

TM11

TM11 DATA RELIAB
CZTMCDO

AH-S171D-MC
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IDENTIFICATION

PRODUCT CODE: AC-9402D-MC

PRODUCT NAME: CZTMCD0 TM11 DATA RELIAB

PROGRAM DATE: MAY 1980

MAINTAINER: DIAGNOSTIC GROUP

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1. ABSTRACT

THE TM11 DATA RELIABILITY PROGRAM COLLECTS STATISTICAL INFORMATION PERTAINING TO THE DATA RELIABILITY OF THE TM11, TU10 WHEN RUN FOR EXTENDED PERIODS OF TIME. IT USES A NUMBER OF DIFFERENT PARAMETERS CONTROLLING DATA PATTERNS, PARITY, DENSITY RECORD LENGTHS, WRITING AND READING SEQUENCES AND STOPPING MODES (NONSTOP, START-STOP, RANDOM STALL DELAY).

2. REQUIREMENTS

2.1 EQUIPMENT

PDP-11 WITH TM11 AND 1 TO 8 TU10 TAPE UNITS (7 CHANNEL ONLY)

2.2 STORAGE

2.2.1 PROGRAM STORAGE

THE ROUTINE REQUIRES 4K OF MEMORY.

2.3 PRELIMINARY PROGRAMS

THE TM11 INSTRUCTION TEST AND TM11 DRIVE FUNCTION TIMER MUST RUN PROPERLY BEFORE ATTEMPTING TO USE THIS PROGRAM.

3. LOADING PROCEDURE

3.1 METHOD

PROCEDURE FOR NORMAL BINARY TAPES SHOULD BE FOLLOWED:

1. ABSOLUTE LOADER MUST BE IN MEMORY.
2. PLACE BINARY TAPE IN READER.
3. LOAD ADDRESS *7500 (* DETERMINED BY LOCATION OF LOADER)
4. PRESS 'START' (PROGRAM WILL LOAD).

4. STARTING PROCEDURE

4.1 CONTROL SWITCH SETTINGS

FOR INITIAL OPERATION OF PROGRAM ALL SWITCHES SHOULD BE - 0 (OR DOWN).

4.2 STARTING ADDRESS

200 - BASIC TEST (AUTOMATIC PARAMETER AND UNIT SELECTION)

204 - OPERATOR CONTROLLED PARAMETER TEST (WITH 4K MEMORY AVAILABLE)

210 - " " " " (" 8k " ")

4.3 PROGRAM AND/OR OPERATOR ACTION

LOAD PROGRAM INTO MEMORY
SET DESIRED TU10 TAPE UNITS ON-LINE
LOAD STARTING ADDRESS 200 (204 OR 210 TO SELECT PARAMETERS AND UNITS)
PRESS START-PROGRAM WILL BEGIN TESTING FOR LOAD ADDRESS OF 200 OTHERWISE
SELECT TAPE UNITS (REFERENCE 4.3.1.1)
SELECT PARAMETERS (REFERENCE 4.3.2)
TYPE CARRIAGE RETURN AND PROGRAM WILL BEGIN TESTING.

4.3.1 TAPE UNIT SELECTION

STARTING THE PROGRAM AT 200 WILL RESULT IN AUTOMATIC SELECTION
OF THE UNITS TO BE TESTED (REFERENCE 4.3.1.2) OTHERWISE STARTING
AT 204 OR 210 WILL ALLOW OPERATOR TO SELECT UNITS.

THE PROGRAM WILL TYPE 'SELECT UNITS'. ANY CONFIGURATION OF
1 TO 8 UNITS MAY BE SELECTED BY TYPING THE UNIT NUMBERS ON
THE TELETYPE. ANY SEQUENCE OF NUMBERS MAY BE TYPED. AFTER
EACH NUMBER IS TYPED A COMMA (,) WILL BE PRINTED. TYPING THE
SAME UNIT NUMBER TWICE WILL CAUSE THAT UNIT NUMBER TO BE DELETED.
TYPING ANY KEY OTHER THAN 0 THRU 7 WILL CAUSE A QUESTION MARK
(?) TO BE PRINTED AND THAT KEY WILL BE IGNORED.

TO TERMINATE UNIT SELECTION TYPE A CARRIAGE RETURN. WHEN
CARRIAGE RETURN IS TYPED THE PROGRAM WILL CONTINUE TO THE
'PARAMETER SELECTION' UNLESS NO UNITS WERE SELECTED AND IN
THAT EVENT WILL RETURN TO THE BEGINNING OF 'SELECT UNITS'.

4.3.1.1 TAPE UNIT SELECTION EXAMPLES

SELECT UNITS 3,4,5
SELECT UNITS 5,3,4

IN EITHER CASE, UNITS 3,4,5 ARE SELECTED.

SELECT UNITS
SELECT UNITS

A CARRIAGE RETURN WAS TYPED WITH NO UNITS SELECTED.

SELECT UNITS 1,9?,1,2

ONLY UNIT 2 SELECTED, UNIT 1 WAS DELETED (TYPED TWICE)
AND THE 9 WAS IGNORED.

4.3.1.2 STARTING AT 200 WILL RESULT IN AUTOMATIC SELECTION OF UNITS TO BE TESTED. A UNIT WILL BE SELECTED FOR TESTING IF IT MEETS THE FOLLOWING CRITERIA.

1. IT IS ON-LINE
2. IT IS SEVEN(7) TRACK
3. IT IS WRITE ENABLED

IF THE ABOVE CRITERIA IS NOT MEET BY AT LEAST ONE(1) UNIT
OPERATOR SELECTION WILL BE REQUIRED (REFERENCE 4.3.1).

4.3.2 PARAMETER SELECTION

STARTING THE PROGRAM AT 200 WILL RESULT IN AN AUTOMATIC SELECTION
OF TEST PARAMETERS (REFERENCE 4.3.2.10) OTHERWISE STARTING AT
ADDRESS 204 OR 210 WILL ALLOW OPERATOR TO SELECT PARAMETERS.
THERE ARE SEVEN TYPES OF PARAMETERS TO BE CONTROLLED BY THE
OPERATOR. THEY INCLUDE: TEST NUMBER, PATTERN, PARITY, DENSITY
RECORD LENGTH, WRITE MODE, AND READ MODE. THE PROGRAM WILL PRINT:

'TST PAT PAR DEN RLS WMO RMO'

TST=TEST NUMBER
PAT=PATTERN
PAR=PARITY
DEN=DENSITY
RLS=RECORD LENGTH SEQUENCE
WMO=WRITE START/STOP MODE
RMO=READ START/STOP MODE

4.3.2.1 TEST NUMBER

THERE ARE 6 TESTS AVAILABLE FOR SELECTION (0 THRU 5).

TEST	DESCRIPTION
0	WRITE 1 RECORD, REPEAT ON ALL UNITS, CONTINUE TO END OF TAPE.
1	WRITE 256 RECORDS, REPEAT FOR ALL UNITS, CONTINUE TO END OF TAPE.
2	WRITE 256 RECORDS, REPEAT FOR ALL UNITS, BACKSPACE 256 RECORDS, REPEAT FOR ALL UNITS, READ 256 RECORDS, REPEAT FOR ALL UNITS, CONTINUE TO END OF TAPE.
3	WRITE 1 RECORD, REPEAT FOR ALL UNITS, BACKSPACE, REPEAT FOR ALL UNITS, READ 1 RECORD, REPEAT FOR ALL UNITS, CONTINUE TO END OF TAPE.
4	WRITE 1 RECORD, REPEAT FOR ALL UNITS, REPEAT FOR 256 RECORDS, BACKSPACE 256 RECORDS, REPEAT FOR ALL UNITS, READ 1 RECORD, REPEAT FOR ALL UNITS, REPEAT FOR 256 RECORDS, CONTINUE TO END OF TAPE.
5	READ 1 RECORD, REPEAT FOR ALL UNITS, CONTINUE TO END OF TAPE.

4.3.2.2 PATTERN

THERE ARE 8 DATA PATTERNS AVAILABLE FOR SELECTION (0 THRU 7) WITH EACH PARITY.

PATTERN	DESCRIPTION	DATA
0 (EVEN)	HIGH FREQUENCY OUTSIDE SKEW	01 01 ETC
0 (ODD)	HALF FREQUENCY OUTSIDE SKEW	01 00 01 00 ETC
1 (EVEN)	SLIDING '0'	37 57 67 73 75 76 ETC
1 (ODD)	SLIDING '1'	40 20 10 4 2 1 ETC
2 (EVEN)	HIGH FREQUENCY ALTERNATING TRACKS	25 25 ETC
2 (ODD)	HIGH FREQUENCY ALTERNATING TRACKS	52 52 ETC
3 (EVEN)	HALF FREQUENCY OUTSIDE TRACK HIGH FREQUENCY INSIDE TRACKS	77 76 77 76 ETC
3 (ODD)	HIGH FREQUENCY OUTSIDE TRACK HALF FREQUENCY INSIDE TRACKS	01 77 01 77 ETC

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PATTERN	DESCRIPTION	DATA
4 (EVEN)	INCREMENTING PATTERN (NO ALL 0'S)	01 02 03 . 77
4 (ODD)	INCREMENTING PATTERN (INCLUDING ALL 0'S)	00 01 02 . 77
5 (EVEN)	THREE 0'S EACH TRACK EVERY 6TH WORD	37 37 37 57 57 57 57 67 67 67 73 73 73 75 75 75 75 76 76 76 ETC
5 (ODD)	THREE 1'S EACH TRACK EVERY 6TH WORD	40 40 40 20 20 20 20 10 10 10 10 04 04 04 02 02 02

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ETC

6 (ODD,EVEN) ALL 1'S
77
77
ETC

7 (EVEN) RANDOM (NO ALL 0'S) ?
7 (ODD) RANDOM (INCLUDING ALL 0'S) ?

4.3.2.3 PARITY

PARITY SELECTION IS EITHER EVEN OR ODD.

PAR	DESCRIPTION
0	EVEN PARITY.
1	ODD PARITY

4.3.2.4 DENSITY

THERE ARE 4 TYPES OF DENSITIES FOR SELECTION (2,5,8,C)

DEN	DESCRIPTION
2	200 BITS PER INCH.
5	556 BITS PER INCH.
8	800 BITS PER INCH.
C	800 BPI CORE DUMP.

4.3.2.5 RECORD LENGTH SEQUENCE

THERE ARE 4 TYPES OF RECORD LENGTH SEQUENCES FOR SELECTION (0 THRU 3)

RLS	DESCRIPTION
0	MINIMUM LENGTH RECORDS (4 BYTES)
1	MAXIMUM LENGTH RECORDS (1024 BYTES)
2	VARIING LENGTH RECORDS, MINIMUM TO MAXIMUM (1ST RECORD= 4 BYTES, EACH SUCCESSIVE RECORD IS 4 BYTES LONGER)

UNTIL 256TH RECORD=1024 BYTES)

- 3 VARYING LENGTH RECORDS, MAXIMUM TO MINIMUM (1ST RECORD=1024 BYTES, EACH SUCCESSIVE RECORD IS 4 BYTES SHORTER UNTIL 256TH RECORD=4 BYTES)

4.3.2.6 WRITE START/STOP MODE

THERE ARE 3 TYPES OF WRITE MODES FOR SELECTION (0 THRU 2)

WMO	DESCRIPTION
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0	NONSTOP - NO WAITING BETWEEN WRITE OPERATIONS. NEW COMMAND IS ISSUED WHEN CU READY SETS.
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1	START/STOP - FULL STOP BETWEEN WRITE OPERATIONS. NEW COMMAND IS ISSUED WHEN TU READY SETS.
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2	RANDOM - FULL STOP WITH RANDOM DELAY (1-256 MILLISECONDS)
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4.3.2.7 READ START/STOP MODE

THERE ARE 3 TYPES OF MODES FOR SELECTION (0 THRU 2)

RMO	DESCRIPTION
-----	-------------

0	NONSTOP - NO WAITING BETWEEN READ OPERATIONS. NEW COMMAND IS ISSUED WHEN CU READY SETS.
---	---

1	START/STOP - FULL STOP BETWEEN READ OPERATIONS. NEW COMMAND IS ISSUED WHEN TU READY SETS.
---	---

2	RANDOM - FULL STOP WITH RANDOM DELAY (1-256 MILLISECONDS)
---	---

4.3.2.8 FINAL TEST SELECT APPROVAL

AFTER SELECTING RMO, IF ALL PARAMETERS SELECTED ARE LEGAL, 'OK' WILL BE PRINTED. IF THE PARAMETERS SELECTED STILL CORRESPOND TO THE OPERATORS INTENTIONS HE MUST TYPE A CARRIAGE RETURN TO SAVE THE PARAMETERS. TYPING ANY OTHER KEY NOW, OR IN FACT AT ANY TIME DURING PARAMETER SELECTION TYPING AN ILLEGAL KEY WILL CAUSE THE PRESENT PARAMETERS TO BE DELETED AND A NEW PARAMETER SELECTION TO BE INITIATED. UP TO TEN SETS OF PARAMETER SELECTIONS CAN BE MADE. EACH SET WILL BE EXECUTED AFTER THE PREVIOUS SET REACHES END OF TAPE. TO TERMINATE PARAMETER SELECTION A SECOND CARRIAGE RETURN MUST BE TYPED AFTER SELECTING A SET OF PARAMETERS.

4.3.2.9 TEST SELECTION EXAMPLES

TST PAT PAR DEN RLS WMO RMO

3	2	0	2	1	0	0	OK (CR)
3	K?						
0	0	1	8	2	2	2	OKX?
0	1	1	8	2	1	0	OK (CR)

TWO PARAMETERS SETS WERE SELECTED BY THE ABOVE SEQUENCE

TEST3, PATTERN 2, EVEN PARITY, 200 BPI, MAXIMUM RECORD LENGTH, WRITE NONSTOP, AND READ NONSTOP.
TEST 0, PATTERN 1, ODD PARITY, 800 BPI, VARYING RECORD LENGTH (MIN TO MAX), WRITE START/STOP, READ NONSTOP.
(NOTE: EVEN THOUGH TEST 0 IS A WRITE ONLY TEST, ALL PARAMETERS MUST BE SATISFIED.) (IN THIS CASE RMO HAS NO EFFECT)

IN THE SECOND PARAMETER SET A 'K' WAS TYPED WHICH WAS ILLEGAL AND THE SFT WAS REINITIALIZED.

IN THE THIRD PARAMETER SET AN 'X' WAS TYPED INSTEAD OF A CARRIAGE RETURN AND THE PARAMETERS WERE IGNORED. AFTER AT LEAST ONE GOOD SET WAS SELECTED A CARRIAGE RETURN WAS TYPED AT THE BEGINNING OF THE PARAMETER SELECTION AND THE PROGRAM WOULD START TESTING.

4.3.2.10 AUTOMATIC PARAMETER SELECTION

STARTING AT 200 WILL CAUSE THE FOLLOWING TEST PARAMETERS TO BE SELECTED AUTOMATICALLY :

TST	PAT	PAR	DEN	RLS	WMO	RMO
3	6	0	8	1	1	1
4	0	1	C	2	2	2
2	7	1	C	2	2	2

5.0 OPERATING PROCEDURE

THIS PROGRAM HAS BEEN MODIFIED TO RUN ON A PROCESSOR WITH OR WITHOUT A HARDWARE SWITCH REGISTER. WHEN FIRST EXECUTED THE PROGRAM TESTS THE EXISTENCE OF A HARDWARE SWITCH REGISTER. IF NOT FOUND A SOFTWARE SWITCH REGISTER LOCATION (SWREG=LOC. 176) IS DEFAULTED TO. IF THIS IS THE CASE, UPON EXECUTION THE CONTENTS OF THE SWREG ARE DUMPED IN OCTAL ON THE CONSOLE TTY AND ANY CHANGES ARE REQUESTED

(IE) SWR=XXXXXX NEW=

POSSIBLE RESPONSES ARE:

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1. <CR> IF NO CHANGES ARE TO BE MADE
2. 6 DIGITS 0-7 TO REPRESENT IN OCTAL THE NEW SWITCH REGISTER VALUE ;LAST DIGIT FOLLOWED BY <CR>.
3. ^U TO ALLOW REENTERING VALUE IF ERROR IS COMMITTED KEYING IN SWREG VALUE.
4. <LF> ONLY VALID FOR ACT-11 SYSTEMS-DO NOT USE

BUILT INTO THE PROGRAM IS THE ABILITY TO DYNAMICALLY CHANGE THE CONTENTS OF SWREG DURING PROGRAM EXECUTION. BY STRIKING ^G (CNTRL G) ON CONSOLE TTY THE OPERATOR SETS A REQUEST FLAG TO CHANGE THE CONTENTS OF SWREG, WHICH IS PROCESSED IN KEY AREAS OF THE PROGRAM CODE (IE) ERROR ROUTINES, AFTER HALTS END OF PASS, AND OTHER APPLICABLE AREAS.

5.1 OPERATIONAL SWITCH SETTINGS

THE OPERATIONAL SWITCH SETTINGS ARE USED TO:

- A. ALTER ERROR RECOVERY PROCEDURES
- B. DELETE ERROR PRINTOUTS
- C. CAUSE A TEST SEQUENCE TO BE REPEATED WITH A VARIATION THE PATTERN, RECORD LENGTH SEQUENCE, WRITE MODE, OR READ MODE

5.1.1 SWITCHES TO ALTER ERROR RECOVERY

THE FUNCTION PERFORMED IS WITH THE SWITCH IN THE '1' (OR UP) POSITION.

SW	FUNCTION	PURPOSE
4	DELETE READ RE-TRYs	USE OF THIS SWITCH WILL CAUSE DELETION OF THE NORMAL SEQUENCE OF TRYING TO RE-READ A RECORD AFTER A READ ERROR. THIS WOULD BE USEFUL FOR SCOPING READ OPERATIONS.
5	DELETE WRITE XIRG	USE OF THIS SWITCH WILL CAUSE RECORDS WITH WRITE ERRORS TO BE LEFT ON TAPE. THE READ PASS WITH DATA TYPEOUTS SELECTED WOULD BE USEFUL FOR DETERMINING WRITE ERROR ORIGINS.
6	WRITE STATISTICAL RECOVERY	USE OF THIS SWITCH WILL CAUSE A BACKSPACE 2 RECORDS, SPACE FORWARD 1 RECORD, REWRITE RECORD

SEQUENCE TO BE USED INSTEAD
OF WRITE XIRG SO THAT THE RECORD
WILL BE REWRITTEN ON APPROXI-
MATELY THE SAME AREA OF TAPE
WHERE THE WRITE ERROR OCCURRED.
THIS METHOD KEEPS THE INTER-
RECORD GAP FROM GETTING LARGER.
DATA IS WRITTEN OVER THE SAME
SPOT ON TAPE TO TRY AND FIND BAD TAPE.

5.1.2 SWITCHES TO CONTROL ERROR PRINTOUTS

THE FUNCTION PERFORMED IS WITH THE SWITCH IN THE '1' (OR
UP) POSITION.

SW	FUNCTION	PURPOSE
13	SUPPRESS ERROR PRINTOUT	THE STATISTICS CONCERNING THE NUMBER AND TYPES OF ERRORS WILL BE PRINTED WHEN THE TAPE UNIT REACHES END OF TAPE. FOR LONG PERIODS OF TESTING (OVERNIGHT, ETC) IT MAY BE SUFFICIENT TO RECEIVE THIS INFORMATION AND NOT HAVE A TYPEOUT EACH TIME AN ERROR OCCURRED.
8	PRINT ERROR STATISTICS	AFTER COMPLETION OF EVERY RECORD LENGTH SEQUENCE INSTEAD OF AFTER END OF TAPE AS IS NORMAL.

5.1.3 TO ALTER TEST PATTERNS

SW	FUNCTION	PURPOSE
0	CHANGE PATTERN	AFTER COMPLETION OF A TEST SE- QUENCE REPEAT WITH NEXT PATTERN. UNTIL PATTERN 7 IS COMPLETED.

THIS FEATURE IS USEFUL FOR TESTING MANY COMBINATIONS OF TEST
PATTERNS WITHOUT REQUIRING THE OPERATOR TO TYPE IN A LARGE
NUMBER OF PARAMETERS.

