IDENTIFICATION

Product Code:	MAINDEC-09-D4CB-D
Product Name:	TC59 DRIVE FUNCTION TIMER
Date Revised:	October 9, 1968
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1.0 ABSTRACT

The TC59 Drive Function Timer (DFT) program is an aid in the hardware debugging and maintenance of the TC59 Magnetic Tape Control (MTC) and its associated magnetic tape drives. The program will operate on any configuration of 1 to 8, 45 or 75 in. per second 7 or 9 track drives.

Selected operations are initiated, timed and the times are then typed in decimal μs. There is no limit checking on times by the program, the decisions on the validity of times typed must be made by the person operating this test.

2.0 REQUIREMENTS

2.1 Equipment

PDP-9 or PDP-9L
TC59 Magnetic Tape Control
1 to 8 TU20 7 or 9 Track or Similar Magnetic Tape Transports

2.2 Storage

The program occupies most of memory from address 200 to 4000 and utilizes a Write Buffer area 10000 to 12525 and a Read Buffer area 12525 to 15252.

2.3 Preliminary Programs

The TC59 control test should run in its entirety before attempting to run the TC59 DFT program.

3.0 PROCEDURES

3.1 Loading Procedure

a. Place the ABS Binary tape in the paper tape reader
b. Set the ADDRESS to 17720
c. Press IO RESET
d. Press READ IN

3.2 Starting Procedure

3.2.1 Control Switch Settings -

a. Drive Selection - Any Configuration of 1 to 8 (7 or 9 track) drives may be selected VIA the Switch Register Bits 0 to 7 and 10 to 17. Each bit is a master bit for selection of a drive. When the switch is a 1, the drive is selected; when a 0, the drive is not selected. Switch 0 is Drive 0; Switch 1 is Drive 1, etc., until Switch 7 is Drive 7.

Any configuration except all 0s is valid. For the 9 track option, Switches 10 - 17 are used as master bits. SW10 is the master bit for Drive 0 and SW17 is the master bit for Drive 7. The SW=0 is 7; track=1 is 9 track.

b. Machine Cycle Time

AC SW0 = 1	PDP-9 1.0 μs cycle time
AC SW1 = 1	PDP-9 (Parity) 1.2 μs cycle time
AC SW2 = 1	PDP-9L 1.5 μs cycle time

3.2.2 Starting Address - The starting address of the TC59 DFT is 0200.

3.2.3 Program and/or Operator Action -

a. Set the ADDRESS to 0200
b. Set the AC Switches to select drives (Ref. 3.2.1 a.)
c. Press I/O RESET
d. Press START. The program will read the switches, test SW0 to SW7 for non-zero and halt at address 0204 if no drives were selected. Select drive per step b. and press CONTINUE. If a drive(s) was selected the program will halt at address 0211
e. Clear all AC Switches
f. Set AC SW0, 1, or 2 to indicate correct machine cycle time (Ref. 3.2.1.b)
g. Set AC SW4 as desired (Ref. 3.3.1)
h. Press CONTINUE; the program will rewind all drives to BOT, initiate selected operations, and type out accumulated times in decimal μs.

3.3 Operating Procedure

3.3.1 Operational Switch Settings -

The test only has 1 switch option
SW3=1 is halt at end of test
SW3=0 is repeat all tests on drives currently selected.

4.0 ERRORS

This program has no internal error detection and, therefore, no actual error typeouts or error halts. The final determination on the validity of function times typed out is left to the discretion of the operator. Inconsistencies in the times typed, however, should indicate specific failures in the control and/or drive. Initially, most of the function times typed by this program appeared to be accurate within .1% of the times expected on a 45 in per second TU20. There are two exceptions to this case:

FWD	DECELERATION
BKW	DECELERATION

4.1 Typical TU20 Function Times

The following typeout examples are typical of the function times expected from a 45 IPS TU20 timed on a standard (No Parity Option) PDP9. For the typeout examples used, Drive 0 is a 9 track drive.

Typeout		Reference Section	Comment
DRIVE 0			
TIME	FUNCTION		
181398	WRITE LOAD POINT DELAY	5.1	
003600	WRITE SHUT DOWN	5.2	
010724	WRITE START	5.3	
005340	SETTLE DOWN	5.4	Settle down is too long
DRIVE 3			
TIME	FUNCTION		
181391	WRITE LOAD POINT DELAY	5.1	
003600	WRITE SHUT DOWN	5.2	
010724	WRITE START	5.3	
004840	SETTLE DOWN	5.4	Settle down is too short
DRIVE 5			
TIME	FUNCTION		
182212	WRITE LOAD POINT DELAY	5.1	Count is 1 ms long
003600	WRITE SHUT DOWN	5.2	
011738	WRITE START	5.3	Count is also 1 ms long
005080	SETTLE DOWN	5.4	Settle down adjusted properly
DRIVE 0			
TIME	FUNCTION		
000075	WRITE TO ERASE HEAD	5.5	Type is not being erased
DRIVE 3			
TIME	FUNCTION		
012915	WRITE TO ERASE HEAD	5.5	
DRIVE 5			
TIME	FUNCTION		
013360	WRITE TO ERASE HEAD	5.5	The difference in times between 3 and 5 is due to the physical positions of the erase head. Both times are acceptable.
DRIVE 0			
TIME	FUNCTION		
014310	WRITE NONSTOP GAP	5.6	
006260	BKSP SHUT DOWN	5.7	
002700	READ SHUT DOWN	5.8	
DRIVE 3			
TIME	FUNCTION		
014310	WRITE NONSTOP GAP	5.6	
006260	BKSP SHUT DOWN	5.7	
002700	READ SHUT DOWN	5.8	

Typeout		Reference Section	Comment
DRIVE 5			
TIME	FUNCTION		
015210	WRITE NONSTOP GAP	5.6	Count is again 1 ms long
006260	BKSP SHUT DOWN	5.7	Count is again 1 ms long
003600	READ SHUT DOWN	5.8	Read shut down must be less than Write
DRIVE 0			
TIME	FUNCTION GAP CONSISTENCY		Since the read and write heads are physically closer together on a 9 track TU20, gap sizes will be smaller than on a 7 track driver.
017820	GAP 1		
015275	GAP 2		
014190	GAP 3		
020255	GAP 4	5.9	
022615	GAP 5		
025430	GAP 6		
027740	GAP 7		
030955	GAP 8		
DRIVE 3			
TIME	FUNCTION GAP CONSISTENCY		
021010	GAP 1		
019405	GAP 2		
018355	GAP 3		
027005	GAP 4		
032725	GAP 5	5.9	
038335	GAP 6		
044520	GAP 7		
049805	GAP 8		
DRIVE 5			
TIME	FUNCTION GAP CONSISTENCY		
022020	GAP 1		
019730	GAP 2		
019945	GAP 3		
028385	GAP 4	5.9	Since write start counts are incorrect on this drive, the gaps sizes will not agree with drive 3.
034730	GAP 5		
041065	GAP 6		
046635	GAP 7		
051485	GAP 8		
GAPS 1 >2 3 < 1 OR 2 8 >7 >6 >5 >4 >1 OR 2			
DRIVE 0			
TIME	FUNCTION		
010740	WRITE START		
DRIVE 3		5.3	These typeouts prove that tape does not drift backwards to BOT after an IO Power clear.
TIME	FUNCTION		
010745	WRITE START	5.11	

Typeout		Reference Section	Comment
DRIVE 5			
TIME	FUNCTION		
011740	WRITE START		
WRITE XIRG TIMES		5.10	
TIME			
096075	DRIVE 0		
096055	DRIVE 3		
096065	DRIVE 5		
READ FROM BOT DELAYS			
TIME			
086300	DRIVE 0	5.11	
086285	DRIVE 3		
086290	DRIVE 5		
LAST CHAR INPUT TO MTF			
TIME			
000946	DRIVE 0	5.12	
000947	DRIVE 3		
000944	DRIVE 5		
WRITE EOF TIMES			Again, for the nine track drive,
TIME		5.13	the read and write heads are
100455	DRIVE 0		closer together than the 7 track
103641	DRIVE 3		drive. The write EOF time will
103620	DRIVE 5		be somewhat less on the 9 track drive.
DRIVE 0			
TIME	FUNCTION		There is an apparent erase head
009411	EOR TO EOF SP TIME STATUS=000100		problem with Drive 0. In con-
002700	SPACE SHUT DOWN	5.15	junction with the write to erase head failure, it would appear that tape was not being saturated.
DRIVE 3			
TIME	FUNCTION		
106872	EOR TO EOF SP TIME STATUS=410100		
002700	SPACE SHUT DOWN	5.16	
DRIVE 5			
TIME	FUNCTION		
106548	EOR TO EOF SP TIME STATUS=410100		
002700	SPACE SHUT DOWN		
DRIVE 3			
TIME	FUNCTIONS AT 556 BPI		556 and 200 BOI tests are not
181380	WRITE LOAD POINT DELAY	5.1	made for 9 track drives. Note
020645	ONE INCH DATA TIME	5.14	that Write Load Point, Write
003600	WRITE SHUT DOWN	5.2	start (200) and Read shut down
006260	BKSP SHUT DOWN	5.7	are still 1 count long on drive 5.

Typeout		Reference Section	Comment
000956	LAST CHAR IN TO MTF	5.12	
002700	READ SHUT DOWN	5.8	
DRIVE 5			
TIME	FUNCTIONS AT 556 BPI		
182410	WRITE LOAD POINT DELAY		
022130	ONE INCH DATA TIME		
003600	WRITE SHUT DOWN		
006260	BKSP SHUT DOWN		
000962	LAST CHAR IN TO MTF		
003600	READ SHUT DOWN		
DRIVE 3			
TIME	FUNCTIONS AT 200 BPI		
010985	WRITE START	5.3	
022260	ONE INCH DATA TIME	5.14	
003600	WRITE SHUT DOWN	5.2	
006260	BKSP SHUT DOWN	5.7	
001165	LAST CHAR IN TO MTF	5.12	
002700	READ SHUT DOWN	5.8	
DRIVE 5			
TIME	FUNCTIONS AT 200 BPI		
011995	WRITE START		
022260	ONE INCH DATA TIME		
003600	WRITE SHUT DOWN		
006260	BKSP SHUT DOWN		
001118	LAST CHAR IN TO MTF		
002700	READ SHUT DOWN		
DRIVE 0			
TIME	FUNCTION		
002960	FWD ACCELERATION	5.17	
000834	FWD DECELERATION	5.18	
DRIVE 3			
TIME	FUNCTION		
002810	FWD ACCELERATION		
001158	FWD DECELERATION		
DRIVE 5			
TIME	FUNCTION		
003060	FWD ACCELERATION		
001050	FWD DECELERATION		
DRIVE 0			
TIME	FUNCTION		
000415	FWD DECELERATION (CALCULATED)	5.18	

Typeout		Reference Section	Comment
001803	BKW DECELERATION	5.19	
000857	BKW DECELERATION (CALCULATED)	5.19	

DRIVE 3

TIME	FUNCTION
001205	FWD DECELERATION (CALCULATED)
002004	BKW DECELERATION
001057	BKW DECELERATION (CALCULATED)

DRIVE

TIME	FUNCTION
001205	FWD DECELERATION (CALCULATED)
002004	BKW DECELERATION
001057	BKW DECELERATION (CALCULATED)

DRIVE 5

TIME	FUNCTION
000770	FWD DECELERATION (CALCULATED)
001932	BKW DECELERATION
000988	BKW DECELERATION (CALCULATED)

END OF TIMING

5.0 DESCRIPTION

The TC59 DFT program is a combined diagnostic testing control and tape unit functions that may interact with each other. The following paragraphs are descriptions of the functions timed (9.X.1), the program procedure to time these function (9.X.2), the drive and/or control failures that can effect the times expected (9.X.3), and the accuracy (or inaccuracies) within the timing loop for that particular test (9.X.4).

5.1 Write Load Point Delay

5.1.1 Purpose of Write Load Point Delay - The write from Load Point Delay is the time necessary for tape to move the Load Point Marker (LPM) from the Load Point Photocell to the Write Head (WH) and then approximately 6 in past the Write Head. The first record on tape must be written at least 6 in past the Load Point Marker.

5.1.2 Program Procedure to Time Write from Load Point - First, all drives selected are rewound to Load Point and the program generates an all 1's pattern in the write buffer area. From Load Point, a write, odd parity at 800 BPI command is executed. The Write command is loaded CA and WC are set up. The MTGO IOT is issued. Immediately after the MTGO IOT, the TC59 does the following:

a. Gets the Write from BOT count for the drive selected
b. Sets the Date Flag to request the first word be output
c. Starts Tape Motion on the selected drive
d. Starts to count out the Write from BOT delay utilizing the 800 BPI clock coming back from the selected drive
e. When the write from BOT delay is counted out, it starts to write the first word.
f. When the first word is written, the data flag is set and the second word is outputted from the computer to the TC59.

Meanwhile, the program is monitoring the Current Address contents waiting for it to indicate that the second word is output, and incrementing a loop count everytime that it finds the second word is not output.

The time from MTGO until the second word is output about equals the WRITE from BOT Delay Count.

5.1.3 Failures That May Effect WRITE BOT Delays -

a. TC59 MUC does not operate correctly.
b. Selected drive does not transmit the right count back to the TC59.
c. 800 BPI Clock is at the wrong frequency.
d. TC59 Timing Buffer operates and/or loads incorrectly.

5.1.4 Accuracy - The timing loop which loses 6 cycles because of 2 data breaks, is itself 7 cycles and could lose up to 11 cycles. The program cannot sense that the delay is over until the second word is output, and the time necessary to write the first word will be reflected in the time typed. Also, the MTGO IOT is not initially synchronized with the 800 BPI Clock coming from the selected drive and the time typed may have an additional variation of 1 clock.

5.2 Write Shut Down

5.2.1 Purpose of Write Shut down - The Write Shut Down count is necessary to keep tape moving after a written record so that the correct interrecord gap will exist on tape between records.

5.2.2 Program Procedure to Time Write Shut Down - The program times the Write Shut Down sequency from the same record used to time Write from Load Point Start. The Write Shut Down period timed by the program is that period of time from when the MTF goes to a 1 until the Control Unit becomes ready.

5.2.3 Failures that May Effect Write Shut Down

a. TC59 MUC does not operate correctly
b. Selected transport does not transmit the correct count to the TC59.
c. 800 BPI Clock is not at the correct frequency.
d. MTF sets at an incorrect time.

5.2.4 Accuracy of Write Shut Down - Write Shut Down is timed with a 20 cycle loop, the program waits for the MTF in a 5 cycle loop.

5.3 Write Start

5.3.1 Purpose of Write Start Count - The Write Start Count is the length of time necessary for tape to: start moving; come fully up to speed and move far enough at full speed to guarantee that a 3/4 in. interrecord gap will be written if the last operation was a read or space forward.

5.3.2 Program Procedure to Time Write Start - The program utilizes the same procedure to time Write Start as it did write from Load Point. The time from MTGO until the second word is output will reflect the Write Start Time.

5.3.3 Failures That May Effect Write Start -

a. TC59 MUC
b. Selected Drive transfers Incorrect Write Start Count
c. 800 BPI Clock in the selected drive is at incorrect frequency.

5.3.4 Accuracy of Write Start Timing - Timing loop loses 6 cycles because of 2 data breaks. The loop itself is 5 cycles. The MTGO IOT is not synchronized with the 800 BPI clock coming from the selected drive and the time typed may have an additional variation of 1 clock time.

5.4 Settle Down Delay

5.4.1 Purpose of Settle Down Delay - Tape does not actually stop moving until some period of time after the shut down counts are timed out. Also, after tape has been fully stopped, an additional period of time is necessary for the tape itself and motion hardware in the drive to "settle down" and become stable.

The Settle Down Delay is that period of time necessary for tape and the mechanical characteristics of the drive to become stable, so that the drive cannot be operated, Start/Stop, at a frequency where it is mechanically resonant.

5.4.2 Program Procedure to Time Settle Down - Settle down is started when any of the Shut Down Counts are completed and the drive is actually told by the control to stop tape motion. This is also the point at which the control unit becomes ready. The tape unit or drive is "Not Ready", then, until the settle down delay is over.

The program times settle down from the same record that is used to time Write Start, after Write Start is timed, the program waits for Control Ready and then monitors and times TAPE UNIT NOT READY until tape unit is ready.

5.4.3 Failures That Can Effect Settle Down

a. Settle Down does not fire (time typed will be 000020)
b. Settle Down not adjusted to the correct time.

5.4.4 Accuracy of timing Settle Down - The program units for Control Ready in a 5 cycle loop. The program monitors Settle Down in a 20 cycle loop.

5.5 Write to Erase Head

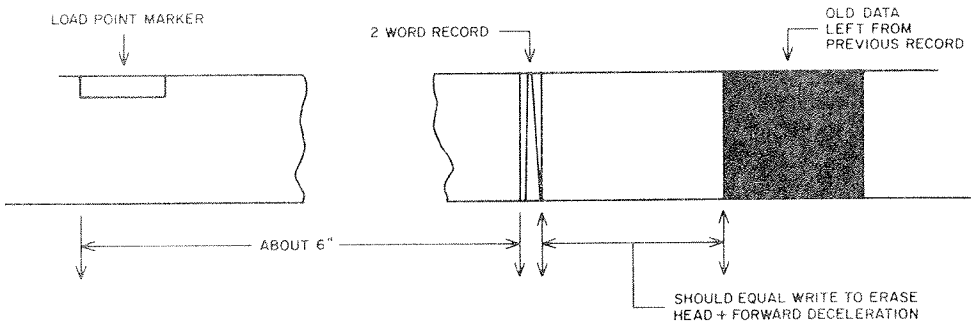
5.5.1 Purpose of Erase Head - The purpose of the erase head is to guarantee that tape past the last block written on tape is the same flux state (Write Reset) of the write heads. This serves several purposes:

a. If the tape is later recorded on from this point, the drive used at that time may have different stop characteristics and it would be possible to leave old data recorded in the interrecord gap.
b. When recording at the higher densities, the erase head removes all the old data recorded on tape and the process of recording new data does not have to also change the old flux pattern on tape.
c. Track alignment and Head width from drive to drive is not identical, and if not for the erase head, it would be possible for some of the edge areas of old data tracks to be left on tape when changing tape from drive to drive and re-writing.

