KDF11–B CPU System Maintenance

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Preface

This guide describes a base system, configuration, ROM-based diagnostics, and troubleshooting procedures for systems containing the KDF11–B central processing unit (CPU).

Intended Audience

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

Organization

This guide has three chapters and two appendixes.

Chapter 1 provides an overview of the KDF11–B CPU and the MSV11–P and MSV11–Q memory modules.

Chapter 2 contains system configuration guidelines and lists current, power, and bus loads for supported options.

Chapter 3 contains ROM-based diagnostic troubleshooting procedures for systems containing the KDF11–B CPU.

Appendix A explains how to format RD- and RX-series disk drives in MicroPDP–11 systems.

Appendix B 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.

Chapter 1
KDF11–B CPU Description

1.1 Introduction

This chapter describes the KDF11–B CPU modules. There are five variants, which differ in ROM code:

- KDF11–BA
- KDF11–BE
- KDF11–BF
- KDF11–BH
- KDF11–BJ

The KDF11–BJ is the newest module, and replaces the KDF11–BH. Unless otherwise stated, the term KDF11–B refers to all five variants.

This chapter also describes the MSV11–P and MSV11–Q memory modules.

The KDF11–B is designed for systems that use the extended LSI–11 bus, commonly called the Q22-bus. The KDF11–B CPU uses MSV11–P or MSV11–Q memory modules and a set of standard Q22-bus options.

1.2 KDF11–B Overview

The KDF11–B module is a quad-height processor with the following features:

- Four interrupt levels
- Memory management unit (MMU) chip
- Socketed (removable) boot and diagnostic ROMs
- Line frequency clock
- Two 40-pin chip sockets for installing an optional floating-point processor (FPP) chip and/or a commercial instruction set (CIS) chip
- Five light-emitting diodes (LEDs) for power and diagnostic status

The KDF11–B Q22-bus systems are listed in Table 1–1.

Table 1–1: KDF11–B Q22-Bus Systems

CPU	Module	System	Enclosure
KDF11–BA	M8189	PDP–11/23 PLUS	BA11
KDF11–BE/–BF/–BH/–BJ	M8189	MicroPDP–11/23	BA23

A MicroPDP–11/23 system contains a KDF11–B CPU module; one or more MSV11–P or MSV11–Q memory modules; an RQDX1, RQDX2, or RQDX3 controller module with RD- or RX-series disk drives; and a communications module (usually the DZV11). A TQK50 controller module supporting a TK50 tape drive may also be present on the KDF11–BH and –BJ.

A PDP–11/23 PLUS system contains a KDF11–BA CPU module. The KDF11–BA CPU can be upgraded to a KDF11–BJ by changing jumpers and installing new ROMs.

You can determine the KDF11–B CPU type as follows:

- Check the power-up self-test messages displayed on the console terminal at power-up, as shown in Examples 1–1, 1–2, and 1–3.
- Check the ROMs installed on the KDF11–B, as listed in Table 1–2.
- Check the jumper settings described in Section 1.2.2.

Example 1–1: KDF11–BA Start-up Message

```
Testing Memory
256 KW
Start?
```

Example 1–2: KDF11–BE or –BF Start-up Message

```
KDF11-B ROM X0.XX
128 KW Memory
9 Step Memory Test
Step 1 2 3 4 5 6 7 8 9
```

Example 1–3: KDF11–BH or –BJ Start-up Message

```
KDF11-B ROM X0.XX
256 KB Memory
Type ? for HELP
Enter command [Boot, Diagnose, Help, List, Map]:
```

Table 1–2: KDF11–B (M8189) ROM Identification

CPU	ROMs Installed
KDF11–BA	23–339E2 and 23–340E2
KDF11–BE	23–238E4 and 23–239E4
KDF11–BF	23–183E4 and 23–184E4
KDF11–BH[1]	23–380E4 and 23–381E4
KDF11–BJ[2]	23–453E4 and 23–454E4

[1]The –BH variant includes support for the TK50 and provides for fault tolerant booting of the QNA.

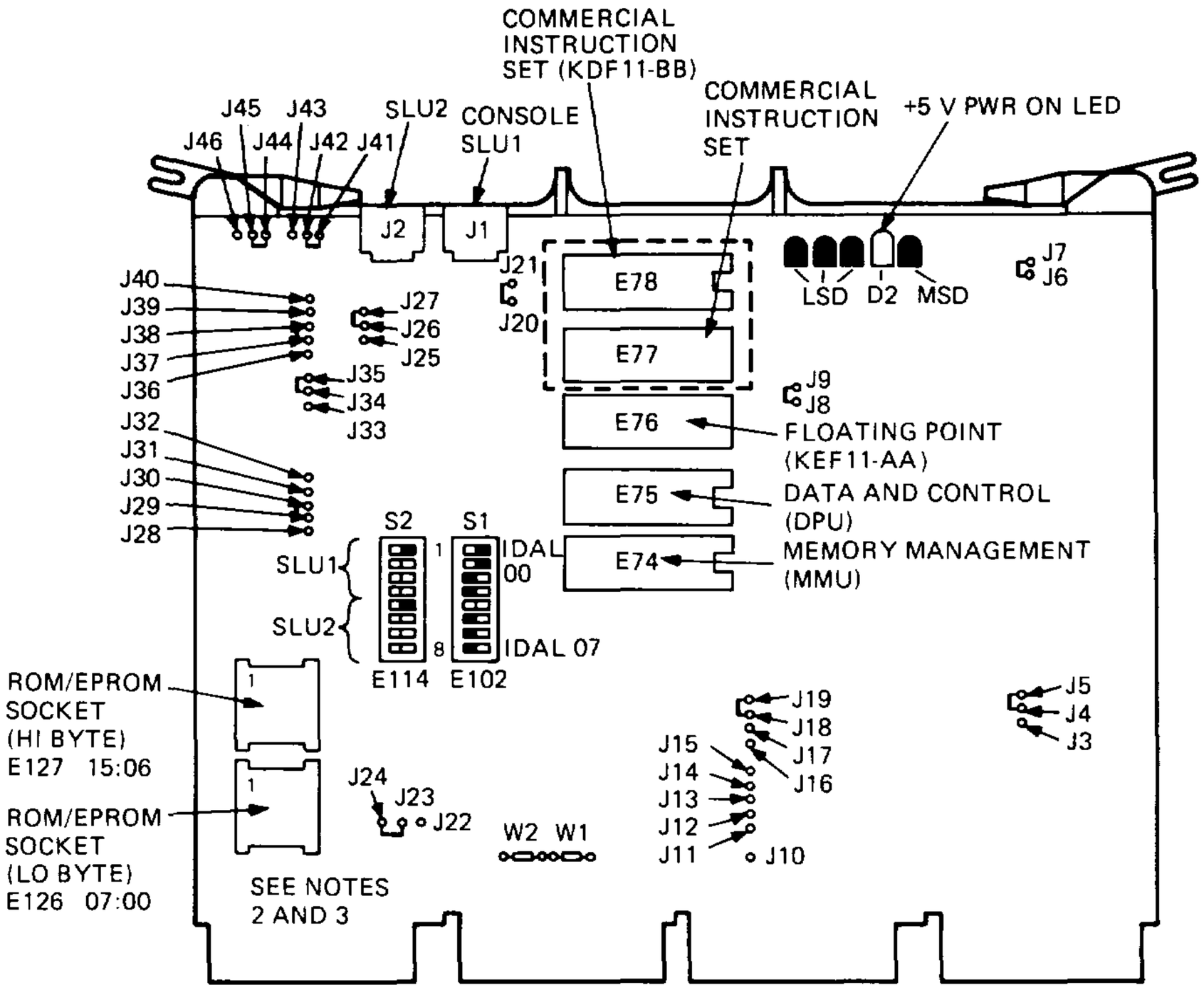
[2]The –BJ variant allows the TK50 to boot under the RSTS/E operating system.

1.2.1 Light Emitting Diodes (LEDs)

Five light emitting diodes (LEDs) on the KDF11–B module provide status information. The single green LED indicates the presence of +5 Vdc. The red LEDs show error detection and diagnostic status codes.

The LEDs are shown on the KDF11–B module in Figure 1–1.

Figure 1–1: KDF11–B CPU Module



NOTES:
1. INSTALLED JUMPERS SHOW THE MicroPDP-11 CONFIGURATION.
2. WHEN 8K EPROMS OR 8K MASKED ROMS ARE USED, J23 IS CONNECTED TO J24.
3. WHEN 2K EPROMS ARE USED, J23 IS CONNECTED TO J22. WHEN 2K MASKED ROMS ARE USED, J23 IS CONNECTED TO J24.

