```
                        .REPT   2
```

IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DZTMD-E-D

PRODUCT NAME: TM11 DRIVE FUNCTION TIMER

PROGRAM DATE: MARCH 1976

MAINTAINER: DIAGNOSTIC ENGINEERING

AUTHOR: JOHN RODENHISER/JIM LACEY/B. BURGESS/RON PLATUKIS

1. ABSTRACT

THE TM11 DRIVE FUNCTION TIMER ASSISTS IN THE TESTING OF THE TM11 CONTROL UNIT AND TU10 TAPE UNIT. SELECTED 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 TAPE UNITS (7 AND 9 CHANNEL) MAY BE SELECTED.

2. REQUIREMENTS

2.1 EQUIPMENT

PDP-11 WITH TM11 CONTROL UNIT AND 1 TO 8 TU10 TAPE UNITS (ANY COMBINATION OF 7 AND 9 CHANNEL UNITS).

2.2 STORAGE

2.2.1 PROGRAM STORAGE

THE PROGRAM REQUIRES 4K OF MEMORY.

3. LOADING PROCEDURE

3.1 METHOD

PROCEDURE FOR NORMAL BINARY TAPES SHOULD BE FOLLOWED

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

4. STARTING PROCEDURE

4.1 BEFORE STARTING PROGRAM SET LOC. 176 WITH THE

DESIRED CONTROL SETTINGS.

BITS 15-8 ARE USED TO INDICATE THE TU10 TAPE UNIT CONFIGURATION.

15=1	HAVE UNIT	8	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	8	SELECTED,	9 TRACK
6=1	"	1	"	"
5=1	"	2	"	"
4=1	"	3	"	"

```
                                3=1        "    4     "        "
                                2=1        "    5     "        "
                                1=1        "    6     "        "
                                0=1        "    7     "        "
```

C1

```
                                4.2     STARTING ADDRESS

                                        200

                                4.3     PROGRAM AND/OR OPERATOR ACTION

                                        LOAD PROGRAM INTO MEMORY.
                                        SET DESIRED TU10 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.  "WRITE NONSTOP GAP" SHOULD APPROXIMATELY EQUAL THE SUM OF
                                            "WRITE SHUTDOWN" & "WRITE START".
                                        B.  "BACKSPACE SHUTDOWN" MUST BE = "WRITE START".
                                        C.  "READ SHUTDOWN" MUST BE < "WRITE SHUTDOWN".
                                        D.  GAPS MUST = 8>7>6>5>4>1, 1-2 < 1.7, 2=3(+1.1, -0.2).
                                        E.  "WRITE EOF" SHOULD BE SLIGHTLY > "WRITE XIRG".
```

6.2 TIME LIMITS AND PRINTOUT FORMAT

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	189.0	(15.0)	SAME	
WRITE SHUTDOWN	2.3	(0.8)	SAME	
WRITE START	8.9	(0.4)	12.6	(0.5)
SETTLE DOWN DELAY	12.8	(4.0)	SAME	
WRITE TO ERASE HEAD	11.8	(4.0)	SAME	
WRITE NONSTOP GAP	11.5	(2.0)	14.9	(2.0)
BACKSPACE SHUTDOWN	1.8	(0.3)	6.2	(0.5)
READ SHUTDOWN	1.8	(0.3)	SAME	
GAPS SHOULD = 8>7>6>5>4>1, 1=2 < 1.7, 2=3 (=1.1, =0.2..				
GAP 1	14.5	SEE	28.8	
GAP 2	13.6	NOTE	19.8	
GAP 3	13.6	ABOVE	19.8	
GAP 4	18.1		27.8	
GAP 5	21.6		35.1	
GAP 6	25.1		42.3	
GAP 7	28.8		48.9	
GAP 8	32.4		56.3	
WRITE START	8.9	(0.4)	12.6	(0.5)
WRITE XIRG	95.8	(10.8)	SAME	
READ FROM BOT DELAY	98.8	(10.8)	SAME	
LAST CHAR TO CU RDY	.4	(0.1)	.4	(0.1)
WRITE EOF	188.8	(10.8)	SAME	
EOR TO EOF SP TIME	188.8	(10.8)	SAME	
SPACE SHUTDOWN	1.8	(0.3)	SAME	
ONE INCH DATA TIME	22.3	(1.8)	SAME	
*FUNCTIONS AT 556 BPI				
WRITE FROM BOT	.8		189.8	(15.8)
ONE INCH DATA TIME	.8		22.8	(0.8)
WRITE SHUTDOWN	.8		1.8	(1.8)
BACKSPACE SHUTDOWN	.8		6.2	(0.5)
LAST CHAR TO CU RDY	.8		.5	(0.1)
READ SHUTDOWN	.8		1.8	(0.3)
*FUNCTIONS AT 288 BPI				
WRITE FROM BOT	.8		189.8	(15.8)
ONE INCH DATA TIME	.8		22.8	(1.8)
WRITE SHUTDOWN	.8		2.3	(0.8)
BACKSPACE SHUTDOWN	.8		6.2	(0.5)
LAST CHAR TO CU RDY	.8		1.3 TO 1.6	(0.1)
READ SHUTDOWN	.8		1.8	(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 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

                                        TM11 INSTRUCTION TEST MUST RUN WITHOUT ERRORS BEFORE ATTEMPTING
                                        TO OPERATE THIS PROGRAM.

                                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 "CU READY" BECOMES A 1, INDICATING THE END OF THE
                                            RECORD, MONITOR "SETTLEDOWN" UNTIL IT BECOMES A 1.
                                        C.  THE TIME FROM "CU READY" 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     WRITE NONSTOP GAP

                        WRITE NONSTOP GAP IS EQUIVALENT TO THE SUM OF "WRITE SHUTDOWN"
                        AND "WRITE START" AND IS THE TIME NECESSARY TO INSURE THAT THE
                        INTERRECORD GAP WILL BE AT LEAST 1/2 OF AN INCH WHEN WRITING
                        NON-STOP.

                        PROCEDURE TO MEASURE TIME:

                        A.  TAPE 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" TO BECOME A 1 AND THEN REPEAT STEPS B
                            AND C,
                        E.  MONITOR CURRENT MEMORY ADDRESS REGISTER TO DETERMINE WHEN
                            2ND BYTE IS OUTPUT,
                        F.  TIME FROM THE 2ND "GO" COMMAND UNTIL 2ND BYTE OF 2ND
                            RECORD IS OUTPUT IS "WRITE NONSTOP GAP",
```

```
                                9.7     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 FUNCTION, 800 BPI, SET "GO"
                                C.  AFTER RECORD IS WRITTEN WAIT FOR "TU READY".
                                D.  SET BYTE RECORD COUNTER TO BACKSPACE 1 RECORD.
                                E.  ISSUE BACKSPACE FUNCTION, SET "GO".
                                F.  AFTER "CU READY" BECOMES A 1, INDICATING THE BEGINNING OF
                                    THE RECORD, MONITOR "SETTLEDOWN" UNTIL IT BECOMES A 1.
                                G.  THE TIME FROM "CU READY" UNTIL "SETTLEDOWN" IS "BACKSPACE
                                    SHUTDOWN".

                                9.8     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 "CU READY" BECOMES A 1, INDICATING THE END OF THE
                                    RECORD, MONITOR "SETTLEDOWN" UNTIL IT BECOMES A 1.
                                E.  THE TIME FROM "CU READY" UNTIL "SETTLEDOWN" IS "READ
                                    SHUTDOWN"
```

9.9 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 NONSTOP.
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 (NONSTOP).

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>1, 1-2<1.7, 2=3(+1.1, -0.2).

9.10 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.

9.11 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 3/9 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".

9.12 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".

```
                        9.13    LAST CHARACTER TO CU READY

                                LAST CHARACTER TO CU READY IS THE AMOUNT OF TIME IT TAKES FOR
                                THE CONTROL TO SENSE 3 MISSING BYTES ON TAPE (END OF RECORD)
                                UNTIL "CU READY" BECOMES A 1.

                                PROCEDURE TO MEASURE TIME:

                                A.  PROGRAM READS SAME RECORD THAT WAS WRITTEN DURING "WRITE
                                    XIRG".
                                B.  INITIALIZE BYTE RECORD COUNTER AND CURRENT MEMORY ADDRESS
                                    REGISTER.
                                C.  ISSUE READ FUNCTION, 800 BPI, SET "GO".
                                D.  WAIT UNTIL BYTE RECORD COUNTER EQUALS 0 AND THEN MONITOR "CU
                                    READY" UNTIL IT BECOMES A 1.
                                E.  THE TIME FROM BYTE RECORD COUNTER = 0 UNTIL "CU READY" = 1
                                    IS "LAST CHARACTER INPUT UNTIL CU READY".

                        9.14    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 "CU READY" TO BECOME A 1.
                                G.  THE TIME FROM "GO" UNTIL "CU READY" IS "WRITE EOF".
```

```
546
547
548
549                             9.15    EOR TO EOF SPACE TIME
550
551                                     EOR TO EOF SPACE TIME IS THE TIME NEEDED TO MOVE TAPE FROM THE
552                                     END OF A RECORD TO AN END OF FILE MARK WRITTEN AFTER IT.  THE
553                                     PROCEDURE USED TURNS OUT TO BE A TEST OF THE WRITE AND ERASE HEAD
554                                     POLARITIES.  IF THE TIME PRINTED IS EQUAL TO ZERO IT IS AN INDICA-
555                                     TION THAT THE EOF WAS NOT FOUND WHEN "CU READY" BECAME A 1.
556
557                                     THIS COULD INDICATE ONE OR MORE OF THE FOLLOWING PROBLEMS:
558
559                                     1.  ERASE HEAD POLARITY REVERSED.
560                                     2.  ERASE HEAD CURRENT NOT SUFFICIENT TO FULLY SATURATE TAPE.
561                                     3.  ONE OR MORE OF WRITE HEAD TRACKS POLARITY REVERSED.
562                                     4.  ONE OR MORE SENSITIVE READ AMPLIFIERS.
563                                     5.  WRITE EOF FUNCTION DIDN'T REALLY WRITE AN EOF MARK.
564                                         OTHERWISE "EOR TO EOF SPACE TIME" SHOULD BE SLIGHTLY LARGER
565                                         THAN "WRITE EOF".
566
567                                     PROCEDURE TO MEASURE TIME:
568
569                                     A.  A RECORD AND EOF WAS PREVIOUSLY WRITTEN FROM BOT FOR "WRITE
570                                         EOF" (REFERENCE 9.14).
571                                     B.  TAPE IS REWOUND TO BOT.
572                                     C.  REWRITE RECORD OVER PREVIOUSLY WRITTEN RECORD.
573                                     D.  BACKSPACE OVER RECORD JUST WRITTEN.
574                                     E.  SET BYTE RECORD COUNTER TO SPACE 2 RECORDS.
575                                     F.  ISSUE SPACE FORWARD FUNCTION, SET "GO".
576                                     G.  WAIT FOR BYTE RECORD COUNTER TO INDICATE THAT 1ST RECORD
577                                         HAS BEEN SPACED OVER THEN MONITOR "CU READY" UNTIL IT BECOMES
578                                         A 1,  AFTER "CU READY" CHECK TO SEE IF "EOF" IS A 1
579                                         IN STATUS REGISTER.  IF "EOF" NOT SET THEN ZERO TIME COUNTER.
580                                     H.  TIME FROM BYTE RECORD COUNTER 0-1 UNTIL "CU READY" IS "EOR
581                                         TO EOF SPACE TIME".
582
583                             9.16    SPACE SHUTDOWN
584
585                                     SPACE SHUTDOWN IS THE AMOUNT OF TIME NECESSARY TO
586                                     CONTINUE MOVING TAPE AFTER A RECORD IS SPACED OVER IN THE
587                                     FORWARD DIRECTION FOR THE SAME REASONS AS "READ SHUTDOWN"
588                                     (REFERENCE 9.8).
589
590                                     PROCEDURE TO MEASURE TIME:
591
592                                     A.  SPACE FORWARD FUNCTION USED TO TIME "EOR TO EOF SPACE TIME"
593                                         IS USED.
594                                     B.  AFTER "CU READY" BECOMES A 1, INDICATING THE END OF THE
595                                         RECORD (EOF), MONITOR "SETTLEDOWN" UNTIL IT BECOMES A 1.
596                                     C.  THE TIME FROM "CU READY" UNTIL "SETTLEDOWN" IS "SPACE
597                                         SHUTDOWN".
```

M1

9.17 ONE INCH DATA TIME

ONE INCH OF DATA, 833 BYTES (ALSO 556 AND 267 IF 7 CHANNEL UNIT), IS WRITTEN AND TIMED TO DETERMINE 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"

9.18 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.

9.19 FUNCTIONS AT 200 BPI

SAME AS ABOVE,
REFERENCE 9.18, "FUNCTIONS AT 556 BPI".

