

TM11

DRIVE FUNCTION TIMER
MD-11-DZTMD-E

EP-DZTMD-E-DL
COPYRIGHT 72-76
FICHE 1 OF 1

APR 1978
digital
MADE IN USA

The microfiche strip contains 14 frames of technical data. Each frame is a small blue card with white text and tables. The data includes:

- Technical specifications and parameters.
- Timing diagrams showing waveforms for various signals.
- Tables of values for different operating conditions.
- Reference to other parts of the manual.

The text is too small to transcribe accurately but appears to be organized into sections and tables.

30

.REPT 0

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48

IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DZTMD-E-D
PRODUCT NAME: TM11 DRIVE FUNCTION TIMER
PROGRAM DATE: MARCH 1976
MAINTAINER: DIAGNOSTIC ENGINEERING
AUTHOR: JOHN RODENWISER/JIM LACEY/B. BURGESS/RON PLATUKIS

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 DOCUMENT

THE SOFTWARE DESCRIBED IN THIS DOCUMENT IS FURNISHED UNDER A LICENSE AND MAY ONLY BE USED OR COPIED IN ACCORDANCE WITH THE TERMS OF SUCH LICENSE.

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

COPYRIGHT (C) 1972; 1976 BY DIGITAL EQUIPMENT CORPORATION

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
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104

1. ABSTRACT

THE TM11 DRIVE FUNCTION TIMER ASSISTS IN THE TESTING OF THE TM11 CONTROL UNIT AND TU10 TAPE UNIT. SELECTED OPERATIONS ARE EXECUTED, TIMED, AND THE TIMES ARE THEN PRINTED (IN MILLISECONDS). THERE IS NO LIMIT OR ERROR TESTING FACILITIES IN THE PROGRAM, THE DECISION ON THE VALIDITY OF TIMES MEASURED MUST BE MADE BY THE OPERATOR. ANY CONFIGURATION OF UP TO 8 TU10 TAPE UNITS (7 AND 9 CHANNEL) MAY BE SELECTED.

2. REQUIREMENTS

2.1 EQUIPMENT

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

2.2 STORAGE

2.2.1 PROGRAM STORAGE

THE PROGRAM REQUIRES 4K OF MEMORY.

3. LOADING PROCEDURE

3.1 METHOD

PROCEDURE FOR NORMAL BINARY TAPES SHOULD BE FOLLOWED

1. ABSOLUTE LOADER MUST BE IN MEMORY.
2. PLACE BINARY TAPE IN READER.
3. LOAD ADDRESS 07500 (0 DETERMINED BY LOCATION OF LOADER).
4. PRESS "START" (PROGRAM WILL LOAD).

4. STARTING PROCEDURE

4.1 BEFORE STARTING PROGRAM SET LOC. 176 WITH THE DESIRED CONTROL SETTINGS.

BITS 15-0 ARE USED TO INDICATE THE TU10 TAPE UNIT CONFIGURATION.

15#1	HAVE UNIT #	SELECTED,	7 TRACK
14#1	" 1	"	"
13#1	" 2	"	"
12#1	" 3	"	"
11#1	" 4	"	"
10#1	" 5	"	"
9#1	" 6	"	"
8#1	" 7	"	"
7#1	HAVE UNIT #	SELECTED,	9 TRACK
6#1	" 1	"	"
5#1	" 2	"	"
4#1	" 3	"	"

B1

105	3=1	"	4	"	"
106	2=1	"	5	"	"
107	1=1	"	6	"	"
108	0=1	"	7	"	"

109
110
111 4.2 STARTING ADDRESS
112
113 200
114
115 4.3 PROGRAM AND/OR OPERATOR ACTION
116
117 LOAD PROGRAM INTO MEMORY,
118 SET DESIRED TUIO TAPE UNITS ON-LINE,
119 LOAD LOC. 176 WITH CONTROL SETTINGS (SEE 4.1)
120 LOAD STARTING ADDRESS
121 PRESS START,
122 THE PROGRAM WILL BEGIN TIMING FUNCTIONS,
123 ON COMPLETION OF ALL TESTS "END OF TIMING" WILL BE PRINTED AND
124 THE PROCESSOR WILL HALT,
125 TO REPEAT TESTS IF SAME CONTROL SETTINGS ARE DESIRED SIMPLY PRESS CONTINUE,
126 IF DIFFERENT SETTINGS ARE NECESSARY RELOAD LOC. 176 AND LOAD ADDRESS 200-START,
127
128 5. OPERATING PROCEDURE
129
130 5.1 OPERATIONAL SWITCH SETTINGS
131
132 NONE
133
134 6. ERRORS
135
136 THE PROGRAM HAS NO INTERNAL ERROR DETECTION FACILITIES AND,
137 THEREFORE, NO ACTUAL ERROR TYPEOUTS. THE VALIDITY OF THE
138 TIMES MEASURED MUST BE DETERMINED BY THE OPERATOR,
139
140 6.1 TIME RELATIONSHIPS
141
142 A. "WRITE NONSTOP GAP" SHOULD APPROXIMATELY EQUAL THE SUM OF
143 "WRITE SHUTDOWN" & "WRITE START".
144 B. "BACKSPACE SHUTDOWN" MUST BE = "WRITE START".
145 C. "READ SHUTDOWN" MUST BE < "WRITE SHUTDOWN".
146 D. GAPS MUST = 0>7>6>5>4>1, 1-2 < 1.7, 2=3(+1.1, -0.2).
147 E. "WRITE EOF" SHOULD BE SLIGHTLY > "WRITE XIRG".

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
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199

6.2 TIME LIMITS AND PRINTOUT FORMAT

TIMES INDICATED UNDER "UNIT A" ARE STANDARD FOR A 9 CHANNEL UNIT AND "UNIT B" FOR A 7 CHANNEL UNIT. TIMES ARE IN MILLISECONDS, TOLERANCES INDICATED WITHIN "()" ARE PLUS OR MINUS.

FUNCTION	UNIT A (9 CHANNEL)	UNIT B (7 CHANNEL)
WRITE FROM BOT DELAY	105.0 (15.0)	SAME
WRITE SHUTDOWN	2.3 (0.8)	SAME
WRITE START	8.9 (0.4)	12.0 (0.5)
SETTLE DOWN DELAY	12.0 (4.0)	SAME
WRITE TO ERASE HEAD	11.0 (4.0)	SAME
WRITE NONSTOP GAP	11.5 (2.0)	14.5 (2.0)
BACKSPACE SHUTDOWN	1.8 (0.3)	6.2 (0.5)
READ SHUTDOWN	1.8 (0.3)	SAME
GAPS SHOULD = 0>7>6>5>4>3, 1-2 < 1.7, 2=3 (+1.1, -0.2).		
GAP 1	14.5	SEE
GAP 2	13.6	NOTE
GAP 3	13.6	ABOVE
GAP 4	18.1	
GAP 5	21.6	
GAP 6	25.1	
GAP 7	28.0	
GAP 8	32.4	
WRITE START	8.9 (0.4)	12.0 (0.5)
WRITE XIRG	95.0 (10.0)	SAME
READ FROM BOT DELAY	98.0 (10.0)	SAME
LAST CHAR TO CU RDY	.4 (0.1)	.4 (0.1)
WRITE EOF	100.0 (10.0)	SAME
EOR TO EOF SP TIME	100.0 (10.0)	SAME
SPACE SHUTDOWN	1.8 (0.3)	SAME
ONE INCH DATA TIME	22.3 (1.0)	SAME
•FUNCTIONS AT 596 BPI		
WRITE FROM BOT	.0	105.0 (15.0)
ONE INCH DATA TIME	.0	22.0 (1.0)
WRITE SHUTDOWN	.0	1.8 (1.0)
BACKSPACE SHUTDOWN	.0	6.2 (0.5)
LAST CHAR TO CU RDY	.0	.5 (0.1)
READ SHUTDOWN	.0	1.8 (0.3)
•FUNCTIONS AT 200 BPI		
WRITE FROM BOT	.0	105.0 (15.0)
ONE INCH DATA TIME	.0	22.0 (1.0)
WRITE SHUTDOWN	.0	2.3 (0.8)
BACKSPACE SHUTDOWN	.0	6.2 (0.5)
LAST CHAR TO CU RDY	.0	1.3 TO 1.6 (0.1)
READ SHUTDOWN	.0	1.8 (0.3)
END OF TIMING		

• NOTE: THESE TIMES ONLY PRINTED WHEN ONE OR MORE 7 CHANNEL TAPE UNITS ARE SELECTED.

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
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255

7. RESTRICTIONS

7.1 STARTING RESTRICTIONS

AT LEAST ONE TUI0 TAPE UNIT MUST BE "ON-LINE" AND SELECTED BY SWITCHES PER 4.1. ALSO MAKE CERTAIN THAT EACH TMI0 THAT IS "ON-LINE" HAS A UNIQUE UNIT NUMBER SELECTED.

7.2 OPERATING RESTRICTIONS

TMI1 INSTRUCTION TEST MUST RUN WITHOUT ERRORS BEFORE ATTEMPTING TO OPERATE THIS PROGRAM.

8. MISCELLANEOUS

8.1 EXECUTION TIME

NOT APPLICABLE

9.0 PROGRAM DESCRIPTION

9.1 WRITE FROM BOT DELAY

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

PROCEDURE TO MEASURE TIME:

- A. IF TUI0 IS NOT AT BOT IT IS REWOUND TO BOT.
- B. INITIALIZE BYTE RECORD COUNTER AND CURRENT MEMORY ADDRESS REGISTER.
- C. ISSUE WRITE FUNCTION, 000 BPI, SET "GO".
- D. MONITOR CURRENT MEMORY ADDRESS REGISTER TO DETERMINE WHEN 2ND BYTE IS OUTPUT.
- E. THE TIME FROM "GO" UNTIL 2ND BYTE IS OUTPUT IS APPROXIMATELY EQUAL TO "WRITE FROM BOT DELAY".

9.2 WRITE SHUTDOWN

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

PROCEDURE TO MEASURE TIME:

- A. THE PROGRAM USES THE SAME RECORD THAT WAS WRITTEN TO TIME "WRITE FROM BOT DELAY".
- B. AFTER "CU READY" BECOMES A 1, INDICATING THE END OF THE RECORD, MONITOR "SETTLEDOWN" UNTIL IT BECOMES A 1.
- C. THE TIME FROM "CU READY" UNTIL "SETTLEDOWN" IS "WRITE SHUTDOWN".

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
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307

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, 000 WPI, 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 TUB 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.

328
329
312
311
312
313
314
315
316
317
318
319
322
321
322
323
324
325
326
327
328
329
332
331
332
333
334
335
336
337
338
339
342
341
342
343
344
345
346
347
348
349
352
351
352
353

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

PROCEDURE TO MEASURE TIME:

- A. A LONG RECORD HAS BEEN WRITTEN FROM BOT, SAME RECORD THAT WAS USED TO TIME "WRITE FROM BOT DELAY",
- B. TAPE IS REMOUND TO BOT,
- C. BYTE RECORD COUNTER IS INITIALIZED FOR A 3 BYTE RECORD AND CURRENT MEMORY ADDRESS REGISTER IS INITIALIZED,
- D. ISSUE WRITE FUNCTION, 800 BPI, SET "GO",
- E. MONITOR BYTE RECORD COUNTER UNTIL IT = 0 INDICATING THAT 2 BYTES ARE WRITTEN IMMEDIATELY ISSUE A POWER CLEAR WHICH STOPS ALL DATA TRANSFERS AND CAUSES THE DRIVE TO SHUTDOWN,
- F. TAPE IS REMOUND TO BOT
- G. INITIALIZE BYTE RECORD COUNTER (3 BYTES) AND CURRENT MEMORY ADDRESS REGISTER,
- H. ISSUE READ FUNCTION, 800 BPI, SET GO
- I. MONITOR BYTE RECORD COUNTER UNTIL IT = -1 AND THEN TIME UNIT IT = 0. THIS TIME WILL INDICATE THE DISTANCE BETWEEN THE 2ND BYTE AND THE 3RD BYTE WHICH IS ALSO THE AMOUNT OF TAPE THAT WAS ERASED BY THE ERASE HEAD DURING THE WRITE OPERATION OR "WRITE TO ERASE HEAD".

9.6 WRITE NONSTOP GAP

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

PROCEDURE TO MEASURE TIME:

- A. TAPE IS REMOUND TO BOT,
- B. INITIALIZE BYTE RECORD COUNTER AND CURRENT MEMORY ADDRESS REGISTER,
- C. ISSUE WRITE FUNCTION, 800 BPI, SET "GO",
- D. WAIT FOR "CU READY" TO BECOME A 1 AND THEN REPEAT STEPS B AND C,
- E. MONITOR CURRENT MEMORY ADDRESS REGISTER TO DETERMINE WHEN 2ND BYTE IS OUTPUT,
- F. TIME FROM THE 2ND "GO" COMMAND UNTIL 2ND BYTE OF 2ND RECORD IS OUTPUT IS "WRITE NONSTOP GAP".

