COMMON 2.5 AND 10 MEGABYTE

DISC FORMATTER

TEST PROGRAM

Consists of:

Program Description	06-251M95A15
Program Listing	06-251M96A13
Program Tape	06-251M17

PERKIN-ELMER

COMMON 2.5 and 10 MEGABYTE DISC FORMATTER
TEST PROGRAM DESCRIPTION

1. GENERAL

The 06-251 Formatter Program formats the 2.5 and 10 Megabyte disc packs and performs extensive error checking on each sector. A list of defective sectors (if any are detected) is produced as the sectors are flagged defective. This list identifies defective sectors by Logical Block Address (position within the linear array of sectors on the pack), and by Cylinder, Head, and Sector Address.

2. REQUIREMENTS

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

- Processor: Model 7/16, 7/32, or 8/32 (or equivalent).

- Minimum Memory: 16K Bytes

- Selector Channel (SELCH or ESELCH)

- 2.5 or 10 Mb Disc Controller, Drive, and Pack

- Console Input Device (refer to Appendix A): Teletype, Video Display Unit, or Carousel

- List Device (refer to Appendix A): Teletype, Video Display Unit, Carousel, or Line Printer

- The 06-251 Formatter program requires a properly operating disc system.

The following test program should be run prior to this test:

- Common Disc Test 06-173

The following is a list of requirements of the system under test:

● Device Addresses

The Disc System Controller should be strapped for device address X'B6'. If the address is different, the DISCON option must be entered. Refer to Appendices B and C.

Each Disc Drive is assumed to be strapped for device addresses X'C6', X'D6', X'E6', and X'F6', for drives 0-3 respectively. A 10 Mb disc has the controller address of X'B6', the fixed discs have addresses X'C7', X'D7', X'E7', X'F7', and the removable discs have addresses X'C6', X'D6', X'E6', X'F6'. A 2.5 Mb disc has the controller address of X'B6', and the removable discs have addresses X'C6', X'D6', X'E6', and X'F6'. There are no fixed discs on a 2.5 Mb disc. The address is trapped by the Controller, and is not specifically entered by any option. To select the desired Drive, the DRIVE option must be entered. Refer to Appendixes B and C.

The Selector Channel (SELCH or ESELCH) is assumed to be strapped for device address X'F0'. If the address is different, the SELCH option must be entered. Refer to Appendixes B and C.

● Hardware Changes

The Format Switch on the Disc System Controller must be manually set to the FORMAT position before executing this program. When formatting is finished, the Format Switch should be placed in the NORMAL position to prevent accidental destruction of the data written to the sector headers.

3. LOADING PROCEDURES

3.1 Object Tape Format

The 06-251M17 Tape is an Absolute, Non-Zoned Memory Image Tape with Front End Boot Loader. The program occupies approximately 16 kb of memory.

3.2 Multimedia and Floppy Disc Loading Procedure

To load this program from the Perkin-Elmer Multimedia Diagnostic System refer to Publication Number 06-176M95A15. To load this program from the Perkin-Elmer Floppy Disc Diagnostic System, refer to Publication Number 06-225M95A15.

3.3   Normal Loading Procedures

1. Manually enter the X'50' sequence shown below, into memory.

LOCATION	CONTENTS
X'30'	X'0000'
X'32'	X'0000'
X'34'	X'0000'
X'36'	X'0050'
X'50'	X'D500'
X'52'	X'00CF'
X'54'	X'4300'
X'56'	X'0080'

	LOCATION	CONTENTS
for Current Loop	X'78'	X'0294'
for HSPTR	X'78'	X'0399'
for HSPTR/P	X'78'	X'1399'
for Micro I/O Bus	X'78'	X'C082'
for 800 bpi mag tape	X'78'	X'85A1'
for floppy media disc	X'78'	X'C186'

2. Place the program tape in the reader.

3. Execute at address X'30'.

4. When the processor halts, observe the value displayed on the console display Registers D1 and D2. If it is zero, loading is complete; otherwise, repeat the loading procedure. If there is no display, observe general register 6; if it is not zero, repeat the loading procedure.

5. Refer to Appendix A and set up the addresses for console input device and the list device.

6. Address memory location X'A00'.

7. Start program execution. Observe the following title is output to the list device:

    COMMON 2.5 AND 10 Mb DISC FORMATTER 06-251

4. PROGRAM EXECUTION

Manually place the format switch on the Disc System Controller in the FORMAT position, mount the disc pack(s), and put the required Drive(s) on-line.

To FORMAT a disc pack, refer to Section 4.1.

To FLAG sectors defective manually, refer to Section 4.4.

To CLEAR recorded information, refer to Section 4.5.

TABLE 1. OPTIONS TO BE ENTERED

OPTION	APPLICATION	DEFAULT
SELCH	Selector Channel Address	X'F0'
DISCON	Disc Controller Address	X'B6'
DRIVE	Selects any Drives 0-3 (Removable) or 4-7 (Fixed)	NONE
PACTYP	Identifies Pack Type and CE Packs	X'0001'
LOCYL	Low Cylinder Address	X'FFFF'
HICYL	High Cylinder Address	X'FFFF'
FMTSEC	Format by Sector (1) or by Track (0)	1

4.1 Formatting the Disc Pack

For a 10 Mb disc, from one to eight disc packs on the same controller may be formatted sequentially without user intervention. For a 2.5 Mb disc, from one to four disc packs on the same controller may be formatted sequentially without user intervention.

4.1.1 Default Formatting Procedure

This section describes the procedure required to format a single 10 Mb disc pack mounted on Drive 0. The procedure for the 2.5 disc pack is the same except the HICYL option is set to X'CA' instead of X'197' and the PACTYP option is set to zero instead of one.

*LOCYL 0 (CR)

*HICYL 197 (CR)

*DRIVE 0 (CR)

*FORMAT (CR)

4.2 Optional Formatting Procedures

The DRIVE, LOCYL, HICYL, FMTSEC, and PACTYP options may be changed from the default values to provide the desired program function. Refer to Appendices B and C.

4.3 Messages Output

1. After the FORMAT command is entered, the cylinders between LOCYL and HICYL (inclusively) are formatted for each indicated Drive. Defective sectors are written with the DEF SEC (TRK) bit set in the sector header, and the following message is output to the List Device for each sector flagged defective:

   DEF SEC FLAGGED mmmmmmmm TTT HH KK

   where: mmmmmmmm is the sector's Logical Block Address

   TTT is the Cylinder Address

   HH is the Head Address

   KK is the Sector Address on the track

   If the FMTSEC option is zero, the message appears in the following format:

   DEF TRK FLAGGED mmmmmmmm TTT HH

   where: mmmmmmmm is the Logical Block Address for sector zero of the flagged track

   and all other printout is a described above.

2. The program tests each sector after flagging, for Defective Sector status from the Disc System Controller. If the expected status is not returned, the following message is output to the List Device:

   FLAG REJECTED mmmmmmmm TTT HH KK < --- X

   where: mmmmmmmm is the Logical Block Address for the sector which cannot be flagged and all other printout is as described above.

3. If a single, recoverable error is detected for any sector, the following message is output to the List Device:

   SOFT ERROR mmmmmmmm TTT HH KK

   where: mmmmmmmm TTT HH and KK identify the sector producing the soft error. For critical applications, any sector identified in the SOFT ERROR message may later be manually flagged as defective (see Section 4.4).

4. When formatting is complete for the packs on all specified Drives, the sequence terminates, an asterisk is output to the Console Device, and the program waits for user input.

NOTES

   a. Special care should be taken not to use any sector identified in the FLAG REJECTED message. In some Operating System environments, the disc pack must be considered unusable if FLAG REJECTED is printed.

   b. Invalid Cylinder Addresses are bypassed for a CE pack. The invalid cylinder addresses are X'10', X'100', X'105', and X'192'.

   c. If an unrecoverable error status is returned from the currently selected disc Drive while formatting, the next Drive specified by the DRIVE option (if any) is selected. When all specified Drives have been selected, the sequence terminates. No attempt is made to re-select a Drive.

   d. If it is desired to halt the formatting process, depress and hold the BREAK (BRK) key on the console I/O device. Formatting stops when the current cylinder is complete.

4.4   Manual Sector Flagging

This program allows the user to set the Defective Sector bit in the header of any specified sector, by entry of the commands detailed below. The user may wish to flag those sectors (if any) identified in the SOFT ERROR message during the formatting process.

If the FMTSEC option is ONE, a sector may be flagged defective by entering one of the following commands:

FLAG mmmmmmmm (CR) ; or

FLAG TTT HH KK (CR)

where: mmmmmmmm is the Sector's Logical Block Address

TTT is the Cylinder Address

HH is the Head Address

KK is the Sector Address

If the FMTSEC option is ZERO, all sectors on the indicated track may be flagged by entering one of the following commands:

FLAG mmmmmmmm (CR) ; or

FLAG TTT HH (CR)

where: the operands are as explained above.

The indicated sector is written with the DEF SEC bit set in the sector header, and the appropriate message is output to the List Device.

DEF SEC FLAGGED mmmmmmmm TTT HH KK ; or

DEF TRK FLAGGED mmmmmmmm TTT HH

where: in the DEF TRK FLAGGED message, mmmmmmmm is the Logical Block Address for sector zero on the indicated track.

The program tests each sector after flagging, for Defective Sector status from the Disc System Controller. If the expected status is not returned, the following message is output to the List Device:

FLAG REJECTED mmmmmmmm TTT HH KK < --- X

where: mmmmmmmm is the Logical Block Address of the sector which could not be flagged.

NOTES

a. Special care should be taken not to use any sector identified in the FLAG REJECTED message. In some Operating System environments, the disc pack must be considered unusable if FLAG REJECTED is printed.

b. An invalid cylinder address causes an error message to be printed for a CE pack; no operation is performed.

c. After flagging a sector on a disc to be used with OS/16 MT or OS/32 MT, the disc pack must be reinitialized, using the appropriate Disc Initialization utility, before attempting normal use of the disc pack.

4.5 Clearing the Disc Pack

The CLEAR command allows the Customer Engineer to remove all recorded information from the sectors on a specified area of the disc pack.

To write binary zeros to the Header, Gap2, Sync2, Data, and Normal and Format Mode LRCC field for each sector on the cylinders from LOCYL to HICYL, inclusively, enter the following command:

CLEAR   (CR)

CAUTION

THE CLEAR COMMAND DESTROYS THE FORMAT FOR ALL SECTORS ON THE DESIGNATED AREA OF THE PACK. THIS OCCURS VERY QUICKLY. THE CLEAR COMMAND SHOULD NOT NORMALLY BE USED, EXCEPT BY THE CUSTOMER ENGINEER.

NOTES

a. Invalid cylinder addresses are bypassed for a CE pack.

b. If it is desired to halt the CLEAR process, depress and hold the BREAK (BRK) key on the console I/O device. The process stops when the current cylinder is complete.

5. ERROR PROCEDURES

5.1 Recoverable Errors

If the SELCH, Disc Controller, or Disc Drive does not respond to the device address sent, the following message is output to the Console Device:

DEV DDD FALSE SYNC **

where: DDD is the device address. If this message is

returned, check that the SELCH and DISCON options are

correct; also check that all interfaces are fully

seated.

5.2 Irrecoverable Errors

If a Machine Malfunction Interrupt is taken, the following message is output to the Console Device:

ERROR   00F3

PSW PPPP LOC LLLL

STATUS = SSSSSSSS

where: F3 is the code for Machine Malfunction

PPPP is the PSW status when error was detected.

ILLL is the PSW location counter when the error was

detected.

SSSSSSSS is the Machine Malfunction Status

In the case of irrecoverable errors other than Machine Malfunction Interrupt, the following message is printed:

ERROR   00FN

PSW PPPP LCC LLLL

where: FN is the code for the Irrecoverable Error detected,

and other printout is as described above (see Addpedix F).

6. PROGRAMMING NOTES

6.1 Formatting Times

This program requires approximately 18 minutes to format a 10 Mb disc pack and approximately 11 minutes to format a 2.5 Mb disc pack.

6.2 Formatting Algorithm

A worst-case data halfword is copied into the entire sector, including Header, GAP2, SYNC2, Data, and Normal Mode LRCC fields. The sector is then "Read-Checked" by doing a format-mode Read without the SELCH; no LRC error should result. The pattern is read three times. On the third read, the SELCH is used, and the data read is tested for correctness. This operation is performed for the hexadecimal halfword patterns F0F0, DB6D, 6DB6, and B6DB. For each read, a single detected error may be tallied as a "soft" error.

The sector is then written with proper format (correct Header, GAP2, SYNC2, and Normal Mode LRCC fields); the Data field is zero-filled. A Read-Check is then performed on the sector. Any detected error is tallied as a "hard" error.

When all sectors in the cylinder have been tested, the individual tallies are checked. A sector with one "soft" error and no "hard" error results in a commentary message. The user may later flag the sector manually, at his option. A sector with two or more "soft" errors, and any "hard" error, is flagged defective, and a message is output. After a sector is flagged, the flag is tested. If the sector could not be flagged, a conspicious message is output.

When this sequence is complete for all sectors in the cylinder, the next cylinder is selected, if so specified.

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APPENDIX A
USER DEVICE DEFINITION

ASCII INPUT/OUTPUT DEVICE SUPPORT

The R05 executive (ETPE R05) of the program uses the concept of Console I/O device and list device. The console I/O device is an interactive device which is capable of logging messages and accepting commands and other user input. When the executive is accepting input from the user, or sending messages to the user, the console device is used. When the test program is running, the list device is used for logging messages.

IO HALFWORD CONTROL OF I/O DEVICE SELECTION

The list device and console device are specified to the Executive by the contents of the halfword "IO" at ORIGIN1+X'10' (normally X'0A10'). The interpretation of this data is detailed in Table 1. The Executive allows only the identifiers shown and changes illegal identifiers to X'01'.

TABLE 1 INPUT/OUTPUT IDENTIFIERS

IO	0 7	8 15
	CONSOLE DEVICE IDENTIFIER	LIST DEVICE IDENTIFIER
	X'01' - CRT on PASLA/PALM or COMM MUX interface	X'01' - CRT on PASLA/PALM or COMM MUX interface
	X'02' - Device on Current Loop interface	X'02' - Device on Current Loop interface
	X'03' - Reserved. Changed to X'01'.	X'03' - Line Printer on line Printer interface
	X'04' - Carousel on PASLA/ PALM or COMM MUX interface	X'04' - Carousel on PASLA/ PALM or COMM MUX interface
	X'05' - CRT on Micro-I/O Bus interface	X'05' - CRT on Micro-I/O Bus interface

I/O DEVICE ADDRESSES AND CHARACTERISTICS

The device types implied by the values contained in the IO halfword are described in the following paragraphs. For each of the devices, including device type X'03', termination of an output line results in a carriage return, line feed, and null character being output by the executive (X'0D', X'0A', X'00').

Devices identified by X'01' are assumed to be on a full-duplex asynchronous RS-232-type interface with addresses X'010' and X'011' for read and write sides, respectively. Examples of such interfaces are PASLA, PALM, and COMM MUX. The Exective programs these devices for highest clock rate, seven data bits, two stop bits, and even parity. If the terminal is set up differently, location CRT2ND must be modified accordingly. Line break status is assumed to be indicated by framing-error status, with BUSY not active, and a zero character in the receive buffer. Off-line status is assumed to be X'0C' (BUSY+EXAMINE STATUS).

Devices identified by X'02' are assumed to be on a Teletype-compatible current loop interface with address X'002'. The Executive programs these devices for unblocked mode (Echoplex). Line break status is assumed to be indicated by framing-error status. Off-line status is assumed to be X'01'. (Device Unavailable). If this bit is set, other status bits are don't-cares.

The list device identified by X'03' is assumed to be a line printer on a line printer interface with address X'062'. Off-Line status is assumed to be X'01' (Device Unavailable). If this bit is set, other status bits are don't-cares.

Devices indicated by X'04' are assumed to be attached as described for device type X'01', having the capability of transmitting DC4 and DC2 transmission pause and resume requests. An example of such a device is the Perkin-Elmer Carousel 300 terminal.

Devices indicated by X'05' are assumed to be on a Micro-I/O bus interface with address X'0C0'. These devices are programmed for Blocked mode (Full Duplex). Line break is assumed to be indicated by framing-error status which is not testable if a character is in the interface read buffer. Off-Line status is assumed to be X'01' (Device unavailable). If this bit is set, other status bits are don't-cares.

SELECTING DEVICES BEFORE STARTING EXECUTION

The IO halfword, described above, controls which device identifiers are used when the program is started. The default data in this halfword is X'0101'. If this value does not indicate the desired type of I/O device, of the types supported, the data in the IO halfword may be modified before starting program execution.

If the default device addresses are not the addresses of the devices configured in the system, the table of device addresses found in the source program adjacent to the IO halfword may be modified. There are two halfword entries used for each type device. The first is the read-side address, and the second is the write-side address. Both these halfwords must be modified for any change required. If the device type has only one address (for example, a line printer), the device address must be placed in each of the two appropriate halfwords. The R05 Executive always uses the read side address to test Off-Line status.

APPENDIX B
COMMAND/OPTION INPUT

An asterisk (*) operator prompt is output to the console device
to indicate that the program is waiting for user input. All
option names must be typed in from the console, followed by a
carriage return (CR) if there are no arguments or if default
arguments are to be used. If arguments are required, the option
name must be followed by a space, and then the desired argument
or arguments separated by commas.

An invalid command/option name or option value causes a question
mark (?) to be output, followed by a carriage return, line feed,
and an asterisk prompt. If, during command/option input, a
mistake is made, the hash mark (#) or a control X can be typed to
delete the entire command line. A carriage return, line feed,
and new prompt is output. The left arrow (<) can be typed to
delete the previously typed character, or a string of characters
can be deleted by typing a left arrow for each character to be
deleted. The backspace character and delete characters are
treated the same as a back arrow.
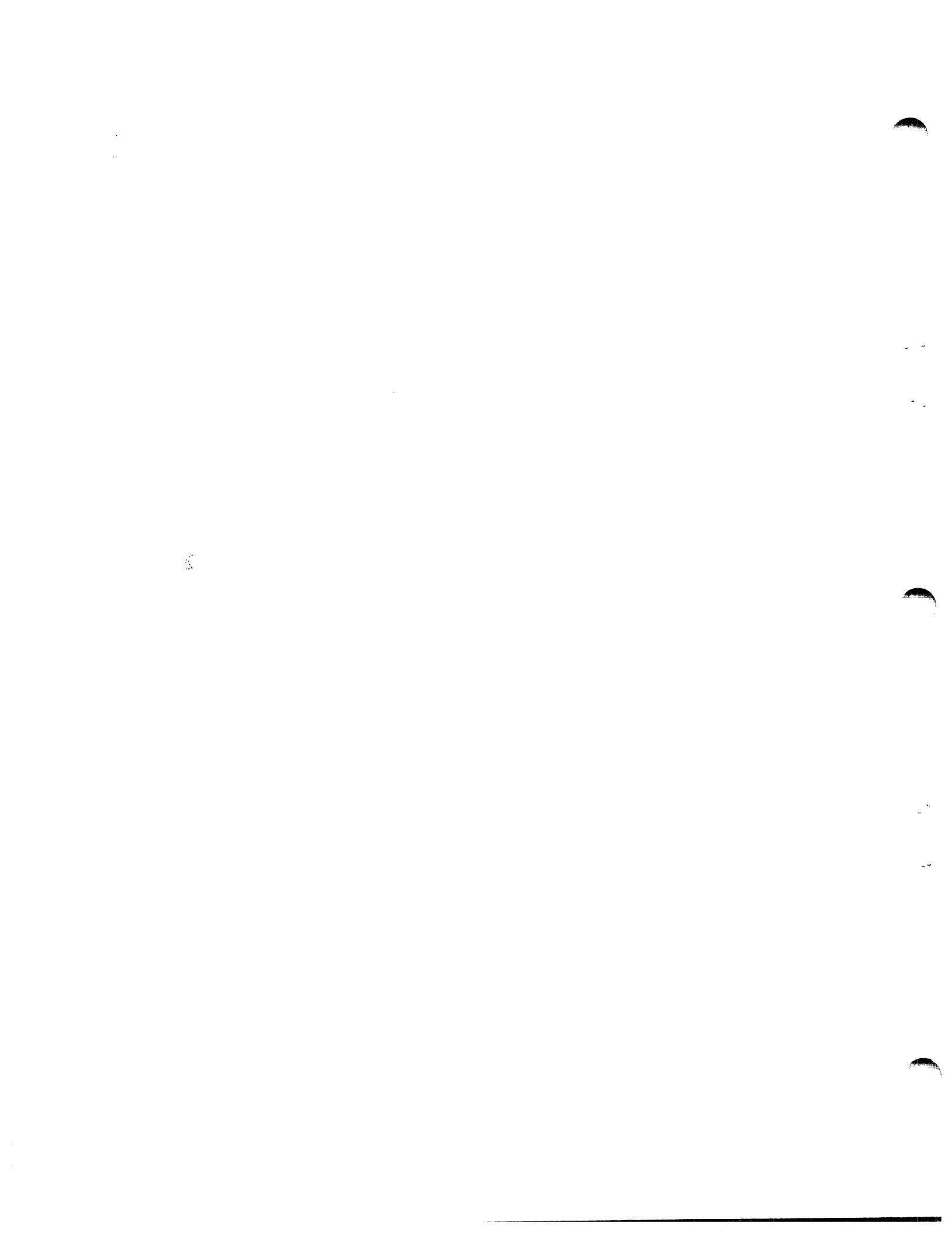
APPENDIX C
OPTION VALUES

Examine each option in the following list, and read each description. If a default value is specified, and is the value desired, 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

All numeric input and printout is hexadecimal (base 16).

OPTION	MANDATORY	DEFAULT VALUE	DESCRIPTION
OPTION		N/A	Option CR causes all options, with their current values, to be displayed on the console device. Option n causes the display to be output to the specified list device (see Appendix A).
SELCH		X'00F0'	Defines Selector Channel Address
DISCON		X'00B6'	Defines Disc Controller Address
DRIVE	X	NONE	Defines which drives attached to the controller are to be used. Any combination of 0-7 may be selected. Drives 0-3 are the removable platters and drives 4-7 are the corresponding fixed platters. For example, to select drives 0 and 1, enter the following command: *Drive 0,1 CR
PACTYP		X'0001'	Identifies the type of pack being formatted. Type X'CE0n' designates a Customer Engineer pack. Type X'000n' designates a user pack. The suffix digits are defined below. 0 = 2.5 Mb Drive (max. cyl. address = X'CA') 1 = 10 Mb Drive (max. cyl. address = X'197')

OPTION	MANDATORY	DEFAULT VALUE	DESCRIPTION
LOCYL	X	X'FFFF'	Establishes the low cylinder address for the formatting process. LOCYL must not be greater than the HICYL option, nor greater than the number of cylinders implied by the PACTYP option.
HICYL	X	X'FFFF'	Establishes the high cylinder address for the formatting process. HICYL must not be less than the LOCYL option, and must not be greater than the number of cylinders implied by the PACTYP option.
FMTSEC		1	Specifies whether defective areas of the pack are to be flagged by sector, or whether all sectors in the track are to be flagged. 0 = FLAG ALL SECTORS IN THE TRACK 1 = FLAG DEFECTIVE SECTORS ONLY
FORMAT		N/A	Causes the Disc Pack to be formatted according to the options selected.
CLEAR		N/A	Causes all sectors from LOCYL to HICYL inclusively to be filled with binary ZEROS, including Header, Data and LRC fields.
FLAG		N/A	1. Causes only the specified sector to be flagged defective, if FMTSEC = 1. Valid commands in this case are: FLAG mmmmmmmm FLAG TTT HH KK

OPTION	MANDATORY	DEFAULT VALUE	DESCRIPTION
			2. Causes the track in which the specified sector lies to be flagged defective, if FMTSEC = 0. Valid commands in this case are: FLAG mmmmmmmm FLAG TTT HH where: mmmmmmmm is the sector's Logical Block Address TTT is the Cylinder Address HH is the Head Address KK is the Sector Address on the track

APPENDIX D
EXPECTED PRINTOUT FOR 10 Mb DISC DRIVES


```
COMMON DISC FORMATTER 06-251R00
*OPTICN
DRIVE
DISCON 00B6
SELCH  00F0
PACTYP 0001
FMTSEC 0001
LOCYL  FFFF
HICYL  FFFF

*LOCYL 0        (Default Formatting Procedure)
*HICYL 197      (or X'CA' for 2.5 Mb disc drives)
*DRIVE 0
*FORMAT
DRIVE 0 SELECTED
*               (Formatting Complete)
```

The sequence above causes the Disc Pack mounted on Drive 0 to be
formatted. More than one Drive may be specified. For example,
to format the packs on Drives 0, 1, 2 and 3:


```
*LOCYL 0
*HICYL 197         (or X'CA' for 2.5 Mb disc drives)
*DRIVE 0,1,2,3
*FORMAT
DRIVE 0 SELECTED
DRIVE 1 SELECTED
DRIVE 2 SELECTED
DRIVE 3 SELECTED
*               (Formatting complete)
```

With the Option Table values shown, if a "hard" sector error is
detected for the pack mounted on Drive 1, a message is printed in
the format shown below. (For this example, the error is shown to
have occurred on Cylinder 147, Head 01, Sector 0C, of the pack
mounted on Drive 1).


```
*FORMAT
DRIVE 0 SELECTED
DRIVE 1 SELECTED
DEF SEC FLAGGED 3D74  147  01  0C
     •
     •
     •
```
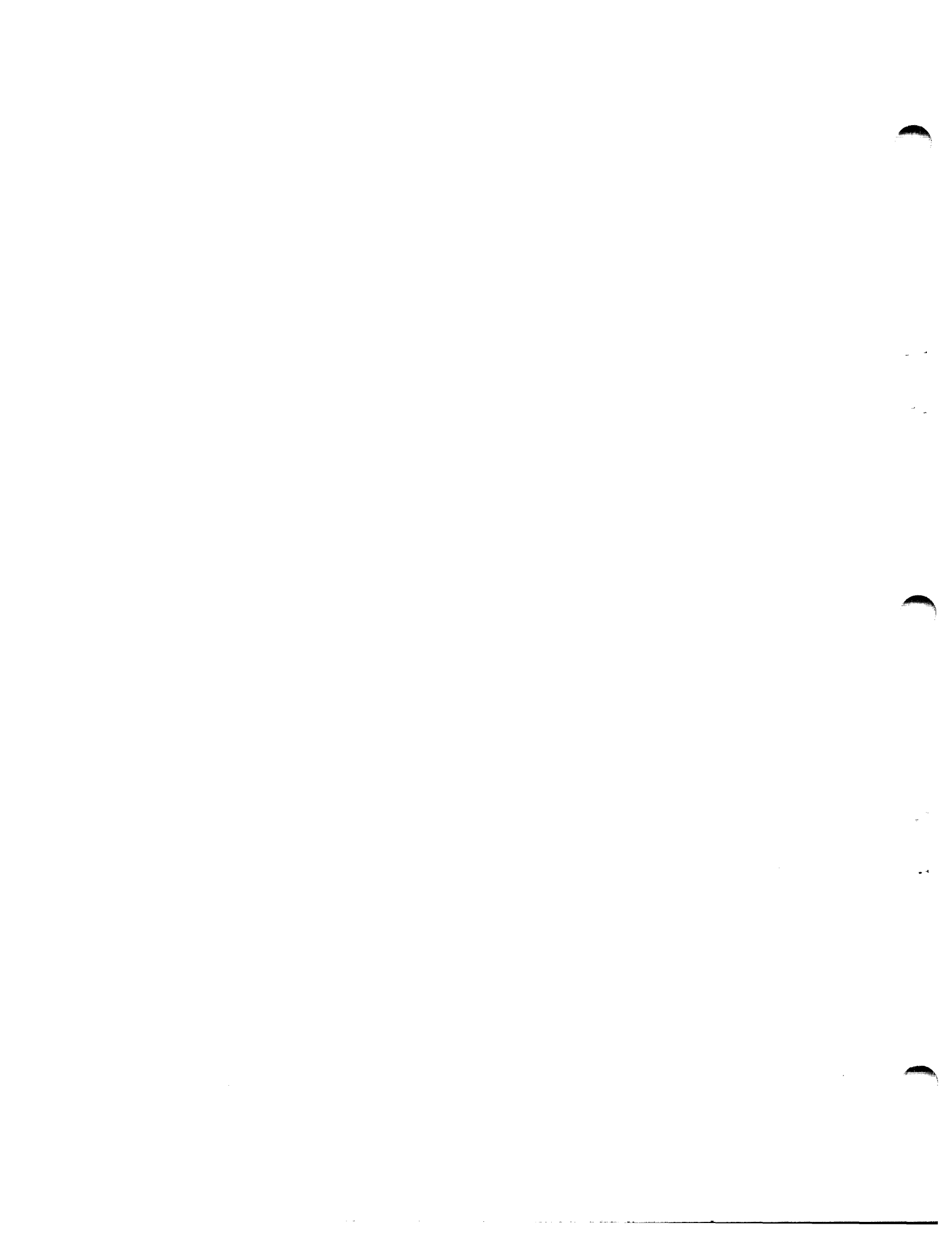
APPENDIX E
ERROR TABLE

Irrecoverable errors result in the printing of the messages
described below:

    ERROR 00FN

    DEV DDD STA SS

    PSW PPPP LOC LLLL

        or

    ERROR 00FN

    PSW PPPP LCC LLLL

        or

    ERROR 00FN

    PSW PPPP LCC LLLL

    STATUS = SSSS

where: 00F1 = Arithmetic Fault Interrupt
        00F2 = Illegal Instruction Interrupt
        00F3 = Machine Malfunction Interrupt
        00F4 = Spurious Device Interrupt
        00F5 = 32-Bit Relocation/Protection Interrupt, or
               16-Bit Floating Point Divide Interrupt
        00F6 = Device Interrupt Level Error
        00F7 = Data Format Fault Interrupt
        00F8 = System Queue Service Interrupt
        00F9 = Supervisor Call Interrupt
         DDD = Device address returned when the interrupt occurred
          SS = Status of the interrupting device
        PPPP = PSW status when the interrupt occurred
        LLLL = PSW Location Counter when the interrupt occurred.
        SSSS = Machine Malfunction Status for the 3200
               family of processors, this is the contents
               of the Machine Malfunction Status word at
               X'0040'. For all other processors, this is the
               old PSW status when the machine malfunction
               interrupt occurred. Refer to the appropriate
               processor user's manual for further details.
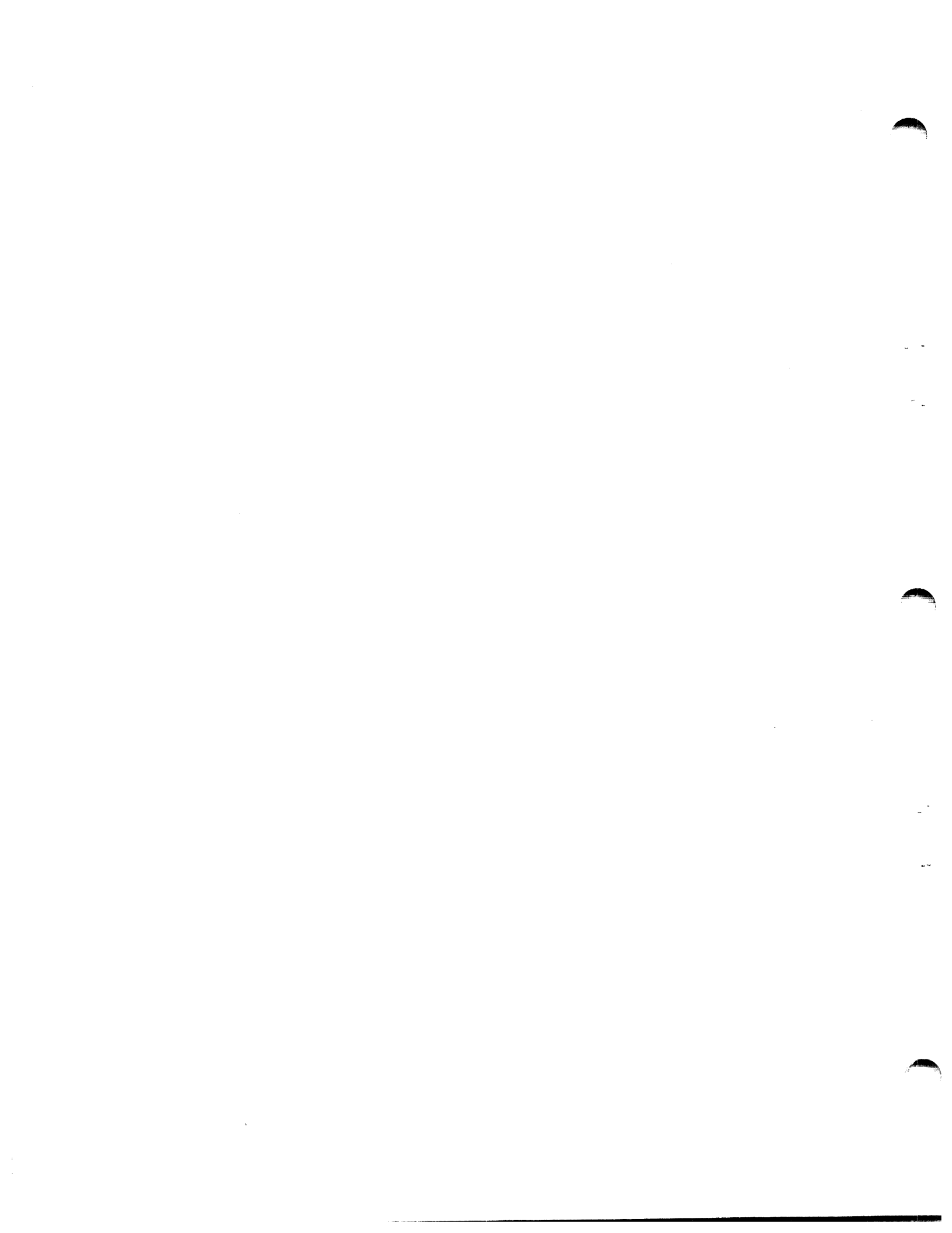
APPENDIX F
MESSAGE SUMMARY

Messages which may be output during execution of this program are summarized below. For additional information, refer to Program Execution (Section 4).

1. INVALID XXXXXX OPTION

This message is printed after the FORMAT, FLAG or CLEAR command is entered, if the indicated option has not been entered, or is incorrect.

2. WHICH DRIVE?

This message is printed after the FLAG or CLEAR command is entered, if the Drive option has not been entered. The user must enter the DRIVE option, specifying the desire Drive only, then re-enter the previous command (FLAG or CLEAR).

3. ILLEGAL CYLINDER ADDRESS XXX - CE PACK

This message is printed after the FLAG command is entered, if the user attempts to flag a sector or track within an "invalid" area on a Customer Engineer pack. The message is also printed if the FORMAT or CLEAR command is entered, and the LOCYL or HICYL option lies within such an area.

4. DEV DDD FALSE SYNC **

This message is printed after the FORMAT, FLAG or CLEAR command is entered, if the SELCH, Controller, or Disc Drive does not respond to address DDD. The user should verify that the SELCH and DISCON options are correct.

NOTE

If the SELCH and DISCON options are correct, Hardware Maintenance personnel should be requested to check that the interfaces and cable connectors are firmly seated, and that the system RACKO/TACKO chain is not broken.

5. DRIVE X: WRITE PROTECTED

This message is printed when the indicated Drive returns Write Protect status. The user should use the Drive's operator panel to turn the write only or protect indicator OFF. The previous command should then be re-entered.

6. DRIVE X: OFF LINE

This message is printed when the indicated Drive returns status X'09'. The user should check that the correct DRIVE option has been entered. If the DRIVE option is correct, verify that a disc pack has been properly mounted, that the pack access door is latched, and that the spindle motor has been started.

7. DRIVE X: UNRECOVERABLE ERROR - STATUS YY

This message is printed when the indicated Drive returns Unsafe, Write Check, Illegal Address or Seek Incomplete status which cannot be cleared by normal techniques. Power should be removed from the Drive for several seconds, then restored.

8. SOFT ERROR mmmmmmmm TTT HH KK

This message is printed if a single, recoverable sector error is detected while formatting. The sector in error is identified by Logical Block Address, and by Cylinder, Head, and Sector Address.

9. DEF SEC FLAGGED mmmmmmmm TTT HH KK

This message is printed when a defective sector is flagged, if the FMTSEC option is ONE. The Sector is identified by Logical Block Address, and by Cylinder, Head, and Sector Address.

10. DEF TRK FLAGGED mmmmmmmm TTT HH

This message is printed when a defective sector is flagged, if the FMTSEC option is ZERO. All Sectors on the indicated track are flagged; the message identifies the Logical Block Address of Sector 0 of the indicated head and cylinder.

11. FLAG REJECTED mmmmmmmm TTT HH KK < --- X

This message is printed when an attempt is made to flag a sector as defective, and the attempt fails. The Logical Block Address and the Cylinder, Head, and Sector Address of the sector rejecting the flag, are displayed.

NOTE

Special care should be taken not to use any sector identified in the FLAG REJECTED message. In some Operating System environments, the disc pack must be considered unusable if FLAG REJECTED is printed.

12. DRIVE X SELECTED

This message is printed following the FORMAT, FLAG, or CLEAR command, and identifies the Drive in use. The message is also printed whenever a new Drive is selected, if multiple-Drive formatting is specified.

13. REDUNDANT SEEK ERROR

This message is printed after the disc pack on the current selected disc drive has been formatted, if the final Read-Check for Head 0, Sector 0 of all cylinders in the range LOCYL:HICYL produces any Header Error status not accompanied by Defective Sector status. This indicates a hardware problem; proper format of the disc pack is not guaranteed.

14. ILLEGAL PACK TYPE ENTERED

This message is printed if the PACTYP option was entered incorrectly.

15. BREAK TERMINATION

This message is printed when the FORMAT, FLAG, or CLEAR operation is aborted due to the user's depressing the BREAK key on the console I/O device.

