5310 N/A

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First Edition - August 1984

This manual provides quick reference for field service personnel working on MicroVAX I

MicroVAX I
Pocket Service Guide

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Contents

Preface

This pocket service guide provides reference information for Digital field service personnel working on the MicroVAX I computer.

The guide is divided into these sections:

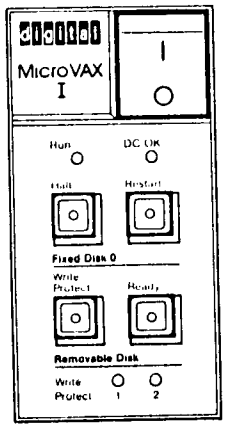
OPERATION: Contains console commands, console halt codes, and a diagram of the front panel.

TROUBLESHOOTING: Contains flowcharts of the procedure to follow when locating problems, plus flowcharts for Macroverify, Microverify, and boot, along with examples of commonly used console commands.

DIAGNOSTICS: Explains how to set-up and run MicroVAX I diagnostics.

REMOVAL & REPLACEMENT: Contains part numbers and a guide for gaining access to all FRUs.

SYSTEM CONFIGURATION: Contains module illustrations, and tables of jumpers and address assignments.



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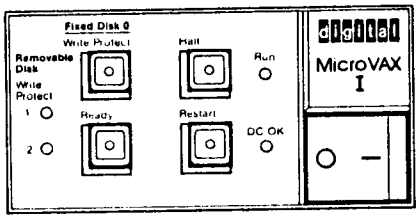
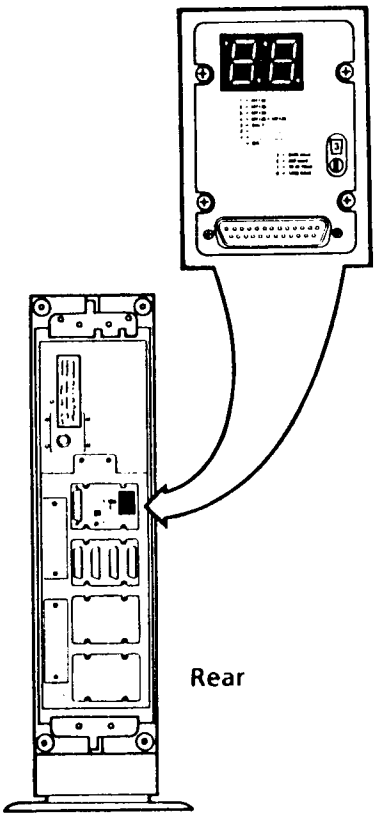


Label: part# 36-21549-02

Front Panel

Controls & Indicators	Function
System Power Switch	1 turns system power on. 0 turns system power off.
DC OK	Glows green if all DC voltages are present and within tolerance.
Run	Glows green when macroinstructions are being executed
Halt	Stops current program, does not shut down system, system enters console mode
Restart	Restarts computer operation, has no effect if Halt is latched in.
Fixed Disk Write Protect	Prohibits writing data to fixed disk.
Fixed Disk Ready	Glows green when out: fixed disk can be written to or read light off when in: fixed disk cannot be written to or read light blinks during disk activity.
Removable Disk Write Protect	LED glows when diskette is write protected

CPU Patch Panel LEDs



Rear

Changing Modes

From Program I/O to Console	From Console to Program I/O
• Press and latch-in Halt button on front control panel	• Press Halt button, if latched-in, on front control panel
• Press Break on console keyboard, if Break is enabled	Then issue BOOT, CONTINUE or START console commands
• Power up when recovery action is halt	
• Press Restart button on front control panel when recovery action is halt	

LED Coding

DAP LEDs	LED Display	Meaning
on, on, on	7	Microverify failed before completing the data path microsequencer test.
on, on, off	6	Error found on DAP module
on, off, on	5	Error found on MCT module.
on, off, off	4	Undetermined error in DAP/MCT interface
off, on, on	3	Microverify worked as expected. If bootstrapping was attempted, bad memory was found. (An error code of 3 in the LEDs has several meanings. See the section below, "Error Code 3.")
off, on, off	2	No boot device was found.
off, off, on	1	Unable to boot from selected device.
off, off, off	•	Control has passed to the secondary bootstrap

Error Code 3

If Microverify completes successfully, it sets the LEDs to 3 and passes control to the console microcode.

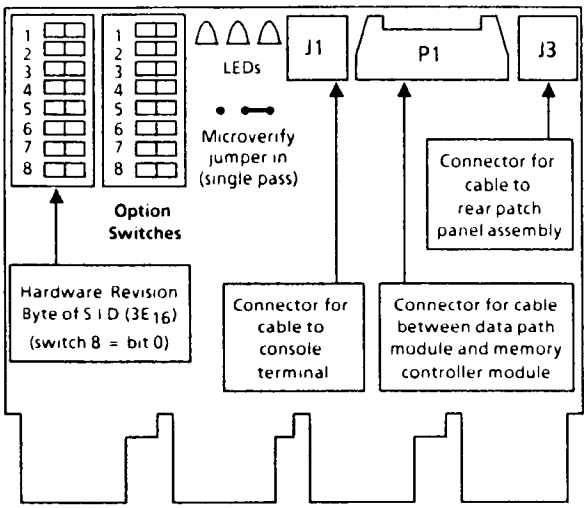
Normally, Microverify is invoked because the system is powered on, and "warm start, boot, halt" is the default action set in the option switches. Assuming the normal case, the console microcode searches for 64Kb of contiguous good memory after it receives control. If the console microcode finds 64Kb of good memory, it loads the primary bootstrap from the boot EPROM into this memory, and transfers control to the primary bootstrap.

If the console microcode does not find 64Kb of contiguous good memory, the LEDs remain set to 3 (off, on, on).

If control passes to the primary bootstrap, the primary bootstrap also lights the LEDs on the DAP module, and the LED display on the rear patch panel assembly, to indicate its progress. If the primary bootstrap fails, an error code of 3, 2, or 1 is displayed in the LEDs to indicate the problem. If the primary bootstrap detects a parity error when it tests memory, it leaves the LEDs set at 3.

When the primary bootstrap completes successfully and passes control to the secondary bootstrap, all three LEDs on the DAP module are turned off, and the LED display is blank except for a lighted dot in the lower right-hand corner of the display.

Switch Packs on Data Path Module



Option Switch Settings

Switch	On/Off	Meaning
8:7 baud rate select	**both off**	**9600**
	8 off, 7 on	19,200
	8 on, 7 off	300
	both on	1200
6	**off**	no effect
5 break detect	**off**	**break key disabled**
	on	break key enabled
4:3 recovery action	**both off**	**warm start, boot, halt**
	4 off, 3 on	boot or halt
	4 on, 3 off	warm start or halt
	both on	halt
2 console terminal	**off**	**VT100 compatible**
	on	bit-mapped graphics terminal
1 bootstrap search order	**off**	**all devices searched**
	on	disk/diskette drives bypassed

Control Key Functions

Key	Control Function
Break	If enabled, puts you in console mode from program I/O mode and causes the command prompt (>>>) to appear. The system is shipped with the Break key disabled.
CTRL/U	Aborts the current command and returns the console command prompt (>>>).
Delete	Aborts the current command and returns the console command prompt (>>>).
Return	Terminates the command string and executes the command.

Console Command Summary

Command		Format
B	Boot	>>>B qualifier device-name (see table below for arguments)
C	Continue	>>>C
D	Deposit	>>>D qualifier-list location data (see table on next page for arguments)
E	Examine	>>>E qualifier-list location data (see table on next page for arguments)
H	Halt	>>>H
I	Initialize	>>>I
N	Single Macro Instruction Step	>>>N
S	Start	>>>S location
T	Test	>>>T
U	Unjam	>>>U
X		>>>X location count CR checksum

BOOT Command Device Names

Device	Name	Device	Name
Disk unit 0	DUA0	Disk unit 3	DUA3
Disk unit 1	DUA1	MRV11 PROM	PRA0
Disk unit 2	DUA2	DEQNA	XQA0

DEPOSIT and EXAMINE Command Qualifiers

Qualifier	Function
B	A byte of data
W	A word of data
L	A longword of data, this is the default data size
P	Data is to be deposited or examined at a physical memory address. This is the initial default address space for the DEPOSIT command
V	At a virtual memory address
G	In a general register. Only longword data in this register (a data length qualifier will be ignored)
I	In an internal processor register. Only longword data in this register (a data length qualifier will be ignored) These registers are listed and described in the Appendix under Privileged Registers.
M	In a machine specific register. Only longword data is deposited in this register (a data length qualifier will be ignored). These registers are listed and described in the Appendix under Privileged Registers

DEPOSIT and EXAMINE Command Locations

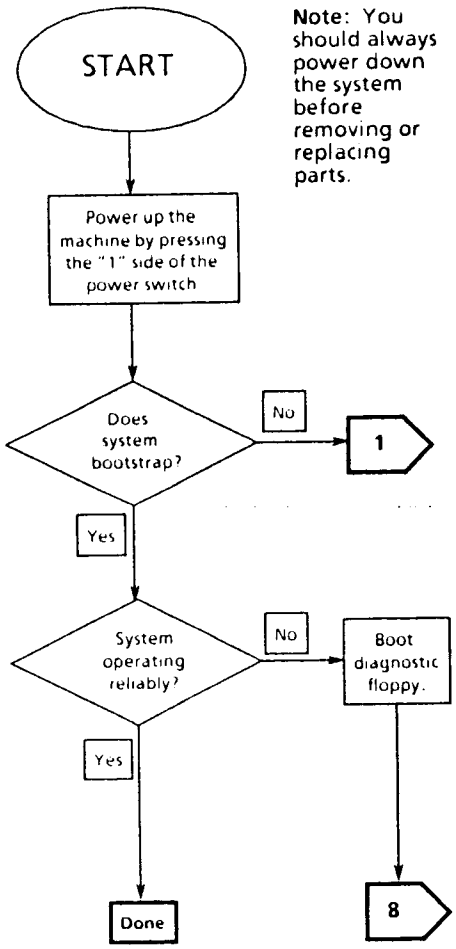
Location	Meaning
address	The address or register number where data is to be deposited or examined. This is expressed as a hexadecimal number. If a register number is supplied, only the lowest hexadecimal digit is used. If an address is supplied only the lowest 8 digits are used
*	The data is to be deposited or examined at the last location deposited or examined in a previous DEPOSIT or EXAMINE command.
@	The data is to be deposited or examined at the address represented by the last data examined or deposited
+	The data, plus the size of the last data, is to be deposited or examined at the last location specified in a previous DEPOSIT or EXAMINE command
–	The data, minus the size of the last data, is to be deposited or examined at the last location specified in a previous DEPOSIT or EXAMINE command
p	The data is to be deposited or examined in the processor status longword

Console Halt Codes

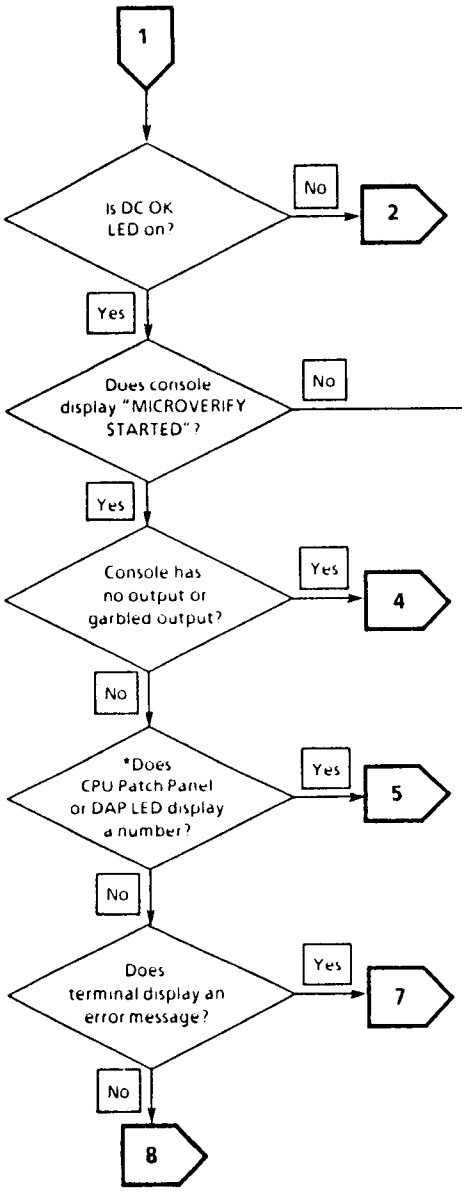
Code	Meaning
00	Not used
01	Microverify succeeded
02	Console halt/break
03	Power up
04	The interrupt stack was not valid when the CPU tried to push the PC/PSL during an exception or an interrupt.
05	A second machine check occurred while the CPU was processing an existing machine check.
06	A Halt instruction was executed while the processor was in kernel mode
07	Not used
08	Not used
09	Not used
0A	A CHMx instruction was executed when the CPU was executing on the interrupt stack
0B	Not used
0C	A hard memory error occurred while the CPU was trying to read a system control block vector.
0D–10	Not used
FF	Microverify failed

