

TS03

DRIVE FUNCTION TIMER
CZTSEB0

AH-9436B-MC

COPYRIGHT © 75-78

FICHE 1 OF 1

JUL 1978

digital

MADE IN USA

.REM 8

IDENTIFICATION

PRODUCT CODE: AC-9453B-MC
PRODUCT NAME: CZTSEBO TS03 DR FCTN TMR
DATE CREATED: JUNE 1978
MAINTAINER: DIAGNOSTIC ENGINEERING
AUTHOR: R. B. BARNES

THE INFORMATION IN THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE AND SHOULD NOT BE CONSTRUED AS A COMMITMENT BY DIGITAL EQUIPMENT CORPORATION. DIGITAL EQUIPMENT CORPORATION ASSUMES NO RESPONSIBILITY FOR ANY ERRORS THAT MAY APPEAR IN THIS MANUAL.

THE SOFTWARE DESCRIBED IN THIS DOCUMENT IS FURNISHED TO THE PURCHASER UNDER A LICENSE FOR USE ON A SINGLE COMPUTER SYSTEM AND CAN BE COPIED (WITH INCLUSION OF DIGITAL'S COPYRIGHT NOTICE) ONLY FOR USE IN SUCH SYSTEM, EXCEPT AS MAY OTHERWISE BE PROVIDED IN WRITING BY DIGITAL.

DIGITAL EQUIPMENT CORPORATION ASSUMES NO RESPONSIBILITY FOR THE USE OR RELIABILITY OF ITS SOFTWARE ON EQUIPMENT THAT IS NOT SUPPLIED BY DIGITAL.

COPYRIGHT (C) 1975,1978, BY DIGITAL EQUIPMENT CORPORATION

TABLE OF CONTENTS

PARAGRAPH	SUBJECT	PAGE
1.	ABSTRACT	3
2.	REQUIREMENTS	3
3.	LOADING PROCEDURE	3
4.	STARTING PROCEDURE	4
5.	OPERATING PROCEDURE	4
6.	ERRORS	4
7.	RESTRICTIONS	6
8.	MISCELLANEOUS	6
9.	PROGRAM DESCRIPTION	7
10.	REGISTER BIT ASSIGNMENTS	15

43
44
45
46
47
48
49
50
51
52
53
54
55
56

57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87

1. ABSTRACT

THE TS03 DRIVE FUNCTION TIMER ASSISTS IN THE TESTING OF THE TMA-11 CONTROL UNIT AND TS03 TAPE UNIT. SELECTED OPERATIONS ARE EXECUTED, TIMED, AND THE TIMES ARE THEN PRINTED (IN MILLISECONDS). THERE IS NO LIMIT OR ERROR TESTING FACILITIES IN THE PROGRAM, THE DECISION ON THE VALIDITY OF TIMES MEASURED MUST BE MADE BY THE OPERATOR. EITHER 1 OR 2 TS03 UNITS MAY BE SELECTED.

2. REQUIREMENTS

2.1 EQUIPMENT

PDP-11 WITH TMA-11 CONTROL UNIT AND 1 OR 2 TS03 TAPE UNITS.

2.2 STORAGE

2.2.1 PROGRAM STORAGE

THE PROGRAM REQUIRES 4K OF MEMORY.

3. LOADING PROCEDURE

3.1 METHOD

PROCEDURE FOR NORMAL BINARY TAPES SHOULD BE FOLLOWED

1. ABSOLUTE LOADER MUST BE IN MEMORY.
2. PLACE BINARY TAPE IN READER.
3. LOAD ADDRESS *7500 (* DETERMINED BY LOCATION OF LOADER).

88 4. PRESS "START" (PROGRAM WILL LOAD).
89
90 4. STARTING PROCEDURE
91
92 4.1 CONTROL SWITCH SETTINGS: NONE
93
94 4.2 STARTING ADDRESS
95
96 200
97
98 4.3 PROGRAM AND/OR OPERATOR ACTION
99
100 LOAD PROGRAM INTO MEMORY.
101 SET DESIRED TS03 TAPE UNITS ON-LINE.
102 SET SWITCH REGISTER TO STARTING ADDRESS.
103 LOAD ADDRESS.
104 PRESS START.
105 ENTER STARTING REGISTER ADDRESS.
106 IF SPEED TEST ONLY, ENTER A ONE(1).
107 IF ALL OTHERS, ENTER A ZERO(0).
108 IF SPEED TEST, MOUNT 800 BPI SKEW TAPE AND TYPE CR.
109 THE PROGRAM WILL AUTOMATICLY FIND THE AVAILABLE
110 TS03 TAPE UNITS TO BE TESTED.
111 THE PROGRAM WILL BEGIN TIMING FUNCTIONS.
112 ON COMPLETION OF ALL TESTS "END OF TIMING" WILL BE PRINTED AND
113 THE PROCESSOR WILL HALT.
114 TO REPEAT TEST: PRESS CONTINUE.
115
116 *NOTE* THE PROGRAM HAS BEEN MODIFIED TO TEST 1-8 TS03
117 UNITS UNDER ACT11M. IN THIS MODE SPEED TEST IS NOT SELECTED.
118
119 5. OPERATING PROCEDURE
120
121 5.1 OPERATIONAL SWITCH SETTINGS
122
123 NONE
124
125 6. ERRORS
126
127 THE PROGRAM HAS NO INTERNAL ERROR DETECTION FACILITIES AND,
128 THEREFORE, NO ACTUAL ERROR TYPEOUTS. THE VALIDITY OF THE
129 TIMES MEASURED MUST BE DETERMINED BY THE OPERATOR.
130
131 6.1 TIME RELATIONSHIPS
132
133 A. "READ SHUTDOWN" MUST BE < "WRITE SHUTDOWN".
134 B. GAPS MUST = 8>7>6>5>4>3, 3=2=1 (+OR- 5.0).
135 C. "WRITE EOF" SHOULD BE SLIGHTLY > "WRITE XIRG".

136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
1776.2 TIME LIMITS AND PRINTOUT FORMAT EXAMPLE
***** (ALL TIMES ARE IN MILLISECONDS) *****

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

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

6.3 SPEED TEST TIME PRINTOUT EXAMPLE

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

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

178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198

7. RESTRICTIONS

7.1 STARTING RESTRICTIONS

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

7.2 OPERATING RESTRICTIONS

TMA-11 INSTRUCTION TEST MUST RUN WITHOUT ERRORS BEFORE ATTEMPTING
TO OPERATE THIS PROGRAM.

8. MISCELLANEOUS

8.1 EXECUTION TIME

NOT APPLICABLE

199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233

9.0 PROGRAM DESCRIPTION

9.1 WRITE FROM BOT DELAY

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

PROCEDURE TO MEASURE TIME:

- A. IF TS03 IS NOT AT BOT IT IS REWOUND TO BOT.
- B. INITIALIZE BYTE RECORD COUNTER AND CURRENT MEM 2Y ADDRESS REGISTER.
- C. ISSUE WRITE FUNCTION, 800 BPI, SET 'GO'.
- D. MONITOR CURRENT MEMORY ADDRESS REGISTER TO DETERMINE WHEN 2ND BYTE IS OUTPUT.
- E. THE TIME FROM 'GO' UNTIL 2ND BYTE IS OUTPUT IS APPROXIMATELY EQUAL TO 'WRITE FROM BOT DELAY'.

9.2 WRITE SHUTDOWN

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

PROCEDURE TO MEASURE TIME:

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

234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285

9.3 WRITE START

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

PROCEDURE TO MEASURE TIME:

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

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

9.4 SETTLEDOWN DELAY

TAPE DOES NOT ACTUALLY COME TO A COMPLETE STOP UNTIL SOME PERIOD OF TIME AFTER SHUTDOWN HAS ENDED. ALSO, AFTER TAPE HAS FULLY STOPPED, AN ADDITIONAL PERIOD OF TIME IS NECESSARY FOR THE TAPE AND HARDWARE TO 'SETTLEDOWN' AND BECOME STABLE. THE 'SETTLEDOWN DELAY' IS THE PERIOD OF TIME NECESSARY FOR THE TAPE AND MECHANICAL CHARACTERISTICS OF THE TS03 TO BECOME STABLE, SO THAT THE UNIT CANNOT BE OPERATED, START/STOP, AT A FREQUENCY WHERE IT IS MECHANICALLY RESONANT.

PROCEDURE TO MEASURE TIME:

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

9.5 WRITE TO ERASE HEAD

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

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

286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305

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

PROCEDURE TO MEASURE TIME:

- A. A LONG RECORD HAS BEEN WRITTEN FROM BOT. SAME RECORD THAT
WAS USED TO TIME 'WRITE FROM BOT DELAY'.
- B. TAPE IS REWOUND TO BOT.
- C. BYTE RECORD COUNTER IS INITIALIZED FOR A 3 BYTE RECORD
AND CURRENT MEMORY ADDRESS REGISTER IS INITIALIZED.
- D. ISSUE WRITE FUNCTION, 800 BPI, SET 'GO'.
- E. AWAIT CUR AT END OF CURRENT WRITE.
- F. ISSUE A 2 BYTE READ.
- G. TIME FROM GO UNTIL CUR OF THE READ IS WRITE TO
ERASE HEAD TIME.
- H. IF TIME IS TOO SHORT, ERASE HEAD IS INOPERATIVE.

306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352

9.6 BACKSPACE SHUTDOWN

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

PROCEDURE TO MEASURE TIME:

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

9.7 READ SHUTDOWN

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

PROCEDURE TO MEASURE TIME:

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

9.8 GAP CONSISTENCY

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

PROCEDURE TO MEASURE TIME:

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

PROGRAM SEQUENCE FOR EACH GAP:

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

GAP LENGTHS SHOULD REFLECT THE FOLLOWING RELATIONSHIP:

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

407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459

9.9 WRITE START

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

9.10 WRITE XIRG

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

PROCEDURE TO MEASURE TIME:

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

9.11 READ FROM BOT

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

PROCEDURE TO MEASURE TIME:

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

9.12 WRITE EOF.

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

PROCEDURE TO MEASURE TIME:

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

9.13 EOR TO EOF SPACE TIME

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

THIS COULD INDICATE ONE OR MORE OF THE FOLLOWING PROBLEMS:

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

PROCEDURE TO MEASURE TIME:

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

513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559

9.14 SPACE SHUTDOWN

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

PROCEDURE TO MEASURE TIME:

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

9.15 ONE INCH DATA TIME

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

PROCEDURE TO MEASURE TIME:

- A. INITIALIZE BYTE RECORD COUNTER AND CURRENT MEMORY ADDRESS.
- B. ISSUE WRITE FUNCTION, 800 BPI, SET 'GO'.
- C. WAIT FOR CURRENT MEMORY ADDRESS REGISTER TO INDICATE 2ND BYTE IS OUTPUT AND THEN MONITOR BYTE RECORD COUNTER UNTIL EQUAL TO ZERO.
- D. TIME FROM 2ND BYTE OUTPUT UNTIL BYTE RECORD COUNTER = 0 IS 'ONE INCH DATA TIME'

9.16 TAPE SPEED TEST (FORWARD ONLY)

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

- A. ASSURE OPERATOR MOUNTS SKEW TAPE
- B. ISSUE READ FUNCTION, 800 BPI, SET 'GO'.
- C. AWAIT 2ND BYTE TRANSFER.
- D. TIME FROM 2ND BYTE UNTIL LAST BYTE IS ONE INCH OF TAPE

560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614

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

COMMAND REGISTER

15	ERROR		
14	DEN 8	00 = 200 BPI 7 TRACK	10 = 800 BPI 7 TRACK
13	DEN 5	01 = 556 BPI 7 TRACK	11 = 800 BPI 9 TRACK
12	POWER CLEAR		
11	PARITY	0 = ODD	1 = EVEN
10	UNIT SEL. BIT 2		
9	UNIT SEL. BIT 1		
8	UNIT SEL. BIT 0		
7	CONTROL UNIT READY		
6	INTERRUPT ENABLE		
5	ADDRESS BIT 17		
4	ADDRESS BIT 16		
3	FUNCTION BIT 2	000 = OFF LINE	100 = SPACE FORWARD
		001 = READ	101 = SPACE REVERSE
2	FUNCTION BIT 1	010 = WRITE	110 = WRITE XIRG
1	FUNCTION BIT 0	011 = WRITE EOF	111 = REWIND
0	GO		

STATUS REGISTER

15	ILLEGAL COMMAND (ILC)
14	END OF FILE (EOF)
13	CYCLICAL REDUNDANCY ERROR (CRE)
12	PARITY ERROR (PAE)
11	BUS GRANT LATE (BGL)
10	END OF TAPE (EOT)
9	RECORD LENGTH ERROR (RLE)
8	BAD TAPE ERROR (BTE)
7	NON EXISTENT MEMORY (NXM)
6	SELECT REMOTE (SELR)
5	BEGINNING OF TAPE (BOT)
4	7 CHANNEL (7CH)
3	SETTLE DOWN (SDWN)
2	WRITE LOCK (WRL)
1	REWIND STATUS (RWS)
0	TAPE UNIT READY (TUR)
X	

