TM02/TU16

BASIC FUNCTION TEST

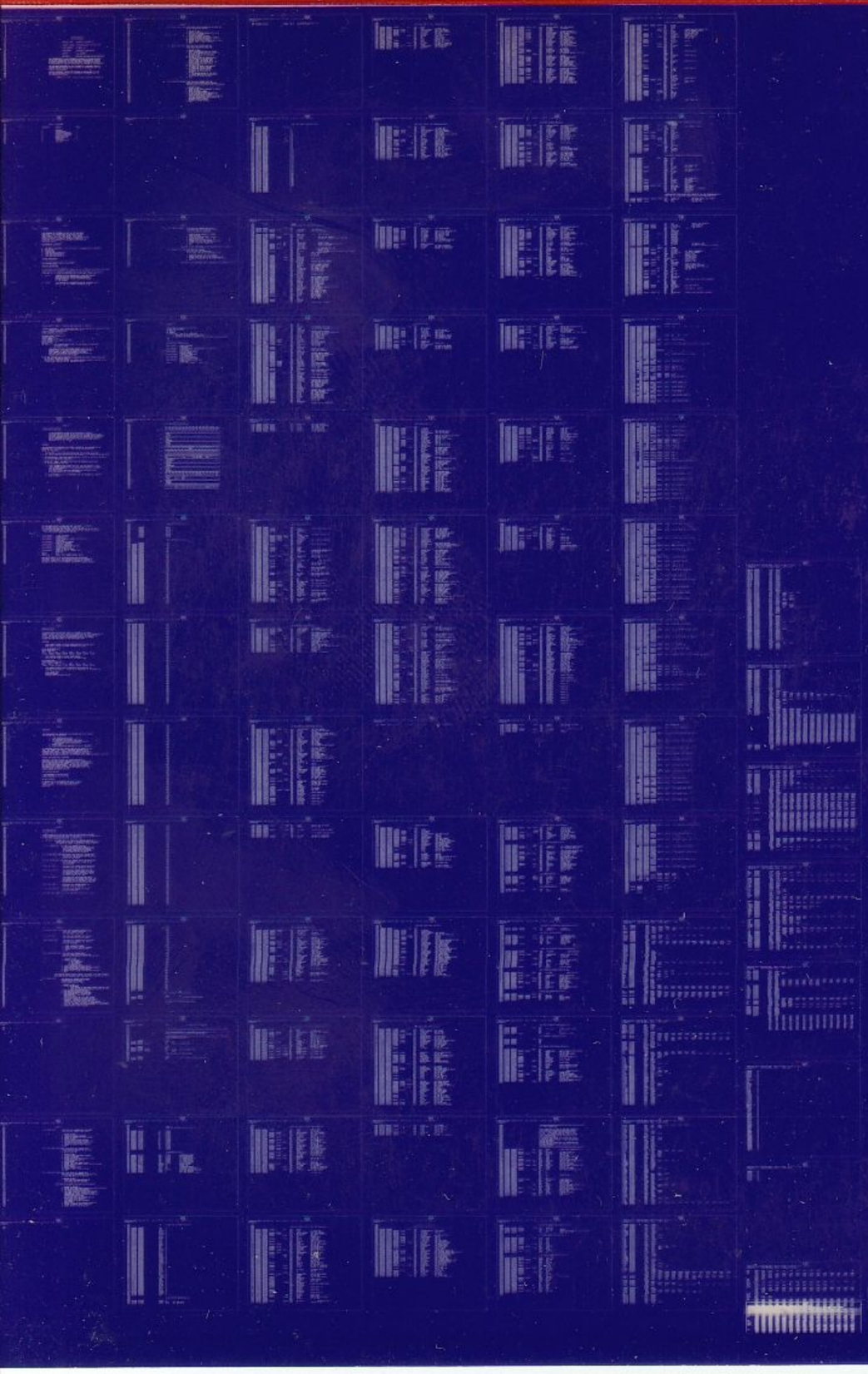
MD-11-DZTUB-E

EP-DZTUB-E-DL-A NOV 1976

FICHE 1 OF 1

digital

MADE IN USA



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                                .REM    %
```

IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DZTUB-E-D

PRODUCT TITLE: TM02/TU16 BASIC FUNCTION TEST

DATE CREATED: 21 APRIL 76

MAINTAINER: DIAGNOSTIC ENGINEERING

AUTHOR: R.B. BARNES

REVISED: SUPPORTS SOFTWARE SWITCH REGISTER

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1. ABSTRACT

THIS PROGRAM IS INTENDED TO TEST ALL OF THE BASIC FUNCTIONAL LEVEL OPERATIONS OF THE TMD2/TU16 MAG TAPE SYSTEM. ALL FUNCTIONS; WRITE, READ, SPACE, ERASE, REWIND, ETC; WILL BE TESTED. IN ADDITION TO THE TMD2/TU16 TESTS, THE RH WILL BE TESTED SEPARATELY IN SO FAR AS IT IS POSSIBLE TO SEPARATE THE RH FROM THE TMD2/TU16 ITSELF.

2. REQUIREMENTS (HARDWARE)

A. ANY PDP-11 PROCESSOR - WITH OR WITHOUT A HARDWARE SWITCH REGISTER
B. 8K OF CORE
C. CONSOLE TTY
D. TMD2 MAGTAPE CONTROLLER
E. MASS BUS CONTROLLER
F. TU16 MAG TAPE TRANSPORT

3. LOADING PROCEEDURE

USE STANDARD BINARY LOADING PROCEEDURE

4. STARTING PROCEEDURE

****SOFTWARE SWITCH REGISTER IS LOCATED AT LOC. 176(REFER TO SECTION 5 FOR MORE

THERE ARE TWO (2) STARTING ADDRESSES THAT MAYBE USED: 200(8) AND 210(8)

A. 200(8): STARTING AT THIS ADDRESS WILL CAUSE THE PROGRAM IDENTIFICATION TO BE PRINTED FOLLOWED BY REQUESTS FOR THE VARIOUS PARAMETERS NEEDED BY THE PROGRAM.

B. 210(8): THIS ADDRESS IS INTENDED FOR USE AS A RESTART ONLY AND WILL USE THE CURRENT PARAMETER VALUES.

```
                                4.1     SAMPLE START AT 200(8): OPERATOR RESPONSES ARE IN PARENS.

                                        ***SWR=XXXXXX NEW=    WILL BE PRINTED FIRST IF SOFTWARE SWITCH REGISTER IS SELEC
                                                (REFER TO SECTION 5 FOR OPERATOR ACTION)
                                        TM02-TU16 BASIC FUNCTION TEST
                                        ENTER CONDITIONS IN OCTAL

                                        REGISTER START: 172440 (CR)
                                        VECTOR: 224 (CR)
                                        DRIVE NUMBER: 0 (3)
                                        SLAVE NUMBER: 0 (6) SERIAL NO: 200
                                        RH11 OR RH70: (0)
                                        RH ONLY: (0)
                                        NRZ ONLY: (1) -NRZ (NON-RETURN-TO ZERO) IS THE METHOD OF RECORDING
                                                      ON MAGNETIC TAPE.

                                                THIS EXAMPLE SLOWS THE PROGRAM START USING THE RH11
                                                ADDRESS (CSI) OF 172440, AN INTERRUPT VECTOR OF 224,
                                                DRIVE NUMBER 3, AND SLAVE NUMBER 6, NRZ ONLY.
                                                NOTE THAT THE CURRENT VALUES FOR EACH PARAMETER IS
                                                PRINTED AND MAY OR NOT BE CHANGED.

                                        ***IF THE SOFTWARE SWITCH REGISTER IS SELECTED THE FIRST TYPE OUT WILL BE
                                           AS FOLLOWS:  SWR=XXXXXX NEW=
                                           THIS WILL BE TYPED OUT BEFORE THE HEADER MESSAGE (REFER TO SECTION 5 FOR
                                           A MORE DETAIL DESCRIPTION FOR OPERATOR ACTION.)
```

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5. CONSOLE SWITCH SETTING

IF THE DIAGNOSTIC IS RUN ON A CPU WITHOUT A SWITCH REGISTER THEN A SOFTWARE SWITCH REGISTER IS USED WHICH ALLOWS THE USER THE SAME SWITCH OPTIONS AS THE HARDWARE SWITCH REGISTER. IF THE HARDWARE SWITCH REGISTER DOES NOT EXIST OR IF ONE DOES AND IT CONTAINS ALL ONES (177777) THEN THE SOFTWARE SWITCH REGISTER (LOC. 176) IS USED.

CONTROL:

THIS PROGRAM ALSO SUPPORTS THE DYNAMIC LOADING OF THE SOFTWARE SWITCH REGISTER (LOC. 176) FROM THE TTY. THIS CAN BE ACCOMPLISHED BY DOING THE FOLLOWING:

1) TYPE CONTROL G <↑G>; THIS WILL ALLOW THE TTY TO ENTER DATA INTO LOC. 176 AT SELECTED POINTS WITHIN THE PROGRAM; I.E. SCOPE ROUTINE AND AFTER

2) THE MACHINE WILL THEN TYPE: SWR=XXXXXXNEW= (XXXXXX IS THE OCTAL CONTENTS OF THE SOFTWARE SWITCH REGISTER.)

3) AFTER THE ''NEW='' HAS BEEN TYPED THEN THE OPERATOR CAN DO ONE OF THE FOLLOWING AT THE TTY:

   A) TYPE A NUMBER TO BE LOADED INTO LOC. 176 FOLLOWED BY A <CR>. (ONLY NUMBERS BETWEEN 0-7 WILL BE ACCEPTED AND ONLY 6 NUMBERS WILL BE ALLOWED)
   IF A <CR> IS THE FIRST KEY DEPRESSED THE SOFTWARE SWITCH REGISTER CONTENTS WILL NOT BE CHANGED.

   B) IF A CONTROL U <↑U> IS DEPRESSED THEN THE PROGRAM WILL SEND YOU BACK TO STEP 2.

```
                        ALL SWITCHES EXCEPT 5-9 ARE USED AND THE NORMAL, OR DEFAULT,
                        RUN IS DONE WITH ALL SWITCHES SET TO ZERO (0).
                        ALL HARDWARE SWITCHES ARE DYNAMIC, AND MAY BE CHANGED AT ANY TIME.
                        ***BUT, THE SOFTWARE SWITCH REGISTER CAN ONLY BE  LOADED DYNAMICALLY
                           AS STATED ABOVE UNDER CONTROL HEADING.


                        SW15(100000):   1=HALT ON ERROR
                                        0=CONTINUE
                        SW14(040000):   1=LOOP ON ERROR (SCOPE: RH TESTS ONLY)
                                        0=CONTINUE
                        SW13(020000):   1=DO NOT PRINT ERRORS
                                        0=PRINT ALL ERRORS
                        SW12(010000):   1=INHIBIT ITERATION
                                        0=DO ALL ITERATIONS PER TEST
                        SW11(004000):   1=CONTINUOUS CYCLE
                                        0=HALT AT END OF PASS
                        SW10(002000):   1=HALT AT END OF CURRENT TEST
                                        0=CONTNUE
                        SW9-5:          N/A
                        SW4-0:          SELECT TEST NUMBER::00=ALL TESTS

                        THE USE OF SW0-4 IS TO ALLOW SELECTION AND CONTINUOUS
                        EXECUTION OF ANY TEST. THE TEST SELECTION MAY BE CHANGED AT
                        ANY TIME, HOWEVER IT IS ADVISABLE TO USE SW10 TO STOP THE
                        PROGRAM AT THE END OF THE CURRENT TEST BEFORE CHANGING NUMBER.
```

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6. ERROR PRINTOUTS

THE ERROR PRINTOUTS FOR EACH TEST WILL APPEAR IN THE SAME GENERAL FORMAT. THE FIRST LINE WILL ALWAYS SHOW THE TEST NUMBER AND ITS TITLE. THE SECOND LINE WILL BE AN EXPLANATION OF THE ERROR. THE FOLLOWING LINES WILL SHOW THE APPROPRIATE REGISTER OR ADDRESS VALUES THAT ARE APPLICABLE TO THE INDIVIDUAL TEST

EXAMPLES:

1. THIS EXAMPLE SHOWS A TYPICAL ERROR PRINTOUT FOR THE WRITE READ TEST: A WRITE CRC ERROR OCCURRED ON SLAVE 6.

```
FT13: WRITE-READ TEST
WRITE ERROR NRZ
CS1     WC      BA      FC      CS2     DS      ER      TC
144260  000000  015650  000000  000103  150600  100000  101306
```

2. THIS EXAMPLE SHOWS A TYPICAL SPACE ERROR:
   THE FC IS NOT ZERO AT THE END OF THE OPERATION.

```
FT14:SPACE TEST
SPACE REVERSE ERROR NRZ
CS1     WC      BA      FC      CS2     DS      ER      TC
144230  177700  017162  177740  000114  150600  001000  161700
```

3. THIS EXAMPLE SHOWS A SPACE OPERATION WHICH RESULTED IN INCORRECT POSITIONING. SHOULD BE AT RECORD 20, IS AT RECORD 22.

```
FT14: SPACE TEST
POSITION ERROR:
REVERSE ERROR EXPT:20 RCVD:22
```

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7. OPERATION

THE PROCEEDURES FOR OPERATING THIS PROGRAM ARE QUITE SIMPLE
AND REQUIRE ONLY A FEW STEP:

1. LOAD ADDRESS 200 OR 210
2. SET SWITCHES FOR DESIRED TEST CYCLE
   ****REFER TO SECTION 5 FOR DYNAMIC LOADING
   OF SOFTWARE SWITCH REGISTER.***
3. PRESS START
4. ENTER APPROPRIATE RESPONES TO THE TTY REQUESTS

ALL HARDWARE SWITCHES ARE DYNAMIC AND MAY BE CHANGED AT ANY
TIME. THE NORMAL, OR DEFAULT, OPERATING SEQUENCE IS ALL
SWITCHES DOWN (ZERO). THE END OF EACH PASS IS NOTED BY A
MESSAGE STATING END OF PASS AND THE NUMBER OF THAT PASS.
*****FOR THE DYNAMIC LOADING OF THE SOFTWARE SWITCH REGISTER REFER TO SECTION 5

SINGLE TEST SELECTION: (SW0-SW4)

WHEN SW0-4 ARE SET TO ZERO (00) THE SCHEDULAR WILL
EXECUTE ALL OF THE TESTS IN SEQUENCE (1-24). IF SW0-4 IS
SET TO SOME SPECIFIC TEST NUMBER (1-24) THAT PARTICULAR TEST
WILL BE EXECUTED CONTINUOUSLY. ANY TEST MAY BE SINGLE
SELECTED IN ANY ORDER; HOWEVER, THE BEST WAY TO AFFECT
THE CHANGE IS TO USE SW10 TO HALT THE CURRENT TEST, THEN
CHANGE NUMBER AND PRESS CONTINUE.

RH11 OR RH70 OPTION:

A ONE RESPONSE IS FOR THE RH70;
A ZERO RESPONSE IS FOR THE RH11.

RH ONLY OPTION:

BY RESPONDING TO THE REQUEST (RH ONLY:) WITH
A ONE (1), ONLY THE TESTS WHICH ARE POINTED TO
THE RH (TESTS 1 - 10) WILL BE EXECUTED IN
EACH PASS.

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8. TEST DESCRIPTION

THE FOLLOWING IS A LIST OF ALL TESTS IN THEIR PROPER SEQUENCE.
A BASIC DESCRIPTION OF EACH TEST IS PROVIDED TO AID IN UNDERSTANDING
OF THE ERROR MESSAGES ASSOCIATED WITH EACH ONE.

A. RH TESTS: THE FIRST TEN (10) TESTS WILL PERFORM BASIC RH OPERATIONS AS FAR AS IS POSSIBLE WITHOUT REQUIRING THE TM02/TU16 ITSELF. (SEE RH ONLY OPTION; PAR 7)

FT1: RH ADDRESSING: THIS TEST WILL ASSURE THAT THE RH WILL RESPOND WITHOUT CAUSING A BUS TRAP TO ALL TM02 REGISTER ADDRESS IN SEQUENCE STARTING AT THE ADDRESS OF CS1 ENTERED BY THE OPERATOR.

FT2: RH REGISTER BITS READ/WRITE: THIS TEST WILL ASSURE THAT ALL BITS OF THE RH WRITE/READ REGISTERS CAN BE SET AND RESET.

FT3: RH INITIALIZE: THIS TEST WILL ASSURE THAT A RH INITIALIZE (BIT 5 OF CS2=1) WILL INDEED CLEAR THE RH ERRORS.

* FT4: SILO TEST 1: THIS TEST WILL ASSURE THAT A READ FROM AN EMPTY SILO WILL CAUSE DLT TO SET.

* FT5: SILO TEST 2: THIS TEST WILL ASSURE THAT BOTH THE IR AND OR BITS WILL CORRECTLY RESPOND TO LOADING OF THE SILO WITH ALL ZEROS AND THEN A WORD OF ALL ONES.

* FT6: SILO TEST 3: THIS TEST WILL WRITE AND THEN READ THE ENTIRE SILO TO ASSURE THAT DATA CAN BE PROPERLY FILLED AND READ. ALSO THE PROPER STATUS OF IR AND OR ARE CHECKED.

* FT7: SILO TEST 4: THIS TEST WILL ASSURE PROPER RH11 RESPONSE TO SILO OVERFLOW.

* FT10: SILO TEST 5: THIS TEST WILL ASSURE SILO RESET BY RH11 INITIALIZE.

**** NOTE: SILO TESTS (FT4-FT10) ARE FOR THE RH11 ONLY. *****

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B. TM02/TU16 BASIC FUNCTIONS: THE FOLLOWING FOURTEEN (14) TESTS WILL ASSURE OPERATION OF THE MAG TAPE BASIC FUNCTIONS.

FT11: NOP TEST: THIS TEST WILL ASSURE THAT THE NOP FUNCTION EXECUTES WITH NO ERROR.

FT12: REWIND TEST: THIS TEST WILL ASSURE THAT THE REWIND FUNCTION WILL POSITION THE TAPE TO BOT WITH NO ERROR.

1. ISSUE A REWIND COMMAND
2. AWAIT PIP RESET (MOTION STOPPED)
3. ASSURE THAT NO ERROR OCCURED
4. END

FT13: WRITE/READ TEST: THIS TEST WILL ASSURE THAT THE UNIT UNDER TEST CAN WRITE AND READ IN ALL DENSITIES (FOR BOTH PE AND NRZ).

1. REWIND TO BOT
2. WRITE 100 RECORDS
   - A, ALL ONES DATA
   - B, 200 FRAMES
   - C, 200 BPI; ODD
3. CHECK FOR ERRORS ON EACH RECORD
4. READ REVERSE THEN FORWARD ALL 100 RECORDS
5. CHECK FOR ERRORS ON EACH RECORD
6. REPEAT STEPS 2 THRU 5 FOR 556,800,1600 BPI
7. END.

DATA RELATED ERRORS (PARITY ERROR, CRC ERROR, ETC) ARE IGNORED.T
DATA READ IS NOT CHECKED; ONLY THE FUNCTION IS TESTED, NOT THE M

FT14: SPACE TEST: THIS TEST WILL ASSURE THAT PROPER POSITIONING IS MAINTAINED BY BOTH SPACE FORWARD AND REVERSE.

1. REWIND TO BOT
2. WRITE 100 RECORDS
   - A. EACH RECORD IS ONE FRAME LARGER THAN THE LAST
     THIS WILL ALLOW FOR POSITION CHECKING BY RECO
3. EACH RECORD IS ERROR CHECKED.
4. DATA RELATED ERRORS ARE IGNORED.
5. NOW SPACE REVERSE 77 RECORDS AND READ REVERSE 1, THE FRAME COUNT SHOULD BE 100.
   THIS IS THE SIZE OF THE FIRST RECORD.
6. NOW SPACE FORWARD 76 RECORDS AND READ FORWARD 1, THE FRAME COUNT SHOULD BE 177.
   THIS IS THE SIZE OF THE NEXT TO LAST RECORD.
7. CONTINUE THE SPACE AND READ (DECREMENTING THE RECORD UNTIL ALL POSITIONS HAVE BEEN CHECKED. IF POSITION IS
8. REPEAT STEPS 1 THRU 7 FOR PE.

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                                                                9. END
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FT15: ERASE TEST: THIS TEST WILL ASSURE THAT THE ERASE FUNCTION WILL INDEED ERASE TAPES.

1. REWIND TO BOT
2. ISSUE 200 ERRASE COMMANDS.
3. ASSURE NO ERRORS FOR EACH COMMAND.
4. REWIND TO BOT.
5. ISSUE A READ FORWARD COMMAND.
6. THE TAPE SHOULD MOVE FORWARD UNTIL STOPPED BY OPI (APPROX 25 FT).
7. ASSURE NO ERRORS OTHER THAN OPI.
8. END

FT16: TAPE MARK WRITE/READ: THIS TEST WILL ASSURE THAT A TAPE MARK CAN BE WRITTEN AND READ IN BOTH PE AND NRZ.

1. REWIND TO BOT.
2. ISSUE A WRITE TAPE MARK COMMAND.
3. ASSURE NO ERRORS.
4. ASSURE THAT TAPE MARK STATUS IS SET IN DRIVE STATUS (BIT 2).
5. READ REVERSE.
6. ASSURE THAT TAPE MARK IS SET.
7. ASSURE THAT NO ERRORS OTHER THAN FCE OCCURED.
8. READ FORWARD.
9. REPEAT STEPS 6 AND 7
10. REPEAT STEPS 1 THRU 9 FOR PE.
11. END

FT17: TAPE MARK SPACE TEST: THIS TEST WILL ASSURE THAT SPACING WILL BE TERMINATED BY RECOGNITION OF TAPE MARK BOTH IN PE AND NRZ.

1. REWIND TO BOT.
2. WRITE THE FOLLOWING PATTERN OF TAPE MARKS AND DATA RECORDS:

TM:20 RECS:TM:40 RECS:TM:60 RECS:TM:100 RECS:TM:

3. ASSURE NO ERRORS.
4. ASSURE THAT TAPE MARK STATUS IS SET FOR TM WRITES.
5. NOW SPACE REVERSE 200 RECORDS.
6. THE SPACE OPERATION SHOULD STOP ON EACH TAPE MARK IT FINDS. THEREFOR 5 SPACE COMMANDS ARE ISSUED TO COVER THE ENTIRE PATTERN WRITTEN ON TAPE.
   BOT SHOULD NEVER BE REACHED AND THE FRAME COUNT WILL REFELCT THE NUMBER OF RECORDS BETWEEN TAPE MARKS.
7. REPEAT STEP 6 IN THE FORWARD DIRECTION.
8. ASSURE NO ERRORS OTHER THAN FCE.
9. REPEAT STEPS 1 THRU 8 FOR PE

