



**macrolink**

1500 NORTH KELLOGG DRIVE, ANAHEIM, CA 92807  
PHONE: (714) 777-8800 TWX: 910-591-1671

**MACRO-3  
SMD  
DISK CONTROLLER**

P/N 202900

CONTAINS: INSTALLATION SPECIFICATION  
MIDC FAST FORMATTER  
EXTENDED MIDC DIAGNOSTICS  
ERROR PROCEDURES  
MODIFICATION OPTIONS  
CUSTOM DRIVE INSTALLATION

Copyright 1985, MACROLINK INC.  
Revision Date: February 7, 1985

## TABLE OF CONTENTS

SECTION		PAGE
1.	INSTALLATION.....	1
1.1	Introduction.....	1
1.2	Unpacking.....	1
1.3	Installing the MACRO-3 into the CPU.....	1
1.4	RACKO/TACKO.....	2
1.5	7/32 - 8/32 Configurations.....	2
1.6	MACRO-3 Configuration.....	2
1.7	Drive Configuration.....	4
1.8	Formats.....	5
1.9	IDC Format.....	5
1.10	EIF Format.....	5
1.11	MSM Format.....	5
1.12	S14 Format.....	5
1.13	IPL Boot Load.....	5
1.14	Bus Switch.....	5
2.	MIDC FAST FORMATTER.....	7
2.1	General.....	7
2.2	Requirements.....	7
2.3	Loading Procedure.....	7
2.4	Operating Procedure.....	8
2.5	Program Description.....	8
2.6	Format Time.....	10
2.7	Optional Drives.....	10
2.8	Flaw Map.....	10
3.	EXTENDED MIDC DIAGNOSTICS.....	15
3.1	General.....	15
3.2	Purpose of the Diagnostics.....	15
3.3	Minimum Hardware Requirements.....	15
3.4	Additional Software Requirements.....	15
3.5	Loading Procedure.....	16
3.6	Device Address.....	17
3.7	Normal Testing.....	17
3.8	Additional Testing.....	18
3.9	Overnight Testing.....	19
4.	ERROR PROCEDURES.....	20
4.1	Introduction.....	20
4.2	Recoverable Errors.....	20
4.3	Unrecoverable Errors.....	20

5.	DIAGNOSTIC OPTIONS.....	22
	5.1 Introduction.....	22
	5.2 Diagnostic Options.....	22
6.	CUSTOM DRIVE INSTALLATION.....	36
APPENDIX A	DRIVE CONFIGURATION DATA.....	37

## CHAPTER 1 INSTALLATION

### 1.1 INTRODUCTION

This section gives detailed instructions for installing the MACRO-3 Intelligent Disk Controller. Before installing, you should be familiar with the overview in Chapter 1.

### 1.2 UNPACKING INSTRUCTIONS

The MACRO-3 is normally shipped with one 20 foot long "A" control cable, and one 20 foot long "B" data cable. The board is packed in an anti-static plastic bag, and foam sponge to cushion the board during shipment. This packing material should be retained so the board may be properly transported if it should need to be returned to the factory for repair.

Inspect the MACRO-3 and cables immediately upon receipt. If any damage is visible from shipment, you should request the carrier's agent to inspect the damage, and file a claim with the carrier. Claims must be filed within 7 days after the shipment arrives.

Notify Macrolink of any discrepancies between the invoice and received material, or of any damage found during inspection.

### 1.3 INSTALLING THE MACRO-3 INTO THE CPU

The MACRO-3 must be properly configured to match your disk drives prior to operation. The only switch option on the board is for address selection. This switch, at location C18, will be normally set at the factory to X'FB', the standard IDC and MSM controller address. If you wish a different value, use the following chart:

POSITION	OFF VALUE	X'FB'	X'EB'
1	1	OFF	OFF
2	2	OFF	OFF
3	4	ON	ON
4	8	OFF	OFF
5	10	OFF	ON
6	20	OFF	OFF
7	40	OFF	OFF
8	80	OFF	OFF

Make sure that all positions of the test switch, at location J20, are switched off. This switch is only used for special features and must not be left on for normal operation. If you are using a disk that is not supported by the standard P-E IPL, see the section on MACRO-3 OS BOOT LOAD.

## INSTALLATION (Continued)

After the address has been set to the desired value, install the MACRO-3 under a Selector Channel. You must use a 3200 SELCH or B-SELCH. While the MACRO-3 is designed to use the features of the 3200 series, 7/32 and 8/32 processors, 16 bit applications can also be supported with factory assistance. The MACRO-3 may be installed under an I/O Bus Switch. For additional information on the Bus Switch, consult Perkin-Elmer publication 29-356.

### 1.4 RACKO/TACKO JUMPER

You must remove the RACKO/TACKO wire wrap jumper between pins 122-1 and 222-1 at the slot selected for the MACRO-3

### 1.5 7/32 - 8/32 CONFIGURATION

The 7/32 and 8/32 CPU's should be modified to conform to the 3200 series false sync time out of 30 uS. On the 7/32 CPU A board, increase C86 to 2400 pF. The 8/32 IOU board can be modified by increasing the capacitor at D3E, 3-4 from 1000pF to 1400pF. These changes will not affect the operation of the computer, but will allow for the increased processing time of some IDC, MIDC and MACRO-3 commands.

### 1.6 MACRO-3 CONFIGURATION

To allow the maximum flexibility in installing your disk system, we have implemented a "soft" configuration feature. Your system console is used to set-up all the features of the MACRO-3 with our built in boot program.

Turn off the IPL switch on your computer (or LSU switch), and set the toggle switch located in the front left edge of the MACRO-3 to "CNFG" (far right position). Press the INIT switch on the CPU. Your CRT console should have the following message:

```
MACRO-3 CONFIGURATION PROGRAM
MACROLINK, INC.
(C) 1984 ALL RIGHTS RESERVED
```

```
CONTROLLER DEVICE ADDRESS?
```

Type in the MACRO-3 disk controller address selected by switch C18 (FB normally). The console should respond with the following:

DRIVE NO.	0	1	2	3
FORMAT	IDC	IDC	IDC	EIF
NUMBER OF TRACKS/CYL	5	5	5	20
NUMBER OF SECTORS	64	64	64	88
SECTOR PULSE CABLE	A	A	A	A
FILE ADDRESS	FC			
HIGH SPEED PROTOCOL	YES			
BUS SWITCH	NO			
CONTROLLER MODE	IDC			
REPROGRAM COUNT	6			

## INSTALLATION (Continued)

NOTE: ON ANY ENTRY USE  
<CR> TO LEAVE ENTRY AS IS  
<ESC> TO EXIT

DRIVE NO. (0,1,2,3)?

(The variable data may be different in your system)

After the DRIVE NO. prompt, respond with drive address 0,1,2 or 3 and <CR> to change a drive related parameter. Each drive may be configured differently for your application. You must insure that the drive sector count matches the controller configuration. Once you are satisfied the configuration data is correct, press the ESCAPE key.

The program will respond:

SAVE THIS CONFIGURATION (YES/NO/MAYBE)?

YES will save the current configuration and return to the CPU '>>' mode.

NO will return to the CPU '>>' with the old configuration.

MAYBE will restart the configuration program.

The Drive address number must match the address of the disk (usually determined by a plug or DIP switch on the drive). The "B" cable can plug into any connector port on the MACRO-3. After pressing the appropriate number, the menu will display the specific configuration.

Four different disk formats are available (see section FORMAT):

IDC: Intelligent Disk Controller (33 sectors)  
MSM: Mass Storage Module (65 sectors)  
EIF: Extended Intelligent Format (<255 sectors)  
S14: Spectra 14A (33 sectors)

Select the correct FORMAT with 1,2 or 3 letters and <CR>. The number of TRACKS in decimal is next entered. The number of logical SECTORS is also in decimal. This value is fixed by the format, and is normally 64 for IDC and MSM format. Optional higher values require high density drives.

The SECTOR PULSE CABLE is set to A for most standard SMD drives, and B for all drives supplied by P-E. Most new series SMD drives have INDEX/SECTOR pulses on both A and B cables.

The following controller related parameters can be changed by pressing <CR> after the DRIVE NO. prompt:

FILE ADDRESS is the first of four consecutive addresses for the drives. The default value is FC.

ALTERNATE PROTOCOL must be set ON for the 3205, or for Bus Switch operation. The MACRO-3 will automatically select normal protocol unless the SELCH is

## INSTALLATION (Continued)

correctly enabled for Alternate Protocol. Alternate Protocol is only used in systems that have an I/O transfer limitation. No additional performance will be realized by installing Alternate Protocol if you don't need it. High speed drives (1.89 MB/SEC) will generally require Alternate Protocol; however. Consult your SELCH manual for proper setup, and verify that the CPU backplane is wired for Alternate Protocol.

BUS SWITCH selects which interface connector pin the Alternate Protocol status uses. For 3205 operation, select NO. Only select YES if you have a Bus Switch installed between the MACRO-3 and SELCH.

