TM03

TM03/TE16,TU77 DFT

CZTEECO

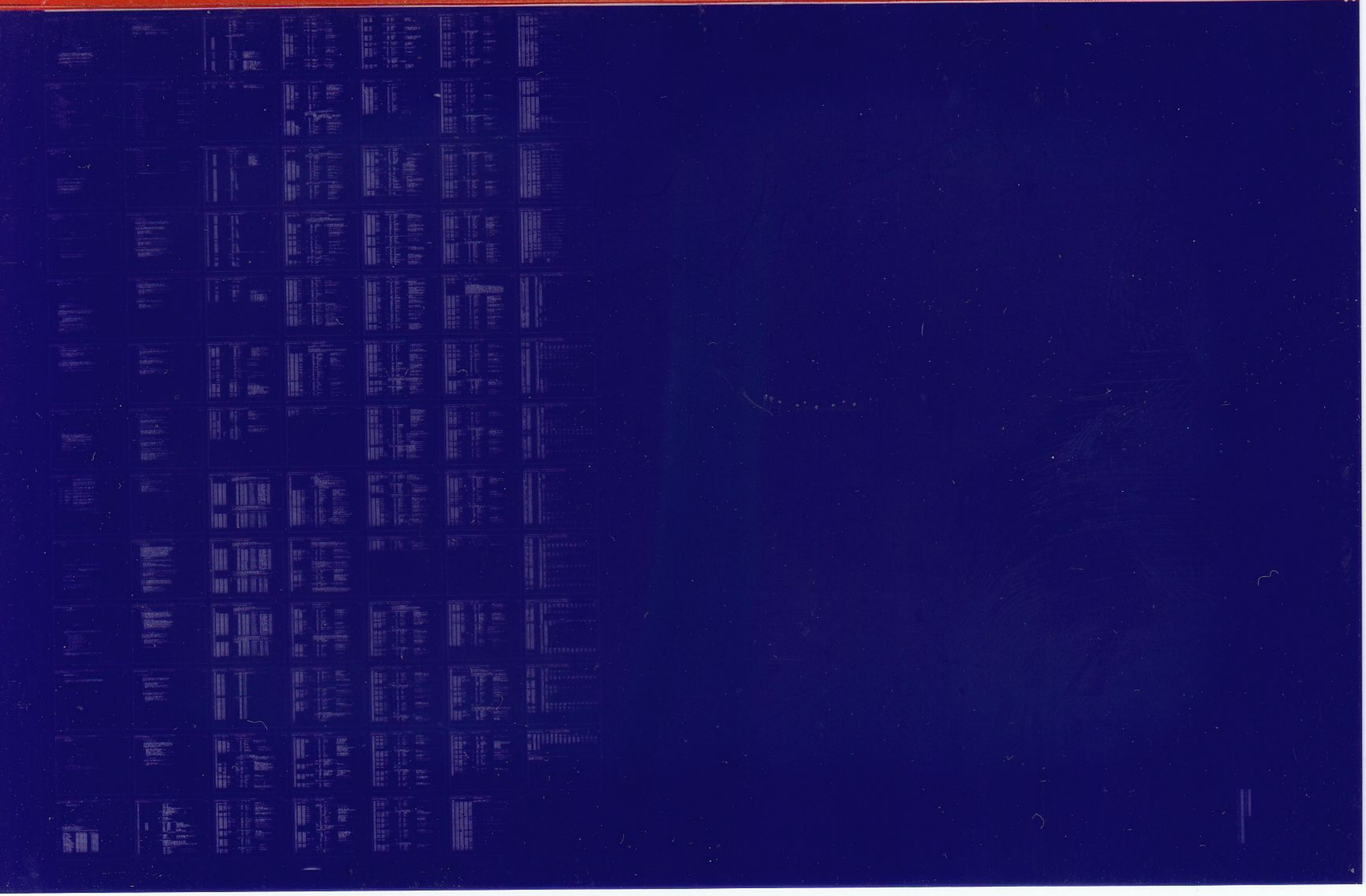
AH-A804C-MC

FICHE 1 OF 1

JAN 1980

digital

MADE IN USA



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IDENTIFICATION

PRODUCT CODE: AC-A803C-MC

PRODUCT NAME: CZTEECO TM03-TE16/TU77 DRIVE FUNCTION TIMER

DATE CREATED: 20 MAR 79

MAINTAINER: DIAGNOSTIC GROUP

AUTHOR: J. G. ADAMS

REVISED TO REV C MIKE PAGE
20 MAR 79
;++C SHOWS CODE ADDED TO REV C.

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ABSTRACT

PROGRAM DZTEE MEASURES THE TIME REQUIRED AND GAP SIZES PRODUCED BY THE TM03-TE16/TU77 MAGTAPE DRIVE/SLAVE.

THE TEST WILL CHECK BOTH THE LOGIC GENERATED TIME DELAYS, AND THE DISTANCES TRAVELED BY THE TAPE.

ACTUAL TAPE SPEED MAY ALSO BE CHECKED BY USING THE SPEED TESTS WITH AN 800 BPI SKEW TAPE.

DEVICE ERRORS ARE CHECKED AND PRINTED AS THEY OCCUR. IF AN ERROR IS DATA RELATED(PARITY; ETC) THEY ARE PRINTED AS SOFT ERRORS.

IF A TIME CHECK IS OUT OF RANGE, IT IS PRINTED AS AN OUT OF RANGE ERROR.

CHAPTER 1

REQUIREMENTS

PDP-11 FAMILY CENTRAL PROCESSOR WITH 4K MEMORY WITH UP TO 64 TM03-TE16/TU77 CONTROLLER/MAGTAPE STATIONS.

1.1 OPTIONAL EQUIPMENT USED

1. NONE

1.2 STORAGE

PROGRAM LOADS AND RUNS IN THE FIRST 4K OF MEMORY.

1.3 PRELIMINARY PROGRAMS (TO ASSURE HARDWARE OPERATION)

MAINDEC-11-DZTEA CONTROL LOGIC TEST(PART 1)
MAINDEC-11-DZTEC BASIC FUNCTION TEST

CHAPTER 2

LOADING AND STARTING PROCEDURE

2.0 LOAD & START PROCEDURE:

LOAD PROGRAM USING THE ABSOLUTE LOADER
LOAD ADDRESS = 200
SET OPERATING SWITCHES SEE CHAPT 3 SWITCH SETTINGS
PRESS START

THE PROGRAM WILL THEN REQUEST THE FIRST BUS ADDRESS OF THE RHXX CONTROLLER, TM03 DRIVES TO BE TESTED, TE16/TU77 SLAVES TO BE TESTED, AND IF SPEED TESTS ARE TO BE RUN. IN ADDITON TO EACH REQUEST A DEFAULT ANSWER WILL BE TYPED. TO INVOKE THE DEFAULT TYPE A CARRIAGE RETURN.

THE REQUESTS & THEIR DEFAULTS ARE:

TYPE FIRST ADDRESS OF CONTROLLER:172440
TYPE TM03 DRIVE #'S TO BE TESTED:ALL
FOR TM03 DRIVE X-TYPE SLAVE #'S TO BE TESTED:ALL
SPEED TESTS ?(YES/NO):NO

NOTES: SLAVE #'S ARE NOT REQUESTED IF DEFAULT TO DRIVE REQUEST IS INVOKED.

IF MORE THAN 1 DRIVE OR SLAVE IS TO BE TESTED, TYPE ',' BETWEEN EACH DRIVE OR SLAVE # TO BE TESTED.

SPEED TESTS CAN & WILL ONLY BE RUN BY ANSWERING YES TO THE REQUEST.

TYPE CONTROL U (^U) TO DELETE LINE TYPED;TYPE 'RUBOUT' TO DELETE LAST CHARACTER(S).
PROGRAM WILL REPORT ERRORS, AND END OF PASS.

2.1 RESTART PROCEDURE

THE PROGRAM MAY BE RESTARTED USING START UP PARAMETERS AT ADDRESS 210.

THE PROGRAM MAY ALSO BE RESTARTED BY TYPING A CONTROL C (^C).
A ^C RESTART WILL REQUEST PARAMETERS.

NOTE: AFTER RESTARTING THE SWITCH REGISTER SHOULD
BE SET TO PROGRAM SWITCH SETTINGS. IF 210
IS LEFT AS THE SWITCH SETTING THE PROGRAM
WILL SELECT & RUN TEST 10 ONLY. SEE SWITCH
SETTINGS FOR EXPLANATION.

2.2 AUTOMATIC MODE OPERATION

IF THE PROGRAM IS LOADED AND RUN IN AUTOMATIC (CHAIN) MODE
DEFAULT RESPONSES TO OPERATOR REQUESTS ARE USED, AND ALL AVAIL-
ABLE TM03-TE16/TU77 COMBINATIONS ARE TESTED. ADDITIONALLY THE SOFTWARE
SWR IS INVOKED WITH A SWITCH SETTING OF 000000 IF LOADED VIA ACT11.
NO OPERATOR INTERVENTION IS REQUIRED

** EXCEPTION: IF LOADED VIA TMDP TM03 DRIVE 0 TE16/TU77 SLAVE 0 IS
NOT TESTED.

**NOTE: IN OREDER TO CHANGE THE DEFAULT SETTING OF THE SOFTWARE
SWR, SET LOC: 176(SWREG:) TO THE DESIRED SETTING.

CHAPTER 3

SWITCH SETTINGS

CONTROL:

1) CONTROL G <^G>;
   SELECTS THE SOFTWARE SWR AND ALLOWS NEW SWITCH SETTINGS.
   THE MACHINE WILL THEN TYPE: SWR=XXXXXXNEW=
   WHERE: XXXXXX IS THE OCTAL CONTENTS OF THE SOFTWARE SWR.
   AFTER THE ''NEW='' HAS BEEN TYPED THEN THE OPERATOR CAN DO ONE
   OF THE FOLLOWING AT THE TTY:
     A) TYPE A NUMBER TO BE LOADED INTO THE SOFTWARE SWR.
     B) IF A <CR> IS THE FIRST KEY DEPRESSED THE SOFTWARE SWITCH
        REGISTER CONTENTS WILL NOT BE CHANGED.

2) CONTROL A <^A>;
   ALTERNATES USAGE OF THE SWR BETWEEN HARDWARE & SOFTWARE.

3) CONTROL C <^C>;
   RESTARTS PROGRAM AT 200

4) CONTROL U <^U>;
   DELETES ALL CHARACTERS TYPED IN RESPONSE TO A REQUEST.

SW15 (100000)		HALT ON ERROR THIS SWITCH WHEN SET WILL HALT THE PROCESSOR WHEN AN ERROR IS DETECTED. THE PC+2 AND PSW AT THE TIME OF THE ERROR IS STORED ON THE STACK. PRESSING CONTINUE WILL CAUSE THE ERROR TO BE TYPED (IF SELECTED) AND FURTHER TESTING RESUMED.
SW14 (040000)	LOOP SUBTEST	THIS SWITCH WHEN SET LOOPS THE CURRENT SUBTEST REGARDLESS OF ERROR CONDITION.
SW13 (020000)	INHIBIT ERROR TYPEOUT	THIS SWITCH WHEN SET INHIBITS ERROR TYPEOUT.
SW11 (004000)	INHIBIT SUB-TEST ITERATION	THIS SWITCH WHEN SET CAUSES EACH SUBTEST TO BE EXECUTED ONLY ONCE.
SW10 (002000)	INHIBIT FUNCTION TIME PUBLICATION	THIS SWITCH WHEN SET WILL INHIBIT THE PRINTING OF THE FUNCTION TIMES. (SEE CHAPTER 8.)
SW09 (001000)	RING BELL ON ERROR	THIS SWITCH WHEN SET WILL RING THE BELL ON THE TTY WHEN AN ERROR IS DETECTED.
SW06 (000100)	CONTINUOUS CYCLE	THIS SWITCH WHEN SET WILL CAUSE THE PROGRAM TO RUN CONTINUOUSLY UNTIL STOPPED BY THE OPERATOR.
SW5-0	TEST SELECT	RUN SUBTEST SELECTED

NOTE: A TEST CAN ONLY BE SELECTED DURING STARTUP (OR RESTART).
DO NOT INHIBIT SUBTEST ITERATIONS WHEN PROGRAM IS RUNNING.

CHAPTER 4

ERRORS

TWO TYPES OF ERRORS ARE DETECTED BY THIS PROGRAM, HARDWARE ERRORS AND INCORECT FUNCTION TIMES.

4.1 ERROR TYPEOUT FORMAT (HARDWARE): DATA RELATED ERRORS (IE: PARITY ERROR) ARE PRINTED AS SOFT ERRORS AND HAVE NO EFFECT ON TIME.

```
TEST # XXXXXX DEVICE ERROR

CS1    WE     BA     FC     CS2    DS     ER1
AAAAAA BBBBBB CCCCCC DDDDDD EEEEEE FFFFFF GGGGGG
```

WHERE:

XXXXXX = TEST NUMBER
AAAAAA-IIIIII = CONTENTS OF TAPE REGISTER 172440-172454

4.2 ERROR TYPEOUT FORMAT (FUNCTION TIME OUT OF RANGE)

```
TEST # XXXXXX OUT OF RANGE ERROR

RANGE = <AAAAAA-BBBBBB> ACTUAL = CCCCCC
```

CHAPTER 5

SUBROUTINE ABSTRACTS

5.1 .SCOPE

THE SCOPE ROUTINE IS CALLED BY THE SCOPE (EMT) INSTRUCTION AT THE START OF EACH SUBTEST. THE .SCOPE ROUTINE PERFORMS THE FOLLOWING FUNCTIONS:

1. LOADS R5 WITH BASE ADDRESS
2. PROVIDES CONTINUOUS LOOP <SW14>
3. MOVES FUNCTION TIME INTO TABLE
4. OUTPUTS LINE ITEM <SW10>=1
5. DELAYS 350MS BEFORE STARTING TEST
6. INIT'S DRIVE/SLAVE
7. CLEARS THE ERROR FLAG (ERFLG)
8. CHECK FOR CONTROL G (^G>

THE ROUTINE MONITORS SW14, SW11, SW10, AND SW07.

5.2 PUBLISH

THE PUBLISH ROUTINE IS CALLED FROM THE SCOPE ROUTINE IF SW10 IS EQUAL TO 0 (PUBLISH TIME DOCUMENT). THE ROUTINE WILL PRINT A THE TIME RECORDED BY THE SUBTEST.

5.3 .HLT

THE HLT ROUTINE IS CALLED BY THE HLT (TRAP) INSTRUCTION WHEN AN ERROR IS DETECTED. A HLT (TRAP) INSTRUCTION FORMATS THE ERROR INFORMATION AS SHOWN IN SEC 4.1. A HLT+1 (TRAP+1) FORMATS THE ERROR AS SHOWN IN SEC 4.2.

CHAPTER 6

MISCELLANEOUS

6.1 STACK POINTER

THE STACK POINTER IS INITAILLY SET TO 500.

6.2 EXECUTION TIME

WHEN SW11=1 (INHIBIT ITERATIONS) THE TIME REQUIRED IS 2 MIN.

WHEN SW11=0 (ITERATE SUBTESTS) THE TIME REQUIRED IS 9 MIN.

CHAPTER 7

PROGRAM DESCRIPTION

7.1 SAMPLE TIME DOCUMENT

```
TYPE FIRST ADDRESS OF CONTROLER:172440
TYPE TM03 DRIVE #'S TO BE TESTED:ALL 0
FOR TM03 DRIVE 0- TYPE SLAVE #'S TO BE TESTED:ALL 0
TAPE SPEED TESTS ONLY? (YES/NO):NO
*****************************************************************
* TM03 DRIVE FUNCTION TIMES- DRIVE # 0 SLAVE # 7 TE16 SER. # 5009
*
* FUNCTION                TIME(SPECIFICATION)     TIME(ACTUAL)
* WRITE FROM BOT          RANGE=<176000-172000>       ACTUAL=174740
* WRITE START             RANGE=<009500-008700>       ACTUAL=009120
* WRITE SHUTDOWN          RANGE=<008500-007500>       ACTUAL=008840
* WRITE SETTLEDOWN        RANGE=<013500-007300>       ACTUAL=010970
* READ FROM BOT           RANGE=<045000-041000>       ACTUAL=043580
* READ START              RANGE=<003200-002400>       ACTUAL=002740
* READ SHUTDOWN           RANGE=<004100-003050>       ACTUAL=004360
* READ SETTLEDOWN         RANGE=<013500-007300>       ACTUAL=010970
* READ REV START          RANGE=<003200-002400>       ACTUAL=002740
* READ REV SHUTDOWN       RANGE=<003700-003300>       ACTUAL=003520
* READ REV SETTLEDOWN     RANGE=<013500-007300>       ACTUAL=010970
* TURN AROUND DELAY F-R   RANGE=<016700-010700>       ACTUAL=013600
* TURN AROUND DELAY R-F   RANGE=<016700-010700>       ACTUAL=013660
* GAP SIZE-STOP HALF      RANGE=<012900-009500>       ACTUAL=012200
* GAP SIZE-START HALF     RANGE=<011800-008500>       ACTUAL=010520
* GAP SIZE-INTERRECORD    RANGE=<014300-012600>       ACTUAL=014500
* GAP CONSISANCY          RANGE=<014000-011800>       ACTUAL=013040-
* DATA TIME-800BPI        RANGE=<024000-022000>       ACTUAL=023400
* DATA TIME-1600BPI       RANGE=<025100-024100>       ACTUAL=024470
* ERASE GAP TIME          RANGE=<101000-098000>       ACTUAL=099510
* WRITE FILE MARK         RANGE=<104000-102000>       ACTUAL=103990
```

7.1.1 SAMPLE TIME DOCUMENT FOR TAPE SPEED TESTS

```
TYPE FIRST ADDRESS OF CONTROLLER 172440:
TYPE TM03 DRIVE #'S TO BE TESTED:ALL 0
FOR TM03 DRIVE 0- TYPE SLAVE #'S TO BE TESTED:ALL 7
SPEED TESTS ONLY? (YES/NO):NO Y
*************************************************************************
*TM03 DRIVE FUNCTION TIMES- DRIVE # 0 SLAVE # 7 TE16 SERIAL # 5009
*
*FUNCTION                TIME(SPECIFICATION)     TIME(ACTUAL)
*TAPE SPEED FWD          RANGE=<022700-021700>       ACTUAL=022500
*TAPE SPEED REV          RANGE=<022700-021700>       ACTUAL=022500
```

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7.2 TEST SEQUENCE WITH RELATED ADJUSTMENTS AND ASSOCIATED HARDWARE

TEST NO./NAME	RELATED ADJUSTMENTS	ASSOCIATED HARDWARE
1. WRITE FROM BOT	*NONE	*M8931/M8940 ROM*M8933 ACCL CNTR
2. WRITE START	* ''	* '' * ''
3. WRITE SHUTDOWN	* ''	* '' * ''
4. WRITE SETTLEDOWN	* ''	*M8916/M8940 (TU77) SETTLEDOWN 0
5. READ FROM BOT	* ''	*M8931/M8940 ROM*M8933 ACCL CNTR
6. READ START	* ''	* '' * ''
7. READ SHUTDOWN	* ''	* '' * ''
10. READ SETTLEDOWN	* ''	*M8916/M8940 (TU77) SETTLEDOWN 0
11. READ REVERSE START	* ''	*M8931/M8940 ROM*M8933 ACCL CNTR
12. READ REVERSE SHUTDOWN	* ''	* '' * ''
13. READ REVERSE SETTLEDOWN	* ''	*M8916/M8940 (TU77) SETTLEDOWN 0
14. TURN AROUND F-R	* ''	*M8931/M8940 ROM*M8933 ACCL CNTR
15. TURN AROUND R-F	* ''	* '' * ''
16. GAP SIZE-STOP HALF	*FWRD/REV SPEED-START/STOP-RAMPS	*CAPSTAN SERVO LOOP
17. GAP SIZE-START HALF	*SAME AS IN TEST 16	* '' '' ''
20. GAP SIZE INTERRECORD	*FWD/REV SPEED	* '' '' ''

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21. GAP CONSISTENCY	*SAME AS IN TEST 16	*WRITE CLOCK
22. DATA TIME 800 BPI	*NONE	* '' ''
23. DATA TIME 1600 BPI	* ''	* '' ''
24. ERASE GAP TIME	* ''	*M8931/M8940 ROM*M8933 ACCL CNTR
25. WRITE FILE MARK	* ''	* '' '' * '' '' ''
26. TAPE SPEED-FORWARD	*FWD SPEED	*CAPSTAN SERVO LOOP
27. TAPE SPEED-REVERSE	*REVERSE SPEED	*CAPSTAN SERVO LOOP

*****NOTE: IF TIME PROBLEMS APPEAR IN T1 THRU T25, RUN TAPE SPEED TESTS FIRST*******
TEST 26 & 27 REQUIRE AN 800 BPI SKEW TAPE

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7.3 SUBTEST DESCRIPTIONS:

THE FIRST THIRTEEN (13) TESTS (T1 - T15) ARE CHECKS OF THE ROM CIRCUITS IN THE TE16 (M8931/M8940), THE ACCL COUNTER IN THE TM03 (M8933), AND THE SETTLEDOWN ONE SHOT (M8916/M8940 (TU77)).

T1. WRITE FROM BOT:

THIS TEST WILL MEASURE ACCELLERATION DELAY REQUIRED TO MOVE THE TAPE APPROXIMATELY SEVEN (7) INCHES FORWARD FROM DEAD STOP AT BOT BEFORE STARTING TO TRANSFER DATA.

1. ASSURE TAPE IS STOPPED AT BOT.
2. ISSUE A WRITE COMMAND
3. MONITOR BIT 15 OF TC (ACCL)
4. TIME FROM GO TO ACCL RESET IS BOT DELAY
5. STOP

T2. WRITE START:

THIS TEST WILL MEASURE ACCELLERATION DELAY JUST AS IN T1. HOWEVER THE TIME WILL BE LESS WHEN NOT STARTING FROM BOT.

1. LEAVE TAPE AT ITS PRESENT POSITION. ASSURE THAT IT IS STOPPED
2. ISSUE A WRITE COMMAND
3. MONITOR BIT 15 OF TC (ACCL)
4. TIME FROM GO TO RESET OF ACCL IS START DELAY
5. STOP

T3. WRITE SHUTDOWN:

THIS TEST WILL MEASURE THE TIME FROM EOR (LAST CHARACTER WRITTEN ON TAPE) TO THE START OF SETTLEDOWN TIME. THIS ASSURES, IN PART, A PROPER INTERROCORD GAP.

1. LEAVE TAPE AT ITS PRESENT POSITION. ASSURE THAT IT IS STOPPED
2. ISSUE A WRITE COMMAND.
3. MONITOR FRAME COUNTER AND BIT 4 OF DS (SDWN)
4. TIME FROM FC=0 TO ASSERTION OF SDWN IS THE SHUTDOWN TIME.
5. STOP

T4. WRITE SETTLEDOWN:

THIS TEST WILL MEASURE THE SLOWDOWN TIME. THE TIME
FROM THE START OF SLOWDOWN UNTIL THE TAPE SHOULD
BE STOPPED. THIS IS A PART OF THE GAP TIMING IN LOGIC.
THE MECHANICAL POSITIONING OF THE TAPE IN THE GAP DISTANCE
WILL BE MEASURED IN A LATER TEST.

1. LEAVE TAPE AT ITS PRESENT POSITION. ASSURE THAT IT IS STOPPED
2. ISSUE A WRITE COMMAND
3. MONITOR BIT 4 OF DS (SDWN)
4. TIME FROM SET OF SDWN TO RESET OF SDWN IS THE
   SETTLEDOWN DELAY
5. STOP

T5. READ FROM BOT

THIS MEASUREMENT IS MADE EXACTLY AS THE WRITE
MEASUREMENT IN T1. USE THE SAME RECORD THAT WAS
WRITTEN IN T1.

1. REWIND TO BOT
2. ASSURE TAPE HAS HAD TIME TO COME TO A COMPLETE STOP
3. READ FORWARD 1 RECORD.
4. MONITOR BIT 15 OF TC (ACCL)
5. TIME FROM GO TO ACCL IS BOT DELAY
6. STOP

T6. READ START

THIS TEST MEASURES THE SAME DELAY AS IN T2.

1. WRITE 1 RECORD, THEN BACKSPACE OVER IT, ASSURE TAPE IS STOPPED.
2. ISSUE A READ FORWARD OF THE RECORD WRITTEN IN STEP 1.
3. MONITOR BIT 15 OF TC (ACCL)
4. TIME FROM GO TO RESET OF ACCL IS START DELAY
5. STOP

T7. READ SHUTDOWN:

THIS TEST MEASURES THE SAME DELAY AS IN T3.

1. WRITE 1 RECORD, THEN BACKSPACE OVER IT, ASSURE TAPE IS STOPPED.
2. READ FORWARD THE RECORD WRITTEN IN STEP 1.
3. MONITOR FRAME COUNT AND BIT 4 OF DS (SDWN).
4. TIME FROM FC=RECORD SIZE (LAST FRAME READ) TO SDWN=1
   IS THE SHUTDOWN TIME.
5. STOP

T10. READ SETTLEDOWN:

THIS TEST MEASURES THE SAME DELAY AS IN T4.

1. WRITE 1 RECORD, THEN BACKSPACE OVER IT, ASSURE TAPE IS STOPPED.
2. READ FORWARD THE RECORD WRITTEN IN STEP 1.
3. MONITOR BIT 4 OF DS (SDWN)
4. TIME FROM SET OF SDWN TO RESET OF SDWN IS THE
   SETTLEDOWN DELAY.
5. STOP

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T11. READ REVERSE START:

THIS TEST WILL MEASURE THE START DELAY IN THE REVERSE DIRECTION.

1. WRITE 1 RECORD, ASSURE TAPE IS STOPPED.
2. READ REVERSE THE RECORD WRITTEN IN STEP 1.
3. MONITOR BIT 15 OF TC (ACCL)
4. THE TIME FROM GO TO RESET OF ACCL IS THE START TIME
5. STOP

T12. READ REVERSE SHUTDOWN

THIS TEST WILL MEASURE THE READ SHUTDOWN IN THE REVERSE DIRECTION.

1. WRITE 1 RECORD, ASSURE TAPE IS STOPPED.
2. READ REVERSE THE RECORD WRITTEN IN STEP 1.
3. MONITOR FRAME COUNTER AND BIT 4 OF DS (SDWN).
4. TIME FROM FC=RECORD SIZE (LAST FRAME READ) TO SDWN=1 IS THE READ REVERSE SHUTDOWN TIME.
5. STOP

T13. READ REVERSE SETTLEDOWN:

THIS TEST WILL MEASURE THE READ SETTLEDOWN IN THE REVERSE DIRECTION.

1. WRITE 1 RECORD, ASSURE TAPE IS STOPPED.
2. READ REVERSE THE RECORD WRITTEN IN STEP 1.
3. MONITOR BIT 4 OF DS (SDWN)
4. TIME FROM SET OF SDWN TO RESET OF SDWN IS THE SETTLEDOWN DELAY
5. STOP

T14. TURN AROUND DELAY-FORWARD TO REVERSE

THIS TEST WILL MEASURE THE TIME REQUIRED FOR THE TAPE TO CHANGE DIRECTION.

1. LEAVE TAPE AT ITS PRESENT POSITION. ASSURE THAT IT IS STOPPED
2. ISSUE A WRITE FORWARD OF AT LEAST 20 FRAMES
3. MONITOR BIT 7 OF DS (DRY)
4. WHEN DRY IS ASSERTED (EOR), IMMEDIATELY ISSUE A READ REVERSE OF THAT RECORD.
5. MONITOR BIT 15 OF TC (ACCL).
6. TIME FROM GO OF READ REVERSE TO RESET OF ACCL IS THE TURNAROUND TIME.
7. STOP

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T15. TURN AROUND DELAY-REVERSE TO FORWARD

THIS TEST WILL MEASURE THE TIME AS IN T14, BUT IN THE
OPPOSITE DIRECTION.

1. WRITE 1 RECORD.
2. ASSURE TAPE IS STOPPED
3. READ REVERSE
4. MONITOR DRY (BIT 7 OF DS)
5. WHEN DRY = 1, ISSUE A READ FORWARD
6. MONITOR ACCL (BIT 15 OF TC)
7. TIME FROM GO FORWARD TO ACCL = 1 IS THE TURN AROUND TIME.
8. STOP.

GAP MEASUREMENTS:

THE PREVIOUS THIRTEEN (13) TESTS WERE MEASUREMENTS OF LOGIC DELAYS PERFORMED BY THE TM03 OR TE16/TU77 IN ORDER TO ALLOW FOR PROPER ACCELERATION AND DECELLERATION OF TAPE ACCORDING TO THE DESIRED INTEROCORD GAP (.6 INCHES). THIS TEST, HOWEVER, WILL MEASURE THE PHYSICAL SIZE OF THE INTERCORD GAP THAT EXISTS ON TAPE AS A RESULT OF THE START/STOP TIMES OF THE CAPSTAN ITSELF. BECAUSE THE INTERRCORD GAP IS CREATED BY TWO ACTIONS, THE START OF MOTION AND THE STOP OF MOTION IT IS NECESSARY TO MAKE TWO SEPERATE MEASUREMENTS. A THIRD MEASUREMENT, MADE ON THE FLY, OF THE ENTIRE LENGTH OF THE GAP WILL ALSO BE MADE.

T16. GAP SIZE (STOP HALF)

THIS TEST WILL MEASURE THE DISTANCE TRAVLED BY THE TAPE IN A STOP CYCLE. IN OTHER WORDS, THE DISTANCE INTO THE IRG.

1. WRITE 1 RECORD.
2. ASSURE TAPE IS STOPPED.
3. ISSUE A READ REVERSE OVER THE RECORD
4. MONITOR THE FRAME COUNT FOR THE FIRST FRAME READ (FC = 1)
5. THE TIME FROM GO=1 TO FC=1 IS THE LENGTH OF THE GAP
6. STOP

T17. GAP SIZE (START HALF)

THIS TEST WILL MEASURE THE DISTANCE OF TAPE TRAVEL DURING START UP.

1. WRITE 1 RECORD, THEN REVERSE OVER IT, ASSURE TAPE IS STOPPED.
2. ISSUE A READ FORWARD
3. MONITOR FC FOR FC=1
4. TIME FROM GO=1 TO FC=1 IS START DISTANCE
5. STOP

T20. GAP SIZE (INTERRECORD)

THIS TEST WILL MEASURE THE ENTIRE LENGTH OF THE IRG ON THE FLG. THE TIME VALUE OF THIS TEST SHOULD NOT BE EQUAL TO A SUMMATION OF T16 AND T17 DUE TO THE FACT THAT THE ACCELLERATION AND DECELLERATION CURVES ARE NOT IN EFFECT. THE VALUE HERE SHOULD ACTUALLY BE LESS THAN THE SUM OF T16 AND T17.

1. WRITE 2 RECORDS.
2. READ REVERSE OVER THE SECOND RECORD
3. MONITOR DRY (BIT 7 OF DS)
4. WHEN DRY = 1, ISSUE A SECOND READ REVERSE
5. MONITOR FRAME COUNT
6. TIME FROM GO=1 OF SECOND READ REVERSE TO FC=1 IS THE LENGTH OF THE GAP.
7. STOP

T21. GAP CONSISTENCY:

NOW THAT WE HAVE ESTABLISHED THAT THE INTERRCORD
GAP IS THE PROPER SIZE, LET US DETERMINE THE CONSISTENCY
OF THE GAP UNDER VARIOUS COMMAND EXECUTION TIMES.
BY WRITING A SERIES OF RECORDS, EACH WITH A DIFFERENT
DELAY BETWEEN EXECUTION, WE CAN ESTABLISH THE CONSISTENCY
OF THE GAPS BY READING THESE RECORDS AND MONITORING
THEIR INTERRECORD GAPS, ON THE FLY.