```
                                                        10. END
```

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FT20: WRITE CHECK TEST: BOTH WRITE CHECK FORWARD AND REVERSE ARE TESTED IN BOTH PE AND NRZ.

1. REWIND TO BOT.
2. WRITE A 400 FRAME RECORD USING DATA PATTERN 3 (125125).
3. ASSURE NO ERRORS OCCURED.
4. ISSUE A REVERSE WRITE CHECK COMMAND.
5. ASSURE NO ERRORS OCCURED.
6. REPEAT STEP 5 FOR A FORWARD WRITE CHECK.
7. REPEAT STEPS 1 THRU 6 FOR PE.
8. END

FT21: ERASE HEAD TEST: THIS TEST WILL ASSURE THAT THE ERASE HEAD ITSELF IS OPERATING.

1. REWIND TO BOT.
2. WRITE 2 RECORDS OF 800(10) FRAMES EACH. EACH RECORD WILL BE 1 INCH OF TAPE. DATA IS NOT ALL ONES.
3. REWIND TO BOT.
4. NOW WRITE A 400(10) FRAME RECORD. THIS RECORD WILL BE ONE HALF INCH OF TAPE. THE ERASE HEAD SHOULD CLEAR THE REMAINDER OF THE FIRST RECORD (ONE HALF INCH).
5. REWIND TO BOT.
6. NOW READ THE SHORT FIRST RECORD. IT SHOULD BE 400(10) FRAMES.
7. NOW READ THE SECOND RECORD. IT SHOULD BE STILL 800(10) FRAMES.
8. IF THE SECOND RECORD IS TOO LONG, THE ERASE HEAD DID NOT FUNCTION OR IT IS IN THE WRONG POLARITY.
10. END

FT22: BUFFERED COMMAND: THIS TEST WILL ASSURE THAT THE TM02 WILL ACCEPT AND EXECUTE ANOTHER COMMAND WHILE ITS SELECTED SLAVE IS REWINDING.

1. REWIND TO BOT.
2. ISSUE 3 LONG WRITE COMMANDS TO ASSURE BEING OFF BOT.
3. ISSUE A REWIND COMMAND.
4. AS SOON AS DRIVE READY BECOMES SET, ISSUE ANOTHER WRITE COMMAND.
5. THE NEXT DRIVE READY SHOULD BE AFTER THE TAPE HAS REACHED BOT AND EXECUTED THE BUFFERED WRITE COMMAND.
6. ASSURE NO ERRORS OCCURED.
7. END

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487
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                                        (PAGE 9)

FT23: READ IN PRESET:  THIS TEST WILL ASSURE THAT UNIT 0
                       IS REWOUND AND SET TO 800 BPI NORMAL.
                       (ONLY IF SLAVE 0 IS SELECTED).

                       1. ISSUE A WRITE COMMAND TO ASSURE
                          BEING OFF BOT.
                       2. ISSUE THE READ-IN PRESET COMMAND.
                       3. AWAIT MOTION STOP.
                       4. ASSURE THAT BOT WAS REACHED.
                       5. ASSURE THAT THE TAPE CONTROL REGISTER
                          IS SET TO 800 BPI,NORMAL,ODD.
                       6. END

                  (THIS TEST IS ONLY PERFORMED IF THE SELECTED SLAVE IS ZERO (0).

FT24: REWIND: OFF LINE THIS TEST WILL ASSURE
                       THAT THE UNIT WILL REWIND AND
                       GO OFF LINE. (NOT IF IN CONTINUOUS CYCLE)

                       1. ISSUE THE REWIND OFF-LINE COMMAND.
                       2. ASSURE THAT MOL (BIT 12 OF DRIVE STATUS)
                          IS RESET INDICATING THE UNIT WENT OFF LINE.
                       3. END

                  (THIS TEST IS NOT PERFORMED WHEN CONTINUOUS CYCLE OPERATION IS S
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                                9.      LISTING
                                        -------
                                        %
                                        .TITLE TM02/TU16 BASIC FUNCTION TEST
                                        ;MAINDEC-11-DZTUB-E-D
                                        ;21 SEPT 75
                                        ;R. BARNES
                                        ;REVISED APRIL ,1976 BY S. CARPENTER
                                        ;       1) SUPPORTS SOFTWARE SWITCH REGISTER
                                        ;       2) SUPPORTS THE DYNAMIC LOADING OF THE SOFTWARE SWITCH REGISTER
                                        .ABS


                                        ;CONSOLE SWITCHES*********
                                        ;
                                        ;SW1(100000):   1=HALT ON ERROR
                                        ;               0=CONTINUE
                                        ;SW14(040000)   1=LOOP ON ERROR (SCOPE(040000) RH TESTS ONLY)
                                        ;               0=CONTINUE
                                        ;SW13(02000):   1=DO NOT PRINT ERRORS
                                        ;               0=PRINT ERRORS
                                        ;SW12(010000):  1=INHIBIT ITERATIONS
                                        ;               0=DO ITERATIONS
                                        ;SW11(004000):  1=CONTINUOUS CYCLE
                                        ;               0=HALT AT END OF PASS
                                        ;SW10(002000):  1=HALT AT END OF EACH TEST
                                        ;               0=CONTINUE
                                        ;SW0-4:         SELECT TEST NUMBER :: 00=ALL TESTS
```

```
                                ;TU16 REGISTER BITS**********

                                ;15 ;14 ;13 ;12 ;11 ;10 ;09 ;08 ;07 ;06 ;05 ;04 ;03 ;02 ;01 ;00 ;
                                ;XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                        ;CS1:   ;SC ;TRE;MCP;SPR;DNA;PSL;A17;A16;RDY;IE ;FUN;FUN;FUN;FUN;FUN;GO ;
                                ;   ;   ;   ;   ;   ;   ;   ;   ;   ;   ;   ;   ;   ;   ;   ;
                                ;XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                        ;WC:    ; WORD                                                          ;
                                ; COUNT                                                         ;
                                ;XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                        ;BA:    ; BUS                                                           ;
                                ; ADDRESS                                                       ;
                                ;XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                        ;FC:    ; FRAME                                                         ;
                                ; COUNT                                                         ;
                                ;XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                        ;CS2:   ;DLT;WCE;UPE;NED;NEM;PGE;MXF;MDP;OR ;IR ;CLR;PAT;BAI;U2 ;U1 ;U0 ;
                                ;   ;   ;   ;   ;   ;   ;   ;ERR;   ;   ;   ;   ;   ;   ;   ;
                                ;XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                        ;DS:    ;ATA;ERR;PIP;MOL;WRL;EOT;SPR;DPR;DRY;SSC;PES;SDN;IDB;TMK;BOT;SLA;
                                ;   ;   ;   ;   ;   ;   ;   ;   ;   ;   ;   ;   ;   ;   ;   ;
                                ;XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                        ;ER:    ;CDE;UNS;OPI;DTE;NEF;CS ;FCE;NSG;PEF;INC;DAT;FMT;CNT;RMR;ILR;ILF;
                                ;CRC;   ;   ;   ;   ;ITM;   ;   ;LRC;VPE;BPE;   ;BPE;   ;   ;   ;
                                ;XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                        ;ATS:   ; ATTENTION                                                     ;
                                ; SUMMARY                                                       ;
                                ;XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                        ;CC:    ; CHECK                                                         ;
                                ; CHARACTER                                                     ;
                                ;XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                        ;DB:    ; DATA                                                          ;
                                ; BUFFER                                                        ;
                                ;XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                        ;MR:    ;DB ;DB ;DB ;DB ;DB ;DB ;DB ;DB ;WRT;MM ;OP ;OP ;OP ;OP ;MM ;
                                ; 0 ; 1 ; 2 ; 3 ; 4 ; 5 ; 6 ; 7 ; P ;CLK;CLK; 4 ; 3 ; 2 ; 1 ;GO ;
                                ;XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                        ;DT:    ; DRIVE     ; 7 ;   ;SLV;                                      ;
                                ; TYPE      ;CH ;   ;PR ;                                      ;
                                ;XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                        ;SN:    ; SERIAL                                                        ;
                                ; NUMBER                                                        ;
                                ;XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                        ;TC:    ;ACL;FCS;TCW;ENA;SPR;DEN;DEN;DEN;FMT;FMT;FMT;FMT;EVN;SSN;SSN;SSN;
                                ;   ;   ;   ;DT ;   ; 4 ; 2 ; 1 ; 8 ; 4 ; 2 ; 1 ;PAR; 4 ; 2 ; 1 ;
                                ;XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

```
                                        ;REGISTER EQUIVS**********

                    000000              R0=%0
                    000001              R1=%1
                    000002              R2=%2
                    000003              R3=%3
                    000004              R4=%4
                    000005              R5=%5
                    000006              SP=%6
                    000007              PC=%7

                                        ;TRAP CATCHERS**********

                    000000              .=0
000000  000002                          .+2
000002  000000                          HALT
000004  000006                          .+2
000006  000000                          HALT
000010  000012                          .+2
000012  000000                          HALT
000014  000016                          .+2
000016  000000                          HALT
000020  000022                          .+2
000022  000000                          HALT
000024  000026                          .+2
000026  000000                          HALT
000030  000032                          .+2
000032  000000                          HALT
000034  000036                          .+2
000036  000000                          HALT
000040  000042                          .+2
000042  000000                          HALT
000044  000046                          .+2
000046  000000                          HALT
000050  000052                          .+2
000052  000000                          HALT
000054  000056                          .+2
000056  000000                          HALT
000060  000062                          .+2
000062  000000                          HALT
000064  000066                          .+2
000066  000000                          HALT
000070  000072                          .+2
000072  000000                          HALT
000074  000076                          .+2
000076  000000                          HALT
000100  000102                          .+2
000102  000000                          HALT
000104  000106                          .+2
000106  000000                          HALT
000110  000112                          .+2
000112  000000                          HALT
000114  000116                          .+2
000116  000000                          HALT
000120  000122                          .+2
000122  000000                          HALT
```

```
  649  000124  000126                    .+2
  650  000126  000000                    HALT
  651  000130  000132                    .+2
  652  000132  000000                    HALT
  653  000134  000136                    .+2
  654  000136  000000                    HALT
  655  000140  000142                    .+2
  656  000142  000000                    HALT
  657  000144  000146                    .+2
  658  000146  000000                    HALT
  659  000150  000152                    .+2
  660  000152  000000                    HALT
  661  000154  000156                    .+2
  662  000156  000000                    HALT
  663  000160  000162                    .+2
  664  000162  000000                    HALT
  665  000164  000166                    .+2
  666  000166  000000                    HALT
  667  000170  000172                    .+2
  668  000172  000000                    HALT
  669  000174  000176                    .+2
  670  000176  000000                    HALT
  671  000200  000202                    .+2
  672  000202  000000                    HALT
  673  000204  000206                    .+2
  674  000206  000000                    HALT
  675  000210  000212                    .+2
  676  000212  000000                    HALT
  677  000214  000216                    .+2
  678  000216  000000                    HALT
  679  000220  000222                    .+2
  680  000222  000000                    HALT
  681  000224  000226                    .+2
  682  000226  000000                    HALT
  683  000230  000232                    .+2
  684  000232  000000                    HALT
  685  000234  000236                    .+2
  686  000236  000000                    HALT
  687  000240  000242                    .+2
  688  000242  000000                    HALT
  689  000244  000246                    .+2
  690  000246  000000                    HALT
  691  000250  000252                    .+2
  692  000252  000000                    HALT
  693  000254  000256                    .+2
  694  000256  000000                    HALT
  695  000260  000262                    .+2
  696  000262  000000                    HALT
  697  000264  000266                    .+2
  698  000266  000000                    HALT
  699  000270  000272                    .+2
  700  000272  000000                    HALT
  701  000274  000276                    .+2
  702  000276  000000                    HALT
  703  000300  000302                    .+2
  704  000302  000000                    HALT
```

```
  705  000304  000306                    .+2
  706  000306  000000                    HALT
  707  000310  000312                    .+2
  708  000312  000000                    HALT
  709  000314  000316                    .+2
  710  000316  000000                    HALT
  711  000320  000322                    .+2
  712  000322  000000                    HALT
  713  000324  000326                    .+2
  714  000326  000000                    HALT
  715  000330  000332                    .+2
  716  000332  000000                    HALT
  717  000334  000336                    .+2
  718  000336  000000                    HALT
  719  000340  000342                    .+2
  720  000342  000000                    HALT
  721  000344  000346                    .+2
  722  000346  000000                    HALT
  723  000350  000352                    .+2
  724  000352  000000                    HALT
  725  000354  000356                    .+2
  726  000356  000000                    HALT
  727  000360  000362                    .+2
  728  000362  000000                    HALT
  729  000364  000366                    .+2
  730  000366  000000                    HALT
  731  000370  000372                    .+2
  732  000372  000000                    HALT
  733  000374  000376                    .+2
  734  000376  000000                    HALT
  735  000400  000402                    .+2
  736  000402  000000                    HALT
  737  000404  000406                    .+2
  738  000406  000000                    HALT
  739  000410  000412                    .+2
  740  000412  000000                    HALT
  741  000414  000416                    .+2
  742  000416  000000                    HALT
  743  000420  000422                    .+2
  744  000422  000000                    HALT
  745  000424  000426                    .+2
  746  000426  000000                    HALT
  747  000430  000432                    .+2
  748  000432  000000                    HALT
  749  000434  000436                    .+2
  750  000436  000000                    HALT
  751  000440  000442                    .+2
  752  000442  000000                    HALT
  753  000444  000446                    .+2
  754  000446  000000                    HALT
  755  000450  000452                    .+2
  756  000452  000000                    HALT
  757  000454  000456                    .+2
  758  000456  000000                    HALT
  759  000460  000462                    .+2
  760  000462  000000                    HALT
```

```
  761  000464  000466                    .+2
  762  000466  000000                    HALT
  763  000470  000472                    .+2
  764  000472  000000                    HALT
  765  000474  000476                    .+2
  766  000476  000000                    HALT
  767  000500  000502                    .+2
  768  000502  000000                    HALT
  769  000504  000506                    .+2
  770  000506  000000                    HALT
  771  000510  000512                    .+2
  772  000512  000000                    HALT
  773  000514  000516                    .+2
  774  000516  000000                    HALT
  775  000520  000522                    .+2
  776  000522  000000                    HALT
  777  000524  000526                    .+2
  778  000526  000000                    HALT
  779  000530  000532                    .+2
  780  000532  000000                    HALT
  781  000534  000536                    .+2
  782  000536  000000                    HALT
  783  000540  000542                    .+2
  784  000542  000000                    HALT
  785  000544  000546                    .+2
  786  000546  000000                    HALT
  787  000550  000552                    .+2
  788  000552  000000                    HALT
  789  000554  000556                    .+2
  790  000556  000000                    HALT
  791  000560  000562                    .+2
  792  000562  000000                    HALT
  793  000564  000566                    .+2
  794  000566  000000                    HALT
  795  000570  000572                    .+2
  796  000572  000000                    HALT
  797  000574  000576                    .+2
  798  000576  000000                    HALT
  799  000600  000602                    .+2
  800  000602  000000                    HALT
  801  000604  000606                    .+2
  802  000606  000000                    HALT
  803  000610  000612                    .+2
  804  000612  000000                    HALT
  805  000614  000616                    .+2
  806  000616  000000                    HALT
  807  000620  000622                    .+2
  808  000622  000000                    HALT
  809  000624  000626                    .+2
  810  000626  000000                    HALT
  811  000630  000632                    .+2
  812  000632  000000                    HALT
  813  000634  000636                    .+2
  814  000636  000000                    HALT
  815  000640  000642                    .+2
  816  000642  000000                    HALT
```

```
  817  000644  000646                    .+2
  818  000646  000000                    HALT
  819  000650  000652                    .+2
  820  000652  000000                    HALT
  821  000654  000656                    .+2
  822  000656  000000                    HALT
  823  000660  000662                    .+2
  824  000662  000000                    HALT
  825  000664  000666                    .+2
  826  000666  000000                    HALT
  827  000670  000672                    .+2
  828  000672  000000                    HALT
  829  000674  000676                    .+2
  830  000676  000000                    HALT
  831  000700  000702                    .+2
  832  000702  000000                    HALT
  833  000704  000706                    .+2
  834  000706  000000                    HALT
  835  000710  000712                    .+2
  836  000712  000000                    HALT
  837  000714  000716                    .+2
  838  000716  000000                    HALT
  839  000720  000722                    .+2
  840  000722  000000                    HALT
  841  000724  000726                    .+2
  842  000726  000000                    HALT
  843  000730  000732                    .+2
  844  000732  000000                    HALT
  845  000734  000736                    .+2
  846  000736  000000                    HALT
  847  000740  000742                    .+2
  848  000742  000000                    HALT
  849  000744  000746                    .+2
  850  000746  000000                    HALT
  851  000750  000752                    .+2
  852  000752  000000                    HALT
  853  000754  000756                    .+2
  854  000756  000000                    HALT
  855  000760  000762                    .+2
  856  000762  000000                    HALT
  857  000764  000766                    .+2
  858  000766  000000                    HALT
  859  000770  000772                    .+2
  860  000772  000000                    HALT
  861  000774  000776                    .+2
  862  000776  000000                    HALT
  863
  864                                    ;TTY INTERRUPT VECTOR**********
  865
  866          000060                    .=60
  867  000060  012116                    TTINT           ;TTY INTERRUPT HEADER ADDRESS
  868  000062  000000                    0
  869
  870                                    ;SOFTWARE SWITCH REGISTER**********
  871
  872          000176                    .=176
```

```
                                SWREG:  0               ;SOFTWARE SWITCH REGISTER


                                ;*******************************************************************************

                                ;THIS PROGRAM SUPPORTS THE SOFTWARE SWITCH REGISTER LOC.176.
                                ;REFER TO SECTION 5 OF DOCUMENT FOR DESCRIPTION

                                ;*******************************************************************************
                                ;START ADDRESS***********

                        000200  .=200
000200  005000                  CLR     R0
000202  000167  001372          JMP     START   ;PROGRAM START

                        000210  .=210
000210  000240                  NOP
000212  012700  000001          MOV     #1,R0   ;SET NO HEADER FLAG
000216  000167  001356          JMP     START

                                ;TM02 INTERRUPT VECTOR**********

                        000224  .=224
000224  012102                  MTINT           ;TAPE INTERRUPT HANDLER ADDRESS
000226  000340                  340
```

```
                                                .=600
                        000600                  ;MASS BUS REGISTER EQUIVS**********

000600  172440          C1:     172440
000602  172442          WC:     172442
000604  172444          BA:     172444
000606  172446          FC:     172446
000610  172450          CS:     172450
000612  172452          DS:     172452
000614  172454          ER:     172454
000616  172456          AS:     172456
000620  172460          CC:     172460
000622  172462          DB:     172462
000624  172464          MR:     172464
000626  172466          DT:     172466
000630  172470          SN:     172470
000632  172472          TC:     172472

                        ;CONSTANTS**********

000634  177776          PSW:    177776          ;PROCESSOR STATUS
000636  177570          SWR:    177570          ;SWITCH REGISTER
000640  177560          TKS:    177560          ;TTY READER STATUS
000642  177562          TKB:    177562          ;TTY READ BUFFER
000644  177564          TPS:    177564          ;TTY PUNCH STATUS
000646  177566          TPB:    177566          ;TTY PUNCH BUFFER
000650  177777          SERNUM: 177777          ;SERIAL NUMBER
000652  000011          DRVTP:  011             ;DRIVE TYPE
000654  000010          ITAMT:  10              ;ITERATION AMOUNT
000656  000224          VECT:   224             ;INTERRUPT VECTOR(RH)
000660  172440          REGS:   172440          ;STARTING REGISTER ADDRESS
000662  000004          BTRP:   4               ;BUS TRAP ADDRESS
000664  000006          BTRP2:  6               ;BUS TRAP PRIORITY LEVEL 7
```

```
                                        ;FLAGS AND COUNTERS**********
                                TOB:    0
                                TIB:    0
                                RH17F:  0
                                HDRFL:  0
                                EMADDR: 0
                                DRVN:   0
                                SLVN:   0
                                BADDR:  0
                                FCNT:   0
                                WCNT:   0
                                RCNT:   0
                                ERRP:   0
                                ERRP1:  0
                                RRD:    0
                                RFD:    0
                                RDYDX:  0
                                OPDYX:  0
                                SCNT:   0
                                PFLG:   0
                                RTRN:   0
                                ERADD:  0
                                TEMP1:  0
                                TEMP2:  0
                                TEMP3:  0
                                STMSK:  0
                                ITCNT:  0
                                DSAV:   0
                                SAV1:   0
                                SAV2:   0
                                SAV3:   0
                                SCOLP:  0
                                ITRLP:  0
                                EXFL:   0
                                PEXFL:  0
                                STFLG:  0
                                LTADD:  0
                                FUN:    0
                                SERFL:  0
                                CRCNT:  0
                                UDES:   0
                                PATRN:  0
                                RHTF:   0
                                NRZOF:  0
                                RHOF:   0
                                PCNTR:  0
                                TEMPST: 0
                                COUNT:  0
                                RDSW:   0

                                        ;DATA PATTERN GENERATORS*****

                                DATBL:  0
                                DATA0:  DAT1    ;ALL ONE BITS
                                DATA1:  DAT2    ;ALL ZERO BITS
```

```
  989  001034  011710                    DATA2:  DAT3    ;ALTERNATING ONE/ZERO BITS
  990  001036  011720                    DATA3:  DAT4    ;ALL BITS 0-377
```

```
                                                ;LOGIC TEST ENTRY TABLE**********
001040  000000                          TSTTBL: 0
001042  000000                                  0
001044  002774                                  FT1
001046  002774                                  FT1
001050  003074                                  FT2
001052  003074                                  FT2
001054  003420                                  FT3
001056  003420                                  FT3
001060  003636                                  FT4
001062  003636                                  FT4
001064  003764                                  FT5
001066  003764                                  FT5
001070  004166                                  FT6
001072  004166                                  FT6
001074  004454                                  FT7
001076  004454                                  FT7
001100  004550                                  FT10
001102  004550                                  FT10
001104  004704                                  FT11
001106  004704                                  FT11
001110  005022                                  FT12
001112  005022                                  FT12
001114  005134                                  FT13
001116  005134                                  FT13
001120  005466                                  FT14
001122  005466                                  FT14
001124  006362                                  FT15
001126  006362                                  FT15
001130  006562                                  FT16
001132  006562                                  FT16
001134  007024                                  FT17
001136  007024                                  FT17
001140  007440                                  FT20
001142  007440                                  FT20
001144  007700                                  FT21
001146  007700                                  FT21
001150  010202                                  FT22
001152  010202                                  FT22
001154  010406                                  FT23
001156  010406                                  FT23
001160  010626                                  FT24
001162  010626                                  FT24
001164  000000                                  0
001166  000000                                  0
001170  000000                                  0
001172  000000                                  0
```

```
1040            001600                          .=1600
1041                                            ;PROGRAM START AND HOUSEKEEPING**********
1042
1043   001600   000240                  START:  NOP
1044   001602   012777   000340  177024         MOV     #340,@PSW       ;SET PRIORITY
1045   001610   012706   000500                 MOV     #500,SP         ;SET STACK POINTER
1046
1047   001614   013746   000006          SUSWR: MOV     @#6,-(SP)               ;SAVE VECTORS
1048   001620   013746   000004                 MOV     @#4,-(SP)
1049   001624   012737   001644  000004         MOV     #1$,@#4                 ;SET UP FOR TIMEOUT
1050   001632   022777   177777  176776         CMP     #-1,@SWR                ;REFERENCE HARDWARE SWITCH REGISTER
1051   001640   001402                         BEQ     2$
1052   001642   000404                         BR      3$
1053   001644   022626                  1$:    CMP     (SP)+,(SP)+             ;ADJUST STACK
1054   001646   012767   000176  176762  2$:    MOV     #SWREG,SWR              ;POINT TO SOFTWARE SWITCH REG
1055   001654   012637   000004          3$:    MOV     (SP)+,@#4               ;RESTORE VECTORS
1056   001660   012637   000006                 MOV     (SP)+,@#6
1057   001664   023727   000636  000176         CMP     @#SWR,#SWREG            ;IS SOFTWARE REG USED
1058   001672   001002                         BNE     4$                      ;BRANCH IF NO
1059   001674   004767   011452                 JSR     PC,CNTLU                ;ALLOW SOFTARE SWITCH REGISTER TO BE CHANGED
1060   001700   005700                  4$:    TST     R0              ;SEE IF PRINT HEADER
1061   001702   001402                         BEQ     STOA            ;IF SO: BR
1062   001704   000167   000562                 JMP     ST4             ;ELSE SKIP
1063   001710   012704   013720          STOA:  MOV     #MSG3,R4
1064   001714   004767   010564                 JSR     PC,TTOUT        ;PRINT TITLE
1065   001720   012704   014025          STOB:  MOV     #MSG4,R4
1066   001724   004767   010554                 JSR     PC,TTOUT        ;REQUEST REGISTER ADDRESS
1067   001730   016703   176724                 MOV     REGS,R3
1068   001734   004767   010710                 JSR     PC,OCTP         ;PRINT CURRENT ADDRESS
1069   001740   012705   000660                 MOV     #REGS,R5        ;SET ADDRESS SAVE LOC
1070   001744   012701   000006                 MOV     #6,R1           ;SET SIZE OF RESPONSE
1071   001750   012702   176400                 MOV     #176400,R2      ;SET UPPER LIMIT
1072   001754   012703   172300                 MOV     #172300,R3      ;SET LOWER LIMIT
1073   001760   004767   010262                 JSR     PC,TTR          ;GO GET RESPONSE
1074   001764   012704   014050                 MOV     #MSG5,R4
1075   001770   004767   010510                 JSR     PC,TTOUT        ;REQUEST VECTOR
1076   001774   016703   176656                 MOV     VECT,R3
1077   002000   004767   010644                 JSR     PC,OCTP         ;PRINT CURRENT VECTOR
1078   002004   012705   000656                 MOV     #VECT,R5        ;SET ADDRESS SAVE LOC
1079   002010   012701   000003                 MOV     #3,R1           ;SET SIZE OF RESPONSE
1080   002014   012702   000224                 MOV     #224,R2         ;SET UPPER LIMIT
1081   002020   012703   000150                 MOV     #150,R3         ;SET LOWER LIMIT
1082   002024   004767   010216                 JSR     PC,TTR          ;GO GET RESPONSE
1083   002030   016700   176622                 MOV     VECT,R0         ;GET VECTOR
1084   002034   012720   012102                 MOV     #MTINT,(R0)+    ;LOAD INTERRUPT ADDRESS IN VECTOR
1085   002040   012710   000340                 MOV     #340,(R0)       ;LOAD PRIORITY
1086   002044   016700   176610                 MOV     REGS,R0         ;GET START OF REGS
1087   002050   012701   000016                 MOV     #16,R1          ;SET NUMBER OF REGS
1088   002054   012702   000600                 MOV     #C1,R2          ;GET START OF TABLE
1089   002060   010022                  STO:   MOV     R0,(R2)+        ;BUILD TABLE
1090   002062   062700   000002                 ADD     #2,R0           ;BUMP ADDRESS
1091   002066   005301                         DEC     R1              ;SEE IF DONE
1092   002070   001373                         BNE     STO             ;IF NOT: BR
1093   002072   012702   000666                 MOV     #TOB,R2
1094   002076   012700   000054                 MOV     #54,R0
1095   002102   005022                  ST1:   CLR     (R2)+           ;CLEAR FLAGS + COUNTERS
```