354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400

9.7 BACKSPACE SHUTDOWN

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

PROCEDURE TO MEASURE TIME:

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

9.8 READ SHUTDOWN

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

PROCEDURE TO MEASURE TIME:

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

421
422
423
424
425
426
427
428
429
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

9.9 GAP CONSISTENCY

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

PROCEDURE TO MEASURE TIME:

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

PROGRAM SEQUENCE FOR EACH GAP:

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

GAP LENGTHS SHOULD REFLECT THE FOLLOWING RELATIONSHIP:

8>7>6>5>4>3, 1-2<1.7, 2=3(+1.1, -0.2).

455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507

9.10 WRITE START

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

9.11 WRITE XIRG

WRITE WITH AN EXTENDED INTERRECORD GAP IS A FUNCTION THAT CAUSES THE GENERATION OF AN INTERRECORD GAP THAT IS AT LEAST 3 INCH LONG AS COMPARED WITH THE NORMAL 3/9 INCH GAP. THE PURPOSE IS TO ELIMINATE WRITE ERRORS THAT MAY BE CAUSED BY A DEFECTIVE AREA ON TAPE. NORMALLY ONE REWRITE WITH XIRG WOULD BE SUFFICIENT TO MOVE PAST THE BAD SPOT, HOWEVER IF IT ISN'T, THE PROCEDURE WOULD BE TO REPEAT THE "BACKSPACE-REWRITE WITH XIRG" SEQUENCE UNTIL A RECORD IS WRITTEN WITHOUT ERRORS. EACH SUCCESSIVE REWRITE WOULD ADD 3 INCHES TO THE INTERRECORD GAP UNTIL "GOOD" TAPE WAS REACHED.

PROCEDURE TO MEASURE TIME:

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

9.12 READ FROM BOT

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

PROCEDURE TO MEASURE TIME:

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

528
529
510
511
512
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

9.13 LAST CHARACTER TO CU READY

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

PROCEDURE TO MEASURE TIME:

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

9.14 WRITE EOF.

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

PROCEDURE TO MEASURE TIME:

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

546
547
548
549
550
551
552
553
554
555
556
557
558
559
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

9.15 EOR TO EOF SPACE TIME

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

THIS COULD INDICATE ONE OR MORE OF THE FOLLOWING PROBLEMS:

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

PROCEDURE TO MEASURE TIME:

- A. A RECORD AND EOF WAS PREVIOUSLY WRITTEN FROM BOT FOR "WRITE EOF" (REFERENCE 9.14).
- 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 0-1 UNTIL "CU READY" IS "EOR TO EOF SPACE TIME".

9.16 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" (REFERENCE 9.8).

PROCEDURE TO MEASURE TIME:

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

598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630

9.17 ONE INCH DATA TIME

ONE INCH OF DATA, 800 BYTES (ALSO 556 AND 200 IF 7 CHANNEL UNIT), IS WRITTEN AND TIMED TO DETERMINE IF TAPE IS MOVING AT PROPER SPEED.

PROCEDURE TO MEASURE TIME:

- A. INITIALIZE BYTE RECORD COUNTER AND CURRENT MEMORY ADDRESS.
- B. ISSUE WRITE FUNCTION, 800 BPI (OR 556, OR 200), SET "GO".
- C. WAIT FOR CURRENT MEMORY ADDRESS REGISTER TO INDICATE 2ND BYTE IS OUTPUT AND THE MONITOR BYTE RECORD COUNTER UNTIL EQUAL TO ZERO.
- D. TIME FROM 2ND BYTE OUTPUT UNTIL BYTE RECORD COUNTER = 0 IS "ONE INCH DATA TIME"

9.18 FUNCTIONS AT 556 BPI

ALL OF THE PREVIOUS TESTS USED THE DENSITY OF 800 BPI. IF A 7 CHANNEL DRIVE IS SELECTED IT IS USEFUL TO RUN SEVERAL OF THE TESTS AGAIN USING DENSITY OF 556 BPI. REFERENCE THE PROPER PARAGRAPHS FOR A DESCRIPTION OF EACH TEST.

9.19 FUNCTIONS AT 200 BPI

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

631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683

STATUS AND COMMAND REGISTER BIT ASSIGNMENTS

COMMAND REGISTER

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

STATUS REGISTER

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

.ENDR


```

684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739

```

```

.TITLE MAINDEC-11-DZTMD-E      TM-11 DRIVE FUNCTION TIMER
;COPYRIGHT 1971, 1976 DIGITAL EQUIPMENT CORP., MAYNARD, MASS, 01754
;REVISED MARCH 1973
;REVISED TO REV,C AUG., 1973 BY BRUCE BURGESS - DIAGNOSTIC ENGINEERING
;
;      THE FOLLOWING CHANGES MAKE UP REV,C I
;      (A) BECAUSE CONTROL UNIT READY NOW OCCURS AFTER SETTLEDOWN
;           THE "WAIT FOR CU READY" LOOPS IN SECTIONS 'T1C', 'T2C',
;           'T4B', 'T4D', AND 'T10C' WERE DELETED,
;      (B) ALSO, IN SECTION
;           'T10F', INSTRUCTIONS WERE ADDED FOR THE PROGRAM TO WAIT
;           FOR CU READY BEFORE ISSUING THE NEW COMMAND; OTHERWISE,
;           AN ILLEGAL COMMAND ERROR (ILC) WILL RESULT
;REVISED TO REV, D MARCH, 1974
;      (A) ALL OF "A" ABOVE WAS REPLACED.
;
;REVISED FEB 1976 REV E
;      (A) MADE TO WORK WITHOUT HARDWARE SWITCH REGISTER
;LOAD PAPERTAPE BINARY USING ABS LOADER
;SET LOC. 176 TO REFLECT TAPE UNIT CONFIGURATION
;LOAD ADDRESS 200, PRESS START
;
STACK=1000
BLENGTH=3000,
      .ENABL ABS
      .=0
;TRAP CATCHER FROM 0 TO 1000

;CONTRCL SETTING LOCATION-MUST BE SET TO RUN PROPERLY
      .=176
SWREGI 0

      .=200
JMP     START

MTS:   172520
MTC:   172522
BCI:   172524
CAI:   172526
MTD:   172530
MTRDI: 172532
SR:    177570
TKS:   177560
TKB:   177562
TPS:   177564
TPB:   177566
MTV:   224
CCI:   177776
R10:   0
R11:   0
R12:   0
R13:   0
TSDRV: 0

```

```

740 021044 000000          T11T: 0
741 021046 012706 001000  START:  MOV  #STACK,X6      ;INITIALIZE STACK
742 021052 012777 000340 177750  MOV  #340,0CC     ;SET PRIORITY LEVEL 7
743 021060 012767 010052 006762  MOV  #MSG1,MESAGE
744 021066 004767 006636      JSR  X7, TOP      ;PRINT PROGRAM TITLE
745 021072 016767 177100 005662  ST0:  MOV  SWREG,DRIVES ;SAVE DRIVES SELECTED
746 021100 001006      BNE  15
747 021102 012767 011223 006740  MOV  #MSG29,MESAGE
748 021110 004767 006614      JSR  X7, TOP      ;ERROR-NO CONFIGURATION SELECTED
749 021114 000000          HALT
750 021116 004767 005524      JSR  X7,RSFORV    ;RESET DRIVES
751 021122 004767 005736  ST1:  JSR  X7,STRREW   ;START REWIND
752 021126 004767 005560      JSR  X7,CHGDRV    ;DONE ALL DRIVES?
753 021132 000773      BR   ST1         ;NO
754 021134 004767 005764  ST2:  JSR  X7,WATREW   ;WAIT FOR BOT
755 021140 004767 005546      JSR  X7,CHGDRV    ;DONE ALL DRIVES?
756 021144 000773      BR   ST2         ;NO
757                                ;PRINT HEADER
758 021146 012767 010137 006674  MOV  #MSG2,MESAGE
759 021154 004767 006550      JSR  X7, TOP      ;PRINT "FUNCTION"
760 021160 012767 010163 006662  ST3:  MOV  #MSG2A,MESAGE
761 021166 004767 006536      JSR  X7, TOP      ;PRINT "UNIT"
762 021172 016767 005566 006512  MOV  FORIVE,DIGIT
763 021200 000367 006506      SWAB  DIGIT
764 021204 042767 177770 006500  BIC  #177770,DIGIT
765 021212 052767 000060 006472  BIS  #60,DIGIT
766 021220 105777 177576      TSTB  #TPS
767 021224 100375      BPL  ,-4
768 021226 016777 006460 177570  MOV  DIGIT,#TPB   ;PRINT DRIVE "NUMBER"
769 021234 004767 005452      JSR  X7,CHGDRV    ;DONE ALL DRIVES?
770 021240 000747      BR   ST3         ;NO
771 021242 004767 005576      JSR  X7,ST15     ;STORE ONES IN WRITE BUFFER
772                                ;TIME WRITE FROM BOT DELAY, AND WRITE SHUTDOWN
773 021246 012700 007212  T11  MOV  #TM1,X0      ;INITIALIZE TIME BUFFERS
774 021252 012701 007236      MOV  #TM2,X1
775 021256 004767 005544  T1A:  JSR  X7,WRINT
776 021262 016777 005476 177512  MOV  FORIVE,#MTC ;SELECT DRIVE
777 021270 052777 040005 177504  BIS  #40005,#MTC ;000 0P], WRITE, GO
778 021276 005067 005706      CLR  TIME
779 021302 022777 011344 177476  T1B:  CMP  #WBUF+2,#CA ;IS 2ND WORD OUTPUT?
780 021310 003403      BLE  T1C         ;YES
781 021312 004767 005650      JSR  X7,TIMER    ;NO, COUNT TIME
782 021316 000771      BR   T1B
783 021320 016720 005664  T1C:  MOV  TIME,(0)+   ;SAVE "WRITE FROM BOT DELAY" TIME
784 021324 005067 005660      CLR  TIME
785 021330 105777 177446      TSTB  #MTC
786 021334 100375      BPL  ,-4
787 021336 032777 000010 177434  T1D:  BIT  #10,#MTC   ;HAS SETTLEDOWN SET?
788 021344 001003      BNE  T1E         ;YES
789 021346 004767 005614      JSR  X7,TIMER    ;NO, COUNT TIME
790 021352 000771      BR   T1D
791 021354 016721 005630  T1E:  MOV  TIME,(1)+   ;SAVE "WRITE SHUTDOWN" TIME
792 021360 004767 005326      JSR  X7,CHGDRV    ;DONE ALL DRIVES
793 021364 000734      BR   T1A         ;NO
794 021366 012720 177777      MOV  #-1,(0)+   ;TERMINATE TIMES
795 021372 012721 177777      MOV  #-1,(1)+   ;TERMINATE TIMES

