

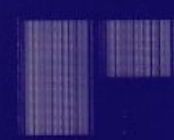
TM03, TU45

TM03/TU45 DR FCTN TMRAH-E500B-MC  
CZTUSBO FICHE 1 OF 1

JUN 1980  
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The table contains multiple columns of data, including numerical values, text labels, and possibly small diagrams or charts. The data is organized in a grid format, typical of a technical manual or data sheet. The text is very small and difficult to read, but the layout suggests a structured data table.



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IDENTIFICATION

PRODUCT CODE: AC-E499B-MC  
PRODUCT NAME: CZTUSB0 TM03/TU45 DR FCTN TMR  
DATE CREATED: 25 MAY 1978  
UPDATE INFORMATION:       DATE               AUTHOR  
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TM03 DRIVE FUNCTION TIMER  
ABSTRACT

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ABSTRACT

PROGRAM CZTUSBO MEASURES THE TIME REQUIRED AND GAP SIZES PRODUCED BY THE TM03/TU45 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.

TM03 DRIVE FUNCTION TIMER  
REQUIREMENTS

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CHAPTER 1  
REQUIREMENTS

PDP-11 FAMILY CENTRAL PROCESSOR WITH 4K MEMORY WITH UP TO 64 TM03/TU45  
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)

CZTUOA CONTROL LOGIC TEST(PART 1)  
CZTUPAO BASIC FUNCTION TEST

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LOADING AND STARTING PROCEDURE

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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, TMO3 DRIVES TO BE TESTED, TU45 SLAVES TO BE TESTED,  
AND IF SPEED TESTS ARE TO BE RUN. IN ADDITION 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 TMO3 DRIVE #'S TO BE TESTED:ALL  
FOR TMO3 DRIVE X-TYPE SLAVE #'S TO BE TESTED:ALL  
SPEED TESTS?(YES/NO):NO

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

IF MORE THAN 1 DRIVE OR SLAVE IS TO BE TESTED, TYPE A COMMA  
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 TMO3/TU45 COMBINATIONS ARE TESTED. ADDITIONALLY THE SOFTWARE  
SWR IS INVOKED WITH A SWITCH SETTING OF 100000 IF LOADED VIA ACT11.  
NO OPERATOR INTERVENTION IS REQUIRED

\*\* EXCEPTION: IF LOADED VIA TMDP TMO3 DRIVE 0 TU45 SLAVE 0 IS  
NOT TESTED.

TMO3 DRIVE FUNCTION TIMER  
SWITCH SETTINGS

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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.
SW08 (000900)	PRINT TIME	THIS SWITCH WHEN SET WILL PRINT A TIME LINE AFTER EACH ITERATION.
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.

TMO3 DRIVE FUNCTION TIMER  
ERRORS

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## CHAPTER 4 ERRORS

TWO TYPES OF ERRORS ARE DETECTED BY THIS PROGRAM, HARDWARE ERRORS AND INCORRECT 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-III IIII = CONTENTS OF TAPE REGISTER 172440-172454

4.2 ERROR TYPEOUT FORMAT (FUNCTION TIME OUT OF RANGE)

TEST # XXXYXX OUT OF RANGE ERROR

RANGE = <AAAAAA-BBBBBB> ACTUAL = CCCCCC

TMO3 DR /F FUNCTION TIMER  
SUBROUTINE ABSTRACTS

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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. TYPES TIME LINE <SW08>=1
3. PROVIDES CONTINUOUS LOOP <SW14>
4. MOVES FUNCTION TIME INTO TABLE
5. OUTPUTS LINE ITEM <SW10>=1
6. DELAYS 350MS BEFORE STARTING TEST
7. INIT'S DRIVE/SLAVE
8. CLEARS THE ERROR FLAG (ERFLG)
9. CHECK FOR CONTROL G (^G>

THE ROUTINE MONITORS SW14, SW11, SW10, SW08, 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.

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SUBROUTINE ABSTRACTS

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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.

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TMO3 DRIVE FUNCTION TIMER  
MISCELLANEOUS

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CHAPTER 6  
MISCELLANEOUS

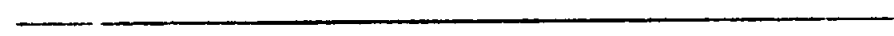
6.1 STACK POINTER

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.



TMO3 DRIVE FUNCTION TIMER  
PROGRAM DESCRIPTION

CHAPTER 7  
PROGRAM DESCRIPTION

7.1 SAMPLE TIME DOCUMENT

TYPE FIRST ADDRESS OF CONTROLLER:172440  
TYPE TMO3 DRIVE #'S TO BE TESTED:ALL 0  
FOR TMO3 DRIVE 0- TYPE SLAVE #'S TO BE TESTED:ALL 0  
TAPE SPEED TESTS ONLY? (YES/NO):NO

\*\*\*\*\*  
\* TMO3 DRIVE FUNCTION TIMES- DRIVE # 0 SLAVE # 7 9 CHAN. SER. # 5009  
\*

* FUNCTION	TIME(SPECIFICATION)	TIME(ACTUAL)
* WRITE FROM BOT	RANGE=<063000-059000>	ACTUAL=061000
* WRITE START	RANGE=<004500-003700>	ACTUAL=004100
* WRITE SHUTDOWN	RANGE=<003600-002600>	ACTUAL=003100
* WRITE SETTLEDOWN	RANGE=<007600-001400>	ACTUAL=4500
* READ FROM BOT	RANGE=<009200-005200>	ACTUAL=007200
* READ START	RANGE=<001700-000900>	ACTUAL=001300
* READ SHUTDOWN	RANGE=<001450-000350>	ACTUAL=000900
* READ SETTLEDOWN	RANGE=<007600-001400>	ACTUAL=004500
* READ REV START	RANGE=<001700-000900>	ACTUAL=001300
* READ REV SHUTDOWN	RANGE=<001900-001500>	ACTUAL=001700
* READ REV SETTLEDOWN	RANGE=<007600-001400>	ACTUAL=004500
* TURN AROUND DELAY F-R	RANGE=<008800-002800>	ACTUAL=005800
* TURN AROUND DELAY R-F	RANGE=<008800-002800>	ACTUAL=005800
* GAP SIZE-STOP HALF	RANGE=<007900-004500>	ACTUAL=006200
* GAP SIZE-START HALF	RANGE=<008550-005250>	ACTUAL=006900
* GAP SIZE-INTERRECORD	RANGE=<006150-004450>	ACTUAL=005300
* GAP CONSISANCY	RANGE=<007050-005350>	ACTUAL=006200
* DATA TIME-800BPI	RANGE=<012000-011000>	ACTUAL=011500
* DATA TIME-1600BPI	RANGE=<012500-011500>	ACTUAL=012000
* ERASE GAP TIME	RANGE=<049900-046900>	ACTUAL=048400
* WRITE FILE MARK	RANGE=<051200-049200>	ACTUAL=050200

TMO3 DRIVE FUNCTION TIMER

7.1.1 SAMPLE TIME DOCUMENT FOR TAPE SPEED TESTS

TYPE FIRST ADDRESS OF CONTROLLER 172440:  
TYPE TMO3 DRIVE #'S TO BE TESTED:ALL 0  
FOR TMO3 DRIVE 0- TYPE SLAVE #'S TO BE TESTED:ALL 7  
SPEED TESTS ONLY? (YES/NO):NO Y

\*\*\*\*\*  
\*TMO3 DRIVE FUNCTION TIMES- DRIVE # 0 SLAVE # 7 9 CHAN. SER. # 5009

*FUNCTION	TIME(SPECIFICATION)	TIME(ACTUAL)
*TAPE SPEED FWD	RANGE=<011300-010300>	ACTUAL=010800
*TAPE SPEED REV	RANGE=<011300-010300>	ACTUAL=010800



TMO3 DRIVE FUNCTION TIMER

7.2 TEST SEQUENCE WITH RELATED ADJUSTMENTS AND ASSOCIATED HARDWARE

TEST NO./NAME	RELATED ADJUSTMENTS	ASSOCIATED HARDWARE
1. WRITE FROM BOT	*NONE	*M8928 ROM*M8903 ACCL CNTR
2. WRITE START	*"	*" *"
3. WRITE SHUTDOWN	*"	*" *"
4. WRITE SETTLEDOWN	*"	*M8928 SETTLEDOWN ONE SHOT
5. READ FROM BOT	*"	*M8928 ROM*M8903 ACCL CNTR
6. READ START	*"	*" *"
7. READ SHUTDOWN	*"	*" *"
10. READ SETTLEDOWN	*"	*M8928 SETTLEDOWN ONE SHOT
11. READ REVERSE START	*"	*M8928 ROM*M8903 ACCL CNTR
12. READ REVERSE SHUTDOWN	*"	*" *"
13. READ REVERSE SETTLEDOWN	*"	*M8928 SETTLEDOWN ONE SHOT
14. TURN AROUND F-R	*"	*M8928 ROM*M8903 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	*" " "

TMO3 DRIVE FUNCTION TIMER

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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     | * "                 | *M8928 ROM*M8903 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 TU45 (M9811), THE ACCL COUNTER IN THE TM03 (M8903), AND THE SETTLEDOWN ONE SHOT (M8928).

T1. WRITE FROM BOT:

THIS TEST WILL MEASURE ACCELERATION 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 ACCELERATION 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 INTERRECORD 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

14. 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

15. 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

TMO3 DRIVE FUNCTION TIMER

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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

TMO3 DRIVE FUNCTION TIMER

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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.



TMO3 DRIVE FUNCTION TIMER

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GAP MEASUREMENTS:

THE PREVIOUS THIRTEEN (13) TESTS WERE MEASUREMENTS OF LOGIC DELAYS PERFORMED BY THE TMO3 OR TU45 IN ORDER TO ALLOW FOR PROPER ACCELERATION AND DECELERATION OF TAPE ACCORDING TO THE DESIRED INTERCORD 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 INTERCORD 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 ACCELERATION AND DECELERATION 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

TMO3 DRIVE FUNCTION TIMER

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T21. GAP CONSISTENCY:

NOW THAT WE HAVE ESTABLISHED THAT THE INTERRECORD 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 200 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.

TM03 DRIVE FUNCTION TIMER

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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

TM03 DRIVE FUNCTION TIMER

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 = 8800(10)
5. TIME FROM FC = 800 TO FC = 8800 IS THE TIME REQUIRED  
FOR TAPE TO TRAVEL 10 INCHES
6. DIVIDE THE TIME FOR 10 INCHES BY 10.
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.

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x

```
.LIST BIN,LOC,SEQ
.NLIST MC
.NLIST TOC
.LIST ME
.ENABLE ABS,AMA
.MCALL SCPVEC,SCPREG,SCATCH,STYPE,.$ACT11,.$EOP,$CHAIN
.TITLE CZTUSBO TM03/TU45 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
SW15= 100000 ;HALT ON ERROR
SW14= 040000 ;LOOP SUBTEST
SW13= 020000 ;INHIBIT ERROR TYPE OUT
```

```

2321      004000      SW11= 004000      ;INHIBIT SUBTEST ITERATION
2322      002000      SW10= 002000      ;INHIBIT PUBLISHING TIME SPECIFICATION
2323      001000      SW09= 001000      ;RING BELL ON ERROR
2324      000400      SW08= 000400      ;TYPE LINE ITEM AFTER EACH ITERATION
2325      000200      SW07= 00200      ;NOT USED
2326      000100      SW06= 000100      ;CONTINUOUS CYCLE
2327      :           SW05-SW00      ;RUN TEST SELECTED
2328      :           ;**NOTE: IF <SW15-SW00> = 177777 AT STARTUP USE SOFTWARE
2329      :           SWITCH REGISTER.
2330
2331      ;CONSOLE COMMANDS
2332      :           CONTROL C           ;RESTART PROGRAM (SAME AS START @ 200)
2333      :           CONTROL G           ;SET NEW SOFTWARE SWITCH REGISTER
2334      :           CONTROL U           ;DELETE LINE TYPED
2335      :           RUBOUT (DELETE)    ;DELETE LAST CHAR TYPED
2336
2337      ;GENERAL REGISTER USAGE:
2338      :           R0=ADDRESS OF 'FC' REGISTER (SET BY SCOPE)
2339      :           R1=ADDRESS OF 'DS' REGISTER (SET BY SCOPE)
2340      :           R2=RETURN PC FROM TIMER (SET BY EACH TEST)
2341      :           R3=INDEX INDICATING PREVIOUS OSCILLATOR POLARITY (SET BY TIMER)
2342      :           R4=CONTAINS 'TICK' COUNT WHEN TIMER IS RUNNING (SET BY TIMER)
2343      :           R5=ADDRESS OF CS1 (SET BY SCOPE)
2344
2345      .SBTTL MACRO DEFINITIONS
2346      .MACRO SAVE
2347      JSR PC, .SAVE           ;SAVE REGISTERS ON THE STACK
2348      .ENDM SAVE
2349      .MACRO RESTORE
2350      JSR PC, .RESTORE        ;RESTORE REGISTERS FROM THE STACK
2351      .ENDM RESTORE
2352      .MACRO INPUT
2353      JSR PC, .INPUT          ;GET USER INPUT
2354      .ENDM INPUT
2355      .MACRO REWIND
2356      JSR PC, .REWIND         ;REWIND SLAVE
2357      BVS 99$                 ;BRANCH IF ERROR ON REWIND
2358      .ENDM REWIND
2359      .MACRO TIMEON
2360      JSR PC, .TIMON          ;TURN TIMER ON
2361      .ENDM TIMEON
2362      .MACRO TIMCHK
2363      JMP TIMER(R3)           ;GO TO TIMER & RETURN VIA R2
2364      .ENDM TIMCHK
2365      .MACRO SETGO
2366      INC (R5)                ;SET 'GO' BIT
2367      .ENDM SETGO
2368
2369      .SBTTL REGISTER ASSIGNMENTS
2370      ;;DEFINITIONS AND REGISTER ASSIGNMENTS
2371      ;;GENERAL REGISTER ASSIGNMENTS
2372      (1)      000000      R0=R0
2373      (1)      000001      R1=R1
2374      (1)      000002      R2=R2
2375      (1)      000003      R3=R3
2376      (1)      000004      R4=R4
  
```

```

(1)      000005      RS=%5
(1)      000006      SP=%6
(1)      000007      PC=%7
(1)      000000      R10=%0
(1)      000001      R11=%1
(1)      000002      R12=%2
(1)      000003      R13=%3
(1)      000004      R14=%4
(1)      000005      R15=%5
(1)
(1)
(1)      177776      ;;REGISTER ADDRESSES
(1)      177774      PSW= 177776      ;;PROCESSER STATUS WORD
(1)      177772      SLR= 177774      ;;STACK LIMIT REGISTER (11/40,11/45)
(1)      177770      PIRQ= 177772      ;;PROGRAM INTERRUPT REQ. (11/45)
(1)      177560      UBREAK= 177770      ;;MICRO-BREAK REGISTER (11/45)
(1)      177562      TKS= 177560      ;;KEYBOARD CSR
(1)      177564      TKB= 177562      ;;KEYBOARD DATA BUFFER REGISTER
(1)      177566      TPS= 177564      ;;TELEPRINTER CSR
(1)      177566      TPB= 177566      ;;TELEPRINTER DATA BUFFER REGISTER
(1)
2371      ;;VECTOR ADDRESSES
(1)      000004      ERRVEC=4      ;;ADDRESS OF ERRGR VECTOR
(1)      000010      RESVEC=10      ;;ADDRESS OF RESERVED INST. TRAP VECTOR
(1)      000014      TBITVEC=14      ;;ADDRESS OF 'T' BIT TRAP VECTOR
(1)      000014      TRTVEC=14      ;;ADDRESS OF 'TRACE' TRAP VECTOR
(1)      000014      BPTVEC=14      ;;ADDRESS OF 'BREAKPOINT' TRAP VECTOR
(1)      000020      IOTVEC=20      ;;ADDRESS OF IOT TRAP VECTOR
(1)      000024      PFVEC=24      ;;ADDRESS OF POWER FAIL TRAP VECTOR
(1)      000030      EMTVEC=30      ;;ADDRESS OF EMT VECTOR
(1)      000034      TRAPVEC=34      ;;ADDRESS OF TRAP VECTOR
(1)      000060      TKVEC= 60      ;;ADDRESS OF TTY KEYBOARD INT. VECTOR
(1)      000064      TPVEC=64      ;;ADDRESS OF TTY PRINTER INTERRUPT VECTOR
(1)      000114      PARVEC= 114      ;;ADDRESS OF MA/MF PARITY ERROR VECTOR
(1)      000240      PIRVEC=240      ;;ADDRESS OF PIRQ VECTOR
(1)      000244      FPEVEC=244      ;;ADDRESS OF FLOATING POINT INT. VECTOR
(1)      000250      MMVEC=250      ;;ADDRESS OF MEM MGMT ERROR TRAP VECTOR
(1)
2372      ;;CLOCK ADDRESS AND VECTORS
2373      172540      PLKCSR= 172540      ;KW11-P
2374      000104      PLKVEC= 104
2375      177546      LKS= 177546      ;KW11-L
2376      000100      LKVEC= 100
2377      177514      LPS= 177514      ;LP11
2378      177516      LPB= 177516
2379
2380      ;;RH, TM03/TU45 REGISTERS
2381      172440      TMCS1= 172440
2382
2383      ;;TM03/TU45 INDEX VALUES
2384      000000      CS1= 00      ;CONTROL STATUS #1
2385      000002      WC= 02
2386      000004      BA= 04      ;BUS ADDRESS REGISTER
2387      000006      FC= 06      ;FRAME COUNT
2388      000010      CS2= 10      ;CONTROL STATUS #2
2389      000012      DS= 12      ;DRIVE STATUS
2390      000014      ER= 14      ;ERROR REG #1
    
```



2391	000016	AS=	16	:ATTENTION SUMMARY
2392	000022	DB=	22	:DATA BUFFER REG
2393	000024	MR=	24	:MAINTENANCE REG
2394	000026	DT=	26	:DRIVE TYPE REG
2395	000030	SN=	30	:SERIAL NUMBER REGISTER
2396	000032	TC=	32	:TAPE CONTROL REG

.SBTTL TM03/TU45 REGISTER BITS  
 ;RHCS1-CS1(R5)

2400	000001	GO=	1
2401	000000	NOP=	0
2402	000002	RWDOFF=	2
2403	000006	RWD=	6
2404	000010	DRYCLR=	10
2405	000026	WFMK=	26
2406	000024	ERASE=	24
2407	000030	SPCFWD=	30
2408	000032	SPCREV=	32
2409	000050	WCHKF=	50
2410	000056	WCHKR=	56
2411	000060	WFWD=	60
2412	000070	RDFWD=	70
2413	000076	RDREV=	76
2414	000100	IE=	100
2415	000200	RDY=	200
2416	000400	A16=	400
2417	001000	A17=	1000
2418	002000	PSEL=	2000
2419	004000	DVA=	4000
2420	020000	MCPE=	20000
2421	040000	TRE=	40000
2422	100000	SC=	100000

;RHCS2-CS2(R5)

2424	000000	DV0=	0
2425	000001	DV1=	1
2426	000002	DV2=	2
2427	000003	DV3=	3
2428	000004	DV4=	4
2429	000005	DV5=	5
2430	000006	DV6=	6
2431	000007	DV7=	7
2432	000010	BAI=	10
2433	000020	PAT=	20
2434	000040	CLR=	40
2435	000100	IR=	100
2436	000200	OR=	200
2437	000400	MDPE=	400
2438	001000	MXF=	1000
2439	002000	PGE=	2000
2440	004000	NEM=	4000
2441	010000	NED=	10000
2442	020000	UPE=	20000
2443	040000	WCE=	40000
2444	100000	DLT=	100000

;RHDS-DS(R5)

2446	000001	SLA=	1
------	--------	------	---

2447	000002	BOT=	2
2448	000004	TMK=	4
2449	000010	IDB=	10
2450	000020	SDWN=	20
2451	000040	PES=	40
2452	000100	SSC=	100
2453	000200	DRY=	200
2454	000400	DPR=	400
2455	002000	EOT=	2000
2456	004000	WRL=	4000
2457	010000	MOL=	10000
2458	020000	PIP=	20000
2459	040000	ERR=	40000
2460	100000	ATA=	100000
2461		;RHER-ER(R5)	
2462	000001	ILF=	1
2463	000002	ILR=	2
2464	000004	RMR=	4
2465			
2466	000020	FMT=	20
2467	000100	INCVAE=	100
2468	000200	PEFLRC=	200
2469	000400	NSG=	400
2470	001000	FCE=	1000
2471	002000	CSITM=	2000
2472	004000	NEF=	4000
2473	010000	DTE=	10000
2474	020000	OPI=	20000
2475	040000	UNS=	40000
2476			
2477		;RHMR-MR(R5)	
2478	000100	OSC=	100
2479			
2480		;RHDT-DT(R5)	
2481	002000	SPR=	2000
2482	010000	CH7=	10000
2483	040000	TAP=	40000
2484			
2485		;RHTC-TC(R5)	
2486	001700	NORM11=	1700
2487	000320	CDM11=	320
2488	000000	BPI200=	0
2489	000400	BPI556=	000400
2490	001000	BPI800=	001000
2491	002300	PE1600=	002300
2492	100000	ACCL=	100000
2493			
2494			
2495			
2496		;INSTRUCTION EQUATES	
2497	104400	HLT=	TRAP
2498	104000	SCOPE=	EMT
2499	000004	TYPE=	LOT
2500			
2501		;MISCELLANEOUS EQUATES	
2502	005650	OUTBUF=	INIT

;OUTPUT BUFFER STARTS AT BEG OF PROGRAM

2503 177400  
2504 177600  
2505  
2506 000001  
2507 000003  
2508 000007  
2509 000011  
2510 000012  
2511 000015  
2512 000017  
2513 000025

FRMCNT= -256.  
WRDCNT= -128.  
;ASCII EQUATES  
CNTRLA= 1  
CNTRLC= 3  
CNTRLG= 7  
HT= 11  
LF= 12  
CR= 15  
CNTRLO= 17  
CNTRLU= 25

;FRAME COUNT  
;WORD COUNT  
;ASCII CODE FOR CONTROL A (^A)  
;ASCII CODE FOR CONTROL C (^C)  
;ASCII CODE FOR CONTROL G (^G)  
;ASCII CODE FOR HORIZONTAL TAB  
;ASCII CODE FOR LINE FEED  
;ASCII CODE FOR CARRIAGE RETURN  
;ASCII CODE FOR CONTROL O (^O)  
;ASCII CODE FOR CONTROL U (^U)

```

2516 ;SETUP TRAP VECTORS
2517     .=TBITVEC
2518     000014 000016     .WORD     .+2           ;SET 'T' TRAP TO TIMER ROUTINE
2519     000016 000000     .WORD     HALT           ;PRIORITY LEVEL 7
2520     000020 002130     .WORD     .TYPE         ;SET IOT TRAP TO .TYPE ROUTINE
2521     000022 000000     .WORD     0             ;PRIORITY LEVEL 0
2522     000024 000026     .WORD     PFVEC+2       ;POWER FAIL TRAP TO HALT
2523     000026 000000     .WORD     HALT         ;AT PFVEC+2
2524     000030 004010     .WORD     .SCOPE        ;SET EMT TRAP TO .SCOPE ROUTINE
2525     000032 000340     .WORD     340          ;PRIORITY LEVEL 7
2526     000034 003544     .WORD     .HLT         ;SET TRAP TRAP TO .HLT ROUTINE
2527     000036 000340     .WORD     340          ;PRIORITY LEVEL 7
2528
2529 ;ACT11 HOOK *****
2530     (1)      000040     $SVPC=.               ;SAVE CURRENT LOCATION CTR
2531     (1)      000046     .=46                 ;SET LOCATION 46
2532     (1) 000046 012712     .WORD     $ENDAD      ;SET LOCATION 46
2533     (1)      000052     .=52                 ;SET LOCATION 52 = 0
2534     (1) 000052 000000     .WORD     0           ;RESTORE LOCATION CTR
2535     (1)      000040     .=$SVPC
2536
2537     .=TKVEC
2538     000060 003420     .WORD     TKISR
2539     000062 000200     .WORD     200
2540
2541 ;SOFTWARE SWITCH REGISTER LOC. 176
2542     .=176
2543     000176 000100     SWREG: .WORD     SW06 ;SOFTWARE SWITCH REGISTER
2544
2545     .=200
2546     000200 000137 005650     JMP      @#INIT      ;GO TO START OF PROGRAM
2547     .=210
2548     000210 000137 006756     JMP      @#RSTRT    ;RESTART ADDRESS
2549
2550     .=500
2551     000500 000600     STKPTR= 600         ;STACK
2552
2553     .=1000
2554 ;PROGRAM TAGS
2555     001000 177570     SWR: 177570         ;SWITCH REGISTER
2556     001002 000000     SCPADR: .WORD     0 ;TM03 DRIVE UNDER TEST
2557     001004 000     DRVNUM: .BYTE     0 ;TU45 SLAVE UNDER TEST
2558     001005 000     SLVNUM: .BYTE     0 ;POINTER TO SLAVE TABLE (SLVTBL) BELOW
2559     001006 000000     SLVPTR: .WORD     0 ;BASE ADDRESS OF TM03/TU45 REGISTERS
2560     001010 172440     TMBASE: .WORD     TMCS1 ;CONTAINS 'TICK' COUNT
2561     001012 000000     ATIME: .WORD     0 ;EACH ENTRY CONTAINS TIME FOR FUNCTION
2562     001014 000020     ATIMTBL: .BLKW    16. ;ENTRIES ARE MADE BY 'SCOPE' ROUTINE
2563
2564     001054 000020     GAP: .BLKW     16. ;TIMES RECORDED BY 'GAP CONSISTANCY' TEST
2565     001114 000000     DELTIM: .WORD     0 ;VARIABLE DELAY
2566     001116 000000     OCTALO: .WORD     0
2567     001120 000     GAP: .BYTE     0 ;CONTAINS GAP # (USED FOR TST 021)
2568     001121 000     ITCNT: .BYTE     0 ;ITERATION COUNT
2569     001122 000     TSTNUM: .BYTE     0 ;TEST #
2570     001123 000     ERFLG: .BYTE     0 ;ERROR FLAG
2571     001124 000     PRGFLG: .BYTE     0 ;PROGRAM FLAG
    
```