```
                                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
```

```
                                        .TITLE  MAINDEC-11-D2TMD-E      TM-11 DRIVE FUNCTION TIMER
                                        ;COPYRIGHT 1971, 1976 DIGITAL EQUIPMENT CORP., MAYNARD, MASS, 01754
                                        ;REVISED MARCH 1973
                                        ;REVISED TO REV,C AUG., 1973 BY BRUCE BURGESS - DIAGNOSTIC ENGINEERING
                                        ;                   THE FOLLOWING CHANGES MAKE UP REV,C :
                                        ;       (A) BECAUSE CONTROL UNIT READY NOW OCCURS AFTER SETTLEDOWN
                                        ;           THE "WAIT FOR CU READY" LOOPS IN SECTIONS 'T1C', 'T2C',
                                        ;           'T4B', 'T4D', AND 'T10C' WERE DELETED,
                                        ;       (B)  ALSO, IN SECTION
                                        ;           'T10F', INSTRUCTIONS WERE ADDED FOR THE PROGRAM TO WAIT
                                        ;           FOR CU READY BEFORE ISSUING THE NEW COMMAND; OTHERWISE,
                                        ;           AN ILLEGAL COMMAND ERROR (ILC) WILL RESULT
                                        ;REVISED TO REV, D MARCH, 1974
                                        ;       (A) ALL OF "A" ABOVE WAS REPLACED,
                                        ;

                                        ;REVISED FEB 1976 REV E
                                        ;       (A) MADE TO WORK WITHOUT HARDWARE SWITCH REGISTER

                                        ;LOAD PAPERTAPE BINARY USING ABS LOADER
                                        ;SET LCC. 176 TO REFLECT TAPE UNIT CONFIGURATION
                                        ;LOAD ADDRESS 200, PRESS START
                                        ;
            001000                      STACK=1000
            005670                      BLENTH=3000,
                                                .ENABL  ABS
            000000                              .=0
                                        ;TRAP CATCHER FROM 0 TO 1000



                                        ;CONTROL SETTING LOCATION-MUST BE SET TO RUN PROPERLY
            000176                              .=176
  000176    000000                      SWREG:  0

            000200                              .=200
  000200    000167  000642                      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                      SR:     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
  001036    000000                      R12:    0
  001040    000000                      R13:    0
  001042    000000                      T5CRV:  0
```

C2

```
748  001044  000000          T11T:   .
749  001046  012706  001000  START:  MOV     #STACK,%6       ;INITIALIZE STACK
750  001052  012777  000340  177750          MOV     #340,@CC                ;SET PRIORITY LEVEL 7
751  001060  012767  010052  000762          MOV     #MSG1,MESAGE
752  001066  004767  000636                  JSR     %7,TOP          ;PRINT PROGRAM TITLE
753  001072  016767  177100  005662  ST0:    MOV     SWREG,DRIVES    ;SAVE DRIVES SELECTED
754  001100  001006                          BNE     1$
755  001102  012767  011223  000740          MOV     #MSG29,MESAGE
756  001110  004767  000614                  JSR     %7,TOP          ;ERROR-NO CONFIGURATION SELECTED
757  001114  000000                          HALT
758  001116  004767  005524          1$:     JSR     %7,RSFDRV       ;RESET DRIVES
759  001122  004767  005736          ST1:    JSR     %7,STRREW       ;START REWIND
760  001126  004767  005560                  JSR     %7,CHGDRV       ;DONE ALL DRIVES?
761  001132  000773                          BR      ST1             ;NO
762  001134  004767  005764          ST2:    JSR     %7,WATREW       ;WAIT FOR BOT
763  001140  004767  005546                  JSR     %7,CHGDRV       ;DONE ALL DRIVES?
764  001144  000773                          BR      ST2             ;NO
765                                   ;PRINT HEADER
766  001146  012767  010137  000674          MOV     #MSG2,MESAGE
767  001154  004767  000550                  JSR     %7,TOP          ;PRINT "FUNCTION"
768  001160  012767  010163  000662  ST3:    MOV     #MSG2A,MESAGE
769  001166  004767  000536                  JSR     %7,TOP          ;PRINT "UNIT"
770  001172  016767  005566  000512          MOV     FDRIVE,DIGIT
771  001200  000367  000586                  SWAB    DIGIT
772  001204  042767  177770  000580          BIC     #177770,DIGIT
773  001212  052767  000060  000472          BIS     #60,DIGIT
774  001220  105777  177576                  TSTB    @TPS
775  001224  100375                          BPL     .-4
776  001226  016777  000460  177570          MOV     DIGIT,@TPB      ;PRINT DRIVE "NUMBER"
777  001234  004767  005452                  JSR     %7,CHGDRV       ;DONE ALL DRIVES?
778  001240  000747                          BR      ST3             ;NO
779  001242  004767  005576                  JSR     %7,$T1S         ;STORE ONES IN WRITE BUFFER
780                                   ;TIME WRITE FROM BOT DELAY, AND WRITE SHUTDOWN
781  001246  012700  007212          T1:     MOV     #TM1,%0         ;INITIALIZE TIME BUFFERS
782  001252  012701  007236                  MOV     #TM2,%1
783  001256  004767  005544          T1A:    JSR     %7,WRINT
784  001262  016777  005476  177512          MOV     FDRIVE,@MTC     ;SELECT DRIVE
785  001270  052777  040005  177504          BIS     #40005,@MTC     ;800 BPI, WRITE, GO
786  001276  005067  005706                  CLR     TIME
787  001302  022777  011344  177476  T1B:    CMP     #WBUF+2,@CA     ;IS 2ND WORD OUTPUT?
788  001310  003403                          BLE     T1C             ;YES
789  001312  004767  005650                  JSR     %7,TIMER        ;NO, COUNT TIME
790  001316  000771                          BR      T1B
791  001320  016720  005664          T1C:    MOV     TIME,(0)+       ;SAVE "WRITE FROM BOT DELAY" TIME
792  001324  005067  005660                  CLR     TIME
793  001330  105777  177446                  TSTB    @MTC
794  001334  100375                          BPL     .-4
795  001336  032777  000010  177434  T1D:    BIT     #10,@MTS        ;HAS SETTLEDOWN SET?
796  001344  001003                          BNE     T1E             ;YES
797  001346  004767  005614                  JSR     %7,TIMER        ;NO, COUNT TIME
798  001352  000771                          BR      T1D
799  001354  016721  005630          T1E:    MOV     TIME,(1)+       ;SAVE "WRITE SHUTDOWN" TIME
800  001360  004767  005326                  JSR     %7,CHGDRV       ;DONE ALL DRIVES
801  001364  000734                          BR      T1A             ;NO
802  001366  012720  177777                  MOV     #-1,(0)+        ;TERMINATE TIMES
803  001372  012721  177777                  MOV     #-1,(1)+        ;TERMINATE TIMES
```

D2

```
 796  001376  012767  010177  000444          MOV     #MSG3,MESAGE
 797  001404  012708  007212                  MOV     #TM1,%0
 798  001410  004767  000036                  JSR     %7,TYPTIM       ;PRINT "WRITE FROM BOT DELAY" TIMES
 799  001414  012767  010225  000426          MOV     #MSG4,MESAGE
 800  001422  012708  007236                  MOV     #TM2,%0
 801  001426  004767  000020                  JSR     %7,TYPTIM       ;PRINT "WRITE SHUTDOWN" TIMES
 802                                  ;TIME WRITE START AND SETTLEDOWN DELAY
 803  001432  004767  000210          T2:     JSR     %7,RSFDRV       ;RESET DRIVE SELECTION
 804  001436  012700  007212                  MOV     #TM1,%0
 805  001442  012701  007236                  MOV     #TM2,%1
 806  001446  004767  000354          T2A:    JSR     %7,WRINT
 807  001452  016777  000326  177322          MOV     FDRIVE,@MTC     ;SELECT DRIVE
 808  001460  052777  040005  177314          BIS     #40005,@MTC     ;800 BPI, WRITE, GO
 809  001466  005067  000516                  CLR     TIME
 810  001472  022777  011344  177306  T2B:    CMP     #WBUF+2,@CA     ;IS 2ND WORD OUTPUT
 811  001500  003403                          BLE     T2C             ;YES
 812  001502  004767  000460                  JSR     %7,TIMER        ;NO, COUNT TIME
 813  001506  000771                          BR      T2B
 814  001510  016720  000474          T2C:    MOV     TIME,(0)+       ;SAVE "WRITE START" TIME
 815  001514  005067  000470                  CLR     TIME
 816  001520  105777  177256                  TSTB    @MTC
 817  001524  100375                          BPL     .-4
 818  001526  032777  000010  177244          BIT     #10,@MTS
 819  001534  001774                          BEQ     .-6             ;WAIT FOR SETTLEDOWN TO SET
 820  001536  006077  177236          T2D:    ROR     @MTS
 821  001542  103403                          BCS     T2E             ;WAIT FOR TU READY
 822  001544  004767  000416                  JSR     %7,TIMER
 823  001550  000772                          BR      T2D
 824  001552  016721  000432          T2E:    MOV     TIME,(1)+       ;SAVE "SETTLEDOWN" TIME
 825  001556  004767  000130                  JSR     %7,CHGDRV
 826  001562  000731                          BR      T2A
 827  001564  012720  177777                  MOV     #-1,(0)+        ;TERMINATE TIMES
 828  001570  012721  177777                  MOV     #-1,(1)+        ;TERMINATE TIMES
 829  001574  012767  010253  000246          MOV     #MSG5,MESAGE
 830  001602  012708  007212                  MOV     #TM1,%0
 831  001606  004767  000040                  JSR     %7,TYPTIM       ;PRINT "WRITE START" TIMES
 832  001612  012767  010361  000230          MOV     #MSG6,MESAGE
 833  001620  012708  007236                  MOV     #TM2,%0
 834  001624  004767  000022                  JSR     %7,TYPTIM       ;PRINT "SETTLEDOWN" TIMES
 835                                  ;TIME WRITE TO ERASE HEAD
 836                                  ;LONG RECORD WAS PREVIOUSLY WRITTEN
 837                                  ;WRITE A 3 BYTE RECORD AND POWER CLEAR
 838                                  ;DISTANCE FROM NEW DATA TO OLD IS
 839                                  ;ERASE HEAD DISTANCE
 840  001630  004767  000230          T3:     JSR     %7,STRREW       ;START REWIND
 841  001634  004767  000052                  JSR     %7,CHGDRV       ;DONE ALL DRIVES?
 842  001640  000773                          BR      T3              ;NO
 843  001642  004767  000256          T3A:    JSR     %7,WATREW       ;IS DRIVE AT BOT?
 844  001646  004767  000040                  JSR     %7,CHGDRV       ;DONE ALL DRIVES
 845  001652  000773                          BR      T3A             ;NO
 846  001654  012777  177775  177122  T3B:    MOV     #-3,@BC         ;3 BYTE RECORD
 847  001662  012777  011342  177116          MOV     #WBUF,@CA       ;INITIALIZE CURRENT ADDRESS
 848  001670  016777  000070  177104          MOV     FDRIVE,@MTC     ;SELECT DRIVE
 849  001676  052777  040005  177076          BIS     #40005,@MTC     ;800BPI, WRITE, GO
 850  001704  005777  177074                  TST     @BC
 851  001710  001375                          BNE     .-4
```