CZTSEBO TS03 DR FCTN TMR
CZTSEB.P11 16-FEB-78 11:08

MACY11 30A(1052) 16-FEB-78 11:10 ^{D 2} PAGE 17

SEQ 0016

615		.TITLE CZTSEBO TS03 DR FCTN TMR
616		;COPYRIGHT: (C) 1975,1978 DIGITAL EQUIPMENT CORP., MAYNARD, MASS. 01754
617		;
618		;LOAD ADDRESS 200, PRESS START
619		;
620	001000	STACK=1000
621	005670	BLENGTH=3000.
622		.ENABL ABS,AMA
623	000000	=0
624		;TRAP CATCHER FROM 0 TO 1000
625		

```
626
627      ; *****
628      ;                               MODIFIED JAN 23 1978
629      ;
630      ; ++
631      ;                               ACT11 AND XXDP HOOKS
632      ; --
633
634      001000      $SVPC=.      ;SAVE PC
635
636      000040      .=40
637      000040      000      DRIVE: .BYTE 0      ;DRIVE # FOR XXDP LOAD MEDIUM
638      ;ASSEMBLE AS A 0
639
640      000041      .=41
641      000041      000      MEDIUM: .BYTE 0      ;XXDP LOAD MEDIUM
642      ;ASSEMBLE AS A 0
643
644      000042      .=42
645      000042      000000      .WORD 0      ;AUTO/MAN MODE INDICATOR
646      ;ASSEMBLE AS A 0
647
648      000046      .=46
649      000046      006232      .WORD $ENDAD      ;SET TO $ENDAD IN .SEOP
650
651      000052      .=52
652      000052      000000      .WORD 0      ;CHARACTERISTICS OF PROGRAM
653      ;ASSEMBLE AS A 0
654
655      001000      .=$SVPC      ;RESTORE PC
656
657      ; *****
658
```

```
659
660      : *****
661      :                               MODIFIED JAN 23 1978
662      :
663      : ++
664      :                               ACT11 AND XXDP MODE INDICATORS
665      : --
666
667 001000 000000      AUTOM: .WORD      0      :AUTOMATIC MODE INDICATOR
668 001002      000      ACT11M: .BYTE    0      :ACT11 AUTO MODE INDICATOR
669 001003      000      XXDPM: .BYTE    0      :XXDP AUTO MODE INDICATOR
670 001004      000      ADUMPM: .BYTE    0      :ACT11 DUMP MODE INDICATOR
671 001005      000      XDUMPM: .BYTE    0      :XXDP DUMP MODE INDICATOR
672
673      : *****
674
```


675					
676		000200		.=200	
677	000200	000137	001062	JMP	START
678		001000		.=1000	
679	001000	172520		MTS:	172520
680	001002	172522		MTC:	172522
681	001004	172524		BC:	172524
682	001006	172526		CA:	172526
683	001010	172530		MTD:	172530
684	001012	172532		MTRD:	172532
685	001014	177570		SR:	177570
686	001016	177560		TKS:	177560
687	001020	177562		TKB:	177562
688	001022	177564		TPS:	177564
689	001024	177566		TPB:	177566
690	001026	000224		MTV:	224
691	001030	172520		REGS:	172520
692	001032	177776		CC:	177776
693	001034	000000		R10:	0
694	001036	000000		R11:	0
695	001040	000000		R12:	0
696	001042	000000		R13:	0
697	001044	000000		T5DRV:	0
698	001046	000000		T11T:	0
699	001050	000000		T1B:	0
700	001052	000000		TEMP1:	0
701	001054	000000		SPTF:	0
702	001056	000000		UDES:	0
703	001060	000000		TEMPO:	0

704	001062	012706	001000		START:	MOV	#STACK,%6	; INITIALIZE STACK
705	001066	012777	000340	177736		MOV	#340,%ACC	; SET PRIORITY LEVEL 7
706	001074	004737	007706			JSR	PC,CKMODE	; CHECK FOR MODE OF OPERATION ++ C.W
707	001100	105737	001002			TSTB	ACT11M	; ACT MODE? ++ C.W
708	001104	001101				BNE	STO	; BRANCH - IF YES ++ C.W
709	001106	012737	011072	010070		MOV	#MSG28,MESAGE	
710	001114	004737	007566			JSR	%7,TOP	; PRINT TITLE
711	001120	012737	011246	010070		MOV	#MSG31,MESAGE	
712	001126	004737	007566			JSR	%7,TOP	; REQUEST UNIBUS ADDRESS
713	001132	012705	001030			MOV	#REGS,%5	; GET ADDRESS OF RESPONSE
714	001136	012701	000006			MOV	#6,%1	; SET SIZE OF ENTRY
715	001142	012702	172700			MOV	#172700,%2	; SET UPPER LIMIT
716	001146	012703	172300			MOV	#172300,%3	; SET LOWER LIMIT
717	001152	004737	007326			JSR	%7,TTR	; GO GET RESPONSE
718	001156	013700	001030			MOV	REGS,%0	; GET UNIBUS ADDRESS
719	001162	012701	001000			MOV	#MTS,%1	; SET START OF TABLE
720	001166	012702	000006			MOV	#6,%2	; SET SIZE OF TABLE
721	001172	010021			STRS:	MOV	%0,(1)+	; LOAD TABLE
722	001174	005720				TST	(0)+	; BUMP ADDRESS
723	001176	005302				DEC	%2	; SEE IF DONE
724	001200	001374				BNE	STRS	; IF NOT: BR
725	001202	012737	011271	010070		MOV	#MSG32,MESAGE	
726	001210	004737	007566			JSR	%7,TOP	; REQUEST SPEED TESTS ONLY
727	001214	005037	001054			CLR	SPTF	; CLEAN SPEED TEST FLAG
728	001220	012705	001054			MOV	#SPTF,%5	; GET FLAG ADDRESS
729	001224	012701	000001			MOV	#1,%1	; SET SIZE OF ENTRY
730	001230	012702	000001			MOV	#1,%2	; SET UPPER LIMIT
731	001234	012703	000000			MOV	#0,%3	; SET LOWER LIMIT
732	001240	004737	007326			JSR	%7,TTR	; GO GET RESPONSE
733	001244	005737	001054			TST	SPTF	; SEE IF SHOULD DO SPEED TEST
734	001250	001417				BEQ	STO	; IF NOT: BR
735	001252	012737	011325	010070		MOV	#MSG33,MESAGE	
736	001260	004737	007566			JSR	%7,TOP	; REQUEST SKEW TAPE MOUNT
737	001264	012705	001052			MOV	#TEMP1,%5	; SET RESPONSE ADDRESS
738	001270	012701	000001			MOV	#1,%1	; SET SIZE
739	001274	012702	000001			MOV	#1,%2	; SET UPPER
740	001300	012703	000000			MOV	#0,%3	; SET LOWER
741	001304	004737	007326			JSR	PC,TTR	; AWAIT SKEW TAPE MOUNT
742	001310	005037	006372		STO:	CLR	DRIVES	
743	001314	012777	010000	177460		MOV	#10000,%AMTC	; POWER CLEAR
744	001322	012777	000000	177452		MOV	#0,%AMTC	; SELECT UNIT 0
745	001330	032777	000100	177442		BIT	#100,%AMTS	; SEE IF 0 IS THERE
746	001336	001403				BEQ	STOA	; IF NOT: BR
747	001340	052737	000200	006372		BIS	#200,DRIVES	; SET 0 IN AVAILABLE TABLE
748	001346	012777	000400	177426	STOA:	MOV	#400,%AMTC	; SELECT UNIT 1
749	001354	032777	000100	177416		BIT	#100,%AMTS	; SEE IF 1 IS THERE
750	001362	001436				BEQ	STOB	; IF NOT: BR
751	001364	052737	000100	006372		BIS	#100,DRIVES	; SET 1 IN AVAILABLE TABLE
752	001372	012737	000002	001056		MOV	#2,UDES	; GET UNIT 2 ++ C.W
753	001400	022737	000010	001056	SACT:	CMP	#10,UDES	; ALL UNITS DONE ++ C.W
754	001406	001002				BNE	1\$	; BRANCH - IF NO ++ C.W
755	001410	000137	006200			JMP	T13	; GO DO END OF PASS ++ C.W
756	001414	113737	001056	001060	1\$:	MOVB	UDES,TEMPO	; SELECT UNIT ++ C.W
757	001422	000337	001060			SWAB	TEMPO	; POSITION UNIT ++ C.W
758	001426	042777	003400	177346		BIC	#3400,%AMTC	; CLEAR OLD NUMBER ++ C.W
759	001434	053777	001060	177340		BIS	TEMPO,%AMTC	; SET NEW UNIT NUMBER ++ C.W

760	001442	032777	000100	177330		BIT	#100,AMTS	;IS UNIT AVAILABLE ++ C.W
761	001450	001403				BEQ	STOB	;BRANCH - IF NO ++ C.W
762	001452	053737	001060	006372		BIS	TEMPO,DRIVES	;SET AVAILABLE UNIT IN TABLE ++ C.W
763	001460	005737	006372		STOB:	TST	DRIVES	;SEE IF ANY UNITS AVAILABLE
764	001464	001021				BNE	STOC	;IF SO: BR
765	001466	105737	001002			TSTB	ACT11M	;ACT MODE? ++ C.W
766	001472	001407				BEQ	1\$	;BRANCH - IF NO ++ C.W
767	001474	022737	000010	001056		CMP	#10,UDES	;ALL UNITS CHECKED? ++ C.W
768	001502	001403				BEQ	1\$	;BRANCH - IF YES ++ C.W
769	001504	105237	001056			INCB	UDES	;GET NEXT UNIT ++ C.W
770	001510	000733				BR	\$ACT	;CONTINUE TEST ++ C.W
771	001512	012737	011154	010070	1\$:	MOV	#MSG30,MESAGE	
772	001520	004737	007566			JSR	%7,TOP	;PRINT NO UNITS
773	001524	000000				HALT		
774	001526	000670				BR	STO	;RETRY UNIT SELECTION
775	001530	000240			STOC:	NOP		
776	001532	004737	006250			JSR	%7,RSFDRV	;RESET DRIVES
777	001536	004737	006474		ST1:	JSR	%7,STRREW	;START REWIND
778	001542	004737	006314			JSR	%7,CHGDRV	;DONE ALL DRIVES?
779	001546	000773				BR	ST1	;NO
780	001550	004737	006534		ST2:	JSR	%7,WATREW	;WAIT FOR BOT
781	001554	004737	006314			JSR	%7,CHGDRV	;DONE ALL DRIVES?
782	001560	000773				BR	ST2	;NO

```

783
784                                     ;PRINT HEADER
785
786 001562 012737 010115 010070      MOV    #MSG2,MESAGE
787 001570 004737 007566              JSR    %7, TOP      ;PRINT 'FUNCTION'
788 001574 012737 010142 010070  ST3:  MOV    #MSG2A,MESAGE
789 001602 004737 007566              JSR    %7, TOP      ;PRINT 'UNIT'
790 001606 013737 006374 007310      MOV    FDRIVE,DIGIT
791 001614 000337 007310              SWAB   DIGIT
792 001620 042737 177770 007310      BIC    #177770,DIGIT
793 001626 052737 000060 007310      BIS    #60,DIGIT
794 001634 105777 177162              TSTB   @TPS
795 001640 100375                    BPL     .-4
796 001642 013777 007310 177154      MOV    DIGIT,@TPB      ;PRINT DRIVE 'NUMBER'
797 001650 004737 006314              JSR    %7,CHGDRV      ;DONE ALL DRIVES?
798 001654 000747                    BR     ST3             ;NO
799 001656 004737 006454              JSR    %7,ST1S        ;STORE ONES IN WRITE BUFFER
800 001662 012737 011126 010070      MOV    #MSG29,MESAGE
801 001670 004737 007566              JSR    %7, TOP      ;PRINT RANGE HEADER
802 001674 005737 001054              TST    SPTF         ;SEE IF SPEED TESTS ONLY
803 001700 001402                    BEQ    T1             ;IF NOT: BR
804 001702 000137 006032              JMP    T11          ;ELSE DO SPEED TEST

