TS03

DRIVE FUNCTION TIMER

MD-11-DZTSE-A

EP-DZTSE-A-DL-A

FICHE 1 OF 1

OCT 1976

digital

Made in U.S.A.

```
.REPT   0
```

IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DZTSE-A-D

PRODUCT NAME: TS03 DRIVE FUNCTION TIMER

DATE CREATED: 15 APR, 1975

MAINTAINER: DIAGNOSTIC ENGINEERING

AUTHOR: R. B. BARNES

TABLE OF CONTENTS

```
                        1.      ABSTRACT

                                THE TS03 DRIVE FUNCTION TIMER ASSISTS IN THE TESTING OF
                                THE TMA-11 CONTROL UNIT AND TS03 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.
                                EITHER 1 OR 2 TS03 UNITS MAY BE SELECTED.

                        2.      REQUIREMENTS

                        2.1     EQUIPMENT

                                PDP-11 WITH TMA-11 CONTROL UNIT AND 1 OR 2 TS03 TAPE 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     CONTROL SWITCH SETTINGS: NONE

                                4.2     STARTING ADDRESS

                                        200

                                4.3     PROGRAM AND/OR OPERATOR ACTION

                                        LOAD PROGRAM INTO MEMORY.
                                        SET DESIRED TS03 TAPE UNITS ON-LINE.
                                        SET SWITCH REGISTER TO STARTING ADDRESS.
                                        LOAD ADDRESS.
                                        PRESS START.
                                        ENTER STARTING REGISTER ADDRESS.
                                        IF SPEED TEST ONLY, ENTER A ONE(1).
                                        IF ALL OTHERS, ENTER A ZERO(0).
                                        IF SPEED TEST, MOUNT 800 BPI SKEW TAPE AND TYPE CR.
                                        THE PROGRAM WILL AUTOMATICLY FIND THE AVAILABLE
                                        TS03 TAPE UNITS TO BE TESTED.
                                        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: PRESS CONTINUE.

                                5.      OPERATING PROCEDURE

                                5.1     OPERATIONAL SWITCH SETTINGS

                                        NONE

                                6.      ERRORS

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

                                6.1     TIME RELATIONSHIPS

                                        A.  "READ SHUTDOWN" MUST BE < "WRITE SHUTDOWN".
                                        B.  GAPS MUST = 8>7>6>5>4>3, 3=2=1 (+OR- 5.0).
                                        C.  "WRITE EOF" SHOULD BE SLIGHTLY > "WRITE XIRG".
```

6.2 TIME LIMITS AND PRINTOUT FORMAT EXAMPLE
*****(ALL TIMES ARE IN MILLISECONDS)*****

FUNCTION	UNIT 0	UNIT 1	RANGE MAX - MIN
WRITE FROM BOT	565.0	SAME	621.0 - 509.0
WRITE SHUTDOWN	15.6	"	17.6 - 13.6
WRITE START	35.8	"	39.0 - 32.0
SETTLE DOWN DELAY	33.0	"	36.0 - 30.0
WRITE TO ERASE HEAD	69.0	"	76.0 - 58.0
BACKSPACE SHUTDOWN	7.0	"	7.7 - 6.3
READ SHUTDOWN	7.0	"	7.7 - 6.3
GAPS SHOULD=8>7>6>5>4>3,	3=2=1 (+OR- 5.0)		
GAP 1	50.0	"	
GAP 2	50.0	"	
GAP 3	50.2	"	
GAP 4	53.6	"	
GAP 5	67.1	"	
GAP 6	90.4	"	
GAP 7	103.7	"	
GAP 8	117.4	"	
WRITE START	35.9	"	39.0 - 32.0
WRITE XIRG	333.1	"	366.0 - 300.0
READ FROM BOT	235.0	"	258.0 - 212.0
WRITE EOF	385.0	"	420.0 - 340.0
EOR TO EOF SPACE	360.0	"	400.0 - 320.0
SPACE SHUTDOWN	6.9	"	7.6 - 6.3
ONE INCH DATA TIME	81.0	"	89.0 - 73.0

********** END OF TIMING **********

6.3 SPEED TEST TIME PRINTOUT EXAMPLE

FUNCTION	UNIT 0	UNIT 1	RANGE MAX-MIN
TAPE SPEED FIND	81.0	81.0	89.0 - 73.0

********** END OF TIMING **********

```
                                7.      RESTRICTIONS

                                7.1     STARTING RESTRICTIONS

                                        AT LEAST ONE TS03 TAPE UNIT MUST BE "ON-LINE".
                                        ALSO MAKE CERTAIN THAT EACH TS03 THAT IS "ON-LINE"
                                        HAS A UNIQUE UNIT NUMBER SELECTED.

                                7.2     OPERATING RESTRICTIONS

                                        TMA-11 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 TSO3 IS NOT AT BOT IT IS REWOUND TO BOT.
                                        B.  INITIALIZE BYTE RECORD COUNTER AND CURRENT MEMORY ADDRESS
                                            REGISTER.
                                        C.  ISSUE WRITE FUNCTION, 800 BPI, SET "GO".
                                        D.  MONITOR CURRENT MEMORY ADDRESS REGISTER TO DETERMINE WHEN
                                            2ND BYTE IS OUTPUT.
                                        E.  THE TIME FROM "GO" UNTIL 2ND BYTE IS OUTPUT IS
                                            APPROXIMATELY EQUAL TO "WRITE FROM BOT DELAY".


                                9.2     WRITE SHUTDOWN

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

                                        PROCEDURE TO MEASURE TIME:

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

9.3 WRITE START

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

PROCEDURE TO MEASURE TIME:

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

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

9.4 SETTLEDOWN DELAY

TAPE DOES NOT ACTUALLY COME TO A COMPLETE STOP UNTIL SOME PERIOD OF TIME AFTER SHUTDOWN HAS ENDED. ALSO, AFTER TAPE HAS FULLY STOPPED, AN ADDITIONAL PERIOD OF TIME IS NECESSARY FOR THE TAPE AND HARDWARE TO "SETTLEDOWN" AND BECOME STABLE. THE "SETTLEDOWN DELAY" IS THE PERIOD OF TIME NECESSARY FOR THE TAPE AND MECHANICAL CHARACTERISTICS OF THE TS03 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.

```
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
```

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. AWAIT CUR AT END OF CURRENT WRITE.
F. ISSUE A 2 BYTE READ.
G. TIME FROM GO UNTIL CUR OF THE READ IS WRITE TO
   ERASE HEAD TIME.
H. IF TIME IS TOO SHORT, ERASE HEAD IS INOPERATIVE.

9.6 BACKSPACE SHUTDOWN

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

PROCEDURE TO MEASURE TIME:

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

9.7 READ SHUTDOWN

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

PROCEDURE TO MEASURE TIME:

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

9.8 GAP CONSISTENCY

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

PROCEDURE TO MEASURE TIME:

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

PROGRAM SEQUENCE FOR EACH GAP:

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

GAP LENGTHS SHOULD REFLECT THE FOLLOWING RELATIONSHIP:

8>7>6>5>4>3, 3=2=1 (+OR- 5.0).

9.9 WRITE START

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

9.10 WRITE XIRG

WRITE WITH AN EXTENDED INTERRECORD GAP IS A FUNCTION THAT CAUSES THE GENERATION OF AN INTERRECORD GAP THAT IS AT LEAST 3 INCHS LONG AS COMPARED WITH THE NORMAL 3/4 INCH GAP. THE PURPOSE IS TO ELIMINATE WRITE ERRORS THAT MAY BE CAUSED BY A DEFECTIVE AREA ON TAPE. NORMALLY ONE REWRITE WITH XIRG WOULD BE SUFFICIENT TO MOVE PAST THE BAD SPOT, HOWEVER IF IT ISN'T, THE PROCEDURE WOULD BE TO REPEAT THE "BACKSPACE-REWRITE WITH XIRG" SEQUENCE UNTIL A RECORD IS WRITTEN WITHOUT ERRORS. EACH SUCCESSIVE REWRITE WOULD ADD 3 INCHES TO THE INTERRECORD GAP UNTIL "GOOD" TAPE WAS REACHED.

PROCEDURE TO MEASURE TIME:

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

9.11 READ FROM BOT

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

PROCEDURE TO MEASURE TIME:

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

9.12 WRITE EOF.

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

PROCEDURE TO MEASURE TIME:

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

9.13 EOR TO EOF SPACE TIME

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

THIS COULD INDICATE ONE OR MORE OF THE FOLLOWING PROBLEMS:

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

PROCEDURE TO MEASURE TIME:

A. A RECORD AND EOF WAS PREVIOUSLY WRITTEN FROM BOT FOR "WRITE EOF" (REFERENCE 9.12).
B. TAPE IS REWOUND TO BOT.
C. REWRITE RECORD OVER PREVIOUSLY WRITTEN RECORD.
D. BACKSPACE OVER RECORD JUST WRITTEN.
E. SET BYTE RECORD COUNTER TO SPACE 2 RECORDS.
F. ISSUE SPACE FORWARD FUNCTION, SET "GO".
G. WAIT FOR BYTE RECORD COUNTER TO INDICATE THAT 1ST RECORD HAS BEEN SPACED OVER THEN MONITOR "CU READY" UNTIL IT BECOMES A 1. AFTER "CU READY" CHECK TO SEE IF "EOF" IS A 1 IN STATUS REGISTER. IF "EOF" NOT SET THEN ZERO TIME COUNTER.
H. TIME FROM BYTE RECORD COUNTER =-1 UNTIL "CU READY" IS "EOR TO EOF SPACE TIME".

9.14 SPACE SHUTDOWN

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

PROCEDURE TO MEASURE TIME:

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

9.15 ONE INCH DATA TIME

ONE INCH OF DATA, 800 BPI IS WRITTEN AND TIMED TO DETERMINE IF DATA IS TRANSFERRED AT PROPER RATE.

PROCEDURE TO MEASURE TIME:

A. INITIALIZE BYTE RECORD COUNTER AND CURRENT MEMORY ADDRESS.

B. ISSUE WRITE FUNCTION, 800 BPI, SET "GO".

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

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

9.16 TAPE SPEED TEST (FORWARD ONLY)

ONE INCH OF TAPE (800 BYTES) IS READ FROM A SKEW TAPE IN THE FORWARD DIRECTION TO ASSURE TAPE SPEED.

A. ASSURE OPERATOR MOUNTS SKEW TAPE

B. ISSUE READ FUNCTION, 800 BPI, SET "GO".

C. AWAIT 2ND BYTE TRANSFER.

D. TIME FROM 2ND BYTE UNTIL LAST BYTE IS ONE INCH OF TAPE

```
                        10.     STATUS AND COMMAND REGISTER BIT ASSIGNMENTS (TMA-11)

                                                        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-DZTSE-A-D  TSO3 DRIVE FUNCTION TIMER
                                ;COPYRIGHT: (C)  1975 DIGITAL EQUIPMENT CORP., MAYNARD, MASS. 01754
                                ;
                                ;LOAD ADDRESS 200, PRESS START
                                ;
                        001000  STACK=1000
                        005670  BLENTH=3000.
                                        .ENABL  ABS
                        000000          .=0
                                ;TRAP CATCHER FROM 0 TO 1000
                        000200          .=200
000200  000200  000167  000652          JMP     START
                        001000          .=1000
001000  001000  172520          MTS:    172520
001002  001002  172522          MTC:    172522
001004  001004  172524          BC:     172524
001006  001006  172526          CA:     172526
001010  001010  172530          MTD:    172530
001012  001012  172532          MTRD:   172532
001014  001014  177570          SR:     177570
001016  001016  177560          TKS:    177560
001020  001020  177562          TKB:    177562
001022  001022  177564          TPS:    177564
001024  001024  177566          TPB:    177566
001026  001026  000224          MTV:    224
001030  001030  172520          REGS:   172520
001032  001032  177776          CC:     177776
001034  001034  000000          R10:    0
001036  001036  000000          R11:    0
001040  001040  000000          R12:    0
001042  001042  000000          R13:    0
001044  001044  000000          TSDRV:  0
001046  001046  000000          T11T:   0
001050  001050  000000          TIB:    0
001052  001052  000000          TEMP1:  0
001054  001054  000000          SPTF:   0
```

