

**DISTRIBUTED LOGIC CORPORATION**

**MODEL DQ696  
DISK CONTROLLER  
INSTALLATION AND OPERATION  
MANUAL**



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September 1988



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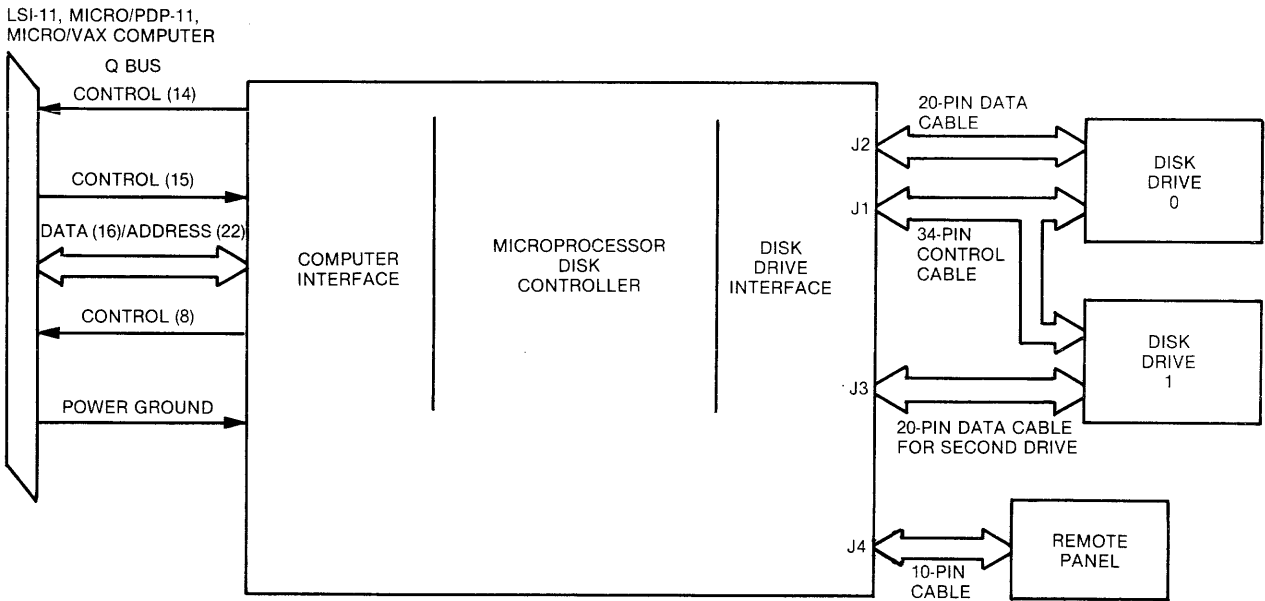
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## SECTION 1 DESCRIPTION

This manual describes the installation and operation of Distributed Logic Corporation (DILOG) Model DQ696 Disk Controller. The controller interfaces one or two ESDI, 5¼-inch Winchester disk drives to DEC\* MicroVAX II, or any Micro DPD-11 or LSI-11 computer systems. Transfer rates of the system are up to 15 MHz.

The controller is software compatible with DU drivers in MicroVMS, MUMPS, RT-11, RSX-11, and ULTRIX operating systems. The controller supports both block mode and non-block mode memory and is programmable by the host software driver to transfer from 1 to 8 words per DMA request.

Figure 1-1 is a simplified diagram of a disk system.



**Figure 1-1. Disk System, Simplified**

\*DEC LSI-11, MICRO/PDP-11, MICRO/VAX 11, RT-11, RSX, RSTS/E, MICRO/VMS, and DU Driver are registered trademarks of Digital Equipment Corporation.  
UNIVERSAL FORMATTING is a trademark of Distributed Logic Corporation.

## **CHARACTERISTICS**

Characteristics of the controller are as follows:

### **Data Buffer**

The controller contains a 28-sector FIFO data buffer to support a 1 to 1 sector interleave and reduce software-generated latencies between the Q bus and disk drive.

### **Command Buffering**

The controller contains a command queue buffer capable of storing up to 16 commands. For two-drive applications, commands are received for both drives until the command buffer is full. Priority for execution of commands is based on the elevator seek algorithm. For controllers that have two drives attached, additional definition of priority is: a drive whose heads are positioned on the proper starting cylinder, or a drive whose heads are positioned closest to the starting cylinder and the required seek is of the proper direction based on the commands stored in the queue for that drive.

### **Parameter Passing Commands**

With this ESDI command, drive parameters are no longer stored in programmable components on the controller or recorded on the surface of the drive(s) attached to the controller. The drive(s) now communicates configuration information to the controller every time power is applied to the system.

### **22-Bit Addressing**

The controller supports 16-, 18-, and 22-bit Q-Bus addressing.

### **Inhibit DMA Increment**

The controller contains the ability to move blocks of data in or out of a specific memory or I/O address location. This function is software selectable for applications that require both incremental and non-incremental applications to run concurrently on the same controller.

### **Onboard Formatting**

The controller onboard formatter is accessible through the system processor to provide interactive terminal access to the controller. The formatter is menu driven and also provides controller and drive test options.

### **Media Flaw Compensation**

The following functions compensate for media defects:

**FIRST**, at format time one sector per track is reserved as an alternate, DILOG's UNIVERSAL FORMATTING system has the ability to reassign reserved sectors for defective sectors. Also at format time the controller has the ability to read the manufacturer's defect map (if recorded per ESDI specification) and replace the sectors found bad by the drive manufacturer.

**SECOND**, if an error is encountered after the drive is formatted the controller will try to reread the sector with ECC disabled.

**THIRD**, if the error still exists, ECC is used to recover the data. This enhanced 32-bit ECC polynomial is capable of correcting one error per sector that is 11 bits or less in length. Error packets are generated by the controller every time an error recovery operation is performed.

**FOURTH**, if the error still exists, reassignment of defective sectors is accomplished through a dynamic replacement scheme controlled by the host software.

## **Hardware Bootstrap**

The controller contains onboard bootstrap support for RP02, RL01/02, RM03, RM05, RM80, RK06/07, RX02, TS11, TSV05, TM11 and DU driver devices. Onboard jumpers allow selectable bootstrap addresses, in addition to enabling/disabling the bootstrap. When the bootstrap is disabled, the DQ696 will boot from the standard DEC module.

## **Automatic Self Test**

The controller is supplied with an automatic self test function that is initiated each time power is applied. The controller performs additional tests each time it is brought online. A green card-edge LED is lit and remains lit after each successful completion. Should self test fail, the controller isolates the disk drive from the system and the LED is extinguished.

## **Remote Panel Interface**

An interface connector is supplied for a remote panel. The panel itself is user-supplied. The panel contains four LEDs and four switches for drive selection and write protection.

## **LSI-11 Q-Bus Interface**

Commands, data and status transfers between the controller and the computer are executed via the parallel I/O bus (Q bus) of the computer. Data transfers are direct to memory via the DMA facility of the Q bus; commands and status are under programmed I/O. Controller/Q-bus interface lines are listed in Table 1-1.

## **Disk Interface**

The controller interfaces one or two disk drives through 34- and 20-pin cables. If two drives are used, the 34-pin control cable is daisy-chained to drives 0 and 1. The 20-pin cables are connected separately from the controller to each drive. Table 1-2 lists the 34-pin interface signals, and Table 1-3 lists the 20-pin interface signals.

Figure 1-2 shows the interface for a customer-supplied remote panel. The switches and LED connections depend on which drives are connected to J2 and J3.

**Table 1-1. Controller/Q-Bus Interface Lines (Dual Module)**

<b>BUS PIN</b>	<b>MNEMONIC</b>	<b>INPUT/ OUTPUT</b>	<b>DESCRIPTION</b>
AJ1, AM1, BJ1, BM1, BT1, BC2	GND	O	Signal Ground and DC return.
AN1	BDMR L	O	Direct Memory Access (DMA) request from controller; active low.
AP1	BHALT L	N/A	Stops program execution. Refresh and DMA is enabled. Console operation is enabled.
AR1	BREF L	N/A	Memory Refresh.
BA1	BDCOK H	I	DC power OK. All DC voltages are normal.
BB1	BPOK H	N/A	Primary power OK. When low activates power fail trap sequence.
BN1	BSACK L	O	Select Acknowledge. Interlocked with BDMGO indicating controller is bus master in a DMA sequence.
BR1	BEVNT L	N/A	External Event Interrupt Request.
BV1, AA2, BA2	+ 5	I	+ 5 volt system power.
AD2, BD2	+ 12	N/A	+ 12 volt system power.
AE2	BDOUT L	I/O	Data Out. Valid data from bus master is on the bus. Interlocked with BRPLY.
AF2	BRPLY L	I/O	Reply from slave to BDOUT or BDIN and during IAK.
AH2	BDIN L	I/O	Data Input. Input transfer to master (states master is ready for data). Interlocked with BRPLY.
AJ2	BSYNC L	I/O	Synchronize: becomes active when master places address on bus; stays active during transfer.
AK2	BWTBT L	I/O	Write Byte: Indicates output sequence to follow (DATO or DATOB) or marks byte address time during a DATOB.
AL2, A1, AB1, BP1	BIRQ4-7 L	O	Interrupt Request 4-7.
AM2 AN2	BIAK11 L BIAK10 L	I O	Serial Interrupt Acknowledge input and output lines routed from Q Bus, through devices, and back to processor to establish an interrupt priority chain.
AT2	BINIT L	I	Initialize. Clears devices on I/O bus.
AU2, AV2, BE2, BF2, BH2, BJ2, BK2, BL2, BM2, BN2, BP2, BR2, BS2, BT2, BU2, BV2	BDAL0 L through BDAL15 L	I/O	Data/address lines, 0-15
AR2 AS2	BDMG11 L BDMG10 L	I O	DMA Grant Input and Output. Serial DMA priority line from computer, through devices and back to computer.
AP2	BBS7 L	I	Bank 7 Select. Asserted by bus master when address in upper 4K bank is placed on the bus.
AC1, AD1, BC1, BD1, BE1, BF1	BDAL16 L -BDAL21 L	O	Extended Address Bits 16-21