APPENDIX G
RELATED DOCUMENTS

Formatter Program Listing   06-251M96A13
Formatter Program Paper Tape   06-251M17
2.5 and 10 Megabyte Removable
   Cartridge Disc Programming Manual   29-454
Common Disc Test Program Description   06-173M95A15
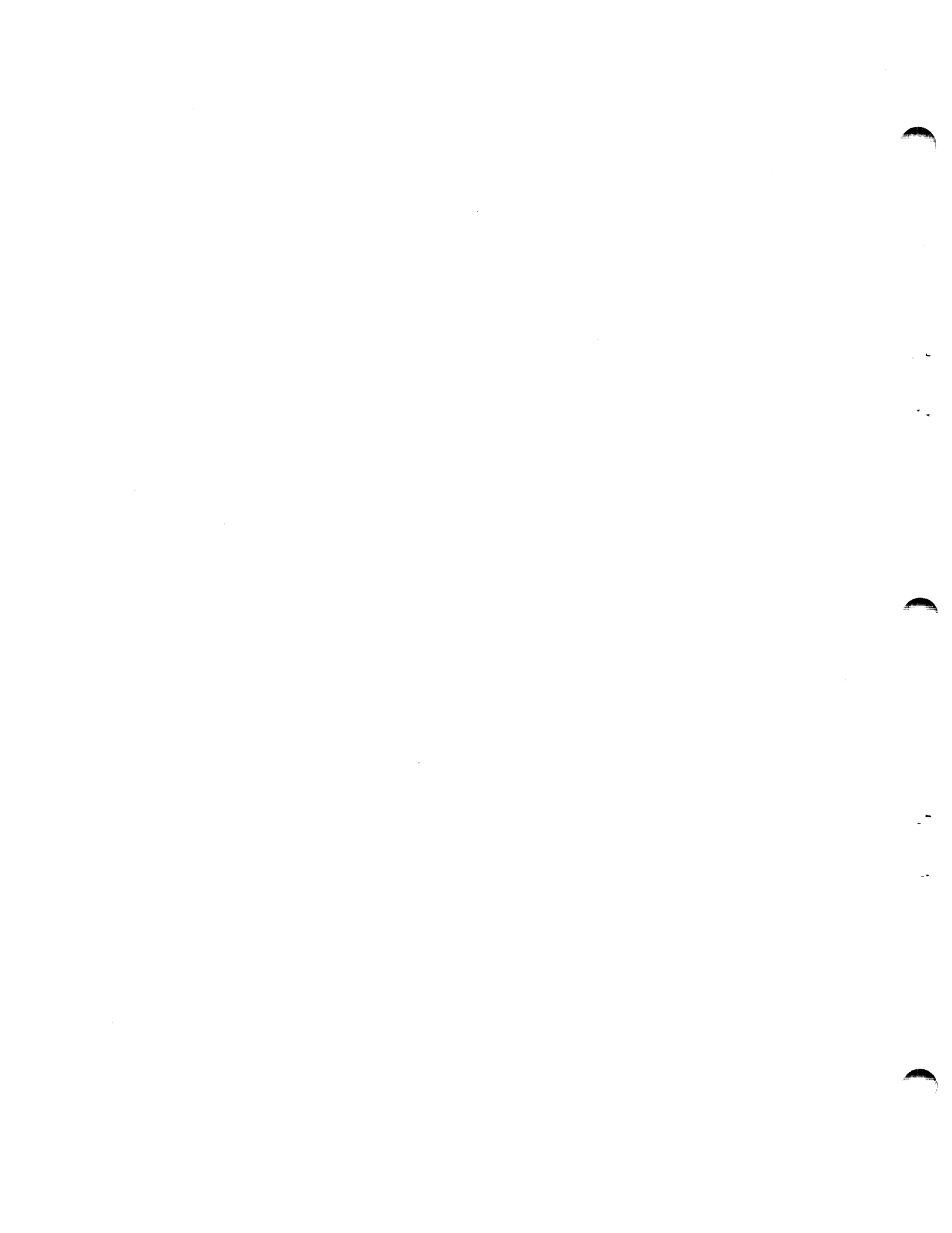
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 1 FMT      PROG  COMMON 2.5 AND 10 MB FORMATTER                              MBF00010
 2          CROSS                                                             MBF00020
 3          NORX3                                                             MBF00030
 4          TARGT 16                                                          MBF00040
 5          WIDTH 120                                                         MBF00050
 6 **                                                                         MBF00060
 7 * COMMON 2.5 AND 10 MB FORMATTER 06-251R00                                 MBF00070
 8 * COPYRIGHT PERKIN-ELMER, SEPTEMBER, 1979                                  MBF00080
 9 *                                                                          MBF00090
10 * PROGRAM USES THE COMMON INSTRUCTION SET                                  MBF00100
11 *                                                                          MBF00110
12 * THIS PROGRAM FORMATS THE PE 2.5 AND 10 MB DISC PACKS.                    MBF00120
13 * FIXED-LENGTH, SEQUENTIAL SECTORING IS PERFORMED                          MBF00130
14 * USING AN INTERLEAVED-SECTOR ACCESS TECHNIQUE FOR FASTER THROUGHPUT.      MBF00140
15 * A SURFACE EVALUATION IS PERFORMED FOR UP TO 8 DISC PACKS,                MBF00150
16 * MOUNTED ON AS MANY DRIVES OF THE SAME TYPE. FAULTY SECTORS ARE           MBF00160
17 * FLAGGED AS DEFECTIVE; THE FLAG IS TESTED FOR EACH FAULTY SECTOR.         MBF00170
18 * THE DISC PACK(S) MAY BE FORMATTED ON A DEFECTIVE SECTOR BASIS            MBF00180
19 * FOR ANY DETECTED SECTOR ERRORS, OR MAY BE FORMATTED ON A DEFECTIVE       MBF00190
20 * TRACK BASIS, WHERE EACH SECTOR IN ANY TRACK WITH A DEFECTIVE             MBF00200
21 * SECTOR HAS ALL SECTORS IN THAT TRACK FLAGGED AS DEFECTIVE.               MBF00210
22 * IN ADDITION, THE WRITE PROTECT BIT IN THE SECTOR HEADERS MAY BE          MBF00220
23 * SET, IF DESIRED.                                                         MBF00230
24 *                                                                          MBF00240
25 * THIS PROGRAM PERMITS MANUAL FLAGGING OF DEFECTIVE SECTORS, BY            MBF00250
26 * ENTRY OF THE SECTOR'S LOGICAL BLOCK ADDRESS, OR BY ENTRY OF THE          MBF00260
27 * CYLINDER, HEAD, AND SECTOR ADDRESSES. IN ADDITION, THE PROGRAM           MBF00270
28 * ALLOWS THE CUSTOMER ENGINEER TO ERASE ALL ACCESSIBLE AREAS               MBF00280
29 * WITHIN A RANGE OF CONTIGUOUS CYLINDERS. CE PACK CYLINDER ADDRESS         MBF00290
30 * CONVENTIONS ARE OBSERVED.                                                MBF00300
31 * DRIVE IDENTIFIERS 00,01,02,03 SPECIFY THE REMOVABLE                      MBF00310
32 * PACKS IN THE RESPECTIVE DRIVES.                                          MBF00320
33 * DRIVE IDENTIFIERS 04,05,06,07 SPECIFY THE FIXED DISCS IN THE             MBF00330
34 * CORRESPONDING DRIVES.                                                    MBF00340
35 *                                                                          MBF00350
36 * THE PROGRAM REQUIRES A 7/16 BASIC, 7/32, 8/32, OR EQUIVALENT             MBF00360
37 * PROCESSOR, WITH MINIMUM 16K BYTES OF MEMORY. OPTIONS AND COMMANDS        MBF00370
38 * ARE TO BE ENTERED VIA A CONSOLE I/O DEVICE.                              MBF00380
39 *                                                                          MBF00390
40 *--------------                                                            MBF00400
41 *                                                                          MBF00410
42 * THE 06-251M17R00 TAPE IS AN ABSOLUTE TAPE WITH FRONT-END BOOT LOADER.    MBF00420
43 *                                                                          MBF00430
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                                45            SQUEZ 2                                                              MBF00450
                                46            ERSQZ                                                               MBF00460
                                47            NLSTC                                                               MBF00470
                                48    *                                                                          MBF00480
                                49    $STRUC1  STRUC                          OPTION TABLE STRUCTURE             MBF00490
0000                            50    $OPTNAME DS     6                       ASCII OPTION NAME                  MBF00500
0006                            51    $CKROUT  DS     2                       Z(CHECK ROUTINE)                  MBF00510
0008                            52    $VALU1   DS     2                       16-BIT VALUE                      MBF00520
000A                            53    $VALU2   DS     2                       SPARE                             MBF00530
000C                            54            ENDS                                                              MBF00540
                                55    *                                                                          MBF00550
        0000 0050               56    $BUFLEN  EQU    80                      I/O BUFFER LENGTH                 MBF00560
                                57    *                                                                          MBF00570
                                58    *                                                                          MBF00580
                                59    *            CONDITIONAL ASSEMBLY PARAMETERS TO FOLLOW                    MBF00590
                                60    *                                                                          MBF00600
                                61    *                   IN ALL CASES, 0 EQUALS DELETE                         MBF00610
                                62    *                                 1 EQUALS INCLUDE                        MBF00620
                                63    *                                                                          MBF00630
                                64    *                                   FOR $CLOCK, FOLLOWING TIMERS INCLUDED MBF00640
                                65    *                                    1 EQUALS INCLUDE SOFTWARE            MBF00650
                                66    *                                    2 EQUALS INCLUDE HARDWARE            MBF00660
                                67    *                                    3 EQUALS INCLUDE BOTH               MBF00670
                                68    *                        TIMER LABEL IS "TIMER" FOR SOFTWARE AND          MBF00680
                                69    *                        HARDWARE. EXCEPT WHEN BOTH ARE INCLUDED.         MBF00690
                                70    *                        THEN LABELS ARE "STIMER" AND "HTIMER"            MBF00700
                                71    *                        RESPECTIVELY.                                    MBF00710
                                72    *                                                                          MBF00720
        0000 0000               73    $R5BIN   EQU    0                                                         MBF00730
        0000 0000               74    $DECTAB  EQU    0                                                         MBF00740
        0000 0000               75    $DECHEX  EQU    0                                                         MBF00750
        0000 0000               76    $DECASC  EQU    0                                                         MBF00760
        0000 0000               77    $KBINT   EQU    0                                                         MBF00770
        0000 0001               78    $CLOCK   EQU    1                                                         MBF00780
        0000 0000               79    $DISPLAY EQU    0                                                         MBF00790
        0000 0000               80    $BUFIO   EQU    0                                                         MBF00800
                                81    *                                                                          MBF00810
        0000 0000               82    R0       EQU    0                                                         MBF00820
        0000 0001               83    R1       EQU    1                                                         MBF00830
        0000 0002               84    R2       EQU    2                                                         MBF00840
        0000 0003               85    R3       EQU    3                                                         MBF00850
        0000 0004               86    R4       EQU    4                                                         MBF00860
        0000 0005               87    R5       EQU    5                                                         MBF00870
        0000 0006               88    R6       EQU    6                                                         MBF00880
        0000 0007               89    R7       EQU    7                                                         MBF00890
        0000 0008               90    R8       EQU    8                                                         MBF00900
        0000 0009               91    R9       EQU    9                                                         MBF00910
        0000 000A               92    R10      EQU    10                                                        MBF00920
        0000 000B               93    R11      EQU    11                                                        MBF00930
        0000 000C               94    R12      EQU    12                                                        MBF00940
        0000 000D               95    R13      EQU    13                                                        MBF00950
        0000 000E               96    R14      EQU    14                                                        MBF00960
        0000 000F               97    R15      EQU    15                                                        MBF00970
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                                      98  *'                                                        MBF00980
                                      99  *   BOOTLOADER WITH CHKSUM                                MBF00990
                                     100  *                                                         MBF01000
         0000R                       101          ORG    X'80'                                      MBF01010
         0080    2421                102          LIS    R2,1                                       MBF01020
         0082    2303                103          BS     BOOT                                       MBF01030
         0084    2D00                104          DC     Z(PSWSAVE+X'FF'&X'FF00') S32/3200 PPF PSW SAVE PTR     MBF01040
         0086    2D08                105          DC     Z(PSWSAVE+X'FF'&X'FF00'+8) S32/3200 PPF REGSAVE PTR    MBF01050
         0088    C810 0A00           106  BOOT    LDAI   R1,ORIGIN1          R1 = ADR( FIRST BYTE OF TEST PROG  MBF01060
         008C    C830 24DC           107          LDAI   R3,LNZB+1           R3 = ADR( LAST NON-ZERO BYTE )     MBF01070
         0090    4030 0022           108          STH    R3,X'22'            S16 REGISTER SAVE POINTER          MBF01080
         0094    2731                109          SIS    R3,1                                       MBF01090
         0096    C860 00FF           110  MN      LHI    R6,X'00FF'          R6 = CHKSUM BYTE = X'MN'           MBF01100
         009A    D340 0078           111          LB     R4,X'78'            INPUT DEV ADR                      MBF01110
         009E    DE40 0079           112          OC     R4,X'79'                                   MBF01120
         00A2    9D45                113  LEADER   SSR    R4,R5                                      MBF01130
         00A4    2091                114          BTBS   9,1                 DU,BSY                  MBF01140
         00A6    9B45                115          RDR    R4,R5                                      MBF01150
         00A8    0855                116          LDAR   R5,R5                                      MBF01160
         00AA    2234                117          BZS    LEADER              IGNORE LEADER           MBF01170
         00AC    D251 0000           118  LOAD    STB    R5,0(R1)            STORE 1ST NON-ZERO & SUBSEQUENT By  MBF01180
         00B0    D351 0000           119          LB     R5,0(R1)            RELOAD DATA BYTE TO                MBF01190
         00B4    0765                120          XAR    R6,R5               GENERATE CHKSUM         MBF01200
         00B6    9481                121          EXBR   R8,R1                                      MBF01210
         00B8    9828                122          WHR    R2,R8               DISPLAY MEMORY ADDRESS  MBF01220
         00BA    9D45                123          SSR    R4,R5                                      MBF01230
         00BC    2091                124          BTBS   9,1                 DU,BSY                  MBF01240
         00BE    9B45                125          RDR    R4,R5                                      MBF01250
         00C0    C110 00AC           126          BXLE   R1,LOAD             LOAD TILL LAST BYTE     MBF01260
         00C4    9486                127          EXBR   R8,R6                                      MBF01270
         00C6    9828                128          WHR    R2,R8               FINAL CHKSUM            MBF01280
         00C8    2478                129  LDWT    LIS    R7,8                                       MBF01290
         00CA    917C                130          SLLS   R7,12               R7 = X'8000'            MBF01300
         00CC    9557                131          EPSR   R5,R7               HALT PROCESSOR.         MBF01310
         00CE    2203                132          BS     LDWT                                       MBF01320
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0000                         134           ORG    X'A00'                                                        MBF01340
0A00    4300 0A5E            135 ORIGIN1   B      START             START HERE FOR 32-BIT PROCESSOR             MBF01350
0A04                         136           IFZ    ADC-2                                                         MBF01360
0A04    4300 0A5E            137 ORIGIN2   B      START             START HERE FOR 16-BIT PROCESSOR             MBF01370
0A08    4300 0A72            138 ORIGIN3   B      START3            SPECIAL 32-BIT PROCESSOR START              MBF01380
0A0C    4300 0A74            139 ORIGIN4   B      START4            SPECIAL 16-BIT PROCESSOR START              MBF01390
                             140           ELSE                                                                 MBF01400
                             144           ENDC                                                                 MBF01440
                             145 *                                                                              MBF01450
                             146 *--------------------------------                                              MBF01460
                             147 *    TEST CONSTANTS                                *                           MBF01470
                             148 *                                                                              MBF01480
        0000 0006            149 $MAXIO    EQU    6                 > MAX VALID IDENTIFIER                       MBF01490
0A10    0101                 150 IO        DC     X'0101'           I/O DEVICE(S) IDENTIFIER                     MBF01500
                             151 *                                                                              MBF01510
0A12    0010                 152 PASLADR   DC     X'0010'           PALSA/PALM READ ADDRESS                     MBF01520
0A14    0011                 153           DC     X'0011'           PASLA/PALM WRITE ADDRESS                    MBF01530
0A16    0002                 154 CLIFADR   DC     X'0002'           CURRENT LOOP INTERFACE READ ADDRES          MBF01540
0A18    0002                 155           DC     X'0002'           CURRENT LOOP INTERFACE WRITE ADDRE          MBF01550
0A1A    0062                 156 LPADR     DC     X'0062'           DUMMY FOR LINE PRINTER                       MBF01560
0A1C    0062                 157           DC     X'0062'           WRITE ADDRESS                               MBF01570
0A1E    0010                 158 C300ADR   DC     X'0010'           CAROUSEL/PASLA READ ADDRESS                 MBF01580
0A20    0011                 159           DC     X'0011'           CAROUSEL/PASLA WRITE ADDRESS                MBF01590
0A22    00C0                 160 MICROBUS  DC     X'00C0'           MICROBUS READ ADDRESS                        MBF01600
0A24    00C0                 161           DC     X'00C0'           MICROBUS WRITE ADDRESS                       MBF01610
0A26    0000                 162           DCX    0                 PROVISION FOR SPECIAL DEVICE (READ          MBF01620
0A28    0000                 163           DCX    0                 WRITE ADDRESS                               MBF01630
                             164 *                                                                              MBF01640
                             165 * IO =    0101  FOR CRT ON PASLA                                               MBF01650
                             166 *         0202  FOR TELETYPE, CAROUSEL 15/30                                   MBF01660
                             167 *         XX03  FOR LINE PRINTER                                               MBF01670
                             168 *         0404  FOR CAROUSEL 300                                               MBF01680
                             169 *         0505  FOR MICROBUS                                                   MBF01690
                             170 *                                                                              MBF01700
                             171 *------------------------------------------------------------                  MBF01710
                             172 *    ETPE IO COMMANDS                                                          MBF01720
                             173 *                                                                              MBF01730
0A2A    0000                 174 CONRADR   DCX    0                 CONSOLE DEVICE READ ADDRESS                 MBF01740
0A2C    0000                 175 CONWADR   DCX    0                 CONSOLE DEVICE WRITE ADDRESS                MBF01750
                             176 *                                                                              MBF01760
0A2E    0000                 177 CONRD     DCX    0                 CONSOLE READ/WRITE COMMANDS                 MBF01770
        0000 0A2F            178 CONWRT    EQU    CONRD+1                                                       MBF01780
0A30    0000                 179 CON2ND    DCX    0                                                             MBF01790
        0000 0A31            180 CONENRD   EQU    CON2ND+1                                                      MBF01800
0A32    0000                 181 CONCMD    DCX    0                 DUMMY HW AS POINTER                          MBF01810
0A34    A1A3                 182 CRTRD     DCX    A1A3              FOR CRT                                     MBF01820
0A36    EE61                 183 CRT2ND    DCX    EE61                                                          MBF01830
0A38    E498                 184 CLIFRD    DCX    E498              *   CURRENT LOOP INTERFACE                  MBF01840
0A3A    0000                 185 CLIF2ND   DCX    0000                                                          MBF01850
0A3C    0080                 186 LPWRT     DCX    0080              *   LINE PRINTER                            MBF01860
0A3E    0000                 187           DCX    0                 DUMMY FOR LP                                MBF01870
0A40    A1A3                 188 CARRD     DCX    A1A3              *   CAROUSEL 300                            MBF01880
0A42    F061                 189 CAR2ND    DCX    F061                                                          MBF01890
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        0A44    8202       190  MREADC   DCX   8202            *    MICROBUS                      MBF01900
        0A46    0000       191           DCX   0               DUMMY HW FOR MICROBUS             MBF01910
                           192  *                                                                MBF01920
                           193  *-------------------------------------------------------         MBF01930
        0A48    00         194  CONRQ2S  DB    0               CONSOLE REQUEST TO SEND CMD       MBF01940
        0A49    23         195  CRTRQ2S  DB    X'23'           FOR CRT                           MBF01950
        0A4A    00         196           DB    0               DUMMY BYTE FOR CLI                MBF01960
        0A4B    00         197           DB    0               *    DUMMY BYTE FOR LP            MBF01970
        0A4C    23         198  CARRQ2S  DB    X'23'           *    CAROUSEL 300                 MBF01980
        0A4D    00         199           DB    0               *    DUMMY BYTE FOR MICROBUS      MBF01990
        0A4E               200           DB    *               (ALIGN ON HW BOUNDRY)            MBF02000
        0A4E    0000       201           DCX   0               RESERVED                          MBF02010
        0A50    30F0       202  PSW      DCX   30F0            PSW USED IN PROGRAM               MBF02020
        0A52    30F0       203  PSW2     DCX   30F0            PSW USED IN EXEC                  MBF02030
        0A54    70F0       204  PSW3     DCX   70F0            PSW USED IN INTERRUPT TESTS       MBF02040
        0A56    0000       205           DCX   0               RESERVED                          MBF02050
        0A58    0000       206           DCX   0               RESERVED                          MBF02060
        0A5A    7FFF       207  $TIMVAL  DCX   7FFF            TIMEOUT CONSTANT                  MBF02070
        0A5C    8800       208  $CON     DCX   8800            BREAKPOINT INSTRUCTION            MBF02080
                           209  *-----------------------------                                   MBF02090
                           210  *                                                                MBF02100
        0A5E    48E0 0A52  211  START    LH    R14,PSW2        NEW PSW FOR ILLEGAL INTERRUPT     MBF02110
        0A62    C8F0 0A76  212           LDAI  R15,STARTA      AND NEW LOC                       MBF02120
        0A66    D0E0 0034  213           STM   R14,X'34'       FOR SERIES 16                     MBF02130
        0A6A    D0E0 0030  214           STM   R14,X'30'       FOR SERIES 32                     MBF02140
        0A6E    0000       215           DCX   0               TAKE AN ILLEGAL INSTRUCTION INT   MBF02150
        0A70    2200       216           BS    *               HALT IF II NOT TAKEN             MBF02160
                           217  *                                                                MBF02170
    *   0A72    2302       218  START3   B     STARTA          INSERT SPECIAL ROUTINE HERE       MBF02180
        0A74               219           IFZ   ADC-2                                             MBF02190
    *   0A74    2301       220  START4   B     STARTA          INSERT SPECIAL ROUTINE HERE       MBF02200
                           221           ENDC                                                    MBF02210
        0A76    C800 8000  222  STARTA   LHI   R0,X'8000'                                        MBF02220
        0A7A    4000 160C  223           STH   R0,ISITERR      FORCE TITLE PRINT                 MBF02230
        0A7E    EC00 0010  224           SRL   R0,16           REGISTER PAIR SHIFTED, SERIES 16  MBF02240
        0A82    4000 15F8  225           STH   R0,MOD32        SIGN EXTENSION, SERIES 32.        MBF02250
                           226  *                                                                MBF02260
        0A86    41E0 1186  227           BAL   R14,STCON       SET UP CONSOLE                    MBF02270
        0A8A    41F0 1368  228           BAL   R15,LCORE       SET UP LOW CORE                   MBF02280
        0A8E    2400       229           LIS   R0,0                                              MBF02290
        0A90    4000 17C8  230           STH   R0,NOMSG+$VALU1 FORCE 'NOMSG 0' AT START          MBF02300
        0A94    4000 1608  231           STH   R0,$BRKFLG      NO BREAK KEY YET                  MBF02310
        0A98    41F0 1036  232           BAL   R15,CRLF                                          MBF02320
        0A9C    41F0 1042  233           BAL   R15,$PRINT      PRINT TEST PROGRAM TITLE          MBF02330
        0AA0    18A0       234           DAC   TITLE                                             MBF02340
        0AA2    41F0 1042  235           BAL   R15,$PRINT                                        MBF02350
        0AA6    18CC       236           DAC   MSG1                                              MBF02360
        0AA8    48F0 1616  237           LH    R15,$WASDU      WAS DEVICE SEEN DU ?              MBF02370
        0AAC    4230 0D8E  238           BNZ   HALT9           PRINT TOTAL, TOTERR               MBF02380
                           239  *                                                                MBF02390
                           240  *                                                                MBF02400
                           241  *   KEYBOARD INPUT ROUTINE                                        MBF02410
                           242  *                                                                MBF02420
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            0000 0AB0        243 OPTIN    EQU   *                                                      MBF02430
  0AB0   41F0 1320           244          BAL   R15,SETKB           ESTABLISH CONSOLE                  MBF02440
  0AB4   41F0 1036           245          BAL   R15,CRLF                                               MBF02450
  0AB8   4820 0A52           246 OPTIN1   LH    R2,PSW2             SPEC'D AS X'30F0'                  MBF02460
  0ABC   4020 160C           247          STH   R2,ISITERR          FORCE EXEC MESSAGE PRINT           MBF02470
  0AC0   9512                248          EPSR  R1,R2               NO INT. REG SET 15                 MBF02480
  0AC2   41F0 1320           249          BAL   R15,SETKB           ESTABLISH CONSOLE                  MBF02490
  0AC6   0340 16D8           250          LB    R4,AMSG             OUTPUT AN * TO INDICATE            MBF02500
  0ACA   41F0 10D2           251          BAL   R15,OUTCHR          COMMAND MODE ESTABLISHED           MBF02510
  0ACE   2541                252          LCS   R4,1                X'FF'                              MBF02520
  0AD0   41F0 10D2           253          BAL   R15,OUTCHR                                             MBF02530
  0AD4   41F0 1138           254          BAL   R15,$READ           GET INPUT RECORD                   MBF02540
                             255 *                                                                     MBF02550
                             256 * ---------------------------------------                            MBF02560
                             257 *                                                                     MBF02570
                             258 * COMMAND DECODE                                                      MBF02580
                             259 *                                                                     MBF02590
  0AD8   C8C0 123A           260 $LOOK    LDAI  R12,QUESTN          GLOBAL ERROR ROUTINE               MBF02600
  0ADC   C810 16F0           261          LDAI  R1,OPT-$STRUC1      TO START AT OPTION TABLE           MBF02610
* 0AE0   261C                262 $LOOK.0  AHI   R1,$STRUC1          ADVANCE TO NEXT TABLE ENTRY        MBF02620
  0AE2   2430                263 $LOOK.1  LIS   R3,0                CLEAR BUFFER INDEX                 MBF02630
  0AE4   4851 0000           264          LH    R5,0(R1)            END OF TABLE ?                     MBF02640
  0AE8   021C                265          BMR   R12                 IF MINUS, THEN NO MATCH => ERROR.  MBF02650
  0AEA   0861                266          LDAR  R6,R1               START OF OPTION ENTRY              MBF02660
  0AEC   D343 2CAC           267 $LOOK.2  LB    R4,$INBUF(R3)       GET INPUT BYTE                     MBF02670
  0AF0   D356 0000           268          LB    R5,0(R6)            GET OPTION NAME BYTE               MBF02680
  0AF4   2631                269          AIS   R3,1                ADVANCE TO NEXT BYTE               MBF02690
  0AF6   C550 0020           270          CLHI  R5,C' '             OPTION NAME SPACE IN TABLE ?       MBF02700
  0AFA   233A                271          BES   $LOOK.3             BRANCH: YES.                       MBF02710
  0AFC   0545                272          CLAR  R4,R5               INPUT, OPTION BYTES MATCH ?        MBF02720
  0AFE   203F                273          BNES  $LOOK.0             BRANCH: NO.                        MBF02730
  0B00   2661                274          AIS   R6,1                INDEX OPTION POINTER               MBF02740
  0B02   C530 0006           275          CLHI  R3,$CKROUT          WHOLE OPTION NAME MATCHED ?        MBF02750
  0B06   208D                276          BLS   $LOOK.2             BRANCH: NOT YET.                   MBF02760
  0B08   D343 2CAC           277          LB    R4,$INBUF(R3)       GET BYTE FOLLOWING OPTION          MBF02770
  0B0C   2631                278          AIS   R3,1                INCREMENT BUFFER POINTER           MBF02780
  0B0E   48F1 0006           279 $LOOK.3  LH    R15,$CKROUT(R1)     .      06-173F02                   MBF02790
  0B12   40F0 1870           280          STA   R15,TESTS           .      06-173F02                   MBF02800
  0B16   C510 1774           281          CLHI  R1,FORMAT           .      06-173F02                   MBF02810
  0B1A   4380 0C7E           282          BNL   $RUNIT              .      06-173F02                   MBF02820
  0B1E   C510 1750           283          CLAI  R1,OPTION           .      06-173F02                   MBF02830
  0B22   4330 0BD6           284          BE    $OPTPRT             .      06-173F02                   MBF02840
  0B26   C510 175C           285          CLAI  R1,CON              'CON' CMD ?                        MBF02850
  0B2A   4330 0A5C           286          BE    $CON                BRANCH: YES.                       MBF02860
  0B2E   C510 16FC           287          CLAI  R1,TEST             'TEST' CMD ?                       MBF02870
  0B32   4330 0B54           288          BE    $TESTOP             BRANCH: YES.                       MBF02880
                             289 *                                                                     MBF02890
                             290 * TO PROCESS COMMANDS WHICH MUST HAVE HEXADECIMAL INPUT VALUE         MBF02900
                             291 *                                                                     MBF02910
  0B36   C540 0020           292 $LOOK.5  CLHI  R4,C' '             OPTION FOLLOWED BY SPACE ?         MBF02920
  0B3A   023C                293          BNER  R12                 IF NO, ERROR.                      MBF02930
  0B3C   41E0 0F3E           294          BAL   R14,OPTVAL          GET OPTION VALUE IN R6             MBF02940
  0B40   274D                295          SIS   R4,X'0D'            TERMINATED BY CR ?                 MBF02950
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0B42   023C            296            BNZR   R12              IF NO, ERROR.                      MBF02960
0B44   48E1 0006       297            LH     R14,$CKROUT(R1)  GET A(OPTION CHECK ROUTINE)        MBF02970
0B48   2332            298            BZS    $LOOK.6          BRANCH: NO SPECIAL ROUTINE.        MBF02980
0B4A   01FE            299            BALR   R15,R14          LINK OPTION CHECK ROUTINE          MBF02990
0B4C   4061 0008       300   $LOOK.6  STH    R6,$VALU1(R1)    STORE OPTION VALUE                 MBF03000
0B50   4300 0AB8       301            B      OPTIN1           TO ACCEPT NEXT COMMAND             MBF03010
                       302   *                                                                  MBF03020
                       303   *                                                                  MBF03030
0B54   4890 1874       304   $TESTOP  LH     R9,DEFTESTS      ASSUME DEFAULT REQUIRED            MBF03040
0B58   4880 1876       305            LH     R8,DEFTESTS+2                                       MBF03050
0B5C   D350 2CB1       306            LB     R5,$INBUF+5      GET NEXT BYTE                      MBF03060
0B60   274D            307            SIS    R4,X'0D'         CARRIAGE RETURN ?                  MBF03070
0B62   4330 0B9A       308            BZ     $TSTOP.5         BRANCH: YES.                       MBF03080
0B66   CB40 0013       309            SHI    R4,C' '-X'0D'    WAS SPACE ?                        MBF03090
0B6A   023C            310            BNZR   R12              BRANCH: INPUT ERROR.               MBF03100
0B6C   2490            311            LIS    R9,0             CLEAR ACCUMULATORS                 MBF03110
0B6E   2480            312            LIS    R8,0                                                MBF03120
                       313   *                                                                  MBF03130
0B70   41E0 0F3E       314   $TSTOP.1 BAL    R14,OPTVAL       GET OPTION VALUE IN R6             MBF03140
0B74   4960 189E       315            CH     R6,MAXTST        VALID TEST NUMBER ?                MBF03150
0B78   022C            316            BPR    R12              ERROR: INVALID TEST NUMBER         MBF03160
0B7A   24E8            317            LIS    R14,8                                               MBF03170
0B7C   91EC            318            SLLS   R14,12           (R14) = '8000'                     MBF03180
0B7E   CCE6 0000       319            SRHL   R14,0(R6)        UNARY OPERAND                      MBF03190
0B82   276F            320            SIS    R6,15            TEST 16:31 ?                       MBF03200
0B84   2123            321            BPS    $TSTOP.3         BRANCH: YES.                       MBF03210
0B86   069E            322            OAR    R9,R14           SET CURRENT BIT                    MBF03220
0B88   2302            323            BS     $TSTOP.4                                            MBF03230
0B8A   068E            324   $TSTOP.3 OAR    R8,R14           SET CURRENT BIT                    MBF03240
0B8C   274D            325   $TSTOP.4 SIS    R4,X'0D'         CMD TERMINATED BY CR ?             MBF03250
0B8E   2336            326            BZS    $TSTOP.5         BRANCH: YES.                       MBF03260
0B90   CB40 001F       327            SHI    R4,C',',-X'0D'   WAS COMMA ?                        MBF03270
0B94   4330 0B70       328            BZ     $TSTOP.1         BRANCH: YES. TRY AGAIN.            MBF03280
0B98   030C            329            BR     R12              INPUT ERROR.                       MBF03290
0B9A   4090 1704       330   $TSTOP.5 STH    R9,TEST+$VALU1   STORE VALID SELECTED TESTS         MBF03300
0B9E   4080 1706       331            STH    R8,TEST+$VALU2   .                                  MBF03310
0BA2   4300 0AB8       332            B      OPTIN1           TO ACCEPT NEXT COMMAND             MBF03320
                       333   *                                                                  MBF03330
                       334   * --------------------------------------------                     MBF03340
                       335   * OPTION CHECK ROUTINES                                            MBF03350
                       336   *                                                                  MBF03360
0BA6   C360 FFFE       337   ZERONE   THI    R6,X'FFFE'       IGNORE LSB                         MBF03370
0BAA   033F            338            BZR    R15              OKAY                               MBF03380
0BAC   030C            339            BR     R12              ERROR RETURN                       MBF03390
                       340   *                                                                  MBF03400
0BAE   C360 FFFE       341   ZERONE1  THI    R6,X'FFFE'       IGNORE LSB                         MBF03410
0BB2   023C            342            BNZR   R12              ERROR RETURN                       MBF03420
0BB4   C850 1A80       343            LDAI   R5,MFF                                              MBF03430
0BB8   40F0 1628       344            STA    R15,FF.SAVE                                         MBF03440
0BBC   41F0 105A       345            BAL    R15,PRINT                                           MBF03450
0BC0   48F0 1628       346            LDA    R15,FF.SAVE                                         MBF03460
0BC4   030F            347            BR     R15                                                 MBF03470
                       348   *                                                                  MBF03480
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0BC6   C360 FC00    349  ADR     THI    R6,X'FC00'            (R6) = 10 BIT DEVICE ADDRESS         MBF03490
0BCA   033F         350          BZR    R15                   RETURN TO LOOK5                      MBF03500
0BCC   030C         351          BR     R12                                                       MBF03510
                    352  *                                                                        MBF03520
0BCE   C360 FFF0    353  LEVEL   THI    R6,X'FFF0'            (R6) = INTERRUPT LEVEL HEX DIGIT     MBF03530
0BD2   033F         354          BZR    R15                   RETURN TO LOOK5                      MBF03540
0BD4   030C         355          BR     R12                                                       MBF03550
                    383  *---------------------------                                             MBF03830
                    384  *  TO PROCESS INPUT COMMAND 'OPTION'                                     MBF03840
                    385  *                                                                        MBF03850
0BD6   C540 000D    386  $OPTPRT CLHI   R4,X'0D'              OPTION (CR) ?                        MBF03860
0BDA   233A         387          BES    $OPT.0                BRANCH: YES.                         MBF03870
0BDC   41E0 0F3E    388          BAL    R14,OPTVAL            NO, GET OPTION DEV. PRINTOUT NUM.    MBF03880
0BE0   C560 0006    389          CLHI   R6,$MAXIO             DEVICE NUMBER VALID ?                MBF03890
0BE4   038C         390          BNLR   R12                   BRANCH: NO.                          MBF03900
0BE6   0866         391          LDAR   R6,R6                 OPTION ZERO ?                        MBF03910
0BE8   033C         392          BZR    R12                   BRANCH: YES, INVALID INPUT.          MBF03920
0BEA   0260 1608    393          STB    R6,IOSAVE+1           CHANGE THE LIST DEVICE               MBF03930
0BEE   4820 1756    394  $OPT.0  LH     R2,OPTION+$CKROUT     SPECIAL PRINTOUT ROUTINE ?           MBF03940
0BF2   2332         395          BZS    OPTRTN                BRANCH: NO.                          MBF03950
0BF4   01F2         396          BALR   R15,R2                LINK USER ROUTINE                    MBF03960
0BF6   C830 16FC    397  OPTRTN  LDAI   R3,OPT                START OF OPTION TABLE                MBF03970
0BFA   244F         398  $OPT.A  LIS    R4,15                                                     MBF03980
0BFC   4040 175A    399          STH    R4,$LINCNT            LINES PER PRINTOUT PAGE ABOUT 15     MBF03990
0C00   2410         400  $OPT.B  LIS    R1,0                                                      MBF04000
0C02   0823         401          LDAR   R2,R3                 START OF OPTION ENTRY                MBF04010
0C04   0302 0000    402  $OPT.2  LB     R0,0(R2)              GET OPTION NAME BYTE                 MBF04020
0C08   02D1 2C5C    403          STB    R0,$OUTBUF(R1)        MOVE TO OUTPUT BUFFER                MBF04030
0C0C   2611         404          AIS    R1,1                                                      MBF04040
0C0E   2621         405          AIS    R2,1                                                      MBF04050
0C10   C510 0006    406          CLHI   R1,$CKROUT            WHOLE NAME MOVED ?                   MBF04060
0C14   2088         407          BLS    $OPT.2                BRANCH: NO.                          MBF04070
0C16   C840 2020    408          LHI    R4,C'  '              SPACES                               MBF04080
0C1A   4040 2C62    409          STH    R4,$OUTBUF+$CKROUT                                         MBF04090
0C1E   C530 16FC    410          CLAI   R3,TEST               PROCESSING 'TEST' OPTION ?           MBF04100
0C22   2136         411          BNES   $OPT.3                BRANCH: NO.                          MBF04110
0C24   C850 1704    412          LDAI   R5,TEST+$VALU1        A(OPTION BITS)                       MBF04120
0C28   41F0 0FC4    413          BAL    R15,$LSTBIT           OUTPUT BIT NUMBERS (E.G.,1,2,...)    MBF04130
0C2C   230D         414          BS     $OPT.5                ADVANCE TO NEXT OPTION               MBF04140
                    415  *                                                                        MBF04150
                    416  * PROCESSING OPTIONS WITH 4-DIGIT HEX VALUES.                            MBF04160
                    417  * OPTION NAME ALREADY IN OUTPUT BUFFER.                                  MBF04170
                    418  *                                                                        MBF04180
0C2E   4813 0008    419  $OPT.3  LH     R1,$VALU1(R3)         OPTION VALUE HALFWORD                MBF04190
0C32   2404         420          LIS    R0,4                                                      MBF04200
0C34   C820 2C63    421          LDAI   R2,$OUTBUF+$CKROUT+1  BUFFER OFFSET                        MBF04210
0C38   41F0 0F9E    422          BAL    R15,HEXASC            WRITE OPTION VALUE IN HEX (4 DIGITS  MBF04220
0C3C   240D         423          LIS    R0,X'0D'              CARRIAGE RETURN                      MBF04230
0C3E   0200 2C67    424          STB    R0,$OUTBUF+$CKROUT+5  INSERT TO BUFFER                     MBF04240
0C42   41F0 1050    425          BAL    R15,@PRINT            OUTPUT PRINT BUFFER                  MBF04250
0C46   263C         426  $OPT.5  AHI    R3,$STRUC1            LENGTH OF TABLE ENTRY                MBF04260
0C48   C530 1750    427          CLAI   R3,OPTEND2            DONE ALL PRINTING OPTIONS ?          MBF04270
0C4C   4380 0AB8    428          BNL    OPTIN1                BRANCH: YES.                         MBF04280
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EXEC - ETPE R05P0