Console Error Codes

Code	Meaning
?11	An attempt has been made to examine data from, or deposit data into, an illegal internal processor register
?7F	An attempt has been made to examine data from, or deposit data into, an illegal machine register
?20	Machine check resulting from, for example, trying to examine data from non-existent memory
?30	Checksum error in an X command

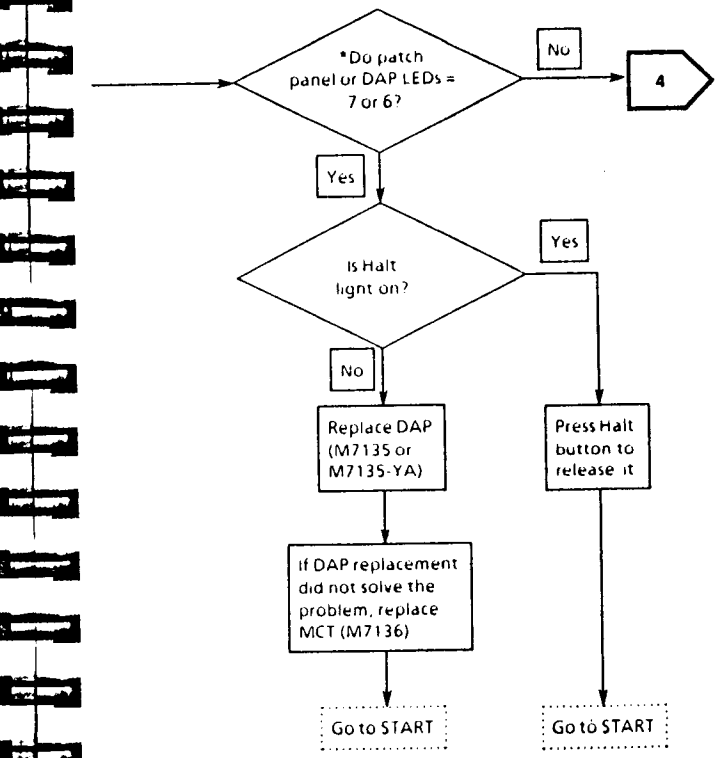


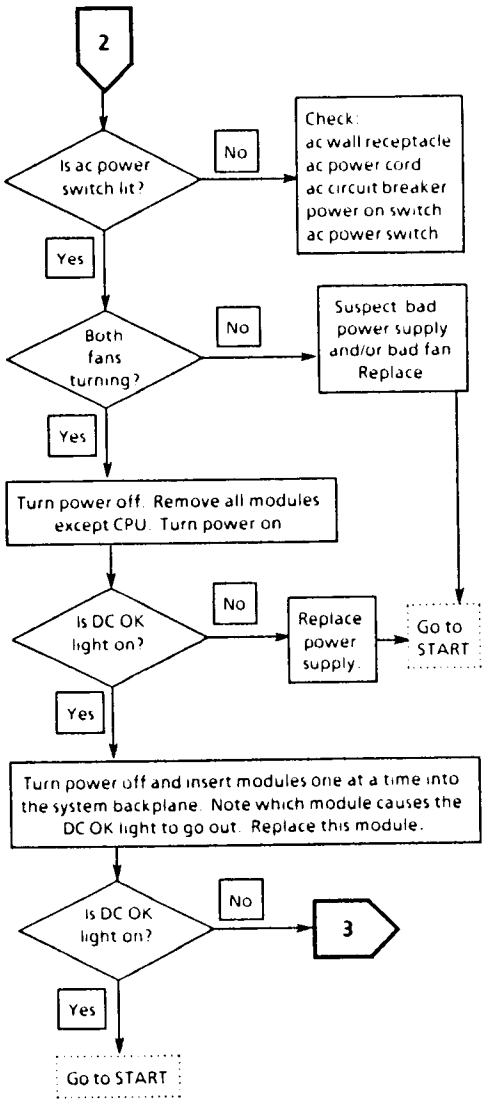
Note: You should always power down the system before removing or replacing parts.



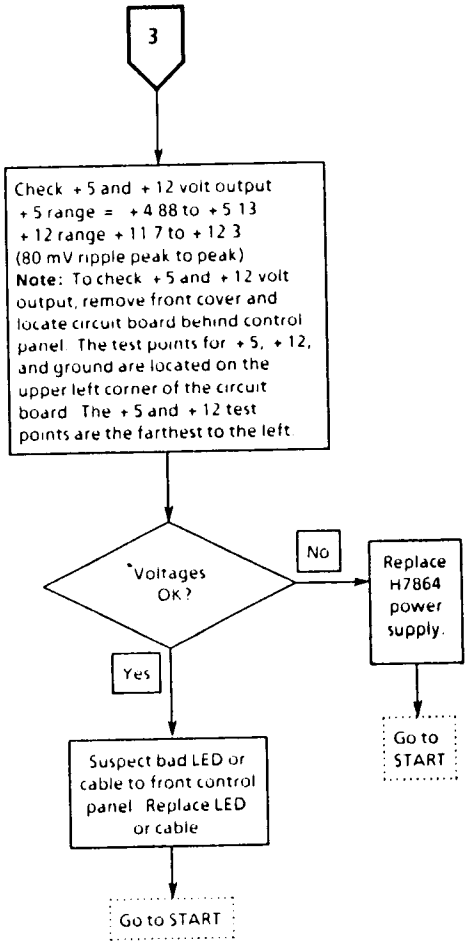
*A number displayed in the LEDs or patch panel is meaningful only if the system is in console halt mode

Note: The system is in console halt mode when the prompt >>> is displayed.

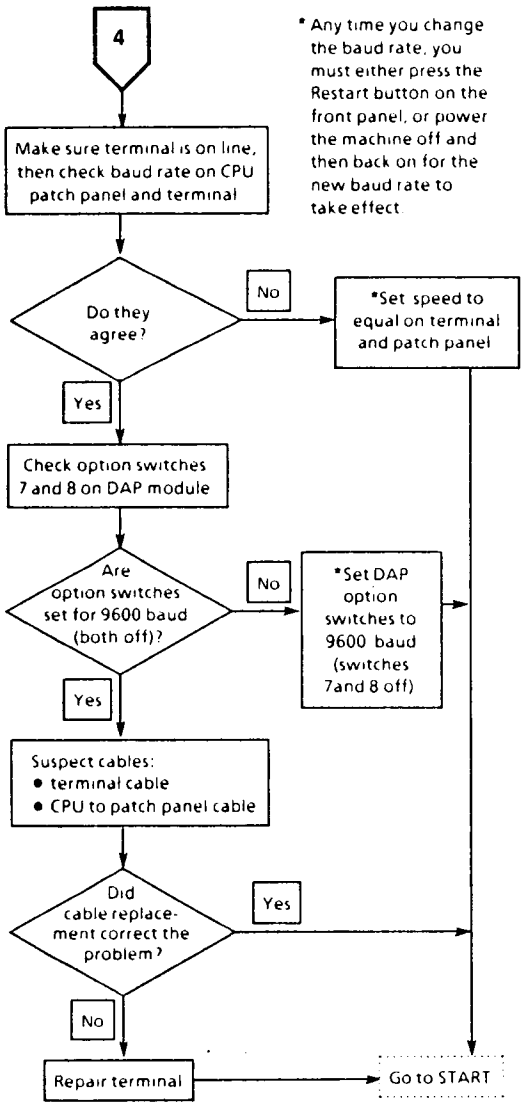




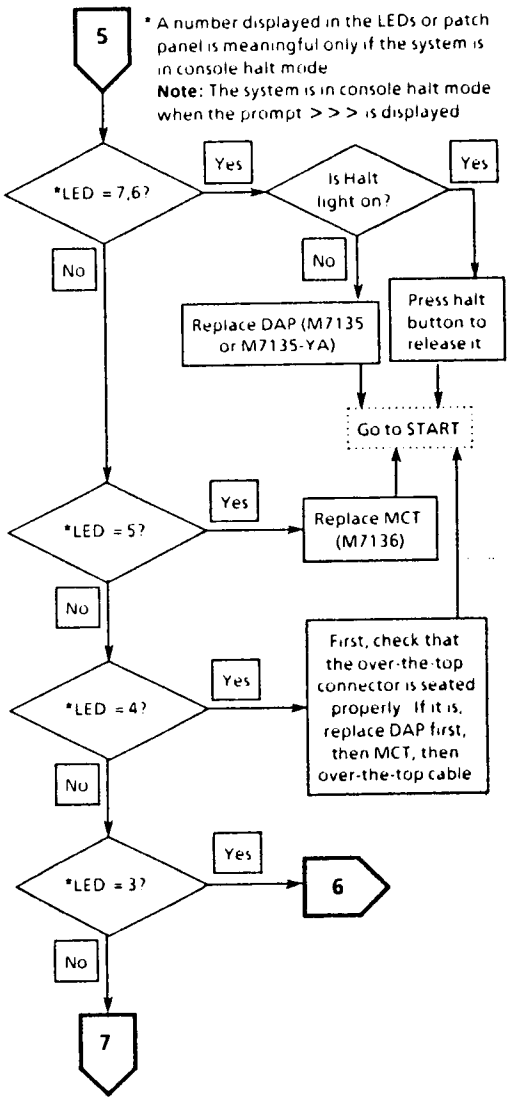
Flowchart (3 of 12)



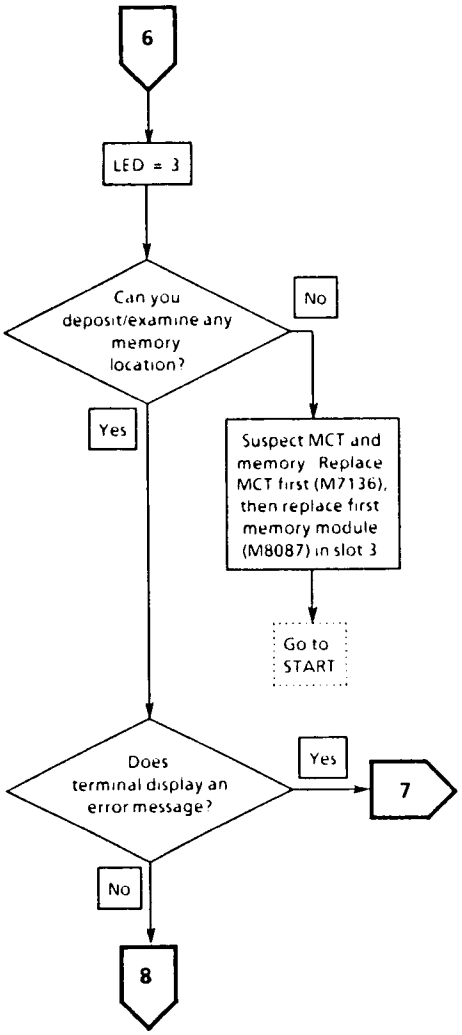
Flowchart (4 of 12)



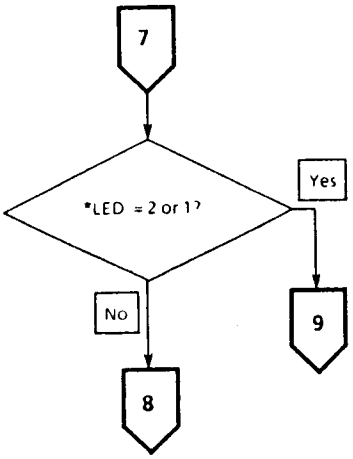
Flowchart (5 of 12)

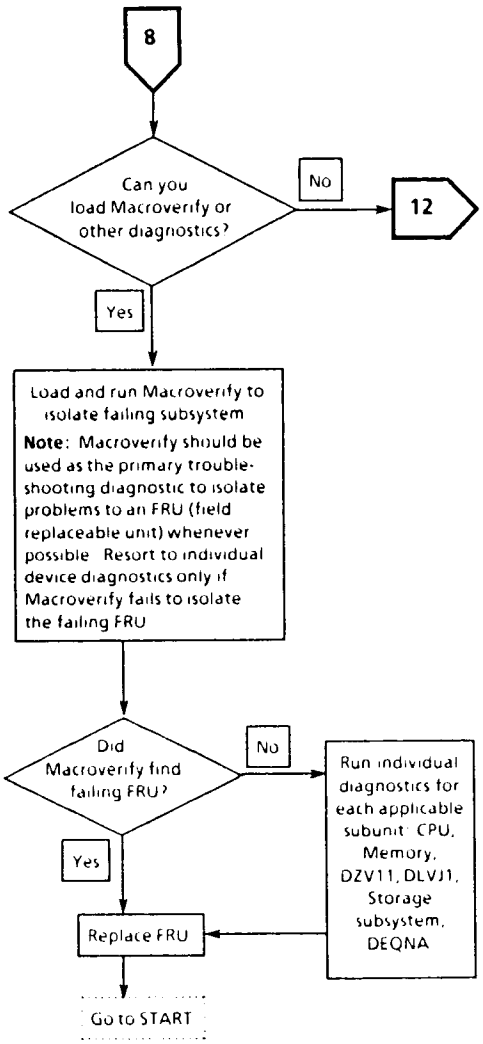


Flowchart (6 of 12)