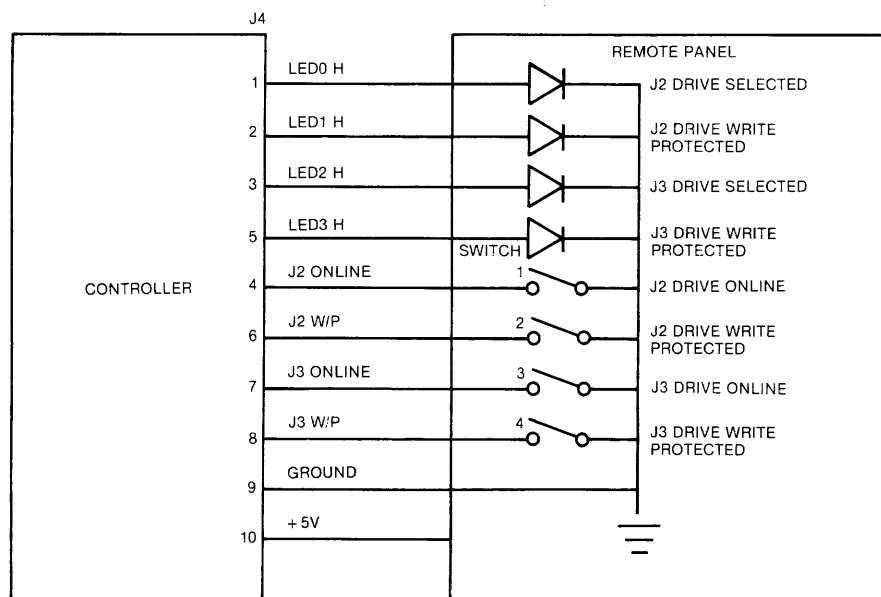


**Table 1-2. Control Cable J1—Controller to Drive**

SIGNAL NAME	SIGNAL PIN	GROUND PIN	SOURCE
– Head Select 2 <sup>3</sup>	2	1	Controller
– Head Select 2 <sup>2</sup>	4	3	Controller
– Write Gate	6	5	Controller
– Configuration Status Data	8	7	Drive
– Transfer Acknowledge	10	9	Drive
– Attention	12	11	Drive
– Head Select 2 <sup>0</sup>	14	13	Controller
– Sector	16	15	Drive
– Head Select 2 <sup>1</sup>	18	17	Controller
– Index	20	19	Drive
– Ready	22	21	Drive
– Transfer Request	24	23	Controller
– Drive Select 1	26	25	Controller
– Drive Select 2	28	27	Controller
– Drive Select 3	30	29	Controller
– Read Gate	32	31	Controller
– Command Data	34	33	Controller

**Table 1-3. Data Cable J2, J3—Controller to Drive**

SIGNAL NAME	SIGNAL PIN	GROUND PIN	SOURCE
– Drive Selected	1		Drive
– Sector	2		NOT USED
– Command Complete	3		Drive
– Address Mark Enable	4		Controller
– Reserved	5	6	
± Write Clock	7/8		Controller
– Reserved	9		
± Read/Reference Clock	10/11	12	Drive
± NRZ Write Data	13/14	15/16	Controller
± DR Data	17/18	19	Drive
– Index	20		Drive



**Figure 1-2. Remote Panel Interface**

## CONTROLLER SPECIFICATIONS\*

### Mechanical

The controller is completely contained on a dual-height module 13.2 cm (5.22 in.) wide by 22.8 cm (8.88 in.) deep and plugs into one standard Q-bus dual-height slot.

### Base Addresses

8 choices, switch selectable:

IP-772150	IP-760334	IP-760340	IP-760344
SA-772152	SA-760336	SA-760342	SA-760346
IP-760354	IP-760360	IP-760374	IP-760400
SA-760356	SA-760362	SA-760376	SA-760402

### Interrupt Vector Address

Programmable by software.

### Priority Level

BR5 in etch; BR4, BR6, and BR7 by jumpers.

### DMA Burst Size

Software selectable, 1-8 words.

### Disk Transfer Rates

Up to 15 MHz per second.

### Disk Drive I/O

One 34-pin flat ribbon cable and two 20-pin flat ribbon cables (one for each drive).

### Power

+5 volts at 2.5 amps.

### Environment

Operating temperature 50 degrees F. (10 degrees C.) to 105 degrees F. (40 degrees C.); Humidity 10-90% non-condensing.

### Shipping Weight

5 pounds, including documentation and cables.

### MTTR

Less than 0.5 hours.

\*Specifications subject to change without notice.

## SECTION 2 INSTALLATION

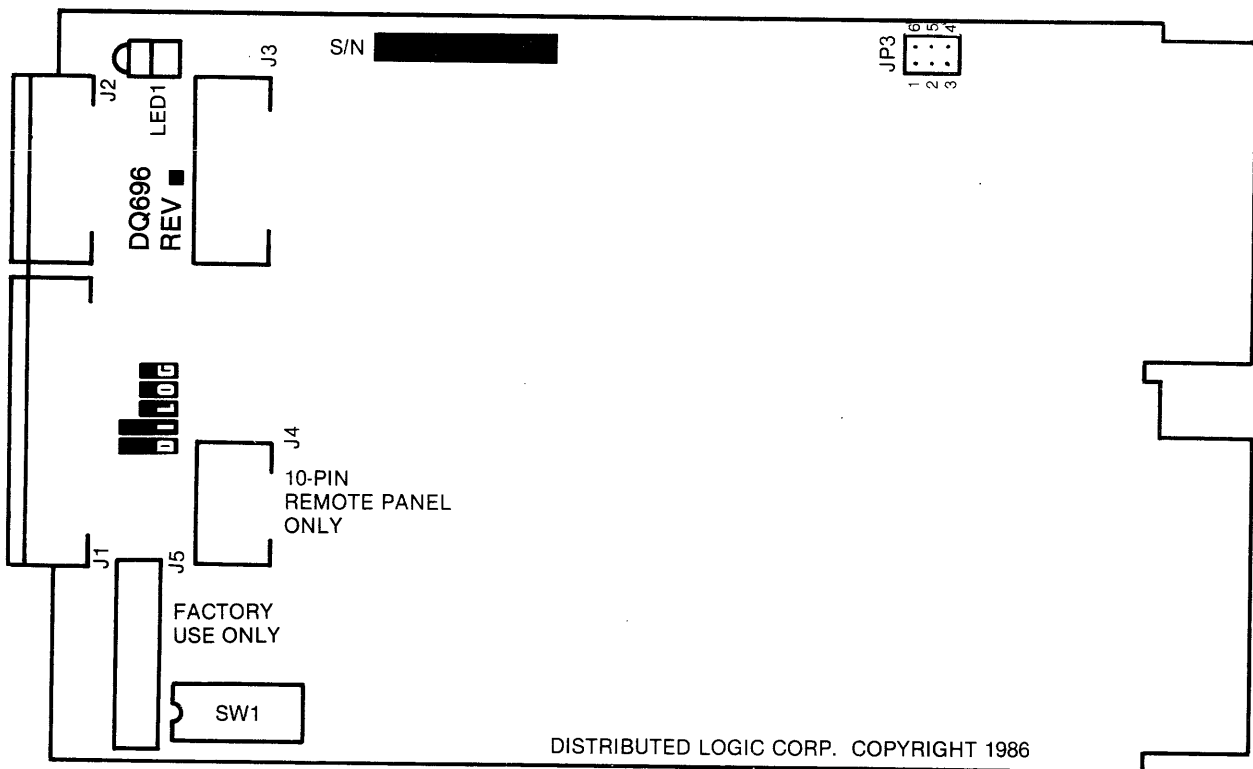
The padded shipping carton contains the controller board and, if specified on the sales order, a 34-pin control cable to the drive, and two optional 20-pin data cables to the drives. Inspect the controller board and its components and the cables for damage.

### NOTE

*If damage to the board, components on the board, or cables is noted, do not install. Immediately inform the carrier and DILOG.*

Figure 2-1 shows the locations of the switch and jumpers.

Table 2-1 describes the switch and jumper settings. Some jumper connections may be etched or cut on the board and are referred to in the table as installed or removed.