```

```

796 021376 012767 010177 006444      MOV      #MSG3,MESAGE
797 021404 012700 007212      MOV      #TM1,X0
798 021410 004767 006036      JSR      X7,TYPTIM      ;PRINT "WRITE FROM HOT DELAY" TIMES
799 021414 012767 010225 006426      MOV      #MSG4,MESAGE
800 021422 012700 007236      MOV      #TM2,X0
801 021426 004767 006020      JSR      X7,TYPTIM      ;PRINT "WRITE SHUTDOWN" TIMES
802                                     ;TIME WRITE START AND SETTLEDOWN DELAY
803 021432 004767 005210      T2:     JSR      X7,RSFORV      ;RESET DRIVE SELECTION
804 021436 012700 007212      MOV      #TM1,X0
805 021442 012701 007236      MOV      #TM2,X1
806 021446 004767 005354      T2A:    JSR      X7,WRINT
807 021452 016777 005306 177322      MOV      FDRIVE,#MTC      ;SELECT DRIVE
808 021460 052777 040005 177314      BIS      #40005,#MTC      ;020 BPI, WRITE, GO
809 021466 005067 005516      CLR      TIME
810 021472 022777 011344 177306      T2B:    CMP      #WBUF-2,#CA      ;IS 2ND WORD OUTPUT
811 021500 003403      BLE      T2C      ;YES
812 021502 004767 005460      JSR      X7,TIMER      ;NO, COUNT TIME
813 021506 000771      BR      T2B
814 021510 016720 005474      T2C:    MOV      TIME,(0)      ;SAVE "WRITE START" TIME
815 021514 005067 005470      CLR      TIME
816 021520 105777 177256      TSTB    #MTC
817 021524 100375      BPL      #-4
818 021526 032777 000010 177244      BIT      #10,#MTC
819 021534 001774      BEQ      #-6      ;WAIT FOR SETTLEDOWN TO SET
820 021536 006077 177236      T2D:    ROR      #MTC
821 021542 103403      BCS      T2E      ;WAIT FOR TU READY
822 021544 004767 005416      JSR      X7,TIMER
823 021550 000772      BR      T2D
824 021552 016721 005432      T2E:    MOV      TIME,(1)      ;SAVE "SETTLEDOWN" TIME
825 021556 004767 005130      JSR      X7,CHGDRV
826 021562 000731      BR      T2A
827 021564 012720 177777      MOV      #-1,(0)      ;TERMINATE TIMES
828 021570 012721 177777      MOV      #-1,(1)      ;TERMINATE TIMES
829 021574 012767 010253 006246      MOV      #MSG5,MESAGE
830 021602 012700 007212      MOV      #TM1,X0
831 021606 004767 005640      JSR      X7,TYPTIM      ;PRINT "WRITE START" TIMES
832 021612 012767 010301 006230      MOV      #MSG6,MESAGE
833 021620 012700 007236      MOV      #TM2,X0
834 021624 004767 005622      JSR      X7,TYPTIM      ;PRINT "SETTLEDOWN" TIMES
835                                     ;TIME WRITE TO ERASE HEAD
836                                     ;LONG RECORD WAS PREVIOUSLY WRITTEN
837                                     ;WRITE A 3 BYTE RECORD AND POWER CLEAR
838                                     ;DISTANCE FROM NEW DATA TO OLD IS
839                                     ;ERASE HEAD DISTANCE
840 021630 004767 005230      T3:     JSR      X7,STRREW      ;START REWIND
841 021634 004767 005052      JSR      X7,CHGDRV      ;DONE ALL DRIVES?
842 021640 000773      BR      T3      ;NO
843 021642 004767 005256      T3A:    JSR      X7,WATREW      ;IS DRIVE AT BOT?
844 021646 004767 005040      JSR      X7,CHGDRV      ;DONE ALL DRIVES
845 021652 000773      BR      T3A      ;NO
846 021654 012777 177775 177122      T3B:    MOV      #-3,#BC      ;3 BYTE RECORD
847 021662 012777 011342 177116      MOV      #WBUF,#CA      ;INITIALIZE CURRENT ADDRESS
848 021670 016777 005070 177104      MOV      FDRIVE,#MTC      ;SELECT DRIVE
849 021676 052777 040005 177076      BIS      #40005,#MTC      ;020BPI, WRITE, GO
850 021704 005777 177074      TST      #BC
851 021710 001375      BNE      #-4

```

```

052 001712 052777 010000 177062      BIS      #10000,0MTC      ;POWER CLEAR
053 001720 004767 009140      JSR      X7,STRREW  ;START REWIND
054 001724 004767 004762      JSR      X7,CHGDRV  ;DONE ALL DRIVES
055 001730 000751      BR       T3B        ;NC
056 001732 004767 009166      T3C:    JSR      X7,WATREW  ;DRIVE AT BOT
057 001736 004767 004750      JSR      X7,CHGDRV  ;DONE ALL DRIVES
058 001742 000773      BR       T3C        ;NO
059                                ;NOW THAT ALL DRIVES ARE AT BOT AGAIN
060                                ;READ CVER PARTIAL RECORD
061 001744 012700 007212      MOV      @TM1,X0
062 001750 012777 177775 177026      T3D:    MOV      @-3,0BC
063 001756 012777 011342 177022      MOV      @WBUF,0CA
064 001764 016777 004774 177010      MOV      @DRIVE,0MTC ;SELECT DRIVE
065 001772 052777 040003 177002      BIS      @40003,0MTC ;@000PI, READ, GO
066 002000 009007 009204      CLR      TIME      ;CLEAR TIME
067 002004 022777 177777 176772      CMP      @-1,0BC
068 002012 001374      BNE     ,-6
069 002014 009777 176764      T3E:    TST      0BC      ;WAIT FOR NEXT WORD IN
070 002020 001403      BEQ     T3F        ;HAVE IT
071 002022 004767 009140      JSR      X7,TIMER   ;INC, COUNT TIME
072 002026 000772      BR       T3E
073 002030 016720 009194      T3F:    MOV      TIME,(0)  ;SAVE "WRITE TO ERASE HEAD TIME"
074 002034 004767 004652      JSR      X7,CHGDRV  ;DONE ALL DRIVES
075 002040 000743      BR       T3D        ;NO
076 002042 012720 177777      MOV      @-1,(0)  ;TERMINATE TIMES
077 002046 012767 010327 009774      MOV      @MSG7,MESSAGE
078 002054 012700 007212      MOV      @TM1,X0
079 002060 004767 009366      JSR      X7,TYPTIM  ;PRINT "WRITE TO ERASE HEAD TIMES"
080 002064 004767 004774      T3G:    JSR      X7,STRREW  ;START REWIND
081 002070 004767 004616      JSR      X7,CHGDRV  ;DONE ALL DRIVES
082 002074 000773      BR       T3C        ;NO
083 002076 004767 009022      T3H:    JSR      X7,WATREW  ;DRIVE AT BOT
084 002102 004767 004604      JSR      X7,CHGDRV  ;DONE ALL DRIVES
085 002106 000773      BR       T3H        ;NO
086                                ;TIME WRITE NONSTOP GAP, BACKSPACE SHUTDOWN AND READ SHUTDOWN
087                                ;WRITE ONE RECORD, FOLLOW WITH ONE RECORD NONSTOP
088                                ;FOLLOWED BY ONE RECORD START-STOP
089                                ;FOLLOWED BY WRITE-BACKSPACE-READ-WRITE
090                                ;FOLLOWED BY WRITE-BACKSPACE-WRITE
091 002110 004767 004730      T4I:    JSR      X7,ST1S
092 002114 012700 007212      MOV      @TM1,X0      ;INITIALIZE TIME BUFFERS
093 002120 012701 007236      MOV      @TM2,X1
094 002124 012702 007262      MOV      @TM3,X2
095 002130 009007 009054      T4AAI  CLR      TIME
096 002134 004767 004666      JSR      X7,WRINT
097 002140 016777 004620 176634      MOV      @DRIVE,0MTC ;TRACK AND DRIVE NUMBERS
098 002146 052777 040005 176626      BIS      @40005,0MTC ;@00 BPI, WRITE, GO
099 002154 109777 176022      TSTB   @MTC
100 002160 100379      BPL     ,-4          ;WAIT FOR CU READY
101                                ;HAVE FIRST RECORD WRITTEN, GO NONSTOP
102 002162 004767 004640      JSR      X7,WRINT
103 002166 009277 176610      INC     0MTC
104 002172 022777 011344 176606      T4A:    CMP      @WBUF+2,0CA ;IS 2ND WORD OUTPUT?
105 002200 003403      BLE     T4B
106 002202 004767 004760      JSR      X7,TIMER   ;YES
107 002206 000771      BR       T4A        ;INC, COUNT TIME

```

```

928 0E221E 016720 004774      T4B:  MOV      TIME,(0)*      ;SAVE "WRITE NONSTOP GAP" TIME
929 0E2214 005067 004770      CLR      TIME
91E 0E2220 105777 176556      TSTB    @MTC
911 0E2224 100375                BPL      ,-4                ;WAIT FOR CU READY
912 0E2226 006077 176546      ROR      @MTC
913 0E2232 103375                BCC      ,-4                ;WAIT FOR TU READY
914                                ;WRITE-BACKSPACE-READ-WRITE
915 0E2234 004767 004566      JSR      X7,WRINT
916 0E2240 016777 004520 176534      MOV      FDRIVE,@MTC      ;DRIVE SELECT
917 0E2246 052777 0400E5 176526      BIS      @40005,@MTC      ;000 BPI, WRITE, GO
918 0E2254 105777 176522      TSTB    @MTC
919 0E2260 100375                BPL      ,-4                ;WAIT FOR CU READY
920 0E2262 012777 177777 176514      MOV      @-1,@BC          ;BACKSPACE 1 RECORD
921 0E2270 042777 000016 176504      BIC      @16,@MTC
922 0E2276 052777 000013 176476      BIS      @13,@MTC        ;SPACE REVERSE, GO
923 0E2304 105777 176472      TSTB    @MTC
924 0E2310 100375                BPL      ,-4
925 0E2312 032777 000010 176460      T4C:  BIT      @10,@MTC      ;HAS SETTLEDOWN SET?
926 0E2320 001003                BNE      T4D                ;YES
927 0E2322 004767 004640      JSR      X7,TIMER         ;NO, COUNT TIME
928 0E2326 000771                BR       T4C
929 0E2330 006077 176444      T4D:  ROR      @MTC
930 0E2334 103375                BCC      ,-4                ;WAIT FOR TU READY
931 0E2336 016721 004646      MOV      TIME,(1)*      ;SAVE "BACKSPACE SHUTDOWN" TIME
932 0E2342 004767 004460      JSR      X7,WRINT
933 0E2346 005067 004636      CLR      TIME
934 0E2352 016777 004406 176422      MOV      FDRIVE,@MTC      ;SELECT DRIVE
935 0E2360 052777 0400E3 176414      BIS      @40003,@MTC      ;000 BPI, READ, GO
936 0E2366 105777 176410      TSTB    @MTC
937 0E2372 100375                BPL      ,-4
938 0E2374 032777 000010 176376      T4E:  BIT      @10,@MTC      ;HAS SETTLEDOWN SET?
939 0E2402 001003                BNE      T4F                ;YES
940 0E2404 004767 004556      JSR      X7,TIMER         ;NO, COUNT TIME
941 0E2410 000771                BR       T4E
942 0E2412 006077 176362      T4F:  ROR      @MTC
943 0E2416 103375                BCC      ,-4                ;WAIT FOR TU READY
944 0E2420 016722 004564      MOV      TIME,(2)*      ;SAVE "READ SHUTDOWN" TIME
945 0E2424 004767 004202      JSR      X7,CHGDRV
946 0E2430 000637                BR       T4AA
947 0E2432 012720 177777      MOV      @-1,(0)*        ;TERMINATE TIMES
948 0E2436 012721 177777      MOV      @-1,(1)*        ;TERMINATE TIMES
949 0E2442 012722 177777      MOV      @-1,(2)*        ;TERMINATE TIMES
950 0E2446 012767 010355 005374      MOV      @MSG0,MESSAGE
951 0E2454 012700 007212      MOV      @TH1,%0
952 0E2460 004767 004706      JSR      X7,TYPTIM        ;PRINT "WRITE NONSTOP GAP" TIMES
953 0E2464 012767 010403 005356      MOV      @MSG9,MESSAGE
954 0E2472 012700 007236      MOV      @TH2,%0
955 0E2476 004767 004750      JSR      X7,TYPTIM        ;PRINT "BACKSPACE SHUTDOWN" TIMES
956 0E2502 012767 010431 005340      MOV      @MSG10,MESSAGE
957 0E2510 012700 007262      MOV      @TH3,%0
958 0E2514 004767 004732      JSR      X7,TYPTIM        ;PRINT "READ SHUTDOWN" TIMES
959 0E2520 004767 004320      JSR      X7,ST15
960                                ;WRITE RECORDS TO BE USED IN GAP TEST
961 0E2524 004767 004276      T4G:  JSR      X7,WRINT
962 0E2530 016777 004230 176244      MOV      FDRIVE,@MTC      ;SELECT DRIVE
963 0E2536 052777 0400E5 176236      BIS      @40005,@MTC      ;000 BPI, WRITE, GO