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0C50  D300 160B   429           LB    R0,IOSAVE+1      CURRENT LIST ID                      MBF04290
0C54  D400 0A10   430           CLB   R0,IO            SAME AS CONSOLE ?                    MBF04300
0C58  4230 0BFA   431           BNE   $OPT.A           BRANCH: YES. NO LINE CNT TEST.       MBF04310
0C5C  2501        432           LCS   R0,1                                                  MBF04320
0C5E  6100 175A   433           AHM   R0,$LINCNT       DECREMENT COUNTER                    MBF04330
0C62  4230 0C00   434           BNZ   $OPT.B           BRANCH: SCREEN NOT FULL              MBF04340
0C66  41F0 1138   435           BAL   R15,$READ        GET (CR) OR (LF) TO CONTINUE         MBF04350
0C6A  D340 2CAC   436           LB    R4,$INBUF        FIRST CHARACTER                      MBF04360
0C6E  274D        437           SIS   R4,X'0D'         CARRIAGE RETURN ?                    MBF04370
0C70  4330 0AB8   438           BZ    OPTIN1           BRANCH: YES. DONE.                   MBF04380
0C74  2643        439           AIS   R4,X'03'         LINE FEED (X'0A') ?                  MBF04390
0C76  4230 0AD8   440           BNZ   $LOOK            BRANCH: NO. ATTEMPT DECODE.          MBF04400
0C7A  4300 0BFA   441  $OPT.6   B     $OPT.A           BRANCH: CONTINUE.                    MBF04410
                  442  *------------------------------                                      MBF04420
                  443  * 'RUN' COMMAND HAS BEEN ENTERED                                     MBF04430
                  444  *                                                                    MBF04440
0C7E  C510 1780   445  $RUNIT   CLAI  R1,FLAG                                               MBF04450
0C82  2333        446           BES   $RUN.1                                               MBF04460
0C84  274D        447           SIS   R4,X'0D'         CARRIAGE RETURN ENTERED ?            MBF04470
0C86  023C        448           BNZR  R12              BRANCH: INPUT ERROR.                 MBF04480
      0000 0C88   449  $RUN.1   EQU   *                                                     MBF04490
                  450  * FIND HIGHEST SELECTED TEST NUMBER                                  MBF04500
0C88  C8F0 001F   451           LHI   R15,31           INITIAL OFFSET FROM 0                MBF04510
0C8C  4800 1706   452           LH    R0,TEST+$VALU2   BITS FOR TESTS 16:31                 MBF04520
0C90  2136        453           BNZS  $KEEP.1          BRANCH: BIT(S) SET.                  MBF04530
0C92  24FF        454           LIS   R15,15           OFFSET FROM 0                        MBF04540
0C94  4800 1704   455           LH    R0,TEST+$VALU1   BITS FOR TESTS 0:15                  MBF04550
0C98  4330 1AC8   456           BZ    ERROR3           BRANCH: NO DRIVE SELECTED .   06-1   MBF04560
0C9C  9001        457  $KEEP.1  SRLS  R0,1             SHIFT UNTIL BIT SEEN                 MBF04570
0C9E  21B3        458           BCS   $KEEP.2          BRANCH: GOT IT.                      MBF04580
0CA0  27F1        459           SIS   R15,1            DECREMENT INDEX                      MBF04590
0CA2  22D3        460           BS    $KEEP.1          AND LOOP.                            MBF04600
0CA4  40F0 1610   461  $KEEP.2  STH   R15,SELTST       HIGHEST SELECTED TEST NUMBER.        MBF04610
0CA8  41F0 1368   462           BAL   R15,LCORE        SET UP LOW CORE                      MBF04620
                  463  *                                                                    MBF04630
0CAC  41F0 1036   464           BAL   R15,CRLF         LINE FEED TO LIST DEVICE             MBF04640
0CB0  41F0 1B74   465           BAL   R15,INIT         LINK USER INITIALIZATION ROUTINE     MBF04650
0CB4  41F0 132A   466  INITRET  BAL   R15,SETLST       SELECT LIST DEVICE                   MBF04660
0CB8  2400        467           LIS   R0,0                                                  MBF04670
0CBA  4000 1618   468           STH   R0,TOTAL         RESET TOTAL                          MBF04680
0CBE  4000 161A   469           STH   R0,TOTERR        RESET TOTERR                         MBF04690
                  470  *-----------------------------------------------------------         MBF04700
                  471  * TO PROCEED TO NEXT SEQUENTIAL TEST (STARTS WITH TEST 0)            MBF04710
                  472  *                                                                    MBF04720
0CC2  2501        473  $KEEP1   LCS   R0,1                                                  MBF04730
0CC4  4000 161C   474           STH   R0,BTESTNO       RESET BINARY TEST NUMBER             MBF04740
0CC8  4810 161C   475  $KEEP2   LH    R1,BTESTNO       BINARY TEST NUMBER                   MBF04750
0CCC  2611        476           AIS   R1,1                                                  MBF04760
0CCE  4910 1610   477           CH    R1,SELTST        STILL VALID ?                        MBF04770
0CD2  4220 0D6C   478           BP    $KEEP5           BRANCH: NO.                          MBF04780
0CD6  4010 161C   479           STH   R1,BTESTNO       INCREMENTED TO CURRENT TEST          MBF04790
0CDA  2480        480           LIS   R8,0             OFFSET TO LOW-ORDER HALFWORD         MBF04800
0CDC  4080 161E   481           STH   R8,COUNT         ZERO LOOP COUNT                      MBF04810
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OCE0    4080 160C    482              STH    R8,ISITERR        RESET ERROR FLAG                          MBF04820
OCE4    C510 0010    483              CLHI   R1,16             TEST 0 TO 15 ?                            MBF04830
OCE8    2182         484              BLS    $KEEP2.1          BRANCH: NO.                               MBF04840
OCEA    2482         485              LIS    R8,2              OFFSET TO HIGH-ORDER HALFWORD             MBF04850
OCEC    0861         486  $KEEP2.1    LDAR   R6,R1                                                       MBF04860
OCEE    41E0 0F72    487              BAL    R14,UNARY         CONVERT (R6) TO BIT IN R3                 MBF04870
OCF2    4438 1704    488              NH     R3,TEST+$VALU1(R8) TEST SELECTED ?                          MBF04880
OCF6    4330 0CC8    489              BZ     $KEEP2            BRANCH: NO. FIND ONE THAT IS.             MBF04890
OCFA    4800 1710    490              LH     R0,DISCON+$VALU1  06-173F02                                 MBF04900
OCFE    CA00 0010    491              AHI    R0,X'10'          .       06-173                            MBF04910
0D02    0861         492              LDAR   R6,R1             .       06-173                            MBF04920
0D04    C460 0003    493              NHI    R6,3              .       06-173                            MBF04930
0D08    2761         494  LAB1        SIS    R6,1              .       06-173                            MBF04940
0D0A    2114         495              BMS    LAB2              .       06-173                            MBF04950
0D0C    CA00 0010    496              AHI    R0,X'10'          .       06-173                            MBF04960
0D10    2204         497              BS     LAB1              .       06-173                            MBF04970
0D12    C510 0004    498  LAB2        CLHI   R1,4              .       06-173                            MBF04980
0D16    2182         499              BLS    LAB3                                                        MBF04990
0D18    2601         500              AIS    R0,1                                                        MBF05000
        0000 001A    501  LAB3        EQU    *                                                           MBF05010
0D1A    4000 189A    502              STH    R0,FUTADRS        06-173F02                                 MBF05020
0D1E    C820 1A1C    503              LDAI   R2,MSG12+6        06-173F02                                 MBF05030
0D22    2401         504              LIS    R0,1              06-173F02                                 MBF05040
0D24    41F0 0F9E    505              BAL    R15,HEXASC        06-173F02                                 MBF05050
0D28    41F0 1320    506              BAL    R15,SETKB         06-173F02                                 MBF05060
0D2C    41F0 1042    507              BAL    R15,$PRINT        06-173F02                                 MBF05070
0D30    1A16         508              DAC    MSG12             DRIVE X SELECTED    06-173F02             MBF05080
0D32    41F0 132A    509              BAL    R15,SETLST        06-173F02                                 MBF05090
0D36    D400 0A10    510              CLB    R0,IO             06-173F02                                 MBF05100
0D3A    2334         511              BES    $KEEP3            06-173F02                                 MBF05110
0D3C    41F0 1042    512              BAL    R15,$PRINT        06-173F02                                 MBF05120
0D40    1A16         513              DAC    MSG12             06-173F02                                 MBF05130
             514  *                                                                              MBF05140
             515  * -------------------------------                                              MBF05150
             516  *  TO RUN CURRENT SELECTED TEST                                                MBF05160
             517  *                                                                              MBF05170
0D42    41F0 1248    518  $KEEP3      BAL    R15,TSTBRK        CHECK BREAK KEY                           MBF05180
0D46    2400         519              LIS    R0,0                                                        MBF05190
0D48    4000 160C    520              STH    R0,ISITERR        RESET ERROR FLAG                          MBF05200
0D4C    48E0 0A50    521              LH     R14,PSW           SPEC'D AS X'70F0'                         MBF05210
0D50    48F0 161C    522              LH     R15,BTESTNO       BINARY TEST NUMBER                        MBF05220
0D54    91F1         523              SLLS   R15,LADC          CONVERT TO OFFSET                         MBF05230
0D56    48F0 1870    524              LDA    R15,TESTS         POINTER TO TEST MODULE   06-173           MBF05240
0D5A    D0E0 15E8    525              STM    R14,NEWPSW                                                  MBF05250
0D5E    C200 15E8    526              LPSW   NEWPSW            GO TO TEST, WITH INTERRUPTS ENABLED       MBF05260
             527  *-------------------------------                                               MBF05270
             528  *  THE SUBTEST HAS BEEN RUN                                                    MBF05280
             529  *                                                                              MBF05290
0D62    4810 0A52    530  TSTEND      LH     R1,PSW2           SPEC'D AS X'30F0'                         MBF05300
0D66    9501         531              EPSR   R0,R1             DISABLE INTERRUPTS                        MBF05310
0D68    4300 0CC8    532              B      $KEEP2            06-173                                    MBF05320
             533  * ------------------------------------                                         MBF05330
             534  *  ENTIRE TEST SEQUENCE HAS RUN                                                MBF05340
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                                    535  *
              0000 0D6C              536  ABORT     EQU     *                      BRANCH HERE TO HALT TESTING          MBF05350
              0000 0D6C              537  $KEEP5    EQU     *                                                           MBF05360
      0D6C    2401                   538            LIS     R0,1                                                        MBF05370
      0D6E    6100 1618              539            AHM     R0,TOTAL              GET TOTAL+1 (MODULO 2**16)            MBF05380
      0D72    41F0 12D8              540            BAL     R15,TSTDU             R1 <> 0 IF LIST OFFLINE                MBF05390
      0D76    4610 178C              541            OH      R1,CONTIN+$VALU1      R1 <> 0 IF CONTIN = 1                  MBF05400
      0D7A    4230 0CC2              542            BNZ     $KEEP1                BRANCH: START NEW SERIES.             MBF05410
      0D7E    48E0 1622              543            LDA     R14,$SHUTDWN          ANY USER-SPEC'D POST-TEST ROUTINE ?    MBF05430
      0D82    2332                   544            BZS     $KEEP5.1              BRANCH: NO.                            MBF05440
      0D84    01FE                   545            BALR    R15,R14               GO TO SPECIFIED ROUTINE.               MBF05450
              0000 0D86              546  $KEEP5.1  EQU     *                       .       06-173F02                   MBF05460
      0D86    4800 1616              547  $KEEP5.2  LH      R0,$WASDU             WAS LIST DEVICE OFFLINE ?              MBF05470
      0D8A    4330 0AB8              548            BZ      OPTIN1                BRANCH: NO. GET NEXT COMMAND           MBF05480
                                    549  *                                                                            MBF05490
              0000 0D8E              550  HALT9     EQU     *                     STOP MACHINE FOR ERROR PRINT          MBF05500
      0D8E    41F0 12D8              551            BAL     R15,TSTDU             CHECK IF LIST DEVICE OFF-LINE          MBF05510
      0D92    2336                   552            BZS     $KEEP7                BRANCH: ON-LINE NOW.                   MBF05520
      0D94    C810 080F              553            LHI     R1,X'080F'                                                  MBF05530
      0D98    9114                   554            SLHLS   R1,4                  R1 = X'80F0'                           MBF05540
      0D9A    9501                   555            EPSR    R0,R1                 STOP PROCESSOR, WHEN .EXE/RUN. DEP    MBF05550
      0D9C    2207                   556            BS      HALT9                 CHECK IF LIST DEVICE ON-LINE.          MBF05560
                                    557  *                                                                            MBF05570
                                    558  * LIST DEVICE WAS OFF-LINE. PRINT TOTAL, TOTERR                              MBF05580
                                    559  *                                                                            MBF05590
              0000 0D9E              560  $KEEP7    EQU     *                                                           MBF05600
      0D9E    2400                   561            LIS     R0,0                                                        MBF05610
      0DA0    4000 1616              562            STH     R0,$WASDU             RESET DU FLAG                          MBF05620
      0DA4    41F0 1042              563            BAL     R15,$PRINT                                                  MBF05630
      0DA8    16F4                   564            DAC     NULLMSG               OUTPUT NULL STRING, CRLF               MBF05640
      0DAA    41F0 1042              565            BAL     R15,$PRINT                                                  MBF05650
      0DAE    1654                   566            DAC     TOTMSG                'TOTAL    TOTERR'                      MBF05660
      0DB0    C840 2020              567            LHI     R4,C'  '              SPACES                                 MBF05670
      0DB4    4040 2C60              568            STH     R4,$OUTBUF+4                                                 MBF05680
      0DB8    4040 2C62              569            STH     R4,$OUTBUF+6                                                 MBF05690
      0DBC    2404                   570            LIS     R0,4                                                        MBF05700
      0DBE    C820 2C5C              571            LDAI    R2,$OUTBUF            DESTINATION                            MBF05710
      0DC2    4810 1618              572            LH      R1,TOTAL                                                    MBF05720
      0DC6    41F0 0F9E              573            BAL     R15,HEXASC            CONVERT TOTAL                          MBF05730
      0DCA    4810 161A              574            LH      R1,TOTERR                                                   MBF05740
      0DCE    2628                   575            AIS     R2,8                  DESTINATION                            MBF05750
      0DD0    41F0 0F9E              576            BAL     R15,HEXASC            CONVERT TOTERR                          MBF05760
      0DD4    240D                   577            LIS     R0,X'0D'             CARRIAGE RETURN                        MBF05770
      0DD6    D202 0004              578            STB     R0,4(R2)              TO TERMINATE MESSAGE.                  MBF05780
      0DDA    41F0 1050              579            BAL     R15,@PRINT            PRINT CONTENTS OF BUFFER:              MBF05790
                                    580  *                                       TOTAL    TOTERR                       MBF05800
                                    581  *                                       XXXX     YYYY                         MBF05810
      0DDE    4300 0A76              582            B       STARTA                PRINT TITLE, ACCEPT COMMAND.          MBF05820
                                    583  * **************************************                                     MBF05830
                                    599  *                                                                            MBF05990
                                    600  * ERROR ROUTINES                          (OVERRIDE NOMSG OPTION)            MBF06000
                                    601  * RETURN LINK R15; NO REGISTERS MODIFIED.                                    MBF06010
                                    602  *                                                                            MBF06020
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0DE2    D0F0 2C50    603  ERR     STM   R15,$R15SAV        SAVE LINK                        MBF06030
0DE6    41F0 0E30    604          BAL   R15,ERRCOM         'ERROR TTNN'                     MBF06040
0DEA    0E5C         605          DAC   ERRCOM1            EXIT                             MBF06050
                     606  *                                                                 MBF06060
0DEC    D0F0 2C50    607  ERRD    STM   R15,$R15SAV        SAVE LINK                        MBF06070
0DF0    41F0 0E30    608          BAL   R15,ERRCOM         'ERROR TTNN'                     MBF06080
0DF4    0E90         609          DAC   ERRD1              'DEV DDD'                        MBF06090
0DF6    0E5C         610          DAC   ERRCOM1            EXIT                             MBF06100
                     611  *                                                                 MBF06110
0DF8    D0F0 2C50    612  ERRS    STM   R15,$R15SAV        SAVE LINK                        MBF06120
0DFC    41F0 0E30    613          BAL   R15,ERRCOM         'ERROR TTNN'                     MBF06130
0E00    0EA2         614          DAC   ERRS1              'STA SS'                         MBF06140
0E02    0E5C         615          DAC   ERRCOM1            EXIT                             MBF06150
                     616  *                                                                 MBF06160
0E04    D0F0 2C50    617  ERRDS   STM   R15,$R15SAV        SAVE LINK                        MBF06170
0E08    41F0 0E30    618          BAL   R15,ERRCOM         'ERROR TTNN'                     MBF06180
0E0C    0E90         619          DAC   ERRD1              'DEV DDD'                        MBF06190
0E0E    0EA2         620          DAC   ERRS1              'STA SS'                         MBF06200
0E10    0E5C         621          DAC   ERRCOM1            EXIT                             MBF06210
                     622  *                                                                 MBF06220
0E12    D0F0 2C50    623  ERRL    STM   R15,$R15SAV        SAVE LINK                        MBF06230
0E16    D0E0 15E0    624          STM   R14,OLDPSW         STORE CALLER'S PSW, LOC          MBF06240
0E1A    41F0 0E30    625          BAL   R15,ERRCOM         'ERROR TTNN'                     MBF06250
0E1E    0EF6         626          DAC   ERRL1              'LOC LLLL'                       MBF06260
0E20    0E5C         627          DAC   ERRCOM1            EXIT                             MBF06270
                     628  *                                                                 MBF06280
0E22    D0F0 2C50    629  ERRALL  STM   R15,$R15SAV        SAVE LINK                        MBF06290
0E26    41F0 0E30    630          BAL   R15,ERRCOM         'ERROR TTNN'                     MBF06300
0E2A    0E84         631          DAC   ERRDS1             'DEV DDD STA SS'                 MBF06310
0E2C    0ED4         632          DAC   ERRPL1             'PSW PPPP  LOC LLLL'             MBF06320
0E2E    0E5C         633          DAC   ERRCOM1            EXIT                             MBF06330
                     634  *                                                                 MBF06340
                     635  *   COMMON ERROR ROUTINE                                          MBF06350
                     636  *                                                                 MBF06360
0E30    D000 2D7C    637  ERRCOM  STM   R0,ERRSAVE         STORE USER REGISTER SET          MBF06370
0E34    4810 0A52    638          LH    R1,PSW2            SPEC'D AS X'30F0'                MBF06380
0E38    9501         639          EPSR  R0,R1              DISABLE INT. @ PROCESSOR LEVEL   MBF06390
0E3A    4800 1642    640          LH    R0,MTESTNO         MASTER TEST NUMBER               MBF06400
0E3E    4000 164C    641          STH   R0,ETESTNO         MOVE TO MESSAGE                  MBF06410
0E42    4000 160C    642          STH   R0,ISITERR         TO FORCE ERROR PRINT             MBF06420
0E46    26F1         643          AIS   R15,ADC-1                                           MBF06430
0E48    C4F0 FFFE    644          NHI   R15,0-ADC                                           MBF06440
0E4C    48CF 0000    645          LDA   R12,0(R15)         FIRST PARAMETER                  MBF06450
0E50    48DF 0002    646          LDA   R13,ADC(R15)       SECOND PARAMETER                 MBF06460
0E54    41E0 0E86    647          BAL   R14,ERR1           'ERROR TTNN'                     MBF06470
0E58    01EC         648          BALR  R14,R12            GO TO FIRST ROUTINE,             MBF06480
0E5A    01ED         649          BALR  R14,R13            SECOND ROUTINE.                  MBF06490
                     650  *                                                                 MBF06500
0E5C    2400         651  ERRCOM1 LIS   R0,0                                                MBF06510
0E5E    4000 160C    652          STH   R0,ISITERR         RESET ERROR PRINT FLAG           MBF06520
0E62    2411         653          LIS   R1,1                                               MBF06530
0E64    4010 160E    654          STH   R1,NOERR           SUPPRESS THAT PRINT              MBF06540
0E68    6110 161A    655          AHM   R1,TOTERR          INCREMENT TOTERR                 MBF06550
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0E6C  2138            656           BNZS  ERRCOM2          BRANCH: STILL COUNTING.           MBF06560
0E6E. 2511            657           LCS   R1,1             65,535 ERRORS REPORTED           MBF06570
0E70  4010 161A       658           STH   R1,TOTERR                                         MBF06580
0E74  41F0 12D8       659           BAL   R15,TSTDU        LIST DEVICE OFF-LINE ?           MBF06590
0E78  4230 0D8E       660           BNZ   HALT9            BRANCH: YES.                     MBF06600
0E7C  D100 207C       661 ERRCOM2   LM    R0,ERRSAVE       RESTORE REGISTERS                MBF06610
0E80  D1F0 2C50       662           LM    R15,$R15SAV      RESTORE LINK                     MBF06620
0E84  030F            663           BR    R15              RETURN TO CALLER.                MBF06630
                      664  *---------------------------                                     MBF06640
                      665  * MESSAGE PRINT ROUTINES        (DO NOT OVERRIDE NOMSG OPTION)   MBF06650
                      666  * RETURN LINK R14; REGISTERS MODIFIED R0,R1,R2,R5.               MBF06660
                      667  *                                                                MBF06670
                      668  *    TO PRINT 'ERROR TTNN'                                       MBF06680
                      669  *                                                                MBF06690
0E86                  670           CNOP  ADC              ALIGN PARAMETER                  MBF06700
0E86  D0E0 2C54       671 ERR1      STM   R14,$R14SAV      SAVE LINK                        MBF06710
0E8A  41E0 0F30       672           BAL   R14,$MSGPRT1     PRINT MESSAGE                    MBF06720
0E8E  1646            673           DAC   ERRMSG           'ERROR TTNN'                     MBF06730
                      674  *                               TT FROM MTESTNO, NN FROM ERRNO  MBF06740
                      675  *                                                                MBF06750
                      676  *    TO PRINT 'DEV DDD'                                          MBF06760
                      677  *                                                                MBF06770
0E90  D0E0 2C54       678 ERRD1     STM   R14,$R14SAV      SAVE LINK                        MBF06780
0E94  2403            679           LIS   R0,3             SET UP DIGITS = 3                MBF06790
0E96  4810 15FA       680           LH    R1,ERRDEV        R1 = ERROR DEV # IN BINARY       MBF06800
0E9A  41E0 0F20       681           BAL   R14,$MSGPRT      PRINT 'DEV DDD'                  MBF06810
0E9E  1681            682           DAC   ASCIDEV2         HEXASC DESTINATION               MBF06820
0EA0  167D            683           DAC   DEVMSG2          A(MESSAGE)                       MBF06830
                      684  *                                                                MBF06840
                      685  *    TO PRINT 'STA SS'                                           MBF06850
                      686  *                                                                MBF06860
0EA2  D0E0 2C54       687 ERRS1     STM   R14,$R14SAV      SAVE LINK                        MBF06870
0EA6  2402            688           LIS   R0,2             SET UP DIGITS = 2                MBF06880
0EA8  D310 15FC       689           LB    R1,ERRSTA        R1 = ERROR STATUS                MBF06890
0EAC  41E0 0F20       690           BAL   R14,$MSGPRT      PRINT 'STA SS'                   MBF06900
0EB0  1678            691           DAC   ASCISTA          HEXASC DESTINATION               MBF06910
0EB2  1674            692           DAC   STAMSG           A(MESSAGE)                       MBF06920
                      693  *                                                                MBF06930
                      694  *    TO PRINT 'DEV DDD STA SS'                                   MBF06940
                      695  *                                                                MBF06950
0EB4  D0E0 2C54       696 ERRDS1    STM   R14,$R14SAV      SAVE LINK                        MBF06960
0EB8  2403            697           LIS   R0,3             SET UP DIGITS = 3                MBF06970
0EBA  4810 15FA       698           LH    R1,ERRDEV        R1 = ERROR DEV #                 MBF06980
0EBE  C820 1670       699           LDAI  R2,ASCIDEV       HEXASC DESTINATION               MBF06990
0EC2  41F0 0F9E       700           BAL   R15,HEXASC       CONVERT IT TO ASCII              MBF07000
0EC6  2402            701           LIS   R0,2             SET UP DIGITS = 2                MBF07010
0EC8  D310 15FC       702           LB    R1,ERRSTA        R1 = ERROR STATUS                MBF07020
0ECC  41E0 0F20       703           BAL   R14,$MSGPRT      PRINT 'DEV DDD STA SS'           MBF07030
0ED0  1678            704           DAC   ASCISTA          HEXASC DESTINATION               MBF07040
0ED2  166C            705           DAC   DEVMSG           A(MESSAGE)                       MBF07050
                      706  *                                                                MBF07060
                      707  *    TO PRINT 'PSW PPPP  LOC LLLL'                               MBF07070
                      708  *                                                                MBF07080
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0ED4    00E0 2C54    709 ERRPL1   STM    R14,$R14SAV      SAVE REGISTERS                MBF07090
0ED8    01E0 15E0    710          LM     R14,OLDPSW       R14 = PSW, R15 = LOC          MBF07100
0EDC    081E         711          LDAR   R1,R14           PSW TO PRINT REGISTER         MBF07110
0EDE                 712          IFZ    ADC-2                                          MBF07120
0EDE    2404         713          LIS    R0,4             ASSUME SERIES 16              MBF07130
0EE0    4850 15F8    714          LH     R5,MOD32                                       MBF07140
0EE4    2332         715          BZS    ERRPL1A                                        MBF07150
                     716          ENDC                                                 MBF07160
0EE6    2406         717          LIS    R0,6             SERIES 32                     MBF07170
0EE8    C820 169B    718 ERRPL1A  LDAI   R2,ASCIPSW       DESTINATION                   MBF07180
0EEC    C850 1697    719          LDAI   R5,PSWMSG                                      MBF07190
0EF0    41F0 0F9E    720          BAL    R15,HEXASC       CONVERT PSW                   MBF07200
0EF4    2305         721          BS     ERRPL1B          GO CONVERT LOC                MBF07210
                     722 *                                                             MBF07220
                     723 *   TO PRINT 'LOC LLLL'                                        MBF07230
                     724 *                                                             MBF07240
0EF6    00E0 2C54    725 ERRL1    STM    R14,$R14SAV      SAVE REGISTERS                MBF07250
0EFA    C850 16A3    726          LDAI   R5,LOCMSG        A(MESSAGE)                    MBF07260
0EFE    01E0 15E0    727 ERRPL1B  LM     R14,OLDPSW       R15 = OLD LOC TO PRINT        MBF07270
0F02    081F         728          LDAR   R1,R15           DATA TO PRINT REGISTER        MBF07280
0F04                 729          IFZ    ADC-2                                          MBF07290
0F04    2404         730          LIS    R0,4             ASSUME SERIES 16              MBF07300
0F06    48F0 15F8    731          LH     R15,MOD32                                      MBF07310
0F0A    2332         732          BZS    ERRL1A                                         MBF07320
                     733          ENDC                                                 MBF07330
0F0C    2406         734          LIS    R0,6             SERIES 32                     MBF07340
0F0E    C820 16A7    735 ERRL1A   LDAI   R2,ASCILOC       DESTINATION                   MBF07350
0F12    41F0 0F9E    736          BAL    R15,HEXASC       CONVERT                       MBF07360
0F16    41F0 105A    737          BAL    R15,PRINT        PRINT                         MBF07370
0F1A    01E0 2C54    738          LM     R14,$R14SAV      RESTORE LINK                  MBF07380
0F1E    030E         739          BR     R14              RETURN                        MBF07390
                     740 *                                                             MBF07400
                     741 * ROUTINE IS CALLED BY MESSAGE PRINT ROUTINES                MBF07410
                     742 *                                                             MBF07420
0F20    26E1         743 $MSGPRT  AIS    R14,ADC-1                                      MBF07430
0F22    C4E0 FFFE    744          NHI    R14,0-ADC                                      MBF07440
0F26    482E 0000    745          LDA    R2,0(R14)        HEXASC DESTINATION            MBF07450
0F2A    41F0 0F9E    746          BAL    R15,HEXASC       CONVERT DATA TO HEXADECIMAL   MBF07460
0F2E    26E2         747          AIS    R14,ADC                                        MBF07470
0F30    485E 0000    748 $MSGPRT1 LDA    R5,0(R14)        A(MESSAGE TO PRINT)           MBF07480
0F34    41F0 105A    749          BAL    R15,PRINT        PRINT SPECIFIED MESSAGE       MBF07490
0F38    01E0 2C54    750          LM     R14,$R14SAV                                    MBF07500
0F3C    030E         751          BR     R14              RETURN TO ORIGINAL CALLER     MBF07510
                     752 * ------------------------------                               MBF07520
                     753 *                                                             MBF07530
                     754 * TO OBTAIN OPTION VALUE IN R6      (R7:R6, TARGT 16)         MBF07540
                     755 * RETURNS WHEN SPECIAL CHARACTER FOUND. IGNORES SPACES.       MBF07550
                     756 *                                                             MBF07560
0F3E    2460         757 OPTVAL   LIS    R6,0             INITIALIZE ACCUMULATOR        MBF07570
0F40                 758          IFZ    ADC-2                                          MBF07580
0F40    2470         759          LIS    R7,0             HIGH-ORDER BITS, TARGT 16     MBF07590
                     760          ENDC                                                 MBF07600
0F42    0343 2CAC    761 $OPTV.0  LB     R4,$INBUF(R3)    GET NEXT INPUT CHARACTER      MBF07610
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EXEC - ETPE R05P0

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0F46   C530 0050      762           CLHI   R3,$BUFLEN      AT END OF INPUT BUFFER ?        MBF07620
0F4A   038E           763           BNLR   R14             RETURN IF YES.                  MBF07630
0F4C   2631           764           AIS    R3,1            ADVANCE BUFFER POINTER          MBF07640
0F4E   C540 0020      765           CLHI   R4,C' '         SPACE ?                         MBF07650
0F52   2238           766           BES    $OPTV.0         BRANCH: YES. IGNORE.            MBF07660
0F54   C540 0030      767           CLHI   R4,C'0'         LESS THAN ZERO ?                MBF07670
0F58   028E           768           BLR    R14             RETURN IF SPECIAL CHARACTER     MBF07680
0F5A   24FF           769           LIS    R15,15                                          MBF07690
0F5C   D44F 162C      770  $OPTV.2  CLB    R4,HEXTAB(R15)  SCAN TABLE                      MBF07700
0F60   2334           771           BES    $OPTV.3         MATCH                           MBF07710
0F62   27F1           772           SIS    R15,1                                           MBF07720
0F64   2214           773           BNMS   $OPTV.2                                         MBF07730
0F66   030C           774           BR     R12             ERROR; VALUE NOT IN TABLE.      MBF07740
0F68   EB60 0004      775  $OPTV.3  RLL    R6,4            (R6:R7), SERIES 16              MBF07750
0F6C   066F           776           OAR    R6,R15          OR IN CURRENT DIGIT             MBF07760
0F6E   4300 0F42      777           B      $OPTV.0                                         MBF07770
                      778  *------------------------------                                 MBF07780
                      779  * TO CONVERT (R6) FROM BINARY TO UNARY PATTERN, IN R3           MBF07790
                      780  *                                                               MBF07800
0F72   2438           781  UNARY    LIS    R3,8            BIT TO SHIFT                    MBF07810
0F74   913C           782           SLHLS  R3,12           R3 = '8000'                     MBF07820
0F76   CC36 0000      783           SRHL   R3,0(R6)        SHIFT TO DESIRED POSITION       MBF07830
0F7A   030E           784           BR     R14             AND RETURN.                     MBF07840
                      785  *                                                               MBF07850
                      786  *-------------------------                                      MBF07860
                      787  *                                                               MBF07870
0F7C                  788           IFNZ   $CLOCK          0 = INCLUDE NO TIMERS           MBF07880
       0000 0F7C      789  $TIMER   EQU    *                                               MBF07890
0F7C                  790           IFZ    $CLOCK-3        3 = INCLUDE BOTH                MBF07900
                      792           ELSE
       0000 0F7C      793  TIMER    EQU    *                                               MBF07930
                      794           ENDC                                                   MBF07940
                      795  * TO PROVIDE # OF MILLISECONDS DELAY SPECIFIED BY R0            MBF07950
                      796  *                                                               MBF07960
0F7C   D000 2CFC      797           STM    R0,RSAVE        SAVE REGISTERS                  MBF07970
0F80   2410           798  $STIM1   LIS    R1,0                                            MBF07980
0F82   2421           799           LIS    R2,1                                            MBF07990
0F84   4830 045A      800           LH     R3,$TIMVAL      (R3) = CONSTANT FOR 1 MSEC DELAY MBF08000
0F88   C110 0F88      801           BXLE   R1,*                                            MBF08010
0F8C   2701           802           SIS    R0,1                                            MBF08020
0F8E   2037           803           BNZS   $STIM1          LOOP TILL SPECIFIED DELAY       MBF08030
*  0F90 2301          804           B      $TIMRET         RELOAD REGISTERS, RETURN (R15)  MBF08040
                      805  *                                                               MBF08050
                      806  *-------------------------                                      MBF08060
                      807  *                                                               MBF08070
0F92   D100 2CFC      829  $TIMRET  LM     R0,RSAVE        RESTORE USER'S REGISTERS        MBF08290
0F96   030F           830  $TIMXT   BR     R15             AND RETURN.                     MBF08300
                      832  * -------------------------                                     MBF08320
                      833  * ROUTINE RESTORES REGISTERS SAVED ON ENTRY TO CALLING ROUTINE  MBF08330
                      834  * AND RETURNS BY R15                                            MBF08340
                      835  *                                                               MBF08350
0F98   D100 2CFC      836  $RSAVRET LM     R0,RSAVE                                        MBF08360
0F9C   030F           837           BR     R15             RETURN TO ORIGINAL CALLER       MBF08370
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                                838   ******* THIS IS WHERE TO IMPLEMENT STACK                      MBF08380
                                839   *                                                             MBF08390
                                861   *------------------------------                               MBF08610
                                862   *  TO CONVERT HEXADECIMAL DATA IN R1 TO ASCII CHAR & STORE @ 0(R2)  MBF08620
                                863   * OUTPUTS UP TO 4 DIGITS (8 DIGITS, SERIES 32)                MBF08630
                                864   *                                                             MBF08640
  0F9E   D000 2CFC              865   HEXASC   STM   R0,RSAVE           STORE REGISTERS             MBF08650
  0FA2   0830                   866            LDAR  R3,R0              R3 = DIGITS                 MBF08660
  0FA4   9132                   867            SLLS  R3,2                                           MBF08670
  0FA6   2734                   868            SIS   R3,4               R3 = 4(DIGITS)-4            MBF08680
  0FA8   0841                   869   $HEXA.1  LDAR  R4,R1              R4 = HEX DATA               MBF08690
  0FAA   EC43 0000              870            SRL   R4,0(R3)                                       MBF08700
  0FAE   C440 000F              871            NHI   R4,15              R4 = HEX DIGIT TO BE CONVERTED  MBF08710
  0FB2   D344 162C              872            LB    R4,HEXTAB(R4)                                  MBF08720
  0FB6   D242 0000              873            STB   R4,0(R2)           STORE ASCII CHAR            MBF08730
  0FBA   2621                   874            AIS   R2,1                                           MBF08740
  0FBC   2734                   875            SIS   R3,4                                           MBF08750
  0FBE   2216                   876            BNMS  $HEXA.1            LOOP TILL ALL DIGITS        MBF08760
  0FC0   4300 0F98              877            B     $RSAVRET           RESTORE REGISTERS, RETURN (R15)  MBF08770
                                904   * ----------------------------------                         MBF09040
                                905   * TO OUTPUT LIST OF BITS IN ASCENDING NUMERIC ORDER,         MBF09050
                                906   * STARTING FROM HIGH-ORDER BIT AS BIT 0                      MBF09060
                                907   * DOES NOT OVERLAY OPTION NAME IN $OUTBUF.                   MBF09070
                                908   *                                                            MBF09080
  0000   0FC4                   909   $LSTBIT  EQU   *                                             MBF09090
  0FC4   D000 207C              910            STM   R0,ERRSAVE         SAVE REGISTERS              MBF09100
  0FC8   2401                   911            LIS   R0,1               DIGITS TO OUTPUT            MBF09110
  0FCA   2410                   912            LIS   R1,0               STARTING WITH NUMBER 0      MBF09120
  0FCC   2470                   913            LIS   R7,0               PRINT FLAG                  MBF09130
  0FCE   4835 0000              914            LH    R3,0(R5)           LOW-NUMBERED PARAMETER BITS MBF09140
  0FD2   2136                   915            BNZS  $LSTB.B            BRANCH: ONE SET             MBF09150
  0FD4   4835 0002              916   $LSTB.A  LH    R3,2(R5)           HIGH-NUMBERED PARAMETER BITS  MBF09160
  0FD8   2402                   917            LIS   R0,2               2 DIGITS NEEDED FOR HEXASC  MBF09170
  0FDA   C810 0010              918            LHI   R1,X'10'           BIT NUMBER BASE             MBF09180
  0FDE   2428                   919   $LSTB.B  LIS   R2,$CKROUT+2       NO OVERLAY OF OPTION NAME   MBF09190
  0FE0   9131                   920   $LSTB.0  SLHLS R3,1               TEST LEFTMOST HALFWORD BIT  MBF09200
  0FE2   4380 1004              921            BNC   $LSTB.2A           BRANCH: ZERO.               MBF09210
  0FE6   C520 0008              922            CLHI  R2,$CKROUT+2       ANY OUTPUT YET ?            MBF09220
  0FEA   2336                   923            BES   $LSTB.1            BRANCH: NO                  MBF09230
  0FEC   C840 002C              924            LHI   R4,C','            COMMA                       MBF09240
  0FF0   D242 2C5C              925            STB   R4,$OUTBUF(R2)     INSERT IN BUFFER            MBF09250
  0FF4   2621                   926            AIS   R2,1                                           MBF09260
  0FF6   08D2                   927   $LSTB.1  LDAR  R13,R2             SAVE BUFFER OFFSET          MBF09270
  0FF8   CA20 2C5C              928            AHI   R2,$OUTBUF         HEXASC DESTINATION          MBF09280
  0FFC   41F0 0F9E              929            BAL   R15,HEXASC         CONVERT BIT NUMBER          MBF09290
  1000   082D                   930            LDAR  R2,R13             GET OFFSET                  MBF09300
  1002   0A20                   931   $LSTB.2  AAR   R2,R0              INCREMENT BUFFER POINTER    MBF09310
  1004   2611                   932   $LSTB.2A AIS   R1,1               INCREMENT BIT NUMBER        MBF09320
  1006   C310 000F              933            THI   R1,15              HALFWORD COMPLETED ?        MBF09330
  100A   4230 0FE0              934            BNZ   $LSTB.0            BRANCH: NO.                 MBF09340
  100E   244D                   935            LIS   R4,X'0D'           CARRIAGE RETURN             MBF09350
  1010   D242 2C5C              936            STB   R4,$OUTBUF(R2)     INSERT IN BUFFER            MBF09360
  1014   0672                   937            OAR   R7,R2              ACCUMULATE HIGHEST BYTE COUNT  MBF09370
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1016   C520 0008      938              CLHI    R2,$CKROUT+2      ANY OUTPUT THIS TIME ?          MBF09380
101A   2333           939              BES     $LSTB.2B          BRANCH: NO.                     MBF09390
101C   41F0 1050      940              BAL     R15,@PRINT        PRINT THE BUFFER.               MBF09400
1020   C510 0020      941  $LSTB.2B    CLHI    R1,32             FULLWORD COMPLETED ?            MBF09410
1024   4280 0F04      942              BL      $LSTB.A           BRANCH: NO.                     MBF09420
1028   2778           943              SIS     R7,$CKROUT+2      ANY OUTPUT DONE ?               MBF09430
102A   2133           944              BNZS    $LSTB.2C          BRANCH: YES.                    MBF09440
102C   41F0 1050      945              BAL     R15,@PRINT        PRINT OPTION NAME IN BUFFER.    MBF09450
1030   D100 2D7C      946  $LSTB.2C    LM      R0,ERRSAVE                                        MBF09460
1034   030F           947              BR      R15               RETURN                          MBF09470
                      948   * ----------------------------                                       MBF09480
                      964   *  TO OUTPUT CR,LF TO LIST DEVICE                                    MBF09640
                      965   *                                                                    MBF09650
1036   D000 2CFC      966  CRLF        STM     R0,RSAVE          SAVE REGISTERS                  MBF09660
103A   C850 16F8      967              LDAI    R5,CRLFMSG        CR, LF                          MBF09670
103E   4300 105E      968              B       $P1               GO PRINT LINE.                  MBF09680
                      969   *                                                                    MBF09690
1042   26F1           970  $PRINT      AIS     R15,ADC-1                                         MBF09700
1044   C4F0 FFFE      971              NHI     R15,0-ADC                                         MBF09710
1048   485F 0000      972              LDA     R5,0(R15)         A(MESSAGE TO PRINT)             MBF09720
104C   26F2           973              AIS     R15,ADC                                           MBF09730
104E   2306           974              BS      $P0                                              MBF09740
                      975   *                                                                    MBF09750
1050   D000 2CFC      976  @PRINT      STM     R0,RSAVE          SAVE REGISTERS                  MBF09760
1054   C850 2C5C      977              LDAI    R5,$OUTBUF        TO PRINT OUTPUT BUFFER          MBF09770
1058   2303           978              BS      $P1                                              MBF09780
                      979   *                                                                    MBF09790
       0000 105A      980  PRINT       EQU     *                 TO PRINT THE ASCII MESSAGE      MBF09800
105A   D000 2CFC      981  $P0         STM     R0,RSAVE          STORE REGISTERS                 MBF09810
105E   2400           982  $P1         LIS     R0,0                                             MBF09820
1060   4000 1612      983              STH     R0,$LINEPOS       RESET BUFFER                    MBF09830
1064   41F0 1208      984              BAL     R15,TSTDU         IS DEVICE UNAVAILABLE ?         MBF09840
1068   4230 0F98      985              BNZ     $RSAVRET          IF YES, RELOAD REGISTERS, RETURN. MBF09850
                      986   *                                                                    MBF09860
106C   4810 1616      987              LH      R1,$WASDU         WAS DEVICE EVER SEEN DU ?       MBF09870
1070   4230 008E      988              BNZ     HALT9             OUTPUT TOTAL, TOTERR.           MBF09880
                      989   *                                                                    MBF09890
1074   4800 160C      990              LH      R0,ISITERR        AN ERROR MESSAGE ?              MBF09900
1078   4500 17C8      991              CLH     R0,NOMSG+$VALU1   IF SO, CAN BE SUPPRESSED ?      MBF09910
107C   4280 0F98      992              BL      $RSAVRET          BRANCH: MESSAGE IS SUPPRESSED.  MBF09920
                      993   *                                                                    MBF09930
1080   D345 0000      994  $PRT.2      LB      R4,0(R5)          GET A MESSAGE BYTE              MBF09940
1084   41F0 1002      995              BAL     R15,OUTCHR        OUTPUT IT                       MBF09950
1088   274D           996              SIS     R4,X'0D'          CR ?                            MBF09960
108A   233A           997              BZS     $PRT.3            MSG OVER                        MBF09970
108C   2651           998              AIS     R5,1                                             MBF09980
108E   C350 0002      999              THI     R5,2              TIME TO CHECK BREAK ?           MBF09990
1092   2239          1000              BZS     $PRT.2            BRANCH: NO.                     MBF10000
1094   4050 1614     1001              STH     R5,$PRTFLG        TO DEFER BREAK ACKNOWLEDGE      MBF10010
1098   41F0 1248     1002              BAL     R15,TSTBRK                                        MBF10020
109C   220E          1003              BS      $PRT.2            LOOP FOR NEXT CHAR              MBF10030
                     1004   *                                                                    MBF10040
109E   244A          1005  $PRT.3      LIS     R4,X'0A'          LF                              MBF10050
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EXEC - ETPE R05P0

