down
5	Up	Down	Up
6	Up	Up	Down
7[2]	Up	Up	Up

[1] Up = toward the head disk assembly (HDA); Down = toward the drive module
[2] Normally reserved for the host adapter

The RF30 ISE contains two LED indicators (Figure 2):

- The Ready indicator displays the activity status of the drive.

  On power-up, the Ready indicator lights and the power-up diagnostics run. After the diagnostics complete successfully, the Ready indicator goes out. The Ready indicator lights again when the media heads are on the requested cylinder and the drive is read/write ready.

- The Fault indicator displays the fault status of the drive.

  On power-up, the Fault indicator lights and the power-up diagnostics run. After the diagnostics complete successfully, the indicator goes out. The Fault indicator lights again if a read/write error or a drive error condition is detected.

See the *RF30 Integrated Storage Element Installation Manual* for a description of drive-resident diagnostics and error codes.

RF31E ISE (Disk Drive)

The RF31E is a DSSI integrated storage element (ISE) that provides 381 Mbytes of formatted storage space.

Storage Capacity	
Data storage capacity	381 Mbytes, formatted
Ordering Information	
RF31E–AF	381 M byte half-height DSSI ISE
Performance	
Average seek time	14.7 milliseconds
Average access time	23.0 milliseconds
Peak transfer rate	4.0 Mbytes/second
Physical Specifications	
Height	4.40 cm (1.75 in)
Width	14.60 cm (5.75 in)
Depth	20.45 cm (8.25 in)
Weight	1.81 kg (4.0 lb)
Configuration Information	
Form factor	Standard 5.25-inch footprint
Power requirements	+5 Vdc, 1.0 A
	+12 Vdc, 2.80
Power consumption	38.6 W
Related Documentation	
EK–RF72D–UG	RF31/RF72 User Guide
EK–RF72D–IM	RF31/RF72 Installation Manual

RF31F ISE (Disk Drive)

The RF31F is a DSSI integrated storage element (ISE) that provides 200 Mbytes of formatted storage space.

Storage Capacity	
Data storage capacity	200 Mbytes, formatted

Ordering Information	
RF31F–EA	200 Mbyte half-height DSSI ISE

Performance	
Average seek time	12.3 milliseconds
Average access time	20.6 milliseconds
Peak transfer rate	4.0 Mbytes/second
Transfer rate from the media	2.0 Mbytes/second

Physical Specifications	
Height	4.40 cm (1.75 in)
Width	14.60 cm (5.75 in)
Depth	20.45 cm (8.25 in)
Weight	1.81 kg (4.0 lb)

Configuration Information	
Form factor	Standard 5.25-inch footprint
Data surfaces	8
Bits per inch	30,064
Tracks per inch	1,875
Power requirements	+5 Vdc, 1.3 A
	+12 Vdc, 1.1 A (seeking)
Power consumption	19.7 W

Related Documentation

EK–RF72D–UG–004	RF31/RF72 User Guide
EK–RF72D–IM–002	RF31/RF72 Installation Manual

RF31T Integrated Storage Element (ISE)

The RF31T is a full height, DSSI integrated storage element (ISE) that provides 381 Mbytes of formatted storage space on a 3.5-inch fixed disk.

Storage Capacity	
Data storage capacity	381 Mbytes, formatted

Ordering Information	
RF31T-AA	Factory-installed into a BA400-series enclosure
RF31T-AF	Field-installed into a BA400-series enclosure
RF31U-AF	Field upgraded to an RF312 into a BA400-series enclosure
RF31T-SA	Factory-installed into a BA200-series enclosure
RF31T-SF	Field-installed into a BA200-series enclosure
RF31U-AF	Upgrade kit for expansion of RF31V-AA/AF to 381 Mbytes including cables. Field installed only, for installation in BA400-series enclosure
RF31T-SA	Factory-installed fixed disk ISE with DSSI interface, installed in BA200-series enclosures
RF31T-SF	Field-installed fixed disk ISE with DSSI interface, installed in BA200-series enclosures

Performance	
Average seek time	7.5 milliseconds
Average access time	13.06 milliseconds
Peak transfer rate	4.0 Mbytes/second

Physical Specifications	
Height	4.08 cm (1.63 in)
Width	10 cm (4.00 in)
Depth	14.38 cm (5.75 in)
Weight	.86 kg (1.9 lb)

Configuration Information	
Form factor	Standard 3.5-inch footprint
Power requirements	+5 Vdc, 1.[illegible]1 A
	+12 Vdc, 0.85 A
Power consumption	13.7 W

Related Documentation	
EK-RF72D-UG	RF31/RF72 User Guide
EK-RF72D-IM	RF31/RF72 Installation Manual

RF312 Dual RF31T 3.5-inch DSSI Integrated Storage Element (ISE)

The RF312 is a dual RF31T DSSI integrated storage element (ISE) that provides 762 Mbytes of storage space.

Storage Capacity	
Data storage capacity	762 Mbytes, formatted
Ordering Information	
RF312–AA	Factory-installed dual pack in a BA400-series enclosure
RF312–AF	Field-installed dual pack in a BA400-series enclosure
RF31A–A6	Quantity of 6 RF31T ISEs, factory-installed dual pack into a BA400-series enclosure
RF31A–AB	Quantity of 12 RF31T ISEs, factory-installed dual pack into a BA400-series enclosure
Performance	**(per drive)**
Average seek time	7.5 milliseconds
Average access time	13.06 milliseconds
Peak transfer rate	4.0 Mbytes/second
Physical Specifications	**(per drive)**
Height	4.08 cm (1.63 in)
Width	10 cm (4.00 in)
Depth	14.38 cm (5.75 in)
Weight	0.86 kg (1.9 lb)
Configuration Information	**(per drive)**
Form factor	Standard 3.5-inch footprint
Power requirements	+5 Vdc, 1.71 A
	+12 Vdc, 0.85 A
Power consumption	13.7 W
Related Documentation	
EK–RF72D–UG	RF31/RF72 User Guide
EK–RF72D–IM	RF31/RF72 Installation Manual

RF35E Integrated Storage Element (ISE)

The RF35E is a full-height, DSSI integrated storage element (ISE) that provides 852 Mbytes of formatted storage space on a 3.5 inch disk.

Storage Capacity	
Data storage capacity	852 Mbytes. formatted

Ordering Information	
RF35E–AA	Factory-installed into a BA400 enclosure.
RF35E–AF	Field-installed into a BA400 enclosure.
RF35E–SA	Factory-installed into a BA200 enclosure.
RF35E–SF	Field-installed into a BA200 enclosure.
RF35U–AA	Field upgrade to an RF352 into a BA400 enclosure.

Performance	
Average seek time	9.5 milliseconds
Average access time	15.1 milliseconds
Peak disk transfer rate	3.3 Mbytes/second
Transfer rate from the bus	4.0 Mbytes/second
Latency	5.6 ms
Throughput	73 I/O seconds (100 ms)
Aerial density	128 Mbytes/in

Physical Specifications	
Height	4.08 cm (1.63 in)
Width	10 cm (4.00 in)
Depth	14.38 cm (5.75 in)
Weight	0.86 kg (1.9 lb)

Configuration Information

Form factor	Standard 3.5-inch footprint
Data surfaces	14
Bits per inch	48,300
Tracks per inch	2650
Power requirements	+5 Vdc, 1.71 A; +12 Vdc, 0.85 A (seeking)
Power consumption	13.7 W

Power requirements

RF35E–AA/AF	
	+5 Vdc, 1.42 A (typical) peak @ spin-up
	+5 Vdc, 1.69 A (mix) peak @ spin-up
	+5 Vdc, 1.42 A (typical) seeking
	+5 Vdc, 1.69 A (mix) seeking
	+12 Vdc, 4.58 A (typical), peak @ spin-up
	+12 Vdc, 5.10 A (maximum), peak @ spin-up
	+12 Vdc, 1.70 A (typical), seeking
	+12 Vdc, 1.91 A (maximum), seeking
Power consumption	
	27.5 W (typical), seeking
	33.0 W (maximum), seeking

Related Documentation

EK–RF72D–UG	RF35/RF72 User Guide
EK–RF72D–IM	RF35/RF72 Installation Manual

RF352 Integrated Storage Element

The RF352 is a dual RF35E DSSI integrated storage element (ISE). It provides 1.7 gigabytes of storage space.

Ordering Information	
Dual RF35 ISE for BA4xx systems and R400X/B400X enclosures (factory installed)	RF352–AA
Dual RF35 ISE for BA4xx systems and R400X/B400X enclosures (field installed)	RF352–AF
Three RF352 ISEs, factory installed in a BA4xx expander box	DL-RF35A-A6
Six RF352 ISEs, factory installed in a BA4xx expander box	DL-RF35A-AB

Storage Capacity	
Data storage capacity	1.7 gigabytes, formatted

Performance	(per drive)
Average seek time	9.5 milliseconds
Average access time	15.1 milliseconds
Peak transfer rate	4.0 megabytes/second
Transfer rate from the media	2.7 megabytes/second

Physical Specifications	(per drive)
Height	4.08 cm (1.63 in)
Width	10 cm (4.00 in)
Depth	14.38 cm (5.75 in)
Weight	0.9 kg (1.9 lb)

Configuration Information	(per drive)
Form factor	Standard 3.5-inch footprint

Power Requirements	(per drive)
	+5 Vdc, 0.71 A (typical) peak at spin-up
	+5 Vdc, 0.85 A (maximum) peak at spin-up
	+5 Vdc, 0.71 A (typical) seeking
	+5 Vdc, 0.85 A (maximum) seeking
	+12 Vdc, 2.29 A (typical), peak at spin-up
	+12 Vdc, 2.55 A (maximum), peak at spin-up
	+12 Vdc, 0.85 A (typical), seeking
	+12 Vdc, 0.96 A (maximum), seeking
Power consumption	13.8 W (typical), seeking
	16.5 W (maximum), seeking

Related Documentation	
RF Series Integrated Storage Element Installation in BA200 Series Enclosures	EK–RF72D–IM
RF Series Integrated Storage Element Pocket Service Guide	EK–RFSIS–PS
RF Series Integrated Storage Element User Guide	EK–RF72D–UG
BA400 Storage Devices Installation Procedure	EK–BA44A–IN

RF36E Integrated Storage Element

The RF36E is a 3.5-inch, fixed-disk integrated storage element (ISE) that provides 1.6 gigabytes of storage space for DSSI-based systems.

Ordering Information	
RF36E ISE for BA4xx-based systems or expanders (factory installed)	RF36E–AA
RF36E ISE for BA4xx-based systems or expanders (field installed)	RF36E–AF
RF36E ISE for BA2xx-based systems or expanders (factory installed)	RF36E–SA
RF36E ISE for BA2xx-based systems or expanders (field installed)	RF36E–SF
Upgrade kit for capacity expansion of RF36E-AA/AF (field installed)	RF36U–AF
Storage Capacity	
Data storage capacity	1.6 gigabytes, formatted
Performance	
Average seek time	9.7 milliseconds
Average access time	15.3 milliseconds
Peak transfer rate	6.25 megabytes/second
Physical Specifications	
Height	4.1 cm (1.62 in)
Width	10.16 cm (4.0 in)
Depth	14.6 cm (5.75 in)
Weight	0.86 kg (1.87 lb)
Configuration Information	
Form factor	Standard 3.5-inch footprint

Power Requirements	
	+5 Vdc, 0.86 A (maximum) +12 Vdc, 2.89 A (peak) first 3 seconds of spin-up
	+12 Vdc, 0.69 A (maximum) idle
	+12 Vdc, 0.96 A (maximum average) continuous random seeks
	+12 Vdc, 1.70 A (maximum peak) continuous random seeks
Power consumption	11.5 W (typical) idle
	14.9 W (typical) continuous random seeks

Operating System Support	
OpenVMS	Version 5.5–2 and later

Diagnostic Support	
Power-On Self-test (POST)	See the device documentation.
Diagnostic Utilities Protocol (DUP)	See the device documentation.
MicroVAX Diagnostic Monitor (MDM)	Version 137A and later

Related Documentation	
RF Series Integrated Storage Element Installation in BA200 Series Enclosures	EK–RF72D–IM
RF Series Integrated Storage Element Pocket Service Guide	EK–RFSIS–PS
RF Series Integrated Storage Element User Guide	EK–RF72D–UG
BA400 Storage Devices Installation Procedure	EK–BA44A–IN

Jumpers

The RF36E has three jumpers for specifying the DSSI node ID number. Table 1 lists the jumper positions, and Figure 1 shows their location.

Note

When the ISE is connected to an operator control panel (OCP), the jumpers are ignored. Instead, the DSSI node ID number is determined by the DSSI node ID plug on the OCP.

Table 1 DSSI Node ID Jumper Positions

DSSI Node ID	Jumper 2	Jumper 1	Jumper 0
0	Out	Out	Out
1	Out	Out	In
2	Out	In	Out
3	Out	In	In
4	In	Out	Out
5	In	Out	In
6	In	In	Out
7	In	In	In

Jumper in = 1
Jumper out = 0
DSSI address 7 is typically assigned to the host adapter.

Indicators

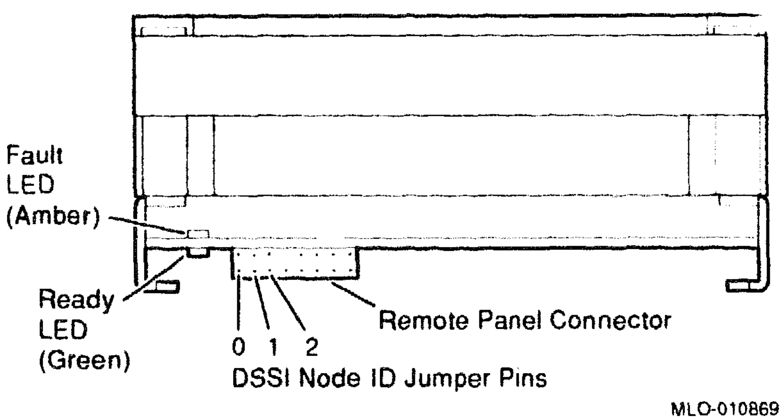
The RF36E has two LEDs to indicate the drive status. Table 2 lists the LED status indicators, and Figure 1 shows their location on the drive.

See the device documentation for a description of the indicators that reside on the OCP.

Table 2 RF36E LED Indications

LED	Description	Indication
Green	Ready	When ON, indicates that power is applied to the ISE, and the heads are on cylinder. When FLASHING, indicates that the ISE is active. When OFF, indicates that power is *not* applied to the ISE.
Amber	Fault	When ON, indicates that a fault condition exists in the ISE. See the device documentation for user action. When OFF, indicates the normal operating condition.

Figure 1 RF36E LED and Jumper Locations



RF362 Dual Integrated Storage Element

The RF362 is a dual RF36 integrated storage element (ISE) that provides 3.2 gigabytes of storage space for DSSI-based systems.

Ordering Information	
Dual RF36 ISE for BA4xx-based systems or expanders (factory installed)	RF362–AA
Dual RF36 ISE for BA4xx-based systems or expanders (field installed)	RF362–AF
Upgrade kit for capacity expansion of RF36E–AA/AF (field installed)	RF36U–AF
Three RF362 ISEs, factory installed in a BA4xx expander box	DL–RF36A–A6
Six RF362 ISEs, factory installed in a BA4xx expander box	DL–RF36A–AB

Storage Capacity	
Data storage capacity	3.2 gigabytes, formatted

Performance	**(per drive)**
Average seek time	9.7 milliseconds
Average access time	15.3 milliseconds
Peak transfer rate	6.25 megabytes/second

Physical Specifications	**(per drive)**
Height	4.1 cm (1.62 in)
Width	10.16 cm (4.0 in)
Depth	14.6 cm (5.75 in)
Weight	0.86 kg (1.87 lb)

Configuration Information	**(per drive)**
Form factor	Standard 3.5-inch footprint

Power Requirements	(per drive)
	+5 Vdc, 0.86 A (maximum) +12 Vdc, 2.89 A (peak) first 3 seconds of spin-up
	+12 Vdc, 0.69 A (maximum) idle
	+12 Vdc, 0.96 A (maximum average) continuous random seeks
	+12 Vdc, 1.70 A (maximum peak) continuous random seeks
Power consumption	11.5 W (typical) idle
	14.9 W (typical) continuous random seeks

Operating System Support	
OpenVMS	Version 5.5–2 and later

Diagnostic Support	
Power-On Self-test (POST)	See the device documentation.
Diagnostic Utilities Protocol (DUP)	See the device documentation.
MicroVAX Diagnostic Monitor (MDM)	Version 137A and later

Related Documentation	
RF Series Integrated Storage Element Installation in BA200 Series Enclosures	EK–RF72D–IM
RF Series Integrated Storage Element Pocket Service Guide	EK–RFSIS–PS
RF Series Integrated Storage Element User Guide	EK–RF72D–UG
BA400 Storage Devices Installation Procedure	EK–BA44A–IN

Jumpers

Each RF36 has three jumpers for specifying the DSSI node ID number. Table 1 lists the jumper positions, and Figure 1 shows their location.

Note

When the ISE is connected to an operator control panel (OCP), the jumpers are ignored. Instead, the DSSI node ID number is determined by the DSSI node ID plug on the OCP.

Table 1 DSSI Node ID Jumper Positions

DSSI Node ID	Jumper 2	Jumper 1	Jumper 0
0	Out	Out	Out
1	Out	Out	In
2	Out	In	Out
3	Out	In	In
4	In	Out	Out
5	In	Out	In
6	In	In	Out
7	In	In	In

Jumper in = 1
Jumper out = 0

DSSI address 7 is typically assigned to the host adapter.

Indicators

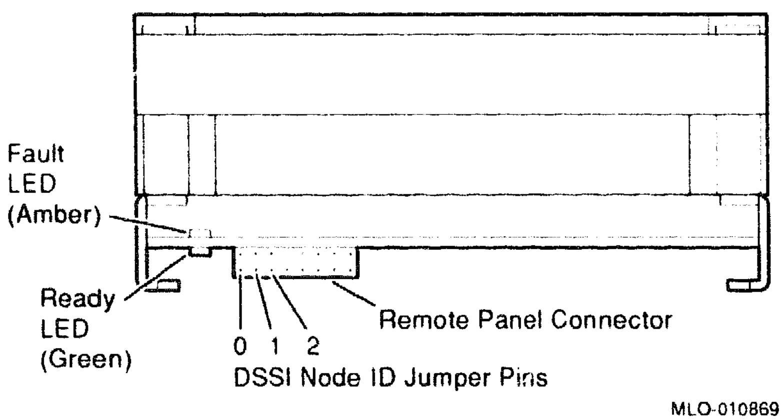
Each RF36 has two LEDs to indicate the drive status. Table 2 lists the LED status indicators, and Figure 1 shows their location on the drive.

See the device documentation for a description of the indicators that reside on the OCP.

Table 2 RF36 LED Indications

LED	Description	Indication
Green	Ready	When ON, indicates that power is applied to the ISE, and the heads are on cylinder. When FLASHING, indicates that the ISE is active. When OFF, indicates that power is *not* applied to the ISE.
Amber	Fault	When ON, indicates that a fault condition exists in the ISE. See the device documentation for user action. When OFF, indicates the normal operating condition.

Figure 1 RF36 LED and Jumper Locations



RF71 Integrated Storage Element (ISE)

The RF71 integrated storage element (ISE) is supported in BA200-series enclosures only. An ISE is an intelligent storage device that handles device operations internally rather than through a disk controller.

Ordering Information

RF71 ISE	RF71E–SA (factory installed) RF71E–SF (field upgrade)

Operating System Support

ULTRIX–32m	Version 3.0 and later
VAXELN	Version 3.2 and later
VMS	Version 5.0–2A and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 3.01 (release 126) and later

Documentation

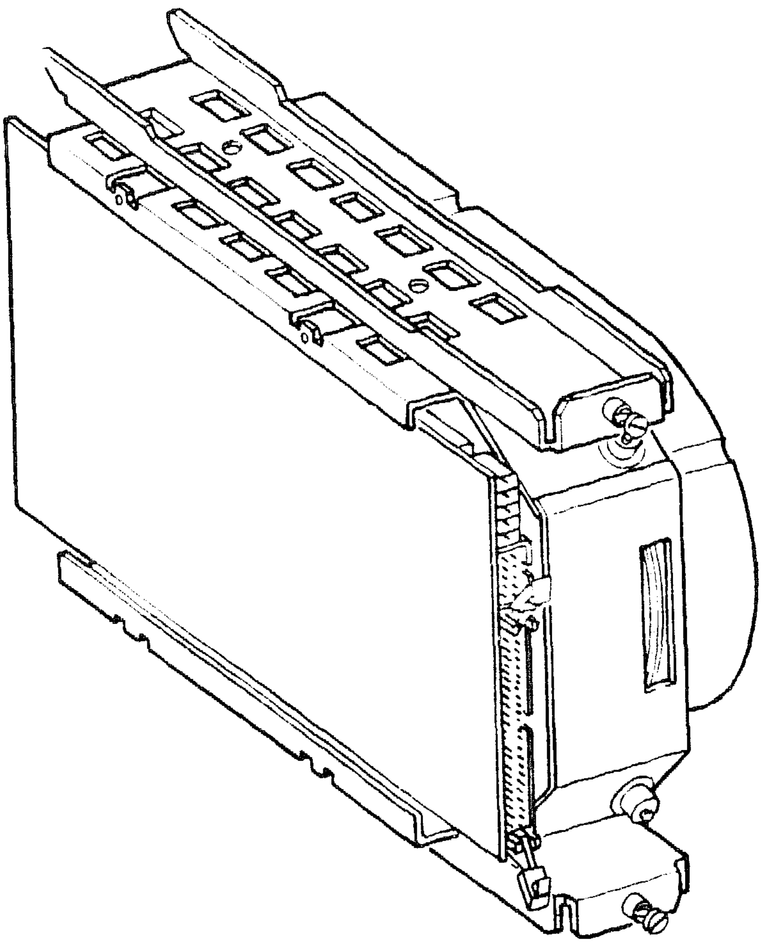
RF71 Integrated Storage Element User's Guide	EK–RF71D–UG

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	Module	+5 V	+12 V	Watts	AC	DC	Insert
RF71–S	–	1.10	1.35	21.7	–	–	–

The RF71 is a full-height, 13.3-cm (5.25-in), fixed-disk integrated storage element (ISE), with a storage capacity of 400 Mbytes and a maximum data transfer rate of about 4.0 Mbytes per second. Figure 1 shows the RF71 ISE in its installation position for BA200-series enclosures, with slides attached.

Figure 1: RF71 ISE with Attached Slides



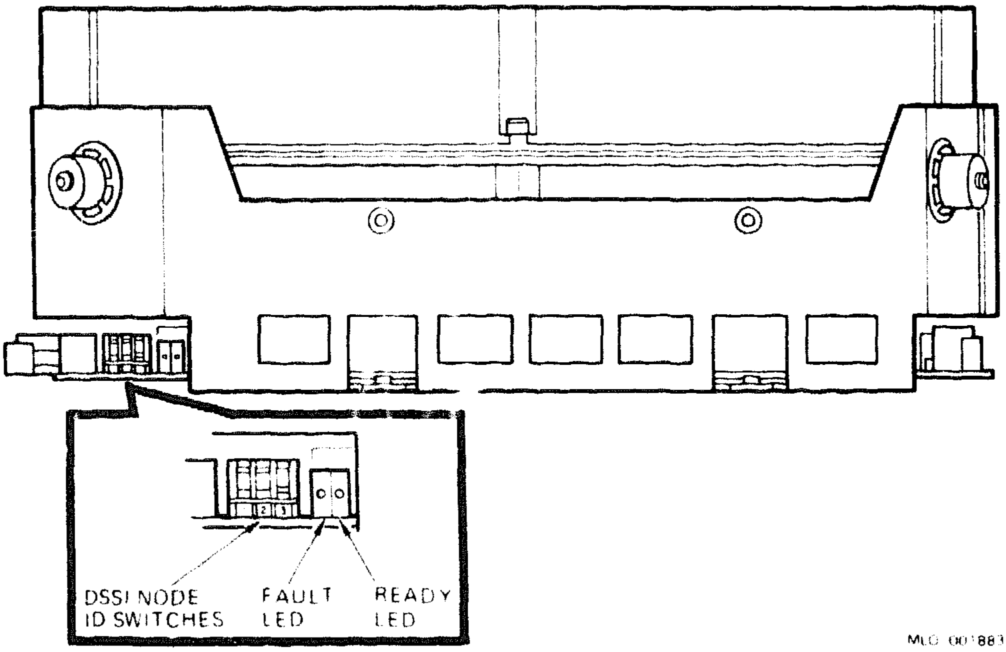
The RF71 ISE is based on the Digital Storage System Interconnect (DSSI) architecture. DSSI supports up to seven storage elements, daisy-chained to the host system through either the KA640 CPU or a host adapter board such as the KFQSA module. You can install the RF71 with other ISEs.