CONTROLLER MODE sets the software mode of the controller. The IDC and MSM controllers have different programming characteristics. Older releases of OS/32 (prior to 6.2) will only work with MSM mode. IDC mode should be selected for current OS/32 applications. Do not confuse CONTROLLER MODE with FORMAT. The MACRO-3 may use any format in any mode of operation. For example, an OS/32 5.2 system should be set to CONTROLLER MODE MSM. Each individual drive can be set for IDC or MSM formats as required.

REPROGRAM COUNT is a running total of the number of times the configuration has been modified. The non-volatile storage device will retain the configuration information indefinitely, and will accommodate at least 10,000 changes (once a day for 30 years).

### 1.7 DRIVE CONFIGURATION

Each SMD disk drive connected to the MACRO-3 must be configured for proper sector counts and drive address.

## INSTALLATION (Continued)

### 1.8 FORMATS

Four disk media formats are available on the MACRO-3. While any combination of formats may be selected on the controller, the formats are not compatible with each other. Additionally, the correct format and diagnostic software must be used.

### 1.9 IDC FORMAT

The Intelligent Disk Controller format is recommended for most new applications. The packs generated correspond to P-E's specification of 33 physical sectors per track, and up to 1024 cylinders. The IDC format offers ECC correction of up to 11 bits. If you are using standard P-E supplied drives, or an OEM version purchased directly from the drive manufacturer, you can use P-E diagnostic and format software, or Macrolink Enhanced IDC software.

### 1.10 EIF FORMAT

The Macrolink Extended Intelligent Format, EIF, has all the features of IDC plus up to 255 sectors per track. Additionally, this format compensates for high transfer rate disk drives, like the Fujitsu Eagle and CDC XMD drive. These drives are not compatible with P-E's IDC, and our Enhanced format and diagnostic software must be used.

### 1.11 MSM FORMAT

The Mass Storage Module format should only be used in applications where existing P-E MSM disk systems are not converted to IDC format. The MSM format lacks the ECC features of IDC, and is generally limited to 80MB and 300MB drive capacities. The standard Perkin-Elmer MSM formatter and diagnostic software are used with this format.

### 1.12 S14 FORMAT

The S14 format may be used to read and write the Spectra Logic Spectra 14 disk format. This format is generally not recommended because it lacks comprehensive diagnostic and format software. The S14 format will not test the header and gap for data reliability. In addition, this format is not compatible with any P-E controller. The MACRO-3 must be in MSM mode to use Spectra 14 compatible diagnostic software.

### 1.13 IPL BOOT LOAD

The MACRO-3 features an onboard bootload program for Initial Program Load (IPL) that is capable of loading an Operating System. The P-E IPL program can be used with standard drives connected to the MACRO-3. For advanced drives, like the Eagle, with different head or sector counts, the MACRO-3 IPL should be used.



## INSTALLATION (Continued)

To enable the IPL, turn ON switch 4 at location 20J. The 'FMT/RUN/CNFG' switch will now act as the enable/disable switch. Switch to 'FMT' to enable the IPL. Switch to 'RUN' to disable the IPL. The ENABLE/DISABLE switch for the P-E loader on the 3200 console, or LSU switch MUST be in the disable position for the MACRO-3 to IPL to work.

### 'FMT/RUN/CNFG' SWITCH

SWITCH 20J-4	FMT	RUN	CNFG
OFF	FORMAT	NORMAL	CONFIGURATION
ON	IPL	NORMAL	CONFIGURATION

To bootload, place the 'FMT/RUN/CNFG' switch in the FMT position, and press the INIT on the CPU. The system console should respond as follows:

CONTROLLER DEVICE ADDRESS? FB

SELCH ADDRESS? FO

DRIVE NO. (0,1,2,3)? 0

VOL = VOL0 FILE = OS123.OS

If the file can't be found, or an error is encountered, the IPL will restart from the beginning.

When in the IPL mode, the format program is also enabled.

### 1.14 Bus Switch Installation

Refer to the installation manual provided with the P-E bus switch for normal installation. Because the Bus Switch reduces the data transfer rate, drives with data rates over 1.2MB/SEC must be formatted with a 2:1 interleave factor (see section 2). Additionally, any drive on the 3205 must be interleaved when used on the Bus Switch.

## CHAPTER 2 MIDC FAST FORMATTER

### 2.1 GENERAL

The Macrolink Intelligent Disk Controller (MIDC) Fast Formatter, P/N 450201, performs pack analysis and header format of the disk pack or data module. Any errors found during the pack analysis phase will cause the corresponding sector to be flagged as defective. A list of all defective sectors is generated when the format process has completed. In addition, defective sector locations may be input directly to flag a specific sector as defective. This program will not function with the Perkin-Elmer IDC. However all P-E IDC tests and format programs will work with the MIDC and MACRO-3. This formatter will produce compatible pack formats that may be exchanged with P-E's IDC.

### 2.2 REQUIREMENTS

The following is a list of the minimum hardware configuration required to run the formatter:

Macrolink MIDC P/N 202700 REV 3.0 or above microcode / OR  
Macrolink MACRO-3 P/N 202900

32 bit CPU model 3200, 7/32 or 8/32

256KB memory

3200 SELCH or B-SELCH

SMD interface disk drive

Console device

List Device (may be console)

### 2.3 LOADING PROCEDURE

The MIDC Fast Format program is supplied in an OS image format. To load this program, mount the tape on a 1600 BPI tape drive and use the standard P-E IPL boot and respond as follows:

```
INPUT DEVICE=<TAPE UNIT>  
FILEMARKS=n
```

Where n (typically 0) equals the filemark value on the label attached to the tape.

After a short delay, the tape will be loaded into the system and started. This tape cannot be loaded using MDL loader or X'50' sequence.

## MIDC FAST FORMATTER (Continued)

The tape is generated with the following programs:

```
FAST FORMAT PROGRAM 450201 (OS IMAGE)
ENHANCED IDC TEST 450202 (OS IMAGE)
IDC TEST 06-267 (OS IMAGE)
IDC FORMAT 06-268 (OS IMAGE)
FAST FORMAT PROGRAM 450201 (OBJECT)
ENHANCED IDC TEST 450202 (OBJECT)
DCB63 (BACKUP FORMAT)
```

The ENHANCED IDC test can be loaded by entering '1' after FILEMARKS. The object format is for use with systems that do not have the standard 3200 series LSU boot loader. The user should copy the program into a suitable format for loading.

### 2.4 OPERATING PROCEDURE

1. Manually set the 'FORMAT' switch, located on the left front of the MIDC or MACRO-3 to the 'ON' position. Place the drive on-line.
2. Enter the correct values for your drive:

OPTION	FUNCTION	DEFAULT
SELCH	Selector Channel Address	X'F0'
DISCON	Disk Controller Address	X'FB'
DRIVE	Drive # 0 to 3	X'FFFF'
PACTYP	ID of Drive type and CE pack	X'CE00'
LOCYL	Low Cylinder Number	X'FFFF'
HICYL	High Cylinder Number	X'FFFF'

3. Type 'RUN' to start program execution.

If you are using a MACRO-3, it must be in IDC mode and set to IDC format for the drive in use. The formatter will display the selected drive number, and sequence through the cylinder numbers for format, write, and read phases.

### 2.5 PROGRAM DESCRIPTION

#### 2.5.1. Test 0

This test performs an initial status check of the SELCH, Disk Controller and File sections of the MIDC/MACRO-3. If the status is correct, a Seek operation is performed to the LOCYL number. The header is written to Head 0, sector 0 of this cylinder along with an improper ECC halfword using the Write Format Command. A normal read data operation is performed and a Data Transfer Error should occur. The PRS is read and should be X'FE'. The final operation is a normal write format with the correct header and ECC character. Test 0 cannot be bypassed, and will terminate formatting if an error should occur.

## MIDC FAST FORMATTER (Continued)

### 2.5.2 Test 1

This portion of the diagnostic program performs the media certification and formatting. The modes are:

- Pack Analysis
- Format
- Pack Data Write
- Pack Data Read
- Report Results

### 2.4.2.1 Pack Analysis

A halfword data pattern is written using the off-line write format command. A single halfword transfer from the SELCH to the disk controller is made. The controller uses this halfword to write a complete track. The contents of the RPS are read when the controller becomes idle, and should be zero. An off-line read is performed FMREAD times (from options), and indexes the offset table. On each pass, the RPS register is tested to ensure a full track has been read without error. When FMREAD has been reached, the data pattern is rotated one bit position, and the process is repeated. When SHIFT has been reached, the defective track table is examined for any entries. If any errors are set, the alternation routines are executed:

A single error will alternate the sector.

Multiple errors will cause the highest sector to be alternated and all other sectors to be flagged defective.

The entire pack is then written with the physical address of each sector. A final read phase reads and verifies no ECC errors, and proper sector address compares.

If any sectors have been flagged defective, a report is generated and sent to the list device.

## MIDC FAST FORMATTER (Continued)

### 2.6 FORMAT TIME

The basic format time of an 80MB drive (CDC RSD type) is 10 minutes. The write/read test adds an additional 3 minutes. The basic format time is increased by adding additional SHIFT and FMREAD options. FMREAD testing insures that all offset values will work on your pack and drive, and that media may be exchanged with other drives. Increasing the SHIFT option will test additional data patterns. With the default value of 2, all bit positions are tested for both 0 and 1.