2564	001125	000	UNTFND: .BYTE	0	;UNIT FOUND INDICATOR
2565	001126	000	TYPFLG: .BYTE	0	
2566	001127	000	PSCNT: .BYTE	0	;CONTAINS PASS COUNT
2567	001130	000	ASFLG: .BYTE	0	;1/0 = YES/NO.
2568		001132			
2569	001132	030460	DIGTAB: .EVEN		
2570	001134	031462			
2571	001136	032464			
2572	001140	033466			
2573	001142	034470			
2574	001144	000006	ODIGITS: .BLKB	6	;RESERVE SPACE FOR CONVERTED DIGITS
2575	001152	000			;TERMINATOR
2576		001154			
2577	001154	000010	DRVTBL: .BLKB	8.	;A 0/-1 = DRIVE NOT TO BE/TO BE TESTED
2578	001164	000100	SLVTBL: .BLKB	64.	;A 0/-1 = SLAVE NOT TO BE/TO BE TESTED
2579	001264	000110	INBUF: .BLKB	72.	;TELETYPE INPUT BUFFER
2580	001374	005015	CRLF: .ASCIZ	<CR><LF>	;MISCELLANEOUS ASCII CHARACTERS
2581	001377	134	BKSLSH: .ASCIZ	'\'	
2582	001401	060	ECHO: .ASCIZ	'0'	
2583	001403	007	BELL: .ASCIZ	<7>	
2584	001405	055	DASH: .ASCIZ	'-'	
2585	001407	040	SPACE2: .ASCIZ	' '	
2586	001410	000040	SPACE: .ASCIZ	' '	
2587	001412	004476	ANGTAB: .ASCIZ	'>'<HT>	
2588		001416		.EVEN	

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001416 000000 000000  
 001422 014234 013414  
 001426 000702 000562  
 001432 000550 000404  
 001436 001370 000214  
 001442 001630 001010  
 001446 000252 000132  
 001452 000221 000043  
 001456 001370 000214  
 001462 000252 000132  
 001466 000276 000226  
 001472 001370 000214  
 001476 001560 000430  
 001502 001560 000430  
 001506 001426 000702  
 001512 001527 001015  
 001516 001147 000675  
 001522 001301 001027  
 001526 002260 002114  
 001532 002342 002176  
 001536 011576 011122  
 001542 012000 011470  
 001546 002152 002006  
 001552 002152 002006

.SBTTL TIME SPECIFICATION TABLE  
 ;THE BELOW TABLE CONTAINS THE SPECIFIED FUNCTION TIMES IN TENS OF  
 ;MICROSECONDS. 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 #
STIMTBL: .WORD	0,0	:SPARE		
.WORD	6300.,5900.	:63.0-59.0	WRITE FROM BOT	TST001
.WORD	00450.,00370.	:4.5-3.7	WRITE START	TST002
.WORD	00360.,00260.	:3.6-2.6	WRITE SHUTDOWN	TST003
.WORD	00760.,00140.	:7.6-1.4	WRITE STLDOWN	TST004
.WORD	00920.,00520.	:9.2-5.2	READ FROM BOT	TST005
.WORD	00170.,00090.	:1.7-0.9	READ START	TST006
.WORD	00145.,00035.	:1.45-0.35	READ SHUTDOWN	TST007
.WORD	00760.,00140.	:7.6-1.4	READ SETTLEDOWN	TST010
.WORD	00170.,00090.	:1.7-0.9	RD REV START	TST011
.WORD	00190.,00150.	:1.9-1.5	RD REV SHTDWN	TST012
.WORD	00760.,00140.	:7.6-1.4	RD REV STLDWN	TST013
.WORD	00880.,00280.	:8.8-2.8	TRN RND DLY F-R	TST014
.WORD	00880.,00280.	:8.8-2.8	TRN RND DLY R-F	TST015
.WORD	00790.,00450.	:7.9-4.5	GAP SIZE STOP	TST016
.WORD	00855.,00525.	:8.55-5.25	GAP SIZE STRT	TST017
.WORD	00615.,00445.	:6.15-4.45	GAP SIZE INTER	TST020
.WORD	00705.,00535.	:7.05-5.35	GAP CONSISANCY	TST021
.WORD	01200.,01100.	:12.0-11.0	DAT TIME 800BPI	TST022
.WORD	01250.,01150.	:12.5-11.5	DAT TIME 1600PE	TST023
.WORD	04990.,04690.	:49.9-46.9	ERASE	TST024
.WORD	05120.,04920.	:51.2-49.2	WRT FILE MARK	TST025
.WORD	01130.,01030.	:11.3-10.3	TAPE SPEED FWD	TST026
.WORD	01130.,01030.	:11.3-10.3	TAPE SPEED REV	TST027

;NOTE: TEST 26 AND 27 REQUIRE PRERECORDED 800BPI SKEW TAPE.

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001556 001274 001041  
 001562 001344 001200  
 001566 001370 001154  
 001572 001274 001060  
 001576 001306 000776  
 001602 001351 000707  
 001606 001351 000733  
 001612 001351 000733  
 001616 001274 000764  
 001622 001262 000764  
 001626 001262 000764  
 001632 001262 000764  
 001636 001262 000764  
 001642 001262 000764  
 001646 001262 000764  
 001652 001262 000764

.SBTTL GAP TIME SPECIFICATION TABLE  
 ;THIS TABLE CONTAINS THE 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)
GTIMTBL:	.WORD	00700.,00545.	:7.00-5.45	GAP-0	0 MS
	.WORD	00740.,00640.	:7.4-6.4	GAP-1	1.0 MS
	.WORD	00760.,00620.	:7.6-6.2	GAP-2	2.0 MS
	.WORD	00700.,00560.	:7.0-5.6	GAP-3	3.0 MS
	.WORD	00710.,00510.	:7.1-5.1	GAP-4	4.0 MS
	.WORD	00745.,00455.	:7.45-4.55	GAP-5	5.0 MS
	.WORD	00745.,00475.	:7.45-4.75	GAP-6	6.0 MS
	.WORD	00745.,00475.	:7.45-4.75	GAP-7	7.0 MS
	.WORD	00700.,00500.	:7.0-5.0	GAP-10	8.0 MS
	.WORD	00690.,00500.	:6.9-5.0	GAP-11	9.0 MS
	.WORD	00690.,00500.	:6.9-5.0	GAP-12	10.0 MS
	.WORD	00690.,00500.	:6.9-5.0	GAP-13	11.0 MS
	.WORD	00690.,00500.	:6.9-5.0	GAP-14	12.0 MS
	.WORD	00690.,00500.	:6.9-5.0	GAP-15	13.1 MS
	.WORD	00690.,00500.	:6.9-5.0	GAP-16	14.1 MS
	.WORD	00690.,00500.	:6.9-5.0	GAP-17	15.1 MS



2648  
 2649  
 2650 001656 000000  
 2651 001660 015103  
 2652 001662 015125  
 2653 001664 015145  
 2654 001666 015167  
 2655 001670 015213  
 2656 001672 015235  
 2657 001674 015254  
 2658 001676 015276  
 2659 001700 015321  
 2660 001702 015343  
 2661 001704 015370  
 2662 001706 015417  
 2663 001710 015450  
 2664 001712 015501  
 2665 001714 015527  
 2666 001716 015556  
 2667 001720 015606  
 2668 001722 015631  
 2669 001724 015655  
 2670 001726 015702  
 2671 001730 015724  
 2672 001732 015747  
 2673 001734 015771  
 2674  
 2675  
 2676 001736 007224  
 2677 001740 007474  
 2678 001742 007560  
 2679 001744 007636  
 2680 001746 007726  
 2681 001750 010034  
 2682 001752 010120  
 2683 001754 010204  
 2684 001756 010304  
 2685 001760 010424  
 2686 001762 010522  
 2687 001764 010632  
 2688 001766 010772  
 2689 001770 011064  
 2690 001772 011172  
 2691 001774 011266  
 2692 001776 011376  
 2693 002000 011516  
 2694 002002 012022  
 2695 002004 012152  
 2696 002006 012302  
 2697 002010 012422  
 2698 002012 012764  
 2699 002014 013112

.SBTTL TEST HEADER POINTERS  
 ;THE BELOW TABLE CONTAINS POINTERS TO EACH TEST'S DESCRIPTOR  
 NAMPTR: .WORD 0

.WORD A.T001  
 .WORD A.T002  
 .WORD A.T003  
 .WORD A.T004  
 .WORD A.T005  
 .WORD A.T006  
 .WORD A.T007  
 .WORD A.T010  
 .WORD A.T011  
 .WORD A.T012  
 .WORD A.T013  
 .WORD A.T014  
 .WORD A.T015  
 .WORD A.T016  
 .WORD A.T017  
 .WORD A.T020  
 .WORD A.T021  
 .WORD A.T022  
 .WORD A.T023  
 .WORD A.T024  
 .WORD A.T025  
 .WORD A.T026  
 .WORD A.T027

;TABLE OF TEST STARTING ADDRESSES  
 TSTTBL: .WORD TST000

.WORD TST001  
 .WORD TST002  
 .WORD TST003  
 .WORD TST004  
 .WORD TST005  
 .WORD TST006  
 .WORD TST007  
 .WORD TST010  
 .WORD TST011  
 .WORD TST012  
 .WORD TST013  
 .WORD TST014  
 .WORD TST015  
 .WORD TST016  
 .WORD TST017  
 .WORD TST020  
 .WORD TST021  
 .WORD TST022  
 .WORD TST023  
 .WORD TST024  
 .WORD TST025  
 .WORD TST026  
 .WORD TST027

```

2701 002016 000000
2702
2703
2704 002020 022737 000176 001000 GTSWR:  CMP    #SWREG,SWR      ;BRANCH IF SOFTWARE SWR
2705 002026 001027                BNE    2$                ;NOT INVOKED
2706 002030 004737 002354                JSR    PC,.SAVE         ;SAVE REGISTERS ON THE STACK
2707 002034 000004 016020                TYPE,L.SWR
2708 002040 017702 176734                MOV    @SWR,R2
2709 002044 004737 002426                JSR    PC,TYPECT
2710 002050 000004 016027                TYPE,L.NEW
2711 002054 004737 003272                JSR    PC,.INPUT       ;GET USER INPUT
2712 002060 122737 000015 001264                CMPB  #CR,@#INBUF     ;EXIT IF FIRST CHAR IS <CR>
2713 002066 001405                BEQ    1$
2714 002070 004737 003056                JSR    PC,CNVTAO      ;CONERT ASCII TO OCTAL
2715 002074 013777 001116 176676                MOV    @#OCTALO,@SWR ;SET NEW SWITCH REG CONTENTS
2716 002102 004737 002376 1$: JSR    PC,.RESTORE
2717 002106 000207 2$: RTS    PC
2718
2719
2720                .SBTTL  PROGRAM SUBROUTINES
2721                .SBTTL  TYPE SUBROUTINE
2722                ;;ROUTINE TO TYPE ASCII MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
(1)                ;;THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
(1)                ;;CALL: TYPE                ;;A TRAP TYPE INSTRUCTION
(1)                ;;                ;;MESADR IS FIRST ADDRESS OF ASCIZ STRING
(1)                ;;TAGS USED BY THE TYPE ROUTINE BELOW
(1)                $HT=11                ;;HORIZONTAL TAB
(1) 002110 000011 $NULL: .BYTE 0                ;;CONTAINS NULL CHARACTER
(1) 002111 002 $FILL: .BYTE 2                ;;CONTAINS # OF FILLER CHARACTERS
(1) 002112 000 $STPFLG: .BYTE 0                ;;CONTAINS TELEPRINTER AVAILABLE FLAG
(1)                ;;0/377 = AVAIL/NOT AVAIL
(1) 002113 000 $TKFLG: .BYTE 0                ;;CONTAINS KEYBOARD AVAILABLE FLAG
(1) 002114 177564 $TPS: .WORD 177564                ;;ADDRESS OF TELEPRINTER STATUS REGISTER
(1) 002116 177566 $TPB: .WORD 177566                ;;ADDRESS OF TELEPRINTER DATA BUFFER
(1) 002120 000 $CHARCNT: .BYTE 0                ;;CONTAINS # OF CHARS TYPED
(1) 002121 000 $CNTRLO: .BYTE 0                ;;CONTAINS CONTROL 0 CHAR (IF TYPED)
(1) 002122 005015 000 $CRLF: .ASCIZ <15><12>
(1)                .EVEN
(1) 002126 000000 RDSW: .WORD 0
(1)
(1) 002130 010046 .TYPE: MOV    R0,-(SP)                ;;SAVE R0
(1) 002132 017600 000002 MOV    @2(SP),R0                ;;GET MESSAGE ADDRESS
(1) 002136 062766 000002 000002 ADD    #2,2(SP)                ;;ADJUST RETURN PC
(1) 002144 105037 002121 CLR    $CNTRLO
(1)
(1) 002150 105737 002121 TYPE1: TSTB  $CNTRLO                ;;BRANCH IF CONTROL 0(^O) WASN'T TYPED
(1) 002154 001410                BEQ    TYPE2
(1) 002156 000004 002122 TCRLF: TYPE,$CRLF                ;;TYPE <CR><LF>
(1) 002162 105737 002126                TSTB  RDSW
(1) 002166 100006                BPL    TYPE3
(1) 002170 005037 002126                CLR    RDSW
(1) 002174 000207                RTS    PC
(1) 002176 112046 TYPE2: MOVB  (R0)+,-(SP)                ;;PUSH CHARACTER TO BE TYPED ONTO STACK
(1) 002200 001003                BNE    TYPE4                ;;BRANCH IF NOT THE TERMINATOR
(1) 002202 005726                TST   (SP)+                ;;POP TERMINATOR CHAR OFF THE STACK

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(1) 002204 012600 TYPE3: MOV (SP)+,R0 ;;RESTORE R0
(1) 002206 000002 RTI ;;RETURN TO CALLER
(1)
(1) 002210 122716 000011 TYPE4: CMPB #SHT,(SP) ;;BRANCH IF HORIZONTAL TAB <HT>
(1) 002214 001445 BEQ 9$
(1) 002216 004737 002250 JSR PC,5$ ;;TYPE CHARACTER
(1) 002222 122726 000012 3$: CMPB #12,(SP)+ ;;CHECK IF CHARACTER WAS A LINE FEED
(1) 002226 001350 BNE TYPE1 ;;BRANCH IF NOT LINE FEED
(1) 002230 013746 002110 MOV $NULL,-(SP) ;;GET # OF FILLERS REQUIRED AND FILLER
(1) ;;CHARACTER.
(1)
(1) 002234 105366 000001 4$: DECB 1(SP) ;;DECREMENT FILLERS REQ. COUNT
(1) 002240 002770 BLT 3$ ;;BRANCH IF NO MORE FILLERS ARE REQUIRED
(1) 002242 004737 002250 JSR PC,5$ ;;TYPE FILLER CHARACTER
(1) 002246 000772 BR 4$
(1)
(1) 002250 105777 177640 5$: TSTB @STPS ;;WAIT FOR OUTPUT DEVICE
(1) 002254 100375 BPL .-4
(1) 002256 122737 000017 002121 CMPB #17,@#SCNTRLO ;;CHECK IF CONTROL O WAS TYPED
(1) 002264 001403 BEQ 6$ ;;STOP TYPING MESSAGE IF ^O WAS TYPED
(1) 002266 116677 000002 177622 MOVB 2(SP),@STPB ;;OUTPUT CHARACTER
(1) 002274 122766 000015 000002 6$: CMPB #15,2(SP) ;;BRANCH IF NOT <CR>
(1) 002302 001003 BNE 7$
(1) 002304 105037 002120 CLRB $CHARCNT ;;CLEAR CHARACTERS TYPED COUNT
(1) 002310 000406 BR 8$
(1) 002312 122766 000012 000002 7$: CMPB #12,2(SP) ;;BRANCH IF <LF> OR 'NULL'
(1) 002320 002002 BGE 8$
(1) 002322 105237 002120 INCB $CHARCNT ;;INCREMENT CHARACTER TYPED COUNT
(1) 002326 000207 8$: RTS PC
(1)
(1) ;;HORIZONTAL TAB <HT> PROCESSER
(1) 002330 112716 000040 9$: MOVB #40,(SP) ;;LOAD 'SPACE'
(1) 002334 004737 002250 10$: JSR PC,5$ ;;TYPE 'SPACE'
(1) 002340 132737 000007 002120 BITB #7,$CHARCNT ;;TYPE SPACES UNTIL A MULTIPLE
(1) 002346 001372 BNE 10$ ;;OF 8 CHARACTERS HAVE BEEN TYPED
(1) 002350 105726 TSTB (SP)+ ;;POP SPACE
(1) 002352 000676 BR TYPE1 ;;GET NEXT CHARACTER
2723
2724 ;SUBROUTINE TO SAVE GENERAL REGISTERS ON THE STACK
2725 ;CALL: SAVE
2726 002354 010546 .SAVE: MOV R5,-(SP) ;SAVE REGISTERS ON THE STACK
2727 002356 010446 MOV R4,-(SP)
2728 002360 010346 MOV R3,-(SP)
2729 002362 010246 MOV R2,-(SP)
2730 002364 010146 MOV R1,-(SP)
2731 002366 010046 MOV R0,-(SP)
2732 002370 016646 000014 MOV 14(SP),-(SP) ;GET RETURN PC
2733 002374 000207 RTS PC ;RETURN
2734
2735 ;SUBROUTINE TO RESTORE GENERAL REGISTERS FROM THE STACK
2736 ;CALL: RESTORE
2737 002376 012666 000014 .RESTORE:MOV (SP)+,14(SP) ;MOVE RETURN PC
2738 002402 012600 MOV (SP)+,R0 ;RESTORE REGISTERS
2739 002404 012601 MOV (SP)+,R1
2740 002406 012602 MOV (SP)+,R2
2741 002410 012603 MOV (SP)+,R3

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2742 002412 012604      MOV      (SP)+,R4
2743 002414 012605      MOV      (SP)+,R5
2744 002416 000207      RTS      PC                ;RETURN
2745
2746      ;SUBROUTINE TO CONVERT OCTAL DATA TO ASCII
2747      ;CALL:  MOV      NUMBER,R2          ;MOVE NUMBER TO R2
2748      ;      JSR      PC,CNVOCCT
2749
2750 002420 110637 001126  CNVOCCT: MOVB   SP,TYPFLG          ;SET DO NOT TYPE FLAG
2751 002424 000402      BR      CNVTO
2752
2753      .SBTTL      OCTAL TO ASCII & TYPE ROUTINE
2754      ;SUBROUTINE TO CONVERT OCTAL NUMBER TO ASCII AND TYPE IT OUT
2755      ;CALL:  MOV      NUMBER,R2          ;PUT # IN R2
2756      ;      JSR      PC,TYPOCT          ;CALL ROUTINE
2757
2758 002426 105037 001126  TYPOCT: CLRB   @#TYPFLG          ;SET TYPE FLAG
2759 002432 004737 002354  CNVTO:      JSR      PC,.SAVE          ;SAVE REGISTERS ON THE STACK
2760 002436 012704 001144      MOV      #ODIGITS,R4          ;SET PTR TO OUTPUT
2761 002442 005003      CLR      R3                  ;R3 WILL CONTAIN OCTAL DIGIT
2762 002444 010201      MOV      R2,R1              ;GET # TO BE TYPED
2763 002446 006302 1$:      ASL      R2                  ;SHIFT #
2764 002450 006103      ROL      R3
2765 002452 012700 000006      MOV      #6,R0              ;SET DIGIT COUNTER
2766 002456 000404      BR      3$
2767
2768 002460 006302 2$:      ASL      R2                  ;SHIFT # 3 PLACES LEFT
2769 002462 006103      ROL      R3
2770 002464 005301      DEC      R1
2771 002466 001374      BNE      2$
2772 002470 012701 000003 3$:      MOV      #3,R1              ;SET SHIFT COUNTER
2773 002474 116324 001132      MOVB   DIGTAB(R3),(R4)+      ;MOVE ASCII EQUIV TO OUTPUT
2774 002500 005003      CLR      R3
2775 002502 005300      DEC      R0                  ;DECREMENT DIGIT COUNT
2776 002504 001365      BNE      2$                  ;GET NEXT DIGIT
2777 002506 105737 001126      TSTB   @#TYPFLG            ;BRANCH IF ASCII IS
2778 002512 001002      BNE      4$                  ;NOT TO BE TYPED
2779 002514 000004 001144      TYPE,ODIGITS
2780 002520 004737 002376 4$:      JSR      PC,.RESTORE         ;RESTORE REGISTERS FROM THE STACK
2781 002524 000207      RTS      PC
2782
2783
2784      ;SUBROUTINE TO CONVERT OCTAL DATA TO DECIMAL ASCII
2785      ;CALL:  MOV      NUMBER,R2          ;MOVE NUMBER TO R2
2786      ;      JSR      PC,CNVDEC
2787
2788 002526 110637 001126  CNVDEC: MOVB   SP,@#TYPFLG          ;SET DO NOT TYPE FLAG
2789 002532 000402      BR      CNVTD
2790
2791      .SBTTL      OCTAL TO DECIMAL & TYPE ROUTINE
2792      ;THIS ROUTINE CONVERTS AN OCTAL # TO DECIMAL ASCII AND TYPES IT OUT
2793      ;CALL:  MOV      NUMBER,R2          ;PUT # IN R2
2794      ;      JSR      PC,TYPDEC          ;CALL ROUTINE
2795 002534 105037 001126  TYPDEC: CLRB   @#TYPFLG          ;SET TYPE FLAG
  
```

2796 002540  
 (1) 002540 004737 002354  
 2797 002544 005000  
 2798 002546 012704 001144  
 2799 002552 005003  
 2800 002554 166002 002634  
 2801 002560 103402  
 2802 002562 005203  
 2803 002564 000773  
 2804 002566 066002 002634  
 2805 002572 116324 001132  
 2806 002576 062700 000002  
 2807 002602 005760 002634  
 2808 002606 001361  
 2809 002610 112724 000060  
 2810 002614 105737 001126  
 2811 002620 001002  
 2812 002622 000004 001144  
 2813 002626  
 (1) 002626 004737 002376  
 2814 002632 000207  
 2815  
 2816 002634 023420  
 2817 002636 001750  
 2818 002640 000144  
 2819 002642 000012  
 2820 002644 000001  
 2821 002646 000000  
 2822  
 2823  
 2824  
 2825  
 2826  
 2827  
 2828  
 2829  
 2830  
 2831  
 2832  
 2833  
 2834 002650 010246  
 2835 002652 010346  
 2836 002654 006302  
 2837 002656 006302  
 2838 002660 010203  
 2839 002662 000004 015063  
 2840 002666 016302 001416  
 2841 002672 004737 002534  
 2842 002676 000004 001405  
 2843 002702 016302 001420  
 2844 002706 004737 002534  
 2845 002712 000004 001412  
 2846 002716 000004 015073  
 2847 002722 013702 001012  
 2848 002726 004737 002534  
 2849 002732 000004 001374