5.5.2 Program Procedure for timing Write to Erase Head - First, a fairly long record of all 1s is recorded from Load Point. (This program utilizes the same record used to time Write Load Point Count). The drive is rewound to Load Point and the program sets up to write a 3 word record of all 1s and starts the Write operation. When the third word is output, indicating that the first two words are written, the program issues a CAF (IO Power Clr) IOT which stops all data transfers to and within the TC59 and causes the drive to Shut Down. Tape on the selected drive will still coast for the forward deceleration time of the drive and the Erase Head should still be erasing tape.

The tape is again rewound to Load Point and a Read operation is initiated. The MTF will set to a 1 in the gap following the 2 word record. At this point, the program forces tape to go non-stop (MTAF/MTGO) and times until the first data word that the erase head did not erase is input. The time typed should about equal the length of time it takes for tape to move the distance from the Erase Head to the Write Head at full acceleration.

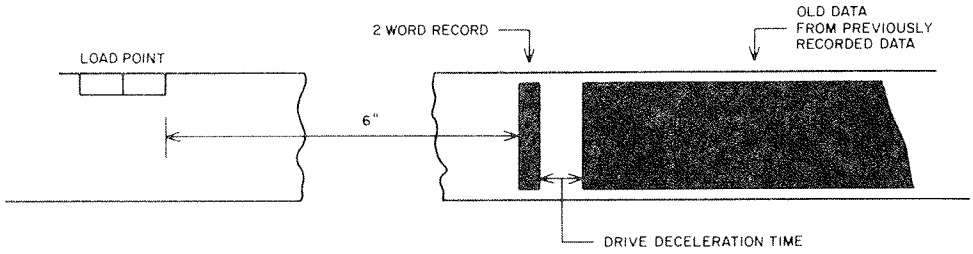
If tape is developed it should appear as follows:



5.5.3 Failures that can effect Write to Erase Head Time -

a. No current through the Erase Head
b. Not enough current through the Erase Head to fully saturate.
c. Erase Head too far from the tape surface
d. Tape speed at full acceleration is incorrect
e. Deceleration time is incorrect
f. Last character input to MTF time is incorrect

For failures a, b, and c the time typed will be a minimal number, probably less than 100 μs, and tape when developed would appear as follows:



5.5.4 Accuracy of Write to Erase Head Timing - Program is not synchronized with the 800 BPI clock from the selected drive. MTF time could vary by 1 clock. The Timing loop is itself 5 cycles. 12 to 17 cycles could be lost sensing the MTF and to execute MTAF/MTGO. Since the erase head position is adjustable, the Write to Erase Head time from drive to drive can vary up to 15%, but should remain fairly constant for the same drive from pass to pass.

5.6 Write Non-stop Gap

5.6.1 Purpose of Write Non-stop Gap - The Write Non-stop Gap Time, is the accumulation of Write Shut Down and Write Start times. The total of these two times should be great enough to guarantee that the interrecord gap will be greater than 3/4 in when writing Start/Stop.

5.6.2 Program Procedure for Timing Write Non-stop Gap - First, the drive is rewound to Load Point, and a record is written. When the MTF goes to 1, indicating the first record has been written, the program forces tape to go non-stop and write a second record. The time typed is the period from the MTF for the first record until the second word is output for the second record. (see "Write Load Point" Section 5.1 and "Write Start", Section 5.3)

5.6.3 Failures That Can Effect Write Non-Stop GAP

a. Write Shut Down incorrect) (See Section 5.2.3)
b. Write Start incorrect (see Section 5.3.3)

5.6.4 Accuracy of Write Non-Stop Gap Timing - Sensing MTF=1 and MTAF/MTGO sequence, including settings CA and WC, could cause 2 cycles to be lost in the timing loop. The timing loop itself is 5 cycles. There are 6 cycles lost due to 2 data breaks.

5.7 Backspace Shut Down

5.7.1 Purpose of Backspace Shut Down - Backspace Shut Down is the length of time necessary to guarantee that if a Write operation is started forward after a backspace, tape will be positioned such that all previous data is in front of the Write Head and will be erased.

Backspace Shut Down must be less than Write Start. This is to guarantee that inter-record gaps will be larger if a backspace/rewrite operation is initiated.

5.7.2 Program Procedure for Timing Backspace Shut Down - The program writes a record, issues a backspace command to the control and drive setting the -1 for 1 record. When the MTF is set to 1 indicating backspace complete, the program times from that point until the control unit becomes ready.

5.7.3 Failures That Can Effect Backspace Shut Down Time -

a. TC59 MUC operates incorrectly
b. 800 BPI Clock is the wrong frequency
c. Selected drive transmits the wrong delay count to the TC59.

5.7.4 Accuracy of Backspace Shut Down Timing - Two cycles could be lost sensing for MTF=1. The timing loop for Backspace Shut Down is 20 cycles.

5.8 Read Shut Down

5.8.1 Purpose of Read Shut Down - The Read Shut Down time is to move data past the Read Head far enough for the tape to be fully accelerated if a Read is followed by a backspace.

Read Shut Down must also be less than Write Shut Down to guarantee that the Erase Head and Write Head will stop in the correct areas to fully erase tape if a Read is followed by a Write. Also, if a Read is followed by a Write, the interrecord gap must still be at least 3/4 in.

5.8.2 Failures That May Effect Read Shut Down

a. MUC not operating correctly
b. Drive transfer incorrect count to TC59 for Read Shut Down
c. 800 BPI Clock from selected drive is at the wrong frequency.

5.8.3 Accuracy of Read Shut Down Timing - Two cycles may be lost during sensing of the MTF. The Read Shut Down timing loop is a 20 cycle loop.

5.9 Gap Consistency

Since none of the gap lines typed will (or should) be the same, the term Gap Consistency may initially appear to be a mis-nomer. However, it is the gap size relationship that must be consistent.

5.9.1 Purpose of Gap Consistency - For operation, the interrecord gaps on tape must be at least 3/4 in, to guarantee that data may be written on one drive and Read on another drive with completely different stop/start characteristics. The minimum gap size of 3/4 in. is generated when a Read operation is followed by a Write. All of the other gaps should be correspondingly larger depending on how they were written.

5.9.2 Program Procedure for Timing Gap Consistency

a. A total of 10 records are written on tape (from BOT) utilizing different programmed sequences to generate the interrecord gaps.
b. The drive is rewound to load point and a Read operation is initiated. As the MTF is set at each end of record, the Read command is continued non-stop and the program times until the first word of the next record is input.
c. At the end of the 10th record, the accumulated Gap Times are typed in decimal μs. There are a total of 8 interrecord gaps that are timed between the 10 records and they are generated as follows:

GAP NUMBER	WRITE PROCEDURE	GAP TIME RELATIONSHIP
1	NONSTOP WRITE TO WRITE	WRITE SHUT DOWN + WRITE START + TAPE MOTION TIME FROM WRITE HEAD TO READ HEAD
2	START/STOP WRITE TO WRITE	GAP 1 + FORWARD DECELERATION - FORWARD ACCELERATION
3	START/STOP READ TO WRITE	3/4 IN TAPE GAP 2 - (WRITE SHUT DOWN - READ SHUT DOWN)
4	START/STOP A - WRITE B - BACKSPACE C - WRITE	NOT LESS THAN TAPE MOTION TIME GAP 2 + FROM WRITE TO READ HEAD
5	START/STOP A - WRITE B - BACKSPACE C - WRITE D - REPEAT FROM "B" (BACKSPACE - WRITE TWICE)	NOT LESS THAN GAP 4 + TAPE MOTION TIME FROM WRITE TO READ HEAD.

GAP NUMBER	WRITE PROCEDURE	GAP TIME RELATIONSHIP
6	SEE GAP 5 REPEAT B AND C THREE TIMES	NOT LESS THAN GAP 5 + TAPE MOTION TIME FROM WRITE TO READ HEAD.
7	SEE GAP 5 REPEAT B AND C FOUR TIMES	NOT LESS THAN GAP 6 + TAPE MOTION TIME FROM WRITE TO READ HEAD
8	SEE GAP 5 REPEAT B AND C FIVE TIMES	NOT LESS THAN GAP 7 + TAPE MOTION TIME FROM WRITE TO READ HEAD.

5.9.3 Failures That Can Effect Gap Consistency

a. Write Start Count incorrect
   GAPS 1 to 8
b. Write Shut Down incorrect
   Excludes GAP 3
   (See 5.2, 5.6)
c. Forward Acceleration incorrect
   Gaps 2 to 8
   (See 5.17)
d. Backward Deceleration incorrect
   Gaps 4 to 8
   (See 5.19.3)
e. Read Shut Down incorrect
   GAP 3
   (See 5.8)
f. Backspace Shut Down Incorrect
   GAPS 4 to 8
   (See 5.7)

5.9.4 Accuracy of the Gap Consistency Timing - 2 Cycles may be lost for sensing the MTF at the start of each gap.

The 800 BPI Clock is not synchronized with the data being input and the times may vary by 1 clock pulse.

The timing loop is itself cycles.

5.10 Write With Extended Interrecord Gap

5.10.1 Purpose of Extended Interrecord Gap - The Write with extended interrecord gap is a function somewhat peculiar to the TC59 Mag Tape Control. This function allows recovery from a write error to consist of issuing only 2 commands. (Space Reverse, Write with XIRG) Instead of the normal Write Start Delay necessary to generate a 3/4 inch gap, the XIRG delay is long enough to erase at least 3 in of tape more than the normal gap.

The result is that the same data may be written on an entirely different area on tape and with any erroneous data being erased.

5.10.2 Procedure for Timing Write with Extended Interrecord Gap - The start process for Write with extended gap is the same as a normal write except that command register bit 5 is a 1. (See 5.1.2, 5.3.2)

That period of time from MTGO until the second data word is output constitutes the XIRG delay count.

5.10.3 Failures That May Effect Write With XIRG

a. Control improperly decodes CM5.
b. All failures that may effect Write Start or Write from BOT (5.1 and 5.3)

5.10.4 Accuracy of Write XIRG Timing - The processor is not synchronized with the 800 BPI clock and the time typed may vary by 1 clock time.

The program utilizes a 5 cycle loop to test for the second data work out.

6 cycles may be lost due to 2 data breaks.

5.11 Read From BOT Delays

5.11.1 Purpose of Read from BOT Delay - The BOT wait count for a Read operation is that period of time necessary to move the Load Point Marker from its sensing photocell to the Read Head and then approximately 3 in past the Read Head.

Note that the first record written on tape is written at lease 6 in past the load point. For compatibility purposes, the tape control must be capable of reading the first record from load point even though its start may be less than the 6 in written by the TC59.

5.11.2 Program Procedure for Timing Read From BOT - First, all drives are rewound to BOT. Each drive is moved forward until the BOT status goes away (the drive is no longer at load point). Then an IO PWR Clear (CAF) is issued causing all tape motion and data transfer to cease. Then, an extra long record (approximately 10 in) is written and its Write Start delay timed and typed as an indication that tape did not drift backwards into load position again. (These are the Write Start Typeouts that precede the Write XIRG Times.)

This extra long record covers that area of tape that would be skipped by a normal Write from BOT.

All drives are again rewound to BOT and a read command is initiated. The program times from this MTGO until the first data word is input. This period of time constitutes the Read from BOT Delay. The operation is timed on all selected drives and the accumulated times are typed in decimal microseconds.

5.11.3 Failures That May Effect Read From BOT The drive transfers the incorrect count to the TC59. By this point it should be known if the MUC or 800 BPI Clock are operating incorrectly.

5.11.4 Accuracy of the Read from BOT Timing - A full word has to be assembled before the first word is input.

The processor and data being read from tape are not synchronized with the 800 BPI Clock and the time typed may vary by 1 clock pulse.

The program loop for sensing the first data word input is itself 5 cycles.

5.12 Last Character Input to MTF

5.12.1 Purpose of Last Character Input to MTF - Last character in to MTF is that period of time for the TC59 to sense missing 3 data characters (EOR) on tape and to make one pass through the MUC and set the MTF. This time is typed for 800 BPI, and if the drive is 7 track it is also typed for 200 and 556 BPI.

5.12.2 Program Procedure for Timing Last Character to MTF - A record with a known word length is written on tape. The program then backspaces and reads until the last data word is input and then waits in a 3 cycle loop until the program is interrupted. The backspace/read operation is repeated three times so that the time typed is an average of the 3 tries and some of the inaccuracies in the procedure are compensated for.

5.12.3 Failures That May Effect Last Characteristics to MTF

a. Sensing of EOR improper
b. MUC not operating correctly
c. 800 BPI Clock at the incorrect frequency

5.12.4 Accuracy of Timing Last Character to MTF - The data being input and the processor are not synchronized with either the 800 and 556 BPI Clocks in the drive, and the 800 and 556 BPI Clocks are themselves not synchronized. The times for 800 and 200 BPI may vary up to 1 800 BPI Clock. The time for 556 BPI may vary as much as 1 556 BPI Clock with an additional variation of 1 800 BPI Clock.

Of the three times, 200 BPI will be the most accurate.

The program counts in a 3 cycle loop while waiting for MTF.

A fudge factor of 18 cycles is added to the accumulated times to compensate for data breaks and sensing that that last data word is input.

5.13 Write EOF Time

5.13.1 Purpose of Write EOF Time - The Write EOF Time is to erase approximately 3 in of tape, write the EOF mark and its LPCC and move the marks from the Write to the Read Head and detect them.

5.13.2 Program Procedure for Timing Write EOF - A write EOF command is initiated. The program then times from MTGO until it is interrupted by the write EOF Status.

5.13.3 Failures That May Effect Write EOF Times

a. Incorrect count transfer from the drive to the TC59
b. 800 BPI Clock at the wrong frequency

5.13.4 Accuracy of Write EOF Timing - The processor is not synchronized with the 800 BPI Clock and the time typed may vary by 1 to 3 Clock times.

The time typed should approximate write extended interrecord gap, plus tape motion time from the Write Head to the Read Head, plus approximately last character to MTF time.

5.14 One Inch Data Time

5.14.1 Purpose of One Inch Data Timing - The program times the data output fransfer of 556 and 200 BPI to prove that the control selects the correct transfer times for those densities. Also, to prove that the 556 BPI clock is operating at the correct frequency.

5.14.2 Program Procedure to Time One Inch Data - The program writes records at 556 and 200 BPI that corresponds to approximately 1 in. of data on tape. Since the PDP-9 word length is an increment of 3 characters, the number of characters written do not correspond to exactly 200 or 556

The record written to time 556 BPI is actually 564 characters in length. The record written to time 200 BPI is actually 207 characters in length. In both cases, the program actually times from the point that the second word in the record is output (see paragraph 5.1) until the last word is output. Six character times out of the records written are not included in the timing process. The number of characters actually timed are 558 for 556 BPI and 201 for 200 BPI.

5.14.3 Failures That Can Effect One Inch Data Time

a. 556 or 800 BPI Clocks at incorrect frequency Tape Control does not select the correct clock frequency.
b. Character counter and/or writing set data flag operate incorrectly.

5.14.4 Accuracy of One Inch Data Timing - The program is not exactly synchronized with the 800 or 556 BPI clocks. The program waits for second data word output in a 5 cycle loop and also waits timing for last word output in a 5 cycle loop. The program adds in a factor to compensate for the number of timing cycles not counted for the sequence of data breaks made.

5.15 EOR to EOF Space Time STATUS = 410100

5.15.1 Purpose of EOR to EOF Space Time - This is for tape to move non-stop from the end of a record to an EOF mark following the record. The procedure used to time this operation is actually a test of ERASE and WRITE Head polarities.

5.15.2 Procedure to Time EOR to EOF Space

a. All drives are rewound to BOT
b. A three word record is written
c. An EOF is written and timed (see 5.14)
d. All drives are again rewound to BOT
e. The three word record is re-written
f. Tape is backspaced over the three word record
g. Tape is spaced forward 2 records, when the WC indicates the first record has been spaced over, interrupts are enabled and the program times until an interrupt is received that should indicate an EOF.

5.15.3 Failures that can Effect EOR to EOF Space Time

a. Status does not = 410100
   Erase head wrong polarity
   Erase head current less than enough to fully saturate the tape
   One or more of the write tracks at a polarity different from the 0 state polarity of the other heads.
   Write Reset fails
   One or more sensitive read amplifiers
   Write EOF does not actually write EOF
b. Status does = 410100
   Write EOF time is incorrect (see 5.14)

5.15.4 Accuracy of EOR to EOF Space Time - The processor is not synchronized with the 800 BPI clock and the time may vary by 1 to three clock pulses for the same drive.

5.16 Space Shut Down

Same as a Read Shut Down; See 5.8

5.17 Forward Acceleration

5.17.1 Purpose of Forward Acceleration - This is the amount of time necessary for tape to start moving from a complete stop and for it to move far enough to input 1 data word.