```

964	002544	105777	176232		TSTB	OMTC	
965	002552	100375			BPL	,=4	;WAIT FOR CU READY
966	002552	004767	004250		JSR	X7,WRINT	
967	002556	005277	176220		INC	OMTC	;GO NONSTOP
968	002562	105777	176214		TSTB	OMTC	
969	002566	100375			BPL	,=4	;WAIT FOR CU READY
970	002570	012777	177777	176206	MOV	#-1,0BC	
971	002576	016777	004162	176176	MOV	FORIVE,OMTC	;SELECT DRIVE
972	002604	052777	040013	176170	BIS	040013,OMTC	;000 BPI, BACKSPACE, GO
973	002612	105777	176164		TSTB	OMTC	
974	002616	100375			BPL	,=4	;WAIT FOR CU READY
975	002620	004767	004202		JSR	X7,WRINT	
976	002624	016777	004134	176150	MOV	FORIVE,OMTC	
977	002632	052777	040005	176142	BIS	040005,OMTC	;000 BPI, WRITE, GO
978	002640	105777	176136		TSTB	OMTC	
979	002644	100375			BPL	,=4	
980	002646	012767	177777	176100	MOV	#-1,R11	;INDICATES BACK 3 COMPLETE
981	002654	012767	177777	176154	MOV	#-1,R12	;INDICATES BACK 4 COMPLETE
982	002662	012767	177777	176150	MOV	#-1,R13	;INDICATES BACK 5 COMPLETE
983	002670	012767	177776	176134	MOV	#-2,R10	;FIRST SEQUENCE BACK 2 TIMES
984							
985							
986	002676	004767	004124				
987	002702	005277	176074		MULWRT: JSR	X7,WRINT	
988	002706	105777	176070		INC	OMTC	;GO NONSTOP
989	002712	100375			TSTB	OMTC	
990	002714	012777	177777	176062	BPL	,=4	;WAIT FOR DONE
991	002722	042777	000016	176092	MULBAK: MOV	#-1,0BC	;BACKSPACE 1 RECORD
992	002730	052777	000013	176044	BIC	016,OMTC	
993	002736	105777	176040		BIS	013,OMTC	;SET BACKSPACE, GO
994	002742	100375			TSTB	OMTC	
995	002744	004767	004056		BPL	,=4	;WAIT FOR BACKSPACE DONE
996	002750	042777	000016	176024	JSR	X7,WRINT	
997	002756	052777	000005	176016	BIC	016,OMTC	
998	002764	105777	176012		BIS	05,OMTC	;SET WRITE, GO
999	002770	100375			TSTB	OMTC	
1000	002772	005267	176034		BPL	,=4	;WAIT FOR WRITE DONE
1001	002776	001346			INC	R10	;BACKSPACED ENOUGH TIMES?
1002	003000	005267	176030		BNE	MULBAK	;NO BACKSPACE AND WRITE AGAIN
1003	003004	001004			INC	R11	;DONE 3 BACKSPACE SEQUENCES?
1004	003006	012767	177775	176016	BNE	MUL1	;YES
1005	003014	000730			MOV	#-3,R10	
1006	003016	005267	176014		BR	MULWRT	
1007	003022	001004			MUL1: INC	R12	;DONE 4 BACKSPACE SEQUENCES?
1008	003024	012767	177774	176000	BNE	MUL2	;YES
1009	003032	000721			MOV	#-4,R10	
1010	003034	005267	176000		BR	MULWRT	
1011	003040	001004			MUL2: INC	R13	;DONE 5 BACKSPACE SEQUENCES?
1012	003042	012767	177773	175762	BNE	MUL3	;YES
1013	003050	000712			MOV	#-5,R10	
1014	003052	006077	175722		BR	MULWRT	
1015	003056	103375			MUL3: ROR	OMTS	
1016	003060	004767	004000		BCC	,=4	;WAIT FOR TU READY
1017	003064	004767	003622		JSR	X7,STRREW	;START REWIND
1018	003070	000615			JSR	X7,CHGDRV	
1019					BR	T4C	
							;NOW READ NONSTOP

```

1020 ;ACCUMLLATE GAP TIMES ON READ
1021 ;TYPE ACCUMULATED TIMES AT END OF READ
1022 ;GAP1 SHOULD = GAP2, GAP3 <GAP1 AND GAP2
1023 ;GAP4 THRU GAP8 SHOULD GET INCREASINGLY LONGER
1024 003072 005067 175744          CLR          T5DRV
1025 003076 004767 004022      T5:   JSR          X7,WATREN
1026 003102 004767 003720          JSR          X7,WRINT
1027 003106 012700 007212          MOV          #TM1,X0
1028 003112 066700 175724          ADD          T5DRV,X0
1029 003116 016777 003642 175656  MOV          FDRIVE,#MTC      ;SELECT DRIVE
1030 003124 052777 040023 175650  BIS          #40003,#MTC      ;000 BPI, READ, GO
1031 003132 012767 177770 175672  MOV          #-0,,R10        ;COUNT 0 GAPS
1032 003140 105777 175636      T5A:   TSTB         #MTC
1033 003144 100375                    BPL          ,-4            ;WAIT FOR CU READY
1034 003146 004767 003654          JSR          X7,WRINT
1035 003152 005067 004032          CLR          TIME
1036 003156 005277 175620          INC          #MTC            ;GO NONSTOP
1037 003162 022777 011344 175616  T5B:   CMP          #WBUF+2,#CA    ;IS 2ND WORD OUTPUT
1038 003170 003403                    BLE          T5C            ;YES
1039 003172 004767 003770          JSR          X7,TIMER        ;NO, COUNT TIME
1040 003176 000771                    BR           T5B
1041 003200 016720 004004      T5C:   MOV          TIME,(0)*    ;SAVE GAP TIME
1042 003204 012710 177777          MOV          #-1,(0)        ;TERMINATE, JUST IN CASE AT END
1043 003210 062700 000022          ADD          #22,X0         ;STEP GAP POINTER
1044 003214 005267 175612          INC          R10            ;DONE ALL 8 GAPS?
1045 003220 001347                    BNE          T5A            ;NO
1046 003222 006077 175552          ROR          #MTC
1047 003226 103375                    BCC          ,-4            ;WAIT FOR TU READY
1048 003230 004767 003630          JSR          X7,STRREW        ;START REWIND
1049 003234 062767 000002 175600  ADD          #2,T5DRV        ;+2 TO DRIVE TIME POINTER
1050 003242 004767 003444          JSR          X7,CHGDRV
1051 003246 000713                    BR           T5
1052 003250 112767 000061 005276  MOVB         #1,MSG11A+6
1053 003256 012767 010457 004564  MOV          #MSG11,MESSAGE
1054 003264 004767 004440          JSR          X7,TOP
1055 003270 012767 010546 004552  MOV          #MSG11A,MESSAGE
1056 003276 012700 007212          MOV          #TM1,X0
1057 003302 004767 004144          JSR          X7,TYPTIM        ;PRINT "GAP 1"
1058 003306 105267 005242          INCB        MSG11A+6
1059 003312 012767 010546 004530  MOV          #MSG11A,MESSAGE
1060 003320 012700 007236          MOV          #TM2,X0
1061 003324 004767 004122          JSR          X7,TYPTIM        ;PRINT "GAP 2"
1062 003330 105267 005220          INCB        MSG11A+6
1063 003334 012767 010546 004506  MOV          #MSG11A,MESSAGE
1064 003342 012700 007262          MOV          #TM3,X0
1065 003346 004767 004100          JSR          X7,TYPTIM        ;PRINT "GAP 3"
1066 003352 105267 005176          INCB        MSG11A+6
1067 003356 012767 010546 004464  MOV          #MSG11A,MESSAGE
1068 003364 012700 007306          MOV          #TM4,X0
1069 003370 004767 004056          JSR          X7,TYPTIM        ;PRINT "GAP 4"
1070 003374 105267 005154          INCB        MSG11A+6
1071 003400 012767 010546 004442  MOV          #MSG11A,MESSAGE
1072 003406 012700 007332          MOV          #TM5,X0
1073 003412 004767 004034          JSR          X7,TYPTIM        ;PRINT "GAP 5"
1074 003416 105267 005132          INCB        MSG11A+6
1075 003422 012767 010546 004420  MOV          #MSG11A,MESSAGE

```

1076	023432	012700	007356		MOV	#TM6,X0	
1077	023434	004767	004012		JSR	X7,TYPTIM	;PRINT "GAP 6"
1078	023442	105267	009110		INCB	MSG11A+6	
1079	023444	012767	010546	004376	MOV	#MSG11A,MESAGE	
1080	023452	012700	007402		MOV	#TM7,X0	
1081	023456	004767	003770		JSR	X7,TYPTIM	;PRINT "GAP 7"
1082	023462	105267	009066		INCB	MSG11A+6	
1083	023466	012767	010546	004354	MOV	#MSG11A,MESAGE	
1084	023474	012700	007426		MOV	#TM8,X0	
1085	023500	004767	003746		JSR	X7,TYPTIM	;PRINT "GAP 8"
1086	023504	004767	003334		JSR	X7,ST1S	
1087							
1088	023510	012700	007212				
1089	023514	012701	007236		T6I: MOV	#TM1,X0	
1090	023520	004767	003302		MOV	#TM2,X1	
1091	023524	016777	003234	179250	T6A: JSR	X7,WRINT	
1092	023532	105777	179244		MOV	FDRIVE,OMTC	;SELECT DRIVE
1093	023536	100379			TSTB	OMTC	
1094	023540	006077	179234		BPL	,=4	
1095	023544	103379			ROR	OMTS	
1096	023546	052777	040005	179226	BCC	,=4	;WAIT FOR TU READY
1097	023554	032777	000040	179216	BIS	#40005,OMTC	;000 BPI, WRITE, GO
1098	023562	001374			BIT	#40,OMTS	
1099	023564	052777	010000	179210	BNE	,=6	;WAIT FOR BOT TO CLEAR
1100	023572	016777	003166	179202	BIS	#10000,OMTC	;PCWER CLEAR
1101	023600	004767	003222		MOV	FDRIVE,OMTC	
1102	023604	004777	179170		JSR	X7,WRINT	
1103	023610	103379			ROR	OMTS	
1104	023612	009067	003372		BCC	,=4	;WAIT FOR TU READY
1105	023616	016777	003142	179156	CLR	TIME	
1106	023624	052777	040005	179150	MOV	FDRIVE,OMTC	;SELECT DRIVE
1107	023632	022777	011344	179146	BIS	#40005,OMTC	;000 BPI, WRITE, GO
1108	023640	003403			CMP	#WBUF+2,0CA	;IS 2ND WORD OUTPUT?
1109	023642	004767	003320		BLE	T6C	;YES
1110	023646	000771			JSR	X7,TIMER	;NO, COUNT TIME
1111	023650	006077	179124		BR	T6B	
1112	023654	103379			T6C: ROR	OMTS	
1113	023656	016720	003126		BCC	,=4	;WAIT FOR TU READY
1114	023662	009067	003322		MOV	TIME,(0)+	;SAVE "WRITE START" TIME
1115	023666	004767	003134		CLR	TIME	
1116	023672	016777	003066	179102	JSR	X7,WRINT	
1117	023700	052777	040015	179074	MOV	FDRIVE,OMTC	;SELECT DRIVE
1118	023706	022777	011344	179072	BIS	#40015,OMTC	;000 BPI, WRITE XIRG, GO
1119	023714	003403			CMP	#WBUF+2,0CA	;IS 2ND WORD OUTPUT?
1120	023716	004767	003244		BLE	T6E	;YES
1121	023722	000771			JSR	X7,TIMER	;NO COUNT TIME
1122	023724	006077	179050		BR	T6D	
1123	023730	103379			T6E: ROR	OMTS	
1124	023732	016721	003252		BCC	,=4	;WAIT FOR TU READY
1125	023736	004767	003122		MOV	TIME,(1)+	;SAVE "WRITE XIRG" TIME
1126	023742	004767	002744		JSR	X7,STRREW	
1127	023746	000664			JSR	X7,CHGDRV	
1128	023750	012720	177777		BR	T6A	
1129	023754	012721	177777		MOV	#-1,(0)+	;TERMINATE TIMES
1130	023760	012767	010253	004062	MOV	#-1,(1)+	;TERMINATE TIMES
1131	023766	012700	007212		MOV	#MSG9,MESAGE	
					MOV	#TM1,X0	


```

1132 003772 004767 003454      JSR      X7,TYPTIM      ;TYPE "WRITE START" TIME
1133 003776 012767 010574 004044  MOV      #MSG12,MESSAGE
1134 004004 012700 007236      MOV      #TM2,X0
1135 004010 004767 003436      JSR      X7,TYPTIM      ;TYPE "WRITE XIRC" TIME
1136 004014 004767 003104  T6F:    JSR      X7,WATREW
1137 004020 004767 002666      JSR      X7,CHGDRV
1138 004024 000773      BR       T6F           ;WAIT FOR ALL DRIVES AT BOT.
1139      ;NOW TIME "READ FROM BOT DELAY
1140 004026 012700 007212  T7I:    MOV      #TM1,X0
1141 004032 005067 003152  T7A:    CLR      TIME
1142 004036 004767 002764      JSR      X7,WRINT
1143 004042 016777 002716 174732  MOV      FDRIVE,#MTC      ;SELECT DRIVE
1144 004050 052777 040003 174724  BIS      #40003,#MTC      ;000 BPI, READ GO
1145 004056 022777 011344 174722  T7B:    CMP      #WBUF*2,#CA      ;IS 2ND WORD INPUT?
1146 004064 003403      BLE     T7C           ;YES
1147 004066 004767 003074      JSR      X7,TIMER      ;NO COUNT TIME
1148 004072 000771      BR       T7B
1149 004074 016720 003110  T7C:    MOV      TIME,(0)+      ;SAVE "READ FROM BOT" TIME
1150 004100 105777 174676      TSTB    #MTC
1151 004104 100375      BPL     ,-4           ;WAIT FOR CU READY.
1152 004106 004767 002600      JSR      X7,CHGDRV      ;DONE ALL DRIVES?
1153 004112 000747      BR       T7A           ;NO
1154 004114 006077 174600      ROR     #MTC
1155 004120 103375      BCC     ,-4
1156 004122 012720 177777      MOV      #-1,(0)+      ;TERMINATE TIMES
1157 004126 012767 010622 003714  MOV      #MSG13,MESSAGE
1158 004134 012700 007212      MOV      #TM1,X0
1159 004140 004767 003306      JSR      X7,TYPTIM      ;PRINT "READ FROM BOT" TIME
1160 004144 004767 002674      JSR      X7,ST10
1161      ;TIME "LAST CHARACTER INPUT TO CU READY"
1162 004150 012700 007212  T8I:    MOV      #TM1,X0
1163 004154 004767 002646  T8A:    JSR      X7,WRINT
1164 004160 005067 003024      CLR      TIME
1165 004164 016777 002574 174610  MOV      FDRIVE,#MTC      ;SELECT DRIVE
1166 004172 052777 040003 174602  BIS      #40003,#MTC      ;000 BPI, READ, GO
1167 004200 005777 174600      TST     #BC
1168 004204 001375      BNE     ,-4           ;WAIT FOR LAST WORD IN
1169 004206 105777 174570  T8B:    TSTB    #MTC          ;IS CU READY?
1170 004212 100403      BMI     T8C           ;YES
1171 004214 004767 002746      JSR      X7,TIMER      ;NO, COUNT TIME
1172 004220 000772      BR       T8B
1173 004222 006077 174552  T8C:    ROR     #MTC
1174 004226 103375      BCC     ,-4           ;WAIT FOR TU READY
1175 004230 016720 002754      MOV      TIME,(0)+      ;SAVE "LAST CHAR TO CU READY" TIME
1176 004234 004767 002624      JSR      X7,STRREW      ;REWIND
1177 004240 004767 002446      JSR      X7,CHGDRV      ;ANYMORE DRIVES?
1178 004244 000743      BR       T8A           ;NO
1179 004246 012720 177777      MOV      #-1,(0)+      ;TERMINATE TIMES
1180 004252 012767 010650 003570  MOV      #MSG14,MESSAGE
1181 004260 012700 007212      MOV      #TM1,X0
1182 004264 004767 003162      JSR      X7,TYPTIM      ;PRINT "LAST CHAR TO CU READY" TIMES
1183 004270 004767 002630  T8D:    JSR      X7,WATREW
1184 004274 004767 002412      JSR      X7,CHGDRV
1185 004300 000773      BR       T8D
1186      ;TIME "WRITE EOF"
1187      ;WRITE A 3 BYTE RECORD FROM BOT FOLLOWED BY AN EOF.