**Figure 2-1. Controller Configuration**

**Table 2-1. Switch and Jumper Setting**

<b>Switch SW1</b> Slave Address Select (IP/SA Register)				<b>Switch SW1-5</b> BOOT ENABLE ON = ENABLE LSI-11 BOOT OFF = DISABLE LSI-11 BOOT (OFF for MicroVAX)			
<b>SW1-1</b>	<b>SW1-2</b>	<b>SW1-3</b>	<b>ADDRESS SELECT</b>				<b>Switch SW1-6</b> AUTOBOOT ON = BOOTS DU0 ON POWER UP/RESET OFF = AUTO BOOT DISABLED
OFF	OFF	OFF	= 772150				<b>Switch SW1-7</b> EXTENDED DWELL TIME ON = Extends the dwell time between DMA bursts (12.8 usec) if pending interrupt requests OFF = Normal dwell time between DMA bursts  <b>Switch SW1-8</b> Q-BUS PARITY ENABLE ON = Checks and reports parity to host OFF = Parity disabled
ON	OFF	OFF	= 760334				
OFF	ON	OFF	= 760340				
ON	ON	OFF	= 760344				
OFF	OFF	ON	= 760354				
ON	OFF	ON	= 760360				
OFF	ON	ON	= 760374				
ON	ON	ON	= 760400				
<b>Switch SW1-4</b> SW1-4 = SELECT BOOT ADDRESS OFF = 773000 ON = 775000							
<b>Jumper JP3—Priority Level</b>							
<b>Pin Connections</b>							
<b>1 to 6</b>	<b>2 to 5</b>	<b>3 to 4</b>	<b>Priority Level</b>				
Installed (etch)	Installed (etch)	Installed	BR 4 (Factory Set)				
Installed (etch)	Installed (etch)	Removed	BR5				
Installed (etch)	Removed (cut)	Installed	BR6				
Removed (cut)	Removed (cut)	Installed	BR7				

**PRE-INSTALLATION CHECKS**

Before the controller is installed, it may be necessary to check the operating system for device addresses. The drives are designated DUX except in VAX/VMS where they are designated DUAX. The "X" represents drive number and drives may be any number from 0 to 6, providing one drive is numbered odd and one drive is numbered even.

**NOTE**

*The ESDI drive numbering system is 1-7; the DEC numbering system is 0-6. Consult the drive manufacturer's documentation for selecting the ESDI configuration of the drive. The controller onboard formatting program lists both numbers; for example, "ESDI DRIVE 01 (DU00) SELECTED."*

- From the operating system, determine and select the address of the controller to be installed. Available addresses are listed in Table 2-1. Examples of controller names for the first controller for some operating systems are as follows:

OPERATING SYSTEM	CONTROLLER
RSTS/E	RU1
RSX-11M-PLUS	DUA
RT-11	Port0
VAX/VMS	DUA

- Determine and select the drive name. The first drive may be DU0, except for VAX/VMS, which is DUA0. Set the switches and jumpers in the controller and drive for the selected addresses.
- Remove power from the system and install the controller as follows:

## RECOMMENDED DRIVE SETUP

The switches and jumpers on the disk drive need not be set up to accommodate the controller. The controller interrogates the drive for the status and configuration and selects the optimum format. However, where there are choices for selecting drive options (for example, hard/soft sectoring), for the most efficient use of the system, DILOG recommends the following:

OPTION	RECOMMENDATION/REQUIREMENT
Hard/Soft Sector	Hard Sector—The controller can accept both, but hard sectoring is the most efficient use of drive capacity.
Motor Control Enable/Disable	Enabled—With motor control enabled, the controller can sequence the drive, requiring less power consumption.
Drive Cabling From J2 and J3	No recommendation—J2 and J3 cables may be connected to either drive; they need not be connected to sequential drive numbers. The remote panel connections depend on the J2 and J3 connections.
Step or Serial Mode	SERIAL MODE REQUIRED—Few drives offer a step mode option, but these must be set for serial mode. (With the step mode, the controller must know where the head is and where the next Seek must go. With the serial mode, a single command causes a Seek to a given track.)

## INSTALLATION

After the jumpers have been positioned and the switches set, install the controller as follows:

### CAUTION

*Ensure all power is off before installing the controller or cables.*

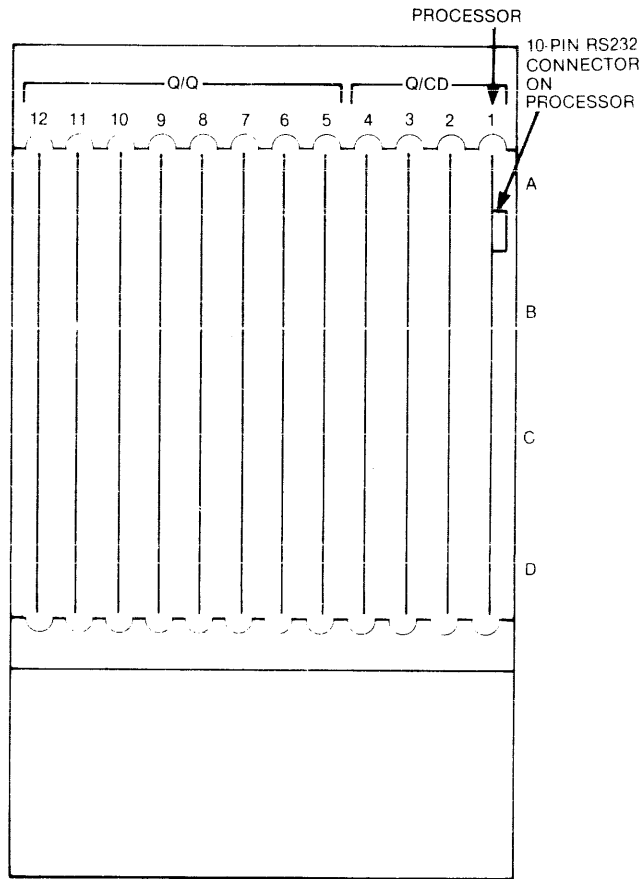
*Damage to the backplane assembly will occur if the controller is plugged in backwards.*

1. Select the backplane location into which the controller is to be inserted. There are several backplane assemblies available from DEC and other manufacturers. Figures 2-2 and 2-3 show typical MicroVAX backplane configurations. Figure 2-4 shows a typical LSI-11 backplane.

It is important that all option slots between the processor and the disk controller be filled to ensure that the daisy-chained interrupt (BIAK) and DMA (BDMG) signals be complete to the controller slots. If there must be empty slots between the controller and any option board, the following backplane jumpers must be installed:

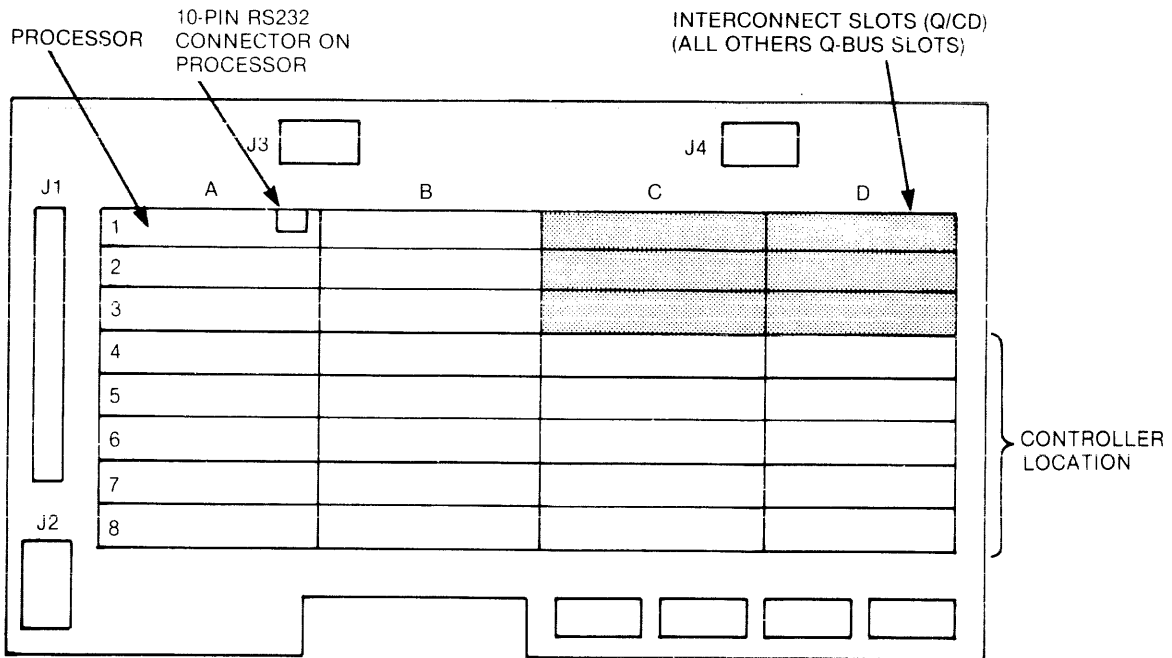
FROM	TO	SIGNAL
C0 X NS	C0 X M2	BIAK1/LO
C0 X S2	C0 X R2	BDMG1/LO

2. Perform this step if the remote panel switch/indicator is to be connected. Connect the cable from J4 on the controller to the remote panel (not supplied by DILOG). Refer to Figure 1-2 for pinouts and descriptions.
3. Install J1 and J2 into the connectors on the controller and J3 if two drives are used. Ensure pin 1 on each cable is matched with the triangle on each connector as indicated on Figure 2-1.
4. Ensure the controller is oriented with the components facing row one, the processor, and gently press both handles until the module connectors are firmly seated in the backplane.