```

```
805 ;TIME WRITE FROM BOT DELAY, AND WRITE SHUTDOWN
806
807 001706 012700 006610 T1: MOV #TM1,%0 ;INITIALIZE TIME BUFFERS
808 001712 012701 006634 MOV #TM2,%1
809 001716 004737 006436 T1A: JSR %7,WRINT
810 001722 013777 006374 177052 MOV FDRIVE,%MTC ;SELECT DRIVE
811 001730 052777 040005 177044 BIS #40005,%MTC ;800 BPI, WRITE, GO
812 001736 005037 006606 CLR TIME
813 001742 022777 011774 177036 T1B: CMP #WBUF+2,%CA ;IS 2ND WORD OUTPUT?
814 001750 003403 BLE T1C ;YES
815 001752 004737 006564 JSR %7,TIMER ;NO, COUNT TIME
816 001756 000771 BR T1B
817 001760 013720 006606 T1C: MOV TIME,(0)+ ;SAVE 'WRITE FROM BOT DELAY' TIME
818 001764 005037 006606 CLR TIME
819 001770 005777 177010 TST @BC ;SEE IF WORD COUNT DONE
820 001774 001375 BNE .-4 ;IF NOT: BR
821 001776 032777 000010 176774 T1D: BIT #10,%MTC ;HAS SETTLEDOWN SET?
822 002004 001003 BNE T1E ;YES
823 002006 004737 006564 JSR %7,TIMER ;NO, COUNT TIME
824 002012 000771 BR T1D
825 002014 013721 006606 T1E: MOV TIME,(1)+ ;SAVE 'WRITE SHUTDOWN' TIME
826 002020 004737 006314 JSR %7,CHGDRV ;DONE ALL DRIVES
827 002024 000734 BR T1A ;NO
828 002026 012720 177777 MOV #-1,(0)+ ;TERMINATE TIMES
829 002032 012721 177777 MOV #-1,(1)+ ;TERMINATE TIMES
830 002036 012737 010156 010070 MOV #MSG3,MESAGE
831 002044 012700 006610 MOV #TM1,%0
832 002050 004737 007050 JSR %7,TYPTIM ;PRINT 'WRITE FROM BOT DELAY' TIMES
833 002054 012737 011427 010070 MOV #RMSG1,MESAGE
834 002062 004737 007566 JSR %7,TOP ;PRINT RANGE
835 002066 012737 010204 010070 MOV #MSG4,MESAGE
836 002074 012700 006634 MOV #TM2,%0
837 002100 004737 007050 JSR %7,TYPTIM ;PRINT 'WRITE SHUTDOWN' TIMES
838 002104 012737 011447 010070 MOV #RMSG2,MESAGE
839 002112 004737 007566 JSR %7,TOP ;PRINT RANGE
```

```
840 ;TIME WRITE START AND SETTLEDOWN DELAY
841
842 002116 004737 006250 T2: JSR X7,RSFDRV ;RESET DRIVE SELECTION
843 002122 012700 006610 MOV #TM1,X0
844 002126 012701 006634 MOV #TM2,X1
845 002132 004737 006436 T2A: JSR X7,WRINT
846 002136 013777 006374 176636 MOV FDRIVE,@MTC ;SELECT DRIVE
847 002144 052777 040005 176630 BIS #40005,@MTC ;800 BPI, WRITE, GO
848 002152 005037 006606 CLR TIME
849 002156 022777 011774 176622 T2B: CMP #WBUF+2,@CA ;IS 2ND WORD OUTPUT
850 002164 003403 BLE T2C ;YES
851 002166 004737 006564 JSR X7,TIMER ;NO, COUNT TIME
852 002172 000771 BR T2B
853 002174 013720 006606 T2C: MOV TIME,(0)+ ;SAVE 'WRITE START' TIME
854 002200 005037 006606 CLR TIME
855 002204 005777 176574 TST @BC
856 002210 001375 BNE .-4
857 002212 032777 000010 176560 BIT #10,@MTS
858 002220 001774 BEQ .-6 ;WAIT FOR SETTLEDOWN TO SET
859 002222 006077 176552 T2D: ROR @MTS
860 002226 103403 BCS T2E ;WAIT FOR TU READY
861 002230 004737 006564 JSR X7,TIMER
862 002234 000772 BR T2D
863 002236 013721 006606 T2E: MOV TIME,(1)+ ;SAVE 'SETTLEDOWN' TIME
864 002242 004737 006314 JSR X7,CHGDRV
865 002246 000731 BR T2A
866 002250 012720 177777 MOV #-1,(0)+ ;TERMINATE TIMES
867 002254 012721 177777 MOV #-1,(1)+ ;TERMINATE TIMES
868 002260 012737 010232 010070 MOV #MSG5,MESAGE
869 002266 012700 006610 MOV #TM1,X0
870 002272 004737 007050 JSR X7,TYPTIM ;PRINT 'WRITE START' TIMES
871 002276 012737 011466 010070 MOV #RMSG3,MESAGE
872 002304 004737 007566 JSR X7,TOP
873 002310 012737 010260 010070 MOV #MSG6,MESAGE
874 002316 012700 006634 MOV #TM2,X0
875 002322 004737 007050 JSR X7,TYPTIM ;PRINT 'SETTLEDOWN' TIMES
876 002326 012737 011505 010070 MOV #RMSG4,MESAGE
877 002334 004737 007566 JSR X7,TOP
```



```
878      ;TIME WRITE TO ERASE HEAD
879      ;LONG RECORD WAS PREVIOUSLY WRITTEN
880      ;WRITE A 3 BYTE RECORD AND POWER CLEAR
881      ;DISTANCE FROM NEW DATA TO OLD IS
882      ;ERASE HEAD DISTANCE
883
884 002340 004737 006474      T3:      JSR      X7,STRREW      ;START REWIND
885 002344 004737 006314      JSR      X7,CHGDRV      ;DONE ALL DRIVES?
886 002350 000773              BR      T3              ;NO
887 002352 004737 006534      T3A:     JSR      X7,WATREW      ;IS DRIVE AT BOT?
888 002356 004737 006314      JSR      X7,CHGDRV      ;DONE ALL DRIVES
889 002362 000773              BR      T3A             ;NO
890 002364 012777 177775 176412 T3B:     MOV      #-3,@BC      ;3 BYTE RECORD
891 002372 012777 011772 176406      MOV      #WBUF,@CA      ;INITIALIZE CURRENT ADDRESS
892 002400 013777 006374 176374      MOV      FDRIVE,@MTC      ;SELECT DRIVE
893 002406 052777 040005 176366      BIS      #40005,@MTC      ;800BPI, WRITE, GO
894 002414 105777 176362      TSTB     @MTC
895 002420 100375              BPL      -4              ;AWAIT CUR
896 002422 004737 006314      JSR      X7,CHGDRV      ;DONE ALL DRIVES
897 002426 000756              BR      T3B             ;NO
898
899      ;NOW READ OVER PARTIAL RECORD
900
901 002430 012700 006610      MOV      #TM1,X0
902 002434 012777 177776 176342 T3D:     MOV      #-2,@BC
903 002442 012777 011772 176336      MOV      #WBUF,@CA
904 002450 013777 006374 176324      MOV      FDRIVE,@MTC      ;SELECT DRIVE
905 002456 052777 040003 176316      BIS      #40003,@MTC      ;800BPI, READ, GO
906 002464 005037 006606      CLR      TIME          ;CLEAR TIME
907 002470 005777 176310      T3E:     TST      @BC          ;WAIT FOR NEXT WORD IN
908 002474 001403              BEQ      T3F             ;HAVE IT
909 002476 004737 006564      JSR      X7,TIMER        ;NO, COUNT TIME
910 002502 000772              BR      T3E
911 002504 013720 006606      T3F:     MOV      TIME,(0)+      ;SAVE 'WRITE TO ERASE HEAD TIME'
912 002510 105777 176266      TSTB     @MTC          ;SEE IF CUR
913 002514 100375              BPL      -4              ;AWAIT CUR
914 002516 004737 006314      JSR      X7,CHGDRV      ;DONE ALL DRIVES
915 002522 000744              BR      T3D             ;NO
916 002524 012720 177777      MOV      #-1,(0)+      ;TERMINATE TIMES
917 002530 012737 010306 010070      MOV      #MSG7,MESAGE
918 002536 012700 006610      MOV      #TM1,X0
919 002542 004737 007050      JSR      X7,TYPTIM      ;PRINT 'WRITE TO ERASE HEAD TIMES'
920 002546 012737 011524 010070      MOV      #RMSG5,MESAGE
921 002554 004737 007566      JSR      X7,TOP
922 002560 004737 006474      T3G:     JSR      X7,STRREW      ;START REWIND
923 002564 004737 006314      JSR      X7,CHGDRV      ;DONE ALL DRIVES
924 002570 000773              BR      T3G             ;NO
925 002572 004737 006534      T3H:     JSR      X7,WATREW      ;DRIVE AT BOT
926 002576 004737 006314      JSR      X7,CHGDRV      ;DONE ALL DRIVES
927 002602 000773              BR      T3H             ;NO
```

```
928 ;TIME WRITE NONSTOP GAP, BACKSPACE SHUTDOWN AND READ SHUTDOWN
929 ;WRITE ONE RECORD, FOLLOW WITH ONE RECORD NONSTOP
930 ;FOLLOWED BY ONE RECORD START-STOP
931 ;FOLLOWED BY WRITE-BACKSPACE-READ-WRITE
932 ;FOLLOWED BY WRITE-BACKSPACE-WRITE
933
934 002604 004737 006454 T4: JSR X7,ST1S
935 002610 012700 006610 MOV #TM1,X0 ;INITIALIZE TIME BUFFERS
936 002614 012701 006634 MOV #TM2,X1
937 002620 012702 006660 MOV #TM3,X2
938 002624 005037 006606 T4AA: CLR TIME
939 002630 004737 006436 JSR X7,WRINT
940 002634 013777 006374 176140 MOV FDRIVE,@MTC ;TRACK AND DRIVE NUMBERS
941 002642 052777 040005 176132 BIS #40005,@MTC ;800 BPI, WRITE, GO
942 002650 105777 176126 TSTB @MTC
943 002654 100375 BPL .-4 ;WAIT FOR CU READY
944
945 ;HAVE FIRST RECORD WRITTEN, GO NONSTOP
946
947 002656 004737 006436 JSR X7,WRINT
948 002662 005277 176114 INC @MTC ;GO
949 002666 022777 011774 176112 T4A: CMP #WBUF+2,@CA ;IS 2ND WORD OUTPUT?
950 002674 003403 BLE T4B ;YES
951 002676 004737 006564 JSR X7,TIMER ;NO, COUNT TIME
952 002702 000771 BR T4A
953 002704 013720 006606 T4B: MOV TIME,(0)+ ;SAVE 'WRITE NONSTOP GAP' TIME
954 002710 005037 006606 CLR TIME
955 002714 105777 176062 TSTB @MTC
956 002720 100375 BPL .-4 ;WAIT FOR CU READY
957 002722 006077 176052 ROR @MTC
958 002726 103375 BCC .-4 ;WAIT FOR TU READY
959
960 ;WRITE-BACKSPACE-READ-WRITE
961
962 002730 004737 006436 JSR X7,WRINT
963 002734 013777 006374 176040 MOV FDRIVE,@MTC ;DRIVE SELECT
964 002742 052777 040007 176032 BIS #40007,@MTC ;800 BPI, WRITE EOF, GO
965 002750 105777 176026 TSTB @MTC
966 002754 100375 BPL .-4 ;WAIT FOR CU READY
967 002756 012777 177777 176020 MOV #-1,@BC ;BACKSPACE 1 RECORD
968 002764 042777 000016 176010 BIC #16,@MTC
969 002772 052777 000013 176002 BIS #13,@MTC ;SPACE REVERSE, GO
970 003000 000240 NOP
971 003002 032777 040000 175770 T4BA: BIT #40000,@MTC ;SEE IF EOF
972 003010 001774 BEQ T4BA ;IF NOT: BR
973 003012 000240 NOP
974 003014 000240 NOP
975 003016 032777 000010 175754 T4C: BIT #10,@MTC ;HAS SETTLEDOWN SET?
976 003024 001003 BNE T4D ;YES
977 003026 004737 006564 JSR X7,TIMER ;NO, COUNT TIME
978 003032 000771 BR T4C
979 003034 006077 175740 T4D: ROR @MTC
980 003040 103375 BCC .-4 ;WAIT FOR TU READY
981 003042 013721 006606 MOV TIME,(1)+ ;SAVE 'BACKSPACE SHUTDOWN' TIME
982 003046 004737 006436 JSR X7,WRINT
983 003052 005037 006606 CLR TIME
```


Line	Address	Label	Operation	Comments
984	003056	013777	006374	175716
985	003064	052777	040003	175710
986	003072	032777	040000	175700
987	003100	001774		
988	003102	032777	000010	175670
989	003110	001003		
990	003112	004737	006564	
991	003116	000771		
992	003120	006077	175654	
993	003124	103375		
994	003126	013722	006606	
995	003132	004737	006314	
996	003136	000632		
997	003140	012720	177777	
998	003144	012721	177777	
999	003150	012722	177777	
1000	003154	012737	010362	010070
1001	003162	012700	006634	
1002	003166	004737	007050	
1003	003172	012737	011543	010070
1004	003200	004737	007566	
1005	003204	012737	010410	010070
1006	003212	012700	006660	
1007	003216	004737	007050	
1008	003222	012737	011561	010070
1009	003230	004737	007566	
1010	003234	004737	006454	
1011	003240	004737	006474	
1012	003244	004737	006314	
1013	003250	000773		
1014	003252	004737	006534	
1015	003256	004737	006314	
1016	003262	000773		
1017	003264	000240		
1018	003266	004737	006436	
1019	003272	013777	006374	175502
1020	003300	052777	040005	175474
1021	003306	105777	175470	
1022	003312	100375		
1023	003314	000240		
1024	003316	004737	006436	
1025	003322	005277	175454	
1026	003326	105777	175450	
1027	003332	100375		
1028	003334	004737	006436	
1029	003340	005277	175436	
1030	003344	105777	175432	
1031	003350	100375		
1032	003352	004737	006314	
1033	003356	000743		
1034	003360	000240		
1035				

```

1036
1037
1038
1039 003362 004737 006436
1040 003366 013777 006374 175406
1041 003374 052777 040005 175400
1042 003402 105777 175374
1043 003406 100375
1044 003410 004737 006436
1045 003414 005277 175362
1046 003420 105777 175356
1047 003424 100375
1048 003426 012777 177777 175350
1049 003434 013777 006374 175340
1050 003442 052777 040013 175332
1051 003450 105777 175326
1052 003454 100375
1053 003456 004737 006436
1054 003462 013777 006374 175312
1055 003470 052777 040005 175304
1056 003476 105777 175300
1057 003502 100375
1058 003504 012737 177777 001036
1059 003512 012737 177777 001040
1060 003520 012737 177777 001042
1061 003526 012737 177776 001034

;WRITE RECORDS TO BE USED IN GAP TEST

T4G: JSR X7,WRINT
      MOV FDRIVE,@MTC ;SELECT DRIVE
      BIS #40005,@MTC ;800 BPI, WRITE, GO
      TSTB @MTC
      BPL .-4 ;WAIT FOR CU READY
      JSR X7,WRINT
      INC @MTC ;WRITE NEXT
      TSTB @MTC
      BPL .-4 ;WAIT FOR CU READY
      MOV #-1,@BC
      MOV FDRIVE,@MTC ;SELECT DRIVE
      BIS #40013,@MTC ;800 BPI, BACKSPACE, GO
      TSTB @MTC
      BPL .-4 ;WAIT FOR CU READY
      JSR X7,WRINT
      MOV FDRIVE,@MTC
      BIS #40005,@MTC ;800 BPI, WRITE, GO
      TSTB @MTC
      BPL .-4
      MOV #-1,R11 ;INDICATES BACK 3 COMPLETE
      MOV #-1,R12 ;INDICATES BACK 4 COMPLETE
      MOV #-1,R13 ;INDICATES BACK 5 COMPLETE
      MOV #-2,R10 ;FIRST SEQUENCE BACK 2 TIMES