#### FORMAT TIMES FOR 80MB CDC RSD

FMREAD	SHIFT	TOTAL TIME
1	1	13 MINUTES
1	2	16.5 MINUTES (DEFAULT)
9	1	24 MINUTES
9	8	123 MINUTES

\*These times are for error free packs.

### 2.7 OPTIONAL DRIVES

By selecting PACTYP B, the 5 optional table inputs are selected. Note that these are decimal values. The table has been present for the Amcodyne Arapahoe 7110 drive. Non standard drives may be supported on OS/32 by using the Macrolink DBC63. The standard P-E diagnostic may indicate errors for configurations that are not supported. Use the Macrolink Enhanced IDC test for these drives.

### 2.8 FLAW MAP

When the INFLAW flag is set to 1, the user is prompted at the start of the format to enter the map information that is supplied with most fixed-media drives. This flaw information is usually given as a decimal offset in bytes from the index. Divide this value by 600 to find the approximate physical sector number of the flaw, and enter the integer portion when prompted. If the format should be terminated and restarted, the flaw map information may be reused if desired. The user should note that the disk drive manufactures flaw map is generated using special analog test fixtures and represents the best indication of defective and marginal media. A full format using maximum SHIFT and FMREAD values will probably not find all of the latent flaws. A high speed format, in conjunction with the flaw map will produce the maximum media reliability.

### OPTION TABLE

OPTION	MANDATORY	DEFAULT	DESCRIPTION
TEST	NO	0,1	TEST 0 - BASIC CONTROLLER TEST TEST 1 - PACK FORMAT TEST 2 - WRITE/READ TEST ONLY
DISCON	NO	X'00FB'	DISK CONTROLLER ADDRESS
SELCH	NO	X'00FD'	SELCH ADDRESS
PACTYP	YES	CE	IDENTIFIES PACK TYPE TO BE FORMATTED CE00 - CUSTOMER ENGINEER PACK 0000 - 67MB PACK 0001 - 256MB PACK 0002 - 675MB PACK 0003 - 16MB CMD REMOVABLE 0004 - 16MB CMD FIXED 0005 - 48MB CMD FIXED 0006 - 80MB CMD FIXED 0007 - CAPRICORN 0008 - 19.8MB REMOVABLE LARK 0009 - 19.8MB FIXED LARK 000A - 160MB FIXED (CDC 9715) 000B - OPTION TABLE INPUT
LOCYL	YES	X'FFFF'	STARTING LOW CYLINDER (HEX) FOR START OF FORMAT. MUST BE <= HICYL AND MAXIMUM FOR PACTYP. USUALLY SET TO X'0000'
HICYL	YES	X'FFFF'	ENDING HIGH CYLINDER FOR FORMAT. MUST BE >= LOCYL AND <= MAXIMUM FOR PACTYP. USUALLY SET TO X'0336'
DRIVE	YES	X'FFFF'	SET TO 0,1,2 OR 3 FOR EACH DRIVE ADDRESS.
DATPAT	NO	X'6BD6'	DATA PATTERN USED FOR PACK CERTIFICATION
SHIFT	NO	X'0002'	NUMBER OF TIMES DATA PATTERN IS SHIFTED. MINIMUM OF 1, MAY BE INCREASED TO IMPROVE CHANCE OF FLAGGING ALL DEFECTIVE SECTORS. MAX VALUE OF 8 SUGGESTED.

OPTION TABLE (Continued)

OPTION	MANDATORY	DEFAULT	DESCRIPTION
FMREAD	NO	X'0001'	INCREASING ALLOWS STROBE/OFFSET TESTING 1 - STROBE NORM/OFFSET NORM 2 - STROBE EARLY/OFFSET PLUS 3 - STROBE LATE/OFFSET MINUS 4 - STROBE EARLY/OFFSET MINUS 5 - STROBE NORM/OFFSET MINUS 6 - STROBE LATE/OFFSET PLUS 7 - STROBE NORM/OFFSET PLUS 8 - STROBE LATE/OFFSET NORM 9 - STROBE EARLY/OFFSET NORMAL A - STROBE NORM/OFFSET NORMAL
MAPFAC	NO	0001	MAPPING FACTOR FOR INTERLEAVED FORMAT. NORMALLY 1:1. SET TO 2 FOR DRIVE TRANSFER RATE OVER 1.2 MB/SEC ON 3205, AND BUS SWITCH
.CYL	NO	0644	PACTYP B TABLE INPUT. MAXIMUM CYLINDER NUMBER
.TRK	NO	0002	PACTYP B TABLE INPUT. MAX TRACK (HEAD) NUMBER
.HOFF	NO	0000	PACTYP B TABLE INPUT. HEAD OFFSET FOR FIXED/REMOVABLE PACKS. SET TO 2 FOR LARK REMOVABLE PACK.
.LSEC	NO	0062	PACTYP B TABLE INPUT. LOGICAL SECTOR COUNT. NORMALLY 64, REDUCE TO 32 FOR LARK.
.DDTB1	NO	0019	GAP 1 SIZE ; 0021 FOR EIF APPLICATIONS
.DDTB2	NO	0138	GAP 2 SIZE ; 0139 FOR EIF APPLICATIONS
INFLAW	NO	0001	INPUT FLAW MAP INFORMATION. IF SET TO 1, FLAW LOCATIONS ARE ENTERED AT START OF TEST.
CLYPRT	NO	0001	SETS DISPLAY OF EVERY 'N' LINE OF DIAGNOSTIC RUN MESSAGE.
PANEL	NO	0000	SET TO 1 FOR HEX DISPLAY PANEL OUTPUT
DIAG	NO	0000	SET TO 1 FOR IMMEDIATE ERROR MESSAGE DISPLAY SET TO 8000 FOR EIF FORMAT. MOVES DEFECTIVE SECTOR BIT TO FLAG BYTE IN HEADER FOR ADDITIONAL MAXIMUM SECTORS.
NOMSG	NO	0000	SET TO 1 TO SUPPRESS MESSAGES
CONTIN	NO	0000	SET TO 1 FOR CONTINUOUS TESTING
INTLEV	NO	0000	INTERRUPT LEVEL

OPTION TABLE (Continued)

LOOP	NO	0000	RERUNS TESTS 'N' TIMES
OPTION	MANDATORY	DEFAULT	DESCRIPTION
OPTION			CAUSES OPTION TABLE TO BE PRINTED
RUN			CAUSES DIAGNOSTIC TO BE EXECUTED
CON			CAUSES DEBUG MODE TO BE ENTERED
@<CR>			CAUSES DEBUG MODE TO BE ENTERED

\*  
\* "Y" FIELD ERROR DICTIONARY  
\*  
\* X0X = CHECKING INITIAL STATUS  
\* X1X = SEEK, PRIOR TO COMMAND  
\* X2X = SEEK, AFTER COMMAND  
\* X3X = RESTORE, PRIOR TO COMMAND  
\* X4X = RESTORE, AFTER COMMAND  
\* X5X = OFF-LINE READ FORMAT  
\* X6X = WRITE FORMAT  
\* X7X = READ  
\* X8X = OFF-LINE WRITE FORMAT  
\* X9X = ATTEMPTING TO FLAG DEFECTIVE AFTER NORMAL READ(FINAL FORMAT)  
\* XAX = AFTER SET HEAD COMMAND  
\* XBX = DOING OFFSET (STROBE/TRACK) COMMANDS  
\* XCX = SELCH ERROR  
\* XDX = READ FORMAT  
\* XEX = TEST 0 EXPECTED CRC ERROR NOT RECEIVED  
\* XEX = TEST 1 NORMAL READ AFTER FORMAT PROCESS  
\* XFX = WRITE  
\*  
\*  
\*



OPTION TABLE (Continued)

\* "Z" FIELD ERROR DICTIONARY

\*

* Z =	1	BAD FILE STATUS
*	2	TIME OUT
*	3	DISC CONTROLLER ERROR
*	4	DISC CONTROLLER ERROR - FORCES DEFECTIVE SECTOR
*	5	ERROR ON OFFSET READ
*	6	DISC CONTROLLER ERROR - WRITING BAD CRC
*	7	SOLID READ ERROR
*	8	ILLEGAL SECTOR ADDRESS
*	9	SELCH FINAL ADDRESS WRONG
*	A	FILE STATUS BAD - READ CHECK INIT.
*	B	RPS INCORRECT
*	C	EXPECTING ERROR - NONE RECEIVED
*	D	SELCH ERROR
*	E	DRIVE FAULT
*	F	(NOT USED)

DIAG OPTIONS:

X'8000'	SPECIAL EIF FORMAT
X'100'	HALT AFTER DUMP
X'80'	NO ABORT AFTER TEST 0
X'40'	DUMP AFTER ERROR 5
X'02'	PRINT ERROR 3 ON READ CHECK
X'01'	PRINT ERROR 5

## CHAPTER 3 EXTENDED MIDC DIAGNOSTICS

### 3.1 GENERAL

The Macrolink Extended IDC test, P/N 450202, performs a comprehensive test of all the features of the MIDC AND MACRO-3 emulating disk controllers.

