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1.0 PURPOSE

F0FE was written to provide the Field Engineer a means of maintaining and/or generating his IBM System/360 diagnostic programs on the 2311 or 2314 disk drives.

2.0 REQUIREMENTS

2.1 EQUIPMENT

CPU - System/360, all models with the standard instruction set.

Main Storage - This program requires a minimum of 8192 bytes of storage to operate.

Control Card Device - 1052, Card Reader

Data Card Device - 1052, Card Reader (Data Card Device and Control Card Device may be the same device).

Hi Speed Hard Copy Device - 1052, Printer.

Systems Error Log Device - 1052, Printer (Hi Speed Hard Copy Device and Systems Log Device may be the same device).

Systems Residence Device - 2311, 2314.

New Master - 2311, 2314 (Systems Residence Device and New Master must be the same device unless a Dup or Merge function is intended.

2.1.1 Program

The Disk Utility F0FE is a stand-alone program, and as such requires no monitor programs to operate.

F0FE requires the disk pack (System Residence Device) onto which it will reside and update to be formatted by F0FE's FORMAT module.

3.0 PROGRAM PHILOSOPHY

3.1 GENERAL

F0FE is loaded by standard IPL procedures from cards, or F0FE loader from an F0FE formatted disk pack. After partial loading, the program will go into wait state to allow the operator to define the I/O units to be used. I/O unit definition can be entered via the 1052 typewriter, manually stored in storage or by prepunching the data in a definition card. When the I/O units have been defined, the program will complete loading and initialize the system.

At the completion of the initialization phase F0FE will interrogate the Control Card Device and will begin execution of the first function requested. When the first function is completed, the control card device will be interrogated again and the next function will be executed. This continues until the program is terminated by an EOF (from the card reader) or by the TERM message (from the 1052 typewriter, or card reader).

4.0 OPERATING PROCEDURES

4.1 PROGRAM INITIALIZATION

The operator must define the I/O configuration to be used by the program. This may be done by pre-punching a definition card, (see 4.1.4 example #1), entering the data via 1052 typewriter. (see 4.1.5), or by manually storing the data via console data keys, (see 4.1.6).

Each unit is defined by an alphabetic character that describes the unit type and a four (4) hex character I/O unit address. The following characters represent unit types:

Y = 1052 Typewriter
C = Card Reader
D = 2311 File
F = 2314 File
P = Printer
T = Tape unit

The remaining four hex characters are a leading zero followed by I/O unit address.

Examples of acceptable entries:

a) 1052 Typewriter, address 009 = Y0009
b) 2311 File, unit address 192 = D0192

4.1.1 LOADING

4.1.2 Cards - (If you have just received F0FE and this is the first time it is to be used, please see 8.0).

Set the IPL switches to the address of the card reader and depress load. After partial loading, the program will enter Wait state. At this point, the operator must define to the program the I/O units to be used during the Utility run.

In defining to the program the I/O units to be used, one of the following procedures may be used.

- Pre-punched definition card
  Action - Depress Interrupt (see 4.1.4)
- 1052 Typewriter entry
  Action - Depress Request on 1052 (see 4.1.5)
- Console Data Keys
  (see 4.1.6)

CAUTION: SYSTEMS RESIDENCE DEVICE AND NEW MASTER MUST BE THE SAME DEVICE UNLESS A DUP OR MERGE FUNCTION IS INTENDED.

4.1.3 DISK

Set the IPL switches to the address of the 2311/2314 disk file and depress load button. The IPL program will load and it will enter Wait state. At Hex location 180 the operator must store FE and depress interrupt. The load program will then load the object program and transfer control to it.

F0FE will load and enter Wait state. At this point, the operator must define to the program the I/O units to be used during the Utility run.

If loading an IPL program other than F0FE enter that program's P3 S1 number in Hex location 180.

Example: DME = F040, enter 40
DMA8 = F024, enter 24

CAUTION

When loading from disk and defining the I/O units the System Residence device must be the same device as that which was IPL'ed.

In defining to the program the I/O units to be used, one of the following procedures may be used.

- Pre-punched Definition Card
  Action - Depress Interrupt (see 4.1.4)
- 1052 Typewriter Entry
  Action - Depress Request on 1052 (see 4.1.5)
- Console Data Keys
  (see 4.1.6)

CAUTION: SYSTEMS RESIDENCE DEVICE AND NEW MASTER MUST BE THE SAME DEVICE UNLESS A DUP OR MERGE FUNCTION IS INTENDED.

4.1.4 PRE-PUNCHED DEFINITION CARD (Procedure 1)

If a definition card is used, it must be pre-punched and IPL loaded with the deck. This is card #0FE40079. Columns 1-16 and 52-80 must be an exact duplicate of the one provided, columns 17-51 must be prepunched as follows (see example #1).

Card Column	Punch
17	C - if control card device is a card reader Y - if control card device is a 1052
18-21	4 digit address of control card device (right justified with leading zeros inserted as necessary) - see Note 1.
22	Blank
23	C - if data card device is a card reader Y - if data card device is a 1052 T - if data card device is a tape
24-27	4 digit address of data card device
28	Blank
29	D - if the diagnostic system residence device is a 2311 F - if the diagnostic system residence device is a 2314
30-33	4 digit address of the diagnostic system residence or if doing a generate 4 digit address of the disk drive that the diagnostics are to be placed onto
34	Blank
35	D - if the new master device is a 2311 F - if the new master device is a 2314
36-39	4 digit address of the new master if merge or duplicate 4 digit address of the diagnostic residence device if any other function
40	Blank
41	P - if the high speed output device is a printer Y - if the high speed output device is a 1052
42-45	4 digit address of the 1052 or printer - see Note 2
46	Blank
47	P - if the error log device is a printer Y - if the error log device is a typewriter
48-51	4 digit address of the 1052 or printer - see Note 2

EXAMPLE #1

Example of Pre-Punched Definition Card

```
          1 2         3         4         5
Col.      78901234567890123456789012345678901

Punch     Y0009 C000C D0190 D0190 F000E Y001F
```

Meaning: 1052 is the control card device
Card reader is the data card device
2311 is the system residence device
2311 is the new master
The printer is the high speed hard copy device
The 1052 is the error log device

Note 1

Control cards for update functions are always loaded from CONTROL CARD DEVICE. Program decks (on F0FF Format tape) may be loaded from a separate device, or DATA CARD DEVICE, if desired.

Note 2

The high speed output device is used by F0FE for listing and printing diagnostic and diagnostic ID's residing on the diagnostic disk pack.

The error log device is used by F0FE for the logging of error messages. If the error log device is a 1052 it can also be used as a decision making device. After any error message ending with a HALT the option of depressing the 1052 request key can be taken. The message, READY FOR INPUT, will type. The following input messages can be given:

R the I/O operation will be retried.

I the error will be ignored, and processing will attempt to continue as if no error had occurred.

S this option is only applicable during generate, add, delete, punch and print. This option will terminate operation on the diagnostic program in progress and will skip to the next diagnostic program to be processed.

Note 3

All the entries punched in the prepunched definition card may be overlayed by depressing request on the 1052 when the CPU enters wait state during loading, and following those steps defined in 4.1.5

4.1.5 1052 Typewriter Entry (Procedure 2)

As an alternative for providing a pre-punched definition card, the operator may enter the I/O unit addresses through the on-line 1052 typewriter.

When the CPU enters WAIT state during loading, depress the request key on the 1052. The following lines will print. (The asterisk will be replaced with the current level of F0FE.)

```
F0FE-* DISK UTILITY;READY FOR I/O CONFIGURATION
ASSIGN I/O DEVICES BY TYPE AND 4 BYTE ADDRESS

C = READER DEVICE TYPE
T = TAPE DEVICE TYPE
P = PRINTER DEVICE TYPE
Y = 1052 DEVICE TYPE
D = 2311 DEVICE TYPE
F = 2314 DEVICE TYPE

EXAMPLE; USE 'P000E' FOR PRINTER WITH ADDRESS OF 00E
DATA INPUT DEVICE; USE C, T OR Y
```

The keyboard will then unlock and you should enter the following information:

Char. No.	Type
1	C - if the data card device is a card reader Y - if the data card device is a 1052 T - if the data card device is tape
2-5	4 digit address of the data card device right-justified with leading zeros inserted as necessary
6	End of Block (alternate code 5)

The following line will then be printed:

```
CONTROL CARD DEVICE; USE Y OR C
```

Enter the following information:

Char. No.	Type
1	End of Block - if the control card device is the same as the DATA INPUT DEVICE, and ignore characters 2-6 C - if the control card device is a card reader Y - if the control card device is a 1052
2-5	4 digit address of the control card device
6	End of Block

The following line will then be printed:

```
HI SPEED HARD COPY DEVICE; USE P OR Y
```


Enter the following information:

Char. No.	Type
1	End of Block - if no high speed output device is available or desired P - Printer Y - 1052
2-5	4 digit address of the high speed hard copy device
6	End of Block

The following line will then be printed:

```
SYSTEMS LOG DEVICE; USE Y OR P
```

Enter the following information:

Char. NO.	Type
1	End of Block - if the system's error log device is the same as the high speed hard copy device and a high speed hard copy device was provided. P - Printer other than a 1052 Y - 1052
2-5	4 digit address of the system's error log device
6	End of Block

The following line will then be printed:

```
SYSTEM RESIDENCE DEVICE; USE D OR F
```

Enter the following information:

Char. No.	Type
1	D - for 2311 F - for 2314
2-5	4 digit address of the diagnostic resident disk pack - or if doing a generate, the 4 digit address of the device onto which the diagnostics are to be written.
6	End of Block

The following line will then be printed:

```
NEW MASTER; USE D OR F
```

Enter the following information:

Char. No.	Type
1	End of Block - if the NEW MASTER device is the same as the Systems Residence device D - 2311 F - 2314
2-5	4 digit address of the new master device
6	End of Block

Notes

1. Either upper or lower case alphabetic characters may be entered.
2. Cancel (alternate code 0) may be pressed at any time before EOB and will cause reinitiation of the last read.
3. If the first character does not match one of these defined in the above, the following message will be printed:

   INVALID I/O CONFIGURATION

   and the read which was in error will be reissued.
4. If neither hard copy or systems log device is provided, F0FE will hang.

4.1.6 Via Console Data Keys (Procedure 3)

Instead of the above procedures, the I/O units may be defined through the console data keys.

When the CPU enters the WAIT state enter into the following locations the information for each unit as described in procedure 2.

Control Card Device	Loc 1000 1001-1004	Device type 4-byte address
Data Input Device	Loc 1006 1007-100A	Device type 4-byte address
System Residence Device	Loc 100C 100D-1010	Device type 4-byte address
New Master	Loc 1012 1013-1016	Device type 4-byte address
High Speed Output Device	Loc 1018 1019-101C	Device type 4-byte address
Systems Error Log Device	Loc 101E 101F-1022	Device type 4-byte address

As an aid in entering data via the Console Data Keys the following characters are provided

Dec Hex	Dec Hex	Dec Hex	Dec Hex
0 = F0	5 = F5	A = C1	P = D7
1 = F1	6 = F6	C = C3	T = E3
2 = F2	7 = F7	D = C4	Y = E8
3 = F3	8 = F8	E = C5	
4 = F4	9 = F9	F = C6	

Example: When 1052 is Control Card Device with device address of 01F.

Loc	1000	1001	1002	1003	1004
Store	11101000	11110000	11110000	11110001	1100011C

5.0 OPERATION

5.1 UPDATE CONTROL RECORDS

The following pages explain in detail the options available in this program. All update functions, with the exception of condense, merge and duplicate are done on the single diagnostic resident pack.

Function	Section
ADD Program from cards	5.1.1
ADD Program from FOFF Tape	5.1.2
Change programs	5.1.3
ALTER Program	5.1.4
Assign I/O devices	5.1.5
Condense disk	5.1.6
Delete programs	5.1.7
Duplicate disk	5.1.8
Format disk	5.1.9
Generate disk	5.1.10
List programs	5.1.11
Loader core storage address assignment	5.1.12
Merge disk	5.1.13
Print program	5.1.14
Punch program	5.1.15
Rearrange programs	5.1.16
System Definition	5.1.17
Terminate	5.1.18

*In examples on the next few pages the word 'Type' is used to indicate what is to be entered via the 1052 when it is the control device. The word 'Punch' is used to indicate what is to be punched into the control card when the control device is the reader.

5.1.1 Add Programs - Card or Card Image Tape

Purpose:

This control card provides the ability to add a new program or programs to the pack. It also provides the ability to change or replace an entire program or programs on the disk pack. The add and change control cards are interchangeable and provide the same function.

Restrictions:

1. If the control card and data input devices are the same, all program sections existing in the data input device will be added to or changed on the disk pack until the next control card is read or until end of file on the data input device is read.

2. If the control card and data input devices are different units, all program sections existing in the data input device will be added to or changed on the disk pack until the end of file on the data input device is read.

Card Format:

```
Column*   12345678
Type      ADD
Punch     CNTRLADD
```

Procedure:

Load FOFE and define I/O devices. Load the data input device with the program(s) to be added to or changed on the disk pack. Enter via the control card device, an add message. The program(s) in the data input device will then be placed on the pack.

5.1.2 Add Programs - FOFF Format Diagnostic Tape

Purpose:

This control card provides the ability to add a new program or programs to the system resident disk pack. It also provides the ability to change or replace an entire program or programs on the system resident disk pack. The add and change control cards are interchangeable and provide the same function.

Card Format 1

```
Column*   12345678
Type      ADD
Punch     CNTRLADD
```

This control card format will add or change all programs from the FOFF tape to the diagnostic resident disk pack.

Card Format 2

```
                   1
Column*   12345678901
Type      ADDXXX
Punch     CNTRLADDXXX
```

This control card format will add or change the single program specified by XXX to the diagnostic resident disk pack.

Procedure:

Load FOFE and define I/O devices. Mount the FOFF diagnostic tape on the tape drive assigned as the data input device. Supply on the control card device, one of the add messages defined above. The program(s) specified will then be added to or changed on the diagnostic resident device.

5.1.3 Change Program

This option is designed to give the user the ability to change or replace an entire program with a program(s) from the data card device. This function is identical to the add function and is included as a compatibility function. See 5.1.1 and 5.1.2 for complete details.

Restrictions:

No program in the F.E. block can be changed using the CHG option (see REARRANGE).

Card Format 1

```
                    1
Column*   12345678901
Type      CHGXXX
Punch     CNTRLCHGXXX
```

This control card format will change the single program specified by XXX.

Card Format 2

```
                    1
Column*   123456789012345
Type      CHGXXX-YYY
Punch     CNTRLCHGXXX-YYY
```

This control card format will change all programs starting at XXX through and including YYY.

Procedure:

See add functions 5.1.1 and/or 5.1.2. The change function consists logically of a delete-add operation.

5.1.4 Alter Program

Purpose:

The purpose of alter is to change on a byte basis the text portion of any program on the diagnostic resident disk pack.

Restrictions:

The data input must be in the format of 80 character records. No alter records may be used to change a data card. If a 1052 is used to introduce the control records (ALT records), and another device is used for the alter data, each group of alter data must be delimited by an ALTEND record.

CAUTION: REP cards or RPL data is placed into the program addressed as is. FOFE does not interrogate this data for accuracy.

Card Format

```
                    1                   1
Column*   12345678901 or 123456789012
Type      ALTXXX          ALTXXXY
Punch     CNTRLALTXXX     CNTRLALTXXXY
```

XXX is the three digit identity of the program to be altered. The first format is used to alter the main program load. The second format is used to specify the overlay to be altered, where Y = 1 for overlay 1, 2 for overlay 2 ... F for overlay 15.

The alter data may be a standard form TXT card, REP card or if the data is to be entered from a 1052, an RPL message may be used as data. The format of an RPL message is as follows:

```
                    1         2
Column*   12345678901234567890
Type      RPL XXXXXX YYYY
Punch      REP  XXXXXX    YYYY
           TXT                  (normal TXT card)
```

Type in columns 5-10 the starting address (in hollerith) and type in columns 12-15 the first of up to 14 data fields separated by commas.

Punch in columns 7-12 the starting address (in hollerith) and punch in columns 17-20 the first of up to 14 data fields separated by commas.

If the data and control devices are separate the end of an alter should be indicated by an ALTEND card. Its format is:

```
                    1
Column*   12345678901
Type      ALTEND
Punch     CNTRLALTEND
```

Procedure:

Load F0FE and define I/O devices. Load the control card device with an ALT card. Load the data input device with the TXT, REP, or RPL card/messages. If more than one program is to be altered, the information in the data input device must be delimited by an ALTEND record. If the control card and data input device are the same and more than one program is to be altered, the ALTXXX card will suffice.

5.1.5 Assign I/O Device

Purpose:

The purpose of the assign card is to allow I/O device assignments to be changed between job steps without reloading F0FE. An example of this is to generate disk from F0FF tape, change the data input device assignment, then add programs from cards without reloading F0FE.

Restriction - SYSRES device may not be changed with the ASSIGN function.

Message Format:

Data Input Device

```
                    1         2
Column*   12345678901234567890123
Type      ASSGN DATAIN,ZXXXX
Punch     CNTRLASSGN DATAIN,ZXXXX
```

where Z can be T for tape, C for cards and Y for the 1052, and XXXX is the 4 digit address of the data input device.

Control Card Device

```
                    1         2
Column*   12345678901234567890123
Type      ASSGN CONTROL,ZXXXX
Punch     CNTRLASSGN CONTROL,ZXXXX
```

where Z can be C for cards or Y for the 1052 and XXXX is the 4 digit address of the control card device.

New Master Disk

```
                    1         2
Column*   12345678901234567890123
Type      ASSGN NEWMAS,ZXXXX
Punch     CNTRLASSGN NEWMAS,ZXXXX
```

where Z can be D for the 2311 or F for the 2314 and XXXX is the 4 digit device address of the new master.

Systems Error Log Device

```
                    1         2
Column*   1234567890.234567890123
Type      ASSGN ERRLOG,ZXXXX
Punch     CNTRLASSGN ERRLOG,ZXXXX
```

where Z can be P for a printer or Y for a 1052 and XXXX is the 4 digit device address of the systems error log device.

High Speed Output Device

```
                    1         2
Column*   123456789012345678901234
Type      ASSGN PRINTER,ZXXXX
Punch     CNTRLASSGN PRINTER,ZXXXX
```

Where Z can be P for a printer or Y for a 1052 and XXXX is the 4 digit device address of the high speed output device.

5.1.6 Condense:

Purpose:

To provide a means by which the F.E. can physically remove deleted program from the disk pack should the pack become full.

Restrictions:

1. If the MIDAS program exists on the resident pack, it must be deleted before the condense function is used.
2. Any rearranged programs should be deleted prior to this operation or they will be generated twice on the resident pack.
3. The data input device will be altered by the program to address the tape unit used as the intermediate storage device. To change it back to its original assignment use an assign control card placed after the condense control card.
4. For those systems that have no tape units, a duplicate function can be used which will duplicate only those programs present onto the New Master.

Card Format

```
                    1
Column*   1234567890123 45
Type      COND,ZXXXX
Punch     CNTRLCOND,ZXXXX
```

where z is T for a 2400 series tape unit and XXXX is the 4 digit address used as an intermediate storage device for the condense operation.

Procedure:

Load F0FE and define I/O devices. Enter through the control card device a condense message. The system resident device will proceed to go disk to tape and will then go tape to disk. This tape may be kept as a backup and used as input to the Generate function if desired.

5.1.7 Delete Program

Purpose:

To delete a program or programs from the system resident disk pack.

Card Format

```
                    1
Column*   12345678901
Type      DELXXX
Punch     CNTRLDELXXX

          or

                    1
Column*   123456789012345
Type      DELXXX-YYY
Punch     CNTRLDELXXX-YYY
```

If the first format is used the single program denoted by XXX will be deleted. If the second format is used all programs starting at XXX through and including YYY will be deleted.

Procedure:

Load FOFE and define I/O devices. Enter through the control card device a delete card/message. The referenced program or programs will then be deleted.

5.1.8 Duplicate Disk

Purpose:

To allow the F.E. to duplicate his system resident pack onto the new master disk drive.

Restrictions:

1. The new master and system residence device must not be the same device.
2. The FORMAT control card must be used to initialize the NEW MASTER pack prior to the duplicate function.
3. If the MIDAS program exists on the resident pack, it must be deleted before the Duplicate function is used.

The new master and system residence device must not be the same device.

The FORMAT control card must be used to initialize the NEW MASTER pack prior to the duplicate function.

Message Format

```
Column*   12345678
Type      DUP
Punch     CNTRLDUP
```

Procedure:

Load FOFE and assign I/O devices. Enter through the control card device a DUP card/message.

5.1.9 Format Disk

Purpose:

To provide the F.E. with a method of initializing and providing a surface analysis of the diagnostic resident and new master disk packs required by FOFE.

Restrictions:

1. This control card must be used prior to the initial generation of the diagnostic resident pack, the new master when duplicating or merging and the scratch pack when condensing.
2. This routine always initializes the new master disk pack, therefore the new master assignment when generating must be the same as the system resident disk assignment.
3. Do not use any other initializer or formater on this disk pack after FOFE format function has been used.

Message Format

```
                    1
Column*   12345678901
Type      FORMAT
Punch     CNTRLFORMAT
```

Procedure:

Load FOFE and assign I/O devices. Load the control card device with the format control message.

5.1.10 Generate Disk

This control record gives the user the ability to generate a diagnostic disk pack from card image records or F0FF format tape.

Restrictions:

The FORMAT control card must be used prior to the initial generate on the diagnostic resident pack. If for some reason additional generations are done it is unnecessary to re-format the disk pack.

Message Format:

Column*	12345678
Type	GEN
Punch	CNTRLGEN

Procedure:

Load F0FE and define I/O devices. If this is the initial run load a FORMAT control statement. After the initialization is complete load or type the GEN control statement.

CAUTION: Extreme caution must be used during a generation pass if errors occur on the data input device. If, for example, a record is omitted while recovering from a unit check on a card reader, it may not be evident until the created disk is in use.

5.1.11 List Programs

Purpose:

To make a list of the programs appearing on the new master disk. The items appearing in the list are: Program I.D., Search Number, Part Number, E.C. Level.

Restrictions:

None

Card Format:

Column*	123456789
Type	LIST
Punch	CNTRLLIST

Procedure:

The file from which the programs are to be listed is the new master disk device which may also be the system resident disk device. Provide a LIST card or message, as specified above, via the control card device.

5.1.12 Loader Core Storage Assignment

Purpose:

To provide F0FE with a core storage address in which to build an IPL loader. This is required because of the endless number of IPL loader address assignments used by different IPL programs.

Restrictions:

1. This assignment is required before punching stand-alone program decks.
2. It is also required if a stand-alone program is to be used as an exclusive disk IPL program such as SIF, System/360-65 Hard Core program.
3. The default core storage assignment area begins at location hex 80 which is the logout area.
4. The IPL loader which F0FE builds is a maximum of 256 characters.
5. When F0FE is to be punched the LDR function must be used with an address of 001E60.
6. Address specified must be a double word address.

Message Format:

	1
Column*	123456789012345
Type	LDR AAAAAA
Punch	CNTRLLDR AAAAAA

AAAAAA is a 6 digit core storage address punched in hex designating the starting address of the IPL loader.

Procedure:

Load F0FE and assign I/O devices. Provide to F0FE the LDR control message.

5.1.13 Merge Disk

Purpose:

To merge two diagnostic disk packs in F0FE format onto a single new master pack. Where the same program appears on more than one pack, the program with the highest level will appear on the new master pack. If the duplicate programs are at the same level, the program from the diagnostic resident pack will appear on the new master.

Restrictions:

CAUTION: The F0FE program desired on the new master must be on the IPL'ed SYSRES disk device.

1. The new master device must not be the same device as the system residence device or the merge input device.
2. The new master disk pack must be initialized prior to the merge by using the FORMAT control card (see 5.1.9).

3. If the MIDAS program exists on the resident pack, it must be deleted before the merge function is used.

Card Format:

```
                  1
Column*   123456789012345
Type      MERG,ZXXXX
Punch     CNTRLMERG,ZXXXX
```

where Z can be either D for 2311 or F for 2314 and XXXX is the 4 digit device address of the disk to be merged with the diagnostic system resident device to form a new master diagnostic disk.

Procedure:

Load FOFE and assign I/O devices. Provide a merge card or message, as specified above, via the control card device. The new master will contain the results of the merge.

NOTE: MERGE will take a minimum of 20 minutes.

5.1.14 Print A Program

Purpose:

To produce a printout of a program as it appears on the disk on the hard copy device.

Restrictions:

When SYSRES and NEW MASTER are different devices, the NEW MASTER will be used.

Message Format:

```
                  1
Column*   12345678901234 56
Type      PRNTXXX,YYY
Punch     CNTRLPRNTXXX,YYY
```

Where XXX is the first of up to 14 three-digit fields separated by commas. These fields contain the update numbers of the programs to be printed. The search numbers do not have to be in any particular sequence. Each except the last must be followed by a comma.

Procedure:

Enter, through the control card device, a PRINT message. The new master pack is searched for the requested programs and they are printed in the order requested on the hard copy output device.

5.1.15 Punch A Program

Purpose:

To punch programs from the FOFE disk onto cards in the standard object deck format.

Restrictions:

The new master disk device will be used as input to the punch operation. The object deck output will be capable of running, but is not guaranteed to be an exact duplicate of the original deck. Punched DM's will include the DMIC, SRT, SDT, CMI, and UDT text information that was on disk, but will not contain the designation found in columns 13 through 16.

Card Format:

```
                  1         2
Column*   123456789012345678901
Type      PNCHXXXX,ZZZ,ZZZ
Punch     CNTRLPNCHXXXX,ZZZ,ZZZ
```

XXXX specifies the 4 digit I/O address of the punch device. Each ZZZ specifies the 3 digit search number of a program to be punched, up to 14 programs. Each except the last must be followed by a comma.

Procedure:

Enter, through the control card device, a PNCH message. The new master disk is searched for the requested programs and they are punched in the order requested.

Note: Before punching IPL programs, see LDR 5.1.12.

5.1.16 Rearrange Programs

Purpose:

To rearrange selected diagnostic sections from this present search number to the "C.E. block." The rearranged program will appear only once on the systems resident pack, but can be accessed by the two search numbers.

Restrictions:

The IPL stand-alone programs cannot be rearranged. A maximum of 255 sections may be rearranged.

Card Format:

```
                  1         2
Column*   12345678901234567890
Type      RARXXX,XXX,XXX etc.
Punch     CNTRLRAR XXX,XXX,XXX etc.
```

Each XXX specifies the 3 digit search number of a program to be rearranged.

Procedure:

Load FOFE and assign I/O devices. Provide a RAR card or message, as specified above, via the control card device.

5.1.17 System Definition

Purpose:

To insert DMIO, SRT, SDT, CMT, and UDT information into the diagnostic monitors specified by the 1st control card. One or more of these system configuration cards can be used and in any order to update the DM or DM's.

Card Format:

First card:

```
                    1         2
Column*   12345678901234567890
Type      SYS S40,S23
Punch     CNTRLSYS S40,S23
```

This card indicates that three DM's are to be updated. If only one DM is to be updated one search number would appear. A maximum of three DM's can be specified. DMA8, DMK, and DME can be specified on the same card; however if it is desired to update DMA4 (S20) only S20 can appear in the control card. In other words DMA4 cannot be specified with any other DM. The reason being that the system configuration card format for DMA4 is different than the other DM's.

Card Format: (Data Cards)

```
                    1                   7
Columns   1----------234567-----------------2
          Do not care DMIO  See DM User's Guide
          Do not care UDT2  Procedure for Punching
          Do not care UDT1  Systems Configuration
          Do not care SRT1  Cards.
          Do not care SDT1
          Do not care CMT2
```

Note that the order and number of system configuration cards does not matter. However, the number in column 16 is important if there is more than one card of a type such as the UDT cards: UDT0, UDT1, UDT2, etc. The number in column 16 determines which of the possible cards of that type will be changed in the DM specified. If a number is not punched in column 16 (blank) a 0 or 1 is assembled depending on the first card of that type DM. For example DME uses 0 in column 6 as its first UDT card where DMA8 uses 1 in column 16 as its first UDT card.

Card Format:

Last card:

```
                    1
Column*   12345678901
Type      SYSEND
Punch     CNTRLSYSEND
```


Alternate Format:

If the alternate format of the DMIO, SRT, SDT, CMT, and UDT cards is used, the data input device must be a 1052. When using this procedure, the format is the same except the data starts as character 1 and runs through character 60.

Procedure:

Enter the system configuration cards via the data input device.

5.1.18 Terminate

Purpose:

Since there is a large number of control functions which may be performed by this program, it must be told when all the desired functions may have been completed. If the control records always come from the card reader, an EOF from the reader would suffice; however, the control records may be from the 1052, therefore, a term message must be entered for program completion.

Message Format:

```
Column*   123456789
Type      TERM
Punch     CNTRLTERM
```

Procedure:

When all utility operations are complete, enter a terminate message.

6.0 ERROR RECOVERY

The following methods of error recovery can be used by the operator when F0FE enters the wait state following a halt message.

1. If the error log device has been assigned to the 1052 depress the request key.

   a. The message "Ready for Input" will type.

   b. Enter the following:

      1) R - to retry the I/O operation that failed
      2) I - ignore the error and continue processing
      3) S - when working with program sections (input or output) skip to the next section and continue processing.

2. Depress external interrupt.

   a. The default option will be taken which is normally retry.

3. In the event of card I/O or hard copy devices, F0FE will retry following the device end interrupt when the device becomes ready.

4. PSW restart - This action will request the operator to position the control card device to be positioned to read a control card.

6.1 HALTS, WAITS OR HANG-UP CONDITIONS

6.1.1 Hang-up Conditions when Loading from Disk

Location Counter 000B52

Thirty errors have occurred while reading the IPL track, unable to load any stand-alone program.

Location Counter 000B74

Desired IPL program does not exist on disk.

Location counter 000C8E

Thirty errors have occurred while reading in the IPL program.

6.1.2 Initial Loading

The program will enter Wait State during initial loading to allow entry of the I/O units addresses, as described in Section 4.1. The IC set by the program is as follows:

IC: 00FFFE

6.1.3 Termination

When all functions have been completed by either:

a. An EOF (and reader only), or
b. A Term Control message (card reader of 1052)

the program will type

```
DISK UTILITY PROGRAM TERMINATED
NEXT AVAILABLE DISK ADDRESS IS CC XXX HH XX
```

and will enter wait State.

6.1.4 I/O Error

Standard Error Message

```
*I/O ERROR ON DEVICE XXX
 CSW   XXXXXXXXXXXXXXXX
 CCW   XXXXXXXXXXXXXXXX
 SENSE XXXXXXXXXXXX
 HALT
```

See Section 6.0 for error recovery.

6.1.5 CPU Error

```
*XXX YYYYYYYYYYYYYYYY
 HALT
```

where XXX is a three character designation of the error and YY...Y is the old PSW associated with the error

PGM - Program interruption
SVC - Supervisor call error
EXT - External interruption error
MCK - Machine check interruption

Depress external interrupt to restart F0FE.

6.1.6 All Other Errors

Most other types of set-up errors, tape and disk positioning errors, etc., result in entry to wait state. Most result in error printouts, which are further described in Section 7.1 as well as recovery procedures (6.0).

7.0 PRINTOUTS

7.1 INSTRUCTIONS TO OPERATOR

INTERV REQ ON DEVICE 0000

Meaning - I/O unit required, found not ready. Ready the I/O unit.

SEEK ADDR, CCHER IS 0000000000

Meaning - Had a seek error while trying to load in a part of F0FE. See section 6.0 for error recovery.

UNABLE TO LOAD F0FE, RELOAD

Meaning - Unable to load F0FE from disk, reload from cards.

*I/O ERROR ON DEVICE 0000
CSW is XXXXXXXXXXXXXXXX
CCW is XXXXXXXXXXXXXXXX
SENSE is XXXXXXXXXXXX
HALT

Meaning - An I/O error has occurred. See section 6.0 for error recovery.

*PSW 0000000000000000

Meaning - An interruption has occurred. The old PSW is printed along with three character designation. External interrupt to restart.

READY FOR INPUT

Meaning - Typed as a result of operator depressing the Request key after a HALT message.

INVALID CARD TYPE, XXX

Meaning - An invalid card type appeared in the F0FE deck. Remove card and continue. See 6.0.

F0F PRIOR TO END CARD, RESTART

Meaning - An F0F from the card reader occurred before the F0FE End card was read. Reload F0FE.

INVALID RESPONSE or INVLD

Meaning - An invalid or non-exceptable response via the 1052 following the READY FOR INPUT message. Depress the 1052 request key and enter an exceptable message. See 6.0.

UNRECOVERABLE ERROR, RELOAD

Meaning - Self-explanatory

DEFECTIVE TRACK

Meaning - A defective track was encountered while writing part of F0FE on disk. F0FE will continue.

RECORD LENGTH EXCEEDS TRACK CAPACITY, F0FE DECK IS IN ERROR.

Meaning - F0FE deck is not in sequence. Correct deck and restart.

INVALID I/O CONFIGURATION

Meaning - A character entered from the 1052 during F0FE initialization did not match one of these permitted in Section 4.1.5 or the second character was not zero or the length of the input did not equal 0 or 5 characters.

ERROR ON SYSTEM CONFIGURATION CARD, CORRECT AND RELOAD

Meaning - One of the I/O unit types on the pre-punched control card or stored via console data keys did not match one of those permitted in Section 4.1.4 or 4.1.6. Correct and reload.

F0FE DISK UTILITY - READY FOR I/O CONFIGURATION
ASSIGN I/O DEVICE BY TAPE AND 4 BYTE ADDRESS

C = READER DEVICE TYPE
T = TAPE DEVICE TYPE
P = PRINTER DEVICE TYPE
Y = 1052 DEVICE TYPE
D = 2311 DEVICE TYPE
F = 2314 DEVICE TYPE

EXAMPLE: USE 'P000E' FOR PRINTER WITH ADDRESS OF 00E
DATA INPUT DEVICE: USE C, T OR Y

Meaning - F0FE is ready to be initialized through the 1052. See Section 4.1.5

INVALID DEVICE TYPE, CORRECT AND RETRY

Meaning - The device type in the control card is not correct. Correct error and retry.

SYSRES/NEWMAS AND THE IPL'D F0FE ARE AT DIFFERENT EC LEVELS. SEE SPECIAL CONDITIONS IN USER'S GUIDE.

Meaning - the unit defined as SYSRES or NEWMAS, (message will indicate which) is not a current F0FE disk pack. Caution: if IPL was from cards and a customer disk pack is mounted on the unit defined as SYSRES or NEWMAS this message will appear.

Action: Insure the disk pack is the pack desired, if so push external interrupt. The next control function should be FORMAT. See 5.1.9.

IPL WAS FROM DISK. IPL UNIT NOT = SYSRES, PUSH REQUEST ON 1052, RECONFIGURE.

Meaning - when F0FE is IPL'ed from disk the SYSRES unit must be the IPL unit.

NO DEVICE ASSIGNED, CORRECT AND RETRY

Meaning - A control card function is being tried without a device assignment. Assign device and retry.

RESTART, POSITION CARD READER TO READ A CONTROL CARD

Meaning - A restart is being attempted either via PSW restart or following a CPU error. Position card reader to a control card.

RESTART
ENTER CONTROL CARD

Meaning - A restart is being attempted either via a PSW restart or following a CPU error. Enter control card via the 1052.

AN UNDEFINED CONTROL CARD HAS BEEN READ
COLUMNS 6-9 ARE XXXX

Meaning - Correct control card to agree with definitions found under Section 5.1.

EOF PRIOR TO READING CONTROL CARD

Meaning - No control card followed FOFE when the control card device was assigned to the card reader.

PROGRAM XXX NOT FOUND, CORRECT AND RETRY

Meaning - An add was attempted from tape, but FOFE was unable to find the desired program on tape. Correct the add control card and retry.

ERROR ON BACKSPACE or ERRBKS

Meaning - Self-explanatory.

ERROR ON FORWARD SPACE FILE

Meaning - Self-explanatory.

ERROR ON REWIND

Meaning - Self-explanatory.

FOFE HAD COMMAND REJECT WHEN READING IN OVERLAY, ATTEMPTING TO RESTART

Meaning - FOFE was attempting to read in an overlay to perform the stated function.

DEVICE ERROR, ATTEMPTING TO RESTART

Meaning - The disk had a device error while attempting to read in an overlay.

NO RECORD FOUND, ATTEMPTING TO RESTORE

Meaning - The record number of an overlay cannot be found on disk. A restore operation will be attempted followed by another read to send in the desired overlay.

ERROR ON RECALIBRATE, RELOAD

Meaning - Unable to recalibrate after the no record found. Disk is in error, reload FOFE to continue.

DISK PACK FULL, CONDENSE PACK or FULL,COND

Meaning - All surfaces on the disk pack have been used. If many updates have been performed with programs deleted, condense pack to free unused cylinders. If initial run, an addition pack will be required.

XXX NOT VALID. COL. 73-80 ARE 00000000
POSITION DECK TO START OF THIS PROGRAM TO RESTART

Meaning - Card in error, or misplaced in deck. (Typical example: REP card following RLD cards is illegal.) Correct and reload entire deck.

PROGRAM NOT ON DISK

Meaning - The program requested by the alter control card does not exist on disk. Correct control card or add program to disk.

ENTER RPL Card

Meaning - The 1052 has been assigned as the data input device. Enter RPL card as described in Section 5.1.4.

INVALID CARD TYPE, CARD IGNORED

Meaning - A card other than TXT, REP or RPL was read during an alter operation. Card is ignored.

SYSRES AND NEWMAS CAN'T BE SAME DEVICE FOR DUP. ASSIGN NEW MASTER.

Meaning - An attempt was made to DUP when SYSRES and NEW MASTER were the same physical unit. This cannot be allowed as it would be self destructive.

SYSRES, MERG INPUT AND NEW MASTER CAN'T BE SAME DEVICE. ASSIGN NEW MASTER.

Meaning - An attempt was made to merge onto a new master which had the same unit address as the System Residence device or the merge input device. This would be self destructive.

8.0 FIRST RUN WITH F0FE

The first run of F0FE will require more time than most succeeding runs because the CE disk pack must be FORMATED. In formating, F0FE does not disturb the reserved CE track on either the 2311 or 2314.

If the 2311/2314 is a new CE disk pack and this pack is going to have diagnostics run against it, then the appropriate initializer (FFF0 or FFF1) should be run before F0FE.

Once F0FE has formatted the CE pack and the programs are written on it, no other initializing program should be used against that pack.

The functions that must be performed on the first run are as follows:

- IPL F0FE from card reader or card image tape.
- FORMAT the system residence device.
- GENERATE F0FE onto the system residence device.

An example follows to aid the operator in this first run.

Assume the system has a card reader, printer, 1052 typewriter, 9 track tape drive, and 2311 disk file. Addresses of these I/O units are:

Device	Unit Address
Card reader	00C
1052 Typewriter	01F
Printer	00E
2311 file	190
2400 9 track tape	180

F0FE is in card deck format or card image tape and all IPL and ESD programs are in card deck format.

Place F0FE in the card reader or mount the F0FE card image tape on the tape drive and the CE disk pack on the 2311 file unit.

- IPL F0FE from card reader or tape.
  After partial load the system will enter WAIT state.

- Depress Request on 1052
  The following will be typed.

```
F0FE-* DISK UTILITY; READY FOR I/O CONFIGURATION
ASSIGN I/O DEVICES BY TYPE AND 4 BYTE ADDRESS

    C = READER DEVICE TYPE
    T = TAPE DEVICE TYPE
    P = PRINTER DEVICE TYPE
    Y = 1052 DEVICE TYPE
    D = 2311 DEVICE TYPE
    F = 2314 DEVICE TYPE

EXAMPLE; USE 'P000E" FOR PRINTER WITH ADDRESS OF 00E
DATA INPUT DEVICE; USE C, T or Y

    enter:  C000C E.O.B.  or if a card image F0FE tape is being used
    enter:  C0180 E.O.B.  (note that we are calling the tape drive
                           a reader).
```



```
CONTROL CARD DEVICE; USE Y or C

    enter:  Y001F E.O.B.

HI SPEED HARD COPY DEVICE; USE P or Y

    enter:  P000E E.O.B.

SYSTEMS LOG DEVICE; USE Y or P

    enter:  Y001F E.O.B.

SYSTEM RESIDENCE DEVICE; USE D or F

    enter:  D0190 E.O.B.

NEW MASTER; USE D or F

    enter:  E.O.B.
```

F0FE will now resume loading. During this time the modules of F0FE are being written on the Systems Residence Device. When loading is completed the following message will be typed and the read light will turn on on the Control Card Device.

```
SYSRES AND THE IPL'D F0FE ARE AT DIFFERENT EC LEVELS.  SEE SPECIAL
CONDITIONS IN USER'S GUIDE.

    Action:  Depress Interrupt

NEWMAS AND THE IPL'D F0FE ARE AT DIFFERENT EC LEVELS.  SEE SPECIAL
CONDITIONS IN USER'S GUIDE

    Action:  Depress Interrupt

ENTER CONTROL CARD

    enter:  FORMAT E.O.B.
```

F0FE will now format the CE disk pack (Systems Residence Device) and do a surface analysis. This is a rather lengthy process. While this is being done the operator can put the F0FE deck back in the reader or if using a F0FE card image tape, rewind the tape device (Data Card Device).

When FORMAT is complete a message will be typed and the read light will turn on on the Control Card Device.

```
ENTER CONTROL CARD

    enter:  GEN E.O.B.
```

F0FE will now be written on the CE disk pack. Also the IPL disk pack loader will be generated onto CYL 0 H 0 R 1.

When the disk generation is completed the message again appears.

```
ENTER CONTROL CARD

    enter:  TERM E.O.B.
```

Your CE disk pack is now ready to use and can be IPL'ed.

8.1 SPECIAL CONDITIONS

Message

SYSRES AND THE IPL'D FOFE ARE AT DIFFERENT EC LEVELS. SEE SPECIAL CONDITIONS IN USER'S GUIDE.

Meaning - The above message appears after the operator has completed the I/O assignments. The significance of the message is to inform the user of one of the possibilities shown below.

a) The FOFE program read in and the FOFE on the SYSRES device are not at the same level.

b) FOFE has not been generated onto the SYSRES device at all.

c) The pack assigned as SYSRES device is a Customers pack.

Action: If a or b is the cause of the message, depress interrupt.

If c is the cause of the message, IPL FOFE again and assign the correct pack as the SYSRES.

All of the above applies to the NEW MASTER as well.

When SYSRES and NEW MASTER are defined as the same device, the message will appear for each.

The normal procedure is to FORMAT that pack when the 'Enter Control Card' message is typed.

8.1.1 Patch

```
                    1         2
Column*   12345678901234567890
Punch       REP  000AD9    XX00
```

Note: In Column 1 punch a 12, 2, 9 punch.

For easy loading from disk, you may patch in the most frequently loaded IPL programs sequence number into FOFE disk IPL loader.

Punch the above REP card and place it behind card #0FE40705.

XX is the D3 S1 of the desired IPL program.

Example: DMK = F023-* punch 23
DMA8 = F024-* punch 24
DME = F040-* punch 40

If the above is used loading procedure from disk would be:

- Dial in address of SYSRES Disk Pack
- Depress Load
  Disk Loader is read in and SYS enters wait state
- Depress Interrupt

9.0 MODEL 25 ADDENDUM TO FOFE-* USER's GUIDE

9.1 PURPOSE

FOFE is a disk utility program for creating a diagnostic library on the 2311/2314 Disk. Model 25 micro diagnostic decks are a different format than normal System/360 object decks and thus require special handling. The normal System/360 modules of FOFE will not handle the Model 25 micro decks yet some of the same functions are required; i.e., ADD, DELETE, etc.

In order to handle these Model 25 micro decks special modules were written. These modules are considered micro modules and must be used to process Model 25 micro diagnostics into the disk.

9.2 REQUIREMENTS - see FOFE User's Guide 2.0

9.3 PROGRAM PHILOSOPHY - see FOFE User's Guide 3.0

9.4 OPERATING PROCEDURES

9.4.1 PROGRAM INITIALIZATION - see FOFE User's Guide 4.1 thru 4.1.6

9.5 OPERATION

9.5.1 UPDATE CONTROL RECORDS

The following pages explain in detail the options available in Model 25 micro mode.

Micro modules of FOFE are available only in micro mode of operation.

There are five functions available in micro mode.

	Function	Section
1.	ADD	9.5.1.2
2.	DELETE	9.5.1.3
3.	DUPLICATE	9.5.1.4
4.	MERGE	9.5.1.5
5.	TERMINATE	9.5.1.6

In order to use these modules, the control MICRO must be entered. FOFE then operates using micro modules and will process micro programs. Control M360 must be used to put FOFE back in the mode to handle System/360 object deck.

9.5.1.1 MICRO

Purpose:

This causes the mode of operation in F0FE to call micro modules rather than 360 modules. It indicates that micro programs are going to be processed and directs itself to the proper cylinders.

Control Message Format:

```
                    1
Column*   1234567890
Type      MICRO
Punch     CNTRLMICRO
```

Procedure:

Before trying to process any micro program decks, enter MICRO then any of the available micro modules may be requested.

9.5.1.2 ADD micro programs - card input

Control Message Format:

```
Column*   12345678
Type      ADD
Punch     CNTRLADD
```

See 5.1.1 of F0FE User's Guide.

9.5.1.3 DEL micro programs

Control Message Format:

```
Column*   12345678
Type      DEL
Punch     CNTRLDEL
```

Note: If program 100 is deleted a warning will be output on the SYSLOG device.

See 5.1.7 of F0FE User's Guide.

9.5.1.4 DUP micro loader and update pointer to program 100.

Model 25 DUP is provided only to duplicate the CSL loader and provide a linkage to program 100. Loader will be copied from the SYSRES device. Normal use procedure would be:

1. DUP in normal 360 mode. See 5.1.8 of F0FE User's Guide.
2. Put F0FE in micro mode - see micro above.
3. DUP in micro mode.

Control Message Format:

```
Column*   12345678
Type      DUP
Punch     CNTRLDUP
```

A message will be output on the SYSLOG device indicating the success or failure of the loader DUP and linkage to program 100.

9.5.1.5 MERG micro loader and update pointer to program 100.

Model 25 MERGE is provided only to duplicate the CSL loader and provide a linkage to program 100. Loader will be copied from the SYSRES device. Normal use procedure would be:

1. MERG in normal 360 mode. See 5.1.13 of F0FE User's Guide.
2. Put F0FE in micro mode. See micro above.
3. MERG in micro mode.

Control Message Format:

```
Column*   123456789
Type      MERG
Punch     CNTRLMERG
```

A message will be output on the SYSLOG device indicating the success or failure of the loader DUP and linkage to program 100.

9.5.1.6 TERM in micro mode

Control Message Format:

```
Column*   123456789
Type      TERM
Punch     CNTRLTERM
```

Same function as normal term but retains micro status; i.e., a PSW restart after a micro term will restart the program in micro mode.

See 5.1.18 of F0FE User's Guide.

9.5.1.7 M360

Purpose:

This causes the mode of operation in F0FE to call macro modules rather than micro modules. It indicates that macro programs are going to be processed and directs itself to the proper cylinders. If MICRO mode has not been entered then M360 is assumed.

Control Message Format:

Column* 123456789
Type M360
Punch CNTRLM360

Procedure:

Before processing any macro program decks, enter M360, then any of the available macro modules may be requested.

*In above examples the word 'Type' is used to indicate what is to be entered via the 1052 when it is the control device. The word 'Punch' is used to indicate what is to be punched into the control card when the control device is the reader.

9.6 UNIQUE TO MODEL 25 MICRO MODE PRINTOUTS

MICRO MODE ON

Meaning - A MICRO control card has been read and F0FE is ready to process micro diagnostics.

MICRO MODE OFF

Meaning - A M360 control card has been read and F0FE is ready to process macro diagnostics.

NOT VALID FOR MICRO MODE ON THIS MODEL

Meaning - F0FE was in micro mode and a control card was read which requested a function not provided for on this model of SYSTEM/360. i.e., LIST on a Model 25 in micro mode.

CARD ERR. COL 73-80 ARE XXXXXXXX. POS DECK TO CARD 1 TO RESTART.

Meaning - Incorrect sequence or format of a card read in micro mode ADD. XXXXXXXX will be filled with contents of the card columns 73-80. Note: All Model 25 micro deck cards must have an asterisk in column 73.

MODEL 25 PGM 100 IS NOT PRESENT ON THE NEW MASTER.
CSL LOADER HAS NOT BEEN LINKED TO PGM 100.

Meaning - Micro mode DUP or MERGE could not find program 100 on the new master micro ESD cylinder. The micro CSL loader program has not been placed on the new master disk.

CSL LOADER HAS BEEN LINKED TO PGM 100

Meaning - A micro MERGE or DUP was successful.

MODEL 25 PGM XXX THRU XXX DELETED

Meaning - Self-explanatory. Delete was called by the user; or by the add module after an error occurred and a program had been partially added.

WARNING, PGM 100 WAS DELETED AND MUST BE ADDED BEFORE CSL WILL WORK.

Meaning - Self-explanatory.

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1. PURPOSE

1.1 INTENT. THIS PROGRAM INITIALIZES 2314 CUSTOMER ENGINEER PACKS.

1.2 MODIFICATIONS. NONE

2. PREREQUISITES

2.1 PROGRAM REQUIREMENTS. DIAGNOSTIC MONITOR PROGRAM.

2.2 EQUIPMENT REQUIREMENTS.

CPU
CUSTOMER ENGINEER OUTPUT DEVICE
2314 WHICH WILL EXECUTE THE FOLLOWING COMMANDS CORRECTLY -

CONTROL SEEK	READ HOME ADDRESS
WRITE HOME ADDRESS	READ RECORD -0-
WRITE RECORD -0-	SEARCH HOME ADDRESS

2314 CUSTOMER ENGINEER DISK PACK
METHOD OF LOADING PROGRAM.
I/O CHANNEL
8 K CORE STORAGE
THIS PROGRAM IS RELOCATABLE.

3. USE PROCEDURE

3.1 PROGRAM LOADING. STANDARD VIA DIAGNOSTIC MONITOR AS DESCRIBED BY THE USERS GUIDE.

3.2 PROGRAM OPERATING

3.2.1 SENSE SWITCH CONTROL OPTIONS

THE PROGRAM SENSE SWITCHES SHOWN BELOW ARE IN THE SENSE SWITCH BYTES OF THEIR RESPECTIVE SECTION PREFACES. THE CHARACTER X REPRESENTS THE RELOCATION FACTOR CONTAINED IN REGISTER 15 DURING RUN TIME. THE SWITCH BITS ARE ZERO WHEN OFF, AND ONE WHEN ON.

SENSE SW. =	FUNCTION	SECTION OR ROUTINE	BYTE AND BIT
0	OFF--PROCEED NORMALLY ON --LOOP ON START I/O	ROUTINE --ALL	X004 0
	NOTE--THE OBJECT OF SENSE SWITCH 0 IS TO PROVIDE A SCOPING OR TROUBLE SHOOTING LOOP THAT CONSTANTLY REPEATS A SINGLE SIO PERTAINING TO A CHAIN OF CCWS. THE MOST EFFECTIVE WAY TO USE THIS SENSE SWITCH IS IN CONJUNCTION WITH THE DM SENSE SWITCH --HALT ON ERROR--. WHEN AN ERROR MESSAGE IS INDICATED BY A ROUTINE A HALT --WAIT STATE-- OCCURS IF THE DM HALT ON ERROR OPTION IS SET. IF DURING THIS HALT, SECTION PREFACE SENSE SWITCH 0 WERE TURNED ON, THE CHAIN THAT CAUSED THE ERROR IS LOOPED WHEN THE SECTION IS CONTINUED.		
6	OFF--PROCEED NORMALLY ON --PRINT ROUTINE TITLE	ROUTINE --ALL	X004 6
7	OFF--PROCEED NORMALLY ON --PRINT CORRECT RESULTS	ROUTINE --ALL	X004 7
8	OFF--SKIP RTN 3 DO NOT WR HA AND RO FOR CYL 1 AND 199) ON--RUN RTN 3	ROUTINE 3	X005 0

3.3 PROGRAM HALTS. NONE

3.4 PROGRAM TERMINATION. STANDARD--VIA MONITOR CALL SVC 06.

4. PRINTOUTS

4.1 INSTRUCTION TO THE OPERATOR. NONE

4.2.1 STATUS MESSAGES COMMON TO ALL ROUTINES.

-DID NOT INT FROM UNIT XXX AFTER SIO ACC CAW XXXXXXXX-
THIS MESSAGE OCCURS WHEN A START I/O WAS ISSUED AND ACCEPTED, BUT AFTER WAITING A PREDETERMINED TIME FOR AN INTERRUPT IT NEVER OCCURED. THE MONITOR CALL SVC D8 IS USED TO WAIT FOR THE INTERRUPT. ALL PRINTOUTS WHICH HAVE XX..X IN THEM SIGNIFY THAT DATA WILL BE FILLED IN, FOR THE X, BY THE PROGRAM PRIOR TO THE PRINTOUT.

-GOT CC 2 ON UNIT XXX CAW XXXXXXXX-
UNEXPECTED CHANNEL OR SUBCHANNEL BUSY WHEN ISSUING A START I/O CAUSED THIS MESSAGE TO OCCUR.

-GOT CC 3 ON SIO TO UNIT XXX CAW XXXXXXXX-
UNEXPECTED DEVICE NOT OPERATIONAL ON START I/O CAUSED THIS MESSAGE.

-ERR ON STO UNIT XXX CSW XXXXXXXXXXXXXXXX SNS XXXXXXXXXXXX CAW XXXXXXXX-
UNEXPECTED RESULTS ON START I/O. UNIT NUMBER, CHANNEL STATUS WORD, SENSE DATA, ANC CHANNEL ADDRESS WORD ARE INDICATED.

4.2.2 STATUS MESSAGES FOR ROUTINE 1, SECTION FFF1

-2314 C.E. PACK INITIALIZATION -ROUT 1 WR HA AND RO-
ROUTINE TITLE.

--XXX- HA RD XXXXXXXX RO RD XXXXXXXXXXXXXXXXXXXXXXXXXXXX-
-HA SHLD BE XXXXXXXX RO SHLD BE XXXXXXXXXXXXXXXXXXXXXXXXXX-
THIS IS EITHER THE CORRECT OR ERROR RESULT MESSAGE. IF THE HOME ADDRESS AND RECORD ZERO READ AND EXPECTED ARE EQUAL -OK - WILL BE MOVED IN THE MESSAGE AND IF THEY ARE NOT EQUAL -ERR- WILL BE MOVED IN.

4.2.3 STATUS MESSAGES FOR ROUTINE 2, SECTION FFF1

-2314 C.E. PACK INITIALIZATION ROUT 2 CHECK DISK RPM-
ROUTINE TITLE.

-RPM TOO SLOW, NO OVERRUN, SNS XXXXXXXXXXX-
THIS MEANS THAT THE RPM WAS SO SLOW THAT ALL 9000 BYTES WERE WRITTEN, THE RESIDUAL COUNT IS ZERO AND THE OVERRUN BIT IS NOT ON.

-RPM XXXX IS XXXXXX TOLERANCE
THIS IS THE COMPUTED RPM. IF IT IS BELOW 2352 THEN BELOW WILL BE MOVED INTO THE MESSAGE, IF IT IS 2352 OR HIGHTER THEN WITHIN WILL BE MOVED INTO THE MESSAGE.

4.2.4 STATUS MESSAGES FOR ROUTINE 3, SECTION FFF1

2314 C.E. PACK INITIALIZATION -ROUT 2 WR CYLS 1 AND 199 WITH HA AND ROUTINE TITLE.

--OK - RO ID RD XXXXXXXXXXXXXXX-
-RO ID SHOULD BE XXXXXXXXXXXXXXX-
THIS IS THE CORRECT RESULT MESSAGE, WHICH IS UNDER CONTROL OF SECTION PREFACE SENSE SWITCH 7. THE RO ID AND RO DATA ARE INDICATED ON SEPARATE LINE WITH THE APPROPRIATE HEADINGS. THIS MESSAGE IS GIVEN IF THE RO RECORD WERE COMPARED EQUAL BY THE PROGRAM. IN THE CASE THE DATA READ DOES NOT COMPARE EQUAL THE WORD --OK -- IS REPLACED WITH THE WORD --ERR--. WHEN THIS MESSAGE AND THE HOME ADDRESS MESSAGE FOR ROUTINE 1 ARE OUTPUT AS AN ERROR INDICATION, SECTION PREFACE SENSE SWITCH 0 IS TESTED, AFTER THE ENTIRE MESSAGE IS GIVEN, AND IF IT IS ON THE READ SIO IS LOOPED.

5. COMMENTS

5.1 COMMENTS ON SECTION FFF1, ROUTINE 1.

THIS ROUTINE WRITES HOME ADDRESS AND RO RECORD ON ALL TRACKS OF ALL CYLINDERS EXCEPT CYLINDER 1,71,73,74,75,117,118,119, AND 199. AFTER HOME ADDRESSES AND RO RECORDS HAVE BEEN WRITTEN ON ALL THE CYLINDERS DESCRIBED ABOVE A READ PASS IS MADE WHICH VERIFIES THAT THE HOME ADDRESS AND RO RECORDS WERE WRITTEN PROPERLY AT THE CORRECT LOCATION ON THE PACK. ON THE READ PASS THE HOME ADDRESSES AND RO RECORDS READ ARE COMPARED BY THE PROGRAM TO ASSURE THEY WERE WRITTEN CORRECTLY. AN UNEQUAL COMPARE OF THE READ DATA IS INDICATED. ALSO, ANY ERROR STATUS RECEIVED FROM THE DEVICE OR CHANNEL IS INDICATED WHEN IT OCCURS ON EITHER THE READ PASS OR WRITE PASS.

5.2 COMMENTS ON SECTION FFF1, ROUTINE 2.

THIS ROUTINE IS DESIGNED TO TEST FILE ROTATION SPEED. CALCULATIONS ARE BASED ON A WRITE TIME OF 400 NANOSECONDS PER BIT AND ASSUMES THE VFO IS OPERATING WITHIN ITS SPECIFIED TOLERANCE.

A TRACK OVERRUN CONDITION IS FORCED BY WRITING A 9000 BYTE RECORD 128 TIMES AND TAKING AN AVERAGE OF THE RESIDUAL COUNTS. FROM THIS THE PROGRAM CALCULATES THE NUMBER OF BYTES ACTUALLY WRITTEN AND CONVERTS IT TO RPM. THIS CALCULATED RPM IS THEN CHECKED FOR A TOLERANCE LIMIT AND THE RESULTS ARE PRINTED OUT.

NO CHECK IS MADE FOR A DRIVE BEING TOO FAST SINCE THIS CONDITION IS HIGHLY IMPROBABLE.

5.3 COMMENTS ON SECTION FFF1, ROUTINE 3.

IF SENSE SWITCH 8 IS OFF THIS ROUTINE IS BYPASSED. IF SENSE SWITCH 8 IS ON THIS ROUTINE WRITES THE HA AND RO RECORDS ON ALL THE TRACKS OF CYLINDERS 001 AND 199 WHICH IS REQUIRED BY THE IN-LINE MICRO-DIAGNOSTICS. THE RO DATA PORTION OF THE RECORD CONSISTS OF 7000 BYTES OF CORE STORAGE.

A WRITE PASS AND READ PASS ARE MADE AS DESCRIBED FOR ROUTINE 1 EXCEPT THE RO DATA RECORD IS 7000 BYTES IN LENGTH. A WRITE HOME ADDRESS COMMAND AND A WRITE RO COMMAND IS USED TO FORMAT THE TRACK ON THE WRITE PASS. A SEARCH HOME ADDRESS AND READ RO COMMAND IS USED TO CHECK THE DATA ON THE READ PASS. A BURST CHECK OF ONLY THE RO RECORD READ IS PERFORMED ON THE READ PASS.

5.4 BLOCK OF 100 BYTES OF HEXIDECIMAL -E5-(11100101)

THE 7000 BYTES OF RECORD -0- DATA CONTAIN A BLOCK OF 100 BYTES OF HEXIDECIMAL -E5- (BINARY-11100101). THIS BLOCK IS LOCATED 3228 (DECIMAL) BYTES FROM THE BEGINNING OF RECORD-0-DATA.

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C H A N G E S F R O M F R I E N D 2

-CHANGE VERSION NUMBER FROM 2 TO 3.

-2314 RELEASE.

-INCLUDE REFERENCE TO DESCRIPTION LOCATION IN 2314 VOLUMES.

-ADDED 2314 MULTIPLEX STORAGE CONTROL FEATURE COMMANDS.

-PROVISION FOR SYSTEM/360 MODEL 25.

-PROVIDE A ANY HEXADECIMAL COMMAND CODE FACILITY (CMD XX) FOR GENERATING ANY CCW. IF INPUT COMMAND,ASK FOR DATA LENGTH (DL=). IF OUTPUT OR CONTROL COMMAND ASK FOR DATA (DATA=).

-PROVIDE A TIME DELAY CAPABILITY BETWEEN CCW CHAINS (WAIT XXX).

-INCREASE SENSE CCW,AREA,AND TYPEOUT TO 12 BYTES,FOR FUTURE EXPANSION TO OTHER I/O UNITS.

-CHANGE THE OBJECT DECK SEQUENCE IDENTIFICATION TO '061' TO PERMIT LOADING BY FILE EDITOR PROGRAM -FOFE-.

-CORRECT THE PROBLEM OF WRONG UNIT ADDRESS PRINTING OUT IN 'LOOP IS FINISHED ON UNIT XXXX' MESSAGE.

-CORRECT THE PROBLEM OF CHANGING THE MODE SET CCW COMMAND ENTERED BY THE USER.

-CORRECT THE PROBLEM OF CHANGING THE FIRST HEXADECIMAL OPERAND ADDRESS OF THE COMPARE COMMAND.

-REMOVE RESTRICTION OF CE CELL OR SCRATCH CELL IN CELL POSITION ZERO.

-INHIBIT INSERTING ANY ADDITIONAL COMMANDS IF 'REP' MODE.

-ADD 'SUBST' (SUBSTITUTE) AND 'COPY' COMMANDS.

-ADD 'SFM' FOR SET FILE MASK CCW COMMAND.

-ADD 'READ INQUIRY' AND 'INHIBIT' CCW COMMANDS.

0. WHAT DOES FRIEND STAND FOR --

F - FAST
R - RUNNING
I - INTERPRETOR
E - ENABLING
N - NATURAL
D - DIAGNOSIS

1. WHAT IS FRIEND--

FRIEND SUPPORTS ALL THE COMMANDS FOR ALL S/360 FILES AND DRUMS. ALL COMMANDS FOR 2400 TAPE DRIVES ARE SUPPORTED BUT IN AN ABREVIATED FORM. LIMITED CHANNEL PROGRAMS CAN BE CONSTRUCTED FOR TELEPROCESSING, PRINTERS, CARD READERS, CARD PUNCHES, AND ETC.