```

```

1062      ;NOW WRITE, BACKSPACE, WRITE, BACKSPACE, WRITE
1063      ;GAP SHOULD GET LARGER
1064
1065 003534 004737 006436      MULWRT: JSR      X7,WRINT
1066 003540 005277 175236      INC      @MTC      ;GO NONSTOP
1067 003544 105777 175232      TSTB     @MTC
1068 003550 100375      BPL      .-4      ;WAIT FOR DONE
1069 003552 012777 177777 175224 MULBAK: MOV      #-1,@BC      ;BACKSPACE 1 RECORD
1070 003560 042777 000016 175214      BIC      #16,@MTC
1071 003566 052777 000013 175206      BIS      #13,@MTC      ;SET BACKSPACE, GO
1072 003574 105777 175202      TSTB     @MTC
1073 003600 100375      BPL      .-4      ;WAIT FOR BACKSPACE DONE
1074 003602 004737 006436      JSR      X7,WRINT
1075 003606 042777 000016 175166      BIC      #16,@MTC
1076 003614 052777 000005 175160      BIS      #5,@MTC      ;SET WRITE, GO
1077 003622 105777 175154      TSTB     @MTC
1078 003626 100375      BPL      .-4      ;WAIT FOR WRITE DONE
1079 003630 005237 001034      INC      R10      ;BACKSPACED ENOUGH TIMES?
1080 003634 001346      BNE      MULBAK      ;NO BACKSPACE AND WRITE AGAIN
1081 003636 005237 001036      INC      R11      ;DONE 3 BACKSPACE SEQUENCES?
1082 003642 001004      BNE      MUL1      ;YES
1083 003644 012737 177775 001034      MOV      #-3,R10
1084 003652 000730      BR      MULWRT
1085 003654 005237 001040      MUL1: INC      R12      ;DONE 4 BACKSPACE SEQUENCES?
1086 003660 001004      BNE      MUL2      ;YES
1087 003662 012737 177774 001034      MOV      #-4,R10
1088 003670 000721      BR      MULWRT
1089 003672 005237 001042      MUL2: INC      R13      ;DONE 5 BACKSPACE SEQUENCES?
1090 003676 001004      BNE      MUL3      ;YES
1091 003700 012737 177773 001034      MOV      #-5,R10
1092 003706 000712      BR      MULWRT
1093 003710 006077 175064      MUL3: ROR      @MTS
1094 003714 103375      BCC      .-4      ;WAIT FOR TU READY
1095 003716 004737 006474      JSR      X7,STRREW      ;START REWIND
1096 003722 004737 006314      JSR      X7,CHGDRV
1097 003726 000615      BR      T4G

```

```
1098 ;NOW READ NONSTOP
1099 ;ACCUMULATE GAP TIMES ON READ
1100 ;TYPE ACCUMULATED TIMES AT END OF READ
1101 ;GAP1 SHOULD = GAP2, GAP3 < GAP1 AND GAP2
1102 ;GAP4 THRU GAP8 SHOULD GET INCREASINGLY LONGER
1103 003730 005037 001044 CLR T5DRV
1104
1105 003734 004737 006534 T5: JSR X7,WATREW
1106 003740 004737 006436 JSR X7,WRINT
1107 003744 012700 006610 MOV #TM1,X0
1108 003750 063700 001044 ADD T5DRV,X0
1109 003754 013777 006374 175020 MOV FDRIVE,@MTC ;SELECT DRIVE
1110 003762 052777 040003 175012 BIS #40003,@MTC ;800 BPI, READ, GO
1111 003770 012737 177770 001034 MOV #-8.,R10 ;COUNT 8 GAPS
1112 003776 105777 175000 T5A: TSTB @MTC
1113 004002 100375 BPL .-4 ;WAIT FOR CU READY
1114 004004 004737 006436 JSR X7,WRINT
1115 004010 005037 006606 CLR TIME
1116 004014 005277 174762 INC @MTC ;GO NONSTOP
1117 004020 022777 011774 174760 T5B: CMP #WBUF+2,@CA ;IS 2ND WORD OUTPUT
1118 004026 003403 BLE T5C ;YES
1119 004030 004737 006564 JSR X7,TIMER ;NO, COUNT TIME
1120 004034 000771 BR T5B
1121 004036 013720 006606 T5C: MOV TIME,(0)+ ;SAVE GAP TIME
1122 004042 012710 177777 MOV #-1,(0) ;TERMINATE, JUST IN CASE AT END
1123 004046 062700 000022 ADD #22,X0 ;STEP GAP POINTER
1124 004052 005237 001034 INC R10 ;DONE ALL 8 GAPS?
1125 004056 001347 BNE T5A ;NO
1126 004060 006077 174714 ROR @MTC
1127 004064 103375 BCC .-4 ;WAIT FOR TU READY
1128 004066 004737 006474 JSR X7,STRREW ;START REWIND
1129 004072 062737 000002 001044 ADD #2,T5DRV ;+2 TO DRIVE TIME POINTER
1130 004100 004737 006314 JSR X7,CHGDRV
1131 004104 000713 BR T5
1132 004106 112737 000061 010523 MOVB #'1,MSG11A+6
1133 004114 012737 010436 010070 MOV #MSG11,MESAGE
1134 004122 004737 007566 JSR X7,TOP
1135 004126 012737 010515 010070 MOV #MSG11A,MESAGE
1136 004134 012700 006610 MOV #TM1,X0
1137 004140 004737 007050 JSR X7,TYPTIM ;PRINT 'GAP 1'
1138 004144 105237 010523 INCB MSG11A+6
1139 004150 012737 010515 010070 MOV #MSG11A,MESAGE
1140 004156 012700 006634 MOV #TM2,X0
1141 004162 004737 007050 JSR X7,TYPTIM ;PRINT 'GAP 2'
1142 004166 105237 010523 INCB MSG11A+6
1143 004172 012737 010515 010070 MOV #MSG11A,MESAGE
1144 004200 012700 006660 MOV #TM3,X0
1145 004204 004737 007050 JSR X7,TYPTIM ;PRINT 'GAP 3'
1146 004210 105237 010523 INCB MSG11A+6
1147 004214 012737 010515 010070 MOV #MSG11A,MESAGE
1148 004222 012700 006704 MOV #TM4,X0
1149 004226 004737 007050 JSR X7,TYPTIM ;PRINT 'GAP 4'
1150 004232 105237 010523 INCB MSG11A+6
1151 004236 012737 010515 010070 MOV #MSG11A,MESAGE
1152 004244 012700 006730 MOV #TM5,X0
1153 004250 004737 007050 JSR X7,TYPTIM ;PRINT 'GAP 5'
```

```
1154 004254 105237 010523      INCB  MSG11A+6
1155 004260 012737 010515 010070 MOV  #MSG11A,MESAGE
1156 004266 012700 006754      MOV  #TM6,X0
1157 004272 004737 007050      JSR  X7,TYPTIM      ;PRINT 'GAP 6'
1158 004276 105237 010523      INCB  MSG11A+6
1159 004302 012737 010515 010070 MOV  #MSG11A,MESAGE
1160 004310 012700 007000      MOV  #TM7,X0
1161 004314 004737 007050      JSR  X7,TYPTIM      ;PRINT 'GAP 7'
1162 004320 105237 010523      INCB  MSG11A+6
1163 004324 012737 010515 010070 MOV  #MSG11A,MESAGE
1164 004332 012700 007024      MOV  #TM8,X0
1165 004336 004737 007050      JSR  X7,TYPTIM      ;PRINT 'GAP 8'
1166 004342 004737 006454      JSR  X7,ST1S
1167
1168      ;TIME WHITE START NOT AT BOT
1169
1170 004346 012700 006610      T6:   MOV  #TM1,X0
1171 004352 012701 006634      MOV  #TM2,X1
1172 004356 004737 006436      T6A:  JSR  X7,WRINT
1173 004362 013777 006374 174412 MOV  FDRIVE,@MTC      ;SELECT DRIVE
1174 004370 105777 174406      TSTB  @MTC
1175 004374 100375      BPL  .-4
1176 004376 006077 174376      ROR  @MTC
1177 004402 103375      BCC  .-4      ;WAIT FOR TU READY
1178 004404 052777 040005 174370 BIS  #40005,@MTC      ;800 BPI, WRITE, GO
1179 004412 032777 000040 174360 BIT  #40,@MTC
1180 004420 001374      BNE  .-6      ;WAIT FOR BOT TO CLEAR
1181 004422 052777 010000 174352 BIS  #10000,@MTC      ;POWER CLEAR
1182 004430 013777 006374 174344 MOV  FDRIVE,@MTC
1183 004436 004737 006436      JSR  X7,WRINT
1184 004442 006077 174332      ROR  @MTC
1185 004446 103375      BCC  .-4      ;WAIT FOR TU READY
1186 004450 005037 006606      CLR  TIME
1187 004454 013777 006374 174320 MOV  FDRIVE,@MTC      ;SELECT DRIVE
1188 004462 052777 040005 174312 BIS  #40005,@MTC      ;800 BPI, WRITE, GO
1189 004470 022777 011774 174310 T6B:  CMP  #WBUF+2,@CA      ;IS 2ND WORD OUTPUT?
1190 004476 003403      BLE  T6C      ;YES
1191 004500 004737 006564      JSR  X7,TIMER      ;NO, COUNT TIME
1192 004504 000771      BR  T6B
1193 004506 006077 174266      T6C:  ROR  @MTC
1194 004512 103375      BCC  .-4      ;WAIT FOR TU READY
1195 004514 013720 006606      MOV  TIME,(0)+      ;SAVE 'WRITE START' TIME
1196 004520 005037 006606      CLR  TIME
1197 004524 004737 006436      JSR  X7,WRINT
1198 004530 013777 006374 174244 MOV  FDRIVE,@MTC      ;SELECT DRIVE
1199 004536 052777 040015 174236 BIS  #40015,@MTC      ;800 BPI, WRITE XIRG, GO
1200 004544 022777 011774 174234 T6D:  CMP  #WBUF+2,@CA      ;IS 2ND WORD OUTPUT
1201 004552 003403      BLE  T6E      ;YES
1202 004554 004737 006564      JSR  X7,TIMER      ;NO COUNT TIME
1203 004560 000771      BR  T6D
1204 004562 006077 174212      T6E:  ROR  @MTC
1205 004566 103375      BCC  .-4      ;WAIT FOR TU READY
1206 004570 013721 006606      MOV  TIME,(1)+      ;SAVE 'WRITE XIRG' TIME
1207 004574 004737 006474      JSR  X7,STRREW
1208 004600 004737 006314      JSR  X7,CHGDRV
1209 004604 000664      BR  T6A
```