```

1188	024302	012700	007212		T9I	MOV	#TM1,X0	
1189	024306	005067	002676		T9AI	CLR	TIME	
1190	024312	012777	177775	174464		MOV	#-3,,0BC	:WRITE 3 BYTES
1191	024320	012777	011342	174460		MOV	#WBUF,0CA	
1192	024326	016777	002432	174446		MOV	FORIVE,0MTC	:SELECT DRIVE
1193	024334	052777	040005	174440		BIS	#40005,0MTC	:000 BPI, WRITE, GO
1194	024342	105777	174434			TSTB	0MTC	
1195	024346	100375				BPL	,=4	
1196	024350	006077	174424			ROR	0MTC	
1197	024354	103375				BCC	,=4	:WAIT FOR TU READY
1198	024356	042777	000016	174416		BIC	#16,0MTC	
1199	024364	052777	000007	174410		BIS	#7,0MTC	:WRITE EOF, GO
1200	024372	105777	174404		T9BI	TSTB	0MTC	:IS CU READY SET?
1201	024376	100403				BMI	T9C	:YES
1202	024400	004767	002562			JSR	X7,TIMER	:NO, COUNT TIME
1203	024404	000772				BR	T9B	
1204	024406	016720	002576		T9CI	MOV	TIME,(0)*	:SAVE "WRITE EOF" TIME
1205	024412	004767	002446			JSR	X7,STRREW	:REWIND
1206	024416	004767	002270			JSR	X7,CHGORV	:ANYMORE DRIVES?
1207	024422	000731				BR	T9A	:YES
1208	024424	012720	177777			MOV	#-1,(0)*	:TERMINATE TIMES
1209	024430	012767	010676	003412		MOV	#MSG19,MESSAGE	
1210	024436	012700	007212			MOV	#TM1,X0	
1211	024442	004767	003004			JSR	X7,TYPTIM	:PRINT "WRITE EOF" TIMES
1212	024446	004767	002492		T9DI	JSR	X7,WATREW	
1213	024452	004767	002234			JSR	X7,CHGORV	
1214	024456	000773				BR	T9D	
1215								:TIME "EOR TO EOF SPACE TIME", "SPACE SHUTDOWN" AND "ONE INCH DATA TIME".
1216								:WRITE A 3 BYTE RECORD OVER ONE PREVIOUSLY WRITTEN
1217								:BACKSPACE 1 RECORD AND THEN SPACE FORWARD 2 RECORDS
1218								:TIME FROM THE END OF FIRST RECORD UNTIL EOF IS REACHED
1219	024460	012700	007212		T10I	MOV	#TM1,X0	
1220	024464	012701	007236			MOV	#TM2,X1	
1221	024470	012702	007262			MOV	#TM3,X2	
1222	024474	005067	002510		T10AI	CLR	TIME	
1223	024500	012777	177775	174276		MOV	#-3,0BC	:3 BYTE RECORD
1224	024506	012777	011342	174272		MOV	#WBUF,0CA	
1225	024514	016777	002244	174260		MOV	FORIVE,0MTC	:SELECT DRIVE
1226	024522	052777	040005	174252		BIS	#40005,0MTC	:000 BPI, WRITE, GO
1227	024530	105777	174246			TSTB	0MTC	
1228	024534	100375				BPL	,=4	:WAIT FOR CU READY
1229	024536	012777	177777	174240		MOV	#-1,0BC	:BACKSPACE 1 RECORD
1230	024544	042777	000016	174230		BIC	#16,0MTC	:SELECT DRIVE
1231	024552	052777	000013	174222		BIS	#13,0MTC	:BACKSPACE, GO
1232	024560	105777	174216			TSTB	0MTC	
1233	024564	100375				BPL	,=4	:WAIT FOR CU READY
1234	024566	012777	177776	174210		MOV	#-2,0BC	:SPACE FORWARD 2 RECORDS
1235	024574	042777	000016	174200		BIC	#16,0MTC	
1236	024602	052777	000011	174172		BIS	#11,0MTC	:SPACE FORWARD, GO
1237	024610	022777	177777	174166	T10BI	CHP	#-1,0BC	
1238	024616	001374				BNE	T10B	:WAIT FOR 1ST RECORD TO BE SPACED OVER
1239	024620	032777	040000	174152	T10CI	BIT	#40000,0MTC	:IS EOF SET?
1240	024626	001014				BNE	T10D	:YES
1241	024630	105777	174146			TSTB	0MTC	:IS CU READY
1242	024634	100403				BMI	T10CC	:YES
1243	024636	004767	002324			JSR	X7,TIMER	:NO, COUNT TIME

1244	024642	000766				BR	T10C		
1245	024644	032777	040020	174126	T10CC:	BIT	#40000,0MTS	:	HAVE CU READY
1246	024652	001002				BNE	T10D	:	IS EOF SET?
1247	024654	005067	002330			CLR	TIME	:	INC, SET ERROR
1248	024660	016720	002324		T10D:	MOV	TIME,(0)+	:	SAVE "EOR TO EOF SPACE TIME"
1249	024664	005067	002320			CLR	TIME		
1250	024670	105777	174106			TSTB	0MTC		
1251	024674	100375				BPL	, -4		
1252	024676	032777	000010	174074	T10E:	BIT	#10,0MTS	:	IS SETTLEDOWN SET?
1253	024704	001003				BNE	T10F	:	YES
1254	024706	004767	002254			JSR	X7,TIMER	:	INC, COUNT TIME
1255	024712	000771				BR	T10E		
1256	024714	016721	002270		T10F:	MOV	TIME,(1)+	:	SAVE "SPACE SHUTDOWN" TIME
1257	024720	012777	176340	174056		MOV	#-000,,0BC	:	1 INCH OF DATA
1258	024726	012777	011342	174052		MOV	#WBUF,0CA		
1259	024734	005067	002250			CLR	TIME		
1260	024740	016777	002020	174034		MOV	FORIVE,0MTC	:	SELECT DRIVE
1261	024746	105777	174030			TSTB	0MTC	:	WAIT FOR CU READY
1262	024752	100375				BPL	, -4		
1263	024754	052777	040025	174020		BIS	#40005,0MTC	:	000 BPI, WRITE, GO
1264	024762	022777	011344	174016		CMF	#WBUF+2,0CA	:	IS 2ND BYTE OUTPUT
1265	024770	003374				BGT	, -6	:	NO
1266	024772	005777	174026		T10G:	TST	0BC	:	YES IS LAST BYTE OUT
1267	024776	001403				BEO	T10H	:	YES
1268	025000	004767	002162			JSR	X7,TIMER	:	INC, COUNT TIME
1269	025004	000772				BR	T10C		
1270									
1271	025006	016722	002176		T10H:	MOV	TIME,(2)+	:	SAVE "ONE INCH DATA TIME"
1272	025012	004767	002046			JSR	X7,STRREW	:	REWIND
1273	025016	004767	001670			JSR	X7,CHGDRV	:	ANYMORE DRIVES?
1274	025022	000624				BR	T10A	:	YES
1275	025024	012720	177777			MOV	#-1,(0)+	:	TERMINATE TIMES
1276	025030	012721	177777			MOV	#-1,(1)+		
1277	025034	012722	177777			MOV	#-1,(2)+		
1278	025040	012767	010724	003002		MOV	#MSG16,MESSAGE		
1279	025046	012700	007212			MOV	#TM1,X0		
1280	025052	004767	002374			JSR	X7,TYPTIM	:	PRINT "EOR TO EOF SPACE TIME"
1281									
1282	025056	012767	010752	002764		MOV	#MSG18,MESSAGE		
1283	025064	012700	007236			MOV	#TM2,X0		
1284	025070	004767	002356			JSR	X7,TYPTIM	:	PRINT "SPACE SHUTDOWN" TIME
1285	025074	012767	011027	002746		MOV	#MSG20,MESSAGE		
1286	025102	012700	007262			MOV	#TM3,X0		
1287	025106	004767	002340			JSR	X7,TYPTIM	:	PRINT "ONE INCH DATA TIME"
1288									
1289	025112	012700	007212		T11:	MOV	#TM1,X0	:	INITIALIZE TIME BUFFERS
1290	025116	012701	007236			MOV	#TM2,X1		
1291	025122	012702	007262			MOV	#TM3,X2		
1292	025126	012703	007306			MOV	#TM4,X3		
1293	025132	012704	007332			MOV	#TM5,X4		
1294	025136	012705	007356			MOV	#TM6,X5		
1295	025142	005067	173676			CLR	T11T		
1296	025146	004767	001752		T11A:	JSR	X7,WATREW	:	WAIT FOR REWIND
1297	025152	032767	020000	001604		BIT	#20000,FORIVE	:	IS DRIVE 9 TRACK?
1298	025160	001161				BNE	T11P	:	YES, GET NEXT DRIVE
1299	025162	012767	177777	173654		MOV	#-1,T11T	:	INDICATE 7 TRACK