The device controller is built into the RF71; it is not a separate module. This feature enables many functions to be handled without requiring adapters or intervention by the host system, resulting in improved I/O performance and throughput rates.

CAUTION: *Handle the RF71 ISE with care. Dropping or bumping the RF71 can damage the disk surface.*

DSSI node ID switches are located on the drive module, at the connector end of the RF71 (Figure 2). Set these switches to assign a unique node ID number to each ISE on the DSSI bus.

Figure 2: RF71 ID Switches and LEDs



RF71 ISEs are factory configured to the same unit ID. When installing an additional or replacement RF71, make sure the unit ID plug on the operator control panel (OCP) and the unit ID DIP switch on the RF71 are set to the same value. Although the OCP unit ID plugs override the RF71 unit ID DIP switch, it is good practice to set them to the same value. Doing so eliminates the possibility of creating a duplicate unit ID by disconnecting the OCP from the drives and failing to set the DIP switches to the correct value.

Table 1 shows the RF71 switch settings for up to seven DSSI nodes.

Table 1: RF71 Switch Settings

DSSI Node ID	Switch[1] 1 (MSB)	2	3 (LSB)
0	Down	Down	Down
1	Down	Down	Up
2	Down	Up	Down
3	Down	Up	Up
4	Up	Down	Down
5	Up	Down	Up
6	Up	Up	Down
7[2]	Up	Up	Up

[1] Up = toward the head disk assembly (HDA); Down = toward the drive module

[2] Normally reserved for the host adapter

The RF71 ISE contains two LED indicators (Figure 2):

- The Ready indicator displays the activity status of the drive.

  On power-up, the Ready indicator lights and the power-up diagnostics run. After the diagnostics complete successfully, the Ready indicator goes out. The Ready indicator lights again when the media heads are on the requested cylinder and the drive is read/write ready.

- The Fault indicator displays the fault status of the drive.

  On power-up, the Fault indicator lights and the power-up diagnostics run. After the diagnostics complete successfully, the indicator goes out. The Fault indicator lights again if a read/write error or a drive error condition is detected.

See the *RF71 Integrated Storage Element User's Guide* for a description of drive-resident diagnostics and error codes.

RF72 Integrated Storage Element

The RF72 ISE provides 1 Gbyte of formatted storage space, or 1.4 Gbytes of unformatted data storage. The RF72 supports Q-bus, MicroVAX, VAX 4000 series and DECsystem enclosures. Up to three RF72 ISEs can be installed in the VAX 4000 series system enclosures and four if a tape drive is not used. Expanders can contain up to seven RF72 ISEs.

Storage Capacity

User Capacity Formatted	1.0 Gbytes
User Capacity Unformatted	1.4 Gbytes

Ordering Information

RF72E–AA	Embedded (Factory installed) BA400 Series
RF72E–AF	Embedded (Field installed) BA400 Series
RF72E–SA	Embedded (Factory installed) BA200 Series
RF72E–SF	Embedded (Field installed) BA200 Series

Performance

Average seek time	13.3 milliseconds
Average raw seek time, high speed	10.3 milliseconds
Average rotational latency	18.6 milliseconds
Peak transfer rate	2.0 Mbytes/second

Physical Specifications

Height	7.75 cm (3.05 in)
Width	14.60 cm (5.75 in)
Depth	20.75 cm (8.17 in)
Weight	4.09 kg (9.0 lb)

Configuration Information

Form factor	13.3-cm (5.25 in) full rack width
	+5 Vdc, 1.25 A/+12 Vdc, 3.12 A
Power consumption, spin-up	57.1 W
Power consumption, seeking	27.7 W

Related Documentation

EK–RF72D–IM	RF31/RF72 Installation Manual for BA200 Enclosures
EK–RF72D–UG	RF31/RF72 User Guide

RF73 Integrated Storage Element

The RF73 is a DSSI integrated storage element (ISE) that provides 2.0 Gbytes of formatted storage space. RF-series ISEs are used in DSSI busses (Digital Storage Systems Interconnect). An ISE is an integrated storage element that is housed in a special mounting bracket for simplified installation and upgrading.

Storage Capacity	
User capacity	2.0 Gbytes

Ordering Information	
RF73E–AA	Factory-installed 2.0 Gbyte ISE
RF73E–AF	Same as –AA but is field installed

Performance	
Average seek time	13.0 milliseconds
Average rotational latency	8.3 milliseconds
Peak transfer rate	4.0 Mbytes/second

Physical Specifications	
Height	8.26 cm (3.25 in)
Width	14.71 cm (5.79 in)
Depth	20.85 cm (8.21 in)
Weight	2.89 kg (6.36 lb)

Configuration Information	
Form factor	Standard 5.25-inch high footprint
Power requirements	+5 Vdc, 1.25 A; +12 Vdc, 3.12 A
Power consumption, spin-up	56.6 W
Power consumption, seeking	23.2 W

Related Documentation	
EK–RF72D–UG	RF31/RF73 User Guide
EK–RF72D–SV	RF31/RF73 Service Guide

RF74 Integrated Storage Element

The RF74 is a 5.25-inch, fixed-disk integrated storage element (ISE) that provides 3.57 gigabytes of storage space for DSSI-based systems.

Ordering Information	
RF74E ISE for BA4xx-based systems or expanders (factory installed)	RF74E–AA
RF74E ISE for BA4xx-based systems or expanders (field installed)	RF74E–AF
RF74E ISE for BA2xx-based systems or expanders (factory installed)	RF74E–SA
RF74E ISE for BA2xx-based systems or expanders (field installed)	RF74E–SF
Storage Capacity	
Data storage capacity	3.57 gigabytes, formatted
Performance	
Average seek time	12.5 milliseconds
Average access time	18.1 milliseconds
Peak transfer rate	5.0 megabytes/second
Physical Specifications	
Height	8.3 cm (3.25 in)
Width	14.7 cm (5.79 in)
Depth	20 9 cm (8.21 in)
Weight	2.9 kg (6.4 lb)
Configuration Information	
Form factor	Standard 5.25-inch footprint

Power Requirements	
	+5 Vdc, 1 A (typical) +5 Vdc, 1.2 A (peak)
	+12 Vdc, 2.4 A (typical) idle
	+12 Vdc, 4.0 A (maximum peak) continuous random seeks
	+12 Vdc, 2.9 A (maximum average) continuous random seeks
	+12 Vdc, 6.1 A (peak) at spin-up
Power consumption	35 W (typical) idle
	40.8 W (typical) continuous random seeks
Operating System Support	
OpenVMS	Version 5.5–2 and later
Diagnostic Support	
Power-On Self-test (POST)	See the device documentation.
Diagnostic Utilities Protocol (DUP)	See the device documentation.
MicroVAX Diagnostic Monitor (MDM)	Version 137A and later
Related Documentation	
RF Series Integrated Storage Element Installation in BA200 Series Enclosures	EK–RF72D–IM
RF Series Integrated Storage Element Pocket Service Guide	EK–RFSIS–PS
RF Series Integrated Storage Element User Guide	EK–RF72D–UG
BA400 Storage Devices Installation Procedure	EK–BA44A–IN

Switches

The RF74 has three switches for specifying the DSSI node ID number. Table 1 lists the switch positions, and Figure 1 shows their location. In the figure, the DSSI node ID is set to 7.

Note

When the ISE is connected to an operator control panel (OCP), the switches are ignored. Instead, the DSSI node ID number is determined by the DSSI node ID plug on the OCP.

Table 1 DSSI Node ID Switch Settings

DSSI Node ID	Switch 1	Switch 2	Switch 3
0	Down	Down	Down
1	Down	Down	Up
2	Down	Up	Down
3	Down	Up	Up
4	Up	Down	Down
5	Up	Down	Up
6	Up	Up	Down
7	Up	Up	Up

Switch positions:

On = 0 = Down (toward the module)
Off = 1 = Up (toward the HDA)

DSSI address 7 is typically assigned to the host adapter.

Indicators

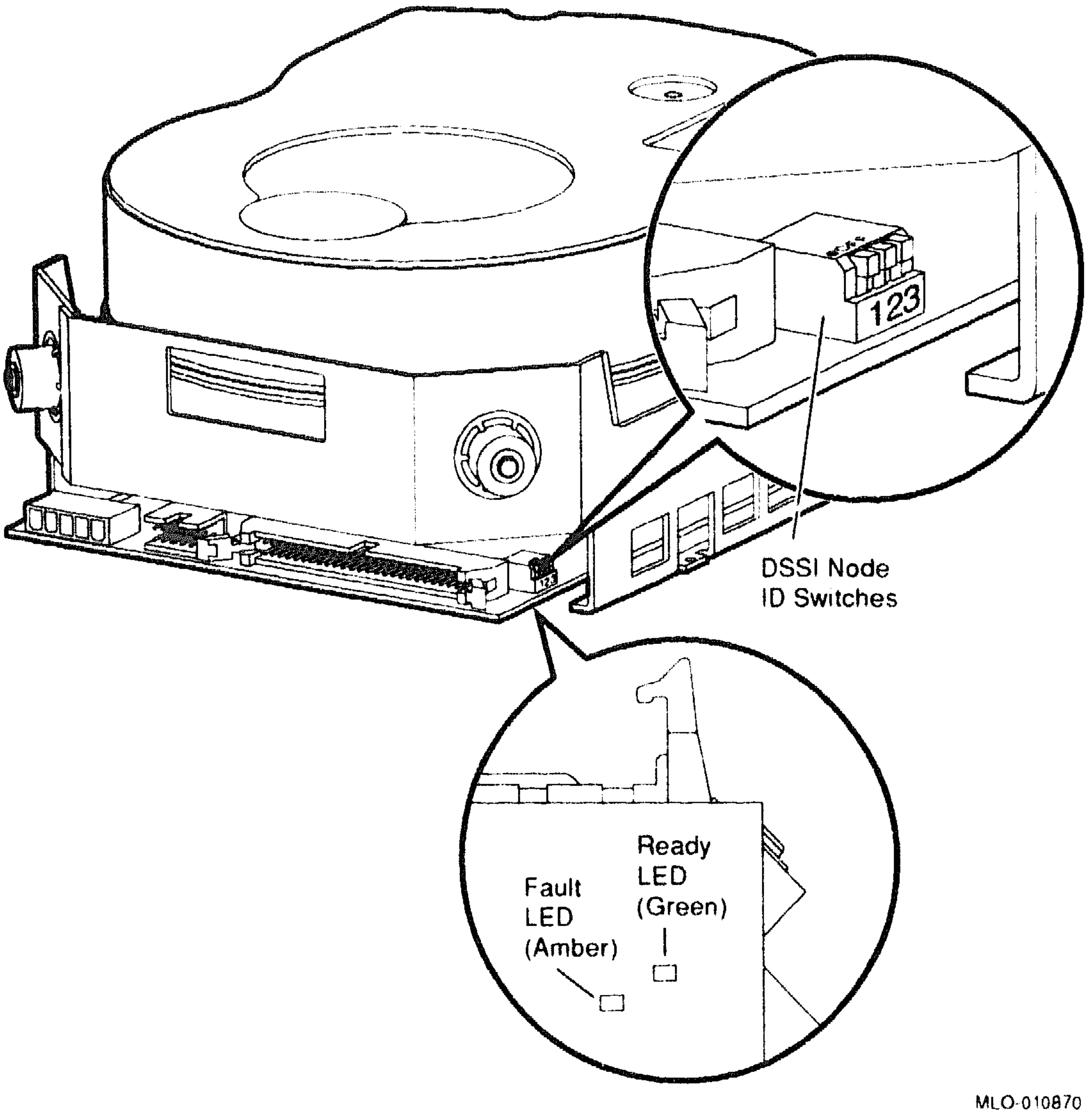
The RF74 has two LEDs to indicate the drive status. Table 2 lists the LED status indicators, and Figure 1 shows their location on the drive.

See the device documentation for a description of the indicators that reside on the OCP.

Table 2 RF74 LED Indications

LED/Description		
Green/Ready	**Amber/Fault**	**Indication**
On	On	The ISE was powered up less than 10 seconds ago, and POST is being run.
Off	Off	POST has completed successfully, or there is no power applied to the ISE.
On	Off	The read/write heads are on cylinder.
Flickering	Off	The ISE is active.
On	Flashing at 5 Hz	The ISE is performing the Module /HDA calibration test. See the device documentation for information about this test.
Off	Flashing at 10 Hz	The ISE has detected a defective OCP, or the OCP DSSI node ID plug is missing. See the device documentation for user action.
Off	On	A fault condition exists in the ISE. See the device documentation for user action.

Figure 1 RF74 Switch and Indicator Locations



RQDX2 and RQDX3 Disk Controllers

Ordering Information

	BA23 or H9642–J	BA123	BA200-Series
RQDX2 kit	RQDX2–AA	RQDX2–BA	–
Module	M8639–YB	M8639–YB	–
50-pin cable	BC02D–1D	17–01520–01	–
40-pin cable	–	17–00862–01	–
Signal distribution board	–	M9058	–
RQDX3 kit	RQDX3–AA	RQDX3–BA	
Module	M7555	M7555	M7555
50-pin cable	BC02D–1D	17–01520–01	17–00285–02
40-pin cable	–	17–00862–01	–
Signal distribution board	–	M9058	–

Operating System Support

DSM–11	Version 3.3 and later
Micro/RSTS	Version 2.2 and later
Micro/RSX	Version 4.0 and later
MicroVMS	RQDX2: Version 4.1m and later RQDX3: Version 4.2 and later
RSX–11M	Version 4.3 and later
RSX–11M–PLUS	Version 4.0 and later
RT–11	Version 5.4D and later
ULTRIX–11	Version 3.1 and later
ULTRIX–32m	Version 1.1 and later
VAXELN	Version 2.0 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	RQDX2: All versions and releases RQDX3: Version 1.06 (release 106) and later
Power-up self-test LEDs	RQDX2: 4 LEDs RQDX3: 1 LED. (On indicates correct operation.)

RQDX2/M8639-Y
RQDX3/M7555

Documentation

RQDX2 Controller Module User's Guide	EK-RQDX2-UG
RQDX3 Controller Module User's Guide	EK-RQDX3-UG

DC Power and Bus Loads

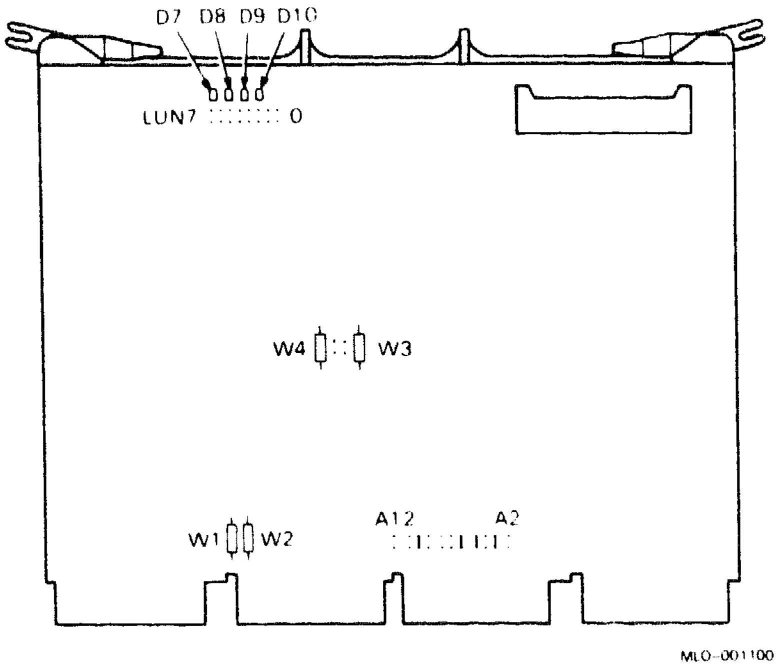
		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
RQDX2	M8639-YB	6.4	0.1	33.2	2.0	1.0	–
RQDX3	M7555	2.48	0.06	13.2	1.0	1.0	–

NOTE: *In BA123 enclosures, use the 17-01520-01 cable to connect the RQDX3 to the M9058 distribution board. In older BA123 systems, replace the 17-00862-01 cable with the 17-01520-01 cable.*

RQDX2 and RQDX3 are intelligent controllers with onboard microprocessors, used to interface fixed-disk drives and diskette drives to the Q22-bus. Both controllers transfer data by using direct memory access (DMA). Host system programs communicate with the controller and drives by using the mass storage control protocol (MSCP).

The RQDX2 and RQDX3 can control a maximum of four drives. Each fixed-disk drive and each RX33 drive counts as one drive. Each RX50 drive counts as two drives. Figure 1 shows jumper and LED locations for the RQDX2.

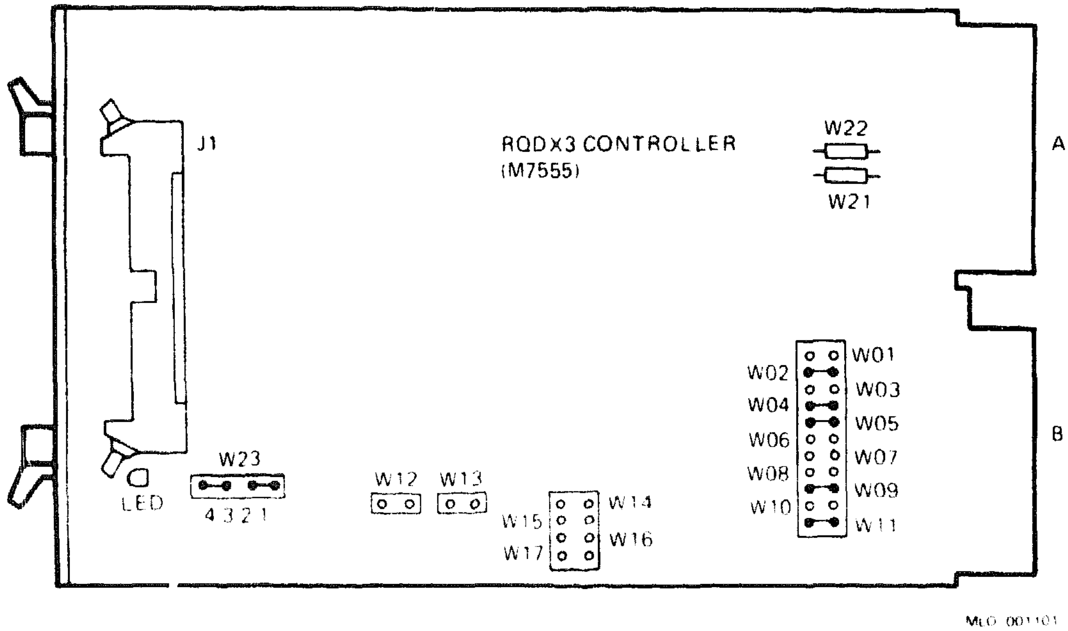
Figure 1: RQDX2 Module Layout (M8639)



RQDX2/M8639-Y
RQDX3/M7555

Figure 2 shows jumper and LED locations for the RQDX3.

Figure 2: RQDX3 Module Layout (M7555)



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29-26246) when you work with the internal parts of a computer system.*

NOTE: *The RQDX2 does not support the RD54 drive.*

The CSR address of the first MSCP controller is fixed. If you install a second controller, its CSR address is floating. The following table lists the factory configuration and other common settings for a second MSCP controller:

RQDX2/RQDX3 CSR Address: 17772150 (factory position)

RQDX2 Jumpers:	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2
RQDX3 Jumpers:	W11	W10	W9	W8	W7	W6	W5	W4	W3	W2	W1
Starting Address:											
17772150	1	0	1	0	0	0	1	1	0	1	0
Possible settings for a second controller:											
17760334	0	0	0	0	0	1	1	0	1	1	1
17760354	0	0	0	0	0	1	1	1	0	1	1
17760374	0	0	0	0	0	1	1	1	1	1	1

1 = installed, 0 = removed

NOTE:

- *RQDX2: Jumpers W1 through W4 (Figure 1) are for factory test purposes and should remain installed.*
- *RQDX3: The two W23 jumpers should connect pins 1, 2, 3, and 4 for all configurations (Figure 2). Jumpers W21 and W22 are for factory test purposes and should remain installed; these jumpers are present on etch revision D1 and later only.*

The interrupt vector for the RQDX2 and RQDX3 controllers is set under program control. The first controller is assigned a fixed interrupt vector of 154. If you install a second controller, its interrupt vector floats.

NOTE: *RQDX2 and RQDX3 controllers are mass storage control protocol (MSCP) devices. The first MSCP device in a system is assigned a CSR address of 17772150. If you install more than one MSCP device, you must set the CSR address of the second device within the floating range. In MicroVAX II systems, you should not install logical unit number (LUN) jumpers W12 through W17 on RQDX3 modules or LUN jumpers 0 through 7 on RQDX2 modules.*

RQDX2 Power-Up LEDs

Figure 3 shows the RQDX2 LEDs. Table 1 lists the LED error codes.

Figure 3: RQDX2 Module LEDs

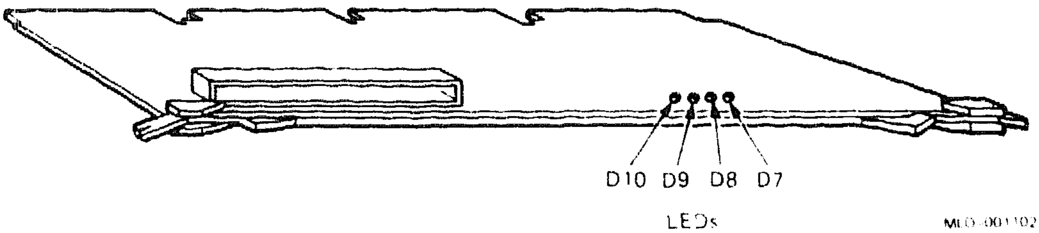


Table 1: RQDX2 LED Error Codes

LEDs				
D10	**D9**	**D8**	**D7**	**Test**
On	On	On	On	Start of power-up test
Off	Off	Off	On	T11 processor test
Off	Off	On	Off	T11 timer/counter/address generator test
Off	Off	On	On	Q22-bus timer/counter/address generator test
Off	On	Off	Off	Serializer/deserializer test
Off	On	Off	On	CRC generator test
Off	On	On	Off	Hardware version test
Off	On	On	On	ROM checksum test
On	Off	Off	Off	RAM test
On	Off	Off	On	Diagnostic interrupt test
On	Off	On	Off	Shuffle oscillator test
On	Off	On	On	Valid configuration test
On	On	Off	Off	Not used
On	On	Off	On	Not used
On	On	On	Off	Not used
Off	Off	Off	Off	End of test

RQDXE Expander Module

The RQDXE expander module is an option for the BA23 enclosure or the H9642–J cabinet only.