CZTSEBO TS03 DR FCTN TMR
CZTSEB.P11 16-FEB-78 11:08

MACY11 30A(1052) 16-FEB-78 11:10 PAGE 33

SEQ 0032

```
1210 004606 012720 177777      MOV      #-1,(0)+      ;TERMINATE TIMES
1211 004612 012721 177777      MOV      #-1,(1)+      ;TERMINATE TIMES
1212 004616 012737 010232 010070  MOV      #MSG5,MESAGE
1213 004624 012700 006610      MOV      #TM1,X0
1214 004630 004737 007050      JSR      X7,TYPTIM      ;TYPE 'WRITE START' TIME
1215 004634 012737 011577 010070  MOV      #RMSG8,MESAGE
1216 004642 004737 007566      JSR      X7,TOP
1217 004646 012737 010543 010070  MOV      #MSG12,MESAGE
1218 004654 012700 006634      MOV      #TM2,X0
1219 004660 004737 007050      JSR      X7,TYPTIM      ;TYPE 'WRITE XIRG' TIME
1220 004664 012737 011616 010070  MOV      #RMSG9,MESAGE
1221 004672 004737 007566      JSR      X7,TOP
1222 004676 004737 006534      T6F:    JSR      X7,WATREW
1223 004702 004737 006314      JSR      X7,CHGDRV
1224 004706 000773      BR      T6F      ;WAIT FOR ALL DRIVES AT BOT.
1225
1226      ;NOW TIME 'READ FROM BOT DELAY
1227
1228 004710 012700 006610      T7:    MOV      #TM1,X0
1229 004714 005037 006606      T7A:    CLR      TIME
1230 004720 004737 006436      JSR      X7,WRINT
1231 004724 013777 006374 174050  MOV      FDRIVE,@MTC      ;SELECT DRIVE
1232 004732 052777 040003 174042  BIS      #40003,@MTC      ;800 BPI, READ GO
1233 004740 022777 011774 174040  T7B:    CMP      #WBUF+2,@CA      ;IS 2ND WORD INPUT?
1234 004746 003403      BLE      T7C      ;YES
1235 004750 004737 006564      JSR      X7,TIMER      ;NO COUNT TIME
1236 004754 000771      BR      T7B
1237 004756 013720 006606      T7C:    MOV      TIME,(0)+      ;SAVE 'READ FROM BOT' TIME
1238 004762 105777 174014      TSTB     @MTC
1239 004766 100375      BPL      .-4      ;WAIT FOR CU READY.
1240 004770 004737 006314      JSR      X7,CHGDRV      ;DONE ALL DRIVES?
1241 004774 000747      BR      T7A      ;NO
1242 004776 006077 173776      ROR      @MTS
1243 005002 103375      BCC      .-4
1244 005004 012720 177777      MOV      #-1,(0)+      ;TERMINATE TIMES
1245 005010 012737 010571 010070  MOV      #MSG13,MESAGE
1246 005016 012700 006610      MOV      #TM1,X0
1247 005022 004737 007050      JSR      X7,TYPTIM      ;PRINT 'READ FROM BOT' TIME
1248 005026 012737 011636 010070  MOV      #RMSG10,MESAGE
1249 005034 004737 007566      JSR      X7,TOP
1250 005040 004737 006454      JSR      X7,ST1S
1251
1252      ;TIME 'LAST CHARACTER INPUT TO CU READY'
1253
1254 005044 012700 006610      T8:    MOV      #TM1,X0
1255 005050 004737 006436      T8A:    JSR      X7,WRINT
1256 005054 005037 006606      CLR      TIME
1257 005060 013777 006374 173714  MOV      FDRIVE,@MTC      ;SELECT DRIVE
1258 005066 052777 040003 173706  BIS      #40003,@MTC      ;800 BPI, READ, GO
1259 005074 005777 173704      TST      @BC
1260 005100 001375      BNE      .-4      ;WAIT FOR LAST WORD IN
1261 005102 105777 173674      T8B:    TSTB     @MTC      ;IS CU READY?
1262 005106 100403      BMI      T8C      ;YES
1263 005110 004737 006564      JSR      X7,TIMER      ;NO, COUNT TIME
1264 005114 000772      BR      T8B
1265 005116 006077 173656      T8C:    ROR      @MTS
```



```
1266 005122 103375          BCC      .-4          ;WAIT FOR TU READY
1267 005124 013720 006606    MOV      TIME,(0)+      ;SAVE 'LAST CHAR TO CU READY' TIME
1268 005130 004737 006474    JSR      %7,STRREW      ;REWIND
1269 005134 004737 006314    JSR      %7,CHGDRV      ;ANYMORE DRIVES?
1270 005140 000743          BR       T8A          ;YES
1271 005142 012720 177777    MOV      #-1,(0)+      ;TERMINATE TIMES
1272 005146 004737 006534    T8D:    JSR      %7,WATREW
1273 005152 004737 006314    JSR      %7,CHGDRV
1274 005156 000773          BR       T8D
1275
1276          ;TIME 'WRITE EOF'
1277          ;WRITE A 3 BYTE RECORD FROM BOT FOLLOWED BY AN EOF.
1278
1279 005160 012700 006610    T9:    MOV      #TM1,%0
1280 005164 005037 006606    T9A:   CLR      TIME
1281 005170 012777 177775 173606    MOV      #-3,%ABC          ;WRITE 3 BYTES
1282 005176 012777 011772 173602    MOV      #WBUF,%CA
1283 005204 013777 006374 173570    MOV      FDRIVE,%MTC      ;SELECT DRIVE
1284 005212 052777 040005 173562    BIS      #40005,%MTC      ;800 BPI, WRITE, GO
1285 005220 105777 173556          TSTB      %MTC
1286 005224 100375          BPL      .-4
1287 005226 006077 173546          ROR      %MTC
1288 005232 103375          BCC      .-4          ;WAIT FOR TU READY
1289 005234 042777 000016 173540    BIC      #16,%MTC
1290 005242 052777 000007 173532    BIS      #7,%MTC          ;WRITE EOF, GO
1291 005250 105777 173526    T9B:   TSTB      %MTC      ;IS CU READY SET?
1292 005254 100403          BMI      T9C          ;YES
1293 005256 004737 006564          JSR      %7,TIMER      ;NO, COUNT TIME
1294 005262 000772          BR       T9B
1295 005264 013720 006606    T9C:   MOV      TIME,(0)+      ;SAVE 'WRITE EOF' TIME
1296 005270 004737 006474          JSR      %7,STRREW      ;REWIND
1297 005274 004737 006314          JSR      %7,CHGDRV      ;ANYMORE DRIVES?
1298 005300 000731          BR       T9A          ;YES
1299 005302 012720 177777    MOV      #-1,(0)+      ;TERMINATE TIMES
1300 005306 012737 010645 010070    MOV      #MSG15,MESAGE
1301 005314 012700 006610          MOV      #TM1,%0
1302 005320 004737 007050          JSR      %7,TYPTIM      ;PRINT 'WRITE EOF' TIMES
1303 005324 012737 011656 010070    MOV      #RMSG11,MESAGE
1304 005332 004737 007566          JSR      %7,TOP
1305 005336 004737 006534    T9D:   JSR      %7,WATREW
1306 005342 004737 006314          JSR      %7,CHGDRV
1307 005346 000773          BR       T9D
```

```
1308 ;TIME 'EOR TO EOF SPACE TIME', 'SPACE SHUTDOWN' AND 'ONE INCH DATA TIME'.
1309 ;WRITE A 3 BYTE RECORD OVER ONE PREVIOUSLY WRITTEN
1310 ;AND THEN SPACE FORWARD 1 RECORD
1311 ;TIME FROM GO UNTIL EOF IS REACHED
1312
1313 005350 012700 006610 T10: MOV #TM1,X0
1314 005354 012701 006634 MOV #TM2,X1
1315 005360 012702 006660 MOV #TM3,X2
1316 005364 005037 006606 T10A: CLR TIME
1317 005370 012777 177775 173406 MOV #-3,ABC ;3 BYTE RECORD
1318 005376 012777 011772 173402 MOV #WBUF,ACA
1319 005404 013777 006374 173370 MOV FDRIVE,AMTC ;SELECT DRIVE
1320 005412 105777 173364 TSTB AMTC
1321 005416 100375 BPL .-4 ;WAIT FOR CU READY
1322 005420 012777 177776 173356 MOV #-2,ABC ;SPACE FORWARD 2 RECORDS
1323 005426 042777 000016 173346 BIC #16,AMTC
1324 005434 052777 000011 173340 BIS #11,AMTC ;SPACE FORWARD, GO
1325 005442 022777 177777 173334 T10B: CMP #-1,ABC
1326 005450 001374 BNE T10B ;WAIT FOR 1ST RECORD TO BE SPACED OVER
1327 005452 032777 040000 173320 T10C: BIT #40000,AMTS ;IS EOF SET?
1328 005460 001014 BNE T10D ;YES
1329 005462 105777 173314 TSTB AMTC ;IS CU READY
1330 005466 100403 BMI T10CC ;YES
1331 005470 004737 006564 JSR X7,TIMER ;NO, COUNT TIME
1332 005474 000766 BR T10C
1333 005476 032777 040000 173274 T10CC: BIT #40000,AMTS ;HAVE EOF
1334 005504 001002 BNE T10D ;IS EOF SET?
1335 005506 005037 006606 CLR TIME ;NO, SET ERROR
1336 005512 013720 006606 T10D: MOV TIME,(0)+ ;SAVE 'EOR TO EOF SPACE TIME'
1337 005516 005037 006606 CLR TIME
1338 005522 000240 NOP
1339 005524 000240 NOP
1340 005526 000240 NOP
1341 005530 032777 000010 173242 T10E: BIT #10,AMTS ;IS SETTLEDOWN SET?
1342 005536 001003 BNE T10F ;YES
1343 005540 004737 006564 JSR X7,TIMER ;NO, COUNT TIME
1344 005544 000771 BR T10E
1345 005546 013721 006606 T10F: MOV TIME,(1)+ ;SAVE 'SPACE SHUTDOWN' TIME
1346 005552 105777 173224 TSTB AMTC ;SEE IF CUR
1347 005556 100375 BPL .-4 ;IF NOT: BR
1348 005560 012777 176340 173216 MOV #-800.,ABC ;1 INCH OF DATA
1349 005566 012777 011772 173212 MOV #WBUF,ACA
1350 005574 005037 006606 CLR TIME
1351 005600 013777 006374 173174 MOV FDRIVE,AMTC ;SELECT DRIVE
1352 005606 105777 173170 TSTB AMTC ;WAIT FOR CU READY
1353 005612 100375 BPL .-4
1354 005614 052777 040005 173160 BIS #40005,AMTC ;800 BPI, WRITE, GO
1355 005622 022777 011774 173156 CMP #WBUF+2,ACA ;IS 2ND BYTE OUTPUT
1356 005630 003374 BGT .-6 ;NO
1357 005632 005777 173146 T10G: TST ABC ;YES IS LAST BYTE OUT
1358 005636 001403 BEQ T10H ;YES
1359 005640 004737 006564 JSR X7,TIMER ;NO, COUNT TIME
1360 005644 000772 BR T10G
1361
1362 005646 013722 006606 T10H: MOV TIME,(2)+ ;SAVE 'ONE INCH DATA TIME'
1363 005652 004737 006474 JSR X7,STRREW ;REWIND
```



```
1364 005656 004737 006314 JSR X7,CHGDRV ;ANYMORE DRIVES?
1365 005662 000640 BR T10A ;YES
1366 005664 012720 177777 MOV #-1,(0)+ ;TERMINATE TIMES
1367 005670 012721 177777 MOV #-1,(1)+
1368 005674 012722 177777 MOV #-1,(2)+
1369 005700 012737 010673 010070 MOV #MSG16,MESAGE
1370 005706 012700 006610 MOV #TM1,X0
1371 005712 004737 007050 JSR X7,TYPTIM ;PRINT 'EOR TO EOF SPACE TIME'
1372 005716 012737 011676 010070 MOV #RMSG12,MESAGE
1373 005724 004737 007566 JSR X7,TOP
1374 005730 012737 010721 010070 MOV #MSG18,MESAGE
1375 005736 012700 006634 MOV #TM2,X0
1376 005742 004737 007050 JSR X7,TYPTIM ;PRINT 'SPACE SHUTDOWN' TIME
1377 005746 012737 011716 010070 MOV #RMSG13,MESAGE
1378 005754 004737 007566 JSR X7,TOP
1379 005760 012737 010747 010070 MOV #MSG20,MESAGE
1380 005766 012700 006660 MOV #TM3,X0
1381 005772 004737 007050 JSR X7,TYPTIM ;PRINT 'ONE INCH DATA TIME'
1382 005776 012737 011734 010070 MOV #RMSG14,MESAGE
1383 006004 004737 007566 JSR X7,TOP
1384 006010 105737 001002 TSTB ACT11M ;ACT MODE? ++ C.W
1385 006014 001404 BEQ 1$ ;BRANCH - IF NO ++ C.W
1386 006016 105237 001056 INCB UDES ;GET NEXT UNIT ++ C.W
1387 006022 000137 001400 JMP SACT ;CONTINUE TEST ++ C.W
1388 006026 000137 006200 1$: JMP T13 ;GO TO END OF TIMING
1389
1390 ;SPECIAL TAPE SPEED TEST USING 800 BPI SKEW TAPE
1391 ;READ FOWARD FROM BOT, MONITOR CA UNTIL IT EQUALS WBUF+2.
1392 ;TIME FROM WBUF+2 UNTIL BC=0 IS ONE INCH OF TAPE.
1393
1394 006032 000240 T11: NOP
1395 006034 012700 006610 MOV #TM1,X0
1396 006040 005037 006606 T11A: CLR TIME ;INITIALIZE TIME
1397 006044 013777 006374 172730 MOV FDRIVE,@MTC ;SELECT DRIVE
1398 006052 105777 172724 TSTB @MTC
1399 006056 100375 BPL -4 ;AWAIT CUR
1400 006060 012777 176340 172716 MOV #-800.,@BC ;800 BYTES =1 INCH OF DATA
1401 006066 012777 011772 172712 MOV #WBUF,@CA ;SET BUS ADDRESS
1402 006074 052777 040003 172700 BIS #40003,@MTC ;LOAD 800 BPI READ AND GO
1403 006102 022777 011774 172676 CMP #WBUF+2,@CA
1404 006110 003374 BGT -6 ;AWAIT 2ND BYTE
1405 006112 005777 172666 T11B: TST @BC ;SEE IF LAST BYTE
1406 006116 001403 BEQ T11C ;IF SO: BR
1407 006120 004737 006564 JSR X7,TIMER ;NO, COUNT TIME
1408 006124 000772 BR T11B
1409 006126 013720 006606 T11C: MOV TIME,(0)+ ;SAVE TAPE SPEED TIME
1410 006132 004737 006502 JSR X7,STRW ;REWIND
1411 006136 004737 006314 JSR X7,CHGDRV ;ANYMORE DRIVER?
1412 006142 000736 BR T11A ;YES
1413 006144 012720 177777 MOV #-1,(0)+ ;TERMINALS TIMER
1414 006150 012737 010775 010070 MOV #MSG21,MESAGE
1415 006156 012700 006610 MOV #TM1,X0 ;PRINT 'TAPE SPEED FWD'
1416 006162 004737 007050 JSR X7,TYPTIM
1417 006166 012737 011753 010070 MOV #RMSG15,MESAGE
1418 006174 004737 007566 JSR X7,TOP ;PRINT RANGE
1419 006200 012737 011023 010070 T13: MOV #MSG27,MESAGE
```

```
1420 006206 004737 007566      JSR      %7, TOP      ;PRINT 'END OF TIMING'
1421 006212 105737 001002      TSTB     ACT11M      ;ACT MODE? ++ C.W
1422 006216 001001              BNE      1$          ;BRANCH - IF YES ++ C.W
1423 006220 000000              HALT
1424 006222 013700 000042      1$:    MOV     @#42, R0      ;GET MONITOR'S ADDRESS ++ C.W
1425 006226 001405              BEQ      HERE          ;BRANCH - IF NOT AUTO MODE ++ C.W
1426 006230 000005              RESET      ;CLEAR THE WORLD ++ C.W
1427 006232 004710      $ENDAD: JSR      PC, (R0)      ;GO TO MONITOR'S ADDRESS ++ C.W