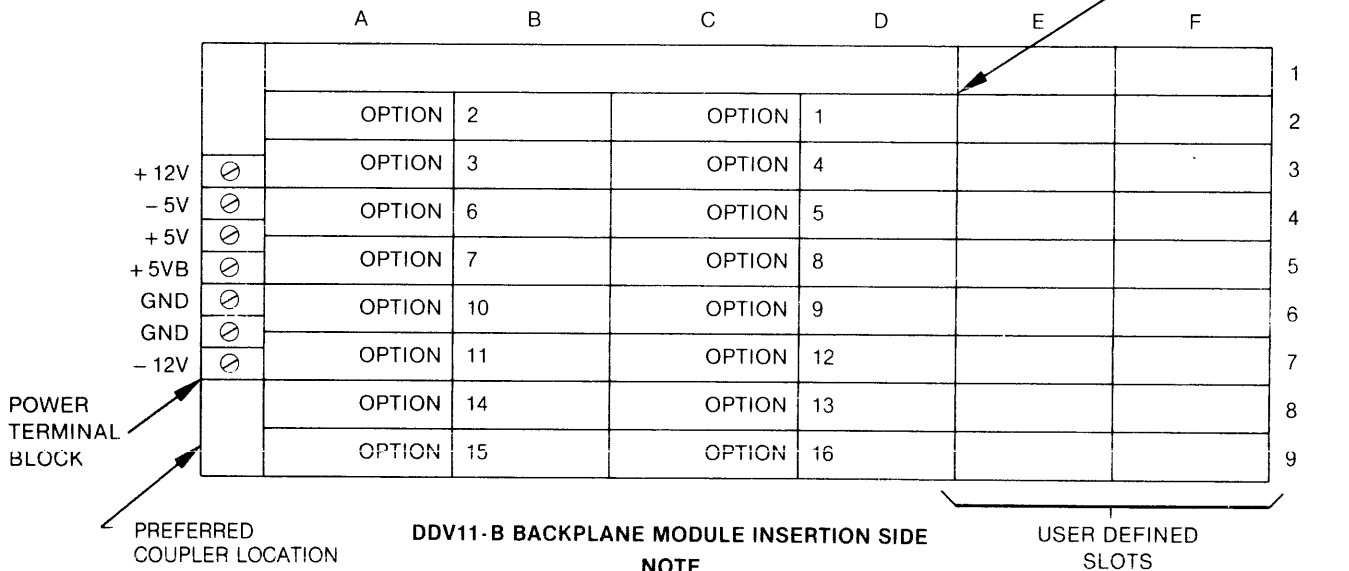
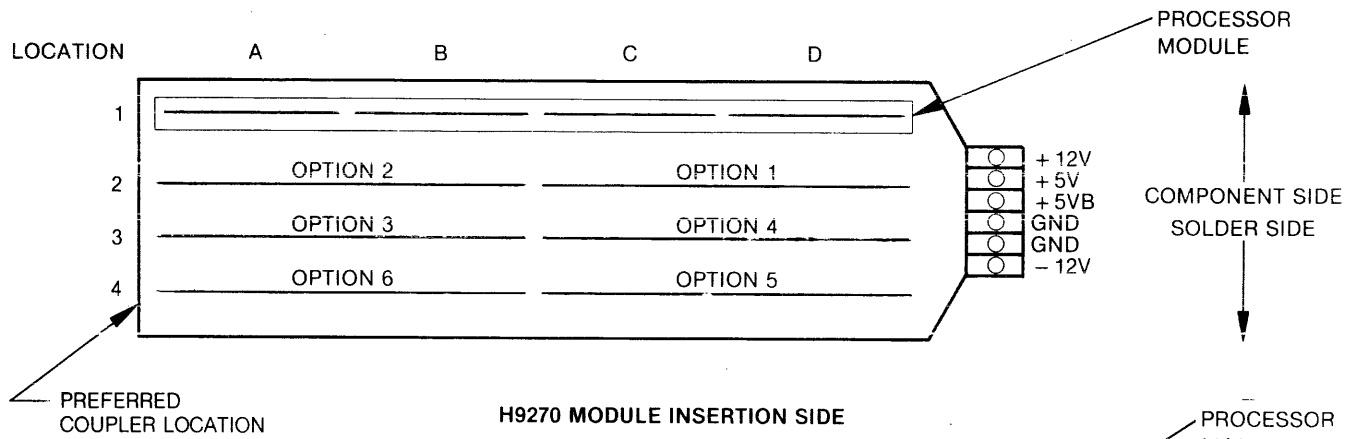
NOTE: COMPONENTS ON THE BOARD MUST BE FACING TOWARDS THE PROCESSOR.

**Figure 2-2. MicroVAX II Backplane (Typical)**



NOTE: COMPONENTS ON THE BOARD MUST BE FACING TOWARDS THE PROCESSOR.

**Figure 2-3. MicroVAX II H9278 Backplane**



**NOTE**  
 MEMORY CAN BE INSTALLED IN ANY SLOT; IT IS NOT PRIORITY DEPENDENT AND DOES NOT NEED TO BE ADJACENT TO THE PROCESSOR.  
 CONTROLLERS ARE ALSO COMPATIBLE WITH H9273A MODULES.

**Figure 2-4. Typical Backplane Configurations**

5. Connect J1 to the drive or drives if daisy-chained. Ensure the terminator is installed in the last drive. Connect the J2 cable to drive 0 and J3 to drive 1.
6. Refer to the disk drive manual for operating instructions, and apply power to the drive(s) and the computer.
7. Power up the system. If the green LED lights, self test passed. If the green LED does not light, self test failed. If the remote panel (J4) is used, the remote panel LEDs will display the self test error code. (See Table 2-2 for self test error code definitions.) If the green LED does not light, perform the following steps:
  - A. Power down the system.
  - B. Remove all drive cables.
  - C. Power up the system.
  - D. If the green LED does not light, the cabling is probably wrong. Install the cables into the proper connector.
8. The system is now ready to operate. Format the disks as described in Section 3.

Self test is entered upon initialization (Reset or Write IP Register). If self test fails, the error code is displayed on the Remote Panel LEDs and the self test LED is off. Upon self test failure, report the status to DILOG Customer Service.

**Table 2-2. Test in Error—Remote Panel**

<b>LED3 J3 Drive Write Protected</b>	<b>LED2 J3 Drive Selected</b>	<b>LED1 J2 Drive Write Protected</b>	<b>LED0 J2 Drive Selected</b>	<b>DESCRIPTION</b>
0	0	0	1	Test Drive Status A Register
0	0	1	0	Test Drive Status B Register
0	0	1	1	Test Controller Status Register (Remote Write Protect)
0	1	0	0	Request QBIC Status Register and Test Status Bits
0	1	0	1	Test QBIC DMA LSB Byte Count Register
0	1	1	0	Test QBIC DMA MSB Byte Count Register
0	1	1	1	Test QBIC DMA MSB Byte Count Register
1	0	0	0	Clear QBIC DMA Byte Count Register
1	0	0	1	Test QBIC DMA Control Register (Enable Zero Fill)
1	0	1	0	Test Z80 Working RAM Address Test (only on power up)
1	0	1	1	Test Z80 Working RAM Pattern (5AH) (only on power up)
1	1	0	0	Test Z80 Working RAM Pattern (A5H) (only on power up)
1	1	0	1	Test Disk Data RAM Address/Pattern (only on power up) First 8K
1	1	1	0	Test Disk Data RAM Address/Pattern (only on power up) Second 8K
1	1	1	1	Zero Fill Data RAM and test for zeros (16K) (only on power up)



## SECTION 3 BOOTSTRAP AND FORMAT

The Bootstrap operation establishes communication between the CPU and the controller. The format program establishes communication with the drive and performs tests to ensure proper communication. Error log messages are listed at the end of this section.

There are two methods for establishing communications with the formatting program:

- DILOG LSI-11 Boot procedure
- MicroVAX II communications procedure

These methods are described below. Diagnostic procedures and error log messages are listed at the end of this section.

### COMMUNICATION WITH CRT OR HARD COPY CONSOLE

If using the optional DILOG Format Paddle Card, the system console must be set up as follows:

- 9600
- 8 bit
- no parity
- 1 stop bit

If the system console is attached directly to the host, the setup is as follows:

- 9600, 4800, 2400, or 1200
- 8 bit
- no parity
- 1 stop bit

### DILOG LSI-11 BOOTSTRAP PROCEDURE

The controller not only supports standard DEC devices, but also allows the use of the onboard formatter. When DU is used, the standard DEC emulation is called. When FT is used, the onboard formatter is enabled for use through the system console.

The following assumes the system is in ODT mode. Note that the bootstrap can be used under processor Power Up Mode 2 conditions. Refer to the appropriate DEC manual for a discussion of the Power Up modes. Further note that the disk drive does not need to be READY to enter the bootstrap.

Reset the system by pressing RESET (Break) or enter the following (characters underlined are output by the system; characters not underlined are input by the operator):

@ 773000G OR 775000G

Depends on switch configuration set in Section 2.

\* Enter one of the following: DM0, DP0, DL0, DR0, MS0, MT0, MU, DY0, DU, or FT <CR>.

Definitions are as follows:

DM = RK06/07 Disk

DP = RP02/03 Disk

DL = RL01/02 Disk

- DR = RM03/05/80
- MS = TS11 Tape
- MT = Tape
- MU = (TMSCP) Tape
- DY = RX02 Floppy Disk
- DU = DU emulation
- FT = Enable onboard formatter through system console

Booting can be executed from logical units other than "0" shown above by entering the desired logical unit number, i.e., 1, 2, 3, . . . or 7.

## MICROVAX II COMMUNICATIONS PROCEDURE

There are two methods to boot MicroVAX II. Refer to Table 2-1 for Micro VAX II switch settings. The first is as follows:

1. Press RESTART
2. Enter the following - >>> B/8 DUA9, where "A" is selected slave address.

With the second method, a unique code is loaded into the SA register causing the controller to act as a UART. Ensure the boot switch is disabled.

