IDENTIFICATION

Product Code:	MAINDEC-08-D8SC-D
Product Name:	DM01 Exerciser
Date Created:	March 26, 1971
Maintainer:	Diagnostic Group
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1. ABSTRACT

The DM01 Exerciser is a program written to exercise the DM01 Data Break Multiplexer to assure that it can properly interlace data breaks from several peripheral devices to the PDP-8 computer. It does this by exercising several data break devices simultaneously.

2. REQUIREMENTS

2.1 Equipment

Family-of-8 Computer and
DM01 Data Break Multiplexer, plus at least one of the following

TC01 DECtape and/or
TC58 MAGtape and/or
338 Display and/or
Extended Memory and/or
RM08 Drum or
DF32 Disk or
RF08 Disk

2.2 Storage

The program occupies all of the lowest 4K of the computer's memory and uses some of this area and areas in other memory banks (if available) for data storage.

2.3 Preliminary Programs

The appropriate diagnostic programs for the data break devices.

3. LOADING PROCEDURE

3.1 Method

The program is loaded, using the "standard binary loader" technique, into memory bank 0.

4. STARTING PROCEDURE

4.1 Control Switch Settings

The following is a table of AC Switch settings and their action on the program.

AC Switch	Set As	Action on Program
0	1	Don't halt on hardware errors
	0	Halt on hardware errors
1	1	Don't halt on data errors
	0	Halt on data errors
2	1	Don't print hardware errors
	0	Print hardware errors
3	1	Don't print data errors
	0	Print data errors
4	1	Look at ACS5 for disk/drum transfer direction
	0	Ignore ACS5
5	1	Write
	0	Read
6	1	Suppress DECtape exercising
	0	None
7	1	Suppress MAGtape exercising
	0	None
8	1	Suppress disk/drum exercising
	0	None
9	1	
	0	
10	1	
	0	
11	1	Freeze memory field
	0	None

4.2 Starting Addresses

There are two starting addresses for the program.

a. Start at location 00200 when the program is initially read into memory, to allow the program to interrogate the operator.

b. Restart at location 00201 to avoid re-interrogating the operator about computer configuration.

4.3 Starting Procedure

Start the program using the following starting procedure, and ignoring those steps not applicable to computer configuration.

a. Load program into memory bank 0 using the "standard binary loader."

b. Mount onto a DECtape transport a reel of DECtape which has the standard mark and timing track format (2702 blocks, 201 words each). Set the transport selector to 8, set switch to WRITE ENABLE, set switch to REMOTE.

c. Mount onto a MAGtape transport a reel of MAGtape which is certified to operate at 800 bpi with the "write-lock" ring in (able to write). Set the transport selector to 0 and ON LINE.

d. Set up the DF32, disk 0, so that the upper 16K may be written on (not write-lock).

e. Set up RF08, disk 0, so that uppermost locations may be written on (not write-lock) (256K).

f. Set up RM08 drum so that track 77, sectors 50 to 77 may be written on (not write-lock).

g. Set up 338 Display so that it can be operated by the 8.

h. Set ACS to 00200.

i. Depress LOAD ADDRESS.

j. Set ACS per Section 4.1 (normal setting is 0000).

k. Depress START.

l. Answer questions asked by program with "Y" for Yes, "N" for No, and number of extra memory banks (between 1 and 7) (if applicable).

m. After interrogation is complete, program will start exercising the devices whose answers are "Yes" and the DM01.

5. OPERATING PROCEDURE

5.1 Operational Switch Settings

See Section 4.1

5.2 Subroutine Abstracts

None

5.3 Program and/or Operator Action

After setting up the I/O devices and answering the questions asked by the program, the operator need perform no other action unless an error occurs. If a particular device consistently has errors, it may be "turned off" by setting to 1 its ACS (see Section 4.1, ACS 6-8).

6. ERRORS

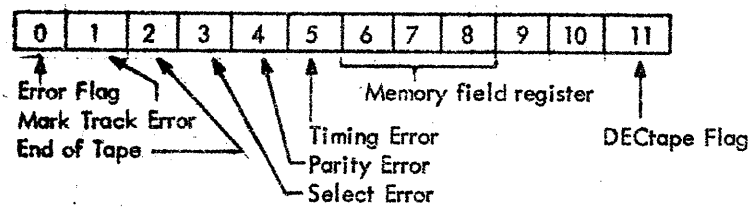
6.1 Error Typeouts

Since all error typeouts occur with the program interrupt facility off, a DECtape timing error will generally occur if any non-DECtape error has been typed out. Normally, the DECtape timing error can be ignored under these circumstances.

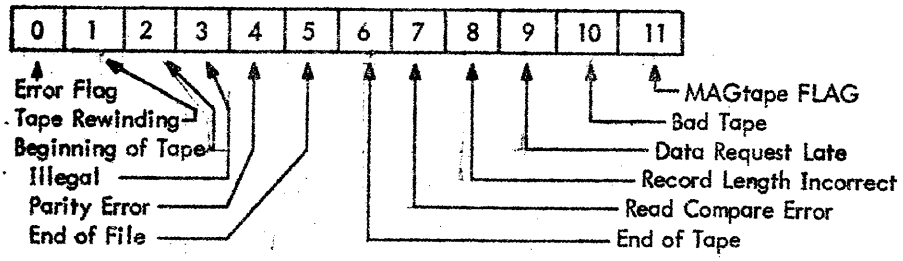
6.1.1 Hardware Errors

Hardware errors cause an error status typeout for the device in error. Shown below are the error status bits for the various devices.

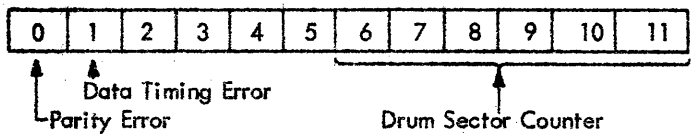
6.1.1.1 DECtape Error Status (TC01) -



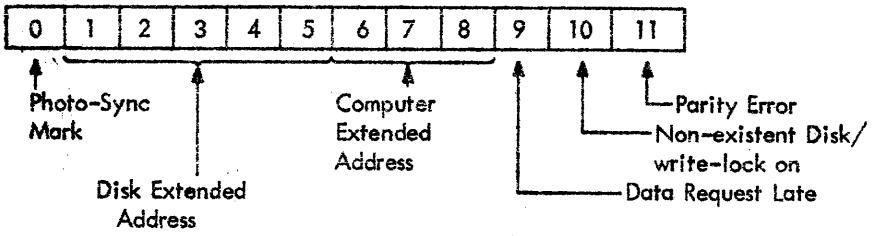
6.1.1.2 MAGtape Error Status (TC-58) -



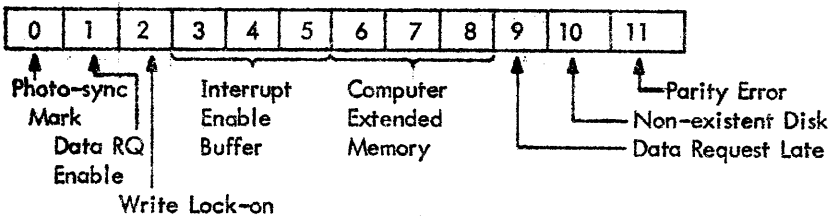
6.1.1.3 Drum Error Status (RM08) -



6.1.1.4 Disk Error Status (DF32) -



6.1.1.5 Disk Error Status (RF08) -



6.1.2 Data Errors

Data error typeouts present the following information:

a. Offending Device (DECtape, MAGtape, DISK/DRUM
b. Memory Field in which error occurred
c. Address of "Good" Data ("GADD")
d. Good Data ("GDAT")
e. Address of "Bad" Data ("BADD")
f. Bad Data ("BDAT")

6.2 Error Halts

Each error, which has an error typeout, also has an error halt.

6.3 Error Recovery

To recover from an error halt, depress CONTINUE. If it was a data error, the program will continue until another data error is found for the device, or until all the data has been checked. If it was a hardware error, the program will attempt to perform the function again, except a non-existent disk error which is not recoverable.

7. RESTRICTIONS

7.1 Starting Restrictions

None

7.2 Operating Restrictions

None

8. MISCELLANEOUS

8.1 Execution Time

Not applicable. Since this is an exerciser program, it does not stop on its own accord, except for errors.

9. PROGRAM DESCRIPTION

9.1 Interrogation

The first function that is performed by the program is interrogation. The operator is questioned by the program to determine what peripherals are to be exercised.

9.2 Initialization

Next, initialization takes place. Random memory fields (if applicable) are selected for the devices being tested. The DECtape is initialized by causing it to move to the end zone at the beginning of tape. The MAGtape is initialized by causing it to rewind to the beginning of tape; tests are also made at this time to assure that the tape control is ready and that the tape transport is also ready (and exists). A two word transfer is made to disk or one sector to the drum to initialize it. The 338 Display is set up to execute a display program.

9.3 DECtape Exercising

The exercising of DECtape follows this procedure:

a. Six hundred (octal) words are obtained from a random number generator and are stored in an output buffer in memory (some memory bank). This is done with PI off.

b. The block to be sought for writing is incremented by 3. It is initially 0.

c. The data is written on DECtape into the selected block (and the two following). While this is taking place, the PI facility is turned on to allow interrupts from any I/O devices in use.

d. After the data is written, the information is read back from the selected block (S) into an input buffer in the same memory bank data was written from. This takes place with PI on.

e. The data written is compared with the data read to see if any errors occurred. This is done with the PI on. Any discrepancies will be reported on the teletype (unless suppressed) and will cause error halts (unless suppressed).

f. A new data field is selected for data transfer for DECtape. The program then returns to Step a (above).

9.4 MAGtape Exercising

The exercising of MAGtape follows this procedure:

a. Six hundred (octal) words are obtained from a random number generator and are stored in an output buffer in memory (some memory bank). This is done with the PI on.

b. The data is written on MAGtape in an area not previously written on by this program. While this is taking place, the PI facility is turned on to allow interrupts from any I/O devices in use.

c. After the data is written, the information is read back into an input buffer in the same memory bank data was written from. This is accomplished by rewinding the MAGtape to "BOT," spacing forward as many records as necessary to get to the data, then reading it into memory. This is done with the PI on.

d. The data written is compared with the data read to see if any errors occurred. This is done with the PI on. Any discrepancies will be reported on the Teletype and will cause error halts.

e. The data on MAGtape is then "Read Compared" against the data in memory. This is done with the PI on. Any discrepancies will result in the hardware error "Read Compare Error".

f. A new data field is selected for data transfer for MAGtape. The program then returns to Step a (above).

9.5 Disk/Drum Exercising

The exercising of disk/drum follows this procedure:

a. Six hundred (octal) words are obtained from a random number generator and are stored in an output buffer in memory (some memory bank). This is done with PI on.

b. The data is written on the disk/drum into the highest 601 (octal) locations (on disk/drum 0) (265K). While this is taking place, the PI facility is on.

c. After the data is written, the information is read back into an input buffer in the same memory bank data was written from. This takes place with the PI on.

d. The data written is compared with the data read to see if any errors occurred. This is done with PI on. Any discrepancies will be reported on the Teletype and will cause error halts.

e. A new data field is selected for data transfer for disk/drum. The program then returns to Step a (above).

If a hardware error occurs during any function of a peripheral, that function will usually be attempted repeatedly until it is successful, or the operator intervenes.

9.6 Data Buffers Memory Map

The following locations in each memory bank being used for data transfer are used as buffer areas.