```
1096  002104  005300                      DEC     R0
1097  002106  001375                      BNE     ST1
1098  002110  012767  000001  176672      MOV     #1,RHTF         ;SET ADDRESS TEST FLAG
1099  002116  000167  000376              JMP     TSRH            ;GO DO INITIAL ADDRESS TEST PASS
1100  002122  012704  014131      ST1A:   MOV     #MSG10,R4
1101  002126  004767  010352              JSR     PC,TTOUT        ;REQUEST DRIVE NUMBER
1102  002132  012705  000700              MOV     #DRVN,R5        ;SET ADDRESS OF DRIVE NUMBER SAVE
1103  002136  012701  000001              MOV     #1,R1           ;SET SIZE OF RESPONSE
1104  002142  012702  000007              MOV     #7,R2           ;SET UPPER LIMIT
1105  002146  012703  000000              MOV     #0,R3           ;SET LOWER LIMIT
1106  002152  004767  010070              JSR     PC,TTR          ;GO GET RESPONSE
1107  002156  012777  000040  176424      MOV     #40,@CS         ;SET INIT
1108  002164  056777  176510  176416      BIS     DRVN,@CS        ;SET DRIVE NUMBER
1109  002172  005777  176402              TST     @C1             ;ACCESS DRIVE
1110  002176  032777  010000  176404      BIT     #10000,@CS      ;SEE IF NED
1111  002204  001405                      BEQ     ST2             ;IF NOT: BR
1112  002206  012704  015063              MOV     #MSG41,R4
1113  002212  004767  010266              JSR     PC,TTOUT        ;PRINT NOT AVAIL
1114  002216  000741                      BR      ST1A            ;REDO DRIVE REQUEST
1115  002220  012704  014151      ST2:    MOV     #MSG11,R4
1116  002224  004767  010254              JSR     PC,TTOUT        ;REQUEST SLAVE NUMBER
1117  002230  012705  000702              MOV     #SLVN,R5        ;SET ADDRESS OF SLAVE SAVE
1118  002234  012701  000001              MOV     #1,R1           ;SET SIZE OF RESPONSE
1119  002240  012702  000007              MOV     #7,R2           ;SET UPPER LIMIT
1120  002244  012703  000000              MOV     #0,R3           ;SET LOWER LIMIT
1121  002250  004767  007772              JSR     PC,TTR          ;GO GET RESPONSE
1122  002254  012777  000040  176326      MOV     #40,@CS         ;INIT
1123  002262  056777  176412  176320      BIS     DRVN,@CS        ;SET DRIVE NUMBER
1124  002270  016777  176406  176334      MOV     SLVN,@TC        ;LOAD SLAVE NUMBER
1125  002276  032777  002000  176322      BIT     #2000,@DT       ;SEE IF SLAVE PRESENT
1126  002304  001005                      BNE     ST3             ;IF SO: BR
1127  002306  012704  015104              MOV     #MSG42,R4
1128  002312  004767  010166              JSR     PC,TTOUT        ;PRINT NON-EXIST SLAVE
1129  002316  000740                      BR      ST2             ;REDO SLAVE REQUEST
1130  002320  012704  015125      ST3:    MOV     #MSG43,R4
1131  002324  004767  010154              JSR     PC,TTOUT        ;PRINT SERIAL NUMBER TAG
1132  002330  017703  176274              MOV     @SN,R3
1133  002334  004767  010636              JSR     PC,SNPT         ;PRINT SERIAL NUMBER
1134  002340  012704  015707              MOV     #MSG61,R4
1135  002344  004767  010134              JSR     PC,TTOUT        ;REQUEST RH11 OR RH70
1136  002350  012705  000672              MOV     #RH17F,R5       ;GET ADDRESS OF FLAG
1137  002354  012701  000001              MOV     #1,R1           ;SET SIZE OF RESPONSE
1138  002360  012702  000001              MOV     #1,R2           ;SET UPPER LIMIT
1139  002364  012703  000000              MOV     #0,R3           ;SET LOWER LIMIT
1140  002370  004767  007652              JSR     PC,TTR          ;GET RESPONSE
1141  002374  012704  015727              MOV     #MSG62,R4
1142  002400  004767  010100              JSR     PC,TTOUT        ;REQUEST RH11 ONLY RESPONSE
1143  002404  012705  001014              MOV     #RH0F,R5        ;SET FLAG ADDRESS
1144  002410  012701  000001              MOV     #1,R1           ;SET SIZE OF RESPONSE
1145  002414  012702  000001              MOV     #1,R2           ;SET UPPER LIMIT
1146  002420  012703  000000              MOV     #0,R3           ;SET LOWER LIMIT
1147  002424  004767  007616              JSR     PC,TTR          ;GO GET RESPONSE
1148  002430  005767  176360              TST     RH0F            ;SEE IF RH11 ONLY
1149  002434  001016                      BNE     ST4             ;IF SO: BR
1150  002436  012704  015600              MOV     #MSG55,R4
1151  002442  004767  010036              JSR     PC,TTOUT        ;REQUEST NRZ ONLY RESPONSE
```

```
1152  002446  012705  001012                MOV     #NRZOF,R5       ;SET FLAG ADDRESS
1153  002452  012701  000001                MOV     #1,R1           ;SET SIZE OF RESPONSE
1154  002456  012702  000001                MOV     #1,R2           ;SET UPPER LIMIT
1155  002462  012703  000000                MOV     #0,R3           ;SET LOWER LIMIT
1156  002466  004767  007554                JSR     PC,TTR          ;GO GET RESPONSE
1157  002472  005067  176320        ST4:    CLR     PCNTR           ;CLEAR PASS COUNTER
```

```
                                                ;TEST SCHEDULAR**********

002476  000240                        TSCD:   NOP
002500  005067  176266                        CLR     STFLG           ;CLEAR SINGLE TEST FLAG
002504  017700  176126                        MOV     @SWR,R0
002510  042700  177740                        BIC     #177740,R0
002514  005700                                TST     R0
002516  001055                                BNE     STSCD           ;GO SELECT SINGLE TEST
002520  012767  001040  176246      TSRH:   MOV     #TSTTBL,LTADD
002526  062767  000004  176240      TSCD0:  ADD     #4,LTADD
002534  016767  176234  176222              MOV     LTADD,ITRLP
002542  062767  000002  176214              ADD     #2,ITRLP        ;SET ITERATION ADDRESS
002550  005777  176220                        TST     @LTADD
002554  001002                                BNE     TSCD1
002556  000167  000144                        JMP     TEND            ;GO TO END ROUTINE
002562  000240                        TSCD1:  NOP
002564  005067  176156                        CLR     STMSK
002570  005067  176120                        CLR     ERRP
002574  005067  176074                        CLR     HDRFL           ;CLEAR PRINT HEADER FLAG
002600  017700  176170                        MOV     @LTADD,R0       ;SET POINTER TO TEST
002604  000110                                JMP     (R0)            ;GO TO TEST
002606  000240                        TSCD2:  NOP
002610  032777  002000  176020              BIT     #2000,@SWR      ;SEE IF HALT ON TEST
002616  001401                                BEQ     TSCD3           ;IF NOT: BR
002620  000000                                HALT
002622  004767  010452                TSCD3:  JSR     PC,CKSWR                ;CHECK FOR CNTL G
002626  000240                                NOP
002630  005767  176136                        TST     STFLG           ;SE IF SINGLE TEST
002634  001734                                BEQ     TSCD0           ;IF NOT: BR
002636  017700  175774                        MOV     @SWR,R0
002642  042700  177740                        BIC     #177740,R0      ;MASK TEST NUMBER
002646  005700                                TST     R0              ;SEE IF RETURN TO ALL
002650  001712                                BEQ     TSCD            ;IF SO: BR
002652  000240                        STSCD:  NOP
002654  012767  000001  176110              MOV     #1,STFLG        ;SET SINGLE TEST FLAG
002662  022700  000025                        CMP     #25,R0          ;SEE IF EXCEEDED TESTS
002666  003417                                BLE     TEND            ;IF SO: BR
002670  000241                                CLC
002672  006100                                ROL     R0
002674  006100                                ROL     R0              ;SET TABLE MODIFIER
002676  012767  001040  176070              MOV     #TSTTBL,LTADD
002704  060067  176064                        ADD     R0,LTADD        ;SET TEST POINTER
002710  016767  176060  176046              MOV     LTADD,ITRLP
002716  062767  000002  176040              ADD     #2,ITRLP        ;SET ITERATION POINTER
002724  000716                                BR      TSCD1
002726  012704  014063                TEND:   MOV     #MSG6,R4
002732  004767  007546                        JSR     PC,TTOUT        ;PRINT END OF PASS
002736  016703  176054                        MOV     PCNTR,R3
002742  004767  007702                        JSR     PC,OCTP         ;PRINT PASS NUMBER
002746  032777  004000  175662              BIT     #4000,@SWR      ;SEE IF HALT ON PASS
002754  001001                                BNE     TENDX           ;IF NOT: BR
002756  000000                                HALT
002760  004767  010314                TENDX:  JSR     PC,CKSWR                ;CHECK FOR CNTL G
002764  005267  176026                        INC     PCNTR           ;BUMP PASS COUNTER
002770  000167  177502                        JMP     TSCD            ;RESTART
```

```
1213
1214                                                    ;RH ADDRESSING TEST**********
1215
1216  002774  012767  015742  175674  FT1:    MOV     #MSFT1,EMADDR   ;SET HEADER
1217  003002  012777  012126  175652          MOV     #TRAP,@BTRP     ;SET TRAP HANDLER ADDRESS
1218  003010  012777  000340  175646          MOV     #340,@BTRP2
1219  003016  012700  000016                  MOV     #16,R0          ;SET NUMBER OF REGISTER
1220  003022  016701  175552                  MOV     C1,R1           ;GET FIRST ADDRESS (CS1)
1221  003026  005711                  FT1A:   TST     (R1)            ;REFERENCE REGISTER
1222  003030  000240                          NOP                     ;IF ADDRESS IS BAD, BUS TRAP WILL OCCUR
1223  003032  005300                  FT1B:   DEC     R0              ;SEE IF DONE ALL
1224  003034  001403                          BEQ     FT1X            ;IF SO: BR
1225  003036  062701  000002                  ADD     #2,R1           ;BUMP ADDRESS POINTER
1226  003042  000771                          BR      FT1A            ;CONTINUE
1227  003044  012777  000006  175610  FT1X:   MOV     #6,@BTRP        ;RESET TRAP CATCHER
1228  003052  005767  175732                  TST     RHTF            ;SEE IF INITIAL ADDRESS TEST PASS
1229  003056  001404                          BEQ     FT1XX           ;IF NOT: BR
1230  003060  005067  175724                  CLR     RHTF            ;CLEAR FLAG
1231  003064  000167  177032                  JMP     ST1A            ;RETURN
1232  003070  000167  177512          FT1XX:  JMP     TSCD2           ;RETURN TO SCHEDULAR
```

```
                                        ;RH REGISTER BITS READ/WRITE**********

003074  012767  015767  175574  FT2:    MOV     #MSFT2,EMADDR   ;SET TEST HEADER
003102  012701  177777                  MOV     #-1,R1          ;SET ALL ONES PATTERN
003106  004767  006742          FT2A:   JSR     PC,INIT1        ;GO INIT
003112  016700  175464                  MOV     WC,R0           ;GET ADDRESS OF WORD COUNT
003116  010102                          MOV     R1,R2           ;SET EXPT REGISTER BIT PATTERN
003120  010110                          MOV     R1,(R0)         ;LOAD PATTERN
003122  021002                          CMP     (R0),R2         ;SEE IF EXPT=RCVD
003124  001410                          BEQ     FT2B            ;IF SO: BR
003126  012767  014411  175602          MOV     #MSG25,ERADD    ;SET CODE
003134  012767  003106  175620          MOV     #FT2A,SCOLP     ;SET SCOPE
003142  004767  000116                  JSR     PC,FT2ER        ;GO DO ERROR
003146  016700  175432          FT2B:   MOV     BA,R0           ;GET ADDRESS OF BUS ADDRESS
003152  010102                          MOV     R1,R2
003154  042702  000001                  BIC     #1,R2           ;SET EXPT PATTERN
003160  010110                          MOV     R1,(R0)         ;LOAD PATTERN
003162  020210                          CMP     R2,(R0)         ;SEE IF EXPT=RCVD
003164  001410                          BEQ     FT2C            ;IF SO:BR
003166  012767  014417  175542          MOV     #MSG26,ERADD    ;SET ERROR CODE
003174  012767  003146  175560          MOV     #FT2B,SCOLP     ;SET SCOPE ADDRESS
003202  004767  000056                  JSR     PC,FT2ER        ;GO DO ERROR
003206  016700  175410          FT2C:   MOV     DB,R0           ;GET ADDRESS OF DATA BUFFER
003212  010102                          MOV     R1,R2
003214  010110                          MOV     R1,(R0)         ;LOAD PATTERN
003216  012703  004000                  MOV     #4000,R3
003222  005303          FT2D:   DEC     R3                      ;DELAY
003224  001376                          BNE     FT2D
003226  020210                          CMP     R2,(R0)         ;SEE IF EXPT=RCVD
003230  001410                          BEQ     FT2E            ;IF SO: BR
003232  012767  014425  175476          MOV     #MSG27,ERADD    ;SET ERROR CODE
003240  012767  003206  175514          MOV     #FT2C,SCOLP     ;SET SCOPE ADDRESS
003246  004767  000012                  JSR     PC,FT2ER        ;GO DO ERROR
003252  005701          FT2E:   TST     R1                      ;SEE IF DONE RESET
003254  001454                          BEQ     FT2X            ;IF SO: BR
003256  005001                          CLR     R1              ;SET ZERO PATTERN
003260  000167  177622                  JMP     FT2A            ;DO ZERO BITS
003264  000240          FT2ER:  NOP
003266  032777  020000  175342          BIT     #20000,@SWR     ;SEE IF PRINT ERROR
003274  001034                          BNE     FT2ERB          ;IF NOT: BR
003276  005767  175372                  TST     HDRFL           ;SEE ID DONE HEADER
003302  001004                          BNE     FT2ERA          ;IF SO: BR
003304  016704  175366                  MOV     EMADDR,R4
003310  004767  007170                  JSR     PC,TTOUT        ;DO HEADER
003314  012767  000001  175352  FT2ERA: MOV     #1,HDRFL        ;SET FLAG
003322  016704  175410                  MOV     ERADD,R4
003326  004767  007152                  JSR     PC,TTOUT        ;PRINT ERROR CODE
003332  012704  014355                  MOV     #MSG22,R4
003336  004767  007142                  JSR     PC,TTOUT        ;PRINT EXPT TAG
003342  010103                          MOV     R1,R3
003344  004767  007266                  JSR     PC,OCTPE        ;PRINT EXPT
003350  012704  014365                  MOV     #MSG23,R4
003354  004767  007124                  JSR     PC,TTOUT        ;PRINT RCVD TAG
003360  011003                          MOV     (R0),R3
003362  004767  007250                  JSR     PC,OCTPE        ;PRINT RCVD
```

```
1289  003366  005777  175244        FT2ERB: TST     @SWR            ;SEE IF HALT ON ERROR
1290  003372  100001                        BPL     FT2ERC          ;IF NOT: BR
1291  003374  000000                        HALT
1292  003376  004767  006340        FT2ERC: JSR     PC,SCOPE        ;GO SEE IF SCOPE ON ERROR
1293  003402  000240                        NOP
1294  003404  000207                        RTS     PC              ;IF NO SCOPE: CONTINUE TEST
1295  003406  000240                FT2X:   NOP
1296  003410  004767  006370                JSR     PC,ITER         ;GO SEE IF ITERATIONS
1297  003414  000167  177166                JMP     TSCD2           ;RETURN TO SCHEDULAR
```

```
1298
1299                                                    ;RH INITIALIZE TEST**********
1300
1301  003420  012767  016024  175250  FT3:    MOV     #MSFT3,EMADDR   ;SET TEST HEADER
1302  003426  012767  003420  175326          MOV     #FT3,SCOLP
1303  003434  004767  006414                  JSR     PC,INIT1        ;GO INIT
1304  003440  052777  020000  175142          BIS     #20000,@CS      ;FORCE UPE =1
1305  003446  000240                          NOP
1306  003450  004767  006400                  JSR     PC,INIT1        ;GO INIT
1307  003454  005777  175120                  TST     @C1             ;SEE IF SC IS RESET
1308  003460  100005                          BPL     FT3A            ;IF SO: BR
1309  003462  012767  014463  175246          MOV     #MSG29,ERADD    ;SET ERROR CODE
1310  003470  004767  000060                  JSR     PC,FT3ER        ;GO DO ERROR
1311  003474  032777  040000  175076  FT3A:   BIT     #40000,@C1      ;SEE IF TRE IS RESET
1312  003502  001405                          BEQ     FT3B            ;IF SO: BR
1313  003504  012767  014512  175224          MOV     #MSG30,ERADD    ;SET ERROR CODE.
1314  003512  004767  000036                  JSR     PC,FT3ER        ;GO DO ERROR
1315  003516  017701  175066          FT3B:   MOV     @CS,R1          ;GET CS2
1316  003522  042701  000307                  BIC     #307,R1         ;MARK IR/OR
1317  003526  005701                          TST     R1              ;SEE IF RESET
1318  003530  001405                          BEQ     FT3X            ;IF SO: BR
1319  003532  012767  014542  175176          MOV     #MSG31,ERADD    ;SET ERROR CODE
1320  003540  004767  000010                  JSR     PC,FT3ER        ;GO DO ERROR
1321  003544  004767  006234          FT3X:   JSR     PC,ITER         ;GO SEE IF ITERATION
1322  003550  000167  177032                  JMP     TSCD2           ;RETURN TO SCHEDULAR
1323  003554  032777  020000  175054  FT3ER:  BIT     #20000,@SWR     ;SEE IF PRINT ERROR
1324  003562  001015                          BNE     FT3ERB          ;IF NOT: BR
1325  003564  005767  175104                  TST     HDRFL           ;SEE IF DONE HEADER
1326  003570  001006                          BNE     FT3ERA          ;IF SO: BR
1327  003572  016704  175100                  MOV     EMADDR,R4
1328  003576  004767  006702                  JSR     PC,TTOUT        ;PRINT HEADER
1329  003602  005267  175066                  INC     HDRFL
1330  003606  016704  175124          FT3ERA: MOV     ERADD,R4
1331  003612  004767  006666                  JSR     PC,TTOUT        ;PRINT ERROR CODE
1332  003616  005777  175014          FT3ERB: TST     @SWR            ;SEE IF HALT ON ERROR
1333  003622  100001                          BPL     FT3ERC          ;IF NOT: BR
1334  003624  000000                          HALT
1335  003626  000240          FT3ERC: NOP
1336  003630  004767  006106                  JSR     PC,SCOPE        ;GO SEE IF SCOPE
1337  003634  000207                          RTS     PC              ;IF NOT: BR
```

```
1338
1339                                        ;RH11 SILO TEST 1: EPMTY SILO READ**********
1340
1341  003636  005767  175030        FT4:    TST     RH17F
1342  003642  001141                BNE     FT5X            ;IF RH70: BR
1343  003644  012767  016056  175024        MOV     #MSFT4,EMADDR   ;SET TEST TEST HEADER
1344  003652  012777  000040  174730        MOV     #40,@CS         ;INIT
1345  003660  017700  174736                MOV     @DB,R0          ;READ DB
1346  003664  005777  174720                TST     @CS             ;SEE IF DLT IS SET
1347  003670  100013                        BPL     FT4ER           ;IF NOT: BR
1348  003672  005777  174702                TST     @C1             ;SEE IF SC IS SET
1349  003676  100014                        BPL     FT4ERA          ;IF NOT: BR
1350  003700  032777  040000  174672        BIT     #40000,@C1      ;SEE IF TRE IS SET
1351  003706  001414                        BEQ     FT4ERB          ;IF NOT: BR
1352  003710  004767  006070        FT4X:   JSR     PC,ITER         ;GO SEE IF ITERATION
1353  003714  000167  176666                JMP     TSCD2           ;RETURN TO SCHEDULAR
1354  003720  012767  014572  175010  FT4ER:  MOV     #MSG32,ERADD    ;SET ERROR CODE
1355  003726  000407                        BR      FT4ERC
1356  003730  012767  014610  175000  FT4ERA: MOV     #MSG33,ERADD    ;SET ERROR CODE
1357  003736  000403                        BR      FT4ERC
1358  003740  012767  014625  174770  FT4ERB: MOV     #MSG34,ERADD    ;SET ERROR CODE.
1359  003746  000240                FT4ERC: NOP
1360  003750  012767  003636  175004        MOV     #FT4,SCOLP      ;SET SCOPE ADDRESS
1361  003756  004767  177572                JSR     PC,FT3ER        ;GO PRINT ERROR
1362  003762  000752                        BR      FT4X
```

```
1363
1364                                            ;RH11 SILO TEST 2: IR/OR CHECK**********
1365
1366  003764  005767  174702          FT5:      TST     RH17F           ;SEE IF RH70
1367  003770  001066                            BNE     FT5X            ;IF SO: BR
1368  003772  012767  016106  174676            MOV     #MSFT5,EMADDR   ;SET TEST HEADER
1369  004000  012767  004006  174754            MOV     #FT5A,$COLP     ;SET SCOPE ADDRESS
1370  004006  004767  006042          FT5A:     JSR     PC,INIT1        ;GO INIT
1371  004012  032777  000100  174570            BIT     #100,@CS        ;SEE IF IR IS SET
1372  004020  001005                            BNE     FT5B            ;IF SO: BR
1373  004022  012767  014643  174706            MOV     #MSG35,ERADD    ;SET ERROR CODE
1374  004030  004767  000122                    JSR     PC,FT5ER        ;GO DO ERROR
1375  004034  032777  000200  174546  FT5B:     BIT     #200,@CS        ;SEE IF OR IS RESET
1376  004042  001405                            BEQ     FT5C            ;IF SO: BR
1377  004044  012767  014670  174664            MOV     #MSG36,ERADD    ;SET ERROR CODE
1378  004052  004767  000100                    JSR     PC,FT5ER        ;GO DO ERROR
1379  004056  012777  000000  174536  FT5C:     MOV     #0,@DB          ;LOAD ZERO INTO SILO
1380  004064  032777  000200  174516            BIT     #200,@CS        ;SEE THAT OR RESET
1381  004072  001405                            BEQ     FT5D            ;IF IT DOES: BR
1382  004074  012767  014717  174634            MOV     #MSG37,ERADD    ;SET ERROR CODE
1383  004102  004767  000050                    JSR     PC,FT5ER        ;GO DO ERROR
1384  004106  012777  177777  174506  FT5D:     MOV     #-1,@DB         ;LOAD SILO WITH -1
1385  004114  012700  004000                    MOV     #4000,R0
1386  004120  032777  000200  174462  FT5E:     BIT     #200,@CS        ;SEE IF OR IS SET
1387  004126  001007                            BNE     FT5X            ;IF SO: BR
1388  004130  005300                            DEC     R0
1389  004132  001372                            BNE     FT5E            ;AWAIT OR
1390  004134  012767  014717  174574            MOV     #MSG37,ERADD    ;SET ERROR CODE
1391  004142  004767  000010                    JSR     PC,FT5ER        ;GO DO ERROR
1392  004146  004767  005632          FT5X:     JSR     PC,ITER         ;GO SEE IF ITERATION
1393  004152  000167  176430                    JMP     TSCD2           ;RETURN TO SCHEDULAR
1394  004156  004767  177372          FT5ER:    JSR     PC,FT3ER        ;GO PRINT ERROR
1395  004162  000240                            NOP
1396  004164  000207                            RTS     PC              ;CONTINUE TEST
```

```
1397
1398                                                ;RH11 SILO TEST 3: SILO DATA TEST**********
1399
1400  004166  005767  174500          FT6:    TST     RH17F
1401  004172  001052                          BNE     FT6X            ;IF RH70: BR
1402  004174  012767  016136  174474          MOV     #MSFT6,EMADDR   ;SET TEST HEADER
1403  004202  012767  004210  174552          MOV     #FT6A,SCOLP     ;SET SCOPE ADDRESS
1404  004210  004767  005640          FT6A:   JSR     PC,INIT1        ;GO INIT
1405  004214  005000                          CLR     R0              ;PRESET DATA
1406  004216  010077  174400          FT6B:   MOV     R0,@DB          ;LOAD SILO
1407  004222  005200                          INC     R0              ;BUMP DATA
1408  004224  022700  000102                  CMP     #102,R0         ;SEE IF FILLED ALL
1409  004230  001372                          BNE     FT6B            ;IF NOT: BR
1410  004232  032777  000100  174350          BIT     #100,@CS        ;SEE IF IR IS RESET.
1411  004240  001405                          BEQ     FT6C            ;IF SO: BR
1412  004242  012767  015030  174466          MOV     #MSG40,ERADD    ;SET ERROR CODE
1413  004250  004767  000054                  JSR     PC,FT6ER        ;GO DO ERROR
1414  004254  032777  000200  174326  FT6C:   BIT     #200,@CS        ;SEE IF OR IS SET
1415  004262  001005                          BNE     FT6D            ;IF SO: BR
1416  004264  012767  014756  174444          MOV     #MSG38,ERADD    ;SET ERROR CODE
1417  004272  004767  000032                  JSR     PC,FT6ER        ;GO DO ERROR
1418  004276  005000          FT6D:   CLR     R0              ;PRESET DATA
1419  004300  017701  174316          FT6E:   MOV     @DB,R1          ;READ SILO
1420  004304  020001                          CMP     R0,R1           ;SEE IF EXPT=RCVD
1421  004306  001014                          BNE     FT6DE           ;IF NOT: BR
1422  004310  005200                          INC     R0              ;BUMP DATA
1423  004312  022700  000102                  CMP     #102,R0         ;SEE IF DONE ALL
1424  004316  001370                          BNE     FT6E            ;IF NOT: BR
1425  004320  004767  005460          FT6X:   JSR     PC,ITER         ;GO SEE IF ITERATION
1426  004324  000167  176256                  JMP     TSCD2           ;RETURN TO SCHEDULAR
1427  004330  000240          FT6ER:  NOP
1428  004332  004767  177216                  JSR     PC,FT3ER        ;GO PRINT ERROR
1429  004336  000207                          RTS     PC              ;RETURN
1430  004340  000240          FT6DE:  NOP
1431  004342  032777  020000  174266          BIT     #20000,@SWR     ;SEE IF PRINT ERROR
1432  004350  001032                          BNE     FT6DEB          ;IF NOT: BR
1433  004352  005767  174316                  TST     HDRFL           ;SEE IF DONE HEADER
1434  004356  016701  174314                  MOV     EMADDR,R1
1435  004362  004767  006116                  JSR     PC,TTOUT        ;PRINT HEADER
1436  004366  005267  174302                  INC     HDRFL           ;SET FLAG
1437  004372  012704  015010          FT6DEA: MOV     #MSG39,R4
1438  004376  004767  006102                  JSR     PC,TTOUT        ;PRINT SILO READ ERROR
1439  004402  012704  014355                  MOV     #MSG22,R4
1440  004406  004767  006072                  JSR     PC,TTOUT        ;PRINT EXPT TAG
1441  004412  010003                          MOV     R0,R3
1442  004414  004767  006230                  JSR     PC,OCTP         ;PRINT EXPT
1443  004420  012704  014365                  MOV     #MSG23,R4
1444  004424  004767  006054                  JSR     PC,TTOUT        ;PRINT RCVD TAG
1445  004430  010103                          MOV     R1,R3
1446  004432  004767  006212                  JSR     PC,OCTP         ;PRINT RCVD
1447  004436  005777  174174          FT6DEB: TST     @SWR            ;SEE IF HALT ON ERROR
1448  004442  100001                          BPL     FT6DEX          ;IF NOT: BR
1449  004444  000000                          HALT
1450  004446  004767  006626          FT6DEX: JSR     PC,CKSWR                ;CHECK FOR CNTL G
1451  004452  000207                          RTS     PC              ;RETURN TO TEST
```