EXAMPLE: TST PAT PAR DEN RLS WMO RMO
3 2 0 2 1 0 0
4 6 0 2 0 0 0

WITH SW0=1
TEST 3 WILL BE EXECUTED 6 TIMES (PATTERNS 2-7)
AND THEN TEST 4 WILL BE EXECUTED 2 TIMES (PATTERNS 6,7)

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6. ERRORS

6.1 WRITE ERRORS

THE FOLLOWING ERROR TYPEOUTS ARE POSSIBLE DURING A WRITE OPERATION.

A. WRITE STATUS ERROR

COMD	STATUS	RECORD	LENGTH	EXPECTED	ACTUAL
XXXXXX	XXXXXX				

THIS WILL OCCUR IF ERROR (BIT 15 OF COMMAND REGISTER) SETS ON A WRITE COMMAND. THE CONTENTS OF THE COMMAND AND STATUS REGISTERS IS PRINTED ALONG WITH THE RECORD NUMBER AND RECORD LENGTH.

B. XIRG WRITTEN 4 TIMES

THIS WILL OCCUR IF A WRITE STATUS ERROR CANNOT BE ELIMINATED IN 4 ATTEMPTS AT RE-WRITING THE RECORD WITH EXTENDED INTERRECORD GAP. NOT POSSIBLE DURING TEST 0 OR 1 AS THESE ARE 'WRITE ONLY' TESTS AND IT IS NOT ABSOLUTELY NECESSARY FOR THE RECORDS TO BE WRITTEN PROPERLY. SETTING SWITCH 5 TO A '1' WILL DELETE 'WRITE WITH XIRG'.

C. END OF TAPE

DRV	PAT	PAR	DEN	MODE	RECORD	LENGTH
0	7	0	800	SSTP	1276	MAX

WRITE ERRORS = 5
RECOVERED AT 1 = 3
RECOVERED AT 3 = 1
PERMANENT BADSPOT = 1

DRV = UNIT NUMBER
PAT = PATTERN NUMBER
PAR = PARITY
DEN = DENSITY
MODE = WRITE START/STOP MODE
RECORD = NUMBER OF RECORDS
LENGTH = LENGTH OF RECORDS

ON UNIT 0, USING PATTERN 7, EVEN PARITY, 800 BPI, WRITE MODE START/STOP, 1276 RECORDS OF MAXIMUM (1048 BYTES) LENGTH WERE WRITTEN. DURING THAT TIME 5 WRITE STATUS ERRORS OCCURRED, 3 WERE RECOVERED ON THE 1ST RE-WRITE, 1 RECOVERED ON THE 3RD RE-WRITE. THE REMAINING ERROR NOT RECOVERED IS CONSIDERED TO BE CAUSED BY A PERMANENT BAD SPOT ON TAPE.

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6.2 READ ERRORS

THE FOLLOWING ERROR TYPEOUTS ARE POSSIBLE DURING A READ OPERATION:

A. READ STATUS ERROR

COMD	STATUS	RECORD	LENGTH	EXPECTED	ACTUAL
XXXXXX	XXXXXX	47	4		

THIS WILL OCCUR WHEN ERROR (BIT 15 OF COMMAND REGISTER) SETS DURING A READ OPERATION. THE CONTENTS OF THE COMMAND AND STATUS REGISTERS IS PRINTED ALONG WITH THE RECORD NUMBER AND RECORD LENGTH.

B. READ DATA ERROR

COMD	STATUS	RECORD	LENGTH	EXPECTED	ACTUAL
XXXXXX	XXXXXX	107	1024	177777	175777

THIS WILL OCCUR WHEN THE DATA READ DOES NOT AGREE WITH THE DATA WRITTEN. THE CONTENTS OF THE COMMAND AND STATUS REGISTERS IS PRINTED, ALONG WITH THE RECORD NUMBER AND RECORD LENGTH. ALSO PRINTED IS THE CONTENTS OF THE MEMORY ADDRESS FROM WHICH THE DATA WAS WRITTEN (EXPECTED) AND THE CONTENTS OF THE MEMORY ADDRESS INTO WHICH IT WAS READ (ACTUAL). THIS INDICATES THE FIRST DATA TRANSFER ERROR FOUND FOR THE RECORD. NO ATTEMPT IS MADE TO DETERMINE IF THERE ARE OTHER DATA ERRORS IN THE RECORD.

C. READ PASS

END OF TAPE

DRV	PAT	PAR	DEN	MODE	RECORD	LENGTH
3	4	1	CD	NSTP	1276	M-MAX

READ STATUS ERRORS = 3
DATA ERRORS = 1
NON RECOVERABLE ERRORS = 0

ON UNIT 3, USING PATTERN 4, ODD PARITY, CORE DUMP, READ MODE NONSTOP, 1276 RECORDS OF VARYING LENGTH (4 TO 1024) WERE READ. DURING THAT TIME 2 READ STATUS ERRORS AND 1 DATA ERROR OCCURRED. THERE WERE 0 NON-RECOVERABLE ERRORS WHICH INDICATES THAT THE STATUS AND DATA ERRORS WERE ELIMINATED BY RE-READING THE RECORD UP TO THREE TIMES.

6.3 ERROR RECOVERY PROCEDURES

6.3.1 WRITE ERROR RECOVERY

THE PROCEDURE TO RECOVER FROM A WRITE ERROR IS DETERMINED BY THE FOLLOWING:

A. IS IT A 'WRITE ONLY' TEST OR WILL THE DATA BE READ?

B. IS 'WRITE STATISTICAL RECOVERY' SELECTED (SW 6=1)?

C. IS 'DELETE WRITE WITH XIRG' SELECTED (SW 5=1)?

6.3.1.1 IF IT IS A 'WRITE ONLY' TEST AND 'WRITE STATISTICAL RECOVERY' IS NOT SELECTED (SW 6=0) THE WRITE ERROR IS SIMPLY COUNTED AND THE PROGRAM PROCEEDS TO THE NEXT RECORD.

6.3.1.2 IF IT IS A 'WRITE ONLY' TEST AND 'WRITE STATISTICAL RECOVERY' IS SELECTED (SW 6=1), A WRITE ERROR IS COUNTED AND THEN A RECOVERY SEQUENCE (BACKSPACE 2 RECORDS, SPACE FORWARD 1 RECORD, REWRITE RECORD) IS ENTERED. THIS RECOVERY SEQUENCE WILL BE REPEATED UP TO 7 TIMES IF THE WRITE ERROR PERSISTS. IF A WRITE ERROR IS NOT ELIMINATED AFTER THE 8TH ATTEMPT IT IS COUNTED AS A PERMANENT BAD SPOT ON TAPE. STATISTICS ARE SAVED TO INDICATE HOW MANY TIMES THE REWRITE SEQUENCE HAD TO BE REPEATED TO RECOVER FROM EACH WRITE ERROR.

6.3.1.3 IF IT IS A 'WRITE AND READ' TEST AND 'WRITE STATISTICAL RECOVERY' IS SELECTED (SW 6=1) AND 'WRITE WITH XIRG' IS NOT DELETED (SW 5=0) THE PROGRAM WILL FIRST ATTEMPT TO DO A 'WRITE STATISTICAL RECOVERY'. IF A PERMANENT BAD SPOT IS ENCOUNTERED THE PROGRAM WILL THEN ATTEMPT TO RECOVER WITH A 'WRITE WITH XIRG'. FAILURE TO RECOVER AT THIS POINT SHOULD RESULT IN A READ ERROR DURING THE READ PASS.

6.3.1.4 IF IT IS A 'WRITE AND READ' TEST AND 'WRITE STATISTICAL RECOVERY' IS NOT SELECTED (SW 6=0) AND 'WRITE WITH XIRG' IS NOT DELETED (SW 5=0) THE PROGRAM WILL TRY TO RECOVER ONLY BY REWRITING THE RECORD WITH EXTENDED INTERRECORD GAP. FAILURE TO RECOVER SHOULD RESULT IN A READ ERROR DURING READ PASS.

6.3.2 READ ERROR RECOVERY

A READ ERROR CAN OCCUR FOR TWO REASONS: STATUS ERROR OR DATA ERROR. A PROPER COUNT IS TAKEN FOR EACH TYPE OF ERROR. RECOVERY OF A READ ERROR WILL CONSIST OF TRYING TO RE-READ THE RECORD UP TO TWO MORE TIMES (UNLESS SW 4=1 TO DELETE READ RE-TRYs FOR SCOPING PURPOSES). IF THE ERROR PERSISTS IT IS CONSIDERED 'NON-RECOVERABLE' AND THE PROGRAM WILL CONTINUE WITH THE NEXT RECORD.

7. RESTRICTIONS

NONE

8. MISCELLANEOUS

8.1 TAPE LENGTH

SINCE EACH OF THE TESTS DEPEND ON REACHING THE 'EOT' REFLECTOR FOR TERMINATING IT COULD BE ADVANTAGEOUS TO USE A 'SHORT' TAPE. THIS WOULD ALLOW FOR LESS TIME TO RUN A SERIES OF TESTS WHILE VARYING THE TEST PARAMETERS (REFERENCE 5.1.3). HOWEVER, THIS IS NOT INTENDED TO IMPLY THAT CONSTANTLY CHANGING THE TEST PARAMETERS CONSTITUTES A MORE DIFFICULT TEST OF DATA RELIABILITY. THE LENGTH OF TIME UNDER TEST IS MORE LIKELY TO SUPPLY THAT. IN ANY EVENT, IF A 'SHORT' TAPE IS DESIRED, JUST PLACE AN 'EOT' REFLECTIVE STRIP APPROXIMATELY 50 FEET DOWN TAPE FROM THE 'BOT' MARKER. SO THAT THE TAPE IS STILL USEFUL AS A 'LONG' TAPE ANOTHER 'BOT' MARKER COULD BE PLACED A SHORT DISTANCE (APPROXIMATELY 10 FEET) FARTHER DOWN ON TAPE. THIS WOULD EFFECTIVELY GIVE YOU TWO TAPES. CARE MUST BE EXERCISED WHEN MOUNTING THE TAPE TO POSITION 'T' AT THE PROPER 'BOT' MARKER.

8.2 MEMORY AVAILABLE

THE PROGRAM REQUIRES 4K OF MEMORY. IF 8K IS AVAILABLE, STARTING THE PROGRAM AT ADDRESS 200 OR 210 WILL EXPAND THE WRITE AND READ BUFFERS SO THAT MINIMUM LENGTH RECORDS WILL BE 8 BYTES AND MAXIMUM LENGTH RECORDS WILL BE 2048 BYTES.

9. PROGRAM DESCRIPTION

9.1 GENERAL DESCRIPTION

THE PROGRAM IS DESIGNED AROUND TWO MAIN SUBROUTINES 'WRITE' AND 'READ' AND A SERIES OF MINOR SUBROUTINES FOR MANIPULATING UNIT SELECTION, HANDLING ERROR STATISTICS, AND RECORD POSITIONING. IF MORE THAN ONE UNIT IS SELECTED THE UNIT WITH THE LOWEST NUMBER IS SELECTED FIRST AND WHEN THE SEQUENCE IS COMPLETED THEN THE NEXT LOWEST UNIT NUMBER IS SELECTED UNTIL ALL UNITS HAVE BEEN SELECTED. THIS PROCESS IS REPEATED UNTIL ALL UNITS REACH END OF TAPE.

9.2 TEST 0

THIS IS A 'WRITE ONLY' TEST. THE PROCEDURE IS TO WRITE 1 RECORD, REPEAT FOR ALL UNITS, CONTINUE UNTIL EOT. WRITE MODE OF NONSTOP (WMO=0) WILL NOT BE AN EFFECTIVE SELECTION FOR THIS TEST BECAUSE THE WRITE ROUTINE IS EXITED AFTER EACH RECORD TO DETERMINE IF ANY OTHER UNITS ARE SELECTED. READ MODE (RMO) HAS NO EFFECT ON THIS TEST.

9.3 TEST 1

THIS IS A 'WRITE ONLY' TEST SIMILAR TO TEST 0 EXCEPT A SEQUENCE OF 256 RECORDS IS WRITTEN ON EACH UNIT BEFORE CHANGING TO THE NEXT UNIT. READ MODE (RMO) HAS NO EFFECT ON THIS TEST.

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- 9.4 TEST 2
- THIS IS A 'WRITE AND READ' TEST. THE PROCEDURE IS TO WRITE 256 RECORDS ON EACH UNIT, THEN BACKSPACE 256 RECORDS ON EACH UNIT, THEN READ 256 RECORDS ON EACH UNIT, AND THEN REPEAT THE SEQUENCE UNTIL ALL UNITS ARE AT EOT.
- 9.5 TEST 3
- THIS IS A 'WRITE AND READ' TEST. THE PROCEDURE IS TO WRITE 1 RECORD, BACKSPACE, READ 1 RECORD AND REPEAT FOR EACH UNIT, THEN REPEAT THE SEQUENCE UNTIL ALL UNITS ARE AT EOT. WRITE MODE OR READ MODE OF NONSTOP (WMO=0 OR RMO=0) WILL NOT BE EFFECTIVE FOR THIS TEST.
- 9.6 TEST 4
- THIS IS A 'WRITE AND READ' TEST. IT IS SIMILAR TO TEST 2 EXCEPT UNITS ARE CHANGED BETWEEN EACH RECORD DURING WRITE, BACKSPACE, AND READ. WRITE MODE OR READ MODE OF NONSTOP (WMO=0 OR RMO=0) WILL NOT BE EFFECTIVE FOR THIS TEST.
- 9.7 TEST 5
- THIS IS A 'READ ONLY' TEST. THE PROCEDURE IS TO READ 1 RECORD, REPEAT FOR ALL UNITS, AND CONTINUE UNTIL ALL UNITS ARE AT EOT. THE MAIN PURPOSE OF THIS TEST IS TO PROVE COMPATIBILITY AMONG TAPE UNITS. A TAPE THAT IS WRITTEN ON ONE UNIT SHOULD BE ABLE TO BE READ ON ANY OTHER UNIT. TEST PARAMETERS THAT SELECT PATTERN AND RECORD LENGTH SEQUENCE MUST BE THE SAME AS THOSE USED TO WRITE THE DATA ON TAPE. ANY OF THE OTHER TESTS (0 THRU 4) CAN BE USED TO GENERATE THE DATA.
10. LISTING
- STATUS AND COMMAND REGISTER BIT ASSIGNMENTS
- COMMAND REGISTER
- | | | | |
|----|--------------------|----------------------|----------------------|
| 15 | ERROR | | |
| 14 | DEN 8 | 00 = 200 BPI 7 TRACK | 10 = 800 BPI 7 TRACK |
| 13 | DEN 5 | 01 = 556 BPI 7 TRACK | 11 = 800 BPI 9 TRACK |
| 12 | POWER CLEAR | | |
| 11 | PARITY | 0 = ODD | 1 = EVEN |
| 10 | UNIT SEL. BIT 2 | | |
| 9 | UNIT SEL. BIT 1 | | |
| 8 | UNIT SEL. BIT 0 | | |
| 7 | CONTROL UNIT READY | | |
| 6 | INTERRUPT ENABLE | | |

884
885 5 ADDRESS BIT 17
886 4 ADDRESS BIT 16
887 3 FUNCTION BIT 2 000 = OFF LINE 100 = SPACE FORWARD
888 001 = READ 101 = SPACE REVERSE
889 2 FUNCTION BIT 1 010 = WRITE 110 = WRITE XIRG
890 1 FUNCTION BIT 0 011 = WRITE EOF
891 0 GO 111 = REWIND

STATUS REGISTER

892
893
894
895
896 15 ILLEGAL COMMAND (ILC)
897
898 14 END OF FILE (EOF)
899 13 CYCLICAL REDUNDANCY ERROR (CRE)
900 12 PARITY ERROR (PAE)
901
902 11 BUS GRANT LATE (BGL)
903 10 END OF TAPE (EOT)
904 9 RECORD LENGTH ERROR (RLE)
905
906 8 BAD TAPE ERROR (BTE)
907 7 NON EXISTENT MEMORY (NXM)
908 6 SELECT REMOTE (SELR)
909
910 5 BEGINNING OF TAPE (BOT)
911 4 7 CHANNEL (7CH)
912 3 SETTLE DOWN (SDWN)
913
914 2 WRITE LOCK (WRL)
915 1 REWIND STATUS (RWS)
916 0 TAPE UNIT READY (TUR)
917 !
918

919 .TITLE CZTMCD0 TM11 DATA RELIAB
920 :COPYRIGHT 1970,1980 DIGITAL EQUIPMENT CORP., MAYNARD, MASS. 01754
921 :REVISED SEPT 1971, J.RODENHISER
922 :REVISED AUGUST 1972, JIM LACEY
923 :REVISED FEB 1976, RON PLATUKIS
924 :REVISED MAY 1980, LEN LORANGER
925 : CHGD1 - INSERTED SUSW AFTER AUTOST FOR SWITCHLESS PROC.
926 : CHGD2 - INSERTED END OF PASS STATEMENT.
927
928
929

930 :*****
931
932 :NOTE: THIS PROGRAM HAS BEEN MODIFIED TO WORK WITH OR WITHOUT
933 : A HARDWARE SWITCH REGISTER
934
935 :*****

936
937 000000 R0 %0
938 000001 R1 %1
939 000002 R2-%2

940		000003		R3=X3
941		000004		R4=X4
942		000005		R5=X5
943		000006		SP=X6
944		000007		PC=X7
945				
946				;TRAP CATCHER IN UNUSED LOCATIONS 0-476
947				
948				.ENABL ABS
949		000000		.-0
950		000034		.=34
951	000034	012426		TRAP34
952		000046		.=46
953	000046	003310		ENDADR
954		000052		.=52
955	000052	040000		40000
956				
957				
958				;*****
959				;SOFTWARE SWITCH REGISTER LOCATION
960				;*****
961		000174		.=174
962	000174	000000		DISPREG:0
963	000176	000000		SWREG: 0
964				
965		000200		.=200
966	000200	000167	001162	JMP AUTOST
967	000204	000167	001612	JMP MEM4K
968	000210	000167	001632	JMP MEM8K
969				
970				
971		000500		.=500
972	000500	172520		MTS: 172520
973	000502	172522		MTC: 172522
974	000504	172524		BC: 172524
975	000506	172526		CA: 172526
976	000510	177776		CC: 177776
977	000512	177570		SWR: 177570
978	000514	177570		DISPLAY: 177570
979	000516	177560		TKS: 177560
980	000520	177562		TKB: 177562
981	000522	177564		TPS: 177564
982	000524	177566		TPB: 177566
983	000526	002000		MAXLEN: 1024.
984	000530	000004		MINLEN: 4.
985	000532	014004		WBUF: BUFFER
986	000534	016004		RBUF: BUFFER+1024.
987	000536	000224		MTV: 224
988		000500		STACK=500
989				
990				;TEMPORARY STORAGE AREAS
991	000540	000000		TIB: 0
992	000542	000000		TEMPST: 0
993	000544	000000		COUNT: 0
994	000546	000000		RDSW: 0
995	000550	000000		ATST: 0

;MAX RECORD LENGTH
;MIN RECORD LENGTH
;STARTING ADDRESS OF WRITE BUFFER
;STARTING ADDRESS OF READ BUFFER

996	000552	000000	DRVSEL:	0
997	000554	000000	STRLEN:	0
998	000556	000000	LENGTH:	0
999	000560	000000	MSBITS:	0
1000	000562	000000	SVRECR:	0
1001	000564	000000	COMAND:	0
1002	000566	000000	CDRVBT:	0
1003	000570	000000	CDRIVE:	0
1004	000572	000000	RDPASS:	0
1005	000574	000000	WRPASS:	0
1006	000576	000000	BLKINC:	0
1007	000600	000000	STATRD:	0
1008	000602	000000	WRCHEK:	0
1009	000604	000000		0
1010	000606	000000		0
1011	000610	000000		0
1012	000612	000000		0
1013	000614	000000		0
1014	000616	000000		0
1015	000620	000000		0
1016				
1017	000622	000000	PERMBS:	0
1018	000624	000000	RECORD:	0
1019	000626	000000	WRRECR:	0
1020	000630	000000	LASRCR:	0
1021	000632	000000	RDERRS:	0
1022	000634	000000	DAERRS:	0
1023	000636	000000	NRREAD:	0
1024	000640	000000	WRTLEN:	0
1025	000642	000000	READLN:	0
1026	000644	000000	MODES:	0
1027				
1028				
1029	000646	000666	DRVADR:	D0TAB
1030	000650	000732		D1TAB
1031	000652	000776		D2TAB
1032	000654	001042		D3TAB
1033	000656	001106		D4TAB
1034	000660	001152		D5TAB
1035	000662	001216		D6TAB
1036	000664	001262		D7TAB
1037				
1038	000666	000000	D0TAB:	0
1039		000732		.=D0TAB+44
1040	000732	000000	D1TAB:	0
1041		000776		.=D1TAB+44
1042	000776	000000	D2TAB:	0
1043		001042		.=D2TAB+44
1044	001042	000000	D3TAB:	0
1045		001106		.=D3TAB+44
1046	001106	000000	D4TAB:	0
1047		001152		.=D4TAB+44
1048	001152	000000	D5TAB:	0
1049		001216		.=D5TAB+44
1050	001216	000000	D6TAB:	0
1051		001262		.=D6TAB+44