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10A0    41F0 1002      1006            BAL    R15,OUTCHR       LF                                  MBF10060
10A4    2440           1007            LIS    R4,0             ASCII 'NUL'                         MBF10070
10A6    41F0 1002      1008            BAL    R15,OUTCHR       TERMINAL CHARACTER                  MBF10080
10AA    41F0 1248      1009            BAL    R15,TSTBRK                                           MBF10090
10AE    4040 1614      1010            STH    R4,$PRTFLG       RE-ENABLE BREAK ACKNOWLEDGE         MBF10100
10B2    48F0 1608      1011            LH     R15,$BRKFLG                                          MBF10110
10B6    4040 1608      1012            STH    R4,$BRKFLG       BREAK BEING ACKNOWLEDGED            MBF10120
10BA    4330 0F98      1013            BZ     $RSAVRET         RESTORE REGISTERS, RETURN (R15)     MBF10130
10BE    40F0 160C      1014            STH    R15,ISITERR      FORCE MESSAGE PRINT                 MBF10140
10C2    C550 16F3      1015            CLAI   R5,$BRKEND       PRINTING 'BRK TERM' MESSAGE ?       MBF10150
10C6    2334           1016            BES    $PRT.4           BRANCH: YES.                        MBF10160
10C8    41F0 1042      1017            BAL    R15,$PRINT       'RECURSIVE' CALL                    MBF10170
10CC    160A           1018            DAC    BRKMSG           'BREAK TERMINATION'                 MBF10180
10CE    4300 0AB8      1019  $PRT.4    B      OPTIN1           TO CMD PROCESSOR                    MBF10190
                       1020        *--------------------------------                               MBF10200
                       1021        *  TO OUTPUT A CHARACTER TO THE LIST DEVICE                     MBF10210
                       1022        *                                                              MBF10220
1002    40F0 1624      1023  OUTCHR    STA    R15,OUT.SAV      SAVE RETURN ADDRESS                 MBF10230
1006    0310 160B      1024            LB     R1,IOSAVE+1                                          MBF10240
100A    2714           1025            SIS    R1,4                                                MBF10250
100C    4230 110C      1026            BNZ    $OTC.4           BRANCH IF NOT CAROUSEL              MBF10260
10E0    4010 1620      1027  $OTC.0    STH    R1,$PAUSE        ZERO $PAUSE FLAG                    MBF10270
10E4    41F0 1208      1028  $OTC.1    BAL    R15,TSTDU        ON LINE ?                           MBF10280
10E8    4230 1132      1029            BNZ    $OTC.7           BRANCH: OFFLINE. EXIT.              MBF10290
10EC    9D21           1030            SSR    R2,R1            GET CAROUSEL STATUS                 MBF10300
10EE    2385           1031            BFFS   8,$OTC.3         BRANCH IF CHAR. IS TO BE READ       MBF10310
10F0    4810 1620      1032  $OTC.2    LH     R1,$PAUSE        PAUSED NOW ?                        MBF10320
10F4    2038           1033            BNZS   $OTC.1           YES, LOOP                           MBF10330
10F6    230B           1034            BS     $OTC.4           NO, GO OUTPUT CHARACTER             MBF10340
10F8    9821           1035  $OTC.3    RDR    R2,R1            GET CAROUSEL CHARACTER              MBF10350
10FA    C410 007F      1036            NHI    R1,X'7F'                                            MBF10360
10FE    C510 0014      1037            CLHI   R1,X'14'         DC4 ?                               MBF10370
1102    4330 10E0      1038            BE     $OTC.0           DC4. SET $PAUSE FLAG.               MBF10380
1106    CB10 0012      1039            SHI    R1,X'12'         DC2 ?                               MBF10390
110A    203D           1040            BNZS   $OTC.2           BRANCH: NO. CHECK IF PAUSED NOW.    MBF10400
                       1041        *                                                              MBF10410
110C    4010 1620      1042  $OTC.4    STH    R1,$PAUSE        RESET FLAG                          MBF10420
1110    4110 1350      1043            BAL    R1,$SETUP        SET UP FOR OUTPUT                   MBF10430
1114    9D01           1044  $OTC.5    SSR    R0,R1            WAIT FOR NOT BUSY                   MBF10440
1116    4230 1132      1045            BTC    3,$OTC.7         BRANCH IF OFF-LINE                  MBF10450
111A    C410 00FC      1046            NHI    R1,X'FC'                                            MBF10460
111E    C510 000C      1047            CLHI   R1,X'0C'         HDX PASLA OFF-LINE ?                MBF10470
1122    2338           1048            BES    $OTC.7           BRANCH: YES.                        MBF10480
1124    C310 0008      1049            THI    R1,8             BUSY ?                              MBF10490
1128    203A           1050            BNZS   $OTC.5           WAIT FOR NOT BUSY.                  MBF10500
112A    9A04           1051            WDR    R0,R4            OUTPUT DATA BYTE                    MBF10510
112C    9D01           1052  $OTC.6    SSR    R0,R1            WAIT FOR NOT BUSY                   MBF10520
112E    2172           1053            BTFS   7,$OTC.7         BRANCH IF OFF-LINE (PASLA HANGS)    MBF10530
1130    2082           1054            BTBS   8,$OTC.6         WAIT FOR NOT BSY                    MBF10540
1132    48F0 1624      1055  $OTC.7    LDA    R15,OUT.SAV                                          MBF10550
1136    030F           1056            BR     R15              RETURN                              MBF10560
                       1057        * --------------------------------                              MBF10570
                       1075        * ROUTINE GETS INPUT RECORD                                     MBF10750
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                             1076  *                                                                                   MBF10760
1138    D000 2CFC            1077  $READ    STM    R0,RSAVE              SAVE REGISTERS                                MBF10770
113C    25D1                 1078  $RD.1    LCS    R13,1                 INITIALIZE                                    MBF10780
113E    26D1                 1079  $RD.2    AIS    R13,1                 INCREMENT BUFFER POINTER                      MBF10790
1140    40D0 1612            1080           STH    R13,$LINEPOS          ADDRESS OF CURRENT BYTE                       MBF10800
1144    4140 1334            1081  $RD.3    BAL    R4,KBREAD             PUT DEVICE IN READ MODE                       MBF10810
1148    9D04                 1082           SSR    R0,R4                                                               MBF10820
114A    2081                 1083           BTBS   8,1                   IF BUSY, LOOP (POSSIBLE HANG)                 MBF10830
114C    9B04                 1084           RDR    R0,R4                 READ A CHAR IN R4                             MBF10840
114E    D390 0A10            1085           LB     R9,IO                                                               MBF10850
1152    2792                 1086           SIS    R9,2                                                               MBF10860
1154    2338                 1087           BZS    $RD.3D                                                             MBF10870
1156    4890 0A2C            1088           LH     R9,CONWADR            GET WRITE ADDRESS                             MBF10880
115A    DE90 0A2F            1089           OC     R9,CONWRT             TURN DEVICE AROUND                            MBF10890
115E    9D93                 1090           SSR    R9,R3                                                               MBF10900
1160    2081                 1091           BTBS   8,1                   WAIT FOR BUSY NOT                             MBF10910
1162    9A94                 1092           WDR    R9,R4                 ECHO RECEIVED BYTE                            MBF10920
1164    C440 007F            1093  $RD.3D   NHI    R4,X'7F'             REMOVE PARITY BIT                             MBF10930
1168    C540 0060            1094           CLHI   R4,X'60'             UPPER-CASE CHARACTER ?                        MBF10940
116C    2183                 1095           BLS    $RD.4                 BRANCH: NO.                                   MBF10950
116E    CB40 0020            1096           SHI    R4,X'20'             CONVERT TO LOWER-CASE                         MBF10960
1172    C540 0023            1097  $RD.4    CLHI   R4,X'23'             HASH-MARK ?                                   MBF10970
1176    4330 0AB0            1098           BE     OPTIN                 BRANCH: YES. GO TO CMD PROC.                 MBF10980
117A    C540 0018            1099           CLHI   R4,X'18'             ASCII 'CANCEL' CHARACTER ?                    MBF10990
117E    4330 0AB0            1100           BE     OPTIN                 BRANCH: YES.                                  MBF11000
1182    C540 005F            1101           CLHI   R4,X'5F'             BACKARROW, UNDERLINE, DELETE ?                MBF11010
1186    2334                 1102           BES    $RD.5                 BRANCH: DELETE LAST CHARACTER                MBF11020
1188    C540 0008            1103           CLHI   R4,X'08'             BACKSPACE ?                                   MBF11030
118C    2136                 1104           BNES   $RD.6                 BRANCH: NO.                                   MBF11040
118E    27D2                 1105  $RD.5    SIS    R13,2                 TO DELETE LAST CHARACTER                      MBF11050
1190    4210 113C            1106           BM     $RD.1                 BRANCH: NO UNDERFLOW ALLOWED.                MBF11060
1194    4300 113E            1107           B      $RD.2                 GET ANOTHER CHARACTER                         MBF11070
1198    D24D 2CAC            1108  $RD.6    STB    R4,$INBUF(R13)        STORE CURRENT INPUT BYTE                     MBF11080
119C    C540 000D            1109           CLHI   R4,X'0D'             CARRIAGE RETURN ?                             MBF11090
11A0    2135                 1110           BNES   $RD.7                 BRANCH: NOT YET.                              MBF11100
11A2    C850 16F8            1111           LDAI   R5,CRLFMSG                                                          MBF11110
11A6    4300 105E            1112           B      $P1                   OUTPUT (CR),(LF) TO CONSOLE, RETURN.         MBF11120
11AA    C5D0 004F            1113  $RD.7    CLHI   R13,$BUFLEN-1         BUFFER AT MAX ?                              MBF11130
11AE    4280 113E            1114           BL     $RD.2                 BRANCH: NOT YET.                              MBF11140
11B2    4300 1144            1115           B      $RD.3                 BRANCH: FORCE OVERLAY OF LAST CHARACT        MBF11150
                             1116  *                                                                                   MBF11160
                             1117  * -------------------------------                                                  MBF11170
                             1118  * SET UP FOR CONSOLE, LIST I/O DEVICES                                             MBF11180
                             1119  *                                                                                   MBF11190
11B6    D310 0A10            1120  STCON    LB     R1,IO                 GET I/O IDENTIFIERS                           MBF11200
11BA    D320 0A11            1121           LB     R2,IO+1                                                             MBF11210
11BE    2436                 1122           LIS    R3,$MAXIO             IDENTIFIER CAN BE 1,2,3,4,5                  MBF11220
11C0    0513                 1123           CLAR   R1,R3                                                              MBF11230
11C2    2182                 1124           BLS    $STC.1                BRANCH IF KB IDENTIFIER OK                    MBF11240
11C4    2411                 1125           LIS    R1,1                  ELSE FORCE CRT                                MBF11250
11C6    0523                 1126  $STC.1   CLAR   R2,R3                                                              MBF11260
11C8    2182                 1127           BLS    $STC.2                SAME TEST FOR LIST DEVICE                     MBF11270
11CA    2421                 1128           LIS    R2,1                                                               MBF11280
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11CC   D210 0A10      1129   $STC.2    STB    R1,IO              REESTABLISH VALUES                        MBF11290
11D0   D220 0A11      1130             STB    R2,IO+1                                                      MBF11300
11D4   D362 0A48      1131             LB     R6,CONRQ2S(R2)                                               MBF11310
11D8   4060 1604      1132             STH    R6,$LSTPAS         SET PASLA FLAG (LIST DEVICE)              MBF11320
11DC   0866           1133             LDAR   R6,R6                                                        MBF11330
11DE   2336           1134             BZS    $STC.3             SKIP IF NOT PASLA                         MBF11340
11E0   9122           1135             SLHLS  R2,2                                                         MBF11350
11E2   4802 0A10      1136             LH     R0,IO(R2)                                                    MBF11360
11E6   DE02 0A32      1137             OC     R0,CONCMD(R2)      ISSUE 2ND COMMAND (TO LIST DEVICE***      MBF11370
                      1138   *                                                                            MBF11380
11EA   41F0 1320      1139   $STC.3    BAL    R15,SETKB          ESTABLISH KEYBOARD DEVICE (& IOSAVE)      MBF11390
11EE   9310           1140             LBR    R1,R0              (R1) = 1,2,4,5 ; (R0 = KBIDENT)           MBF11400
11F0   9112           1141             SLHLS  R1,2               (R1)=4,8,16,20                            MBF11410
11F2   2712           1142             SIS    R1,2                                                         MBF11420
11F4   4831 0A10      1143             LH     R3,IO(R1)                                                    MBF11430
11F8   4030 0A2A      1144             STH    R3,CONRADR         SET UP CONSOLE DEVICE READ ADDRESS        MBF11440
11FC   4831 0A12      1145             LH     R3,IO+2(R1)                                                  MBF11450
1200   4030 0A2C      1146             STH    R3,CONWADR         SET UP CONSOLE WRITE ADDRESS              MBF11460
1204   4821 0A32      1147             LH     R2,CONCMD(R1)                                                MBF11470
1208   4020 0A2E      1148             STH    R2,CONRD           SET UP R/W COMMANDS                       MBF11480
120C   4821 0A34      1149             LH     R2,CONCMD+2(R1)                                              MBF11490
1210   4020 0A30      1150             STH    R2,CON2ND          2ND CMD: ENABLE READ CMD                  MBF11500
1214   9310           1151             LBR    R1,R0                                                        MBF11510
1216   D341 0A48      1152             LB     R4,CONRQ2S(R1)                                               MBF11520
121A   D240 0A48      1153             STB    R4,CONRQ2S         CONSOLE REQUEST TO SEND                   MBF11530
121E   4040 1602      1154             STH    R4,$CONPAS         SET PASLA FLAG (CONSOLE)                  MBF11540
1222   0844           1155             LDAR   R4,R4                                                        MBF11550
1224   2333           1156             BZS    $STC.4             SKIP 2ND OC IF NOT PASLA DEVICE           MBF11560
1226   9422           1157             EXBR   R2,R2                                                        MBF11570
1228   9E32           1158             OCR    R3,R2              ISSUE 2ND COMMAND (TO CONSOLE)            MBF11580
122A   DE30 0A2E      1159   $STC.4    OC     R3,CONRD           PUT CONSOLE IN READ MODE                  MBF11590
122E   9B32           1160             RDR    R3,R2              READ A DUMMY CHARACTER (SET BUSY)         MBF11600
1230   0844           1161             LDAR   R4,R4              CONSOLE PASLA DEVICE ?                    MBF11610
1232   2333           1162             BZS    $STC.5             BRANCH: NO.                               MBF11620
1234   DE30 0A48      1163             OC     R3,CONRQ2S         REQUEST TO SEND (KEEP ON-LINE)            MBF11630
       0000 1238      1164   $STC.5    EQU    *                                                            MBF11640
1238   030E           1165             BR     R14                RETURN                                    MBF11650
                      1166   *----------------------------                                                MBF11660
                      1167   *   TO OUTPUT '?' TO CONSOLE                                                  MBF11670
                      1168   *                                                                            MBF11680
123A   41F0 1320      1169   QUESTN    BAL    R15,SETKB          SELECT KEYBOARD DEVICE                    MBF11690
123E   41F0 1042      1170             BAL    R15,$PRINT                                                   MBF11700
1242   16D4           1171             DAC    QMSG               QUESTION MARK, CRLF                       MBF11710
1244   4300 0AB8      1172             B      OPTIN1             ACCEPT NEXT COMMAND                       MBF11720
                      1173   *----------------------------                                                MBF11730
                      1174   * IF BREAK KEY DEPRESSED, GO TO 'OPTIN' OR (BRKVECT); ELSE RETURN.           MBF11740
                      1175   *                                                                            MBF11750
       0000 1248      1176   TSTBRK    EQU    *                                                            MBF11760
1248   D0E0 2C48      1177             STM    R14,$TBRKSV        SAVE REGISTERS                            MBF11770
124C   48F0 17C8      1178             LH     R15,NOMSG+$VALU1   (R15) = 15 IF IGNORING I/O                MBF11780
1250   46F0 1608      1179             OH     R15,$BRKFLG        (R15) = 15 IF BRK ALREADY SEEN            MBF11790
1254   27FF           1180             SIS    R15,15             LOOK FOR BREAK ?                          MBF11800
1256   2137           1181             BNZS   $TSTB.2            BRANCH: YES.                              MBF11810
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                          1182  *                                                              MBF11820
1258    24F0              1183  $TSTB.1  LIS  R15,0                                            MBF11830
125A    40F0 1606         1184           STH  R15,BRKVECT      CANCEL BREAK VECTOR            MBF11840
125E    01E0 2C48         1185  $TSTB.1A LM   R14,$TBRKSV      RELOAD REGISTERS.             MBF11850
1262    030F              1186           BR   R15              RETURN TO CALLER.             MBF11860
                          1187  *                                                              MBF11870
1264    48E0 0A2A         1188  $TSTB.2  LH   R14,CONRADR      READ SIDE ADDRESS FOR TERMINAL MBF11880
1268    D3F0 0A10         1189           LB   R15,IO           CONSOLE ID CODE               MBF11890
126C    C5F0 0002         1190           CLHI R15,2                                          MBF11900
1270    2333              1191           BES  $TSTB.3          BRANCH: TTY                   MBF11910
1272    C5F0 0005         1192           CLHI R15,5                                          MBF11920
1276    4330 12B4         1193  $TSTB.3  BE   $TSTB.5          BRANCH: MICRO-I/O BUS         MBF11930
127A    9DEF              1194           SSR  R14,R15                                        MBF11940
127C    4280 1258         1195           BTC  8,$TSTB.1        BRANCH: BSY = NO BRK          MBF11950
1280    C3F0 0020         1196           THI  R15,X'20'                                      MBF11960
1284    4330 1258         1197           BZ   $TSTB.1          BRANCH: NO FRERR = NO BRK     MBF11970
1288    9BEF              1198           RDR  R14,R15                                        MBF11980
128A    08FF              1199           LDAR R15,R15                                        MBF11990
128C    4230 1258         1200           BNZ  $TSTB.1          BRANCH: NONZERO CHAR = NO BRK MBF12000
                          1201  *                                                              MBF12010
        0000 1290         1202  $TSTB.4  EQU  *                IT IS BREAK                   MBF12020
1290    24FF              1203           LIS  R15,15                                         MBF12030
1292    40F0 1608         1204           STH  R15,$BRKFLG      SET FLAG                      MBF12040
1296    48F0 1614         1205           LH   R15,$PRTFLG      PRINTING NOW ?                MBF12050
129A    4230 125E         1206           BNZ  $TSTB.1A         BRANCH: YES.                  MBF12060
129E    24E0              1207           LIS  R14,0                                          MBF12070
12A0    48F0 1606         1208           LH   R15,BRKVECT      SPECIFIED VECTOR              MBF12080
12A4    40E0 1606         1209           STH  R14,BRKVECT      CANCEL VECTOR                 MBF12090
12A8    023F              1210           BNZR R15              BUT TAKE IMMEDIATELY IF NON-ZERO. MBF12100
12AA    41F0 1042         1211           BAL  R15,$PRINT                                     MBF12110
12AE    16DA              1212           DAC  BRKMSG           'BREAK TERMINATION'           MBF12120
12B0    4300 0AB8         1213           B    OPTIN1                                         MBF12130
                          1214  *                                                              MBF12140
12B4    9DEF              1215  $TSTB.5  SSR  R14,R15                                        MBF12150
12B6    C3F0 0020         1216           THI  R15,X'20'                                      MBF12160
12BA    2134              1217           BNZS $TSTB.6          BRANCH: BRK.                  MBF12170
12BC    9BEF              1218           RDR  R14,R15          IF BRK QUEUED, SEE IT NEXT TIME. MBF12180
12BE    4300 1258         1219           B    $TSTB.1          BRANCH: NO FRERR = NO BRK     MBF12190
12C2    9BEF              1220  $TSTB.6  RDR  R14,R15          READ BREAK CHAR               MBF12200
12C4    C8F0 8000         1221           LHI  R15,X'8000'                                    MBF12210
12C8    26F1              1222  $TSTB.7  AIS  R15,1                                          MBF12220
12CA    2031              1223           BNZS $TSTB.7                                        MBF12230
12CC    9DEF              1224           SSR  R14,R15                                        MBF12240
12CE    C3F0 0020         1225           THI  R15,X'20'        BRK KEY STILL DOWN ?          MBF12250
12D2    2038              1226           BNZS $TSTB.6          BRANCH: YES.                  MBF12260
12D4    4300 1290         1227           B    $TSTB.4          GO SERVICE BREAK              MBF12270
                          1228  *----------------------------                                  MBF12280
                          1229  * SEE IF CURRENT LIST DEVICE IS OFF-LINE (R1 & CC NON-ZERO IF OFF) MBF12290
                          1230  *                                                              MBF12300
12D8    241F              1231  TSTDU    LIS  R1,15                                          MBF12310
12DA    4510 17C8         1232           CLH  R1,NOMSG+$VALU1  IGNORING I/O ?                MBF12320
12DE    4330 1310         1233           BE   $IS.DU           BRANCH: CONSIDER AS DU.       MBF12330
12E2    4800 1602         1234           LH   R0,$CONPAS                                     MBF12340
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12E6   0310 160B      1235            LB    R1,IOSAVE+1       LIST DEVICE ID                        MBF12350
12EA   0410 0A10      1236            CLB   R1,IO             SAME AS CONSOLE DEVICE ?              MBF12360
12EE   2333           1237            BES   $TSTDU.1          BRANCH: YES.                          MBF12370
12F0   4800 1604      1238            LH    R0,$LSTPAS        NON-ZERO IF LIST DEVICE ON PASLA.     MBF12380
12F4   9112           1239  $TSTDU.1  SLLS  R1,2                                                    MBF12390
12F6   4821 0A0E      1240            LH    R2,PASLADR-4(R1)  *READ SIDE* ADDRESS                   MBF12400
12FA   9D21           1241            SSR   R2,R1             GET DEVICE STATUS                     MBF12410
12FC   211A           1242            BTFS  1,$IS.DU                                                MBF12420
12FE   0800           1243            LDAR  R0,R0             DEVICE ON PASLA ?                     MBF12430
1300   2336           1244            BZS   $NOT.DU                                                 MBF12440
1302   C410 00FC      1245            NHI   R1,X'FC'                                                MBF12450
1306   C510 000C      1246            CLHI  R1,X'0C'          PASLA DU IF BSY+EX SET HERE           MBF12460
130A   2333           1247            BES   $IS.DU            BRANCH: DU.                           MBF12470
130C   2410           1248  $NOT.DU   LIS   R1,0                                                    MBF12480
130E   2302           1249            BS    $DU.X                                                   MBF12490
1310   2511           1250  $IS.DU    LCS   R1,1                                                    MBF12500
1312   4800 1616      1251  $DU.X     LH    R0,$WASDU         GET OLD FLAG                          MBF12510
1316   0601           1252            OAR   R0,R1                                                   MBF12520
1318   4000 1616      1253            STH   R0,$WASDU         ACCUMULATE                            MBF12530
131C   0811           1254            LDAR  R1,R1             SET CC <> 0 IF DU                     MBF12540
                      1255   *                                OR CC = 0 IF NOT DU                   MBF12550
131E   030F           1256            BR    R15               RETURN                               MBF12560
                      1257   * ------------------------------                                       MBF12570
                      1258   * TO DIRECT INPUT AND OUTPUT TO CONSOLE DEVICE                         MBF12580
                      1259   *                                                                      MBF12590
1320   D300 0A10      1260  SETKB     LB    R0,IO             GET KEYBOARD DEVICE                   MBF12600
1324   D200 160B      1261            STB   R0,IOSAVE+1       SET LIST TO KEYBOARD                  MBF12610
1328   030F           1262            BR    R15               RETURN                               MBF12620
                      1263   * -------------------------                                            MBF12630
                      1264   * TO RESELECT USER'S I/O CHOICE                                        MBF12640
                      1265   *                                                                      MBF12650
132A   4800 0A10      1266  SETLST    LH    R0,IO                                                   MBF12660
132E   4000 160A      1267            STH   R0,IOSAVE                                               MBF12670
1332   030F           1268            BR    R15               RETURN                               MBF12680
                      1269   *-----------------------------                                         MBF12690
                      1270   *   TO PUT KEYBOARD DEVICE IN READ MODE                                MBF12700
                      1271   *                                                                      MBF12710
1334   4800 0A2A      1272  KBREAD    LH    R0,CONRADR                                              MBF12720
1338   DE00 0A2E      1273            OC    R0,CONRD          OC CONSOLE - READ COMMAND             MBF12730
133C   DB00 1600      1274            RD    R0,SINK           READ A DUMMY CHARACTER (SET BUSY)     MBF12740
1340   4890 1602      1275            LH    R9,$CONPAS        PASLA ?                               MBF12750
1344   4200 1344      1276            NOP   *                 FOR SPECIAL KB DEVICE                 MBF12760
1348   2333           1277            BZS   $KBR.1            NO, BRANCH TO EXIT                    MBF12770
134A   DE00 0A48      1278            OC    R0,CONRQ2S        YES, OC (REQUEST TO SEND)             MBF12780
134E   0304           1279  $KBR.1    BR    R4                RETURN                                MBF12790
                      1292   *-------------------------                                             MBF12920
                      1293   * LIST DEVICE SET UP ROUTINE                                           MBF12930
                      1294   *                                                                      MBF12940
1350   4010 162A      1295  $SETUP    STA   R1,SET.RTN                                              MBF12950
1354   D310 160B      1296            LB    R1,IOSAVE+1       GET LIST DEVICE IDENTIFIER            MBF12960
1358   9112           1297            SLHLS R1,2              HW INDEX                              MBF12970
135A   4801 0A10      1298            LH    R0,IO(R1)         GET LIST DEVICE WRITE ADDRESS         MBF12980
135E   DE01 0A31      1299            OC    R0,CONCMD-1(R1)                                         MBF12990
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1362   4810 162A      1300           LDA    R1,SET.RTN                                       MBF13000
1366   0301           1301           BR     R1           RETURN                              MBF13010
                      1302   * ****************************                                   MBF13020
                      1303   *   LOW CORE SET UP ROUTINE                                      MBF13030
                      1304   *                                                               MBF13040
1368   D0E0 2C54      1305   LCORE   STM    R14,$R14SAV  SAVE REGISTERS                      MBF13050
136C   2400           1306           LIS    R0,0                                             MBF13060
136E   C810 004E      1307           LHI    R1,X'4E'                                         MBF13070
1372   4001 0000      1308   $LCOR1  STH    R0,0(R1)     ZERO MEMORY FROM X'0000'-X'004F'    MBF13080
1376   4001 0080      1309           STH    R0,X'80'(R1) ZERO MEMORY FROM X'0080'-X'00CF'    MBF13090
137A   2712           1310           SIS    R1,2                                             MBF13100
137C   2215           1311           BNMS   $LCOR1                                           MBF13110
                      1312   *                                                               MBF13120
137E                  1313           IFZ    ADC-2                                            MBF13130
137E   4800 15F8      1314           LH     R0,MOD32     SERIES 32 ?                         MBF13140
1382   2333           1315           BZS    $LCOR2       BRANCH: NO.                         MBF13150
                      1316           ENDC                                                    MBF13160
1384   C800 1438      1317           LHI    R0,$XI32     32-BIT I/O HANDLER                  MBF13170
1388   C810 07FE      1318   $LCOR2  LHI    R1,1023*2    FOR MAX I/O SERVICE TABLE           MBF13180
138C   4001 00D0      1319   $LCOR3  STH    R0,X'D0'(R1) VECTORS TO MEMORY X'00D0'-X'08CE'   MBF13190
1390   2712           1320           SIS    R1,2         ARE ZERO FOR SERIES 16              MBF13200
1392   2213           1321           BNMS   $LCOR3                                           MBF13210
                      1322   *                                                               MBF13220
1394   C8E0 3000      1323           LHI    R14,X'3000'  ARITH FAULT, MALFUNCTION, ONLY.     MBF13230
1398   C8F0 155C      1324           LDAI   R15,$ERRF2   ILLEGAL INSTRUCTION HANDLER         MBF13240
139C                  1325           IFZ    ADC-2                                            MBF13250
139C   D0E0 0034      1326           STM    R14,X'34'    FOR SERIES 16                       MBF13260
                      1327           ENDC                                                    MBF13270
13A0   D0E0 0030      1328           STM    R14,X'30'    FOR SERIES 32                       MBF13280
                      1329   *                                                               MBF13290
13A4   24E0           1330           LIS    R14,0        TO ZERO MMF BIT IN NEW PSW          MBF13300
13A6   C8F0 14F2      1331           LDAI   R15,$ERRF3   MACHINE MALFUNCTION NEW LOC         MBF13310
13AA                  1332           IFZ    ADC-2                                            MBF13320
13AA   D0E0 003C      1333           STM    R14,X'3C'    FOR SERIES 16                       MBF13330
                      1334           ENDC                                                    MBF13340
13AE   D0E0 0038      1335           STM    R14,X'38'    FOR SERIES 32                       MBF13350
                      1336   *                                                               MBF13360
13B2   C8E0 3000      1337           LHI    R14,X'3000'  ARITH FAULT, MALFUNCTION, ONLY.     MBF13370
13B6   C8F0 156C      1338           LDAI   R15,$ERRF1                                       MBF13380
13BA                  1339           IFZ    ADC-2                                            MBF13390
13BA   4800 15F8      1340           LH     R0,MOD32                                         MBF13400
13BE   2133           1341           BNZS   $LCOR3A      BRANCH: PROTECT X'50' SEQUENCE      MBF13410
13C0   D0E0 004C      1342           STM    R14,X'4C'    FIXED-POINT DIV FAULT HDLR, S16     MBF13420
       0000 13C4      1343   $LCOR3A EQU    *                                                MBF13430
                      1344           ENDC                                                    MBF13440
13C4   D0E0 0048      1345           STM    R14,X'48'    ARITHMETIC FAULT HDLR, S32          MBF13450
                      1346   *                                                               MBF13460
13C8   40E0 009A      1347           STH    R14,X'9A'    SVC NEW PSW                         MBF13470
13CC   241E           1348           LIS    R1,14                                            MBF13480
13CE   C800 1558      1349           LHI    R0,$ERRF9    SVC INTERRUPT HDLR                  MBF13490
13D2   4001 009C      1350   $LCOR4  STH    R0,X'9C'(R1) SVC INTPT NEW LOC'S                 MBF13500
13D6   2712           1351           SIS    R1,2                                             MBF13510
13D8   2213           1352           BNMS   $LCOR4       DO ALL 16                           MBF13520
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                                1353  *
  13DA   C840 2D08              1354              LHI    R4,PSWSAVE+X'FF'&X'FF00'+8 PPF REG SAVE AREA        MBF13530
  13DE                          1355              IFZ    ADC-2                                              MBF13540
  13DE   4810 15F8              1356              LH     R1,MOD32                                           MBF13550
  13E2   213D                   1357              BNZS   $LCOR5                                             MBF13560
                                1358  *                                                                    MBF13570
                                1359  * SET UP ADDITIONAL LOW CORE FOR 16-BIT MACHINE ONLY                 MBF13580
                                1360  *                                                                    MBF13590
  13E4   4040 0022              1361              STH    R4,X'22'             REG SAVE POINTER              MBF13600
  13E8   C8F0 1564              1362              LHI    R15,$ERRF5A                                        MBF13610
  13EC   D0E0 002C              1363              STM    R14,X'2C'            S16 FLOAT-POINT INTPT NEW PSW MBF13620
                                1364  *                                                                    MBF13630
  13F0   C8FC 142A              1365              LHI    R15,$XI16            S16 I/O HANDLER               MBF13640
  13F4   D0E0 0044              1366              STM    R14,X'44'            S16 EXTERNAL INTPT NEW PSW    MBF13650
  13F8   4300 1424              1367              B      $LCORXIT            RESTORE R14:R15, RETURN (R15)  MBF13660
                                1368  *                                                                    MBF13670
                                1369  * SET UP ADDITIONAL LOW CORE FOR 32-BIT MACHINE ONLY                 MBF13680
                                1370  *                                                                    MBF13690
  13FC   24F0                   1371              ENDC                                                     MBF13700
  13FE   D0F0 0040              1372  $LCOR5      LIS    R15,0                                              MBF13710
                                1373              STM    R15,X'40'            ZERO MALFUNCTION STATUS WORD, S320  MBF13720
                                1374  *                                                                    MBF13730
  1402   4040 0086              1375              STH    R4,X'86'             S32 PPF REG SAVE POINTER      MBF13740
  1406   2748                   1376              SIS    R4,8                                              MBF13750
  1408   4040 0084              1377              STH    R4,X'84'             S32 PPF PSW SAVE POINTER      MBF13760
                                1378  *                                    FOR S3200, IS ONE 24-BIT ADDRESS. MBF13770
                                1379  *                                                                    MBF13780
  140C   C8F0 1554              1380              LDAI   R15,$ERRF8                                         MBF13790
  1410   D0E0 0088              1381              STM    R14,X'88'            SYSTEM QUEUE INTPT NEW PSW    MBF13800
                                1382  *                                                                    MBF13810
  1414   C8F0 1568              1383              LDAI   R15,$ERRF5                                         MBF13820
  1418   D0E0 0090              1384              STM    R14,X'90'            RELOC/PROTECT INTPT NEW PSW   MBF13830
                                1385  *                                                                    MBF13840
  141C   C8F0 1550              1386              LDAI   R15,$ERRF7                                         MBF13850
  1420   D0E0 00C8              1387              STM    R14,X'C8'            DATA FORMAT FAULT NEW PSW     MBF13860
                                1388  *                                                                    MBF13870
  1424   D1E0 2C54              1389  $LCORXIT    LM     R14,$R14SAV          RESTORE REGISTERS             MBF13880
  1428   030F                   1390              BR     R15                  AND RETURN.                   MBF13890
                                1391  *                                                                    MBF13900
                                1417  *                                                                    MBF13910
                                1418  * **********************************************************         MBF14170
                                1419  *   EXTERNAL INTERRUPT HANDLER                                       MBF14180
  142A                          1420              IFZ    ADC-2                                              MBF14190
  142A   D000 2D3C              1421  $XI16       STM    R0,INTSAV            FOR 16-BIT PROCESSOR          MBF14200
  142E   9F23                   1422              ACKR   R2,R3                ACKNOWLEDGE THE INTERRUPT     MBF14210
  1430   D1E0 0040              1423              LM     R14,X'40'            OLD PSW, EXTERNAL INTERRUPT   MBF14220
  1434   24A0                   1424              LIS    R10,0                AVOID $ERRF6 ON SERIES 16     MBF14230
  1436   2306                   1425              BS     $XI16A                                             MBF14240
                                1426  *                                                                    MBF14250
                                1427  *                                    FOR 32-BIT PROCESSOR            MBF14260
  1438   95AA                   1428  $XI32       EPSR   R10,R10              PSW AFTER INTERRUPT           MBF14270
  143A   50A0                   1429              DC     X'50A0',Z(INTPSW)    * ST R10,INTPSW              MBF14280
  143C   15F0                                                                                              MBF14290
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143E    08E0                    1430            LDAR    R14,R0          OLD PSW                                 MBF14300
1440    08F1                    1431            LDAR    R15,R1          OLD LOC                                 MBF14310
        0000 1442               1432    $XI16A  EQU     *                                                       MBF14320
                                1433            ELSE                                                            MBF14330
                                1438            ENDC                                                            MBF14380
1442    4020 15FA               1439            STH     R2,INTDEV       INTERRUPTING DEVICE ADDRESS            MBF14390
1446    D230 15FC               1440            STB     R3,INTSTA       INTERRUPTING DEVICE STATUS             MBF14400
144A    D0E0 15E0               1441            STM     R14,OLDPSW                                              MBF14410
144E    4520 0A2A               1442            CLH     R2,CONRAOR      CONSOLE READ-SIDE INTERRUPT ?          MBF14420
144E                            1443            IFZ     $KBINT-1                                                MBF14430
                                1445            ELSE                                                            MBF14430
1452    4330 14AC               1446            BE      RETOPSW         IGNORE (FOR 1610,20,30)                MBF14460
                                1447            ENDC                                                            MBF14470
                                1448    *                                                                       MBF14480
1456    2450                    1449            LIS     R5,0                                                    MBF14490
1458    4865 17CC               1450    $XI1    LH      R6,DEVSADR(R5)  GET DEV ADRS FROM TABLE                MBF14500
145C    4210 14BA               1451            BM      $ERRF4          TABLE OVERFLOW.                        MBF14510
1460    0562                    1452            CLAR    R6,R2           COMPARE INTERRUPTING DEVICE ADDRES     MBF14520
1462    2333                    1453            BES     $XI2                                                    MBF14530
1464    2652                    1454            AIS     R5,2                                                    MBF14540
1466    2207                    1455            BS      $XI1                                                    MBF14550
1468    4865 17E2               1456    $XI2    LH      R6,DEVINT(R5)   GET INTERRUPT HANDLER ADDRESS          MBF14560
146C    4330 14BA               1457            BZ      $ERRF4          INTERRUPT NOT EXPECTED                 MBF14570
1470    9051                    1458            SRLS    R5,1            IF SERIES 32,                          MBF14580
1472    90A4                    1459            SRLS    R10,4           INTERRUPT LEVEL MUST BE CORRECT        MBF14590
1474    C4A0 000F               1460            NHI     R10,15                                                  MBF14600
1478    D4A5 17F6               1461            CLB     R10,INTLVL(R5)  CHECK PROPER INTERRUPT LEVEL           MBF14610
147C    4230 14BE               1462            BNE     $ERRF6          SERIES 16 ZERO ALWAYS MATCHES.         MBF14620
                                1463    *                                                                       MBF14630
1480    081F                    1464            LDAR    R1,R15          OLD LOC AT INTERRUPT                   MBF14640
1482    48E0 0A52               1465            LH      R14,PSW2        SPEC'D AS X'30F0'                      MBF14650
1486    08F6                    1466            LDAR    R15,R6          INTERRUPT VECTOR                       MBF14660
1488                            1467            IFZ     ADC-2                                                   MBF14670
1488    D0E0 15E8               1468            STM     R14,NEWPSW      PSW TO ENTER SERVICE ROUTINE           MBF14680
148C    4800 15F8               1469            LH      R0,MOD32        SERIES 32 ?                            MBF14690
1490    213C                    1470            BNZS    $XI4            BRANCH: YES.                           MBF14700
1492    C510 0F7C               1471            CLAI    R1,$TIMER       WAS IN TIMER ROUTINE ?                 MBF14710
1496    2187                    1472            BLS     $XI3            BRANCH: NO.                            MBF14720
1498    C510 0F96               1473            CLAI    R1,$TIMXT       FINAL CHECK:                           MBF14730
149C    2384                    1474            BNLS    $XI3            BRANCH: NOT IN TIMER ROUTINE.          MBF14740
149E    D100 2CFC               1475            LM      R0,RSAVE        RELOAD REGISTERS SAVED BY TIMER        MBF14750
14A2    2303                    1476            BS      $XI4                                                    MBF14760
14A4    D100 2D3C               1477    $XI3    LM      R0,INTSAV       RELOAD REGISTERS SAVED BY $XI16        MBF14770
14A8    C200 15E8               1478    $XI4    LPSW    NEWPSW          AND GO TO SERVICE ROUTINE.             MBF14780
                                1479            ELSE                                                            MBF14790
                                1481            ENDC                                                            MBF14810
                                1482    *                                                                       MBF14820
                                1483    * ---------------------------------------------------                   MBF14830
                                1484    * TO RETURN ON OLD PSW FOLLOWING I/O INTERRUPT                         MBF14840
                                1485    *                                                                       MBF14850
        0000 14AC               1486    RETOPSW EQU     *                                                       MBF14860
14AC                            1487            IFZ     ADC-2                                                   MBF14870
14AC    4800 15F8               1488            LH      R0,MOD32        SERIES 32 ?                            MBF14880
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14B0   2133                   1489           BNZS  RETOPSW1          BRANCH: NO.                          MBF14890
14B2   D100 203C              1490           LM    R0,INTSAV         RESTORE USER REGISTER, SERIES 16     MBF14900
                              1491           ENDC                                                        MBF14910
       0000 14B6              1492 RETOPSW1  EQU   *                                                     MBF14920
14B6   C200 15E0              1493           LPSW  OLDPSW                                                 MBF14930
                              1494 * ----------------------------------                                  MBF14940
                              1495 *   EXTERNAL INTERRUPT ERROR ROUTINE                                  MBF14950
                              1496 *                                                                     MBF14960
14BA   2464                   1497 $ERRF4    LIS   R6,4              ERROR TTF4                           MBF14970
14BC   2302                   1498           BS    XIERR1                                                MBF14980
                              1499 *----------------------------------                                   MBF14990
                              1500 * DEVICE INTERRUPTED IN WRONG INTERRUPT LEVEL                         MBF15000
                              1501 *                                                                     MBF15010
14BE   2466                   1502 $ERRF6    LIS   R6,6              ERROR TTF6                           MBF15020
14C0   C660 4630              1503 XIERR1    OHI   R6,C'F0'          CONVERT TO ASCII                     MBF15030
14C4   4060 164E              1504           STH   R6,ERRNO                                              MBF15040
14C8   4810 0A52              1505           LH    R1,PSW2           SPEC'D AS X'30F0'                    MBF15050
14CC   9501                   1506           EPSR  R0,R1             ENSURE USER REGISTER SET             MBF15060
14CE   41F0 0E22              1507           BAL   R15,ERRALL        'ERROR TTFN', 'DEV DDD STA SS'       MBF15070
                              1508 *                                 'PSW PPPP  LOC LLLL'                 MBF15080
14D2   4860 164E              1509           LH    R6,ERRNO                                              MBF15090
14D6   C560 4636              1510           CLHI  R6,C'F6'          WRONG INTERRUPT LEVEL ?              MBF15100
14DA   213A                   1511           BNES  XIERR2            BRANCH: NO.                          MBF15110
14DC   03AA 162C              1512           LB    R10,HEXTAB(R10)   CONVERT LEVEL TO ASCII               MBF15120
14E0   D2A0 16C3              1513           STB   R10,ERRLVL        AND STORE IN MESSAGE                 MBF15130
14E4   4060 160C              1514           STH   R6,ISITERR        FORCE PRINT                          MBF15140
14E8   41F0 1042              1515           BAL   R15,$PRINT                                            MBF15150
14EC   16AE                   1516           DAC   INTLVLM           'INTERRUPTED IN LEVEL N'             MBF15160
14EE   4300 0AB8              1517 XIERR2    B     OPTIN1            ENTER COMMAND MODE.                  MBF15170
                              1518 *----------------------------------                                   MBF15180
                              1519 *   SPURIOUS INTERRUPT HANDLERS                                       MBF15190
                              1520 *                                                                     MBF15200
                              1521 *   MACHINE MALFUNCTION INTERRUPT TRAP                                MBF15210
                              1522 *                                                                     MBF15220
14F2   95DD                   1523 $ERRF3    EPSR  R13,R13           PSW AT ENTRY TO HANDLER & SAME CC    MBF15230
14F4   01E0 0020              1524           LM    R14,X'20'         S32 MALFUNCTION OLD PSW              MBF15240
14F8                          1525           IFZ   ADC-2                                                 MBF15250
14F8   4800 15F8              1526           LH    R0,MOD32          SERIES 32 ?                          MBF15260
14FC   233D                   1527           BZS   $MM16.1           BRANCH: NO..                         MBF15270
14FE   50DD                   1528           DC    X'50DD',Z(MMSW)   * ST R13,MMSW                        MBF15280
1500   15F4
1502   5800                   1529           DC    X'5800',X'0040'   * L R0,X'40'                         MBF15290
1504   0040
1506   4330 1524              1530           BZ    $MM.1             BRANCH: NOT S3200                    MBF15300
150A   5000                   1531           DC    X'5000',Z(MMSW)   * ST R0,MMSW                         MBF15310
150C   15F4
150E   4210 152A              1532           BM    $MM.2             BRANCH: S3200 POWER FAIL             MBF15320
1512   4300 153A              1533           B     $MM.3             BRANCH: OTHER S3200 MALFUNCTION      MBF15330
                              1534 *                                                                     MBF15340
1516   D1E0 0038              1535 $MM16.1   LM    R14,X'38'         S16 MALFUNCTION OLD PSW              MBF15350
151A   40D0 15F6              1536           STH   R13,MMSW+2        PSW STATUS AT INTERRUPT              MBF15360
151E   2400                   1537           LIS   R0,0                                                  MBF15370
1520   4000 15F4              1538           STH   R0,MMSW           LEADING ZEROS                        MBF15380
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1524  C3D0 0001    1539  $MM.1   THI    R13,X'0001'     POWER FAIL ?                   MBF15390
1528  2339         1540          BZS    $MM.3           BRANCH: NO.                    MBF15400
152A  C800 153A    1541  $MM.2   LHI    R0,$MM.3                                       MBF15410
152E  4000 003E    1542          STH    R0,X'3E'        CHANGE INTERRUPT NEW LOC       MBF15420
                   1543          ELSE                                                  MBF15430
                   1556          ENDC                                                  MBF15560
1532  4810 0A52    1557          LH     R1,PSW2         SPEC'D AS X'30F0'              MBF15570
1536  9501         1558          EPSR   R0,R1           RE-ENABLE MALFUNCTION          MBF15580
1538  2200         1559          BS     *               AND WAIT FOR POWER RESTORE.    MBF15590
                   1560  *                                                             MBF15600
                   1561  * AT THIS POINT, WE KNOW IT IS NOT A POWER FAIL.              MBF15610
                    562  * POWER RESTORE REPORTS 'POWER FAIL' AS REASON FOR INTERRUPT. MBF15620
                   1563  *                                                             MBF15630
153A  C810 14F2    1564  $MM.3   LDAI   R1,$ERRF3       RESTORE INTERRUPT VECTOR       MBF15640
153E               1565          IFZ    ADC-2                                          MBF15650
153E  4010 003E    1566          STH    R1,X'3E'                                       MBF15660
1542  4800 15F8    1567          LH     R0,MOD32                                       MBF15670
1546  2333         1568          BZS    $MM.3A                                         MBF15680
1548  5010         1569          DC     X'5010',X'003C'  * ST R1,X'3C'                 MBF15690
154A  003C
      0000 154C    1570  $MM.3A  EQU    *                                             MBF15700
                   1571          ELSE                                                  MBF15710
                   1573          ENDC                                                  MBF15730
                   1574  *                                                             MBF15740
154C  2463         1575          LIS    R6,3            ERROR TTF3                     MBF15750
154E  2304         1576          BS     $BS.COMM                                       MBF15760
                   1577  * -------------------------                                   MBF15770
                   1578  * DATA FORMAT FAULT INTERRUPT                                 MBF15780
                   1579  *                                                             MBF15790
1550  2467         1580  $ERRF7  LIS    R6,7            ERROR TTF7                     MBF15800
1552  2302         1581          BS     $BS.COMM                                       MBF15810
                   1582  * -------------------------                                   MBF15820
                   1583  * SYSTEM QUEUE SERVICE INTERRUPT                              MBF15830
                   1584  *                                                             MBF15840
1554  2468         1585  $ERRF8  LIS    R6,8            ERROR TTF8                     MBF15850
1556  230E         1586  $BS.COMM BS    COMM                                          MBF15860
                   1587  * -------------------------                                   MBF15870
                   1588  * SUPERVISOR CALL INTERRUPT                                   MBF15880
                   1589  *                                                             MBF15890
1558  2469         1590  $ERRF9  LIS    R6,9            ERROR TTF9                     MBF15900
155A  230C         1591          BS     COMM                                          MBF15910
                   1592  * -------------------------                                   MBF15920
                   1593  *   ILLEGAL INSTRUCTION INTERRUPT TRAP                        MBF15930
                   1594  *                                                             MBF15940
155C  2462         1595  $ERRF2  LIS    R6,2            ERROR TTF2                     MBF15950
155E               1596          IFZ    ADC-2                                          MBF15960
155E  C820 0030    1597          LHI    R2,X'30'        WHERE TO FIND OLD PSW, SERIES 16  MBF15970
                   1598          ENDC                                                  MBF15980
1562  2308         1599          BS     COMM                                          MBF15990
                   1600  * --------------------------                                  MBF16000
1564               1601          IFZ    ADC-2                                          MBF16010
                   1602  * FLOATING-PT ARITH FAULT INT TRAP  (16 BIT PROCESSOR)        MBF16020
                   1603  *                                                             MBF16030
```

```
1564   C820 0028          1604  $ERRF5A LHI   R2,X'28'          WHERE TO FIND OLD PSW, SERIES 16    MBF16040
                          1605  * ---------------------------                                     MBF16050
                          1606         ENDC                                                       MBF16060
                          1607  *  RELOCATION/PROTECTION INT TRAP                                 MBF16070
                          1608  *                                                                 MBF16080
1568   2465               1609  $ERRF5  LIS   R6,5              ERROR TTF5                         MBF16090
156A   2304               1610          BS    COMM                                                MBF16100
                          1611  * ---------------------------                                     MBF16110
                          1612  *  ARITHMETIC FAULT INT (32-BIT PROCESSOR) TRAP                   MBF16120
156C                      1613          IFZ   ADC-2                                               MBF16130
                          1614  *  FIXED-PT DIVIDE FAULT INT (16-BIT PROCESSOR) TRAP              MBF16140
                          1615          ENDC                                                      MBF16150
                          1616  *                                                                 MBF16160
156C   2461               1617  $ERRF1  LIS   R6,1              ERROR TTF1                         MBF16170
156E                      1618          IFZ   ADC-2                                               MBF16180
156E   C820 0048          1619          LHI   R2,X'48'          WHERE TO FIND OLD PSW, SERIES 16   MBF16190
                          1620          ENDC                                                      MBF16200
                          1621  *                                                                 MBF16210
                          1622  * ERROR TTFN PRINTOUT ROUTINE. EXPECTS USER REGISTER SET SELECTED. MBF16220
                          1623  *                                                                 MBF16230
       0000 1572          1624  COMM    EQU   *                                                   MBF16240
1572                      1625          IFZ   ADC-2                                               MBF16250
1572   4800 15F8          1626          LH    R0,MOD32          SERIES 16 ?                        MBF16260
1576   2136               1627          BNZS  $COMM1            BRANCH: NO.                        MBF16270
1578   C560 0003          1628          CLHI  R6,3              FROM $ERRF3 ?                      MBF16280
157C   2333               1629          BES   $COMM1            BRANCH: YES.                       MBF16290
157E   01E2 0000          1630          LM    R14,0(R2)         GET INTERRUPT OLD PSW             MBF16300
                          1631          ENDC                                                      MBF16310
1582   D0E0 15E0          1632  $COMM1  STM   R14,OLDPSW        OLD PSW, OLD LOC                  MBF16320
1586   C660 4630          1633          OHI   R6,C'F0'          CONVERT ERROR NUMBER TO ASCII     MBF16330
158A   4060 164E          1634          STH   R6,ERRNO          ERROR NUMBER                      MBF16340
158E   4060 160C          1635          STH   R6,ISITERR        FORCE ERROR MESSAGE PRINT         MBF16350
1592   4810 0A52          1636          LH    R1,PSW2           SPEC'D AS X'30F0'                 MBF16360
1596   9501               1637          EPSR  R0,R1             ENSURE USER REGISTER SET          MBF16370
1598   41E0 11B6          1638  $COMM2  BAL   R14,STCON         SET UP & SELECT KEYBOARD DEVICE   MBF16380
159C   41F0 12D8          1639          BAL   R15,TSTDU         TEST IF KEYBOARD OFF-LINE         MBF16390
15A0   2034               1640          BNZS  $COMM2            WAIT FOR ON-LINE.                 MBF16400
15A2   41F0 1036          1641          BAL   R15,CRLF          SEND LINE FEED                    MBF16410
15A6   41F0 0DE2          1642          BAL   R15,ERR           PRINT 'ERROR XXFN'                MBF16420
15AA   4860 164E          1643          LH    R6,ERRNO          GET ERROR NUMBER                  MBF16430
15AE   4060 160C          1644          STH   R6,ISITERR        FORCE PRINT                       MBF16440
15B2   41E0 0ED4          1645          BAL   R14,ERRPL1        PRINT 'PSW PPPP  LOC LLLL'        MBF16450
15B6   C560 4633          1646          CLHI  R6,C'F3'          MACHINE MALFUNCTION ?             MBF16460
15BA   4230 0AB8          1647          BNE   OPTIN1            BRANCH: NO.                       MBF16470
                          1648  *                                                                 MBF16480
15BE                      1649          IFZ   ADC-2                                               MBF16490
15BE   4810 15F6          1650          LH    R1,MMSW+2         ASSUME SERIES 16                  MBF16500
15C2   4800 15F8          1651          LH    R0,MOD32          SERIES 32 ?                       MBF16510
15C6   2333               1652          BZS   $COMM3            BRANCH: NO.                       MBF16520
15C8   5810               1653          DC    X'5810',Z(MMSW)   * L R1,MMSW                       MBF16530
15CA   15F4
       0000 15CC          1654  $COMM3  EQU   *                                                   MBF16540
                          1655          ELSE                                                      MBF16550
```

```
15CC   2408          1658         LIS   R0,8                DIGIT COUNT                          MBF16580
15CE   C820 168E     1659         LDAI  R2,ASCIMSW          DESTINATION                          MBF16590
15D2   41F0 0F9E     1660         BAL   R15,HEXASC          CONVERT 3200 MMSW FOR PRINT          MBF16600
15D6   41F0 1042     1661         BAL   R15,$PRINT                                               MBF16610
15DA   1685          1662         DAC   MMSWMSG             'STATUS = XXXXXXXX'                   MBF16620
15DC   4300 0AB0     1663         B     OPTIN               GET COMMAND INPUT                    MBF16630
                     1664  * ****************************                                        MBF16640
                     1665  *   ETPE CONSTANTS & TABLES                                           MBF16650
15E0                 1666         ALIGN 8                                                        MBF16660
                     1667  *-----------------------                                              MBF16670
15E0   0000          1668  OLDPSW  DCX   0000,0000,0000,0000                                     MBF16680
15E2   0000
15E4   0000
15E6   0000
15E8   0000          1669  NEWPSW  DCX   0000,0000,0000,0000                                     MBF16690
15EA   0000
15EC   0000
15EE   0000
15F0   0000 0000     1670  INTPSW  DCY   0                  (SERIES 32 ONLY)                     MBF16700
15F4   0000          1671  MMSW    DCX   0000,0000          MACHINE MALFUNCTION STATUS           MBF16710
15F6   0000
                     1672  *-----------------------                                              MBF16720
15F8   0000          1673  MOD32   DCX   0                  NON-ZERO, SERIES 32                  MBF16730
15FA   0000          1674  INTDEV  DCX   0                  INTERRUPTING DEV ADR                 MBF16740
       0000 15FA     1675  ERRDEV  EQU   INTDEV             ERROR DEVICE #                       MBF16750
15FC   00            1676  INTSTA  DB    0                  INTERRUPTING DEV STATUS              MBF16760
       0000 15FC     1677  ERRSTA  EQU   INTSTA             ERRONEOUS STATUS                     MBF16770
15FD   80            1678  NORM    DB    X'80'              CONSOLE NORMAL MODE                  MBF16780
15FE   40            1679  INCR    DB    X'40'              CONSOLE INCREMENTAL MODE             MBF16790
15FF   E0            1680  $CLKSTRT DB   X'E0'              PIC CMD DISARM+START                 MBF16800
1600                 1681          DB    *                  (ALIGN ON HW BOUNDARY)               MBF16810
1600   0000          1682  SINK    DC    0                  BIT BUCKET                           MBF16820
1602   0000          1683  $CONPAS DCX   0                  SET WHEN CONSOLE ON PASLA/PALM       MBF16830
1604   0000          1684  $LSTPAS DCX   0                  SET WHEN LIST DEVICE ON PASLA        MBF16840
                     1685  * ------------------                                                  MBF16850
1606   0000          1689  BRKVECT DC    Z(0)               BREAK KEY VECTOR                     MBF16890
1608   0000          1690  $BRKFLG DCX   0                  SET IF BREAK KEY DETECTED            MBF16900
160A   0000          1691  IOSAVE  DCX   0                  CURRENT I/O IDENTIFIERS              MBF16910
160C   0000          1692  ISITERR DCX   0                  MESSAGE LEVEL                        MBF16920
160E   0000          1693  NOERR   DCX   0                  ZERO = 'NO ERROR'                    MBF16930
1610   0000          1694  SELTST  DCX   0                  HIGHEST SELECTED TEST #              MBF16940
1612   0000          1695  $LINEPOS DCX  0                  CURRENT $OUTBUF POSITION             MBF16950
1614   0000          1696  $PRTFLG DCX   0                  FLAG USED FOR DEFERRING BRK ACKNOWLED MBF16960
1616   0000          1697  $WASDU  DCX   0                  ZERO IF I/O DEVICE ON-LINE           MBF16970
1618   0000          1698  TOTAL   DCX   0                  TIMES WHOLE TEST RAN                 MBF16980
161A   0000          1699  TOTERR  DCX   0                  TOTAL ERRORS DETECTED                MBF16990
161C   0000          1700  BTESTNO DCX   0                  CURRENT TEST # IN BINARY             MBF17000
161E   0000          1701  COUNT   DCX   0                  TIMES CURRENT TEST RAN               MBF17010
1620   0000          1702  $PAUSE  DCX   0                  SET DURING TRANSMISSION PAUSE        MBF17020
1622   0000          1703  $SHUTDWN DAC  0                  A(USER-DEFINED SHUTDOWN ROUTINE)     MBF17030
1624   0000          1704  OUT.SAV DAC   0                  OUTCHR RETURN ADDRESS SAVE           MBF17040
1626   0000          1705  BRK.SAV DAC   0                  TSTBRK RETURN ADDRESS SAVE           MBF17050
```