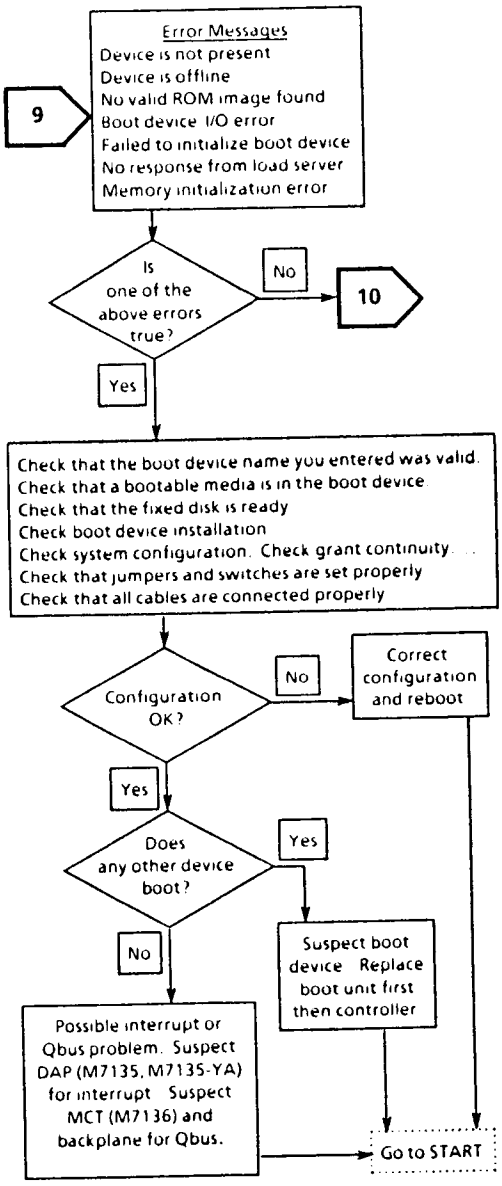


* A number displayed by the LEDs or patch panel is meaningful only if the system is in console halt mode.
Note: The system is in console halt mode when the prompt > > > is displayed.

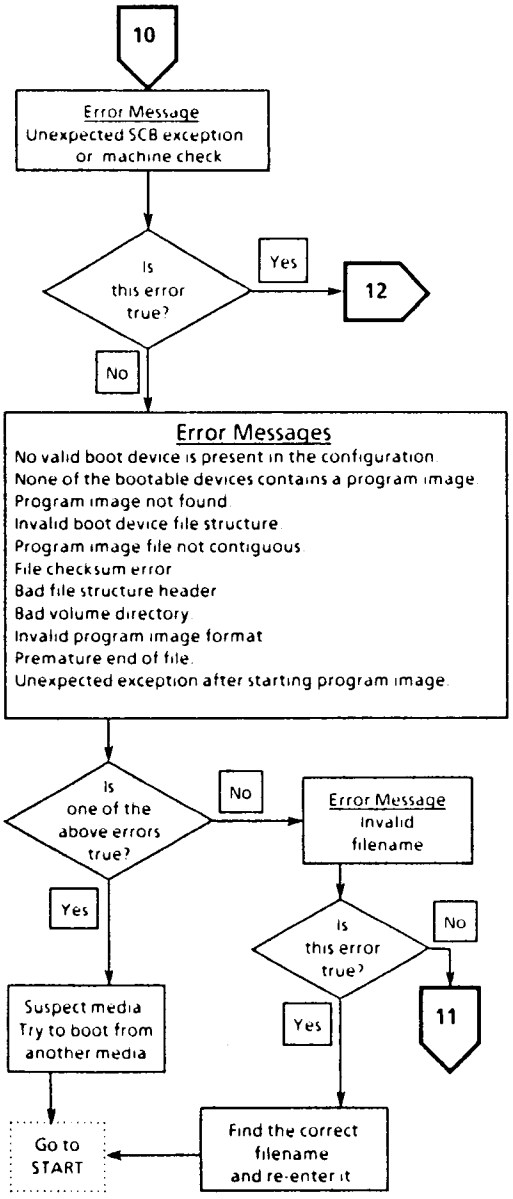




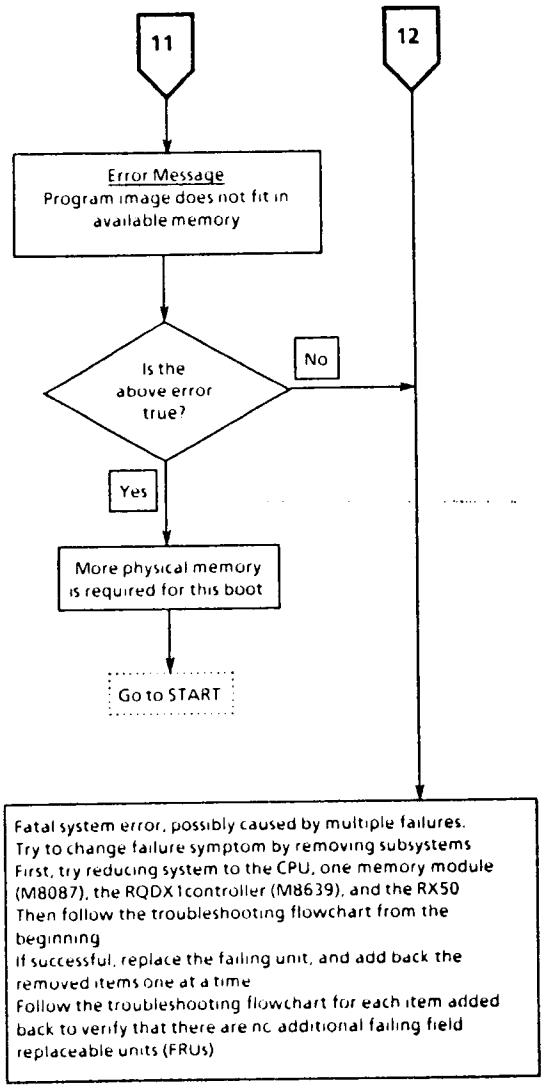
Flowchart (9 of 12)



Flowchart (10 of 12)



Flowchart (11 of 12)



Flowchart (12 of 12)

2: Troubleshooting

Microverify Diagnostic Flowchart

(Testing sequence corresponds to numerical order of tests and subtests)

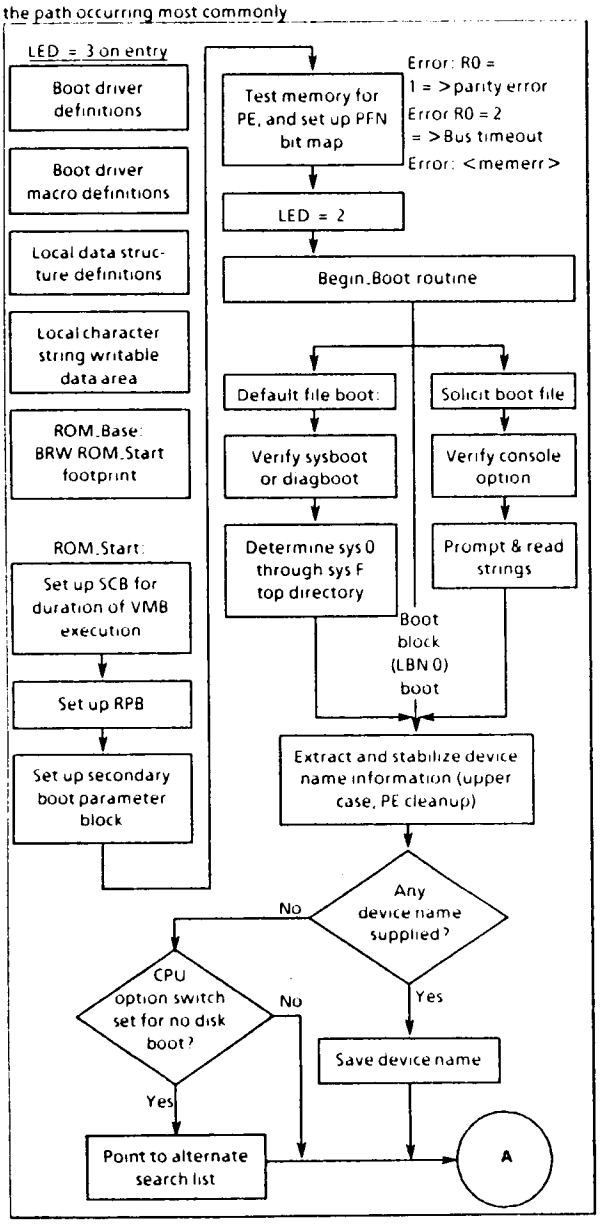
Test #	Test sub#	LED Display	Terminal Displays: Infinite Loop Mode	Terminal Displays: Single Pass	Test Description
--	--	7			Main Sequencer Test
0	--	6	"0", followed by line feed & carriage return.		Data Path Chip Test: tests all opcodes with byte, word & longword interval timer, all ROM constants, general register reads & writes, etc
1	--	6	"Microverify Started," followed by line feed and carriage return (followed by "1" in infinite loop mode only)		Console Subsystem Test: tests data read/write in local loopback mode, console interrupt priorities, etc
2	--	6	"2"		Tests OR-MUX logic with IB invalid
3	--	6	"3"		Tests ID bus registers and ID bus lines
4	--	4	"4"		Tests DAP & MCT interface signals and the Handshaking sequence: busy, required acknowledge, MCT control store, MCT sequencer, etc
5	--	5			Setting up test
	1	4	"+"		Tests MCT adder with 8-bit pattern
	2	5	"+"		Tests MCT data bus (MCD) & control bus (MCA), and rotator & reverse pass logic, all with 8-bit pattern
	3	4	"+"		Same logic test as subtest 2, but with a 32-bit pattern.
	4	5	"+"		Tests MCT register file with a 32-bit pattern
	5	5	"+"		Tests cache with a 32-bit pattern
	6	5	"+"		Tests TB with a 32-bit pattern
	7	5	"+"		Tests unique cache addresses
	8	5	"5"		Tests unique TB addresses
6	--	5	"6"		Tests to ensure that If-write-cache-enable & power-up will invalidate all cache locations. Also tests MCT adder, MCT page cross, and MCT sequencer.
7	1	4	"+"		Tests the DAP/MCT interface, and memory control bus/I byte with various patterns
	2	4	"+"		Tests sign/zero extenders
	3	6	"+"		Tests DAP operation during I-stream request & memory request: increments PC correctly, saves size information
	--	6	"7"		No test. "7" is displayed in infinite loop mode only

