TU10-TE10

TM,A,B-11/TU10,N,W/TE10N,W

MD-11-DZTME-D

DRIVE FUNCTION TIMER

EP-DZTME-D-DL-D

FICHE 1 OF 1

OCT 1977

digital

MADE IN USA

B01

EOF1DZRPWCSEQ	00010000	770920	PDP10 411	HDR1DZTMEDSEQ	00010000	770920

```
1
                        .REPT   0
```

IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DZTME-D-D

PRODUCT NAME: TM,A,B-11/TU10,N,W/TE10N,W DRIVE FUNCTION TIMER

DATE : AUGUST 1977

MAINTAINER: DIAGNOSTIC ENGINEERING

AUTHOR: R. B. BARNES

REVISED BY: RON PLATUKIS/R. SOLER

TABLE OF CONTENTS

1. ABSTRACT

THE DRIVE FUNCTION TIMER ASSISTS IN THE TESTING OF THE TM-11
OR TMA,B-11 CONTROL UNIT AND TU10 OR TU10W OR TU10N OR TE10N OR
TE10W TAPE UNITS.
OPERATIONS ARE EXECUTED, TIMED, AND THE TIMES ARE THEN
PRINTED (IN MILLISECONDS). THERE IS NO LIMIT OR ERROR
TESTING FACILITIES IN THE PROGRAM, THE DECISION ON THE
VALIDITY OF TIMES MEASURED MUST BE MADE BY THE OPERATOR.
ANY CONFIGURATION OF UP TO 8 TU10,N,W/TE10N,W TAPE UNITS (7 AND 9
CHANNEL) MAY BE SELECTED.

2. REQUIREMENTS

2.1 EQUIPMENT

PDP-11;TM,A,B-11 TAPE CONTROL UNIT AND 1 TO 8 TAPE DRIVES.
(TU10,N,W/TE10N,W AND ANY CONFIGURATION OF 7 OR 9 CHANNEL DRIVES)
*NOTE: TU10W/TE10W TAPE UNITS WILL GO IN COMBINATION W/TMA,B-11
CONTROL UNITS ONLY.

2.2 STORAGE

2.2.1 PROGRAM STORAGE

THE PROGRAM REQUIRES 4K OF MEMORY.

3. LOADING PROCEDURE

3.1 METHOD

A. PROCEDURE FOR NORMAL BINARY TAPES SHOULD BE FOLLOWED
B. PROGRAM IS LOADABLE AND CHAINABLE IN 8K OF MEMORY.
DEFAULT IS DRIVE 0 9TRK ONLY.

4. STARTING PROCEDURE

4.1 BEFORE STARTING PROGRAM SET LOC. 176 WITH DESIRED CONTROL SETTINGS. (DEFAULT=200:DRIVE 0;9 TRK)

BITS 15-0 ARE USED TO INDICATE THE TAPE UNIT CONFIGURATION.

15=1	HAVE UNIT	0	SELECTED,	7 TRACK
14=1	"	1	"	"
13=1	"	2	"	"
12=1	"	3	"	"
11=1	"	4	"	"
10=1	"	5	"	"
9=1	"	6	"	"
8=1	"	7	"	"
7=1	HAVE UNIT	0	SELECTED,	9 TRACK
6=1	"	1	"	"
5=1	"	2	"	"
4=1	"	3	"	"
3=1	"	4	"	"
2=1	"	5	"	"
1=1	"	6	"	"
0=1	"	7	"	"

4.2 STARTING ADDRESS

200

4.3 PROGRAM AND/OR OPERATOR ACTION

LOAD PROGRAM INTO MEMORY.
SET DESIRED TAPE UNITS ON-LINE.
LOAD LOC. 176 WITH CONTROL SETTINGS (SEE 4.1)
LOAD STARTING ADDRESS.
PRESS START.
THE PROGRAM WILL BEGIN TIMING FUNCTIONS.
ON COMPLETION OF ALL TESTS "END OF TIMING" WILL BE PRINTED AND
THE PROCESSOR WILL HALT.
TO REPEAT TEST: IF SAME CONTROL SETTINGS ARE DESIRED SIMPLY PRESS CONTINUE.
IF DIFFERENT SETTINGS ARE NECESSARY RELOAD LOC.176 AND LOAD ADDRESS 200-START.

5. OPERATING PROCEDURE

5.1 OPERATIONAL SWITCH SETTINGS

NONE

6. ERRORS

THE PROGRAM HAS NO INTERNAL ERROR DETECTION FACILITIES AND, THEREFORE, NO ACTUAL ERROR TYPEOUTS. THE VALIDITY OF THE TIMES MEASURED MUST BE DETERMINED BY THE OPERATOR.

6.1 TIME RELATIONSHIPS

A. "READ SHUTDOWN" MUST BE < "WRITE SHUTDOWN".
B. GAPS MUST = 8>7>6>5>4>3, 3=2=1 (1.5).
C. "WRITE EOF" SHOULD BE SLIGHTLY > "WRITE XIRG".
*NOTE:
1. TU10 TIMING INFO REFERENCE 6.2
2. TE10W (M8926) TIMING INFO REFERENCE 6.3
3. TU10W (M9826) TIMING INFO REFERENCE 6.4
4. TU10N/TE10N (M8927) TIMING INFO REFERENCE 6.5

6.2 TIME LIMITS AND PRINTOUT FORMAT

****
*** TU10 ONLY ***
****

TIMES INDICATED UNDER "UNIT A" ARE STANDARD FOR A 9 CHANNEL UNIT
AND "UNIT B" FOR A 7 CHANNEL UNIT. TIMES ARE IN MILLISECONDS.
TOLERANCES INDICATED WITHIN "()" ARE PLUS OR MINUS.

FUNCTION	UNIT A	(9 CHANNEL)	UNIT B	(7 CHANNEL)
WRITE FROM BOT DELAY	180.0	(15.0)	SAME	
WRITE SHUTDOWN	7.1	(1.0)	10.4	(1.0)
WRITE START	8.9	(0.4)	12.6	(0.5)
SETTLE DOWN DELAY	12.0	(4.0)	SAME	
WRITE TO ERASE HEAD	11.0	(4.0)	SAME	
BACKSPACE SHUTDOWN	2.2	(0.3)	6.5	(0.5)
READ SHUTDOWN	2.2	(0.3)	SAME	
GAPS SHOULD = 8>7>6>5>4>3, 3=2=1 (1.5).				
GAP 1	13.4	SEE	20.1	
GAP 2	13.4	NOTE	20.1	
GAP 3	13.4	ABOVE	20.1	
GAP 4	16.8		26.7	
GAP 5	20.2		33.3	
GAP 6	23.4		39.9	
GAP 7	26.5		46.5	
GAP 8	30.2		53.1	
WRITE START	8.9	(0.4)	12.6	(0.5)
WRITE XIRG	95.0	(10.0)	SAME	
READ FROM BOT DELAY	90.0	(10.0)	SAME	
WRITE EOF	114.0	(10.0)	118.0	(10.0)
EOR TO EOF SP TIME	100.0	(10.0)	SAME	
SPACE SHUTDOWN	2.2	(0.3)	SAME	
ONE INCH DATA TIME	22.3	(1.0)	SAME	
*FUNCTIONS AT 556 BPI				
WRITE FROM BOT	.0		185.0	(15.0)
ONE INCH DATA TIME	.0		22.0	(0.8)
WRITE SHUTDOWN	.0		10.4	(1.0)
BACKSPACE SHUTDOWN	.0		6.7	(0.5)
READ SHUTDOWN	.0		2.3	(0.3)
*FUNCTIONS AT 200 BPI				
WRITE FROM BOT	.0		185.0	(15.0)
ONE INCH DATA TIME	.0		22.0	(1.0)
WRITE SHUTDOWN	.0		10.4	(1.0)
BACKSPACE SHUTDOWN	.0		7.5	(0.5)
READ SHUTDOWN	.0		3.1	(0.3)
END OF TIMING				

* NOTE: THESE TIMES ONLY PRINTED WHEN ONE OR MORE 7 CHANNEL TAPE UNITS ARE SELECTED.

6.3 TIME LIMITS AND PRINTOUT FORMAT

****
*** TE10W (M8926) ONLY ***
****

TIMES INDICATED UNDER "UNIT A" ARE STANDARD FOR A 9 CHANNEL UNIT
AND "UNIT B" FOR A 7 CHANNEL UNIT. TIMES ARE IN MILLISECONDS.
TOLERANCES INDICATED WITHIN "()" ARE PLUS OR MINUS.

FUNCTION	UNIT A	(9 CHANNEL)	UNIT B	(7 CHANNEL)
WRITE FROM BOT DELAY	151.5	(15.0)	200.7	(15.0)
WRITE SHUTDOWN	6.5	(0.6)	6.8	(0.6)
WRITE START	8.9	(0.8)	15.1	(1.3)
SETTLE DOWN DELAY	12.0	(4.0)	SAME	
WRITE TO ERASE HEAD	11.0	(5.0)	SAME	
BACKSPACE SHUTDOWN	2.2	(0.2)	6.6	(0.6)
READ SHUTDOWN	2.2	(0.2)	SAME	
GAPS SHOULD = 8>7>6>5>4>3, 3=2=1		(1.5)		(1.6)
GAP 1	13.2	SEE	19.1	
GAP 2	13.2	NOTE	19.1	
GAP 3	13.2	ABOVE	19.1	
GAP 4	16.8		26.7	
GAP 5	20.2		33.3	
GAP 6	23.4		39.9	
GAP 7	26.5		46.5	
GAP 8	30.2		53.1	
WRITE START	8.9	(0.8)	15.1	(1.3)
WRITE XIRG	95.0	(9.0)	98.6	(9.0)
READ FROM BOT DELAY	35.0	(5.0)	87.0	(9.0)
WRITE EOF	114.0	(15.0)	117.2	(15.0)
EOR TO EOF SP TIME	100.9	(9.0)	104.4	(9.0)
SPACE SHUTDOWN	2.2	(0.2)	SAME	
ONE INCH DATA TIME	22.3	(1.0)	SAME	
*FUNCTIONS AT 556 BPI				
WRITE FROM BOT	.0		200.7	(15.0)
ONE INCH DATA TIME	.0		22.3	(1.0)
WRITE SHUTDOWN	.0		7.2	(0.7)
BACKSPACE SHUTDOWN	.0		6.9	(0.6)
READ SHUTDOWN	.0		2.3	(0.2)
*FUNCTIONS AT 200 BPI				
WRITE FROM BOT	.0		200.7	(15.0)
ONE INCH DATA TIME	.0		22.3	(1.0)
WRITE SHUTDOWN	.0		9.4	(1.0)
BACKSPACE SHUTDOWN	.0		7.9	(0.7)
READ SHUTDOWN	.0		3.3	(0.3)
END OF TIMING				

* NOTE: THESE TIMES ONLY PRINTED WHEN ONE OR MORE 7 CHANNEL TAPE UNITS ARE SELECTED.

6.4 TIME LIMITS AND PRINTOUT FORMAT *** TU10W (M8926) ONLY ***

TIMES INDICATED UNDER "UNIT A" ARE STANDARD FOR A 9 CHANNEL UNIT
AND "UNIT B" FOR A 7 CHANNEL UNIT. TIMES ARE IN MILLISECONDS.
TOLERANCES INDICATED WITHIN "()" ARE PLUS OR MINUS.

FUNCTION	UNIT A	(9 CHANNEL)	UNIT B	(7 CHANNEL)
WRITE FROM BOT DELAY	184.6	(15.0)	200.7	(15.0)
WRITE SHUTDOWN	6.5	(0.6)	6.8	(0.6)
WRITE START	8.9	(0.8)	15.1	(1.3)
SETTLE DOWN DELAY	12.0	(4.0)	SAME	
WRITE TO ERASE HEAD	11.0	(5.0)	SAME	
BACKSPACE SHUTDOWN	2.2	(0.2)	6.6	(0.6)
READ SHUTDOWN	2.2	(0.2)	SAME	
GAPS SHOULD = 8>7>6>5>4>3, 3=2=1	(1.5)		(1.6)	
GAP 1	13.2	SEE	19.1	
GAP 2	13.2	NOTE	19.1	
GAP 3	13.2	ABOVE	19.1	
GAP 4	16.8		26.7	
GAP 5	20.2		33.3	
GAP 6	23.4		39.9	
GAP 7	26.5		46.5	
GAP 8	30.2		53.1	
WRITE START	8.9	(0.8)	15.1	(1.3)
WRITE XIRG	95.0	(9.0)	98.6	(9.0)
READ FROM BOT DELAY	150.6	(13.0)	90.0	(9.0)
WRITE EOF	114.0	(15.0)	117.2	(15.0)
EOR TO EOF SP TIME	100.9	(9.0)	104.4	(9.0)
SPACE SHUTDOWN	2.2	(0.2)	SAME	
ONE INCH DATA TIME	22.3	(1.0)	SAME	
*FUNCTIONS AT 556 BPI				
WRITE FROM BOT	.0		200.7	(15.0)
ONE INCH DATA TIME	.0		22.3	(1.0)
WRITE SHUTDOWN	.0		7.2	(0.7)
BACKSPACE SHUTDOWN	.0		6.9	(0.6)
READ SHUTDOWN	.0		2.3	(0.2)
*FUNCTIONS AT 200 BPI				
WRITE FROM BOT	.0		200.7	(15.0)
ONE INCH DATA TIME	.0		22.3	(1.0)
WRITE SHUTDOWN	.0		9.4	(1.0)
BACKSPACE SHUTDOWN	.0		7.9	(0.7)
READ SHUTDOWN	.0		3.3	(0.3)
END OF TIMING				

* NOTE: THESE TIMES ONLY PRINTED WHEN ONE OR MORE 7 CHANNEL TAPE UNITS ARE SELECTED.

6.5 TIME LIMITS AND PRINTOUT FORMAT

****
*** TU10N/TE10N (M8927) ***
****

TIMES INDICATED UNDER "UNIT A" ARE STANDARD FOR A 9 CHANNEL UNIT
AND "UNIT B" FOR A 7 CHANNEL UNIT. TIMES ARE IN MILLISECONDS.
TOLERANCES INDICATED WITHIN "()" ARE PLUS OR MINUS.

FUNCTION	UNIT A	(9 CHANNEL)	UNIT B	(7 CHANNEL)
WRITE FROM BOT DELAY	180.0	(15.0)	SAME	
WRITE SHUTDOWN	7.1	(1.0)	7.1	(1.0)
WRITE START	8.9	(0.4)	15.3	(0.5)
SETTLE DOWN DELAY	12.0	(4.0)	SAME	
WRITE TO ERASE HEAD	11.0	(4.0)	SAME	
BACKSPACE SHUTDOWN	2.2	(0.3)	6.5	(0.5)
READ SHUTDOWN	2.2	(0.3)	SAME	
GAPS SHOULD = 8>7>6>5>4>3, 3=2=1 (1.5).				
GAP 1	13.4	SEE	20.1	
GAP 2	13.4	NOTE	20.1	
GAP 3	13.4	ABOVE	20.1	
GAP 4	16.8		26.7	
GAP 5	20.2		33.3	
GAP 6	23.5		39.9	
GAP 7	26.5		46.5	
GAP 8	30.2		53.1	
WRITE START	8.9	(0.4)	15.3	(0.5)
WRITE XIRG	95.0	(10.0)	SAME	
READ FROM BOT DELAY	90.0	(10.0)	SAME	
WRITE EOF	114.0	(10.0)	118.0	(10.0)
EOR TO EOF SP TIME	100.0	(10.0)	SAME	
SPACE SHUTDOWN	2.2	(0.3)	SAME	
ONE INCH DATA TIME	22.3	(1.0)	SAME	
*FUNCTIONS AT 556 BPI				
WRITE FROM BOT	.0		185.0	(15.0)
ONE INCH DATA TIME	.0		22.0	(0.8)
WRITE SHUTDOWN	.0		7.1	(1.0)
BACKSPACE SHUTDOWN	.0		6.7	(0.5)
READ SHUTDOWN	.0		2.3	(0.3)
*FUNCTIONS AT 200 BPI				
WRITE FROM BOT	.0		185.0	(15.0)
ONE INCH DATA TIME	.0		22.0	(1.0)
WRITE SHUTDOWN	.0		7.1	(1.0)
BACKSPACE SHUTDOWN	.0		7.5	(0.5)
READ SHUTDOWN	.0		3.1	(0.3)
END OF TIMING				

* NOTE: THESE TIMES ONLY PRINTED WHEN ONE OR MORE 7 CHANNEL TAPE UNITS ARE SELECTED.

7. RESTRICTIONS

7.1 STARTING RESTRICTIONS

AT LEAST ONE TU10/TE10 TAPE UNIT MUST BE "ON-LINE" AND SELECTED BY SWITCHES PER 4.1. ALSO MAKE CERTAIN THAT EACH TM10 THAT IS "ON-LINE" HAS A UNIQUE UNIT NUMBER SELECTED.

7.2 OPERATING RESTRICTIONS

THE INSTRUCTION TEST MUST RUN WITHOUT ERRORS BEFORE ATTEMPTING TO OPERATE THIS PROGRAM. (DZTMA)

8. MISCELLANEOUS

8.1 EXECUTION TIME

NOT APPLICABLE

9.0 PROGRAM DESCRIPTION

9.1 WRITE FROM BOT DELAY

WRITE FROM BOT DELAY IS THE TIME NECESSARY TO MOVE THE BEGINNING OF TAPE (BOT) MARKER APPROXIMATELY 6 INCHES PAST THE WRITE HEAD. THE FIRST RECORD ON TAPE MUST BE WRITTEN AT LEAST 3 INCHES AWAY FROM THE BOT MARKER.

