

IDENTIFICATION

Product Code: MAINDEC-08-D8SC-D

Product Name: DM01 Exerciser

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Maintainer: Diagnostic Group

Author: Edward P. Steinberger

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.

<u>AC Switch</u>	<u>Set As</u>	<u>Action on Program</u>
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

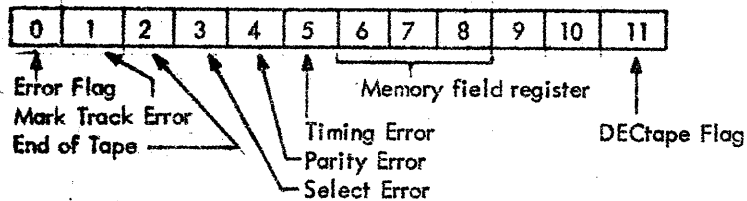
6.1 Error Typeouts

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.

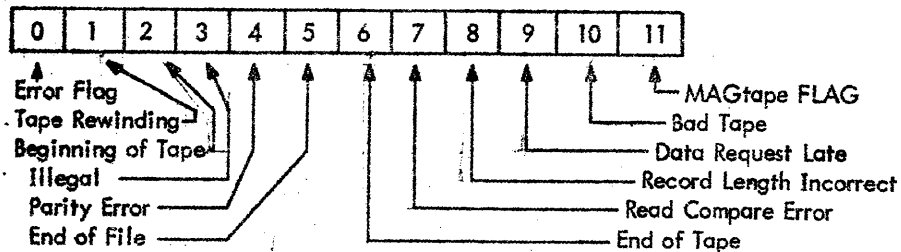
6.1.1 Hardware Errors

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

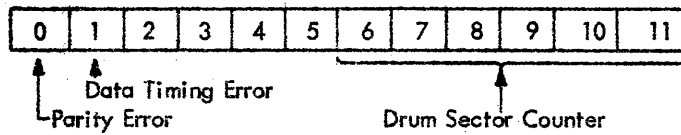
6.1.1.1 DECTape Error Status (TC01) -



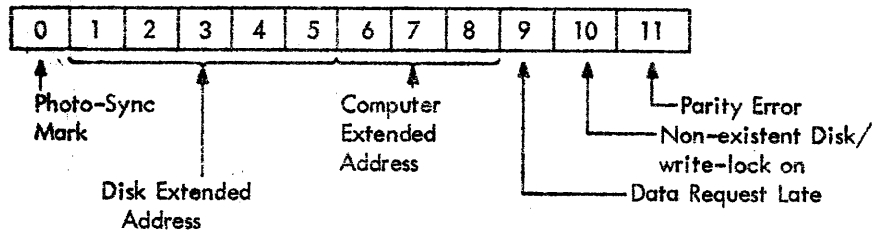
6.1.1.2 MAGtape Error Status (TC-58) -



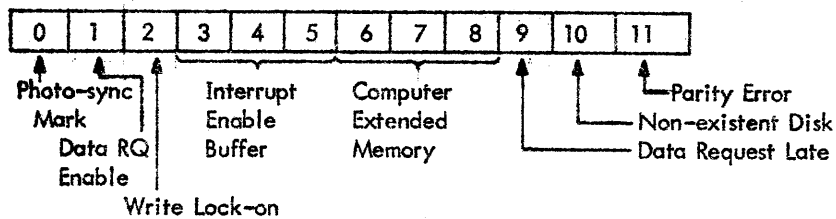
6.1.1.3 Drum Error Status (RM08) -



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, 100; to be displayed in vector mode. Diagnosis of display errors is visual.

/DMB1 EXERCISER - TAPE 1
/IOT DEFINITIONS

6603 DRCR=6603
6605 DRCH=6605
6611 DRCF=6611
6612 DREF=6612
6615 DRTS=6615
6621 DRSE=6621
6622 DRSC=6622
6624 DRCN=6624
6612 DRES=6612
6624 DRFS=6624

/DISC

6601 DCMA=6601
6603 DMAR=6603
6605 DMAW=6605
6611 DCEA=6611
6612 DSAC=6612
6615 DEAL=6615
6616 DEAC=6616
6621 DFSE=6621
6622 DFSC=6622
6626 DMAC=6626
6611 DCIM=6611
6615 DIML=6615
6616 DIMA=6616
6643 DXAL=6643

/TC01

6761 DTRA=6761
6762 DTCA=6762
6764 DTXA=6764
6766 DTLA=6766
6771 DTSF=6771
6772 DTRB=6772
6774 DTLB=6774

/TC58

6701 MTSF=6701
6711 MTCR=6711
6721 MTTR=6721
6712 MTAF=6712
6714 MTCM=6714
6716 MTLC=6716
6706 MTRS=6706
6722 MTGO=6722

/EXTENDED MEMORY

6201 CDF=6201
6202 CIF=6202
6214 RDF=6214
6224 RIF=6224
6234 RIB=6234

4244

RMF=6244

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/ DISPATCH TO PI SCAN FLAG ROUTINE
*1
0001 0001
0001 5402          JMP I .+1
0002 2600          SCAN
/ POINTERS, GOBS OF POINTERS
0003 2321          PNTR1, MESSAGE
0004 2254          PNTR2, INPUT
0005 2400          PNTR3, RANGEN
0006 2554          PNTR4, GET
0007 2726          PNTR5, DDATA+6

0020 0020          *20
0020 0000          DTFELD, 0
0021 0000          MTFELD, 0
0022 0000          DDFELD, 0
0023 2630          PNTR6, EXIT
0024 2654          PNTR7, RAND3
0025 2720          PNTR8, DDATA
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, MTHAIT
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 1563          PMESS2, MESS02
0065 2171          PMESS3, MESS03