```
001056  012706  001000          START:  MOV     #STACK,%6               ;INITIALIZE STACK
001062  012777  000340  177742          MOV     #340,@CC                ;SET PRIORITY LEVEL 7
001070  012767  010467  006412          MOV     #MSG28,MESAGE
001076  004767  006266                  JSR     %7,TOP                  ;PRINT TITLE
001102  012767  010656  006400          MOV     #MSG31,MESAGE
001110  004767  006254                  JSR     %7,TOP                  ;REQUEST UNIBUS ADDRESS
001114  012705  001030                  MOV     #REGS,%5                ;GET ADDRESS OF RESPONSE
001120  012701  000006                  MOV     #6,%1                   ;SET SIZE OF ENTRY
001124  012702  172700                  MOV     #172700,%2              ;SET UPPER LIMIT
001130  012703  172300                  MOV     #172300,%3              ;SET LOWER LIMIT
001134  004767  005770                  JSR     %7,TTR                  ;GO GET RESPONSE
001140  016700  177664                  MOV     REGS,%0                 ;GET UNIBUS ADDRESS
001144  012701  001000                  MOV     #MTS,%1                 ;SET START OF TABLE
001150  012702  000006                  MOV     #6,%2                   ;SET SIZE OF TABLE
001154  010021                  STRS:   MOV     %0,(1)+                 ;LOAD TABLE
001156  005720                          TST     (0)+                    ;BUMP ADDRESS
001160  005302                          DEC     %2                      ;SEE IF DONE
001162  001374                          BNE     STRS                    ;IF NOT: BR
001164  012767  010701  006316          MOV     #MSG32,MESAGE
001172  004767  006172                  JSR     %7,TOP                  ;REQUEST SPEED TESTS ONLY
001176  005067  177652                  CLR     SPTF                    ;CLEAN SPEED TEST FLAG
001202  012705  001054                  MOV     #SPTF,%5                ;GET FLAG ADDRESS
001206  012701  000001                  MOV     #1,%1                   ;SET SIZE OF ENTRY
001212  012702  000001                  MOV     #1,%2                   ;SET UPPER LIMIT
001216  012703  000000                  MOV     #0,%3                   ;SET LOWER LIMIT
001222  004767  005702                  JSR     %7,TTR                  ;GO GET RESPONSE
001226  005767  177622                  TST     SPTF                    ;SEE IF SHOULD DO SPEED TEST
001232  001417                          BEQ     STO                     ;IF NOT: BR
001234  012767  010735  006246          MOV     #MSG33,MESAGE
001242  004767  006122                  JSR     %7,TOP                  ;REQUEST SKEW TAPE MOUNT
001246  012705  001052                  MOV     #TEMP1,%5               ;SET RESPONSE ADDRESS
001252  012701  000001                  MOV     #1,%1                   ;SET SIZE
001256  012702  000001                  MOV     #1,%2                   ;SET UPPER
001262  012703  000000                  MOV     #0,%3                   ;SET LOWER
001266  004767  005636                  JSR     PC,TTR                  ;AWAIT SKEW TAPE MOUNT
001272  005067  004676          STO:    CLR     DRIVES
001276  012777  010000  177476          MOV     #10000,@MTC             ;POWER CLEAR
001304  012777  000000  177470          MOV     #0,@MTC                 ;SELECT UNIT 0
001312  032777  000100  177460          BIT     #100,@MTS               ;SEE IF 0 IS THERE
001320  001403                          BEQ     STOA                    ;IF NOT: BR
001322  052767  000200  004644          BIS     #200,DRIVES             ;SET 0 IN AVAILABLE TABLE
001330  012777  000400  177444  STOA:   MOV     #400,@MTC               ;SELECT UNIT 1
001336  032777  000100  177434          BIT     #100,@MTS               ;SEE IF 1 IS THERE
001344  001403                          BEQ     STOB                    ;IF NOT: BR
001346  052767  000100  004620          BIS     #100,DRIVES             ;SET 1 IN AVAILABLE TABLE
001354  005767  004614          STOB:   TST     DRIVES                  ;SEE IF ANY UNITS AVAILABLE
001360  001007                          BNE     STOC                    ;IF SO: BR
001362  012767  010564  006120          MOV     #MSG30,MESAGE
001370  004767  005774                  JSR     %7,TOP                  ;PRINT NO UNITS
001374  000000                          HALT
001376  000735                          BR      STO                     ;RETRY UNIT SELECTION
001400  000240                  STOC:   NOP
001402  004767  004444                  JSR     %7,RSFDRV               ;RESET DRIVES
001406  004767  004664          ST1:    JSR     %7,STRREW               ;START REWIND
001412  004767  004500                  JSR     %7,CHGDRV               ;DONE ALL DRIVES?
001416  000773                          BR      ST1                     ;NO
```

```
   706  001420  004767  004712          ST2:    JSR     %7,WATREW       ;WAIT FOR BOT
   707  001424  004767  004466                  JSR     %7,CHGDRV       ;DONE ALL DRIVES?
   709  001430  000773                          BR      ST2             ;NO
```

```
                                        ;PRINT HEADER
001432  012767  007512  006050    MOV   #MSG2,MESAGE
001440  004767  005724            JSR   %7,TOP          ;PRINT "FUNCTION"
001444  012767  007537  006036 ST3: MOV   #MSG2A,MESAGE
001452  004767  005712            JSR   %7,TOP          ;PRINT "UNIT"
001456  016767  004514  005426    MOV   FDRIVE,DIGIT
001464  000367  005422            SWAB  DIGIT
001470  042767  177770  005414    BIC   #177770,DIGIT
001476  052767  000060  005406    BIS   #60,DIGIT
001504  105777  177312            TSTB  @TPS
001510  100375                    BPL   .-4
001512  016777  005374  177304    MOV   DIGIT,@TPB      ;PRINT DRIVE "NUMBER"
001520  004767  004372            JSR   %7,CHGDRV       ;DONE ALL DRIVES?
001524  000747                    BR    ST3             ;NO
001526  004767  004524            JSR   %7,ST1S         ;STORE ONES IN WRITE BUFFER
001532  012767  010536  005750    MOV   #MSG29,MESAGE
001540  004767  005624            JSR   %7,TOP          ;PRINT RANGE HEADER
001544  005767  177304            TST   SPIF            ;SEE IF SPEED TESTS ONLY
001550  001402                    BEQ   T1              ;IF NOT: BR
001552  000167  004106            JMP   T11             ;ELSE DO SPEED TEST
```

```
                                        ;TIME WRITE FROM BOT DELAY, AND WRITE SHUTDOWN
                                        
001556  012700  006412          T1:     MOV     #TM1,%0         ;INITIALIZE TIME BUFFERS
001562  012701  006436                  MOV     #TM2,%1
001566  004767  004446          T1A:    JSR     %7,WRINT
001572  016777  004400  177202          MOV     FDRIVE,@MTC     ;SELECT DRIVE
001600  052777  040005  177174          BIS     #40005,@MTC     ;800 BPI, WRITE, GO
001606  005067  004576                  CLR     TIME
001612  022777  011404  177166  T1B:    CMP     #WBUF+2,@CA     ;IS 2ND WORD OUTPUT?
001620  003403                          BLE     T1C             ;YES
001622  004767  004540                  JSR     %7,TIMER        ;NO, COUNT TIME
001626  000771                          BR      T1B
001630  016720  004554          T1C:    MOV     TIME,(0)+       ;SAVE "WRITE FROM BOT DELAY" TIME
001634  005067  004550                  CLR     TIME
001640  005777  177140                  TST     @BC             ;SEE IF WORD COUNT DONE
001644  001375                          BNE     .-4             ;IF NOT: BR
001646  032777  000010  177124  T1D:    BIT     #10,@MTS        ;HAS SETTLEDOWN SET?
001654  001003                          BNE     T1E             ;YES
001656  004767  004504                  JSR     %7,TIMER        ;NO, COUNT TIME
001662  000771                          BR      T1D
001664  016721  004520          T1E:    MOV     TIME,(1)+       ;SAVE "WRITE SHUTDOWN" TIME
001670  004767  004222                  JSR     %7,CHGDRV       ;DONE ALL DRIVES
001674  000734                          BR      T1A             ;NO
001676  012720  177777                  MOV     #-1,(0)+        ;TERMINATE TIMES
001702  012721  177777                  MOV     #-1,(1)+        ;TERMINATE TIMES
001706  012767  007553  005574          MOV     #MSG3,MESAGE
001714  012700  006412                  MOV     #TM1,%0
001720  004767  004726                  JSR     %7,TYPTIM       ;PRINT "WRITE FROM BOT DELAY" TIMES
001724  012767  011037  005556          MOV     #RMSG1,MESAGE
001732  004767  005432                  JSR     %7,TOP          ;PRINT RANGE
001736  012767  007601  005544          MOV     #MSG4,MESAGE
001744  012700  006436                  MOV     #TM2,%0
001750  004767  004676                  JSR     %7,TYPTIM       ;PRINT "WRITE SHUTDOWN" TIMES
001754  012767  011057  005526          MOV     #RMSG2,MESAGE
001762  004767  005402                  JSR     %7,TOP          ;PRINT RANGE
```

```
                                        ;TIME WRITE START AND SETTLEDOWN DELAY
                                        ;
001766  004767  004060          T2:    JSR     %7,RSFDRV       ;RESET DRIVE SELECTION
001772  012700  006412                 MOV     #TM1,%0
001776  012701  006436                 MOV     #TM2,%1
002002  004767  004232          T2A:   JSR     %7,WRINT
002006  016777  004164  176766         MOV     FDRIVE,@MTC     ;SELECT DRIVE
002014  052777  040005  176760         BIS     #40005,@MTC     ;800 BPI, WRITE, GO
002022  005067  004362                 CLR     TIME
002026  022777  011404  176752  T2B:   CMP     #WBUF+2,@CA     ;IS 2ND WORD OUTPUT
002034  003403                       BLE     T2C             ;YES
002036  004767  004324                 JSR     %7,TIMER        ;NO, COUNT TIME
002042  000771                       BR      T2B
002044  016720  004340          T2C:   MOV     TIME,(0)+       ;SAVE "WRITE START" TIME
002050  005067  004334                 CLR     TIME
002054  005777  176724                 TST     @BC
002060  001375                       BNE     .-4
002062  032777  000010  176710         BIT     #10,@MTS
002070  001774                       BEQ     .-6             ;WAIT FOR SETTLEDOWN TO SET
002072  006077  176702          T2D:   ROR     @MTS
002076  103403                       BCS     T2E             ;WAIT FOR TU READY
002100  004767  004262                 JSR     %7,TIMER
002104  000772                       BR      T2D
002106  016721  004276          T2E:   MOV     TIME,(1)+       ;SAVE "SETTLEDOWN" TIME
002112  004767  004000                 JSR     %7,CHGDRV
002116  000731                       BR      T2A
002120  012720  177777                 MOV     #-1,(0)+        ;TERMINATE TIMES
002124  012721  177777                 MOV     #-1,(1)+        ;TERMINATE TIMES
002130  012767  007627  005352         MOV     #MSG5,MESAGE
002136  012700  006412                 MOV     #TM1,%0
002142  004767  004504                 JSR     %7,TYPTIM       ;PRINT "WRITE START" TIMES
002146  012767  011076  005334         MOV     #RMSG3,MESAGE
002154  004767  005210                 JSR     %7,TOP
002160  012767  007655  005322         MOV     #MSG6,MESAGE
002166  012700  006436                 MOV     #TM2,%0
002172  004767  004454                 JSR     %7,TYPTIM       ;PRINT "SETTLEDOWN" TIMES
002176  012767  011115  005304         MOV     #RMSG4,MESAGE
002204  004767  005160                 JSR     %7,TOP
```

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

002210  004767  004062          T3:     JSR     %7,STRREW       ;START REWIND
002214  004767  003676                  JSR     %7,CHGDRV       ;DONE ALL DRIVES?
002220  000773                          BR      T3              ;NO
002222  004767  004110          T3A:    JSR     %7,WATREW       ;IS DRIVE AT BOT?
002226  004767  003664                  JSR     %7,CHGDRV       ;DONE ALL DRIVES
002232  000773                          BR      T3A             ;NO
002234  012777  177775  176542  T3B:    MOV     #-3,@BC         ;3 BYTE RECORD
002242  012777  011402  176536          MOV     #WBUF,@CA       ;INITIALIZE CURRENT ADDRESS
002250  016777  003722  176524          MOV     FDRIVE,@MTC     ;SELECT DRIVE
002256  052777  040005  176516          BIS     #40005,@MTC     ;800BPI, WRITE, GO
002264  105777  176512                  TSTB    @MTC
002270  100375                          BPL     .-4             ;AWAIT CUR
002272  004767  003620                  JSR     %7,CHGDRV       ;DONE ALL DRIVES
002276  000756                          BR      T3B             ;NO

                                        ;NOW READ OVER PARTIAL RECORD

002300  012700  006412                  MOV     #TM1,%0
002304  012777  177776  176472  T3D:    MOV     #-2,@BC
002312  012777  011402  176466          MOV     #WBUF,@CA
002320  016777  003652  176454          MOV     FDRIVE,@MTC     ;SELECT DRIVE
002326  052777  040003  176446          BIS     #40003,@MTC     ;800BPI, READ, GO
002334  005067  004050                  CLR     TIME            ;CLEAR TIME
002340  005777  176440          T3E:    TST     @BC             ;WAIT FOR NEXT WORD IN
002344  001403                          BEQ     T3F             ;HAVE IT
002346  004767  004014                  JSR     %7,TIMER        ;NO, COUNT TIME
002352  000772                          BR      T3E
002354  016720  004030          T3F:    MOV     TIME,(0)+       ;SAVE "WRITE TO ERASE HEAD TIME"
002360  105777  176416                  TSTB    @MTC            ;SEE IF CUR
002364  100375                          BPL     .-4             ;AWAIT CUR
002366  004767  003524                  JSR     %7,CHGDRV       ;DONE ALL DRIVES
002372  000744                          BR      T3D             ;NO
002374  012720  177777                  MOV     #-1,(0)+        ;TERMINATE TIMES
002400  012767  007703  005102          MOV     #MSG7,MESAGE
002406  012700  006412                  MOV     #TM1,%0
002412  004767  004234                  JSR     %7,TYPTIM       ;PRINT "WRITE TO ERASE HEAD TIMES"
002416  012767  011134  005064          MOV     #RMSG5,MESAGE
002424  004767  004740                  JSR     %7,TOP
002430  004767  003642          T3G:    JSR     %7,STRREW       ;START REWIND
002434  004767  003456                  JSR     %7,CHGDRV       ;DONE ALL DRIVES
002440  000773                          BR      T3G             ;NO
002442  004767  003670          T3H:    JSR     %7,WATREW       ;DRIVE AT BOT
002446  004767  003444                  JSR     %7,CHGDRV       ;DONE ALL DRIVES
002452  000773                          BR      T3H             ;NO
```