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1052 001262 000000      D7TAB: 0
1053      001326 001326      =D7TAB+44
1054 001326 000000      CHARIN: 0      ; CHARACTER JUST INPUT
1055 001330 000000      NUMTST: 0      ; NUMBER OF TEST
1056 001332 000000      PARAM: 0      ; TEST PARAMETERS
1057 001334 000000      TSTEX: 0      ; POINTS TO TEST PARAMETERS TO BE EXECUTED
1058 001336 000000      TEST: 0      ; CONTAINS CURRENT TEST NUMBER
1059
1060 001340 000000      TSTTBL: 0      ; TEST TABLE
1061 001342 000000      0      ; UP TO 10 TESTS CAN BE SELECTED TO
1062 001344 000000      0      ; BE RUN IN CONSECUTIVE ORDER
1063 001346 000000      0
1064 001350 000000      0
1065 001352 000000      0
1066 001354 000000      0
1067 001356 000000      0
1068 001360 000000      0
1069 001362 000000      0
1070 001364 000000      0
1071
1072
1073 001366 012706 000500      AUTOST: MOV      #STACK,SP
1074 001372 104432      CHGD1: SUSW      ;SEE IF SOFT SW REG NECESSARY
1075 001374 012767 177777 177146      MOV      #-1,ATST
1076 001402 012767 036225 177730      MOV      #36225,TSTTBL
1077 001410 012767 040752 177724      MOV      #40752,TSTTBL+2
1078 001416 012767 027752 177720      MOV      #27752,TSTTBL+4
1079 001424 012767 000003 177676      MOV      #3,NUMTST
1080 001432 012767 123456 005760      MOV      #123456,LONUM      ;PRIME RANDOM NUMBER GENERATER
1081 001440 012767 176543 005754      MOV      #176543,HINUM
1082      ; DETERMINE THE SIZE OF THE WRITE AND READ BUFFERS.
1083 001446 012737 001464 000004      MOV      #NXMRET,@#4      ;SETUP NXM VECTOR
1084 001454 005767 022324      TST      BUFFER+4096.      ;OVER 4K OF MEMORY?
1085 001460 000240      NOP
1086 001462 000413      BR      OVER4K      ;BR IF YES
1087 001464 022626      NXMRET: CMP      (SP)+,(SP)+      ;POP THE STACK
1088 001466 012767 000004 177034      MOV      #4,MINLEN
1089 001474 012767 002000 177024      MOV      #1024.,MAXLEN
1090 001502 012767 016004 177024      MOV      #BUFFER+1024.,RBUF
1091 001510 000411      BR      TU.SEL      ;GO SELECT DRIVES
1092 001512 012767 000010 177010      OVER4K: MOV      #8.,MINLEN
1093 001520 012767 004000 177000      MOV      #2048.,MAXLEN
1094 001526 012767 020004 177000      MOV      #BUFFER+2048.,RBUF
1095      ; DETERMINE DRIVES TO BE TESTED.
1096      ; A DRIVE WILL BE TESTED IF:
1097      : 1. IT CAN BE SELECTED
1098      : 2. IT IS 7 TRACK
1099      : 3. IT IS WRITE ENABLED
1100 001534 012737 000006 000004      TU.SEL: MOV      #6,@#4      ;SET TRAP CATCHER
1101 001542 012777 010000 176732      MOV      #10000,@MTC      ;PWR CLR
1102 001550 005067 176776      CLR      DRVSEL      ;CLEAR DRIVE TABLE
1103 001554 005067 177000      CLR      MSBITS
1104 001560 012700 000200      MOV      #200,R0      ;R0=DRIVE 0
1105 001564 105777 176712      TSTB      @MTC
1106 001570 100033      BPL      IDSELF      ;BR IF NO CU RDY
1107 001572 016777 176754 176702      NXT.TU: MOV      DRVSEL,@MTC      ;SELECT A DRIVE
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1108 001600 012702 000024      MOV      #20.,R2      ;SETUP R2 FOR WAIT LOOP
1109 001604 032777 000100 176666 USSTST: BIT      #100,AMTS    ;DOES DRIVE EXIST?
1110 001612 001003          BNE      USS.OK      ;BR IF YES
1111 001614 005302          DEC      R2
1112 001616 003372          BGT      USSTST
1113 001620 000412          BR       NO.SEL      ;DRIVE IS NON-EXISTENCE
1114 001622 032777 000020 176650 USS.OK: BIT      #20,AMTS    ;IS THIS DRIVE 7 OR 9 CHN?
1115 001630 001406          BEQ      NO.SEL      ;BR IF 9 CHN.
1116 001632 032777 000004 176640          BIT      #4,AMTS     ;IS WRITE LOCK ON?
1117 001640 001002          BNE      NO.SEL      ;BR IF YES
1118 001642 050067 176712          BIS      R0,MSBITS    ;PUT DRIVE INTO TABLE
1119 001646 105267 176701          NO.SEL: INCB     DRVSEL+1    ;INC. THE DRIVE NUMBER
1120 001652 000241          CLC
1121 001654 006000          ROR      R0
1122 001656 001345          BNE      NXT.TU      ;HAS ALL DRIVES BEEN TESTED FOR EXISTENCE?
1123                                     ;BR IF NO
1124                                     ;TYPE-OUT NAME OF PROGRAM AND MIN. AND MAX. RECORD LENGTHS.
1125 001660 012702 013115 IDSELF: MOV      #MSG10A,R2
1126 001664 104404          TOP
1127 001666 016702 176636          MOV      MINLEN,R2
1128 001672 104426          DECPRT          ;PRINT MIN. LENGTH
1129 001674 016702 176626          MOV      MAXLEN,R2
1130 001700 104426          DECPRT          ;PRINT MAX. LENGTH
1131 001702 005767 176652          TST      MSBITS    ;WAS ANY DRIVES SELECTED?
1132 001706 001002          BNE      .+6         ;BR IF YES
1133 001710 000167 000160          JMP      START1    ;NO--GO HAVE OPERATOR SELECT DRIVES
1134
1135                                     ;TYPE-OUT THE DRIVE/S TO BE TESTED
1136 001714 012702 013217          MOV      #MSG10B,R2
1137 001720 104404          TOP
1138 001722 105067 012056          CLRB     BUFFER
1139 001726 012701 014004          MOV      #BUFFER,R1
1140 001732 005000          CLR      R0
1141 001734 012702 000200          MOV      #200,R2      ;SET R0 TO DRIVE 0
1142                                     ;SET R2 TO DRIVE 0
1143
1144                                     ;FORM AND SAVE DRIVE NUMBER FOR TYPE-OUT
1145 001740 105021          CLRB     (R1)+      ;SET EOM
1146 001742 112721 000040          MOVB     #'',(R1)+    ;SPACE
1147 001746 030267 176606          LOOPER: BIT      R2,MSBITS    ;DID THIS DRIVE NUMBER EXIST?
1148 001752 001405          BEQ      $ZEROS      ;BR IF NO
1149 001754 110011          MOVB     R0,(R1)      ;YES--SAVE THE NUMBER
1150 001756 152721 000060          BISB     #'0,(R1)+    ;MAKE IT ASCII
1151 001762 112721 000054          MOVB     #'',(R1)+    ;COMMA
1152 001766 000241          $ZEROS: CLC          ;POSITION DRIVE BIT
1153 001770 006002          ROR      R2
1154 001772 005200          INC      R0          ;UPDATE DRIVE NUMBER
1155 001774 020027 000007          CMP      R0,#7      ;LAST
1156 002000 003762          BLE      LOOPER      ;BR IF NO
1157 002002 105011          CLRB     (R1)        ;SET EOM
1158 002004 112741 000100          MOVB     #'a,-(R1)    ;CR & LF
1159 002010 012702 014004          MOV      #BUFFER,R2    ;TYPE THE DRIVE/S SELECTED
1160 002014 104404          TOP
1161 002016 000167 001074          JMP      EXECUT    ;GO START TESTING
1162                                     ;MODIFY RECORD LENGTHS AND BUFFER AREAS FOR 4K.
1163 002022 012767 000004 176500 MEM4K: MOV      #4.,MINLEN
1164 002030 012767 002000 176470          MOV      #1024.,MAXLEN
```

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1164 002036 012767 016004 176470      MOV      #BUFFER+1024.,RBUF
1165 002044 000411                      BR      START
1166                      ;MODIFY RECORD LENGTHS AND BUFFER AREAS FOR 8K.
1167 002046 012767 000010 176454 MEM8K: MOV      #8.,MINLEN
1168 002054 012767 004000 176444      MOV      #2048.,MAXLEN
1169 002062 012767 020004 176444      MOV      #BUFFER+2048.,RBUF
1170 002070 005067 176454      START: CLR      ATST      ;NOT AUTO START
1171 002074 012706 000500      START1: MOV     #STACK,SP      ;INITIALIZE STACK
1172 002100 104432                      SUSW
1173 002102 012767 123456 005310      MOV      #123456,LONUM      ;PRIME RANDOM
1174 002110 012767 176543 005304      MOV      #176543,HINUM      ;NUMBER GENERATOR
1175 002116 012702 012513      MOV      #MSG1,R2
1176 002122 104404                      TOP      ;PRINT 'SELECT DRIVES'
1177 002124 005067 176430      CLR      MSBITS      ;CLEAR SELECTED DRIVE INDICATOR
1178 002130 104400      SELDRV: WAITKY
1179 002132 122767 000015 177166      CMPB     #15,CHARIN      ;WAS CHARACTER A CARRIAGE RETURN?
1180 002140 001010                      BNE      SELD1      ;NO
1181 002142 005767 176412                      TST      MSBITS      ;YES, WERE ANY DRIVES SELECTED
1182 002146 001752                      BEQ      START1      ;NO
1183 002150 005767 176374                      TST      ATST
1184 002154 001454                      BEQ      SELTST      ;YES NOW SELECT TESTS
1185 002156 000167 000734                      JMP      EXECUT
1186 002162 122767 000070 177136 SELD1:  CMPB     #70,CHARIN      ;IS CHARACTER A VALID NUMBER 0-7?
1187 002170 003404                      BLE      SELD2      ;NO, PRINT '?'
1188 002172 122767 000060 177126      CMPB     #60,CHARIN      ;IS CHARACTER A VALID NUMBER 0-7?
1189 002200 003407                      BLE      VALID      ;YES
1190 002202 105777 176314      SELD2:  TSTB     @TPS
1191 002206 100375                      BPL      .-4
1192 002210 012777 000077 176306      MOV      #'?',@TPB      ;PRINT '?'
1193 002216 000424                      BR      VAL4
1194                      ;HAVE VALID DRIVE NUMBER
1195 002220 142767 000270 177100 VALID:  BICB     #270,CHARIN      ;MASK OUT NUMBER
1196 002226 105167 177074                      COMB     CHARIN
1197 002232 012700 000200                      MOV      #200,R0
1198 002236 105267 177064      VAL1:  INCB     CHARIN
1199 002242 001402                      BEQ      VAL2
1200 002244 006200                      ASR      R0
1201 002246 000773                      BR      VAL1
1202 002250 130067 176304      VAL2:  BITB     R0,MSBITS
1203 002254 001003                      BNE      VAL3
1204 002256 150067 176276                      BISB     R0,MSBITS      ;DRIVE WASN'T PREVIOUSLY SET, SO SET IT NOW.
1205 002262 000402                      BR      VAL4
1206 002264 140067 176270      VAL3:  BICB     R0,MSBITS      ;DRIVE WAS SET, CLEAR IT.
1207 002270 105777 176226      VAL4:  TSTB     @TPS
1208 002274 100375                      BPL      .-4
1209 002276 012777 000054 176220      MOV      #'',@TPB      ;PRINT COMMA
1210 002304 000711                      BR      SELDRV      ;RETURN TO WAIT FOR NEXT KEY
1211
1212
1213                      ;HAVE DRIVES SELECTED-NOW GET TEST SELECTION
1214 002306 012702 012534      SELTST: MOV     #MSG2,R2
1215 002312 104404                      TOP
1216 002314 005067 177010                      CLR      NUMTST
1217 002320 012700 001340                      MOV      #TSTBL,R0
1218 002324 104400                      SELT1:  WAITKY
1219 002326 122767 000015 176772      CMPB     #15,CHARIN      ;WAS CHARACTER A CARRIAGE RETURN?
```

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1220 002334 001005      BNE      SELT2
1221 002336 005767 176766 TST      NUMTST      ;WERE ANY TESTS SELECTED?
1222 002342 001412      BEQ      SELT3      ;NO
1223 002344 000167 000546 JMP      EXECUT      ;YES, EXECUTE TESTS
1224 002350 122767 000066 176750 SELT2: CMPB     #66,CHARIN ;IS CHARACTER A VALID NUMBER 0-5
1225 002356 003404      BLE      SELT3      ;NO
1226 002360 122767 000060 176740 CMPB     #60,CHARIN ;IS CHARACTER A VALID NUMBER 0-5
1227 002366 003404      BLE      SELPAT      ;YES
1228 002370 012702 012506 SELT3: MOV     #MSG0,R2
1229 002374 104404      TOP
1230 002376 000752      BR       SELT1      ;RETURN TO WAIT FOR TEST SELECT
1231 002400 016704 176722 SELPAT: MOV     CHARIN,R4
1232 002404 000304      SWAB     R4      ;ROTATE TEST NUMBER INTO POSITION
1233 002406 006104      ROL      R4
1234 002410 006104      ROL      R4
1235 002412 006104      ROL      R4
1236 002414 006104      ROL      R4
1237 002416 042704 107777 BIC      #107777,R4
1238 002422 104430      SP3
1239      ;HAVE VALID TEST SELECTED, NOW GET SELECTED PATTERN
1240 002424 104400      WAITKY
1241 002426 122767 000070 176672 CMPB     #70,CHARIN ;IS CHARACTER A VALID NUMBER 0-7
1242 002434 003755      BLE      SELT3      ;NO
1243 002436 122767 000057 176662 CMPB     #57,CHARIN ;IS CHARACTER A VALID NUMBER 0-7
1244 002444 002351      BGE      SELT3      ;NO
1245 002446 000367 176654      SWAB     CHARIN ;MOVE PATTERN SELECT INTO POSITION
1246 002452 006167 176650      ROL      CHARIN
1247 002456 042767 170777 176642 BIC      #170777,CHARIN
1248 002464 056704 176636 BIS      CHARIN,R4 ;COMBINE PATTERN WITH TEST
1249 002470 104430      SP3
1250      ;WAIT FOR PARITY SELECTION (0=EVEN, 1=ODD)
1251 002472 104400      WAITKY
1252 002474 122767 000050 176624 CMPB     #60,CHARIN ;IS CHARACTER=0
1253 002502 001406      BEQ      SELPR      ;YES, EVEN PARITY
1254 002504 122767 000061 176614 CMPB     #61,CHARIN ;IS CHARACTER=1
1255 002512 001326      BNE      SELT3      ;NO, HAVE ILLEGAL KEY
1256 002514 052704 000400 BIS      #400,R4 ;YES, ODD PARITY
1257 002520 104430 SELPR: SP3
1258
1259
1260      ;WAIT FOR DENSITY SELECTION
1261 002522 104400      WAITKY
1262 002524 122767 000062 176574 CMPB     #62,CHARIN ;IS CHARACTER=2
1263 002532 001424      BEQ      SELDN3      ;YES, DENSITY=200BPI
1264 002534 122767 000065 176564 CMPB     #65,CHARIN ;IS CHARACTER=5
1265 002542 001003      BNE      SELDN1      ;NO
1266 002544 052704 000100 BIS      #100,R4 ;SET DENSITY=556 BPI
1267 002550 000415      BR       SELDN3
1268 002552 122767 000070 176546 SELDN1: CMPB     #70,CHARIN ;IS CHARACTER=8
1269 002560 001003      BNE      SELDN2
1270 002562 052704 000200 BIS      #200,R4 ;SET DENSITY=800 BPI
1271 002566 000406      BR       SELDN3
1272 002570 122767 000103 176530 SELDN2: CMPB     #'C,CHARIN ;IS CHARACTER=C
1273 002576 001274      BNE      SELT3      ;NO, HAVE ILLEGAL KEY
1274 002600 052704 000300 BIS      #300,R4 ;SET CORE DUMP MODE
1275 002604 104430 SELDN3: SP3
```

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1276 ;WAIT FOR RECORD LENGTH SEQUENCES SELECTION
1277 002606 104400 WAITKY
1278 002610 122767 000060 176510 CMPB #60,CHARIN ;IS CHARACTER=0
1279 002616 001424 BEQ SELR3 ;YES, RLS=MIN
1280 002620 122767 000061 176500 CMPB #61,CHARIN ;IS CHARACTER=1
1281 002626 001003 BNE SELR1
1282 002630 052704 000020 BIS #20,R4 ;SET RLS=MAX
1283 002634 000415 BR SELR3
1284 002636 122767 000062 176462 SELR1: CMPB #62,CHARIN ;IS CHARACTER=2
1285 002644 001003 BNE SELR2
1286 002646 052704 000040 BIS #40,R4 ;SET RLS=MIN-MAX
1287 002652 000406 BR SELR3
1288 002654 122767 000063 176444 SELR2: CMPB #63,CHARIN ;IS CHARACTER=3
1289 002662 001242 BNE SELT3
1290 002664 052704 000060 BIS #60,R4 ;SET RLS=MAX-MIN
1291 002670 104430 SELR3: SP3
1292 ;WAIT FOR WRITE MODE SELECTION
1293 002672 104400 WAITKY
1294 002674 122767 000060 176424 CMPB #60,CHARIN
1295 002702 001415 BEQ SELW2 ;SET WMO=NONSTOP
1296 002704 122767 000061 176414 CMPB #61,CHARIN
1297 002712 001003 BNE SELW1
1298 002714 052704 000004 BIS #4,R4 ;SET WMO=START-STOP
1299 002720 000406 BR SELW2
1300 002722 122767 000062 176376 SELW1: CMPB #62,CHARIN
1301 002730 001217 BNE SELT3
1302 002732 052704 000010 BIS #10,R4 ;SET WMO=RANDOM
1303 002736 104430 SELW2: SP3
1304 ;WAIT FOR READ MODE SELECTION
1305 002740 104400 WAITKY
1306 002742 122767 000060 176356 CMPB #60,CHARIN
1307 002750 001417 BEQ SELRM2 ;SET RMO=NONSTOP
1308 002752 122767 000061 176346 CMPB #61,CHARIN
1309 002760 001003 BNE SELRM1
1310 002762 052704 000001 BIS #1,R4 ;SET RMO=START-STOP
1311 002766 000410 BR SELRM2
1312 002770 122767 000062 176330 SELRM1: CMPB #62,CHARIN
1313 002776 001402 BEQ .+6
1314 003000 000167 177364 JMP SELT3
1315 003004 052704 000002 BIS #2,R4 ;SET RMO=RANDOM
1316 003010 104430 SELRM2: SP3
1317
1318 ;HAVE ALL PARAMETERS
1319 003012 012702 012621 MOV #MSG6,R2
1320 003016 104404 TOP ;PRINT 'OK'
1321 003020 104400 WAITKY ;WAIT FOR CARRIAGE RETURN
1322 003022 122767 000015 176276 CMPB #15,CHARIN
1323 003030 001402 BEQ .+6
1324 003032 000167 177332 JMP SELT3
1325 003036 105777 175460 TSTB @TPS
1326 003042 100375 BPL .-4
1327 003044 012777 000012 175452 MOV #12,@TPB
1328 003052 105777 175444 TSTB @TPS
1329 003056 100375 BPL .-4
1330 003060 012777 000040 175436 MOV #40,@TPB
1331 003066 010420 MOV R4,(0)+

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1332 003070 005267 176234      INC      NUMTST      ;+1 TO TEST COUNT
1333 003074 022767 000012 176226  CMP      #10.,NUMTST ;EQUAL TO TEN YET
1334 003102 001402      .      BEQ      SELOK1      ;YES
1335 003104 000167 177214      JMP      SELT1      ;NO, ACCEPT NEXT SET
1336 003110 012702 012574      SELOK1: MOV     #MSG5,R2
1337 003114 104404      TOP
1338
1339      ;EXECUTE SELECTED TEST
1340 003116 005067 175522      EXECUT: CLR     MODES      ;INITIALIZE MODES
1341 003122 104434      CNTL
1342 003124 012767 001340 176202  MOV     #TSTTBL,TSTEX
1343 003132 017767 176176 176172  EXEC:  MOV     @TSTEX,PARAM ;GET TEST PARAMS
1344 003140 016700 176166      EXEC1: MOV     PARAM,R0
1345 003144 042700 007777      BIC     #7777,R0
1346 003150 010067 176162      MOV     R0,TEST
1347 003154 001465      BEQ     TEST0
1348 003156 022700 010000      CMP     #10000,R0
1349 003162 001506      BEQ     TEST1
1350 003164 022700 020000      CMP     #20000,R0
1351 003170 001527      BEQ     TEST2
1352 003172 022700 030000      CMP     #30000,R0
1353 003176 001573      BEQ     TEST3
1354 003200 022700 040000      CMP     #40000,R0
1355 003204 001402      BEQ     .+6
1356 003206 000167 001014      JMP     TEST5
1357 003212 000167 000466      JMP     TEST4
1358      ;RETURN HERE AFTER COMPLETION OF TEST
1359 003216 012702 013723      DONE:  MOV     #MSG30,R2
1360 003222 104404      TOP
1361 003224 104436      CKSW
1362 003226 032777 000001 175256  BIT     #1,@SWR      ;IF BIT 0=1 REPEAT ALL PATTERNS
1363 003234 001413      BEQ     DONE1
1364 003236 016700 176070      MOV     PARAM,R0
1365 003242 042700 170777      BIC     #170777,R0
1366 003246 022700 007000      CMP     #7000,R0      ;REACHED PAT 7
1367 003252 001404      BEQ     DONE1      ;YES
1368 003254 062767 001000 176050  ADD     #1000,PARAM    ;NO, +1 TO PAT
1369 003262 000726      BR      EXEC1      ;REPEAT
1370 003264 005367 176040      DONE1: DEC     NUMTST
1371 003270 001013      BNE     DOAGN
1372 003272 013702 000042      MOV     @#42,R2
1373 003276 001004      BNE     ENDADR
1374 003300 012702 013730      CHGD2: MOV     #MSG31,R2      ;PRINT END OF PASS
1375 003304 104404      TOP
1376 003306 000000      HALT      ;FINISHED ALL TESTS
1377 003310 004712      ENDADR: JSR     PC,(2)
1378 003312 000240      NOP
1379 003314 000240      NOP
1380 003316 000240      NOP
1381 003320 062767 000002 176006  DOAGN: ADD     #2,TSTEX
1382 003326 000701      BR      EXEC      ;DO NEXT TEST
1383
1384      ;TEST0
1385      ;WRITE ONE RECORD, CHANGE DRIVES, GO TO EOT
1386 003330 052767 000002 175306  TEST0: BIS     #2,MODES ;EXIT WRITE EVERY RECORD, NO READ PASS
1387 003336 104420      CLRALL ;CLEAR ERROR COUNTERS AND REWIND
```