PROCEDURE TO MEASURE TIME:

A. IF TU10 IS NOT AT BOT IT IS REWOUND TO BOT.
B. INITIALIZE BYTE RECORD COUNTER AND CURRENT MEMORY ADDRESS REGISTER.
C. ISSUE WRITE FUNCTION, 800 BPI, SET "GO".
D. MONITOR CURRENT MEMORY ADDRESS REGISTER TO DETERMINE WHEN 2ND BYTE IS OUTPUT.
E. THE TIME FROM "GO" UNTIL 2ND BYTE IS OUTPUT IS APPROXIMATELY EQUAL TO "WRITE FROM BOT DELAY".

9.2 WRITE SHUTDOWN

WRITE SHUTDOWN IS THE AMOUNT OF TIME NECESSARY TO CONTINUE MOVING TAPE AFTER A RECORD IS WRITTEN SO THAT THE PROPER INTERRECORD GAP WILL EXIST BETWEEN RECORDS.

PROCEDURE TO MEASURE TIME:

A. THE PROGRAM USES THE SAME RECORD THAT WAS WRITTEN TO TIME "WRITE FROM BOT DELAY".
B. AFTER THE LAST BYTE (BC=0), INDICATING THE END OF THE RECORD, MONITOR "SETTLEDOWN" UNTIL IT BECOMES A 1.
C. THE TIME FROM "BC=0" UNTIL "SETTLEDOWN" IS "WRITE SHUTDOWN".

9.3 WRITE START

WRITE START IS THE TIME NECESSARY FOR TAPE TO ACCELERATE TO FULL SPEED AND GUARANTEE A 1/2 INCH INTERRECORD GAP.

PROCEDURE TO MEASURE TIME:

SAME AS "WRITE FROM BOT" EXCEPT NOW WE ARE NOT AT BOT.

A. INITIALIZE BYTE RECORD COUNTER AND CURRENT MEMORY ADDRESS REGISTER.
B. ISSUE WRITE FUNCTION, 800 BPI, SET "GO".
C. MONITOR CURRENT MEMORY ADDRESS REGISTER TO DETERMINE WHEN 2ND BYTE IS OUTPUT.
D. THE TIME FROM "GO" UNTIL 2ND BYTE IS OUTPUT IS APPROXIMATELY EQUAL TO "WRITE START".

9.4 SETTLEDOWN DELAY

TAPE DOES NOT ACTUALLY COME TO A COMPLETE STOP UNTIL SOME PERIOD OF TIME AFTER SHUTDOWN HAS ENDED. ALSO, AFTER TAPE HAS FULLY STOPPED, AN ADDITIONAL PERIOD OF TIME IS NECESSARY FOR THE TAPE AND HARDWARE TO "SETTLEDOWN" AND BECOME STABLE. THE "SETTLEDOWN DELAY" IS THE PERIOD OF TIME NECESSARY FOR THE TAPE AND MECHANICAL CHARACTERISTICS OF THE TU10 TO BECOME STABLE, SO THAT THE UNIT CANNOT BE OPERATED, START/STOP, AT A FREQUENCY WHERE IT IS MECHANICALLY RESONANT.

PROCEDURE TO MEASURE TIME:

A. THE PROGRAM USES THE SAME RECORD THAT WAS WRITTEN TO TIME "WRITE START"
B. AFTER "SETTLEDOWN" BECOMES A 1, INDICATING THE START OF SETTLEDOWN, MONITOR "TU READY" UNTIL IT BECOMES A 1.
C. THE TIME FROM "SETTLEDOWN" UNTIL "TU READY" IS "SETTLEDOWN".

9.5 WRITE TO ERASE HEAD

THE PURPOSE OF THE ERASE HEAD IS TO INSURE THAT THE TAPE IS IN THE SAME FLUX STATE AS THE WRITE HEADS. THIS IS NECESSARY FOR SEVERAL REASONS.

1. START/STOP CHARACTERISTICS VARY AMONG TAPE UNITS AND IT WOULD BE POSSIBLE TO LEAVE OLD DATA IN THE INTERRECORD GAPS WHEN USING A TAPE ON MORE THAN ONE UNIT.
2. A TAPE PREVIOUSLY USED AT ONE RECORDING DENSITY COULD NOT BE USED LATER AT ANOTHER DENSITY.
3. TRACK ALIGNMENT AND HEAD WIDTH VARY FROM TAPE UNIT TO TAPE UNIT AND IT WOULD BE POSSIBLE FOR DATA TO BE LEFT ON THE TRACK EDGES FROM OLD RECORDS.

THE "WRITE TO ERASE HEAD" TEST INSURES THAT THE TAPE IN FRONT OF
THE WRITE HEAD IS ERASED DURING A WRITE OPERATION.

PROCEDURE TO MEASURE TIME:

A. A LONG RECORD HAS BEEN WRITTEN FROM BOT. SAME RECORD THAT
   WAS USED TO TIME "WRITE FROM BOT DELAY".
B. TAPE IS REWOUND TO BOT.
C. BYTE RECORD COUNTER IS INITIALIZED FOR A 3 BYTE RECORD
   AND CURRENT MEMORY ADDRESS REGISTER IS INITIALIZED.
D. ISSUE WRITE FUNCTION, 800 BPI, SET "GO".
E. MONITOR BYTE RECORD COUNTER UNTIL IT = 0 INDICATING THAT 2
   BYTES ARE WRITTEN IMMEDIATELY ISSUE A POWER CLEAR WHICH
   STOPS ALL DATA TRANSFERS AND CAUSES THE DRIVE TO SHUTDOWN.
F. TAPE IS REWOUND TO BOT
G. INITIALIZE BYTE RECORD COUNTER (3 BYTES) AND CURRENT
   MEMORY ADDRESS REGISTER.
H. ISSUE READ FUNCTION, 800 BPI, SET GO
I. MONITOR BYTE RECORD COUNTER UNTIL IT = -1 AND THEN TIME
   UNIT IT = 0. THIS TIME WILL INDICATE THE DISTANCE BETWEEN THE
   2ND BYTE AND THE 3RD BYTE WHICH IS ALSO THE AMOUNT OF TAPE
   THAT WAS ERASED BY THE ERASE HEAD DURING THE WRITE OPERATION
   OR "WRITE TO ERASE HEAD".

9.6 BACKSPACE SHUTDOWN

"BACKSPACE SHUTDOWN" IS THE LENGTH OF TIME NECESSARY TO GUARANTEE THAT IF A WRITE OPERATION FOLLOWS A BACKSPACE THE TAPE WILL BE POSITIONED SUCH THAT ALL PREVIOUS DATA IS IN FRONT OF THE WRITE AND ERASE HEADS AND WILL BE ERASED. "BACKSPACE SHUTDOWN" MUST BE LESS THAN "WRITE START" SO THAT INTERRECORD GAPS WILL INCREASE IF A BACKSPACE/REWRITE OPERATION IS INITIATED.

PROCEDURE TO MEASURE TIME:

A. INITIALIZE BYTE RECORD COUNTER AND CURRENT MEMORY ADDRESS REGISTER.
B. ISSUE WRITE EOF FUNCTION, 800 BPI, SET "GO"
C. AFTER EOF RECORD IS WRITTEN WAIT FOR "TU READY".
D. SET BYTE RECORD COUNTER TO BACKSPACE 1 RECORD.
E. ISSUE BACKSPACE FUNCTION, SET "GO".
F. AFTER "EOF" BECOMES A 1, INDICATING THE RECOGNITION OF THE "EOF" RECORD, MONITOR "SETTLEDOWN" UNTIL IT BECOMES A 1.
G. THE TIME FROM "EOF" UNTIL "SETTLEDOWN" IS "BACKSPACE SHUTDOWN".

9.7 READ SHUTDOWN

READ SHUTDOWN IS THE AMOUNT OF TIME NECESSARY TO CONTINUE MOVING TAPE AFTER A RECORD IS READ SO THAT THERE IS ENOUGH GAP FOR TAPE TO BE FULLY ACCELERATED IF A READ IS FOLLOWED BY A BACKSPACE. "READ SHUTDOWN" MUST ALSO BE LESS THAN "WRITE SHUTDOWN" TO GUARANTEE THAT THE WRITE AND ERASE HEADS WILL BE POSITIONED SUCH THAT ALL PREVIOUS DATA IS IN FRONT OF THE HEADS AND WILL BE ERASED IF A WRITE FOLLOWS A READ. IN ADDITION, WHEN A WRITE FOLLOWS A READ THE INTERRECORD GAP MUST STILL BE AT LEAST 1/2 OF AN INCH.

PROCEDURE TO MEASURE TIME:

A. RECORD PREVIOUSLY USED IN "BACKSPACE SHUTDOWN" IS READ.
B. INITIALIZE BYTE RECORD COUNTER AND CURRENT MEMORY ADDRESS REGISTER
C. ISSUE READ FUNCTION, 800 BPI, SET "GO".
D. AFTER "EOF" BECOMES A 1, INDICATING THE END OF THE RECORD, MONITOR "SETTLEDOWN" UNTIL IT BECOMES A 1.
E. THE TIME FROM "EOF" UNTIL "SETTLEDOWN" IS "READ SHUTDOWN"

9.8 GAP CONSISTENCY

FOR PROPER OPERATION, THE INTERRECORD GAPS ON TAPE MUST ALWAYS BE AT LEAST 1/2 OF AN INCH. THIS WILL ALLOW DATA WRITTEN USING ONE TAPE UNIT TO BE READ ON ANOTHER TAPE UNIT WHEN THE START/STOP CHARACTERISTICS OF EACH UNIT ARE DIFFERENT. THE MINIMUM GAP SIZE OF 1/2 INCH IS GENERATED WHEN A WRITE FOLLOWS A READ. ALL OTHER GAPS SHOULD BE LARGER DEPENDING ON HOW THEY WERE WRITTEN.

PROCEDURE TO MEASURE TIME:

A. A TOTAL OF NINE RECORDS ARE WRITTEN ON TAPE (FROM BOT) UTILIZING DIFFERENT SEQUENCES TO GENERATE THE INTERRECORD GAPS.
B. THE TAPE IS REWOUND TO BOT.
C. INITIALIZE BYTE RECORD COUNTER AND CURRENT MEMORY ADDRESS REGISTER.
D. ISSUE READ FUNCTION, 800 BPI, SET "GO".
E. WAIT FOR "CU READY" TO BECOME A 1, THEN REPEAT STEP C AND RESET "GO" TO CONTINUE.
F. MONITOR CURRENT MEMORY ADDRESS TO DETERMINE WHEN 2ND BYTE IS INPUT.
G. THE TIME FROM WHEN "GO" IS RESET UNTIL THE 2ND BYTE IS INPUT WILL REFLECT THE SIZE OF THE GAP.
H. STEPS E, F ARE REPEATED UNTIL ALL 8 GAPS ARE MEASURED.

PROGRAM SEQUENCE FOR EACH GAP:

GAP 1	WRITE FOLLOWED BY A WRITE (START/STOP).
GAP 2	WRITE FOLLOWED BY A WRITE (START/STOP).
GAP 3	READ FOLLOWED BY A WRITE (START/STOP).
GAP 4	WRITE-BACKSPACE FOLLOWED BY A WRITE (START/STOP).
GAP 5	SAME AS GAP 4 EXCEPT WRITE-BACKSPACE REPEATED 2 TIMES.
GAP 6	SAME AS GAP 4 EXCEPT WRITE-BACKSPACE REPEATED 3 TIMES.
GAP 7	SAME AS GAP 4 EXCEPT WRITE-BACKSPACE REPEATED 4 TIMES.
GAP 8	SAME AS GAP 4 EXCEPT WRITE-BACKSPACE REPEATED 5 TIMES.

GAP LENGTHS SHOULD REFLECT THE FOLLOWING RELATIONSHIP:

8>7>6>5>4>3, 3=2=1 (1.5).

9.9 WRITE START

THIS IS A REPEAT OF THE "WRITE START" TEST PREVIOUSLY COMPLETED (REFERENCE 9.3). IT'S PURPOSE IS TO DETERMINE IF TAPE WILL DRIFT BACKWARDS TO BOT IF A "POWER CLEAR" IS ISSUED AS SOON AS BOT DISAPPEARS WHEN MOVING FORWARD FROM BOT. TIME SHOULD EQUAL "WRITE START" AS MEASURED IN 9.3.

9.10 WRITE XIRG

WRITE WITH AN EXTENDED INTERRECORD GAP IS A FUNCTION THAT CAUSES THE GENERATION OF AN INTERRECORD GAP THAT IS AT LEAST 3 INCH LONG AS COMPARED WITH THE NORMAL 3/5 INCH GAP. THE PURPOSE IS TO ELIMINATE WRITE ERRORS THAT MAY BE CAUSED BY A DEFECTIVE AREA ON TAPE. NORMALLY ONE REWRITE WITH XIRG WOULD BE SUFFICIENT TO MOVE PAST THE BAD SPOT, HOWEVER IF IT ISN'T, THE PROCEDURE WOULD BE TO REPEAT THE "BACKSPACE-REWRITE WITH XIRG" SEQUENCE UNTIL A RECORD IS WRITTEN WITHOUT ERRORS. EACH SUCCESSIVE REWRITE WOULD ADD 3 INCHES TO THE INTERRECORD GAP UNTIL "GOOD" TAPE WAS REACHED.

PROCEDURE TO MEASURE TIME:

A. TAPE IS NOT AT BOT
B. INITIALIZE BYTE RECORD COUNTER AND CURRENT MEMORY ADDRESS REGISTER.
C. ISSUE WRITE WITH XIRG FUNCTION, 800 BPI, SET "GO".
D. MONITOR CURRENT MEMORY ADDRESS REGISTER TO DETERMINE WHEN 2ND BYTE IS OUTPUT.
E. THE TIME FROM "GO" UNIT 2ND BYTE IS OUTPUT IS "WRITE WITH XIRG".

9.11 READ FROM BOT

THE FIRST RECORD WRITTEN ON TAPE IS SUPPOSED TO BE AT LEAST 6 INCHES FROM THE BOT MARKER. IN THE EVENT THAT THIS CONDITION WASN'T MET IT IS STILL DESIREABLE TO READ THE RECORD. READ FROM BOT IS THE TIME FROM WHEN A READ FUNCTION IS ISSUED UNTIL THE 2ND BYTE IS INPUT.

PROCEDURE TO MEASURE TIME:

A. THE RECORD THAT WAS WRITTEN JUST OFF BOT DURING "WRITE START" (REFERENCE 9.10) IS USED.
B. TAPE IS REWOUND TO BOT
C. INITIALIZE BYTE RECORD COUNTER AND CURRENT MEMORY ADDRESS REGISTER.
D. ISSUE READ FUNCTION, 800 BPI, SET "GO".
E. MONITOR CURRENT MEMORY ADDRESS REGISTER TO DETERMINE WHEN 2ND BYTE IS INPUT.
F. THE TIME FROM "GO" UNTIL 2ND BYTE IS INPUT IS "READ FROM BOT".

9.12 WRITE EOF.

TO WRITE AN END OF FILE MARK IT IS NECESSARY FOR TAPE TO MOVE 3 INCHES BEFORE WRITING. IN THAT RESPECT IT IS SIMILAR TO WRITING A RECORD WITH EXTENDED INTERRECORD GAP. HOWEVER, AN EOF MARK CORRESPONDS TO A 1 BYTE RECORD. THE TIME SHOULD BE SLIGHTLY LARGER THAN "WRITE XIRG".

PROCEDURE TO MEASURE TIME:

A. TAPE UNIT IS REWOUND TO BOT.
B. INITIALIZE BYTE RECORD COUNTER AND CURRENT MEMORY ADDRESS REGISTER.
C. ISSUE WRITE FUNCTION, 800 BPI, SET "GO".
D. WAIT FOR "CU READY" AND THEN "TU READY" TO BECOME A 1.
E. ISSUE WRITE EOF FUNCTION, 800 BPI, SET "GO".
F. WAIT FOR "TU READY" TO BECOME A 1.
G. THE TIME FROM "GO" UNTIL "TU READY" IS "WRITE EOF".

9.13 EOR TO EOF SPACE TIME

EOR TO EOF SPACE TIME IS THE TIME NEEDED TO MOVE TAPE FROM THE END OF A RECORD TO AN END OF FILE MARK WRITTEN AFTER IT. THE PROCEDURE USED TURNS OUT TO BE A TEST OF THE WRITE AND ERASE HEAD POLARITIES. IF THE TIME PRINTED IS EQUAL TO ZERO IT IS AN INDICATION THAT THE EOF WAS NOT FOUND WHEN "TU READY" BECAME A 1.

THIS COULD INDICATE ONE OR MORE OF THE FOLLOWING PROBLEMS:

1. ERASE HEAD POLARITY REVERSED.
2. ERASE HEAD TURRENT NOT SUFFICIENT TO FULLY SATURATE TAPE.
3. ONE OR MORE OF WRITE HEAD TRACKS POLARITY REVERSED.
4. ONE OR MORE SENSITIVE READ AMPLIFIERS.
5. WRITE EOF FUNCTION DIDN'T REALLY WRITE AN EOF MARK. OTHERWISE "EOR TO EOF SPACE TIME" SHOULD BE SLIGHTLY LARGER THAN "WRITE EOF".