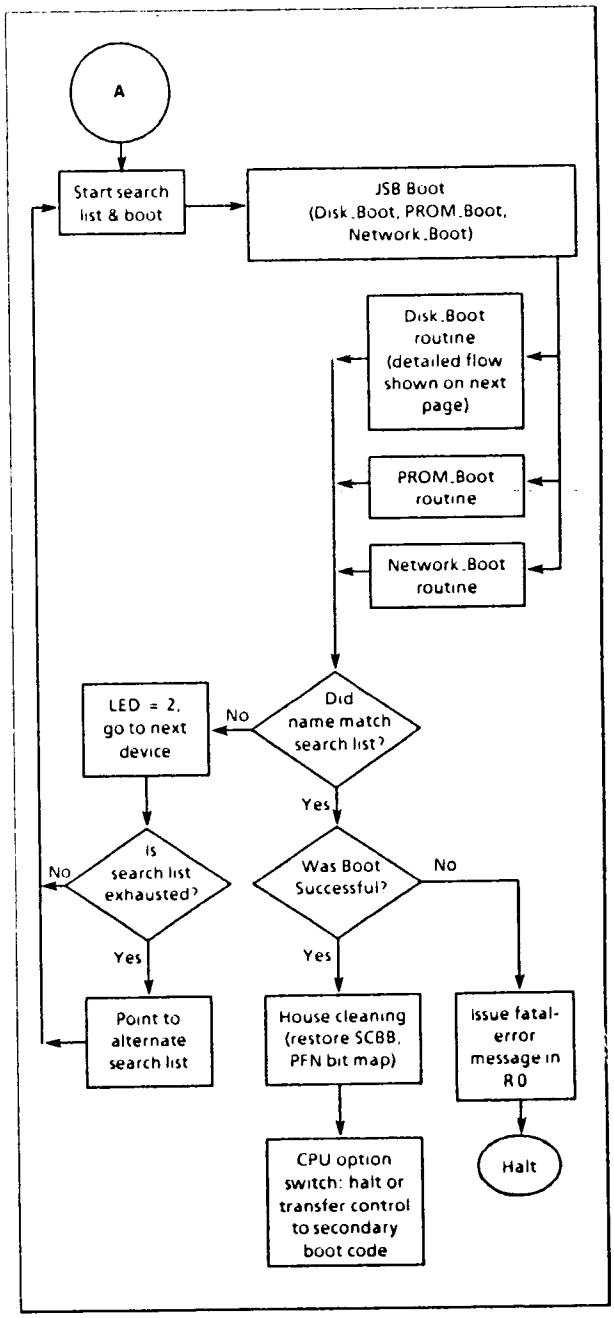
Continued on next two pages

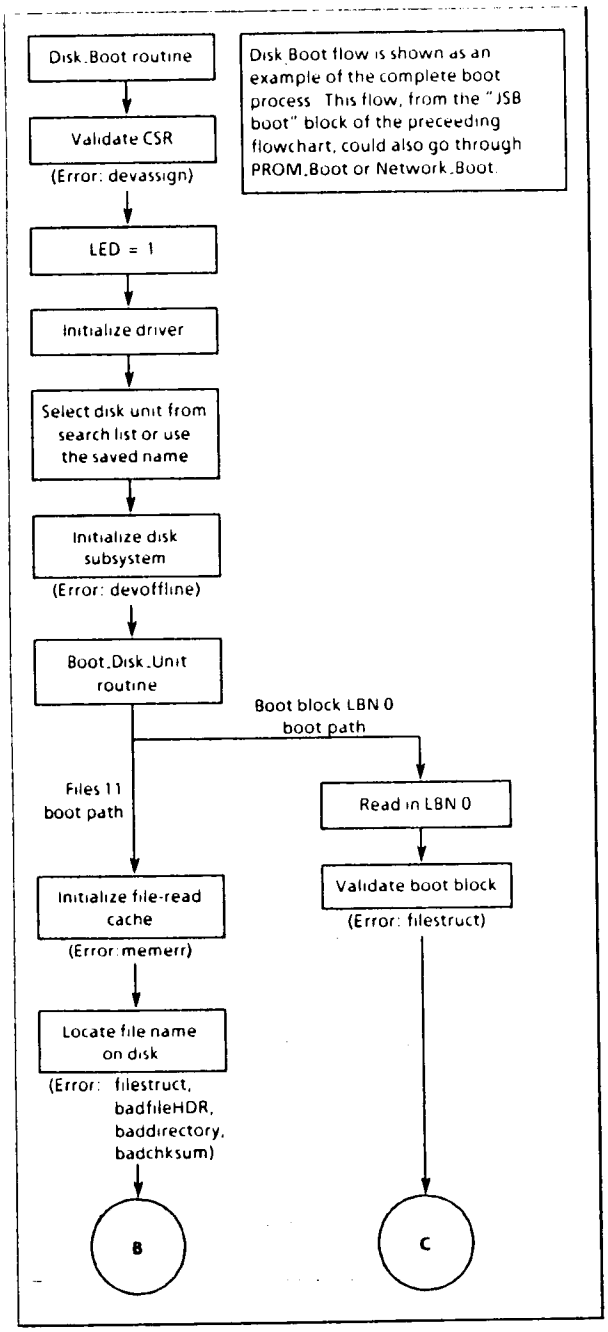
Test #	Test sub#	LED Display	Terminal Displays: Infinite Loop Mode	Terminal Displays: Single Pass	Test Description
8	--	4	"8"		Tests IB invalid to OR-MUX
9	--	6	"9"		Tests opcode decode control logic: PC incrementer, size register, and various specific decodes
10	--	6	"A"		Tests OR-MUX states with and without IB invalid set: branch, decode, index, size, states, etc
11	--	4	"B"		Tests OR-MUX in memory state: TB miss, access violation, page crossings, etc. (verifies MCT to OR-MUX)
12	1	6	"+"		Tests jump MUX with "always" condition
	2	6	"+"		No test
	3	6	"+"		Tests jump MUX with "never" condition
	4	6	"+"		Tests jump MUX with "IB OK" condition
	5	6	"+"		Tests jump MUX with "console halt" condition
	6	6	"+"		Tests jump MUX with "interrupt pending" condition
	7	6	"+"		Tests jump MUX with "stack register" selected
	8		"C"		Tests jump MUX with "register destination" selected
13	--	6	"D"		Tests trap & conditional decrement logic in micro-sequencer
14	--	6	"E"		Calculate and verify the boot ROM check sum
15	--	5	"F"		Tests MCT CSR registers
--	--	3	Carriage return & linefeed, "Microverify Passed", carriage return & linefeed		Prints "Microverify Passed" message, then returns control to console microcode

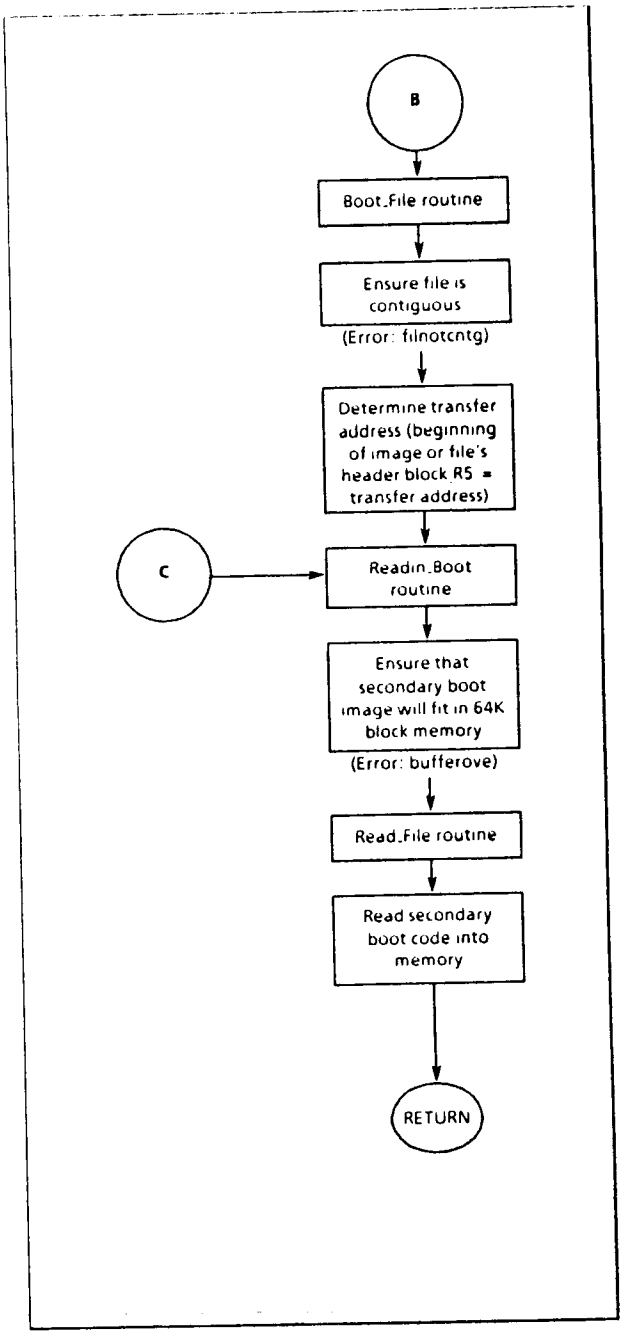
VMBUVAX I Boot flowchart

Note: This MicroVAX I boot flowchart is a simplified representation of the Boot_Prom code. This chart shows one possible path, Disk_Boot, the path occurring most commonly.



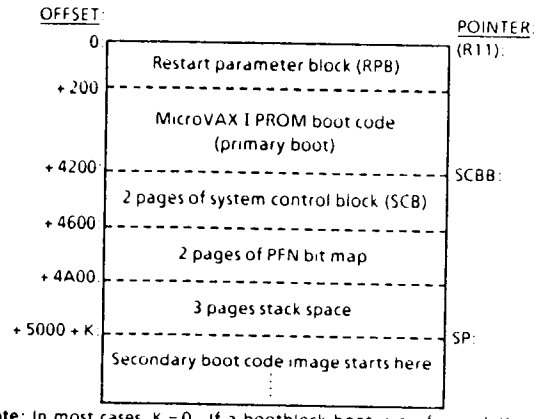



Disk_Boot routine
Validate CSR
(Error: devassign)
LED = 1
Initialize driver
Select disk unit from search list or use the saved name
Initialize disk subsystem
(Error: devoffline)
Boot_Disk_Unit routine
Boot block LBN 0 boot path
Files 11 boot path
Read in LBN 0
Validate boot block
(Error: filestruct)
Initialize file-read cache
(Error: memerr)
Locate file name on disk
(Error: filestruct, badfileHDR, baddirectory, badchksum)
B
C
Disk Boot flow is shown as an example of the complete boot process. This flow, from the "JSB boot" block of the preceeding flowchart, could also go through PROM_Boot or Network_Boot.


B
Boot_File routine
Ensure file is contiguous
(Error: filnotcntg)
Determine transfer address (beginning of image or file's header block R5 = transfer address)
C
Readin_Boot routine
Ensure that secondary boot image will fit in 64K block memory
(Error: bufferove)
Read_File routine
Read secondary boot code into memory
RETURN

Memory Layout

(when control is passed to secondary boot)



Note: In most cases, K = 0. If a bootblock boot is performed, K is the offset specified in LBN 0, and LBN 0 contains the bootblock format.

Boot Command Flags (/n values)

Bit No.	Hex Flag Value	Flag Name and Meaning
3	00000008	BOOTBLOCK – Secondary boot from bootblock. When this bit is set, the primary bootstrap skips the normal operation, which is to search the volume as a Files-11 volume. Instead, the primary bootstrap reads logical block number 0 of the volume and tests it for conformance with the bootblock format.
4	00000010	DIAGNOSTIC – Diagnostic boot. When this bit is set, the secondary bootstrap is the image called [SYS0.SYSMAINT]DIAGBOOT.EXE.
6	00000040	HEADER – Image header. If this bit is not set, the primary bootstrap transfers control to the first byte of the secondary bootstrap file. If this bit is set, the primary bootstrap transfers control to the address of the secondary bootstrap obtained from that file's image header.
7	00000080	NOTEST – Memory test inhibit. This flag disables parity checking during boot.
8	00000100	SOLICT – Solicit file name. When this bit is set, the primary bootstrap prompts for the name of a secondary bootstrap file.
9	00000200	HALT – Halt before transfer. When this bit is set, it causes a Halt instruction to be executed before transferring control to the secondary bootstrap.
31:28	X0000000	TOPSYS. X can be any value from 0 through F (hex). The TOPSYS flag changes the top level directory name for system disks with multiple operating systems. For instance, if X = 1, the top level directory name is [SYS1.].

Restart Parameter Block

This table shows the contents of the RPB when the primary bootstrap transfers control to the secondary bootstrap.

OFFSET	
00:	address of the RPB
04:	0
08:	0
0C:	0
10:	PC at restart/halt
14:	PSL at restart/halt
18:	restart reason from microcode
1C:	saved boot parameter R0
20:	saved boot parameter R1
24:	saved boot parameter R2
28:	saved boot parameter R3
2C:	saved boot parameter R4
30:	saved boot parameter R5
34:	two longwords reserved
3C:	disk block address of secondary image
40:	size of secondary bootstrap file
44:	descriptor for PFN bitmap (two longwords)
4C:	count of good physical pages
50:	reserved
54:	physical CSR address of boot device
58:	four longwords reserved
68:	boot file name in ASCII, up to 40 characters (ten longwords)
90:	eight longwords reserved
80:	system control block base address

Secondary Bootstrap Argument List

This table shows the argument list prepared by the primary bootstrap for the secondary bootstrap.