/ DECTAPE EXTENDED MEMORY FIELD
/ MAGTAP EXTENDED MEMORY FIELD
/ DISC OR DRUM EXTENDED MEMORY FIELD

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0806	2371	PHES54.	PHES04
0807	1770	PHES56.	PHES06
0870	2565	PHES57.	PHES07
0871	3040	PHES58.	PHES08
0872	3046	PHES59.	PHES09
0873	3055	PHES10.	PHES10
0874	3132	PHES15.	PHES15

0075	7750	K7750.	7750	/NO - DISC
0076	7751	K7751.	7751	/CA - DISC
0077	7752	K7752.	7752	/NO - DISC
0100	7753	K7753.	7753	/CA - DISC
0101	7754	K7754.	7754	/NO - DISC
0102	7755	K7755.	7755	/CA - DISC

0103	0400	K0400	400	/REVERSE DIRECTION (DECTAPE)
0104	0200	K0200.	200	/NO STOP (DECTAPE)
0105	7200	K7200.	7200	/MAX SIZE OF DATA TRANSFERS
0106	3177	BUFF1.	3177	/DECTAPE OUTPUT BUFFER -1
0107	3377	BUFF4.	3377	/DECTAPE INPUT BUFFER -1
0110	0014	K0014.	14	/REWIND ENABLE (MAGTAPE)
0111	0177	BUFF5.	0177	/MAGTAPE INPUT BUFFER -1
0112	3377	BUFF2.	3377	/MAG TAPE OUTPUT BUFFER -1
0113	0777	BUFF6.	0777	/DISC OR DRUM INPUT BUFFER -1
0114	4577	BUFF3.	4577	/DISC OR DRUM OUTPUT BUFFER -1
0115	7775	M0003.	7775	/MINUS 3
0116	7462	M0316.	7462	/MINUS N
0117	7462	M0331.	7462	/MINUS Y
0120	0100	M2700.	0100	/HIGHEST DISK TAPE BLOCK TO BE USED
0121	0100	M2004.	0100	
0122	3000	K3000.	3000	/24 9000 DRUM SECTORS
0123	0070	K0070.	0070	/MAGN FOR MEMORY DURING DIS
0124	0040	K0040.	0040	/MAGN FOR DECTAPE SUPPRESSION
0125	0140	K0140.	0140	/SP100
0126	0100	K0100.	0100	/CR
0127	0100	K0100.	0100	/LF
0130	0000	K0000.	0000	
0131	0100			
0132	0100			
0133	0100			
0134	0020			
0135	0010			
0136	1000			

0137	0100	DISC01.	0100	/DISC EXTENDED ADDRESS (OF 32)
0140	0100	DISC02.	0100	/DISC ADDRESS
0141	0100	DISC03.	0100	/DRUM ADDRESS (OF 400)
0142	0100	DISC04.	0100	/DISC EXTENDED ADDRESS (OF 32)
0143	0100	DISC05.	0100	/DISC EXTENDED ADDRESS (OF 32)
0144	0100	DISC06.	0100	/DISC EXTENDED ADDRESS (OF 32)
0145	0100	DISC07.	0100	/DISC EXTENDED ADDRESS (OF 32)
0146	0100	DISC08.	0100	/DISC EXTENDED ADDRESS (OF 32)
0147	0100	DISC09.	0100	/DISC EXTENDED ADDRESS (OF 32)
0148	0100	DISC10.	0100	/DISC EXTENDED ADDRESS (OF 32)
0149	0100	DISC11.	0100	/DISC EXTENDED ADDRESS (OF 32)
0150	0100	DISC12.	0100	/DISC EXTENDED ADDRESS (OF 32)
0151	0100	DISC13.	0100	/DISC EXTENDED ADDRESS (OF 32)
0152	0100	DISC14.	0100	/DISC EXTENDED ADDRESS (OF 32)
0153	0100	DISC15.	0100	/DISC EXTENDED ADDRESS (OF 32)

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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 JMP032, 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 FELO, 0 /NUMBER OF EXTENDED MEMORY FIELDS
0163 1000 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 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 4001 ION /TURN ON PI
0206 5206 JMP /IDLE HERE WHEN THERE IS NOTHING BETTER TO DO.

/INTERROGATE THE OPERATOR ABOUT MACHINE CONFIGURATION
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 330 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 RMB8
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 MEMORY
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 FELO	/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

0315	3400	DCA I 0	
0316	1162	TAD FELD	
0317	7041	CIA	
0320	1400	TAD I 0	
0321	7740	SMA S2A CLA	
0322	0313	JMP .-7	
0323	2000	ISE 0	
0324	2010	ISE 10	
0325	9313	JMP .-12	
0326	0201	JMP START+1	
0327	0000	0	TEST,
0330	4032	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	0727	JMP I TEST	/YES
0337	2327	ISE TEST	/NO, INCREMENT
0340	1153	TAD CHAR	
0341	1117	TAD M0331	
0342	7650	SNA CLA	/Y-YES?
0343	2327	ISE TEST	/YES, INCREMENT
0344	0727	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	OCA DDSTAT	
0351	1151	TAD DDSTAT	
0352	7012	RTR	
0353	7620	SNL CLA	/NON-EXISTANT DISC ERROR
0354	9423	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	0362	JMP .-1	/NON-RECOVERABLE ERROR-RESTART
0364	0062	PME11A, MESS11	
/338 DISPLAY STARTER ROUTINE			
0365	7200	DIS338, CLA	
0366	4145	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	0205	JMP START+3	
0376	3161	PRO338	