5.17.2 Program Procedure to Time FWD Acceleration

a. A fairly long record is written on tape
b. Tape is backspaced over the record
c. A read forward is begun and when the first word of data is input, an IO PWR Clear (CAF) is issued, stopping all tape motion and data transfer
d. Wait for settle down
e. A new read operation is started, and the program times from MTGO to first data word input.

5.17.3 Failures that can Effect FWD Acceleration -

a. All mechanical forward start adjustments
b. Drive Settle Down
c. Read start count cannot be timed, but a failure that would cause this count to exceed normal tape acceleration time would appear here.

5.17.4 Accuracy of FWD ACCELERATION Timing - The program can only sense a full word input; this will add a small amount of time. Tape may have stopped any place within one bit time (800 BPI Clock) of the first character read. This could cause the time typed to vary by 1 bit time.

5.18 Forward Deceleration

5.18.1 Purpose of Forward Deceleration - After the drive has actually been told by the control to stop, tape will keep moving in the forward direction for some period of time. (i.e., on a TU20 until the pinch roller actually leaves the surface of the tape). This period of time is the forward deceleration time.

5.18.2 Program Procedure for Timing Forward Deceleration - This program uses two methods to determine the forward deceleration time. The results of the two methods can be distinguished as follows:

FWD DECELERATION (5.18.1)
FWD DECELERATION (CALCULATED) (5.18.2b)

a. FWD DECELERATION - The program writes a fairly long record on tape. Then backspaces over the record reads and times from the first word input until the MTF is set at end of record. This time is saved. Then forward acceleration is timed (utilizing the same record). Once FWD acceleration has been determined, the program again times until the MTF is set to 1 at end of record. This time is then subtracted from the original first word to MTF. The difference between the two times should reflect the amount of data missed by FWD deceleration. The difference between the two times should reflect the amount of data missed by the forward deceleration time of the drive.

b. FWD DECELERATION (CALCULATED) - The second method the program uses to determine the forward deceleration time of a particular drive is as follows:

(1) GAP 1 of the gap consistency test was written non-stop, and tape should have been moving at full speed for the accumulated Write Shut Down and Write start times.

(2) GAP 2 of the gap consistency test was written start/stop. Tape moves at full speed for Write Shut Down, continues on at full speed for the forward deceleration time of the drive, and then stops. The drive is told to the forward acceleration time, comes almost fully up to speed at this point, accelerates to full speed within a short period of time and then moves at full speed for the rest of the write start time.

c. FWD DECELERATION (CALCULATED) is determined by subtracting forward deceleration from GAP 1 and then subtracting that result from GAP 2. The result of these two subtractions should reflect the forward deceleration of the drive.

5.18.3 Failures that can Effect Forward Deceleration - Most failures reflected in the forward deceleration time will be due to mechanical adjustments in the drive. Since both methods used to determine forward deceleration rely on the forward acceleration, failures in forward acceleration will effect the deceleration time.

The more obvious indications are as follows:

a. If tape does not come to full speed within a short period of time, the relationship between GAP 1 and GAP 2 will be such that the result of the two subtractions (See 5.18.2 b) will underflow (become a negative number) and be typed in the order of 200 ms.

b. Allow the timer program to make two or more passes. The times typed should remain fairly constant from pass to pass. Large variations in times measured will indicate tape speed fluctuation.

c. During the timing process described in 5.18.2 a, it is possible for tape to determine forward acceleration, and then drop out of speed to the point where end of record is seen, causing a premature MTF. If this failure occurs, the time typed for FORWARD DECELERATION will be in the magnitude of time that it takes for tape to move 5 in.

5.18.4 Accuracy of Forward Deceleration - Of the times measured by this program, forward deceleration is the least accurate measurement; the inaccuracies are mainly due to the fact that tape does not accelerate to full speed immediately. This may cause the times typed to be 20% less than actually expected, but should not be less than 50% of the times expected.

5.19 Backward Deceleration

5.19.1 Purpose of Backward Deceleration - For a short period of time after the tape drive is actually stopped, tape continues moving in the reverse direction. This period of time is backward deceleration time.

5.19.2 Program Procedure for Timing Backward Deceleration -

a. The program writes a fairly long record at even parity, writes several words of zeros, and then a few more words of ones.
b. A space reverse is executed; the tape control finds the false end of record at the few words of zeros and the Bad Tape Status is set when the all 1s pattern is re-entered. At this point, the program issues an I/O power clear (CAF) IOT, clearing out the DEL process in the tape control and causing the tape drive to start de-acceleration.

When the drive again becomes ready after settle down, the program initiates a read command and waits for the first word to be input indicating forward acceleration is completed. The program then times from the first word input until the MTF is set at the false end of record. This time is typed as BKWD DECELERATION. The program then subtracts LAST CHARACTER TO MTF time and types this result as, BKWD DECELERATION (CALCULATED)

5.19.3 Failures That Can Effect BKWD DECELERATION - Most discrepancies in the BKWD DECELERATION times measured will be due to mechanical adjustments in the drive. The BKWD DECELERATION time measured can be effected by forward acceleration.

5.19.4 Accuracy of BKWD DECELERATION Timing - The BKWD DECELERATION Timing appeared to be accurate within 10% of the time expected on a 45IPS TU20.

```
                        .TITLE DRVNOS
                        .ABS
                        /TC59 DRIVE FUNCTION TIMER
                        /WILL RUN ON PDP-9, PDP-9L
                        /IOT DEFINITIONS
007552                  MTRS=707552
007512                  MTRC=707512
007541                  MTSF=707541
007521                  MTCR=707521
007501                  MTTR=707501
007526                  MTLC=707526
007504                  MTGO=707504
007522                  MTAF=707522
007524                  LCM=707524
002525                  MLENTH=2525
004000                  WRBUF=4000
000037                  CALOC=35
000032                  WCLOC=32
000274                  WC555=274               /WORDS TO TIME 555
000145                  WC200=145               /WORDS TO TIME 200
000160                  FUG555=160              /FUDGE FACTOR FOR DATA BREAKS
000050                  FUG200=50               /BREAKS STEAL 3 CYCLES FROM LOOP COUNT
700406                  TLS=700406
700401                  TSF=700401
700402                  TCF=700402
                        /
                        .EJECT
```

```
/FIRST SERIES OF TESTS TIMES THE FOLLOWING
/WRITE DELAY FROM LOAD POINT
/WRITE SHUT DOWN AT EOF TO CORREADY
/DRIVE SETTLE DOWN DELAY COR TO TOF
/WRITE START DELAY NOT AT LOAD POINT
/
/TC59 DRIVE DIAGNOSTIC
/FOR USE WITH TU70 OR SIMILAR TRACK DRIVE
/HOPEFULLY WILL ALSO HANDLE 75 IPS DRIVES
/
/START AT ADDRESS 200
/SWITCHES 0 TO 7 MASTER BIT FOR SELECTION
/SW0 = DRIVE 0 = 1 SELECTED = 0 NOT SELECTED
/SW1 = DRIVE 1       DITTO          DITTO
/SW2 = DRIVE 2         ETC
/SW7 = DRIVE 7
/PROGRAM WILL HALT AFTER SELECT
/
/AFTER HALT SET SWITCHES FOR PROPER MACHINE BEING USED
/PRESS CONTINUE
/
/TIMING ASSUMPTIONS
/PDP-8 1.0 USEC                  AC SW0=1
/PDP-8 WITH PARITY 1.2 USEC      AC SW1=1
/PDP-8L 1.5 USEC                 AC SW2=1
/THE IOT INSTRUCTIONS TAKE EXACTLY 4 MACHINE CYCLES
/TO SELECT 7 OR 9 TRACK
/BITS 10 TO 17 ARE MASTER BIT SELECTS
/THE SWITCH A 4 IS 7 TRACK DRV
/THE SWITCH A 1 IS 9 TRACK
/SW10 IS MASTER BIT FOR DRV 0
/SW11 FOR DRIV1 ETC SW7 IS FOR DRV 7
/ANY COMBINATION OF 7 OR 9 TRACK DRVS IS VALID
/
            .EJECT
```

```
00200                           .LOC 240
                                /
00240   750004  DRVTFS  LAS                     /GET SWITCHES
00241   503473          AND (776000             /MASK DRIVES
00242   740200          SZA                     /SHOULD SELECT AT LEAST 1
00243   600206          JMP .+3                 /OK
00244   740040          HLT                     /HLT NO DRIVES SELECTED
00245   600200          JMP DRVTFS                      /TRY AGAIN
00246   750004          LAS
00247   503474          AND (776377
00250   042752          DAC MSBITS                      /SAVE DRIVES SELECTED
00251   740040          HLT                     /WAIT FOR MACHINE TYPE
00252   750004          LAS
00253   042753          DAC MACHPO              /SAVE MACHINE TYPE (CYCLE TIME)
00254   777777          LAW -1
00255   041673          DAC TYPFLG                      /SET TYPE TIME INDICATOR
                        /
                        /
                        /START WITH FIRST DRIVE SELECTED AND REWIND
                        /
00256   102615          JMS SETPTR
00257   102713          JMS RSFDRV                      /SET SELECTION TO FIRST DRIVE
00260   103004          JMS STRREW                      /START REWIND COMMAND
00261   102730          JMS CHGDRV                      /SELECT NEXT SKP IF ALL
00262   600260          JMP .-2
00263   103017          JMS WATREW                      /WAIT FOR FINISH REWIND
00264   102730          JMS CHGDRV                      /SELECT NEXT DRIVE
00265   600263          JMP .-2                 /WAIT FOR IT TO FINISH
                        /
00266   101435  TIMTS1  JMS ST1                 /STORE ALL ONES
00267   141425          DZM LPTIME              /CLEAR TIMES
00270   141426          DZM SDTIME              /TO BE ACCUMULATED
00271   141427          DZM TRTIME
00272   141430          DZM STRTIM
00273   102776          JMS WRINT /INITIALIZE WC AND CA
00274   203475          LAC (44600                      /WRITE 800 BPI ENI
00275   342750          TAD FDRIVE              /+ DRIVE BEING TESTED
00276   707326          MILC                    /LOAD COMMAND
00277   707304          MIGO                    /GO
00300   200433  TIMLP1  LAC CALOC               /DOES CA INDICATE
00301   543476          SAD (WRBUF+1            /THAT 2ND WORD IS TAKEN
00302   600305          JMP .+3                 /YES
00303   441425          ISZ LPTIME              /+1 TO PASSES THRU LOOP
00304   600300          JMP TIMLP1              /TRY AGAIN
00305   203477          LAC (JMP TIMLP2
00306   040001          DAC 1                   /NOW WAIT FOR MIF
00307   700042          ION                     /AND TIME CUREADY
00310   600310          JMP .
                        /
                                .EJECT
```

```
00251  203503          TIMLP2  LAC (-3                 /2 A
00252  040010                  DAC 10                  /2 TOTAL
00253  600254                  JMP .+1                 /1
00254  440010                  ISZ 10                  /6 OF 20 CYCLES
00255  600254                  JMP .-1                 /2 IN WAIT FOR
00256  441426                  ISZ SUTIME              /2 CONSTANT LOOP
00257  707321                  MICR                    /4 IN TIMING
00260  600251                  JMP TIMLP2              /1 WRITE SHUT DOWN
00261  707301                  MITR
00262  600261                  JMP .-1
00263  102776                  JMS WRINT /INITIALIZE WC AND CA
00264  203475                  LAC (44600
00265  342750                  TAD DRIVE
00266  707526                  MILC
00267  707304                  MTGO
                       /
                       /TIME WRITE START DELAY NOT AT LOAD POINT
00270  200033          TIMLP3  LAC CALOC
00271  543476                  SAD (WRBUF+1
00272  600275                  JMP .+3
00273  441433                  ISZ STRTIM
00274  600277                  JMP TIMLP3
00275  707321                  MICR
00276  600275                  JMP .-1
                       /
                       /TIME DRIVE SETTLE DOWN DELAY
00277  203504          TIMLP4  LAC (-4
00300  040010                  DAC 10
00301  600302                  JMP .+1
00302  440010                  ISZ 10
00303  600302                  JMP .-1
00304  441427                  ISZ TRTIME
00305  707301                  MITR
00306  600277                  JMP TIMLP4
                       /
                       /TYPE OUT ACCUMULATED TIMES FOR THIS DRIVE
                       /FIRST WRITE FROM LOAD POINT TIME
00307  103425                  JMS TYPDRV
00310  201425                  LAC LPTIME              /WRITE FROM LOAD POINT
00311  101616                  JMS TYPTIM              /AC=NUM LOOPS
00312  000007                      7                   /7 CYCLES PER LOOP
00313  003036                      TEXT1               /FUNCTION TEXT
                       /
                       /NOW WRITE SHUT DOWN TIME
00314  201426                  LAC SUTIME
00315  101616                  JMS TYPTIM              /AC=NUMBER OF LOOPS
00316  000024                      24                  /20 CYCLES PER LOOP
00317  003053                      TEXT2               /WRITE SHUT DOWN TEXT
                       /
                               .EJECT
```

```
                        /NOW TYPE WRITE START TIME
                                LAC STRTIM
                                JMS TYPTIM              /AC=NUMBER OF LOOPS
                                    7                   /7 CYCLES PER LOOP
                                    TEXT3               /WRITE START TIME
                        /
                        /TYPE DRIVE SETTLE DOWN TIME