CNVTD:  
 JSR PC,SAVE ;SAVE REGISTERS ON THE STACK  
 CLR RO ;RO IS INDEX TO DECIMAL CONSTANT  
 MOV #ODIGITS,R4 ;SET OUTPUT PTR  
 1\$: CLR R3 ;R3 CONTAINS DECIMAL DIGIT  
 2\$: SUB DCONST(R0),R2 ;SUBTRACT DECIMAL CONSTANT UNTIL  
 BLO 3\$ ;INPUT # GOES NEGATIVE  
 INC R3 ;KEEPING TRACK OF SUBTRACTIONS  
 BR 2\$  
 3\$: ADD DCONST(R0),R2 ;ADD BACK CONSTANT WHEN NEGATIVE  
 MOVB DIGTAB(R3),(R4)+ ;MOVE ASCII EQUIVALENT  
 ADD #2,R0 ;NEXT CONSTANT  
 TST DCONST(R0) ;UNTIL ALL CONSTANTS DONE  
 BNE 1\$  
 MOVB #'0,(R4)+ ;LAST DIGIT IS 0  
 TSTB @#TYPFLG ;BRANCH IF ASCII IS  
 BNE 4\$ ;NOT TO BE TYPED  
 TYPE,ODIGITS  
 4\$: JSR PC,RESTORE ;RESTORE REGISTERS FROM THE STACK  
 RTS PC  
 DCONST: .WORD 10000.  
 .WORD 1000.  
 .WORD 100.  
 .WORD 10.  
 .WORD 1.  
 .WORD 0 ;TERMINATOR  
 .SBTTL TYPE SPECIFIED TIMES ROUTINE  
 :THIS SUBROUTINE OUTPUTS THE TIME SPECIFICATIONS FOR THE TEST  
 :AND ALSO THE ACTUAL TIME RECORDED (ATIME)  
 :FORMAT OF LINE TYPED  
 :RANGE=<AAAAAA-BBBBBB> ACTUAL=CCCCC  
 :WHERE: AAAAAA IS MAXIMUM TIME FOR TEST (STIMTBL(TSTNUMX4)).  
 :BBBBBB IS MINIMUM TIME FOR TEST (STIMTBL(TSTNUMX4+2)).  
 :CCCCC IS ACTUAL TIME RECORDED BY TEST (ATIME).  
 :CALL: MOVB TEST NUMBER,R2 ;LOAD TEST NUMBER  
 : MOV #TIME,@#ATIME ;MOVE TIME TO ATIME  
 : JSR PC,OUTSPC  
 OUTSPC: MOV R2,-(SP) ;SAVE R2 & R3 ON THE STACK  
 MOV R3,-(SP)  
 ASL R2 ;MULTIPLY TEST # TIMES 4  
 ASL R2 ;TO FORM INDEX INTO STIMTBL  
 MOV R2,R3 ;R3 CONTAINS INDEX INTO TABLE  
 TYPE,L.RNG  
 MOV STIMTBL(R3),R2 ;GET MAXIMUM SPEC TIME  
 JSR PC,TYPDEC ;CONVERT TO DECIMAL & TYPE  
 TYPE,DASH  
 MOV STIMTBL+2(R3),R2 ;GET MINIMUM TIME  
 JSR PC,TYPDEC ;CONVERT TO DECIMAL & TYPE  
 TYPE,ANGTAB  
 TYPE,L.ACT  
 MOV @#ATIME,R2 ;GET ACTUAL TIME  
 JSR PC,TYPDEC ;CONVERT TO DECIMAL & TYPE  
 TYPE,CRLF

2850 002736 012603  
 2851 002740 012602  
 2852 002742 000207  
 2853  
 2854  
 2855  
 2856  
 2857  
 2858  
 2859  
 2860  
 2861  
 2862 002744 010246  
 2863 002746 010346  
 2864 002750 113703 001120  
 2865 002754 006303  
 2866 002756 006303  
 2867 002760 000004 015063  
 2868 002764 016302 001556  
 2869 002770 004737 002534  
 2870 002774 000004 001405  
 2871 003000 016302 001560  
 2872 003004 004737 002534  
 2873 003010 000004 001412  
 2874 003014 000004 015073  
 2875 003020 013702 001012  
 2876 003024 004737 002534  
 2877 003030 000004 014552  
 2878 003034 113702 001120  
 2879 003040 004737 002426  
 2880 003044 000004 001374  
 2881 003050 012603  
 2882 003052 012602  
 2883 003054 000207  
 2884  
 2885  
 2886  
 2887  
 2888 003056  
 (1) 003056 004737 002354  
 2889 003062 012700 001264  
 2890 003066 012701 001116  
 2891 003072 005011  
 2892 003074 005061 000002  
 2893 003100 122710 000015  
 2894 003104 001414  
 2895 003106 112002  
 2896 003110 042702 177770  
 2897 003114 012703 000003  
 2898 003120 006311  
 2899 003122 006161 000002  
 2900 003126 005303  
 2901 003130 001373  
 2902 003132 050211  
 2903 003134 000761  
 2904 003136

```

MOV      (SP)+,R3
MOV      (SP)+,R2
RTS      PC                ;RETURN

.SBTTL      TYPE GAP TIMES SUBROUTINE
;THIS SUBROUTINE IS USED TO TYPE THE SPECIFIED GAP SIZES (RECORDED IN
;TST021). IT IS CALLED BY THE GAPOK ROUTINE IF THE GAP SIZE IS OUT OF
;RANGE VIA THE HLT ROUTINE (HLT+2).
;CALL:  MOVB  #GAP,GAP      ;LOAD GAP # INTO GAP
;       MOV   #TIME,ATIME   ;LOAD ACTUAL TIME INTO ATIME
;       JSR   PC,OUTGAP

OUTGAP:  MOV   R2,-(SP)      ;SAVE R2 AND R3
         MOV   R3,-(SP)
         MOVB  GAP,R3       ;GET GAP #
         ASL   R3
         ASL   R3
         TYPE ,L.RNG
         MOV   GTIMTBL(R3),R2 ;GET MAX TIME
         JSR   PC,TYPDEC    ;CONVERT TO DECIMAL & TYPE
         TYPE ,DASH
         MOV   GTIMTBL+2(R3),R2 ;GET MIN TIME
         JSR   PC,TYPDEC    ;CONVERT TO DECIMAL & TYPE
         TYPE ,ANGTAB
         TYPE ,L.ACT
         MOV   @#ATIME,R2   ;GET ACTUAL TIME
         JSR   PC,TYPDEC    ;CONVERT TO DECIMAL & TYPE
         TYPE ,E.GAP
         MOVB  @#GAP,R2     ;GET GAP #
         JSR   PC,TYPDEC    ;TYPE GAP #
         TYPE ,CRLF
         MOV   (SP)+,R3     ;RESTORE R3 AND R2
         MOV   (SP)+,R2
         RTS      PC

.SBTTL      ASCII TO OCTAL CONVERT SUBROUTINE
;SUBROUTINE TO CONVERT ASCII DATA TO OCTAL. CONVERTED OCTAL DATA
;IS LEFT IN OCTALO <15-00>.
CNVTAO:  JSR   PC,SAVE      ;SAVE REGISTERS ON THE STACK
         MOV   #INBUF,R0   ;SET PTR TO ASCII DATA
         MOV   #OCTALO,R1  ;GET ADDRESS OF OCTAL DATA
         CLR   (R1)        ;CLEAR OUT OLD OCTAL DATA
         CLR   2(R1)
         1$:  CMPB  #CR,(R0) ;<CR> TERMINATES INPUT
         BEQ   3$
         MOVB (R0)+,R2     ;GET 'OCTAL' DATA
         BIC   #177770,R2  ;STRIP UNUSED BITS
         MOV   #3,R3       ;SET SHIFT COUNT
         2$:  ASL   (R1)    ;SHIFT LAST
         ROL   2(R1)      ;OCTAL DIGIT
         DEC   R3
         BNE   2$
         BIS   R2,(R1)    ;AND INSERT THIS DIGIT
         BR   1$         ;GO GET NEXT DIGIT
         3$:
    
```

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(1) 003136 004737 002376 JSR PC,.RESTORE ;RESTORE REGISTERS FROM THE STACK
2905 003142 000207 RTS PC ;RETURN
2906
2907 .SBTTL PUBLISH SUBROUTINE
2908 ;THE PUBLISH SUBROUTINE AVERAGES THE RECORDED TIMES FOR EACH TEST IT-
2909 ;ERATION (IF 16. ITERATIONS) AND PLACES THE AVERAGE RESULT IN 'ATIME'.
2910 ;IT TYPES THE NAME OF THE FUNCTION THAT WAS TIMED,THE TIME SPEC-
2911 ;IFICATION AND THE ACTUAL TIME .
2912
2913 PUBLISH:
(1) 003144 004737 002354 JSR PC,.SAVE ;SAVE REGISTERS ON THE STACK
2914 003150 012700 001014 MOV #ATIMTBL,R0 ;GET TABLE ADDRESS CONTAINING TIMES
2915 003154 113701 001121 MOVB @#ITCNT,R1 ;GET # OF ENTRIES (GIVEN BY ITERATION COUNT)
2916 003160 122701 000001 CMPB #1,R1 ;BRANCH IF SINGLE ITERATION
2917 003164 001423 BEQ 4$
2918 003166 005002 CLR R2 ;CLEAR 'SUM' REGISTERS
2919 003170 005003 CLR R3
2920 003172 122701 000004 CMPB #4.,R1 ;BRANCH IF 4. ITERATIONS
2921 003176 001402 BEQ 1$
2922 003200 000000 HALT ;ITERATION COUNT MUST BE 1 OR 4.
2923 003202 000777 BR . ;DO NOT CHANGE POSIT OF SW11
2924 ;WHEN TEST IS RUNNING.
2925
2926 003204 062002 1$: ADD (R0)+,R2 ;SUM INDIVIDUAL TIMES
2927 003206 005503 ADC R3
2928 003210 005301 DEC R1
2929 003212 001374 BNE 1$
2930
2931 003214 012700 000002 2$: MOV #2,R0
2932 003220 006203 3$: ASR R3 ;SHIFT TIME IN R3 & R2 2 PLACES
2933 003222 006002 ROR R2 ;RIGHT = DIVIDE BY 4.
2934 003224 005300 DEC R0
2935 003226 001374 BNE 3$
2936 003230 010237 001012 MOV R2,@#ATIME ;MOVE AVERAGED TIMES
2937
2938 003234 113700 001122 4$: MOVB @#TSTNUM,R0 ;GET TEST #
2939 003240 006300 ASL R0
2940 003242 016037 001656 003252 MOV NAMPTR(R0),5$ ;GET TEST NAME STRING ADDRESS
2941 003250 000004 TYPE
2942 003252 000000 5$: .WORD 0
2943 003254 113702 001122 MOVB @#TSTNUM,R2 ;GET TEST #
2944 003260 004737 002650 JSR PC,OUTSPC ;OUTPUT TIMES
2945 003264 004737 002376 JSR PC,.RESTORE ;RESTORE REGISTERS FROM THE STACK
2946 003270 000207 RTS PC
2947
2948 .SBTTL INPUT SUBROUTINE
2949 ;SUBROUTINE TO GET TTY INPUT
2950 ;CALL: JSR PC,.INPUT
2951 ;INPUT DATA IS RETURNED IN BUFFER BEGINNING AT INBUF.
2952
2953 .INPUT: MOV R0,-(SP) ;SAVE R0 ON THE STACK
2954 003272 010046 1$: MOV #INBUF,R0
2955 003274 012700 001264 2$: TSTB @#TKS
2956 003300 105737 177560 BPL 2$
2957
2958 003306 113746 177562 MOVB @#TKB,-(SP) ;GET CHARACTER
  
```

```

2959 003312 042716 000200      BIC      #200,(SP)
2960 003316 122716 000177      CMPB     #177,(SP)      ;CHECK RUBOUT
2961 003322 001004          BNE      3$
2962 003324 124026          CMPB     -(RO),(SP)+    ;REMOVE CHARACTER FROM INPUT
2963 003326 000004 001377      TYPE,BKSLSH
2964 003332 000762          BR       2$            ;WAIT FOR NEXT CHARACTER
2965 003334 122716 000025      3$:      CMPB     #CNTRLU,(SP) ;CHECK CONTROL U (^U)
2966 003340 001004          BNE      4$
2967 003342 005726          TST     (SP)+
2968 003344 000004 001374      TYPE,CRLF
2969 003350 000751          BR       1$
2970 003352 122716 000003      4$:      CMPB     #CNTRLC,(SP) ;BRANCH IF NOT CONTROL C
2971 003356 001003          BNE      40$
2972 003360 000005          RESET   ;RESET I/O
2973 003362 000137 005650      JMP      @#INIT        ;RESTART PROGRAM
2974 003366 111637 001401      40$:     MOVB     (SP),@#ECHO
2975 003372 111620          MOVB     (SP),(RO)+
2976 003374 122726 000015      CMPB     #CR,(SP)+
2977 003400 001403          BEQ     5$
2978 003402 000004 001401      TYPE,ECHO
2979 003406 000734          BR       2$
2980 003410 000004 001374      5$:      TYPE,CRLF
2981 003414 012600          MOV     (SP)+,RO
2982 003416 000207          RTS      PC

;KEYBOARD INTERRUPT SERVICE ROUTINE
TKISR:
2984          MOVB     @#TKB,-(SP) ;GET TYPED CHARACTER
2985          BIC      #200,(SP) ;STRIP PARITY BIT
2986          CMPB     #CNTRLO,(SP) ;BRANCH IF NOT CONTROL O (^O)
2987          BNE      1$
2988          MOVB     (SP),#CNTRLO ;SET CONTROL O INDICATOR IN TYPE ROUTINE
2989
2990
2991          1$:      CMPB     #3,(SP) ;BRANCH IF NOT CONTROL C (^C)
2992          BNE      2$
2993          CMP     @#42,#$ENDAD ;INHIBIT ^C IF ACT11 QV OR AA
2994          BEQ     2$
2995          RESET   ;RESTART PROGRAM
2996          JMP      @#INIT
2997
2998          2$:      CMPB     #CNTRLA,(SP) ;BRANCH IF NOT ^A
2999          BNE      3$
3000          CMP     #SWREG,SWR ;BRANCH IF HARDWARE SWR IS INVOKED
3001          BNE     4$
3002          MOV     #177570,SWR ;INVOKE HARDWARE SWR
3003          TYPE,M.HSWR
3004          3$:      CMPB     #CNTRLG,(SP) ;BRANCH IF NOT ^G
3005          BNE      5$
3006          MOV     #SWREG,SWR ;INVOKE SOFTWARE SWR
3007          JSR     PC,GTSWR ;GET NEW SWITCH REGISTER
3008          5$:      TST     (SP)+ ;POP CHARACTER OFF THE STACK
3009          RTI      ;RETURN TO CALLER
    
```



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3011          .SBTTL          ERROR SERVICE ROUTINES
3012          ;ROUTINE TO PROCESS ERROR TRAPS (TRAPS TO 4)
3013 003542 000000  ERRTRP: HALT
3014
3015          ;ERROR SERVICE ROUTINE
3016          ;THIS ROUTINE PROCESSES TWO TYPES OF ERRORS (OUT OF RANGE AND HARDWARE)
3017          ;THE CALLS FOR AN OUT OF RANGE ERROR ARE <HLT+1>,<HLT+2> AND, FOR A
3018          ;HARDWARE ERROR THE CALL IS <HLT>.
3019
3020 003544 004737 002354  .HLT:  JSR    PC,SAVE          ;SAVE REGISTERS ON THE STACK
3021 003550 110637 001123 1$:   MOVB   SP,@#ERFLG      ;SET ERROR FLAG
3022 003554 032777 020000 175216 BIT    #SW13,@SWR      ;BRANCH IF NO TYP0UT
3023 003562 001075          BNE    4$
3024 003564 000004 014353 TYPE,E.HDR
3025 003570 113702 001122 MOVB   @#TSTNUM,R2     ;GET TEST #
3026 003574 004737 002426 JSR    PC,TYPOCT      ;AND TYPE IT
3027 003600 016600 000016 MOV    16(SP),R0      ;GET RETURN PC
3028 003604 162700 000002 SUB    #2,R0          ;NOW PC OF HLT CALL
3029 003610 111000          MOVB   (R0),R0        ;NOW HLT CALL ITSELF
3030 003612 001417          BEQ    2$             ;BRANCH IF HLT
3031 003614 000004 014436 TYPE,E.HDR2
3032 003620 122700 000002 CMPB   #2,R0          ;BRANCH IF NOT HLT+2
3033 003624 001005          BNE    10$
3034 003626 004737 002744 JSR    PC,OUTGAP      ;TYPE GAP SPECIFIED TIMES
3035 003632 000004 001374 TYPE,CRLF
3036 003636 000447          BR     4$
3037 003640 004737 002650 10$:  JSR    PC,OUTSPC     ;TYPE SPECIFIED TIMES
3038 003644 000004 001374 TYPE,CRLF
3039 003650 000442          BR     4$
3040 003652 016500 000014 2$:   MOV    ER(R5),R0
3041 003656 032765 002300 000032 BIT    #PE1600,TC(R5)
3042 003664 001403          BEQ    20$
3043 003666 042700 102100 BIC    #102100,R0
3044 003672 000402          BR     21$
3045 003674 042700 102300 20$:  BIC    #102300,R0
3046 003700 005700 21$:  TST    R0
3047 003702 001003          BNE    22$
3048 003704 000004 014327 TYPE,E.SFT           ;TYPE SOFT ERROR MESSAGE
3049 003710 000434          BR     6$
3050
3051 003712 000004 014363 22$:  TYPE,E.HDR1
3052 003716 010500          MOV    R5,R0         ;GET FIRST ADDRESS OF REGS.
3053 003720 012701 000007          MOV    #7,R1        ;TYPE FIRST 7 REGS.
3054 003724 012002 3$:   MOV    (R0)+,R2      ;GET REG CONTENTS
3055 003726 004737 002426 JSR    PC,TYPOCT      ;AND TYPE IT
3056 003732 000004 001407 TYPE,SPACE2
3057 003736 005301          DEC    R1
3058 003740 001371          BNE    3$
3059 003742 016502 000032 MOV    TC(R5),R2     ;GET CONTENTS OF TC REGISTER
3060 003746 004737 002426 JSR    PC,TYPOCT
3061 003752 000004 001374 TYPE,CRLF
3062
3063 003756 032777 001000 175014 4$:  BIT    #SW09,@SWR    ;BRANCH IF NO RING THE BELL
3064 003764 001402          BEQ    5$
3065 003766 000004 001403 TYPE,BELL
3066 003772 005777 175002 5$:  TST    @SWR         ;HALT ON ERROR?
  