```
1628   0000                    1706  FF.SAVE   DAC   0                       FF OPTION SAVE                    MBF17060
162A   0000                    1707  SET.RTN   DAC   0                       $SETUP RETURN ADDRESS SAVE       MBF17070
                               1708  *                                                                        MBF17080
162C   3031 3233 3435 3637     1712  HEXTAB    DB    C'0123456789ABCDEF' HEXADECIMAL DIGITS                    MBF17120
1634   3839 4142 4344 4546
                               1713  *--------------------------------                                        MBF17130
                               1714  *   ETPE MESSAGES                                                         MBF17140
                               1715  *                                                                        MBF17150
163C   5445 5354 2020 2A2A     1716  TSTMSG    DB    C'TEST  **',X'0D'                                         MBF17160
1644   0D
       0000 1642               1717  MTESTNO   EQU   TSTMSG+6                MASTER TEST NUMBER (ASCII)        MBF17170
1646                           1718            ALIGN 2                                                         MBF17180
1646   4552 524F 5220 3030     1719  ERRMSG    DB    C'ERROR 00**   ',X'0D' 06-173                            MBF17190
164E   2A2A 2020 200D
       0000 164C               1720  ETESTNO   EQU   ERRMSG+6                STORED BY ETPE                    MBF17200
       0000 164E               1721  ERRNO     EQU   ERRMSG+8                STORE ERRNO AS CHAR CONSTANT      MBF17210
1654   544F 5441 4C20 2020     1722  TOTMSG    DB    C'TOTAL    TOTERR',X'0D'                                  MBF17220
165C   544F 5445 5252 0D
1663   4E4F 2045 5252 4F52     1723  NOERMSG   DB    C'NO ERROR',X'0D'                                        MBF17230
166B   0D
166C   4445 5620 2A2A 2A20     1724  DEVMSG    DB    C'DEV *** STA **   ',X'0D' 06-173                        MBF17240
1674   5354 4120 2A2A 2020
167C   0D
       0000 1670               1725  ASCIDEV   EQU   DEVMSG+4                                                  MBF17250
       0000 1674               1726  STAMSG    EQU   DEVMSG+8                                                  MBF17260
       0000 1678               1727  ASCISTA   EQU   DEVMSG+12                                                 MBF17270
167D   4445 5620 2A2A 2A00     1728  DEVMSG2   DB    C'DEV ***',X'0D'                                          MBF17280
       0000 1681               1729  ASCIDEV2  EQU   DEVMSG2+4                                                 MBF17290
1685   5354 4154 5553 2030     1730  MMSWMSG   DB    C'STATUS =        ',X'0D'                                 MBF17300
168D   2020 2020 2020 2020
1695   200D
       0000 168E               1731  ASCIMSW   EQU   MMSWMSG+9                                                 MBF17310
1697   5053 5720 2020 2020     1732  PSWMSG    DB    C'PSW        LOC      ',X'0D'                             MBF17320
169F   2020 2020 4C4F 4320
16A7   2020 2020 2020 00
       0000 169B               1733  ASCIPSW   EQU   PSWMSG+4                                                  MBF17330
       0000 16A3               1734  LOCMSG    EQU   PSWMSG+12                                                 MBF17340
       0000 16A7               1735  ASCILOC   EQU   PSWMSG+16                                                 MBF17350
16AE   494E 5445 5252 5550     1736  INTLVLM   DB    C'INTERRUPTED IN LEVEL *',X'0D'                           MBF17360
16B6   5445 4420 494E 204C
16BE   4556 454C 202A 0D
       0000 16C3               1737  ERRLVL    EQU   INTLVLM+21                                                MBF17370
16C5   454E 4420 4F46 2054     1738  EOTMSG    DB    C'END OF TEST',X'0D'                                      MBF17380
16CD   4553 540D
16D4                           1739            ALIGN 4                                                         MBF17390
16D4   800A 3F0D               1740  QMSG      DB    X'8D',X'0A',C'?',X'0D' CR,LF,?,CR                         MBF17400
16D8   2A0D                    1741  AMSG      DB    C'*',X'0D'              *,CR                               MBF17410
16DA   FFFF FFFF FFFF FFFF     1742  BRKMSG    DB    -1,-1,-1,-1,-1,-1,-1,-1                                   MBF17420
16E2   4252 4541 4B20 5445     1743            DB    C'BREAK TERMINATION',X'0D'                                MBF17430
16EA   5240 494E 4154 494F
16F2   4E0D
       0000 16F3               1744  $BRKEND   EQU   *-1                                                       MBF17440
16F4   FFFF FFFF 0D            1745  NULLMSG   DB    -1,-1,-1,-1,X'0D'                                         MBF17450
```

EXEC - ETPE R05P0

```
        0000 16F8        1746  CRLFMSG  EQU    NULLMSG+4                                         MBF17460
16F9    00               1747           DB     *                        HALFWORD ALIGN          MBF17470
```

```
                                  1749  *------------------------------                    MBF17490
                                  1750  *   OPTION/COMMAND TABLE                           MBF17500
                                  1751  *   STRUCTURE DEFINED BY 'SSTRUC1' AT TOP OF LISTING   MBF17510
        16FC                      1752            ALIGN 4                                  MBF17520
                                  1753  * ** COPY ETPE FILE ONLY TO HERE                  MBF17530
        0000 16FC                 1754  OPT      EQU     *                                MBF17540
16FC    4452 4956 4520            1755  TEST     DC      C'DRIVE ',X'0000',X'0000',X'0000'   MBF17550
1702    0000
1704    0000
1706    0000
        0000 16FC                 1756  DRIVE    EQU     TEST                             MBF17560
1708    4449 5343 4F4E            1757  DISCON   DC      C'DISCON',Z(ADR),X'00B6',X'0000'   MBF17570
170E    0BC6
1710    00b6
1712    0000
1714    5345 4C43 4820            1758  SELCH    DC      C'SELCH ',Z(ADR),X'00F0',X'0000'   MBF17580
171A    0BC6
171C    00F0
171E    0000
1720    5041 4354 5950            1759  PACTYP   DC      C'PACTYP',X'0000',X'0001',X'0000' DEFAULT 10 MB USER   MBF17590
1726    0000
1728    0001
172A    0000
172C    464D 5453 4543            1760  FMTSEC   DC      C'FMTSEC',Z(ZERONE),X'0001',X'0000'   MBF17600
1732    0BA6
1734    0001
1736    0000
1738    4C4F 4359 4C20            1761  LOCYL    DC      C'LOCYL ',X'0',X'FFFF',0          MBF17610
173E    0000
1740    FFFF
1742    0000
1744    4849 4359 4C20            1762  HICYL    DC      C'HICYL ',X'0',X'FFFF',0          MBF17620
174A    0000
174C    FFFF
174E    0000
        0000 1750                 1763  OPTEND   EQU     *                                MBF17630
        0000 1750                 1764  OPTEND2  EQU     *                END OF PRINTING OPTIONS   MBF17640
1750    4F50 5449 4F4E            1765  OPTION   DC      C'OPTION',0,0,0                  MBF17650
1756    0000
1758    0000
175A    0000
        0000 175A                 1766  $LINCNT  EQU     OPTION+$VALU2                    MBF17660
175C    434F 4E20 2020            1767  CON      DC      C'CON   ',X'0',X'0',X'0'          MBF17670
1762    0000
1764    0000
1766    0000
1768    4646 2020 2020            1768  FF       DC      C'FF    ',Z(ZERONE1),X'0',X'0'    MBF17680
176E    0BAE
1770    0000
1772    0000
1774    464F 524D 4154            1769  FORMAT   DC      C'FORMAT',Z(FMT.MOD),X'0',X'0'    MBF17690
177A    1EF4
177C    0000
```

DATA CONSTANTS & CHECK ROUTINES

```
177E    0000
1780    464C 4147 2020      1770  FLAG      DC    C'FLAG  ',Z(FLG.MOD),X'0',X'0'                                    MBF17700
1786    21E4
1788    0000
178A    0000
178C    434C 4541 5220      1771  CLEAR.    DC    C'CLEAR ',Z(CLR.MOD),X'0',X'0',X'0'                               MBF17710
1792    2234
1794    0000
1796    0000
1798    0000
179A    FFFF                1772            DC    -1                                                                MBF17720
179C    4C4F 4F50 2020      1773  LOOP      DC    C'LOOP  ',X'0',X'0',X'0'                                          MBF17730
17A2    0000
17A4    0000
17A6    0000
17A8    494E 544C 4556      1774  INTLEV    DC    C'INTLEV',X'0',X'0',X'0'                                          MBF17740
17AE    0000
17B0    0000
17B2    0000
17B4    434F 4E54 494E      1775  CONTIN    DC    C'CONTIN',X'0',X'0',X'0'                                          MBF17750
17BA    0000
17BC    0000
17BE    0000
17C0    4E4F 4D53 4720      1776  NOMSG     DC    C'NOMSG ',X'0',X'0',X'0'                                          MBF17760
17C6    0000
17C8    0000
17CA    0000
                            1777  *                                                                                MBF17770
        0000 17CC           1778  DEVSADR   EQU   *                        INTERRUPTING DEVICES                    MBF17780
17CC    0000                1779            DC    X'0'                     SELCH                                   MBF17790
17CE    0000                1780            DC    X'0'                     CONTROLLER                              MBF17800
17D0    0000                1781            DC    X'0'                     DRIVE 0                                 MBF17810
17D2    0000                1782            DC    X'0'                     DRIVE 1                                 MBF17820
17D4    0000                1783            DC    X'0'                     DRIVE 2                                 MBF17830
17D6    0000                1784            DC    X'0'                     DRIVE 3                                 MBF17840
17D8    0000                1785            DC    X'0'                     FIXD 0                                  MBF17850
17DA    0000                1786            DC    X'0'                     FIXD 1                                  MBF17860
17DC    0000                1787            DC    X'0'                     FIXD 2                                  MBF17870
17DE    0000                1788            DC    X'0'                     FIXD 3                                  MBF17880
17E0    FFFF                1789            DC    X'FFFF'                                                           MBF17890
        0000 17E2           1790  DEVINT    EQU   *                        INTERRUPT VECTORS                       MBF17900
17E2                        1791            DO    10                                                               MBF17910
17E2    0000                1792            DC    X'0'                                                             MBF17920
17E4    0000                1792            DC    X'0'
17E6    0000                1792            DC    X'0'
17E8    0000                1792            DC    X'0'
17EA    0000                1792            DC    X'0'
17EC    0000                1792            DC    X'0'
17EE    0000                1792            DC    X'0'
17F0    0000                1792            DC    X'0'
17F2    0000                1792            DC    X'0'
17F4    0000                1792            DC    X'0'
17F6                        1793  INTLVL    DO    10                       INTERRUPT LEVELS                        MBF17930
```

```
17F6    00                    1794        DB      X'0'                                            MBF17940
17F7    00                    1794        DB      X'0'
17F8    00                    1794        DB      X'0'
17F9    00                    1794        DB      X'0'
17FA    00                    1794        DB      X'0'
17FB    00                    1794        DB      X'0'
17FC    00                    1794        DB      X'0'
17FD    00                    1794        DB      X'0'
17FE    00                    1794        DB      X'0'
17FF    00                    1794        DB      X'0'
                              1795  *                                                             MBF17950
                              1796  * REGISTER EQUATES                                            MBF17960
                              1797  *                                                             MBF17970
        0000 0005             1798  FUT     EQU     5                                             MBF17980
        0000 0006             1799  DCAD    EQU     6                                             MBF17990
        0000 0007             1800  SLAD    EQU     7                                             MBF18000
        0000 0008             1801  SECT    EQU     8                                             MBF18010
        0000 0009             1802  HEAD    EQU     9                                             MBF18020
        0000 000A             1803  STAT    EQU     10                                            MBF18030
        0000 000B             1804  TRACK   EQU     11                                            MBF18040
                              1805  *                                                             MBF18050
                              1806  * COMMAND BYTES                                               MBF18060
                              1807  *                                                             MBF18070
        0000 0002             1808  IDLE    EQU     2                                             MBF18080
1800    06                    1809  WCMD    DB      X'06'     CONTROLLER WRITE FORMAT             MBF18090
1801    48                    1810  STOP    DB      X'48'     SELCH STOP (EXTENDED)               MBF18100
1802    30                    1811  GOREAD  DB      X'30'     SELCH GO, READ                      MBF18110
1803    10                    1812  GOWRITE DB      X'10'     SELCH GO, WRITE                     MBF18120
1804    05                    1813  RCMD    DB      X'05'     CONTROLLER READ FORMAT              MBF18130
1805    10                    1814  CYLCMD  DB      X'10'     DRIVE SET CYLINDER                  MBF18140
1806    C2                    1815  SEEK    DB      X'C2'     DRIVE SEEK                          MBF18150
1807    03                    1816  RCHECK  DB      X'03'     CONTROLLER READ CHECK               MBF18160
1808    C8                    1817  RESET   DB      X'C8'     CONTROLLER RESET                    MBF18170
1809    C1                    1818  RESTOC  DB      X'C1'     DRIVE RESTORE                       MBF18180
180A                          1819          DB      *         END OF COMMAND BYTES                MBF18190


        0000 0002             1821  TABSIZ  EQU     2         2 DISC TYPE SUPPORTED.              MBF18210
                              1822  *                                                             MBF18220
        0000 180A             1823  SECTAB  EQU     *         SECTORS/TRACK                       MBF18230
180A    0018                  1824          DC      H'24',H'24',H'24'                             MBF18240
180C    0018
180E    0018
        0000 1810             1825  HEDTAB  EQU     *         HEADS/CYLINDER                      MBF18250
1810    0002                  1826          DC      H'2',H'2',H'2'                                MBF18260
1812    0002
1814    0002
        0000 1816             1827  CYLTAB  EQU     *         CYLINDERS/PACK                      MBF18270
1816    00CB                  1828          DC      H'203',H'408',H'408'                          MBF18280
1818    0198
181A    0198
        0000 181C             1829  INDXTAB EQU     *         PATTERN SELECT INDEX                MBF18290
```

DATA CONSTANTS & CHECK ROUTINES

```
181C  0006                    1830          DC    H'6',H'6',H'6'                                                         MBF18300
181E  0006
1820  0006
      0000 1822               1831  INCRTAB EQU   *                      SECTOR ADVANCE INCREMENT                        MBF18310
1822  0004                    1832          DC    H'4',H'2',H'2'                                                         MBF18320
1824  0002
1826  0002
      0000 1828               1833  SYNCTAB EQU   *                      HEADER SYNC BYTE                                MBF18330
1828  0303 03                 1834          DB    X'03',X'03',X'03'                                                      MBF18340
182B  00                      1835          DB    *                                                                      MBF18350
      0000 182C               1836  GAPTAB  EQU   *                      HEADER GAP SIZE                                 MBF18360
182C  0008                    1837          DC    H'8',H'8',H'8'                                                         MBF18370
182E  0008
1830  0008
      0000 1832               1838  LRECLTAB EQU  *                      LOGICAL RECORD LENGTH                           MBF18380
1832  0100                    1839          DC    H'256',H'256',H'256'                                                   MBF18390
1834  0100
1836  0100
      0000 1838               1840  PRECLTAB EQU  *                      PHYSICAL RECORD LENGTH (FORMAT MODE)            MBF18400
1838  010E                    1841          DC    H'270',H'270',H'270'                                                   MBF18410
183A  010E
183C  010E
      0000 183E               1842  TYPTAB  EQU   *                      SUPPORTED PACTYP ID'S                           MBF18420
183E  0001 01                 1843          DB    X'00',X'01',X'01'                                                      MBF18430
1844                          1844          DSF   0                      ALIGN TABLE                                     MBF18440
      0000 1844               1845  DATAB   EQU   *                      DATA PATTERNS USED                              MBF18450
1844  F0F0                    1846          DCX   F0F0,DB6D,6DB6,B6DB .            MB SET                                MBF18460
1846  DB6D
1848  6DB6
184A  B6DB
184C  F0F0                    1847  DATAB1  DCX   F0F0,0F0F              FAST FORMAT PATTERN                             MBF18470
184E  0F0F
1850                          1848          DSF   0                                                                      MBF18480
1850  0000                    1849  WSA     DC    X'0',Z(WTF)                                                            MBF18490
1852  290C
1854  0000                    1850  WFA     DC    X'0',X'0'                                                              MBF18500
1856  0000
1858  0000                    1851  RSA     DC    X'0',Z(RDF)                                                            MBF18510
185A  2810
185C  0000                    1852  RFA     DC    X'0',X'0'                                                              MBF18520
185E  0000
1860  0000 0000               1853  FLAGRET DCY   0                      SAVE                                            MBF18530
1864  0000 0000               1854  SKRTRY  DCY   0                      SEEK ERROR RERUN ADRS                           MBF18540
1868  0000 0000               1855  FATAL   DCY   0                      SET ON 'FATAL' ERROR                            MBF18550
186C  0000 0000               1856  LBN     DCY   0                      LINEAR SECTOR POINTER                           MBF18560
1870  0000 0000               1857  TESTS   DCY   0                      VECTOR TO MODULE                                MBF18570
1874  0000 0000               1858  DEFTESTS DCY  0                                                                      MBF18580
1878  0000                    1859  MAXSEC  DCX   0                      SECTORS/TRACK                                   MBF18590
187A  0000                    1860  MAXHEAD DCX   0                      HEADS/CYLINDER                                  MBF18600
187C  0000                    1861  MAXCYL  DCX   0                      CYLINDERS/PACK                                  MBF18610
187E  0000                    1862  MAXDEX  DCX   0                      MAX DATA PATTERN INDEX                          MBF18620
1880  0000                    1863  SKCNT   DCX   0                      MAX SEEK RETRY COUNT                            MBF18630
1882  0000                    1864  INCRMT  DCX   0                      TDATA SECTOR ADVANCE                            MBF18640
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1884   0000                    1865  GAPSIZE  DCX   0              GAP2 SIZE                                MBF18650
1886   0000                    1866  LRECL    DCX   0              NORMAL RECORD LENGTH                     MBF18660
1888   0000                    1867  PRECL    DCX   0              FORMAT RECORD LENGTH                     MBF18670
188A   0000                    1868  SYNC     DCX   0              SYNC2 BYTE                               MBF18680
188C   0000                    1869  INDEX    DCX   0              POINTER INTO DATA TABLES                 MBF18690
188E   0000                    1870  POINTER  DCX   0              DSTBL INDEX SAVE                         MBF18700
1890   0000                    1871  CYLNUM   DCX   0              CURRENT CYLINDER ADRS                    MBF18710
1892   0000                    1872  HEADNUM  DCX   0              CURRENT HEAD ADRS                        MBF18720
1894   0000                    1873  SECTNUM  DCX   0              CURRENT SECTOR ADRS                      MBF18730
1896   0000                    1874  DSTSIZ   DCX   0              DSTBL SIZE                               MBF18740
1898   0000                    1875  LPCNT    DCX   0              FORMAT-READS COUNTER                     MBF18750
189A   0000                    1876  FUTADRS  DCX   0              SELECTED DRIVE'S ADDRESS                 MBF18760
189C   0000                    1877  PROTECT  DCX   0              WRITE-PROTECT HEADER BIT                 MBF18770
189E   0007                    1878  MAXTST   DCX   7              LAST DRIVE NUMBER                        MBF18780


18A0   434F 4040 4F4E 2032     1880  TITLE    DC    C'COMMON 2.5 AND 10 MB DISC FORMATTER 06-251'         MBF18800
18A8   2E35 2041 4E44 2031
18B0   3020 4D42 2044 4953
18B8   4320 464F 524D 4154
18C0   5445 5220 3036 2032
18C8   3531
18CA   0D0A                    1881           DC    X'0D0A'                                                MBF18810
18CC   454E 4741 4745 2046     1882  MSG1     DC    C'ENGAGE FORMAT SWITCH',X'0D0A'                        MBF18820
18D4   4F52 4D41 5420 5357
18DC   4954 4348
18E0   0D0A
18E2   5748 4943 4820 4452     1883  MSG2     DC    C'WHICH DRIVE?',X'0D0A'                                MBF18830
18EA   4956 453F
18EE   0D0A
18F0   494C 4C45 4741 4C20     1884  MSG3     DC    C'ILLEGAL CYLINDER ADDRESS *** - CE PACK',X'0D0A'      MBF18840
18F8   4359 4C49 4E44 4552
1900   2041 4444 5245 5353
1908   202A 2A2A 202D 2043
1910   4520 5041 434B
1916   0D0A
1918   4445 5620 2A2A 2A20     1885  MSG4     DC    C'DEV *** FALSE SYNC **',X'0D0A'                       MBF18850
1920   4641 4C53 4520 5359
1928   4E43 202A 2A20
192E   0D0A
       0000 1918               1886  OUSYS    EQU   MSG4                                                   MBF18860
1930   4445 4620 5345 4320     1887  MSG5     DC    C'DEF SEC FLAGGED ********  *** ** **',X'0D0A'         MBF18870
1938   464C 4147 4745 4420
1940   2A2A 2A2A 2A2A 2A2A
1948   2020 2A2A 2A20 2A2A
1950   202A 2A20
1954   0D0A
1956   4445 4620 5452 4B20     1888  MSG6     DC    C'DEF TRK FLAGGED ********  *** **',X'0D0A'            MBF18880
195E   464C 4147 4745 4420
1966   2A2A 2A2A 2A2A 2A2A
196E   2020 2A2A 2A20 2A2A
1976   0D0A
```

DATA CONSTANTS & CHECK ROUTINES

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1978    464C 4147 2052 454A    1889  MSG7    DC    C'FLAG REJECTED    ******** *** ** ** <---X',X'0D0A'         MBF18890
1980    4543 5445 4420 2020
1988    2A2A 2A2A 2A2A 2A2A
1990    2020 2A2A 2A20 2A2A
1998    202A 2A20 3C2D 2D2D
19A0    5820
19A2    0D0A
19A4    434F 4E54 524F 4C4C    1890  MSG8    DC    C'CONTROLLER FORMAT SWITCH OFF',X'0D0A'                      MBF18900
19AC    4552 2046 4F52 4D41
19B4    5420 5357 4954 4348
19BC    204F 4646
19C0    0D0A
19C2    534F 4654 2045 5252    1891  MSG9    DC    C'SOFT ERROR       ******** *** ** **',X'0D0A'              MBF18910
19CA    4F52 2020 2020 2020
19D2    2A2A 2A2A 2A2A 2A2A
19DA    2020 2A2A 2A20 2A2A
19E2    202A 2A20
19E6    0D0A
19E8    494E 5641 4C49 4420    1892  MSG10   DC    C'INVALID          OPTION',X'0D0A'                          MBF18920
19F0    2020 2020 2020 204F
19F8    5054 494F 4E20
19FE    0D0A
1A00    5245 4455 4E44 414E    1893  MSG11   DC    C'REDUNDANT SEEK ERROR',X'0D0A'                             MBF18930
1A08    5420 5345 454B 2045
1A10    5252 4F52
1A14    0D0A
1A16    4452 4956 4520 2A20    1894  MSG12   DC    C'DRIVE * SELECTED',X'0D0A'                                 MBF18940
1A1E    5345 4C45 4354 4544
1A26    0D0A
1A28    4452 4956 4520 2A3A    1895  MSG13   DC    C'DRIVE *: WRITE PROTECTED',X'0D0A'                         MBF18950
1A30    2057 5249 5445 2050
1A38    524F 5445 4354 4544
1A40    0D0A
1A42    4452 4956 4520 2A3A    1896  MSG15   DC    C'DRIVE *: OFF LINE',X'0D0A'                                MBF18960
1A4A    204F 4646 204C 494E
1A52    4520
1A54    0D0A
1A56    4452 4956 4520 2A3A    1897  MSG16   DC    C'DRIVE *: UNRECOVERABLE ERROR - STATUS **',X'0D0A'        MBF18970
1A5E    2055 4E52 4543 4F56
1A66    4552 4142 4C45 2045
1A6E    5252 4F52 202D 2053
1A76    5441 5455 5320 2A2A
1A7E    0D0A
1A80    4946 2046 463D 3120    1898  MFF     DC    C'IF FF=1 THEN A NON-STANDARD FORMAT WILL'                  MBF18980
1A88    5448 454E 2041 204E
1A90    4F4E 2053 5441 4E44
1A98    4152 4420 464F 524D
1AA0    4154 2057 494C 4C20
1AA8    2042 4520 5045 5246    1899          DC    C' BE PERFORMED',X'0D0A'                                    MBF18990
1AB0    4F52 4D45 4420
1AB6    0D0A
                              1900  *                                                                          MBF19000
1AB8    C850 1738             1901  ERROR1  LDAI  R5,LOCYL            INVALID LOCYL OPTION                      MBF19010
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1ABC	4300 1B48	1902		B	SETMSG		MBF19020
1AC0	C850 1744	1903	ERROR2	LDAI	R5,HICYL	INVALID HICYL OPTION	MBF19030
1AC4	4300 1B48	1904		B	SETMSG		MBF19040
1AC8	C850 18E2	1905	ERROR3	LDAI	R5,MSG2	'WHICH DRIVE ?'	MBF19050
1ACC	4050 1868	1906		STH	R5,FATAL		MBF19060
1AD0	4300 1B60	1907		B	PRINTIT		MBF19070
1AD4	081B	1908	ERROR4	LDAR	R1,TRACK		MBF19080
1AD6	2403	1909		LIS	R0,3		MBF19090
1AD8	4000 1868	1910		STA	R0,FATAL		MBF19100
1ADC	C820 1909	1911		LDAI	R2,MSG3+25		MBF19110
1AE0	41F0 0F9E	1912		BAL	R15,HEXASC		MBF19120
1AE4	C850 18F0	1913		LDAI	R5,MSG3	CE PACK CYL ADRS VIOLATION	MBF19130
1AE8	4300 1B60	1914		B	PRINTIT		MBF19140
1AEC	C850 1A00	1915	ERROR5	LDAI	R5,MSG11	REDUNDANT SEEK ERROR	MBF19150
1AF0	4300 1B60	1916		B	PRINTIT		MBF19160
1AF4	C850 16FC	1917	ERROR6	LDAI	R5,DRIVE	INVALID DRIVE OPTION	MBF19170
1AF8	4300 1B48	1918		B	SETMSG		MBF19180
1AFC	C850 1A28	1919	ERROR7	LDAI	R5,MSG13	DRIVE WRITE-PROTECTED	MBF19190
1B00	4300 1B30	1920		B	SELECT		MBF19200
1B04	C850 1A42	1921	ERROR8	LDAI	R5,MSG15	DRIVE OFFLINE	MBF19210
1B08	4300 1B30	1922		B	SELECT		MBF19220
1B0C	C850 1720	1923	ERROR10	LDAI	R5,PACTYP	INVALID PACTYP OPTION	MBF19230
1B10	4300 1B48	1924		B	SETMSG		MBF19240
1B14	C850 19A4	1925	ERROR11	LDAI	R5,MSG8	FORMAT SWITCH OFF	MBF19250
1B18	4050 1868	1926		STA	R5,FATAL		MBF19260
1B1C	4300 1B60	1927		B	PRINTIT		MBF19270
1B20	081A	1928	ERROR13	LDAR	R1,STAT		MBF19280
1B22	2402	1929		LIS	R0,2		MBF19290
1B24	C820 1A7C	1930		LDAI	R2,MSG16+38		MBF19300
1B28	41F0 0F9E	1931		BAL	R15,HEXASC		MBF19310
1B2C	C850 1A56	1932		LDAI	R5,MSG16	UNRECOVERABLE DRIVE ERROR	MBF19320
		1933	*				MBF19330
1B30	4810 161C	1934	SELECT	LH	R1,BTESTNO	CONVT DRIVE NUMBER TO PRINT	MBF19340
1B34	D311 162C	1935		LB	R1,HEXTAB(R1)		MBF19350
1B38	D210 1A2E	1936		STB	R1,MSG13+6		MBF19360
1B3C	D210 1A48	1937		STB	R1,MSG15+6		MBF19370
1B40	D210 1A5C	1938		STB	R1,MSG16+6		MBF19380
1B44	4300 1B60	1939		B	PRINTIT		MBF19390
		1940	*				MBF19400
1B48	2416	1941	SETMSG	LIS	R1,6		MBF19410
1B4A	4010 1868	1942		STA	R1,FATAL		MBF19420
1B4E	D305 0005	1943	SETMSG1	LB	R0,5(R5)		MBF19430
1B52	D201 19EF	1944		STB	R0,MSG10+7(R1)		MBF19440
1B56	2751	1945		SIS	R5,1		MBF19450
1B58	2711	1946		SIS	R1,1		MBF19460
1B5A	2026	1947		BPS	SETMSG1		MBF19470
1B5C	C850 19E8	1948		LDAI	R5,MSG10		MBF19480
		1949	*				MBF19490
1B60	41F0 1320	1950	PRINTIT	BAL	R15,SETKB		MBF19500
1B64	41F0 105A	1951		BAL	R15,PRINT		MBF19510
1B68	4800 1868	1952		LDA	R0,FATAL	ABORT CURRENT SEQUENCE ?	MBF19520
1B6C	4330 0062	1953		BZ	TSTEND	BRANCH IF NO.	MBF19530
1B70	4300 0AB8	1954		B	OPTIN1	TO EXEC.	MBF19540

DATA CONSTANTS & CHECK ROUTINES

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                              1955  *                                                      MBF19550


          0000 1B74           1957  INIT    EQU     *                                      MBF19570
    1B74  D320 1729           1958          LB      R2,PACTYP+$VALU1+1  LOAD PHYSICAL IDENTIFIER   MBF19580
    1B78  2410                1959          LIS     R1,0                                   MBF19590
    1B7A  4010 1868           1960          STA     R1,FATAL                               MBF19600
    1B7E  D421 183E           1961  INI.0   CLB     R2,TYPTAB(R1)                          MBF19610
    1B82  2337                1962          BES     INI.0A              BRANCH: MATCH.     MBF19620
    1B84  2611                1963          AIS     R1,1                                   MBF19630
    1B86  C510 0002           1964          CLHI    R1,TABSIZ           SEARCH DONE?       MBF19640
    1B8A  4380 1B0C           1965          BNL     ERROR10             INVALID PACTYP OPTION  MBF19650
    1B8E  2208                1966          BS      INI.0                                  MBF19660
    1B90  0822                1967  INI.0A  LDAR    R2,R2                                  MBF19670
    1B92  2137                1968          BNZS    INI.1                                  MBF19680
    1B94  C800 0F00           1969          LHI     R0,X'0F00'                             MBF19690
    1B98  4400 1704           1970          NH      R0,DRIVE+$VALU1                        MBF19700
    1B9C  4230 1AF4           1971          BNZ     ERROR6                                 MBF19710
                              1972  *                                                      MBF19720
    1BA0  D301 1828           1973  INI.1   LB      R0,SYNCTAB(R1)      HEADER SYNC BYTE   MBF19730
    1BA4  4000 188A           1974          STH     R0,SYNC                                MBF19740
    1BA8  9111                1975          SLLS    R1,1                (HALFWORD INDEX)   MBF19750
    1BAA  4801 180A           1976          LH      R0,SECTAB(R1)       SECTORS/TRACK      MBF19760
    1BAE  4000 1878           1977          STH     R0,MAXSEC                              MBF19770
    1BB2  4801 1810           1978          LH      R0,HEDTAB(R1)       HEADS/CYLINDER     MBF19780
    1BB6  4000 187A           1979          STH     R0,MAXHEAD                             MBF19790
    1BBA  4801 1816           1980          LH      R0,CYLTAB(R1)       CYLINDERS/PACK     MBF19800
    1BBE  4000 187C           1981          STH     R0,MAXCYL                              MBF19810
    1BC2  4801 181C           1982          LH      R0,INDXTAB(R1)      PATTERNS/FORMAT    MBF19820
    1BC6  4000 187E           1983          STH     R0,MAXDEX                              MBF19830
    1BCA  4801 1822           1984          LH      R0,INCRTAB(R1)      SECTOR ADVANCE INCREMENT  MBF19840
    1BCE  4000 1882           1985  INI.1A  STH     R0,INCRMT                              MBF19850
    1BD2  4801 182C           1986          LH      R0,GAPTAB(R1)       HEADER GAP SIZE    MBF19860
    1BD6  4000 1884           1987          STH     R0,GAPSIZE                             MBF19870
    1BDA  4801 1832           1988          LH      R0,LRECLTAB(R1)     LOGICAL BYTES/SECTOR  MBF19880
    1BDE  4000 1886           1989          STH     R0,LRECL                               MBF19890
    1BE2  4801 1838           1990          LH      R0,PRECLTAB(R1)     PHYSICAL BYTES/SECTOR  MBF19900
    1BE6  4000 1888           1991          STH     R0,PRECL                               MBF19910
                              1992  *                                                      MBF19920
    1BEA  2400                1993          LIS     R0,0                                   MBF19930
    1BEC  4000 1896           1994          STH     R0,DSTSIZ                              MBF19940
    1BF0  4800 1878           1995          LH      R0,MAXSEC                              MBF19950
    1BF4  4810 187A           1996          LH      R1,MAXHEAD                             MBF19960
    1BF8  6100 1896           1997  INI.2   AHM     R0,DSTSIZ           COMPUTE SECTORS/CYLINDER  MBF19970
    1BFC  2711                1998          SIS     R1,1                                   MBF19980
    1BFE  2023                1999          BPS     INI.2                                  MBF19990
                              2000  *                                                      MBF20000
    1C00  2405                2001          LIS     R0,5                                   MBF20010
    1C02  4000 1880           2002          STH     R0,SKCNT            MAX SEEK RETRY COUNT  MBF20020
                              2003  *                                                      MBF20030
    1C06  4810 1888           2004          LH      R1,PRECL                               MBF20040
    1C0A  4800 185A           2005          LH      R0,RSA+2                               MBF20050
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1C0E    CA01 FFFF    2006          AHI    R0,-1(R1)                                      MBF20060
1C12    4000 185E    2007          STH    R0,RFA+2                                       MBF20070
1C16    4800 1852    2008          LH     R0,WSA+2                                       MBF20080
1C1A    CA01 FFFF    2009          AHI    R0,-1(R1)                                      MBF20090
1C1E    4000 1856    2010          STH    R0,WFA+2                                       MBF20100
                     2011  *                                                            MBF20110
1C22    4860 171C    2012          LH     R6,SELCH+$VALU1                                MBF20120
1C26    0E60 1801    2013          OC     R6,STOP             STOP SELCH                 MBF20130
1C2A    4060 17CC    2014          STH    R6,DEVSADR                                     MBF20140
1C2E    0E60 1801    2015          OC     R6,STOP                                        MBF20150
1C32    4860 1710    2016          LH     R6,DISCON+$VALU1                               MBF20160
1C36    0E60 1808    2017          OC     R6,RESET                                       MBF20170
1C3A    4060 17CE    2018          STH    R6,DEVSADR+2                                   MBF20180
1C3E    2516         2019          LCS    R1,6                                           MBF20190
1C40    0320 1729    2020          LB     R2,PACTYP+$VALU1+1                             MBF20200
1C44    CA60 0010    2021  INI.3   AHI    R6,X'10'                                       MBF20210
1C48    C876 0001    2022          LHI    R7,1(R6)                                       MBF20220
1C4C    4061 17D6    2023          STH    R6,DEVSADR+10(R1)   REMOVABLE                  MBF20230
1C50    0822         2024          LDAR   R2,R2               2.5 MB ?                   MBF20240
1C52    2132         2025          BNZS   INI.3A              BR. NO.                    MBF20250
1C54    2571         2026          LCS    R7,1                                           MBF20260
1C56    4071 17DE    2027  INI.3A  STH    R7,DEVSADR+18(R1)   FIXED                      MBF20270
1C5A    2612         2028          AIS    R1,2                                           MBF20280
1C5C    222C         2029          BNPS   INI.3                                          MBF20290
                     2030  *                                                            MBF20300
1C5E    4800 1704    2031          LH     R0,DRIVE+$VALU1                                MBF20310
1C62    4330 1AF4    2032          BZ     ERROR6              INVALID DRIVE OPTION       MBF20320
1C66    4810 1870    2033          LDA    R1,TESTS                                       MBF20330
1C6A    C510 1EF4    2034          CLAI   R1,FMT.MOD                                     MBF20340
1C6E    4330 1D24    2035          BE     INI.5               NOT USED BY FMT.MOD        MBF20350
1C72    9001         2036  INI.4   SRLS   R0,1                                           MBF20360
1C74    2281         2037          BNCS   INI.4                                          MBF20370
1C76    4230 1AC8    2038          BNZ    ERROR3              'WHICH DRIVE'              MBF20380
                     2039  *                                                            MBF20390
                     2040  * CHECK 'FLAG' INPUT PARAMETERS.                             MBF20400
                     2041  *                                                            MBF20410
1C7A    C510 21E4    2042          CLAI   R1,FLG.MOD                                     MBF20420
1C7E    4230 1D24    2043          BNE    INI.5               USED BY FLG.MOD            MBF20430
1C82    24A5         2044          LIS    R10,5               SET CURSOR TO OPERAND START MBF20440
1C84    41E0 1D90    2045          BAL    R14,SCAN            GET NUMERIC STRING         MBF20450
1C88    C540 000D    2046          CLHI   R4,X'0D'            CARRIAGE RETURN ?          MBF20460
1C8C    4230 1CAE    2047          BNE    SC.5                                           MBF20470
                     2048  *                                                            MBF20480
                     2049  * IF CARRIAGE RETURN, STORE LBN.                             MBF20490
1C90    C520 0009    2050          CLHI   R2,9                                           MBF20500
1C94    038C         2051          BNLR   R12                 INPUT ERROR - 8 CHARS ALLOWED. MBF20510
1C96    48F0 15F8    2052          LH     R15,MOD32                                      MBF20520
1C9A    2332         2053          BZS    SC.4                                           MBF20530
1C9C    3401         2054          DCX    3401                *EXHR R0,R1                MBF20540
1C9E    4000 186C    2055  SC.4    STH    R0,LBN                                         MBF20550
1CA2    4010 186E    2056          STH    R1,LBN+2            STORE LOGICAL BLOCK NUMBER. MBF20560
1CA6    41E0 1E3A    2057          BAL    R14,DECODE                                     MBF20570
1CAA    4300 1D02    2058          B      TSTPARM                                        MBF20580
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DATA CONSTANTS & CHECK ROUTINES

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                                2059  *                                                              MBF20590
                                2060  * IF SPACE WAS ENCOUNTERED, STORE CYLINDER ADDRESS.          MBF20600
1CAE    C540 0020               2061  SC.5    CLHI   R4,X'20'            SPACE ?                     MBF20610
1CB2    023C                    2062          BNER   R12                 BRANCH: INPUT ERROR         MBF20620
1CB4    C520 0004               2063          CLHI   R2,4                CHECK CHAR COUNT            MBF20630
1CB8    038C                    2064          BNLR   R12                 3 CHARS MAX ALLOWED.        MBF20640
1CBA    4010 1890               2065          STH    R1,CYLNUM           SAVE CYLINDER ADRS          MBF20650
                                2066  *                                                              MBF20660
                                2067  * PROCESS HEAD ADDRESS                                        MBF20670
1CBE    26A1                    2068          AIS    R10,1               POSITION CURSOR             MBF20680
1CC0    41E0 1D90               2069          BAL    R14,SCAN            GET HEAD ADRS NUMERIC STRING MBF20690
1CC4    C520 0003               2070          CLHI   R2,3                                            MBF20700
1CC8    038C                    2071          BNLR   R12                 INPUT ERROR                 MBF20710
1CCA    4010 1892               2072          STH    R1,HEADNUM                                      MBF20720
                                2073  *                                                              MBF20730
                                2074  * PROCESS SECTOR ADDRESS                                      MBF20740
1CCE    2410                    2075          LIS    R1,0                                            MBF20750
1CD0    4800 1734               2076          LH     R0,FMTSEC+$VALU1                                MBF20760
1CD4    233A                    2077          BZS    SC.8                                            MBF20770
1CD6    C540 0020               2078          CLHI   R4,X'20'            SPACE ?                     MBF20780
1CDA    023C                    2079          BNER   R12                 INPUT ERROR                 MBF20790
                                2080  *                                                              MBF20800
1CDC    26A1                    2081          AIS    R10,1               POSITION CURSOR             MBF20810
1CDE    41E0 1D90               2082          BAL    R14,SCAN                                        MBF20820
1CE2    C520 0003               2083          CLHI   R2,3                                            MBF20830
1CE6    038C                    2084          BNLR   R12                                             MBF20840
1CE8    4010 1894               2085  SC.8    STH    R1,SECTNUM                                      MBF20850
1CEC    C540 000D               2086          CLHI   R4,X'0D'                                        MBF20860
1CF0    023C                    2087          BNER   R12                                             MBF20870
1CF2    4880 1894               2088          LH     SECT,SECTNUM                                    MBF20880
1CF6    4890 1892               2089          LH     HEAD,HEADNUM                                    MBF20890
1CFA    4880 1890               2090          LH     TRACK,CYLNUM                                    MBF20900
1CFE    41E0 1DF8               2091          BAL    R14,ENCODE          CREATE LBN                  MBF20910
                                2092  *                                                              MBF20920
1D02    4880 1890               2093  TSTPARM LH     TRACK,CYLNUM                                    MBF20930
1D06    45B0 187C               2094          CLH    TRACK,MAXCYL                                    MBF20940
1D0A    038C                    2095          BNLR   R12                 CYLINDER ADDRESS ERROR      MBF20950
1D0C    4890 1892               2096          LH     HEAD,HEADNUM                                    MBF20960
1D10    4590 187A               2097          CLH    HEAD,MAXHEAD                                    MBF20970
1D14    038C                    2098          BNLR   R12                 INPUT ERROR                 MBF20980
1D16    4880 1894               2099          LH     SECT,SECTNUM                                    MBF20990
1D1A    4580 1878               2100          CLH    SECT,MAXSEC                                     MBF21000
1D1E    038C                    2101          BNLR   R12                 INPUT ERROR                 MBF21010
1D20    4300 1D5A               2102          B      INI.6               NOT USED BY FLG.MOD         MBF21020
                                2103  *                                                              MBF21030
1D24    4800 174C               2104  INI.5   LH     R0,HICYL+$VALU1                                 MBF21040
1D28    4210 1AC0               2105          BM     ERROR2              INVALID HICYL OPTION        MBF21050
1D2C    4500 187C               2106          CLH    R0,MAXCYL                                       MBF21060
1D30    4380 1AC0               2107          BNL    ERROR2              INVALID HICYL OPTION        MBF21070
1D34    08B0                    2108          LDAR   TRACK,R0                                        MBF21080
1D36    C8E0 1AD4               2109          LDAI   R14,ERROR4                                      MBF21090
1D3A    41F0 1EC4               2110          BAL    R15,ILLADD                                      MBF21100
1D3E    4810 1740               2111          LH     R1,LOCYL+$VALU1                                 MBF21110
```