0400

*400

/DISC OR DRUM EXERCISER

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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 SEA CLA /SUPPRESS DISK OR DRUM?
0407 5423 JMP I PNTR6 /YES, EXIT
0410 7604 LAS
0411 0104 AND K0200
0412 7640 SEA CLA /BIT 4 SET?
0413 9365 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 SEA 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 3414 TAD I 14 /COMPARE DATA OUT WITH DATA IN

```

0462	7041	CIA	
0463	1415	TAD I 15	
0464	6201	COF	
0465	7440	SEA	/GOOD?
0466	4425	JMS I PNTR8	/NO, DATA ERROR
0467	2174	ISE DDCNTR	/DONE?
0470	5260	JMP .-10	/NO
0471	7604	LAS	
0472	7010	RAR	
0473	7630	SZL CLA	/CHANGE MEMORY FIELD?
0474	0305	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 SEA CLA	
0504	9275	JMP .-7	
0505	6002	IOF	
0506	4347	JMS DREST	/RESTORE PI STUFF
0507	9200	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	

```

0535 0000 /DISC-DRUM SAVE SUBROUTINE
0536 1144 DDSAVE, 0
0537 3361 TAD AC /SAVE AC
0540 1145 DCA DDAC
0541 3362 TAD LINK /LINK
0542 1456 DCA DDLINK
0543 3363 TAD I PNTR40 /MEMORY FIELD
0544 1000 DCA DDIB
0545 3364 TAD 0 /AND LOC 0
0546 0735 DCA DDPC
JMP I DDSAVE

```

```

0547 0000 /DISC-DRUM RESTORE SUBROUTINE
0550 1361 DDREST, 0
0551 3144 TAD DDAC /RESTORE SAVED AC
0552 1362 DCA AC
0553 3145 TAD DDLINK /LINK
0554 1363 DCA LINK
0555 3456 TAD DDIB /MEMORY FIELD
0556 1364 DCA I PNTR40
0557 3000 TAD DDPC /AND LOC 0
0560 0747 DCA 0
JMP I DDREST

```

```

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

```

```

0565 7604 /DISC-DRUM LOOP ROUTINE
0566 0132 DDLOOP, LAS
0567 7640 AND K0100
0570 5373 SZA CLA /LOOP ON READ?
0571 1243 JMP .+3 /NO, WRITE
0572 7410 TAD DDREAD /YES, READ
0573 1235 SKP
0574 3375 TAD DDRITE
0575 7402 DCA .+1
0576 5200 HLT /JMS INSTRUCTION IS STORED HERE
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 0607 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 4716 MTLT /LOAD COMMAND REGISTER WITH "REIND, ENABLE"
0616 6721 MTRR /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 PNTR18
0624 5625 JMP I .+1
0625 0203 START+3

```

/RM08 DRUM STARTER ROUTINE

```

0626 0204 RM08, START+4
0627 7201 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

```

/RF00 DISC STARTER ROUTINE

```

0662 7244 RF00, CLA CMA RAL
0663 3475 DCA I K7750 /SET UP MC
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 OMAN
0674 1167 TAD RF00PR
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 RM00-1 /RETURN TO START+4
0703 2626 PNTR45, EXIT-2
0704 2627 PNTR46, EXIT-1
0705 2624 PNTR47, EXIT-4

0706 5461 JMPCQN, 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 DDFFLD	/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	6005	DMAH	/LOAD DISC ADDRESS AND WRITE
0751	4307	JMS DF32WT	/WAIT FOR DISC FLAG
0752	6621	DFSE	/ANY ERRORS
0753	9336	JMP DF32WR+1	/YES, REPEAT FUNCTION
0754	9735	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 DDFFLD	/COMBINE DISC CORE MEMORY FIELD
0764	1137	TAD DISCEA	/AND DISC EXTENDED ADDRESS
0765	6015	DEAL	/AND XFER TO DISC CONTROL
0766	7200	CLA	
0767	1140	TAD DISCAD	
0770	6003	DMAH	/LOAD DISC ADDRESS AND READ
0771	4307	JMS DF32WT	/WAIT FOR DISC FLAG
0772	6621	DFSE	/ANY ERRORS?
0773	9336	JMP DF32RD+1	/YES, REPEAT FUNCTION
0774	9755	JMP I DF32RD	/EXIT
0775	3062	PMES11. MESS11	
0776	0604	K0604. 0604	/GO. REVERSE MOVE. ENABLE

/COM01 - TAPE2
*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	/END POINT
1012	9216	JMP	
1013	1354	TAD	
1014	6764	DTKA	/READ A
1015	9206	JMP SEARCH+6	/AROUND

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	7490	SNA	/CURRENT BLOCK?
1033	5243	JMP LOC8ED	/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	LOC8ED, 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 REGISTER
1075	1351	TAD K0130	
1076	6764	DTXA	/CHANGE FROM SEARCH TO WRITE DATA CONT.
1077	1105	TAD K7200	

1160	3531	DCB	K7754	/SETUP MC
1161	3532	ADD	0000	
1162	3533	DCB	K7755	SETUP OF
1163	4307	ADD	0001	PRINT FOR DECTAPE FLAG
1164	4308	DCB	0000	ENDMST
1165	0270	ADD	0000	PRINT DECTAPE FUNCTION
1166	0271	ADD	0001	