```

3067	003776	100001		BPL	6S	
3068	004000	000000		HALT		
3069	004002		6S:			
(1)	004002	004737	002376	JSR	PC,.RESTORE	:RESTORE REGISTERS FROM THE STACK
3070	004006	000002		RTI		:RETURN
3071						
3072						

```
3074 .SBTTL SCOPE SUBROUTINE
3075 :SCOPE ROUTINE
3076 :THIS ROUTINE IS ENTERED UPON COMPLETION OF EACH SUBTEST
3077 :THE SCOPE ROUTINE:
3078 :   OUTPUTS TIME SPEC ON EACH ITERATION IF SW08 IS SET
3079 :   REPEATS TEST IF SW14 IS SET
3080 :   STORES ACTUAL TIME FOR FUNCTION IN TIME TABLE (ATIMTBL)
3081 :   PUBLISHES TIME IF SW10=0
3082 :   UPDATES ITERATION COUNT AND IF ITERATIONS COMPLETE CONTINUES
3083 :   TO NEXT TEST, OTHERWISE REPEATS TEST.
3084 :   DELAYS BEFORE CONTINUING OR REPEATING TEST.
3085 :   INITIALIZES DRIVE
3086 :RETURNS: R5=BASE ADDRESS OF TM03 REGISTERS (ADDRESS OF CS1)
3087 :          R1='DS' REG ADDRESS
3088 :          R0='FC' REG ADDRESS
3089
3090 .SCOPE: MOV @#TMBASE,R5 ;SET R5 TO FIRST TM REG
3091 BIT #SW08,@SWR ;BRANCH IF SPECIFICATION LINE
3092 BEQ 10$ ;NOT DESIRED ON EACH ITERATION
3093 MOV @#TSTNUM,R2 ;GET TEST NUMBER
3094 JSR PC,OUTSPC ;OUTPUT TIME RECORDED
3095 004034 032777 040000 174736 10$: BIT #SW14,@SWR ;BRANCH IF CONTINUOUS LOOP
3096 004042 001432 BEQ 2$ ;NOT DESIRED
3097 004044 017701 174730 1$: MOV @SWR,R1 ;GET SWITCHES
3098 004050 042701 177740 BIC #177740,R1 ;CLEAR ALL BUT TEST #
3099 004054 001406 BEQ 11$ ;BRANCH IF ALL SELECTED
3100 004056 020137 001122 CMP R1,@#TSTNUM ;BRANCH IF RUNNING SELECTED TEST
3101 004062 001403 BEQ 11$
3102 004064 012737 007224 001002 11$: MOV #TST000,SCPADR ;RESTART AT TST000
3103 004072 004737 004634 JSR PC,DELAY ;DELAY 350 MS
3104 004076 004737 005120 JSR PC,RHINIT ;INIT
3105 004102 105037 001123 CLRB @#ERFLG ;CLEAR ERROR FLAG
3106 004106 013716 001002 MOV SCPADR,(SP)
3107 004112 010501 MOV R5,R1
3108 004114 062701 000012 ADD #DS,R1 ;ADDRESS OF 'DS' REG IS IN R1
3109 004120 010500 MOV R5,R0
3110 004122 062700 000006 ADD #FC,R0 ;ADDRESS OF 'FC' REG IS IN R0
3111 004126 000002 RTI
3112
3113 004130 105737 001123 2$: TSTB @#ERFLG ;BRANCH IF ERROR FLAG IS SET
3114 004134 001006 BNE 3$
3115 004136 113700 001121 MOV @#ITCNT,R0 ;GET ITERATION COUNT
3116 004142 006300 ASL R0 ;STORE TIME IN TABLE
3117 004144 013760 001012 001014 MOV @#ATIME,ATIMTBL(R0)
3118 004152 105237 001121 3$: INCB @#ITCNT ;INCREMENT ITERATION COUNT
3119 004156 105737 001127 TSTB @#PSCNT ;INHIBIT ITERATIONS ON
3120 004162 001410 BEQ 4$ ;ON FIRST PASS
3121 004164 032777 004000 174606 BIT #SW11,@SWR ;BRANCH IF SINGLE ITERATION DESIRED
3122 004172 001004 BNE 4$
3123 004174 122737 000004 001121 CMPB #4.,@#ITCNT ;BRANCH IF ITERATIONS INCOMPLETE
3124 004202 001320 BNE 1$
3125 004204 032777 000037 174566 4$: BIT #37,@SWR ;IF TEST SELECTED IS TEST 0
3126 004212 001002 BNE 42$ ;TREAT AS ALL TESTS
3127 004214 011637 001002 40$: MOV (SP),@#SCPADR ;SET SCOPE ADDRESS TO NEXT TEST
3128 004220 032777 002000 174552 42$: BIT #SW10,@SWR ;BRANCH IF NO PUBLICATION DESIRED
3129 004226 001005 BNE 5$
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3130 004230 005737 005746      TST      CHNFLG      ;BRANCH IF IN CHAIN MODE
3131 004234 001002              BNE      5$
3132 004236 004737 003144      JSR      PC,PUBLISH ;GO PUBLISH TEST DATA
3133 004242 105037 001121      5$:     CLR      @#ITCNT ;RESET ITERATION COUNT
3134 004246 000676              BR       1$
3135
3136                          .SBTTL  TIMER SUBROUTINES
3137
3138                          ;SUBROUTINE TO SYNCHRONIZE THE TIMER AND TURN IT ON.
3139                          ;REGISTER 4 IS CLEARED, AND THE OSCILLATOR POLARITY IS MONITORED
3140                          ;THE ROUTINE IS EXITED WHEN THE OSCILLATOR POLARITY CHANGES WITH R3
3141                          ;SET TO INDICATE THE POLARITY OF THE OSCILLATOR.
3142                          ;CALL:  JSR      PC,TIMON
3143                          ;RETURNS: R3 SET TO INDICATE LAST POLARITY (+24/-24=0/1)
3144                          ;
3145                          ;
3146                          ;
3147 004250 005004              TIMON:   CLR      R4      ;CLEAR TIME COUNT
3148 004252 012703 000024      MOV      #24,R3     ;SET POLARITY TO '0' STATE
3149 004256 032765 000100 000024  BIT      #OSC,MR(R5) ;BRANCH IF POLARITY IS '0'
3150 004264 001405              BEQ      2$
3151 004266 032765 000100 000024  1$:     BIT      #OSC,MR(R5) ;WAIT FOR OSCILLATOR TO RETURN
3152 004274 001374              BNE      1$
3153 004276 000405              BR       4$
3154 004300 005403              2$:     NEG      R3      ;NEGATE PREV POLARITY INDICATOR
3155 004302 032765 000100 000024  3$:     BIT      #OSC,MR(R5) ;WAIT FOR OSCILLATOR TO RETURN
3156 004310 001774              BEQ      3$         ;TO '1' STATE
3157 004312 000207              4$:     RTS      PC
3158
3159                          ;SUBROUTINE TO COUNT TIME
3160                          ;EACH TIME THE OSCILLATOR TOGGLES (BIT <06> IN MR REG) REGISTER
3161                          ;R4 IS INCREMENTED, AND THE REGISTER R3 IS NEGATED TO INDICATE
3162                          ;THE LAST STATE OF THE OSCILLATOR.
3163                          ;CALL  JMP      TIMER(R3)      ;R3 IS SET BY TIMON ROUTINE
3164                          ;
3165                          ;R2=RETURN ADDRESS TO CALLER
3166                          ;NOTE: THE TIME TO EXECUTE THIS ROUTINE IS VERY CRITICAL. IT MUST BE
3167                          ;LESS THAN 40 US.
3168
3169 004314 032765 000100 000024  ;ENTER HERE VIA JMP TIMER(R3) WHEN R3=-24 (PREV STATE=1)
3170 004322 001406      TIMER1: BIT      #OSC,MR(R5) ;BRANCH IF CURRENT STATE IS '0'
3171 004324 000112      BEQ      TIMER      ;GO INCREMENT TIME
3172                          JMP      (R2)      ;RETURN TO TEST
3173
3174 004340 005403      .=TIMER1+24
3175 004342 005204      TIMER:  NEG      R3      ;NEGATE PREV STATE INDICATOR
3176 004344 100401      INC      R4      ;INCREMENT 'TICK' COUNT
3177 004346 000112      BMI      TIMERR    ;BRANCH ON OVERFLOW
3178 004350 000004 014464      JMP      (R2)      ;RETURN TO TEST
3179 004354 104400      TIMERR: TYPE,E.TIMOV ;TYPE 'TIMER OVERFLOWED'
3180 004356 000177 174420      HLT                      ;REPORT HARDWARE ERROR
3181                          JMP      @SCPADR ;RETURN TO BEGINNING OF TEST
3182
3183                          .=TIMER+24
3184 004364 032765 000100 000024  ;ENTER HERE VIA JMP TIMER(R3) WHEN R3=+24 (PREV STATE=0)
3185 004372 001362      TIMERO: BIT      #OSC,MR(R5) ;BRANCH IF CURRENT STATE - '1'
3185                          BNE      TIMER
    
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3186 004374 000112          JMP      (R2)
3187
3188 ;SUBROUTINE TO CHECK TIME RECORDED BY SUBTEST.
3189 ;THIS SUBROUTINE COMPUTES THE ACTUAL TIME (IN MICROSECONDS) AND CHECKS
3190 ;THAT THE TIME RECORDED BY THE SUBTEST IS CORRECT BY COMPARING THE TIME
3191 ;WITH THE HIGH LIMIT (STIMTBL(R0)) AND THE LOW LIMIT (STIMTBL+2(R0)).
3192 ;IF THE TIME IS OUT OF RANGE AN OUT OF RANGE ERROR TYPEOUT RESULTS.
3193 ;THE SUBROUTINE IS ENTERED WITH:
3194 ;       R4=TICK COUNT
3195
3196 004376          TIMOK:
3197 (1) 004376 004737 002354      JSR      PC, .SAVE          ;SAVE REGISTERS ON THE STACK
3198 004402 012700 000070      MOV      #56, R0          ;GET TIME PER TICK
3199 004406 010401          MOV      R4, R1          ;GET TICKS COUNT
3200 004412 005003          CLR      R2              ;CLEAR SUMMING REGISTERS
3201 004414 060002          CLR      R3
3202 004416 005503          1$:  ADD      R0, R2          ;MULTIPLY TIME PER TICK
3203 004420 005301          ADC      R3              ;BY TICK COUNT
3204 004422 001374          DEC      R1
3205 004424 010246          BNE      1$
3206          MOV      R2, -(SP)          ;DIVIDE COUNT BY 10.
3207 004426 010346          MOV      R3, -(SP)
3208 004430 012746 000012      MOV      #10, -(SP)
3209 004434 004737 004722      JSR      PC, DIVIDE
3210 004440 005726          TST      (SP)+          ;DISCARD REMAINDER
3211 004442 012637 001012      MOV      (SP)+, @#ATIME   ;STORE QUOTIENT
3212 004446 113700 001122      MOV      @#TSTNUM, R0    ;GET TEST #
3213 004452 006300          ASL      R0
3214 004454 006300          ASL      R0
3215 004456 023760 001012 001416  CMP      @#ATIME, STIMTBL(R0) ;CHECK THAT TIME IS WITHIN
3216 004464 101004          BHI      2$              ;LIMITS SPECIFIED
3217 004466 023760 001012 001420  CMP      @#ATIME, STIMTBL+2(R0)
3218 004474 101001          BHI      3$
3219 004476 104401          2$:  HLT+1          ;CALL ERROR ROUTINE
3220 004500          3$:
3221 (1) 004500 004737 002376      JSR      PC, .RESTORE     ;RESTORE REGISTERS FROM THE STACK
3222 004504 000207          RTS      PC              ;RETURN
3223
3224 ;SUBROUTINE TO CHECK INDIVIDUAL GAP TIMES (PRODUCED BY TST021)
3225 ;SUBROUTINE COMPUTES THE ACTUAL TIME (IN MICROSECONDS) AND CHECKS
3226 ;THAT THE GAP TIME RECORDED BY THE SUBTEST (TST021) BY COMPARING THE
3227 ;TIME WITH THE MAX LIMIT (GTIMTBL-GAPTBL(R1)) AND THE MIN LIMIT
3228 ;:(GTIMTBL+2-GAPTBL(R1)).
3229 ;CALL:  MOV      #TICK COUNT, R4          ;R4 CONTAINS TICK COUNT
3230 ;       MOV      #GAP, @#GAP            ;LOCATION GAP CONTAINS GAP #
3231 ;       JSR      PC, GAPOK
3232 004506          GAPOK:
3233 (1) 004506 004737 002354      JSR      PC, .SAVE          ;SAVE REGISTERS ON THE STACK
3234 004512 012700 000070      MOV      #56, R0          ;GET TIME PER TICK
3235 004516 010401          MOV      R4, R1          ;GET TICK COUNT
3236 004520 005002          CLR      R2              ;CLEAR SUMMING REGISTERS
3237 004522 005003          CLR      R3
3238 004524 060002          1$:  ADD      R0, R2          ;MULTIPLY TICK COUNT
3239 004526 005503          ADC      R3              ;BY TIME PER TICK

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```

3239 004530 005301          DEC    R1
3240 004532 001374          BNE    1$
3241
3242 004534 010246          MOV    R2,-(SP)          ;DIVIDE TIME BY 10.
3243 004536 010346          MOV    R3,-(SP)
3244 004540 012746 000012      MOV    #10,-(SP)
3245 004544 004737 004722      JSR    PC,DIVIDE
3246 004550 005726          TST    (SP)+          ;DISCARD REMAINDER
3247 004552 012637 001012      MOV    (SP)+,@#ATIME  ;STORE QUOTIENT
3248 004556 113703 001120      MOVB  @#GAP,R3        ;GET GAP #
3249 004562 006303          ASL    R3             ;MULTPLY BY 4
3250 004564 006303          ASL    R3             ;TO GET AT TABLE ENTRY
3251 004566 023763 001012 001556      CMP    @#ATIME,GTIMTBL(R3) ;CHECK TIME (MAX)
3252 004574 101004          BHI    2$
3253 004576 023763 001012 001560      CMP    @#ATIME,GTIMTBL+2(R3) ;CHECK TIME (MIN)
3254 004604 101002          BHI    3$
3255 004606 104402          HLT+2 2$            ;REPORT OUT OF RANGE ERROR
3256 004610 000406          BR     100$
3257 004612 032777 000400 174160 3$:   BIT    #SW08,@SWR     ;BRANCH IF TIMES NOT WANTED
3258 004620 001402          BEQ    100$
3259 004622 004737 002744          JSR    PC,OUTGAP     ;TYPE GAP TIMES
3260
3261 004626          100$:
(1) 004626 004737 002376          JSR    PC,.RESTORE   ;RESTORE REGISTERS FROM THE STACK
3262 004632 000207          RTS    PC            ;RETURN TO TEST
3263
3264          .SBTTL          DELAY SUBROUTINES
3265          ;THIS SUBROUTINE CAUSES A DELAY OF 350 MS.
3266 004634 004737 004250      DELAY: JSR    PC,TIMON
3267 004640 010246          MOV    R2,-(SP)          ;SAVE R2 ON THE STACK
3268 004642 012702 004652      MOV    #2$,R2          ;SET RETURN ADDRESS FOR TIMER
3269 004646          1$:
(1) 004646 000163 004340      JMP    TIMER(R3)       ;GO TO TIMER & RETURN VIA R2
3270 004652 032704 004000      2$:   BIT    #4000,R4
3271 004656 001773          BEQ    1$
3272 004660 012602          MOV    (SP)+,R2       ;RESTORE R2
3273 004662 000207          RTS    PC
3274
3275          ;THIS SUBROUTINE ALLOWS A CALLER SPECIFIED DELAY (UP TO 65MS.)
3276          ;CALL: MOV    DELAY TIME,DELTIM ;LOAD DELAY TIME (IN US)
3277          ;      JSR    PC,DELAYV
3278 004664 005737 001114      DELAYV: TST    DELTIM   ;BRANCH IF 0 DELAY
3279 004670 001413          BEQ    3$
3280 004672 004737 004250      JSR    PC,TIMON       ;TURN TIMER ON
3281 004676 010246          MOV    R2,-(SP)       ;SAVE R2 ON THE STACK
3282 004700 012702 004710      MOV    #2$,R2        ;SET RETURN ADDRESS FROM TIMER
3283 004704          1$:
(1) 004704 000163 004340      JMP    TIMER(R3)       ;GO TO TIMER & RETURN VIA R2
3284 004710 023704 001114      2$:   CMP    @#DELTIM,R4
3285 004714 101373          BHI    1$
3286 004716 012602          MOV    (SP)+,R2       ;RESTORE R2
3287 004720 000207          3$:   RTS    PC
3288
3289          .SBTTL          DIVIDE SUBROUTINE
3290          ;THIS SUBROUTINE DIVIDES A DOUBLE PRECISION # AND RETURNS THE RESULT
3291          ;TO THE CALLER ON THE STACK. BOTH DIVIDEND & DIVISOR MUST BE POSITIVE.

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3292      ;CALL:  MOV    LEAST SIGNIFICANT HALF DIVIDEND,-(SP)
3293      ;      MOV    #MOST SIGNIFICANT HALF DIVIDEND,-(SP)
3294      ;      MOV    #DIVISOR,-(SP)
3295      ;      JSR    PC,DIVIDE
3296      ;RETURN
3297      ;      (SP)=REMAINDER ON STACK
3298      ;      2(SP)=QUOTIENT
3299
3300      ;NOTE: THIS SUBROUTINE DESTROYS PREVIOUS CONTENTS OF R0,R1,R2 & R3.
3301
3302      DIVIDE: CLR    -(SP)          ;SAVE LOC FOR SIGNS
3303      MOV    #17,-(SP)          ;SET ITERATION COUNT
3304      MOV    12(SP),R1         ;GET LSH DIVIDEND
3305      MOV    10(SP),R0         ;GET MSH DIVIDEND
3306      MOV    6(SP),R2          ;GET DIVISOR
3307      NEG    R2                ;NEGATE DIVISOR
3308      CLC                      ;CLEAR 'C' BIT IN PSW
3309      BR    2$
3310      1$:  ROL    R0            ;ROTATE MSH DIVIDEND
3311      MOV    R0,R3            ;SAVE IN R3
3312      ADD    R2,R3            ;SUBTRACT DIVISOR FROM MSH DIVIDEND
3313      BCC   2$                ;BRANCH IF DIVIDEND > DIVISOR
3314      MOV    R3,R0            ;SAVE REMAINDER IN R0
3315      2$:  ROL    R1            ;ROTATE LSH DIVIDEND
3316      DEC    (SP)             ;DECREMENT ITERATION COUNT
3317      BNE   1$
3318      TST   (SP)+             ;POP ITERATION COUNTER
3319      TST   (SP)+             ;POP SIGN CORRECTION
3320      MOV    R1,6(SP)          ;PUSH REMAINDER ON STACK
3321      MOV    R0,4(SP)          ;PUSH QUOTIENT ONTO STACK
3322      MOV    (SP)+,(SP)
3323      RTS    PC
3324
3325      .SBTTL  DRIVE SUBROUTINES
3326      ;SUBROUTINE TO CHECK IF DRIVE IS AVAILABLE
3327      ;CALL:  MOV    DRIVE#,DRVNUM
3328      ;      JSR    PC,DRVAVA
3329      ;RETURN: 'C' BIT SET IF NOT AVAILABLE
3330      DRVAVA: MOV    @#DRVNUM,CS2(R5) ;LOAD DRIVE #
3331      BIT    #TAP,DT(R5)          ;CHECK IF TAPE UNIT
3332      BNE   1$
3333      JSR    PC,RHINIT
3334      SEV
3335      1$:  RTS    PC            ;SET 'V' TO IND NOT AVAIL
3336      ;RETURN
3337      ;SUBROUTINE TO CHECK IF TU45 SLAVE IS AVAILABLE FOR TEST
3338      ;CALL:  MOV    DRIVE #,@#DRVNUM ;PASS DRIVE # VIA DRVNUM
3339      ;      MOV    SLAVE #,@#SLVNUM  ;PASS SLAVE # VIA SLVNUM
3340      ;      JSR    PC,SLVAVA         ;CALL SUBROUTINE
3341      SLVAVA: MOV    @#DRVNUM,CS2(R5) ;LOAD DRIVE #
3342      MOV    @#SLVNUM,TC(R5)        ;AND SLAVE #
3343      BIT    #SPR,DT(R5)           ;BRANCH IF SLAVE NOT PRESENT
3344      BEQ   1$
3345      BIT    #MOL,DS(R5)           ;BRANCH IF ON LINE
3346      BNE   2$
3347      MOV    DIGTAB(R0),@#E.NSL1   ;SET DRIVE # IN MESSAGE
  
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3348 005102 116137 001132 014245      MOVB  DIGTAB(R1),@#E.MSG      ;SET SLAVE # IN MESSAGE
3349 005110 000004 014226      TYPE,E.NDR1                  ;PRINT DRIVE #,SLAVE # NOT
3350                                     ;ON LINE
3351 005114 000262      1$: SEV                      ;SET 'V' TO INDICATE NO SLAVE
3352 005116 000207      2$: RTS      PC
3353
3354      ;SUBROUTINE TO INITIALIZE RM CONTROLLER
3355      ;CALL: JSR PC,RHINIT
3356
3357 005120 012765 000040 000010 RHINIT: MOV      #40,CS2(R5)
3358 005126 113765 001004 000010      MOVB  @#DRVNUM,CS2(R5)
3359 005134 005046      CLR   -(SP)
3360 005136 113716 001005      MOVB  @#SLVNUM,(SP)
3361 005142 012665 000032      MOV   (SP)+,TC(R5)          ;LOAD SLAVE # INTO TC REG
3362 005146 052765 001700 000032      BIS   #NORM11,TC(R5)
3363 005154 000207      RTS      PC
3364
3365      ;SUBROUTINE TO WAIT FOR DRIVE READY (DRY)
3366 005156 005027      WAITRDY:CLR      (PC)+      ;CLEAR WAIT TIMER
3367 005160 000000      WAITTIM:.WORD   0
3368 005162 105765 000012      1$: TSTB  DS(R5)          ;WAIT FOR READY TO SET
3369 005166 100406      BMI   2$
3370 005170 005237 005160      INC   WAITTIM            ;INCREMENT WAIT TIMER
3371 005174 001372      BNE   1$                ;BRANCH IF TIME HAS NOT EXPIRED
3372 005176 000004 014511      TYPE,E.TIMEXP            ;TYPE 'TIME EXPIRED WAITING FOR RDY'
3373 005202 000425      BR    99$               ;TAKE ERROR EXIT
3374 005204 032765 002000 000012 2$: BIT   #EOT,DS(R5)        ;CHECK FOR END OF TAPE
3375 005212 001415      BEQ   3$                ;BRANCH IF NO EOT
3376 005214 000004 013322      TYPE,M.NAM
3377 005220 000004 014035      TYPE,M.EOT              ;TYPE 'END OF TAPE'
3378 005224 004737 005262      JSR   PC,.REWIND        ;REWIND SLAVE
3379 (1) 005230 102412      BVS   99$               ;BRANCH IF ERROR ON REWIND
3380 005232 004737 005344      JSR   PC,WRITE          ;WRITE A RECORD
3381 005240 005215      INC   (R5)              ;SET 'GO' BIT
3382 005244 000404      JSR   PC,WAITRDY        ;WAIT FOR READY
3383 005246 032765 040000 000012 3$: BIT   #ERR,DS(R5)        ;TAKE ERROR EXIT
3384 005254 001401      BEQ   100$              ;CHECK ERROR EXIT
3385 005256 000262      99$: SEV
3386 005260 000207      100$: RTS      PC
3387      ;SUBROUTINE TO REWIND A UNIT (DRIVE/SLAVE COMBINATION)
3388      ;CALL  MOVB  DRIVE #,@#DRVNUM
3389      ;      MOVB  SLAVE #,@#SLVNUM
3390      ;      JSR   PC,.REWIND
3391      ;SUBROUTINE RETURNS TO CALLER WITH SELECTED SLAVE AT 'BOT', & 'V' SET IF
3392      ;AN ERROR OCCURS.
3393
3394 005262 004737 005120      .REWIND:JSR      PC,RHINIT      ;INITIALIZE CONTROLLER
3395 005266 004337 005500      JSR      R3,TMCMND            ;GO TO TM COMMAND SUBROUTINE
3396 005272 000000      .WORD   0                  ;BUS ADDRESS (NOT USED)
3397 005274 000000      .WORD   0                  ;WORD COUNT (NOT USED)
3398 005276 000000      .WORD   0                  ;FRAME COUNT (NOT USED)
3399 005300 000006      .WORD   RWD                ;REWIND COMMAND
3400 005302 005215      INC   (R5)                ;SET 'GO' BIT
3401 005304 032765 000002 000012 1$: BIT   #BOT,DS(R5)        ;BRANCH IF 'BOT' SET
3402 005312 001005      BNE   2$

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3403 005314 032765 040000 000012      BIT      #ERR,DS(R5)      ;CHECK ERROR BIT
3404 005322 001006      BNE      99$           ;BRANCH IF ERROR BIT SET
3405 005324 000767      BR       1$           ;
3406
3407 005326 032765 020000 000012 2$:      BIT      #PIP,DS(R5)      ;WAIT FOR TAPE MOTION TO STOP
3408 005334 001374      BNE      2$           ;
3409 005336 000401      BR       100$        ;
3410 005340 000262      99$:      SEV           ;
3411 005342 000207      100$:     RTS          PC
3412
3413      ;SUBROUTINE TO WRITE 256. WORD RECORD
3414      ;CALL: JSR          PC,WRITE
3415
3416 005344 004337 005500      WRITE: JSR          R3,TMCMD      ;GO TO TM COMMAND SUBROUTINE
3417 005350 016046      .WORD   WTBUF         ;BUS ADDRESS
3418 005352 177600      .WORD   WRDCNT        ;WORD COUNT
3419 005354 177400      .WORD   FRMCNT        ;FRAME COUNT
3420 005356 000060      .WORD   WFW          ;WRITE FORWARD COMMAND
3421 005360 000207      RTS          PC
3422
3423      ;SUBROUTINE TO READ A 256. WORD RECORD.
3424      ;CALL: JSR          PC,READ
3425
3426 005362 004337 005500      READ:  JSR          R3,@#TMCMD
3427 005366 016046      .WORD   RDBUF         ;ADDRESS OF READ BUFFER
3428 005370 177600      .WORD   WRDCNT        ;2'S COMPLEMENT OF WORD COUNT
3429 005372 177400      .WORD   FRMCNT        ;2'S COMPLEMENT OF FRAME COUNT
3430 005374 000070      .WORD   RDFWD        ;READ FORWARD COMMAND
3431 005376 000207      RTS          PC
3432
3433      ;SUBROUTINE TO INITIATE READ REVERSE COMMAND
3434      ;CALL: JSR          PC,REVRD
3435
3436 005400 004337 005500      REVRD: JSR          R3,TMCMD
3437 005404 016446      .WORD   RDBUF+256.    ;ADDRESS OF READ REVERSE BUFFER
3438 005406 177600      .WORD   WRDCNT        ;2'S COMPLEMENT OF WORD COUNT
3439 005410 177400      .WORD   FRMCNT        ;2'S COMPLEMENT OF FRAME COUNT
3440 005412 000076      .WORD   RDREV        ;READ REVERSE COMMAND
3441 005414 000207      RTS          PC
3442
3443      ;SUBROUTINE TO SPACE FORWARD 1 RECORD
3444 005416 012765 177777 000006  FWDSPC: MOV          #-1,FC(R5)      ;LOAD RECORD COUNT
3445 005424 012715 000031      MOV          #SPCFWD+1,(R5)      ;LOAD COMMAND
3446 005430 004737 005156      JSR          PC,WAITRDY          ;WAIT FOR READY
3447 005434 000207      RTS          PC                 ;RETURN
3448
3449      ;SUBROUTINE TO WRITE A RECORD AND BACK SPACE OVER THE RECORD.
3450 005436 004737 005344      WRT.BK: JSR          PC,WRITE      ;WRITE THE RECORD
3451 005442 005215      INC          (R5)                ;SET 'GO' BIT
3452 005444 004737 005156      JSR          PC,WAITRDY          ;
3453 005450 102412      BVS        2$                 ;
3454 005452 012765 177777 000006      MOV          #-1,FC(R5)      ;LOAD RECORD COUNT
3455 005460 012715 000033      MOV          #SPCREV+1,(R5)      ;LOAD COMMAND
3456 005464 004737 005156      JSR          PC,WAITRDY          ;
3457 005470 102402      BVS        2$                 ;
3458 005472 004737 004634      1$:      JSR          PC,DELAY          ;WAIT FOR TAPE MOTION TO STOP

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3459	005476	000207	2\$:	RTS	PC	
3460						
3461				;SUBROUTINE TO LOAD A COMMAND		
3462				;CALL: JSR R3,TMCMD		
3463				: .WORD BUS ADDRESS		
3464				: .WORD WORD COUNT (2'S COMPLEMENT)		
3465				: .WORD FRAME COUNT (2'S COMPLEMENT)		
3466				: .WORD COMMAND		
3467						
3468	005500	012365	000004	TMCMD:	MOV (R3)+,BA(R5)	;LOAD BUS ADDRESS
3469	005504	012365	000002		MOV (R3)+,WC(R5)	;LOAD WORD COUNT
3470	005510	012365	000006		MOV (R3)+,FC(R5)	;LOAD FRAME COUNT
3471	005514	012315			MOV (R3)+,(R5)	;LOAD COMMAND
3472	005516	000203			RTS R3	;RETURN
3473						
3474					;SUBROUTINE TO PRINT TU45 SERIAL NUMBER	
3475					;JSR PC,SNPT	
3476						
3477	005520	016503	000030	SNPT:	MOV SN(R5),R3	
3478	005524	012701	001144		MOV #ODIGITS,R1	
3479	005530	000303			SWAB R3	
3480	005532	006003			ROR R3	
3481	005534	006003			ROR R3	
3482	005536	006003			ROR R3	
3483	005540	006003			ROR R3	;GET FIRST DIGIT
3484	005542	042703	177760		BIC #177760,R3	
3485	005546	052703	000260		BIS #260,R3	
3486	005552	110321			MOVB R3,(R1)+	;FILL FIRST DIGIT
3487	005554	016503	000030		MOV SN(R5),R3	
3488	005560	000303			SWAB R3	
3489	005562	042703	177760		BIC #177760,R3	
3490	005566	052703	000260		BIS #260,R3	
3491	005572	110321			MOVB R3,(R1)+	;GET SECOND DIGIT
3492	005574	016503	000030		MOV SN(R5),R3	
3493	005600	006003			ROR R3	
3494	005602	006003			ROR R3	
3495	005604	006003			ROR R3	
3496	005606	006003			ROR R3	
3497	005610	042703	177760		BIC #177760,R3	
3498	005614	052703	000260		BIS #260,R3	
3499	005620	110321			MOVB R3,(R1)+	;GET THIRD DIGIT
3500	005622	016503	000030		MOV SN(R5),R3	
3501	005626	042703	177760		BIC #177760,R3	
3502	005632	052703	000260		BIS #260,R3	
3503	005636	110321			MOVB R3,(R1)+	;GET FOURTH DIGIT
3504	005640	105011			CLRB (R1)	
3505	005642	000004	001144		TYPE,ODIGITS	;TYPE SERIAL NUMBER
3506	005646	000207			RTS PC	;RETURN
3507						

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3509          .SBTTL  PROGRAM INITIALIZATION
3510 005650 012706 000600  INIT:  MOV      #STKPTR,SP      ;SET STACK PTR
3511 005654 005037 001264  CLR      @#INBUF
3512
3513 005660 013716 000006          MOV      @#6,-(SP)      ;SAVE VECTORS
3514 005664 013746 000004          MOV      @#4,-(SP)
3515 005670 012737 005710 000004  MOV      #61$,@#4      ;SET UP FOR TIMEOUT
3516 005676 022777 177777 173074  CMP      #-1,@SWR      ;REFERENCE HARDWARE SWITCH REGISTER
3517 005704 001402          BEQ      60$
3518 005706 000404          BR       62$
3519 005710 022626          61$:  CMP      (SP)+,(SP)+    ;ADJUST STACK
3520 005712 012737 000176 001000 60$:  MOV      #SWREG,SWR    ;POINT TO SOFTWARE SWITCH REG
3521 005720 012637 000004          62$:  MOV      (SP)+,@#4    ;RESTORE VECTORS
3522 005724 012637 000006          MOV      (SP)+,@#6
3523 005730 105037 001124          CLRB    @#PRGFLG      ;CLEAR PROGRAM FLAG
3524 005734 105037 001130          CLRB    @#ASFLG      ;CLEAR ASK FLAG
3525 005740 105037 001127          CLRB    @#PSCNT      ;SET PASS COUNT = 0
3526 005744 005027          CLR     (PC)+        ;;CLEAR CHAIN INDICATOR
(1) 005746 000000  CHNFLG: .WORD 0      ;;CHAIN MODE INDICATOR
(1)
(1) 005750 022737 012712 000042  CMP      #SENDAD,@#42 ;;I/O = CHAIN/NOT CHAIN MODE
(1) 005756 001404          BEQ      50$          ;;BRANCH IF LOADED VIA ACT11 CHAIN MODE
(1) 005760 005737 000042          TST     @#42          ;;BRANCH IF IN DUMP MODE
(1) 005764 001413          BEQ      52$
(1) 005766 000406          BR       51$
(1) 005770 012737 000176 001000 50$:  MOV      #SWREG,SWR    ;;INVOKE SOFTWARE SWR
(1) 005776 012777 100000 172774  MOV      #100000,@SWR ;;WITH HALT ON ERROR SET
(1) 006004 005237 005746          51$:  INC     CHNFLG      ;;SET CHNFLG = CHAIN MODE
(1) 006010 000137 006106          JMP     5$           ;;GO TO CHAIN ADDRESS
(1) 006014          52$:
3527 006014 122737 000006 000041  CMPB    #6,@#41      ;BRANCH IF NOT LOADED VIA TMDP
3528 006022 001002          BNE     1$
3529 006024 000004 013525          TYPE ,I.REM          ;ADVISE USER TO REMOVE TMDP
3530 006030 000004 013322          1$:  TYPE ,M.NAM          ;TYPE TITLE
3531 006034 105037 013322          CLRB    M.NAM        ;DO NOT TYPE TITLE ON RESTART
3532 006040 000004 013572          TYPE ,I.REG          ;ASK USER TO TYPE CONT BASE ADRS
3533 006044 013702 001010          MOV     @#TMBASE,R2  ;GET CURRENT CONT BASE ADDRESS
3534 006050 004737 002426          JSR    PC,TYPEOCT    ;AND TYPE IT
3535 006054 000004 001410          TYPE ,SPACE
3536 006060 004737 003272          JSR    PC,.INPUT     ;GET USER INPUT
3537 006064 122737 000015 001264  CMPB    #CR,@#INBUF  ;DO NOT CHANGE CURRENT VALUE
3538 006072 001405          BEQ     5$           ;IF USER TYPES <CR>
3539 006074 004737 003056          4$:  JSR    PC,CNVTAO     ;CONVERT ASCII TO OCTAL
3540 006100 013737 001116 001010  MOV     @#OCTALO,@#TMBASE ;SET NEW ADDRESS
3541 006106 013705 001010          5$:  MOV     @#TMBASE,R5
3542
3543          ;ROUTINE TO CHECK IF CONTROLLER (RH11) IS AVAILAABLE
3544 006112 000261          SEC
3545 006114 005715          TST     (R5)         ;SET 'C' IN PSW
3546 006116 103003          BCC     6$           ;BRANCH IF CONTROLLER AVAIL
3547 006120 000004 014074          TYPE ,E.NCON
3548 006124 000651          BR     INIT
3549 006126 012737 003542 000004 6$:  MOV     #ERRTRP,@#ERRVEC ;SET ERROR TRAP VECTOR
    
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3551 ;ROUTINE TO GET TM03 DRIVES USER DESIRES TO TEST
3552 006134 105037 001123 DRIVES: CLR @#ERFLG ;CLEAR ERROR FLAG
3553 006140 012701 001154 MOV #DRVTBL,R1 ;MARK ALL DRIVES AS NOT TO
3554 006144 012700 000004 MOV #4,RO ;BE TESTED. A '0' INDICATES
3555 006150 005021 1$: CLR (R1)+ ;THAT A DRIVE IS NOT TO BE
3556 006152 005300 DEC RO ;TESTED
3557 006154 001375 BNE 1$
3558 006156 005737 005746 TST CHNFLG ;BRANCH IF IN CHAIN MODE
3559 006162 001014 BNE 2$
3560 006164 000004 013637 TYPE,I.DRVS
3561 006170 004737 003272 JSR PC,,INPUT ;GET USER INPUT
3562 006174 012700 001264 MOV #INBUF,RO
3563 006200 122710 000101 CMPB #'A,(RO) ;IF USER RESPONDS WITH 'A' OR
3564 006204 001403 BEQ 2$ ;<CR> THEN ALL AVAILABLE DRIVES
3565 006206 122710 000015 CMPB #CR,(RO) ;ARE TO BE TESTED
3566 006212 001013 BNE 4$
3567 006214 110637 001124 2$: MOVB SP,PRGFLG ;SET FLAG TO IND ALL DRIVES
3568 006220 012701 001154 MOV #DRVTBL,R1 ;MARK ALL DRIVES TO BE TESTED
3569 006224 012700 000004 MOV #4,RO ;A '-1' INDICATES THAT A DRIVE
3570 006230 012721 177777 3$: MOV #-1,(R1)+ ;IS TO BE TESTED
3571 006234 005300 DEC RO
3572 006236 001374 BNE 3$
3573 006240 000417 BR CHKDRV ;GO CHECK DRIVE AVAILABILITY
3574
3575 ;GET USER SELECTED DRIVES AND MARK EACH DRIVE SELECTED TO BE TESTED
3576 006242 122710 000015 4$: CMPB #CR,(RO)
3577 006246 001414 BEQ CHKDRV
3578 006250 121027 000054 CMPB (RO),#', ;CHECK IF 'COMMA'
3579 006254 001001 BNE 5$
3580 006256 105720 TSTB (RO)+ ;STEP PTR PAST 'COMMA'
3581 006260 112001 5$: MOVB (RO)+,R1
3582 006262 042701 177770 BIC #177770,R1
3583 006266 112761 177777 001154 MOVB #-1,DRVTBL(R1)
3584 006274 000240 NOP
3585 006276 000761 BR 4$
3586
3587 ;ASCERTAIN THAT DRIVES (TM03'S) SPECIFIED ARE AVAILABLE
3588 006300 005000 CHKDRV: CLR RO ;A (0) IN DRVTBL(RO) INDICATES
3589 006302 105760 001154 1$: TSTB DRVTBL(RO) ;THE DRIVE IS NOT TO BE TESTED
3590 006306 001005 BNE 3$ ;A '1' INDICATES TO BE TESTED
3591 006310 005200 2$: INC RO
3592 006312 122700 000010 CMPB #8.,RO
3593 006316 001371 BNE 1$
3594 006320 000424 BR 5$
3595 006322 110037 001004 3$: MOVB RO,@#DRVNUM ;GET DRIVE #
3596 006326 004737 005012 JSR PC,@#DRVAVA ;AND CHECK IF AVAILABLE
3597 006332 102366 BVC 2$ ;'V' BIT SET INDICATES NOT AVAIL
3598 006334 105737 001124 TSTB @#PRGFLG ;DO NOT TYPE NOT AVAILABLE
3599 006340 001011 BNE 4$ ;MESSAGE IF ALL SELECTED
3600 006342 000004 014141 TYPE,E.NDRV
3601 006346 116037 001132 014173 MOVB DIGTAB(RO),@#E.NAVA ;SET DRIVE # IN MESSAGE
3602 006354 000004 014173 TYPE,E.NAVA
3603 006360 110637 001123 MOVB SP,@#ERFLG ;SET 'ERROR' FLAG
3604 006364 105060 001154 4$: CLRB DRVTBL(RO) ;MARK DRIVE UNAVAILABLE
3605 006370 000147 BR 2$ ;CHECK NEXT DRIVE
3606 006372 105737 001123 5$: TSTB @#ERFLG ;GO GET SLAVES IF NO ERROR
  
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3607 006376 001256          BNE      DRIVES          ;ELSE ASK USER TO RETYPE DRIVES
3608
3609          ;ROUTINE TO GET SLAVES (TU45'S) USER DESIRES TO TEST
3610 006400 105037 001123  SLAVES: CLR      @#ERFLG          ;CLEAR ERROR INDICATOR
3611 006404 012701 001164      MOV      #SLVTBL,R1          ;MARK ALL SLAVES (64.) AS NOT
3612 006410 012700 000040      MOV      #32.,R0           ;TO BE TESTED.A 0 INDICATES THAT
3613 006414 005021          1$: CLR      (R1)+          ;A DRIVE'S SLAVE IS NOT TO BE
3614 006416 005300          DEC      R0                ;TESTED
3615 006420 001375          BNE      1$
3616 006422 012701 001164      MOV      #SLVTBL,R1          ;R1 POINTS TO DRIVE'S SLAVE
3617 006426 105760 001154      2$: TSTB   DRVTBL(R0)        ;BRANCH IF DRIVE IS TO BE TESTED
3618 006432 001007          BNE      4$                ;& IS AVAILABLE
3619 006434 062701 000010      3$: ADD      #8.,R1          ;STEP SLAVE PTR TO NEXT DRIVE'S
3620 006440 005200          INC      R0                ;SLAVES AND INCREMENT DRIVE #
3621 006442 122700 000010      CMPB   #8.,R0             ;CHECK ALL DRIVES
3622 006446 001367          BNE      2$                ;AND WHEN ALL DRIVES CHECKED
3623 006450 000457          BR       CHKSLV           ;GO CHECK SLAVE AVAILABILITY
3624
3625 006452 105737 001124      4$: TSTB   @#PRGFLG          ;BRANCH IF USER SELECTED ALL
3626 006456 001021          BNE      5$                ;DRIVES
3627 006460 110037 001004      MOVB   RO,DRVNUM          ;GET DRIVE #
3628 006464 116037 001132 013726  MOVB   DIGTAB(RO),@#1.DRV  ;PREPARE USER ACTION MESSAGE
3629 006472 000004 013707      TYPE,I.SLVS
3630 006476 004737 003272      JSR    PC,INPUT           ;GET USER INPUT
3631 006502 012703 001264      MOV    #INBUF,R3          ;SET PTR TO USER INPUT
3632 006506 122713 000101      CMPB  #'A,(R3)           ;AN 'A' OR <CR> AS FIRST CHAR
3633 006512 001403          BEQ    5$                 ;INDICATES TEST ALL SLAVES
3634 006514 122713 000015      CMPB  #CR,(R3)
3635 006520 001015          BNE    7$
3636 006522 110637 001124      5$: MOVB   SP,@#PRGFLG          ;SET 'ALL' INDICATOR
3637 006526 012701 001164      MOV    #SLVTBL,R1          ;MARK ALL SLAVES FOR ALL
3638 006532 012700 000040      MOV    #32.,R0            ;DRIVES AS TO BE TESTED
3639 006536 012721 177777      6$: MOV    #-1,(R1)+
3640 006542 005300          DEC    R0
3641 006544 001374          BNE    6$
3642 006546 105737 001124      TSTB  @#PRGFLG          ;BRANCH IF ALL WAS SELECTED
3643 006552 001016          BNE    CHKSLV
3644
3645 006554 122713 000015      7$: CMPB  #CR,(R3)          ;GET USER SELECTED SLAVES FOR
3646 006560 001725          BEQ    3$                 ;DRIVE
3647 006562 121327 000054      CMPB  (R3),#',          ;STEP PTR PAST 'COMMA'
3648 006566 001001          BNE    8$
3649 006570 105723          TSTB  (R3)+
3650 006572 112304          8$: MOVB  (R3)+,R4          ;AND MARK SELECED SLAVE
3651 006574 042704 177770      BIC   #177770,R4         ;AS TO BE TESTED
3652 006600 060104          ADD   R1,R4
3653 006602 112714 177777      MOVB  #-1,(R4)
3654 006606 000762          BR    7$
3655
3656          ;ASCERTAIN THAT SLAVES (TU45'S) SELECTED ARE AVAILABLE
3657 006610 005000  CHKSLV: CLR    R0          ;R0 WILL CONTAIN THE DRIVE #
3658 006612 005100          COM    R0                ;COMPLEMENT DRIVE #
3659 006614 012702 001164      MOV    #SLVTBL,R2          ;SET PTR TO SLAVE TABLE
3660 006620 005200          1$: INC    R0              ;INCREMENT DRIVE NUMBER
3661 006622 022700 000010      CMP    #8.,R0            ;CHECK FOR END
3662 006626 001445          BEQ    8$                ;IF SO:BR
    
```