PROCEDURE TO MEASURE TIME:

A. A RECORD AND EOF WAS PREVIOUSLY WRITTEN FROM BOT FOR "WRITE EOF" (REFERENCE 9.14).
B. TAPE IS REWOUND TO BOT.
C. REWRITE RECORD OVER PREVIOUSLY WRITTEN RECORD.
D. BACKSPACE OVER RECORD JUST WRITTEN.
E. SET BYTE RECORD COUNTER TO SPACE 2 RECORDS.
F. ISSUE SPACE FORWARD FUNCTION, SET "GO".
G. WAIT FOR BYTE RECORD COUNTER TO INDICATE THAT 1ST RECORD HAS BEEN SPACED OVER THEN MONITOR "TU READY" UNTIL IT BECOMES A 1. AFTER "TU READY" CHECK TO SEE IF "EOF" IS A 1 IN STATUS REGISTER. IF "EOF" NOT SET THEN ZERO TIME COUNTER.
H. TIME FROM BYTE RECORD COUNTER =-1 UNTIL "TU READY" IS "EOR TO EOF SPACE TIME".

9.14 SPACE SHUTDOWN

SPACE SHUTDOWN IS THE AMOUNT OF TIME NECESSARY TO
CONTINUE MOVING TAPE AFTER A RECORD IS SPACED OVER IN THE
FORWARD DIRECTION FOR THE SAME REASONS AS "READ SHUTDOWN"

PROCEDURE TO MEASURE TIME:

A. SPACE FORWARD FUNCTION USED TO TIME "EOR TO EOF SPACE TIME"
   IS USED.
B. AFTER "EOF" BECOMES A 1, INDICATING THE END OF THE
   RECORD (EOF), MONITOR "SETTLEDOWN" UNTIL IT BECOMES A 1.
C. THE TIME FROM "EOF" UNTIL "SETTLEDOWN" IS "SPACE
   SHUTDOWN".

9.15 ONE INCH DATA TIME

ONE INCH OF DATA, 800 BYTES (ALSO 556 AND 200 IF 7 CHANNEL UNIT), IS WRITTEN AND TIMED TO DETERMING IF TAPE IS MOVING AT PROPER SPEED.

PROCEDURE TO MEASURE TIME:

A. INITIALIZE BYTE RECORD COUNTER AND CURRENT MEMORY ADDRESS.

B. ISSUE WRITE FUNCTION, 800 BPI (OR 556, OR 200), SET "GO".

C. WAIT FOR CURRENT MEMORY ADDRESS REGISTER TO INDICATE 2ND BYTE IS OUTPUT AND THEN MONITOR BYTE RECORD COUNTER UNTIL EQUAL TO ZERO.

D. TIME FROM 2ND BYTE OUTPUT UNTIL BYTE RECORD COUNTER = 0 IS "ONE INCH DATA TIME"

9.16 FUNCTIONS AT 556 BPI

ALL OF THE PREVIOUS TESTS USED THE DENSTIY OF 800 BPI. IF A 7 CHANNEL DRIVE IS SELECTED IT IS USEFUL TO RUN SEVERAL OF THE TESTS AGAIN USING DENSITY OF 556 BPI. REFERENCE THE PROPER PARAGRAPHS FOR A DESCRIPTION OF EACH TEST.