FRIEND IS A STAND-ALONE, OFF-LINE, INTERPRETIVE DIAGNOSTIC PROGRAM AND REQUIRES 16 K BYTES OF CORE STORAGE AND A CONSOLE TYPEWRITER.

IT ALLOWS A USER TO CONSTRUCT S/360 CHANNEL PROGRAMS IN ENGLISH LANGUAGE.

EACH CHANNEL COMMAND IS ENTERED IN ENGLISH FROM THE CONSOLE KEYBOARD, CARD OR TAPE. CHANNEL PROGRAMS FOR SEVERAL DEVICES CAN BE ENTERED AND EXECUTED SIMULTANEOUSLY. THE USER WILL NOT HAVE TO LEARN A STRICT SET OF COMMAND SPELLINGS, AS SEVERAL FORMS AND ALTERNATIVES ARE PROVIDED.

IF FRIEND NEEDS ANY ADDITIONAL INFORMATION ABOUT THE COMMAND SUCH AS SEEK ARGUMENTS,RECORD NUMBERS,DATA LENGTHS,OR DATA, THE PROGRAM WILL REQUEST THIS INFORMATION TO BE ENTERED.

THERE ARE SEVERAL INTERPRETOR COMMANDS FOR COMMUNICATING WITH FRIEND AND FOR CONTROLLING CCW CHAIN EXECUTION.

2. HOW DO YOU USE FRIEND --

-LOAD FRIEND INTO CPU

1. INSURE THAT CONSOLE KEYBOARD IS READY (REQUIRED).
2. PLACE 'FRIEND' IN CARD READER/TAPE DRIVE AND MAKE READY.
3. SET CPU LOAD ROTARY SWITCHES TO THE LOADING UNIT ADDRESS.
4. PRESS IPL LOAD BUTTON.
   (IPL LOADER OCCUPIES THE LOG OUT AREA AND LOWER CORE.)
5. 'FRIEND' SHOULD NOW LOAD.

AFTER FRIEND IS LOADED, IT TRIES TO DETERMINE THE KEYBOARD ADDRESS. A READ INQUIRY (0A) AND WRITE (09) COMMANDS ARE SENT TO THE FOLLOWING ADDRESS - 01F,009,209,21F, AND 309. IF YOUR KEYBOARD ADDRESS IS NOT ONE OF THESE, FRIEND WILL ENTER THE WAIT STATE AND THE USER SHOULD PRESS THE KEYBOARD REQUEST BUTTON.

THE USER SHOULD READ AND FOLLOW THE INSTRUCTIONS PRINTED OUT.

-SINGLE CCW CHAIN

1. SPECIFY THE DEVICE ADDRESS OF THE UNIT YOU WANT TO EXERCISE WHEN FRIEND ASKS FOR IT. (DEV=)
2. WHEN PROCEED LIGHT TURNS ON, ENTER A CCW COMMAND IN ENGLISH LANGUAGE. (FOLLOWED BY EOB = ALTERNATE CODE 5)
3. ENTER ANY ADDITIONAL INFORMATION REQUESTED BY 'FRIEND'.
4. AFTER YOUR ENTIRE CCW CHAIN HAS BEEN ENTERED, TYPE 'GO'.
5. THE DEVICE SHOULD NOW BE FUNCTIONING.
6. WHEN YOU WANT TO ENTER ANOTHER CCW CHAIN, PRESS KEYBOARD REQUEST.
7. WHEN PROCEED LIGHT TURNS ON TYPE 'RESET'.
8. GO TO INSTRUCTION 1 FOR NEXT CCW CHAIN.

EXAMPLE

F R I E N D -3- DESCRIPTION IN 2841 VOL. A02 OR 2314 VOL. S01

WARNING WRITE COMMANDS MAY DESTROY DATA
ON A CUSTOMER PACK/CELL OR CE TRACKS.

INTERPRETIVE PROGRAM TO XEQ CCW COMMANDS
THAT YOU ENTER FOR ANY DEVICE(S).

AFTER INSTRUCTIONS ARE TYPED,ENTER EACH COMMAND
WHEN PROCEED LIGHT TURNS ON.

TERMINATE EACH ENTRY WITH AN ALTERNATE CODE 5 (EOB).

AFTER CCW CHAIN HAS BEEN ENTERED,TYPE GO.
TO ENTER NEXT CCW CHAIN,PRESS REQUEST,TYPE RESET.

```
CPU MODEL XX=30
DEV=DEVICE ADDRESS XXX=190
ENTER CCW LIST IN ENGLISH

SEEK
  CYL=5       (HIGH ORDER ZEROS ARE NOT REQUIRED)
  HD =7
SK            (AN ABBREVIATED FORM OF SEEK)
  CYL=198
  HD =9
GO            (CAUSE CCW CHAIN TO BE EXECUTED)
RESET         (PRESS KEYBOARD REQUEST BUTTON FIRST)
DEV=          (READY FOR NEXT DEVICE ADDRESS)
              (ENTER NEXT CCW CHAIN)
```

3.0 ADVANCED CAPABILITIES OF FRIEND

-MULTIPLE CCW CHAINS IN OVERLAP

FRIEND ALLOWS THE USER TO ENTER SEVERAL DIFFERENT CCW CHAINS FOR THE SAME OR DIFFERENT DEVICES. THIS CAPABILITY IS PROVIDED TO LET THE USER GENERATE A SIMPLE SYSTEM TEST TO CHECK FOR INTERACTION BETWEEN DIFFERENT I/O DEVICES.

TO OVERLAP CCW CHAINS -

1. START AS YOU WOULD SINGLE CCW CHAIN EXECUTION
2. AFTER TYPING 'GO' THIS CHAIN WILL BE EXECUTING
3. PRESS KEYBOARD REQUEST
4. WHEN PROCEED LIGHT TURNS ON, ENTER 'DEV=XXX'. WHERE XXX IS HEXADECIMAL DEVICE ADDRESS ON WHICH THE FOLLOWING CCW CHAIN ENTERED IS TO BE EXECUTED. THIS DEVICE ADDRESS MAY BE THE SAME AS A PREVIOUS DEVICE.
   DO NOT TYPE 'RESET'.
5. ENTER THE CCW CHAIN TO BE OVERLAPPED.
6. TYPE 'GO'.
7. GO TO INSTRUCTION NUMBER 3 FOR NEXT CCW CHAIN.

EXAMPLE --

```
DEV=190                 (UNIT ADDRESS FOR FIRST CCW CHAIN)
ENTER CCW LIST IN ENGLISH          (FRIEND TYPE OUT)
SEEK
  CYL=0
  HD =1
SEEK
  CYL=100
  HD =2
GO                  (START EXECUTING FIRST CCW CHAIN)
DEV=191             (PRESS REQUEST, ENTER 'DEV=' AND DEVICE
                     ADDRESS FOR NEXT CHAIN)
```

```
SEEK
  CYL=100
  HD=3
SEEK
  CYL=200
  HD=4
GO                    (START EXECUTING BOTH CHAINS IN OVERLAP)
                      (PRESS REQUEST TO ENTER DEV=XXX FOR ANOTHER
```

-SYMBOLIC I/O AREAS

FRIEND ALLOWS THE USER TO REFERENCE THE DATA ADDRESS IN A CCW TO ANOTHER CCW. THIS CAPABILITY IS PROVIDED SO THAT DATA READ MAY BE USED AS WRITE DATA OR VICE VERSA. ALSO A LARGE WRITE OR READ AREA CAN BE USED REPEATEDLY TO CONSERVE USE OF CORE STORAGE. FOR FILES, THE SYMBOLIC I/O ONLY APPLIES TO THE DATA AREA OF ANY COUNT-KEY-DATA OR KEY-DATA COMMAND. FRIEND WILL USE DATA CHAINING TO GET THE DATA FIELD OF THESE COMMANDS.

TO USE SYMBOLIC I/O --

1. TYPE THE NORMAL READ CKD, RD, WRITE, PRINT, OR ETC COMMAND.
2. FOLLOWED BY 'INTO $X' IF THE I/O COMMAND IS AN INPUT TYPE OR BY 'FROM $X' IF THE I/O COMMAND IS AN OUTPUT. X CAN BE ANY KEYBOARD CHARACTER, BUT WE RECOMMEND THAT YOU USE A THRU Z FOR EASE OF CROSS REFERENCING.
3. IF THIS IS THE FIRST USE OF THE SYMBOLIC CHARACTER, FRIEND WILL ASK FOR THE NORMAL ADDITIONAL INFORMATION. IF THE SYMBOLIC CHARACTER HAS BEEN USED BEFORE, FRIEND WILL NOT ASK FOR THE DATA LENGTH OR DATA FIELD. THE SYMBOL TABLE GENERATED BY FRIEND CONTAINS THE CORRESPONDING DATA ADDRESS AND IMPLIED LENGTH OF THE DATA AREA.

EXAMPLE --

```
DEV=190
ENTER CCW LIST IN ENGLISH       (FRIEND TYPE OUT)
SEEK
  CYL=5
  HD =1
SET FILE MASK
  MASK=C0
SRCH EQ HA          (FRIEND WILL USE CCHH FROM SEEK ARGUMENT)
TIC *-8             (*-8 WILL TAKE CHANNEL TO THE PRECEDING
                     COMMAND)
WRITE RO FROM $A (SA ACTUALLY POINTS TO DATA FIELD)
  KEY=              (EOB WILL CAUSE NO KEY TO BE GENERATED)
  DATA=0500XFOOF (DATA FIELD IS 1000 BYTES LONG)
WR CKD FROM $A    (DATA PORTION WILL BE DATA CHAINED)
  RCD NO.=1
  KEY=            (FRIEND WILL NOT ASK FOR 'DATA=')
GO                (START EXECUTION)
```

-CCW CHAIN SEQUENCE CONTROL AND DELAY BETWEEN CHAINS

WAIT N...N (N...N IS OPTIONAL)

THIS COMMAND CAUSES FRIEND TO WAIT UNTIL A CCW CHAIN HAS COMPLETED (DEVICE END INTERRUPT) BEFORE THE NEXT CCW CHAIN IS STARTED. THIS CAPABILITY IS PROVIDED FOR USE WITH SYMBOLIC I/O AREAS WHEN YOU ARE WRITING DATA THAT WAS READ BY A PREVIOUS CCW CHAIN. THIS WILL INSURE THAT ALL THE DATA IS READ BEFORE THE WRITE CCW CHAIN IS EXECUTED.

N...N IS AN OPTIONAL OPERAND. IF N...N IS NOT SPECIFIED, FRIEND WILL START THE NEXT CCW CHAIN IMMEDIATELY UPON THE

RECEIPT OF THE DEVICE END INTERRUPT. IF N...N IS SPECIFIED, FRIEND WILL WAIT (DELAY) FOR N...N MILLISECONDS BEFORE STARTING THE NEXT CCW CHAIN. THIS COMMAND CAN ALSO BE USED FOR A SINGLE CCW CHAIN.

TO USE WAIT --

1. WAIT (OPTIONAL N...N) CAN BE SPECIFIED ANYTIME DURING THE ENTRY OF THE CCW CHAIN.
2. AFTER 'WAIT' HAS BEEN TYPED AFTER THE LAST CCW CHAIN HAS BEEN ENTERED, TYPE 'GO' TO EXECUTE THE CHAINS.

```
EXAMPLE --              (TAPE TO PRINTER 80/80 LIST)
  DEV=181               (TAPE UNIT ADDRESS)
  ENTER CCW LIST IN ENGLISH (FRIEND TYPE OUT)
  READ INTO $B
    DL=80
  WAIT                  (INSTRUCTS FRIEND TO WAIT TILL CHAIN IS
                         FINISHED)
  DEV=E                 (PRINTER ADDRESS)
  PRINT FROM $B
  CSW=0100              (TELLS FRIEND TO MASK OUT UNIT EXCEPTION)
  WAIT                  (TELLS FRIEND TO WAIT ON PRINTING, BEFORE
                         READING AGAIN)
  GO

  RESET                 (PRESS REQUEST FIRST)
  DEV=185               (ENTER PHYSICAL DEVICE ADDRESS)
  ENTER CCW LIST IN ENGLISH (FRIEND TYPE OUT)
  WRITE
   DATA=100XFOOF
  WAIT 500              (CAUSES FRIEND TO DELAY 500 MS
                         AFTER DEVICE END BEFORE STARTING
                         THE NEXT CCW CHAIN.)
  GO
```

-COMPARE

THIS COMMAND CAN BE USED TO INSTRUCT FRIEND TO COMPARE TWO DATA AREAS. ONLY TWO AREAS CAN BE COMPARED FOR ANY ONE CCW CHAIN. THE TWO AREAS COMPARED CAN BE DEFINED IN ANY CCW CHAIN (S).

HOW TO USE COMPARE-

TYPE 'COMPARE AND THE NECESSARY PARAMETERS' ANYTIME DURING THE ENTRY OF THE CCW CHAIN. IF SYMBOLIC I/O AREAS ARE USED, THEY MUST HAVE ALREADY BEEN DEFINED. FRIEND WILL PERFORM THE COMPARE AT EACH COMPLETION OF THE CCW CHAIN.

COMPARE $X,$Y
COMPARE COMMAND SPECIFYING SYMBOLIC I/O AREAS. 'X' AND 'Y' CAN BE ANY PREVIOUSLY DEFINED I/O AREAS. THE LENGTH OF THE FIRST OPERAND 'X' WILL BE USED FOR THE AMOUNT OF DATA TO BE COMPARED.

COMPARE A...A,B...B,N...N
COMPARE COMMAND SPECIFYING ACTUAL ABSOLUTE ADDRESS AND LENGTH. 'A...A' AND 'B...B' REPRESENT ABSOLUTE HEXADECIMAL ADDRESSES OF THE AREAS YOU WANT TO COMPARE. 'N...N' IS THE DECIMAL NUMBER OF BYTES YOU WANT COMPARED. THE 'CCW' COMMAND CAN BE USED TO LIST CCW CHAIN TO OBTAIN THE ABSOLUTE ADDRESSES.

EXAMPLE

```
DEV=190          (SPECIFY DEVICE TO BE USED)
```

```
        ENTER CCW LIST IN ENGLISH (FRIEND TYPE OUT)
        SEEK
          CYL=5
          HD =7
        WR HA              (HA IS WRITTEN FROM SEEK ARGUMENT)
        SET FILE MASK INSERTED (USER FORGOT TO SPECIFY, SO FRIEND
                                INSERTED IT)
        WR RO FROM $R
         KEY=
         DATA=1800XF00F    (DATA AREA IS 3600 BYTES LONG)
        RD RO INTO $S
          KL=              (EOB WILL GIVE A KL=0)
          DL=3600
        COMPARE $R,$S      (THE LENGTH OF $R IS USED FOR COMPARE
                            LENGTH)
        GO

      EXAMPLE
        RESET              (PRESS REQUEST FIRST)
        DEV=283            (SPECIFIES A DEVICE)
        ENTER CCW LIST IN ENGLISH  (FRIEND TYPE OUT)
        WRITE              (WRITE A TAPE RECORD)
          DATA=1000XFF
        BKSP               (BACKSPACE RECORD ON TAPE)
        READ               (READ DATA PREVIOUSLY WRITTEN)
          DL=1000
        CCW                (TYPE OUT CCW CHAIN)
        0024C8  01  002978  6000  0064
        0024D0  27  000000  6000  0001
        0024D8  02  0029DD  6000  0064 (CHAIN BIT IS TURNED OFF
                                        WHEN 'GO' IS ENTERED)
        COMPARE  2978,29DD,100 (ABSOLUTE ADDRESSES)
```

-RIPPLE/RANDOM

RIPPLE OR RANDOM
THIS IS A COMMAND MODIFIER ENTERED WITH AND FOLLOWING THE CCW COMMAND. THIS MODIFIER WILL CAUSE FRIEND TO PERFORM THE FOLLOWING FUNCTION AT EACH CONCLUSION OF THE CCW CHAIN. FRIEND WILL SEARCH FOR ALL CCWS TO BE RIPPLED OR RANDOMIZED IN THE CCW CHAIN AND EITHER RIPPLE (ROTATE THE DATA PATTERN 1 BYTE TO THE LEFT) OR GENERATE A RANDOM DATA PATTERN. RANDOM DATA IS GENERATED 4 BYTES AT A TIME AND DATA IS RIPPLED IN BLOCKS OF 256 BYTES. SEARCH, WRITE HA, AND THE COUNT FIELD OF WRITE CKD CCW'S WILL BE BYPASSED.

THE PROGRAM WILL ASK FOR THE DATA TO BE USED. IF 'RANDOM' WAS INDICATED FOR THE CCW,THIS REQUEST WILL ESTABLISH THE LENGTH OF THE RECORD AND THE DATA TO BE USED FOR THE FIRST RECORD. FRIEND WILL GENERATE RANDOM DATA FOR ALL FOLLOWING RECORDS.

SOME BITS ARE USED IN BYTE 5 OF THE CCW BY FRIEND TO INDICATE RANDOM OR RIPPLE AND PRESENCE OF A COUNT FIELD.

RESTRICTIONS

DO NOT USE RIPPLE OR RANDOM FOR WRITE SPECIAL CKD CCW'S. THE KEY FIELD OF WRITE CKD SHOULD NOT BE USED AS THE KEY WOULD BE CHANGING ON EACH EXECUTION OF THE CCW CHAIN.

EXAMPLE--

```
DEV=190                (SPECIFY TEST DEVICE ADDRESS)
ENTER CCW LIST IN ENGLISH  (A FRIEND TYPE OUT)
SEEK
  CYL=5
  HD =1
SET MASK               (SET FILE MASK)
  MASK=C0              (FILE MASK BYTE IN HEXADECIMAL)
```



```
        WR HA
        WR RO RANDOM
          KEY=
          DATA=3600XFF     (USED FOR FIRST RECORD AND ESTABLISHES DATA
                            LENGTH)
        RD HA              (VERIFY HA)
        RD RO              (VERIFY RECORD ZERO WRITTEN)
          KL=0
          DL=3600
        GO

      EXAMPLE
        RESET              (REQUEST FIRST)
        DEV=E              (HIGH ORDER ZEROS NOT NEEDED)
        ENTER CCW LIST IN ENGLISH  (FRIEND TYPE OUT)
        PRINT RIPPLE       (PRINT RIPPLE PATTERN ON PRINTER)
          DATA=12C0123456789 (DATA IS 120 BYTE EBCDIC STRING
        CSW=0100           (MASK OUT UNIT EXCEPTION IN CSW)
        LOOP               (EXECUTE A FIXED NUMBER OF TIMES)
          NUMBER OF TIMES=500 (NUMBER OF TIMES TO EXECUTE CCW CHAIN)
        GO
```

-CARD/TAPE CCW COMMAND INPUT

```
        START RDR,XXX          (OR ST RDR,XXX  OR S,XXX)
```

THIS COMMAND IS USED TO INSTRUCT FRIEND TO READ IN THE CCW CHAIN(S) TO BE EXECUTED FROM EITHER A CARD READER OR TAPE DRIVE. THE RECORDS READ MUST BE 80 BYTES (COLUMNS) AND SEQUENTIAL. THE INPUT RECORDS MUST CONTAIN AN EXACT DUPLICATE OF WHAT WOULD HAVE PRINTED ON THE CONSOLE PRINTER. INCLUDE KEYWORDS WHICH WOULD HAVE BEEN TYPED OUT BY FRIEND REQUESTING INFORMATION. INPUT PARAMETERS AND OPERANDS MUST BE SEPARATED BY A / (SLASH). SLASHES CAN NOT BE USED IN THE DATA FIELD AS EBCDIC DATA. THE DATA FIELD FOR EBCDIC DATA MUST BE IMMEDIATELY TERMINATED BY A SLASH OR THE BLANKS BETWEEN ACTUAL END OF DATA AND SLASH WILL BE USED AS PART OF THE DATA FIELD. THE ENTIRE 80 COLUMNS OF THE RECORD (CARD) MAY BE USED AND A PARAMETER CAN BE SPLIT BETWEEN RECORDS.
IF A 'RESET' (OR ITS ALTERNATIVES) IS USED, THE NEXT COMMAND PROCESSED WILL BE THE FIRST COMMAND OF A NEW RECORD. FRIEND WILL TYPE OUT THE INPUT RECORD READ BEFORE ANY COMMANDS ARE PROCESSED.

EXAMPLES

```
DEV=  (NO NEED TO ENTER DEVICE ADDRESS, IF IT IS SPECIFIED ON INPUT
       RECORD)
ENTER CCW LIST IN ENGLISH          (FRIEND TYPE OUT)
START RDR,C                (SPECIFIES INPUT DEVICE AS 00C)
DEV=190 /SEEK/CYL=5/HD=7/SRCH HA/TIC *-8/
        /SEEK/CYL=198/HD=9/SRCH HA/TIC *-8/NOP/GO/
(PRESS REQUEST, IF 'RESET' IS NOT TYPED, THE FOLLOWING CCW CHAIN
WILL BE OVERLAPPED)
ST RDR, 00C
DEV=282/WRITE/DATA=1000XF00F/BSR/RD/DL=2000/GO/
(PRESS REQUEST)
S,C
DEV=192/SK/WRHA/WRRO/KEY=/DATA=8X33/
        WR CKD/RCD NO.=1/KEY=/DATA=100XF00F/
        RD HA/RDRO/KL=/DL=8/
        RD CKD/KL=/DL=200,/GO/
```

4.0 COMMANDS FOR FRIEND

COMMAND	ALTERNATE	EXPLANATION
CCW	LIST	THIS COMMAND WILL INSTRUCT FRIEND TO TYPE OUT THE CHANNEL PROGRAM BEING GENERATED. IF GO (OR ITS ALTERNATIVES) HAS NOT BEEN ENTERED, THE COMMAND CHAIN BIT WILL BE ON IN THE LAST CCW TYPED OUT. IF CCW IS ENTERED IMMEDIATELY AFTER AN I/O ERROR MESSAGE, THE CHANNEL PROGRAM TYPED OUT WILL BE THE ONE THAT DETECTED THE ERROR. THE ACTUAL FAILING COMMAND WILL BE FLAGGED BY ** (CCW ADDRESS IN CSW MINUS 8).

EXAMPLE

```
CCW
002440  1F 0028F0 4000 0001
002448  07 0028F1 4000 0006
002450  39 0028F3 4000 0004
002458  08 002450 4000 0000
002460  15 0028F7 4000 0009
002468  1D 002900 4000 0009
002470  1D 002909 4000 0009
002478  12 002912 0000 0008
  .     .    .     .    .
  .     .    .     .    ....CCW COUNT
  .     .    .     ...CCW TAGS
  .     .    ....DATA ADDRESS
  .     ...CCW COMMAND
  ...STORAGE ADDRESS OF CCW
```

DUMP N...N,ADDRESS DUMP N...N,$X DUMP $X	THIS COMMAND WILL INSTRUCT FRIEND TO TYPE OUT THE HEXADECIMAL CONTENTS OF STORAGE. STORAGE IS TYPED OUT IN LINES OF 32 BYTES ALONG WITH THE ADDRESS OF THE FIRST BYTE. EACH CHARACTER TYPED WILL REPRESENT 4 BITS.
OR	
DUMP N...N,ADDRESS,PPP DUMP N...N,$X,PPP DUMP $X,PPP	THE HEXADECIMAL DEVICE ADDRESS 'PPP' OF A PRINTER MAY BE SPECIFIED AFTER THE 'ADDRESS' OR '$X'. FRIEND WILL THEN PRINT OUT THE HEXADECIMAL CONTENTS OF CORE STORAGE. DUMP N...N,ADDRESS WILL CAUSE A DUMP FROM THE HEXADECIMAL ADDRESS SPECIFIED TO INCLUDE DECIMAL N...N BYTES. DUMP N...N,$X IS THE SAME AS THE ABOVE EXCEPT CORE IS DUMPED FROM A SYMBOLIC AREA $X. WHERE X IS A PREVIOUSLY DEFINED I/O AREA USED IN AN 'INTO' OR 'FROM' COMMAND MODIFIER DUMP $X IS THE SAME AS THE ABOVE EXCEPT THE LENGTH OF THE I/O AREA IS USED FOR N...N

EXAMPLE

```
DUMP  10,291A
00291A  AABBCC    ...      000000 (32 BYTES)

DUMP  0050,32C0
0032C0  012345    ...      CDEF01 (64 BYTES
0032E0  234567    ...      EF0123  DUMPED)

DUMP  $8   (ASSUME $8 IS 50 BYTES)
02C42   2C637B    ...      F23A
```



```
02C62   9DE162    ...      0000

DUMP  1000,003C48,E      (FRIEND WILL PRINT
                          ON DEVICE '00E')

DUMP  $D,00E
```

REP N...N	RP N...N	THIS COMMAND WILL INSTRUCT FRIEND TO REPLACE THE NUMBER N...N CCW IN THE CHAIN, WITH THE NEXT CCW COMMAND THAT IS ENTERED. N...N IS THE DECIMAL NUMBER OF THE CCW IN THE CURRENT CHAIN. WHERE THE FIRST CCW IN THE CHAIN IS NUMBER 1, SECOND IS NUMBER 2, AND ETC.

EXAMPLE

```
CCW          (CHAIN BEFORE   REP)
002440       07 0028F0 4000 0006
002480       13 0028F7 2000 0001
REP 2        (REPLACE CCW NUMBER 2)
NOP          (NEW COMMAND)
CCW          (CHAIN AFTER REPLACEMENT)
002440       07 0028F0 4000 0006
002448       03 0028F8 2000 0001
```

ADD	DD	THIS COMMAND WILL INSTRUCT FRIEND TO ADD THE FOLLOWING CCW(S) TO THE LAST CCW CHAIN ENTERED. FRIEND WILL TURN ON THE COMMAND CHAIN BIT IN THE PRECEDING CCW.

EXAMPLE

```
CCW          (CHAIN BEFORE ADD)
002440       01 0028F0 4000 0064
002448       27 002954 2000 0001
 ADD
 READ        (COMMAND ADDED)
  DL=192
GO           (START EXECUTION)
CCW          (CHAIN AFTER ADD)
002440       01 0028F0 6000 0064
002448       27 002954 6000 0001
002450       02 002955 2000 00C0
```

DEV=XXX	DEVICE=	THIS COMMAND WILL INSTRUCT FRIEND TO INITIALIZE AN ENTRY IN THE DEVICE QUEUE TO EXECUTE THE NEXT CCW CHAIN ENTERED. XXX IS THE HEXADECIMAL PHYSICAL DEVICE ADDRESS. HIGH ORDER ZEROS ARE NOT REQUIRED.

EXAMPLE

```
DEV=192
DEVICE=185
DEV=E
```

RMV=XXX	REMOVE=	THIS COMMAND IS USED TO REMOVE DEVICES FROM THE DEVICE QUEUE. IF A USER IS EXECUTING SEVERAL DIFFERENT DEVICES IN OVERLAP MODE, ALL THE CCW CHAINS FOR A DEVICE CAN BE REMOVED WITH THIS COMMAND. HIGH ORDER ZEROS ARE NOT REQUIRED.

EXAMPLE

```
RMV=192
REMOVE=185
RMV=E
```

TIME DELAY N...N	THIS COMMAND TELLS FRIEND TO SET THE TIME OUT COUNTER TO DECIMAL 'N...N' SECONDS. AN

ERROR MESSAGE IS INDICATED IF FRIEND DOES NOT RECEIVE A DEVICE END FOR A CCW CHAIN WITHIN A SPECIFIED TIME OUT PERIOD. FRIEND INITIALLY SETS THIS TO 5 SECONDS. A USER WOULD WANT TO INCREASE IT FOR TAPE REWINDING OR TELEPROCESSING.
THIS IS THE MINIMUM TIME THAT WILL BE WAITED FOR. THE TIME WILL BE INCREASED IF SEVERAL OTHER DEVICES OR RIPPLE/RANDOM ARE BEING USED.
EXAMPLE
TIME DELAY 30 SETS TIME OUT COUNTER TO AT LEAST 30 SECONDS.

SUBST XXX,YYY SUB ...
(SUBSTITUTE XXX FOR YYY)

THIS COMMAND WILL SEARCH ALL CHANNEL PROGRAMS FOR DEVICE ADDRESS YYY AND CHANGE THEIR DEVICE ADDRESS TO XXX.

EXAMPLE
SUBST 182,181
SUBST 137,130
SUB 191,190
SUB F,E (HI-ORDER ZEROS NOT RQ'D)

COPY XXX CP XXX

THIS COMMAND WILL DUPLICATE THE REFERENCES TO THE LAST CHANNEL PROGRAM AND CONDITIONS ENTERED FOR DEVICE XXX. THE CHANNEL PROGRAM IS NOT ACTUALLY DUPLICATED. THE POINTER TO THE CCW CHAIN AND OTHER CONDITIONS ARE INSERTED IN THE TABLE ENTRY BEING GENERATED FOR A NEW DEVICE ADDRESS WHICH THE CHAIN IS TO BE RUN ON.
THIS PERMITS THE SAME CHANNEL PROGRAM TO BE RUN ON SEVERAL DEVICES AT THE SAME TIME. THE DEVICES MUST BE THE SAME TYPE.
EXAMPLE
DEV=191
COPY 190 (USE THE LAST CCW CHAIN
GO ENTERED FOR 190 FOR THE
CCW CHAIN FOR 191)

5.0 COMMANDS FOR CONTROLLING CCW EXECUTION

PRIMARY	ALTERNATE	EXPLANATION
GO	B XEQ (END OF BLOCK)	THIS COMMAND INSTRUCTS FRIEND TO START EXECUTION OF THE PRECEDING CCW CHAIN(S).
RESET	I,INIT NEW,F RST	THIS COMMAND INSTRUCTS FRIEND TO RE-INITIALIZE ITSELF. THE DEVICE QUEUE, CCW AREA, AN DATA AREA WILL BE ZEROED OUT. ANOTHER TEST DEVICE ADDRESS WILL BE REQUESTED. THE CONSOLE REQUEST BUTTON MUST BE PRESSED, IF FRIEND IS EXECUTING CCW CHAINS, IN ORDER TO TYPE 'RESET'.
SCOPE	SCP	THIS COMMAND INSTRUCTS FRIEND TO DO A SCOPE LOOP ON THE START I/O OR TEST I/O. 'SCOPE' CAN ONLY BE USED IN SINGLE CCW CHAIN MODE. IF 'SCOPE' IS SPECIFIED AFTER A TEST I/O A PSW RESTART MUST BE PERFORMED TO EXIT THE SCOPE LOOP. CONSOLE REQUEST CAN BE USED TO EXIT THE START I/O SCOPE LOOP.
STOP	HALT H	THIS COMMAND INSTRUCTS FRIEND TO STOP AFTER EACH DEVICE ERROR PRINTOUT. IF FRIEND DETECTS AN I/O ERROR, ERROR MESSAGE IS PRINTED. IF 'STOP' WAS SPECIFIED, 'STOPPED ON ERROR' WILL BE PRINTED AND CONSOLE PROCEED LIGHT IS TURNED ON. 'STOP' CAN BE ENTERED ANYTIME. ONCE FRIEND IS TOLD TO 'STOP' IT WILL ALWAYS STOP.
LOOP	LP	THIS COMMAND INSTRUCTS FRIEND TO ASK FOR HOW MANY TIMES IT IS TO PERFORM THE CCW CHAIN 'NUMBER OF TIMES='. 'LOOP' CAN BE SPECIFIED FOR EACH CCW CHAIN ENTERED. WHEN A CCW CHAIN HAS BEEN EXECUTED THE SPECIFIED NUMBER OF TIMES, FRIEND WILL PRINT OUT 'LOOP IS FINISHED ON UNIT XXXX' AND THE PROCEED LIGHT IS TURNED ON. TYPE 'GO' TO CAUSE THE CCW CHAIN TO BE REPEATED.
CSW=XXXX		THIS COMMAND INSTRUCTS FRIEND TO GENERATE A A CSW DEVICE AND CHANNEL STATUS MASK. THE 2 BYTE HEXADECIMAL XXXX FIELD INDICATES THOSE BITS THAT THE USER WANTS TO TURN OFF IN THE CSW BEFORE FRIEND CHECKS IT. FRIEND CHECKS FOR ANY ATTENTION, UNIT EXCEPTION, UNIT CHECK, AND ANY CHANNEL STATUS. AN ERROR MESSAGE IS PRINTED OUT IF ANY ONE OF THOSE BITS ARE ON. A UNIT CHECK ERROR IS NOT INDICATED IF THERE ARE NO SENSE BITS (TURNED OFF BY SENSE MASK). 'CSW=' CAN BE ENTERED ANYTIME DURING GENERATION OF A CCW CHAIN AND MAY BE SPECIFIED FOR EACH CCW CHAIN ENTERED. THE DEVICE END BIT CAN NOT BE TURNED OFF. BY TURNING OFF THE UNIT CHECK BIT (I.E. CSW=0200),THE USER CAN OBTAIN A SCOPE LOOP FOR RUNNING IN OVERLAP MODE. EXAMPLE CSW=0140 TURNS OFF UNIT EXCEPTION AND

INCORRECT LENGTH.

SNS=XXXX	THIS COMMAND INSTRUCTS FRIEND TO GENERATE A SENSE BYTE STATUS MASK. THE 2 BYTE HEXADECIMAL 'XXXX' FIELD INDICATES THOSE BITS THAT THE USER WANTS TO IGNORE IN THE FIRST 2 BYTES OF SENSE. NO ERROR MESSAGE IS PRINTED IF THE SENSE IS ZERO AFTER THE MASKED BITS ARE TURNED OFF. 'SNS=' CAN BE ENTERED ANYTIME DURING GENERATION OF A CCW CHAIN AND MAY BE SPECIFIED FOR EACH CCW CHAIN ENTERED. EXAMPLE SNS=0800 TURN OFF DATA CHECK BIT.
WAIT N...N	SEE SECTION 3.0 CCW CHAIN SEQUENCING AND DELAY FOR AN EXPLANATION ON HOW TO DELAY BETWEEN CCW CHAINS.

6. CHANNEL COMMANDS

PRIMARY	ALTERNATE	CODE (HEXADECIMAL)	EXPLANATION
NO OP	NOP	03	NO-OPERATION
SENSE	SNS	04	SENSE I/O (12 BYTES)
TEST I/O	TIO T	00	TEST I/O CPU INSTRUCTION FRIEND WILL REPEATEDLY EXECUTE THE TEST I/O INSTRUCTION AND TYPE OUT THE RESULTS OF THE INSTRUCTION I.E. CONDITION CODE, CSW, AND SENSE.
TIC *-NNN TIC *+NNN	TIC -NNN TIC +NNN TIC	08	TRANSFER IN CHANNEL 'NNN' IS THE DECIMAL NUMBER OF BYTES FOR THE CHANNEL TO TRANSFER TO . THE * OR + IS NOT NECESSARY AND IF ONLY 'TIC' IS USED FRIEND WILL ASSUME *-8. EXAMPLE TIC *-8 (TRANSFER TO PRECEDING CCW) TIC 8 (TRANSFER TO FOLLOWING CCW) TIC -16 (TRANSFER TO PRECEDING SECOND CCW
HEX HH...HH	XHH...HH	--	THIS INSTRUCTION ALLOWS AN ABSOLUTE ACTUAL CCW TO BE ENTERED INTO CCW CHAIN. HH...HH IS 16 HEXADECIMAL CHARACTERS. THESE WILL BE PACKED INTO AN 8 BYTE CCW AND INSERTED IN THE CCW CHAIN. THE DATA ADDRESS IN THE CCW WILL BE CHANGED TO POINT TO THE NEXT AVAILABLE DATA AREA IN FRIEND. BLANKS MAY BE USED TO SEPARATE FIELDS EXAMPLE HEX 0B 000000 6000 0001 X 1B 000000 6000 0001

CMD HH	HH	THIS COMMAND WILL CAUSE FRIEND TO GENERATE A CCW WITH HEX HH AS THE COMMAND CODE. IF BITS 6 + 7 OF THE COMMAND ARE 01 OR 11,THEN FRIEND WILL ASK FOR DATA.THE CCW COUNT IS TAKEN FROM THE AMOUNT OF DATA ENTERED. FOR CONTROL CCWS THAT DO NOT USE DATA ENTER 'XFF' WHEN FRIEND ASK FOR DATA=. IF BITS ARE 10 OR 00,THEN FRIEND WILL ASK FOR DATA LENGTH (DL=). ANY ADDITIONAL MODIFIERS CAN BE USED.

EXAMPLE

```
CMD C1   (WRITE )
 DATA=X010203
CMD 27   (CONTROL)
 DATA=XFF
CMD C2 INTO $A  (READ)
 DL=3
CCW      (DISPLAY CCW CHAIN)
002770 C1 002C20 6000 0003
002778 27 002C23 6000 0001
002780 C2 002C24 6000 0003
```


FILE/DRUM CCW COMMANDS

PRIMARY	ALTERNATE	CODE (HEXADECIMAL)	EXPLANATION
SEEK	SK	07	CONTROL SEEK (FRIEND WILL ASK FOR ARGUMENTS
RECALIBRATE	RECAL	13	RECALIBRATE
SET FILE MASK	SFM FILE MK SET MK MK	1F	SET FILE MASK (FRIEND WILL ASK FOR MASK BYTE EOB WILL DEFAULT TO HEX C0)
SEEK CYL	SK CYL SK CC	0B	SEEK CYLINDER
SEEK HD	SK HD SK HH	1B	SEEK HEAD
RESTORE	RSTR	17	RESTORE 2321 STRIP
RELEASE	REL	94	RELEASE
RESERVE	RSV	B4	RESERVE
SPACE COUNT	SP CNT	0F	SPACE COUNT (SPACE RECORD)

NOTE IN THE FOLLOWING SEARCH COMMAND, 'SEARCH', 'SRCH','SCH','S' CAN BE USED FOR SEARCH.

SEARCH HA EQ	SRCH EQ HA SCH HA	39	SEARCH HOME ADDRESS EQUAL
SEARCH ID EQ	SRCH EQ ID SCH ID SCH =ID	31	SEARCH IDENTIFIER EQUAL
SEARCH ID HI	SRCH HI ID SCH ID HI	51	SEARCH IDENTIFIER HIGH
SEARCH ID EQ HI	SRCH EQ HI ID SCH HI EQ ID	71	SEARCH IDENTIFIER EQUAL OR HIGH
SEARCH KEY EQ	SRCH EQ K SCH K EQ SCH K	29	SEARCH KEY EQUAL
SEARCH KEY HI	SRCH HI K SCH K HI	49	SEARCH KEY HIGH
SEARCH KEY EQ HI	SRCH EQ HI K SCH HI EQ K	69	SEARCH KEY EQUAL OR HIGH
SEARCH KD EQ	SRCH EQ DT SCH DT	2D	SEARCH KEY AND DATA EQUAL (OPTIONAL FEATURE)
SEARCH KD HI	SRCH HI DT	4D	SEARCH KEY AND DATA HIGH (OPTIONAL FEATURE)
SEARCH KD EQ HI	SRCH EQ HI DT SCH HI EQ DT	6D	SEARCH KEY AND DATA EQUAL OR HIGH (OPTIONAL FEATURE)
M/T	INDICATES MULTITRACK, ENTER WITH AND PRECEDING A READ OR SEARCH. EXAMPLE M/T SEARCH ID OR M/T RD CNT		
READ HA	RD HA RH	1A	READ HOME ADDRESS

READ COUNT	RD CNT RC	12	READ COUNT
READ RO	RD RO RRO	16	READ RECORD ZERO
READ DATA	RD DT RD D	06	READ DATA FIELD
READ KEY DATA	RD KDT R KD	0E	READ KEY DATA
READ COUNT KEY DATA	RD CKD R CKD	1E	READ COUNT KEY DATA
READ IPL	RD IPL READ,RD	02	READ IPL (INITIAL PROGRAM LOAD
WRITE HA	WRT HA WR HA W HA	19	WRITE HOME ADDRESS (REQUIRES SET FILE MASK)
WRITE RO	WRT RO WR RO	15	WRITE RECORD ZERO (REQUIRES SET FILE MASK)
WRITE COUNT KEY DATA	WRT CKD WR CKD W CKD	1D	WRITE COUNT KEY DATA
WRITE SPECIAL COUNT KEY DATA	WR SP CKD	01	WRITE SPECIAL COUNT KEY DATA (OPTIONAL FEATURE)
WRITE KEY DATA	WRT KD WR KD W KD	0D	WRITE KEY DATA
WRITE DATA	WRT DT WR D W D	05	WRITE DATA
ERASE	RS	11	ERASE (WR CKD WITHOUT ADRS MARK)

2314 MULTIPLEX STORAGE FEATURE COMMANDS

INIT BUF	INIT BF	E3	INITIATE MULTIPLEX MODE FRIEND WILL REQUEST CONTROL RECORD.
RESET BUF	RST BF	C3	RESET BUFFER TO BASIC MODE
READ BUF	RD BUF R BF	E2	READ BUFFER
WRITE BUF	WRT BUF WR BF	E1	WRITE BUFFER (LOAD BUFFER)

NOTE RESET BUF IS AN IMMEDIATE COMMAND AND SHOULD BE FOLLOWED BY A NOP. ALSO REPEATED START I/O'S WILL GIVE COMMAND REJECT AS IT IS ONLY ACCEPTED IF CONTROL UNIT IS IN BUFFER MODE.

TAPE CCW COMMANDS

THE TAPE CONTROL COMMANDS ARE IMMEDIATE (CONDITION CODE 1 ON SIO). THEREFORE FRIEND WILL ADD A 'NOP' CCW AFTER THE TAPE CONTROL COMMANDS AND THE NEXT CCW ENTERED, IF THERE IS ONE, WILL OVERLAY THE 'NOP'.

REWIND	RWD REW	07	REWIND
UNLOAD	RUN	0F	REWIND AND UNLOAD
ERG		17	ERASE RECORD GAP
WTM		1F	WRITE TAPE MARK
BKSP	BSR BK	27	BACKSPACE RECORD
BSF		2F	BACKSPACE FILE
FSR		37	FORWARD SPACE RECORD
FSF		3F	FORWARD SPACE FILE
READ	RD R	02	READ RECORD
READ BACKWARDS	RD BCK RD BK R B	0C	READ BACKWARDS
WRITE	WRT WR W	01	WRITE A RECORD
MODE SET	SET MODE	XX	MODE SET FRIEND WILL ASK FOR THE 2 HEXA DECIMAL CHARACTERS (1 BYTE) TO USED FOR THE MODE SET COMMAND.

TELEPROCESSING, PRINTERS, CARD READERS, CARD PUNCHES, TYPEWRITERS, ETC.

ENABLE	NBL	27	T/P ENABLE CONTROL
DISABLE	DSBL	2F	T/P DISABLE CONTROL
WRAP	WRP	05	T/P WRAP
INHIBIT	INH	0A	T/P INHIBIT
READ	RD R	02	READ
RD DC		02	READ DATA CHAIN
READ INQUIRY	RD INQ	0A	READ INQUIRY (1050 READ)
WRITE	WRT WR W	01	WRITE (WILL GIVE A SPACE SUPPRESS AND REPEATED OPERATIONS MAY DESTROY 1403N1 RIBBONS.)
WR DC		01	WRITE DATA CHAIN
READ CARD	RD CD	02	READ A CARD
PRINT	PRNT PRT	09	PRINT WITH 1 SPACE THIS IS AN EBCDIC PRINT AND DOES NOT UNPACK THE BYTES. 'DUMP ...' IS THE INSTRUCTION TO USE TO DISPLAY DATA.
TYPE	TYP	90	TYPE WITH CARRIAGE RETURN
PUNCH	PNCH PCH	01	2540 PNCH,FEED,SELECT STACKER
PUNCH 42	PNCH42	C1	1442 PUNCH,EJECT,STACKER 2
PUNCH BINARY	PNCH BNR	21	2540 PUNCH BINARY, FEED, STACKER 0
PUNCH 42 BINARY	PNCH 42 BNR	31	1442 PUNCH BINARY,EJECT,STACK

CCW FLAG BITS

ENTER THESE MODIFIERS AFTER THE COMMAND.

PRIMARY	ALTERNATE	CODE	EXPLANATION
SILI	SL	20	SUPPRESS INCORRECT LENGTH INDICATION
SKIP	SKP	10	SUPPRESS DATA TRANSFER INTO CORE
PCI	PC	08	PROGRAM CONTROL INTERRUPT
DC		80	DATA CHAIN
LENGTH		--	FRIEND WILL REQUEST KEY LENGTH AND DATA FIELD LENGTHS FOR THE FILE COUNT FIELDS INSTEAD OF USING THE AMOUNT OF DATA ENTERED FROM 'KEY=' AND 'DATA='.

7. INFORMATION THAT FRIEND WILL REQUEST

REQUEST CODE	EXPLANATION
CPU MODEL XX=	FRIEND IS ASKING FOR THE MODEL OF CPU ON WHICH IT IS RUNNING. ENTER IN THE 2 DIGIT MODEL TYPE--25, 30, 40, 50, 65, OR 75. EXAMPLE-- CPU MODEL XX=50
DEV=DEVICE ADDRESS XXX= DEV=	(FIRST TIME ONLY) (ALL OTHER TIMES) FRIEND IS ASKING FOR THE HEXADECIMAL ADDRESS OF THE DEVICE TO BE USED. THIS IS THE DEVIC WHICH WILL EXECUTE THE CCW CHAIN THAT IS TO BE ENTERED. HIGH ORDER ZEROS ARE NOT NECESSARY EXAMPLE-- DEV=DEVICE ADDRESS XXX=190 DEV=281 DEV=E
CYL=	FRIEND IS REQUESTING WHICH CYLINDER IT IS TO SEEK. ENTER THE DECIMAL CYLINDER NUMBER. HIGH ORDER ZEROS ARE NOT REQUIRED. FILE/DRUM RANGE (DECIMAL) 2311 0-202 (255=SEEK INCOMPLETE) 2314 0-202 (255=SEEK INCOMPLETE) 2302 0-250 (251=REZERO) 2303 0-79 2301 0 EXAMPLE CYL=5 CYL=198 CYL=(EOB) (FRIEND WILL ASSUME 0)
HD=	FRIEND IS REQUESTING THE HEAD TO BE USED. ENTER THE DECIMAL HEAD NUMBER. HIGH ORDER ZEROS ARE NOT REQUIRED. FILE/DRUM RANGE (DECIMAL) 2311 0-9 2314 0-19 2302 0-45 2303 0-9 2301 0-399 EXAMPLE HD=3 HD=16 HD=(EOB) (FRIEND WILL ASSUME 0)
BBCCHH=	FRIEND IS REQUESTING THE 2321 SEEK ARGUMENT OR THE SEEK ARGUMENT FOR A FILE WHICH IT CAN NOT DETERMINE ITS TYPE. ENTER EXACTLY 12 HEXADECIMAL CHARACTERS (6 BYTES) FOR THE CELL, SUBCELL, STRIP, HEAD POSITION, AND HEAD NUMBER. BYTE FUNCTION RANGE (HEXADECIMAL) 0 ---- 00 1 CELL 00-09 2 SUBCELL 00-13 3 STRIP 00-09 4 HEAD POSITION 00-04 5 HEAD NUMBER 00-13 EXAMPLE BBCCHH= 0000 1206 0003 (CAN USE SPACES TO DELIMITATE) BBCCHH= 0004 0801 020C

RCD NO.=

FRIEND IS REQUESTING THE RECORD NUMBER TO BE USED. ENTER THE DECIMAL RECORD NUMBER TO BE USED IN THE FILE IDENTIFIER FIELD. HIGH ORDER ZEROS ARE NOT REQUIRED. RANGE OF THE RECORD NUMBER IS DECIMAL 0 TO 255.
EXAMPLE
RCD NO.=3
RCD NO.=010
RCD NO.=(EOB) (FRIEND WILL ASSUME 0)

KL=

FRIEND IS REQUESTING THE KEY LENGTH TO BE USED. ENTER THE DECIMAL KEY LENGTH. HIGH HIGH ORDER ZEROS ARE NOT REQUIRED. RANGE OF THE KEY LENGTH IS DECIMAL 0 TO 255.
EXAMPLE
KL=4
KL=10
KL=(EOB) (FRIEND WILL ASSUME 0)

DL=

FRIEND IS REQUESTING THE DATA LENGTH TO BE USED. ENTER THE DECIMAL DATA FIELD LENGTH. HIGH ORDER ZEROS ARE NOT REQUIRED. RANGE OF THE DATA LENGTH IS 0 TO 32767.
EXAMPLE
DL=80
DL=1000
DL=(EOB) (FRIEND WILL ASSUME 0)

DATA=

FRIEND IS REQUESTING THE DATA FOR THE DATA FIELD. ENTER THE DATA IN EITHER OF THE FOLLOWING FORMATS.
N...NXHHH...HHH OR N...NCAAA...AA
FOR REPEATING THE DATA PORTION.
'N...N' IS A DECIMAL DUPLICATION FACTOR
'HH...HH' IS HEXADECIMAL DATA. TWO CHARACTERS DETERMINE ONE BYTE OF DATA.
'AA...AA' IS EBCDIC CHARACTERS. ONE CHARACTER PER BYTE. FRIEND WILL NOT CONVERT ANY LOWER CASE EBCDI CHARACTERS IN THIS FIELD TO UPPE CASE.
'X' IS USED TO INDICATE THAT THE FOLLOWING DATA IS HEXADECIMAL.
'C' IS USED TO INDICATE THAT THE FOLLOWING DATA IS EBCDIC CHARACTERS.
EXAMPLE

DATA=100XFF (GENERATES 100 BYTES OF HEX 'FF')
DATA=1000XF00F (GENERATES 2000 BYTES OF F00FF00F...F00F)
DATA=80C1 (GENERATES 80 BYTES OF EBCDIC 1'S)
DATA=12C0123456789 (GENERATES 120 BYTES OF EBCDIC 01234567890123 ...789)
DATA=(EOB) (FRIEND WILL ASSUME NO DATA FIELD)

KEY=

FRIEND IS REQUESTING THE DATA FOR THE KEY FIELD. ENTER THE DATA AS SHOWN IN THE FORMA FOR 'DATA='. THE LENGTH OF THE KEY SHOULD BE 255 BYTES OR LESS.
EXAMPLE
KEY=4X11 (GENERATES KEY FIELD OF HEX 11111111)
KEY=X11111111 (GENERATES KEY FIELD OF HEX 11111111)
KEY=CABCD (GENERATES EBCDIC KEY OF ABCD)
KEY=(EOB) (FRIEND NOT GENERATE A KEY FIELD)

MASK=

FRIEND IS ASKING FOR THE FILE MASK TO BE USE FOR THE SET FILE MASK CCW. ENTER 2 HEXA-DECIMAL CHARACTERS FOR THE 1 BYTE TO BE USED AS THE FILE MASK.
EXAMPLE
MASK=C0
MASK=(EOB) (FRIEND WILL ASSUME A MASK OF HEX 'C0')
MASK=18

MODE CMD=

FRIEND IS ASKING FOR THE MODE SET CCW COMMAN CODE TO BE USED. ENTER 2 HEXADECIMAL CHARACTERS FOR THE ACTUAL 1 BYTE SET MODE COMMAND.
EXAMPLE
EXAMPLE
MODE CMD=93 (800 BPI, ODD PARITY, CON-VERTER ON,XLATOR OFF)
MODE CMD=B3 (BPI, ODD PARITY, CON-VERTER OFF, XLATOR OFF)
MODE CMD=(EOB) (FRIEND WILL ASSUME HEX '93')

NUMBER OF TIMES=

FRIEND IS ASKING FOR THE NUMBER OF TIMES THE USER WANTS TO EXECUTE THIS CCW CHAIN. ENTER A DECIMAL NUMBER FOR THE DESIRED LIMIT.
RANGE IS 1 TO 32767
EXAMPLE
NUMBER OF TIMES=1000

MLCCCBBCCHHRDDS=

THIS IS THE REQUEST FOR THE BUFFER CONTROL RECORD. THIS IS THE DATA RECORD TRANSFERRED TO THE 2314 ON AN INITIATE BUFFER COMMAND. ENTER 30 HEXADECIMAL CHARACTERS FOR THE 15 BYTE RECORD.
M=MODE BYTE (81 OR 01,81 NEEDS WR BUF)
L=LENGTH BYTE (FIXED AT 6D)
CCC=COMMAND 1 (07,13,00)
COMMAND 2 (31,29,A9,69,E9)
COMMAND 3 (05,35,0D,3D,06,0E,1A,16)
BBCCHH=SEEK ARGUMENT (HEX)
R=RECORD NUMBER (HEX)
DD=DATA LENGTH (HEX)
S=SEARCH KEY LENGTH (HEX)
EXAMPLE
INIT BUF
MLCCCBBCCHHRDDS=816D07313500000C30001 01005000
WRITE BUF
DATA=40XF00F

8. USER AND STATUS MESSAGES

F R I E N D -3- DESCRIPTION IN 2841 VOL. A02 OR 2314 VOL. S01

WARNING WRITE COMMANDS MAY DESTROY DATA
ON A CUSTOMER PACK/CELL OR CE TRACKS.

INTERPRETIVE PROGRAM TO XEQ CCW COMMANDS
THAT YOU ENTER FOR ANY DEVICE(S).

AFTER INSTRUCTIONS ARE TYPED,ENTER EACH COMMAND
WHEN PROCEED LIGHT TURNS ON.

TERMINATE EACH ENTRY WITH AN ALTERNATE CODE 5 (EOB).

AFTER CCW CHAIN HAS BEEN ENTERED,TYPE GO.
TO ENTER NEXT CCW CHAIN,PRESS REQUEST,TYPE RESET.

THE ABOVE STATEMENTS ARE THE INTRODUCTORY AND OPERATIONAL MESSAGES PRINTED OUT BY FRIEND. THESE ARE ONLY PRINTED ONCE, IMMEDIATELY AFTER FRIEND IS LOADED.

A PSW RESTART CAN BE USED AFTER THE FIRST LINE IS TYPED TO SKIP THE REST OF THE PRINT OUTS.

ENTER CCW LIST IN ENGLISH

THIS MESSAGE PRINTS OUT INITIALLY AND AFTER 'DEV=' HAS BEEN REQUESTED AFTER THE USER HAS ENTERED 'RESET'. IT SERVES AS A REMINDER FOR THE USER TO TYPE IN THE CCW COMMANDS IN ENGLISH LANGUAGE.

SET FILE MK INSERTED

THIS MESSAGE PRINTS OUT TO INFORM THE USER THAT FRIEND INSERTED A 'SET FILE MASK' CCW. THE COMMAND WAS INSERTED PRECEDING THE LAST COMMAND ENTERED. THE CCW CHAIN BEING GENERATED WILL REQUIRE A SET FILE MASK IF WRITE HA AND WRITE RECORD ZERO CCW COMMANDS ARE USED. IF THE USER FORGETS TO SPECIFY ONE, FRIEND WILL INSERT IT.

TIC *-8 INSERTED

THIS MESSAGE PRINTS OUT TO INFORM THE USER THAT FRIEND INSERTED A 'TIC *-8' CCW. THE 'TIC' CCW WAS INSERTED PRICEDING THE LAST COMMAND ENTERED.
THE CCW CHAIN BEING GENERATED WILL REQUIRE A 'TIC' CCW IF A 'SEARCH' CCW WAS USED. IF THE USER FORGETS TO SPECIFY THE 'TIC', FRIEND WILL INSERT ONE.

LOOP IS FINISHED ON UNIT XXXX

THIS MESSAGE WILL REPEATEDLY PRINT OUT TO INDICATE THE STATUS OF THE 'TEST I/O'. CONDITION CODE '0' INDICATES THAT THE DEVICE, WHOSE ADDRESS IS 'XXXX', IS READY AND AVAILABLE. CONDITION CODE '2' INDICATES THAT THE CHANNEL OR SUBCHANNEL IS BUSY FOR WHICH THE DEVICE IS ATTACHED. CONDITION CODE '3' INDICATES THAT THE ADDRESS WAS NOT RECOGNIZED BY A CHANNEL OR ANY DEVICE ON THE CHANNEL. PRESS REQUEST AND TYPE 'RESET' TO ENTER COMMANDS. IF 'SCOPE' IS ENTERED, FRIEND WILL REQUIRE A PSW RESTART TO EXIT FROM SCOPE LOOP.

COND CODE= 1 ON UNIT XXXX
CSW YY YY ... YY YY
SNS ZZ ZZ ... ZZ ZZ

THIS MESSAGE WILL REPEATEDLY PRINT OUT TO INDICATE THE STATUS OF THE 'TEST I/O'. CONDITION CODE '1' INDICATES THAT THE CSW WAS STORED. THE CSW AND SENSE BYTES ARE TYPED OUT TO FURTHER CLARIFY THE ERROR CONDITION.

9. EXPLANATION OF ERROR MESSAGES PRINTED OUT BY FRIEND

SYNTAX ERROR

FRIEND WAS UNABLE TO DETERMINE THE MEANING OF THE INPUT STATEMENT. THE STATEMENT OR INFORMATION WAS INCORRECTLY SPELLED, INVALID CHARACTERS, WRONG NUMBER OF CHARACTERS ENTERED (HEX), UNDEFINED CCW, UNKNOWN VERB AND ETC.
FRIEND REQUIRES THAT THE ENTIRE CCW COMMAND BE REENTERED. TRY A DIFFERENT SPELLING OF CCW COMMAND.

SYNTAX ERROR ON INPUT

FRIEND DETECTS AN ERROR ON THE 'DATA=', 'KEY=' OR 'BBCCHH'= REQUESTED INFORMATION. THE 'BBCCHH=' HAS AN INCORRECT NUMBER OF CHARACTERS. IT REQUIRES 12 HEXADECIMAL CHARACTERS. THERE IS A POSSIBLE ERROR IN THE DATA FIELD FORMAT-
-NO X OR C TO INDICATE DATA TYPE CODE
-NO DATA AFTER THE TYPE CODE.
DATA MUST BE ENTERED IN EITHER OF THE FOLLOWING FORMS- N...NXHH...HH
OR N...NCAA...AA
REENTER THE REQUESTED INFORMATION.

*UNDEFINED SYMBOL(S)

FRIEND HAS DETECTED THE USE OF A SYMBOL THAT WAS NOT PREVIOUSLY DEFINED. THE USER CAN NOT 'COMPARE' OR 'DUMP' FROM A SYMBOLIC I/O AREA UNLESS IT HAS ALREADY BEEN DEFINED BY AN 'INTO' OR 'FROM' COMMAND MODIFIER. THE COMPARE OR DUMP WAS IGNORED.

*DEVICE QUEUE FULL, LAST CMD IGNORED

FRIEND WILL ALLOW ONLY 20 DEVICES TO BE ENTERED INTO THE DEVICE QUEUE AT ANY ONE TIME. IF THE USER TRIES TO PUT IN ANOTHER ('DEV=' WITHOUT A PREVIOUS 'RESET'), THIS ERROR MESSAGE IS PRINTED. THE REQUEST FOR AN ADDITIONAL DEVICE IS IGNORED. TO ENTER ANYMORE DEVICES THE USER MUST ENTER 'RESET'.

*SYMBOL TABLE FULL, LAST CMD IGNORED

FRIEND WILL ALLOW ONLY 26 SYMBOLIC CHARACTERS TO BE USED AT ANY ONE TIME. IF THE USER TRIES TO USE A 27-TH, THIS ERROR MESSAGE IS PRINTED. THE COMMAND USING THIS SYMBOLIC AREA IS IGNORED. TO ENTER 'RESET' TO RESET THE SYMBOL TABLE.

*KEYWORD MISMATCH ON INPUT-XXX...XXX

THE USER IS READING THE CCW COMMANDS FROM CARD OR TAPE. THE RECORD READ MUST ALSO CONTAIN THE INFORMATION THAT FRIEND WOULD NORMALLY REQUEST. THE REQUESTED INFORMATION MUST BE IN THE CORRECT SEQUENCE AND BE AN EXACT DUPLICATE OF THE REQUEST TYPEOUT. IF FRIEND IS UNABLE TO MAKE A MATCH OF THE PARAMETER ON THE INPUT RECORD WITH WHAT IT IS LOOKING FOR ('XXX...XXX'), THIS ERROR MESSAGE RESULTS. THE USER SHOULD VERIFY THAT THE LAST RECORD TYPED OUT CONTAINS THE PARAMETER TYPED OUT IN ERROR MESSAGE. THE USER WILL HAVE TO ENTER 'START RDR,XXX' AGAIN AFTER ENTERING 'RESET'.

*UNIT=0190 - I/O INTRPT,UNIT CHECK
CSW 00 0024E0 0E 00 0000
SNS 10 00 20 C8 00 00 00 00 00 00 00 00
LOOP 00662

THIS ERROR MESSAGE WILL RESULT IF FRIEND RECEIVES AN I/O INTERRUPT AND UNIT CHECK IS ON IN THE CSW. FRIEND WILL PRINT OUT THE DEVICE ADDRESS THAT GAVE THE UNIT CHECK, ACTUAL CSW, AND THE SENSE BYTES IN HEXADECIMAL RECEIVED FROM THE DEVICE.

```
*UNIT=XXXX - INCORRECT CSW OR SNS
CSW  YY ... YY
SNS  ZZ ... ZZ
LOOP NNNN
```

THIS ERROR MESSAGE WILL RESULT IF ANY UNUSUAL STATUS OR SENSE BITS ARE DETECTED. THIS INCLUDES ATTENTION, UNIT EXCEPTION, AND ANY CHANNEL STATUS IN THE CSW AND ANY SENSE BITS. UNIT CHECK WILL RESULT IN THE PRECEDING ERROR MESSAGE.

```
*UNIT= XXXX - START I/O NOT ACCEPTED
CSW  YY ... YY
SNS  ZZ ... ZZ
LOOP NNNN
```

THIS ERROR MESSAGE WILL RESULT IF THE START I/O INSTRUCTION IS NOT ACCEPTED. IF CONDITION CODE 2 OR 3 IS DETECTED ON THE SIO, THEN THE ERROR MESSAGE IS PRINTED. IF CONDITION CODE 1 AND CSW DEVICE STATUS IS NOT CONTROL UNIT BUSY OR DEVICE BUSY, THEN THE ERROR MESSAGE IS PRINTED.

THE USER SHOULD CHECK THAT THE DEVICE IS READY AND ON-LINE.

```
*UNIT= XXXX DATA COMPARE ERROR
BYTE NO.=AAAA $X=BB $Y=CC
  .
  .   (FOR EACH BYTE THAT FAILED TO COMPARE)
  .
LOOP NNNN
```

THIS ERROR MESSAGE WILL RESULT IF THE USER HAS SPECIFIED THAT DATA IS TO BE COMPARED AT EACH COMPLETION OF THE CCW CHAIN AND THE TWO AREAS COMPARED WERE NOT EQUAL.