DATA CONSTANTS & CHECK ROUTINES

```
1042    4210 1AB8     2112              BM      ERROR1          INVALID LOCYL OPTION        MBF21120
1046    4510 187C     2113              CLH     R1,MAXCYL                                   MBF21130
104A    4380 1AB8     2114              BNL     ERROR1          INVALID LOCYL OPTION        MBF21140
104E    05B1          2115              CLAR    TRACK,R1                                    MBF21150
1050    4280 1AC0     2116              BL      ERROR2          INVALID HICYL OPTION        MBF21160
1054    08B1          2117              LDAR    TRACK,R1                                    MBF21170
1056    41F0 1EC4     2118              BAL     R15,ILLADD                                  MBF21180
                      2119      *                                                          MBF21190
105A    24F0          2120    INI.6     LIS     R15,0                   .     06173F02      MBF21200
105C    2440          2121              LIS     R4,0                    .     06173F02      MBF21210
105E    4814 17CC     2122    INI.6A    LH      R1,DEVSADR(R4)          .     06173F02      MBF21220
1062    4210 1D86     2123              BM      INI.7                   .     06173F02      MBF21230
1066    9D10          2124              SSR     R1,R0                   .     06173F02      MBF21240
1068    2704          2125              SIS     R0,4                    .     06173F02      MBF21250
106A    213B          2126              BNZS    INISYS                  .     06173F02      MBF21260
106C    2403          2127    OUTSYS    LIS     R0,3                    .     06173F02      MBF21270
106E    C820 191C     2128              LHI     R2,OUSYS+4              .     06173F02      MBF21280
1072    41F0 0F9E     2129              BAL     R15,HEXASC              .     06173F02      MBF21290
1076    40F0 160C     2130              STH     R15,ISITERR             .     06173F02      MBF21300
107A    41F0 1042     2131              BAL     R15,$PRINT              .     06173F02      MBF21310
107E    1918          2132              DAC     OUSYS                   .     06173F02      MBF21320
1080    2642          2133    INISYS    AIS     R4,2                    .     06173F02      MBF21330
1082    4300 105E     2134              B       INI.6A                  .     06173F02      MBF21340
1086    08FF          2135    INI.7     LDAR    R15,15                  .     06173F02      MBF21350
1088    4230 0A80     2136              BNZ     OPTIN                   .     06173F02      MBF21360
108C    4300 0CB4     2137              B       INITRET                 .     06173F02      MBF21370


                      2139    * SUBROUTINE SCAN CHECKS INPUT PARAMETERS FOR THE 'FLAG' COMMAND.     MBF21390
                      2140    * REGISTERS DESTROYED: R0,R1,R2,R4,R10,R13,R15                        MBF21400
                      2141    * BAL     R14,SCAN                                                    MBF21410
                      2142    *                                                                     MBF21420
1090    2400          2143    SCAN      LIS     R0,0                                        MBF21430
1092    2410          2144              LIS     R1,0            ACCUMULATOR                 MBF21440
1094    2420          2145              LIS     R2,0            DIGIT COUNTER               MBF21450
1096    24FF          2146    SCAN1     LIS     R15,15                                      MBF21460
1098    D34A 2CAC     2147              LB      R4,$INBUF(R10)                              MBF21470
109C    D44F 162C     2148    SC.1      CLB     R4,HEXTAB(R15)  MATCH DIGIT (?)             MBF21480
10A0    2334          2149              BES     SC.2                                        MBF21490
10A2    27F1          2150              SIS     R15,1                                       MBF21500
10A4    021E          2151              BMR     R14             NO MATCH                    MBF21510
10A6    2205          2152              BS      SC.1            CONTINUE                    MBF21520
                      2153    *                                                            MBF21530
10A8    48D0 15F8     2154    SC.2      LH      R13,MOD32                                   MBF21540
10AC    2332          2155              BZS     SC.3            BRANCH: SERIES 16 PROC.     MBF21550
10AE    1114          2156              DCX     1114            *SLLS R1,4 (32 BIT SHIFT)   MBF21560
10B0    ED00 0004     2157    SC.3      SLL     R0,4            32-BIT SHIFT                MBF21570
10B4    061F          2158              OAR     R1,R15          ACCUMULATE                  MBF21580
10B6    26A1          2159              AIS     R10,1           BUMP POINTER                MBF21590
10B8    2621          2160              AIS     R2,1            AND COUNTER                 MBF21600
10BA    4300 1D96     2161              B       SCAN1                                       MBF21610
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                              2163  * SUBROUTINE FMSUDF SETS UP CORRECT GAP2, SYNC2, AND NORMAL-MODE          MBF21630
                              2164  * LRC FIELDS, AND SETS DATA FIELD TO ZERO FOR FORMAT-MODE TRANSFER.       MBF21640
                              2165  * REGISTERS DESTROYED: R0,R1,R2,R3,R4,R13                                 MBF21650
                              2166  *                                                                         MBF21660
    1DBE   2411               2167  FMSUDF    LIS   R1,1                        SET SECTOR COUNT               MBF21670
    1DC0   C820 29DC          2168            LHI   R2,WTF                                                     MBF21680
    1DC4   24D0               2169  FMSUDFA   LIS   R13,0                                                      MBF21690
    1DC6   2711               2170  FMSU.1    SIS   R1,1                                                       MBF21700
    1DC8   021F               2171            BMR   R15                                                        MBF21710
    1DCA   D300 24DA          2172            LB    R0,GAP1                                                    MBF21720
    1DCE   2432               2173            LIS   R3,2                                                       MBF21730
    1DD0   C842 0009          2174            LHI   R4,9(R2)                                                   MBF21740
    1DD4   4002 0002          2175  FMSU.2    STH   R0,2(R2)                                                   MBF21750
    1DD8   C120 1DD4          2176            BXLE  R2,FMSU.2                                                  MBF21760
    1DDC   4800 188A          2177            LH    R0,SYNC                                                    MBF21770
    1DE0   4002 0000          2178            STH   R0,0(R2)                                                   MBF21780
    1DE4   2622               2179            AIS   R2,2                                                       MBF21790
    1DE6   0842               2180            LDAR  R4,R2                                                      MBF21800
    1DE8   4A40 1886          2181            AH    R4,LRECL                                                   MBF21810
    1DEC   40D2 0000          2182  FMSU.3    STH   R13,0(R2)                                                  MBF21820
    1DF0   C120 1DEC          2183            BXLE  R2,FMSU.3                                                  MBF21830
    1DF4   4300 1DC6          2184            B     FMSU.1                                                     MBF21840


                              2186  * SUBROUTINE ENCODE CONVERTS CYLINDER, HEAD, & SECTOR ADRESS TO           MBF21860
                              2187  * A POINTER INTO THE LINEAR SECTOR ARRAY                                  MBF21870
                              2188  * REGISTERS DESTROYED: NONE.                                              MBF21880
                              2189  *                                                                         MBF21890
           0000 1DF8          2190  ENCODE    EQU   *                           CONVERT CYL, HEAD, SECT TO LBN MBF21900
    1DF8   D000 2CFC          2191            STM   R0,RSAVE                                                   MBF21910
    1DFC   2421               2192            LIS   R2,1                        .                              MBF21920
    1DFE   2400               2193            LIS   R0,0                                                       MBF21930
    1E00   4000 186C          2194            STH   R0,LBN                                                     MBF21940
    1E04   4080 186E          2195            STH   SECT,LBN+2                  SECTOR NUMBER                  MBF21950
    1E08   4810 1878          2196            LH    R1,MAXSEC                   TRACK SECTOR DELTA             MBF21960
    1E0C   0809               2197            LDAR  R0,HEAD                     .                              MBF21970
*   1E0E   2328               2198            BNP   ENC.3                       .                              MBF21980
    1E10   6110 186E          2199  ENC.1     AHM   R1,LBN+2                    .                              MBF21990
    1E14   2383               2200            BNCS  ENC.2                       .                              MBF22000
    1E16   6120 186C          2201            AHM   R2,LBN                      .                              MBF22010
    1E1A   2701               2202  ENC.2     SIS   R0,1                        .                              MBF22020
    1E1C   2026               2203            BPS   ENC.1                       .                              MBF22030
    1E1E   4810 1896          2204  ENC.3     LH    R1,DSTSIZ                   CYLINDER SECTOR DELTA          MBF22040
    1E22   080B               2205            LDAR  R0,TRACK                    .                              MBF22050
    1E24   2328               2206            BNPS  ENC.6                       .                              MBF22060
    1E26   6110 186E          2207  ENC.4     AHM   R1,LBN+2                    .                              MBF22070
    1E2A   2383               2208            BNCS  ENC.5                       .                              MBF22080
    1E2C   6120 186C          2209            AHM   R2,LBN                      .                              MBF22090
    1E30   2701               2210  ENC.5     SIS   R0,1                        .                              MBF22100
    1E32   2026               2211            BPS   ENC.4                       .                              MBF22110
    1E34   D100 2CFC          2212  ENC.6     LM    R0,RSAVE                                                   MBF22120
    1E38   030E               2213            BR    R14                         RETURN.                        MBF22130
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                              2215  * SUBROUTINE DECODE CONVERTS THE LINEAR SECTOR POINTER INTO        MBF22150
                              2216  * THE CORRESPONDING CYLINDER, HEAD, AND SECTOR ADDRESSES.          MBF22160
                              2217  * REGISTERS DESTROYED: R0,R1,R2                                     MBF22170
                              2218  *                                                                  MBF22180
            0000 1E3A         2219  DECODE   EQU    *            GET CYL, HEAD, SECTOR FROM LBN         MBF22190
1E3A   2490                   2220           LIS    HEAD,0                                             MBF22200
1E3C   2480                   2221           LIS    SECT,0                                             MBF22210
1E3E   24B0                   2222           LIS    TRACK,0                                            MBF22220
1E40   4800 15F8              2223           LH     R0,MOD32                                           MBF22230
1E44   2336                   2224           BZS    DEC.0                                              MBF22240
1E46   7300                   2225           OC     X'7300',Z(LBN)     *LHL R0,LBN                     MBF22250
1E48   186C
1E4A   7310                   2226           OC     X'7310',Z(LBN+2)   *LHL R1,LBN+2                   MBF22260
1E4C   186E
1E4E   2305                   2227           BS     DEC.1                                              MBF22270
1E50   4800 186C              2228  DEC.0    LH     R0,LBN                                             MBF22280
1E54   4810 186E              2229           LH     R1,LBN+2                                           MBF22290
1E58   4810 1896              2230  DEC.1    SH     R1,DSTSIZ    ADVANCE CYLINDER                      MBF22300
1E5C   2386                   2231           BNCS   DEC.2                                              MBF22310
1E5E   2701                   2232           SIS    R0,1                                               MBF22320
1E60   2384                   2233           BNCS   DEC.2                                              MBF22330
1E62   4A10 1896              2234           AH     R1,DSTSIZ    CORRECT EXCESS SUBTRACTION            MBF22340
1E66   2309                   2235           BS     DEC.3                                              MBF22350
1E68   26B1                   2236  DEC.2    AIS    TRACK,1                                            MBF22360
1E6A   4820 15F8              2237           LH     R2,MOD32                                           MBF22370
1E6E   223B                   2238           BZS    DEC.1                                              MBF22380
1E70   F410                   2239           DCX    F410,0000,FFFF     *NI R1,Y'0000FFFF'              MBF22390
1E72   0000
1E74   FFFF
1E76   220F                   2240           BS     DEC.1                                              MBF22400
1E78   4810 1878              2241  DEC.3    SH     R1,MAXSEC    ADVANCE HEAD                          MBF22410
1E7C   2384                   2242           BNCS   DEC.4                                              MBF22420
1E7E   4A10 1878              2243           AH     R1,MAXSEC    CORRECT EXCESS SUBTRACTION            MBF22430
1E82   2303                   2244           BS     DEC.5                                              MBF22440
1E84   2691                   2245  DEC.4    AIS    HEAD,1                                             MBF22450
1E86   2207                   2246           BS     DEC.3                                              MBF22460
1E88   0881                   2247  DEC.5    LDAR   SECT,R1      RESIDUE = SECTOR ADRS                 MBF22470
1E8A   4080 1890              2248           STH    TRACK,CYLNUM                                       MBF22480
1E8E   4090 1892              2249           STH    HEAD,HEADNUM                                       MBF22490
1E92   4080 1894              2250           STH    SECT,SECTNUM                                       MBF22500
1E96   030E                   2251           BR     R14          RETURN TO CALLER                      MBF22510


                              2253  * SUBROUTINE RECODE CONVERTS CURRENT CYLINDER ADDRESS AND DSTBL   MBF22530
                              2254  * INDEX TO THE CORRESPONDING LINEAR SECTOR POINTER.               MBF22540
                              2255  * REGISTERS DESTROYED: HEAD,SECT                                  MBF22550
            0000 1E98         2256  RECODE   EQU    *            COMPUTE LBN, SECT, HEAD FROM DSTBL    MBF22560
1E98   2490                   2257           LIS    HEAD,0                                             MBF22570
1E9A   0881                   2258           LDAR   SECT,R1      COPY DSTBL INDEX                      MBF22580
1E9C   4580 1878              2259  REC.1    CLH    SECT,MAXSEC                                        MBF22590
1EA0   4280 1DF8              2260           BL     ENCODE       COMPUTE LBN; RETURN ON R14           MBF22600
1EA4   4B80 1878              2261           SH     SECT,MAXSEC                                        MBF22610
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DATA CONSTANTS & CHECK ROUTINES

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1EA8    2691              2262           AIS   HEAD,1                                              MBF22620
1EAA    2207              2263           BS    REC,1                                               MBF22630


                          2265    * SUBROUTINE DISPLAY WRITES DRIVE, CYLINDER, HEAD, AND SECTOR    MBF22650
                          2266    * ADDRESSES TO THE PROCESSOR DISPLAY PANEL.                       MBF22660
                          2267    * REGISTERS DESTROYED: R0,R1                                      MBF22670
                          2268    *                                                                 MBF22680
1EAC    2401              2269    PANLWRT LIS   R0,1                                                MBF22690
1EAE    DE00 15FE         2270            OC    R0,INCR      DISPLAY TO INCREMENTAL MODE            MBF22700
1EB2    9A08              2271            WDR   R0,SECT      SECTOR                                 MBF22710
1EB4    9A09              2272            WDR   R0,HEAD      HEAD                                   MBF22720
1EB6    941B              2273            EXBR  R1,TRACK     CYLINDER                               MBF22730
1EB8    9801              2274            WHR   R0,R1                                               MBF22740
1EBA    DA00 161D         2275            WD    R0,BTESTNO+1                                        MBF22750
1EBE    DE00 15FD         2276            OC    R0,NORM                                             MBF22760
1EC2    030E              2277            BR    R14          RETURN                                 MBF22770


                          2279    * CHECK FOR INVALID CYLINDERS ON CE DISC PACK                    MBF22790
                          2280    * REGISTERS DESTROYED: R0                                        MBF22800
                          2281    *                                                                MBF22810
1EC4    C800 00CE         2282    ILLADD  LHI   R0,X'CE'     CE DISC PACK ?                        MBF22820
1EC8    D400 1728         2283            CLB   R0,PACTYP+$VALU1                                   MBF22830
1ECC    023F              2284            BNER  R15          RETURN                                 MBF22840
1ECE    C5B0 0197         2285            CLHI  TRACK,X'197'  FOR CYL X'192'                        MBF22850
1ED2    038F              2286            BNLR  R15          BR: OK                                 MBF22860
1ED4    C5B0 0180         2287            CLHI  TRACK,X'180'                                        MBF22870
1ED8    038E              2288            BNLR  R14          REJECT                                 MBF22880
1EDA    C5B0 010A         2289            CLHI  TRACK,X'10A'  FOR CYLS X'100',X'105'               MBF22890
1EDE    038F              2290            BNLR  R15          BR: OK                                 MBF22900
1EE0    C5B0 00FB         2291            CLHI  TRACK,X'FB'                                         MBF22910
1EE4    038E              2292            BNLR  R14                                                 MBF22920
1EE6    C5B0 0015         2293            CLHI  TRACK,X'15'   FOR CYL X'010'                        MBF22930
1EEA    038F              2294            BNLR  R15          BR: OK                                 MBF22940
1EEC    C5B0 000B         2295            CLHI  TRACK,X'0B'                                         MBF22950
1EF0    028F              2296            BLR   R15          BR: OK                                 MBF22960
1EF2    030E              2297            BR    R14          REJECT                                 MBF22970
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2299  *  ***********************************************************  MBF22990
2300  *                                                              MBF23000
2301  *                    F O R M A T    M O D U L E                MBF23010
2302  *                                                              MBF23020
2303  * PURPOSE OF MODULE:                                           MBF23030
2304  * FMT.MOD EVALUATES THE SURFACE OF THE DISC PACK, ESTABLISHES  MBF23040
2305  * PROPER FORMAT, AND FLAGS FAULTY SECTORS AS DEFECTIVE, BY SETTING  MBF23050
2306  * THE DEF SEC BIT IN THE HEADER OF EACH DEFECTIVE SECTOR.      MBF23060
2307  *                                                              MBF23070
2308  * ASSUMPTIONS:                                                 MBF23080
2309  * EACH DISC DRIVE TO BE SELECTED MUST BE ON-LINE, AND NOT WRITE-  MBF23090
2310  * PROTECTED. THE CONTROLLER FORMAT SWITCH MUST BE IN THE FORMAT  MBF23100
2311  * POSITION.                                                    MBF23110
2312  *                                                              MBF23120
2313  * DESIGN SPECIFICATIONS:                                       MBF23130
2314  * A SEEK IS BEGUN TO THE SPECIFIED LOCYL; DURING THE SEEK, A   MBF23140
2315  * TABLE TO CONTAIN ENTRIES FOR FAULTY SECTORS IS ESTABLISHED.  MBF23150
2316  * WHEN THE SEEK IS COMPLETE, A WORST-CASE PATTERN IS WRITTEN   MBF23160
2317  * TO EVERY SECTOR IN THE CYLINDER, INCLUDING HEADER, SYNC, AND  MBF23170
2318  * GAP FIELDS.                                                  MBF23180
2319  *                                                              MBF23190
2320  * EACH SECTOR IS THEN 'READ-CHECKED' IN FORMAT MODE,TWO TIMES  MBF23200
2321  * NO LRC ERROR IS EXPECTED. A FIFTH READ IS DONE, USING THE    MBF23210
2322  * SELCH, AND THE DATA READ IS TESTED. ANY ERROR CAUSES A 'SOFT'  MBF23220
2323  * ERROR TALLY TO BE INCREMENTED FOR THE SECTOR, IN 'DSTBL'.    MBF23230
2324  *                                                              MBF23240
2325  * AFTER THIS SEQUENCE HAS BEEN REPEATED FOR EACH WORST-CASE    MBF23250
2326  * PATTERN, PROPER FORMAT IS WRITTEN TO THE ENTIRE CYLINDER, AND  MBF23260
2327  * EACH SECTOR IS NORMAL-MODE READ-CHECKED. ANY ERROR CAUSES A  MBF23270
2328  * FLAG TO BE SET IN DSTBL FOR THE SECTOR, INDICATING 'HARD ERROR'.  MBF23280
2329  *                                                              MBF23290
2330  * FINALLY, DSTBL IS SCANNED FOR ANY SECTOR ERRORS. TWO 'SOFT'  MBF23300
2331  * ERRORS, OR ANY 'HARD' ERROR, CAUSE A SECTOR TO BE FLAGGED    MBF23310
2332  * DEFECTIVE, BY SETTING THE DEF SEC BIT IN THE SECTOR HEADER.  MBF23320
2333  * THE SECTOR IS TESTED AFTER FLAGGING, FOR DEFECTIVE SECTOR    MBF23330
2334  * STATUS FROM THE DISC SYSTEM CONTROLLER.                      MBF23340
2335  *                                                              MBF23350
2336  * WHEN FLAGGING/TESTING IS COMPLETE, A SEEK IS MADE TO THE NEXT  MBF23360
2337  * CYLINDER, IF REQUIRED. WHEN ALL SPECIFIED CYLINDERS HAVE BEEN  MBF23370
2338  * PROCESSED, A READ-CHECK IS MADE OF SECTOR 0, HEAD 0 OF EACH  MBF23380
2339  * CYLINDER BETWEEN LOCYL AND HICYL. ANY HEADER ERROR STATUS    MBF23390
2340  * (IF NOT ACCOMPANIED BY DEF SEC STATUS) IS ASSUMED TO BE THE  MBF23400
2341  * RESULT OF A REDUNDANT SEEK ERROR; AND A MESSAGE IS OUTPUT TO  MBF23410
2342  * THAT EFFECT. IN THIS CASE, THE FORMAT OF THE DISC PACK IS NOT  MBF23420
2343  * GUARANTEED.                                                  MBF23430
2344  *                                                              MBF23440
2345  * WHEN FORMATTING IS COMPLETE FOR THE SELECTED DRIVE, THE DRIVE  MBF23450
2346  * IS DESELECTED, AND THE PROCESS IS REPEATED FOR THE NEXT      MBF23460
2347  * SPECIFIED DRIVE (IF ANY).                                    MBF23470
2348  *                                                              MBF23480
2349  *                         N O T E                             MBF23490
2350  *                                                              MBF23500
2351  * IF A DRIVE ERROR OCCURS, UP TO FIVE ATTEMPTS ARE MADE TO RECOVER  MBF23510
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                        2352  * FROM THE ERROR. IF RECOVERY CANNOT BE MADE, THE DRIVE IS          MBF23520
                        2353  * DESELECTED, AND THE NEXT SPECIFIED DRIVE (IF ANY) IS SELECTED.    MBF23530
                        2354  *                                                                   MBF23540
                        2355  * OPERATING PROCEDURES:                                             MBF23550
                        2356  * MOUNT DISC PACKS ON REQUIRED DRIVES. ENTER THE CORRECT SELCH,     MBF23560
                        2357  * DISCON, DRIVE, LOCYL AND HICYL OPTIONS. ENTER 'FORMAT'. THE       MBF23570
                        2358  * FORMATTER PROCEEDS WITHOUT OPERATOR INTERVENTION.                 MBF23580
                        2359  *                                                                   MBF23590
                        2360  * OPTIONS:                                                          MBF23600
                        2361  * SELCH, DISCON, DRIVE, PACTYP, LOCYL, HICYL, FMTSEC                MBF23610
                        2362  *                                                                   MBF23620
                        2363  *                                                                   MBF23630
          0000 1EF4     2364  FMT.MOD EQU    *                          TESTS & FORMATS DISC SURFACE  MBF23640
1EF4      4850 189A     2365          LH     FUT,FUTADRS                                          MBF23650
1EF8      4860 1710     2366          LH     DCAD,DISCON+$VALU1                                   MBF23660
1EFC      4870 171C     2367          LH     SLAD,SELCH+$VALU1                                    MBF23670
1F00      48B0 1740     2368          LH     TRACK,LOCYL+$VALU1                                   MBF23680


                        2370  * START SEEK TO SPECIFIED CYLINDER, DO TABLE SETUP WHILE SEEKING.   MBF23700
          0000 1F04     2371  FMT.1   EQU    *                          SEEK & PROCESS CYLINDER    MBF23710
1F04      40B0 1890     2372          STH    TRACK,CYLNUM                                         MBF23720
1F08      C8E0 2110     2373          LDAI   R14,CYLADV1                                          MBF23730
1F0C      41F0 1EC4     2374          BAL    R15,ILLADD                 CHECK CE PACK CYL ADRS    MBF23740
1F10      4UF0 1864     2375          STA    R15,SKRTRY                 SEEK ERROR RERUN ADRS     MBF23750
1F14      DE60 1808     2376          OC     DCAD,RESET                                           MBF23760
1F18      906A          2377          SSR    DCAD,STAT                                            MBF23770
1F1A      2221          2378          BFBS   IDLE,1                                               MBF23780
1F1C      985B          2379          WHR    FUT,TRACK                  SEND CYLINDER ADRS        MBF23790
1F1E      906A          2380          SSR    DCAD,STAT                                            MBF23800
1F20      2221          2381          BFBS   IDLE,1                                               MBF23810
1F22      DE50 1806     2382          OC     FUT,SEEK                   AND SEEK CYLINDER.        MBF23820
                        2383  *                                                                   MBF23830
1F26      2400          2384          LIS    R0,0                                                 MBF23840
1F28      2410          2385          LIS    R1,0                                                 MBF23850
1F2A      2422          2386          LIS    R2,2                                                 MBF23860
1F2C      4830 1896     2387          LH     R3,DSTSIZ                  GET DSTBL SIZE            MBF23870
1F30      4001 24DC     2388  FMT.1A  STH    R0,DSTBL(R1)               ZERO DSTBL.               MBF23880
1F34      C110 1F30     2389          BXLE   R1,FMT.1A                                            MBF23890
                        2390  *                                                                   MBF23900
1F38      4830 187E     2391          LH     R3,MAXDEX                                            MBF23910
1F3C      4800 1770     2392          LH     R0,FF+$VALU1               CHECK FOR FAST FORMAT     MBF23920
1F40      2332          2393          BZS    PATLOOP                                              MBF23930
1F42      2734          2394          SIS    R3,4                                                 MBF23940
1F44      4030 188C     2395  PATLOOP STH    R3,INDEX                   INITIALIZE PATTERN INDEX  MBF23950
1F48      4800 1770     2396          LH     R0,FF+$VALU1               CHECK FOR FAST FORMAT     MBF23960
1F4C      2134          2397          BNZS   PATLOOP1                                             MBF23970
1F4E      4803 1844     2398          LH     R0,DATAB(R3)               LOAD DISC W/C PATTERN     MBF23980
1F52      2303          2399          BS     PATLOOP2                                             MBF23990
1F54      4803 184C     2400  PATLOOP1 LH    R0,DATAB1(R3)              GET FAST FORMAT PATTERN   MBF24000
1F58      0810          2401  PATLOOP2 LDAR  R1,R0                                                MBF24010
                        2402  *                                                                   MBF24020
```

DATA CONSTANTS & CHECK ROUTINES

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1F5A    2420            2403  SUD.0    LIS    R2,0                                          MBF24030
1F5C    2434            2404           LIS    R3,4                                          MBF24040
1F5E    4840 1888       2405           LH     R4,PRECL        FORMAT-MODE RECORD SIZE       MBF24050
1F62    4002 29DC       2406  SUD.1    STH    R0,WTF(R2)      SET UP WORST-CASE PATTERN     MBF24060
1F66    4012 29DE       2407           STH    R1,WTF+2(R2)                                  MBF24070
1F6A    C120 1F62       2408           BXLE   R2,SUD.1                                      MBF24080
1F6E    4014 2810       2409           STH    R1,RDF(R4)      DUMMY DATA FOR FW COMPARES    MBF24090
                        2410  *                                                            MBF24100
1F72    4830 187E       2411           LH     R3,MAXDEX                                     MBF24110
1F76    4530 188C       2412           CLH    R3,INDEX                                      MBF24120
* 1F7A  2138            2413           BNE    MOD1            BYPASS IF ON-CYLINDER         MBF24130
                        2414  *                                                            MBF24140
1F7C    905A            2415  FMT.1B   SSR    FUT,STAT                                      MBF24150
1F7E    C3A0 00E3       2416           THI    STAT,X'E3'                                    MBF24160
1F82    4230 2386       2417           BNZ    DRVERR                                        MBF24170
1F86    08AA            2418           LDAR   STAT,STAT                                     MBF24180
1F88    2036            2419           BNZS   FMT.1B                                        MBF24190


                        2421  * WRITE WORST-CASE PATTERNS TO FULL CYLINDER, SECTOR-AT-A-TIME.   MBF24210
                        2422  *                                                            MBF24220
                        2423  * SECTOR ADVANCE SEQUENCE: INITIAL ACCESS IS MADE ON AN ODD-EVEN  MBF24230
                        2424  * BASIS, BEGINNING WITH HEAD 0, SECTOR 0. WHEN ALL EVEN-NUMBERED  MBF24240
                        2425  * SECTORS HAVE BEEN WRITTEN FOR THE CYLINDER, THE ODD SECTORS ARE MBF24250
                        2426  * WRITTEN, BEGINNING WITH HEAD 0.                            MBF24260
                        2427  * HEAD     SECTORS                                           MBF24270
                        2428  * ----     -------                                           MBF24280
                        2429  *  0       0,2,4,6,....18 (20)     FIRST REVOLUTION          MBF24290
                        2430  *  1       0,2,4,6,....18 (20)     SECOND REVOLUTION         MBF24300
                        2431  * ETC.                                                       MBF24310
                        2432  *                                                            MBF24320
                        2433  * THIS GUARANTEES 1 SECTOR LEAD-TIME FOLLOWING A HEAD SWITCH. MBF24330
                        434   *                                                            MBF24340
                        2435  * TIME TO PROCESS CYLINDER = INITIAL SYNC TIME + 2T(R)*HEADS  MBF24350
                        2436  *                                                            MBF24360
1F8A    2480            2437  MOD1     LIS    SECT,0                                        MBF24370
1F8C    2490            2438  WF1.0    LIS    HEAD,0                                        MBF24380
1F8E    41F0 228C       2439  WF1.1    BAL    R15,WFMT        WRITE THE SECTOR             MBF24390
1F92    2682            2440           AIS    SECT,2                                        MBF24400
1F94    4580 1878       2441           CLH    SECT,MAXSEC     STILL VALID ?                 MBF24410
1F98    2085            2442           BLS    WF1.1           BRANCH: YES.                  MBF24420
1F9A    4B80 1878       2443           SH     SECT,MAXSEC     REVERT TO 0/1                 MBF24430
1F9E    2691            2444  HADV1    AIS    HEAD,1                                        MBF24440
1FA0    4590 187A       2445           CLH    HEAD,MAXHEAD    STILL VALID ?                 MBF24450
1FA4    208B            2446           BLS    WF1.1                                         MBF24460
1FA6    C780 0001       2447           XHI    SECT,1                                        MBF24470
1FAA    203F            2448           BNZS   WF1.0                                         MBF24480