1. On the MicroVAX II, perform INIT by depressing the RESTART switch.
2. Enter the code below. (Underlined values are outputs to the terminal.) The values of XXXXXXXXX are hex values of the controller address of the SA register and are listed below:

>>>D/P/L 20088004 80000001 <CR>

>>>D/P/W 20001F40 20 <CR>

>>>D/P/W XXXXXXXXX 3FFF <CR>

>>> S 200 <CR>

### NOTE

*When a GPX (Graphics Work Station) is used, enter >>>S 218 <CR> instead of 200.*

The hex values of the addresses are as follows:

IP REGISTER OCTAL ADDRESS	SA REGISTER OCTAL ADDRESS	SA REGISTER HEX ADDRESS ENTERED
772150	772152	2000146A
760334	760336	200000DE
760340	760342	200000E2
760344	760346	200000E6
760354	760356	200000EE
760360	760362	200000F2
760374	760376	200000FE
760400	760402	20000102

An optional step may be used to examine the values entered. After the first three lines are entered and before S200 starts, examine by entering and checking for the following:

>>>E/P/W XXXXXXXXX 800D

If 800D does not appear, there may be a problem in validating the memory maps. Contact the factory if this occurs.

## FORMATTING PROGRAM

After communication is established, the program is ready to format the disk.

### NOTE

*Inputs or outputs to or from the program may be in either decimal or Hexadecimal. In the upper right hand corner of the screen after the header, either "DECIMAL" or "HEX" will be shown. To change values, use the CONTROL and B keys. When these keys are pressed an audible alarm will sound, and outputs will toggle immediately. Exceptions are listed below:*

The following outputs are fixed, and will not change:

- SA/IP Registers—Always Octal
- Firmware Version—Always Decimal
- Date—Always Decimal
- Drive Capacity and Transfer Rate—Always Decimal
- Correction Pattern and Vector—Always Hexadecimal

The first display of the program will be:

NO DRIVE SELECTED

ARE YOU USING A (P)RINTER OR (C)RT?

If a CRT is used, the program will display rolling cylinder addresses. If a printer is used, the addresses will not be printed unless an error is detected. If an address is needed when a printer is used, use the CONTROL and P keys and the address will be printed.

Each display on the screen will list the program name, the version, and the controller model, followed by either "NO DRIVE SELECTED" or "DRIVE 0 (or 1) SELECTED." The main formatter menu will appear next. The logo is shown in the first example, below, but is omitted in the subsequent examples after the Main Formatter Menu. The ESDI convention of numbering drives is 1-7; the DU driver convention is 0-6.

### MAIN MENU

---

<b>DILOG On Board Disk Formatter</b>	<b>IP/SA Address = 772150</b>
<b>Version: A-B-C Model DQ696</b>	<b>Boot Address = 775000</b>

---

ESDI DRIVE 01 (DU00) SELECTED DECIMAL

#### Main Formatter Menu

1—SELECT DRIVE 01  
2—SELECT DRIVE 02  
3—DISPLAY DRIVE CONFIGURATION  
4—FORMAT DRIVE  
5—READ DRIVE DATA  
6—WRITE DATA TO DRIVE  
9—MEMORY—DMA TEST  
E—PRINT ERROR LOG R—REPLACE BAD BLOCKS  
T—READ/WRITE RANDOM SECTORS TEST W—WR/RD/COMPARE DRIVE DATA

Enter a Selection:

The first letter (A) of the version number represents the hardware revision number, the second letter (B) represents the formatter version number, and the third letter (C) represents the DU emulation revision. The IP/SA and boot addresses are read from the switch settings. The address shown above is the IP register. Add 2 for the SA register (772152). Items 1 and 2, SELECT DRIVE, will be the number of the drive as wired on the drive; for example, if the second drive is selected (jumpered) as 6 on the drive, the display will be 06. If the drives are assigned the same number or if both numbers are odd (or even), the program will prompt as follows:

**ERROR—BOTH DRIVES HAVE THE SAME UNIT NUMBER  
RESET THE UNIT NUMBERS AND PRESS RETURN TO RESTART**

or

**ERROR—ONE DRIVE UNIT NUMBER MUST BE ODD AND THE OTHER MUST BE EVEN  
RESET THE UNIT NUMBER AND PRESS RETURN TO RESTART**

### **DMA MEMORY TEST**

In the DILOG LSI-11 mode or the MicroVAX II mode, the system will only size, but will not test the memory. The onboard formatting program will size and test the memory. If a CRT is used, the size number in Kbytes will change continually until the total memory size is displayed. For the DILOG LSI-11 or MicroVAX II, the following message will appear:

**CANNOT DO DMA TEST WHILE FORMATTING FROM HOST**

Select Item 9 on the menu, and after the logo, a display similar to the following example will appear:

```
MEMORY SIZE (KBYTES) = 0512
*** ** CAUTION ** **
This test MODIFIES DEC MEMORY!!
If the host is running and you continue,
you will CRASH the OS!!!
*** ** ** ** ** ** ** ** ** ** **
```

1—Continue  
<ANY OTHER KEY>—Abort, return to Main Menu

Enter a Selection: 1

**CHECKING DMA—PLEASE WAIT**

**CHECKING DMA AT (KBYTES) = 0512**

**DMA IS OPERATIONAL OVER THE ENTIRE MEMORY RANGE**

Press RETURN to continue

#### **NOTE**

*If a printer is used, the memory size will be displayed when the test is completed. The line "CHECKING DMA AT (KBYTES)" will be displayed only when a CRT is used.*

If there is a failure, the program will give one of two reasons and display the address where DMA failed:

**DMA TEST FAILED DUE TO DATA MISCOMPARE AT DEC ADDRESS = XXXXXX**

**DMA TEST FAILED DUE TO NONEXISTENT MEMORY AT DEC ADDRESS = XXXXXX**

### **SELECT DRIVE**

Before Items 3 through 8 are selected, a drive must be selected by selecting Item 1 or 2. If drive 1 is selected, the Main Menu will appear with a message similar to the following example:

**ESDI DRIVE 01 (DU00) SELECTED**

If a drive is selected, but the drive is not powered up, the message will be similar to the following:

**1—SELECT DRIVE NULL**

When the drive is selected and powered up, the message will be:

1—SELECT DRIVE 01

After a drive is selected, it must spin up. If the drive does not spin up within the program time-out period (approximately 45 seconds), the program will display the following error message:

DRIVE SETUP ERROR

Press RETURN to continue

When the Main Menu reappears, the message will again be:

NO DRIVE SELECTED

#### NOTE

*Selecting a drive will clear the formatter's internal error log (see the "R" menu entry).*

### DRIVE CONFIGURATION

Item 3 in the Main Menu will present the drive configuration. An example follows:

ESDI DRIVE 01 (DU00) SELECTED

DECIMAL

Display Drive Configuration

DRIVE IS HARD SECTORED

DRIVE HAS MOTOR CONTROL

DATA TRANSFER RATE

>5 MHZ <=10 MHZ

NUMBER OF CYLINDERS

= 0922

NUMBER OF HEADS

= 0009

NUMBER OF USER SECTORS/TRACK (NOT INCLUDING ONE SPARE)

= 0017 INTERLEAVE = 01

USER DRIVE CAPACITY (MBYTES)

= 071.8 USER RECORDS = 00141066

#### NOTE

*Data Transfer Rate and Drive Capacity will always be in decimal.*

The interleave factor may be specified or changed in the Format Section, Item 4, from the Main Menu.

### FORMAT

To format the drive, enter Item 4 from the Main Menu, and the following will appear:

ESDI DRIVE 01 (DU00) SELECTED

DECIMAL

Format Selected Drive

\*\*\* \*\* CAUTION \*\* \*\*

*If you continue, ALL data will be lost on the selected drive!!!*

\*\*\* \*\* \*\* \*\* \*\*

1—Continue with format

<ANY OTHER KEY>— Abort, return to Main Menu

Enter a selection:

The default for the interleave prompt is 01. Interleaving is a technique of assigning successive addresses to sectors which are physically separated on the disk, in order to reduce access time. A 3 to 1 interleave requires three rotations of the disk to transfer one track. The range for interleaving is from 1 to 7; that is, 1 to 1 through 7 to 1. DILOG recommends a 1 to 1 interleave as the most efficient. Any response other than 2

through 7 will result in the interleave factor being set to 01, the default value. When the disk is formatted for the first time, the program in Item 3 will indicate that the interleave factor is UNKNOWN.

### CAUTION

*When an interleave number is changed, the entire disk must be formatted without abort (CTRL-A) or the disk may become formatted with two different interleaves.*

When the prompt CORRECT (Y/N)? appears, any response other than Y will force the prompt to repeat.

The program writes and reads two different data patterns to and from the drive. This technique precludes any possibility that a previously formatted drive will read erroneous data. If the controller is unable to read a sector, the next sector in the track is used.

To ensure the disk can be formatted, the program writes to and reads from cylinder 0, head 0, sector 0. (If item 7, Specific Drive Areas, is chosen from the main menu, the program starts at the assigned partition: Configuration, Host, RCT, or Diagnostics. Refer to "Specific Drive Areas" below.) If the disk cannot be formatted after two tries, the program will display the following message:

FORMAT ABORTED—UNABLE TO WRITE HEADERS

Pressing both the CONTROL and A keys will cause the program to stop the current step of the test and proceed to the next step. Pressing both the CONTROL and C keys will cause the program to proceed to the Main Menu.