DECtape Output Buffer	3200 - 3777
MAGtape Output Buffer	4000 - 4577
Disk/Drum Output Buffer	4600 - 5377
DECtape Input Buffer	5400 - 6177
MAGtape Input Buffer	6200 - 6777
Disk/Drum Input Buffer	7000 - 7577

9.7 Display Exercising

The exercising of the display is handled quite simply. The 338 is initialized by clearing the "initial conditions", and the break field is set to 0. The display address register is then set to the starting address of the display program. The display program, which is written in 338 display instructions, causes a square, with corners at 100,100; 100,1700, 1700, 1700, 1700. 100; to be displayed in vector mode. Diagnosis of display errors is visual.

```
                /DM01 EXERCISER - TAPE 1
                /IOT DEFINITIONS
                /DRUM
006003          DRCR=006003
006005          DRCW=006005
006011          DRCF=006011
006012          DREF=006012
006015          DRTS=006015
006021          DRSE=006021
006022          DRSC=006022
006024          DRCN=006024
006012          DRES=006012
006024          DRFS=006024
                /DISC
006001          DCMA=006001
006003          DMAR=006003
006005          DMAW=006005
006011          DCEA=006011
006012          DSAC=006012
006015          DEAL=006015
006016          DEAC=006016
006021          DFSE=006021
006022          DFSC=006022
006026          DMAC=006026
006011          DCIM=006011
006015          DIML=006015
006016          DIMA=006016
006043          DXAL=006043

                /TC01
006761          DTRA=006761
006762          DTCA=006762
006764          DTXA=006764
006766          DTLA=006766
006771          DTSF=006771
006772          DTRB=006772
006774          DTLB=006774

                /TC58
006701          MTSF=006701
006711          MTCR=006711
006721          MTTR=006721
006712          MTAF=006712
006714          MTCM=006714
006716          MTLC=006716
006706          MTRS=006706
006722          MTGO=006722

                /EXTENDED MEMORY
006201          CDF=006201
006202          CIF=006202
006214          RDF=006214
006224          RIF=006224
006234          RIB=006234
```

```
                4244    RMF=6244


                        /DISPATCH TO PI SCAN FLAG ROUTINE
                0001    *1
0001    5402            JMP I .+1
0002    2000            SCAN
                        /POINTERS, GOBS OF POINTERS
0003    2321    PNTR1,  MESAGE
0004    2254    PNTR2,  INPUT
0005    2400    PNTR3,  RANGEN
0006    2554    PNTR4,  GET
0007    2726    PNTR5,  DDDATA+6

                0020    *20
0020    0000    DTFELD, 0               /DECTAPE EXTENDED MEMORY FIELD
0021    0000    MTFELD, 0               /MAGTAPE EXTENDED MEMORY FIELD
0022    0000    DDFELD, 0               /DISC OR DRUM EXTENDED MEMORY FIELD
0023    2630    PNTR6,  EXIT
0024    2654    PNTR7,  RAND3
0025    2720    PNTR8,  DDDATA
0026    1501    PNTR9,  RF08WR
0027    1461    PNTR10, RF08RD
0030    1416    PNTR11, RM08WR
0031    1400    PNTR12, RM08RD
0032    2643    PNTR13, DDFLAG
0033    0735    PNTR14, DF32WR
0034    0755    PNTR15, DF32RD
0035    2637    PNTR16, DTFLAG
0036    2112    PNTR17, SPCFWD
0037    2641    PNTR18, MTFLAG
0040    1240    PNTR19, REWIND
0041    1255    PNTR20, MTERR
0042    2444    PNTR21, RAND1
0043    1067    PNTR22, DTRITE
0044    1047    PNTR23, DTREAD
0045    2277    PNTR24, PRINT
0046    2645    PNTR25, TYPE
0047    1266    PNTR32, MTWAIT
0050    2363    PNTR33, CRLF
0051    0600    PNTR34, DECTAP
0052    0610    PNTR35, MAGTAP
0053    0627    PNTR36, RM08
0054    0644    PNTR38, DF32
0055    0662    PNTR39, RF08
0056    2634    PNTR40, MEMORY
0057    1331    PNTR41, DTSAVE
0060    1343    PNTR42, DTREST
0061    0345    PNTR48, NODISC
0062    0365    PNTR49, DI8338

0063    3000    PMESS1, MESS01
0064    1565    PMESS2, MESS02
0065    2171    PMESS3, MESS03
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0066  2371     PMESS4, MESS04
0067  1770     PMESS6, MESS06
0070  2565     PMESS7, MESS07
0071  3040     PMESS8, MESS08
0072  3046     PMESS9, MESS09
0073  3055     PMES10, MESS10
0074  3132     PMES15, MESS15


0075  7750     K7750,  7750    /WC - DISC
0076  7751     K7751,  7751    /CA - DISC
0077  7752     K7752,  7752    /WC - TC58
0100  7753     K7753,  7753    /CA - TC58
0101  7754     K7754,  7754    /WC - TC01
0102  7755     K7755,  7755    /CA - TC01

0103  0400     K0400   400     /REVERSE DIRECTION (DECTAPE)
0104  0200     K0200,  200     /GO, STOP (DECTAPE)
0105  7200     K7200,  7200    /-600 (SIZE OF DATA TRANSFERS
0106  31[illegible]     BUFF1,  [illegible]    /(DECTAPE OUTPUT BUFFER) -1
0107  3377     BUFF4,  3377    /(DECTAPE INPUT BUFFER) -1
0110  0014     K0014,  14      /REWIND ENABLE (MAGTAPE)
0111  6177     BUFF5,  6177    /(MAGTAPE INPUT BUFFER) -1
0112  3[illegible]     BUFF2,  [illegible]    /(MAG TAPE OUTPUT BUFFER) -1
0113  6[illegible]     BUFF6,  [illegible]    /(DISC OR DRUM INPUT BUFFER) -1
0114  4577     BUFF3,  [illegible]    /(DISC OR DRUM OUTPUT BUFFER)-1
0115  7775     M0003,  -3      /MINUS 3
0116  7462     M0316,  -316    /MINUS N
0117  7447     M0331,  -331    /MINUS Y
0120  5100     M2700   -2700   /HIGHEST DECTAPE BLOCK TO BE USED
012[illegible]  [illegible]     M0004,  -4
0122  3000     K3000,  3000    /24 WORD DRUM SECTORS
0123  00[illegible]     K0070,  70      /MASK FOR MEMORY FIELD BITS
0124  0040     K0040,  40      /MASK FOR DECTAPE SUPPRESSION
0125  0[illegible]40     K0240,  240     /SPACE
0126  2[illegible]     K021[illegible],  [illegible]     /CR
0127  [illegible]     K02[illegible],  [illegible]     /LF
0130  0007     K0007,  7
01[illegible]  [illegible]42     [illegible]
013[illegible]  0[illegible]00     [illegible]
0[illegible]  7610     S[illegible]    [illegible]   /[illegible] INSTRUCTION
0[illegible]  0020     K00[illegible]  [illegible]     /MASK FOR MAG TAPE SUPPRESSION
0[illegible]  0010     K00[illegible],  10      /MASK FOR DISC OR DRUM SUPPRESSION
0[illegible]  1000     K1000,  1000    /MASK FOR TC58 BIT


0[illegible]  [illegible]     [illegible],  70[illegible]              /DISC EXTENDED ADDRESS (DF 32)
0[illegible]  [illegible]     DISCAD, [illegible]                /DISC ADDRESS
0[illegible]  [illegible]     DRUMAD, [illegible]                /DRUM ADDRESS ([illegible]00)
0[illegible]  [illegible]     [illegible]                        /DISC EXTENDED ADDRESS (RF08
[illegible]  [illegible]00     [illegible]  [illegible]           /INTERRUPT ENABLE (RF08)
0[illegible]  [illegible]     [illegible]      /[illegible]
0[illegible]  [illegible]     [illegible]NK    0     /[illegible]
0[illegible]  0000     [illegible]  0     /DECTAPE STATUS
0[illegible]  0000     [illegible]  0     /MAG TAPE STATUS
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```
0150  0000    RECORD, 0          /NUMBER OF RECORDS WRITTEN ON MAG TAPE
0151  0000    DDSTAT, 0          /DRUM OR DISC STATUS
0152  0000    DRMSEC, 0          /DRUM SECTOR COUNTER
0153  0000    CHAR,   0          /CHARACTER FROM KEYBOARD
0154  5451    JMPDEC, JMP I PNTR34     /JUMP TO DECTAPE STARTER
0155  5452    JMPMAG, JMP I PNTR35     /JUMP TO MAGTAPE STARTER
0156  5453    JMPRM8, JMP I PNTR36     /JUMP TO RM08 STARTER
0157  5454    JMPD32, JMP I PNTR38     /JUMP TO DF32 STARTER
0160  5455    JMPR08, JMP I PNTR39     /JUMP TO RF08 STARTER
0161  5462    JMP338, JMP I PNTR49
0162  0000    FELD,   0          /NUMBER OF EXTENDED MEMORY FIELDS
0163  1600    DTPNTR, DTEXER     /POINTER TO DECTAPE EXERCISOR
0164  2000    MTPNTR, MTEXER     /POINTER TO MAGTAPE EXERCISER
0165  0510    RM08PR, RM08EX     /POINTER TO RM08 DRUM EXERCISER
0166  0526    DF32PR, DF32EX     /POINTER TO DF32 DISC EXERCISE
0167  0517    RF08PR, RF08EX     /POINTER TO RF08 DISC EXERCISER
0170  0000    DTCNTR, 0          /DECTAPE LOOP COUNTER
0171  0000    TEMP,   0          /TEMP STORAGE
0172  0000    TEMP1,  0
0173  0000    MTCNTR, 0          /MAGTAPE LOOP COUNTER
0174  0000    DDCNTR, 0          /DISC OR DRUM COUNTER
0175  0000    LOOK,   0          /BLOCK LOOKED FOR


      0200    *200
0200  5207    START,  JMP      INTERR          /INTERROGATE OPERATOR
0201  0000            0                        /(DECTAPE) THESE AND'S MAY BE REPLACED
0202  0000            0                        /(MAGTAPE) BY JUMPS
0203  0000            0                        /(DISC OR DRUM) IF THESE DEVICES ARE AVAILABLE
0204  0000            0                        /(338 DISPLAY)
0205  6001            ION                      /TURN ON PI
0206  5206            JMP      .               /IDLE HERE WHEN THERE IS NOTHING BETTER TO DO

                /INTERROGATE THE OPERATOR ABOUT MACHINE CONFIGURATION
0207  7200    INTERR, CLA                      /INITIALIZE STARTER JUMPS TO AND 0
0210  3201            DCA START+1
0211  3202            DCA START+2
0212  3203            DCA START+3
0213  3204            DCA START+4
0214  1063            TAD PMESS1
0215  4403            JMS I PNTR1              /TYPE OUT HEADER
0216  1064    ASK1,   TAD PMESS2
0217  4403            JMS I PNTR1      /ASK OPERATOR ABOUT DECTAPE
0220  4327            JMS TEST
0221  5225            JMP ASK2
0222  5216            JMP ASK1
0223  1154            TAD JMPDEC
0224  3201            DCA START+1
0225  1066    ASK2,   TAD PMESS4
0226  4403            JMS I PNTR1      /ASK OPERATOR ABOUT MAGTAPE
0227  4327            JMS TEST
0230  5234            JMP ASK3
0231  5225            JMP ASK2
0232  1155            TAD JMPMAG
0233  3202            DCA START+2
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0234  1065  ASK3,  TAD PMESS3
0235  4403        JMS I PNTR1          /ASK OPERATOR ABOUT 338 DISPLAY
0236  4327        JMS TEST
0237  5243        JMP ASK4
0240  5234        JMP ASK3
0241  1161        TAD JMP338
0242  3204        DCA START+4

0243  1067  ASK4,  TAD PMESS6
0244  4403        JMS I PNTR1      /ASK OPERATOR ABOUT RM08
0245  4327        JMS TEST
0246  5253        JMP ASK5
0247  5243        JMP ASK4
0250  1156        TAD JMPRM8
0251  3203        DCA START+3
0252  5272        JMP ASK7
0253  1070  ASK5,  TAD PMESS7
0254  4403        JMS I PNTR1      /ASK OPERATOR ABOUT DF32
0255  4327        JMS TEST
0256  5263        JMP ASK6
0257  5253        JMP ASK5
0260  1157        TAD JMPD32
0261  3203        DCA START+3
0262  5272        JMP ASK7
0263  1071  ASK6,  TAD PMESS8
0264  4403        JMS I PNTR1      /ASK OPERATOR ABOUT RF08
0265  4327        JMS TEST
0266  5272        JMP ASK7
0267  5263        JMP ASK6
0270  1160        TAD JMPR08
0271  3203        DCA START+3
0272  1072  ASK7,  TAD PMESS9
0273  4403        JMS I PNTR1      /ASK OPERATOR ABOUT EXTENDED MENORY
0274  4327        JMS TEST
0275  5303        JMP .+6
0276  5272        JMP ASK7
0277  1073        TAD PMES10
0300  4403        JMS I PNTR1      /ASK HOW MUCH
0301  4404        JMS I PNTR2
0302  5277        JMP .-3
0303  7104        RAL CLL          /POSITION BITS
0304  7006        RTL
0305  3162        DCA FELD                 /STORE NUMBER OF EXTRA MEMORY BANKS
0306  4450        JMS I PNTR33             /CR-LF

                  /LOAD EXTENDED MEMORY FIELDS FOR
                  /DECTAPE, MAGTAPE, AND DISC/DRUM
0307  1134              TAD K0020
0310  3000              DCA 0
0311  1115              TAD M0003
0312  3010              DCA 10
0313  4405              JMS I PNTR3
0314  0123              AND K0070
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0315  3400          DCA I 0
0316  1162          TAD FELD
0317  7041          CIA
0320  1400          TAD I 0
0321  7740          SMA SZA CLA
0322  5313          JMP .-7
0323  2000          ISZ 0
0324  2010          ISZ 10
0325  5313          JMP .-12
0326  5201          JMP START+1
0327  0000  TEST,    0
0330  6032          KCC
0331  4406          JMS I PNTR4
0332  3153          DCA CHAR
0333  1153          TAD CHAR
0334  1116          TAD M0316
0335  7650          SNA CLA             /N-N0?
0336  5727          JMP I TEST          /YES
0337  2327          ISZ TEST            /NO, INCREMENT
0340  1153          TAD CHAR
0341  1117          TAD M0331
0342  7650          SNA CLA             /Y-YES?
0343  2327          ISZ TEST                    /YES, INCREMENT
0344  5727          JMP I TEST          /THEN EXIT

                /PROCESS POTENTIAL NON-EXISTANT DISC ERROR
0345  7200  NODISC, CLA
0346  6616          DEAC                /READ DISC STATUS