```
1452
1453                                                ;RH11 SILO TEST 4: SILO OVERFLOW**********
1454
1455  004454  005767  174212          FT7:    TST     RH17F
1456  004460  001021                  BNE     FT7X                ;IF RH70: BR
1457  004462  012767  016166  174206  MOV     #MSFT7,EMADDR       ;SET TEST HEADER
1458  004470  012767  004454  174264  MOV     #FT7,SCOLP          ;SET SCOPE ADDRESS
1459  004476  004767  005352          JSR     PC,INIT1            ;GO INIT
1460  004502  012700  000103          MOV     #103,R0             ;SET SIZE OF SILO +1
1461  004506  010077  174110  FT7A:   MOV     R0,@DB              ;LOAD SILO
1462  004512  005300                  DEC     R0                  ;SEE IF DONE
1463  004514  001374                  BNE     FT7A                ;IF NOT: BR
1464  004516  005777  174066          TST     @CS                 ;SEE IF DLT IS SET
1465  004522  100004                  BPL     FT7ER               ;IF NOT: BR
1466  004524  004767  005254  FT7X:   JSR     PC,ITER             ;GO SEE IF ITERATION
1467  004530  000167  176052          JMP     TSCD2               ;RETURN TO SCHEDULAR
1468  004534  012767  014572  174174  FT7ER:  MOV     #MSG32,ERADD        ;SET ERROR CODE
1469  004542  004767  177006          JSR     PC,FT3ER            ;GO DO ERROR
1470  004546  000766                  BR      FT7X
```

```
1471
1472                                                ;RH11 SILO TEST 5: SILO RESET**********
1473
1474  004550  005767  174116          FT10:   TST     RH17F
1475  004554  001034                  BNE     FT10X           ;IF RH70: BR
1476  004556  012767  016216  174112  MOV     #MSFT10,EMADDR  ;SET TEST HEADER
1477  004564  012767  004550  174170  MOV     #FT10,SCOLP     ;SET SCOPE ADDRESS
1478  004572  012777  000040  174010  MOV     #40,@CS         ;INITIALIZE
1479  004600  012700  000004          MOV     #4,R0           ;SET NUMBER OF SILO WRITER
1480  004604  010077  174012          FT10A:  MOV     R0,@DB          ;WRITE SILO
1481  004610  005300                  DEC     R0              ;SEE IF DONE
1482  004612  001374                  BNE     FT10A           ;IF NOT: BR
1483  004614  052777  000040  173766  BIS     #40,@CS         ;INITIALIZE
1484  004622  012777  177777  173772  MOV     #-1,@DB         ;WRITE SILO
1485  004630  017701  173766          MOV     @DB,R1          ;READ SILO 1
1486  004634  017701  173762          MOV     @DB,R1          ;READ SILO 2
1487  004640  005777  173744          TST     @CS             ;SEE IF DLT IS SET
1488  004644  100011                  BPL     FT10ER          ;IF NOT: BR
1489  004646  004767  005132          FT10X:  JSR     PC,ITER         ;GO SEE IF ITERATION
1490  004652  005767  174136          TST     RH0F            ;SEE IF RH11 ONLY
1491  004656  001402                  BEQ     FT10XX          ;IF NOT: BR
1492  004660  000167  176042          JMP     TEND            ;ELSE GO TO END
1493  004664  000167  175716          FT10XX: JMP     TSCD2           ;RETURN TO SCHEDULAR
1494  004670  012767  014572  174040  FT10ER: MOV     #MSG32,ERADD    ;SET ERROR CODE
1495  004676  004767  176652          JSR     PC,FT3ER        ;GO DO ERROR
1496  004702  000761                  BR      FT10X
```

```
1497                                            ;NOP TEST*****
1498
1499   004704  000240                   FT11:   NOP
1500   004706  012767  004704  174046           MOV     #FT11,SCOLP     ;SET SCOPE ADDRESS
1501   004714  004767  005134                    JSR-    PC,INIT1
1502   004720  012767  000300  174056           MOV     #300,UDES       ;SET TC= ALL NRZ,NORM,ODD
1503   004726  012767  177777  173752           MOV     #-1,FCNT        ;SET FC= ALL OVER
1504   004734  012767  177777  173746           MOV     #-1,WCNT        ;SET WC= ALL OVER
1505   004742  012767  177777  173734           MOV     #-1,BADDR       ;SET BA= ALL OVER
1506   004750  012767  000001  173746           MOV     #1,RDYDX        ;SET DELAY
1507   004756  012767  000001  173742           MOV     #1,OPDYX        ;SET OP DELAY
1508   004764  012767  000001  174004           MOV     #1,FUN          ;SET NOP FUNCTIONS CODE
1509   004772  004767  003732                    JSR     PC,EXEC         ;GO EXECUTE COMMAND
1510   004776  000240                           NOP
1511   005000  012767  016247  173670           MOV     #MSFT11,EMADDR
1512   005006  004767  004146                    JSR     PC,ERCHK        ;GO CHECK REGISTER
1513   005012  004767  004766                    JSR     PC,ITER         ;GO SEE IF ITERATIONS
1514   005016  000167  175564                    JMP     TSCD2           ;RETURN TO SCHEDULAR
```

```
1515                                                ;REWIND TEST*****
1516
1517  005022  000240                        FT12:   NOP
1518  005024  012767  005022  173730                MOV     #FT12,SCOLP
1519  005032  004767  005016                        JSR     PC,INITI        ;GO INITIALIZE
1520  005036  052777  001700  173566                BIS     #1700,@TC       ;SET TO NRZ,NORMAL
1521  005044  012767  177760  173634                MOV     #-20,FCNT       ;SET FC=20
1522  005052  012767  177770  173630                MOV     #-10,WCNT       ;SET WC=10
1523  005060  012767  016726  173616                MOV     #WDATA,BADDR    ;SET BA=WRITE BUFFER
1524  005066  012767  000007  173702                MOV     #7,FUN          ;SET REWIND OP CODE
1525  005074  004767  003630                        JSR     PC,EXEC         ;GO EXECUTE COMMAND
1526  005100  000240                                NOP
1527  005102  032777  020000  173502  FT12A:  BIT     #20000,@DS
1528  005110  001374                                BNE     FT12A           ;AWAIT PIP
1529  005112  012767  016267  173556                MOV     #MSFT12,EMADDR
1530  005120  004767  004034                        JSR     PC,ERCHK        ;GO CHECK FOR ERROR
1531  005124  004767  004654                        JSR     PC,ITER         ;GO SEE IF ITERATION
1532  005130  000167  175452                        JMP     TSCD2           ;RETURN TO SCHEDULAR
1533
```

```
1534                                                    ;WRITE/READ TEST*****
1535
1536  005134  000240                          FT13:     NOP
1537  005136  012767  000001  173560                    MOV     #1,RDYDX
1538  005144  012767  000001  173554                    MOV     #1,OPDYX
1539  005152  012767  000100  173532                    MOV     #100,RCNT       ;SET RECORD COUNT
1540  005160  012767  016312  173510                    MOV     #MSFT13,EMADDR  ;SET TEST HEADER
1541  005166  012767  000001  173612                    MOV     #1,PATRN
1542  005174  004767  004366                           JSR     PC,DSUP         ;SET UP ALL ONES DATA PATTERN
1543  005200  012767  000300  173576                    MOV     #300,UDES       ;REWIND TO BOT
1544  005206  004767  003650                FT13A:    JSR     PC,RWND         ;SET 200 BPI, NORMAL
1545  005212  012767  177600  173466                    MOV     #-200,FCNT      ;SET FC
1546  005220  012767  177700  173462                    MOV     #-100,WCNT      ;SET WC
1547  005226  012767  016726  173450                    MOV     #WDATA,BADDR    ;SET BA
1548  005234  012767  000061  173534                    MOV     #61,FUN         ;SET WRITE OP-CODE
1549  005242  012767  014171  173444                    MOV     #MSG12,ERRP
1550  005250  004767  003454                FT13B:    JSR     PC,EXEC         ;GO EXECUTE COMMAND
1551  005254  005067  173502                           CLR     SCOLP           ;NO SCOPE LOOP
1552  005260  004767  003674                           JSR     PC,ERCHK        ;GO CHECK ERROR
1553  005264  005367  173422                           DEC     RCNT            ;SEE IF DONE ALL
1554  005270  001367                                   BNE     FT13B           ;IF NOT: BR
1555  005272  012767  000100  173412                    MOV     #100,RCNT       ;SET RECORD COUNT
1556  005300  012767  020440  173376                    MOV     #RDATA,BADDR
1557  005306  062767  000200  173370                    ADD     #200,BADDR      ;SET BA
1558  005314  012767  000077  173454                    MOV     #77,FUN         ;SET READ REVERSE OP-CPDE
1559  005322  012767  014207  173364                    MOV     #MSG13,ERRP
1560  005330  004767  003374                FT13C:    JSR     PC,EXEC         ;GO EXECUTE COMMAND
1561  005334  004767  003620                           JSR     PC,ERCHK        ;GO CHECK ERROR
1562  005340  005367  173346                           DEC     RCNT            ;SEE IF READ ALL
1563  005344  001371                                   BNE     FT13C           ;IF NOT:BR
1564  005346  162767  000200  173330                    SUB     #200,BADDR      ;SET BA
1565  005354  012767  000071  173414                    MOV     #71,FUN         ;SET READ FORWARD OP-CODE
1566  005362  012767  014234  173324                    MOV     #MSG14,ERRP
1567  005370  012767  000100  173314                    MOV     #100,RCNT       ;SET RECORD COUNT
1568  005376  004767  003326                FT13D:    JSR     PC,EXEC         ;GO EXECUTE COMMAND
1569  005402  004767  003552                           JSR     PC,ERCHK        ;GO CHECK ERRORS
1570  005406  005367  173300                           DEC     RCNT            ;SEE IF DONE ALL
1571  005412  001371                                   BNE     FT13D           ;IF NOT:BR
1572  005414  032767  062000  173362                    BIT     #2000,UDES      ;SEE IF DONE PE
1573  005422  001017                                   BNE     FT13X           ;IF SO: BR
1574  005424  062767  000400  173352                    ADD     #400,UDES       ;SELECT NEXT DENSITY
1575  005432  032767  002000  173344                    BIT     #2000,UDES      ;SEE IF PE
1576  005440  001403                                   BEQ     FT13E           ;IF NOT: BR
1577  005442  005767  173344                           TST     NRZOF           ;SEE IF NRZ ONLY
1578  005446  001005                                   BNE     FT13X           ;IF SO: BR
1579  005450  012767  000100  173234        FT13E:    MOV     #100,RCNT       ;RESET RECORD COUNT
1580  005456  000167  177524                           JMP     FT13A           ;GO DO NEXT DENSITY
1581  005462  000167  175120                FT13X:    JMP     TSCD2           ;RETURN TO SCHEDULAR
```

```
1582                                            ;SPACE TEST*****
1583
1584  005466  000240                    FT14:   NOP
1585  005470  012767  016341  173200            MOV     #MSFT14,EMADDR  ;SET TEST HEADER
1586  005476  012767  001700  173300            MOV     #1700,UDES      ;SET NRZ,NORMAL
1587  005504  004767  003352            FT14A1: JSR     PC,RWND         ;GO INITIALIZE
1588  005510  012767  000100  173174            MOV     #100,RCNT       ;SET NUMBER OF RECORDER
1589  005516  012767  177777  011202            MOV     #-1,WDATA       ;SET DATA PATTERN
1590  005524  012767  177700  173154            MOV     #-100,FCNT      ;PRESET FRAME CNT
1591  005532  012767  177740  173150            MOV     #-40,WCNT       ;PRESET WORD CNT
1592  005540  004767  004310            FT14A:  JSR     PC,INIT1        ;GO REWIND
1593  005544  012767  001000  173154            MOV     #1000,OPDYX
1594  005552  012767  040000  173144            MOV     #40000,RDYDX
1595  005560  012767  000061  173210            MOV     #61,FUN         ;SET WRITE OP-CODE
1596  005566  012767  102300  173152            MOV     #102300,STMSK   ;MASK DATA RELATED ERRORS
1597  005574  052777  000010  173006            BIS     #10,@CS         ;INHIBIT BUS ADDRESS INCREMENT
1598  005602  004767  003122                    JSR     PC,EXEC         ;GO EXECUTE COMMAND
1599  005606  000240                            NOP
1600  005610  012767  015244  173076            MOV     #MSG46,ERRP     ;SET ERROR CODE
1601  005616  004767  003336                    JSR     PC,ERCHK        ;GO CHECK ERRORS
1602  005622  005767  173152                    TST     SERFL           ;SEE IF ERROR
1603  005626  001402                            BEQ     FT14A2          ;IF NOT: BR
1604  005630  000167  000466                    JMP     FT14X           ;ELSE EXIT
1605  005634  162767  000001  173044  FT14A2:   SUB     #1,FCNT         ;BUMP FC
1606  005642  032767  000001  173036            BIT     #1,FCNT         ;SEE IF SHOULD BUMP WC
1607  005650  001403                            BEQ     FT14A3          ;IF NOT: BR
1608  005652  162767  000001  173030            SUB     #1,WCNT         ;BUMP WC
1609  005660  005367  173026            FT14A3: DEC     RCNT            ;SEE IF DONE ALL
1610  005664  001325                            BNE     FT14A           ;WRITE ALL RECORDS
1611  005666  000240                            NOP
1612  005670  012767  000100  173022            MOV     #100,RRD        ;PRESET RECORD POSITION
1613  005676  012767  000176  173016            MOV     #176,RFD
1614  005704  000240                            NOP
1615  005706  012767  177701  173014            MOV     #-77,SCNT       ;SET SPACE AMOUNT
1616  005714  012767  000033  173054  FT14B:    MOV     #33,FUN         ;SET OP-CODE SPACE REVERSE
1617  005722  004767  003002                    JSR     PC,EXEC         ;GO EXECUTE COMMAND
1618  005726  012767  015315  172760            MOV     #MSG48,ERRP     ;SET ERROR CODE
1619  005734  004767  003220                    JSR     PC,ERCHK        ;GO CHECK ERRORS
1620  005740  005767  173034                    TST     SERFL           ;SEE IF ERROR
1621  005744  001166                            BNE     FT14X           ;IF SO: BR
1622  005746  004767  000070                    JSR     PC,FT14RR       ;GO READ REVERSE + CHECK DATA
1623  005752  000240                            NOP
1624  005754  012767  000031  173014            MOV     #31,FUN         ;SET SPACE FORWARD OP-CODE
1625  005762  005267  172742                    INC     SCNT            ;SET SPACE AMOUNT
1626  005766  001555                            BEQ     FT14X           ;IF DONE: BR
1627  005770  004767  002734                    JSR     PC,EXEC         ;GO EXECUTE COMMAND
1628  005774  012767  015270  172712            MOV     #MSG47,ERRP     ;SET ERROR CODE
1629  006002  004767  003152                    JSR     PC,ERCHK        ;GO CHECK ERROR
1630  006006  005767  172766                    TST     SERFL           ;SEE IF ERROR FLAG
1631  006012  001143                            BNE     FT14X           ;IF NO: BR
1632  006014  004767  000064                    JSR     PC,FT14RF       ;GO READ FORWARD FOR POSITION CHECK
1633  006020  000240                            NOP
1634  006022  005267  172702                    INC     SCNT            ;DECREMENT SPACE AMOUNT
1635  006026  001535                            BEQ     FT14X           ;IF DONE: BR
1636  006030  005267  172664                    INC     RRD             ;BUMP DATA EXPT
1637  006034  005367  172662                    DEC     RFD             ;BUMP DATA EXPT
```

```
1638  006040  000725                        BR      FT14B
1639  006042  000240              FT14RR:   NOP
1640  006044  012767  020440  172632        MOV     #RDATA,BADDR    ;SET BA
1641  006052  012767  000077  172716        MOV     #77,FUN         ;SET READ REVERSE OP-CODE
1642  006060  004767  002644                JSR     PC,EXEC         ;GO EXECUTE COMMAND
1643  006064  000240                        NOP
1644  006066  016705  172626                MOV     RRD,R5
1645  006072  020577  172510                CMP     R5,@FC          ;SEE IF CORRECT RECORD
1646  006076  001020                        BNE     FT14RER         ;IF NOT: BR
1647  006100  000167  000026                JMP     FT14EC          ;GO CLEAR RH11 ERROR BIT
1648  006104  000240              FT14RF:   NOP
1649  006106  012767  000071  172662        MOV     #71,FUN         ;SET READ FORWARD OP-CODE
1650  006114  004767  002610                JSR     PC,EXEC         ;GO EXECUTE COMMAND
1651  006120  016705  172576                MOV     RFD,R5
1652  006124  020577  172456                CMP     R5,@FC          ;SEE IF CORRECT RECORD
1653  006130  001003                        BNE     FT14RER         ;IF NOT: BR
1654  006132  004767  003716      FT14EC:   JSR     PC,INIT1        ;CLEAR RH
1655  006136  000207                        RTS     PC              ;RETURN
1656  006140  000240              FT14RER:  NOP
1657  006142  032777  020000  172466        BIT     #20000,@SWR     ;SEE IF PRINT INHIBITED
1658  006150  001060                        BNE     FT14R3          ;IF SO: BR
1659  006152  012704  016341                MOV     #MSFT14,R4
1660  006156  004767  004322                JSR     PC,TTOUT        ;PRINT HEADER
1661  006162  012704  014107                MOV     #MSG9,R4
1662  006166  004767  004312                JSR     PC,TTOUT        ;PRINT ERROR TYPE
1663  006172  012704  014342                MOV     #MSG20,R4       ;SET NRZ TAG POINTER
1664  006176  032767  002000  172600        BIT     #2000,UDES      ;SEE IF PE
1665  006204  001402                        BEQ     FT14RD          ;IF NOT: BR
1666  006206  012704  014350                MOV     #MSG21,R4       ;ELSE SET PE TAG POINTER
1667  006212  004767  004266      FT14RD:   JSR     PC,TTOUT        ;PRINT TAG
1668  006216  032767  000002  172552        BIT     #2,FUN          ;SEE IF READ REVERSE
1669  006224  001003                        BNE     FT14R1          ;IF SO: BR
1670  006226  012704  014322                MOV     #MSG17,R4
1671  006232  000402                        BR      FT14R2          ;GO PRINT
1672  006234  012704  014302      FT14R1:   MOV     #MSG16,R4
1673  006240  004767  004240      FT14R2:   JSR     PC,TTOUT        ;PRINT FRWD/REV
1674  006244  012704  014355                MOV     #MSG22,R4
1675  006250  004767  004230                JSR     PC,TTOUT        ;PRINT EXPT TAG
1676  006254  010503                        MOV     R5,R3
1677  006256  042703  177700                BIC     #177700,R3      ;MASK RECORD NUMBER
1678  006262  004767  004362                JSR     PC,OCTP         ;PRINT EXPT RECORD NUMBER
1679  006266  012704  014365                MOV     #MSG23,R4
1680  006272  004767  004206                JSR     PC,TTOUT        ;PRINT RCVD TAG
1681  006276  017703  172304                MOV     @FC,R3
1682  006302  042703  177700                BIC     #177700,R3      ;MASK RECORD NUMBER
1683  006306  004767  004336                JSR     PC,OCTP         ;PRINT ACTUAL RECORD NUMBER
1684  006312  005777  172320      FT14R3:   TST     @SWR            ;SEE IF HALT ON ERROR
1685  006316  100001                        BPL     FT14X           ;IF NOT: BR
1686  006320  000000                        HALT
1687  006322  004767  004752      FT14X:    JSR     PC,CKSWR                ;CHECK FOR CNTL G
1688  006326  005767  172460                TST     NRZOF           ;SEE IF NRZ ONLY
1689  006332  001011                        BNE     FT14XX          ;IF SO: BR
1690  006334  032767  002000  172442        BIT     #2000,UDES      ;SEE IF DONE PE
1691  006342  001005                        BNE     FT14XX          ;IF SO: BR
1692  006344  012767  002300  172432        MOV     #2300,UDES      ;SET TO PE
1693  006352  000167  177126                JMP     FT14A1          ;DO IN PE
```

```
 1694  006356  000167  174224          FT14XX: JMP     TSCD2           ;RETURN TO SCHEDULAR
```

```
1695                                                ;ERASE TEST*****
1696
1697  006362  000240                        FT15:   NOP
1698  006364  005067  172356                        CLR     STMSK
1699  006370  012767  000100  172326                MOV     #100,RDYDX
1700  006376  012767  000010  172322                MOV     #10,OPDYX
1701  006404  012767  016363  172264                MOV     #MSFT15,EMADDR  ;SET TEST HEADER
1702  006412  004767  002444                        JSR     PC,RWND         ;REWIND
1703  006416  012767  020440  172260                MOV     #RDATA,BADDR    ;SET BA
1704  006424  012767  001700  172352                MOV     #1700,UDES      ;SET NRZ, NORMAL
1705  006432  012767  000025  172336        FT15A:  MOV     #25,FUN         ;SET ERASE OP-CODE
1706  006440  012767  000200  172244                MOV     #200,RCNT       ;SET TO ERASE 128 TIMES
1707  006446  004767  002256                FT15B:  JSR     PC,EXEC         ;GO EXECUTE COMMAND
1708  006452  012767  015244  172234                MOV     #MSG46,ERRP     ;SET ERROR CODE
1709  006460  004767  002474                        JSR     PC,ERCHK        ;GO CHECK ERRORS
1710  006464  005767  172310                        TST     SERFL           ;SEE IF ANY ERRORS
1711  006470  001032                                BNE     FT15X           ;IF SO EXIT
1712  006472  005367  172214                        DEC     RCNT            ;SEE IF DONE ERASING
1713  006476  001363                                BNE     FT15B           ;IF NOT: BR
1714  006500  000240                                NOP
1715  006502  004767  002354                        JSR     PC,RWND         ;REWIND
1716  006506  012767  177600  172174                MOV     #-200,WCNT      ;SET WC
1717  006514  012767  000071  172254                MOV     #71,FUN         ;SET READ FORWARD OP-CODE
1718  006522  012767  000040  172174                MOV     #40,RDYDX       ;SET DELAY
1719  006530  004767  002174                        JSR     PC,EXEC         ;GO EXECUTE COMMAND
1720  006534  000240                                NOP
1721  006536  012767  015640  172150                MOV     #MSG60,ERRP     ;SET ERROR CODE
1722  006544  012767  020000  172174                MOV     #20000,STMSK
1723  006552  004767  002402                        JSR     PC,ERCHK        ;GO CHECK ERRORS
1724  006556  000167  174024                FT15X:  JMP     TSCD2           ;RETURN TO SCHEDULAR
```