```
 852  001712  052777  010000  177262          BIS     #10000,@MTC     ;POWER CLEAR
 853  001720  004767  005140                  JSR     %7,STRREW       ;START REWIND
 854  001724  004767  004762                  JSR     %7,CHGDRV       ;DONE ALL DRIVES
 855  001730  000751                          BR      T3B             ;NO
 856  001732  004767  005166          T3C:    JSR     %7,WATREW       ;DRIVE AT BOT
 857  001736  004767  004750                  JSR     %7,CHGDRV       ;DONE ALL DRIVES
 858  001742  000773                          BR      T3C             ;NO
 859                                  ;NOW THAT ALL DRIVES ARE AT BOT AGAIN
 860                                  ;READ OVER PARTIAL RECORD
 861  001744  012700  007212                  MOV     #TM1,%0
 862  001750  012777  177775  177026  T3D:    MOV     #-3,@BC
 863  001756  012777  011342  177022          MOV     #WBUF,@CA
 864  001764  016777  004774  177010          MOV     FDRIVE,@MTC     ;SELECT DRIVE
 865  001772  052777  040003  177002          BIS     #40003,@MTC     ;800BPI, READ, GO
 866  002000  005067  005204                  CLR     TIME            ;CLEAR TIME
 867  002004  022777  177777  176772          CMP     #-1,@BC
 868  002012  001374                          BNE     .-6
 869  002014  005777  176764          T3E:    TST     @BC             ;WAIT FOR NEXT WORD IN
 870  002020  001403                          BEQ     T3F             ;HAVE IT
 871  002022  004767  005140                  JSR     %7,TIMER        ;NO, COUNT TIME
 872  002026  000772                          BR      T3E
 873  002030  016720  005154          T3F:    MOV     TIME,(0)+       ;SAVE "WRITE TO ERASE HEAD TIME"
 874  002034  004767  004652                  JSR     %7,CHGDRV       ;DONE ALL DRIVES
 875  002040  000743                          BR      T3D             ;NO
 876  002042  012720  177777                  MOV     #-1,(0)+        ;TERMINATE TIMES
 877  002046  012767  010327  005774          MOV     #MSG7,MESAGE
 878  002054  012700  007212                  MOV     #TM1,%0
 879  002060  004767  005366                  JSR     %7,TYPTIM       ;PRINT "WRITE TO ERASE HEAD TIMES"
 880  002064  004767  004774          T3G:    JSR     %7,STRREW       ;START REWIND
 881  002070  004767  004616                  JSR     %7,CHGDRV       ;DONE ALL DRIVES
 882  002074  000773                          BR      T3G             ;NO
 883  002076  004767  005022          T3H:    JSR     %7,WATREW       ;DRIVE AT BOT
 884  002102  004767  004604                  JSR     %7,CHGDRV       ;DONE ALL DRIVES
 885  002106  000773                          BR      T3H             ;NO
 886                                  ;TIME WRITE NONSTOP GAP, BACKSPACE SHUTDOWN AND READ SHUTDOWN
 887                                  ;WRITE ONE RECORD, FOLLOW WITH ONE RECORD NONSTOP
 888                                  ;FOLLOWED BY ONE RECORD START-STOP
 889                                  ;FOLLOWED BY WRITE-BACKSPACE-READ-WRITE
 890                                  ;FOLLOWED BY WRITE-BACKSPACE-WRITE
 891  002110  004767  004730          T4:     JSR     %7,ST1S
 892  002114  012700  007212                  MOV     #TM1,%0         ;INITIALIZE TIME BUFFERS
 893  002120  012701  007236                  MOV     #TM2,%1
 894  002124  012702  007262                  MOV     #TM3,%2
 895  002130  005067  005054          T4AA:   CLR     TIME
 896  002134  004767  004666                  JSR     %7,WRINT
 897  002140  016777  004620  176634          MOV     FDRIVE,@MTC     ;TRACK AND DRIVE NUMBERS
 898  002146  052777  040005  176626          BIS     #40005,@MTC     ;800 BPI, WRITE, GO
 899  002154  105777  176622                  TSTB    @MTC
 900  002160  100375                          BPL     .-4             ;WAIT FOR CU READY
 901                                  ;HAVE FIRST RECORD WRITTEN, GO NONSTOP
 902  002162  004767  004640                  JSR     %7,WRINT
 903  002166  005277  176610                  INC     @MTC            ;GO
 904  002172  022777  011344  176606  T4A:    CMP     #WBUF+2,@CA     ;IS 2ND WORD OUTPUT?
 905  002200  003403                          BLE     T4B             ;YES
 906  002202  004767  004760                  JSR     %7,TIMER        ;NO, COUNT TIME
 907  002206  000771                          BR      T4A
```

```
                                ;WRITE-BACKSPACE-READ-WRITE
002234  004767  004566          T4G:    JSR     %7,WRINT
002240  016777  004520  176534          MOV     FDRIVE,@MTC     ;DRIVE SELECT
002246  052777  040005  176526          BIS     #40005,@MTC     ;800 BPI, WRITE, GO
002254  105777  176522          T4G1:   TSTB    @MTC
002260  100375                          BPL     .-4             ;WAIT FOR CU READY
002262  012777  177777  176514          MOV     #-1,@BC         ;BACKSPACE 1 RECORD
002270  042777  000016  176504          BIC     #16,@MTC
002276  052777  000013  176476          BIS     #13,@MTC        ;SPACE REVERSE, GO
002304  105777  176472          T4C1:   TSTB    @MTC
002310  100375                          BPL     .-4
002312  032777  000010  176460          BIT     #10,@MTS        ;HAS SETTLEDOWN SET?
002320  001003                          BNE     T4D             ;YES
002322  004767  004640                  JSR     %7,TIMER        ;NO, COUNT TIME
002326  000771                          BR      T4C
002330  006077  176444          T4D:    ROR     @MTS
002334  103375                          BCC     .-4             ;WAIT FOR TU READY
002336  016721  004646                  MOV     TIME,(1)+       ;SAVE "BACKSPACE SHUTDOWN" TIME
002342  004767  004460                  JSR     %7,WRINT
002346  005067  004636                  CLR     TIME
002352  016777  004466  176422          MOV     FDRIVE,@MTC     ;SELECT DRIVE
002360  052777  040003  176414          BIS     #40003,@MTC     ;800 BPI, READ, GO
002366  105777  176410          T4E1:   TSTB    @MTC
002372  100375                          BPL     .-4
002374  032777  000010  176376          BIT     #10,@MTS        ;HAS SETTLEDOWN SET?
002402  001003                          BNE     T4F             ;YES
002404  004767  004556                  JSR     %7,TIMER        ;NO, COUNT TIME
002410  000771                          BR      T4E
002412  006077  176362          T4F:    ROR     @MTS
002416  103375                          BCC     .-4             ;WAIT FOR TU READY
002420  016722  004564                  MOV     TIME,(2)+       ;SAVE "READ SHUTDOWN" TIME
002424  004767  004262                  JSR     %7,CHGDRV
002430  000637                          BR      T4AA
002432  012720  177777                  MOV     #-1,(0)+        ;TERMINATE TIMES
002436  012721  177777                  MOV     #-1,(1)+        ;TERMINATE TIMES
002442  012722  177777                  MOV     #-1,(2)+        ;TERMINATE TIMES
002446  012767  010355  005374          MOV     #MSG8,MESAGE
002454  012700  007212                  MOV     #TM1,%0
002460  004767  004766                  JSR     %7,TYPTIM       ;PRINT "WRITE NONSTOP GAP" TIMES
002464  012767  010423  005356          MOV     #MSG9,MESAGE
002472  012700  007236                  MOV     #TM2,%0
002476  004767  004750                  JSR     %7,TYPTIM       ;PRINT "BACKSPACE SHUTDOWN" TIMES
002502  012767  010431  005340          MOV     #MSG10,MESAGE
002510  012700  007262                  MOV     #TM3,%0
002514  004767  004732                  JSR     %7,TYPTIM       ;PRINT "READ SHUTDOWN" TIMES
002520  004767  004320                  JSR     %7,ST1S
                                ;WRITE RECORDS TO BE USED IN GAP TEST
002524  004767  004276          T4G:    JSR     %7,WRINT
002530  016777  004230  176244          MOV     FDRIVE,@MTC     ;SELECT DRIVE
002536  052777  040005  176236          BIS     #40005,@MTC     ;800 BPI, WRITE, GO
```

G2

```
 964  002544  105777  176232            TSTB    @MTC
 965  002550  100375                    BPL     .-4             ;WAIT FOR CU READY
 966  002552  004767  004250            JSR     %7,WRINT
 967  002556  005277  176220            INC     @MTC            ;GO NONSTOP
 968  002562  105777  176214            TSTB    @MTC
 969  002566  100375                    BPL     .-4             ;WAIT FOR CU READY
 970  002570  012777  177777  176206    MOV     #-1,@BC
 971  002576  016777  004162  176176    MOV     FDRIVE,@MTC     ;SELECT DRIVE
 972  002604  052777  040013  176170    BIS     #40013,@MTC     ;800 BPI, BACKSPACE, GO
 973  002612  105777  176164            TSTB    @MTC
 974  002616  100375                    BPL     .-4             ;WAIT FOR CU READY
 975  002620  004767  004202            JSR     %7,WRINT
 976  002624  016777  004134  176150    MOV     FDRIVE,@MTC
 977  002632  052777  040005  176142    BIS     #40005,@MTC     ;800 BPI, WRITE, GO
 978  002640  105777  176136            TSTB    @MTC
 979  002644  100375                    BPL     .-4
 980  002646  012767  177777  176160    MOV     #-1,R11         ;INDICATES BACK 3 COMPLETE
 981  002654  012767  177777  176154    MOV     #-1,R12         ;INDICATES BACK 4 COMPLETE
 982  002662  012767  177777  176150    MOV     #-1,R13         ;INDICATES BACK 5 COMPLETE
 983  002670  012767  177776  176134    MOV     #-2,R10         ;FIRST SEQUENCE BACK 2 TIMES
 984                            ;NOW WRITE, BACKSPACE, WRITE, BACKSPACE, WRITE
 985                            ;GAP SHOULD GET LARGER
 986  002676  004767  004124    MULWRT: JSR     %7,WRINT
 987  002702  005277  176074            INC     @MTC            ;GO NONSTOP
 988  002706  105777  176070            TSTB    @MTC
 989  002712  100375                    BPL     .-4             ;WAIT FOR DONE
 990  002714  012777  177777  176062    MULBAK: MOV     #-1,@BC         ;BACKSPACE 1 RECORD
 991  002722  042777  000016  176052            BIC     #16,@MTC
 992  002730  052777  000013  176044            BIS     #13,@MTC        ;SET BACKSPACE, GO
 993  002736  105777  176040            TSTB    @MTC
 994  002742  100375                    BPL     .-4             ;WAIT FOR BACKSPACE DONE
 995  002744  004767  004056            JSR     %7,WRINT
 996  002750  042777  000016  176024            BIC     #16,@MTC
 997  002756  052777  000005  176016            BIS     #5,@MTC         ;SET WRITE, GO
 998  002764  105777  176012            TSTB    @MTC
 999  002770  100375                    BPL     .-4             ;WAIT FOR WRITE DONE
1000  002772  005267  176034            INC     R10             ;BACKSPACED ENOUGH TIMES?
1001  002776  001346                    BNE     MULBAK          ;NO BACKSPACE AND WRITE AGAIN
1002  003000  005267  176030            INC     R11             ;DONE 3 BACKSPACE SEQUENCES?
1003  003004  001004                    BNE     MUL1            ;YES
1004  003006  012767  177775  176016            MOV     #-3,R10
1005  003014  000738                    BR      MULWRT
1006  003016  005267  176014    MUL1:   INC     R12             ;DONE 4 BACKSPACE SEQUENCES?
1007  003022  001004                    BNE     MUL2            ;YES
1008  003024  012767  177774  176000            MOV     #-4,R10
1009  003032  000721                    BR      MULWRT
1010  003034  005267  175770    MUL2:   INC     R13             ;DONE 5 BACKSPACE SEQUENCES?
1011  003040  001004                    BNE     MUL3            ;YES
1012  003042  012767  177773  175762            MOV     #-5,R10
1013  003050  000712                    BR      MULWRT
1014  003052  006077  175722    MUL3:   ROR     @MTS
1015  003056  103375                    BCC     .-4             ;WAIT FOR TU READY
1016  003060  004767  004060            JSR     %7,STRREW       ;START REWIND
1017  003064  004767  003622            JSR     %7,CHGDRV
1018  003070  000615                    BR      T4G
1019                            ;NOW READ NONSTOP
```

H2