0347  7000          NOP
0350  3151          DCA DDSTAT
0351  1151          TAD DDSTAT
0352  7012          RTR
0353  7620          SNL CLA             /NON-EXISTANT DISC ERROR?
0354  5423          JMP I PNTR6                 /NO,EXIT
0355  1364          TAD PME11A                  /YES, TYPE OUT HEADER
0356  4403          JMS I PNTR1
0357  1151          TAD DDSTAT
0360  4445          JMS I PNTR24                /TYPE OUT STATUS WORD
0361  4450          JMS I PNTR33                /CR-LF
0362  7402          HLT                 /STOP
0363  5362          JMP .-1             /NON-RECOVERABLE ERROR-RESTART
0364  3062  PME11A, MESS11
                /338 DISPLAY STARTER ROUTINE
0365  7200  DIS338, CLA
0366  6145          6145                        /SET DISPLAY INITIAL CONDIITIONS TO 0
0367  7330          CLA CLL CML RAR             /SET AC TO 4000
0370  6155          6155                        /CLEAR BREAK FIELD REGISTER
0371  7200          CLA
0372  1376          TAD .+4                     /GET STARTING ADDRESS OF 338 PROGRAM
0373  6165          6165                        /LOAD DAC
0374  7200          CLA
0375  5205          JMP START+3
0376  3161          PRO338
```

```
                0400    *400
                        /DISC OR DRUM EXERCISER

        0400    7200    DDEXER, CLA
        0401    6601            6601            /CLEAR EF AND DONE
        0402    1133            TAD SKIP
        0403    3407            DCA I PNTR5
        0404    7604            LAS
        0405    0135            AND K0010
        0406    7640            SZA CLA         /SUPPRESS DISK OR DRUM?
        0407    5423            JMP I PNTR6     /YES, EXIT
        0410    7604            LAS
        0411    0104            AND K0200
        0412    7640            SZA CLA         /BIT 4 SET?
        0413    5365            JMP DDLOOP      /YES
        0414    4335            JMS DDSAVE      /SAVE PI STUFF
        0415    6001            ION
        0416    1105            TAD K7200
        0417    3015            DCA 15
        0420    1114            TAD BUFF3
        0421    3014            DCA 14
        0422    1230            TAD .+6
        0423    1022            TAD DDFELD
        0424    3226            DCA .+2
        0425    4424            JMS I PNTR7
        0426    6201            CDF
        0427    3414            DCA I 14                /STORE DATA IN OUTPUT BUFFER
        0430    6201            CDF
        0431    2015            ISE 15          /DONE
        0432    5225            JMP .-5         /NO
        0433    6002            IOF
        0434    4347            JMS DDREST              /RESTORE PI STUFF

        0435    5235    DDRITE, JMP .           /WRITE DATA ONTO DISC OR DRUM
        0436    6601            6601            /CLEAR FLAGS
        0437    7604            LAS
        0440    0135            AND K0010
        0441    7640            SZA CLA         /SUPPRESS DISC OR DRUM?
        0442    5423            JMP I PNTR6     /YES, EXIT
        0443    5243    DDREAD, JMP .           /READ DATA FROM DISC OR DRUM
        0444    6601            6601            /CLEAR FLAGS
        0445    4335            JMS DDSAVE      /SAVE PI STUFF
        0446    6001            ION             /TURN ON INTERRUPT
        0447    1114            TAD BUFF3       /OUTPUT BUFFER
        0450    3014            DCA 14
        0451    1113            TAD BUFF6       /INPUT BUFFER
        0452    3015            DCA 15
        0453    1105            TAD K7200       /COUNT
        0454    3174            DCA DDCNTR
        0455    1264            TAD .+7
        0456    1022            TAD DDFELD
        0457    3260            DCA .+1
        0460    6201            CDF
        0461    1414            TAD I 14        /COMPARE DATA OUT WITH DATA IN
```

```
0462  7041          CIA
0463  1415          TAD I 15
0464  6281          COF
0465  7440          SZA               /GOOD?
0466  4425          JMS I PNTR8       /NO, DATA ERROR
0467  2174          ISZ DDCNTR        /DONE?
0470  5260          JMP .-10          /NO
0471  7604          LAS
0472  7010          RAR
0473  7630          SZL CLA           /CHANGE MEMORY FIELD?

0474  5305          JMP .+11          /NO
0475  4424          JMS I PNTR7       /YES
0476  0123          AND K0070
0477  3022          DCA DDFELD
0500  1162          TAD FELD
0501  7041          CIA
0502  1022          TAD DDFELD
0503  7740          SMA SZA CLA
0504  5275          JMP .-7
0505  6002          IOF
0506  4347          JMS DDREST        /RESTORE PI STUFF
0507  5200          JMP DDEXER



                    /RM08 DRUM EXERCISER SETUP ROUTINE

0510  1315    RM08EX, TAD RM08RI
0511  3235            DCA DDRITE
0512  1316            TAD RM08RE
0513  3243            DCA DDREAD
0514  5200            JMP DDEXER
0515  4430    RM08RI, JMS I PNTR11
0516  4431    RM08RE, JMS I PNTR12
                    /RF08 DISC EXERCISER SETUP ROUTINE
0517  1324    RF08EX, TAD RF08RI
0520  3235            DCA DDRITE
0521  1325            TAD RF08RE
0522  3243            DCA DDREAD
0523  5200            JMP DDEXER
0524  4426    RF08RI, JMS I PNTR9
0525  4427    RF08RE, JMS I PNTR10

                    /DF32 DISC EXERCISER SETUP ROUTINE

0526  1333    DF32EX, TAD DF32RI
0527  3235            DCA DDRITE
0530  1334            TAD DF32RE
0531  3243            DCA DDREAD
0532  5200            JMP DDEXER
0533  4433    DF32RI, JMS I PNTR14
0534  4434    DF32RE, JMS I PNTR15
```

```
                        /DISC-DRUM SAVE SUBROUTINE
0535  0000    DDSAVE, 0
0536  1144            TAD AC          /SAVE AC
0537  3361            DCA DDAC
0540  1145            TAD LINK        /LINK
0541  3362            DCA DDLINK
0542  1456            TAD I PNTR40    /MEMORY FIELD
0543  3363            DCA DDIB
0544  1000            TAD 0           /AND LOC 0
0545  3364            DCA DDPC
0546  5735            JMP I DDSAVE

                        /DISC-DRUM RESTORE SUBROUTINE
0547  0000    DDREST, 0
0550  1361            TAD DDAC        /RESTORE SAVED AC
0551  3144            DCA AC
0552  1362            TAD DDLINK      /LINK
0553  3145            DCA LINK
0554  1363            TAD DDIB        /MEMORY FIELD
0555  3456            DCA I PNTR40
0556  1364            TAD DDPC        /AND LOC 0
0557  3000            DCA 0
0560  5747            JMP I DDREST

0561  0000    DDAC,   0
0562  0000    DDLINK, 0
0563  0000    DDIB,   0
0564  0000    DDPC,   0

                        /DISC-DRUM LOOP ROUTINE
0565  7604    DDLOOP, LAS
0566  0132            AND K0100
0567  7640            SZA CLA         /LOOP ON READ?
0570  5373            JMP .+3         /NO, WRITE
0571  1243            TAD DDREAD      /YES, READ
0572  7410            SKP
0573  1235            TAD DDRITE
0574  3375            DCA .+1
0575  7402            HLT             /JMS INSTRUCTION IS STORED HERE
0576  5200            JMP DDEXER


      0600    *600
                        /DECTAPE STARTER ROUTINE

0600  7200    DECTAP, CLA
0601  3175            DCA LOOK                /ZERO BLOCK SPECIFIER
0602  1376            TAD K0604
0603  6766            DTLA            /LOAD "A" WITH "GO,REVERSE,MOVE,ENABLE,CLEAR"
0604  1163            TAD DTPNTR
0605  3435            DCA I PNTR16    /SET UP RETURN FROM P.I.
0606  5607            JMP I .+1
0607  0202            START+2
```

```
                    /MAGTAPE STARTER ROUTINE

0610  7200    MAGTAP, CLA
0611  3150            DCA RECORD      /CLEAR RECORD COUNT
0612  1110            TAD K0014
0613  6711            MTCR            /SKIP IF MAG TAPE CONTROL READY
0614  7402    MTHLT1, HLT
0615  6716            MTLC            /LOAD COMMAND REGISTER WITH "REWIND, ENABLE"
0616  6721            MTTR            /SKIP IF MAG TAPE UNIT READY
0617  7402    MTHLT2, HLT
0620  7200            CLA
0621  6722            MTGO            /GO
0622  1164            TAD MTPNTR
0623  3437            DCA I PNTR10
0624  5625            JMP I .+1
0625  0203            START+3


                    /RM08 DRUM STARTER ROUTINE

0626  0204            START+4
0627  7201    RM08,   CLA IAC
0630  6624            DRFS            /LOAD SECTOR COUNTER TO 1
0631  1114            TAD BUFF3
0632  6605            DRCW            /LOAD CORE ADDRESS, WRITE
0633  1141            TAD DRUMAD
0634  6615            DRTS            /LOAD DRUM ADDRESS, INITIATE XFER
0635  1165            TAD RM08PR
0636  3432            DCA I PNTR13
0637  1105            TAD K7200
0640  3704            DCA I PNTR46
0641  1705            TAD I PNTR47
0642  3703            DCA I PNTR45
0643  5626            JMP I RM08-1

                    /DF32 DISC STARTER ROUTINE

0644  7244    DF32,   CLA CMA RAL
0645  3475            DCA I K7750     /SET UP W.C.
0646  1114            TAD BUFF3
0647  3476            DCA I K7751     /SET UP C.A.
0650  1137            TAD DISCEA
0651  6615            DEAL            /LOAD CONTROL WITH DISC EXTENDED ADDRESS
0652  7200            CLA
0653  1140            TAD DISCAD
0654  6605            DMAW            /LOAD DISC ADDRESS AND WRITE
0655  1166            TAD DF32PR
0656  3432            DCA I PNTR13
0657  1306            TAD JMPCON
0660  3704            DCA I PNTR46
0661  5241            JMP RM08+12
```

```
                    /RF08   DISC STARTER ROUTINE

0662  7244    RF08,   CLA CMA RAL
0663  3475            DCA I K7750     /SET UP WC
0664  1114            TAD BUFF3
0665  3476            DCA I K7751     /SET UP CA
0666  1143            TAD INTERN
0667  6615            DIML            /SET UP INTERRUPT ENABLES
0670  1142            TAD TRACK
0671  6643            DXAL            /LOAD DISC EXTENDED ADDRESS
0672  1140            TAD DISCAD      /LOAD DISC ADDRESS AND WRITE
0673  6605            DMAW
0674  1167            TAD RF08PR
0675  3432            DCA I PNTR13
0676  1133            TAD SKIP        /SET UP SKIP CHAIN
0677  3703            DCA I PNTR45
0700  1705            TAD I PNTR47
0701  3704            DCA I PNTR46
0702  5626            JMP I RM08-1    /RETURN TO START+4
0703  2626    PNTR45, EXIT-2
0704  2627    PNTR46, EXIT-1
0705  2624    PNTR47, EXIT-4

0706  5461    JMPCON, JMP I PNTR48


                    /DF32 DISC WAIT FOR FLAG AND NO ERRORS SUBROUTINE

0707  0000    DF32WT, 0
0710  4432            JMS I PNTR13    /WAIT FOR DISC FLAG
0711  6621            DFSE            /ANY ERRORS?
0712  7410            SKP             /YES
0713  5707            JMP I DF32WT    /NO
0714  7604            LAS
0715  7006            RTL
0716  7510            SPA             /PRINT ERRORS?
0717  5331            JMP HALT4-2     /NO
0720  7200            CLA
0721  6616            DEAC            /READ STATUS
0722  7000            NOP
0723  3151            DCA DDSTAT
0724  1375            TAD PMES11
0725  4403            JMS I PNTR1     /TYPE OUT HEADER
0726  1151            TAD DDSTAT
0727  4445            JMS I PNTR24    /TYPE OUT STATUS WORD
0730  4450            JMS I PNTR33    /CRLF
0731  7604            LAS
0732  7700            SMA CLA         /HALT ON ERROR?
0733  7402    HALT4,  HLT             /YES
0734  5707            JMP I DF32WT    /EXIT

                    /DF32 DISC WRITE SUBROUTINE

0735  0000    DF32WR, 0
```

```
      0736  7200              CLA
      0737  1105              TAD K7200
      0740  3475              DCA I K7750      /SET UP W. C
      0741  1114              TAD BUFF3
      0742  3476              DCA I K7751      /SET UP C.A
      0743  1022              TAD DDFELD       /COMBINE DISC CORE MEMORY FIELD
      0744  1137              TAD DISCEA       /AND DISC EXTENDED ADDRESS
      0745  6615              DEAL             /AND TRANSFER TO DISC CONTROL
      0746  7200              CLA
      0747  1140              TAD DISCAD
      0750  6605              DMAW             /LOAD DISC ADDRESS AND WRITE
      0751  4307              JMS DF32WT       /WAIT FOR DISC FLAG
      0752  6621              DFSE             /ANY ERRORS
      0753  5336              JMP DF32WR+1     /YES, REPEAT FUNCTION
      0754  5735              JMP I DF32WR     /EXIT
                        /DF32 DISC READ SUBROUTINE

      0755  0000        DF32RD, 0
      0756  7200              CLA
      0757  1105              TAD K7200
      0760  3475              DCA I K7750      /SET UP WC
      0761  1113              TAD BUFF6
      0762  3476              DCA I K7751      /SET UP CA