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1.2.2 Switch and Jumper Settings

The KDF11–B module contains numerous jumpers and two dual in-line package (DIP) switch units, S1 (E102) and S2 (E114). The jumpers and switches allow you to select various module features. Figure 1–1 shows the location of these jumpers and switches, as well as the chip socket and LED locations.

Table 1–3 lists the factory configuration of the jumpers.

Table 1–3: KDF11–B Factory Jumper Settings

Jumpers	State	Function
J4–J5	In	Disables the CPU halt feature from the console SLU BREAK key on the terminal.
J6–J7	In	For manufacturing use only.
J8–J9	In	For manufacturing use only.
J18–J19	In	Enables CPU power-up mode: bootstrap from location 773000.
J20–J21	In	For manufacturing use only.
J23–J24	In[1]	Used with 8K masked ROMs or 8K EPROMs.
J26–J27	In	Connects the output of the console serial line drive to the serial line.
J29–J30	In	One stop bit for console SLU port.
J34–J35	In	Connects LINMF(1)H to the SLU UART reset input.
J37–J38	In	One stop bit for second SLU port.
J41–J42	In[1]	Disables DIP switches S2–1 to S2–3. Enables baud rate rotary switches to select console SLU baud rate.
J43–J42	In[1]	Disables DIP switches S2–5 to S2–8. Enables baud rate rotary switches to select second SLU baud rate.
W1	In	Provides bus grant continuity for the BIAK signal.
W2	In	Provides bus grant continuity for the BDMG signal.

[1]These jumpers are Out for a KDF11–BA module (PDP–11/23 PLUS). All other jumpers for that module are In.

Table 1–4 shows the factory configuration of switchpacks S1 and S2. The factory configuration of J41 to J42 In, and J44 to J45 In, disables the S2 switchpack SLU baud rate. When S2 is disabled, the two 16-position baud rate switches on the SLU panel are used to select the baud rate.

Table 1–4: KDF11–B Factory Switch Settings

Switch 1	State[1]	Function
S1–8	On	ANSI mode console terminal.
S1–7	On	Performs quick-verify memory diagnostic.
S1–6	Off	
S1–5	Off	
S1–4	On	Selects MSCP autoboot.
S1–3	On	
S1–2	On	
S1–1	On	
Switch 2		
S2–8	Off	
S2–7	Off	
S2–6	Off	
S2–5	On	Sets second SLU for 9600 baud.
S2–4	Off	
S2–3	Off	
S2–2	Off	
S2–1	On	Sets console SLU for 9600 baud.

[1]On = closed (1), Off = open (0)

The input controls for the diagnostic and boot ROM are the eight DIP switches, S1–1 through S1–8 (E102). All unimplemented switch configurations cause an error message to be printed and control to be passed to the console dialog routine. Table 1–5 shows the bootstrap switch settings.

Table 1–5: KDF11–B Diagnostic/Bootstrap Configuration (E102)

Switch Settings[1] 8 7 6 5 4 3 2 1	Function
1 1 0 0 1 1 1 1	Factory setting. MSCP Autoboot selected, ANSI mode console terminal, quick-verify diagnostics executed.
x x 0 0 0 0 0 0	Inhibit power on autoboot.
0 x x x x x x x	Console terminal is not an ANSI mode SCOPE.
1 x x x x x x x[2]	Console terminal is an ANSI mode SCOPE.
x 0 x x x x x x	Inhibit quick-verify memory diagnostics.
x 1 x x x x x x[2]	Execute quick-verify memory diagnostics.
x x 0 0 0 0 0 1[3]	Select TS05 drive 0 or TK25.
x x 0 0 0 0 1 0	Select TU58 drive 0.
x x 0 0 0 0 1 1	Select TU58 drive 1.
x x 0 0 0 1 0 0	Select RX01 drive 0.
x x 0 0 0 1 0 1	Select RX01 drive 1.
x x 0 0 0 1 1 0	Select RX02 drive 0.
x x 0 0 0 1 1 1	Select RX02 drive 1.
x x 0 0 1 0 0 0	Select MSCP drive 0.
x x 0 0 1 0 0 1	Select MSCP drive 1.
x x 0 0 1 0 1 0	Select MSCP drive 2.
x x 0 0 1 0 1 1	Select MSCP drive 3.
x x 0 0 1 1 0 0	Select MSCP drive 4.
x x 0 0 1 1 0 1	Select MSCP drive 5.
x x 0 0 1 1 1 0	Select MSCP drive 6.
x x 0 0 1 1 1 1[3]	Select MSCP autoboot.
x x 0 1 0 0 0 0	Select RL01/RL02 drive 0.
x x 0 1 0 0 0 1	Select RL01/RL02 drive 1.
x x 0 1 0 0 1 0	Select RL01/RL02 drive 2.
x x 0 1 0 0 1 1	Select RL01/RL02 drive 3.
x x 0 1 1 0 0 0[3]	Select TK50 drive 0.
x x 0 1 0 1 0 0[4]	Select XHO QNA device 0.
x x 0 1 0 1 0 1[4]	Select XH1 QNA device 1.
x x 0 1 1 1 1 0	Reserved for future devices.
x x 1 1 0 1 1 1	Reserved for future devices.
x x 1 1 1 0 0 0	Select DECnet DUV11.
x x 1 1 1 0 0 1	Select DECnet DLV11–E.
x x 1 1 1 0 1 0	Select DECnet DLV11–F.
x x 1 1 1 0 1 1	Unused
x x 1 1 1 1 0 0	Unused

[1] 0 = off, 1 = on, x = can be either 1 or 0

[2] Factory position

[3] KDF11–BH and –BJ only

[4] KDF11–BF, –BH, and –BJ only

Table 1–5 (Cont.): KDF11–B Diagnostic/Bootstrap Configuration (E102)

Switch Settings[1] 8 7 6 5 4 3 2 1	Function
x x 1 1 1 1 0 1	Unused
x x 1 1 1 1 1 0	Unused
x 0 1 1 1 1 1 1	Loop self-test but do not execute memory diagnostic.
x 1 1 1 1 1 1 1	Loop self-test and memory diagnostic.

[1]0 = off, 1 = on, x = can be either 1 or 0

NOTE: *The XXDP diagnostic monitor boots only from the standard control status register (CSR) address (17772150).*

1.2.3 Serial Line Unit (SLU) Panel

The KDF11–B CPU module connects to a cabinet kit containing a console SLU panel (Figure 1–2) and two cables. The SLU panel is installed in the I/O panel of the enclosure. The two cables carry the signals from the CPU module to the following parts of the SLU panel:

- Baud rate select switch
- 25-pin, D-subminiature console terminal connector (A0)
- 25-pin, D-subminiature secondary device connector, usually a printer (A1)