                        2450  * 'READ-CHECK' EACH SECTOR IN FORMAT MODE                    MBF24500
                        2451  * TIME TO PROCESS CYLINDER = INITIAL SYNC TIME +             MBF24510
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DATA CONSTANTS & CHECK ROUTINES

```
                           2452  *        2T(R)*HEADS*LPCNT                                      MBF24520
                           2453  *                                                              MBF24530
1FAC    2402               2454  MOD2    LIS    R0,2              ESTABLISH ITERATION COUNT      MBF24540
1FAE    4000 1898          2455  PATLP1  STH    R0,LPCNT                                         MBF24550
                           2456  *                                                              MBF24560
1FB2    2480               2457  FCHK    LIS    SECT,0                                           MBF24570
1FB4    2490               2458  FCK.0   LIS    HEAD,0                                           MBF24580
1FB6    41F0 2322          2459  FCK.1   BAL    R15,FMRDCK        FORMAT READ CHECK THE SECTOR   MBF24590
1FBA    2682               2460          AIS    SECT,2                                           MBF24600
1FBC    4580 1878          2461          CLH    SECT,MAXSEC       STILL VALID ?                  MBF24610
1FC0    2085               2462          BLS    FCK.1             BRANCH: YES.                   MBF24620
1FC2    4880 1878          2463          SH     SECT,MAXSEC       REVERT TO 0/1                  MBF24630
1FC6    2691               2464  HADV2   AIS    HEAD,1                                           MBF24640
1FC8    4590 187A          2465          CLH    HEAD,MAXHEAD      STILL VALID ?                  MBF24650
1FCC    208B               2466          BLS    FCK.1                                            MBF24660
1FCE    C780 0001          2467          XHI    SECT,1                                           MBF24670
1FD2    203F               2468          BNZS   FCK.0                                            MBF24680
                           2469  *                                                              MBF24690
1FD4    4800 1898          2470          LH     R0,LPCNT                                         MBF24700
1FD8    2701               2471          SIS    R0,1                                             MBF24710
1FDA    4220 1FAE          2472          BP     PATLP1            DO AGAIN !                     MBF24720


                           2474  * READ EACH SECTOR IN THE CYLINDER, CHECKING FOR DATA          MBF24740
                           2475  * COMPARISON ERRORS AND LRC ERRORS.                            MBF24750
                           2476  * TIME TO PROCESS CYLINDER = INITIAL SYNC TIME + T(R)*HEADS*INCRMT  MBF24760
                           2477  *                                                              MBF24770
1FDE    2490               2478  MOD3    LIS    HEAD,0                                           MBF24780
1FE0    C8F0 2066          2479          LDAI   R15,SECTADV       RETURN ADRS                    MBF24790
1FE4    C8E0 235E          2480          LDAI   R14,FLGDST        ERROR RETURN                   MBF24800
1FE8    C8D0 202A          2481          LDAI   R13,TDATA         16 BIT XFER VECTOR             MBF24810
1FEC    4800 15F8          2482          LH     R0,MOD32                                         MBF24820
1FF0    2333               2483          BZS    RF1.0                                            MBF24830
1FF2    C8D0 204E          2484          LDAI   R13,TDA32         32 BIT XFER VECTOR             MBF24840
                           2485  *                                                              MBF24850
                           2486  * READ A SECTOR IN THE FORMAT MODE                             MBF24860
                           2487  *                                                              MBF24870
1FF6    2480               2488  RF1.0   LIS    SECT,0                                           MBF24880
        0000 1FF8          2489  RF1.1   EQU    *                                               MBF24890
1FF8    DE70 1801          2490          OC     SLAD,STOP         STOP SELCH                     MBF24900
1FFC    D870 185A          2491          WH     SLAD,RSA+2        SEND TRANSFER                  MBF24910
2000    D870 185E          2492          WH     SLAD,RFA+2        LIMITS                         MBF24920
2004    985B               2493          WHR    FUT,TRACK                                        MBF24930
2006    9D6A               2494          SSR    DCAD,STAT                                        MBF24940
2008    2221               2495          BFBS   IDLE,1                                           MBF24950
200A    0809               2496          LDAR   R0,HEAD                                          MBF24960
200C    9105               2497          SLLS   R0,5                                             MBF24970
200E    0608               2498          OAR    R0,SECT                                          MBF24980
2010    9A60               2499          WDR    DCAD,R0                                          MBF24990
2012    DE60 1804          2500          OC     DCAD,RCMD                                        MBF25000
2016    DE70 1802          2501          OC     SLAD,GOREAD       START SELCH READ               MBF25010
201A    9D7A               2502          SSR    SLAD,STAT                                        MBF25020
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201C    2081              2503              BTBS    8,1             WAIT FOR SELCH IDLE     MBF25030
201E    DE70 1801         2504              OC      SLAD,STOP       STOP SELCH             MBF25040
2022    9D6A              2505              SSR     DCAD,STAT                              MBF25050
2024    2221              2506              BFBS    IDLE,1          WAIT FOR CONTROLLER IDLE MBF25060
2026    035D              2507              BFCR    5,R13           NORMAL                MBF25070
2028    030E              2508              BR      R14             ERROR                 MBF25080
                          2509      *                                                     MBF25090
                          2510      * TEST DATA READ.                                     MBF25100
                          2511      *                                                     MBF25110
        0000 202A         2512      TDATA   EQU     *               TEST DATA READ FROM SECTOR MBF25120
202A    4800 29DC         2513              LH      R0,WTF          GET WRITTEN DATA      MBF25130
202E    4810 29DE         2514              LH      R1,WTF+2                              MBF25140
2032    2420              2515              LIS     R2,0                                  MBF25150
2034    2434              2516              LIS     R3,4                                  MBF25160
2036    4840 1888         2517              LH      R4,PRECL                             MBF25170
203A    2742              2518              SIS     R4,2                                  MBF25180
203C    4502 2810         2519      TDA.1   CLH     R0,RDF(R2)      CHECK DATA READ       MBF25190
2040    023E              2520              BNER    R14             FLAG DSTBL            MBF25200
2042    4512 2812         2521              CLH     R1,RDF+2(R2)                          MBF25210
2046    023E              2522              BNER    R14                                   MBF25220
2048    C120 203C         2523              BXLE    R2,TDA.1                              MBF25230
204C    03DF              2524              BR      R15             CONTINUE             MBF25240
                          2525      *                                                     MBF25250
204E    5800              2526      TDA32   DC      X'5800',Z(WTF)  *L R0,WTF             MBF25260
2050    29DC
2052    2410              2527              LIS     R1,0                                  MBF25270
2054    2424              2528              LIS     R2,4                                  MBF25280
2056    4830 1888         2529              LH      R3,PRECL                             MBF25290
205A    2732              2530              SIS     R3,2                                  MBF25300
205C    5501              2531      TDA.2   DC      X'5501',Z(RDF)  *CL R0,RDF(R1)        MBF25310
205E    2810
2060    023E              2532              BNER    R14             FLAG DSTBL            MBF25320
2062    C110 205C         2533              BXLE    R1,TDA.2                              MBF25330
                          2534      *                                                     MBF25340
                          2535      * ADVANCE TO NEXT SECTOR.                             MBF25350
                          2536      *                                                     MBF25360
        0000 2066         2537      SECTADV EQU     *               ADVANCE TO NEXT SECTOR MBF25370
2066    4A80 1882         2538              AH      SECT,INCRMT     ADVANCE N SECTORS     MBF25380
206A    4580 1878         2539              CLH     SECT,MAXSEC                           MBF25390
206E    4280 1FF8         2540              BL      RF1.1                                 MBF25400
2072    2681              2541              AIS     SECT,1                                MBF25410
2074    4B80 1878         2542              SH      SECT,MAXSEC                           MBF25420
2078    4580 1882         2543              CLH     SECT,INCRMT                           MBF25430
207C    4280 1FF8         2544              BL      RF1.1                                 MBF25440
2080    2691              2545              AIS     HEAD,1                                MBF25450
2082    4590 187A         2546              CLH     HEAD,MAXHEAD                          MBF25460
2086    4280 1FF6         2547              BL      RF1.0           DO NEXT TRACK, SAME CYLINDER MBF25470
                          2548      *                                                     MBF25480
                          2549      *ADVANCE TO NEXT WORST-CASE PATTERN                   MBF25490
                          2550      *                                                     MBF25500
208A    4830 188C         2551              LH      R3,INDEX                              MBF25510
208E    2732              2552              SIS     R3,2                                  MBF25520
2090    4310 1F44         2553              BNM     PATLOOP         DO NEXT PATTERN.      MBF25530
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                              2555  * WRITE PROPER FORMAT TO ENTIRE CYLINDER                          MBF25550
                              2556  * TIME TO PROCESS CYLINDER = INITIAL SYNC TIME + 2T(R)*HEADS      MBF25560
                              2557  *            + FMSUDF DATA SETUP TIME.                            MBF25570
                              2558  *                                                                MBF25580
      2094   41F0 1DBE        2559  MOD4     BAL    R15,FMSUDF          SET UP DATA BUFFER            MBF25590
      2098   2480             2560  WF2      LIS    SECT,0                                            MBF25600
      209A   2490             2561  WF2.0    LIS    HEAD,0                                            MBF25610
      209C   0809             2562  WF2.1    LDAR   R0,HEAD             FORMAT HEADER                 MBF25620
      209E   9105             2563           SLLS   R0,5                                              MBF25630
      20A0   0608             2564           OAR    R0,SECT                                           MBF25640
      20A2   9400             2565           EXBR   R0,R0                                             MBF25650
      20A4   92B0             2566           STBR   TRACK,R0                                          MBF25660
      20A6   4600 189C        2567           OH     R0,PROTECT                                        MBF25670
      20AA   4000 29DC        2568           STH    R0,WTF                                            MBF25680
      20AE   41F0 22BC        2569           BAL    R15,WFMT            WRITE THE SECTOR              MBF25690
      20B2   2682             2570           AIS    SECT,2                                            MBF25700
      20B4   4580 1878        2571           CLH    SECT,MAXSEC                                       MBF25710
*     20B8   208E             2572           BL     WF2.1                                             MBF25720
      20BA   4B80 1878        2573           SH     SECT,MAXSEC         REVERT TO 0/1                 MBF25730
      20BE   2691             2574  HADV3    AIS    HEAD,1                                            MBF25740
      20C0   4590 187A        2575           CLH    HEAD,MAXHEAD                                      MBF25750
      20C4   4280 209C        2576           BL     WF2.1                                             MBF25760
      20C8   C780 0001        2577           XHI    SECT,1                                            MBF25770
      20CC   4230 209A        2578           BNZ    WF2.0                                             MBF25780


                              2580  * PROPER FORMAT ESTABLISHED. DO READ CHECK ON EACH SECTOR.        MBF25800
                              2581  * TIME TO PROCESS CYLINDER = INITIAL SYNC TIME + 2T(R)*HEADS      MBF25810
                              2582  *                                                                MBF25820
      20D0   2480             2583  MOD5     LIS    SECT,0                                            MBF25830
      20D2   2490             2584  RCK.0    LIS    HEAD,0                                            MBF25840
      20D4   41F0 230C        2585  RCK.1    BAL    R15,RDCK            READ-CHECK SECTOR             MBF25850
      20D8   2682             2586  RCKRTN   AIS    SECT,2                                            MBF25860
      20DA   4580 1878        2587           CLH    SECT,MAXSEC                                       MBF25870
      20DE   2085             2588           BLS    RCK.1                                             MBF25880
      20E0   4B80 1878        2589           SH     SECT,MAXSEC                                       MBF25890
      20E4   2691             2590  HADV4    AIS    HEAD,1                                            MBF25900
      20E6   4590 187A        2591           CLH    HEAD,MAXHEAD                                      MBF25910
      20EA   208B             2592           BLS    RCK.1                                             MBF25920
      20EC   C780 0001        2593           XHI    SECT,1                                            MBF25930
      20F0   203F             2594           BNZS   RCK.0                                             MBF25940


                              2596  * ALL SECTORS IN CYLINDER HAVE BEEN TESTED, AND SHOULD            MBF25960
                              2597  * HAVE PROPER FORMAT. DSTBL ENTRIES FOR EACH OF THESE SECTORS     MBF25970
                              2598  * ARE INTERPRETED AS FOLLOWS:                                     MBF25980
                              2599  *                                                                MBF25990
                              2600  *            1. ENTRY = 0.                                        MBF26000
                              2601  *               NO ERROR DETECTED FOR SECTOR.                     MBF26010
                              2602  *            2. ENTRY = 1.                                        MBF26020
                              2603  *               'SOFT ERROR' DETECTED FOR SECTOR                  MBF26030
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DATA CONSTANTS & CHECK ROUTINES

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                       2604  *              3. ENTRY > 1.                                          MBF26040
                       2605  *                 'HARD ERROR' DETECTED FOR SECTOR                    MBF26050
                       2606  *                                                                     MBF26060
20F2   2410            2607  SCANDST LIS   R1,0                INDEX                               MBF26070
20F4   2421            2608          LIS   R2,1                INCREMENT & COMPARAND               MBF26080
20F6   4830 1896       2609          LH    R3,DSTSIZ           FINAL                               MBF26090
20FA   2731            2610          SIS   R3,1                                                    MBF26100
20FC   D421 24DC       2611  SCD.1   CLB   R2,DSTBL(R1)        CHECK SECTOR ENTRY                  MBF26110
2100   2324            2612          BNPS  SECTERR                                                 MBF26120
2102   C110 20FC       2613  SCD.2   BXLE  R1,SCD.1            CONTINUE.                           MBF26130
2106   2305            2614          BS    CYLADV1                                                 MBF26140
                       2615  *                                                                     MBF26150
       0000 2108       2616  SECTERR EQU   *                   DECODE SECTOR ERROR TYPE            MBF26160
2108   4330 2190       2617          BE    SOFTERR             ENTRY = 1     SOFT ERROR MESSAGE    MBF26170
210C   4300 2174       2618          B     FLAGSECT            ENTRY > 1     FLAG SECTOR           MBF26180


                       2620  * CYLINDER COMPLETE: ADVANCE TO NEXT CYLINDER.                        MBF26200
2110   45B0 174C       2621  CYLADV1 CLH   TRACK,HICYL+$VALU1  ALL CYLINDERS DONE ?               MBF26210
2114   2386            2622          BNLS  REDUNCK             BRANCH: YES.                        MBF26220
2116   41F0 1248       2623          BAL   R15,TSTBRK          CHECK FOR BREAK KEY                 MBF26230
211A   26B1            2624          AIS   TRACK,1                                                 MBF26240
211C   4300 1F04       2625          B     FMT.1               DO NEXT CYLINDER                    MBF26250


                       2627  * CHECK ALL CYLINDERS FOR REDUNDANT SEEK ERROR.                       MBF26270
2120   2480            2628  REDUNCK LIS   SECT,0                                                  MBF26280
2122   2490            2629          LIS   HEAD,0                                                  MBF26290
2124   48B0 174C       2630          LH    TRACK,HICYL+$VALU1                                      MBF26300
2128   C8E0 2166       2631  REDUN.1 LDAI  R14,CYLADV3         BYPASS ADRS                         MBF26310
212C   41F0 1EC4       2632          BAL   R15,ILLADD          CHECK INVALID CYLINDER ADRS         MBF26320
2130   40F0 1864       2633          STA   R15,SKRTRY          SEEK ERROR RERUN ADRS               MBF26330
2134   906A            2634          SSR   DCAD,STAT           SEEK CYLINDER                       MBF26340
2136   2221            2635          BFBS  IDLE,1              .                                   MBF26350
2138   985B            2636          WHR   FUT,TRACK           .                                   MBF26360
213A   DE50 1806       2637          OC    FUT,SEEK            .                                   MBF26370
213E   906A            2638          SSR   DCAD,STAT           .                                   MBF26380
2140   2221            2639          BFBS  IDLE,1              .                                   MBF26390
2142   9D5A            2640  REDUN.2 SSR   FUT,STAT                                                MBF26400
2144   C3A0 00E3       2641          THI   STAT,X'E3'                                              MBF26410
2148   4230 2386       2642          BNZ   DRVERR                                                  MBF26420
214C   08AA            2643          LDAR  STAT,STAT                                               MBF26430
214E   2036            2644          BNZS  REDUN.2                                                 MBF26440
                       2645  *                                                                     MBF26450
2150   41E0 1EAC       2646  REDUN.3 BAL   R14,PANLWRT                                             MBF26460
2154   41F0 230C       2647          BAL   R15,RDCK            READ-CHECK SECTOR 0 HEAD 0          MBF26470
2158   C3A0 0040       2648          THI   STAT,X'40'          HEADER ERROR ?                      MBF26480
215C   2335            2649          BZS   CYLADV3             BRANCH: NO.                         MBF26490
215E   C3A0 0020       2650          THI   STAT,X'20'          DEFECTIVE SECTOR ?                  MBF26500
2162   4330 14EC       2651          BZ    ERROR5              REDUNDANT SEEK ERROR                MBF26510
                       2652  *                                                                     MBF26520
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2166   45B0 1740      2653  CYLADV3 CLH    TRACK,LOCYL+$VALU1                                   MBF26530
216A   4330 0D62      2654          BE     TSTEND         DONE. DESELECT DRIVE.                 MBF26540
216E   2781           2655          SIS    TRACK,1                                              MBF26550
2170   4300 2128      2656          B      REDUN.1        CONTINUE.                             MBF26560


                      2658  * A DEFECTIVE SECTOR IS TO BE FLAGGED.                              MBF26580
       0000 2174      2659  FLAGSECT EQU   *              TO FLAG A SINGLE SECTOR IN DSTBL      MBF26590
2174   4010 188E      2660          STH    R1,POINTER     SAVE INDEX                            MBF26600
2178   41E0 1E98      2661          BAL    R14,RECODE                                           MBF26610
217C   D000 2D7C      2662          STM    R0,ERRSAVE                                           MBF26620
2180   41E0 23DC      2663          BAL    R14,FLAGIT                                           MBF26630
2184   D100 2D7C      2664          LM     R0,ERRSAVE                                           MBF26640
2188   4810 188E      2665          LH     R1,POINTER     RELOAD INDEX                          MBF26650
218C   4300 2102      2666          B      SCD.2                                                MBF26660


                      2668  * A 'SOFT ERROR' MESSAGE IS TO BE PRINTED.                          MBF26680
       0000 2190      2669  SOFTERR EQU    *              TO COMMENT ON SOFT ERROR              MBF26690
2190   41E0 1E98      2670          BAL    R14,RECODE                                           MBF26700
2194   D000 2D7C      2671          STM    R0,ERRSAVE                                           MBF26710
2198   081B           2672          LDAR   R1,TRACK       CONVERT SECT, HEAD, CYL, LBN TO PRINT MBF26720
219A   2403           2673          LIS    R0,3                                                 MBF26730
219C   C820 19DC      2674          LDAI   R2,MSG9+26                                           MBF26740
21A0   41F0 0F9E      2675          BAL    R15,HEXASC                                           MBF26750
21A4   0819           2676          LDAR   R1,HEAD                                              MBF26760
21A6   2402           2677          LIS    R0,2                                                 MBF26770
21A8   C820 19E0      2678          LDAI   R2,MSG9+30                                           MBF26780
21AC   41F0 0F9E      2679          BAL    R15,HEXASC                                           MBF26790
21B0   0818           2680          LDAR   R1,SECT                                              MBF26800
21B2   C820 19E3      2681          LDAI   R2,MSG9+33                                           MBF26810
21B6   41F0 0F9E      2682          BAL    R15,HEXASC                                           MBF26820
21BA   2404           2683          LIS    R0,4                                                 MBF26830
21BC   4810 186C      2684          LH     R1,LBN                                               MBF26840
21C0   C820 19D2      2685          LDAI   R2,MSG9+16                                           MBF26850
21C4   41F0 0F9E      2686          BAL    R15,HEXASC                                           MBF26860
21C8   4810 186E      2687          LH     R1,LBN+2                                             MBF26870
21CC   C820 19D6      2688          LDAI   R2,MSG9+20                                           MBF26880
21D0   41F0 0F9E      2689          BAL    R15,HEXASC                                           MBF26890
21D4   C850 19C2      2690          LDAI   R5,MSG9                                              MBF26900
21D8   41F0 105A      2691          BAL    R15,PRINT      'SOFT ERROR...'                       MBF26910
21DC   D100 2D7C      2692          LM     R0,ERRSAVE                                           MBF26920
21E0   4300 2102      2693          B      SCD.2                                                MBF26930
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                              2695  * **********************************************************   MBF26950
                              2696  *                                                              MBF26960
                              2697  *                   F L A G   M O D U L E                      MBF26970
                              2698  *                                                              MBF26980
                              2699  * PURPOSE OF MODULE:                                           MBF26990
                              2700  * FLG.MOD ALLOWS THE USER TO FLAG A SECTOR (TRACK) AS DEFECTIVE, MBF27000
                              2701  * BY ENTRY OF THE APPROPRIATE COMMAND.                         MBF27010
                              2702  *                                                              MBF27020
                              2703  * ASSUMPTIONS:                                                 MBF27030
                              2704  * THE DISC DRIVE TO BE SELECTED MUST BE ON-LINE AND NOT WRITE- MBF27040
                              2705  * PROTECTED. THE CONTROLLER FORMAT SWITCH MUST BE IN THE FORMAT MBF27050
                              2706  * POSITION.                                                    MBF27060
                              2707  *                                                              MBF27070
                              2708  * DESIGN SPECIFICATIONS:                                       MBF27080
                              2709  * THE DEF SEC BIT IS SET IN THE HEADER OF THE SPECIFIED SECTOR. MBF27090
                              2710  * THE DATA AND NORMAL MODE LRC FIELDS ARE SET TO ZEROS. THE SECTOR MBF27100
                              2711  * IS THEN READ, WITH DEFECTIVE SECTOR STATUS EXPECTED FROM THE MBF27110
                              2712  * DISC SYSTEM CONTROLLER; IF THE CORRECT STATUS IS NOT RETURNED, MBF27120
                              2713  * THE MESSAGE 'FLAG REJECTED' IS DISPLAYED. IF FMTSEC = 0, ALL MBF27130
                              2714  * SECTORS ON THE INDICATED TRACK ARE FLAGGED DEFECTIVE.        MBF27140
                              2715  *                                                              MBF27150
                              2716  * OPERATING PROCEDURES:                                        MBF27160
                              2717  * MOUNT THE DISC PACK ON THE DESIRED DRIVE, AND ENTER THE CORRECT MBF27170
                              2718  * SELCH, DISCON, AND DRIVE OPTIONS. TO FLAG A SECTOR,          MBF27180
                              2719  * ACCEPTABLE INPUTS FOR THE 'FLAG' COMMAND ARE AS FOLLOWS:     MBF27190
                              2720  *                                                              MBF27200
                              2721  * FOR FMTSEC = 0                                               MBF27210
                              2722  *         FLAG MMMMMMMM                                        MBF27220
                              2723  *         FLAG TTT HH                                          MBF27230
                              2724  *                                                              MBF27240
                              2725  * FOR FMTSEC = 1                                               MBF27250
                              2726  *         FLAG MMMMMMMM                                        MBF27260
                              2727  *         FLAG TTT HH KK                                       MBF27270
                              2728  *                                                              MBF27280
                              2729  * WHERE   M = LOGICAL BLOCK ADDRESS                            MBF27290
                              2730  *         T = CYLINDER ADDRESS                                 MBF27300
                              2731  *         H = HEAD ADDRESS                                     MBF27310
                              2732  *         K = SECTOR ADDRESS                                   MBF27320
                              2733  *                                                              MBF27330
                              2734  * OPTIONS:                                                     MBF27340
                              2735  * SELCH, DISCON, DRIVE, PACTYP, FMTSEC                         MBF27350
                              2736  *                                                              MBF27360
                              2737  *                                                              MBF27370
            0000 21E4         2738  FLG.MOD EQU    *                                               MBF27380
21E4        4850 189A         2739          LH     FUT,FUTADRS                                     MBF27390
21E8        4860 1710         2740          LH     DCAD,DISCON+$VALU1                              MBF27400
21EC        4870 171C         2741          LH     SLAD,SELCH+$VALU1                               MBF27410
21F0        48B0 1890         2742          LH     TRACK,CYLNUM                                    MBF27420
21F4        4890 1892         2743          LH     HEAD,HEADNUM                                    MBF27430
21F8        4880 1894         2744          LH     SECT,SECTNUM                                    MBF27440
21FC        C8E0 1AD4         2745          LDAI   R14,ERROR4                                      MBF27450
2200        41F0 1EC4         2746          BAL    R15,ILLADD         CHECK CE PACK CYL ADRS VIOL  MBF27460
2204        40F0 1864         2747          STA    R15,SKRTRY         SEEK ERROR RERUN ADRS        MBF27470
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                              2748  *                                                              MBF27480
     2208   9D6A              2749         SSR    DCAD,STAT                                         MBF27490
     220A   2221              2750         BFBS   IDLE,1                                            MBF27500
     220C   985B              2751         WHR    FUT,TRACK        SEEK CYLINDER                    MBF27510
     220E   9D6A              2752         SSR    DCAD,STAT                                         MBF27520
     2210   2221              2753         BFBS   IDLE,1                                            MBF27530
     2212   DE50 1806         2754         OC     FUT,SEEK                                          MBF27540
                              2755  *                                                              MBF27550
     2216   41F0 1DBE         2756         BAL    R15,FMSUDF       SET UP HEADER, DATA FIELDS       MBF27560
                              2757  *                                                              MBF27570
     221A   9D6A              2758         SSR    DCAD,STAT                                         MBF27580
     221C   2221              2759         BFBS   IDLE,1                                            MBF27590
     221E   9D5A              2760  FLG.M1  SSR    FUT,STAT                                         MBF27600
  *  2220   23F6              2761         BFC    15,FLG.M2                                         MBF27610
     2222   C3A0 0063         2762         THI    STAT,X'63'                                        MBF27620
     2226   2234              2763         BZS    FLG.M1                                            MBF27630
     2228   4300 2386         2764         B      DRVERR                                            MBF27640
                              2765  *                                                              MBF27650
                              2766  * FLAG THE SECTOR OR TRACK.                                    MBF27660
                              2767  *                                                              MBF27670
     222C   41E0 23DC         2768  FLG.M2  BAL    R14,FLAGIT       FLAG SECTOR                     MBF27680
     2230   4300 0AB0         2769         B      OPTIN            EXIT                             MBF27690
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                                    2771  * *****************************************************          MBF27710
                                    2772  *                                                               MBF27720
                                    2773  *                      C L E A R    M O D U L E                  MBF27730
                                    2774  *                                                               MBF27740
                                    2775  * PURPOSE OF MODULE:                                            MBF27750
                                    2776  * CLR.MOD ALLOWS THE CUSTOMER ENGINEER (CE) TO REMOVE ALL RECORDED  MBF27760
                                    2777  * INFORMATION FROM A SPECIFIED AREA OF THE DISC PACK.           MBF27770
                                    2778  *                                                               MBF27780
                                    2779  * ASSUMPTIONS:                                                  MBF27790
                                    2780  * THE DISC DRIVE TO BE SELECTED MUST BE ON-LINE AND NOT WRITE-  MBF27800
                                    2781  * PROTECTED. THE CONTROLLER FORMAT SWITCH MUST BE IN THE FORMAT MBF27810
                                    2782  * POSITION.                                                     MBF27820
                                    2783  *                                                               MBF27830
                                    2784  * DESIGN SPECIFICATIONS:                                        MBF27840
                                    2785  * ALL SECTORS FROM LOCYL:HICYL, INCLUSIVELY, ARE WRITTEN TO THE MBF27850
                                    2786  * DISC WITH SECTOR HEADER, GAP, SYNC, DATA, AND NORMAL AND FORMAT MODE  MBF27860
                                    2787  * LRC FIELDS SET TO ZERO.                                       MBF27870
                                    2788  *                                                               MBF27880
                                    2789  * 'INVALID' CYLINDER ADDRESSES ARE BYPASSED, FOR CE PACKS.      MBF27890
                                    2790  *                                                               MBF27900
                                    2791  * OPERATING PROCEDURES:                                         MBF27910
                                    2792  * ENSURE THAT THE REQUIRED DRIVE IS ON-LINE, WITH THE          MBF27920
                                    2793  * DESIRED DISC PACK MOUNTED. ENTER THE CORRECT PACTYP          MBF27930
                                    2794  * OPTION, AND THE LOCYL AND HICYL OPTIONS DESIRED.             MBF27940
                                    2795  * TO REMOVE RECORDED INFORMATION, ENTER 'CLEAR'.               MBF27950
                                    2796  *                                                               MBF27960
                                    2797  *          *****    C A U T I O N     *****                     MBF27970
                                    2798  *                                                               MBF27980
                                    2799  * THE CLEAR COMMAND CAUSES THE DESTRUCTION OF SECTOR HEADERS    MBF27990
                                    2800  * AND RECORDED DATA FOR ALL SECTORS FROM LOCYL:HICYL.          MBF28000
                                    2801  * THIS HAPPENS VERY QUICKLY. THE CLEAR COMMAND SHOULD NOT      MBF28010
                                    2802  * NORMALLY BE USED, EXCEPT BY THE CUSTOMER ENGINEER.          MBF28020
                                    2803  *                                                               MBF28030
                                    2804  * OPTIONS:                                                      MBF28040
                                    2805  * SELCH, DISCON, DRIVE, PACTYP, LOCYL, HICYL                    MBF28050
                                    2806  *                                                               MBF28060
                                    2807  *                                                               MBF28070
          0000 2234                 2808  CLR.MOD  EQU     *                      TO WRITE ALL ZEROS, LOCYL:HICYL  MBF28080
2234      4850 189A                 2809           LH      FUT,FUTADRS                                    MBF28090
2238      4860 1710                 2810           LH      DCAD,DISCON+$VALU1                             MBF28100
223C      4870 171C                 2811           LH      SLAD,SELCH+$VALU1                             MBF28110
2240      2400                      2812           LIS     R0,0                                          MBF28120
2242      2410                      2813           LIS     R1,0                                          MBF28130
2244      2422                      2814           LIS     R2,2                                          MBF28140
2246      4830 1888                 2815           LH      R3,PRECL                                      MBF28150
224A      2732                      2816           SIS     R3,2                                          MBF28160
224C      4001 290C                 2817  CLR.0    STH     R0,WTF(R1)             ZERO WRITE BUFFER       MBF28170
2250      C110 224C                 2818           BXLE    R1,CLR.0                                       MBF28180
                                    2819  *                                                               MBF28190
2254      4880 1740                 2820  CLR.1    LH      TRACK,LOCYL+$VALU1                             MBF28200
2258      C8E0 22AA                 2821  CLR.2    LDAI    R14,CYLADV2                                    MBF28210
225C      41F0 1EC4                 2822           BAL     R15,ILLADD             CHECK CE PACK CYL ADRS VIOL  MBF28220
2260      40F0 1864                 2823           STA     R15,SKRTRY             SEEK ERROR RERUN ADRS   MBF28230
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DATA CONSTANTS & CHECK ROUTINES

```
2264   9D6A              2824           SSR    DCAD,STAT        SEEK CYLINDER            MBF28240
2266   2221              2825           BFBS   IDLE,1           .                       MBF28250
2268   985B              2826           WHR    FUT,TRACK        .                       MBF28260
226A   DE50 1805         2827           OC     FUT,CYLCMD       .                       MBF28270
226E   9D6A              2828           SSR    DCAD,STAT        .                       MBF28280
2270   2221              2829           BFBS   IDLE,1           .                       MBF28290
2272   DE50 1806         2830           OC     FUT,SEEK         .                       MBF28300
2276   9D6A              2831           SSR    DCAD,STAT        .                       MBF28310
2278   2221              2832           BFBS   IDLE,1           .                       MBF28320
227A   9D5A              2833  CLR.2A   SSR    FUT,STAT                                 MBF28330
* 227C 23F6              2834           BFC    15,CMOD1                                 MBF28340
227E   C3A0 0063         2835           THI    STAT,X'63'                              MBF28350
2282   2234              2836           BES    CLR.2A                                  MBF28360
2284   4300 2386         2837           B      DRVERR                                  MBF28370


2288   2480              2839  CMOD1    LIS    SECT,0                                   MBF28390
228A   2490              2840  CM1.0    LIS    HEAD,0                                   MBF28400
228C   41F0 22BC         2841  CM1.1    BAL    R15,WFMT         WRITE ZEROS TO SECTOR   MBF28410
2290   2682              2842           AIS    SECT,2                                   MBF28420
2292   4580 1878         2843           CLH    SECT,MAXSEC      STILL VALID ?           MBF28430
2296   2085              2844           BLS    CM1.1                                    MBF28440
2298   4880 1878         2845           SH     SECT,MAXSEC                             MBF28450
229C   2691              2846           AIS    HEAD,1                                   MBF28460
229E   4590 187A         2847           CLH    HEAD,MAXHEAD                            MBF28470
22A2   208B              2848           BLS    CM1.1                                    MBF28480
22A4   C780 0001         2849           XHI    SECT,1                                   MBF28490
22A8   203F              2850           BNZS   CM1.0                                    MBF28500
                         2851   *                                                      MBF28510
22AA   4580 174C         2852  CYLADV2  CLH    TRACK,HICYL+$VALU1  ALL CYLINDERS DONE ? MBF28520
22AE   4380 0AB0         2853           BNL    OPTIN            EXIT                    MBF28530
22B2   26B1              2854           AIS    TRACK,1                                  MBF28540
22B4   41F0 1248         2855           BAL    R15,TSTBRK                              MBF28550
22B8   4300 2258         2856           B      CLR.2                                   MBF28560
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              0000 22BC     2858 WFMT   EQU   *              WRITES 1 SECTOR IN FORMAT MODE   MBF28580
22BC  DE70 1801            2859        OC    SLAD,STOP       STOP SELCH                       MBF28590
22C0  D870 1852            2860        WH    SLAD,WSA+2      SEND TRANSFER                    MBF28600
22C4  D870 1856            2861        WH    SLAD,WFA+2      LIMITS                           MBF28610
22C8  985B                 2862        WHR   FUT,TRACK       CYL ADRESS                       MBF28620
22CA  9D6A                 2863        SSR   DCAD,STAT                                        MBF28630
22CC  2221                 2864        BFBS  IDLE,1                                           MBF28640
22CE  0809                 2865        LDAR  R0,HEAD         CONTROLLER HEADER                MBF28650
22D0  9105                 2866        SLLS  R0,5                                             MBF28660
22D2  0608                 2867        OAR   R0,SECT                                          MBF28670
22D4  9A60                 2868        WDR   DCAD,R0                                          MBF28680
22D6  DE60 1800            2869        OC    DCAD,WCMD       START CONTROLLER WRITE           MBF28690
22DA  DE70 1803            2870        OC    SLAD,GOWRITE    START SELCH WRITE.               MBF28700
22DE  41E0 1EAC            2871        BAL   R14,PANLWRT     DISPLAY PANEL                    MBF28710
22E2  4300 2336            2872        B     SLCHWT          WAIT 'TIL COMPLETE:              MBF28720
                           2873  *                          RETURN ON R15 THROUGH            MBF28730
                           2874  *                          STATCHK ROUTINE.                 MBF28740


              0000 22E6     2876 RFMT   EQU   *              READS ONE SECTOR IN FORMAT MODE  MBF28760
22E6  DE70 1801            2877        OC    SLAD,STOP       STOP SELCH                       MBF28770
22EA  D870 185A            2878        WH    SLAD,RSA+2      SEND TRANSFER                    MBF28780
22EE  D870 185E            2879        WH    SLAD,RFA+2      LIMITS                           MBF28790
22F2  985B                 2880        WHR   FUT,TRACK                                        MBF28800
22F4  9D6A                 2881        SSR   DCAD,STAT                                        MBF28810
22F6  2221                 2882        BFBS  IDLE,1                                           MBF28820
22F8  0809                 2883        LDAR  R0,HEAD                                          MBF28830
22FA  9105                 2884        SLLS  R0,5                                             MBF28840
22FC  0608                 2885        OAR   R0,SECT                                          MBF28850
22FE  9A60                 2886        WDR   DCAD,R0                                          MBF28860
2300  DE60 1804            2887        OC    DCAD,RCMD                                        MBF28870
2304  DE70 1802            2888        OC    SLAD,GOREAD     START SELCH READ                 MBF28880
2308  4300 2336            2889        B     SLCHWT          WAIT 'TIL COMPLETE:              MBF28890
                           2890  *                          RETURN ON R15 THROUGH            MBF28900
                           2891  *                          STATCHK ROUTINE.                 MBF28910


              0000 230C     2893 RDCK   EQU   *              READ-CHECKS ONE SECTOR           MBF28930
230C  985B                 2894        WHR   FUT,TRACK                                        MBF28940
230E  9D6A                 2895        SSR   DCAD,STAT                                        MBF28950
2310  2221                 2896        BFBS  IDLE,1                                           MBF28960
2312  0809                 2897        LDAR  R0,HEAD                                          MBF28970
2314  9105                 2898        SLLS  R0,5                                             MBF28980
2316  0608                 2899        OAR   R0,SECT                                          MBF28990
2318  9A60                 2900        WDR   DCAD,R0                                          MBF29000
231A  DE60 1807            2901        OC    DCAD,RCHECK     START CONTROLLER READ-CHECK      MBF29010
231E  4300 233E            2902        B     CTRLWT          WAIT 'TIL  COMPLETE:             MBF29020
                           2903  *                          RETURN ON R15 THROUGH            MBF29030
                           2904  *                          STATCHK ROUTINE.                 MBF29040
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DATA CONSTANTS & CHECK ROUTINES

```
            0000 2322    2906  FMRDCK  EQU     *                      FORMAT READ-CHECKS ONE SECTOR       MBF29060
     2322   985B         2907          WHR     FUT,TRACK                                                  MBF29070
     2324   9D6A         2908          SSR     DCAD,STAT                                                  MBF29080
     2326   2221         2909          BFBS    IDLE,1                                                     MBF29090
     2328   0809         2910          LDAR    R0,HEAD                                                    MBF29100
     232A   9105         2911          SLLS    R0,5                                                       MBF29110
     232C   0608         2912          OAR     R0,SECT                                                    MBF29120
     232E   9A60         2913          WDR     DCAD,R0                                                    MBF29130
     2330   DE60 1804    2914          OC      DCAD,RCMD                                                  MBF29140
*    2334   2305         2915          B       CTRLWT              WAIT 'TIL COMPLETE:                    MBF29150
                         2916  *                                   RETURN ON R15 THROUGH                 MBF29160
                         2917  *                                   STATCHK ROUTINE.                      MBF29170


                         2919  * WAIT FOR I/O TO COMPLETE.                                               MBF29190
                         2920  *                                                                         MBF29200
            0000 2336    2921  SLCHWT  EQU     *                                                          MBF29210
     2336   9D7A         2922          SSR     SLAD,STAT                                                  MBF29220
     2338   2081         2923          BTBS    8,1                                                        MBF29230
     233A   DE70 1801    2924          OC      SLAD,STOP                                                  MBF29240
     233E   9D6A         2925  CTRLWT  SSR     DCAD,STAT                                                  MBF29250
     2340   2221         2926          BFBS    IDLE,1                                                     MBF29260
     2342   9D50         2927  LAB4    SSR     FUT,R0                                                     MBF29270
     2344   C300 0010    2928          THI     R0,X'10'                                                   MBF29280
     2348   2033         2929          BNZS    LAB4                                                       MBF29290
     234A   C3A0 0005    2930          THI     STAT,X'05'                                                 MBF29300
     234E   033F         2931          BZR     R15                                                        MBF29310
                         2932  *                                                                         MBF29320
                         2933  * ABNORMAL TERMINATION.                                                   MBF29330
     2350   9D5A         2934  STATCHK SSR     FUT,STAT                                                   MBF29340
*    2352   23F6         2935          BFC     15,FLGDST                                                  MBF29350
     2354   C3A0 00E3    2936          THI     STAT,X'E3'                                                 MBF29360
     2358   2234         2937          BZS     STATCHK                                                    MBF29370
     235A   4300 2386    2938          B       DRVERR                                                     MBF29380
                         2939  *                                                                         MBF29390
                         2940  * SECTOR ERROR. INCREMENT SECTOR'S DSTBL TALLY.                           MBF29400
     235E   2410         2941  FLGDST  LIS     R1,0                FLAG DSTBL ENTRY                       MBF29410
     2360   0809         2942          LDAR    R0,HEAD             COMPUTE DSTBL INDEX                    MBF29420
     2362   2701         2943  FDST.1  SIS     R0,1                  .                                   MBF29430
     2364   2114         2944          BMS     FDST.2                .                                   MBF29440
     2366   4A10 1878    2945          AH      R1,MAXSEC             .                                   MBF29450
     236A   2204         2946          BS      FDST.1                .                                   MBF29460
     236C   0A18         2947  FDST.2  AAR     R1,SECT               .                                   MBF29470
     236E   D301 24DC    2948          LB      R0,DSTBL(R1)        TALLY THE ERROR                       MBF29480
     2372   2601         2949          AIS     R0,1                  .                                   MBF29490
     2374   D201 24DC    2950          STB     R0,DSTBL(R1)          .                                   MBF29500
     2378   C5F0 20D8    2951          CLAI    R15,RCKRTN                                                 MBF29510
     237C   023F         2952          BNER    R15                                                       MBF29520
     237E   240F         2953          LIS     R0,15                                                      MBF29530
     2380   D201 24DC    2954          STB     R0,DSTBL(R1)        GUARANTEE SECTOR FLAG                  MBF29540
     2384   030F         2955          BR      R15                 RETURN TO CALLER                      MBF29550
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DATA CONSTANTS & CHECK ROUTINES

```
                              2957  * DRIVE ERROR STATUS RECOVERY ROUTINE.                           MBF29570
                              2958  *                                                                MBF29580
            0000 2386         2959  DRVERR    EQU    *                DRIVE STATUS ERROR DETECTED     MBF29590
     2386   C3A0 0081         2960            THI    STAT,X'81'                                       MBF29600
     238A   4230 23C8         2961            BNZ    DRVR.3                                           MBF29610
     238E   4800 1880         2962            LH     R0,SKCNT                                         MBF29620
     2392   2701              2963            SIS    R0,1                                             MBF29630
     2394   4320 23C8         2964            BNP    DRVR.3           BRANCH: RETRY COUNT EXHAUSTED.  MBF29640
     2398   4000 1880         2965            STH    R0,SKCNT                                         MBF29650
                              2966  *                                                                MBF29660
     239C   0E70 1801         2967            OC     SLAD,STOP                                        MBF29670
     23A0   906A              2968            SSR    DCAD,STAT                                        MBF29680
     23A2   2221              2969            BFBS   IDLE,1                                           MBF29690
     23A4   2400              2970            LIS    R0,0                                             MBF29700
     23A6   9850              2971            WHR    FUT,R0                                           MBF29710
     23A8   906A              2972            SSR    DCAD,STAT                                        MBF29720
     23AA   2221              2973            BFBS   IDLE,1                                           MBF29730
     23AC   0E50 1809         2974            OC     FUT,RESTOC       RESTORE.                        MBF29740
     23B0   906A              2975            SSR    DCAD,STAT                                        MBF29750
     23B2   2221              2976            BFBS   IDLE,1                                           MBF29760
     23B4   905A              2977  DRVR.1    SSR    FUT,STAT                                         MBF29770
     23B6   4210 2386         2978            BTC    1,DRVERR                                         MBF29780
     23BA   2083              2979            BTBS   8,DRVR.1                                         MBF29790
     23BC   08AA              2980            LDAR   STAT,STAT                                        MBF29800
     23BE   4230 2386         2981            BNZ    DRVERR                                           MBF29810
                              2982  *                                                                MBF29820
     23C2   48F0 1864         2983            LDA    R15,SKRTRY                                       MBF29830
     23C6   030F              2984            BR     R15              RETRY SEEK                      MBF29840
                              2985  *                                                                MBF29850
     23C8   C3A0 0001         2986  DRVR.3    THI    STAT,X'01'       DRIVE OFF-LINE ?                MBF29860
     23CC   4330 1804         2987            BE     ERROR8                                           MBF29870
     23D0   C3A0 0080         2988            THI    STAT,X'80'       DRIVE WRITE-PROTECTED ?         MBF29880
     23D4   4230 1AFC         2989            BNZ    ERROR7                                           MBF29890
     23D8   4300 1820         2990            B      ERROR13          OTHER BAD DRIVE STATUS          MBF29900


                              2992  * SUBROUTINE FLAGIT FLAGS THE SPECIFIED SECTOR OR TRACK, TESTS THE   MBF29920
                              2993  * FLAGGED SECTOR(S), AND OUTPUTS APPROPRIATE ERROR MESSAGES.      MBF29930
                              2994  * REGISTERS DESTROYED: R0,R1,R2,R15,SECT                          MBF29940
                              2995  *                                                                MBF29950
            0000 23DC         2996  FLAGIT    EQU    *                                                MBF29960
     23DC   40E0 1860         2997            STA    R14,FLAGRET                                      MBF29970
     23E0   4800 1734         2998            LH     R0,FMTSEC+$VALU1                                 MBF29980
     23E4   2137              2999            BNZS   FLG.1                                            MBF29990
     23E6   4800 1878         3000            LH     R0,MAXSEC                                        MBF30000
     23EA   0B08              3001            SAR    R0,SECT                                          MBF30010
     23EC   6100 188E         3002            AHM    R0,POINTER                                       MBF30020
     23F0   2480              3003            LIS    SECT,0                                           MBF30030
     23F2   081B              3004  FLG.1     LDAR   R1,TRACK         CONVT CYL ADRS TO PRINT         MBF30040
     23F4   2403              3005            LIS    R0,3                                             MBF30050
     23F6   C820 194A         3006            LDAI   R2,MSG5+26                                       MBF30060
     23FA   41F0 0F9E         3007            BAL    R15,HEXASC                                       MBF30070
```

DATA CONSTANTS & CHECK ROUTINES

23FE	C820 1970	3008		LDAI	R2,MSG6+26		MBF30080
2402	41F0 0F9E	3009		BAL	R15,HEXASC		MBF30090
2406	C820 1992	3010		LDAI	R2,MSG7+26		MBF30100
240A	41F0 0F9E	3011		BAL	R15,HEXASC		MBF30110
		3012	*				MBF30120
240E	0819	3013		LDAR	R1,HEAD	CONVT HEAD ADRS TO PRINT	MBF30130
2410	2402	3014		LIS	R0,2		MBF30140
2412	C820 194E	3015		LDAI	R2,MSG5+30		MBF30150
2416	41F0 0F9E	3016		BAL	R15,HEXASC		MBF30160
241A	C820 1974	3017		LDAI	R2,MSG6+30		MBF30170
241E	41F0 0F9E	3018		BAL	R15,HEXASC		MBF30180
2422	C820 1996	3019		LDAI	R2,MSG7+30		MBF30190
2426	41F0 0F9E	3020		BAL	R15,HEXASC		MBF30200
242A	2402	3021	FLG.2	LIS	R0,2		MBF30210
242C	0818	3022		LDAR	R1,SECT	CONVT SECTOR ADRS TO PRINT	MBF30220
242E	C820 1999	3023		LDAI	R2,MSG7+33		MBF30230
2432	41F0 0F9E	3024		BAL	R15,HEXASC		MBF30240
2436	C820 1951	3025		LDAI	R2,MSG5+33		MBF30250
243A	41F0 0F9E	3026		BAL	R15,HEXASC		MBF30260
		3027	*				MBF30270
243E	41E0 1DF8	3028		BAL	R14,ENCODE	GET LBN.	MBF30280
2442	4810 186C	3029		LH	R1,LBN	AND CONVT TO PRINT	MBF30290
2446	2404	3030		LIS	R0,4		MBF30300
2448	C820 1940	3031		LDAI	R2,MSG5+16		MBF30310
244C	41F0 0F9E	3032		BAL	R15,HEXASC		MBF30320
2450	C820 1966	3033		LDAI	R2,MSG6+16		MBF30330
2454	41F0 0F9E	3034		BAL	R15,HEXASC		MBF30340
2458	C820 1988	3035		LDAI	R2,MSG7+16		MBF30350
245C	41F0 0F9E	3036		BAL	R15,HEXASC		MBF30360
2460	4810 186E	3037		LH	R1,LBN+2		MBF30370
2464	C820 1944	3038		LDAI	R2,MSG5+20		MBF30380
2468	41F0 0F9E	3039		BAL	R15,HEXASC		MBF30390
246C	C820 196A	3040		LDAI	R2,MSG6+20		MBF30400
2470	41F0 0F9E	3041		BAL	R15,HEXASC		MBF30410
2474	C820 198C	3042		LDAI	R2,MSG7+20		MBF30420
2478	41F0 0F9E	3043		BAL	R15,HEXASC		MBF30430
		3044	*				MBF30440
247C	0809	3045	FLG.3	LDAR	R0,HEAD	BUILD HEADER, SETTING DEF SEC	MBF30450
247E	9105	3046		SLLS	R0,5		MBF30460
2480	0608	3047		OAR	R0,SECT		MBF30470
2482	9400	3048		EXBR	R0,R0		MBF30480
2484	92B0	3049		STBR	TRACK,R0		MBF30490
2486	C600 4000	3050		OHI	R0,X'4000'	DEF TRK BIT	MBF30500
248A	40U0 29DC	3051		STH	R0,WTF		MBF30510
248E	41F0 22BC	3052		BAL	R15,WFMT	FLAG SECTOR	MBF30520
2492	C850 1930	3053		LDAI	R5,MSG5	'DEF SEC FLAGGED...'	MBF30530
2496	4800 1734	3054		LH	R0,FMTSEC+$VALU1		MBF30540
249A	2135	3055		BNZS	TEST0		MBF30550
249C	0888	3056		LDAR	SECT,SECT	DEF TRK MSG FOR SECTOR 0 ONLY.	MBF30560
249E	2135	3057		BNZS	TEST1		MBF30570
24A0	C850 1956	3058		LDAI	R5,MSG6	'DEF TRK FLAGGED...'	MBF30580
24A4	41F0 105A	3059	TEST0	BAL	R15,PRINT		MBF30590
24A8	4850 189A	3060	TEST1	LH	FUT,FUTADRS		MBF30600

DATA CONSTANTS & CHECK ROUTINES

```
24AC    41F0 230C          3061            BAL    R15,RDCK                                                      MBF30610
24B0    9D6A               3062            SSR    DCAD,STAT                                                     MBF30620
24B2    C3A0 0020          3063            THI    STAT,X'20'        DEFECTIVE SECTOR STATUS ?                   MBF30630
24B6    2137               3064            BNZS   TST.1                                                         MBF30640
24B8    C850 1978          3065            LDAI   R5,MSG7           'FLAG REJECTED...'                          MBF30650
24BC    41F0 105A          3066            BAL    R15,PRINT                                                     MBF30660
24C0    4850 189A          3067            LH     FUT,FUTADRS                                                   MBF30670
24C4    48E0 1860          3068    TST.1   LDA    R14,FLAGRET                                                   MBF30680
24C8    4800 1734          3069            LH     R0,FMTSEC+$VALU1                                              MBF30690
24CC    023E               3070            BNZR   R14               FMTSEC = 1: RETURN                          MBF30700
24CE    2681               3071            AIS    SECT,1                                                        MBF30710
24D0    4580 1878          3072            CLH    SECT,MAXSEC                                                   MBF30720
24D4    038E               3073            BNLR   R14                                                           MBF30730
24D6    4300 242A          3074            B      FLG.2             FMTSEC = 0: DO COMPLETE TRACK.              MBF30740
```

DATA CONSTANTS & CHECK ROUTINES

```
24DA    0000              3076  GAP1     DCX    0                                                              MBF30760
        0000 24DB         3077  LNZB     EQU    *-1                                                            MBF30770
24DC                      3078  DSTBL    DS     1280           DEFECTIVE SECTOR TABLE                          MBF30780
29DC                      3079           ALIGN  4                                                              MBF30790
29DC                      3080  WTF      DS     308            WRITE BUFFER                                    MBF30800
2B10                      3081           ALIGN  4                                                              MBF30810
2B10                      3082  RDF      DS     308            READ BUFFER                                     MBF30820
                          3083  **CHKSUM ETPER05 DATA STATEMENTS                                              MBF30830
2C48                      3084           ALIGN  8                                                              MBF30840
        0000 2C48         3085  PSWSAVE  EQU    *              PPF PSW SAVE AREA (MOVES)                       MBF30850
2C48                      3086  $TBRKSV  DS     8              STORAGE FOR TSTBRK ROUTINE                      MBF30860
2C50                      3087  $R15SAV  DS     4                                                              MBF30870
2C54                      3088  $R14SAV  DS     8              MUST BE SEPARATE                                MBF30880
2C5C                      3089  $OUTBUF  DS     $BUFLEN        LENGTH IS $BUFLEN                               MBF30890
2CAC                      3090  $INBUF   DS     $BUFLEN        LENGTH IS $BUFLEN                               MBF30900
2CFC                      3091           ALIGN  4                                                              MBF30910
2CFC                      3092  RSAVE    DS     64             REGISTER SAVE AREA                              MBF30920
2D3C                      3093  INTSAV   DS     64             REGISTERS ON EXT/IMM INTERRUPT                  MBF30930
2D7C                      3094  ERRSAVE  DS     64             STORAGE FOR ERROR ROUTINES                      MBF30940
                          3095  **END ETPER05 DATA STATEMENTS                                                 MBF30950
```

```
2DBC    2400              3097    $CHKSUM  LIS   R0,0             PUNCH M17 TAPE WITH CHECKSUM      MBF30970
2DBE    9510              3098             EPSR  R1,R0            SELECT REG. SET 0 & CLEAR PSW     MBF30980
                          3099    *                                                                MBF30990
2DC0    C810 0A00         3100             LDAI  R1,ORIGIN1       LOAD START ADDRESS                MBF31000
2DC4    2421              3101             LIS   R2,1             LOAD INCREMENT VALUE              MBF31010
2DC6    C830 24DB         3102             LDAI  R3,LNZB          LOAD FINAL ADDRESS                MBF31020
2DCA    2440              3103             LIS   R4,0             INITIALIZE CHKSUM BYTE            MBF31030
                          3104    *                                                                MBF31040
2DCC    0351 0000         3105    $GEN     LB    R5,0(R1)                                           MBF31050
2DD0    0745              3106             XAR   R4,R5            CALCULATE CHKSUM BYTE             MBF31060
2DD2    C110 2DCC         3107             BXLE  R1,$GEN                                            MBF31070
2DD6    D240 0099         3108             STB   R4,MN+3          CHECKSUM BYTE TO BOOT LOADER      MBF31080
                          3109    *                                                                MBF31090
2DDA    C810 0080         3110    $TAPE    LHI   R1,X'0080'                                         MBF31100
2DDE    9411              3111             EXBR  R1,R1                                              MBF31110
2DE0    9501              3112             EPSR  R0,R1            HALT PROCESSOR                     MBF31120
                          3113    *                                                                MBF31130
                          3114    *-------------------------------                                  MBF31140
                          3115    *                                                                MBF31150
2DE2    D360 007A         3116    $PUNCH   LB    R6,X'7A'         GET BOUTDV (PUNCH) ADDRESS.       MBF31160
2DE6    DE60 007B         3117             OC    R6,X'7B'         START TAPE PUNCH                  MBF31170
2DEA    9D60              3118             SSR   R6,R0                                              MBF31180
2DEC    2081              3119             BTBS  8,1                                                MBF31190
2DEE    41F0 2E2E         3120             BAL   R15,$TAPL        PUNCH LEADER                      MBF31200
2DF2    C810 0080         3121             LHI   R1,X'80'                                           MBF31210
2DF6    C830 00CF         3122             LHI   R3,X'CF'                                           MBF31220
                          3123    *                                                                MBF31230
2DFA    DA61 0000         3124    $PNCH1   WD    R6,0(R1)         PUNCH BOOT LOADER                 MBF31240
2DFE    9D60              3125             SSR   R6,R0                                              MBF31250
2E00    2081              3126             BTBS  8,1                                                MBF31260
2E02    C110 2DFA         3127             BXLE  R1,$PNCH1                                          MBF31270
2E06    41F0 2E34         3128             BAL   R15,$TAPL1       PUNCH ONE-FOLD GAP.               MBF31280
                          3129    *                                                                MBF31290
2E0A    D340 0099         3130             LB    R4,MN+3          GET CHECKSUM BYTE                 MBF31300
2E0E    C810 0A00         3131             LDAI  R1,ORIGIN1       (NORMALLY X'A00')                 MBF31310
2E12    C830 24DB         3132             LDAI  R3,LNZB                                            MBF31320
                          3133    *                                                                MBF31330
2E16    D351 0000         3134    $PNCH2   LB    R5,0(R1)         PUNCH PROGRAM                     MBF31340
2E1A    0745              3135             XAR   R4,R5                                              MBF31350
2E1C    9A65              3136             WDR   R6,R5                                              MBF31360
2E1E    9D60              3137             SSR   R6,R0                                              MBF31370
2E20    2081              3138             BTBS  8,1                                                MBF31380
2E22    C110 2E16         3139             BXLE  R1,$PNCH2                                          MBF31390
2E26    41F0 2E2E         3140             BAL   R15,$TAPL        PUNCH TRAILER.                    MBF31400
2E2A    4300 2DDA         3141             B     $TAPE            DISPLAY CHECKSUM, HALT PROCESSOR. MBF31410
```

```
                              3143  * CHKSUM/M17 PUNCHER                                           MBF31430

2E2E    C800 0100            3145  $TAPL    LHI   R0,256        TO PUNCH BLANK LEADER              MBF31450
2E32    2303                 3146           BS    $TAPLP                                          MBF31460
                             3147  *                                                              MBF31470
2E34    C800 0080            3148  $TAPL1   LHI   R0,128        TO PUNCH 1-FOLD GAP               MBF31480
                             3149  *                                                              MBF31490
2E38    2701                 3150  $TAPLP   SIS   R0,1                                            MBF31500
2E3A    032F                 3151           BNPR  R15           RETURN                            MBF31510
2E3C    2430                 3152           LIS   R3,0                                            MBF31520
2E3E    9A63                 3153           WDR   R6,R3         PUNCH BLANK FRAME                 MBF31530
2E40    9D68                 3154           SSR   R6,R8                                           MBF31540
2E42    2081                 3155           BTBS  8,1                                             MBF31550
2E44    2206                 3156           BS    $TAPLP        CONTINUE.                         MBF31560