Ordering Information

	BA23	H9642–J
RQDXE cabinet kit	RQDXE–AA	RQDXE–FA
RQDXE module	M7513–00	M7513–00
RQDX2/3 to RQDXE cable	BC02D–0K	BC02D–0K
RQDXE to distribution board cable	BC02D–1D	BC02D–1D
RQDX2/3 to I/O panel cable	70–18652–01	–
I/O panel insert	70–2866–01	–
RQDXE to 2nd distribution board cable	–	BC02D–04

Operating System Support

DSM-11	Version 3.3 and later
Micro/RSTS	Version 2.2 and later
Micro/RSX	Version 4.0 and later
MicroVMS	RQDX2: Version 4.1m and later RQDX3: Version 4.2 and later
RSX-11M	Version 4.3 and later
RSX-11M-PLUS	Version 4.0 and later
RT-11	Version 5.4D and later
ULTRIX-11	Version 3.1 and later
ULTRIX-32m	Version 1.1 and later
VAXELN	Version 2.0 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	RQDX2: All versions and releases RQDX3: Version 1.06 (release 106) and later
Power-up self-test LEDs	None

Documentation

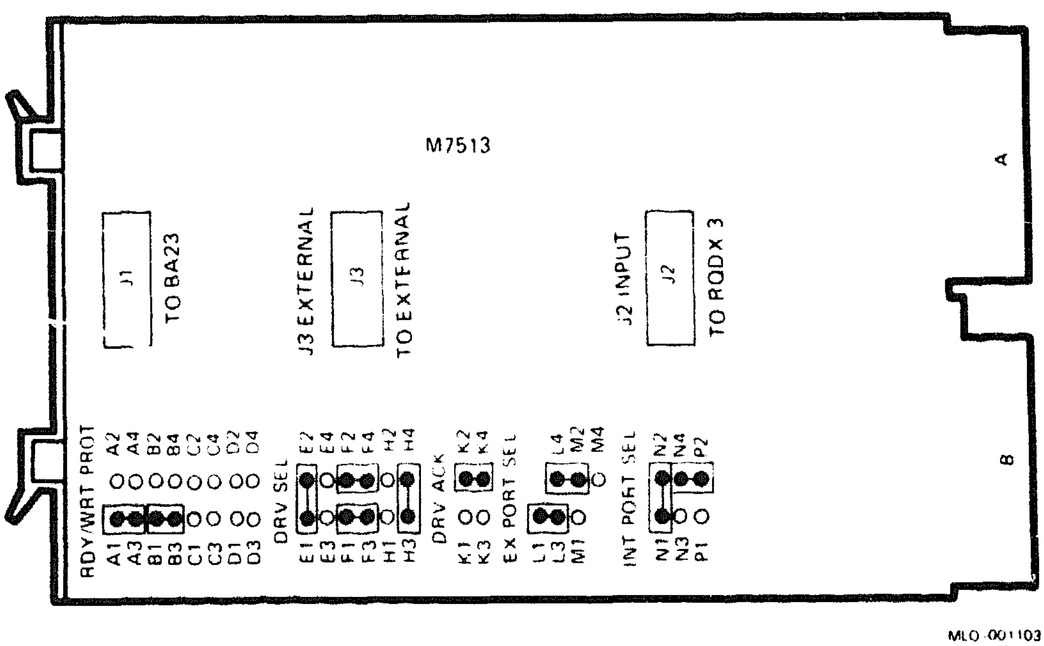
RQDXE Expander Module User's Guide	EK-RQDXE-UG

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	Module	+5 V	+12 V	Watts	AC	DC	Insert
RQDXE	M7513	0.8	0.0	4.0	1.0	0.0	-

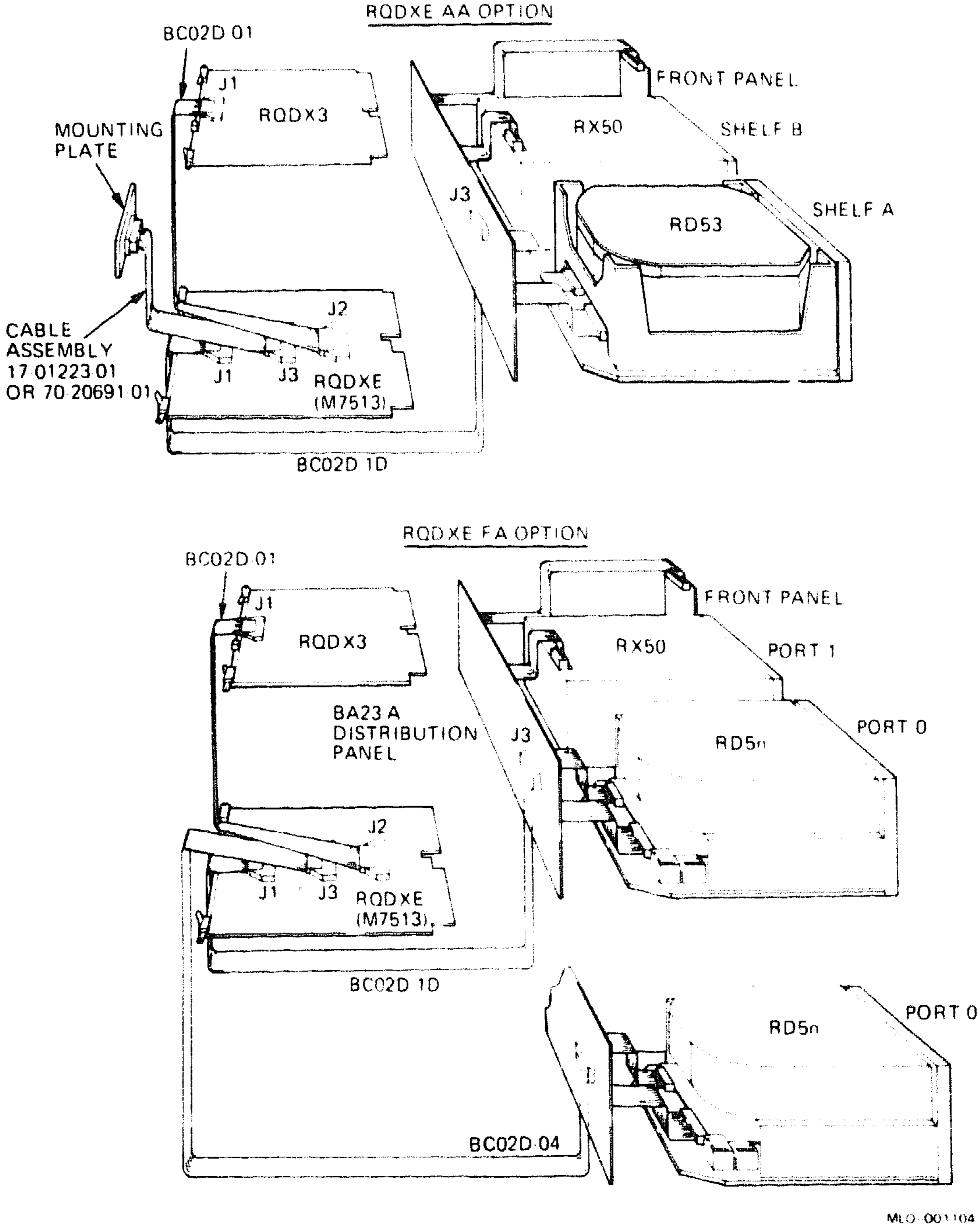
The RQDXE module, shown in Figure 1, connects external RD50-series or RX50 drives to an RQDX2 or RQDX3 controller in the BA23 enclosure.

Figure 1: RQDXE Module Layout (M7513)



The external drives may be tabletop (-D) or rack mount (-R) models. The RQDXE is installed in the BA23 backplane, directly under the RQDX2 or RQDX3. The RQDXE internal cabling is shown in Figure 2.

Figure 2: RQDXE Internal Cabling



In an H9642–J cabinet, the RQDXE connects one RD50-series and/or one RX50 drive in the BA23–C (bottom) enclosure to the RQDX2 or RQDX3 in the BA23–A (top) enclosure. The RQDXE is installed in the AB rows of the BA23 backplane, directly under the RQDX2 or RQDX3. The cabling is similar to that shown in Figure 2, except that the cable from the J3 connector on the RQDXE connects to the BA23–C distribution panel instead of to a mounting plate in the I/O panel.

Figure 1 shows the factory position for the jumpers. Use the factory configuration when the RQDXE connects to one of the following:

- One external tabletop or rack mount RD drive for a BA23 system
- One RD drive in the left mass storage slot of the BA23–C (bottom) enclosure in an H9642–J system

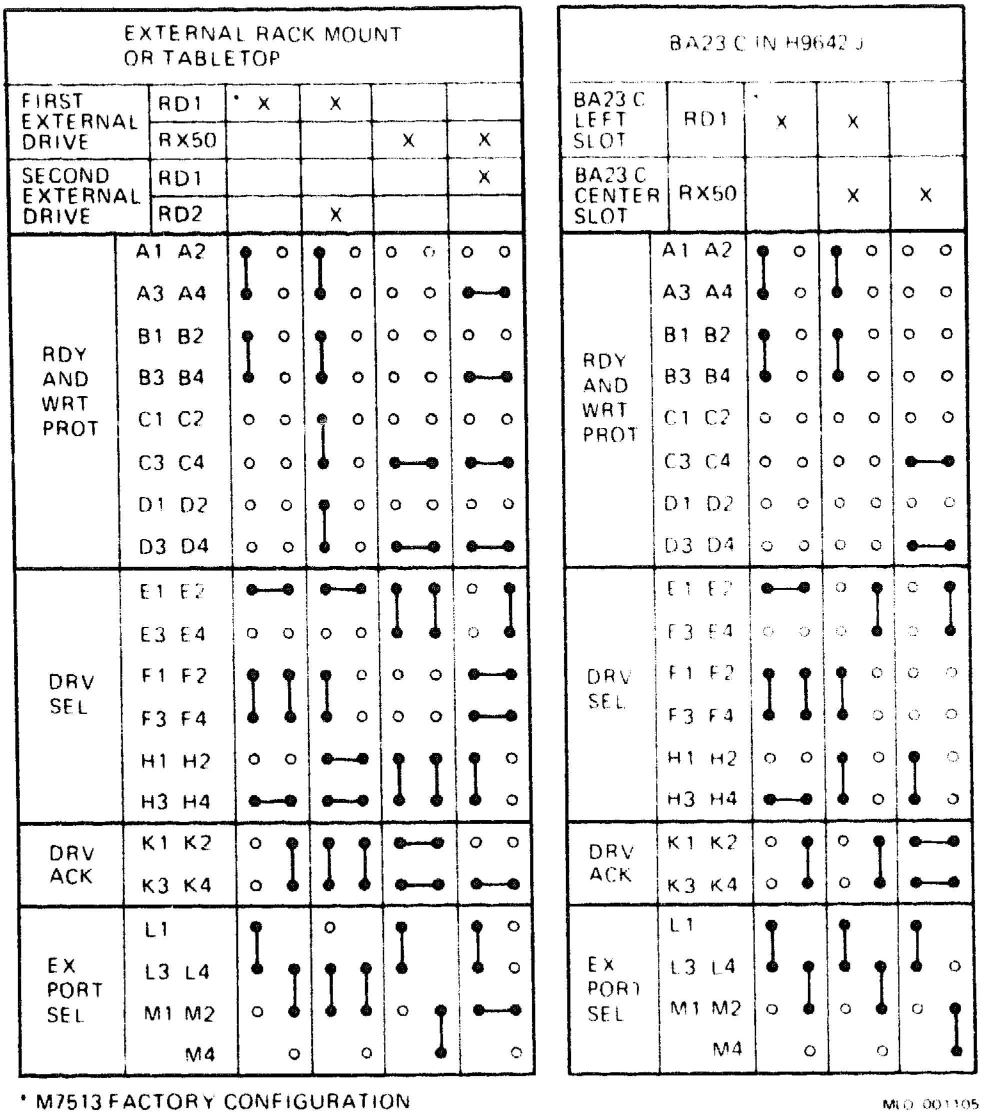
Figure 3 shows the RQDXE jumper settings for other supported configurations. These include RD50-series and RX50 drives in external tabletop or rack mount enclosures, and in the BA23–C enclosure of an H9642 system.

An external tabletop or rack mount drive has three connectors on the rear: J1, J2, and J3. Use J1 to connect drive RD1, and J2 to connect drive RD2.

NOTE: *Version A1 or B1 of the RQDXE module does not support an external drive as RD0. You must use external drives as RD1 or RD2; install the first fixed-disk drive in the system (RD0) in port 0 of the BA23–A enclosure.*

An updated version of the RQDXE supports an external drive as RD0. The new module has a part revision of C1 or C2 (on the handle). Jumper settings are listed in an addendum to the RQDXE Expander Module User's Guide, which is shipped with the new module.

Figure 3: RQDXE Jumper Settings



RRD40 Optical Disc Drive Subsystem

The RRD40 is a high-performance, read-only optical disc storage device. The RRD40 stores 600 Mbytes of information (equivalent to 1600 floppy disks) or 200,000 typewritten pages. The RRD40 has an average seek time of less than 500 microseconds and a transfer rate of 175 Kbytes/s. The media is a removable 4.7-inch compact disc enclosed in a protective self-loading carrier

Up to two RRD40 drives can be controlled by a single KRQ50–SA or SF Q-bus controller.

The RRD40–DC is a tabletop device for MicroVAX II, MicroVAX 3500/3600, and MicroVAX 3800/3900 systems. The Q-bus system uses a KRQ50 (M7552) controller module to interface with the host system.

Ordering Information

RRD40 Optical Disc Drive	RRD40–AA (SCSI) RRD40–DA (tabletop) RRD40–DC (Q-bus)
Module KRQ50–xx and Tabletop Q-bus Controller	M7552–XX
External I/O Cable	BC06R–12 (Q-bus)
Test Disk	23–23507–03

Operating System Support

MicroVMS
DECnet RSX
RT-11
RSTS
ULTRIX-32
VAXELN

Diagnostic Support

Q-bus Interface	Uses the MicroVAX Diagnostic Monitor, Version 3.01 (release 126) and later to test
Maintenance Kit	ZNABX–GZ, C5
Test Disc	23–23507–03

Documentation

RRD40 Disc Drive Owner's Manual	EK–RRD40–OM
MicroVAX Diagnostic Monitor (MDM) UG	AA–FM7AE–DN
MicroVAX Systems Maintenance Guide	EK–O01AA–UD
MicroVAX 3500/3600 Systems Maintenance Update	EK–159AA–UD

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
KRQ50 Q-bus Controller	M7552	3.5	0.0	17.5	2.4	0.5	–

The RRD40 tabletop drive (Figure 1) has been designed for Q-bus and SCSI systems. The half-height drive (Figure 2) is only used with SCSI media.

Figure 1: RRD40 Tabletop Drive

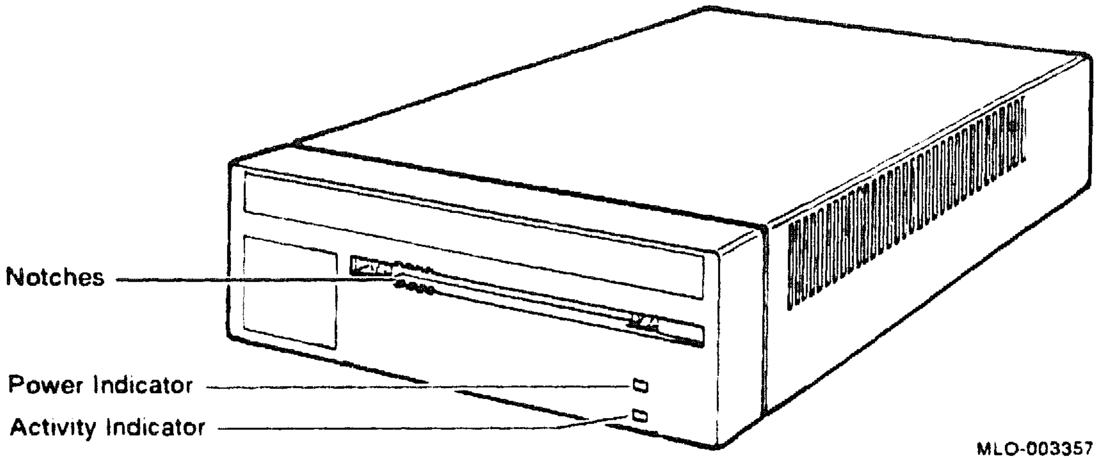


Figure 2: RRD40 Half-Height Drive

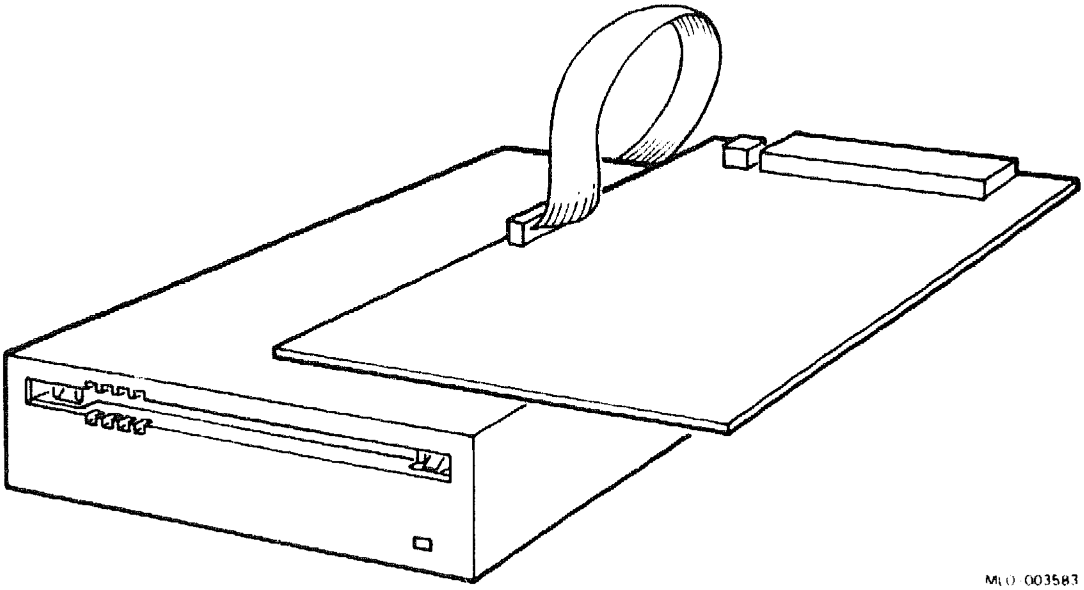
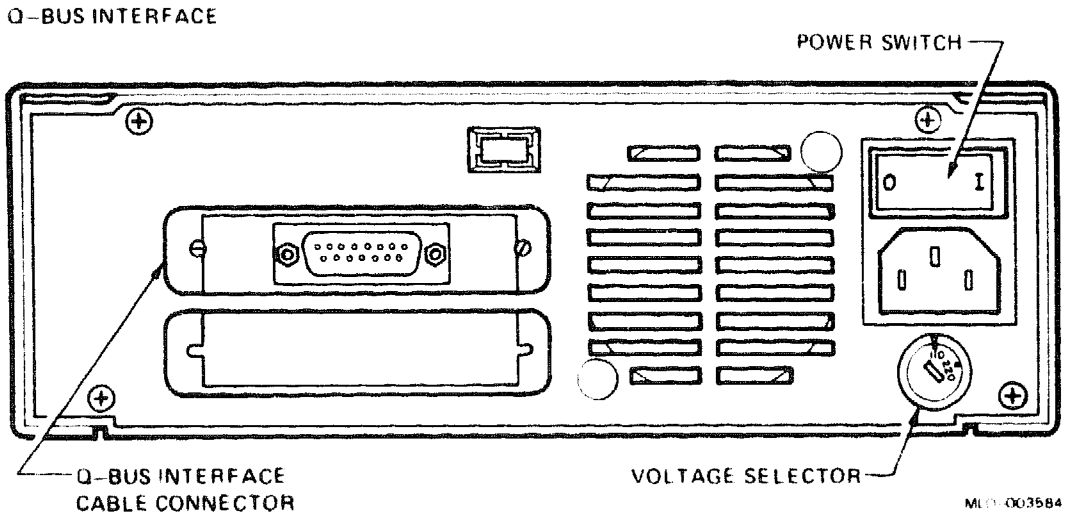


Table 1: Front Panel

Front panel	Activity indicator
Activity indicator lights solid	When disc is correctly loaded
Activity indicator light flashes	When disc is transferring data
Power indicator lights	When power is applied to RRD40

The rear panel (Figure 3) clearly shows the Q-bus cable connection, the power switch, and voltage selector.

Figure 3: RRD40 Rear Panel



KRQ50–xx (M7552–PA) Controller Module

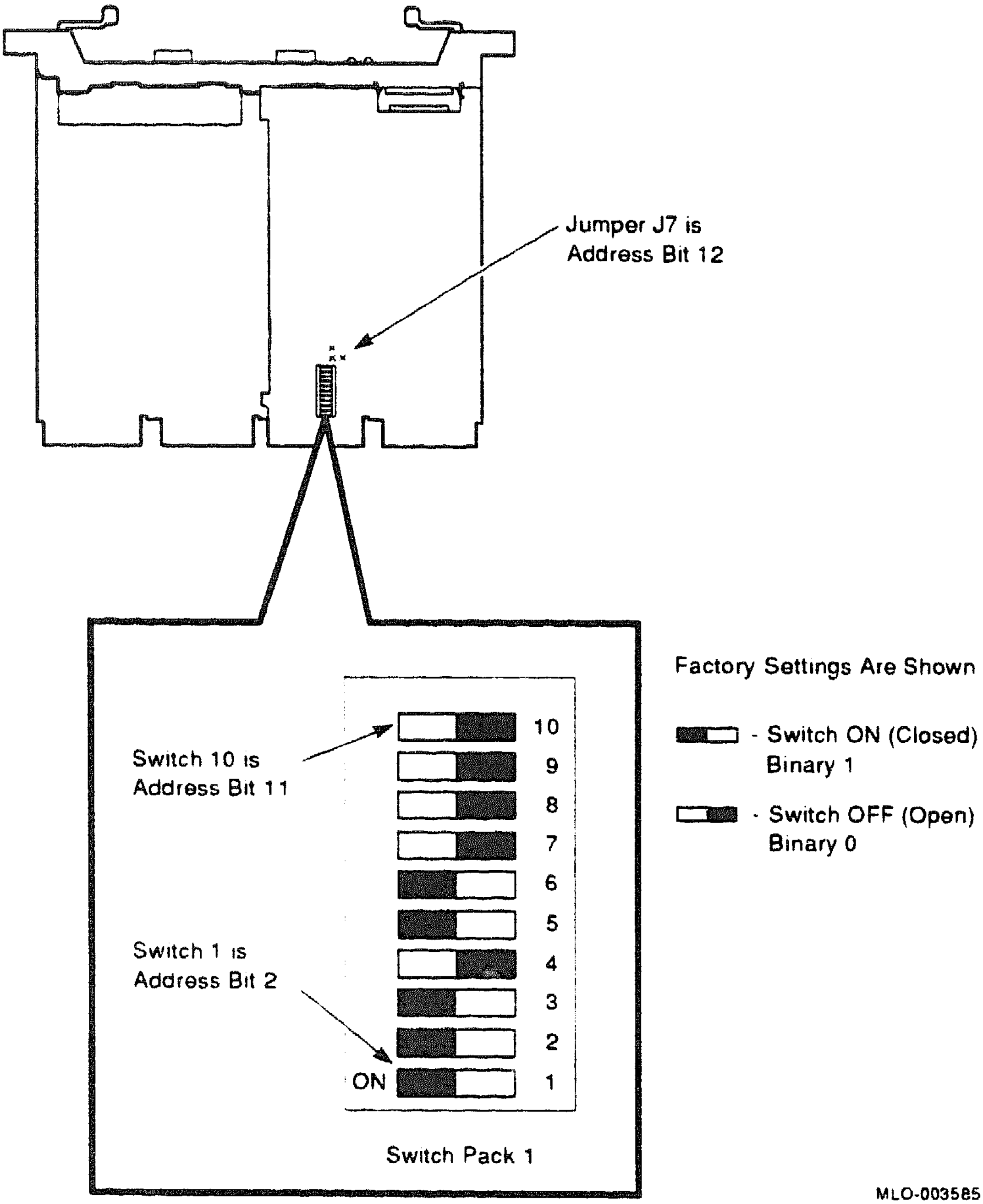
The KRQ50 Q-bus adapter module is used to control one or two RRD40–DC compact disc drive units. The RRD40–DC/KRQ50–xx subsystem is used with B200-series enclosures.

Configuring the KRQ50 Module

Select the CSR address on the KRQ50 with switchpack S1 and jumper J7 (Figure 4). Switchpack S1 has 10 switches, numbered 1 through 10. The switches set Q-bus address bits 2 through 11. Jumper J7 sets Q-bus address bit 12. Address bits 0 and 1 and 13 through 21 are preset. These bits cannot be changed on the KRQ50 module.

The CSR address for the KRQ50 is floating. The factory setting for the KRQ50–SF is 17760334_8. If the system has other options with floating addresses, you may need to change the factory setting after calculating the CSR address for the KRQ50.

Figure 4: KRQ50 Module Layout (M7552)



When setting up the address on the KRQ50 module, follow these three rules:

1. Jumper J7 is the highest selectable address bit. It is address bit 12.
2. Switch 10, the closest switch to J7 on the switchpack, is the second highest selectable address bit. It is address bit 11.
3. Switch 1, the switch that is the farthest away from J7, is the lowest selectable address bit. It is address bit 2.

Use Table 2 to assign any of the first seven available addresses. Determine the address the KRQ50 will have and set the jumper and the switches according to Table 2. Use Figure 4 as a guide to setting jumper J7.

Table 2: KRQ50 CSR Addresses

Q-bus Addr Bit	Switch-pack	772150	760334	760340	760344	760350	760354	760360
12	Jumper	1	0	0	0	0	0	0
11	10	0	0	0	0	0	0	0
10	9	1	0	0	0	0	0	0
9	8	0	0	0	0	0	0	0
8	7	1	0	0	0	0	0	0
7	6	0	1	1	1	1	1	1
6	5	1	1	1	1	1	1	1
5	4	1	0	1	1	1	1	1
4	3	0	1	0	0	0	0	1
3	2	1	1	0	0	1	1	0
2	1	0	1	0	1	0	1	0

Switches

```
0 = Off = Open.

1 = On  = Closed.
```

Jumper J7

```
0 == Jumper installed horizontally X
 (Parallel to handle)  X---X

1 == Jumper installed vertically X
 (Perpendicular to handle)       |
                                 X   X
```

Assigning a Q-bus Interface Address ID/Unit Number

For the Q-bus interface, the unit number is set through the MicroVAX Diagnostic Monitor (MDM). The RRD40 drive comes preset to unit number 0. If you are assigning the RRD40 drive unit number 0, you need not run the MDM utility. If you want to set the RRD40 to a uni number other than unit number 0, procede as follows:

1. Load the MicroVAX Diagnostic Monitor.
2. At the Main Menu select Option #3: Display System Utilities Menu. This will put you into the utility that sets the unit number.
3. Follow the step by step instructions and set the unit number.
4. Return to the Main Menu and exit out of MDM by selecting Option #5.