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

002454  004767  003576          T4:     JSR     %7,ST1S
002460  012700  006412                  MOV     #TM1,%0         ;INITIALIZE TIME BUFFERS
002464  012701  006436                  MOV     #TM2,%1
002470  012702  006462                  MOV     #TM3,%2
002474  005067  003710          T4AA:   CLR     TIME
002500  004767  003534                  JSR     %7,WRINT
002504  016777  003466  176270          MOV     FDRIVE,@MTC     ;TRACK AND DRIVE NUMBERS
002512  052777  040005  176262          BIS     #40005,@MTC     ;800 BPI, WRITE, GO
002520  105777  176256                  TSTB    @MTC
002524  100375                          BPL     .-4             ;WAIT FOR CU READY

                                        ;HAVE FIRST RECORD WRITTEN, GO NONSTOP

002526  004767  003506                  JSR     %7,WRINT
002532  005277  176244                  INC     @MTC            ;GO
002536  022777  011404  176242  T4A:    CMP     #WBUF+2,@CA     ;IS 2ND WORD OUTPUT?
002544  003403                          BLE     T4B             ;YES
002546  004767  003614                  JSR     %7,TIMER        ;NO, COUNT TIME
002552  000771                          BR      T4A
002554  016720  003630          T4B:    MOV     TIME,(0)+       ;SAVE "WRITE NONSTOP GAP" TIME
002560  005067  003624                  CLR     TIME
002564  105777  176212                  TSTB    @MTC
002570  100375                          BPL     .-4             ;WAIT FOR CU READY
002572  006077  176202                  ROR     @MTS
002576  103375                          BCC     .-4             ;WAIT FOR TU READY

                                        ;WRITE-BACKSPACE-READ-WRITE

002600  004767  003434                  JSR     %7,WRINT
002604  016777  003366  176170          MOV     FDRIVE,@MTC     ;DRIVE SELECT
002612  052777  040007  176162          BIS     #40007,@MTC     ;800 BPI, WRITE EOF, GO
002620  105777  176156                  TSTB    @MTC
002624  100375                          BPL     .-4             ;WAIT FOR CU READY
002626  012777  177777  176150          MOV     #-1,@BC         ;BACKSPACE 1 RECORD
002634  042777  000016  176140          BIC     #16,@MTC
002642  052777  000013  176132          BIS     #13,@MTC        ;SPACE REVERSE, GO
002650  000240                          NOP
002652  032777  040000  176120  T4BA:   BIT     #40000,@MTS     ;SEE IF EOF
002660  001774                          BEQ     T4BA            ;IF NOT: BR
002662  000240                          NOP
002664  000240                          NOP
002666  032777  000010  176104  T4C:    BIT     #10,@MTS        ;HAS SETTLEDOWN SET?
002674  001003                          BNE     T4D             ;YES
002676  004767  003464                  JSR     %7,TIMER        ;NO, COUNT TIME
002702  000771                          BR      T4C
002704  006077  176070          T4D:    ROR     @MTS
002710  103375                          BCC     .-4             ;WAIT FOR TU READY
002712  016721  003472                  MOV     TIME,(1)+       ;SAVE "BACKSPACE SHUTDOWN" TIME
002716  004767  003316                  JSR     %7,WRINT
002722  005067  003462                  CLR     TIME
```

```
  910  002726  016777  003244  176046          MOV     FDRIVE,@MTC     ;SELECT DRIVE
  911  002734  052777  040003  176040          BIS     #40003,@MTC     ;800 BPI, READ, GO
  912  002742  032777  040000  176030  T4DA:   BIT     #40000,@MTS
  913  002750  001774                          BEQ     T4DA            ;AWAIT EOF
  914  002752  032777  000010  176020  T4E:    BIT     #10,@MTS        ;HAS SETTLEDOWN SET?
  915  002760  001003                          BNE     T4F             ;YES
  916  002762  004767  003400                  JSR     %7,TIMER        ;NO, COUNT TIME
  917  002766  000771                          BR      T4E
  918  002770  006077  176004          T4F:    ROR     @MTS
  919  002774  103375                          BCC     .-4             ;WAIT FOR TU READY
  920  002776  016722  003406                  MOV     TIME,(2)+       ;SAVE "READ SHUTDOWN" TIME
  921  003002  004767  003110                  JSR     %7,CHGDRV
  922  003006  000632                          BR      T4AA
  923  003010  012720  177777                  MOV     #-1,(0)+        ;TERMINATE TIMES
  924  003014  012721  177777                  MOV     #-1,(1)+        ;TERMINATE TIMES
  925  003020  012722  177777                  MOV     #-1,(2)+        ;TERMINATE TIMES
  926  003024  012767  007757  004456          MOV     #MSG9,MESAGE
  927  003032  012700  006436                  MOV     #TM2,%0
  928  003036  004767  003610                  JSR     %7,TYPTIM       ;PRINT "BACKSPACE SHUTDOWN" TIMES
  929  003042  012767  011153  004440          MOV     #RMSG6,MESAGE
  930  003050  004767  004314                  JSR     %7,TOP
  931  003054  012767  010005  004426          MOV     #MSG10,MESAGE
  932  003062  012700  006462                  MOV     #TM3,%0
  933  003066  004767  003560                  JSR     %7,TYPTIM       ;PRINT "READ SHUTDOWN" TIMES
  934  003072  012767  011171  004410          MOV     #RMSG7,MESAGE
  935  003100  004767  004264                  JSR     %7,TOP
  936  003104  004767  003146                  JSR     %7,ST1S
  937  003110  004767  003162          T4FA:   JSR     %7,STRREW       ;START REWIND
  938  003114  004767  002776                  JSR     %7,CHGDRV       ;CHANGE DRIVE
  939  003120  000773                          BR      T4FA
  940  003122  004767  003210          T4FB:   JSR     %7,WATREW       ;AWAIT BOT
  941  003126  004767  002764                  JSR     %7,CHGDRV       ;CHANGE DRIVE
  942  003132  000773                          BR      T4FB
  943  003134  000240                          NOP
  944  003136  004767  003076          T4FC:   JSR     %7,WRINT        ;SET UP FOR WRITE
  945  003142  016777  003030  175632          MOV     FDRIVE,@MTC     ;SET DRIVE NUMBER
  946  003150  052777  040005  175624          BIS     #40005,@MTC     ;SET 800 BPI, WRITE, GO
  947  003156  105777  175620                  TSTB    @MTC
  948  003162  100375                          BPL     .-4             ;AWAIT CUR
  949  003164  000240                          NOP
  950  003166  004767  003046                  JSR     %7,WRINT        ;SET UP FOR NEXT WRITE
  951  003172  005277  175604                  INC     @MTC            ;SET GO
  952  003176  105777  175600                  TSTB    @MTC
  953  003202  100375                          BPL     .-4             ;AWAIT CUR
  954  003204  004767  003030                  JSR     %7,WRINT        ;SET UP FOR NEXT WRITE
  955  003210  005277  175566                  INC     @MTC            ;SET GO
  956  003214  105777  175562                  TSTB    @MTC
  957  003220  100375                          BPL     .-4             ;AWAIT CUR
  958  003222  004767  002670                  JSR     %7,CHGDRV       ;CHANGE DRIVE
  959  003226  000743                          BR      T4FC
  960  003230  000240                          NOP
  961
```

```
                                        ;WRITE RECORDS TO BE USED IN GAP TEST

003232  004767  003002          T4G:    JSR     %7,WRINT
003236  016777  002734  175536          MOV     FDRIVE,@MTC     ;SELECT DRIVE
003244  052777  040005  175530          BIS     #40005,@MTC     ;800 BPI, WRITE, GO
003252  105777  175524                  TSTB    @MTC
003256  100375                          BPL     .-4             ;WAIT FOR CU READY
003260  004767  002754                  JSR     %7,WRINT
003264  005277  175512                  INC     @MTC            ;WRITE NEXT
003270  105777  175506                  TSTB    @MTC
003274  100375                          BPL     .-4             ;WAIT FOR CU READY
003276  012777  177777  175500          MOV     #-1,@BC
003304  016777  002666  175470          MOV     FDRIVE,@MTC     ;SELECT DRIVE
003312  052777  040013  175462          BIS     #40013,@MTC     ;800 BPI, BACKSPACE, GO
003320  105777  175456                  TSTB    @MTC
003324  100375                          BPL     .-4             ;WAIT FOR CU READY
003326  004767  002706                  JSR     %7,WRINT
003332  016777  002640  175442          MOV     FDRIVE,@MTC
003340  052777  040005  175434          BIS     #40005,@MTC     ;800 BPI, WRITE, GO
003346  105777  175430                  TSTB    @MTC
003352  100375                          BPL     .-4
003354  012767  177777  175454          MOV     #-1,R11         ;INDICATES BACK 3 COMPLETE
003362  012767  177777  175450          MOV     #-1,R12         ;INDICATES BACK 4 COMPLETE
003370  012767  177777  175444          MOV     #-1,R13         ;INDICATES BACK 5 COMPLETE
003376  012767  177776  175430          MOV     #-2,R10         ;FIRST SEQUENCE BACK 2 TIMES
```

```
                                        ;NOW WRITE, BACKSPACE, WRITE, BACKSPACE, WRITE
                                        ;GAP SHOULD GET LARGER
                                        
003404  004767  002630          MULWRT: JSR     %7,WRINT
003410  005277  175366                  INC     @MTC            ;GO NONSTOP
003414  105777  175362                  TSTB    @MTC
003420  100375                          BPL     .-4             ;WAIT FOR DONE
003422  012777  177777  175354  MULBAK: MOV     #-1,@BC         ;BACKSPACE 1 RECORD
003430  042777  000016  175344          BIC     #16,@MTC
003436  052777  000013  175336          BIS     #13,@MTC        ;SET BACKSPACE, GO
003444  105777  175332                  TSTB    @MTC
003450  100375                          BPL     .-4             ;WAIT FOR BACKSPACE DONE
003452  004767  002562                  JSR     %7,WRINT
003456  042777  000016  175316          BIC     #16,@MTC
003464  052777  000005  175310          BIS     #5,@MTC         ;SET WRITE, GO
003472  105777  175304                  TSTB    @MTC
003476  100375                          BPL     .-4             ;WAIT FOR WRITE DONE
003500  005267  175330                  INC     R10             ;BACKSPACED ENOUGH TIMES?
003504  001346                          BNE     MULBAK          ;NO BACKSPACE AND WRITE AGAIN
003506  005267  175324                  INC     R11             ;DONE 3 BACKSPACE SEQUENCES?
003512  001004                          BNE     MUL1            ;YES
003514  012767  177775  175312          MOV     #-3,R10
003522  000730                          BR      MULWRT
003524  005267  175310          MUL1:   INC     R12             ;DONE 4 BACKSPACE SEQUENCES?
003530  001004                          BNE     MUL2            ;YES
003532  012767  177774  175274          MOV     #-4,R10
003540  000721                          BR      MULWRT
003542  005267  175274          MUL2:   INC     R13             ;DONE 5 BACKSPACE SEQUENCES?
003546  001004                          BNE     MUL3            ;YES
003550  012767  177773  175256          MOV     #-5,R10
003556  000712                          BR      MULWRT
003560  006077  175214          MUL3:   ROR     @MTS
003564  103375                          BCC     .-4             ;WAIT FOR TU READY
003566  004767  002504                  JSR     %7,STRREW       ;START REWIND
003572  004767  002320                  JSR     %7,CHGDRV
003576  000615                          BR      T4G
```