      0763  1022              TAD DDFELD       /COMBINE DISC CORE MEMORY FIELD
      0764  1137              TAD DISCEA       /AND DISC EXTENDED ADDRESS
      0765  6615              DEAL             /AND XFER TO DISC CONTROL
      0766  7200              CLA
      0767  1140              TAD DISCAD
      0770  6603              DMAR             /LOAD DISC ADDRESS AND READ
      0771  4307              JMS DF32WT       /WAIT FOR DISC FLAG
      0772  6621              DFSE             /ANY ERRORS?
      0773  5356              JMP DF32RD+1     /YES, REPEAT FUNCTION
      0774  5755              JMP I DF32RD     /EXIT
      0775  3062        PMES11, MESS11
      0776  0604        K0604,  0604           /GO, REVERSE, MOVE, ENABLE


                        /OM01 - TAPE2
            1000        *1000
                        /DECTAPE SEARCH ROUTINE

      1000  0000        SEARCH, 0
      1001  1346              TAD FOUND+1
      1002  3502              DCA I K7755      /SET UP BLOCK NUMBER TO GO TO FOUND
      1003  1355              TAD K0614        / SEARCH, NORM, REV, ENABLE
      1004  6766              DTLA             /LOAD A
      1005  6774              DTLB             /CLEAR B
      1006  4435              JMS I PNTR16     /WAIT FOR DECTAPE FLAG
      1007  6772              DTRB             /READ B
      1010  7006              RTL
      1011  7700              SMA [illegible]  [illegible]
      1012  5216              JMP [illegible]
      1013  1354              TAD [illegible]  [illegible]
      1014  6 64              DT[illegible]    /AROUND
      1015  5206              [illegible] SEARCH+6
```

```
1016  4772            DTRB            /READ STATUS B
1017  7700            SMA CLA         /DECTAPE ERROR
1020  5223            JMP .+3         /NO
1021  4307            JMS DTWAIT      /YES, STOP TRANSPORT, ETC
1022  5203            JMP SEARCH+3    /TRY SEARCHING AGAIN
1023  4761            DTRA            /READ A
1024  7006            RTL             /MOVE DIRECTION
1025  7006            RTL             /BIT INTO LINK
1026  7200            CLA
1027  1345            TAD FOUND       /GET BLOCK NUMBER FOUND
1030  7041            CIA
1031  1175            TAD LOOK
1032  7450            SNA             /CURRENT BLOCK?
1033  5243            JMP LOCBED      /YES, CHECK DIRECTION
1034  7041            CIA             /NO, TAKE 2'S COMPLEMENT
1035  7420            SNL             /LINK IS 1 IF BKWD AND NOT AT OR LOWER THAN BLOCK
1036  1352            TAD K0002       /ADD TWO TO ENABLE TURN AROUND
1037  7620            SNL CLA         /TURN AROUND (3 BEYOND)?
1040  1103            TAD K0400       /YES
1041  6764            DTXA            /CLEAR FLAG
1042  5206            JMP SEARCH+6    /WAIT FOR NEXT FLAG
1043  7620  LOCBED,   SNL CLA         /FOUND BLOCK FORWARD?
1044  5241            JMP .-3         /NO
1045  6764            DTXA            /YES, CLEAR FLAGS
1046  5600            JMP I SEARCH    /EXIT


                      /DECTAPE READ SUBROUTINE

1047  0000  DTREAD,   0
1050  4200            JMS SEARCH      /SEARCH OUT BLOCK
1051  4337            JMS DTERR
1052  5250            JMP .-2
1053  1020            TAD DTFELD
1054  6774            DTLB            /LOAD MEMORY FIELD REGISTER
1055  1350            TAD K0130
1056  6764            DTXA            /CHANGE FROM SEARCH TO READ DATA CONT
1057  1105            TAD K7200
1060  3501            DCA I K7754     /SET UP WC
1061  1107            TAD BUFF4
1062  3502            DCA I K7755     /SET UP CA
1063  4307            JMS DTWAIT      /WAIT FOR DECTAPE FLAG
1064  4337            JMS DTERR       /ERRORS?
1065  5250            JMP DTREAD+1    /YES, REPEAT FUNCTION
1066  5647            JMP I DTREAD    /EXIT
                      /DECTAPE WRITE SUBROUTINE
1067  0000  DTRITE,   0
1070  4200            JMS SEARCH      /SEARCH OUT BLOCK
1071  4337            JMS DTERR
1072  5270            JMP .-2
1073  1020            TAD DTFELD
1074  6774            DTLB            /LOAD MEMORY FIELD REGISTOR
1075  1351            TAD K0150
1076  6764            DTXA            /CHANGE FROM SEARCH TO WRITE DATA CONT.
1077  1105            TAD K7200
```

```
1100 3501         DCA I K7754      /SETUP WC
1101 [illegible]  TAD WORDS
1102 3502         DCA I K7755      /SET UP CA
1103 4307         JMS DTWAIT       /WAIT FOR DECTAPE FLAG
1104 4537         JMS I DTERR      /ERRORS?
1105 5270         JMP DTRDSR+1     /REPEAT FUNCTION
1106 5647         JMP I [illegible]TE

        /SUBROUTINE TO WAIT FOR DECTAPE FLAG AND NO ERRORS
        /EXIT WITH TRANSPORT STOPPED

1107 0000  DTWAIT, 0
1110 4432         JMS I PNTR10     /WAIT FOR [illegible] FLAG
1111 [illegible]  DTRB             /READ STATUS B
1112 0204         [illegible]
1113 [illegible]  [illegible]
1114 [illegible]  [illegible]
1115 [illegible]  [illegible]
1116 [illegible]  SNA CLA          /ERRORS?
1117 [illegible]  JMP I DTWAIT     /NO
1120 [illegible]  [illegible]
1121 [illegible]  RTL
1122 [illegible]  SPA CLA          /PRINT ERRORS?
1123 [illegible]  JMP WAIT[illegible]
1124 [illegible]  DTRB             /READ STATUS
1125 [illegible]  DCA DTSTAT
1126 [illegible]  TAD [illegible]
1127 [illegible]  JMS I PNTR[illegible]  /[illegible] HEADER
1130 [illegible]  TAD DTSTAT
1131 [illegible]  JMS I PNTR24     /TYPE OUT STATUS WORD

1132 [illegible]  JMS I PNTR35     /CR-LF

1133 [illegible]  [illegible]
1134 [illegible]  [illegible] CLA  [illegible]
1135 [illegible]  [illegible] HLT  /[illegible]
1136 [illegible]  JMP I [illegible]

        /DECTAPE ERROR ROUTINE, DON'T SKIP IF ANY ERROR

1137 0000  DTERR, 0
1140 7200         CLA
1141 [illegible]  DTRB
1142 7700         SMA CLA
1143 2337         ISZ DTERR
1144 5737         JMP I DTERR
1145 0000  FOUND, 0                /BLOCK FOUND
1146 [illegible]  [illegible]
1147 [illegible]  [illegible],  [illegible]
1150 0130  [illegible]  [illegible]  /SEARCH TO READ DATA CONTINUOUS
1151 0190  [illegible]  [illegible]  /SEARCH TO WRITE DATA CONTINUOUS
1152 0002  K0002, 0002
1153 0003  K0003, 0003
```

```
1154  0600    K0600,  0600            /REVERSE, GO
1155  0614    K0614,  0614            /SEARCH, NORMAL, REVERSE, ENABLE
1156  2403    MESS16, 2403            /T.C
1157  6570            6570            /5.8
1160  4004            4004            /SP.D
1161  0124            0124            /A.T
1162  0140            0140            /A.SP
1163  0522            0522            /E.R
1164  2217            2217            /R.O
1165  2240            2240            /R.SP
1166  1116            1116            /I.N
1167  4002            4002            /SP.B
1170  0116            0116            /A.N
1171  1340            1340            /K.SP
1172  4000            4000            /SP,END


      1200    *1200
              /MAGTAPE READ SUBROUTINE

1200  0000    MTREAD, 0
1201  4240            JMS REWIND      /REWIND TAPE
1202  4436            JMS I PNTR17    /SPACE TO BEGINNING OF RECORD
1203  1356            TAD K0626
1204  6716            MTLC            /LOAD CM WITH "ODD,7CH,READ,ENABLE,800" AND CLEAR FLAGS
1205  7200            CLA
1206  1105            TAD K7200
1207  3477            DCA I K7752     /SET UP WC
1210  1111            TAD BUFF3
1211  3500            DCA I K7753     /SET UP CA
1212  1021            TAD MTFELD
1213  6722            MTGO            /LOAD EXTENDED FIELD REGISTER, GO
1214  4266            JMS MTWAIT      /WAIT FOR MT FLAG AND NO ERRORS
1215  4255            JMS MTERR       /ERRORS?
1216  5201            JMP MTREAD+1    /YES, REPEAT FUNCTION
1217  5600            JMP I MTREAD    /NO, EXIT

              /MAGTAPE READ-COMPARE SUBROUTINE

1220  0000    RDCOMP, 0
1221  4240            JMS REWIND      /REWIND TAPE
1222  4436            JMS I PNTR17    /SPACE TO BEGINNING OF RECORD
1223  1355            TAD K0636
1224  6716            MTLC            /LOAD CM WITH "ODD,7CH,RD COMP,ENABLE800" AND CLEAR FLAGS
1225  7200            CLA
1226  1105            TAD K7200
1227  3477            DCA I K7752     /SET UP WC
1230  1112            TAD BUFF2
1231  3500            DCA I K7753     /SET UP CA
1232  1021            TAD MTFELD
1233  6722            MTGO            /LOAD EXTENDED FIELD REGISTER, GO
1234  4266            JMS MTWAIT      /WAIT FOR MT FLAG AND NO ERRORS
1235  4255            JMS MTERR       /ERRORS?
1236  5221            JMP RDCOMP+1    /YES,REPEAT FUNCTION
```

```
1237  5628          JMP I RDCOMP    /NO, EXIT


                /MAGTAPE REWIND SUBROUTINE (ACTUALLY SPACE REVERSE)

1240  0000    REWIND, 0
1241  1254            TAD K0676
1242  6716            MTLC            /LOAD CM WITH "ODD,7CH,SPACE REVERSE,ENABLE,800" AND CLEAR FLAGS
1243  7200            CLA
1244  6722            MTGO            /SET GO
1245  3477            DCA I K7752     /SET UP W.C.
1246  4266            JMS MTWAIT      /WAIT FOR MT FLAG
1247  6706            MTRS            /READ STATUS
1250  7006            RTL
1251  7700            SMA CLA         /BOT?
1252  5241            JMP REWIND+1    /NO, TRY AGAIN
1253  5640            JMP I REWIND    /YES, EXIT
1254  0676    K0676,  0676            /ODD,7CH,SPACE REVERSE,ENABLE,800


                /MAG TAPE ERROR ROUTINE
1255  0000    MTERR,  0
1256  6706            MTRS            /READ STATUS
1257  7500            SMA             /ERRORS?
1260  5263            JMP .+3         /NO
1261  0136            AND K1000       /YES
1262  7640            SZA CLA         /BOT?
1263  2255            ISZ MTERR       /YES, NO ERROR
1264  7200            CLA
1265  5655            JMP I MTERR
                /SUBROUTINE TO WAIT FOR MAGTAPE FLAG AND NO ERRORS
                /EXIT WITH TRANSPORT STOPPING

1266  0000    MTWAIT, 0
1267  4437            JMS I PNTR18    /WAIT FOR MAGTAPE FLAG
1270  4255            JMS MTERR       /READ MAGTAPE STATUS
1271  7410            SKP             /ERRORS?
1272  5312            JMP HALT2+2     /NO
1273  7604            LAS
1274  7006            RTL
1275  7710            SPA CLA         /PRINT ERRORS?
1276  5306            JMP HALT2-2     /NO
1277  6706            MTRS
1300  3147            DCA MTSTAT
1301  1326            TAD PMES13
1302  4403            JMS I PNTR1     /TYPE OUT HEADER
1303  1147            TAD MTSTAT
1304  4445            JMS I PNTR24    /TYPE OUT STATUS WORD

1305  4450            JMS I PNTR33    /CRLF
1306  7604            LAS
1307  7700            SMA CLA         /HALT ON ERROR?
1310  7402    HALT2,  HLT             /YES
```

```
1311  5666          JMP I MTWAIT
1312  6712          MTAF                /CLEAR FLAGS
1313  4727          JMS I PNTR43
1314  6001          ION
1315  6721          MTTR                /WAIT FOR
1316  5315          JMP .-1             /TAPE TRANSPORT READY
1317  6002          IOF
1320  4730          JMS I PNTR44
1321  5666          JMP I MTWAIT
1322  0000  DTAC,    0
1323  0000  DTLINK,  0
1324  0000  DTIB,    0
1325  0000  DTPC,    0
1326  3106  PMES13,  MESS13
1327  2132  PNTR43,  MTSAVE
1330  2144  PNTR44,  MTREST

                    /DECTAPE SAVE SUBROTINE
1331  0000  DTSAVE,  0
1332  1144          TAD AC              /SAVE AC
1333  3322          DCA DTAC
1334  1145          TAD LINK            /LINK
1335  3323          DCA DTLINK
1336  1456          TAD I PNTR40        /MEMORY FIELD
1337  3324          DCA DTIB
1340  1000          TAD 0               /AND LOC 0
1341  3325          DCA DTPC
1342  5731          JMP I DTSAVE

                    /DECTAPE RESTORE SUBROUTINE
1343  0000  DTREST,  0
1344  1322          TAD DTAC            /RESTORE SAVED AC
1345  3144          DCA AC
1346  1323          TAD DTLINK          /LINK
1347  3145          DCA LINK
1350  1324          TAD DTIB            /MEMORY FIELD
1351  3456          DCA I PNTR40
1352  1325          TAD DTPC            /AND LOC 0
1353  3000          DCA 0
1354  5743          JMP I DTREST

1355  0636  K0636,   0636               /ODD, 7CH READ COMPARE, ENABLE, 800
1356  0626  K0626,   0626               /ODD, 7CH, READ, ENABLE, 800
1357  0411  MESS17,  0411               /D,I
1360  2303          2303                /S,C
1361  4017          4017                /SP,O
1362  2240          2240                /R,SP
1363  0422          0422                /D,R
1364  2515          2515                /U,M
1365  4004          4004                /SP,D
1366  0124          0124                /A,T