The preferred address for the KRQ50 is $17{,}772{,}150_8$. If this address is occupied by another MSCP disk controller (such as the M7555 RQDX3 controller), the KRQ50 is set to the first available address starting at $17{,}760{,}334_8$.

NOTE: *Address $17{,}760{,}334_8$ is the factory setting for the KRQ50.*

Testing the Existing System

Use the MicroVAX diagnostic monitor (MDM) to test the existing MicroVAX system as follows:

1. Boot the MDM.
2. Refer to MDM System User's Guide (AA–FM7AE–DN)
3. Test the existing system to make sure it is running properly.
4. After the test runs sucessfully, remove the tape cartridge.
5. Turn the power switch off (O).
6. Unplug the ac power cord from the wall outlet.

CAUTION: *Always remove the tape cartridge before turning power off.*

RRD42 Optical Compact-Disc Subsystem

The RRD42 is a 600-Mbyte optical CD reader that retrieves data in fixed-length blocks from removable compact-disc media.

Performance

Seek time, average	400 ms, (typical)
Seek time, maximum full stroke	800 ms, (typical)
Rotational speed, innermost track	530 rpm
Rotational speed, outermost track	200 rpm
Start time	2.0 second (maximum)
Stop time	2.0 second (maximum)
Transfer rate, sustained	150 Kbytes/second
Transfer rate, burst	1.50 Mbytes/second (maximum)

Physical Specifications

Height	4.15 cm (1.62 in)
Width	14.60 cm (5.75 in)
Depth	20.80 cm (8.0 in)
Weight	1.30 kg (2.8 lb) RRD42–AA version
	2.9 kg (6.30 lb) RRD42–DA version

Ordering Information

RRD42–DA	Tabletop model, with power supply
RRD42–FB	600-Mbyte CDROM SCSI tabletop for adding to the MicroVAX 3300, 3400, 3800, 3900, MicroVAX II and VAX 4000 (USA only).
RRD42–DH	Same as the –FB but is for Europe and GIA only.

RRD42/Optical Compact Disc

Figure 1: RRD42 Front Panel (Tabletop and Embedded)

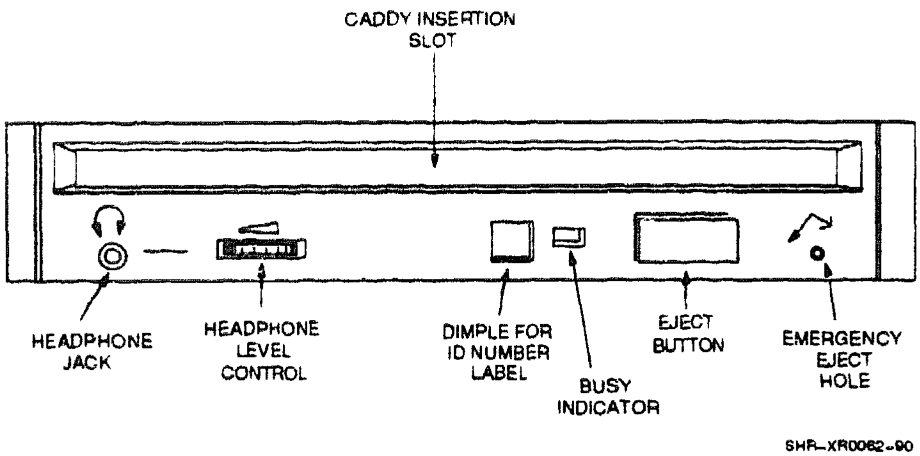


Figure 2: RRD42 Tabletop Drive Rear Panel

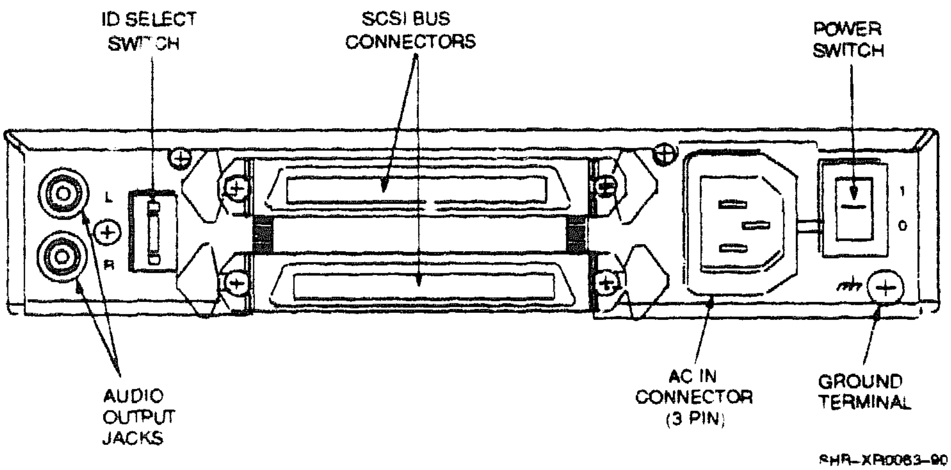


Figure 1: RRD42 Front Panel (Tabletop and Embedded)

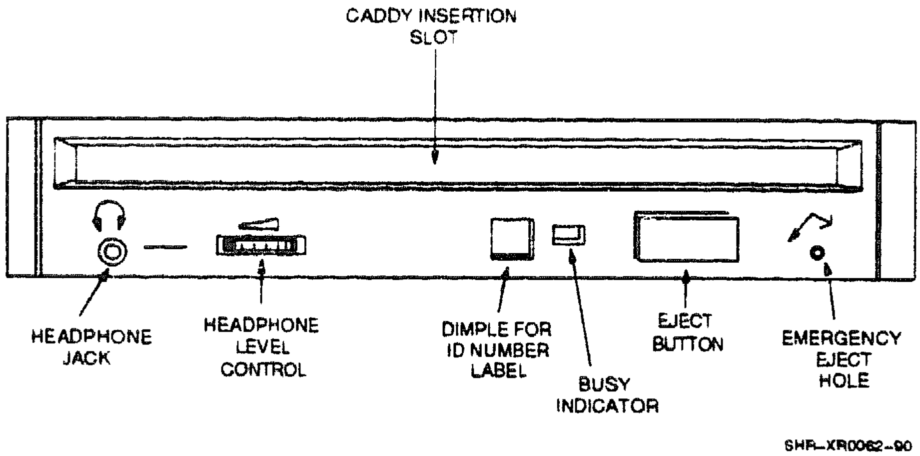


Figure 2: RRD42 Tabletop Drive Rear Panel

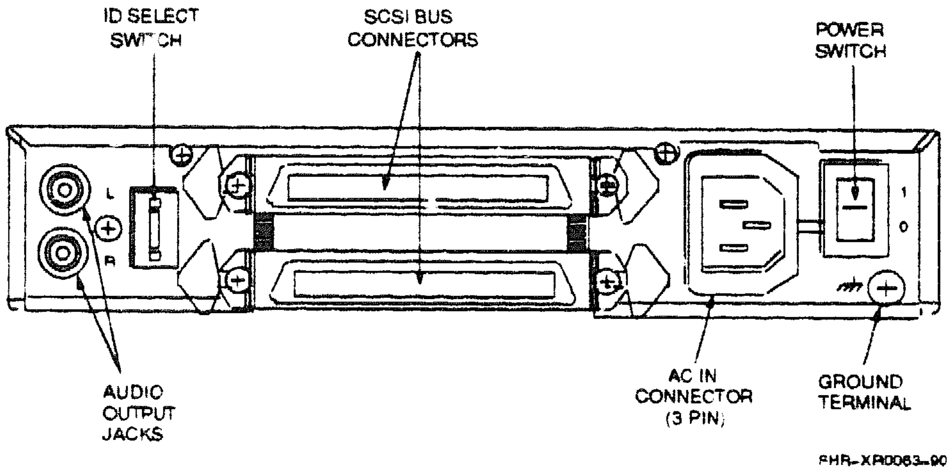


Figure 3: RRD42 Embedded Drive (–AA Version) Rear Panel

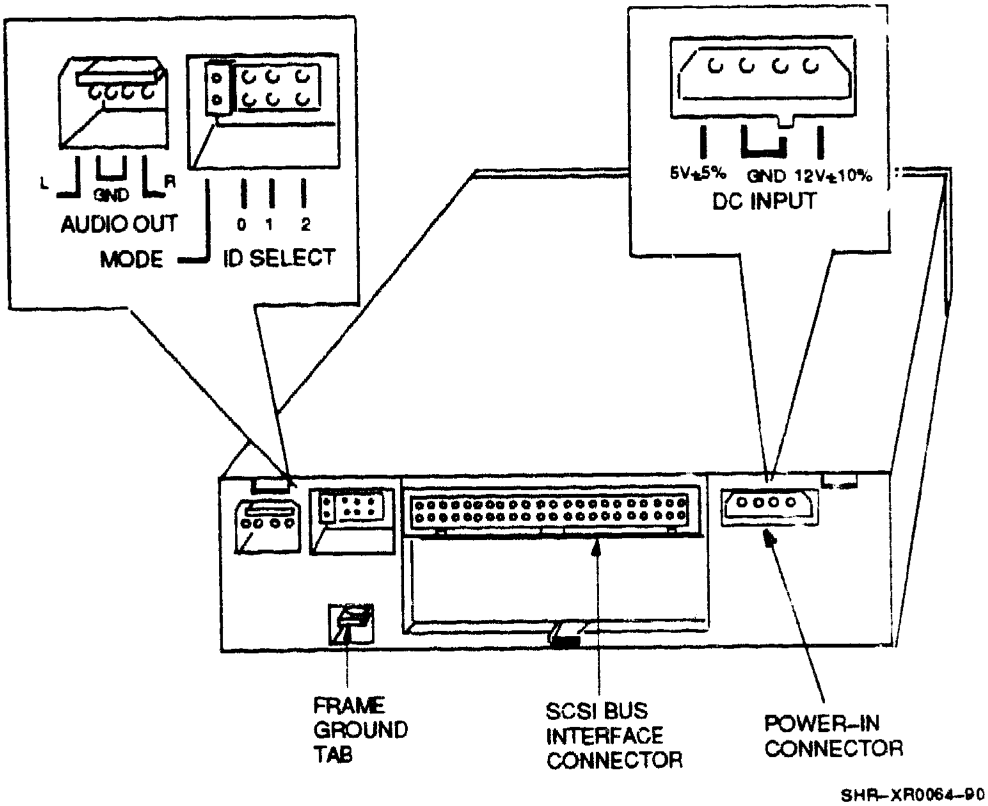


Figure 4: Connecting a SCSI Signal Cable (Drive-to-System)

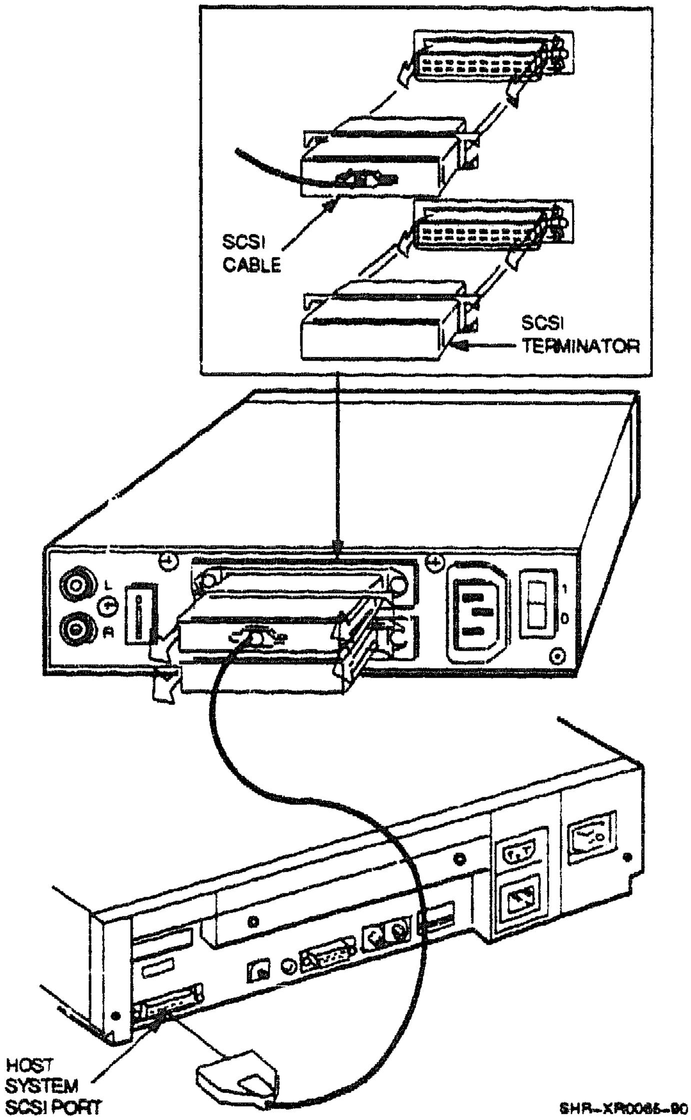
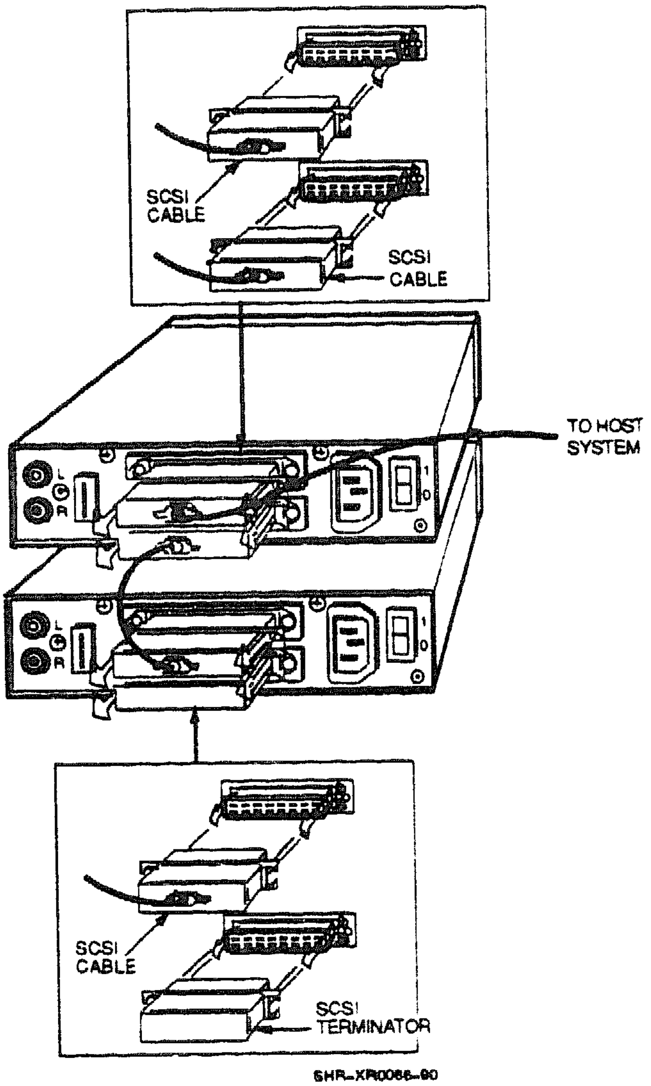


Figure 5: Connecting the 50-Pin SCSI Signal Cable (Drive-to-Drive)



RRD50 Digital Disk Subsystem

Ordering Information

	120 V	240 V
RRD50 optical disk drive subsystem	RRD50-QA	RRD50-QC
RRD50 optical disk drive	–	–
KRP50 controller module	M7552	M7552
Filtered connector	–	–
Cable from drive to filtered connector	BC18R-6	BC18R-6

Operating System Support

MicroVMS	Version 4.2 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 1.08 (release 108) and later
Power-up self-test LEDs	Two LEDs on front of RRD50 Two LEDs on the M7552 module

Documentation

RRD Subsystem Pocket Service Guide	EK-RRD50-PS
RRD50 Digital Disk Drive User's Guide	EK-RRD50-UG

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	Module	+5 V	+12 V	Watts	AC	DC	Insert
KRP50	M7552	–	–	–	–	–	–

RRD50

The RRD50 subsystem, shown in Figure 1, is a read-only storage device that reads data stored on 11.8-cm (4.7-in) optical disks. One optical disk stores 600 Mbytes of data. The following table lists the CSR addresses for RRD50 systems. Figure 2 shows the switch locations on the KRP50 controller module.

CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

CSR Addresses for an KRP50 Controller

Address Bits:	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2
Jumper/ Switches:	W*	10	9	8	7	6	5	4	3	2	1
CSR Address:											
17772150	1	0	1	0	0	0	1	1	0	1	0
17760334	0	0	0	0	0	1	1	0	1	1	1
17760354	0	0	0	0	0	1	1	1	0	1	1

1 = switch on, 0 = switch off

* 1 = jumper in horizontal position
0 = jumper in vertical position

Figure 1: RRD50 Subsystem

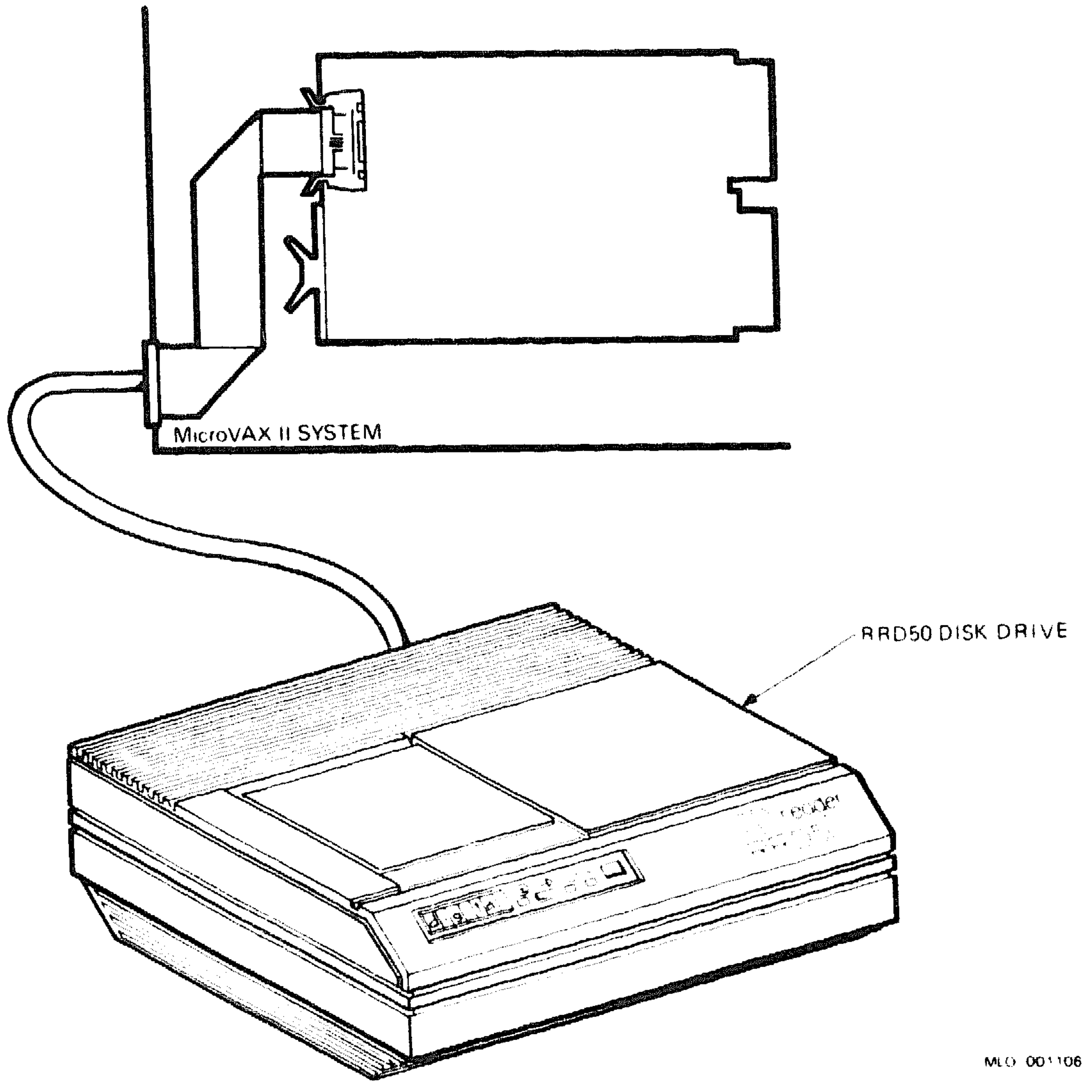
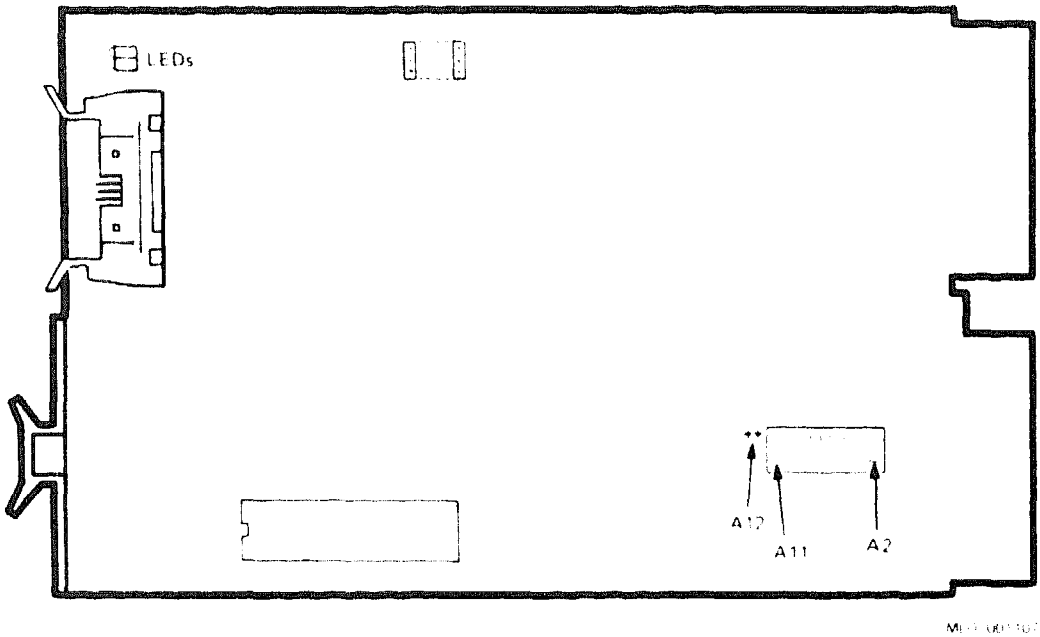


Figure 2: KRP50 Controller Module Layout (M7552)



NOTE: *If a system contains an RQDX2 or RQDX3 controller, this controller must use the first MSCP address (17772150), and the KRP50 must use a floating address.*

RRD50 Power-Up Tests

Figure 3 shows the power-up self-test LEDs on the M7752 controller module. Table 1 lists the LED sequence for a successful test.

Figure 3: RRD50 (M7552) Power-Up Self-Test LEDs

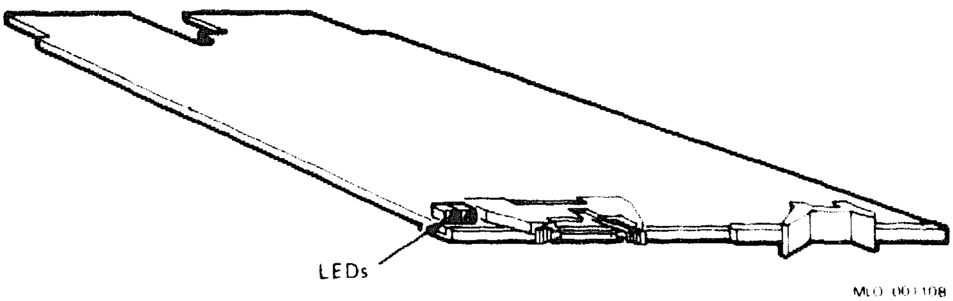


Table 1: RRD50 (M7552) Power-Up LED Sequence

LED Sequence for Successful Test		Meaning
Left LED flashes at 1-second intervals. Right LED is off.		No RRD50 drives are present.
A 2-second cycle occurs as follows:		One good RRD50 drive is present.
Left LED	Right LED	
On	On	
Off	On	
On	Off	
Off	Off	
Cycle repeats.		
Both LEDs flash together at 1-second intervals.		Two good RRD50 drives are present.
Right LED stays on continuously.		One or two bad RRD50 drives are present.