/ASSEMBLY TO WAIT FOR DECTAPE FLAG AND NO ERRORS
/LIFE WHEN TRANSPORT STOPPED

1167	0000	DTERR	0	
1168	4305	INT	0000	WAIT FOR DECTAPE FLAG
1169	4306	DCB	0000	READ DECTAPE
1170	4307	ADD	0000	
1171	4308	ADD	0001	
1172	4309	ADD	0002	
1173	4310	ADD	0003	
1174	4311	ADD	0004	
1175	4312	ADD	0005	
1176	4313	ADD	0006	
1177	4314	ADD	0007	
1178	4315	ADD	0008	
1179	4316	ADD	0009	
1180	4317	ADD	0010	
1181	4318	ADD	0011	
1182	4319	ADD	0012	
1183	4320	ADD	0013	
1184	4321	ADD	0014	
1185	4322	ADD	0015	
1186	4323	ADD	0016	
1187	4324	ADD	0017	
1188	4325	ADD	0018	
1189	4326	ADD	0019	
1190	4327	ADD	0020	
1191	4328	ADD	0021	
1192	4329	ADD	0022	
1193	4330	ADD	0023	
1194	4331	ADD	0024	
1195	4332	ADD	0025	
1196	4333	ADD	0026	
1197	4334	ADD	0027	
1198	4335	ADD	0028	
1199	4336	ADD	0029	
1200	4337	ADD	0030	
1201	4338	ADD	0031	
1202	4339	ADD	0032	
1203	4340	ADD	0033	
1204	4341	ADD	0034	
1205	4342	ADD	0035	
1206	4343	ADD	0036	
1207	4344	ADD	0037	
1208	4345	ADD	0038	
1209	4346	ADD	0039	
1210	4347	ADD	0040	
1211	4348	ADD	0041	
1212	4349	ADD	0042	
1213	4350	ADD	0043	
1214	4351	ADD	0044	
1215	4352	ADD	0045	
1216	4353	ADD	0046	
1217	4354	ADD	0047	
1218	4355	ADD	0048	
1219	4356	ADD	0049	
1220	4357	ADD	0050	
1221	4358	ADD	0051	
1222	4359	ADD	0052	
1223	4360	ADD	0053	
1224	4361	ADD	0054	
1225	4362	ADD	0055	
1226	4363	ADD	0056	
1227	4364	ADD	0057	
1228	4365	ADD	0058	
1229	4366	ADD	0059	
1230	4367	ADD	0060	
1231	4368	ADD	0061	
1232	4369	ADD	0062	
1233	4370	ADD	0063	
1234	4371	ADD	0064	
1235	4372	ADD	0065	
1236	4373	ADD	0066	
1237	4374	ADD	0067	
1238	4375	ADD	0068	
1239	4376	ADD	0069	
1240	4377	ADD	0070	
1241	4378	ADD	0071	
1242	4379	ADD	0072	
1243	4380	ADD	0073	
1244	4381	ADD	0074	
1245	4382	ADD	0075	
1246	4383	ADD	0076	
1247	4384	ADD	0077	
1248	4385	ADD	0078	
1249	4386	ADD	0079	
1250	4387	ADD	0080	
1251	4388	ADD	0081	
1252	4389	ADD	0082	
1253	4390	ADD	0083	

/DECTAPE ERROR ROUTINE: DON'T SELF IF ANY ERROR

1137	0000	DTERR	0	
1138	7200	CLA		
1139	0702	DTERR	0	
1140	7200	DCB	0000	
1141	2337	DCB	0000	
1142	0702	ADD	0000	
1143	0703	ADD	0001	
1144	0704	ADD	0002	
1145	0705	ADD	0003	
1146	0706	ADD	0004	
1147	0707	ADD	0005	
1148	0708	ADD	0006	
1149	0709	ADD	0007	
1150	0710	ADD	0008	
1151	0711	ADD	0009	
1152	0712	ADD	0010	
1153	0713	ADD	0011	

1154	0600	K0600,	0600	/REVERSE, GO
1155	0614	K0614,	0614	/SEARCH, NORMAL, REVERSE, ENABLE
1156	2403	MESS16,	2403	/T,C
1157	6570		6570	/S,B
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,B00" 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 MTHWAIT	/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,ENABLEB00" 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 MTHWAIT	/WAIT FOR MT FLAG AND NO ERRORS
1235	4255	JMS MTERR	/ERRORS?
1236	5221	JMP RDCOMP+1	/YES, REPEAT FUNCTION

1237 0620 JMP I RDCOMP /NO, EXIT

/MAGTAPE REWIND SUBROUTINE (ACTUALLY SPACE REVERSE)

```

1240 0000 REWIND, 0
1241 1254 TAD K0676
1242 6716 MTLCL /LOAD CM WITH "000,7CH,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 MTHWAIT /WAIT FOR HT 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 /000,7CH,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 SEA CLA /BOT?
1263 2255 ISE 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 MTHWAIT, 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 0606      JMP I MTHWAIT
1312 0712      MTHAF      /CLEAR FLAG
1313 0727      JMS I PNTR43
1314 0801      ION
1315 0721      MTR      /WAIT FOR
1316 0315      JMP .-1      /TAPE TRANSPORT READY
1317 0802      IOF
1320 0730      JMS I PNTR44
1321 0606      JMP I MTHWAIT
1322 0000      DTAC, 0
1323 0000      DTLINK, 0
1324 0000      DTIB, 0
1325 0000      DTPC, 0
1326 0106      PMES13, MESS13
1327 0132      PNTR43, MTHSAVE
1330 0144      PNTR44, MTHREST

```

/DECTAPE SAVE SUBROUTINE

```

1331 0000      DTHSAVE, 0
1332 1144      TAD AC      /SAVE AC
1333 0322      DCA DTAC
1334 1145      TAD LINK      /LINK
1335 0323      DCA DTLINK
1336 1456      TAD I PNTR40 /MEMORY FIELD
1337 0324      DCA DTIB
1340 1000      TAD 0      /AND LOC 0
1341 0325      DCA DTPC
1342 0731      JMP I DTHSAVE