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1388 003340 104416
1389 003342 104410
1390 003344 104414
1391 003346 032767 000040 175270
1392 003354 001002
1393 003356 104402
1394 003360 104406
1395
1396 003362 104422
1397 003364 000767
1398 003366 004767 001452
1399 003372 000763
1400 003374 000167 177616
1401
1402
1403 003400 052767 000001 175236
1404 003406 104420
1405 003410 104416
1406 003412 104410
1407 003414 104414
1408 003416 032767 000040 175220
1409 003424 001002
1410 003426 104402
1411 003430 104406
1412 003432 104422
1413 003434 000767
1414 003436 004767 001402
1415 003442 000763
1416 003444 000167 177546
1417
1418
1419
1420
1421 003450 052767 000005 175166
1422 003456 104420
1423 003460 104416
1424 003462 104410
1425 003464 104414
1426 003466 032767 000040 175150
1427 003474 001002
1428 003476 104402
1429 003500 104406
1430 003502 104422
1431 003504 000767
1432 003506 104414
1433 003510 032767 000020 175126
1434 003516 001003
1435 003520 004767 005206
1436 003524 104406
1437 003526 104422
1438 003530 000766
1439 003532 104414
1440 003534 032767 000020 175102
1441 003542 001001
1442 003544 104424
1443 003546 104406
```

TO:
T0A: BIT
BNE
T0B:
BR
JSR
BR
JMP
T1:
T1A: BIT
BNE
T1B:
BR
JSR
BR
JMP
T2:
T2A: BIT
BNE
T2B:
BR
T2C:
BIT
BNE
JSR
T2D:
BR
T2E:
BIT
BNE
T2F:

GENPAT
RSFDRV
MVCTRS
#40,MODES
T0B
WRITIT
SVCTRS
CHGDRV
T0A
PC,ALLEOT
T0
DONE
#1,MODES
CLRALL
GENPAT
RSFDRV
MVCTRS
#40,MODES
T1B
CHGDRV
T1A
PC,ALLEOT
T1
DONE
#5,MODES
CLRALL
GENPAT
RSFDRV
MVCTRS
#40,MODES
T2B
WRITIT
SVCTRS
CHGDRV
T2A
MVCTRS
#20,MODES
T2D
PC,GOBKWD
SVCTRS
CHGDRV
T2C
MVCTRS
#20,MODES
T2F
READIT
SVCTRS

;GENERATE PATTERN
;RESET DRIVE SELECTION TO LOWEST NUMBER
;RESTORE DRIVE COUNTERS
;IS THIS DRIVE AT EOT?
;YES, SKIP WRITE
;WRITE
;SAVE DRIVE COUNTERS
;ANY MORE DRIVES SELECTED?
;YES
;ARE ALL DRIVES AT EOT?
;NO
;YES, EXIT
;TEST1
;WRITE RECORD LENGTH SEQUENCE, GO TO NEXT DRIVE, CONTINUE TO EOT ON ALL DRIVES.
;EXIT WRITE AFTER RLS, NO READ PASS
;CLEAR ERROR COUNTERS AND REWIND
;GENERATE PATTERN
;RESET DRIVE SELECTION TO LOWEST NUMBER
;RESTORE DRIVE COUNTERS
;IS THIS DRIVE AT EOT?
;YES, SKIP WRITE
;WRITE
;SAVE DRIVE COUNTERS
;ANY MORE DRIVE SELECTED?
;YES
;ARE ALL DRIVES AT EOT?
;NO
;YES EXIT
;TEST2
;WRITE A RECORD LENGTH SEQUENCE, CHANGE DRIVES
;BACKSPACE, CHANGE DRIVES, READ, CHANGE DRIVES. CONTINUE TO EOT ON ALL DRIVES
;EXIT WRITE AFTER RLS, DO READ PASS
;CLEAR ERROR COUNTERS AND REWIND
;GENERATE PATTERN
;SET DRIVE SELECTION TO LOWEST NUMBER
;RESTORE DRIVE COUNTERS
;IS THIS DRIVE AT EOT?
;YES, SKIP WRITE
;WRITE
;SAVE DRIVE COUNTERS
;ANYMORE DRIVERS SELECTED?
;YES
;RESTORE DRIVE COUNTERS
;IS THIS READ AT EOI?
;YES, SKIP BACKSPACE
;BACKSPACE
;SAVE DRIVE COUNTERS
;ANY MORE DRIVES SELECTED?
;YES
;RESTORE DRIVE COUNTERS
;IS THIS READ AT EOT
;YES, SKIP READ
;READ
;SAVE DRIVE COUNTERS