Figure 1–2: KDF11–B SLU Panel

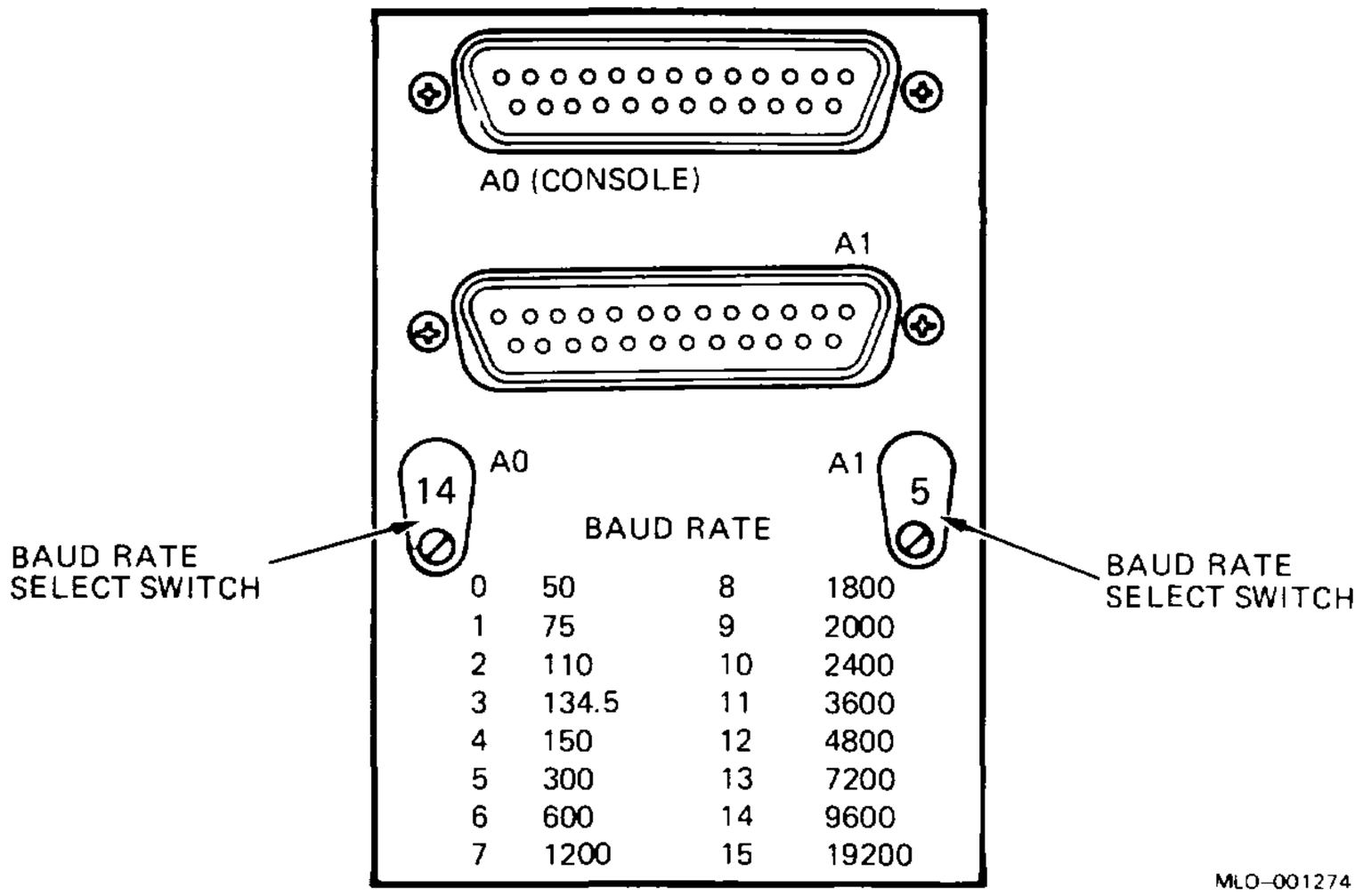


Table 1–6 lists the signals on each pin used by the console SLU (A0) and secondary SLU (A1) connectors. The SLU panel also contains two baud rate select switches that enable the independent selection of the baud rates for SLU A0 and SLU A1.

A ribbon cable installed in J2 of the backplane assembly carries CPU signals to the 20-pin connector on the control panel.

Table 1–6: KDF11–B SLU Pin Functions (A0 and A1)

Pin	Signal
1	Protective or earth ground
2	Transmitted data
3	Received data
4	Request to send (RTS)
6	Data set ready (DSR)
7	Logic or signal ground
20	Data terminal ready (DTR)

1.2.4 Baud Rate Select Switches

Set the baud rates of the two SLUs using the two 16-position baud rate switches on the SLU panel (Figure 1–2). The number displayed above the switch corresponds to the baud rates listed in Table 1–7.

Table 1–7: KDF11–B Baud Rate Settings

Switch	Baud Rate	Switch	Baud Rate
0	50	8	1800
1	75	9	2000
2	110	10	2400
3	134.5	11	3600
4	150	12	4800
5	300	13	7200
6	600	14	9600
7	1200	15	19,200

When you upgrade a KDF11–BA in the field (that is, when you install new ROMs), you set the baud rate for both the console SLU and second SLU using the S2 switchpack (E114). Table 1–8 lists these settings.

Table 1–8: KDF11–B Switchpack S2 (E114) Settings

Baud Rate	Second SLU (SW2)[1] 8 7 6 5	Console SLU (SW2)[1] 4 3 2 1
50	1 1 1 1	1 1 1 1
75	1 1 1 0	1 1 1 0
110	1 1 0 1	1 1 0 1
134.5	1 1 0 0	1 1 0 0
150	1 0 1 1	1 0 1 1
300	1 0 1 0	1 0 1 0
600	1 0 0 1	1 0 0 1
1200	1 0 0 0	1 0 0 0
1800	0 1 1 1	0 1 1 1
2000	0 1 1 0	0 1 1 0
2400	0 1 0 1	0 1 0 1
3600	0 1 0 0	0 1 0 0
4800	0 0 1 1	0 0 1 1
7200	0 0 1 0	0 0 1 0

[1] 0 = off, 1 = on

Table 1–8 (Cont.): KDF11–B Switchpack S2 (E114) Settings

Baud Rate	Second SLU (SW2)[1] 8 7 6 5	Console SLU (SW2)[1] 4 3 2 1
9600	0 0 0 1	0 0 0 1
19,200	0 0 0 0	0 0 0 0

[1]0 = off, 1 = on

1.2.5 Automatic Boot Mode

When set to the factory configuration, the KDF11–B runs diagnostic self-tests when you turn on or restart the system.

If you enter CTRL/C during the self-test, the self-test stops and causes the system to attempt to boot, as if the self-test had completed successfully.

After successful completion of the power-up self-test, the ROM code directs the system to take one of the following actions:

- Boot from one or more previously selected devices.
- Enter console dialog mode (Section 1.2.6).
- Enter console emulator mode (Section 3.4).

The factory configuration of the CPU causes the ROM code to attempt to boot automatically. It searches for and identifies available devices in the following order:

- MSCP devices with removable media (RX50)
- MSCP devices with fixed media (RD5n)
- Other devices

The system boots when a bootable device is found. If you have not loaded a bootable device, the system displays a message similar to the following:

```
ERROR UNIT DUO
ERR 16 NOT BOOTABLE
WISH TO REBOOT [Y, (N)]?
```

This message indicates that the system has entered console dialog mode and is waiting for user input.

If you load a bootable device, you type Y, and press RETURN. The system returns to automatic boot mode and boots the appropriate device.

If you enter CTRL/P while the system is booting, the system stops the boot process and enters console dialog mode.

If you respond to the message either by typing N and pressing Return or by entering CTRL/P, the system displays the console dialog mode menu shown below. The console dialog commands are described in Section 1.2.6.

```
128 KW MEMORY     KDF11-B ROM VOXX     CLOCK ENABLED
BOOT
HELP
MAP
DIAGNOSE
Press RETURN to select BOOT
Use cursor controls "UP ARROW" or "DOWN ARROW" to select function
Use CTRL/W to reset menu
```

1.2.6 Console Dialog Mode

The system enters console dialog mode if it fails to find a bootable device, or if you enter CTRL/P while the system is booting.

In console dialog mode, you use the following commands:

- BOOT—Selects the boot source. Use a device name and unit number mnemonic (DU0), an octal unit number (you must enter the /O switch), or a nonstandard CSR address (you must enter the /A switch).
- HELP—Displays a help file that provides a brief description of each command.
- MAP—Lists options installed on the CPU module. It also searches for, identifies, and lists all memory in the system and all occupied register locations in the system I/O page.
- DIAGNOSE—Executes an extended test of the memory that requires about 25 minutes for 128K words of memory.
- LIST—Displays (only on non-ANSI terminals) a listing of all bootable devices present in the system. The listing includes the device name, unit number range, source of the program, and a short device description. (This function is part of the BOOT command on ANSI terminals.)

For more information on the components and operation of the KDF11–B CPU, see the *KDF11–BA CPU User's Guide*.

1.3 MSV11–P Memory

The MSV11–P memory is a quad-height module that occupies the slot(s) in the backplane immediately following the KDF11–B CPU in slot 1.