RWZ01 Magneto-Optical Disc Subsystem

The RWZ01 Magneto-Optical Disc, hereafter called the RWZ01, provides 594 Mbytes of formatted data. This device uses large capacity removable discs and has the following features:

- A read/write disc using magneto-optical recording with a multiple write capability.
- A large capacity disc (594 Mbyte, 512 bytes/sector, excluding alternate areas).
- A disk format that complies with Continuous/Composite Servo (CS) format (ISO/IEC DIS 10089) of International Standards Organization (ISO), which is the world standard.
- A Small Computer Systems Interface (SCSI) which complies with ANSI X3,131-1986, CCS Rev.B4. Up to eight units, including the host computer, can be connected to one SCSI bus.
- A high-speed transmission of data using a 2400-rpm spindle motor. A seek time of 95 ms using thin, light-weight optical pick-up.
- An error detection using Long Distance Code (LDC).

Storage Capacity	
Storage capacity (formatted)	590 Mbytes per disk

Performance	
Average seek time	95 milliseconds (1/3 full stroke)
Maximum seek time (rotational delay including SCSI overhead)	185 milliseconds.
Average access time	Less than 110 milliseconds
Transfer rate from the media	7.40 Mbytes/second
Loading time	6.4 seconds (average)
Unloading time	3.6 seconds (average)
Transmission speed	620 Kbytes
Laser Wave length	785 nm
Laser Output	30 mW
Laser Method	Semiconductor Laser GaAIAs

Physical Specifications

Height	12.2 cm (4.96 in)
Width	21.1 cm (8.3 in.)
Depth	30.0 cm (11.81 in)
Weight	6.73 kg (14.96 lb)

Configuration Information

Data surfaces	2
Number of tracks	18751/side
Number of sectors	31
Power Requirements:	
United States and Canada:	100 to 120 Vac @ 50/60 A
Europe:	220 to 440 Vac @ 50/60 A
Current drain:	
U.S.A. and Canada:	0.45 A max.
Europe:	0.3 A max.

Ordering Information

Part	Name
RWX1K-01	Magneto-optical disc cartridge
RWX1H-AA	Lens cleaning cartridge kit
RWZ01-AA	Tabletop magneto-optical disc subsystem (includes power cord)
BC13C-07	SCSI Interface Cable

Related Documentation

EK-RWZ01-AA	RWZ01 Magneto-Optical Disc Subsystem Users Guide
EK-RWZ01-MG	RWZ01 Magneto-Optical Disc Subsystem Maintenance Guide
EK-RWX1H-UG	Lens Cleaning Cartridge User's Manual

RWZ01 ID Switch Positions

SCSI ID	SW-6	SW-7	SW-8
0	OFF	OFF	OFF
1	OFF	OFF	ON
2	OFF	ON	OFF
3	OFF	ON	ON
4	ON	OFF	OFF
5	ON	OFF	ON
6	ON	ON	OFF
7	ON	ON	ON

NOTE:

OFF = switch position down (0)

ON = switch position up (1)

RX33 Diskette Drive

The RX33 is an option for BA23 and BA123 enclosures only.

Ordering Information

	BA23	BA123
RX33 drive	RX33-A	RX33-BA
RX33 drive plus mounting hardware and cabling for first RX33	RX33A-AA	RX33A-BA
RX33 drive plus mounting hardware and cabling for second RX33	RX33A-AB	RX33A-BB

Operating System Support

DSM-11	Version 3.3 and later
Micro/RSX	Version 4.0 and later
MicroVMS	Version 5.0 and later
RSX-11M	Version 4.3 and later
RT-11	Version 5.4D and later
ULTRIX-11	Version 3.1 and later
ULTRIX-32m	Version 1.1 and later
VAXELN	Version 2.0 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 2.01 (release 116) and later

Documentation

RX33 Technical Description Manual	EK-RX33T-TM

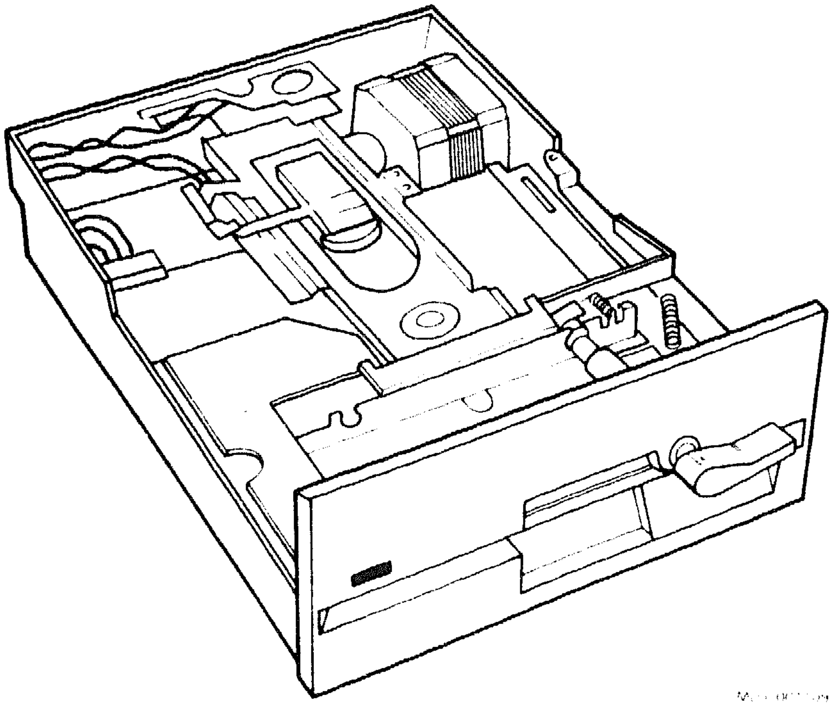
DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
RX33A	–	0.35	0.22	4.40	–	–	–

The RX33, shown in Figure 1, is a 13.3-cm (5.25-in), dual-speed, half-height diskette drive with a formatted capacity of 1.2 Mbytes. In high-density mode, the RX33 provides industry-standard compatibility utilizing double-sided, high-density diskettes. In standard density mode, the RX33 can both read and write RX50-type standard density diskettes on a single side.

The RX33 uses the RQDX3 controller module as an interface to the Q22-bus. Only revisions E3 or E4 of the RQDX3 controller module support the RX33 in MicroVAX systems.

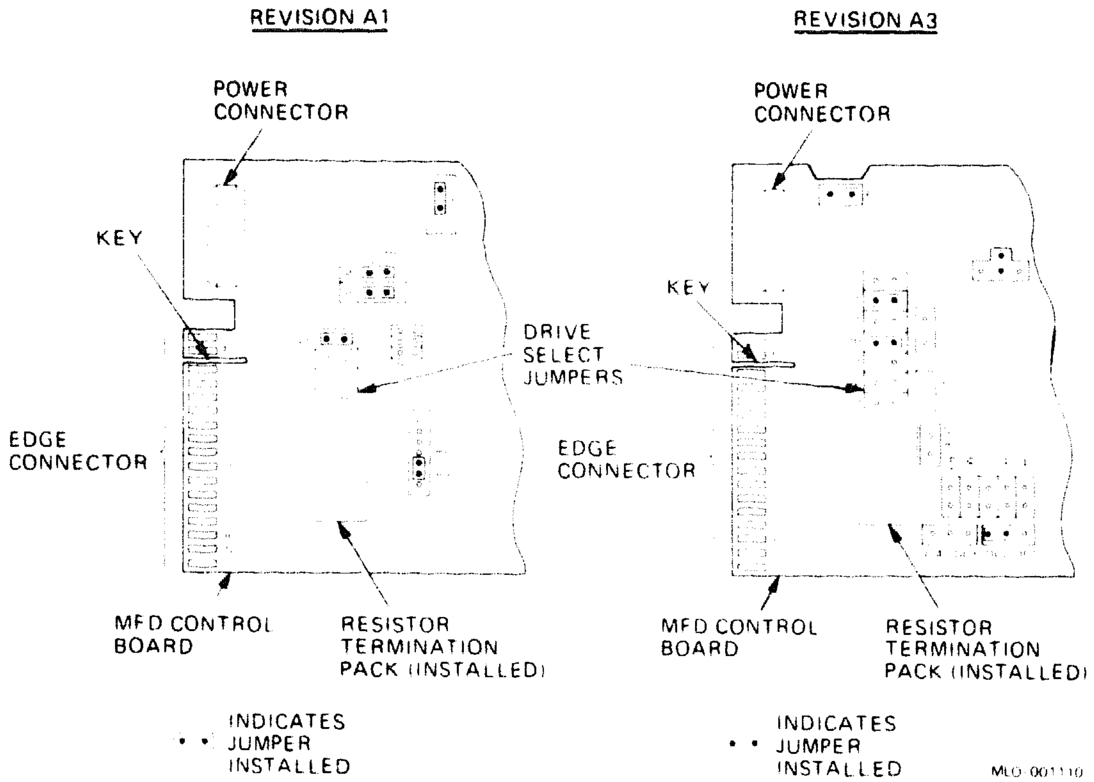
Figure 1: RX33 Diskette Drive



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

You set up the RX33 by using jumpers and components on the device electronics board (Figure 2). The factory configuration for the RX33 is drive select 0 (DS0). If the system configuration contains more than two RD-type disk drives, you must configure the RX33 for DS1.

Figure 2: RX33 Jumper Settings



RX50 Diskette Drive

Ordering Information

	BA23 or H9642–J	BA123
Internal Drive		
RX50 drive and cabinet kit	RX50A–AA	RX50A–BA
RX50 diskette drive	RX50–A	RX50–A
34-pin cable, RX50 to signal distribution	17–00285–02	17–00867–01
External Drive	RX50–DA	RX50–DA

Operating System Support

DSM–11	Version 3.3 and later
Micro/RSTS	Version 2.2 and later
Micro/RSX	Version 4.0 and later
MicroVMS	Version 4.1m and later
RSX–11M	Version 4.3 and later
RSX–11M–PLUS	Version 4.0 and later
RT–11	Version 5.4D and later
ULTRIX–11	Version 2.1 and later
ULTRIX–32m	Version 1.1 and later
VAXELN	Version 2.0 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	All versions and releases
Power-up self-test LEDs	None

Documentation

RX50 Diskette Drive Installation Guide EK-DM250-IN

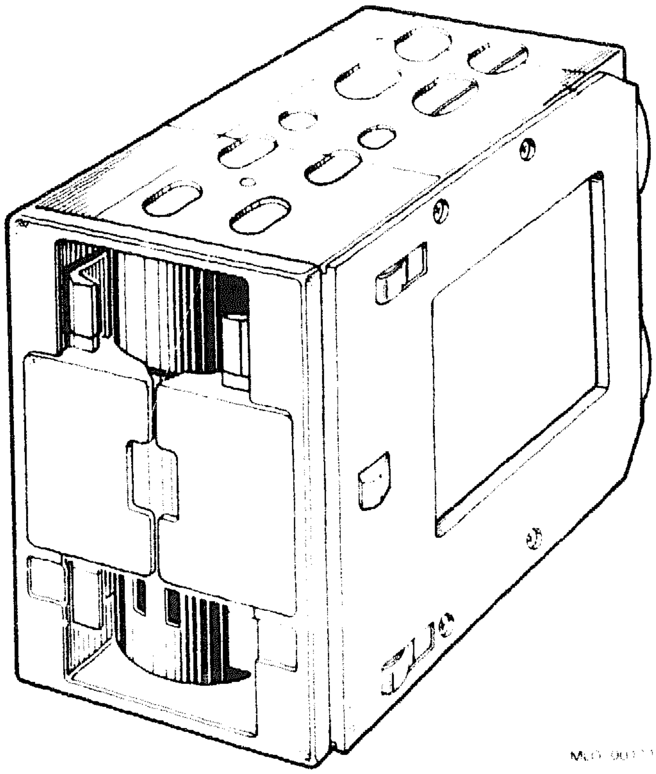
DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	Module	+5 V	+12 V	Watts	AC	DC	Insert
RX50	–	0.85	1.80	28.85	–	–	–

The RX50, shown in Figure 1, is a dual-diskette drive that uses two single-sided, 13.3-cm (5.25-in) RX50K diskettes. The RX50 has a formatted capacity of 818 Kbytes (409 Kbytes per diskette). The RX50 has two access doors and slots for inserting diskettes. A light next to each slot indicates when the system is reading or writing to the diskette in that slot.

NOTE: *Use one RX50 drive with one RQDX2 controller module.*

Figure 1: RX50 Diskette Drive



RZ58E SCSI Integrated Storage Element (ISE)

The RZ58E is a high-capacity, high-performance SCSI integrated storage element (ISE) that provides 1.38 Gbytes of formatted data storage space on a full-height 5-1/4-inch hard disk footprint.

Storage Capacity	
Data storage capacity	1.38 Gbytes, formatted

Functional Spec	
Interface	SCSI II
Track Density	1854 tpi
Tracks/Surface Formatted	2098
Tracks/Surface Unformatted	2111
R/W Heads	15
Disks	8

Ordering Information	
RZ58E–AA	Factory-installed in a BA400 series enclosure.
RZ58E–AF	Field-installed RZ58E–AA in a BA400 series enclosure.

Performance	
Average seek time	12.5 milliseconds
Average access time	18.1 milliseconds
Peak transfer rate	5.0 Mbytes/second
Transfer rate (Bus Asynchronous)	1.6 Mbytes/second
Transfer rate (Bus Synchronous)	5.0 Mbytes/second
Peak transfer rate from the media	5.0 Mbytes/second
Data sectors per track	73/95

Physical Specifications	
Height	8.26 cm (3.25 in)
Width	14.61 cm (5.75 in)
Depth	20.32 cm (8.00 in)
Weight	3.78 kg (8.4 lb)

Configuration Information	
Form factor	Standard 5-1/4-inch footprint
Data surfaces	15
Number of disks	8
Track to track seek	2.5 ms

Configuration Information

Peak current (power-up)	1.25 A @ +5.25 Vdc; 4.35 A.; @ +12.6 Vdc
Peak power (at idle)	+5.25 Vdc; @ 5.25 W; +12.6 Vdc; @ 22.7 W
Total power after 30 min. run-time	28 W
Total peak power	61.5 W @ 12.6 Vdc
Average power (random seek mode)	5.25 W @ 5.25 Vdc
Maximum power (random seek mode)	22.72 W @12.6 Vdc
Total power (random seek mode)	28.00 W

Related Documentation

EK-RZ58-UG	RZ58 User Guide
EK-RZ58-SV	RZ58 Service Guide

RZ58 Address Switches

SCSI ID	ID 3	ID 2	ID 1
0	OUT	OUT	OUT
1	OUT	OUT	IN
2	OUT	IN	OUT
3	OUT	IN	IN
4	IN	OUT	OUT
5	IN	OUT	IN
6	IN	IN	OUT
7	IN	IN	IN

TF85 Tape Subsystem

The TF85 tape drive is a cartridge-type subsystem that can store up to 2.6 Gbytes. The TF85 is a streaming tape drive with a built-in DSSI (Digital Storage Systems Interconnect) controller, and can be used as a part of a DSSI VAXcluster.

Functional Information

Recording media	Magnetic, metal-particle tape
Tape dimensions	1.27 cm (0.5 inch) wide, 366 m (1200 ft) long
Mode of operation	Streaming
Recording method	Serpentine
Recording density	42,500 bits/in
Number of tracks	48
Storage capacity	2.6 Gbytes, formatted
Transfer rate	800 Kbytes/second, formatted

Ordering Information

TF85–AA	2.6 GB cartridge tape subsystem for DSSI-based systems; includes tape drive, DSSI controller, tape cartridge, and head cleaning cartridge
TF85E–JA	Embedded (Factory installed) BA400-Series
TF85E–JF	Embedded (Field installed) BA400-Series
TF85–TA	Tabletop Tape Subsystem, 120 V
TF85–TB	Same as –AA but tabletop, 220 V

Performance

Tape start time	300 milliseconds maximum
Tape stop time	300 milliseconds maximum
Tape speed	390 cm/second (100 in/second)
Streaming data rate	800 Kbytes/second
Recording technique	Two-track parallel, serpentine
Burst rate on DSSI bus	3.8 Mbytes/second
TF85 mode	3 minutes maximum

TF85 Tape Subsystem

Physical Specifications

Height	8.25 cm (3.25 in)
Width	14.60 cm (5.70 in)
Depth	21.44 cm (8.44 in)
Weight	15.4 kg (7.0 lb)

Configuration Information

Form factor	Half-rack, 5.25-inch footprint

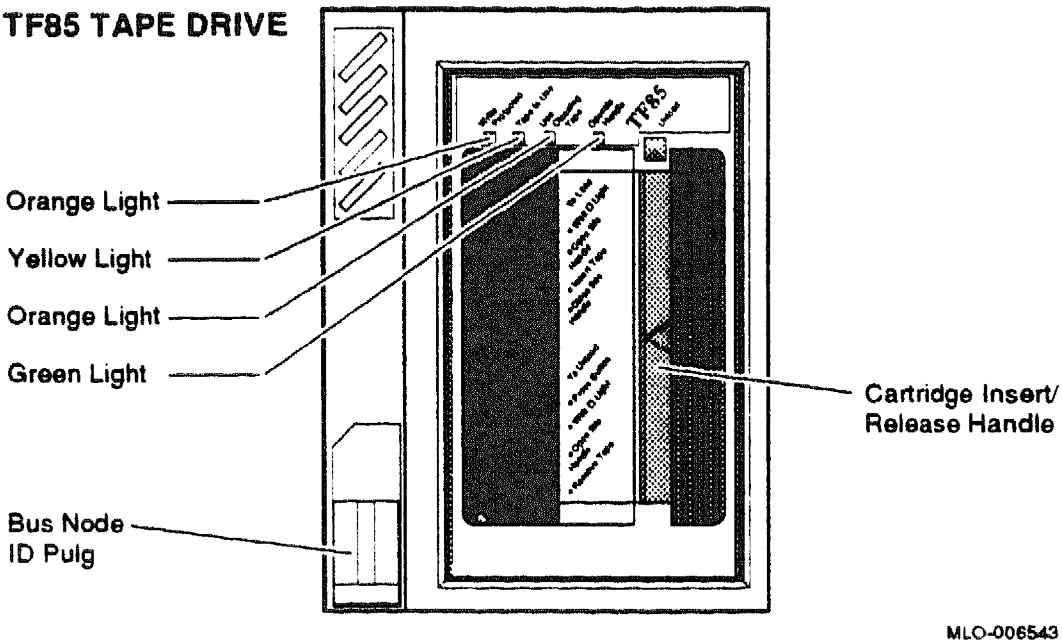
Related Documentation

EK–TF85–OM	TF85 Cartridge Tape Subsystem Owner's Manual
EK–TK85–RC	TK85 Cartridge Tape Drive Reference Card

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads (Maximum)	
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**
TF85	—	1.5	1.0	36.3	0.0	0.0

Figure 6: TF85 Tape Drive Front Panel



TF86 Cartridge Tape Subsystem

The TF86 is a DSSI-based streaming cartridge tape drive that provides 6 gigabytes of storage on a CompacTape III cartridge.

Ordering Information	
TF86 DLT in a tabletop enclosure, CompacTape III cartridge, U.S. power cord, and documentation (requires external DSSI cable)	TF86–TA
TF86 for BA4xx enclosure, CompacTape III cartridge, U.S. power cord, and documentation (factory installed)	TF86E–JA
TF86 for BA4xx enclosure, CompacTape III cartridge, U.S. power cord, and documentation (field installed)	TF86E–JF
Storage Capacity	
Data storage capacity	6 gigabytes, formatted
Performance	
Transfer rate (formatted user data)	800 kilobytes/second
Tape speed	390 cm/second (100 in/second)
Recording density	42,500 bits/inch
Number of tracks	112
Recording technique	Two-track parallel, serpentine
Compatibility	
TZ30/TK50/TK70 tape drives	Read compatibility
Tx85 tape drives	Read/write compatibility

Physical Specifications	
Height	8.6 cm (3.4 in)
Width	14.9 cm (5.9 in)
Depth	24.4 cm (9.6 in)
Weight	3.2 kg (7.0 lb)
Configuration Information	
Form factor	5.25-inch footprint
Power Requirements	
	+5 Vdc, 3.5 A (typical)
	+12 Vdc, 1.2 A (typical)
	+12 Vdc, 1.5 A (peak)
Power consumption	35 W
Operating System Support	
OpenVMS	Version 5.4–2 with restrictions in: Device name recognition Error reporting facility Standalone backup
Diagnostic Support	
Power-On Self-test (POST)	See the device documentation.
Diagnostic Utilities Protocol (DUP)	See the device documentation.
MicroVAX Diagnostic Monitor (MDM)	Release 137A and later
Related Supplies	
CompacTape III tape cartridge	TK85K–01
Cleaning cartridge	TK85–HC
DSSI cable	CK–SF200–LP

Related Documentation

Tx86 Tape Drive Operator's Reference Card	EK–OTK86–RC
Tx86 Series Cartridge Tape Subsystem Owner's Manual	EK–OTX86–OM
Installing the TF86 Tabletop Cartridge Tape Subsystem	EK–TF86T–IG
BA400 Storage Devices Installation Procedure	EK–BA44A–IN

TF867 Magazine Tape Subsystem

The TF867 subsystem combines the TF86 cartridge tape drive with an automatic cartridge loader. It provides reliable, unattended backup capability for DSSI-based systems. When fully loaded with seven cartridges, the TF867 subsystem can back up as much as 42 gigabytes of data in 16 hours without operator intervention.

Ordering Information	
TF867 cartridge loader subsystem with pedestal enclosure, 120 V/240 V, field installed (requires external DSSI cable)	SF106–AA/AB
TF857-to-TF867 and SF100-to-SF106 upgrade	TF867–UG
Storage Capacity	
Data storage capacity	42 gigabytes, formatted (6 gigabytes per cartridge)
Performance	
Transfer rate (formatted user data)	800 kilobytes/second
Tape speed	390 cm/second (100 in/second)
Recording density	42,500 bits/inch
Number of tracks	112
Recording technique	Two-track parallel, serpentine
Compatibility	
TZ30/TK50/TK70 tape drives	Read compatibility
Tx85 tape drives	Read/write compatibility
TF867 Physical Specifications	
Height	26.5 cm (10.4 in)
Width	22.2 cm (8.8 in)
Depth	64.7 cm (25.5 in)
Weight	25 kg (55.0 lb)

Magazine Physical Specifications	
Height	21.0 cm (8.63 in)
Width	13.25 cm (5.22 in)
Depth	11.8 cm (4.65 in)
Weight (fully loaded)	2.1 kg (4.5 lb)

SF106 Physical Specifications	
Height	68.6 cm (27.0 in)
Width	45.7 cm (18.0 in)
Depth	86.4 cm (34.0 in)
Weight	102.2 kg (225.0 lb)

Power Requirements	
	+5 Vdc, 3.5 A (typical) +12 Vdc, 1.2 A (typical)
	+12 Vdc, 1.5 A (peak)
Power consumption	82 W (typical)

Operating System Support	
OpenVMS	Version 5.4–2 with restrictions in: Device name recognition Error reporting facility Standalone backup

Diagnostic Support	
Power-On Self-test (POST)	See the device documentation.
Diagnostic Utilities Protocol (DUP)	See the device documentation.
MicroVAX Diagnostic Monitor (MDM)	Release 137A and later

Related Documentation

Tx86 Tape Drive Operator's Reference Card	EK–OTK86–RC
SF106 Storage Array Installation Guide	EK–SF106–IN
Tx867 Series Magazine Tape Subsystem Owner's Manual	EK–TX867–OM

TKZ60 Cartridge Tape Subsystem

The TKZ60 is a tape drive that is an industry standard 1/4-inch (QIC) cartridge streaming tape device. The tape cartridge capacity is 220 Mbytes, using a 600-foot tape. The TKZ60 is used for backup and for data interchange for BA400-series enclosures.

The TKZ60 is a 1/2-inch SCSI cartridge tape drive subsystem. The TKZ60 has 18 tracks of parallel recording with a thin film head. It can interface with the IBM 3480 to provide format data interchange, archival storage, software distribution, on-line transaction management, and backup for large and small computing systems. The TKZ60 uses the same 200-Mbyte tape cartridge as the TA90 and IBM 3480 drives. It can also provide 1 Gbyte of data storage using a five-magazine loader, and 2 Gbytes using a ten-magazine loader.

The TKZ60 uses an optional KZQSA for SCSI interface and for VAX/VMS Q–bus systems.