### 3.2 PURPOSE OF THE DIAGNOSTIC

The Extended Intelligent Disk Controller (IDC) Disk Test provides a comprehensive test of all component features of Macrolink MIDC and MACRO-3 disk systems. Format mode testing, seek interrupt queuing from multiple files, and multiple file data transfers can be tested.

#### NOTE

This test program assumes that the disk pack used has been formatted. To format the pack, refer to the IDC Disk Formatter Program Description. The IDC Disk Test can destroy the format of the disk pack used.

Prior to performing this test, the user should be familiar with the contents of the MIDC or MACRO-3 Programming Manual.

### 3.3 MINIMUM HARDWARE REQUIREMENTS

The following is a list of the minimum hardware required to run this test program:

- \* Perkin-Elmer series 3200 processor, 7/32 or 8/32
- \* 256KB minimum of memory
- \* 3200 selector channel (SELCH), B-SELCH
- \* MIDC or MACRO-3, drives, cables and packs
- \* Video Display unit (VDU) as a console input device.
- \* VDU or line printer as a list device.

### 3.4 ADDITIONAL SOFTWARE REQUIREMENTS

The following test programs must be run prior to loading this test:

- \* Series 3200 memory test
- \* Series 3200 processor test
- \* Console device test
- \* SELCH test

## EXTENDED MIDC DIAGNOSTICS (Continued)

### 3.5 LOADING PROCEDURE

The Enhanced IDC Diagnostic program is supplied in an OS image format. To load this program, mount the tape on a 1600 BPI tape drive and use the standard P-E IPL boot and respond as follows:

```
INPUT DEVICE=<TAPE UNIT>  
FILEMARKS=n
```

Where n (typically 1) equals the filemark value on the label attached to the tape.

After a short delay, the tape will be loaded into the system and started. This tape cannot be loaded using MDL loader or X'50' sequence.

The tape is generated with the following programs:

```
FAST FORMAT PROGRAM 450201 (OS IMAGE)  
ENHANCED IDC TEST 450202 (OS IMAGE)  
IDC TEST 06-267 (OS IMAGE)  
IDC FORMAT 06-268 (OS IMAGE)  
FAST FORMAT PROGRAM 450201 (OBJECT)  
ENHANCED IDC TEST 450202 (OBJECT)  
DCB63 (BACKUP FORMAT)
```

The ENHANCED IDC test can be loaded by entering '1' after FILEMARKS. The object format is for use with systems that do not have the standard 3200 series LSU boot loader. The user should copy the program into a suitable format for loading.

## EXTENDED MIDC DIAGNOSTICS (Continued)

### 3.6 DEVICE ADDRESSES

The MIDC / MACRO-3 disk controller should be strapped for device address X'FB'. If the address is different, the DISCON option must be entered.

The drive is assumed to be strapped for device addresses from X'FC'-X'FF' for drives 0-3 respectively. This address is set by the controller and is not specifically entered by any option. To select the desired drive, the DRIVE option must be entered.

The selector channel (SELCH) is assumed to be strapped for device address X'FD'. If the address is different, the SELCH option must be entered.

### 3.7 NORMAL TESTING

After the test program is loaded, the correct values for the TIMVAL, DRIVE, LOCYL, HICYL and PACTYP options must be entered. If the default value for any other option is not the desired value, the correct value must be entered.

When the RUN command is entered, the option table is tested for validity. If an invalid option value is detected (e.g., invalid HICYL option for the type of drive under test), an error advisory is printed.

Example:

```
*RUN
INVALID HICYL OPTION
*
```

The user should see the option table for the valid option entry, correct the error, and again enter the RUN command. If all test option entries are correct, TEST 0 is selected and run. When TEST 0 terminates, all other selected tests are run and control is returned to the command processor.

The default testing sequence included TESTS 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, 15, 18, 19 and 1D.

The tests will print an activity indicator line for all tests using normal mode or format mode reads and writes. This activity indicator will only print to a CRT console device. The line shows an activity count and the current cylinder, head and starting sector of disk transfers.

If the message:

```
SELECT NEW SECTOR OPTION
```

is displayed, reformat the selected sector in LOCYL or use the NOAUTO option. Select and run the indicated test again with a different track number.

## EXTENDED MIDC DIAGNOSTICS (Continued)

### 3.8 ADDITIONAL TESTING

The tests listed in this section do not lend themselves to the default mode of testing, but must be run successfully (where applicable) before testing is complete.

#### Manual Intervention Test (TESTB)

Select TEST B and enter the RUN command. Follow the directions displayed on the console device as testing proceeds. For example, when the message:

TAKE DRIVE OFFLINE

is displayed, depress the START switch on the drive switch panel to turn off the lamp.

#### Multidisk Test (TEST C)

If two or more disk drives of the same type are attached to the controller, select the desired secondary file by entering the XFILE option. To avoid destruction of data on the drive-mounted packs specified by the DRIVE and XFILE options, enter the appropriate LOCYL and SECTOR options; then enter the RUN command. The multidisk test simulates an actual operating environment, testing interrupt sequencing and data transfers. When used in conjunction with the LOOP option, this test provides an extensive multidisk exerciser.

#### Scope Loop Tests

Select and run tests D, E, F, 10, 11, 12, 13, 14, 16, 1A AND 1B for repetitive testing of:

- \* Data transfers in normal and format modes
- \* Sector match and redundancy check logic
- \* Seek/restore logic
- \* Serve offset/data strobe offset logic

See the test program listing for the options applicable to each test.

#### Read-Only Test (TEST 15)

Select and run TEST 15 for a quick check of normal mode disk operation. Each sector between the limits specified by the LOCYL and HICYL options (inclusive) is read with error checking. Data on the disk is not destroyed. When used in conjunction with TEST 4 (Interrupt Seek) and TEST 7 (Interrupt Data Transfer), a brief non-destructive confidence test of the drive is performed.

#### Reformat Test (TEST 17)

Any test writing to the disk in format mode causes an automatic reformat of the track upon completion of the test. In the event that the reformat is aborted, or if it is desired to establish format on a track specified by the LOCYL option, TEST 17 must be run. For example, if the automatic reformat is aborted after running TEST E, the following message appears:

## EXTENDED MIDC DIAGNOSTICS (Continued)

```
*TEST E
*RUN
```

```
TEST OE
ATTEMPTING REFORMAT
ERROR OE5021
REFORMAT ABORTED
END OF TEST
```

```
REFORMAT LOCYL
*
```

The LOCYL track can then be reformatted by the following command sequence:

```
*TEST 17
*RUN
```

### 3.9 OVERNIGHT TESTING

To run the selected tests for an extended period of time, enter RUN and take the console device off-line. Testing continues until the console device is put back on-line, at which time the number of test sequence executions and the number of detected errors are printed:

```
TOTAL  TOTERR
XXXX  YYYY
```

The Manual Intervention Test (TEST B) cannot be run in this mode. Those tests which destroy format may be selected and run in this mode as part of a string, including tests that expect proper format. However, in the event that the automatic reformat is aborted, testing is terminated.

## CHAPTER 4 ERROR PROCEDURES

### 4.1 INTRODUCTION

The following section in this chapter provide methods of recovery for conditions other than machine malfunctions.

### 4.2 RECOVERABLE ERRORS

If a recoverable error is detected, an error message is displayed on the list device.

Example:

```
ALTERNATE CHANNEL BUSY
```

The program then attempts to recover from the error. If the error is not corrected, another error message is displayed. The sequence continues until the error is corrected or until the RETRY count is exhausted. In the latter case, the following message is displayed:

```
SOLID ERROR:  
TEST nn ABORTED
```

where nn is the test number. The next selected test is then executed.

### 4.3 UNRECOVERABLE ERRORS

If a machine malfunction interrupt is taken, the processor is halted. When the RUN (EXECUTE) switch is depressed, the following message is displayed:

```
ERROR TTF3  
PSW PPPPPP LOC LLLLLL
```

Where:

TT is the number of the test in which the error was detected.

F3 is the code for machine malfunction.

PPPPPP is the least significant 24 bits of the program status word (PSW) status when the error was detected.

LLLLLL is the least significant 24 bits of the PSW location counter when the error was detected.

Control is then returned to the command processor, and the program waits for console input.

## ERROR PROCEDURES (Continued)

In the case of unrecoverable errors other than machine malfunction interrupt, the following message is immediately printed, and control is returned to the command processor:

```
ERROR TTFN  
PSW PPSPPP LOC LLLLLL
```

where FN is the code for the unrecoverable error detected, and the other printout is as previously described.



## CHAPTER 5 DIAGNOSTIC OF OPTIONS

### 5.1 INTRODUCTION

The option table provides a means for the user to tailor the test sequence as necessary. The option values can be set in different combinations to test additional functions or to place emphasis on a particular test sequence.

### 5.2 MODIFICATION OF OPTIONS

The following modifications are recommended as part of the test sequence for the MIDC and MACRO-3 disk system.