1367  0140          0140                /A,SP
1370  0522          0522                /E,R
```

```
1371  2217          2217            /R,D
1372  2240          2240            /R,SP
1373  1116          1116            /I,N
1374  4002          4002            /SP,B
1375  0116          0116            /A,N
1376  1340          1340            /K,SP
1377  4000          4000            /SP,END


      1400          *1400
                    /RM08 DRUM READ SUBROUTINE

1400  0000          RM08RD, 0
1401  7200                  CLA
1402  1022                  TAD DDFELD      /COMBINE MEMORY FIELD
1403  1122                  TAD K3000       /AND NUMBER OF SECTORS
1404  6624                  DRFS            /TO DRUM CONTROL
1405  7201                  CLA IAC
1406  1113                  TAD BUFF6
1407  6603                  DRCR            /LOAD CORE MEMORY ADDRESS, READ
1410  1141                  TAD DRUMAD
1411  6615                  DRTS            /LOAD DRUM ADDRESS REGISTER, INITIATE XFER
1412  4234                  JMS DRUMWT      /WAIT FOR DONE FLAG AND  NO ERRORS
1413  6621                  DRSE            /ERRORS?
1414  5201                  JMP RM08RD+1    /YES, REPEAT XFER
1415  5600                  JMP I RM08RD    /NO

                    /RM08 DRUM WRITE SUBROUTINE

1416  0000          RM08WR, 0
1417  7200                  CLA
1420  1022                  TAD DDFELD      /COMBINE MEMORY FIELD
1421  1122                  TAD K3000       /AND NUMBER OF SECTORS
1422  6624                  DRFS            /TO CONTROL
1423  7201                  CLA IAC
1424  1114                  TAD BUFF3
1425  6605                  DRCW            /LOAD CORE MEMORY ADDRESS, WRITE
1426  1141                  TAD DRUMAD
1427  6615                  DRTS            /LOAD DRUM ADDRESS REGISTER, INITIATE XFER
1430  4234                  JMS DRUMWT      /WAIT FOR DRUM FLAG AND NO ERRORS
1431  6621                  DRSE            /ERRORS?
1432  5217                  JMP RM08WR+1    /YES, REPEAT XFER
1433  5616                  JMP I RM08WR    /NO

                    /DRUM WAIT FOR FLAG AND NO ERRORS SUBROUTINE

1434  0000          DRUMWT, 0
1435  4432                  JMS I PNTR13    /WAIT FOR DRUM FLAG
1436  6621                  DRSE            /ANY ERRORS
1437  7410                  SKP
1440  5634                  JMP I DRUMWT    /NO
1441  7604                  LAS             /YES, PRINT ERRORS?
1442  7006                  RTL
```

```
1443  7510            SPA                 /PRINT ERRORS.
1444  5255            JMP HALT3-2
1445  7200            CLA
1446  6612            DREF                /READ STATUS
1447  3151            DCA DDSTAT
1450  1363            TAD PMES14
1451  4403            JMS I PNTR1         /TYPE OUT HEADER
1452  1151            TAD DDSTAT

1453  4445            JMS I PNTR24        /TYPE OUT ERROR STATUS
1454  4450            JMS I PNTR33        /CRLF
1455  7604            LAS
1456  7700            SMA CLA             /HALT ON ERROR?
1457  7402  HALT3,    HLT                 /YES
1460  5634            JMP I DRUMWT

                /RF08 DISC READ SUBROUTINE
1461  0000  RF08RD, 0
1462  1105            TAD K7200
1463  3475            DCA I K7750         /SET UP WC
1464  1113            TAD BUFF6
1465  3476            DCA I K7751         /SET UP CA
1466  1022            TAD DDFELD          /COMBINE DISC CORE MEMORY FIELD
1467  1143            TAD INTERN          /AND INTERRUPT ENABLES
1470  6615            DIML                /AND TRANSFER TO DISC CONTROL
1471  1142            TAD TRACK
1472  6643            DXAL                /LOAD DISC EXTENDED ADDRESS
1473  1140            TAD DISCAD
1474  6603            DMAR                /LOAD DISC ADDRESS AND READ
1475  4321            JMS RF08WT          /WAIT FOR DISC FLAG
1476  6621            DFSE                /ANY ERRORS?
1477  5661            JMP I RF08RD        /NO
1500  5262            JMP RF08RD+1        /YES, REPEAT FUNCTION

                /RF08 DISC WRITE SUBROUTINE
1501  0000  RF08WR, 0
1502  1105            TAD K7200
1503  3475            DCA I K7750         /SET UP WC
1504  1114            TAD BUFF3
1505  3476            DCA I K7751         /SET UP CA
1506  1022            TAD DDFELD          /COMBINE DISC CORE MEMORY FIELD
1507  1143            TAD INTERN          /AND INTERRUPT ENABLES
1510  6615            DIML                /AND TRANSFER TO DISC CONTROL
1511  1142            TAD TRACK
1512  6643            DXAL                /LOAD DISC EXTENDED ADDRESS
1513  1140            TAD DISCAD
1514  6605            DMAW                /LOAD DISC ADDRESS AND WRITE
1515  4321            JMS RF08WT          /WAIT FOR DISC FLAG
1516  6621            DFSE                /ANY ERRORS
1517  5701            JMP I RF08WR        /NO
1520  5302            JMP RF08WR+1        /YES

               /RF08 DISC WAIT FOR FLAG AND NO ERRORS SUBROUTINE
               /(TRANSFERS CONTROL TO "DF32WT" IF ANY ERRORS)
```

```
1521  0000    RF08WT, 0
1522  4432            JMS I PNTR13    /WAIT FOR DISC FLAG
1523  6621            DFSE            /ANY ERRORS?
1524  5721            JMP I RF08WT    /NO
1525  1321            TAD RF08WT      /YES
1526  3731            DCA I .+3       /SAVE "PC"
1527  5730            JMP I .+1       /TRANSFER CONTROL TO
1530  0714            DF32WT +5       /DDF32 ERROR TYPEOUT
1531  0707            DF32WT


                /MAGTAPE WRITE ROUTINE

1532  0000    MTRITE, 0
1533  7200            CLA
1534  1364            TAD K0746
1535  6716            MTLC            /LOAD CM WITH "ODD,7CH,3 IN. GAP,WRITE,800" AND CLEAR FLAGS
1536  7200            CLA
1537  1105            TAD K7200
1540  3477            DCA I K7752     /SET UP WC
1541  1112            TAD BUFF2
1542  3500            DCA I K7753     /SET UP CA
1543  1021            TAD MTFELD
1544  6722            MTGO            /LOAD EXTENDED FIELD REGISTER, GO
1545  4447            JMS I PNTR32    /WAIT FOR MT FLAG AND NO ERRORS
1546  2150            ISZ RECORD      /INCREMENT NUMBER OF RECORDS
1547  5352            JMP .+3
1550  4440            JMS I PNTR19    /4096 RECORDS, REWIND TAPE
1551  5333            JMP MTRITE+1    /START OVER
1552  4441            JMS I PNTR20    /ANY ERRORS
1553  7410            SKP
1554  5732            JMP I MTRITE    /NO, EXIT
1555  4440            JMS I PNTR19    /YES, REWIND TAPE
1556  4436            JMS I PNTR17    /SPACE FORWARD TO BEGINNING OF THIS RECORD
1557  7240            CLA CMA
1560  1150            TAD RECORD      /DECREMENT RECORD COUNT
1561  3150            DCA RECORD
1562  5334            JMP MTRITE+2    /TRY AGAIN
1563  3120    PMES14, MESS14
1564  0746    K0746,  0746            /ODD, 7CH, WRITE, ENABLE, 800
1565  2403    MESS02, 2403            /T,C
1566  6061            6061            /0,1
1567  4004            4004            /SP,D
1570  0503            0503            /E,C
1571  2401            2401            /T,A
1572  2005            2005            /P,E
1573  7700            7700            /?,END


      1600      *1600
                /DECTAPE EXERCISER

1600  7200    DTEXER, CLA
1601  6764            DTXA            /CLEAR EF AND DTF
1602  1133            TAD SKIP
```

```
1603  3320          DCA DTDATA+6
1604  7004          LAS
1605  0124          AND K0040
1606  7640          SZA CLA          /SUPPRESS DECTAPE?
1607  5423          JMP I PNTR6      /YES, EXIT
1610  4457          JMS I PNTR41     /SAVE PI STUFF
1611  6001          ION
1612  1105          TAD K7200
1613  3011          DCA 11
1614  1106          TAD BUFF1
1615  3010          DCA 10
1616  1224          TAD .+6
1617  1026          TAD DTFELD
1620  3222          DCA .+2
1621  4442          JMS I PNTR21
1622  6201          CDF
1623  3410          DCA I 10         /STORE DATA IN OUTPUT BUFFER
1624  6201          CDF
1625  2011          ISZ 11           /DONE
1626  5221          JMP .-5          /NO
1627  1175          TAD LOOK
1630  1311          TAD K0003A       /INCREMENT BLOCK BY 3
1631  3175          DCA LOOK
1632  7300          CLA CLL
1633  1175          TAD LOOK
1634  1120          TAD M2700
1635  7630           SEL CLA
1636  5231          JMP .-5
1637  6002          IOF
1640  4460          JMS I PNTR42     /RESTORE PI STUFF
1641  4443          JMS I PNTR22     /WRITE DATA ONTO DECTAPE
1642  6764          DTXA             /CLEAR FLAGS
1643  4444          JMS I PNTR23     /READ DATA FROM DECTAPE
1644  1367          TAD K0004        /STOP TAPE, CLEAR ENABLE AND
1645  6764          DTXA             /CLEAR FLAGS
1646  4457          JMS I PNTR41     /SAVE PI STUFF

1647  6001          ION              /TURN ON INTERRUPT
1650  1106          TAD BUFF1        /OUTPUT BUFFER
1651  3010          DCA 10
1652  1107          TAD BUFF4        /INPUT BUFFER
1653  3011          DCA 11
1654  1105          TAD K7200        /COUNT
1655  3170          DCA DTCNTR
1656  1265          TAD .+7
1657  1020          TAD DTFELD
1660  3261          DCA .+1
1661  6201          CDF
1662  1410          TAD I 10         /COMPARE DATA OUT WITH DATA IN
1663  7041          CIA
1664  1411          TAD I 11
1665  6201          CDF
1666  7440          SZA              /GOOD?
1667  4312          JMS DTDATA       /NO, DATA ERROR
```

```
1670  8170            ISZ DTCNTR      /DONE?
1671  5261            JMP .-1         /NO
1672  6002            IOF             /YES
1673  4460            JMS I PNTR42    /RESTORE PI STUFF
1674  7604            LAS
1675  7010            RAR
1676  7630            SZL CLA         /CHANGE MEMORY FIELD?
1677  5200            JMP DTEXER      /NO
1700  4442            JMS I PNTR21    /YES
1701  0123            AND K0070
1702  3020            DCA DTFELD
1703  1162            TAD FELD
1704  7041            CIA
1705  1020            TAD DTFELD
1706  7740            SMA SZA CLA
1707  5300            JMP .-7
1710  5200            JMP DTEXER
1711  0003    K0003A, 3

                /DECTAPE DATA ERROR ROUTINE

1712  0000    DTDATA, 0
1713  7604            LAS
1714  0103            AND K0400
1715  7640            SZA CLA
1716  5361            JMP CHNGE1+1
1717  6002            IOF
1720  7610            SKP CLA         /OR CLA
1721  5335            JMP .+14
1722  1366            TAD PMES18
1723  4403            JMS I PNTR1     /TYPE OUT HEADER
1724  1020            TAD DTFELD
1725  7110            RAR CLL
1726  7012            RTR
1727  4445            JMS I PNTR24    /AND DATA FIELD
1730  1074            TAD PMES15
1731  4403            JMS I PNTR1     /TYPE OUT REST OF HEADER
1732  1105            TAD K7200
1733  3320            DCA DTDATA+6
1734  4450            JMS I PNTR33
1735  1020            TAD DTFELD
1736  1360            TAD CHNGE1
1737  3340            DCA .+1
1740  6201            CDF
1741  1010            TAD 10          /PICK UP "GOOD" ADDRESS
1742  4445            JMS I PNTR24
1743  1125            TAD K0240
1744  4446            JMS I PNTR25
1745  1571            TAD I TEMP      /PICK UP "GOOD" DATA
1746  4445            JMS I PNTR24
1747  1125            TAD K0240
1750  4446            JMS I PNTR25
1751  1011            TAD 11          /PICK UP "BAD" ADDRESS
1752  4445            JMS I PNTR24
```

```
1753  1125            TAD K0240
1754  4446            JMS I PNTR29
1755  1571            TAD I TEMP      /PICK UP "BAD" DATA
1756  4445            JMS I PNTR24
1757  4450            JMS I PNTR33
1760  6201  CHNGE1,   CDF
1761  7604            LAS
1762  7004            RAL
1763  7700            SMA CLA         /HALT ON ERROR?
1764  7402            HLT             /YES
1765  5712            JMP I DTDATA
1766  3144  PMES18,   MESS18
1767  0004  K0004,    4               /ENABLE
1770  2215  MESS06,   2215            /R.M
1771  6070            6070            /0.8
1772  4004            4004            /SP.D
1773  2225            2225            /R.V
1774  1577            1577            /M.?
1775  0000            0               /END


                      /DM01 - TAPE 3
      2000            *2000
                      /MAG TAPE EXERCISER

2000  7200  MTEXER,   CLA
2001  6712            MTAF            /CLEAR MTF AND EF
2002  1133            TAD SKIP
2003  3762            DCA I PNTR26
2004  7604            LAS
2005  0134            AND K0020
2006  7640            SZA CLA         /SUPPRESS MAGTAPE?
2007  5423            JMP I PNTR6     /YES, EXIT
2010  7604            LAS