```
1725                                            ;TAPE MARK WRITE/READ TEST*****
1726
1727  006562  000240                    FT16:   NOP
1728  006564  012767  000001  172132            MOV     #1,RDYDX
1729  006572  012767  001000  172126            MOV     #1000,OPDYX
1730  006600  012767  016405  172070            MOV     #MSFT16,EMADDR  ;SET HEADER
1731  006606  012767  001700  172170            MOV     #1700,UDES      ;SET TO NRZ,NORMAL,ODD
1732  006614  004767  002242            FT16A:  JSR     PC,RWND         ;REWIND
1733  006620  012767  177760  172060  FT16B:  MOV     #-20,FCNT       ;FC=20
1734  006626  012767  177770  172054            MOV     #-10,WCNT       ;WC=10
1735  006634  012767  000027  172134            MOV     #27,FUN         ;SET WRITE TAPE MARK OP-CODE
1736  006642  004767  002062                    JSR     PC,EXEC         ;GO EXECUTE COMMAND
1737  006646  012767  001000  172072            MOV     #1000,STMSK     ;SET FOR FCE MASK
1738  006654  012767  014171  172032            MOV     #MSG12,ERRP     ;SET ERROR CODE
1739  006662  004767  002272                    JSR     PC,ERCHK        ;GO CHECK ERROR
1740  006666  004767  002634                    JSR     PC,TMCHK        ;GO SEE IF TM SET
1741  006672  012767  000077  172076            MOV     #77,FUN         ;SET USED REVERSE OP-CODE
1742  006700  004767  002024                    JSR     PC,EXEC         ;GO EXECUTE COMMAND
1743  006704  012767  001000  172034            MOV     #1000,STMSK     ;SET FCE ERROR MASK
1744  006712  012767  014207  171774            MOV     #MSG13,ERRP     ;SET ERROR CODE
1745  006720  004767  002234                    JSR     PC,ERCHK        ;GO CHECK ERRORS
1746  006724  004767  002576                    JSR     PC,TMCHK        ;GO SEE IF TM SET
1747  006730  012767  000071  172040            MOV     #71,FUN         ;SET READ  FORWARD OP-CODE
1748  006736  004767  001766                    JSR     PC,EXEC         ;GO EXECUTE COMMAND
1749  006742  012767  014234  171744            MOV     #MSG14,ERRP     ;SET ERROR CODE
1750  006750  004767  002204                    JSR     PC,ERCHK        ;TO CHECK ERRORS
1751  006754  004767  002546                    JSR     PC,TMCHK        ;GO SEE IF TM SET
1752  006760  032767  002000  172016            BIT     #2000,UDES      ;SEE IF DONE PE
1753  006766  001012                            BNE     FT16X           ;IF SO: BR
1754  006770  005767  172016                    TST     NRZOF           ;SEE IF NRZ ONLY
1755  006774  001007                            BNE     FT16X           ;IF SO: BR
1756  006776  012767  002300  172000            MOV     #2300,UDES      ;SET PE, NORMAL
1757  007004  004767  003044                    JSR     PC,INIT1        ;INITIALIZE
1758  007010  000167  177604                    JMP     FT16B           ;DO IN PE
1759  007014  004767  002764            FT16X:  JSR     PC,ITER         ;DO ITERATIONS
1760  007020  000167  173562                    JMP     TSCD2           ;RETURN TO SCHEDULAR
1761
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1762
1763                                        ;TAPE MARK SPACE TEST**********
1764
1765  007024  005067  171662        FT17:   CLR     RCNT
1766  007030  012767  016446  171640        MOV     #MSFT17,EMADDR  ;SET HEADER
1767  007036  012767  001700  171740        MOV     #1700,UDES      ;SET TO NRZ
1768  007044  004767  002012        FT17A:  JSR     PC,RWND         ;REWIND TAPE
1769  007050  012767  000027  171720 FT17B: MOV     #27,FUN
1770  007056  012767  040000  171640        MOV     #40000,RDYDX    ;SET DRY DELAY
1771  007064  012767  040000  171634        MOV     #40000,OPDYX    ;SET OP DELAY
1772  007072  004767  001632                JSR     PC,EXEC         ;GO WRITE TM
1773  007076  012767  102300  171642        MOV     #102300,STMSK   ;MASK DATA RELATED ERRORS
1774  007104  012767  014261  171602        MOV     #MSG15,ERRP     ;SET ERROR TYPE
1775  007112  004767  002042                JSR     PC,ERCHK        ;GO CHECK ERROR
1776  007116  005767  171656                TST     SERFL           ;SEE IF ERROR
1777  007122  001144                        BNE     FT17X           ;IF SO: BR
1778  007124  004767  002376                JSR     PC,TMCHK        ;GO SEE IF TM SET
1779  007130  000240                        NOP
1780  007132  000240                        NOP
1781  007134  032767  000100  171550        BIT     #100,RCNT       ;SEE IF DONE PATTERN
1782  007142  001046                        BNE     FT17D           ;IF SO: BR
1783  007144  062767  000020  171540        ADD     #20,RCNT        ;ADD 20 TO RECORD COUNT
1784  007152  016767  171534  171560        MOV     RCNT,TEMP1      ;SAVE RECORD COUNT
1785  007160  012767  177600  171522        MOV     #-200,WCNT      ;WC=128
1786  007166  012767  177400  171512        MOV     #-400,FCNT      ;FC=256
1787  007174  012767  016726  171502        MOV     #WDATA,BADDR    ;BA=WRITE BUFFER
1788  007202  012767  000061  171566        MOV     #61,FUN         ;SET WRITE OP CODE
1789  007210  000240                FT17C:  NOP
1790  007212  000240                        NOP
1791  007214  004767  001510                JSR     PC,EXEC         ;GO WRITE
1792  007220  012767  014171  171466        MOV     #MSG12,ERRP     ;SET ERROR CODE
1793  007226  012767  102300  171512        MOV     #102300,STMSK   ;MASK DATA RELATED ERRORS
1794  007234  004767  001720                JSR     PC,ERCHK        ;GO CHECK ERROR
1795  007240  005767  171534                TST     SERFL           ;SEE IF ERROR
1796  007244  001073                        BNE     FT17X           ;IF SO: BR
1797  007246  005367  171466                DEC     TEMP1           ;SEE IF DONE ALL
1798  007252  001356                        BNE     FT17C           ;IF NOT: BR
1799  007254  000167  177570                JMP     FT17B           ;ELSE GO DO TM
1800  007260  000240                FT17D:  NOP
1801  007262  012767  000033  171506        MOV     #33,FUN         ;SET SPACE REVERSE
1802  007270  012767  014302  171416        MOV     #MSG16,ERRP     ;SET ERROR CODE
1803  007276  012767  177600  171424 FT17D1: MOV     #-200,SCNT      ;SET TO 200 RECORDS
1804  007304  012767  000005  171400        MOV     #5,RCNT         ;SET NUMBER OF OPS TO DO
1805  007312  004767  002536        FT17E:  JSR     PC,INIT1        ;GO INIT
1806  007316  004767  001406                JSR     PC,EXEC         ;GO SPACE
1807  007322  012767  001000  171416        MOV     #1000,STMSK     ;SET ERROR MASK
1808  007330  004767  001624                JSR     PC,ERCHK        ;GO CHECK ERROR
1809  007334  005767  171440                TST     SERFL           ;SEE IF ERROR
1810  007340  001035                        BNE     FT17X           ;IF SO: BR
1811  007342  004767  002160                JSR     PC,TMCHK        ;GO SEE IF TM SET
1812  007346  005367  171340                DEC     RCNT            ;SEE IF DONE SPACES
1813  007352  001357                        BNE     FT17E           ;IF NOT: BR
1814  007354  022767  000031  171414        CMP     #31,FUN         ;SEE IF DONE FORWARD
1815  007362  001410                        BEQ     FT17F           ;IF SO: BR
1816  007364  012767  014322  171322        MOV     #MSG17,ERRP     ;SET ERROR CODE
1817  007372  012767  000031  171376        MOV     #31,FUN         ;SET TO SPACE FORWARD
```

```
 1818  007400  000167  177672                    JMP     FT17D1          ;DO FORWARD
 1819  007404  032767  002000  171372  FT17F:    BIT     #2000,UDES      ;SEE IF DONE PE
 1820  007412  001010                            BNE     FT17X           ;IF SO: BR
 1821  007414  005767  171372                    TST     NRZOF           ;SEE IF NRZ ONLT
 1822  007420  001005                            BNE     FT17X           ;IF SO: BR
 1823  007422  012767  002300  171354            MOV     #2300,UDES      ;SET TO PE
 1824  007430  000167  177410                    JMP     FT17A           ;GO PE
 1825  007434  000167  173146          FT17X:    JMP     TSCD2           ;RETURN  TO SCHEDULAR
```

```
1826
1827                                            ;WRITE CHECK TEST**********
1828
1829  007440  000240                    FT20:   NOP
1830  007442  012767  016474  171226            MOV     #MSFT20,EMADDR  ;SET HEADER
1831  007450  004767  001406                    JSR     PC,RWND         ;REWIND
1832  007454  012767  000003  171324            MOV     #3,PATRN
1833  007462  004767  002100                    JSR     PC,DSUP         ;GO SET PATTERN 3
1834  007466  012767  016726  171210            MOV     #WDATA,BADDR    ;SET BA
1835  007474  012767  177400  171204            MOV     #-400,FCNT      ;SET FC
1836  007502  012767  177600  171200            MOV     #-200,WCNT      ;SET WC
1837  007510  012767  001700  171266            MOV     #1700,UDES      ;SET NRZ NORMAL
1838  007516  012767  000061  171252  FT20A:    MOV     #61,FUN         ;SET WRITE OP CODE
1839  007524  004767  001200                    JSR     PC,EXEC         ;GO WRITE RECORD
1840  007530  012767  015244  171156            MOV     #MSG46,ERRP     ;SET ERROR CODE
1841  007536  004767  001416                    JSR     PC,ERCHK        ;GO CHECK ERROR
1842  007542  005767  171232                    TST     SERFL           ;SEE IF ERORR
1843  007546  001050                            BNE     FT20X           ;IF SO: BR
1844  007550  012767  014302  171136            MOV     #MSG16,ERRP     ;SET REVERSE ERROR TAG
1845  007556  012767  000057  171212            MOV     #57,FUN         ;SET REVERSE WRITE CHECK OP-CODE
1846  007564  062767  000376  171112            ADD     #376,BADDR      ;SET BA FOR REVERSE CHECK
1847  007572  004767  001132                    JSR     PC,EXEC         ;GO DO REVERSE CHECK
1848  007576  004767  001356                    JSR     PC,ERCHK        ;GO CHECK ERROR
1849  007602  012767  014322  171104  FT20B:    MOV     #MSG17,ERRP     ;SET FORWARD TAG
1850  007610  012767  000051  171160            MOV     #51,FUN         ;SET FORWARD CHECK OP CODE
1851  007616  162767  000376  171060            SUB     #376,BADDR      ;SET BA FOR FORWARD CHECK
1852  007624  004767  001100                    JSR     PC,EXEC         ;GO DO FORWARD CHECK
1853  007630  004767  001324                    JSR     PC,ERCHK        ;GO CHECK ERROR
1854  007634  032767  002000  171142  FT20C:    BIT     #2000,UDES      ;SEE IF DONE PE
1855  007642  001012                            BNE     FT20X           ;IF SO: BR
1856  007644  005767  171142                    TST     NRZOF           ;SEE IF NRZ ONLY
1857  007650  001007                            BNE     FT20X           ;IF SO: BR
1858  007652  012767  002300  171124            MOV     #2300,UDES      ;ELSE SET PE
1859  007660  004767  002170                    JSR     PC,INIT1        ;GO INIT
1860  007664  000167  177626                    JMP     FT20A           ;DO IN PE
1861  007670  004767  002110          FT20X:    JSR     PC,ITER         ;DO ITERATIONS
1862  007674  000167  172706                    JMP     TSCD2           ;RETURN TO SCHEDULAR
```

```
1863
1864                                        ;ERASE HEAD TEST*****
1865
1866  007700  012767  016525  170770  FT21:  MOV   #MSFT21,EMADDR  ;SET TEST HEADER
1867  007706  004767  001150                 JSR   PC,RWND         ;GO REWIND
1868  007712  012767  000003  171066         MOV   #3,PATRN
1869  007720  004767  001642                 JSR   PC,DSUP         ;GO SET PATTERN 3
1870  007724  012767  016726  170752         MOV   #WDATA,BADDR    ;SET BA=WRITE BUFFER
1871  007732  012767  176340  170746         MOV   #-1440,FCNT     ;SET FC=800
1872  007740  012767  177160  170742         MOV   #-620,WCNT      ;SET WC=400
1873  007746  012767  001700  171030         MOV   #1700,UDES      ;SET NRZ, NORMAL
1874  007754  012767  000061  171014         MOV   #61,FUN         ;SET WRITE OP-CODE
1875  007762  004767  000742                 JSR   PC,EXEC         ;GO DO WRITE 1
1876  007766  012767  014171  170720         MOV   #MSG12,ERRP     ;SET ERROR CODE
1877  007774  004767  001160                 JSR   PC,ERCHK        ;GO CHECK FOR ERROR
1878  010000  004767  000724                 JSR   PC,EXEC         ;YES DO WRITE 2
1879  010004  004767  001150                 JSR   PC,ERCHK        ;YES CHECK FOR ERROR
1880  010010  000240                         NOP
1881  010012  004767  001044                 JSR   PC,RWND         ;GO REWIND
1882  010016  012767  177160  170662         MOV   #-620,FCNT      ;SET FC=400
1883  010024  012767  177470  170656         MOV   #-310,WCNT      ;SET WC=200
1884  010032  004767  000672                 JSR   PC,EXEC         ;GO REWRITE RECORD 1-WH TO EH
1885  010036  000240          FT21A:         NOP
1886  010040  004767  001016                 JSR   PC,RWND         ;REWIND
1887  010044  012767  020440  170632         MOV   #RDATA,BADDR    ;SET BA=READ BUFFER
1888  010052  012767  177160  170626         MOV   #-620,FCNT      ;SET FC=400
1889  010060  012767  177470  170622         MOV   #-310,WCNT      ;SET WC=200
1890  010066  012767  000071  170702         MOV   #71,FUN         ;SET READ OP-CODE
1891  010074  004767  000630                 JSR   PC,EXEC         ;GO READ RECORD 1
1892  010100  012767  014234  170606         MOV   #MSG14,ERRP     ;SET ERROR CODE
1893  010106  004767  001046                 JSR   PC,ERCHK        ;GO CHECK FOR ERROR
1894  010112  000240                         NOP
1895  010114  052777  000010  170466         BIS   #10,@CS         ;INHIBIT BA INCREMENT
1896  010122  012767  176340  170556         MOV   #-1440,FCNT     ;SET FC=800
1897  010130  012767  177160  170552         MOV   #-620,WCNT      ;SET WC=400
1898  010136  004767  000566                 JSR   PC,EXEC         ;GO READ RECORD 2
1899  010142  022777  001440  170436         CMP   #1440,@FC       ;SEE IF READ RECORD 2
1900  010150  001410                         BEQ   FT21X           ;IF SO: BR
1901  010152  012767  015142  170556         MOV   #MSG44,ERADD    ;SET ERROR CODE
1902  010160  012767  010036  170574         MOV   #FT21A,SCOLP    ;SET SCOPE ADDRESS
1903  010166  004767  173362                 JSR   PC,FT3ER        ;GO PRINT ERROR
1904  010172  004767  001606          FT21X: JSR   PC,ITER         ;GO SEE IF ITERATION
1905  010176  000167  172404                 JMP   TSCD2           ;RETURN TO SCHEDULAR
1906
1907
```

```
                                                ;BUFFERED COMMAND TEST*****

010202  012767  016554  170466  FT22:   MOV     #MSFT22,EMADDR  ;SET TEST HEADER
010210  004767  000646                  JSR     PC,RWND         ;GO REWIND
010214  012700  000003                  MOV     #3,R0           ;SET NUMBER OF WRITES
010220  012767  001700  170556          MOV     #1700,UDES      ;SET TO NRZ NORMAL
010226  012767  016726  170450          MOV     #WDATA,BADDR    ;SET BA=WRITE BUFFER
010234  012767  177000  170444          MOV     #-1000,FCNT     ;SET FC=1000
010242  012767  177400  170440          MOV     #-400,WCNT      ;SET WC=400
010250  012767  000061  170520          MOV     #61,FUN         ;SET WRITE OP-CODE
010256  004767  000446          FT22A:  JSR     PC,EXEC         ;GO DO WRITE
010262  005300                          DEC     R0              ;SEE IF DONE ALL
010264  001374                          BNE     FT22A           ;IF NOT: BR
010266  000240                          NOP
010270  012777  000007  170302          MOV     #7,@C1          ;START REWIND
010276  032777  000200  170306  FT22B:  BIT     #200,@DS
010304  001774                          BEQ     FT22B
010306  004767  001542                  JSR     PC,INIT1        ;INITIALIZE
010312  012767  000010  170404          MOV     #10,RDYDX       ;SET LONG READY DELAY
010320  004767  000404                  JSR     PC,EXEC         ;ISSUE BUFFERED WRITE
010324  000240                          NOP
010326  012767  015342  170360          MOV     #MSG49,ERRP     ;SET ERROR CODE
010334  012767  102300  170404          MOV     #102300,STMSK   ;MARK DATA ERROR
010342  004767  000612                  JSR     PC,ERCHK        ;GO CHECK ERROR
010346  032777  000002  170236          BIT     #2,@DS          ;SEE IF BOT IS SET
010354  001410                          BEQ     FT22X           ;IF NOT: BR
010356  012767  015370  170352          MOV     #MSG50,ERADD    ;SET ERROR CODE
010364  012767  010202  170370          MOV     #FT22,SCOLP
010372  004767  173156                  JSR     PC,FT3ER        ;GO DO ERROR
010376  004767  001402          FT22X:  JSR     PC,ITER         ;GO SEE IF ITERATION
010402  000167  172200                  JMP     TSCD2           ;RETURN TO SCHEDULAR
```

```
1941                                            ;READ-IN PRESET TEST*****
1942
1943  010406  005767  170270          FT23:     TST     SLVN            ;SEE IF SLAVE SELECT=0
1944  010412  001103                            BNE     FT23X           ;IF NOT:BR
1945  010414  012767  016611  170254            MOV     #MSFT23,EMADDR  ;SET TEST HEADER
1946  010422  004767  001426                    JSR     PC,INIT1        ;GO INIT
1947  010426  012767  001700  170350            MOV     #1700,UDES      ;SET TO NRZ NORMAL
1948  010434  012767  016726  170242            MOV     #WDATA,BADDR    ;SET BA=WRITE BUFFER
1949  010442  012767  177400  170236            MOV     #-400,FCNT      ;SET FC=400
1950  010450  012767  177600  170232            MOV     #-200,WCNT      ;SET WC=200
1951  010456  012767  000061  170312            MOV     #61,FUN         ;SET WRITE OP-CODE
1952  010464  004767  000240                    JSR     PC,EXEC         ;GO DO WRITE
1953  010470  000240                            NOP
1954  010472  004767  001356                    JSR     PC,INIT1        ;INITIALIZE
1955  010476  012767  000021  170272            MOV     #21,FUN         ;SET READ-IN PRESET OP CODE
1956  010504  004767  000220                    JSR     PC,EXEC         ;GO DO COMMAND
1957  010510  005000                            CLR     R0
1958  010512  012703  000004                    MOV     #4,R3           ;SET MULT
1959  010516  032777  020000  170066  FT23A:    BIT     #20000,@DS      ;SEE IF PIP RESET
1960  010524  001404                            BEQ     FT23B           ;IF SO: BR
1961  010526  005300                            DEC     R0
1962  010530  001372                            BNE     FT23A           ;AWAIT PIP RESET
1963  010532  005303                            DEC     R3
1964  010534  001370                            BNE     FT23A           ;DELAY
1965  010536  032777  000002  170046  FT23B:    BIT     #2,@DS          ;SEE IF BOT
1966  010544  001010                            BNE     FT23C           ;IF SO: BR
1967  010546  012767  015426  170162            MOV     #MSG51,ERADD    ;SET ERROR CODE
1968  010554  012767  010406  170200            MOV     #FT23,SCOLP
1969  010562  004767  172766                    JSR     PC,FT3ER        ;GO DO ERROR
1970  010566  012701  141000          FT23C:    MOV     #141000,R1      ;SET EXPT TC
1971  010572  016700  170034                    MOV     TC,R0           ;SET TC ADDRESS
1972  010576  020110                            CMP     R1,(R0)         ;SEE IF EXPT=RCVD
1973  010600  001410                            BEQ     FT23X           ;IF SO: BR
1974  010602  012767  015462  170126            MOV     #MSG52,ERADD    ;SET ERROR CODE
1975  010610  012767  010406  170144            MOV     #FT23,SCOLP     ;CLEAR SCOPE ADDRESS
1976  010616  004767  172442                    JSR     PC,FT2ER        ;GO DO ERROR
1977  010622  000167  171760          FT23X:    JMP     TSCD2           ;RETURN TO SCHEDULAR
1978
1979
```

```
 1980                                                ;REWIND: OFF LINE TEST*****
 1981
 1982  010626  032777  004000  170002  FT24:   BIT     #4000,@SWR      ;SEE IF IN CONTINUOUS MODE
 1983  010634  001033                    BNE     FT24XX          ;IF SO: BR
 1984  010636  012767  016644  170032            MOV     #MSFT24,EMADDR  ;SET TEST HEADER
 1985  010644  004767  001204                    JSR     PC,INIT1        ;GO INITIAIZE
 1986  010650  012777  000003  167722            MOV     #3,@C1          ;ISSUE REWIND: OFF LINE COMMAND
 1987  010656  012700  004000                    MOV     #4000,R0
 1988  010662  005300                FT24A:  DEC     R0              ;DELAY
 1989  010664  001376                    BNE     FT24A
 1990  010666  032777  010000  167716            BIT     #10000,@DS      ;SEE IF MOL IS RESET
 1991  010674  001407                    BEQ     FT24X           ;IF SO: BR
 1992  010676  005067  170060                    CLR     SCOLP           ;ASSURE NO SCOPE
 1993  010702  012767  015501  170026            MOV     #MSG53,ERADD    ;SET ERROR CODE
 1994  010710  004767  172640                    JSR     PC,FT3ER        ;GO DO ERROR
 1995  010714  012704  015525            FT24X:  MOV     #MSG54,R4
 1996  010720  004767  001560                    JSR     PC,TTOUT        ;PRINT ON LINE REQUEST
 1997  010724  000167  171656            FT24XX: JMP     TSCD2           ;RETURN TO SCHEDULAR
 1998
 1999
```

```
2000                                                ;COMMAND EXECUTE SUBROUTINE*****
2001
2002  010730  000240                        EXEC:   NOP
2003  010732  056777  170046  167672              BIS     UDES,@TC        ;LOAD TAPE CONT
2004  010740  016777  167744  167634              MOV     WCNT,@WC        ;LOAD WC
2005  010746  016777  167734  167632              MOV     FCNT,@FC        ;LOAD FC
2006  010754  016777  167724  167622              MOV     BADDR,@BA       ;LOAD BA
2007  010762  022767  000031  170006              CMP     #31,FUN         ;SEE IF SPACE FORWARD
2008  010770  001404                              BEQ     EXECA           ;IF SO: BR
2009  010772  022767  000033  167776              CMP     #33,FUN         ;SEE IF SPACE REVERSE
2010  011000  001003                              BNE     EXECB           ;IF NOT: BR
2011  011002  016777  167722  167576  EXECA:      MOV     SCNT,@FC        ;SET SPACE COUNT
2012  011010  000240            EXECB:            NOP
2013  011012  016777  167760  167560              MOV     FUN,@C1         ;LOAD OP-CODE + GO
2014  011020  000240                              NOP
2015  011022  016703  167676                      MOV     RDYDX,R3        ;SET DELAY
2016  011026  005004                              CLR     R4
2017  011030  032777  000200  167554  EXECC:      BIT     #200,@DS        ;SEE IF DRY
2018  011036  001004                              BNE     EXECX           ;IF SO: BR
2019  011040  005304                              DEC     R4
2020  011042  001372                              BNE     EXECC
2021  011044  005303                              DEC     R3              ;DELAY FOR DRY
2022  011046  001370                              BNE     EXECC
2023  011050  016703  167652            EXECX:    MOV     OPDYX,R3
2024  011054  005303                    EXECXA:   DEC     R3              ;DELAY
2025  011056  001376                              BNE     EXECXA
2026  011060  000207                    EXECXX:   RTS     PC              ;RETURN TO CALLER
2027
```

```
2028                                                    ;REWIND SUBROUTINE*****
2029
2030  011062  000240                        RWND:   NOP
2031  011064  004767  000764                        JSR     PC,INIT1        ;INIT
2032  011070  012777  000007  167502                MOV     #7,@C1          ;START REWIND
2033  011076  012700  040000                        MOV     #40000,R0
2034  011102  005300                        RWNDA:  DEC     R0
2035  011104  001376                                BNE     RWNDA           ;DELAY
2036  011106  032777  020000  167476        RWNDB:  BIT     #20000,@DS
2037  011114  001374                                BNE     RWNDB           ;AWAIT PIP
2038  011116  032777  000002  167466                BIT     #2,@DS          ;SEE IF BOT
2039  011124  001012                                BNE     RWNDX           ;IF SO: BR
2040  011126  016704  167544                        MOV     EMADDR,R4
2041  011132  004767  001346                        JSR     PC,TTOUT        ;PRINT HEADER
2042  011136  012704  013702                        MOV     #MSG2,R4
2043  011142  004767  001336                        JSR     PC,TTOUT        ;PRINT REWIND ERROR
2044  011146  000167  171434                        JMP     TSCD2           ;RETURN TO SECHEDULAR
2045  011152  004767  000676                RWNDX:  JSR     PC,INIT1        ;INIT
2046  011156  000207                                RTS     PC              ;RETURN TO CALLER
2047
```