1. REWIND TAPE TO BOT.
2. WRITE ONE (1) RECORD TO GET TAPE OFF BOT
3. WRITE SIXTEEN (16) RECORDS WITH A PROGRESSIVE DELAY
   OF FROM 0 TO 16 MILLISECONDS (APPROX) BETWEEN COMMANDS.
4. BACKSPACE 16 RECORDS AND ALLOW THE TAPE TO STOP.
5. READ FORWARD (NON-STOP) OVER THESE 16 RECORDS, EACH
   TIME MONITORING THE TIME FROM THE END OF RECORD (DRY)
   UNTIL THE FRAME COUNT NEXT GOES FROM 0 TO 1 (FC=1).
6. THE TIMES FROM DRY TO FC=1 IS THE GAP TIME AND IT
   SHOULD REMAIN CONSISTANT FOR ALL RECORDS.
7. STOP

(SEE GTIMTBL IN LISTING FOR GAP TIMES)

T22. DATA TIME AT 800 BPI:

THIS TEST WILL MEASURE THE TIME REQUIRED TO WRITE
ONE (1) INCH OF TAPE AT 800 BPI.
BY WRITING A RECORD OF ENOUGH FRAMES TO MOVE
THE TAPE 1 INCH (800 FRAMES), DATA RATE
CAN BE VARIFIED.

1. REWIND TO BOT AND ALLOW TAPE TO STOP
2. WRITE A RECORD AT 800 BPI.
3. MONITOR DRY (BIT 7 OF DS) FOR EACH RECORD
4. THE TIME FROM FC=FC+1 TO DRY WILL BE THE TIME REQUIRED
   FOR 1 INCH AT THE SELECTED DENSITY
5. STOP

T23. DATA TIME AT 1600 BPI (PE):
     REPEAT STEPS 1 THRU 5 AT 1600 BPI.

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T24. ERASE:

THE ERASE COMMAND WILL CAUSE AN AREA OF THE THREE (3) INCHES TO BE DC ERASED IN THE FORWARD DIRECTION. THIS TEST WILL ASSURE THAT THE PROPER DISTANCE IS ERASED.

1. LEAVE TAPE AT ITS PRESENT POSITION.
2. ISSUE AN ERASE COMMAND.
3. MONITOR DRY (BIT 7 OF DS)
4. THE TIME FROM GO TO DRY WILL BE THE TIME REQUIRED TO ERASE 3 INCHES OF TAPE AND WILL REFLECT THE DISTANCE. DENSITY IS NOT A FACTOR.
5. STOP

T25. TAPE MARK:

THIS TEST IS ALSO A CHECK ON THE THREE (3) INCH GAP. WHEN A TAPE MARK IS WRITTEN, A 3 INCH GAP IS CREATED BEFORE DATA IS PUT ON TAPE.

1. LEAVE TAPE AT ITS PRESENT POSITION
2. ISSUE A WRITE TAPE MARK COMMAND
3. MONITOR DRY (BIT 7 OF DS)
4. THE TIME FROM GO TO DRY WILL BE THE TIME REQUIRED TO WRITE THE TM RECORD PLUS THE 3 INCH GAP.
5. STOP

T26. TAPE SPEED FORWARD:

THIS TEST REQUIRES THE USE OF AN 800 BPI SKEW TAPE!
THE OPERATOR WILL BE REQUIRED TO MOUNT THE SKEW TAPE
BEFORE EXECUTING THE TEST. THE SKEW TAPE IS THE ONLY
WAY TO ASSURE THAT TAPE IS MOVING AT THE PROPER SPEED
BECAUSE THE FREQUENCY OF FRAMES ON A SKEW TAPE IS
GUARANTEED TO BE ACCURATE.

1. ASSURE TAPE IS STOPPED AT BOT.
2. ISSUE A READ FORWARD (800 BPI, NORMAL)
3. MONITOR FC FOR FC = 800(10)
4. MONITOR FC FOR FC = 26400(10)
5. TIME FROM FC = 800 TO FC = 26400 IS THE TIME REQUIRED
   FOR TAPE TO TRAVEL 32 INCHES
6. DIVIDE THE TIME FOR 32 INCHES BY 32.
7. THE RESULT IS AN AVERAGE SPEED FOR 1 INCH.
8. STOP.

T27. TAPE SPEED REVERSE:

THIS TEST IS THE SAME AS TEST 31, BUT SPEED IS
MEASURED IN THE REVERSE DIRECTION.

1. ADVANCE TAPE OFF OF BOT.
2. ISSUE A READ REVERSE.
3. REPEAT STEPS 3 THRU 6 IN THE REVERSE DIRECTION.
4. STOP.

%

```
                                .LIST   BIN,LOC,SEQ
                                .NLIST  MC
                                .NLIST  TOC
                                .LIST   ME
                                .ENABLE ABS,AMA
                                .MCALL  $CPVEC,$CPREG,$CATCH,$TYPE,.$ACT11,.$EOP,$CHAIN
                                .TITLE  CZTEECO TM03-TE16/TU77 DFT
                                ;DRIVE FUNCTION TIMER
                        .       .SBTTL  STARTING INSTRUCTIONS
                       ;LOADING AND STARTING PROCEDURE
                       ;        LOAD PROGRAM USING ABS LOADER
                       ;        LOAD ADDRESS 200
                       ;        SET SWITCH OPTIONS
                       ;        PRESS START
                       ;
                       ;RESTART PROCEDURE
                       ;        LOAD ADDRESS 210
                       ;        SET SWITCH OPTIONS
                       ;        PRESS START
                       ;
                       ;SWITCH REGISTER SWITCH ASSIGNMENTS
100000                          SW15=   100000          ;HALT ON ERROR
040000                          SW14=   040000          ;LOOP SUBTEST
020000                          SW13=   020000          ;INHIBIT ERROR TYPE OUT
004000                          SW11=   004000          ;INHIBIT SUBTEST ITERATION
002000                          SW10=   002000          ;INHIBIT PUBLISHING TIME SPECIFICATION
001000                          SW09=   001000          ;RING BELL ON ERROR
000400                          SW08=   000400          ;
000200                          SW07=   00200           ;NOT USED
000100                          SW06=   000100          ;CONTINUOUS CYCLE
                       ;        SW05-SW00               ;RUN TEST SELECTED
                       ;        **NOTE: IF <SW15-SW00> = 177777 AT STARTUP USE SOFTWARE
                       ;                SWITCH REGISTER.
                       ;
                       ;CONSOLE COMMANDS
                       ;        CONTROL C               ;RESTART PROGRAM (SAME AS START @ 200)
                       ;        CONTROL G               ;SET NEW SOFTWARE SWITCH REGISTER
                       ;        CONTROL U               ;DELETE LINE TYPED
                       ;        RUBOUT (DELETE)         ;DELETE LAST CHAR TYPED
                       ;
                       ;GENERAL REGISTER USAGE:
                       ;        R0=ADDRESS OF 'FC' REGISTER (SET BY SCOPE)
                       ;        R1=ADDRESS OF 'DS' REGISTER (SET BY SCOPE)
                       ;        R2=RETURN PC FROM TIMER (SET BY EACH TEST)
                       ;        R3=INDEX INDICATING PREVIOUS OSCILLATOR POLARITY (SET BY TIMER)
                       ;        R4=CONTAINS 'TICK' COUNT WHEN TIMER IS RUNNING (SET BY TIMER)
                       ;        R5=ADDRESS OF CS1 (SET BY SCOPE)
                       ;
                                .SBTTL  MACRO DEFINITIONS
                                .MACRO  SAVE
                                JSR     PC,.SAVE                ;SAVE REGISTERS ON THE STACK
                                .ENDM   SAVE
                                .MACRO  RESTORE
                                JSR     PC,.RESTORE             ;RESTORE REGISTERS FROM THE STACK
                                .ENDM   RESTORE
                                .MACRO  INPUT
```

```
                        JSR     PC,.INPUT               ;GET USER INPUT
                        .ENDM   INPUT
                        .MACRO  REWIND
                        JSR     PC,.REWIND              ;REWIND SLAVE
                        BVS     99$                     ;BRANCH IF ERROR ON REWIND
                        .ENDM   REWIND
                        .MACRO  TIMEON
                        JSR     PC,TIMON                ;TURN TIMER ON
                        .ENDM
                        .MACRO  TIMCHK
                        JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2
                        .ENDM
                        .MACRO  SETGO
                        INC     (R5)                    ;SET 'GO' BIT
                        .ENDM

                        .SBTTL  REGISTER ASSIGNMENTS
                    ;;DEFINITIONS AND REGISTER ASSIGNMENTS
                    ;;GENERAL REGISTER ASSIGNMENTS
000000                  R0=%0
000001                  R1=%1
000002                  R2=%2
000003                  R3=%3
000004                  R4=%4
000005                  R5=%5
000006                  SP=%6
000007                  PC=%7
000000                  R10=%0
000001                  R11=%1
000002                  R12=%2
000003                  R13=%3
000004                  R14=%4
000005                  R15=%5

                    ;;REGISTER ADDRESSES
177776                  PSW=    177776          ;;PROCESSER STATUS WORD
177774                  SLR=    177774          ;;STACK LIMIT REGISTER (11/40,11/45)
177772                  PIRQ=   177772          ;;PROGRAM INTERRUPT REQ. (11/45)
177770                  UBREAK= 177770          ;;MICRO-BREAK REGISTER (11/45)
177560                  TKS=    177560          ;;KEYBOARD CSR
177562                  TKB=    177562          ;;KEYBOARD DATA BUFFER REGISTER
177564                  TPS=    177564          ;;TELEPRINTER CSR
177566                  TPB=    177566          ;;TELEPRINTER DATA BUFFER REGISTER

                    ;;VECTOR ADDRESSES
000004                  ERRVEC=4                ;;ADDRESS OF ERROR VECTOR
000010                  RESVEC=10               ;;ADDRESS OF RESERVED INST. TRAP VECTOR
000014                  TBITVEC=14              ;;ADDRESS OF 'T' BIT TRAP VECTOR
000014                  TRTVEC=14               ;;ADDRESS OF 'TRACE' TRAP VECTOR
000014                  BPTVEC=14               ;;ADDRESS OF 'BREAKPOINT' TRAP VECTOR
000020                  IOTVEC=20               ;;ADDRESS OF IOT TRAP VECTOR
000024                  PFVEC=24                ;;ADDRESS OF POWER FAIL TRAP VECTOR
000030                  EMTVEC=30               ;;ADDRESS OF EMT VECTOR
000034                  TRAPVEC=34              ;;ADDRESS OF TRAP VECTOR
000060                  TKVEC=  60              ;;ADDRESS OF TTY KEYBOARD INT. VECTOR
000064                  TPVEC=64                ;;ADDRESS OF TTY PRINTER INTERRUPT VECTOR
```

```
1094    000114                  PARVEC= 114             ;;ADDRESS OF MA/MF PARITY ERROR VECTOR
1095    000240                  PIRVEC=240              ;;ADDRESS OF PIRQ VECTOR
1096    000244                  FPEVEC=244              ;;ADDRESS OF FLOATING POINT INT. VECTOR
1097    000250                  MMVEC=250               ;;ADDRESS OF MEM MGMT ERROR TRAP VECTOR
1098
```

```
                        ;RH,TM03-TE16/TU77 REGISTERS
172440                          TMCS1=  172440

                        ;TM03-TE16/TU77 INDEX VALUES
000000                          CS1=    00              ;CONTROL STATUS #1
000002                          WC=     02
000004                          BA=     04              ;BUS ADDRESS REGISTER
000006                          FC=     06              ;FRAME COUNT
000010                          CS2=    10              ;CONTROL STATUS #2
000012                          DS=     12              ;DRIVE STATUS
000014                          ER=     14              ;ERROR REG #1
000016                          AS=     16              ;ATTENTION SUMMARY
000022                          DB=     22              ;DATA BUFFER REG
000024                          MR=     24              ;MAINTENANCE REG
000026                          DT=     26              ;DRIVE TYPE REG
000030                          SN=     30              ;SERIAL NUMBER REGISTER
000032                          TC=     32              ;TAPE CONTROL REG

                                .SBTTL  TM03-TE16/TU77 REGISTER BITS
                        ;RHCS1-CS1(R5)
000001                          GO=     1
000000                          NOP=    0
000002                          RWDOFF= 2
000006                          RWD=    6
000010                          DRYCLR= 10
000026                          WFMK=   26
000024                          ERASE=  24
000030                          SPCFWD= 30
000032                          SPCREV= 32
000050                          WCHKF=  50
000056                          WCHKR=  56
000060                          WFWD=   60
000070                          RDFWD=  70
000076                          RDREV=  76
000100                          IE=     100
000200                          RDY=    200
000400                          A16=    400
001000                          A17=    1000
002000                          PSEL=   2000
004000                          DVA=    4000
020000                          MCPE=   20000
040000                          TRE=    40000
100000                          SC=     100000

                        ;RHCS2-CS2(R5)
000000                          DV0=    0
000001                          DV1=    1
000002                          DV2=    2
000003                          DV3=    3
000004                          DV4=    4
000005                          DV5=    5
000006                          DV6=    6
000007                          DV7=    7
000010                          BAI=    10
000020                          PAT=    20
000040                          CLR=    40
000100                          IR=     100
```

```
                                OR=     200
                                MDPE=   400
                                MXF=    1000
                                PGE=    2000
                                NEM=    4000
                                NED=    10000
                                UPE=    20000
                                WCE=    40000
                                DLT=    100000
                        ;RHDS-DS(R5)
                                SLA=    1
                                BOT=    2
                                TMK=    4
                                IDB=    10
                                SDWN=   20
                                PES=    40
                                SSC=    100
                                DRY=    200
                                DPR=    400
                                EOT=    2000
                                WRL=    4000
                                MOL=    10000
                                PIP=    20000
                                ERR=    40000
                                ATA=    100000
                        ;RHER-ER(R5)
                                ILF=    1
                                ILR=    2
                                RMR=    4

                                FMT=    20
                                INCVAE= 100
                                PEFLRC= 200
                                NSG=    400
                                FCE=    1000
                                CSITM=  2000
                                NEF=    4000
                                DTE=    10000
                                OPI=    20000
                                UNS=    40000
                                HRDERR= UNS!OPI!DTE!NEF!FCE!FMT!RMR!ILR!ILF     ;HARDERROR BITS

                        ;RHMR-MR(R5)
                                OSC=    100

                        ;RHDT-DT(R5)
                                SPR=    2000
                                CH7=    10000
                                TAP=    40000

                        ;RHTC-TC(R5)
                                NORM11= 1700
                                CDM11=  320
                                BPI200= 0
                                BPI556= 000400
                                BPI800= 001000
```

```
1211            002300                  PE1600= 002300
1212            100000                  ACCL=   100000
1213
1214
1215
1216                                    ;INSTRUCTION EQUATES
1217            104400                  HLT=    TRAP
1218            104000                  SCOPE=  EMT
1219            000004                  TYPE=   IOT
1220
1221                                    ;MISCELLANEOUS EQUATES
1222            006274                  OUTBUF=INIT             ;OUTPUT BUFFER STARTS AT BEG OF PROGRAM
1223            177400                  FRMCNT= -256.           ;FRAME COUNT
1224            177600                  WRDCNT= -128.           ;WORD COUNT
1225                                    ;ASCII EQUATES
1226            000001                  CNTRLA= 1               ;ASCII CODE FOR CONTROL A (^A)
1227            000003                  CNTRLC= 3               ;ASCII CODE FOR CONTROL C (^C)
1228            000007                  CNTRLG= 7               ;ASCII CODE FOR CONTROL G (^G)
1229            000011                  HT=     11              ;ASCII CODE FOR HORIZONTAL TAB
1230            000012                  LF=     12              ;ASCII CODE FOR LINE FEED
1231            000015                  CR=     15              ;ASCII CODE FOR CARRIAGE RETURN
1232            000017                  CNTRLO= 17              ;ASCII CODE FOR CONTROL O (^O)
1233            000025                  CNTRLU= 25              ;ASCII CODE FOR CONTROL U (^U)
```

```
1234                                    ;SETUP TRAP VECTORS
1235            000014                          .=TBITVEC
1236  000014    000016                          .WORD   .+2             ;SET 'T' TRAP TO TIMER ROUTINE
1237  000016    000000                          .WORD   HALT            ;PRIORITY LEVEL 7
1238  000020    002636                          .WORD   .TYPE           ;SET IOT TRAP TO .TYPE ROUTINE
1239  000022    000000                          .WORD   0               ;PRIOTITY LEVEL 0
1240  000024    000026                          .WORD   PFVEC+2         ;POWER FAIL TRAP TO HALT
1241  000026    000000                          .WORD   HALT            ;AT PFVEC+2
1242  000030    004516                          .WORD   .SCOPE          ;SET EMT TRAP TO .SCOPE ROUTINE
1243  000032    000340                          .WORD   340             ;PRIORITY LEVEL 7
1244  000034    004252                          .WORD   .HLT            ;SET TRAP TRAP TO .HLT ROUTINE
1245  000036    000340                          .WORD   340             ;PRIORITY LEVEL 7
1246
1247                                    ;ACT11 HOOK ***********
1248            000040                          $SVPC=.                 ;SAVE CURRENT LOCATION CTR
1249            000042                          .=42
1250  000042    000000                          .WORD   0
1251            000046                          .=46
1252  000046    013504                          .WORD   $ENDAD          ;SET LOCATION 46
1253            000052                          .=52
1254  000052    000000                          .WORD   0               ;SET LOCATION 52 = 0
1255            000040                          .=$SVPC                 ;RESTORE LOCATION CTR
1256
1257            000060                          .=TKVEC
1258  000060    004126                          .WORD   TKISR
1259  000062    000200                          .WORD   200
1260
1261                                    ;SOFTWARE SWITCH REGISTER LOC. 176
1262            000176                          .=176
1263  000176    000000                  SWREG:  .WORD   0               ;SOFTWARE SWITCH REGISTER
1264
1265            000200                          .=200
1266  000200    000137  006274                  JMP     @#INIT          ;GO TO START OF PROGRAM
1267            000210                          .=210
1268  000210    000137  007414                  JMP     @#RSTRT         ;RESTART ADDRESS
1269
1270            000500                          .=500
1271            000600          STKPTR= 600                             ;STACK
1272
1273            001000                          .=1000
1274                                    ;PROGRAM TAGS
1275  001000    177570          SWR:    177570                          ;SWITCH REGISTER
1276  001002    000000          SCPADR: .WORD   0
1277  001004       000          DRVNUM: .BYTE   0                       ;TM03 DRIVE UNDER TEST
1278  001005       000          SLVNUM: .BYTE   0                       ;TE16/TU77 SLAVE UNDER TEST
1279  001006    000000          SLVPTR: .WORD   0                       ;POINTER TO SLAVE TABLE (SLVTBL) BELOW
1280  001010    172440          TMBASE: .WORD   TMCS1                   ;BASE ADDRESS OF TM03-TE16/TU77 REGISTERS
1281  001012    000000          OSCTIM: .WORD   0                       ;US/TICK (56/80 FOR TE16/TU77)
1282  001014    000000          GAPDEL: .WORD   0                       ;TICKS/MS (18/6 FOR TE16/TU77)
1283  001016    000000          ATIME:  .WORD   0                               ;CONTAINS 'TICK' COUNT
1284  001020    000020          ATIMTBL:.BLKW   16.                     ;EACH ENTRY CONTAINS TIME FOR FUNCTION
1285                                                                    ;ENTRIES ARE MADE BY 'SCOPE' ROUTINE
1286  001060    000020          GAPTBL: .BLKW   16.                     ;TIMES RECORDED BY 'GAP CONSISTANCY' TEST
1287  001120    000000          DELTIM: .WORD   0                       ;VARIBLE DELAY
1288  001122    000000          OCTAL0: .WORD   0
1289  001124       000          GAP:    .BYTE   0                       ;CONTAINS GAP # (USED FOR TST 021)
```

```
1290  001125  000                 ITCNT:  .BYTE   0               ;ITERATION COUNT
1291  001126  000                 TSTNUM: .BYTE   0               ;TEST #
1292  001127  000                 ERFLG:  .BYTE   0               ;ERROR FLAG
1293  001130  000                 SKEWFLG:        .BYTE 0         ;0/1 = DO NOT/DO SKEW (SPEED) TESTS
1294  001131  000                 PRGFLG: .BYTE   0               ;PROGRAM FLAG
1295  001132  000                 UNTFND: .BYTE   0               ;UNIT FOUND INDICATOR
1296  001133  000                 TYPFLG: .BYTE   0
1297  001134  000                 PSCNT:  .BYTE   0               ;CONTAINS PASS COUNT
1298  001135  000                 ASFLG:  .BYTE   0               ;1/0 = YES/NO.
1299  001136  000                 TE16:   .BYTE   0               ;0/1 = TE16/TU77
1300          001140                      .EVEN
1301  001140  030460              DIGTAB: '01
1302  001142  031462                      '23
1303  001144  032464                      '45
1304  001146  033466                      '67
1305  001150  034470                      '89
1306  001152  000006              ODIGITS:.BLKB   6               ;RESERVE SPACE FOR CONVERTED DIGITS
1307  001160  000                         .BYTE   0               ;TERMINATOR
1308          001162                      .EVEN
1309  001162  000010              DRVTBL: .BLKB   8.              ;A 0/-1 = DRIVE NOT TO BE/TO BE TESTED
1310  001172  000100              SLVTBL: .BLKB   64.             ;A 0/-1 = SLAVE NOT TO BE/TO BE TESTED
1311  001272  000110              INBUF:  .BLKB   72.             ;TELETYPE INPUT BUFFER
1312  001402  005015  000         CRLF:   .ASCIZ  <CR><LF>        ;MISCELLANEOUS ASCII CHARACTERS
1313  001405  134     000         BKSLSH: .ASCIZ  '\'
1314  001407  060     000         ECHO:   .ASCIZ  '0'
1315  001411  007     000         BELL:   .ASCIZ  <7>
1316  001413  055     000         DASH:   .ASCIZ  '-'
1317  001415  040                 SPACE2: .ASCII  '  '
1318  001416  000040              SPACE:  .ASCIZ  ' '
1319  001420  004476  000         ANGTAB: .ASCIZ  '>'<HT>
1320          001424                      .EVEN
```

```
                                        .SBTTL  TE16 TIME SPECIFICATION TABLE
                                ;THE BELOW TABLE CONTAINS THE TE16 SPECIFIED FUNCTION TIMES IN TENS OF
                                ;MICROCESONDS. NOTE THAT WHEN TIMES ARE TYPED THAT THEY ARE TYPED IN
                                ;MICROSECONDS (BY APPENDING A 0).
                                ;FORMAT IS
                                ;       .WORD   MAX,MIN         ;TIME IN MS     FUNCTION        TEST #

001424  000000  000000          TE16TTBL:.WORD  0,0             ;SPARE
001430  036050  035230                  .WORD   15400.,15000.   ;154.0-150.0   WRITE FROM BOT  TST001
001434  001666  001546                  .WORD   00950.,00870.   ;9.5-8.7        WRITE START     TST002
001440  001522  001356                  .WORD   00850.,00750.   ;8.9-8.5        WRITE SHUTDOWN  TST003
001444  002506  001332                  .WORD   01350.,00730.   ;13.5-7.3       WRITE STLDOWN   TST004
001450  007164  006344                  .WORD   03700.,03300.   ;37.0-33.0      READ FROM BOT   TST005
001454  000500  000360                  .WORD   00320.,00240.   ;3.2-2.4        READ START      TST006
001460  000632  000454                  .WORD   00410.,00300.   ;4.1-3.00       READ SHUTDOWN   TST007
001464  002506  001332                  .WORD   01350.,00730.   ;13.5-7.3       READ SETTLEDOWN TST010
001470  000500  000360                  .WORD   00320.,00240.   ;3.2-2.4        RD REV START    TST011
001474  000562  000512                  .WORD   00370.,00330.   ;3.7-3.3        RD REV SHTDWN   TST012
001500  002506  001332                  .WORD   01350.,00730.   ;13.5-7.3       RD REV STLDWN   TST013
001504  003206  002056                  .WORD   01670.,01070.   ;16.7-10.7      TRN RND DLY F-R TST014
001510  003206  002056                  .WORD   01670.,01070.   ;16.7-10.7      TRN RND DLY R-F TST015
001514  002412  001666                  .WORD   01290.,00950.   ;12.9-9.5       GAP SIZE STOP   TST016
001520  002234  001522                  .WORD   01180.,00850.   ;11.8-8.5       GAP SIZE STRT   TST017
001524  002626  002354                  .WORD   01430.,01260.   ;14.3-12.6      GAP SIZE INTER  TST020
001530  002570  002234                  .WORD   01400.,01180.   ;14.0-11.8      GAP CONSISANCY  TST021
001534  004540  004230                  .WORD   02400.,02200.   ;24.0-22.0      DAT TIME 800BPI TST022
001540  004716  004552                  .WORD   02510.,02410.   ;25.1-24.1      DAT TIME 1600PE TST023
001544  023564  023110                  .WORD   10100.,09800.   ;101.0-98.0     ERASE           TST024
001550  024240  023730                  .WORD   10400.,10200.   ;104.0-102.0    WRT FILE MARK   TST025
001554  004336  004172                  .WORD   02270.,02170.   ;22.7-21.7      TAPE SPEED FWD  TST026
001560  004336  004172                  .WORD   02270.,02170.   ;22.7-21.7      TAPE SPEED REV  TST027

                                ;NOTE: TEST 26 AND 27 REQUIRE PRERECORDED 800BPI SKEW TAPE.
                                        .SBTTL  TE16 GAP TIME SPECIFICATION TABLE
                                ;THIS TABLE CONTAINS THE TE16 GAP SIZES (IN TENS OF MICROSECONDS) FOR EACH
                                ;OF THE 16. GAPS RECORDED BY THE GAP CONSISTANCY TEST (TST021).
                                ;NOTE: GAP #'S ARE IN OCTAL.

                                ;       .WORD   MAX,MIN(10)     ;TIME IN MS(10) GAP #   DELAY IN MS(10)

001564  002602  002412          TE16GTBL:.WORD  01410.,01290.   ;14.10-i2.9     GAP-0   0 MS
001570  002652  002506                  .WORD   01450.,01350.   ;14.5-13.5      GAP-1   1.0 MS
001574  002734  002532                  .WORD   01500.,01370.   ;15.0-13.7      GAP-2   2.0 MS
001600  003016  002424                  .WORD   01550.,01300.   ;15.5-13.0      GAP-3   3.0 MS
001604  003016  002304                  .WORD   01550.,01220.   ;15.5-12.2      GAP-4   4.0 MS
001610  002734  002176                  .WORD   01500.,01150.   ;15.0-11.5      GAP-5   5.0 MS
001614  002652  002176                  .WORD   01450.,01150.   ;14.5-11.5      GAP-6   6.0 MS
001620  002652  002176                  .WORD   01450.,01150.   ;14.5-11.5      GAP-7   7.0 MS
001624  002570  002176                  .WORD   01400.,01150.   ;14.0-11.5      GAP-10  8.0 MS
001630  002570  002176                  .WORD   01400.,01150.   ;14.0-11.5      GAP-11  9.0 MS
001634  002570  002176                  .WORD   01400.,01150.   ;14.0-11.5      GAP-12  10.0 MS
001640  002570  002176                  .WORD   01400.,01150.   ;14.0-11.5      GAP-13  11.1 MS
001644  002570  002176                  .WORD   01400.,01150.   ;14.0-11.5      GAP-14  12.1 MS
001650  002570  002176                  .WORD   01400.,01150.   ;14.0-11.5      GAP-15  13.1 MS
001654  002570  002176                  .WORD   01400.,01150.   ;14.0-11.5      GAP-16  14.1 MS
001660  002570  002176                  .WORD   01400.,01150.   ;14.0-11.5      GAP-17  15.1 MS
```

```
1377                                        .SBTTL  TU77 TIME SPECIFICATION TABLE
1378                                    ;THE BELOW TABLE CONTAINS THE TU77 SPECIFIED FUNCTION TIMES IN TENS OF
1379                                    ;MICROCESONDS. NOTE THAT WHEN TIMES ARE TYPED THAT THEY ARE TYPED IN
1380                                    ;MICROSECONDS (BY APPENDING A 0).
1381                                    ;FORMAT IS
1382                                    ;       .WORD   MAX,MIN         ;TIME IN MS     FUNCTION        TEST #
1383
1384  001664  000000  000000           TU77TTBL:.WORD  0,0             ;SPARE
1385  001670  012606  011571                   .WORD   5510.,4985.     ;55.1-49.85     WRITE FROM BOT  TST001
1386  001674  000520  000460                   .WORD   00336.,00304.   ;3.36-3.04      WRITE START     TST002
1387  001700  000346  000313                   .WORD   00230.,00203.   ;2.3-2.03       WRITE SHUTDOWN  TST003
1388  001704  003410  001717                   .WORD   01800.,00975.   ;18.0-9.75       WRITE STLDOWN   TST004
1389  001710  001315  001112                   .WORD   00717.,00586.   ;7.17-5.86       READ FROM BOT   TST005
1390  001714  000111  000067                   .WORD   00073.,00055.   ;.73-.55         READ START      TST006
1391  001720  000111  000067                   .WORD   00073.,00055.   ;.73-.55         READ SHUTDOWN   TST007
1392  001724  003410  001717                   .WORD   01800.,00975.   ;18.0-9.75       READ SETTLEDOWN TST010
1393  001730  000111  000067                   .WORD   00073.,00055.   ;0.73-0.55       RD REV START    TST011
1394  001734  000101  000057                   .WORD   00065.,00047.   ;0.65-0.47       RD REV SHTDWN   TST012
1395  001740  003410  001717                   .WORD   01800.,00975.   ;18.0-9.75       RD REV STLDWN   TST013
1396  001744  003500  002006                   .WORD   01856.,01030.   ;18.56-10.3      TRN RND DLY F-R TST014
1397  001750  003510  002017                   .WORD   01864.,01039.   ;18.64-10.39     TRN RND DLY R-F TST015
1398  001754  000702  000545                   .WORD   0450.,00357.    ;4.50-3.57       GAP SIZE STOP   TST016
1399  001760  000642  000505                   .WORD   0418.,00325.    ;4.18-3.25       GAP SIZE STRT   TST017
1400  001764  001012  000646                   .WORD   0522.,0422.     ;5.22-4.22       GAP SIZE INTER  TST020
1401  001770  001034  000641                   .WORD   0540.,0417.     ;5.40-4.17       GAP CONSISANCY  TST021
1402  001774  001515  001434                   .WORD   0845.,0796.     ;8.45-7.96       DAT TIME 800BPI TST022
1403  002000  001536  001434                   .WORD   0862.,0796.     ;8.62-7.96       DAT TIME 1600PE TST023
1404  002004  007020  006476                   .WORD   3600.,03390.    ;36.00-33.90     ERASE           TST024
1405  002010  007176  006642                   .WORD   3710.,3490.     ;37.10-34.90     WRT FILE MARK   TST025
1406  002014  001560  001320                   .WORD   00880.,00720.   ;8.8-7.2        TAPE SPEED FWD  TST026
1407  002020  001560  001320                   .WORD   00880.,00720.   ;8.8-7.2        TAPE SPEED REV  TST027
1408
1409                                    ;NOTE: TEST 26 AND 27 REQUIRE PRERECORDED 800BPI SKEW TAPE.
1410                                            .SBTTL  TU77 GAP TIME SPECIFICATION TABLE
1411                                    ;THIS TABLE CONTAINS THE TU77 GAP SIZES (IN TENS OF MICROSECONDS) FOR EACH
1412                                    ;OF THE 16. GAPS RECORDED BY THE GAP CONSISTANCY TEST (TST021).
1413                                    ;NOTE: GAP #'S ARE IN OCTAL.
1414
1415                                    ;       .WORD   MAX,MIN(10)     ;TIME IN MS(10) GAP #   DELAY IN MS(10)
1416
1417  002024  000770  000676           TU77GTBL:.WORD  0504.,0446.     ;5.04-4.46      GAP-0   0 MS
1418  002030  001013  000717                   .WORD   0523.,0463.     ;5.23-4.63      GAP-1   0.24 MS
1419  002034  001033  000732                   .WORD   0539.,0474.     ;5.39-4.74      GAP-2   0.48 MS
1420  002040  001050  000742                   .WORD   0552.,0482.     ;5.52-4.82      GAP-3   0.72 MS
1421  002044  001062  000746                   .WORD   0562.,0486.     ;5.62-4.86      GAP-4   0.96 MS
1422  002050  001067  000742                   .WORD   0567.,0482.     ;5.67-4.82      GAP-5   1.20 MS
1423  002054  001072  000736                   .WORD   0570.,0478.     ;5.70-4.78      GAP-6   1.44 MS
1424  002060  001072  000724                   .WORD   0570.,0468.     ;5.70-4.68      GAP-7   1.68 MS
1425  002064  001066  000704                   .WORD   0566.,0452.     ;5.66-4.52      GAP-10  1.92 MS
1426  002070  001065  000660                   .WORD   0565.,0432.     ;5.65-4.32      GAP-11  2.16 MS
1427  002074  001046  000627                   .WORD   0550.,0407.     ;5.50-4.07      GAP-12  2.40 MS
1428  002100  001027  000572                   .WORD   0535.,0378.     ;5.35-3.78      GAP-13  2.64 MS
1429  002104  000776  000632                   .WORD   0510.,0410.     ;5.10-4.10      GAP-14  2.88 MS
1430  002110  000776  000632                   .WORD   0510.,0410.     ;5.10-4.10      GAP-15  3.12 MS
1431  002114  000776  000632                   .WORD   0510.,0410.     ;5.10-4.10      GAP-16  3.36 MS
1432  002120  000776  000632                   .WORD   0510.,0410.     ;5.10-4.10      GAP-17  3.60 MS
```

```
1433                                        .SBTTL  TIME SPECIFICATION TABLE
1434                                    ;THE BELOW TABLE WILL CONTAIN THE SPECIFIED FUNCTION TIMES IN TENS OF
1435                                    ;MICROCESONDS. NOTE THAT WHEN TIMES ARE TYPED THAT THEY ARE TYPED IN
1436                                    ;MICROSECONDS (BY APPENDING A 0).
1437                                    ;FORMAT IS
1438                                    ;       .WORD   MAX,MIN         ;TIME IN MS     FUNCTION        TEST #
1439    002124                          STTBL:
1440    002124  000000  000000          STIMTBL:.WORD   0,0             ;SPARE
1441    002130  036050  035230                  .WORD   15400.,15000.  ;154.0-150.0    WRITE FROM BOT  TST001
1442    002134  001666  001546                  .WORD   00950.,00870.  ;9.5-8.7        WRITE START     TST002
1443    002140  001522  001356                  .WORD   00850.,00750.  ;8.9-8.5        WRITE SHUTDOWN  TST003
1444    002144  002506  001332                  .WORD   01350.,00730.  ;13.5-7.3       WRITE STLDOWN   TST004
1445    002150  007164  006344                  .WORD   03700.,03300.  ;37.0-33.0      READ FROM BOT   TST005
1446    002154  000500  000360                  .WORD   00320.,00240.  ;3.2-2.4        READ START      TST006
1447    002160  000632  000454                  .WORD   00410.,00300.  ;4.1-3.00       READ SHUTDOWN   TST007
1448    002164  002506  001332                  .WORD   01350.,00730.  ;13.5-7.3       READ SETTLEDOWN TST010
1449    002170  000500  000360                  .WORD   00320.,00240.  ;3.2-2.4        RD REV START    TST011
1450    002174  000562  000512                  .WORD   00370.,00330.  ;3.7-3.3        RD REV SHTDWN   TST012
1451    002200  002506  001332                  .WORD   01350.,00730.  ;13.5-7.3       RD REV STLDWN   TST013
1452    002204  003206  002056                  .WORD   01670.,01070.  ;16.7-10.7      TRN RND DLY F-R TST014
1453    002210  003206  002056                  .WORD   01670.,01070.  ;16.7-10.7      TRN RND DLY R-F TST015
1454    002214  002412  001666                  .WORD   01290.,00950.  ;12.9-9.5       GAP SIZE STOP   TST016
1455    002220  002234  001522                  .WORD   01180.,00850.  ;11.8-8.5       GAP SIZE STRT   TST017
1456    002224  002626  002354                  .WORD   01430.,01260.  ;14.3-12.6      GAP SIZE INTER  TST020
1457    002230  002506  002234                  .WORD   01350.,01180.  ;13.5-11.8      GAP CONSISANCY  TST021
1458    002234  004540  004230                  .WORD   02400.,02200.  ;24.0-22.0      DAT TIME 800BPI TST022
1459    002240  004716  004552                  .WORD   02510.,02410.  ;25.1-24.1      DAT TIME 1600PE TST023
1460    002244  023564  023110                  .WORD   10100.,09800.  ;101.0-98.0     ERASE           TST024
1461    002250  024240  023730                  .WORD   10400.,10200.  ;104.0-102.0    WRT FILE MARK   TST025
1462    002254  004336  004172                  .WORD   02270.,02170.  ;22.7-21.7      TAPE SPEED FWD  TST026
1463    002260  004336  004172                  .WORD   02270.,02170.  ;22.7-21.7      TAPE SPEED REV  TST027
1464
1465                                    ;NOTE: TEST 26 AND 27 REQUIRE PRERECORDED 800BPI SKEW TAPE.
1466                                            .SBTTL  GAP TIME SPECIFICATION TABLE
1467                                    ;THIS TABLE WILL CONTAIN THE GAP SIZES (IN TENS OF MICROSECONDS) FOR EACH
1468                                    ;OF THE 16. GAPS RECORDED BY THE GAP CONSISTANCY TEST (TST021).
1469                                    ;NOTE: GAP #'S ARE IN OCTAL.
1470                                    ;       .WORD   MAX,MIN(10)     ;TIME IN MS(10) GAP #   DELAY IN MS(10)
1471    002264  002544  002354          GTIMTBL:.WORD   01380.,01260.  ;13.8-12.6      GAP-0   0 MS
1472    002270  002652  002506                  .WORD   01450.,01350.  ;14.5-13.5      GAP-1   1.0 MS
1473    002274  002722  002506                  .WORD   01490.,01350.  ;14.9-13.5      GAP-2   2.0 MS
1474    002300  002710  002474                  .WORD   01480.,01340.  ;14.8-13.4      GAP-3   3.0 MS
1475    002304  002570  002260                  .WORD   01400.,01200.  ;14.0-12.0      GAP-4   4.0 MS
1476    002310  002556  002114                  .WORD   01390.,01100.  ;13.9-11.0      GAP-5   5.0 MS
1477    002314  002532  002114                  .WORD   01370.,01100.  ;13.7-11.0      GAP-6   6.0 MS
1478    002320  002532  002114                  .WORD   01370.,01100.  ;13.7-11.0      GAP-7   7.0 MS
1479    002324  002506  002176                  .WORD   01350.,01150.  ;13.5-11.5      GAP-10  8.0 MS
1480    002330  002474  002176                  .WORD   01340.,01150.  ;13.4-11.5      GAP-11  9.0 MS
1481    002334  002474  002176                  .WORD   01340.,01150.  ;13.4-11.5      GAP-12  10.0 MS
1482    002340  002474  002176                  .WORD   01340.,01150.  ;13.4-11.5      GAP-13  11.0 MS
1483    002344  002474  002176                  .WORD   01340.,01150.  ;13.4-11.5      GAP-14  12.0 MS
1484    002350  002474  002176                  .WORD   01340.,01150.  ;13.4-11.5      GAP-15  13.1 MS
1485    002354  002474  002176                  .WORD   01340.,01150.  ;13.4-11.5      GAP-16  14.1 MS
1486    002360  002474  002176                  .WORD   01340.,01150.  ;13.4-11.5      GAP-17  15.1 MS
1487    002364                          ENDTBL:
```