- 'XXXX' IS THE HEXADECIMAL DEVICE ADDRESS
- 'NNNN' IS THE LOOP NUMBER THAT FAILED.
- 'AAAA' IS THE RELATIVE BYTE NUMBER OF THE TWO AREAS COMPARED (FIRST BYTE=1).
- 'X' REPRESENTS THE FIRST AREA AND WILL BE A SYMBOLIC CHARACTER IF SYMBOLIC I/O AREAS WERE USED. IF ABSOLUTE COMPARE ADDRESSES WERE USED THEN 'X' =1 AND 'Y' = 2.
- 'Y' REPRESENTS THE SECOND AREA.
- 'BB' REPRESENTS THE HEXADECIMAL BYTE IN THE FIRST AREA.
- 'CC' REPRESENTS THE HEXADECIMAL BYTE IN THE SECOND AREA.

```
*UNIT= XXXX - NO DEV END OR CUE I/O INTRPT
```

THIS MESSAGE WILL BE PRINTED OUT IF FRIEND DOES NOT RECEIVE A DEVICE END OR CONTROL UNIT END (CUE) WITHIN SEVERAL SECONDS (5-10) AFTER STARTING A CCW CHAIN OR RECEIVING A CONTROL UNIT BUSY. THE AMOUNT OF TIME DELAYED WILL VARY DEPENDING UPON THE NUMBER OF DEVICES RUNNING. THE TIME MAY BE CHANGED WITH THE 'TIME DELAY' COMMAND. IF A TIME OUT OCCURS, FRIEND WILL ISSUE A 'HALT I/O' INSTRUCTION TO ATTEMPT TO RESET THE DEVICE AND THEN WAITS ANOTHER TIME PERIOD FOR A DEVICE END INTERRUPT FROM THE HALT I/O.

```
YYY-INTRPT, PSW= XX XX XXXX XX XXXXXX
```

THIS PRINT OUT WILL OCCUR IF FRIEND DETECTS AN ABNORMAL INTERRUPT. THE 'PSW' PRINTED OUT IS THE OLD PSW FOR THE INTERRUPT.

'YYY' CAN BE	EXT	EXTERNAL
	SVC	SUPERVISOR CALL

PGM	PROGRAM
MCK	MACHINE CHECK
I/O	INPUT-OUTPUT

IF 'PGM' INTERRUPTS START TYPING OUT, PERFORM A 'PSW' RESTART. IF THAT DOES NOT CLEAR THEM, THEN FRIEND HAS DESTROYED ITSELF AND YOU WILL HAVE TO RELOAD.

THE 'I/O' INTERRUPTS ARE USUALLY FROM OTHER DEVICES BECOMING READY.

IF 'MCK' INTERRUPT, THE LOG-OUT AREA IS PERSERVED SO IT CAN BE LOOKED AT. THE USER SHOULD RUN WITH THE CPU CHECK SWITCH SET TO 'STOP'.

10. RESTRICTION

FRIEND WILL INSERT BOTH A 'TIC *-8' AND 'SET FILE MASK' CCWS IF THEY ARE LEFT OUT. THIS MAY SOMETIMES CREATE AN INVALID CCW CHAIN.
EXAMPLE OF AN INVALID CHAIN

```
SEEK
  CYL=5
  HD =1
SRCH  EQ HA
WR RO
TIC *-8 INSERTED          (PLACED AFTER THE SEARCH HA)
SET FILE MASK INSERTED    (PLACED BEFORE THE WR RO)
  KL=0
  DL=100
```

THE ABOVE CHAIN IS AN 'INVALID SEQUENCE' AS THE 'WRITE RO' IS NOT DIRECTLY PRECEDED BY A SEARCH CCW. THE USER SHOULD SPECIFY HIS OWN 'SET FILE MASK' BEFORE THE 'SEARCH HA'.

11. ADDITIONAL CAPABILITIES

TO CHANGE THE AREA WHERE FRIEND WILL GENERATE THE DATA AREAS, INCLUDE THE FOLLOWING PATCH CARD PRECEDING THE END (LAST) CARD. OR STORE THE DESIRED DATA AREA ADDRESS AT HEX LOCATION 000184.

```
COLUMN 1234  7       17
       +REP  000184    XXXX,XXXX       WHERE XXXXXXXX IS THE ADDRESS OF
       2                               THE NEW DATA AREA POOL.
       9
```

THIS IS TO PROVIDE A MEANS OF TRANSFERING DATA INTO OR OUT OF HIGH CORE STORAGE.

OBJECT DECK IMAGE THREE LINES/CARD COLUMNS 1-20,21-40,41-60,61-80 PERIODS ARE BLANKS

```
A.JAHDBABAAA.AA+....    ....IPL.FREND....D..    ..............2193    848.422998.F06130001
8 ZR99999999 99                          9
0 88      YYY YY                         .

AAAAAAA9BAAJJAAHBAAH    -AAHBAAA-AAHBAAQJAAH    ABAGAGGGAACGBAAZH-AB    GOAD........06130002
999999989992Z99Z999Z     99Z999Q 99Z999 Z99Z     99999QQ099 Q0998Z 99    Z 9R
YYYYYYY  Y 88YY  YY       YY  YY  YY  YY 8YY     Y Y8YZZZYY Z YY   Y       Y

AAAHAAAAGGGGA+AHDA-A    GJAHG.ADA+AQEA-AGJAQ    G.ADEXAZG-AKH.AZF.B.    ACHAAZK9AAAA06130003
99999999QQQQZ-9RQ9 9    ZZ9RZ 9-Z-9ZQ9 9ZZ9Z    Z 9-- 92Z 90Z 929 Z     9YRZ94 7Z99Z
YYY YYYYZZZZ OY  Y Y     8Y   Y  OY  Y Y 8Y      Y     Y    8             Y  Q    QY Q

GOADHAADDAAAG.A9G7EN    AZG-AB.-ABBAAAAAAZA.    AFA+AEEAASH+ADAAAZA.    ADA9AAEAASEY06130004
Z 9RZZ9ZRZ9ZZ 949 -     922 9-  990999ZZ96Z     99Z 98ZQ9 R 98ZZ97Z     99Z399ZQ9 -3
  Y  QY  QYQ  Y           YO  Y  YYY Q          Y   Y  OY   Y Q 8         Y   Y  OY

AAGAABGOADCZAACLAAEF    AAGJA6AZAAEFAAGJABAJ    AAIJADDAAZOKBNAAA9AB    AEAAF.F.ASGC06130005
Z9Z89ZZ 9RZ399Z999-     Z9ZZ9 Z299- Z9ZZ99Z9    990Z99RR9899Z999Z399    ZR999 Z 9 9Q
QY OY8  Y   YY  Y       QY 8Y   Y8  Q  8        Y8 8Y  8Y      YY  Y       Y     Y  Z

BTXT.AAA..AH..AAAAAA    AAAB................    ....................    ............06130006
9    999  99  999999    999Y
     YYY  Y   Y YYYY    YY

BTXT.AAA..A9..AAAAJA    AAZ.CAHAAAHOABGO7AA.    LHADAJD9.CEG.JG+ABAA    KQGABZA-7AHS06130007
9    998  98  99R9Z9    994 99ZR98Z 90Z  QZ    99ZZ9Z-  9-Q ZZ-9Q-8    9 ZR94Z0 QR8
     Y O  Y   Y 8Y8Y    YY8  Y 8 O             8   Y8      Z 8 O   0    8  8 8

BTXT.AAH..A9..AAADA.    AMA+6AAEAAPG+A+AF.AB    PGLZLZPGMZMZP7NZN7A.    LZ..NM+-OHA.06130008
9    99-  98  9990Z    992  QZR99 Q 9 9Z 9     Q9898 Q9898 89898Z      98  9Y O90Z
     Y O  Y   Y           Y       Y Z Y Y      Z8 8  Z8 8   8 8        8   8  8

BTXT.AAO..A9..AAPE..    PFBG2DBAKRBHKQEAPBAP    PUBDBGEANOGABJEJMDKA    KOAAEAMQEAJB06130009
9    99   98  9998      98-Q R-99 -99 ZQ9Z99    9Q-999-99YZ89ZZZ9Z 9    9 99ZQ99ZQ98
     Y    Y   Y 8       8  Z O Y8   8  O 8     89      Y8  O 8 8 8     8 Y8 O   08

BTXT.ABZ..A9..AAAKP5    EAQHEABMEABFA+7ZEWOG    GABDA+6BERDGGABDEAJB    AGZZGOBZBAOM06130010
9    998  98  999998    ZQ99ZQ98ZQ9RZ- 7- 98    Z890Z- -- 98Z890ZQ98    9922Z 94-99
     Y    Y   Y 888      O          O O 8  8     O   O O 8  O   08      88 8   8 Y8

BTXT.AB-..A9..AAA+3K    EAPBG9KCAD+AHAADGCBA    OMA+4ZEAPBG9PGAAAAKA    AA+AKAAP+ADGO6130011
9    99   98  99Z- 9    Z8989  998-9RQ989Q-9    9 Z- 5Z8989  99R9R 9    9R-9 999-9-9
     Y    Y   Y  O      O       Y OY OY  Z      8  O 8 O       Y8Y8 Y    Y80Y YY O  8

BTXT.ABH..A9..AAAPKA     M+CPCOJOJH.NMFA.CQZ    A+79AAB+EAPBG9DAAM+A    AA+AGABBH.NM06130012
9    99-  98  9999 9    99-9 99Y9YZ 9Y-9 997    Z- 6ZQ9 Z8989  999-9    -Z-9Z89QZ 9Y
     Y    Y   Y Y  Y    Y O   8 8   8          O       O     YY OY      QO  O 9  8

BTXT.AB-..A9..AAFA.B    JAAN+AELNOGAHHEANOG+    BAQBF.AMD7KRAAAFGAC7    C-D2DXAFA.AE06130013
9    990  98  99-R 9    999-9-89YZ899-99YZ-     9Q9R- 99-89 -R9RZ899    809 -Q9R- 9R
     Y    Y   Y  8      YY O   8  O   Y8  O    O O Y   8  8Y  O       8  9Y   Y

BTXT.ACH..A9..AAGAC9    DGAEQEC.O2+EAABH-AB.    -DAEAHAAKRGAC9EAJBAA    JLACAAG+CHKB06130014
9    999  98  99Z896    -Q9R988 9  899-9O9-     09ZQ99-99 ZR96ZQ989R    Z9-99RZ 9Z 9
     Y    Y   Y  O      OY     8   YY   Y       9Y   8  8   08 88     8  8Y8

BTXT.AC...A9..AAAJON    GOGQAX+BG+CBAA+BGACY    ADKRGAGFKG-AAAAEAHBC    AAACAAGAGFHJ06130015
9    99   98  99999     Z 9 -Q-9Z 90-R-9Z896    -99 ZR9Y 9099RZQ99-9    9R-99RZR9YZZ
     Y    Y   Y Y 8       90       80  O        8  8     YY8 9Y        Y8  Y8 8  8

BTXT.ACH..A9..AAAO.J    OUGOGAAH+BGADDAHAFGA    CBEFAPG+DDFHKQADKQGA    C2EAPBAHPEAA06130016
9    99R  98  9999 Z    9 Z 9Z-9-9Z899-99RZ8    9Q-999Z-99-99 -99 Z8    9 ZQ9Z999QZ8
     Y O  Y   Y Y 8     8    Q  ) O    Y  O      Y  O    8  8  O         O 8  8  O

BTXT.ACA..A9..AACKEA    NBG+P9EANIGAP9AJADAA    NOA.OQEAJ-KFSAOQ+$OQ-    KBAJORAWAFAC06130017
9    99Q  98  999Y-9    9QZ-98-99-Z898ZZ99ZZ    9YZ 9 ZQ90 9899  89     9999 ZQ99-9
     Y O  Y   Y    Y    80 O 4 Y80 O 4 8Y8 Q    8   8  08    Y8   8      Y 8  9Y
```

OBJECT DECK IMAGE THREE LINES/CARD COLUMNS 1-20,21-40,41-60,61-80 PERIODS ARE BLANKS

```
BTXT.ACY..A9..AAAAGA    GQGODOEAPBAEPGEALB.J    OBEAPBAEPDEALB.JODGO    CKAA+BGADBAA06130018
9    99   98  999RZR    9 Z 99ZQ9Z999 ZQ9Z Z    9QZQ9Z999ZZQ9Z Z9QZ     9 -8-9Z890-8
     Y    Y   Y Y8 8          0 8  8    8 8     89 0 8  88   8 889       00  0   0

BTXT.ADJ..A9..AAAFGA    DBEPAAGADDADKRGADBKG    -AKSAEAHAAKRGADBEAJB    AMJZGODBFHKQ06130019
9    99Z  98  999RZR    90-99RZ89R-99 ZR90 9    0998ZQ99-99 ZR9OZQ98    99Z3Z 90-93
     Y 8  Y   Y Y  8       8Y8 0   8  8         Y8  9Y   8  8   08      8 8     8

BTXT.ADH..A9..AAEAPB    AFPNEANOG+D+B+SAGOGF    AJABAANDQFEAJ-GOGFAD    +BGAEFENAAG+06130020
9    99R  98  99ZQ9Z    9990-99YZ-9--089Z 9Y    ZZ99ZZ9Y98ZQ9OZ 9Y-9    -9Z899-99RZ-
     Y    Y   Y  0 8       8  Y8  0 0   Y        8Y  Q8    08            0  0 8  Y8 0

BTXT.ADA..A9..AADHLZ    GODMEAPBAAPLEALB.JOF    A.+AGAEFH.OQKCSA.BBZ    ADGOGFBPEDDA06130021
9    99Q  98  999-92    Z 9OZQ9Z999YZQ9Z Z9Q    - -9Z899R 9  989 9Z6    99Z 9Y-999Z9
     Y    Y   Y  8          0 8 88    8 889      0  0 8  8    Y  8  Y      Y    8  Y

BTXT.ADH..A9..AABDBH    AAF.AMDGAEEANOG+DWAJ    AHGOEBE-NOGADBBOEDEF    NOG+DFBONDEA06130022
9    99   98  9990-9    9R- 99-Q9R-99YZ-9 ZZ    99Z 99- 9YZ89Q-999-8    9YZ-9Q- 9YZQ
     Y    Y   Y         Y8  Y  OY  Y8  0  8    Y       8  0 Z  8       8  0 Z  8

BTXT.AEA..A9..AALBQE    PB+.ADGOGB+SO+PEOSOS    AB+BGAE.ABAAGAEAAAAM    GAE.EAPBADPD06130023
9    999  98  999Z98    9Z  98Z 9- 89  99898    -9-9Z89 -99RZR9Z-999    Z89 ZQ9Z999-
     Y Y  Y   Y  8      8   Y       8  8 8      0  0    Y8 8 Q  Y       0   0 8  80

BTXT.AE9..A9..AAEALB    .JOSAA+BGAEHEDAAGAE-    ABAAGAE-AAAMGAEHADAM    GAEHAA2YEAOH06130024
9    998  98  99ZQ9Z    Z9 -9-9Z890-99RZ89     -99RZR9 -999Z890-999    Z89RZZ 5Z09R
     Y    Y   Y    8    88   0  0   8Y8 0       Y8 8    Y  0    Y       0 0 Q  0

BTXT.AE+..A9..AAAAP-    GAEHEAPBADPHEALB.JOU    AJ+AGAGAAA+AGAEQEAEF    GOG9FBKQEAPB06130025
9    99-  98  99-99    Z890ZQ9Z999-ZQ9Z Z9     -Z-9ZR9Z-R-9Z89 Z89Q    Z 94-99 ZQ9Z
     Y 0  Y   Y  8      0   0 8  80   8 88     80  8 Q 80  0   0 0        8  0 8

BTXT.AEQ..A9..AAAFPA    EAOHHJOSKAOUOSGOG9AB    AMGHADAA2YEAOHAAP-GH    G8ADE9AAG+E006130026
9    990  98  99999     Z89-ZZ98 99 98Z 94-9    99ZO099ZZ 5ZQ9R-99 90    Z 99-89RZ-9
     Y    Y   Y  8       0  88  8 8             Y  Y  Q  0    8          Y  1Y8 0

BTXT.AES..A9..AAH.OQ    ADAB+.ADGOGFAD+BGAFA    A.+AGAFAH.OQADABKCSA    .AKASDOGQOPB06130027
9    998  98  99R 9     ZZ99  98Z 9Q-9-9Z89Z    - -9ZR9ZR 9 ZZ99 989    9 9899Q9Y 9
     Y    Y   Y  8       Y   Y        0 0 Q     0  8 Q  8   Y   Y       Y Y  89

BTXT.AFQ..A9..AASESE    AWAHFAKRAAANGAFAF.AN    A.+BGAFFAAAMGAFHEAOT    GAFFFBKQEAPB06130028
9    999  98  998989    ZQ99--89 -Z99Z89Z- 99   - -9Z89R-999Z89Z-99     Z89R-99 ZQ9Z
     Y    Y   Y         9Y  08  QY  0 Q  Y      0  0 0  Y  0   Y8      0 0 8  0 8

BTXT.AF+..A9..AAAEPD    EAOHAAAMGAFOKAOSOSKA    JEOTKAOSOSBSOSAJ+BGA    FMAAAMGAFAOA06130029
9    99   98  999990    Z89--999ZR9Z 99 98 9    Y99  99 98889 -Z-9Z8    9 -999Z89Q 9
     Y    Y   Y  8D      0    Y  8    8 8  Y     8   8 8   8  8D  0       Y  0

BTXT.AFH..A9..AAOUOU    GAFMEAEFGOFBFBKQEAPB    AFPAEAOHAAAMGAFFKAOU    OSKAJFOUKAOU06130030
9    990  98  999 9     Z89 Z89QZ 9Z-99 ZQ9Z    999 Z89--999ZR9- 99     98 9Y99  99
     Y    Y   Y 8 8     0   0 0   8  8  0 8     8  0    Y  8 0  8       8    8  8

BTXT.AF+..A9..AAOSBS    OUGOFM.JOUKAJFOUA.+A    GAF8AJ+BGAFUHJOSGOGQ    HJOSBJOUGOGQO6130031
9    990  98  999888    9 Z 9   Z9  9Y99 - -9    Z89 -Z-9ZR9QZZ9 Z 90    ZZ9 8Z9 Z 90
     Y    Y   Y 8       8       88     8  0     0   80  8 9 88           88  88

BTXT.AF8..A9..AAEGAA    G+GAKASAOTKASAOUGOGF    EOAAGAGJEOAAG+GBAJAH    FAKRBJOSBJOU06130032
9    99   98  99-99R    Z-9R 9899   9899 Z 9Y    -99RZ89Z-99RZ-9ZZZ99    -89 8Z9 8Z9
     Y    Y   Y 8Y8     0 8 Y Y8    8            Y8 0 8 8Y8 0   8Y      08  88  88

BTXT.AGA..A9..AA+SO+    AAAMGAGQKSGOGQLZEFAA    GAGZEJAAG+GMH.OQADAA    +.ADGOGFAAKR06130033
9    99Z  98  99 89     -R99ZR909 Z 9092-99R    Z894-99RZ-9ZR 9 ZZ99    98Z 9Q-89
     Y Q  Y   Y  8       8Y  8  8     8  8Y8     0   8Y8 0    8   Y       Y     08

BTXT.AGQ..A9..AAGAG4    AJAHBJOSBJOUGOGOLZEE    AAGAG+EEAAGAGD+SADAA    AMGAGQBSAOKB06130034
9    99Z  98  99Z898    ZZ998Z9 8Z9 Z 9092-9    9RZ89--99RZ89R 898-R    99ZR9 8899 9
     Y    Y   Y  0       8Y  88  88     8  8    Y8 0 0  Y8 0 0  Y  8    Y 8   Y
```


OBJECT DECK IMAGE THREE LINES/CARD COLUMNS 1-20,21-40,41-60,61-80 PERIODS ARE BLANKS

```
BTXT.AGJ..A9..AAAJAE    GOGQ.JAOAAAMGAGOKBAJ    OAAFAMG+HQEDAAG+GQH.    AAB.AOF.+.AA06130035
9    99Y  98  999998    Z 9  Z99-R99ZR9  999    9R-999Z 99-99RZ-9 R    9R8 999  9R
     Y    Y   Y Y Y       8Y  8Y  8   Y        8  Y    8Y8 0           Y8  Y   Y8

BTXT.AGQ..A9..AAOCAD    +AA.KOGAGWFAAADGKOD8    AMKG-AAAAEAHADKRGAAA    GOBZKA2YNOKE06130036
9    99   98  99 99R    -9- 9 Z89Q-89R-Q9 -     99 9099RZQ99-99 ZRRQ    Z 94 9 49Y Q
     Y    Y   Y  Y      0Y  8  0 9 0Y8 08      Y    YY8 9Y   8  880       8   8

BTXT.AHA..A9..AANONA    GOBSAA2YEAOMADP-GAHB    QZCJOU+JADKBAAAEKAAD    OUGOGBAAKRGA06130037
9    99R  98  999Y9Q    Z 9 ZZ 4ZQ99-99 ZR9Z    968Z9  Z98 9Z998 9Z9    9 Z 9 -89 ZR
     Y 8  Y   Y 8 80       Q   0    8  8        8 88  8Y  Q Y  Q          8     08 8

BTXT.AHH..A9..AAHKKB    AJAAKAAOADGOGBHJAOCJ    OUKZGAHB.JAOBAAMKG-A    AAAEAHBAAAB-06130038
9    99Z  98  9998 9     99Z9 999Z9Z 9 ZZ998Z    9 92Z898 Z99-899 909    9RZQ99-99R-
     Y    Y   Y          Y Q  Y Q     8Y  8      8   0  8Y  OY   Y      Y8 9Y  YY8

BTXT.AHA..A9..AAAMBA    ANGOHBABKRGAJBDFKRD7    OBQEC.O2DH.DFAKQDGKQ    A.BZ+.A4H.NM06130039
9    998  98  9999-9    99Z 98-99 ZR99-Q9 -8    9Q988 9 -- 9-89 -Q9     Z 98  98Z 9Y
     Y O  Y   Y Y  Y      Y       8  8 8 Z8      8Z   8  0  08  98       8   Y  8

BTXT.AHH..A9..AAQ9AJ    LHL9A+AJLZNZBAACMJOA    QCLZHAOHNZ+AODA-LHAO    AJAADDGAAADE06130040
9    99-  98  9994ZZ    9992Z 9Z9295ZZ9-8Z9Q    9R92RZ9-95 Z9YZ 99ZZ    9Z899Q998990
     Y O  Y   Y  8      8 8   Y88 8  Q80 88      8  Q8 8  Q8   8         Y80Y8Z YOY8Z

BTXT.AHO..A9..AAA-NM    GJHFAA-CGAHSAF-CGAAZ    HFAAADAA+FAAJ.ODGJA2    AA-BGAHWGOHS06130041
9    99   98  998 9Y    ZZ9Q-9 9Z89 -9 9Z898    RZ9RZZ99 Z9R8 9YZY9     -8 9ZR9 Z 9
     Y    Y   Y  8       8 9      0      08      Y8  Y  Y8  8  8        0  8

BTXT.AAZ..A9..AAHFAA    A+LHAEAJJFGAABAEAAG+    ABAF+CG+HSA+NMG+AAD7    P-HFAD++AHPG06130042
9    998  98  99Z 99    Z 99ZR9Z9RZ898B 99Z-    98-9 9Z 9 8 9YZ-9Z-8    9 ZR99  9Z 9
     Y8   Y   Y  YY       8   Y88  08   YY 0     8           8  08Q      8  Y  Y

BTXT.AA-..A9..AAA.A.    PCOWOWDA+AE.AAOBGAAF    EA+AG+AHAAODGAAAOEGO    A+D.G+AHGJAQ06130043
9    99   98  999 9     99 9 Q9099 -89QZ89Y     Q909Z-9R899Q998990Z     9-9 Z 9-ZZ90
     Y8   Y   Y Y Y      88 8  Y Y   08Z 08     Y Y 0800Y8Z YOY8Z       8     80 88

BTXT.AAH..A9..AAFB-C    HFAOADAA.FAOAA-BGAHS    A+AAGOHWEAADGAASE+AD    GAASDABHEAFO06130044
9    99-  98  99-9 9    ZZ99ZZ99 Z99-8 9Z89    Z-99Z 9 -R9ZZ89Q- 9Z    Z89QZ990Z899
     Y8   Y   Y          Y8  Y   Y8 0   0       0YY     8Y  089  Y      089 Y8  088

BTXT.AA-..A9..AAEAMF    KC1+ADEAJBAZZHEAEMGO    HWFD-CG0AQAA-BGABBDA    BDF+HWHFAAEA06130045
9    990  98  99Z89-    9 098ZQ98961-ZQ98Z     9 -9 9Z 90-8 9Z899Z9    9-Z-9 Z 99Z8
     Y8   Y   Y 0 0       Y  08 8  0  8        8  0  08  Y            8  0   YY 0

BTXT.ABH..A9..AAMFKC    OIADEAJBAZJCHFAAFA+A    DABDGOHSAZOMH+A9A+EZ    A-LHADAJA-NM06130046
9    999  98  999- 9     98ZQ9898Z Z 99Q909     Z99-Z 9 Q39YZ098Z 92    Z 99ZZ9Z8 9Y
     Y8   Y   Y  0        Y  08 8 8   YY Y Y    Y8       88    Y2  88      8   Y8  8

BTXT.AB...A9..AAGZAF    -CGAB9AJADGABHD+U+HZ    AADJO+JBG+B9AD-CGAB9    D9-CA+DHG0B906130047
9    99   98  9995-9    9Z898-Z9ZZ89RRO9-Z6    99RZ9-9 Z-98-9 9Z898    -  9Z 9-Z 98
     Y8   Y   Y          08  8Y  080  80        YY 8808  08     08        80  8

BTXT.ABH..A9..AAAFAA    G+B9AJKQGABFKAOB-DMA    AD-FPC-A-ANAADPFGADH    ABADGAE9AAAD06130048
9    99R  98  998 99    Z-98-Z9 ZR9Y 99Y 9 9    9Z 9 9 R R 99Z9RZ89-    -99ZZR96-09Z
     Y80  Y   Y  YY      08  88  88   8         Y       8 8  Y 8  080      Y  88  Y

BTXT.ABA..A9..AAG+ED    AGAEG+EDADADGADHD9-C    AA-BGABBGAHFADF.BOA.    -BGACFKAOI-M06130049
9    99Q  98  99Z 9Q    -Q9ZZ 9Q-99ZZ89--  9    -8 9Z89Q99RZ99Z 9 -    9Z89- 9 - 9
     Y80  Y   Y  8Z      ZY   8Z  Y  080         0   089 Y  Y8  8          080 Y 0

BTXT.ABY..A9..AAKAOG    -QDGP-HFAMHOAQA+AAHZ    AMAJO6G+CZNG+AJAG+C9    AGAAAKAAAEAA06130050
9    99   98  99 9 Q    9-Q9 RR99R099Z 99Z6    998Z9 Z098 Q-9Y9Z-98    ZR99ZY99ZR99
     Y8   Y   Y Y 0      08  OY   Y   Y       Y8 88   8  ZOY Y 08      0 Y   Y   Y

BTXT.ACJ..A9..AACJO6    GOCBFJBJCZNA+AJAGACK    NA+AJAG+CKAGAAAKAAAF    AMGJCKAEAAG006130051
9    99Z  98  99BZ9     Z 999ZZZ97 9-9Y9Z89Y    9-9Y9Z-98ZR99ZY998R    99ZY9YZR99Z
     Y88  Y   Y  88       8  8 888 YOY Y 08      YOY Y 08  OY   Y      Y8  8   Y
```

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BTXT.ACH..A9..AAC9A.    P-GACHF.P-EAMFKCOAAD    EAJBAOJBF+AHFGAG3B0B    AEQ9AJAAA.0C06130052
9    99R  98  9998-     9 ZR9R- 9 Z89- 9 -98    ZQ9899ZY8 99-999 Z -    9997ZZ99Z  Q
     Y8   Y   Y 8       8  880  8  0 0    Y     08 888   Y  8Y8   0     Y8   8Y    0

BTXT.ACA..A9..AAEAJD    Q9A.OAEAJDEAJBALJQGO    CBA.P-GACFEAE-AJKQGA    DDAA-BGADDHZ06130053
9    99Q  98  99ZQ9-    98Z   ZQ9-ZQ9899ZOZ     9Z- 9 Z89-ZQ90-Z9 ZR    9Q-R 9Z89-Z6
     Y8   Y   Y  08     2     08  08 888        8  8 080  8  88  8     89 8   08

BTXT.ACH..A9..AAADAA    JEGADDAAJDGACFAZAHH9    AAHBAFA.JEGAC6A9AHC.    O2AAJEGAD9CC06130054
9    99   98  9999-Z    Z9Z890-8Z9Z89QZZ99R2    99ZZ99- Z9Z89 Z3998    9 -RZ9ZR96ZR
     Y8   Y   Y Y  Q    8  08  08  089  Y      YY  Y   8  08    Y       8  88  88  0

BTXT.ADA..A9..AAAAAC    .AFAA.O6G+DZKGAAAAA9    AAC.O6GODHF.B.DZKAAA    AAB1AAGODDGA06130055
9    999  98  9999Z-    99Q8 9 ZO92 QZ9Z9Z3     998 9 Z 999 Z 91 9Z9    Z9Z899Z 9OZ9
     Y8Y  Y   Y YY      Y    8   8  ZQYQ       Y  8   8     88 YQY    Q   YY  8  Y

BTXT.AD9..A9..AADBFA    -LHFAA++OQBOD9HAOQMA    OM+AOQA.PHG+DD+AADKC    AAADA9ADC.PH06130056
9    998  98  9998-9    9RR9R  9O- 97RQ9088     90 Q9O8 9RZO9R Q98 9    Z998Z3998 9R
     Y8   Y   Y 8          Y8  8   8   8  0     8  8   8   80  Y       QYY   Y   8

BTXT.AD+..A9..AAGODB    HAAQBCAAA9AAF.DBA+JD    GADDAZAHGOCBOA-B-BGA    DQNA-B-OG+D+06130057
9    99-  98  99Z 98    OQ99Z-99Z399Z 98-OZ9    Z89-Z299Z 9Z 9 9 9Z8    9O 9 9 9ZO90
     Y8O  Y   Y  8      Y   YY  Y  8  8         O8  Y   88  8 8 O    8   8 8 8

BTXT.ADQ..A9..AAHZOM    H3O+ADAJBAA9HZOMBAA9    HFAAEAMFKC18ADPA-O-O    EAJBAPZFFJKQO06130058
9    99O  98  99-59Y    -89OZZ9ZO998-39YO998    Z 99Z89- 9  98 9 9 9    ZQ98991Q-Z9
     Y8   Y   Y  8       8   Y8 YY  88  YY      YY O O    Y   8 8      O8 88 9 88

BTXT.ADS..A9..AAA.LZ    AAODGAAAQEAF.CGAEOHD    AAAEAA+DAAJ+ODG.DSD9    .CHDAAFA+AAD06130059
9    998  98  99Z 98    899Q99899Q-9 9Z899RR    9RZR99 R9R8 9YZ 98-     9Z 99Q909ZZ
     OY8Z YOY8Z   O8    OY8Z  Y   Y8  8  8     Y8 Y   Y8  8  8        YY Y Y

BTXT.AEQ..A9..AAAJA.    NMG+DUAABAGOQMA+KMGA    DDGOKHD9-CEAMFKC1AAD    D7P-EAFOEAJB06130060
9    999  98  999Z8     9YZO9 ZQ9ZZ 99809 Z8    9QZ 9R-  9Z89- 9 Z98    -89 Z899ZQ98
     Y8   Y   Y Y8      8   8  O Q      8  O    89  8      O  O   QY      8  O88 O8

BTXT.AE+..A9..AAAZZZ    EAEMGOCFKA1C1GKE1F11    KA1517KA1A1AB.1BB.17    B.14EAJBAQZYO06130061
9    99   98  999418    ZQ98Z 9- 9 R R 9 R 8    9 8 8 9 8 O-  O-  8      -  8ZQ989917
     Y8   Y   Y 8         8   8O   O O   O                 O             08 8

BTXT.AEH..A9..AAAAP-    GAE-AJADAAOWA.1FEAJD    AJACAA1CA.1FKAAA.AB.    ABA9ACADABFJO6130062
9    990  98  99-89     ZR9OZZ99ZZ9 Z  -ZO9-    ZZ99ZZ YZ  - 9Z9 9-    Z9Z399ZZ99ZZ
     Y8   Y   Y 08      88  8Y8 Q8      08      8Y8 Q        QY Y       Q   Y   Y 8

BTXT.AE+..A9..AAEMEA    JBAZZGABKRGJHFAOF.AH    FGAG3B1CAEEAJBABZOAD    OBGIEAJBAAZEO6130063
9    990  98  999YZQ    989710-99 99ZZ998 99    -999 Z -99ZQ98991Y-9    9Q90ZQ989R1Q
     Y8   Y   Y 8 0      8 8     8  8  Y8  Y    8Y8   OY8 O8 88          8Z   O8 88 Z

BTXT.AE8..A9..AAGODD    D9-CEAMFEAFOKC1DADEA    JBAZZDFAP-GOEDAJAHAA    A.A.1GEAJDKGO6130064
9    99   98  99Z 9Q    -  9Z89-Z899 9 R9BZQ    989318-89 Z 9RZZ99ZZ    9 Z  RZQ9- 9
     Y8   Y   Y  89       0 O 088   Y  O       8 8    O8  8  8Y Q      Y    O O8

BTXT.AFA..A9..AAAHA.    OBAAAAGAFFH.A.C.O2+.    OJAAP-GQA.KY+.AHDA+A    GAFQEA+AGOFHO6130065
9    99Z  98  99999     99Z9ZZ89ZR 9 8 9        9Y-89 99Z 9   9ZQ909    ZQ9ZQ909Z 9R
     Y8Q  Y   Y Y Y      Y Y  O8   Y  8        8  O8     8   Y Y Y      O8  Y Y 8

BTXT.AFQ..A9..AAEA+A    GJFQABADGHMAOW-HOAOW    OWGABMG8FAOBABKRGAJB    GOHBFDOBGOBZO6130066
9    99Z  98  99Q909    ZZ9Z-99990 99  9 99    9 Z89Y9 -89Q-99 ZR99    Z 9Q-99QZ 94
     Y8   Y   Y Y Y      88   Y8   8    8       8  O8    O8Z 8 8 8       8Z  8

BTXT.AFJ..A9..AAHAOH    A.NIAJAHOGAAAAGABZEA    JDKANFNIKENINCKCN+NA    B.NDB.NGB.NHO6130067
9    99Y  98  99RZ90    Z 9-ZZ99 9Z9Z9Z894ZQ    9- 99-9- 99-9Q 9909    - 9 - 9Q- 9-
     Y8   Y   Y  Q8      8O 8Y   QYQY O 8 O      8   8080  8080  8 8      8   8O  80

BTXT.AFQ..A9..AAKAND    2EJAOJG+F2PCOJOJKAND    2GBONB+AADAJACAAAEA.    NOEAJDHAADEAO6130068
9    99   98  99 99-     98Z9YZ-9  99Y9Y 99-     9- 9  Z98ZZ99ZZ98Z    9YZQ9-RZ98ZQ
     Y8   Y   Y  80      8 Q8  08   8 8  80     8  8  QY  8Y  QY       8  O8  QY  O
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BTXT.AGA..A9..AAJBAL    NOA+ADGABZA9AHGOFMH+    NMAEAJEG+AGAGO.+NM.N    AD+-OHQEC.O206130069
9    99R  98  999899     9Y-OZ9Z894Z399Z 9OZ     9YZR9Z-Q 9Z898  9Y      99 090988 9
     Y88  Y   Y 8 88     8   Q  O 8  Y   8       8   Y8 Z Y O8   8       Y  8    8

BTXT.AGH..A9..AADH.D    EJMDKAKQAAEAMQGOBZEA    JBAZJTGOBZEJMDKBOYAH    H.ADKANO.AEJ06130070
9    99Z  98  99-- 9     ZZ9Z 99 99ZQ99Z 94ZQ    9893ZQZ 94ZZ9Z 99499    R 98 99Y 9ZZ
     Y8   Y   Y  O       8 8  8 Y8 O    8 O     8 8 89   8 8 8  8 Y      Y  88   8

BTXT.AGA..A9..AAMDA.    LHADAJNA.AAAG+GBKA.A    OYEG.JG+GFGOBZEJMDA.    LHH+NMADAJNAO6130071
9    998  98  999ZZ     99ZZ9Z 9 999Z-9Q 9 9    95-Q ZZ-9OZ 94ZZ9ZZ     99Z 9YZZ9Z 9
     Y8O  Y   Y  8      8   Y8   YY8 O8   Y     8 Z 8 O8    8 8 8      8  8  Y8

BTXT.AGH..A9..AA.AAA    G+GDKN+B.BKAOB+DEG.J    G+GBGOBZAAGYFHKQEAPB    AJPCEANDG+P906130072
9    99-  98  99 999    Z-9Z 9 9 9 99Y 9-Q Z    Z-9-Z 94Z89 -99 ZQ9Z    999Q-99ZZ-98
     Y8O  Y   Y  YY8    O88 8     8    Z 8     O80   8 O8   8  0 8      89 Y88 O 4

BTXT.AGO..A9..AAEANC    GAP9AJAOANDQFEAJ-PA     NONOA+OHGOBDAJABAANO    A.ODEAJ-A+OD06130073
9    99   98  99-99Z    Z898ZZ99ZZ9Y98ZQ9O 9    9Y9YZ-9RZ 9OZZ99ZZ9Y    Z 9OZQ9OZ-90
     Y8   Y   Y  Y88     O 4 8Y8 Q8    O8  8    8 8  O80     8Y  Q8      8  O8  O8

BTXT.AAZ..A9..AAKEND    NAAAODGAA.KAOAO'OA+OA    EAQDGOBDAJADAANOA.AD    EAJ-H.NMPA.F06130074
9    9R8  98  99 Q9Y    9Q-990ZRR  9989OZ-98    ZQ9OZ 9OZZ99ZZ9YZ 98    ZQ9OZ 9Y 9 9
     Y8   Y   Y  8      8O  8  88  Y8O8  O8O    O     8Y  Q8   Y       O8  8

BTXT.AA-..A9..AAADFD    .FGOBZAJADAANOA.ADEA    J-H.NMPA.HADGOBZFDKR    PCADAD+-OYEA06130075
9    9R   98  9998-9    9Z 94ZZ99ZZ9YZ 98ZQ    9OZ 9Y 9 998Z 94-99     99R9R O94ZQ
     Y8   Y   Y Y        8 8Y  Q8   Y  O      8   8     Y   8  8       Y Y  8

BTXT.AAH..A9..AALBFJ    IJACKJOHQKKAOC-DGOBZ    DCKRC-O2A.OCGAADDH-D    DAADH-OYGOBZ06130076
9    9R-  98  999Z9Z    OZ998Z909   99QO9Z 94   -Q9 809 - 9QZRR --09    Z9RYRO94Z 94
     Y8   Y   Y 8 8      8Y  88    Y8Z    8    Z8  8  8Z 88  O       Y8  8   8

BTXT.AA-..A9..AAQEC.    O2F..DGOBZEANEGAB+EA    NFG+B+AJAAAANOA.AAEA    J-A+4ZGOBUFBO6130077
9    9RO  98  99988     9 -  9Z 94-99QZ89 -9     9QZ-9 ZZ9RZZ9YZ 9RZQ    9OZ- 5Z 9Q-9
     Y8   Y   Y         8       8 Y8O O   Y     80 O   8Y8 Q8   Y8 O    8  O 8   9

BTXT.AJH..A9..AAKRH+    KOA.BZ+.A4EA+AE+AADB    GAJOD+G.J9EAJDAAODGA    AAOEGOJBAJAM06130078
9    999  98  999 ZO    9 Z 98   98Q9099 -89Q    ZR999 Z 98ZQ9R899099    899QZ 99ZZ99
     Y    Y   Y 8      8   8   Y Y Y   O8Z      8       4   OOY8Z Y      OY8Z   8 8Y

BTXT.AJ...A9..AAAAA.    A.1GEAJDEAJDA.KY+..AH    H+KODA+AEA+AGJJ-DHP-    EAEMGOJZH+AM06130079
9    99   98  99ZZ9     Z  RZO9-ZQ9RZ 9   9Z     Z09 Q9O9Q9O9ZZ9 -R9     ZQ98Z 960 99
     Y    Y   Y QY      0 O8   0  8  Y           8  Y Y Y Y Y 8  O8       8   8  Y8

BTXT.AJH..A9..AAB+1K    D31KFO1KEAMFKC1ZADEA    JBAKZFG9F.KQG9ELNOG+    JDAANPEAOHQKO06130080
9    99R  98  99Z 9     -  9-  9Z89- 9 498ZQ    9899199 - 9 9 -89YZ-    9-ZZ9YZQ9R9Z
     Y O  Y   Y  8       8   8 O O    Y  O     8 88 8    8     8  O     O Q8  O

BTXT.AJA..A9..AAGOJW    EALBQKHAADKLNOAAELNO    GAJFEJMDHAADKBAEAHGO    J2AANPEAOHAA06130081
9    99Q  98  99Z 9     ZQ9Z9ZRQ98 99YQ9-89Y    Z89QZZ9ZRQ98 99899Z    9 ZZ9YZQ9RZQ
     Y O  Y   Y         8    Y  8    8         0 9 8 8  Y  Y Y         Q8  O

BTXT.AJY..A9..AANAAA    P-GAL2HAADKLNOAAKAPD    KMEANOGAKMEJMDKAPDAA    Q9AJAJA.NFEA06130082
9    99   98  9990-9    9 ZR98R898 99YQ9 99R    9 -99YZ899ZZ9Z 99R99    98ZZ9ZZ 9-ZQ
     Y    Y   Y 80      8 8   OY  8    8       8 Y8  O   8 8  8 Y8      8Y8  80 O

BTXT.AKJ..A9..AAJD+A    ADAJACAAAEA.NOEAJDKA    ND2EHAADEAJBAHNDAJAJ    O9LKGJKKGOBZ06130083
9    99Z  98  99  99-     98ZZ99ZZ98Z 9YZQ9-  9    9- 9RZ98ZQ9Z9Z9YZZ9Z    929ZZZ99Z 94
     Y 8  Y   Y 8 Q      Y  8Y  QY   8  O8      80 8 QY  O8 8 8  8Y8      8 8  8 8   8

BTXT.AKH..A9..AAEAPB    AAJCEALBH.NM.ZABGOBZ    EJMDA.LHADAJNA.AAAG+    KBBA.CEG.JG+06130084
9    99R  98  99ZQ9Z    9RZ9ZO9ZZ 9Y 499Z 94    ZZ9ZZ 99ZZ9Z 9 999Z-    9Y-9 9-Q ZZ-
     Y    Y   Y O 8      88   8  8  Y8   8      8 8 8   Y8   YY8 O       Y   Z 8 O

BTXT.AKA..A9..AAKHGO    BZFHKQEAPBABPJEANOG+    KBBCO4GOKBAJABAANOA.    O4EAJ-A+O4PA06130085
9    99Q  98  999RZ     94-99 ZQ9Z999 -99YZ-    9---98Z 9 ZZ99ZZ9YZ     98ZQ90Z-98 9
     Y    Y   Y O      8  8  O 8 88  Y8  O     O  8      8Y  Q8        8  O8  O8  8
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OBJECT DECK IMAGE THREE LINES/CARD COLUMNS 1-20,21-40,41-60,61-80 PERIODS ARE BLANKS

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BTXT.AKH..A9..AANONO    G0BDEALBQ9MJOD+AOHGO    BZEJMDKAPBAAFAKRGOBZ    EMNOGAB9H-NM06130086
9    99   98  999Y9Y    Z 90Z09Z98Z9Q Z9-Z      94ZZ9Z 99R99-99 Z 94    - 9YZ894Z 9Y
     Y    Y   Y 8 8        8  88 Q8              8 8 8  8 Y8  8   8       8 0   8

BTXT.ALA..A9..AAFA-B    FA-CEALBDJO8Q9LZNJOD    K9GJLZAAAA+9ADG0BZH-    NMF.-BELNOG+06130087
9    999  98  99-8 9    -9 9ZQ9Z8Z9 92928Z9-    93ZZ9ZZZ99 699Z 94Z     9Y-  9-89YZ-
     Y Y  Y   Y  0          8 88   8  88          8   QY  Y8  8          8      8 0

BTXT.AL9..A9..AALFAA    NPEAOHAAP-GAL2KB-NAE    .ZAMAANBEADHAAP-GAL2    KB-JAEKA-MNP06130088
9    998  98  9990ZZ    9YZQ9R-99 ZR98 9 998    699ZZ9-ZQ9R-99 ZR98     9 998 9 99Y
     Y    Y   Y   Q     8 0   8  8     Y        Y8 Q80 0   8  8        8Y  Y  8

BTXT.AL+..A9..AAKA-Q    NBG0BZEAJBAMJCG0BZB1    -MB2-QEJMDKB-NAHHJAD    KENOJAEJMDKB06130089
9    99-  98  99 9 9    9-Z 94ZQ9899ZRZ 94-     9-  9ZZ9Z 9 999RZ98      99YZ9ZZ9Z 9
     Y 0  Y   Y  Y      80   8 08 8 8    8          8 8     Y  8Y          88 8  8 8

BTXT.ALQ..A9..AA-JAH    HJADEYJAG+B+KENOJAEA    LB.ZAMGOBZLZABNOEA.A    GALOEY.AGALO06130090
9    990  98  99 999    RZ98-3Z9Z-9  99YZ9ZQ     9Z 699Z 9492ZZ9Y-9 9    Z89 -3 9Z89
     Y    Y   Y  8Y      8Y   8Y 0    8 8       8  Y8   88   8 Y Y       0    Y O

BTXT.ALS..A9..AAEO.A    G.B+AZAAGOLD+.ADKZGA    LDFJBJMEF+ME2+AHNODO    AGFDAGGJAHG906130091
9    998  98  99-  9    Z 9 Z299Z 9Z  9892Z8    9Q9ZZZ99--99 -999Y-     99-9998Z999
     Y    Y   Y   Y        Y    8 Y   0         Z 8 8   0   OY 8         Y8 8Y8 8Y

BTXT.AMQ..A9..AAH+NM    BH+CKC+FNQPCADADKA+A    KO.NADDCKQBDMGH+KO+-    OHEA+AEA+AG+06130092
9    999  98  99Z 9Y    -9 9 9 990 99R9R 9 9    9   99-Q9 -99QZ 9  0    9QO9 9Q9 9Z-
     Y    Y   Y   8         8  Y Y    Y         8   Y Z8       8       8 Y Y Y Y O

BTXT.AM+..A9..AAMFA.    LQ+.AHDA+AG+MMEA+AGJ    MKEAAGG+MMA.LA+.AHDA    +AG+MMEA+AGJO06130093
9    99   98  999QZ     99  9ZQ9 9Z-90Q9 9ZZ    9Z-99ZZ-90Z 99  9ZQ9    9Z-90Q9 9ZZ
     Y    Y   Y         8   Y Y Y O   Y Y 8       YY  0    8Y  Y  Y       Y 0   Y Y 8

BTXT.AMH..A9..AAMBAB    ADGAMMABOXGAMFFDKQFA    KQGCEAMGGCA.KYBAMGGO    MF.+ADAJABAA06130094
9    990  98  9990-9    9ZZR90-99 Z89Q-99 -9    9 9Q-99Q9YZ 9 -99QZ     9R 098ZZ99ZZ
     Y    Y   Y         Y 8   8  0   8  Y      8 Z Y       8  Y        0  Y  8Y  Q

BTXT.AM+..A9..AAADA.    ADEAJDG8QBAJNOPGAHAH    KDAHAAKAAEJAEAJAG.B+    EOJAGJMDEFJAO06130095
9    990  98  9998Z     98ZQ9-9 9RZZ9Y 99999    99999 999Z9- Z9Z 9      - Z9ZY9Q- Z9
     Y    Y   Y Y       Y 08       88   Y Y      Y Y8 YY88Y  8Y          8Y   Z  8Y

BTXT.AM8..A9..AAGJB+    AZAAEYJAGANAEAJAG+MQ    +JADAJAFAAAHA.AHEAJ-    G5DEP-HJK2E.06130096
9    99   98  99ZZ9     Z299--3Z9Z89R-9Z9Z-9    Z98ZZ99ZZ99Z 99ZQ90     9 -Q9 ZZ9 -
     Y    Y   Y 8       Y   8Y 0 8 Y8Y 0        8Y  8Y  QY  Y  O8        Z8  88

BTXT.ANA..A9..AAJAG+    N9AZAAGONZE-N4NAJA.A    G+NOE6.AG+N9FBP-AJNO    PGNONOE-N4E/06130097
9    99Z  98  99Z9Z-    98Z299Z 96Z 98 9Z9 9    Z-9 -8 9Z-96-99 ZZ9Y    Q9Y9YZ 98-
     Y Q  Y   Y 8Y 0      6  Y    8      Y8Y Y    0      Y O    8  88       8 8

BTXT.ANQ..A9..AA.AGA    QBKAJA.AAZAAGONKH.PF    ADAAA.P+G.NFH+PBA+LA    ++AHDA+AG+NHO06130098
9    99Z  98  99 9Z8    9R 9Z9 9Z299Z 9ZZ 98    ZZ998 9 Z 9ZZ09RZ 9R    9ZQ909Z-9-
     Y    Y   Y Y O       Y8Y Y  Y        8      Y   8   8 8   88        Y  Y Y O

BTXT.ANJ..A9..AAEA+A    GJNJA.AAF.ADOEE.+AGA    NMB.NEQCEAJBAAOFQDA.    OFE..AGAND..06130099
9    99Y  98  99Q909    ZZ9YZ 9R9 ZR9Q-  9Z8    9YZ 9 98ZQ98999Q9-Z     9Q-  9Z89Q
     Y    Y   Y Y Y     8    Y     8Z   Y O              08 8Y8Z 0       8Z   Y O 9

BTXT.ANQ..A9..AAPFG6    ABP-GANAABKQGANOGONA    Q9CAPHKBQAAAEAJBAMJ9    EAJBAAAADFKR06130100
9    99   98  99989     -99 Z898-99 ZR9 Z 98    988Z9R 999Z9ZQ9899Z7    ZQ989999-Q9
     Y    Y   Y 8       8  0 0  8  8     0    3 Q8    8Q  08  88      08 8YYY Z8

BTXT.AOA..A9..AAGOBZ    DCP-+.2+A.2YADAFNA.A    AAGAODEG.AG+OJEG.AGA    ODKA.AAABG.F06130101
9    99R  98  99Z 94    -Q9    -Z  6ZZ99 9 9    Z9Z898-Q 9Z-9Z-Q 9Z8    9Y 9 9Z9-Q 9
     Y 8  Y   Y   8     Z8     0      Y Y Y    Q  0   Z Y O 8 Z   0       Y YQ  Z

BTXT.AOH..A9..AAGOO+    FDP-Q9H.2+GCAJ2YDFP-    AZAFNAJAAAGAO4EGJAG+    O-FAP-GCKBAE06130102
9    99Z  98  99Z 9    -99 94R  -9QZZ 6-Q9     Z299 9Z9Z9Z898-QZ9Z-    9 -99 9Q 998
     Y    Y   Y        8       0 Z 8   Z8       Y  Y8YQY 0    Z8Y 0       8  Z  Y
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OBJECT DECK IMAGE THREE LINES/CARD COLUMNS 1-20,21-40,41-60,61-80 PERIODS ARE BLANKS

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BTXT.ADA..A9..AAJABA    ADHZADGCEAJBAZJPG0BZ    L9DEKQEANOGAP9A+NOF.    +AEX+AGAOFEC06130103
9    998  98  9929-9    98Z2999QZQ9893ZZZ 94    93-Q9 -99YZ896Z 9Y-     9-  9Z89Z-
     Y O  Y   Y 8 Y      Y   Y Z O8 8 8    8    8  Z8  Y8  O    8       Y   Y O 8

BTXT.ADH..A9..AA+AGA    OFE0+AG.P9AEAAG0OKAA    NOQZLZGJOSAJAAGOOWEA    L4QKKZGHEA+A06130104
9    99-  98  99 9Z8    9Z-  9Z 98ZR99Z 9YZZ    9Y9593ZZ9 ZZ99Z 9 ZQ    9 9Z9290-9 9
     Y O  Y   Y  Y O      8   Y  4  Y     Q     8   8  8   8Y              Y

BTXT.ADO..A9..AAGAP9    QEA9AAADAAEA.AG+OBQZ    LZQCEX+AG+PMEAJ-HJAA    FJBJPZAZAAQ906130105
9    99   98  99Z898    9ZZ599ZZ99-9 9Z-9Q94    939Z-  9Z-99ZQ90OZ99          9ZZZ91Z29998
     Y    Y   Y 0 4        Y   Y  Y Y O Z       8      Y O 8 O8  8Y          8 8 8  Y  6

BTXT.APZ..A9..AAKAAA    .AK9F-PZL9.AOSG8EAJB    AJZZCA04G8AGADLOCNAA    F-B-PPD7PPC-06130106
9    998  98  99 9Z9    9922 9898 Z989 ZQ98    9922889 9 ZR999ZZZ99    9 Z 9Z-89ZZ
     Y    Y   Y  YQY    Y8     86 Q8    08      88 8 08      Y 8  YY

BTXT.AP-..A9..AAPPAE    AANANO+AGAPFF+AA+AGA    PDOFAEABGOP+OFAEABQE    EG+AG+PBG8A+06130107
9    99   98  999ZZR    99 99Y 9Z89-9 -8 9Z8    9O9RZR99Z 9 9RZR999R    -Q-9Z-989 Z
     Y    Y   Y         Y  Y8  Y O    0 Y O      8  Y    8   Y  O       ZOY O

BTXT.APH..A9..AAAFPF    B+PPA+NPOFKANO+AAAOM    GHABEA+AGHABKCAD+AH+    ADGOPBAZODKA06130108
9    99-  98  999Q9R    Z 90Z 9Y9R 99Y 9-99     ZO99-9-9ZR99 998-9R-    98Z 98Q69R 9
     Y    Y   Y Y 8        8 8  Y8  Y  8        Y  YOY OY   Y OY O       Y     8  Y

BTXT.AP-..A9..AAKOAA    KAK2ABKAK7AAAJKO+JAH    H+KMACADAAKRGANZDA+A    EA+AGJPD60QD06130109
9    990  98  999 09    99 09 99 Q9ZZ9  Z9Z     ZO9 ZQ99-99 ZR96Q9O9    Q9O9ZZ9QZ 99
     Y    Y   Y 8 OY      8 O  Y8 0  88  8Y      8  OY   8  8  Y Y       Y Y 8 Z  8

BTXT.AQH..A9..AAAZOD    AAKRGANDH+KMAJK8+JAH    A.Q9+.A4PGNONODA+AG+    QZBALJA+A9G+06130110
9    999  98  99O69R    -99 ZR9RZO9 ZZ9  Z9Z    Z 98  98 Q9Y9YQ909Z-    96099Z8098Z-
     Y    Y   Y   8       8  8    8  88  8Y     2  Y   8 8  Y Y O       8 Y88  Y2 O

BTXT.AQ...A9..AAQ9AA    ADGAQZADADGAQ9EANPG+    Q+EINOGAABEINOGAABND    NOPHG+Q4EANC06130111
9    99   98  9996-9    9ZZR98-99ZZ896-99YZ-    9-- 9YZ89--09YZ89- 9    9Y9-Z-98-99-
     Y    Y   Y         Y 8    Y O   Y8  O      8  O O 8  O O          8 8 0   Y80

BTXT.AQH..A9..AAGAAB    ABKQGAJOAJNOBCQLAHKQ    GAQDBDQLD7KQF.JAAAAA    ACP/NAJA.AGA06130112
9    99R  98  99Z89-    -99 ZR99ZZ9Y-990-99     Z89Q-990- 9 - Z9ZZ99    ZZ9  9Z9 9Z8
     Y O  Y   Y O O       8  888 88  8    8     0       8   8Y QYY       8  Y8Y Y O

BTXT.AQA..A9..AAJZFA    QMELJAG+QBAZAAF.JAGO    JDE6JAG+QBBDQLBQJANA    NO4NGAJHNANO06130113
9    99Q  98  9996ZZ    90-8Z9Z-9ZZ299- Z9Z     99-8Z9Z-9Q-990- Z9 9    9Y 9Z899 99Y
     Y O  Y   Y 88 Q      8Y O 8  Y   8Y        88  8Y O 9    8Y          8    08   8

BTXT.AQY..A9..AA4FGA    JHNANO38GAJHEYJAGAJH    EXJAG+JDBDQLAZAAEAJA    G+QDKAOGNOHZ06130114
9    99   98  99 9Z8    99 99Y  Z899-3Z9Z899    - Z9Z-99-990Z299-9Z9    Z-9Q 9989Y-6
     Y    Y   Y 8 O    8   8     08   8Y 08      8Y 088       Y  Y8Y    0   Y8 8

BTXT.AJJ..A9..AAODNC    NO3YGAABGCAAOEL98AJ9    KAJAJAGOJAH+PDGOJFH+    KMDAPFDAPMDA06130115
9    99Z  98  999R 9    9Y 4Z89-9QZZ9892ZZ98    9Z9Z9Z 9RZO9RZ 98ZO     9 Z99ZZ99 Z9
     Y88  Y   Y  Y      8    0 O Z Q8 8  Q81    Y8Y8   88  8  8         8  Y 8 Y  Y

BTXT.AJH..A9..AAPBAA    KO+AAHBAP/EA+ADA+AG+    JOEA+AGAJBGAJHOAP/AD    GOJBAAP/GADD06130116
9    99R  98  999QZ9    9  99Z-99 Q909Q909Z-    9ZQ909ZZ9RZ890 99 9Z    Z 9R-89 ZR9Q
     Y8   Y   Y  9 Y    8  YY  Y8  Y Y Y Y O    8  Y Y Q80 O8  Y8 Y       80 08  889

BTXT.AJA..A9..AAGCAD    AZODK9KBKBLEFAF.CCAA    D+ODCEPYBDAAF.CCAAH+    ADCEPYBDAAFJO6130117
9    99Q  98  99ZQ99    Q59R929Z9ZR9Z9 ZR99    R 9RZR95ZR999 ZR990     99ZR95ZR99ZZ
     Y8   Y   Y  ZY      8 8 8 8 8  Q   YY      80  8   YY    YY        Y   8  YY 8

BTXT.AJH..A9..AAJJHZ    ODGCAZODCCAAA+AAGAJU    AAAAGAJUAEAAI+ADCLAA    A+AAGAKHAAAA06130118
9    99   98  999Y-5    9R9QQ69RZR99-0Z9Z89Q    -ZZ9ZR9QZR990 99ZZ99    -0Z9Z899-ZZ9
     Y8   Y   Y 8       8  Z  8   YY  QY O89     QQY 889  Y8  Y   Y       Q  08  QQ

BTXT.AKA..A9..AAGAKH    AOAAD-ODOFBDAAFJKODO    .AGOKZA9ABADAAFJJMHZ    ODGCKD2D2JG006130119
9    999  98  99ZR99    ZZ99R 9R9RZR99ZZ99-    9Z 9ZZ399ZZ99ZZ9 -6     9R9Q 9 Z 9Z
     Y8Y  Y   Y  88      Y8  80    YY 888      Y  88  Y   Y  88        8  Z
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OBJECT DECK IMAGE THREE LINES/CARD COLUMNS 1-20,21-40,41-60,61-80 PERIODS ARE BLANKS

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BTXT.AK9..A9..AAKOKD     2D2OGOKOKD2D2LGOKOKD     2D2JGOKOKD2D2ZHA2DAZ     ODAJAHA.2LEA06130120
9    998  98  9998 9     Z 9Z 98 9 Z 9Z 98 9      Z ZZ 98 9 Z 5ZZ ZQ5      9RZZ99Z  8ZQ
     Y8   Y   Y 8           8      8  8             8  8        Q          8  8Y     O

BTXT.AK+..A9..AAJHKA     2G2LKA2K2NKC2N2PKA2K     2L8.2MB.2/B.2MEAJBAZ     ZFBAAA......06130121
9    99-  92  999- 9     R 8 9 8 8 9 8 8 9 Z      Z-  Z-   -  8ZQ9896      2ZO9Z9
     Y80  Y   Y 8                                                08 8        YQY

BTXT.AKM..A9..AAAAAA     AAAAAAAAPAPG.AAADAOW     JAADAAAAAAAABANDJAAJ     GAPK.AAFCALH06130122
9    99   98  999999     99999999999- 999999      Z99999999999999YZ99Y     9998 9999999
     Y8   Y   Y YYYY     YYYYYYYY8Y8  YY  Y8      8YY8YYYYYYYY8Y8 8YY       Y8  YY  Y8

BTXT.ALD..A9..AAJAAA     BAOFJAA+CANQAAADFFAA     GAQ9AAAAAAAAAAAAAAAA     AAAAAAAAAAAA06130123
9    999  98  99Z999     999QZ99 999O9999Q999     9998999999999999999      999999999999
     Y88  Y   Y 8YY      Y8Z8YY 8Y8 YYY Z YY      8Y 2YYYYYYYYYYYYYYYY     YYYYYYYYYYYY

BTXT.ALD..AD..AAAAAA     ......................   ......................   ............06130124
9    99Z  99  999999
     Y8   Y   Y YYYY

BTXT.ANQ..AF..AAGGGG     AA....................   ......................   ............06130125
9    990  99  990QQQ     99
     Y8   Y   Y ZZZZ      YY

BTXT.AOF..A9..AAAAAA     AAAAAAAAAAAAAAAAAAAA     AAAAAAAAAAAAGOAAAGTP     AAAAAJGJAJGA06130126
9    998  98  999999     99999999999999999999     9999999999990 9999 9     99999ZQZ9ZQR
     Y8   Y   Y YYYY     YYYYYYYYYYYYYYYYYYYY     YYYYYYYYYYYYZ YYY8 8     YYY Y8Z8 8Z8

BTXT.AOF..A9..AAJJAA     AAAAAAAAA9AAAFADC.AG     B.AAAAAAACAAAAAAAAAA     AAAAAAAAAAAA06130127
9    990  98  99ZZ99     99999999979999Q988 99     Z 999999999999999999     9999999999
     Y8   Y   Y 88YY     YYYYYYYY  YYYOY   Y8       YYYYY Y YYYYYYYYYY     YYYYYYYYYYYY

BTXT.AOF..A9..AAAAAA     AAAAAAAAAAAAAAAAAAAA     OWAAAAAAAAAAAAAAAAAA     AAAAAAAAAHAA06130128
9    99Q  98  999999     99999999999999999999     9 999999999999999999     99999999999R
     Y80  Y   Y YYYY     YYYYYYYYYYYYYYYYYYYY     8 YYYYYYYYYYYYYYYYYY     YYYYYYYYY Y8

BTXT.AO6..AH..AAAAZA     AAFA..................   ......................   ............06130129
9    99   99  99997R     99Q9
     Y8   Y   Y  Y 8     YYZ

BTXT.APF..A9..AAAAPF     AAAAA.ADAAAAAAAA..C/     YUOIEAMO123456789ABC     DEFENTER.CCW06130130
9    998  98  999998     99999 9999R99999  8          8
     Y8   Y   Y YY8      YYYYY Y YY8YYYYY