(AP) + 0:	12
(AP) + 4:	reserved
(AP) + 8:	reserved
(AP) + C:	lowest valid PFN
(AP) + 10:	highest valid PFN
(AP) + 14:	PFN map byte size
(AP) + 18:	address of the PFN bitmap
(AP) + 1C:	reserved
(AP) + 20:	reserved
(AP) + 24:	reserved
(AP) + 28:	7 (processor ID)
(AP) + 2C:	reserved
(AP) + 30:	reserved

Bootblock Format (LBN 0)

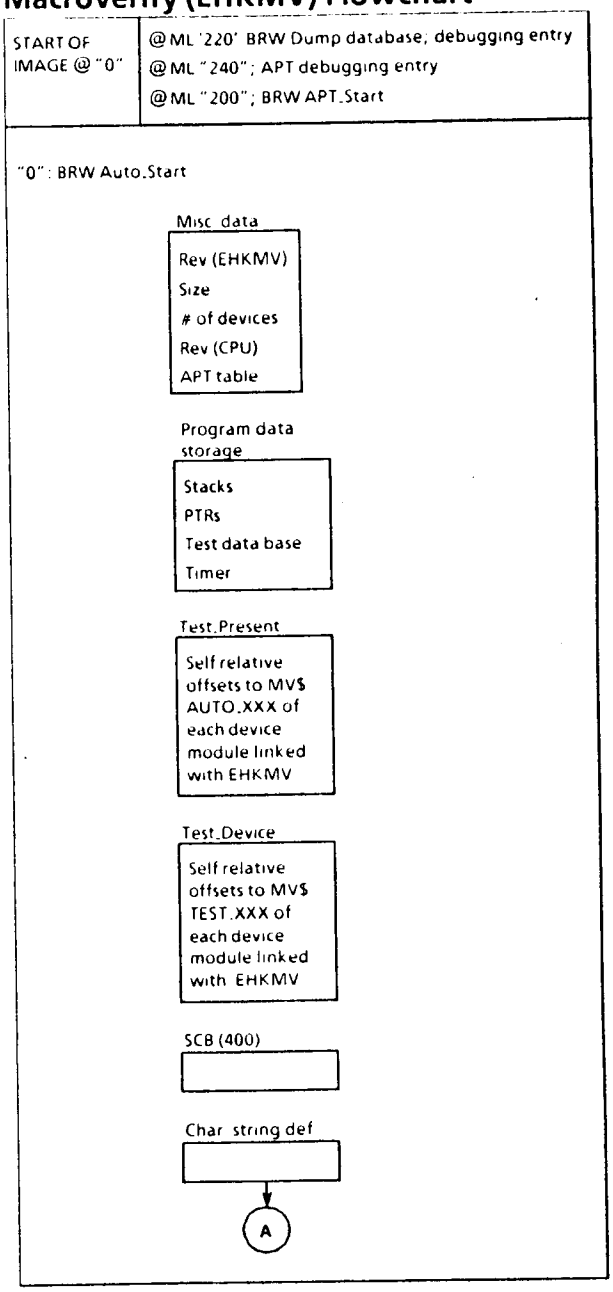
				OFFSET (hex)
	1	n	any value	:BB + 0
	low-word LBN of secondary bootstrap		high-word LBN of secondary bootstrap	:BB + 4
Identification Area	check byte	k	0	18 (hex) :BB + (2*n) + 0
	any value		1 or 81 (hex)	0 :BB + (2*n) + 4
	offset into secondary bootstrap to start execution			:BB + (2*n) + 8
	sum of the previous three longwords			:BB + (2*n) + C
	size in blocks of the secondary bootstrap			:BB + (2*n) + 10
	offset from default load address where the secondary bootstrap will be loaded			:BB + (2*n) + 14

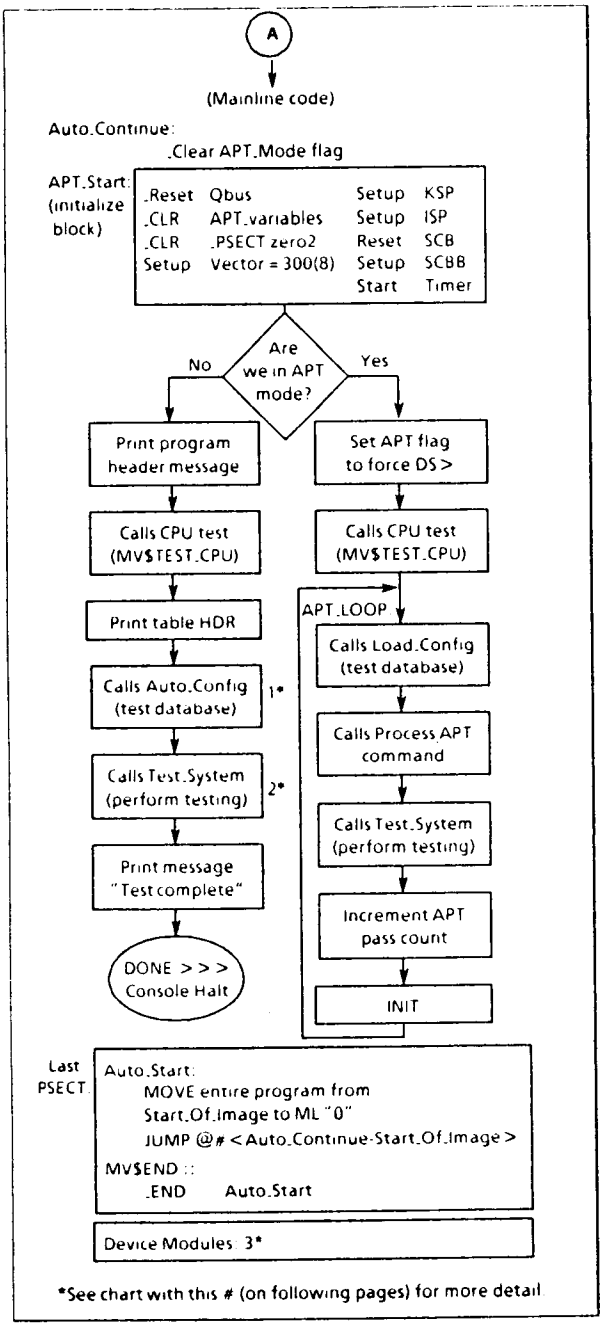
BB + 2: **n.** The value n is the word offset from the start of the block to the identification area described below.

BB + (2*n) + 0: **18 (hex).** This byte defines the expected instruction set; 18 means VAX.

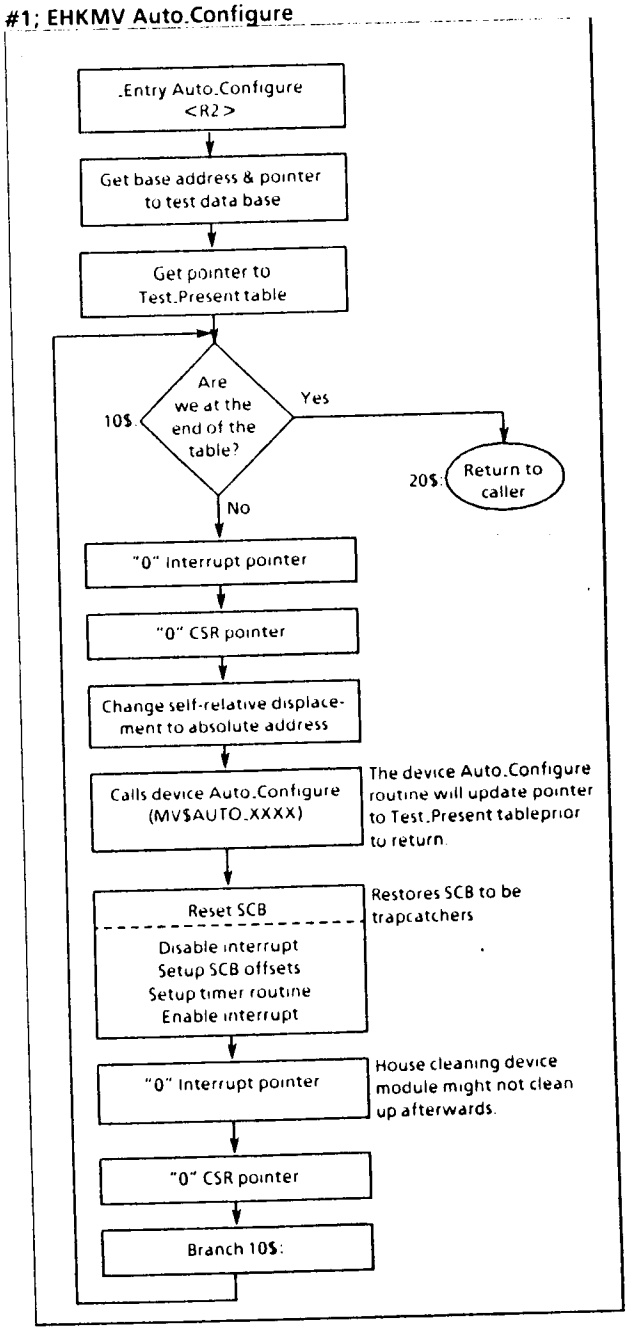
BB + (2*n) + 5: **1 or 81 (hex).** This byte defines the version number of the format standard and the type of disk. The version is 1. The high bit is 0 for single-sided and 1 for double-sided.

Macroverify (EHKMV) Flowchart

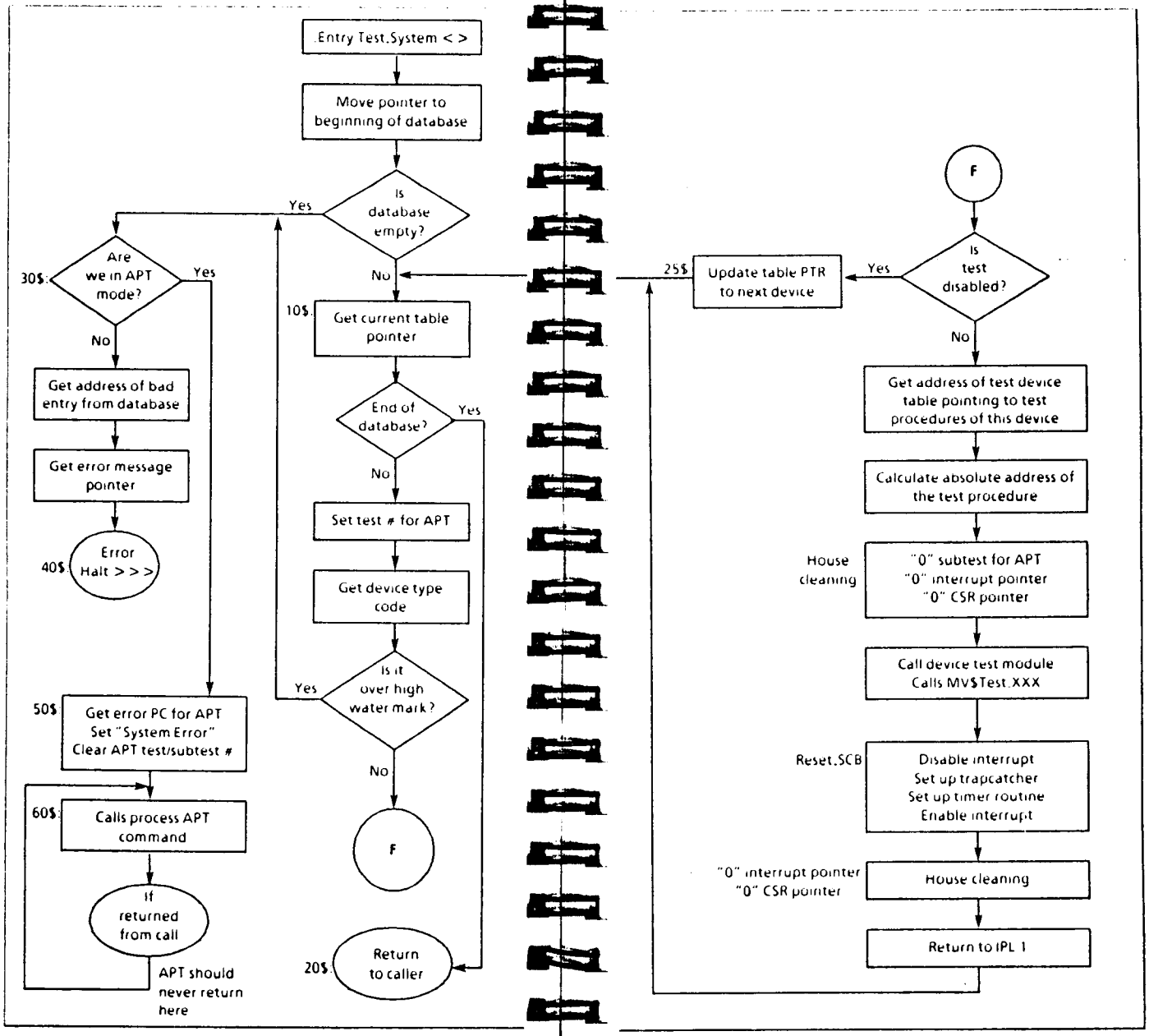




#1; EHKMV Auto.Configure

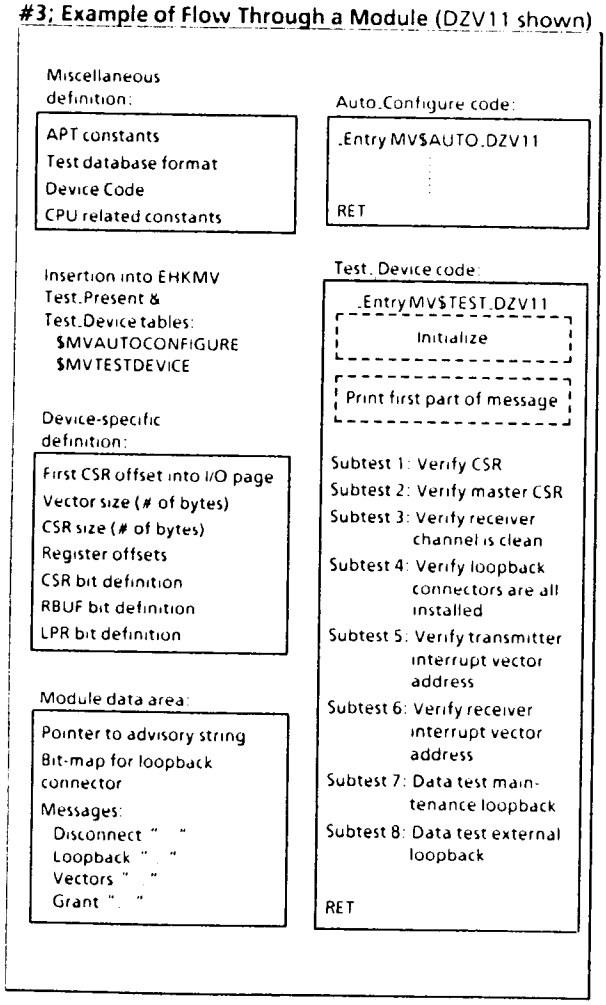


#2; Test System Subroutine



2: Troubleshooting

#3; Example of Flow Through a Module (DZV11 shown)



Commonly Used Console Commands

Finding the hardware address of a DEQNA module

The last two characters of each output string, when joined consecutively, form the DEQNA module's address.

```
>>> E/P/W 2000F920
    P 2001920 0000FFAA
>>> E +
    P 20001922 0000FF00
>>> E +
    P 20001924 0000FF03
>>> E +
    P 20001926 0000FF01
>>> E +
    P 20001928 0000FF12
>>> E +
    P 2000192A 0000FF49
```

This DEQNA's address is AA-00-03-01-12-49

Examining the CPU microcode revision

```
>>> E/I 3E
    I 0000003E 07010500
```

Byte 3 = 07; CPU type is MicroVAX I
Byte 2 = 01; "D" floating format
00; "F" floating format
Byte 1 = 05; software revision level is 5
Byte 0 = 00; hardware revision level is 0

Example of 1 Mb Memory Test

This program puts a longword memory address into the corresponding longword memory location.