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3663 006630 105760 001154          TSTB   DRVTBL(R0)          ;BRANCH IF DRIVE SELECTED
3664 006634 001003          BNE    3$                 ;AND AVAILABLE FOR TEST
3665 006636 062702 000010          ADD    #8.,R2             ;ELSE STEP SLAVE PTR TO
3666 006642 000766          BR     1$                 ;NEXT DRIVES SLAVES AND CHECK
3667                                     ;FOR DRIVE
3668
3669 006644 005001          3$:   CLR    R1             ;SET SLAVE # 0
3670 006646 105712          4$:   TSTB   (R2)          ;BRANCH IF DRIVE'S SLAVE IS SEL-
3671 006650 001006          BNE    6$                 ;ECTED FOR TEST
3672 006652 005201          5$:   INC    R1             ;INCREMENT SLAVE #
3673 006654 005202          INC    R2                 ;STEP PTR TO NEXT SLAVE
3674 006656 022701 000010          CMP    #8.,R1            ;GO TO 4$ IF ALL SLAVES NOT
3675 006662 001371          BNE    4$                 ;CHECKED
3676 006664 000755          BR     1$                 ;OTHERWISE GO TO 1$ ABOVE
3677
3678 006666 110037 001004          6$:   MOVB   R0,@#DRVNUM   ;PASS DRIVE & SLAVE #
3679 006672 110137 001005          MOVB   R1,@#SLVNUM
3680 006676 004737 005040          JSR    PC,@#SLVAVA
3681 006702 102363          BVC    5$                 ;AND CHECK IF AVAILABLE
3682 006704 105737 001124          TSTB   @#PRGFLG          ;'V' SET INDICATES ERROR
3683 006710 001012          BNE    7$                 ;DO NOT TYPE ERROR MSG IF ALL
3684 006712 116037 001132 014163          MOVB   DIGTAB(R0),@#E.DRV ;SLAVES SELECTED
3685 006720 116137 001132 014173          MOVB   DIGTAB(R1),@#E.NAVA ;ICATES ERROR. PREPARE ERROR
3686 006726 000004 014155          TYPE ,E.NSLV            ;MESSAGE
3687 006732 110637 001123          MOVB   SP,@#ERFLG
3688 006736 105012          7$:   CLRB   (R2)          ;SET ERROR INDICATOR
3689 006740 000744          BR     5$                 ;CLEAR SLAVE TABLE ENTRY
3690                                     ;GET NEXT SLAVE
3691 006742 105737 001123          8$:   TSTB   @#ERFLG
3692 006746 001214          BNE    SLAVES            ;BRANCH IF ERROR
3693 006750 012737 003542 000004 100$:  MOV    #ERRTRP,@#ERRVEC ;ASK USER TO RETYPE SLAVES
3694
3695                                     ;SCAN DRIVE AND SLAVE TABLE FOR DRIVE/SLAVE COMBINATION TO TEST.
3696                                     ;RESTART ADDRESS--PROGRAM STARTS HERE WHEN START ADDRESS = 210 AND
3697                                     ;AFTER EACH PASS
3698 006756 105037 001004          RSTRT: CLRB   @#DRVNUM    ;SET DRIVE AND SLAVE # 0
3699 006762 105037 001005          CLRB   @#SLVNUM
3700 006766 012737 001164 001006          MOV    #SLVTBL,@#SLVPTR ;SET PTR TO SLAVE TABLE
3701 006774 105037 001125          CLRB   @#UNTFND         ;CLEAR 'UNIT FOUND' IND.
3702
3703                                     ;PROGRAM RESTARTS HERE AFTER EACH DRIVE/SLAVE HAS BEEN TESTED.
3704 007000 113700 001004          BEGIN: MOVB   @#DRVNUM,R0 ;GET DRIVE #
3705 007004 113701 001005          MOVB   @#SLVNUM,R1      ;AND SLAVE #
3706 007010 013702 001006          MOV    @#SLVPTR,R2     ;GET SLAVE PTR
3707 007014 122737 000006 000041          CMPB   #6,@#41         ;BRANCH IF LOADED VIA TMDP
3708 007022 001004          BNE    1$
3709 007024 005737 001004          TST    @#DRVNUM        ;TEST FOR DRIVE#0,SLAVE#0
3710 007030 001001          BNE    1$               ;IF NOT : BR
3711 007032 105012          CLRB   (R2)            ;SET DRIVE #0,SLAVE #0 NOT TO
3712                                     ;BE TESTED.
3713 007034 105760 001154          1$:   TSTB   DRVTBL(R0)   ;BRANCH IF DRIVE AVAIL TO TEST
3714 007040 001011          BNE    3$
3715 007042 005001          CLR    R1               ;CLEAR SLAVE #
3716 007044 062702 000010          ADD    #8.,R2          ;AND STEP PTR TO NEXT DRIVE'S
3717 007050 005200          2$:   INC    R0             ;SLAVES AND INCREMENT DRIVE #
3718 007052 022700 000010          CMP    #8.,R0         ;EXIT TEST IF ALL DRIVES
    
```

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3719 007056 001366          BNE 1$          ;CHECKED OTHERWISE CONTINUE
3720 007060 000137 012632  JMP @#END      ;SCAN FOR NEXT 'UNIT'
3721
3722 007064 105712          3$: TSTB (R2)    ;BRANCH IF SLAVE ON DRIVE IS
3723 007066 001007          BNE 4$          ;AVAILABLE THERWISE STEP
3724 007070 005202          INC R2          ;PTR TO NEXT SLAVE
3725 007072 005201          INC R1          ;INCREMENT SLAVE #
3726 007074 122701 000010  CMPB #8.,R1    ;UNTIL ALL SLAVES CHECKED
3727 007100 001371          BNE 3$          ;WHEN ALL SLAVES CHECKED
3728 007102 005001          CLR R1         ;SET SLAVE # 0
3729 007104 000761          BR 2$          ;AND CONTINUE SCAN
3730
3731 007106 110637 001125  4$: MOVB SP,@#UNTFND ;INDICATE THAT A 'UNIT' IS FOUND
3732 007112 110037 001004  MOVB RO,@#DRVNUM  ;SET DRIVE 3
  
```

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3737 007116 110137 001005      MOVB   R1,@#SLVNUM      ;SET SLAVE #
3738 007122 010237 001006      MOV    R2,@#SLVPTR     ;SAVE SLAVE PTR
3739
3740 007126 105737 001130      5$:   TSTB   @#ASFLG
3741 007132 001034 001130      BNE    7$
3742 007134 112737 000001 001130      MOVB   #1,ASFLG
3743 007142 105037 001124      CLRB   @#PRGFLG       ;CLEAR PROGRAM INDICATOR
3744 007146 005737 005746      TST    CHNFLG         ;BRANCH IF IN CHAIN MODE
3745 007152 001024 001124      BNE    7$
3746 007154 000004 013773      TYPE ,I.SPD          ;ASK USER IF HE WANTS TO RUN SPEED TESTS
3747 007160 004737 003272      JSR    PC,.INPUT     ;GET USER INPUT
3748 007164 012703 001264      MOV    #INBUF,R3     ;GET REPLY
3749 007170 122713 000015      CMPB   #CR,'R3)     ;DO NOT DO SKEW TESTS IF <CR> IS FIRST
3750 007174 001405 000015      BEQ    6$
3751 007176 132713 000001      BITB   #1,(R3)       ;BRANCH IF 'N'
3752 007202 001402 000001      BEQ    6$
3753 007204 111337 001124      MOVB   (R3),@#PRGFLG ;SET INDICATOR
3754 007210 022737 000176 001000 6$:   CMP    #SWREG,SWR    ;BRANCH IF SOFTWARE SWR
3755 007216 001002 000176      BNE    7$            ;NOT INVOKED
3756 007220 004737 002020      JSR    PC,GTSWR      ;GET SWITCH REGISTER
3757 007224
3758
3759
3760      ;NOTE THIS IS NOT A TEST
3761      ;INITIALIZE PROGRAM FLAGS
3761 007224 105037 001122      TST000: CLRB   @#TSTNUM
3762 007230 013705 001010      MOV    @#TMBASE,R5   ;SET ADDRESS OF FIRST TMO3 REG
3763 007234 010500 001010      MOV    R5,R0
3764 007236 062700 000006      ADD    #FC,R0        ;R0 CONTAINS ADDRESS OF FC REG
3765 007242 010501 000006      MOV    R5,R1
3766 007244 062701 000012      ADD    #DS,R1        ;R1 CONTAINS ADDRESS OF DS REG
3767 007250 012703 004340      MOV    #TIMER,R3     ;SET JUMP ADDRESS TO TIMER
3768 007254 105037 001121      CLRB   @#ITCNT       ;CLEAR SUBTEST ITERATION COUNT
3769 007260 052737 000100 177560      BIS    #100,@#TKS    ;SET KEYBOARD IE BIT
3770
3771      ;GET USER RUN PROCEDURE
3772      ;IF SWR <05::00> IS NOT 0 THEN RUN TEST IN SWR<05::00>
3773      ;OTHERWISE RUN ALL TESTS
3774 007266 105737 001124      TSTB   @#PRGFLG     ;SPEED TESTS?
3775 007272 001042 001124      BNE    2$           ;IF SO: BR
3776
3777 007274 004737 005262      JSR    PC,.REWIND    ;REWIND SLAVE
3778 007300 102471 005262      BVS    99$          ;BRANCH IF ERROR ON REWIND
3779 007302 004737 005344      JSR    PC,WRITE     ;WRITE A RECORD
3780 007306 005215 005344      INC    (R5)         ;SET 'GO' BIT
3781 007310 004737 005156      JSR    PC,WAITRDY   ;WAIT FOR READY
3782 007314 102463 005156      BVS    99$
3783 007316 005737 005746      TST    CHNFLG       ;BRANCH IF IN CHAIN MODE
3784 007322 001061 005746      BNE    100$
3785 007324 117702 171450      MOVB   @SWR,R2       ;GET SWITCHES
3786 007330 042702 177740      BIC    #177740,R2   ;CLEAR ALL BUT TEST #
3787 007334 001421 005746      BEQ    2$           ;& BRANCH IF TEST 0 WAS SELECTED
3788 007336 000004 014353      TYPE ,E.HDR        ;TYPE TEST #
3789 007342 004737 002426      JSR    PC,TYPEOCT   ;FORM INDEX VALUE
3790 007346 006302 002426      ASL    R2
3791 007350 016237 001656 007360      MOV    NAMPTR(R2),1$ ;GET ADDRESS OF TEST'S NAME
3792 007356 000004 001656      TYPE
3793