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1488                                    .SBTTL  TEST HEADER POINTERS
1489                                ;THE BELOW TABLE CONTAINS POINTERS TO EACH TEST'S DESCRIPTOR
1490  002364  015701                NAMPTR: .WORD   A.T000
1491  002366  015731                        .WORD   A.T001
1492  002370  015753                        .WORD   A.T002
1493  002372  015773                        .WORD   A.T003
1494  002374  016015                        .WORD   A.T004
1495  002376  016041                        .WORD   A.T005
1496  002400  016063                        .WORD   A.T006
1497  002402  016102                        .WORD   A.T007
1498  002404  016124                        .WORD   A.T010
1499  002406  016147                        .WORD   A.T011
1500  002410  016171                        .WORD   A.T012
1501  002412  016216                        .WORD   A.T013
1502  002414  016245                        .WORD   A.T014
1503  002416  016276                        .WORD   A.T015
1504  002420  016327                        .WORD   A.T016
1505  002422  016355                        .WORD   A.T017
1506  002424  016404                        .WORD   A.T020
1507  002426  016434                        .WORD   A.T021
1508  002430  016457                        .WORD   A.T022
1509  002432  016503                        .WORD   A.T023
1510  002434  016530                        .WORD   A.T024
1511  002436  016552                        .WORD   A.T025
1512  002440  016575                        .WORD   A.T026
1513  002442  016617                        .WORD   A.T027
1514
1515                                ;TABLE OF TEST STARTING ADDRESSES
1516  002444  010000                TSTTBL: .WORD   TST000
1517  002446  010274                        .WORD   TST001
1518  002450  010360                        .WORD   TST002
1519  002452  010436                        .WORD   TST003
1520  002454  010526                        .WORD   TST004
1521  002456  010634                        .WORD   TST005
1522  002460  010720                        .WORD   TST006
1523  002462  011004                        .WORD   TST007
1524  002464  011104                        .WORD   TST010
1525  002466  011224                        .WORD   TST011
1526  002470  011322                        .WORD   TST012
1527  002472  011432                        .WORD   TST013
1528  002474  011572                        .WORD   TST014
1529  002476  011664                        .WORD   TST015
1530  002500  011772                        .WORD   TST016
1531  002502  012066                        .WORD   TST017
1532  002504  012176                        .WORD   TST020
1533  002506  012316                        .WORD   TST021
1534  002510  012622                        .WORD   TST022
1535  002512  012752                        .WORD   TST023
1536  002514  013102                        .WORD   TST024
1537  002516  013222                        .WORD   TST025
1538  002520  013556                        .WORD   TST026
1539  002522  013714                        .WORD   TST027
```

```
1540  002524  000000                    TIB:    .WORD   0
1541                                    ;ROUTINE TO LOAD SOFTWARE SWR
1542
1543  002526  022737  000176  001000  GTSWR:  CMP     #SWREG,SWR      ;BRANCH IF SOFTWARE SWR
1544  002534  001027                          BNE     2$              ;NOT INVOKED
1545  002536  004737  003062                  JSR     PC,.SAVE        ;SAVE REGISTERS ON THE STACK
1546  002542  000004  016646                  TYPE,L.SWR
1547  002546  017702  176226                  MOV     @SWR,R2
1548  002552  004737  003134                  JSR     PC,TYPOCT
1549  002556  000004  016655                  TYPE,L.NEW
1550  002562  004737  004000                  JSR     PC,.INPUT               ;GET USER INPUT
1551  002566  122737  000015  001272          CMPB    #CR,@#INBUF             ;EXIT IF FIRST CHAR IS <CR>
1552  002574  001405                          BEQ     1$
1553  002576  004737  003564                  JSR     PC,CNVTAO               ;CONERT ASCII TO OCTAL
1554  002602  013777  001122  176170          MOV     @#OCTAL0,@SWR           ;SET NEW SWITCH REG CONTENTS
1555  002610  004737  003104          1$:     JSR     PC,.RESTORE
1556  002614  000207                  2$:     RTS     PC
1557
1558
1559                                            .SBTTL  PROGRAM SUBROUTINES
1560                                            .SBTTL          TYPE SUBROUTINE
1561                                    ;;ROUTINE TO TYPE ASCII MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
1562                                    ;;THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
1563                                    ;;CALL: TYPE                    ;;A TRAP TYPE INSTRUCTION
1564                                    ;;      MESADR                  ;;MESADR IS FIRST ADDRESS OF ASCIZ STRING
1565
1566                                    ;;TAGS USED BY THE TYPE ROUTINE BELOW
1567          000011                            $HT=11                  ;;HORIZONTAL TAB
1568  002616    000                   $NULL:  .BYTE   0               ;;CONTAINS NULL CHARACTER
1569  002617    002                   $FILL:  .BYTE   2               ;;CONTAINS # OF FILLER CHARACTERS
1570  002620    000                   $TPFLG: .BYTE   0               ;;CONTAINS TELEPRINTER AVAILABLE FLAG
1571                                                                    ;;0/377 = AVAIL/NOT AVAIL
1572  002621    000                   $TKFLG: .BYTE   0               ;;CONTAINS KEYBOARD AVAILABLE FLAG
1573  002622  177564                  $TPS:   .WORD   177564          ;;ADDRESS OF TLEPRINTER STATUS REGISTER
1574  002624  177566                  $TPB:   .WORD   177566          ;;ADDRESS OF TELEPRINTER DATA BUFFER
1575  002626    000                   $CHARCNT:.BYTE  0               ;;CONTAINS # OF CHARS TYPED
1576  002627    000                   $CNTRLO:.BYTE   0               ;;CONTAINS CONTROL O CHAR (IF TYPED)
1577  002630  005015      000         $CRLF:  .ASCIZ  <15><12>
1578          002634                          .EVEN
1579  002634  000000                  RDSW:   .WORD   0
1580
1581  002636  010046                  .TYPE:  MOV     R0,-(SP)        ;;SAVE R0
1582  002640  017600  000002                  MOV     @2(SP),R0       ;;GET MESSAGE ADDRESS
1583  002644  062766  000002  000002          ADD     #2,2(SP)        ;;ADJUST RETURN PC
1584  002652  105037  002627                  CLRB    $CNTRLO
1585
1586  002656  105737  002627          TYPE1:  TSTB    $CNTRLO         ;;BRANCH IF CONTROL O(^O) WASN'T TYPED
1587  002662  001410                          BEQ     TYPE2
1588  002664  000004  002630          TCRLF:  TYPE,$CRLF              ;;TYPE <CR><LF>
1589  002670  105737  002634                  TSTB    RDSW
1590  002674  100006                          BPL     TYPE3
1591  002676  005037  002634                  CLR     RDSW
1592  002702  000207                          RTS     PC
1593  002704  112046                  TYPE2:  MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
1594  002706  001003                          BNE     TYPE4           ;;BRANCH IF NOT THE TERMINATOR
1595  002710  005726                          TST     (SP)+           ;;POP TERMINATOR CHAR OFF THE STACK
```