This program's memory section, ML"0" through ML "7", will be skipped

```
--DEPOSIT    8(hex) into R 0        ; to skip this program.
--DEPOSIT    3FFFF(hex) into R 1    ; to load 1 Mb of memory
                                      with its own address.

80 50 D0 1$:  MOVL R 0, (R 0) +
   FA 51 F5   SOBGTR R 1, 1$
         00   Halt

>>> D/P/L 0 F58050D0    ; deposit first 4 bytes into ML "0"
>>> D + FA51            ; deposit next 4 bytes into memory
                          location "4"
>>> D/G/L 0 8           ; deposit "8" into R 0
>>> D + 3FFFF           ; deposit value of 256 K into R 1
>>> S 0                 ; starts execution at ML "0"
```

These examples use a MicroVAX I with a DLVJ1 asynchronous serial line interface. There is a VT100 attached to line 0 on the DLVJ1.

Examining and Depositing CSR of an I/O Device

```
>>> E/P/W 2000FD44      ; examine XCSR channel 0 on DLV,
                         XCSR = 776504 (2000FD44)
    P 2000FD44 00000080; transmit buffer is ready
>>> D + 41              ; deposit ASCII "A" to channel 0
                         XBUF, XBUF = 776506 (2000FD46)
>>>                     ; an "A" should appear at the
                         terminal
```

Loading Programs by Using the Deposit Command

This example types "ABCDEFGHIJKLMNOPQRSTUVWXYZ" on a terminal through a DLVJ1 device.

```
                        ; R4 = loop count (26)
                        ; R2 = ASCII "A"
                        ; R0 = DLVJ1 base address
                          (776500oct = 2000FD40hex)
    MOVL R4, R3         ; R3 <---- loop count
    MOVW R2, R1         ; R1 <---- starting ASCII character
                          (A)
1$: MOVW 4(R0), R5      ; read XCSR status
    BBC #7, R5, 1$      ; loop if not ready
    MOVW R1, 6(R0)      ; write character to XBUF
    INCW R1             ; next character
    SOBGTR R3, 1$       ; loop if not finished
    HALT
    END
```

```
>>> D/G 4 1A            ; R4 <---- character count
>>> D 2 41              ; R2 <---- ASCII "A"
>>> D 0 2000FD40        ; R0 <---- DLVJ1 base address
>>> D/P/L 0 B05354D0    ; start entering program
>>> D + A0B05152
>>> D + 07E15544
>>> D + 51B0F855
>>> D + 51B606A0
>>> D + 00EF53F5        ; program ends with a HALT
```

The program can be checked by using the EXAMINE command.

```
>>> E/P/L 0             ; examine a longword with physical
                         address
    P 00000000 B05354D0
>>> E +                 ; examine next (other attributes are
                         from previous console instruction)
    P 00000004 A0B05152
>>> E/B +               ; examine a byte using next address
```


The START command will run the program.

```
>>> S 0
00000018 06
>>>
```

If PC is set to point to the beginning of the program, the program can be stepped through using the NEXT command.

```
>>> D/G F 0             ; PC <---- 0
>>> N 00000003 B05152B0 ; MOVW R1, R2
>>> N 00000006 5504A0B0 ; MOVW 4(R0), 55
>>> N 0000000A F85507E1 ; BBC #7, R5, 1$
>>> etc.
```

Option Module CSRs

Option	Module #	First CSR Octal	First CSR Hex.	Vector Octal
MSV11-PL	M8067-LA	772100	2000F440	--
MSV11-PK	M8067-KA	772100	2000F440	--
DZV11	M7957	760010*	2000E008	300-760
DLVJ1	M8043	776500	2000FD40	300-760
RQDX1	M8639-YA	772150	2000F468	154
DEQNA	M7054	774440	2000F920	120

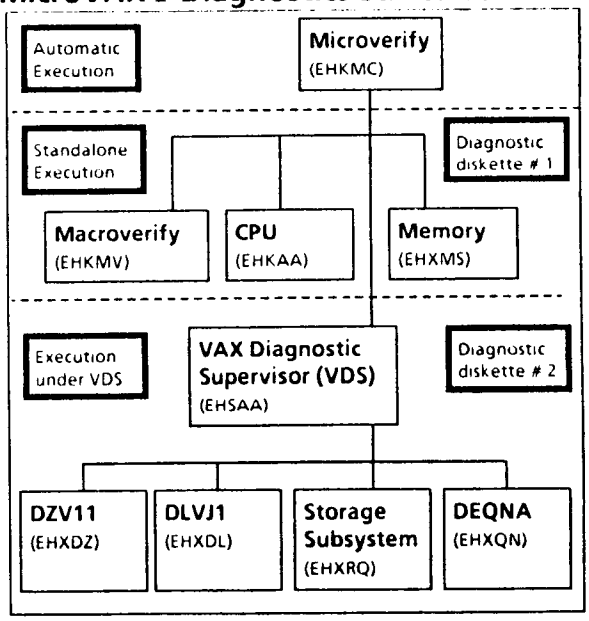
*This is first CSR as the module is shipped. It must be changed to 760100 (2000E040) for first DZV11 in a MicroVAX I.

Diagnostics Summary

Diagnostic	Diskette	Space needed	Run time
Microverify	None--executed automatically		
Macroverify	"1 of 2"	30 Kb	4 minutes
CPU	"1 of 2"	196 Kb	2 minutes
Memory	"1 of 2"	30 Kb	12min./256 Kb full testing (default), 7 min./256 Kb no memory parity testing
DZV11	"2 of 2"	512 Kb	5 minutes
DLVJ1	"2 of 2"	512 Kb	10 min @ 150 baud 3 min. @ 38,400 baud
Storage Subsystem	"2 of 2"	512 Kb	<10 minutes for any valid disk configuration
DEQNA	"2 of 2"	512 Kb	5 minutes

Item	Part Number
Diskette "1 of 2"	#BL-T856A-DE
Diskette "2 of 2"	#BL-T857A-DE
MicroVAX I field maintenance printset	#MP-01896-01
Diagnostics kit (both diskettes, *Owner's Manual*, MicroVAX I print set)	#ZHO55-C3

MicroVAX I Diagnostics Structure



Microverify

Microverify consists of permanently resident microcode. It is executed automatically when system power is turned on.

You may specifically invoke Microverify by issuing the TEST console command.

Operation

Microverify has two modes of operation, single pass and infinite loop. A jumper on the Data Path Module (DAP) determines which mode is in effect.

JUMPER	
In	single pass (default mode)
Out	infinite loop

Macroverify (EHKMV.EXE)

Diskette	Space needed	Run time
"1 of 2"	30 Kb	4 minutes

- All devices in the configuration must be powered up.
- Set disk drives to write-enabled.
- Place diskettes in each diskette drive.
- Disconnect any external cables from the DLVJ1 or DZV11 patch panels. Loopback test connectors may be connected on the DLVJ1 or DZV11 patch panel lines; see the description of these diagnostics.

Booting

Insert diagnostic floppy "1 of 2" into the top or left floppy drive (this will usually be designated as drive 1) and type:

```
>>>B DUA1
```

Operation

Macroverify runs until completion without you having to intervene. When it has finished running, a HALT instruction is executed and the console command prompt (>>>) is displayed.

If the diagnostic does not issue a message regarding the test status of any single device after the amount of time allotted in the test output has expired, you should assume there is a problem with the device and perform the replacement procedure described in "FRU Removal and Replacement."

NOTE: Testing will NOT destroy disk data.

CPU Diagnostic (EHKAA.EXE)

Diskette	Space needed	Run time
"1 of 2"	196 Kb	2 minutes

Booting

Insert diskette "1 of 2" into the first RX50 diskette drive (this will usually be designated as drive 1) and type:

```
>>>B/100 DUA1
Bootfile: [SYS0.SYSMAINT]EHKAA.EXE
```

Operation

Once the diagnostic is bootstrapped, the tests are run continuously. After each 10 passes of the diagnostic (this takes approximately 20 seconds), a single line, containing the version number of the diagnostic, is listed. The diagnostic continues until an error is detected or until you terminate the program by pressing the Halt pushbutton.

Memory Diagnostic (EHXMS.EXE)

Diskette	Space needed	Run time
"1 of 2"	30 Kb	12 min/256 Kb for full testing (default), 7 min/256 Kb with no memory parity testing.

Booting

Insert diskette "1 of 2" into the first RX50 diskette drive (this will usually be designated as drive 1) and type:

```
>>>B/100 DUA1
Bootfile: [SYS0.SYSMAINT]EHXMS.EXE
```

Operation

Once the diagnostic is bootstrapped, it produces a header message which contains the diagnostic version number. You are then prompted to issue commands which control the diagnostic.

Memory Diagnostic HELP File

The diagnostic's *HELP* file, printed below, contains a description of the diagnostic's commands, options, and syntax:

```
EHXMS>HELP
HELP Information for EHXMS - MSV11-PL/K Memory
Diagnostic

Valid Commands:

  DISABLE option     Disables testing option (see below)
  ENABLE option      Enables testing option (see below)
```

HELP	Output this message
MEMORY SIZE [size]	Set expected memory size (specified in Kb)
START [test#]	Start testing at test 1 or specified test number
VIEW	Print status of testing options

Valid test options:

BELL	(enabled)	Sounds terminal bell on errors
ERRORS	(enabled)	Prints error message when hardware error is detected
HALT	(enabled)	Stops testing when hardware error is detected
LOOP	(disabled)	Loop testing on any test that fails
MAP	(enabled)	Prints memory map before starting test
PARITY	(enabled)	Performs Force Bad Parity test during test process
RELOCATION	(enabled)	Relocates diagnostic to high memory during testing
TRACE	(disabled)	Prints test name on terminal before starting test

Command and test options may be abbreviated to their first letter

NOTE: The following error message requires that you run the CPU diagnostic, recheck the memory, and replace any faulty memory modules. If the fault persists you may need to replace the CPU.

- *Unexpected trap or exception or interrupt via SCB vector [vector] Return PC would be [number]*

DZV11 Diagnostic (EHXDZ.EXE)

Diskette	Space needed	Run time
"2 of 2"	512 Kb (includes VDS)	5 minutes

Setting Up

- Install a loopback test connector (H329) on the DZV11 module to run the complete diagnostic
- Install jumpers W1 - W4 on each DZV11 under test (the DZV11 is shipped with these jumpers installed)
- Disconnect all external cables from the DZV11 patch panel before starting the diagnostic

Booting

Insert diskette "2 of 2" into the first RX50 diskette drive (this will usually be designated as drive 1) and type:

```
>>> B/10 DUA1
VDS header
```

The following defines the first DZV11 installed (if no other device with a floating vector is installed):

```
DS> ATTACH DZV11 HUB TTA 760100 300
DS> SELECT TTA
DS> RUN EHXDZ
```


Operation

Before running the diagnostic, ATTACH and SELECT all of the units to be tested. All four channels of each selected DZV11 will be tested. The following information is required in order to attach a DZV11. It must be supplied in the order shown (examples in brackets define the first DZV11 installed)

- The device type [DZV11].
- The link type [HUB]
- The device name [TTA]. This is specified as TTx, where x is either A, B, etc. for successive DZV11 modules under test
- The base control and status register (CSR) address (specified in octal) [760100]. This is the Q22 bus address of the group of 4 device registers that the DZV11 provides for programmed control.
- The base vector address (specified in octal) [300]. This is the base vector address of the group of two interrupt vectors that the DZV11 provides for programmed control.