BTXT.APF..A9..AA.LIS     T.IN.ENGLISHN+IEKEL.     BBCCHH6.MASK6.RCD.NO     C6.KL6.DL6.KO06130131
9    990  98  99                  90-0000          8     8                  88   8   8
     Y8   Y   Y

BTXT.APF..A9..AAEY6.     DATA6.CYL6.HD.6.MODE     .CMD6.MLCCCBBCCHHRDD     S6DEV6DEVICE06130132
9    99Q  98  99  8          8    8    8             8                      8    8
     Y80  Y   Y

BTXT.AP6..A9..AA.ADD     RESS.XXX6NUMBER.OF.T     IMES6TIC.M-8.INSERTE     DSET.FILE.MK06130133
9    99   98  99                  8                8    8
     Y8   Y   Y

BTXT.AJZ..A9..AA.INS     ERTEDMKEYWORD.MISMAT     CH.ON.INPUT.-MUNDEFI     NED.SYMBOLES06130134
9    9Z6  98  99                  8                        8
     Y88  Y   Y

BTXT.AJO..A9..AANMSY     MBOL.TABLE.FULLYLAST     .CMD.IGNOREDNMUNIT6X     XXX.DATA.COM06130135
9    9ZZ  98  9988                    3                        98   8
     Y8   Y   Y

BTXT.AJF..A9..AAPARE     .ERROR.BYTE.NOC.XXXX     X.LX6XX.LX6XXMUNIT6X     XXX.-NO.DEV.06130136
9    9ZQ  98  99                        8          8 8   8 8   8    8
     Y8   Y   Y
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OBJECT DECK IMAGE THREE LINES/CARD COLUMNS 1-20,21-40,41-60,61-80 PERIODS ARE BLANKS

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BTXT.AJO..A9..AAEND.     OR.CUE.I/O.INTRPTMDE     VICE.QUEUE.FULLYLAST     .CMD.IGNORED06130137
9    9Z   98  99                      8                        3
     Y8   Y   Y

BTXT.AZF..A9..AACOND     .CODE.6.9.ON.UNIT.XX     XXNNMUNIT6XXXX.-.I/O     .INTRPTYUNIT06130138
9    919  98  99          8                        998    8                 3
     Y 8  Y   Y

BTXT.AZF..A9..AA.CHE     CKNNMUNIT6XXXX.-.INC     ORRECT.CSW.OR.SNSCSW     .XX.XXXXXX.X06130139
9    91Z  98  99              998    8
     Y    Y   Y

BTXT.AZ6..A9..AAX.XX     .XXXXSNS.XX.XX.XX.XX     .XX.XX.XX.XX.XX.XX.X     X.XXLOOP.XXX06130140
9    918  98  99
     Y    Y   Y

BTXT.AZF..A9..AAXXNN     MUNIT6XXXX.-.START.I     /O.NOT.ACCEPTED.NLOO     P.IS.FINISHE06130141
9    91-  98  99  99          8    8                        9
     Y O  Y   Y

BTXT.AZW..A9..AAD.ON     .UNIT.XXXXNSTOPPED.O     N.ERROR..MMAQEXTAJSV     CAZPGMAAMCKA06130142
9    91Q  98  99                  9                        8899   9Z        98   9Z   9
     Y 9  Y   Y                                             Y    Y8        Y    YQ   Y

BTXT.AZZ..A9..AA9I/O     NMSYNTAX.ERRORM.ON.I     NPUTNAAAXXX-INTRPTYP     SW.6.XX.XX.X06130143
9    926  98  998         98              8           9999          3        8
     Y    Y   Y                                      YYY

BTXT.AZO..A9..AAXXX.     XX.XXXXXXNXXAAAAAAAA     AAAAAAAAAAAAAAAAAAAA     AAAAAAAAAAAA06130144
9    928  98  99                  9  99999999     99999999999999999999     999999999999
     Y    Y   Y                      YYYYYYYY     YYYYYYYYYYYYYYYYYYYY     YYYYYYYYYYYY

BTXT.AZF..A9..AAAAAA     AAAAAAAAAAAAAAAAAAAA     AAAAAAAAAAAAAAAAAAAA     AAAAAAAAAAAA06130145
9    92-  98  999999     99999999999999999999     99999999999999999999     999999999999
     Y    Y   Y YYYY     YYYYYYYYYYYYYYYYYYYY     YYYYYYYYYYYYYYYYYYYY     YYYYYYYYYYYY

BTXT.AZF..A9..AAAAAA     AAAAAAAAAAAAAAAAAAAA     AAAAAAAAAAAAAAAAAAAA     AAAAAAAAAAAA06130146
9    92Z  98  999999     99999999599999999999     99999999999999999999     999999999999
     Y 8  Y   Y YYYY     YYYYYYYYYYYYYYYYYYYY     YYYYYYYYYYYYYYYYYYYY     YYYYYYYYYYYY

BTXT.AZF..AB..AAAAAA     AAAAAA................   ......................   ............06130147
9    939  99  999999     999999
     Y    Y8  Y YYYY     YYYYYY

BTXT.AZJ..A9..AAGAAH     BBXQBBABGAAAAAFHCHLT     CSTPBHAAAFJCLSTCCCWA     AKSHSTRTRDRY06130148
9    939  98  990999     YO 0 90 999999-0         0   9 9999YO   9   9     99 0      3
     Y    Y   Y ZYY          Y  Y YYY8              YYY8       Y     Y

BTXT.AZA..A9..AAFSTR     DRYBSYAAGZDDVCQCDVQA     AABCRQTBFADRSTAAAFHC     SCPAAAHDCSWQ06130149
9    938  98  990           39 399960    9   9     99-0   0 99   999909     99RZ9
     Y    Y   Y                YY8         Y     Y 0      Y    YYY8       YY8

BTXT.AZA..A9..AAAAA+     DSNSQAAAHBRPAAA-BDDA     AAFBHXAXAAJFBTACTSTA     ADBBTCAAJHBM06130150
9    930  98  9999R-     9    99RO9  99RO9  9     9RQO  9 99990 99   9     99 9  999-9
     Y    Y   Y YY8          YY8    YY8    Y     Y89     YY    Y    Y     Y     YY
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BTXT.AZI..A9..AATAAJ     FCDMPAAKHBLPAAK+DRMV     QAAKFDMDSTDSTMDAAK4B     WTAALZFCMPAR06130151
9    93-  98  99 999     Q9   999R9  999-9     999-0    9   999 9     99920
     Y O  Y   Y  YY          YY     YY 0      YY           YY        YY 8

BTXT.AZ1..A9..AAEDCM     PRCCMPAAK-DTMDLAAG+D     SBSTBSBAAGDCCPYBCPAA     GQDNTBFAAAMC06130152
9    93   98  99 0          9   99909     999-0      9  99900   9  99     9 9    99R99
     Y    Y   Y               YY        YY8           YY8        YY     8    YY8

BTXT.AZZ..A9..AACMDG     CAAJBNPDDAJCSNSDFAJC     RLSBRLDFAJDRSRVCRSVP     AAAGSTFLMSKF06130153
9    941  98  99   Q     999Z9  999Z9   -99ZO     9   -99ZO   9   9     9890       0
     Y 8  Y   Y   Z       Y8     8Y8      Y8          0 Y8       8     0Y
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OBJECT DECK IMAGE THREE LINES/CARD COLUMNS 1-20,21-40,41-60,61-80 PERIODS ARE BLANKS

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BTXT.AZ/..A9..AASTFL    MKDFLMKDSTMKCSFMBMKL    FHADSKHODSKHHCFHADSK    CLDSKCCGFHAB06130154
9    94   98  99        0  0   0  9  9         9990   9  99990          9  99995
     Y    Y   Y                    3            Y      8  Y               Y

BTXT.AZI..A9..AASKLA    AJFRCLBRTCRCLPAAJDRS    FRCAAJERSTBFGCCJESPC    NTFSPCCNTGAA06130155
9    94-  98  99  99     9Z0        9  99929     99Z0      999Z0          9      99R
     Y    Y   Y          Y8                      Y8        8  8                  8

BTXT.AZJ..A9..AAJDRN    NDCRWDBRWCAA.BRNCNLD    PAAJBMAPAAJBRGZAAJCN    8LDBKSPBBKCB06130156
9    94   98  99Z0       0  9  99RZ0  9         99RZ9 999RZ9  79RZ0          0  0  9
     Y    Y   Y 8                    8 88        8 88  Y  88     88

BTXT.AZA..A9..AASRZA    AJDDSRLCSS?0AAJCFSRR    AAJCPSPJAYJBRSBJAJDN    HBTBNHSRDN0R06130157
9    959  98  99  79     RZ0    9   79RZ9   8    9RZ9   99ZZ9  9Z9Z0          0  0
     Y 8  Y   Y  8      88             88  7     88     0 8    88 8

BTXT.AZA..A9..AADRDN    0AA.CDSPCHESCHASAAZ/    DRDARAAZGCWRTBWRAWAA    JJCPLLBTPCPR06130158
9    95Z  98  999        99500    0   9 996      0  9 996 9   0  9 9R    ZZ0   0  0
     Y    Y   Y          YY 0                    YY                 88    88

BTXT.AZI..A9..AATDPR    NTJAJJAPNCH42BNRAAJJ    FPNCH42ZAJJGPNCHBNRA    AJJCPCHDPNCH06130159
9    958  98  99 9       9RZZ9          RZZ      9        1RZZ9      9    RZZ0   9
     Y    Y   Y          08888          888               888             888

BTXT.AZA..A9..AADAAA    DXXXXG9DHACCHACHQABH    ACCHAZ.LJBDTCQDTCKDQ    E.LJCHDTCKDH06130160
9    95-  98  99Z999     9    Q8Z990  90  90     99   5 ZZ0  0   9       8 ZZ0   9
     Y 0  Y   Y 8YYY          Z1  Y   Y   Y     Y    0  8                  8

BTXT.AZZ..A9..AAY.LJ    DQHDTDHQDTDKDQH9EDAC    QLD8DQBDABQDCQIDAEDA    DHGHDBHDBDHA06130161
9    95   98  995 ZZ          0   0   9   1Z990      0  0 90  9   RZ99      0    0  9  R
     Y    Y   Y   8                       8Y             Y        8Y              0

BTXT.AZZ..A9..AAEDAC    DQHCQHDCHQDZ.BJCQLK8    KABQKBKQA.BJDHGHKBHK    BKHY.BJCQHKC06130162
9    961  98  99Z990        0   9   1 ZZ0   0    90  9  8 ZZ0    0    9  8 ZZ0   0
     Y    Y   Y  8Y           8  0              Y       8                  8

BTXT.AZJ..A9..AAHQKC    KQHGKEAAAHDACJBRDARO    ACJFCNTKDTCCKDFACJCK    DT8KDBJAABDC06130163
9    968  98  99   9        Q99999 999Z0   9 9     89ZO       9   989ZC      9  9Z989
     Y    Y   Y              Z8 YY   Y 8   8     0 8             80 8           8 0

BTXT.AZA..A9..AAFJAJ    BDTADBJAJCCRDBCDBPLK    HAACCNTACBJAJAADJAJG    BCKWRDSCBCKB06130164
9    96-  98  999Y9Z       0  9 9Z9Z0   0  9  9    9990   9 9Z9Z999Z9Z0          0   0
     Y    Y   Y   8            8 8              YY       8 8 Y88 8

BTXT.AZI..A9..AABKBB    ASJAJBBFGJEHAAHNAXAB    ROBRANAYAFCNTKDTCCKD    AAYABSPCLCNT06130165
9    96   98  99  C     9 Z9Z9   Q99099 98090      9 998790        9    9879Y
     Y    Y   Y          Y 8 8    Z8  Y   09Y        Y80 Y             0 Y

BTXT.AZA..A9..AAKDTE    SPCKDEALACKDTBKDAAJ+    BDCEAZABPABDTADJAJAB    BFAAJJAAG.AA0o130166
9    979  98  99   9       98Z90    9  9RZ0      9  98190 90  9 9RZ99    9RZZ99Q 99
     Y    Y   Y             80 Y        88        0 Y   Y     088Y       888 YZ YY

BTXT.AZ9..A9..AAAAAA    AAACSKPJAAABSLAAAABD    CAAAAELNGTNHAAABPCBA    AACFRMDAAABN06130167
9    978  98  99999R     9999    Z9999  89999    99999      99999  99      999   99999
     Y 1  Y   Y Y Y8       YYY     8YYY   0YYY     YYY      YYY    Y      YY     YYY

BTXT.AZA..A9..AAT.JA    ADRPPLBRF.AAADSNDMER    .GAGAGAKZAHCDKBA+NGH    +ABEA+AGJ7JA06130168
9    97R  98  99  Z9     30    3   8990    3     Q99999 79RC9 99 907     099Q909ZZ YZ
     Y 0  Y   Y  8Y          Y        8YY        ZY Y Y  Y  Y   Y 8     Y  Y Y 8

BTXT.AZR..A9..AA-CZH    FAAGA+A.A/DA.8H+.AHC    A+A. A8DA.KY+.AHDA+AE    A+AGJ7MADABE06130169
9    970  98  99 04Z        9909909ZR 0Z      9ZO    90Z8 87 9   0Z909090    909ZZ  ZZ99--
     Y    Y   Y  Z8          YY Y Y 8 9         Y    Y 0    3   Y  Y Y       Y Y 8     Y

BTXT.AZJ..A9..AAG-AG    +7MA.74+.A98A80AAADG    .7GU+A9U03ZFA+AEA+AC    +8HA.8-+.AHD06130170
9    979  98  990 9Z          - YZ      980S  -89ZZ    8  Z098Z  8Q9090909Z    - 9Z  0  9ZQ
     Y 0  Y   Y Z Y           0         Y  Y   0Y       0    Y2     Y Y Y Y          Y
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OBJECT DECK IMAGE THREE LINES/CARD COLUMNS 1-20,21-40,41-60,61-80 PERIODS ARE BLANKS

```
BTXT.AZJ..A9..AAA+AG    >7HEA>AG+8J.>PD.+KME    AJBA9ZJKGAA8YGA8BEAJ    8A>ZNEAJBACZ06130171
9    989  98  999092       . 0909Z- Z 09R 05 /     Q98981Z 999  Z9 RZQ9    89 18ZQ98981
     Y 8  Y   Y Y Y        0  Y Y 0 8  9   8      08 8588  YY   Y 0 08      8 8  08 8 8

BTXT.AZA..A9..AANEAJ    8AE2AEAJc894ZBEAJBAZZ    2EAJBA9ZNEAP8AFZOE2N    0G.8FE7NOGJ806130172
9    98R  98  99YZQ9     8981 Z0989522Z0989932    8ZQ98912020992992 - 9    YZ  -- 9YZZ
     Y    /   -  08       8 0  08 0 0  08 886      08 8 8  0 8 8R  8        0  3  8

BTXT.AZI..AS..AAFDGN    0LZ.....  .....9R/YAOAN    99A+ADDKGAA8SBAACGOA    8EAJBAMZUG0806130173
9    980  98  99--99     /9222Z9YY0Z0992    Z99R    2 9 Z9- 999 8-99-Z 9    -ZQ98992 Z
     Y    Y   / 0  8       8  00  8Y      08        Y Q8   YY   Y           08 888

BTXT.AZA..AS..AABAAA    AA..AAAAAAAAAAZYAAAOP    FAAGAZOADAAGAABADAAA    AZBAAAEAAA9A06130174
9    9R   99  99R999     9Y9999  Z9999999999Q    999997 9999999-99999    98R999Z99979
     .    Y   Y 0YYY     YYYYY  8YY  YYYYYYY Z    YY8Y   YY8Y  Y YYY     Y 0YY 8YY  Y

BTXT.AZ9..A9..AAAEN     .AAAAAAAAAAAAAAAAAFA    AA+AAA9AAAAAAADF.R.I    .E.N.D.-3-.D06130175
9    9R   9R  999999     .9Z9999999999999999Q9    99-999799999999
     /    /   Y YY Y     YY YYY YYYBYY QYYYDY     YY YYY YYY YYY8

BTXT.AZ9..A9..AAESCR    OPTION..N.2841.VOLC.     AO2.DR.2314.VOLC.S01    NMWARNINGM.W06130176
9    911  98  99            9                        8                  98      8
     Y8   Y   Y

BTXT.AZY..A9..AARITE    .COMMANDS.MAY.DESTRO    Y.DATANON.A.CUSTOMER    .PACK/CELL.006130177
9    918  98  99                                      9
     Y8   Y   Y

BTXT.AZJ..A9..AAR.CE    .TRACKSONINTERPRETIV    E.PROGRAM.TO.XEQ.CCW    .COMMANDSNTH06130178
9    910  98  99                 89                                        9
     Y8   Y   Y

BTXT.AZR..A9..AAAT.Y    OU.ENTER.FOR.ANY.DEV    ICEESNCNAFTER.INSTRU    CTIONS.ARE.T06130179
9    91   98  99                                  8 889
     Y8   Y   Y

BTXT.AZJ..A9..AAYPED    YENTER.EACH.COMMANDN    WHEN.PROCEED.LIGHT.T    URNS.ONCNTER06130180
9    929  98  99                 3                        9                  89
     Y8   Y   Y

BTXT.AZA..A9..AAMINA    TE.EACH.ENTRY.WITH.A    N.ALTERNATE.CODE.5.E    EOBNCNAFTER.06130181
9    928  98  99                                          8                  889
     Y8   Y   Y

BTXT.AZA..A9..AACCW.    CHAIN.HAS.BEEN.ENTER    EDYTYPE..GOCTO.ENTER    .NEXT.CCW.CH06130182
9    920  98  99                                 3        8
     Y6   Y   Y

BTXT.AZI..A9..AAAINY    PRESS.REQUESTYTYPE.R    ESETCNCPU.MODEL.XX6M    INVALID.CPU.06130183
9    92-  98  99   3                 3                  89          98
     Y80  Y   /

BTXT.AZI..A9..AAMODE    CLOSE.29-75N9FPADAAG    AKAADAAGAK9ADAAAAKDA    AAAGAKFADAAG06130184
9    92   98  99                 3          269699999    99Z99999998999999929    999999899999
     Y8   Y   Y                              / YY8        F80  YY8Y8Z  YYYY8    YYY8Y8   YY8

BTXT.AZZ..AK..AAAAAA    PA.OABPL..AAAAG.....    ..........  ..........    ..........06130185
9    931  99  999999     99999999999999
     Y8R  Y   Y YYYY     JY8 8 8 8YYYZY7

BEND.....               .....  ..........      ..........  ..........    ..........06130186
0
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1. PURPOSE

1.1 INTENT. THIS PROGRAM FUNCTIONALLY TESTS THE 2314 CONTROL UNIT. ALL FILE COMMANDS ARE TESTED AND ALL SENSE BITS THAT CAN BE FORCED BY PROGRAMMING ARE CHECKED.

1.2 BRIEF DESCRIPTION OF EACH ROUTINE

SECTION	ROUT.	EXPLANATION
F6A0	1	TEST I/O
	2	SENSE I/O
	3	NO-OPERATION
	4	CONTROL HEAD SEEK (HH)
	5	CONTROL CYLINDER SEEK (CCHH)
	6	RECALIBRATE
	7	CONTROL SEEK (BBCCHH)
F6A1	1	READ WRITE HOME ADDRESS
	2	SEARCH = HA, WRITE-READ RECORD -0-
	3	SEARCH = ID, WRITE-READ COUNT-KEY-DATA
	4	TEST GAP LENGTH
F6A2	1	SEARCH = ID, WRITE-READ KEY-DATA
	2	SEARCH = KEY, WRITE-READ DATA
	3	SEARCH = ID, WRITE-READ DATA
	4	SEARCH = ID, READ COUNT
F6A3	1	SEARCH COMMANDS
F6A4	1	FILE PROTECT
F6A5	1	CONTROL UNIT BUSY, CONTROL UNIT END
	2	UNIT EXCEPTION
	3	COMMAND REJECT ON INVALID COMMANDS (SEE SECTION 5.6 'NOTE' FOR I/O OPTIONS BYTE REQUIREMENTS IF 'AUXILIARY STORAGE' IS INSTALLED IN THE 2314)
F6A6	1	INVALID SEQUENCES (PART 1)
F6A7	1	INVALID SEQUENCES (PART 2)
F6A8	1	CHANNEL/2314 OVERRUN SENSE BIT
	2	TRACK CONDITION CHECK SENSE BIT (DEFLECTIVE TRK)
	3	CK SETTING OF TRK CONDITION CK SNS BIT
	4	SEEK CHECK SENSE BIT (INVALID ARGUMENT)
	5	SEEK CHECK SENSE BIT (4 BYTES)
	6	TRACK OVERRUN SENSE BIT
	7	END OF CYLINDER SENSE BIT
	8	NO RECORD FOUND SENSE BIT
F6A9	1	TRUNCATED READ DATA
	2	MULTI-TRACK BIT
	3	LONG RECORDS
F6AA	1	ERASE
	2	SPACE COUNT
	3	READ IPL
	4	END OF FILE
F6AB	1	OVER/UNDER TRUNCATION

F6AC	1	HALT I/O ON READ
	2	HALT I/O ON WRITE
	3	CHECK IF CU WILL MISS AN ADDRESS MARK
	4	CHECK IF CU WILL PICK UP AN ADDRESS MARK
F6AD	1	FILE INTERATION
F6AE	1	SEARCH EQUAL KEY-DATA
	2	SEARCH COMMANDS FOR SCAN
F6AF	1	WRITE SPECIAL COUNT-KEY-DATA
	2	WRITE-READ DATA WITH RECORD OVERFLOW
	3	WRITE-READ KEY-DATA WITH RECORD OVERFLOW
	4	READ COUNT WITH RECORD OVERFLOW
	5	TEST WR AND READ DATA WITH OVERFLOW HALF CYL
	6	WRITE-READ K-D, RECORD OVERFLOW, SEVERAL TRACKS
	7	READ COUNT, RECORD OVERFLOW, SEVERAL TRACKS
F6B0	1	RECORD OVERFLOW IN VIOLATION OF FILE MASK
	2	RECORD OVERFLOW TO TRACK WITH INCORRECT HD NO.
	3	RECORD OVERFLOW FROM AN ALTERNATE TRACK
	4	SCAN AN OVERFLOW RECORD
	5	OVERFLOW TO END OF CYLINDER
F6B1	1	6-TH SENSE BYTE COMMAND 06
	2	6-TH SENSE BYTE COMMAND 05
F6B2	1	6-TH SENSE BYTE COMMAND 25
	2	6-TH SENSE BYTE COMMAND 45 AND 75
F6B3	1	6-TH SENSE BYTE COMMAND 55 AND 65

1.3 MODIFICATIONS. NONE

2. PREREQUISITES

2.1 PROGRAM REQUIREMENTS.
DIAGNOSTIC MONITOR PROGRAM
THIS PROGRAM IS RELOCATABLE.

2.2 EQUIPMENT REQUIREMENTS.

CPU
8 K CORE STORAGE
I/O CHANNEL
METHOD OF LOADING PROGRAM
CUSTOMER ENGINEER OUTPUT DEVICE
2314 STORAGE FACILITY
CE PACK OR SCRATCH PACK WITH STANDARD HOME ADDRESSES WRITTEN.

3. USE PROCEDURE

3.1 PROGRAM LOADING. STANDARD VIA DIAGNOSTIC MONITOR AS DESCRIBED BY THE USERS GUIDE.

3.2 PROGRAM OPERATING

3.2.1 SENSE SWITCH CONTROL OPTIONS

THE SENSE SWITCHES SHOWN BELOW ARE IN THE SENSE SWITCH BYTES OF THEIR FACTOR CONTAINED IN REGISTER 15 DURING RUN TIME. THE SWITCH BITS A ZERO WHEN OFF, AND ONE WHEN ON.

SENSE SW. =	FUNCTION	SECTION OR ROUTINE	BYTE AND BIT
0	OFF--PROCEED NORMALLY ON --LOOP ON START I/O	SECTION --ALL EXCEPT F6AD	X004 0
1	OFF--PROCEED NORMALLY ON --LOOP ON COMMANDS OR ROUTINE	SECTION ALL EXCEPT F6A0 F6A1 F6A2 F6AE F6AF	X004 1
2	OFF--PROCEED NORMALLY ON --LOOP ON SEARCH	SECTION F6A3 RT1 F6A5	X004 2
2	OFF--PROCEED NORMALLY ON --LOOP ON SEEK	SECT--5 ROUT--1	X004 2
3	OFF--PROCEED NORMALLY ON --LOOP ON WRITE	SECT--5 ROUT--1	X004 3
4 3	BOTH OFF--PROCEED NORMALLY 4 ON 3 OFF--LOOP ON READ 4 OFF 3 ON--LOOP ON WRITE BOTH ON--LOOP ON READ AND WRITE	SECT--1 ROUT 2,3 SECT--2 RT 1,2,3 RT 4	X004 4 3
4	OFF--PROCEED NORMALLY ON --LOOP ON READ	SECT 1 ROUT 4, F6AE F6AF RT1,4,7	X004 4
6	OFF--PROCEED NORMALLY ON --PRINT ROUTINE TITLE	SECTION --ALL	X004 6
7	OFF--PROCEED NORMALLY ON --PRINT CORRECT RESULTS	SECTION --ALL EXCEPT F6BB	X004 7
8	OFF-PROCEED NORMALLY ON -- BYPASS OPERATIONS ON WRITE-READ FILE (TEST SEEK INTERACTION ONLY)	SECTION F6AD	X005 0

3.3 PROGRAM HALTS. NONE

3.4 PROGRAM TERMINATION. STANDARD--VIA MONITOR CALL SVC D6.

4. PRINTOUTS

4.1 INSTRUCTION TO THE OPERATOR. NONE

4.2 STATUS MESSAGES

4.2.1 STATUS MESSAGES COMMON TO ALL ROUTINES.

-DID NOT INT FROM UNIT XXX AFTER SIO ACC CAW XXXXXXXX-
THIS MESSAGE OCCURS WHEN A START I/O WAS ISSUED AND ACCEPTED, BUT WHEN WAITING A PREDETERMINED TIME FOR AN INTERRUPT IT NEVER OCCURRED. THE MONITOR CALL SVC D8 IS USED TO WAIT FOR THE INTERRUPT. ALL PRINTOUTS WHICH HAVE XX...X IN THEM SIGNIFY THAT DATA WILL BE FILLED IN, FOR THE X, BY THE PROGRAM PRIOR TO THE PRINTOUT.

-GOT CC 2 ON UNIT XXX CAW XXXXXXXX-
UNEXPECTED CHANNEL OR SUBCHANNEL BUSY WHEN ISSUING A START I/O CAUSES THIS MESSAGE TO OCCUR.

-GOT CC 3 ON SIO TO UNIT XXX CAW XXXXXXXX-
UNEXPECTED DEVICE NOT OPERATIONAL ON START I/O CAUSED THIS MESSAGE.

-ERR ON SIO UNIT XXX CSW XXXXXXXXXXXXXXXX SNS XXXXXXXXXXXX CAW XXXXXXXX-
UNEXPECTED RESULTS ON START I/O. UNIT NUMBER, CHANNEL STATUS WORD, SENSE DATA, AND CHANNEL ADDRESS WORD ARE INDICATED.

4.2.2 STATUS MESSAGES FOR ROUTINE 1, SECTION F6A0.

-ROUT 1-CHECK TEST I-O-
ROUTINE TITLE.

-XXXXX GOT CC X SHLD GET CC 0-
IF THE RESPONSE FROM THE TEST I/O IS AVAILABLE, CC 0, -O.K. - WILL BE MOVED IN THIS MESSAGE AND IT WILL BE CORRECT RESULTS. IF ANYTHING MOVED IN THIS MESSAGE AND IT WILL BE CORRECT RESULTS. IF ANY THING BESIDES AVAILABLE IS RECEIVED -ERROR- WILL BE MOVED IN AND ERROR CONDITION CODES INDICATED.

4.2.3 STATUS MESSAGES FOR ROUTINE 2, SECTION F6A0.

-ROUT 2-CHECK SENSE I-O-
ROUTINE TITLE.

-SENSE I-O O.K.-
SELF EXPLANATORY.

-DIDNOT INTERRUPT-
THIS MESSAGE OCCURS WHEN THE SENSE I-O COMMAND WAS ISSUED AND ACCEPTED, BUT WHEN WAITING A PREDETERMINED TIME FOR AN INTERRUPT, BY A SVC D8, IT NEVER OCCURRED.

-ERR-GOT CHANNEL BUSY-
UNEXPECTED CHANNEL OR SUBCHANNEL BUSY OCCURRED WHEN SENSE WAS ISSUED.

-ERR-GOT NOT OPERATIONAL-
UNEXPECTED DEVICE NOT OPERATIONAL ON SENSE COMMAND.

-ERR-CC 1-GOT CSW STATUS OF XXXX-
UNEXPECTED STATUS STORED ON SENSE COMMAND.

-ERR-CSW IS XXXXXXXXXXXXXXXX SNS IS XXXXXXXXXXXX-
IF ANY STATUS BESIDES CHANNEL END AND DEVICE END ON SENSE COMMAND THIS MESSAGE OCCURS.

4.2.4 STATUS MESSAGES FOR ROUTINE 3, SECTION F6A0.

-ROUT 3-CK NO-OP-
ROUTINE TITLE.

-OK-GOT CC 0 ON NO-OP WITH STATUS OF CE + DE-
SELF EXPLANATORY.

-ERR-CSW STATUS IS XXXX SHLD BE 0C00 SNS IS XXXXXXXXXXXX-
IF STATUS IS ANYTHING BESIDES CHANNEL END AND DEVICE END THIS MESSAGE OCCURS.

4.2.5 STATUS MESSAGES FOR ROUTINE 4, SECTION F6A0.

-ROUT 4-TEST HEAD SEEK-
ROUTINE TITLE.

-XXXXX ACT HEAD XXXX EXP HEAD XXXX-
-CSW IS XXXXXXXXXXXXXXXX CSW SHLD BE XXXXXXXXXXXXXXXX-
-SNS IS XXXXXXXXXXXX SNS SHLD BE 00000040XXXX-
THIS IS EITHER THE CORRECT OR ERROR MESSAGE. IF THE HEAD, CHANNEL STATUS WORD, AND SENSE ARE EQUAL -O.K. - WILL BE MOVED IN THE MESSAGE AND IF THEY ARE NOT EQUAL -ERROR- WILL BE MOVED IN. THIS ROUTINE ISSUES A SENSE COMMAND TO MAKE SURE SENSE DATA CAN BE SENT.

4.2.6 STATUS MESSAGES FOR ROUTINE 5, SECTION F6A0.

-ROUT 5-TEST CYLINDER SEEKS-
ROUTINE TITLE.
-EXPECTED HA XXXXXXXX ACTUAL HA XXXXXXXXXX-
THIS IS EITHER THE CORRECT OR ERROR MESSAGE. IF THE EXPECTED AND ACTUAL HOME ADDRESSES ARE EQUAL -O.K. - WILL BE MOVED IN THE MESSAGE AND IF THEY ARE NOT EQUAL -ERROR- WILL BE MOVED IN.

4.2.7 STATUS MESSAGES FOR ROUTINE 6, SECTION F6A0.

-ROUT 6-TEST RESTORE OPERATION-
ROUTINE TITLE.

-INITIAL SEEK IN ERROR,RESTORE OP NOT ISSUED-
BEFORE THE RESTORE OPERATION IS ISSUED THE ACCESS IS SEEKED TO A GIVEN LOCATION. IF THIS SEEK IS NOT SATISFACTORY THIS MESSAGE OCCURS.

RESULT MESSAGE THE SAME AS ROUTINE 5.

4.2.8 STATUS MESSAGES FOR ROUTINE 7, SECTION F6A0.

-ROUT 7-CHECK CONTROL SEEK-
ROUTINE TITLE.

RESULT MESSAGE THE SAME AS ROUTINE 5.

4.2.9 STATUS MESSAGES FOR ROUTINE 1, SECTION F6A1.

-ROUTINE 1-TEST HOME ADDRESS OPERATIONS-
ROUTINE TITLE.

-NOT AT TRACK ZERO OF CE CYLINDER-
-EXPECTED HA XXXXXXXXXX ACTUAL HA XXXXXXXXXX ERROR-
BEFORE WRITE HOME ADDRESS IS CHECKED, THE HOME ADDRESS IS READ AND COMPARED TO MAKE SURE THAT ACCESS IS AT PROPER CYLINDER FOR THIS TEST. IF THE COMPARE IS UNEQUAL THIS MESSAGE OCCURS AND IT INDICATES WHERE THE ACCESS IS LOCATED. THE REMAINDER OF THE ROUTINE IS NOT RUN IF THIS OCCURS BECAUSE INFORMATION MAY BE DESTROYED.

RESULT MESSAGE THE SAME AS ROUTINE 5,SECTION F6A0.

4.2.10 STATUS MESSAGES FOR ROUTINE 2, SECTION F6A1.
-ROUTINE 2 -TEST SRH HA,WRITE + READ RO-
ROUTINE TITLE FOR TEST SEARCH HOME ADDRESS, WRITE AND READ RECORD ZERO.

-RO WAS NOT WRITTEN CORRECTLY-

AFTER RECORD ZERO IS READ IT IS COMPARED AGAINST WHAT SHOULD HAVE BEEN WRITTEN. IF THEY ARE NOT EQUAL, THIS MESSAGE OCCURS.

-OPERATION WAS COMPLETED O.K.-
SELF EXPLANATORY.

4.2.11 STATUS MESSAGES FOR ROUTINE 3, SECTION F6A1.

-ROUT 3 -TEST SRH EQ CT,WR AND RD CT-KY-DATA-
ROUTINE TITLE FOR TEST SEARCH EQUAL COUNT, WRITE AND READ RECORDS.

-R1 WRITTEN O.K.-
-R2 WRITTEN O.K.-
SELF EXPLANATORY RESULT MESSAGES.

-EXP AND ACT R1 ARE NOT EQ-
-EXP AND ACT R2 ARE NOT EQ-
AFTER EACH COUNT-KEY-DATA IS WRITTEN IT IS READ BACK AND COMPARED. IF THEY ARE NOT EQUAL THESE ERROR MESSAGES ARE INDICATED.

4.2.12 STATUS MESSAGES FOR ROUTINE 4, SECTION F6A1.

-ROUT 4 -TEST GAP LENGTH-
ROUTINE TITLE.

-GAP OK-REC FOUND-
CORRECT MESSAGE WHICH IS INDICATED IF WHEN WRITING RECORD ONE THE GAP DOES NOT VARY SIGNIFICANTLY TO DESTROY RECORD TWO.

-GAP VARIED-DESTROYED REC 2-NO REC FOUND-
ERROR MESSAGE WHICH OCCURS WHEN GAP VARIED AND DESTROYED RECORD TWO.

-CSW IS XXXXXXXXXXXXXXX SHLD BE XXXXXXXXXXXXXXX SNS IS XXXXXXXXXXX
THIS ERROR MESSAGE OCCURS WHEN THE GAP VARIES ENOUGH TO DESTROY RECORD
ERROR-
TWO BUT WHEN TRYING TO READ RECORD TWO SOME SENSE BITS BESIDES -NO
RECORD FOUND- ARE SET.

4.2.13 STATUS MESSAGES FOR ROUTINE 1, SECTION F6A2.

-ROUTINE 1 -TEST SRH EQ CT,WRITE AND READ KY,DATA-
ROUTINE TITLE FOR TEST SEARCH EQUAL COUNT, WRITE AND READ KEY, DATA.

-KEY + DATA WRITTEN O.K.-
SELF EXPLANATORY.

-KEY + DATA READ DOES NOT EQ WRITTEN-
SELF EXPLANATORY.

4.2.14 STATUS MESSAGES FOR ROUTINE 2, SECTION F6A2.

-ROUTINE 2 -TEST SRH EQ KEY,WR AND RD DATA-
ROUTINE TITLE FOR TEST SEARCH EQUAL KEY, WRITE AND READ DATA.

-DATA WRITTEN OK-
SELF EXPLANATORY.

-DATA READ DOESNOT EQ DATA WRITTEN-
SELF EXPLANATORY.

4.2.15 STATUS MESSAGES FOR ROUTINE 3, SECTION F6A2.

-ROUTINE 3 -TEST SRH EQ CT,WR AND RD DATA-
ROUTINE TITLE FOR TEST SEARCH EQUAL COUNT, WRITE AND READ DATA.

-DATA WRITTEN AND READ OK-
SELF EXPLANATORY.

-DATA READ DOES NOT EQ DATA WRITTEN-
SELF EXPLANATORY.

4.2.16 STATUS MESSAGES FOR ROUTINE 4, SECTION F6A2.

-ROUTINE 4 -TEST SRH EQ CT,RD CT-
ROUTINE TITLE.

-COUNT READ O.K.-
SELF EXPLANATORY.

-COUNT RD DOES NOT EQ CT EXP-
COUNT READ DOES NOT EQUAL COUNT EXPECTED.

4.2.18 STATUS MESSAGES FOR ROUTINE 1, SECTION F6A3.

-ROUT 1 -
-3 RECS ARE USED WITH RO-
-REC ID KEY,DATA DATA-
-1 00C3000001 REC1 REC1-
-2 00C3000002 REC2 REC2-
-3 00C3000007 REC7 REC7-
THIS IS THE ROUTINE TITLE WHICH EXPLAINS THE THREE RECORDS WHICH ARE USED IN ADDITION TO RECORD ZERO.

-SRCH HI ID,CORE DATA 00C3000008-
THIS IS ONE EXAMPLE OF THE SUBTITLES THAT OCCUR BEFORE EACH PASS THROUGH THIS ROUTINE. IT TELLS THE COMMAND TO BE TESTED, IN THIS CASE SEARCH HIGH IDENTIFIER, AND THE CORE DATA TO BE SEARCHED AGAINST.

-SRCH HI ID,CORE DATA 00C3000001 OR.ON RO-
THIS IS ANOTHER EXAMPLE OF A SUBTITLE.
THE ADDITIONAL PORTION HERE,-OR.ON RO- , TELLS THAT THE FILE IS ORIENTED ON RECORD ZERO BEFORE THE SEARCH IS ISSUED.

-SRCH HI ID,CCW CT EQ 6,CORE DATA 00C3000000,OR.ON RO-
THIS IS ANOTHER EXAMPLE OF A SUBTITLE. THE ADDITIONAL PORTION HERE,-CCW CT EQ 6-, TELLS THAT THE COMMAND IS ISSUED WITH AN INCORRECT LENGTH.
NOTE. (OR ON RO = ORIENT ON RO)

THE ABOVE THREE EXAMPLES OF MESSAGES ARE SUBTITLES WHICH OCCUR AT THE BEGINNING OF EACH SECTION OF THIS ROUTINE. THEY OCCUR TO DESCRIBE THE SEARCH COMMAND TO BE TESTED AND THE WAY IT IS TESTED.

-GOT ER FORMATTING TRACK -
SELF EXPLANATORY.

-ERR CSW IS XXXXXXXXXXXXXXX SHLD BE XXXXXXXXXXXXXXX-
-SNS IS XXXXXXXXXXX SHD BE XXXXXXXXXXX
UNEXPECTED RESULTS FROM SEARCH COMMAND CAUSE THESE TWO ERROR MESSAGES.
-OK CSW IS XXXXXXXXXXXXXXX SHLD BE XXXXXXXXXXXXXXX-
-SNS IS XXXXXXXXXXX SHD BE XXXXXXXXXXX-
SELF EXPLANATORY CORRECT RESULTS.

-RECX CAUSED HIT NO REC SHLD CAUSE HIT-
IN THIS MESSAGE AND THE FOLLOWING TWO, -HIT- MEANS THE SEARCH CONDITIONS BEING TESTED ARE SATISFIED. IN OTHER WORDS STATUS MODIFIER IS SENT WITH THE ENDING STATUS. THE ENDING STATUS SHOULD CONSIST OF CHANNEL END, DEVICE END AND STATUS MODIFIER.

-RECX CAUSED HIT RECY SHLD CAUSE HIT-
SEE MESSAGE ABOVE
-RECY SHLD CAUSE HIT NO REC CAUSED HIT-
SEE MESSAGE ABOVE

4.2.19 STATUS MESSAGES FOR ROUTINE 1, SECTION F6A4.

-ROUT 1 -TEST ALL COMBINATIONS OF FILE MASK BYTE-

ROUTINE TITLE

-WR CKDT-PROT.BIT 0-0 1-1-
ALL OF THE WRITE AND SEEK COMMANDS ARE TESTED WITH THE DIFFERENT COMBINATIONS OF THE FILE MASK BYTE. A SUBTITLE SUCH AS THIS ONE IS INDICATED. IT GIVES THE COMMAND, SUCH AS IN THIS CASE WRITE COUNT--KEY--DATA, AND THE STATE OF THE PROTECT BITS.

-XXX CSW IS XXXXXXXXXXXXXXX SHLD BE XXXXXXXXXXXXXXX-
-SNS IS XXXXXXXXXXX SHLD BE XXXXXXXXXXX-
THESE ARE EITHER THE CORECT OR ERROR PRINTOUTS.

-DT RD NOT EQ DT EXP-
AFTER THE WRITE OR SEEK IS COMPLETED THE PERTAINING DATA IS READ BACK AND COMPARED AGAINST THE EXPECTED DATA. IF THEY ARE UNEQUAL THIS OCCURS

-SHLD NOT READ-
IF READ SHOULD NOT BE PERFORMED BUT THIS MESSAGE OCCURS.

4.2.20 STATUS MESSAGES FOR ROUTINE 1, SECTION F6A5.

-RTN 1 -CK CUB, CUE, CE, + DE OF CSW STAT BY WR HA SIO FOLLOWED BY SEEK SIO-
ROUTINE TITLE FOR ROUTINE CHECKING CONTROL UNIT BUSY, CONTROL UNIT END, CHANNEL END, AND DEVICE END.

-ROUT OKAY -
-ERROR CSW IS XXXXXXXXXXXXXXX CSW SHLD BE XXXXXXXXXXXXXXX
SNS XXXXXXXXXXX-
-SHLD GET CC1 ON SEEK INDICATING CUB BUT DID NOT CSW IS XXXXXXXX XXXXXXXX-
ABOVE THREE MESSAGES ARE RESULT MESSAGES. SELF EXPLANATORY.

4.2.21 STATUS MESSAGES FOR ROUTINE 2, SECTION F6A5.

-ROUT 2 CK UNIT EXC BY WR CT KEY DATA WITH KL + DL EQ 0 + RD CT KEY DATA-
ROUTINE TITLE FOR ROUTINE WHICH FORCES UNIT EXCEPTION BY WRITING A RECORD WITH KEY LENGTH AND DATA LENGTH EQUAL ZERO AND THEN ATTEMPTING TO READ THE RECORD.

-ERR CSW XXXXXXXXXXXXXXX CSW SHLD BE XXXXXXXXXXXXXXX-
-SNS DATA XXXXXXXXXX SNS DATA SHLD BE 0000004OXXXX-
-RD DATA XXXXXXXXXXXXXXX RD DATA SHLD BE XXXXXXXXXXXXXXX-
THESE ARE EITHER THE CORRECT OR ERROR PRINTOUTS STATING ACTUAL AND EXPECTED CHANNEL STATUS WORDS, SENSE DATA AND READ DATA.

4.2.22 STATUS MESSAGES FOR ROUTINE 3, SECTION F6A5.

-ROUT 3 CHECK ALL INVALID CCWS-
ROUTINE TITLE.

-GOT ERR WHEN TRYING TO FORMAT TRACK WITH WR HA,R0,R1-
SELF EXPLANATORY.

-XXX INV OP XX CSW SHLD BE XXXXXXXXXXXXXXX CSW IS XXXXXXXXXXXXXXX-
-SNS DATA SHLD BE 80000040XXXX SNS IS XXXXXXXXXXX-
THIS IS THE RESULT MESSAGE STATING EITHER ERROR OR OK, INVALID COMMAND TESTED, EXPECTED AND ACTUAL CHANNEL STATUS WORD AND SENSE DATA.

4.2.23 STATUS MESSAGES FOR ROUTINE 1, SECTION F6A6.

-ROUT 1 PERFORM INVALID SEQUENCES-
ROUTINE TITLE.

-GOT ERR WHEN TRYING TO FORMAT TRACK WITH HA,R0,R1,R2-
SELF EXPLANATORY.

-SET PROT, SCH HA, WR CKD-
THIS IS AN EXAMPLE OF A SUBTITLE WHICH OCCURS BEFORE EACH INVALID SEQUENCE. IT SPECIFIES THE INVALID SEQUENCE OF COMMANDS ISSUED, SUCH AS IN THIS EXAMPLE, SET PROTECT, SEARCH HOME ADDRESS, WRITE RECORD.

-XXX CSW XXXXXXXXXXXXXXX CSW SHLD BE XXXXXXXXXXXXXXX-
-SNS XXXXXXXXXXX SNS SHLD BE 80100040XXXX-
THIS IS THE RESULT MESSAGE STATING EITHER ERROR OR OK, AND EXPECTED AND ACTUAL CHANNEL STATUS WORD AND SENSE DATA.

4.2.24 STATUS MESSAGES FOR ROUTINE 1, SECTION F6A7.

-ROUT 1 PERFORM INVALID SEQUENCES-
ROUTINE TITLE

ALL OTHER MESSAGES ARE THE SAME AS ROUTINE 1, SECTION F6A6.

4.2.25 STATUS MESSAGES FOR ROUTINE 1, SECTION F6A8.

-ROUT 1 -FORCE SETTING OF THE OVERRUN SNS BIT-
ROUTINE TITLE

-XXXXX CSW IS XXXXXXXXXXXXXXX SHD BE XXXXXXXXXXXXXXX-
-SNS IS XXXXXXXXXXX SHD BE XXXXXXXXXXX-
THIS IS THE RESULT MESSAGE STATING EITHER ERROR OR OK AND EXPECTED AND ACTUAL CHANNEL STATUS WORD AND SENSE DATA.

4.2.26 STATUS MESSAGES FOR ROUTINE 2, SECTION F6A8.

-ROUT 2 -FORCE TRACK CONDITION CK SNS BIT-
ROUTINE TITLE.
RESULT MESSAGES THE SAME AS ROUTINE 1, SECTION F6A8.
4.2.27 STATUS MESSAGES FOR ROUTINE 3, SECTION F6A8.

-ROUT 3 -FORCE TRACK CONDITION CK SNS BIT-
ROUTINE TITLE.

RESULT MESSAGES THE SAME AS ROUTINE 1, SECTIOG6A8.

4.2.28 STATUS MESSAGES FOR ROUTINE 4, SECTION F6A8.

-ROUT 4 -CHECK SETTING OF SEEK CK SNS BIT-
ROUTINE TITLE.

RESULT MESSAGES THE SAME AS ROUTINE 1, SECTION F6A8.
4.2.29 STATUS MESSAGES FOR ROUTINE 5, SECTION F6A8.
ROUTINE TITLE

RESULT MESSAGES THE SAME AS ROUTINE 1, SECTION F6A8.

4.2.30 STATUS MESSAGES FOR ROUTINE 6, SECTION F6A8.

-ROUT 6 -CK SETTING OF TRACK OVERRUN SNS BIT-
ROUTINE TITLE.

RESULT MESSAGES THE SAME AS ROUTINE 1, SECTION F6A8.

-XXXX MEANS NOT COMPARED-
THIS MESSAGE OCCURS AFTER THE RESULT MESSAGE. IT INDICATES THAT THE PORTION OF THE CHANNEL STATUS WORD INDICATED BY XXXX WAS NOT COMPARED.

4.2.31 STATUS MESSAGES FOR ROUTINE 7, SECTION F6A8.

-ROUT 7 -CK SETTING THE END OF CYL SNS BIT-
ROUTINE TITLE.

RESULT MESSAGES THE SAME AS ROUTINE 1, SECTION F6A8.

4.2.32 STATUS MESSAGES FOR ROUTINE 8, SECTION F6A8.

-ROUT 8 -CK SETTING THE NO RECORD FOUND SNS BIT-
ROUTINE TITLE.

RESULT MESSAGES THE SAME AS ROUTINE 1, SECTION F6A8.

4.2.33 STATUS MESSAGES FOR ROUTINE 1, SECTION F6A9.

-ROUT 1 -TEST TRUNCATED READ-
ROUTINE TITLE.

--XXX R1 DATA WRITTEN C3C3C3C3C3--
-- R1 DATA EXP RD C3C3C3C3 --
-- R1 DATA ACT RD XXXXXXXXX--
THIS IS THE RESULT MESSAGE. EITHER -ERR- OR -OK - AND ACTUAL READ DATA ARE MOVED IN PRIOR TO PRINTOUT.

4.2.34 STATUS MESSAGES FOR ROUTINES 2, SECTION F6A9

-ROUT 2 -CK MULTI TRACK BIT-
ROUTINE TITLE.

-MULTI TRACK O.K.-
SELF EXPLANATORY.

-H.A.RD NOT EQ EXP-MULTI TRK ER-
THE HOME ADDRESSES FOR A WHOLE CYLINDER ARE READ AND THEN COMPARED AGAINST EXPECTED. IF THEY ARE NOT EQUAL THIS MESSAGE OCCURS.

4.2.35 STATUS MESSAGES FOR ROUTINE 3, SECTION F6A9.

-RT3-LONG RECORD-
ROUTINE TITLE

-OK -LONG RECORD CAW X ... X
ACCOMPANIES CORRECT RESULTS PRINT OUT WITH SW 7 ON

-ERR-LONG RECORD CAW X ... X
ERROR MESSAGE WHEN AN ERROR IS DETECTED WHILE ROUTINE IS PERFORMING WRITE-READ LONG RECORD (FULL TRACK RO) ALTERNATING BETWEEN TWO TEST TRACKS. THE CSW AND SENSE WILL ALSO BE PRINTED OUT.BY REFERRING TO THIS AND THE LISTING,THE USER CAN DETERMINE ON WHAT COMMAND (CCW) AND WHAT ERROR (SENSE BIT) OCCURRED.

4.2.36 STATUS MESSAGES FOR ROUTINE, SECTION -F6AA-

-RT1-E R A S E
ROUTINE TITLE

-OK - E R A S E CAW XXXXXX
ACCOMPANIES CORRECT RESULTS PRINT OUT WITH SWITCH 7 ON.

-ERR - E R A S E CAW X...X
ERROR MESSAGE WHEN AN ERROR IS DETECTED AFTER ERASE COMMAND A TRACK IS FORMATTED WITH RECORDS 1 AND 2. A COMMAND CHAIN IS EXECUTED THAT ERASES RECORD 2 AND WRITES RECORD 3. THE PROGRAM THEN SEARCHES FOR RECORD 1 AND DOES A READ COUNT. RECORD 3 COUNT FIELD SHOULD BE READ AS RECORD 2 SHOULD NOT HAVE AN ADDRESS MARK. THE ACTUAL AND EXPECTED CSW, SENSE, AND DATA ARE ALSO PRINTED OUT.

4.2.37 STATUS MESSAGES FOR ROUTINE 2, SECTION F6AA

-RT2- SPACE COUNT
ROUTINE TITLE

-OK - SPACE COUNT CAW X...X

ACCOMPANIES CORRECT RESULTS PRINT OUT WITH SWITCH 7 ON.

-ERR -SPACE COUNT CAW X...X
ERROR MESSAGE WHEN AN ERROR IS DETECTED AFTER A SPACE COUNT. THE FOLLOWING SPACE COUNT FUNCTIONS ARE CHECKED (THE USER CAN FIND OUT WHICH FUNCTION FAILED BY REFERRING TO THE CAW).

1. SPACE COUNT SHOULD SET FILE PROTECT SO AS TO INHIBIT ANY WRITE COMMANDS.
2. IF INDEX IS DETECTED WHILE SPACE COUNT IS SEARCHING FOR AN ADDRESS MARK, NO RECORD FOUND SHOULD BE SET.
3. SPACE COUNT FOLLOWING A FORMAT WRITE SHOULD SET INVALID SEQUENCE.
4. SPACE COUNT NOT CHAINED FROM A PREVIOUS COMMAND SHOULD SPACE OVER RECORD -0-.
5. TWO CHAINED SPACE COUNTS NOT CHAINED FROM A PREVIOUS COMMAND SHOULD SPACE TO RECORD -2-.
6. CHECK THAT SPACE COUNT WILL REQUEST -3- BYTES FROM THE CHANNEL AND USE THESE BYTES AS THE KEY AND DATA LENGTHS. (CORRECT LENGTHS PROVIDED)
7. SAME AS NUMBER 6 EXCEPT DATA LENGTH IS INCORRECT. THIS WILL ALSO FORCE A BURST CHECK. THE ACTUAL AND EXPECTED CSW, SENSE, AND DATA ARE ALSO PRINTED OUT.

4.2.38 STATUS MESSAGES FOR ROUTINE 3, SECTION -F6AA-

-RT3 - R E A D I P L
ROUTINE TITLE

-OK - R E A D I P L CAW X...X
ACCOMPANIES CORRECT RESULTS PRINTOUT WITH SWITCH 7 ON.

-ERR - R E A D I P L CAWX...X
ERROR MESSAGE WHEN AN ERROR IS DETECTED AFTER A READ IPL COMMAND. READ IPL IS CHECK THAT IT WILL POSITION THE ACCESS TO CYLINDER 00, HD 0 AND READ THE FIRST DATA RECORD OF THE TRACK. IF THERE IS NO IPL DATA RECORD PRESENT, THE PROGRAM WILL WRITE ONE. THE ACTUAL AND EXPECTED CSW, SENSE, AND DATA ARE PRINTED OUT.

4.2.39 STATUS MESSAGES FOR ROUTINE 4, SECTION -F6AA-

-RT4 - END OF FILE
ROUTINE TITLE
-OK - END OF FILE CAW X...X
ACCOMPANIES CORRECT RESULTS PRINTOUT WITH SWITCH 7 ON.

-ERR - END OF FILE CAW X...X
ERROR MESSAGE WHEN AN ERROR IS DETECTED ON AN END OF FILE RECORD. THE FOLLOWING COMMANDS ARE CHECKED ON AN END OF FILE RECORD (THE USER CAN FIND OUT WHICH COMMAND FAILED BY REFERRING TO THE CAW).

-UNIT EXCEPTION - SHOULD NOT BE SET ON THE FOLLOWING COMMANDS ---
SEARCH EQUAL ID READ COUNT
SEARCH EQUAL KEY

-UNIT EXCEPTION - SHOULD BE SET ON THE FOLLOWING COMMANDS ---
READ RO WRITE KD
READ CKD WRITE D
READ KD SEARCH KD

READ D
THE ACTUAL AND EXPECTED CSW, AND SENSE ARE ALSO PRINTED OUT.

4.2.40 STATUS MESSAGES FOR ROUTINE 1, SECTION -F6AB-

-ROUT 1-OVER/UNDER TRUNC OF CMDS
ROUTINE TITLE

-OK-OVER/UNDER TRUNC OF CMDS CAW X...X
ACCOMPANIES CORRECT RESULTS PRINTOUT WITH SWITCH 7 ON.

-ERR-OVER/UNDER TRUNC OF CMDS CAW X...X
CMD AA CCW CNT BB EXP CSW ... ACT CSW ...
EXP DATA CCCC ... CCCCC5
ACT DATA DDDD ... DDDDC5

CODE EXPLANATION --
AA 2314 OPERATION CODE
WILL BE ONE OF THE FOLLOWING COMMANDS'

1A - READ HA	05 - WRITE DATA
16 - READ RO	0D - WRITE KEY-DATA
12 - READ COUNT	1D - WRITE C-K-D
06 - READ DATA	39 - SEARCH EQ-HA
0E - READ KEY-DATA	31 - SEARCH EQ-ID
1E - CARD C-K-D	29 - SEARCH EQ-KEY
19 - WRITE HA	51 - SEARCH HI-ID
15 - WRITE RO	

BB THIS IS THE CCW COUNT THAT WAS USED IN THE CCW
C...C THIS IS THE EXPECTED DATA
D...D THIS IS THE ACTUAL DATA
C5 THIS IS THE PATTERN THAT IS USED TO RESET THE ACTUAL READ IN AREA BEFORE THE COMMAND IS EXECUTED. 1 MORE BYTE THAN IS TRANSFERED IS PRINTED OUT THIS BYTE SHOULD BE --C5--.
X...X CHANNEL ADDRESS WORD - POINTS TO CCW CHAIN
ERROR MESSAGE WHEN AN ERROR IS DETECTED ON AN OVER OR UNDER TRUNCATION OF A FILE COMMAND. OVER TRUNCATION IS WHEN THE CHANNEL REQUESTS MORE BYTES THAN THERE ARE AVAILABLE. UNDER TRUNCATION IS WHEN THE CHANNEL REQUESTS LESS BYTES THAN THERE ARE AVAILABLE.

TRACK FORMAT --
HA, R0 (K=2, D=4), R1 (K=0, D=4), R2 (K=2, D=4)

COMMAND	NORMAL COUNT	CHANNEL COUNT FOR TRUNCATION
1A	5	3,9
16	14	6,8,9,10,11,12,13,15
12	8	5,10
06	4 (R1)	3,5
0E	6 (R2)	1,2,3,8
1E	14 (R2)	2,5,8,9,10,11,17
19	5	4,6
15	14	2,8,11,17
05	4 (R1)	3,5
0D	6 (R2)	1,2,4,9
1D	14 (R2)	5,8,9,10,13,15
39	4	2,6
31	5 (R1)	4,8
29	2 (R2)	1,3
51	2 (R2)	3,7

THE ACTUAL AND EXPECTED CSW ARE ALSO PRINTED OUT. IF A UNIT CHECK OCCURRED, THE SENSE BYTES ARE ALSO PRINTED OUT.

4.2.41 STATUS MESSAGES FOR ROUTINE 1, SECTION F6AC

-ROUT 1-TEST HALT I/O ON READ-
THIS MESSAGE PRINTS IF ROUTINE TITLE IS REQUESTED AND IS UNDER CONTROL OF SECTION SENSE SWITCH 6.

-XXX HIO EXPECT CC=2 ACTUAL CC=X-
THE CONDITION CODE IS EXAMINED AFTER HIO HAS BEEN ISSUED. IF THE CONDITION CODE IS 2 (STOPPED), THE LETTERS -OK- REPLACE THE FIRST THREE X'S AND A 2 IS INSERTED AS THE ACTUAL CC. IF THE CONDITION CODE IS OTHER THAN 2, THE LETTERS -EEK- REPLACE THE FIRST THREE X'S AND THE APPROPORATE NUMBER IS SHOWN AS THE ACTUAL CC. PRINTING OF THE -OK- MESSAGE IS UNDER CONTROL OF SECTION SENSE SWITCH 7.

-ERR-HIO FAILED TO STOP CHAIN - EXP DATA = FFF-
ACT DATA = XXXXXXXXXXXXXXX-
THIS MESSAGE WILL PRINT OUT IF HIO FAILS TO BREAK THE CHAIN OF CCW'S THAT INCLUDE A READ RECORD 1 COMMAND. THE ACTUAL DATA X'S WILL BE REPLACED BY A'S WHICH ARE WRITTEN ON RECORD 1.

-HIO STOPPED CHAIN-
THIS MESSAGE IS UNDER CONTROL OF SECTION SENSE SWITCH 7 AND PRINTS OUT IF THE HIO COMMAND WORKED PROPERLY. IT INDICATES THAT THE HIO COMMAND STOPPED THE READ OPERATION DURING THE READING OF RECORD ZERO AS EXPECTED.

4.2.42 STATUS MESSAGES FOR ROUTINE 2, SECTION F6AC

-ROUT 2- TEST HALT I/O ON WRITE-
THIS MESSAGE PRINTS IF ROUTINE TITLES ARE REQUESTED AND IS UNDER CONTROL OF SECTION SENSE SWITCH 6.

-XXX HIO EXPECT CC=2, ACTUAL CC=X-
SAME AS ROUTINE 1.

-HIO STOPPED CHAIN-
SAME AS ROUTINE 1.

-ERR-HIO FAILED TO STOP CHAIN ON WRITE-
DID NOT PAD WITH ZEROS-
THIS MESSAGE PRINTS IF THE HIO ISSUED DURING THE WRITE COMMAND DOES NOT RESULT IN PADDING THE UNWRITTEN PORTION OF THE RECORD WITH ZEROS.

4.2.43 STATUS MESSAGES FOR ROUTINE 3, SECTION F6AC

-ROUT 3-CK IF CU WILL MISS AN AM
ROUTINE TITLE

-OK-CK IF CU WILL MISS AN AM
ACCOMPANIES CORRECT RESULTS PRINTOUT WITH SWITCH 7 ON.

-CU MISSED AN ADRS MK
LAST CNT READ XXX...XXX
ERROR MESSAGE WHEN AN ERROR IS DETECTED AFTER THE READ COUNT CHAIN IS PERFORMED. THIS ROUTINE CHECKS FOR THE POSSIBILITY THAT THE CONTROL UNIT (CU) WILL MISS AN ADDRESS MARK. A TRACK IS FORMATTED WITH AS MANY ADDRESS MARKS AS POSSIBLE (71 RECORDS WITH KEY LENGTH = 0, DATA LENGTH = 1). THEN THE FOLLOWING CHAIN IS EXECUTED --
READ HA (ORIENTATION)
READ COUNT
TIC *-8
THIS CHAIN WILL READ COUNT (CU HAS TO DETECT ADDRESS

MARK IN ORDER TO PERFORM READ) ON ALL RECORDS OF THE TRACK. EACH COUNT (OR ADDRESS MARK) WILL BE READ TWICE BEFORE CHAIN IS BROKEN VIA NO RECORD FOUND (INDEX SENSED TWICE).
THE CHAIN IS REPEATED -500- TIMES BEFORE EXITING.
IF AN ADDRESS MARK IS MISSED THIS SHOULD BREAK THE CHAIN VIA A UNIT CHECK AND SET MISSING ADDRESS MARKER IN SENSE BYTES. THE LAST COUNT READ WHICH WILL BE THE COUNT OF THE RECORD IN FRONT OF THE RECORD WHOSE ADDRESS MARK WAS MISSED IS PRINTED OUT. ALSO THE CAW, CSW, AND SENSE ARE PRINTED OUT.

-ERR-CK IF CU WILL MISS AN AM
LAST CNT READ XXX...XXX
ERROR MESSAGE WHEN AN ERROR IS DETECTED.
WHEN THE READ COUNT CHAIN IS BROKEN, THE PROGRAM EXAMINES THE SENSE BYTES FOR MISSING ADDRESS MARKER BIT. IF OFF, THIS MESSAGE IS PRINTED OUT ALONG WITH THE CAW, CSW, AND SENSE.

PROBABLE DATA CHECK IN COUNT FIELD.

4.2.44 STATUS MESSAGES FOR ROUTINE 4, SECTION F6AC

-ROUT 4-CK IF CU WILL PICK UP AM
ROUTINE TITLE

-OK-CK IF CU WILL PICK UP AM
ACCOMPANIES CORRECT RESULTS PINTOUT WITH SWITCH 7 ON.

-CU-PICKED UP AN ADRS MK -AM-OXX
ERROR MESSAGE WHEN AN ERROR IS DETECTED.
THIS ROUTINE CHECKS FOR THE POSSIBILITY THAT THE CONTROL UNIT (CU) WILL PICK UP ANN ADDRESS MARK. THE ROUTINE WILL PROCESS RECORDS WHOSE DATA AREA VERY CLOSELY APPROXIMATES A --GAP, ADDRESS MARK, COUNT -- TO CHECK IF THE CONTROL UNIT WILL DETECT THIS SIMULATED GAP AND ADDRESS MARK AND TRANSFER THE DUMMY COUNT FIELD THAT FOLLOWS IT.
A TRACK IS FORMATTED WITH 43 RECORDS -
RECORD FORMAT --
NORMAL COUNT, NO KEY, DATA AREA
DATA AREA --
-GAP-, -AM-, -COUNT-
COUNT --
--AM-OXX- WHERE XX IS RECORD NUMBER.
THE BURST BYTES FOR THE COUNT ARE SUCH THAT IF THE CU DETECTS A GAP AND ADDRESS MAKR AND TRANSFER THE COUNT, A DATA (BURST) CHECK WILL OCCUR AND BREAK THE READ COUNT CHAIN.
THE FOLLOWING CHAIN IS EXECUTED --
READ HA (ORIENTATION)
READ COUNT
TIC *-8
THIS CHAIN WILL READ COUNT (CU HAS TO SEARCH FOR AN ADDRESS MARK IN ORDER TO READ COUNT) ON ALL RECORDS OF THE TRACK. SINCE CONTROL UNIT WILL BE SEARCHING FOR AN -ADDRESS MARK- OVER THE DATA AREA OF A RECORD, WHERE THE SIMULATED GAP AND AM ARE LOCATED. IF ADDRESS MARK RECOGNITION IS FAILING AN ADDRESS MARK MAY BE PICKED UP. EACH COUNT IS READ TWICE BEFORE THE CHAIN IS BROKEN VIA NO RECORD FOUND (INDEX SENSED TWICE).
THE CHAIN IS REPEATED -500- TIMES BEFORE EXITING.
ALSO THE CAW, CSW, AND SENSE ARE PRINTED OUT.

-ERR-CK IF CU WILL PICK UP AM
ERROR MESSAGE WHEN AN ERROR IS DETECTED AND CONTROL UNIT DID NOT PICK UP AN ADDRESS MARK.
WHEN THE READ COUNT CHAIN IS BROKEN, THE PROGRAM EXAMINES

THE SENSE BYTES AND READ AREA TO DETERMINE IF AN ADDRESS MARK WAS PICKED UP OR NOT. IF NOT THE MESSAGE IS PRINTED ALONG WITH CAW, CSW, AND SENSE. PROBABLE DATA CHECK IN COUNT FIELD.

4.2.45 STATUS MESSAGES FOR ROUTINE 1, SECTION F6AD

-ROUT 1-FILE INTERACTION
ROUTINE TITLE

-GOT ERROR FORMATTING CYLINDER
WHILE PROGRAM WAS FORMATTING THE WRITE-READ FILE AN ERROR WAS DETECTED. EXAMINE CSW AND SENSE BYTES FOR REASON.

-COMMAND CHAIN WAS NOT ACCEPTED
CAW --- CSW --- SNS ---
WHEN A START I/O WAS ISSUED TO A FILE DRIVE (WRITE-READ OR SEEK), A CONDITION CODE OF 1, 2, OR 3 RESULTED. AFTER EXAMINING THE CSW, THE CONTROL UNIT IS NOT BUSY, SO ERROR MESSAGE IS PRINTED OUT.

-FILE STATUS 0 1 1 9 1 9 9 9
THIS MESSAGE FOLLOWS MOST OF THE OTHER ERROR MESSAGES AND GIVES THE STATUS OF THE FILE DRIVES AT THE TIME THE ERROR OCCURS. IN STATUS MAP LEFT MOST POSITION IS DRIVE 0, NEXT POSITION IS DRIVE 1, AND SO ON UNTIL THE RIGHT MOST POSITION IS DRIVE 7.

CODE	DEFINITION
9	THIS DRIVE IS NOT BEING USED.
1	A START I/O COMMAND WAS ISSUED AND ACCEPTED TO THIS FILE DRIVE, BUT THE FILE HAS NOT INDICATED ENDING STATUS YET.
0	A START I/O COMMAND WAS ISSUED AND ACCEPTED BY THIS FILE DRIVE AND THE FILE HAS INDICATED AN ENDING STATUS.

-CANT GET SENSE BYTES
ERROR MESSAGE WHEN PROGRAM RECEIVES A CONDITION CODE 1, 2, OR 3 ON A START I/O WITH A SENSE COMMAND CODE.

-NO INTRPT FROM FILE
ERROR MESSAGE WHEN DIAGNOSTIC MONITOR CALL SVC X'D8' (WAIT) TIME OUT. THIS INDICATES THAT SOME FILE HAS NOT INDICATED AN ENDING INTERRUPT.
IF WRITE-READ FILE, PROBABLY MISSING CHANNEL AND DEVICE END OR CONTROL UNIT END. ALSO CONTROL UNIT COULD BE FAILING TO INDICATE CONTROL UNIT BUSY. IF SEEK FILE, PROBABLY MISSING DEVICE END.

-EXTRA DEVICE END FROM FILE XXX
ERROR MESSAGE WHEN A -DEVICE END- I/O INTERRUPT IS RECEIVED FROM A FILE AND THAT PARTICULAR FILE HAS ALREADY INDICATED A DEVICE END INTERRUPT OR THE FILE WAS NOT BEING USED.

-SEEK FILE WENT TO WRONG CYL
WAS AT ... SK TO ... WENT TO ...
ERROR MESSAGE WHEN AN ERROR IS DETECTED ON A FILE DRIVE BEING USED FOR SEEKING. AFTER ALL FILES BEING USED HAVE INDICATED AN ENDING CONDITION, THE HOME ADDRESSES ARE READ ON THOSE FILES BEING USED FOR SEEKING. IF THE HOME ADDRESS READ DOES NOT AGREE WITH THE SEEK ARGUMENT (WHERE ACCESS WAS TOLD TO SEEK TO), THIS ERROR MESSAGE IS PRINTED OUT INDICATING WHERE THE ACCESS WAS,

WHERE IT WAS TOLD TO SEEK TO, AND WHERE IT WENT. THIS REQUIRES THAT A GOOD PACK BE USED WITH HOME ADDRESS ON ALL CYLINDERS. IF A UNIT CHECK ERROR WAS DETECTED AS A RESULT OF ACCESS GOING TO INNER OR OUTER POSITIVE STOP, THE -WENT TO- IS NOT PRINTED OUT. ALSO PRINTED IS THE CAW, CSW, AND SENSE BYTE INFORMATION. FILE APPEARS TO BE SEEKING WRONG, RUN PROGRAM F68A TO F68D ON THIS DRIVE.

-ERROR ON WRITE-READ FILE
CAW ... CSW ... SNS ...
ERROR MESSAGE WHEN AN ERROR IS DETECTED ON THE FILE DRIVE BEING USED TO READ AND WRITE ON. IF A UNIT CHECK, DEVICE END, AND CHANNEL END I/O INTERRUPT IS RECEIVED FROM THE FILE BEING USED FOR WIRINTG AND READING, THIS MESSAGE IS PRINTED OUT ALONG WITH CAW, CSW, AND SENSE BYTE INFORMATION. USER SHOULD EXAMINE THIS DATA FOR TROUBLE.

-READ-WRITE DATA DOES NOT CAMPARE CAW XXXXX
ERROR MESSAGE WHEN AN ERROR IS DETECTED ON THE FILE DRIVE BEING USED FOR READ AND WRITE. AFTER THE READ AND WRITE OPERATIONS HAVE BEEN COMPLETED ON THE WRITE-READ FILE DRIVE, THE PROGRAM WILL COMPARE THE READ DATA WITH THE WRITE DATA. THIS ERROR MESSAGE IS PRINTED OUT IF THESE DATA RECORDS DO NOT COMPARE.
THE CAW IS PRINTED OUT TO INDICATE WHICH CHAIN THE ERROR OCCURED ON. THE PROGRAM WILL ALTERNATE BETWEEN THE FOLLOWING CHAINS.

-OR-

SEEK HEAD	SEEK HEAD
READ COUNT	SEARCH ID
SEARCH KEY	TIC *-8
TIC *-16	WRITE KEY-DATA FROM A1
READ DATA INTO AREA A1	SEARCH ID
SEARCH ID	TIC *-8
TIC *-8	READ KEY-DATA INTO AREA A2
WRITE DATA FROM AREA A1	
SEARCH ID	
TIC *-8	
READ DATA INTO AREA A2	

4.2.46 STATUS MESSAGES FOR ROUTINE 1, SECTION F6AE.

-ROUTINE 1 -TEST SRH EQ KEY-DATA-
ROUTINE TITLE.

-CT-KY-DATA RD AND EXP EQ-
THE SEARCH EQ KEY--DATA COMMAND IS CHECKED BY FOLLOWING IT WITH A READ COUNT--KEY--DATA. THE RECORD WRITTEN AND READ IS COMPARED TO SEE IF SEARCH WAS CORRECT.

-CT-KY-DATA READ NOT EQ CT-KY-DATA WRITTEN-
UNEQUAL RESULTS FROM ABOVE MENTIONED COMPARE.

4.2.47 STATUS MESSAGES FOR ROUTINE 2, SECTION F6AE.

-ROUT 2 -
-3 RECS ARE USED WITH RO-

-REC	ID	KEY,DATA	DATA-
-1	00C3000001	REC1	REC1-
-2	00C3000002	REC2	REC2-
-3	00C3000007	REC7	REC7-

THIS IS THE ROUTINE TITLE WHICH EXPLAINS THE THREE RECORDS WHICH ARE USED IN ADDITION TO RECORD ZERO.

THE COLUMN UNDER THE HEADING --REC-- REPRESENT THE RECORDS FOLLOWING RO. THAT IS, RECORD 1, RECORD 2, AND RECORD 3 ARE WRITTEN FOLLOWING

THE RECORD 0. THE DATA IN THE COLUMN UNDER --ID-- REPRESENT THE COUNT OR ID FIELDS, IN HEXADECIMAL REPRESENTATION, OF THE CORRESPONDING RECORDS. IN OTHER WORDS, THIS IS THE CCHHR PORTION OF THE COUNT FIELDS FOR THE CORRESPONDING RECORD. THE DATA IN THE COLUMN UNDER --KEY,DATA-- REPRESENT THE KEY FIELD OF THE RESPECTIVE RECORDS. THE DATA IN THE COLUMN UNDER THE HEADING --DATA-- REPRESENT THE DATA FIELD OF THE RESPECTIVE RECORDS. IT SHOULD BE NOTED THAT THE KEY FIELDS AND DATA FIELDS ARE FOUR BYTES IN LENGTH AND ARE REPRESENTED IN THIS MESSAGE BY THE PRINTABLE CHARACTERS OF THE EBCDIC.

-SRCH HI KEY-DATA,CORE KEY-DATA REC8REC8-
THIS IS ONE EXAMPLE OF THE SUBTITLES THAT OCCUR BEFORE EACH PASS THROUGH THIS ROUTINE. IT TELLS THE COMMAND TO BE TESTED, AND THE CORE KEY,DATA TO BE SEARCHED AGAINST.

-SRCH HI KEY-DATA,CORE KEY-DATA REC1REC1,ORIEN. ON R1-
THIS IS ANOTHER EXAMPLE OF A SUBTITLE. THE ADDITIONAL PORTION HERE, -ORIEN. ON RO- , TELLS THAT THE FILE IS ORIENTED ON RECORD ZERO BEFORE THE SEARCH IS ISSUED.

-SRCH HI KEY-DATA,CCW CT EQ 6,FILE CT EQ 8,CORE DATA REC2RE,ORIEN.ON RO-
THIS IS ANOTHER EXAMPLE OF A SUBTITLE. THE ADDITIONAL PORTION HERE,-CCW CT EQ 6,FILE CT EQ 8- TELLS THE INCORRECT LENGTH COMMAND ISSUED, AND WHAT LENGTH IT IS ON FILE.

THE ABOVE THREE EXAMPLES OF MESSAGES ARE SUBTITLES WHICH OCCUR AT THE BEGINNING OF EACH SECTION OF THIS ROUTINE. THEY OCCUR TO DESCRIBE THE SEARCH COMMAND TO BE TESTED AND THE WAY IT IS TESTED.

-GOT ER FORMATING TRACK-
SELF EXPLANATORY.

-ERR CSW IS XXXXXXXXXXXXXXX SHLD BE XXXXXXXXXXXXXXX-
-SNS IS XXXXXXXXXXX SHD BE XXXXXXXXXXX-
UNEXPECTED RESULTS FROM SEARCH COMMAND CAUSE THESE TWO ERROR MESSAGES.

-RECX CAUSED HIT NO REC SHLD CAUSE HIT-
IN THIS MESSAGE AND THE FOLLOWING TWO, -HIT- MEANS THE SEARCH CONDITIONS BEING TESTED ARE SATISFIED.

-RECX CAUSED HIT RECY SHLD CAUSE HIT-
SEE MESSAGE ABOVE.

-RECY SHLD CAUSE HIT NO REC CAUSED HIT-
SEE MESSAGE ABOVE.

4.2.48 STATUS MESSAGES FOR ROUTINE 1,SECTION F6AF.

-ROUT 1 -WRITE AND READ SPECIAL CT,KEY AND DATA-
ROUTINE TITLE.

-CT-KEY-DATA READ DOES NOT EQ WRITTEN-
SELF EXPLANATORY.

-SPECIAL CT-KY-DATA WRITTEN CORRECTLY-
SELF EXPLANATORY.

4.2.49 STATUS MESSAGES FOR ROUTINE 2,SECTION F6AF.

-ROUT 2 -TEST WRITE AND READ DATA WITH RECORD OVERFLOW-
ROUTINE TITLE.

-DATA READ DOES NOT EQUAL DATA WRITTEN-
SELF EXPLANATORY.

-DATA WRITTEN AND READ CORRECTLY-
SELF EXPLANATORY.

4.2.50 STATUS MESSAGES FOR ROUTINE 3,SECTION F6AF.

-ROUT 3 -TEST WRITE AND READ KEY-DATA WITH RECORD OVERFLOW-
ROUTINE TITLE.

-KEY DATA RD DOES NOT EQ KY-DATA WR-
KEY DATA READ DOES NOT EQUAL KEY DATA WRITTEN.

-KEY-DATA WRITTEN AND READ CORRECTLY-
SELF EXPLANATORY.

4.2.51 STATUS MESSAGES FOR ROUTINE 4,SECTION F6AF.

-ROUT 4 -TEST READ COUNT WITH RECORD OVERFLOW-
ROUTINE TITLE.

-COUNT READ DOES NOT EQ COUNT EXP-
COUNT READ DOES NOT EQUAL COUNT EXPECTED.

-COUNT READ EQUALS COUNT EXPECTED-
SELF EXPLANATORY.

4.2.52 STATUS MESSAGES FOR ROUTINE 5,SECTION F6AF.

-ROUT 5 -TEST WRITE AND READ DATA WITH REC OVERFLOW OF HALF A CYL-
ROUTINE TITLE.

-DATA READ DOES NOT EQUAL DATA WRITTEN-
SELF EXPLANATORY.

-DATA WRITTEN AND READ CORRECTLY-
SELF EXPLANATORY.

4.2.53 STATUS MESSAGES FOR ROUTINE 6,SECTION F6AF.

-ROUT 6 -TEST WRITE AND READ KEY-DATA WITH RECORD OVERFLOW-HALF CYL-
ROUTINE TITLE.

-KY-DATA RD DOES NOT EQ KY-DATA WR-
KEY DATA READ DOES NOT EQUAL KEY DATA WRITTEN.

-KEY-DATA WRITTEN AND READ CORRECTLY-
SELF EXPLANATORY.

4.2.54 STATUS MESSAGES FOR ROUTINE 7,SECTION F6AF.

-ROUT 7 -TEST READ COUNT WITH RECORD OVERFLOW-
ROUTINE TITLE.

-COUNT READ DOES NOT EQ COUNT EXP-
SELF EXPLANATORY.

-COUNT READ EQUALS COUNT EXPECTED-
SELF EXPLANATORY.

4.2.55 STATUS MESSAGES FOR ROUTINE 1,SECTION F6B0.

-RT 1-VIOLATION OF FILE MK WITH OVFLO
ROUTINE TITLE

-OK -VIOLATE FILE MK WITH OVFLO
ACCOMPANIES CORRECT RESULTS PRINT OUT WITH SW 7 ON

-ERR-VIOLATE FILE MK WITH OVFLO
ERROR MESSAGE WHEN OVERFLOWING TO A FILE PROTECTED
BOUNDARY DOES NOT INDICATE CORRECT CSW AND SENSE BITS.

4.2.56 STATUS MESSAGES FOR ROUTINE 2, SECTION F6B0.

-RT 2-REC OVFLO TO TRK WITH WRONG HEAD NO.
ROUTINE TITLE

-OK -OFLO TO TRK WITH WRONG HD NO.
ACCOMPANIES CORRECT RESULTS PRINT OUT WITH SW 7 ON

-ERR-OFLO TO TRK WITH WRONG HD NO.
ERROR MESSAGE WHEN OVERFLOWING TO A TRACK
WITH WRONG HEAD NUMBER INDICATES THE CORRECT
AND INCORRECT CSW AND SENSE BITS.

4.2.57 STATUS MESSAGES FOR ROUTINE 3,SECTION F6B0.

-RT 3-REC OVFLO FROM ALT TRK
ROUTINE TITLE

-OK -REC OVFLO FROM ALT TRK
ACCOMPANIES CORRECT RESULTS PRINT OUT WITH SW 7 ON

-ERR-REC OVFLO FROM ALT TRK
ERROR MESSAGE WHEN OVERFLOWING FROM AN ALTERNATE TRACK TO
A NORMAL TRACK DOES NOT INDICATE THE CORRECT CSW AND SENSE BITS.

4.2.58 STATUS MESSAGES FOR ROUTINE 4, SECTION F6B0.

-RT 4-SCAN AN OFLO RECORD-
ROUTINE TITLE

-OK -SCAN AN OFLO RECORD
ACCOMPANIES CORRECT RESULTS PRINT-OUT WITH SW 7 ON.

-ERR-SCAN AN OFLO RECORD
ERROR MESSAGE WHEN SCANNING AN OVERFLOW RECORD
INDICATES CORRECT AND INCORRECT CSW AND SENSE BITS.

4.2.59 STATUS MESSAGES FOR ROUTINE 5, SECTION F6B0.

-RT5-OVFLO TO END-OF-CYL
ROUTINE TITLE

-OK -OVFLO TO END-OF-CYL
ACCOMPANIES CORRECT RESULTS PRINT OUT WITH SW 7 ON

-ERR-OVFLO TO END-OF-CYL
ERROR MESSAGE WHEN OVERFLOW TO END-OF-CYLINDER
DOES NOT RESULT IN CORRECT CSW AND SENSE BITS

4.2.60 STATUS MESSAGES FOR ROUTINE 1, SECTION F6B1.

CK USE OF 6TH SNS BYTE WHEN OVERFLOW TO DEF SURF WHILE READING A KD
OVERFLOW REC
ROUTINE TITLE

-ROUT RAN OK

-ERR WHEN CK RD KD OVFL REC TO A DEF SURF
ERROR WHEN CHECKING READ KEY-DATA OVERFLOW RECORD TO A DEFECTIVE
SURFACE. PRINTS AS A RESULT OF INCORRECT CSW OR SENSE.

-ERR WHEN RD DATA VIA 6TH SNS BYTE CCW, ON ALT SURF
ERROR MESSAGE WHEN READ DATA VIA 6TH SENSE BYTE CCW, ON ALTERNATE
SURFACE. PRINTS AS A RESULT OF INCORRECT CSW OR SENSE.

-ERR WHEN RD REMAINDER OF CYL, FOLLOWING THE DEF TRK, VIA 6TH SNS
BYTE CCW. PRINTS AS A RESULT OF INCORRECT CSW OR SENSE.

4.2.61 STATUS MESSAGES FOR ROUTINE 2, SECTION F6B1.

CK USE OF 6TH SNS BYTE WHEN OVERFLOW TO DEF SURF WHILE WRITING THE DATA PORTION OF AN OVFLO REC
ROUTINE TITLE
-ERR WHEN CK WR DATA OVFL REC TO A DEF SURF
ERROR PRINT-OUT BECAUSE OF INCORRECT CSW OR SENSE.

-ERR WHEN WR DATA VIA 6TH SNS BYTE CCW, ON ALT SURF
ERROR PRINT-OUT BECAUSE OF INCORRECT CSW OR SENSE.

-ERR WHEN WR REMAINDER OF CYL, FOLLOWING THE DEF TRK, VIA 6TH SNS BYTE

4.2.62 STATUS MESSAGES FOR ROUTINE1, SECTION F6B2.

-CK USE OF 6TH SNS BYTE WHEN OVERFLOW TO DEF SURF WHILE SCANNING EQ
TITLE

-KEY-DATA PORTION OF AN OVERFLOW REC DATA IS EQ

-ERR WHEN SCAN EQ KEY DATA REMAINDER OF CYL, AFTER DEF TRK VIA 6TH SNS BYTE
ERROR PRINT-OUT BECAUSE OF INCORRECT CSW OR SENSE

-ROUTINE RAN OK

4.2.63 STATUS MESSAGES FOR ROUTINE 2, SECTION F6B2.

-CK 6TH SENSE BYTE 45 AND 75
TITLE

-ERR WHEN CK SCAN HI KEY DATA OVFL REC TO A DEF SURF CORE DATA EQ
FILE DATA
RESULT OF INCORRECT CSW OR SENSE

-ERR WHEN SCAN HI KD, VIA 6TH SNS BYTE CCW, ON ALT SURF FILE HI THAN CORE.
RESULT OF INCORRECT CSW OR SENSE

-ERR WHEN SCAN HI REMAINDER OF CYL FOLLOWING THE DEF TRK, VIA 6TH SENSE BYTE, WHEN HI HAS BEEN SATISFIED ON DEF SURF
RESULT OF INCORRECT CSW OR SENSE.

4.2.64 STATUS MESSAGES FOR ROUTINE 1, SECTION F6B3.

-CK 6TH SENSE BYTE 65 AND 55
TITLE

-ERR WHEN CK SCAN HI OR EQUAL OVFL REC TO A DEF SURF CORE DATA EQ
FILE DATA
RESULT OF INCORRECT CSW OR SENSE.

-ERR WHEN SCAN HI EQ, VIA 6TH SNS BYTE CCW, ON ALT SURF FILE LO THAN CORE
RESULT OF INCORRECT CSW OR SENSE.

-ERR SCAN HI--EQ REMAINDER OF CYL FOLLOWING THE DEF TRK, VIA 6TH SNS BYTE, WHEN LO HAS BEEN SATISFIED ON DEF SURF
RESULT OF INCORRECT CSW OR SENSE

5. COMMENTS

5.1 COMMENTS ON SECTION F6A0.

ROUTINE ONE CHECKS THE TEST I/O INSTRUCTION BY ISSUING A TEST I/O AND CHECKING THE STATUS FOR RESULTS.

ROUTINE TWO CHECKS SENSE I/O BY ISSUING A SENSE AND CHECKING THE STATUS. THE INITIAL STATUS SHOULD BE ZERO AND FINAL STATUS SHOULD BE CHANNEL END AND DEVICE END.

ROUTINE THREE CHECKS NO--OP COMMAND BY ISSUING A NO--OP AND MAKING SURE THAT IT IS TREATED AS AN IMMEDIATE OPERATION AND THAT THE STATUS IS CHANNEL END AND DEVICE END.

ROUTINE FOUR CHECKS CONTROL HEAD SEEK. A HEAD IS SEEKED AND THE HOME ADDRESS READ. IT IS THEN COMPARED TO MAKE SURE SEEK WAS SUCCESSFUL.

ROUTINE FIVE CHECKS CONTROL CYLINDER SEEK BY THE SAME METHOD AS ROUTINE FOUR CHECKS HEAD SEEK.

ROUTINE SIX TEST CONTROL RESTORE BY SEEKING A GIVEN CYLINDER AND HEAD AND THEN ISSUING THE RESTORE. THE HOME ADDRESS IS THEN READ AND COMPARED TO MAKE SURE THE RESTORE WAS SUCCESSFUL.

ROUTINE SEVEN TEST CONTROL SEEK BY THE SAME METHOD AS ROUTINE FOUR CHECKS HEAD SEEKS.

5.2 COMMENTS ON SECTION F6A1.

ROUTINE ONE CHECKS THE HOME ADDRESS OPERATIONS. A HOME ADDRESS IS WRITTEN DIFFERENT THAN THE STANDARD AND IS READ BACK. IT IS THEN COMPARED TO SEE THAT IT IS OKAY, AND THEN THE STANDARD HOME ADDRESS IS REWRITTEN.

ROUTINE TWO CHECKS SEARCH HOME ADDRESS, WRITE AND READ RECORD ZERO. SEARCH HOME ADDRESS, WRITE RECORD ZERO ARE FOLLOWED BY A SEARCH HOME ADDRESS, READ RECORD ZERO. THE RECORD ZERO WRITTEN AND READ IS COMPARED TO SEE IF THE OPERATION WAS SUCCESSFUL.

ROUTINE THREE CHECKS SEARCH EQUAL COUNT, WRITE AND READ COUNT--KEY--DATA BY THE SAME METHOD AS ROUTINE TWO.
NO CHECK IS MADE FOR MISSING ADDRESS MARKS IN FRONT OF A KEY OR DATA FIELD, HOWEVER THIS CONDITION WILL BE INDICATED AS A DATA CHECK BY THE PROGRAM UNLESS THE KEY AND DATA FIELDS ARE BOTH THE SAME LENGTH. IN WHICH CASE NO ERROR WILL BE DETECTED.

ROUTINE FOUR CHECKS THE GAP LENGTH BETWEEN RECORD ONE AND RECORD TWO. ROUTINE ELEVEN CHECKS THE GAP LENGTH BETWEEN RECORD ONE AND RECORD TWO. IT DOES THIS BY CONTINUOUSLY REWRITING RECORD ONES DATA AND SEARCHING RECORD TWO COUNT. IF THE GAP VARIES SIGNIFICANTLY THE COUNT OF RECORD TWO WILL BE DESTROYED AND THEREFORE NOT FOUND. IF RECORD TWO COUNT IS FOUND THE GAP REMAINED OKAY. A SECTION OF ROUTINE THREE IS USED TO FORMAT THE TRACK.

5.3 COMMENTS ON SECTION F6A2.

ROUTINE ONE TESTS SEARCH EQUAL COUNT, WRITE AND READ KEY--DATA. SEARCH EQUAL COUNT, WRITE KEY--DATA ARE FOLLOWED BY SEARCH EQUAL COUNT, READ KEY--DATA. THE KEY--DATA WRITTEN AND READ ARE COMPARED TO SEE IF THE OPERATIONS WERE SUCCESSFUL.
NO CHECK IS MADE FOR MISSING ADDRESS MARKS IN FRONT OF A KEY OR DATA FIELD, HOWEVER THIS CONDITION WILL BE INDICATED AS A DATA CHECK BY THE PROGRAM UNLESS THE KEY AND DATA FIELDS ARE BOTH THE SAME LENGTH. IN WHICH CASE NO ERROR WILL BE DETECTED.

ROUTINE TWO TESTS SEARCH EQUAL KEY, WRITE AND READ DATA BY THE SAME METHOD AS ROUTINE ONE.

6. APPENDIX

6.1 COMMAND CODES