The MSV11–P contains 64K metallic oxide semiconductor (MOS) chips that provide storage for 18-bit words (16 data bits and 2 parity bits). The module also contains parity control circuitry and a control status register (CSR). The MSV11–P variants and their storage capacities are as follows:

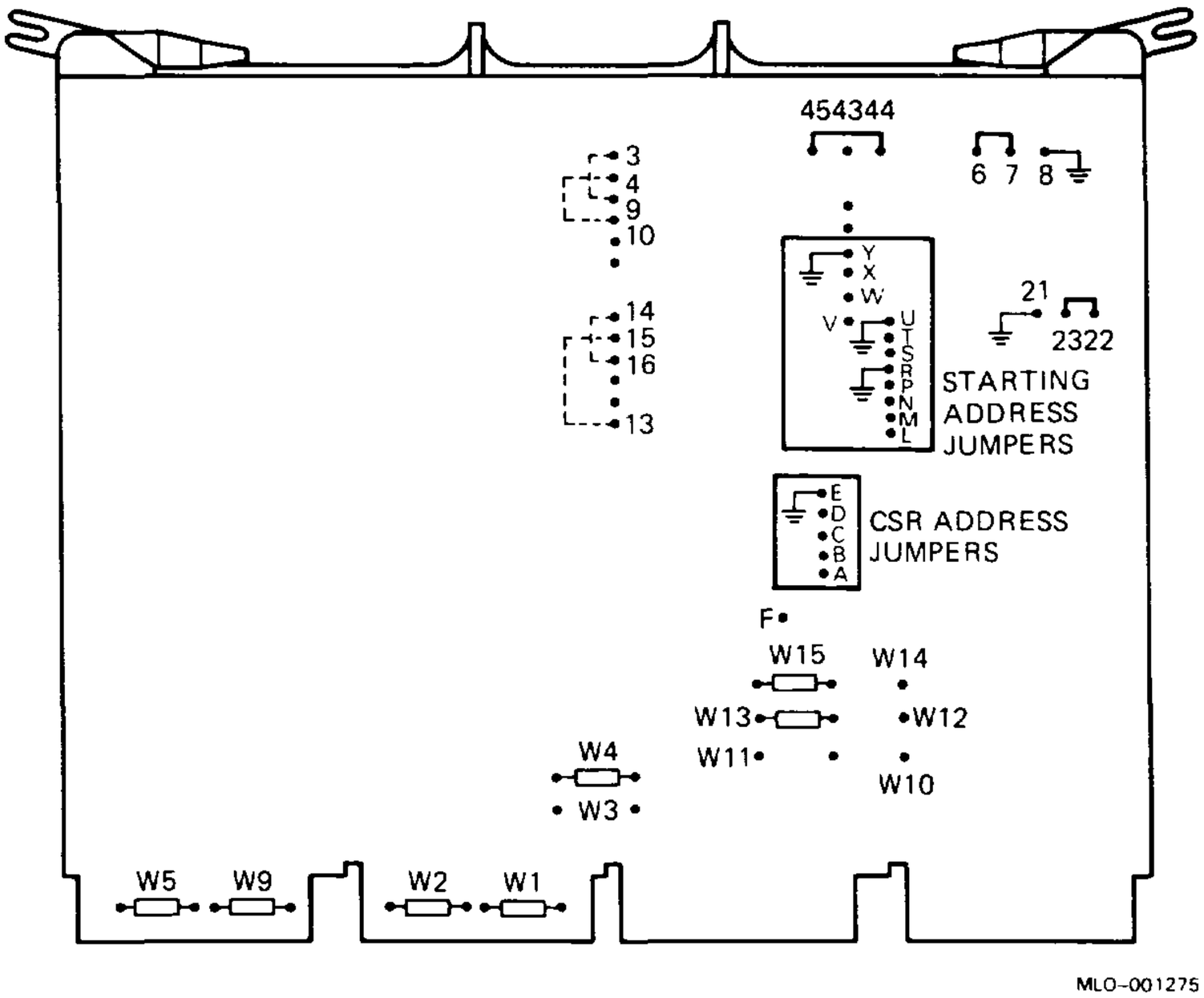
- MSV11–PK (M8967–K)—256 Kbytes
- MSV11–PL (M8067–L)—512 Kbytes

The MSV11–P, shown in Figure 1–3, is configured by means of jumpers and wire-wrap pins. The –PK and –PL models have the same factory configuration.

The MSV11–P module has two LEDs that perform the following:

- A green LED: lights to indicate that +5 Vdc is present.
- A red LED: lights to indicate that a parity error has been detected.

Figure 1–3: MSV11–P Module Layout



1.3.1 MSV11–P Addresses

You can add additional MSV11–P modules for system expansion.

For each memory module that you add to the Q22-bus, you must reposition jumpers on the wire-wrap pins to provide a CSR address and a starting address.

Figure 1–3 (above) shows the CSR address jumpers on the MSV11–P module. Table 1–9 lists the CSR address and corresponding jumper configurations for each memory module (–PK or –PL) that you add to the system.

Table 1–9: MSV11–P CSR Configuration

Board No. in System	Pins to Wire-Wrap	CSR Address x = 177721
1	None	x00
2	A to E	x02
3	B to E	x04
4	A to B, B to E	x06
5	C to E	x10
6	A to C, C to E	x12
7	B to C, C to E	x14
8	A to B, B to C, C to E	x16

The starting address depends on the amount of memory already in the system.

Table 1–10 lists the first address ranges (FAR) to select the 256K word range. Table 1–11 lists the partial starting address (PSA) ranges for additional MSV11–P memory modules.

Table 1–10: MSV11–P FAR Configurations

First Address Ranges		
Decimal K Words	**Octal K Words**	**Pins to Wire-Wrap**
000–248	00000000–01740000	None
256–504	02000000–03740000	V to Y
512–760	04000000–05740000	W to Y
768–1016	06000000–07740000	W to Y, V to Y
1024–1727	10000000–11740000	X to Y
1280–1528	12000000–13740000	X to Y, V to Y
1526–1784	14000000–15740000	X to Y, W to Y
1742–2040	16000000–17740000	X to Y, W to Y, V to Y

Table 1–11: MSV11–P PSA Configurations

Partial Starting Address		
Decimal K Words	**Octal K Words**	**Pins to Wire-Wrap**
0	00000000	None
8	00040000	T to R
16	00100000	L to R
24	00140000	L to R, T to R
32	00200000	M to R
40	00240000	M to R, T to R
48	00300000	M to R, L to R
56	00340000	M to R, L to R, T to R
64	00400000	N to R
72	00440000	N to R, T to R
80	00500000	N to R, L to R
88	00540000	N to R, L to R, T to R
96	00600000	N to R, M to R
104	00640000	N to R, M to R
112	00700000	N to R, M to R, L to R
120	00740000	N to R, M to R, L to R, T to R
128	01000000	P to R
136	01040000	P to R, T to R
144	01100000	P to R, L to R
152	01140000	P to R, L to R, T to R
160	01200000	P to R, M to R
168	01240000	P to R, M to R, T to R
176	01300000	P to R, M to R, L to R
184	01340000	P to R, M to R, L to R, T to R
192	01400000	P to R, N to R
200	01440000	P to R, N to R, T to R
208	01400000	P to R, N to R, L to R
216	01540000	P to R, N to R, L to R, T to R
224	01600000	P to R, N to R, M to R
232	01640000	P to R, N to R, M to R, T to R
240	01700000	P to R, N to R, M to R, L to R
248	01740000	P to R, N to R, M to R, L to R, T to R

Table 1–12 lists the jumper configuration for additional MSV11–PK modules. Table 1–13 lists the jumper configuration for additional MSV11–PL modules.

Table 1–12: MSV11–PK Starting Addresses (256-Kbyte increments)

Board No. in System	Pins to Wire-Wrap
1	None
2	P to R
3	V to Y
4	V to Y, P to R
5	W to Y
6	W to Y, P to R
7	W to Y, V to Y
8	W to Y, V to Y, P to R

Table 1–13: MSV11–PL Starting Addresses (512-Kbyte increments)

Board No. in System	Pins to Wire-Wrap
1	None
2	V to Y
3	W to Y
4	V to Y, W to Y
5	X to Y
6	X to Y, V to Y
7	X to Y, W to Y
8	X to Y, W to Y, V to Y

For more information on the MSV11–P memory, refer to the *MSV11–P User's Guide* (EK–MSVOP–UG).

1.4 MSV11–Q Memory

The MSV11–Q memory is a quad-height module, shown in Figure 1–4, that occupies the slot(s) in the backplane immediately following the KDF11–B CPU in slot 1.

The MSV11–Q has a 1, 2, or 4 Mbyte capacity using either 64K or 256K MOS dynamic RAMs. The CSR contains bits used to store the parity error address bits. You can force wrong parity by setting a bit in the CSR to check the parity logic.