If formatting continues, the program will write and read data and initialize the Replacement And Caching Table (RCT), but will do no revectoring. The addresses change as each cylinder is read from or written to.

If formatting is successful, a display similar to the following will appear.

ESDI DRIVE 01 (DU00) SELECTED

DECIMAL

Format Selected Drive

(CTRL-A ABORTS TO NEXT STEP, CTRL-C ABORTS TO MAIN MENU)

INTERLACE FACTOR [1]? 1 INTERLEAVE = 01 CORRECT (Y/N)? Y

WRITING HEADERS

CYLINDER ADDRESS XXXX

WRITING HEADERS

CYLINDER ADDRESS XXXX

WRITING DATA

CYLINDER ADDRESS XXXX

INITIALIZING RCT TO NO DEFECT STATE

WRITING DATA

CYLINDER ADDRESS XXXX

READING DATA

CYLINDER ADDRESS XXXX

Press RETURN to continue

The first WRITING HEADERS is to the host area. The second is to the RCT. The WRITING ZERO DATA is to the RCT. The last two entries, WRITING DATA and READING DATA, are to the host area.

If the remote panel is used and the WRITE PROTECT switch is ON, the following will appear:

\*\*\* DRIVE IS WRITE PROTECTED \*\*\*

## READ DRIVE

When the disk is formatted, the program will return to the Main Menu. Item 5 from the Main Menu is a further test for reading data. The following is an example:

ESDI DRIVE 01 (DU00) SELECTED

DECIMAL

### Read Drive Data

(CTRL-L TO LOOP ON TEST CTRL-R TO ENABLE RETRIES)  
(CTRL-C ABORTS TO MAIN MENU)

READING DATA \*\*LOOP\*\*  
CYLINDER ADDRESS XXXX

NUMBER OF PASSES = 0001

NUMBER OF PASSES = 0002

NUMBER OF PASSES = 0003

NUMBER OF PASSES = 0004

Press RETURN to continue

The Loop On Test feature is used for scanning for long periods to detect media flaws which are not on the manufacturer's defect list (NOM - Not On Map). The scan may be performed overnight or during weekends. All Errors will be posted in the error log in the order in which they occurred. The sequence for using this procedure is as follows:

1. Format the drive (4)
2. Replace Manufacturer's Defect List (R and D)
3. Read Drive Data (5)
4. Replace from Error Log (R and L)
5. Change Pattern - Write Data to Drive (6) **\*\*OPTIONAL\*\***
6. Read Drive Data (5)
7. Replace from Error Log (R and L)  
[Repeat Replace and Read until the media is error free.]
8. CTRL-L to Loop On Test
9. CTRL-C to discontinue test

DIALOG recommends items 1 through 7 be performed for all new drives.

If a printer is used, the cylinder address is given when the CONTROL and P keys are pressed.

Data errors will display the cylinder, head, sector, logical block address (LBA), type of error, and whether the error is correctable or uncorrectable. If the error is correctable, the pattern and the vector will be displayed. The following are examples of each:

CYL=0014 HEAD=0000 SECTOR=0013 LBA=000005545 READ DATA ERROR  
(UNCORRECTABLE)

CYL=0028 HEAD=0002 SECTOR=0007 LBA=000011091 READ DATA ERROR (CORRECTABLE)  
CORR PAT 01FA02 (10 BITS CORR) CORR VEC 0061

## WRITE DATA

Item 6 from the Main Menu is a further test which writes zeroes to the disk. The following is an example:

ESDI DRIVE 01 (DU00) SELECTED

DECIMAL

### Write Data to Drive

\*\*\* \*\* CAUTION \*\* \*\*

*If you continue, ALL data will be lost  
on the selected drive!!!*

\*\*\* \*\* \*\* \*\* \*\*

1—Continue with format

<ANY OTHER KEY>—Abort, return to Main Menu

### Write Data to Drive

(CTRL-C ABORTS TO MAIN MENU)

ENTER 16-BIT HEX DATA PATTERN [0000]:

CYLINDER ADDRESS XXXX

Press RETURN to continue

## PRINT ERROR LOG

When E is selected from the Main Menu, the error log lists the errors from the last read operation. The error log may contain up to 150 entries, and after 150 entries, the log accepts no more. The following is an example of an error log:

### Print Error Log

(USE CTRL-S/CTRL-Q TO START/STOP LISTING)

CYL=0014 HEAD=0000 SECTOR=0013 LBA=00005545 READ DATA ERROR (UNCORRECTABLE)

CYL=0028 HEAD=0002 SECTOR=0007 LBA=00011091 READ DATA ERROR (CORRECTABLE)

NUMBER OF ERRORS = 0002

## REPLACE BAD BLOCKS

Ensure a drive is selected, then enter R from the main menu. The following replacement menu will appear:

ESDI DRIVE 01 (DU00) SELECTED

DECIMAL

### Replace Bad Blocks

D—LOAD MANUFACTURER'S DEFECT LIST INTO ERROR LOG AND REPLACE

L—REPLACE ALL ENTRIES IN ERROR LOG

M—MANUALLY REVECTOR BAD BLOCKS

S—SUMMARIZE PRESENT RCT STATE

Q—RETURN TO MAIN MENU

Enter a selection:

D (Subset of R, Replace Bad Blocks)



If D, Load Manufacturer's Defect List, is selected from the replacement menu, the following will appear:

ESDI DRIVE 01 (DU00) SELECTED DECIMAL  
Replace Bad Blocks

\*\*\* \*\* CAUTION \*\* \*\*  
REVECTOR MANUF. DEFECT LIST ENTRIES.  
\*\*\* \*\*

1—Continue  
< ANY OTHER KEY >— Abort, return to Main Menu

Enter a selection:

If the response is 1, the following will appear:

ESDI DRIVE 01 (DU00) SELECTED DECIMAL  
Replace Bad Blocks  
REPLACE ALL DEFECTS (Y/N) ?

When Y is the response, the drive defect list is loaded into the error log and replacement is completed automatically.

The program takes the defect list from the drive and lists the the cylinder and the Bytes From Index (BFI). If the prompt to replace is Y, the program list the replacement.

If the response is N, the following will appear:

ESDI DRIVE 01 (DU00) SELECTED DECIMAL  
Replace Bad Blocks  
LOADING DRIVE DEFECT LIST FOR HEAD 00

The ESDI specification lists four data field lengths: 256, 512, 1024, and 2048. DILOG supports only 256.

Note that the defect list is in descending order:

CYL = 1186 BFI = 00005212  
CYL = 0521 BFI = 00004599  
CYL = 0052 BFI = 00020248

HEAD 00 DEFECT LIST CONTAINS 03 ERRORS AND WAS CREATED ON 03-05-86.

CYL=1186 HEAD=0000 SECTOR=0004 LBA=00483484 DRIVE DEFECT LIST ENTRY  
CYL=0521 HEAD=0000 SECTOR=0021 LBA=00212181 DRIVE DEFECT LIST ENTRY  
CYL=0052 HEAD=0000 SECTOR=0034 LBA=00020842 DRIVE DEFECT LIST ENTRY

NUMBER OF ERRORS = 03

REPLACE (Q TO QUIT) (Y/N/Q)?

If the response is Y, the following will appear:

REPLACING LBN 00483484 WITH RBN 00014225  
REPLACING LBN 00021061 WITH RBN 00006244

Press RETURN to continue

The program then repeats the above for each head.

L (Subset of R, Replace Bad Blocks)

If L, Replace Entries in Error Log, is entered from the menu, the following will appear:

ESDI DRIVE 01 (DU00) SELECTED DECIMAL

Replace Bad Blocks

\*\*\* \*\* CAUTION \*\*\* \*\*  
*REPLACE ALL ENTRIES IN ERROR LOG.*  
\*\*\* \*\* \*\* \*\* \*\* \*\* \*\* \*\* \*\* \*\* \*\* \*\* \*\* \*\* \*\*

1—Continue  
< ANY OTHER KEY >—Abort, return to Main Menu

Enter a selection:

If 1 is selected and there are no errors in the error log, the following will appear:

ESDI DRIVE 01 (DU00) SELECTED DECIMAL

Replace Bad Blocks

Press RETURN to continue

When the block is replaced, the LBN (Logical Block Number) will appear as follows:

REPLACING LBN 008290 WITH RBN 0003D7

If the block replacing the LBN is also bad, the following will appear:

REPLACING LBN 008290 WITH RBN 0003D7  
REPLACE FAILED

The program will then re-replace the LBN:

REPLACED LBN WITH BAD RBN—RE-REPLACING LBN  
REPLACING LBN 008290 WITH RBN 0003D8

If all spares are used (which will rarely hapen), the following will appear:

REPLACE FAILED—RCT IS FULL

If this condition occurs, the disk must be reformatted before any further revectoring may be done.

**CAUTION**

*To avoid losing logical blocks, DILOG requires multiple read and replace passes (Item 5 from the Main Menu) for all soft sectorred drives. Read and replace until there are no errors. The same technique should also be applied for hard sectorred drives.*

Q (Subset of R, Replace Bad Blocks)

If Q, Quit, is selected, the program will display the Main Menu.