DZV11 HELP File

The diagnostic's *HELP* file, printed below, contains a description of the DZV11 diagnostic's commands, options, and syntax:

```
DS> help ehxdz

HELP
  EHXDZ
    This program checks the functionality of the DZV11
    providing error messages that may aid in the repair of
    the device. The diagnostic uses the internal loopback
    mode to check most of the circuitry of the device.

  DEVICE
    This program will be runnable only on a MicroVAX I
    computer and with a VAX Diagnostic Supervisor of
    version 6.12 or later. This program is a level 3 functional
    diagnostic and will not support any device other than
    the DZV11

  DEVICE
    DZV11
      Description: DZV11 Asynchronous four-line
      communications interface
      link: HUB
      Generic name: TTa
      Additional information:
          QBUS CSR [octal 760000-777776] <760100>
          QBUS vector [octal 2-776]
      Tested by EHXDZ

  REQUIREMENTS
    HARDWARE:              MicroVAX I processor with
                           512Kb of memory, DZV11 M7957
    OPTIONAL HARDWARE:     H329 turnaround connector,
                           another terminal
    SOFTWARE:              VAX Diagnostic Supervisor V6.12
                           or later
```

EVENT
There are no user-settable event flags

QUICK
This diagnostic does not use the VDS QUICK-pass flag

SUMMARY
This diagnostic does not produce a summary report

MANUAL
Test section ECHO (test 22) requires manual intervention A terminal must be connected to one of the channels and the operator must enter characters finishing with a control-z to complete the test

SECTIONS
This program consists of 22 tests in six sections The default and "INTERNAL" sections include tests 1 thru 19 Section "ALL" includes tests 1 thru 21 and requires an H329 turnaround connector Section "MODEM" is test 20 and requires an H329 turnaround connector Section "STAGGERED" includes tests 20 and 21 and requires an H329 turnaround connector Section "ECHO" is test 22 and requires manual intervention and a terminal connected to a DZV11 channel.

SECTIONS
DEFAULT
Used for minimal testing This section includes tests 1 thru 19 Internal logic is tested.

SECTIONS
INTERNAL
Used for minimal testing This section includes tests 1 thru 19 Internal logic is tested This is exactly the same as the DEFAULT section.

SECTIONS
MODEM
Used to test the modem control feature Requires an H329 turnaround connector This section includes test 20 only

SECTIONS
STAGGERED
Used to test staggered loopback mode Requires an H329 turnaround connector This section includes tests 20 and 21

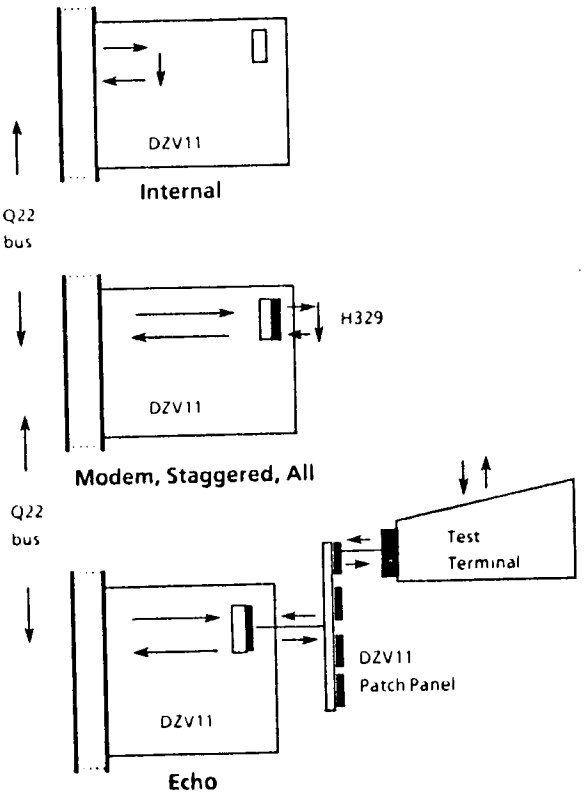
SECTIONS
ALL
Used to test all internal circuitry Requires an H329 turnaround connector This section includes tests 1 thru 21

SECTIONS
ECHO
Used to verify communications with an external terminal. Requires manual intervention and a terminal The operator is required to respond to one question on the console and to enter characters on the external terminal The test completes when a control-z is entered. This section includes test 22 only.

ATTACHING
The following is an example of how to attach the device to be tested, and load and run EHXDZ (answers to hardware questions are typed in octal)

```
DS> LOAD EHXDZ          ; load the diagnostic
DS> ATTACH DZV11        ; attach the DZV11
Device link? HUB        ; the option is linked to HUB
Device name? TTA        ; the option is named unit A
                          (range = A-Z)
CSR? 760100             ; the CSR address is 760100
Vector? 300             ; vector address is 300
                          (range = 000-770)
DS> SEL TTA             ; select device
DS> START               ; start the diagnostic
```

DZV11 Testing Modes



DLVJ1 Diagnostic (EHXDL.EXE)

Diskette	Space needed	Run time
"2 of 2"	512 Kb (includes VDS)	10 minutes if all lines are at 150 baud, 3 minutes if all lines are at 38,400 baud

Setting Up

Note. Before testing a DLVJ1 in a MicroVAX I, make sure:

1. The X to 1 wire wraps are removed from jumpers C1 and C2. Wire wraps from X to 0 are installed on C1 and C2.
2. The BREAK jumper wire wrap is removed from X to H.
3. The X to 0 wire wrap is removed from jumper V5.

All channels on each DLVJ1 module must be configured identically for each of the following parameters:

- Number of data bits (D jumpers).
- Number of stop bits (S jumpers).
- Parity detection (P jumpers).
- Even/Odd parity (E jumpers).

Install the H315 loopback connector in order to run the complete diagnostic.

Disconnect all external cables from the DLVJ1 patch panel before running this diagnostic.

Booting

Insert diskette "2 of 2" into the first RX50 diskette drive (this will usually be designated as drive 1) and type:

```
>>>B/10 DUA1
VDS header
```

The following defines the first DLVJ1 installed:

```
DS> ATTACH DLVJ1 HUB TTA 776500 300 8 1 NO NO
DS> SELECT TTA
DS> RUN EHXDL
```

Operation

Before running the diagnostic, locate and install the H315 test connectors. Connect one H315 to each connector on the DLVJ1 patch panel. ATTACH and SELECT all of the units to be tested. All four channels of each selected DLVJ1 are tested.

DLVJ1 HELP File

The diagnostic's *HELP* file, printed below, contains a description of the DLVJ1 Diagnostic's commands, options, and syntax:

```
DS> help ehxdl

  HELP
    EHXDL
      This program checks the functionality of the DLVJ1
      providing error messages that may aid in the repair of the
      device. The diagnostic uses the internal loopback mode to
      check most of the circuitry of the device.
```



```
DEVICE
  This program will run only on a MicroVAX I computer and
  with a VAX Diagnostic Supervisor of version 6.12 or later.
  This program is a level 3 functional diagnostic and will not
  support any device other than the DLVJ1.

DEVICE
  DLVJ1
    Description: DLVJ1 Asynchronous four-line
    communications interface
    link: HUB
    Generic name: TTa
    Additional information:
      QBUS CSR [octal 760000-777776] <776500>
      QBUS vector [octal 2-776]
      Number of data bits configured [7 or 8] <8>
      Number of stop bits configured [1 or 2] <1>
      Parity detection enabled <no>
      Even parity enabled <no>
    Tested by EHXDL

REQUIREMENTS
  HARDWARE:   MicroVAX I processor with
              512Kb of memory, DLVJ1 dual
              size board
  OPTIONAL
  HARDWARE:   H315 turnaround connector,
              another terminal
  SOFTWARE:   VAX Diagnostic Supervisor V6.12
              or later

EVENT
  There are no user-settable event flags.

QUICK
  This diagnostic does not use the VDS QUICK-pass flag.

SUMMARY
  This diagnostic does not produce a summary report.

MANUAL
  Test section ECHO (test 9) requires manual intervention.
  An additional terminal must be connected to one of the
  channels and the operator must enter characters finishing
  with a control-z to complete the test.

SECTIONS
  There are five sections in this diagnostic. Sections
  "LOOPBACK" and "ALL" require an H315 loopback
  connector. Section "ECHO" requires another terminal and
  manual intervention.

SECTIONS
  DEFAULT
    Used for minimal testing. This section includes tests 1, 2,
    and 4. Logic not requiring any loopback is tested.

SECTIONS
  REGISTER
    Used for minimal testing. This section includes tests 1, 2,
    and 4. Logic not requiring any loopback is tested. This is
    exactly the same as the DEFAULT section.
```

SECTIONS
LOOPBACK

Used to test internal loopback. Requires an H315 loopback connector. This section includes tests 3, 5, 6, 7, and 8

SECTIONS
ALL

Used to test all internal circuitry. Requires an H315loopback connector. This section includes tests 1, 2, 3, 4, 5, 6, 7, and 8

SECTIONS
ECHO

Used to verify communications with an external terminal. Requires manual intervention and another terminal. The operator is required to respond to one question on the console and to enter characters on the external terminal. The test completes when a control-z is entered. This section includes test 9 only

ATTACHING

The following is an example of how to attach the device to be tested, and how to load and run EHXDL (answers to hardware questions are typed in octal)

```
DS > LOAD EHXDL                 ; load the diagnostic
DS > ATTACH DLVJ1               ; attach the DLVJ1
Device link? HUB                ; the option is linked to
                                  HUB
Device name? TTA                ; the option is named
                                  unit A (range = A-Z)
CSR? 776500                     ; the CSR address is
                                  776500
Vector? 300                     ; vector address is 300
                                  (range = 000-770)
Number of data bits? 8          ; 8 bits per character
Number of stop bits? 1          ; 1 stop bit
Parity detection enabled? YES   ; parity enabled
Even parity enabled? NO         ; even parity not selected
                                  (odd parity)
DS > SEL TTA                    ; select device
DS > START                      ; start the diagnostic
```


Storage Subsystem Diagnostic (EHXRQ.EXE)

Diskette	Space needed	Run time
"2 of 2"	512 Kb (includes VDS)	< 10 minutes for any valid disk configuration Formatting: 11 min/RD51, 25 min/RD52.

This diagnostic verifies the operation of the mass storage subsystem by exercising the drives (default). This diagnostic may also be used to format an RD51 or RD52 drive.

Setting Up

Any floppy unit to be tested by this diagnostic must contain media.

Booting

Insert diskette "2 of 2" into the first RX50 diskette drive (this will usually be designated as drive 1) and type:

```
>>> B/10 DUA1
VDS header
DS > LOAD EHXRQ
```

The following defines the RQDX1 controller and, as an example, an RD51 (drive 0) and an RX50 (drive 2):

```
DS > ATTACH RQDX1 HUB DUA 772150
DS > ATTACH RD51 DUA DUA0
DS > ATTACH RX50 DUA DUA2
DS > SELECT DUA0, DUA2
DS > START
```

To format an RD51 or RD51 (RX50s cannot be fomatted by this diagnostic), type:

```
DS > START/SEC = FORMAT
```

Operation

Before running the diagnostic, ATTACH and SELECT all of the drives and the associated controller to be tested.

First, attach the RQDX1 disk controller with the drives to be tested. The following information, supplied in the order shown, is required in order to attach each controller:

- The device name. This is specified as RQDX1.
- The link name. This is specified as HUB.
- The controller name. This is specified as DUA.
- The base control and status register (CSR) address (specified in octal). This is the Q22 bus address of the group of two device registers that provides for programmed control.

Then, attach each drive to be tested. The following information is required in order to attach the drives. It must be specified in the order shown:

- The device type. This is specified as RX50, RD51 or RD52.
- TThe link type. This is specified as DUA.
- The device name. This is specified as DUAn, where n is 0, 1, 2, etc. for successive drives.