Figure 1–4: MSV11–Q Module Layout

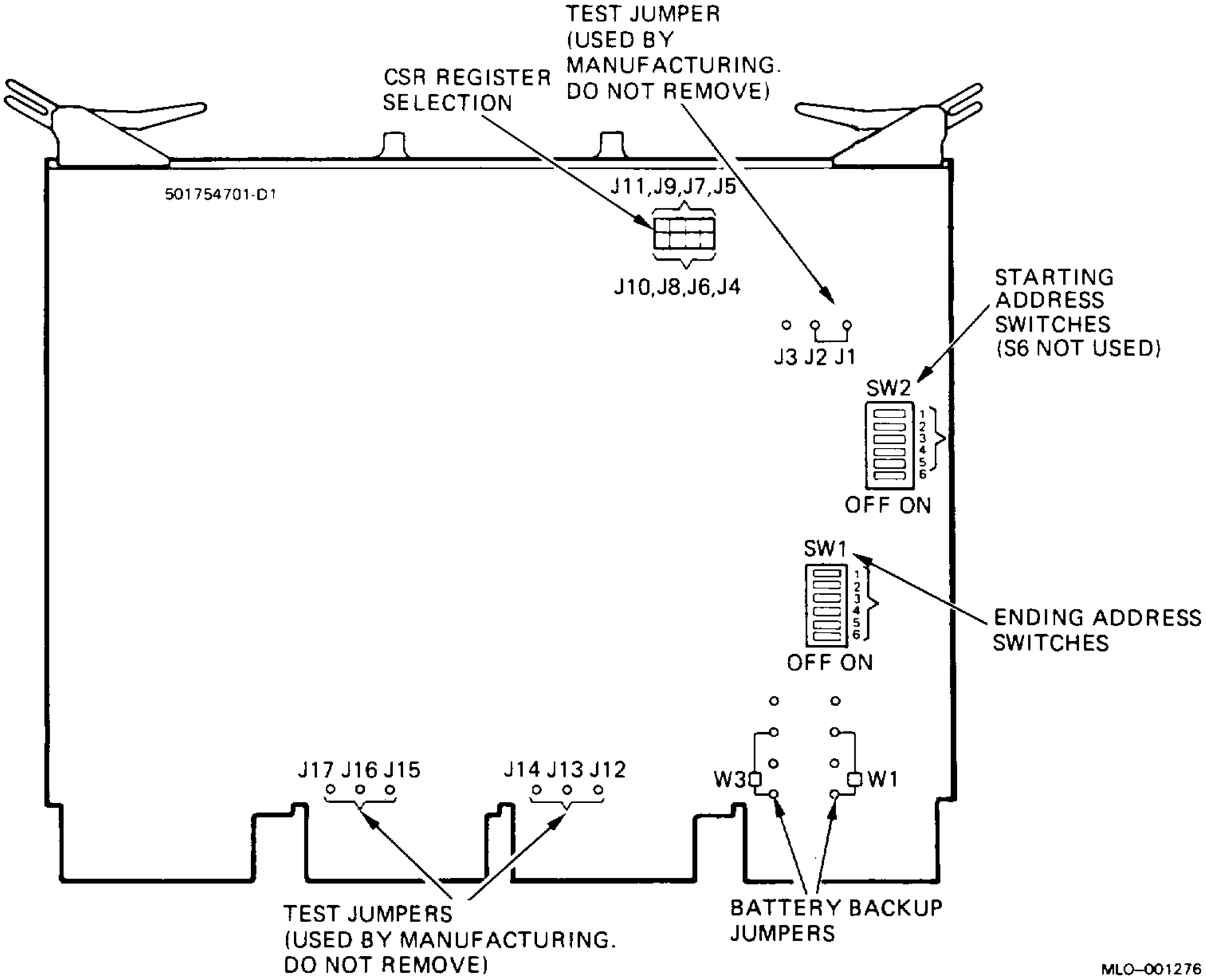


Table 1–14 lists the memory module variants and their storage capacities.

Table 1–14: MSV11–Q Variants

Revision[1]	Option	Module	Storage	RAM Size
A, C	MSV11–QA	M7551–AA	1 Mbyte	56K
C	MSV11–QB	M7551–BA	2 Mbyte	256K (half populated)
C	MSV11–QC	M7551–CA	4 Mbyte	256K (fully populated)

[1]Identify the revision level by the following printed circuit board number:

A = 5017547A1 on upper right corner of component side of module
C = 5017547–01–C1 on upper left corner of component side of module

1.4.1 MSV11–Q Addresses

You configure the MSV11–Q starting and ending address using DIP switches SW1 and SW2 (Figure 1–4). SW1 is the ending address and SW2 is the starting address.

Table 1–15 shows the switch settings for the starting and ending addresses.

Table 1–15: MSV11–Q Starting and Ending Addresses

Starting Address (in Kbytes)	SW2 Position[1] 12345[2]	SW1 Position 6	Ending Address (in Kbytes)	SW1 Position 12345[2]
0	00000	0	128	1111
128	11111	1	256	01111
256	01111	1	384	10111
384	10111	1	512	00111
512	00111	1	640	11011
640	11011	1	768	01011
768	01011	1	896	10011
896	10011	1	1024 (1 Mbyte)	00011
1024 (1 Mbyte)	00011	1	1152	11101
1152	11101	1	1280	01101
1280	01101	1	1408	10101
1408	10101	1	1536	00101
1536	00101	1	1664	11001
1664	11001	1	1792	01001
1792	01001	1	1920	10001
1920	10001	1	2048 (2 Mbytes)	00001
2048 (2 Mbytes)	00001	1	2176	11110
2176	11110	1	2304	01110
2304	01110	1	2432	10110
2432	10110	1	2560	00110
2560	00110	1	2688	11010
2688	11010	1	2816	01010
2816	01010	1	2944	10010
2944	10010	1	3072 (3 Mbytes)	00010
3072 (3 Mbytes)	00010	1	3200	11100
3200	11100	1	3328	01100
3328	01100	1	3456	10100
3456	10100	1	3584	00100
3584	00100	1	3712	11000
3712	11000	1	3840	01000

[1]Switch S6 of SW2 is not used. For a memory starting address of 0, set switch S6 of SW1 to on (0). For all other starting addresses, set switch S6 of SW1 to off (1).

[2]1 = off, 0 = on

Table 1–15 (Cont.): MSV11–Q Starting and Ending Addresses

Starting Address (in Kbytes)	SW2 Position[1] 12345[2]	SW1 Position 6	Ending Address (in Kbytes)	SW1 Position 12345[2]
3849	01000	1	3968	10000
3968	10000	1	4096 (4 Mbytes)	00000

[1]Switch S6 of SW2 is not used. For a memory starting address of 0, set switch S6 of SW1 to on (0). For all other starting addresses, set switch S6 of SW1 to off (1).

[2]1 = off, 0 = on

You configure the MSV11–Q CSR address by setting jumpers J4 through J11 (Figure 1–4). Figure 1–5 shows the jumper settings for a CSR register address of 17772102 representing a second MSV11–Q.

Figure 1–5: MSV11–Q CSR 17772102 Setting

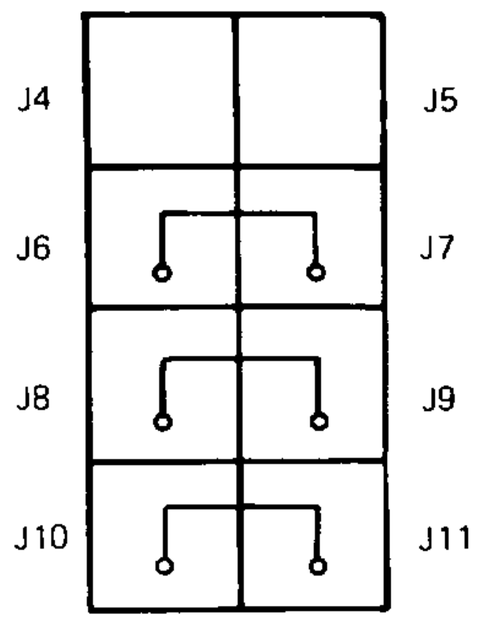


Table 1–16 shows the jumper positions and the corresponding CSR register addresses for up to 16 locations. The factory configuration for the remaining jumpers is listed in Table 1–17.

Table 1–16: MSV11–Q CSR Addresses

Number CSR Memory[1]	Jumper J4 to J5	Jumper J6 to J7	Jumper J8 to J9	Jumper J10 to J11	CSR Address
1	In	In	In	In	x00
2	Out	In	In	In	x02
3	In	Out	In	In	x04
4	Out	Out	In	In	x06
5	In	In	Out	In	x10
6	Out	In	Out	In	x12
7	In	Out	Out	In	x14
8	Out	Out	Out	In	x16
9	In	In	In	Out	x20
10	Out	In	In	Out	x22
11	In	Out	In	Out	x24
12	Out	Out	In	Out	x26
13	In	In	Out	Out	x30
14	Out	In	Out	Out	x32
15	In	Out	Out	Out	x34
16	Out	Out	Out	Out	x36

[1]If more than one CSR parity-type memory is installed, use care to ensure that no two modules have the same address.