M (Subset of R, Replace Bad Blocks)

If M, Manually Revector Bad Blocks, is selected from the replace menu, another menu is displayed for which the values must be entered for each defect. The program prompts to replace and does the replacement. The following are examples:

ESDI DRIVE 01 (DU00) SELECTED

DECIMAL

Replace Bad Block

\*\*\* \*\* CAUTION \*\* \*\*  
*MANUALLY REVECTOR BAD BLOCKS.*  
\*\*\* \*\* \*\* \*\* \*\*

1— Continue

<ANY OTHER KEY >— Abort, return to main menu

Enter a selection:

When 1 is the response the following secondary menu appears:

Replace Bad Blocks

Select one of the following input formats:

B—Cylinder, Head, Bytes From Index

S—Cylinder, Head, Sector

L—Logical Block Number

Q—Quit

Enter a selection:

(ENTER Q IN RESPONSE TO ANY PROMPT TO EXIT)

B (Subset of M, Manually Revector Bad Blocks)

If B is entered, a display similar to the following will appear:

CYL=1186 HEAD=0000 BFI=5212 CORRECT (Y/N)?

The CORRECT prompt and the replacement result are described below.

S (Subset of M, Manually Revector Bad Blocks)

If S is selected, a display similar to the following will appear:

CYL=1186 HEAD=0000 SECTOR=0004 CORRECT (Y/N)?

The prompts and replacement results are described below.

L (Subset of M, Manually Revector Bad Blocks)

If L is selected, the program will prompt for decimal or hexadecimal entries, depending on the current base (toggled by Control B). If decimal, the display will be similar to the following:

ENTER 4 MOST SIGNIFICANT DIGITS OF 8 DIGIT  
DECIMAL LBA VALUE—0012

ENTER 4 LEAST SIGNIFICANT DIGITS OF 8 DIGIT  
DECIMAL LBA VALUE—3456

LBA=00123456 CORRECT (Y/N)?

If hexadecimal, the display will be similar to the following:

ENTER 2 MOST SIGNIFICANT DIGITS OF 6 DIGIT HEX

LBA VALUE—AB

ENTER 4 LEAST SIGNIFICANT DIGITS OF 6 DIGIT HEX

LBA VALUE—CDEF

LBA=ABCDEF CORRECT (Y/N)?

The prompts and replacement results are described below.

Q (Subset of M, Manually Revector Bad Blocks)

If Q is selected, the program will display the previous menu.

If the response to the CORRECT prompt is Yes, a display similar to the following will appear:

REPLACING LBN 00483484 WITH RBN 00014225

Other combinations of responses will present the Replace Menu: B, S, L, Q.

S (Subset of R, Replace Bad Blocks)

If S, Summarize Present RCT State, is selected from the replace menu, the program will list the Replacement Block Number for the Logical Block Number being replaced. The program will also specify if the Replacement Blocks are at the end of the track on which the LBN resides (primary) or on another track on which the LBN being replaced does not reside (non-primary). The program will also specify unusable RBNs. The summary will list total spares, unused spares, primary and non-primary allocated spares, and unusable spares. The following is an example:

ESDI DRIVE 01 (DU00) SELECTED

DECIMAL

Replace Bad Blocks

RBN 00000200 IS ALLOCATED (PRIMARY) FOR LBN 00006811

RBN 00000251 IS ALLOCATED (NON-PRIMARY) FOR LBN 00008541

RBN 00000263 IS UNUSABLE

RBN 00000344 IS ALLOCATED (PRIMARY) FOR LBN 00011725

TOTAL SPARES = 00014568

UNUSED SPARES = 00014564

ALLOCATED (PRIMARY) SPARES = 00000002

ALLOCATED (NON-PRIMARY) SPARES = 00000001

UNUSABLE SPARES = 00000001

Press RETURN to Continue

**READ/WRITE RANDOM SECTORS TEST**

When T is entered from the Main Menu, the program either reads or writes, reads, and compares data randomly over the user portion of the drive (Host area). The pattern written corresponds to cylinder, head, and sector. The default value of NUMBER OF PASSES is infinite unless the CONTROL A or CONTROL C keys are pressed, in which case the program will return to the Main Menu. When T is entered, the following will appear:

Read/Write Random Sectors Test

(R)EAD TEST OR (W)RITE READ TEST [R]?

NUMBER OF PASSES [INFINITE]?

R—If the response is R (or any key other than W), the following will appear:

Read/Write Random Sectors Test

(CTRL-C ABORTS TO MAIN MENU)  
CYLINDER ADDRESS XXXX

The XXXX above represents the random cylinder address displayed.

If an error occurs, the program will display the error and continue with the test. The error display will be similar to the following:

CYL=0014 HEAD=0000 SECTOR=0013 LBA=00005545 READ DATA ERROR UNCORRECTABLE

W—If W, Write, is selected, the following will appear:

Read/Write Random Sectors Test

(R)EAD TEST OR (W)RITE TEST [R] W

\*\*\* \*\* CAUTION \*\* \*\*  
*If you continue, ALL data will be lost on  
the selected drive!!!*  
\*\*\* \*\* \*\* \*\* \*\*

1—Continue  
<ANY OTHER KEY>— Abort, return to Main Menu

Enter a selection:

The cylinder address will be displayed as in the read test, and if an error appears, it will be displayed as in the read test.

### WRITE, READ, AND COMPARE DRIVE DATA

When W is entered from the main menu, the program checks the complete data path between the controller and the drive by writing and reading to and from the disk and comparing data. This option also ensures revectoring was successful. An example of the first prompt is as follows:

ESDI DRIVE 01 (DU00) SELECTED

DECIMAL

Write, Read, and Compare Drive Data

\*\*\* \*\* CAUTION \*\* \*\*  
*If you continue, ALL data will be lost on  
the selected drive!!!*  
\*\*\* \*\* \*\* \*\* \*\*

1—Continue  
<ANY OTHER KEY>— Abort, return to Main Menu

Enter a selection:

The program will list the current cylinder (if a CRT is used) until a compare error occurs. An example is as follows:

ESDI DRIVE 01 (DU00) SELECTED DECIMAL

Write, Read, and Compare Drive Data

(CTRL-A ABORTS TO NEXT STEP, CTRL-C ABORTS TO MAIN MENU)

WRITING DATA

CYLINDER ADDRESS: XXXX

CYL=0082 HEAD=0011 SECTOR=0001 LBA=00033424

WRITE, READ, COMPARE TEST ERROR

If the remote panel is used and the WRITE PROTECT switch is ON, the following will appear:

\*\*\* DRIVE IS WRITE PROTECTED \*\*\*

## ERROR LOGGING

Error messages for the disk subsystem are as follows:

Error Message Number	Description
0	Undefined Error
1	Invalid Command
2	Command Aborted
3	Unit Offline
4	Unit Available
5	Media Format Error
6	Write Protected
7	Compare Error
8	Data Error
9	Host Buffer Access Error
10	Controller Error
11	Drive Error
12	Invalid CPU Type
13	Controller/drive contains unreasonable error rate
14	Cylinder 0 cannot be formatted
15	RCT area cannot be formatted
16	Drive not formatted
17	Controller interrupt but no transition indicated
18	Command ring transition interrupt
19	Controller not online
20	Command Ring Error
21	Controller initialization failed
22	Controller interrupt never received

## SECTION 4 DIAGNOSTICS

Two DEC RC25 diagnostics may be used to test the controller. They are ZRCFB3, Front End Test, and ZRCDA1, Disk Exerciser. The MDM KDA50-Q is used to test MicroVax II.

### SETUP AND SELF TEST

Install the controller as described in Section 2. Apply power to the system, and verify that the green LED lights. Install the XXDP+ diagnostic floppy in the floppy drive and boot the system. When the boot switch on the system is toggled, the LED will go out, but will light again when the controller is brought online by the diagnostic.

When booting is completed, the XXDP+ sign-on will appear:

```
XXDP-SM SMALL MONITOR VERSION 2
BOOT FROM DY0
28KW MEMORY
UNIBUS SYSTEM

RESTART ADDR: 152010
THIS IS XXDP-SM  TYPE "H" OR "H/L" FOR HELP
(NOTE: 28 KW = 28 Kilowords)
```

### FRONT END TEST ZRCFB3

The controller will support only tests 1-8 which must be selected by the user. These tests will bring the controller through initialization several times and do extensive checks on the DMA capability. Once the prompt "." has appeared, enter the following command line to start ZRCFB3 diagnostic:

```
.R ZRCFB3
```

The system will echo the filename to let the user know that the file is being loaded.

```
.R ZRCFB3
ZRCFB3.BIN
```

When the diagnostic has been loaded, the diagnostic startup message will appear on the user's console.

```
DRSSM-F0
CZRCF-A-0
RC25 FRONT END/HOST DIAGNOSTIC
UNIT IS AZTEC RC25 PLATTER
RSTRT ADR 145676

DR>
```

The diagnostic can be started by entering the following command line:

```
DR>START/TEST:1-8<CR>
```

The above command line instructs the diagnostic supervisor to start the test but initiate only tests 1 through 8. The supervisor will then prompt the user for hardware or software changes.

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

The diagnostic must be informed of the hardware parameters of the system under test. Enter the following information.

```
CHANGE HW (L) ? Y<CR>
```

Enter the number of controllers that are being tested.

```
# UNITS (D) ? 1<CR>
```

The diagnostic will then prompt the user to enter the following information for the number of units that have been selected. The following is an example:

```
UNIT 0  
IP ADDRESS (0) 172150 ? <CR>  
VECTOR (0) 154 ? <CR>  
BR LEVEL (0) 5 ? <CR>  
PLATTER ADDRESS[ES] (D) ? 0<CR>
```

The platter address is the unit number of the disk drive under test. Since the controller does not support the tests which require a disk, this question is not appropriate but must be answered to start the diagnostic. Once the hardware questions are answered, the supervisor will prompt for software changes.