9.17 FUNCTIONS AT 200 BPI

SAME AS ABOVE. REFERENCE 9.17, "FUNCTIONS AT 556 BPI"

```
                10.     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

                5       ADDRESS BIT 17
                4       ADDRESS BIT 16
                3       FUNCTION BIT 2  000 = OFF LINE          100 = SPACE FORWARD
                                        001 = READ              101 = SPACE REVERSE
                2       FUNCTION BIT 1  010 = WRITE             110 = WRITE XIRG
                1       FUNCTION BIT 0  011 = WRITE EOF         111 = REWIND
                0       GO

                                        STATUS REGISTER

                15      ILLEGAL COMMAND (ILC)

                14      END OF FILE (EOF)
                13      CYCLICAL REDUNDANCY ERROR (CRE)
                12      PARITY ERROR (PAE)

                11      BUS GRANT LATE (BGL)
                10      END OF TAPE (EOT)
                9       RECORD LENGTH ERROR (RLE)

                8       BAD TAPE ERROR (BTE)
                7       NON EXISTENT MEMORY (NXM)
                6       SELECT REMOTE (SELR)

                5       BEGINNING OF TAPE (BOT)
                4       7 CHANNEL (7CH)
                3       SETTLE DOWN (SDWN)

                2       WRITE LOCK (WRL)
                1       REWIND STATUS (RWS)
                0       TAPE UNIT READY (TUR)
                        .ENDR
797                                     .LIST   SEQ,BIN
```

```
                                .TITLE  MAINDEC-11-DZTME-D-D  TM,A,B-11/TU10,N,W/TE10N,W DRIVE FUNCTION TIMER
                                ;COPYRIGHT: (C)  1974,1977 DIGITAL EQUIPMENT CORP., MAYNARD, MASS. 01754
                                ;
                                ;SET LOC 176 WITH DESIRED CONTROL SETTINGS
                                ;LOAD ADDRESS 200, PRESS START
                                ;
001000                          STACK=1000
005670                          BLENTH=3000.
                                        .ENABL  ABS,AMA
                                ;TRAP CATCHER FROM 0 TO 1000
000000                                  .=0
000042                                  .=42
                                .SBTTL  ACT11 HOOKS
                                ;;*****************************************************************
                                ;HOOKS REQUIRED BY ACT11
000042                                  $SVPC=.                 ;SAVE PC
000046                                  .=46
000046  007164                          $ENDAD                  ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
000052                                  .=52
000052  000000                          .WORD   0               ;;2)SET LOC.52 TO ZERO
000042                                  .=$SVPC                 ;; RESTORE PC
                                ;*****************************************************************
                                ;NOTE:PROGRAM HAS BEEN MODIFIED TO RUN WITHOUT SWITCH REGISTER
                                ;*****************************************************************
000176                          SWITCH: 200             ;DRIVE SELECT MAP(DEFAULT=DRIVE 0;9 TRK)
000200                                  .=200
000200  000137  001046                 JMP     START
001000                                  .=1000
001000  172520                  MTS:    172520
001002  172522                  MTC:    172522
001004  172524                  BC:     172524
001006  172526                  CA:     172526
001010  172530                  MTD:    172530
001012  172532                  MTRD:   172532
001014  177570                  SWR:    177570
001016  177560                  TKS:    177560
001020  177562                  TKB:    177562
001022  177564                  TPS:    177564
001024  177566                  TPB:    177566
001026  000224                  MTV:    224
001030  177776                  CC:     177776
001032  000000                  R10:    0
001034  000000                  R11:    0
```

```
 854  001036  000000                    R12:   0
 855  001040  000000                    R13:   0
 856  001042  000000                    T5DRV: 0
 857  001044  000000                    T11T:  0
 858
```

```
                                START:  MOV     #STACK,%6       ;INITIALIZE STACK
                                        MOV     #340,@CC        ;SET PRIORITY LEVEL 7
                                        MOV     #MSG28,MESAGE
                                        JSR     %7,TOP          ;PRINT TITLE
                                        CMPB    #4,@#41         ;SEE IF LOAD MEDIUM
                                        BNE     ST0             ;IF NOT: BR
                                        MOV     #MSG31,MESAGE
                                        JSR     %7,TOP          ;PRINT NO TEST
                                        JMP     T13             ;END TEST
                                ST0:    MOV     SWITCH,DRIVES   ;SAVE DRIVES SELECTED
                                        BNE     1$
                                        MOV     #MSG30,MESAGE
                                        JSR     %7,TOP
                                        HALT
                                1$:     JSR     %7,RSFDRV       ;RESET DRIVES
                                ST1:    JSR     %7,STRREW       ;START REWIND
                                        JSR     %7,CHGDRV       ;DONE ALL DRIVES?
                                        BR      ST1             ;NO
                                ST2:    JSR     %7,WATREW       ;WAIT FOR BOT
                                        JSR     %7,CHGDRV       ;DONE ALL DRIVES?
                                        BR      ST2             ;NO

                                ;PRINT HEADER

                                        MOV     #MSG2,MESAGE
                                        JSR     %7,TOP          ;PRINT "FUNCTION"
                                ST3:    MOV     #MSG2A,MESAGE
                                        JSR     %7,TOP          ;PRINT "UNIT"
                                        MOV     FDRIVE,DIGIT
                                        SWAB    DIGIT
                                        BIC     #177770,DIGIT
                                        BIS     #60,DIGIT
                                        TSTB    @TPS
                                        BPL     .-4
                                        MOV     DIGIT,@TPB      ;PRINT DRIVE "NUMBER"
                                        JSR     %7,CHGDRV       ;DONE ALL DRIVES?
                                        BR      ST3             ;NO
                                        JSR     %7,ST1S         ;STORE ONES IN WRITE BUFFER
```

```
                                        ;TIME WRITE FROM BOT DELAY, AND WRITE SHUTDOWN
                                        ;
001274  012700  007550          T1:     MOV     #TM1,%0         ;INITIALIZE TIME BUFFERS
001300  012701  007574                  MOV     #TM2,%1
001304  004737  007364          T1A:    JSR     %7,WRINT
001310  013777  007322  177464          MOV     FDRIVE,@MTC     ;SELECT DRIVE
001316  052777  040005  177456          BIS     #40005,@MTC     ;800 BPI, WRITE, GO
001324  005037  007546                  CLR     TIME
001330  022777  012140  177450  T1B:    CMP     #WBUF+2,@CA     ;IS 2ND WORD OUTPUT?
001336  003403                          BLE     T1C             ;YES
001340  004737  007524                  JSR     %7,TIMER        ;NO, COUNT TIME
001344  000771                          BR      T1B
001346  013720  007546          T1C:    MOV     TIME,(0)+       ;SAVE "WRITE FROM BOT DELAY" TIME
001352  005037  007546                  CLR     TIME
001356  005777  177422                  TST     @BC             ;SEE IF WORD COUNT DONE
001362  001375                          BNE     .-4             ;IF NOT: BR
001364  032777  000010  177406  T1D:    BIT     #10,@MTS        ;HAS SETTLEDOWN SET?
001372  001003                          BNE     T1E             ;YES
001374  004737  007524                  JSR     %7,TIMER        ;NO, COUNT TIME
001400  000771                          BR      T1D
001402  013721  007546          T1E:    MOV     TIME,(1)+       ;SAVE "WRITE SHUTDOWN" TIME
001406  004737  007250                  JSR     %7,CHGDRV       ;DONE ALL DRIVES
001412  000734                          BR      T1A             ;NO
001414  012720  177777                  MOV     #-1,(0)+        ;TERMINATE TIMES
001420  012721  177777                  MOV     #-1,(1)+        ;TERMINATE TIMES
001424  012737  010450  010406          MOV     #MSG3,MESAGE
001432  012700  007550                  MOV     #TM1,%0
001436  004737  010010                  JSR     %7,TYPTIM       ;PRINT "WRITE FROM BOT DELAY" TIMES
001442  012737  010476  010406          MOV     #MSG4,MESAGE
001450  012700  007574                  MOV     #TM2,%0
001454  004737  010010                  JSR     %7,TYPTIM       ;PRINT "WRITE SHUTDOWN" TIMES
```

```
                                        ;TIME WRITE START AND SETTLEDOWN DELAY
                                        ;
001460  004737  007204          T2:     JSR     %7,RSFDRV       ;RESET DRIVE SELECTION
001464  012700  007550                  MOV     #TM1,%0
001470  012701  007574                  MOV     #TM2,%1
001474  004737  007364          T2A:    JSR     %7,WRINT
001500  013777  007322  177274        MOV     FDRIVE,@MTC     ;SELECT DRIVE
001506  052777  040005  177266        BIS     #40005,@MTC     ;800 BPI, WRITE, GO
001514  005037  007546                CLR     TIME
001520  022777  012140  177260  T2B:  CMP     #WBUF+2,@CA     ;IS 2ND WORD OUTPUT
001526  003403                        BLE     T2C             ;YES
001530  004737  007524                JSR     %7,TIMER        ;NO, COUNT TIME
001534  000771                        BR      T2B
001536  013720  007546          T2C:  MOV     TIME,(0)+       ;SAVE "WRITE START" TIME
001542  005037  007546                CLR     TIME
001546  005777  177232                TST     @BC
001552  001375                        BNE     .-4
001554  032777  000010  177216        BIT     #10,@MTS
001562  001774                        BEQ     .-6             ;WAIT FOR SETTLEDOWN TO SET
001564  006077  177210          T2D:  ROR     @MTS
001570  103403                        BCS     T2E             ;WAIT FOR TU READY
001572  004737  007524                JSR     %7,TIMER
001576  000772                        BR      T2D
001600  013721  007546          T2E:  MOV     TIME,(1)+       ;SAVE "SETTLEDOWN" TIME
001604  004737  007250                JSR     %7,CHGDRV
001610  000731                        BR      T2A
001612  012720  177777                MOV     #-1,(0)+        ;TERMINATE TIMES
001616  012721  177777                MOV     #-1,(1)+        ;TERMINATE TIMES
001622  012737  010524  010406        MOV     #MSG5,MESAGE
001630  012700  007550                MOV     #TM1,%0
001634  004737  010010                JSR     %7,TYPTIM       ;PRINT "WRITE START" TIMES
001640  012737  010552  010406        MOV     #MSG6,MESAGE
001646  012700  007574                MOV     #TM2,%0
001652  004737  010010                JSR     %7,TYPTIM       ;PRINT "SETTLEDOWN" TIMES
```

```
                                        ;TIME WRITE TO ERASE HEAD
                                        ;LONG RECORD WAS PREVIOUSLY WRITTEN
                                        ;WRITE A 3 BYTE RECORD AND POWER CLEAR
                                        ;DISTANCE FROM NEW DATA TO OLD IS
                                        ;ERASE HEAD DISTANCE

001656  004737  007422          T3:     JSR     %7,STRREW       ;START REWIND
001662  004737  007250                  JSR     %7,CHGDRV       ;DONE ALL DRIVES?
001666  000773                          BR      T3              ;NO
001670  004737  007462          T3A:    JSR     %7,WATREW       ;IS DRIVE AT BOT?
001674  004737  007250                  JSR     %7,CHGDRV       ;DONE ALL DRIVES
001700  000773                          BR      T3A             ;NO
001702  012777  177775  177074  T3B:    MOV     #-3,@BC         ;3 BYTE RECORD
001710  012777  012136  177070          MOV     #WBUF,@CA       ;INITIALIZE CURRENT ADDRESS
001716  013777  007322  177056          MOV     FDRIVE,@MTC     ;SELECT DRIVE
001724  052777  040005  177050          BIS     #40005,@MTC     ;800BPI, WRITE, GO
001732  005777  177046                  TST     @BC
001736  001375                          BNE     .-4
001740  052777  010000  177034          BIS     #10000,@MTC     ;POWER CLEAR
001746  004737  007422                  JSR     %7,STRREW       ;START REWIND
001752  004737  007250                  JSR     %7,CHGDRV       ;DONE ALL DRIVES
001756  000751                          BR      T3B             ;NO
001760  004737  007462          T3C:    JSR     %7,WATREW       ;DRIVE AT BOT
001764  004737  007250                  JSR     %7,CHGDRV       ;DONE ALL DRIVES
001770  000773                          BR      T3C             ;NO

                                        ;NOW THAT ALL DRIVES ARE AT BOT AGAIN
                                        ;READ OVER PARTIAL RECORD

001772  012700  007550                  MOV     #TM1,%0
001776  012777  177775  177000  T3D:    MOV     #-3,@BC
002004  012777  012136  176774          MOV     #WBUF,@CA
002012  013777  007322  176762          MOV     FDRIVE,@MTC     ;SELECT DRIVE
002020  052777  040003  176754          BIS     #40003,@MTC     ;800BPI, READ, GO
002026  005037  007546                  CLR     TIME            ;CLEAR TIME
002032  022777  177777  176744          CMP     #-1,@BC
002040  001374                          BNE     .-6
002042  005777  176736          T3E:    TST     @BC             ;WAIT FOR NEXT WORD IN
002046  001403                          BEQ     T3F             ;HAVE IT
002050  004737  007524                  JSR     %7,TIMER        ;NO, COUNT TIME
002054  000772                          BR      T3E
002056  013720  007546          T3F:    MOV     TIME,(0)+       ;SAVE "WRITE TO ERASE HEAD TIME"
002062  006077  176712                  ROR     @MTS
002066  103375                          BCC     .-4             ;AWAIT TUR
002070  004737  007250                  JSR     %7,CHGDRV       ;DONE ALL DRIVES
002074  000740                          BR      T3D             ;NO
002076  012720  177777                  MOV     #-1,(0)+        ;TERMINATE TIMES
002102  012737  010600  010406          MOV     #MSG7,MESAGE
002110  012700  007550                  MOV     #TM1,%0
002114  004737  010010                  JSR     %7,TYPTIM       ;PRINT "WRITE TO ERASE HEAD TIMES"
002120  004737  007422          T3G:    JSR     %7,STRREW       ;START REWIND
002124  004737  007250                  JSR     %7,CHGDRV       ;DONE ALL DRIVES
002130  000773                          BR      T3G             ;NO
002132  004737  007462          T3H:    JSR     %7,WATREW       ;DRIVE AT BOT
002136  004737  007250                  JSR     %7,CHGDRV       ;DONE ALL DRIVES
002142  000773                          BR      T3H             ;NO
```

```
                                ;TIME WRITE NONSTOP GAP, BACKSPACE SHUTDOWN AND READ SHUTDOWN
                                ;WRITE ONE RECORD, FOLLOW WITH ONE RECORD NONSTOP
                                ;FOLLOWED BY ONE RECORD START-STOP
                                ;FOLLOWED BY WRITE-BACKSPACE-READ-WRITE
                                ;FOLLOWED BY WRITE-BACKSPACE-WRITE

002144  004737  007402        T4:     JSR     %7,ST1S
002150  012700  007550                MOV     #TM1,%0         ;INITIALIZE TIME BUFFERS
002154  012701  007574                MOV     #TM2,%1
002160  012702  007620                MOV     #TM3,%2
002164  005037  007546        T4AA:   CLR     TIME
002170  004737  007364                JSR     %7,WRINT
002174  013777  007322  176600        MOV     FDRIVE,@MTC     ;TRACK AND DRIVE NUMBERS
002202  052777  040005  176572        BIS     #40005,@MTC     ;800 BPI, WRITE, GO
002210  000240                        NOP
002212  032777  000001  176560        BIT     #1,@MTS
002220  001774                        BEQ     .-6             ;AWAIT TUR

                                ;HAVE FIRST RECORD WRITTEN, GO NONSTOP

002222  004737  007364                JSR     %7,WRINT
002226  005277  176550                INC     @MTC            ;GO
002232  022777  012140  176546  T4A:   CMP     #WBUF+2,@CA     ;IS 2ND WORD OUTPUT?
002240  003403                        BLE     T4B             ;YES
002242  004737  007524                JSR     %7,TIMER        ;NO, COUNT TIME
002246  000771                        BR      T4A
002250  013720  007546        T4B:    MOV     TIME,(0)+       ;SAVE "WRITE NONSTOP GAP" TIME
002254  005037  007546                CLR     TIME
002260  105777  176516                TSTB    @MTC
002264  100375                        BPL     .-4             ;WAIT FOR CU READY
002266  006077  176506                ROR     @MTS
002272  103375                        BCC     .-4             ;WAIT FOR TU READY

                                ;WRITE-BACKSPACE-READ-WRITE

002274  004737  007364                JSR     %7,WRINT
002300  013777  007322  176474        MOV     FDRIVE,@MTC     ;DRIVE SELECT
002306  052777  040007  176466        BIS     #40007,@MTC     ;800 BPI, WRITE EOF, GO
002314  105777  176462                TSTB    @MTC
002320  100375                        BPL     .-4             ;WAIT FOR CU READY
002322  006077  176452                ROR     @MTS
002326  103375                        BCC     .-4             ;AWAIT TUR
002330  012777  177777  176446        MOV     #-1,@BC         ;BACKSPACE 1 RECORD
002336  042777  000016  176436        BIC     #16,@MTC
002344  052777  000013  176430        BIS     #13,@MTC        ;SPACE REVERSE, GO
002352  000240                        NOP
002354  032777  040000  176416  T4BA:  BIT     #40000,@MTS     ;SEE IF EOF
002362  001774                        BEQ     T4BA            ;IF NOT: BR
002364  000240                        NOP
002366  000240                        NOP
002370  032777  000010  176402  T4C:   BIT     #10,@MTS        ;HAS SETTLEDOWN SET?
002376  001003                        BNE     T4D             ;YES
002400  004737  007524                JSR     %7,TIMER        ;NO, COUNT TIME
002404  000771                        BR      T4C
002406  006077  176366        T4D:    ROR     @MTS
002412  103375                        BCC     .-4             ;WAIT FOR TU READY
```

```
1074  002414  013721  007546                    MOV     TIME,(1)+       ;SAVE "BACKSPACE SHUTDOWN" TIME
1075  002420  004737  007364                    JSR     %7,WRINT
1076  002424  005037  007546                    CLR     TIME
1077  002430  013777  007322  176344            MOV     FDRIVE,@MTC     ;SELECT DRIVE
1078  002436  052777  040003  176336            BIS     #40003,@MTC     ;800 BPI, READ, GO
1079  002444  032777  040000  176326  T4DA:     BIT     #40000,@MTS
1080  002452  001774                            BEQ     T4DA            ;AWAIT EOF
1081  002454  032777  000010  176316  T4E:      BIT     #10,@MTS        ;HAS SETTLEDOWN SET?
1082  002462  001003                            BNE     T4F             ;YES
1083  002464  004737  007524                    JSR     %7,TIMER        ;NO, COUNT TIME
1084  002470  000771                            BR      T4E
1085  002472  006077  176302            T4F:    ROR     @MTS
1086  002476  103375                            BCC     .-4             ;WAIT FOR TU READY
1087  002500  013722  007546                    MOV     TIME,(2)+       ;SAVE "READ SHUTDOWN" TIME
1088  002504  004737  007250                    JSR     %7,CHGDRV
1089  002510  000625                            BR      T4AA
1090  002512  012720  177777                    MOV     #-1,(0)+        ;TERMINATE TIMES
1091  002516  012721  177777                    MOV     #-1,(1)+        ;TERMINATE TIMES
1092  002522  012722  177777                    MOV     #-1,(2)+        ;TERMINATE TIMES
1093  002526  012737  010654  010406            MOV     #MSG9,MESAGE
1094  002534  012700  007574                    MOV     #TM2,%0
1095  002540  004737  010010                    JSR     %7,TYPTIM       ;PRINT "BACKSPACE SHUTDOWN" TIMES
1096  002544  012737  010702  010406            MOV     #MSG10,MESAGE
1097  002552  012700  007620                    MOV     #TM3,%0
1098  002556  004737  010010                    JSR     %7,TYPTIM       ;PRINT "READ SHUTDOWN" TIMES
1099  002562  004737  007402                    JSR     %7,ST1S
1100  002566  004737  007422            T4FA:   JSR     %7,STRREW       ;START REWIND
1101  002572  004737  007250                    JSR     %7,CHGDRV       ;CHANGE DRIVE
1102  002576  000773                            BR      T4FA
1103  002600  004737  007462            T4FB:   JSR     %7,WATREW       ;AWAIT BOT
1104  002604  004737  007250                    JSR     %7,CHGDRV       ;CHANGE DRIVE
1105  002610  000773                            BR      T4FB
1106  002612  000240                            NOP
1107  002614  004737  007364            T4FC:   JSR     %7,WRINT        ;SET UP FOR WRITE
1108  002620  013777  007322  176154            MOV     FDRIVE,@MTC     ;SET DRIVE NUMBER
1109  002626  052777  040005  176146            BIS     #40005,@MTC     ;SET 800 BPI, WRITE, GO
1110  002634  105777  176142                    TSTB    @MTC
1111  002640  100375                            BPL     .-4             ;AWAIT CUR
1112  002642  006077  176132                    ROR     @MTS
1113  002646  103375                            BCC     .-4             ;AWAIT TUR
1114  002650  000240                            NOP
1115  002652  004737  007364                    JSR     %7,WRINT        ;SET UP FOR NEXT WRITE
1116  002656  005277  176120                    INC     @MTC            ;SET GO
1117  002662  105777  176114                    TSTB    @MTC
1118  002666  100375                            BPL     .-4             ;AWAIT CUR
1119  002670  006077  176104                    ROR     @MTS
1120  002674  103375                            BCC     .-4             ;AWAIT TUR
1121  002676  004737  007364                    JSR     %7,WRINT        ;SET UP FOR NEXT WRITE
1122  002702  005277  176074                    INC     @MTC            ;SET GO
1123  002706  105777  176070                    TSTB    @MTC
1124  002712  100375                            BPL     .-4             ;AWAIT CUR
1125  002714  006077  176060                    ROR     @MTS
1126  002720  103375                            BCC     .-4             ;AWAIT TUR
1127  002722  004737  007250                    JSR     %7,CHGDRV       ;CHANGE DRIVE
1128  002726  000732                            BR      T4FC
1129  002730  000240                            NOP
```

```
1130
```

```
1131
1132
1133                                    ;WRITE RECORDS TO BE USED IN GAP TEST
1134  002732  004737  007364            T4G:    JSR     %7,WRINT
1135  002736  013777  007322  176036            MOV     FDRIVE,@MTC     ;SELECT DRIVE
1136  002744  052777  040005  176030            BIS     #40005,@MTC     ;800 BPI, WRITE, GO
1137  002752  105777  176024                    TSTB    @MTC
1138  002756  100375                            BPL     .-4             ;WAIT FOR CU READY
1139  002760  006077  176014                    ROR     @MTS
1140  002764  103375                            BCC     .-4             ;AWAIT TUR
1141  002766  004737  007364                    JSR     %7,WRINT
1142  002772  005277  176004                    INC     @MTC            ;GO NONSTOP
1143  002776  105777  176000                    TSTB    @MTC
1144  003002  100375                            BPL     .-4             ;WAIT FOR CU READY
1145  003004  006077  175770                    ROR     @MTS
1146  003010  103375                            BCC     .-4             ;AWAIT TUR
1147  003012  012777  177777  175764            MOV     #-1,@BC
1148  003020  013777  007322  175754            MOV     FDRIVE,@MTC     ;SELECT DRIVE
1149  003026  052777  040013  175746            BIS     #40013,@MTC     ;800 BPI, BACKSPACE, GO
1150  003034  105777  175742                    TSTB    @MTC
1151  003040  100375                            BPL     .-4             ;WAIT FOR CU READY
1152  003042  006077  175732                    ROR     @MTS
1153  003046  103375                            BCC     .-4             ;AWAIT TUR
1154  003050  004737  007364                    JSR     %7,WRINT
1155  003054  013777  007322  175720            MOV     FDRIVE,@MTC
1156  003062  052777  040005  175712            BIS     #40005,@MTC     ;800 BPI, WRITE, GO
1157  003070  105777  175706                    TSTB    @MTC
1158  003074  100375                            BPL     .-4
1159  003076  006077  175676                    ROR     @MTS
1160  003102  103375                            BCC     .-4             ;AWAIT TUR
1161  003104  012737  177777  001034            MOV     #-1,R11         ;INDICATES BACK 3 COMPLETE
1162  003112  012737  177777  001036            MOV     #-1,R12         ;INDICATES BACK 4 COMPLETE
1163  003120  012737  177777  001040            MOV     #-1,R13         ;INDICATES BACK 5 COMPLETE
1164  003126  012737  177776  001032            MOV     #-2,R10         ;FIRST SEQUENCE BACK 2 TIMES
```

```
                                        ;NOW WRITE, BACKSPACE, WRITE, BACKSPACE, WRITE
                                        ;GAP SHOULD GET LARGER

003134  004737  007364          MULWRT: JSR     %7,WRINT
003140  005277  175636                  INC     @MTC            ;GO NONSTOP
003144  105777  175632                  TSTB    @MTC
003150  100375                          BPL     .-4             ;WAIT FOR DONE
003152  006077  175622                  ROR     @MTS
003156  103375                          BCC     .-4             ;AWAIT TUR
003160  012777  177777  175616  MULBAK: MOV     #-1,@BC         ;BACKSPACE 1 RECORD
003166  042777  000016  175606          BIC     #16,@MTC
003174  052777  000013  175600          BIS     #13,@MTC        ;SET BACKSPACE, GO
003202  105777  175574                  TSTB    @MTC
003206  100375                          BPL     .-4             ;WAIT FOR BACKSPACE DONE
003210  006077  175564                  ROR     @MTS
003214  103375                          BCC     .-4             ;AWAIT TUR
003216  004737  007364                  JSR     %7,WRINT
003222  042777  000016  175552          BIC     #16,@MTC
003230  052777  000005  175544          BIS     #5,@MTC         ;SET WRITE, GO
003236  105777  175540                  TSTB    @MTC
003242  100375                          BPL     .-4             ;WAIT FOR WRITE DONE
003244  006077  175530                  ROR     @MTS
003250  103375                          BCC     .-4             ;AWAIT TUR
003252  005237  001032                  INC     R10             ;BACKSPACED ENOUGH TIMES?
003256  001340                          BNE     MULBAK          ;NO BACKSPACE AND WRITE AGAIN
003260  005237  001034                  INC     R11             ;DONE 3 BACKSPACE SEQUENCES?
003264  001004                          BNE     MUL1            ;YES
003266  012737  177775  001032          MOV     #-3,R10
003274  000717                          BR      MULWRT
003276  005237  001036          MUL1:   INC     R12             ;DONE 4 BACKSPACE SEQUENCES?
003302  001004                          BNE     MUL2            ;YES
003304  012737  177774  001032          MOV     #-4,R10
003312  000710                          BR      MULWRT
003314  005237  001040          MUL2:   INC     R13             ;DONE 5 BACKSPACE SEQUENCES?
003320  001004                          BNE     MUL3            ;YES
003322  012737  177773  001032          MOV     #-5,R10
003330  000701                          BR      MULWRT
003332  006077  175442          MUL3:   ROR     @MTS
003336  103375                          BCC     .-4             ;WAIT FOR TU READY
003340  004737  007422                  JSR     %7,STRREW       ;START REWIND
003344  004737  007250                  JSR     %7,CHGDRV
003350  000137  002732                  JMP     T4G
```

```
                                        ;NOW READ NONSTOP
                                        ;ACCUMULATE GAP TIMES ON READ
                                        ;TYPE ACCUMULATED TIMES AT END OF READ
                                        ;GAP1 SHOULD = GAP2, GAP3 <GAP1 AND GAP2
                                        ;GAP4 THRU GAP8 SHOULD GET INCREASINGLY LONGER
003354  005037  001042                      CLR     TSDRV

003360  004737  007462              T5:     JSR     %7,WATREW
003364  004737  007364                      JSR     %7,WRINT
003370  012700  007550                      MOV     #TM1,%0
003374  063700  001042                      ADD     TSDRV,%0
003400  013777  007322  175374              MOV     FDRIVE,@MTC     ;SELECT DRIVE
003406  052777  040003  175366              BIS     #40003,@MTC     ;800 BPI, READ, GO
003414  012737  177770  001032              MOV     #-8.,R10        ;COUNT 8 GAPS
003422  105777  175354              T5A:    TSTB    @MTC
003426  100375                      BPL     .-4                     ;WAIT FOR CU READY
003430  006077  175344                      ROR     @MTS
003434  103375                      BCC     .-4                     ;AWAIT TUR
003436  004737  007364                      JSR     %7,WRINT
003442  005037  007546                      CLR     TIME
003446  005277  175330                      INC     @MTC            ;GO NONSTOP
003452  022777  012140  175326      T5B:    CMP     #WBUF+2,@CA     ;IS 2ND WORD OUTPUT
003460  003403                      BLE     T5C                     ;YES
003462  004737  007524                      JSR     %7,TIMER        ;NO, COUNT TIME
003466  000771                      BR      T5B
003470  013720  007546              T5C:    MOV     TIME,(0)+       ;SAVE GAP TIME
003474  012710  177777                      MOV     #-1,(0)         ;TERMINATE, JUST IN CASE AT END
003500  062700  000022                      ADD     #22,%0          ;STEP GAP POINTER
003504  005237  001032                      INC     R10             ;DONE ALL 8 GAPS?
003510  001344                      BNE     T5A                     ;NO
003512  006077  175262                      ROR     @MTS
003516  103375                      BCC     .-4                     ;WAIT FOR TU READY
003520  004737  007422                      JSR     %7,STRREW       ;START REWIND
003524  062737  000002  001042              ADD     #2,TSDRV        ;+2 TO DRIVE TIME POINTER
003532  004737  007250                      JSR     %7,CHGDRV
003536  000710                      BR      T5
003540  112737  000061  011007              MOVB    #'1,MSG11A+6
003546  012737  010730  010406              MOV     #MSG11,MESAGE
003554  004737  010266                      JSR     %7,TOP
003560  012737  011001  010406              MOV     #MSG11A,MESAGE
003566  012700  007550                      MOV     #TM1,%0
003572  004737  010010                      JSR     %7,TYPTIM       ;PRINT "GAP 1"
003576  105237  011007                      INCB    MSG11A+6
003602  012737  011001  010406              MOV     #MSG11A,MESAGE
003610  012700  007574                      MOV     #TM2,%0
003614  004737  010010                      JSR     %7,TYPTIM       ;PRINT "GAP 2"
003620  105237  011007                      INCB    MSG11A+6
003624  012737  011001  010406              MOV     #MSG11A,MESAGE
003632  012700  007620                      MOV     #TM3,%0
003636  004737  010010                      JSR     %7,TYPTIM       ;PRINT "GAP 3"
003642  105237  011007                      INCB    MSG11A+6
003646  012737  011001  010406              MOV     #MSG11A,MESAGE
003654  012700  007644                      MOV     #TM4,%0
003660  004737  010010                      JSR     %7,TYPTIM       ;PRINT "GAP 4"
003664  105237  011007                      INCB    MSG11A+6
003670  012737  011001  010406              MOV     #MSG11A,MESAGE
```

```
1263  003676  012700  007670            MOV   #TM5,%0
1264  003702  004737  010010            JSR   %7,TYPTIM      ;PRINT "GAP 5"
1265  003706  105237  011007            INCB  MSG11A+6
1266  003712  012737  011001  010406    MOV   #MSG11A,MESAGE
1267  003720  012700  007714            MOV   #TM6,%0
1268  003724  004737  010010            JSR   %7,TYPTIM      ;PRINT "GAP 6"
1269  003730  105237  011007            INCB  MSG11A+6
1270  003734  012737  011001  010406    MOV   #MSG11A,MESAGE
1271  003742  012700  007740            MOV   #TM7,%0
1272  003746  004737  010010            JSR   %7,TYPTIM      ;PRINT "GAP 7"
1273  003752  105237  011007            INCB  MSG11A+6
1274  003756  012737  011001  010406    MOV   #MSG11A,MESAGE
1275  003764  012700  007764            MOV   #TM8,%0
1276  003770  004737  010010            JSR   %7,TYPTIM      ;PRINT "GAP 8"
1277  003774  004737  007402            JSR   %7,ST1S
1278
1279                                    ;TIME WRITE START NOT AT BOT
1280
1281  004000  012700  007550    T6:     MOV   #TM1,%0
1282  004004  012701  007574            MOV   #TM2,%1
1283  004010  004737  007364    T6A:    JSR   %7,WRINT
1284  004014  013777  007322  174760    MOV   FDRIVE,@MTC    ;SELECT DRIVE
1285  004022  105777  174754            TSTB  @MTC
1286  004026  100375                    BPL   .-4
1287  004030  006077  174744            ROR   @MTS
1288  004034  103375                    BCC   .-4            ;WAIT FOR TU READY
1289  004036  052777  040005  174736    BIS   #40005,@MTC     ;800 BPI, WRITE, GO
1290  004044  032777  000040  174726    BIT   #40,@MTS
1291  004052  001374                    BNE   .-6            ;WAIT FOR BOT TO CLEAR
1292  004054  052777  010000  174720    BIS   #10000,@MTC    ;POWER CLEAR
1293  004062  013777  007322  174712    MOV   FDRIVE,@MTC
1294  004070  004737  007364            JSR   %7,WRINT
1295  004074  006077  174700            ROR   @MTS
1296  004100  103375                    BCC   .-4            ;WAIT FOR TU READY
1297  004102  005037  007546            CLR   TIME
1298  004106  013777  007322  174666    MOV   FDRIVE,@MTC    ;SELECT DRIVE
1299  004114  012777  160000  174662    MOV   #160000,@BC    ;SET FOR VERY LONG RECORD
1300  004122  052777  040005  174652    BIS   #40005,@MTC    ;800 BPI, WRITE, GO
1301  004130  022777  012140  174650  T6B:  CMP   #WBUF+2,@CA   ;IS 2ND WORD OUTPUT?
1302  004136  003403                    BLE   T6C            ;YES
1303  004140  004737  007524            JSR   %7,TIMER       ;NO, COUNT TIME
1304  004144  000771                    BR    T6B
1305  004146  006077  174626    T6C:    ROR   @MTS
1306  004152  103375                    BCC   .-4            ;WAIT FOR TU READY
1307  004154  013720  007546            MOV   TIME,(0)+      ;SAVE "WRITE START" TIME
1308  004160  005037  007546            CLR   TIME
1309  004164  004737  007364            JSR   %7,WRINT
1310  004170  013777  007322  174604    MOV   FDRIVE,@MTC    ;SELECT DRIVE
1311  004176  052777  040015  174576    BIS   #40015,@MTC    ;800 BPI, WRITE XIRG, GO
1312  004204  022777  012140  174574  T6D:  CMP   #WBUF+2,@CA   ;IS 2ND WORD OUTPUT
1313  004212  003403                    BLE   T6E            ;YES
1314  004214  004737  007524            JSR   %7,TIMER       ;NO COUNT TIME
1315  004220  000771                    BR    T6D
1316  004222  006077  174552    T6E:    ROR   @MTS
1317  004226  103375                    BCC   .-4            ;WAIT FOR TU READY
1318  004230  013721  007546            MOV   TIME,(1)+      ;SAVE "WRITE XIRG" TIME
```

```
1319  004234  004737  007422                  JSR     %7,STRREW
1320  004240  004737  007250                  JSR     %7,CHGDRV
1321  004244  000661                          BR      T6A
1322  004246  012720  177777                  MOV     #-1,(0)+        ;TERMINATE TIMES
1323  004252  012721  177777                  MOV     #-1,(1)+        ;TERMINATE TIMES
1324  004256  012737  010524  010406          MOV     #MSG5,MESAGE
1325  004264  012700  007550                  MOV     #TM1,%0
1326  004270  004737  010010                  JSR     %7,TYPTIM       ;TYPE "WRITE START" TIME
1327  004274  012737  011027  010406          MOV     #MSG12,MESAGE
1328  004302  012700  007574                  MOV     #TM2,%0
1329  004306  004737  010010                  JSR     %7,TYPTIM       ;TYPE "WRITE XIRG" TIME
1330  004312  004737  007462          T6F:    JSR     %7,WATREW
1331  004316  004737  007250                  JSR     %7,CHGDRV
1332  004322  000773                          BR      T6F             ;WAIT FOR ALL DRIVES AT BOT.
1333
1334                                ;NOW TIME "READ FROM BOT DELAY
1335
1336  004324  012700  007550          T7:     MOV     #TM1,%0
1337  004330  005037  007546          T7A:    CLR     TIME
1338  004334  004737  007364                  JSR     %7,WRINT
1339  004340  013777  007322  174434          MOV     FDRIVE,@MTC     ;SELECT DRIVE
1340  004346  052777  040003  174426          BIS     #40003,@MTC     ;800 BPI, READ GO
1341  004354  022777  012140  174424  T7B:    CMP     #WBUF+2,@CA     ;IS 2ND WORD INPUT?
1342  004362  003403                          BLE     T7C             ;YES
1343  004364  004737  007524                  JSR     %7,TIMER        ;NO COUNT TIME
1344  004370  000771                          BR      T7B
1345  004372  013720  007546          T7C:    MOV     TIME,(0)+       ;SAVE "READ FROM BOT" TIME
1346  004376  105777  174400                  TSTB    @MTC
1347  004402  100375                          BPL     .-4             ;WAIT FOR CU READY.
1348  004404  006077  174370                  ROR     @MTS
1349  004410  103375                          BCC     .-4             ;AWAIT TUR
1350  004412  004737  007250                  JSR     %7,CHGDRV       ;DONE ALL DRIVES?
1351  004416  000744                          BR      T7A             ;NO
1352  004420  006077  174354                  ROR     @MTS
1353  004424  103375                          BCC     .-4
1354  004426  012720  177777                  MOV     #-1,(0)+        ;TERMINATE TIMES
1355  004432  012737  011055  010406          MOV     #MSG13,MESAGE
1356  004440  012700  007550                  MOV     #TM1,%0
1357  004444  004737  010010                  JSR     %7,TYPTIM       ;PRINT "READ FROM BOT" TIME
1358  004450  004737  007402                  JSR     %7,ST1S
1359
1360  004454  004737  007422          T8:     JSR     %7,STRREW       ;REWIND
1361  004460  004737  007250                  JSR     %7,CHGDRV       ;ANYMORE DRIVES?
1362  004464  000773                          BR      T8              ;YES
1363  004466  012720  177777                  MOV     #-1,(0)+        ;TERMINATE TIMES
1364  004472  004737  007462          T8A:    JSR     %7,WATREW
1365  004476  004737  007250                  JSR     %7,CHGDRV
1366  004502  000773                          BR      T8A
1367
1368                                ;TIME "WRITE EOF"
1369                                ;WRITE A 3 BYTE RECORD FROM BOT FOLLOWED BY AN EOF.
1370
1371  004504  012700  007550          T9:     MOV     #TM1,%0
1372  004510  005037  007546          T9A:    CLR     TIME
1373  004514  012777  177775  174262          MOV     #-3.,@BC                ;WRITE 3 BYTES
1374  004522  012777  012136  174256          MOV     #WBUF,@CA
```

```
 1375  004530  013777  007322  174244          MOV     FDRIVE,@MTC     ;SELECT DRIVE
 1376  004536  052777  040005  174236          BIS     #40005,@MTC     ;800 BPI, WRITE, GO
 1377  004544  105777  174232                  TSTB    @MTC
 1378  004550  100375                          BPL     .-4
 1379  004552  006077  174222                  ROR     @MTS
 1380  004556  103375                          BCC     .-4             ;WAIT FOR TU READY
 1381  004560  042777  000016  174214          BIC     #16,@MTC
 1382  004566  052777  000007  174206          BIS     #7,@MTC         ;WRITE EOF, GO
 1383  004574  105777  174202          T9B:    TSTB    @MTC            ;IS CU READY SET?
 1384  004600  100403                          BMI     1$              ;YES
 1385  004602  004737  007524                  JSR     %7,TIMER        ;NO, COUNT TIME
 1386  004606  000772                          BR      T9B
 1387  004610  006077  174164          1$:     ROR     @MTS
 1388  004614  103403                          BCS     T9C             ;IF TUR: BR
 1389  004616  004737  007524                  JSR     %7,TIMER        ;ELSE CONTINUE TIMER
 1390  004622  000772                          BR      1$
 1391  004624  013720  007546          T9C:    MOV     TIME,(0)+       ;SAVE "WRITE EOF" TIME
 1392  004630  004737  007422                  JSR     %7,STRREW       ;REWIND
 1393  004634  004737  007250                  JSR     %7,CHGDRV       ;ANYMORE DRIVES?
 1394  004640  000723                          BR      T9A             ;YES
 1395  004642  012720  177777                  MOV     #-1,(0)+        ;TERMINATE TIMES
 1396  004646  012737  011131  010406          MOV     #MSG15,MESAGE
 1397  004654  012700  007550                  MOV     #TM1,%0
 1398  004660  004737  010010                  JSR     %7,TYPTIM       ;PRINT "WRITE EOF" TIMES
 1399  004664  004737  007462          T9D:    JSR     %7,WATREW
 1400  004670  004737  007250                  JSR     %7,CHGDRV
 1401  004674  000773                          BR      T9D
```

```
1402                                    ;TIME "EOR TO EOF SPACE TIME", "SPACE SHUTDOWN" AND "ONE INCH DATA TIME".
1403                                    ;WRITE A 3 BYTE RECORD OVER ONE PREVIOUSLY WRITTEN
1404                                    ;BACKSPACE 1 RECORD AND THEN SPACE FORWARD 2 RECORDS