```

/DECTAPE RESTORE SUBROUTINE

```

1343 0000      DTHREST, 0
1344 1322      TAD DTAC      /RESTORE SAVED AC
1345 0144      DCA AC
1346 1323      TAD DTLINK /LINK
1347 0145      DCA LINK
1350 1324      TAD DTIB      /MEMORY FIELD
1351 0456      DCA I PNTR40
1352 1325      TAD DTPC      /AND LOC 0
1353 0000      DCA 0
1354 0743      JMP I DTHREST

```

```

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,0
1362 2240      2240 /R,SP
1363 0422      0422 /D,R
1364 2515      2515 /U,H
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	7220	CLA	
1446	6612	DREF	/READ STATUS
1447	3151	DCA DOSTAT	
1452	1363	TAD PHES14	
1451	4483	JMS I PNTR1	/TYPE OUT HEADER
1452	1151	TAD DOSTAT	

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	HLT	/YES
1460	5634	JMP I DRUMWT	

/RF00 DISC READ SUBROUTINE
RF00RD, 0

1461	0000	TAD K7200	
1462	1105	DCA I K7750	/SET UP WC
1463	3475	TAD BUFF6	
1464	1113	DCA I K7751	/SET UP CA
1465	3476	TAD DDFELD	/COMBINE DISC CORE MEMORY FIELD
1466	1022	TAD INTERN	/AND INTERRUPT ENABLES
1467	1143	DIML	/AND TRANSFER TO DISC CONTROL
1470	6615	TAD TRACK	
1471	1142	DXAL	/LOAD DISC EXTENDED ADDRESS
1472	6643	TAD DISCAD	
1473	1140	DMAR	/LOAD DISC ADDRESS AND READ
1474	6603	JMS RF00WT	/WAIT FOR DISC FLAG
1475	4321	DFSE	/ANY ERRORS?
1476	6621	JMP I RF00RD	/NO
1477	5661	JMP RF00RD+1	/YES, REPEAT FUNCTION
1500	5262		

/RF00 DISC WRITE SUBROUTINE
RF00WR, 0

1501	0000	TAD K7200	
1502	1105	DCA I K7750	/SET UP WC
1503	3475	TAD BUFF3	
1504	1114	DCA I K7751	/SET UP CA
1505	3476	TAD DDFELD	/COMBINE DISC CORE MEMORY FIELD
1506	1022	TAD INTERN	/AND INTERRUPT ENABLES
1507	1143	DIML	/AND TRANSFER TO DISC CONTROL
1510	6615	TAD TRACK	
1511	1142	DXAL	/LOAD DISC EXTENDED ADDRESS
1512	6643	TAD DISCAD	
1513	1140	DMAW	/LOAD DISC ADDRESS AND WRITE
1514	6605	JMS RF00WT	/WAIT FOR DISC FLAG
1515	4321	DFSE	/ANY ERRORS
1516	6621	JMP I RF00WR	/NO
1517	5701	JMP RF00WR+1	/YES
1520	5302		

/RF00 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 8721 JMP I RF08WT /NO
1525 1321 TAD RF08WT /YES
1526 3731 DCA I .+3 /SAVE "PC"
1527 8730 JMP I .+1 /TRANSFER CONTROL TO
1530 8714 DF32WT +5 /DF32 ERROR TYPEOUT
1531 8707 DF32WT
    
```

/MAGTAPE WRITE ROUTINE

```

1532 0000 MTRITE, 0
1533 7200 CLA
1534 1364 TAD K0746
1535 6716 MTLG /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 MTGD /LOAD EXTENDED FIELD REGISTER, GO
1545 4447 JMS I PNTR32 /WAIT FOR MT FLAG AND NO ERRORS
1546 2150 ISR RECORD /INCREMENT NUMBER OF RECORDS
1547 5392 JMP .+3
1550 4440 JMS I PNTR19 /4096 RECORDS, REWIND TAPE
1551 8333 JMP MTRITE+1 /START OVER
1552 4441 JMS I PNTR20 /ANY ERRORS
1553 7410 SKP
1554 8732 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 8334 JMP MTRITE+2 /TRY AGAIN
1563 3120 PMES14, MESS14
1564 8746 K0746, 0746 /ODD, 7CH, WRITE, ENABLE, 800
1565 2403 MESS02, 2403 /T,C
1566 6061 6061 /0,1
1567 4004 4004 /SP,D
1570 8503 8503 /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	7040	SZA CLA	/SUPPRESS DECTAPE?
1607	5423	JMP I PNTR6	/YES, EXIT
1610	4457	JMS I PNTR41	/SAVE PI STUFF
1611	0001	ION	
1612	1105	TAD K7200	
1613	3011	DCA 11	
1614	1106	TAD BUFF1	
1615	3010	DCA 10	
1616	1224	TAD .+6	
1617	1020	TAD DTFELD	
1620	3222	DCA .+2	
1621	4442	JMS I PNTR21	
1622	0201	CPF	
1623	3410	DCA I 10	/STORE DATA IN OUTPUT BUFFER
1624	0201	CPF	
1625	0011	ISZ 11	/DONE
1626	0221	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	0231	JMP .-5	
1637	0002	IOF	
1640	4400	JMS I PNTR42	/RESTORE PI STUFF
1641	4443	JMS I PNTR22	/WRITE DATA ONTO DECTAPE
1642	0764	DTXA	/CLEAR FLAGS
1643	4444	JMS I PNTR23	/READ DATA FROM DECTAPE
1644	1367	TAD K0004	/STOP TAPE, CLEAR ENABLE AND
1645	0764	DTXA	/CLEAR FLAGS
1646	4457	JMS I PNTR41	/SAVE PI STUFF
1647	0001	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	1205	TAD .+7	
1657	1020	TAD DTFELD	
1660	3261	DCA .+1	
1661	0201	CPF	
1662	1410	TAD I 10	/COMPARE DATA OUT WITH DATA IN
1663	7041	CIA	
1664	1411	TAD I 11	
1665	0201	CPF	
1666	7440	SZA	/GOOD?
1667	4312	JMS DTDATA	/NO. DATA ERROR

1670	2170	ISZ DTCNTR	/DONE?
1671	5241	JMP .-10	/NO
1672	4002	IOF	/YES
1673	4460	JMS I PNTR42	/RESTORE PI STUFF
1674	7004	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	0300	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 PMES10	
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	GDF	
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, COF	
1761	7604	LAS	
1762	7004	RAL	
1763	7700	SMA CLA	/HALT ON ERROR?
1764	7402	HLT	/YES
1765	9712	JMP I DTDATA	
1766	3144	PHES18, MESS10	
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

2000

/DM01 - TAPE 3
*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	SEA CLA	/SUPPRESS MAGTAPE?
2007	5423	JMP I PNTR6	/YES, EXIT
2010	7604	LAS	
2011	0104	AND K0200	
2012	7640	SEA 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	COF	
2027	3412	DCA I 12	/STORE DATA IN OUTPUT BUFFER
2030	6201	COF	
2031	2013	ISE 13	/DONE?
2032	5225	JMP .-5	/NO
2033	4002	IOF	
2034	4344	JMS MTREST	/RESTORE PI STUFF

2035	4764	JMS I PNTR20	/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 PNTR0	/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 BUFFER
2050	3012	DCA 12	
2051	1111	TAD BUFF9	/INPUT BUFFER
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	COF	
2061	1412	TAD I 12	/COMPARE DATA OUT WITH DATA IN
2062	7041	CIA	
2063	1413	TAD I 13	
2064	6201	COF	
2065	7440	SZA	/GOOD?
2066	4767	JMS I PNTR31	/NO, DATA ERROR
2067	2173	ISE 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, 800" AND CLEAR FLAGS
2115	7240	CLA CMA	