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

The software question can be answered NO because the controller does not support the tests which require a disk drive.

```
CHANGE SW (L) ? N<CR>
```

The diagnostic will print each test as it runs and will inform the user of any errors that occur.

```
TESTING UNIT #: 0 IP_REGISTER: 172150 PLATTER #: 0  
TEST 1 REGISTER EXISTENCE TEST  
TEST 2 STEP 1 READ/WRITE POWERUP DIAGNOSTICS  
TEST 3 DIAGNOSTIC WRAP TEST  
TEST 4 VECTOR AND BR LEVEL TEST  
TEST 5 STEP 1-3 READ/WRITE DIAGNOSTIC  
TEST 6 PURGE POLL TEST  
TEST 7 SMALL RING TEST  
TEST 8 LARGE RING TEST
```

When the diagnostic has completed all the tests, the end of pass message will be printed and the diagnostic will be restarted.

```
DZRCF EOP 1  
      0 TOTAL ERRORS  
DR>EXIT<CR>
```

## DISK EXERCISER, ZRCDA1

The controller is also compatible with the multi-drive exerciser, ZRCDA1. This diagnostic will bring the controller online and issue random record numbers to the selected unit(s). This diagnostic also supports multiple controllers as well as multiple units on a single controller.



Once the XXDP prompt “.” is displayed, run ZRCDA1 by typing the following command line:

```
.R ZRCDA1<CR>
```

The system will echo the filename to inform the user that the program is being loaded:

```
.R ZRCDA1  
ZRCDA1.BIN
```

Once the diagnostic is loaded, the diagnostics startup message will be displayed on the user’s console:

```
DRSSM-F0  
CZRCD-A-0  
RC25 DISK EXERCISER  
UNIT IS SINGLE RC25 PLATTER  
RSTRT ADR 145676  
  
DR>
```

Patch as follows:

	ADDRESS	IS	SHOULD BE
PATCH 1	26070	16237	12737
	26072	50	143326
PATCH 2	30644	1003	1367
PATCH 3	30704	1003	1367
PATCH 4	37522	1416	240

Start the test after the diagnostic supervisor prompt “DR>” appears.

```
DR>START<CR>
```

The supervisor will then prompt the user to change hardware or software default parameters:

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

The diagnostic must be informed of the hardware parameters of the system under test. Enter the following command line to change hardware parameters:

```
CHANGE HW (L) ? Y<CR>
```

Enter the number of controllers or drives that are currently being tested:

```
# UNITS (D) ? 1<CR>
```

If 2 is entered the next prompt will appear twice so that the second controller or second drive may be selected.

The diagnostic will prompt the user to enter the following information for the number of units that have been selected:

```
UNIT 0  
IP ADDRESS (0) 172150 ? <CR>  
VECTOR (0) 154 ? <CR>  
BR LEVEL (D) 5 ? <CR>  
PLATTER ADDRESS (UNIT PLUG) (D) 0 ? <CR>  
ALLOW WRITES TO CUSTOMER DATA AREA ON THIS PLATTER (L) ? Y<CR>  
**WARNING—CUSTOMER DATA AREA MAY BE OVERWRITTEN! . . .  
CONFIRM (L) ? Y<CR>
```

The platter address is the unit number of the disk drive under test. The customer data area is the host data area of the disk drive and is used to test the controller. Backup any data in the host partition, if necessary, before continuing with the diagnostic.

After the hardware questions are answered, the supervisor will prompt the user for any software changes:

CHANGE SW (L) ?

The user can take the default software values because the drives are larger than an RC25. If the tests are being run on a contracted unit, some of the software values may have to be changed to prevent errors from occurring.

If the selected unit is fully formatted, use the default values by typing NO to the software query:

CHANGE SW (L) ? N<CR>

To change the software default values, answer YES to the software query:

CHANGE SW (L) ? Y<CR>

The user will then be prompted by the supervisor to input the following information:

ERROR LIMIT (0 FOR NO LIMIT) (D) 32 ? <CR>

Enter the error limit that must be reached before a unit is deselected by the diagnostic. The default value of 32 is used.

TRANSFER LIMIT IN MEGABYTES (0 FOR NO LIMIT) (D) 2 ? <CR>

Enter the number of bytes to be transferred between the controller and the diagnostic. Effectively, this selects the time required to reach an END OF PASS.

SUPPRESS PRINTING ERROR LOG MESSAGES (L) Y ? <CR>

The default value should be used unless multiple errors occur and more information is required to resolve the problem.

RUN DM EXERCISER INSTEAD OF MULTI-DRIVE SUBTEST (L) N ? <CR>

The default must always be taken because the controller does not support Diagnostic Mode (DM) of operation.

RANDOM SEEK MODE (L) Y ? <CR>

The best possible test is to seek randomly across the entire disk surface. Therefore, the default value should be used.

STARTING TRACK (D) 0 ? <CR>

The starting track number is to be entered. (Because the controller does not emulate the RC25, the questions regarding starting and ending track numbers do not apply. If the unit under test is fully formatted and is more than 40 megabytes, the diagnostic will not overflow the cylinder address.)

ENDING TRACK (D) 1641 ? <CR>

Enter the ending track number. If the unit is larger than an RC25 unit (40 megabytes), the default can be used.

READ-COMPARES PERFORMED AT THE CONTROLLER (L) Y ? <CR>

The default value is used to require the controller to compare the data read with host memory.

THE REMAINING QUESTIONS APPLY ONLY TO UNPROTECTED PLATTERS.

The user can use the default values for the remaining questions.

WRITE ONLY (L) N ? <CR>

The disk drive under test is never a write only disk; therefore, always take the default.

WRITE-COMPARES PERFORMED AT THE CONTROLLER (L) Y ? <CR>

The controller will perform write checks if the default is taken.

CHECK ALL WRITES AT HOST BY READING (L) N ? <CR>

The diagnostic will NOT issue read commands to check the data just written if the default is taken. Otherwise, the diagnostic software will perform the write check function.

USER DEFINED DATA PATTERN (L) N ? <CR>

The data pattern used in the diagnostic is worst case. To ensure prompt testing, always use the default value.

SELECT PREDEFINED DATA PATTERN (0 FOR SEQUENTIAL SELECTION) (D) 0 ? <CR>

Always use the default value.

The test will begin after the hardware and software questions are answered.

INIT SUBTEST START

ABOUT TO VERIFY VECTOR 154(0) FOR DEVICE 172150(0) . . . COMPLETED

The diagnostic will run until the transfer limit is reached. After the limit has been reached, the diagnostic will print status information about the unit under test and display the END OF PASS message:

CZRCD EOP 1  
0 TOTAL ERRS

## **MICROVAX II, MDM KDA50-Q**

The controller is compatible with the MicroVAX II diagnostics as described below. Parts of the functional test, the exerciser, and the utility test are listed as either PASS or FAIL. Where FAIL is indicated, the error advisory is described. For detailed descriptions consult the MDM section of the MicroVAX II Maintenance Manual.

### **Functional Test**

#### **Test 1—PASS—Controller Wrap Mode Test**

This test tests the ability of the controller to read in the SA register contents from the host and then turn around and write the same value back to the host.

#### **Test 2—FAIL—Controller Interrupt Test**

This test tests the controller's ability to interrupt at the correct IPL and vector. It also verifies that the controller can be successfully initialized by the host.

The error advisory for this test failure was, "The controller interrupted above BR level 4," which is true since the controller's BR level is jumper selectable and was set to 5. The test will pass if the jumper is set to BR4 on the controller.

#### **Test 3—FAIL—Controller RAM Test**

This test writes data patterns to the controller RAM and then reads the data patterns back to the host where they are verified.

The error advisory for this test failure was, "The controller SA register contains error code: 100016 <octal>." The controller does not allow direct access to its Data Buffer RAM.

**Test 4—PASS—Function Test (Verify Mode)**

This test enables the controller and disk drives. An MSCP read and access command are issued to test the read and positioner circuitry of the drives.

**Test 5—PASS—Functional Test (Service Mode)**

This test operates the same as Test 4 except in Service Mode.

**Exerciser**

**Test 1—PASS—Exerciser (Verify Mode)**

This test performs random MSCP read and access operations on all of the drives selected for test. Data integrity is verified. The exerciser will run for 3 minutes.

**Test 2—PASS—Exerciser (Service Mode)**

This test operates the same as Test 1 except in Service Mode.

**Utility**

**Test 1—PASS—MSCP Exerciser**

This test is run the same as Test 2 of the Exerciser Section if run in the Read-Only Mode.

This test (when run in the Read/Write Mode) will perform random MSCP read, access, write, and erase commands. Error log and attention messages are enabled during this test. The exerciser will run for 3 minutes.

**Test 2—FAIL—DUP Functional Test**

This test loads a DUP program into the controller for improved fault isolation of controller and disk drives.

The error advisory for this test failure was, "The controller SA register contains error code: 100016 <octal>." The controller does not allow direct access to its Data Buffer RAM nor is it architecturally designed to run "downloaded" programs.

**Test 3—FAIL—DUP RA Series Disk Formatter**

This test loads a DUP program into the controller for disk formatting.

The error advisory for this test failure was, "The controller SA register contains error code: 100016 <octal>." The controller does not allow direct access to its Data Buffer RAM nor is it architecturally designed to run "downloaded" programs.

Fiji 22635

CNH6 15-16 open

CNH7 1-2 short

7-8 short

9-10 open

11-12 short

13-14 open

15-16 short

CNH5 15-16 short

CNH3 15-16 short

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