- \* DRIVE - If more than one drive is attached to the controller, repeat all test sequences for each valid DRIVE option to verify the operation of each drive in the disk system.
- \* LOCYL - This option determines the lower cylinder address limit for most of the test sequences. Those data transfer tests transferring 64 logical sectors of data or less use the cylinder specified by the LOCYL option. Since the recording density compensation varies as the cylinder address increases, the LOCYL option should be varied through several steps from zero through maximum, and the tests should be repeated for each LOCYL option entered.
- \* HICYL - This option determines the upper cylinder address limit for most of the test sequences. Modify this option in conjunction with the LOCYL option to further test the data transfer option and seek logic sequencing.
- \* RETRY - This option determines the maximum number of errors allowed before the current test is aborted. Increase this value to prevent aborting the test.
- \* SECNUM - This option specifies how many logical sectors are transferred at a time in the data tests. Modify this option to isolate a fault in multisector data transfers.
- \* XFILE - This option specifies the secondary file used in this multidisk test. Vary this option in conjunction with the DRIVE option to test all combinations of primary and secondary files.
- \* DATA - This option specifies the worst case data halfword used for data transfers. Modify this option if a data recovery or bus problem is suspected.
- \* INBUF, OUTBUF - These options determine whether the program default buffers or the user-specified buffers are used for data transfers. The option should be modified to test extended memory data transfers. Often, faults may be isolated with the buffers located at 16kb or 64kb boundaries.

## DIAGNOSTIC OF OPTIONS (Continued)

- \* HEADS - This option allows the user to delete undesired heads from the testing cycle. A HEADS 0 option must be input whenever a value change is made in the testing cycle.
- \* SECTOR - This option, in conjunction with the LOCYL option, determines where single sector data transfers will be made on the disk. Because the data transfer timing is different for each sector in any given track, the SECTOR option should be varied in conjunction with the LOCYL and DATA options to verify proper operation over the valid range.
- \* OTHER OPTIONS - The LOOP, CONTIN, SCOPE, OFFSET, BUFSIZ and SEEK options allow the user to run the selected test a specified number of times or continuously and to tailor the scope loop tests as needed. For a description of option usage in the scope loop tests, see the program listing.

### EXAMINE Command

The EXAMINE command displays the halfword contents of memory. The EXAMINE command is in the following format:

```
EXA yyyyyy,zzzz(CR)
```

Where:

yyyyyy is the address to start the display.  
zzzz is the hexadecimal number of half words to display.

The MODIFY command changes the contents of memory. The MODIFY command is in the following format:

```
MOD yyyyyy,zzzz,zzzz,zzzz,.....(CR)
```

Where:

yyyyyy is the address to modify  
zzzz is the new data.

Sequential halfword locations are modified if multiple new data values follow the starting address. If nonexistent memory is referenced, the following message is output:

```
"REQUESTED MEMORY NONEXISTENT"
```

## OPTIONS TABLE

Examine each option in the following table and read each description. If a default value is specified and it is the desired value, no action is necessary. If a default value is not specified or is not the desired value, then the option must be entered. See Appendix B for command input structure.

### NOTE

TEST 0 is run prior to any test sequence and only the random access memory (RAM) transfer portion of the test will loop according to the LOOP option. If CONTIN 1 is specified, however, TEST 0 is run once each time the selected string of tests is executed.

## OPTIONS TABLE

OPTION	MANDATORY (X)	DEFAULT VALUE	DESCRIPTION
a		N/A	RETURNS CONTROL TO THE SYSTEM CONSOLE BY EXECUTING A BREAK-POINT INSTRUCTION.
BUFSIZ		0	SELECTS THE NUMBER OF SECTORS TRANSFERRED AT ONE TIME IN TESTS D AND E.  0 = 1 SECTOR TRANSFER SIZE 1 = 2 SECTOR TRANSFER SIZE
BYCKAD		0	DETERMINES WHETHER AN ADDRESS CHECK (READ CHECK) IS TO BE PERFORMED FOLLOWING A SEEK OR RESTORE OPERATION.  0 = BYPASS ADDRESS CHECK 1 = PERFORM ADDRESS CHECK
CON		N/A	RETURNS CONTROL TO THE SYSTEM CONSOLE BY EXECUTING A BREAK-POINT INSTRUCTION.
CONTIN		0	ENABLES THE USER TO RUN ALL SELECTED TESTS CONTINUOUSLY UNTIL THE BREAK KEY RETURNS THE PROGRAM TO THE COMMAND MODE.  0 = NORMAL EXECUTION 1 = CONTINUOUS EXECUTION

OPTION TABLE (Continued)

OPTION	MANDATORY (X)	DEFAULT VALUE	DESCRIPTION
DATA		X'B8B8'	DEFINES THE WORST CASE DATA PATTERN READ AND WRITTEN.
		X'0000'	DEFINES THE BYTE USED IN:  TEST D (COUNT ALLOWED 3-FF) TEST 1E (COUNT ALLOWED 2-FF)
DISCON		X'00FB'	DEFINES DISK CONTROLLER ADDRESS.
DRIVE	X	X'FFFF'	DEFINES WHICH DRIVE ATTACHED TO THE CONTROLLER SHOULD BE USED FOR TESTING. SET EQUAL TO 0, 1, 2 OR 3. SEE XFILE.
EXA			USED TO EXAMINE MEMORY
HEADS		NONE	<p>DETERMINES WHICH HEADS SHOULD NOT BE USED DURING EXECUTION OF THE TESTS. WHEN HEADS 1 IS ENTERED, THE FOLLOWING MESSAGE IS PRINTED:</p> <p style="padding-left: 40px;">ENTER DELETED HEADS &gt;</p> <p>ENTER THE ADDRESS(ES) OF THE DESIRED HEADS, FOLLOWED BY A CR.</p> <p>EXAMPLE:</p> <p>TO DELETE HEAD ADDRESSES 10, 11 AND 14:</p> <p style="padding-left: 40px;">*HEADS 1 CR ENTER DELETED HEADS &gt; 10, 11, 14, CR</p> <p>NO HEAD ADDRESS CAN BE GREATER THAN THE MAXIMUM ADDRESS IMPLIED BY THE PACTYP OPTION.</p> <p>IF HEADS 0 IS ENTERED, NO HEADS ARE DELETED. SEE SECTOR.</p>
HICYL	X	X'0336'	ESTABLISHES THE HICYL ADDRESS DURING THE TEST PROCEDURE. HICYL MUST NOT BE LESS THAN THE LOCYL OPTION AND MUST NOT BE GREATER THAN THE NUMBER OF CYLINDERS IMPLIED BY THE PACTYP OPTION.

OPTION TABLE (Continued)

OPTION	MANDATORY (X)	DEFAULT VALUE	DESCRIPTION
INBUF		SEE LISTING	SPECIFIES THE READ BUFFER START LOCATION IN MEMORY. THE OPTION VALUE IS INTERPRETED AS FOLLOWS:  X'KKKKKK' = 24-BIT ABSOLUTE STARTING ADDRESS  IF THE DEFAULT VALUE IS NOT USED, THE BUFFER ADDRESS MUST NOT LIE WITHIN THE TEST PROGRAM. SEE OUTBUF.
INTLEV		0	DEFINES THE INTERRUPT LEVEL OF THE SELCH, CONTROLLER AND DISK DRIVE.  N = 0 TO 3
INTERAT		X'05DC'	ITERATION COUNT USED IN SCOPE LOOP TESTS. A DEFAULT VALUE OF DECIMAL 1500 PASSES.
LOCYL	X	X'0000'	ESTABLISHES THE LOCYL ADDRESS DURING THE TEST PROCEDURE. LOCYL MUST BE LESS THAN OR EQUAL TO THE HICYL OPTION AND NOT GREATER THAN THE NUMBER OF CYLINDERS IMPLIED BY THE PACTYP OPTION.
LOOP		0	DETERMINES THE NUMBER OF TIMES A TEST IS EXECUTED BEFORE ADVANCING TO THE NEXT SELECTED TEST.  N = < '7FFF'
MODIFY			USED TO MODIFY MEMORY
NOAUTO		0	INHIBITS TRACK EVALUATION BEFORE EXECUTION OF FORMAT MODE TESTS AND INHIBITS AUTOMATIC REFORMATTING OF THE TRACK FOLLOWING EXECUTION OF SUCH TESTS. THIS OPTION MUST BE CHANGED ONLY BY THE CUSTOMER ENGINEER; PACK CERTIFICATION CAN BE DESTROYED IF USED INCORRECTLY.  0 = NORMAL OPERATION 1 = INHIBIT AUTOMATIC FUNCTIONS (ALLOWS CHANGING OF LOCYL AND SECTOR OPTION).