```

2116 1190 TAD RECORD
2117 7490 SNA
2120 5712 JMP I SPCFND
2121 7041 CIA
2122 3477 DCA I K7792 /SET UP WC
2123 6722 MTGO /SET "GO",
2124 4447 JMS I PNTR32 /WAIT FOR MT FLAG AND NO ERRORS
2125 4441 JMS I PNTR20 /ERRORS
2126 7610 SKP CLA /YES
2127 9712 JMP I SPCFND /NO
2130 4440 JMS I PNTR19 /REWIND TAPE, TRY AGAIN
2131 5313 JMP SPCFND+1

```

/MAGTAPE SAVE SUBROUTINE

```

2132 0000 MTSAVE, 0
2133 1144 TAD AC /SAVE AC
2134 3356 DCA MTAC
2135 1145 TAD LINK /LINK
2136 3397 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 0732 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 /8.SP
2173 0411 /0.I
2174 2320 /S.P
2175 1401 /L.A
2176 3177 /Y.?

```

2177 0000 0 /END

2200 *2200
/MAGTAPE DATA ERROR ROUTINE

```

2200 8000 MTDATA, 0
2201 7604 LAS
2202 0103 AND K0400
2203 7640 SZA CLA
2204 5247 JMP CHNGE2+1
2205 6002 IOP
2206 7610 SKP CLA /OR CLA
2207 0223 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 0201 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	4486	JMS I PNTR4
2256	3153	DCA CHAR
2257	1153	TAD CHAR
2260	7841	CIA
2261	1360	TAD K0260
2262	7540	SMA SZA
2263	9273	JMP QUEST
2264	1135	TAD K0010
2265	7710	SPA CLA
2266	9273	JMP QUEST
2267	1153	TAD CHAR
2270	0130	AND K0007
2271	2254	ISZ INPUT
2272	5654	JMP I INPUT
2273	1397	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	MESSAGE, 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 MESSAGE
2330	7110	RAR CLL
2331	7010	RAR
2332	7012	RTR
2333	7012	RTR
2334	4344	JMS POSIT

2335	1571	TAD I TEMP
2336	8361	AND K0077
2337	7450	SNA
2340	9721	JMP I MESSAGE
2341	4344	JMS POSIT
2342	2171	ISE TEMP
2343	5324	JMP MESSAGE+3
2344	8000	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
2372	6570	6570
2373	4015	4015
2374	0107	0107
2375	2401	2401
2376	2005	2005
2377	7700	7700

/?"

/T,C

/5,8

/SP,M

/A,G

/T,A

/P,E

/? ,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	9215	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	ISE 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	RANTNO, -RANTND
2443	0000	RANSAV, 0

2444	0000	RAND1, 0
2445	7200	CLA
2446	1306	TAD .+40
2447	1273	TAD .+24
2450	7640	SEA CLA
2451	5261	JMP .+10
2452	1275	TAD .+23
2453	3273	DCA .+20
2454	1274	TAD .+20
2455	7104	CLL RAL
2456	7430	SEL
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	ISE .+4
2470	3307	DCA .+17
2471	1307	TAD .+16
2472	5644	JMP I .-26
2473	2506	.+43
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	8000	0
2510	0000	RAND2, 0
2511	7200	CLA
2512	1392	TAD .+40
2513	1337	TAD .+24
2514	7640	SZA CLA
2515	9325	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	ISE .+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
2554	0000	/GET SUBROUTINE
2555	6031	GET, 0
2556	5355	KSF
2557	6036	JMP .-1
2560	6046	KRB
2561	6041	TLB
2562	5361	TSF
2563	6042	JMP .-1
2564	5754	TCF
2565	0406	JMP I GET
2566	6362	MESS07, 0406
2567	4004	6362

/D,F
/3,2
/SP,D

2570 1123
2571 0377
2572 0000

1123
0377
0

/I.S
/C.7
/END

2600 2600
2600 3144
2601 7004
2602 3145
2603 6234
2604 7104
2605 7006
2606 0123
2607 1366
2610 3234
2611 0031
2612 7410
2613 5230
2614 6771
2615 7410
2616 5637
2617 6701
2620 7410
2621 5641
2622 6622
2623 7410
2624 5643
2625 6621
2626 7200
2627 7200
2630 6032
2631 1145
2632 7110
2633 1144
2634 6201
2635 6001
2636 5400

*2600
SCAN.