2E46                         3158           END                                                  MBF31580
```

ASSEMBLED BY CAL 03-066R07-00   (32-BIT)

START OPTIONS: T=16,ERLST

    NO CAL ERRORS
    NO CAL WARNINGS
    3 PASSES

```
$BRKEND    0000 16F3     1015   1744*
$BRKFLG    0000 1608      231   1011   1012   1179   1204   1690*
$BS.COMM   0000 1556     1576   1581   1586*
$BUFIO     0000 0000       80*   949   1058
$BUFLEN    0000 0050       56*   762   1113   3089   3090
$CHKSUM    C000 2DBC     3097*
$CKROUT    0000 0006       51*   275    279    297    394    406    409    421    424    919    922    938    943
$CLKSTRT   0000 15FF     1680*
$CLOCK     0000 0001       78*   788    790    808
$COMM1     0000 1582     1627   1629   1632*
$COMM2     0000 1598     1638*  1640
$COMM3     0000 15CC     1652   1654*
$CON       0000 0A5C      208*   286
$CONPAS    0000 1602     1154   1234   1275   1683*
$DECASC    0000 0000       76*   870
$DECHEX    0000 0000       75*   356
$DECTAB    0000 0000       74*  1709
$DISPLAY   0000 0000       79*   584
$DU.X      0000 1312     1249   1251*
$ERRF1     0000 156C     1338   1617*
$ERRF2     0000 155C     1324   1595*
$ERRF3     0000 14F2     1331   1523*  1564
$ERRF4     0000 148A     1451   1457   1497*
$ERRF5     0000 1568     1383   1609*
$ERRF5A    0000 1564     1362   1604*
$ERRF6     0000 14BE     1462   1502*
$ERRF7     0000 1550     1386   1580*
$ERRF8     0000 1554     1380   1585*
$ERRF9     0000 1558     1349   1590*
$GEN       0000 2DCC     3105*  3107
$HEXA.1    0000 0FA8      869*   876
$INBUF     0000 2CAC      267    277    306    436    761   1108   2147   3090*
$IS.DU     0000 1310     1233   1242   1247   1250*
$KBINT     0000 0000       77*  1280   1392   1443   1686
$KBR.1     0000 134E     1277   1279*
$KEEP.1    0000 0C9C      453    457*   460
$KEEP.2    0000 0CA4      458    461*
$KEEP1     0000 0CC2      473*   542
$KEEP2     0000 0CC8      475*   489    532
$KEEP2.1   0000 0CEC      484    486*
$KEEP3     0000 0D42      511    518*
$KEEP5     0000 0D6C      478    537*
$KEEP5.1   0000 0D86      544    546*
$KEEP5.2   0000 0D86      547*
$KEEP7     0000 0D9E      552    560*
$LCOR1     0000 1372     1308*  1311
$LCOR2     0000 1388     1315   1318*
```

```
$LCOR3      0000 138C     1319*    1321
$LCOR3A     0000 13C4     1341     1345*
$LCOR4      0000 13D2     1350*    1352
$LCOR5      0000 13FC     1357     1372*
$LCORXIT    0000 1424     1367     1389*
$LINCNT     0000 175A     399      433      1766*
$LINEPOS    0000 1612     983      1080     1695*
$LOOK       0000 0AD8     260*     440
$LOOK.0     0000 0AE0     262*     273
$LOOK.1     0000 0AE2     263*
$LOOK.2     0000 0AEC     267*     276
$LOOK.3     0000 0B0E     271      279*
$LOOK.5     0000 0B36     292*
$LOOK.6     0000 0B4C     298      300*
$LSTB.0     0000 0FE0     920*     934
$LSTB.1     0000 0FF6     923      927*
$LSTB.2     0000 1002     931*
$LSTB.2A    0000 1004     921      932*
$LSTB.2B    0000 1020     939      941*
$LSTB.2C    0000 1030     944      946*
$LSTB.A     0000 0FD4     916*     942
$LSTB.B     0000 0FDE     915      919*
$LSTBIT     0000 0FC4     413      909*
$LSTPAS     0000 1604     1132     1238     1684*
$MAXIO      0000 0006     149*     389      1122
$MM.1       0000 1524     1530     1539*
$MM.2       0000 152A     1532     1541*
$MM.3       0000 153A     1533     1540     1541     1564*
$MM.3A      0000 154C     1568     1570*
$MM16.1     0000 1516     1527     1535*
$MSGPRT     0000 0F20     681      690      703      743*
$MSGPRT1    0000 0F30     672      748*
$NOT.DU     0000 130C     1244     1248*
$OPT.0      0000 0BEE     387      394*
$OPT.2      0000 0C04     402*     407
$OPT.3      0000 0C2E     411      419*
$OPT.5      0000 0C46     414      426*
$OPT.6      0000 0C7A     441*
$OPT.A      0000 0BFA     398*     431      441
$OPT.B      0000 0C00     400*     434
$OPTNAME    0000 0000     50*
$OPTPRT     0000 0BD6     284      386*
$OPTV.0     0000 0F42     761*     766      777
$OPTV.2     0000 0F5C     770*     773
$OPTV.3     0000 0F68     771      775*
$OTC.0      0000 10E0     1027*    1038
$OTC.1      0000 10E4     1028*    1033
$OTC.2      0000 10F0     1032*    1040
$OTC.3      0000 10F8     1031     1035*
$OTC.4      0000 110C     1026     1034     1042*
$OTC.5      0000 1114     1044*    1050
$OTC.6      0000 112C     1052*    1054
$OTC.7      0000 1132     1029     1045     1048     1053     1055*
$OUTBUF     0000 2C5C     403      409      421      424      568      569      571      925      928      936      977      3089*
$P0         0000 105A     974      981*
```

```
$P1         0000 105E      968      978      982*  1112
$PAUSE      0000 1620     1027     1032     1042   1702*
$PNCH1      0000 2DFA     3124*    3127
$PNCH2      0000 2E16     3134*    3139
$PRINT      0000 1042      233      235      507    512    563    565    970*  1017   1170   1211   1515   1661   2131
$PRT.2      0000 1080      994*    1000     1003
$PRT.3      0000 109E      997     1005*
$PRT.4      0000 10CE     1016     1019*
$PRTFLG     0000 1614     1001     1010     1205   1696*
$PUNCH      0000 2DE2     3116*
$R14SAV     0000 2C54      671      678      687    696    709    725    738    750   1305   1389   3088*
$R15SAV     0000 2C50      603      607      612    617    623    629    662   3087*
$R5BIN      0000 0000       73*     840
$RD.1       0000 113C     1078*    1106
$RD.2       0000 113E     1079*    1107     1114
$RD.3       0000 1144     1081*    1115
$RD.3D      0000 1164     1087     1093*
$RD.4       0000 1172     1095     1097*
$RD.5       0000 118E     1102     1105*
$RD.6       0000 1198     1104     1108*
$RD.7       0000 11AA     1110     1115*
$READ       0000 1138      254      435     1077*
$RSAVRET    0000 0F98      836*     877      985    992   1013
$RUN.1      0000 0C88      446      449*
$RUN1T      0000 0C7E      282      445*
$SETUP      0000 1350     1043     1295*
$SHUTDWN    0000 1622      543     1703*
$STC.1      0000 11C6     1124     1126*
$STC.2      0000 11CC     1127     1129*
$STC.3      0000 11EA     1134     1139*
$STC.4      0000 122A     1156     1159*
$STC.5      0000 1238     1162     1164*
$STIM1      0000 0F80      796*     800
$STRUC1     0000 000C       49*      54      261    262    426
$TAPE       0000 2DDA     3110*    3141
$TAPL       0000 2E2E     3120     3140     3145*
$TAPL1      0000 2E34     3128     3148*
$TAPLP      0000 2E38     3146     3150*    3156
$TBRKSV     0000 2C48     1177     1185     3086*
$TESTOP     0000 0B54      288      304*
$TIMER      0000 0F7C      789*    1471
$TIMRET     0000 0F92      804      829*
$TIMVAL     0000 0A5A      207*     800
$TIMXT      0000 0F96      830*    1473
$TSTB.1     0000 1258     1183*    1195     1197   1200   1219
$TSTB.1A    0000 125E     1185*    1206
$TSTB.2     0000 1264     1181     1188*
$TSTB.3     0000 1276     1191     1193*
$TSTB.4     0000 1290     1202*    1227
$TSTB.5     0000 12B4     1193     1215*
$TSTB.6     0000 12C2     1217     1220*    1226
$TSTB.7     0000 12C8     1222*    1225
$TSTDU.1    0000 12F4     1237     1239*
$TSTOP.1    0000 0B70      314*     328
$TSTOP.3    0000 0B8A      321      324*
```

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$TSTOP.4   0000 0B8C      323     325*
$TSTOP.5   0000 0B9A      308     326     330*
$VALU1     0000 0008       52*    230     300     330     412     419     455     488     490     541     991    1178    1232
                         1958    1970    2012    2016    2020    2031    2076    2104    2111    2283    2366    2367    2368
                         2392    2396    2621    2630    2653    2740    2741    2810    2811    2820    2852    2998    3054
                         3069
$VALU2     0000 000A       53*    331     452    1766
$WASOU     0000 1616      237     547     562     987    1251    1253    1697*
$XI1       0000 1458     1450*   1455
$XI16      0000 142A     1365    1421*
$XI16A     0000 1442     1425    1432*
$XI2       0000 1468     1453    1456*
$XI3       0000 14A4     1472    1474    1477*
$XI32      0000 1438     1317    1428*
$XI4       0000 14A8     1470    1476    1478*
@PRINT     0000 1050      425     579     940     945     976*
ABORT      0000 0D6C      536*
A6STOP     0000 2E46
ADC        0000 0002      136     219     643     644     646     670     712     729     743     744     747     758     970
                          971     975    1513    1325    1332    1339    1355    1420    1467    1487    1525    1565    1596
                         1601    1613    1618    1625    1649
ADR        0000 0BC6      349*   1757    1758
AMSG       0000 16D8      250    1741*
ASCIDEV    0000 1670      699    1725*
ASCIDEV2   0000 1681      682    1729*
ASCILOC    0000 16A7      735    1735*
ASCIMSW    0000 168E     1659    1731*
ASCIPSW    0000 169B      718    1733*
ASCISTA    0000 1678      691     704    1727*
BOOT       0000 0088      103     106*
BRK.SAV    0000 1626     1705*
BRKMSG     0000 16DA     1018    1212    1742*
BRKVECT    0000 1606     1184    1208    1209    1689*
BTESTNO    0000 161C      474     475     479     522    1700*   1934    2275
C300ADR    0000 0A1E      158*
CAR2ND     0000 0A42      189*
CARRD      0000 0A40      188*
CARRQ2S    0000 0A4C      198*
CLEAR.     0000 178C     1771*
CLIF2ND    0000 0A3A      185*
CLIFADR    0000 0A16      154*
CLIFRD     0000 0A38      184*
CLR.0      0000 224C     2817*   2818
CLR.1      0000 2254     2820*
CLR.2      0000 2258     2821*   2856
CLR.2A     0000 227A     2833*   2836
CLR.MOD    0000 2234     1771    2808*
CM1.0      0000 228A     2840*   2850
CM1.1      0000 228C     2841*   2844    2848
CMOD1      0000 2288     2834    2839*
COMM       0000 1572     1586    1591    1599    1610    1624*
CON        0000 175C      285    1767*
CON2ND     0000 0A30      179*    180    1150
CONCMD     0000 0A32      181*   1137    1147    1149    1299
CONENRD    0000 0A31      180*
```

CONRADR	0000 0A2A	174*	1144	1188	1272	1442					
CONRD	0000 0A2E	177*	178	1148	1159	1273					
CONRQ2S	0000 0A48	194*	1131	1152	1153	1163	1278				
CONTIN	0000 17B4	541	1775*								
CONWADR	0000 0A2C	175*	1088	1146							
CONWRT	0000 0A2F	178*	1089								
COUNT	0000 161E	481	1701*								
CRLF	0000 1036	232	245	464	966*	1641					
CRLFMSG	0000 16F8	967	1111	1746*							
CRT2ND	0000 0A36	183*									
CRTRD	0000 0A34	182*									
CRTRQ2S	0000 0A49	195*									
CTRLWT	0000 233E	2902	2915	2925*							
CYLADV1	0000 2110	2373	2614	2621*							
CYLADV2	0000 22AA	2821	2852*								
CYLADV3	0000 2166	2631	2649	2653*							
CYLCMD	0000 1805	1814*	2827								
CYLNUM	0000 1890	1871*	2065	2090	2093	2248	2372	2742			
CYLTAB	0000 1816	1827*	1980								
DATAB	0000 1844	1845*	2398								
DATAB1	0000 184C	1847*	2400								
DCAD	0000 0006	1799*	2366	2376	2377	2380	2494	2499	2500	2505	2634	2638	2740	2749
		2752	2756	2810	2824	2828	2831	2863	2868	2869	2881	2886	2887	2895
		2900	2901	2908	2913	2914	2925	2968	2972	2975	3062	
DEC.0	0000 1E50	2224	2228*								
DEC.1	0000 1E58	2227	2230*	2238	2240						
DEC.2	0000 1E68	2231	2233	2236*							
DEC.3	0000 1E78	2235	2241*	2246							
DEC.4	0000 1E84	2242	2245*								
DEC.5	0000 1E88	2244	2247*								
DECODE	0000 1E3A	2057	2219*								
DEFTESTS	0000 1874	304	305	1858*							
DEVINT	0000 17E2	1456	1790*								
DEVMSG	0000 166C	705	1724*	1725	1726	1727					
DEVMSG2	0000 167D	683	1728*	1729							
DEVSADR	0000 17CC	1450	1778*	2014	2018	2023	2027	2122			
DISCON	0000 1708	490	1757*	2016	2366	2740	2810				
DRIVE	0000 16FC	1756*	1917	1970	2031						
DRVERR	0000 2386	2417	2642	2764	2837	2938	2959*	2978	2981		
DRVR.1	0000 23B4	2977*	2979								
DRVR.3	0000 23C8	2961	2964	2986*							
DSTBL	0000 24DC	2388	2611	2948	2950	2954	3078*				
DSTSIZ	0000 1896	1874*	1994	1997	2204	2230	2234	2387	2609		
ENC.1	0000 1E10	2199*	2205								
ENC.2	0000 1E1A	2200	2202*								
ENC.3	0000 1E1E	2198	2204*								
ENC.4	0000 1E26	2207*	2211								
ENC.5	0000 1E30	2208	2210*								
ENC.6	0000 1E34	2206	2212*								
ENCODE	0000 1DF8	2091	2190*	2260	3028						
EOTMSG	0000 16C5	1738*									
ERR	0000 0DE2	603*	1642								
ERR1	0000 0E86	647	671*								
ERRALL	0000 0E22	629*	1507								
ERRCOM	0000 0E30	604	608	613	618	625	630	637*			

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ERRCOM1    0000 0E5C        605      610      615      621      627      633      651*
ERRCOM2    0000 0E7C        656      661*
ERRD       0000 0DEC        607*
ERRD1      0000 0E90        609      619      678*
ERRDEV     0000 15FA        680      698      1675*
ERRDS      0000 0E04        617*
ERRDS1     0000 0EB4        631      696*
ERRL       0000 0E12        623*
ERRL1      0000 0EF6        626      725*
ERRL1A     0000 0F0E        732      735*
ERRLVL     0000 16C3        1513     1737*
ERRMSG     0000 1646        673      1719*    1720     1721
ERRNO      0000 164E        1504     1509     1634     1643     1721*
ERROR1     0000 1AB8        1901*    2112     2114
ERROR10    0000 1B0C        1923*    1965
ERROR11    0000 1B14        1925*
ERROR13    0000 1B20        1928*    2990
ERROR2     0000 1AC0        1903*    2105     2107     2116
ERROR3     0000 1AC8        456      1905*    2038
ERROR4     0000 1AD4        1908*    2109     2745
ERROR5     0000 1AEC        1915*    2651
ERROR6     0000 1AF4        1917*    1971     2032
ERROR7     0000 1AFC        1919*    2989
ERROR8     0000 1B04        1921*    2987
ERRPL1     0000 0ED4        632      709*     1645
ERRPL1A    0000 0EE8        715      718*
ERRPL1B    0000 0EFE        721      727*
ERRS       0000 0DF8        612*
ERRS1      0000 0EA2        614      620      687*
ERRSAVE    0000 2D7C        637      661      910      946      2662     2664     2671     2692     3094*
ERRSTA     0000 15FC        689      702      1677*
ETESTNO    0000 164C        641      1720*
FATAL      0000 1868        1855*    1906     1910     1926     1942     1952     1960
FCHK       0000 1FB2        2457*
FCK.0      0000 1FB4        2458*    2468
FCK.1      0000 1FB6        2459*    2462     2466
FDST.1     0000 2362        2943*    2946
FDST.2     0000 236C        2944     2947*
FF         0000 1768        1768*    2392     2396
FF.SAVE    0000 1628        344      346      1706*
FLAG       0000 1780        445      1770*
FLAGIT     0000 23DC        2663     2768     2996*
FLAGRET    0000 1860        1853*    2997     3068
FLAGSECT   0000 2174        2618     2659*
FLG.1      0000 23F2        2999     3004*
FLG.2      0000 242A        3021*    3074
FLG.3      0000 247C        3045*
FLG.M1     0000 221E        2760*    2763
FLG.M2     0000 222C        2761     2768*
FLG.MOD    0000 21E4        1770     2042     2738*
FLGDST     0000 235E        2480     2935     2941*
FMRDCK     0000 2322        2459     2906*
FMSU.1     0000 1DC6        2170*    2184
FMSU.2     0000 1DD4        2175*    2176
FMSU.3     0000 1DEC        2182*    2183
```

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FMSUDF      0000 1DBE      2167*  2559   2756
FMSUDFA     0000 10C4      2169*
FMT.1       0000 1F04      2371*  2625
FMT.1A      0000 1F30      2388*  2389
FMT.1B      0000 1F7C      2415*  2419
FMT.MOD     0000 1EF4      1769   2034   2364*
FMTSEC      0000 172C      1760*  2076   2998   3054   3069
FORMAT      0000 1774       281   1769*
FUT         0000 0005      1798*  2365   2379   2382   2415   2493   2636   2637   2640   2739   2751   2754   2760
                          2809   2826   2827   2830   2833   2862   2880   2894   2907   2927   2934   2971   2974
                          2977   3060   3067
FUTADRS     0000 189A       502   1876*  2365   2739   2809   3060   3067
GAP1        0000 240A      2172   3076*
GAPSIZE     0000 1884      1865*  1987
GAPTAB      0000 182C      1836*  1986
GOREAD      0000 1802      1811*  2501   2888
GOWRITE     0000 1803      1812*  2870
HADV1       0000 1F9E      2444*
HADV2       0000 1FC6      2464*
HADV3       0000 208E      2574*
HADV4       0000 20E4      2590*
HALT9       0000 00BE       238    550*   556    660    988
HEAD        0000 0009      1802*  2089   2096   2097   2197   2220   2245   2249   2257   2262   2272   2438   2444
                          2445   2458   2464   2465   2478   2496   2545   2546   2561   2562   2574   2575   2584
                          2590   2591   2629   2676   2743   2840   2846   2847   2865   2885   2897   2910   2942
                          3013   3045
HEADNUM     0000 1892      1872*  2072   2089   2096   2249   2743
HEDTAB      0000 1810      1825*  1978
HEXASC      0000 0F9E       422    505    573    576    700    720    736    746    865*   929   1660   1912   1931
                          2129   2675   2679   2682   2686   2689   3007   3009   3011   3016   3018   3020   3024
                          3026   3032   3034   3036   3039   3041   3043
HEXTAB      0000 162C       770    872   1512   1712*  1935   2148
HICYL       0000 1744      1762*  1903   2104   2621   2630   2852
IDLE        0000 0002      1808*  2378   2381   2495   2506   2635   2639   2750   2753   2759   2825   2829   2832
                          2864   2882   2896   2909   2926   2969   2973   2976
ILLADD      0000 1EC4      2110   2118   2282*  2374   2632   2746   2822
IMPTOP      0000 0000R
INCR        0000 15FE      1679*  2270
INCRMT      0000 1882      1864*  1985   2538   2543
INCRTAB     0000 1822      1831*  1984
INDEX       0000 188C      1869*  2395   2412   2551
INDXTAB     0000 181C      1829*  1982
INI.0       0000 1B7E      1961*  1966
INI.0A      0000 1890      1962   1967*
INI.1       0000 1BA0      1968   1973*
INI.1A      0000 1BCE      1985*
INI.2       0000 1BF8      1997*  1999
INI.3       0000 1C44      2021*  2029
INI.3A      0000 1C56      2025   2027*
INI.4       0000 1C72      2036*  2037
INI.5       0000 1D24      2035   2043   2104*
INI.6       0000 1D5A      2102   2120*
INI.6A      0000 1D5E      2122*  2134
INI.7       0000 1D86      2123   2135*
INISYS      0000 1D80      2126   2133*
```

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INIT        0000 1B74        465    1957*
INITRET     0000 0CB4        466*   2137
INTDEV      0000 15FA       1439    1674*  1675
INTLEV      0000 17A8       1774*
INTLVL      0000 17F6       1461    1793*
INTLVLM     0000 16AE       1516    1736*  1737
INTPSW      0000 15F0       1429    1670*
INTSAV      0000 2D3C       1421    1477   1490   3093*
INTSTA      0000 15FC       1440    1676*  1677
IO          0000 0A10        150*    430    510   1085   1120   1121   1129   1130   1136   1143   1145   1189   1236
                            1260    1266   1298
IOSAVE      0000 160A        393     429   1024   1235   1261   1267   1296   1691*
ISITERR     0000 160C        223     247    482    520    642    652    990   1014   1514   1635   1644   1692*  2130
KBREAD      0000 1334       1081    1272*
LAB1        0000 0D08        494*    497
LAB2        0000 0D12        495     498*
LAB3        0000 0D1A        499     501*
LAB4        0000 2342       2927*   2929
LADC        0000 0001        523
LBN         0000 186C       1856*   2055   2056   2194   2195   2199   2201   2207   2209   2225   2226   2228   2229
                            2684    2687   3029   3037
LCORE       0000 1368        228     462   1305*
LDWT        0000 00C8        129*    132
LEADER      0000 00A2        113*    117
LEVEL       0000 0BCE        353*
LNZB        0000 24DB        107    3077*   3102   3132
LOAD        0000 00AC        118*    126
LOCMSG      0000 16A3        726    1734*
LOCYL       0000 1738       1761*   1901   2111   2368   2653   2820
LOOP        0000 179C       1773*
LPADR       0000 0A1A        156*
LPCNT       0000 1898       1875*   2455   2470
LPWRT       0000 0A3C        186*
LRECL       0000 1886       1866*   1989   2181
LRECLTAB    0000 1832       1838*   1988
MAXCYL      0000 187C       1861*   1981   2094   2106   2113
MAXDEX      0000 187E       1862*   1983   2391   2411
MAXHEAD     0000 187A       1860*   1979   1996   2097   2445   2465   2546   2575   2591   2847
MAXSEC      0000 1878       1859*   1977   1995   2100   2196   2241   2243   2259   2261   2441   2443   2461   2463
                            2539    2542   2571   2573   2587   2589   2843   2845   2945   3000   3072
MAXTST      0000 189E        315    1878*
MFF         0000 1A80        343    1898*
MICROBUS    0000 0A22        160*
MMSW        0000 15F4       1528    1531   1536   1538   1650   1653   1671*
MMSWMSG     0000 1685       1662    1730*  1731
MN          0000 0096        110*   3108   3130
MOD1        0000 1F8A       2413    2437*
MOD2        0000 1FAC       2454*
MOD3        0000 1FDE       2478*
MOD32       0000 15F8        225     714    731   1314   1340   1356   1469   1488   1526   1567   1626   1651   1673*
                            2052    2154   2223   2237   2482
MOD4        0000 2094       2559*
MOD5        0000 20D0       2583*
MREADC      0000 0A44        190*
MSG1        0000 18CC        236    1882*
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MSG10       0000 19E8     1892*  1944   1948
MSG11       0000 1A00     1893*  1915
MSG12       0000 1A16      503    508    513   1894*
MSG13       0000 1A28     1895*  1919   1936
MSG15       0000 1A42     1896*  1921   1937
MSG16       0000 1A56     1897*  1930   1932   1938
MSG2        0000 18E2     1883*  1905
MSG3        0000 18F0     1884*  1911   1913
MSG4        0000 1918     1885*  1886
MSG5        0000 1930     1887*  3006   3015   3025   3031   3038   3053
MSG6        0000 1956     1888*  3008   3017   3033   3040   3058
MSG7        0000 1978     1889*  3010   3019   3023   3035   3042   3065
MSG8        0000 19A4     1890*  1925
MSG9        0000 19C2     1891*  2674   2678   2681   2685   2688   2690
MTESINO     0000 1642      640   1717*
NEWPSW      0000 15E8      525    526   1468   1478   1669*
NOERMSG     0000 1663     1723*
NOERR       0000 160E      654   1693*
NOMSG       0000 17C0      230    991   1178   1232   1776*
NORM        0000 15FD     1678*  2276
NULLMSG     0000 16F4      564   1745*  1746
OLDPSW      0000 15E0      624    710    727   1441   1493   1632   1668*
OPT         0000 16FC      261    397   1754*
OPTEND      0000 1750     1763*
OPTEND2     0000 1750      427   1764*
OPTIN       0000 0AB0      243*  1098   1100   1663   2136   2769   2853
OPTIN1      0000 0AB8      246*   301    332    428    438    548   1019   1172   1213   1517   1647   1954
OPTION      0000 1750      283    394   1765*  1766
OPTRTN      0000 0BF6      395    397*
OPTVAL      0000 0F3E      294    314    588    757*
ORIGIN1     0000 0A00      106    135*  3100   3131
ORIGIN2     0000 0A04      137*
ORIGIN3     0000 0A08      138*
ORIGIN4     0000 0A0C      139*
OUSYS       0000 1918     1886*  2128   2132
OUT.SAV     0000 1624     1023   1055   1704*
OUTCHR      0000 10D2      251    253    995   1006   1008   1023*
OUTSYS      0000 1D6C     2127*
PACTYP      0000 1720     1759*  1925   1958   2020   2283
PANLWRT     0000 1EAC     2269*  2646   2871
PASLADR     0000 0A12      152*  1240
PATLOOP     0000 1F44     2393   2395*  2553
PATLOOP1    0000 1F54     2397   2400*
PATLOOP2    0000 1F58     2399   2401*
PATLP1      0000 1FAE     2455*  2472
POINTER     0000 188E     1870*  2660   2665   3002
PRECL       0000 1888     1867*  1991   2004   2405   2517   2529   2815
PRECLTAB    0000 1838     1840*  1990
PRINT       0000 105A      345    737    749    980*  1951   2691   3059   3066
PRINTIT     0000 1B60     1907   1914   1916   1927   1939   1950*
PROTECT     0000 189C     1877*  2567
PSW         0000 0A50      202*   521
PSW2        0000 0A52      203*   211    246    530    638   1465   1505   1557   1636
PSW3        0000 0A54      204*
PSWMSG      0000 1697      719   1732*  1733   1734   1735
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Symbol	Addr		Ref												
PSWSAVE	0000	2C48	104	105	1354	3085*									
PURETOP	0000	0000R													
QMSG	0000	16D4	1171	1740*											
QUESTN	0000	123A	260	1169*											
R0	0000	0000	82*	222	223	224	225	229	230	231	402	403	420	423	424
			429	430	432	433	452	455	457	467	468	469	473	474	490
			491	496	500	502	504	510	519	520	531	538	539	547	555
			561	562	570	577	578	637	639	640	641	642	651	652	661
			679	688	697	701	713	717	730	734	797	802	829	836	865
			866	910	911	917	931	946	966	976	981	982	983	990	991
			1044	1051	1052	1077	1082	1084	1136	1137	1140	1151	1234	1238	1243
			1243	1251	1252	1253	1260	1261	1266	1267	1272	1273	1274	1278	1298
			1299	1306	1308	1309	1314	1317	1319	1340	1349	1350	1421	1430	1469
			1475	1477	1488	1490	1506	1526	1537	1538	1541	1542	1558	1567	1626
			1637	1651	1658	1909	1910	1929	1943	1944	1952	1969	1970	1973	1974
			1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
			1989	1990	1991	1993	1994	1995	1997	2001	2002	2005	2006	2007	2008
			2009	2010	2031	2036	2055	2076	2104	2106	2108	2124	2125	2127	2143
			2157	2172	2175	2177	2178	2191	2193	2194	2197	2202	2205	2210	2212
			2223	2228	2232	2269	2270	2271	2272	2274	2275	2276	2282	2283	2384
			2388	2392	2396	2398	2400	2401	2406	2454	2455	2470	2471	2482	2496
			2497	2498	2499	2513	2519	2562	2563	2564	2565	2565	2566	2567	2568
			2662	2664	2671	2673	2677	2683	2692	2812	2817	2865	2866	2867	2868
			2883	2884	2885	2886	2897	2898	2899	2900	2910	2911	2912	2913	2927
			2928	2942	2943	2948	2949	2950	2953	2954	2962	2963	2965	2970	2971
			2998	3000	3001	3002	3005	3014	3021	3030	3045	3046	3047	3048	3048
			3049	3050	3051	3054	3069	3097	3098	3112	3118	3125	3137	3145	3148
			3150												
R1	0000	0001	83*	106	118	119	121	126	248	261	262	264	266	279	281
			283	285	287	297	300	400	403	404	406	419	445	475	476
			477	479	483	486	492	498	530	531	541	553	554	555	572
			574	638	639	653	654	655	657	658	680	689	698	702	711
			728	798	801	869	912	918	932	933	941	987	1024	1025	1027
			1030	1032	1035	1036	1037	1039	1042	1043	1044	1046	1047	1049	1052
			1120	1123	1125	1129	1140	1141	1142	1143	1145	1147	1149	1151	1152
			1231	1232	1235	1236	1239	1240	1241	1245	1246	1248	1250	1252	1254
			1254	1295	1296	1297	1298	1299	1300	1301	1307	1308	1309	1310	1318
			1319	1320	1348	1350	1351	1356	1431	1464	1471	1473	1505	1506	1557
			1558	1564	1566	1636	1637	1650	1908	1928	1934	1935	1935	1936	1937
			1938	1941	1942	1944	1946	1959	1960	1961	1963	1964	1973	1975	1976
			1978	1980	1982	1984	1986	1988	1990	1996	1998	2004	2006	2009	2019
			2023	2027	2028	2033	2034	2042	2056	2065	2072	2075	2085	2111	2113
			2115	2117	2122	2124	2144	2158	2167	2170	2196	2199	2204	2207	2229
			2230	2234	2241	2243	2247	2258	2273	2274	2385	2388	2389	2401	2407
			2409	2514	2521	2527	2533	2607	2611	2613	2660	2665	2672	2676	2680
			2684	2687	2813	2817	2818	2941	2945	2947	2948	2950	2954	3004	3013
			3022	3029	3037	3098	3100	3105	3107	3110	3111	3111	3112	3121	3124
			3127	3131	3134	3139									
R10	0000	000A	92*	1424	1428	1428	1459	1460	1461	1512	1512	1513	2044	2068	2081
			2147	2159											
R11	0000	000B	93*												
R12	C000	000C	94*	260	265	293	296	310	316	329	339	342	351	355	390
			392	448	645	648	774	2051	2062	2064	2071	2079	2084	2087	2095
			2098	2101											
R13	0000	000D	95*	646	649	927	930	1078	1079	1080	1105	1108	1113	1523	1523

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                        1536   1539   2154   2169   2182   2481   2484   2507
R14       0000 000E      96*    211    213    214    227    294    297    299    314    317    318    319    322
                         324    388    487    521    525    543    545    624    647    648    649    671    672
                         678    681    687    690    696    703    709    710    711    725    727    738    739
                         743    744    745    747    748    750    751    763    768    784   1165   1177   1185
                        1188   1194   1198   1207   1209   1215   1218   1220   1224   1305   1323   1326   1328
                        1330   1333   1335   1337   1342   1345   1347   1363   1366   1381   1384   1387   1389
                        1423   1430   1441   1465   1468   1524   1535   1630   1632   1638   1645   2045   2057
                        2069   2082   2091   2109   2151   2213   2251   2277   2288   2292   2297   2373   2480
                        2508   2520   2522   2532   2631   2646   2661   2663   2670   2745   2768   2821   2871
                        2997   3028   3068   3070   3073
R15       0000 000F      97*    212    228    232    233    235    237    244    245    249    251    253    254
                         279    280    299    338    344    345    346    347    350    354    396    413    422
                         425    435    451    454    459    461    462    464    465    466    505    506    507
                         509    512    518    522    523    524    540    545    551    563    565    573    576
                         579    603    604    607    608    612    613    617    618    623    625    629    630
                         643    644    645    646    659    662    663    700    720    728    731    736    737
                         746    749    769    770    772    776    830    837    929    940    945    947    970
                         971    972    973    984    995   1002   1006   1008   1009   1011   1014   1017   1023
                        1028   1055   1056   1139   1169   1170   1178   1179   1180   1183   1184   1186   1189
                        1190   1192   1194   1196   1198   1199   1199   1203   1204   1205   1208   1210   1211
                        1215   1216   1218   1220   1221   1222   1224   1225   1256   1262   1268   1324   1331
                        1338   1362   1365   1372   1373   1380   1383   1386   1390   1431   1464   1466   1507
                        1515   1639   1641   1642   1660   1661   1912   1931   1950   1951   2052   2110   2118
                        2120   2129   2130   2131   2135   2146   2148   2150   2158   2171   2284   2286   2290
                        2294   2296   2374   2375   2439   2459   2479   2524   2559   2569   2585   2623   2632
                        2633   2647   2675   2679   2682   2686   2689   2691   2746   2747   2756   2822   2823
                        2841   2855   2931   2951   2952   2955   2983   2984   3007   3009   3011   3016   3018
                        3020   3024   3026   3032   3034   3036   3039   3041   3043   3052   3059   3061   3066
                        3120   3128   3140   3151
R2        0000 0002      84*    102    122    128    246    247    248    394    396    401    402    405    421
                         503    571    575    578    699    718    735    745    799    873    874    919    922
                         925    926    927    928    930    931    936    937    938   1030   1035   1121   1126
                        1128   1130   1131   1135   1136   1137   1147   1148   1149   1150   1157   1157   1158
                        1160   1240   1241   1422   1439   1442   1452   1597   1604   1619   1630   1659   1911
                        1930   1958   1961   1967   1967   2020   2024   2024   2050   2063   2070   2083   2128
                        2145   2160   2168   2174   2175   2176   2178   2179   2180   2182   2183   2192   2201
                        2209   2237   2386   2403   2406   2407   2408   2515   2519   2521   2523   2528   2608
                        2611   2674   2678   2681   2685   2688   2814   3006   3008   3010   3015   3017   3019
                        3023   3025   3031   3033   3035   3038   3040   3042   3101
R3        0000 0003      85*    107    108    109    263    267    269    275    277    278    397    401    410
                         419    426    427    488    761    762    764    781    782    783    800    866    867
                         868    870    875    914    916    920   1090   1122   1123   1126   1143   1144   1145
                        1146   1158   1159   1160   1163   1422   1440   2173   2387   2391   2394   2395   2398
                        2400   2404   2411   2412   2516   2529   2530   2551   2552   2609   2610   2815   2816
                        3102   3122   3132   3152   3153
R4        0000 0004      86*    111    112    113    115    123    125    250    252    267    272    277    292
                         295    307    309    325    327    386    398    399    408    409    436    437    439
                         447    567    568    569    761    765    767    770    869    870    871    872    872
                         873    924    925    935    936    994    996   1005   1007   1010   1012   1051   1081
                        1082   1084   1092   1093   1094   1096   1097   1099   1101   1103   1108   1109   1152
                        1153   1154   1155   1155   1161   1161   1279   1354   1361   1375   1376   1377   2046
                        2061   2078   2086   2121   2122   2133   2147   2148   2174   2180   2181   2405   2409
                        2517   2518   3103   3106   3108   3130   3135
R5        0000 0005      87*    113    115    116    116    118    119    120    123    125    131    264    268
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                                270    272    306    343    412    714    719    726    748    914    916    967    972
                                977    994    998    999   1001   1015   1111   1449   1450   1454   1456   1458   1461
                               1901   1903   1905   1906   1913   1915   1917   1919   1921   1923   1925   1926   1932
                               1943   1945   1948   2690   3053   3058   3065   3105   3106   3134   3135   3136
R6         0000 0006            88*    110    120    127    266    268    274    300    315    319    320    337    341
                                349    353    389    391    391    486    492    493    494    757    775    776
                                783   1131   1132   1133   1133   1450   1452   1456   1466   1497   1502   1503   1504
                               1509   1510   1514   1575   1580   1585   1590   1595   1609   1617   1628   1633   1634
                               1635   1643   1644   1646   2012   2013   2014   2015   2016   2017   2018   2021   2022
                               2023   3116   3117   3118   3124   3125   3136   3137   3153   3154
R7         0000 0007            89*    129    130    131    759    913    937    943   2022   2026   2027
R8         0000 0008            90*    121    122    127    128    305    312    324    331    480    481    482    485
                                488   3154
R9         0000 0009            91*    304    311    322    330   1085   1086   1088   1089   1090   1092   1275
RCHECK     0000 1807           1816*   2901
RCK.0      0000 20D2           2584*   2594
RCK.1      0000 20D4           2585*   2588   2592
RCKRTN     0000 20D8           2586*   2951
RCMD       0000 1804           1813*   2500   2887   2914
RDCK       0000 230C           2585    2647   2893*  3061
RDF        0000 2B10           1851    2409   2519   2521   2531   3082*
REC.1      0000 1E9C           2259*   2263
RECODE     0000 1E98           2256*   2661   2670
REDUN.1    0000 2128           2631*   2656
REDUN.2    0000 2142           2640*   2644
REDUN.3    0000 2150           2646*
REDUNCK    0000 2120           2622    2628*
RESET      0000 1808           1817*   2017   2376
RESTOC     0000 1809           1818*   2974
RETOPSW    0000 14AC           1446    1486*
RETOPSW1   0000 14B6           1489    1492*
RF1.0      0000 1FF6           2483    2488*  2547
RF1.1      0000 1FF8           2489    2540   2544
RFA        0000 185C           1852*   2007   2492   2879
RFMT       0000 22E6           2876*
RSA        0000 1858           1851*   2005   2491   2878
RSAVE      0000 2CFC            797     829    836    865    966    976    981   1077   1475   2191   2212   3092*
SC.1       0000 1D9C           2148*   2152
SC.2       0000 1DA8           2149    2154*
SC.3       0000 1DB0           2155    2157*
SC.4       0000 1C9E           2053    2059*
SC.5       0000 1CAE           2047    2061*
SC.8       0000 1CE8           2077    2089*
SCAN       0000 1D90           2045    2069   2082   2143*
SCAN1      0000 1D96           2146*   2161
SCANOST    0000 20F2           2607*
SCO.1      0000 20FC           2611*   2613
SCO.2      0000 2102           2613    2666   2693
SECT       0000 0008           1801*   2088   2099   2100   2195   2221   2247   2250   2258   2259   2261   2271   2437
                               2440    2441   2443   2447   2457   2460   2461   2463   2467   2488   2498   2538   2539
                               2541    2542   2543   2560   2564   2570   2571   2573   2577   2583   2586   2587   2589
                               2593    2628   2680   2744   2839   2842   2843   2845   2849   2867   2885   2899   2912
                               2947    3001   3003   3022   3047   3056   3056   3071   3072
SECTAB     0000 180A           1823*   1976
SECTADV    0000 2066           2479    2537*
```

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SECTERR   0000 2108     2612   2616*
SECTNUM   0000 1894     1873*  2085   2088   2099   2250   2744
SEEK      0000 1806     1815*  2382   2637   2754   2830
SELCH     0000 1714     1758*  2012   2367   2741   2811
SELECT    0000 1B30     1920   1922   1934*
SELTST    0000 1610      461    477   1694*
SET.RTN   0000 162A     1295   1300   1707*
SETKB     0000 1320      244    249    506   1139   1169   1260*  1950
SETLST    0000 132A      466    509   1266*
SETMSG    0000 1B48     1902   1904   1918   1924   1941*
SETMSG1   0000 1B4E     1943*  1947
SINK      0000 1600     1274   1682*
SKCNT     0000 1880     1863*  2002   2962   2965
SKRTRY    0000 1864     1854*  2375   2633   2747   2823   2983
SLAD      0000 0007     1800*  2367   2490   2491   2492   2501   2502   2504   2741   2811   2859   2860   2861
                        2870   2877   2878   2879   2888   2922   2924   2967
SLCHWT    0000 2336     2872   2889   2921*
SOFTERR   0000 2190     2617   2669*
STAMSG    0000 1674      692   1726*
START     0000 0A5E      135    137    211*
START3    0000 0A72      138    218*
START4    0000 0A74      139    220*
STARTA    0000 0A76      212    216    220    222*    582
STAT      0000 000A     1803*  1928   2377   2380   2415   2416   2418   2418   2494   2502   2505   2634   2638
                        2640   2641   2643   2643   2648   2650   2749   2752   2758   2760   2762   2824   2828
                        2831   2833   2835   2863   2881   2895   2908   2922   2925   2930   2934   2936   2960
                        2968   2972   2975   2977   2980   2980   2986   2988   3062   3063
STATCHK   0000 2350     2934*  2937
STCON     0000 11B6      227   1120*  1638
STOP      0000 1801     1810*  2013   2015   2490   2504   2859   2877   2924   2967
SUD.0     0000 1F5A     2403*
SUD.1     0000 1F62     2406*  2408
SYNC      0000 188A     1868*  1974   2177
SYNCTAB   0000 1828     1833*  1975
TABSIZ    0000 0002     1821*  1964
TDA.1     0000 203C     2519*  2523
TDA.2     0000 205C     2531*  2533
TDA32     0000 204E     2484   2526*
TDATA     0000 202A     2481   2512*
TEST      0000 16FC      287    330    331    410    412    452    455    488   1755*  1756
TEST0     0000 24A4     3055   3059*
TEST1     0000 24A8     3057   3060*
TESTS     0000 1870      280    524   1857*  2033
TIMER     0000 0F7C      793*
TITLE     0000 18A0      234   1880*
TOTAL     0000 1618      468    539    572   1698*
TOTERR    0000 161A      469    574    655    658   1699*
TOTMSG    0000 1654      566   1722*
TRACK     0000 000B     1804*  1908   2090   2093   2094   2108   2115   2117   2205   2222   2236   2248   2273
                        2285   2287   2289   2291   2293   2295   2368   2372   2379   2493   2566   2621   2624
                        2630   2636   2653   2655   2672   2742   2751   2820   2826   2852   2854   2862   2880
                        2894   2907   3004   3049
TST.1     0000 24C4     3064   3068*
TSTBRK    0000 1248      518   1002   1009   1176*  2623   2855
TSTDU     0000 12D8      540    551    659    984   1028   1231*  1639
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TSTEND     0000 0D62        530*   1953   2654
TSTMSG     0000 163C       1716*   1717
TSTPARM    0000 1D02       2058    2093*
TYPTAB     0000 183E       1842*   1961
UNARY      0000 0F72        487     781*
WCMD       0000 1800       1809*   2869
WF1.0      0000 1F8C       2438*   2448
WF1.1      0000 1F8E       2439*   2442   2446
WF2        0000 2098       2560*
WF2.0      0000 209A       2561*   2578
WF2.1      0000 209C       2562*   2572   2576
WFA        0000 1854       1850*   2010   2861
WFMT       0000 22BC       2439    2569   2841   2858*  3052
WSA        0000 1850       1849*   2008   2860
WTF        0000 29DC       1849    2168   2406   2407   2513   2514   2526   2568   2817   3051   3080*
XIERR1     0000 14C0       1498    1503*
XIERR2     0000 14EE       1511    1517*
ZERONE     0000 0BA6        337*   1760
ZERONE1    0000 0BAE        341*   1768
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