1300	025170	012777	176724	173606		MOV	#-556,,0BC	:566 BYTES = ONE INCH
1301	025176	012777	011342	173602		MOV	#WBUF,0CA	
1302	025204	005067	002000			CLR	TIME	
1303	025210	016777	001550	173564		MOV	FDRIVE,0MTC	:SELECT DRIVE
1304	025216	052777	020025	173556		BIS	#20005,0MTC	:556 BPI, WRITE, GO
1305								
1306	025224	022777	011344	173554		:TIME	"WRITE FROM BOT DELAY" AT 556 BPI	
1307	025232	003403			T110I	CMP	#WBUF+2,0CA	:IS 2ND WORD OUT?
1308	025234	004767	001726			BLE	T11C	:YES
1309	025242	000771				JSR	X7,TIMER	:INC, COUNT TIME
1310	025242	016720	001742			BR	T11B	
1311	025246	005067	001736		T11CI	MOV	TIME,(0)*	:SAVE "WRITE FROM BOT DELAY"
1312						CLR	TIME	
1313	025252	005777	173526			:TIME	"ONE INCH DATA" AT 556 BPI	
1314	025256	001403			T11DI	TST	0BC	:IS 0C=0
1315	025260	004767	001702			BEO	T11E	:YES
1316	025264	000772				JSR	X7,TIMER	:INC, COUNT TIME
1317	025266	016721	001716			BR	T11D	
1318	025272	005067	001712		T11EI	MOV	TIME,(1)*	:SAVE "1 INCH DATA" TIME
1319						CLR	TIME	
1320						:TIME	"WRITE SHUTDOWN" AT 556 BPI	
1321	025276	105777	173500			TSTB	0MTC	
1322	025302	100375				BPL	,=4	
1323	025304	032777	000010	173466		T11FI	BIT	#10,0MTC
1324	025312	001003				RNE	T11G	:IS SETTLEDOWN SET?
1325	025314	004767	001646			JSR	X7,TIMER	:INC, COUNT TIME
1326	025320	000771				BR	T11F	
1327	025322	016722	001662		T11GI	MOV	TIME,(2)*	:SAVE "WRITE SHUTDOWN"
1328	025326	005067	001656			CLR	TIME	
1329						:TIME	"BACKSPACE SHUTDOWN" AT 556 BPI	
1330	025332	012777	177777	173444		MOV	#-1,0BC	
1331	025340	042777	000016	173434		BIC	#16,0MTC	
1332	025346	052777	000013	173426		BIS	#13,0MTC	:BACKSPACE 1 RECORD, GO
1333	025354	105777	173422			TSTB	0MTC	
1334	025360	100375				BPL	,=4	:WAIT FOR CU READY
1335	025362	032777	000010	173410		T11HI	BIT	#10,0MTC
1336	025370	001003				RNE	T11J	:IS SETTLEDOWN SET?
1337	025372	004767	001570			JSR	X7,TIMER	:INC COUNT TIME
1338	025376	000771				BR	T11I	
1339	025400	016723	001624		T11JI	MOV	TIME,(3)*	:SAVE "BACKSPACE SHUTDOWN"
1340	025404	005067	001600			CLR	TIME	
1341						:TIME	"LAST CHAR IN TO MTF" AT 556 BPI	
1342	025410	006077	173364			ROR	0MTC	
1343	025414	103375				BCC	,=4	:WAIT FOR TU READY
1344	025416	012777	176724	173360		MOV	#-556,,0BC	:556 BYTES
1345	025424	012777	011342	173354		MOV	#WBUF,0CA	
1346	025432	016777	001326	173342		MOV	FDRIVE,0MTC	:SELECT DRIVE
1347	025440	052777	020023	173334		BIS	#20003,0MTC	:556 BPI, READ, GO
1348	025446	005777	173332			TST	0BC	
1349	025452	001375				RNE	,=4	:WAIT FOR LAST WORD OUT
1350	025454	105777	173322			T11KI	TSTB	0MTC
1351	025460	100403				BMI	T11L	:IS CU READY SET?
1352	025462	004767	001500			JSR	X7,TIMER	:INC COUNT TIME
1353	025466	000772				BR	T11K	
1354	025470	016724	001514		T11LI	MOV	TIME,(4)*	:SAVE "LAST CHAR IN TO MTF"
1355	025474	005067	001510			CLR	TIME	

```

1356 025500 032777 000010 173272 T11M1 BIT #10,0MTS
1357 025506 001003 BNE T11N
1358 025510 004767 001492 JSR X7,TIMER
1359 025514 000771 BR T11M
1360 025516 016725 001466 T11N1 MOV TIME,(5)* ;SAVE "READ SHUTDOWN"
1361 025522 000406 BR T11R
1362 025524 005020 T11P1 CLR (0)* ;CLEAR TIMES FOR 9 TRACK DRIVES
1363 025526 005021 CLR (1)*
1364 025530 005022 CLR (2)*
1365 025532 005023 CLR (3)*
1366 025534 005024 CLR (4)*
1367 025536 005025 CLR (5)*
1368 025540 004767 001320 T11R1 JSR X7,$TRREW
1369 025544 004767 001142 JSR X7,CHGDRV
1370 025550 000401 BR ,+4
1371 025552 000402 BR ,+6
1372 025554 000167 177366 JMP T11A
1373
1374 025560 012720 177777 MOV #=1,(0)* ;TERMINATE DRIVES
1375 025564 012721 177777 MOV #=1,(1)*
1376 025570 012722 177777 MOV #=1,(2)*
1377 025574 012723 177777 MOV #=1,(3)*
1378 025600 012724 177777 MOV #=1,(4)*
1379 025604 012725 177777 MOV #=1,(5)*
1380 025610 005767 173230 TST T11T ;HAVE TESTED ANY 7 TRACKS
1381 025614 001461 BEQ T12 INC
1382 025616 012767 011000 002224 MOV #MSG19,MESSAGE ;PRINT "FUNCTIONS AT 556"
1383 025624 004767 002100 JSR X7, TOP
1384 025630 012767 010177 002212 MOV #MSG3,MESSAGE
1385 025636 012700 007212 MOV #TM1,X0
1386 025642 004767 001604 JSR X7, TYPTIM ;PRINT "WRITE FROM BOT DELAY"
1387 025646 012767 011027 002174 MOV #MSG20,MESSAGE
1388 025654 012700 007236 MOV #TM2,X0
1389 025660 004767 001566 JSR X7, TYPTIM ;PRINT "ONE INCH DATA TIME"
1390 025664 012767 010225 002156 MOV #MSG4,MESSAGE
1391 025672 012700 007262 MOV #TM3,X0
1392 025676 004767 001550 JSR X7, TYPTIM ;PRINT "WRITE SHUTDOWN"
1393 025702 012767 010403 002140 MOV #MSG9,MESSAGE
1394 025710 012700 007326 MOV #TM4,X0
1395 025714 004767 001532 JSR X7, TYPTIM ;PRINT "BACKSPACE SHUTDOWN"
1396 025720 012767 010650 002122 MOV #MSG14,MESSAGE
1397 025726 012700 007332 MOV #TM5,X0
1398 025732 004767 001514 JSR X7, TYPTIM ;PRINT "LAST CHAR IN TO MTP"
1399 025736 012767 010431 002104 MOV #MSG10,MESSAGE
1400 025744 012700 007356 MOV #TM6,X0
1401 025750 004767 001476 JSR X7, TYPTIM ;PRINT "READ SHUTDOWN"
1402 025754 004767 001064 JSR X7,$T15
1403 ;TIME OPERATIONS AT 200 BPI
1404 025760 012700 007212 T12: MOV #TM1,X0 ;INITIALIZE TIME BUFFERS
1405 025764 012701 007236 MOV #TM2,X1
1406 025770 012702 007262 MOV #TM3,X2
1407 025774 012703 007306 MOV #TM4,X3
1408 026000 012704 007332 MOV #TM5,X4
1409 026004 012705 007356 MOV #TM6,X5
1410 026010 005067 173030 CLR T11T
1411 026014 004767 001104 T12A1 JSR X7,WATREW ;WAIT FOR REWIND

```

1412	026020	032767	020000	000736	BIT	#20000,FDRIVE	:IS DRIVE 9 TRACK?
1413	026026	001402			BEO	,06	:INC
1414	026030	000107	000342		JMP	T12P	:YES, GET NEXT DRIVE
1415	026034	012767	177777	173002	MOV	#-1,T11T	
1416	026042	012777	177470	172734	MOV	#-200,,0BC	:566 BYTES = ONE INCH
1417	026050	012777	011342	172730	MOV	#WBUF,0CA	
1418	026056	005067	001126		CLR	TIME	
1419	026062	016777	000676	172712	MOV	FDRIVE,0MTC	:SELECT DRIVE
1422	026070	052777	000009	172704	BIS	#00005,0MTC	:200 BPI, WRITE, GO
1421							:TIME "WRITE FROM BOT DELAY" AT 550 BPI
1422	026076	022777	011344	172702	T12B1	CHP	#WBUF+2,0CA
1423	026104	001403			BEO	T12C	:IS 2ND WORD OUT?
1424	026106	004767	001054		JSR	X7,TIMER	:INC, COUNT TIME
1425	026112	000771			BR	T120	
1426	026114	016720	001070		T12C1	MOV	TIME,(0)*
1427	026120	005067	001064		CLR	TIME	:SAVE "WRITE FROM BOT DELAY"
1428							
1429							:TIME "ONE INCH DATA" AT 200 BPI
1430	026124	005777	172654		T12D1	TST	0BC
1431	026130	001403			BEO	T12E	:IS BC=0
1432	026132	004767	001030		JSR	X7,TIMER	:INC, COUNT TIME
1433	026136	000772			BR	T12D	
1434	026140	016721	001044		T12E1	MOV	TIME,(1)*
1435	026144	005067	001040		CLR	TIME	:SAVE "1 INCH DATA" TIME
1436							:TIME "WRITE SHUTDOWN" AT 200 BPI
1437	026150	105777	172626		TST0	0MTC	
1438	026154	100379			BPL	,=4	
1439	026156	032777	000010	172614	T12F1	BIT	010,0MYS
1440	026164	001003			BNE	T12G	:IS SETTLEDOWN SET?
1441	026166	004767	000774		JSR	X7,TIMER	:INC, COUNT TIME
1442	026172	000771			BR	T12F	
1443	026174	016722	001010		T12G1	MOV	TIME,(2)*
1444	026200	005067	001024		CLR	TIME	:SAVE "WRITE SHUTDOWN"
1445							:TIME "BACKSPACE SHUTDOWN" AT 200 BPI
1446	026204	012777	177777	172572	MOV	#-1,0BC	
1447	026212	042777	000016	172562	BIC	016,0MTC	
1448	026220	052777	000013	172554	BIS	013,0MTC	:BACKSPACE 1 RECORD, GO
1449	026226	105777	172550		TST0	0MTC	
1450	026232	100379			BPL	,=4	:WAIT FOR CU READY
1451	026234	032777	000010	172536	T12H1	BIT	010,0MYS
1452	026242	001003			BNE	T12J	:IS SETTLEDOWN SET?
1453	026244	004767	000716		JSR	X7,TIMER	:INC COUNT TIME
1454	026250	000771			BR	T12H	
1455	026252	016723	000732		T12J1	MOV	TIME,(3)*
1456	026256	005067	000726		CLR	TIME	:SAVE "BACKSPACE SHUTDOWN"
1457							:TIME "LAST CHAR IN TO MTF" AT 200 BPI
1458	026262	006077	172512		ROR	0MYS	
1459	026266	103379			BCC	,=4	:WAIT FOR TU READY
1460	026270	012777	177470	172506	MOV	#-200,,0BC	:556 BYTES
1461	026276	012777	011342	172502	MOV	#WBUF,0CA	
1462	026304	016777	000454	172470	MOV	FDRIVE,0MTC	:SELECT DRIVE
1463	026312	052777	000023	172462	BIS	#00003,0MTC	:550 BPI, READ, GO
1464	026320	005777	172460		TST	0BC	
1465	026324	001379			BNE	,=4	:WAIT FOR LAST WORD OUT
1466	026326	105777	172450		T12K1	TST0	:IS CU READY SET?
1467	026332	100403			BMI	T12L	:YES