THE MESSAGE:

PROCEED WITH CAUTION

OPTION TABLE (Continued)

OPTION	MANDATORY (X)	DEFAULT VALUE	DESCRIPTION						
			IS PRINTED EACH TIME THIS OPTION VALUE IS CHANGED.						
NOMSG		0	<p>DETERMINES WHETHER COMMENTARY MESSAGES ARE TO BE PRINTED.</p> <p>0 = ALL MESSAGES            1 = ERROR MESSAGES ONLY            2 = SUPPRESS LEVEL 1 SUPPLEMENTARY INFORMATION            3 = SUPPRESS LEVELS 1 AND 2 SUPPLEMENTARY INFORMATION</p>						
OFFSET		0034	<p>CONTROLS SERVO/DATA STROBE OFFSET IN TEST 16.</p> <p>OFFSET = XXYY</p> <p>WHERE:</p> <p>IF XX = 1, NOMINAL OFFSET IS RESTORED AFTER EACH SEQUENCE AND FAULT IS CLEARED.            IF XX = 0, NOMINAL OFFSET IS RESTORED AND FAULT IS CLEARED ONLY WHEN TEST 16 TERMINATES.            YY = THE OFFSET COMMAND IS TO BE USED.</p> <p>(X'30', X'31', X'32', X'34', X'35', X'36', X'38', X'39' AND X'3A' ARE VALID).</p>						
OPTION		N/A	CAUSES ALL OPTIONS, WITH THEIR CURRENT VALUES, TO BE DISPLAYED ON THE CONSOLE DEVICE.						
OUTBUF		SEE LISTING	SPECIFIES THE WRITE BUFFER STARTING LOCATION IN MEMORY. THE WRITE BUFFER MUST NOT OVERLAY THE READ BUFFER. SEE INBUF.						
FACTYP		X'CE00'	<p>IDENTIFIES THE TYPE OF PACK AND DRIVE. TYPE CE00 DESIGNATES A CUSTOMER ENGINEER PACK.</p> <table border="1"> <thead> <tr> <th>VALUE</th> <th>MEANING</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>67.5MB MSM VOLUME OR 67.5MB MMD VOLUME WITHOUT FIXED HEAD PER TRACK. MAXIMUM HEAD ADDRESS = X'04' MAXIMUM SECTOR ADDRESS = X'3F' MAXIMUM CYLINDER ADDRESS = X'336'</td> </tr> <tr> <td>01</td> <td>256MB MSM VOLUME. MAXIMUM HEAD ADDRESS = X'12' MAXIMUM SECTOR ADDRESS = X'3F' MAXIMUM CYLINDER ADDRESS = X'336'</td> </tr> </tbody> </table>	VALUE	MEANING	00	67.5MB MSM VOLUME OR 67.5MB MMD VOLUME WITHOUT FIXED HEAD PER TRACK. MAXIMUM HEAD ADDRESS = X'04' MAXIMUM SECTOR ADDRESS = X'3F' MAXIMUM CYLINDER ADDRESS = X'336'	01	256MB MSM VOLUME. MAXIMUM HEAD ADDRESS = X'12' MAXIMUM SECTOR ADDRESS = X'3F' MAXIMUM CYLINDER ADDRESS = X'336'
VALUE	MEANING								
00	67.5MB MSM VOLUME OR 67.5MB MMD VOLUME WITHOUT FIXED HEAD PER TRACK. MAXIMUM HEAD ADDRESS = X'04' MAXIMUM SECTOR ADDRESS = X'3F' MAXIMUM CYLINDER ADDRESS = X'336'								
01	256MB MSM VOLUME. MAXIMUM HEAD ADDRESS = X'12' MAXIMUM SECTOR ADDRESS = X'3F' MAXIMUM CYLINDER ADDRESS = X'336'								

OPTION TABLE (Continued)

OPTION	MANDATORY (X)	DEFAULT VALUE	DESCRIPTION
02			67.5MB WINCHESTER VOLUME WITH FIXED HEAD PER TRACK OPTION. MAXIMUM HEAD ADDRESS = X'04' MAXIMUM SECTOR ADDRESS = X'04' MAXIMUM PACK CYLINDER ADDRESS = X'393' FIXED HEAD PER START ADDRESS = X'380' MAXIMUM CYLINDER ADDRESS WITH FIXED HEAD PER TRACK = X'393'  HEAD X'0' ONLY FOR FIXED HEAD PER TRACK SECTION.
03			13.5MB REMOVABLE DISK VOLUME ONLY HEAD ADDRESS = X'00' MAXIMUM SECTOR ADDRESS = X'3F' MAXIMUM CYLINDER ADDRESS = X'336'
04			13.5MB FIXED DISK VOLUME ONLY HEAD ADDRESS = X'10' MAXIMUM SECTOR ADDRESS = X'3F' MAXIMUM CYLINDER ADDRESS = X'336'
05			40.5MB FIXED DISK VOLUME MINIMUM HEAD ADDRESS = X'10' MAXIMUM HEAD ADDRESS = X'12' MAXIMUM SECTOR ADDRESS = X'3F' MAXIMUM CYLINDER ADDRESS = X'336'
06			67.5MB FIXED DISK VOLUME MINIMUM HEAD ADDRESS = X'10' MAXIMUM HEAD ADDRESS = X'14' MAXIMUM SECTOR ADDRESS = X'3F' MAXIMUM CYLINDER ADDRESS = X'3FF'
07			268MB FIXED DISK VOLUME MINIMUM HEAD ADDRESS = X'0' MAXIMUM HEAD ADDRESS = X'F' MAXIMUM SECTOR ADDRESS = X'3F' MAXIMUM CYLINDER ADDRESS = X'3FF'
0A			379MB FUJITSU EAGLE MINIMUM HEAD ADDRESS = X'0' MAXIMUM HEAD ADDRESS = X'13' MAXIMUM SECTOR ADDRESS = X'57' MAXIMUM CYLINDER ADDRESS = X'342'
0B			USER SELECTABLE OPTION TABLE USES .CYL, .TK, .HOFF, .LSEC, .DDTB1, .DDTB2 ENTRY

OPTION TABLE (Continued)

OPTION	MANDATORY (X)	DEFAULT VALUE	DESCRIPTION
			TYPE 00XX DESIGNATES A USER PACK WHERE XX = 00 TO 06.
.CYL		034A	NUMBER OF CYLINDERS STARTING WITH 0
.DDTB1		0019	EIF FORMAT = 0021
.DDTB2		0133	EIF FORMAT = 013F
.HOFF		0000	HEAD OFFSET. SET TO 0 OR 2 FOR LARK TYPE DRIVES
.LSEC		0040	LOGICAL NUMBER OF SECTORS. SEE DRIVE SETUP APPENDIX
RETRY		1	SPECIFIES THE NUMBER OF RETRIES ALLOWED FOLLOWING AN ERROR BEFORE THE TEST IS ABORTED.  N = 0 TO X'7FFF'



OPTION TABLE (Continued)

OPTION	MANDATORY (X)	DEFAULT VALUE	DESCRIPTION
RUN	3	N/A	CAUSES THE SELECTED TESTS TO BE RUN ACCORDING TO THE OPTIONS SPECIFIED.
SCOPE		0	<p>USED IN SCOPE LOOP TESTS D, E, 16 AND 1E</p> <p>0 = WRITE-READ            1 = READ ONLY            2 = WRITE ONLY            3 = WRITE-READ-CHECK DATA</p> <p>ONLY SCOPES 0 AND 2 ARE USABLE IN TESTS F, 10, 11 12 AND 1B.</p>
SECNUM		X'3F'	<p>SPECIFIES THE NUMBER OF SECTORS MINUS 1 PER TRANSFER IN TESTS 8, 9, A, C, 15 AND 16.</p> <p>N = 0, 1, 3, 7, X'F' OR X'3F'</p> <p>MEMORY REQUIRED FOR EACH I/O BUFFER IS (SECNUM + 1) TIMES X'100'. FOR TEST 15, N = X'7F', X'FF', X'1FF' AND X'3FF' ARE ALSO VALID. IN THIS CASE, OUTBUF MAY BE NON-EXISTENT MEMORY. SEE INBUF, OUTBUF.</p>
SECTOR		0	<p>SELECTS THE HEAD AND SECTOR ADDRESSES USED IN TESTS TRANSFERRING NO MORE THAN ONE TRACK OF DATA.</p> <p>SECTOR = HHKK</p> <p>WHERE:</p> <p>HH = THE HEAD ADDRESS            KK = THE ADDRESS OF THE FIRST SECTOR</p> <p>THE ADDRESSES USED MUST NOT BE GREATER THAN THE MAXIMUM ADDRESS IMPLIED BY THE PACTYP OPTION. THE HEAD ADDRESS MUST NOT BE THE SAME AS A HEAD DELETED BY THE HEADS OPTION.</p>
SEEK		0	<p>USED IN SEEK SCOPE LOOP TEST (TEST 14).</p> <p>0 = SEEK LOCYL, RESTORE            1 = SEEK LOCYL, SEEK HICYL</p>
SELCH		X'00F0'	DEFINES SELCH ADDRESS

OPTION TABLE (Continued)