```
1024                                    ;NOW READ NONSTOP
1025                                    ;ACCUMULATE GAP TIMES ON READ
1026                                    ;TYPE ACCUMULATED TIMES AT END OF READ
1027                                    ;GAP1 SHOULD = GAP2, GAP3 <GAP1 AND GAP2
1028                                    ;GAP4 THRU GAP9 SHOULD GET INCREASINGLY LONGER
1029  003600  005067  175240                   CLR     TSDRV
1030
1031  003604  004767  002526           T5:    JSR     %7,WATREW
1032  003610  004767  002424                  JSR     %7,WRINT
1033  003614  012700  006412                  MOV     #TM1,%0
1034  003620  066700  175220                  ADD     TSDRV,%0
1035  003624  016777  002346  175150          MOV     FDRIVE,@MTC     ;SELECT DRIVE
1036  003632  052777  040003  175142          BIS     #40003,@MTC     ;800 BPI, READ, GO
1037  003640  012767  177770  175166          MOV     #-8.,R10        ;COUNT 8 GAPS
1038  003646  105777  175130           T5A:   TSTB    @MTC
1039  003652  100375                         BPL     .-4             ;WAIT FOR CU READY
1040  003654  004767  002360                  JSR     %7,WRINT
1041  003660  005067  002524                  CLR     TIME
1042  003664  005277  175112                  INC     @MTC            ;GO NONSTOP
1043  003670  022777  011404  175110   T5B:   CMP     #WBUF+2,@CA     ;IS 2ND WORD OUTPUT
1044  003676  003403                         BLE     T5C             ;YES
1045  003700  004767  002462                  JSR     %7,TIMER        ;NO, COUNT TIME
1046  003704  000771                         BR      T5B
1047  003706  016720  002476           T5C:   MOV     TIME,(0)+       ;SAVE GAP TIME
1048  003712  012710  177777                  MOV     #-1,(0)         ;TERMINATE, JUST IN CASE AT END
1049  003716  062700  000022                  ADD     #22,%0          ;STEP GAP POINTER
1050  003722  005267  175106                  INC     R10             ;DONE ALL 8 GAPS?
1051  003726  001347                         BNE     T5A             ;NO
1052  003730  006077  175044                  ROR     @MTS
1053  003734  103375                         BCC     .-4             ;WAIT FOR TU READY
1054  003736  004767  002334                  JSR     %7,STRREW       ;START REWIND
1055  003742  062767  000002  175074          ADD     #2,TSDRV        ;+2 TO DRIVE TIME POINTER
1056  003750  004767  002142                  JSR     %7,CHGDRV
1057  003754  000713                         BR      T5
1058  003756  112767  000061  004134          MOVB    #'1,MSG11A+6
1059  003764  012767  010033  003516          MOV     #MSG11,MESAGE
1060  003772  004767  003372                  JSR     %7,TOP
1061  003776  012767  010112  003504          MOV     #MSG11A,MESAGE
1062  004004  012700  006412                  MOV     #TM1,%0
1063  004010  004767  002636                  JSR     %7,TYPTIM       ;PRINT "GAP 1"
1064  004014  105267  004100                  INCB    MSG11A+6
1065  004020  012767  010112  003462          MOV     #MSG11A,MESAGE
1066  004026  012700  006436                  MOV     #TM2,%0
1067  004032  004767  002614                  JSR     %7,TYPTIM       ;PRINT "GAP 2"
1068  004036  105267  004056                  INCB    MSG11A+6
1069  004042  012767  010112  003440          MOV     #MSG11A,MESAGE
1070  004050  012700  006462                  MOV     #TM3,%0
1071  004054  004767  002572                  JSR     %7,TYPTIM       ;PRINT "GAP 3"
1072  004060  105267  004034                  INCB    MSG11A+6
1073  004064  012767  010112  003416          MOV     #MSG11A,MESAGE
1074  004072  012700  006506                  MOV     #TM4,%0
1075  004076  004767  002550                  JSR     %7,TYPTIM       ;PRINT "GAP 4"
1076  004102  105267  004012                  INCB    MSG11A+6
1077  004106  012767  010112  003374          MOV     #MSG11A,MESAGE
1078  004114  012700  006532                  MOV     #TM5,%0
1079  004120  004767  002526                  JSR     %7,TYPTIM       ;PRINT "GAP 5"
```

```
1080  004124  105267  003770                  INCB    MSG11A+6
1081  004130  012767  010112  003352          MOV     #MSG11A,MESAGE
1082  004136  012700  006556                  MOV     #TM6,%0
1083  004142  004767  002504                  JSR     %7,TYPTIM       ;PRINT "GAP 6"
1084  004146  105267  003746                  INCB    MSG11A+6
1085  004152  012767  010112  003330          MOV     #MSG11A,MESAGE
1086  004160  012700  006602                  MOV     #TM7,%0
1087  004164  004767  002462                  JSR     %7,TYPTIM       ;PRINT "GAP 7"
1088  004170  105267  003724                  INCB    MSG11A+6
1089  004174  012767  010112  003306          MOV     #MSG11A,MESAGE
1090  004202  012700  006626                  MOV     #TM8,%0
1091  004206  004767  002440                  JSR     %7,TYPTIM       ;PRINT "GAP 8"
1092  004212  004767  002040                  JSR     %7,ST1S
1093
1094                                  ;TIME WRITE START NOT AT BOT
1095
1096  004216  012700  006412          T6:     MOV     #TM1,%0
1097  004222  012701  006436                  MOV     #TM2,%1
1098  004226  004767  002006          T6A:    JSR     %7,WRINT
1099  004232  016777  001740  174542          MOV     FDRIVE,@MTC     ;SELECT DRIVE
1100  004240  105777  174536                  TSTB    @MTC
1101  004244  100375                          BPL     .-4
1102  004246  006077  174526                  ROR     @MTS
1103  004252  103375                          BCC     .-4             ;WAIT FOR TU READY
1104  004254  052777  040005  174520          BIS     #40005,@MTC     ;800 BPI, WRITE, GO
1105  004262  032777  000040  174510          BIT     #40,@MTS
1106  004270  001374                          BNE     .-6             ;WAIT FOR BOT TO CLEAR
1107  004272  052777  010000  174502          BIS     #10000,@MTC     ;POWER CLEAR
1108  004300  016777  001672  174474          MOV     FDRIVE,@MTC
1109  004306  004767  001726                  JSR     %7,WRINT
1110  004312  006077  174462                  ROR     @MTS
1111  004316  103375                          BCC     .-4             ;WAIT FOR TU READY
1112  004320  005067  002064                  CLR     TIME
1113  004324  016777  001646  174450          MOV     FDRIVE,@MTC     ;SELECT DRIVE
1114  004332  052777  040005  174442          BIS     #40005,@MTC     ;800 BPI, WRITE, GO
1115  004340  022777  011404  174440  T6B:    CMP     #WBUF+2,@CA     ;IS 2ND WORD OUTPUT?
1116  004346  003403                          BLE     T6C             ;YES
1117  004350  004767  002012                  JSR     %7,TIMER        ;NO, COUNT TIME
1118  004354  000771                          BR      T6B
1119  004356  006077  174416          T6C:    ROR     @MTS
1120  004362  103375                          BCC     .-4             ;WAIT FOR TU READY
1121  004364  016720  002020                  MOV     TIME,(0)+       ;SAVE "WRITE START" TIME
1122  004370  005067  002014                  CLR     TIME
1123  004374  004767  001640                  JSR     %7,WRINT
1124  004400  016777  001572  174374          MOV     FDRIVE,@MTC     ;SELECT DRIVE
1125  004406  052777  040015  174366          BIS     #40015,@MTC     ;800 BPI, WRITE XIRG, GO
1126  004414  022777  011404  174364  T6D:    CMP     #WBUF+2,@CA     ;IS 2ND WORD OUTPUT
1127  004422  003403                          BLE     T6E             ;YES
1128  004424  004767  001736                  JSR     %7,TIMER        ;NO COUNT TIME
1129  004430  000771                          BR      T6D
1130  004432  006077  174342          T6E:    ROR     @MTS
1131  004436  103375                          BCC     .-4             ;WAIT FOR TU READY
1132  004440  016721  001744                  MOV     TIME,(1)+       ;SAVE "WRITE XIRG" TIME
1133  004444  004767  001626                  JSR     %7,STRREW
1134  004450  004767  001442                  JSR     %7,CHGDRV
1135  004454  000664                          BR      T6A
```

```
1136  004456  012720  177777                MOV     #-1,(0)+        ;TERMINATE TIMES
1137  004462  012721  177777                MOV     #-1,(1)+        ;TERMINATE TIMES
1138  004466  012767  007627  003014        MOV     #MSG5,MESAGE
1139  004474  012700  006412                MOV     #TM1,%0
1140  004500  004767  002146                JSR     %7,TYPTIM       ;TYPE "WRITE START" TIME
1141  004504  012767  011207  002776        MOV     #RMSG8,MESAGE
1142  004512  004767  002652                JSR     %7,TOP
1143  004516  012767  010140  002764        MOV     #MSG12,MESAGE
1144  004524  012700  006436                MOV     #TM2,%0
1145  004530  004767  002116                JSR     %7,TYPTIM       ;TYPE "WRITE XIRG" TIME
1146  004534  012767  011226  002746        MOV     #RMSG9,MESAGE
1147  004542  004767  002622                JSR     %7,TOP
1148  004546  004767  001564        T6F:    JSR     %7,WATREW
1149  004552  004767  001340                JSR     %7,CHGDRV
1150  004556  000773                        BR      T6F             ;WAIT FOR ALL DRIVES AT BOT.
1151
1152                                ;NOW TIME "READ FROM BOT DELAY
1153
1154  004560  012700  006412        T7:     MOV     #TM1,%0
1155  004564  005067  001620        T7A:    CLR     TIME
1156  004570  004767  001444                JSR     %7,WRINT
1157  004574  016777  001376  174200        MOV     FDRIVE,@MTC     ;SELECT DRIVE
1158  004602  052777  040003  174172        BIS     #40003,@MTC     ;800 BPI, READ GO
1159  004610  022777  011404  174170 T7B:    CMP     #WBUF+2,@CA     ;IS 2ND WORD INPUT?
1160  004616  003403                        BLE     T7C             ;YES
1161  004620  004767  001542                JSR     %7,TIMER        ;NO COUNT TIME
1162  004624  000771                        BR      T7B
1163  004626  016720  001556        T7C:    MOV     TIME,(0)+       ;SAVE "READ FROM BOT" TIME
1164  004632  105777  174144                TSTB    @MTC
1165  004636  100375                        BPL     .-4             ;WAIT FOR CU READY.
1166  004640  004767  001252                JSR     %7,CHGDRV       ;DONE ALL DRIVES?
1167  004644  000747                        BR      T7A             ;NO
1168  004646  006077  174126                ROR     @MTS
1169  004652  103375                        BCC     .-4
1170  004654  012720  177777                MOV     #-1,(0)+        ;TERMINATE TIMES
1171  004660  012767  010166  002622        MOV     #MSG13,MESAGE
1172  004666  012700  006412                MOV     #TM1,%0
1173  004672  004767  001754                JSR     %7,TYPTIM       ;PRINT "READ FROM BOT" TIME
1174  004676  012767  011246  002604        MOV     #RMSG10,MESAGE
1175  004704  004767  002460                JSR     %7,TOP
1176  004710  004767  001342                JSR     %7,ST1S
1177
1178                                ;TIME "LAST CHARACTER INPUT TO CU READY"
1179
1180  004714  012700  006412        T8:     MOV     #TM1,%0
1181  004720  004767  001314        T8A:    JSR     %7,WRINT
1182  004724  005067  001460                CLR     TIME
1183  004730  016777  001242  174044        MOV     FDRIVE,@MTC     ;SELECT DRIVE
1184  004736  052777  040003  174036        BIS     #40003,@MTC     ;800 BPI, READ, GO
1185  004744  005777  174034                TST     @BC
1186  004750  001375                        BNE     .-4             ;WAIT FOR LAST WORD IN
1187  004752  105777  174024        T8B:    TSTB    @MTC            ;IS CU READY?
1188  004756  100403                        BMI     T8C             ;YES
1189  004760  004767  001402                JSR     %7,TIMER        ;NO, COUNT TIME
1190  004764  000772                        BR      T8B
1191  004766  006077  174006        T8C:    ROR     @MTS
```

```
1192  004772  103375                        BCC     .-4             ;WAIT FOR TU READY
1193  004774  016720  001410                MOV     TIME,(0)+       ;SAVE "LAST CHAR TO CU READY" TIME
1194  005000  004767  001272                JSR     %7,STRREW       ;REWIND
1195  005004  004767  001106                JSR     %7,CHGDRV       ;ANYMORE DRIVES?
1196  005010  000743                        BR      T8A             ;YES
1197  005012  012720  177777                MOV     #-1,(0)+        ;TERMINATE TIMES
1198  005016  004767  001314        T8D:    JSR     %7,WATREW
1199  005022  004767  001070                JSR     %7,CHGDRV
1200  005026  000773                        BR      T8D
1201
1202                                  ;TIME "WRITE EOF"
1203                                  ;WRITE A 3 BYTE RECORD FROM BOT FOLLOWED BY AN EOF.
1204
1205  005030  012700  006412        T9:     MOV     #TM1,%0
1206  005034  005067  001350        T9A:    CLR     TIME
1207  005040  012777  177775  173736        MOV     #-3.,@BC                ;WRITE 3 BYTES
1208  005046  012777  011402  173732        MOV     #WBUF,@CA
1209  005054  016777  001116  173720        MOV     FDRIVE,@MTC     ;SELECT DRIVE
1210  005062  052777  040005  173712        BIS     #40005,@MTC     ;800 BPI, WRITE, GO
1211  005070  105777  173706                TSTB    @MTC
1212  005074  100375                        BPL     .-4
1213  005076  006077  173676                ROR     @MTS
1214  005102  103375                        BCC     .-4             ;WAIT FOR TU READY
1215  005104  042777  000016  173670        BIC     #16,@MTC
1216  005112  052777  000007  173662        BIS     #7,@MTC         ;WRITE EOF, GO
1217  005120  105777  173656        T9B:    TSTB    @MTC            ;IS CU READY SET?
1218  005124  100403                        BMI     T9C             ;YES
1219  005126  004767  001234                JSR     %7,TIMER        ;NO, COUNT TIME
1220  005132  000772                        BR      T9B
1221  005134  016720  001250        T9C:    MOV     TIME,(0)+       ;SAVE "WRITE EOF" TIME
1222  005140  004767  001132                JSR     %7,STRREW       ;REWIND
1223  005144  004767  000746                JSR     %7,CHGDRV       ;ANYMORE DRIVES?
1224  005150  000731                        BR      T9A             ;YES
1225  005152  012720  177777                MOV     #-1,(0)+        ;TERMINATE TIMES
1226  005156  012767  010242  002324        MOV     #MSG15,MESAGE
1227  005164  012700  006412                MOV     #TM1,%0
1228  005170  004767  001456                JSR     %7,TYPTIM       ;PRINT "WRITE EOF" TIMES
1229  005174  012767  011266  002306        MOV     #RMSG11,MESAGE
1230  005202  004767  002162                JSR     %7,TOP
1231  005206  004767  001124        T9D:    JSR     %7,WATREW
1232  005212  004767  000700                JSR     %7,CHGDRV
1233  005216  000773                        BR      T9D
```