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3792	007360	000000			1\$:	.WORD 0	
3793	007362	000004	001374			TYPE,CRLF	
3794	007366	016237	001736	001002		MOV TSTTBL(R2),@#SCPADR	;SET SCOPE ADDRESS FOR TEST
3795	007374	000172	001736			JMP @TSTTBL(R2)	;GO TO TEST
3796	007400	000004	014562		2\$:	TYPE,L.HDR1	
3797	007404	113702	001004			MOVB DRVNUM,R2	;GET DRIVE #
3798	007410	113704	001005			MOVB SLVNUM,R4	;AND SLAVE #
3799	007414	116237	001132	014742		MOVB DIGTAB(R2),@#L.DRV	;SET DRIVE AND SLAVE #'S
3800	007422	116437	001132	014754		MOVB DIGTAB(R4),@#L.SLV	;INTO L.HDR2 MESSAGE
3801	007430	112737	000071	014757		MOVB #'9,@#L.CHAN	;GET SLAVES CHANNEL TYPE
3802	007436	000004	014675			TYPE,L.HDR2	
3803	007442	004737	005520			JSR PC,SNPT	;PRINT SLAVE SERIAL #
3804	007446	000004	014776			TYPE,L.HDR3	
3805	007452	105737	001124			TSTB @#PRGFLG	;BRANCH IF SPEED TESTS NOT
3806	007456	001403				BEQ 100\$	;SELECTED
3807	007460	000137	012756			JMP @#SKEWTST	;GO DO SPEED TESTS
3808	007464	104400			99\$:	HLT	
3809	007466	012737	007474	001002	100\$:	MOV #TST001,@#SCPADR	;SET SCOPE LOOP ADDRESS
3810							

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3812          .SBTTL START OF TESTS
3813          :TEST 001 - WRITE FROM BOT
3814          :THIS TEST WILL MEASURE ACCELERATION DELAY REQUIRED TO
3815          :MOVE THE TAPE APPROXIMATELY SEVEN (7) INCHES FORWARD
3816          :FROM DEAD STOP BEFORE STARTING TO TRANSFER DATA.
3817
3818          :THIS TEST MEASURES TIME FROM 'GO'=1 TO 'ACCL'=0.
3819 007474 112737 000001 001122 TST001: MOVB #1,@#TSTNUM ;SET TEST #
3820 007502 012702 007526          MOV #1$,R2 ;SET RETURN PC FROM TIMER
3821 007506 004737 005262          JSR PC,REWIND ;REWIND SLAVE
3822 (1) 007512 102420          BVS 99$ ;BRANCH IF ERROR ON REWIND
3823 007514 004737 005344          JSR PC,WRITE ;GO SETUP WRITE COMMAND
3824 007520 004737 004250          JSR PC,TIMON ;TURN TIMER ON
3825 007524 005215          INC (R5) ;SET 'GO' BIT
3826 007526 005765 000032 1$: TST TC(R5) ;BRANCH WHEN 'ACCL'=0
3827 007532 100002          BPL 2$
3828 007534 000163 004340          JMP TIMER(R3) ;GO TO TIMER & RETURN VIA R2
3829
3830 007540 004737 005156 2$: JSR PC,WAITRDY ;WAIT FOR COMMAND TO FINISH
3831 007544 102403          BVS 99$ ;BRANCH IF ERROR
3832 007546 004737 004376          JSR PC,TIMOK ;GO CHECK TIME
3833 007552 000401          BR 100$
3834 007554 104400 99$: HLT
3835 007556 104000 100$: SCOPE
3836
3837          :TEST 002 - WRITE START
3838          :THIS TST MEASURES TIME FROM 'GO'=1 TO 'ACCL'=0.
3839 007560 112737 000002 001122 TST002: MOVB #2,@#TSTNUM ;SET TEST # 2
3840 007566 004737 005344          JSR PC,WRITE ;INITIATE WRITE COMMAND
3841 007572 012702 007604          MOV #1$,R2 ;SET RETURN PC FROM TIMER
3842 007576 004737 004250          JSR PC,TIMON
3843 007602 005215          INC (R5) ;SET 'GO' BIT
3844
3845 007604 005765 000032 1$: TST TC(R5) ;BRANCH WHEN 'ACCL'=0
3846 007610 100002          BPL 2$
3847 007612 000163 004340          JMP TIMER(R3) ;GO TO TIMER & RETURN VIA R2
3848
3849 007616 004737 005156 2$: JSR PC,WAITRDY ;WAIT FOR READY
3850 007622 102403          BVS 99$ ;BRANCH IF ERROR
3851 007624 004737 004376          JSR PC,TIMOK ;GO CHECK TIME RECORDED
3852 007630 000401          BR 100$ ;EXIT VIA SCOPE
3853
3854 007632 104400 99$: HLT ;REPORT ERROR
3855 007634 104000 100$: SCOPE
3856
3857          :TEST 003- WRITE SHUTDOWN
3858          :THIS TEST MEASURES TIME FROM 'FC REG'=0 TO 'SWDN'=1.
3859 007636 112737 000003 001122 TST003: MOVB #3,@#TSTNUM ;SET TEST#3
3860 007644 004737 005344          JSR PC,WRITE ;INITIATE WRITE COMMAND
3861 007650 005215          INC (R5) ;SET 'GO' BIT
3862
3863 007652 005710 1$: TST (R0) ;BRANCH WHEN WRITING FINISHED
3864 007654 001404          BEQ 2$
3865 007656 032711 040000          BIT #ERR,(R1) ;MONITOR ERROR BIT
3866 007662 001017          BNE 99$
  
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3867 007664 000772          BR      1$
3868
3869 007666          2$:
  (1) 007666 004737 004250      JSR    PC,TIMON      ;TURN TIMER ON
3870 007672 010702      MOV    PC,R2        ;LOAD RETURN PC FROM TIMER
3871 007674 032711 000020      3$:  BIT    #SDWN,(R1)  ;BRANCH WHEN DS <SDWN> SETS
3872 007700 001002      BNE    4$
3873 007702 000163 004340      JMP    TIMER(R3)    ;GO TO TIMER & RETURN VIA R2
3874
3875 007706 004737 005156      4$:  JSR    PC,WAITRDY   ;WAIT FOR READY
3876 007712 102403      BVS    99$
3877 007714 004737 004376      JSR    PC,TIMOK     ;GO CHECK TIME RECORDED
3878 007720 000401      BR     100$
3879 007722 104400      99$:  HLT
3880 007724 104000      100$: SCOPE        ;REPORT ERROR
3881
3882          ;TEST 004 - WRITE SETTLEDOWN
3883          ;THIS TEST MEASURES TIME FROM 'SWDN'=1 TO 'SWDN'=0.
3884 007726 112737 000004 001122  TST004: MOVB    #4,#TSTNUM
3885 007734 004737 005344      JSR    PC,WRITE
3886 007740 005215      INC    (R5)        ;SET 'GO' BIT
3887
3888 007742 005710      1$:  TST    (R0)        ;BRANCH WHEN WRITING FINISHED
3889 007744 001404      BEQ    2$
3890 007746 032711 040000      BIT    #ERR,(R1)   ;CHECK ERROR BIT
3891 007752 001026      BNE    99$
3892 007754 000772      BR     1$
3893
3894 007756 032711 000020      2$:  BIT    #SDWN,(R1) ;WAIT FOR ASSERTION OF 'SDWN'
3895 007762 001004      BNE    3$
3896 007764 032711 040000      BIT    #ERR,(R1)   ;MONITOR ERROR BIT
3897 007770 001017      BNE    99$
3898 007772 000771      BR     2$
3899
3900 007774          3$:
  (1) 007774 004737 004250      JSR    PC,TIMON      ;TURN TIMER ON
3901 010000 010702      MOV    PC,R2        ;SET RETURN PC FROM TIMER
3902 010002 032711 000020      BIT    #SDWN,(R1)  ;BRANCH WHEN SWDN CLEARS
3903 010006 001402      BEQ    5$
3904 010010 000163 004340      JMP    TIMER(R3)    ;GO TO TIMER & RETURN VIA R2
3905
3906 010014 004737 005156      5$:  JSR    PC,WAITRDY   ;WAIT FOR READY
3907 010020 102403      BVS    99$
3908 010022 004737 004376      JSR    PC,TIMOK
3909 010026 000401      BR     100$
3910
3911 010030 104400      99$:  HLT
3912 010032 104000      100$: SCOPE
3913
3914          ;TEST 005 - READ FROM BOT
3915          ;THIS TEST MEASURES TIME FROM 'GO'=1 TO 'ACCL'=0.
3916 010034 112737 000005 001122  TST005: MOVB    #5,#TSTNUM
3917 010042 004737 005262      JSR    PC,.REWIND   ;SET TEST #5
  (1) 010046 102422      BVS    99$          ;REWIND SLAVE
3918 010050 004737 005362      JSR    PC,READ      ;BRANCH IF ERROR ON REWIND
3919 010054 012702 010066      MOV    #1$,R2      ;SET RETURN PC FROM TIMER
  
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3920 010060 004737 004250          JSR    PC,TIMON          ;TURN TIMER ON
3921 010064 005215                   INC    (R5)              ;SET 'GO' BIT
3922
3923 010066 005765 000032          1$:   TST    TC(R5)          ;BRANCH WHEN 'ACCL' RESETS
3924 010072 100002                   BPL    2$
3925 010074 000163 004340          JMP    TIMER(R3)        ;GO TO TIMER & RETURN VIA R2
3926
3927 010100 004737 005156          2$:   JSR    PC,WAITRDY      ;WAIT FOR READY
3928 010104 102403                   BVS    99$              ;BRANCH IF ERROR
3929 010106 004737 004376          JSR    PC,TIMOK         ;CHECK RECORDED TIME
3930 010112 000401                   BR     100$
3931
3932 010114 104400          99$:   HLT
3933 010116 104000          100$:  SCOPE
3934
3935          ;TEST 006 - READ START
3936          ;THIS TEST MEASURES TIME FROM 'GO'=1 TO 'ACCL'=0.
3937 010120 112737 000006 001122  TST006: MOVB    #6,#TSTNUM    ;SET TEST #6
3938 010126 004737 005436          JSR    PC,WRT.BK        ;WRITE A RECORD & BACK SPACE
3939 010132 102422                   BVS    99$
3940 010134 004737 005362          JSR    PC,READ
3941 010140 012702 010152          MOV    #1$,R2           ;SET RETURN PC FROM TIMER
3942 010144 004737 004250          JSR    PC,TIMON
3943 010150 005215                   INC    (R5)              ;SET 'GO' BIT
3944
3945 010152 005765 000032          1$:   TST    TC(R5)          ;BRANCH WHEN 'ACCL' RESETS
3946 010156 100002                   BPL    2$
3947 010160 000163 004340          JMP    TIMER(R3)        ;GO TO TIMER & RETURN VIA R2
3948
3949 010164 004737 005156          2$:   JSR    PC,WAITRDY      ;WAIT FOR READY
3950 010170 102403                   BVS    99$              ;BRANCH IF ERROR
3951 010172 004737 004376          JSR    PC,TIMOK         ;CHECK RECORDED TIME
3952 010176 000401                   BR     100$
3953
3954 010200 104400          99$:   HLT
3955 010202 104000          100$:  SCOPE
3956
3957          ;TEST 007 - READ SHUTDOWN
3958          ;THIS TEST MEASURES TIME FROM 'FC REG'=FRAME COUNT TO 'SWDN'=1.
3959 010204 112737 000007 001122  TST007: MOVB    #7,#TSTNUM    ;SET TEST #7
3960 010212 004737 005436          JSR    PC,WRT.BK        ;WRITE A RECORD & BACK SPACE
3961 010216 102430                   BVS    99$              ;BRANCH IF ERROR
3962 010220 004737 005362          JSR    PC,READ
3963 010224 005215                   INC    (R5)              ;SET 'GO' BIT
3964
3965 010226 022710 000400          1$:   CMP    #-FRMCNT,(R0)      ;WAIT FOR FRAME COUNT TO
3966 010232 001404                   BEQ    2$                ;= # OF FRAMES WRITTEN
3967 010234 032711 040000          BIT    #ERR,(R1)        ;MONITOR ERROR BIT
3968 010240 001017                   BNE    99$
3969 010242 000771                   BR     1$
3970
3971 010244          2$:   JSR    PC,TIMON          ;TURN TIMER ON
    (1) 010244 004737 004250          MOV    PC,R2            ;SET RETURN PC FROM TIMER
3972 010250 010702                   BIT    #SDWN,(R1)       ;BRANCH WHEN SDWN SETS
3973 010252 032711 000020          BNE    3$
3974 010256 001002                   BR     3$
  
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3975 010260 000163 004340          JMP      TIMER(R3)          ;GO TO TIMER & RETURN VIA R2
3976
3977 010264 004737 005156          3$:     JSR      PC, WAITRDY
3978 010270 102403                    BVS     99$
3979 010272 004737 004376          JSR     PC, TIMOK
3980 010276 000401                    BR      100$
3981
3982 010300 104400                    99$:    HLT
3983 010302 104000                    100$:   SCOPE          ;REPORT ERROR
3984
3985
3986
3987 010304 112737 000010 001122 ;TEST 010 - READ SETTLEDOWN
3988 010312 012702 010370          ;THIS TEST MEASURES TIME FROM 'SWDN'=1 TO 'SWDN'=0.
3989 010316 004737 005436          TST010: MOV     #10, @#TSTNUM ;SET TEST #10
3990 010322 102436                    MOV     #4$, R2          ;SET RETURN PC FROM TIMER
3991 010324 004737 005362          JSR     PC, WRT.BK      ;WRITE A RECORD & BACK SPACE
3992 010330 005215                    BVS     99$
3993
3994 010332 105711                    JSR     PC, READ
3995 010334 100404                    INC     (R5)          ;SET 'GO' BIT
3996 010336 032711 040000          1$:     TSTB     (R1)          ;WAIT FOR READY
3997 010342 001026                    BMI     2$            ;BRANCH WHEN SET
3998 010344 000772                    BIT     #ERR, (R1)    ;CHECK ERROR BIT
3999
4000 010346 032711 000020          2$:     BNE
4001 010352 001004                    BR      1$
4002 010354 032711 040000          2$:     BIT     #SDWN, (R1) ;WAIT FOR ASSERTION OF 'SDWN'
4003 010360 001017                    BNE     3$
4004 010362 000771                    BR      2$
4005
4006 010364
4007 (1) 010364 004737 004250          3$:     JSR     PC, TIMON ;TURN TIMER ON
4008 010370 07.765 000020 000012 4$:     BIT     #SDWN, DS(R5) ;WAIT FOR NEGATION OF SDWN
4009 010376 001402                    BEQ     5$
4010 010400 000163 004340          JMP     TIMER(R3)      ;GO TO TIMER & RETURN VIA R2
4011 010404 004737 005156          5$:     JSR     PC, WAITRDY
4012 010410 102403                    BVS     99$
4013 010412 004737 004376          JSR     PC, TIMOK
4014 010416 000401                    BR      100$
4015
4016 010420 104400                    99$:    HLT
4017 010422 104000                    100$:   SCOPE
4018
4019
4020
4021
4022 010424 112737 000011 001122 ;TEST 011-READ REVERSE START
4023 010432 012702 010470          ;THIS TEST MEASURES TIME FROM 'GO'=1 TO 'ACCL'-0.
4024 010436 004737 005344          TST011: MOV     #11, @#TSTNUM ;SET RETURN PC FROM TIMER
4025 010442 005215                    MOV     #1$, R2          ;WRITE A RECORD
4026 010444 004737 005156          JSR     PC, WRITE
4027 010450 102422                    INC     (R5)          ;SET 'GO' BIT
4028 010452 004737 004634          JSR     PC, WAITRDY
4029 010456 004737 005400          BVS     99$
          JSR     PC, DELAY ;WAIT FOR TAPE MOTION TO STOP
          JSR     PC, REVRD

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4030 010462 004737 004250      JSR    PC,TIMON      ;TURN TIMER ON
4031 010466 005215              INC    (R5)          ;SET 'GO' BIT
4032
4033 010470 005765 000032      1$:   TST    TC(R5)      ;BRANCH WHEN 'ACCL' = 0
4034 010474 100002              BPL    2$
4035 010476 000163 004340      JMP    TIMER(R3)     ;GO TO TIMER & RETURN VIA R2
4036
4037 010502 004737 005156      2$:   JSR    PC,WAITRDY
4038 010506 102403              BVS    99$           ;BRANCH IF ERROR
4039 010510 004737 004376      JSR    PC,TIMOK
4040 010514 000401              BR     100$
4041
4042 010516 104400      99$:   HLT
4043 010520 104000      100$:  SCOPE
4044
4045      ;TEST 012-READ REVERSE SHUTDOWN
4046      ;THIS TEST MEASURES TIME FROM 'FC REG' = FRAME COUNT TO 'SDWN'=1.
4047 010522 112737 000012 001122  TST012: MOVB   #12,@#TSTNUM
4048 010530 012702 010600      MOV    #3$,R2        ;SET RETURN PC FROM TIMER
4049 010534 004737 005344      JSR    PC,WRITE      ;WRITE A RECORD
4050 010540 005215              INC    (R5)          ;SET 'GO' BIT
4051 010542 004737 005156      JSR    PC,WAITRDY
4052 010546 102427              BVS    99$
4053 010550 004737 005400      JSR    PC,REVRD
4054 010554 005215              INC    (R5)          ;SET 'GO' BIT
4055
4056 010556 022710 000400      1$:   CMP    #-FRMCNT,(R0) ;BRANCH WHEN FRAME COUNT
4057 010562 001404              BEQ    2$            ;= # OF RECORD WRITTEN
4058 010564 032711 040000      BIT    #ERR,(R1)     ;MONITOR ERROR BIT IN 'DS' REG
4059 010570 001016              BNE    99$
4060 010572 000771              BR     1$
4061
4062 010574      2$:
4063 (1) 010574 004737 004250      JSR    PC,TIMON      ;TURN TIMER ON
4064 010600 032711 000020      3$:   BIT    #SDWN,(R1)   ;BRANCH WHEN SDWN SETS
4065 010604 001002              BNE    4$
4066 010606 000163 004340      JMP    TIMER(R3)     ;GO TO TIMER & RETURN VIA R2
4067 010612 004737 005156      4$:   JSR    PC,WAITRDY ;WAIT FOR READY
4068 010616 102403              BVS    99$
4069 010620 004737 004376      JSR    PC,TIMOK
4070 010624 000401              BR     100$
4071
4072 010626 104400      99$:   HLT
4073 010630 104000      100$:  SCOPE
4074
4075      ;TEST 013-READ REVERSE SETTLEDOWN
4076      ;THIS TEST MEASURES TIME FROM 'SDWN'=1 TO 'SDWN'=0.
4077 010632 112737 000013 001122  TST013: MOVB   #13,@#TSTNUM
4078 010640 012702 010724      MOV    #4$,R2        ;SET RETURN PC FROM TIMER
4079 010644 004737 005344      JSR    PC,WRITE      ;WRITE A RECORD
4080 010650 005215              INC    (R5)          ;SET 'GO' BIT
4081 010652 004737 005156      JSR    PC,WAITRDY
4082 010656 102435              BVS    99$
4083 010660 004737 005400      JSR    PC,REVRD
4084 010664 005215              INC    (R5)          ;SET 'GO' BIT

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4085
4086 010666 105711      1$:   TSTB   (R1)           ;BRANCH WHEN
4087 010670 100404      BMI     2$           ;READY SETS
4088 010672 032711 040000 BIT     #ERR,(R1)
4089 010676 001025      BNE     99$
4090 010700 070772      BR      1$
4091
4092 010700 031111 000020 2$:   BIT     #SDWN,(R1)
4093 010706 001004      BNE     3$
4094 010710 032711 040000 BIT     #ERR,(R1)
4095 010714 001016      BNE     99$
4096 010716 000771      BR      2$
4097
4098 010720      3$:
4099 010720 004737 004250 JSR     PC,TIMON      ;TURN TIMER ON
4100 010724 032711 000020 4$:   BIT     #SDWN,(R1)   ;BRANCH WHEN SWDN = 0
4101 010730 001402      BEQ     5$
4102 010732 000163 004340 JMP     TIMER(R3)     ;GO TO TIMER & RETURN VIA R2
4103 010736 004737 005156 5$:   JSR     PC,WAITRDY   ;WAIT FOR READY
4104 010742 102403      BVS     99$
4105 010744 004737 004376 JSR     PC,TIMOK
4106 010750 000401      BR      100$
4107
4108 010752 104400      99$:   HLT
4109 010754 104000      100$:  SCOPE
4110
4111      ;REWIND DRIVE
4112 010756      A:
4113 010756 004737 005262 JSR     PC,.REWIND    ;REWIND SLAVE
4114 010762 102401      BVS     99$          ;BRANCH IF ERROR ON REWIND
4115 010764 102002      BVC     100$
4116 010766 104400      99$:   HLT
4117 010770 000772      BR      A
4118      100$:
4119      ;TEST 014-TURN AROUND DELAY (FORWARD-REVERSE)
4120 010772 112737 000014 001122 TST014: MOVB   #14,#TSTNUM
4121 011000 012702 011032 MOV     #2$,R2        ;SET RETURN PC FROM TIMER
4122 011004 004737 005344 JSR     PC,WRITE      ;WRITE A RECORD
4123 011010 005215      INC     (R5)         ;SET 'GO' BIT
4124 011012 004737 005156 JSR     PC,WAITRDY
4125 011016 102420      BVS     99$
4126
4127 011020 004737 005400 1$:   JSR     PC,REVRD    ;READ THE RECORD (REVERSE)
4128 011024 004737 004250 JSR     PC,TIMON      ;TURN TIMER ON
4129 011030 005215      INC     (R5)         ;SET 'GO' BIT
4130
4131 011032 005765 000032 2$:   TST     TC(R5)     ;WAIT FOR 'ACCL' - 0
4132 011036 100002      BPL     3$
4133 011040 000163 004340 JMP     TIMER(R3)     ;GO TO TIMER & RETURN VIA R2
4134
4135 011044 004737 005156 3$:   JSR     PC,WAITRDY
4136 011050 102403      BVS     99$
4137 011052 004737 004376 JSR     PC,TIMOK
  
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4138 01056 000401          BR      100$
4139
4140 011060 104400        99$:   HLT
4141 011062 104000        100$:  SCOPE
4142
4143          ;TEST 015- TURN AROUND DELAY (REVERSE-FORWARD)
4144          ;THIS TEST MEASURES TIME FROM 'GO'=1 (READ) TO 'ACCL'=0.
4145 011064 112737 000015 001122 TST015: MOVB   #15,@TSTNUM
4146 011072 012702 011140          MOV    #2$,R2          ;SET RETURN PC FROM TIMER
4147 011076 004737 005344          JSR   PC,WRITE        ;WRITE A RECORD
4148 011102 005215          INC    (R5)           ;SET 'GO' BIT
4149 011104 004737 005156          JSR   PC,WAITPDY     ;WAIT FOR READY
4150 011110 102426          BVS   99$
4151 011112 004737 005400          JSR   PC,REVRD       ;READ A RECORD IN THE
4152 011116 005215          INC    (R5)           ;SET 'GO' BIT
4153
4154 011120 004737 005156          JSR   PC,WAITRDY
4155 011124 102420          BVS   99$
4156
4157 011126 004737 005362        1$:   JSR   PC,READ        ;READ RECORD FORWARD
4158 011132 004737 004250          JSR   PC,TIMON       ;TURN TIMER ON
4159 011136 005215          INC    (R5)           ;SET 'GO' BIT
4160
4161 011140 005765 000032        2$:   TST   TC(R5)       ;WAIT FOR 'ACCL' = 0
4162 011144 100002          BPL   3$
4163 011146 000163 004340          JMP   TIMER(R3)      ;GO TO TIMER & RETURN VIA R2
4164
4165 011152 004737 005156        3$:   JSR   PC,WAITRDY
4166 011156 102403          BVS   99$
4167 011160 004737 004376          JSR   PC,TIMOK
4168 011164 000401          BR    100$
4169
4170 011166 104400        99$:   HLT
4171 011170 104000        100$:  SCOPE
4172
4173          ;TEST 016-GAP SIZE (STOP HALF)
4174 011172 112737 000016 001122 TST016: MOVB   #16,@TSTNUM
4175 011200 012702 011236          MOV    #1$,R2          ;SET RETURN PC FROM TIMER
4176 011204 004737 005344          JSR   PC,WRITE        ;WRITE A RECORD
4177 011210 005215          INC    (R5)           ;SET 'GO' BIT
4178 011212 004737 005156          JSR   PC,WAITRDY
4179 011216 102421          BVS   99$
4180 011220 004737 004634          JSR   PC,DELAY       ;DELAY 350 MS
4181 011224 004737 005400          JSR   PC,REVRD       ;READ REVERSE RECORD
4182 011230 004737 004250          JSR   PC,TIMON       ;TURN TIMER ON
4183 011234 005215          INC    (R5)           ;SET 'GO' BIT
4184
4185 011236 005710        1$:   TST   (R0)           ;WAIT FOR FRAME COUNT > 0
4186 011240 001002          BNE   2$
4187 011242 000163 004340          JMP   TIMER(R3)      ;GO TO TIMER & RETURN VIA R2
4188
4189 011246 004737 005156        2$:   JSR   PC,WAITRDY     ;WAIT FOR READY BIT TO SET
4190 011252 102403          BVS   99$
4191 011254 004737 004376          JSR   PC,TIMOK       ;CHECK TIME
4192 011260 000401          BR    100$
4193