```
1228                                    ;ACCUMULATE GAP TIMES ON READ
1221                                    ;TYPE ACCUMULATED TIMES AT END OF READ
1222                                    ;GAP1 SHOULD = GAP2, GAP3 <GAP1 AND GAP2
1223                                    ;GAP4 THRU GAP8 SHOULD GET INCREASINGLY LONGER
1224  003072  005067  175744                 CLR     T5DRV
1225  003076  004767  004022           T5:   JSR     %7,WATREW
1226  003102  004767  003720                 JSR     %7,WRINT
1227  003106  012700  007212                 MOV     #TM1,%0
1228  003112  066700  175724                 ADD     T5DRV,%0
1229  003116  016777  003642  175656        MOV     FDRIVE,@MTC     ;SELECT DRIVE
1230  003124  052777  040003  175650        BIS     #40003,@MTC     ;800 BPI, READ, GO
1231  003132  012767  177770  175672        MOV     #-8.,R10        ;COUNT 8 GAPS
1232  003140  105777  175636           T5A:  TSTB    @MTC
1233  003144  100375                       BPL     .-4             ;WAIT FOR CU READY
1234  003146  004767  003654                 JSR     %7,WRINT
1235  003152  005067  004032                 CLR     TIME
1236  003156  005277  175620                 INC     @MTC            ;GO NONSTOP
1237  003162  022777  011344  175616  T5B:  CMP     #WBUF+2,@CA     ;IS 2ND WORD OUTPUT
1238  003170  003403                       BLE     T5C             ;YES
1239  003172  004767  003770                 JSR     %7,TIMER        ;NO, COUNT TIME
1240  003176  000771                       BR      T5B
1241  003200  016720  004004           T5C:  MOV     TIME,(0)+       ;SAVE GAP TIME
1242  003204  012710  177777                 MOV     #-1,(0)         ;TERMINATE, JUST IN CASE AT END
1243  003210  062700  000022                 ADD     #22,%0          ;STEP GAP POINTER
1244  003214  005267  175612                 INC     R10             ;DONE ALL 8 GAPS?
1245  003220  001347                       BNE     T5A             ;NO
1246  003222  006077  175592                 ROR     @MTS
1247  003226  103375                       BCC     .-4             ;WAIT FOR TU READY
1248  003230  004767  003630                 JSR     %7,STRREW       ;START REWIND
1249  003234  062767  000002  175600        ADD     #2,T5DRV        ;+2 TO DRIVE TIME POINTER
1252  003242  004767  003444                 JSR     %7,CHGDRV
1251  003246  000713                       BR      T5
1252  003250  112767  000061  005276        MOVB    #'1,MSG11A+6
1253  003256  012767  010457  004564        MOV     #MSG11,MESAGE
1254  003264  004767  004440                 JSR     %7,TOP
1255  003270  012767  010546  004552        MOV     #MSG11A,MESAGE
1256  003276  012700  007212                 MOV     #TM1,%0
1257  003302  004767  004144                 JSR     %7,TYPTIM       ;PRINT "GAP 1"
1258  003306  105267  005242                 INCB    MSG11A+6
1259  003312  012767  010546  004530        MOV     #MSG11A,MESAGE
1260  003320  012700  007236                 MOV     #TM2,%0
1261  003324  004767  004122                 JSR     %7,TYPTIM       ;PRINT "GAP 2"
1262  003330  105267  005220                 INCB    MSG11A+6
1263  003334  012767  010546  004506        MOV     #MSG11A,MESAGE
1264  003342  012700  007262                 MOV     #TM3,%0
1265  003346  004767  004100                 JSR     %7,TYPTIM       ;PRINT "GAP 3"
1266  003352  105267  005176                 INCB    MSG11A+6
1267  003356  012767  010546  004464        MOV     #MSG11A,MESAGE
1268  003364  012700  007306                 MOV     #TM4,%0
1269  003370  004767  004056                 JSR     %7,TYPTIM       ;PRINT "GAP 4"
1270  003374  105267  005154                 INCB    MSG11A+6
1271  003400  012767  010546  004442        MOV     #MSG11A,MESAGE
1272  003406  012700  007332                 MOV     #TM5,%0
1273  003412  004767  004034                 JSR     %7,TYPTIM       ;PRINT "GAP 5"
1274  003416  105267  005132                 INCB    MSG11A+6
1275  003422  012767  010546  004420        MOV     #MSG11A,MESAGE
```

```
1076  003430  012700  007356          MOV     #TM6,%0
1077  003434  004767  004012          JSR     %7,TYPTIM       ;PRINT "GAP 6"
1078  003440  105267  005110          INCB    MSG11A+6
1079  003444  012767  010546  004376  MOV     #MSG11A,MESAGE
1080  003452  012700  007402          MOV     #TM7,%0
1081  003456  004767  003770          JSR     %7,TYPTIM       ;PRINT "GAP 7"
1082  003462  105267  005066          INCB    MSG11A+6
1083  003466  012767  010546  004354  MOV     #MSG11A,MESAGE
1084  003474  012700  007426          MOV     #TM8,%0
1085  003500  004767  003746          JSR     %7,TYPTIM       ;PRINT "GAP 8"
1086  003504  004767  003334          JSR     %7,ST1S
1087                                ;TIME WRITE START NOT AT BOT
1088  003510  012700  007212  T6:    MOV     #TM1,%0
1089  003514  012701  007236          MOV     #TM2,%1
1090  003520  004767  003322  T6A:   JSR     %7,WRINT
1091  003524  016777  003234  175258  MOV     FDRIVE,@MTC     ;SELECT DRIVE
1092  003532  105777  175244          TSTB    @MTC
1093  003536  100375                  BPL     .-4
1094  003540  006077  175234          ROR     @MTS
1095  003544  103375                  BCC     .-4             ;WAIT FOR TU READY
1096  003546  052777  046085  175226  BIS     #46085,@MTC     ;800 BPI, WRITE, GO
1097  003554  032777  000040  175216  BIT     #40,@MTS
1098  003562  001374                  BNE     .-6             ;WAIT FOR BOT TO CLEAR
1099  003564  052777  010000  175210  BIS     #10000,@MTC     ;PCMLR CLEAR
1100  003572  016777  003166  175202  MOV     FDRIVE,@MTC
1101  003600  004767  003222          JSR     %7,WRINT
1102  003604  006077  175170          ROR     @MTS
1103  003610  103375                  BCC     .-4             ;WAIT FOR TU READY
1104  003612  005067  003372          CLR     TIME
1105  003616  016777  003142  175156  MOV     FDRIVE,@MTC     ;SELECT DRIVE
1106  003624  052777  046085  175150  BIS     #46085,@MTC     ;800 BPI, WRITE, GO
1107  003632  022777  011344  175146  T6B:   CMP     @WBUF+2,@CA     ;IS 2ND WORD OUTPUT?
1108  003640  003403                  BLE     T6C             ;YES
1109  003642  004767  003320          JSR     %7,TIMER        ;NO, COUNT TIME
1110  003646  000771                  BR      T6B
1111  003650  006077  175124  T6C:   ROR     @MTS
1112  003654  103375                  BCC     .-4             ;WAIT FOR TU READY
1113  003656  016720  003326          MOV     TIME,(0)+       ;SAVE "WRITE START" TIME
1114  003662  005067  003322          CLR     TIME
1115  003666  004767  003134          JSR     %7,WRINT
1116  003672  016777  003066  175102  MOV     FDRIVE,@MTC     ;SELECT DRIVE
1117  003700  052777  046015  175074  BIS     #46015,@MTC     ;800 BPI, WRITE XIRG, GO
1118  003706  022777  011344  175072  T6D:   CMP     @WBUF+2,@CA     ;IS 2ND WORD OUTPUT
1119  003714  003403                  BLE     T6E             ;YES
1120  003716  004767  003244          JSR     %7,TIMER        ;NO COUNT TIME
1121  003722  000771                  BR      T6D
1122  003724  006077  175050  T6E:   ROR     @MTS
1123  003730  103375                  BCC     .-4             ;WAIT FOR TU READY
1124  003732  016721  003252          MOV     TIME,(1)+       ;SAVE "WRITE XIRG" TIME
1125  003736  004767  003122          JSR     %7,STRREW
1126  003742  004767  002744          JSR     %7,CHGDRV
1127  003746  000664                  BR      T6A
1128  003750  012720  177777          MOV     #-1,(0)+        ;TERMINATE TIMES
1129  003754  012721  177777          MOV     #-1,(1)+        ;TERMINATE TIMES
1130  003760  012767  010253  004362  MOV     #MSG5,MESAGE
1131  003766  012700  007212          MOV     #TM1,%0
```

```
1132  003772  004767  003454                JSR     %7,TYPTIM       ;TYPE "WRITE START" TIME
1133  003776  012767  010574  004044        MOV     #MSG12,MESAGE
1134  004004  012700  007236                MOV     #TM2,%0
1135  004010  004767  003436                JSR     %7,TYPTIM       ;TYPE "WRITE XIRC" TIME
1136  004014  004767  003164        T6F:    JSR     %7,WATREW
1137  004020  004767  002666                JSR     %7,CHGDRV
1138  004024  000773                        BR      T6F             ;WAIT FOR ALL DRIVES AT BOT,
1139                                ;NOW TIME "READ FROM BOT DELAY
1140  004026  012700  007212        T7:     MOV     #TM1,%0
1141  004032  005067  003152        T7A:    CLR     TIME
1142  004036  004767  002764                JSR     %7,WRINT
1143  004042  016777  002716  174732        MOV     FDRIVE,@MTC     ;SELECT DRIVE
1144  004050  052777  040003  174724        BIS     #40003,@MTC     ;800 BPI, READ GO
1145  004056  022777  011344  174722  T7B:   CMP     #WBUF+2,@CA     ;IS 2ND WORD INPUT?
1146  004064  003403                        BLE     T7C             ;YES
1147  004066  004767  003074                JSR     %7,TIMER        ;NO COUNT TIME
1148  004072  000771                        BR      T7B
1149  004074  016720  003110        T7C:    MOV     TIME,(0)+       ;SAVE "READ FROM BOT" TIME
1150  004100  105777  174676                TSTB    @MTC
1151  004104  100375                        BPL     .-4             ;WAIT FOR CU READY,
1152  004106  004767  002600                JSR     %7,CHGDRV       ;DONE ALL DRIVES?
1153  004112  000747                        BR      T7A             ;NO
1154  004114  006077  174660                ROR     @MTS
1155  004120  103375                        BCC     .-4
1156  004122  012720  177777                MOV     #-1,(0)+        ;TERMINATE TIMES
1157  004126  012767  010622  003714        MOV     #MSG13,MESAGE
1158  004134  012700  007212                MOV     #TM1,%0
1159  004140  004767  003386                JSR     %7,TYPTIM       ;PRINT "READ FROM BOT" TIME
1160  004144  004767  002674                JSR     %7,$T1S
1161                                ;TIME "LAST CHARACTER INPUT TO CU READY"
1162  004150  012700  007212        T8:     MOV     #TM1,%0
1163  004154  004767  002646        T8A:    JSR     %7,WRINT
1164  004160  005067  003024                CLR     TIME
1165  004164  016777  002574  174610        MOV     FDRIVE,@MTC     ;SELECT DRIVE
1166  004172  052777  040003  174602        BIS     #40003,@MTC     ;800 BPI, READ, GO
1167  004200  005777  174600                TST     @BC
1168  004204  001375                        BNE     .-4             ;WAIT FOR LAST WORD IN
1169  004206  105777  174570        T8B:    TSTB    @MTC            ;IS CU READY?
1170  004212  100403                        BMI     T8C             ;YES
1171  004214  004767  002746                JSR     %7,TIMER        ;NO, COUNT TIME
1172  004220  000772                        BR      T8B
1173  004222  006077  174552        T8C:    ROR     @MTS
1174  004226  103375                        BCC     .-4             ;WAIT FOR TU READY
1175  004230  016720  002754                MOV     TIME,(0)+       ;SAVE "LAST CHAR TO CU READY" TIME
1176  004234  004767  002624                JSR     %7,$TRREW       ;REWIND
1177  004240  004767  002446                JSR     %7,CHGDRV               ;ANYMORE DRIVES?
1178  004244  000743                        BR      T8A             ;NO
1179  004246  012720  177777                MOV     #-1,(0)+        ;TERMINATE TIMES
1180  004252  012767  010650  003570        MOV     #MSG14,MESAGE
1181  004260  012700  007212                MOV     #TM1,%0
1182  004264  004767  003162                JSR     %7,TYPTIM       ;PRINT "LAST CHAR TO CU READY" TIMES
1183  004270  004767  002630        T8D:    JSR     %7,WATREW
1184  004274  004767  002412                JSR     %7,CHGDRV
1185  004300  000773                        BR      T8D
1186                                ;TIME "WRITE EOF"
1187                                ;WRITE A 3 BYTE RECORD FROM BOT FOLLOWED BY AN EOF.
```

K2