```
1234                                    ;TIME "EOR TO EOF SPACE TIME", "SPACE SHUTDOWN" AND "ONE INCH DATA TIME".
1235                                    ;WRITE A 3 BYTE RECORD OVER ONE PREVIOUSLY WRITTEN
1236                                    ;AND THEN SPACE FORWARD 1 RECORD
1237                                    ;TIME FROM GO UNTIL EOF IS REACHED
1238
1239  005220  012700  006412       T10:    MOV     #TM1,%0
1240  005224  012701  006436               MOV     #TM2,%1
1241  005230  012702  006462               MOV     #TM3,%2
1242  005234  005067  001150       T10A:   CLR     TIME
1243  005240  012777  177775  173536       MOV     #-3,@BC         ;3 BYTE RECORD
1244  005246  012777  011402  173532       MOV     #WBUF,@CA
1245  005254  016777  000716  173520       MOV     FDRIVE,@MTC     ;SELECT DRIVE
1246  005262  105777  173514               TSTB    @MTC
1247  005266  100375                       BPL     .-4             ;WAIT FOR CU READY
1248  005270  012777  177776  173506       MOV     #-2,@BC         ;SPACE FORWARD 2 RECORDS
1249  005276  042777  000016  173476       BIC     #16,@MTC
1250  005304  052777  000011  173470       BIS     #11,@MTC        ;SPACE FORWARD, GO
1251  005312  022777  177777  173464 T10B:  CMP     #-1,@BC
1252  005320  001374                       BNE     T10B            ;WAIT FOR 1ST RECORD TO BE SPACED OVER
1253  005322  032777  040000  173450 T10C:  BIT     #40000,@MTS     ;IS EOF SET?
1254  005330  001014                       BNE     T10D            ;YES
1255  005332  105777  173444               TSTB    @MTC            ;IS CU READY
1256  005336  100403                       BMI     T10CC           ;YES
1257  005340  004767  001022               JSR     %7,TIMER        ;NO, COUNT TIME
1258  005344  000766                       BR      T10C
1259  005346  032777  040000  173424 T10CC: BIT     #40000,@MTS     ;HAVE EOF
1260  005354  001002                       BNE     T10D            ;IS EOF SET?
1261  005356  005067  001026               CLR     TIME            ;NO, SET ERROR
1262  005362  016720  001022       T10D:   MOV     TIME,(0)+       ;SAVE "EOR TO EOF SPACE TIME"
1263  005366  005067  001016               CLR     TIME
1264  005372  000240                       NOP
1265  005374  000240                       NOP
1266  005376  000240                       NOP
1267  005400  032777  000010  173372 T10E:  BIT     #10,@MTS        ;IS SETTLEDOWN SET?
1268  005406  001003                       BNE     T10F            ;YES
1269  005410  004767  000752               JSR     %7,TIMER        ;NO, COUNT TIME
1270  005414  000771                       BR      T10E
1271  005416  016721  000766       T10F:   MOV     TIME,(1)+       ;SAVE "SPACE SHUTDOWN" TIME
1272  005422  105777  173354               TSTB    @MTC            ;SEE IF CUR
1273  005426  100375                       BPL     .-4             ;IF NOT: BR
1274  005430  012777  176340  173346       MOV     #-800.,@BC      ;1 INCH OF DATA
1275  005436  012777  011402  173342       MOV     #WBUF,@CA
1276  005444  005067  000740               CLR     TIME
1277  005450  016777  000522  173324       MOV     FDRIVE,@MTC     ;SELECT DRIVE
1278  005456  105777  173320               TSTB    @MTC            ;WAIT FOR CU READY
1279  005462  100375                       BPL     .-4
1280  005464  052777  040005  173310       BIS     #40005,@MTC     ;800 BPI, WRITE, GO
1281  005472  022777  011404  173306       CMP     #WBUF+2,@CA     ;IS 2ND BYTE OUTPUT
1282  005500  003374                       BGT     .-6             ;NO
1283  005502  005777  173276       T10G:   TST     @BC             ;YES IS LAST BYTE OUT
1284  005506  001403                       BEQ     T10H            ;YES
1285  005510  004767  000652               JSR     %7,TIMER        ;NO, COUNT TIME
1286  005514  000772                       BR      T10G
1287
1288  005516  016722  000666       T10H:   MOV     TIME,(2)+       ;SAVE "ONE INCH DATA TIME"
1289  005522  004767  000550               JSR     %7,STRREW       ;REWIND
```

```
1290  005526  004767  000364          JSR     %7,CHGDRV       ;ANYMORE DRIVES?
1291  005532  000640                  BR      T10A            ;YES
1292  005534  012720  177777          MOV     #-1,(0)+        ;TERMINATE TIMES
1293  005540  012721  177777          MOV     #-1,(1)+
1294  005544  012722  177777          MOV     #-1,(2)+
1295  005550  012767  010270  001732  MOV     #MSG16,MESAGE
1296  005556  012700  006412          MOV     #TM1,%0
1297  005562  004767  001064          JSR     %7,TYPTIM       ;PRINT "EOR TO EOF SPACE TIME"
1298  005566  012767  011306  001714  MOV     #RMSG12,MESAGE
1299  005574  004767  001570          JSR     %7,TOP
1300  005600  012767  010316  001702  MOV     #MSG18,MESAGE
1301  005606  012700  006436          MOV     #TM2,%0
1302  005612  004767  001034          JSR     %7,TYPTIM       ;PRINT "SPACE SHUTDOWN" TIME
1303  005616  012767  011326  001664  MOV     #RMSG13,MESAGE
1304  005624  004767  001540          JSR     %7,TOP
1305  005630  012767  010344  001652  MOV     #MSG20,MESAGE
1306  005636  012700  006462          MOV     #TM3,%0
1307  005642  004767  001004          JSR     %7,TYPTIM       ;PRINT "ONE INCH DATA TIME"
1308  005646  012767  011344  001634  MOV     #RMSG14,MESAGE
1309  005654  004767  001510          JSR     %7,TOP
1310  005660  000167  000146          JMP     T13             ;GO TO END OF TIMING
1311
1312                                  ;SPECIAL TAPE SPEED TEST USING 800 BPI SKEW TAPE
1313                                  ;READ FOWARD FROM BOT, MONITOR CA UNTIL IT EQUALS WBUF+2.
1314                                  ;TIME FROM WBUF+2 UNTIL BC=0 IS ONE INCH OF TAPE.
1315
1316  005664  000240          T11:    NOP
1317  005666  012700  006412          MOV     #TM1,%0
1318  005672  005067  000512  T11A:   CLR     TIME            ;INITIALIZE TIME
1319  005676  016777  000274  173076  MOV     FDRIVE,@MTC     ;SELECT DRIVE
1320  005704  105777  173072          TSTB    @MTC
1321  005710  100375                  BPL     .-4             ;AWAIT CUR
1322  005712  012777  176340  173064  MOV     #-800.,@BC      ;800 BYTES =1 INCH OF DATA
1323  005720  012777  011402  173060  MOV     #WBUF,@CA       ;SET BUS ADDRESS
1324  005726  052777  040003  173046  BIS     #40003,@MTC     ;LOAD 800 BPI READ AND GO
1325  005734  022777  011404  173044  CMP     #WBUF+2,@CA
1326  005742  003374                  BGT     .-6             ;AWAIT 2ND BYTE
1327  005744  005777  173034  T11B:   TST     @BC             ;SEE IF LAST BYTE
1328  005750  001403                  BEQ     T11C            ;IF SO: BR
1329  005752  004767  000410          JSR     %7,TIMER        ;NO, COUNT TIME
1330  005756  000772                  BR      T11B
1331  005760  016720  000424  T11C:   MOV     TIME,(0)+       ;SAVE TAPE SPEED TIME
1332  005764  004767  000314          JSR     %7,STRW         ;REWIND
1333  005770  004767  000122          JSR     %7,CHGDRV       ;ANYMORE DRIVER?
1334  005774  000736                  BR      T11A            ;YES
1335  005776  012720  177777          MOV     #-1,(0)+        ;TERMINALS TIMER
1336  006002  012767  010372  001500  MOV     #MSG21,MESAGE
1337  006010  012700  006412          MOV     #TM1,%0         ;PRINT "TAPE SPEED FWD"
1338  006014  004767  000632          JSR     %7,TYPTIM
1339  006020  012767  011363  001462  MOV     #RMSG15,MESAGE
1340  006026  004767  001336          JSR     %7,TOP          ;PRINT RANGE
1341  006032  012767  010420  001450  T13:    MOV     #MSG27,MESAGE
1342  006040  004767  001324          JSR     %7,TOP          ;PRINT "END OF TIMING"
1343  006044  000000                  HALT
1344  006046  000167  173220          JMP     STO
1345
```

```
1346                                        ;RESET DRIVE SELECTION TO LOWEST NUMBER
1347
1348  006052  005067  000112          RSFDRV: CLR     CDRIVE              ;START WITH DRIVE 0
1349  006056  012767  100000  000106          MOV     #100000,CDRVBT      ;INITIALIZE FOR 0
1350  006064  036767  000102  000102  RSF1:   BIT     CDRVBT,DRIVES       ;MASK WITH SELCTED DRIVES .
1351  006072  001006                          BNE     RSF2
1352  006074  005267  000070                  INC     CDRIVE              ;+1 TO DRIVE NUMBER
1353  006100  000241                          CLC
1354  006102  006067  000064                  ROR     CDRVBT              ;MOVE MASK BIT TO NEXT DRIVE
1355  006106  000766                          BR      RSF1
1356  006110  004767  000064          RSF2:   JSR     %7,GTNINE           ;CHECK 9 TRACK
1357  006114  000207                          RTS     %7
1358
```

```
                                        ;SELECT NEXT DRIVE IN SEQUENCE
                                        ;SKIP FIRST EXIT ADDRESS IF LAST DRIVE SELECTED
                                        
006116  105777  172660          CHGDRV: TSTB    @MTC
006122  100375                          BPL     .-4             ;AWAIT CUR
006124  005267  000040                  INC     CDRIVE          ;+1 TO DRIVE
006130  000241                          CLC
006132  006067  000034                  ROR     CDRVBT          ;MOVE MASK BIT TO NEXT DRIVE
006136  001005                          BNE     CHG1
006140  004767  177706                  JSR     %7,RSFDRV       ;RESET TO LOWEST DRIVE
006144  062716  000002                  ADD     #2,(6)          ;+2 TO SKIP FIRST EXIT
006150  000207                          RTS     %7              ;EXIT
006152  036767  000014  000014  CHG1:   BIT     CDRVBT,DRIVES   ;MASK WITH SELECTED DRIVES
006160  001756                          BEQ     CHGDRV          ;CHECK FOR NEXT DRIVE
006162  004767  000012                  JSR     %7,GTNINE       ;CHECK 9 TRACK
006166  000207                          RTS     %7
006170  000000                  CDRIVE: 0
006172  000000                  CDRVBT: 0
006174  000000                  DRIVES: 0
006176  000000                  FDRIVE: 0
                                        
                                        ;CHECK FOR NINE TRACK DRIVES
                                        
006200  016767  177764  177770  GTNINE: MOV     CDRIVE,FDRIVE
006206  000367  177764                  SWAB    FDRIVE          ;POSITION UNIT SELECT BITS
006212  042767  174377  177756          BIC     #174377,FDRIVE  ;CLEAR ALL OTHER BITS
006220  032767  000010  177742          BIT     #10,CDRIVE      ;TEST FOR 9 TRACK
006226  001403                          BEQ     GNT1            ;NO
006230  052767  020000  177740          BIS     #20000,FDRIVE   ;YES SET 9 TRACK BIT
006236  000207                  GNT1:   RTS     %7
                                        
                                        ;INITIALIZE BYTE COUNT AND CURRENT ADDRESS FOR WRITE
                                        
006240  012777  172110  172536  WRINT:  MOV     #-BLENTH,@BC
006246  012777  011402  172532          MOV     #WBUF,@CA
006254  000207                          RTS     %7
                                        
                                        ;STORE 1'S IN WRITE BUFFER
                                        
006256  012700  011402          ST1S:   MOV     #WBUF,%0
006262  012720  177777          ST1SA:  MOV     #-1,(0)+
006266  022700  017274                  CMP     #WBUF+BLENTH+2,%0
006272  001373                          BNE     ST1SA
006274  000207                          RTS     %7
                                        
                                        ;START REWIND OPERATIONS
                                        
006276  016777  177674  172476  STRREW: MOV     FDRIVE,@MTC     ;SELECT DRIVE
006304  105777  172472          STRW:   TSTB    @MTC
006310  100375                          BPL     .-4             ;WAIT FOR CU READY
006312  006077  172462                  ROR     @MTS
006316  103375                          BCC     .-4             ;WAIT FOR TAPE UNIT READY
006320  052777  000017  172454          BIS     #17,@MTC        ;GO REWIND
006326  105777  172450                  TSTB    @MTC
006332  100375                          BPL     .-4             ;WAIT FOR CONTROL UNIT READY
006334  000207                          RTS     %7
```