```
1596  002712  012600                TYPE3:  MOV     (SP)+,R0        ;;RESTORE R0
1597  002714  000002                        RTI                     ;;RETURN TO CALLER
1598
1599  002716  122716  000011        TYPE4:  CMPB    #$HT,(SP)       ;;BRANCH IF HORIZONTAL TAB <HT>
1600  002722  001445                        BEQ     9$
1601  002724  004737  002756                JSR     PC,5$           ;;TYPE CHARACTER
1602  002730  122726  000012        3$:     CMPB    #12,(SP)+       ;;CHECK IF CHARACTER WAS A LINE FEED
1603  002734  001350                        BNE     TYPE1           ;;BRANCH IF NOT LINE FEED
1604  002736  013746  002616                MOV     $NULL,-(SP)     ;;GET # OF FILLERS REQUIRED AND FILLER
1605                                                                ;;CHARACTER.
1606
1607  002742  105366  000001        4$:     DECB    1(SP)           ;;DECREMENT FILLERS REQ. COUNT
1608  002746  002770                        BLT     3$              ;;BRANCH IF NO MORE FILLERS ARE REQUIRED
1609  002750  004737  002756                JSR     PC,5$           ;;TYPE FILLER CHARACTER
1610  002754  000772                        BR      4$
1611
1612  002756  105777  177640        5$:     TSTB    @$TPS           ;;WAIT FOR OUTPUT DEVICE
1613  002762  100375                        BPL     .-4
1614  002764  122737  000017  002627        CMPB    #17,@#$CNTRLO   ;;CHECK IF CONTROL O WAS TYPED
1615  002772  001403                        BEQ     6$              ;;STOP TYPING MESSAGE IF ^O WAS TYPED
1616  002774  116677  000002  177622        MOVB    2(SP),@$TPB     ;;OUTPUT CHARACTER
1617  003002  122766  000015  000002  6$:   CMPB    #15,2(SP)       ;;BRANCH IF NOT <CR>
1618  003010  001003                        BNE     7$
1619  003012  105037  002626                CLRB    $CHARCNT        ;;CLEAR CHARACTERS TYPED COUNT
1620  003016  000406                        BR      8$
1621  003020  122766  000012  000002  7$:   CMPB    #12,2(SP)       ;;BRANCH IF <LF> OR 'NULL'
1622  003026  002002                        BGE     8$
1623  003030  105237  002626                INCB    $CHARCNT        ;;INCREMENT CHARACTER TYPED COUNT
1624  003034  000207                8$:     RTS     PC
1625
1626                                        ;;HORIZONTAL TAB <HT> PROCESSER
1627  003036  112716  000040        9$:     MOVB    #40,(SP)        ;;LOAD 'SPACE'
1628  003042  004737  002756        10$:    JSR     PC,5$           ;;TYPE 'SPACE'
1629  003046  132737  000007  002626        BITB    #7,$CHARCNT     ;;TYPE SPACES UNTIL A MULTIPLE
1630  003054  001372                        BNE     10$             ;;OF 8 CHARACTERS HAVE BEEN TYPED
1631  003056  105726                        TSTB    (SP)+           ;;POP SPACE
1632  003060  000676                        BR      TYPE1           ;;GET NEXT CHARACTER
1633
1634                                        ;SUBROUTINE TO SAVE GENERAL REGISTERS ON THE STACK
1635                                        ;CALL:  SAVE
1636  003062  010546                .SAVE:  MOV     R5,-(SP)                ;SAVE REGISTERS ON THE STACK
1637  003064  010446                        MOV     R4,-(SP)
1638  003066  010346                        MOV     R3,-(SP)
1639  003070  010246                        MOV     R2,-(SP)
1640  003072  010146                        MOV     R1,-(SP)
1641  003074  010046                        MOV     R0,-(SP)
1642  003076  016646  000014                MOV     14(SP),-(SP)            ;GET RETURN PC
1643  003102  000207                        RTS     PC                      ;RETURN
1644
1645                                        ;SUBROUTINE TO RESTORE GENERAL REGISTERS FROM THE STACK
1646                                        ;CALL:  RESTORE
1647  003104  012666  000014        .RESTORE:MOV    (SP)+,14(SP)            ;MOVE RETURN PC
1648  003110  012600                        MOV     (SP)+,R0                ;RESTORE REGISTERS
1649  003112  012601                        MOV     (SP)+,R1
1650  003114  012602                        MOV     (SP)+,R2
1651  003116  012603                        MOV     (SP)+,R3
```

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1652  003120  012604                    MOV     (SP)+,R4
1653  003122  012605                    MOV     (SP)+,R5
1654  003124  000207                    RTS     PC                      ;RETURN
1655
1656                              ;SUBROUTINE TO CONVERT OCTAL DATA TO ASCII
1657                              ;CALL:  MOV     NUMBER,R2               ;MOVE NUMBER TO R2
1658                              ;       JSR     PC,CNVOCT
1659
1660  003126  110637  001133      CNVOCT: MOVB    SP,TYPFLG               ;SET DO NOT TYPE FLAG
1661  003132  000402                    BR      CNVTO
1662
1663                                      .SBTTL          OCTAL TO ASCII & TYPE ROUTINE
1664                              ;SUBROUTINE TO CONVERT OCTAL NUMBER TO ASCII AND TYPE IT OUT
1665                              ;CALL:  MOV     NUMBER,R2               ;PUT # IN R2
1666                              ;       JSR     PC,TYPOCT               ;CALL ROUTINE
1667
1668  003134  105037  001133      TYPOCT: CLRB    @#TYPFLG                ;SET TYPE FLAG
1669  003140                      CNVTO:
1670  003140  004737  003062            JSR     PC,.SAVE                ;SAVE REGISTERS ON THE STACK
1671  003144  012704  001152            MOV     #ODIGITS,R4             ;SET PTR TO OUTPUT
1672  003150  005003                    CLR     R3                      ;R3 WILL CONTAIN OCTAL DIGIT
1673  003152  010201                    MOV     R2,R1                   ;GET # TO BE TYPED
1674  003154  006302            1$:     ASL     R2                      ;SHIFT #
1675  003156  006103                    ROL     R3
1676  003160  012700  000006            MOV     #6,R0                   ;SET DIGIT COUNTER
1677  003164  000404                    BR      3$
1678
1679  003166  006302            2$:     ASL     R2                      ;SHIFT # 3 PLACES LEFT
1680  003170  006103                    ROL     R3
1681  003172  005301                    DEC     R1
1682  003174  001374                    BNE     2$
1683  003176  012701  000003    3$:     MOV     #3,R1                   ;SET SHIFT COUNTER
1684  003202  116324  001140            MOVB    DIGTAB(R3),(R4)+        ;MOVE ASCII EQUIV TO OUTPUT
1685  003206  005003                    CLR     R3
1686  003210  005300                    DEC     R0                      ;DECREMENT DIGIT COUNT
1687  003212  001365                    BNE     2$                      ;GET NEXT DIGIT
1688  003214  105737  001133            TSTB    @#TYPFLG                ;BRANCH IF ASCII IS
1689  003220  001002                    BNE     4$                      ;NOT TO BE TYPED
1690  003222  000004  001152            TYPE,ODIGITS
1691  003226                      4$:
1692  003226  004737  003104            JSR     PC,.RESTORE             ;RESTORE REGISTERS FROM THE STACK
1693  003232  000207                    RTS     PC
1694
1695
1696                              ;SUBROUTINE TO CONVERT OCTAL DATA TO DECIMAL ASCII
1697                              ;CALL:  MOV     NUMBER,R2               ;MOVE NUMBER TO R2
1698                              ;       JSR     PC,CNVDEC
1699
1700  003234  110637  001133      CNVDEC: MOVB    SP,@#TYPFLG             ;SET DO NOT TYPE FLAG
1701  003240  000402                    BR      CNVTD
1702                                      .SBTTL          OCTAL TO DECIMAL & TYPE ROUTINE
1703                              ;THIS ROUTINE CONVERTS AN OCTAL # TO DECIMAL ASCII AND TYPES IT OUT
1704                              ;CALL:  MOV     NUMBER,R2               ;PUT # IN R2
1705                              ;       JSR     PC,TYPDEC               ;CALL ROUTINE
1706
1707  003242  105037  001133      TYPDEC: CLRB    @#TYPFLG                ;SET TYPE FLAG
```

```
1708  003246
1709  003246  004737  003062          CNVTD:
1710  003252  005000                          JSR     PC,..SAVE               ;SAVE REGISTERS ON THE STACK
1711  003254  012704  001152                  CLR     R0                      ;R0 IS INDEX TO DECIMAL CONSTANT
1712  003260  005003                          MOV     #ODIGITS,R4             ;SET OUTPUT PTR
1713  003262  166002  003342          1$:     CLR     R3                      ;R3 CONTAINS DECIMAL DIGIT
1714  003266  103402                  2$:     SUB     DCONST(R0),R2           ;SUBTRACT DECIMAL CONSTANT UNTIL
1715  003270  005203                          BLO     3$                      ;INPUT # GOES NEGATIVE
1716  003272  000773                          INC     R3                      ;KEEPING TRACK OF SUBTRACTIONS
1717  003274  066002  003342                  BR      2$
1718  003300  116324  001140          3$:     ADD     DCONST(R0),R2           ;ADD BACK CONSTANT WHEN NEGATIVE
1719  003304  062700  000002                  MOVB    DIGTAB(R3),(R4)+        ;MOVE ASCII EQUIVILENT
1720  003310  005760  003342                  ADD     #2,R0                   ;NEXT CONSTANT
1721  003314  001361                          TST     DCONST(R0)              ;UNTIL ALL CONSTANTS DONE
1722  003316  112724  000060                  BNE     1$
1723  003322  105737  001133                  MOVB    #'0,(R4)+               ;LAST DIGIT IS 0
1724  003326  001002                          TSTB    @#TYPFLG                ;BRANCH IF ASCII IS
1725  003330  000004  001152                  BNE     4$                      ;NOT TO BE TYPED
1726  003334                                  TYPE,ODIGITS
1727  003334  004737  003104          4$:
1728  003340  000207                          JSR     PC,..RESTORE            ;RESTORE REGISTERS FROM THE STACK
1729                                          RTS     PC
1730  003342  023420                  DCONST: .WORD   10000.
1731  003344  001750                          .WORD   1000.
1732  003346  000144                          .WORD   100.
1733  003350  000012                          .WORD   10.
1734  003352  000001                          .WORD   1.
1735  003354  000000                          .WORD   0                       ;TERMINATOR
1736
1737                                          .SBTTL          TYPE SPECIFIED TIMES ROUTINE
1738                                  ;THIS SUBROUTINE OUTPUTS THE TIME SPECIFICATIONS FOR THE TEST
1739                                  ;AND ALSO THE ACTUAL TIME RECORDED (ATIME)
1740                                  ;FORMAT OF LINE TYPED
1741                                  ;RANGE=<AAAAAA-BBBBBB>          ACTUAL=CCCCCC
1742                                  ;WHERE:         AAAAAA IS MAXIMUM TIME FOR TEST (STIMTBL(TSTNUMX4)).
1743                                  ;               BBBBBB IS MINIMUM TIME FOR TEST (STIMTBL(TSTNUMX4+2)).
1744                                  ;               CCCCCC IS ACTUAL TIME RECORDED BY TEST (ATIME).
1745                                  ;CALL:  MOVB    TEST NUMBER,R2  ;LOAD TEST NUMBER
1746                                  ;       MOV     #TIME,@#ATIME           ;MOVE TIME TO ATIME
1747                                  ;       JSR     PC,OUTSPC
1748  003356  010246                  OUTSPC: MOV     R2,-(SP)                ;SAVE R2 & R3 ON THE STACK
1749  003360  010346                          MOV     R3,-(SP)
1750  003362  006302                          ASL     R2                      ;MULTIPLY TEST # TIMES 4
1751  003364  006302                          ASL     R2                      ;TO FORM INDEX INTO STIMTBL
1752  003366  010203                          MOV     R2,R3                   ;R3 CONTAINS INDEX INTO TABLE
1753  003370  000004  015661                  TYPE,L.RNG
1754  003374  016302  002124                  MOV     STIMTBL(R3),R2          ;GET MAXIMUM SPEC TIME
1755  003400  004737  003242                  JSR     PC,TYPDEC               ;CONVERT TO DECIMAL & TYPE
1756  003404  000004  001413                  TYPE,DASH
1757  003410  016302  002126                  MOV     STIMTBL+2(R3),R2        ;GET MINIMUM TIME
1758  003414  004737  003242                  JSR     PC,TYPDEC               ;CONVERT TO DECIMAL & TYPE
1759  003420  000004  001420                  TYPE,ANGTAB
1760  003424  000004  015671                  TYPE,L.ACT
1761  003430  013702  001016                  MOV     @#ATIME,R2              ;GET ACTUAL TIME
1762  003434  004737  003242                  JSR     PC,TYPDEC               ;CONVERT TO DECIMAL & TYPE
1763  003440  000004  001402                  TYPE,CRLF
```

```
1764  003444  012603                  MOV     (SP)+,R3
1765  003446  012602                  MOV     (SP)+,R2
1766  003450  000207                  RTS     PC                      ;RETURN
1767
1768                                    .SBTTL          TYPE GAP TIMES SUBROUTINE
1769                                ;THIS SUBROUTINE IS USED TO TYPE THE SPECIFIED GAP SIZES (RECORDED IN
1770                                ;TST021). IT IS CALLED BY THE GAPOK ROUTINE IF THE GAP SIZE IS OUT OF
1771                                ;RANGE VIA THE HLT ROUTINE (HLT+2).
1772                                ;CALL:  MOVB    #GAP,GAP                ;LOAD GAP # INTO GAP
1773                                ;       MOV     #TIME,ATIME             ;LOAD ACTUAL TIME INTO ATIME
1774                                ;       JSR     PC,OUTGAP
1775
1776  003452  010246                OUTGAP: MOV     R2,-(SP)                ;SAVE R2 AND R3
1777  003454  010346                        MOV     R3,-(SP)
1778  003456  113703  001124               MOVB    GAP,R3                  ;GET GAP #
1779  003462  006303                        ASL     R3
1780  003464  006303                        ASL     R3
1781  003466  000004  015661               TYPE,L.RNG
1782  003472  016302  002264               MOV     GTIMTBL(R3),R2          ;GET MAX TIME
1783  003476  004737  003242               JSR     PC,TYPDEC               ;CONVERT TO DECIMAL & TYPE
1784  003502  000004  001413               TYPE,DASH
1785  003506  016302  002266               MOV     GTIMTBL+2(R3),R2        ;GET MIN TIME
1786  003512  004737  003242               JSR     PC,TYPDEC               ;CONVERT TO DECIMAL & TYPE
1787  003516  000004  001420               TYPE,ANGTAB                     ;TYPE <
1788  003522  000004  015671               TYPE,L.ACT
1789  003526  013702  001016               MOV     @#ATIME,R2              ;GET ACTUAL TIME
1790  003532  004737  003242               JSR     PC,TYPDEC               ;CONVERT TO DECIMAL & TYPE
1791  003536  000004  015336               TYPE,E.GAP
1792  003542  113702  001124               MOVB    @#GAP,R2                ;GET GAP #
1793  003546  004737  003134               JSR     PC,TYPOCT               ;TYPE GAP #
1794  003552  000004  001402               TYPE,CRLF
1795  003556  012603                        MOV     (SP)+,R3                ;RESTORE R3 AND R2
1796  003560  012602                        MOV     (SP)+,R2
1797  003562  000207                        RTS     PC
1798
1799                                    .SBTTL          ASCII TO OCTAL CONVERT SUBROUTINE
1800                                ;SUBROUTINE TO CONVERT ASCII DATA TO OCTAL. CONVERTED OCTAL DATA
1801                                ;IS LEFT IN OCTAL0 <15-00>.
1802  003564                        CNVTAO:
1803  003564  004737  003062               JSR     PC,.SAVE                ;SAVE REGISTERS ON THE STACK
1804  003570  012700  001272               MOV     #INBUF,R0               ;SET PTR TO ASCII DATA
1805  003574  012701  001122               MOV     #OCTAL0,R1              ;GET ADDRESS OF OCTAL DATA
1806  003600  005011                        CLR     (R1)                    ;CLEAR OUT OLD OCTAL DATA
1807  003602  005061  000002               CLR     2(R1)
1808  003606  122710  000015       1$:     CMPB    #CR,(R0)                ;<CR> TERMINATES INPUT
1809  003612  001414                        BEQ     3$
1810  003614  112002                        MOVB    (R0)+,R2                ;GET 'OCTAL' DATA
1811  003616  042702  177770               BIC     #177770,R2              ;STRIP UNUSED BITS
1812  003622  012703  000003               MOV     #3,R3                   ;SET SHIFT COUNT
1813  003626  006311                2$:     ASL     (R1)                    ;SHIFT LAST
1814  003630  006161  000002               ROL     2(R1)                   ;OCTAL DIGIT
1815  003634  005303                        DEC     R3
1816  003636  001373                        BNE     2$
1817  003640  050211                        BIS     R2,(R1)                 ;AND INSERT THIS DIGIT
1818  003642  000761                        BR      1$                      ;GO GET NEXT DIGIT
1819  003644                        3$:
```

```
1820  003644  004737  003104          JSR     PC,..RESTORE            ;RESTORE REGISTERS FROM THE STACK
1821  003650  000207                  RTS     PC                      ;RETURN
1822
1823                                  .SBTTL          PUBLISH SUBROUTINE
1824                          ;THE PUBLISH SUBROUTINE AVERAGES THE RECORDED TIMES FOR EACH TEST IT-
1825                          ;ERATION (IF 16. ITERATIONS) AND PLACES THE AVERAGE RESULT IN 'ATIME'.
1826                          ;IT TYPES THE NAME OF THE FUNCTION THAT WAS TIMED,THE TIME SPEC-
1827                          ;IFICATION AND THE ACTUAL TIME .
1828
1829  003652                  PUBLISH:
1830  003652  004737  003062          JSR     PC,..SAVE               ;SAVE REGISTERS ON THE STACK
1831  003656  012700  001020          MOV     #ATIMTBL,R0     ;GET TABLE ADDRESS CONTAINING TIMES
1832  003662  113701  001125          MOVB    @#ITCNT,R1      ;GET # OF ENTRIES (GIVEN BY ITERATION COUNT)
1833  003666  122701  000001          CMPB    #1,R1                   ;BRANCH IF SINGLE ITERATION
1834  003672  001423                  BEQ     4$
1835  003674  005002                  CLR     R2                      ;CLEAR 'SUM' REGISTERS
1836  003676  005003                  CLR     R3
1837  003700  122701  000020          CMPB    #16.,R1                 ;BRANCH IF 16. ITERATIONS
1838  003704  001402                  BEQ     1$
1839  003706  000000                  HALT                            ;ITERATION COUNT MUST BE 1 OR 16.
1840  003710  000777                  BR      .                       ;DO NOT CHANGE POSIT OF SW11
1841                                                                  ;WHEN TEST IS RUNNING.
1842
1843  003712  062002          1$:     ADD     (R0)+,R2                ;SUM INDIVIDUAL TIMES
1844  003714  005503                  ADC     R3
1845  003716  005301                  DEC     R1
1846  003720  001374                  BNE     1$
1847
1848  003722  012700  000004  2$:     MOV     #4,R0
1849  003726  006203          3$:     ASR     R3                      ;SHIFT TIME IN R3 & R2 4 PLACES
1850  003730  006002                  ROR     R2                      ;RIGHT = DIVIDE BY 16.
1851  003732  005300                  DEC     R0
1852  003734  001374                  BNE     3$
1853  003736  010237  001016          MOV     R2,@#ATIME              ;MOVE AVERAGED TIMES
1854
1855  003742  113700  001126  4$:     MOVB    @#TSTNUM,R0             ;GET TEST #
1856  003746  006300                  ASL     R0
1857  003750  016037  002364  003760  MOV     NAMPTR(R0),5$           ;GET TEST NAME STRING ADDRESS
1858  003756  000004                  TYPE
1859  003760  000000          5$:     .WORD   0
1860  003762  113702  001126          MOVB    @#TSTNUM,R2             ;GET TEST #
1861  003766  004737  003356          JSR     PC,OUTSPC               ;OUTPUT TIMES
1862  003772  004737  003104          JSR     PC,..RESTORE            ;RESTORE REGISTERS FROM THE STACK
1863  003776  000207                  RTS     PC
1864
1865                                  .SBTTL          INPUT SUBROUTINE
1866                          ;SUBROUTINE TO GET TTY INPUT
1867                          ;CALL:  JSR     PC,..INPUT
1868                          ;INPUT DATA IS RETUNED IN BUFFER BEGINNING AT INBUF.
1869
1870  004000  010046          .INPUT: MOV     R0,-(SP)        ;SAVE R0 ON THE STACK
1871  004002  012700  001272  1$:     MOV     #INBUF,R0
1872  004006  105737  177560  2$:     TSTB    @#TKS
1873  004012  100375                  BPL     2$
1874
1875  004014  113746  177562          MOVB    @#TKB,-(SP)     ;GET CHARACTER
```

```
1876  004020  042716  000200                  BIC     #200,(SP)
1877  004024  122716  000177                  CMPB    #177,(SP)       ;CHECK RUBOUT
1878  004030  001004                          BNE     3$
1879  004032  124026                          CMPB    -(R0),(SP)+     ;REMOVE CHARACTER FROM INPUT
1880  004034  000004  001405                  TYPE,BKSLSH
1881  004040  000762                          BR      2$              ;WAIT FOR NEXT CHARACTER
1882  004042  122716  000025          3$:     CMPB    #CNTRLU,(SP)    ;CHECK CONTROL U (^U)
1883  004046  001004                          BNE     4$
1884  004050  005726                          TST     (SP)+
1885  004052  000004  001402                  TYPE,CRLF
1886  004056  000751                          BR      1$
1887  004060  122716  000003          4$:     CMPB    #CNTRLC,(SP)    ;BRANCH IF NOT CONTROL C
1888  004064  001003                          BNE     40$
1889  004066  000005                          RESET                   ;RESET I/O
1890  004070  000137  006274                  JMP     @#INIT          ;RESTART PROGRAM
1891  004074  111637  001407          40$:    MOVB    (SP),@#ECHO
1892  004100  111620                          MOVB    (SP),(R0)+
1893  004102  122726  000015                  CMPB    #CR,(SP)+
1894  004106  001403                          BEQ     5$
1895  004110  000004  001407                  TYPE,ECHO
1896  004114  000734                          BR      2$
1897  004116  000004  001402          5$:     TYPE,CRLF
1898  004122  012600                          MOV     (SP)+,R0
1899  004124  000207                          RTS     PC
1900
1901                                  ;KEYBOARD INTERRUPT SERVICE ROUTINE
1902  004126  113746  177562          TKISR:  MOVB    @#TKB,-(SP)     ;GET TYPED CHARACTER
1903  004132  042716  000200                  BIC     #200,(SP)       ;STRIP PARITY BIT
1904  004136  122716  000017                  CMPB    #CNTRLO,(SP)    ;BRANCH IF NOT CONTROL O (^O)
1905  004142  001002                          BNE     1$
1906  004144  111637  002627                  MOVB    (SP),$CNTRLO    ;SET CONTROL O INDICATOR IN TYPE ROUTINE
1907
1908  004150  122716  000003          1$:     CMPB    #3,(SP)         ;BRANCH IF NOT CONTROL C (^C)
1909  004154  001007                          BNE     2$
1910  004156  023727  000042  013504          CMP     @#42,#$ENDAD    ;INHIBIT ^C IF ACT11 QV OR AA
1911  004164  001403                          BEQ     2$
1912  004166  000005                          RESET
1913  004170  000137  006274                  JMP     @#INIT          ;RESTART PROGRAM
1914
1915  004174  122716  000001          2$:     CMPB    #CNTRLA,(SP)    ;BRANCH IF NOT ^A
1916  004200  001011                          BNE     3$
1917  004202  022737  000176  001000          CMP     #SWREG,SWR      ;BRANCH IF HARDWARE SWR IS INVOKED
1918  004210  001010                          BNE     4$
1919  004212  012737  177570  001000          MOV     #177570,SWR     ;INVOKE HARDWARE SWR
1920  004220  000004  014314                  TYPE,M.HSWR
1921  004224  122716  000007          3$:     CMPB    #CNTRLG,(SP)    ;BRANCH IF NOT ^G
1922  004230  001005                          BNE     5$
1923  004232  012737  000176  001000  4$:     MOV     #SWREG,SWR      ;INVOKE SOFTWARE SWR
1924  004240  004737  002526                  JSR     PC,GTSWR        ;GET NEW SWITCH REGISTER
1925  004244  005726                  5$:     TST     (SP)+           ;POP CHARACTER OFF THE STACK
1926  004246  000002                          RTI                     ;RETURN TO CALLER
```

```
1927                                    .SBTTL          ERROR SERVICE ROUTINES
1928                                ;ROUTINE TO PROCESS ERROR TRAPS (TRAPS TO 4)
1929  004250  000000               ERRTRP: HALT
1930
1931                                ;ERROR SERVICE ROUTINE
1932                                ;THIS ROUTINE PROCESSES TWO TYPES OF ERRORS (OUT OF RANGE AND HARDWARE)
1933                                ;THE CALLS FOR AN OUT OF RANGE ERROR ARE <HLT+1>,<HLT+2> AND, FOR A
1934                                ;HARDWARE ERROR THE CALL IS <HLT>.
1935
1936  004252  004737  003062        .HLT:   JSR     PC,..SAVE               ;SAVE REGISTERS ON THE STACK
1937  004256  110637  001127        1$:     MOVB    SP,@#ERFLG              ;SET ERROR FLAG
1938  004262  032777  020000  174510        BIT     #SW13,@SWR              ;BRANCH IF NO TYPOUT
1939  004270  001075                       BNE     4$
1940  004272  000004  015137               TYPE,E.HDR
1941  004276  113702  001126               MOVB    @#TSTNUM,R2             ;GET TEST #
1942  004302  004737  003134               JSR     PC,TYPOCT               ;AND TYPE IT
1943  004306  016600  000016               MOV     16(SP),R0               ;GET RETURN PC
1944  004312  162700  000002               SUB     #2,R0                   ;NOW PC OF HLT CALL
1945  004316  111000                       MOVB    (R0),R0                 ;NOW HLT CALL ITSELF
1946  004320  001417                       BEQ     2$                      ;BRANCH IF HLT
1947  004322  000004  015222               TYPE,E.HDR2
1948  004326  122700  000002               CMPB    #2,R0                   ;BRANCH IF NOT HLT+2
1949  004332  001005                       BNE     10$
1950  004334  004737  003452               JSR     PC,OUTGAP               ;TYPE GAP SPECIFIED TIMES
1951  004340  000004  001402               TYPE,CRLF
1952  004344  000447                       BR      4$
1953  004346  004737  003356       10$:    JSR     PC,OUTSPC               ;TYPE SPECIFIED TIMES
1954  004352  000004  001402               TYPE,CRLF
1955  004356  000442                       BR      4$
1956  004360  016500  000014       2$:     MOV     ER(R5),R0
1957  004364  032765  002300  000032       BIT     #PE1600,TC(R5)
1958  004372  001403                       BEQ     20$
1959  004374  042700  102100               BIC     #102100,R0
1960  004400  000402                       BR      21$
1961  004402  042700  102300       20$:    BIC     #102300,R0
1962  004406  005700               21$:    TST     R0
1963  004410  001003                       BNE     22$
1964  004412  000004  015113               TYPE,E.SFT              ;TYPE SOFT ERROR MESSAGE
1965  004416  000434                       BR      6$
1966
1967  004420  000004  015147       22$:    TYPE,E.HDR1
1968  004424  010500                       MOV     R5,R0                   ;GET FIRST ADDRESS OF REGS.
1969  004426  012701  000007               MOV     #7.,R1                  ;TYPE FIRST 7 REGS.
1970  004432  012002               3$:     MOV     (R0)+,R2                ;GET REG CONTENTS
1971  004434  004737  003134               JSR     PC,TYPOCT               ;AND TYPE IT
1972  004440  000004  001415               TYPE,SPACE2
1973  004444  005301                       DEC     R1
1974  004446  001371                       BNE     3$
1975  004450  016502  000032               MOV     TC(R5),R2               ;GET CONTENTS OF TC REGISTER
1976  004454  004737  003134               JSR     PC,TYPOCT
1977  004460  000004  001402               TYPE,CRLF
1978
1979  004464  032777  001000  174306 4$:    BIT     #SW09,@SWR              ;BRANCH IF NO RING THE BELL
1980  004472  001402                       BEQ     5$
1981  004474  000004  001411               TYPE,BELL
1982  004500  005777  174274       5$:     TST     @SWR                    ;HALT ON ERROR?
```

```
1983  004504  100001                  BPL     6$
1984  004506  000000                  HALT
1985  004510                  6$:
1986  004510  004737  003104          JSR     PC,..RESTORE            ;RESTORE REGISTERS FROM THE STACK
1987  004514  000002                  RTI                             ;RETURN
1988
1989
```

```
                        .SBTTL          SCOPE SUBROUTINE
                ;SCOPE ROUTINE
                ;THIS ROUTINE IS ENTERED UPON COMPLETION OF EACH SUBTEST
                ;THE SCOPE ROUTINE:
                ;       REPEATS TEST IF SW14 IS SET
                ;       STORES ACTUAL TIME FOR FUNCTION IN TIME TABLE (ATIMTBL)
                ;       PUBLISHES TIME IF SW10=0
                ;       UPDATES ITERATION COUNT AND IF ITERATIONS COMPLETE CONTINUES
                ;       TO NEXT TEST, OTHERWISE REPEATS TEST.
                ;       DELAYS BEFORE CONTINUING OR REPEATING TEST.
                ;       INITIALIZES DRIVE
                ;RETURNS:       R5=BASE ADDRESS OF TM03 REGISTERS (ADDRESS OF CS1)
                ;               R1='DS' REG ADDRESS
                ;               R0='FC' REG ADDRESS
004516 013705 001010            .SCOPE: MOV     @#TMBASE,R5             ;SET R5 TO FIRST TM REG
004522 032777 040000 174250             BIT     #SW14,@SWR              ;BRANCH IF CONTINUOS LOOP
004530 001432                           BEQ     2$                      ;NOT DESIRED
004532 017701 174242            1$:     MOV     @SWR,R1                 ;GET SWITCHES
004536 042701 177740                    BIC     #177740,R1              ;CLEAR ALL BUT TEST #
004542 001406                           BEQ     11$                     ;BRANCH IF ALL SELECTED
004544 120137 001126                    CMPB    R1,@#TSTNUM             ;BRANCH IF RUNNING SELECTED TEST
004550 001403                           BEQ     11$
004552 012737 010000 001002             MOV     #TST000,SCPADR          ;RESTART AT TST000
004560 004737 005310            11$:    JSR     PC,DELAY                ;DELAY 350 MS
004564 004737 005544                    JSR     PC,RHINIT               ;INIT
004570 105037 001127                    CLRB    @#ERFLG                 ;CLEAR ERROR FLAG
004574 013716 001002                    MOV     SCPADR,(SP)
004600 010501                           MOV     R5,R1
004602 062701 000012                    ADD     #DS,R1                  ;ADDRESS OF 'DS' REG IS IN R1
004606 010500                           MOV     R5,R0
004610 062700 000006                    ADD     #FC,R0                  ;ADDRESS OF 'FC' REG IS IN R0
004614 000002                           RTI

004616 105737 001127            2$:     TSTB    @#ERFLG                 ;BRANCH IF ERROR FLAG IS SET
004622 001006                           BNE     3$
004624 113700 001125                    MOVB    @#ITCNT,R0              ;GET ITERATION COUNT
004630 006300                           ASL     R0                      ;STORE TIME IN TABLE
004632 013760 001016 001020             MOV     @#ATIME,ATIMTBL(R0)
004640 105237 001125            3$:     INCB    @#ITCNT                 ;INCREMENT ITERATION COUNT
004644 105737 001134                    TSTB    @#PSCNT                 ;INHIBIT ITERATIONS ON
004650 001410                           BEQ     4$                      ;ON FIRST PASS
004652 032777 004000 174120             BIT     #SW11,@SWR              ;BRANCH IF SINGLE ITERATION DESIRED
004660 001004                           BNE     4$
004662 122737 000020 001125             CMPB    #16.,@#ITCNT            ;BRANCH IF ITERATIONS INCOMPLETE
004670 001320                           BNE     1$
004672 032777 000037 174100     4$:     BIT     #37,@SWR        ;IF TEST SELECTED IS TEST 0
004700 001002                           BNE     42$             ;TREAT AS ALL TESTS
004702 011637 001002            40$:    MOV     (SP),@#SCPADR   ;SET SCOPE ADDRESS TO NEXT TEST
004706 032777 002000 174064     42$:    BIT     #SW10,@SWR      ;BRANCH IF NO PUBLICATION DESIRED
004714 001002                           BNE     5$
004716 004737 003652                    JSR     PC,PUBLISH              ;GO PUBLISH TEST DATA
004722 105037 001125            5$:     CLRB    @#ITCNT                 ;RESET ITERATION COUNT
004726 000701                           BR      1$

                        .SBTTL  TIMER SUBROUTINES
```

```
2046
2047                                    ;SUBROUTINE TO SYNCHRONIZE THE TIMER AND TURN IT ON.
2048                                    ;REGISTER 4 IS CLEARED, AND THE OSCILLATOR POLARITY IS MONITORED
2049                                    ;THE ROUTINE IS EXITED WHEN THE OSCILLATOR POLARITY CHANGES WITH R3
2050                                    ;SET TO INDICATE THE POLARITY OF THE OSCILLATOR.
2051                                    ;CALL:  JSR     PC,TIMON
2052                                    ;RETURNS:       R3 SET TO INDICATE LAST POLARITY (+24/-24=0/1)
2053                                    ;               R4 = 0
2054
2055  004730  005004                    TIMON:  CLR     R4                      ;CLEAR TIME COUNT
2056  004732  012703  000024                    MOV     #24,R3                  ;SET POLARITY TO '0' STATE
2057  004736  032765  000100  000024            BIT     #OSC,MR(R5)             ;BRANCH IF POLARITY IS '0'
2058  004744  001405                            BEQ     2$
2059  004746  032765  000100  000024  1$:       BIT     #OSC,MR(R5)             ;WAIT FOR OSCILLATOR TO RETURN
2060  004754  001374                            BNE     1$
2061  004756  000405                            BR      4$
2062
2063  004760  005403                    2$:     NEG     R3                      ;NEGATE PREV POLARITY INDICATOR
2064  004762  032765  000100  000024  3$:       BIT     #OSC,MR(R5)             ;WAIT FOR OSCILLATOR TO RETURN
2065  004770  001774                            BEQ     3$                      ;TO '1' STATE
2066  004772  000207                    4$:     RTS     PC
2067
2068                                    ;SUBROUTINE TO COUNT TIME
2069                                    ;EACH TIME THE OSCILLATOR TOGGLES (BIT <06> IN MR REG) REGISTER
2070                                    ;R4 IS INCREMENTED, AND THE REGISTER R3 IS NEGATED TO INDICATE
2071                                    ;THE LAST STATE OF THE OSCILLATOR.
2072                                    ;CALL   JMP     TIMER(R3)               ;R3 IS SET BY TIMON ROUTINE
2073                                    ;       R2=RETURN ADDRESS TO CALLER
2074                                    ;NOTE: THE TIME TO EXECUTE THIS ROUTINE IS VERY CRITICAL. IT MUST BE
2075                                    ;LESS THAN 40 US.
2076
2077                                    ;ENTER HERE VIA JMP  TIMER(R3) WHEN R3=-24 (PREV STATE=1)
2078  004774  032765  000100  000024  TIMER1: BIT     #OSC,MR(R5)             ;BRANCH IF CURRENT STATE IS '0'
2079  005002  001406                            BEQ     TIMER                   ;GO INCREMENT TIME
2080  005004  000112                            JMP     (R2)                    ;RETURN TO TEST
2081
2082          005020                            .=TIMER1+24
2083  005020  005403                    TIMER:  NEG     R3                      ;NEGATE PREV STATE INDICATOR
2084  005022  005204                            INC     R4                      ;INCREMENT 'TICK' COUNT
2085  005024  100401                            BMI     TIMERR                  ;BRANCH ON OVERFLOW
2086  005026  000112                            JMP     (R2)                    ;RETURN TO TEST
2087  005030  000004  015250            TIMERR: TYPE,E.TIMOV                    ;TYPE 'TIMER OVERFLOWED'
2088  005034  104400                            HLT                             ;REPORT HARDWARE ERROR
2089  005036  000177  173740                    JMP     @SCPADR                 ;RETURN TO BEGINNING OF TEST
2090
2091          005044                            .=TIMER+24
2092                                    ;ENTER HERE VIA JMP  TIMER(R3) WHEN R3=+24 (PREV STATE=0)
2093  005044  032765  000100  000024  TIMER0: BIT     #OSC,MR(R5)             ;BRANCH IF CURRENT STATE = '1'
2094  005052  001362                            BNE     TIMER
2095  005054  000112                            JMP     (R2)
2096
2097                                    ;SUBROUTINE TO CHECK TIME RECORDED BY SUBTEST.
2098                                    ;THIS SUBROUTINE COMPUTES THE ACTUAL TIME (IN MICROSECONDS) AND CHECKS
2099                                    ;THAT THE TIME RECORDED BY THE SUBTEST IS CORRECT BY COMPARING THE TIME
2100                                    ;WITH THE HIGH LIMIT (STIMTBL(R0)) AND THE LOW LIMIT (STIMTBL+2(R0)).
2101                                    ;IF THE TIME IS OUT OF RANGE AN OUT OF RANGE ERROR TYPEOUT RESULTS.
```

```
                                        ;THE SUBROUTINE IS ENTERED WITH:
                                        ;       R4=TICK COUNT
                                        TIMOK:
005056  004737  003062                          JSR     PC,..SAVE               ;SAVE REGISTERS ON THE STACK
005062  013700  001012                          MOV     OSCTIM,R0               ;GET TIME PER TICK
005066  010401                                  MOV     R4,R1                   ;GET TICKS COUNT
005070  005002                                  CLR     R2                      ;CLEAR SUMMING REGISTERS
005072  005003                                  CLR     R3
005074  060002                          1$:     ADD     R0,R2                   ;MULTIPLY TIME PER TICK
005076  005503                                  ADC     R3                      ;BY TICK COUNT
005100  005301                                  DEC     R1
005102  001374                                  BNE     1$
005104  010246                                  MOV     R2,-(SP)                ;DIVIDE COUNT BY 10.

005106  010346                                  MOV     R3,-(SP)
005110  012746  000012                          MOV     #10.,-(SP)
005114  004737  005376                          JSR     PC,DIVIDE
005120  005726                                  TST     (SP)+                   ;DISCARD REMAINDER
005122  012637  001016                          MOV     (SP)+,@#ATIME           ;STORE QUOTIENT
005126  113700  001126                          MOVB    @#TSTNUM,R0             ;GET TEST #
005132  006300                                  ASL     R0
005134  006300                                  ASL     R0
005136  023760  001016  002124                  CMP     @#ATIME,STIMTBL(R0)     ;CHECK THAT TIME IS WITHIN
005144  101004                                  BHI     2$                      ;LIMITS SPECIFIED
005146  023760  001016  002126                  CMP     @#ATIME,STIMTBL+2(R0)
005154  101001                                  BHI     3$
005156  104401                          2$:     HLT+1                           ;CALL ERROR ROUTINE
005160                                  3$:
005160  004737  003104                          JSR     PC,..RESTORE            ;RESTORE REGISTERS FROM THE STACK
005164  000207                                  RTS     PC                      ;RETURN

                                        ;SUBROUTINE TO CHECK INDIVIDUAL GAP TIMES (PRODUCED BY TST021)
                                        ;SUBROUTINE COMPUTES THE ACTUAL TIME (IN MICROSECONDS) AND CHECKS
                                        ;THAT THE GAP TIME RECORDED BY THE SUBTEST (TST021) BY COMPARING THE
                                        ;TIME WITH THE MAX LIMIT (GTIMTBL-GAPTBL(R1)) AND THE MIN LIMIT
                                        ;(GTIMTBL+2-GAPTBL(R1)).
                                        ;CALL:  MOV     #TICK COUNT,R4          ;R4 CONTAINS TICK COUNT
                                        ;       MOVB    #GAP,@#GAP              ;LOCATION GAP CONTAINS GAP #
                                        ;       JSR     PC,GAPOK

                                        GAPOK:
005166  004737  003062                          JSR     PC,..SAVE               ;SAVE REGISTERS ON THE STACK
005172  013700  001012                          MOV     @#OSCTIM,R0             ;GET TIME PER TICK
005176  010401                                  MOV     R4,R1                   ;GET TICK COUNT
005200  005002                                  CLR     R2                      ;CLEAR SUMMING REGISTERS
005202  005003                                  CLR     R3
005204  060002                          1$:     ADD     R0,R2                   ;MULTIPLY TICK COUNT
005206  005503                                  ADC     R3                      ;BY TIME PER TICK
005210  005301                                  DEC     R1
005212  001374                                  BNE     1$

005214  010246                                  MOV     R2,-(SP)                ;DIVIDE TIME BY 10.
005216  010346                                  MOV     R3,-(SP)
005220  012746  000012                          MOV     #10.,-(SP)
005224  004737  005376                          JSR     PC,DIVIDE
```

```
2158  005230  005726                          TST     (SP)+                   ;DISCARD REMAINDER
2159  005232  012637  001016                  MOV     (SP)+,@#ATIME           ;STORE QUOTIENT
2160  005236  113703  001124                  MOVB    @#GAP,R3                ;GET GAP #
2161  005242  006303                          ASL     R3                      ;MULTPLY BY 4
2162  005244  006303                          ASL     R3                      ;TO GET AT TABLE ENTRY
2163  005246  023763  001016  002264          CMP     @#ATIME,GTIMTBL(R3)     ;CHECK TIME (MAX)
2164  005254  101004                          BHI     2$
2165  005256  023763  001016  002266          CMP     @#ATIME,GTIMTBL+2(R3)   ;CHECK TIME (MIN)
2166  005264  101001                          BHI     3$
2167  005266  104402                  2$:     HLT+2                           ;REPORT OUT OF RANGE ERROR
2168  005270  032777  002000  173502  3$:     BIT     #SW10,@SWR              ;BRANCH IF TIMES NOT WANTED
2169  005276  001001                          BNE     100$
2170  005300  000240                          NOP
2171
2172  005302                          100$:
2173  005302  004737  003104                  JSR     PC,..RESTORE            ;RESTORE REGISTERS FROM THE STACK
2174  005306  000207                          RTS     PC                              ;RETURN TO TEST
2175
2176                                          .SBTTL          DELAY SUBROUTINES
2177                                  ;THIS SUBROUTINE CAUSES A DELAY OF 115 MS.
2178  005310  004737  004730          DELAY:  JSR     PC,TIMON
2179  005314  010246                          MOV     R2,-(SP)                ;SAVE R2 ON THE STACK
2180  005316  012702  005326                  MOV     #2$,R2                  ;SET RETURN ADDRESS FOR TIMER
2181  005322                          1$:
2182  005322  000163  005020                  JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2
2183  005326  032704  004000          2$:     BIT     #4000,R4
2184  005332  001773                          BEQ     1$
2185  005334  012602                          MOV     (SP)+,R2                ;RESTORE R2
2186  005336  000207                          RTS     PC
2187
2188                                  ;THIS SUBROUTINE ALLOWS A CALLER SPECIFIED DELAY.
2189                                  ;CALL:  MOV     DELAY TIME,DELTIM       ;LOAD DELAY TIME (# OF TICKS)
2190                                  ;       JSR     PC,DELAYV
2191  005340  005737  001120          DELAYV: TST     DELTIM                  ;BRANCH IF 0 DELAY
2192  005344  001413                          BEQ     3$
2193  005346  004737  004730                  JSR     PC,TIMON                ;TURN TIMER ON
2194  005352  010246                          MOV     R2,-(SP)                ;SAVE R2 ON THE STACK
2195  005354  012702  005364                  MOV     #2$,R2                  ;SET RETURN ADDRESS FROM TIMER
2196  005360                          1$:
2197  005360  000163  005020                  JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2
2198  005364  023704  001120          2$:     CMP     @#DELTIM,R4
2199  005370  101373                          BHI     1$
2200  005372  012602                          MOV     (SP)+,R2                ;RESTORE R2
2201  005374  000207                  3$:     RTS     PC
2202
2203                                          .SBTTL  DIVIDE SUBROUTINE
2204                                  ;THIS SUBROUTINE DIVIDES A DOUBLE PRECISION # AND RETURNS THE RESULT
2205                                  ;TO THE CALLER ON THE STACK. BOTH DIVIDEND & DIVISOR MUST BE POSITIVE.
2206                                  ;CALL:  MOV     LEAST SIGNIFICANT HALF DIVIDEND,-(SP)
2207                                  ;       MOV     #MOST SIGNIFICANT HALF DIVIDEND,-(SP)
2208                                  ;       MOV     #DIVISOR,-(SP)
2209                                  ;       JSR     PC,DIVIDE
2210                                  ;RETURN
2211                                  ;       (SP)=REMAINDER ON STACK
2212                                  ;       2(SP)=QUOTIENT
2213
```

```
2214                                    ;NOTE:  THIS SUBROUTINE DESTROYS PREVIOUS CONTENTS OF R0,R1,R2 & R3.
2215
2216  005376  005046                    DIVIDE: CLR     -(SP)                   ;SAVE LOC FOR SIGNS
2217  005400  012746  000021                    MOV     #17.,-(SP)              ;SET ITERATION COUNT
2218  005404  016601  000012                    MOV     12(SP),R1               ;GET LSH DIVIDEND
2219  005410  016600  000010                    MOV     10(SP),R0               ;GET MSH DIVIDEND
2220  005414  016602  000006                    MOV     6(SP),R2                ;GET DIVISOR
2221  005420  005402                            NEG     R2                      ;NEGATE DIVISOR
2222  005422  000241                            CLC                             ;CLEAR 'C' BIT IN PSW
2223  005424  000405                            BR      2$
2224  005426  006100                    1$:     ROL     R0                      ;ROTATE MSH DIVIDEND
2225  005430  010003                            MOV     R0,R3                   ;SAVE IN R3
2226  005432  060203                            ADD     R2,R3                   ;SUBTRACT DIVISOR FROM MSH DIVIDEND
2227  005434  103001                            BCC     2$                      ;BRANCH IF DIVIDEND > DIVISOR
2228  005436  010300                            MOV     R3,R0                   ;SAVE REMAINDER IN R0
2229  005440  006101                    2$:     ROL     R1                      ;ROTATE LSH DIVIDEND
2230  005442  005316                            DEC     (SP)                    ;DECREMENT ITERATION COUNT
2231  005444  001370                            BNE     1$
2232  005446  005726                            TST     (SP)+                   ;POP ITERATION COUNTER
2233  005450  005726                            TST     (SP)+                   ;POP SIGN CORRECTION
2234  005452  010166  000006                    MOV     R1,6(SP)                ;PUSH REMAINDER ON STACK
2235  005456  010066  000004                    MOV     R0,4(SP)                ;PUSH QUOTIENT ONTO STACK
2236  005462  012616                            MOV     (SP)+,(SP)
2237  005464  000207                            RTS     PC
2238
2239                                            .SBTTL  DRIVE SUBROUTINES
2240                                    ;SUBROUTINE TO CHECK IF DRIVE IS AVAILABLE
2241                                    ;CALL:  MOVB    DRIVE#,DRVNUM
2242                                    ;       JSR     PC,DRVAVA
2243                                    ;RETURN:        'C' BIT SET IF NOT AVAILABLE
2244  005466  113765  001004  000010    DRVAVA: MOVB    @#DRVNUM,CS2(R5)        ;LOAD DRIVE #
2245  005474  032765  040000  000026            BIT     #TAP,DT(R5)             ;CHECK IF TAPE UNIT
2246  005502  001003                            BNE     1$
2247  005504  004737  005544                    JSR     PC,RHINIT
2248  005510  000262                            SEV                             ;SET 'V' TO IND NOT AVAIL
2249  005512  000207                    1$:     RTS     PC                      ;RETURN
2250
2251                                    ;SUBROUTINE TO CHECK IF TE16/TU77 SLAVE IS AVAILABLE FOR TEST
2252                                    ;CALL:  MOVB    DRIVE #,@#DRVNUM        ;PASS DRIVE # VIA DRVNUM
2253                                    ;       MOVB    SLAVE #,@#SLVNUM        ;PASS SLAVE # VIA SLVNUM
2254                                    ;       JSR     PC,SLVAVA               ;CALL SUBROUTINE
2255  005514  113765  001004  000010    SLVAVA: MOVB    @#DRVNUM,CS2(R5)        ;LOAD DRIVE #
2256  005522  113765  001005  000032            MOVB    @#SLVNUM,TC(R5)         ;AND SLAVE #
2257  005530  032765  002000  000026            BIT     #SPR,DT(R5)             ;BRANCH IF SLAVE PRESENT
2258  005536  001001                            BNE     1$
2259  005540  000262                            SEV                             ;SET 'V' TO INDICATE NO SLAVE
2260  005542  000207                    1$:     RTS     PC
2261
2262                                    ;SUBROUTINE TO  INITIALIZE RH CONTROLLER
2263                                    ;CALL:  JSR PC,RHINIT
2264
2265  005544  012765  000040  000010    RHINIT: MOV     #40,CS2(R5)
2266  005552  113765  001004  000010            MOVB    @#DRVNUM,CS2(R5)
2267  005560  005046                            CLR     -(SP)
2268  005562  113716  001005                    MOVB    @#SLVNUM,(SP)
2269  005566  012665  000032                    MOV     (SP)+,TC(R5)            ;LOAD SLAVE # INTO TC REG
```

```
2270  005572  052765  001700  000032          BIS     #NORM11,TC(R5)
2271  005600  000207                          RTS     PC
2272
2273                                  ;SUBROUTINE TO WAIT FOR DRIVE READY (DRY)
2274  005602  005027                  WAITRDY:CLR     (PC)+                   ;CLEAR WAIT TIMER
2275  005604  000000                  WAITTIM:.WORD   0
2276  005606  105765  000012          1$:     TSTB    DS(R5)                  ;WAIT FOR READY TO SET
2277  005612  100406                          BMI     2$
2278  005614  005237  005604                  INC     WAITTIM                 ;INCREMENT WAIT TIMER
2279  005620  001372                          BNE     1$                      ;BRANCH IF TIME HAS NOT EXPIRED
2280  005622  000004  015275                  TYPE,E.TIMEXP                   ;TYPE 'TIME EXPIRED WAITING FOR RDY'
2281  005626  000425                          BR      99$                     ;TAKE ERROR EXIT
2282  005630  032765  002000  000012  2$:     BIT     #EOT,DS(R5)             ;CHECK FOR END OF TAPE
2283  005636  001415                          BEQ     3$                      ;BRANCH IF NO EOT
2284  005640  000004  014134                  TYPE,M.NAM
2285  005644  000004  014653                  TYPE,M.EOT                      ;TYPE 'END OF TAPE'
2286  005650  004737  005706                  JSR     PC,.REWIND              ;REWIND SLAVE
2287  005654  102412                          BVS     99$                     ;BRANCH IF ERROR ON REWIND
2288  005656  004737  005770                  JSR     PC,WRITE                ;WRITE A RECORD
2289  005662  005215                          INC     (R5)                    ;SET 'GO' BIT
2290  005664  004737  005602                  JSR     PC,WAITRDY              ;WAIT FOR READY
2291  005670  000404                          BR      99$                     ;TAKE ERROR EXIT
2292  005672  032765  040000  000012  3$:     BIT     #ERR,DS(R5)             ;CHECK ERROR EXIT
2293  005700  001401                          BEQ     100$
2294  005702  000262                  99$:    SEV
2295  005704  000207                  100$:   RTS     PC
2296                                  ;SUBROUTINE TO REWIND A UNIT (DRIVE/SLAVE COMBINATION)
2297                                  ;CALL   MOVB    DRIVE #,@#DRVNUM
2298                                  ;       MOVB    SLAVE #,@#SLVNUM
2299                                  ;       JSR     PC,.REWIND
2300                                  ;SUBROUTINE RETURNS TO CALLER WITH SELECTED SLAVE AT 'BOT', & 'V' SET IF
2301                                  ;AN ERROR OCCURS.
2302
2303  005706  004737  005544          .REWIND:JSR     PC,RHINIT               ;INITIALIZE CONTROLLER
2304  005712  004337  006124                  JSR     R3,TMCMD                ;GO TO TM COMMAND SUBROUTINE
2305  005716  000000                          .WORD   0                       ;BUS ADDRESS (NOT USED)
2306  005720  000000                          .WORD   0                       ;WORD COUNT (NOT USED)
2307  005722  000000                          .WORD   0                       ;FRAME COUNT (NOT USED)
2308  005724  000006                          .WORD   RWD                     ;REWIND COMMAND
2309  005726  005215                          INC     (R5)                    ;SET 'GO' BIT
2310  005730  032765  000002  000012  1$:     BIT     #BOT,DS(R5)             ;BRANCH IF 'BOT' SET
2311  005736  001005                          BNE     2$
2312  005740  032765  040000  000012          BIT     #ERR,DS(R5)             ;CHECK ERROR BIT
2313  005746  001006                          BNE     99$                     ;BRANCH IF ERROR BIT SET
2314  005750  000767                          BR      1$
2315
2316  005752  032765  020000  000012  2$:     BIT     #PIP,DS(R5)             ;WAIT FOR TAPE MOTION TO STOP
2317  005760  001374                          BNE     2$
2318  005762  000401                          BR      100$
2319  005764  000262                  99$:    SEV
2320  005766  000207                  100$:   RTS     PC
2321
2322                                  ;SUBROUTINE TO WRITE 256. WORD RECORD
2323                                  ;CALL:  JSR     PC,WRITE
2324
2325  005770  004337  006124          WRITE:  JSR     R3,TMCMD                ;GO TO TM COMMAND SUBROUTINE
```

```
2326  005774  016674                    .WORD   WTBUF                   ;BUS ADDRESS
2327  005776  177600                    .WORD   WRDCNT                  ;WORD COUNT
2328  006000  177400                    .WORD   FRMCNT                  ;FRAME COUNT
2329  006002  000060                    .WORD   WFWD                    ;WRITE FORWARD COMMAND
2330  006004  000207                    RTS     PC
2331
2332                                ;SUBROUTINE TO READ A 256. WORD RECORD.
2333                                ;CALL:  JSR     PC,READ
2334
2335  006006  004337  006124      READ:   JSR     R3,@#TMCMD
2336  006012  016674                    .WORD   RDBUF                   ;ADDRESS OF READ BUFFER
2337  006014  177600                    .WORD   WRDCNT                  ;2'S COMPLEMENT OF WORD COUNT
2338  006016  177400                    .WORD   FRMCNT                  ;2'S COMPLEMENT OF FRAME COUNT
2339  006020  000070                    .WORD   RDFWD                   ;READ FORWARD COMMAND
2340  006022  000207                    RTS     PC
2341
2342                                ;SUBROUTINE TO INITIATE READ REVERSE COMMAND
2343                                ;CALL:  JSR     PC,REVRD
2344                                ;
2345  006024  004337  006124      REVRD:  JSR     R3,TMCMD
2346  006030  017274                    .WORD   RDBUF+256.              ;ADDRESS OF READ REVERSE BUFFER
2347  006032  177600                    .WORD   WRDCNT                  ;2'S COMPLEMENT OF WORD COUNT
2348  006034  177400                    .WORD   FRMCNT                  ;2'S COMPLEMENT OF FRAME COUNT
2349  006036  000076                    .WORD   RDREV                   ;READ REVERSE COMMAND
2350  006040  000207                    RTS     PC
2351
2352                                ;SUBROUTINE TO SPACE FORWARD 1 RECORD
2353  006042  012765  177777  000006 FWDSPC:  MOV     #-1,FC(R5)              ;LOAD RECORD COUNT
2354  006050  012715  000031                  MOV     #SPCFWD+1,(R5)          ;LOAD COMMAND
2355  006054  004737  005602                  JSR     PC,WAITRDY              ;WAIT FOR READY
2356  006060  000207                          RTS     PC                      ;RETURN
2357
2358                                ;SUBROUTINE TO WRITE A RECORD AND BACK SPACE OVER  THE RECORD.
2359  006062  004737  005770      WRT.BK: JSR     PC,WRITE                ;WRITE THE RECORD
2360  006066  005215                  INC     (R5)                    ;SET 'GO' BIT
2361  006070  004737  005602          JSR     PC,WAITRDY
2362  006074  102412                  BVS     2$
2363  006076  012765  177777  000006    MOV     #-1,FC(R5)              ;LOAD RECORD COUNT
2364  006104  012715  000033          MOV     #SPCREV+1,(R5)          ;LOAD COMMAND
2365  006110  004737  005602          JSR     PC,WAITRDY
2366  006114  102402                  BVS     2$
2367  006116  004737  005310      1$:     JSR     PC,DELAY                ;WAIT FOR TAPE MOTION TO STOP
2368  006122  000207                2$:     RTS     PC
2369
2370                                ;SUBROUTINE TO LOAD A COMMAND
2371                                ;CALL:  JSR     R3,TMCMD
2372                                ;       .WORD   BUS ADDRESS
2373                                ;       .WORD   WORD COUNT (2'S COMPLEMENT)
2374                                ;       .WORD   FRAME COUNT (2'S COMPLEMENT)
2375                                ;       .WORD   COMMAND
2376
2377  006124  012365  000004      TMCMD:  MOV     (R3)+,BA(R5)            ;LOAD BUS ADDRESS
2378  006130  012365  000002              MOV     (R3)+,WC(R5)            ;LOAD WORD COUNT
2379  006134  012365  000006              MOV     (R3)+,FC(R5)            ;LOAD FRAME COUNT
2380  006140  012315                      MOV     (R3)+,(R5)              ;LOAD COMMAND
2381  006142  000203                      RTS     R3                      ;RETURN
```

```
2382
2383                                    ;SUBROUTINE TO PRINT SERIAL NUMBER
2384                                    ;JSR    PC,SNPT
2385
2386  006144  016503  000030  SNPT:   MOV     SN(R5),R3
2387  006150  012701  001152          MOV     #ODIGITS,R1
2388  006154  000303                   SWAB    R3
2389  006156  006003                   ROR     R3
2390  006160  006003                   ROR     R3
2391  006162  006003                   ROR     R3
2392  006164  006003                   ROR     R3              ;GET FIRST DIGIT
2393  006166  042703  177760          BIC     #177760,R3
2394  006172  052703  000260          BIS     #260,R3
2395  006176  110321                   MOVB    R3,(R1)+        ;FILL FIRST DIGIT
2396  006200  016503  000030          MOV     SN(R5),R3
2397  006204  000303                   SWAB    R3
2398  006206  042703  177760          BIC     #177760,R3
2399  006212  052703  000260          BIS     #260,R3
2400  006216  110321                   MOVB    R3,(R1)+        ;GET SECOND DIGIT
2401  006220  016503  000030          MOV     SN(R5),R3
2402  006224  006003                   ROR     R3
2403  006226  006003                   ROR     R3
2404  006230  006003                   ROR     R3
2405  006232  006003                   ROR     R3
2406  006234  042703  177760          BIC     #177760,R3
2407  006240  052703  000260          BIS     #260,R3
2408  006244  110321                   MOVB    R3,(R1)+        ;GET THIRD DIGIT
2409  006246  016503  000030          MOV     SN(R5),R3
2410  006252  042703  177760          BIC     #177760,R3
2411  006256  052703  000260          BIS     #260,R3
2412  006262  110321                   MOVB    R3,(R1)+        ;GET FOURTH DIGIT
2413  006264  105011                   CLRB    (R1)
2414  006266  000004  001152          TYPE,ODIGITS            ;TYPE SERIAL NUMBER
2415  006272  000207                   RTS     PC              ;RETURN
2416
```

```
2417                                            .SBTTL  PROGRAM INITIALIZATION
2418  006274  012706  000600          INIT:     MOV     #STKPTR,SP              ;SET STACK PTR
2419  006300  005037  001272                    CLR     @#INBUF
2420
2421  006304  013746  000006                    MOV     @#6,-(SP)               ;SAVE VECTORS
2422  006310  013746  000004                    MOV     @#4,-(SP)
2423  006314  012737  006334  000004            MOV     #61$,@#4                        ;SET UP FOR TIMEOUT
2424  006322  022777  177777  172450            CMP     #-1,@SWR                ;REFERENCE HARDWARE SWITCH REGISTER
2425  006330  001402                            BEQ     60$
2426  006332  000404                            BR      62$
2427  006334  022626                    61$:    CMP     (SP)+,(SP)+             ;ADJUST STACK
2428  006336  012737  000176  001000    60$:    MOV     #SWREG,SWR              ;POINT TO SOFTWARE SWITCH REG
2429  006344  012637  000004            62$:    MOV     (SP)+,@#4               ;RESTORE VECTORS
2430  006350  012637  000006                    MOV     (SP)+,@#6
2431  006354  105037  001131                    CLRB    @#PRGFLG                ;CLEAR PROGRAM FLAG
2432  006360  105037  001135                    CLRB    @#ASFLG                 ;CLEAR ASK FLAG
2433  006364  105037  001134                    CLRB    @#PSCNT         ;SET PASS COUNT = 0
2434  006370  005027                            CLR     (PC)+           ;;CLEAR CHAIN INDICATOR
2435  006372  000000                    CHNFLG: .WORD   0               ;;CHAIN MODE INDICATOR
2436                                                                    ;;1/0 = CHAIN/NOT CHAIN MODE
2437  006374  005737  000042                    TST     @#42            ;;BRANCH IF IN DUMP MODE
2438  006400  001407                            BEQ     50$
2439  006402  012737  000176  001000            MOV     #SWREG,SWR      ;;INVOKE SOFTWARE SWR
2440  006410  005237  006372                    INC     CHNFLG          ;;SET CHNFLG = CHAIN MODE
2441  006414  000137  006420                    JMP     1$              ;;GO TO CHAIN ADDRESS
2442  006420                            50$:
2443  006420  122737  000006  000041    1$:     CMPB    #6,@#41         ;BRANCH IF NOT LOADED VIA TMDP
2444  006426  001003                            BNE     2$
2445  006430  000004  014344                    TYPE,I.REM              ;ADVISE USER TO REMOVE TMDP
2446  006434  000000                            HALT
2447  006436  000004  014134            2$:     TYPE,M.NAM                      ;TYPE TITLE
2448  006442  005737  006372                    TST     CHNFLG          ;SEE IF CHAIN MODE
2449  006446  001025                            BNE     5$              ;IF SO: BR
2450  006450  105037  014134                    CLRB    M.NAM                   ;DO NOT TYPE TITLE ON RESTART
2451  006454  000004  014417                    TYPE,I.REG                      ;ASK USER TO TYPE CONT BASE ADRS
2452  006460  013702  001010                    MOV     @#TMBASE,R2             ;GET CURRENT CONT BASE ADDRESS
2453  006464  004737  003134                    JSR     PC,TYPOCT               ;AND TYPE IT
2454  006470  000004  001416                    TYPE,SPACE
2455  006474  004737  004000                    JSR     PC,.INPUT               ;GET USER INPUT
2456  006500  122737  000015  001272            CMPB    #CR,@#INBUF             ;DO NOT CHANGE CURRENT VALUE
2457  006506  001405                            BEQ     5$                      ;IF USER TYPES <CR>
2458  006510  004737  003564            4$:     JSR     PC,CNVTAO               ;CONVERT ASCII TO OCTAL
2459  006514  013737  001122  001010            MOV     @#OCTALO,@#TMBASE       ;SET NEW ADDRESS
2460  006522  013705  001010            5$:     MOV     @#TMBASE,R5
2461
2462                                    ;ROUTINE TO CHECK IF CONTROLLER (RH11) IS AVAILAABLE
2463  006526  000261                            SEC                             ;SET 'C' IN PSW
2464  006530  005715                            TST     (R5)                    ;BRANCH IF CONTROLLER AVAIL
2465  006532  103003                            BCC     6$
2466  006534  000004  014712                    TYPE,E.NCON
2467  006540  000655                            BR      INIT
2468  006542  012737  004250  000004    6$:     MOV     #ERRTRP,@#ERRVEC        ;SET ERROR TRAP VECTOR
```