                                LAC TRTIME
                                JMS TYPTIM              /AC=NUMBER OF LOOPS
                                    24                  /20 CYCLES PER LOOP
                                    TEXT4
                                JMS CHGDRV
                                JMP TIMTS1
                        /
                        /NOW TIME DISTANCE BETWEEN WRITE AND ERASE HEAD
                                JMS STPREW
                                JMS CHGDRV
                                JMP .-2
                                JMS WATREW
                                JMS CHGDRV
                                JMP .-2
                        /
                        /
                        /START A 3 WORD RECORD FROM LOAD POINT
                        /WHEN THIRD WORD GOES OUT PWR CLR (PANIC STOP)
                        /DRIVE STOPS WRITING TIME FROM CAF TO OLD DATA=HEAD DIST
                        TIMTS2  LAC -3                  /3 INCR BLOCK WAS
                                DAC WCLOC /PREVIOUSLY RECORDED
                                LAC (WRBUF-1            /NOW WILL WRITE A
                                DAC CALOC               /THREE WORD BLOCK
                                LAC (44000              /AND PWR CLR OFFONF
                                TAD FDRIVE
                                MIIC                    /IT IS COMPLETLY WRITTEN
                                MIGO
                                LAC WCLOC               /WAIT FOR WC
                                SZA                     /TO GO TO 0
                                JMP .-2                 /INDICATING DATA IS RECORDED
                                CAF                     /STOP WRITE TURN OFF EVERTHING
                                JMS STPREW
                                JMS CHGDRV
                                JMP TIMTS2
                                JMS WATREW
                                JMS CHGDRV
                                JMP .-2
                        /
                                .EJECT
```

```
                                /NOW THAT ALL DRIVES ARE AT LOAD POINT READ OVER PARTIAL BLOCK
007362  777777          TIMT2A  LAW -1
007363  004032                  DAC WCLOC
007364  203501                  LAC (WCBUF-1
007365  040033                  DAC CALOC
007366  203502                  LAC (42600
007367  342754                  TAD DRIVE
007370  707326                  MTLC
007371  707304                  MTLO
007372  141425                  DZM LPTIME
007373  203503                  LAC (JMP TIMLP5
007374  040001                  DAC 1
007375  700042                  IOF
007376  600376                  JMP .
007377  707322          TIMLP5  MTAF
010400  707304                  MTLO
010401  750040                  CLA
010402  441425                  ISZ LPTIME
010403  540032                  SAD WCLOC
010404  600442                  JMP .-2
010405  703340                  CAF
010406  103025                  JMS TYPDRV
010407  201425                  LAC LPTIME
010410  101616                  JMS TYPTIM
010411  000005                      5
010412  003142                      TEXT5
010413  102736                  JMS CHGDRV
010414  000362                  JMP TIMT2A
010415  103004                  JMS SETREW
010416  102736                  JMS CHGDRV
010417  600415                  JMP .-2
010420  103717                  JMS WATREW
010421  102736                  JMS CHGDRV
010422  600422                  JMP .-2
/
                                .EJECT
```

```
                        /ALL DRIVES ARE AT LOAD POINT AGAIN
                        /WRITE ONE RECORD
                        /FOLLOW WITH ONE RECORD NONSTOP
                        /FOLLOWED WITH ONE RECORD START STOP
                        /FOLLOWED BY WRITE BACKSPACE READ WRITE
                        /FOLLOWED BY WRITE BACK WRITE
                        /THE FOLLOWING OPERATIONS ARE TIMED DURING WRITE PASS
                        /EOR TO FIRST WORD WRITTEN NONSTOP
                        /BACKSPACE SHUTDOWN AND READ SHUTDOWN
                        /
00423   101435  TIMTS3  JMS ST1             /STORE ONES IN BUFFER
00424   102776          JMS WRINT /INITIALIZE WC AND CA
00425   203475          LAC (44600          /WRITE 800 BNI
00426   342750          TAD FDRIVE          /+ DRIVE NUMBER
00427   707326          MTLC                /LOAD SOMMAND
00430   707304          MTGO                /AND GO
00431   203504          LAC (JMP TIMLPG     /AND GO
00432   040001          DAC 1               /TO RETURN FROM INTERRUPT
00433   141425          DZM LPTIME          /CLR A PASS COUNTER
00434   700042          ION                 /ENABLE INTERRUPT
00435   600435          JMP .               /WAIT FOR DONE
                        /TIME WRITE NONSTOP GAP TIME DURING WRITE
00436   102776  TIMLPG  JMS WRINT /INITIALIZE WC AND CA
00437   707322          MTAF                /GO NONSTOP
00440   707304          MTGO
00441   203476          LAC (WRBUF+1        /GET ADRS+1
00442   540033          SAD CALOC           /WRITE GAP
00443   600446          JMP .+3             /2ND WORD HAS BEEN OUT
00444   441425          ISZ LPTIME          /+1 LOOP COUNTER
00445   600442          JMP .-3
00446   707301          MTTR                /WAIT FOR DRIVE READY
00447   600446          JMP .-1             /LPTIME=WRITE NONSTOP GAP
00450   102776          JMS WRINT /INITIALIZE WC AND CA
00451   203475          LAC (44600          /WRITE AT 800
00452   342750          TAD FDRIVE          /T DRIVE
00453   707326          MTLC                /LOAD
00454   707304          MTGO                /AND GO
                        /
                        .EJECT
```

```
00455   707341          MISF            /WAIT FOR MTF
00456   600455          JMP .-1
00457   203505          LAC (7400
00460   707324          LCM             /CHANGE COMMAND
00461   707322          MTAF            /TO BACKSPACE
00462   707304          MTGO
00463   141426          DZM SUTIME              /COUNT FOR 1 BLOCK
00464   777777          LAW -1
00465   040032          DAC WCLOC
00466   203506          LAC (JMP TIMLP7
00467   040001          DAC 1           /INTERRUPT RETURN
00470   700042          ION             /ION
00471   600471          JMP .           /WAIT FOR FLAG
00472   203500  TIMLP7   LAC (-3
00473   040010          DAC 10          /TOTAL OF
00474   600475          JMP .+1         /20 CYCLES IN
00475   440010          ISZ 10          /THIS TIMING LOOP
00476   600475          JMP .-1
00477   441426          ISZ SUTIME      /+1 TO LOOP COUNT
00500   707321          MTCR            /READY YET
00501   600472          JMP TIMLP7      /NO WAIT SOME MORE
00502   707301          MTTR            /HAVE ACCUM BKSPACE
00503   600502          JMP .-1         /SHUT DOWN TIME IN SUTIME
                /
                /NOW ACCUMULATE READ SHUT DOWN TIME
00504   203502          LAC (42600      /READ AT 800 BPI
00505   342750          TAD FDRIVE      /+ DRIVE NUMBER
00506   707326          MTLC            /LOAD COM
00507   102776          JMS WRINT /INITIALIZE WC AND CA
00510   141427          DZM TRTIME      /CLR A PASS COUNTER
00511   707304          MTGO            /GO
00512   203507          LAC (JMP TIMLP8 /INT RET
00513   040001          DAC 1
00514   700042          ION             /WAIT
00515   600515          JMP .           /FOR DONE
                /
                /RETURN FROM MTF INTERRUPT TIME READ SHUT DOWN
00516   203500  TIMLP8   LAC (-5
00517   040010          DAC 10          /TIMING LOOP
00520   600521          JMP .+1
00521   440010          ISZ 10          /HAS 20 CYCLES
00522   600521          JMP .-1
00523   441427          ISZ TRTIME      /+1 LOOP COUNT
00524   707321          MTCR            /CU READY
00525   600516          JMP TIMLP8      /NO READ SHUT DOWN STILON
00526   707301          MTTR            /CONTENTS OF TRTIME
00527   600526          JMP .-1         /IS READ SHUT DOWN
                /
                .EJECT
```

```
                                /NOW WRITE              /MORE RECORD
                                /THIS GAP SHOULD BE LESS THAN FIRST TWO
00530   102776                          JMS WRINT /INITIALIZE WC AND CA
00531   203475                          LAC (446Ø0                      /WRITE 6ØØ BPI
00532   342750                          TAD FDRIVE
00533   707326                          MTLC                    /1 DRIVE
00534   707304                          MTGO                    /LOAD AND GO
00535   707341                          MTSF
00536   600535                          JMP .-1
00537   102776                          JMS WRINT /INITIALIZE WC AND CA
00540   707322                          MTAF                    /MAKE GAP SIZE LARGER
00541   707304                          MTGO
00542   707341                          MTSF                    /WAIT FOR WRITE
00543   600542                          JMP .-1                 /TO EOR
                                /
                                /BACKSPACE AND REWRITE ONCE
00544   203505                          LAC (7Ø0
00545   707324                          LCM                     /CHNG TO BACKSP
00546   777777                          LAW -1
00547   040032                          DAC WCLOC               /1 RECORD
00550   707322                          MTAF                    /CLR FLAGS
00551   707304                          MTGO                    /AND GO
00552   707341                          MTSF
00553   600552                          JMP .-1                 /WAIT FOR BACK DONE
00554   102776                          JMS WRINT /INITIALIZE WC AND CA
00555   203514                          LAC (4Ø0
00556   707324                          LCM                     /CHNG BACK TO WRITE
00557   707322                          MTAF                    /CLR FLGS
00560   707304                          MTGO                    /AND GO
00561   707341                          MTSF                    /WAIT FOR DONE
00562   600561                          JMP .-1
00563   777777                          LAW -1                  /TO INDICATE
00564   040011                          DAC 11                  /BACK 3 COMPLETE
00565   040012                          DAC 12                  /BACK 4 COMPLETE
00566   040013                          DAC 13                  /BACK 5 COMPLETE
00567   777776                          LAW -2                  /FIRST SEQUENCE
00570   040010                          DAC 10                  /IS BACK 2 TIMES
                                /
                                        .EJECT
```

```
                                /NOW WRITE BACKSPACE WRITE BACK WRITE
                                /GAP SHOULD GET LARGER YET
                                /FIRST RECORD 2 BACKSPACE 2ND=3 3RD=4 4TH=5 BACKUPS
                                /
00571   102776          MULWRT  JMS WRINT /INITIALIZE WC AND CA
00572   707322                  MTAF                    /START FIRST WRITE
00573   707304                  MTGO
00574   707341                  MTSF                    /WAIT FOR DONE
00575   600574                  JMP .-1
00576   777777          MULBAK  LAW -1
00577   040032                  DAC WCLOC
00600   203505                  LAC (7400               /CHNG TO BKSPAC
00601   707324                  LCM                     /1 RECORD
00602   707322                  MTAF                    /CLR FLAGS
00603   707304                  MTGO                    /AND GO
00604   707341                  MTSF                    /WAIT FOR BACKSPAC
00605   600604                  JMP .-1                 /TO FINISH
00606   102776                  JMS WRINT /INITIALIZE WC AND CA
00607   203510                  LAC (4000               /CHNG BACKSPAC
00610   707324                  LCM                     /BACK TO A WRITE
00611   707322                  MTAF                    /CLEAR
00612   707304                  MTGO                    /AND GO
00613   707341                  MTSF                    /WAIT FOR DONE
00614   600613                  JMP .-1
00615   440010                  ISZ 10                  /BACKSPACE ENOUGH TIMES
00616   600576                  JMP MULBAK              /NO BAK AND WRT AGAIN
00617   440011                  ISZ 11                  /HAVE DONE 3 BAK SEQ
00620   600624                  JMP .+4                 /YES
00621   777775                  LAW -3
00622   040010                  DAC 10
00623   600571                  JMP MULWRT
00624   440012                  ISZ 12                  /DONE 4 BAK SEQ
00625   600631                  JMP .+4
00626   777774                  LAW -4
00627   040010                  DAC 10
00630   600571                  JMP MULWRT
00631   440013                  ISZ 13                  /DONE 5 BAK SEQ
00632   600636                  JMP .+4                 /YES TYPE ACCUM TIMES
00633   777773                  LAW -5
00634   040010                  DAC 10
00635   600571                  JMP MULWRT
                                /
                                .EJECT
```

```
00636   707301          MITR            /WAIT FOR
00637   600636          JMP .-1         /DRIVE READY
00640   103004                          /START REWIND
00641   103425          JMS TYPDRV      /TYPE DRIVE AND HEADER
00642   201425          LAC IPTIME      /GET LOOP COUNT
00643   101616          JMS TYPTIM      /FOR WRITE NONSTOP GAP
00644   000005          5               /5 CYCLE LOOP
00645   003115          TEXT6           /FUNCTION TEXT
00646   201426          LAC SDTIME      /GET LOOP COUNT BACKSPACE
00647   101616          JMS TYPTIM      /SHUT DOWN TIME
00650   000024          24              /20 CYCLE LOOP
00651   003127          TEXT7
00652   201427          LAC TRTIME      /GET LOOP COUNT
00653   201427          LAC TRTIME
00654   101616          JMS TYPTIM      /READ SHUT DOWN TIME
00655   000024          24              /20 CYCLE LOOP
00656   003140          TEXT8
00657   102730          JMS CHGDRV      /DONE WRITE PASS FOR A L
00660   600423          JMP TIMTST      /NO DO NEXT DRIVE
```