```
1415
1416                                    ;WAIT FOR REWIND TO FINISH
1417
1418  006336  016777  177634  172436  WATREW: MOV     FDRIVE,@MTC
1419  006344  006077  172430          ROR     @MTS
1420  006350  103375                  BCC     .-4
1421  006352  032777  000040  172420  BIT     #40,@MTS        ;IS BOT SET?
1422  006360  001001                  BNE     .+4             ;YES
1423  006362  000000                  HALT                    ;ERROR, NOT AT BOT AFTER REWIND
1424  006364  000207                  RTS     %7
1425
1426                                    ;KEEP COUNT OF ELAPSED TIME
1427                                    ;EXIT EVERY 100 USEC
1428
1429  006366  005777  172420  TIMER:  TST     @MTRD
1430  006372  100375                  BPL     .-4
1431  006374  005777  172412          TST     @MTRD
1432  006400  100775                  BMI     .-4
1433  006402  005267  000002          INC     TIME            ;+1 TO 100 USEC COUNT
1434  006406  000207                  RTS     %7
1435  006410  000000          TIME:   0
1436  006412  000000          TM1:    0
1437          006436                  .=TM1+20.
1438  006436  000000          TM2:    0
1439          006462                  .=TM2+20.
1440  006462  000000          TM3:    0
1441          006506                  .=TM3+20.
1442  006506  000000          TM4:    0
1443          006532                  .=TM4+20.
1444  006532  000000          TM5:    0
1445          006556                  .=TM5+20.
1446  006556  000000          TM6:    0
1447          006602                  .=TM6+20.
1448  006602  000000          TM7:    0
1449          006626                  .=TM7+20.
1450  006626  000000          TM8:    0
1451          006652                  .=TM8+20.
```

```
                                        ;PRINT TITLE OF TEST EXECUTED AND THE DRIVE TIMES

006652  004767  000512          TYPTIM: JSR     %7,TOP          ;PRINT TITLE
006656  012067  000224          TYPTO:  MOV     (0)+,VALUE      ;GET TIME
006662  022767  177777  000216          CMP     #-1,VALUE       ;FINISHED TIME BUFFER
006670  001001                          BNE     .+4
006672  000207                          RTS     %7
006674  012767  007120  000214          MOV     #DECPNT+2,DECPNT;INITIALIZE DECIMAL VALUE POINTER
006702  012767  000040  000204          MOV     #40,ZERO        ;INITIALIZE SPACE
006710  012767  177774  000172          MOV     #-4,DIGCNT      ;DIGIT COUNT
006716  012767  177777  000166  TYPT1:  MOV     #-1,DIGIT       ;INITIAL VALUE
006724  005267  000162          TYPT2:  INC     DIGIT           ;+1 TO VALUE
006730  167767  000162  000150          SUB     @DECPNT,VALUE   ;SUBTRACT CONSTANT
006736  100372                          BPL     TYPT2           ;NOT NEGATIVE YET
006740  067767  000152  000140          ADD     @DECPNT,VALUE   ;RESTORE LAST POSITIVE VALUE
006746  004767  000064                  JSR     %7,DECOUT       ;PRINT DECIMAL DIGIT
006752  005267  000132                  INC     DIGCNT          ;+1 TO DIGIT COUNT
006756  001006                          BNE     TYP2A
006760  012767  007547  000522          MOV     #MSG2B,MESAGE
006766  004767  000376                  JSR     %7,TOP
006772  000731                          BR      TYPTO
006774  022767  177777  000106  TYP2A:  CMP     #-1,DIGCNT      ;CHECK FOR DECIMAL PLACE
007002  001011                          BNE     TYPT3           ;NO
007004  105777  172012                  TSTB    @TPS
007010  100375                          BPL     .-4
007012  012777  000056  172004          MOV     #'.,@TPB                ;PRINT DECIMAL POINT
007020  012767  000060  000066          MOV     #60,ZERO
007026  062767  000002  000062  TYPT3:  ADD     #2,DECPNT       ;+2 TO DECIMAL VALUE POINTER
007034  000730                          BR      TYPT1           ;DO AGAIN

007036  005767  000050          DECOUT: TST     DIGIT           ;IS DIGIT 0
007042  001004                          BNE     DEC1            ;NO
007044  016767  000044  000040          MOV     ZERO,DIGIT      ;SUPPRESS LEADING ZEROS
007052  000406                          BR      DEC2
007054  012767  000060  000032  DEC1:   MOV     #60,ZERO        ;INITIALIZE ZERO AFTER SOME VALUE FOUND
007062  052767  000060  000022          BIS     #60,DIGIT       ;CONVERT TO ANSCII
007070  105777  171726          DEC2:   TSTB    @TPS
007074  100375                          BPL     .-4
007076  016777  000010  171720          MOV     DIGIT,@TPB      ;PRINT
007104  000207                          RTS     %7
007106  000000          VALUE:  0
007110  000000          DIGCNT: 0
007112  000000          DIGIT:  0
007114  000040          ZERO:   40                              ;CONTAINS ZERO OR SPACE
007116  007120          DECPNT: .+2
007120  001750                  1000.
007122  000144                  100.
007124  000012                  10.
007126  000001                  1.
```

```
                                ;*****************************************************************
                                ;TTY ENTRY SUBROUTINE:
                                ;
                                ;THIS SUBROUTINE IS USED BY THE TEST CONDITION
                                ;ENTRY ROUTINE TO READ THE RESPONSE ENTERED
                                ;AT THE TTY AND CHECK THEM FOR LEGALITY AND
                                ;LIMITS.  ALL RESPONSE MUST BE TYPED IN OCTAL
                                ;(0-7) AND MUST FALL WITHIN THE LIMITS SET BY
                                ;THE CALLING ROUTINE.
                                ;IF AN ENTRY IS ILLEGAL OR OUTSIDE THE LIMITS,
                                ;A QUESTION MARK IS TYPED (?) AND THE RESPONSE
                                ;MAY BE REENTERED.
                                ;ENTRIES MAY NOT EXCEED SIX (6) CHARACTERS AND
                                ;MAY BE TERMINATED AT LESS THAN SIZ BY TYPING A
                                ;CARRIAGE RETURN
                                ;*****************************************************************

007130  005067  171716        TTR:    CLR     TEMP1           ;CLEAR FIRST CHARACTER FLAG
007134  005000                        CLR     %0
007136  004767  000154        TTR0:   JSR     %7,TTIN         ;GO READ CHARACTER
007142  122767  000215  171700        CMPB    #215,TIB        ;SEE IF CR
007150  001005                        BNE     TTR1            ;IF NOT:  BR
007152  005767  171674                TST     TEMP1           ;SEE IF FIRST CHARACTER
007156  001446                        BEQ     TTR5            ;IF SO:  BR
007160  000167  000066                JMP     TTR2            ;ELSE GO LOAD VALUE
007164  122767  000260  171656  TTR1:  CMPB    #260,TIB        ;SEE IF CHAR IS LESS THAN 0
007172  101402                        BLOS    TTR1A           ;IF NOT:  BR
007174  000167  000076                JMP     TINER           ;ELSE GO TO ERROR
007200  122767  000270  171642  TTR1A: CMPB    #270,TIB        ;SEE IF CHAR IS GREATER THEN 7
007206  101002                        BHI     TTR1B           ;IF NOT:  BR
007210  000167  000062                JMP     TINER           ;ELSE GO TO ERROR
007214  005267  171632        TTR1B:  INC     TEMP1           ;SET FIRST CHARACTER FLAG
007220  000241                        CLC
007222  006100                        ROL     %0
007224  000241                        CLC
007226  006100                        ROL     %0              ;SHIFT 3  LEFT
007230  000241                        CLC
007232  006100                        ROL     %0
007234  042767  177770  171606        BIC     #177770,TIB     ;STRIP ASCII
007242  056700  171602                BIS     TIB,%0          ;LOAD CHARACTER
007246  005301                        DEC     %1              ;SEE IF DONE
007250  001332                        BNE     TTR0            ;IF NOT:  BR
007252  020002                TTR2:   CMP     %0,%2           ;SEE IF EXCEEDED MAXIMUM LIMIT
007254  101402                        BLOS    TTR3            ;IF NOT:  BR
007256  000167  000014                JMP     TINER           ;ELSE GO TO ERROR
007262  020300                TTR3:   CMP     %3,%0           ;SEE IF BELOW MINIMUM LIMIT
007264  101402                        BLOS    TTR4            ;IF NOT:  BR
007266  000167  000004                JMP     TINER           ;ELSE GO TO ERROR
007272  010015                TTR4:   MOV     %0,(5)          ;LOAD VALUE
007274  000207                TTR5:   RTS     %7              ;EXIT
```

```
1551
1552                                        ;TTY ENTRY ERROR SUBROUTINE**********
1553
1554  007276  012767  011032  000204  TINER:  MOV     #MSG34,MESAGE
1555  007304  004767  000060                  JSR     %7,TOP          ;PRINT?
1556  007310  162716  000020                  SUB     #20,(6)         ;RESET SP TO START OF VALUE ROUTINE
1557  007314  000207                         RTS     %7              ;READO VALUE ENTRY
1558
1559                                        ;TTY READ SUBROUTINE**********
1560
1561  007316  005077  171474          TTIN:  CLR     @TKS
1562  007322  005077  171472                 CLR     @TKB
1563  007326  005067  171516                 CLR     TIB
1564  007332  005277  171460                 INC     @TKS
1565  007336  105777  171454          TTIN1: TSTB    @TKS
1566  007342  100375                         BPL     TTIN1
1567  007344  017767  171450  171476       MOV     @TKB,TIB
1568  007352  105777  171444          TTIN2: TSTB    @TPS
1569  007356  100375                         BPL     TTIN2
1570  007360  116777  171464  171436       MOVB    TIB,@TPB
1571  007366  000207                         RTS     %7
1572
1573                                        ;TELETYPE OUTPUT PACKAGE
1574
1575  007370  142777  000177  171424  TOP:   BICB    #177,@TPS       ;CLEAR FLAGS
1576  007376  117767  000106  000102         MOVB    @MESAGE,EOMK    ;SAVE MESSAGE DELIMETER
1577  007404  005267  000100                 INC     MESAGE          ;+2 TO POINTER
1578  007410  127767  000074  000070  TOP1:  CMPB    @MESAGE,EOMK    ;IS CHARACTER THE 2ND DELIMETER
1579  007416  001001                         BNE     .+4             ;NO
1580  007420  000207                         RTS     %7              ;YES END
1581  007422  127727  000062  000100         CMPB    @MESAGE,#'@     ;IS CHARACTER AN @ INDICATING A CARRIAGE RETURN
1582  007430  001411                         BEQ     TOP3            ;YES
1583  007432  105777  171364                 TSTB    @TPS
1584  007436  100375                         BPL     .-4
1585  007440  117777  000044  171356         MOVB    @MESAGE,@TPB    ;PRINT CHARACTER
1586  007446  005267  000036          TOP2:  INC     MESAGE          ;+2 TO POINTER
1587  007452  000756                         BR      TOP1            ;LOOP
1588
1589                                        ;CARRIAGE RETURN, LINE FEED
1590
1591  007454  105777  171342          TOP3:  TSTB    @TPS
1592  007460  100375                         BPL     .-4
1593  007462  112777  000215  171334       MOVB    #215,@TPB
1594  007470  105777  171326                 TSTB    @TPS
1595  007474  100375                         BPL     .-4
1596  007476  112777  000212  171320       MOVB    #212,@TPB
1597  007504  000760                         BR      TOP2
1598  007506  000000          EOMK:  0
```

```
1599  007510  000000                          MESAGE: 0
1600  007512  040057  043100  047125  MSG2:   .ASCII  ;/@@FUNCTION          /;
1601  007520  052103  047511  020116
1602  007526  020040  020040  020040
1603  007534  020040    057
1604  007537    057   052440  044516  MSG2A:  .ASCII  ;/ UNIT /;
1605  007544  020124    057
1606  007547    057   020040    057   MSG2B:  .ASCII  ;/ /;
1607  007553    057   053500  044522  MSG3:   .ASCII  ;/@WRITE FROM BOT      /;
1608  007560  042524  043040  047522
1609  007566  020115  047502  020124
1610  007574  020040  020040    057
1611  007601    057   053500  044522  MSG4:   .ASCII  ;/@WRITE SHUTDOWN      /;
1612  007606  042524  051440  052510
1613  007614  042124  053517  020116
1614  007622  020040  020040    057
1615  007627    057   053500  044522  MSG5:   .ASCII  ;/@WRITE START         /;
1616  007634  042524  051440  040524
1617  007642  052122  020040  020040
1618  007650  020040  020040    057
1619  007655    057   051500  052105  MSG6:   .ASCII  ;/@SETTLE DOWN DELAY  /;
1620  007662  046124  020105  047504
1621  007670  047127  042040  046105
1622  007676  054501  020040    057
1623  007703    057   053500  044522  MSG7:   .ASCII  ;/@WRITE TO ERASE HEAD/;
1624  007710  042524  052040  020117
1625  007716  051105  051501  020105
1626  007724  042510  042101    057
1627  007731    057   053500  044522  MSG8:   .ASCII  ;/@WRITE NONSTOP GAP  /;
1628  007736  042524  047040  047117
1629  007744  052123  050117  043440
1630  007752  050101  020040    057
1631  007757    057   041100  041501  MSG9:   .ASCII  ;/@BACKSPACE SHUTDOWN /;
1632  007764  051513  040520  042503
1633  007772  051440  052510  042124
1634  010000  053517  020116    057
1635  010005    057   051100  040505  MSG10:  .ASCII  ;/@READ SHUTDOWN      /;
1636  010012  020104  044123  052125
1637  010020  047504  047127  020040
1638  010026  020040  020040    057
1639  010033    057   040100  040507  MSG11:  .ASCII  ;/@@GAPS SHOULD = 8>7>6>5>4>3, 3=2=1 (+OR- 5.0)/;
1640  010040  051520  051440  047510
1641  010046  046125  020104  020075
1642  010054  037070  037067  037066
1643  010062  037065  037064  026063
1644  010070  031440  031075  030475
1645  010076  024040  047453  026522
1646  010104  032440  030056  027451
1647  010112  040057  040507  020120  MSG11A: .ASCII  ;/@GAP 1              /;
1648  010120  020061  020040  020040
1649  010126  020040  020040  020040
1650  010134  020040  027440
1651  010140  040057  051127  052111  MSG12:  .ASCII  ;/@WRITE XIRG         /;
1652  010146  020105  044530  043522
1653  010154  020040  020040  020040
1654  010162  020040  027440
```