```
1188  004302  012700  007212          T9:     MOV     #TM1,%0
1189  004306  005067  002676          T9A:    CLR     TIME
1190  004312  012777  177775  174464          MOV     #-3,,@BC                ;WRITE 3 BYTES
1191  004320  012777  011342  174460          MOV     #WBUF,@CA
1192  004326  016777  002432  174446          MOV     FDRIVE,@MTC     ;SELECT DRIVE
1193  004334  052777  046005  174440          BIS     #46005,@MTC     ;800 BPI, WRITE, GO
1194  004342  105777  174434                  TSTB    @MTC
1195  004346  100375                          BPL     .-4
1196  004350  006077  174424                  ROR     @MTS
1197  004354  103375                          BCC     .-4             ;WAIT FOR TU READY
1198  004356  042777  000016  174416          BIC     #16,@MTC
1199  004364  052777  000007  174410          BIS     #7,@MTC         ;WRITE EOF, GO
1200  004372  105777  174404          T9B:    TSTB    @MTC            ;IS CU READY SET?
1201  004376  100403                          BMI     T9C             ;YES
1202  004400  004767  002562                  JSR     %7,TIMER        ;NO, COUNT TIME
1203  004404  000772                          BR      T9B
1204  004406  016720  002576          T9C:    MOV     TIME,(0)+       ;SAVE "WRITE EOF" TIME
1205  004412  004767  002446                  JSR     %7,STRREW       ;REWIND
1206  004416  004767  002270                  JSR     %7,CHGDRV       ;ANYMORE DRIVES?
1207  004422  000731                          BR      T9A             ;YES
1208  004424  012720  177777                  MOV     #-1,(0)+        ;TERMINATE TIMES
1209  004430  012767  010676  003412          MOV     #MSG19,MESAGE
1210  004436  012700  007212                  MOV     #TM1,%0
1211  004442  004767  003004                  JSR     %7,TYPTIM       ;PRINT "WRITE EOF" TIMES
1212  004446  004767  002452          T9D:    JSR     %7,WATREW
1213  004452  004767  002234                  JSR     %7,CHGDRV
1214  004456  000773                          BR      T9D
1215                                  ;TIME "EOR TO EOF SPACE TIME", "SPACE SHUTDOWN" AND "ONE INCH DATA TIME",
1216                                  ;WRITE A 3 BYTE RECORD OVER ONE PREVIOUSLY WRITTEN
1217                                  ;BACKSPACE 1 RECORD AND THEN SPACE FORWARD 2 RECORDS
1218                                  ;TIME FROM THE END OF FIRST RECORD UNTIL EOF IS REACHED
1219  004460  012700  007212          T10:    MOV     #TM1,%0
1220  004464  012701  007236                  MOV     #TM2,%1
1221  004470  012702  007262                  MOV     #TM3,%2
1222  004474  005067  002518          T10A:   CLR     TIME
1223  004500  012777  177775  174276          MOV     #-3,@BC         ;3 BYTE RECORD
1224  004506  012777  011342  174272          MOV     #WBUF,@CA
1225  004514  016777  002244  174260          MOV     FDRIVE,@MTC     ;SELECT DRIVE
1226  004522  052777  046005  174252          BIS     #46005,@MTC     ;800 BPI, WRITE, GO
1227  004530  105777  174246                  TSTB    @MTC
1228  004534  100375                          BPL     .-4             ;WAIT FOR CU READY
1229  004536  012777  177777  174240          MOV     #-1,@BC         ;BACKSPACE 1 RECORD
1230  004544  042777  000016  174230          BIC     #16,@MTC        ;SELECT DRIVE
1231  004552  052777  000013  174222          BIS     #13,@MTC        ;BACKSPACE, GO
1232  004560  105777  174216                  TSTB    @MTC
1233  004564  100375                          BPL     .-4             ;WAIT FOR CU READY
1234  004566  012777  177776  174210          MOV     #-2,@BC         ;SPACE FORWARD 2 RECORDS
1235  004574  042777  000016  174200          BIC     #16,@MTC
1236  004602  052777  000011  174172          BIS     #11,@MTC        ;SPACE FORWARD, GO
1237  004610  022777  177777  174166  T10B:   CMP     #-1,@BC
1238  004616  001374                          BNE     T10B            ;WAIT FOR 1ST RECORD TO BE SPACED OVER
1239  004620  032777  040000  174152  T10C:   BIT     #40000,@MTS     ;IS EOF SET?
1240  004626  001014                          BNE     T10D            ;YES
1241  004630  105777  174146                  TSTB    @MTC            ;IS CU READY
1242  004634  100403                          BMI     T10CC           ;YES
1243  004636  004767  002324                  JSR     %7,TIMER        ;NO, COUNT TIME
```

L2

```
1244  004642  000766                        BR      T10C
1245  004644  032777  040000  174126  T10CC:  BIT     #40000,@MTS     ;HAVE CU READY
1246  004652  001002                        BNE     T10D            ;IS EOF SET?
1247  004654  005067  002330                CLR     TIME            ;NO, SET ERROR
1248  004660  016720  002324        T10D:   MOV     TIME,(0)+       ;SAVE "EOR TO EOF SPACE TIME"
1249  004664  005067  002320                CLR     TIME
1250  004670  105777  174106                TSTB    @MTC
1251  004674  100375                        BPL     .-4
1252  004676  032777  000010  174074  T10E:  BIT     #10,@MTS        ;IS SETTLEDOWN SET?
1253  004704  001003                        BNE     T10F            ;YES
1254  004706  004767  002254                JSR     %7,TIMER        ;NO, COUNT TIME
1255  004712  000771                        BR      T10E
1256  004714  016721  002270        T10F:   MOV     TIME,(1)+       ;SAVE "SPACE SHUTDOWN" TIME
1257  004720  012777  176340  174056        MOV     #-800.,@BC      ;1 INCH OF DATA
1258  004726  012777  011342  174052        MOV     #WBUF,@CA
1259  004734  005067  002250                CLR     TIME
1260  004740  016777  002020  174034        MOV     FDRIVE,@MTC     ;SELECT DRIVE
1261  004746  105777  174030                TSTB    @MTC            ;WAIT FOR CU READY
1262  004752  100375                        BPL     .-4
1263  004754  052777  040005  174020        BIS     #40005,@MTC     ;800 BPI, WRITE, GO
1264  004762  022777  011344  174016        CMP     #WBUF+2,@CA     ;IS 2ND BYTE OUTPUT
1265  004770  003374                        BGT     .-6             ;NO
1266  004772  005777  174006        T10G:   TST     @BC             ;YES IS LAST BYTE OUT
1267  004776  001403                        BEQ     T10H            ;YES
1268  005000  004767  002162                JSR     %7,TIMER        ;NO, COUNT TIME
1269  005004  000772                        BR      T10G
1270
1271  005006  016722  002176        T10H:   MOV     TIME,(2)+       ;SAVE "ONE INCH DATA TIME"
1272  005012  004767  002046                JSR     %7,STRREW       ;REWIND
1273  005016  004767  001670                JSR     %7,CHGDRV       ;ANYMORE DRIVES?
1274  005022  000624                        BR      T10A            ;YES
1275  005024  012720  177777                MOV     #-1,(0)+        ;TERMINATE TIMES
1276  005030  012721  177777                MOV     #-1,(1)+
1277  005034  012722  177777                MOV     #-1,(2)+
1278  005040  012767  010724  003002        MOV     #MSG16,MESAGE
1279  005046  012700  007212                MOV     #TM1,%0
1280  005052  004767  002374                JSR     %7,TYPTIM       ;PRINT "EOR TO EOF SPACE TIME"
1281                        ;PRINT STATUS
1282  005056  012767  010752  002764        MOV     #MSG18,MESAGE
1283  005064  012700  007236                MOV     #TM2,%0
1284  005070  004767  002356                JSR     %7,TYPTIM       ;PRINT "SPACE SHUTDOWN" TIME
1285  005074  012767  011027  002746        MOV     #MSG20,MESAGE
1286  005102  012700  007262                MOV     #TM3,%0
1287  005106  004767  002340                JSR     %7,TYPTIM       ;PRINT "ONE INCH DATA TIME"
1288                        ;TIME SOME OF PREVIOUS OPERATIONS AT 200 BPI AND 556 BPI
1289  005112  012700  007212        T11:    MOV     #TM1,%0         ;INITIALIZE TIME BUFFERS
1290  005116  012701  007236                MOV     #TM2,%1
1291  005122  012702  007262                MOV     #TM3,%2
1292  005126  012703  007306                MOV     #TM4,%3
1293  005132  012704  007332                MOV     #TM5,%4
1294  005136  012705  007356                MOV     #TM6,%5
1295  005142  005067  173676                CLR     T11T
1296  005146  004767  001752        T11A:   JSR     %7,WAITREW      ;WAIT FOR REWIND
1297  005152  032767  020000  001604        BIT     #20000,FDRIVE   ;IS DRIVE 9 TRACK?
1298  005160  001161                        BNE     T11P            ;YES, GET NEXT DRIVE
1299  005162  012767  177777  173654        MOV     #-1,T11T        ;INDICATE 7 TRACK
```