/

.EJECT

```
                        /NOW READ NONSTOP
                        /ACCUMULATE GAP TIMES ON READ
                        /TYPE ACCUMULATED TIMES AT END OF READ
                        /FIRST AND SECOND GAP TIMES SHOULD BE EQUAL
                        /THIRD GAP SHOULD BE LESS THAN FIRST TWO
                        /FOURTH TO 8TH GAPS SHOULD GET INCREASINGLY LONGER
00661   103017  TIMTS4  JMS WATREW              /WAIT FOR DRIVE TO
00662   141425          DZM LPTIME              /FINISH REWINDING
00663   141426          DZM SDTIME              /CLR
00664   141427          DZM TRTIME              /ALL
00665   141430          DZM STRTIM              /LOCATIONS
00666   141431          DZM GAP5                /TO ACCUMULATE
00667   141432          DZM GAP6                /GAP TIMES
00670   141433          DZM GAP7
00671   141434          DZM GAP8
00672   102776          JMS WRINT /INITIALIZE WC AND CA
00673   203511          LAC (2600
00674   342750          TAD FORMIVE
00675   707326          MTLC
00676   707304          MTGO
00677   777770          LAW -14
00700   440010          DAC 10                  /TO COUNT 8 GAPS
00701   203512          LAC (ISZ LPTIME)
00702   040715          DAC RDTIMR              /LOCATION +1 FOR EACH GAP
00703   203513          LAC (JMP READL1
00704   040001          DAC 1                   /SET UP INT RETURN
00705   700042          ION
00706   600706          JMP .                   /WAIT FOR INTERRUPT
00707   102776  READL1   JMS WRINT /INITIALIZE WC AND CA
00710   707322          MTAF
00711   707304          MTGO                    /GO NONSTOP
00712   775254          LAW -BLENTH+1           /TO DETECT FIRST BREAK
00713   540032          SAE WCLOC               /DATA BREAK YET
00714   600717          JMP .+3                 /YES
00715   441425  RDTIMR  ISZ LPTIME              /+1 LOOP COUNTER
00716   600713          JMP .-3                 /WAIT FOR BREAK
00717   440715          ISZ RDTIMR              /+1 LOOP COUNTR ADDRS
00720   440010          ISZ 10                  /DONE 8 GAPS
00721   600705          JMP READL1-2            /NO TIME NEXT GAP
                        /
                        .EJECT
```

```
00722   777770          LAW -10
00723   040012          DAC 12          /TO COUNT 8 TYPEOUTS
00724   707301          MTTR
00725   000724          JMP .-1         /WAIT FOR DRV RD4
00726   103004          JMS STAREW      /START REWIND
00727   203514          LAC (LPTIME-1
00730   040010          DAC 10          /TO PICK UP EACH LOOP COUNT
00731   040013          DAC 13          /AND TO SAVE CONVERT
00732   203515          LAC (261        /FOR TYPEOUT GAP NUMBER
00733   040011          DAC 11
00734   103025          JMS TYPDRV      /TYPE DRIVE AND HEADER
00735   203516          LAC (TEXT9      /TYPE RECORD GAP
00736   101447          JMS TYPET       /CONSISTENCY
00737   220010  RDDUMP  LAC* 10         /GET NEXT LOOP COUNT
00740   101616          JMS TYPTIM      /TYPE TIME
00741   000005          5               /5 CYCLES PER LOOP
00742   003162          TEXT10          /WORD GAP
00743   060013          DAC* 13         /SAVE CONVERTED TIME
00744   200011          LAC 11          /+1 FOR NEXT GAP
00745   440011          ISZ 11
00746   101473          JMS TY1ASC      /TYPE GAP NUMBER
00747   440012          ISZ 12          /DONE 8 GAP TYPEOUTS
00750   600737          JMP RDDUMP      /NO DO NEXT
00751   201425          LAC LPTIME
00752   062631          DAC* GP1SAV                     /SAVE GAP1
00753   201426          LAC LPTIME+1
00754   062632          DAC* GP2SAV                     /SAVE GAP2
00755   442631          ISZ GP1SAV
00756   442632          ISZ GP2SAV
00757   102730          JMS CHGDRV      /DONE ALL DRIVES
00760   600661          JMP TIMTS4      /NO DO NEXT DRIVE
00761   203517          LAC (TEXT11     /TYPEOUT DESCRIPTION
00762   101447          JMS TYPET       /OF GAP TIMES
                /
                .EJECT
```

```
                                /
                                /9-DRVNOS  -  TAPE 2
                                /
                                /NOW MOVE EACH DRIVE RIGHT OFF LOAD POINT
                                /SO THAT A RECORD MAY BE WRITTEN TO
                                /TEST LOAD POINT READ DELAY TIME
00763   203475          TIMTS5  LAC (446000             /WRITE 800PBI
00764   342750                  TAD FDRIVE              /+ DRIVE NUMBER
00765   707326                  MTLC                    /LOAD
00766   707301                  MTTR                    /WAIT DRIVE READY
00767   600766                  JMP .-1
00770   707304                  MTGO                    /GO
00771   707352                  MTRS                    /READ STATUS
00772   503520                  AND (100000             /BOT GO AWAY YET
00773   740200                  SZA
00774   600771                  JMP .-3                 /BOT STILL UP WAIT
00775   703302                  CAF                     /POWER CLEAR
00776   102730                  JMS CHGDRV              /DONE ALL DRIVES
00777   600763                  JMP TIMTS5              /NO MOVE NEXT ONE
01000   777770                  LAW -1^
01001   040010                  DAC 10                  /CLEAR 8
01002   203521                  LAC (LPTIME-1           /LOOP COUNTERS
01003   040011                  DAC 11                  /TO 0 TO
01004   160011                  DZM* 11                 /TIME WRITE XING
01005   440010                  ISZ 10                  /TIME FOR UP
01006   601004                  JMP .-2                 /TO 8 DRIVES
01007   203522                  LAC (ISZ LPTIME
01010   041052                  DAC TMXIRG
                                /
                                .EJECT
```

```
                                /TIME WRITE START NOT ROT AGAIN CTR SHOULD CLEAR AT CAF
                                /WRITE A RECORD NOT AT LOAD POINT IS FAKED
01011   772526          TIMTS6  LAW -BLENTH-BLENTH  /WRITE FIRST
01012   040032                  DAC WCLOC           /RECORD IN WHAT
01013   203501                  LAC (WRBUF-1        /WORLD NORMALLY
01014   040033                  DAC CALOC           /BE LOAD POINT GAP
01015   203475                  LAC (4460Ø
01016   342750                  TAD FDRIVE
01017   707326                  MTLC
01020   707301                  MITR
01021   601020                  JMP .-1
01022   141424                  DZM EXTRA
01023   707304                  MTGO
01024   203476                  LAC (WRBUF+1
01025   540033                  SAD CALOC
01026   601031                  JMP .+3
01027   441424                  ISZ EXTRA
01030   601025                  JMP .-3
01031   103025                  JMS TYPDRV
01032   201424                  LAC EXTRA
01033   101616                  JMS TYPTIM
01034   000005                      5
01035   003064                      TEXT3
01036   707341                  MTSF                /WAIT FOR EOR
01037   601036                  JMP .-1
01040   707301                  MITR                /AND FOR DRIVE
01041   601040                  JMP .-1             /TO BECOME READY
01042   203523                  LAC (54600          /WRITE XIRG 800 BPE
01043   342750                  TAD FDRIVE          /+ DRIVE NUMBER
01044   707326                  MTLC                /LOAD
01045   102776                  JMS WRINT /INITIALIZE WC AND CA
01046   203476                  LAC (WRBUF+1        /TO COMPARE AGAINST CA
01047   707304                  MTGO                /START
01050   540033                  SAD CALOC           /REQUEST 2ND WORD
01051   601054                  JMP .+3             /YES XIRG IS OVER
01052   441425          TMXIRG  ISZ LPTIME          /+1 LPTIME TO GAP8
01053   601050                  JMP .-3             /WAIT XIRG OVER
01054   707321                  MTCR                /WAIT COREADY
01055   601054                  JMP .-1
01056   441052                  ISZ TMXIRG          /STEP LOOP COUNTER
01057   102730                  JMS CHGDRV          /DONE ALL DRIVES
01060   601011                  JMP TIMTS6          /NO DO NEXT DRIVE
01061   707301                  MITR
01062   601061                  JMP .-1
01063   203524                  LAC (LAC LPTIME     /TO GET LOOP COUNTER
01064   041070                  DAC GIXIRG          /LOC +1 EV DRV AFTE FIRST
01065   203525                  LAC (TEXT12
01066   101447                  JMS TYPET           /TYPE WRITE XIRG HEADER
01067   103004                  JMS STOREW          /REWIND THE DRIVE
                                .EJECT
```

```
01070   201425          GTXIRG  LAC LPTIME              /GET LOOP COUNT
01071   101616                  JMS TYPTIM                      /TYPE TIME
01072   000005                  5                       /5 CYCLES IN LOOP
01073   003220                  TEXT13                  /TYPE DRIVE
01074   202751                  LAC CURIVE
01075   343526                  TAD (260
01076   101473                  JMS TY1ASC              /TYPE DRIVE NUMBER
01077   441070                  ISZ GTXIRG              /+1 LAC TO GET NXT LOOP
01100   102730                  JMS CHGDRV              /DONE ALL DRIVES
01101   601067                  JMP GTXIRG-1            /NO REWIND AND TYPE
                        /
                        /NOW TIME READ FROM LOAD POINT DELAY
01102   777776                  LAW -10
01103   040010                  DAC 10                  /TO COUNT 8 DEM
01104   203527                  LAC (LPTIME-1
01105   040011                  DAC 11                  /FOR DEM*
01106   160011                  DEM* 11                 /0 TO 1 LOOP COUNTER
01107   440010                  ISZ 10                  /DONE 8
01110   601106                  JMP .-2                 /NO 0 NEXT LOC
01111   203532                  LAC (ISZ LPTIME         /TO LOOP COUNT
01112   041124                  DAC TMRDLP              /LOC +1 AFTER FIRST DRIVE
01113   103017                  JMS WATREW
                        /
                        /TIME READ FROM LOAD POINT TO FIRST WORD IN
01114   102776          TIMTS7  JMS WRINT               /INITIALIZE WC AND CA
01115   203502                  LAC (42600              /READ 800 BPI
01116   342750                  TAD FORIVE
01117   707326                  MTLC                    /LOAD COMMAND
01120   775254                  LAW -BLENTH+1           /TO COMPARE AGAINST WC
01121   707304                  MIGO                    /GO
01122   540032                  SAD WCLOC               /READ FIRST WORD YET
01123   601126                  JMP .+3                 /YES LP DELAY HAS GONE AWAY
01124   441425          TMRDLP  ISZ LPTIME              /+1 LOOP COUNT
01125   601122                  JMP .-3                 /WAIT AGAIN
01126   441124                  ISZ TMRDLP              /+1 TO LOOP ISZ
01127   707321                  MICR                    /CU READY YET
01130   601127                  JMP .-1                 /NO WAIT
01131   102730                  JMS CHGDRV              /DONE ALL DRIVES
01132   601113                  JMP TIMTS7-1            /NO DO NEXT
01133   203531                  LAC (LAC LPTIME         /TO GET LOOP COUNTERS
01134   041137                  DAC GTLPRT              /LAC +1 EVERY DRV AFTER FIRST
01135   203532                  LAC (TEXT14
01136   101447                  JMS TYPET               /TYPE READ FROM BOT HEADER
                        /
                                .EJECT
```

```
01137   201425      GTLPRT  LAC LPTIME              /GET LOOP COUNT
01140   101616              JMS TYPTIM              /TYPE TIME
01141   000005              5                       /5 CYCLES IN WAIT LOOP
01142   003220              TEXT13                  /TYPE DRIVE
01143   202751              LAC CURIVE              /GET DRIVE NUMBER
01144   343526              TAD (260                /CONVERT TO ASCII
01145   101473              JMS TY1ASC              /+1 TO GET COUNT NEXT DRIVE
01146   441137              ISZ GTLPRT
01147   102730              JMS CHGDRV              /DONE ALL DRIVES
01150   601137              JMP GTLPRT                      /NO TYPE NEXT DRIVE
01151   707301              MITR                    /MAKE SURE
01152   601151              JMP .-1                 /LAST DRIVE IS READY
                    /
                    /READ THE RECORD WRITTEN WITH XIRG
                    /WHEN LAST WORD COMES IN TIME UNTIL MTF=1
                    /LAST CHARACTER TO EOR TIME
                    /
01153   777777              LAW -1                  /ZERO OUT
01154   040010              DAC 10                  /LOCATIONS TO
01155   203533              LAC (LPTIME-1           /COUNT FOR TIMES
01156   040011              DAC 11
01157   160011              DAM* 11
01160   440010              ISZ 10                  /ZEROS IN ALL M
01161   601157              JMP .-2                 /NO
01162   203534              LAC (ISZ LPTIME
01163   041203              DAC TRUEOR                      /TO LOOP COUNT EOR
01164   203535              LAC (JMP TYPEOR         /TO COME BACK FROM
01165   040001              DAC 1                   /INTERRUPT AT EOR
01166   777775              LAW -3
01167   040010              DAC 10
                    /
01170   102776      TIMT7A  JMS WRINT /INITIALIZE WC AND CA
01171   203502              LAC (42600                      /READ ODD AT 600
01172   342750              TAD FDRIVE                      /+ DRIVE NUMBER
01173   707326              MILC
01174   707301              MITR                    /WAIT READY
01175   601174              JMP .-1
01176   707314              MIGO 14                 /GO
01177   700042              ION                     /ENABLE PIE
01200   540032              SAD WCLOC               /LAST WORD YET
01201   741000              SKP                     /YES START COUNTING
01202   601200              JMP .-2                 /WAIT FOR LAST WORD
01203   441425      TRUEOR  ISZ LPTIME                      /3 CYCLE LOOP
01204   601203              JMP .-1                 /UNTIL MTF=1 AND PIE
                    /
                            .EJECT
```

```
                                /RETURN TO TYPEOR AFTER PIE FROM MTF READ FOR
                                /
01205   707301          TYPEOR  MITR
01206   601205                  JMP .-1                 /WAIT CU READY
01207   203536                  LAC (47600
01210   342750                  TAD FDRIVE
01211   707326                  MIIC
01212   777777                  LAW -1
01213   040032                  DAC WCLOC
01214   707304                  MTCO
01215   740000                  NOP
01216   707301                  MITR
01217   601216                  JMP .-1
01220   440010                  ISZ 10
01221   601170                  JMP TINT7A
01222   441203                  ISZ TRDEOR                      /+1 TO COUNT FOR NEXT DRV
01223   102730                  JMS CHGDRV                      /DONE ALL DRVS
01224   601166                  JMP TINT7A-2            /NO DO NEXT DRIVE
                                /
01225   203537                  LAC (TEXT22             /TYPE LAST CHAR TO
01226   101447                  JMS TYPET               /MTF TEXT
01227   203540                  LAC (LAC LPTIME         /TO GET DRIVE TIME
01230   041232                  DAC GTFORT                      /LAC +1 FOR EACH DRV
01231   103004                  JMS STRREW                      /REWIND START
01232   201425          GTFORT  LAC LPTIME                      /GET TIME
01233   343541                  TAD (22                 /MINIMUM OF 18 CYCLES FOR DB
01234   101616                  JMS TYPTIM                      /CONVERT AND TYPE
01235   000001                      1                   /3 CYCLES IN LOOP DONE 3 TIMES
01236   003220                      TEXT13                      /DRIVE
01237   062634                  DAC* EORTSV
01240   442634                  ISZ EORTSV
01241   202751                  LAC CDRIVE
01242   343526                  TAD (260                /TYPE DRIVE NUMBER
01243   101473                  JMS TY1ASC
01244   441232                  ISZ GTFORT
01245   102730                  JMS CHGDRV
01246   601231                  JMP GTFORT-1
01247   707301                  MITR
01250   601247                  JMP .-1
                                /
                                .EJECT
```

```
                        /CLEAR OUT 8 LOOP COUNTERS
                        /TO TIME WRITE EOF TIME
                        /SET UP INTER RETURN FOR WRITE EOF
01251   777770          LAW -10
01252   040010          DAC 10
01253   203542          LAC (LPTIME-1
01254   040011          DAC 11
01255   160011          DZM* 11
01256   440010          ISZ 10
01257   601255          JMP .-2
01260   203543          LAC (ISZ LPTIME
01261   041303          DAC TMWEOF
01262   203544          LAC (JMP TIMEOF
01263   040001          DAC 1
                        /
                        /NOW WRITE A RECORD FROM LOAD POINT
                        /THEN AN EOF AND TIME EOF START DELAY
01264   777775  TIMTS8   LAW -3                /3 WORD RECORD
01265   040032          DAC WCLOC             /FOR WC
01266   203501          LAC (WRBUF-1
01267   040033          DAC CALOC             /SET CA
01270   203475          LAC (44600            /WRITE ODD 800 BPI
01271   342750          TAD FDRIVE            /+ DRIVE NUMBER
01272   707326          MTLC                  /LOAD
01273   707304          MTGO                  /AND GO
01274   203545          LAC (45600                    /ODD IN CASE 9 TRK
01275   707301          MTR                   /WAIT FOR RECORD DONE
01276   601275          JMP .-1               /AND TAPE READY
                                              /WRITE EOF 800
01277   342750          TAD FDRIVE            /+ DRIVE
01300   707326          MTLC                  /LOAD COMMAND
01301   707304          MTGO                  /GO
01302   700042          ION
01303   441425  TMWEOF   ISZ LPTIME                   /TIME FOR INTERRUPT
01304   601303          JMP .-1               /TO OCCUR
                        /
                        /EOF IS FINISHED INTER RECD
                        /TYPE OUT ACCUMULATED TIMES
01305   707321  TIMEOF   MTCR                  /WAIT FOR CU READY
01306   601305          JMP .-1
01307   441303          ISZ TMWEOF            /+1 LOOP COUNTER
01310   102730          JMS CHGDRV            /DONE ALL DRIVES
01311   601264          JMP TIMTS8            /NO DO NEXT
01312   203546          LAC (TEXT15           /WRITE END OF FILE
01313   101447          JMS TYPET             /HEADER
01314   203547          LAC (LAC LPTIME       /TO GET LOOP COUNTS
01315   041317          DAC GTWEOF            /LAC IS +1 FOR NEXT DRIVE
01316   103004          JMS STRREW            /REWIND CURRENT DRIVE
                        /
                        .EJECT
```

```
01317   201425      GTWEOF  LAC LPTIME          /GET LOOP COUNT
01320   101616              JMS TYPTIM          /CONVERT TO MICRO SEC TYPE
01321   000003              3                   /3 CYCLES IN LOOP
01322   003220              TEXT13              /DRIVE
01323   202751              LAC DRIVE           /GET DRV NUM
01324   343526              TAD (260            /CONVERT TO ASCII
01325   101473              JMS TY1ASC          /TYPE IT
01326   441317              ISZ GTWEOF          /+1 FOR NEXT LOOP COUNT
01327   102730              JMS CHGDRV          /DONE ALL DRIVES
01330   601316              JMP GTWEOF-1        /NO REWIND THIS ONE
01331   707301              MITR
01332   601331              JMP .-1
                    /
01333   141425      TIMTS9  DZM LPTIME          /CLEAR 2 LOOP COUNTERS
01334   141426              DZM SUTIME          /TO ACCUM SPACE AND SHUT DOWN
01335   777775              LAW -3
01336   040032              DAC WCLOC           /REWRITE THE
01337   203501              LAC (WRBUF-1        /3 WORD RECORD
01340   040033              DAC CALOC           /FROM LOAD POINT
01341   203475              LAC (44600          /WRITE 800 BPI
01342   342750              TAD FDRIVE          /+DRIVE NUMBER
01343   707326              MTLC                /LOAD COMMAND
01344   707304              MTGO                /AND GO
01345   707341              MTSF                /WAIT FOR WRITE DONE
01346   601345              JMP .-1
01347   777777              LAW -1              /TO COUNT 1 ON
01350   040032              DAC WCLOC           /BACKSPACE
01351   203505              LAC (7000
01352   707324              LCM                 /CHNG WRITE TO BACKSP
01353   707322              MTAF
01354   707304              MTGO                /GO AGAIN
01355   707341              MTSF
01356   601355              JMP .-1
01357   777776              LAW -2              /TO COUNT 2 FOR
01360   040032              DAC WCLOC /SPACE FWD
01361   203550              LAC (6000
01362   707324              LCM                 /CHNG BACKSP TO
01363   707322              MTAF                /SPACE FWD
01364   707304              MTGO                /CLEAR AND GO
01365   203551              LAC (JMP TMSPSD     /WHEN INTR DONE
01366   040001              DAC 1               /TIMF SPACE SHUT DOWN
01367   777776              LAW -2
01370   540032              SAD WCLOC           /WC +1 YET
01371   601370              JMP .-1             /NO NOT OVER FIRST RECORD
01372   700042              ION                 /ENABLE EOF INTERRUPT
01373   441425              ISZ LPTIME          /COUNT UNTIL
01374   601373              JMP .-1             /LOOP IS INTERRUPTED
                    /
                            .EJECT
```

```
                                /NOW TIME SPACE SHUT DOWN TIME
01375   203500  TMSPSD  LAC (-3         /NOW TIME
01376   040010          DAC 10          /SPACE SHUT DOWN