```
2048                                                    ;ERROR CHECK SUBROUTINE*****
2049
2050  011160  005067  167614          ERCHK:  CLR     SERFL           ;CLEAR FLAG
2051  011164  017767  167422  167560          MOV     @DS,DSAV        ;SAVE DRIVE STATUS REGISTER
2052  011172  032777  040000  167412          BIT     #40000,@DS      ;SEE IF ERROR
2053  011200  001001                          BNE     ERPT            ;IF SO: BR
2054  011202  000207                          RTS     PC              ;RETURN
2055  011204  017704  167404          ERPT:   MOV     @ER,R4          ;GET ERROR REGISTER
2056  011210  032767  002000  167566          BIT     #2000,UDES      ;SEE IF PE
2057  011216  001403                          BEQ     ERPTA1          ;IF SO: BR
2058  011220  042767  000200  167520          BIC     #200,STMSK      ;RESET PEF MASK
2059  011226  046704  167514          ERPTA1: BIC     STMSK,R4        ;MASK DONT CARE BITS
2060  011232  001530                          BEQ     ERPTX           ;IF NO UNEXPECTED ERRORS: BR
2061  011234  012767  000001  167536  ERPTG:  MOV     #1,SERFL        ;SET FLAG
2062  011242  032777  020000  167366          BIT     #20000,@SWR     ;SEE IF SHOULD PRINT ERRORS
2063  011250  001115                          BNE     ERPTD           ;IF NOT: BR
2064  011252  005767  167416                  TST     HDRFL           ;SEE IF DONE HEADER
2065  011256  001006                          BNE     ERPTA           ;IF SO: BR
2066  011260  005267  167410                  INC     HDRFL           ;SET HEADER FLAG
2067  011264  016704  167406                  MOV     EMADDR,R4
2068  011270  004767  001210                  JSR     PC,TTOUT        ;PRINT HEADER
2069  011274  016704  167414          ERPTA:  MOV     ERRP,R4         ;GET ERROR CODE
2070  011300  001414                          BEQ     ERPTB           ;IF NONE: BR
2071  011302  004767  001176                  JSR     PC,TTOUT        ;PRINT ERROR CODE
2072  011306  012704  014342                  MOV     #MSG20,R4       ;SET NRZ TAG
2073  011312  032777  002000  167312          BIT     #2000,@TC       ;SEE IF PE
2074  011320  001402                          BEQ     ERPT1A          ;IF NOT: BR
2075  011322  012704  014350                  MOV     #MSG21,R4       ;ELSE SET PE TAG
2076  011326  004767  001152          ERPT1A: JSR     PC,TTOUT        ;PRINT TAG
2077  011332  016704  167360          ERPTB:  MOV     ERRP1,R4        ;SEE IF CODE 2
2078  011336  001402                          BEQ     ERPTB1          ;IF NOT: BR
2079  011340  004767  001140                  JSR     PC,TTOUT        ;PRINT CODE 2
2080  011344  032777  010000  167264  ERPTB1: BIT     #10000,@SWR     ;SEE IF ITERATION
2081  011352  001010                          BNE     ERPTC           ;IF NOT: BR
2082  011354  012704  015614                  MOV     #MSG56,R4
2083  011360  004767  001120                  JSR     PC,TTOUT        ;PRINT ITER TAG
2084  011364  016703  167360                  MOV     ITCNT,R3
2085  011370  004767  001254                  JSR     PC,OCTP         ;PRINT ITERATION
2086  011374  012704  013614          ERPTC:  MOV     #MSG1,R4
2087  011400  004767  001100                  JSR     PC,TTOUT        ;PRINT REGISTER TAG
2088  011404  017703  167170                  MOV     @C1,R3
2089  011410  004767  001222                  JSR     PC,OCTPE        ;PRINT CS1
2090  011414  017703  167162                  MOV     @WC,R3
2091  011420  004767  001212                  JSR     PC,OCTPE        ;PRINT WC
2092  011424  017703  167154                  MOV     @BA,R3
2093  011430  004767  001202                  JSR     PC,OCTPE        ;PRINT BA
2094  011434  017703  167146                  MOV     @FC,R3
2095  011440  004767  001172                  JSR     PC,OCTPE        ;PRINT FC
2096  011444  017703  167140                  MOV     @CS,R3
2097  011450  004767  001162                  JSR     PC,OCTPE        ;PRINT CS2
2098  011454  017703  167132                  MOV     @DS,R3
2099  011460  004767  001152                  JSR     PC,OCTPE        ;PRINT DS
2100  011464  017703  167124                  MOV     @ER,R3
2101  011470  004767  001142                  JSR     PC,OCTPE        ;PRINT ER
2102  011474  017703  167132                  MOV     @TC,R3
2103  011500  004767  001132                  JSR     PC,OCTPE        ;PRINT TC
```

```
2104  011504  005777  167126          ERPTD:  TST     @SWR            ;SEE IF HALT ON ERROR
2105  011510  100001                          BPL     ERPTX           ;IF NOT: BR
2106  011512  000000                          HALT
2107  011514  004767  001560          ERPTX:  JSR     PC,CKSWR                ;CHECK FOR CNTL G
2108  011520  004767  000330                  JSR     PC,INIT1        ;INIT
2109  011524  000207                  ERPTXX: RTS     PC              ;RETURN
2110
2111
```

```
2112                                            ;TAPE MARK STATUS CHECK**********
2113
2114  011526  032767  000004  167216  TMCHK:    BIT     #4,DSAV         ;SEE IF TM SET
2115  011534  001401                            BEQ     TMCHK1          ;IF NOT: BR
2116  011536  000207                  TMCHK0:   RTS     PC              ;ELSE RETURN
2117  011540  005767  167234          TMCHK1:   TST     SERFL           ;SEE IF HAD ERROR
2118  011544  001374                            BNE     TMCHK0          ;IF SO: BR
2119  011546  012767  015624  167142            MOV     #MSG57,ERRP1    ;SET ERROR CODE 2
2120  011554  004767  177454                    JSR     PC,ERPTG        ;GO PRINT TM ERROR
2121  011560  005067  167132                    CLR     ERRP1           ;CLEAR CODE 2 FLAG
2122  011564  000207                            RTS     PC              ;RETURN
2123
2124                                            ;DATA SETUP ROUTINE**********
2125
2126  011566  000240                  DSUP:     NOP
2127  011570  012703  016726          DS0:      MOV     #WDATA,R3       ;R3 = ADDRS OF WRITE BUFFER
2128  011574  016701  167206                    MOV     PATRN,R1        ;R1 = PATTERN SELECTOR
2129  011600  000241                            CLC
2130  011602  006101                            ROL     R1              ;MAKE PATTERN SELECTOR EVEN
2131  011604  000171  001026                    JMP     @DATBL(R1)      ;GO GENERATE PATTERN
2132  011610  032777  010000  167010  DS1:      BIT     #10000,@DT      ;SEE IF SEVEN TRACK
2133  011616  001410                            BEQ     DS3             ;IF NOT: BR
2134  011620  012702  000640                    MOV     #640,R2         ;SET BUFFER SIZE
2135  011624  012701  016726                    MOV     #WDATA,R1       ;SET START OF BUFFER
2136  011630  042721  140300          DS2:      BIC     #140300,(R1)+   ;MASK FOR 7 CH
2137  011634  005302                            DEC     R2              ;SEE IF DONE
2138  011636  001374                            BNE     DS2             ;IF NOT: BR
2139  011640  012702  000640          DS3:      MOV     #640,R2         ;R2=BUFFER SIZE +2
2140  011644  012701  020440                    MOV     #RDATA,R1       ;R1=READ DATA START
2141  011650  005021                  DS4:      CLR     (R1)+           ;CLEAR BUFFER
2142  011652  005302                            DEC     R2              ;SEE IF DONE ALL
2143  011654  001375                            BNE     DS4             ;IF NOT: BR
2144  011656  000207                            RTS     PC              ;EXIT
2145
2146                                            ;ALL ONES**********
2147
2148  011660  012701  177777          DAT1:     MOV     #-1,R1          ;R1=DATA
2149  011664  012702  000640          DAT1A:    MOV     #640,R2         ;R2=WORD COUNT +2
2150  011670  010123                  DAT1B:    MOV     R1,(R3)+        ;LOAD BUFFER
2151  011672  005302                            DEC     R2              ;SEE IF DONE
2152  011674  001375                            BNE     DAT1B           ;IF NOT: BR
2153  011676  000167  177706                    JMP     DS1             ;RETURN
2154
2155                                            ;ALL ZEROS**********
2156
2157  011702  005001                  DAT2:     CLR     R1              ;R1=DATA
2158  011704  000167  177754                    JMP     DAT1A           ;LOAD BUFFER
2159
```

```
                                        ;ONE/ZERO IN ALTERNATING CHARACTERS**********
                                        
011710  012701  125125          DAT3:   MOV     #125125,R1      ;R1=DATA
011714  000167  177744                  JMP     DAT1A           ;LOAD BUFFER
                                        
                                        ;ALL BITS 0-377**********
                                        
011720  005001                  DAT4:   CLR     R1              ;R1=STARTING DATA
011722  012702  001500                  MOV     #1500,R2        ;R2=CHARACTER COUNT
011726  110123                  DAT4A:  MOVB    R1,(R3)+        ;LOAD BUFFER
011730  105201                          INCB    R1              ;BUMP DATA
011732  005302                          DEC     R2              ;SEE IF DONE
011734  001374                          BNE     DAT4A           ;IF NOT: BR
011736  000167  177646                  JMP     DS1             ;RETURN
                                        
                                        ;SCOPE LOOP ON ERROR SUBROUTINE**********
                                        
011742  004767  001332          SCOPE:  JSR     PC,CKSWR                ;CHECK FOR CNTL G
011746  000240                          NOP
011750  032777  040000  166660          BIT     #40000,@SWR     ;SEE IF LOOP ON ERROR
011756  001001                          BNE     SCOPE1          ;IF SO: BR
011760  000207                          RTS     PC              ;ELSE EXIT
011762  000240                  SCOPE1: NOP
011764  005767  166772                  TST     SCOLP           ;SEE IF SCOPE ADDRESS
011770  001001                          BNE     SCOPE2          ;IF NOT: BR
011772  000207                          RTS     PC              ;ELSE EXIT
011774  005726                  SCOPE2: TST     (SP)+           ;RESET STACK
011776  005726                          TST     (SP)+
012000  000177  166756                  JMP     @SCOLP          ;LOOP ON ERROR
                                        
                                        ;TEST ITERATION SUBROUTINE**********
                                        
012004  004767  001270          ITER:   JSR     PC,CKSWR                ;CHECK FOR CNTL G
012010  000240                          NOP
012012  032777  010000  166616          BIT     #10000,@SWR     ;SEE IF ITERATIONS
012020  001403                          BEQ     ITER1           ;IF SO: BR
012022  005067  166722          ITER0:  CLR     ITCNT           ;CLEAR ITERATION COUNTER
012026  000207                          RTS     PC              ;ELSE EXIT
012030  005267  166714          ITER1:  INC     ITCNT           ;BUMP COUNTER
012034  026767  166710  166612          CMP     ITCNT,ITAMT     ;SEE IF DONE ALL
012042  001767                          BEQ     ITER0           ;IF SO: BR
012044  005726                          TST     (SP)+           ;RESET STACK
012046  017700  166712                  MOV     @ITRLP,R0       ;SET ITERATION POINTER
012052  000110                          JMP     (R0)            ;GO ITERATE
                                        
                                        ;INITIALIZE SUBROUTINE**********
                                        
012054  000240                  INIT1:  NOP
012056  012777  000040  166524          MOV     #40,@CS         ;INIT
012064  016777  166610  166516  INIT2:  MOV     DRVN,@CS        ;SELECT DRIVE
012072  016777  166604  166532          MOV     SLVN,@TC        ;SELECT SLAVE
012100  000207                          RTS     PC              ;RETURN
```

```
2214                                            ;MAG TAPE INTERRUPT HANDLER**********
2215
2216  012102  000240                    MTINT:  NOP
2217  012104  022626                            CMP     (SP)+,(SP)+     ;RESET STACK POINTER
2218  012106  000240                            NOP
2219  012110  000240                            NOP
2220  012112  000177  166616                    JMP     @RTRN           ;RETURN TO CALLER
2221
2222                                            ;TTY INTERRUPT HANDLER**********
2223
2224  012116  000240                    TTINT:  NOP
2225  012120  000240                            NOP
2226  012122  000240                            NOP
2227  012124  000002                            RTI
2228
2229                                            ;BUS ADDRESS TRAP HANDLER**********
2230
2231  012126  000240                    TRAP:   NOP
2232  012130  032777  020000  166500            BIT     #20000,@SWR     ;SEE IF SHOULD PRINT ERRORS
2233  012136  001020                            BNE     TRAP2           ;IF NOT: BR
2234  012140  005767  166530                    TST     HDRFL           ;SEE IF DONE HEADER
2235  012144  001006                            BNE     TRAP1           ;IF SO: BR
2236  012146  005267  166522                    INC     HDRFL           ;ELSE SET HEADER FLAG
2237  012152  016704  166520                    MOV     EMADDR,R4
2238  012156  004767  000322                    JSR     PC,TTOUT        ;PRINT HEADER
2239  012162  012704  014375            TRAP1:  MOV     #MSG24,R4
2240  012166  004767  000312                    JSR     PC,TTOUT        ;PRINT ERROR
2241  012172  010103                            MOV     R1,R3
2242  012174  004767  000450                    JSR     PC,OCTP         ;PRINT ADDRESS OF TRAP
2243  012200  005777  166432            TRAP2:  TST     @SWR            ;SEE IF HALT ON ERROR
2244  012204  100001                            BPL     TRAPX           ;IF NOT: BR
2245  012206  000000                            HALT
2246  012210  004767  001064            TRAPX:  JSR     PC,CKSWR                ;CHECK FOR CNTL G
2247  012214  022626                            CMP     (SP)+,(SP)+     ;RESET STACK
2248  012216  012767  003026  166536            MOV     #FT1A,SCOLP     ;SET SCOPE ADDRESS
2249  012224  004767  177512                    JSR     PC,SCOPE        ;GO SEE IF SCOPE LOOP
2250  012230  005767  166554                    TST     RHTF            ;SEE IF INITIAL ADDRESS TEST
2251  012234  001402                            BEQ     TRAPXX          ;IF NOT: BR
2252  012236  000167  167456                    JMP     STOB            ;ELSE REDO ADDRESS REQUEST
2253  012242  000167  170564            TRAPXX: JMP     FT1B            ;RETURN TO TEST 1
2254
```

```
                                        ;*********************************************************
                                        ;TTY ENTRY SUBROUTINE:
                                        ;
                                        ;THIS SUBROUTINE IS USED BY THE TEST CONDITION
                                        ;ENTRY ROUTINE TO READ THE RESPONSE ENTERED
                                        ;AT THE TTY AND CHECK THEM FOR LEGALITY AND
                                        ;LIMITS.  ALL RESPONSE MUST BE TYPED IN OCTAL
                                        ;(0-7) AND MUST FALL WITHIN THE LIMITS SET BY
                                        ;THE CALLING ROUTINE.
                                        ;IF AN ENTRY IS ILLEGAL OR OUTSIDE THE LIMITS,
                                        ;A QUESTION MARK IS TYPED (?) AND THE RESPONSE
                                        ;MAY BE REENTERED.
                                        ;ENTRIES MAY NOT EXCEED SIX (6) CHARACTERS AND
                                        ;MAY BE TERMINATED AT LESS THAN SIX BY TYPING A
                                        ;CARRIAGE RETURN
                                        ;*********************************************************

012246  005067  166466        TTR:    CLR     TEMP1           ;CLEAR FIRST CHARACTER FLAG
012252  005000                TTR0:   CLR     R0
012254  004767  000152                JSR     PC,TTIN         ;GO READ CHARACTER
012260  122767  000215  166402        CMPB    #215,TIB        ;SEE IF CR
012266  001005                        BNE     TTR1            ;IF NOT: BR
012270  005767  166444                TST     TEMP1           ;SEE IF FIRST CHARACTER
012274  001446                        BEQ     TTR5            ;IF SO: BR
012276  000167  000066                JMP     TTR2            ;ELSE GO LOAD VALUE
012302  122767  000260  166360  TTR1:  CMPB    #260,TIB        ;SEE IF CHAR IS LESS THAN 0
012310  101402                        BLOS    TTR1A           ;IF NOT: BR
012312  000167  000076                JMP     TINER           ;ELSE GO TO ERROR
012316  122767  000270  166344  TTR1A: CMPB    #270,TIB        ;SEE IF CHAR IS GREATER THAN 7
012324  101002                        BHI     TTR1B           ;IF NOT: BR
012326  000167  000062                JMP     TINER           ;ELSE GO TO ERROR
012332  005267  166402        TTR1B:  INC     TEMP1           ;SET FIRST CHARACTER FLAG
012336  000241                        CLC
012340  006100                        ROL     R0
012342  000241                        CLC
012344  006100                        ROL     R0              ;SHIFT 3 LEFT
012346  000241                        CLC
012350  006100                        ROL     R0
012352  042767  177770  166310        BIC     #177770,TIB     ;STRIP ASCII
012360  056700  166304                BIS     TIB,R0          ;LOAD CHARACTER
012364  005301                        DEC     R1              ;SEE IF DONE
012366  001332                        BNE     TTR0            ;IF NOT: BR
012370  020002                TTR2:   CMP     R0,R2           ;SEE IF EXCEEDED MAXIMUM LIMIT
012372  101402                        BLOS    TTR3            ;IF NOT: BR
012374  000167  000014                JMP     TINER           ;ELSE GO TO ERROR
012400  020300                TTR3:   CMP     R3,R0           ;SEE IF BELOW MINIMUM LIMIT
012402  101402                        BLOS    TTR4            ;IF NOT: BR
012404  000167  000004                JMP     TINER           ;ELSE GO TO ERROR
012410  010015                TTR4:   MOV     R0,(R5)         ;LOAD VALUE
012412  000207                TTR5:   RTS     PC              ;EXIT
```

```
2306                                            ;TTY ENTRY ERROR SUBROUTINE**********
2307
2308  012414  012704  014101          TINER:  MOV     #MSG7,R4
2309  012420  004767  000060                  JSR     PC,TTOUT        ;PRINT?
2310  012424  162716  000020                  SUB     #20,(SP)        ;RESET SP TO START OF VALUE ROUTINE
2311  012430  000207                          RTS     PC              ;REDO VALUE ENTRY
2312
2313                                            ;TTY READ SUBROUTINE**********
2314
2315  012432  005077  166202          TTIN:   CLR     @TKS
2316  012436  005077  166200                  CLR     @TKB
2317  012442  005067  166222                  CLR     TIB
2318  012446  005277  166166                  INC     @TKS
2319  012452  105777  166162          TTIN1:  TSTB    @TKS
2320  012456  100375                          BPL     TTIN1
2321  012460  017767  166156  166202          MOV     @TKB,TIB
2322  012466  105777  166152          TTIN2:  TSTB    @TPS
2323  012472  100375                          BPL     TTIN2
2324  012474  116777  166170  166144          MOVB    TIB,@TPB
2325  012502  000207                          RTS     PC
2326
2327                                            ;TTY OUTPUT SUBROUTINE************
2328
2329  012504  112467  166156          TTOUT:  MOVB    (R4)+,TOB
2330  012510  122767  000043  166150          CMPB    #43,TOB
2331  012516  001446                          BEQ     TEX
2332  012520  122767  000045  166140          CMPB    #45,TOB
2333  012526  001403                          BEQ     TCRLF
2334  012530  004767  000064                  JSR     PC,TOG
2335  012534  000763                          BR      TTOUT
2336  012536  112767  000015  166122  TCRLF:  MOVB    #15,TOB
2337  012544  004767  000050                  JSR     PC,TOG
2338  012550  012703  000004                  MOV     #4,R3
2339  012554  005067  166106          TCRLFA: CLR     TOB
2340  012560  004767  000034                  JSR     PC,TOG
2341  012564  005303                          DEC     R3
2342  012566  001372                          BNE     TCRLFA          ;DO FILLERS
2343  012570  112767  000012  166070          MOVB    #12,TOB
2344  012576  004767  000016                  JSR     PC,TOG
2345  012602  105767  166216                  TSTB    RDSW
2346  012606  100401                          BMI     1$
2347  012610  000735                          BR      TTOUT
2348  012612  005067  166206          1$:     CLR     RDSW
2349  012616  000406                          BR      TEX
2350  012620  105777  166020          TOG:    TSTB    @TPS
2351  012624  100375                          BPL     TOG
2352  012626  116777  166034  166012          MOVB    TOB,@TPB
2353  012634  000207                  TEX:    RTS     PC
2354
2355
```

```
                                                ;OCTAL OUTPUT SUBROUTINE************
                                                
012636  012767  000001  000222  OCTPE:  MOV     #1,OFL
012644  010304                        MOV     R3,R4
012646  000410                        BR      OCTPO
012650  005067  000212          OCTP:   CLR     OFL             ;CLEAR FLAG FOR LEADING ZERO
012654  010304                  OCTPE1: MOV     R3,R4           ;SEE IF NUMBER IS ZERO
012656  001004                        BNE     OCTPO           ;IF NOT ZERO: BR
012660  004767  000162                JSR     PC,OCTPG1       ;ELSE PRINT ZERO
012664  000167  000120                JMP     OCTP3           ;SPACE AND EXIT
012670  032704  100000          OCTPO:  BIT     #100000,R4      ;SEE IF MSD = 1
012674  001406                        BEQ     OCTP1           ;IF NOT: BR
012676  012704  000001                MOV     #1,R4
012702  004767  000116                JSR     PC,OCTPG        ;PRINT 1
012706  000167  000006                JMP     OCTP2
012712  005004                  OCTP1:  CLR     R4
012714  004767  000104                JSR     PC,OCTPG        ;PRINT 0
012720  010304                  OCTP2:  MOV     R3,R4
012722  006004                        ROR     R4
012724  006004                        ROR     R4
012726  006004                        ROR     R4              ;POSITION DIGIT
012730  006004                        ROR     R4
012732  000304                        SWAB    R4
012734  004767  000064                JSR     PC,OCTPG        ;PRINT DIGIT 2
012740  010304                        MOV     R3,R4
012742  006004                        ROR     R4
012744  000304                        SWAB    R4
012746  004767  000052                JSR     PC,OCTPG        ;PRINT DIGIT 3
012752  010304                        MOV     R3,R4
012754  006104                        ROL     R4
012756  006104                        ROL     R4
012760  000304                        SWAB    R4
012762  004767  000036                JSR     PC,OCTPG        ;PRINT DIGIT 4
012766  010304                        MOV     R3,R4
012770  006004                        ROR     R4
012772  006004                        ROR     R4
012774  006004                        ROR     R4
012776  004767  000022                JSR     PC,OCTPG
013002  010304                        MOV     R3,R4
013004  004767  000014                JSR     PC,OCTPG        ;PRINT DIGIT 5
013010  012767  000240  165650  OCTP3:  MOV     #240,TOB
013016  004767  177576                JSR     PC,TOG          ;PRINT SPACE
013022  000207                        RTS     PC              ;EXIT
013024  042704  177770          OCTPG:  BIC     #177770,R4
013030  001004                        BNE     OCTPGO
013032  005767  000030                TST     OFL
013036  001001                        BNE     OCTPGO
013040  000207                        RTS     PC
013042  005267  000020          OCTPGO: INC     OFL
013046  052704  000260          OCTPG1: BIS     #260,R4
013052  010467  165610                MOV     R4,TOB
013056  004767  177536                JSR     PC,TOG
013062  010304                        MOV     R3,R4
013064  000207                        RTS     PC
013066  000000                  OFL:    0               ;FIRST CHAR FLAG
```

```
2412                                                    ;DATA CHARACTER OUTPUT SUBROUTINE************
2413
2414  013070  005067  165572          DOUT:   CLR     TOB
2415  013074  012704  000010                  MOV     #10,R4          ;SET NUMBER TO PRINT
2416  013100  110367  165562                  MOVB    R3,TOB
2417  013104  105777  165534          DOUT1:  TSTB    @TPS
2418  013110  100375                          BPL     DOUT1
2419  013112  132767  000200  165546          BITB    #200,TOB
2420  013120  001404                          BEQ     DOUT2
2421  013122  012777  000061  165516          MOV     #061,@TPB
2422  013130  000403                          BR      DOUT3
2423  013132  012777  000060  165506  DOUT2:  MOV     #060,@TPB
2424  013140  006167  165522          DOUT3:  ROL     TOB
2425  013144  005304                          DEC     R4
2426  013146  001356                          BNE     DOUT1
2427  013150  000207                          RTS     PC
2428  013152  016703  165566          DOUTD:  MOV     TEMP3,R3
2429  013156  000303                          SWAB    R3
2430  013160  004767  177704                  JSR     PC,DOUT
2431  013164  016703  165554                  MOV     TEMP3,R3
2432  013170  004767  177674                  JSR     PC,DOUT
2433  013174  000207                          RTS     PC
2434
2435                                                    ;TU16 SERIAL NUMBER PRINT SUBROUTINE**********
2436
2437  013176  010304          SNPT:   MOV     R3,R4
2438  013200  000304                  SWAB    R4
2439  013202  006004                  ROR     R4
2440  013204  006004                  ROR     R4
2441  013206  006004                  ROR     R4
2442  013210  006004                  ROR     R4              ;GET FIRST DIGIT
2443  013212  004767  000036          JSR     PC,SNPG         ;GO PRINT
2444  013216  010304                  MOV     R3,R4
2445  013220  000304                  SWAB    R4              ;GET SECOND DIGIT
2446  013222  004767  000026          JSR     PC,SNPG         ;GO PRINT
2447  013226  010304                  MOV     R3,R4
2448  013230  006004                  ROR     R4
2449  013232  006004                  ROR     R4
2450  013234  006004                  ROR     R4
2451  013236  006004                  ROR     R4              ;GET THIRD DIGIT
2452  013240  004767  000010          JSR     PC,SNPG         ;GO PRINT
2453  013244  010304                  MOV     R3,R4           ;GET FOURTH DIGIT
2454  013246  004767  000002          JSR     PC,SNPG         ;GO PRINT
2455  013252  000207                  RTS     PC              ;EXIT
2456  013254  012767  000260  165404  SNPG:   MOV     #260,TOB        ;SET BASE = 0
2457  013262  042704  177760          BIC     #177760,R4      ;MASK DIGIT
2458  013266  050467  165374          BIS     R4,TOB          ;SET ASCII
2459  013272  004767  177322          JSR     PC,TOG          ;TYPE DIGIT
2460  013276  000207                  RTS     PC              ;RETURN
2461
2462                                                    ;CKSWR ROUTINE THAT ALLOWS THE LOADING OF LOC.176, SWREG**********
2463                                                    ;FROM THE TTY AT SELECTED POINTS WITHIN THE PROGRAM**********
2464
2465  013300  022767  000176  165330  CKSWR:  CMP     #SWREG,SWR              ;SOFTWARE SWITCH REG PRESENT
2466  013306  001041                          BNE     OUT                     ;NO, GET OUT
2467  013310  105777  165324                  TSTB    @TKS                    ;YES,WAIT FOR
```