```
1306  025170  012777  176724  173606          MOV     #-596.,@BC      ;596 BYTES = ONE INCH
1307  025176  012777  011342  173602          MOV     #WBUF,@CA
1308  025204  005067  002000                  CLR     TIME
1309  025210  016777  001550  173564          MOV     FDRIVE,@MTC     ;SELECT DRIVE
1310  025216  052777  020005  173556          BIS     #20005,@MTC     ;556 BPI, WRITE, GO
1311                        ;TIME "WRITE FROM BOT DELAY" AT 556 BPI
1312  025224  022777  011344  173554  T11B:   CMP     #WBUF+2,@CA     ;IS 2ND WORD OUT?
1313  025232  003403                          BLE     T11C            ;YES
1314  025234  004767  001720                  JSR     %7,TIMER        ;NO, COUNT TIME
1315  025240  000771                          BR      T11B
1316  025242  016720  001742          T11C:   MOV     TIME,(0)+       ;SAVE "WRITE FROM BOT DELAY"
1317  025246  005067  001736                  CLR     TIME
1318                        ;TIME "ONE INCH DATA" AT 556 BPI
1319  025252  005777  173526          T11D:   TST     @BC             ;IS BC=0
1320  025256  001403                          BEQ     T11E            ;YES
1321  025260  004767  001702                  JSR     %7,TIMER        ;NO, COUNT TIME
1322  025264  000772                          BR      T11D
1323  025266  016721  001716          T11E:   MOV     TIME,(1)+       ;SAVE "1 INCH DATA" TIME
1324  025272  005067  001712                  CLR     TIME
1325
1326                        ;TIME "WRITE SHUTDOWN" AT 556 BPI
1327  025276  105777  173500                  TSTB    @MTC
1328  025302  100375                          BPL     .-4
1329  025304  032777  000010  173466  T11F:   BIT     #10,@MTS        ;IS SETTLEDOWN SET?
1330  025312  001003                          BNE     T11G            ;YES
1331  025314  004767  001646                  JSR     %7,TIMER        ;NO, COUNT TIME
1332  025320  000771                          BR      T11F
1333  025322  016722  001662          T11G:   MOV     TIME,(2)+       ;SAVE "WRITE SHUTDOWN"
1334  025326  005067  001656                  CLR     TIME
1335                        ;TIME "BACKSPACE SHUTDOWN" AT 556 BPI
1336  025332  012777  177777  173444          MOV     #-1,@BC
1337  025340  042777  000016  173434          BIC     #16,@MTC
1338  025346  052777  000013  173426          BIS     #13,@MTC        ;BACKSPACE 1 RECORD, GO
1339  025354  105777  173422                  TSTB    @MTC
1340  025360  100375                          BPL     .-4             ;WAIT FOR CU READY
1341  025362  032777  000010  173410  T11H:   BIT     #10,@MTS        ;IS SETTLEDOWN SET?
1342  025370  001003                          BNE     T11J            ;YES
1343  025372  004767  001570                  JSR     %7,TIMER        ;NO COUNT TIME
1344  025376  000771                          BR      T11H
1345  025400  016723  001624          T11J:   MOV     TIME,(3)+       ;SAVE "BACKSPACE SHUTDOWN"
1346  025404  005067  001620                  CLR     TIME
1347                        ;TIME "LAST CHAR IN TO MTF" AT 556 BPI
1348  025410  006077  173364                  ROR     @MTS
1349  025414  103375                          BCC     .-4             ;WAIT FOR TU READY
1350  025416  012777  176724  173360          MOV     #-596.,@BC      ;596 BYTES
1351  025424  012777  011342  173354          MOV     #WBUF,@CA
1352  025432  016777  001326  173342          MOV     FDRIVE,@MTC     ;SELECT DRIVE
1353  025440  052777  020003  173334          BIS     #20003,@MTC     ;556 BPI, READ, GO
1354  025446  005777  173332                  TST     @BC
1355  025452  001375                          BNE     .-4             ;WAIT FOR LAST WORD OUT
1356  025454  105777  173322          T11K:   TSTB    @MTC            ;IS CU READY SET?
1357  025460  100403                          BMI     T11L            ;YES
1358  025462  004767  001520                  JSR     %7,TIMER        ;NO COUNT TIME
1359  025466  000772                          BR      T11K
1360  025470  016724  001514          T11L:   MOV     TIME,(4)+       ;SAVE "LAST CHAR IN TO MTF"
1361  025474  005067  001510                  CLR     TIME
```

```
1356  025500  032777  000010  173272  T11M:  BIT   #10,@MTS
1357  025506  001003                        BNE   T11N
1358  025510  004767  001452                JSR   %7,TIMER
1359  025514  000771                        BR    T11M
1360  025516  016725  001466          T11N:  MOV   TIME,(5)+        ;SAVE "READ SHUTDOWN"
1361  025522  000406                        BR    T11R
1362  025524  005020                  T11P:  CLR   (0)+             ;CLEAR TIMES FOR 9 TRACK DRIVES
1363  025526  005021                        CLR   (1)+
1364  025530  005022                        CLR   (2)+
1365  025532  005023                        CLR   (3)+
1366  025534  005024                        CLR   (4)+
1367  025536  005025                        CLR   (5)+
1368  025540  004767  001320          T11R:  JSR   %7,$TRREW
1369  025544  004767  001142                JSR   %7,CHGDRV
1370  025550  000401                        BR    .+4
1371  025552  000402                        BR    .+6
1372  025554  000167  177366                JMP   T11A
1373
1374  025560  012720  177777                MOV   #-1,(0)+        ;TERMINATE DRIVES
1375  025564  012721  177777                MOV   #-1,(1)+
1376  025570  012722  177777                MOV   #-1,(2)+
1377  025574  012723  177777                MOV   #-1,(3)+
1378  025600  012724  177777                MOV   #-1,(4)+
1379  025604  012725  177777                MOV   #-1,(5)+
1380  025610  005767  173230                TST   T11T            ;HAVE TESTED ANY 7 TRACKS
1381  025614  001401                        BEQ   T12             ;NO
1382  025616  012767  011000  002224        MOV   #MSG19,MESAGE   ;PRINT "FUNCTIONS AT 556"
1383  025624  004767  002100                JSR   %7,TOP
1384  025630  012767  010177  002212        MOV   #MSG3,MESAGE
1385  025636  012700  007212                MOV   #TM1,%0
1386  025642  004767  001604                JSR   %7,TYPTIM       ;PRINT "WRITE FROM BOT DELAY"
1387  025646  012767  011027  002174        MOV   #MSG20,MESAGE
1388  025654  012700  007236                MOV   #TM2,%0
1389  025660  004767  001566                JSR   %7,TYPTIM       ;PRINT "ONE INCH DATA TIME"
1390  025664  012767  010225  002156        MOV   #MSG4,MESAGE
1391  025672  012700  007262                MOV   #TM3,%0
1392  025676  004767  001550                JSR   %7,TYPTIM       ;PRINT "WRITE SHUTDOWN"
1393  025702  012767  010403  002140        MOV   #MSG9,MESAGE
1394  025710  012700  007306                MOV   #TM4,%0
1395  025714  004767  001532                JSR   %7,TYPTIM       ;PRINT "BACKSPACE SHUTDOWN"
1396  025720  012767  010650  002122        MOV   #MSG14,MESAGE
1397  025726  012700  007332                MOV   #TM5,%0
1398  025732  004767  001514                JSR   %7,TYPTIM       ;PRINT "LAST CHAR IN TO MTP"
1399  025736  012767  010431  002104        MOV   #MSG10,MESAGE
1400  025744  012700  007356                MOV   #TM6,%0
1401  025750  004767  001476                JSR   %7,TYPTIM       ;PRINT "READ SHUTDOWN"
1402  025754  004767  001864                JSR   %7,$T1S
1403                                  ;TIME OPERATIONS AT 200 BPI
1404  025760  012700  007212          T12:  MOV   #TM1,%0         ;INITIALIZE TIME BUFFERS
1405  025764  012701  007236                MOV   #TM2,%1
1406  025770  012702  007262                MOV   #TM3,%2
1407  025774  012703  007306                MOV   #TM4,%3
1408  026000  012704  007332                MOV   #TM5,%4
1409  026004  012705  007356                MOV   #TM6,%5
1410  026010  005067  173030                CLR   T11T
1411  026014  004767  001124          T12A: JSR   %7,WAITREW       ;WAIT FOR REWIND
```

```
1412  026020  032767  020000  030736          BIT     #20000,FDRIVE   ;IS DRIVE 9 TRACK?
1413  026026  001402                          BEQ     .+6             ;NO
1414  026030  000167  000342                  JMP     T12P            ;YES, GET NEXT DRIVE
1415  026034  012767  177777  173002          MOV     #-1,T11T
1416  026042  012777  177470  172734          MOV     #-200.,@BC      ;556 BYTES @ ONE INCH
1417  026050  012777  011342  172738          MOV     #WBUF,@CA
1418  026056  005067  001126                  CLR     TIME
1419  026062  016777  000676  172712          MOV     FDRIVE,@MTC     ;SELECT DRIVE
1420  026070  052777  000005  172704          BIS     #000005,@MTC    ;200 BPI, WRITE, GO
1421                                  ;TIME "WRITE FROM BOT DELAY" AT 556 BPI
1422  026076  022777  011344  172702  T12B:   CMP     #WBUF+2,@CA     ;IS 2ND WORD OUT?
1423  026104  001403                          BEQ     T12C            ;YES
1424  026106  004767  001054                  JSR     %7,TIMER        ;NO, COUNT TIME
1425  026112  000771                          BR      T12B
1426  026114  016720  001070          T12C:   MOV     TIME,(0)+       ;SAVE "WRITE FROM BOT DELAY"
1427  026120  005067  001064                  CLR     TIME
1428
1429                                  ;TIME "ONE INCH DATA" AT 200 BPI
1430  026124  005777  172654          T12D:   TST     @BC             ;IS DONE
1431  026130  001403                          BEQ     T12E            ;YES
1432  026132  004767  001038                  JSR     %7,TIMER        ;NO, COUNT TIME
1433  026136  000772                          BR      T12D
1434  026140  016721  001044          T12E:   MOV     TIME,(1)+       ;SAVE "1 INCH DATA" TIME
1435  026144  005067  001040                  CLR     TIME
1436                                  ;TIME "WRITE SHUTDOWN" AT 200 BPI
1437  026150  105777  172626                  TSTB    @MTC
1438  026154  100375                          BPL     .-4
1439  026156  032777  000010  172614  T12F:   BIT     #10,@MTS        ;IS SETTLEDOWN SET?
1440  026164  001003                          BNE     T12G            ;YES
1441  026166  004767  000774                  JSR     %7,TIMER        ;NO, COUNT TIME
1442  026172  000771                          BR      T12F
1443  026174  016722  001010          T12G:   MOV     TIME,(2)+       ;SAVE "WRITE SHUTDOWN"
1444  026200  005067  001004                  CLR     TIME
1445                                  ;TIME "BACKSPACE SHUTDOWN" AT 200 BPI
1446  026204  012777  177777  172572          MOV     #-1,@BC
1447  026212  042777  000010  172562          BIC     #10,@MTC
1448  026220  052777  000013  172554          BIS     #13,@MTC        ;BACKSPACE 1 RECORD, GO
1449  026226  105777  172550                  TSTB    @MTC
1450  026232  100375                          BPL     .-4             ;WAIT FOR CU READY
1451  026234  032777  000010  172536  T12H:   BIT     #10,@MTS        ;IS SETTLEDOWN SET?
1452  026242  001003                          BNE     T12J            ;YES
1453  026244  004767  000716                  JSR     %7,TIMER        ;NO COUNT TIME
1454  026250  000771                          BR      T12H
1455  026252  016723  000732          T12J:   MOV     TIME,(3)+       ;SAVE "BACKSPACE SHUTDOWN"
1456  026256  005067  000726                  CLR     TIME
1457                                  ;TIME "LAST CHAR IN TO MTF" AT 200 BPI
1458  026262  006077  172512                  ROR     @MTS
1459  026266  103375                          BCC     .-4             ;WAIT FOR TU READY
1460  026270  012777  177470  172506          MOV     #-200.,@BC      ;556 BYTES
1461  026276  012777  011342  172502          MOV     #WBUF,@CA
1462  026304  016777  000454  172470          MOV     FDRIVE,@MTC     ;SELECT DRIVE
1463  026312  052777  000003  172462          BIS     #000003,@MTC    ;556 BPI, READ, GO
1464  026320  005777  172460                  TST     @BC
1465  026324  001375                          BNE     .-4             ;WAIT FOR LAST WORD OUT
1466  026326  105777  172450          T12K:   TSTB    @MTC            ;IS CU READY SET?
1467  026332  100403                          BMI     T12L            ;YES
```

```
026334  004767  002626                    JSR   %7,TIMER        ;INC COUNT TIME
026340  000772                            BR    T12K
026342  016724  000642          T12L:     MOV   TIME,(4)+       ;SAVE "LAST CHAR IN TO MTF"
026346  005067  000636                    CLR   TIME
026352  032777  000010  172420  T12M:     BIT   #10,@MTS
026360  001003                            BNE   T12N
026362  004767  000620                    JSR   %7,TIMER
026366  000771                            BR    T12M
026370  016725  000614          T12N:     MOV   TIME,(5)+       ;SAVE "READ SHUTDOWN"
026374  000406                            BR    T12R