1428 006234 000240              NOP
1429 006236 000240              NOP
1430 006240 000240              NOP
1431 006242 000240      HERE:    NOP
1432 006244 000137 001310      JMP      STO          ;RESTART ++ C.W
1433
1434      ;RESET DRIVE SELECTION TO LOWEST NUMBER
1435
1436 006250 005037 006366      RSFDRV: CLR      CDRIVE      ;START WITH DRIVE 0
1437 006254 012737 100000 006370 MOV     #100000, CDRVBT ;INITIALIZE FOR 0
1438 006262 033737 006370 006372 RSF1:  BIT      CDRVBT, DRIVES ;MASK WITH SELCTED DRIVES
1439 006270 001006              BNE      RSF2
1440 006272 005237 006366      INC      CDRIVE      ;+1 TO DRIVE NUMBER
1441 006276 000241              CLC
1442 006300 006037 006370      ROR      CDRVBT      ;MOVE MASK BIT TO NEXT DRIVE
1443 006304 000766              BR       RSF1
1444 006306 004737 006376      RSF2:  JSR      %7, GTNINE ;CHECK 9 TRACK
1445 006312 000207              RTS      %7
1446
```

```
1447      ;SELECT NEXT DRIVE IN SEQUENCE
1448      ;SKIP FIRST EXIT ADDRESS IF LAST DRIVE SELECTED
1449
1450 006314 105777 172462      CHGDRV: TSTB      @MTC
1451 006320 100375              BPL      .-4          ;AWAIT CUR
1452 006322 005237 006366      INC      CDRIVE      ;+1 TO DRIVE
1453 006326 000241              CLC
1454 006330 006037 006370      ROR      CDRVBT      ;MOVE MASK BIT TO NEXT DRIVE
1455 006334 001005              BNE      CHG1
1456 006336 004737 006250      JSR      %7,RSFDRV      ;RESET TO LOWEST DRIVE
1457 006342 062716 000002      ADD      #2,(6)      ;+2 TO SKIP FIRST EXIT
1458 006346 000207              RTS      %7          ;EXIT
1459 006350 033737 006370 006372 CHG1: BIT      CDRVBT,DRIVES ;MASK WITH SELECTED DRIVES
1460 006356 001756              BEQ      CHGDRV      ;CHECK FOR NEXT DRIVE
1461 006360 004737 006376      JSR      %7,GTNINE      ;CHECK 9 TRACK
1462 006364 000207              RTS      %7
1463 006366 000000      CDRIVE: 0
1464 006370 000000      CDRVBT: 0
1465 006372 000000      DRIVES: 0
1466 006374 000000      FDRIVE: 0
1467
1468      ;CHECK FOR NINE TRACK DRIVES
1469
1470 006376 013737 006366 006374 GTNINE: MOV      CDRIVE,FDRIVE
1471 006404 000337 006374          SWAB      FDRIVE      ;POSITION UNIT SELECT BITS
1472 006410 042737 174377 006374          BIC      #174377,FDRIVE ;CLEAR ALL OTHER BITS
1473 006416 032737 000010 006366          BIT      #10,CDRIVE      ;TEST FOR 9 TRACK
1474 006424 001403              BEQ      GNT1          ;NO
1475 006426 052737 020000 006374          BIS      #20000,FDRIVE ;YES SET 9 TRACK BIT
1476 006434 000207      GNT1:  RTS      %7
1477
1478      ;INITIALIZE BYTE COUNT AND CURRENT ADDRESS FOR WRITE
1479
1480 006436 012777 172110 172340 WRINT:  MOV      #-BLENGTH,@BC
1481 006444 012777 011772 172334          MOV      #WBUF,@CA
1482 006452 000207              RTS      %7
1483
1484      ;STORE 1'S IN WRITE BUFFER
1485
1486 006454 012700 011772      ST1S:  MOV      #WBUF,%0
1487 006460 012720 177777      ST1SA: MOV      #-1,(0)+
1488 006464 022700 017664          CMP      #WBUF+BLENGTH+2,%0
1489 006470 001373              BNE      ST1SA
1490 006472 000207              RTS      %7
1491
1492      ;START REWIND OPERATIONS
1493
1494 006474 013777 006374 172300 STRREW: MOV      FDRIVE,@MTC      ;SELECT DRIVE
1495 006502 105777 172274      STRW:  TSTB      @MTC
1496 006506 100375              BPL      .-4          ;WAIT FOR CU READY
1497 006510 006077 172264      ROR      @MTC
1498 006514 103375              BCC      .-4          ;WAIT FOR TAPE UNIT READY
1499 006516 052777 000017 172256      BIS      #17,@MTC      ;GO REWIND
1500 006524 105777 172252      TSTB      @MTC
1501 006530 100375              BPL      .-4          ;WAIT FOR CONTROL UNIT READY
1502 006532 000207              RTS      %7
```

```
1503
1504           ;WAIT FOR REWIND TO FINISH
1505
1506 006534 013777 006374 172240 WATREW: MOV     FDRIVE,@MTC
1507 006542 006077 172232          ROR      @MTS
1508 006546 103375          BCC      .-4
1509 006550 032777 000040 172222          BIT     #40,@MTS      ;IS BOT SET?
1510 006556 001001          BNE      .+4      ;YES
1511 006560 000000          HALT
1512 006562 000207          RTS      %7      ;ERROR, NOT AT BOT AFTER REWIND
1513
1514           ;KEEP COUNT OF ELAPSED TIME
1515           ;EXIT EVERY 100 USEC
1516
1517 006564 005777 172222          TIMER:  TST      @MTRD
1518 006570 100375          BPL      .-4
1519 006572 005777 172214          TST      @MTRD
1520 006576 100775          BMI      .-4
1521 006600 005237 006606          INC      TIME      ;+1 TO 100 USEC COUNT
1522 006604 000207          RTS      %7
1523 006606 000000          TIME:  0
1524 006610 000000          TM1:    0
1525          006634          . = TM1+20.
1526 006634 000000          TM2:    0
1527          006660          . = TM2+20.
1528 006660 000000          TM3:    0
1529          006704          . = TM3+20.
1530 006704 000000          TM4:    0
1531          006730          . = TM4+20.
1532 006730 000000          TM5:    0
1533          006754          . = TM5+20.
1534 006754 000000          TM6:    0
1535          007000          . = TM6+20.
1536 007000 000000          TM7:    0
1537          007024          . = TM7+20.
1538 007024 000000          TM8:    0
1539          007050          . = TM8+20.
```

```
1540 ;PRINT TITLE OF TEST EXECUTED AND THE DRIVE TIMES
1541
1542 007050 004737 007566 TYPTIM: JSR X7, TOP ;PRINT TITLE
1543 007054 012037 007304 TYPT0: MOV (0)+, VALUE ;GET TIME
1544 007060 022737 177777 007304 CMP #-1, VALUE ;FINISHED TIME BUFFER
1545 007066 001001 BNE .+4
1546 007070 000207 RTS X7
1547 007072 012737 007316 007314 MOV #DECPNT+2, DECPNT ;INITIALIZE DECIMAL VALUE POINTER
1548 007100 012737 000040 007312 MOV #40, ZERO ;INITIALIZE SPACE
1549 007106 012737 177774 007306 MOV #-4, DIGCNT ;DIGIT COUNT
1550 007114 012737 177777 007310 TYPT1: MOV #-1, DIGIT ;INITIAL VALUE
1551 007122 005237 007310 TYPT2: INC DIGIT ;+1 TO VALUE
1552 007126 167737 000162 007304 SUB @DECPNT, VALUE ;SUBTRACT CONSTANT
1553 007134 100372 BPL TYPT2 ;NOT NEGATIVE YET
1554 007136 067737 000152 007304 ADD @DECPNT, VALUE ;RESTORE LAST POSITIVE VALUE
1555 007144 004737 007234 JSR X7, DECOUT ;PRINT DECIMAL DIGIT
1556 007150 005237 007306 INC DIGCNT ;+1 TO DIGIT COUNT
1557 007154 001006 BNE TYP2A
1558 007156 012737 010152 010070 MOV #MSG2B, MESSAGE
1559 007164 004737 007566 JSR X7, TOP
1560 007170 000731 BR TYPT0
1561 007172 022737 177777 007306 TYP2A: CMP #-1, DIGCNT ;CHECK FOR DECIMAL PLACE
1562 007200 001011 BNE TYPT3 ;NO
1563 007202 105777 171614 TSTB @TPS
1564 007206 100375 BPL .-4
1565 007210 012777 000056 171606 MOV #'., @TPB ;PRINT DECIMAL POINT
1566 007216 012737 000060 007312 MOV #60, ZERO
1567 007224 062737 000002 007314 TYPT3: ADD #2, DECPNT ;+2 TO DECIMAL VALUE POINTER
1568 007232 000730 BR TYPT1 ;DO AGAIN
1569
1570 007234 005737 007310 DECOUT: TST DIGIT ;IS DIGIT 0
1571 007240 001004 BNE DEC1 ;NO
1572 007242 013737 007312 007310 MOV ZERO, DIGIT ;SUPPRESS LEADING ZEROS
1573 007250 000406 BR DEC2
1574 007252 012737 000060 007312 DEC1: MOV #60, ZERO ;INITIALIZE ZERO AFTER SOME VALUE FOUND
1575 007260 052737 000060 007310 BIS #60, DIGIT ;CONVERT TO ANSCII
1576 007266 105777 171530 DEC2: TSTB @TPS
1577 007272 100375 BPL .-4
1578 007274 013777 007310 171522 MOV DIGIT, @TPB ;PRINT
1579 007302 000207 RTS X7
1580 007304 000000 VALUE: 0
1581 007306 000000 DIGCNT: 0
1582 007310 000000 DIGIT: 0
1583 007312 000040 ZERO: 40 ;CONTAINS ZERO OR SPACE
1584 007314 007316 DECPNT: .+2
1585 007316 001750 1000.
1586 007320 000144 100.
1587 007322 000012 10.
1588 007324 000001 1.
```

```
1589
1590
1591
1592
1593
1594
1595
1596
1597
1598
1599
1600
1601
1602
1603
1604
1605
1606 007326 005037 001052      TTR:  CLR      TEMP1      ;CLEAR FIRST CHARACTER FLAG
1607 007332 005000              CLR      %0
1608 007334 004737 007514      TTR0:  JSR      %7,T1IN      ;GO READ CHARACTER
1609 007340 122737 000215 001050  CMPB    #215,T1B      ;SEE IF CR
1610 007346 001005              BNE      TTR1      ;IF NOT: BR
1611 007350 005737 001052              TST      TEMP1      ;SEE IF FIRST CHARACTER
1612 007354 001446              BEQ      TTR5      ;IF SO: BR
1613 007356 000137 007450              JMP      TTR2      ;ELSE GO LOAD VALUE
1614 007362 122737 000260 001050  TTR1:  CMPB    #260,T1B      ;SEE IF CHAR IS LESS THAN 0
1615 007370 101402              BLOS     TTR1A      ;IF NOT: BR
1616 007372 000137 007474              JMP      T1NER      ;ELSE GO TO ERROR
1617 007376 122737 000270 001050  TTR1A: CMPB    #270,T1B      ;SEE IF CHAR IS GREATER THEN 7
1618 007404 101002              BHI      TTR1B      ;IF NOT: BR
1619 007406 000137 007474              JMP      T1NER      ;ELSE GO TO ERROR
1620 007412 005237 001052      TTR1B:  INC      TEMP1      ;SET FIRST CHARACTER FLAG
1621 007416 000241              CLC
1622 007420 006100              ROL      %0
1623 007422 000241              CLC
1624 007424 006100              ROL      %0      ;SHIFT 3 LEFT
1625 007426 000241              CLC
1626 007430 006100              ROL      %0
1627 007432 042737 177770 001050  BIC      #177770,T1B      ;STRIP ASCII
1628 007440 053700 001050      BIS      T1B,%0      ;LOAD CHARACTER
1629 007444 005301              DEC      %1      ;SEE IF DONE
1630 007446 001332              BNE      TTR0      ;IF NOT: BR
1631 007450 020002      TTR2:  CMP      %0,%2      ;SEE IF EXCEEDED MAXIMUM LIMIT
1632 007452 101402              BLOS     TTR3      ;IF NOT: BR
1633 007454 000137 007474              JMP      T1NER      ;ELSE GO TO ERROR
1634 007460 020300      TTR3:  CMP      %3,%0      ;SEE IF BELOW MINIMUM LIMIT
1635 007462 101402              BLOS     TTR4      ;IF NOT: BR
1636 007464 000137 007474              JMP      T1NER      ;ELSE GO TO ERROR
1637 007470 010015      TTR4:  MOV      %0,(5)      ;LOAD VALUE
1638 007472 000207      TTR5:  RTS      %7      ;EXIT
```



```

1639
1640 ;TTY ENTRY ERROR SUBROUTINE*****
1641
1642 007474 012737 011422 010070 T1NER: MOV #MSG34,MESAGE
1643 007502 004737 007566 JSR %7, TOP ;PRINT?
1644 007506 162716 000020 SUB #20,(6) ;RESET SP TO START OF VALUE ROUTINE
1645 007512 000207 RTS %7 ;READO VALUE ENTRY
1646
1647 ;TTY READ SUBROUTINE*****
1648
1649 007514 005077 171276 TTIN: CLR @TKS
1650 007520 005077 171274 CLR @TKB
1651 007524 005037 001050 CLR TIB
1652 007530 005277 171262 INC @TKS
1653 007534 105777 171256 TTIN1: TSTB @TKS
1654 007540 100375 BPL TTIN1
1655 007542 017737 171252 001050 MOV @TKB,TIB
1656 007550 105777 171246 TTIN2: TSTB @TPS
1657 007554 100375 BPL TTIN2
1658 007556 113777 001050 171240 MOVB TIB,@TPB
1659 007564 000207 RTS %7
1660
1661 ;TELETYPE OUTPUT PACKAGE
1662
1663 007566 142777 000177 171226 TOP: BICB #177,@TPS ;CLEAR FLAGS
1664 007574 117737 000270 007704 MOVB @MESSAGE,EOMK ;SAVE MESSAGE DELIMETER
1665 007602 005237 010070 INC MESSAGE ;+2 TO POINTER
1666 007606 127737 000256 007704 TOP1: CMPB @MESSAGE,EOMK ;IS CHARACTER THE 2ND DELIMETER
1667 007614 001001 BNE .+4 ;NO
1668 007616 000207 RTS %7 ;YES END
1669 007620 127727 000244 000100 CMPB @MESSAGE,#'a ;IS CHARACTER AN a INDICATING A CARRIAGE RETURN
1670 007626 001411 BEQ TOP3 ;YES
1671 007630 105777 171166 TSTB @TPS
1672 007634 100375 BPL .-4
1673 007636 117777 000226 171160 MOVB @MESSAGE,@TPB ;PRINT CHARACTER
1674 007644 005237 010070 TOP2: INC MESSAGE ;+2 TO POINTER
1675 007650 000756 BR TOP1 ;LOOP
1676
1677 ;CARRIAGE RETURN, LINE FEED
1678
1679 007652 105777 171144 TOP3: TSTB @TPS
1680 007656 100375 BPL .-4
1681 007660 112777 000215 171136 MOVB #215,@TPB
1682 007666 105777 171130 TSTB @TPS
1683 007672 100375 BPL .-4
1684 007674 112777 000212 171122 MOVB #212,@TPB
1685 007702 000760 BR TOP2
1686 007704 000000 EOMK: 0
1687