OPTION	MANDATORY (X)	DEFAULT VALUE	DESCRIPTION										
TEST			0,1,2,3, SELECTS THE TEST(S) TO BE EXECUTED WHEN THE 8,9,A,15, RUN 4,5,6,7, COMMAND IS ENTERED. TEST 0 IS 18,19,1D ALWAYS SELECTED.										
TIMVAL	X	X'400'	ESTABLISHES A COUNT VALUE FOR 1-MILLISECOND SOFTWARE TIMEOUT.										
			<table border="1"> <thead> <tr> <th>PROCESSOR</th> <th>VALUE</th> </tr> </thead> <tbody> <tr> <td>3220</td> <td>29A</td> </tr> <tr> <td>3230</td> <td>2A3</td> </tr> <tr> <td>3240, 3250</td> <td>301</td> </tr> <tr> <td>3210, 3210A</td> <td>201</td> </tr> </tbody> </table>	PROCESSOR	VALUE	3220	29A	3230	2A3	3240, 3250	301	3210, 3210A	201
PROCESSOR	VALUE												
3220	29A												
3230	2A3												
3240, 3250	301												
3210, 3210A	201												
XFILE	X	X'FFFF'	DEFINES WHICH DRIVE ATTACHED TO THE CONTROLLER IS TO BE USED AS THE SECONDARY FILE, FOR DISK-TO-DISK DATA TRANSFERS IN TEST 0C. XFILE MUST NOT REFERENCE THE SAME DRIVE AS THE DRIVE OPTION.										
MESSAGE		0	<p>0 = RESET OPTION</p> <p>1 = THE ACTIVITY LINE IS PRINTED TO THE LIST DEVICE. IF THE LIST DEVICE IS THE LINE PRINTER, IT PRINTS BACK TO THE CONSOLE. IF THE LIST DEVICE IS THE CONSOLE, IT WILL CAUSE THE ACTIVITY LINE TO SCROLL.</p> <p>2 = DISPLAY THE OPERATION AND COMMAND CODES ONTO THE ACTIVITY LINE.</p> <p>3 = SELECT OPTIONS 1 AND 2 TOGETHER.</p>										
HELP			TYPING HELP* WILL DISPLAY ALL AVAILABLE HELP MESSAGES. THEN TYPE HELPPXX FOR A CERTAIN OPTION, WHERE XXXX = NAME OF OPTION.										
PAGE			XXX = MICROCODE OCTAL VALUE CR = DISPLAY ALL LOCATIONS (0-377).										

## TEST SUMMARY

### TEST 00 - Basic Status Test

Check the status of the selector channel (SELCH), intelligent disk controller (IDC) and disk drive. The Controller Self Test is invoked and checked for completion. The IDC diagnostic commands are used to test the random access memory (RAM) on the controller by transferring, via the SELCH, data to and from the RAM. An unrecoverable error causes an error message to be printed, and the test is aborted. TEST 00 is executed whenever the run command is entered and cannot be bypassed.

### NOTE

The above does not apply when TEST 1E is running.

### TEST 01 - Servo Offset Test

Performs a simple test of the seek and restore operations. A seek is made to the maximum valid cylinder address, followed by a restore to Cylinder 0. The sequence is repeated for each valid cylinder address bit. The seek incomplete status bit and servo/strobe offsets are then tested.

### TEST 02 - Oscillating Seek Test

Performs an exhaustive check of the head positioning servo.

### TEST 03 - Random Seek Test

Is designed to detect problems not found by the preceding tests.

### TEST 04 - Interrupt Seek Test

Performs a simple check of seek interrupt logic by seeking to a distant cylinder, the current cylinder and an invalid cylinder. Also tests the restore interrupt and servo offset interrupts.

### TEST 05 - Format Mode Read/Write Test

Synthesizes and tests the following errors:

- \*Header comparison failure
- \*Defective sector status
- \*Left and right sector ID checksum error

### TEST 06 - Multisector Transfer Test

Check multisector data transfer, head switching, cylinder overflow logic and head select error.

### TEST 07 - Interrupt Data Transfer Test

Checks data transfer interrupt logic and SELCH/disk controller interrupt sequencing.

## TEST SUMMARY (Continued)

### TEST 08 - Spiral Data Test

Checks read and write logic with all possible data patterns. The number of consecutive sectors in each transfer is variable from one to a full track.

### TEST 09 - Worst Case Data Test

Checks read and write logic with a selectable worst case data pattern. The number of consecutive sectors in each transfer is variable from one to a full track.

### TEST 0A - Random Data Test

Checks read and write logic with a random data pattern. The number of consecutive sectors in each transfer is variable from one to a full track.

### TEST 0B - Manual Intervention Test (requires operator response)

Performs testing that requires manual intervention on the following:

- \*Drive off-line status
- \*Drive write protect status

### TEST 0C - Multidisk Test

Requires two drives of the same type on the same controller. Perform the following checks:

- \*Overlapping seek operations
- \*Seek interrupting queuing
- \*Multiple sector data transfer between drives

### TEST 0D - Normal Read/Write Scope Loop Test

Reads and writes a selectable data pattern in normal mode. The number of consecutive sectors transferred is variable from one to two.

### TEST 0E - Format Read/Write Scope Test

Reads and writes a selectable data pattern in format mode. The number of consecutive sectors transferred is variable from one to two.

### TEST 0F - Defective Sector Scope Loop Test

Reads and writes a selectable sector with an incorrect normal mode ECC checkword.

### TEST 11 - Defective Cylinder Address Scope Loop Test

Reads and writes a selectable sector with an incorrect cylinder address in the sector header.

### TEST 12 - Defective Head Address Scope Loop Test

## TEST SUMMARY (Continued)

Reads and writes a selectable sector with an incorrect head address in the sector header.

### TEST 13 - Read Check Scope Loop Test

Performs a read check operation on a selectable sector.

### TEST 14 - Seek/Restore Scope Loop Test

Seeks to a selectable cylinder or between selectable cylinders.

### TEST 15 - Read-Only Test

Reads a selectable area of the disk and performs error checking in normal mode.

### TEST 16 - Read/Write Offset Scope Loop Test

Tests head offset and data strobe offset read operations in normal mode.

### TEST 17 - Tracks Reformat Test

Restores proper format on a selectable track. Sectors with errors are flagged as defective; the flag is tested.

### TEST 18 - Rotational Position Sense (RPS) Test

Tests the normal mode rotational mode position sense value of X'FE' when read from the drive.

### TEST 19 - Off-line Format Test

Verifies proper operation of the controller read format off-line and write off-line features and sector alternation.

### TEST 1A - Defective Sector Alternation Test

Tests defect-free and defective-flagged alternated sectors on a selectable track.

### TEST 1B - Defective Sector Alternation Loop Test

Alternated a selectable sector; then attempts to read the sector.

### TEST 1C - Off-line Read/Write Format Scope Loop Test

Reads and writes a selectable track in the format off-line mode.

### TEST 1D - ECC Correction Algorithm Test

Various correctable data errors are produced via the write format operation. Data errors are detected when read back uncorrected. Data is then read back in normal mode and the data is expected to be corrected.

## TEST SUMMARY (Continued)

### TEST 1E - Random Access Memory (RAM) Data Scope Loop Test

Writes and reads a selectable data pattern to the board RAM. The number of transferable bytes is variable from 3 to 2FF.

## CHAPTER 6 CUSTOM DRIVE INSTALLATION

The custom Macrolink DCB63 allows installation of any size disk with the use of a single device code number. The DCB module is supplied in backup format on the software distribution tape included with the MACRO-3 disk controller.

The file containing DCB63 may be loaded onto your system disk by positioning the tape forward the number of filemarks indicated on it's label, and running BACKUP with the 'no-rewind' option. Once the file has been loaded onto your disk, it may be displayed by the command D F,DCB63-.-. Examination of the name(s) will reveal the format of DCB63Rn.xx. The 'n' reflects the revision of the module and the 'xx' reflects applicable revision of the OS. These DCB modules are to be used with SYSGEN32 for OS/32 R06.02 and above. Contact Macrolink for future OS/32 revisions compatibility.

The custom DCB files must be included into the file USERDLIB.MLB that is used during SYSGEN. Using MTM this may be done with the following procedure:

```
*LOAD MLU32
*START
MLU >GET USERDLIB.MLB (If you receive a DOES NOT EXIST message
                       use ES USERDLIB.MLB to create a new file)
MLU >INC DCB63R0.62 (extension and revision as needed)
MLU >SAVE *
MLU >END
```

You are now ready to use the DCB by doing a normal sysgen. If your system was previously using disks with a device code of 63, the new DCB will generate the correct structures, as before, without modification to your SYSGEN statements. The device code 63 will also allow you to specify disks with a different number of tracks, cylinders or sectors than P-E supports with standard device codes. The DCB63 can also be used for standard disk drives simply by specifying the specific hardware attributes of the drive.

These parameters may be entered by including new user supplied values on the disk specification line of your SYSGEN32 file. A typical definition might read as follows (for Fujitsu Eagle):

```
DSK1:FC,63,SELCH=FO,CONTR=FB,USER=(TRKS=20),USER=(SEC=88),
      USER=(CYL=842)
```

## CUSTOM DRIVE INSTALLATION (Continued)

TRKS is the logical number of tracks. SEC is the logical number of sectors. CYL is the physical number of cylinders. These values are supplied in decimal. For values that are too long to fit on one line, simply terminate the line with a comma, and continue the definition on the next line. Refer to the supplied table for definitions, or the specifications supplied with the disk drive. If you use a non-standard configuration, the drive must be correctly formatted with the MACRO-3 formatter prior to FASTCHEK initialization.



## APPENDIX A

The following data are examples of drive configuration information, and are not to be construed as the only drives that are available to run on the MACRO-3 disk controller; they are to be used as examples only.