026376  005020                  T12P:     CLR   (0)+
026400  005021                            CLR   (1)+
026402  005022                            CLR   (2)+
026404  005023                            CLR   (3)+
026406  005024                            CLR   (4)+
026410  005025                            CLR   (5)+
026412  004767  000274          T12R:     JSR   %7,CHGDRV
026416  000401                            BR    .+4
026420  000402                            BR    .+6
026422  000167  177366                    JMP   T12A
026426  012720  177777                    MOV   #-1,(0)+        ;TERMINATE DRIVES
026432  012721  177777                    MOV   #-1,(1)+
026436  012722  177777                    MOV   #-1,(2)+
026442  012723  177777                    MOV   #-1,(3)+
026446  012724  177777                    MOV   #-1,(4)+
026452  012725  177777                    MOV   #-1,(5)+
026456  005767  172362                    TST   T11T            ;HAVE TESTED ANY 7 TRACKS?
026462  001401                            BEQ   T13             ;NO
026464  012767  011055  001356            MOV   #MSG21, MESAGE  ;PRINT "FUNCTIONS AT 200"
026472  004767  001232                    JSR   %7,TOP
026476  012767  010177  001344            MOV   #MSG3,MESAGE
026504  012700  007212                    MOV   #TM1,%0
026510  004767  000736                    JSR   %7,TYPTIM       ;PRINT "WRITE FROM BOT DELAY"
026514  012767  011027  001326            MOV   #MSG20,MESAGE
026522  012700  007236                    MOV   #TM2,%0
026526  004767  000720                    JSR   %7,TYPTIM       ;PRINT "ONE INCH DATA TIME"
026532  012767  010225  001310            MOV   #MSG4,MESAGE
026540  012700  007262                    MOV   #TM3,%0
026544  004767  000702                    JSR   %7,TYPTIM       ;PRINT "WRITE SHUTDOWN"
026550  012767  010403  001272            MOV   #MSG9,MESAGE
026556  012700  007306                    MOV   #TM4,%0
026562  004767  000664                    JSR   %7,TYPTIM       ;PRINT "BACKSPACE SHUTDOWN"
026566  012767  010650  001254            MOV   #MSG14,MESAGE
026574  012700  007332                    MOV   #TM5,%0
026600  004767  000646                    JSR   %7,TYPTIM       ;PRINT "LAST CHAR IN TO MTF"
026604  012767  010431  001236            MOV   #MSG10,MESAGE
026612  012700  007356                    MOV   #TM6,%0
026616  004767  000630                    JSR   %7,TYPTIM       ;PRINT "READ SHUTDOWN"
026622  004767  000216                    JSR   %7,ST10
026626  012767  011104  001214  T13:      MOV   #MSG27,MESAGE
026634  004767  001070                    JSR   %7,TOP          ;PRINT "END OF TIMING"
026640  000000                            HALT
026642  000167  172224                    JMP   ST0

                                ;RESET DRIVE SELECTION TO LOWEST NUMBER
```

D3

```
1524  000646  005067  000124          RSFDRV: CLR     CDRIVE          ;START WITH DRIVE 0
1525  000652  012767  100000  000100          MOV     #100000,CDRVBT  ;INITIALIZE FOR 0
1526  000660  036767  000074  000074  RSF1:   BIT     CDRVBT,DRIVES   ;MASK WITH SELECTED DRIVES
1527  000666  001006                          BNE     RSF2
1528  000670  005267  000062                  INC     CDRIVE          ;+1 TO DRIVE NUMBER
1529  000674  000241                          CLC
1530  000676  006067  000056                  ROR     CDRVBT          ;MOVE MASK BIT TO NEXT DRIVE
1531  000702  000766                          BR      RSF1
1532  000704  004767  000056          RSF2:   JSR     %7,GTNINE       ;CHECK 9 TRACK
1533  000710  000207                          RTS     %7
1534                                  ;SELECT NEXT DRIVE IN SEQUENCE
1535                                  ;SKIP FIRST EXIT ADDRESS IF LAST DRIVE SELECTED
1536  000712  005267  000040          CHGDRV: INC     CDRIVE          ;+1 TO DRIVE
1537  000716  000241                          CLC
1538  000720  006067  000034                  ROR     CDRVBT          ;MOVE MASK BIT TO NEXT DRIVE
1539  000724  001005                          BNE     CHG1
1540  000726  004767  177714                  JSR     %7,RSFDRV       ;RESET TO LOWEST DRIVE
1541  000732  062716  000002                  ADD     #2,(6)          ;+2 TO SKIP FIRST EXIT
1542  000736  000207                          RTS     %7              ;EXIT
1543  000740  036767  000014  000014  CHG1:   BIT     CDRVBT,DRIVES   ;MASK WITH SELECTED DRIVES
1544  000746  001761                          BEQ     CHGDRV          ;CHECK FOR NEXT DRIVE
1545  000750  004767  000012                  JSR     %7,GTNINE       ;CHECK 9 TRACK
1546  000754  000207                          RTS     %7
1547  000756  000000          CDRIVE: 0
1548  000760  000000          CDRVBT: 0
1549  000762  000000          DRIVES: 0
1550  000764  000000          FDRIVE: 0
1551                                  ;CHECK FOR NINE TRACK DRIVES
1552  000766  016767  177764  177770  GTNINE: MOV     CDRIVE,FDRIVE
1553  000774  000367  177764                  SWAB    FDRIVE          ;POSITION UNIT SELECT BITS
1554  001000  042767  174377  177756          BIC     #174377,FDRIVE  ;CLEAR ALL OTHER BITS
1555  001006  032767  000010  177742          BIT     #10,CDRIVE      ;TEST FOR 9 TRACK
1556  001014  001403                          BEQ     GNT1            ;NO
1557  001016  052767  020000  177740          BIS     #20000,FDRIVE   ;YES SET 9 TRACK BIT
1558  001024  000207          GNT1:   RTS     %7
1559                                  ;INITIALIZE BYTE COUNT AND CURRENT ADDRESS FOR WRITE
1560  001026  012777  172110  171750  WRINT:  MOV     #-BLENTH,@#BC
1561  001034  012777  011342  171744          MOV     #WBUF,@#CA
1562  001042  000207                          RTS     %7
1563                                  ;STORE 1'S IN WRITE BUFFER
1564  001044  012700  011342          ST1S:   MOV     #WBUF,%0
1565  001050  012720  177777          ST1SA:  MOV     #-1,(0)+
1566  001054  022700  011734                  CMP     #WBUF+BLENTH+2,%0
1567  001060  001373                          BNE     ST1SA
1568  001062  000207                          RTS     %7
1569                                  ;START REWIND OPERATIONS
1570  001064  016777  177674  171710  STRREW: MOV     FDRIVE,@MTC     ;SELECT DRIVE
1571  001072  105777  171704                  TSTB    @MTC
1572  001076  100375                          BPL     .-4             ;WAIT FOR CU READY
1573  001100  006077  171674                  ROR     @MTS
1574  001104  103375                          BCC     .-4             ;WAIT FOR TAPE UNIT READY
1575  001106  052777  000017  171666          BIS     #17,@MTC        ;GO REWIND
1576  001114  105777  171662                  TSTB    @MTC
1577  001120  100375                          BPL     .-4             ;WAIT FOR CONTROL UNIT READY
1578  001122  000207                          RTS     %7
1579                                  ;WAIT FOR REWIND TO FINISH
```

```
1588  027124  016777  177634  171658  WATREW: MOV     FDRIVE,@MTC
1581  027132  006077  171642          ROR     @MTS
1582  027136  103375                  BCC     .-4
1583  027140  032777  000040  171632  BIT     #40,@MTS        ;IS BOT SET?
1584  027146  001006                  BNE     1$              ;YES
1585  027150  012767  011153  000672  MOV     #MSG28,MESAGE
1586  027156  004767  000546          JSR     PC,TOP
1587  027162  000000                  HALT                    ;ERROR, NOT AT BOT AFTER REWIND
1588  027164  000207          1$:     RTS     %7
1589                          ;KEEP COUNT OF ELAPSED TIME
1590                          ;EXIT EVERY 100 USEC
1591  027166  005777  171620  TIMER:  TST     @MTRD
1592  027172  100375                  BPL     .-4
1593  027174  005777  171612          TST     @MTRD
1594  027200  100775                  BMI     .-4
1595  027202  005267  000002          INC     TIME            ;+1 TO 100 USEC COUNT
1596  027206  000207                  RTS     %7
1597  027210  000000          TIME:   0
1598  027212  000000          TM1:    0
1599          027236                  .=TM1+20.
1600  027236  000000          TM2:    0
1601          027262                  .=TM2+20.
1602  027262  000000          TM3:    0
1603          027306                  .=TM3+20.
1604  027306  000000          TM4:    0
1605          027332                  .=TM4+20.
1606  027332  000000          TM5:    0
1607          027356                  .=TM5+20.
1608  027356  000000          TM6:    0
1609          027402                  .=TM6+20.
1610  027402  000000          TM7:    0
1611          027426                  .=TM7+20.
1612  027426  000000          TM8:    0
1613          027452                  .=TM8+20.
1614                          ;PRINT TITLE OF TEST EXECUTED AND THE DRIVE TIMES
1615  027452  004767  000252  TYPTIM: JSR     %7,TOP          ;PRINT TITLE
1616  027456  012067  000224  TYPT8:  MOV     (0)+,VALUE      ;GET TIME
1617  027462  022767  177777  000216  CMP     #-1,VALUE       ;FINISHED TIME BUFFER
1618  027470  001001                  BNE     .+4
1619  027472  000207                  RTS     %7
1620  027474  012767  027720  000214  MOV     #DECPNT+2,DECPNT;INITIALIZE DECIMAL VALUE POINTER
1621  027502  012767  000040  000204  MOV     #40,ZERO        ;INITIALIZE SPACE
1622  027510  012767  177774  000172  MOV     #-4,DIGCNT      ;DIGIT COUNT
1623  027516  012767  177777  000166  TYPT1:  MOV     #-1,DIGIT       ;INITIAL VALUE
1624  027524  005267  000162          TYPT2:  INC     DIGIT           ;+1 TO VALUE
1625  027530  167767  000162  000150  SUB     @DECPNT,VALUE   ;SUBTRACT CONSTANT
1626  027536  100375                  BPL     TYPT2           ;NOT NEGATIVE YET
1627  027540  067767  000152  000140  ADD     @DECPNT,VALUE   ;RESTORE LAST POSITIVE VALUE
1628  027546  004767  000064          JSR     %7,DECOUT       ;PRINT DECIMAL DIGIT
1629  027552  005267  000132          INC     DIGCNT          ;+1 TO DIGIT COUNT
1630  027556  001006                  BNE     TYP2A
1631  027560  012767  010173  003262  MOV     #MSG28,MESAGE
1632  027566  004767  000136          JSR     %7,TOP
1633  027572  000731                  BR      TYPT8
1634  027574  022767  177777  000106  TYP2A:  CMP     #-1,DIGCNT      ;CHECK FOR DECIMAL PLACE
1635  027602  001011                  BNE     TYPT3           ;NO
```

F3

```
1636  027604  105777  171212                  TSTB    @TPS
1637  027610  100375                          BPL     .-4
1638  027612  012777  000056  171204          MOV     #'.,@TPB                ;PRINT DECIMAL POINT
1639  027620  012767  000060  000046          MOV     #60,ZERO
1640  027626  062767  000002  000062  TYPT3:  ADD     #2,DECPNT               ;+2 TO DECIMAL VALUE POINTER
1641  027634  000730                          BR      TYPT1                   ;DO AGAIN
1642
1643  027636  005767  000050          DECOUT: TST     DIGIT                   ;IS DIGIT 0
1644  027642  001004                          BNE     DEC1                    ;NO
1645  027644  016767  000044  000040          MOV     ZERO,DIGIT              ;SUPPRESS LEADING ZEROS
1646  027652  000406                          BR      DEC2
1647  027654  012767  000060  000032  DEC1:   MOV     #60,ZERO                ;INITIALIZE ZERO AFTER SOME VALUE FOUND
1648  027662  052767  000060  000022          BIS     #60,DIGIT               ;CONVERT TO ANSCII
1649  027670  105777  171126          DEC2:   TSTB    @TPS
1650  027674  100375                          BPL     .-4
1651  027676  016777  000010  171120          MOV     DIGIT,@TPB              ;PRINT
1652  027704  000207                          RTS     %7
1653  027706  000000                  VALUE:  0
1654  027710  000000                  DIGCNT: 0
1655  027712  000000                  DIGIT:  0
1656  027714  000040                  ZERO:   40                              ;CONTAINS ZERO OR SPACE
1657  027716  000728                  DECPNT: .+2
1658  027720  001750                          1000.
1659  027722  000144                          100.
1660  027724  000012                          10.
1661  027726  000001                          1.
1662                                  ;TELETYPE OUTPUT PACKAGE
1663  027730  142777  000177  171064  TOP:    BICB    #177,@TPS               ;CLEAR FLAGS
1664  027736  117767  000106  000102          MOVB    @MESAGE,EOMK            ;SAVE MESSAGE DELIMETER
1665  027744  005267  000100                  INC     MESAGE                  ;+2 TO POINTER
1666  027750  127767  000074  000070  TOP1:   CMPB    @MESAGE,EOMK            ;IS CHARACTER THE 2ND DELIMETER
1667  027756  001001                          BNE     .+4                     ;NO
1668  027760  000207                          RTS     %7                      ;YES EXT
1669  027762  127727  000062  000100          CMPB    @MESAGE,#'@             ;IS CHARACTER AN @ INDICATING A CARRIAGE RETURN
1670  027770  001411                          BEQ     TOP3                    ;YES
1671  027772  105777  171024                  TSTB    @TPS
1672  027776  100375                          BPL     .-4
1673  030000  117777  000044  171016          MOVB    @MESAGE,@TPB            ;PRINT CHARACTER
1674  030006  005267  000036          TOP2:   INC     MESAGE                  ;+2 TO POINTER
1675  030012  000756                          BR      TOP1                    ;LOOP
1676                                  ;CARRIAGE RETURN, LINE FEED
1677  030014  105777  171002          TOP3:   TSTB    @TPS
```