01377   601400          JMP .+1         /WAIT FOR CORDY
01400   440010          ISZ 10          /INA 20 CYCLE
01401   601400          JMP .-1         /LOOP
01402   441426          ISZ SUTIME
01403   707321          MICR            /STILL SHUT DOWN
01404   601375          JMP TMSPSD      /YES
01405   103425          JMS TYPDRV      /TYPE DRIVE HEADER
01406   201425          LAC LPTIME      /GET EOF GAP COUNT
01407   101616          JMS TYPTIM      /CONVERT AND TYPE IT
01410   000003              3           /3 CYCLES IN LOOP
01411   003261              TEXT16      /EOR TO EOF SPACE
01412   707352          MTRS            /ALSO TYPE STATUS
01413   101506          JMS TYPCON      /IN CASE NOT EOF
01414   201426          LAC SUTIME      /GET LOOP COUNT
01415   101616          JMS TYPTIM      /FOR SPACE SHUT DOWN
01416   000024              24          /20 CYCLES IN THE LOOP
01417   003300              TEXT17      /SPACE SHUT DOWN
01420   103004          JMS STRREW      /START REWIND
01421   102730          JMS CHGDRV      /ANY MORE DRIVES
01422   601333          JMP TIMTS9      /YES DO IT
01423   601674          JMP TIM556                  /TIME 556 AND 2ms
01424   000000  EXTRA   0
01425   000000  LPTIME  0
01426   000000  SUTIME  0
01427   000000  TRTIME  0
01430   000000  STRTIM  0
01431   000000  GAP5    0
01432   000000  GAP6    0
01433   000000  GAP7    0
01434   000000  GAP8    0
                        .EJECT
```

```
01435   601435  ST1     JMP .
01436   775253          LAW -BLENTH
01437   040016          DAC 16
01440   203501          LAC (WRBUF-1
01441   040017          DAC 17
01442   777777          LAW -1
01443   060017          DAC* 17
01444   440016          ISZ 16
01445   601443          JMP .-2
01446   621435          JMP* ST1
                        /
                        /TYPE MESSAGE ROUTINE TYPET
                        /AC=MESSAGE ADDRESS
01447   601447  TYPET   JMP .
01450   041670          DAC TYPDEX
01451   221670          LAC* TYPDEX
01452   441670          ISZ TYPDEX
01453   041671          DAC TYPDEX+1
01454   742020          RTR
01455   742020          RTR
01456   742020          RTR
01457   742020          RTR
01460   740020          RAR
01461   503552          AND (377
01462   540377          SAD 377
01463   621447          JMP* TYPET
01464   101473          JMS TY1ASC
01465   201671          LAC TYPDEX+1
01466   503552          AND (377
                        .EJECT
```

```
01467   543552          SAD (377
01470   621447          JMP* TYPET
01471   101473          JMS TY1ASC
01472   601451          JMP TYPET+2
                        /
                        /TYPE ONE ASCII CHARACTER
                        /AC=CHARACTER
01473   601473  TY1ASC  JMP .
01474   700406          TLS
01475   700401          TSF
01476   601475          JMP .-1
01477   700402          TCF
01500   621473          JMP* TY1ASC
                        /
                        /TYPE 1 OCTAL CHARACTER
                        /AC 15 TO 17=CHAR
01501   601501  TY1OCT  JMP .
01502   503553          AND (7
01503   343526          TAD (260
01504   101473          JMS TY1ASC
01505   621501          JMP* TY1OCT
                        /
                        /TYPE CONTENTS OCTAL
                        /CONTENTS OF AC=18 BIT OCTAL NUMBER
01506   601506  TYPCON  JMP .
01507   041670          DAC TYPDEX
01510   742020          RTR
01511   742020          RTR
01512   742020          RTR
01513   041671          DAC TYPDEX+1
01514   742020          RTR
01515   742020          RTR
01516   742020          RTR
01517   101525          JMS TY2OCT
01520   201671          LAC TYPDEX+1
01521   101525          JMS TY2OCT
01522   201670          LAC TYPDEX
01523   101525          JMS TY2OCT
01524   621506          JMP* TYPCON
                        /
                        /TYPE 2 OCTAL CHARACTERS
                        /AC 12 TO 17=CHARACTERS
01525   601525  TY2OCT  JMP .
01526   041447          DAC TYPET
01527   742020          RTR
01530   740020          RAR
01531   101501          JMS TY1OCT
01532   201447          LAC TYPET
01533   101501          JMS TY1OCT
01534   621525          JMP* TY2OCT
                        /
                        .EJECT
```

```
                        /TYPE CONTENTS DECIMAL
                        /AC=18 BIT UNSIGNED OCTAL NUMBER
                        /CONVERT TO 6 ASCII CHARACTERS IN DECIMAL
                        /
01535   601535          TYDECI  JMP .
01536   041670                  DAC TYPDEX
01537   141572                  DZM TYDECM
01540   141573                  DZM TYDECM+1
01541   141574                  DZM TYDECM+2
01542   201670          TYDCLP  LAC TYPDEX              /CONVERT LEAST OF 2
01543   101576                  JMS TYVERT
01544   041671                  DAC TYPDEX+1
01545   201670                  LAC TYPDEX
01546   101576                  JMS TYVERT
01547   744010                  RCI                     /CONVERT MOST OF 2
01550   742010                  RTL                     /POSITION INTO
01551   742010                  RTL                     /UPPER 9 BITS
01552   742010                  RTL
01553   742010                  RTL
01554   341671                  TAD TYPDEX+1            /COMBINE 2 DECIMAL
01555   041671                  DAC TYPDEX+1            /DIGITS AND SAVE THEM
01556   201573                  LAC TYDECM+1            /SHUFFLE
01557   041574                  DAC TYDECM+2            /TYPEOUT TO
01560   201572                  LAC TYDECM              /POSITION DIGITS
01561   041573                  DAC TYDECM+1
01562   201671                  LAC TYPDEX+1
01563   041572                  DAC TYDECM
01564   201574                  LAC TYDECM+2
01565   741200                  SNA                     /CONVERTED 6 DIGITS YET
01566   601542                  JMP TYDCLP              /NO DO 2 MORE
01567   203554                  LAC (TYDECM
01570   101447                  JMS TYPET               /TYPE OUT THE 6 DIGITS
01571   621535                  JMP* TYDECI
01572   260260          TYDECM  260260
01573   260260                  260260
01574   260260                  260260
01575   377377                  377377
                        /
                                .EJECT
```

```
                        /CONVERT TO DECIMAL CHARACTER ROUTINE
                        /ENTER AC=NUMBER TO GET Ø TO 9 REMAINDER FROM
                        /EXIT AC=REMAINDER IN ASCII
                        /(TYPDEX)=QUOTIENT 15 BIT UNSIGNED
Ø1576   601576  TYVERT  JMP .
Ø1577   141670          DZM TYPDEX          /CLR QUOTIENT
Ø1600   740100          SMA                 /IS AC START-
Ø1601   601606          JMP TVRTPL          /NO JUST CONVERT
Ø1602   441670          ISZ TYPDEX          /+1 QUOTIENT
Ø1603   343555          TAD (-12            /-1Ø FROM DIV
Ø1604   741100          SPA                 /GONE + YET
Ø1605   601602          JMP .-3             /NO MAKE NEXT TRIAL SUB
Ø1606   343555  TVRTPL  TAD (-12            /-1Ø
Ø1607   741100          SPA                 /STILL +
Ø1610   601613          JMP .+3             /NO AC=CHAR -1Ø
Ø1611   441670          ISZ TYPDEX          /+1 QUOTIENT
Ø1612   601606          JMP TVRTPL          /TRIAL SUBTRACT AGAIN
Ø1613   343556          TAD (12             /+1Ø TO GET TRUE DIGIT
Ø1614   343526          TAD (26Ø            /CONVERT TO ASCII
Ø1615   621576          JMP* TYVERT         /EXIT AC=ASCII DIGIT
                        /
                        .EJECT
```

```
                        /CONVERT LOOP TIME TO MICROSECOND
                        /THEN CONVERT TO DECIMAL AND TYPE IT
                        /JMS+1=CYCLES PER LOOP JMS+2=TEXT ADDRESS
01616   601616  TYPTIM  JMP .
01617   041666          DAC TIMSAV          /SAVE LOOP COUNT
01620   203557          LAC (TEXT19         /CAR RET LINE FEED
01621   101447          JMS TYPET
01622   221616          LAC* TYPTIM         /GET CYCLES PER LOOP
01623   740001          CMA                 /MAKE-
01624   041667          DAC TIMSAV+1        /SAVE IT TO MUL
01625   441667          ISZ TIMSAV+1        /MAKE 2 COMP
01626   750000          CLA
01627   341666          TAD TIMSAV          /* LOOP COUNT
01630   441667          ISZ TIMSAV+1        /MUL ENOUGH
01631   601627          JMP .-2             /NO +1 AGAIN
01632   041667          DAC TIMSAV+1        /SAVE ACCUMULATED COUNT
01633   202753          LAC MACHPO          /TEST FOR CORRECT MACHINE CYCLE TIME
01634   741100          SPA
01635   601652          JMP TYPT1 /CYCLE TIME IS 1.0 USEC
01636   740010          RAL
01637   741100          SPA
01640   601644          JMP .+4
01641   201667          LAC TIMSAV+1        /CYCLE TIME IS  1.5 USEC
01642   744020          RCR
01643   601650          JMP .+5
01644   201667          LAC TIMSAV+1        /CYCLE TIME IS 1.2 USEC
01645   101576          JMS TYVERT
01646   201670          LAC TYPDEX
01647   744010          RCL
01650   341667          TAD TIMSAV+1
01651   041667          DAC TIMSAV+1
01652   201667  TYPT1   LAC TIMSAV+1        /GET TIME
01653   441673          ISZ TYPFLG
01654   601662          JMP TYPTXT
01655   101535          JMS TYDECI          /TYPE IN DECIMAL
01656   441616          ISZ TYPTIM          /STEP ADDRS
01657   221616          LAC* TYPTIM         /GET TEXT ADDRS
01660   101447          JMS TYPET           /TYPE FUNCTION TEXT
01661   441616          ISZ TYPTIM          /STEP EXIT
01662   777777  TYPTXT  LAW -1
01663   041673          DAC TYPFLG                  /RESET TO TYPE NEXT
01664   201667          LAC TIMSAV+1        /EXIT AC=TIME
01665   621616          JMP* TYPTIM         /EXIT
01666   000000  TIMSAV  0
01667   000000          0
01670   000000  TYPDEX  0
01671   000000          0
01672   000000          0
01673   000000  TYPFLG  0
                        /
                        .EJECT
```

```
                        /TAPE 3 OF DRVNOS
                        /NOW TIME SOME OF THE SAME OPERATIONS
                        /AT 556 AND 200 BPI
                        /WRITE START FROM BUT SHOULD = SAME AS 800
                        /WRITE SHUT DOWN SHOULD BE SAME
                        /WRITE START SHOULD BE SAME
                        /BKSPACE SHUT DOWN SHOULD BE SAME
                        /DATA TRANSFER TIMES SHOULD BE APPOX EQUAL.
                        /558 CHARACTERS TRANSFERED AT 556BPI
                        /201 CHARACTERS AT 200 BPI
                        /LAST INPUT CHAR TO MTF TIMES SHOULD
                        /BE GREATER AT LOWER DENSITIES
001432                  GAP1=GAP6
001433                  GAP2=GAP7
                        /
                                .EJECT
```

```
01674   777777          TIM556  LAW -1
01675   040010                  DAC 10                  /TO CLEAR 8 COUNTERS
01676   203514                  LAC (LPTIME-1
01677   040011                  DAC 11                  /INDIRECTLY
01700   160011                  DZM* 11                 /CLEAR A COUNTER
01701   440010                  ISZ 10                  /DONE 8
01702   601700                  JMP .-2                 /NO
01703   202750                  LAC FDRIVE
01704   503561                  AND (24000
01705   740200                  SZA                     /9 TRK DEV
01706   602072                  JMP ENO556              /NOT RM556
01707   103617                  JMS WAITREW             /WAIT REWIND TO FINISH
01710   777704                  LAW -WC556              /WORD COUNT TO TIME
01711   040032                  DAC WCLOC               /1 INCH TRANSFER AT 556
01712   203501                  LAC (WRBUF-1
01713   040033                  DAC CALOC
01714   203562                  LAC (44500              /WRITE ODD AT 556
01715   342750                  TAD FDRIVE              /+ DRIVE NUMBER
01716   707326                  MTLC
01717   707301                  MITR                    /WAIT FOR DRIVE
01720   601717                  JMP .-1
01721   203476                  LAC (WRBUF+1            /TO SENSE 2ND OUT
01722   707304                  MIGO
                        /WHEN 2ND  WORD IS OUT BOT DELAY IS OVER
01723   540033                  SAD CALOC               /2ND OUT YET
01724   601727                  JMP .+3                 /YES
01725   441425                  ISZ LPTIME              /NO +1 LOOP COUNT
01726   601723                  JMP .-3                 /TRY AGAIN
                        /WHEN WE GOES TO 0-ONE INCH DATA TRANSFERED
01727   750000                  CLA                     /FIRST WORD NOT COUNTER IN INCH
01730   540032                  SAD WCLOC               /OUTPUT 556 FROM 2ND
01731   601734                  JMP .+3                 /YES 1 INCH OVER
01732   441426                  ISZ SUTIME              /NO +1 LOOP COUNT
01733   601730                  JMP .-3                 /TRY AGAIN
                        /SET UP INTERRUPT TIME WRITE SHUT DOWN
01734   203563                  LAC (JMP WSD556
01735   040001                  DAC 1
01736   700042                  ION
01737   601737                  JMP .
                        /
                                .EJECT
```

```
                                /WRITE SHUT DOWN IS A 20 CYCLE LOOP
01740   203500          WSD556  LAC (-3                 /CONTROL SHOULD
01741   040010                  DAC 10                  /CHANGE BACK TO
01742   601743                  JMP .+1                 /800 BPI CLOCK
01743   440010                  ISZ 10                  /SHUT DOWN AT 556
01744   601743                  JMP .-1                 /SHOULD = AT 800
01745   441427                  ISZ TRTIME
01746   707321                  MTCR
01747   601746                  JMP WSD556
01750   777775                  LAW -3
01751   040017                  DAC 17
01752   707301          RDS5LP  MITR                    /WAIT DRIVE READY
01753   601752                  JMP .-1
                                /NOW BACKUP AGAIN TIME BACKSP SHUT DOWN
01754   203564                  LAC (47500
01755   342750                  TAD FDRIVE
01756   707326                  MTLC                    /LOAD BACK ODD 556
01757   777777                  LAW -1
01760   040032                  DAC WCLOC               /1 BLOCK
01761   707304                  MTGO                    /GO
01762   203565                  LAC (JMP BSD556
01763   040001                  DAC 1                   /SET UP FOR INTRUPT
01764   700042                  ION
01765   601765                  JMP .                   /WAIT DONE
                                /20 CYCLE LOOP TO TIME BACKSP SHUT DOWN
01766   203500          BSD556  LAC (-3
01767   040010                  DAC 10                  /SHOULD SWITCH
01770   601771                  JMP .+1                 /BACK TO 800 BPI
01771   440010                  ISZ 10                  /FOR SHUT DOWN
01772   601771                  JMP .-1                 /556 TIME SHD=800
01773   441430                  ISZ STRTIM
01774   707321                  MTCR                    /READY YET
01775   601766                  JMP BSD556              /NO TRY AGAIN
01776   707301                  MITR                    /WAIT DRIVE READY
01777   601776                  JMP .-1
                                /NOW READ WHEN WC=0 TIME TO FOR
02000   777704                  LAW -WC556
02001   040032                  DAC WCLOC
02002   203501                  LAC (WRBUF-1            /SET UP CA AND WC
02003   040033                  DAC CALOC
02004   203566                  LAC (42500              /READ ODD 556
02005   342750                  TAD FDRIVE              /+ DRIVE NUM
02006   707326                  MTLC                    /LOAD
02007   203567                  LAC (JMP ER556L
02010   040001                  DAC 1                   /SET UP INTRUPT
02011   707304                  MTGO                    /GO
                                /
                                .EJECT
```

```
02012   700052          ION 10              /ENABLE PIE CLR AC
02013   540032          SAD WCLOC           /WC=0 YET
02014   602016          JMP .+2             /YES TIME TO EOR
02015   602013          JMP .-2
02016   441431          ISZ GAP5            /5 CYCLE LOOP
02017   602016          JMP .-1             /UNTIL MTF INTRUPTS
                /NOW TIME READ SHUT DOWN 2V CYCLE LOOP
                /TIME READ EOR 3 TIMES ACCUMULATED
02020   440017  ER556L  ISZ 17
02021   741003          SKP
02022   602025          JMP EOR556
02023   141430          DZM STRTIM
02024   601752          JMP RDSDLP
02025   203500  EOR556  LAC (-4             /CONTROL SHOULD
02026   040010          DAC 10              /BE BACK ON 800 BPI
02027   602030          JMP .+1             /CLOCK
02030   440010          ISZ 10
02031   602030          JMP .-1
02032   441432          ISZ GAP6
02033   707521          MTCR
02034   602025          JMP EOR556
                /TYPE OUT ACCUMULATED TIMES FOR 556
02035   103025          JMS TYPDRV
02036   203570          LAC (TEXT23         /AT 556BPI
02037   101447          JMS TYPET
                /TYPE 556 WRITE OUT DELAY
02040   201425          LAC LPTIME          /LOOP COUNT WRITE BOT
02041   101616          JMS TYPTIM
02042   000005              5               /5 CYCLES IN LOOP
02043   003436              TEXT1           /BOT TEXT
                /TYPE TIME TO TRANSFER 556 CHARACTERS
02044   201426          LAC SUTIME          /CYCLES IN TRANSFER LOOP
02045   343571          TAD (FUG556         /+FACTOR FOR DATA BREAKS
02046   101616          JMS TYPTIM          /TIMES 5 TO DECIMAL OUTPUT
02047   000005              5
02050   003372              TEXT24                  /1 INCH TRANSFER TIME
/
                .EJECT
```

```
                                /TYPE WRITE SHUT DOWN FOR 556 SHD=800
0200051  201427                       LAC TRTIME
0200052  101616                       JMS TYPTIM
0200053  000024                            24
0200054  003053                            TEXT2
                                /NOW TYPE RACSPACE SHUT DOWN FOR 556
                                /SHOULD = 800 BPI TIME
0200055  201430                       LAC STRTIM
0200056  101616                       JMS TYPTIM
0200057  000024                            24
0200060  003127                            TEXT7
                                /NOW TYPE LAST CHARACTER TO FOR TIME
                                /AT 556 BPI SHOULD BE GREATER THAN AT 800
0200061  201431                       LAC GAP5
0200062  343541                       TAD C22
0200063  101616                       JMS TYPTIM
0200064  000001                            1                  /3 CYCLE LOOP ACCUMULATED 3
0200065  003413                            TEXT26
                                /TYPE READ SHUT DOWN AT 556 SHOULD = 800 BPI
0200066  201432                       LAC GAP6
0200067  101616                       JMS TYPTIM
0200070  000024                            24
0200071  003140                            TEXT8
0200072  102730              END556   JMS CHGDRV
0200073  601674                       JMP TIM556
                                /
                                       .EJECT
```

```
                        /NOW WRITE A RECORD AT 240BPI
                        /TIME WRITE START
                        /1 INCH TRANSFER TIME
                        /AND WRITE SHUT DOWN
                        /BACKSPACE TIME SHUT DOWN
                        /READ TIME LAST CHAR TO FOR
                        /TIME READ SHUT DOWN
02074   777770  TIM240  LAW -11
02075   040010          DAC 10                  /TO CLR 8 COUNTRS
02076   203514          LAC (LPTIME-1           /INDIRECT
02077   040011          DAC 11
02100   160011          DZM* 11                 /CLR1
02101   440010          ISZ 10                  /DONE 8
02102   602100          JMP .-2                 /NO
                        /WAIT FOR DRIVE READY
02103   707301          MTTR
02104   602103          JMP .-1
02105   202750          LAC FDRIVE
02106   503561          AND (24000
02107   740200          SZA                     /Y TRACK
02110   602276          JMP END200              /DON'T DO 200
                        /SETUP WC AND CA TO TIME WRITE START
02111   777673          LAW -WC200              /AND TO TIME
02112   040032          DAC WCLOC               /DATA FOR 1 INCH OF TAPE
02113   203501          LAC (WRBUF-1
02114   040033          DAC CALOC
02115   203572          LAC (44000              /WRITE ODD 200 BPI
02116   342750          TAD FDRIVE              /+ DRIVE
02117   707326          MTLC                    /COM TO CU
02120   203476          LAC (WRBUF+1            /TO WAIT 2ND WORD
02121   707304          MTGO                    /START TAPE
02122   540033          SAD CALOC               /2ND WORD OUT
02123   602126          JMP .+3                 /YES
02124   441425          ISZ LPTIME              /+1 WRITE START LOOP
02125   602122          JMP .-3
                        /NOW TIME FOR NEXT 200 CHAR OUT
02126   750000          CLA
02127   540032          SAD WCLOC               /200 CHARACTERS OUT
02130   602133          JMP .+3                 /YES 200 ONCE 2ND WORD
02131   441426          ISZ SUTIME              /NO +1 1 INCH TIME
02132   602127          JMP .-3
                        /
                        .EJECT
```

```
                                /WAIT FOR FLAG TIME WRITE SHUT DOWN
02133   707341                  MTSF
02134   602133                  JMP .-1                 /WAIT FLAG
02135   203500                  LAC (-3                 /20 CYCLE
02136   040010                  DAC 10                  /LOOP TO
02137   602140                  JMP .+1                 /TIME WRITE SHUT DOWN
02140   440010                  ISZ 10
02141   602140                  JMP .-1
02142   441427                  ISZ TRTIME
02143   707321                  MTCR
02144   602135                  JMP .-7