```
1444 003550 104422          CHGDRV          ;ANYMORE DRIVES SELECTED?
1445 003552 000767          T2E              ;YES
1446 003554 004767 001264    BR              ;ARE ALL DRIVES AT EOT?
1447 003560 000740          JSR PC,ALLEOT
1448 003562 000167 177430    BR T2          ;NO
                                JMP DONE      ;YES EXIT
1449
1450
1451          ;TEST3
1452 003566 052767 000006 175050 ;WRITE ONE RECORD, CHANGE DRIVES, BACKSPACE, CHANGE DRIVES, READ, CHANGE DRIVES
1453 003574 104420          TEST3: BIS #6,MODES ;EXIT WRITE EVERY RECORD, DO READ PASS
1454 003576 104416          CLRALL          ;CLEAR ERROR COUNTERS AND REWIND
1455 003600 104410          GENPAT          ;GENERATE PATTERN
1456 003602 104414          T3: RSFDRV      ;SET DRIVE SELECTION TO LOWEST NUMBER
1457 003604 032767 000040 175032 T3A: MVCTRS ;RESTORE DRIVE COUNTERS
1458 003612 001002          BIT #40,MODES ;IS THIS DRIVE AT EOT?
1459 003614 104402          BNE T3B        ;YES, SKIP WRITE
1460 003616 104406          WRITIT         ;WRITE
1461 003620 104422          SVCTRS         ;SAVE DRIVE COUNTERS
1462 003622 000767          T3B: CHGDRV     ;ANY MORE DRIVES SELECTED
1463          BR T3A          ;YES
1464 003624 104414          T3C: MVCTRS     ;RESTORE DRIVE COUNTERS
1465 003626 032767 000020 175010 BIT #20,MODES ;IS THIS DRIVE AT EOT?
1466 003634 001002          BNE T3D        ;YES, SKIP BACKSPACE
1467 003636 004767 005070    JSR PC,GOBKWD ;BACKSPACE
1468 003642 104406          T3D: SVCTRS     ;SAVE DRIVE COUNTERS
1469 003644 104422          CHGDRV         ;ANY MORE DRIVES SELECTED?
1470 003646 000766          BR T3C        ;GO
1471 003650 104414          T3E: MVCTRS     ;RESTORE DRIVE COUNTERS
1472 003652 032767 000020 174764 BIT #20,MODES ;IS THIS DRIVE AT EOT?
1473 003660 001001          BNE T3F        ;YES, SKIP READ
1474 003662 104424          READIT         ;READ
1475 003664 104406          T3F: SVCTRS     ;SAVE DRIVE COUNTERS
1476 003666 104422          CHGDRV         ;ANY MORE DRIVES SELECTED
1477 003670 000767          BR T3E        ;YES
1478 003672 004767 001146    JSR PC,ALLEOT ;ARE ALL DRIVES AT EOT?
1479 003676 000740          BR T3          ;NO
1480 003700 000167 177312    JMP DONE      ;YES, EXIT
1481
1482          ;TEST4
1483          ;WRITE RECORD, CHANGE DRIVES, REPEAT FOR RECORD LENGTH SEQUENCE
1484          ;READ RECORD, CHANGE DRIVES, REPEAT FOR RLS
1485 003704 052767 000006 174732 TEST4: BIS #6,MODES ;EXIT WRITE EVERY RECORD, DO READ PASS
1486 003712 104416          GENPAT          ;GENERATE PATTERN
1487 003714 032777 000014 175412 BIT #14,ATSTEX
1488 003722 001006          BNE T4          ;
1489 003724 042767 000007 174712 BIC #7,MODES
1490 003732 052767 000005 174704 BIS #5,MODES ;EXIT WRITE AFTER RLS, DO READ PASS
1491 003740 104420          T4: CLRALL      ;CLEAR ERROR COUNTERS AND REWIND
1492 003742 104410          T4A: RSFDRV     ;SET DRIVE SELECTION TO LOWEST NUMBER
1493 003744 104414          T4B: MVCTRS     ;RESTORE DRIVE COUNTERS
1494 003746 016767 174652 174652 MOV RECORD,WRRECR ;SAVE RECORD
1495 003754 104406          SVCTRS         ;SAVE DRIVE COUNTERS
1496 003756 104422          CHGDRV         ;ANYMORE DRIVES SELCTED?
1497 003760 000771          BR T4B        ;YES
1498 003762 042767 000010 174654 BIC #10,MODES ;INDICATE RLS END
1499 003770 104410          T4C: RSFDRV     ;SET DRIVE SELECTION TO LOWEST NUMBER
```

1500	003772	104414			T4D:	MVCTRS	:RESTORE DRIVE COUNTERS
1501	003774	032767	000040	174642		#40,MODES	:IS DRIVE AT EOT
1502	004002	001010			BIT	T4E	:YES, SKIP WRITE
1503	004004	016767	174616	174550	BNE	WRRECR,SVRECR	:SAVE START OF RLS
1504	004012	104402			MOV	WRITIT	:WRITE
1505	004014	016767	174542	174604	MOV	SVRECR,WRRECR	:RESTORE START OF RLS
1506	004022	104406				SVCTRS	:SAVE DRIVE COUNTERS
1507	004024	104422			T4E:	CHGDRV	:ANYMORE DRIVES SELECTED?
1508	004026	000761				T4D	:YES
1509	004030	032767	000010	174606	BR	#10,MODES	:ARE WE AT END OF RLS
1510	004036	001007			BIT	T4G	:YES
1511	004040	104414			BNE	MVCTRS	:RESTORE DRIVE COUNTERS
1512	004042	032767	000040	174574	T4F:	#40,MODES	:ARE WE AT EOT?
1513	004050	001747			BIT	T4C	:NO
1514	004052	104422			BEQ	CHGDRV	:ANYMORE DRIVES SELECTED?
1515	004054	000771			BR	T4F	:YES
1516							
1517							
1518	004056	104410			T4G:	RSFDRV	:SET DRIVE SELECTION TO LOWEST NUMBER
1519	004060	104414			T4H:	MVCTRS	:RESTORE DRIVE COUNTERS
1520	004062	032767	000020	174554		#20,MODES	:IS THIS DRIVE AT EOT?
1521	004070	001002			BIT	T4J	:YES, SKIP BACKSPACE
1522	004072	004767	004634		BNE	PC,GOBKWD	:BACKSPACE
1523	004076	104406			JSR	SVCTRS	:SAVE DRIVE COUNTERS
1524	004100	104422			T4J:	CHGDRV	:ANY MORE DRIVES SELECTED?
1525	004102	000766				T4H	:YES
1526	004104	104410			BR	RSFDRV	:SET DRIVE SELECTION TO LOWEST NUMBER
1527	004106	104414			T4K:	MVCTRS	:RESTORE DRIVE COUNTERS
1528	004110	032767	000020	174526	T4L:	#20,MODES	:IS THIS READ AT EOT?
1529	004116	001025			BIT	T4N	:YES, SKIP READ
1530	004120	026767	174504	174476	BNE	LASRCR,RECORD	:HAVE WE READ LAST RECORD WRITTEN?
1531	004126	001421			CMP	T4N	:YES
1532	004130	016767	174474	174424	BEQ	LASRCR,SVRECR	:SAVE LAST RECORD
1533	004136	032767	000003	175166	MOV	#3,PARAM	:IS READ MODE NONSTOP?
1534	004144	001405			BIT	T4M	:YES
1535	004146	016767	174452	174454	BEQ	RECORD,LASRCR	
1536	004154	005267	174450		MOV	LASRCR	:+1 TO LAST RECORD WRITTEN
1537	004160	104424			INC	READIT	:READ
1538	004162	016767	174374	174440	T4M:	SVRECR,LASRCR	:RESTORE LAST RECORD WRITTEN
1539	004170	104406			MOV	SVCTRS	:SAVE DRIVE COUNTERS
1540	004172	104422			T4N:	CHGDRV	:ANYMORE DRIVES SELECTED?
1541	004174	000744				T4L	:YES
1542	004176	104414			BR	MVCTRS	:RESTORE DRIVE COUNTERS
1543	004200	026767	174424	174416	T4P:	LASRCR,RECORD	:ARE WE AT END OF RLS?
1544	004206	001336			CMP	T4K	:NO
1545	004210	104422			BNE	CHGDRV	:ANYMORE DRIVES SELECTED?
1546	004212	000771				T4P	:YES
1547	004214	004767	000624		BR	PC,ALLEOT	:ARE ALL DRIVES AT EOT?
1548	004220	000650			JSR	T4A	:NO
1549	004222	000167	176770		BR	DONE	:YES,EXIT
1550					JMP		
1551							
1552					:TEST5		
1553					:READ ONLY		
1554	004226	052767	000002	174410	:RANDOM PATTERN	INVALID EXCEPT FOR SPECIFIC CASES	
1555	004234	104420			TEST5: BIS	#2,MODES	
					CLRALL		:CLEAR ERROR COUNTERS AND REWIND

Line	Address	Offset	Label	Op	Op2	Op3	Op4	Op5	Op6	Op7	Op8	Op9	Op10	Op11	Op12	Op13	Op14	Op15	Op16	Op17	Op18	Op19	Op20	Op21	Op22	Op23	Op24	Op25	Op26	Op27	Op28	Op29	Op30	Op31	Op32	Op33	Op34	Op35	Op36	Op37	Op38	Op39	Op40	Op41	Op42	Op43	Op44	Op45	Op46	Op47	Op48	Op49	Op50	Op51	Op52	Op53	Op54	Op55	Op56	Op57	Op58	Op59	Op60	Op61	Op62	Op63	Op64	Op65	Op66	Op67	Op68	Op69	Op70	Op71	Op72	Op73	Op74	Op75	Op76	Op77	Op78	Op79	Op80	Op81	Op82	Op83	Op84	Op85	Op86	Op87	Op88	Op89	Op90	Op91	Op92	Op93	Op94	Op95	Op96	Op97	Op98	Op99	Op100	Op101	Op102	Op103	Op104	Op105	Op106	Op107	Op108	Op109	Op110	Op111	Op112	Op113	Op114	Op115	Op116	Op117	Op118	Op119	Op120	Op121	Op122	Op123	Op124	Op125	Op126	Op127	Op128	Op129	Op130	Op131	Op132	Op133	Op134	Op135	Op136	Op137	Op138	Op139	Op140	Op141	Op142	Op143	Op144	Op145	Op146	Op147	Op148	Op149	Op150	Op151	Op152	Op153	Op154	Op155	Op156	Op157	Op158	Op159	Op160	Op161	Op162	Op163	Op164	Op165	Op166	Op167	Op168	Op169	Op170	Op171	Op172	Op173	Op174	Op175	Op176	Op177	Op178	Op179	Op180	Op181	Op182	Op183	Op184	Op185	Op186	Op187	Op188	Op189	Op190	Op191	Op192	Op193	Op194	Op195	Op196	Op197	Op198	Op199	Op200	Op201	Op202	Op203	Op204	Op205	Op206	Op207	Op208	Op209	Op210	Op211	Op212	Op213	Op214	Op215	Op216	Op217	Op218	Op219	Op220	Op221	Op222	Op223	Op224	Op225	Op226	Op227	Op228	Op229	Op230	Op231	Op232	Op233	Op234	Op235	Op236	Op237	Op238	Op239	Op240	Op241	Op242	Op243	Op244	Op245	Op246	Op247	Op248	Op249	Op250	Op251	Op252	Op253	Op254	Op255	Op256	Op257	Op258	Op259	Op260	Op261	Op262	Op263	Op264	Op265	Op266	Op267	Op268	Op269	Op270	Op271	Op272	Op273	Op274	Op275	Op276	Op277	Op278	Op279	Op280	Op281	Op282	Op283	Op284	Op285	Op286	Op287	Op288	Op289	Op290	Op291	Op292	Op293	Op294	Op295	Op296	Op297	Op298	Op299	Op300	Op301	Op302	Op303	Op304	Op305	Op306	Op307	Op308	Op309	Op310	Op311	Op312	Op313	Op314	Op315	Op316	Op317	Op318	Op319	Op320	Op321	Op322	Op323	Op324	Op325	Op326	Op327	Op328	Op329	Op330	Op331	Op332	Op333	Op334	Op335	Op336	Op337	Op338	Op339	Op340	Op341	Op342	Op343	Op344	Op345	Op346	Op347	Op348	Op349	Op350	Op351	Op352	Op353	Op354	Op355	Op356	Op357	Op358	Op359	Op360	Op361	Op362	Op363	Op364	Op365	Op366	Op367	Op368	Op369	Op370	Op371	Op372	Op373	Op374	Op375	Op376	Op377	Op378	Op379	Op380	Op381	Op382	Op383	Op384	Op385	Op386	Op387	Op388	Op389	Op390	Op391	Op392	Op393	Op394	Op395	Op396	Op397	Op398	Op399	Op400	Op401	Op402	Op403	Op404	Op405	Op406	Op407	Op408	Op409	Op410	Op411	Op412	Op413	Op414	Op415	Op416	Op417	Op418	Op419	Op420	Op421	Op422	Op423	Op424	Op425	Op426	Op427	Op428	Op429	Op430	Op431	Op432	Op433	Op434	Op435	Op436	Op437	Op438	Op439	Op440	Op441	Op442	Op443	Op444	Op445	Op446	Op447	Op448	Op449	Op450	Op451	Op452	Op453	Op454	Op455	Op456	Op457	Op458	Op459	Op460	Op461	Op462	Op463	
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1612 ;RESET DRIVE COUNTERS BACK INTO PROGRAM
1613 MVCTR: JSR PC,CTRDEX
1614 004530 004767 000012 MV1: MOV (1)+,(0)+
1615 004534 012120 CMP #DRVADR,R0
1616 004536 022700 000646 BNE MV1
1617 004542 001374 RTS PC
1618 004544 000207
1619 ;SET UP POINTERS FOR MOVE AND SAVE COUNTERS
1620 CTRDEX: MOV #WRCHEK,R0
1621 004546 012700 000602 MOV #DRVADR,R1
1622 004552 012701 000646 ADD CDRIVE,R1
1623 004556 066701 174006 ADD CDRIVE,R1
1624 004562 066701 174002 MOV @R1,R1
1625 004566 011101 RTS PC
1626 004570 000207
1627 ;CLEAR ALL DRIVE COUNTERS
1628 CLRAL: JSR RSFDRV
1629 004572 104410 CLR1: JSR PC,REWIND
1630 004574 004767 000206 JSR PC,CLRTBL
1631 004600 004767 000352 SVCTRS
1632 004604 104406 CHGDRV
1633 004606 104422 CLR1
1634 004610 000771 BR
1635 004612 052767 000010 174024 BIS #10,MODES ;AT END OF RLS
1636 004614 005067 177662 CLR T5FLAG
1637 004624 000207 RTS PC
1638 ;RESET DRIVE SELECTION TO LOWEST NUMBER
1639 RSFDR: CLR CDRIVE ;START WITH DRIVE 0
1640 004626 005067 173736 MOV #200,CDRVBT ;BIT FOR DRIVE 0
1641 004632 012767 000200 173726 RSF1: BIT MSBITS,CDRVBT ;IS DRIVE SELECTED?
1642 004640 036767 173714 173720 BNE RSF2 ;YES
1643 004646 001006 INC CDRIVE ;NO + 1 TO DRIVE
1644 004650 005267 173714 CLC
1645 004654 000241 ROR CDRVBT ;ROTATE DRIVE BIT
1646 004656 006067 173704 BR RSF1 ;REPEAT
1647 004662 000766 RSF2: MOV CDRIVE,COMAND
1648 004664 016767 173700 173672 SWAB COMAND
1649 004672 000367 173666 TSTB PARAM ;SET PROPER DENSITY BITS
1650 004676 105767 174430 BPL .+10
1651 004702 100003 BIS #40000,COMAND
1652 004704 052767 040000 173652 BIT #100,PARAM
1653 004712 032767 000100 174412 BEQ .+10
1654 004720 001403 BIS #20000,COMAND
1655 004722 052767 020000 173634 BIT #400,PARAM ;TEST PARITY SELECTED
1656 004730 032767 000400 174374 BNE .+10 ;ODD
1657 004736 001003 BIS #4000,COMAND ;EVEN
1658 004740 052767 004000 173616 RTS PC
1659 004746 000207
1660 ;SELECT NEXT DRIVE IN SEQUENCE
1661 ;+1 WORD TO EXIT ADDRESS IF LAST DRIVE TESTED
1662 CHGDR: INC CDRIVE ;+1 TO DRIVE NUMBER
1663 004750 005267 173614 CLC
1664 004754 000241 ROR CDRVBT ;MOVE MASK BIT OVER 1 PLACE
1665 004756 006067 173604 BNE CHG1 ;BRANCH IF MORE DRIVES SELECTED
1666 004762 001004 RSFDRV ;RESET DRIVE SELECT TO LOWEST NUMBER
1667 004764 104410 ADD #2,@SP ;+ 2 TO SKIP OVER FIRST EXIT
1668 004766 062716 000002 RTS PC
1669 004772 000207 CHG1: BIT CDRVBT,MSBITS
1670 004774 036767 173566 173556 BEQ CHGDR
1671 005002 001762
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1668 005004 000727 BR RSF2
1669
1670 ;REWIND DRIVE TO BOT
1671 005006 105777 173470 REWIND: TSTB @MTC
1672 005012 100375 BPL -4 ;WAIT FOR CONTROL UNIT
1673 005014 016777 173544 173460 MOV COMAND,@MTC ;SELECT DRIVE
1674 005022 006077 173452 ROR @MTC
1675 005026 103375 BCC -4 ;WAIT FOR TU READY
1676 005030 052777 000016 173444 BIS #16,@MTC ;REWIND
1677 005036 004767 000140 JSR PC,GOWAIT
1678 005042 000207 RTS PC ;EXIT
1679 ;ARE ALL DRIVES AT END OF TAPE
1680 005044 104410 ALLEOT: RSFDRV
1681 005046 104414 ALL1: MVCTRS
1682 005050 032767 000060 173566 BIT #60,MODES ;AT EOT?
1683 005056 001403 BEQ ALLEOS ;NO
1684 005060 104422 CHGDRV ;DONE ALL DRIVES?
1685 005062 000771 BR ALL1 ;NO
1686 005064 000431 BR ALL3
1687 005066 104436 ALLEOS: CKSW
1688 005070 032777 000400 173414 BIT #400,@SWR ;TEST SWITCH 8 TO EXIT AT END OF SEQUENCE
1689 005076 001426 BEQ ALL2 ;NO, GO TO EOT
1690 005100 032767 000010 173536 BIT #10,MODES ;AT END OF SEQUENCE
1691 005106 001422 BEQ ALL2 ;NO, EXIT, DON'T DUMP ERROR COUNTERS
1692 ;DUMP ERROR COUNTERS ON ALL DRIVES
1693 005110 104410 CTRDMP: RSFDRV
1694 005112 104414 MVCTRS
1695 005114 005767 177366 TST T5FLAG
1696 005120 001007 BNE CTRD1 ;DUMP READ ONLY
1697 005122 004767 001100 JSR PC,ENDT1
1698 005126 104436 CKSW
1699 005130 032767 000004 173506 BIT #4,MODES ;READ PASS SELECTED?
1700 005136 001402 BEQ CDMEND ;NO
1701 005140 004767 003112 CTRD1: JSR PC,RNDTP1
1702 005144 104422 CDMEND: CHGDRV ;DONE ALL DRIVES
1703 005146 000761 BR CTRDMP+2 ;NO
1704 005150 062716 000002 ALL3: ADD #2,(6) ;INCREMENT RETURN POINT
1705 005154 000207 ALL2: RTS PC
1706
1707
1708 ;CLEAR READ AND WRITE TABLES
1709 005156 012700 000602 CLRTBL: MOV #WRCHK,R0
1710 005162 005020 CLRT1: CLR (0)+
1711 005164 020027 000644 CMP R0,#MODES
1712 005170 001374 BNE CLRT1
1713 005172 042767 000070 173444 BIC #70,MODES
1714 005200 000207 RTS PC
1715 ;INTERRUPT ENABLE, GO, WAIT FOR INTERRUPT
1716 005202 012777 000200 173300 GOWAIT: MOV #200,@CC ;SET PRIORITY LEVEL 4
1717 005210 012767 000001 000014 MOV #1,$WAIT ;#1=WAIT INSTR
1718 005216 012777 005244 173312 MOV #GW1,@MTV ;SET INTERRUPT RETURN
1719 005224 052777 000101 173250 BIS #101,@MTC ;INTERRUPT ENABLE, GO
1720 005232 000001 $WAIT: WAIT ;WAIT FOR INTERRUPT
1721 005234 012777 000340 173246 MOV #340,@CC ;RESTORE PRIORITY LEVEL 7
1722 005242 000207 RTS PC ;EXIT
1723 005244 012767 000240 177760 GW1: MOV #240,$WAIT ;NOP IT JUST IN CASE 11/34
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1724 005252 000002 RTI ;RETURN FROM INTERRUPT
1725
1726 ;WRITE RECORD SECTION
1727 005254 005767 173344 WRITI: TST RECORD ;IS THIS THE FIRST RECORD
1728 005260 001031 BNE NOINCR ;NO, SKIP SET UP OF RECORD LENGTH AND BLOCK INCREMENT
1729 005262 016767 173240 173264 MOV MAXLEN,STRLEN
1730 005270 012767 177774 173300 MOV #4, BLKINC
1731 005276 032767 000020 174026 BIT #20,PARAM
1732 005304 001006 BNE W1
1733 005306 016767 173216 173240 MOV MINLEN,STRLEN
1734 005314 012767 000004 173254 MOV #4, BLKINC
1735 005322 016767 173226 173310 W1: MOV STRLEN,WRTLEN
1736 005330 032767 000040 173774 BIT #40,PARAM ;DOES RECORD LENGTH CHANGE?
1737 005336 001002 BNE NOINCR ;YES
1738 005340 005067 173232 CLR BLKINC ;NO
1739 005344 016767 173254 173254 NOINCR: MOV RECORD,WRRECR
1740 005352 005767 177130 TST T5FLAG
1741 005356 001401 BEQ .+4
1742 005360 000207 RTS PC ;EXIT WRITE ROUTINE IF TEST 5
1743 005362 005067 173206 CLR WRPASS
1744 005366 016777 173172 173106 STRTOP: MOV COMMAND,@MTC ;SELECT UNIT
1745 005374 105777 173102 TSTB @MTC
1746 005400 100375 BPL .-4 ;WAIT FOR CU READY
1747 005402 006077 173072 ROR @MTC ;WAIT FOR TU READY
1748 005406 103375 BCC .-4
1749 005410 016777 173224 173066 NONSTP: MOV WRTLEN,@BC ;SET BYTE COUNT
1750 005416 005477 173062 NEG @BC
1751 005422 016777 173104 173056 MOV WBUF,@CA ;SET CURRENT ADDRESS
1752 005430 052777 000004 173044 BIS #4,@MTC ;WRITE
1753 005436 004767 177540 JSR PC,GOWAIT ;INTERRUPT ENABLE, GO, WAIT FOR DONE
1754 ;RETURN HERE AFTER INTERRUPT
1755 005442 017767 173032 173130 MOV @MTC,STATRD ;SAVE STATUS
1756 005450 005777 173026 TST @MTC
1757 005454 100542 BMI ERROR ;HAVE ERROR FLAG, CHECK FOR EOT
1758 005456 005767 173112 TST WRPASS ;WAS THIS A RECOVERY PASS
1759 005462 001410 BEQ TSTSTP ;NO
1760 005464 016700 173104 MOV WRPASS,R0 ;YES
1761 005470 006300 ASL R0
1762 005472 062700 000602 ADD #WRCHK,R0
1763 005476 005210 INC @R0 ;+1 TO APPROPRIATE RECOVERY PASS COUNTER
1764 005500 005067 173070 CLR WRPASS
1765 005504 032767 000014 173620 TSTSTP: BIT #14,PARAM ;IS WRITE MODE NONSTOP?
1766 005512 001023 BNE STOPOP ;NO
1767 005514 005767 173054 TST WRPASS ;YES
1768 005520 001333 BNE NONSTP
1769 005522 004767 000142 JSR PC,TESINC ;CHANGE RECORD LENGTH
1770 005526 032767 000001 173110 BIT #1,MODES ;EXIT AFTER RLS?
1771 005534 001405 BEQ W10 ;NO
1772 005536 032767 000010 173100 BIT #10,MODES ;YES, ARE WE AT END OF RLS?
1773 005544 001721 BEQ NONSTP ;NO
1774 005546 000207 RTS PC ;YES
1775 005550 032767 000002 173066 W10: BIT #2,MODES ;EXIT EVERY RECORD?
1776 005556 001714 BEQ NONSTP ;NO
1777 005560 000207 RTS PC ;YES
1778 005562 032767 000010 173542 STOPOP: BIT #10,PARAM ;IS WRITE MODE RANDOM?
1779 005570 001414 BEQ W11 ;NO
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1780 ;RANDOM STALL DELAY
1781 005572 004767 001450 RANSTP: JSR PC,RANGEN
1782 005576 052767 177400 001612 BIS #177400,RANDOM
1783 005604 012704 177470 RAN1: MOV #-200.,R4 ;DELAY 1 MILLISECOND
1784 005610 005204 INC R4
1785 005612 001376 BNE .-2
1786 005614 005267 001576 INC RANDOM
1787 005620 001371 BNE RAN1
1788 005622 005767 172746 W11: TST WRPASS
1789 005626 001257 BNE STRTOP
1790 005630 004767 000034 JSR PC,TESINC
1791 005634 032767 000001 173002 BIT #1,MODES ;EXIT AFTER RLS?
1792 005642 001405 BEQ W12 ;NO
1793 005644 032767 000010 172772 BIT #10,MODES ;YES, ARE WE AT END OF RLS?
1794 005652 001645 BEQ STRTOP ;NO
1795 005654 000207 RTS PC ;YES
1796 005656 032767 000002 172760 W12: BIT #2,MODES ;EXIT EVERY RECORD?
1797 005664 001640 BEQ STRTOP ;NO
1798 005666 000207 RTS PC ;YES
1799 ;SEE IF RECORD LENGTH SHOULD BE CHANGED
1800 005670 005267 172730 TESINC: INC RECORD ;+1 TO RECORD COUNT
1801 005674 042767 000010 172742 BIC #10,MODES ;NOT END OF RLS UNLESS SET BELOW
1802 005702 005767 172670 TST BLKINC
1803 005706 001416 BEQ TSINC2
1804 005710 066767 172662 172722 ADD BLKINC,WRTLEN
1805 005716 026767 172716 172604 CMP WRTLEN,MINLEN ;RECORD LENGTH TOO SHORT?
1806 005724 002404 BLT RESETL ;YES, RESET
1807 005726 026767 172706 172572 CMP WRTLEN,MAXLEN ;RECORD LENGTH TOO LONG?
1808 005734 003403 BLE TSINC2 ;NO
1809 005736 016767 172612 172674 RESETL: MOV STRLEN,WRTLEN ;YES, RESET
1810 005744 105767 172654 TSINC2: TSTB RECORD
1811 005750 001003 BNE TSINC3 ;NO
1812 005752 052767 000010 172664 BIS #10,MODES ;INDICATE AT END OF RLS
1813 005760 000207 TSINC3: RTS PC
1814
1815
1816 ;HAVE AN ERROR FLAG DURING WRITE OPERATION
1817 ;IF ERROR IS CAUSED BY END OF TAPE FLAG DUMP WRITE ERROR COUNTERS
1818 ;FOR ALL OTHER ERRORS: PRINT COMMAND AND STATUS REGISTERS AND RECORD NUMBER
1819 ;IF READ PASS IS SELECTED, TRY TO RECOVER BY WRITING WITH XIRG.
1820 005762 032767 175600 172610 ERROR: BIT #175600,STATRD ;AT EOT?
1821 005770 001511 BEQ ENDTAP ;YES
1822 005772 005767 172576 TST WRPASS
1823 005776 001002 BNE ERR1 ;FIRST ERROR?
1824 006000 005267 172576 INC WRCHEK ;YES, + 1 TO WRITE ERROR
1825 006004 032777 020000 172500 ERR1: BIT #20000,@SWR ;TYPE ALL ERRORS?
1826 006012 001011 BNE TESREC ;NO
1827 006014 012702 012626 MOV #MSG7,R2
1828 006020 104404 TOP ;PRINT ERROR
1829 006022 016767 172612 172526 MOV WRTLEN,LENGTH
1830 006030 004767 003006 JSR PC,PRTS ;PRINT STATUS, COMMAND, RECORD, LENGTH
1831 006034 104436 CKSW
1832 006036 032777 000100 172446 TESREC: BIT #100,@SWR ;RECOVER STATISTICALLY SELECTED?
1833 006044 001410 BEQ TESRC1 ;NO
1834 006046 005267 172522 INC WRPASS ;+1 TO WRITE RECOVER
1835 006052 022767 000010 172514 CMP #8.,WRPASS ;HAVE WE TRIED TO WRITE RECOVER 8 TIMES?
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1836	006060	001020			BNE	STREC1		;NO
1837	006062	005267	172534		INC	PERMBS		;YES, +1 TO PERMANENT BADSPOT?
1838	006066	032767	000004	172550	TESRC1: BIT	#4,MODES		;IS READ PASS SELECTED?
1839	006074	001402			BEQ	.+6		;NO
1840	006076	004767	002412		JSR	PC,XRGREC		
1841	006102	005067	172466		CLR	WRPASS		
1842	006106	032767	002000	172464	BIT	#2000,STATRD		
1843	006114	001037			BNE	ENDTAP		
1844	006116	000167	177500		JMP	W11		
1845	006122	004767	002052		STREC1: JSR	PC,BACK1		
1846	006126	004767	002046		JSR	PC,BACK1		;BACKSPACE 2 RECORDS
1847	006132	032777	000040	172340	BIT	#40,AMTS		
1848	006140	001402			BEQ	.+6		
1849	006142	000167	177220		JMP	STRTOP		
1850	006146	012777	177777	172330	MOV	#-1,ABC		
1851	006154	016777	172404	172320	MOV	COMAND,AMTC		
1852	006162	052777	000010	172312	BIS	#10,AMTC		
1853	006170	004767	177006		JSR	PC,GOWAIT		;SPACE FORWARD 1 RECORD
1854	006174	042777	000016	172300	BIC	#16,AMTC		
1855	006202	052777	000004	172272	BIS	#4,AMTC		;CHANGE FROM SPACE TO WRITE
1856	006210	000167	177152		JMP	STRTOP		
1857					;DRIVE IS AT EOT			
1858	006214	005267	172404		ENDTAP: INC	RECORD		
1859	006220	052767	000040	172416	BIS	#40,MODES		;INDICATE DRIVE AT EOT
1860	006226	012702	013555		ENDT1: MOV	AMSG24,R2		
1861	006232	104404				TOP		
1862	006234	012702	012654		MOV	AMSG8,R2		
1863	006240	104404				TOP		
1864					;DUMP WRITE ERRORS			
1865	006242	004767	002640		WRTDMP: JSR	PC,PRTD		;PRINT DRIVE, PATTERN, PARITY, DENSITY
1866								
1867	006246	016767	173060	003162	MOV	PARAM,CHAR		
1868	006254	042767	177763	003154	BIC	#177763,CHAR		
1869	006262	012702	013310		MOV	AMSG14,R2		
1870	006266	022767	000004	003142	CMP	#4,CHAR		
1871	006274	001002			BNE	.+6		
1872	006276	012702	013270		MOV	AMSG12,R2		
1873	006302	022767	000010	003126	CMP	#10,CHAR		
1874	006310	001002			BNE	.+6		
1875	006312	012702	013300		MOV	AMSG13,R2		
1876	006316	104404				TOP		;PRINT WRITE MODE
1877	006320	016702	172300		MOV	RECORD,R2		
1878	006324	104426				DECPRT		;PRINT RECORD NUMBER
1879	006326	016767	173000	003102	MOV	PARAM,CHAR		
1880	006334	042767	177717	003074	BIC	#177717,CHAR		
1881	006342	012702	013336		MOV	AMSG17,R2		
1882	006346	022767	000020	003062	CMP	#20,CHAR		
1883	006354	001002			BNE	.+6		
1884	006356	012702	013345		MOV	AMSG18,R2		
1885	006362	022767	000040	003046	CMP	#40,CHAR		
1886	006370	001002			BNE	.+6		
1887	006372	012702	013320		MOV	AMSG15,R2		
1888	006376	022767	000060	003032	CMP	#60,CHAR		
1889	006404	001002			BNE	.+6		
1890	006406	012702	013327		MOV	AMSG16,R2		
1891	006412	104404				TOP		;PRINT RECORD LENGTH SEQUENCE