```
1678  010020  100375                    BPL     .-4
1679  010022  112777  000215  170774    MOVB    #215,@TPB
1680  010030  105777  170766            TSTB    @TPS
1681  010034  100375                    BPL     .-4
1682  010036  112777  000212  170760    MOVB    #212,@TPB
1683  010044  000760                    BR      TOP2
1684  010046  000000            EOMK:   0
1685  010050  000000            MESAGE: 0
1686  010052  040057  046520  026504    MSG1:   .ASCII  |/0MD-11-DZTMD-E          TM-11 DRIVE FUNCTION |
1687  010060  030461  042055  052132
1688  010066  042115  042455  020040
1689  010074  020040  020040  020040
1690  010102  052040  026515  030461
1691  010110  042040  044522  042526
1692  010116  043040  047125  052103
1693  010124  047511  020116
1694  010130  044524  042515  040122            .ASCII  |TIMER0/|
1695  010136     057
1696  010137     057  043120  047125  MSG2:   .ASCII  |/0FUNCTION          /|
1697  010144  052103  047511  020116
1698  010152  020040  020040  020040
1699  010160  020040     057
1700  010163     057  052440  044516  MSG2A:  .ASCII  |/ UNIT /|
1701  010170  020124     057
1702  010173     057  020040     057  MSG2B:  .ASCII  |/  /|
1703  010177     057  053520  044522  MSG3:   .ASCII  |/0WRITE FROM BOT      /|
1704  010204  042524  043040  047522
1705  010212  020115  047502  020124
1706  010220  020040  020040     057
```

```
 1707  010225     057  053520  044522  MSG4:   .ASCII  :/PWRITE SHUTDOWN     /:
 1708  010232  042524  051440  052510
 1709  010240  042124  053517  020116
 1710  010246  020040  020040     057
 1711  010253     057  053520  044522  MSG5:   .ASCII  :/PWRITE START        /:
 1712  010260  042524  051440  040524
 1713  010266  052122  020040  020040
 1714  010274  020043  020040     057
 1715  010301     057  051520  052105  MSG6:   .ASCII  :/PSETTLE DOWN DELAY  /:
 1716  010306  046124  020105  047504
 1717  010314  047127  042040  046105
 1718  010322  054501  020040     057
 1719  010327     057  053520  044522  MSG7:   .ASCII  :/PWRITE TO ERASE HEAD/:
 1720  010334  042524  052040  020117
 1721  010342  051105  051501  020105
 1722  010350  042510  042101     057
```

I3

```
010355     057  053500  044522  MSG8:   .ASCII  !/@WRITE NONSTOP GAP  /!
010362  042524  047040  047117
010370  052123  050117  043440
010376  050101  020040     057
010403     057  041100  041501  MSG9:   .ASCII  !/@BACKSPACE SHUTDOWN /!
010410  051513  040520  042503
010416  051440  052510  042124
010424  053517  020116     057
010431     057  051100  040505  MSG10:  .ASCII  !/@READ SHUTDOWN      /!
010436  020104  044123  052125
010444  047504  047127  020040
010452  020040  020040     057
010457     057  043500  050101  MSG11:  .ASCII  !/@GAPS SHOULD = 8>7>6>5>4>1, 1-2<1.7, 2=3(+1.1, -0.2),/!
010464  020123  044123  052517
010472  042114  036440  034040
010500  033476  033076  032476
010506  032076  030476  020054
010514  026461  036062  027061
010522  026067  031040  031475
010530  025450  027061  026061
010536  026440  027060  024462
010544  027454
010546  040057  040507  020120  MSG11A: .ASCII  !/@GAP 1              /!
010554  020061  020040  020040
010562  020040  020040  020040
010570  020040  027440
010574  040057  051127  052111  MSG12:  .ASCII  !/@WRITE XIRG         /!
010602  020105  044530  043522
010610  020040  020040  020040
010616  020040  027440
010622  040057  042522  042101  MSG13:  .ASCII  !/@READ FROM BOT DELAY/!
010630  043040  047522  020115
010636  047502  020124  042504
010644  040514  027531
010650  040057  040514  052123  MSG14:  .ASCII  !/@LAST CHAR TO CU RDY/!
010656  041440  040510  020122
010664  047524  041440  020125
010672  042122  027531
010676  040057  051127  052111  MSG15:  .ASCII  !/@WRITE EOF          /!
010704  020105  047505  020106
010712  020040  020040  020040
010720  020040  027440
010724  040057  047505  020122  MSG16:  .ASCII  !/@EOR TO EOF SP TIME /!
010732  047524  042440  043117
010740  051440  020120  044524
010746  042515  027440
010752  040057  050123  041501  MSG18:  .ASCII  !/@SPACE SHUTDOWN     /!
010760  020105  044123  052125
010766  047504  047127  020040
010774  020040  027440
011000  040057  052506  041516  MSG19:  .ASCII  !/@FUNCTIONS AT 556 BPI/!
011006  044524  047117  020123
011014  052101  032440  033065
011022  041040  044520     057
011027     057  047500  042516  MSG20:  .ASCII  !/@ONE INCH DATA TIME /!
011034  044440  041516  020110
```

```
 1779  011842  040504  046524  052040
 1780  011850  046511  020105     057
 1781  011855     057  043160  047125  MSG21:  .ASCII  I/0FUNCTIONS AT 202 BPI/I
 1782  011862  052103  047511  051516
 1783  011870  040440  020124  030062
 1784  011876  020060  050102  027511
 1785  012104  040057  025052  025052  MSG27:  .ASCII  I/0000000000END OF TIMING000000000000/I
 1786  012112  025052  025052  025052
 1787  012120  042452  042116  047440
 1788  012126  020106  044524  044515
 1789  012134  043516  025052  025052
 1790  012142  025052  025052  025052
 1791  012150  040052     057
 1792  012153     057  040100  051105  MSG28:  .ASCII  I/0ERROR-NOT AT BOT AFTER REWIND-HALT00/I
 1793  012160  047522  026922  047516
 1794  012166  020124  052101  041040
 1795  012174  052117  040440  052106
 1796  012202  051105  051040  053505
 1797  012210  047111  041504  040510
 1798  012216  052114  040100     057
 1799  012223     057  040100  047514  MSG29:  .ASCII  I/0LOC. 176 MUST CONTAIN UNIT CONFIGURATION/I
 1800  012230  027103  030440  033067
 1801  012236  046440  051525  020124
 1802  012244  047503  052116  044501
 1803  012252  020116  047125  052111
 1804  012260  041440  047117  044506
 1805  012266  052507  040522  044524
 1806  012274  047117
 1807  012276  052100  020117  052522          .ASCII  I0TO RUN-REFER 4.3 DOCUMENT--HALT110/I
 1808  012304  026516  042522  042506
 1809  012312  020122  027064  020063
 1810  012320  047504  052503  042515
 1811  012326  052116  026455  040510
 1812  012334  052114  020441  027500
 1813                                    .EVEN
 1814  012342  000000                  WBUF:   0
 1815          000001                          .END
```

K3

```
BC      001004      MSG7    012327      TM1     007212      T11G    005322      T4A     002172
BLEATH  005076      MSG8    010355      TM2     007236      T11H    005362      T4AA    002136
CA      001006      MSG9    010403      TM3     007262      T11J    005400      T4B     002216
CC      001036      MTC     001002      TM4     007306      T11K    005454      T4C     002312
CDRIVE  006756      MTC     001010      TM5     007332      T11L    005470      T4D     002330
CDRVBT  006760      MTRD    001012      TM6     007356      T11M    005500      T4E     002374
CHGCRV  006712      MTS     001000      TM7     007402      T11N    005516      T4F     002412
CHG1    006746      MTV     001026      TM8     007426      T11P    005524      T4G     002924
CECOLT  007636      MULBAK  002714      TOP     007730      T11R    005540      T5      003076
CECPAT  007716      MULWRT  002676      TOP1    007750      T11T    001044      T5A     003140
CEC1    007654      MUL1    003016      TOP2    010006      T12     005760      T5B     003162
CEC2    007670      MUL2    003034      TOP3    010014      T12A    006014      T5C     003200
CIGCAT  007710      MUL3    003052      TPB     001024      T12B    006076      T5DRV   001042
CIGIT   007712      PC    =%000007      TPS     001022      T12C    006114      T6      003910
CRIVES  006762      RSPDRV  006646      TYPTIM  007452      T12D    006124      T6A     003920
ECHK    010046      RSP1    006660      TYPT0   007456      T12E    006140      T6B     003632
FCRIVE  006764      RSP2    006704      TYPT1   007516      T12F    006156      T6C     003650
GAT1    007024      R0    =%000000      TYPT2   007524      T12G    006174      T6D     003706
GTAIAE  006766      R1    =%000001      TYPT3   007626      T12H    006234      T6E     003724
MESAGE  010052      R10     001032      TYP2A   007574      T12J    006252      T6F     004014
MSG1    010052      R11     001034      T1      001246      T12K    006326      T7      004026
MSG10   010431      R12     001036      T1A     001256      T12L    006342      T7A     004032
MSG11   010457      R13     001040      T1B     001302      T12M    006352      T7B     004056
MSG11A  010546      R2    =%000002      T1C     001320      T12N    006370      T7C     004074
MSG12   010574      R3    =%000003      T1D     001336      T12P    006376      T8      004150
MSG13   010622      R4    =%000004      T1E     001354      T12R    006412      T8A     004154
MSG14   010650      R5    =%000005      T1F     004460      T13     006626      T8B     004206
MSG15   010676      SP    =%000006      T1GA    004474      T2      001432      T8C     004222
MSG16   010724      SR      001014      T1GB    004610      T2A     001446      T8D     004270
MSG18   010752      STACK = 001000      T1HC    004620      T2B     001472      T9      004302
MSG19   011006      START   001046      T1GCC   004644      T2C     001510      T9A     004306
MSG2    010137      STRREW  007004      T1GD    004660      T2D     001536      T9B     004372
MSG2A   010163      ST0     001072      T1GE    004676      T2E     001552      T9C     004406
MSG2B   010173      ST1     001122      T1GF    004714      T3      001630      T9D     004446
MSG2E   011027      ST1S    007044      T1GG    004772      T3A     001642      VALUE   007706
MSG21   011055      ST1SA   007050      T1GH    005006      T3B     001654      WATREW  007124
MSG27   011104      ST2     001134      T11     005112      T3C     001732      WBUF    011342
MSG2F   011153      ST3     001160      T11A    005146      T3D     001750      WRINT   007026
MSG2G   011223      SWREG   000176      T11B    005224      T3E     002014      ZERO    007714
MSG3    010177      TIME    007210      T11C    005242      T3F     002030      .     = 011344
```

```
ERRORS DETECTED:  0
DEFAULT GLOBALS GENERATED:  0

*D2TMCE,D2TMCE/SOL=D2TMCE,P11
RUN-TIME:  6 11  .5 SECONDS
RUN-TIME RATIO:  143/18=7.9
CORE USED:  11K  (21 PAGES)
```