Storage Subsystem HELP File

The diagnostic's HELP file, printed below, contains a description of the Storage Subsystem Diagnostic's commands, options, and syntax:

```
DS > help ehxrq

  HELP
    EHXRQ
      This program checks the functionality of the RQDX1 disk
      controller and associated drives (RX50, RD51, and RD52) by
      exercising the drives in a manner similar to a typical user
      load. The default test section is a multi-drive disk exerciser.
      Additionally, the capability of formatting RD51 and RD52
      disk drives is provided via a disk formatting test section.
      This is a level 3 diagnostic.

      THE DEFAULT TEST OPERATION DESTROYS USER DATA ON
      A DISK IF THE DISK IS WRITE-ENABLED WHEN THE
      DIAGNOSTIC IS STARTED. IF YOU WRITE-PROTECT ANY
      DISKS WITH MEANINGFUL DATA ON THEM BEFORE
      STARTING THE DIAGNOSTIC, THE TESTING ON THAT DRIVE
      WILL BE LIMITED TO READ-ONLY TESTING.

    DEVICE
      This program will run only on a MicroVAX I computer and
      with a VAX Diagnostic Supervisor of version 6.12 or later.
      This program is a level 3 diagnostic.

      This program will support the following devices ONLY:

    DEVICE
      RD51
        Description: RD51 fixed media disk (RQDX1)
        link: DUa
        Generic name: DUan
        Tested by: EHXRQ

    DEVICE
      RD52
        Description: RD52 fixed media disk (RQDX1)
        link: DUa
        Generic name: DUan
        Tested by: EHXRQ

    DEVICE
      RQDX1
        Description: RQDX1 QBUS MSCP disk controller
        link:HUB
        Generic name: DUa
        Additional information:
          QBUS IP register address
          [octal 76000-777776]<772150>
        Tested by: EHXRQ

    DEVICE
      RX50
        Description: RX50 removable media disk (RQDX1)
        link: DUa
        Generic name: DUan
        Tested by: EHXRQ
```



```
REQUIREMENTS
  HARDWARE:   MicroVAX I processor with 512Kb of
              memory, RQDX1 disk controller (M8639),
              One or more RD51, RD52, or RX50 drives
  SOFTWARE:   VAX Diagnostic Supervisor V6.12 or later

EVENT
  There are no user-settable event flags.

QUICK
  This diagnostic does not use the VDS QUICK-pass flag.

SUMMARY
  A summary report is generated when running the exerciser
  portion of the diagnostic. It is output at the end of testing
  or whenever a user issues a VDS SUMMARY command. No
  summary report is produced when the FORMATTER section
  is run.

  The summary report consists of a table with one line for
  each disk drive under test. The output looks like:

        Bytes    Bytes     Total   Soft    Hard
Drive   Read     Written   Bytes   Errors  Errors
DUA0    123456   245677    369133  0       0
DUA2    250456   0         250456  0       10      DROPPED

  You can learn the meaning of each column by issuing a
  "HELP EHXRQ SUMMARY <topic>" command.

SUMMARY
  DRIVE
    This is the name of the drive tested.

SUMMARY
  BYTES READ
    The total number of bytes READ from, or ACCESS
    commands performed on, the drive during testing.

SUMMARY
  BYTES WRITTEN
    The total number of WRITE commands performed on the
    drive during testing. Drives that are WRITE-PROTECTED
    when the program is started are READ-ONLY tested and
    this column will be zero for any such drives.

SUMMARY
  TOTAL BYTES
    The total of the "Bytes Read" and "Bytes Written"
    columns.

SUMMARY
  SOFT ERRORS
    The total number of write errors detected by the software
    after rereading the data written and discovering a
    mismatch.

SUMMARY
  HARD ERRORS
    The total number of hardware-detected errors on the
    drives. Typical errors include drive-not-ready and/or
    RQDX1-detected data compare failures. These errors are a
    result of the controller returning a non-zero packet status
    in a command response or are the result of an operation
    timing out.
```

SUMMARY
COMMENTS
This last unlabeled column may contain the word "DROPPED" to denote a drive that has been dropped from testing as the result of an excessive number of errors detected during testing

MANUAL
All test sections should be considered manual intervention sections in that the user must ensure that the appropriate media are loaded into each SELECTED drive before starting the program

THE DEFAULT TEST OPERATION DESTROYS USER DATA ON A DISK IF THE DISK IS WRITE-ENABLED WHEN THE DIAGNOSTIC IS STARTED. WRITE-PROTECT ANY DISKS WITH MEANINGFUL DATA ON THEM BEFORE STARTING THE DIAGNOSTIC AND THE TESTING ON THAT DRIVE WILL BE LIMITED TO READ-ONLY TESTING

SECTIONS
There are three sections provided in this diagnostic: the EXERCISER section, the FORMATTER section, and the DEFAULT section

Note that the DEFAULT section is exactly the same as the EXERCISER section in this diagnostic

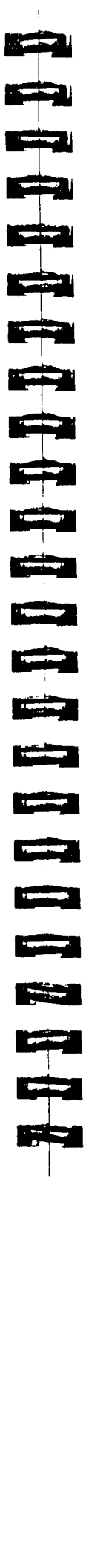
SECTIONS
DEFAULT
The DEFAULT section is the same as the EXERCISER section in this diagnostic. Enter "HELP EHXRQ SECTIONS EXERCISER" for more information.

SECTIONS
EXERCISER
This section is used to simulate a typical I/O load on the user's disk drives. All selected disk drives are subjected to a series of random READ, WRITE (if disk is write enabled), and ACCESS commands

NOTE THAT DISKS THAT ARE WRITE-ENABLED MUST BE SCRATCH, AS ALL DATA ON THEM WILL BE DESTROYED AS THE RESULT OF THE TESTING OPERATION. WRITE PROTECT ANY SENSITIVE DISKS (INCLUDING THE DIAGNOSTIC DISTRIBUTION DISKS) ON DRIVES THAT ARE SELECTED BEFORE STARTING THIS TEST SECTION

Note that the EXERCISER section is also the DEFAULT section in this diagnostic

After starting this section, the user is asked to confirm write testing on a disk drive for each disk drive that is write enabled when the diagnostic is started. Answering in the negative causes the test to be aborted.



SECTIONS
FORMATTER
This test section is used to hardware-format RD51 and RD52 drives. Formatting RX50 floppy diskettes is NOT SUPPORTED. Attempting to format an RX50 will result in a fatal error message being output by the diagnostic.

FORMATTING A DISK DESTROYS ANY EXISTING DATA ON THE DISK. You will be asked to confirm destroying any existing data on the disk for each drive selected.

Formatting an RD51 disk takes approximately 11 minutes. Formatting an RD52 disk takes approximately 25 minutes.

ATTACH
The following is an example of how to attach the RQDX1 and disks to be tested or formatted. The RQDX1 controller is first ATTACHED to the HUB, and the drives to be tested or formatted are ATTACHED to the RQDX1. The drives to be tested are then SELECTED and the diagnostic is started.

```
DS>LOAD EHXRQ                ;load the diagnostic
DS>ATTACH RQDX1              ;attach the RQDX1
Device link?HUB              ;the option is linked to HUB
Device name?DUA              ;the option is named "DUA"
IP?772150                    ;the IP CSR address is
                              772150(8)
DS>ATTACH RD51               ;attach the RD51
Device link?DUA              ;the option is linked to
                              above RQDX1
Device name?DUA0             ;the option is named
                              "DUA0"
DS>ATTACH RX50               ;attach the second RX50
                              drive
Device link?DUA              ;the option is linked to
                              above RQDX1
Device name?DUA2             ;the option is named
                              "DUA2"
DS>SELECT DUA0,DUA2          ;select the drives to be tested
DS>START                     ;start the exerciser running
```

DEQNA Diagnostic (EHXQN.EXE)

Diskette	Space needed	Run time
"2 of 2"	512 Kb (includes VDS)	5 minutes

Setting Up Procedures

Install the loopback connector (part number 70-21489-01) on the DEQNA module to run the complete diagnostic.

Booting

Insert diskette "2 of 2" into the first RX50 diskette drive (this will usually be designated as drive 1) and type:

```
>>>B/10 DUA1
VDS header
```

The following defines the first DEQNA installed:

```
DS> ATTACH DEQNA HUB XQA 774440
DS> SELECT XQA
DS> RUN EHXQN
```

Operation

Before running the diagnostic you must ATTACH and SELECT all of the units to be tested. The following information is required in order to attach a unit. It must be supplied in the order shown.

- The device type. This is specified as DEQNA.
- The link type. This is specified as HUB.
- The device name. This is specified as XQx, where x is either A, B, C, etc. for successive modules under test.
- The base control and status register (CSR) address (specified in octal). This is the Q22 bus address of the group of four device registers that the DEQNA provides for programmed control.

DEQNA HELP File

The diagnostic's HELP file, printed below, contains a description of the DEQNA Diagnostic's commands, options, and syntax:

```
DS> help ehxqn

  HELP
    EHXQN
      This program checks the functionality of the DEQNA
      Ethernet-QBUS communications interface.  It does so by
      utilizing the DEQNA built-in loopback testing modes:
      Setup mode, Internal loopback mode, Internal-Extended
      loopback mode, and External loopback mode.  In addition,
      a simple network confidence test is provided to loopback
      data over a working Ethernet to a remote system.  This is a
      level 3 diagnostic.

    DEVICE
      This program will run only on a MicroVAX I computer and
      with a VAX Diagnostic Supervisor of version 6.12 or later.
      This program is a level 3 diagnostic.
```



```
      This program will support the following device ONLY:

  DEVICE
    DEQNA
      Description: DEQNA Ethernet-to-QBUS communications
      interface
      link: HUB
      Generic name: XQa
      Additional information:
        QBUS CSR [octal 760000-777776] <774440>
      Tested by: EHXQN

  REQUIREMENTS
    HARDWARE:   MicroVAX I processor with
                512Kb of memory, module loopback
                connector (part number 70-21489-01)
    SOFTWARE:   VAX Diagnostic Supervisor V6.12
                or later

  EVENT
    Setting event flag one causes the diagnostic to suppress
    the printout of the module's Ethernet physical station
    address during test 3.  The default setting for this event
    flag is "cleared."

  QUICK
    This diagnostic does not use the VDS QUICK-pass flag.

  SUMMARY
    This diagnostic does not produce a summary report.

  MANUAL
    The default test section may be run on a DEQNA module
    without any external cabling required.  The internal
    loopback test section (INTERNAL) may also be run with no
    special setup required.

    The external loopback test section (EXTERNAL) requires
    that a DEQNA module loopback connector (part number
    70-21489-01) be installed on the module before testing is
    started.

    The network confidence test section (NETWORK) and
    loopback assistant utility test section (LOOPBACK) require
    that the unit under test be completely connected to a
    functioning Ethernet.  This setup includes a bulkhead
    assembly, transceiver cable, and an installed transceiver on
    an Ethernet cable.

  SECTIONS
    There are five sections provided in this diagnostic, the
    INTERNAL loopback section, the EXTERNAL loopback
    section, the NETWORK confidence section, the LOOPBACK
    assistant section, and the DEFAULT section.

    Note that the DEFAULT section is exactly the same as the
    INTERNAL section in this diagnostic.

  SECTIONS
    DEFAULT
      The DEFAULT test section is the same as the INTERNAL
      test section in this diagnostic.  Enter "HELP EHXQN
      SECTIONS INTERNAL" for more information.
```

SECTIONS
INTERNAL

This test section consists of those tests that can be run on a UUT without any special setup. Testing includes device register testing, boot/diagnostic ROM access testing, interrupt sanity testing, Setup mode testing, internal loopback mode testing, internal-extended loopback mode testing, and Ethernet address filtering testing.

SECTIONS
EXTERNAL

This test section consists of external mode loopback testing. This test section requires that a DEQNA module loopback connector (part number 70-21489-01) be installed on the module before testing is started.

SECTIONS
NETWORK

This test section is used to perform loopback data operations to a remote system on the Ethernet. Ethernet Configuration Testing Protocol packets are used to perform the test. This test may be run on an Ethernet that is being used for normal data transfers at the same time; its operation is transparent to other Ethernet stations.

This test is intended to be a simple test of confidence that data may be successfully transferred from the system under test to another system.

This test section requires that the unit under test be completely connected to a functioning Ethernet. This setup includes a bulkhead assembly, transceiver cable, and an installed transceiver on an Ethernet cable.

Additionally, this test requires the presence on the network of a remote system that will respond to loopback requests directed to the "loopback assistant" multicast address (CF-00-00-00-00-00). This requirement may be met by running the LOOPBACK test section of this diagnostic on another system on the network before starting the network confidence test section on the system under test.

SECTIONS
LOOPBACK

This test section is not a test section, per se. It is a utility that allows the current node to function as a loopback assistant, responding to the "loopback assistant" multicast address. It is for use with the network confidence test section (NETWORK) in the situation where no loopback assistant is found on the network.

To use this test section in conjunction with the network confidence test section, you must first start the loopback test section running on one system in the network and then start the network test section running on the system you wish to test. After the network confidence test section completes, you will then be required to manually stop the loopback test section running on the remote node.

This test section requires that the unit under test be completely connected to a functioning Ethernet. This setup includes a bulkhead assembly, transceiver cable, and an installed transceiver on an Ethernet cable.

ATTACHING

The following is an example of how to run this diagnostic:

```
DS > LOAD EHXQN          ; load the diagnostic
DS > ATTACH DEQNA        ; attach the DEQNA
Device link ? HUB        ; the option is linked to
                           HUB
Device name? XQA         ; the option is named
                           "XQA"
CSR? 774440              ; the CSR address is
                           774440 (8)
DS > SELECT XQA          ; select the device to test
DS > START               ; start the internal tests
```