```
1892 006414 012702 013354      MOV      #MSG19,R2
1893 006420 104404              TOP
1894 006422 016702 172154      MOV      WRCKEK,R2
1895 006426 104426              DECPRT      ;PRINT 'WRITE ERRORS='
1896 006430 012700 000604      MOV      #WRCKEK+2,R0
1897 006434 112767 000060      MOV      #60,MSG20+17
1898 006442 105267 004747      WRTD1: INCB   MSG20+17      ;PRINT STATISTICAL RECOVERY
1899 006446 005710              TST      @R0
1900 006450 001405              BEQ      WRTD2
1901 006452 012702 013376      MOV      #MSG20,R2
1902 006456 104404              TOP
1903 006460 011002              MOV      (0),R2
1904 006462 104426              DECPRT      ;RECOVERED AT X
1905 006464 005720              WRTD2: TST      (0)+      ;JUST INCREMENTING
1906 006466 020027 000622      CMP      R0,#WRCKEK+20
1907 006472 001363              BNE      WRTD1
1908 006474 005767 172122      TST      PERMBS
1909 006500 001002              BNE      1$      ;SKIP PRINT IF = 0
1910 006502 104436              CKSW
1911 006504 000207              RTS      PC
1912
1913
1914 006506 012702 013420      1$:  MOV      #MSG20A,R2
1915 006512 104404              TOP
1916 006514 016702 172102      MOV      PERMBS,R2      ;PRINT 'PERMANENT BADSPOT'
1917
1918 006520 104426              DECPRT
1919 006522 104436              CKSW
1920 006524 000207              RTS      PC
1921
1922
1923
1924      ;GENERATE DATA PATTERN
1925      ;ALL PATTERNS HAVE BITS 15,14,7,6 SET IN CASE CORE DUMP SELECTED
1926 006526 016702 172000      GENPA: MOV      WBUF,R2
1927 006532 016703 172574      MOV      PARAM,R3
1928 006536 000303              SWAB      R3
1929 006540 006303              ASL      R3
1930 006542 042703 177741      BIC      #177741,R3
1931 006546 062703 006554      ADD      #PATPNT,R3
1932 006552 011307              MOV      @R3,PC
1933 006554 006614      PATPNT: PATE0
1934 006556 006622      PAT00
1935 006560 006630      PATE1
1936 006562 006644      PAT01
1937 006564 006660      PATE2
1938 006566 006666      PAT02
1939 006570 006674      PATE3
1940 006572 006702      PAT03
1941 006574 006710      PATE4
1942 006576 006734      PAT04
1943 006600 006754      PATE5
1944 006602 007002      PAT05
1945 006604 C^7032      PAT6
1946 006606 007032      PAT6
1947 006610 007040      PATE7
```

1948	006612	007070		PAT07
1949				;PATTERN 0
1950				;HIGH FREQUENCY OUTSIDE SKEW
1951	006614	012703	140701	PATE0: MOV #140701,R3 ;401
1952	006620	000533		BR PFIL1
1953				;HALF FREQUENCY OUTSIDE SKEW
1954				
1955	006622	012703	140301	PAT00: MOV #140301,R3 ;1
1956	006626	000530		BR PFIL
1957				;PATTERN 1
1958				;SLIDING 0
1959	006630	012703	006636	PATE1: MOV #PE1,R3
1960	006634	000532		BR PFIL3
1961	006636	167737		PE1: 167737 ;27437
1962	006640	175767		175767 ;35467
1963	006642	177375		177375 ;37075
1964				;SLIDING 1
1965	006644	012703	006652	PAT01: MOV #PO1,R3
1966	006650	000524		BR PFIL3
1967	006652	150340		PO1: 150340 ;10040
1968	006654	142310		142310 ;2010
1969	006656	140702		140702 ;402
1970				
1971				;PATTERN 2
1972				;HIGH FREQUENCY EVERY OTHER TRACK
1973	006660	012703	152725	PATE2: MOV #152725,R3 ;12425
1974	006664	000511		BR PFIL1
1975				
1976				;HIGH FREQUENCY EVERY OTHER TRACK
1977	006666	012703	165352	PAT02: MOV #165352,R3 ;25052
1978	006672	000506		BR PFIL1
1979				;PATTERN 3
1980				;HALF FREQUENCY OUTSIDE TRACK, HIGH FREQUENCY INSIDE TRACKS
1981	006674	012703	177377	PATE3: MOV #177377,R3 ;37077
1982	006700	000503		BR PFIL1
1983				;HIGH FREQUENCY OUTSIDE TRACK, HALF FREQUENCY INSIDE TRACKS
1984	006702	012703	177701	PAT03: MOV #177701,R3 ;37401
1985	006706	000500		BR PFIL1
1986				;PATTERN 4
1987				;INCREMENTING PATTERN (NO ALL 0'S)
1988	006710	012703	000301	PATE4: MOV #301,R3
1989	006714	110322		MOVB R3,(2)+
1990	006716	026702	171612	CMP RBUF,R2
1991	006722	001001		BNE .+4
1992	006724	000530		BR PATEND
1993	006726	105203		INCB R3
1994	006730	001767		BEQ PATE4
1995	006732	000770		BR PATE4+4
1996				;INCREMENTING PATTERN (INCLUDING ALL 0'S)
1997	006734	005003		PAT04: CLR R3
1998	006736	110322		MOVB R3,(2)+
1999	006740	026702	171570	CMP RBUF,R2
2000	006744	001001		BNE .+4
2001	006746	000517		BR PATEND
2002	006750	005203		INC R3
2003	006752	000771		BR PAT04+2

2004				:PATTERN 5	
2005				:THREE 0'S EACH TRACK EVERY 6TH WORD	
2006	006754	012703	006762	PAT5: MOV #P05,R3	
2007	006760	000475		BR PFIL9	
2008	006762	157437		PE5: 157437	:17437
2009	006764	167737		167737	:27437
2010	006766	167757		167757	:27457
2011	006770	173767		173767	:33467
2012	006772	171767		171767	:31467
2013	006774	171773		171773	:31473
2014	006776	176775		176775	:37075
2015	007000	177376		177376	:37076
2016					
2017					
2018				:THREE 1'S EACH TRACK EVERY 6TH WORD	
2019	007002	012703	007010	PAT05: MOV #P05,R3	
2020	007006	000462		BR PFIL9	
2021	007010	160340		POS: 160340	:20040
2022	007012	150340		150340	:10040
2023	007014	150320		150320	:10020
2024	007016	144310		144310	:4010
2025	007020	142310		142310	:2010
2026	007022	142304		142304	:2004
2027	007024	141302		141302	:1002
2028	007026	140702		140702	:402
2029	007030	140701		140701	:401
2030				:PATTERN 6	
2031				:ALL 1'S ALL TRACKS	
2032	007032	012703	177777	PAT6: MOV #-1,R3	
2033	007036	000424		BR PFIL1	
2034				:PATTERN 7	
2035				:RANDOM (NONE ALL 0'S)	
2036	007040	004767	000202	PATE7: JSR PC,RANGEN	
2037	007044	132767	000077	BITB #77,RANDOM	
2038	007052	001772		BEQ PATE7	
2039	007054	116722	000336	MOVB RANDOM,(2)+	
2040	007060	026702	171450	CMP RBUF,R2	
2041	007064	001365		BNE PATE7	
2042	007066	000447		BR PATEND	
2043				:RANDOM (WITH ALL 0'S)	
2044	007070	004767	000152	PAT07: JSR PC,RANGEN	
2045	007074	016722	000316	MOV RANDOM,(2)+	
2046	007100	026702	171430	CMP RBUF,R2	
2047	007104	001371		BNE PAT07	
2048	007106	000437		BR PATEND	
2049				:FILL WRITE BUFFER WITH CONSTANT PATTERN	
2050	007110	010322		PFIL1: MOV R3,(2)+	
2051	007112	026702	171416	CMP RBUF,R2	
2052	007116	001374		BNE PFIL1	
2053	007120	000432		BR PATEND	
2054				:FILL WRITE BUFFER WITH 3 WORD PATTERN	
2055	007122	010304		PFIL3: MOV R3,R4	
2056	007124	062704	000006	ADD #6,R4	
2057	007130	012322		PFIL3A: MOV (3)+,(2)+	
2058	007132	026702	171376	CMP RBUF,R2	
2059	007136	001001		BNE .+4	

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2060 007140 000422          BR      PATEND
2061 007142 020304          CMP     R3,R4
2062 007144 001002          BNE     .+6
2063 007146 162703 000006    SUB     #6,R3
2064 007152 000766          BR      PFIL3A
2065
2066          ;FILL WRITE BUFFER WITH 9 WORD PATTERN
2067 007154 010304          PFIL9:  MOV     R3,R4
2068 007156 062704 000022    ADD     #22,R4
2069 007162 012322          PFIL9A: MOV     (3)+,(2)+
2070 007164 026702 171344    CMP     RBUF,R2
2071 007170 001001          BNE     .+4
2072 007172 000405          BR      PATEND
2073 007174 020304          CMP     R3,R4
2074 007176 001002          BNE     .+6
2075 007200 162703 000022    SUB     #22,R3
2076 007204 000766          BR      PFIL9A
2077
2078          ;FINISHED PATTERN GENERATION
2079          ;IF CORE DUMP NOT SELECTED CLEAR BITS 15,14,7,6 IN ALL WORDS OF WRITE DATA BUFFER
2079 007206 032767 000100 172116 PATEND: BIT     #100,PARAM      ;IS CORE DUMP SET?
2080 007214 001404          BEQ     PATEN      ;NO
2081 007216 032767 000200 172106    BIT     #200,PARAM      ;MAYBE, IS CORE DUMP SET?
2082 007224 001007          BNE     PATEN2     ;YES
2083 007226 016702 171300    PATEN:  MOV     WBUF,R2      ;NO
2084 007232 042722 140300    PATEN1: BIC     #140300,(2)+    ;CLEAR BITS 15,14,7,6
2085 007236 026702 171272    CMP     RBUF,R2      ;DONE ALL?
2086 007242 001373          BNE     PATEN1     ;NO
2087 007244 000207          PATEN2: RTS      PC
2088
2089          ;RANDOM NUMBER GENERATOR
2090          ;EXIT WITH RANDOM NUMBER IN LOCATION NAMED 'RANDOM'
2091 007246 010067 000152    RANGEN: MOV     R0,SV0      ;SAVE REGISTERS
2092 007252 010167 000150    MOV     R1,SV1
2093 007256 010267 000146    MOV     R2,SV2
2094 007262 010367 000144    MOV     R3,SV3
2095 007266 016700 000126    MOV     LONUM,R0      ;SET UP LOW DIGIT
2096 007272 016701 000124    MOV     HINUM,R1      ;SET UP HIGH DIGIT
2097 007276 012703 000007    MOV     #7,R3      ;SET UP SHIFT COUNT
2098 007302 005002          CLR     R2
2099 007304 006300          RANG1:  ASL     R0      ;SHIFT R0 LEFT AND
2100 007306 006101          ROL     R1      ;ROTATE CARRY INTO LSB OF R1 AND
2101 007310 006102          ROL     R2      ;ROTATE CARRY OUT OF R1 INTO R2
2102 007312 005303          DEC     R3      ;DECREMENT R3
2103 007314 001373          BNE     RANG1     ;CONTINUE SHIFT LOOP
2104 007316 066700 000076    ADD     LONUM,R0      ;ADD NUMBER TO MAKE X 129
2105 007322 005501          ADC     R1      ;PROPAGATE CARRY
2106 007324 066701 000072    ADD     HINUM,R1      ;ADD NUMBER TO MAKE X 129
2107 007330 005502          ADC     R2      ;PROPAGATE CARRY
2108 007332 062700 001057    ADD     #1057,R0      ;ADD LOW CONSTANT
2109 007336 005501          ADC     R1      ;PROPAGATE CARRY
2110 007340 005502          ADC     R2      ;PROPAGATE CARRY
2111 007342 062701 047401    ADD     #47401,R1      ;ADD HIGH CONSTANT
2112 007346 005502          ADC     R2      ;PROPAGATE CARRY
2113 007350 062702 000006    ADD     #6,R2      ;ADD HIGH CONSTANT
2114 007354 060200          ADD     R2,R0      ;RE-PRIME R0 WITH HIGH DIGIT
2115 007356 005501          ADC     R1      ;PROPAGATE CARRY
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2116 007360 010067 000032      MOV      R0,RANDOM      ;SAVE RANDOM NUMBER
2117 007364 010067 000030      MOV      R0,LONUM      ;PUT R0 BACK IN LONUM
2118 007370 010167 000026      MOV      R1,HINUM      ;PUT R1 BACK IN HINUM
2119 007374 016700 000024      MOV      SV0,R0      ;RESTORE REGISTERS
2120 007400 016701 000022      MOV      SV1,R1
2121 007404 016702 000020      MOV      SV2,R2
2122 007410 016703 000016      MOV      SV3,R3
2123 007414 000207              RTS      PC      ;EXIT
2124 007416 000000              RANDOM: 0
2125 007420 000000              LONUM: 0
2126 007422 000000              HINUM: 0
2127 007424 000000              SV0: 0
2128 007426 000000              SV1: 0
2129 007430 000000              SV2: 0
2130 007432 000000              SV3: 0
2131
2132
2133      ;READ RECORD SECTION
2134 007434 005767 171164      READI: TST      RECORD      ;FIRST RECORD?
2135 007440 001003              BNE      $R1      ;NO
2136 007442 016767 171106 171172      MOV      STRLEN,READLN      ;SET INITIAL READ LENGTH
2137 007450 012767 177775 171114      $R1: MOV      #-3,RDPASS      ;INITIALIZE READ PASS COUNTER
2138 007456 016777 171102 171016      RDSTPD: MOV      COMAND,@MTC
2139 007464 105777 171012              TSTB      @MTC
2140 007470 100375              BPL      .-4      ;WAIT FOR CONTROL UNIT READY
2141 007472 006077 171002              ROR      @MTC
2142 007476 103375              BCC      .-4      ;WAIT FOR TAPE UNIT READY
2143 007500 016700 171030      READGO: MOV      RBUF,R0
2144 007504 016701 171132              MOV      READLN,R1
2145 007510 105020              RG1: CLRB      (0)+      ;CLEAR READ BUFFER
2146 007512 005301              DEC      R1
2147 007514 001375              BNE      RG1
2148 007516 016777 171120 170760      MOV      READLN,@BC      ;SET BYTE COUNT
2149 007524 005477 170754              NEG      @BC
2150 007530 016777 171000 170750      MOV      RBUF,@CA      ;SET CURRENT ADDRESS
2151 007536 016777 171022 170736      MOV      COMAND,@MTC
2152 007544 052777 000002 170730      BIS      #2,@MTC
2153 007552 004767 175424              JSR      PC,GOWAIT
2154
2155 007556 017767 170716 171014      ;RETURN HERE AFTER INTERRUPT
2156 007564 005777 170712              MOV      @MTC,STATRD
2157 007570 100504              TST      @MTC      ;ANY STATUS ERRORS
2158
2159 007572 016700 170736              BMI      RDERRO      ;YES
2160 007576 016701 170730              ;CHECK FOR DATA ERRORS
2161 007602 016702 171034              MOV      RBUF,R0
2162 007606 022021              MOV      WBUF,R1
2163 007610 001045              MOV      READLN,R2
2164 007612 162702 000002      $R5: CMP      (0)+,(1)+      ;CHECK FOR PROPER DATA TRANSFER
2165 007616 001373              BNE      DATERR      ;HAVE DATA ERROR
2166 007620 032767 000003 171504      SUB      #2,R2      ;CHECKED ALL TRANSFERS?
2167 007626 001007              BNE      $R5      ;NO
2168 007630 004767 000274      RTSSTP: BIT      #3,PARAM
2169 007634 026767 170764 170766      BNE      RDSTPC
2170 007642 001316              JSR      PC,RDINCR      ;INCREMENT FOR NEXT BLOCK
2171 007644 000207              CMP      RECORD,LASRCR
2171 007644 000207              BNE      READGO
2171 007644 000207              RTS      PC      ;EXIT READIT
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2172 007646 032767 000002 171456 RDSTPC: BIT #2,PARAM ;IS READ MODE RANDOM?
2173 007654 001414 BEQ RDSTP ;NO
2174 007656 004767 177364 RNDRDS: JSR PC,RANGEN
2175 007662 052767 177400 177526 BIS #177400,RANDOM
2176 007670 012704 177470 RNDST1: MOV #-200.,R4 ;DELAY 1 MILLISECOND
2177 007674 005204 INC R4
2178 007676 001376 BNE .-2
2179 007700 005267 177512 INC RANDOM
2180 007704 001371 BNE RNDST1
2181 007706 004767 000216 RDSTP: JSR PC,RDINCR
2182 007712 026767 170706 170710 CMP RECORD,LASRCR ;DONE LAST RECORD?
2183 007720 001256 BNE RDSTPD ;NO
2184 007722 000207 RTS PC ;YES EXIT
2185 ;HAVE DATA ERROR
2186 007724 032777 020000 170560 DATERR: BIT #20000,@SWR ;TYPE ALL READ ERRORS?
2187 007732 001014 BNE DATER1 ;NO
2188 007734 012702 013006 MOV #MSG9A,R2
2189 007740 104404 TOP
2190 007742 016767 170674 170606 MOV READLN,LENGTH
2191 007750 004767 001066 JSR PC,PRTS
2192 007754 014102 MOV -(1),R2 ;PRINT EXPECTED DATA
2193 007756 104412 OCTPRT
2194 007760 014002 MOV -(0),R2 ;PRINT ACTUAL DATA
2195 007762 104412 OCTPRT
2196 007764 022767 177775 170600 DATER1: CMP #-3,RDPASS
2197 007772 001002 BNE .+6
2198 007774 005267 170634 INC DAERRS ;+1 TO DATA ERRORS
2199 010000 000426 BR RTSR1
2200 ;STATUS INDICATES AN ERROR, CHECK FOR EOT
2201 010002 032767 175600 170570 RDERRO: BIT #175600,STATRD ;IS ERROR LEGITIMATE OR EOT?
2202 010010 001515 BEQ RNDTAP ;HAVE EOT
2203 010012 032777 020000 170472 BIT #20000,@SWR ;TYPE ALL READ ERRORS?
2204 010020 001010 BNE RTSREC ;NO
2205 010022 012702 012761 MOV #MSG9,R2
2206 010026 104404 TOP ;PRINT ERROR
2207 010030 016767 170606 170520 MOV READLN,LENGTH
2208 010036 004767 001000 JSR PC,PRTS
2209 ;+ 1 TO RDERRS IF FIRST ERROR PASS
2210 010042 022767 177775 170522 RTSREC: CMP #-3,RDPASS
2211 010050 001002 BNE .+6
2212 010052 005267 170554 INC RDERRS ;+1 TO STATUS ERRORS
2213 010056 032777 000020 170426 RTSR1: BIT #20,@SWR ;DELETE READ RETRYS (SW 4)?
2214 010064 001011 BNE RPASS3 ;YES
2215 010066 005267 170500 INC RDPASS ;DONE ALL RE-READS?
2216 010072 001404 BEQ RPASS1 ;YES
2217 010074 004767 000100 JSR PC,BACK1 ;NO, BACKSPACE TAPE
2218 010100 000167 177352 JMP RDSTPD ;GO AGAIN
2219 010104 005267 170526 RPASS1: INC NRREAD ;+1 TO NONRECOVERABLE READ
2220 010110 012767 177775 170454 RPASS3: MOV #-3,RDPASS
2221 010116 032767 002000 170454 BIT #2000,STATRD ;AT EOT?
2222 010124 001054 BNE RNDTP1 ;YES, TYPE 'EOT'
2223 010126 000667 BR RDSTP
2224 ;SET UP POINTERS FOR NEXT RECORD
2225 010130 005267 170470 RDINCR: INC RECORD
2226 010134 005767 170436 TST BLKINC
2227 010140 001416 BEQ RESTR1
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2228 ;RECORD LENGTH IS CHANGING, COUNT IT
2229 010142 066767 170430 170472 ADD BLKINC,READLN
2230 010150 026767 170466 170352 CMP READLN,MINLEN ;IS LENGTH LESS THAN MINIMUM
2231 010156 002404 BLT RESTR1 ;NO
2232 010160 026767 170456 170340 CMP READLN,MAXLEN ;IS LENGTH GREATER THAN MAXIMUM?
2233 010166 003403 BLE RESTR1 ;NO
2234 010170 016767 170360 170444 RESTR1: MOV STRLEN,READLN ;RESET INITIAL LENGTH
2235 010176 000207 RESTR1: RTS PC
2236
2237
2238 ;BACKSPACE ONE RECORD
2239 010200 006077 170274 BACK1: ROR @MTS
2240 010204 103375 BCC .-4 ;WAIT FOR TAPE UNIT READY
2241 010206 012777 177777 170270 MOV #-1,@BC ;COUNT 1 RECORD
2242 010214 016777 170344 170260 MOV COMAND,@MTC ;SELECT DRIVE
2243 010222 052777 000012 170252 BIS #12,@MTC ;ISSUE BACKSPACE
2244 010230 004767 174746 JSR PC,GOWAIT
2245 010234 042777 000016 170240 BIC #16,@MTC
2246 010242 000207 RTS PC
2247 ;DRIVE HAS REACHED EOT IN READ MODE
2248 010244 004767 177660 RNDTAP: JSR PC,RDINCR
2249 010250 052767 000020 170366 BIS #20,MODES ;INDICATE AT EOT
2250 010256 012702 013620 RNDTP1: MOV #MSG25,R2
2251 010262 104404 TOP
2252 010264 012702 012654 MOV #MSG8,R2
2253 010270 104404 TOP
2254 ;DUMP ERROR COUNTERS
2255 010272 004767 000610 READMP: JSR PC,PRTD ;PRINT DRIVE, PATTERN, PARITY, DENSITY
2256
2257 010276 016767 171030 001132 MOV PARAM,CHAR
2258 010304 042767 177774 001124 BIC #177774,CHAR
2259 010312 012702 013310 MOV #MSG14,R2
2260 010316 022767 000001 001112 CMP #1,CHAR
2261 010324 001002 BNE .+6
2262 010326 012702 013270 MOV #MSG12,R2
2263 010332 022767 000002 001076 CMP #2,CHAR
2264 010340 001002 BNE .+6
2265 010342 012702 013300 MOV #MSG13,R2
2266 010346 104404 TOP ;PRINT READ MODE
2267 010350 016702 170250 MOV RECORD,R2 ;PRINT RECORD NUMBER
2268 010354 104426 DECPRT
2269 010356 016767 170750 001052 MOV PARAM,CHAR
2270 010364 042767 177717 001044 BIC #177717,CHAR
2271 010372 012702 013336 MOV #MSG17,R2
2272 010376 022767 000020 001032 CMP #20,CHAR
2273 010404 001002 BNE .+6
2274 010406 012702 013345 MOV #MSG18,R2
2275 010412 022767 000040 001016 CMP #40,CHAR
2276 010420 001002 BNE .+6
2277 010422 012702 013320 MOV #MSG15,R2
2278 010426 022767 000060 001002 CMP #60,CHAR
2279 010434 001002 BNE .+6
2280 010436 012702 013327 MOV #MSG16,R2
2281 010442 104404 TOP ;PRINT RECORD LENGTH SEQUENCE
2282 010444 012702 013450 MOV #MSG21,R2
2283 010450 104404 TOP
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2284 010452 016702 170154      MOV      RDERRS,R2
2285 010456 104426      DECPR    TOP
2286
2287
2288 010460 012702 013500      MOV      #MSG22,R2
2289 010464 104404      TOP
2290 010466 016702 170142      MOV      DAERRS,R2
2291 010472 104426      DECPR    TOP
2292 010474 012702 013521      MOV      #MSG23,R2
2293 010500 104404      TOP
2294 010502 016702 170130      MOV      NRREAD,R2
2295 010506 104426      DECPR    TOP
2296 010510 104436      CKSW
2297 010512 000207      RTS      PC
2298
2299
2300
2301      ;WRITE RECOVERY UTILIZING EXTENDED INTERRECORD GAP
2302      ;USED AFTER EVERY 7 REWRITES OR AFTER
2303      ;EACH WRITE ERROR IF STATISTICAL RECOVERY NOT SELECTED
2304      ;USED ONLY IF READ PASS SELECTED
2305 010514 012767 177774 170052 XRGREC: MOV      #-4,WRPASS      ;COUNT 4 REWRITES
2306 010522 032777 000040 167762 XRG0:  BIT      #40,ASWR      ;DELETE WRITE XIRG (SW 5)
2307 010530 001036      BNE      XRGRC    ;YES
2308 010532 004767 177442      JSR      PC,BACK1
2309 010536 105777 167740      TSTB     @MTC
2310 010542 100375      BPL      .-4
2311 010544 016777 170014 167730      MOV      COMAND,@MTC
2312 010552 052777 000014 167722      BIS      #14,@MTC      ;WRITE XIRG
2313 010560 016777 170054 167716      MOV      WRTLEN,@BC      ;SET BYTE COUNT
2314 010566 005477 167712      NEG      @BC
2315 010572 016777 167734 167706      MOV      WBUF,@CA      ;SET CURRENT ADDRESS
2316 010600 006077 167674      ROR      @MTC      ;WAIT FOR TU READY
2317 010604 103375      BCC      .-4
2318 010606 004767 174370      JSR      PC,GOWAIT
2319
2320      ;RETURN HERE AFTER INTERRUPT
2321 010612 017767 167662 167760      MOV      @MTC,STATRD      ;SAVE STATUS
2322 010620 005777 167656      TST      @MTC
2323 010624 100403      BMI      XRG5      ;HAVE ERROR FLAG, CHECK FOR EOT
2324 010626 005067 167742      XRGRC: CLR      WRPASS
2325 010632 000207      RTS      PC      ;EXIT WRITE XIRG
2326 010634 032767 175600 167736 XRG5:  BIT      #175600,STATRD
2327 010642 001771      BEQ      XRGRC    ;ONLY EOT, EXIT
2328 010644 005267 167724      INC      WRPASS      ;DONE 4 XIRG
2329 010650 001324      BNE      XRG0
2330      ;PRINT STATUS AFTER 4 XIRG ERRORS
2331 010652 012702 012626      MOV      #MSG7,R2
2332 010656 104404      TOP
2333 010660 016767 167754 167670      MOV      WRTLEN,LENGTH      ;PRINT WRITE STATUS ERROR
2334 010666 004767 000150      JSR      PC,PRTS      ;PRINT STATUS, COMMAND, RECORD, LENGTH
2335 010672 012702 013242      MOV      #MSG11,R2
2336 010676 104404      TOP
2337 010700 032767 002000 167672      BIT      #2000,STATRD      ;PRINT 'XIRG WRITTEN 4 TIMES'
2338 010706 001702      BEQ      XRGREC
2339 010710 042777 000016 167564      BIC      #16,@MTC
```

```
2340 010716 052777 000003 167556 BIS #3,@MTC ;WRITE AN EOF
2341 010724 004767 174252 JSR PC,GOWAIT
2342 010730 000207 RTS PC
2343
2344 ;GO BACKWARD ON TAPE X RECORDS
2345 010732 016767 167666 167670 GOBKWD: MOV RECORD,LASRCR
2346 010740 016767 167662 167656 MOV WRRECR,RECORD
2347 010746 001003 BNE GOB1 ;IS NEW RECORD=0
2348 010750 004767 174032 JSR PC,REWIND ;YES,REWIND
2349 010754 000207 RTS PC ;EXIT
2350 010756 016777 167646 167520 GOB1: MOV LASRCR,@BC ;SET BYTE COUNT TO DIFFERENCE
2351 010764 166777 167636 167512 SUB WRRECR,@BC ;BETWEEN LASRCR AND WRRECK
2352 010772 005477 167506 NEG @BC
2353 010776 016777 167562 167476 MOV COMAND,@MTC
2354 011004 105777 167472 TSTB @MTC ;WAIT FOR CU READY
2355 011010 100375 BPL .-4
2356 011012 006077 167462 ROR @MTC ;WAIT FOR TU READY
2357 011016 103375 BCC .-4
2358 011020 042777 000016 167454 BIC #16,@MTC
2359 011026 052777 000012 167446 BIS #12,@MTC
2360 011034 004767 174142 JSR PC,GOWAIT
2361 011040 000207 RTS PC
2362 ;PRINT COMMAND, STATUS, RECORD NUMBER, LENGTH
2363 011042 012702 013031 PRTS: MOV #MSG9B,R2
2364 011046 104404 TOP
2365 011050 017702 167426 MOV @MTC,R2
2366 011054 104412 OCTPRT
2367 011056 016702 167516 MOV STATRD,R2
2368 011062 104412 OCTPRT
2369 011064 016702 167534 MOV RECORD,R2
2370 011070 005202 INC R2
2371 011072 104426 DECPRT
2372 011074 016702 167456 MOV LENGTH,R2
2373 011100 104426 DECPRT
2374 011102 104436 CKSW
2375 011104 000207 RTS PC
2376
2377 ;PRINT DRIVE, PATTERN, PARITY, DENSITY
2378 011106 016767 167452 000322 PRTD: MOV COMAND,CHAR
2379 011114 000367 000316 SWAB CHAR
2380 011120 142767 000170 000310 BICB #170,CHAR
2381 011126 052767 000260 000302 BIS #260,CHAR
2382 011134 004767 000300 JSR PC,OCTP ;PRINT DRIVE NUMBER
2383 011140 104430 SP3
2384 011142 016767 170164 000266 MOV PARAM,CHAR
2385 011150 000367 000262 SWAB CHAR
2386 011154 006067 000256 ROR CHAR
2387 011160 042767 000170 000250 BIC #170,CHAR
2388 011166 052767 000260 000242 BIS #260,CHAR
2389 011174 004767 000240 JSR PC,OCTP ;PRINT PATTERN NUMBER
2390 011200 104430 SP3
2391 011202 016767 170124 000226 MOV PARAM,CHAR
2392 011210 000367 000222 SWAB CHAR
2393 011214 042767 000176 000214 BIC #176,CHAR
2394 011222 052767 000260 000206 BIS #260,CHAR
2395 011230 004767 000204 JSR PC,OCTP ;PRINT PARITY
```

```
2396
2397
2398 011234 016767 170072 000174      MOV      PARAM,CHAR
2399 011242 042767 177477 000166      BIC      #177477,CHAR
2400 011250 012702 013663              MOV      #MSG26,R2
2401 011254 022767 000100 000154      CMP      #100,CHAR
2402 011262 001002              BNE      .+6
2403 011264 012702 013673              MOV      #MSG27,R2
2404 011270 022767 000200 000140      CMP      #200,CHAR
2405 011276 001002              BNE      .+6
2406 011300 012702 013703              MOV      #MSG28,R2
2407 011304 022767 000300 000124      CMP      #300,CHAR
2408 011312 001002              BNE      .+6
2409 011314 012702 013713              MOV      #MSG29,R2
2410 011320 104404              TOP
2411 011322 104436              CKSW
2412 011324 000207              RTS
2413
2414 011326 012767 000060 000102      ;PRINT OCTAL VALUE IN REGISTER 2
2415 011334 005702      OCTPR: MOV      #'0,CHAR      ;INITIALIZE 1ST NUMBER AS 0
2416 011336 100003              TST      R2          ;IS VALUE POSITIVE
2417 011340 012767 000061 000070      BPL      OCT1          ;YES PRINT 0
2418 011346 004767 000066              MOV      #'1,CHAR      ;NO PRINT 1
2419 011352 006102      OCT1: JSR      PC,OCTP
2420 011354 006102              ROL      R2
2421 011356 012767 177773 000050      MOV      #-5,OCT          ;COUNT 5 DIGITS
2422 011364 006102      OCT2: ROL      R2
2423 011366 006102              ROL      R2
2424 011370 006102              ROL      R2
2425 011372 010267 000040              MOV      R2,CHAR          ;SAVE DIGIT
2426 011376 042767 177770 000032      BIC      #177770,CHAR      ;CLEAR OTHER BITS
2427 011404 052767 000060 000024      BIS      #60,CHAR          ;MAKE ASCII DIGIT
2428 011412 006002              ROR      R2
2429 011414 004767 000020              JSR      PC,OCTP          ;PRINT
2430 011420 006102              ROL      R2
2431 011422 005267 000006              INC      OCT          ;+1 TO DIGIT COUNT
2432 011426 001356              BNE      OCT2          ;NOT DONE
2433 011430 104430              SP3
2434 011432 000207              RTS      PC          ;EXIT
2435 011434 000000      OCT: 0
2436 011436 000000      CHAR: 0
2437 011440 105777 167056      OCTP: TSTB      @TPS
2438 011444 100375              BPL      .-4          ;WAIT FOR READY
2439 011446 016777 177764 167050      MOV      CHAR,@TPB      ;PRINT
2440 011454 000207              RTS      PC
2441
2442
2443      ;PRINT DECIMAL VALUE IN REGISTER 2
2444 011456 012767 177773 000150      DECPR: MOV      #-5,DIGCNT
2445 011464 012767 011642 000146              MOV      #DECPNT+2,DECPNT
2446 011472 012767 000040 000136              MOV      #40,ZERO
2447 011500 012767 177777 000124      TYPT1: MOV      #-1,DIGIT
2448 011506 005267 000120      TYPT2: INC      DIGIT
2449 011512 167702 000122              SUB      @DECPNT,R2
2450 011516 100373              BPL      TYPT2
2451 011520 067702 000114              ADD      @DECPNT,R2
```