Table 1–17: MSV11–Q Factory Jumper Settings

Jumper	State	Condition
J1 to J2	In	For manufacturing test. Do not remove.
J13 to J14	In	Selects 64K RAMs. Do not remove.
J15 to J16	In	Selects 64K RAMs. Do not remove.
W3, W1	In	Battery backup configuration.

For more information on the MSV11–Q memory, see *MSV11–Q MOS Memory User's Guide*.

Chapter 2
Configuration

2.1 Introduction

This chapter describes the rules and guidelines for changing the configuration of a KDF11–B system. Before you change a system's configuration, you must consider the following factors:

Module order in the backplane
Module configuration
Mass storage device configuration

Section 2.2 lists the guidelines for module order and configuration. These guidelines apply to the KDF11–B CPU in the BA23 enclosure.

If you are adding a device to a system, you must know the capacity of the system enclosure in the following areas:

Backplane
I/O panel
Power supply
Mass storage devices

The BA23 enclosure worksheet (Figure 2–1) provides information about system capacities.

2.2 Module Order

The order of modules in the backplane depends on four factors:

- Relative use of devices in the system
- Expected performance of each device relative to other devices
- The ability of a device to tolerate delays between bus requests and bus grants (known as "delay tolerance" or "interrupt latency")
- The tendency of a device to prevent devices farther from the CPU from accessing the bus

The relative use and performance of devices depends on the application. This means the order of modules also depends on the application. Most

applications try to balance the use of devices. To achieve maximum system performance, use the order listed below. The order is based on the Q-bus DMA transfer characteristics; use it as a guideline. Make sure you read the rules and guidelines in Section 2.3.

Recommended Module Order

KDF11–B
MSV11–P/MSV11–Q
DMV11–M
DMV11–N
DHV11
DEQNA
RLV12
TQK25
TQK50
RQDXx

CAUTION: *If an option has Q/CD jumpers, check the documentation for that option for the correct Q/CD jumper settings. An incorrect jumper setting can cause damage to the option.*

When devices do not perform as expected, you can change the recommended module order to meet the needs of the application. Often, performance problems involve a device that is heavily used or has a low delay tolerance. Usually, there are other heavily used devices between the device with the low delay tolerance and the CPU. In this case, move the problem device closer to the CPU.

2.3 Configuration Rules

Follow these configuration rules when you install or remove modules from the BA23 enclosure card cage:

- Always install the KDF11–B CPU module in slot 1.
- Always install MSV11–P or MSV11–Q memory modules in the slots next to the KDF11–B CPU, beginning with slot 2.
- Install any dual-height modules in the AB rows of slots 1 through 3. No grant continuity card is necessary.
- Install dual-height modules in either the AB or CD rows of slots 4 through 8. The opposite row must contain either another dual-height module or a grant continuity card (M9047 or G7272) in rows A or C.
- Install modules following the CPU and memory using the sequence shown in Section 2.2.

For detailed information on the BA23 enclosure backplane and I/O panel, see *BA23 Enclosure Maintenance*.

2.4 Configuration Procedure

Each module in a system must use a unique device address and interrupt vector. The device address is also known as the control status register (CSR) address. Most modules have switches or jumpers for setting the CSR address and interrupt vector values.

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 the other modules in the system.

See *Microsystems Options* for CSR addresses and interrupt vectors for MicroPDP–11 options. Most modules have switches and jumpers to change their operating characteristics. For some applications, you may have to change the factory switch and jumper positions according to the guidelines in *Microsystems Options*.

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

2.5 Configuration Worksheet

Use the configuration worksheet (Figure 2–1) to make sure a configuration does not exceed a system's limits for expansion space, I/O space, power, and bus loads. If you use standard DIGITAL modules, you will not exceed the limits for bus loads. Use the configuration worksheet as follows:

1. List all the devices already installed in the system.
2. List all the devices you plan to install in the system.
3. Fill in the information for each device, using the data listed in Table 2–1.
4. Add up the columns. Make sure the totals are within the limits for the enclosure power supply.

Table 2–1: Power, Bus Load, and I/O Insert Data

Option	Module	Current (Amps) +5 V	Current (Amps) +12 V	Power Watts	Bus Loads AC	Bus Loads DC	Insert[1]
AAV11–D[2]	A1009	1.8	0.0	9.0	1.0	1.0	–
ADV11–D[2]	A1008	3.2	0.0	16.0	1.0	1.0	–
DEQNA	M7504	3.5	0.5	23.5	2.8	0.5	A
DELQA	M7516	2.7	0.5	19.5	2.2	0.5	A
DHV11	M3104	4.5	0.55	29.1	2.9	0.5	B (2)
DLVEI–DP	M8017	1.0	1.5	23.0	1.6	1.0	A
DLVJ1	M8043	1.0	0.25	8.0	1.0	1.0	B
DMV11–M	M8053	3.4	0.4	21.8	2.0	1.0	A
DMV11–AP	M8053–MA	3.4	0.38	21.6	2.0	1.0	B
DMV11–BP	M8053–MA	3.4	0.38	21.6	2.0	1.0	A
DMV11–CP	M8064–MA	3.35	0.26	19.9	2.0	1.0	B
DMV11–FP	M8053–MA	3.4	0.38	21.6	2.0	1.0	A (2)
DMV11–N	M8064	3.4	0.4	21.8	2.0	1.0	A
DPV11	M8020	1.2	0.3	9.6	1.0	1.0	A
DUV11–DP	M7951	1.2	0.39	10.7	3.0	1.0	A (2)
DZV11	M7957	1.2	0.39	10.7	3.9	1.0	B
KDF11–B	M8189	4.5	0.3	26.1	2.0	1.0	–
KWV11–C[2]	M4002	2.2	0.013	11.2	1.0	1.0	–
LPV11	M8027	0.8	0.0	4.0	1.4	1.0	A
MRV11–D[3]	M7942	1.6	0.0	8.0	3.0	0.5	–
MRV11–D	M7942	2.8	0.0	14.0	1.8	1.0	–
MSV11–PK	M8067–K	3.45	0.0	17.25	2.0	1.0	–
MSV11–PL	M8067–L	3.6	0.0	17.5	2.0	1.0	–
MSV11–QA	M7551–AA	2.4	0.0	12.0	2.0	1.0	–
MSV11–QB	M7551–BA	2.3	0.0	11.5	2.0	1.0	–
MSV11–QC	M7551–CA	2.5	0.0	12.5	2.0	1.0	–
RC25		1.0	2.5	35.0	–	–	–
RD33		0.9	1.0	15.7	–	–	–
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		1.3	1.34	22.6	–	–	–

[1]A = 2.5 cm x 10.0 cm (1 in x 4 in)
B = 5.0 cm x 7.5 cm (2 in x 3 in)

[2]Usually connected through a universal data input panel (UDIP), using a 13.13-cm (5.25-in) mass storage slot

[3]Unpopulated module

Table 2–1 (Cont.): Power, Bus Load, and I/O Insert Data

Option	Module	Current (Amps) +5 V	Current (Amps) +12 V	Power Watts	Bus Loads AC	Bus Loads DC	Insert[1]
RLV12–AP	M8061	5.0	0.10	26.2	2.7	1.0	A
RQDX1	M8639–YA	6.4	0.25	35.0	2.0	1.0	–
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	–
RQDXE	M7513	0.5	0.0	2.5	1.0	0.0	–
RX33		0.5	0.3	5.6	–	–	–
RX50		0.85	1.8	25.9	–	–	–
TK50		1.35	2.4	33.55	–	–	–
TK50–AA		1.35	2.4	34.5	–	–	–
TK50E–EA		1.35	2.4	35.6	–	–	–
TQK25–KA	M7605	4.0	–	20.0	2.0	1.0	A
TQK50	M7546	2.9	0.0	14.5	2.8	0.5	–
TSV05	M7196	6.5	0.0	32.5	3.0	1.0	A

[1]A = 2.5 cm x 10.0 cm (1 in x 4 in)
B = 5.0 cm x 7.5 cm (2 in x 3 in)

Figure 2–1: BA23 Configuration Worksheet

ADD THESE COLUMNS

BACKPLANE SLOT	MODULE	CURRENT (A) +5 V	CURRENT (A) +12 V	POWER (W)	I/O INSERTS B	I/O INSERTS A
1 AB CD						
2 AB CD						
3 AB CD						
4 AB CD						
5 AB CD						
6 AB CD						
7 AB CD						
8 AB CD						
MASS STORAGE 1						
2						
COLUMN TOTALS:						
MUST NOT EXCEED:		36.0	7.0	230	4	2*

*IF MORE THAN TWO TYPE-A FILTER CONNECTORS ARE REQUIRED, AN ADAPTER TEMPLATE (PN 74-27740-01), MAY BE USED. THIS ALLOWS THREE ADDITIONAL TYPE-A FILTER CONNECTORS, BUT REDUCES THE AVAILABLE TYPE-B CUTOUTS TO TWO.