### DRIVE CONFIGURATION DATA

MAKER	MODEL	CYL	HD	SEC	ROTATE SPEED	XFER RATE	LNFMT BYTES/ TRACK	FORMATTED MBYTES/ DRIVE	
-----	-----	---	---	---	-----	-----	-----	-----	
CDC	9762	823	5	64	3600	1.2M	20160	67.4	
CDC	9766	823	19	64	3600	1.2M	20160	256.1	
CDC	9710	823	5	64	3600	1.2M	20160	67.4	
CDC	9715-160	823	10	64	3600	1.2M	20160	134.8	
CDC	9715-340	712	24	64	3600	1.2M	20160	280.0	* *
CDC	9715-500	712	24	96	3600	1.8M	30240	420.0	***
CDC	9771	1024	16	158	2160	1.8M	50400	662.7	***
CDS	AMS-315	845	19	64	3600	1.2M	20160	263.0	
CDS	AMS-513	845	19	102	2400	1.3M	32000	419.2	*
CDS	AMS-571	941	19	104	3600	2.0M	33012	476.0	*
FUJITSU	M2351A	842	20	88	3961	1.9M	28160	379.4	*
MGA	M2860-3	621	7	64	3600	1.2M	20160	71.2	
MGA	M4870	1024	12	64	3544	1.2M	20480	201.3	
NEC	D2351	760	19	114	3070	1.9M	36288	421.4	

APPENDIX A

DRIVE TYPE : CONTROL DATA 9762                      80MB (67MB) removable

SWITCH SETTINGS :

SECTOR SWITCHES : 1,2,4,7,8 on for IDC mode  
                  0,2,3,6,7 on for MSM mode

CONFIGURATION :

NUMBER OF TRACKS/CYL        5  
NUMBER OF SECTORS            64

MACROLINK            FORMATTER /        TEST :

LOCYL	0	0
HICYL	336	336
PACTYP	0	0

SYSGEN STATEMENT MATRIX :

XXXX: ,53,XX,SELCH=XX,CONTR=XX

## APPENDIX A

DRIVE TYPE : CONTROL DATA 9766

300MB removeable

SWITCH SETTINGS :

SECTOR SWITCHES : 1,2,4,7,8 on for IDC mode

CONFIGURATION :

NUMBER OF TRACKS/CYL	19
NUMBER OF SECTORS	64

MACROLINK            FORMATTER /    TEST :

LOCYL	0	0
HICYL	336	336
PACTYP	1	1
.CYL		
.TRK		
.LSEC		

SYSGEN STATEMENT MATRIX :

XXXX: ,54,XX,SELCH=XX,CONTR=XX

APPENDIX A

DRIVE TYPE : CONTROL DATA 9710                      80MB (67MB) removable

SWITCH SETTINGS :

SECTOR SWITCHES : 1,2,4,7,8 on for IDC mode  
                            0,2,3,6,7 on for MSM mode

CONFIGURATION :

NUMBER OF TRACKS/CYL	5
NUMBER OF SECTORS	64

MACROLINK              FORMATTER /      TEST :

LOCYL	0	0
HICYL	336	336
PACTYP	0	0

SYSGEN STATEMENT MATRIX :

XXXX: ,53,XX,SELCH=XX,CONTR=XX

APPENDIX A

DRIVE TYPE : CONTROL DATA 9715-160 160MB fixed

SWITCH SETTINGS :

SECTOR SWITCHES : 1,2,4,7,8 on for IDC mode

CONFIGURATION :

NUMBER OF TRACKS/CYL	10
NUMBER OF SECTORS	64

MACROLINK FORMATTER / TEST :

LOCYL	0	0
HICYL	336	336
PACTYP	A	B
.CYL		337
.TRK		A
.LSEC		40

SYSGEN STATEMENT MATRIX :

XXXX: ,46,XX,SELCH=XX,CONTR=XX

APPENDIX A

DRIVE TYPE : CONTROL DATA 9715-340 340MB fixed

SWITCH SETTINGS :

CONFIGURATION :

NUMBER OF TRACKS/CYL	24
NUMBER OF SECTORS	64

MACROLINK FORMATTER / TEST :

LOCYL	0	0*
HICYL	2C7	2C7
PACTYP	B	B
.CYL	2C8	2C8
.TRK	18	18
.LSEC	40	40

SYSGEN STATEMENT MATRIX :

XXXX: ,63,XX,SELCH=XX,CONTR=XX,  
USER=(CYL=712),USER=(TRKS=24),USER=(SEC=64)

APPENDIX A

DRIVE TYPE : CONTROL DATA 9715-500 515MB fixed

SWITCH SETTINGS :

CONFIGURATION :

NUMBER OF TRACKS/CYL	24
NUMBER OF SECTORS	96

MACROLINK FORMATTER / TEST :

LOCYL	0	0
HICYL	2C7	2C7
FACTYP	B	B
.CYL	2C8	2C8
.TRK	18	18
.LSEC	60	60

SYSGEN STATEMENT MATRIX :

XXXX: ,63,XX,SELCH=XX,CONTR=XX,  
USER=(CYL=712),USER=(TRKS=24),USER=(SEC=96)

APPENDIX A

DRIVE TYPE : CONTROL DATA 9771 XMD 825MB fixed

SWITCH SETTINGS :

SECTOR SWITCHES : 123456 123456  
COCOCO 00C000

CONFIGURATION :

NUMBER OF TRACKS/CYL 16  
NUMBER OF SECTORS 158

MACROLINK FORMATTER / TEST :

LOCYL	0	0
HICYL	3FF	3FF
PACTYP	B	B
.CYL	400	400
.TRK	10	10
.LSEC	9E	9E
DIAG	8000	8000

SYSGEN STATEMENT MATRIX :

XXXX: ,63,XX,SELCH=XX,CONTR=XX,  
USER=(CYL=1024),USER=(TRKS=16),USER=(SEC=158)



APPENDIX A

DRIVE TYPE : CENTURY DATA AMS-315                      300MB fixed

SWITCH SETTINGS :

S1= 0000000C      S2= CC0CC00C      S3= CC0C00CC

CONFIGURATION :

NUMBER OF TRACKS/CYL	19
NUMBER OF SECTORS	64

MACROLINK              FORMATTER /      TEST :

LOCYL	0	0
HICYL	336	336
PACTYP	1	1

SYSGEN STATEMENT MATRIX :

XXXX: ,54,XX,SELCH=XX,CONTR=XX

APPENDIX A

DRIVE TYPE : CENTURY DATA AMS-513                    513MB fixed

SWITCH SETTINGS :

SQL ACCESS : S1(1:4)= CCOC    S2= CC0CC00C    S3= CCOC

DUAL ACCESS : S1(1:8)= 0000000C    S2= CC0CC00C    S3= CC0C00CC

CONFIGURATION :

NUMBER OF TRACKS/CYL        19  
NUMBER OF SECTORS            102

MACROLINK            FORMATTER /    TEST :

LOCYL	0	0
HICYL	34C	34C
FACTYP	B	B
.CYL	34D	34D
.TRK	13	13
.LSEC	66	66

SYSGEN STATEMENT MATRIX :

XXXX: ,63,XX,SELCH=XX,CONTR=XX,  
USER=(CYL=845),USER=(TRKS=19),USER=(SEC=102)

APPENDIX A

DRIVE TYPE : CENTURY DATA AMS-571                    571MB fixed

SWITCH SETTINGS :

CONFIGURATION :

NUMBER OF TRACKS/CYL	19
NUMBER OF SECTORS	104

MACROLINK            FORMATTER /    TEST :

LOCYL	0	0
HICYL	3AC	3AC
PACTYP	B	B
.CYL	3AD	3AD
.TRK	13	13
.LSEC	68	68

SYSGEN STATEMENT MATRIX :

XXXX: ,63,XX,SELCH=XX,CONTR=XX,  
USER=(CYL=941),USER=(TRKS=19),USER=(SEC=104)

APPENDIX A

DRIVE TYPE : FUJITSU M2351A EAGLE 472MB fixed

SWITCH SETTINGS :

SECTOR SWITCHES : Book value for 45 sectors

CONFIGURATION :

NUMBER OF TRACKS/CYL	20
NUMBER OF SECTORS	88

MACROLINK FORMATTER / TEST :

LOCYL	0	0
HICYL	349	349
PACTYP	B	A
.CYL	34A	
.TRK	14	
.LSEC	58	

SYSGEN STATEMENT MATRIX :

XXXX: ,63,XX,SELCH=XX,CONTR=XX,  
USER=(CYL=842);USER=(TRKS=20);USER=(SEC=88)

APPENDIX A

DRIVE TYPE : NEC            02351                    520MB fixed

SWITCH SETTINGS :

SWITCH 11C : 00000001  
SWITCH 11M : 00000000  
SWITCH 11A : 10111010    58 SECTORS

CONFIGURATION :

NUMBER OF TRACKS/CYL    19  
NUMBER OF SECTORS        114

MACROLINK            FORMATTER /    TEST :

LOCYL	0	0
HICYL	2F7	2F7
FACTYP	B	B
.CYL	2F8	2F8
.TRK	13	13
.LSEC	72	72

SYSGEN STATEMENT MATRIX :

XXXX: ,63,XX,SELCH=XX,CONTR=XX,  
USER=(CYL=760),USER=(TRKS=19),USER=(SEC=114)