```
*
* VALID FILE COMMAND CODES.
*
* FUNCTION            COMMAND CODE BITS          HEX CODE -- WHERE ALL X
*                      0 1 2 3  4 5 6 7                     CHARACTERS
*                                                            ARE IN THE
* WR HOME ADDR.  . .   0 0 0 1  1 0 0 1 . . . . . 19        ZERO STATE
* WRITE RO . . . . .   0 0 0 1  0 1 0 1 . . . . . 15
* WR DATA  . . . . .   0 0 0 0  0 1 0 1 . . . . . 05
* WR KEY-DATA  . . .   0 0 0 0  1 1 0 1 . . . . . 0D
* WR CNT,KEY,DATA  .   0 0 0 1  1 1 0 1 . . . . . 1D
* ERASE    . . . . .   0 0 0 1  0 0 0 1 . . . . . 11
*
* WR.SPEC.CNT.KEY DATA0 0 0 0   0 0 0 1 . . . . . 01
*
* SEARCH EQUAL ID  .   X 0 1 1  0 0 0 1 . . . . . 31
* SEARCH EQUAL KEY .   X 0 1 0  1 0 0 1 . . . . . 29
* SEARCH EQ HOME ADDR  X 0 1 1  1 0 0 1 . . . . . 39
* SEARCH EQ KEY,DATA   X 0 1 0  1 1 0 1 . . . . . 2D
* SEARCH HI ID . . .   X 1 0 1  0 0 0 1 . . . . . 51
* SEARCH HI,KEY  . .   X 1 0 0  1 0 0 1 . . . . . 49
* SRCH HI KEY,DATA .   X 1 0 0  1 1 0 1 . . . . . 4D
* SRCH HI,EQ ID  . .   X 1 1 1  0 0 0 1 . . . . . 71
* SRCH HI,EQ KEY . .   X 1 1 0  1 0 0 1 . . . . . 69
* SRCH HI,EQ KEY,DATA  X 1 1 0  1 1 0 1 . . . . . 6D
*
* RD HOME ADDR.  . .   X 0 0 1  1 0 1 0 . . . . . 1A
* READ RO  . . . . .   X 0 0 1  0 1 1 0 . . . . . 16
* READ COUNT . . . .   X 0 0 1  0 0 1 0 . . . . . 12
* READ IPL . . . . .   X 0 0 0  0 0 1 0 . . . . . 02
* READ DATA  . . . .   X 0 0 0  0 1 1 0 . . . . . 06
* READ KEY,DATA  . .   X 0 0 0  1 1 1 0 . . . . . 0E
* RD CNT, KEY,DATA .   X 0 0 1  1 1 1 0 . . . . . 1E
*
* CONT.HEAD SEEK . .   0 0 0 1  1 0 1 1 . . . . . 18
* CONT. CYL. SEEK  .   0 0 0 0  1 0 1 1 . . . . . 0B
* CONTROL SEEK . . .   0 0 0 0  0 1 1 1 . . . . . 07
* RECALIBRATE  . . .   0 0 0 1  0 0 1 1 . . . . . 13
* CONT. SPACE CNT  .   0 0 0 0  1 1 1 1 . . . . . 0F
* CONT. NO OP. . . .   0 0 0 0  0 0 1 1 . . . . . 03
* CONT.SET FILE MASK   0 0 0 1  1 1 1 1 . . . . . 1F
* RESERVE  . . . . .   1 0 0 1  0 1 0 0 . . . . . 94
* RELEASE  . . . . .   1 0 1 1  0 1 0 0 . . . . . B4
* TEST I/O . . . . .   0 0 0 0  0 0 0 0 . . . . . 00
* SENSE I/O  . . . .   0 0 0 0  0 1 0 0 . . . . . 04
*
```

6.2 CSW - CHANNEL STATUS WORDS DEVICE AND CHANNEL STATUS BIT BREAKDOWN IN HEX.

```
CSW ... YY YY ...
          80 ---PROGRAM-CONTROLLED INTERRUPT
          40 ---INCORRECT LENGTH
          20 ---PROGRAM CHECK
          10 ---PROTECTION CHECK
          08 ---CHANNEL DATA CHECK
          04 ---CHANNEL CONTROL CHECK
          02 ---INTERFACE CONTROL CHECK
          01 ---CHAINING CHECK
       80 ---ATTENTION
       40 ---STATUS MODIFIER
       20 ---CONTROL UNIT END
       10 ---BUSY
```


ILL RETURN THE

K) ON THE

56 RECORDS
--

ORDS

M CYLINDERS FOR FILES
CORD FOR WRITE-READ FILES.
CCESSIVE SEEKS TO THE
FOR SEEKING.THIS
EEK COMMAND, NO
HE PROGRAM RECEIVES
NEXT FILE SEEKING.
ED SEEKING, PROGRAM

LLOWING CHAINS ON THE
--

```
     SEEK HEAD
     SEARCH = ID
     TIC  *-8
     WRITE KEY-DATA (RANDOM,A1
     SEARCH = ID
     TIC  *-8
     READ KEY-DATA INTO A2
```

HE PROGRAM CHECKS
READY. AREA 1
UAL. ALSO THE
CORRECT CYLINDER.
SEEKING
E STOP, OR
TA DID NOT
STATUS

GRAP..

HE KEY--DATA OF RECORD ONE
TWO READ IS COMPARED WITH
CESSFUL.

SEARCH HIGH OR EQUAL
ACH OF THE FOLLOWING

CH FIELD.
FIELD.
H FIELD.
YTES THAN FILE SEARCH FIELD.
YTES THAN FILE SEARCH FIELD.
UNS SEQUENTIALLY THROUGH A

```
                08 ---CHANNEL END
                04 ---DEVICE END
                02 ---UNIT CHECK
                01 ---UNIT EXCEPTION
```

6.3 SNS - SENSE BYTES RECEIVED ON A SENSE I/O COMMAND
BIT BREAKDOWN IN BINARY.

```
          SNS 00000000 00000000 00000000 01000000
              ..*..*.. ..*..*.. ..*..*.. ..*..*..
  COMMAND REJECT.*..*.. ..*..*.. ..*..*.. ..*..*.SEEK INCOMPLETE
INTERVENTION REQ'D*..*.. ..*..*.. ..*..*.. ..*..*MULTI MOD SELECT
    BUS OUT PARITY..*.. ..*..*.. ..*..*.. ..*..*END OF CYLINDER
    EQUIPMENT CHECK.*.. ..*..*.. ..*..*.. ..*.*PACK CHANGE
  (BURST) DATA CHECK*.. ..*..*.. ..*..*.. ..*WRITE CURRENT SENSE
CHANNEL/2314 OVER RUN.. ..*..*.. ..*..*.. ..UNSAFE
 TRACK CONDITION CHECK. ..*..*.. ..*..*.. .ON-LINE
           SEEK CHECK ..*..*.. ..*..*.. BUSY
                      ..*..*.. ..*..*..
DATA CHECK IN COUNT FIELD.*..*.. ..*..*.NOT USED
          TRACK OVERFLOW*..*.. ..*..*NOT USED
          END-OF-CYLINDER..*.. ..*..UNSELECTED FILE STATUS
          INVALID SEQUENCE.*.. ..*.2841 ALU CHECK
            NO RECORD FOUND*.. ..*NOT USED
              FILE PROTECTED.. ..SERIALIZER/DESERIALIZER CHECK
      MISSING ADDRESS MARKERS. .NOT USED
          OVERFLOW INCOMPLETE.UNSAFE
```

SNS BYTE 4	00000000	DRIVE A
	00000001	DRIVE B
	00000010	DRIVE C
	00000011	DRIVE D
	00000100	DRIVE E
	00000101	DRIVE F
	00000110	DRIVE G
	00000111	DRIVE H
	00001000	DRIVE J
	00001111	DRIVE CANNOT BE DETERMINED

WHERE IT WAS TOLD TO SEEK TO, AND WHERE IT WENT. THIS REQUIRES THAT A GOOD PACK BE USED WITH HOME ADDRESS ON ALL CYLINDERS. IF A UNIT CHECK ERROR WAS DETECTED AS A RESULT OF ACCESS GOING TO INNER OR OUTER POSITIVE STOP, THE -WENT TO- IS NOT PRINTED OUT. ALSO PRINTED IS THE CAW, CSW, AND SENSE BYTE INFORMATION. FILE APPEARS TO BE SEEKING WRONG, RUN PROGRAM F6BA TO F6BD ON THIS DRIVE.

-ERROR ON WRITE-READ FILE
CAW ... CSW ... SNS ...
ERROR MESSAGE WHEN AN ERROR IS DETECTED ON THE FILE DRIVE BEING USED TO READ AND WRITE ON. IF A UNIT CHECK, DEVICE END, AND CHANNEL END I/O INTERRUPT IS RECEIVED FROM THE FILE BEING USED FOR WIRINTG AND READING, THIS MESSAGE IS PRINTED OUT ALONG WITH CAW, CSW, AND SENSE BYTE INFORMATION. USER SHOULD EXAMINE THIS DATA FOR TROUBLE.

-READ-WRITE DATA DOES NOT CAMPARE CAW XXXXX
ERROR MESSAGE WHEN AN ERROR IS DETECTED ON THE FILE DRIVE BEING USED FOR READ AND WRITE. AFTER THE READ AND WRITE OPERATIONS HAVE BEEN COMPLETED ON THE WRITE-READ FILE DRIVE, THE PROGRAM WILL COMPARE THE READ DATA WITH THE WRITE DATA. THIS ERROR MESSAGE IS PRINTED OUT IF THESE DATA RECORDS DO NOT COMPARE.
THE CAW IS PRINTED OUT TO INDICATE WHICH CHAIN THE ERROR OCCURED ON. THE PROGRAM WILL ALTERNATE BETWEEN THE FOLLOWING CHAINS.

-OR-

SEEK HEAD	SEEK HEAD
READ COUNT	SEARCH ID
SEARCH KEY	TIC *-8
TIC *-16	WRITE KEY-DATA FROM A1
READ DATA INTO AREA A1	SEARCH ID
SEARCH ID	TIC *-8
TIC *-8	READ KEY-DATA INTO AREA A2
WRITE DATA FROM AREA A1	
SEARCH ID	
TIC *-8	
READ DATA INTO AREA A2	

4.2.46 STATUS MESSAGES FOR ROUTINE 1, SECTION F6AE.

-ROUTINE 1 -TEST SRH EQ KEY-DATA-
ROUTINE TITLE.

-CT-KY-DATA RD AND EXP EQ-
THE SEARCH EQ KEY--DATA COMMAND IS CHECKED BY FOLLOWING IT WITH A READ COUNT--KEY--DATA. THE RECORD WRITTEN AND READ IS COMPARED TO SEE IF SEARCH WAS CORRECT.

-CT-KY-DATA READ NOT EQ CT-KY-DATA WRITTEN-
UNEQUAL RESULTS FROM ABOVE MENTIONED COMPARE.

4.2.47 STATUS MESSAGES FOR ROUTINE 2, SECTION F6AE.

-ROUT 2 -
-3 RECS ARE USED WITH RO-

-REC	ID	KEY,DATA	DATA-
-1	00C3000001	REC1	REC1-
-2	00C3000002	REC2	REC2-
-3	00C3000007	REC7	REC7-

THIS IS THE ROUTINE TITLE WHICH EXPLAINS THE THREE RECORDS WHICH ARE USED IN ADDITION TO RECORD ZERO.

THE COLUMN UNDER THE HEADING --REC-- REPRESENT THE RECORDS FOLLOWING RO. THAT IS, RECORD 1, RECORD 2, AND RECORD 3 ARE WRITTEN FOLLOWING

THE RECORD 0. THE DATA IN THE COLUMN UNDER --ID-- REPRESENT THE COUNT OR ID FIELDS, IN HEXADECIMAL REPRESENTATION, OF THE CORRESPONDING RECORDS. IN OTHER WORDS, THIS IS THE CCHHR PORTION OF THE COUNT FIELDS FOR THE CORRESPONDING RECORD. THE DATA IN THE COLUMN UNDER --KEY,DATA-- REPRESENT THE KEY FIELD OF THE RESPECTIVE RECORDS. THE DATA IN THE COLUMN UNDER THE HEADING --DATA-- REPRESENT THE DATA FIELD OF THE RESPECTIVE RECORDS. IT SHOULD BE NOTED THAT THE KEY FIELDS AND DATA FIELDS ARE FOUR BYTES IN LENGTH AND ARE REPRESENTED IN THIS MESSAGE BY THE PRINTABLE CHARACTERS OF THE EBCDIC.

-SRCH HI KEY-DATA,CORE KEY-DATA REC8REC8-
THIS IS ONE EXAMPLE OF THE SUBTITLES THAT OCCUR BEFORE EACH PASS THROUGH THIS ROUTINE. IT TELLS THE COMMAND TO BE TESTED, AND THE CORE KEY,DATA TO BE SEARCHED AGAINST.

-SRCH HI KEY-DATA,CORE KEY-DATA REC1REC1,ORIEN. ON R1-
THIS IS ANOTHER EXAMPLE OF A SUBTITLE. THE ADDITIONAL PORTION HERE, -ORIEN. ON RO- , TELLS THAT THE FILE IS ORIENTED ON RECORD ZERO BEFORE THE SEARCH IS ISSUED.

-SRCH HI KEY-DATA,CCW CT EQ 6,FILE CT EQ 8,CORE DATA REC2RE,ORIEN.ON RO-
THIS IS ANOTHER EXAMPLE OF A SUBTITLE. THE ADDITIONAL PORTION HERE,-CCW CT EQ 6,FILE CT EQ 8- TELLS THE INCORRECT LENGTH COMMAND ISSUED, AND WHAT LENGTH IT IS ON FILE.

THE ABOVE THREE EXAMPLES OF MESSAGES ARE SUBTITLES WHICH OCCUR AT THE BEGINNING OF EACH SECTION OF THIS ROUTINE. THEY OCCUR TO DESCRIBE THE SEARCH COMMAND TO BE TESTED AND THE WAY IT IS TESTED.

-GOT ER FORMATING TRACK-
SELF EXPLANATORY.

-ERR CSW IS XXXXXXXXXXXXXXX SHLD BE XXXXXXXXXXXXXXX-
-SNS IS XXXXXXXXXXX SHD BE XXXXXXXXXXX-
UNEXPECTED RESULTS FROM SEARCH COMMAND CAUSE THESE TWO ERROR MESSAGES.

-RECX CAUSED HIT NO REC SHLD CAUSE HIT-
IN THIS MESSAGE AND THE FOLLOWING TWO, -HIT- MEANS THE SEARCH CONDITIONS BEING TESTED ARE SATISFIED.

-RECX CAUSED HIT RECY SHLD CAUSE HIT-
SEE MESSAGE ABOVE.

-RECY SHLD CAUSE HIT NO REC CAUSED HIT-
SEE MESSAGE ABOVE.

4.2.48 STATUS MESSAGES FOR ROUTINE 1,SECTION F6AF.

-ROUT 1 -WRITE AND READ SPECIAL CT,KEY AND DATA-
ROUTINE TITLE.

-CT-KEY-DATA READ DOES NOT EQ WRITTEN-
SELF EXPLANATORY.

-SPECIAL CT-KY-DATA WRITTEN CORRECTLY-
SELF EXPLANATORY.

4.2.49 STATUS MESSAGES FOR ROUTINE 2,SECTION F6AF.

-ROUT 2 -TEST WRITE AND READ DATA WITH RECORD OVERFLOW-
ROUTINE TITLE.

-DATA READ DOES NOT EQUAL DATA WRITTEN-
SELF EXPLANATORY.

-DATA WRITTEN AND READ CORRECTLY-
SELF EXPLANATORY.

4.2.50 STATUS MESSAGES FOR ROUTINE 3,SECTION F6AF.

-ROUT 3 -TEST WRITE AND READ KEY-DATA WITH RECORD OVERFLOW-
ROUTINE TITLE.

-KEY DATA RD DOES NOT EQ KY-DATA WR-
KEY DATA READ DOES NOT EQUAL KEY DATA WRITTEN.

-KEY-DATA WRITTEN AND READ CORRECTLY-
SELF EXPLANATORY.

4.2.51 STATUS MESSAGES FOR ROUTINE 4,SECTION F6AF.

-ROUT 4 -TEST READ COUNT WITH RECORD OVERFLOW-
ROUTINE TITLE.

-COUNT READ DOES NOT EQ COUNT EXP-
COUNT READ DOES NOT EQUAL COUNT EXPECTED.

-COUNT READ EQUALS COUNT EXPECTED-
SELF EXPLANATORY.

4.2.52 STATUS MESSAGES FOR ROUTINE 5,SECTION F6AF.

-ROUT 5 -TEST WRITE AND READ DATA WITH REC OVERFLOW OF HALF A CYL-
ROUTINE TITLE.

-DATA READ DOES NOT EQUAL DATA WRITTEN-
SELF EXPLANATORY.

-DATA WRITTEN AND READ CORRECTLY-
SELF EXPLANATORY.

4.2.53 STATUS MESSAGES FOR ROUTINE 6,SECTION F6AF.

-ROUT 6 -TEST WRITE AND READ KEY-DATA WITH RECORD OVERFLOW-HALF CYL-
ROUTINE TITLE.

-KY-DATA RD DOES NOT EQ KY-DATA WR-
KEY DATA READ DOES NOT EQUAL KEY DATA WRITTEN.

-KEY-DATA WRITTEN AND READ CORRECTLY-
SELF EXPLANATORY.

4.2.54 STATUS MESSAGES FOR ROUTINE 7,SECTION F6AF.

-ROUT 7 -TEST READ COUNT WITH RECORD OVERFLOW-
ROUTINE TITLE.

-COUNT READ DOES NOT EQ COUNT EXP-
SELF EXPLANATORY.

-COUNT READ EQUALS COUNT EXPECTED-
SELF EXPLANATORY.

4.2.55 STATUS MESSAGES FOR ROUTINE 1,SECTION F6B0.

-RT 1-VIOLATION OF FILE MK WITH OVFLO
ROUTINE TITLE

-OK -VIOLATE FILE MK WITH OVFLO
ACCOMPANIES CORRECT RESULTS PRINT OUT WITH SW 7 ON

-ERR-VIOLATE FILE MK WITH OVFLO
ERROR MESSAGE WHEN OVERFLOWING TO A FILE PROTECTED
BOUNDARY DOES NOT INDICATE CORRECT CSW AND SENSE BITS.

4.2.56 STATUS MESSAGES FOR ROUTINE 2, SECTION F6B0.

-RT 2-REC OVFLO TO TRK WITH WRONG HEAD NO.
ROUTINE TITLE

-OK -OFLO TO TRK WITH WRONG HD NO.
ACCOMPANIES CORRECT RESULTS PRINT OUT WITH SW 7 ON

-ERR-OFLO TO TRK WITH WRONG HD NO.
ERROR MESSAGE WHEN OVERFLOWING TO A TRACK
WITH WRONG HEAD NUMBER INDICATES THE CORRECT
AND INCORRECT CSW AND SENSE BITS.

4.2.57 STATUS MESSAGES FOR ROUTINE 3,SECTION F6B0.

-RT 3-REC OVFLO FROM ALT TRK
ROUTINE TITLE

-OK -REC OVFLO FROM ALT TRK
ACCOMPANIES CORRECT RESULTS PRINT OUT WITH SW 7 ON

-ERR-REC OVFLO FROM ALT TRK
ERROR MESSAGE WHEN OVERFLOWING FROM AN ALTERNATE TRACK TO
A NORMAL TRACK DOES NOT INDICATE THE CORRECT CSW AND SENSE BITS.

4.2.58 STATUS MESSAGES FOR ROUTINE 4, SECTION F6B0.

-RT 4-SCAN AN OFLO RECORD-
ROUTINE TITLE

-OK -SCAN AN OFLO RECORD
ACCOMPANIES CORRECT RESULTS PRINT-OUT WITH SW 7 ON.

-ERR-SCAN AN OFLO RECORD
ERROR MESSAGE WHEN SCANNING AN OVERFLOW RECORD
INDICATES CORRECT AND INCORRECT CSW AND SENSE BITS.

4.2.59 STATUS MESSAGES FOR ROUTINE 5, SECTION F6B0.

-RT5-OVFLO TO END-OF-CYL
ROUTINE TITLE

-OK -OVFLO TO END-OF-CYL
ACCOMPANIES CORRECT RESULTS PRINT OUT WITH SW 7 ON

-ERR-OVFLO TO END-OF-CYL
ERROR MESSAGE WHEN OVERFLOW TO END-OF-CYLINDER
DOES NOT RESULT IN CORRECT CSW AND SENSE BITS

4.2.60 STATUS MESSAGES FOR ROUTINE 1, SECTION F6B1.

CK USE OF 6TH SNS BYTE WHEN OVERFLOW TO DEF SURF WHILE READING A KD
OVERFLOW REC
ROUTINE TITLE

-ROUT RAN OK

-ERR WHEN CK RD KD OVFL REC TO A DEF SURF
ERROR WHEN CHECKING READ KEY-DATA OVERFLOW RECORD TO A DEFECTIVE
SURFACE. PRINTS AS A RESULT OF INCORRECT CSW OR SENSE.

-ERR WHEN RD DATA VIA 6TH SNS BYTE CCW, ON ALT SURF
ERROR MESSAGE WHEN READ DATA VIA 6TH SENSE BYTE CCW, ON ALTERNATE
SURFACE. PRINTS AS A RESULT OF INCORRECT CSW OR SENSE.

-ERR WHEN RD REMAINDER OF CYL, FOLLOWING THE DEF TRK, VIA 6TH SNS
BYTE CCW. PRINTS AS A RESULT OF INCORRECT CSW OR SENSE.

4.2.61 STATUS MESSAGES FOR ROUTINE 2, SECTION F6B1.

CK USE OF 6TH SNS BYTE WHEN OVERFLOW TO DEF SURF WHILE WRITING THE DATA PORTION OF AN OVFLO REC
ROUTINE TITLE

-ERR WHEN CK WR DATA OVFL REC TO A DEF SURF
ERROR PRINT-OUT BECAUSE OF INCORRECT CSW OR SENSE.

-ERR WHEN WR DATA VIA 6TH SNS BYTE CCW, ON ALT SURF
ERROR PRINT-OUT BECAUSE OF INCORRECT CSW OR SENSE.

-ERR WHEN WR REMAINDER OF CYL, FOLLOWING THE DEF TRK, VIA 6TH SNS BYTE

4.2.62 STATUS MESSAGES FOR ROUTINE1, SECTION F6B2.

-CK USE OF 6TH SNS BYTE WHEN OVERFLOW TO DEF SURF WHILE SCANNING EQ
TITLE

-KEY-DATA PORTION OF AN OVERFLOW REC DATA IS EQ

-ERR WHEN SCAN EQ KEY DATA REMAINDER OF CYL, AFTER DEF TRK VIA 6TH SNS BYTE
ERROR PRINT-OUT BECAUSE OF INCORRECT CSW OR SENSE

-ROUTINE RAN OK

4.2.63 STATUS MESSAGES FOR ROUTINE 2, SECTION F6B2.

-CK 6TH SENSE BYTE 45 AND 75
TITLE

-ERR WHEN CK SCAN HI KEY DATA OVFL REC TO A DEF SURF CORE DATA EQ FILE DATA
RESULT OF INCORRECT CSW OR SENSE

-ERR WHEN SCAN HI KD, VIA 6TH SNS BYTE CCW, ON ALT SURF FILE HI THAN CORE.
RESULT OF INCORRECT CSW OR SENSE

-ERR WHEN SCAN HI REMAINDER OF CYL FOLLOWING THE DEF TRK, VIA 6TH SENSE BYTE, WHEN HI HAS BEEN SATISFIED ON DEF SURF
RESULT OF INCORRECT CSW OR SENSE.

4.2.64 STATUS MESSAGES FOR ROUTINE 1, SECTION F6B3.

-CK 6TH SENSE BYTE 65 AND 55
TITLE

-ERR WHEN CK SCAN HI OR EQUAL OVFL REC TO A DEF SURF CORE DATA EQ FILE DATA
RESULT OF INCORRECT CSW OR SENSE.

-ERR WHEN SCAN HI EQ, VIA 6TH SNS BYTE CCW, ON ALT SURF FILE LO THAN CORE
RESULT OF INCORRECT CSW OR SENSE.

-ERR SCAN HI--EQ REMAINDER OF CYL FOLLOWING THE DEF TRK, VIA 6TH SNS BYTE, WHEN LO HAS BEEN SATISFIED ON DEF SURF
RESULT OF INCORRECT CSW OR SENSE

5. COMMENTS

5.1 COMMENTS ON SECTION F6A0.

ROUTINE ONE CHECKS THE TEST I/O INSTRUCTION BY ISSUING A TEST I/O AND CHECKING THE STATUS FOR RESULTS.

ROUTINE TWO CHECKS SENSE I/O BY ISSUING A SENSE AND CHECKING THE STATUS. THE INITIAL STATUS SHOULD BE ZERO AND FINAL STATUS SHOULD BE CHANNEL END AND DEVICE END.

ROUTINE THREE CHECKS NO--OP COMMAND BY ISSUING A NO--OP AND MAKING SURE THAT IT IS TREATED AS AN IMMEDIATE OPERATION AND THAT THE STATUS IS CHANNEL END AND DEVICE END.

ROUTINE FOUR CHECKS CONTROL HEAD SEEK. A HEAD IS SEEKED AND THE HOME ADDRESS READ. IT IS THEN COMPARED TO MAKE SURE SEEK WAS SUCCESSFUL.

ROUTINE FIVE CHECKS CONTROL CYLINDER SEEK BY THE SAME METHOD AS ROUTINE FOUR CHECKS HEAD SEEK.

ROUTINE SIX TEST CONTROL RESTORE BY SEEKING A GIVEN CYLINDER AND HEAD AND THEN ISSUING THE RESTORE. THE HOME ADDRESS IS THEN READ AND COMPARED TO MAKE SURE THE RESTORE WAS SUCCESSFUL.

ROUTINE SEVEN TEST CONTROL SEEK BY THE SAME METHOD AS ROUTINE FOUR CHECKS HEAD SEEKS.

5.2 COMMENTS ON SECTION F6A1.

ROUTINE ONE CHECKS THE HOME ADDRESS OPERATIONS. A HOME ADDRESS IS WRITTEN DIFFERENT THAN THE STANDARD AND IS READ BACK. IT IS THEN COMPARED TO SEE THAT IT IS OKAY, AND THEN THE STANDARD HOME ADDRESS IS REWRITTEN.

ROUTINE TWO CHECKS SEARCH HOME ADDRESS, WRITE AND READ RECORD ZERO. SEARCH HOME ADDRESS, WRITE RECORD ZERO ARE FOLLOWED BY A SEARCH HOME ADDRESS, READ RECORD ZERO. THE RECORD ZERO WRITTEN AND READ IS COMPARED TO SEE IF THE OPERATION WAS SUCCESSFUL.

ROUTINE THREE CHECKS SEARCH EQUAL COUNT, WRITE AND READ COUNT--KEY--DATA BY THE SAME METHOD AS ROUTINE TWO.
NO CHECK IS MADE FOR MISSING ADDRESS MARKS IN FRONT OF A KEY OR DATA FIELD, HOWEVER THIS CONDITION WILL BE INDICATED AS A DATA CHECK BY THE PROGRAM UNLESS THE KEY AND DATA FIELDS ARE BOTH THE SAME LENGTH. IN WHICH CASE NO ERROR WILL BE DETECTED.

ROUTINE FOUR CHECKS THE GAP LENGTH BETWEEN RECORD ONE AND RECORD TWO. ROUTINE ELEVEN CHECKS THE GAP LENGTH BETWEEN RECORD ONE AND RECORD TWO. IT DOES THIS BY CONTINUOUSLY REWRITING RECORD ONES DATA AND SEARCHING RECORD TWO COUNT. IF THE GAP VARIES SIGNIFICANTLY THE COUNT OF RECORD TWO WILL BE DESTROYED AND THEREFORE NOT FOUND. IF RECORD TWO COUNT IS FOUND THE GAP REMAINED OKAY. A SECTION OF ROUTINE THREE IS USED TO FORMAT THE TRACK.

5.3 COMMENTS ON SECTION F6A2.

ROUTINE ONE TESTS SEARCH EQUAL COUNT, WRITE AND READ KEY--DATA. SEARCH EQUAL COUNT, WRITE KEY--DATA ARE FOLLOWED BY SEARCH EQUAL COUNT, READ KEY--DATA. THE KEY--DATA WRITTEN AND READ ARE COMPARED TO SEE IF THE OPERATIONS WERE SUCCESSFUL.
NO CHECK IS MADE FOR MISSING ADDRESS MARKS IN FRONT OF A KEY OR DATA FIELD, HOWEVER THIS CONDITION WILL BE INDICATED AS A DATA CHECK BY THE PROGRAM UNLESS THE KEY AND DATA FIELDS ARE BOTH THE SAME LENGTH. IN WHICH CASE NO ERROR WILL BE DETECTED.

ROUTINE TWO TESTS SEARCH EQUAL KEY, WRITE AND READ DATA BY THE SAME METHOD AS ROUTINE ONE.

ROUTINE THREE TESTS SEARCH EQUAL COUNT, WRITE AND READ DATA BY THE SAME METHOD AS ROUTINE ONE.

ROUTINE FOUR TESTS SEARCH EQUAL COUNT AND READ COUNT. RECORD ZERO COUNT IS SEARCHED AND RECORD ONE COUNT IS READ. THE COUNT READ IS COMPARED WITH THE COUNT EXPECTED TO SEE IF THE OPERATION WAS SUCCESSFUL.

ROUTINE FIVE TESTS SPACE RECORD BY SEARCHING RECORD ZERO COUNT, SPACING RECORD ONE AND READING RECORD TWO COUNT. THE COUNT READ IS COMPARED WITH THE COUNT EXPECTED TO SEE IF THE OPERATION WAS SUCCESSFUL.

5.4 COMMENTS ON SECTION F6A3.

ROUTINE ONE TESTS SEARCH HIGH COUNT, SEARCH HIGH KEY, SEARCH HIGH OR EQUAL COUNT, AND SEARCH HIGH OR EQUAL KEY. THESE SEARCHES ARE TESTED FOR EACH OF THE FOLLOWING FIVE CASES.
1. CORE SEARCH FIELD HIGHER THAN FILE SEARCH FIELD.
2. CORE SEARCH FIELD EQUAL TO FILE SEARCH FIELD.
3. CORE SEARCH FIELD LOWER THAN FILE SEARCH FIELD.
4. SEARCH COMMAND TESTED SPECIFYING LESS BYTES THAN FILE SEARCH FIELD.
5. SEARCH COMMAND TESTED SPECIFYING MORE BYTES THAN FILE SEARCH FIELD.

THE SEARCHES ARE TESTED BY A COMMON ROUTINE WHICH RUNS SEQUENTIALLY THROUGH A TABLE OF DATA. THE COMMANDS ARE TESTED BY GIVING THE SEARCH AND THEN READING THE EXPECTED RECORD. A COMPARE IS PERFORMED AND THE RESULTS ARE INDICATED.

5.5 COMMENTS ON SECTION F6A4.

ROUTINE ONE TESTS THE SET PROTECT OPERATION. A COMMON ROUTINE IS USED TO RUN THROUGH MANY TIMES TO CHECK VARIOUS COMBINATIONS OF THE PROTECT BITS.

FIRST ALL COMBINATIONS OF BITS 0 AND 1 ARE CHECKED FOR ALL THE DIFFERENT WRITE OPERATIONS. THE SET PROTECT IS ISSUED AND THEN THE WRITE ATTEMPTED. WHERE WRITE SHOULD BE ALLOWED A READ IS PERFORMED. THE DATA READ IS THEN COMPARED WITH DATA WRITTEN FOR RESULTS. WHERE WRITE IS INHIBITED THE CHANNEL STATUS WORD AND SENSE DATA ARE CHECKED TO MAKE SURE THEY ARE AS EXPECTED.

NEXT, ALL COMBINATIONS OF BITS THREE AND FOUR ARE TESTED FOR EACH OF THE SEEK OPERATIONS. THE RESULTS ARE CHECKED THE SAME AS FOR BITS ZERO AND ONE.

NEXT, ALL COMBINATIONS OF BITS FIVE AND SIX ARE SET TO MAKE SURE THAT UNIT CHECK IS SET WITH SENSE BIT OF INVALID COMMAND. THIS IS EXPECTED BECAUSE THESE BITS HAVE TO BE ZERO TO BE VALID.

LASTLY, ALL COMBINATIONS OF BITS TWO AND SEVEN ARE TESTED FOR THE SAME CONDITIONS AS BITS FIVE AND SIX.

5.6 COMMENTS ON SECTION F6A5.

ROUTINE ONE FORCES THE SETTING OF STATUS MODIFIER, CONTROL UNIT END, BUSY, CHANNEL END, AND DEVICE END BITS. THEY ARE SET BY PERFORMING A WRITE HOME ADDRESS WITH COMMAND CHAIN BIT OFF, THEN ADDRESSING THE SAME FILE WITH A SEEK OPERATION. AS SOON AS HOME ADDRESS IS WRITTEN, AN INTERRUPT WILL BE INITIATED AND THE CHANNEL STATUS WORD SHOULD INDICATE CHANNEL END AND DEVICE END. AT THIS TIME THE SEEK IS ATTEMPTED ON THE SAME FILE AND THE STATUS MODIFIER AND BUSY BITS TURNED ON IN THE CHANNEL STATUS WORD. THE CHANNEL IS THEN ENABLED, AND THE PROGRAM WAITS FOR CONTROL UNIT END INTERRUPT.

ROUTINE TWO FORCES UNIT EXCEPTION. IT IS SET BY WRITING A COUNT--KEY--DATA WITH KEY LENGTH EQUAL DATA LENGTH EQUAL ZERO, AND THEN ATTEMPTING TO READ THE COUNT--KEY--DATA.

ROUTINE THREE CHECKS ATTEMPTING ALL INVALID COMMANDS. THIS IS DONE

BY GENERATING AN EIGHT BIT COMMAND BY ADDING ONE TO THESE EIGHT BITS. THE GENERATED COMMAND IS COMPARED WITH ALL THE VALID COMMANDS, AS LISTED IN A STORAGE TABLE, AND IF NONE ARE FOUND TO MATCH THE GENERATED COMMAND, THE GENERATED COMMAND IS INVALID AND IS EXECUTED. THE ADD TAKES PLACE 256 TIMES, AT WHICH POINT THE CAPACITY OF EIGHT BITS IS EXHAUSTED. A SUBROUTINE REFORMATS TRACK WHEN NECESSARY.

*** NOTE ***

IF THE AUXILIARY STORAGE FEATURE IS INSTALLED ON THE 2314, THE 'TWO-CHANNEL SWITCH' FEATURE MUST BE DEFINED IN THE UDT I/O OPTIONS BYTE WHETHER IT EXISTS ON THE MACHINE OR NOT.

5.7 COMMENTS ON SECTION F6A6.

ROUTINE ONE FORCES THE INVALID SEQUENCE BIT TO BE SET BY ATTEMPTING A LARGE NUMBER OF INVALID SEQUENCES.

5.8 COMMENTS ON SECTION F6A7.

ROUTINE ONE ALSO FORCES THE INVALID SEQUENCE BIT TO BE SET, IDENTICALLY TO ROUTINE 1, SECTION F6A6.

5.9 COMMENTS ON SECTION F6A8.

ROUTINE ONE FORCES THE OVERRUN SENSE BIT TO BE SET BY ATTEMPTING TO READ HOME ADDRESS WITH CHAIN DATA ADDRESS BIT ON.

ROUTINE TWO FORCES THE TRACK CONDITION CHECK SENSE BIT TO BE SET BY SEARCHING COUNT ON A FLAGGED TRACK.

ROUTINE THREE FORCES THE TRACK CONDITION CHECK SENSE BIT TO BE SET BY COMMAND CHAINING, WITH MULTIPLE TRACK BIT ON, FROM AN ALTERNATE TRACK.

ROUTINE FOUR FORCES THE SEEK CHECK SENSE BIT TO BE SET BY ATTEMPTING A SEEK OUTSIDE THE INNER CYLINDER BOUNDARY.

ROUTINE FIVE FORCES THE SEEK CHECK SENSE BIT TO BE SET BY ATTEMPTING A SEEK SPECIFYING LESS THAN SIX BYTES OF SEEK ADDRESS.

ROUTINE SIX FORCES THE TRACK OVERRUN SENSE BIT TO BE SET BY FORMATING A TRACK BEYOND ITS CAPACITY.

ROUTINE SEVEN FORCES THE END OF CYLINDER SENSE BIT TO BE SET BY PERFORMING TWO CHAINED READ HOME ADDRESS CCWS WITH THE FIRST ADDRESSING HEAD 19 AND WITH THE MULTIPLE TRACK BIT ON FOR THE SECOND.

ROUTINE EIGHT CHECKS THAT THE NO RECORD FOUND SENSE BIT IS SET BY PERFORMING A SEARCH HOME ADDRESS EQUAL WHERE THE CORE HOME ADDRESS AND FILE HOME ADDRESS ARE NOT EQUAL.

5.10 COMMENTS ON SECTION F6A9.
ROUTINE ONE TESTS TRUNCATED READ BY FORMATTING THE TRACK WITH A RECORD WITH A DATA LENGTH OF FIVE BYTES. AFTER THIS A READ COMMAND IS ISSUED WITH A DATA LENGTH OF 4 BYTES.

ROUTINE TWO TEST USING THE MULTI TRACK BIT. IT IS TESTED BY READING HOME ADDRESSES, WITH MULTI TRACK BIT ON, FOR A COMPLETE CYLINDER AND COMPARING THEM TO SEE IF THEY ARE CORRECT.

ROUTINE THREE WILL SEEK TO A TEST TRACK,WRITE A FULL TRACK RECORD -0- (DATA WILL CONSIST OF THE LOWER PART OF CORE STORAGE) AND VERIFY THAT THE RECORD WAS WRITTEN CORRECTLY,THEN ANOTHER TEST TRACK IS SEEKED TO AND ANOTHER FULL TRACK IS WRITTEN AND VERIFIED. THE FIRST TRACK IS SEEKED TO AND THE RECORD -0- DATA IS READ WITH THE SKIP BIT ON IN THE CCW THUS BURST

CHECKING THE DATA THAT WAS WRITTEN. THEN THE SECOND TEST TRACK IS SEEKED TO AND ITS RECORD -0- DATA IS BURST CHECKED IN A SIMILAR MANNER.
EACH TIME THE ABOVE SEQUENCE (CHAIN OF COMMANDS) IS EXECUTED THE STORAGE ADDRESS OF WHERE THE DATA IS WRITTEN FROM IS INCREMENTED BY -1-.
THE ABOVE SEQUENCE IS REPEATED 100 TIMES.

5.11 COMMENTS ON SECTION -F6AA-

ROUTINE -1- E R A S E COMMAND
THIS ROUTINE WILL FORMAT A TRACK WITH RECORD 1 AND RECORD 2. THEN THE PROGRAM WILL VERIFY THAT RECORD 2 IS ON THE TRACK. THE PROGRAM WILL THEN ATTEMPT TO -ERASE- RECORD 2 CHAINED TO A WRITE RECORD 3. AFTER ERASING, THE ROUTINE WILL CHECK THAT RECORF IS MISSING AND THAT RECORD 3 CAN BE READ.

ROUTINE -2- S P A C E C O U N T
THIS ROUTINE WILL CHECK THE FOLLOWING FUNCTIONS THE -SPACE COUNT- COMMAND.

1. SPACE COUNT SHOULD SET FILE PROTECT SO AS TO INHIBIT ANY WRITE COMMANDS.
2. IF INDEX IS DETECTED WHILE SPACE COUNT IS SEARCHING FOR AN ADDRESS MARK, NO RECORD FOUND SHOULD BE SET.
3. SPACE COUNT FOLLOWING A FORMAT WRITE SHOULD SET INVALID SEQUENCE.
4. SPACE COUNT NOT CHAINED FROM A PREVIOUS COMMAND SHOULD SPACE OVER RECORD -0-.
5. TWO CHAINED SPACE COUNTS NOT CHAINED FROM A PREVIOUS COMMAND SHOULD SPACE TO RECORD -2-.
6. CHECK THAT SPACE COUNT WILL REQUEST -3- BYTES FROM CHANNEL AND USE THESE BYTES AS KL AND DL OF THE RECORD. (CORRECT LENGTHS)
7. SAME AS NUMBER 6, EXCEPT KEY LENGTH AND DATA LENGTH THAT THE CHANNEL SENDS THE CONTROL UNIT ARE INCORRECT.

ROUTINE -3- R E A D I P L
THIS ROUTINE WILL CHECK THAT READ IPL (INITIAL PROGRAM LOAD) WILL FUNCTION CORRECTLY. THAT IS THE ACCESS WILL MOVE TO CYLINDER 000, SELECT HEAD 00, SEARCH FOR INDEX, CLOCK PAST THE HOME ADDRESS, AND RECORD ZERO, AND TRANSFER THE DATA PORTION OF RECORD 1.
THE PROGRAM WILL CHECK IF A RECORD 1 DATA RECORD IS PRESENT. IF ONE IS NOT, A RECORD 1 DATA RECORD IS WRITTEN.
THE ACCESS IS POSITIONED AT CYLINDER 198, HEAD 9, BEFORE THE READ IPL COMMAND IS EXECUTED.

ROUTINE -4- E N D O F F I L E
THIS ROUTINE WILL CHECK THAT THE END OF FILE RECORD (A RECORD WITH DATA LENGTH = 00) WILL NOT SET -UNIT EXCEPTION- ON THE FOLLOWING COMMANDS ---

SEARCH EQ ID	READ COUNT
SEARCH EQ KEY	SPECIAL CASES

THIS ROUTINE WILL CHECK THAT THE END OF FILE RECORD (A RECORD WITH DATA LENGTH = 0) WILL SET -UNIT EXCEPTION- ON THE FOLLOWING COMMANDS ---

READ RO	WRITE KD
READ CKD	WRITE D
READ KD	SRCH KD

READ D

5.12 COMMENTS ON SECTION -F6AB-

ROUTINE -1- TEST OVER UNDER TRUNCATION OF COMMANDS
THIS ROUTINE WILL CHECK THE FOLLOWING COMMANDS CAN BE TRUNCATED. BOTH OVER-TRUNCATION (CHANNEL COUNT IS GREATER THAN 2314 COUNT) AND UNDER-TRUNCATION (CHANNEL COUNT IS LESS THAN 2314) COUNT) ARE CHECKED.

TRACK FORMAT - HA,RO (K=2 D=4), R1 (K=0 D=4), R2 (K=2 D=4)

COMMAND	NORMAL-CNT	CHNL-CNT FOR TRUNC
RD HA	5	3,9
RD RO	14	6,8,9,10,11,12,13,15
RD CNT	8	5,10
RD D	4	3,5
RD K-D	6	1,2,3,8
RD CKD	14	2,5,8,9,10,11,17
WR HA	5	4,6
WR RO	14	2,8,11,17
WR D	4	3,5
WR K-D	6	1,2,4,9
WR CKD	14	5,8,9,10,13,15
SRCH = HA	4	2,6
SRCH = ID	5	4,8
SRCH = KEY	2	1,3
SRCH HI-ID	2	3,7

5.13 COMMENTS ON SECTION -F6AC-

ROUTINE ONE CHECKS THE HALT I/O COMMAND DURING A READ OPERATION. IT CHECKS TO SEE IF READING WAS ACTUALLY STOPPED BY THE I/O COMMAND. THE TRACK IS FIRST FORMATTED WITH HA-RO-R1 THEN HIO IS ISSUED AFTER A SUCCESSFUL SEARCH FOR RECORD 0. IF ANY PART OF RECORD 1 IS THEN READ, HIO DURING READ IS CONSIDERED TO HAVE FAILED. THIS ROUTINE WILL NOT RUN ON A MODEL 30 SYSTEM.

ROUTINE TWO CHECKS THE HALT I/O COMMAND DURING A WRITE OPERATION. HALT I/O IS ISSUED DURING A WRITE OPERATION AND A CHECK IS MADE TO SEE IF THE REMAINDER OF THE RECORD WAS PADDED WITH ZEROS. TO INSURE THAT THE HIO COMMAND IS ISSUED DURING WRITING OF DATA, A SYNCRONIZING OPERATION IS PERFORMED ON THE COUNT FIELD OF THE RECORD TO BE WRITTEN. AFTER SYNCRONIZING ON THE COUNT FIELD, THE PROGRAM WAITS A PRE-DETERMINED AMOUNT OF TIME AND ISSUES THE HIO. THE WAIT FACTOR IS CALCULATED BY FIRST FORMATTING THE COUNT FIELD TO ZERO AND INITIATING A WRITE CHAIN. THE COUNT FIELD IS CONTINUOUSLY COMPARED TO ZERO AS A MEANS OF DETERMINING WHEN ACTUAL WRITING BEGINS. EACH TIME THE COMPARISON IS MADE, THE NUMBER ONE IS SUBTRACTED FROM A CONSTANT. THIS METHOD GIVES A COUNT OF THE NUMBER OF COMPARISONS MADE BEFORE WRITING BEGAN AND ELIMINATES THE NEED FOR GIVING SPECIAL CONSIDERATION TO THE VARIOUS SYSTEM SPEEDS. THIS ROUTINE WILL NOT RUN ON A MODEL 30 SYSTEM

ROUTINE -3- CHECKING IF CU WILL MISS AN ADDRESS MARK
THIS ROUTINE WILL PROCESS SMALL RECORDS (KEY LENGTH = 00, DATA LENGTH = 01, AND TRACK = -80- RECORDS) TO CHECK IF THE CONTROL UNIT WILL MISS AN ADDRESS MARK.

THE ROUTINE WILL FIRST FORMAT THE TRACK WITH -
HA--0-R1-R2-R3-R4... -R67-R68-R69-R70-R71
KL = 00, DL = 01, DATA = RECORD NUMBER
THE ROUTINE WILL THEN PERFORM THE FOLLOWING CHAIN ---