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Chapter 3
Troubleshooting

3.1 Overview

This chapter describes the KDF11–B CPU power-up self-test procedure and error messages, and the console emulator mode and octal debugging technique (ODT).

NOTE: *The XXDP V2 diagnostic monitor is described in the XXDP User's Manual.*

Read the Troubleshooting section of the customer documentation before using this chapter. Many apparent system problems have simple causes, such as incorrect external cabling or monitor settings. Always check for obvious problems before troubleshooting the system.

The KDF11–B CPU and most option modules run self-tests when you power up the system. A module self-test can detect hard or repeatable errors, but not intermittent errors.

The LEDs on the module display test results. A successful module self-test does not guarantee that the module is performing correctly, 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. An unsuccessful module self-test is accurate; the test does not require any other part of the system to be working.

Refer to *Microsystems Options* for a description of self-tests for individual modules. For detailed information, including the contents of the command status register (CSR) of the module's Q22-bus interface, see the user's guide for the module.

3.2 General Procedures

System problems are generally of two types:

- The system fails to boot (Section 3.2.1).
- The system boots, but a device in the system fails (Section 3.2.2).

You should ask two questions before troubleshooting any problem:

- Has the system been used before, and did it work correctly?
- Have changes been made to the system recently?

Two common problems occur when you make a change to the system:

- Cabling is incorrect.
- Module configuration errors (incorrect CSR addresses and interrupt vectors) are introduced.

When you troubleshoot problems, note the status of cables and connectors before you perform each step. Since cables are not always keyed, they can easily be installed backward, or into the wrong connector. Label cables before you disconnect them, to prevent introducing new problems that make it more difficult to diagnose the original problem.

3.2.1 System Fails To Boot

The KDF11–B CPU module self-tests are described in Section 3.3. If the system fails (or appears to fail) to boot the operating system, then load and boot the XXDP diagnostic monitor.

If you cannot boot XXDP V2, do the following:

- Check the console terminal screen for an error message. Error messages are listed in Section 3.3.1.
- If no error message appears, make sure the on/off power switches on the console terminal and the system are set to on (1). Check the DC OK light on both, if applicable.
- Check the cabling to the console terminal.
- Check the hex display on the CPU I/O insert. If the display does not light, check the CPU module's LEDs and the CPU cabling. If a hex error message appears (F through 1) on the insert or the module, see Section 3.3.1.
- If the console terminal remains off, check the power supply and power supply cabling.

If you can boot XXDP V2, and the system passes all tests, then the fault may be in the operating system.

3.2.2 System Boots, but Device Fails

If the system boots successfully, but a device seems to fail or an intermittent failure occurs, run the XXDP diagnostic monitor to isolate the failure to an FRU. The failing device is usually in one of the following areas:

CPU
Memory
Mass storage
Communications devices

Here are some common indications of an intermittent or device-specific problem:

- Operating system error messages appear at power-up for a particular communications device.
- Periodic operating system error messages indicate that a device is not present or cannot be found.
- Periodic data loss or scrambled data occur on one or more communications lines.
- Attached devices either do not work, or work incorrectly.
- The system cannot communicate with another computer.

3.3 KDF11–B Self-Test

The KDF11–B CPU is configured at the factory for automatic self-test and boot mode. The self-test is stored in boot ROMs, and runs each time the system is turned on or restarted. The self-test performs tests on the following:

- CPU
- Memory
- Connections between both CPU and memory modules and the Q22-bus

The self-test first tests a small portion of the CPU module, then progressively tests the rest of the system. The system enters automatic boot mode (Section 1.2.5) upon successful completion of the self-test. If the self-test discovers an error or failure, the system displays a message (Section 3.3.1).

If you enter CTRL/C during the self-test, the system attempts to boot as if the self-test had completed successfully.

After successful completion of the self-test, the system searches for an operating system to boot. If a bootable operating system is found, the system displays a message similar to the following:

```
BOOTING FROM DU1
Loading -- -- -- --
Please wait....
```

3.3.1 Self-Test Error Messages

If any part of the self-test or boot diagnostics fails, the console terminal displays a message. Normally the system displays a message on the console terminal and on the KDF11–B module LEDs.

The console terminal display follows this format, where nn is a number from 00 to 23:

```
nn <a message>
```

Table 3–1 lists the error messages and the recommended action for each. For example, if the system fails to boot, the console terminal displays a message similar to the following:

```
ERROR UNIT DU0
ERR 16 NOT BOOTABLE

ERROR UNIT DU2
ERR NOT BOOTABLE

ERROR UNIT DU1
ERR 16 NOT BOOTABLE
WISH TO REBOOT [Y, (N)]?
```

Table 3–1: KDF11–B Self-Test Error Messages

Number	Message	Description and Recommended FRU/Action
01	No memory	
02	Fatal memory fault	Errors 01 through 11 indicate a faulty CPU or memory module. First replace CPU module. Retry. If fault persists, replace memory module.
02	Memory fault	
04	MMU abort	
05	Trap	
05	Trap 10	
07	Trap 14	
08	Trap 20	
09	Power fail	
10	Trap 30	
11	Trap 34	
12	Nonexistent controller	Boot device as specified by S1 not found. Check setting of S1. Retry. If error persists, replace controller module.
13	Drive not ready	Make sure a diskette is in the drive. Make sure the fixed-disk is on line.
14	Drive error	Check the diskette and diskette drive.
15	Controller error	Replace controller module.
16	Not bootable	No bootable operating system. Install operating system.
17	No disk	Install diskette or disk containing bootable operating system.
18	No tape	System is accessing tape drive with no tape. Mount tape.
19	Nonexistent unit	Boot device as specified by switch S1 not found. Check setting. Retry. If error persists, replace controller module.
20	ROM E126 bad	Replace CPU boot ROM E126.
21	ROM E127 bad	Replace CPU boot ROM E127.
22	No forced parity	See description of errors 01 through 11 (CPU and memory errors).

3.3.2 Diagnostic LEDs

If a program fails and the console terminal does not display any messages, check the LEDs on the KDF11–B module for the diagnostic code. Table 3–2 lists the possible errors.

Table 3–2: KDF11–B LED Self-Test Display Codes

Display in Octal	Definition
00	Diagnostic/boot ROM not executing. Cleared by ROM code before transferring control to secondary boot.
01	Either halt, CPU test, or CPU error.
02	Either halt, memory test, or memory error.
03	Waiting for XON.
04	Waiting for console terminal ready flag.
05	Boot device status error.
06	Invalid boot block.
07	DECnet waiting for response from host.
10	DECnet waiting for message completion.
11	DECnet processing received message.
12	Either halt, MMU test, or MMU error.
13	Error in first 16 Kbytes of memory. Fatal error.
14	Scope loop.
15	Extended memory test in progress.
16	MAP function in progress.
17	System is hung, halt switch is on, or system is not in power-up mode 2. Set by hardware reset.

3.4 Console Emulator Mode

Some errors cause the system to halt any type of program. In this case, control passes to the console emulator mode. This mode allows you to simulate error conditions using the octal debugging technique (ODT).

The system enters console emulator mode when one of the following occurs:

- The program executes a halt instruction.
- You press the Halt button on the control panel.

Console emulator mode replaces the use of control switches and indicators for communicating directly with the system. When you type commands, the system displays responses on the console terminal instead of lighting indicators on the control panel.

When the system halts, it enters console emulator mode and displays the following:

```
nnnnnn
@
```

The number nnnnnn is the contents of PC (R7), and @ is the ODT prompt character. You can examine or modify the contents of the registers and memory by entering ODT commands (Section 3.5).

A portion of the microcode on the KDF11–B module emulates the capability normally found on a programmer's console. The CPU interprets streams of ASCII characters from the console terminal as console commands. The micro-ODT accepts 18-bit addresses, allowing it to access 248 Kbytes of memory and the 8-Kbyte I/O page.

3.5 Octal Debugging Technique (ODT)

The octal debugging technique (ODT) functions only when the system is in console emulator mode. ODT consists of a group of commands and routines for finding error conditions and for simple communication with the system. ODT helps you interactively debug binary programs that reside in memory. When using ODT commands, express all addresses, registers, and memory location contents in octal. Letters and symbols make up the command set for ODT.