2452	011524	004767	000022			JSR	PC,DECOU		
2453	011530	005267	000100			INC	DIGCNT		
2454	011534	001002				BNE	TYPT3		
2455	011536	104430				SP3			
2456	011540	000207				RTS	PC		
2457	011542	062767	000002	000070	TYPT3:	ADD	#2,DECPNT		
2458	011550	000753				BR	TYPT1		
2459	011552	005767	000054		DECOUT:	TST	DIGIT		
2460	011556	001010				BNE	DEC1		
2461	011560	022767	177777	000046		CMP	#-1,DIGCNT		
2462	011566	001404				BEQ	DEC1		
2463	011570	016767	000042	000034		MOV	ZERO,DIGIT		
2464	011576	000406				BR	DEC2		
2465	011600	012767	000060	000030	DEC1:	MOV	#60,ZERO		
2466	011606	052767	000060	000016		BIS	#60,DIGIT		
2467	011614	105777	166702		DEC2:	TSTB	@TPS		
2468	011620	100375				BPL	.-4		
2469	011622	016777	000004	166674		MOV	DIGIT,@TPB		
2470	011630	000207				RTS	PC		
2471	011632	000000			DIGIT:	0			
2472	011634	000000			DIGCNT:	0			
2473	011636	000040			ZERO:	40			
2474	011640	011642			DECPNT:	.-+2			
2475	011642	023420				10000.			
2476	011644	001750				1000.			
2477	011646	000144				100.			
2478	011650	000012				10.			
2479	011652	000001				1.			
2480					;KEYBOARD INPUT				
2481	011654	105777	166636		WAITK:	TSTB	@TKS	;WAIT FOR KEY	
2482	011660	100375				BPL	.-4		
2483	011662	105777	166634			TSTB	@TPS	;WAIT FOR TELEPRINTER READY	
2484	011666	100375				BPL	.-4		
2485	011670	117777	166624	166626		MOVB	@TKB,@TPB	;ECHO CHARACTER	
2486	011676	117767	166616	167422		MOVB	@TKB,CHARIN	;SAVE IT	
2487	011704	042767	000200	167414		BIC	#200,CHARIN		
2488	011712	000207				RTS	PC	;EXIT	
2489					;TYPE 3 SPACES				
2490	011714	012702	011724		SP3X:	MOV	#SP3A,R2		
2491	011720	104404					TOP		
2492	011722	000207				RTS	PC		
2493	011724	020057	020040	057	SP3A:	.ASCII	:/ /;		
2494		011732				.EVEN			
2495					;TELETYPE OUTPUT PACKAGE				
2496					TO:	BICB	#177,@TPS	;CLEAR TELETYPE FLAGS	
2497						MOVB	(2)+,EOMK	;SAVE MESSAGE DELIMETER	
2498	011732	142777	000177	166562	TOP1:	CMPB	@R2,EOMK	;IS CHARACTER THE SECOND MESSAGE DELIMITER?	
2499	011740	112267	000100			BNE	.-+10	;NO	
2500	011744	121267	000074		TOP3:	CLR	RDSW		
2501	011750	001003				RTS	PC	;YES, EXIT	
2502	011752	005067	166570			CMPB	@R2,#'a	;IS CHARACTER AN @ WHICH INDICATES A CARRIAGE RET.	
2503	011756	000207				BEQ	TOP2	;YES	
2504	011760	121227	000100			TSTB	@TPS	;NO, WAIT FOR TELETYPE READY	
2505	011764	001406				BPL	.-4		
2506	011766	105777	166530						
2507	011772	100375							

```
2508 011774 112277 166524      MOVB      (2)+, @TPB      ;PRINT CHARACTER
2509 012000 000761      BR          TOP1
2510      ;CARRIAGE RETURN, LINE FEED
2511 012002 105777 166514      TOP2: TSTB      @TPS
2512 012006 100375      BPL          -4
2513 012010 112777 000215 166506      MOVB      #215, @TPB      ;CR
2514 012016 105777 166500      TSTB      @TPS
2515 012022 100375      BPL          -4
2516 012024 112777 000212 166472      MOVB      #212, @TPB      ;LF
2517 012032 105202      INCB      R2
2518 012034 105767 166506      TSTB      RDSW
2519 012040 100744      BMI          TOP3
2520 012042 000740      BR          TOP1
2521 012044 000000      EOMK: 0
2522
2523
2524
2525 012046 013746 000006      SUSWR: MOV      @#6, -(SP)      ;SAVE VECTORS
2526 012052 013746 000004      MOV      @#4, -(SP)
2527 012056 012737 012076 000004      MOV      #1$, @#4      ;SET UP FOR TIMEOUT
2528 012064 022777 177777 166420      CMP      #-1, @SWR      ;REFERENCE HARDWARE SWITCH REGISTER
2529 012072 001402      BEQ          2$
2530 012074 000407      BR          3$
2531 012076 022626      1$: CMP      (SP)+, (SP)+      ;ADJUST STACK
2532 012100 012767 000176 166404      2$: MOV      #SWREG, SWR      ;POINT TO SOFTWARE SWITCH REG
2533 012106 012767 000174 166400      MOV      #DISPREG, DISPLAY      ;POINT TO SOFT DISPLAY REG
2534 012114 012637 000004      3$: MOV      (SP)+, @#4      ;RESTORE VECTORS
2535 012120 012637 000006      MOV      (SP)+, @#6
2536 012124 000207      RTS          PC
2537
2538
2539
2540 012126 022767 000176 166356      CKSWR: CMP      #SWREG, SWR      ;SOFTWARE SWITCH REG PRESENT
2541 012134 001035      BNE          OUT      ;NO, GET OUT
2542 012136 105777 166354      TSTB      @TKS      ;YES, WAIT FOR
2543 012142 100032      BPL          OUT      ;READY, GET CHARACTER
2544 012144 017767 166350 166366      MOV      @TKB, TIB      ;AND STRIP OFF
2545 012152 042767 177600 166360      BIC      #177600, TIB      ;THE GARBAGE
2546 012160 022767 000007 166352      CMP      #7, TIB      ;IS IT A <^G>
2547 012166 001020      BNE          OUT
2548 012170 012702 013747      MOV      #SCNTG, R2
2549 012174 104404      TOP
2550 012176 012702 013754      CNTLU: MOV      #SMSWR, R2
2551 012202 104404      TOP
2552 012204 017702 166302      MOV      @SWR, R2
2553 012210 104412      OCTPRT
2554 012212 012702 013765      MOV      #SMNEW, R2
2555 012216 104404      TOP
2556 012220 005037 000542      CLR      @TEMPST
2557 012224 004767 000002      JSR      PC, $READ      ;GO READ A LINE
2558 012230 000207      OUT: RTS          PC      ;RETURN TO MAIN BODY OF PROGRAM
2559
2560 012232 005067 166304      $READ: CLR      TEMPST
2561 012236 012767 000007 166300      MOV      #7, COUNT
2562 012244 104400      1$: WAITKY
2563 012246 042767 177600 167052      BIC      #177600, CHARIN ;GO READ A CHARACTER
                                ;STRIP OFF GARBAGE
```