                                /DO A BACKSPACE AND TIME SHUT DOWN
02145   707301                  MTTR                    /WAIT DRV RDY AGN
02146   602145                  JMP .-1
02147   203573                  LAC (47400              /BK SPACE 200 PBI
02150   342750                  TAD FDRIVE              /+ DRIVE
02151   707326                  MTLC
02152   777777                  LAW -1
02153   040032                  DAC WCLOC
02154   203574                  LAC (JMP BSD200         /WHEN MTF=1
02155   040001                  DAC 1                   /WILL INTERRUPT
02156   700042                  ION
02157   707304                  MTGO
02160   602160                  JMP .
                                /TIME BACKSPACE SHUT DOWN 20 CYCLE LOOP
02161   203500          BSD2M0  LAC (-3
02162   040010                  DAC 10                  /STALL
02163   602164                  JMP .+1
02164   440010                  ISZ 10
02165   602164                  JMP .-1
02166   441430                  ISZ STRTIM              /+1 LOOP COUNT
02167   707321                  MTCR                    /CONTROL READY YET
02170   602161                  JMP BSD2M0                      /NO STALL AND COUNT
02171   777775                  LAW -3
02172   040017                  DAC 17
02173   707301          BDS2LP  MTTR                    /WAIT FOR DRV READY
02174   602173                  JMP .-1
02175   203501                  LAC (WRBUF-1
02176   040033                  DAC CALOC
02177   203575                  LAC (42400                      /READ ODD 204 PBI
02200   342750                  TAD FDRIVE              /+ DRIVE
02201   707326                  MTLC                    /TO CONTROL
02202   777673                  LAW -WC200
02203   040032                  DAC WCLOC
02204   203576                  LAC (JMP ER200L         /WHEN MTF INPUTS
02205   040001                  DAC 1                   /TIME READ SHUT DOWN
02206   707304                  MTGO                    /OR REPEAT READ LOOP
02207   700052                  ION 16
                                /
                                .EJECT
```

```
02210  540032          SKO WCLOC           /WAIT FOR
02211  602214          JMP .+3             /LAST CHARACTER IS IN
02212  602212          JMP .-2             /IS NOT IN
02213  441431          ISZ GAP5            /5 CYCLE LOOP
02214  602213          JMP .-1             /UNTIL INTERRUPT
                /USE ANOTHER 20 CYCLE READ SHUT DOWN LOOP
                /TIME 5 TIMES ACCUMULATED
02215  440017   ER20AL  ISZ 17
02216  741000          SKP
02217  602231          JMP FOR20Ø
02220  203505          LAC (7400
02221  707624          LDM
02222  777777          LAC -1
02223  040032          DAC WCLOC
02224  707322          MIAF
02225  707304          MIGO
02226  707341          MISF
02227  602225          JMP .-1
02230  602173          JMP RUS2LP
02231  203500  FOR20Ø   LAC (-5
02232  040016          DAC 16              /STALL
02233  602234          JMP .+1
02234  440016          ISZ 16
02235  602234          JMP .-1
02236  441432          ISZ GAP6            /+1 LOOP COUNT
02237  707321          MICR                /READY YET
02240  602231          JMP FOR200          /NO READ NOT SHUT DOWN
/TYPE OUT ACCUMULATED TIMES FOR 200 BPI
02241  103025          JMS TYPDRV
02242  203577          LAC (TEXT25         /5 AT 200BPI
02243  101447          JMS TYPET
/TYPE  WRITE START AT 200 BPI SHD = 800 BPI
02244  201425          LAC IPTIME
02245  101616          JMS TYPTIM
02246  000005              5
02247  003364              TEXT3
/TYPE 1 INCH OF DATA TRANSFER TIME
02250  201426          LAC SDTIME
02251  343600          TAD (FDG200
02252  101616          JMS TYPTIM
02253  000005              5
02254  003372              TEXT24
/TYPE WRITE SHUT DOWN TIME
02255  201427          LAC TRTIME
02256  101616          JMS TYPTIM
02257  000024              24
02260  003353              TEXT2
/
                .EJECT
```

```
                        /TYPE BACKSPACE SHUT DOWN
02261   201432          LAC SIPTIM
02262   101616          JMS TYPTIM
02263   000024              24
02264   003127              TEXT7
                        /TYPE LAST CHARACTER TO MTF TIME
02265   201431          LAC GAP5
02266   343541          TAD (2                  /18 CYCLES FOR DATA BRKS
02267   101616          JMS TYPTIM
02270   000001              1
02271   003413              TEXT26                      /TEXT26 LAST CHAR TO MTF
                        /TYPE READ SHUT DOWN TIME
02272   201432          LAC GAP6
02273   101616          JMS TYPTIM
02274   000024              24
02275   003140              TEXT8
02276   102736  END2=0  JMS CHCDRV
02277   002374          JMP T1=200
                        /NOW TIME FORWARD AND REVERSE
                        /DECELERATION AND FORWARD
                        /ACCELERATION
02300   141425  ACCELT  DZM LPTIME                  /CLEAR 5 LOCATIONS
02301   141431          DZM SIPTIM                  /IO LOOP COUNT
02302   141426          DZM SUTIME                  /TIMES
02303   141432          DZM GAP1
02304   141433          DZM GAP2
02305   101435          JMS ST1             /PUT ALL ONES IN WRITE
02306   102776          JMS WRINT /INITIALIZE WC AND CA
02307   203475          LAC (44000                  /WRITE ODD 0 0 BPI
02310   342750          TAD FDRIVE                  /+ DRIVE NUMBER
02311   707321          MICR
02312   602311          JMP .-1             /WAIT CU READY
02313   707326          MTLC                /SELECT DRIVE
02314   707301          MITR
02315   602314          JMP .-1             /WAIT DRIVE READY
02316   707304          MIGO                /START WRITE
02317   707341          MISF
02320   602317          JMP .-1             /WAIT WRITE DONE
02321   203505          LAC (7700
02322   707324          LCM                 /CHNG WRITE TO BACKSPACE
02323   777777          LAW -1
02324   040032          DAC WCLOC           /1 RECORD
02325   707322          MIAF                /CLR FLGS
02326   707304          MIGO                /AND GO
02327   707341          MISF                /WAIT FOR
02330   602327          JMP .-1             /BACK SPA DONE
                        /
                        .EJECT
```

```
                        /NOW READ TIME HOW LONG IT TAKES TO
                        /GET OVER THE FULL RECORD TO MTF AFTER WD1
                        /THIS TIME - TIME IN DATA AFTER CAF SHD=FWD DECELERATION
02331   707701          MITR
02332   602331          JMP .-1                 /WAIT DRV READY
02333   203502          LAC (47600                      /READ 600 ENI
02334   342750          TAD FDRIVE                      /+ DRIVE NUMBER
02335   707326          MILC
02336   777777          LAW -1
02337   040032          DAC WCLOC               /READ 1 WORD
02340   203501          LAC (WRBUF-1
02341   040033          DAC CALOC
02342   707304          MIGO                    /START TAPE
02343   203601          LAC (JMP ACCEL1
02344   040001          DAC 1                   /TO RETURN AFTER INT
02345   700052          ION 10                  /ENABLE I CLR AC
02346   540032          SAD WCLOC               /FIRST WORD YET
02347   741000          SKP                     /YES
02350   602346          JMP .-2                 /WAIT FOR FIRST WORD
02351   441432          ISZ GAP1                /COUNT UNTIL MTF
02352   602351          JMP .-1
                        /WAIT DRV RDY AND BACKSPACE AGAIN
02353   707701  ACCEL1  MITR
02354   602353          JMP .-1                 /WAIT RDY
02355   777777          LAW -1
02356   040032          DAC WCLOC               /1 RECORD BACK
02357   203536          LAC (47600                      /BKSPACE 600 ENI
02360   342750          TAD FDRIVE
02361   707326          MILC
02362   707304          MIGO
02363   707341          MISF                    /WAIT BKSPACE DONE
02364   602363          JMP .-1
                        /
                        .EJECT
```

```
02365   777777
02366   040032
02367   203501
02370   040033
02371   203602
02372   707324
02373   707322
02374   707304
02375   203603
02376   040001
02377   750010
02400   540032
02401   741000
02402   602400
02403   203502
02404   342750
02405   703302
02406   707326
02407   740010
02410   707301
02411   602410
02412   707326
02413   777777
02414   040032
02415   700042
02416   707314
02417   540032
02420   602423
02421   441430
02422   602417
02423   441433
02424   602423
02425   707301      FWDDEC  MTR             /WAIT DRIVE READY
02426   602425              JMP .-1         /AGAIN
02427   203644              LAC (WRBUF+BLENTH-10
02430   040010              DAC 10          /TO CLR 5 LOCATIONS
02431   777773              LAW -5          /0'S CODES WILL
02432   040011              DAC 11          /CAUSE BAD TAPE STATUS
02433   160013              DZM* 13         /CLR 1 BUFFER LOC
02434   440011              ISZ 11          /DONE 5
02435   602433              JMP .-2         /NO
                    /
                            .EJECT
```

```
                    LAW -1
                    DAC WCLOC           /TO COUNT 1 WORD
                    LAC (WRBUF-1        /INTO RECORD
                    DAC CALOC
                    LAC (2300
                    LCM                 /CHNG BKSPACE TO READ
                    MTAF                /CLR FLGS
                    MTGO                /AND GO AGAIN
                    LAC (JMP FWDDEC)    /DECELERATION IS DONE WHEN
                    DAC 1               /WHEN MTF INTERRUPTS
                    CLA                 /ENABLE PIE
                    SAD WCLOC           /INTO RECORD YET
                    SKP                 /YES STOP TAPE
                    JMP .-2             /YES WAIT FOR 10 WORDS
                    LAC (420000                 /GET READ CO MD
                    TAD DRIVE                   /+ DRIVE TO RESET
                    CAF                 /PWR CLR IO
                    MTLC                /LOAD READ ENT AGAIN
                    NOP
                    MTR                 /WAIT DRIVE READY
                    JMP .-1
                    MTLC                /LOAD READ COMMAND AGAIN
                    LAW -1
                    DAC WCLOC           /IO COUNT 1 WORD IN
                    ION
                    MTGO 1              /START TAPE
                    SAD WCLOC           /WHEN WCF0 ACCELERATED
                    JMP .+3
                    ISZ STATIM                  /+1 ACCEL LOOP COUNT
                    JMP .-3             /TEST WC AGAIN
                    ISZ GAP2
                    JMP .-1
```

```
02436   203605          LAC (4600           /WRITE 800 EVEN PAR
02437   342750          TAD FDRIVE                  /+ DRIVE NUMBER
02440   707326          MTLC                /LOAD WRITE COMMD
02441   102776          JMS WRINT /INITIALIZE WC AND CA
02442   707304          MTGO
02443   740000          NOP                 /WAIT TO TEST
02444   707301          MTTR                /WAIT FOR DRIVE
02445   602444          JMP .-1             /SETTLE DOWN
02446   203606          LAC (7600           /BACKSPACE AT 800
02447   342750          TAD FDRIVE                  /+ DRIVE NUMBER
02450   707326          MTLC                /LOAD COMMD
02451   777777          LAW -1
02452   040032          DAC WCLOC           /1 RECORD
02453   707304          MTGO                /GO BKWD
02454   203607          LAC (JMP B(WDEC)    /MTF WILL GO TO 1
02455   040001          DAC 1               /AFTER FIRST WORDS OF ONES
02456   707352          MTRS                /WHEN BAD TAPE STATUS
02457   503610          AND (210            /=1 THE TAPE IS OVER
02460   741200          SNA                 /LONGER LENGTH
02461   602456          JMP .-3             /0 FONES
02462   777777          LAW -1
02463   040032          DAC WCLOC           /RESET IN CASE OF
02464   203606          LAC (7600
02465   342750          TAD FDRIVE                  /PREP AC FOR BKWD ENT
02466   703302          CAF                 /PWR CLR
02467   707326          MTLC                /RELOAD AGAIN
02470   140032          DZM WCLOC
02471   203501          LAC (WRBUF-1
02472   040033          DAC CALOC
02473   707301          MTTR
02474   602473          JMP .-1
02475   203502          LAC (4200
02476   342750          TAD FDRIVE
02477   707326          MTLC
02500   707304          MTGO
02501   700052          ION 10
02502   540032          SAD WCLOC
02503   602502          JMP .-1

                                            /ENABLE INT
02504   441426          ISZ SDTIME                  /COUNT UNTIL MTF
02505   602504          JMP .-1             /=1 AGAIN TAPE IS STOPPED

/

                        .EJECT
```

```
                                /TYPE OUT ACCUMULATED LOOP TIMES
002506  103025  BKWDEC  JMS TYPDRV
002507  201430          LAC SIRTIM              /GET FWD ACCEL
002510  101616          JMS TYPTIM              /CONVERT AND TYPE
002511  000005          5                       /5 CYCLES IN LOOP
002512  003440          TEXT2b                  /FWD ACCELERATION
002513  062633          DAC* ACCLSV
002514  442633          ISZ ACCLSV
002515  201426          LAC SUTIME              /SAVE
002516  341032          TAD WCLOC               /+BRK CYCLES
002517  062635          DAC* DECLSV             /BKWD
002520  442635          ISZ DECLSV              /DECELERATE
                        /NOW TYPE FWD DECELERATION
002521  201433          LAC GAP2                /TIME IN DATA AFTER CAR
002522  740031          CMA                     /MADE - AND SUBTRACTED FROM
002523  341432          TAD GAP1                /TOTAL DATA TIME SAVE FWD DECEL
002524  101616          JMS TYPTIM
002525  000023          3
002526  003426          TEXT27
002527  103004          JMS STRREW              /START REWIND
002530  102730          JMS CHKDRV              /DONE ALL DRIVES
002531  602507          JMP ACCELT              /NO GO TO NEXT
                        /
                                .EJECT
```

```
                        /CALCULATE AND TYPE OUT
                        /FORWARD AND BACKWARD DECELERATION TIMES
                        /FIRST CALCULATE FWD DECELERATION
02532   102615  CALTMS  JMS SETPTR
02533   103025          JMS TYPDRV
02534   777777          LAW -1
02535   362631          TAD* GP1SAV         /NON STOP GAP-1
02536   740001          CMA                 /MAKE 2S COMP
02537   362633          TAD* ACCLSV         /LESS FWD ACCEL
02540   362632          TAD* GP2SAV         /DIFF BETWEEN GAPS
02541   040017          DAC 17              /SHOULD=FWD DECCEL
02542   203611          LAC (TEXT19
02543   101447          JMS TYPET           /CR LF
02544   200017          LAC 17
02545   101535          JMS TYDECI                  /TYPE CALCULATED TIME
02546   203612          LAC (TEXT27
02547   101447          JMS TYPET           /FWD DECELERATION
02550   203613          LAC (TEXT30         /CALCULATED
02551   101447          JMS TYPET
02552   442631          ISZ GP1SAV                  /STEP ADDRESSES
02553   442633          ISZ ACCLSV                  /FOR NEXT DRIVE
02554   442632          ISZ GP2SAV
                        /NOW CALCULATE AND TYPE BKWARD DECELERATION ACCUMULATED TO MTR
02555   222635          LAC* DECLSV
02556   442635          ISZ DECLSV
02557   101616          JMS TYPTIM                  /TYPE II
02560   000003              3
02561   003452              TEXT29
02562   040017          DAC 17              /SAVE CONVERTED
02563   777777          LAW -1
02564   362634          TAD* EORTSV
02565   442634          ISZ EORTSV                  /-TIME TO EOR
02566   740001          CMA
02567   340017          TAD 17              /FROM TOTAL DATA TO EOR
02570   040016          DAC 16              /SHOULD = BKWD DECELERATION
02571   203614          LAC (TEXT19
02572   101447          JMS TYPET           /CR LF
02573   200016          LAC 16
02574   101535          JMS TYDECI                  /TYPE CALCULATED
02575   203615          LAC (TEXT29         /BACKWARD DECELERATION
02576   101447          JMS TYPET
02577   203616          LAC (TEXT30
02600   101447          JMS TYPET           /(CALCULATED)
02601   102730          JMS CHGDRV                  /DONE ALL DRIVES
02602   602533          JMP CALTMS+1
                        /
                        .EJECT
```

```
02603  2003417                  LAC (TEXT1B
02604  1001447                  JMS TYPET
02605  7500404                  LAS
02606  5003021                  AND (4'0000
02607  7402040                  SZA                     /HALT AT EOT = 1
02610  7402041                  HLT                     /YES
02611  1003417                  JMS WATREW                      /WAIT FINISH REWIND
02612  1002737                  JMS CHGDRV                      /FOR ALL DRIVES
02613  6002611                  JMP .-2
02614  6000226                  JMP TIMTS1                      /START OVER
                        /
                        /RESTORE ADDRESSES TO SAVE TIMES TO CALC DECELERATION
02615  6002615          SETPTR  JMP .
02616  2002636                  LAC SAVGP1
02617  3402631                  DAC GP1SAV
02620  2002647                  LAC SAVGP2
02621  3402632                  DAC GP2SAV
02622  2002661                  LAC SVACCL
02623  3402633                  DAC ACCLSV
02624  2002671                  LAC SVFORT
02625  3402634                  DAC FORTSV
02626  2002702                  LAC SVDECL
02627  3402635                  DAC DECLSV
02630  6022615                  JMP* SETPTR
                        /
                        /TABLES TO SAVE SOME ACCUMULATED TIMES
02631  0000000          GP1SAV  0
02632  0000000          GP2SAV  0
02633  0000000          ACCLSV  0
02634  0000000          FORTSV  0
02635  0000000          DECLSV  0
02636  0002637          SAVGP1  .+1                     /TO SAVE GAP1 FOR 8 DRIVES
                        /
02647                           .LOC SAVGP1+11
02647  0002650          SAVGP2      .+1                 /TO SAVE GAP2 FOR 8 DRIVES
02660                           .LOC SAVGP2+11
02661  0002661          SVACCL      .+1                 /TO SAVE FORWARD ACCEL FOR 8 DRIVES
02671                           .LOC SVACCL+11
02671  0002672          SVFORT      .+1                 /TO SAVE END OF REC FOR 8 DRIVES
02702                           .LOC SVFORT+11
02702  0002703          SVDECL      .+1                 /TO SAVE LOP COUNT BKWD FOR 8
02713                           .LOC SVDECL+11
                        /
                                .EJECT
```

```
                        /TAPE 4 OF DRIVE DIAGNOSTIC
                        /
                        /RESET DRIVE SELECTION TO LOWEST DRIVE NUMBER
002713  002713  RSFDRV  JMP .
002714  142751          DZM CDRIVE          /START WITH 0
002715  203021          LAC (400000         /BIT FOR 0
002716  042754          DAC CDRVBT          /SAVE IT
002717  502752          AND MSKITS          /MASK WITH DRVS SELECTED
002720  744200          SZA!CLL             /DRIVE EXIST
002721  602726          JMP .+5             /YES
002722  442751          ISZ CDRIVE          /+1 DRV NUMBER
002723  202754          LAC CDRVBT
002724  744020          RCR                 /MOVE BIT OVER 1
002725  602716          JMP RSFDRV+3        /TRY AGAIN
002726  102755          JMS GTNINE
002727  622713          JMP* RSFDRV
                        /
                        /SELECT NEXT DRIVE IN SEQUENCE
                        /+1 EXIT ADDRESS IF LAST DRIVE TESTED
002730  602730  CHGDRV  JMP .
002731  202754          LAC CDRVBT          /GET MASK BIT
002732  744020          RCR                 /MOVE OVER 1
002733  442751          ISZ CDRIVE                  /+1 DRIVE NUMBER
002734  503473          AND (7760000        /MASK OF 6 BITS
002735  740200          SZA                 /END OF 8 DRIVES
002736  602742          JMP .+4             /NO SEE IF DRV EXISTS
002737  102713          JMS RSFDRV                  /RESET TO FIRST SELECTED
002740  442730          ISZ CHGDRV          /+1 EXIT END OF DRIVES
002741  622730          JMP* CHGDRV         /EXIT
002742  042754          DAC CDRVBT          /SAVE CUR BIT
002743  502752          AND MSKITS          /MASK DRIVES SELECTED
002744  745200          SNA!CLL             /DRIVE EXIST
002745  602731          JMP CHGDRV+1        /NO SEE IF NEXT EXISTS
002746  102755          JMS GTNINE
002747  622730          JMP* CHGDRV         /EXIT WITHOUT SKIP
                        /
002750  000000  FDRIVE  0
002751  000000  CDRIVE  0
002752  000000  MSKITS  0
002753  000000  MACHPU  0
002754  000000  CDRVBT  0
                        /
                        .EJECT
```

```
                        /SET CORE DUMP BIT IF DRIVE IS 9 TRACK
0?755   002755  GTNIVE  JMP .
0?756   202751          LAC CURIVE              /GET CURRENT DRIVE
0?757   742?2?          RIR
0?760   742?2?          RTR                     /POSITION FOR FUNCTION
0?761   004757          DAC FUNIVE
0?762   202754          LAC CONVRT                      /MOVE COMPARE BIT
0?763   742?2?          RTR                     /OVER 10 PLACES
0?764   742?2?          RTR                     /TO TEST FOR
0?765   742?2?          RTR                     /9 TRACK ON A 1
0?766   742?2?          RTR
0?767   742?2?          RTR
0?770   502752          AND (7777
0?771   740200          SZA                     /SKIP /TRK
0?772   203622          LAC (2^100              /CORE DUMP AND OVR BPI
0?773   342757          TAD FUNIVE              /+ DRIVE FOR FUNCTION
0?774   004757          DAC FUNIVE                      /RESTORE
0?775   622755          JMP* GTNINE                     /EXIT
                        /
                        /INITIALIZE WORD COUNT AND CURRENT ADDRESS
0?776   002777  WRINT   JMP .
0?777   775253          LAW -BLENTH
1?000   004032          DAC WCLOC