1405                                    ;TIME FROM THE END OF FIRST RECORD UNTIL EOF IS REACHED
1406
1407  004676  012700  007550           T10:    MOV     #TM1,%0
1408  004702  012701  007574                   MOV     #TM2,%1
1409  004706  012702  007620                   MOV     #TM3,%2
1410  004712  005037  007546           T10A:   CLR     TIME
1411  004716  012777  177775  174060           MOV     #-3,@BC         ;3 BYTE RECORD
1412  004724  012777  012136  174054           MOV     #WBUF,@CA
1413  004732  013777  007322  174042           MOV     FDRIVE,@MTC     ;SELECT DRIVE
1414  004740  052777  040005  174034           BIS     #40005,@MTC     ;800 BPI, WRITE, GO
1415  004746  105777  174030                   TSTB    @MTC
1416  004752  100375                           BPL     .-4             ;WAIT FOR CU READY
1417  004754  006077  174020                   ROR     @MTS
1418  004760  103375                           BCC     .-4             ;AWAIT TUR
1419  004762  012777  177777  174014           MOV     #-1,@BC         ;BACKSPACE 1 RECORD
1420  004770  042777  000016  174004           BIC     #16,@MTC        ;SELECT DRIVE
1421  004776  052777  000013  173776           BIS     #13,@MTC        ;BACKSPACE, GO
1422  005004  105777  173772                   TSTB    @MTC
1423  005010  100375                           BPL     .-4             ;WAIT FOR CU READY
1424  005012  006077  173762                   ROR     @MTS
1425  005016  103375                           BCC     .-4             ;AWAIT TUR
1426  005020  012777  177776  173756           MOV     #-2,@BC         ;SPACE FORWARD 2 RECORDS
1427  005026  042777  000016  173746           BIC     #16,@MTC
1428  005034  052777  000011  173740           BIS     #11,@MTC        ;SPACE FORWARD, GO
1429  005042  022777  177777  173734  T10B:    CMP     #-1,@BC
1430  005050  001374                           BNE     T10B            ;WAIT FOR 1ST RECORD TO BE SPACED OVER
1431  005052  032777  040000  173720  T10C:    BIT     #40000,@MTS     ;IS EOF SET?
1432  005060  001014                           BNE     T10D            ;YES
1433  005062  006077  173712                   ROR     @MTS
1434  005066  103403                           BCS     T10CC           ;AWAIT TUR
1435  005070  004737  007524                   JSR     %7,TIMER        ;NO, COUNT TIME
1436  005074  000766                           BR      T10C
1437  005076  032777  040000  173674  T10CC:   BIT     #40000,@MTS     ;HAVE TU READY
1438  005104  001002                           BNE     T10D            ;IS EOF SET?
1439  005106  005037  007546                   CLR     TIME            ;NO, SET ERROR
1440  005112  013720  007546           T10D:   MOV     TIME,(0)+       ;SAVE "EOR TO EOF SPACE TIME"
1441  005116  005037  007546                   CLR     TIME
1442  005122  000240                           NOP
1443  005124  000240                           NOP
1444  005126  000240                           NOP
1445  005130  032777  000010  173642  T10E:    BIT     #10,@MTS        ;IS SETTLEDOWN SET?
1446  005136  001003                           BNE     T10F            ;YES
1447  005140  004737  007524                   JSR     %7,TIMER        ;NO, COUNT TIME
1448  005144  000771                           BR      T10E
1449  005146  013721  007546           T10F:   MOV     TIME,(1)+       ;SAVE "SPACE SHUTDOWN" TIME
1450  005152  006077  173622                   ROR     @MTS
1451  005156  103375                           BCC     .-4             ;AWAIT TUR
1452  005160  012777  176340  173616           MOV     #-800.,@BC      ;1 INCH OF DATA
1453  005166  012777  012136  173612           MOV     #WBUF,@CA
1454  005174  005037  007546                   CLR     TIME
1455  005200  013777  007322  173574           MOV     FDRIVE,@MTC     ;SELECT DRIVE
1456  005206  006077  173566                   ROR     @MTS
1457  005212  103375                           BCC     .-4             ;AWAIT TUR
```

```
1458  005214  052777  040005  173560          BIS     #40005,@MTC     ;800 BPI, WRITE, GO
1459  005222  022777  012140  173556          CMP     #WBUF+2,@CA     ;IS 2ND BYTE OUTPUT
1460  005230  003374                          BGT     .-6             ;NO
1461  005232  005777  173546          T10G:   TST     @BC             ;YES IS LAST BYTE OUT
1462  005236  001403                          BEQ     T10H            ;YES
1463  005240  004737  007524                  JSR     %7,TIMER        ;NO, COUNT TIME
1464  005244  000772                          BR      T10G
1465
1466  005246  013722  007546          T10H:   MOV     TIME,(2)+       ;SAVE "ONE INCH DATA TIME"
1467  005252  004737  007422                  JSR     %7,STRREW       ;REWIND
1468  005256  004737  007250                  JSR     %7,CHGDRV       ;ANYMORE DRIVES?
1469  005262  000613                          BR      T10A            ;YES
1470  005264  012720  177777                  MOV     #-1,(0)+        ;TERMINATE TIMES
1471  005270  012721  177777                  MOV     #-1,(1)+
1472  005274  012722  177777                  MOV     #-1,(2)+
1473  005300  012737  011157  010406          MOV     #MSG16,MESAGE
1474  005306  012700  007550                  MOV     #TM1,%0
1475  005312  004737  010010                  JSR     %7,TYPTIM       ;PRINT "EOR TO EOF SPACE TIME"
1476                                          ;PRINT STATUS
1477  005316  012737  011205  010406          MOV     #MSG18,MESAGE
1478  005324  012700  007574                  MOV     #TM2,%0
1479  005330  004737  010010                  JSR     %7,TYPTIM       ;PRINT "SPACE SHUTDOWN" TIME
1480  005334  012737  011264  010406          MOV     #MSG20,MESAGE
1481  005342  012700  007620                  MOV     #TM3,%0
1482  005346  004737  010010                  JSR     %7,TYPTIM       ;PRINT "ONE INCH DATA TIME"
1483
1484                                  ;TIME SOME OF PREVIOUS OPERATIONS AT 200 BPI AND 556 BPI
1485
1486  005352  012700  007550          T11:    MOV     #TM1,%0         ;INITIALIZE TIME BUFFERS
1487  005356  012701  007574                  MOV     #TM2,%1
1488  005362  012702  007620                  MOV     #TM3,%2
1489  005366  012703  007644                  MOV     #TM4,%3
1490  005372  012704  007670                  MOV     #TM5,%4
1491  005376  012705  007714                  MOV     #TM6,%5
1492  005402  005037  001044                  CLR     T11T
1493  005406  004737  007462          T11A:   JSR     %7,WATREW       ;WAIT FOR REWIND
1494  005412  032737  020000  007322          BIT     #20000,FDRIVE   ;IS DRIVE 9 TRACK?
1495  005420  001402                          BEQ     T11AA           ;NO: BR
1496  005422  000137  006032                  JMP     T11P            ;ELSE GET NEXT DRIVE
1497  005426  012737  177777  001044  T11AA:  MOV     #-1,T11T        ;INDICATE 7 TRACK
1498  005434  012777  176724  173342          MOV     #-556.,@BC      ;566 BYTES = ONE INCH
1499  005442  012777  012136  173336          MOV     #WBUF,@CA
1500  005450  005037  007546                  CLR     TIME
1501  005454  013777  007322  173320          MOV     FDRIVE,@MTC     ;SELECT DRIVE
1502  005462  052777  020005  173312          BIS     #20005,@MTC     ;556 BPI, WRITE, GO
1503
1504                                  ;TIME "WRITE FROM BOT DELAY" AT 556 BPI
1505
1506  005470  022777  012140  173310  T11B:   CMP     #WBUF+2,@CA     ;IS 2ND WORD OUT?
1507  005476  003403                          BLE     T11C            ;YES
1508  005500  004737  007524                  JSR     %7,TIMER        ;NO, COUNT TIME
1509  005504  000771                          BR      T11B
1510  005506  013720  007546          T11C:   MOV     TIME,(0)+       ;SAVE "WRITE FROM BOT DELAY"
1511  005512  005037  007546                  CLR     TIME
1512
```

```
1513
1514                                    ;TIME "ONE INCH DATA" AT 556 BPI
1515
1516  005516  005777  173262    T11D:   TST     @BC             ;IS BC=0
1517  005522  001403                    BEQ     T11E            ;YES
1518  005524  004737  007524            JSR     %7,TIMER        ;NO, COUNT TIME
1519  005530  000772                    BR      T11D
1520  005532  013721  007546    T11E:   MOV     TIME,(1)+       ;SAVE "1 INCH DATA" TIME
1521  005536  005037  007546            CLR     TIME
1522
1523                                    ;TIME "WRITE SHUTDOWN" AT 556 BPI
1524
1525  005542  000240                    NOP
1526  005544  000240                    NOP
1527  005546  000240                    NOP
1528  005550  032777  000010  173222 T11F:   BIT     #10,@MTS        ;IS SETTLEDOWN SET?
1529  005556  001003                    BNE     T11G            ;YES
1530  005560  004737  007524            JSR     %7,TIMER        ;NO, COUNT TIME
1531  005564  000771                    BR      T11F
1532  005566  013722  007546    T11G:   MOV     TIME,(2)+       ;SAVE "WRITE SHUTDOWN"
1533  005572  005037  007546            CLR     TIME
1534
1535                                    ;TIME "BACKSPACE SHUTDOWN" AT 556 BPI
1536
1537  005576  006077  173176            ROR     @MTS
1538  005602  103375                    BCC     .-4             ;AWAIT TUR
1539  005604  042777  000016  173170    BIC     #16,@MTC
1540  005612  052777  000007  173162    BIS     #7,@MTC         ;SET WRITE EOF+GO
1541  005620  105777  173156            TSTB    @MTC
1542  005624  100375                    BPL     .-4             ;AWAIT CUR
1543  005626  006077  173146            ROR     @MTS
1544  005632  103375                    BCC     .-4             ;AWAIT TUR
1545  005634  012777  177777  173142    MOV     #-1,@BC
1546  005642  042777  000016  173132    BIC     #16,@MTC
1547  005650  052777  000013  173124    BIS     #13,@MTC        ;BACKSPACE 1 RECORD, GO
1548  005656  000240                    NOP
1549  005660  032777  040000  173112 T11GA:  BIT     #40000,@MTS
1550  005666  001774                    BEQ     T11GA           ;AWAIT EOF
1551  005670  000240                    NOP
1552  005672  000240                    NOP
1553  005674  032777  000010  173076 T11H:   BIT     #10,@MTS        ;IS SETTLEDOWN SET?
1554  005702  001003                    BNE     T11J            ;YES
1555  005704  004737  007524            JSR     %7,TIMER        ;NO COUNT TIME
1556  005710  000771                    BR      T11H
1557  005712  013723  007546    T11J:   MOV     TIME,(3)+       ;SAVE "BACKSPACE SHUTDOWN"
1558  005716  005037  007546            CLR     TIME
1559
1560                                    ;TIME "LAST CHAR IN TO MTF" AT 556 BPI
1561
1562  005722  105777  173054            TSTB    @MTC            ;SEE IF CUR
1563  005726  100375                    BPL     .-4             ;IF NOT: BR
1564  005730  006077  173044            ROR     @MTS
1565  005734  103375                    BCC     .-4             ;WAIT FOR TU READY
1566  005736  012777  176724  173040    MOV     #-556.,@BC      ;556 BYTES
1567  005744  012777  012136  173034    MOV     #WBUF,@CA
1568  005752  013777  007322  173022    MOV     FDRIVE,@MTC     ;SELECT DRIVE
```

```
1569  005760  052777  020003  173014          BIS     #20003,@MTC     ;556 BPI, READ, GO
1570  005766  032777  040000  173004  T11JA:  BIT     #40000,@MTS
1571  005774  001774                          BEQ     T11JA           ;AWAIT EOF
1572  005776  032777  000010  172774  T11K:   BIT     #10,@MTS        ;SEE IF SDWN
1573  006004  001003                          BNE     T11L            ;YES
1574  006006  004737  007524                  JSR     %7,TIMER        ;NO COUNT TIME
1575  006012  000771                          BR      T11K
1576  006014  013724  007546          T11L:   MOV     TIME,(4)+
1577  006020  013725  007546                  MOV     TIME,(5)+       ;SAVE "READ SHUTDOWN"
1578  006024  005037  007546                  CLR     TIME
1579  006030  000406                          BR      T11R
1580  006032  005020                  T11P:   CLR     (0)+            ;CLEAR TIMES FOR 9 TRACK DRIVES
1581  006034  005021                          CLR     (1)+
1582  006036  005022                          CLR     (2)+
1583  006040  005023                          CLR     (3)+
1584  006042  005024                          CLR     (4)+
1585  006044  005025                          CLR     (5)+
1586  006046  004737  007422          T11R:   JSR     %7,STRREW
1587  006052  004737  007250                  JSR     %7,CHGDRV
1588  006056  000401                          BR      .+4
1589  006060  000402                          BR      .+6
1590  006062  000137  005406                  JMP     T11A
1591
1592  006066  012720  177777                  MOV     #-1,(0)+        ;TERMINATE DRIVES
1593  006072  012721  177777                  MOV     #-1,(1)+
1594  006076  012722  177777                  MOV     #-1,(2)+
1595  006102  012723  177777                  MOV     #-1,(3)+
1596  006106  012724  177777                  MOV     #-1,(4)+
1597  006112  012725  177777                  MOV     #-1,(5)+
1598  006116  005737  001044                  TST     T11T            ;HAVE TESTED ANY 7 TRACKS
1599  006122  001452                          BEQ     T12             ;NO
1600  006124  012737  011233  010406          MOV     #MSG19,MESAGE   ;PRINT "FUNCTIONS AT 55E"
1601  006132  004737  010266                  JSR     %7,TOP
1602  006136  012737  010450  010406          MOV     #MSG3,MESAGE
1603  006144  012700  007550                  MOV     #TM1,%0
1604  006150  004737  010010                  JSR     %7,TYPTIM       ;PRINT "WRITE FROM BOT DELAY"
1605  006154  012737  011264  010406          MOV     #MSG20,MESAGE
1606  006162  012700  007574                  MOV     #TM2,%0
1607  006166  004737  010010                  JSR     %7,TYPTIM       ;PRINT "ONE INCH DATA TIME"
1608  006172  012737  010476  010406          MOV     #MSG4,MESAGE
1609  006200  012700  007620                  MOV     #TM3,%0
1610  006204  004737  010010                  JSR     %7,TYPTIM       ;PRINT "WRITE SHUTDOWN"
1611  006210  012737  010654  010406          MOV     #MSG9,MESAGE
1612  006216  012700  007644                  MOV     #TM4,%0
1613  006222  004737  010010                  JSR     %7,TYPTIM       ;PRINT "BACKSPACE SHUTDOWN"
1614  006226  012737  010702  010406          MOV     #MSG10,MESAGE
1615  006234  012700  007714                  MOV     #TM6,%0
1616  006240  004737  010010                  JSR     %7,TYPTIM       ;PRINT "READ SHUTDOWN"
1617  006244  004737  007402                  JSR     %7,ST1S
1618
1619                          ;TIME OPERATIONS AT 200 BPI
1620
1621  006250  012700  007550          T12:    MOV     #TM1,%0         ;INITIALIZE TIME BUFFERS
1622  006254  012701  007574                  MOV     #TM2,%1
1623  006260  012702  007620                  MOV     #TM3,%2
1624  006264  012703  007644                  MOV     #TM4,%3
```

```
1625  006270  012704  007670                    MOV     #TM5,%4
1626  006274  012705  007714                    MOV     #TM6,%5
1627  006300  005037  001044                    CLR     T11T
1628  006304  004737  007462          T12A:     JSR     %7,WAITREW      ;WAIT FOR REWIND
1629  006310  032737  020000  007322            BIT     #20000,FDRIVE   ;IS DRIVE 9 TRACK?
1630  006316  001402                            BEQ     .+6             ;NO
1631  006320  000137  006730                    JMP     T12P            ;YES, GET NEXT DRIVE
1632  006324  012737  177777  001044            MOV     #-1,T11T
1633  006332  012777  177470  172444            MOV     #-200.,@BC      ;566 BYTES = ONE INCH
1634  006340  012777  012136  172440            MOV     #WBUF,@CA
1635  006346  005037  007546                    CLR     TIME
1636  006352  013777  007322  172422            MOV     FDRIVE,@MTC     ;SELECT DRIVE
1637  006360  052777  000005  172414            BIS     #00005,@MTC     ;200 BPI, WRITE, GO
1638
1639                                  ;TIME "WRITE FROM BOT DELAY" AT 556 BPI
1640
1641  006366  022777  012140  172412  T12B:     CMP     #WBUF+2,@CA     ;IS 2ND WORD OUT?
1642  006374  001403                            BEQ     T12C            ;YES
1643  006376  004737  007524                    JSR     %7,TIMER        ;NO, COUNT TIME
1644  006402  000771                            BR      T12B
1645  006404  013720  007546          T12C:     MOV     TIME,(0)+       ;SAVE "WRITE FROM BOT DELAY"
1646  006410  005037  007546                    CLR     TIME
1647
1648                                  ;TIME "ONE INCH DATA" AT 200 BPI
1649
1650  006414  005777  172364          T12D:     TST     @BC             ;IS BC=0
1651  006420  001403                            BEQ     T12E            ;YES
1652  006422  004737  007524                    JSR     %7,TIMER        ;NO, COUNT TIME
1653  006426  000772                            BR      T12D
1654  006430  013721  007546          T12E:     MOV     TIME,(1)+       ;SAVE "1 INCH DATA" TIME
1655  006434  005037  007546                    CLR     TIME
1656
1657                                  ;TIME "WRITE SHUTDOWN" AT 200 BPI
1658
1659  006440  005777  172340                    TST     @BC             ;SEE IF WORD COUNT DONE
1660  006444  001375                            BNE     .-4             ;IF NOT: BR
1661  006446  032777  000010  172324  T12F:     BIT     #10,@MTS        ;IS SETTLEDOWN SET?
1662  006454  001003                            BNE     T12G            ;YES
1663  006456  004737  007524                    JSR     %7,TIMER        ;NO, COUNT TIME
1664  006462  000771                            BR      T12F
1665  006464  013722  007546          T12G:     MOV     TIME,(2)+       ;SAVE "WRITE SHUTDOWN"
1666  006470  005037  007546                    CLR     TIME
1667
1668                                  ;TIME "BACKSPACE SHUTDOWN" AT 200 BPI
1669
1670  006474  006077  172300                    ROR     @MTS
1671  006500  103375                            BCC     .-4             ;AWAIT TUR
1672  006502  042777  000016  172272            BIC     #16,@MTC
1673  006510  052777  000007  172264            BIS     #7,@MTC         ;SET WRITE EOF+GO
1674  006516  105777  172260                    TSTB    @MTC
1675  006522  100375                            BPL     .-4             ;AWAIT CUR
1676  006524  006077  172250                    ROR     @MTS
1677  006530  103375                            BCC     .-4             ;AWAIT TUR
1678  006532  012777  177777  172244            MOV     #-1,@BC
1679  006540  042777  000016  172234            BIC     #16,@MTC
1680  006546  052777  000013  172226            BIS     #13,@MTC        ;BACKSPACE 1 RECORD, GO
```

```
1681  006554  000240                          NOP
1682  006556  000240                          NOP
1683  006560  000240                          NOP
1684  006562  032777  040000  172210  T12GA:  BIT     #40000,@MTS
1685  006570  001774                          BEQ     T12GA           ;AWAIT EOF
1686  006572  032777  000010  172200  T12H:   BIT     #10,@MTS        ;IS SETTLEDOWN SET?
1687  006600  001003                          BNE     T12J            ;YES
1688  006602  004737  007524                  JSR     %7,TIMER        ;NO COUNT TIME
1689  006606  000771                          BR      T12H
1690  006610  013723  007546          T12J:   MOV     TIME,(3)+       ;SAVE "BACKSPACE SHUTDOWN"
1691  006614  005037  007546                  CLR     TIME
1692
1693                                  ;TIME "LAST CHAR IN TO MTF" AT 200 BPI
1694
1695  006620  006077  172154                  ROR     @MTS
1696  006624  103375                          BCC     .-4             ;WAIT FOR TU READY
1697  006626  012777  177470  172150          MOV     #-200.,@BC      ;556 BYTES
1698  006634  012777  012136  172144          MOV     #WBUF,@CA
1699  006642  013777  007322  172132          MOV     FDRIVE,@MTC     ;SELECT DRIVE
1700  006650  052777  000003  172124          BIS     #00003,@MTC     ;556 BPI, READ, GO
1701  006656  032777  040000  172114  T12JA:  BIT     #40000,@MTS
1702  006664  001774                          BEQ     T12JA           ;AWAIT EOF
1703  006666  000240                  T12K:   NOP
1704  006670  000240                          NOP
1705  006672  000240                          NOP
1706  006674  013724  007546          T12L:   MOV     TIME,(4)+       ;SAVE "LAST CHAR IN TO MTF"
1707  006700  005037  007546                  CLR     TIME
1708  006704  032777  000010  172066  T12M:   BIT     #10,@MTS
1709  006712  001003                          BNE     T12N
1710  006714  004737  007524                  JSR     %7,TIMER
1711  006720  000771                          BR      T12M
1712  006722  013725  007546          T12N:   MOV     TIME,(5)+       ;SAVE "READ SHUTDOWN"
1713  006726  000406                          BR      T12R
1714
1715  006730  005020                  T12P:   CLR     (0)+
1716  006732  005021                          CLR     (1)+
1717  006734  005022                          CLR     (2)+
1718  006736  005023                          CLR     (3)+
1719  006740  005024                          CLR     (4)+
1720  006742  005025                          CLR     (5)+
1721  006744  004737  007250          T12R:   JSR     %7,CHGDRV
1722  006750  000401                          BR      .+4
1723  006752  000402                          BR      .+6
1724  006754  000137  006304                  JMP     T12A
1725  006760  012720  177777                  MOV     #-1,(0)+        ;TERMINATE DRIVES
1726  006764  012721  177777                  MOV     #-1,(1)+
1727  006770  012722  177777                  MOV     #-1,(2)+
1728  006774  012723  177777                  MOV     #-1,(3)+
1729  007000  012724  177777                  MOV     #-1,(4)+
1730  007004  012725  177777                  MOV     #-1,(5)+
1731  007010  005737  001044                  TST     T11T            ;HAVE TESTED ANY 7 TRACKS?
1732  007014  001452                          BEQ     T13             ;NO
1733  007016  012737  011312  010406          MOV     #MSG21, MESAGE  ;PRINT "FUNCTIONS AT 200"
1734  007024  004737  010266                  JSR     %7,TOP
1735  007030  012737  010450  010406          MOV     #MSG3,MESAGE
1736  007036  012700  007550                  MOV     #TM1,%0
```

```
1737  007042  004737  010010          JSR     %7,TYPTIM       ;PRINT "WRITE FROM BOT DELAY"
1738  007046  012737  011264  010406  MOV     #MSG20,MESAGE
1739  007054  012700  007574          MOV     #TM2,%0
1740  007060  004737  010010          JSR     %7,TYPTIM       ;PRINT "ONE INCH DATA TIME"
1741  007064  012737  010476  010406  MOV     #MSG4,MESAGE
1742  007072  012700  007620          MOV     #TM3,%0
1743  007076  004737  010010          JSR     %7,TYPTIM       ;PRINT "WRITE SHUTDOWN"
1744  007102  012737  010654  010406  MOV     #MSG9,MESAGE
1745  007110  012700  007644          MOV     #TM4,%0
1746  007114  004737  010010          JSR     %7,TYPTIM       ;PRINT "BACKSPACE SHUTDOWN"
1747  007120  012737  010702  010406  MOV     #MSG10,MESAGE
1748  007126  012700  007714          MOV     #TM6,%0
1749  007132  004737  010010          JSR     %7,TYPTIM       ;PRINT "READ SHUTDOWN"
1750  007136  004737  007402          JSR     %7,ST1S
1751  007142  012737  011343  010406  T13:    MOV     #MSG27,MESAGE
1752  007150  004737  010266          JSR     %7,TOP          ;PRINT "END OF TIMING"
1753  007154  013700  000042          MOV     @#42,%0
1754  007160  001405                  BEQ     HERE
1755  007162  000005                  RESET
1756  007164  004710                  SENDAD: JSR     %7,(%0)
1757  007166  000240                  NOP
1758  007170  000240                  NOP
1759  007172  000240                  NOP
1760  007174  000240                  HERE:   NOP
1761  007176  000000                  HALT
1762  007200  000137  001120          JMP     STO
1763
1764                                  ;RESET DRIVE SELECTION TO LOWEST NUMBER
1765
1766  007204  005037  007314          RSFDRV: CLR     CDRIVE          ;START WITH DRIVE 0
1767  007210  012737  100000  007316  MOV     #100000,CDRVBT  ;INITIALIZE FOR 0
1768  007216  033737  007316  007320  RSF1:   BIT     CDRVBT,DRIVES   ;MASK WITH SELECTED DRIVES
1769  007224  001006                  BNE     RSF2
1770  007226  005237  007314          INC     CDRIVE          ;+1 TO DRIVE NUMBER
1771  007232  000241                  CLC
1772  007234  006037  007316          ROR     CDRVBT          ;MOVE MASK BIT TO NEXT DRIVE
1773  007240  000766                  BR      RSF1
1774  007242  004737  007324          RSF2:   JSR     %7,GTNINE       ;CHECK 9 TRACK
1775  007246  000207                  RTS     %7
```

```
                                        ;SELECT NEXT DRIVE IN SEQUENCE
                                        ;SKIP FIRST EXIT ADDRESS IF LAST DRIVE SELECTED

007250  005237  007314        CHGDRV: INC     CDRIVE          ;+1 TO DRIVE
007254  000241                        CLC
007256  006037  007316                ROR     CDRVBT          ;MOVE MASK BIT TO NEXT DRIVE
007262  001005                        BNE     CHG1
007264  004737  007204                JSR     %7,RSFDRV       ;RESET TO LOWEST DRIVE
007270  062716  000002                ADD     #2,(6)          ;+2 TO SKIP FIRST EXIT
007274  000207                        RTS     %7              ;EXIT
007276  033737  007316  007320  CHG1:  BIT     CDRVBT,DRIVES   ;MASK WITH SELECTED DRIVES
007304  001761                        BEQ     CHGDRV          ;CHECK FOR NEXT DRIVE
007306  004737  007324                JSR     %7,GTNINE       ;CHECK 9 TRACK
007312  000207                        RTS     %7
007314  000000          CDRIVE: 0
007316  000000          CDRVBT: 0
007320  000000          DRIVES: 0
007322  000000          FDRIVE: 0

                                        ;CHECK FOR NINE TRACK DRIVES

007324  013737  007314  007322  GTNINE: MOV     CDRIVE,FDRIVE
007332  000337  007322                SWAB    FDRIVE          ;POSITION UNIT SELECT BITS
007336  042737  174377  007322        BIC     #174377,FDRIVE  ;CLEAR ALL OTHER BITS
007344  032737  000010  007314        BIT     #10,CDRIVE      ;TEST FOR 9 TRACK
007352  001403                        BEQ     GNT1            ;NO
007354  052737  020000  007322        BIS     #20000,FDRIVE   ;YES SET 9 TRACK BIT
007362  000207                GNT1:   RTS     %7

                                        ;INITIALIZE BYTE COUNT AND CURRENT ADDRESS FOR WRITE

007364  012777  172110  171412  WRINT:  MOV     #-BLENTH,@BC
007372  012777  012136  171406          MOV     #WBUF,@CA
007400  000207                        RTS     %7

                                        ;STORE 1'S IN WRITE BUFFER

007402  012700  012136          ST1S:   MOV     #WBUF,%0
007406  012720  177777          ST1SA:  MOV     #-1,(0)+
007412  022700  020030                  CMP     #WBUF+BLENTH+2,%0
007416  001373                        BNE     ST1SA
007420  000207                        RTS     %7

                                        ;START REWIND OPERATIONS

007422  013777  007322  171352  STRREW: MOV     FDRIVE,@MTC     ;SELECT DRIVE
007430  105777  171346                TSTB    @MTC
007434  100375                        BPL     .-4             ;WAIT FOR CU READY
007436  006077  171336                ROR     @MTS
007442  103375                        BCC     .-4             ;WAIT FOR TAPE UNIT READY
007444  052777  000017  171330        BIS     #17,@MTC        ;GO REWIND
007452  105777  171324                TSTB    @MTC
007456  100375                        BPL     .-4             ;WAIT FOR CONTROL UNIT READY
007460  000207                        RTS     %7

                                        ;WAIT FOR REWIND TO FINISH
```

```
1832
1833  007462  013777  007322  171312  WATREW: MOV     FDRIVE,@MTC
1834  007470  006077  171304                  ROR     @MTS
1835  007474  103375                          BCC     .-4
1836  007476  032777  000040  171274          BIT     #40,@MTS        ;IS BOT SET?
1837  007504  001006                          BNE     1$              ;YES
1838  007506  012737  011745  010406          MOV     #MSG29,MESAGE
1839  007514  004737  010266                  JSR     %7,TOP
1840  007520  000000                          HALT                    ;ERROR, NOT AT BOT AFTER REWIND
1841  007522  000207                  1$:     RTS     %7
1842
1843                                  ;KEEP COUNT OF ELAPSED TIME
1844                                  ;EXIT EVERY 100 USEC
1845
1846  007524  005777  171262          TIMER:  TST     @MTRD
1847  007530  100375                          BPL     .-4
1848  007532  005777  171254                  TST     @MTRD
1849  007536  100775                          BMI     .-4
1850  007540  005237  007546                  INC     TIME            ;+1 TO 100 USEC COUNT
1851  007544  000207                          RTS     %7
1852  007546  000000                  TIME:   0
1853  007550  000000                  TM1:    0
1854          007574                          .=TM1+20.
1855  007574  000000                  TM2:    0
1856          007620                          .=TM2+20.
1857  007620  000000                  TM3:    0
1858          007644                          .=TM3+20.
1859  007644  000000                  TM4:    0
1860          007670                          .=TM4+20.
1861  007670  000000                  TM5:    0
1862          007714                          .=TM5+20.
1863  007714  000000                  TM6:    0
1864          007740                          .=TM6+20.
1865  007740  000000                  TM7:    0
1866          007764                          .=TM7+20.
1867  007764  000000                  TM8:    0
1868          010010                          .=TM8+20.
```

```
                                        ;PRINT TITLE OF TEST EXECUTED AND THE DRIVE TIMES
                                        
010010  004737  010266          TYPTIM: JSR     %7,TOP          ;PRINT TITLE
010014  012037  010244          TYPT0:  MOV     (0)+,VALUE      ;GET TIME
010020  022737  177777  010244          CMP     #-1,VALUE       ;FINISHED TIME BUFFER
010026  001001                          BNE     .+4
010030  000207                          RTS     %7
010032  012737  010256  010254          MOV     #DECPNT+2,DECPNT;INITIALIZE DECIMAL VALUE POINTER
010040  012737  000040  010252          MOV     #40,ZERO        ;INITIALIZE SPACE
010046  012737  177774  010246          MOV     #-4,DIGCNT      ;DIGIT COUNT
010054  012737  177777  010250  TYPT1:  MOV     #-1,DIGIT       ;INITIAL VALUE
010062  005237  010250          TYPT2:  INC     DIGIT           ;+1 TO VALUE
010066  167737  000162  010244          SUB     @DECPNT,VALUE   ;SUBTRACT CONSTANT
010074  100372                          BPL     TYPT2           ;NOT NEGATIVE YET
010076  067737  000152  010244          ADD     @DECPNT,VALUE   ;RESTORE LAST POSITIVE VALUE
010104  004737  010174                  JSR     %7,DECOUT       ;PRINT DECIMAL DIGIT
010110  005237  010246                  INC     DIGCNT          ;+1 TO DIGIT COUNT
010114  001006                          BNE     TYP2A
010116  012737  010444  010406          MOV     #MSG2B,MESAGE
010124  004737  010266                  JSR     %7,TOP
010130  000731                          BR      TYPT0
010132  022737  177777  010246  TYP2A:  CMP     #-1,DIGCNT      ;CHECK FOR DECIMAL PLACE
010140  001011                          BNE     TYPT3           ;NO
010142  105777  170654                  TSTB    @TPS
010146  100375                          BPL     .-4
010150  012777  000056  170646          MOV     #'.,@TPB                ;PRINT DECIMAL POINT
010156  012737  000060  010252          MOV     #60,ZERO
010164  062737  000002  010254  TYPT3:  ADD     #2,DECPNT       ;+2 TO DECIMAL VALUE POINTER
010172  000730                          BR      TYPT1           ;DO AGAIN
                                        
010174  005737  010250          DECOUT: TST     DIGIT           ;IS DIGIT 0
010200  001004                          BNE     DEC1            ;NO
010202  013737  010252  010250          MOV     ZERO,DIGIT      ;SUPPRESS LEADING ZEROS
010210  000406                          BR      DEC2
010212  012737  000060  010252  DEC1:   MOV     #60,ZERO        ;INITIALIZE ZERO AFTER SOME VALUE FOUND
010220  052737  000060  010250          BIS     #60,DIGIT       ;CONVERT TO ANSCII
010226  105777  170570          DEC2:   TSTB    @TPS
010232  100375                          BPL     .-4
010234  013777  010250  170562          MOV     DIGIT,@TPB      ;PRINT
010242  000207                          RTS     %7
010244  000000                  VALUE:  0
010246  000000                  DIGCNT: 0
010250  000000                  DIGIT:  0
010252  000040                  ZERO:   40                      ;CONTAINS ZERO OR SPACE
010254  010256                  DECPNT: .+2
001750                                  1000.
000144                                  100.
000012                                  10.
000001                                  1.
```

```
                                        ;TELETYPE OUTPUT PACKAGE
                                        
010266  142777  000177  170526  TOP:    BICB    #177,@TPS       ;CLEAR FLAGS
010274  117737  000106  010404          MOVB    @MESAGE,EOMK    ;SAVE MESSAGE DELIMETER
010302  005237  010406                  INC     MESAGE          ;+2 TO POINTER
010306  127737  000074  010404  TOP1:   CMPB    @MESAGE,EOMK    ;IS CHARACTER THE 2ND DELIMETER
010314  001001                          BNE     .+4             ;NO
010316  000207                          RTS     %7              ;YES ENT
010320  127727  000062  000100          CMPB    @MESAGE,#'@     ;IS CHARACTER AN @ INDICATING A CARRIAGE RETURN
010326  001411                          BEQ     TOP3            ;YES
010330  105777  170466                  TSTB    @TPS
010334  100375                          BPL     .-4
010336  117777  000044  170460          MOVB    @MESAGE,@TPB    ;PRINT CHARACTER
010344  005237  010406          TOP2:   INC     MESAGE          ;+2 TO POINTER
010350  000756                          BR      TOP1            ;LOOP
                                        
                                        ;CARRIAGE RETURN, LINE FEED
                                        
010352  105777  170444          TOP3:   TSTB    @TPS
010356  100375                          BPL     .-4
010360  112777  000215  170436          MOVB    #215,@TPB
010366  105777  170430                  TSTB    @TPS
010372  100375                          BPL     .-4
010374  112777  000212  170422          MOVB    #212,@TPB
010402  000760                          BR      TOP2
010404  000000          EOMK:   0
```

```
1944  010406  000000                        MESAGE: 0
1945  010410  040057  052506  041516  MSG2:   .ASCII  ;/@FUNCTION        /;
1946  010416  044524  047117  020040
1947  010424  020040  020040  020040
1948  010432  027440
1949  010434  020057  047125  052111  MSG2A:  .ASCII  ;/ UNIT /;
1950  010442  027440
1951  010444  020057  027440          MSG2B:  .ASCII  ;/  /;
1952  010450  040057  051127  052111  MSG3:   .ASCII  ;/@WRITE FROM BOT     /;
1953  010456  020105  051106  046517
1954  010464  041040  052117  020040
1955  010472  020040  027440
1956  010476  040057  051127  052111  MSG4:   .ASCII  ;/@WRITE SHUTDOWN     /;
1957  010504  020105  044123  052125
1958  010512  047504  047127  020040
1959  010520  020040  027440
1960  010524  040057  051127  052111  MSG5:   .ASCII  ;/@WRITE START        /;
1961  010532  020105  052123  051101
1962  010540  020124  020040  020040
1963  010546  020040  027440
1964  010552  040057  042523  052124  MSG6:   .ASCII  ;/@SETTLE DOWN DELAY  /;
1965  010560  042514  042040  053517
1966  010566  020116  042504  040514
1967  010574  020131  027440
1968  010600  040057  051127  052111  MSG7:   .ASCII  ;/@WRITE TO ERASE HEAD/;
1969  010606  020105  047524  042440
1970  010614  040522  042523  044040
1971  010622  040505  027504
1972  010626  040057  051127  052111  MSG8:   .ASCII  ;/@WRITE NONSTOP GAP  /;
1973  010634  020105  047516  051516
1974  010642  047524  020120  040507
1975  010650  020120  027440
1976  010654  040057  040502  045503  MSG9:   .ASCII  ;/@BACKSPACE SHUTDOWN /;
1977  010662  050123  041501  020105
1978  010670  044123  052125  047504
1979  010676  047127  027440
1980  010702  040057  042522  042101  MSG10:  .ASCII  ;/@READ SHUTDOWN      /;
1981  010710  051440  052510  042124
1982  010716  053517  020116  020040
1983  010724  020040  027440
1984  010730  040057  040507  051520  MSG11:  .ASCII  ;/@GAPS SHOULD = 8>7>6>5>4>3, 3=2=1 (1.5)/;
1985  010736  051440  047510  046125
1986  010744  020104  020075  037070
1987  010752  037067  037066  037065
1988  010760  037064  026063  031440
1989  010766  031075  030475  024040
1990  010774  027061  024465     057
1991  011001     057  043500  050101  MSG11A: .ASCII  ;/@GAP 1             /;
1992  011006  030440  020040  020040
1993  011014  020040  020040  020040
1994  011022  020040  020040     057
1995  011027     057  053500  044522  MSG12:  .ASCII  ;/@WRITE XIRG        /;
1996  011034  042524  054040  051111
1997  011042  020107  020040  020040
1998  011050  020040  020040     057
1999  011055     057  051100  040505  MSG13:  .ASCII  ;/@READ FROM BOT DELAY/;
```

```
2000  011062  020104  051106  046517
2001  011070  041040  052117  042040
2002  011076  046105  054501      057
2003  011103      057  046100  051501  MSG14:  .ASCII  ;/@LAST CHAR TO CU RDY/;
2004  011110  020124  044103  051101
2005  011116  052040  020117  052503
2006  011124  051040  054504      057
2007  011131      057  053500  044522  MSG15:  .ASCII  ;/@WRITE EOF          /;
2008  011136  042524  042440  043117
2009  011144  020040  020040  020040
2010  011152  020040  020040      057
2011  011157      057  042500  051117  MSG16:  .ASCII  ;/@EOR TO EOF SP TIME /;
2012  011164  052040  020117  047505
2013  011172  020106  050123  052040
2014  011200  046511  020105      057
2015  011205      057  051500  040520  MSG18:  .ASCII  ;/@SPACE SHUTDOWN     /;
2016  011212  042503  051440  052510
2017  011220  042124  053517  020116
2018  011226  020040  020040      057
2019  011233      057  025100  043052  MSG19:  .ASCII  ;/@**FUNCTIONS AT 556 BPI/;
2020  011240  047125  052103  047511
2021  011246  051516  040440  020124
2022  011254  032465  020066  050102
2023  011262  027511
2024  011264  040057  047117  020105  MSG20:  .ASCII  ;/@ONE INCH DATA TIME /;
2025  011272  047111  044103  042040
2026  011300  052101  020101  044524
2027  011306  042515  027440
2028  011312  040057  025052  052506  MSG21:  .ASCII  ;/@**FUNCTIONS AT 200 BPI/;
2029  011320  041516  044524  047117
2030  011326  020123  052101  031040
2031  011334  030060  041040  044520
2032  011342      057
2033  011343      057  025100  025052  MSG27:  .ASCII  ;/@**********END OF TIMING**********@/;
2034  011350  025052  025052  025052
2035  011356  025052  047105  020104
2036  011364  043117  052040  046511
2037  011372  047111  025107  025052
2038  011400  025052  025052  025052
2039  011406  025052  027500
2040  011412  040057  052100  026115  MSG28:  .ASCII  ;/@@TM,A,B-11:TU10,N,W/TE10N,W DRIVE FUNCTION TIMER (DZTME-D);
2041  011420  026101  026502  030461
2042  011426  052072  030525  026060
2043  011434  026116  027527  042524
2044  011442  030061  042116  020127
2045  011450  051104  053111  020105
2046  011456  052506  041516  044524
2047  011464  047117  052040  046511
2048  011472  051105  024040  055104
2049  011500  046524  026505  024504
2050  011506  052100  030525  020060          .ASCII  ;@TU10 TIMING INFO REFERENCE 6.2;
2051  011514  044524  044515  043516
2052  011522  044440  043116  020117
2053  011530  042522  042506  042522
2054  011536  041516  020105  027066
2055  011544      062
```

```
2056  011545  000100  042524  030061          .ASCII  ;@TE10W (M8926) TIMING INFO REFERENCE 6.3;
2057  011552  020127  046450  034470
2058  011560  033062  020051  044524
2059  011566  044515  043516  044440
2060  011574  043116  020117  042522
2061  011602  042506  042522  041516
2062  011610  020105  027066  000063
2063  011615  000100  052524  030061          .ASCII  ;@TU10W (M8926) TIMING INFO REFERENCE 6.4;
2064  011622  020127  046450  034470
2065  011630  033062  020051  044524
2066  011636  044515  043516  044440
2067  011644  043116  020117  042522
2068  011652  042506  042522  041516
2069  011660  020105  027066  000064
2070  011665  000100  052524  030061          .ASCII  ;@TU10N/TE10N (M8927) TIMING INFO REFERENCE 6.5@/;
2071  011672  027516  042524  030061
2072  011700  020116  046450  034470
2073  011706  033462  020051  044524
2074  011714  044515  043516  044440
2075  011722  043116  020117  042522
2076  011730  042506  042522  041516
2077  011736  020105  027066  040065
2078  011744  000057
2079  011745  000057  040100  051105  MSG29:  .ASCII  ;/@@ERROR-NOT AT BOT AFTER REWIND-HALT@@/;
2080  011752  047522  026522  047516
2081  011760  020124  052101  041040
2082  011766  052117  040440  052106
2083  011774  051105  051040  053505
2084  012002  047111  026504  040510
2085  012010  052114  040100  000057
2086  012015  000057  040100  047514  MSG30:  .ASCII  ;/@@LOC.176 MUST BE LOADED PRIOR TO EXECUTION-HALT@@/;
2087  012022  027103  033461  020066
2088  012030  052515  052123  041040
2089  012036  020105  047514  042101
2090  012044  042105  050040  044522
2091  012052  051117  052040  020117
2092  012060  054105  041505  052125
2093  012066  047511  026516  040510
2094  012074  052114  040100  000057
2095  012101  000057  040100  040503  MSG31:  .ASCII  ;/@@CANNOT TEST LOAD MEDIUM@@/;
2096  012106  047116  052117  052040
2097  012114  051505  020124  047514
2098  012122  042101  046440  042105
2099  012130  052511  040115  027500
2100                                          .EVEN
2101  012136  000000                  WBUF:   0
2102          000001                          .END
```