```
2468  013314  100036                        BPL     OUT                     ;READY, GET CHARACTER
2469  013316  017767  165320  165344        MOV     @TKB,TIB                ;AND STRIP OFF
2470  013324  042767  177600  165336        BIC     #177600,TIB             ;THE GARBAGE
2471  013332  022767  000007  165330        CMP     #7,TIB          ;IS IT A ^G
2472  013340  001024                        BNE     OUT
2473  013342  012704  016700                MOV     #$CNTG,R4
2474  013346  004767  177132                JSR     PC,TTOUT
2475  013352  012704  016704        CNTLU:  MOV     #$MSWR,R4
2476  013356  004767  177122                JSR     PC,TTOUT
2477  013362  017703  165250                MOV     @SWR,R3
2478  013366  004767  177244                JSR     PC,OCTPE
2479  013372  012704  016713                MOV     #$MNEW,R4
2480  013376  004767  177102                JSR     PC,TTOUT
2481  013402  005037  001020                CLR     @#TEMPST
2482  013406  004767  000002                JSR     PC,$READ                ;GO READ A LINE
2483  013412  000207                OUT:    RTS     PC                      ;RETURN TO MAIN BODY OF PROGRAM
2484
2485  013414  005067  165400        $READ:  CLR     TEMPST
2486  013420  012767  000007  165374        MOV     #7,COUNT
2487  013426  004767  177000        1$:     JSR     PC,TTIN         ;GO  READ A CHARACTER
2488  013432  042767  177600  165230        BIC     #177600,TIB     ;STRIP OFF GARBAGE
2489  013440  122767  000025  165222        CMPB    #25,TIB         ;IS IT A ^U?
2490  013446  001002                        BNE     2$              ;BRANCH IF NOT
2491  013450  005726                3$:     TST     (SP)+           ;POP THE STACK
2492  013452  000737                        BR CNTLU                ;START OVER
2493  013454  122767  000015  165206  2$:     CMPB    #15,TIB         ;IS IT A <CR>?
2494  013462  001013                        BNE     4$              ;BRANCH IF NOT
2495  013464  012767  000200  165332        MOV     #200,RDSW
2496  013472  004767  177040                JSR     PC,TCRLF        ;ECHO IT WITH <LF>
2497  013476  022767  000007  165316        CMP     #7,COUNT        ;WAS IT FIRST CHARACTER
2498  013504  001037                        BNE     7$              ;CHANGE SWR IF NOT FIRST ONE
2499  013506  005726                8$:     TST     (SP)+           ;POP THE STACK
2500  013510  000740                        BR      OUT             ;GET OUT
2501  013512  122767  000060  165150  4$:     CMPB    #60,TIB
2502  013520  003004                        BGT     5$
2503  013522  122767  000067  165140        CMPB    #67,TIB
2504  013530  003005                        BGT     6$
2505  013532  012704  016723                5$:     MOV     #$QUEST,R4
2506  013536  004767  176742                JSR     PC,TTOUT
2507  013542  000742                        BR      3$              ;START OVER IF NOT LEGAL CHARACTER
2508  013544  006367  165250                6$:     ASL     TEMPST
2509  013550  006367  165244                ASL     TEMPST
2510  013554  006367  165240                ASL     TEMPST
2511  013560  142767  000060  165102        BICB    #60,TIB         ;GET NITTY-GRITTY
2512  013566  156767  165076  165224        BISB    TIB,TEMPST
2513  013574  005367  165222                DEC     COUNT           ;ONLY WANT 6   DIGITS
2514  013600  001754                        BEQ     5$
2515  013602  000711                        BR      1$
2516  013604  016777  165210  165024  7$:     MOV     TEMPST,@SWR     ;CHANGE SWITCH REGISTER CONTENTS
2517  013612  000735                        BR      8$
2518
```

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2519                                                    ;MESSAGE TABLE*****
2520
2521  013614  041445  030523  020040  MSG1:   .ASCII  /%CS1    WC     BA     FC     CS2    /
2522  013622  020040  041527  020040
2523  013630  020040  041040  020101
2524  013636  020040  020040  041506
2525  013644  020040  020040  041440
2526  013652  031123  020040  020040
2527  013660  051504  020040  020040          .ASCII  /DS     ER     TC%#/
2528  013666  042440  020122  020040
2529  013674  020040  041524  021445
2530  013702  051045  053505  047111  MSG2:   .ASCII  /%REWIND ERROR#/
2531  013710  020104  051105  047522
2532  013716  021522
2533  013720  022445  046524  031060  MSG3:   .ASCII  /%%TM02-TU16 BASIC FUNCTION TEST (DZTUB-E)%/
2534  013726  052055  030525  020066
2535  013734  040502  044523  020103
2536  013742  052506  041516  044524
2537  013750  047117  052040  051505
2538  013756  020124  042050  052132
2539  013764  041125  042455  022451
2540  013772  047105  042524  020122          .ASCII  /ENTER CONDITIONS IN OCTAL%#/
2541  014000  047503  042116  052111
2542  014006  047511  051516  044440
2543  014014  020116  041517  040524
2544  014022  022514     043
2545  014025     045  042522  044507  MSG4:   .ASCII  /%REGISTER START = #/
2546  014032  052123  051105  051440
2547  014040  040524  052122  036440
2548  014046  021440
2549  014050  053045  041505  047524  MSG5:   .ASCII  /%VECTOR = #/
2550  014056  020122  020075     043
2551  014063     045  047105  020104  MSG6:   .ASCII  /%END OF PASS #/
2552  014070  043117  050040  051501
2553  014076  020123     043
2554  014101     040  020077     043  MSG7:   .ASCII  / ? #/
2555  014105     045     043          MSG8:   .ASCII  /%#/
2556  014107     045  047520  044523  MSG9:   .ASCII  /%POSITION ERROR: #/
2557  014114  044524  047117  042440
2558  014122  051122  051117  020072
2559  014130     043
2560  014131     045  051104  053111  MSG10:  .ASCII  /%DRIVE NUMBER: #/
2561  014136  020105  052516  041115
2562  014144  051105  020072     043
2563  014151     045  046123  053101  MSG11:  .ASCII  /%SLAVE NUMBER: #/
2564  014156  020105  052516  041115
2565  014164  051105  020072     043
2566  014171     045  051127  052111  MSG12:  .ASCII  /%WRITE ERROR #/
2567  014176  020105  051105  047522
2568  014204  020122     043
2569  014207     045  042522  042101  MSG13:  .ASCII  /%READ REVERSE ERROR #/
2570  014214  051040  053105  051105
2571  014222  042523  042440  051122
2572  014230  051117  021440
2573  014234  051045  040505  020104  MSG14:  .ASCII  /%READ FORWARD ERROR #/
2574  014242  047506  053522  051101
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2575  014250  020104  051105  047522
2576  014256  020122     043
2577  014261     045  051127  052111  MSG15:  .ASCII  /%WRITE TM ERROR #/
2578  014266  020105  046524  042440
2579  014274  051122  051117  021440
2580  014302  051045  053105  051105  MSG16:  .ASCII  /%REVERSE ERROR #/
2581  014310  042523  042440  051122
2582  014316  051117  021440
2583  014322  043045  051117  040527  MSG17:  .ASCII  /%FORWARD ERROR #/
2584  014330  042122  042440  051122
2585  014336  051117  021440
2586  014342  047040  055122  021440  MSG20:  .ASCII  / NRZ #/
2587  014350  050040  020105     043  MSG21:  .ASCII  / PE #/
2588  014355     040  054105  052120  MSG22:  .ASCII  / EXPT: #/
2589  014362  020072     043
2590  014365     040  041522  042126  MSG23:  .ASCII  / RCVD: #/
2591  014372  020072     043
2592  014375     045  052502  020123  MSG24:  .ASCII  /%BUS TRAP: #/
2593  014402  051124  050101  020072
2594  014410     043
2595  014411     045  041527  020072  MSG25:  .ASCII  /%WC: #/
2596  014416     043
2597  014417     045  040502  020072  MSG26:  .ASCII  /%BA: #/
2598  014424     043
2599  014425     045  041104  020072  MSG27:  .ASCII  /%DB: #/
2600  014432     043
2601  014433     045  047111  052111  MSG28:  .ASCII  /%INIT DID NOT CLEAR RH #/
2602  014440  042040  042111  047040
2603  014446  052117  041440  042514
2604  014454  051101  051040  020110
2605  014462     043
2606  014463     045  041523  047040  MSG29:  .ASCII  /%SC NOT RESET BY INIT #/
2607  014470  052117  051040  051505
2608  014476  052105  041040  020131
2609  014504  047111  052111  021440
2610  014512  052045  042522  047040  MSG30:  .ASCII  /%TRE NOT RESET BY INIT #/
2611  014520  052117  051040  051505
2612  014526  052105  041040  020131
2613  014534  047111  052111  021440
2614  014542  041445  031123  047040  MSG31:  .ASCII  /%CS2 NOT RESET BY INIT #/
2615  014550  052117  051040  051505
2616  014556  052105  041040  020131
2617  014564  047111  052111  021440
2618  014572  042045  052114  047040  MSG32:  .ASCII  /%DLT NOT SET #/
2619  014600  052117  051440  052105
2620  014606  021440
2621  014610  051445  020103  047516  MSG33:  .ASCII  /%SC NOT SET #/
2622  014616  020124  042523  020124
2623  014624     043
2624  014625     045  051124  020105  MSG34:  .ASCII  /%TRE NOT SET #/
2625  014632  047516  020124  042523
2626  014640  020124     043
2627  014643     045  051111  047040  MSG35:  .ASCII  /%IR NOT SET BY INIT #/
2628  014650  052117  051440  052105
2629  014656  041040  020131  047111
2630  014664  052111  021440
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2631  014670  047445  020122  047516  MSG36:  .ASCII  /%OR NOT RESET BY INIT #/
2632  014676  020124  042522  042523
2633  014704  020124  054502  044440
2634  014712  044516  020124     043
2635  014717     045  051117  047040  MSG37:  .ASCII  /%OR NOT RESET BY 1 SILO ENTRY #/
2636  014724  052117  051040  051505
2637  014732  052105  041040  020131
2638  014740  020061  044523  047514
2639  014746  042440  052116  054522
2640  014754  021440
2641  014756  047445  020122  047516  MSG38:  .ASCII  /%OR NOT SET BY SILO FULL #/
2642  014764  020124  042523  020124
2643  014772  054502  051440  046111
2644  015000  020117  052506  046114
2645  015006  021440
2646  015010  041045  042101  051440  MSG39:  .ASCII  /%BAD SILO READ #/
2647  015016  046111  020117  042522
2648  015024  042101  021440
2649  015030  044445  020122  047516  MSG40:  .ASCII  /%IR NOT RESET BY SILO FULL#/
2650  015036  020124  042522  042523
2651  015044  020124  054502  051440
2652  015052  046111  020117  052506
2653  015060  046114     043
2654  015063     040  047516  026516  MSG41:  .ASCII  / NON-EXIST DRIVE#/
2655  015070  054105  051511  020124
2656  015076  051104  053111  021505
2657  015104  047040  047117  042455  MSG42:  .ASCII  / NON-EXIST SLAVE#/
2658  015112  044530  052123  051440
2659  015120  040514  042526     043
2660  015125     040  042523  044522  MSG43:  .ASCII  / SERIAL NO: #/
2661  015132  046101  047040  035117
2662  015140  021440
2663  015142  042445  040522  042523  MSG44:  .ASCII  /%ERASE HEAD INOPERATIVE/
2664  015150  044040  040505  020104
2665  015156  047111  050117  051105
2666  015164  052101  053111     105
2667  015171     045  044103  041505          .ASCII  /%CHECK POLARITY#/
2668  015176  020113  047520  040514
2669  015204  044522  054524     043
2670  015211     045  051105  051501  MSG45:  .ASCII  /%ERASE HEAD POLARITY WRONG#/
2671  015216  020105  042510  042101
2672  015224  050040  046117  051101
2673  015232  052111  020131  051127
2674  015240  047117  021507
2675  015244  051445  052105  052455  MSG46:  .ASCII  /%SET-UP WRITE ERROR#/
2676  015252  020120  051127  052111
2677  015260  020105  051105  047522
2678  015266  021522
2679  015270  051445  040520  042503  MSG47:  .ASCII  /%SPACE FORWARD ERROR#/
2680  015276  043040  051117  040527
2681  015304  042122  042440  051122
2682  015312  051117     043
2683  015315     045  050123  041501  MSG48:  .ASCII  /%SPACE REVERSE ERROR#/
2684  015322  020105  042522  042526
2685  015330  051522  020105  051105
2686  015336  047522  021522
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 2687  015342  041045  043125  042506  MSG49:  .ASCII  /%BUFFERED WRITE ERROR#/
 2688  015350  042522  020104  051127
 2689  015356  052111  020105  051105
 2690  015364  047522  021522
 2691  015370  041045  052117  051440  MSG50:  .ASCII  /%BOT SET AFTER BUFFERED WRITE#/
 2692  015376  052105  040440  052106
 2693  015404  051105  041040  043125
 2694  015412  042506  042522  020104
 2695  015420  051127  052111  021505
 2696  015426  047045  020117  047502  MSG51:  .ASCII  /%NO BOT FROM READ IN PRESET#/
 2697  015434  020124  051106  046517
 2698  015442  051040  040505  020104
 2699  015450  047111  050040  042522
 2700  015456  042523  021524
 2701  015462  052045  020103  047111  MSG52:  .ASCII  /%TC INCORRECT #/
 2702  015470  047503  051122  041505
 2703  015476  020124     043
 2704  015501     045  046123  053101  MSG53:  .ASCII  /%SLAVE NOT OFF LINE#/
 2705  015506  020105  047516  020124
 2706  015514  043117  020106  044514
 2707  015522  042516     043
 2708  015525     045  051045  051505  MSG54:  .ASCII  /%%RESET SLAVE TO ON LINE BEFORE CONTINUING#/
 2709  015532  052105  051440  040514
 2710  015540  042526  052040  020117
 2711  015546  047117  046040  047111
 2712  015554  020105  042502  047506
 2713  015562  042522  041440  047117
 2714  015570  044524  052516  047111
 2715  015576  021507
 2716  015600  047045  055122  047440  MSG55:  .ASCII  /%NRZ ONLY: #/
 2717  015606  046116  035131  021440
 2718  015614  044440  042524  035122  MSG56:  .ASCII  / ITER: #/
 2719  015622  021440
 2720  015624  052045  020115  047516  MSG57:  .ASCII  /%TM NOT SET#/
 2721  015632  020124  042523  021524
 2722  015640  042445  052111  042510  MSG60:  .ASCII  /%EITHER TAPE NOT ERASED OR OPI PROBLEM#/
 2723  015646  020122  040524  042520
 2724  015654  047040  052117  042440
 2725  015662  040522  042523  020104
 2726  015670  051117  047440  044520
 2727  015676  050040  047522  046102
 2728  015704  046505     043
 2729  015707     045  044122  030461  MSG61:  .ASCII  /%RH11 OR RH70: #/
 2730  015714  047440  020122  044122
 2731  015722  030067  020072     043
 2732  015727     045  044122  047440  MSG62:  .ASCII  /%RH ONLY: #/
 2733  015734  046116  035131  021440
 2734
```

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                                                ;TEST HEADERS*****

015742  022445  052106  035061  MSFT1:  .ASCII  /%%FT1:RH ADDRESSING #/
015750  044122  040440  042104
015756  042522  051523  047111
015764  020107     043
015767     045  043045  031124  MSFT2:  .ASCII  /%%FT2:RH REGISTER BITS TEST #/
015774  051072  020110  042522
016002  044507  052123  051105
016010  041040  052111  020123
016016  042524  052123  021440
016024  022445  052106  035063  MSFT3:  .ASCII  /%%FT3:RH INITIALIZE TEST #/
016032  044122  044440  044516
016040  044524  046101  055111
016046  020105  042524  052123
016054  021440
016056  022445  052106  035064  MSFT4:  .ASCII  /%%FT4:RH11 SILO TEST 1 #/
016064  044122  030461  051440
016072  046111  020117  042524
016100  052123  030440  021440
016106  022445  052106  035065  MSFT5:  .ASCII  /%%FT5:RH11 SILO TEST 2 #/
016114  044122  030461  051440
016122  046111  020117  042524
016130  052123  031040  021440
016136  022445  052106  035066  MSFT6:  .ASCII  /%%FT6:RH11 SILO TEST 3 #/
016144  044122  030461  051440
016152  046111  020117  042524
016160  052123  031440  021440
016166  022445  052106  035067  MSFT7:  .ASCII  /%%FT7:RH11 SILO TEST 4 #/
016174  044122  030461  051440
016202  046111  020117  042524
016210  052123  032040  021440
016216  022445  052106  030061  MSFT10: .ASCII  /%%FT10:RH11 SILO TEST 5 #/
016224  051072  030510  020061
016232  044523  047514  052040
016240  051505  020124  020065
016246     043
016247     045  043045  030524  MSFT11: .ASCII  /%%FT11:NOP TEST#/
016254  035061  047516  020120
016262  042524  052123     043
016267     045  043045  030524  MSFT12: .ASCII  /%%FT12:REWIND TEST#/
016274  035062  042522  044527
016302  042116  052040  051505
016310  021524
016312  022445  052106  031461  MSFT13: .ASCII  /%%FT13:WRITE-READ TEST#/
016320  053472  044522  042524
016326  051055  040505  020104
016334  042524  052123     043
016341     045  043045  030524  MSFT14: .ASCII  /%%FT14:SPACE TEST#/
016346  035064  050123  041501
016354  020105  042524  052123
016362     043
016363     045  043045  030524  MSFT15: .ASCII  /%%FT15:ERASE TEST#/
016370  035065  051105  051501
016376  020105  042524  052123
016404     043
```

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2791  016405    045  043045  030524  MSFT16: .ASCII  /%%FT16:TAPE MARK WRITE-READ TEST#/
2792  016412 035066  040524  042520
2793  016420 046440  051101  020113
2794  016426 051127  052111  026505
2795  016434 042522  042101  052040
2796  016442 051505  021524
2797  016446 022445  052106  033461  MSFT17: .ASCII  /%%FT17:TM SPACE TEST #/
2798  016454 052072  020115  050123
2799  016462 041501  020105  042524
2800  016470 052123  021440
2801  016474 022445  052106  030062  MSFT20: .ASCII  /%%FT20:WRITE CHECK TEST #/
2802  016502 053472  044522  042524
2803  016510 041440  042510  045503
2804  016516 052040  051505  020124
2805  016524    043
2806  016525    045  043045  031124  MSFT21: .ASCII  /%%FT21:ERASE HEAD TEST#/
2807  016532 035061  051105  051501
2808  016540 020105  042510  042101
2809  016546 052040  051505  021524
2810  016554 022445  052106  031062  MSFT22: .ASCII  /%%FT22:BUFFERED COMMAND TEST#/
2811  016562 041072  043125  042506
2812  016570 042522  020104  047503
2813  016576 046515  047101  020104
2814  016604 042524  052123    043
2815  016611    045  043045  031124  MSFT23: .ASCII  /%%FT23:READ IN PRESET TEST#/
2816  016616 035063  042522  042101
2817  016624 044440  020116  051120
2818  016632 051505  052105  052040
2819  016640 051505  021524
2820  016644 022445  052106  032062  MSFT24: .ASCII  /%%FT24:REWIND-OFF LINE TEST#/
2821  016652 051072  053505  047111
2822  016660 026504  043117  020106
2823  016666 044514  042516  052040
2824  016674 051505  021524
2825  016700 057045  021507          $CNTG:  .ASCII  /%↑G#/
2826  016704 051445  051127  020075  $MSWR:  .ASCII  /%SWR= #/
2827  016712    043
2828  016713    040  047040  053505  $MNEW:  .ASCII  /  NEW= #/
2829  016720 020075    043
2830  016723    077  021445          $QUEST: .ASCII  /?%#/
2831
2832
2833                                          .EVEN
2834  016726 000000                  WDATA:  0
2835         020440                          .=.+1510
2836  020440 000000                  RDATA:  0
2837
2838         000001                          .END
```

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AS      000616          910#
BA      000604          905#    1247    2006*   2092
BADDR   000704          942#    1505*   1523*   1547*   1556*   1557*   1564*   1640*   1703*   1787*   1834*   1846*   1851*
                        1870*   1887*   1914*   1948*   2006
BTRP    000662          931#    1217*   1227*
BTRP2   000664          932#    1218*
CC      000620          911#
CKSWR   013300          1183    1210    1450    1687    2107    2178    2193    2246    2465#
CNTLU   013352          1059    2475#   2492
COUNT   001022          981#    2486*   2497    2513*
CRCNT   001002          973#
CS      000610          907#    1107*   1108*   1110    1122*   1123*   1304*   1315    1344*   1346    1371    1375    1380
                        1386    1410    1414    1464    1478*   1483*   1487    1597*   1895*   2096    2209*   2210*
C1      000600          903#    1088    1109    1220    1307    1311    1348    1350    1922*   1986*   2013*   2032*   2088
DATA0   001030          987#
DATA1   001032          988#
DATA2   001034          989#
DATA3   001036          990#
DATBL   001026          986#    2131
DAT1    011660          987     2148#
DAT1A   011664          2149#   2158    2163
DAT1B   011670          2150#   2152
DAT2    011702          988     2157#
DAT3    011710          989     2162#
DAT4    011720          990     2167#
DAT4A   011726          2169#   2172
DB      000622          912#    1256    1345    1379*   1384*   1406*   1419    1461*   1480*   1484*   1485    1486
DOUT    013070          2414#   2430    2432
DOUTD   013152          2428#
DOUT1   013104          2417#   2418    2426
DOUT2   013132          2420    2423#
DOUT3   013140          2422    2424#
DRVN    000700          940#    1102    1108    1123    2210
DRVTP   000652          927#
DS      000612          908#    1527    1923    1932    1959    1965    1990    2017    2036    2038    2051    2052    2098
DSAV    000752          961#    2051*   2114
DSUP    011566          1542    1833    1869    2126#
DSO     011570          2127#
DS1     011610          2132#   2153    2173
DS2     011630          2136#   2138
DS3     011640          2133    2139#
DS4     011650          2141#   2143
DT      000626          914#    1125    2132
EMADDR  000676          939#    1216*   1236*   1276    1301*   1327    1343*   1368*   1402*   1434    1457*   1476*   1511*
                        1529*   1540*   1585*   1701*   1730*   1766*   1830*   1866*   1910*   1945*   1984*   2040    2067
                        2237
ER      000614          909#    2055    2100
ERADD   000736          955#    1244*   1253*   1264*   1279    1309*   1313*   1319*   1330    1354*   1356*   1358*   1373*
                        1377*   1382*   1390*   1412*   1416*   1468*   1494*   1901*   1934*   1967*   1974*   1993*
ERCHK   011160          1512    1530    1552    1561    1569    1601    1619    1629    1709    1723    1739    1745    1750
                        1775    1794    1808    1841    1848    1853    1877    1879    1893    1931    2050#
ERPT    011204          2053    2055#
ERPTA   011274          2065    2069#
ERPTA1  011226          2057    2059#
ERPTB   011332          2070    2077#
ERPTB1  011344          2078    2080#
```

DZTUBE.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
ERPTC   011374          2081    2086#
ERPTD   011504          2063    2104#
ERPTG   011234          2061#   2120
ERPTX   011514          2060    2105    2107#
ERPTXX  011524          2109#
ERPT1A  011326          2074    2076#
ERRP    000714           946#   1175*   1549*   1559*   1566*   1600*   1618*   1628*   1708*   1721*   1738*   1744*   1749*
                        1774*   1792*   1802*   1816*   1840*   1844*   1849*   1876*   1892*   1929*   2069
ERRP1   000716           947#   2077    2119*   2121*
EXEC    010730          1509    1525    1550    1560    1568    1598    1617    1627    1642    1650    1707    1719    1736
                        1742    1748    1772    1791    1806    1839    1847    1852    1875    1878    1884    1891    1898
                        1918    1927    1952    1956    2002#
EXECA   011002          2008    2011#
EXECB   011010          2010    2012#
EXECC   011030          2017#   2020    2022
EXECX   011050          2018    2023#
EXECXA  011054          2024#   2025
EXECXX  011060          2026#
EXFL    000766           967#
FC      000606           906#   1645    1652    1681    1899    2005*   2011*   2094
FCNT    000706           943#   1503*   1521*   1545*   1590*   1605*   1606    1733*   1786*   1835*   1871*   1882*   1888*
                        1896*   1915*   1949*   2005
FT1     002774           996     997    1216#
FT1A    003026          1221#   1226    2248
FT1B    003032          1223#   2253
FT1X    003044          1224    1227#
FT1XX   003070          1229    1232#
FT10    004550          1010    1011    1474#   1477
FT10A   004604          1480#   1482
FT10ER  004670          1488    1494#
FT10X   004646          1475    1489#   1496
FT10XX  004664          1491    1493#
FT11    004704          1012    1013    1499#   1500
FT12    005022          1014    1015    1517#   1518
FT12A   005102          1527#   1528
FT13    005134          1016    1017    1536#
FT13A   005206          1544#   1580
FT13B   005250          1550#   1554
FT13C   005330          1560#   1563
FT13D   005376          1568#   1571
FT13E   005450          1576    1579#
FT13X   005462          1573    1578    1581#
FT14    005466          1018    1019    1584#
FT14A   005540          1592#   1610
FT14A1  005504          1587#   1693
FT14A2  005634          1603    1605#
FT14A3  005660          1607    1609#
FT14B   005714          1616#   1638
FT14EC  006132          1647    1654#
FT14RE  006140          1646    1653    1656#
FT14RF  006104          1632    1648#
FT14RR  006042          1622    1639#
FT14RO  006212          1665    1667#
FT14R1  006234          1669    1672#
FT14R2  006240          1671    1673#
FT14R3  006312          1658    1684#
```