2011  0104            AND K0200
2012  7640            SZA CLA         /BIT 4 SET?
2013  7000            NOP             /YES
2014  4332            JMS MTSAVE      /SAVE PI STUFF
2015  6001            ION
2016  1105            TAD K7200
2017  3013            DCA 13
2020  1112            TAD BUFF2
2021  3012            DCA 12
2022  1230            TAD .+6
2023  1021            TAD MTFELD
2024  3226            DCA .+2
2025  4763            JMS I PNTR27
2026  6201            CDF
2027  3412            DCA I 12        /STORE DATA IN OUTPUT BUFFER
2030  6201            CDF
2031  2013            ISZ 13          /DONE?
2032  5225            JMP .-5         /NO
2033  6002            IOF
2034  4344            JMS MTREST      /RESTORE PI STUFF
```

```
2035  4764          JMS I PNTR28    /WRITE DATA ONTO MAG TAPE
2036  6712          MTAF            /CLEAR FLAGS
2037  7604          LAS
2040  0134          AND K0020
2041  7648          SZA CLA         /SUPPRESS MAGTAPE?
2042  5423          JMP I PNTR4     /YES, EXIT
2043  4765          JMS I PNTR29    /READ DATA FROM MAGTAPE
2044  6712          MTAF            /CLEAR FLAGS
2045  4332          JMS MTSAVE      /SAVE PI STUFF
2046  6001          ION             /TURN ON INTERRUPT
2047  1112          TAD BUFF2       /OUTPUT BUFFOR
2050  3012          DCA 12


2051  1111          TAD BUFF5       /INPUT BUFFOR
2052  3013          DCA 13
2053  1105          TAD K7200       /COUNT
2054  3173          DCA MTCNTR
2055  1264          TAD .+7
2056  1021          TAD MTFELD
2057  3260          DCA .+1
2060  6201          CDF
2061  1412          TAD I 12        /COMPARE DATA OUT WITH DATA IN
2062  7041          CIA
2063  1413          TAD I 13
2064  6201          CDF
2065  7440          SZA             /GOOD?
2066  4767          JMS I PNTR31    /NO, DATA ERROR
2067  2173          ISZ MTCNTR      /DONE?
2070  5260          JMP .-10        /NO
2071  6002          IDF             /YES
2072  4344          JMS MTREST      /RESTORE PI STUFF
2073  4766          JMS I PNTR30    /READ COMPARE DATA
2074  6712          MTAF            /CLEAR MTF AND EF
2075  7604          LAS
2076  7010          RAR
2077  7630          SZL CLA         /CHANGE MEMORY FIELD?
2100  5200          JMP MTEXER      /NO
2101  4763          JMS I PNTR27    /YES
2102  0123          AND K0070
2103  3021          DCA MTFELD
2104  1162          TAD FELD
2105  7041          CIA
2106  1021          TAD MTFELD
2107  7740          SMA SZA CLA
2110  5301          JMP .-7
2111  5200          JMP MTEXER

              /MAGTAPE SPACE FORWARD SUBROUTINE

2112  0000    SPCFWD, 0
2113  1370            TAD K0666
2114  6716            MTLC            /LOAD CM WITH "ODD,7CH, SPACE FORWARD, ENABLE, 666" AND CLEAR FLAGS
2115  7240            CLA CMA
```

```
2116  1158            TAD RECORD
2117  7458            SNA
2120  5712            JMP I SPCFWD
2121  7041            CIA
2122  3477            DCA I  K7752    /SET UP WC
2123  6722            MTGO            /SET "GO",
2124  4447            JMS I PNTR32    /WAIT FOR MT FLAG AND NO ERRORS
2125  4441            JMS I PNTR28    /ERRORS
2126  7610            SKP CLA         /YES
2127  5712            JMP I SPCFWD    /NO
2130  4446            JMS I PNTR19    /REWIND TAPE, TRY AGAIN
2131  5313            JMP SPCFWD+1


                  /MAGTAPE SAVE SUBROUTINE
2132  0000        MTSAVE, 0
2133  1144                TAD AC          /SAVE AC
2134  3356                DCA MTAC
2135  1145                TAD LINK        /LINK
2136  3357                DCA MTLINK
2137  1456                TAD I PNTR40    /MEMORY FIELD
2140  3360                DCA MTIB
2141  1000                TAD 0   /AND LOC 0
2142  3361                DCA MTPC
2143  5732                JMP I MTSAVE


                  /MAGTAPE RESTORE SUBROUTINE
2144  0000        MTREST, 0
2145  1356                TAD MTAC        /RESTORE SAVED AC
2146  3144                DCA AC
2147  1357                TAD MTLINK      /LINK
2150  3145                DCA LINK
2151  1360                TAD MTIB        /MEMORY FIELD
2152  3456                DCA I PNTR40
2153  1361                TAD MTPC        /AND LOC 0
2154  3000                DCA 0
2155  5744                JMP I MTREST
2156  0000        MTAC,   0
2157  0000        MTLINK, 0
2160  0000        MTIB,   0
2161  0000        MTPC,   0
2162  2206        PNTR26, MTDATA+6
2163  2510        PNTR27, RAND2
2164  1532        PNTR28, MTRITE
2165  1200        PNTR29, MTREAD
2166  1220        PNTR30, RDCOMP
2167  2200        PNTR31, MTDATA
2170  0666        K0666,  0666            /ODD, 7CH, SPACE FWD, ENABLE, 800
2171  6363        MESS03, 6363            /3,3
2172  7040                7040            /8,SP
2173  0411                0411            /D,I
2174  2320                2320            /S,P
2175  1401                1401            /L,A
2176  3177                3177            /Y,?
```

```
2177  0000          0                 /END


      2200    *2200
              /MAGTAPE DATA ERROR ROUTINE

2200  0000    MTDATA, 0
2201  7604            LAS
2202  0103            AND K0400
2203  7640            SZA CLA
2204  5247            JMP CHNGE2+1
2205  6002            IOF
2206  7610            SKP CLA           /OR CLA
2207  5223            JMP .+14
2210  1356            TAD PMES16
2211  4403            JMS I PNTR1       /TYPE OUT HEADER
2212  1021            TAD MTFELD
2213  7110            RAR CLL
2214  7012            RTR
2215  4445            JMS I PNTR24      /AND DATA FIELD
2216  1074            TAD PMES15
2217  4403            JMS I PNTR1       /TYPE OUT REST OF HEADER
2220  1105            TAD K7200
2221  3206            DCA MTDATA+6
2222  4450            JMS I PNTR33
2223  1021            TAD MTFELD
2224  1246            TAD CHNGE2
2225  3226            DCA .+1
2226  6201            CDF
2227  1012            TAD 12            /PICK UP "GOOD" ADDRESS
2230  4445            JMS I PNTR24
2231  1125            TAD K0240
2232  4446            JMS I PNTR25
2233  1571            TAD I TEMP        /PICK UP "GOOD" DATA
2234  4445            JMS I PNTR24
2235  1125            TAD K0240
2236  4446            JMS I PNTR25
2237  1013            TAD 13            /PICK UP "BAD" ADDRESS
2240  4445            JMS I PNTR24
2241  1125            TAD K0240
2242  4446            JMS I PNTR25
2243  1571            TAD I TEMP        /PICK UP "BAD" DATA
2244  4445            JMS I PNTR24
2245  4450            JMS I PNTR33
2246  6201    CHNGE2, CDF
2247  7604            LAS
2250  7004            RAL
2251  7700            SMA CLA           /HALT ON ERROR?
2252  7402            HLT               /YES
2253  5600            JMP I MTDATA


              /INPUT FROM KEYBOARD AN OCTAL DIGIT, SKIP IF OK

2254  0000    INPUT,  0
```

```
2255  4406            JMS I PNTR4
2256  3153            DCA CHAR
2257  1153            TAD CHAR
2260  7841            CIA
2261  1360            TAD K0260
2262  7540            SMA SZA
2263  5273            JMP QUEST
2264  1135            TAD K0010
2265  7710            SPA CLA
2266  5273            JMP QUEST
2267  1153            TAD CHAR
2270  0130            AND K0007
2271  2254            ISZ INPUT
2272  5654            JMP I INPUT
2273  1357  QUEST,    TAD K0277
2274  4446            JMS I PNTR25
2275  4450            JMS I PNTR33
2276  5654            JMP I INPUT

                      /OCTAL PRINT SUBROUTINE

2277  0000  PRINT,    0
2300  3171            DCA TEMP
2301  1121            TAD M0004
2302  3172            DCA TEMP1
2303  1171            TAD TEMP
2304  7104            RAL CLL
2305  7004            RAL
2306  7006            RTL
2307  3171            DCA TEMP
2310  1171            TAD TEMP
2311  0130            AND K0007
2312  1360            TAD K0260
2313  4446            JMS I PNTR25
2314  1171            TAD TEMP
2315  2172            ISZ TEMP1
2316  5305            JMP .-11
2317  7200            CLA
2320  5677            JMP I PRINT


                      /MESSAGE PRINT SUBROUTINE

2321  0000  MESAGE,   0
2322  3171            DCA TEMP
2323  4450            JMS I PNTR33
2324  1571            TAD I TEMP
2325  0362            AND K7700
2326  7450            SNA
2327  5721            JMP I MESAGE
2330  7110            RAR CLL
2331  7010            RAR
2332  7012            RTR
2333  7012            RTR
2334  4344            JMS POSIT
```

```
2335  1571          TAD I TEMP
2336  0361          AND K0077
2337  7450          SNA
2340  5721          JMP I MESAGE
2341  4344          JMS POSIT
2342  2171          ISZ TEMP
2343  5324          JMP MESAGE+3
2344  0000  POSIT,  0
2345  3172          DCA TEMP1
2346  1172          TAD TEMP1
2347  1131          TAD M0040
2350  7710          SPA CLA
2351  1132          TAD K0100
2352  1104          TAD K0200
2353  1172          TAD TEMP1
2354  4446          JMS I PNTR25
2355  5744          JMP I POSIT
2356  1156  PMES16, MESS16
2357  0277  K0277,  277             /"?"
2360  0260  K0260,  260
2361  0077  K0077,  77
2362  7700  K7700,  7700
            /CARRIAGE RETURN-LINE FEED SUBROUTINE
2363  0000  CRLF,   0
2364  1126          TAD K0215
2365  4446          JMS I PNTR25
2366  1127          TAD K0212
2367  4446          JMS I PNTR25
2370  5763          JMP I CRLF
2371  2403  MESS04, 2403            /T,C
2372  6570          6570            /5,8
2373  4015          4015            /SP,M
2374  0107          0107            /A,G
2375  2401          2401            /T,A
2376  2005          2005            /P,E
2377  7700          7700            /?,END

      2400    *2400
            /RANDOM NUMBER GENERATOR

2400  0000  RANGEN, 0
2401  7200          CLA
2402  1242          TAD RANTND
2403  1227          TAD RANDEX
2404  7640          SZA CLA
2405  5215          JMP RANTAD
2406  1231          TAD RANTBL
2407  3227          DCA RANDEX
2410  1230          TAD RANCON
2411  7104          CLL RAL
2412  7430          SZL
2413  7001          IAC
2414  3230          DCA RANCON
2415  1230  RANTAD, TAD RANCON
```

```
2416  1627            TAD I RANDEX
2417  3627            DCA I RANDEX
2420  1243            TAD RANSAV
2421  7010            RAR
2422  1627            TAD I RANDEX
2423  2227            ISZ RANDEX
2424  3243            DCA RANSAV
2425  1243            TAD RANSAV
2426  5600            JMP I RANGEN
2427  2442    RANDEX, RANTND
2430  6543    RANCON, 6543
2431  2432    RANTBL, .+1
2432  6543            6543
2433  3210            3210
2434  0765            0765
2435  5432            5432
2436  2107            2107
2437  7654            7654
2440  4321            4321
2441  1076            1076
2442  5336    RANTND, -RANTND
2443  0000    RANSAV, 0


2444  0000    RAND1,  0
2445  7200            CLA
2446  1306            TAD .+40
2447  1273            TAD .+24
2450  7640            SZA CLA
2451  5261            JMP .+10
2452  1275            TAD .+23
2453  3273            DCA .+20
2454  1274            TAD .+20
2455  7104            CLL RAL
2456  7430            SZL
2457  7001            IAC
2460  3274            DCA .+14
2461  1274            TAD .+13
2462  1673            TAD I .+11
2463  3673            DCA I .+10
2464  1277            TAD .+13
2465  7010            RAR
2466  1673            TAD I .+5
2467  2273            ISZ .+4
2470  3307            DCA .+17
2471  1307            TAD .+16
2472  5644            JMP I .-26
2473  2506            .+13
2474  6543            6543
2475  2476            .+1
2476  1076            1076
2477  7654            7654
2500  5432            5432
2501  3210            3210
2502  6543            6543
```

```
2503  0765            0765
2504  2107            2107
2505  4321            4321
2506  5272            -.
2507  0000            0

2510  0000  RAND2,    0
2511  7200            CLA
2512  1352            TAD .+40
2513  1337            TAD .+24
2514  7640            SZA CLA
2515  5325            JMP .+10
2516  1341            TAD .+23
2517  3337            DCA .+20
2520  1340            TAD .+20
2521  7104            CLL RAL
2522  7430            SZL
2523  7001            IAC
2524  3340            DCA .+14
2525  1340            TAD .+13
2526  1737            TAD I .+11
2527  3737            DCA I .+10
2530  1343            TAD .+13
2531  7010            RAR
2532  1737            TAD I .+5
2533  2337            ISZ .+4
2534  3353            DCA .+17
2535  1353            TAD .+16
2536  5710            JMP I .-26