BC	001004	841#	911	943	974*	978	992*	997	999	1060*	1147*	1174*	1299*	1373*
		1411*	1419*	1426*	1429	1452*	1461	1498*	1516	1545*	1566*	1633*	1650	1659
		1678*	1697*	1807*										
BLENTH=	005670	806#	1807	1815										
CA	001006	842#	905	937	975*	993*	1040	1228	1301	1312	1341	1374*	1412*	1453*
		1459	1499*	1506	1567*	1634*	1641	1698*	1808*					
CC	001030	851#	860*											
CDRIVE	007314	1766*	1770*	1779*	1790#	1797	1800							
CDRVBT	007316	1767*	1768	1772*	1781*	1786	1791#							
CHGDRV	007250	875	878	894	918	952	969	972	982	985	1006	1013	1016	1088
		1101	1104	1127	1205	1241	1320	1331	1350	1361	1365	1393	1400	1468
		1587	1721	1779#	1787									
CHG1	007276	1782	1786#											
DECOUT	010174	1884	1899#											
DECPNT	010254	1876*	1881	1883	1896*	1913#								
DEC1	010212	1900	1903#											
DEC2	010226	1902	1905#											
DIGCNT	010246	1878*	1885*	1890	1910#									
DIGIT	010250	887*	888*	889*	890*	893	1879*	1880*	1899	1901*	1904*	1907	1911#	
DRIVES	007320	868*	1768	1786	1792#									
EOMK	010404	1921*	1923	1943#										
FDRIVE	007322	887	902	934	976	994	1030	1054	1077	1108	1135	1148	1155	1218
		1284	1293	1298	1310	1339	1375	1413	1455	1494	1501	1568	1629	1636
		1699	1793#	1797*	1798*	1799*	1802*	1821	1833					
GNT1	007362	1801	1803#											
GTNINE	007324	1774	1788	1797#										
HERE	007174	1754	1760#											
MESAGE	010406	861*	865*	870*	883*	885*	922*	925*	956*	959*	1009*	1093*	1096*	1244*
		1246*	1250*	1254*	1258*	1262*	1266*	1270*	1274*	1324*	1327*	1355*	1396*	1473*
		1477*	1480*	1600*	1602*	1605*	1608*	1611*	1614*	1733*	1735*	1738*	1741*	1744*
		1747*	1751*	1838*	1887*	1921	1922*	1923	1926	1930	1931*	1944#		
MSG10	010702	1096	1614	1747	1980#									
MSG11	010730	1244	1984#											
MSG11A	011001	1243*	1246	1249*	1250	1253*	1254	1257*	1258	1261*	1262	1265*	1266	1269*
		1270	1273*	1274	1991#									
MSG12	011027	1327	1995#											
MSG13	011055	1355	1999#											
MSG14	011103	2003#												
MSG15	011131	1396	2007#											
MSG16	011157	1473	2011#											
MSG18	011205	1477	2015#											
MSG19	011233	1600	2019#											
MSG2	010410	883	1945#											
MSG2A	010434	885	1949#											
MSG2B	010444	1887	1951#											
MSG20	011264	1480	1605	1738	2024#									
MSG21	011312	1733	2028#											
MSG27	011343	1751	2033#											
MSG28	011412	861	2040#											
MSG29	011745	1838	2079#											
MSG3	010450	922	1602	1735	1952#									
MSG30	012015	870	2086#											
MSG31	012101	865	2095#											
MSG4	010476	925	1608	1741	1956#									
MSG5	010524	956	1324	1960#										
MSG6	010552	959	1964#											