```
        SEEK CYL 198, HD 0
        RD HA
        READ COUNT
        TIC  *-8
    THIS CHAIN WILL READ COUNT (CU HAS TO DETECT
    -AM- IN ORDER TO PERFORM READ) ON ALL RECORDS
    OF THE TRACK.  EACH COUNT (OR ADDRESS MARK)
    WILL BE PROCESSED TWICE BEFORE CHAIN IS BROKEN
    VIA NO RECORD FOUND (INDEX SENSED TWICE).
    CHAIN IS REPEATED -500- TIMES BEFORE EXITING.

    ROUTINE -4-     CHECK IF CU WILL PICK UP AN ADDRESS  MARK
    THIS ROUTINE WILL PROCESS RECORDS WHOSE DATA
    AREA VERY CLOSELY APPROXIMATES A GAP-AM-COUNT
    TO CHECK IF THE CONTROL UNIT WILL DETECT THIS
    SIMULATED GAP AND ADDRESS MARK AND WILL TRANSFER
    THE COUNT FIELD THAT FOLLOWS IT.
    THE ROUTINE WILL FIRST FORMAT THE TRACK WITH ---
    HA - R0 - R1 - R2 - ... R41 - R42 - R43
    RECORD FORMAT ---
        NORMAL COUNT - NO KEY - DATA AREA
        DATA AREA --
        --GAP--AM--COUNT-- (COUNT = -AM 0XX -, XX = RCD NO.)
        THE BURST BYTES FOR THE COUNT ARE SUCH THAT,
        IF THE CU DETECTS THE GAP AND AM AND TRANSFERS
        THE COUNT, A DATA CHECK WILL OCCUR TO BREAK
        COMMAND CHAIN.
    THE ROUTINE WILL, AFTER FORMATTING, PERFORM THE
    FOLLOWING CHAIN ---
        READ A          ORIENTATION
        READ COUNT      CU WILL SEARCH FOR AM, X
        TIC  *-8        REPEAT READ COUNT
    THIS CHAIN WILL READ COUNT (CU HAS TO SEARCH
    FOR AN -AM- IN ORDER TO READ COUNT) ON ALL
    RECORDS OF THE TRACK.  (APPROXIMATELY 43 RECORDS
    ON TRACK) SINCE CONTROL UNIT WILL BE SEARCHING FOR
    AN -AM- OVER THE DATA AREA, WHERE SIMULATED GAP AND
    ADDRESS MARK ARE LOCATED, IF ADDRESS MARK RECOGNITION
    IS FAILING, AND AN ADDRESS MARK MAY BE PICKED UP.
    EACH COUNT IS READ TWICE BEFORE CHAIN IS BROKEN
    VIA NO RECORD FOUND (INDEX PASSED TWICE).
    CHAIN IS REPEATED -500- TIMES BEFORE EXITING.
```

5.14 COMMENTS ON SECTION -F6AD-

```
    ROUTINE 1     FILE INTERACTION
    THIS ROUTINE WILL CHECK FOR INTERACTION BETWEEN
    FILES.  THAT IS WHILE ONE OR MORE FILES ARE
    ACCESSING, THE PROGRAM WILL ATTEMPT TO READ AND
    WRITE ON ANOTHER FILE DRIVE.
    THE FILE DRIVE THAT WILL BE USED TO WRITE AND READ
    ON IS THE ONE THAT HAS THE ADDRESS THAT -DM- PLACES
    IN -SPUT- (SECTION PREFACE UNIT TABLE).
    THE FILE DRIVES THAT WILL BE USED TO PERFORM
    SEEKS ARE ANY OTHER DRIVES THAT ARE READY OTHER
    THAN THE WRITE-READ DRIVE.  AT LEAST ONE OTHER DRIVE MUST BE READY
    AND OPERABLE.
    NOTE 1 ALL DRIVES THAT ARE READY OTHER THAN THE WRITE-READ
    DRIVE MUST CONTAIN COMPLETELY FORMATTED PACKS.  THIS MEANS
    THE CE PACK CANNOT BE USED EXCEPT ON THE WRITE-READ DRIVE
    BECAUSE THE ALIGNMENT CYLINDER DOES NOT CONTAIN HA OR R0.
    NOTE 2 THIS SECTION MUST BE RUN WITH ONLY 1 DRIVE DEFINED AS THE
    WRITE-READ DRIVE.  THE WRITE-READ DRIVE SHOULD CONTAIN EITHER
    A SCRATCH PACK OR THE CE PACK BECAUSE CYLINDER 5 WILL BE
    WRITTEN ON FOR THE WRITE-READ DRIVE.
    FIRST --
        PROGRAM WILL DETERMINE WHICH FILE DRIVES
        ARE READY, SET-UP FILE ADDRESS LIST FOR PERFORMING
```



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        SEEKS, AND MODIFY -SPUT- SO -DM- WILL RETURN THE
        INTERRUPTS FROM THESE FILES.
    SECOND --
        FORMAT THE CE PACK (OR SCRATCH PACK) ON THE
        FILE THAT -DM- GAVE SECTION.
        CYLINDER -005- IS FORMATTED WITH 256 RECORDS
        WHERE EACH RECORDS IS COMPOSED OF --
        KEY             DATA
        XXRRRRRRRR  - RRRRR ... RRRRR
        9 BYTES KEY
        360 BYTES DATA
        XX IS RECORD KEY IDENTIFIER
        RR RANDOM BYTES
        13 RECORDS PER TRACK EXCEPT 12 RECORDS
        ON LAST TRACK.
        THIRD ---
            PROGRAM WILL COMPUTE RANDOM CYLINDERS FOR FILES
            TO SEEK TO AND A RANDOM RECORD FOR WRITE-READ FILES.
            PROGRAM WILL THEN ISSUE SUCCESSIVE SEEKS TO THE
            FILES WHICH ARE TO BE USED FOR SEEKING.THIS
            IS A STAND ALONE SEEK (1 SEEK COMMAND, NO
            CHAINING) AND AS SOON AS THE PROGRAM RECEIVES
            CHANNEL END, IT STARTS THE NEXT FILE SEEKING.
            AFTER ALL FILES HAVE STARTED SEEKING, PROGRAM
            WRITE-READ FILE.
            WILL PERFORM ONE OF THE FOLLOWING CHAINS ON THE
            PROGRAM ALTERNATES BETWEEN --
                        -OR-
            SEEK HEAD                   SEEK HEAD
            READ COUNT                  SEARCH = ID
            SEARCH = KEY                TIC  *-8
            TIC TO READ CNT             WRITE KEY-DATA (RANDOM,A1
            READ DATA INTO A1           SEARCH = ID
            SEARCH = ID                 TIC  *-8
            TIC  *-8                    READ KEY-DATA INTO A2
            WRITE DATA FROM A1
            SEARCH = ID
            TIC  *-8
            RD DATA INTO A2
    AT THE COMPLETION OF THE OPERATIONS, THE PROGRAM CHECKS
    THAT ALL FILES HAVE DETENTED, AND ARE READY.  AREA 1
    AND AREA 2 ARE CHECKED THAT THEY ARE EQUAL.  ALSO THE
    FILES ARE CHECKED THAT THEY WENT TO THE CORRECT CYLINDER.
    IF ANY ERROR IS DETECTED SUCH AS FILES SEEKING
    TO THE WRONG CYLINDER, GOING TO POSITIVE STOP, OR
    BURST (DATA) CHECK, NO RECORD FOUND, DATA DID NOT
    COMPARE, ETC., ALL PERTINENT ERROR AND STATUS
    INFORMATION IS OUTPUTTED.
    THE SEQUENCE IS REPEATED -500- TIMES.
    SECTION SENSE SWITCH -3- WILL LOOP PARAGRAP..
    SECTION SENSE SWITCH -8- ON WILL BYPASS
    OPERATIONS ON WRITE-READ FILE.
```

5.15 COMMENTS ON SECTION F6AE.

```
    ROUTINE ONE TEST SEARCH EQUAL KEY--DATA.  THE KEY--DATA OF RECORD ONE
    IS SEARCHED AND RECORD TWO IS READ.  RECORD TWO READ IS COMPARED WITH
    RECORD TWO WRITTEN TO SEE IF SEARCH WAS SUCCESSFUL.

    ROUTINE TWO TEST SEARCH HIGH KEY--DATA, AND SEARCH HIGH OR EQUAL
    KEY--DATA.  THESE SEARCHES ARE TESTED FOR EACH OF THE FOLLOWING
    FIVE CASES.
    1.  CORE SEARCH FIELD HIGHER THAN FILE SEARCH FIELD.
    2.  CORE SEARCH FIELD EQUAL TO FILE SEARCH FIELD.
    3.  CORE SEARCH FIELD LOWER THAN FILE SEARCH FIELD.
    4.  SEARCH COMMAND TESTED SPECIFYING LESS BYTES THAN FILE SEARCH FIELD.
    5.  SEARCH COMMAND TESTED SPECIFYING MORE BYTES THAN FILE SEARCH FIELD.
    THEY ARE TESTED BY A COMMON ROUTINE WHICH RUNS SEQUENTIALLY THROUGH A
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TABLE OF DATA. THE COMMANDS ARE TESTED BY GIVING THE SEARCH AND THEN READING THE EXPECTED RECORD. A COMPARE IS GIVEN AND THE RESULTS ARE INDICATED.

5.16 COMMENTS ON SECTION F6AF.

ROUTINE ONE FORMATS THE CYLINDER FOR RECORD OVERFLOW BY WRITING SPECIAL COUNT--KEY--DATA THROUGH OUT THE CYLINDER. THE COUNT--KEY--DATA IS READ BACK AND COMPARED TO MAKE SURE THE TRACK WAS FORMATED CORRECTLY. THIS ROUTINE MUST BE RAN PRIOR TO THE FOLLOWING SIX ROUTINES.

ROUTINE TWO TESTS WRITE AND READ DATA WITH RECORD OVERFLOW. THE CYLINDER FORMATED BY ROUTINE THREE WILL BE USED. THE DATA IS WRITTEN AND THEN READ BACK. THE DATA READ IS COMPARED WITH DATA WRITTEN TO SEE IF OPERATIONS WERE SUCCESSFUL.

ROUTINE THREE TESTS WRITE AND READ KEY--DATA WITH RECORD OVERFLOW, BY THE SAME PROCEDURE AS ROUTINE TWO CHECKS READ AND WRITE DATA.

ROUTINE FOUR TESTS READ COUNT WITH RECORD OVERFLOW. THE COUNT IS READ AND COMPARED AGAINST COUNT EXPECTED TO SEE IF OPERATION WAS SUCCESSFUL. THE CYLINDER FORMATTED BY ROUTINE ONE IS USED.

ROUTINE FIVE TESTS WRITE AND READ DATA WITH RECORD OVERFLOW BY THE SAME METHOD AS ROUTINE TWO EXCEPT IT IS DONE FOR HALF A CYLINDER.

ROUTINE SIX TESTS WRITE AND READ KEY--DATA WITH RECORD OVERFLOW BY THE SAME METHOD AS ROUTINE THREE EXCEPT IT IS DONE FOR HALF A CYLINDER.

ROUTINE SEVEN TESTS READ COUNT WITH RECORD OVERFLOW BY THE SAME METHOD AS ROUTINE FOUR EXCEPT IT IS DONE FOR HALF A CYLINDER.

5.17 COMMENTS ON SECTION F6BO.

ROUTINE ONE (01) FORMATS TRACK 0 AS AN OVERFLOW RECORD AND TRACK 1 AS A NORMAL RECORD. THE ROUTINE THEN SETS THE FILE MASK TO INHIBIT ALL SEEKS AND THEN PERFORMS A READ DATA COMMAND THAT SHOULD OVERFLOW FROM TRACK 0 TO TRACK 1. THE ROUTINE EXPECTS AN ERROR WHEN IT ATTEMPTS TO OVERFLOW IN VIOLATION OF THE FILE MASK. ROUTINE IS EXPECTING SENSE BITS- OVERFLOW INCOMPLETE, AND FILE PROTECT

ROUTINE TWO (2) FORMATS CYL 195, HD 0, RECORD 1 CORRECTLY AS THE FIRST SEGMENT OF AN OVERFLOW RECORD AND CYLINDER 195, HEAD 1, RECORD 1 INCORRECTLY AS HEAD 2. S I O ERRORS ARE SUPPRESSED AND OVERFLOW RECORD IS READ STARTING AT CYL 195, HD 0, REC 1. ROUTINE IS EXPECTING OVERFLOW INCOMPLETE AND COMMAND REJECT SENSE BITS.

ROUTINE THREE (3) FORMATS TRACK 0 AS AN ALTERNATE TRACK WITH AN OVERFLOW RECORD AND TRACK 1 AS A NORMAL TRACK. THE ROUTINE THEN PERFORMS A READ DATA COMMAND THAT SHOULD OVERFLOW FROM TRACK 0 TO TRACK 1. THE ROUTINE IS EXPECTING AN ERROR WHEN IT ATTEMPTS TO OVERFLOW FROM AN ALTERNATE TRACK. ROUTINE IS EXPECTING SENSE BITS- OVERFLOW INCOMPLETE, AND TRACK CONDITION CHECK.

ROUTINE FOUR (4) FORMATS CYLINDER 195, HD 0, RECORD 1 AS AN OVERFLOW RECORD WITH THE SECOND (AND LAST), SEGMENT AT HEAD 1, RECORD 1. RECORD 2 IS A NORMAL RECORD WITH THE FOLLOWING DATA WRITTEN ON IT, 00C3000102. THIS HEXIDECIMAL ADDRESS OF CYL 195, HEAD 1, RECORD 1 WILL BE PRINTED OUT IF SCAN GOES PAST THE LAST SEGMENT OF THE OVERFLOW RECORD.

ROUTINE FIVE (5) CAUSES A RECORD OVERFLOW TO END-OF-CYLINDER TO BE PERFORMED AND CHECKS FOR THE FOLLOWING SENSE BITS --

OVERFLOW INCOMPLETE AND END-OF-CYLINDER

5.18 COMMENTS ON SECTION F6B1.

ROUTINE ONE CHECKS THAT THE 6TH SENSE BYTE -06- IS GENERATED WHEN READING AN OVERFLOW RECORD THAT OVERFLOWS TO A DEFECTIVE TRACK AND WHEN READING AN OVERFLOW RECORD THAT OVERFLOWS FROM AN ALTERNATE SURFACE. THE INITIAL READ IS A READ KEY-DATA CCW. THE 6TH SENSE BYTE -06-, THAT SHOULD BE RECEIVED WHEN THESE CONDITIONS OCCUR, IS USED IN A CCW TO CONTINUE THE READ UNTIL THE ENTIRE CYLINDER IS READ. UNIT CHECK AND TRACK CONDITION SHOULD BE SET UNDER BOTH THESE CONDITIONS. THE CSW, SENSE, AND DATA READ ARE CHECKED BY THE ROUTINE AND IF THEY ARE NOT AS EXPECTED AN ERROR MESSAGE IS GIVEN.

ROUTINE TWO CHECKS THAT THE 6TH SENSE BYTE -05-IS GENERATED WHEN WRITING AN OVERFLOW RECORD THAT OVERFLOWS FROM AN ALTERNATE SURFACE. THE INITIAL WRITE IS A WRITE DATA CCW. THE 6TH SENSE BYTE -05-, THAT SHOULD BE RECEIVED WHEN THESE CONDITIONS OCCUR, IS USED IN A CCW TO CONTINUE THE WRITE UNTIL THE ENTIRE CYLINDER IS WRITTEN. UNIT CHECK AND TRACK CONDITION SHOULD BE SET UNDER BOTH THESE CONDITIONS. AFTER THE ENTIRE CYLINDER, INCLUDING THE ALTERNATE TRACK, HAS BEEN WRITTEN THE DATA IS READ. THE CSW, SENSE, AND DATA READ ARE CHECKED BY THE ROUTINE AND IF THEY ARE NOT AS EXPECTED AN ERROR MESSAGE IS GIVEN.

5.19 COMMENTS ON SECTION F6B2.

ROUTINE ONE CHECKS THAT THE 6TH SENSE BYTE CONTAINS-25- WHEN PERFORMING A SEARCH EQUAL KEY-DATA ON AN OVERFLOW RECORD TO A DEFECTIVE TRACK WHEN THE SCAN HAS BEEN EQUAL TO THAT POINT. THIS IS ALSO DONE ON THE ALTERNATE SURFACE. THE ALTERNATE TRACK IS SCANNED USING A CCW WITH A -25- IN THE OPERATION CODE. THE SCAN ON THE ALTERNATE TRACK SHOULD BE EQUAL, WITH A -25- BEING SET INTO THE 6TH SENSE BYTE WHEN THE END OF THE ALTERNATE TRACK IS DETECTED. THE PORTION OF THE CYLINDER FOLLOWING THE DEFECTIVE TRACK, ON WHICH THE DATA EQUALS THE CORE DATA, IS ALSO SCANNED USING THE -25- IN A CCW. STATUS MODIFIER SHOULD BE GENERATED AT THE COMPLETION OF THIS SCAN. TRACK CONDITION AND UNIT CHECK INDICATION SHOULD BE GENERATED WHEN OVERFLOWING TO THE DEFECTIVE TRACK AND WHEN OVERFLOWING FROM THE ALTERNATE TRACK. IF THE CSW AND SENSE DATA ARE NOT AS EXPECTED ON ERROR MESSAGE IS GIVEN.

ROUTINE TWO CHECKS THE ABILITY OF THE CONTROL UNIT TO GENERATE THE 6TH SENSE BYTES -45- AND -75-. THIS IS DONE BY PERFORMING A SEARCH HIGH KEY-DATA ON AN OVERFLOW RECORD TO A DEFECTIVE TRACK WHEN THE SCAN HAS BEEN EQUAL TO THAT POINT, WHICH SHOULD CAUSE A 6TH SENSE BYTE OF -45- TO BE GENERATED. THE SEARCH HIGH KEY - DATA IS CONTINUED ON THE ALTERNATE SURFACE BY EXECUTING A CCW WITH A -45- IN THE OPERATION CODE. THE DATA ON THE ALTERNATE SURFACE IS HIGHER THAN THE CORE DATA WHICH SHOULD SATISFY THE HIGH CONDITION. THE 6TH SENSE BYTE SHOULD BE -75- INDICATING THAT THE CONDITIONS FOR STATUS MODIFIER HAVE BEEN MET AND SHOULD BE PRESENTED AT THE COMPLETION OF THE LOGICAL RECORD. THE REMAINDER OF THE RECORD IS SCANNED BY POSITIONING THE ACCESS AT THE PROPER LOCATION AND EXECUTING A CCW CONTAINING A -75- IN THE OPERATION CODE. THIS SHOULD CAUSE THE SCAN TO BE PERFORMED ON THE LAST FEW SEGMENTS OF THE RECORD WITH STATUS MODIFIER PRESENTED IN THE ENDING STATUS. TRACK CONDITION AND UNIT CHECK INDICATIONS SHOULD BE GENERATED WHEN OVERFLOWING TO THE DEFECTIVE TRACK AND WHEN OVERFLOWING FROM THE ALTERNATE TRACK. IF THE CSW AND SENSE DATA ARE NOT AS EXPECTED AN ERROR MESSAGE IS GIVEN.

5.20 COMMENTS ON SECTION F6B3.

ROUTINE ONE CHECKS THE ABILITY OF THE CONTROL UNIT TO GENERATE THE 6TH SENSE BYTES -65- AND -55-. THIS IS DONE BY PERFORMING A SEARCH HIGH OR EQUAL KEY-DATA ON AN OVERFLOW RECORD TO A DEFECTIVE TRACK WHEN THE SCAN HAS BEEN EQUAL TO THAT POINT, WHICH SHOULD CAUSE A 6TH SENSE BYTE OF -65 - TO BE GENERATED. THE SEARCH HIGH OR EQUAL KEY-DATA IS CONTINUED ON THE ALTERNATE SURFACE BY EXECUTING A CCW WITH A -65- IN THE OPERATION CODE. THE DATA ON THE ALTERNATE SURFACE IS LESS THAN THE CORE DATA WHICH SHOULD CAUSE THE CONTROL UNIT TO GENERATE A 6TH SENSE BYTE OF -55- WHEN

THE OVERFLOW OCCURS ON THE ALTERNATE SURFACE. 55 INDICATES THAT STATUS MODIFIER IS NOT TO BE PRESENTED AT THE COMPLETION OF THE LOGICAL RECORD. THE REMAINDER OF THE RECORD IS SCANNED BY POSITIONING THE ACCESS AT THE PROPER LOCATION AND EXECUTING A CCW CONTAINING A -55- IN THE OPERATION CODE. THIS SHOULD CAUSE THE SCAN TO BE PERFORMED ON THE LAST FEW SEGMENTS OF THE RECORD WITH STATUS MODIFIER NOT PRESENTED IN THE ENDING STATUS. TRACK CONDITION AND UNIT CHECK INDICATIONS SHOULD BE GENERATED WHEN OVERFLOWING TO THE DEFECTIVE TRACK AND WHEN OVERFLOWING FROM THE ALTERNATE TRACK. IF THE CSW AND SENSE DATA ARE NOT AS EXPECTED AN ERROR MESSAGE IS GIVEN.

5.21 GENERAL COMMENTS

A STANDARD START I/O ROUTINE IS USED FOR THIS TEST. EACH ROUTINE SETS UP THE CAW AND BRANCHES INTO THIS ROUTINE TO DO ITS START I/O. THIS ROUTINE ISSUES THE START I/O, CLEARS THE STATUS, AND INDICATES ANY ERRORS WHICH OCCUR.

6. APPENDIX

6.1 COMMAND CODES

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*
* VALID FILE COMMAND CODES.
*
* FUNCTION              COMMAND CODE BITS          HEX CODE -- WHERE ALL X
*                        0 1 2 3  4 5 6 7          CHARACTERS
*                                                  ARE IN THE
* WR HOME ADDR. . .     0 0 0 1  1 0 0 1 . . . . . 19   ZERO STATE
* WRITE RO . . . . .    0 0 0 1  0 1 0 1 . . . . . 15
* WR DATA . . . . .     0 0 0 0  0 1 0 1 . . . . . 05
* WR KEY-DATA . . .     0 0 0 0  1 1 0 1 . . . . . 0D
* WR CNT,KEY,DATA .     0 0 0 1  1 1 0 1 . . . . . 1D
* ERASE . . . . .       0 0 0 1  0 0 0 1 . . . . . 11
*
* WR.SPEC.CNT.KEY DATAO 0 0 0  0 0 0 1 . . . . . 01
*
* SEARCH EQUAL ID .     X 0 1 1  0 0 0 1 . . . . . 31
* SEARCH EQUAL KEY .    X 0 1 0  1 0 0 1 . . . . . 29
* SEARCH EQ HOME ADDR   X 0 1 1  1 0 0 1 . . . . . 39
* SEARCH EQ KEY,DATA    X 0 1 0  1 1 0 1 . . . . . 2D
* SEARCH HI ID . . .    X 1 0 1  0 0 0 1 . . . . . 51
* SEARCH HI,KEY . .     X 1 0 0  1 0 0 1 . . . . . 49
* SRCH HI KEY,DATA .    X 1 0 0  1 1 0 1 . . . . . 4D
* SRCH HI,EQ ID . .     X 1 1 1  0 0 0 1 . . . . . 71
* SRCH HI,EQ KEY . .    X 1 1 0  1 0 0 1 . . . . . 69
* SRCH HI,EQ KEY,DATA   X 1 1 0  1 1 0 1 . . . . . 6D
*
* RD HOME ADDR. . .     X 0 0 1  1 0 1 0 . . . . . 1A
* READ RO . . . . .     X 0 0 1  0 1 1 0 . . . . . 16
* READ COUNT . . . .    X 0 0 1  0 0 1 0 . . . . . 12
* READ IPL . . . . .    X 0 0 0  0 0 1 0 . . . . . 02
* READ DATA . . . .     X 0 0 0  0 1 1 0 . . . . . 06
* READ KEY,DATA . .     X 0 0 0  1 1 1 0 . . . . . 0E
* RD CNT, KEY,DATA .    X 0 0 1  1 1 1 0 . . . . . 1E
*
* CONT.HEAD SEEK . .    0 0 0 1  1 0 1 1 . . . . . 1B
* CONT. CYL. SEEK .     0 0 0 0  1 0 1 1 . . . . . 0B
* CONTROL SEEK . . .    0 0 0 0  0 1 1 1 . . . . . 07
* RECALIBRATE . . .     0 0 0 1  0 0 1 1 . . . . . 13
* CONT. SPACE CNT .     0 0 0 0  1 1 1 1 . . . . . 0F
* CONT. NO OP. . . .    0 0 0 0  0 0 1 1 . . . . . 03
* CONT.SET FILE MASK    0 0 0 1  1 1 1 1 . . . . . 1F
* RESERVE . . . . .     1 0 0 1  0 1 0 0 . . . . . 94
* RELEASE . . . . .     1 0 1 1  0 1 0 0 . . . . . B4
* TEST I/O . . . . .    0 0 0 0  0 0 0 0 . . . . . 00
* SENSE I/O . . . .     0 0 0 0  0 1 0 0 . . . . . 04
*
```

6.2 CSW - CHANNEL STATUS WORDS DEVICE AND CHANNEL STATUS BIT BREAKDOWN IN HEX.

```
CSW ... YY YY ...
          80 ---PROGRAM-CONTROLLED INTERRUPT
          40 ---INCORRECT LENGTH
          20 ---PROGRAM CHECK
          10 ---PROTECTION CHECK
          08 ---CHANNEL DATA CHECK
          04 ---CHANNEL CONTROL CHECK
          02 ---INTERFACE CONTROL CHECK
          01 ---CHAINING CHECK
       80 ---ATTENTION
       40 ---STATUS MODIFIER
       20 ---CONTROL UNIT END
       10 ---BUSY
```

```
          08 ---CHANNEL END
          04 ---DEVICE END
          02 ---UNIT CHECK
          01 ---UNIT EXCEPTION
```

6.3 SNS - SENSE BYTES RECEIVED ON A SENSE I/O COMMAND
BIT BREAKDOWN IN BINARY.

```
          SNS 00000000 00000000 00000000 01000000
              ..*..*.. ..*..*.. ..*..*.. ..*..*..
 COMMAND REJECT.*..*.. ..*..*.. ..*..*.. ..*..*.SEEK INCOMPLETE
INTERVENTION REQ'D*..*.. ..*..*.. ..*..*.. ..*..*MULTI MOD SELECT
   BUS OUT PARITY..*.. ..*..*.. ..*..*.. ..*..*..END OF CYLINDER
   EQUIPMENT CHECK.*.. ..*..*.. ..*..*.. ..*.*.PACK CHANGE
 (BURST) DATA CHECK*.. ..*..*.. ..*..*.. ..*.WRITE CURRENT SENSE
CHANNEL/2314 OVER RUN.. ..*..*.. ..*..*.. ..UNSAFE
 TRACK CONDITION CHECK. ..*..*.. ..*..*.. .ON-LINE
          SEEK CHECK ..*..*.. ..*..*.. BUSY
                     ..*..*.. ..*..*..
DATA CHECK IN COUNT FIELD.*..*.. ..*..*.NOT USED
        TRACK OVERFLOW*..*.. ..*..*NOT USED
        END-OF-CYLINDER..*.. ..*..UNSELECTED FILE STATUS
        INVALID SEQUENCE.*.. ..*.2841 ALU CHECK
          NO RECORD FOUND*.. ..*NOT USED
            FILE PROTECTED.. ..SERIALIZER/DESERIALIZER CHECK
    MISSING ADDRESS MARKERS. .NOT USED
         OVERFLOW INCOMPLETE.UNSAFE
```

SNS BYTE 4	00000000	DRIVE A
	00000001	DRIVE B
	00000010	DRIVE C
	00000011	DRIVE D
	00000100	DRIVE E
	00000101	DRIVE F
	00000110	DRIVE G
	00000111	DRIVE H
	00001000	DRIVE J
	00001111	DRIVE CANNOT BE DETERMINED

2314 FUNCTION TEST INDEX

2314 FUNCTION TEST INDEX

NOTE. SECTION FFF1 IS THE CE DISK PACK INITIALIZER, SECTIONS F6A0 THRU SECTION F6B3 ARE CONTROL UNIT FUNCTION TEST, AND SECTIONS F6BA THRU F6BD ARE FILE DIAGNOSTIC TESTS.

2314 FUNCTION TEST INDEX

2314 FUNCTION TEST INDEX

TABLE OF CONTENTS

1. PURPOSE

1.. INTENT - THIS PROGRAM IS DESIGNED TO (1) DETECT MALFUNTIONS IN THE IBM 2314 DISK FILE, AND (2) AID IN THE ISOLATION OF FAILURES BY PROVIDING DIAGNOSTIC INFORMATION AND SCOPE LOOP FACILITIES.

** NOTE TO CE ** IF PROGRAMS 6BB AND 6BC ARE RUN ON THE 2314-A FILE, PROGRAM 6BF SHOULD ALSO BE RUN.

1.2 BRIEF DESCRIPTION OF TEST ROUTINES -

SECTION	ROUTINE		
F6BA	1	TEST CHANNEL	VERIFIES THAT CHANNAL IS FREE AND AVAILABLE.
	2	TEST I/O	TESTS FOR CONDITION OF ACCESS. IF CONDITION CODE IS ZERO, ACCESS IS READY AND AVAILABLE .
	3	NO-OP	CHECKS INITIAL SELECTION + ENDING PROCEDURE TO + FROM CONTROL UNIT.
	4	SENSE I/O	VERIFIES THAT SENSE DATA CAN BE TRANSFERED FROM 2314 TO THE CHANNEL
	5	COMMAND EXIT	CHECKS FOR HANG UP CONDITIONS ON START I/O COMMANDS.
	6	READ TEST	READS HA FROM ALL HEADS
	7	RECALIBRATE	EXECUTES RETURN TO 000 SEEK
SECTION	ROUTINE		
F6BB	1	CAR AND DIFF CNTRS	TESTS ALL COMBINATIONS OF BITS ON AND OFF IN CAR AND DIFF COUNTER.
	2	SEEK INCOMPLETE	EXECUTES SEEK TO 255 AND CHECKS FOR SEEK INCOMPLETE.
	3	SEQUENTIAL INC/DEC SEEK	EXECUTES SINGLE CYL. SEEKS FROM CYL 000 TO 001 ...TO 202, TO 201 TO 200 TO 199,..TO 000.
	4	WORST CASE ACTUATOR	LOOPS SEEKING BETWEEN CYL 000 AND 2, 4, 6, 13, 31, 66, 70, 76, 81, AND 201 RESPECTIVELY.
	5	NOT USED	
	6	RANDOM SEEK	EXECUTES SERIES OF 500 RANDOM SEEKS CHECKING FOR CORRECT HA.

SECTION	ROUTINE		
F68C	1	WRITE TEST	WRITES RO RECORDS WITH ALL HEADS
	2	HAR ADVANCE	CHECKS HAR AC HEAD ADVANCE
	3	END OF CYL	CHECKS END OF CYLINDER
SECTION	ROUTINE		
F68D	1	GENERATE END OF TEST MSG.	CHECKS FOR SSW 9 TO 13 TO DETERMINE IF USER WISHES TO RUN ANY OPTIONAL ROUTINES. IF NOT, PRINTS END MESG.
	2	-OPTIONAL- RPM TEST	CHECK DISK SPEED (RPM) IF SSW 9 ON
	3	-OPTIONAL- POWER OFF-ON, CPU RUNNING	IF SSW 9 ON
	5	-OPTIONAL- POWER ON/OFF STATUS.	IF SWW 9 ON
	6	-OPTIONAL- METER INTERLOCK.	CHECKS THAT METER OUT HOLDS DEVICE ENABLE IF SSW 9 IS ON
	7	-OPTIONAL- HEAD ALIGNMENT	(CONTROLLED BY SSW 10) BRINGS UP READ, ALLOWS USER TO SELECT HEAD, AND AIDS IN ALIGNING HEADS PER INSTRUCTIONS IN MAINTENANCE MANUAL
	8	NOT USED	
	9	-OPTIONAL- WRITE HOME ADDRESS	(CONTROLLED BY SSW 12) ALLOWS USER TO WRITE HA ON ANY ONE CYLINDER
	A	-OPTIONAL- INTERCHANGEABILITY	(CONTROLLED BY SSW 13) CHECKS INTERCHANGEABILITY BETWEEN FILE DRIVES
	B	-OPTIONAL- PHYS DR LOGGING	(CONTROLLED BY SSW 14) CHECKS LOGGING OF PHYS DR ADDRESS IN SNS BYTE 4

2. PREREQUISITES

2.1 PROGRAM REQUIREMENTS.
-DIAGNOSTIC MONITOR PROGRAM WITH AT LEAST THE FACILITY OF DMA4.

2.2 EQUIPMENT REQUIREMENTS.
-CPU WITH THE STANDARD INSTRUCTION SET, COMPLETELY OPERATIVE.
-HARD COPY OUTPUT DEVICE
-METHOD OF LOADING PROGRAM
-CHANNEL WHICH IS COMPLETELY OPERATIVE
-2314 FILE CONTROL UNIT
-2314 DISK FILE DRIVE WHICH WILL POWER-ON SEEK CORRECTLY
-CE PACK OR SCRATCH PACK WITH HOME ADDRESSES

** NOTE- UTILITY PROGRAM FFF1,CE PACK INITIALIZER, WRITES HOME ADDRESSES. DO NOT USE FFF1 UNLESS SUBSYSTEM IS COMPLETELY OPERATIONAL , AND THEN ONLY WHEN HOME ADDRESSES ARE NOT ALREADY PRESENT.

** NOTE- IF THE TWO CHANNEL SWITCH FEATURE IS ON CONTROL UNIT DISABLE THE INTERFACE NOT BEING USED.

3. USE PROCEDURE.

3.1 PROGRAM LOADING.

1.SELECT ONE ACCESS TO BE TESTED.

THIS PROGRAM IS MOST EFFECTIVE WHEN RUN ON ONE ACCESS AT A TIME.
ON MULTIPLE FILE SYSTEMS,
INSTRUCT DM TO RUN THIS PROGRAM ON THE DESIRED FILE ACCESS.

A. DMK, AND DMA4(MOD30),USE ONE UDT CARD FOR ADDRESS PLUG -0-.
ARRANGE THE PLUG SO THAT THE -0- PLUG WILL BE IN THE DESIRED FILE DRIVE. THIS WILL BE THE DRIVE THAT IS TESTED.

TO TEST ANOTHER FILE DRIVE MOVE THE DISK PACK AND PLUG TO THE OTHER DRIVE.

(INSTRUCTIONS FOR PUNCHING UDT CARDS ARE IN THE USERS GUIDE.)

B.DMA8 AND ALL OTHER DM'S.- USE PROCEDURE DESCRIBED ABOVE, OR USE INPUT MESSAGE TO SPECIFY ONE ACCESS FROM THE CONSOLE AFTER DM IS LOADED AS DESCRIBED IN THE USERS GUIDE.

2.PROCEED WITH STANDARD DM LOADING.

3.2 PROGRAM OPERATION.

1.SECTIONS F6BA-F6BD SHOULD BE RUN ON ALL FILE DRIVES.

2.INSTALL CE PACK OR SCRATCH PACK WITH HOME ADDRESSES ON ACCESS TO BE TESTED.

3.SECTION SENSE SWITCHES. (NORMAL RUN, WITH ALL SWITCHES OFF, GIVES ERROR PRINTOUTS,STOP ON ERROR, AND BYPASS OPTIONAL ROUTINES.

THE PROGRAM SECTION SENSE SWITCHES SHOWN BELOW ARE IN THE SENSE SWITCH BYTES IN THE PROGRAM SECTION PREFACE. THE CHARACTER -X- REPRESENTS THE RELOCATION FACTOR CONTAINED IN BASE REGISTER 15 DURING EXECUTION TIME. BITS ARE ZERO WHEN OFF AND ONE WHEN ON.

SECTION SWITCH	STATUS	FUNCTION	BYTE	BIT
0	OFF	DO NOT LOOP	X004	0
	ON	TIGHT LOOP ON START I/O,TEST I/O.		
1	OFF	DO NOT LOOP	X004	1
	ON	LOOP ON ERROR OR ENTER SCOPE LOOP AND BYPASS HALTS.		
2	OFF	DO NOT LOOP	X004	2
	ON	LOOP IN START I/O SUBROUTINE.		
3	OFF	PROCEED TO NEXT ROUTINE.	X004	3
	ON	LOOP IN ROUTINE.		
4	OFF	NOT USED	X004	4
	ON	NOT USED		
5	OFF	HALT AFTER PRINTING ERROR NUMBER.	X004	5
	ON	PROCEED AFTER ERROR PRINTOUT.		
6	OFF	BYPASS PRINTING ROUTINE TITLES.	X004	6
	ON	PRINT ROUTINE TITLES.		
7	OFF	DO NOT PRINT CORRECT RESULTS	X004	7
	ON	PRINT CORRECT RESULTS		
8	OFF	RETRY SIO TIO IN SIO SUBROUTINE.	X005	0
	ON	EXIT SIO SUBROUTINE (SVC X'D6')		
9	OFF	BYPASS ROUTNS 2 THRU 6 (F6BD)	X005	1
	ON	RUN OPTIONAL ROUTNS 2 THRU 6		
10	OFF	BYPASS OPTIONAL ROUTINE 7,(F6BD)	X005	2
	ON	RUN HEAD ALIGNMENT ROUTINE		
12	OFF	BYPASS OPTIONAL ROUTINE 9, F6BD	X005	4
	ON	RUN WRITE HA ON ANY CYLINDER		
13	OFF	BYPASS OPTIONAL ROUTINE A	X005	5
	ON	RUN INTERCHANGEABILITY ROUTINE		
14	OFF	BYPASS OPTIONAL ROUTINE B	X005	6
	ON	RUN PHYS DR LOGGING ROUTINE		

3. TO RUN OPTIONAL ROUTINES IN SECTION F68D, SET SECTION SENSE SWITCHES 9,10,12,13,.((RELOAD SECTION 3 (F68D) IF TEST HAS TERMINATED.))

** NOTE- THIS PROGRAM IS DESIGNED TO BE MOST EFFECTIVE WHEN RUNNING UNDER -HALT AFTER ERROR PRINTOUT-. IF USER WISHES TO BYPASS THESE HALTS,SECTION SENSE SW. 5 MUST BE TURNED ON.

3.3 PROGRAM HALTS.

BESIDES THE NORMAL HALT AFTER ERROR DESCRIBED ABOVE, THERE ARE SEVERAL ERROR CONDITIONS INWHICH THE PROGRAM CANNOT CONTINUE.(EXAMPLE, ACCESS NOT READY,HANG UP BUSY,ETC.) THE ERROR MESSAGE WILL IDENTIFY SUCH CONDITIONS.

3.4 PROGRAM TERMINATION.

1.END OF NORMAL TEST. (F6BA THROUCH F6BD)
TEST ENDS WITH DM -T- STATEMENT AFTER F6BD HAS BEEN READ IN AND PROGRAM DETERMINES THAT NO OPTIONAL ROUTINES ARE TO BE RUN.
-END OF NORMAL TEST- MESSAGE IS PRINTED IF SSW 6 (PRINT TITLES) IS ON

2.OPTIONAL ROUTINES. (F6BD)

SECTION 3 (F6BD) TERMINATES WITH DM (T) STATEMENT.

4.0 PRINTOUTS

4.1 MESSAGE FORMATS

A. ERROR MESSAGES

THE PRIMARY MESSAGE FROM THIS PROGRAM IS AN ERROR NUMBER.
THE PURPOSE OF THE NUMBER IS TO REFER THE USER TO A DESCRIPTION OF THE ERROR CONDITION IN THIS DOCUMENT. (SECTION 4.2) THE ERROR DESCRIPTION PROVIDES DIAGNOSTIC INFORMATION ABOUT THE ERROR AND SCOPE LOOP OPTIONS.

ERROR NUMBER FORMAT

1. SIO,TIO,SENSE I/O,ERRORS--

** ER XX ERROR ON SIO,SECTION S, ROUTINE R, UNIT CUU ADRS AAAAAA

2. ERROR NUMBER WITH MESSAGE.

** ER SRXX .....MESSAGE..... UNIT CUU ADRS AAAAAA

3. NORMAL ERROR NUMBER PRINTOUT.

** ER SRXX UNIT CUU ADRS AAAAAA

4. THE SECOND LINE OF AN ERROR PRINTOUT GIVES VARIABLE DATA ON MACHINE CONDITIONS.

CAW KKKKKK CSW YY YYYYYY YY YY YYYY

5.EXPLANATION OF CHARACTORS-

S	SECTION NUMBER
R	ROUTINE NUMBER
XX	SEQUENTIAL ERROR NUMBER WITHIN EACH ROUTINE
CUU	CHANNEL AND DEVICE ADDRESS IN HEX
A-A	ADDRESS OF ERROR BRANCH + LINK INSTRUCTION IN LISTING
K-K	CHANNEL ADDRESS WORD FOR THE CCW CHAIN
Y-Y	CHANNEL STATUS WORD IN HEX

B. REFERENCE STATEMENTS. (OPTIONAL ROUTINES ONLY)

--SEE REF A--

THESE STATEMENTS DIRECT THE USER TO PROCEDURAL INSTRUCTIONS FOR OPERATING THE OPTIONAL ROUTINES. THE REFERENCES ARE IN ALPHABETICAL ORDER IN THE BACK OF THIS WRITEUP. (SECTION 4.3)

4.2 ERROR NUMBER DESCRIPTIONS

01 - CONDITION CODE 1 ON TEST I/O (SECTION 'X', ROUTINE 'X').

A CONDITION CODE 1 WAS DETECTED ON THE TEST I/O WHICH WAS PERFORMED AT THE BEGINNING OF THE START I/O SUBROUTINE. THE SECTION AND ROUTINE BEING EXECUTED WHEN THIS TEST I/O WAS ISSUED IS PRINTED OUT.

- DIAGNOSTIC INFORMATION-

CONDITION CODE 1 INDICATES THAT STATUS WAS STORED BECAUSE OF SOME ERROR CONDITION. EXAMINE CSW AND SENSE DATA IN ERROR PRINTOUT. CAW PRINTOUT INDICATES PREVIOUS COMMAND CHAIN. ALSO DETERMINE WHAT ROUTINE WAS BEING EXECUTED WHEN FAILURE OCCURED.

- USER OPTIONS-

1. SECTION AND ROUTINE BEING EXECUTED WHEN FAILURE OCCURED IS PRINTED WITH ERROR. TO LOOP THIS ROUTINE, TURN ON SECTION SENSE SW. 3.
2. TURN ON SECTION SENSE SW -0- FOR A TIGHT LOOP ON TEST IO COMMAND. (SCOPE LOOP)
3. TURN ON SECTION SENSE SW. 2 TO LOOP IN SIO SUBROUTINE, CONTINUOUSLY CHECKING FOR CONDITION CODE ERRORS.
4. TO CONTINUE PROGRAM, TURN ON SECTION SENSE SW 8. PROGRAM WILL BRANCH TO BEGINNING OF NEXT ROUTINE.

02 - CONDITION CODE 2 ON TEST I/O (SECTION XX ROUTINE XX)

A CONDITION CODE 2 WAS DETECTED ON THE TEST I/O AT THE BEGINNING OF THE START I/O SUBROUTINE. THE SECTION AND ROUTINE NUMBER OF THE ROUTINE BEING EXECUTED WHEN THIS START IO WAS ISSUED IS PRINTED OUT.

- DIAGNOSTIC INFORMATION

CONDITION CODE 2 INDICATES CHANNEL OR SUBCHANNEL BUSY. INDICATES MISSING DEVICE END ON PREVIOUS OPERATION. CAW PRINTOUT INDICATES PREVIOUSLY EXECUTED COMMAND CHAIN.

- USER OPTIONS-

USER SHOULD DO A PSW RESTART TO CLEAR BUSY CHANNEL.
ERROR 01 OPTIONS ALSO AVAILABLE.

03 - CONDITION CODE 3 ON TEST I/O (SECTION X, ROUTINE X.)

A CONDITION CODE 3, (NOT OPERATIONAL), WAS DETECTED ON THE TEST I/O AT THE BEGINNING OF THE START I/O SUBROUTINE. THE SECTION AND ROUTINE NOS. OF THE ROUTINE BEING EXECUTED WHEN THIS TIO WAS ISSUED IS PRINTED OUT.

- DIAGNOSTIC INFORMATION-

CONDITION CODE 3 INDICATES THE I/O UNIT IS INOPERATIVE. (I.E. - CHANNEL RECEIVED SELECT IN AS A RESPONSE TO SELECT - OUT.) EXAMPLE, UNIT ADDRESS WAS NOT RECOGNIZED, 2314 NOT RUNNING, OR HUNG-UP.

- USER OPTIONS-

SAME AS ER. 01

11 - CONDITION CODE 1 ON START I/O (SECTION X, ROUTINE X)

CONDITION CODE 1 WAS DETECTED ON START I/O. SAME AS ERROR 01 EXCEPT ERROR OCCURRED ON START I/O RATHER THAN TEST I/O.

- DIAGNOSTIC INFORMATION-

1. MOST CONDITION CODE ERRORS SHOULD SHOW UP IN ROUTINE 1, CHANNEL STATUS TEST, AND IN THE TIO AT THE BEGINNING OF THIS START I/O SUBROUTINE. THIS ERROR PRINT OUT, IF THE ONLY ERROR NUMBER, SUGGESTS COMMAND REJECT, OR INTERMITTENT CONTROL UNIT TROUBLE.
2. IF END OF CYLINDER BIT IS ON, CHECK FILE BUS. 7.

- USER OPTIONS-

SAME AS ERROR NO. 01

12 - CONDITICN CODE 2 ON START I/O

CHANNEL OR SUBCHANNEL BUSY WAS DETECTED IN THE START I/O SUBROUTINE.

- DIAGNOSTIC INFORMATION-

SOLID CONDITION CODE 2 ERRORS SHOULD BE DETECTED IN ROUTINE 1, TEST CHANNEL STATUS, OR AT ERROR 02, TEST I/O. IF THIS ERROR OCCURS AT ANY OTHER TIME, SUSPECT INTERMITTENT ERROR. CC2 SUGGESTS PREVIOUS OPERATION WAS NOT COMPLETED. CAW PRINTOUT INDICATES PREVIOUSLY EXECUTED COMMAND CHAIN.

- USER OPTIONS-

SAME AS ERROR 01.

13 - CONDITION CODE 3 ON START I/O

NOT OPERATIONAL WAS DETECTED WHILE IN THE START I/O SUBROUTINE.

- DIAGNOSTIC INFORMATION-

SOLID CC 3 ERRORS SHOULD BE DETECTED IN ROUTINE 1, TEST CHANNEL, OR SHOW UP AS ERROR 03 IN TEST I/O. IF THIS ERROR OCCURS AT ANY OTHER ROUTINE, SUSPECT INTERMITTENT FAILURE.

- USER OPTIONS-

SAME AS ERROR 01.

21 - CONDITION CODE 1 ON SENSE I/O

PROGRAM DETECTED UNIT CHECK ON A SENSE I/O IN THE SENSE I/O SUBROUTINE. TEST I/O AND START I/O HAVE ALREADY BEEN TESTED. SHOULD NOT GET THIS ERROR EXCEPT ON INTERMITTENT FAILURES. THE SECTION AND ROUTINE BEING EXECUTED WHEN ERROR OCCURED IS PRINTED WITH ERROR NUMBER. EXAMINE ACCUMULATED STATUS DATA IN CSW FOR CLUES TO FAILURES.

- USER OPTIONS-

SAME AS ERROR 01

22 - CONDITION CODE 2 ON SENSE I/O.

PROGRAM EXECUTED A SENSE I/O AND GOT A BUSY CONDITION. PRINTOUT GIVES SECTION AND ROUTINE BEING EXECUTED WHEN THIS ERROR OCCURED.

- DIAGNOSTIC INFORMATION-

DETERMINE WHY CONTROL UNIT WENT BUSY. SHOULD BE RELATED TO ROUTINE BEING EXECUTED. CAW PRINTOUT INDICATES PREVIOUSLY EXECUTED COMMAND CHAIN.

- USER OPTIONS-

1. USER SHOULD DO A PSW RESTART TO CLEAR BUSY CONDITION-
2. CONTROL UNIT HUNG UP - PROBABLY CAN'T LOOP, SO CONTINUE OFF LINE.
3. TRY TURNING SECTION SWITCH 3 ON TO LOOP IN ROUTINE. RESET, START-START WILL RESTART AT BEGINNING OF SECTION.

23 - CONDITION CODE 3 ON SENSE I/O

NOT OPERATIONAL ON SENSE I/O -

0101 - CONDITION CODE 1 ON A TEST CHANNEL COMMAND

THE FIRST COMMAND IN THIS DIAGNOSTIC PROGRAM IS A TEST CHANNEL TO DETERMINE THAT THE CHANNEL IS AVAILABLE. A CONDITION CODE 1 WAS DETECTED ON THE FIRST TEST CHANNEL COMMAND. THE PROGRAM EXECUTED A TEST I/O TO CLEAR THE INTERRUPT CONDITIONS AND THEN RETRIED THE TEST CHANNEL COMMAND. THE CONDITION CODE 1 CONDITION WAS STILL PRESENT.

- DIAGNOSTIC INFORMATION -

THE CHANNEL MUST BE CLEARED OF PENDING INTERRUPTIONS BEFORE ANY OTHER COMMANDS MAY BE EXECUTED.

- USER OPTIONS -

1. TRY SYSTEM RESET, START, START. THIS WILL RESTART THIS ROUTINE FROM THE BEGINNING AND MAY CLEAR THE INTERUPT.
2. TO LOOP ON TEST CHANNEL COMMAND, TURN ON SECTION SENSE SWITCH 0.
3. TO LOOP IN ROUTINE, TESTING FOR CC 0 AFTER TEST CHANNEL COMMAND, TURN ON SECTION SENSE SWITCH 3.

0102 - CONDITION CODE 2 ON TEST CHANNEL COMMAND

SAME AS ERROR 0101 EXCEPT CC = 2, SUBCHANNEL OR CHANNEL BUSY. NEVER RECEIVED DEVICE END FROM PREVIOUS COMMAND.

- USER OPTIONS -

- USER OPTIONS -

SAME AS ER. 0101

0103 - CONDITION CODE 3 ON A TEST CHANNEL COMMAND.

THE FIRST OPERATION ATTEMPTED IN THIS DIAGNOSTIC IS A TEST CHANNEL TO DETERMINE THAT THE CHANNEL IS AVAILABLE. CONDITION CODE 3 WAS DETECTED, INDICATING CHANNEL IS NOT OPERATIONAL.

- DIAGNOSTIC INFORMATION -

CHANNEL IS NOT OPERATIONAL.

- USER OPTIONS -

1. TO LOOP ON THE TEST CHANNEL COMMAND, TURN ON SECTION SENSE SWITCH 0.
2. TO LOOP ROUTINE, TESTING FOR CC=0, TURN ON SECTION SENSE SWITCH 3.
3. TRY SYSTEM RESET, START-START - PROGRAM WILL RERUN FROM BEGINNING OF ROUTINE.

0201 - CONDITION CODE 1 ON TEST I/O BUT NO UNIT CHECK

PROGRAM ATTEMPTED A TEST I/O AND RECEIVED A CONDITION CODE 1. UNIT CHECK WAS NOT SET, BUT CHANNEL STATUS WAS STORED.

- DIAGNOSTIC INFORMATION -

EXAMINE CHANNEL STATUS DATA TO DETERMINE WHICH STATUS BIT CAUSED THE CONDITION CODE 1.

- USER OPTIONS -

1. TO LOOP ON TEST I/O COMMAND, TURN ON SECTION SENSE SWITCH 0.
2. TO LOOP ROUTINE, TESTING FOR CC 0, TURN ON SECTION SENSE SWITCH 3.

0202 - CHANNEL OR SUBCHANNELS BUSY ON TEST I/O

PROGRAM RECEIVED A CONDITION CODE 2 ON A TEST I/O COMMAND.

- DIAGNOSTIC INFORMATION -

SUSPECT SOME PREVIOUS OPERATION WAS NOT COMPLETED. SOLID CONDITION CODE ERRORS SHOULD NOT SHOW UP HERE. SUSPECT INTERMITTENT ERROR. (UNLESS OTHER ERROR NUMBERS ARE ALSO PRINTED

- USER OPTIONS-

1. TURN ON SECTION SENSE SWITCH 0. PROGRAM WILL LOOP ON TIO COMMAND.
2. TO LOOP IN ROUTINE TESTING FOR CORRECT CONDITION CODE (CC 0), TURN ON SECTION SENSE SWITCH 3.

0203 - ACCESS NOT OPERATIONAL

PROGRAM RECEIVED A CONDITION CODE 3 ON A TEST IO, INDICATING ADDRESS ON CHANNEL WAS NOT RECOGNIZED. CHANNEL RECEIVED-SELECT IN- IN RESPONSE TO -SELECT OUT-.