2537  2552            .+13
2540  6543            6543
2541  2542            .+1
2542  6543            6543
2543  0765            0765
2544  2107            2107
2545  4321            4321
2546  1076            1076
2547  7654            7654
2550  5432            5432
2551  3210            3210
2552  5226            -.
2553  0000            0
                /GET SUBROUTINE
2554  0000  GET,      0
2555  6031            KSF
2556  5355            JMP .-1
2557  6036            KRB
2560  6046            TLS
2561  6041            TSF
2562  5361            JMP .-1
2563  6042            TCF
2564  5754            JMP I GET
2565  0406  MESS07,   0406            /D,F
2566  6362            6362            /3,2
2567  4004            4004            /SP,D
```

```
2570  1123                1123            /I.S
2571  0377                0377            /C.7
2572  0000                0               /END
```

```
      2600    *2600
2600  3144    SCAN,   DCA AC
2601  7004            RAL
2602  3145            DCA LINK
2603  6234            RIB
2604  7104            RAL CLL
2605  7006            RTL
2606  0123            AND K0070
2607  1366            TAD CHNGES
2610  3234            DCA MEMORY
2611  6031            KSF             /KEYBOARD FLAG?
2612  7410            SKP             /NO
2613  5230            JMP EXIT        /YES
2614  6771            DTSF            /DECTAPE FLAG?
2615  7410            SKP
2616  5637            JMP I DTFLAG    /YES
2617  6701            MTSF            /MAGTAPE FLAG?
2620  7410            SKP
2621  5641            JMP I MTFLAG    /YES
2622  6622            6622            /DISC OR DRUM DONE FLAG?
2623  7410            SKP
2624  5643            JMP I DDFLAG    /YES
2625  6621            6621            /DISC OR DRUM ERROR FLAG?
2626  7200            CLA             /YES
2627  7200            CLA             /OR YES, DEPENDING ON DISC OR DRUM TESTED
2630  6032    EXIT,   KCC             /CLEAR AC & KEYBOARDFLAG
2631  1145            TAD LINK        /RESTORE LINK & AC
2632  7110            RAR CLL
2633  1144            TAD AC
2634  6201    MEMORY, CDF             /RESTORE MEMORY FIELDS
2635  6001            ION             /TURN ON INTERRUPT
2636  5400            JMP I 0         /EXIT
```

```
                /DECTAPE FLAG RETURN ADDRESS

2637  0000    DTFLAG, 0
2640  5230            JMP EXIT        /EXIT TO TURN P.I. ON

                /MAGTAPE FLAG RETURN ADDRESS

2641  0000    MTFLAG, 0
2642  5230            JMP EXIT

                /DISC OR DRUM FLAG RETURN ADDRESS

2643  0000    DDFLAG, 0
2644  5230            JMP EXIT

                /TYPE SUBROUTINE
```

```
2645  0000    TYPE,   0
2646  6046            TLS
2647  6041            TSF
2650  5247            JMP .-1
2651  6042            TCF
2652  7200            CLA
2653  5645            JMP I TYPE

2654  0000    RAND3,  0
2655  7200            CLA
2656  1316            TAD .+40
2657  1303            TAD .+24
2660  7640            SZA CLA
2661  5271            JMP .+10
2662  1305            TAD .+23
2663  3303            DCA .+20
2664  1304            TAD .+20
2665  7104            CLL RAL
2666  7430            SEL
2667  7001            IAC
2670  3304            DCA .+14
2671  1304            TAD .+13
2672  1703            TAD I .+11
2673  3703            DCA I .+10
2674  1307            TAD .+13
2675  7010            RAR
2676  1703            TAD I .+5
2677  2303            ISZ .+4
2700  3317            DCA .+17
2701  1317            TAD .+16
2702  5654            JMP I .-26
2703  2716            .+13
2704  6543            6543
2705  2706            .+1
2706  2107            2107
2707  5432            5432
2710  7654            7654
2711  0765            0765
2712  4321            4321
2713  3210            3210
2714  1076            1076
2715  6543            6543
2716  5062            -.
2717  0000            0

                /DISC OR DRUM DATA ERROR ROUTINE

2720  0000    DDDATA, 0
2721  7604            LAS
2722  0103            AND K0400
2723  7640            SZA CLA
2724  5367            JMP CHNGE3+1
```

```
2725  6002          IOF
2726  7610          SKP CLA          /OR CLA
2727  5343          JMP .+14
2730  1374          TAD PMES17
2731  4403          JMS I PNTR1      /TYPE OUT HEADER
2732  1022          TAD DDFELD
2733  7110          RAR CLL
2734  7012          RTR
2735  4445          JMS I PNTR24     /AND DATA FIELD
2736  1074          TAD PMES15
2737  4403          JMS I PNTR1      /TYPE OUT REST OF HEADER
2740  1105          TAD K7200
2741  3326          DCA DDDATA+6
2742  4450          JMS I PNTR33
2743  1022          TAD DDFELD
2744  1366          TAD CHNGE3
2745  3346          DCA .+1
2746  6201          CDF
2747  1014          TAD 14           /PICK UP "GOOD" ADDRESS
2750  4445          JMS I PNTR24
2751  1125          TAD K0240
2752  4446          JMS I PNTR25
2753  1571          TAD I TEMP       /PICK UP "GOOD" DATA
2754  4445          JMS I PNTR24
2755  1125          TAD K0240
2756  4446          JMS I PNTR25
2757  1015          TAD 15           /PICK UP "BAD" ADDRESS
2760  4445          JMS I PNTR24
2761  1125          TAD K0240
2762  4446          JMS I PNTR25
2763  1571          TAD I TEMP       /PICK UP "BAD" DATA
2764  4445          JMS I PNTR24
2765  4450          JMS I PNTR33
2766  6201  CHNGE3, CDF
2767  7604          LAS
2770  7004          RAL
2771  7700          SMA CLA          /HALT ON ERROR?
2772  7402          HLT              /YES
2773  5720          JMP I DDDATA
2774  1357  PMES17, MESS17


      3000  *3000
3000  0417  MESS01, 0417    /D,O
3001  0523          0523    /E,S
3002  4024          4024    /SP,T
3003  1005          1005    /H,E
3004  4003          4003    /SP,C
3005  1715          1715    /O,M
3006  2025          2025    /P,U
3007  2405          2405    /T,E
3010  2240          2240    /R,SP
3011  1001          1001    /H,A
3012  2605          2605    /V,E
```

```
3013  4024              4024    /SP,T
3014  1005              1005    /H,E
3015  4006              4006    /SP,F
3016  1714              1714    /O,L
3017  1417              1417    /L,O
3020  2711              2711    /W,I
3021  1607              1607    /N,G
3022  4004              4004    /SP,D
3023  0526              0526    /E,V
3024  1103              1103    /I,C
3025  0523              0523    /E,S
3026  4050              4050    /SP,(
3027  2431              2431    /T,Y
3030  2005              2005    /P,E
3031  4031              4031    /SP,Y
3032  5531              5531    /-,Y
3033  0523              0523    /E,S
3034  4016              4016    /SP,N
3035  5516              5516    /-,N
3036  1751              1751    /0,)
3037  0000              0       /END

3040  2206  MESS08,     2206    /R,F
3041  6070              6070    /0,8
3042  4004              4004    /SP,D
3043  1123              1123    /I,S
3044  0377              0377    /C,?
3045  0000              0       /END
3046  0530  MESS09,     0530    /E,X
3047  2422              2422    /T,R
3050  0140              0140    /A,SP
3051  1505              1505    /M,E
3052  1517              1517    /M,O
3053  2231              2231    /R,Y
3054  7700              7700    /?,END
3055  1017  MESS10,     1017    /H,O
3056  2740              2740    /W,SP
3057  1525              1525    /M,U
3060  0310              0310    /C,H
3061  7700              7700    /?,END
3062  0411  MESS11,     0411    /D,I
3063  2303              2303    /S,C
3064  4005              4005    /SP,E
3065  2222              2222    /R,R
3066  1722              1722    /O,R
3067  4023              4023    /SP,S
3070  2401              2401    /T,A
3071  2425              2425    /T,U
3072  2340              2340    /S,SP
3073  4000              4000    /SP,END

3074  2403  MESS12,     2403    /T,C
3075  6061              6061    /0,1
```

```
3076  4005            4005    /SP,E
3077  2222            2222    /R,R
3100  1722            1722    /O,R
3101  4023            4023    /SP,S
3102  2401            2401    /T,A
3103  2425            2425    /T,U
3104  2340            2340    /S,SP
3105  4000            4000    /SP,END
3106  2403    MESS13, 2403    /T,C
3107  6570            6570    /5,8
3110  4005            4005    /SP,E
3111  2222            2222    /R,R
3112  1722            1722    /O,R
3113  4023            4023    /SP,S
3114  2401            2401    /T,A
3115  2425            2425    /T,U
3116  2340            2340    /S,SP
3117  4000            4000    /SP,END
3120  0422    MESS14, 0422    /D,R
3121  2515            2515    /U,M
3122  4005            4005    /SP,E
3123  2222            2222    /R,R
3124  1722            1722    /O,R
3125  4023            4023    /SP,S
3126  2401            2401    /T,A
3127  2425            2425    /T,U
3130  2340            2340    /S,SP
3131  4000            4000    /SP,END
3132  0701    MESS15, 0701    /G,A
3133  0404            0404    /D,D
3134  4007            4007    /SP,G
3135  0401            0401    /D,A
3136  2440            2440    /T,SP
3137  0201            0201    /B,A
3140  0404            0404    /D,D
3141  4002            4002    /SP,B
3142  0401            0401    /D,A
3143  2400            2400    /T,END


3144  2403    MESS18, 2403    /T,C
3145  6061            6061    /0,1
3146  4004            4004    /SP,D
3147  0124            0124    /A,T
3150  0140            0140    /A,SP
3151  0522            0522    /E,R
3152  2217            2217    /R,O
3153  2240            2240    /R,SP
3154  1116            1116    /I,N
3155  4002            4002    /SP,B
3156  0116            0116    /A,N
3157  1340            1340    /K,SP
3160  4000            4000    /SP,END

3161  0414    PRO338, 414             /SET SCALE TO 1, INTENSITY TO 4
```

```
3162  1107          1107          /ENTER POINT MODE AND DATA STATE, CLEAR COORD AND SECTORS
3163  0100          100           /SET Y=100
3164  4100          4100          /SET X=100, ESCAPE
3165  1121          1121          /ENTER VECTOR MODE AND DATA STATE
3166  4000          4000          /DELTA Y=0, INTENSIFY
3167  1600          1600          /DELTA X=1600
3170  5600          5600          /DELTA Y=1600, INTENSIFY
3171  0000          0             /DELTA X=0
3172  4000          4000          /DELTA Y=0, INTENSIFY
3173  3600          3600          /DELTA X=-1600
3174  7600          7600          /DELTA Y=-1600, INTENSIFY
3175  4000          4000          /DELTA X=0, ESCAPE
3176  2000          2000          /JMP I .+1
3177  3165          PRO338+4
```

```
0000  01111111  00000000  11111111  11111111  11111111  11111111  11111111  11111111
0100  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111100

0200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
0300  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111110

0400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
0500  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111110

0600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
0700  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111110

1000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1100  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11100000

1200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1300  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

1400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1500  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11110000

1600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1700  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111100

2000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
2100  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

2200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
2300  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

2400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
2500  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11100000

2600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
2700  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111000

3000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
3100  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

3200
3300

3400
3500

3600
3700
```

```
4000
4100

4200
4300

4400
4500

4600
4700


5000
5100

5200
5300

5400
5500

5600
5700


6000
6100

6200
6300

6400
6500

6600
6700


7000
7100

7200
7300

7400
7500

7600
7700
```