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4194 011262 104400
4195 011264 104000
4196
4197
4198 011266 112737 000017 001122 ;TEST 017-GAP SIZE (START HALF)
4199 011274 012702 011346 TST017: MOVB #17,#TSTNUM
4200 011300 004737 005344 MOV #1$,R2 ;SET RETURN PC FROM TIMER
4201 011304 005215 JSR PC,WRITE ;WRITE A RECORD
4202 011306 004737 005156 INC (R5) ;SET 'GO' BIT
4203 011312 102427 BVS 99$ ;WAIT FOR READY
4204 011314 004737 005400 JSR PC,REVRD ;READ REVERSE THE RECORD
4205 011320 005215 INC (R5) ;SET 'GO' BIT
4206 011322 004737 005156 JSR PC,WAITRDY ;WAIT FOR READY
4207 011326 102421 BVS 99$ ;BRANCH ON ERROR
4208 011330 004737 004634 JSR PC,DELAY ;WAIT FOR TAPE MOTION TO STOP
4209 011334 004737 005362 JSR PC,READ ;READ RECORD
4210 011340 004737 004250 JSR PC,TIMON ;TURN TIMER ON
4211 011344 005215 INC (R5) ;SET 'GO' BIT
4212
4213 011346 005710 1$: TST (R0) ;WAIT FOR FRAME COUNT > 0
4214 011350 001002 BNE 2$
4215 011352 000163 004340 JMP TIMER(R3) ;GO TO TIMER & RETURN VIA R2
4216
4217 011356 004737 005156 2$: JSR PC,WAITRDY ;WAIT FOR READY
4218 011362 102403 BVS 99$
4219 011364 004737 004376 JSR PC,TIMOK ;CHECK TIME
4220 011370 000401 BR 100$
4221
4222 011372 104400 99$: HLT
4223 011374 104000 100$: SCOPE
4224
4225 ;TEST 020- GAP SIZE (INTERRECORD)
4226 ;THIS TEST MEASURES TIME FROM 'GO'=1 TO 'FC REG' >0.
4227 011376 112737 000020 001122 TST020: MOVB #20,#TSTNUM
4228 011404 012702 011466 MOV #1$,R2 ;SET RETURN PC FROM TIMER
4229 011410 004737 005344 JSR PC,WRITE ;WRITE A RECORD
4230 011414 005215 INC (R5) ;SET 'GO' BIT
4231 011416 004737 005156 JSR PC,WAITRDY ;WAIT FOR READY
4232 011422 102433 BVS 99$
4233 011424 004737 005344 JSR PC,WRITE ;WRITE SECOND RECORD
4234 011430 005215 INC (R5) ;SET 'GO' BIT
4235 011432 004737 005156 JSR PC,WAITRDY ;WAIT FOR READY
4236 011436 102425 BVS 99$
4237 011440 004737 005400 JSR PC,REVRD ;READ REVERSE SECOND RECORD
4238 011444 005215 INC (R5) ;SET 'GO' BIT
4239 011446 004737 005156 JSR PC,WAITRDY ;WAIT FOR READY
4240 011452 102417 BVS 99$
4241 011454 004737 005400 JSR PC,REVRD ;READ REVERSE FIRST RECORD
4242 011460 004737 004250 JSR PC,TIMON ;TURN TIMER ON
4243 011464 005215 INC (R5) ;SET 'GO' BIT
4244
4245 011466 005710 1$: TST (R0) ;WAIT FOR FRAME COUNT > 0
4246 011470 001002 BNE 2$
4247 011472 000163 004340 JMP TIMER(R3) ;GO TO TIMER & RETURN VIA R2
4248
4249 011476 004737 005156 2$: JSR PC,WAITRDY ;WAIT FOR READY
    
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4250	011502	102403			BVS	99\$	
4251	011504	004737	004376		JSR	PC,TIMOK	
4252	011510	000401			BR	100\$	
4253							
4254	011512	104400			99\$:	HLT	
4255	011514	104000			100\$:	SCOPE	
4256							
4257							
4258							
4259							
4260							
4261							
4262							
4263							
4264							
4265							
4266							
4267							
4268							
4269	011516	112737	000021	001122	TST021: MOV	#21, @#TSTNUM	
4270	011524	012702	011662		MOV	#4\$, R2	;SET RETURN PC FROM TIMER
4271	011530	004737	005262		JSR	PC, .REWIND	;REWIND SLAVE
(1)	011534	102530			BVS	99\$	;BRANCH IF ERROR ON REWIND
4272	011536	005037	001114		CLR	DELTIM	;CLEAR VARIABLE DELAY TIME
4273	011542	012700	000021		MOV	#17., R0	;SET # OF RECORDS TO WRITE
4274	011546	004737	005344		1\$: JSR	PC, WRITE	;WRITE 17. RECORDS
4275	011552	005215			INC	(R5)	;SET 'GO' BIT
4276	011554	004737	005156		JSR	PC, WAITRDY	;WAIT FOR READY
4277	011560	102516			BVS	99\$	
4278	011562	004737	004664		JSR	PC, DELAYV	;DELAY BEFORE WRITING NEXT REC.
4279	011566	062737	000022	001114	ADD	#18., DELTIM	;SET NEXT DELAY TIME
4280	011574	005300			DEC	R0	;DECREMENT RECORDS WRITTEN COUNT
4281	011576	001363			BNE	1\$	
4282							
4283	011600	012700	000021		MOV	#17., R0	;SET # OF RECS. TO REVERSE READ
4284	011604	004737	005400		2\$: JSR	PC, REVRD	;REVERSE READ 17. RECORDS
4285	011610	005215			INC	(R5)	;SET 'GO' BIT
4286	011612	004737	005156		JSR	PC, WAITRDY	;WAIT FOR READY
4287	011616	102477			BVS	99\$	
4288	011620	005300			DEC	R0	;DECREMENT RECORD COUNT
4289	011622	001370			BNE	2\$	
4290							
4291	011624	012700	000020		MOV	#16., R0	;SET # OF RECORDS TO READ
4292	011630	012701	001054		MOV	#GAPTBL, R1	;SET PTR TO GAP TABLE FOR TEST
4293	011634	004737	005362		JSR	PC, READ	;READ A RECORD
4294	011640	005215			INC	(R5)	;SET 'GO' BIT
4295							
4296	011642	004737	005156		3\$: JSR	PC, WAITRDY	;WAIT FOR READY
4297	011646	102463			BVS	99\$	
4298	011650	004737	005362		JSR	PC, READ	;READ NEXT RECORD
4299	011654	004737	004250		JSR	PC, TIMON	;TURN TIMER ON
4300	011660	005215			INC	(R5)	;SET 'GO' BIT
4301							
4302	011662	005765	000006		4\$: TST	FC(R5)	;WAIT FOR FRAME COUNT > 0
4303	011666	001002			BNE	5\$	
4304	011670	000163	004340		JMP	TIMER(R3)	;GO TO TIMER & RETURN VIA R2

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:TEST 021- GAP CONSISTANCY
:THIS TEST MEASURES TIME FROM 'GO'=1 TO 'FC REG' > 0.
:THE TEST REWINDS THE TAPE, WRITES 17 RECORDS WITH A DELAY FROM 1-16 MS
:BEETWEEN EACH WRITE COMMAND. AFTER THE 17. RECORDS ARE WRITTEN THE
:PROGRAM READ REVERSES 16 RECORDS. AT THIS POINT THE TAPE IS STOPPED BE-
:TWEEN THE FIRST AND SECOND RECORD. A READ COMMAND IS EXECUTED TO READ
:THE 16 RECORDS WITH THE TIME BETEWEN GO=1 TO FC > 0 STORED IN 'GAPTBL'
:FOR EACH RECORD READ. AFTER 16 RECORDS HAVE BEEN READ THE TIME IS VER-
:IFIED FOR EACH READ. AFTER ALL RECORD TIMES ARE VERIFIED THEY ARE AVER-
:AGED AND PLACED IN THE 'ATIMTBL' (BY SCOPE). THE ABOVE PROCESS IS RE-
:PEATED FOR EACH ITERATION.
  
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```

4305
4306 011674 004737 005156 5$: JSR PC,WAITRDY ;WAIT FOR READY
4307 011700 102446 BVS 99$
4308 011702 010421 MOV R4,(R1)+ ;STORE TIME IN GAP TBL
4309 011704 005300 DEC R0 ;DECREMENT # OF RECORDS READ
4310 011706 001355 BNE 3$
4311
4312 011710 105037 001120 CLR B @#GAP ;SET GAP # 0
4313 011714 012700 000020 MOV #16.,R0
4314 011720 012701 001054 MOV #GAPTBL,R1
4315
4316 011724 012104 6$: MOV (R1)+,R4 ;GET GAP TICK COUNT
4317 011726 004737 004506 JSR PC,GAPOK ;CHECK TIME
4318 011732 105237 001120 INCB @#GAP ;INCREMENT GAP #
4319 011736 122737 000020 001120 CMPB #16.,@#GAP ;BRANCH IF ALL GAPS NOT CHECKED
4320 011744 001367 BNE 6$
4321
4322 011746 012700 000020 MOV #16.,R0 ;SETUP TO AVERAGE GAP SIZES
4323 011752 012701 001054 MOV #GAPTBL,R1 ;SET PTR TO TABLE
4324 011756 005002 CLR R2 ;CLEAR 'SUM' REGISTERS
4325 011760 005003 CLR R3
4326 011762 062102 7$: ADD (R1)+,R2 ;ADD ALL GAP SIZES TOGETHER
4327 011764 005503 ADC R3
4328 011766 005300 DEC R0
4329 011770 001374 BNE 7$
4330 011772 012700 000004 MOV #4,R0 ;NOW DIVIDE BY 16.
4331 011776 006203 8$: ASR R3 ;BY SHIFTING 4 PLACES RIGHT
4332 012000 006002 ROR R2
4333 012002 005300 DEC R0
4334 012004 001374 BNE 8$
4335 012006 010204 MOV R2,R4 ;MOVE AVERAGED TIMES TO R4
4336 012010 004737 004376 JSR PC,TIMOK ;CHECK AVERAGED TIMES
4337 012014 000401 BR 100$
4338
4339 012016 104400 99$: HLT
4340 012020 104000 100$: SCOPE
4341
4342
4343
4344 ;TEST 022-DATA TIME (800BPI)
4345 ;THIS TEST MEASURES THE TIME FROM FC REG >-6400 TO 'RDY' = 1.
4346 012022 112737 000022 001122 TST022: MOVB #022,@#TSTNUM
4347 012030 012702 012110 MOV #3$,R2 ;SET RETURN PC FROM TIMER
4348 012034 004737 005262 JSR PC,.REWIND ;REWIND SLAVE
(1) 012040 102442 BVS 99$ ;BRANCH IF ERROR ON REWIND
4349 012042 052765 001700 000032 BIS #NORM11,TC(R5) ;SET 800 BPI
4350 012050 004337 005500 JSR R3,TMCMO ;WRITE 3200. WORD RECORD
4351 012054 016046 .WORD WTBUF
4352 012056 171600 .WORD -3200.
4353 012060 163400 .WORD -6400.
4354 012062 000060 .WORD WFWO
4355 012064 005215 INC (R5) ;SET 'GO' BIT
4356
4357 012066 022710 163400 1$: CMP #-6400.,(R0) ;WAIT FOR WRITING TO START
4358 012072 001004 BNE 2$
4359 012074 032711 040000 BIT #ERR,(R1) ;MONITOR ERROR BIT
    
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4360 012100 001022      BNE 99$
4361 012102 000771      BR 1$
4362
4363 012104      2$:
(1) 012104 004737 004250      JSR PC,TIMON ;TURN TIMER ON
4364 012110 105711      3$: TSTB (R1) ;BRANCH WHEN READY SETS
4365 012112 100402      BMI 4$
4366 012114 000163 004340      JMP TIMER(R3) ;GO TO TIMER & RETURN VIA R2
4367
4368 012120 012700 000003      4$: MOV #3,R0 ;SET SHIFT COUNT
4369 012124 006204      5$: ASR R4
4370 012126 005300      DEC R0
4371 012130 001375      BNE 5$
4372 012132 004737 005156      JSR PC,WAITRDY
4373 012136 102403      BVS 99$
4374 012140 004737 004376      JSR PC,TIMOK ;CHECK TIME
4375 012144 000401      BR 100$
4376
4377 012146 104400      99$: HLT
4378 012150 104000      100$: SCOPE
4379
4380 ;TEST 023-DATA TIME (1600BPI)
4381 ;THIS TEST MEASURES THE TIME FROM FC REG >-6400 TO 'RDY' = 1.
4382 012152 112737 000023 001122 TST023: MOVB #023,#TSTNUM
4383 012160 012702 012246      MOV #3$,R2 ;SET RETURN PC FROM TIMER
4384 012164 004737 005262      JSR PC,.REWIND ;REWIND SLAVE
(1) 012170 102442      BVS 99$ ;BRANCH IF ERROR ON REWIND
4385 012172 042765 003700 000032      BIC #3700,TC(R5) ;CLEAR CURRENT DENSITY
4386 012200 052765 002300 000032      BIS #PE1600,TC(R5) ;SET 1600 BPI
4387 012206 004337 005500      JSR R3,TMCMO ;WRITE 3200. WORD RECORD
4388 012212 016046      .WORD WTBUF
4389 012214 171600      .WORD -3200.
4390 012216 163400      .WORD -6400.
4391 012220 000060      .WORD WFWD
4392 012222 005215      INC (R5) ;SET 'GO' BIT
4393
4394 012224 022710 163400      1$: CMP #-6400.,(R0) ;BRANCH WHEN WRITING STARTS
4395 012230 001004      BNE 2$
4396 012232 032711 040000      BIT #ERR,(R1) ;MONITOR ERROR BIT
4397 012236 001017      BNE 99$
4398 012240 000771      BR 1$
4399
4400 012242      2$:
(1) 012242 004737 004250      JSR PC,TIMON ;TURN TIMER ON
4401 012246 105711      3$: TSTB (R1) ;BRANCH WHEN READY SETS
4402 012250 100402      BMI 4$
4403 012252 000163 004340      JMP TIMER(R3) ;GO TO TIMER & RETURN VIA R2
4404
4405 012256 006204      4$: ASR R4 ;DIVIDE TIME BY 4
4406 012260 006204      ASR R4
4407 012262 004737 005156      JSR PC,WAITRDY
4408 012266 102403      BVS 99$
4409 012270 004737 004376      JSR PC,TIMOK ;CHECK TIME
4410 012274 000401      BR 100$
4411
4412 012276 104400      99$: HLT
  
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4413 012300 104000          100%:  SCOPE
4414
4415                          ;TEST 024-ERASE
4416                          ;THIS TEST MEASURES TIME FROM 'GO'=1 TO 'RDY'=1.
4417 012302 112737 000024 001122 TST024: MOVB   #24,@#TSTNUM
4418 012310 012702 012372          MOV    #2$,R2          ;SET RETURN PC FROM TIMER
4419 012314 004737 005262          JSR   PC,REWIND       ;REWIND SLAVE
(1) 012320 102436          BVS   99$            ;BRANCH IF ERROR ON REWIND
4420 012322 004737 005120          JSR   PC,RHINIT      ;SET NRZ
4421 012326 004737 005344          JSR   PC,WRITE      ;WRITE A RECORD
4422 012332 005215          INC   (R5)          ;SET 'GO' BIT
4423 012334 004737 005156          JSR   PC,WAITRDY
.24 012340 102426          BVS   99$
.425 012342 012737 012350 001002 MOV    #1$,@#SCPADR
4426 012350 004337 005500          JSR   R3,@#TMCMD
4427 012354 000000          .WORD 0
4428 012356 000000          .WORD 0
4429 012360 000000          .WORD 0
4430 012362 000024          .WORD ERASE
4431 012364 004737 004250          JSR   PC,TIMON      ;TURN TIMER ON
4432 012370 005215          INC   (R5)          ;SET 'GO' BIT
4433
4434 012372 105711          2$:   TSTB   (R1)      ;BRANCH WHEN READY SETS
4435 012374 100402          BMI   3$
4436 012376 000163 004340          JMP   TIMER(R3)     ;GO TO TIMER & RETURN VIA R2
4437
4438 012402 004737 005156          3$:   JSR   PC,WAITRDY
4439 012406 102403          BVS   99$
4440 012410 004737 004376          JSR   PC,TIMOK
4441 012414 000401          BR    100$
4442
4443 012416 104400          99$:  HLT
4444 012420 104000          100$: SCOPE
4445
4446                          ;TEST 025 TAPE MARK
4447                          ;THIS TEST MEASURES TIME FROM 'GO'=1 TO 'RDY'=1.
4448 012422 112737 000025 001122 TST025: MOVB   #25,@#TSTNUM
4449 012430 012702 01247?          MOV    #1$,R2          ;SET RETURN PC FROM TIMER
4450 012434 004737 005344          JSR   PC,WRITE      ;WRITE A RECORD
4451 012440 005215          INC   (R5)          ;SET 'GO' BIT
4452 012442 004737 005156          JSR   PC,WAITRDY
4453 012446 102423          BVS   99$
4454 012450 004337 005500          JSR   R3,@#TMCMD
4455 012454 000000          .WORD 0
4456 012456 000000          .WORD 0
4457 012460 000000          .WORD 0
4458 012462 000026          .WORD WFMK
4459 012464 004737 004250          JSR   PC,TIMON      ;TURN TIMER ON
4460 012470 005215          INC   (R5)          ;SET 'GO' BIT
4461
4462 012472 105711          1$:   TSTB   (R1)      ;BRANCH WHEN READY SETS
4463 012474 100402          BMI   2$
4464 012476 000163 004340          JMP   TIMER(R3)     ;GO TO TIMER & RETURN VIA R2
4465
4466 012502 004737 005156          2$:   JSR   PC,WAITRDY
4467 012506 102403          BVS   99$
    
```

4468	012510	004737	004376	JSR	PC_TIMOK	
4469	012514	000401		BR	100\$	
4470						
4471	012516	104400		99\$: HLT		
4472	012520			100\$:		
(1)	012520	004737	005262	JSR	PC_REWIND	:REWIND SLAVE
(1)	012524	102774		BVS	99\$	:BRANCH IF ERROR ON REWIND
4473	012526	104000		SCOPE		
4474						

```

4476 012530 032777 002000 166242 FINISH: BIT      #SW10,@SWR      ;DO NOT SPACE PAPER
4477 012536 001011          BNE      2$          ;IF USER SELECTED NO OUTPUT
4478 012540 005737 005746          TST     CHNFLG      ;OR IF IN CHAIN MODE
4479 012544 001006          BNE      2$
4480 012546 012700 000012          MOV     #10.,R0     ;SET LINE FEED COUNT
4481 012552 000004 001374          1$:    TYPE,CRLF
4482 012556 005300          DEC     R0
4483 012560 001374          BNE     1$
4484
4485
4486 012562 105237 001005          2$:    INCB    @#SLVNUM      ;SET NEXT SLAVE #
4487 012566 005237 001006          INC     @#SLVPTR     ;AND ITS POINTER
4488 012572 122737 000010 001005          CMPB   #8.,@#SLVNUM ;BRANCH IF LAST SLAVE (?)
4489 012600 001402          BEQ     3$
4490 012602 000137 007000          JMP     @#BEGIN      ;BEGIN TEST ON NEXT SLAVE
4491 012606 105037 001005          3$:    CLRB    @#SLVNUM      ;SET SLAVE #0
4492 012612 105237 001004          INCB   @#DRVNUM     ;AND INCREMENT DRIVE #
4493 012616 122737 000010 001004          CMPB   #8.,@#DRVNUM ;AND CHECK IF LAST DRIVE
4494 012624 001402          BEQ     END
4495 012626 000137 007000          JMP     @#BEGIN
4496
4497 012632 105737 001125          END:   TSTB    @#UNTFND     ;BRANCH IF A UNIT WAS FOUND
4498 012636 001007          BNE     1$
4499 012640 000004 014265          TYPE,E.UNIT
4500 012644 005737 005746          TST     CHNFLG      ;CHAIN MODE ?
4501 012650 001002          BNE     1$          ;YES BRANCH
4502 012652 000137 005650          JMP     @#INIT
4503 012656 105237 001127          1$:    INCB    @#PSCNT      ;INCREMENT PASS COUNT
4504 012662 000004 013456          TYPE,M.EOP
4505 012666 113702 001127          MOVB   @#PSCNT,R2   ;GET PASSCOUNT
4506 012672 004737 002426          JSR    PC,TYPOCT    ;AND TYPE IT
4507 012676 000004 001374          TYPE,CRLF
4508 012702 013700 000042          MOV     @#42,R0     ;GET ACT11 RETURN ADDRESS
(1) 012706 001405          BEQ     HERE        ;BRANCH IF NOT ACT11
(1) 012710 000005          RESET
(1) 012712 004710          $ENDAD: JSR     PC,(R0)
(1) 012714 000240          NOP
(1) 012716 000240          NOP
(1) 012720 000240          NOP
(1) 012722 000240          HERE:  NOP
4509 012724 005737 005746          TST     CHNFLG      ;BRANCH IF CHAIN MODE
4510 012730 001004          BNE     1$
4511 012732 032777 000100 166040          BIT     #SW06,@SWR   ;BRANCH IF NOT CONTINOUS LOOP
4512 012740 001402          BEQ     2$
4513 012742 000137 006756          1$:    JMP     @#RSTRT      ;RESTART
4514 012746 000000          2$:    HALT
4515 012750 000005          RESET
4516 012752 000137 005650          JMP     @#INIT      ;RESTART