1468	026334	004767	002626		JSR	X7, TIMER		:INC COUNT TIME
1469	026342	000772			BR	T12K		
1472	026342	016724	002642	T12L1	MOV	TIME, (4)*		:SAVE "LAST CHAR IN TO MTF"
1471	026346	005067	002636		CLR	TIME		
1472	026352	032777	000010	172420 T12M1	BIT	#10, #MTS		
1473	026362	001003			BNE	T12N		
1474	026362	004767	000620		JSR	X7, TIMER		
1475	026366	000771			BR	T12M		
1476	026372	016725	000614	T12N1	MOV	TIME, (5)*		:SAVE "HEAD SHUTDOWN"
1477	026374	000406			BR	T12R		
1478								
1479	026376	005020		T12P1	CLR	(0)*		
1482	026402	005021			CLR	(1)*		
1481	026402	005022			CLR	(2)*		
1482	026404	005023			CLR	(3)*		
1483	026406	005024			CLR	(4)*		
1484	026412	005025			CLR	(5)*		
1485	026412	004767	000274	T12R1	JSR	X7, CHGDRV		
1486	026416	000401			BR	, 04		
1487	026422	000402			BR	, 06		
1488	026422	000167	177366		JMP	T12A		
1489	026426	012720	177777		MOV	#-1, (0)*		:TERMINATE DRIVES
1492	026432	012721	177777		MOV	#-1, (1)*		
1491	026436	012722	177777		MOV	#-1, (2)*		
1492	026442	012723	177777		MOV	#-1, (3)*		
1493	026446	012724	177777		MOV	#-1, (4)*		
1494	026452	012725	177777		MOV	#-1, (5)*		
1495	026456	005767	172362		TST	T11T		:HAVE TESTED ANY 7 TRACKS?
1496	026462	001461			BEO	T13		:INC
1497	026464	012767	011055	001356	MOV	#MSG21, MESSAGE		:PRINT "FUNCTIONS AT 200"
1498	026472	004767	001232		JSR	X7, TOP		
1499	026476	012767	010177	001344	MOV	#MSG3, MESSAGE		
1522	026504	012700	007212		MOV	#TM1, X0		
1521	026512	004767	000736		JSR	X7, TYPTIM		:PRINT "WRITE FROM BOT DELAY"
1522	026514	012767	011027	001326	MOV	#MSG20, MESSAGE		
1523	026522	012700	007236		MOV	#TM2, X0		
1524	026526	004767	000720		JSR	X7, TYPTIM		:PRINT "ONE INCH DATA TIME"
1525	026532	012767	010229	001310	MOV	#MSG4, MESSAGE		
1526	026540	012700	007262		MOV	#TM3, X0		
1527	026544	004767	000722		JSR	X7, TYPTIM		:PRINT "WRITE SHUTDOWN"
1528	026550	012767	010423	001272	MOV	#MSG9, MESSAGE		
1529	026556	012700	007326		MOV	#TM4, X0		
1512	026562	004767	000664		JSR	X7, TYPTIM		:PRINT "BACKSPACE SHUTDOWN"
1511	026566	012767	010650	001254	MOV	#MSG14, MESSAGE		
1512	026574	012700	007332		MOV	#TM5, X0		
1513	026602	004767	000646		JSR	X7, TYPTIM		:PRINT "LAST CHAR IN TO MTF"
1514	026604	012767	010431	001236	MOV	#MSG10, MESSAGE		
1515	026612	012700	007356		MOV	#TM6, X0		
1516	026616	004767	000630		JSR	X7, TYPTIM		:PRINT "READ SHUTDOWN"
1517	026622	004767	000216		JSR	X7, ST18		
1518	026626	012767	011124	001214	MOV	#MSG27, MESSAGE		
1519	026634	004767	001070		JSR	X7, TOP		:PRINT "END OF TIMING"
1522	026642	000000			HALT			
1521	026642	000167	172224		JMP	ST0		
1522								
1523								

:RESET DRIVE SELECTION TO LOWEST NUMBER

```

1524 026646 005067 002124          RSFDRV: CLR      CDRIVE          ;START WITH DRIVE 0
1525 026652 012767 100020 000100      MOV      #100000,CDRVBT ;INITIALIZE FOR 0
1526 026660 036767 000074 000074  RSF1:   BIT      CDRVBT,DRIVES ;MASK WITH SELECTED DRIVES
1527 026666 001006          BNE      RSF2
1528 026670 005267 000062          INC      CDRIVE          ;+1 TO DRIVE NUMBER
1529 026674 000241          CLC
1530 026676 006067 000056          ROR      CDRVBT          ;MOVE MASK BIT TO NEXT DRIVE
1531 026702 000766          BR       RSF1
1532 026704 004767 000056  RSF2:   JSR      X7,GTNINE ;CHECK 9 TRACK
1533 026710 000207          RTS      X7
1534
1535          ;SELECT NEXT DRIVE IN SEQUENCE
1536          ;SKIP FIRST EXIT ADDRESS IF LAST DRIVE SELECTED
1536 026712 005267 000040  CHGDRV: INC      CDRIVE          ;+1 TO DRIVE
1537 026716 000241          CLC
1538 026720 006067 000034          ROR      CDRVBT          ;MOVE MASK BIT TO NEXT DRIVE
1539 026724 001005          BNE      CHG1
1540 026726 004767 177714  JSR      X7,RSFDRV      ;RESET TO LOWEST DRIVE
1541 026732 062716 000022          ADD      #2,(6)         ;+2 TO SKIP FIRST EXIT
1542 026736 000207          RTS      X7            ;EXIT
1543 026740 036767 000014 000014  CHG1:   BIT      CDRVBT,DRIVES ;MASK WITH SELECTED DRIVES
1544 026746 001761          BEQ      CHGDRV        ;CHECK FOR NEXT DRIVE
1545 026750 004767 000012  JSR      X7,GTNINE      ;CHECK 9 TRACK
1546 026754 000207          RTS
1547 026756 000000      CDRIVE: 0
1548 026760 000000      CDRVBT: 0
1549 026762 000000      DRIVES: 0
1550 026764 000000      FDRIVE: 0
1551          ;CHECK FOR NINE TRACK DRIVES
1552 026766 016767 177764 177770  GTNINE: MOV      CDRIVE,FDRIVE
1553 026774 000367 177764          SWAB    FDRIVE          ;POSITION UNIT SELECT BITS
1554 027000 042767 174377 177756  BIC      #174377,FDRIVE ;CLEAR ALL OTHER BITS
1555 027006 032767 000010 177742  BIT      #10,CDRIVE     ;TEST FOR 9 TRACK
1556 027014 001403          BEQ      GNT1          ;NO
1557 027016 052767 020000 177740  BIS      #20000,FDRIVE  ;YES SET 9 TRACK BIT
1558 027024 000207  GNT1:   RTS      X7
1559          ;INITIALIZE BYTE COUNT AND CURRENT ADDRESS FOR WRITE
1560 027026 012777 172110 171750  WRINT:  MOV      #0,BLENGTH,0BC
1561 027034 012777 011342 171744  MOV      #WBUF,0CA
1562 027042 000207          RTS      X7
1563          ;STORE 1'S IN WRITE BUFFER
1564 027044 012700 011342  ST1S:  MOV      #WBUF,X0
1565 027050 012720 177777  ST1SA: MOV      #-1,(0)+
1566 027054 022700 017234          CMP     #WBUF-BLENGTH+2,X0
1567 027060 001373          BNE     ST1SA
1568 027062 000207          RTS     X7
1569          ;START REWIND OPERATIONS
1570 027064 016777 177674 171710  STRREW: MOV      FDRIVE,0MTC ;SELECT DRIVE
1571 027072 105777 171704          TSTB   0MTC
1572 027076 100375          BPL     ,-4            ;WAIT FOR CU READY
1573 027100 006077 171674          ROR     0MTC
1574 027104 103375          BCC     ,-4            ;WAIT FOR TAPE UNIT READY
1575 027106 052777 000017 171666  BIS     #17,0MTC        ;GO REWIND
1576 027114 105777 171662          TSTB   0MTC
1577 027120 100375          BPL     ,-4            ;WAIT FOR CONTROL UNIT READY
1578 027122 000207          RTS     X7
1579          ;WAIT FOR REWIND TO FINISH

```



```

1588 027124 016777 177634 171650 WATREW: MOV     FDRIVE,DMTC
1581 027132 006077 171642          ROR     DMTC
1582 027136 103375          BCC     ,=4
1583 027142 032777 000040 171632          BIT     #40,DMTC      ;IS HGT SET?
1584 027146 001000          BNE     15          ;YES
1585 027150 012767 011153 000672          MOV     #MSG20,MESAGE
1586 027156 004767 000546          JSR     PC, TOP
1587 027162 000000          HALT
1588 027164 000207          RTS     ;ERROR, NOT AT BOT AFTER REWIND
1589
1590          ISI
1591          ;KEEP COUNT OF ELAPSED TIME
1592          ;EXIT EVERY 100 USEC
1591 027166 005777 171620 TIMER: TST     DMTRD
1592 027172 100375          BPL     ,=4
1593 027174 005777 171612          TST     DMTRD
1594 027200 100775          BMI     ,=4
1595 027202 005267 000002          INC     TIME          ;+1 TO 100 USEC COUNT
1596 027206 000207          RTS     X7
1597 027210 000000 TIME: 0
1598 027212 000000 TM1: 0
1599          ,=TM1+20.
1600 027236 000000 TM2: 0
1601          ,=TM2+20.
1602 027262 000000 TM3: 0
1603          ,=TM3+20.
1604 027306 000000 TM4: 0
1605          ,=TM4+20.
1606 027332 000000 TM5: 0
1607          ,=TM5+20.
1608 027356 000000 TM6: 0
1609          ,=TM6+20.
1610 027402 000000 TM7: 0
1611          ,=TM7+20.
1612 027426 000000 TM8: 0
1613          ,=TM8+20.
1614          ;PRINT TITLE OF TEST EXECUTED AND THE DRIVE TIMES
1615 027452 004767 000252 TYPTM: JSR     X7, TOP      ;PRINT TITLE
1616 027456 012067 000224 TYPT0: MOV     (0),VALUE    ;GET TIME
1617 027462 022767 177777 000216      CMP     #-1,VALUE      ;FINISHED TIME BUFFER
1618 027470 001001          BNE     ,=4
1619 027472 000207          RTS     X7
1620 027474 012767 007720 000214      MOV     #DECPNT+2,DECPNT ;INITIALIZE DECIMAL VALUE POINTER
1621 027502 012767 000040 000204      MOV     #40,ZERO       ;INITIALIZE SPACE
1622 027510 012767 177774 000172      MOV     #-4,DIGCNT     ;DIGIT COUNT
1623 027516 012767 177777 000166      TYPT1: MOV     #-1,DIGIT  ;INITIAL VALUE
1624 027524 005267 000162      TYPT2: INC     DIGIT     ;+1 TO VALUE
1625 027530 167767 000162 000150      SUB     #DECPNT,VALUE  ;SUBTRACT CONSTANT
1626 027536 100372          BPL     TYPT2          ;NOT NEGATIVE YET
1627 027540 067767 000152 000140      ADD     #DECPNT,VALUE  ;RESTORE LAST POSITIVE VALUE
1628 027546 004767 000064          JSR     X7,DECOU      ;PRINT DECIMAL DIGIT
1629 027552 005267 000132          INC     DIGCNT        ;+1 TO DIGIT COUNT
1630 027556 001000          BNE     TYP2A
1631 027560 012767 010173 000262      MOV     #MSG20,MESAGE
1632 027566 004767 000136          JSR     X7, TOP
1633 027572 000731          BR      TYPT0
1634 027574 022767 177777 000106      TYP2A: CMP     #-1,DIGCNT ;CHECK FOR DECIMAL PLACE
1635 027602 001011          BNE     TYPT3          ;NO

```

1636	027604	105777	171212		TSTB	0TPS	
1637	027610	100375			BPL	,-4	
1638	027612	012777	000056	171204	MOV	#1,,0TPB	;PRINT DECIMAL POINT
1639	027620	012767	000060	000066	MOV	#60,ZERO	
1642	027626	062767	000022	000062	TYPTS: ADD	#2,DECPNT	;+2 TO DECIMAL VALUE POINTER
1641	027634	000730			BR	TYPT1	;DC AGAIN
1642							
1643	027636	005767	000050		DECOUT: TST	DIGIT	;IS DIGIT 0
1644	027642	001004			BNE	DEC1	;NC
1645	027644	016767	000044	000040	MOV	ZERO,DIGIT	;SUPPRESS LEADING ZEROS
1646	027652	000406			BR	DEC2	
1647	027654	012767	000060	000032	DEC1: MOV	#60,ZERO	;INITIALIZE ZERO AFTER SOME VALUE FOUND
1648	027662	052767	000060	000022	BIS	#60,DIGIT	;CONVERT TO ANSCI
1649	027670	105777	171126		DEC2: TSTB	0TPS	
1652	027674	100375			BPL	,-4	
1651	027676	016777	000010	171120	MOV	DIGIT,0TPB	;PRINT
1652	027704	000207			RTS	X7	
1653	027706	000000			VALUE: 0		
1654	027710	000000			DIGCNT: 0		
1655	027712	000000			DIGIT: 0		
1656	027714	000040			ZERO: 40		;CONTAINS ZERO OR SPACE
1657	027716	007720			DECPNT: .+2		
1658	027720	001750			1000,		
1659	027722	000144			100,		
1662	027724	000012			10,		
1661	027726	000001			1,		
1662					;TELETYPE OUTPUT PACKAGE		
1663	027732	142777	000177	171064	TOP: BICB	#177,0TPS	;CLEAR FLAGS
1664	027736	117767	000106	000102	MOV	0MESSAGE,EOMK	;SAVE MESSAGE DELIMETER
1665	027744	005267	000100		INC	MESSAGE	;+2 TO POINTER
1666	027752	127767	000074	000070	TOP1: CMPB	0MESSAGE,EOMK	;IS CHARACTER THE 2ND DELIMETER
1667	027756	001001			BNE	,-4	;NC
1668	027762	000207			RTS	X7	;YES ENT
1669	027762	127727	000062	000100	CMPB	0MESSAGE,0'0	;IS CHARACTER AN 0 INDICATING A CARRIAGE RETURN
1672	027770	001411			BEO	TOP3	;YES
1671	027772	105777	171024		TSTB	0TPS	
1672	027776	100375			BPL	,-4	
1673	010002	117777	000044	171016	MOV	0MESSAGE,0TPB	;PRINT CHARACTER
1674	010006	005267	000036		TOP2: INC	MESSAGE	;+2 TO POINTER
1675	010012	000756			BR	TOP1	;LOOP
1676					;CARRIAGE RETURN, LINE FEED		
1677	010014	105777	171022		TOP3: TSTB	0TPS	