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2469                                    ;ROUTINE TO GET TM03 DRIVES USER DESIRES TO TEST
2470  006550  105037  001127  DRIVES: CLRB    @#ERFLG                 ;CLEAR ERROR FLAG
2471  006554  012701  001162          MOV     #DRVTBL,R1              ;MARK ALL DRIVES AS NOT TO
2472  006560  012700  000004          MOV     #4,R0                   ;BE TESTED. A '0' INDICATES
2473  006564  005021          1$:     CLR     (R1)+                   ;THAT A DRIVE IS NOT TO BE
2474  006566  005300                  DEC     R0                      ;TESTED
2475  006570  001375                  BNE     1$
2476  006572  005737  006372          TST     CHNFLG                  ;BRANCH IF IN CHAIN MODE
2477  006576  001014                  BNE     2$
2478  006600  000004  014464          TYPE,I.DRVS
2479  006604  004737  004000          JSR     PC,.INPUT               ;GET USER INPUT
2480  006610  012700  001272          MOV     #INBUF,R0
2481  006614  122710  000101          CMPB    #'A,(R0)                ;IF USER RESPONDS WITH 'A' OR
2482  006620  001403                  BEQ     2$                      ;<CR> THEN ALL AVAILABLE DRIVES
2483  006622  122710  000015          CMPB    #CR,(R0)                ;ARE TO BE TESTED
2484  006626  001013                  BNE     4$
2485  006630  110637  001131  2$:     MOVB    SP,PRGFLG               ;SET FLAG TO IND ALL DRIVES
2486  006634  012701  001162          MOV     #DRVTBL,R1              ;MARK ALL DRIVES TO BE TESTED
2487  006640  012700  000004          MOV     #4,R0                   ;A '-1' INDICATES THAT A DRIVE
2488  006644  012721  177777  3$:     MOV     #-1,(R1)+               ;IS TO BE TESTED
2489  006650  005300                  DEC     R0
2490  006652  001374                  BNE     3$
2491  006654  000417                  BR      CHKDRV                  ;GO CHECK DRIVE AVAILABILITY
2492
2493                                    ;GET USER SELECTED DRIVES AND MARK EACH DRIVE SELECTED TO BE TESTED
2494  006656  122710  000015  4$:     CMPB    #CR,(R0)
2495  006662  001414                  BEQ     CHKDRV
2496  006664  121027  000054          CMPB    (R0),#',                ;CHECK IF 'COMMA'
2497  006670  001001                  BNE     5$
2498  006672  105720                  TSTB    (R0)+                   ;STEP PTR PAST 'COMMA'
2499  006674  112001          5$:     MOVB    (R0)+,R1
2500  006676  042701  177770          BIC     #177770,R1
2501  006702  112761  177777  001162  MOVB    #-1,DRVTBL(R1)
2502  006710  000240                  NOP
2503  006712  000761                  BR      4$
2504
2505                                    ;ASCERTAIN THAT DRIVES (TM03'S) SPECIFIED ARE AVAILABLE
2506  006714  005000  CHKDRV: CLR     R0                      ;A (0) IN DRVTBL(R0) INDICATES
2507  006716  105760  001162  1$:     TSTB    DRVTBL(R0)              ;THE DRIVE IS NOT TO BE TESTED
2508  006722  001005                  BNE     3$                      ;A '1' INDICATES TO BE TESTED
2509  006724  005200          2$:     INC     R0
2510  006726  122700  000010          CMPB    #8.,R0
2511  006732  001371                  BNE     1$
2512  006734  000424                  BR      5$
2513  006736  110037  001004  3$:     MOVB    R0,@#DRVNUM             ;GET DRIVE #
2514  006742  004737  005466          JSR     PC,@#DRVAVA             ;AND CHECK IF AVAILABLE
2515  006746  102366                  BVC     2$                      ;'V' BIT SET INDICATES NOT AVAIL
2516  006750  105737  001131          TSTB    @#PRGFLG                ;DO NOT TYPE NOT AVAILABLE
2517  006754  001011                  BNE     4$                      ;MESSAGE IF ALL SELECTED
2518  006756  000004  014757          TYPE,E.NDRV
2519  006762  116037  001140  015011  MOVB    DIGTAB(R0),@#E.NAVA     ;SET DRIVE # IN MESSAGE
2520  006770  000004  015011          TYPE,E.NAVA
2521  006774  110637  001127          MOVB    SP,@#ERFLG              ;SET 'ERROR' FLAG
2522  007000  105060  001162  4$:     CLRB    DRVTBL(R0)              ;MARK DRIVE UNAVAILABLE
2523  007004  000747                  BR      2$                      ;CHECK NEXT DRIVE
2524  007006  105737  001127  5$:     TSTB    @#ERFLG                 ;GO GET SLAVES IF NO ERROR
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2525  007012  001256                        BNE     DRIVES                  ;ELSE ASK USER TO RETYPE DRIVES
2526
2527                                  ;ROUTINE TO GET SLAVES (TE16/TU77'S) USER DESIRES TO TEST
2528  007014  105037  001127          SLAVES: CLRB    @#ERFLG         ;CLEAR ERROR INDICATOR
2529  007020  012701  001172                  MOV     #SLVTBL,R1              ;MARK ALL SLAVES (64.) AS NOT
2530  007024  012700  000040                  MOV     #32.,R0                 ;TO BE TESTED.A 0 INDICATES THAT
2531  007030  005021                  1$:     CLR     (R1)+                   ;A DRIVE'S SLAVE IS NOT TO BE
2532  007032  005300                          DEC     R0                      ;TESTED
2533  007034  001375                          BNE     1$
2534  007036  012701  001172                  MOV     #SLVTBL,R1              ;R1 POINTS TO DRIVE'S SLAVE
2535  007042  105760  001162          2$:     TSTB    DRVTBL(R0)              ;BRANCH IF DRIVE IS TO BE TESTED
2536  007046  001007                          BNE     4$                      ;& IS AVAILABLE
2537  007050  062701  000010          3$:     ADD     #8.,R1                  ;STEP SLAVE PTR TO NEXT DRIVE'S
2538  007054  005200                          INC     R0                      ;SLAVES AND INCREMENT DRIVE #
2539  007056  122700  000010                  CMPB    #8.,R0                  ;CHECK ALL DRIVES
2540  007062  001367                          BNE     2$                      ;AND WHEN ALL DRIVES CHECKED
2541  007064  000457                          BR      CHKSLV                  ;GO CHECK SLAVE AVAILABILITY
2542
2543  007066  105737  001131          4$:     TSTB    @#PRGFLG                ;BRANCH IF USER SELECTED ALL
2544  007072  001021                          BNE     5$                      ;DRIVES
2545  007074  110037  001004                  MOVB    R0,DRVNUM               ;GET DRIVE #
2546  007100  116037  001140  014553          MOVB    DIGTAB(R0),@#I.DRV      ;PREPARE USER ACTION MESSAGE
2547  007106  000004  014534                  TYPE,I.SLVS
2548  007112  004737  004000                  JSR     PC,.INPUT               ;GET USER INPUT
2549  007116  012703  001272                  MOV     #INBUF,R3               ;SET PTR TO USER INPUT
2550  007122  122713  000101                  CMPB    #'A,(R3)                ;AN 'A' OR <CR> AS FIRST CHAR
2551  007126  001403                          BEQ     5$                      ;INDICATES TEST ALL SLAVES
2552  007130  122713  000015                  CMPB    #CR,(R3)
2553  007134  001015                          BNE     7$
2554  007136  110637  001131          5$:     MOVB    SP,@#PRGFLG             ;SET 'ALL' INDICATOR
2555  007142  012701  001172                  MOV     #SLVTBL,R1              ;MARK ALL SLAVES FOR ALL
2556  007146  012700  000040                  MOV     #32.,R0                 ;DRIVES AS TO BE TESTED
2557  007152  012721  177777          6$:     MOV     #-1,(R1)+
2558  007156  005300                          DEC     R0
2559  007160  001374                          BNE     6$
2560  007162  105737  001131                  TSTB    @#PRGFLG                ;BRANCH IF ALL WAS SELECTED
2561  007166  001016                          BNE     CHKSLV
2562
2563  007170  122713  000015          7$:     CMPB    #CR,(R3)                ;GET USER SELECTED SLAVES FOR
2564  007174  001725                          BEQ     3$                      ;DRIVE
2565  007176  121327  000054                  CMPB    (R3),#',                ;STEP PTR PAST 'COMMA'
2566  007202  001001                          BNE     8$
2567  007204  105723                          TSTB    (R3)+
2568  007206  112304                  8$:     MOVB    (R3)+,R4                ;AND MARK SELECED SLAVE
2569  007210  042704  177770                  BIC     #177770,R4              ;AS TO BE TESTED
2570  007214  060104                          ADD     R1,R4
2571  007216  112714  177777                  MOVB    #-1,(R4)
2572  007222  000762                          BR      7$
2573
2574                                  ;ASCERTAIN THAT SLAVES (TE16/TU77'S) SELECTED ARE AVAILABLE
2575  007224  005000                  CHKSLV: CLR     R0                      ;R0 WILL CONTAIN THE DRIVE #
2576  007226  005001                          CLR     R1                      ;AND R1 THE SLAVE #
2577  007230  012702  001172                  MOV     #SLVTBL,R2              ;SET PTR TO SLAVE TABLE
2578  007234  105760  001162          1$:     TSTB    DRVTBL(R0)              ;BRANCH IF DRIVE SELECTED
2579  007240  001020                          BNE     3$                      ;& AVAILABLE FOR TEST
2580  007242  005200                  2$:     INC     R0                      ;INCREMENT DRIVE #
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2581  007244  105760  001161            TSTB    <DRVTBL-1>(R0)          ;++C WAS PREVIOUS DRIVE SELECTED
2582  007250  001003                    BNE     9$                      ;++C BRANCH IF AVAIL.
2583  007252  062702  000010            ADD     #8.,R2                  ;++C ADJUST SLAVE POINTER
2584  007256  000405                    BR      10$
2585  007260  105737  001131    9$:     TSTB    @#PRGFLG                ;++C WAS ALL SELECTED
2586  007264  001002                    BNE     10$
2587  007266  062702  000010            ADD     #8.,R2                  ;++C ADJUST SLAVE POINTER
2588  007272  022700  000010    10$:    CMP     #8.,R0                  ;SLAVES. BRANCH TO 1$ IF NOT ALL
2589  007276  001356                    BNE     1$                      ;DRIVES CHECKED OTHERWISE EXIT
2590  007300  000437                    BR      8$
2591
2592  007302  005001            3$:     CLR     R1                      ;SET SLAVE # 0
2593  007304  105712            4$:     TSTB    (R2)                    ;BRANCH IF DRIVE'S SLAVE IS SEL-
2594  007306  001006                    BNE     6$                      ;ECTED FOR TEST
2595  007310  005201            5$:     INC     R1                      ;INCREMENT SLAVE #
2596  007312  005202                    INC     R2                      ;STEP PTR TO NEXT SLAVE
2597  007314  022701  000010            CMP     #8.,R1                  ;GO TO 4$ IF ALL SLAVES NOT
2598  007320  001371                    BNE     4$                      ;CHECKED
2599  007322  000747                    BR      2$                      ;OTHERWISE GO TO 2$ ABOVE
2600
2601  007324  110037  001004    6$:     MOVB    R0,@#DRVNUM             ;PASS DRIVE & SLAVE #
2602  007330  110137  001005            MOVB    R1,@#SLVNUM
2603  007334  004737  005514            JSR     PC,@#SLVAVA             ;AND CHECK IF AVAILABLE
2604  007340  102363                    BVC     5$                      ;'V' SET INDCATES ERROR
2605  007342  105737  001131            TSTB    @#PRGFLG                ;DO NOT TYPE ERROR MSG IF ALL
2606  007346  001012                    BNE     7$                      ;SLAVES SELECTED
2607  007350  116037  001140  015001    MOVB    DIGTAB(R0),@#E.DRV      ;ICATES ERROR. PREPARE ERROR
2608  007356  116137  001140  015011    MOVB    DIGTAB(R1),@#E.NAVA     ;MESSAGE
2609  007364  000004  014773            TYPE,E.NSLV
2610  007370  110637  001127            MOVB    SP,@#ERFLG              ;SET ERROR INDICATOR
2611  007374  105012            7$:     CLRB    (R2)                    ;CLEAR SLAVE TABLE ENTRY
2612  007376  000744                    BR      5$                      ;GET NEXT SLAVE
2613
2614  007400  105737  001127    8$:     TSTB    @#ERFLG                 ;BRANCH IF ERROR
2615  007404  001203                    BNE     SLAVES                  ;ASK USER TO RETYPE SLAVES
2616  007406  012737  004250  000004    100$:   MOV     #ERRTRP,@#ERRVEC
2617
2618                                    ;SCAN DRIVE AND SLAVE TABLE FOR DRIVE/SLAVE COMBINATION TO TEST.
2619                                    ;RESTART ADDRESS--PROGRAM STARTS HERE WHEN START ADDRESS = 210 AND
2620                                    ;AFTER ALL SELECTED DRIVE/SLAVE COMBINATIONS HAVE BEEN TESTED.
2621  007414  012706  000600    RSTRT:  MOV     #600,SP                 ;SET STACK PTR
2622  007420  105037  001004            CLRB    @#DRVNUM                ;SET DRIVE AND SLAVE # 0
2623  007424  105037  001005            CLRB    @#SLVNUM
2624  007430  012737  001172  001006    MOV     #SLVTBL,@#SLVPTR        ;SET PTR TO SLAVE TABLE
2625  007436  105037  001132            CLRB    @#UNTFND                ;CLEAR 'UNIT FOUND' IND.
2626
2627                                    ;PROGRAM RESTARTS HERE AFTER A DRIVE/SLAVE HAS BEEN TESTED.
2628  007442  113700  001004    BEGIN:  MOVB    @#DRVNUM,R0             ;GET DRIVE #
2629  007446  113701  001005            MOVB    @#SLVNUM,R1             ;AND SLAVE #
2630  007452  013702  001006            MOV     @#SLVPTR,R2             ;GET SLAVE PTR
2631  007456  122737  000006  000041    CMPB    #6,@#41                 ;BRANCH IF LOADED VIA TMDP
2632  007464  001001                    BNE     1$
2633  007466  105012                    CLRB    (R2)                    ;SET DRIVE #0,SLAVE #0 NOT TO
2634                                                                    ;BE TESTED.
2635  007470  105760  001162    1$:     TSTB    DRVTBL(R0)              ;BRANCH IF DRIVE AVAIL TO TEST
2636  007474  001011                    BNE     3$
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2637  007476  005001                        CLR     R1                      ;CLEAR SLAVE #
2638  007500  062702  000010                ADD     #8.,R2                  ;AND STEP PTR TO NEXT DRIVE'S
2639  007504  005200                2$:     INC     R0                      ;SLAVES AND INCREMENT DRIVE #
2640  007506  022700  000010                CMP     #8.,R0                  ;EXIT TEST IF ALL DRIVES
2641  007512  001366                        BNE     1$                      ;CHECKED OTHERWISE CONTINUE
2642  007514  000137  013432                JMP     @#END                   ;SCAN FOR NEXT 'UNIT'
2643
2644  007520  105712                3$:     TSTB    (R2)                    ;BRANCH IF SLAVE ON DRIVE IS
2645  007522  001007                        BNE     4$                      ;AVAILABLE THERWISE STEP
2646  007524  005202                        INC     R2                      ;PTR TO NEXT SLAVE
2647  007526  005201                        INC     R1                      ;INCREMENT SLAVE #
2648  007530  122701  000010                CMPB    #8.,R1                  ;UNTIL ALL SLAVES CHECKED
2649  007534  001371                        BNE     3$                      ;WHEN ALL SLAVES CHECKED
2650  007536  005001                        CLR     R1                      ;SET SLAVE # 0
2651  007540  000761                        BR      2$                      ;AND CONTINUE SCAN
2652
2653  007542  110637  001132        4$:     MOVB    SP,@#UNTFND             ;INDICATE THAT A 'UNIT' IS FOUND
2654  007546  110037  001004                MOVB    R0,@#DRVNUM             ;SET DRIVE #
2655  007552  110137  001005                MOVB    R1,@#SLVNUM             ;SET SLAVE #
2656  007556  010237  001006                MOV     R2,@#SLVPTR             ;SAVE SLAVE PTR
2657
2658  007562  105737  001135        5$:     TSTB    @#ASFLG
2659  007566  001034                        BNE     7$
2660  007570  112737  000001  001135        MOVB    #1,ASFLG
2661  007576  005737  006372                TST     CHNFLG                  ;BRANCH IF IN CHAIN MODE
2662  007602  001026                        BNE     7$
2663  007604  105037  001130                CLRB    @#SKEWFLG       ;++B CLEAR SKEW (SPEED) TESTS SELECTED FLAG
2664  007610  000004  014620                TYPE,I.SPD              ;ASK USER IF HE WANTS TO RUN SPEED TESTS
2665  007614  004737  004000                JSR     PC,..INPUT              ;GET USER INPUT
2666  007620  012703  001272                MOV     #INBUF,R3       ;GET REPLY
2667  007624  122713  000015                CMPB    #CR,(R3)        ;DO NOT DO SKEW TESTS IF <CR> IS FIRST
2668  007630  001405                        BEQ     6$
2669  007632  132713  000001                BITB    #1,(R3)         ;BRANCH IF 'N'
2670  007636  001402                        BEQ     6$
2671  007640  111337  001130                MOVB    (R3),@#SKEWFLG  ;SET INDICATOR
2672  007644  022737  000176  001000  6$:   CMP     #SWREG,SWR              ;BRANCH IF SOFTWARE SWR
2673  007652  001002                        BNE     7$                      ;NOT INVOKED
2674  007654  004737  002526                JSR     PC,GTSWR                ;GET SWITCH REGISTER
2675  007660                        7$:
2676                                ;ROUTINE TO ASCERTAIN SLAVE TYPE AND LOAD APPROPRIATE SPECFICATION
2677                                ;TABLES (TE16 OR TU77) INTO STIMTBL AND GTIMTBL.
2678  007660  013705  001010                MOV     @#TMBASE,R5     ;GET BASE ADDRESS OF REGISTERS
2679  007664  004737  005544                JSR     PC,RHINIT       ;INIT DRIVE/SLAVE
2680  007670  012704  000240                MOV     #ENDTBL-STTBL,R4;GET TABLE LENGTH
2681  007674  012703  002124                MOV     #STIMTBL,R3     ;AND STARTING ADDRESS OF TABLE
2682  007700  012702  001424                MOV     #TE16TTBL,R2    ;GET ADDRESS OF TE16 TIME TABLE
2683  007704  105037  001136                CLRB    @#TE16          ;SET FLAG = TE16
2684  007710  032765  000004  000026        BIT     #4,DT(R5)       ;BRANCH IF TU77
2685  007716  001012                        BNE     9$
2686  007720  012737  000070  001012        MOV     #56.,OSCTIM     ;SET US/TICK = 56
2687  007726  012737  000022  001014        MOV     #18.,GAPDEL     ;SET 18 TICKS/MS
2688  007734  112223                8$:     MOVB    (R2)+,(R3)+     ;MOVE TE16 TIME AND GAP TABLES
2689  007736  005304                        DEC     R4              ;INTO STIMTBL & GTIMTBL
2690  007740  001375                        BNE     8$
2691  007742  000416                        BR      11$             ;EXIT ROUTINE
2692
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2693  007744  012702  001664          9$:     MOV     #TU77TTBL,R2    ;GET ADDRESS OF TU77 TIME TABLE
2694  007750  112737  000001  001136          MOVB    #1,@#TE16       ;SET FLAG = TU77
2695  007756  012737  000120  001012          MOV     #80.,OSCTIM     ;SET US/TICK = 80
2696  007764  012737  000003  001014          MOV     #3,GAPDEL       ;SET 3 TICKS PER .25MS
2697  007772  112223                  10$:    MOVB    (R2)+,(R3)+     ;MOVE TU77 TIME AND GAP TABLES
2698  007774  005304                          DEC     R4              ;INTO STIMTBL & GTIMTBL
2699  007776  001375                          BNE     10$
2700  010000                          11$:
2701
2702                                  ;NOTE THIS IS NOT A TEST
2703                                  ;INITIALIZE PROGRAM FLAGS
2704  010000  105037  001126          TST000: CLRB    @#TSTNUM                ;SET TEST # 0
2705  010004  013705  001010                  MOV     @#TMBASE,R5             ;SET ADDRESS OF FIRST TM03 REG
2706  010010  010500                          MOV     R5,R0
2707  010012  062700  000006                  ADD     #FC,R0                  ;R0 CONTAINS ADDRESS OF FC REG
2708  010016  010501                          MOV     R5,R1
2709  010020  062701  000012                  ADD     #DS,R1                  ;R1 CONTAINS ADDRESS OF DS REG
2710  010024  012703  005020                  MOV     #TIMER,R3               ;SET JUMP ADDRESS TO TIMER
2711  010030  105037  001125                  CLRB    @#ITCNT                 ;CLEAR SUBTEST ITERATION COUNT
2712  010034  052737  000100  177560          BIS     #100,@#TKS              ;SET KEYBOARD IE BIT
2713
2714                                  ;GET USER RUN PROCEDURE
2715                                  ;IF SWR <05::00> IS NOT 0 THEN RUN TEST IN SWR<05::00>
2716                                  ;OTHERWISE RUN ALL TESTS
2717
2718  010042  004737  005706                  JSR     PC,.REWIND              ;REWIND SLAVE
2719  010046  102504                          BVS     99$                     ;BRANCH IF ERROR ON REWIND
2720  010050  105737  001130                  TSTB    @#SKEWFLG               ;++B BRANCH IF SWEW (SPEED) TEST SELECTED
2721  010054  001006                          BNE     10$
2722  010056  004737  005770                  JSR     PC,WRITE                ;WRITE A RECORD
2723  010062  005215                          INC     (R5)                    ;SET 'GO' BIT
2724  010064  004737  005602                  JSR     PC,WAITRDY              ;WAIT FOR READY
2725  010070  102473                          BVS     99$
2726  010072  117702  170702          10$:    MOVB    @SWR,R2                 ;GET SWITCHES
2727  010076  042702  177740                  BIC     #177740,R2              ;CLEAR ALL BUT TEST #
2728  010102  001421                          BEQ     2$                      ;& BRANCH IF TEST 0 WAS SELECTED
2729  010104  000004  015137                  TYPE,E.HDR                      ;TYPE TEST #
2730  010110  004737  003134                  JSR     PC,TYPOCT
2731  010114  006302                          ASL     R2                      ;FORM INDEX VALUE
2732  010116  016237  002364  010126          MOV     NAMPTR(R2),1$           ;GET ADDRESS OF TEST'S NAME
2733  010124  000004                          TYPE                            ;AND TYPE IT
2734  010126  000000                  1$:     .WORD   0
2735  010130  000004  001402                  TYPE,CRLF
2736  010134  016237  002444  001002          MOV     TSTTBL(R2),@#SCPADR     ;SET SCOPE ADDRESS FOR TEST
2737  010142  000172  002444                  JMP     @TSTTBL(R2)             ;GO TO TEST
2738  010146  032777  002000  170624  2$:     BIT     #SW10,@SWR              ;BRANCH IF TIMES NOT TO BE TYPED
2739  010154  001034                          BNE     5$
2740  010156  000004  015346                  TYPE,L.HDR1
2741  010162  113702  001004                  MOVB    DRVNUM,R2               ;GET DRIVE #
2742  010166  113704  001005                  MOVB    SLVNUM,R4               ;AND SLAVE #
2743  010172  116237  001140  015530          MOVB    DIGTAB(R2),@#L.DRV      ;SET DRIVE AND SLAVE #'S
2744  010200  116437  001140  015542          MOVB    DIGTAB(R4),@#L.SLV      ;INTO L.HDR2 MESSAGE
2745  010206  000004  015463                  TYPE,L.HDR2
2746  010212  105737  001136                  TSTB    @#TE16          ;BRANCH IF NOT TE16
2747  010216  001003                          BNE     3$
2748  010220  000004  015546                  TYPE,L.TE16             ;TYPE 'TE16'
```