Storage Capacity

User cartridge capacity formatted	220 Mbytes
Maximum cartridge magazine capacity formatted	2.2 Gbytes

Ordering Information

2R–TKZ60–BA	Tabletop tape cartridge subsystem that is used with SCSI based VAX 4000 systems
2R–TKZ60–BC	Tabletop tape cartridge subsystem with loader, that is used with SCSI based VAX 4000 systems and a DECsystem 5500

Accessories Information

CompacTape EYE Length	36,576 cm (1200 ft)
CompacTape EYE Width	10.795 cm (4 1/4 in)
Number of Tracks	24 pairs (48)
Jumper Part Number	12–14314–00
Supported	ULTRIX V4.1, VMS V5, 4-2, and SCO UNIX
Model	Tabletop

TKZ60

Performance

Average transfer rate	200 kilobytes/second
Burst transfer rate	1.5 megabytes/second
Read/write speed	120 inches/second - streaming
Transfer rate	200 Kbytes
Surge current at start-up	12 Vdc @ 5.0 A
Form factor	5.25-inch half height
Tape speed	39.4-in/second
Nominal load/unload time	15 second
Nominal rewind time	60 second
Maximum reposition time	250 ms

Tabletop Dimensions

Height	13.3 cm (5.25 in)
Width	21.7 cm (8.55 in)
Depth	54 cm (21.25 in)

Dimensions

Height	19 cm (7.5 in)
Width	22.9 cm (9.0 in)
Depth with loader	76.2 cm (30.0 in)
Depth	58.4 cm (23.0 in)
Weight	13.5 kg (30.0 lb)
Loader Weight	2.47 kg (5.5 lb)

Power Requirements

Power consumption	Nominal 150 W Maximum (180 W) +5 Vdc @ 1.0 A 12 Vdc @ 1.75 A
Voltage	88 to 132 VAC 176 to 264 VAC
Frequency	47.0 to 63.0 Hertz
Inrush current	1st cycle 45 A (Max) 2nd cycle (25 A Max)

Related Documentation

EK–SCSIS–OV	Small Computer System Interface (An Overview Version 1.0)
EK–SCSIS–SP	Small Computer System Interface (A development guide)
AA–PAJ2A–TE	VMS Version 5.3 Small Computer System Interface (SCSI–2) Device Support ManuaL

TKZ60 Jumpers

SCSI ID	SEL2	SEL1	SEL0
0	OUT	OUT	OUT
1	OUT	OUT	IN
2	OUT	IN	OUT
3	OUT	IN	IN
4	IN	OUT	OUT
5	IN	OUT	IN
6	IN	IN	OUT
7	IN	IN	IN

TK50 Tape Drive Subsystem

For BA200-series enclosures, order the TK50 as a system option only.

You can install a TK50 tape drive subsystem in a BA23 enclosure, or use the TK50 as a standalone desktop unit. In a BA123 system, the TK50 is usually installed in the enclosure.

If you want a complete TK50 subsystem, you must order a TK50 drive and a TQK50 controller subsystem.

Ordering Information

Tape drive for BA200-series	TK50–SA (factory installed) TK50–SF (field upgrade)	

Internal Drives	BA23 or H9642–J	BA123
TK50 drive and blank cartridge	TK50–AA	TK50–AA
TQK50 (M7546) controller subsystem	TQK50–AA	TQK50–BA

External Drives	BA23	BA123
120 V desktop drive	TK50–DA	TK50–DA
240 V desktop drive	TK50–DB	TK50–DB
120 V rack mount drive	TK50–RA	TK50–RA
240 V rack mount drive	TK50–RB	TK50–RB
TQK50 (M7546) controller subsystem	TQK50–AB	TQK50–BB

Operating System Support

Micro/RSTS	Version 2.2 and later
Micro/RSX	Version 4.0 and later
MicroVMS	Version 4.1m and later
RSTS/E	Version 9.5 and later
RSX–11M	Version 4.3 and later
RSX–11M–PLUS	Version 4.0 and later
RT–11	Version 5.4D and later
ULTRIX–11	Version 3.1 and later
ULTRIX–32m	Version 1.1 and later
VAXELN	Version 2.0 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 1.03 (release 103) and later
XXDP	Version 2.1 (release 134) and later: XTKAB0.OBJ, ZTKAE0.BIC, ZTKBC0.BIC.
Power-up self-test LEDs	Two LEDs (controller module) Two LEDs (tape drive)

Documentation

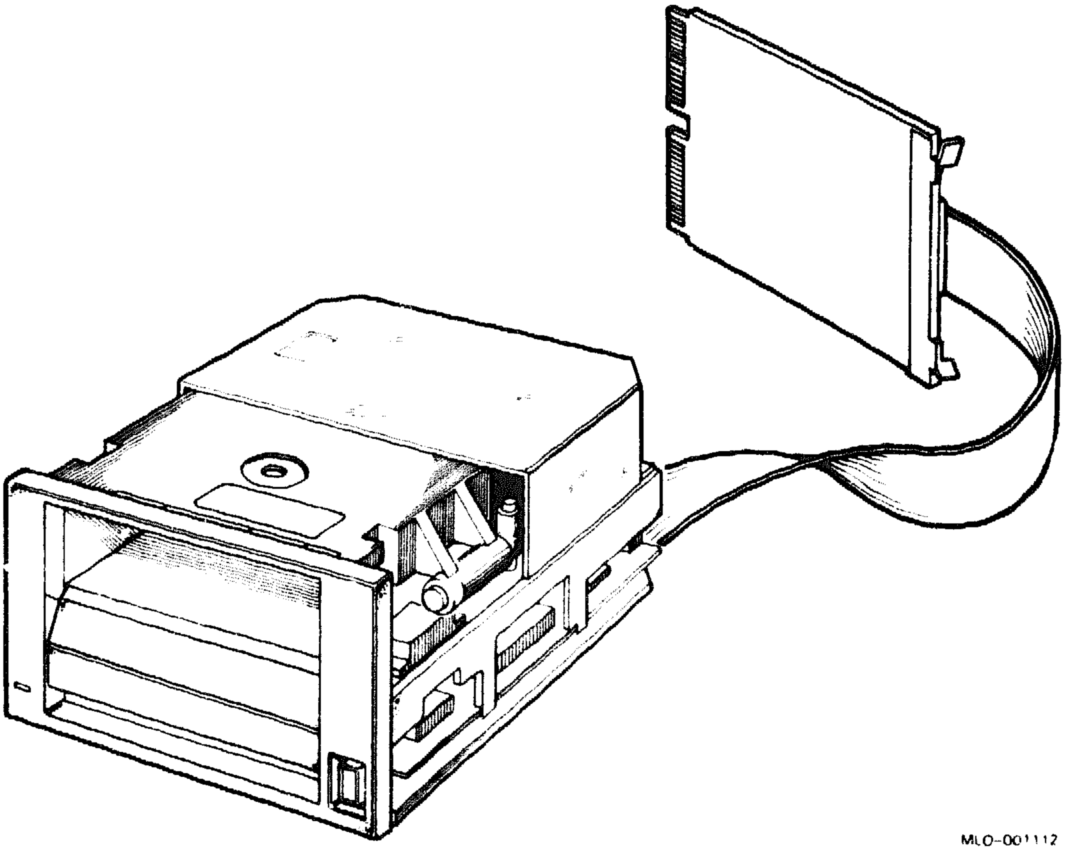
TK50 Tape Drive Subsystem User's Guide	EK-LEP05-OM
TK70 Tape Drive Subsystem Owner's Manual	EK-OTK70-OM

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
TK50-AA	-	1.4	0.0	-	-	-	-
TK50-DA	-	0.0	0.0	-	-	-	-
TK50-RA	-	0.0	0.0	-	-	-	-
TQK50	M7546	3.0	0.0	2.0	1.0	A	-

The TK50, shown in Figure 1, is a streaming tape drive subsystem that provides up to 95 Mbytes of backup data storage on a tape cartridge.

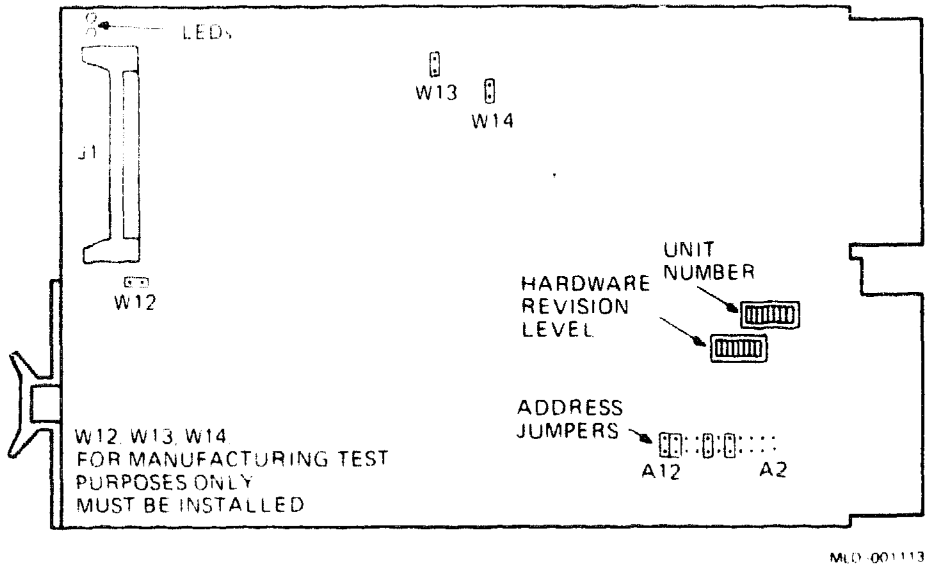
Figure 1: TK50 Tape Drive Subsystem, BA23 and BA123 Enclosures



The TQK50 (M7546) controller module provides the interface between the TK50–AA tape drive and the Q22-bus. The M7546 has two DIP switches, shown in Figure 2, which set the following features:

- Hardware revision level (set at the factory)
- Unit number

Figure 2: TQK50 Module Layout (M7546)



The hardware revision level DIP switch is set to match the module revision level stamped on the back of the module. Make sure the switch setting is correct. The eight switches in this DIP switch represent a binary-weighted value, as listed in the following table:

Revision Level Switch Settings

Revision Level	Switches 1	2	3	...	8
0	0	0	0	...	0
1 (A)	1	0	0	...	0
2 (B)	0	1	0	...	0
3 (C)	1	1	0	...	0
.					
.					
.					
7	1	1	1	...	0

0 = open, 1 = closed
Switch 8 is nearest the module edge.

CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

You can select the unit number by setting the unit number DIP switch. If the MicroVMS operating system is installed, you do not have to change the switch setting. The following table lists the unit number settings:

Unit Number Settings

Unit Number	Switches 1	2	3	...	8	
0	0	0	0	...	0	factory
1	1	0	0	...	0	
2	0	1	0	...	0	
3	1	1	0	...	0	
.						
.						
.						
7	1	1	0	...	0	

0 = open, 1 = closed
Switch 8 is nearest the module edge.

The M7546 controller is a tape mass storage control protocol (TMSCP) device. The CSR address for the first controller is fixed, using jumpers shown in Figure 2. If you add a second subsystem, the CSR address of the second controller floats. The following table lists the fixed CSR address for the first controller and typical settings for a second controller:

Controller Module M7546
Default for first TMSCP device: 17774500

Address Bits (Jumpers*):	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2
CSR Address:											
17774500	1	1	0	0	1	0	1	0	0	0	0
Possible addresses for second controller:											
17760404	0	0	0	0	1	0	0	0	0	0	1
17760444	0	0	0	0	1	0	0	1	0	0	1

1 = jumper installed, 0 = jumper removed
* A2 is the jumper nearest the module edge.

The interrupt vector for the M7546 is fixed at 260, set under program control.

TQK50 Power-Up Tests

Figure 3 shows the LEDs on the TQK50 controller (M7546). Table 1 lists the LED codes and probable FRU failures.

Figure 3: TK50 Module LEDs

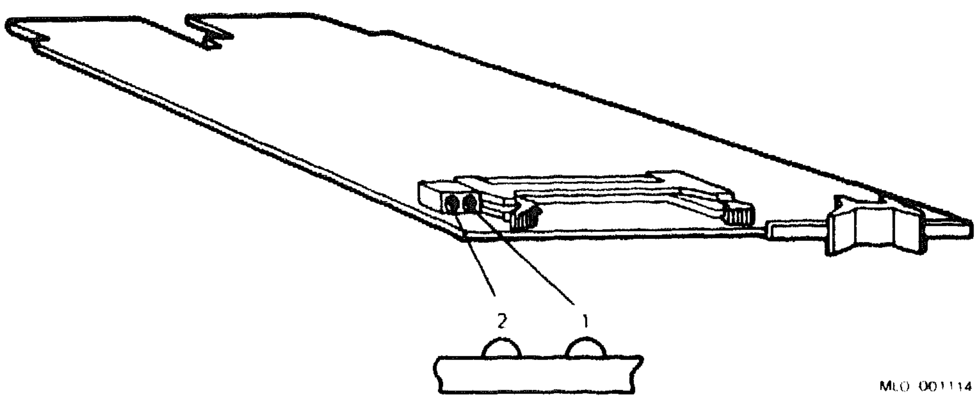


Table 1: TK50 LED Error Codes

LEDs		
2	**1**	**Test and Probable FRU Failures**
On	On	Power-up test 1. TQK50 module
Off	On	U/Q port initialization 1. Controller 2. Interconnect cable 3. TK50 drive
Flashing	Flashing	Fatal error detected by controller. 1. Interconnect cable (incorrectly keyed) 2. Controller 3. TK50 drive
Off	Off	Normal operation

TK70 Tape Drive Subsystem

For BA200-series enclosures, order the TK70 as a system option only.

If you want a complete TK70 subsystem, you must order a TK70 drive and a TQK70 controller subsystem.

Ordering Information

Tape drive, BA200-series	TK70E–SA (factory installed) TK70E–SF (field upgrade)
TQK70 (M7559) controller subsystem	TQK70–SA (factory installed) TQK70–SF (field upgrade)
Tape drive, BA23, BA123, and H9642–J enclosures	TK70–AA
TQK70 (M7559) controller subsystem, plus 75-cm (30-in) cable for BA23	TKQ70–AA
TQK70 (M7559) controller subsystem, plus 75-cm (30-in) cable for BA123	TKQ70–BA

Operating System Support

ULTRIX–32	Version 2.2 and later
VMS	Version 4.6a and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 1.03 (release 103) and later
XXDP	Version 2.1 (release 134) and later: ZTKAE0.BIC, ZTKBC0.BIC.
Power-up self-test LEDs	Two on controller module, two on tape drive

Documentation

TK70 Tape Drive Subsystem Owner's Manual	EK–OTK70–OM

DC Power and Bus Loads

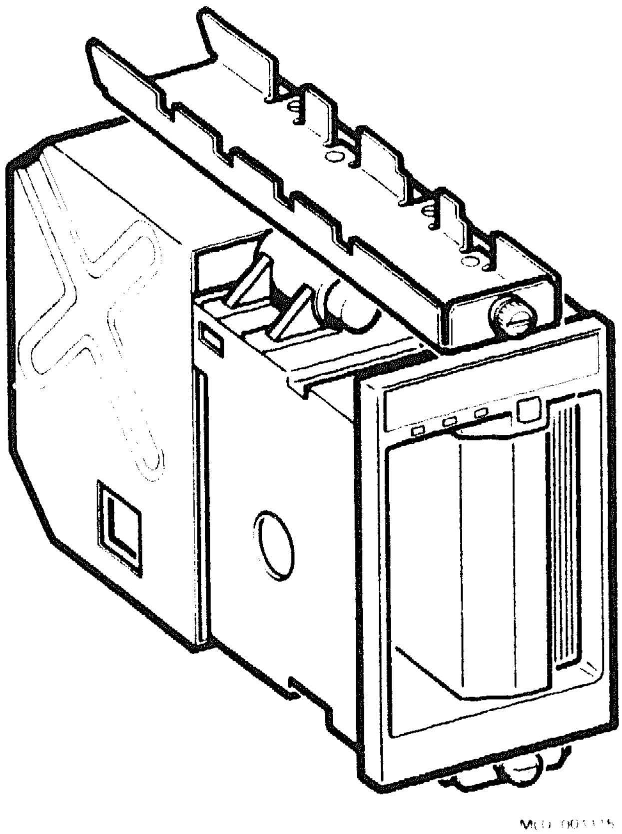
		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
TK70–A	–	1.4	2.4	35.8	–	–	–
TK70E–S	–	1.4	2.4	35.8	–	–	–
TQK70–A	M7559	3.5	–	17.5	2.0	1.0	A
TQK70–S	M7559	3.5	–	17.5	4.3	0.5	–

The TK70 is a streaming tape drive subsystem that provides up to 296 Mbytes of backup data storage on a tape cartridge. Figure 1 shows the TK70 in its installation position, with attached sliding tracks.

The TK70 can read from, but cannot write to, cartridges that have been formatted by a TK50 tape drive. The TK50 tape drive cannot read from cartridges that have been formatted on the TK70 drive.

Digital recommends that you use CompacTape II cartridges with the TK70 drive.

Figure 1: TK70 Tape Drive



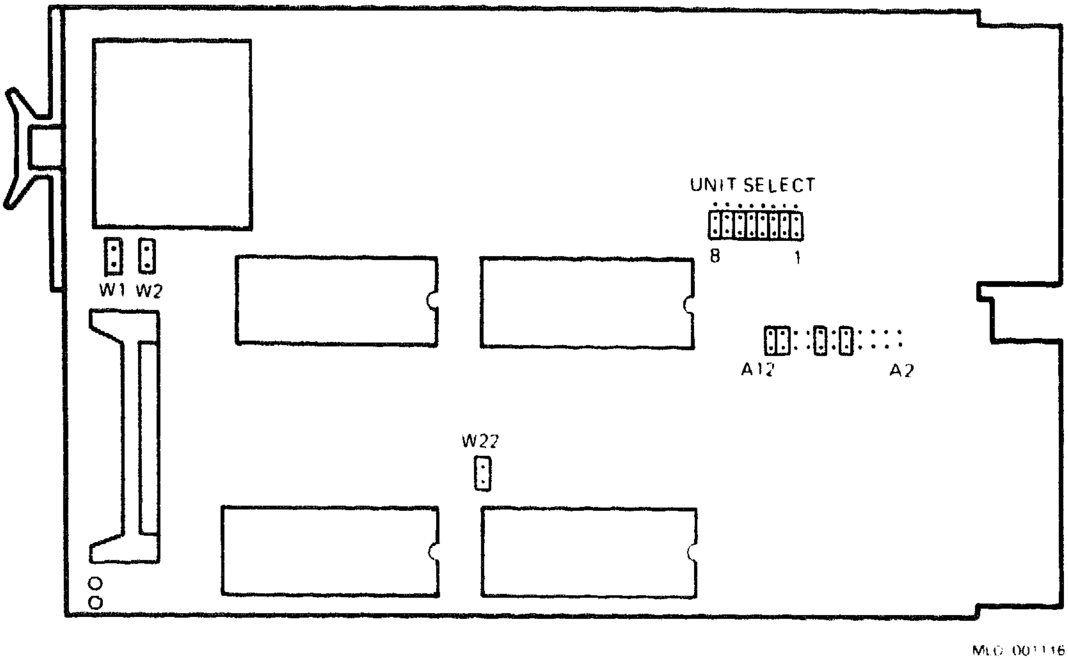
The TQK70 controller module (M7559) provides the interface between the TK70 tape drive and the Q22-bus. The TQK70 has jumpers used to set the following:

- CSR address
- Unit number
- Clock signals

CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29-26246) when you work with the internal parts of a computer system.*

Select the unit number by setting the jumpers shown in Figure 2. If the VMS operating system is installed, you do not have to change the jumper.

Figure 2: TQK70 Module Layout (M7559)



The unit number is set as follows:

Unit Number Settings

Unit Number	Jumpers 8	...	3	2	1
0	0	...	0	0	0
1	0	...	0	0	1
2	0	...	0	1	0
3	0	...	0	1	1
.					
.					
7	0		1	1	1
and so on					

0 = jumper on bottom and center post
1 = jumper on top and center post
(module fingers to the right)

Three other jumpers on the M7559 module are installed by the factory. Their functions are as follows:

- W1: jumper IN connects 9-MHz 80186 CPU clock
- W2: jumper IN connects the 18-MHz system clock
- W22: jumper IN connects a 3-MHz clock to TxCB and RxCB pins (pins 7 and 4)

The M7559 controller is a tape mass storage control protocol (TMSCP) device. The CSR address for the first M7546 is fixed, using jumpers shown in Figure 2. If you add a second TK70 subsystem, the CSR address of the second controller floats. The following table lists the fixed CSR address for the first controller and typical settings for a second controller:

Controller Module M7559 CSR Address: 17774500 (factory position)

Address Bits (Jumpers*):	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2
CSR Address:											
17774500	1	1	0	0	1	0	1	0	0	0	0
Possible addresses for second controller:											
17760404	0	0	0	0	1	0	0	0	0	0	1
17760444	0	0	0	0	1	0	0	1	0	0	1

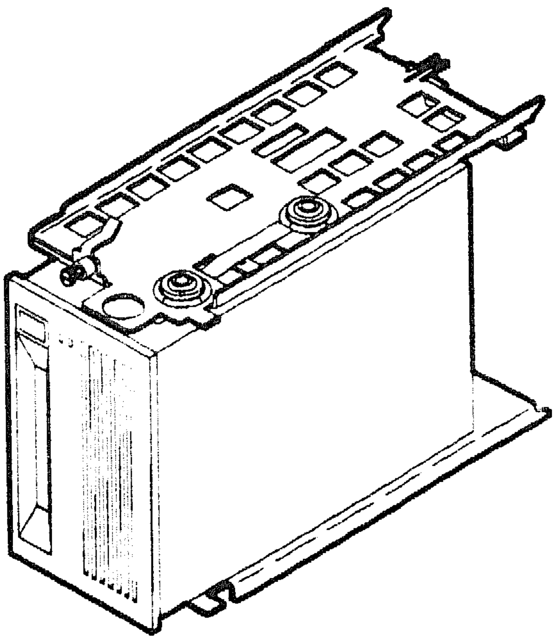
1 = jumper installed, 0 = jumper removed
* A2 is the jumper nearest the module edge.

The interrupt vector is fixed at 260, set under program control.

TLZ04 Tape Drive

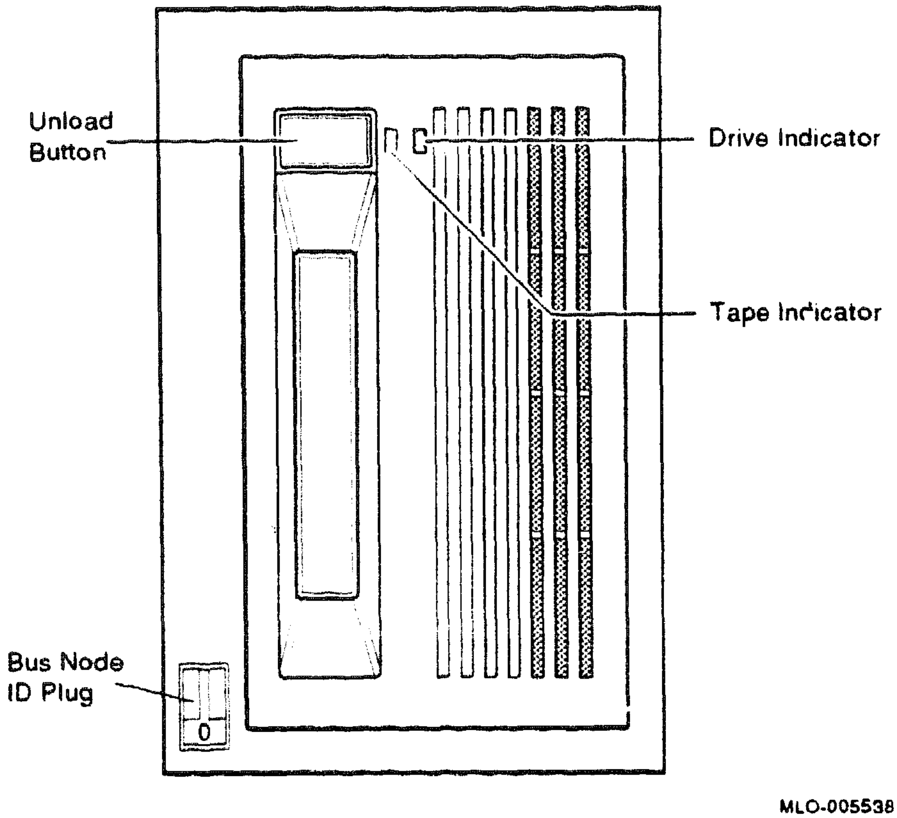
The TLZ04 is a 1.2-Gbyte cassette (DAT) SCSI tape drive, either tabletop or embedded in the VAX 4000 system. The KZQSA controller module is used to interface with the TLZ04 drive.