```

```
1688
1689      : *****
1690      :                               MODIFIED JAN 23 1978
1691      :
1692      : ++
1693      :                               CHECK FOR DUMP MODE OR AUTOMATIC/ACT11-XXDP MODE
1694      : --
1695
1696 007706 005037 001000      CKMODE: CLR      AUTOM      ;INIT AUTOMATIC MODE INDICATOR
1697 007712 105037 001002      CLR      ACT11M     ;INIT ACT11 AUTO MODE INDICATOR
1698 007716 105037 001003      CLR      XXDPM      ;INIT XXDP AUTO MODE INDICATOR
1699 007722 105037 001004      CLR      ADUMPM     ;INIT ACT11 DUMP MODE INDICATOR
1700 007726 105037 001005      CLR      XDUMPM     ;INIT XXDP DUMP MODE INDICATOR
1701 007732 005737 000042      TST      @#42      ;AUTO MODE?
1702 007736 001424      BEQ      2$              ;BRANCH - IF NO
1703 007740 005237 001000      INC      AUTOM      ;SET AUTO MODE INDICATOR
1704 007744 032737 020000 000052      BIT      #20000,@#52 ;MANUAL INTERVENTION?
1705 007752 001402      BEQ      6$              ;BRANCH - IF NO
1706 007754 000137 010032      JMP      ABORT      ;ABORT THE PROGRAM
1707 007760 023737 000042 000046 6$:      CMP      @#42,@#46 ;ACT11 MODE?
1708 007766 001403      BEQ      1$              ;BRANCH - IF YES
1709 007770 105237 001003      INCB     XXDPM      ;INDICATE XXDP AUTO MODE
1710 007774 000415      BR      5$              ;AND EXIT
1711 007776 105237 001002      1$:      INCB     ACT11M ;INDICATE ACT11 AUTO MODE
1712 010002 005037 001054      CLR      SPTF      ;DO NOT SELECT SPEED TEST
1713 010006 000410      BR      5$              ;AND EXIT
1714 010010 105737 000041      2$:      TSTB     @#41 ;MAN/MODE VIA ACT11/PAPER TAPE?
1715 010014 001003      BNE      3$              ;BRANCH - IF NOT
1716 010016 105237 001004      INCB     ADUMPM     ;INDICATE MAN/MODE VIA ACT11/PAPER TAPE
1717 010022 000402      BR      5$              ;AND EXIT
1718 010024 105237 001005      3$:      INCB     XDUMPM ;INDICATE MANUAL MODE VIA XXDP
1719 010030 000207      5$:      RTS      PC      ;RETURN
1720
1721      : *****
1722
```



```
1723
1724      : *****
1725      :                                     MODIFIED JAN 23 1978
1726      :
1727      : ++
1728      :                                     CHECK FOR DUMP MODE OR AUTOMATIC/ACT11-XXDP MODE
1729      : --
1730
1731 010032 000005      ABORT: RESET      ;CLEAR THE WORLD
1732 010034 012737 010072 010070      MOV      #MSG0,MESAGE      ;GET ABORT MESSAGE
1733 010042 004737 007566      JSR      %7, TOP      ;PRINT ABORT MESSAGE
1734 010046 105737 001003      TSTB     XXDPM      ;XXDP AUTO MODE?
1735 010052 001405      BEQ      1$      ;BRANCH - IF NO
1736 010054 013700 000042      MOV      @#42,R0      ;GET MONITOR EXIT ADDRESS
1737 010060 005037 000042      CLR      @#42      ;USE AS ABORT FLAG
1738 010064 004700      JSR      PC,R0      ;EXIT TO XXDP MONITOR
1739 010066 000777      1$:      BR      .      ;AND HANG
1740
1741      : *****
1742
```

CZTSEBO TS03 DR FCTN TMR MACY11 30A(1052) 16-FEB-78 11:10 F 4 PAGE 45
CZTSEB.P11 16-FEB-78 11:08

SEQ 0044

1743

```

1744 010070 000000 MESSAGE: 0
1745
1746 010072 040057 051120 043517 MSG0: .ASCII ;/aPROGRAM ABORTED /;
1747 010100 040522 020115 041101
1748 010106 051117 042524 004504
1749 010114 057
1750 010115 057 040100 052506 MSG2: .ASCII ;/aFUNCTION /;
1751 010122 041516 044524 047117
1752 010130 020040 020040 020040
1753 010136 020040 027440
1754 010142 020057 047125 052111 MSG2A: .ASCII ;/ UNIT /;
1755 010150 027440
1756 010152 020057 027440 MSG2B: .ASCII ;/ /;
1757 010156 040057 051127 052111 MSG3: .ASCII ;/aWRITE FROM BOT /;
1758 010164 020105 051106 046517
1759 010172 041040 052117 020040
1760 010200 020040 027440
1761 010204 040057 051127 052111 MSG4: .ASCII ;/aWRITE SHUTDOWN /;
1762 010212 020105 044123 052125
1763 010220 047504 047127 020040
1764 010226 020040 027440
1765 010232 040057 051127 052111 MSG5: .ASCII ;/aWRITE START /;
1766 010240 020105 052123 051101
1767 010246 020124 020040 020040
1768 010254 020040 027440
1769 010260 040057 042523 052124 MSG6: .ASCII ;/aSETTLE DOWN DELAY /;
1770 010266 042514 042040 053517
1771 010274 020116 042504 040514
1772 010302 020131 027440
1773 010306 040057 051127 052111 MSG7: .ASCII ;/aWRITE TO ERASE HEAD/;
1774 010314 020105 047524 042440
1775 010322 040522 042523 044040
1776 010330 040505 027504
1777 010334 040057 051127 052111 MSG8: .ASCII ;/aWRITE NONSTOP GAP /;
1778 010342 020105 047516 051516
1779 010350 047524 020120 040507
1780 010356 020120 027440
1781 010362 040057 040502 045503 MSG9: .ASCII ;/aBACKSPACE SHUTDOWN /;
1782 010370 050123 041501 020105
1783 010376 044123 052125 047504
1784 010404 047127 027440
1785 010410 040057 042522 042101 MSG10: .ASCII ;/aREAD SHUTDOWN /;
1786 010416 051440 052510 042124
1787 010424 053517 020116 020040
1788 010432 020040 027440
1789 010436 040057 043500 050101 MSG11: .ASCII ;/aGAPS SHOULD = 8>7>6>5>4>3, 3=2=1 (+OR- 5.0)/;
1790 010444 020123 044123 052517
1791 010452 042114 036440 034040
1792 010460 033476 033076 032476
1793 010466 032076 031476 020054
1794 010474 036463 036462 020061
1795 010502 025450 051117 020055
1796 010510 027065 024460 057
1797 010515 057 043500 050101 MSG11A: .ASCII ;/aGAP 1 /;
1798 010522 030440 020040 020040
1799 010530 020040 020040 020040
  
```

1800	010536	020040	020040	057	
1801	010543	057	053500	044522	MSG12: .ASCII ;/aWRITE XIRG /;
1802	010550	042524	054040	051111	
1803	010556	020107	020040	020040	
1804	010564	020040	020040	057	
1805	010571	057	051100	040505	MSG13: .ASCII ;/aREAD FROM BOT /;
1806	010576	020104	051106	046517	
1807	010604	041040	052117	020040	
1808	010612	020040	020040	057	
1809	010617	057	046100	051501	MSG14: .ASCII ;/aLAST CHAR TO CU RDY/;
1810	010624	020124	044103	051101	
1811	010632	052040	020117	052503	
1812	010640	051040	054504	057	
1813	010645	057	053500	044522	MSG15: .ASCII ;/aWRITE EOF /;
1814	010652	042524	042440	043117	
1815	010660	020040	020040	020040	
1816	010666	020040	020040	057	
1817	010673	057	042500	051117	MSG16: .ASCII ;/aEOR TO EOF SPACE /;
1818	010700	052040	020117	047505	
1819	010706	020106	050123	041501	
1820	010714	020105	020040	057	
1821	010721	057	051500	040520	MSG18: .ASCII ;/aSPACE SHUTDOWN /;
1822	010726	042503	051440	052510	
1823	010734	042124	053517	020116	
1824	010742	020040	020040	057	
1825	010747	057	047500	042516	MSG20: .ASCII ;/aONE INCH DATA TIME /;
1826	010754	044440	041516	020110	
1827	010762	040504	040524	052040	
1828	010770	046511	020105	057	
1829	010775	057	052100	050101	MSG21: .ASCII ;/aTAPE SPEED FWD /;
1830	011002	020105	050123	042505	
1831	011010	020104	053506	020104	
1832	011016	020040	020040	057	
1833	011023	057	025100	025052	MSG27: .ASCII ;/a*****END OF TIMING*****a/;
1834	011030	025052	025052	025052	
1835	011036	025052	047105	020104	
1836	011044	043117	052040	046511	
1837	011052	047111	025107	025052	
1838	011060	025052	025052	025052	
1839	011066	025052	027500		
1840	011072	040057	041500	052132	MSG28: .ASCII ;/aaCZTSEBO TS03 DR FCTN TMR/;
1841	011100	042523	030102	052040	
1842	011106	030123	020063	051104	
1843	011114	043040	052103	020116	
1844	011122	046524	027522		
1845	011126	020057	020040	040522	MSG29: .ASCII ;/ RANGE MAX - MINa /;
1846	011134	043516	020105	040515	
1847	011142	020130	020055	044515	
1848	011150	040116	027440		
1849	011154	040057	047516	052440	MSG30: .ASCII ;/aNO UNITS AVAILABLE FOR TEST aPRESS CONTINUE WHEN READYa/;
1850	011162	044516	051524	040440	
1851	011170	040526	046111	041101	
1852	011176	042514	043040	051117	
1853	011204	052040	051505	020124	
1854	011212	050100	042522	051523	
1855	011220	041440	047117	044524	