DZTUBE.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
FT14X   006322          1604    1621    1626    1631    1635    1685    1687#
FT14XX  006356          1689    1691    1694#
FT15    006362          1020    1021    1697#
FT15A   006432          1705#
FT15B   006446          1707#   1713
FT15X   006556          1711    1724#
FT16    006562          1022    1023    1727#
FT16A   006614          1732#
FT16B   006620          1733#   1758
FT16X   007014          1753    1755    1759#
FT17    007024          1024    1025    1765#
FT17A   007044          1768#   1824
FT17B   007050          1769#   1799
FT17C   007210          1789#   1798
FT17D   007260          1782    1800#
FT17D1  007276          1803#   1818
FT17E   007312          1805#   1813
FT17F   007404          1815    1819#
FT17X   007434          1777    1796    1810    1820    1822    1825#
FT2     003074           998     999    1236#
FT2A    003106          1238#   1245    1270
FT2B    003146          1243    1247#   1254
FT2C    003206          1252    1256#   1265
FT2D    003222          1260#   1261
FT2E    003252          1263    1267#
FT2ER   003264          1246    1255    1266    1271#   1976
FT2ERA  003314          1275    1278#
FT2ERB  003366          1273    1289#
FT2ERC  003376          1290    1292#
FT2X    003406          1268    1295#
FT20    007440          1026    1027    1829#
FT20A   007516          1838#   1860
FT20B   007602          1849#
FT20C   007634          1854#
FT20X   007670          1843    1855    1857    1861#
FT21    007700          1028    1029    1866#
FT21A   010036          1885#   1902
FT21X   010172          1900    1904#
FT22    010202          1030    1031    1910#   1935
FT22A   010256          1918#   1920
FT22B   010276          1923#   1924
FT22X   010376          1933    1937#
FT23    010406          1032    1033    1943#   1968    1975
FT23A   010516          1959#   1962    1964
FT23B   010536          1960    1965#
FT23C   010566          1966    1970#
FT23X   010622          1944    1973    1977#
FT24    010626          1034    1035    1982#
FT24A   010662          1988#   1989
FT24X   010714          1991    1995#
FT24XX  010724          1983    1997#
FT3     003420          1000    1001    1301#   1302
FT3A    003474          1308    1311#
FT3B    003516          1312    1315#
FT3ER   003554          1310    1314    1320    1323#   1361    1394    1428    1469    1495    1903    1936    1969    1994
FT3ERA  003606          1326    1330#
```

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FT3ERB  003616          1324    1332#
FT3ERC  003626          1333    1335#
FT3X    003544          1318    1321#
FT4     003636          1002    1003    1341#   1360
FT4ER   003720          1347    1354#
FT4ERA  003730          1349    1356#
FT4ERB  003740          1351    1358#
FT4ERC  003746          1355    1357    1359#
FT4X    003710          1352#   1362
FT5     003764          1004    1005    1366#
FT5A    004006          1369    1370#
FT5B    004034          1372    1375#
FT5C    004056          1376    1379#
FT5D    004106          1381    1384#
FT5E    004120          1386#   1389
FT5ER   004156          1374    1378    1383    1391    1394#
FT5X    004146          1342    1367    1387    1392#
FT6     004166          1006    1007    1400#
FT6A    004210          1403    1404#
FT6B    004216          1406#   1409
FT6C    004254          1411    1414#
FT6D    004276          1415    1418#
FT6DE   004340          1421    1430#
FT6DEA  004372          1437#
FT6DEB  004436          1432    1447#
FT6DEX  004446          1448    1450#
FT6E    004300          1419#   1424
FT6ER   004330          1413    1417    1427#
FT6X    004320          1401    1425#
FT7     004454          1008    1009    1455#   1458
FT7A    004506          1461#   1463
FT7ER   004534          1465    1468#
FT7X    004524          1456    1466#   1470
FUN     000776           971#   1508#   1524#   1548#   1558#   1565#   1595#   1616#   1624#   1641#   1649#   1668    1705#
                        1717#   1735#   1741#   1747#   1769#   1788#   1801#   1814    1817#   1838#   1845#   1850#   1874#
                        1890#   1917#   1951#   1955#   2007    2009    2013
HDRFL   000674           938#   1176#   1274    1278#   1325    1329#   1433    1436#   2064    2066#   2234    2236#
INIT1   012054          1238    1303    1306    1370    1404    1459    1501    1519    1592    1654    1757    1805    1859
                        1925    1946    1954    1985    2031    2045    2108    2208#
INIT2   012064          2210#
ITAMT   000654           928#   2200
ITCNT   000750           960#   2084    2197#   2199#   2200
ITER    012004          1296    1321    1352    1392    1425    1466    1489    1513    1531    1759    1861    1904    1937
                        2193#
ITER0   012022          2197#   2201
ITER1   012030          2196    2199#
ITRLP   000764           966#   1168#   1169#   1200#   1201#   2203
LTADD   000774           970#   1166#   1167#   1168    1170    1177    1198#   1199#   1200
MR      000624           913#
MSFT1   015742          1216    2737#
MSFT10  016216          1476    2767#
MSFT11  016247          1511    2772#
MSFT12  016267          1529    2775#
MSFT13  016312          1540    2779#
MSFT14  016341          1585    1659    2783#
MSFT15  016363          1701    2787#
```

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MSFT16  016405          1730    2791#
MSFT17  016446          1766    2797#
MSFT2   015767          1236    2741#
MSFT20  016474          1830    2801#
MSFT21  016525          1866    2806#
MSFT22  016554          1910    2810#
MSFT23  016611          1945    2815#
MSFT24  016644          1984    2820#
MSFT3   016024          1301    2746#
MSFT4   016056          1343    2751#
MSFT5   016106          1368    2755#
MSFT6   016136          1402    2759#
MSFT7   016166          1457    2763#
MSG1    013614          2086    2521#
MSG10   014131          1100    2560#
MSG11   014151          1115    2563#
MSG12   014171          1549    1738    1792    1876    2566#
MSG13   014207          1559    1744    2569#
MSG14   014234          1566    1749    1892    2573#
MSG15   014261          1774    2577#
MSG16   014302          1672    1802    1844    2580#
MSG17   014322          1670    1816    1849    2583#
MSG2    013702          2042    2530#
MSG20   014342          1663    2072    2586#
MSG21   014350          1666    2075    2587#
MSG22   014355          1281    1439    1674    2588#
MSG23   014365          1285    1443    1679    2590#
MSG24   014375          2239    2592#
MSG25   014411          1244    2595#
MSG26   014417          1253    2597#
MSG27   014425          1264    2599#
MSG28   014433          2601#
MSG29   014463          1309    2606#
MSG3    013720          1063    2533#
MSG30   014512          1313    2610#
MSG31   014542          1319    2614#
MSG32   014572          1354    1468    1494    2618#
MSG33   014610          1356    2621#
MSG34   014625          1358    2624#
MSG35   014643          1373    2627#
MSG36   014670          1377    2631#
MSG37   014717          1382    1390    2635#
MSG38   014756          1416    2641#
MSG39   015010          1437    2646#
MSG4    014025          1065    2545#
MSG40   015030          1412    2649#
MSG41   015063          1112    2654#
MSG42   015104          1127    2657#
MSG43   015125          1130    2660#
MSG44   015142          1901    2663#
MSG45   015211          2670#
MSG46   015244          1600    1708    1840    2675#
MSG47   015270          1628    2679#
MSG48   015315          1618    2683#
MSG49   015342          1929    2687#
MSG5    014050          1074    2549#
```

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MSG50   015370          1934    2691#
MSG51   015426          1967    2696#
MSG52   015462          1974    2701#
MSG53   015501          1993    2704#
MSG54   015525          1995    2708#
MSG55   015600          1150    2716#
MSG56   015614          2082    2718#
MSG57   015624          2119    2720#
MSG6    014063          1203    2551#
MSG60   015640          1721    2722#
MSG61   015707          1134    2729#
MSG62   015727          1141    2732#
MSG7    014101          2308    2554#
MSG8    014105          2555#
MSG9    014107          1661    2556#
MTINT   012102           896    1084    2216#
NRZOF   001012           977#   1152    1577    1688    1754    1821    1856
OCTP    012650          1068    1077    1206    1442    1446    1678    1683    2085    2242    2361#
OCTPE   012636          1284    1288    2089    2091    2093    2095    2097    2099    2101    2103    2358#   2478
OCTPE1  012654          2362#
OCTPG   013024          2369    2372    2379    2383    2388    2393    2395    2399#
OCTPG0  013042          2400    2402    2404#
OCTPG1  013046          2364    2405#
OCTP0   012670          2360    2363    2366#
OCTP1   012712          2367    2371#
OCTP2   012720          2370    2373#
OCTP3   013010          2365    2396#
OFL     013066          2358*   2361*   2401    2404*   2410#
OPDYX   000726           951#   1507*   1538*   1593*   1700*   1729*   1771*   2023
OUT     013412          2466    2468    2472    2483#   2500
PATRN   001006           975#   1541*   1832*   1868*   2128
PC      =%000007         602#   1059*   1064*   1066*   1068*   1073*   1075*   1077*   1082*   1101*   1106*   1113*   1116*
                        1121*   1128*   1131*   1133*   1135*   1140*   1142*   1147*   1151*   1156*   1183*   1204*   1206*
                        1210*   1238*   1246*   1255*   1266*   1277*   1280*   1282*   1284*   1286*   1288*   1292*   1294*
                        1296*   1303*   1306*   1310*   1314*   1320*   1321*   1328*   1331*   1336*   1337*   1352*   1361*
                        1370*   1374*   1378*   1383*   1391*   1392*   1394*   1396*   1404*   1413*   1417*   1425*   1428*
                        1429*   1435*   1438*   1440*   1442*   1444*   1446*   1450*   1451*   1459*   1466*   1469*   1489*
                        1495*   1501*   1509*   1512*   1513*   1519*   1525*   1530*   1531*   1542*   1544*   1550*   1552*
                        1560*   1561*   1568*   1569*   1587*   1592*   1598*   1601*   1617*   1619*   1622*   1627*   1629*
                        1632*   1642*   1650*   1654*   1655*   1660*   1662*   1667*   1673*   1675*   1678*   1680*   1683*
                        1687*   1702*   1707*   1709*   1715*   1719*   1723*   1732*   1736*   1739*   1740*   1742*   1745*
                        1746*   1748*   1750*   1751*   1757*   1759*   1768*   1772*   1775*   1778*   1791*   1794*   1805*
                        1806*   1808*   1811*   1831*   1833*   1839*   1841*   1847*   1848*   1852*   1853*   1859*   1861*
                        1867*   1869*   1875*   1877*   1878*   1879*   1881*   1884*   1886*   1891*   1893*   1898*   1903*
                        1904*   1911*   1918*   1925*   1927*   1931*   1936*   1937*   1946*   1952*   1954*   1956*   1969*
                        1976*   1985*   1994*   1996*   2026*   2031*   2041*   2043*   2045*   2046*   2054*   2068*   2071*
                        2076*   2079*   2083*   2085*   2087*   2089*   2091*   2093*   2095*   2097*   2099*   2101*   2103*
                        2107*   2108*   2109*   2116*   2120*   2122*   2144*   2178*   2182*   2186*   2193*   2198*   2212*
                        2238*   2240*   2242*   2246*   2249*   2274*   2304*   2309*   2311*   2325*   2334*   2337*   2340*
                        2344*   2353*   2364*   2369*   2372*   2379*   2383*   2388*   2393*   2395*   2397*   2398*   2403*
                        2407*   2409*   2427*   2430*   2432*   2433*   2443*   2446*   2452*   2454*   2455*   2459*   2460*
                        2474*   2476*   2478*   2480*   2482*   2483*   2487*   2496*   2506*
PCNTR   001016           979#   1157*   1205    1211*
PEXFL   000770           968#
PFLG    000732           953#
PSW     000634           920#   1044*
```

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RCNT    000712   945#  1539*  1553*  1555*  1562*  1567*  1570*  1579*  1588*  1609*  1706*  1712*  1765*
                1781   1783*  1784   1804*  1812*
RDATA   020440   1556   1640   1703   1887   2140   2836#
RDSW    001024    982#  2345   2348*  2495*
RDYDX   000724    950#  1506*  1537*  1594*  1699*  1718*  1728*  1770*  1926*  2015
REGS    000660    930#  1067   1069   1086
RFD     000722    949#  1613*  1637*  1651
RHOF    001014    978#  1143   1148   1490
RHTF    001010    976#  1098*  1228   1230*  2250
RH17F   000672    937#  1136   1341   1366   1400   1455   1474
RRD     000720    948#  1612*  1636*  1644
RTRN    000734    954#  2220
RWND    011062   1544   1587   1702   1715   1732   1768   1831   1867   1881   1886   1911   2030#
RWNDA   011102   2034#  2035
RWNDB   011106   2036#  2037
RWNDX   011152   2039   2045#
R0      =%000000  595#   885*   890*  1060   1083*  1084*  1085*  1086*  1089   1090*  1094*  1096*  1162*
                1163*  1164   1177*  1178   1187*  1188*  1189   1193   1196*  1197*  1199   1219*  1223*
                1239*  1241*  1242   1247*  1250*  1251   1256*  1258*  1262   1287   1345*  1385*  1388*
                1405*  1406   1407*  1408   1418*  1420   1422*  1423   1441   1460*  1461   1462*  1479*
                1480   1481*  1912*  1919*  1957*  1961*  1971*  1972   1987*  1988*  2033*  2034*  2203*
                2204   2273*  2288*  2290*  2292*  2294*  2297   2300   2303
R1      =%000001   596#  1070*  1079*  1087*  1091*  1103*  1118*  1137*  1144*  1153*  1220*  1221   1225*
                1237*  1240   1241   1248   1250   1257   1258   1267   1269*  1283   1315*  1316*  1317
                1419*  1420   1434*  1445   1485*  1486*  1970*  1972   2128*  2130*  2131   2135*  2136*
                2140*  2141*  2148*  2150   2157*  2162*  2167*  2169   2170*  2241   2295*
R2      =%000002   597#  1071*  1080*  1088*  1089*  1093*  1095*  1104*  1119*  1138*  1145*  1154*  1240*
                1242   1248*  1249*  1251   1257*  1262   2134*  2137*  2139*  2142*  2149*  2151*  2168*
                2171*  2297
R3      =%000003   598#  1067*  1072*  1076*  1081*  1105*  1120*  1132*  1139*  1146*  1155*  1205*  1259*
                1260*  1283*  1287*  1441*  1445*  1676*  1677*  1681*  1682*  1958*  1963*  2015*  2021*
                2023*  2024*  2084*  2088*  2090*  2092*  2094*  2096*  2098*  2100*  2102*  2127*  2150*
                2169*  2241*  2300   2338*  2341*  2359   2362   2373   2380   2384   2389   2394   2408
                2416   2428*  2429*  2431*  2437   2444   2447   2453   2477*
R4      =%000004   599#  1063*  1065*  1074*  1100*  1112*  1115*  1127*  1130*  1134*  1141*  1150*  1203*
                1276*  1279*  1281*  1285*  1327*  1330*  1437*  1439*  1443*  1659*  1661*  1663*  1666*
                1670*  1672*  1674*  1679*  1995*  2016*  2019*  2040*  2042*  2055*  2059*  2067*  2069*
                2072*  2075*  2077*  2082*  2086*  2237*  2239*  2308*  2329   2359*  2362*  2366   2368*
                2371*  2373*  2374*  2375*  2376*  2377*  2378*  2380*  2381*  2382*  2384*  2385*  2386*
                2387*  2389*  2390*  2391*  2392*  2394*  2399*  2405*  2406   2408*  2415*  2425*  2437*
                2438*  2439*  2440*  2441*  2442*  2444*  2445*  2447*  2448*  2449*  2450*  2451*  2453*
                2457*  2458   2473*  2475*  2479*  2505*
R5      =%000005   600#  1069*  1078*  1102*  1117*  1136*  1143*  1152*  1644*  1645   1651*  1652   1676
                2303*
SAV1    000754    962#
SAV2    000756    963#
SAV3    000760    964#
SCNT    000730    952#  1615*  1625*  1634*  1803*  2011
SCOLP   000762    965#  1245*  1254*  1265*  1302*  1360*  1369*  1403*  1458*  1477*  1500*  1518*  1551*
                1902*  1935*  1968*  1975*  1992*  2184   2189   2248*
SCOPE   011742   1292   1336   2178#  2249
SCOPE1  011762   2181   2183#
SCOPE2  011774   2185   2187#
SERFL   001000    972#  1602   1620   1630   1710   1776   1795   1809   1842   2050*  2061*  2117
SERNUM  000650    926#
SLVN    000702    941#  1117   1124   1943   2211
```

DZTUBE.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
SN       000630          915#  1132
SNPG     013254         2443  2446  2452  2454  2456#
SNPT     013176         1133  2437#
SP     =%000006          601#  1045* 1047* 1048* 1053  1055  1056  2187  2188  2202  2217  2247  2310*
                        2491  2499
START    001600          886   891   1043#
STFLG    000772          969#  1161* 1185  1192*
STMSK    000746          959#  1174* 1596* 1698* 1722* 1737* 1743* 1773* 1793* 1807* 1930* 2058* 2059
STSCD    002652         1165  1191#
STO      002060         1089#  1092
STOA     001710         1061  1063#
STOB     001720         1065#  2252
STI      002102         1095#  1097
ST1A     002122         1100#  1114  1231
ST2      002220         1111  1115#  1129
ST3      002320         1126  1130#
ST4      002472         1062  1149  1157#
SUSWR    001614         1047#
SWR      000636          921#  1050  1054* 1057  1162  1180  1187  1207  1272  1289  1323  1332  1431
                        1447  1657  1684  1982  2062  2080  2104  2180  2195  2232  2243  2465  2477
                        2516*
SWREG    000176          873#  1054  1057  2465
TC       000632          916#  1124* 1520* 1971  2003* 2073  2102  2211*
TCRLF    012536         2333  2336# 2496
TCRLFA   012554         2339#  2342
TEMPST   001020          980#  2481* 2485* 2508* 2509* 2510* 2512* 2516
TEMP1    000740          956#  1784* 1797* 2272* 2277  2286*
TEMP2    000742          957#
TEMP3    000744          958#  2428  2431
TEND     002726         1172  1194  1203#  1492
TENDX    002760         1208  1210#
TEX      012634         2331  2349  2353#
TIB      000670          936#  2275  2280  2283  2293* 2294  2317* 2321* 2324  2469* 2470* 2471  2488*
                        2489  2493  2501  2503  2511* 2512
TINER    012414         2282  2285  2299  2302  2308#
TKB      000642          923#  2316* 2321  2469
TKS      000640          922#  2315* 2318* 2319  2467
TMCHK    011526         1740  1746  1751  1778  1811  2114#
TMCHK0   011536         2116#  2118
TMCHK1   011540         2115  2117#
TOB      000666          935#  1093  2329* 2330  2332  2336* 2339* 2343* 2352  2396* 2406* 2414* 2416*
                        2419  2424* 2456* 2458*
TOG      012620         2334  2337  2340  2344  2350# 2351  2397  2407  2459
TPB      000646          925#  2324* 2352* 2421* 2423*
TPS      000644          924#  2322  2350  2417
TRAP     012126         1217  2231#
TRAPX    012210         2244  2246#
TRAPXX   012242         2251  2253#
TRAP1    012162         2235  2239#
TRAP2    012200         2233  2243#
TSCD     002476         1160#  1190  1212
TSCD0    002526         1167#  1186
TSCD1    002562         1171  1173#  1202
TSCD2    002606         1179#  1232  1297  1322  1353  1393  1426  1467  1493  1514  1532  1581  1694
                        1724  1760  1825  1862  1905  1938  1977  1997  2044
TSCD3    002622         1181  1183#
```

```
TSRH    002520          1099  1166#
TSTTBL  001040           994# 1166  1198
TTIN    012432          2274  2315# 2487
TTINT   012116           867  2224#
TTIN1   012452          2319# 2320
TTIN2   012466          2322# 2323
TTOUT   012504          1064  1066  1075  1101  1113  1116  1128  1131  1135  1142  1151  1204  1277
                        1280  1282  1286  1328  1331  1435  1438  1440  1444  1660  1662  1667  1673
                        1675  1680  1996  2041  2043  2068  2071  2076  2079  2083  2087  2238  2240
                        2309  2329# 2335  2347  2474  2476  2480  2506
TTR     012246          1073  1082  1106  1121  1140  1147  1156  2272#
TTRO    012254          2274# 2296
TTR1    012302          2276  2280#
TTR1A   012316          2281  2283#
TTR1B   012332          2284  2286#
TTR2    012370          2279  2297#
TTR3    012400          2298  2300#
TTR4    012410          2301  2303#
TTR5    012412          2278  2304#
UDES    001004           974# 1502* 1543* 1572  1574* 1575  1586* 1664  1690  1692* 1704* 1731* 1752
                        1756* 1767* 1819  1823* 1837* 1854  1858* 1873* 1913* 1947* 2003  2056
VECT    000656           929# 1076  1078  1083
WC      000602           904# 1239  2004* 2090
WCNT    000710           944# 1504* 1522* 1546* 1591* 1608* 1716* 1734* 1785* 1836* 1872* 1883* 1889*
                        1897* 1916* 1950* 2004
WDATA   016726          1523  1547  1589* 1787  1834  1870  1914  1948  2127  2135  2834#
$CNTG   016700          2473  2825#
$MNEW   016713          2479  2828#
$MSWR   016704          2475  2826#
$QUEST  016723          2505  2830#
$READ   013414          2482  2485#
.     = 020442           606#  607   609   611   613   615   617   619   621   623   625   627   629
                         631   633   635   637   639   641   643   645   647   649   651   653   655
                         657   659   661   663   665   667   669   671   673   675   677   679   681
                         683   685   687   689   691   693   695   697   699   701   703   705   707
                         709   711   713   715   717   719   721   723   725   727   729   731   733
                         735   737   739   741   743   745   747   749   751   753   755   757   759
                         761   763   765   767   769   771   773   775   777   779   781   783   785
                         787   789   791   793   795   797   799   801   803   805   807   809   811
                         813   815   817   819   821   823   825   827   829   831   833   835   837
                         839   841   843   845   847   849   851   853   855   857   859   861   866#
                         872#  884#  888#  895#  900#  1040#  2835#
```

```
COMMEN      1#
ENDCOM      1#
ESCAPE      1#
GETPRI      1#
GETSWR      1#
MULT        1#
NEWTST      1#
POP         1#
PUSH        1#
REPORT      1#
SETPRI      1#
SETUP       1#
SKIP        1#
SLASH       1#
STARS       1#
SWRSU       1#
TYPBIN      1#
TYPDEC      1#
TYPNAM      1#
TYPNUM      1#
TYPOCS      1#
TYPOCT      1#
TYPTXT      1#
$$ESCA      1#
$$NEWT      1#
$$SKIP      1#
.EQUAT      1#
.HEADE      1#
.KT11       1#
.SETUP      1#
.SWRHI      1#
.$ACTI      1#
.$APTB      1#
.$APTI      1#
.$APTY      1#
.$ASTA      1#
.$CATC      1#
.$CMTA      1#
.$DB2D      1#
.$DB2O      1#
.$DIV       1#
.$EOP       1#
.$ERRO      1#
.$ERRT      1#
.$MULT      1#
.$POWE      1#
.$RAND      1#
.$RDDE      1#
.$RDOC      1#
.$READ      1#
.$R2AZ      1#
.$SAVE      1#
.$SB2D      1#
.$SB2O      1#
.$SCOP      1#
.$SIZE      1#
```

```
.$SUPR      1#
.$TRAP      1#
.$TYPB      1#
.$TYPD      1#
.$TYPE      1#
.$TYPO      1#
.$40CA      1#
.1170       1#
```