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2564 012254 122767 000025 167044      CMPB    #25,CHARIN      ;IS IT A ^U?
2565 012262 001002          BNE     2$      ;BRANCH IF NOT
2566 012264 005726          TST     (SP)+    ;POP THE STACK
2567 012266 000743          BR CNTLU    ;START OVER
2568 012270 122767 000015 167030 2$:    CMPB    #15,CHARIN      ;IS IT A <CR>?
2569 012276 001013          BNE     4$      ;BRANCH IF NOT
2570 012300 012767 000200 166240      MOV     #200,RDSW
2571 012306 004767 177470          JSR     PC, TOP2
2572 012312 022767 000007 166224      CMP     #7,COUNT
2573 012320 001036          BNE     7$
2574 012322 005726          TST     (SP)+    ;ECHO IT WITH <LF>
2575 012324 000741          BR     OUT      ;WAS IT FIRST CHARACTER
2576 012326 122767 000060 166772 4$:    CMPB    #60,CHARIN      ;CHANGE SWR IF NOT FIRST ONE
2577 012334 003004          BGT     5$      ;POP THE STACK
2578 012336 122767 000067 166762      CMPB    #67,CHARIN      ;GET OUT
2579 012344 002004          BGE     6$
2580 012346 012702 013776          MOV     #SQUEST,R2
2581 012352 104404          TOP
2582 012354 000743          BR     3$      ;START OVER IF NOT LEGAL CHARACTER
2583 012356 006367 166160          ASL     TEMPST
2584 012362 006367 166154          ASL     TEMPST
2585 012366 006367 166150          ASL     TEMPST
2586 012372 142767 000060 166726      BICB    #60,CHARIN      ;GET NITTY-GRITTY
2587 012400 156767 166722 166134      BISB    CHARIN,TEMPST
2588 012406 005367 166132          DEC     COUNT      ;ONLY WANT 6 DIGITS
2589 012412 001755          BEQ     5$
2590 012414 000713          BR     1$
2591 012416 016777 166120 166066 7$:    MOV     TEMPST,@SWR      ;CHANGE SWITCH REGISTER CONTENTS
2592 012424 000736          BR     8$
2593          ;TRAP HANDLER
2594 012426 011666 000002          TRAP34: MOV     @SP,2(6)
2595 012432 162716 000002          SUB     #2,@SP
2596 012436 013646          MOV     @6)+,-(6)
2597 012440 062716 106046          ADD     #TABLE-104400,@SP
2598 012444 013607          MOV     @6)+,PC
2599 012446 011654          TABLE: WAITK
2600 012450 005254          WRITI
2601 012452 011732          TO
2602 012454 004512          SVCTR
2603 012456 004626          RSFDR
2604 012460 011326          OCTPR
2605 012462 004530          MVCTR
2606 012464 006526          GENPA
2607 012466 004572          CLRAL
2608 012470 004750          CHGDR
2609 012472 007434          READI
2610 012474 011456          DECPR
2611 012476 011714          SP3X
2612 012500 012046          SUSWR
2613 012502 012176          CNTLU
2614 012504 012126          CKSWR
2615          WAITKY=104400
2616          WRITIT=104402
2617          TOP=104404
2618          SVCTRS=104406
2619          RSFDRV=104410
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2620		104412			OCTPRT=104412	
2621		104414			MVCTRS=104414	
2622		104416			GENPAT=104416	
2623		104420			CLRALL=104420	
2624		104422			CHGDRV=104422	
2625		104424			READIT=104424	
2626		104426			DECPRT=104426	
2627		104430			SP3=104430	
2628		104432			SUSW=104432	
2629		104434			CNTL=104434	
2630		104436			CKSW=104436	
2631					;TEXT MESSAGES	
2632	012506	037457	020100	057	MSG0: .ASCII	:/?a /;
2633	012513	057	051500	046105	MSG1: .ASCII	;/@SELECT UNITS /;
2634	012520	041505	020124	047125		
2635	012526	052111	020123	027440		
2636	012534	040057	051524	020124	MSG2: .ASCII	;/@TST PAT PAR DEN RLS WMO RMOa /;
2637	012542	040520	020124	040520		
2638	012550	020122	042504	020116		
2639	012556	046122	020123	046527		
2640	012564	020117	046522	040117		
2641	012572	027440				
2642	012574	046457	054101	052040	MSG5: .ASCII	;/MAX TESTS SELECTEDa/;
2643	012602	051505	051524	051440		
2644	012610	046105	041505	042524		
2645	012616	040104	057			
2646	012621	057	047440	027513	MSG6: .ASCII	;/ OK/;
2647	012626	040057	051127	052111	MSG7: .ASCII	;/@WRITE STATUS ERRORa/;
2648	012634	020105	052123	052101		
2649	012642	051525	042440	051122		
2650	012650	051117	027500			
2651	012654	042457	042116	047440	MSG8: .ASCII	;/END OF TAPE*****a/;
2652	012662	020106	040524	042520		
2653	012670	025052	025052	025052		
2654	012676	025052	025052	025052		
2655	012704	025052	025052	025052		
2656	012712	025052	100			
2657	012715	104	053122	050040	.ASCII	;/DRV PAT PAR DEN MODE RECORD LENGTHa/;
2658	012722	052101	050040	051101		
2659	012730	042040	047105	046440		
2660	012736	042117	020105	042522		
2661	012744	047503	042122	046040		
2662	012752	047105	052107	040110		
2663	012760	057				
2664	012761	057	051100	040505	MSG9: .ASCII	;/@READ STATUS ERRORa/;
2665	012766	020104	052123	052101		
2666	012774	051525	042440	051122		
2667	013002	051117	027500			
2668	013006	040057	042522	042101	MSG9A: .ASCII	;/@READ DATA ERRORa/;
2669	013014	042040	052101	020101		
2670	013022	051105	047522	040122		
2671	013030	057				
2672	013031	057	047503	042115	MSG9B: .ASCII	;/COMD STATUS RECORD LENGTH EXPECTED ACTUALa/;
2673	013036	020040	020040	051440		
2674	013044	040524	052524	020123		
2675	013052	020040	042522	047503		

2676	013060	042122	020040	046040		
2677	013066	047105	052107	020110		
2678	013074	054105	042520	052103		
2679	013102	042105	040440	052103		
2680	013110	040525	040114	057		
2681	013115	057	041500	052132	MSG10A: .ASCII	;/@CZTMCD0 TM11 DATA RELIAB;
2682	013122	041515	030104	052040		
2683	013130	030515	020061	040504		
2684	013136	040524	051040	046105		
2685	013144	040511	102			
2686	013147	100	042522	047503	.ASCII	;/@RECORD LIMITS IN BYTES;
2687	013154	042122	046040	046511		
2688	013162	052111	020123	047111		
2689	013170	041040	052131	051505		
2690	013176	046500	047111	042514	.ASCII	;/@MINLEN MAXLEN@/;
2691	013204	020116	046440	054101		
2692	013212	042514	040116	057		
2693	013217	057	042500	042530	MSG10B: .ASCII	;/@EXERCISING UNITS/;
2694	013224	041522	051511	047111		
2695	013232	020107	047125	052111		
2696	013240	027523				
2697	013242	054057	051111	020107	MSG11: .ASCII	;/XIRG WRITTEN 4 TIMES/;
2698	013250	051127	052111	042524		
2699	013256	020116	020064	044524		
2700	013264	042515	027523			
2701	013270	020057	051523	050124	MSG12: .ASCII	;/ SSTP /;
2702	013276	027440				
2703	013300	020057	047122	046504	MSG13: .ASCII	;/ RNDM /;
2704	013306	027440				
2705	013310	020057	051516	050124	MSG14: .ASCII	;/ NSTP /;
2706	013316	027440				
2707	013320	046457	046455	054101	MSG15: .ASCII	;/M-MAX/;
2708	013326	057				
2709	013327	057	026515	044515	MSG16: .ASCII	;/M-MIN/;
2710	013334	027516				
2711	013336	046457	047111	020040	MSG17: .ASCII	;/MIN /;
2712	013344	057				
2713	013345	057	040515	020130	MSG18: .ASCII	;/MAX /;
2714	013352	027440				
2715	013354	040057	051127	052111	MSG19: .ASCII	;/@WRITE ERRORS - /;
2716	013362	020105	051105	047522		
2717	013370	051522	036440	027440		
2718	013376	040057	042522	047503	MSG20: .ASCII	;/@RECOVERED AT 0 /;
2719	013404	042526	042522	020104		
2720	013412	052101	030040	027440		
2721	013420	040057	042520	046522	MSG20A: .ASCII	;/@PERMANENT BADSPOTS = /;
2722	013426	047101	047105	020124		
2723	013434	040502	051504	047520		
2724	013442	051524	036440	027440		
2725	013450	040057	042522	042101	MSG21: .ASCII	;/@READ STATUS ERRORS = /;
2726	013456	051440	040524	052524		
2727	013464	020123	051105	047522		
2728	013472	051522	036440	027440		
2729	013500	040057	040504	040524	MSG22: .ASCII	;/@DATA ERRORS = /;
2730	013506	042440	051122	051117		
2731	013514	020123	020075	057		

2732	013521	057	047100	047117	MSG23: .ASCII	;/@NON RECOVERABLE ERRORS = /;
2733	013526	051040	041505	053117		
2734	013534	051105	041101	042514		
2735	013542	042440	051122	051117		
2736	013550	020123	020075	057		
2737	013555	057	025100	025052	MSG24: .ASCII	;/@*****WRITE PASS /;
2738	013562	025052	025052	025052		
2739	013570	025052	025052	025052		
2740	013576	025052	025052	053452		
2741	013604	044522	042524	050040		
2742	013612	051501	020123	027440		
2743	013620	040057	025052	025052	MSG25: .ASCII	;/@*****READ PASS /;
2744	013626	025052	025052	025052		
2745	013634	025052	025052	025052		
2746	013642	025052	025052	042522		
2747	013650	042101	050040	051501		
2748	013656	020123	020040	057		
2749	013663	057	020040	031040	MSG26: .ASCII	;/ 200/;
2750	013670	030060	057			
2751	013673	057	020040	032440	MSG27: .ASCII	;/ 556/;
2752	013700	033065	057			
2753	013703	057	020040	034040	MSG28: .ASCII	;/ 800/;
2754	013710	030060	057			
2755	013713	057	020040	041440	MSG29: .ASCII	;/ CD /;
2756	013720	020104	057			
2757	013723	057	040100	027500	MSG30: .ASCII	;/@@@/;
2758	013730	040057	047105	020104	MSG31: .ASCII	;/@END OF PASS@/;
2759	013736	043117	050040	051501		
2760	013744	040123	057			
2761						
2762	013747	057	057100	027507	SCNTG: .ASCII	;/@^G/;
2763	013754	040057	051500	051127	SMSWR: .ASCII	;/@@SWR= /;
2764	013762	020075	057			
2765	013765	057	020040	042516	SMNEW: .ASCII	;/ NEW= /;
2766	013772	036527	027440			
2767	013776	040057	040077	027500	SQUEST: .ASCII	;/@?@@/;
2768					.EVEN	
2769						
2770	014004	014004			BUFFER: .	;/WRITE BUFFER BEGINS HERE
2771		000001			.END	

CZTMCD0 TM11 DATA RELIAB
CZTMCD.P11 03-JUN-80 15.26

MACY11 30A(1052) 03-JUN-80 15:27 M 4
CROSS REFERENCE TABLE -- USER SYMBOLS

SEQ 0051

ALLEOS	005066	1683	1687#											
ALLEOT	005044	1398	1414	1446	1478	1547	1588	1600	1680#					
ALL1	005046	1681#	1685											
ALL2	005154	1689	1691	1705#										
ALL3	005150	1686	1704#											
ATST	000550	995#	1075*	1170*	1183									
AUTOST	001366	966	1073#											
BACK1	010200	1845	1846	2217	2239#	2308								
BC	000504	974#	1749*	1750*	1850*	2148*	2149*	2241*	2313*	2314*	2350*	2351*	2352*	
BLKINC	000576	1006#	1730*	1734*	1738*	1802	1804	2226	2229					
BUFFER	014004	985	986	1084	1090	1094	1138*	1139	1158	1164	1169	2770#		
CA	000506	975#	1751*	2150*	2315*									
CC	000510	976#	1716*	1721*										
CDMEND	005144	1700	1702#											
CDRIVE	000570	1003#	1621	1622	1636*	1640*	1644	1659*						
CDRVBT	000566	1002#	1637*	1638	1642*	1661*	1666							
CHAR	011436	1867*	1868*	1870	1873	1879*	1880*	1882	1885	1888	2257*	2258*	2260	2263
		2269*	2270*	2272	2275	2278	2378*	2379*	2380*	2381*	2384*	2385*	2386*	2387*
		2388*	2391*	2392*	2393*	2394*	2398*	2399*	2401	2404	2407	2414*	2417*	2425*
		2426*	2427*	2436#	2439									
CHARIN	001326	1054#	1179	1186	1188	1195*	1196*	1198*	1219	1224	1226	1231	1241	1243
		1245*	1246*	1247*	1248	1252	1254	1262	1264	1268	1272	1278	1280	1284
		1288	1294	1296	1300	1306	1308	1312	1322	2486*	2487*	2563*	2564	2568
		2576	2578	2586*	2587									
CHGDR	004750	1659#	1667	2608										
CHGDRV=	104422	1396	1412	1430	1437	1444	1461	1469	1476	1496	1507	1514	1524	1540
		1545	1572	1586	1596	1630	1684	1702	2624#					
CHGD1	001372	1074#												
CHGD2	003300	1374#												
CHG1	004774	1662	1666#											
CKSW =	104436	1361	1687	1698	1831	1910	1919	2296	2374	2411	2630#			
CKSWR	012126	2540#	2614											
CLRAL	004572	1626#	2607											
CLRALL=	104420	1387	1404	1422	1453	1491	1555	2623#						
CLRTBL	005156	1628	1709#											
CLRT1	005162	1710#	1712											
CLR1	004574	1627#	1631											
CNTL =	104434	1341	2629#											
CNTLU	012176	2550#	2567	2613										
COMAND	000564	1001#	1644*	1645*	1648*	1651*	1654*	1673	1744	1851	2138	2151	2242	2311
		2353	2378											
COUNT	000544	993#	2561*	2572	2588*									
CTRDEX	004546	1607	1613	1619#										
CTRDMP	005110	1693#	1703											
CTRD1	005140	1696	1701#											
DAERRS	000634	1022#	2198*	2290										
DATERR	007724	2163	2186#											
DATER1	007764	2187	2196#											
DECOUT	011552	2452	2459#											
DECPNT	011640	2445*	2449	2451	2457*	2474#								
DECPR	011456	2444#	2610											
DECPRT=	104426	1128	1130	1878	1895	1904	1918	2268	2285	2291	2295	2371	2373	2626#
DEC1	011600	2460	2462	2465#										
DEC2	011614	2464	2467#											
DIGCNT	011634	2444*	2453*	2461	2472#									
DIGIT	011632	2447*	2448*	2459	2463*	2466*	2469	2471#						

DISPLA	000514	978#	2533*
DISPRE	000174	962#	2533
DJEN	003320	1371	1381#
DNE1	003216	1359#	1400
DRVADR	000646	1363	1367
DRVSEL	000552	1029#	1609
DOTAB	000666	996#	1102*
D1TAB	000732	1029	1038#
D2TAB	000776	1030	1040#
D3TAB	001042	1031	1042#
D4TAB	001106	1032	1044#
D5TAB	001152	1033	1046#
D6TAB	001216	1034	1048#
D7TAB	001262	1035	1050#
ENDADR	003310	1036	1052#
ENDTAP	006214	953	1373
ENDT1	006226	1821	1843
EOPK	012044	1697	1860#
ERROR	005762	2499*	2500
ERR1	006004	1757	1820#
EXEC	003132	1823	1825#
EXECUT	003116	1343#	1382
EXEC1	003140	1160	1185
GENPA	006526	1344#	1369
GENPAT=	104416	1926#	2606
GOBKWD	010732	1388	1405
GOB1	010756	1435	1467
GOWAIT	005202	2347	2350#
GW1	005244	1677	1716#
HINUM	007422	1718	1723#
IDSELF	001660	1081*	1174*
LASRCR	000630	1106	1125#
		1020#	1530
		1593	2169
LENGTH	000556	998#	1829*
LONUM	007420	1080*	1173*
LOOPER	001746	1146#	1155
MAXLEN	000526	983#	1089*
MEM4K	002022	967	1162#
MEMBK	002046	968	1167#
MINLEN	000530	984#	1088*
MODES	000644	1026#	1340*
		1472	1485*
		1567	1576
		1791	1793
MSBITS	000560	999#	1103*
MSG0	012506	1228	2632#
MSG1	012513	1175	2633#
MSG10A	013115	1125	2681#
MSG10B	013217	1136	2693#
MSG11	013242	2335	2697#
MSG12	013270	1872	2262
MSG13	013300	1875	2265
MSG14	013310	1869	2259
MSG15	013320	1887	2277
MSG16	013327	1890	2280
			2701#
			2703#
			2705#
			2707#
			2709#
			1416
			1448
			1480
			1549
			1590
			1602
			1615
			1620
			1107
			1119*
			1039
			1041
			1043
			1045
			1047
			1049
			1051
			1053
			1377#
			1858#
			2521#
			1223
			1340#
			1423
			1454
			1486
			1556
			2622#
			1522
			2345#
			1753
			1853
			2153
			2244
			2318
			2341
			2360
			2096
			2106
			2118*
			2126#
			1532
			1535*
			1536*
			1538*
			1543
			1569*
			1570*
			1578
			1581*
			1582*
			1584*
			2182
			2345*
			2350
			2207*
			2333*
			2372
			2104
			2117*
			2125#
			1093*
			1129
			1163

[illegible]

[illegible]

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CROSS REFERENCE TABLE -- USER SYMBOLS

[illegible]

[illegible]

T4A	003742	1492#	1548																	
T4B	003744	1493#	1497																	
T4C	003770	1499#	1513																	
T4D	003772	1500#	1508																	
T4E	004024	1502	1507#																	
T4F	004040	1511#	1515																	
T4G	004056	1510	1518#																	
T4H	004060	1519#	1525																	
T4J	004076	1521	1523#																	
T4K	004104	1526#	1544																	
T4L	004106	1527#	1541																	
T4M	004160	1534	1537#																	
T4N	004172	1529	1531	1540#																
T4P	004176	1542#	1546																	
T5	004240	1557#	1601																	
T5A	004264	1560	1562#																	
T5B	004276	1564#																		
T5C	004306	1566#	1573																	
T5D	004336	1568	1572#																	
T5E	004344	1575#	1587	1599																
T5F	004406	1580	1583#																	
T5FLAG	004506	1557*	1603#	1633*	1695	1740														
T5G	004420	1577	1586#																	
T5H	004436	1589	1591#																	
T5INC	004510	1562*	1570	1604#																
T5J	004440	1592#	1597																	
T5K	004460	1594	1596#																	
USSTST	001604	1109#	1112																	
USS.OK	001622	1110	1114#																	
VALID	002220	1189	1195#																	
VAL1	002236	1198#	1201																	
VAL2	002250	1199	1202#																	
VAL3	002264	1203	1206#																	
VAL4	002270	1193	1205	1207#																
WAITK	011654	2481#	2599																	
WAITKY=	104400	1178	1218	1240	1251	1261	1277	1293	1305	1321	2562	2615#								
WBUF	000532	985#	1751	1926	2083	2160	2315													
WRCHEK	000602	1008#	1619	1709	1762	1824*	1894	1896	1906											
WRITI	005254	1727#	2600																	
WRITIT=	104402	1393	1410	1428	1459	1504	1558	2616#												
WRPASS	000574	1005#	1743*	1758	1760	1764*	1767	1788	1822	1834*	1835	1841*	2305*	2324*						
		2328*																		
WRRECR	000626	1019#	1494*	1503	1505*	1739*	2346	2351												
WRTDMP	006242	1865#																		
WRTD1	006442	1898#	1907																	
WRTD2	006464	1900	1905#																	
WRTLEN	000640	1024#	1735*	1749	1804*	1805	1807	1809*	1829	2313	2333									
W1	005322	1732	1735#																	
W10	005550	1771	1775#																	
W11	005622	1779	1788#	1844																
W12	005656	1792	1796#																	
XRGRCO	010626	2307	2324#	2327																
XRGREC	010514	1840	2305#	2338																
XRGO	010522	2306#	2329																	
XRG5	010634	2323	2326#																	
ZERO	011636	2446*	2463	2465*	2473#															

SEQ 0058

. ABS. 014006 000

ERRORS DETECTED: 0

CZTMCD.BIN,CZTMCD.LST/CRF/SOL/NL:TOC=CZTMCD.P11
 RUN-TIME: 8 16 2 SECONDS
 RUN-TIME RATIO: 65/27-2.3
 CORE USED: 8K (15 PAGES)