The hardware ODT commands are a subset of commands within a larger ODT program. The hardware program, which resides on the KDF11–B module, is intended primarily for diagnosis of hardware problems. The system's response to ODT commands helps trace events that occur in the system.

Table 3–3 lists the basic ODT commands for the KDF11–B CPU module.

Table 3–3: KDF11–B Console ODT Commands

Command	Symbol	Function
Forward slash	/	Prints the contents of a specified register or memory location.
Carriage return	<CR>	Closes an open location.
Line feed	<LF>	Closes an open location and opens the next contiguous location.
Internal register designator	$ or R	Used with forward slash (/) to open a specified CPU register.
Processor status word designator	S	Used with forward slash (/) to open the CPU's processor status PS register, R6; must follow a $ or R command.
Go	G	Starts program execution at a specified address.
Proceed	P	Resumes execution of a program.
Binary dump	CTRL/S	Manufacturing use only.
(Reserved)	H	Reserved for future use.

For more information on ODT commands, see *KDF11–BA CPU Module User's Guide*.

Appendix A
Formatting RD- and RX-Series Disk Drives

A.1 Disk Formatting

Format an RD- or RX-series disk drive as follows:

CAUTION: *Do not format disks without first backing up the data. The disk formatting procedure destroys previous disk contents.*

1. Insert the formatter diskette or the tape cartridge into its drive. Press RETURN.

2. Type R ZRQx?? after the . (period) prompt; x is B for RQDX1 or RQDX2, C for RQDX3, and F for RX33. The question marks allow you to use any revision of the program. Press RETURN.

   NOTE: *When formatting an RD52 drive, make sure you have Version C0 or later. Earlier versions format the RD52 (31 Mbytes) as though it were an RD51 (11 Mbytes).*

   A prompt similar to the following appears on the terminal:

   ```
   DR>
   ```

3. To run the program, type START and press RETURN. The following dialog takes place:

   ```
   CHANGE HW (L)?
   ```

   Type N (no) and press RETURN.

   ```
   CHANGE SW (L)?
   ```

   Type N and press RETURN.

   ```
   ENTER DATE (in mm-dd-yy format) (A)
   ```

   Type the current date (for example, 11-15-88). Press RETURN.

   ```
   ENTER UNIT NUMBER TO FORMAT <0>
   ```

Type 0 for the first fixed-disk drive, or type 1 for the second. Press RETURN.

USE EXISTING BAD BLOCK INFORMATION?

Type Y (yes) and press RETURN. This activates the reformat mode (Section A.1.1).

NOTE: *The program requires about 12 minutes to format an RD51 and about 30 minutes to format an RD52 or RD53. Typing N (no) doubles the time required to format the disk drive.*

CONTINUE IF BAD BLOCK INFORMATION IS INACCESSIBLE?

Type Y and press RETURN.

ENTER A NON-ZERO SERIAL NUMBER:

Type your serial number (located on top of the disk drive) and press RETURN.

FORMAT BEGUN

After about 12 minutes, the system displays a completion message as follows:

FORMAT COMPLETED

If the formatting is not successful, the system displays a message when the error occurs (Section A.1.2). Remove the diskette or tape cartridge if the formatting has completed successfully.

A.1.1 Format Modes

The program can run three types of format modes: reformat, restore, or reconstruct. In order, the program asks you the following questions. Your answers determine the format mode that runs.

1. Use existing bad block information?
2. Down-line load?
3. Continue if bad block information is inaccessible?

The second question does not appear unless you answer N to the first question. Answering N to the third question causes the diagnostic program to stop and print a message if a problem is found.

The format modes operate as follows:

- Reformat mode—If you answer Y to question one, no further questions are asked. The format program reads the manufacturer's bad blocks from a block on the disk. It then formats the disk except for these bad

blocks. The process requires about 12 minutes. If the program fails, try restore mode.

- Restore mode—If you answer N to question one, the program asks you to type in a list of the bad blocks. It then formats the disk except for the bad blocks you specify. You can specify the bad blocks using the list that comes with the drive. The program asks you for the last eight digits of the serial number (found at the top of the disk drive). Restore mode requires about 15 minutes.
- Reconstruct mode—If you answer N to questions one and two, the program searches the disk and identifies the bad blocks. It does not use the manufacturer's bad block information. It then formats the disk except for the identified bad blocks. Reconstruct mode requires about 30 minutes.

A.1.2 Formatter Messages

Table A–1 lists the formatter messages, their probable causes, and actions to correct the problem. The first few errors can occur almost immediately. The remaining errors can occur from one minute to longer than ten minutes after the program starts.

Table A–1: MicroPDP–11 Formatter Messages

Message	Description/Action
Unit is not Winchester or cannot be selected.	Unit is either unavailable or is an RX-series diskette drive. Check to make sure the fixed-disk is not write-protected. Make sure the jumper on the disk drive is set correctly.
Initial failure accessing FCT.	The format control table (FCT) cannot be read. Try reconstruct mode (Section A.1.1).
Factory bad block information is inaccessible.	Occurs only in reformat mode. Run in reconstruct mode (Section A.1.1).
Seek failure during actual formatting.	There is a hardware error. Check for hardware problems.
Revector limit exceeded.	The disk is bad. Replace the disk.
RCT write failure.	Write to disk failed after successful formatting and surface analysis. Check write-protect status.
Failure closing FCTS.	Disk is marked as unformatted.

Appendix B
Related Documentation

The following documents contain information relating to MicroVAX or MicroPDP–11 systems.

Document Title	Order Number
Modules	
CXA16 Technical Manual	EK–CAB16–TM
CXY08 Technical Manual	EK–CXY08–TM
DEQNA Ethernet User's Guide	EK–DEQNA–UG
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
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
DZV11 Asynchronous Multiplexer User's Guide	EK–DZV11–UG
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 CPU Module User's Guide	EK–KDFEB–UG
KMV11 Programmable Communications Controller User's Guide	EK–KMV11–UG
KMV11 Programmable Communications Controller Technical Manual	EK–KMV11–TM

Document Title	Order Number
Modules	
LSI–11 Analog System User's Guide	EK–AXV11–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
Disk and Tape Drives	
RA60 Disk Drive Service Manual	EK–ORA60–SV
RA60 Disk Drive User's Guide	EK–ORA60–UG
RA81 Disk Drive Service Manual	EK–ORA81–SV
RA81 Disk Drive User's Guide	EK–ORA81–UG
SA482 Storage Array User's Guide (for RA82)	EK–SA482–UG
SA482 Storage Array Service Manual (for RA82)	EK–SA482–SV
RC25 Disk Subsystem User's Guide	EK–ORC25–UG
RC25 Disk Subsystem Pocket Service Guide	EK–ORC25–PS
RRD50 Subsystem Pocket Service Guide	EK–RRD50–PS
RRD50 Digital Disk Drive User's Guide	EK–RRD50–UG
RX33 Technical Description Manual	EK–RX33T–TM
RX50–D, –R Dual Flexible Disk Drive Subsystem Owner's Manual	EK–LEP01–OM
TK50 Tape Drive Subsystem User's Guide	EK–LEP05–UG
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

Document Title	Order Number
Systems	
MicroVAX Special Systems Maintenance	EK–181AA–MG
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–J 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
KDF11–B CPU System Maintenance	EK–245AA–MG
KDJ11–D/S CPU System Maintenance	EK–246AA–MG
KDJ11–B CPU System Maintenance	EK–247AA–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–J)	00–ZYAAE–GZ
MicroPDP–11 Hardware Information Kit (for BA213)	00–ZYAAS–GZ
Microsystems Options	EK–192AA–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–J)	00–ZNAAE–GZ
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

Document Title	Order Number
Diagnostics	
DEC/X11 Reference Card	AV–F145A–MC
DEC/X11 User's Manual	AC–FO53D–MC
XXDP User's Manual	AZ–GNJAA–MC
XXDP DEC/X11 Programming Card	EK–OXXDP–MC
MicroVAX Diagnostic Monitor Ethernet Server User's Guide	AA–FNTAC–DN
MicroVAX Diagnostic Monitor Reference Card	AV–FMXAA–DN
MicroVAX Diagnostic Monitor User's Guide	AA–FM7AB–DN
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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NOTES

Reader's Comments

KDF11–B CPU System Maintenance
EK–245AA–MG–001

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Figures (useful)	☐	☐	☐	☐
Examples (useful)	☐	☐	☐	☐
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