```
 2749  010224  000402                          BR      4$
 2750  010226  000004  015554            3$:   TYPE,L.TU77             ;TYPE 'TU77
 2751  010232  000004  015562            4$:   TYPE,L.SER              ;TYPE 'SERIAL #'
 2752  010236  004737  006144                  JSR     PC,SNPT                 ;PRINT SLAVE SERIAL #
 2753  010242  000004  015574                  TYPE,L.HDR3
 2754  010246  105737  001130            5$:   TSTB    @#SKEWFLG               ;++B BRANCH IF SPEED TESTS NOT
 2755  010252  001405                          BEQ     100$                    ;SELECTED
 2756  010254  000137  013550                  JMP     @#SKEWTST               ;GO DO SPEED TESTS
 2757  010260  104400                    99$:  HLT
 2758  010262  000137  010000                  JMP     TST000                  ;LOOP TEST AS LONG AS ERROR PERSISTS
 2759  010266  012737  010274  001002  100$:  MOV     #TST001,@#SCPADR        ;SET SCOPE LOOP ADDRESS
 2760
```

```
                                        .SBTTL  START OF TESTS
                                ;TEST 001 - WRITE FROM BOT
                                ;THIS TEST WILL MEASURE ACCELERATION DELAY REQUIRED TO
                                ;MOVE THE TAPE APPROXIMATELY SEVEN (7) INCHES FORWARD
                                ;FROM DEAD STOP BEFORE STARTING TO TRANSFER DATA.

                                ;THIS TEST MEASURES TIME FROM 'GO'=1 TO 'ACCL'=0.
010274  112737  000001  001126  TST001: MOVB    #1,@#TSTNUM             ;SET TEST #
010302  012702  010326                  MOV     #1$,R2                  ;SET RETURN PC FROM TIMER
010306  004737  005706                  JSR     PC,.REWIND              ;REWIND SLAVE
010312  102420                          BVS     99$                     ;BRANCH IF ERROR ON REWIND
010314  004737  005770                  JSR     PC,WRITE                ;GO SETUP WRITE COMMAND
010320  004737  004730                  JSR     PC,TIMON                ;TURN TIMER ON
010324  005215                          INC     (R5)                    ;SET 'GO' BIT

010326  005765  000032          1$:     TST     TC(R5)                  ;BRANCH WHEN 'ACCL'=0
010332  100002                          BPL     2$
010334  000163  005020                  JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2

010340  004737  005602          2$:     JSR     PC,WAITRDY              ;WAIT FOR COMMAND TO FINISH
010344  102403                          BVS     99$                     ;BRANCH IF ERROR
010346  004737  005056                  JSR     PC,TIMOK                ;GO CHECK TIME
010352  000401                          BR      100$
010354  104400                  99$:    HLT
010356  104000                  100$:   SCOPE

                                ;TEST 002 - WRITE START
                                ;THIS TST MEASURES TIME FROM 'GO'=1 TO 'ACCL'=0.
010360  112737  000002  001126  TST002: MOVB    #2,@#TSTNUM             ;SET TEST # 2
010366  004737  005770                  JSR     PC,WRITE                ;INITIATE WRITE COMMAND
010372  012702  010404                  MOV     #1$,R2                  ;SET RETURN PC FROM TIMER
010376  004737  004730                  JSR     PC,TIMON
010402  005215                          INC     (R5)                    ;SET 'GO' BIT

010404  005765  000032          1$:     TST     TC(R5)                  ;BRANCH WHEN 'ACCL'=0
010410  100002                          BPL     2$
010412  000163  005020                  JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2

010416  004737  005602          2$:     JSR     PC,WAITRDY              ;WAIT FOR READY
010422  102403                          BVS     99$                     ;BRANCH IF ERROR
010424  004737  005056                  JSR     PC,TIMOK                ;GO CHECK TIME RECORDED
010430  000401                          BR      100$                    ;EXIT VIA SCOPE

010432  104400                  99$:    HLT                             ;REPORT ERROR
010434  104000                  100$:   SCOPE

                                ;TEST 003- WRITE SHUTDOWN
                                ;THIS TEST MEASURES TIME FROM 'FC REG'=0 TO 'SWDN'=1.
010436  112737  000003  001126  TST003: MOVB    #3,@#TSTNUM             ;SET TEST#3
010444  004737  005770                  JSR     PC,WRITE                ;INITIATE WRITE COMMAND
010450  005215                          INC     (R5)                    ;SET 'GO' BIT

010452  005710                  1$:     TST     (R0)                    ;BRANCH WHEN WRITING FINISHED
010454  001404                          BEQ     2$
010456  032711  040000                  BIT     #ERR,(R1)               ;MONITOR ERROR BIT
010462  001017                          BNE     99$
```

```
2817  010464  000772                        BR      1$
2818
2819  010466                          2$:
2820  010466  004737  004730                 JSR     PC,TIMON                ;TURN TIMER ON
2821  010472  010702                          MOV     PC,R2                   ;LOAD RETURN PC FROM TIMER
2822  010474  032711  000020          3$:     BIT     #SDWN,(R1)              ;BRANCH WHEN DS <SDWN> SETS
2823  010500  001002                          BNE     4$
2824  010502  000163  005020                 JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2
2825
2826  010506  004737  005602          4$:     JSR     PC,WAITRDY              ;WAIT FOR READY
2827  010512  102403                          BVS     99$
2828  010514  004737  005056                 JSR     PC,TIMOK                ;GO CHECK TIME RECORDED
2829  010520  000401                          BR      100$
2830  010522  104400                  99$:    HLT                             ;REPORT ERROR
2831  010524  104000                  100$:   SCOPE
2832
2833                                  ;TEST 004 - WRITE SETTLEDOWN
2834                                  ;THIS TEST MEASURES TIME FROM 'SWDN'=1 TO 'SWDN'=0.
2835  010526  112737  000004  001126 TST004: MOVB    #4,@#TSTNUM
2836  010534  004737  005770                 JSR     PC,WRITE
2837  010540  005215                          INC     (R5)                    ;SET 'GO' BIT
2838
2839  010542  005710                  1$:     TST     (R0)                    ;BRANCH WHEN WRITING FINISHED
2840  010544  001404                          BEQ     2$
2841  010546  032711  040000                 BIT     #ERR,(R1)               ;CHECK ERROR BIT
2842  010552  001026                          BNE     99$
2843  010554  000772                          BR      1$
2844
2845  010556  032711  000020          2$:     BIT     #SDWN,(R1)              ;WAIT FOR ASSERTION OF 'SDWN'
2846  010562  001004                          BNE     3$
2847  010564  032711  040000                 BIT     #ERR,(R1)               ;MONITOR ERROR BIT
2848  010570  001017                          BNE     99$
2849  010572  000771                          BR      2$
2850
2851  010574                          3$:
2852  010574  004737  004730                 JSR     PC,TIMON                ;TURN TIMER ON
2853  010600  010702                          MOV     PC,R2                   ;SET RETURN PC FROM TIMER
2854  010602  032711  000020                 BIT     #SDWN,(R1)              ;BRANCH WHEN SWDN CLEARS
2855  010606  001402                          BEQ     5$
2856  010610  000163  005020                 JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2
2857
2858  010614  004737  005602          5$:     JSR     PC,WAITRDY              ;WAIT FOR READY
2859  010620  102403                          BVS     99$
2860  010622  004737  005056                 JSR     PC,TIMOK
2861  010626  000401                          BR      100$
2862
2863  010630  104400                  99$:    HLT
2864  010632  104000                  100$:   SCOPE
2865
2866                                  ;TEST 005 - READ FROM BOT
2867                                  ;THIS TEST MEASURES TIME FROM 'GO'=1 TO 'ACCL'=0.
2868  010634  112737  000005  001126 TST005: MOVB    #5,@#TSTNUM             ;SET TEST #5
2869  010642  004737  005706                 JSR     PC,.REWIND              ;REWIND SLAVE
2870  010646  102422                          BVS     99$                     ;BRANCH IF ERROR ON REWIND
2871  010650  004737  006006                 JSR     PC,READ
2872  010654  012702  010666                 MOV     #1$,R2                  ;SET RETURN PC FROM TIMER
```

```
2873  010660  004737  004730            JSR     PC,TIMON                ;TURN TIMER ON
2874  010664  005215                    INC     (R5)                    ;SET 'GO' BIT
2875
2876  010666  005765  000032    1$:     TST     TC(R5)                  ;BRANCH WHEN 'ACCL' RESETS
2877  010672  100002                    BPL     2$
2878  010674  000163  005020            JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2
2879
2880  010700  004737  005602    2$:     JSR     PC,WAITRDY              ;WAIT FOR READY
2881  010704  102403                    BVS     99$                     ;BRANCH IF ERROR
2882  010706  004737  005056            JSR     PC,TIMOK                ;CHECK RECORDED TIME
2883  010712  000401                    BR      100$
2884
2885  010714  104400            99$:    HLT
2886  010716  104000            100$:   SCOPE
2887
2888                            ;TEST 006 - READ START
2889                            ;THIS TEST MEASURES TIME FROM 'GO'=1 TO 'ACCL'=0.
2890  010720  112737  000006  001126 TST006: MOVB    #6,@#TSTNUM             ;SET TEST #6
2891  010726  004737  006062            JSR     PC,WRT.BK               ;WRITE A RECORD & BACK SPACE
2892  010732  102422                    BVS     99$
2893  010734  004737  006006            JSR     PC,READ
2894  010740  012702  010752            MOV     #1$,R2                  ;SET RETURN PC FROM TIMER
2895  010744  004737  004730            JSR     PC,TIMON                ;TURN TIMER ON
2896  010750  005215                    INC     (R5)                    ;SET 'GO' BIT
2897
2898  010752  005765  000032    1$:     TST     TC(R5)                  ;BRANCH WHEN 'ACCL' RESETS
2899  010756  100002                    BPL     2$
2900  010760  000163  005020            JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2
2901
2902  010764  004737  005602    2$:     JSR     PC,WAITRDY
2903  010770  102403                    BVS     99$
2904  010772  004737  005056            JSR     PC,TIMOK
2905  010776  000401                    BR      100$
2906
2907  011000  104400            99$:    HLT
2908  011002  104000            100$:   SCOPE
2909
2910                            ;TEST 007 - READ SHUTDOWN
2911                            ;THIS TEST MEASURES TIME FROM 'FC REG'=FRAME COUNT TO 'SWDN'=1.
2912  011004  112737  000007  001126 TST007: MOVB    #7,@#TSTNUM             ;SET TEST #7
2913  011012  004737  006062            JSR     PC,WRT.BK               ;WRITE A RECORD & BACK SPACE
2914  011016  102430                    BVS     99$                     ;BRANCH IF ERROR
2915  011020  004737  006006            JSR     PC,READ
2916  011024  005215                    INC     (R5)                    ;SET 'GO' BIT
2917
2918  011026  022710  000400    1$:     CMP     #-FRMCNT,(R0)           ;WAIT FOR FRAME COUNT TO
2919  011032  001404                    BEQ     2$                      ;= # OF FRAMES WRITTEN
2920  011034  032711  040000            BIT     #ERR,(R1)               ;MONITOR ERROR BIT
2921  011040  001017                    BNE     99$
2922  011042  000771                    BR      1$
2923
2924  011044                    2$:
2925  011044  004737  004730            JSR     PC,TIMON                ;TURN TIMER ON
2926  011050  010702                    MOV     PC,R2                   ;SET RETURN PC FROM TIMER
2927  011052  032711  000020            BIT     #SDWN,(R1)              ;BRANCH WHEN SDWN SETS
2928  011056  001002                    BNE     3$
```

```
2929  011060  000163  005020                    JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2
2930
2931  011064  004737  005602          3$:       JSR     PC,WAITRDY
2932  011070  102403                            BVS     99$
2933  011072  004737  005056                    JSR     PC,TIMOK
2934  011076  000401                            BR      100$
2935
2936  011100  104400                99$:       HLT                             ;REPORT ERROR
2937  011102  104000                100$:      SCOPE
2938
2939                                ;TEST 010 - READ SETTLEDOWN
2940                                ;THIS TEST MEASURES TIME FROM 'SWDN'=1 TO 'SWDN'=0.
2941  011104  112737  000010  001126  TST010:  MOVB    #10,@#TSTNUM            ;SET TEST #10
2942  011112  012702  011170                  MOV     #4$,R2                  ;SET RETURN PC FROM TIMER
2943  011116  004737  006062                  JSR     PC,WRT.BK               ;WRITE A RECORD & BACK SPACE
2944  011122  102436                          BVS     99$
2945  011124  004737  006006                  JSR     PC,READ
2946  011130  005215                          INC     (R5)                    ;SET 'GO' BIT
2947
2948  011132  105711                1$:       TSTB    (R1)                    ;WAIT FOR READY
2949  011134  100404                          BMI     2$                      ;BRANCH WHEN SET
2950  011136  032711  040000                  BIT     #ERR,(R1)               ;CHECK ERROR BIT
2951  011142  001026                          BNE     99$
2952  011144  000772                          BR      1$
2953
2954  011146  032711  000020          2$:       BIT     #SDWN,(R1)              ;WAIT FOR ASSERTION OF 'SDWN'
2955  011152  001004                          BNE     3$
2956  011154  032711  040000                  BIT     #ERR,(R1)               ;MONITOR ERROR BIT
2957  011160  001017                          BNE     99$
2958  011162  000771                          BR      2$
2959
2960  011164                          3$:
2961  011164  004737  004730                  JSR     PC,TIMON                ;TURN TIMER ON
2962  011170  032765  000020  000012  4$:       BIT     #SDWN,DS(R5)            ;WAIT FOR NEGATION OF SDWN
2963  011176  001402                          BEQ     5$
2964  011200  000163  005020                  JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2
2965
2966  011204  004737  005602          5$:       JSR     PC,WAITRDY
2967  011210  102403                          BVS     99$
2968  011212  004737  005056                  JSR     PC,TIMOK
2969  011216  000401                          BR      100$
2970
2971  011220  104400                99$:       HLT
2972  011222  104000                100$:      SCOPE
2973
2974
2975                                ;TEST 011-READ REVERSE START
2976                                ;THIS TEST MEASURES TIME FROM 'GO'=1 TO 'ACCL'=0.
2977  011224  112737  000011  001126  TST011:  MOVB    #11,@#TSTNUM
2978  011232  012702  011270                  MOV     #1$,R2                  ;SET RETURN PC FROM TIMER
2979  011236  004737  005770                  JSR     PC,WRITE                ;WRITE A RECORD
2980  011242  005215                          INC     (R5)                    ;SET 'GO' BIT
2981  011244  004737  005602                  JSR     PC,WAITRDY
2982  011250  102422                          BVS     99$
2983  011252  004737  005310                  JSR     PC,DELAY                ;WAIT FOR TAPE MOTION TO STOP
2984  011256  004737  006024                  JSR     PC,REVRD
```

```
2985  011262  004737  004730          JSR     PC,TIMON                ;TURN TIMER ON
2986  011266  005215                  INC     (R5)                    ;SET 'GO' BIT
2987
2988  011270  005765  000032  1$:     TST     TC(R5)                  ;BRANCH WHEN 'ACCL' = 0
2989  011274  100002                  BPL     2$
2990  011276  000163  005020          JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2
2991
2992  011302  004737  005602  2$:     JSR     PC,WAITRDY
2993  011306  102403                  BVS     99$                     ;BRANCH IF ERROR
2994  011310  004737  005056          JSR     PC,TIMOK
2995  011314  000401                  BR      100$
2996
2997  011316  104400  99$:     HLT
2998  011320  104000  100$:    SCOPE
2999
3000                  ;TEST 012-READ REVERSE SHUTDOWN
3001                  ;THIS TEST MEASURES TIME FROM 'FC REG' = FRAME COUNT TO 'SDWN'=1.
3002  011322  112737  000012  001126  TST012: MOVB    #12,@#TSTNUM
3003  011330  012702  011400          MOV     #3$,R2                  ;SET RETURN PC FROM TIMER
3004  011334  004737  005770          JSR     PC,WRITE                ;WRITE A RECORD
3005  011340  005215                  INC     (R5)                    ;SET 'GO' BIT
3006  011342  004737  005602          JSR     PC,WAITRDY
3007  011346  102427                  BVS     99$
3008  011350  004737  006024          JSR     PC,REVRD
3009  011354  005215                  INC     (R5)                    ;SET 'GO' BIT
3010
3011  011356  022710  000400  1$:     CMP     #-FRMCNT,(R0)           ;BRANCH WHEN FRAME COUNT
3012  011362  001404                  BEQ     2$                      ;= # OF RECORD WRITTEN
3013  011364  032711  040000          BIT     #ERR,(R1)               ;MONITOR ERROR BIT IN 'DS' REG
3014  011370  001016                  BNE     99$
3015  011372  000771                  BR      1$
3016
3017  011374  2$:
3018  011374  004737  004730          JSR     PC,TIMON                ;TURN TIMER ON
3019  011400  032711  000020  3$:     BIT     #SDWN,(R1)              ;BRANCH WHEN SDWN SETS
3020  011404  001002                  BNE     4$
3021  011406  000163  005020          JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2
3022
3023  011412  004737  005602  4$:     JSR     PC,WAITRDY              ;WAIT FOR READY
3024  011416  102403                  BVS     99$
3025  011420  004737  005056          JSR     PC,TIMOK
3026  011424  000401                  BR      100$
3027
3028  011426  104400  99$:     HLT
3029  011430  104000  100$:    SCOPE
3030
3031                  ;TEST 013-READ REVERSE SETTLEDOWN
3032                  ;THIS TEST MEASURES TIME FROM 'SDWN'=1 TO 'SDWN'=0.
3033  011432  112737  000013  001126  TST013: MOVB    #13,@#TSTNUM
3034  011440  012702  011524          MOV     #4$,R2                  ;SET RETURN PC FROM TIMER
3035  011444  004737  005770          JSR     PC,WRITE                ;WRITE A RECORD
3036  011450  005215                  INC     (R5)                    ;SET 'GO' BIT
3037  011452  004737  005602          JSR     PC,WAITRDY
3038  011456  102435                  BVS     99$
3039  011460  004737  006024          JSR     PC,REVRD
3040  011464  005215                  INC     (R5)                    ;SET 'GO' BIT
```