Figure 1: TLZ04 Tape Drive



MLO-006535

Figure 2: TLZ04 Front Panel



Functional Information	
Recording media	Magnetic tape
Data storage capacity	1.2 Gbytes, unformatted
Mode of operation	Streaming and start/stop
Drive interface	RDAT compatible

Ordering Information	
TLZ04–JA	Embedded (Factory installed) BA400-series
TLZ04–JF	Embedded (Field installed) BA400-series
TLZ04–DA	Tabletop
TLZ04–GA	Tabletop including BC06P cable

Performance

Passes per cassette tape	300
Media	TLZ04–CA cassette tape
Bit density	114 Mbytes/square inch
Transfer rate (sustained)	183 Kbytes/second
Recording format	Digital data storage (DDS)
Cassette capacity	1.2 Gbytes
Read/Write speed	0.87 Kbytes/second
Peak transfer rate, raw	180 Kbytes/second
Peak transfer rate, user data	170 Kbytes/second
Average file access time	20 seconds
Rewinding time	40 seconds

Physical Specifications

Height	10.0 cm (3.8 in) tabletop 8.2 cm (3.35 in) embedded
Width	32.5 cm (12.7 in) tabletop 14.60 cm (5.7 in) embedded
Depth	28.5 cm (11.2 in) tabletop 21.44 cm (8.44 in) embedded
Weight	7.72 kg (17.0 lb) tabletop 2.20 kg (7.72 lb) embedded

Data Organization

Recording technology	Helical scan
Recording method	Digital Data Storage (DDS)
Recording density	61,000 bits/inch
Record size	Variable
Maximum capacity	1.2 Gbytes, formatted
60 m x 4 mm	—

Maintenance

Recommended cleaning	Every 25 hours

Configuration Information

Form factor	Standard 5.25-inch footprint (DAT drive)
Power requirements	90 to 132 V, 1.6 A 198.0 to 264 V, 1.0 A
Power consumption (drive)	40.0 W
Power consumption (tabletop)	230 W

Related Documentation

EK–TLZ04–MM	TLZ04 Tape Drive Subsystem Service Manual
EK–BA400–IN	Tape Drive Subsystem Service Manual
EK–TLZ04–OM	TLZ04 Cassette Tape Drive Owners Manual
AA–DO23C–TE	VAX/VMS Command Language User Guide
AA–Z407B–TE	VAX/VMS Backup Utility Reference Manual
AA–M539A–TE	VAX/VMS Disk and Magnetic Tape Operations
AA–Z424A–TE	VAX/VMS Mount Utility Reference Manual

TLZ06 Cassette Tape Drive Subsystem

The TLZ06 cassette tape drive provides high capacity, off-line, data storage unit. The TLZ06 cassette drive incorporates both digital data storage (DDS) and digital audio tape (DAT).

The TLZ06–DA is the tabletop version which is a compact external unit with a built-in power supply. The storage capacity is 4-mm data cassette tape-dependent. The TLZ06 is compatible with the TLZ04 when used in noncompressed mode and using 60-m cassette tape. Depending on the 4-mm tape used, the TLZ06 can typically store.

Storage Capacity

Tape	No Compression	Compression
TLZ04–DA (60-m)	1.3 Gbytes	-----
TLZ06–DA (90-m)	2.0 Gbytes	4.0 Gbytes

Ordering Information

TLZ06–DA	TLZ06 tabletop tape drive subsystem

Performance

Operating mode	Streaming and start/stop
Sustained transfer rate	183 Kbytes/second (noncompressed)
Burst transfer rate	1.5 Mbytes/second
Burst transfer rate	4.0 Mbytes/second synchronous SCSI transfers
Recording format	Digital data storage (DDS, DC)

Physical Drive Specifications

Height	12 mm (3.5 in)
Width	22.5 mm (5 in)
Depth	29.5 mm (9 in)
Weight	2.2 kg (4.7 lb)

Configuration Information

Bit density	114 Mbytes per inch
Voltage Requirements	100–120Vac
	200–240 Vac @ 1.0 A

Tabletop Electrical Requirements

Electrical interface	SCSI-2
+5 Vdc	1.0 A maximum (including ripple)
+12 Vdc	1.75 A maximum (including ripple)
Maximum 12 Vdc current draw at motor startup	3.5 A
Average steady-state power consumption	20 W
Maximum steady-state power consumption	25 W

Related Documentation

EK-TLZ06-OM	TLZ06 Cassette Tape Drive Owner's Manual
EK-TLZ06-UM	TLZ06 Cassette Tape Drive User's Manual

TLZ06 Switches

SCSI ID	S3	S2	S1
0	0	0	0 (factory set)
1	0	0	1
2	0	1	0
3	0	1	1
4	1	0	0
5	1	0	1
6	1	1	0
7	1	1	1

0=UP, 1=DOWN:

TQK70 Controller

The TQK70 controller module provides the interface between the TK70 tape drive and the Q22-bus.

Functional Information

Controller protocol	TMSCP
Supported drive	TK70
Drives per controller	1
Drive interconnect	Direct
Controllers per system	1 maximum

Ordering Information

TQK70–AA	Controller for TK70E–AF

Performance

Data throughput rate	125 Kbytes/second
Read/Write data transfers	Up to 16-word burst mode DMA, truncated to 8-word burst mode if another device is requesting the bus
Buffer size	64 Kbytes

Configuration Information

Form factor	Dual height
Power requirements	+5 Vdc, 3.5 A
	+12 Vdc, 0.0 A
Power consumption	17.5 W
Bus loads	4.3 ac
	0.5 dc

Related Documentation

EK–OTK70–OM	TK70 Tape Drive Subsystem Owner's Manual
EK–OTK70E–IN	TK70E–SF and TQK70–SF Installation Guide

TS05 Tape Drive

Ordering Information

BA23 Enclosure

TSV05-ZA/ZB	TS05 subsystem in rack mount kit, which includes controller module (TSV05-A), cables, and top access cover.
TSV05-BA/BB	TS05 subsystem mounted in a 106-cm (41.7-in) H9642-type cabinet with controller module.

BA200-Series Enclosures

TSV05-SE/SF	TS05 subsystem mounted in a 106-cm (41.7-in) H9642-type cabinet with controller module
TSV05-SK/SL	TS05 subsystem in rack mount kit, which includes controller module (TSV05-S) and top access cover.

Operating System Support

DSM-11	Version 3.3 and later
Micro/RSX	Version 4.0 and later
Micro/RSTS	Version 2.2 and later
MicroVMS	Version 4.2 and later
RSX-11M	Version 4.3 and later
RSX-11M-PLUS	Version 4.0 and later
RT-11	Version 5.4D and later
ULTRIX-11	Version 3.1 and later
ULTRIX-32m	Version 1.1 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 1.06 (release 106) and later
XXDP	Version 2.1 (release 134) and later: VTSAC0.BIN, VTSBE0.BIN, VTSCD0.BIN, VTSDE0.BIN, VTSED0.BIN, XTSVA0.OBJ
Power-up self-test LEDs	None

Documentation

TS05 Pocket Service Guide	EK-TSV05-PG
TSV05 Tape Transport System User's Guide	EK-TSV05-UG

DC Power and Bus Loads

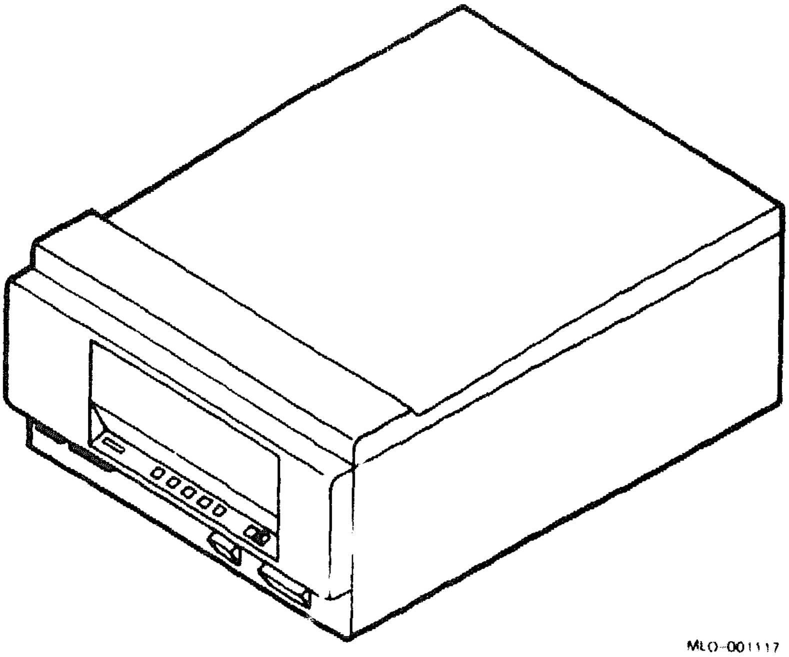
		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
TSV05-A	M7196	6.5	0.0	32.5	3.0	1.0	(2) A
TSV05-S	M7696	6.5	0.0	32.5	3.0	1.0	-

NOTE: *A tape drive system includes two of each type cable and two type A filtered connectors.*

The TS05, shown in Figure 1, is a magnetic streaming tape drive that provides 40.5 Mbytes of backup data storage. You install the TS05 in the top 26.3-cm (10.5-in) mass storage shelf of the H9642-J or H9644 cabinet.

The TS05 reads or writes up to 160 Kbytes/s in standard ANSI format. The drive uses automatic read after write to verify that data is accurately recorded.

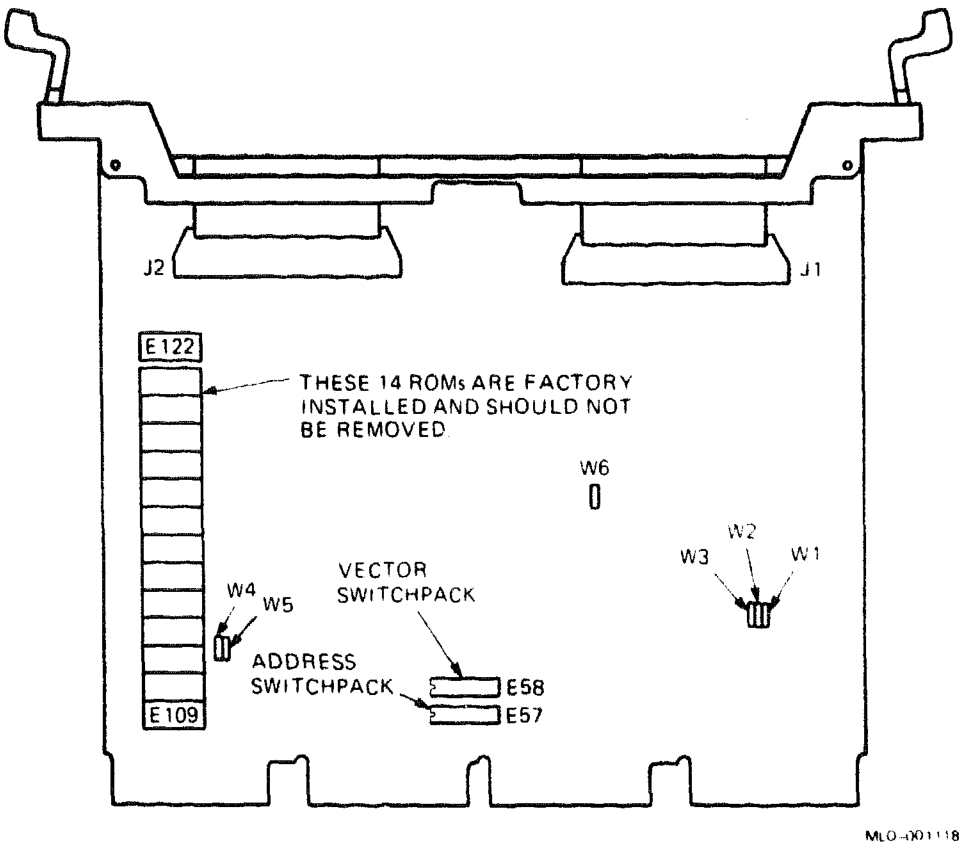
Figure 1: TS05 Tape Drive



Tape data is buffered in 3.5 Kbytes of RAM on the drive's TSV05 controller (M7196). The TSV05 is a tape mass storage control protocol (TMSCP) device.

Figure 2 shows a TSV05 with a BA200-series handle.

Figure 2: TSV05 (M7196) Controller Module (Example)



CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29-26246) when you work with the internal parts of a computer system.*

Use switchpacks E57 and E58 to set the CSR address and interrupt vector for the TSV05 (Figure 2). The following tables list the factory configurations for the CSR address and interrupt vector, which are both fixed:

TSV05 Controller Module (M7196)
CSR Address: 17772520 (factory position)
Switchpack E57 and E58

Address Bits:	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2
Switchpacks:	E58	<-------------			E57	------------------>					
Switches:	10	1	2	3	4	5	6	7	8	9	10
CSR Address:											
17772520	1	0	1	0	1	0	1	0	1	0	0

1 = switch on, 0 = switch off

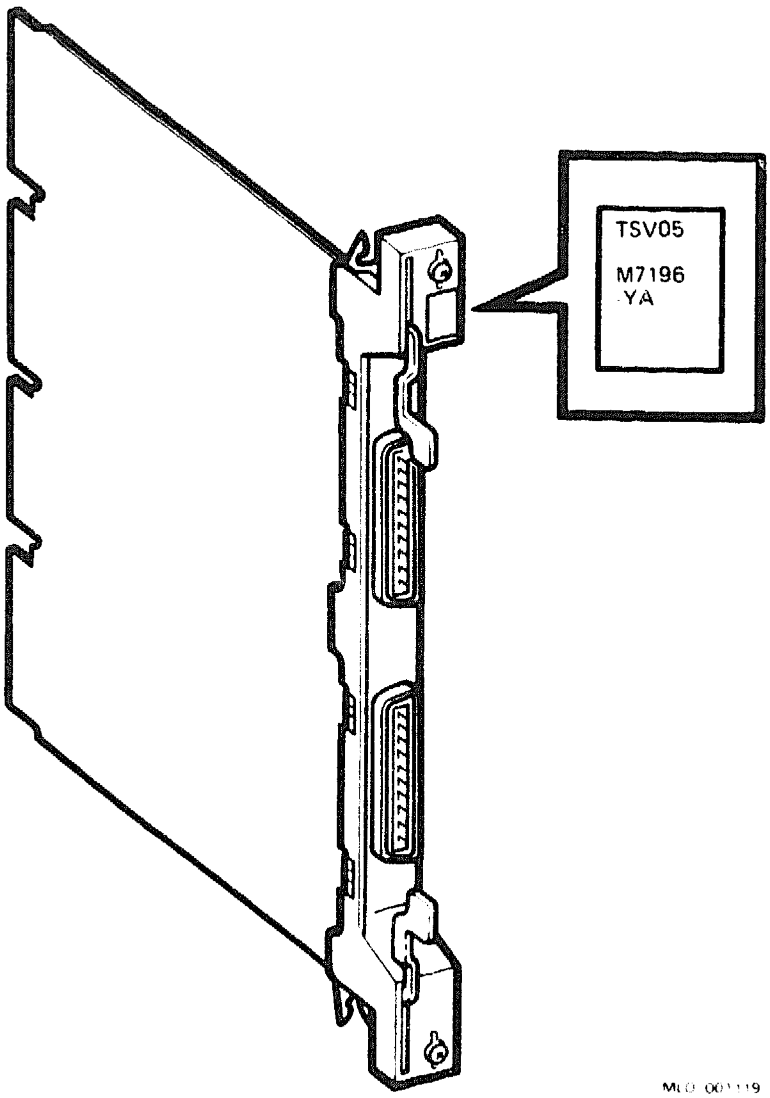
TSV05 Controller Module (M7196)
Interrupt Vector: 224 (factory position)
Switchpack E58

Vector Bits:	V8	V7	V6	V5	V4	V3	V2
E58 Switches:	1	2	3	4	5	6	7
Vector Address:							
224	0	1	0	0	1	0	1

If you use a TSV05 controller in the H9642–J cabinet, you must install it in slot 4 of the top BA23 backplane. The TS05 tape drive connects to the TSV05 controller through two type-A insert panels installed in the H9642–J I/O panel. Two 50-conductor cables run between the TS05 and the insert panels. Two 50-conductor cables also run internally between the insert panels and the TSV05 controller.

If you use a TSV05 controller in the H9644 cabinet, the TS05 tape drive connects to the TSV05 through the TSV05 handle (Figure 3).

Figure 3: TSV05 Module Handle, BA200-Series

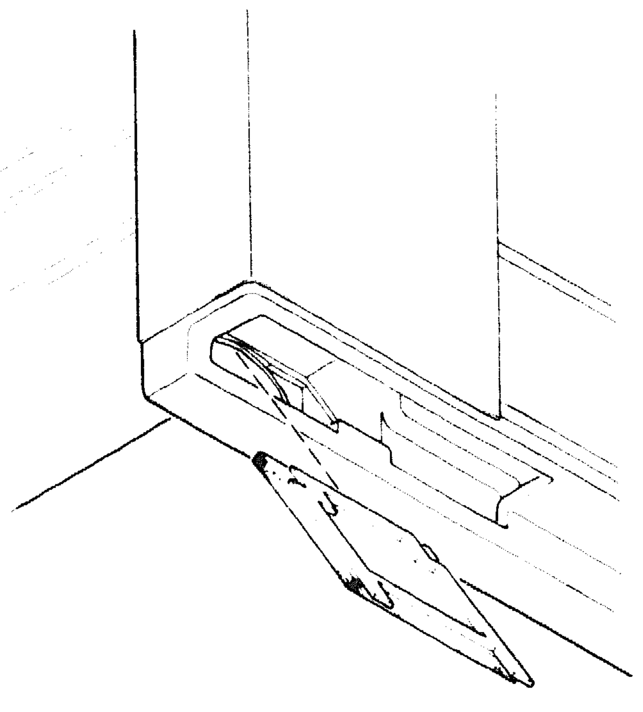


The fan filter is a field replaceable unit (FRU) on the TS05 tape drive. Remove the TS05 fan filter as follows:

1. Remove the TS05 from the cabinet, using the procedure in the appropriate cabinet maintenance documentation.

2. For the TS05 sandcast unit:
   a. Raise the unit to the service access position.
   b. Replace the filter. See Section 5.2.2 of the *TS05 Pocket Service Guide*.
3. For the diecast unit:
   a. Remove the fan filter from inside the air duct opening at the lower-left of the front panel, as shown in Figure 4.
   b. If the fan filter only needs to be cleaned, use low-pressure compressed air or vacuum in the direction opposite to the air flow.

Figure 4: Removing the TS05 Fan Filter



TSZ07 Tape Drive

The TSZ07 is a high-capacity, SCSI, streaming, 9-track, reel-to-reel, half-inch magnetic tape drive with dual recording densities. The TSZ07 is available in tabletop or rack mount models, and cannot be mounted inside the VAX 4000 Model 300 system.

Functional Information	
Recording densities	1600 bits/inch or 6250 bits/inch
Mode of operation	Streaming and start/stop
Storage capacity	40 Mbytes @1600 bpi with 8-Kbyte blocks, formatted
Number of tracks	9 on 0.5-inch magnetic tape
Drive interface	SCSI compatible

Ordering Information	
TSZ07–AA	Rackmount, specify country kit
TSZ07–BA	Cabinet, 120 V
TSZ07–BB	Cabinet, 240 V
TSZ07–CA	Tabletop, specify country kit

Performance	
Transfer rate	4 Mbytes/second
Load/unload time	55 second
Recording speed	100 in/second
Rewinding speed	150 second (with 2400 reel)

Physical Specifications	
Height	26.78 cm (10.50 in), tabletop
Width	50.36 cm (19.75 in), tabletop
Depth	68.85 cm (27.00 in), tabletop
Height	22.32 cm (8.75 in), rackmount
Width	43.35 cm (17.0 in), rackmount
Depth	64.03 cm (25.5 in), rackmount
Height	101.0 cm (40.0 in), cabinet
Width	56.10 cm (22.0 in), cabinet
Depth	76.50 cm (30.0 in), cabinet

TSZ07 Tape Drive

Physical Specifications	
Weight	7.72 kg (17 lb), tabletop 2.20 kg (7.72 lb), embedded

Maintenance	
Recommended cleaning	Every 25 hours

Configuration Information	
Form factor	5.25-inch DAT drive
Power consumption	50.0 W, tabletop 50.0 W, rackmount

Related Documentation	
EK–TSZ07–IN–001	TSZ07 Installation/Owner's Manual
EK–TSZ07–TM–001	TSZ07 Technical Manual

TZ85 Cartridge Tape Subsystem

The TZ85 series of SCSI cartridge tape subsystems are primarily used as backup storage devices and as devices for loading software onto Digital computer systems. The transfer rate of 800 Kbytes/second o·, a single cartridge (unattended).

The TZ85 tape subsystem is a streaming tape device with a sustained transfer rate of up to 800 Kbytes/second, and up to 2.6 Gbytes of formatted capacity on a single cartridge.

Storage Capacity	
User Cartridge Capacity Formatted	2.6 Gbytes

Ordering Information	
TZ85–JA	Embedded (Factory installed) BA400 Series
TZ85–JF	Embedded (Field installed) BA400 Series
TZ85–TA	Tabletop model for SCSI based systems.

Performance	
CompacTape EYE Length	36,000 cm (1200 ft)
CompacTape EYE Width	10.8 cm (4.25 in)
Number of tracks	24 pairs (48)
Tape speed	100 inches/second, streaming
Bit density	42,500 bits per inch
Track density	96 tracks/in (48 tracks)
Track format	Two-track parallel, serpentine recording
Transfer rate, raw	1.1 Mbytes/second
Sustained transfer rate, user data	.8 Mbytes/second
Peak transfer rate	On SCSI-2 bus = 4.0 Mbytes/second (sync mode)

Tabletop Power Requirements	
Form factor	Tabletop
	+5 Vdc @ 3.5 A (75 mV ripple peak-to-peak)
	+12 Vdc @ 1.2 A (1.5 A surge)
Power consumption	56.4 W maximum
	29.7 W typical
	35 W average
Line type	Molex 5129–4A
Peak in-rush	50 A
Line frequency	47–63 Hz

Tabletop Power Requirements

Line type	Single-phase AC

Data Organization

Recording format	48 track serial serpentine fixed block
Recording density	42,500 bpi
Recording method	MFM, but serial data
Track density	96 tracks/inch
Normal track spacing	8.5 mils
Read-write head	Two channel ferrite, servo-controller
Record size	Variable up to (64 Kbytes - 1 Mbytes) 4 Kbyte blocking factor
Read-write gap (spacing)	.21 inches +/- .001 inches

Cartridge Specifications

Height	2.54 cm (1.0 in), drive only
Width	10.54 cm (4.15 in)
Length	10.57 cm (4.165 in)
Weight	226 grams (8 ounces)

Enclosure Specifications

Height	14.48 cm (5.7 in), drive only
Width	11.43 cm (4.5in)
Length	22.86 cm (9.0 in)
Weight	3.15 kg (7 pounds)

TZ85 Tabletop Specifications

Height	14.53 cm (5.7 in), drive only
Width	23.50 cm (9.25 in)
Length	33.22 cm (13.08 in)
Weight (box)	4.5 kg (10 pounds)
Weight (tabletop)	7.2 kg (17 pounds)

Related Documentation

EK-OTK85-RC	Tx85 Tape Drive Operator's Reference Card
AA-Z407B-TE	VAX/VMS Backup Utility Reference Manual
AI-Y506B-TE	Guide to VAX/VMS Disk and Magnetic Tape Operations
AA-Z424A-TE	VAX/VMS Mount Utility Reference Manual

Related Supplies

TK85K-01	Data cartridge
TK85K-07	Data Cartridge, quantity 7
TK85-HC	Head cleaner
TK85-M	SZ100 cartridge magazine
BC56H-3F	Three-foot 68-pin to 50-pin positive SCSI adapter cable assembly
BC56H-6F	Six-foot 68-pin to 50-pin positive SCSI adapter cable assembly
BC56H-9F	Nine-foot 68-pin to 50-pin positive SCSI adapter cable assembly

TZ857 Magazine Tape Subsystem

The TZ857 magazine ta,)e subsystem is an electromechanical device that can store approximately 18.2 Gbytes of data. Using CompacTape EYE cartridges, the TZ857 subsystem can store up to 2.6 Gbytes of data per cartridge.

The TZ857 magazine tape subsystem can load or unload tape cartridges into and from a tape drive providing unattended backup as well as performing single cartridge operations. The TZ857 performs automatic, sequential tape operations.

In addition, the TZ857 subsystem executes operating system commands, qualifiers, and parameters to store data from user disk areas to the tape drive.