- DIAGNOSTIC INFORMATION -

1. SUSPECT WRONG CONTROL UNIT ADDRESS.
2. CONTROL UNIT C.E. SWITCH ON -CE-
3. CONTROL UNIT METER SWITCH ON DISABLE.
4. COVER INTERLOCK SWITCH.

- USER OPTIONS -

1. TURN ON SECTION SENSE SWITCH 3 TO LOOP IN ROUTINE TESTING FOR FOR CORRECT CONDITION CODE (CC 0).

0204 - UNSAFE CONDITION -

PROGRAM ATTEMPTED A TEST I/O COMMAND AND RECEIVED A CONDITION CODE OF 1 AND UNIT CHECK ON. PROGRAM THEN ISSUED A SENSE COMMAND AND DETERMINED THAT UNSAFE BIT WAS ON.

- DIAGNOSTIC INFORMATION -

MUST DETERMINE WHAT UNSAFE CONDITION EXISTS. SEE SAFTY CIRCUITS OR TRUBLE SHOOTING PROCEDURE IN MAINTENANCE MANUAL

- USER OPTIONS -

1. GO OFF LINE AND DETERMINE CAUSE OF UNSAFE CONDITION.
2. JUMPER OFF SELECT LOCK AND LOOP BY TURNING ON SECTION SENSE SW 3 LOOP ROUTINE.
3. JUMPER OFF SELECT LOCK AND RESTART SECTION. (RESET,START,START)

0205 - FILE NOT ON LINE

PROGRAM ATTEMPTED A TEST I/O COMMAND AND RECEIVED A CONDITION CODE 1 WITH UNIT CHECK ON.
PROGRAM THEN PERFORMED A SENSE IO AND DETERMINED THAT -ON LINE- BIT IS OFF AND INTERVENTION REQUIRED BIT IS ON.

- DIAGNOSTIC INFORMATION -

1. SUSPECT POWER ON SEQUENCE IS NOT FUNCTIONING CORRECTLY. SEE POWER ON SEEK FLOW CHART.

NOTE- HEADS EXTENDED SWITCH TRANSFER GENERATES ON LINE SIGNAL TO CONTROL UNIT.

2. CHECK FILE METER SWITCHES NOT ON DISABLE
2. NOT GETTING MOD SELECT TO FILE

- USER OPTIONS -

1. TURN ON SECTION SENSE SW. 0 FOR TIGHT LOOP ON TEST I/O
2. TURN ON SECTION SENSE SW. 1 TO LOOP ON ERROR (INCLUDING TEST FOR CONDITION CODE)
3. TURN ON SECTION SENSE SWITCH 3 TO LOOP IN ROUTINE.

0206 - FILE BUSY -

PROGRAM ATTEMPTED A TEST I/O COMMAND AND RECEIVED A CONDITION CODE 1 WITH UNIT CHECK ON. SENSE DATA INDICATES THAT FILE IS ON LINE AND BUSY.

- DIAGNOSTIC INFORMATION -

SUSPECT POWER ON SEEK SEQUENCE
1. CYL PULSES
2. DETENT IN SIGNAL
REFER TO POWER ON SEEK FLOW CHART

- USER OPTIONS -

SAME AS ER. 0205

0207 - UNSELECTED FILE STATUS -

PROGRAM ATTEMPTED A TEST I/O COMMAND AND RECEIVED A CONDITION CODE 1 WITH UNIT CHECK ON. PROGRAM THEN ISSUED A SENSE I/O AND SENSE DATA INDICATES THAT FILE IS ON LINE, READY, BUT UNSELECTED STATUS BIT IS ON.

- DIAGNOSTIC INFORMATION -

SOME UNSELECTED ACCESS HAS A FILE SAFETY (FS) LINE-UP- TO THE CONTROL UNIT.
1. SOLID MOD SELECT
2. SOLID SELECTED READY
3. SOLID SELECTED END OF CYL.

- USERS OPTIONS -

1. SYSTEM RESET AND EXAMINE -FS- LINES TO DETERMINE WHICH ACCESS LINE IS INCORRECT.
2. TURN ON SECTION SENSE SWITCH 0 FOR SCOPE LOOP ON T I/O
3. TURN ON SECTION SENSE SWITCH 1 TO LOOP ON ERROR (TIO AND CHECK FOR CC 0)

0208 - UNIT CHECK ON TEST I/O

PROGRAM RECEIVED A UNIT CHECK ON A TEST I/O COMMAND AND ISSUED A SENSE COMMAND. PROGRAM HAS DETERMINED THAT UNIT CHECK WAS NOT CAUSED BY UNSAFE, NOT ON LINE, NOT READY, OR UNSELECTED STATUS. THUS, SOME OTHER CONDITION CAUSED THE UNIT CHECK.

- DIAGNOSTIC INFORMATION -

1. SUSPECT SEEK INCOMPLETE, BUSS OUT PARITY, OR SEEK CHECK. BIT SHOULD SHOW UP IN SENSE DATA PRINTED WITH ERROR TYPEOUT.

- USER OPTIONS -

1. SAME AS ER. 0205
2. TRY TURNING FILE DRIVE OFF -ON AND PSW RESTART

0209 - CONDITION CODE 1 BUT NO CHANNEL STATUS.

PROGRAM RECEIVED A CONDITION CODE 1 ON A TEST I/O, BUT NO CHANNEL STATUS WAS STORED, NO UNIT CHECK OCCURED, AND CONTROL UNIT IS NOT BUSY.

- DIAGNOSTIC INFORMATION -

2. COULD HAVE GOTTEN AN UNEXPECTED DEVICE END, IF USER POWERED OFF-ON THE FILE (DETENT CAUSES DEVICE END)

1. POSSIBLY LOOSING READY AT FILE DRIVE WITH A SOLID FILE BUS

- USER OPTIONS -

1. TRY STARTING TEST OVER, LEAVE FILE DRIVE ON. IF SAME FAILURE OCCURS, DETERMINE WHY CONTROL UNIT IS HANGING IN LOOP OR WHY DRI LOOSING READY.
2. OPTIONAL SCOPE LOOPS, SAME AS ERROR 0205.

0210 - UNEXPECTED END OF CYLINDER -

PROGRAM RECEIVED A UNIT CHECK ON A TEST I/O COMMAND AND DETERMINED THAT END OF CYL. BIT IS ON.

- DIAGNOSTIC INFORMATION -

1. SUSPECT ERRONEOUS END OF CYLINDER FROM FILE BUS 4
2. NO HAR RESET IF THIS ERROR OCCURS ON 2ND TIME THROUGH THIS SECTION

- USER OPTIONS -

SAME AS ERROR 0205

0211 - CONTROL UNIT HUNG UP BUSY

PROGRAM RECEIVED A CONDITION CODE 1 ON A TEST I/O WITH CONTROL UNIT BUSY (STATUS MODIFIER AND BUSY IN CSW.)

- DIAGNOSTIC INFORMATION -

1. NO MOD SELECT
2. SOLID CONTROL UNIT BUSY
3. IF -2- CH SW,OTHER INTERFACE HAS CONTROL UNIT.

- USER OPTIONS -

SAME AS ERROR 0205

0301 - CHANL. STATUS OR UNIT CHECK ON NO OP COMMAND

PROGRAM EXECUTED A NO OP COMMAND AND DETECTED ERROR STATUS OR UNIT CHECK

- DIAGNOSTIC INFORMATION -

1. IF END OF CYLINDER BIT ON, CHECK FOR SOLID FILE BUS 7.
2. OTHERWISE, EXAMINE SENSE DATA TO DETERMINE CAUSE OF STATUS OR UNIT CHECK.

- USERS OPTIONS -

1. TO LOOP ON START I/O, TURN ON SECTION SENSE SWITCH 0.
2. TO LOOP IN NO-OP ROUTINE TURN ON SECTION SENSE SWITCH 3.

0302 - NO CHANL OR DEVICE END ON NO-OP. COMMAND

PROGRAM ATTEMPTED A NO-OP COMMAND BUT DID NOT RECEIVE CHNL AND DEVICE END IN THE CHANNEL STATUS WORD.

- DIAGNOSTIC INFORMATION -

1. POSSIBLE CONTROL UNIT TROUBLE

- USER OPTIONS -

SAME AS ERROR 0301

0303 - CONDITION 0, 2, OR 3 ON NO-OP COMMAND.

PROGRAM EXECUTED A NO-OP COMMAND AND DETECTED INCORRECT CONDITION CODE. (SHOULD GET CC1)

- DIAGNOSTIC INFORMATION -

1. POSSIBLE SOLID FILE BUS 7

- USER OPTIONS -

SAME AS ERROR 0301

0401 - CHANNEL STATUS OR UNIT CHECK ON SENSE COMMAND

PROGRAM ISSUED A SENSE COMMAND AND SOME CHANNEL STATUS BIT OR UNIT CHECK WAS SET.

- DIAGNOSTIC INFORMATION -

EXAMINE CHANNEL STATUS TO DETERMINE WHICH CHECK BIT IS ON. (DEFINITION CHART AT PARAGRAPH 6.1) IF THIS IS THE ONLY ERROR NUMBER PRINTED, SUSPECT INTERMITTENT TROUBLE.

- USER OPTIONS -

1. TO LOOP ON SENSE I/O COMMAND, TURN ON SECTION SENSE SWITCH 3.

0403 - NO CHANL OR DEVICE END ON SENSE COMMAND

COULD BE A CHANNEL PROBLEM.
(SERVICE IN, SERVICE OUT AREA)
THIS COMMAND IS THE FIRST ATTEMPT TO TRANSFER BYTES FROM CONTROL UNIT ON SERVICE IN/SERVICE OUT BASIS.

- USERS OPTIONS-

SAME AS ERROR 0401

0404 - INCORRECT SENSE ON SENSE COMMAND

PROGRAM ISSUED A SENSE COMMAND AND SENSE DATA RECEIVED WAS INCORRECT. SENSE DATA SHOULD BE 0-0, 0-0, 0-0, 01000000. UNIT CHECK AND CHANL STATUS WERE NOT SET.

- DIAGNOSTIC INFORMATION -

ONLY ON-LINE BIT SHOULD BE ON IN THE SENSE DATA. ANY BITS ON IN THE FIRST 3 SENSE BYTES SHOULD TURNED ON UNIT CHECK IN DEVICE STATUS. SUSPECT FAULTY INDICATION OF ERROR IN SENSE DATA.

- USER OPTIONS -

SAME AS ERROR 0401

0501 - HANG UP CONDITION ON READ H A COMMAND

PROGRAM ATTEMPTED A READ H A COMMAND WHICH CAUSED A HANG UP CONDITION IN THE CONTROL UNIT. NO CHECK IS MADE ON THE READ OPERATION. CONTROL UNIT AND FILE WHERE NOT AVAILABLE TO CHANNEL AFTER 2 SECONDS, SO A HANG UP CONDITION IS ASSUMED.

- DIAGNOSTIC INFORMATION -

1. NO PULSES ON INDEX LINE FROM FILE TO CONTROL UNIT
2. LOOKS LIKE CONTROL UNIT NOT GETTING TO ENDING PROCEDURE IN THE MICRO PROGRAM (I.E. NOT SETTING CHANNEL AND DEVICE END.)

- USER OPTIONS -

1. TURN ON SECTION SENSE SWITCH 0 FOR LOOP ON SIO-READ HA.
2. TURN ON SECTION SENSE SW. 3 TO LOOP IN ROUTINE.

0502 - HANG UP CONDITION ON A CONTROL HEAD SEEK -

PROGRAM ATTEMPTED A HEAD SEEK COMMAND. BUT CONTROL UNIT AND FILE DID NOT BECOME AVAILABLE WITHIN 2 SECONDS. NO CHECKING IS MADE ON THE SEEK OPERATION ITSELF.

- DIAGNOSTIC INFORMATION -

LOOKS LIKE CONTROL UNIT IS NOT GETTING TO ENDING PROCEDURE IN THE MICRO PROGRAM. NOT GETTING CONTROL UNIT END AND DEVICE END FROM CONTROL UNIT.

- USER OPTIONS -

1. TO LOOP ON SIO-SEEK HH, TURN ON SECTION SENSE SW. 0.
2. TO LOOP IN ROUTINE, TURN ON SECTION SENSE SW 3.

0503 - NO DEVICE END ON FIRST CONTROL CYL SEEK

ON THE FIRST ATTEMPTED CONTROL SEEK,
HANG UP CONDITION OCCURED IN CONTROL UNIT.

- DIAGNOSTIC INFORMATION -

1. FAILED TO GET DEVICE END AFTER A SEEK OP - (IE. NO SEEK START)
2. SOLID RESET TO GATED ATTENTION LATCH (I.E. SOLID SELECT READ GATE)
3. SUSPECT NO GATED ATTENTION
4. SOLID ATTENTION VIA NO SELECTED READ GATE TO ATTENTION LATCH
5. NO SELECTED CONTROL TAG. OR SOLID BUS 5

- USER OPTIONS -

SAME AS ERROR 0501

0504 - HANG UP ON RECALIBRATE COMMAND -

PROGRAM ATTEMPTED A RETURN TO ZERO SEEK AND CPU DID NOT GET DEVICE END WITH-IN 2 SECONDS.

- DIAGNOSTIC INFORMATION -

1. SUSPECT RETURN TO 000
2. FILE BUS 6
3. LOST FILE READY (NO DETENT MAYBE)

- USER OPTIONS -

TRY RUNNING SEEK TEST, (F6BB) IF 1 AND 2 ABOVE DO NOT CORRECT FAILURE.
LOOP OPTIONS AT ERROR 0501 ARE AVAILABLE.

0505 - LOST READY ON A HEAD SEEK

PROGRAM DETECTED LOSS OF READY ON FIRST CONTROL HEAD SEEK.

- DIAGNOSTIC INFORMATION

1. SUSPECT NO SET DIFFERENCE OR NO FILE BUS 6
2. SOLID CONTROL TAG (SHOULD GIVE SELECT LOCK)

- USER OPTIONS -

SAME AS ER. 501

0600 - READ HEAD MAP DESCRIPTION -

READ HEAD MAP ERRORS ARE THE RESULT OF THE PROGRAM'S ATTEMPT TO READ HA WITH ALL 20 HEADS. IF ANY ERRORS OCCUR, AN ERROR NUMBER IS PRINTED OUT FOLLOWED BY THE HEAD MAP. PROGRAM HALTS TO ALLOW USER TO EXAMINE THE MAP AND CHOOSE AN OPTION TO CONTINUE.

- EXAMPLE OF HEAD MAP PRINT OUT

```
** ER 06XX  CUU  AAAAAA
     READ HEAD MAP -
     HEAD NUMBER---00 01 02 03 04 05 06 07 08 09 10 11 12 ... 18 19
     RD HA RESULT--00 01 02 03 0X NF TX SD US BC SE 11 12 ... 18 19
     HD 04  HA READ  0000000000
     CSW  YY  YYYYYY  YY  YY  YYYY  SNS B-B B-B B-B B-B
     HD 05   ...
      .      ...
      .      ...
      .      ...
     HD 10   ...
     CSW     ...
```

- EXPLANATION OF MAP SYMBOLS-

0X - ACTUAL HEAD NUMBER FROM HA READ, (WILL EQUAL HEAD NUMBER IF CORRECT)
NF - NO RECORD FOUND ON THIS HEAD
TX - NO DATA BEING TRANSFERED
SD - SER/DES CHECK ON THIS HEAD
US - UNSAFE ON THIS HEAD
BC - DATA CHECK (BURST CHECK) ON THIS HEAD
SE - SOME OTHER SENSE ERROR (LIKE SEEK CHECK, OR END OF CYLINDER)

THE LINES FOLLOWING THE HEAD MAP PROVIDE THE ACTUAL HOME ADDRESS (5 BYTES) RECEIVED BY THE CPU, AND THE CSW AND SENSE DATA FOR EACH FAILING HEAD. IF ALL HEADS FAIL, ONLY DATA ON HEAD 00 IS PRINTED.

- READ IN AREA IN CORE STORAGE IS SET TO HEX C5'S BEFORE READ IS PERFORMED

- USER OPTIONS -

1. SCOPE LOOP
   TURN ON SECTION SENSE SW 0 TO LOOP IN SIO READING HA ON THE FIRST FAILING HEAD IN THE MAP.
2. TO LOOP IN ROUTINE, READING HA ON ALL HEADS CHECKING FOR ERRORS, TURN ON SECTION SENSE SW 3.
3. TO LOOP IN ROUTINE, READING HA WITH ALL HEADS WITHOUT CHECKING FOR ERRORS, TURN ON SECTION SENSE SWITCH 1.
4. TO CONTINUE PROGRAM - PRESS INTERRUPT. (WITH ABOVE SWITCHES OFF) PROGRAM WILL PROCEED TO NEXT ROUTINE.

0601 - ERROR ON READ HA, NO RECORD FOUND ON ALL HEADS

PROGRAM WAS UNABLE TO READ HA FROM ANY HEAD, AND THE SENSE DATA INDICATES NO RECORD FOUND ON ALL HEADS.

- DIAGNOSTIC INFORMATION -

1. NO DATA GETTING FROM FILE TO CONTROL UNIT
2. SOLID SELECTED INDEX
3. FILE NOT GETTING READ GATE
4. OPEN READ COAX.

- USER OPTIONS -

SEE ER. NO. 0600 FOR DESCRIPTION OF READ HEAD MAP AND OPTIONAL SCOPE LOOPS

0602 - ERROR ON READ HA, DATA CHECK (BURST CHECKS) ON ALL HEADS -

PROGRAM ATTEMPTED TO READ HA FROM ALL HEADS AND DETECTED BURST CHECK ERRORS ON ALL HEADS. (INDICATES ALL READ DATA IS BAD)

- DIAGNOSTIC INFORMATION -

1. CHECK THAT HEADS ARE LOADED AND FLYING AGAINST DISK SURFACE
2. NO HEAD SELECT OR SOLID HEAD DESELECT
3. DETENT LATCH ON SOLID, OR ACCESS TROUBLE CAUSES ACCESS TO LOCATE AT CYL. MINUS 1, (DETENT LATCH) (SEE OPTION 2)
4. BURST CHECK ERRORS SUGGEST CONTROL UNIT S/D CLOCKING TROUBLE.

- USER OPTIONS -

1. SEE ERROR NO. 0600 FOR HEAD MAP DESCRIPTION AND SCOPE LOOPS.
2. MANUALLY POSITION ACCESS AT LEGITIMATE CYLINDER 0 OR 1 AND TURN SECTION SENSE SWITCH 3 ON. IF NO ERRORS, CONTINUE TO SEEK TEST. DO NOT DO A PSW RESTART BECAUSE ACCESS WILL PROBABLY RETURN TO CYLINDER -1.

0603 - ERROR ON READ HA, S/D CHECK ON ALL HEADS -

VERY SIMILAR TO ERROR 0602
POSSIBLE VFO ADJUSTMENT PROBLEM

0604 - READ HA ERROR, UNSAFE ON ALL HEADS

PROGRAM ATTEMPTED TO READ HA FROM ALL HEADS AND DETECTED UNSAFE ON ALL HEADS.

- DIAGNOSTIC INFORMATION -

SUSPECT -
SOLID WRITE GATE
SOLID SEEK READY

- USER OPTIONS -

SEE ER NO. 600 FOR EXPLANATION OF HEAD MAP AND SCOPE LOOPS.

0605 - ERROR ON READ HA, DATA CHECK AND NRF ON ALL HEADS.

PROGRAM ATTEMPTED TO READ HA FROM ALL HEADS AND RECEIVED NRF AND/ OR DATA CHECKS ON ALL HEADS

- DIAGNOSTIC INFORMATION -

1. POSSIBLE NO READ DATA LINE
2. SUSPECT NO HOME ADDRESSES ON THIS TRACK

- USER OPTIONS - SEE ERROR 600 FOR HEAD MAP DESCRIPTION AND SCOPE LOOPS

0607 - ERROR ON READ HA, UNSAFE ON 19 HEADS -

PROGRAM ATTEMPTED TO READ HA FROM ALL HEADS AND DETECTED UNSAFE CONDITION ON ALL BUT ONE HEAD

- DIAGNOSTIC INFORMATION -

NINETEEN UNSAFE CONDITIONS INDICATE SOLID Y SELECT. THE HEAD WHICH READ CORRECTLY IS THE HEAD SOLIDLY SELECTED.
(HAR DECODE)

- USER OPTIONS -

SEE ER. NO. 0600 FOR HEAD MAP DESCRIPTION AND SCOPE LOOPS.

0608 - ERROR ON READ HA - WRONG HEAD SELECTED

PROGRAM ATTEMPTED TO READ HA FROM ALL HEADS. NO MACHINE ERROR CONDITIONS WERE DETECTED, BUT HA READ INDICATES THAT HEADS WERE NOT SELECTED CORRECTLY. HEAD MAP PRINTED OUT WILL SHOW HEAD NUMBERS THAT WERE READ DO NOT ALL EQUAL HEAD NUMBER SELECTED. EXAMINE PATTERN FOR CLUES TO FAILURE.

- DIAGNOSTIC INFORMATION -

LOOKS LIKE SOME ADDRESS REGISTER BIT FAILING. (SOLID ON OR SOLID OFF)
1. SUSPECT HAR - AND BUS LINES INTO HAR (SUCH AS FILE BUS 4 OR 7
2. IF SAME HEAD NUMBER LISTED IN ALL 20 HEAD POSITIONS, SUSPECT NO SET HEAD LINE
3. SOLID HAR RESET (IF HEAD MAP ALL ZEROS)

- USER OPTIONS -
SEE ERROR NO 0600 FOR HEAD MAP DESCRIPTION AND SCOPE LOOPS

0609 - ERROR ON READ HA

PROGRAM ATTEMPTED TO READ HA FROM ALL HEADS, AND DETECTED ERRORS ON SEVERAL HEADS OR 'SE' ERRORS. EXAMINE HEAD MAP AND DETAILED PRINTOUT FOR ANALYSIS OF TROUBLE.

- DIAGNOSTIC INFORMATION -

1. FAILING HAR RESET LINE WILL CAUSE THIS ERROR (EXAMPLE - NO FILE BUS 3
2. SUSPECT ONE HEAD SELECTED SOLID
(EXAMPLE - HEAD MAP
4 5 6 4 5 6 7 12 13 14 15 12 13 14 15 TX TX TX TX
INDICATES SOLID HEAD 4 SELECTED.

- USER OPTIONS -
SAME AS ERROR 0608

0610 - ERROR ON READ HA, NO RECORD FOUND ON ONE HEAD

PROGRAM READ HA'S FROM ALL HEADS AND DETECTED A NRF ON ONE HEAD. HEAD MAP WILL SHOW WHICH HEAD WAS IN ERROR. A SINGLE ERROR LIKE THIS SUGGESTS A PROBLEM COMMON TO THE PARTICULAR HEAD

- DIAGNOSTIC INFORMATION -

1. BAD HEAD OR OPEN LINE ON THE FAILING HEAD INDICATED IN MAP
2. HEAD OUT OF ADJUSTMENT OR LOOSE

- USER OPTIONS -

1. SEE ER. NO. 0600 FOR DESCRIPTION OF HEAD MAP AND SCOPE LOOPS.
2. FOR HEAD ALIGNMENT PROBLEMS, RUN OPTIONAL ROUTINE 7 IN SECTION 3

0611 - ERROR ON READ HA, DATA (BURST) CHECK ON ONE HEAD

PROGRAM READ HA FROM ALL HEADS AND DETECTED A BURST CHECK ON ONE HEAD. THE READ HEAD MAP PRINTED OUT WILL SHOW WHICH HEAD WAS IN ERROR. THIS ERROR SUGGESTS SOMETHING COMMON TO THE PARTICULAR HEAD.

- DIAGNOSTIC INFORMATION -

1. NO HEAD SELECT FOR THIS HEAD
2. ONE HEAD OUT OF ADJUSTMENT
3. LOOSE OR OPEN HEAD PLUG
4. INTERMITTENT READ ERROR ON THIS HEAD
5. BAD HEAD (R/W COIL)

- USER OPTIONS -

1. SEE ER. NO. 0600 FOR DESCRIPTION OF HEAD MAP AND SCOPE LOOPS
2. NOTE - OPTIONAL ROUTINE A IN SECTION F68D IS INTERCHANGEABILITY ROUTINE.
3. NOTE - OPTIONAL ROUTINE 7 IN SECTION F68D IS TRACKING ADJUSTMENT ROUTINE.

0701 - UNIT CHECK ON RETURN TO 000 SEEK

PROGRAM ATTEMPTED A RESTORE TO 00 FOLLOWED BY A TEST I/O AND DETECTED A UNIT CHECK.

- DIAGNOSTIC INFORMATION -

IF THIS IS THE FIRST ERROR NUMBER PRINTED, ASSUME POWER-ON SEEK WORKED PROPERLY. PROBLEM IS THEN RELATED TO RETURN TO 000 SEEK. EXAMINE SENSE DATA TO DETERMINE WHAT SET UNIT CHECK.

1. LOOSING-ON LINE-DURING THE RECALIBRATE COMMAND.

- USER OPTIONS -

1. TO LOOP IN ROUTINE, TURN ON SECTION SENSE SWITCH 3.

0702 - NOT BUSY ON RETURN TO 000 SEEK

PROGRAM ATTEMPTED A RETURN TO 000 COMMAND, BUT FILE NEVER WENT BUSY SEEKING. PROGRAM FAILED TO GET BUSY BIT IN CSW ON TIO AFTER RECALIBRATE.

- DIAGNOSTIC INFORMATION -

1. SUSPECT NO SEEK START
2. SUSPECT SOLID SEEK READY
3. SOLID SELECTED FILE READY

- USER OPTIONS -

1. TO LOOP IN ROUTINE, TURN ON SECTION SENSE SWITCH 3.

0703 - HANG UP CONDITION ON RECALIBRATE COMMAND

PROGRAM ATTEMPTED A RETURN TO ZERO SEEK. THE OPERATION WAS NOT COMPLETED WITHIN 2 SECONDS, CAUSING A TIME OUT ERROR FROM THE START I/O SUBROUTINE. UNIT CHECK WAS NOT SET.

- DIAGNOSTIC INFORMATION -

LOOKS LIKE CONTROL UNIT HANG UP CONDITION. MICRO-PROGRAM IS NOT GET TO ENDING SEQUENCE (NO DEVICE AND CHANNEL END SIGNAL)

- USER OPTIONS -

1. USER SHOULD DO A PSW RESTART TO CLEAR CHANNEL AND CONTROL UNIT.
2. TO LOOP ON START I/O, TURN ON SECTION SENSE SW. 0. PROGRAM WILL LOOP ON RECALIBRATE COMMAND.
3. TO LOOP ROUTINE, TURN ON SECTION SENSE SWITCH 3. PROGRAM WILL LOOP IN THIS ROUTINE.

0704 - SEEK INCOMPLETE ON RECALIBRATE COMMAND

PROGRAM EXECUTED RECALIBRATE COMMAND AND ACCESS WENT TO INNER OR OUTER CRASH STOP.

- USER OPTIONS -

SAME AS ER. 0703.

0706 - FAILED TO RETURN TO 000 ON RECALIBRATE COMMAND

PROGRAM ATTEMPTED A RECALIBRATE COMMAND FOLLOWED BY A READ HA. THE HOME ADDRESS READ WAS NOT FOR CYLINDER 000, HEAD 00. NO UNIT CHECK ERRORS OCCURRED.

- DIAGNOSTIC INFORMATION -

1. SOLID ON-LINE SIGNAL
2. CONTROL TAG LINE OR FILE BUS 6

- USER OPTIONS -

1. TO LOOP IN ROUTINE, TURN ON SECTION SENSE SWITCH 3.
2. TO LOOP ON RECALIBRATE START I/O, TURN ON SECTION SENSE SWITCH 0.

0707 - UNIT CHECK ON READ HA

PROGRAM EXECUTED A RECALIBRATE COMMAND AND THEN READ HA TO CHECK FOR CYL. 000 AND UNIT CHECK WAS DETECTED ON THE READ HA COMMAND.

- DIAGNOSTIC INFORMATION -

NOTE - ROUTINE 6 TESTS READ HA - (ALREADY COMPLETED) COULD BE THAT ACCESS DETENTED AT CYLINDER MINUS 1.

- USER OPTIONS -

SAME AS ERROR 0706

1000 - CONTROL UNIT PARITY CHECK OR HANG-UP

AN UNEXPECTED CONTROL UNIT PARITY ERROR OR HANG-UP OCCURED, CAUSING HANG UP CONDITION WITH CHANNEL NOT CLEARED. PROGRAM PRINTS ERROR, CAW AND CSW.

- DIAGNOSTIC INFORMATION -

SUGGESTS TROUBLE IS IN CONTROL UNIT.

- USER OPTIONS -

1. TRY PSW RESTART (RESET, START, START)
THIS WILL RESTART THE PROGRAM AT THE BEGINNING OF THIS SECTION.
2. LOOK FOR ERROR IN CONTROL UNIT.

1100 - EXPLANATION OF SEEK MAP -

THE PROGRAM EXECUTES A SERIES OF SELECTIVE CYLINDER SEEKS DESIGNED TO TEST ALL-CAR- AND DIFF. COUNTER BIT POSITIONS FOR ON AND OFF CONDITIONS. THE PARTICULAR HA READ AT THE DETENTED CYLINDER IS ANALYZED BY THE PROGRAM, AND PARTICULAR ERROR CONDITIONS ARE DEDUCED AND IDENTIFIED BY ERROR NUMBER. EACH ERROR NUMBER IS ACCOMPANIED BY A SEEK MAP.

- EXAMPLE OF SEEK MAP ERROR PRINT-OUT-

```
** ER 11XX UNIT CUU, ADRS. AAAAAA.
SEEK MAP --
BIT POSITION-1   2   4   8   16  32  64  128
SEEK RESULTS-OK  CON COF DON DOF ERR +1  XXX
```

(EXAMPLE SHOWS ALL POSSIBLE MAP CHARACTERS)

- DEFINITION OF MAP CHARACTERS -

1. OK CAR AND DIF. CNTR. FUNCTIONED PROPERLY, THIS POSITION.
2. CON THIS BIT ON SOLID IN CAR.
3. COF THIS BIT OFF SOLID IN CAR.
4. DON THIS BIT ON SOLID IN DIF. CNTR.
5. DOF THIS BIT OFF SOLID IN DIF. CNTR.
6. ERR SOME OTHER ER. SUCH AS BURST CHECK OR CAN'T READ HA
7. +1 ACCESS SEEKED TO WRONG CYL BY +1 (OVERSHOOT)
8. -1 ACCESS SEEKED TO WRONG CYL BY -1 (UNDERSHOOT)
9. XXX CYL ADDRESS SEEKED - OCCURS WHEN ACCESS WENT TO THE WRONG CYLINDER.

- USER OPTIONS -

1. FOR SCOPE LOOP ON ERROR CONDITION TURN ON SECTION SENSE SW -1- RECALIBRATE, SEEK TO FIRST FAILING CYL., RECALIBRATE, SEEK ...) THE RECALIBRATE CCW COMMAND CAN BE CHANGED TO A SEEK CYL 000, BY CHANGING COMMAND CODE -13- TO -07- OR -0B- AT LABEL -CCW5- IN F6BB ROUTINE 1.
2. TO LOOP IN THIS ROUTINE (WITH OR WITHOUT ERRORS), TURN ON SECTION SENSE SW 3

1101 - SPECIAL UNIQUE MAP

PROGRAM DETECTED ERRORS DURING TEST OF CAR AND DIFF. COUNTER. EXAMINE MAP FOR UNIQUE PATTERNS LISTED BELOW.

- DIAGNOSTIC INFORMATION -

SUSPECT INCORRECT GATED CAR OUTPUT

1. IF LAST TWO CODES IN MAP = 032 64 THEN INITIAL SEEK LATCH IS NOT TURNING ON.
2. IF LAST TWO MAP CODES = 032 OK THEN THE INITIAL SK LATCH BLOCK TO CAR BITS 1,4,16, AND 64 IS FAILING.
3. IF LAST TWO MAP CODES = OK 064 THEN THE INITIAL SK LAYCH BLOCK TO CAR BITS. 2,8,32, AND 128 IS FAILING.

- USER OPTIONS -

SEE ER. 1100 FOR MAP DISCRIPTION AND SCOPE LOOPS

1110 - DIFFERENCE COUNTER BIT ON OR OFF SOLID.

SEEK CHECK AND SEEK INCOMPLETE ON CYLINDER SEEK COMMAND SUGGESTS ACCESS WENT TO INNER OR OUTER CRASH STOP, LIKE COUNTER CAN'T COUNT TO ZERO BECAUSE SOME DIFF. COUNTER BIT IS SOLID ON.

- DIAGNOSTIC INFORMATION -

1. DIFF. CNTR. - (SOME BIT ON OR OFF SOLID)
2. SET DIFFERENCE - (SOLID RESET ON)
3. COUNTER ZERO - NO STOP SIGNAL TO DETENT
4. CAR OUTPUT BUS LINE 'ON' - CONTROL UNIT WILL THEN COMPUTE WRONG DIFFERENCE (ONE 'DOF' INDICATES FAILING BUS LINE 6)

- USER OPTIONS -

SEE ER. NO. 1100 FOR SEEK MAP DESCRIPTION AND SCOPE LOOP OPTIONS.

1111 - ALL DIFF. COUNTERS ON SOLID -

GOING TO INNER CE CYLINDER ON ALL SEEKS, (DIFF. COUNTER NOT COUNTING DOWN) THEREFORE, NOT GETTING COUNTER ZERO.

- DIAGNOSTIC INFORMATION -

1. NO SET DIFFERENCE (DIFF CNTR TRIGGERS ALL LEFT ON)
2. SUSPECT NOT GETTING CORRECT DETENT BECAUSE OF FAILING SLOW OR INTERMEDIATE
3. NO GATED CYL. PULSES
4. NO FILE BUS SIGNALS

- USER OPTIONS -

SEE ERROR 1100 FOR DESCRIPTION OF SEEK MAP AND SCOPE LOOPS.

1120 - DIFFERENCE COUNTER BIT OFF SOLID -

PROGRAM EXECUTED CYL SEEKS TO CYLINDERS 1, 2, 4, 8, 16, 32, 64, AND 128, AND ON AT LEAST ONE SEEK, ACCESS FAILED TO MOVE, INDICATING THAT THAT BIT DID NOT GET SET ON IN DIFF. CNTR.

- DIAGNOSTIC INFORMATION -

SUSPECT.
1. DIFF. COUNTER - (SOME BIT OFF SOLID)
2. COUNTER RESET - (SOME BIT NOT RESET ON)
3. LINE DRIVERS

- USER OPTIONS -

SEE ER. NO 1100 FOR DESCRIPTION OF SEEK MAP AND SCOPE LOOPS.

1121 - ALL DIFF CNTRS OFF SOLID

PROGRAM EXECUTED SERIES OF CYL. SEEKS DESIGNED TO TEST CAR AND DIFF. COUNTERS. THIS ERROR SAYS ALL DIF. COUNTERS ARE OFF.

- DIAGNOSTIC INFORMATION -

1. GETTING CONSTANT DIFFERENCE RESET (MODULE SELECTED SET CYLINDER TAG TURNS ON ALL DIFF. COUNTERS.
2. NOT GETTING SET CYLINDER
3. SOLID COUNTER ZERO (-L STOP)
4. SOLID SET DIFFERENCE TAG

- USER OPTIONS -

SEE ERROR NUMBER 1100 FOR DESCRIPTION OF SEEK MAP AND SCOPE LOOPS.

1130 - CYL. ADDRESS. REG. BITS ON SOLID -

PROGRAM ATTEMPTED A SERIES OF CYLINDER SEEKS AND ACCESS DETENTED AT WRONG CYLINDER. CPU CALCULATIONS INDICATE SOME CAR BIT ON SOLID BECAUSE ACCESS DETENTS OFF BY A CONSTANT NO. OF CYLINDERS. EXAMPLE, IF CAR BIT 4 ON SOLID AND WE TRY TO SEEK TO CYL 128 AFTER RESTORE OPERATION, ACCESS WILL SEEK TO 128 BECAUSE FIRST SEEK LATCH BLOCKS CAR OUTPUT TO CONTROL UNIT ON THE SECOND SEEK TO CYL. 128, CONTROL UNIT WILL COMPUTE A DIFFERENCE BASED UPON OLD ADDRESS OF 132 (128+4) BECAUSE CAR-4BIT IS ON SOLID. THE SECOND ATTEMPTED SEEK TO 128 WILL RESULT IN ACCESS MOVING BACKWARD TO 124, AND PROGRAM DECODES THIS AS ERROR.

- DIAGNOSTIC INFORMATION -

SUSPECT.
1. CAR
2. LINE DRIVERS

- USER OPTIONS -
SEE ERROR NO. 1100 FOR DESCRIPTION OF SEEK MAP AND SCOPE LOOPS.

1140 - CYL ADDRESS REG BITS OFF SOLID -

AFTER PROGRAM CHECKS THAT ALL CAR BITS TURN OFF, A TEST IS MADE FOR ALL CAR BITS TURNING ON BY ATTEMPTING SELECTIVE CYLINDER SEEKS FOLLOWED BY SEEK TO CYL 16. IF ACCESS FAILS TO RETURN TO CYL 16, SOME CAR BIT IS PROBABLY FAILING TO TURN ON. THAT IS, THE ADDRESS IN CAR WAS INCORRECT.

- DIAGNOSTIC INFORMATION -

1. CAR - SOME BIT OFF SOLID
2. INITIAL SEEK LATCH ON SOLID

- USER OPTIONS -
SEE ERROR NUMBER 1100 FOR DESCRIPTION OF SEEK MAP AND SCOPE LOOPS.

1150 - ACCESS OVERSHOOT BY PLUS 1

A READ HA FOLLOWING A SEEK COMMAND INDICATES THAT ACCESS DETENTED ONE CYLINDER TOO FAR ON AT LEAST 3 SEEKS.

- DIAGNOSTIC INFORMATION -
1. SUSPECT NO SLOW SIGNAL
2. SUSPECT - CYLINDER PULSES FAILING

- USER OPTIONS -

SEE ERROR NO. 1100 FOR DESCRIPTION OF SEEK MAP AND SCOPE LOOPS

1160 - ACCESS UNDERSHOT BY MINUS 1 CYLINDER

A READ HA FOLLOWING A SEEK COMMAND INDICATES THAT ACCESS DETENTED ONE CYLINDER TOO SHORT ON AT LEAST 3 SEEKS

- DIAGNOSTIC INFORMATION -

1. SLOW AT 3 SOLENOID PICKED SOLID.
2. CYL. TRANSDUCER ADJUSTMENT - SUGGESTS TRANSDUCER SET TOO HIGH

- USER OPTIONS -

SEE ERROR NUMBER 1100 FOR DESCRIPTION OF SEEK MAP AND SCOPE LOOPS

1190 - SOME OTHER SEEK ERROR -

PROGRAM HAS DETECTED SEEK ERRORS WHICH CANNOT BE CLASSIFIED INTO THE SEEK MAP CHARACTERS.

- DIAGNOSTIC INFORMATION -

1. SUSPECT HAVING TROUBLE READING HA IF ANY 'ERR' MESSAGES ARE PRINTED IN MAP.
2. EXAMINE MAP AND DETAILED PRINTOUT FOR CLUES TO FAILURE

- USER OPTIONS -

SEE ERROR NUMBER 1100 FOR DESCRIPTION OF SEEK MAP AND SCOPE LOOPS

1201 - NO UNIT CHECK ON SEEK TO CYL 255

SEEK INCOMPLETE IS NOT GIVING GATED ATTENTION

- DIAGNOSTIC INFORMATION -

600 MS SINGLE SHOT IS NOT TIMING OUT.

1202 - DID NOT GENERATE SEEK INCOMPLETE, SEEK CHECK, AND NOT READY.

PROGRAM ATTEMPTED A SEEK TO CYL 255 AND EXPECTED SEEK INCOMPLETE, SEEK CHECK AND NOT READY.

- DIAGNOSTIC INFORMATION -

USER SHOULD CHECK SENSE INFORMATION FOR FAILING BITS.

1203 - FAILED TO GET TO CYL. 000 ON RECALIBRATE

(SHOULD NOT FAIL HERE - THIS COMMAND WORKED BEFORE, SECTION 0 ROUTINE 7.

1301 - SEEK INCOMPLETE DURING SINGLE CYL SEEKS

ACCESS WENT TO INNER OR OUTER CRASH STOP. (SHOULDN'T GET THIS ERROR EXCEPT ON INTERMITTENT FAILURES SUCH AS CYL. TRANSDUCER ADJUSTMENTS OR DETENT ADJUSTMENT)

1302 - UNIT CHECK ON CYL. SEEK OR ERROR READING HOME ADDRESS

SHOULDN'T GET THIS ERROR EXCEPT ON INTERMITTENT TROUBLE. TRY TO CONTINUE (PRESS INTERRUPT)
NOTE. CANNOT ALWAYS DETERMINE THE 'WENT TO' CYLINDER BECAUSE OF TROUBLE READING HOME ADDRESS AS INDICATED BY UNIT CHECK

1303 - FAILED ON SINGLE CYLINDER SEEKS, OVERSHOOT

PROGRAM WAS ATTEMPTING TO SINGLE CYLINDER SEEK FROM CYLINDER 000, 001, 002, ..., 201, 202, 201, ... 000. THE SEQUENCE WAS BROKEN AT SO POINT AND ERROR PRINT OUT GIVES -
1. WAS AT CYL XX HD XX
2. ATTEMPTED TO SEEK TO CYL XXX HD XX
3. BUT WENT TO CYL XXX HD XX

- DIAGNOSTIC INFORMATION -

SUSPECT
1. CYL. TRANSDUCER ADJUSTMENT

- USER OPTIONS -

1. TO LOOP ON ERROR, TURN ON SECTION SENSE SWITCH 1. PROGRAM LOOPS IN SINGLE CYL. SEEKS (NO ERROR CHECKING). IF A HANG-UP OCCURS SUCH AS INNER OR OUTER CRASH STOP, PSW RESTART WILL RESTART SECTION
2. TO LOOP IN ROUTINE. TURN ON SECTION SENSE SWITCH 3.

1304 - ERROR ON SINGLE CYL SEEKS

PROGRAM DETECTED AN INCORRECT HA DURING SINGLE CYL. SEEK ROUTINE. ACCESS WENT TO WRONG CYLINDER. ERROR PRINTOUT INDICATES CYLINDERS AND HEADS INVOLVED.

- DIAGNOSTIC INFORMATION -

1. STRONGLY SUGGESTS CYL. TRANSDUCER OUT OF ADJUSTMENT, ESPECIALLY IF ACCESS IS FAILING ONLY ON SINGLE CYL SEEKS.

- USER OPTIONS -

SEE ERROP 1303

1401 -
-OR-
1402 - UNIT CHECK ON CYL SEEK TO CYL 10 OR CYL 85 OR ERROR READING HA

PROGRAM ATTEMPTS A SERIES OF 50 SEEKS BETWEEN CYLINDER 10 AND 85. A UNIT CHECK OCCURED, CAUSING THIS ERROR PRINTOUT.

- DIAGNOSTIC INFORMATION -

LOOKS LIKE INTERMITTENT SEEK TROUBLE. ACCESS PROBABLY WENT TO INNER OR OUTER CRASH STOP.

- USER OPTIONS -

SAME AS ERROR 1403

1403 -
-OR-
1404 - INCORRECT SEEK, (CYL 10 TO CYL 85 TO 10---)

PROGRAM WAS TESTING FOR WORSE CASE SEEKS BY ATTEMPTING TO SEEK BETWEEN CYL. 10 AND CYL. 85, 50 TIMES. AN INCORRECT SEEK OCCURED, AND PRINT OUT GIVES INFORMATION ON FAILURE. PROGRAM WILL EXECUTE A

-RECALIBRATE- OPERATION IF CONTINUED AFTER AN ERROR.

- DIAGNOSTIC INFORMATION -

1. DETENT TIMING, ADJUSTMENT, ETC.
2. SOLID SLOW AT 3
3. CYL. TRANSDUCER ADJUSTMENT
4. INTERMITTENT CYL. PULSES, CAR, DIFF CNTR.

- USER OPTIONS -

1. SCOPE LOOP - TURN ON SECTION SENSE SW. 1. PROGRAM WILL LOOP IN ROUTINE, RECALIBRATING AFTER ERRORS + BYPASSING ERROR PRINTOUTS
2. LOOP ROUTINE - TURN ON SECTION SENSE SW 3. SAME AS ABOVE BUT ERROR PRINTOUTS AND HALTS ARE NOT BYPASSED.

1501 -
-OR-
1502 - UNIT CHECK ON LONG SEEK TEST OR ERROR READING HA

SHOULD NOT GET UNIT CHECK HERE EXCEPT ON INTERMITTENT FAILURES

- PRESS INTERRUPT TO CONTINUE -

TURN ON SSW 1 OR 3 TO LOOP THIS ROUTINE

1503 -
-OR-
1504 - ERROR ON LONG CYL. SEEK -

PROGRAM ATTEMPTED TO SEEK BETWEEN CYL 001 AND CYL 200 FOR 50 SEEKS. AN INCORRECT SEEK (WRONG HA) WAS DETECTED, AND PROGRAM PRINTS OUT RELEVENT INFORMATION

- DIAGNOSTIC INFORMATION -

1. DETENT (INTERMITTENT) , CYL. TRANSDUCER, ETC. ANYTHING SPECIFICALLY RELATED TO LONG SEEK FAILURES.

- USERS OPTIONS -

1. SCOPE LOOP - TURN ON SECTION SENSE SW 1. PROGRAM WILL LOOP IN ROUTINE, RECALIBRATE AFTER ERRORS, AND BYPASS ERROR HALTS
2. LOOP ROUTINE - TURN ON SECTION SENSE SW 3 - SAME AS ABOVE BUT ERROR PRINTOUTS NOT BYPASSED

1601 - UNIT CHECK ON RANDOM SEEK TEST OR ERROR READING HA

THIS ERROR NUMBER SHOULD NOT OCCUR EXCEPT ON INTERMIT. FAILURES

- USER OPTIONS -

1. TO LOOP SEEKING BETWEEN THE 'WAS AT' CYL. AND THE 'SEEK TO' CYL., TURN ON SECTION SENSE SWITCH 1.
2. TO LOOP IN RANDOM SEEK ROUTINE, TURN ON SECTION SENSE SWITCH 3.

1602 - INCORRECT SEEK DURING RANDOM SEEK TEST

THE RANDOM SEEK ROUTINE EXECUTES A SERIES OF 500 RANDOMLY COMPUTED CYLINDER SEEKS, READING HA AFTER EACH TO VERIFY CORRECT ACCESS POSITION. THE SEQUENCE WAS BROKEN BECAUSE PROGRAM DETECTED A SEEK ERROR. (UNEQUAL HA)

- DIAGNOSTIC INFORMATION -

IF THIS IS ONLY ERROR, SUSPECT INTERMITTENT FAILURE LOOK FOR FAILURE PATTERNS IN PRINTOUTS

- USER OPTIONS -

SEE ER. 1601

2000 - CONTROL UNIT HANG UP

A CONTROL UNIT FAILURE OCCURED CAUSING A CONTROL UNIT HANG UP WITH CHANNEL NOT CLEARED

- DIAGNOSTIC INFORMATION -

LOOKS LIKE CONTROL UNIT TROUBLE. COULD BE PARITY ERROR

- USER OPTIONS -

1. TRY RESET, START, START - THIS WILL RESTART PROGRAM AT BEGINNING OF THIS SECTION.
2. TRY TURNING ON SECTION SENSE SW -6- TO PRINT ROUTINE SUBTITLES TO FIND OUT WHICH ROUTINE IS CAUSING PROBLEM. THIS WILL BE LAST ROUTINE TITLE PRINTOUT BEFORE ERROR OCCURS.

2100 - WRITE HEAD MAP DESCRIPTION

THE WRITE HEAD MAP IS PRINTED OUT WITH ALL WRITE TEST ERROR NUMBERS. DURING THE WRITE TEST, SEVERAL WRITE PATTERNS ARE WRITTEN ON CYLINDER 005 AND READ BACK FOR CPU COMPARISON. IF AN ERROR OCCURS, A CODE CHARACTER IS PLACED IN THE HEAD MAP AT THAT HEAD POSITION. WHEN ALL HEADS HAVE BEEN CHECKED, AN ERROR NUMBER IS PRINTED OUT, FOLLOWED BY THE WRITE HEAD MAP. PROGRAM STOPS TO ALLOW USER TO EXAMINE PRINTOUT AND CHOOSE AN OPTION TO CONTINUE.

- EXAMPLE OF WRITE HEAD MAP PRINTOUTS

(SHOWING ALL POSSIBLE MAP CHARACTERS)

```
** ER 21XX CUU AAAAAA
    WRITE HEAD MAP --
    HEAD NUMBER ---- 00 01 02 03 04 05 06 07 08 09 10 11 ... 18 19
WR RD RO RESULT ---- OK WX WU WS RN WW DS BC NX SE OK OK ... OK OK
HD 01  WR  DATA  XX  RD  DATA  XX ...XX
CAW X...X CSW X...X      SNS  BBB...B  (STATUS AND SENSE AFTER WRITE)
CAW X...X CSW X...X      SNS  BBB...B  (STATUS AND SENSE AFTER READ)
```

- EXPLANATION OF MAP CHARACTERS -

OK - DATA READ COMPARES WITH DATA WRITTEN AND NOT UNIT CHECK
WX - NO RECORD FOUND WITH THIS HEAD ON WRITE RO (COULDN'T FIND HA)
WU - UNSAFE ON THIS HEAD DURING WRITE RO
WS - SER/DES CHECK WITH THIS HEAD ON WRITE RO
RN - READ DATA DID NOT EQUAL WRITE DATA
WW - SOME OTHER UNIT CHECK CONDITION DURING WRITE
SD - SER/DES CHECK ON ATTEMPT TO READ RO JUST WRITTEN
BC - BURST CHECK ON ATTEMPT TO READ RO JUST WRITTEN
NX - NRF ON ATTEMPT TO READ RO JUST WRITTEN
SE - SOME OTHER UNIT CHECK ON ATTEMPT TO READ RO

FOLLOWING THE HEAD MAP, SPECIFIC INFORMATION FOR EACH FAILING HEAD IS PRINTED OUT.

WR DATA WAS XX (HEX)

THE RO WRITE DATA PATTERNS USED ARE (HEX)

1. 00 (FIRST PATTERN WRITTEN)
2. FF
3. 80
4. 40
5. 20
6. 10
7. 08
8. 04
9. 02
10. 01
11. 13
12. E5 (LAST PATTERN WRITTEN) SHOULD REMAIN ON WRITE TEST CYLINDER UNTIL NEXT TEST RUN.

THE CHANNEL WILL ONLY TRANSFER 100 BYTES OF R. DATA, BUT THE CONTROL UNIT WILL PAD FOR 7000 BYTES TO FILL OUT RECORD.

DATA READ WAS XX XX

THE HEX PATTERN ACTUALLY READ WHEN ATTEMPTING TO VERIFY THAT DATA WAS WRITTEN CORRECTLY.

CSW AND SENSE DATA (AFTER WRITE AND AFTER READ)

THE CSW IS PRINTED IN HEX
THE SENSE DATA IS PRINTED IN BINARY
READ AREA IN CORE IS SET TO C5 BEFORE WRITE DATA IS READ BACK

- USER OPTIONS -

1. SCOPE LOOP
TURN ON SECTION SENSE SW 0. PROGRAM WILL LOOP ON SIO WRITING FROM THE FIRST FAILING HEAD. WRITE DATA WILL BE THE PATTERN INDICATED IN PRINTOUT. (SIO SEQUENCE = SEEK HH, SEARCH-HA, WRITE R0
2. TO LOOP IN ROUTINE, WRITING R 0 WITH ALL TWENTY HEADS WITHOUT CHECKING FOR ERRORS, TURN ON SECTION SENSE SWITCH 1.
3. LOOP IN ROUTINE - TURN ON SECTION SENSE SW 3

2101 - WRITE FAILURES ON ALL HEADS

PROGRAM ATTEMPTED TO WRITE A TEST PATTERN WITH ALL 20 HEADS. SOME COMBINATION OF ERRORS OCCURED ON ALL HEADS. THE FAILING WRITE PATTERN IS PRINTED ALONG WITH HEAD MAP

- DIAGNOSTIC INFORMATION -

1. SUSPECT NOT WRITING AT ALL AS ALL HEADS ARE FAILING. COULD BE NO SELECTED WRITE GATE
2. TYPICAL ERROR WOULD SHOW AS-
-WROTE 00, READ XX -
INDICATING NOTHING WAS WRITTEN OVER THE OLD XX DATA PATTERN ON CYL 005

- USER OPTIONS - (SEE ERROR NO. 2100 FOR DESCRIPTION OF WRITE HEAD MAP AND SCOPE LOOPS.

2102 - UNSAFE ON ALL HEADS

PROGRAM ATTEMPTED TO WRITE R0 RECORDS WITH ALL HEADS BUT DETECTED UNSAFE CONDITION ON ALL HEADS. THE R0 RECORD INVOLVED IS SHOWN AS PART OF ERROR PRINTOUTS.

- DIAGNOSTIC INFORMATION -

WRITE UNSAFE - (SEE MAINTENANCE MANUAL)

- USER OPTIONS -

SEE ER. NO. 2100 FOR DESCRIPTION OF WRITE HEAD MAP AND SCOPE LOOPS.

2103 - BURST CHECKS ON ALL HEADS

PROGRAM ATTEMPTED TO WRITE R0 RECORDS WITH ALL HEADS AND DETECTED BURST CHECKS ERRORS ON ALL HEADS. PRINT OUT INCLUDES HEAD MAP AND R0 TEST RECORD

- DIAGNOSTIC INFORMATION -

1. FAULTY WRITE DRIVER (CAUSING BURST CHECKS WHEN ATTEMPTING TO READ BACK)
2. WRITE DATA A AND B AT BASE PLATE.
3. SUSPECT SERIALIZER IN CONTROL UNIT (THIS IS THE FIRST ATTEMPT WRITE IN THIS TEST.)

- USER OPTIONS -

SEE ERROR NO 2100 FOR DESCRIPTION OF WRITE HEAD MAP AND SCOPE LOOPS.

2104 - NO RECORD FOUND ON ALL HEADS - (READ R0)

PROGRAM ATTEMPTED TO WRITE RO RECORDS WITH ALL HEADS. WHEN ATTEMPTING TO READ THE RECORDS BACK (READ RO), NRF OCCURED ON ALL HEADS

- DIAGNOSTIC INFORMATION -

NO RECORD FOUND INDICATES NO DATA GETTING TO S/D IN CONTROL UNIT. HOWEVER, WE WERE ABLE TO READ HA BEFORE (MAYBE READ RO COMMAND NOT WORKING)

- USER OPTIONS.
SEE ERROR NO. 2100 FOR DESCRIPTION OF HEAD MAP AND SCOPE LOOPS.

2105 - 20 NO RECORD FOUNDS ON SEARCH HA

- DIAGNOSTIC INFORMATION -

PROGRAM CAN'T FIND HOME ADDRESS OR CYLINDER 5
HOME ADDRESSES MAY BE MISSING

- USER OPTIONS -

SEE ERROR 2100

2106 - READ DATA NOT EQUAL WRITE DATA ON ALL HEADS

LCOKS LIKE NOT ACTUALLY WRITING, THEREFORE, RO DATA THAT WAS ON THE DISC WILL NOT BE DESTROYED. AFTER WRITING IS COMPLETED, PROGRAM WILL READ THE DATA CORRECTLY. BUT SINCE THE NEW DATA WAS NOT ACTUALLY WRITTEN, THIS ERROR WILL RESULT.

- DIAGNOSTIC INFORMATION -

LOOKS LIKE NO WRITE CURRENT
CHECK WRITE DRIVER
(HEADS 1,2,5,6,9, 110,13,14,17,18, INDICATES 'A' SIDE WRITE DRIVER,
HEADS 0,3,4,7,8,11,12,15,16,19 'B' SIDE DRIVER)

- USER OPTIONS -

SEE ERROR 2100 FOR READ HEAD MAP AND SCOPE LOOPS

2107 - SER/DES CHECKS ON ALL HEADS

INDICATES CONTROL UNIT PROBLEM

- DIAGNOSTIC INFORMATION -

SER/DES IN CONTROL UNIT

- USER OPTIONS -

SEE ERROR NUMBER 2100 FOR MAP DESCRIPTION AND SCOPE LOOPS

2108 - WRITE ERROR ON ONE HEAD

PROGRAM WENT THROUGH WRITE TEST, WRITING RO RECORDS FROM ALL HEADS. SOME ERROR OCCURED ON ONE HEAD WHILE ALL OTHER HEADS WROTE CORRECTLY. HEAD MAP SHOULD SHOW WHICH HEAD AND TYPE OF ERROR.

- DIAGNOSTIC INFORMATION -

1. ALL HEADS READ HA OK (IF THIS IS ONLY ERROR TYPEOUT)
2. TROUBLE MUST BE IN WRITE OR ERASE COIL IN FAILING HEAD (BAD

HEAD) OR LINES FROM THAT HEAD (WRITE ONLY)
3. POSSIBLE INTERMITTENT WRITE OR READ TROUBLE OR DISC SURFACE WITH THIS HEAD AT CYL 005

- USER OPTIONS -

SEE ERROR NO. 2100 FOR WRITE HEAD MAP DESCRIPTION AND SCOPE LOOPS

2109 - TWO OR MORE BURST CHECKS OR NO. REC. FOUNDS.

- DIAGNOSTIC INFORMATION -

DATA CLOCKING IN CONTROL UNIT

2110 - MORE THAN ONE HEAD WITH WRITE ERRORS

2111 - CAN'T READ CORRECT HA AFTER TRY TO SEEK TO CYL. 5

(THIS SHOULDN'T HAPPEN HERE - READ HA HAS BEEN TESTED AND SEEK HAS BEEN TESTED)
EITHER NO HA ON CYL 005 OR INTERMITTENT READ OR SEEK.

- USER OPTIONS -

PRESS INTERRUPT, PROGRAM WILL RETRY IN ATTEMPT TO GET HA AT CYL. 005.

2112 - TIME OUT ON SEEK HH, SEARCH HA, WR. RO

HANG UP CONDITION IN CONTROL UNIT
THIS CONDITION IS CHECKED OUT AT BEGINNING OF THIS ROUTINE TO INSURE AGAINST HANGUP DURING WRITE TEST
A HANG UP AT THIS TIME SUGGESTS PROBLEM UNIQUE TO WRITE RO COMMAND

- USER OPTIONS -

-DETERMINE IF CONTROL UNIT IS HUNG UP IN A LOOP, THIS LOOP SHOULD INDICATE ERROR
SEE ERROR 2100 FOR SCOPE LOOP OPTIONS

2113 - UNIT CHECK ON SEEK TO CYL. 005 AND READ HA

(THIS SHOULDN'T HAPPEN AT THIS POINT IN PROGRAM)
SEEK AND READ HA WERE CHECKED IN SECTIONS 0 AND 1.
RERUN TEST FROM BEGINNING (F680)

2201 - UNIT CHECK CN MULTI - TRACK OPERATION

PROGRAM WAS TESTING HEAD ADVANCE BY ATTEMPTING
A MULTI-TRACK READ HA. UNIT CHECK OCCURED, GIVING THIS ERROR NUMBER.

- DIAGNOSTIC INFORMATION -

EXAMINE CSW DATA TO DETERMINE WHERE CHAIN WAS BROKEN

- USER OPTIONS -

1. LOOP ON SIO - TURN ON SECTION SENSE SWITCH 0. PROGRAM WILL LOOP ON MULTI-TRACK READ CHAIN.
2. LOOP ON ERROR, TURN ON SECTION SENSE SW 1. PROGRAM WILL LOOP ON MULTI-TRACT OPERATION (WITH ERROR PRINTOUTS)

3. TO LOOP ON COMPLETE ROUTINE. TURN ON SECTION SENSE SW 3.

2202 - HAR ADVANCE FAILURE

HOME ADDRESSES READ ON THE MULTIPLE-TRACK READ HOME ADDRESS WERE INCORRECT.

- DIAGNOSTIC INFORMATION -

HAR ADV. MAP XX XX ... XX XX
THE HAR ADVANCE MAP INDICATES THE HOME ADDRESSES THAT WERE READ (HH PORTION ONLY)
SUSPECT -
1. HAR AC ADVANCE
2. HAR ADVANCE SIGNAL
3. HAR CARD

- USER OPTIONS -
SAME AS ERROR 2201

2301 - FAILED TO SELECT HEAD 19

PROGRAM WAS ATTEMPTING TO SET UP FOR CHECKING END OF CYLINDER BUT COULD NOT GET HEAD 19 SELECTED.

- DIAGNOSITC INFORMATION -

MUST BE INTERMIT. ERROR BECAUSE HEAD SELECT WAS TESTED IN ROUTINE 6, SECTION 0. READ HA FROM ALL HEADS.
RERUN TEST STARTING WITH .68A.

2302 - UNIT CHECK WITH NOT END OF CYLINDER

CHAIN WAS BROKEN ON SET UP FOR CHECKING END OF CYL. SUSPECT INTERMITTENT ERROR.

- USERS OPTIONS -

SEE 2301

2303 - NO END OF CYLINDER

WHEN HEAD ADVANCED FROM HEAD 19 TO HEAD 20, NO END OF CYL. WAS GENERATED.

- DIAGNOSTIC INFORMATION -

SUSPECT END OF CYL. 'AND' CIRCUIT

- USERS OPTIONS -

TURN ON SECTION SENSE SWITCH 0 TO LOOP ON S I/O. PROGRAM WILL LOOP THE COMMAND CHAIN CAUSING THE ERROR.

2304 - NO HEAD ADVANCE

SEE 2303 FOR DESCRIPTION OF OPERATION

- DIAGNOSTIC INFORMATION -

SUSPECT NO HAR ADVANCE (FROM HEAD 19 TO HEAD 20)

- USER OPTIONS -

SAME AS ER. 2303

3201 - NC TRACK OVERRUN BIT

PROGRAM ATTEMPTED TO WRITE A 9000 BYTE RECORD AS PART OF DISK RPM TEST LOOKS LIKE ALL 9000 BYTES WERE WRITTEN - OR OVER RUN IS NOT WORKING. 9000 BYTES SHOULD NOT BE WRITTEN UNLESS DISK IS RUNNING VERY SLOW.

3202 - DISK RPM IS BELOW SPEC.

DISK ROTATION SHOULD BE 2400 RPM.
TOLERANCE AT 1 PERCENT SAYS ANY RPM LOWER THAN 2376 IS BELOW SPEC.
CHECK - BELT SLIPPING
BRAKE DRAG
SPINDLE BEARINGS, ETC.

3301 - CC 1 ON TEST I/O

DO NOT HAVE UNIT CHECK, DIV. END, OR BUSY. EXAMINE STATUS AND SENSE DATA FOR INDICATION OF FAILURE.
- TEST I/O AFTER POWER OFF/ON -

3302 - CC 2 OR 3 ON TEST I/O

SUBCHANNEL OR CHAN. BUSY OR UNIT ADDRESS NOT RECOGNIZED.