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```
4518 ;SKEW TAPE TIMING TESTS
4519 ;THE FOLLOWING TESTS REQUIRE A SPECIALLY WRITTEN 800 BPI SKEW TAPE
4520 012756 012737 012764 001002 SKEWTST:MOV #TST026,@#SCPADR ;SET SCOPE POINTER
4521
4522 ;TEST 026- SKEW TAPE SPEED TEST-FORWARD
4523 ;THIS TEST READS 32" OF TAPE (26400.-800. = 25600. FRAMES), THEN
4524 ;DIVIDES TIME BY 32. TO GET TIME TO READ 1" (800. FRAMES) OF TAPE.
4525 012764 112737 000026 001122 TST026: MOVB #26,@#TSTNUM
4526 012772 012702 013050 MOV #28,R2 ;SET RETURN PC FROM TIMER
4527 012776 004737 005262 JSR PC,.REWIND ;REWIND SLAVE
(1) 013002 102441 BVS 99$ ;BRANCH IF ERROR ON REWIND
4528 013004 052765 001700 000032 BIS #NORM11,TC(R5) ;SET 800 BPI
4529 013012 052765 000010 000010 BIS #BA1,CS2(R5) ;INHIBIT BUS ADDRESS INCREMENT
4530 013020 004337 005500 JSR R3,@#TMCMD ;READ 32" OF TAPE-FORWARD
4531 013024 016046 .WORD RDBUF
4532 013026 177777 .WORD -1.
4533 013030 063440 10$: .WORD 26400. ;FRAME COUNT
4534 013032 000070 .WORD RDFWD
4535 013034 005215 INC (R5) ;SET 'GO' BIT
4536
4537 013036 022710 001440 1$: CMP #800.,(R0) ;WAIT FOR FIRST 800 FRAMES
4538 013042 101375 BHI 1$ ;TO BE READ
4539
4540 013044 004737 004250 JSR PC,TIMON ;TURN TIMER ON
4541 013050 023710 013030 2$: CMP @#10$, (R0) ;WAIT FOR READING TO FINISH
4542 013054 10340? BLO 3$
4543 013056 00016, 004340 JMP TIMER(R3) ;GO TO TIMER & RETURN VIA R2
4544
4545 013062 012700 000005 3$: MOV #5,R0 ;DIVIDE TIME BY 32.
4546 013066 006204 4$: ASR R4
4547 013070 005300 DEC R0
4548 013072 001375 BNE 4$
4549 013074 004737 005120 JSR PC,RH:INIT ;INIT DRIVE
4550 013100 004737 004376 JSR PC,TIM:CK ;CHECK TIME
4551 013104 000401 BR 100$
4552
4553 013106 104400 99$: HLT
4554 013110 104000 100$: SCOPE
4555
4556 ;TEST 027-SKEW TAPE SPEED TEST-REVERSE
4557 ;THIS TEST READS FORWARD 40" (32000. FRAMES) OF TAPE, THEN READS REVERSE
4558 ;32" (26400.-800. = 25600. FRAMES) OF TAPE. THE TIME IS THEN DIVIDED BY
4559 ;32. TO GET TIME TO READ 1" (800. FRAMES) OF TAPE.
4560 013112 112737 000027 001122 TST027: MOVB #27,@#TSTNUM
4561 013120 012702 013246 MOV #3$,R2 ;SET RETURN PC FROM TIMER
4562 013124 004737 005262 JSR PC,.REWIND ;REWIND SLAVE
(1) 013130 102465 BVS 99$ ;BRANCH IF ERROR ON REWIND
4563 013132 052765 001700 000032 BIS #NORM11,TC(R5)
4564 013140 052765 000010 000010 BIS #BA1,CS2(R5)
4565 013146 004337 005500 JSR R3,@#TMCMD ;READ FORWARD 32000. FRAMES
4566 013152 016046 .WORD RDBUF
4567 013154 177777 .WORD -1. ;WORD COUNT
4568 013156 076400 10$. .WORD 32000. ;FRAME COUNT
4569 013160 000070 .WORD RDFWD ;READ FORWARD
4570 013162 005215 INC (R5) ;SET 'GO' BIT
4571
```



4572	013164	023710	013156	1\$:	CMP	@#10\$, (R0)	
4573	013170	101375			BHI	1\$	
4574							
4575	013172	004737	05120		JSR	PC, RHINIT	; INIT DRIVE
4576	013176	004737	004634		JSR	PC, DELAY	; WAIT FOR TAPE MOTION TO STOP
4577	013202	052765	001700	000032	BIS	#NORM11, TC(R5)	; SET 800 BPI
4578	013210	052765	000010	000010	BIS	#BAI, CS2(R5)	; INHIBIT BUS ADDRESS INCREMENT
4579	013216	004337	005500		JSR	R3, @#TMCMD	; READ REVERSE 32" OF TAPE
4580	013222	016046			.WORD	RDBUF	; READ BUFFER
4581	013224	177777			.WORD	-1.	; WORD COUNT
4582	013226	063440		11\$:	.WORD	26400.	; FRAME COUNT
4583	013230	000076			.WORD	RDREV	; READ REVERSE
4584	013232	005215			INC	(R5)	; SET 'GO' BIT
4585							
4586	013234	022710	001440	2\$:	CMP	#800., (R0)	; WAIT FOR FIRST 800 FRAMES
4587	013240	101375			BHI	2\$	; TO BE READ
4588							
4589	013242	004737	004250		JSR	PC, TIMON	; TURN TIMER ON
4590	013246	023710	013226	3\$:	CMP	@#11\$, (R0)	; WAIT FOR ALL FRAMES TO BE READ
4591	013252	103402			BLO	4\$	
4592	013254	000163	004340		JMP	TIMER(R3)	; GO TO TIMER & RETURN VIA R2
4593							
4594	013260	012700	000005	4\$:	MOV	#5, R0	; DIVIDE TIME BY 32.
4595	013264	006204		5\$:	ASR	R4	
4596	013266	005300			DEC	R0	
4597	013270	001375			BNE	5\$	
4598	013272	004737	005120		JSR	PC, RHINIT	
4599	013276	004737	004376		JSR	PC, TIMOK	
4600	013302	000401			BR	100\$	
4601							
4602	013304	104400		99\$:	HLT		
4603	013306			100\$:			
(1)	013306	004737	005262		JSR	PC, .REWIND	; REWIND SLAVE
(1)	013312	102774			BVS	99\$	; BRANCH IF ERROR ON REWIND
4604	013314	104000			SCOPE		
4605							
4606	013316	000137	012530		JMP	@#FINISH	
4607							
4608							
4609							

4611  
4612  
4613 013322 005015 046524 031460  
013330 052057 032125 020065  
013336 051104 053111 020105  
013344 052506 041516 044524  
013352 047117 052040 046511  
013360 051105 024040 055103  
013366 052524 041123 024460  
4614 013374 005015 054524 042520  
013402 036040 051103 020076  
013410 047524 052040 051105  
013416 044515 040516 042524  
013424 051040 051505 047520  
013432 051516 020105 020046  
013440 041536 052040 020117  
013446 042522 052123 051101  
013454 000124  
4615 013456 005015 047105 020104  
013464 043117 050040 051501  
013472 020123 000  
4616 013475 015 044012 051101  
013502 053504 051101 020105  
013510 053523 020122 047111  
013516 052440 042523 005015  
013524 000  
4617 013525 015 051012 046505  
013532 053117 020105 046524  
013540 050104 043040 047522  
013546 020115 052524 032464  
013554 052040 020117 042502  
013562 052040 051505 042524  
013570 000104  
4618 013572 005015 054524 042520  
013600 043040 051111 052123  
013606 040440 042104 042522  
013614 051523 047440 020106  
013622 047503 052116 047522  
013630 046114 051105 020040  
013636 000  
4619 013637 124 050131 020105  
013644 046524 031460 042040  
013652 044522 042526 021440  
013660 051447 052040 020117  
013666 042502 052040 051505  
013674 042524 035104 020040  
013702 046101 020114 000  
4620 013707 106 051117 052040  
013714 030115 020063 051104  
013722 053111 020105  
4621 013726 026460 052040 050131  
013734 020105 046123 053101  
013742 020105 023443 020123  
013750 047524 041040 020105  
013756 042524 052123 042105  
013764 020072 046101 020114

.SBTTL PROGRAM MESSAGES  
:OPERATOR INSTRUCTIONS  
M.NAM: .ASCII <CR><LF>'TM03/TU45 DRIVE FUNCTION TIMER (CZTUSB0)'  
  
.ASCIIZ <CR><LF>'TYPE <CR> TO TERMINATE RESPONSE & ^C TO RESTART'  
  
M.EOP: .ASCIIZ <CR><LF>'END OF PASS '  
  
M.HSWR: .ASCIIZ <CR><LF>'HARDWARE SWR IN USE'<CR><LF>  
  
I.REM: .ASCIIZ <CR><LF>'REMOVE TMDP FROM TU45 TO BE TESTED'  
  
I.REG: .ASCIIZ <CR><LF>'TYPE FIRST ADDRESS OF CONTROLLER '  
  
I.DRVS: .ASCIIZ %TYPE TM03 DRIVE #'S TO BE TESTED: ALL %  
  
I.SLVS: .ASCII 'FOR TM03 DRIVE '  
  
I.DRV: .ASCIIZ %0- TYPE SLAVE #'S TO BE TESTED: ALL %

4622	013772	000				
	013773	123	042520	042105	I.SPD: .ASCIZ	'SPEED TESTS? (YES=1/NO=<CR>): NO '
	014000	052040	051505	051524		
	014006	020077	054450	051505		
	014014	030475	047057	036517		
	014022	041474	037122	035051		
	014030	047040	020117	000		
4623	014035	015	042412	042116	M.EOT: .ASCIZ	<CR><LF>'END OF TAPE'<CR><LF>
	014042	047440	020106	040524		
	014050	042520	005015	000		
4624						
4625						
4626	014055	015	052012	040522		
	014062	050120	042105	052040		
	014070	020117	000064			
4627	014074	047516	041440	047117	E.NCON: .ASCIZ	'NO CONTROLLER AT ADDRESS SPECIFIED'<CR><LF>
	014102	051124	046117	042514		
	014110	020122	052101	040440		
	014116	042104	042522	051523		
	014124	051440	042520	044503		
	014132	044506	042105	005015		
	014140	000				
4628	014141	124	030115	020063	E.NDRV: .ASCIZ	'TM03 DRIVE '
	014146	051104	053111	020105		
	014154	000				
4629	014155	104	044522	042526	E.NSLV: .ASCII	'DRIVE '
	014162	040				
4630	014163	060	051440	040514	E.DRV: .ASCII	'0 SLAVE '
	014170	042526	040			
4631	014173	060	047040	052117	E.NAVA: .ASCIZ	'0 NOT AVAILABLE FOR TEST'<CR><LF>
	014200	040440	040526	046111		
	014206	041101	042514	043040		
	014214	051117	052040	051505		
	014222	006524	000012			
4632	014226	051104	053111	020105	E.NDR1: .ASCII	'DRIVE '
4633	014234	026060	051440	040514	E.NSL1: .ASCII	'0, SLAVE '
	014242	042526	040			
4634	014245	060	047040	052117	E.MSG: .ASCIZ	'0 NOT ON LINE'<CR><LF>
	014252	047440	020116	044514		
	014260	042516	005015	000		
4635	014265	116	020117	046524	E.UNIT: .ASCIZ	'NO TM03/TU45 UNIT FOUND TO TEST'<CR><LF>
	014272	031460	052057	032125		
	014300	020065	047125	052111		
	014306	043040	052517	042116		
	014314	052040	020117	042524		
	014322	052123	005015	000		
4636	014327	123	043117	020124	E.SFT: .ASCIZ	'SOFT ERROR (DATA)'<CR><LF>
	014334	051105	047522	020122		
	014342	042050	052101	024501		
	014350	005015	000			
4637	014353	124	051505	020124	E.HDR: .ASCIZ	'TEST # '
	014360	020043	000			
4638	014363	040	042504	044526	E.HDR1: .ASCII	' DEVICE ERROR'<CR><LF>
	014370	042503	042440	051122		
	014376	051117	005015			
4639	014402	051503	004461	041527	.ASCIZ	'CS1'<HT>'WC'<HT>'BA'<HT>'FC'<HT>'CS2'<HT>'DS'<HT>'ER'<HT>'TC'<CR><LF>

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014410 041011 004501 041506
014416 041411 031123 042011
014424 004523 051105 052011
014432 006503 000012
4640 014436 047440 052125 047440 E.HDR2: .ASCIZ ' OUT OF RANGE ERROR'<CR><LF>
014444 020106 040522 043516
014452 020105 051105 047522
014460 006522 000012
4641 014464 005015 044524 042515 E.TIMOV: .ASCIZ <CR><LF>'TIMER OVERFLOWED'<CR><LF>
014472 020122 053117 051105
014500 046106 053517 042105
014506 005015 000
4642 014511 015 052012 046511 E.TIMEX: .ASCIZ <CR><LF>'TIME EXPIRED WAITING FOR RDY'<CR><LF>
014516 020105 054105 044520
014524 042522 020104 040527
014532 052111 047111 020107
014540 047506 020122 042122
014546 006531 000012
4643 014552 043440 050101 021440 E.GAP: .ASCIZ ' GAP # '
014560 000040
4644
4645 ;TIME DOCUMENT LINES
4646 L.HDR1: .ASCIZ '*****
014562 025052 025052 025052
014570 025052 025052 025052
014576 025052 025052 025052
014604 025052 025052 025052
014612 025052 025052 025052
014620 025052 025052 025052
014626 025052 025052 025052
014634 025052 025052 025052
014642 025052 025052 025052
014650 025052 025052 025052
014656 025052 025052 025052
014664 025052 025052 025052
014672 005015 000
4647 014675 052 052040 030115 L.HDR2: .ASCII '* TMO3 DRIVE FUNCTION TIMES- DRIVE # '
014702 020063 051104 053111
014710 020105 052506 041516
014716 044524 047117 052040
014724 046511 051505 020055
014732 051104 053111 020105
014740 020043
4648 014742 020060 046123 053101 L.DRV: .ASCII '0 SLAVE # '
014750 020105 020043
4649 014754 020060 040
4650 014757 071 041440 040510 L.SLV: .ASCII '0 '
014764 027116 051440 051105 L.CHAN: .ASCIZ '9 CHAN. SER # '
014772 021440 000040
4651 014776 006440 025012 005015 L.HDR3: .ASCII ' '<CR><LF>'*<CR><LF>
4652 015004 020052 052506 041516 .ASCIZ '* FUNCTION'<HT><HT>'TIME(SPECIFICATION)'<HT>'TIME(ACTUAL)'<CR><LF>
015012 044524 047117 004411
015020 044524 042515 051450
015026 042520 044503 044506
015034 040503 044524 047117
015042 004451 044524 042515
015050 040450 052103 040525
```

LINE	ADDR1	ADDR2	ADDR3	ADDR4	TEXT
	015056	024514	005015	000	
4653	015063	122	047101	042507	L.RNG: .ASCIZ 'RANGE=<'
4654	015070	036075	000		
4655	015073	101	052103	040525	L.ACT: .ASCIZ 'ACTUAL='
4656	015100	036514	000		
4657					:TEST DESCRIPTOR HEADERS
4658	015103	052	053440	044522	A.T001: .ASCIZ '* WRITE FROM BOT'<HT>
	015110	042524	043040	047522	
	015116	020115	047502	004524	
	015124	000			
4659	015125	052	053440	044522	A.T002: .ASCIZ '* WRITE START'<HT><HT>
	015132	042524	051440	040524	
	015140	052122	004411	000	
4660	015145	052	053440	044522	A.T003: .ASCIZ '* WRITE SHUTDOWN'<HT>
	015152	042524	051440	052510	
	015160	042124	053517	004516	
	015166	000			
4661	015167	052	053440	044522	A.T004: .ASCIZ '* WRITE SETTLEDOWN'<HT>
	015174	042524	051440	052105	
	015202	046124	042105	053517	
	015210	004516	000		
4662	015213	052	051040	040505	A.T005: .ASCIZ '* READ FROM BOT'<HT><HT>
	015220	020104	051106	046517	
	015226	041040	052117	004411	
	015234	000			
4663	015235	052	051040	040505	A.T006: .ASCIZ '* READ START'<HT><HT>
	015242	020104	052123	051101	
	015250	004524	000011		
4664	015254	020052	042522	042101	A.T007: .ASCIZ '* READ SHUTDOWN'<HT><HT>
	015262	051440	052510	042124	
	015270	053517	004516	000011	
4665	015276	020052	042522	042101	A.T010: .ASCIZ '* READ SETTLEDOWN'<HT>
	015304	051440	052105	046124	
	015312	042105	053517	004516	
	015320	000			
4666	015321	052	051040	040505	A.T011: .ASCIZ '* READ REV START'<HT>
	015326	020104	042522	020126	
	015334	052123	051101	004524	
	015342	000			
4667	015343	052	051040	040505	A.T012: .ASCIZ '* READ REV SHUTDOWN'<HT>
	015350	020104	042522	020126	
	015356	044123	052125	047504	
	015364	047127	000011		
4668	015370	020052	042522	042101	A.T013: .ASCIZ '* READ REV SETTLEDOWN'<HT>
	015376	051040	053105	051440	
	015404	052105	046124	042105	
	015412	053517	004516	000	
4669	015417	052	052040	051125	A.T014: .ASCIZ '* TURN AROUND DELAY F-R'<HT>
	015424	020116	051101	052517	
	015432	042116	042040	046105	
	015440	054501	043040	051055	
	015446	000011			
4670	015450	020052	052524	047122	A.T015: .ASCIZ '* TURN AROUND DELAY R-F'<HT>
	015456	040440	047522	047125	

	015464	020104	042504	040514	
	015472	020131	026522	004506	
	015500	000			
4671	015501	052	043440	050101	A.T016: .ASCIZ '* GAP SIZE-STOP HALF'<HT>
	015506	051440	055111	026505	
	015514	052123	050117	044040	
	015522	046101	004506	000	
4672	015527	052	043440	050101	A.T017: .ASCIZ '* GAP SIZE-START HALF'<HT>
	015534	051440	055111	026505	
	015542	052123	051101	020124	
	015550	040510	043114	000011	
4673	015556	020052	040507	020120	A.T020: .ASCIZ '* GAP SIZE-INTERRECORD'<HT>
	015564	044523	042532	044455	
	015572	052116	051105	042522	
	015600	047503	042122	000011	
4674	015606	020052	040507	020120	A.T021: .ASCIZ '* GAP CONSISTANCY'<HT>
	015614	047503	051516	051511	
	015622	040524	041516	004531	
	015630	000			
4675	015631	052	042040	052101	A.T022: .ASCIZ '* DATA TIME-800BPI'<HT>
	015636	020101	044524	042515	
	015644	034055	030060	050102	
	015652	004511	000		
4676	015655	052	042040	052101	A.T023: .ASCIZ '* DATA TIME-1600BPI'<HT>
	015662	020101	044524	042515	
	015670	030455	030066	041060	
	015676	044520	000011		
4677	015702	020052	051105	051501	A.T024: .ASCIZ '* ERASE GAP TIME'<HT>
	015710	020105	040507	020120	
	015716	044524	042515	000011	
4678	015724	020052	051127	052111	A.T025: .ASCIZ '* WRITE FILE MARK'<HT>
	015732	020105	044506	042514	
	015740	046440	051101	004513	
	015746	000			
4679	015747	052	052040	050101	A.T026: .ASCIZ '* TAPE SPEED-FWD'<HT>
	015754	020105	050123	042505	
	015762	026504	053506	004504	
	015770	000			
4680	015771	052	052040	050101	A.T027: .ASCIZ '* TAPE SPEED-REV'<HT>
	015776	020105	050123	042505	
	016004	026504	042522	004526	
	016012	000			
4681					
4682	016013	015	057012	000107	L.CNTG: .ASCIZ <CR><LF>'^G'
4683	016020	005015	053523	036522	L.SWR: .ASCIZ <CR><LF>'SWR='
	016026	000			
4684	016037	040	047040	053505	L.NEW: .ASCIZ ' NEW= '
	016034	020075	000		
4685	016037	015	037412	005015	L.QUEST: .ASCIZ <CR><LF>'?'<CR><LF>
	016044	000			
4686		016046			.EVEN
4687		016046			RDBUF=.
4688		016046			WTBUF=.
4689	016046	000200			.BLKW 128.
4690		000001			.END











READ	005362	3426#	3918	3940	3962	3991	4157	4209	4293	4298					
RESVEC=	000010	2371#													
REVRD	005400	3436#	4029	4053	4083	4127	4151	4181	4204	4237	4241	4284			
RHINIT	005120	3104	3333	3357#	3394	4420	4549	4575	4598						
RMR =	000004	2464#													
RSTRT	006756	2540	3698#	4513											
RWD =	000006	2403#	3399												
RWDOFF=	000002	2402#													
SC =	100000	2422#													
SCOPE =	104000	2498#	3835	3855	3880	3912	3933	3955	3983	4017	4043	4073	4109	4141	
		4171	4195	4223	4255	4340	4378	4413	4444	4473	4554	4604			
SCPADR	001002	2548#	3102*	3106	3127*	3180	3794*	3809*	4425*	4520*					
SDWN =	000020	2450#	3871	3894	3902	3973	4000	4007	4063	4092	4099				
SKEWTS	012756	3807	4520#												
SLA =	000001	2446#													
SLAVES	006400	3610#	3692												
SLR =	177774	2370#													
SLVAVA	005040	3341#	3680												
SLVNUM	001005	2550#	3342	3360	3679*	3699*	3705	3737*	3798	4486*	4488	4491*			
SLVPTR	001006	2551#	3700*	3706	3738*	4487*									
SLVTBL	001164	2578#	3611	3616	3637	3659	3700								
SN =	000030	2395#	3477	3487	3492	3500									
SNPT	005520	3477#	3803												
SPACE	001410	2586#	3535												
SPACE2	001407	2585#	3056												
SPCFWD=	000030	2407#	3445												
SPCREV=	000032	2408#	3455												
SPR =	002000	2481#	3343												
SSC =	000100	2452#													
STIMTB	001416	2597#	2840	2843	3215	3217									
TKPTR=	000600	2543#	3510												
SWR	001000	2547#	2704	2708	2715*	3000	3002*	3006*	3022	3063	3066	3091	3095	3097	
		3121	3125	3128	3257	3516	3520*	3526*	3754	3784	4476	4511			
		2535#	2704	3000	3006	3520	3526	3754							
SWREG	000176	2326#	2535	4511											
SW06 =	000100	2325#													
SW07 =	000200	2324#	3091	3257											
SW08 =	000400	2323#	3063												
SW09 =	001000	2322#	3128	4476											
SW10 =	002000	2321#	3121												
SW11 =	004000	2320#	3022												
SW13 =	020000	2319#	3095												
SW14 =	040000	2318#													
SW15 =	100000	2483#	3331												
TAP =	040000	2371#	2517												
TBITVE=	000014	2396#	3041	3059	3342*	3361*	3362*	3826	3845	3923	3945	4033	4131	4161	
TC =	000032	4349*	4385*	4386*	4528*	4563*	4577*								
TCRLF	002156	2722#													
TIB	002016	2701#													
TIMER	004340	3170	3174#	3182	3185	3269	3283	3767	3828	3847	3873	3904	3925	3947	
		3975	4009	4035	4065	4101	4133	4163	4187	4215	4247	4304	4366	4403	
		4436	4464	4543	4592										
TIMERR	004350	3176	3178#												
TIMERO	004364	3184#													
TIMER1	004314	3169#	3173												
TIMOK	004376	3196#	3832	3851	3877	3908	3929	3951	3979	4013	4039	4069	4105	4137	

TIMON	004250	4167	4191	4219	4251	4336	4374	4409	4440	4468	4550	4599		
TKB =	177562	3146#	3266	3280	3823	3842	3869	3900	3920	3942	3971	4005	4030	4062
TKISR	003420	4098	4128	4158	4182	4210	4242	4299	4363	4400	4431	4459	4540	4589
TKS =	177560	2370#	2958	2985										
TKVEC =	000060	2530	2985#											
TMBASE	001010	2370#	2955	3769*										
TMCMD	005500	2371#	2529											
TMCS1 =	172440	2552#	3090	3533	3540*	3541	3762							
TMK =	000004	3395	3416	3426	3436	3468#	4350	4387	4426	4454	4530	4565	4579	
TPB =	177566	2381#	2552											
TPS =	177564	2448#												
TPVEC =	000064	2370#												
TRAPVE =	000034	2370#												
TRE =	040000	2371#												
TRIVEC =	000014	2421#												
TSTNUM	001122	2371#												
		2561#	2938	2943	3025	3093	3100	3212	3761*	3819*	3839*	3859*	3884*	3916*
		3937*	3959*	3987*	4022*	4047*	4077*	4120*	4145*	4174*	4198*	4227*	4269*	4346*
		4382*	4417*	4448*	4525*	4560*								
TSTTBL	001736	2676#	3794	3795										
TST000	007224	2676	3102	3761#										
TST001	007474	2677	3809	3819#										
TST002	007560	2678	3839#											
TST003	007636	2679	3859#											
TST004	007726	2680	3884#											
TST005	010034	2681	3916#											
TST006	010120	2682	3937#											
TST007	010204	2683	3959#											
TST010	010304	2684	3987#											
TST011	010424	2685	4022#											
TST012	010522	2686	4047#											
TST013	010632	2687	4077#											
TST014	010772	2688	4120#											
TST015	011064	2689	4145#											
TST016	011172	2690	4174#											
TST017	011266	2691	4198#											
TST020	011376	2692	4227#											
TST021	011516	2693	4269#											
TST022	012022	2694	4346#											
TST023	012152	2695	4382#											
TST024	012302	2696	4417#											
TST025	012422	2697	4448#											
TST026	012764	2698	4520	4525#										
TST027	013112	2699	4560#											
TYPDEC	002534	2795#	2841	2844	2848	2869	2872	2876						
TYPE =	000004	2499#	2707	2710	2722	2779	2812	2839	2842	2845	2846	2849	2867	2870
		2873	2874	2877	2880	2941	2963	2968	2978	2980	3003	3024	3031	3035
		3038	3048	3051	3056	3061	3065	3178	3349	3372	3376	3377	3505	3529
		3530	3532	3535	3547	3560	3600	3602	3629	3686	3746	3787	3791	3793
		3796	3802	3804	4481	4499	4504	4507						
TYPE1	002150	2722#												
TYPE2	002176	2722#												
TYPE3	002204	2722#												
TYPE4	002210	2722#												
TYPFLG	001126	2565#	2750*	2758*	2777	2788*	2795*	2810						





\$TCREG	192#		
\$TRAPS	402#		
\$TYPE	518#	2303#	2722
\$TYPEF	592#		
\$UMMRE	272#		
\$VECTA	1163#		
.\$ACT1	67#	2303#	2528
.\$EOP	78#	2303#	4508

. ABS. 016446 000

ERRORS DETECTED: 0

CZTUSB,CZTUSB/CRF=CZTUSB.P11  
RUN-TIME: 16 26 2 SECONDS  
RUN-TIME RATIO: 100/45=2.2  
CORE USED: 15K (29 PAGES)