Storage Capacity	
Magazine Capacity Formatted	18.2 Gbytes

Performance	
Cartridge capacity	2.6 Gbytes
CompacTape EYE Length	36,576 cm (1200 ft)
CompacTape EYE Width	10.7 cm (4.25 in)
Number of Tracks	24 pairs (48)
Operating mode	Streaming
Tape speed	100 inches /second
Bit density	42,500 bits per inch
Track density	96 tracks/in (48 tracks)
Track format	Two-track parallel, serpentine recording
Transfer rate	Up to 800 Kbytes per second

Magazine Characteristics	
Height	21.9 cm (8.62 in)
Width	13.3 cm (5.22 in)
Length	11.74 cm (4.646 in)
Weight (empty)	0.58 kg (1.3 lbs)
Weight (loaded)	2.03 kg (4.5 lbs)

Power Requirements

Form factor	
Voltage normal	120 Vac/230 Vac
Voltage minimum	90 Vac/180 Vac
Voltage maximum	135 Vac/270 Vac
Power consumption	83.5 W maximum, 82 W typical
Peak in-rush	50 A
Line frequency	47-63 Hertz
Line type	Single-phase AC
Electrical rate	100-120 Vac @ 2.0 A, 220-240 Vdc @ 1.0 A

Physical Specifications

Height	26.47 cm (10.42 inches)
Length	64.77 cm (25.5 inches)
Width	22.20 cm (8.74 inches)
Weight	24.9 kg
Noise level	62 dB

Related Documentation

EK-TF857-OM	TX857 Series Magazine Tape Subsystem Owners Manual
EK-OTK85-RC	Tx85 Tape Drive Operator's Reference Card
AA-Z407B-TE	VAX/VMS Backup Utility Reference Manual
AI-Y506B-TE	Guide to VAX/VMX Disk and Magnetic Tape Operations
AA-Z424A-TE	VAX/VMX Mount Utility Reference Manual

Related Supplies

TK85K-01	Data cartridge
TK85K-07	Data Cartridge, quantity 7
TK85-HC	Head cleaner
TK85-M	SZ100 cartridge magazine
BC56H-3F	Three-foot 68-pin to 50-pin positive SCSI adapter cable assembly
BC56H-6F	Six-foot 68-pin to 50-pin positive SCSI adapter cable assembly
BC56H-9F	Nine-foot 68-pin to 50-pin positive SCSI adapter cable assembly

TU81–PLUS Tape Drive

Ordering Information

	120 V, 60 Hz	240 V, 50 Hz
TU81–PLUS tape drive subsystem	TU81–PLUS	TU81–PLUS
TU81–PLUS tape drive	–	–
KLESI–S adapter module for BA200-series	M7740–PA	M7740–PA
KLESI–A adapter module for BA23	M7740	M7740
90-cm (36-in) cable to signal distribution	70–19923–04	70–19923–04
Cable from signal distribution to drive	BC17Y–xx	BC17Y–xx
I/O panel insert	74–28666–01	74–28666–01

Operating System Support

MicroVMS	Version 4.3 buffer support only by backup utility
MicroVMS	Version 4.4 and later
RSTS/E	Version 9.5 and later
RSX–11M	Version 4.3 and later
RSX–11M–PLUS	Version 4.0 and later
RT–11	Version 5.4D and later
ULTRIX–11	Version 3.1 and later
ULTRIX–32m	Version 1.2 and later
VAXELN	Version 2.3 and later

Diagnostic Support

MicroVAX Diagnostic Monitor	Version 1.14 (release 114) and later
XXDP	Version 2.1 (release 134) and later: ZTU1A0.BIN, XTUCB0.OBJ
Power-up self-tests	None

Documentation

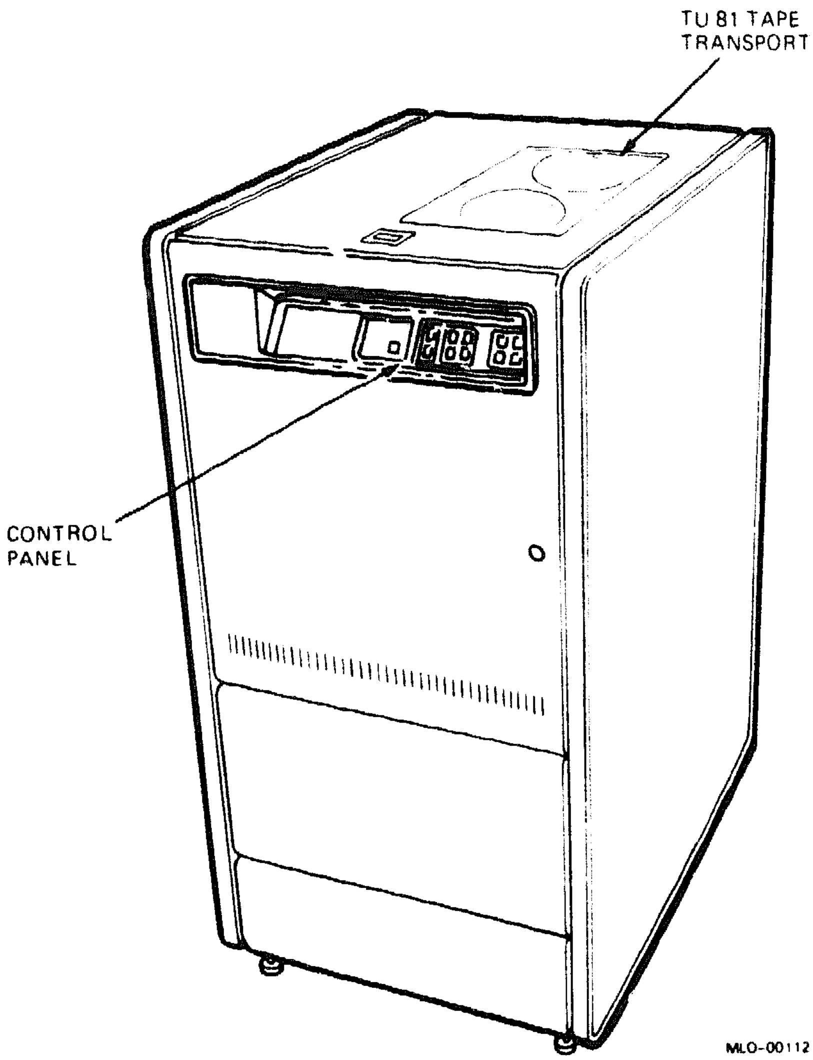
TU81/TA81 Tape Subsystem User's Guide	EK–TUA81–UG
TU81/TA81 Tape Subsystem Technical Manual	EK–TUA81–TM
TU81 Magnetic Tape Subsystem Pocket Service Guide	EK–OTU81–PS

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
KLESI–A	M7740	3.0	0.0	15.0	2.3	1.0	A
KLESI–S	M7740–PA	3.0	0.0	15.0	2.3	1.0	–

The TU81–PLUS, shown in Figure 1, is a dual-speed, 9-track magnetic streaming tape subsystem. The drive is microprocessor-controlled and includes a 256-Kbyte cache buffer memory. The buffer increases the amount of time that the drive is streaming, which reduces backup and copy time.

Figure 1: TU81–PLUS Drive in an H9643 Enclosure



The TU81–PLUS is installed in a separate 48.3-cm (19-in) H9643 rack mount cabinet, similar to the H9642–J. For removal and replacement procedures, see the *TU81 Magnetic Tape Subsystem Pocket Service Guide.*

CAUTION: *Static electricity can damage integrated circuits. Use the wrist strap and antistatic mat found in the Antistatic Kit (29–26246) when you work with the internal parts of a computer system.*

The TU81–E subsystem includes a KLESI Q22-bus adapter module, two cables, and an I/O panel insert. You set the CSR address for the KLESI module (M7740) by using DIP switch E58 (Figure 2 for BA200-series enclosures; Figure 3 for the BA23 enclosure). The table under Figure 3 lists the CSR address to use. The interrupt vector is set under program control.

NOTE: *When you order a KLESI module, check the setting of the CSR address. If necessary, reset the CSR address before installing the module.*

The TU81–PLUS drive is powered by the 874–D (120 V, 60 Hz) or the 874–F (240 V, 50 Hz) power controller. The drive uses 300 VA when loaded or on standby, and up to 550 VA when starting and stopping.

Figure 2: KLESI Module Layout (M7740), BA200-Series

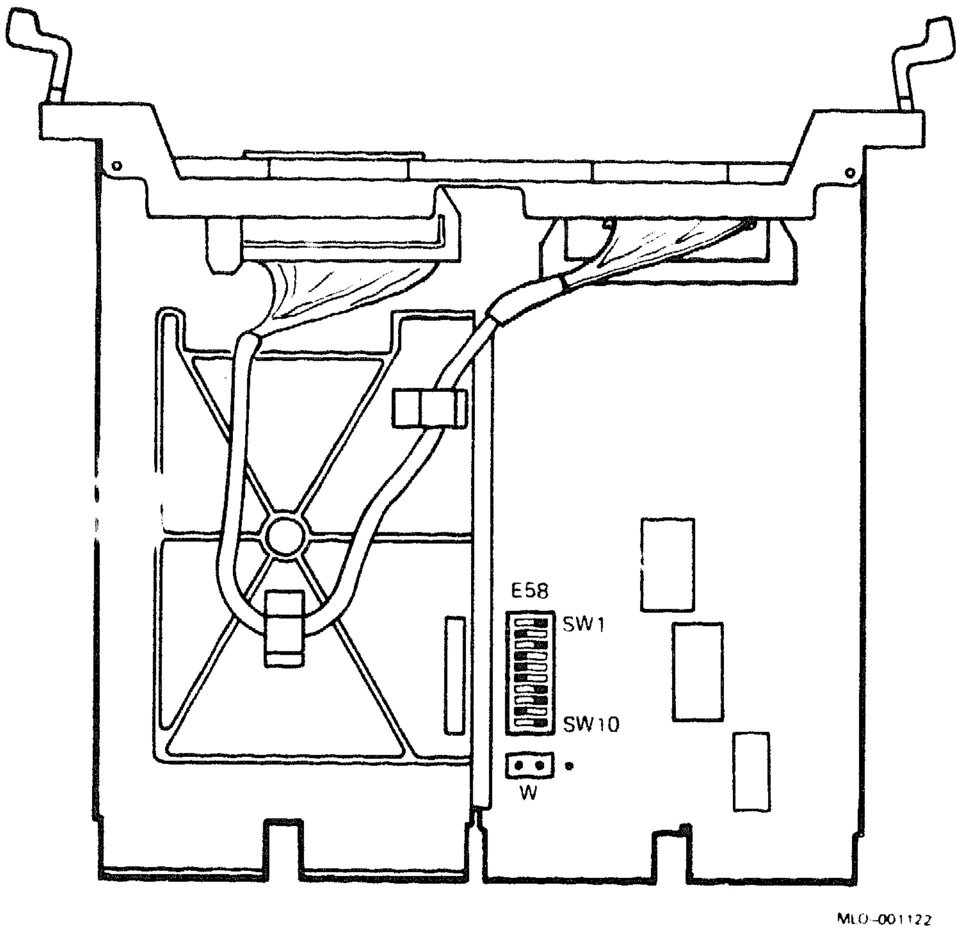
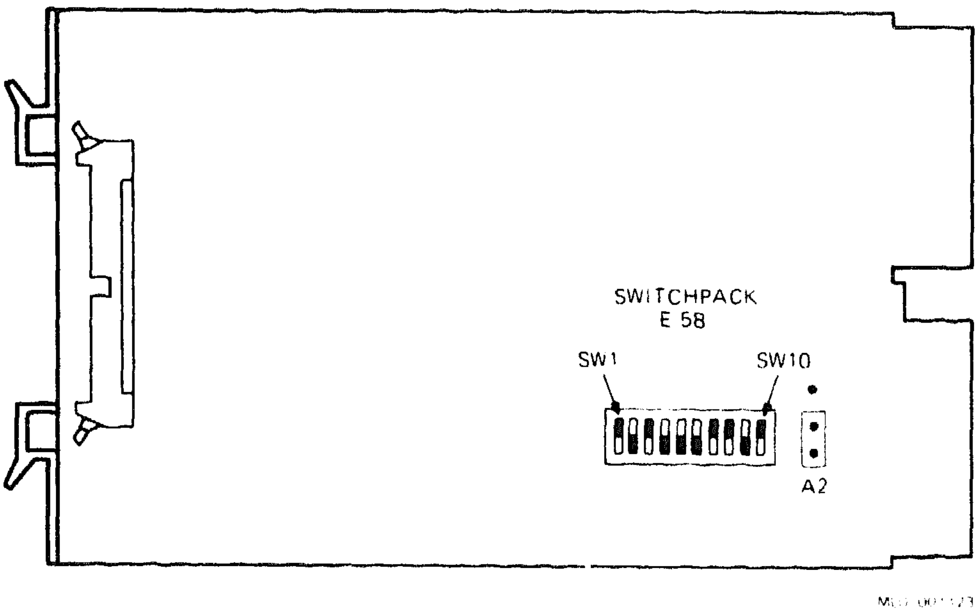


Figure 3: KLESI Module Layout (M7740)



KLESI (M7740) CSR Address: 17774500 (factory position)
Switchpack E58

Address Bits:	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2
	<----------			E58	Switches		----------		-->	Jumper	
	1	2	3	4	5	6	7	8	9	10	W
CSR Address: 17774500	1	1	0	0	1	0	1	0	0	0	0*

1 = switch on, 0 = switch off

* 0 = jumper on left and center pin (module edge facing you)
1 = jumper on right and center pin

VCB02 Video Subsystem

The VCB02 is a full-page, high-resolution DMA color video subsystem capable of 8-plane color video memory display.

Ordering Information

VCB02–CA	Base module and two 4-plane modules

Configuration Information

Form factor	Quad height
Power requirements	Base module at +5 Vdc, 5.8 A (typical) Base module at +12 Vdc, 0.7 A (typical) 4-plane module at +5 Vdc, 3.4 A (typical)

DC Power and Bus Loads

		Current (Amps)		Power	Bus Loads		
Option	**Module**	**+5 V**	**+12 V**	**Watts**	**AC**	**DC**	**Insert**
VCB02–SA	M7168 M7169	12.0	0.47	65.64	3.5	0.1	B

A

Related Documentation

The following documents contain information relating to MicroVAX or MicroPDP–11 systems and supported options for the BA400 series enclosures.

Document Title	Order Number
Module Options	
CXA16 Technical Manual	EK–CAB16–TM
CXY08 Technical Manual	EK–CXY08–TM
DEC FDDIcontroller/Q–bus Installation	EK–DEFQA–IN
DEQNA Ethernet User's Guide	EK–DEQNA–UG
DESQA Ethernet Adapter Option Installation Guide	EK–DEQNA–IN
DESQA Technical Manual	EK–DEQNA–TM
DHV11 Technical Manual	EK–DHV11–TM
DLV11–J User's Guide	EK–DLV1J–UG
DMV11 Synchronous Controller Technical Manual	EK–DMV11–TM
DMV11 Synchronous Controller User's Guide	EK–DMV11–UG
DPV11 Synchronous Controller Technical Manual	EK–DPV11–TM
DPV11 Synchronous Controller User's Guide	EK–DPV11–UG
DRV11–J Interface User's Manual	EK–DRV1J–UG
DRV11–WA General Purpose DMA User's Guide	EK–DRVWA–UG
DTC05 DECvoice Multivoice	EK–DTC05–UG
DZQ11 Asynchronous Multiplexer Technical Manual	EK–DZQ11–TM
DZQ11 Asynchronous Multiplexer User's Guide	EK–DZQ11–UG
DZV11 Asynchronous Multiplexer Technical Manual	EK–DZV11–TM

Document Title	Order Number
Module Options	
DZV11 Asynchronous Multiplexer User's Guide	EK-DZV11-UG
IBQ01 BITBUS Controller Technical Manual	EK-IBQ01-TM
IBQ01 BITBUS Controller Users Guide	EK-IBQ01-UG
IBQ01 Option Installation Guide	EK-IBQ01-IN
IEU11-A/IEQ11-A User's Guide	EK-IEUQ1-UG
KA630-AA CPU Module User's Guide	EK-KA630-UG
KA640-AA CPU Module User's Guide	EK-KA640-UG
KA650-AA CPU Module User's Guide	EK-KA650-UG
KDA50-Q CPU Module User's Guide	EK-KDA5Q-UG
KDJ11-B CPU Module User's Guide	EK-KDJ1B-UG
KDJ11-D/S CPU Module User's Guide	EK-KDJ1D-UG
KDF11-BA User's Guide	EK-KDFEB-UG
KFQSA Installation Guide	EK-KFQSA-IN
KMV11 Programmable Communications Controller User's Guide	EK-KMV11-UG
KMV11 Programmable Communications Controller Technical Manual	EK-KMV11-TM
LSI-11 Analog System User's Guide	EK-AXV11-UG
MRV11-D Universal PROM Module Users Guide	EK-MRV1D-UG
Q-Bus DMA Analog System User's Guide	EK-AV11D-UG
RQDX2 Controller Module User's Guide	EK-RQDX2-UG
RQDX3 Controller Module User's Guide	EK-RQDX3-UG

Document Title	Order Number
Disk and Tape Drives	
BA400 Enclosures Storage Devices Installation Procedures	EK–BA44A–IN
DECarray Installation Guide	EK–SF2XX–IG
EF51R, EF52R, EF53 Solid State Disk User Guide	EK–EF5XX–UG
EF5xx-Series Solid State Disk Service Guide	EK–EF5XX–SG
EF5xx-Series Solid State Disk User Guide	EK–EF5XX–UG
RA60 Disk Drive Service Manual	EK–ORA60–SV
RA60 Disk Drive User Guide	EK–ORA60–UG
RA81 Disk Drive Service Manual	EK–ORA81–SV
RA81 Disk Drive User Guide	EK–ORA81–UG
RA90 Disk Drive Service Manual	EK–ORA90–SV
RA90 Disk Drive User Guide	EK–ORA90–UG
RC25 Disk Subsystem User Guide	EK–ORC25–UG
RC25 Disk Subsystem Pocket Service Guide	EK–ORC25–PS
RF30 Integrated Storage Element	EK–RF30D–UG
RF30 Integrated Storage Element Installation Guide	EK–RF30D–IN
RF31F Integrated Storage Element User Guide	EK–RF31F–UG
RF31T Integrated Storage Element User Guide	EK–RF31T–UG
RF35E/RF352 Integrated Storage Element User Guide	EK–RF35E–UG
RF35T Integrated Storage Element User Guide	EK–RF35T–UG
RF71 Integrated Storage Element Users Guide	EK–RF71D–UG
RF Series Integrated Storage Element Installation in BA200 Series Enclosures	EK–RF72D–IM
RF Series Integrated Storage Element Pocket Service Guide	EK–RFSIS–PS
RF Series Integrated Storage Element User Guide	EK–RF72D–UG
RRD50 Subsystem Pocket Service Guide	EK–RRD50–PS
RRD50 Digital Disc Drive User's Guide	EK–RRD50–UG
RWZ01 Magneto Optical Disk Subsystem Maintenance Guide	EK–RWZ01– MG
RWZ01 Magneto Optical Disk Subsystem User's Guide	EK–RWZ01–UG
RX33 Technical Description Manual	EK–RX33T–TM

Document Title	Order Number
Disk and Tape Drives	
RX50–D, –R Dual Flexible Disk Drive Subsystem Owner's Manual	EK–LEP01–OM
RZ58 Integrated Storage Element Users Guide	EK–RZ58–UG
RZ85 Integrated Storage Element Users Guide	EK–RZ85–UG
RRD40 Subsystem Optical Disc Drive Owner's Manual	EK–RRD40–OM
SA482 Storage Array Service Manual (for RA82)	EK–SA482–SV
SA482 Storage Array User Guide (for RA82)	EK–SA482–UG
SF106 Storage Array Installation Guide	EK–SF106–IN
TF85 Reference Card	EK-OTF85-RC
TF85 Cartridge Tape Subsystem Owner's Manual	EK–TF85–OM
TF857 Magazine Tape Subsystem Service Manual	EK–TK857–SM
Installing the TF86 Tabletop Cartridge Tape Subsystem	EK–TF86T–IG
Tx86 Tape Drive Operator's Reference Card	EK–OTK86–RC
Tx86 Series Cartridge Tape Subsystem Owner's Manual	EK–OTX86–OM
Tx867 Series Magazine Tape Subsystem Owner's Manual	EK–TX867–OM
TK50 Tape Drive Subsystem User's Guide	EK–LEP05–UG
TK70E–SF & TQK70–SF Installation Guide	EK–TK70E–IN
TK70 Tape Drive Owner's Manual	EK–OTK70–OM
TKZ60 Cartridge Tape Subsystem User's Guide	EK–TKZ60–UG
TLZ06 DAT Drive Owner's Manual	EK–TLZ06–OM
TS05 Tape Transport Pocket Service Guide	EK–TSV05–PS
TS05 Tape Transport Subsystem Technical Manual	EK–TSV05–TM
TS05 Tape Transport System User's Guide	EK–TSV05–UG
TZ85 Cartridge Tape Subsystem Owner's Manual	EK–TZ85–OM
TZ85 Reference Card	EK–OTZ85–RC
TZ857 Magazine Tape Subsystem Service Manual	EK–TZ857–SM

Document Title	Order Number
Systems	
630QB Maintenance Print Set	MP-02071-01
630QE Maintenance Print Set	MP-02219-01
630QY Maintenance Print Set	MP-02065-01
630QZ Maintenance Print Set	MP-02068-01
BA23 Enclosure Maintenance	EK-186AA-MG
BA123 Enclosure Maintenance	EK-188AA-MG
BA213 Enclosure Maintenance	EK-189AA-MG
BA214 Enclosure Maintenance	EK-190AA-MG
BA215 Enclosure Maintenance	EK-191AA-MG
H9642 Cabinet Maintenance	EK-187AA-MG
H9644 Cabinet Maintenance	EK-221AA-MG
KA630 CPU System Maintenance	EK-178AA-MG
KA640 CPU System Maintenance	EK-179AA-MG
KA650 CPU System Maintenance	EK-180AA-MG
KA675/KA680/KA690 CPU System Maintenance	EK-454AA-MG
KDF11-B CPU System Maintenance	EK-245AA-MG
KDJ11-D CPU System Maintenance	EK-247AA-MG
KDJ11-B/S CPU System Maintenance	EK-246AA-MG
MicroPDP-11 Hardware Information Kit (for BA23)	00-ZYAAA-GZ
MicroPDP-11 Hardware Information Kit (for BA123)	00-ZYAAB-GZ
MicroPDP-11 Hardware Information Kit (for H9642)	00-ZYAAE-GZ
MicroPDP-11 Hardware Information Kit (for BA213)	00-ZYAAS-GZ
Microsystems Options	EK-192AB-MG
Microsystems Site Preparation Guide	EK-O67AB-PG
MicroVAX II Hardware Information Kit (for BA23)	00-ZNAAA-GZ
MicroVAX II Hardware Information Kit (for BA123)	00-ZNAAB-GZ
MicroVAX II Hardware Information Kit (for H9642)	00-ZNAAE-GZ

Document Title	Order Number
Systems	
MicroVAX 3500 Customer Hardware Information Kit	00–ZNAES–GZ
MicroVAX 3600 Customer Hardware Information Kit (for H9644)	00–ZNAEF–GZ
VAXstation 3200 Owner's Manual (BA23)	EK–154AA–OW
VAXstation 3500 Owner's Manual (BA213)	EK–171AA–OW
VAXstation II/GPX Owner's Manual (BA23)	EK–106AA–OW
VAXstation II/GPX Owner's Manual (BA123)	EK–105AA–OW
Diagnostics	
DEC/X11 Reference Card	AV–F145A–MC
DEC/X11 User's Manual	AC–FO53D–MC
MicroVAX Diagnostic Monitor Ethernet Server User's Guide	AA–FNTAF–DN
MicroVAX Diagnostic Monitor Reference Card	AV–FMXAC–DN
MicroVAX Diagnostic Monitor User's Guide	AA–FM7AE–DN
XXDP DEC/X11 Quick Reference Guide	AA–FK84A–TE
XXDP User's Manual	AA–FK83A–TE
Networks	
Ethernet Transceiver Tester User's Manual	EK–ETHTT–UG
VAX/VMS Networking Manual	AA–Y512C–TE
VAX NI Exerciser User's Guide	AA–HI06A–TE

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	613–592–5111 (for hardware documentation)	
Internal orders (for software documentation)	DTN: 241–3023 508–874–3023	Software Supply Business (SSB) Digital Equipment Corporation Westminster MA 01473
Internal orders (for hardware documentation)	DTN: 234–4323 508–351–4323	Publishing & Circulation Services (P&CS) NRO3–1/W3 Digital Equipment Corporation Northboro MA 01532