```
3041
3042  011466  105711                1$:     TSTB    (R1)            ;BRANCH WHEN
3043  011470  100404                        BMI     2$              ;READY SETS
3044  011472  032711  040000              BIT     #ERR,(R1)
3045  011476  001025                        BNE     99$
3046  011500  000772                        BR      1$
3047
3048  011502  032711  000020        2$:     BIT     #SDWN,(R1)
3049  011506  001004                        BNE     3$
3050  011510  032711  040000              BIT     #ERR,(R1)
3051  011514  001016                        BNE     99$
3052  011516  000771                        BR      2$
3053
3054  011520                        3$:
3055  011520  004737  004730              JSR     PC,TIMON        ;TURN TIMER ON
3056  011524  032711  000020        4$:     BIT     #SDWN,(R1)      ;BRANCH WHEN SWDN = 0
3057  011530  001402                        BEQ     5$
3058  011532  000163  005020              JMP     TIMER(R3)       ;GO TO TIMER & RETURN VIA R2
3059
3060  011536  004737  005602        5$:     JSR     PC,WAITRDY      ;WAIT FOR READY
3061  011542  102403                        BVS     99$
3062  011544  004737  005056              JSR     PC,TIMOK
3063  011550  000401                        BR      100$
3064
3065  011552  104400                99$:    HLT
3066  011554  104000                100$:   SCOPE
3067
3068                                ;REWIND DRIVE
3069  011556                        A:
3070  011556  004737  005706              JSR     PC,.REWIND      ;REWIND SLAVE
3071  011562  102401                        BVS     99$             ;BRANCH IF ERROR ON REWIND
3072  011564  102002                        BVC     100$
3073  011566  104400                99$:    HLT
3074  011570  000772                        BR      A
3075  011572                        100$:
3076
3077                                ;TEST 014-TURN AROUND DELAY (FORWARD-REVERSE)
3078                                ;THIS TEST MEASURES TIME FROM 'GO'=1 (READ REVERSE) TO 'ACCL'=0
3079  011572  112737  000014  001126  TST014: MOVB    #14,@#TSTNUM
3080  011600  012702  011632              MOV     #2$,R2          ;SET RETURN PC FROM TIMER
3081  011604  004737  005770              JSR     PC,WRITE        ;WRITE A RECORD
3082  011610  005215                        INC     (R5)            ;SET 'GO' BIT
3083  011612  004737  005602              JSR     PC,WAITRDY
3084  011616  102420                        BVS     99$
3085
3086  011620  004737  006024        1$:     JSR     PC,REVRD        ;READ THE RECORD (REVERSE)
3087  011624  004737  004730              JSR     PC,TIMON        ;TURN TIMER ON
3088  011630  005215                        INC     (R5)            ;SET 'GO' BIT
3089
3090  011632  005765  000032        2$:     TST     TC(R5)          ;WAIT FOR 'ACCL' = 0
3091  011636  100002                        BPL     3$
3092  011640  000163  005020              JMP     TIMER(R3)       ;GO TO TIMER & RETURN VIA R2
3093
3094  011644  004737  005602        3$:     JSR     PC,WAITRDY
3095  011650  102403                        BVS     99$
3096  011652  004737  005056              JSR     PC,TIMOK
```

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3097  011656  000401                          BR      100$
3098
3099  011660  104400                  99$:    HLT
3100  011662  104000                  100$:   SCOPE
3101
3102                                  ;TEST 015- TURN AROUND DELAY (REVERSE-FORWARD)
3103                                  ;THIS TEST MEASURES TIME FROM 'GO'=1 (READ) TO 'ACCL'=0.
3104  011664  112737  000015  001126  TST015: MOVB    #15,@#TSTNUM
3105  011672  012702  011740                  MOV     #2$,R2                  ;SET RETURN PC FROM TIMER
3106  011676  004737  005770                  JSR     PC,WRITE                ;WRITE A RECORD
3107  011702  005215                          INC     (R5)                    ;SET 'GO' BIT
3108  011704  004737  005602                  JSR     PC,WAITRDY              ;WAIT FOR READY
3109  011710  102426                          BVS     99$
3110  011712  004737  006024                  JSR     PC,REVRD                ;READ A RECORD IN THE
3111  011716  005215                          INC     (R5)                    ;SET 'GO' BIT
3112
3113  011720  004737  005602                  JSR     PC,WAITRDY
3114  011724  102420                          BVS     99$
3115
3116  011726  004737  006006          1$:     JSR     PC,READ                 ;READ RECORD FORWARD
3117  011732  004737  004730                  JSR     PC,TIMON                ;TURN TIMER ON
3118  011736  005215                          INC     (R5)                    ;SET 'GO' BIT
3119
3120  011740  005765  000032          2$:     TST     TC(R5)                  ;WAIT FOR 'ACCL' = 0
3121  011744  100002                          BPL     3$
3122  011746  000163  005020                  JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2
3123
3124  011752  004737  005602          3$:     JSR     PC,WAITRDY
3125  011756  102403                          BVS     99$
3126  011760  004737  005056                  JSR     PC,TIMOK
3127  011764  000401                          BR      100$
3128
3129  011766  104400                  99$:    HLT
3130  011770  104000                  100$:   SCOPE
3131
3132                                  ;TEST 016-GAP SIZE (STOP HALF)
3133  011772  112737  000016  001126  TST016: MOVB    #16,@#TSTNUM
3134  012000  012702  012036                  MOV     #1$,R2                  ;SET RETURN PC FROM TIMER
3135  012004  004737  005770                  JSR     PC,WRITE                ;WRITE A RECORD
3136  012010  005215                          INC     (R5)                    ;SET 'GO' BIT
3137  012012  004737  005602                  JSR     PC,WAITRDY
3138  012016  102421                          BVS     99$
3139  012020  004737  005310                  JSR     PC,DELAY                ;DELAY 350 MS
3140  012024  004737  006024                  JSR     PC,REVRD                ;READ REVERSE RECORD
3141  012030  004737  004730                  JSR     PC,TIMON                ;TURN TIMER ON
3142  012034  005215                          INC     (R5)                    ;SET 'GO' BIT
3143
3144  012036  005710                  1$:     TST     (R0)                    ;WAIT FOR FRAME COUNT > 0
3145  012040  001002                          BNE     2$
3146  012042  000163  005020                  JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2
3147
3148  012046  004737  005602          2$:     JSR     PC,WAITRDY              ;WAIT FOR READY BIT TO SET
3149  012052  102403                          BVS     99$
3150  012054  004737  005056                  JSR     PC,TIMOK                ;CHECK TIME
3151  012060  000401                          BR      100$
3152
```

```
3153  012062  104400                  99$:    HLT
3154  012064  104000                  100$:   SCOPE
3155
3156                                  ;TEST 017-GAP SIZE (START HALF)
3157  012066  112737  000017  001126  TST017: MOVB    #17,@#TSTNUM
3158  012074  012702  012146                  MOV     #1$,R2          ;SET RETURN PC FROM TIMER
3159  012100  004737  005770                  JSR     PC,WRITE        ;WRITE A RECORD
3160  012104  005215                          INC     (R5)            ;SET 'GO' BIT
3161  012106  004737  005602                  JSR     PC,WAITRDY      ;WAIT FOR READY
3162  012112  102427                          BVS     99$
3163  012114  004737  006024                  JSR     PC,REVRD        ;READ REVERSE THE RECORD
3164  012120  005215                          INC     (R5)            ;SET 'GO' BIT
3165  012122  004737  005602                  JSR     PC,WAITRDY      ;WAIT FOR READY
3166  012126  102421                          BVS     99$             ;BRANCH ON ERROR
3167  012130  004737  005310                  JSR     PC,DELAY        ;WAIT FOR TAPE MOTION TO STOP
3168  012134  004737  006006                  JSR     PC,READ         ;READ RECORD
3169  012140  004737  004730                  JSR     PC,TIMON        ;TURN TIMER ON
3170  012144  005215                          INC     (R5)            ;SET 'GO' BIT
3171
3172  012146  005710                  1$:     TST     (R0)            ;WAIT FOR FRAME COUNT > 0
3173  012150  001002                          BNE     2$
3174  012152  000163  005020                  JMP     TIMER(R3)       ;GO TO TIMER & RETURN VIA R2
3175
3176  012156  004737  005602          2$:     JSR     PC,WAITRDY      ;WAIT FOR READY
3177  012162  102403                          BVS     99$
3178  012164  004737  005056                  JSR     PC,TIMOK        ;CHECK TIME
3179  012170  000401                          BR      100$
3180
3181  012172  104400                  99$:    HLT
3182  012174  104000                  100$:   SCOPE
3183
3184                                  ;TEST 020- GAP SIZE (INTERRECORD)
3185                                  ;THIS TEST MEASURES TIME FROM 'GO'=1 TO 'FC REG' >0.
3186  012176  112737  000020  001126  TST020: MOVB    #20,@#TSTNUM
3187  012204  012702  012266                  MOV     #1$,R2          ;SET RETURN PC FROM TIMER
3188  012210  004737  005770                  JSR     PC,WRITE        ;WRITE A RECORD
3189  012214  005215                          INC     (R5)            ;SET 'GO' BIT
3190  012216  004737  005602                  JSR     PC,WAITRDY      ;WAIT FOR READY
3191  012222  102433                          BVS     99$
3192  012224  004737  005770                  JSR     PC,WRITE        ;WRITE SECOND RECORD
3193  012230  005215                          INC     (R5)            ;SET 'GO' BIT
3194  012232  004737  005602                  JSR     PC,WAITRDY      ;WAIT FOR READY
3195  012236  102425                          BVS     99$
3196  012240  004737  006024                  JSR     PC,REVRD        ;READ REVERSE SECOND RECORD
3197  012244  005215                          INC     (R5)            ;SET 'GO' BIT
3198  012246  004737  005602                  JSR     PC,WAITRDY      ;WAIT FOR READY
3199  012252  102417                          BVS     99$
3200  012254  004737  006024                  JSR     PC,REVRD        ;READ REVERSE FIRST RECORD
3201  012260  004737  004730                  JSR     PC,TIMON        ;TURN TIMER ON
3202  012264  005215                          INC     (R5)            ;SET 'GO' BIT
3203
3204  012266  005710                  1$:     TST     (R0)            ;WAIT FOR FRAME COUNT > 0
3205  012270  001002                          BNE     2$
3206  012272  000163  005020                  JMP     TIMER(R3)       ;GO TO TIMER & RETURN VIA R2
3207
3208  012276  004737  005602          2$:     JSR     PC,WAITRDY      ;WAIT FOR READY
```

```
3209  012302  102403                        BVS     99$
3210  012304  004737  005056                JSR     PC,TIMOK
3211  012310  000401                        BR      100$
3212
3213  012312  104400                99$:    HLT
3214  012314  104000                100$:   SCOPE
3215
3216                                ;TEST 021- GAP CONSISTANCY
3217                                ;THIS TEST MEASURES TIME FROM 'GO'=1 TO 'FC REG' > 0.
3218                                ;THE TEST REWINDS THE TAPE,WRITES 17 RECORDS WITH A DELAY FROM 1-16 MS
3219                                ;BETWEEN EACH WRITE COMMAND. AFTER THE 17. RECORDS ARE WRITTTEN THE
3220                                ;PROGRAM READ REVERSES 16 RECORDS. AT THIS POINT THE TAPE IS STOPPED BE-
3221                                ;TWEEN THE FIRST AND SECOND RECORD. A READ COMMAND IS EXECUTED TO READ
3222                                ;THE 16 RECORDS WITH THE TIME BETEWEN GO=1 TO FC > 0 STORED IN 'GAPTBL'
3223                                ;FOR EACH RECORD READ. AFTER 16 RECORDS HAVE BEEN READ THE TIME IS VER-
3224                                ;IFIED FOR EACH READ. AFTER ALL RECORD TIMES ARE VERIFIED THEY ARE AVER-
3225                                ;AGED AND PLACED IN THE 'ATIMTBL' (BY SCOPE). THE ABOVE PROCESS IS RE-
3226                                ;PEATED FOR EACH ITERATION.
3227
3228  012316  112737  000021  001126  TST021: MOVB    #21,@#TSTNUM
3229  012324  012702  012462                MOV     #4$,R2          ;SET RETURN PC FROM TIMER
3230  012330  004737  005706                JSR     PC,.REWIND      ;REWIND SLAVE
3231  012334  102530                        BVS     99$             ;BRANCH IF ERROR ON REWIND
3232  012336  005037  001120                CLR     DELTIM          ;CLEAR VARIABLE DELAY TIME
3233  012342  012700  000021                MOV     #17.,R0         ;SET # OF RECORDS TO WRITE
3234  012346  004737  005770          1$:   JSR     PC,WRITE        ;WRITE 17. RECORDS
3235  012352  005215                        INC     (R5)            ;SET 'GO' BIT
3236  012354  004737  005602                JSR     PC,WAITRDY      ;WAIT FOR READY
3237  012360  102516                        BVS     99$
3238  012362  004737  005340                JSR     PC,DELAYV       ;DELAY BEFORE WRITING NEXT REC.
3239  012366  063737  001014  001120        ADD     GAPDEL,DELTIM   ;ADD 1MS TO DELAY TIME
3240  012374  005300                        DEC     R0              ;DECREMENT RECORDS WRITTEN COUNT
3241  012376  001363                        BNE     1$
3242
3243  012400  012700  000021          2$:   MOV     #17.,R0         ;SET # OF RECS. TO REVERSE READ
3244  012404  004737  006024                JSR     PC,REVRD        ;REVERSE READ 17. RECORDS
3245  012410  005215                        INC     (R5)            ;SET 'GO' BIT
3246  012412  004737  005602                JSR     PC,WAITRDY      ;WAIT FOR READY
3247  012416  102477                        BVS     99$
3248  012420  005300                        DEC     R0              ;DECREMENT RECORD COUNT
3249  012422  001370                        BNE     2$
3250
3251  012424  012700  000020                MOV     #16.,R0         ;SET # OF RECORDS TO READ
3252  012430  012701  001060                MOV     #GAPTBL,R1      ;SET PTR TO GAP TABLE FOR TEST
3253  012434  004737  006006                JSR     PC,READ         ;READ A RECORD
3254  012440  005215                        INC     (R5)            ;SET 'GO' BIT
3255
3256  012442  004737  005602          3$:   JSR     PC,WAITRDY      ;WAIT FOR READY
3257  012446  102463                        BVS     99$
3258  012450  004737  006006                JSR     PC,READ         ;READ NEXT RECORD
3259  012454  004737  004730                JSR     PC,TIMON        ;TURN TIMER ON
3260  012460  005215                        INC     (R5)            ;SET 'GO' BIT
3261
3262  012462  005765  000006          4$:   TST     FC(R5)          ;WAIT FOR FRAME COUNT > 0
3263  012466  001002                        BNE     5$
3264  012470  000163  005020                JMP     TIMER(R3)       ;GO TO TIMER & RETURN VIA R2
```

```
3265
3266  012474  004737  005602          5$:   JSR     PC,WAITRDY              ;WAIT FOR READY
3267  012500  102446                        BVS     99$
3268  012502  010421                        MOV     R4,(R1)+                ;STORE TIME IN GAPTBL
3269  012504  005300                        DEC     R0                      ;DECREMENT # OF RECORDS READ
3270  012506  001355                        BNE     3$
3271
3272  012510  105037  001124                CLRB    @#GAP                   ;SET GAP # 0
3273  012514  012700  000020                MOV     #16.,R0
3274  012520  012701  001060                MOV     #GAPTBL,R1
3275
3276  012524  012104                  6$:   MOV     (R1)+,R4                ;GET GAP TICK COUNT
3277  012526  004737  005166                JSR     PC,GAPOK                ;CHECK TIME
3278  012532  105237  001124                INCB    @#GAP                   ;INCREMENT GAP #
3279  012536  122737  000020  001124        CMPB    #16.,@#GAP              ;BRANCH IF ALL GAPS NOT CHECKED
3280  012544  001367                        BNE     6$
3281
3282  012546  012700  000020                MOV     #16.,R0                 ;SETUP TO AVERAGE GAP SIZES
3283  012552  012701  001060                MOV     #GAPTBL,R1              ;SET PTR TO TABLE
3284  012556  005002                        CLR     R2                      ;CLEAR 'SUM' REGISTERS
3285  012560  005003                        CLR     R3
3286  012562  062102                  7$:   ADD     (R1)+,R2                ;ADD ALL GAP SIZES TOGETHER
3287  012564  005503                        ADC     R3
3288  012566  005300                        DEC     R0
3289  012570  001374                        BNE     7$
3290  012572  012700  000004                MOV     #4,R0                   ;NOW DIVIDE BY 16.
3291  012576  006203                  8$:   ASR     R3                      ;BY SHIFTING 4 PLACES RIGHT
3292  012600  006002                        ROR     R2
3293  012602  005300                        DEC     R0
3294  012604  001374                        BNE     8$
3295  012606  010204                        MOV     R2,R4                   ;MOVE AVERAGED TIMES TO R4
3296  012610  004737  005056                JSR     PC,TIMOK                ;CHECK AVERAGED TIMES
3297  012614  000401                        BR      100$
3298
3299  012616  104400                  99$:  HLT
3300  012620  104000                  100$: SCOPE
3301
3302
3303
3304                                  ;TEST 022-DATA TIME (800BPI)
3305                                  ;THIS TEST MEASURES THE TIME FROM FC REG >-6400 TO 'RDY' = 1.
3306  012622  112737  000022  001126  TST022: MOVB   #022,@#TSTNUM
3307  012630  012702  012710                MOV     #3$,R2                  ;SET RETURN PC FROM TIMER
3308  012634  004737  005706                JSR     PC,.REWIND              ;REWIND SLAVE
3309  012640  102442                        BVS     99$                     ;BRANCH IF ERROR ON REWIND
3310  012642  052765  001700  000032        BIS     #NORM11,TC(R5)          ;SET 800 BPI
3311  012650  004337  006124                JSR     R3,TMCMD                ;WRITE 3200. WORD RECORD
3312  012654  016674                        .WORD   WTBUF
3313  012656  171600                        .WORD   -3200.
3314  012660  163400                        .WORD   -6400.
3315  012662  000060                        .WORD   WFWD
3316  012664  005215                        INC     (R5)                    ;SET 'GO' BIT
3317
3318  012666  022710  163400          1$:   CMP     #-6400.,(R0)            ;WAIT FOR WRITING TO START
3319  012672  001004                        BNE     2$
3320  012674  032711  040000                BIT     #ERR,(R1)               ;MONITOR ERROR BIT
```

```
3321  012700  001022                    BNE     99$
3322  012702  000771                    BR      1$
3323
3324  012704                    2$:
3325  012704  004737  004730            JSR     PC,TIMON                ;TURN TIMER ON
3326  012710  105711            3$:     TSTB    (R1)                    ;BRANCH WHEN READY SETS
3327  012712  100402                    BMI     4$
3328  012714  000163  005020            JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2
3329
3330  012720  012700  000003    4$:     MOV     #3,R0                   ;SET SHIFT COUNT
3331  012724  006204            5$:     ASR     R4
3332  012726  005300                    DEC     R0
3333  012730  001375                    BNE     5$
3334  012732  004737  005602            JSR     PC,WAITRDY
3335  012736  102403                    BVS     99$
3336  012740  004737  005056            JSR     PC,TIMOK                ;CHECK TIME
3337  012744  000401                    BR      100$
3338
3339  012746  104400            99$:    HLT
3340  012750  104000            100$:   SCOPE
3341
3342                            ;TEST 023-DATA TIME (1600BPI)
3343                            ;THIS TEST MEASURES THE TIME FROM FC REG >-6400 TO 'RDY' = 1.
3344  012752  112737  000023  001126  TST023: MOVB    #023,@#TSTNUM
3345  012760  012702  013046            MOV     #3$,R2                  ;SET RETURN PC FROM TIMER
3346  012764  004737  005706            JSR     PC,.REWIND              ;REWIND SLAVE
3347  012770  102442                    BVS     99$                     ;BRANCH IF ERROR ON REWIND
3348  012772  042765  003700  000032    BIC     #3700,TC(R5)            ;CLEAR CURRENT DENSITY
3349  013000  052765  002300  000032    BIS     #PE1600,TC(R5)          ;SET 1600 BPI
3350  013006  004337  006124            JSR     R3,TMCMD                ;WRITE 3200. WORD RECORD
3351  013012  016674                    .WORD   WTBUF
3352  013014  171600                    .WORD   -3200.
3353  013016  163400                    .WORD   -6400.
3354  013020  000060                    .WORD   WFWD
3355  013022  005215                    INC     (R5)                    ;SET 'GO' BIT
3356
3357  013024  022710  163400    1$:     CMP     #-6400.,(R0)            ;BRANCH WHEN WRITING STARTS
3358  013030  001004                    BNE     2$
3359  013032  032711  040000            BIT     #ERR,(R1)               ;MONITOR ERROR BIT
3360  013036  001017                    BNE     99$
3361  013040  000771                    BR      1$
3362
3363  013042                    2$:
3364  013042  004737  004730            JSR     PC,TIMON                ;TURN TIMER ON
3365  013046  105711            3$:     TSTB    (R1)                    ;BRANCH WHEN READY SETS
3366  013050  100402                    BMI     4$
3367  013052  000163  005020            JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2
3368
3369  013056  006204            4$:     ASR     R4                      ;DIVIDE TIME BY 4
3370  013060  006204                    ASR     R4
3371  013062  004737  005602            JSR     PC,WAITRDY
3372  013066  102403                    BVS     99$
3373  013070  004737  005056            JSR     PC,TIMOK                ;CHECK TIME
3374  013074  000401                    BR      100$
3375
3376  013076  104400            99$:    HLT
```

```
3377  013100  104000                  100$:   SCOPE
3378
3379                                  ;TEST 024-ERASE
3380                                  ;THIS TEST MEASURES TIME FROM 'GO'=1 TO 'RDY'=1.
3381  013102  112737  000024  001126  TST024: MOVB    #24,@#TSTNUM
3382  013110  012702  013172                  MOV     #2$,R2                  ;SET RETURN PC FROM TIMER
3383  013114  004737  005706                  JSR     PC,.REWIND              ;REWIND SLAVE
3384  013120  102436                        BVS     99$                     ;BRANCH IF ERROR ON REWIND
3385  013122  004737  005544                  JSR     PC,RHINIT               ;SET NRZ
3386  013126  004737  005770                  JSR     PC,WRITE                ;WRITE A RECORD
3387  013132  005215                        INC     (R5)                    ;SET 'GO' BIT
3388  013134  004737  005602                  JSR     PC,WAITRDY
3389  013140  102426                        BVS     99$
3390  013142  012737  013150  001002          MOV     #1$,@#SCPADR
3391  013150  004337  006124          1$:     JSR     R3,@#TMCMD
3392  013154  000000                        .WORD   0
3393  013156  000000                        .WORD   0
3394  013160  000000                        .WORD   0
3395  013162  000024                        .WORD   ERASE
3396  013164  004737  004730                  JSR     PC,TIMON                ;TURN TIMER ON
3397  013170  005215                        INC     (R5)                    ;SET 'GO' BIT
3398
3399  013172  105711          2$:     TSTB    (R1)                    ;BRANCH WHEN READY SETS
3400  013174  100402                        BMI     3$
3401  013176  000163  005020                  JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2
3402
3403  013202  004737  005602          3$:     JSR     PC,WAITRDY
3404  013206  102403                        BVS     99$
3405  013210  004737  005056                  JSR     PC,TIMOK
3406  013214  000401                        BR      100$
3407
3408  013216  104400                  99$:    HLT
3409  013220  104000                  100$:   SCOPE
3410
3411                                  ;TEST 025 TAPE MARK
3412                                  ;THIS TEST MEASURES TIME FROM 'GO'=1 TO 'RDY'=1.
3413  013222  112737  000025  001126  TST025: MOVB    #25,@#TSTNUM
3414  013230  012702  013272                  MOV     #1$,R2                  ;SET RETURN PC FROM TIMER
3415  013234  004737  005770                  JSR     PC,WRITE                ;WRITE A RECORD
3416  013240  005215                        INC     (R5)                    ;SET 'GO' BIT
3417  013242  004737  005602                  JSR     PC,WAITRDY
3418  013246  102423                        BVS     99$
3419  013250  004337  006124                  JSR     R3,@#TMCMD
3420  013254  000000                        .WORD   0
3421  013256  000000                        .WORD   0
3422  013260  000000                        .WORD   0
3423  013262  000026                        .WORD   WFMK
3424  013264  004737  004730                  JSR     PC,TIMON                ;TURN TIMER ON
3425  013270  005215                        INC     (R5)                    ;SET 'GO' BIT
3426
3427  013272  105711          1$:     TSTB    (R1)                    ;BRANCH WHEN READY SETS
3428  013274  100402                        BMI     2$
3429  013276  000163  005020                  JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2
3430
3431  013302  004737  005602          2$:     JSR     PC,WAITRDY
3432  013306  102403                        BVS     99$
```

```
3433  013310  004737  005056          JSR     PC,TIMOK
3434  013314  000401                  BR      100$
3435
3436  013316  104400            99$:  HLT
3437  013320                    100$:
3438  013320  004737  005706          JSR     PC,.REWIND          ;REWIND SLAVE
3439  013324  102774                  BVS     99$                 ;BRANCH IF ERROR ON REWIND
3440  013326  104000                  SCOPE
3441
```

```
3442  013330  032777  002000  165442  FINISH: BIT     #SW10,@SWR              ;DO NOT SPACE PAPER
3443  013336  001011                          BNE     2$                      ;IF USER SELECTED NO OUTPUT
3444  013340  005737  006372                  TST     CHNFLG                  ;OR IF IN CHAIN MODE
3445  013344  001006                          BNE     2$
3446  013346  012700  000012                  MOV     #10.,R0                 ;SET LINE FEED COUNT
3447  013352  000004  001402          1$:     TYPE,CRLF
3448  013356  005300                          DEC     R0
3449  013360  001374                          BNE     1$
3450
3451
3452  013362  105237  001005          2$:     INCB    @#SLVNUM                ;SET NEXT SLAVE #
3453  013366  005237  001006                  INC     @#SLVPTR                ;AND ITS POINTER
3454  013372  122737  000010  001005          CMPB    #8.,@#SLVNUM            ;BRANCH IF LAST SLAVE (7)
3455  013400  001402                          BEQ     3$
3456  013402  000137  007442                  JMP     @#BEGIN                 ;BEGIN TEST ON NEXT SLAVE
3457  013406  105037  001005          3$:     CLRB    @#SLVNUM                ;SET SLAVE #0
3458  013412  105237  001004                  INCB    @#DRVNUM                ;AND INCREMENT DRIVE #
3459  013416  122737  000010  001004          CMPB    #8.,@#DRVNUM            ;AND CHECK IF LAST DRIVE
3460  013424  001402                          BEQ     END
3461  013426  000137  007442                  JMP     @#BEGIN
3462
3463  013432  105737  001132          END:    TSTB    @#UNTFND                ;BRANCH IF A UNIT WAS FOUND
3464  013436  001004                          BNE     1$
3465  013440  000004  015044                  TYPE,E.UNIT
3466  013444  000137  006274                  JMP     @#INIT
3467  013450  105237  001134          1$:     INCB    @#PSCNT         ;INCREMENT PASS COUNT
3468  013454  000004  014275                  TYPE,M.EOP
3469  013460  113702  001134                  MOVB    @#PSCNT,R2      ;GET PASSCOUNT
3470  013464  004737  003134                  JSR     PC,TYPOCT       ;AND TYPE IT
3471  013470  000004  001402                  TYPE,CRLF
3472  013474  013700  000042                  MOV     @#42,R0         ;GET ACT11 RETURN ADDRESS
3473  013500  001405                          BEQ     HERE            ;BRANCH IF NOT ACT11
3474  013502  000005                          RESET
3475  013504  004710                  $ENDAD: JSR     PC,(R0)
3476  013506  000240                          NOP
3477  013510  000240                          NOP
3478  013512  000240                          NOP
3479  013514  000240                  HERE:   NOP
3480  013516  005737  006372                  TST     CHNFLG          ;BRANCH IF CHAIN MODE
3481  013522  001004                          BNE     1$
3482  013524  032777  000100  165246          BIT     #SW06,@SWR              ;BRANCH IF NOT CONTINOUS LOOP
3483  013532  001402                          BEQ     2$
3484  013534  000137  007414          1$:     JMP     @#RSTRT                 ;RESTART
3485  013540  000000                  2$:     HALT
3486  013542  000005                          RESET
3487  013544  000137  006274                  JMP     @#INIT                  ;RESTART
```

```
3488                                    ;SKEW TAPE TIMING TESTS
3489                                    ;THE FOLLOWING TESTS REQUIRE A SPECIALLY WRITTEN 800 BPI SKEW TAPE
3490  013550  012737  013556  001002    SKEWTST:MOV     #TST026,@#SCPADR        ;SET SCOPE POINTER
3491
3492                                    ;TEST 026- SKEW TAPE SPEED TEST-FORWARD
3493                                    ;THIS TEST READS 32'' OF TAPE (26400.-800. = 25600. FRAMES),THEN
3494                                    ;DIVIDES TIME BY 32. TO GET TIME TO READ 1'' (800. FRAMES) OF TAPE.
3495  013556  112737  000026  001126    TST026: MOVB    #26,@#TSTNUM
3496  013564  012702  013652                    MOV     #2$,R2                  ;SET RETURN PC FROM TIMER
3497  013570  004737  005706                    JSR     PC,.REWIND              ;REWIND SLAVE
3498  013574  102445                            BVS     99$                     ;BRANCH IF ERROR ON REWIND
3499  013576  052765  001700  000032            BIS     #NORM11,TC(R5)          ;SET 800 BPI
3500  013604  052765  000010  000010            BIS     #BAI,CS2(R5)            ;INHIBIT BUS ADDRESS INCREMENT
3501  013612  004337  006124                    JSR     R3,@#TMCMD              ;READ 32'' OF TAPE-FORWARD
3502  013616  016674                            .WORD   RDBUF
3503  013620  177777                            .WORD   -1.
3504  013622  063440                    10$:    .WORD   26400.                  ;FRAME COUNT
3505  013624  000070                            .WORD   RDFWD
3506  013626  005215                            INC     (R5)                    ;SET 'GO' BIT
3507
3508  013630  032765  075027  000014    1$:     BIT     #HRDERR,ER(R5)          ;BRANCH IF ANY HARD ERROR BIT SETS
3509  013636  001024                            BNE     99$
3510  013640  022710  001440                    CMP     #800.,(R0)              ;WAIT FOR FIRST 800 FRAMES
3511  013644  101371                            BHI     1$                      ;TO BE READ
3512
3513  013646  004737  004730                    JSR     PC,TIMON                ;TURN TIMER ON
3514  013652  023710  013622            2$:     CMP     @#10$,(R0)              ;WAIT FOR READING TO FINISH
3515  013656  103402                            BLO     3$
3516  013660  000163  005020                    JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2
3517
3518  013664  012700  000005            3$:     MOV     #5,R0                   ;DIVIDE TIME BY 32.
3519  013670  006204                    4$:     ASR     R4
3520  013672  005300                            DEC     R0
3521  013674  001375                            BNE     4$
3522  013676  004737  005544                    JSR     PC,RHINIT               ;INIT DRIVE
3523  013702  004737  005056                    JSR     PC,TIMOK                ;CHECK TIME
3524  013706  000401                            BR      100$
3525
3526  013710  104400                    99$:    HLT
3527  013712  104000                    100$:   SCOPE
3528
3529                                    ;TEST 027-SKEW TAPE SPEED TEST-REVERSE
3530                                    ;THIS TEST READS FORWARD 40'' (32000. FRAMES) OF TAPE, THEN READS REVERSE
3531                                    ;32'' (26400.-800. = 25600. FRAMES) OF TAPE. THE TIME IS THEN DIVIDED BY
3532                                    ;32. TO GET TIME TO READ 1'' (800. FRAMES) OF TAPE.
3533  013714  112737  000027  001126    TST027: MOVB    #27,@#TSTNUM
3534  013722  012702  014060                    MOV     #3$,R2                  ;SET RETURN PC FROM TIMER
3535  013726  004737  005706                    JSR     PC,.REWIND              ;REWIND SLAVE
3536  013732  102471                            BVS     99$                     ;BRANCH IF ERROR ON REWIND
3537  013734  052765  001700  000032            BIS     #NORM11,TC(R5)
3538  013742  052765  000010  000010            BIS     #BAI,CS2(R5)
3539  013750  004337  006124                    JSR     R3,@#TMCMD              ;READ FORWARD 32000. FRAMES
3540  013754  016674                            .WORD   RDBUF
3541  013756  177777                            .WORD   -1.                     ;WORD COUNT
3542  013760  076400                    10$:    .WORD   32000.                  ;FRAME COUNT
3543  013762  000070                            .WORD   RDFWD                   ;READ FORWARD
```

```
3544  013764  005215                          INC     (R5)                    ;SET 'GO' BIT
3545
3546  013766  032711  040000          1$:     BIT     #ERR,(R1)               ;BRANCH IF ERROR BITS SETS
3547  013772  001051                          BNE     99$
3548  013774  023710  013760                  CMP     @#10$,(R0)
3549  014000  101372                          BHI     1$
3550
3551  014002  004737  005544                  JSR     PC,RHINIT               ;INIT DRIVE
3552  014006  004737  005310                  JSR     PC,DELAY                ;WAIT FOR TAPE MOTION TO STOP
3553  014012  052765  000010  000010          BIS     #BAI,CS2(R5)            ;INHIBIT BUS ADDRESS INCRENENT
3554  014020  004337  006124                  JSR     R3,@#TMCMD              ;READ REVERSE 32'' OF TAPE
3555  014024  016674                          .WORD   RDBUF                   ;READ BUFFER
3556  014026  177777                          .WORD   -1.                     ;WORD COUNT
3557  014030  063440                  11$:    .WORD   26400.                  ;FRAME COUNT
3558  014032  000076                          .WORD   RDREV                   ;READ REVERSE
3559  014034  005215                          INC     (R5)                    ;SET 'GO' BIT
3560
3561  014036  032765  075027  000014  2$:     BIT     #HRDERR,ER(R5)          ;EXIT TEST IF ERROR BIT SETS
3562  014044  001024                          BNE     99$
3563  014046  022710  001440                  CMP     #800.,(R0)              ;WAIT FOR FIRST 800 FRAMES
3564  014052  101371                          BHI     2$                      ;TO BE READ
3565
3566  014054  004737  004730                  JSR     PC,TIMON                ;TURN TIMER ON
3567  014060  023710  014030          3$:     CMP     @#11$,(R0)              ;WAIT FOR ALL FRAMES TO BE READ
3568  014064  103402                          BLO     4$
3569  014066  000163  005020                  JMP     TIMER(R3)               ;GO TO TIMER & RETURN VIA R2
3570
3571  014072  012700  000005          4$:     MOV     #5,R0                   ;DIVIDE TIME BY 32.
3572  014076  006204                  5$:     ASR     R4
3573  014100  005300                          DEC     R0
3574  014102  001375                          BNE     5$
3575  014104  004737  005544                  JSR     PC,RHINIT
3576  014110  004737  005056                  JSR     PC,TIMOK
3577  014114  000401                          BR      100$
3578
3579  014116  104400                  99$:    HLT
3580  014120                          100$:
3581  014120  004737  005706                  JSR     PC,.REWIND              ;REWIND SLAVE
3582  014124  102774                          BVS     99$                     ;BRANCH IF ERROR ON REWIND
3583  014126  104000                          SCOPE
3584
3585  014130  000137  013330                  JMP     @#FINISH
3586
3587
3588
```

```
3589                                            .SBTTL    PROGRAM MESSAGES
3590                                    ;OPERATOR INSTRUCTIONS
3591  014134  005015  046524  031460  M.NAM:   .ASCII  <CR><LF>'TM03-TE16/TU77 DRIVE FUNCTION TIMER (CZTEEC0)';++B
3592  014142  052055  030505  027466
3593  014150  052524  033467  042040
3594  014156  044522  042526  043040
3595  014164  047125  052103  047511
3596  014172  020116  044524  042515
3597  014200  020122  041450  052132
3598  014206  042505  030103     051
3599  014213     015  052012  050131          .ASCIZ  <CR><LF>'TYPE <CR> TO TERMINATE RESPONSE & ^C TO RESTART'
3600  014220  020105  041474  037122
3601  014226  052040  020117  042524
3602  014234  046522  047111  052101
3603  014242  020105  042522  050123
3604  014250  047117  042523  023040
3605  014256  057040  020103  047524
3606  014264  051040  051505  040524
3607  014272  052122     000
3608  014275     015  042412  042116  M.EOP:   .ASCIZ  <CR><LF>'END OF PASS '
3609  014302  047440  020106  040520
3610  014310  051523  000040
3611  014314  005015  040510  042122  M.HSWR: .ASCIZ  <CR><LF>'HARDWARE SWR IN USE'<CR><LF>
3612  014322  040527  042522  051440
3613  014330  051127  044440  020116
3614  014336  051525  006505  000012
3615  014344  005015  042522  047515  I.REM:   .ASCIZ  <CR><LF>'REMOVE TMDP FROM SLAVE 0. CLEAR LOC. 40.'
3616  014352  042526  052040  042115
3617  014360  020120  051106  046517
3618  014366  051440  040514  042526
3619  014374  030040  020056  046103
3620  014402  040505  020122  047514
3621  014410  027103  032040  027060
3622  014416     000
3623  014417     015  052012  050131  I.REG:   .ASCIZ  <CR><LF>'TYPE FIRST ADDRESS OF CONTROLLER  '
3624  014424  020105  044506  051522
3625  014432  020124  042101  051104
3626  014440  051505  020123  043117
3627  014446  041440  047117  051124
3628  014454  046117  042514  020122
3629  014462  000040
3630  014464  054524  042520  052040  I.DRVS: .ASCIZ  %TYPE TM03 DRIVE #'S TO BE TESTED:  ALL %
3631  014472  030115  020063  051104
3632  014500  053111  020105  023443
3633  014506  020123  047524  041040
3634  014514  020105  042524  052123
3635  014522  042105  020072  040440
3636  014530  046114  000040
3637  014534  047506  020122  046524  I.SLVS: .ASCII  'FOR TM03 DRIVE '
3638  014542  031460  042040  044522
3639  014550  042526     040
3640  014553     060  020055  054524  I.DRV:   .ASCIZ  %0- TYPE SLAVE #'S TO BE TESTED: ALL %
3641  014560  042520  051440  040514
3642  014566  042526  021440  051447
3643  014574  052040  020117  042502
3644  014602  052040  051505  042524
```