DCA AC
RAL
DCA LINK
RIO
RAL CLL
RTL
AND K0070
TAD CHNGES
DCA MEMORY
KSF
SKP
JMP EXIT
DTSF
SKP
JMP I DTFLAG
MTSF
SKP
JMP I MTFLAG
6622
SKP
JMP I DDFLAG
6621
CLA
CLA
KCC
TAD LINK
RAR CLL
TAD AC
MEMORY. CDF
ION
JMP I 0

/KEYBOARD FLAG?
/NO
/YES
/DECTAPE FLAG?

/YES
/MAGTAPE FLAG?

/YES
/DISC OR DRUM DONE FLAG?

/YES
/DISC OR DRUM ERROR FLAG?

/YES
/OR YES, DEPENDING ON DISC OR DRUM TESTED
/CLEAR AC & KEYBOARDFLAG
/RESTORE LINK & AC

/RESTORE MEMORY FIELDS
/TURN ON INTERRUPT
/EXIT

EXIT.

/DECTAPE FLAG RETURN ADDRESS

2637 0000
2640 5230

DTFLAG, 0
JMP EXIT /EXIT TO TURN P.I. ON

/MAGTAPE FLAG RETURN ADDRESS

2641 0000
2642 5230

MTFLAG, 0
JMP EXIT

/DISC OR DRUM FLAG RETURN ADDRESS

2643 0000
2644 5230

DDFLAG, 0
JMP EXIT

/TYPE SUBROUTINE

2645	8888	TYPE,	0
2646	6046		TLB
2647	8041		TSP
2650	8247		JMP .-1
2651	8042		TCF
2652	7200		CLA
2653	5645		JMP I TYPE

2654	8888	RANDS,	0
2655	7200		CLA
2656	1316		TAD .+40
2657	1303		TAD .+24
2660	7640		SEA CLA
2661	8271		JMP .+10
2662	1305		TAD .+23
2663	3303		DCA .+20
2664	1304		TAD .+20
2665	7104		QLL 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		ISE .+4
2700	3317		DCA .+17
2701	1317		TAD .+16
2702	8654		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	8062		-.
2717	8000		0

/DISC OR DRUM DATA ERROR ROUTINE

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

2725	6802	IOP	
2726	7610	SNP 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
2780	4445	JMS I PNTR24	
2781	1125	TAD K0240	
2782	4446	JMS I PNTR25	
2783	1571	TAD I TEMP	/PICK UP "GOOD" DATA
2784	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	/O.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	/M,E
3015	4006	4006	/SP,F
3016	1714	1714	/O,L
3017	1417	1417	/L,O
3020	2711	2711	/M,I
3021	1607	1607	/N,G
3022	4004	4004	/SP,O
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	0531	0531	/-,Y
3033	0523	0523	/E,S
3034	4016	4016	/SP,N
3035	0516	0516	/-,N
3036	1751	1751	/O,)
3037	0000	0	/END

3040	2206	MESS08, 2206	/R,F
3041	6070	6070	/O,0
3042	4004	4004	/SP,O
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	/S,B
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 1187
3163 8100
3164 4100
3165 1121
3166 4000
3167 1600
3170 5600
3171 8000
3172 4000
3173 3600
3174 7600
3175 4000
3176 2000
3177 3165

1187
100
4100
1121
4000
1600
5600
0
4000
3600
7600
4000
2000
PRO338+4

/ENTER POINT MODE AND DATA STATE, CLEAR COORD AND SECTORS
/SET Y=100
/SET X=100, ESCAPE
/ENTER VECTOR MODE AND DATA STATE
/DELTA Y=0, INTENSIFY
/DELTA X=1600
/DELTA Y=1600, INTENSIFY
/DELTA X=0
/DELTA Y=0, INTENSIFY
/DELTA X=-1600
/DELTA Y=-1600, INTENSIFY
/DELTA X=0, ESCAPE
/JMP I .+1