3303 - NOT ON-LINE AFTER POWER OFF - ON.

PROGRAM HANGS IN A TEST I/O LOOP WAITING FOR ON-LINE.
AFTER 2 MINUTES, PROGRAM TIMES OUT AND GIVES THIS ERROR NUMBER.
PROGRAM ALLOWS USER A MAXIMUM OF 1 MIN. TO POWER DOWN AND BACK UP.
THIS NUMBER MAY OCCUR IF THIS REQUIREMENT IS NOT MET. BE SURE YOU FOLLOWED DIRECTIONS IN REF.A.

- DIAGNOSTIC INFORMATION -

SUSPECT SWITCH EFFECTIVE LATCH HOLDING FILE IN DISABLE CONDITION.
DETERMINE CAUSE OF NOT READY OR NOT ON LINE.
1. TURN SECTION SENSE SWITCH 1 ON TO LOOP ON ERROR.

3304 - UNIT CHECK ON POWER OFF TEST.

PROGRAM IS LOOKING FOR UNIT CHECK WHEN USER TURNS FILE DRIVE MOTOR OFF PER REF. A.
SUSPECT USER DID NOT TURN DRIVE SWITCH OFF-ON WITH-IN THE ONE MINUTE TIME LIMIT, OR DID NOT LEAVE PROCESSOR RUNNING WHILE TURNING DRIVE OFF-ON.

3305 - FAILED ON POWER UP SEEK TO CYL. 00. DURING POWER OFF-ON TEST, PROGRAM

DETECTED THAT ACCESS DID NOT POWER UP SEEK TO CYL 00. PROGRAM PRINTS HA FROM CYLINDER ACCESS WENT TO.

3501 - CONDITION CODE 0, 2, OR 3 ON START I/O AFTER DISK DRIVE STOP BUTTON

PRESSED.
(DID YOU POWER DOWN PER REFERENCE D)

3502 - UNIT CHECK OFF OR WRONG SENSE WITH CONDITION CODE 1 ON START I/O (DISK

DRIVE STOPPED)

SHOULD HAVE INTERVENTION REQUIRED ONLY.

3503 - CONDITION CODE 0, 2, OR 3 ON TEST I/O AFTER POWER UP.

3504 - UNIT CHECK OR NO DEVICE END AFTER POWER UP AT DISK DRIVE

3505 - WRONG SENSE ON POWER UP -

PROGRAM EXPECTS INTERVENTION REQUIRED,
READY AND ON-LINE.

3601 - FAILED TO HOLD ENABLE CONDITION

PROGRAM DETECTED UNIT CHECK OR WRONG SENSE INFORMATION WHILE TESTING METER OUT CIRCUITS.
METER OUT SHOULD HOLD DEVICE IN THE ENABLE CONDITION EVEN THOUGH METER SWITCH IS IN DISABLE POSITION.

3901 - ERROR OCCURED WHILE USING SPECIAL ROUTINE 9, WRITE HOME ADDRESS ON ANY SELECTED CYLINDER
TRY AGAIN OR RUN F610

3A01 - ERROR ON FORMATTING (PHASE 1)

THE PROGRAM IS WRITING A 7000 BYTE RECORD -0- WITH DATA CONSISTING OF RANDOM DATA IN CORE STORAGE. THIS DATA IS WRITTEN WITH A READ BACK CHECK ON ALL TRACKS OF CYLINDER 5 AND 195 . THE ERROR PRINT OUT WILL OCCUR IF A UNIT CHECK IS DETECTED. (EXAMINE CSW AND SENSE BYTES TO DETERMINE THE ERROR)

SUSPECT---
1. A BURST (DATA) CHECK ON THE READ BACK CHECK VERIFY OPERATION.
2. INTERRMITTENT WRITE DRIVER OR READ AMPLIFIER.

OPTIONS---
1. PROGRAM WILL AUTOMATICALLY RETRY THE SEQUENCE OF COMMANDS UNTIL THEY PERFORM CORRECTLY.
2. -PSW- RESTART WILL START OVER WITH PHASE 1 (WRITE PORTION).

3A02 - ERROR ON READING DATA (PHASE 2)

THE PROGRAM IS READING THE DATA THAT WAS WRITTEN IN PHASE 1. THIS DATA WAS PRABABLY WRITTEN ON ANOTHER FILE DRIVE. SO WHEN AN ERROR IS DETECTED (EXAMINE CSW AND SENSE FOR ERROR INFORMATION) USER SHOULD LOOK AT THE RECORD -ID- THAT IS PRINTED OUT FOR THE HEAD NUMBER.
POSSIBLY THIS HEAD IS OUT OF ALIGNMENT OR THE HEAD THAT WROTE THE DATA WAS OUT OF ALIGNMENT.
CONTINUE SO AS TO DETERMINE IF THE FAILURE IS REASONABLY SOLID OR WAS JUST INTERRMITTENT.
USER SHOULD MOVE THE DISK PACK AND ADDRESS PLUG TO ANOTHER DRIVE AND OBSERVE IF A FAILURE OCCURS.
IF NO FAILURE. THE HEAD IS OUT OF ALIGNMENT ON THE PREVIOUS DRIVE.
IF THIS DRIVE ALSO FAILS ON THE SAME HEAD,THE HEAD IS OUT OF ALIGNMENT ON THE DRIVE THAT WAS USED TO WRITE THE DATA.

SUSPECT---
1. HEAD OUT OF ALIGNMENT.
2. INTERRMITTENT ERROR - READ AMPLIFIER.

OPTICNS---
1. CONTINUE TO DETERMINE FREQUENCY OF ERRORS
2. MOVE DISK AND ADDRESS PLUG TO ANOTHER DRIVE TO DETERMINE IF THAT WILL FAIL.

4.3 REFERENCE STATEMENTS

REF. A. CHECKING POWER DOWN OF FILE WHILE CPU IS RUNNING AND SELECTING FILE.

1. DO NOT STOP CPU FROM RUNNING.
2. TURN DISC DRIVE START - STOP SWITCH OFF.
3. TURN DISK DRIVE START - STOP SWITCH BACK ON.
PROGRAM WILL AUTOMATICALLY CONTINUE WHEN FILE BECOMES READY.
NOTE. A MAXIMUM OF ONE MINUTE IS ALLOWED FOR COMPLETION OF STEPS 2 AND 3.

REF. D. CHECKING READY TO NOT READY WITH FILE START - STOP SWITCH.

1. PRESS CPU STOP BUTTON
2. TURN FILE DRIVE SWITCH TO 'STOP'
3. (ON MOD 30, ROTARY 'F' MUST BE SET TO 0
4. PRESS CPU START
5. PRESS INTERRUPT
6. VISUALLY CHECK THAT METER DOES NOT RUN WITH DISK DRIVE STOPPED.

REF. E.

NOTE - IF 2 CH SW IS INSTALLED ON 2314 DISABLE OTHER INTERFACE.
1. PRESS CPU STOP BUTTON
2. TURN FILE DRIVE SWITCH TO START
3. WAIT FOR DRIVE TO BECOME READY
4. PRESS CPU START
5. PRESS INTERRUPT
ROUTINE WILL CHECK FOR READY STATUS.

REF. F. CHECKING INTERLOCK STATUS OF DEVICE METER SWITCH WHILE CPU IS IN RUN STATE

1. (ON MOD 30, ROTARY F MUST BE SET TO 0)
2. PRESS INTERRUPT TO START PROGRAM.
3. WHILE FILE IS SEEKING, CHANGE FILE METER SWITCH TO DISABLE FOR SEVERAL SECONDS THEN RETURN TO ENABLE STATUS.
4. IF FILE STOPS SEEKING WHEN SWITCH IS TURNED TO DISABLE, METER INTERLOCK IS FAILING
AT THE END OF 50 SEEKS, ROUTINE TERMINATES AUTOMATICALLY.

REF. G. OPERATING PROCEDURES FOR TRACKING ADJUSTMENT ROUTINE.

1. PROGRAM SEEKS TO CYL 073 AND HALTS, WAITING FOR USER TO PREPARE FOR ADJUSTING HEADS.
2. PRESS INTERRUPT BUTTON. PROGRAM BEGINS BY SELECTING HEAD 1 AND CPU RUNNING WITH CONTINOUS READ GATE ON.
3. ADJUST HEAD 1 PER INSTRUCTIONS IN MAINTENANCE MANUAL, (PAGE 4.24)
4. TO ADVANCE TO NEXT HEAD, PRESS INTERRUPT BUTTON.
   HEAD NUMBER PRINTS OUT AND CPU HALTS.
   PRESS INTERRUPT AGAIN AND CPU STARTS RUNNING WITH CONTINOUS READ GATE AND HEAD 2 SELECTED.
5. HEADS ARE SELECTED IN THE FOLLOWING ORDER-
   SIDE A (1,2,5,6,9 ...) SIDE B (0,3,4,7,8 ...)
6. WHEN ALL HEADS HAVE BEEN ADJUSTED, PROGRAM EXECUTES 10 SEEKS AFTER WHICH ADJUSTMENTS CAN BE RECHECKED.
7. TURN OFF SSW 10 TO EXIT THIS ROUTINE.

REF. H. NUMBER OF DRIVES.LOC XXXX.

THIS MESSAGE IS PRINTED ONLY IF ROUTINE 11 OF PROGRAM 68D IS SELECTED TO RUN. THE MESSAGE ASKS THE CE TO ENTER THE NUMBER OF 2314 DRIVES ATTACHED TO THE CPU IN A PREDETERMINED CORE LOCATION. THE CE THEN ENTERS THE NUMBER VIA THE CONSOLE TYPEWRITER AND PRESSES INTERRUPT TO EXECUTE THE ROUTINE. THE FOLLOWING FORMAT MUST BE USED BY THE CE TO ENTER THE DATA--

THE PROGRAM TYPES--

REF H-NUMBER OF DRIVES.LOC XXXX.

CE ANSWERS BY TYPING--

EA.XXXX.01.0Y

WHERE

XXXX= ADDRESS OF THE CORE LOCATION TO BE MODIFIED BY THE CE.
Y = NUMBER OF PHYSICAL DRIVES ATTACHED. THIS NUMBER MUST BE BETWEEN 1 AND 9. THE PROGRAM ASSUMES 9 IF THAT CORE LOCATION IS NOT MODIFIED.
EA ='ENTER DATA MESSAGE' PROVIDED BY DMA8. FOR OTHER MONITORS, USE APPROPRIATE METHODS OF MODIFYING CORE.

5. COMMENTS

5.1 DETAILED DESCRIPTION OF PROGRAM ROUTINES

SECTION --F68A--

ROUTINE 1. TEST CHANNEL.
THIS ROUTINE WILL EXECUTE THE TEST CHANNEL INSTRUCTION TO CHECK THAT THE CHANNEL IS FREE AND AVAILABLE BEFORE ANY OTHER I-O COMMANDS ARE EXECUTED.

ROUTINE 2, TEST I/O.
THIS ROUTINE WILL EXECUTE A TEST I/O TO DETERMINE THE STATUS OF THE ACCESS. IF PROGRAM RECEIVES CONDITION CODE -0- ON TEST I/O, THEN THE DEVICE IS READY AND AVAILABLE. IF CONDITION CODE IS -1- AND UNIT CHECK IS ON IN CSW, THEN THE ROUTINE WILL ISSUE A SENSE COMMAND AND EXAMINE THE SENSE BYTES FOR UNUSUAL CONDITIONS.
CONDITIONS CHECKED--
NO SELECT LOCKS
FILES ON-LINE
READY (DETENTED AT SOME CYLINDER)

ROUTIEN 3, NO-OP.
THIS ROUTINE WILL EXECUTE A NO-OPERATION COMMAND. THIS IS THE FIRST -START I/O- INSTRUCTION THAT IS EXECUTED AND WILL USE A NOP CCW. THIS COMMAND SHOULD GO THROUGH THE 2841 INITIAL SELECTION SEQUENCE, THE INITIAL STATUS PRESENTATION AND THE ENDING PROCEDURE. MODULE SELECT AND HEAD SELECT ARE THE ONLY FILE LINES ACTIVATED.
NOP --- IS AN IMMEDIATED COMMAND
CONDITIONS CHECKED--
START I/O COMMAND SEQUENCE
2314 INITIAL SELECTION AND ENDING PROCEDURE

ROUTINE 4, SENSE I/O.
THIS ROUTINE WILL PERFORM A SENSE I-O OPERATION. THIS CHECKS THAT WE CAN TRANSFER DATA FROM THE 2314 TO THE CHANNEL AND PROCESSOR. THE PROGRAM WILL REQUEST THAT -6- BYTES BE SENT.
CONDITIONS CHECKED--
DATA TRANSFER FROM 2314 TO PROCESSOR

ROUTINE 5, COMMAND EXIT.
THIS ROUTINE WILL PERFORM THE FOLLOWING FILE COMMANDS TO CHECK THAT THEY CAN BE EXECUTED WITHOUT THE CONTROL UNIT -HANGING UP-.
NO CHECK IS MADE TO DETERMINE IF THE COMMANDS FUNCTIONED PROPERLY. THE ONLY THING EXPECTED IS THAT THE CONTROL UNIT AND FILE BECOME AVAILABLE (CC 0 ON TIO) WITHIN 2 SECONDS AFTER GIVING THE COMMAND.
CONDITIONS CHECKED--
CONTROL UNIT HANG-UPS
SET DIFFERENCE
ATTENTION FROM FILE DRIVE
COMMANDS USED--
READ HOME ADDRESS
CONTROL HEAD SEEK
CONTROL CYLINDER SEEK
RECALIBRATE

ROUTINE 6, READ HEAD MAP.
THIS ROUTINE WILL CONSTRUCT A MAP USING EACH HEAD FROM 00 TO 09.

THE RESULT OF A READ HOME ADDRESS IS CODED AND STORED IN A MAP (ARRAY). AFTER THE MAP IS CONSTRUCTED (ALL HEADS USED), THE PROGRAM DETERMINES IF AN ERROR OCCURRED AND IF SO ATTEMPTS TO BREAK THE ERROR DOWN INTO LOGICAL AREAS. THE MAP IS PRINTED OUT IF ANY ERRORS ARE DETECTED ALONG WITH AN APPROPRIATE ERROR NUMBER.

EQUIPMENT CHECKED--
- READ AMPLIFIER
- HEAD ADRS REG
- HAR DECODE
- HEAD SELECTION
- READ HEAD
- DATA TRANSFER
- SOME BUS AND TAG LINES

ROUTINE 7, RECALIBRATE

THIS ROUTINE WILL EXECUTE THE RECALIBRATE COMMAND AND CHECK FOR THE FOLLOWING---ACCESS IS OPERATIVE WHILE CARRIAGE IS IN MOTION-THE DETENT IS BEING PULLED (LOSS OF READY)-SEEK COMPLETE AFTER RECEIVING DEVICE END, THE ROUTINE WILL PERFORM A READ HOME ADDRESS TO CHECK THE CARRIAGE POSITION AFTER RECALIBRATE.

CIRCUITS CHECKED--
- ADDRESS BUS 6
- CONTROL TAG
- DETENT LATCH
- ON LINE
- 300 MS INHIBIT

SECTION --F68B--

ROUTINE 1, DIFFERENCE COUNTER AND CAR.

THIS ROUTINE WILL PERFORM SEVERAL COMMAND CHAINS OF THE TYPE--
- RECALIBRATE
- CONTROL CYLINDER SEEK
- READ HOME ADDRESS

BY USING DIFFERENT COMBINATIONS OF CYLINDERS MALFUNCTIONS IN THE DIFFERENCE COUNTER, CYLINDER ADDRESS REGISTER, INITIAL SEEK LATCH, AND COUNTER DECODE LOGIC CAN BE ANALYZED AS TO THE CAUSE OF THE FAILURE. A SEEK HEAD MAP IS PRINTED IF AN ERROR IS DETECTED.
- DIFFERENCE CNTR
- CAR
- BUS LINES
- DIFF CNTR DECODE
- INITIAL SEEK LATCH
- DETENT

ROUTINE 2, SEEK INCOMPLETE.

THIS ROUTINE WILL PERFORM A SEEK TO CYLINDER 255 TO FORCE ACCESS CARRIAGE TO GO TO INNER POSITIVE STOP. THE CONTROL UNIT SHOULD INDICATE THAT THE FILE HAS LOST READY, SEEK CHECK, AND SEEK INCOMPLETE. AFTER THE CORRECT STATUS HAS BEEN RECEIVED, THE PROGRAM WILL PERFORM A RESTORE AND CHECK THAT IT FUNCTIONED CORRECTLY.

ROUTINE 3, SEQUENTIAL INCREMENT/DECREMENT SEEK.

THIS ROUTINE CHECKS THE CYLINDER AND DETENT TRANSDUCER ADJUSTMENTS BY PERFORMING SEQUENTIAL SEEK COMMANDS AND CHECKING CORRECT POSITION BY READING HOME ADDRESS. EACH SEEK COMMAND WILL SEEK TO THE NEXT HIGHER CYLINDER. SUCH AS, CYLINDER 1, 2, 3, 4, ..., ETC. THIS IS ALSO CHECKED IN THE REVERSE DIRECTION. IF THE USER IS USING THE CE DISK PACK, WHEN THE PROGRAM SEEKS TO ONE OF THE ALIGNMENT CYLINDERS (71, 72, 73, 74, 75, 117, 118,

AND 119) AND TRIES TO READ HA. IF AN ERROR IS DETECTED (NRF, BURST CHK) THE CYLINDER COMPARE WILL BE BYPASSED.
CIRCUITS CHECKED--
CYLINDER AND DETENT TRANSDUCER

ROUTINE 4, WORST CASE ACTUATOR.
THIS ROUTINE WILL CONTINOUSLY SEEK BETWEEN CYLINDER 000 AND 2, 4, 6, 13, 31, 66, 70, 76, 80, AND 201 RESPECTIVELY FOR 50 SEEKS. THIS IS A STRESS TEST ON THE ACTUATOR AND FAILURES WILL SHOW UP AS OVERSHOTS BY 1 OR MORE CYLINDERS.
COMPONENTS CHECKED--
FORWARD SOLENOID
INTERMEDIATE, SLOW, AND STOP

ROUTINE 5, NOT USED

ROUTINE 6, RANDOM SEEKS.
THIS ROUTINE WILL PERFORM CONTINOUS RANDOM SEEKS FOR APPROXIMATELY 500 CYLINDERS. AFTER DETENTING AT EACH RANDOM CYLINDER, THE HOME ADDRESS IS READ WITH A RANDOM HEAD TO CHECK ACCESS LOCATION. THE POWER RESIDUE METHOD IS USED TO GENERATE RANDOM NUMBERS. THE INITIAL STARTING NUMBER INTO THE RANDOM GENERATOR IS ALSO RANDOMIZED. BY USING A PROGRAM COUNTER TO WAIT FOR THE FIRST BYTE TO TRANSFER IN A - RECALIBRATE, READ HA CHAIN. THIS COUNTER IS USED AS THE STARTING NUMBER.

SECTION --F68C--

ROUTINE 1, WRITE TEST.
THIS ROUTINE WILL CONSTRUCT A MAP USING EACH HEAD FROM 00 TO 19. THE RESULTS OF A WRITE RECORD 0 FOLLOWED BY READ RECORD 0 ARE CODED AND STORED IN A MAP (ARRAY). AFTER THE MAP IS CONSTRUCTED (ALL HEADS USED, THE PROGRAM DETERMINES IF AN ERROR OCCURRED AND IF SO ATTEMPTS TO BREAK THE FAILURE INTO A LOGICAL AREA. THE MAP IS PRINTED OUT IF ANY ERRORS WERE DETECTED ALONG WITH AN APPROPRIATE ERROR NUMBER. THE CHANNEL WILL SEND -100- BYTES OF R-0 DATA TO THE 2314, BUT THE DATA LENGTH IN THE R-0 COUNT IS 7100 BYTES. SO THE 2314 WILL WRITE AND READ BACK A FULL TRACK RECORD.
RECORD 0 DATA PATTERNS------
HEX-
00
FF
80
40
20
10
08
04
02
01
13
E5
ROOM HAS BEEN PROVIDED FOR PATTERN EXPANSION
EQUIPMENT CHECKED--
WRITE DRIVER
ERASE DRIVER
HEADS
DATA TRANSFER
SOME BUS + TAG LINES

ROUTINE 2, HAR AC ADVANCE

THIS ROUTINE WILL CHECK THE AC CONDITIONS OF THE HEAD ADDRESS REGISTER. THIS AC CONDITION IS USED TO ADVANCE HAR TO THE NEXT HEAD. TEN READ HOME ADDRESS COMMAND ARE CHAINED WITH THE MULTIPLE TRACK BIT ON. THE CPU WILL THEN CHECK THE HA-S READ.

ROUTINE 3, END OF CYLINDER.
THIS ROUTINE WILL CHECK THE END OF CYLINDER SIGNAL. THE PROGRAM WILL SELECT HEAD 19 OF CYLINDER 000 THEN READS THE HOME ADDRESS TO INSURE THE CORRECT CYLINDER AND HEAD WERE SELECTED. THEN TWO CHAINED READ HOME ADDRESS COMMANDS, WITH MUTIPLE TRACK BIT ON FOR SECOND COMMAND, ARE EXECUTED. THIS SHOULD FORCE HAR TO ADVANCE FROM HEAD 19 TO HEAD 20 THUS TURNING ON END OF CYLINDER

SECTION --F68D--

ROUTINE 1, END OF NORMAL TEST.
THIS ROUTINE WILL GENERATE AN END OF NORMAL TEST MESSAGE IF SSW 6, PRINT ROUTINE TITLES. CHECKS SECTION SENSE SWITCHES 9 THROUGH 12 TO DETERMINE WHICH IF ANY OPTIONAL ROUTINES SHOULD BE RUN. IF SECTION SENSE SWITCH -9- IS ON, ROUTINE 1 WILL PASS CONTROL TO ROUTINES 2 TO 6. IF SECTION SENSE SWITCH -10- IS ON, ROUTINE 1 WILL PASS CONTROL TO ROUTINE 7. IF SECTION SENSE SWITCH -12- IS ON, ROUTINE 1 WILL PASS CONTROL TO ROUTINE 9. IF IF SECTION SENSE SWITCH -13- IS ON, ROUTINE 1 WILL PASS CONTROL TO ROUTINE A . IF ONE OF THE OPTIONAL ROUTINES IS REQUESTED VIA OM, THEN THIS ROUTINE IS NOT RUN.

ROUTINE 2, DISK RPM (OPTIONAL)
THIS ROUTINE IS DESIGNED TO TEST FILE ROTATION SPEED. CALCULATIONS ARE BASED ON A WRITE TIME OF 400 NANO-SECONDS PER BIT AND ASSUMES THE VFO IS OPERATING WITHIN ITS SPECIFIED TOLERANCE. A TRACK OVERRUN CONDITION IS FORCED BY WRITING A 9000 BYTE RECORD 128 TIMES AND TAKING AN AVERAGE OF THE BYTES WROTE. THIS TOTAL NUMBER OF BYTES IS THEN CONVERTED TO RPM. THIS CALCULATED RPM IS THEN CHECKED FOR A TOLERANCE LIMIT AND THE RESULTS ARE PRINTED OUT. NO CHECK IS MADE FOR A DRIVE BEING TOO FAST SINCE THIS CONDITION IS HIGHLY IMPROBABLE.

ROUTINE 3, POWER OFF-ON, CPU RUNNING (OPTIONAL)
THIS ROUTINE CHECKS THE CAPABILITY OF A FILE DRIVE TO BE POWERED DOWN AND POWERED UP WHILE THE CPU IS ATTEMPTING TO COMMUNICATE WITH IT. ALSO POWER-UP SEEK TO CYLINDER 00,HEAD 00 IS CHECKED. REF-A- IS PRINTED, DIRECTING USER TO INSTRUCTIONS IN THE REF. SECTION OF THE MANUAL (SECTION 4.3)
REF -A- 1-DO NOT STOP CPU FROM RUNNING
2-PRESS DISK DRIVE STOP-START BUTTON TO STOP DISK DRIVE MOTOR
3-PRESS DISK DRIVE STOP-START BUTTON TO START DISK DRIVE MOTOR
PROGRAM WILL AUTOMATICALLY PROCEED UPON RECEIVING COND CODE 0 ON TEST I/O AFTER DISK DRIVE BECONES READY. PROGRAM WILL READ HA AND VERIFY POWER-UP SEQUENCE.

ROUTINE 5, POWER OFF/ON STATUS (OPTIONAL)

REFERENCES -D- AND -E- ARE PRINTED DIRECTING USER TO OPERATING INSTRUCTIONS IN THE REF. SECTION OF THIS DOCUMENT. (SECTION 4.3)

THIS ROUTINE WILL CHECK INTERVENTION REQUIRED AND NOT-READY TO READY STATUS VIA THE FILE START/STOP SWITCH.
REF -D-
1-WHEN THE CPU GOES INTO THE WAIT STATE PERFORM THE

FOLLOWING--
2-PRESS THE CPU STOP KEY
3-PRESS DISK START/STOP KEY TO STOP DISK DRIVE MOTOR. (ON MOD 30 MAKE SURE ROTARY F IS SET TO -0-.)
4-PRESS CPU START KEY, THEN DEPRESS INTERRUPT KEY
ROUTINE NOW CHECKS THE NOT READY STATUS OF THE 2311

REF -E-
NOTE IF 2 CH SW , DISABLE THE OTHER INTERFACE.
1-WHEN THE CPU GOES INTO THE WAIT STATE PERFORM THE FOLLOWING--
2-PRESS THE CPU STOP KEY
3-PRESS DISK START/STOP KEY TO START DISK DRIVE MOTOR. (ON MOD 30 MAKE SURE ROTARY F IS SET TO -0-.)
4-AFTER FILE BECOMES READY-DEPRESS CPU START KEY, THEN DEPRESS INTERRUPT KEY.
ROUTINE WILL NOW CHECK THAT FILE HAS BECOME READY.

ROUTINE 6, METER INTERLOCK (OPTIONAL)

REFERENCE -F- PRINTS OUT DIRECTING USER TO OPERATING INSTRUCTIONS IN THE REF. SECTION OF THIS MANUAL. (SECTION 4.3) THIS ROUTINE WILL CHECK THE INTERLOCK STATUS OF DEVICE METER SWITCH WHILE CPU IS IN RUN STATE. IF THE CPU METER IS RUNNING, AND THE CPU IS COMMUNICATING WITH THE FILE -- TURNING THE FILE METER SWITCH TO DISABLE SHOULD HAVE NO EFFECT ON THE FILE METER.
REF -F- DEV CUU
1-AFTER PRINTING THIS MESSAGE THE CPU WILL ENTER THE WAIT STATE.
2-SINCE THE OBJECTIVE IS TO CHANGE THE FILE METER SWITCH WHILE THE CPU IS RUNNING, PERFORM THE FOLLOWING. (ON MOD 30 MAKE SURE ROTARY F IS SET TO -0-.)
3-DEPRESS INTERRUPT KEY TO START PROGRAM
4-WHILE FILE IS SEEKING, CHANGE FILE METER SWITCH TO DISABLE FOR SEVERAL SECONDS-THEN RETURN TO ENABLE POSITION.
IF METER INTERLOCK FAILS, THEN WHEN METER SWITCH IS SET TO DISABLE THE FILE DROPS ON-LINE AND THE CPU CAN NOT COMMUNICATE WITH THE FILE.

ROUTINE 7, TRACKING ADJUSTMENT

REF -G- PRINTS OUT DIRECTING USER TO OPERATING INSTRUCTIONS IN THE REFERENCE SECTION OF THIS WRITEUP. (SECTION 4.3) THIS ROUTINE IS DESIGNED TO ASSIST THE FIELD ENGINEER IN MAKING THE TRACKING ADJUSTMENT AS OUTLINED IN THE FIELD ENGINEERING MAINTENCE MANUAL. AFTER ALL READ/WRITE HEADS HAVE BEEN ALIGNED TO CYLINDER 73, THE PROGRAM CAUSES 10 SEEKS TO CYLINDERS 201 AND 000 AFTER WHICH ALIGNMENT CAN BE RECHECKED. SECTION SENSE SWITCH 10 IN THE ON CONDITION WILL ALLOW A READ LOOP FOR ADJUSTING EACH HEAD. SWITCH 10 IN THE OFF CONDITION ALLOWS AN EXIT FROM THIS ROUTINE AFTER A SEEK TO CYLINDER 000. HEADS ARE SELECTED, ACCORDING TO THE FOLLOWING SEQUENCE, BY ACTIVATING EXTERNAL INTERRUPT, 1, 2, 5, 6, 9, 10, 13, 14, 17, 19,16,15,12,11,8,7,4,3,0. THIS SEQUENCE WILL FACILITATE ADJUSTMENT BY SEPARATING THE HEADS ACCORDING TO THEIR TERMINAL BLOCK LOCATION. SECTION SENSE SWITCH -10- MUST BE --ON-- TO LOOP.

ROUTINE 8, NOT USED

ROUTINE 9, WRITE HOME ADDRESSES ON ANY ONE CYLINDER.
THIS ROUTINE WILL WRITE HOME ADDRESSES ON ANY DESIRED CYLINDER. THE CYLINDER ARGUMENT IS SET-UP BY THE USER VIA THE GENERAL PURPOSE REGISTER -1-. THE LOW ORDER BYTE OF REGISTER 1 CONTAINS

THE CYLINDER TO BE USED BY THE ROUTINE. THE CONTENTS OF REGISTER 1 CAN BE CHANGED AFTER A PSW RESTART TO ALTER THE CYLINDER BEING USED.
ROUTINE CHECKS THE CYLINDER TO DETERMINE IF ITS AN ALIGNMENT CYLINDER. IF SO THEN A WARNING MESSAGE IS PRINTED.
TO RUN ROUTINE---
-REQUEST THAT DM RUN ROUTINE 9 IN SECTION F6BD OR
-TURN ON SECTION SENSE SWITCH 12 AND RUN SECTION F6BD.
TO EXIT ROUTINE--
PRESS EXTERNAL INTERRUPT
HOME ADDRESSES WRITTEN ARE READ BACK AND CHECKED

ROUTINE A , INTERCHANGEABILITY BETWEEN FILES

THIS ROUTINE PROVIDES A PROCEDURE FOR CHECKING THE READ/WRITE INTERCHANGEABILITY BETWEEN THE 2314 FILE MODULES. THE ROUTINE IS ORGANIZED IN --2-- PHASES.

PHASE 1 --

THIS PHASE WRITES A 7000 CHARACTER RECORD 0 DATA RECORD WITH ALL HEADS ON CYLINDERS 5 AND 195. AFTER EACH RECORD IS WRITTEN, IT IS READ BACK AND VERIFIED. THE FIRST 7000 BYTES OF MAIN STORAGE ARE USED FOR DATA. AFTER BOTH CYLINDERS HAVE BEEN FORMATTED AND CHECKED, PHASE 2 IS ENTERED. PHASE 1 CAN BE RE-ENTERED ON A PSW RESTART IN ORDER TO RE-FORMAT THE CYLINDERS ON ANOTHER DRIVE.

PHASE 2 --

THIS PHASE READS THE RECORD 0 DATA AND CHECKS FOR BURST CHECK AND NO RECORD FOUND ERRORS. THE PROGRAM WILL CONTINUOUSLY READ WITH ALL HEADS ON CYLINDERS 5 AND 195. AFTER THE USER IS SATISFIED THAT THE PROGRAM CAN READ THE DATA OFF OF THIS FILE DRIVE, HE SHOULD POWER DOWN THE FILE AND MOVE THE PACK AND THE MODULE ADDRESS PLUG TO ANOTHER FILE DRIVE AND POWER IT UP WITH THE FORMATTED PACK AND SAME ADDRESS PLUG. THE PROGRAM WILL SENSE A POWER OFF CONDITION AND WAIT IN A TIO LOOP FOR ANOTHER DRIVE WITH THE SAME ADDRESS TO POWER UP.

USING THIS TECHNIQUE, THE USER CAN FORMAT A PACK ON A DRIVE AND THEN DETERMINE IF THE OTHER DRIVES CAN READ IT. THEN HE CAN FORMAT THE PACK ON ANOTHER DRIVE.

P S W RESTART WILL FORMAT PACK.

TO RUN ROUTINE---
-REQUEST THAT DM RUN ROUTINE 10 IN SECTION F6BD.
OR
-TURN ON SECTION SENSE SWITCH 13 AND RUN SECTION F6BD.

TO EXIT ROUTINE---
TURN SECTION SENSE SWITCH -13- OFF
OR
EXTERNAL INTERRUPT.

ROUTINE B , CHECK LOGGING OF PHYS DR ADDRESS IN SNS BYTE 4

THIS ROUTINE WILL CHECK THE SETTING OF THE PHYSICAL DRIVE ADDRESS IN SENSE BYTE 4.

THE PROGRAM WILL REQUEST THE OPERATOR TO INSERT PLUG X IN PHYSICAL DRIVE A (X BEING THE DEVICE PORTION OF THE UDT ENTRY). THE PROGRAM WILL WAIT 40 SECONDS FOR THE OPERATOR TO PERFORM THIS OPERATION IF THE DRIVE IS NOT READY. IF THE DRIVE IS READY, THE PROGRAM WILL PRO-

CEED ON A DEVICE END FROM THE UDT ADDRESS. AFTER THE PLUG HAS BEEN CHANGED, THE PROGRAM WILL SENSE THE DEVICE AND COMPARE SENSE BYTE 4 FOR THE ADDRESS EXPECTED FOR PHYSICAL DRIVE A. THIS PROCESS WILL BE REPEATED FOR DRIVES B THROUGH J. SENSE BYTE 4 EXPECTED (X MEANS NOT CHECKED).

SENSE BYTE 4	PHYSICAL DRIVE
?0	A
?1	B
?2	C
?3	D
?4	E
?5	F
?6	G
?7	H
?8	J

COMMON SUBROUTINES

1. SENSE I/O.
   THIS SUBROUTINE IS USED BY MOST ROUTINES TO GET FOUR -4- SENSE BYTES OF ACCESS STATUS. AFTER THE SUBROUTINE HAS DONE THE START

   I/O AND CHECKED THE SENSE COMMAND HAS BEEN ACCEPTED, IT WILL WAIT IN A TEST I/O - BRANCH CONDITION CODE 2 LOOP FOR THE 4 BYTES TO TRANSFER. THE PROGRAM WILL HANG-UP IF IT FOREVER RECEIVES CONDITION CODE 2.

2. START I/O.
   THIS SUBROUTINE IS USED BY ALL ROUTINES TO START A CHAIN OF CCW-S (CHANNEL COMMAND WORDS). BEFORE THE START I/O IS EXECUTED, THE SUBROUTINE PERFORMS A TEST I/O TO CHECK THAT THE ACCESS IS AVAILABLE (COND CODE 0). PROGRAM THEN SETS UP THE CAW, DOES A START I/O AND CHECKS THAT THE COMMAND WAS ACCEPTED. THE -WAIT- SUBROUTINE IS USED TO WAIT FOR COMPLETION OF THE CHAIN OF COMMANDS BEFORE RETURNING TO THE CALLING ROUTINE.

3. EROUT.
   THIS SUBROUTINE IS USED BY ALL ROUTINES TO PRINT OUT AN ERROR NUMBER OR ERROR MESSAGE, THE CAW, CSW, AND/OR SENSE INFORMATION. THE ROUTINE ALSO PROVIDES FOR PRINTING A BLANK LINE AS A SEPARATOR, WILL GET THE SENSE BYTES, STOP AFTER PRINTING ERROR, RETURN TO PROGRAM VIA A OPTIONAL REG, AND/OR EXIT TO NEXT ROUTINE.

6. APPENDIX

6.1 CHANNEL STATUS WORDS DEVICE AND CHANNEL STATUS BIT BREAKDOWN IN HEX

CSW ... YY YY ...

- 80 ---PROGRAM-CONTROLLED INTERRUPT
- 40 ---INCORRECT LENGTH
- 20 ---PROGRAM CHECK
- 10 ---PROTECTION CHECK
- 08 ---CHANNEL DATA CHECK
- 04 ---CHANNEL CONTROL CHECK
- 02 ---INTERFACE CONTROL CHECK
- 01 ---CHAINING CHECK

- 80 ---ATTENTION
- 40 ---STATUS MODIFIER
- 20 ---CONTROL UNIT END
- 10 ---BUSY
- 08 ---CHANNEL END
- 04 ---DEVICE END
- 02 ---UNIT CHECK
- 01 ---UNIT EXCEPTION

6.2 SENSE BYTES RECEIVED ON A SENSE I/O COMMAND BIT BREAKDOWN IN BINARY

```
          SNS 00000000 00000000 00000000 01000000
              ..*..*.. ..*..*.. ..*..*.. ..*..*..
 COMMAND REJECT.*..*.. ..*..*.. ..*..*.. ..*..*.SEEK INCOMPLETE
INTERVENTION REQ'D*..*.. ..*..*.. ..*..*.. ..*..*NOT USED
    BUS OUT PARITY..*.. ..*..*.. ..*..*.. ..*..END OF CYLINDER
    EQUIPMENT CHECK.*.. ..*..*.. ..*..*.. ..*.PACK CHANGE
  (BURST) DATA CHECK*.. ..*..*.. ..*..*.. ..*NOT USED
CHANNEL/2314 OVER RUN.. ..*..*.. ..*..*.. ..UNSAFE
 TRACK CONDITION CHECK. ..*..*.. ..*..*.. .ON-LINE
           SEEK CHECK ..*..*.. ..*..*.. BUSY
                      ..*..*.. ..*..*..
DATA CHECK IN COUNT FIELD.*..*.. ..*..*.NOT USED
          TRACK OVERFLOW*..*.. ..*..*NOT USED
          END-OF-CYLINDER..*.. ..*..UNSELECTED FILE STATUS
          INVALIC SEQUENCE.*.. ..*.2314 ALU CHECK
            NO RECORD FOUND*.. ..*NOT USED
              FILE PROTECTED.. ..SERIALIZER/DESERIALIZER CHECK
      MISSING ADDRESS MARKERS. .NOT USED
           OVERFLOW INCOMPLETE.UNSAFE
```

SNS BYTE 4	00000000	DRIVE A
	00000001	DRIVE B
	00000010	DRIVE C
	00000011	DRIVE D
	CC000100	DRIVE E
	00000101	DRIVE F
	00000110	DRIVE G
	C0000111	DRIVE H
	00001000	DRIVE J
	00001111	DRIVE CANNOT BE DETERMINED

TABLE OF CONTENTS

1. PURPOSE

1.1 INTENT

THIS IS A DIAGNOSTIC TEST PROGRAM TO AID IN DETERMINING WHETHER OR NOT TRACKS OF DATA ON A 2316 DISK PACK CAN BE READ WITHOUT ERRORS.

1.2 BRIEF DESCRIPTION

THIS PROGRAM OUTIPUTS INFORMATION TO BE USED IN DETERMINING THE STATE OF DATA OR POSSIBLE DISK DAMAGE ON A 2316 DISK PACK. NO WRITING OR MOVING OF PACK DATA WILL BE DONE. EVERY RECORD ON A PACK WILL BE BURST CHECKED AND THE RESULTS SORTED AND LOGGED FOR SUBSEQUENT PRINTOUT. THE 2314 DRIVES THAT WILL TEST THE 2316 PACKS MUST BE OPERATING CORRECTLY AND DEFINED IN MONITORS UDT.

*** NOTE ***

DISK SURFACE DAMAGE IN AREAS OF A PACK NOT FORMATTED WITH DATA WILL NOT BE DETECTED BY THIS PROGRAM.
PACKS FORMATTED WITH FFF1 WILL EXHIBIT ERRORS ON C.E. CYLINDERS. DISREGARD THESE ERRORS.

2. PREREQUISITE

2.1 PROGRAM REQUIREMENTS

THIS TEST MUST BE RUN WITH ONE OF THE FOLLOWING DIAGNOSTIC MONITORS

DMA4
DMA8
DMK
DME
DM44

2.2 EQUIPMENT REQUIREMENTS

-CPU WITH STANDARD INSTRUCTION SET COMPLETELY OPERATIVE
-SELECTOR OF MULTIPLEXOR CHANNEL
-HARD COPY OUTPUT DEVICE
-METHOD OF LOADING PROGRAM
-2314 WITH AT LEAST 1 DRIVE COMPLETELY OPERATIVE
-ONE OR MORE 2316 DISK PACKS

3. USE PROCEDURE

3.1 PROGRAM LOADING

PROGRAM LOADING IS STANDARD - VIA DIAGNOSTIC MONITOR AS DESCRIBED BY THE USERS GUIDE.

THE UDT TYPE CODE ENTRY FOR THIS PROGRAM IS 6A.

3.2 RUNNING THE PROGRAM

THE PROGRAM WILL ATTEMPT TO RUN ON ANY UDT DEFINED 2314 DRIVE THAT INTERRUPTS THE CPU AFTER THE PROGRAM IS LOADED. TO START THE PROGRAM TESTING A PACK SIMPLY PLACE THE PACK ON A DRIVE AND TURN THE POWER SWITCH 'ON' OR REMOVE AND REPLACE THE MODULE IDENTIFIER PLUG ON THE PARTICULAR DRIVE (DRIVES MUST BE DEFINED IN UDT). WHEN THE PROGRAM HAS COMPLETED THE TESTING OF A PACK, THE TEST RESULT MESSAGES ARE OUTPUT.

*** NOTE ***

IF THE MACHINE CONFIGURATION IS A 2844 OR A 2314 2-CHANNEL SWITCH IN A 2-CPU ENVIRONMENT, AND IF THE CUSTOMER CONTINUES TO RUN ON ONE CPU WITH F6BE RUNNING ON THE OTHER CPU, CUSTOMER PACK CHANGE INTERRUPTS MAY BE TAKEN BY DM UNLESS THE 2844 OR THE 2314 IS OPERATING IN THE 'MULTITAGGED' MODE.

3.3 SENSE SWITCH OPTIONS

THE SECTION SENSE SWITCHES ARE BYTES FOUR THROUGH SEVEN IN THE SECTION PREFACE PORTION OF THE PROGRAM. EACH BIT IS USED AS A SEPARATE SWITCH. THEY ARE CONSIDERED 'OFF' WHEN A ZERO IS STORED, AND 'ON' WHEN A ONE IS STORED IN THE APPROPRIATE BIT POSITION.

THE SECTION SENSE SWITCHES ARE SET TO ZERO AS EACH SECTION IS READ IN. ANY SENSE SWITCHES WHICH SHOULD BE 'ON' DURING A PARTICULAR SECTION MAY BE TURNED 'ON' DURING EXECUTION OF THAT SECTION VIA THE CONSOLE CONTROLS AS DESCRIBED IN THE DM USER'S GUIDE, OR BY STORING THE APPROPRIATE BITS IN THE STORAGE LOCATIONS LISTED BELOW. IF A PERMANENT 'TURN ON' OF ANY SWITCH IS DESIRED, IT MAY BE DONE WITH A REP CARD WITH APPROPRIATE PUNCHES.

NOTE — DM SWITCH 20 'ON' WILL PUT THE SYSTEM INTO A WAIT STATE AFTER A SECTION IS LOADED SO THAT ANY SENSE SWITCHES NEEDED CAN BE TURNED 'ON' BEFORE THE SECTION ACTUALLY RUNS.

THE SENSE SWITCHES SHOWN BELOW ARE IN THE SENSE SWITCH BYTES OF THE RESPECTIVE SECTION PREFACES. THE CHARACTER X REPRESENTS THE RELOCATION FACTOR CONTAINED IN REGISTER 15 DURING RUN TIME. THE THE SWITCH BITS ARE ZERO WHEN OFF, AND ONE WHEN ON.

SENSE SW. =	FUNCTION	BYTE AND BIT
0	OFF--PROCEED NORMALLY ON --LOOP ON START I/O	X004 0
1	OFF--PROCEED NORMALLY ON --LOOP ON HARDWARE ERROR	X004 1
5	OFF--STOP ON HARDWARE ERRORS ON --BYPASS SOME HALTS (ERRORS OTHER THAN DATA CHECK, DATA CHECK IN COUNT FIELD OR MISSING ADDRESS MARK THESE ERRORS WILL BE ACCOMPANIED BY NOS. E001-E003 AND E101 AND E104)	X004 5
9	OFF--PRINT SENSE BYTES IN BINARY ON --PRINT SENSE BYTES IN HEX	X005 1
10	OFF--DO NOT MOVE ACCESS AFTER DATA ERROR ON --MOVE ACCESS AFTER DATA ERROR	X005 2
11	OFF--PROCEED NORMALLY ON --HALT ON ERROR (DATA CHECK, DATA CHECK IN COUNT FIELD OR MISSING ADDRESS MARKER)	X005 3
12	OFF--PROCEED NORMALLY ON --LOOP ON ERROR TRACK. (DATA CHECK DATA CHECK IN COUNT FIELD, MISSING ADDRESS MARK)	X005 4
13	OFF--DO NOT LOOP ON FE SPECIFIED TRACK ADDRESS ON --LOOP ON CE SPECIFIED TRACK ADDRESS	X005 5
14	OFF--PROCEED NORMALLY ON --HALT AN HARD TRACK DATA ERROR (10 OUT OF 10)	X005 6

3.4 HALTS

3.3.1 NORMAL

THE PROGRAM WILL TYPE OUT 'READY A PACK', THEN LOOP WAITING FOR A 2314 DEVICE END INTERRUPT. THE PROGRAM WILL RUN ON THE DEVICES THAT ARE UDT DEFINED AND PRESENT SUCH INTERRUPTS.

3.3.2 ABNORMAL

ALL ABNORMAL HALTS ARE ACCOMPANIED BY AN ERROR NUMBER AND OR MESSAGE. THESE ARE DESCRIBED BELOW UNDER ERROR NUMBER DESCRIPTIONS.

3.5 PROGRAM TERMINATION

THIS PROGRAM WILL NOT TERMINATE BY ITSELF. OPERATOR INTERVENTION IS REQUIRED FOR PROGRAM TERMINATION WHICH IS ACCOMPLISHED BY DEPRESSING THE EXTERNAL INTERRUPT KEY. MONITOR MUST BE RELOADED TO RUN FURTHER DIAGNOSTIC SECTIONS AFTER F6BE TERMINATES. THIS IS TO PREVENT ANY SUBSEQUENT DIAGNOSTIC SECTION FROM INADVERTENTLY RUNNING ON A CUSTOMER PACK AND DESTROYING GOOD DATA.

4. PRINTOUTS

4.1 NORMAL OPERATOR MESSAGES

4.1.1 READY PACK OR POP ID PLUG.

THIS MESSAGE IS PRINTED OUT AT THE BEGINNING OF F6BE AND AT ANY OTHER TIME THAT THE DEVICE QUEUE IS EMPTY OR A PSW RESTART OCCURS.

4.2 ERROR MESSAGE FORMATS

-LINE 1-

*SDO SSSSS RR LLLLLL CUU

*SDO - STANDARD LINE TITLE FOR DM SVC X 'D0'
S-S - SECTION NUMBER AND VERSION
R-R - ROUTINE NUMBER
L-L - STORAGE ADDRESS
CUU - CHANNEL CONTROL UNIT AND DEVICE ADDRESS OF FILE.

-LINE 2-

ERROR NUMBER XYNN -OR- ERROR MESSAGE

X - UNITS CHARACTER OF SECTION NUMBER
Y - ROUTINE NUMBER
NN - NUMBER OF THE ERROR WITHIN ROUTINE

-LINE 3-

CAW 00AAAAAA

A-A - ADDRESS OF CCW CHAIN

-LINE 4-

CSW KK AAAAAA XX YY CCCC

KK - STORAGE PROTECT KEY
A-A - ADDRESS OF NEXT CCW IF CHAIN HAD NOT BROKEN
XX - DEVICE STATUS (OR'ED TOGETHER)
YY - CHANNEL STATUS
C-C - RESIDUAL COUNT

-LINE 5-

SNS BBBBBBBB BBBBBBBB BBBBBBBB BBBBBBBB BBBB BBBB

B-B - SENSE BYTES IN BINARY, BITS 0 TO 7 FOR 6 BYTES OF SENSE (0 TO 5)

-OR-

SNS XX XX XX XX (SECTION SNS SW 9 'ON')

XX - SENSE BYTES IN HEXADECIMAL

-LAST LINE-

HLT SSSSS RR PPPPPPPPPPPPPPPP

S-S - SECTION NUMBER AND VERSION
RR - ROUTINE NUMBER
P-P - OLD SUPERVISOR PSW

THIS IS THE MONITOR HALT (HLT) MESSAGE. THE USER CAN AT THIS TIME SET SENSE SWITCHES FOR LOOPING AND PERFORM OTHER USER OPTIONS. TO PROCEED EITHER PRESS CONSOLE INTERRUPT OR USE CE INPUT MESSAGE 'B' IF APPLICABLE.

4.3 REFERENCE STATEMENTS

REF A - ENTER A VALID 2314 TEST TRACK

THIS MESSAGE IS PRINTED OUT AFTER THE PROGRAM HONORS THE TURNNING ON OF SENSE SWITCH 13 TO LOOP ON A SPECIFIC TRACK. THE METHODS OF ENTERING SUCH INFORMATION DEPEND ON THE MONITOR IN USE AND ARE LISTED BELOW.

METHOD 1 - MONITORS THAT DO NOT HAVE THE DEFINE CE INPUT MESSAGE ('D' MESSAGE).
INTO THE STORAGE LOCATIONS INDICATED, ENTER THE FOLLOWING BYTES -

LOCATION X103 STORE CYLINDER BYTE (HEX 00 - CA)
X107 STORE HEAD BYTE (HEX 00 - 13)

WHERE X IS DETERMINED BY THE CONTENTS OF BASE REGISTER 15 -

X = 1 FOR DMA4 AND DMK
X = 2 FOR DMA8 WITH SYSTEMS LESS THAN 32K
X = 3 FOR DMA8 WITH SYSTEMS 32K OR GREATER
X = 5 FOR DME

METHOD 2 - USE THE 'DEFINE CE INPUT MESSAGE' PROVIDED BY DME

EXAMPLE

DEPRESS 'REQUEST' AND TYPE ON THE TYPWRITER -

DSSS.OCC.OHH/B (EOB)
OR D.OCC.OHH/B (EOB)

WHERE SSS IS THE SECTION ID NUMBER
CC IS THE CYLINDER BYTE (HEX 00 - CA)
HH IS THE HEAD BYTE (HEX 00 - 13)

METHOD 3 - USE THE 'ENTER DATA MESSAGE' PROVIDED BY DMA8

EXAMPLE

DEPRESS 'REQUEST' AND TYPE ON THE TYPWRITER -

E.000103.01.CC/ (EOB)
E.000107.01.HH/B (EOB)

WHERE CC IS THE CYLINDER BYTE (HEX 00 - CA)
HH IS THE HEAD BYTE (HEX 00 - 13)

NOTE- BASE REGISTER 15 IS ADDED TO THE DISPLACEMENT INDICATED IN THE 'E' VERB BY DMA8.

THE TEST TRACK INFORMATION IS ALWAYS STORED INTO OPERAND 1 OF THE SECTION.

4.4 ERROR NUMBEER DESCRIPTIONS

4.3.1 HARDWARE ERRORS DETECTED IN SUBROUTINES

21 - CONDITION CODE 1 ON SENSE I/O

PROGRAM SETECTED UNIT CHECK ON A SENSE I/O IN THE SENSE I/O SUBROUTINE. TEST I/O AND START I/O HAVE ALREADY BEEN TESTED. SHOULD NOT GET THIS ERROR EXCEPT ON INTERMITTENT FAILURES. THE SECTION AND ROUTINE BEING EXECUTED WHEN ERROR OCCURED IS PRINTED WITH ERROR NUMBER. EXAMINE ACCUMULATED STATUS DATA IN CSW FOR CLUES TO FAILURES.

22 - CONDITION CODE 2 ON SENSE I/O.

PROGRAM EXECUTED A SENSE I/O AND GOT A BUSY CONDITION. PRINTOUT GIVES SECTION AND ROUTINE BEING EXECUTED WHEN THIS ERROR OCCURED.

23 - CONDITION CODE 3 ON SENSE I/O

CONDITION CODE 3 (NOT OPERATIONAL) ON START I/O WITH A SENSE COMMAND

4.3.2 HARDWARE ERRORS DETECTED BY TEST ROUTINES

E001

START I/O INSTRUCTION ACCEPTED BUT NO INTERRUPT RECEIVED AFTER 10 SECONDS. PROGRAM ABORTS THE RUN ON THAT ONE DRIVE. THIS ERROR USUALLY INDICATES CONTROL UNIT OR FILE HARDWARE PROBLEMS.

E002

A TEST I/O INDICATED THAT THE DEVICE WAS AVAILABLE BUT A SUCCESSIVE START I/O INSTRUCTION TO BURST CHECK A TRACK WAS NOT ACCEPTED. PROGRAM RETRIES FOR 5 SECONDS THEN ABORTS THE RUN ON THAT ONE DRIVE IF THE ERROR PERSISTS.

E003

A TEST I/O INSTRUCTION TO A DEVICE INDICATED THAT THE DEVICE WAS UNEXPECTEDLY UNAVAILABLE. THE PROGRAM RETRIES FOR 5 SECONDS THEN ABORTS THE RUN ON THAT ONE DRIVE IF THE ERROR PERSISTS.

E101

PROGRAM DETECTED SENSE INFORMATION AFTER BURST CHECKING A TRACK OTHER THAN DATA CHECK, DATA CHECK IN COUNT FIELD OR MISSING ADDRESS MARK. CHECKING CONTINUES TO NEXT TRACK. TRACK NOT LOGGED. THIS ERROR USUALLY INDICATES CONTROL UNIT OR FILE HARDWARE PROBLEMS.

E104

BURST CHECK CCW CHAIN COMPLETED WITHOUT A UNIT CHECK. PROGRAM ABORTS THE RUN ON THAT ONE DRIVE. THIS ERROR USUALLY INDICATES CONTROL UNIT OR FILE HARDWARE PROBLEMS.

BECAUSE THE FILE MASK OF THE CCW CHAIN TO BURST CHECK A TRACK IS SET TO INHIBIT HEAD SEEKS AND THE LAST CCW COMMANDS ARE READ CKD M/T AND A TIC BACK TO THE READ CKD, A START I/O WITH THIS CHAIN SHOULD ALWAYS TERMINATE WITH 'UNIT CHECK'. IF 'FILE PROTECT' OR 'FILE PROTECT' OR 'FILE PROTECT' AND 'OVERFLOW INCOMPLETE' ARE THE ONLY SENSE BITS 'ON', THE CCW CHAIN HAS EXECUTED CORRECTLY AND FOUND NO DATA ERRORS.

5. COMMENTS

5.1 SECTION DESCRIPTION

THIS TEST SECTION OBTAINS AND PRINTS RESULTS OF TESTS THAT HAVE BURST CHECKED EVERY RECORD ON A 2316 DISK PACK. NO WRITING OR MOVING OF PACK DATA WILL OCCUR AT ANY TIME. NO DIAGNOSTIC SECTION CAN BE RUN AFTER THIS SECTION HAS TERMINATED WITHOUT A RE-IPL OF MONITOR. THERE IS ONLY ONE ROUTINE IN THIS SECTION.

ROUTINE 1 DESCRIPTION

THE ROUTINE FIRST ISSUES A START I/O INSTRUCTION TO OBTAIN THE VOLUME SERIAL NUMBER FROM THE PARTICULAR PACK ON THE DRIVE IT HAS BEEN ASSIGNED TO TEST. IF NO VOLUME SERIAL IS AVAILABLE IN THE NORMAL LOCATION, IT WILL PRINT 'VOL ID NONE'. THE ADDRESS OF THE DEVICE DOING THE TESTING IS PRINTED WITH THE VOLUME ID AS THE FIRST LINE FOR EACH NEW PACK THAT IS TESTED.

A BRANCH IS MADE TO A START I/O SUBROUTINE AND A DECODE SUBROUTINE TO OBTAIN THE PERTINENT BURST CHECK TEST DATA. WHEN THE ENTIRE PACK HAS BEEN ANALYZED OR AT ANYTIME THECAPACITY OF THE DATA TABLES IS EXCEEDED, THE TEST DATA IS PRINTED. IT INCLUDES A LINE WITH THE CUMULATIVE TOTAL OF LOGGED BAD TRACKS TO THIS POINT PLUS A LINE OF DATA FOR EACH LOGGED TRACK. THE TRACKS WILL APPEAR SORTED IN ORDER BY HEAD NUMBER RATHER THAN BY CYLINDER. A LINE OF DATA WILL INCLUDE THE FOLLOWING -

1. DECIMAL TRACK ADDRESS
2. HEX TRACK ADDRESS
3. COUNT FIELD OF ERROR RECORD IF RELIABLE
4. NO. OF TIMES OUT OF 10 RETRIES ERROR OCCURRED
5. FIRST 2 SENSE BYTES OBTAINED AFTER ERROR OCCURRED
6. REASON CODE (SEE DESCRIPTION OF CODES BELOW)

SECTION SENSE SWITCH 13 IS PROVIDED IF IT IS DESIRED TO LOOP THE BURST CHECK CCW CHAIN ON ONE PARTICULAR TRACK. THIS SWITCH MAY BE TURNNED ON AT ANY TIME. IF IT IS TURNNED ON WITH NO TESTING IN PROGRESS, THE NEXT DRIVE TO BECOME READY WILL BE THE ONE THE TEST EXERCISES ON THE ENTERED TRACK. IF IT IS TURNNED ON WHILE A PACK IS BEING TESTED, THIS PACK WILL BE THE ONE THE TEST EXERCISES ON THE ENTERED TRACK. WHEN SECTION SENSE SWITCH 13 IS TURNNED OFF, ANY DATA ACCUMULATED IN THE BAD TRACK TABLE IS PRINTED AFTER WHICH TESTING TERMINATES ON THAT DRIVE.

WHEN TESTING IS COMPLETED ON ANY DRIVE, A MESSAGE IS PRINTED WITH THE VOLUME SERIAL NUMBER OF THE PACK AND THE TEST DRIVE ADDRESS.

THE CCW CHAIN THAT BURST CHECKS THE TRACKS APPEARS AS FOLLOWS --

SEEK
SET FILE MASK TO INHIBIT HEAD SEEKS AND ALL WRITING
READ HOME ADDRESS
READ RECORD 0 TRUNCATED 8 BYTES
READ COUNT-KEY-DATA MULTITRACK TRUNCATED 8 BYTES
TIC BACK TO READ COUNT-KEY-DATA M/T

THE FOLLOWING CODES APPEAR WITH OTHER INFORMATION ON THE PRINTED OUTPUT FOR EACH LOGGED TRACK WHEN THIS PROGRAM COMPLETES THE TESTING OF A PACK. IT IS A CODE THAT DESCRIBES IN DETAIL WHAT THE STATUS OF THE ERROR CONDITION WAS.

REASON CODES

REASON CODE	DESCRIPTION
1.	HA AND RO WERE LOCATED. HA WAS READ SUCCESSFULLY. R(X) HAD DATA CHECK IN COUNT.
2.	HA AND RO WERE LOCATED. HA WAS READ SUCCESSFULLY. R(X) HAD DATA CHECK.
3.	HA AND RO WERE LOCATED. ~~HA WAS READ SUCCESSFULLY.~~ RO WAS READ SUCCESSFULLY. A RECORD WAS FOUND MISSING OR DAMAGED BETWEEN GOOD ONES.
4.	HA NOT FOUND ON TRACK
5.	HA AND RO WERE LOCATED. ALL RECORDS ON TRACK BURST CHECKED OK HA READ DID NOT EQUAL HA EXPECTED.
6.	HA AND RO WERE LOCATED. HA READ DID NOT EQUAL HA EXPECTED. A BURST CHECK OCCURRED IN THE HA FIELD.
7.	HA AND RO WERE LOCATED. HA READ DID NOT EQUAL HA EXPECTED. A BURST CHECK OCCURRED IN A R(X) COUNT FIELD.
8.	RO NOT FOUND ON TRACK.
9.	HA AND RO WERE LOCATED. HA READ DID NOT EQUAL HA EXPECTED. A BURST CHECK OCCURRED IN A R(X) DATA FIELD.

5.2 DETAILED DESCRIPTIONS OF ALL OTHER SUBROUTINES IN THE SECTION ARE DESCRIBED IN THE PROGRAM LISTING.

6. APPENDIX

6.1 CHANNEL STATUS WORD BYTE CHART

CHANNEL STATUS WORD STATUS BIT CHART (HEX)

```
CSW = KK  AAAAAA  00  00  CCCC-- RESIDUAL BYTE COUNT
       '   '   '   ..  ..
       '    ' '    ..  80--PROGRAM CONTROLLED INTERRUPT   '
     KEY     ''    ..  40--INCORRECT LENGTH               '
             ''    ..  20--PROGRAM CHECK                  '-- CHANNEL
          COMMAND  ..  10--PROTECTION CHECK               '   STATUS
          ADDRESS  ..  08--CHANNEL DATA CHECK             '    BITS
                   ..  04--CHANNEL CONTROL CHECK          '
                   ..  02--INTERFACE CONTROL CHECK        '
                   ..  01--CHAINING CHECK                 '
                   ..                                     '
                   80------ATTENTION                      '
                   40------STATUS MODIFIER                 '
                   20------CONTROL UNIT END               '-- DEVICE
                   10------BUSY                           '   STATUS
                   08------CHANNEL END                    '    BITS
                   04------DEVICE END                     '
                   02------UNIT CHECK                     '
                   01------UNIT EXCEPTION                 '
```

6.2 SENSE BYTE CHART FOR BYTES 0, 1, 2 AND 3

	SENSE BYTE 0	SENSE BYTE 1	SENSE BYTE 2	SENSE BYTE 3
BIT 0	COMMAND REJECT	DATA CHECK IN COUNT FIELD	UNSAFE	BUSY
BIT 1	INTERVENTION REQUIRED	TRACK OVERRUN	NOT USED	ON-LINE
BIT 2	BUS-OUT PARITY	END OF CYLINDER	SERIALIZER CHECK	UNSAFE
BIT 3	EQUIPMENT CHECK	INVALID SEQUENCE	NOT USED	WRITE CURRENT SENSE
BIT 4	DATA CHECK	NO RECORD FOUND	ALU CHECK	PACK CHANGE
BIT 5	OVERRUN	FILE PROTECTED	UNSELECTED FILE STATUS	END OF CYLINDER
BIT 6	TRACK CONDITION CHECK	MISSING ADDRESS MARK	NOT USED	NOT USED
BIT 7	SEEK CHECK	OVERFLOW INCOMPLETE	NOT USED	SEEK INCOMPLETE

SNS BYTE 4	00000000	DRIVE A
	00000001	DRIVE B
	00000010	DRIVE C
	00000011	DRIVE D
	00000100	DRIVE E
	00000101	DRIVE F
	00000110	DRIVE G
	00000111	DRIVE H
	00001000	DRIVE J
	00001111	DRIVE CANNOT BE DETERMINED