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3645  014610  035104  040440  046114
3646  014616  000040
3647  014620  050123  042505  020104  I.SPD:  .ASCIZ  'SPEED TESTS? (YES/NO): NO '
3648  014626  042524  052123  037523
3649  014634  024040  042531  027523
3650  014642  047516  035051  047040
3651  014650  020117     000
3652  014653     015  042412  042116  M.EOT:  .ASCIZ  <CR><LF>'END OF TAPE'<CR><LF>
3653  014660  047440  020106  040524
3654  014666  042520  005015     000
3655
3656                          ;ERROR MESSAGES
3657  014673     015  052012  040522  E.TRP4: .ASCIZ  <CR><LF>'TRAPPED TO 4'
3658  014700  050120  042105  052040
3659  014706  020117  000064
3660  014712  047516  041440  047117  E.NCON: .ASCIZ  'NO CONTROLLER AT ADDRESS SPECIFIED'<CR><LF>
3661  014720  051124  046117  042514
3662  014726  020122  052101  040440
3663  014734  042104  042522  051523
3664  014742  051440  042520  044503
3665  014750  044506  042105  005015
3666  014756     000
3667  014757     124  030115  020063  E.NDRV: .ASCIZ  'TM03 DRIVE '
3668  014764  051104  053111  020105
3669  014772     000
3670  014773     104  044522  042526  E.NSLV: .ASCII  'DRIVE '
3671  015000     040
3672  015001     060  051440  040514  E.DRV:  .ASCII  '0 SLAVE '
3673  015006  042526     040
3674  015011     060  047040  052117  E.NAVA: .ASCIZ  '0 NOT AVAILABLE FOR TEST'<CR><LF>
3675  015016  040440  040526  046111
3676  015024  041101  042514  043040
3677  015032  051117  052040  051505
3678  015040  006524  000012
3679  015044  047516  052040  030115  E.UNIT: .ASCIZ  'NO TM03-TE16/TU77 UNIT FOUND TO TEST'<CR><LF>
3680  015052  026463  042524  033061
3681  015060  052057  033525  020067
3682  015066  047125  052111  043040
3683  015074  052517  042116  052040
3684  015102  020117  042524  052123
3685  015110  005015     000
3686  015113     123  043117  020124  E.SFT:  .ASCIZ  'SOFT ERROR (DATA)'<CR><LF>
3687  015120  051105  047522  020122
3688  015126  042050  052101  024501
3689  015134  005015     000
3690  015137     124  051505  020124  E.HDR:  .ASCIZ  'TEST # '
3691  015144  020043     000
3692  015147     040  042504  044526  E.HDR1: .ASCII  ' DEVICE ERROR'<CR><LF>
3693  015154  042503  042440  051122
3694  015162  051117  005015
3695  015166  051503  004461  041527          .ASCIZ  'CS1'<HT>'WC'<HT>'BA'<HT>'FC'<HT>'CS2'<HT>'DS'<HT>'ER'<HT>'TC'<CR><LF>
3696  015174  041011  004501  041506
3697  015202  041411  031123  042011
3698  015210  004523  051105  052011
3699  015216  006503  000012
3700  015222  047440  052125  047440  E.HDR2: .ASCIZ  ' OUT OF RANGE ERROR'<CR><LF>
```

```
  3701  015230  020106  040522  043516
  3702  015236  020105  051105  047522
  3703  015244  006522  000012
  3704  015250  005015  044524  042515  E.TIMOV:        .ASCIZ  <CR><LF>'TIMER OVERFLOWED'<CR><LF>
  3705  015256  020122  053117  051105
  3706  015264  046106  053517  042105
  3707  015272  005015     000
  3708  015275     015  052012  046511  E.TIMEX:        .ASCIZ  <CR><LF>'TIME EXPIRED WAITING FOR RDY'<CR><LF>
  3709  015302  020105  054105  044520
  3710  015310  042522  020104  040527
  3711  015316  052111  047111  020107
  3712  015324  047506  020122  042122
  3713  015332  006531  000012
  3714  015336  043440  050101  021440  E.GAP:  .ASCIZ  ' GAP # '
  3715  015344  000040
  3716
  3717                                  ;TIME DOCUMENT LINES
  3718  015346  005015  025052  025052  L.HDR1: .ASCIZ  <CR><LF>'**********************************************************************
  3719  015354  025052  025052  025052
  3720  015362  025052  025052  025052
  3721  015370  025052  025052  025052
  3722  015376  025052  025052  025052
  3723  015404  025052  025052  025052
  3724  015412  025052  025052  025052
  3725  015420  025052  025052  025052
  3726  015426  025052  025052  025052
  3727  015434  025052  025052  025052
  3728  015442  025052  025052  025052
  3729  015450  025052  025052  025052
  3730  015456  025052  005015     000
  3731  015463     052  052040  030115  L.HDR2: .ASCII  '* TM03 DRIVE FUNCTION TIMES- DRIVE # '
  3732  015470  020063  051104  053111
  3733  015476  020105  052506  041516
  3734  015504  044524  047117  052040
  3735  015512  046511  051505  020055
  3736  015520  051104  053111  020105
  3737  015526  020043
  3738  015530  020060  046123  053101  L.DRV:  .ASCII  '0 SLAVE # '
  3739  015536  020105  020043
  3740  015542  020060  000040          L.SLV:  .ASCIZ  '0  '
  3741  015546  042524  033061  000040  L.TE16: .ASCIZ  'TE16 '
  3742  015554  052524  033467  000040  L.TU77: .ASCIZ  'TU77 '
  3743  015562  042523  044522  046101  L.SER:  .ASCIZ  'SERIAL # '
  3744  015570  021440  000040
  3745  015574  006440  025012  005015  L.HDR3: .ASCII  ' '<CR><LF>'*'<CR><LF>
  3746  015602  020052  052506  041516          .ASCIZ  '* FUNCTION'<HT><HT>'TIME(SPECIFICATION)'<HT>'TIME(ACTUAL)'<CR><LF>
  3747  015610  044524  047117  004411
  3748  015616  044524  042515  051450
  3749  015624  042520  044503  044506
  3750  015632  040503  044524  047117
  3751  015640  004451  044524  042515
  3752  015646  040450  052103  040525
  3753  015654  024514  005015     000
  3754
  3755  015661     122  047101  042507  L.RNG:  .ASCIZ  'RANGE=<'
  3756  015666  036075     000
```

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  3757  015671     101  052103  040525  L.ACT:  .ASCIZ  'ACTUAL='
  3758  015676  036514     000
  3759
  3760                               ;TEST DESCRIPTOR HEADERS
  3761  015701     052  020052  047111  A.T000: .ASCIZ  '** INITIALIZATION ERROR'
  3762  015706  052111  040511  044514
  3763  015714  040532  044524  047117
  3764  015722  042440  051122  051117
  3765  015730     000
  3766  015731     052  053440  044522  A.T001: .ASCIZ  '* WRITE FROM BOT'<HT>
  3767  015736  042524  043040  047522
  3768  015744  020115  047502  004524
  3769  015752     000
  3770  015753     052  053440  044522  A.T002: .ASCIZ  '* WRITE START'<HT><HT>
  3771  015760  042524  051440  040524
  3772  015766  052122  004411     000
  3773  015773     052  053440  044522  A.T003: .ASCIZ  '* WRITE SHUTDOWN'<HT>
  3774  016000  042524  051440  052510
  3775  016006  042124  053517  004516
  3776  016014     000
  3777  016015     052  053440  044522  A.T004: .ASCIZ  '* WRITE SETTLEDOWN'<HT>
  3778  016022  042524  051440  052105
  3779  016030  046124  042105  053517
  3780  016036  004516     000
  3781  016041     052  051040  040505  A.T005: .ASCIZ  '* READ FROM BOT'<HT><HT>
  3782  016046  020104  051106  046517
  3783  016054  041040  052117  004411
  3784  016062     000
  3785  016063     052  051040  040505  A.T006: .ASCIZ  '* READ START'<HT><HT>
  3786  016070  020104  052123  051101
  3787  016076  004524  000011
  3788  016102  020052  042522  042101  A.T007: .ASCIZ  '* READ SHUTDOWN'<HT><HT>
  3789  016110  051440  052510  042124
  3790  016116  053517  004516  000011
  3791  016124  020052  042522  042101  A.T010: .ASCIZ  '* READ SETTLEDOWN'<HT>
  3792  016132  051440  052105  046124
  3793  016140  042105  053517  004516
  3794  016146     000
  3795  016147     052  051040  040505  A.T011: .ASCIZ  '* READ REV START'<HT>
  3796  016154  020104  042522  020126
  3797  016162  052123  051101  004524
  3798  016170     000
  3799  016171     052  051040  040505  A.T012: .ASCIZ  '* READ REV SHUTDOWN'<HT>
  3800  016176  020104  042522  020126
  3801  016204  044123  052125  047504
  3802  016212  047127  000011
  3803  016216  020052  042522  042101  A.T013: .ASCIZ  '* READ REV SETTLEDOWN'<HT>
  3804  016224  051040  053105  051440
  3805  016232  052105  046124  042105
  3806  016240  053517  004516     000
  3807  016245     052  052040  051125  A.T014: .ASCIZ  '* TURN AROUND DELAY F-R'<HT>
  3808  016252  020116  051101  052517
  3809  016260  042116  042040  046105
  3810  016266  054501  043040  051055
  3811  016274  000011
  3812  016276  020052  052524  047122  A.T015: .ASCIZ  '* TURN AROUND DELAY R-F'<HT>
```

```
3813  016304  040440  047522  047125
3814  016312  020104  042504  040514
3815  016320  020131  026522  004506
3816  016326     000
3817  016327     052  043440  050101  A.T016: .ASCIZ  '* GAP SIZE-STOP HALF'<HT>
3818  016334  051440  055111  026505
3819  016342  052123  050117  044040
3820  016350  046101  004506     000
3821  016355     052  043440  050101  A.T017: .ASCIZ  '* GAP SIZE-START HALF'<HT>
3822  016362  051440  055111  026505
3823  016370  052123  051101  020124
3824  016376  040510  043114  000011
3825  016404  020052  040507  020120  A.T020: .ASCIZ  '* GAP SIZE-INTERRECORD'<HT>
3826  016412  044523  042532  044455
3827  016420  052116  051105  042522
3828  016426  047503  042122  000011
3829  016434  020052  040507  020120  A.T021: .ASCIZ  '* GAP CONSISTANCY'<HT>
3830  016442  047503  051516  051511
3831  016450  040524  041516  004531
3832  016456     000
3833  016457     052  042040  052101  A.T022: .ASCIZ  '* DATA TIME-800BPI'<HT>
3834  016464  020101  044524  042515
3835  016472  034055  030060  050102
3836  016500  004511     000
3837  016503     052  042040  052101  A.T023: .ASCIZ  '* DATA TIME-1600BPI'<HT>
3838  016510  020101  044524  042515
3839  016516  030455  030066  041060
3840  016524  044520  000011
3841  016530  020052  051105  051501  A.T024: .ASCIZ  '* ERASE GAP TIME'<HT>
3842  016536  020105  040507  020120
3843  016544  044524  042515  000011
3844  016552  020052  051127  052111  A.T025: .ASCIZ  '* WRITE FILE MARK'<HT>
3845  016560  020105  044506  042514
3846  016566  046440  051101  004513
3847  016574     000
3848  016575     052  052040  050101  A.T026: .ASCIZ  '* TAPE SPEED-FWD'<HT>
3849  016602  020105  050123  042505
3850  016610  026504  053506  004504
3851  016616     000
3852  016617     052  052040  050101  A.T027: .ASCIZ  '* TAPE SPEED-REV'<HT>
3853  016624  020105  050123  042505
3854  016632  026504  042522  004526
3855  016640     000
3856
3857  016641     015  057012  000107  L.CNTG: .ASCIZ  <CR><LF>'^G'
3858  016646  005015  053523  036522  L.SWR:  .ASCIZ  <CR><LF>'SWR='
3859  016654     000
3860  016655     040  047040  053505  L.NEW:  .ASCIZ  '  NEW= '
3861  016662  020075     000
3862  016665     015  037412  005015  L.QUEST:        .ASCIZ  <CR><LF>'?'<CR><LF>
3863  016672     000
3864          016674                          .EVEN
3865          016674                  RDBUF=.
3866          016674                  WTBUF=.
3867  016674  000200                  .BLKW   128.
3868          000001                  .END
```

```
A       011556            3069#   3074
ACCL  = 100000            1212#
ANGTAB  001420            1319#   1759    1787
AS    = 000016            1110#
ASFLG   001135            1298#   2432*   2658    2660*
ATA   = 100000            1179#
ATIME   001016            1283#   1761    1789    1853*   2028    2121*   2125    2127    2159*   2163    2165
ATIMTB  001020            1284#   1831    2028*
A.T000  015701            1490    3761#
A.T001  015731            1491    3766#
A.T002  015753            1492    3770#
A.T003  015773            1493    3773#
A.T004  016015            1494    3777#
A.T005  016041            1495    3781#
A.T006  016063            1496    3785#
A.T007  016102            1497    3788#
A.T010  016124            1498    3791#
A.T011  016147            1499    3795#
A.T012  016171            1500    3799#
A.T013  016216            1501    3803#
A.T014  016245            1502    3807#
A.T015  016276            1503    3812#
A.T016  016327            1504    3817#
A.T017  016355            1505    3821#
A.T020  016404            1506    3825#
A.T021  016434            1507    3829#
A.T022  016457            1508    3833#
A.T023  016503            1509    3837#
A.T024  016530            1510    3841#
A.T025  016552            1511    3844#
A.T026  016575            1512    3848#
A.T027  016617            1513    3852#
A16   = 000400            1135#
A17   = 001000            1136#
BA    = 000004            1105#   2377*
BAI   = 000010            1151#   3500    3538    3553
BEGIN   007442            2628#   3456    3461
BELL    001411            1315#   1981
BKSLSH  001405            1313#   1880
BOT   = 000002            1166#   2310
BPI200= 000000            1208#
BPI556= 000400            1209#
BPI800= 001000            1210#
BPTVEC= 000014            1087#
CDM11 = 000320            1207#
CHKDRV  006714            2491    2495    2506#
CHKSLV  007224            2541    2561    2575#
CHNFLG  006372            2435#   2440*   2448    2476    2661    3444    3480
CH7   = 010000            1202#
CLR   = 000040            1153#
CNTRLA= 000001            1226#   1915
CNTRLC= 000003            1227#   1887
CNTRLG= 000007            1228#   1921
CNTRLO= 000017            1232#   1904
CNTRLU= 000025            1233#   1882
CNVDEC  003234            1700#
```

```
CNVOCT  003126  1660#
CNVTAO  003564  1553  1802#  2458
CNVTD   003246  1701  1708#
CNVTO   003140  1661  1669#
CR    = 000015  1231# 1312  1551  1808  1893  2456  2483  2494  2552  2563  2667  3591  3599
                3608  3611  3615  3623  3652  3657  3660  3674  3679  3686  3692  3695  3700
                3704  3708  3718  3745  3746  3857  3858  3862
CRLF    001402  1312# 1763  1794  1885  1897  1951  1954  1977  2735  3447  3471
CSITM = 002000  1190#
CS1   = 000000  1103#
CS2   = 000010  1107# 2244* 2255* 2265* 2266* 3500* 3538* 3553*
DASH    001413  1316# 1756  1784
DB    = 000022  1111#
DCONST  003342  1713  1717  1720  1730#
DELAY   005310  2014  2178# 2367  2983  3139  3167  3552
DELAYV  005340  2191# 3238
DELTIM  001120  1287# 2191  2198  3232* 3239*
DIGTAB  001140  1301# 1684  1718  2519  2546  2607  2608  2743  2744
DIVIDE  005376  2119  2157  2216#
DLT   = 100000  1163#
DPR   = 000400  1173#
DRIVES  006550  2470# 2525
DRVAVA  005466  2244# 2514
DRVNUM  001004  1277# 2244  2255  2266  2513* 2545* 2601* 2622* 2628  2654* 2741  3458* 3459
DRVTBL  001162  1309# 2471  2486  2501* 2507  2522* 2535  2578  2581  2635
DRY   = 000200  1172#
DRYCLR= 000010  1123#
DS    = 000012  1108# 2019  2276  2282  2292  2310  2312  2316  2709  2962
DT    = 000026  1113# 2245  2257  2684
DTE   = 010000  1192# 1195
DVA   = 004000  1138#
DV0   = 000000  1143#
DV1   = 000001  1144#
DV2   = 000002  1145#
DV3   = 000003  1146#
DV4   = 000004  1147#
DV5   = 000005  1148#
DV6   = 000006  1149#
DV7   = 000007  1150#
ECHO    001407  1314# 1891* 1895
EMTVEC= 000030  1090#
END     013432  2642  3460  3463#
ENDTBL  002364  1487# 2680
EOT   = 002000  1174# 2282
ER    = 000014  1109# 1956  3508  3561
ERASE = 000024  1125# 3395
ERFLG   001127  1292# 1937* 2016* 2024  2470* 2521* 2524  2528* 2610* 2614
ERR   = 040000  1178# 2292  2312  2815  2841  2847  2920  2950  2956  3013  3044  3050  3320
                3359  3546
ERRTRP  004250  1929# 2468  2616
ERRVEC= 000004  1083# 2468* 2616*
E.DRV   015001  2607* 3672#
E.GAP   015336  1791  3714#
E.HDR   015137  1940  2729  3690#
E.HDR1  015147  1967  3692#
E.HDR2  015222  1947  3700#
```

```
E.NAVA  015011  2519* 2520  2608* 3674#
E.NCON  014712  2466  3660#
E.NDRV  014757  2518  3667#
E.NSLV  014773  2609  3670#
E.SFT   015113  1964  3686#
E.TIME  015275  2280  3708#
E.TIMO  015250  2087  3704#
E.TRP4  014673  3657#
E.UNIT  015044  3465  3679#
FC    = 000006  1106# 2021  2353* 2363* 2379* 2707  3262
FCE   = 001000  1189# 1195
FINISH  013330  3442# 3585
FMT   = 000020  1185# 1195
FPEVEC= 000244  1096#
FRMCNT= 177400  1223# 2328  2338  2348  2918  3011
FWDSPC  006042  2353#
GAP     001124  1289# 1778  1792  2160  3272* 3278* 3279
GAPDEL  001014  1282# 2687* 2696* 3239
GAPOK   005166  2143# 3277
GAPTBL  001060  1286# 3252  3274  3283
GO    = 000001  1119#
GTIMTB  002264  1471# 1782  1785  2163  2165
GTSWR   002526  1543# 1924  2674
HERE    013514  3473  3479#
HLT   = 104400  1217# 2088  2129  2167  2757  2784  2804  2830  2863  2885  2907  2936  2971
                2997  3028  3065  3073  3099  3129  3153  3181  3213  3299  3339  3376  3408
                3436  3526  3579
HRDERR= 075027  1195# 3508  3561
HT    = 000011  1229# 1319  3695  3746  3766  3770  3773  3777  3781  3785  3788  3791  3795
                3799  3803  3807  3812  3817  3821  3825  3829  3833  3837  3841  3844  3848
                3852
IDB   = 000010  1168#
IE    = 000100  1133#
ILF   = 000001  1181# 1195
ILR   = 000002  1182# 1195
INBUF   001272  1311# 1551  1804  1871  2419* 2456  2480  2549  2666
INCVAE= 000100  1186#
INIT    006274  1222  1266  1890  1913  2418# 2467  3466  3487
IOTVEC= 000020  1088#
IR    = 000100  1154#
ITCNT   001125  1290# 1832  2026  2029* 2034  2042* 2711*
I.DRV   014553  2546* 3640#
I.DRVS  014464  2478  3630#
I.REG   014417  2451  3623#
I.REM   014344  2445  3615#
I.SLVS  014534  2547  3637#
I.SPD   014620  2664  3647#
LF    = 000012  1230# 1312  3591  3599  3608  3611  3615  3623  3652  3657  3660  3674  3679
                3686  3692  3695  3700  3704  3708  3718  3745  3746  3857  3858  3862
L.ACT   015671  1760  1788  3757#
L.CNTG  016641  3857#
L.DRV   015530  2743* 3738#
L.HDR1  015346  2740  3718#
L.HDR2  015463  2745  3731#
L.HDR3  015574  2753  3745#
L.NEW   016655  1549  3860#
```

```
L.QUES  016665          3862#
L.RNG   015661          1753    1781    3755#
L.SER   015562          2751    3743#
L.SLV   015542          2744*   3740#
L.SWR   016646          1546    3858#
L.TE16  015546          2748    3741#
L.TU77  015554          2750    3742#
MCPE  = 020000          1139#
MDPE  = 000400          1156#
MMVEC = 000250          1097#
MOL   = 010000          1176#
MR    = 000024          1112#   2057    2059    2064    2078    2093
MXF   = 001000          1157#
M.EOP   014275          3468    3608#
M.EOT   014653          2285    3652#
M.HSWR  014314          1920    3611#
M.NAM   014134          2284    2447    2450*   3591#
NAMPTR  002364          1490#   1857    2732
NED   = 010000          1160#
NEF   = 004000          1191#   1195
NEM   = 004000          1159#
NOP   = 000000          1120#
NORM11= 001700          1206#   2270    3310    3499    3537
NSG   = 000400          1188#
OCTALO  001122          1288#   1554    1805    2459
ODIGIT  001152          1306#   1671    1690    1711    1725    2387    2414
OPI   = 020000          1193#   1195
OR    = 000200          1155#
OSC   = 000100          1198#   2057    2059    2064    2078    2093
OSCTIM  001012          1281#   2107    2145    2686*   2695*
OUTBUF= 006274          1222#
OUTGAP  003452          1776#   1950
OUTSPC  003356          1748#   1861    1953
PARVEC= 000114          1094#
PAT   = 000020          1152#
PEFLRC= 000200          1187#
PES   = 000040          1170#
PE1600= 002300          1211#   1957    3349
PFVEC = 000024          1089#   1240
PGE   = 002000          1158#
PIP   = 020000          1177#   2316
PIRQ  = 177772          1075#
PIRVEC= 000240          1095#
PRGFLG  001131          1294#   2431*   2485*   2516    2543    2554*   2560    2585    2605
PSCNT   001134          1297#   2030    2433*   3467*   3469
PSEL  = 002000          1137#
PSW   = 177776          1073#
PUBLIS  003652          1829#   2041
RDBUF = 016674          2336    2346    3502    3540    3555    3865#
RDFWD = 000070          1131#   2339    3505    3543
RDREV = 000076          1132#   2349    3558
RDSW    002634          1579#   1589    1591*
RDY   = 000200          1134#
READ    006006          2335#   2871    2893    2915    2945    3116    3168    3253    3258
RESVEC= 000010          1084#
REVRD   006024          2345#   2984    3008    3039    3086    3110    3140    3163    3196    3200    3244
```

```
RHINIT  005544  2015  2247  2265#  2303  2679  3385  3522  3551  3575
RMR   = 000004  1183# 1195
RSTRT   007414  1268  2621#  3484
RWD   = 000006  1122# 2308
RWDOFF= 000002  1121#
SC    = 100000  1141#
SCOPE = 104000  1218# 2785  2805  2831  2864  2886  2908  2937  2972  2998  3029  3066  3100
                3130  3154  3182  3214  3300  3340  3377  3409  3440  3527  3583
SCPADR  001002  1276# 2013* 2017  2038* 2089  2736* 2759* 3390* 3490*
SDWN  = 000020  1169# 2822  2845  2854  2927  2954  2962  3019  3048  3056
SKEWFL  001130  1293# 2663* 2671* 2720  2754
SKEWTS  013550  2756  3490#
SLA   = 000001  1165#
SLAVES  007014  2528# 2615
SLR   = 177774  1074#
SLVAVA  005514  2255# 2603
SLVNUM  001005  1278# 2256  2268  2602* 2623* 2629  2655* 2742  3452* 3454  3457*
SLVPTR  001006  1279# 2624* 2630  2656* 3453*
SLVTBL  001172  1310# 2529  2534  2555  2577  2624
SN    = 000030  1114# 2386  2396  2401  2409
SNPT    006144  2386# 2752
SPACE   001416  1318# 2454
SPACE2  001415  1317# 1972
SPCFWD= 000030  1126# 2354
SPCREV= 000032  1127# 2364
SPR   = 002000  1201# 2257
SSC   = 000100  1171#
STIMTB  002124  1440# 1754  1757  2125  2127  2681
STKPTR= 000600  1271# 2418
STTBL   002124  1439# 2680
SWR     001000  1275# 1543  1547  1554* 1917  1919* 1923* 1938  1979  1982  2006  2008  2032
                2036  2039  2168  2424  2428* 2439* 2672  2726  2738  3442  3482
SWREG   000176  1263# 1543  1917  1923  2428  2439  2672
SW06  = 000100  1011# 3482
SW07  = 000200  1010#
SW08  = 000400  1009#
SW09  = 001000  1008# 1979
SW10  = 002000  1007# 2039  2168  2738  3442
SW11  = 004000  1006# 2032
SW13  = 020000  1005# 1938
SW14  = 040000  1004# 2006
SW15  = 100000  1003#
TAP   = 040000  1203# 2245
TBITVE= 000014  1085# 1235
TC    = 000032  1115# 1957  1975  2256* 2269* 2270* 2776  2795  2876  2898  2988  3090  3120
                3310* 3348* 3349* 3499* 3537*
TCRLF   002664  1588#
TE16    001136  1299# 2683* 2694* 2746
TE16GT  001564  1361#
TE16TT  001424  1328# 2682
TIB     002524  1540#
TIMER   005020  2079  2083#  2091  2094  2182  2197  2710  2778  2797  2824  2856  2878  2900
                2929  2964  2990  3021  3058  3092  3122  3146  3174  3206  3264  3328  3367
                3401  3429  3516  3569
TIMERR  005030  2085  2087#
TIMER0  005044  2093#
```

```
TIMER1  004774  2078# 2082
TIMOK   005056  2105# 2782  2801  2828  2860  2882  2904  2933  2968  2994  3025  3062  3096
                3126  3150  3178  3210  3296  3336  3373  3405  3433  3523  3576
TIMON   004730  2055# 2178  2193  2773  2792  2820  2852  2873  2895  2925  2961  2985  3018
                3055  3087  3117  3141  3169  3201  3259  3325  3364  3396  3424  3513  3566
TKB   = 177562  1078# 1875  1902
TKISR   004126  1258  1902#
TKS   = 177560  1077# 1872  2712*
TKVEC = 000060  1092# 1257
TMBASE  001010  1280# 2005  2452  2459* 2460  2678  2705
TMCMD   006124  2304  2325  2335  2345  2377# 3311  3350  3391  3419  3501  3539  3554
TMCS1 = 172440  1100# 1280
TMK   = 000004  1167#
TPB   = 177566  1080#
TPS   = 177564  1079#
TPVEC = 000064  1093#
TRAPVE= 000034  1091#
TRE   = 040000  1140#
TRTVEC= 000014  1086#
TSTNUM  001126  1291# 1855  1860  1941  2011  2122  2704* 2768* 2789* 2809* 2835* 2868* 2890*
                2912* 2941* 2977* 3002* 3033* 3079* 3104* 3133* 3157* 3186* 3228* 3306* 3344*
                3381* 3413* 3495* 3533*
TSTTBL  002444  1516# 2736  2737
TST000  010000  1516  2013  2704# 2758
TST001  010274  1517  2759  2768#
TST002  010360  1518  2789#
TST003  010436  1519  2809#
TST004  010526  1520  2835#
TST005  010634  1521  2868#
TST006  010720  1522  2890#
TST007  011004  1523  2912#
TST010  011104  1524  2941#
TST011  011224  1525  2977#
TST012  011322  1526  3002#
TST013  011432  1527  3033#
TST014  011572  1528  3079#
TST015  011664  1529  3104#
TST016  011772  1530  3133#
TST017  012066  1531  3157#
TST020  012176  1532  3186#
TST021  012316  1533  3228#
TST022  012622  1534  3306#
TST023  012752  1535  3344#
TST024  013102  1536  3381#
TST025  013222  1537  3413#
TST026  013556  1538  3490  3495#
TST027  013714  1539  3533#
TU77GT  002024  1417#
TU77TT  001664  1384# 2693
TYPDEC  003242  1707# 1755  1758  1762  1783  1786  1790
TYPE  = 000004  1219# 1546  1549  1588  1690  1725  1753  1756  1759  1760  1763  1781  1784
                1787  1788  1791  1794  1858  1880  1885  1895  1897  1920  1940  1947  1951
                1954  1964  1967  1972  1977  1981  2087  2280  2284  2285  2414  2445  2447
                2451  2454  2466  2478  2518  2520  2547  2609  2664  2729  2733  2735  2740
                2745  2748  2750  2751  2753  3447  3465  3468  3471
TYPE1   002656  1586# 1603  1632
```

```
TYPE2   002704          1587    1593#
TYPE3   002712          1590    1596#
TYPE4   002716          1594    1599#
TYPFLG  001133          1296#   1660*   1668*   1688    1700*   1707*   1723
TYPOCT  003134          1548    1668#   1793    1942    1971    1976    2453    2730    3470
UBREAK= 177770          1076#
UNS     = 040000        1194#   1195
UNTFND  001132          1295#   2625*   2653*   3463
UPE     = 020000        1161#
WAITRD  005602          2274#   2290    2355    2361    2365    2724    2780    2799    2826    2858    2880    2902    2931
                        2966    2981    2992    3006    3023    3037    3060    3083    3094    3108    3113    3124    3137
                        3148    3161    3165    3176    3190    3194    3198    3208    3236    3246    3256    3266    3334
                        3371    3388    3403    3417    3431
WAITTI  005604          2275#   2278*
WC      = 000002        1104#   2378*
WCE     = 040000        1162#
WCHKF   = 000050        1128#
WCHKR   = 000056        1129#
WFMK    = 000026        1124#   3423
WFWD    = 000060        1130#   2329    3315    3354
WRDCNT= 177600          1224#   2327    2337    2347
WRITE   005770          2288    2325#   2359    2722    2772    2790    2810    2836    2979    3004    3035    3081    3106
                        3135    3159    3188    3192    3234    3386    3415
WRL     = 004000        1175#
WRT.BK  006062          2359#   2891    2913    2943
WTBUF   = 016674        2326    3312    3351    3866#
$CHARC  002626          1575#   1619*   1623*   1629
$CNTRL  002627          1576#   1584*   1586    1614    1906*
$CRLF   002630          1577#   1588
$ENDAD  013504          1252    1910    3475#
$FILL   002617          1569#
$HT     = 000011        1567#   1599
$NULL   002616          1568#   1604
$SVPC   = 000040        1248#   1255
$TKFLG  002621          1572#
$TPB    002624          1574#   1616*
$TPFLG  002620          1570#
$TPS    002622          1573#   1612
.       = 017274        1234#   1235#   1236    1248    1249#   1251#   1253#   1255#   1257#   1262#   1265#   1267#   1270#
                        1273#   1284#   1286#   1300#   1306#   1308#   1309#   1310#   1311#   1320#   1578#   1613    1840
                        2082#   2091#   3864#   3865    3866    3867#
.HLT    004252          1244    1936#
.INPUT  004000          1550    1870#   2455    2479    2548    2665
.RESTO  003104          1555    1647#   1692    1727    1820    1862    1986    2131    2173
.REWIN  005706          2286    2303#   2718    2770    2869    3070    3230    3308    3346    3383    3438    3497    3535
                        3581
.SAVE   003062          1545    1636#   1670    1709    1803    1830    1936    2106    2144
.SCOPE  004516          1242    2005#
.TYPE   002636          1238    1581#
```

```
INPUT    1037#  1550  2455  2479  2548  2665
RESTOR   1034#  1691  1726  1819  1862  1985  2130  2172
REWIND   1040#  2286  2718  2770  2869  3069  3230  3308  3346  3383  3437  3497  3535  3580
SAVE     1031#  1669  1708  1802  1829  2105  2143
SETGO    1050#  2289  2309  2360  2723  2896  2916  2946  2980  2986  3005  3009  3036  3040  3082
         3088   3107  3111  3118  3136  3142  3160  3164  3170  3189  3193  3197  3202  3235  3245
         3254   3260  3316  3355  3387  3397  3416  3425  3506  3544  3559
TIMCHK   1047#  2181  2196  2778  2797  2824  2856  2878  2900  2929  2964  2990  3021  3058  3092
         3122   3146  3174  3206  3264  3328  3367  3401  3429  3516  3569
TIMEON   1044#  2193  2773  2819  2851  2873  2895  2924  2960  2985  3017  3054  3087  3117  3141
         3169   3201  3259  3324  3363  3396  3424  3513  3566
$CATCH    987#  1234
$CHAIN    987#  2434
$CPREG    987#  1055
$CPVEC    987#  1082
$TYPE     987#  1561
.$ACT1    987#  1246
.$EOP     987#  3472


. ABS.  017274     000


 ERRORS DETECTED:  0

 DSKZ:CZTEEC.BIN,DSKZ:CZTEEC.SEQ/CRF/SOL=DSKZ:CZTEAC.SML/ML,DSKM:CZTEEC.P11
 RUN-TIME: 14 23 2 SECONDS
 RUN-TIME RATIO: 236/40=5.8
 CORE USED:  8K  (15 PAGES)
```