5

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	DIMA	6610	HALT2	1310	LINK	0145
ASK1	0210	DIML	6615	HALT3	1497	LOC8ED	1043
ASK2	0225	DIB330	0345	HALT4	0733	LOOK	0175
ASK3	0234	DISCAD	0140	INPUT	2254	M0003	0119
ASK4	0243	DISCEA	0137	INTERN	0143	M0004	0121
ASK5	0253	DMAC	6626	INTERR	0207	M0040	0131
ASK6	0263	DMAR	6603	JMP330	0161	M0316	0116
ASK7	0272	DMAW	6605	JMPCON	0706	M0331	0117
BUFF1	0106	DRCF	6621	JMPD32	0157	M2700	0120
BUFF2	0112	DRCN	6624	JMPOEC	0154	MACTAP	0610
BUFF3	0114	DRCR	6603	JMPHAG	0155	MEMORY	2634
BUFF4	0107	DRCH	6605	JMPR00	0160	MESSAGE	2321
BUFF5	0111	DREF	6612	JMPRH0	0156	MESS01	3000
BUFF6	0113	DRES	6612	K0002	1152	MESS02	1565
CDF	0201	DRFS	6624	K0003	1153	MESS03	2171
CHAR	0153	DRHSEC	0192	K0003A	1711	MESS04	2371
CHNGE1	1760	DRSC	6622	K0004	1767	MESS06	1770
CHNGE2	2246	DRSE	6621	K0007	0130	MESS07	2565
CHNGE3	2766	DRTS	6615	K0010	0135	MESS08	3040
CIF	0202	DRUMAD	0141	K0014	0110	MESS09	3046
CRLF	0363	DRUMHT	1434	K0020	0134	MESS10	3055
DCEA	6611	DSAC	6612	K0040	0124	MESS11	3062
DCIM	6611	DTAC	1322	K0070	0123	MESS12	3074
DCMA	6601	DTCA	6762	K0077	2361	MESS13	3106
DDAC	0561	DTCNTR	0170	K0100	0132	MESS14	3120
DDCNTR	0174	DTDATA	1712	K0130	1150	MESS15	3132
DDDATA	2720	DTERR	1137	K0150	1151	MESS16	1156
DDEXER	0400	DTEXER	1600	K0200	0104	MESS17	1357
DDFELD	0022	DTFELD	0020	K0212	0127	MESS18	3144
DDFLAG	2643	DTFLAG	2637	K0215	0126	MTAC	2156
DDIB	0563	DTIB	1324	K0240	0125	MTAF	6712
DDLINK	0562	DTLA	6766	K0260	2360	MTCM	6714
DDLOOP	0565	DTLB	6774	K0277	2357	MTCNTR	0173
DDPC	0564	DTLINK	1323	K0400	0103	MTCR	6711
DDREAD	0443	DTPC	1325	K0600	1154	MTDATA	2200
DDREST	0547	DTPNTR	0163	K0604	0776	MTERR	1255
DDRITE	0435	DTRA	6761	K0614	1155	MTEXER	2000
DDSAVE	0535	DTRB	6772	K0626	1356	MTFELD	0021
DDSTAT	0151	DTREAD	1047	K0636	1355	MTFLAG	2641
DEAC	6616	DTREST	1343	K0666	2170	MTGO	6722
DEAL	6615	DTRITE	1067	K0676	1254	MTHLT1	0614
DECTAP	0600	DTSAVE	1331	K0746	1564	MTHLT2	0617
DF32	0644	DT9F	6771	K1000	0136	MTIB	2160
DF32EX	0526	DTSTAT	0146	K3000	0122	MTLC	6716
DF32PR	0166	DTWAIT	1107	K7200	0105	MTLINK	2157
DF32RD	0755	DTXA	6764	K7700	2362	MTPC	2161
DF32RE	0534	DXAL	6643	K7750	0075	MTPNTR	0164
DF32RI	0533	EXIT	2630	K7751	0076	MTREAD	1200
DF32WR	0735	FELD	0162	K7752	0077	MTREST	2144
DF32WT	0707	FOUND	1145	K7753	0100	MTRITE	1532
DF5C	6622	GET	2594	K7754	0101	MTRS	6706
DF5E	6621	HALT1	1135	K7755	0102	MTSAVE	2132

MTSF	0701	PNTR36	0093	RM08RI	0519
MTSTAT	0147	PNTR38	0094	RM08WR	1416
MTR	0721	PNTR39	0095	RNF	4244
MTHAIT	1206	PNTR4	0096	SCAN	2600
NODIBC	0345	PNTR40	0096	SEARCH	1000
PME11A	0364	PNTR41	0097	SKIP	0133
PMES10	0073	PNTR42	0040	SPCFWD	2112
PMES11	0779	PNTR43	1327	START	0200
PMES12	1147	PNTR44	1330	TEMP	0171
PMES13	1326	PNTR45	0703	TEMP1	0172
PMES14	1543	PNTR46	0704	TEST	0327
PMES15	0074	PNTR47	0705	TRACK	0142
PMES16	0390	PNTR48	0001	TYPE	2645
PMES17	2774	PNTR49	0002		
PMES18	1766	PNTR5	0007		
PMES19	0063	PNTR6	0023		
PMES2	0064	PNTR7	0024		
PMES3	0065	PNTR8	0025		
PMES4	0066	PNTR9	0026		
PMES6	0067	POSIT	2344		
PMES7	0070	PRINT	2277		
PMES8	0071	PRO338	3161		
PMES9	0072	QUEST	2273		
PNTR1	0003	RANCON	2430		
PNTR10	0027	RAND1	2444		
PNTR11	0030	RAND2	2510		
PNTR12	0031	RAND3	2654		
PNTR13	0032	RANDEX	2427		
PNTR14	0033	RANGEN	2400		
PNTR15	0034	RANSAY	2443		
PNTR16	0035	RANTAD	2415		
PNTR17	0036	RANTBL	2431		
PNTR18	0037	RANTND	2442		
PNTR19	0040	ROCOMP	1220		
PNTR2	0004	RDF	6214		
PNTR20	0041	RECORD	0150		
PNTR21	0042	REWIND	1240		
PNTR22	0043	RF08	0662		
PNTR23	0044	RF08EX	0517		
PNTR24	0045	RF08PR	0167		
PNTR25	0046	RF08RD	1461		
PNTR26	2162	RF08RE	0525		
PNTR27	2163	RF08RI	0524		
PNTR28	2164	RF08WR	1501		
PNTR29	2165	RF08WT	1521		
PNTR3	0005	RIB	6234		
PNTR30	2166	RIF	6224		
PNTR31	2167	RM08	0627		
PNTR32	0047	RM08EX	0510		
PNTR33	0050	RM08PR	0165		
PNTR34	0051	RM08RD	1400		
PNTR35	0052	RM08RE	0516		

/DM02

.SER - TAPE 1

PAL10

V101

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/119

PAGE 1-40

ERRORS DETECTED: 0

LINKS GENERATED: 0

RUN-TIME: 16 SECONDS

3K CORE USED