```
 1655  010166  040057  042522  042101  MSG13:  .ASCII  ;/@READ FROM BOT      /;
 1656  010174  043040  047522  020115
 1657  010202  047502  020124  020040
 1658  010210  020040  027440
 1659  010214  040057  040514  052123  MSG14:  .ASCII  ;/@LAST CHAR TO CU RDY/;
 1660  010222  041440  040510  020122
 1661  010230  047524  041440  020125
 1662  010236  042122  027531
 1663  010242  040057  051127  052111  MSG15:  .ASCII  ;/@WRITE EOF          /;
 1664  010250  020105  047505  020106
 1665  010256  020040  020040  020040
 1666  010264  020040  027440
 1667  010270  040057  047505  020122  MSG16:  .ASCII  ;/@EOR TO EOF SPACE   /;
 1668  010276  047524  042440  043117
 1669  010304  051440  040520  042503
 1670  010312  020040  027440
 1671  010316  040057  050123  041501  MSG18:  .ASCII  ;/@SPACE SHUTDOWN     /;
 1672  010324  020105  044123  052125
 1673  010332  047504  047127  020040
 1674  010340  020040  027440
 1675  010344  040057  047117  020105  MSG20:  .ASCII  ;/@ONE INCH DATA TIME /;
 1676  010352  047111  044103  042040
 1677  010360  052101  020101  044524
 1678  010366  042515  027440
 1679  010372  040057  040524  042520  MSG21:  .ASCII  ;/@TAPE SPEED FWD     /;
 1680  010400  051440  042520  042105
 1681  010406  043040  042127  020040
 1682  010414  020040  027440
 1683  010420  040057  025052  025052  MSG27:  .ASCII  ;/@**********END OF TIMING**********@/;
 1684  010426  025052  025052  025052
 1685  010434  042452  042116  047440
 1686  010442  020106  044524  044515
 1687  010450  043516  025052  025052
 1688  010456  025052  025052  025052
 1689  010464  040052      057
 1690  010467      057  040100  051524  MSG28:  .ASCII  ;/@@TSO3 DRIVE FUNCTION TIMER (DZTSE-A)/;
 1691  010474  031460  042040  044522
 1692  010502  042526  043040  047125
 1693  010510  052103  047511  020116
 1694  010516  044524  042515  020122
 1695  010524  042050  052132  042523
 1696  010532  040455  027451
 1697  010536  020057  020040  040522  MSG29:  .ASCII  ;/   RANGE MAX - MIN@ /;
 1698  010544  043516  020105  040515
 1699  010552  020130  020055  044515
 1700  010560  040116  027440
 1701  010564  040057  047516  052440  MSG30:  .ASCII  ;/@NO UNITS AVAILABLE FOR TEST @PRESS CONTINUE WHEN READY@/;
 1702  010572  044516  051524  040440
 1703  010600  040526  046111  041101
 1704  010606  042514  043040  051117
 1705  010614  052040  051505  020124
 1706  010622  050100  042522  051523
 1707  010630  041440  047117  044524
 1709  010636  052516  020105  044127
 1709  010644  047105  051040  040505
 1710  010652  054504  027500
```

```
 1711  010656  040057  042522  044507  MSG31:  .ASCII  ;/@REGISTER START: /;
 1712  010664  052123  051105  051440
 1713  010672  040524  052122  020072
 1714  010700      057
 1715  010701      057  051500  042520  MSG32:  .ASCII  ;/@SPEED TEST (1=YES-0=NO): /;
 1716  010706  042105  052040  051505
 1717  010714  020124  030450  054475
 1718  010722  051505  030055  047075
 1719  010730  024517  020072      057
 1720  010735      057  046500  052517  MSG33:  .ASCII  ;/@MOUNT SKEW TAPE ON ALL AVAILABLE UNITS: TYPE CR WHEN READY/;
 1721  010742  052116  051440  042513
 1722  010750  020127  040524  042520
 1723  010756  047440  020116  046101
 1724  010764  020114  053101  044501
 1725  010772  040514  046102  020105
 1726  011000  047125  052111  035123
 1727  011006  052040  050131  020105
 1728  011014  051103  053440  042510
 1729  011022  020116  042522  042101
 1730  011030  027531
 1731  011032  020057  020077      057  MSG34: .ASCII ;/ ? /;
 1732
 1733  011037      057  033040  030462  RMSG1:  .ASCII  ;/ 621.0 - 509.0/;
 1734  011044  030056  026440  032440
 1735  011052  034460  030056      057
 1736  011057      057  020040  033461  RMSG2:  .ASCII  ;/  17.6 - 13.6/;
 1737  011064  033056  026440  030440
 1738  011072  027063  027466
 1739  011076  020057  031440  027071  RMSG3:  .ASCII  ;/  39.0 - 32.0/;
 1740  011104  020060  020055  031063
 1741  011112  030056      057
 1742  011115      057  020040  033063  RMSG4:  .ASCII  ;/  36.0 - 30.0/;
 1743  011122  030056  026440  031440
 1744  011130  027060  027460
 1745  011134  020057  033440  027066  RMSG5:  .ASCII  ;/  76.0 - 58.0/;
 1746  011142  020060  020055  034065
 1747  011150  030056      057
 1748  011153      057  020040  033440  RMSG6:  .ASCII  ;/   7.7 - 6.3/;
 1749  011160  033456  026440  033040
 1750  011166  031456      057
 1751  011171      057  020040  033440  RMSG7:  .ASCII  ;/   7.7 - 6.3/;
 1752  011176  033456  026440  033040
 1753  011204  031456      057
 1754  011207      057  020040  034463  RMSG8:  .ASCII  ;/  39.0 - 32.0/;
 1755  011214  030056  026440  031440
 1756  011222  027062  027460
 1757  011226  020057  033063  027066  RMSG9:  .ASCII  ;/ 366.0 - 300.0/;
 1758  011234  020060  020055  030063
 1759  011242  027060  027460
 1760  011246  020057  032462  027070  RMSG10: .ASCII  ;/ 258.0 - 212.0/;
 1761  011254  020060  020055  030462
 1762  011262  027062  027460
 1763  011266  020057  031064  027060  RMSG11: .ASCII  ;/ 420.0 - 340.0/;
 1764  011274  020060  020055  032063
 1765  011302  027060  027460
 1766  011306  020057  030064  027060  RMSG12: .ASCII  ;/ 400.0 - 320.0/;
```

```
 1767  011314  020060  020055  031063 .
 1768  011322  027060  027460
 1769  011326  020057  020040  027067  RMSG13: .ASCII  ;/  7.7 - 6.3/;
 1770  011334  020067  020055  027066
 1771  011342  027463
 1772  011344  020057  034040  027071  RMSG14: .ASCII  ;/  89.0 - 73.0/;
 1773  011352  020060  020055  031467
 1774  011360  030056     057
 1775  011363     057  020040  034470  RMSG15: .ASCII  ;/  89.0 - 73.0/;
 1776  011370  030056  026440  033440
 1777  011376  027063  027460
 1778
 1779                                          .EVEN
 1780  011402  000000                  WBUF:   0
 1781          000001                          .END
```

```
BC      001004          629#    745     781     816*    828*    833     893*    974*    995*    1185    1207*   1243*   1248*
                        1251    1274*   1283    1322*   1327    1392*
BLENTH= 005670          620#    1392    1400
CA      001006          630#    739     775     817*    829*    875     1043    1115    1126    1159    1208*   1244*   1275*
                        1281    1323*   1325    1393*
CC      001032          640#    651*
CDRIVE  006170          1348*   1352*   1364*   1375#   1382    1385
CDRVBT  006172          1349*   1350    1354*   1366*   1371    1376#
CHGDRV  006116          704     707     723     752     790     811     814     822     840     849     852     921     938
                        941     958     1022    1056    1134    1149    1166    1195    1199    1223    1232    1290    1333
                        1362#   1372
CHG1    006152          1367    1371#
DECOUT  007036          1467    1482#
DECPNT  007116          1459*   1464    1466    1479*   1496#
DEC1    007054          1483    1486#
DEC2    007070          1485    1488#
DIGCNT  007110          1461*   1468*   1473    1493#
DIGIT   007112          716*    717*    718*    719*    722     1462*   1463*   1482    1484*   1487*   1490    1494#
DRIVES  006174          685*    690*    694*    695     1350    1371    1377#
EOMK    007506          1576*   1578    1598#
FDRIVE  006176          716     736     772     818     830     866     889     910     945     966     975     980     1035
                        1099    1108    1113    1124    1157    1183    1209    1245    1277    1319    1378#   1382*   1383*
                        1384*   1387*   1406    1418
GNT1    006236          1386    1388#
GTNINE  006200          1356    1373    1382#
MESAGE  007510          652*    654*    668*    678*    697*    712*    714*    726*    756*    759*    761*    764*    794*
                        797*    799*    802*    843*    846*    926*    929*    931*    934*    1059*   1061*   1065*   1069*
                        1073*   1077*   1081*   1085*   1089*   1138*   1141*   1143*   1146*   1171*   1174*   1226*   1229*
                        1295*   1298*   1300*   1303*   1305*   1308*   1336*   1339*   1341*   1470*   1554*   1576    1577*
                        1578    1581    1585    1586*   1599#
MSG10   010005          931     1635#
MSG11   010033          1059    1639#
MSG11A  010112          1058*   1061    1064*   1065    1068*   1069    1072*   1073    1076*   1077    1080*   1081    1084*
                        1085    1088*   1089    1647#
MSG12   010140          1143    1651#
MSG13   010166          1171    1655#
MSG14   010214          1659#
MSG15   010242          1226    1663#
MSG16   010270          1295    1667#
MSG18   010316          1300    1671#
MSG2    007512          712     1600#
MSG2A   007537          714     1604#
MSG2B   007547          1470    1606#
MSG20   010344          1305    1675#
MSG21   010372          1336    1679#
MSG27   010420          1341    1683#
MSG28   010467          652     1690#
MSG29   010536          726     1697#
MSG3    007553          756     1607#
MSG30   010564          697     1701#
MSG31   010656          654     1711#
MSG32   010701          668     1715#
MSG33   010735          678     1720#
MSG34   011032          1554    1731#
MSG4    007601          761     1611#
MSG5    007627          794     1138    1615#
```

```
MSG6     007655          799    1619#
MSG7     007703          843    1623#
MSG8     007731         1627#
MSG9     007757          926    1631#
MTC      001002          628#    686*    687*    691*    736*    737*    772*    773*    818*    819*    820     830*    831*
                         838     866*    867*    868     874*    881     889*    890*    891     894*    895*    910*    911*
                         945*    946*    947     951*    952     955*    956     966*    967*    968     971*    972     975*
                         976*    977     980*    981*    982     992*    993     996*    997*    998     1001*   1002*   1003
                        1035*   1036*   1038    1042*   1099*   1100    1104*   1107*   1108*   1113*   1114*   1124*   1125*
                        1157*   1158*   1164    1183*   1184*   1187    1209*   1210*   1211    1215*   1216*   1217    1245*
                        1246    1249*   1250*   1255    1272    1277*   1278    1280*   1319*   1320    1324*   1362    1406*
                        1407    1411*   1412    1418*
MTD      001010          631#
MTRD     001012          632#   1429    1431
MTS      001000          627#    662     688     692     747     783     785*    883*    897     901     905*    912     914
                         918*   1019*   1052*   1102*   1105    1110*   1119*   1130*   1168*   1191*   1213*   1253    1259
                        1267    1409*   1419*   1421
MTV      001026          638#
MULBAK   003422          995#   1006
MULWRT   003404          991#   1010    1014    1018
MUL1     003524         1008    1011#
MUL2     003542         1012    1015#
MUL3     003560         1016    1019#
PC     =%000007          684*
REGS     001030          639#    656     661
RMSG1    011037          759    1733#
RMSG10   011246         1174    1760#
RMSG11   011266         1229    1763#
RMSG12   011306         1298    1766#
RMSG13   011326         1303    1769#
RMSG14   011344         1308    1772#
RMSG15   011363         1339    1775#
RMSG2    011057          764    1736#
RMSG3    011076          797    1739#
RMSG4    011115          802    1742#
RMSG5    011134          846    1745#
RMSG6    011153          929    1748#
RMSG7    011171          934    1751#
RMSG8    011207         1141    1754#
RMSG9    011226         1146    1757#
RSFDRV   006052          702     768    1348#   1368
RSF1     006064         1350#   1355
RSF2     006110         1351    1356#
R10      001034          641#    987*   1005*   1009*   1013*   1017*   1037*   1050*
R11      001036          642#    984*   1007*
R12      001040          643#    985*   1011*
R13      001042          644#    986*   1015*
SPTF     001054          649#    670*    671     676     728
SR       001014          633#
STACK =  001000          619#    650
START    001056          625     650#
STRREW   006276          703     810     848     937    1021    1054    1133    1194    1222    1289    1406#
STRS     001154          664#    667
STRW     006304         1332    1407#
STO      001272          677     685#    700    1344
STOA     001330          689     691#
```