AC	0144
ASK1	0216
ASK2	0225
ASK3	0234
ASK4	0243
ASK5	0253
ASK6	0263
ASK7	0272
BUFF1	0106
BUFF2	0112
BUFF3	0114
BUFF4	0107
BUFF5	0111
BUFF6	0113
CDF	6201
CHAR	0153
CHNGE1	1760
CHNGE2	2246
CHNGE3	2766
CIF	6202
CRLF	2363
DCEA	6611
DCIM	6611
DCMA	6601
DDAC	0561
DDCNTR	0174
DDDATA	2720
DDEXER	0400
DDFELD	0022
DDFLAG	2643
DDIB	0563
DDLINK	0562
DDLOOP	0565
DDPC	0564
DDREAD	0443
DDREST	0547
DDRITE	0435
DDSAVE	0535
DDSTAT	0151
DEAC	6616
DEAL	6615
DECTAP	0600
DF32	0644
DF32EX	0526
DF32PR	0166
DF32RD	0755
DF32RE	0534
DF32RI	0533
DF32WR	0735
DF32WT	0707
DFSC	6622
DFSE	6621
DIMA	6616
DIML	6615
DIS338	0365
DISCAD	0140
DISCEA	0137
DMAC	6626
DMAR	6603
DMAW	6605
DRCF	6611
DRCN	6624
DRCR	6603
DRCW	6605
DREF	6612
DRES	6612
DRFS	6624
DRMSEC	0152
DRSC	6622
DRSE	6621
DRTS	6615
DRUMAD	0141
DRUMWT	1434
DSAC	6612
DTAC	1322
DTCA	6762
DTCNTR	0170
DTDATA	1712
DTERR	1137
DTEXER	1600
DTFELD	0020
DTFLAG	2637
DTIB	1324
DTLA	6766
DTLB	6774
DTLINK	1323
DTPC	1325
DTPNTR	0163
DTRA	6701
DTRB	6772
DTREAD	1047
DTREST	1343
DTRITE	1067
DTSAVE	1331
DTSF	6771
DTSTAT	0146
DTWAIT	1107
DTXA	6764
DXAL	6643
EXIT	2630
FELD	0162
FOUND	1145
GET	2594
HALT1	1135
HALT2	1318
HALT3	1497
HALT4	0733
INPUT	2254
INTERN	0143
INTERR	0207
JMP338	0161
JMPCON	0706
JMPD32	0157
JMPDEC	0154
JMPMAG	0155
JMPR08	0160
JMPRM8	0156
K0002	1152
K0003	1153
K0003A	1711
K0004	1767
K0007	0130
K0010	0135
K0014	0110
K0020	0134
K0040	0124
K0070	0123
K0077	2361
K0100	0132
K0130	1150
K0150	1151
K0200	0104
K0212	0127
K0215	0126
K0240	0125
K0260	2360
K0277	2357
K0400	0103
K0600	1154
K0604	0776
K0614	1155
K0626	1356
K0636	1355
K0666	2170
K0676	1254
K0746	1564
K1000	0136
K3000	0122
K7200	0105
K7700	2362
K7750	0075
K7751	0076
K7752	0077
K7753	0100
K7754	0101
K7755	0102
LINK	0145
LOCBED	1043
LOOK	0175
M0003	0115
M0004	0121
M0040	0131
M0316	0116
M0331	0117
M2700	0120
MAGTAP	0610
MEMORY	2634
MESAGE	2321
MESS01	3000
MESS02	1565
MESS03	2171
MESS04	2371
MESS06	1770
MESS07	2565
MESS08	3040
MESS09	3046
MESS10	3055
MESS11	3062
MESS12	3074
MESS13	3106
MESS14	3120
MESS15	3132
MESS16	1156
MESS17	1357
MESS18	3144
MTAC	2156
MTAF	6712
MTCM	6714
MTCNTR	0173
MTCR	6711
MTDATA	2200
MTERR	1255
MTEXER	2000
MTFELD	0021
MTFLAG	2641
MTGO	6722
MTHLT1	0614
MTHLT2	0617
MTIB	2160
MTLC	6716
MTLINK	2157
MTPC	2161
MTPNTR	0164
MTREAD	1200
MTREST	2144
MTRITE	1532
MTRS	6706
MTSAVE	2132

```
MTSF    6701
MTSTAT  0147
MTTR    6721
MTWAIT  1266
NODISC  0345
PME11A  0364
PMES10  0073
PMES11  0775
PMES12  1147
PMES13  1326
PMES14  1563
PMES15  0074
PMES16  0356
PMES17  2774
PMES18  1766
PMESS1  0063
PMESS2  0064
PMESS3  0065
PMESS4  0066
PMESS6  0067
PMESS7  0070
PMESS8  0071
PMESS9  0072
PNTR1   0003
PNTR10  0027
PNTR11  0030
PNTR12  0031
PNTR13  0032
PNTR14  0033
PNTR15  0034
PNTR16  0035
PNTR17  0036
PNTR18  0037
PNTR19  0040
PNTR2   0004
PNTR20  0041
PNTR21  0042
PNTR22  0043
PNTR23  0044
PNTR24  0045
PNTR25  0046
PNTR26  2162
PNTR27  2163
PNTR28  2164
PNTR29  2165
PNTR3   0005
PNTR30  2166
PNTR31  2167
PNTR32  0047
PNTR33  0050
PNTR34  0051
PNTR35  0052
PNTR36  0053
PNTR38  0054
PNTR39  0055
PNTR4   0006
PNTR40  0056
PNTR41  0057
PNTR42  0060
PNTR43  1327
PNTR44  1330
PNTR45  0703
PNTR46  0704
PNTR47  0705
PNTR48  0061
PNTR49  0062
PNTR5   0007
PNTR6   0023
PNTR7   0024
PNTR8   0025
PNTR9   0026
POSIT   2344
PRINT   2277
PRO338  3161
QUEST   2273
RANCON  2430
RAND1   2444
RAND2   2510
RAND3   2654
RANDEX  2427
RANGEN  2400
RANSAV  2443
RANTAD  2415
RANTBL  2431
RANTND  2442
RDCOMP  1220
RDF     6214
RECORD  0150
REWIND  1240
RF08    0662
RF08EX  0517
RF08PR  0167
RF08RD  1461
RF08RE  0525
RF08RI  0524
RF08WR  1501
RF08WT  1521
RIB     6234
RIF     6224
RM08    0627
RM08EX  0510
RM08PR  0165
RM08RD  1400
RM08RE  0516
RM08RI  0519
RM08WR  1416
RMF     6244
SCAN    2688
SEARCH  1088
SKIP    0133
SPCFWD  2112
START   0200
TEMP    0171
TEMP1   0172
TEST    0327
TRACK   0142
TYPE    2645
```

```
ERRORS DETECTED: 0

LINKS GENERATED: 0

RUN-TIME:  16 SECONDS

3K CORE USED
```