1678	010022	100375			BPL	,-4		
1679	010022	112777	000215	170774	MOVB	#215,0TPB		
1680	010030	105777	170766		TSTB	0TPS		
1681	010034	100375			BPL	,-4		
1682	010036	112777	000212	170760	MOVB	#212,0TPB		
1683	010044	000760			BR	TOP2		
1684	010046	000000			EOMKI	0		
1685	010050	000000			MESSAGE:	0		
1686	010052	040057	044520	026504	MSG11	.ASCII	I/0CMD=11-DZTMD-E	TM-11 DRIVE FUNCTION I
1687	010060	030461	042055	052132				
1688	010066	042115	042455	020040				
1689	010074	020040	020040	020040				
1690	010102	052040	026515	030461				
1691	010110	042040	044522	042526				
1692	010116	043040	047125	052103				
1693	010124	047511	020116					
1694	010132	044524	042515	040122		.ASCII	!TIMER0/I	
1695	010136	057						
1696	010137	057	043100	047125	MSG21	.ASCII	I/0FUNCTION	/I
1697	010144	052103	047511	020116				
1698	010152	020040	020040	020040				
1699	010160	020040	057					
1700	010163	057	052440	044516	MSG2A1	.ASCII	I/ UNIT /I	
1701	010170	020124	057					
1702	010173	057	020040	057	MSG2B1	.ASCII	I/ /I	
1703	010177	057	053500	044522	MSG31	.ASCII	I/0WRITE FROM BOT	/I
1704	010204	042524	043040	047522				
1705	010212	020115	047502	020124				
1706	010220	020040	020040	057				

1707	010225	057	053520	044522	MSG41	.ASCII	1/0WRITE SHUTDOWN	/1
1708	010232	042524	051440	052510				
1709	010240	042124	053517	020116				
1710	010240	020040	020040	057				
1711	010253	057	053520	044522	MSG51	.ASCII	1/0WRITE START	/1
1712	010260	042524	051440	040524				
1713	010266	052122	020040	020040				
1714	010274	020040	020040	057				
1715	010301	057	051500	052109	MSG61	.ASCII	1/0SETTLE DOWN DELAY	/1
1716	010306	046124	020109	047504				
1717	010314	047127	042040	046109				
1718	010322	054501	020040	057				
1719	010327	057	053520	044522	MSG71	.ASCII	1/0WRITE TO ERASE HEAD/1	
1720	010334	042524	052040	020117				
1721	010342	051105	051501	020109				
1722	010350	042510	042101	057				

1723	010355	057	053520	044522	MSG8:	.ASCII	I/0WRITE NONSTOP GAP /I
1724	010362	042524	047040	047117			
1725	010370	052123	050117	043440			
1726	010376	050101	020040	057			
1727	010403	057	041100	041501	MSG9:	.ASCII	I/0BACKSPACE SHUTDOWN /I
1728	010410	051513	040520	042503			
1729	010416	051440	052510	042124			
1730	010424	053517	020116	057			
1731	010431	057	051100	040505	MSG10:	.ASCII	I/0READ SHUTDOWN /I
1732	010436	020104	044123	052125			
1733	010444	047504	047127	020040			
1734	010452	020040	020040	057			
1735	010457	057	043500	050101	MSG11:	.ASCII	I/0GAPS SHOULD = 0>7>6>5>4>1, 1-2<1,7, 2=3(+1,1, -0.2),/I
1736	010464	020123	044123	052517			
1737	010472	042114	036440	034040			
1738	010500	033476	033076	032476			
1739	010506	032076	032476	020054			
1740	010514	026461	036062	027061			
1741	010522	026067	031040	031475			
1742	010530	025450	027061	026061			
1743	010536	026440	027060	024462			
1744	010544	027456					
1745	010546	040057	040507	020120	MSG11A:	.ASCII	I/0GAP 1 /I
1746	010554	020061	020040	020040			
1747	010562	020040	020040	020040			
1748	010570	020040	027440				
1749	010574	040057	051127	052111	MSG12:	.ASCII	I/0WRITE XIRC /I
1750	010602	020105	044530	043522			
1751	010610	020040	020040	020040			
1752	010616	020040	027440				
1753	010622	040057	042522	042101	MSG13:	.ASCII	I/0READ FROM BOT DELAY/I
1754	010630	043040	047522	020115			
1755	010636	047502	020124	042504			
1756	010644	040514	027531				
1757	010650	040057	040514	052123	MSG14:	.ASCII	I/0LAST CHAR TO CU RDY/I
1758	010656	041440	040510	020122			
1759	010664	047524	041440	020125			
1760	010672	042122	027531				
1761	010676	040057	051127	052111	MSG15:	.ASCII	I/0WRITE EOF /I
1762	010704	020105	047505	020106			
1763	010712	020040	020040	020040			
1764	010720	020040	027440				
1765	010724	040057	047505	020122	MSG16:	.ASCII	I/0EOR TO EOF SP TIME /I
1766	010732	047524	042440	043117			
1767	010740	051440	020120	044524			
1768	010746	042515	027440				
1769	010752	040057	050123	041501	MSG18:	.ASCII	I/0SPACE SHUTDOWN /I
1770	010760	020105	044123	052125			
1771	010766	047504	047127	020040			
1772	010774	020040	027440				
1773	011000	040057	052506	041516	MSG19:	.ASCII	I/0FUNCTIONS AT 556 BPI/I
1774	011006	044524	047117	020123			
1775	011014	052101	032440	033065			
1776	011022	041040	044520	057			
1777	011027	057	047500	042516	MSG20:	.ASCII	I/0ONE INCH DATA TIME /I
1778	011034	044440	041516	020110			

1779	011042	040504	040524	052040		
1780	011050	046511	020125	057		
1781	011055	057	043100	047125	MSG21:	.ASCII /@FUNCTIONS AT 202 BPI/;
1782	011062	052103	047511	051516		
1783	011070	040440	020124	030062		
1784	011076	020060	050102	027511		
1785	011104	040057	029052	029052	MSG27:	.ASCII /@*****END OF TIMING*****/;
1786	011112	025052	029052	025052		
1787	011120	042452	042116	047440		
1788	011126	020106	044524	044515		
1789	011134	043516	029052	025052		
1790	011142	025052	029052	025052		
1791	011150	040052	057			
1792	011153	057	040100	051105	MSG28:	.ASCII /@ERROR-NOT AT BCT AFTER REWIND-HALT@/;
1793	011160	047522	026522	047516		
1794	011166	020124	052101	041040		
1795	011174	052117	040440	052106		
1796	011202	051105	051040	053505		
1797	011210	047111	026504	040510		
1798	011216	052114	040100	057		
1799	011223	057	040100	047514	MSG29:	.ASCII /@LOC. 176 MUST CONTAIN UNIT CONFIGURATION/;
1800	011230	027103	030440	033067		
1801	011236	046440	051525	020124		
1802	011244	047503	052116	044501		
1803	011252	020116	047125	052111		
1804	011260	041440	047117	044506		
1805	011266	052507	040522	044524		
1806	011274	047117				
1807	011276	052100	020117	052522	.ASCII	/@TO RUN-REFER 4.3 DOCUMENT--HALT!@/;
1808	011304	026516	042522	042506		
1809	011312	020122	027064	020063		
1810	011320	047504	052503	042519		
1811	011326	052116	026455	040510		
1812	011334	052114	020441	027500		
1813						
1814	011342	000000			MBUF:	.EVEN
1815		000001				.END

BC	001004	MSG7	010327	TM1	007212	T11G	005322	T4A	002172
BLENTM	0025672	MSG8	010355	TM2	007236	T11H	005362	T4AA	002130
CA	001006	MSG9	010403	TM3	007262	T11J	005400	T4B	002210
CC	001030	MTC	001002	TM4	007306	T11K	005454	T4C	002312
CCRIVE	006756	MTC	001010	TM5	007332	T11L	005470	T4D	002330
CCRVEY	006760	MYRD	001012	TM6	007356	T11M	005500	T4E	002374
CHGCRV	006712	MTS	001000	TM7	007402	T11N	005510	T4F	002412
CHG1	006742	MTV	001026	TM8	007426	T11P	005524	T4G	002524
DECOLT	007636	MULBAK	002714	TOP	007730	T11R	005540	T5	003076
DECPNT	007716	MULWRT	002676	TOP1	007750	T11T	001044	T5A	003140
DEC1	007654	MUL1	003016	TOP2	010000	T12	005700	T5B	003162
DEC2	007672	MUL2	003034	TOP3	010014	T12A	006014	T5C	003200
DIGCNT	007712	MUL3	003052	TPB	001024	T12B	006070	T5DRV	001042
DIGIT	007712	PC	0X000007	TPS	001022	T12C	006114	T6	003910
DRIVES	006762	RSPDRV	006646	TYPTIM	007452	T12D	006124	T6A	003520
ECPK	010046	RSF1	006660	TYPT0	007456	T12E	006140	T6B	003632
FDRIVE	006764	RSF2	006704	TYPT1	007516	T12F	006156	T6C	003650
GNV1	007024	R0	0X000000	TYPT2	007524	T12G	006174	T6D	003706
GTAINE	006766	R1	0X000001	TYPT3	007626	T12H	006234	T6E	003724
MESSAGE	010050	R10	001032	TYPTA	007574	T12J	006252	T6F	004014
MSG1	010052	R11	001034	T1	001246	T12K	006326	T7	004026
MSG10	010431	R12	001036	T1A	001256	T12L	006342	T7A	004032
MSG11	010457	R13	001040	T1B	001302	T12M	006352	T7B	004056
MSG11A	010546	R2	0X000002	T1C	001320	T12N	006370	T7C	004074
MSG12	010574	R3	0X000003	T1D	001336	T12P	006376	T8	004150
MSG13	010622	R4	0X000004	T1E	001354	T12R	006412	T8A	004154
MSG14	010650	R5	0X000005	T1F	004460	T13	006626	T8B	004206
MSG15	010676	SP	0X000006	T1GA	004474	T2	001432	T8C	004222
MSG16	010724	SR	001014	T1GB	004610	T2A	001446	T8D	004270
MSG18	010752	STACK	001000	T1GC	004620	T2B	001472	T9	004302
MSG19	011000	START	001046	T1GCC	004644	T2C	001510	T9A	004306
MSG2	010137	STRREW	007064	T1GD	004660	T2D	001536	T9B	004372
MSG2A	010163	STB	001072	T1GE	004676	T2E	001552	T9C	004406
MSG2E	010173	ST1	001122	T1GF	004714	T3	001630	T9D	004446
MSG2E	011027	ST1S	007044	T1GG	004772	T3A	001642	VALUE	007706
MSG21	011055	ST1SA	007050	T1GH	005006	T3B	001654	WATREW	007124
MSG27	011104	ST2	001134	T11	005112	T3C	001732	WBUF	011342
MSG28	011153	ST3	001160	T11A	005146	T3D	001750	WRINT	007026
MSG29	011223	SHREG	000176	T11B	005224	T3E	002014	ZERO	007714
MSG3	010177	TIME	007210	T11C	005242	T3F	002030	.	011344

ERRCRS DETECTED: 0
CEFALLT GLOBALS GENERATED: 0

*CZTMCE,CZTMDE/SOL=CZTMDE.P11
RLN=TIME: 6 11 .5 SECONDS
RLN=TIME RATIO: 143/10=7.9
CCRE LSEC: 11K (21 PAGES)