1?001   203501          LAC (A^BUF-1
1?002   040033          DAC CALOC
1?003   622776          JMP* WRINT
                        .EJECT
```

```
                                /START REWIND OPERATIONS
03004   603004                  STRREW  JMP .
03005   202757                          LAC FDRIVE
03006   707326                          MTLC
03007   707301                          MTTR
03010   603007                          JMP .-1
03011   205023                          LAC (1400
03012   707324                          [illegible]
03013   707304                          MTGO
03014   707321                          MTCR
03015   603014                          JMP .-1
03016   623004                          JMP* STRREW
                                /
                                /WAIT FOR REWIND TO FINISH
03017   603017                  WATREW  JMP .
03020   202757                          LAC FDRIVE
03021   707326                          MTLC
03022   707301                          MTTR
03023   603022                          JMP .-1
03024   623017                          JMP* WATREW
                                /
                                /TYPE DRIVE NUMBER AND HEADER
03025   603025                  TYPDRV  JMP .
03026   205024                          LAC (TEXT2[illegible]
03027   101447                          JMS TYPET
03030   202751                          LAC CDRIVE
03031   343526                          TAD (260
03032   101473                          JMS TY1ASC
03033   205025                          LAC (TEXT21
03034   101447                          JMS TYPET
03035   623025                          JMP* TYPDRV
                                /
                                        .EJECT
```

```
                                    /TEXT1 WRITE LOAD POINT DELAY
003036      240240                  TEXT1   240240
003037      327322                          327322
003040      311324                          311324
003041      305240                          305240
003042      314317                          314317
003043      301314                          301314
003044      240320                          240320
003045      317311                          317311
003046      316324                          316324
003047      240304                          240304
003050      305314                          305314
003051      301331                          301331
003052      377377                          377377
                                    /
                                    /TEXT2 WRITE SHUT DOWN
003053      240240                  TEXT2   240240
003054      327322                          327322
003055      311324                          311324
003056      305240                          305240
003057      323331                          323331
003060      325324                          325324
003061      240304                          240304
003062      317327                          317327
003063      316377                          316377
                                    /
                                    /TEXT3 WRITE START
003064      240240                  TEXT3   240240
003065      327322                          327322
003066      311324                          311324
003067      305240                          305240
003070      323324                          323324
003071      301322                          301322
003072      324377                          324377
                                    /
                                    /TEXT4 SHUTLF DOWN
003073      240247                  TEXT4   240240
003074      323305                          323305
003075      324324                          324324
003076      314305                          314305
003077      240304                          240304
003100      317327                          317327
003101      316377                          316377
                                    /
                                            .EJECT
```

```
                                    /TEXT5 WRITE TO ERASE HEAD
000102      240240      TEXT5       240240
000103      327322                  327322
000104      311324                  311324
000105      305240                  305240
000106      324317                  324317
000107      240305                  240305
000110      322301                  322301
000111      323305                  323305
000112      240316                  240317
000113      305301                  305301
000114      304377                  304377
                                    /
                                    /TEXT6 WRITE AGAINTOP GAP
000115      240240      TEXT6       240240
000116      327322                  327322
000117      311324                  311324
000120      305240                  305240
000121      316317                  316317
000122      316323                  316323
000123      324317                  324317
000124      320240                  320240
000125      307301                  307301
000126      320377                  320377
                                    /
                                    /TEXT7 ERASE SHUT DOWN
000127      240240      TEXT7       240240
000130      302313                  302313
000131      323324                  323324
000132      240323                  240323
000133      310325                  310325
000134      324240                  324240
000135      304317                  304317
000136      327316                  327316
000137      377377                  377377
                                    /
                                    /TEXT 8 READ SHUT DOWN
000140      240240      TEXT8       240240
000141      322305                  322305
000142      301304                  301304
000143      240323                  240323
000144      310325                  310325
000145      324240                  324240
000146      304317                  304317
000147      327316                  327316
000150      377377                  377377
                                    /
                                    .EJECT
```

```
                                    /TEXT9 GAP CONSISTENCY
000151      240307                  TEXT9   240307
000152      301320                          301320
000153      240303                          240303
000154      317316                          317316
000155      323311                          323311
000156      323324                          323324
000157      305316                          305316
000160      303331                          303331
000161      377377                          377377
                                    /
                                    /TEXT10 GAP
000162      240240                  TEXT10  240240
000163      307301                          307301
000164      320240                          320240
000165      377377                          377377
                                    /
                                    /TEXT11
                                    /GAPS 0,7,6,5,4,1,2,3
000166      215212                  TEXT11  215212
000167      212307                          212307
000170      301320                          301320
000171      323240                          323240
000172      270276                          270276
000173      267276                          267276
000174      266276                          266276
000175      265276                          265276
000176      264276                          264276
000177      261276                          261276
000200      262276                          262276
000201      263276                          263276
000202      377377                          377377
                                    /
                                            .EJECT
```

```
                                    /TEXT12
                                    /WRITE XIRG TIMES
                                    /TIME
0003  215212                       TEXT12  215212
0004  212327                               212327
0005  322311                               322311
0006  324305                               324305
0007  240337                               240337
0010  311322                               311322
0011  307240                               307240
0012  324311                               324311
0013  315305                               315305
0014  323215                               323215
0015  212324                               212324
0016  311315                               311315
0017  305377                               305377
                                    /
                                    /TEXT13 DRIVE
0020  240240                       TEXT13  240240
0021  304322                               304322
0022  311326                               311326
0023  305240                               305240
0024  377377                               377377
                                    /
                                    /TEXT 14
                                    /READ FROM SET DELAYS
                                    /TIME
0025  215212                       TEXT14  215212
0026  212322                               212322
0027  305301                               305301
0030  307240                               307240
0031  305322                               305322
0032  317315                               317315
0033  240305                               240305
0034  317324                               317324
0035  240304                               240304
0036  305314                               305314
0037  301331                               301331
0040  323215                               323215
0041  212324                               212324
0042  311315                               311315
0043  305377                               305377
                                    /
                                            .EJECT
```

```
                                    /TEXT15
                                    /WRITE EOF TIMES
                                    /TIME
000244      215212                  TEXT15      215212
000245      212327                              212327
000246      322311                              322311
000247      324305                              324305
000250      240305                              240305
000251      317306                              317306
000252      240324                              240324
000253      311315                              311315
000254      305323                              305323
000255      215212                              215212
000256      324311                              324311
000257      315305                              315305
000260      377377                              377377
                                    /
                                    /TEXT16 FOR TO EOF SP TIME STATUS=
000261      240240                  TEXT16      240240
000262      305317                              305317
000263      322240                              322240
000264      324317                              324317
000265      240305                              240305
000266      317306                              317306
000267      240323                              240323
000270      320240                              320240
000271      324311                              324311
000272      315305                              315305
000273      240323                              240323
000274      324301                              324301
000275      324325                              324325
000276      323275                              323275
000277      377377                              377377
                                    /
                                    /TEXT17 SPACE SHUT DOWN
000300      240240                  TEXT17      240240
000301      323320                              323320
000302      301303                              301303
000303      305240                              305240
000304      323316                              323316
000305      325324                              325324
000306      240304                              240304
000307      317327                              317327
000310      316377                              316377
                                    /
                                                .EJECT
```

```
                                        /TEXT18 END OF TIMING
003311      215212              TEXT18      215212
003312      212305                          212305
003313      316304                          316304
003314      240317                          240317
003315      306240                          306240
003316      324311                          324311
003317      315311                          315311
003320      316307                          316307
003321      377377                          377377
                                /
                                /TEXT19 ER LF
003322      215212              TEXT19      215212
003323      377377                          377377
                                /
                                /TEXT       20
                                /
                                /DRIVE
003324      215212              TEXT20      215212
003325      212304                          212304
003326      322311                          322311
003327      320305                          320305
003330      240377                          240377
                                /
                                /TEXT21
                                /TIME FUNCTION
003331      215212              TEXT21      215212
003332      324311                          324311
003333      315305                          315305
003334      240240                          240240
003335      240240                          240240
003336      306325                          306325
003337      316303                          316303
003340      324311                          324311
003341      317316                          317316
003342      377377                          377377
                                            .EJECT
```

```
003343      215212          /TEXT 22
003344      212314          /LAST CHARACTER INPUT TO MTF
003345      301323          /TIME
003346      324240          TEXT22      215212
003347      303310                      212314
003350      301322                      301323
003351      240311                      324240
003352      316327                      303310
003353      325324                      301322
003354      240324                      240311
003355      317240                      316327
003356      315324                      325324
003357      306215                      240324
003360      212324                      317240
003361      311315                      315324
003362      305377                      306215
                                        212324
003363      323240                      311315
003364      301324                      305377
003365      240265          /TEXT 23 FUNCTIONS AT 556 BPI
003366      265266          TEXT23      323240
003367      240302                      301324
003370      320311                      240265
003371      377377                      265266
                                        240302
003372      240240                      320311
003373      317316                      377377
003374      305240
003375      311316          /TEXT24 ONE INCH DATA TRANSFER TIME
003376      303310          TEXT24      240240
003377      240304                      317316
003400      301324                      305240
003401      301240                      311316
003402      324311                      303310
003403      315305                      240304
003404      377377                      301324
                                        301240
                                        324311
                                        315305
                                        377377
                                /
                                        .EJECT
```

```
                                    /TEXT 25 FUNCTIONS AT 200 RPM
003405      323240      TEXT25      323240
003406      301324                  301324
003407      240262                  240262
003410      260260                  260260
003411      302320                  302320
003412      311377                  311377
                                    /TEXT 26 LAST CHAR IN TO MTR
003413      240240      TEXT26      240240
003414      314301                  314301
003415      323324                  323324
003416      240305                  240305
003417      310301                  310301
003420      322240                  322240
003421      311316                  311316
003422      240324                  240324
003423      317240                  317240
003424      315324                  315324
003425      306377                  306377
                                    /
                                    /TEXT 27 FWD DECELERATION
003426      240240      TEXT27      240240
003427      306327                  306327
003430      304240                  304240
003431      304305                  304305
003432      303305                  303305
003433      314305                  314305
003434      322301                  322301
003435      324311                  324311
003436      317316                  317316
003437      377377                  377377
                                    /TEXT 28 FWD ACCELERATION
003440      240240      TEXT28      240240
003441      306327                  306327
003442      304240                  304240
003443      301303                  301303
003444      303305                  303305
003445      314305                  314305
003446      322301                  322301
003447      324311                  324311
003450      317316                  317316
003451      377377                  377377
                                    /TEXT 29 BKWD DECELERATION
003452      240240      TEXT29      240240
003453      302313                  302313
003454      327240                  327240
003455      304305                  304305
003456      303305                  303305
003457      314305                  314305
003460      322301                  322301
003461      324311                  324311
003462      317316                  317316
003463      377377                  377377
                                    /
                                    .EJECT
```

```
                                                /TEXT 53 INDICATES CALCULATED
                                                TEXT50      240250
                                                            303301
                                                            314303
                                                            325314
                                                            301324
                                                            305304
                                                            251377
                                                            .END
 03464      240250
 03465      303301
 03466      314303
 03467      325314
 03470      301324
 03471      305304
 03472      251377
            000000
 03473      776000      *LIT
 03474      776377      *LIT
 03475      044000      *LIT
 03476      004001      *LIT
 03477      000251      *LIT
 03500      777775      *LIT
 03501      003777      *LIT
 03502      042600      *LIT
 03503      600377      *LIT
 03504      000436      *LIT
 03505      007000      *LIT
 03506      600472      *LIT
 03507      000516      *LIT
 03510      004000      *LIT
 03511      002600      *LIT
 03512      441425      *LIT
 03513      000707      *LIT
 03514      001424      *LIT
 03515      000261      *LIT
 03516      003151      *LIT
 03517      003166      *LIT
 03520      100000      *LIT
 03521      001424      *LIT
 03522      441425      *LIT
 03523      054600      *LIT
 03524      201425      *LIT
 03525      003203      *LIT
 03526      000267      *LIT
 03527      001424      *LIT
 03530      441425      *LIT
 03531      201425      *LIT
 03532      003225      *LIT
 03533      001424      *LIT
 03534      441425      *LIT
 03535      601205      *LIT
 03536      047600      *LIT
 03537      003343      *LIT
 03540      201425      *LIT
 03541      000022      *LIT
 03542      001424      *LIT
 03543      441425      *LIT
 03544      601305      *LIT
 03545      045600      *LIT
 03546      003244      *LIT
 03547      201425      *LIT
 03550      006000      *LIT
```

```
03551   001375   *LIT
03552   000377   *LIT
03553   000007   *LIT
03554   001572   *LIT
03555   777766   *LIT
03556   000012   *LIT
03557   003322   *LIT
03560   001424   *LIT
03561   020000   *LIT
03562   044500   *LIT
03563   001740   *LIT
03564   047500   *LIT
03565   001766   *LIT
03566   042500   *LIT
03567   002020   *LIT
03570   003363   *LIT
03571   000160   *LIT
03572   044000   *LIT
03573   047400   *LIT
03574   002161   *LIT
03575   042400   *LIT
03576   002215   *LIT
03577   003405   *LIT
03600   000050   *LIT
03601   002353   *LIT
03602   002000   *LIT
03603   002425   *LIT
03604   006515   *LIT
03605   004600   *LIT
03606   007600   *LIT
03607   002506   *LIT
03610   000200   *LIT
03611   003322   *LIT
03612   003426   *LIT
03613   003464   *LIT
03614   003322   *LIT
03615   003452   *LIT
03616   003464   *LIT
03617   003311   *LIT
03620   040000   *LIT
03621   400000   *LIT
03622   020100   *LIT
03623   001000   *LIT
03624   003324   *LIT
03625   003331   *LIT
```

NO ERROR LINES