```
STOB    001354          693    695#
STOC    001400          696    701#
ST1     001406          703#   705
ST1S    006256          725    860     936    1092    1176    1398#
ST1SA   006262         1399#  1401
ST2     001420          706#   708
ST3     001444          714#   724
TEMP1   001052          648#   680    1518*   1523   1532*
TIB     001050          647#  1521    1526    1529   1539*   1540   1563*   1567*   1570
TIME    006410          738*   743     744*    751    774*    779    780*    789    832*    837    864*    879    880*
                        907    909*    920    1041*  1047   1112*  1121   1122*  1132   1155*  1163   1182*  1193
                       1206*  1221    1242*  1261*  1262   1263*  1271   1276*  1288   1318*  1331   1433*  1435#
TIMER   006366          741    749     777     787    835     877    903     916   1045    1117   1128    1161   1189
                       1219   1257    1269    1285   1329   1429#
TINER   007276          1528   1531    1545    1548   1554#
TKB     001020          635#  1562*   1567
TKS     001016          634#  1561*   1564*   1565
TM1     006412          733    757     769     795    827     844    861    1033   1062    1096   1139    1154   1172
                       1180   1205    1227    1239   1296   1317   1337   1436#  1437
TM2     006436          734    762     770     800    862     927   1066    1097   1144    1240   1301    1438#  1439
TM3     006462          863    932    1070    1241   1306   1440#  1441
TM4     006506         1074   1442#   1443
TM5     006532         1078   1444#   1445
TM6     006556         1082   1446#   1447
TM7     006602         1086   1448#   1449
TM8     006626         1090   1450#   1451
TOP     007370          653    655     669     679    698    713    715    727    760    765    798    803    847
                        930    935    1060    1142   1147   1175   1230   1299   1304   1309   1340   1342   1454
                       1471   1555    1575#
TOP1    007410         1578#  1587
TOP2    007446         1586#  1597
TOP3    007454         1582   1591#
TPB     001024          637#   722*   1477*   1490*  1570*  1585*  1593*  1596*
TPS     001022          636#   720    1475    1488   1568   1575*  1583   1591   1594
TTIN    007316         1520   1561#
TTIN1   007336         1565#  1566
TTIN2   007352         1568#  1569
TTR     007130          660    675     684    1518#
TTRO    007136         1520#  1542
TTR1    007164         1522   1526#
TTR1A   007200         1527   1529#
TTR1B   007214         1530   1532#
TTR2    007252         1525   1543#
TTR3    007262         1544   1546#
TTR4    007272         1547   1549#
TTR5    007274         1524   1550#
TYPTIM  006652          758    763     796     801    845    928    933   1063   1067   1071   1075   1079   1083
                       1087   1091    1140    1145   1173   1228   1297   1302   1307   1338   1454#
TYPTO   006656         1455#  1472
TYPT1   006716         1462#  1480
TYPT2   006724         1463#  1465
TYPT3   007026         1474   1479#
TYP2A   006774         1469   1473#
T1      001556          729    733#
T1A     001566          735#   753
T1B     001612          739#   742
```

```
T1C     001630          740     743#
T1D     001646          747#    750
T1E     001664          748     751#
T1O     005220         1239#
T1OA    005234         1242#   1291
T1OB    005312         1251#   1252
T1OC    005322         1253#   1258
T1OCC   005346         1256    1259#
T1OD    005362         1254    1260    1262#
T1OE    005400         1267#   1270
T1OF    005416         1268    1271#
T1OG    005502         1283#   1286
T1OH    005516         1284    1288#
T11     005664          730    1316#
T11A    005672         1318#   1334
T11B    005744         1327#   1330
T11C    005760         1328    1331#
T11T    001046          646#
T13     006032         1310    1341#
T2      001766          768#
T2A     002002          771#    791
T2B     002026          775#    778
T2C     002044          776     779#
T2D     002072          785#    788
T2E     002106          786     789#
T3      002210          810#    812
T3A     002222          813#    815
T3B     002234          816#    823
T3D     002304          828#    841
T3E     002340          833#    836
T3F     002354          834     837#
T3G     002430          848#    850
T3H     002442          851#    853
T4      002454          860#
T4A     002536          875#    878
T4AA    002474          864#    922
T4B     002554          876     879#
T4BA    002652          897#    898
T4C     002666          901#    904
T4D     002704          902     905#
T4DA    002742          912#    913
T4E     002752          914#    917
T4F     002770          915     918#
T4FA    003110          937#    939
T4FB    003122          940#    942
T4FC    003136          944#    959
T4G     003232          965#   1023
T5      003604         1031#   1057
T5A     003646         1038#   1051
T5B     003670         1043#   1046
T5C     003706         1044    1047#
T5DRV   001044          645#   1029*   1034    1055*
T6      004216         1096#
T6A     004226         1098#   1135
T6B     004340         1115#   1118
T6C     004356         1116    1119#
```

```
T6D     004414          1126*   1129
T6E     004432          1127    1130*
T6F     004546          1148*   1150
T7      004560          1154*
T7A     004564          1155*   1167
T7B     004610          1159*   1162
T7C     004626          1160    1163*
T8      004714          1180*
T9A     004720          1181*   1196
T8B     004752          1187*   1190
T8C     004766          1188    1191*
T8C     005016          1198*   1200
T9      005030          1205*
T9A     005034          1206*   1224
T9B     005120          1217*   1220
T9C     005134          1218    1221*
T9D     005206          1231*   1233
VALUE   007106          1455*   1456    1464*   1466*   1492*
WATREW  006336           706     813     851     940    1031    1148    1198    1231    1418*
WBUF    011402           739     775     817     829     875    1043    1115    1126    1159    1208    1244    1275    1281
                        1323    1325    1393    1398    1400    1780*
WRINT   006240           735     771     865     873     888     908     944     950     954     965     970     979     991
                        1000    1032    1040    1098    1109    1123    1156    1181    1392*
ZERO    007114          1460*   1478*   1484    1486*   1495*
.     = 011404           622*    624*    626*    721     746     782     784     821     839     869     882     884     892
                         906     919     948     953     957     969     973     978     983     994     999    1004    1020
                        1039    1053    1101    1103    1106    1111    1120    1131    1165    1169    1186    1192    1212
                        1214    1247    1273    1279    1282    1321    1326    1363    1408    1410    1413    1420    1422
                        1430    1432    1437*   1439*   1441*   1443*   1445*   1447*   1449*   1451*   1457    1476    1489
                        1496    1579    1584    1592    1595
```

DZTSEA.P11 CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

```
ADD     1034  1049  1055  1369  1466  1479
BCC      884   906   919  1020  1053  1103  1111  1120  1131  1169  1192  1214  1410  1420
BCS      786
BEQ      677   689   693   729   784   834   898   913  1284  1328  1372  1386  1524  1582
BGT     1282  1326
BHI     1530
BIC      718   894   996  1001  1215  1249  1384  1539
BICB    1575
BIS      690   694   719   737   773   819   831   867   890   895   911   946   967   976   981
         997  1002  1036  1104  1107  1114  1125  1158  1184  1210  1216  1250  1280  1324  1387
        1411  1487  1540
BIT      688   692   747   783   897   901   912   914  1105  1253  1259  1267  1350  1371  1385
        1421
BLE      740   776   876  1044  1116  1127  1160
BLOS    1527  1544  1547
BMI     1188  1218  1256  1432
BNE      667   696   746   748   782   902   915  1006  1008  1012  1016  1051  1106  1186  1252
        1254  1260  1268  1351  1367  1401  1422  1457  1469  1474  1483  1522  1542  1579
BPL      721   821   839   869   882   892   948   953   957   969   973   978   983   994   999
        1004  1039  1101  1165  1212  1247  1273  1279  1321  1363  1408  1413  1430  1465  1476
        1489  1566  1569  1584  1592  1595
BR       700   705   708   724   742   750   753   778   788   791   812   815   823   836   841
         850   853   878   904   917   922   939   942   959  1010  1014  1018  1023  1046  1057
        1118  1129  1135  1150  1162  1167  1190  1196  1200  1220  1224  1233  1258  1270  1286
        1291  1330  1334  1355  1472  1480  1485  1587  1597
CLC     1353  1365  1533  1535  1537
CLR      670   685   738   744   774   780   832   864   880   909  1029  1041  1112  1122  1155
        1182  1206  1242  1261  1263  1276  1318  1348  1518  1519  1561  1562  1563
CMP      739   775   875  1043  1115  1126  1159  1251  1281  1325  1400  1456  1473  1543  1546
CMPB    1521  1526  1529  1578  1581
DEC      666  1541
HALT     624   699  1343  1423
INC      874   951   955   971   992  1005  1007  1011  1015  1042  1050  1352  1364  1433  1463
        1468  1532  1564  1577  1586
INCB    1064  1068  1072  1076  1080  1084  1088
JMP      625   730  1310  1344  1525  1528  1531  1545  1548
JSR      653   655   660   669   675   679   684   698   702   703   704   706   707   713   715
         723   725   727   735   741   749   752   758   760   763   765   768   771   777   787
         790   796   798   801   803   810   811   813   814   822   835   840   845   847   848
         849   851   852   860   865   873   877   888   903   908   916   921   928   930   933
         935   936   937   938   940   941   944   950   954   958   965   970   979   991  1000
        1021  1022  1031  1032  1040  1045  1054  1056  1060  1063  1067  1071  1075  1079  1083
        1087  1091  1092  1098  1109  1117  1123  1128  1133  1134  1140  1142  1145  1147  1148
        1149  1156  1161  1166  1173  1175  1176  1181  1189  1194  1195  1198  1199  1219  1222
        1223  1228  1230  1231  1232  1257  1269  1285  1289  1290  1297  1299  1302  1304  1307
        1309  1329  1332  1333  1338  1340  1342  1356  1368  1373  1454  1467  1471  1520  1555
MOV      650   651   652   654   656   657   658   659   661   662   663   664   668   671   672
         673   674   678   680   681   682   683   686   687   691   697   712   714   716   722
         726   733   734   736   743   751   754   755   756   757   759   761   762   764   769
         770   772   779   789   792   793   794   795   797   799   800   802   816   817   818
         827   828   829   830   837   842   843   844   846   861   862   863   866   879   889
         893   907   910   920   923   924   925   926   927   929   931   932   934   945   966
         974   975   980   984   985   986   987   995  1009  1013  1017  1033  1035  1037  1047
        1048  1059  1061  1062  1065  1066  1069  1070  1073  1074  1077  1078  1081  1082  1085
        1086  1089  1090  1096  1097  1099  1108  1113  1121  1124  1132  1136  1137  1138  1139
        1141  1143  1144  1146  1154  1157  1163  1170  1171  1172  1174  1180  1183  1193  1197
```

DZTSEA.P11 CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

```
        1205  1207  1208  1209  1221  1225  1226  1227  1229  1239  1240  1241  1243  1244  1245
        1248  1262  1271  1274  1275  1277  1288  1292  1293  1294  1295  1296  1298  1300  1301
        1303  1305  1306  1308  1317  1319  1322  1323  1331  1335  1336  1337  1339  1341  1349
        1382  1392  1393  1398  1399  1406  1418  1455  1459  1460  1461  1462  1470  1477  1478
        1484  1486  1490  1549  1554  1567
MOVB    1058  1570  1576  1585  1593  1596
NOP      701   896   899   900   943   949   960  1264  1265  1266  1316
ROL     1534  1536  1538
ROR      785   883   905   918  1019  1052  1102  1110  1119  1130  1168  1191  1213  1354  1366
        1409  1419
RTS     1357  1370  1374  1388  1394  1402  1414  1424  1434  1458  1491  1550  1557  1571  1580
SUB     1464  1556
SWAB     717  1383
TST      665   676   695   728   745   781   833  1185  1283  1327  1429  1431  1482  1523
TSTB     720   820   838   868   881   891   947   952   956   968   972   977   982   993   998
        1003  1038  1100  1164  1187  1211  1217  1246  1255  1272  1278  1320  1362  1407  1412
        1475  1488  1565  1568  1583  1591  1594
.ASCII  1600  1604  1606  1607  1611  1615  1619  1623  1627  1631  1635  1639  1647  1651  1655
        1659  1663  1667  1671  1675  1679  1683  1690  1697  1701  1711  1715  1720  1731  1733
        1736  1739  1742  1745  1748  1751  1754  1757  1760  1763  1766  1769  1772  1775
.ENABL   621
.END    1781
.EVEN   1779
.LIST    624
.NLIST   624
.REPT      2   624
.TITLE   614


ERRORS DETECTED:  0
DEFAULT GLOBALS GENERATED:  0

*DZTSEA,DZTSEA.SEQ/SOL/CRF/DS:ERFZ/EN:ABS=DSKM:DZTSEA.P11
RUN-TIME:  5 11 2 SECONDS
RUN-TIME RATIO:  42/21=2.0
CORE USED:  12K  (23 PAGES)
```

L04

Spooler runtime 6 Seconds, 30 KCS, 172 disk reads, 4 disk writes, 49 pages

[redacted]