1856	011226	052516	020105	044127	
1857	011234	047105	051040	040505	
1858	011242	054504	027500		
1859	011246	040057	042522	044507	MSG31: .ASCII ;/@REGISTER START: /;
1860	011254	052123	051105	051440	
1861	011262	040524	052122	020072	
1862	011270	057			
1863	011271	057	051500	042520	MSG32: .ASCII ;/@SPEED TEST (1=YES-0=NO): /;
1864	011276	042105	052040	051505	
1865	011304	020124	030450	054475	
1866	011312	051505	030055	047075	
1867	011320	024517	020072	057	
1868	011325	057	046500	052517	MSG33: .ASCII ;/@MOUNT SKEW TAPE ON ALL AVAILABLE UNITS: TYPE CR WHEN READY/;
1869	011332	052116	051440	042513	
1870	011340	020127	040524	042520	
1871	011346	047440	020116	046101	
1872	011354	020114	053101	044501	
1873	011362	040514	046102	020105	
1874	011370	047125	052111	035123	
1875	011376	052040	050131	020105	
1876	011404	051103	053440	042510	
1877	011412	020116	042522	042101	
1878	011420	027531			
1879	011422	020057	020077	057	MSG34: .ASCII ;/ ? /;
1880					
1881	011427	057	033040	030462	RMSG1: .ASCII ;/ 621.0 - 509.0/;
1882	011434	030056	026440	032440	
1883	011442	034460	030056	057	
1884	011447	057	020040	033461	RMSG2: .ASCII ;/ 17.6 - 13.6/;
1885	011454	033056	026440	030440	
1886	011462	027063	027466		
1887	011466	020057	031440	027071	RMSG3: .ASCII ;/ 39.0 - 32.0/;
1888	011474	020060	020055	031063	
1889	011502	030056	057		
1890	011505	057	020040	033063	RMSG4: .ASCII ;/ 36.0 - 30.0/;
1891	011512	030056	026440	031440	
1892	011520	027060	027460		
1893	011524	020057	033440	027066	RMSG5: .ASCII ;/ 76.0 - 58.0/;
1894	011532	020060	020055	034065	
1895	011540	030056	057		
1896	011543	057	020040	033440	RMSG6: .ASCII ;/ 7.7 - 6.3/;
1897	011550	033456	026440	033040	
1898	011556	031456	057		
1899	011561	057	020040	033440	RMSG7: .ASCII ;/ 7.7 - 6.3/;
1900	011566	033456	026440	033040	
1901	011574	031456	057		
1902	011577	057	020040	034463	RMSG8: .ASCII ;/ 39.0 - 32.0/;
1903	011604	030056	026440	031440	
1904	011612	027062	027460		
1905	011616	020057	033063	027066	RMSG9: .ASCII ;/ 366.0 - 300.0/;
1906	011624	020060	020055	030063	
1907	011632	027060	027460		
1908	011636	020057	032462	027070	RMSG10: .ASCII ;/ 258.0 - 212.0/;
1909	011644	020060	020055	030462	
1910	011652	027062	027460		
1911	011656	020057	031064	027060	RMSG11: .ASCII ;/ 420.0 - 340.0/;

1912	011664	020060	020055	032063	
1913	011672	027060	027460		
1914	011676	020057	030064	027060	RMSG12: .ASCII ;/ 400.0 - 320.0/;
1915	011704	020060	020055	031063	
1916	011712	027060	027460		
1917	011716	020057	020040	027067	RMSG13: .ASCII ;/ 7.7 - 6.3/;
1918	011724	020067	020055	027066	
1919	011732	027463			
1920	011734	020057	034040	027071	RMSG14: .ASCII ;/ 89.0 - 73.0/;
1921	011742	020060	020055	031467	
1922	011750	030056	057		
1923	011753	057	020040	034470	RMSG15: .ASCII ;/ 89.0 - 73.0/;
1924	011760	030056	026440	033440	
1925	011766	027063	027460		
1926					
1927					
1928	011772	000000			WBUF: .EVEN
1929		000001			0
					.END

[illegible]

MSG29	011126	800	1845#												
MSG3	010156	830	1757#												
MSG30	011154	771	1849#												
MSG31	011246	711	1859#												
MSG32	011271	725	1863#												
MSG33	011325	735	1868#												
MSG34	011422	1642	1879#												
MSG4	010204	835	1761#												
MSG5	010232	868	1212	1765#											
MSG6	010260	873	1769#												
MSG7	010306	917	1773#												
MSG8	010334	1777#													
MSG9	010362	1000	1781#												
MTC	001002	680#	743*	744*	748*	758*	759*	810*	811*	846*	847*	892*	893*	894	
		904*	905*	912	940*	941*	942	948*	955	963*	964*	965	968*	969*	
		984*	985*	1019*	1020*	1021	1025*	1026	1029*	1030	1040*	1041*	1042	1045*	
		1046	1049*	1050*	1051	1054*	1055*	1056	1066*	1067	1070*	1071*	1072	1075*	
		1076*	1077	1109*	1110*	1112	1116*	1173*	1174	1178*	1181*	1182*	1187*	1188*	
		1198*	1199*	1231*	1232*	1238	1257*	1258*	1261	1283*	1284*	1285	1289*	1290*	
		1291	1319*	1320	1323*	1324*	1329	1346	1351*	1352	1354*	1397*	1398	1402*	
		1450	1494*	1495	1499*	1500	1506*								
MTD	001010	683#													
MTRD	001012	684#	1517	1519											
MTS	001000	679#	719	745	749	760	821	857	859*	957*	971	975	979*	986	
		988	992*	1093*	1126*	1176*	1179	1184*	1193*	1204*	1242*	1265*	1287*	1327	
		1333	1341	1497*	1507*	1509									
MTV	001026	690#													
MULBAK	003552	1069#	1080												
MULWRT	003534	1065#	1084	1088	1092										
MUL1	003654	1082	1085#												
MUL2	003672	1086	1089#												
MUL3	003710	1090	1093#												
REGS	001030	691#	713	718											
RMSG1	011427	833	1881#												
RMSG10	011636	1248	1908#												
RMSG11	011656	1303	1911#												
RMSG12	011676	1372	1914#												
RMSG13	011716	1377	1917#												
RMSG14	011734	1382	1920#												
RMSG15	011753	1417	1923#												
RMSG2	011447	838	1884#												
RMSG3	011466	871	1887#												

CZTSEBO TS03 DR FCTN TMR
CZTSEB.P11 16-FEB-78 11:08

MACY11 30A(1052) 16-FEB-78 11:10 PAGE 53
CROSS REFERENCE TABLE -- USER SYMBOLS

SEQ 0051

SR	001014	685#												
STACK =	001000	620#	704											
START	001062	677	704#											
STRREW	006474	777	884	922	1011	1095	1128	1207	1268	1296	1363	1494#		
STRS	001172	721#	724											
STRW	006502	1410	1495#											
STO	001310	708	734	742#	774	1432								
STOA	001346	746	748#											
STOB	001460	750	761	763#										
STOC	001530	764	775#											
ST1	001536	777#	779											
ST1S	006454	799	934	1010	1166	1250	1486#							
ST1SA	006460	1487#	1489											
ST2	001550	780#	782											
ST3	001574	788#	798											
TEMPO	001060	703#	756*	757*	759	762								
TEMP1	001052	700#	737	1606*	1611	1620*								
TIB	001050	699#	1609	1614	1617	1627*	1628	1651*	1655*	1658				
TIME	006606	812*	817	818*	825	848*	853	854*	863	906*	911	938*	953	954*
		981	983*	994	1115*	1121	1186*	1195	1196*	1206	1229*	1237	1256*	1267
		1280*	1295	1316*	1335*	1336	1337*	1345	1350*	1362	1396*	1409	1521*	1523#
TIMER	006564	815	823	851	861	909	951	977	990	1119	1191	1202	1235	1263
		1293	1331	1343	1359	1407	1517#							
TINER	007474	1616	1619	1633	1636	1642#								
TKB	001020	687#	1650*	1655										
TKS	001016	686#	1649*	1652*	1653									
TM1	006610	807	831	843	869	901	918	935	1107	1136	1170	1213	1228	1246
		1254	1279	1301	1313	1370	1395	1415	1524#	1525				
TM2	006634	808	836	844	874	936	1001	1140	1171	1218	1314	1375	1526#	1527
TM3	006660	937	1006	1144	1315	1380	1528#	1529						
TM4	006704	1148	1530#	1531										
TM5	006730	1152	1532#	1533										
TM6	006754	1156	1534#	1535										
TM7	007000	1160	1536#	1537										
TM8	007024	1164	1538#	1539										
TOP	007566	710	712	726	736	772	787	789	801	834	839	872	877	921
		1004	1009	1134	1216	1221	1249	1304	1373	1378	1383	1418	1420	1542
		1559	1643	1663#	1733									
TOP1	007606	1666#	1675											
TOP2	007644	1674#	1685											
TOP3	007652	1670	1679#											
TPB	001024	689#	796*	1565*	1578*	1658*	1673*	1681*	1684*					
TPS	001022	688#	794	1563	1576	1656	1663*	1671	1679	1682				
TTIN	007514	1608	1649#											
TTIN1	007534	1653#	1654											
TTIN2	007550	1656#	1657											
TTR	007326	717	732	741	1606#									
TTR0	007334	1608#	1630											
TTR1	007362	1610	1614#											
TTR1A	007376	1615	1617#											
TTR1B	007412	1618	1620#											
TTR2	007450	1613	1631#											
TTR3	007460	1632	1634#											
TTR4	007470	1635	1637#											
TTR5	007472	1612	1638#											
TYPTIM	007050	832	837	870	875	919	1002	1007	1137	1141	1145	1149	1153	1157

		1161	1165	1214	1219	1247	1302	1371	1376	1381	1416	1542#
TYPT0	007054	1543#	1560									
TYPT1	007114	1550#	1568									
TYPT2	007122	1551#	1553									
TYPT3	007224	1562	1567#									
TYP2A	007172	1557	1561#									
T1	001706	803	807#									
T1A	001716	809#	827									
T1B	001742	813#	816									
T1C	001760	814	817#									
T1D	001776	821#	824									
T1E	002014	822	825#									
T10	005350	1313#										
T10A	005364	1316#	1365									
T10B	005442	1325#	1326									
T10C	005452	1327#	1332									
T10CC	005476	1330	1333#									
T10D	005512	1328	1334	1336#								
T10E	005530	1341#	1344									
T10F	005546	1342	1345#									
T10G	005632	1357#	1360									
T10H	005646	1358	1362#									
T11	006032	804	1394#									
T11A	006040	1396#	1412									
T11B	006112	1405#	1408									
T11C	006126	1406	1409#									
T11T	001046	698#										
T13	006200	755	1388	1419#								
T2	002116	842#										
T2A	002132	845#	865									
T2B	002156	849#	852									
T2C	002174	850	853#									
T2D	002222	859#	862									
T2E	002236	860	863#									
T3	002340	884#	886									
T3A	002352	887#	889									
T3B	002364	890#	897									
T3D	002434	902#	915									
T3E	002470	907#	910									
T3F	002504	908	911#									
T3G	002560	922#	924									
T3H	002572	925#	927									
T4	002604	934#										
T4A	002666	949#	952									
T4AA	002624	938#	996									
T4B	002704	950	953#									
T4BA	003002	971#	972									
T4C	003016	975#	978									
T4D	003034	976	979#									
T4DA	003072	986#	987									
T4E	003102	988#	991									
T4F	003120	989	992#									
T4FA	003240	1011#	1013									
T4FB	003252	1014#	1016									
T4FC	003266	1018#	1033									
T4G	003362	1039#	1097									

CZTSEBO TS03 DR FCTN TMR
CZTSEB.P11 16-FEB-78 11:08

MACY11 30A(1052) 16-FEB-78 11:10 PAGE 55
CROSS REFERENCE TABLE -- USER SYMBOLS

SEQ 0053

T5	003734	1105#	1131															
T5A	003776	1112#	1125															
T5B	004020	1117#	1120															
T5C	004036	1118	1121#															
T5DRV	001044	697#	1103*	1108	1129*													
T6	004346	1170#																
T6A	004356	1172#	1209															
T6B	004470	1189#	1192															
T6C	004506	1190	1193#															
T6D	004544	1200#	1203															
T6E	004562	1201	1204#															
T6F	004676	1222#	1224															
T7	004710	1228#																
T7A	004714	1229#	1241															
T7B	004740	1233#	1236															
T7C	004756	1234	1237#															
T8	005044	1254#																
T8A	005050	1255#	1270															
T8B	005102	1261#	1264															
T8C	005116	1262	1265#															
T8D	005146	1272#	1274															
T9	005160	1279#																
T9A	005164	1280#	1298															
T9B	005250	1291#	1294															
T9C	005264	1292	1295#															
T9D	005336	1305#	1307															
UDES	001056	702#	752*	753	756	767	769*	1386*										
VALUE	007304	1543*	1544	1552*	1554*	1580#												
WATREW	006534	780	887	925	1014	1105	1222	1272	1305	1506#								
WBUF	011772	813	849	891	903	949	1117	1189	1200	1233	1282	1318	1349	1355				
		1401	1403	1481	1486	1488	1928#											
WRINT	006436	809	845	939	947	962	982	1018	1024	1028	1039	1044	1053	1065				
		1074	1106	1114	1172	1183	1197	1230	1255	1480#								
XDUMPM	001005	671#	1700*	1718*														
XXDPM	001003	669#	1698*	1709*	1734													
ZERO	007312	1548*	1566*	1572	1574*	1583#												
\$ACT	001400	753#	770	1387														
\$ENDAD	006232	649	1427#															
\$SVPC =	001000	634#	655															
.	= 011774	623#	625	634	636#	640#	644#	648#	651#	655#	676#	678#	795	820				
		856	858	895	913	943	956	958	966	980	993	1022	1027	1031				
		1043	1047	1052	1057	1068	1073	1078	1094	1113	1127	1175	1177	1180				
		1185	1194	1205	1239	1243	1260	1266	1286	1288	1321	1347	1353	1356				
		1399	1404	1451	1496	1498	1501	1508	1510	1518	1520	1525#	1527#	1529#				
		1531#	1533#	1535#	1537#	1539#	1545	1564	1577	1584	1667	1672	1680	1683				
		1739																

. ABS. 011774 000

ERRORS DETECTED: 0

CZTSEB,CZTSEB.SEQ/CRF/SOL/NL:TOC=SYSMAC.SML 400,1066 ,CZTSEB.P11 400,1424
RUN-TIME: 9 11 .6 SECONDS
RUN-TIME RATIO: 494/21=22.8

CZTSEBO TS03 DR FCTN TMR
CZTSEB.P11 16-FEB-78 11:08

MACY11 30A(1052) 16-FEB-78 11:10 PAGE 56
CROSS REFERENCE TABLE -- USER SYMBOLS

SEQ 0054

CORE USED: 31K (61 PAGES)

DOCUMENT PAGES: 54