DZTMED.SRC 19-AUG-77 08:33 CROSS REFERENCE TABLE -- USER SYMBOLS

```
MSG7    010600  1009  1968#
MSG8    010626  1972#
MSG9    010654  1093  1611  1744  1976#
MTC     001002   840#   902*   903*   934*   935*   976*   977*   980*   994*   995*  1030*  1031*  1039*
                1046  1054*  1055*  1056   1061*  1062*  1077*  1078*  1108*  1109*  1110   1116*  1117
                1122*  1123  1135*  1136*  1137   1142*  1143   1148*  1149*  1150   1155*  1156*  1157
                1169*  1170  1175*  1176*  1177   1182*  1183*  1184   1218*  1219*  1221   1227*  1284*
                1285   1289*  1292*  1293*  1298*  1300*  1310*  1311*  1339*  1340*  1346   1375*  1376*
                1377   1381*  1382*  1383   1413*  1414*  1415   1420*  1421*  1422   1427*  1428*  1455*
                1458*  1501*  1502*  1539*  1540*  1541   1546*  1547*  1562   1568*  1569*  1636*  1637*
                1672*  1673*  1674   1679*  1680*  1699*  1700*  1821*  1822   1826*  1827   1833*
MTD     001010   843#
MTRD    001012   844#  1846  1848
MTS     001000   839#   913   945   947*  1004*  1033   1048*  1058*  1064   1068   1072*  1079   1081
                1085*  1112*  1119*  1125*  1139*  1145*  1152*  1159*  1172*  1179*  1186*  1202*  1223*
                1237*  1287*  1290   1295*  1305*  1316*  1348*  1352*  1379*  1387*  1417*  1424*  1431
                1433*  1437   1445   1450*  1456*  1528   1537*  1543*  1549   1553   1564*  1570   1572
                1661   1670*  1676*  1684   1686   1695*  1701   1708   1824*  1834*  1836
MTV     001026   850#
MULBAK  003160  1174#  1189
MULWRT  003134  1168#  1193  1197  1201
MUL1    003276  1191  1194#
MUL2    003314  1195  1198#
MUL3    003332  1199  1202#
RSFDRV  007204   873   930  1766#  1783
RSF1    007216  1768#  1773
RSF2    007242  1769  1774#
R10     001032   852#  1164*  1188*  1192*  1196*  1200*  1220*  1235*
R11     001034   853#  1161*  1190*
R12     001036   854#  1162*  1194*
R13     001040   855#  1163*  1198*
STACK = 001000   805#   859
START   001046   837    859#
STRREW  007422   874    968   981   1012   1100   1204   1239   1319   1360   1392   1467   1586   1821#
STO     001120   864    868#  1762
ST1     001150   874#   876
ST1S    007402   896   1024  1099   1277   1358   1617   1750   1813#
ST1SA   007406  1814#  1616
ST2     001162   877#   879
ST3     001206   885#   895
SWITCH  000176   834#   868
SWR     001014   845#
TIME    007546   904*   909   910*   917   936*   941   942*   951   996*  1003  1028*  1044  1045*
                1074  1076*  1087   1226*  1232   1297*  1307   1308*  1318   1337*  1345   1372*  1391
                1410*  1439*  1440   1441*  1449   1454*  1466   1500*  1510   1511*  1520   1521*  1532
                1533*  1557   1558*  1576   1577   1578*  1635*  1645   1646*  1654   1655*  1665   1666*
                1690   1691*  1706   1707*  1712   1850*  1852#
TIMER   007524    907    915   939    949   1001   1042   1070   1083   1230   1303   1314   1343   1385
                1389   1435  1447   1463   1508   1518   1530   1555   1574   1643   1652   1663   1688
                1710  1846#
TKB     001020   847#
TKS     001016   846#
TM1     007550   899    923   931    957   991    1010   1025   1216   1247   1281   1325   1336   1356
                1371  1397  1407   1474  1486   1603   1621   1736  1853#  1854
TM2     007574   900    926   932    960  1026   1094   1251   1282   1328   1408   1478   1487   1606
                1622  1739  1855#  1856
```

TM3	007620	1027	1097	1255	1409	1481	1488	1609	1623	1742	1857#	1858		
TM4	007644	1259	1489	1612	1624	1745	1859#	1860						
TM5	007670	1263	1490	1625	1861#	1862								
TM6	007714	1267	1491	1615	1626	1748	1863#	1864						
TM7	007740	1271	1865#	1866										
TM8	007764	1275	1867#	1868										
TOP	010266	862	866	871	884	886	1245	1601	1734	1752	1839	1871	1888	1920#
TOP1	010306	1923#	1932											
TOP2	010344	1931#	1942											
TOP3	010352	1927	1936#											
TP8	001024	849#	893*	1894*	1907*	1930*	1938*	1941*						
TPS	001022	848#	891	1892	1905	1920*	1928	1936	1939					
TYPTIM	010010	924	927	958	961	1011	1095	1098	1248	1252	1256	1260	1264	1268
		1272	1276	1326	1329	1357	1398	1475	1479	1482	1604	1607	1610	1613
		1616	1737	1740	1743	1746	1749	1871#						
TYPT0	010014	1872#	1889											
TYPT1	010054	1879#	1897											
TYPT2	010062	1880#	1882											
TYPT3	010164	1891	1896#											
TYP2A	010132	1886	1890#											
T1	001274	899#												
T1A	001304	901#	919											
T1B	001330	905#	908											
T1C	001346	906	909#											
T1D	001364	913#	916											
T1E	001402	914	917#											
T10	004676	1407#												
T10A	004712	1410#	1469											
T10B	005042	1429#	1430											
T10C	005052	1431#	1436											
T10CC	005076	1434	1437#											
T10D	005112	1432	1438	1440#										
T10E	005130	1445#	1448											
T10F	005146	1446	1449#											
T10G	005232	1461#	1464											
T10H	005246	1462	1466#											
T11	005352	1486#												
T11A	005406	1493#	1590											
T11AA	005426	1495	1497#											
T11B	005470	1506#	1509											
T11C	005506	1507	1510#											
T11D	005516	1516#	1519											
T11E	005532	1517	1520#											
T11F	005550	1528#	1531											
T11G	005566	1529	1532#											
T11GA	005660	1549#	1550											
T11H	005674	1553#	1556											
T11J	005712	1554	1557#											
T11JA	005766	1570#	1571											
T11K	005776	1572#	1575											
T11L	006014	1573	1576#											
T11P	006032	1496	1580#											
T11R	006046	1579	1586#											
T11T	001044	857#	1492*	1497*	1598	1627*	1632*	1731						
T12	006250	1599	1621#											
T12A	006304	1628#	1724											

```
T12B    006366          1641#   1644
T12C    006404          1642    1645#
T12D    006414          1650#   1653
T12E    006430          1651    1654#
T12F    006446          1661#   1664
T12G    006464          1662    1665#
T12GA   006562          1684#   1685
T12H    006572          1686#   1689
T12J    006610          1687    1690#
T12JA   006656          1701#   1702
T12K    006666          1703#
T12L    006674          1706#
T12M    006704          1708#   1711
T12N    006722          1709    1712#
T12P    006730          1631    1715#
T12R    006744          1713    1721#
T13     007142           867    1732    1751#
T2      001460           930#
T2A     001474           933#    953
T2B     001520           937#    940
T2C     001536           938     941#
T2D     001564           947#    950
T2E     001600           948     951#
T3      001656           968#    970
T3A     001670           971#    973
T3B     001702           974#    983
T3C     001760           984#    986
T3D     001776           992#   1007
T3E     002042           999#   1002
T3F     002056          1000    1003#
T3G     002120          1012#   1014
T3H     002132          1015#   1017
T4      002144          1024#
T4A     002232          1040#   1043
T4AA    002164          1028#   1089
T4B     002250          1041    1044#
T4BA    002354          1064#   1065
T4C     002370          1068#   1071
T4D     002406          1069    1072#
T4DA    002444          1079#   1080
T4E     002454          1081#   1084
T4F     002472          1082    1085#
T4FA    002566          1100#   1102
T4FB    002600          1103#   1105
T4FC    002614          1107#   1128
T4G     002732          1134#   1206
T5      003360          1214#   1242
T5A     003422          1221#   1236
T5B     003452          1228#   1231
T5C     003470          1229    1232#
T5DRV   001042           856#   1212*   1217    1240*
T6      004000          1281#
T6A     004010          1283#   1321
T6B     004130          1301#   1304
T6C     004146          1302    1305#
T6D     004204          1312#   1315
```

```
T6E     004222  1313   1316#
T6F     004312  1330#  1332
T7      004324  1336#
T7A     004330  1337#  1351
T7B     004354  1341#  1344
T7C     004372  1342   1345#
T8      004454  1360#  1362
T8A     004472  1364#  1366
T9      004504  1371#
T9A     004510  1372#  1394
T9B     004574  1383#  1386
T9C     004624  1388   1391#
T9D     004664  1399#  1401
VALUE   010244  1872*  1873   1881*  1883*  1909#
WATREW  007462   877    971    984   1015   1103   1214   1330   1364   1399   1493   1628   1833#
WBUF    012136   905    937    975    993   1040   1228   1301   1312   1341   1374   1412   1453   1459
                1499   1506   1567   1634   1641   1698   1808   1813   1815   2101#
WRINT   007364   901    933   1029   1038   1053   1075   1107   1115   1121   1134   1141   1154   1168
                1181   1215   1225   1283   1294   1309   1338   1807#
ZERO    010252  1877*  1895*  1901   1903*  1912#
$ENDAD  007164   820   1756#
$SVPC = 000042   818#   823
.     = 012140   810#   811    813#   818    819#   821#   823#   833#   836#   838#   892    912    944
                946    979    998   1005   1034   1047   1049   1057   1059   1073   1086   1111   1113
               1118   1120   1124   1126   1138   1140   1144   1146   1151   1153   1158   1160   1171
               1173   1178   1180   1185   1187   1203   1222   1224   1238   1286   1288   1291   1296
               1306   1317   1347   1349   1353   1378   1380   1416   1418   1423   1425   1451   1457
               1460   1538   1542   1544   1563   1565   1588   1589   1630   1660   1671   1675   1677
               1696   1722   1723   1823   1825   1828   1835   1847   1849   1854#  1856#  1858#  1860#
               1862#  1864#  1866#  1868#  1874   1893   1906   1913   1924   1929   1937   1940
```

```
COMMEN      1#
ENDCOM      1#
ESCAPE      1#
GETPRI      1#
GETSWR      1#
MULT        1#
NEWTST      1#
POP         1#
PUSH        1#
REPORT      1#
SETPRI      1#
SETUP       1#
SKIP        1#
SLASH       1#
STARS       1#    816
SWRSU       1#
TYPBIN      1#
TYPDEC      1#
TYPNAM      1#
TYPNUM      1#
TYPOCS      1#
TYPOCT      1#
TYPTXT      1#
$$ESCA      1#
$$NEWT      1#
$$SKIP      1#
.EQUAT      1#
.HEADE      1#
.KT11       1#
.SETUP      1#
.SWRHI      1#
.SACTI      1#    808#    814
.SAPTB      1#
.SAPTH      1#
.SAPTY      1#
.SASTA      1#
.SCATC      1#
.SCMTA      1#
.SD82D      1#
.SD820      1#
.SDIV       1#
.SEOP       1#
.SERRO      1#
.SERRT      1#
.SMULT      1#
.SPOWE      1#
.SRAND      1#
.SRODE      1#
.SROOC      1#
.SREAD      1#
.SR2AZ      1#
.SSAVE      1#
.SSB2D      1#
.SSB20      1#
.SSCOP      1#
.SSIZE      1#
```

```
.$SUPR      1#
.$TRAP      1#
.$TYPB      1#
.$TYPD      1#
.$TYPE      1#
.$TYPO      1#
.$40CA      1#
.1170       1#

. ABS.  012140     000

 ERRORS DETECTED:  0

 DZTMED,DZTMED/CRF/SOL/DOC=DZTMED.SML,DZTMED.SRC
 RUN-TIME: 8 10 .6 SECONDS
 RUN-TIME RATIO: 77/19=3.9
 CORE USED:  38K  (75 PAGES)

 DOCUMENT PAGES:  56
```